Background Report Reference

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Title: Emission Inventory Testing at El Segundo Generating Station No. 1 for Southern California Edison Company

Carnot

Carnot

April 1990

AP-42 ~~[illegible]~~ #4
Section 1.4
(BID Ch. 2)

3

EMISSIONS INVENTORY TESTING AT EL SEGUNDO GENERATING STATION UNIT 1

Prepared for:

SOUTHERN CALIFORNIA EDISON COMPANY
Rosemead, California

For Inclusion in:

Air Toxics Hot Spots Inventory
required under
AB2588

Prepared by:

Arlene C. Bell
Richard B. Booth

CARNOT

formerly the California Division of
ENERGY SYSTEMS ASSOCIATES

Tustin, California

APRIL, 1990

ESR 53304-2052

REPORT CERTIFICATION

The sampling and analysis performed for this report was carried out under my direction and supervision.

Robert A. Finken
Director of Testing Services

Date 5/30/90

I have reviewed all testing details and results in this test report and hereby certify that the test report is authentic and accurate.

Arlene C. Bell
Director of Laboratory Services

Date 5/30/90

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SECTION 1.0

INTRODUCTION

Carnot, formerly the California Division of Energy Systems Associates was contracted by the Southern California Edison Company (SCE) to provide emissions measurement services in support of their preparation of emission inventory reports as required by the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588). AB 2588 requires any facility which meets certain criteria to submit an emission inventory report to local air pollution regulatory agencies. Data is compiled by a combination of source test emission measurements and estimations. These reports are prepared according to inventory plans approved by the Ventura County Air Pollution Control District and by the California Air Resources Board (ARB).

This document is the source test report for the emissions tests that were conducted on SCE's El Segundo Generating Station Unit 1. The results of the tests on this unit were used to generate emissions data for it and other similar sources in the SCE power generating system. These results satisfy the requirements for measurements of substances that must be quantified by a source test as set forth in Appendix D of the Emission Inventory Criteria and Guidelines Regulation (The Regulation) published by the ARB on June 2, 1989.

Triplicate emissions tests were conducted while firing gas fuel for:

- formaldehyde
- benzene

Triplicate emissions tests were conducted while firing residual oil for:

- formaldehyde
- benzene
- polycyclic aromatic hydrocarbons (PAH)
- full set of metals (Arsenic, beryllium, cadmium, copper, lead, manganese, mercury, nickel, selenium, and zinc)
- chromium and hexavalent chromium
- arsenic by CARB Method 423

Two residual oil samples were also analyzed for:

- Btu/lb (HHV)
- carbon, hydrogen, oxygen, nitrogen
- sulfur
- ash content
- chloride
- full set of metals to include:
  arsenic, beryllium, cadmium, total and hexavalent chromium, copper, lead, manganese, mercury, nickel, selenium and zinc

Testing was conducted February 20-25, 1990. The Carnot test team members were Bob Finken, Kevin Hopkins, Bill Osborne, Jim Mulligan, Mike Schmitt, and Arlene Bell. Mr. Michael D. Escarcega of SCE coordinated all test activities.

Table 1-1 summarizes the results of the emissions tests while firing natural gas. Tables 1-2 through 1-4 summarize the results of the emissions tests while firing residual oil. Table 1-5 presents the results of the residual oil analyses. Detailed results are included in Section 4.0.

TABLE 1-1
SUMMARY OF AB2588 EMISSIONS TEST RESULTS
SCE/EL SEGUNDO UNIT 1
NATURAL GAS FUEL
February 25, 1990

Species	
Benzene:	
ppb	ND <1
lb/hr	ND $<5.18 \times 10^{-3}$
lb/MMBtu	ND $<2.81 \times 10^{-6}$
Formaldehyde	
ppb	204
lb/hr	4.07×10^{-1}
lb/MMBtu	2.22×10^{-4}

TABLE 1-2
SUMMARY OF AB2588 EMISSIONS TEST RESULTS
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL
February 20-24, 1990

Species	
Benzene:	
ppb	ND <1
lb/hr	ND <5.78 x 10^{-3}
lb/MMBtu	ND <3.00 x 10^{-6}
Formaldehyde	
ppb	ND <12
lb/hr	ND <2.60 x 10^{-2}
lb/MMBtu	ND <1.48 x 10^{-5}
Total PAH	
$\mu g/m^3$	<9.14
lb/hr	<1.63 x 10^{-2}
lb/MMBtu	<9.10 x 10^{-6}

TABLE 1-3
SUMMARY OF PAH EMISSION RESULTS
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL
February 20-24, 1990

Species	$\mu g/m^3$	lb/hr	lb/MMBtu
Acenaphthene	<0.02	$<4.12 \times 10^{-5}$	$<2.12 \times 10^{-8}$
Acenaphthylene	ND <0.01	ND $<1.31 \times 10^{-5}$	ND $<6.92 \times 10^{-9}$
Anthracene	<0.02	$<2.76 \times 10^{-5}$	$<1.43 \times 10^{-8}$
Benz[a]anthracene	<0.11	$<1.97 \times 10^{-4}$	$<1.02 \times 10^{-7}$
Benzo[b+k]fluoranthene	<0.04	$<6.52 \times 10^{-5}$	$<3.65 \times 10^{-8}$
Benzo[a]pyrene	ND <0.01	ND $<1.31 \times 10^{-5}$	ND $<6.92 \times 10^{-9}$
Benzo[g,h,i]perylene	<0.07	$<1.34 \times 10^{-4}$	$<6.95 \times 10^{-8}$
Chrysene	<0.05	$<8.87 \times 10^{-5}$	$<4.55 \times 10^{-8}$
Dibenz[a,h]anthracene	<0.03	$<4.78 \times 10^{-5}$	$<2.47 \times 10^{-8}$
Fluoranthene	<0.08	$<1.51 \times 10^{-4}$	$<7.78 \times 10^{-8}$
Fluorene	<0.01	$<2.16 \times 10^{-5}$	$<1.12 \times 10^{-8}$
Indeno[1,2,3-cd]pyrene	<0.07	$<1.20 \times 10^{-4}$	$<6.25 \times 10^{-8}$
Naphthalene	8.43	1.51×10^{-2}	8.44×10^{-6}
Phenanthrene	<0.12	$<2.06 \times 10^{-4}$	$<1.08 \times 10^{-7}$
Pyrene	<0.08	$<1.37 \times 10^{-4}$	$<7.07 \times 10^{-8}$
TOTAL PAH	<9.14	$<1.63 \times 10^{-2}$	$<9.10 \times 10^{-6}$

TABLE 1-4
SUMMARY OF METALS EMISSION RESULTS
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL
February 20-24, 1990

Species	$\mu g/m^3$	lb/hr	lb/MMBtu
Arsenic	10.55	1.82×10^{-2}	1.03×10^{-5}
Arsenic (CARB M 423)	1.76	2.98×10^{-3}	1.68×10^{-6}
Beryllium	<0.18	$<3.05 \times 10^{-4}$	$<1.71 \times 10^{-7}$
Cadmium	1.18	2.04×10^{-3}	1.16×10^{-6}
Chromium	6.74	1.19×10^{-2}	6.31×10^{-6}
Hexavalent Chromium	1.38	2.44×10^{-3}	1.31×10^{-6}
Copper	16.63	2.87×10^{-2}	1.65×10^{-5}
Lead	<2.56	$<4.43 \times 10^{-3}$	$<2.51 \times 10^{-6}$
Manganese	8.36	1.44×10^{-2}	8.11×10^{-6}
Mercury	ND <31.62	ND $<5.46 \times 10^{-2}$	ND $<3.08 \times 10^{-5}$
Nickel	346.5	5.99×10^{-1}	3.40×10^{-4}
Selenium	<4.12	$<7.12 \times 10^{-3}$	$<4.03 \times 10^{-6}$
Zinc*	29.68	5.13×10^{-2}	2.81×10^{-5}

* Duplicate sample: Test 7-Mtls excluded because of Zn contamination

TABLE 1-5
FUEL ANALYSIS SUMMARY
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL
February 20-24, 1990

Parameter	
Btu/lb (HHV)	19,166
Carbon, %	85.46
Hydrogen, %	12.58
Nitrogen, %	0.10
Oxygen, %	1.62
Sulfur, %	0.18
Ash, %	0.02
F factor, dscf/MMBtu @ 0% 0_2 and 60°F	9,039
Chlorine, mg/l	132
Arsenic, mg/l	ND <1.1
Beryllium, mg/l	ND <0.22
Cadmium mg/l	ND <0.22
Chromium, mg/l	0.22
Hexavalent Chromium, mg/l	ND <0.50
Copper, mg/l	0.44
Lead, mg/l	ND <1.1
Mercury, mg/l	ND <0.10
Manganese, mg/l	<0.43
Nickel, mg/l	10
Selenium, mg/l	ND <1.0
Zinc, mg/l	0.97

ND - not detected

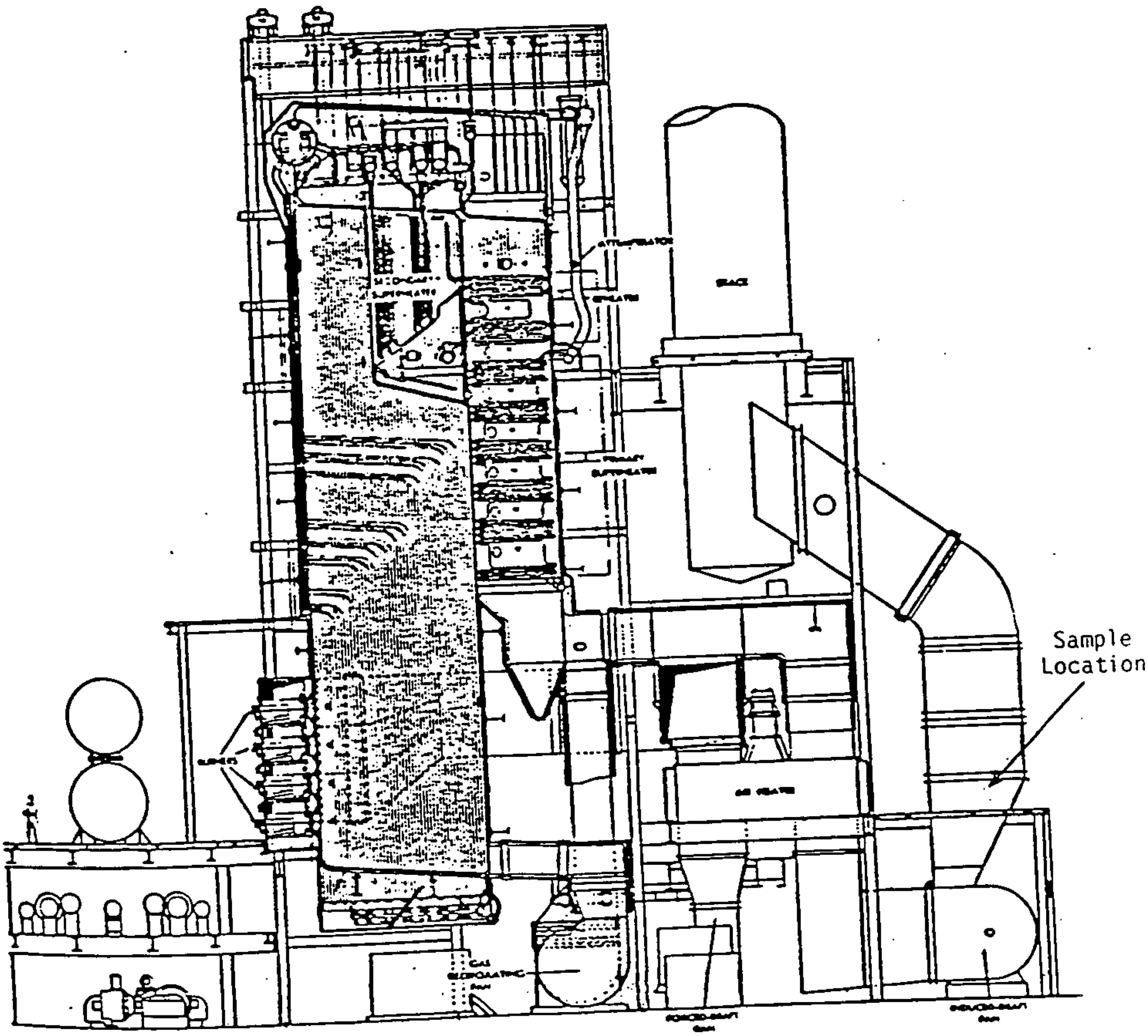


Figure 2-1. Cross-section of El Segundo Unit 1 showing sample location.

SECTION 2.0

UNIT DESCRIPTION AND OPERATION

2.1 UNIT DESCRIPTION

Unit 1 at the El Segundo Generating Station consists of a Babcock and Wilcox utility boiler and steam turbine electric generator. The boiler and generator have a full load rating of 175 megawatts. The boiler is capable of firing natural gas or residual fuel oil via 16 burners. The burners are arranged in a 4 x 4 face firing pattern. Gas flow through the boiler is provided by 2 forced and 2 induced draft fans. The gas flow is divided into two separate streams each with a set of fans and a vertical rotary air preheater. Figure 2-1 shows a cross sectional view of the boiler and related ductwork.

2.2 UNIT OPERATION

El Segundo Generating Station Unit 1 was operated at nominal full load while firing natural gas or residual oil. Table 2-1 summarizes unit operation during each test. Complete unit operation during each test. Complete unit operation data is in Appendix C.2.

TABLE 2-1
SUMMARY OF UNIT OPERATION
SCE/EL SEGUNDO GENERATING STATION UNIT 1
February 22-25, 1990

Date	Test No.	Test Location	Fuel	Load (MW)	Fuel Flow	Steam Flow K lb/hr
2/22/90	2-Cr	South Duct	Oil	173	76 K lb/hr	1210
	3-Cr	South Duct	Oil	170	75 K lb/hr	1175
	2-PAH	North Duct	Oil	172	77 K lb/hr	1205
	3-PAH	North Duct	Oil	170	75 K lb/hr	1175
2/23/90	4-Mtls	North Duct	Oil	157	70 K lb/hr	1050
	5-Mtls	North Duct	Oil	158	73 K lb/hr	1050
	4-As	South Duct	Oil	157	70 K lb/hr	1050
	5-As	South Duct	Oil	158	73 K lb/hr	1050
2/24/90	6-Cr	North Duct	Oil	157	72 K lb/hr	1043
	6-PAH	South Duct	Oil	157	72 K lb/hr	1043
	7-Mtls	South Duct	Oil	157	71 K lb/hr	1045
	7-As	North Duct	Oil	157	71 K lb/hr	1045
2/25/90	8-Benzene	North Duct	Natural Gas	151	1543 KCFH	1003
	8-Formaldehyde	North Duct	Natural Gas	151	1543 KCFH	1003
	8-Benzene	South Duct	Natural Gas	151	1543 KCFH	1003
	8-Formaldehyde	South Duct	Natural Gas	151	1543 KCFH	1003

TABLE 3-2
TEST SCHEDULE AB2588 EMISSIONS TESTING
SCE/EL SEGUNDO GENERATING STATION UNIT 1
February 22-25, 1990

Test No.	Location	Date	Time	Fuel	Type of Test
2-PAH	North Duct	2/22/90	1200-1531	Residual Oil	PAH
2-Cr	South Duct	2/22/90	1350-1615	Residual Oil	Chromium/Hexavalent Chromium
2-CEM	North Duct	2/22/90	1200-1615	Residual Oil	CEM (O_2, CO_2)
3-PAH	North Duct	2/22/90	1706-2041	Residual Oil	PAH
3-Cr	South Duct	2/22/90	1702-1936	Residual Oil	Chromium/Hexavalent Chromium
3-CEM	North Duct	2/22/90	1702-2041	Residual Oil	CEM (O_2, CO_2)
4-Mtls	North Duct	2/23/90	0945-1200	Residual Oil	Metals
4-As	South Duct	2/23/90	0944-1159	Residual Oil	Arsenic
4-CEM	North Duct	2/23/90	0944-1200	Residual Oil	CEM (O_2, CO_2)
5-Mtls	North Duct	2/23/90	1531-1721	Residual Oil	Metals
5-As	South Duct	2/23/90	1530-1720	Residual Oil	Arsenic
5-CEM	North Duct	2/23/90	1530-1721	Residual Oil	CEM (O_2, CO_2)
6-Cr	North Duct	2/24/90	0900-1129	Residual Oil	Chromium/Hexavalent Chromium
6-PAH	South Duct	2/24/90	0937-1322	Residual Oil	PAH
6-CEM	North Duct	2/24/90	0900-1419	Residual Oil	CEM (O_2, CO_2)
6A-Benzene	North Duct	2/24/90	1017-1037	Residual Oil	Benzene
6B-Benzene	North Duct	2/24/90	1040-1100	Residual Oil	Benzene
6C-Benzene	South Duct	2/24/90	1122-1142	Residual Oil	Benzene
6A-Form	North Duct	2/24/90	1311-1341	Residual Oil	Formaldehyde
6B-Form	North Duct	2/24/90	1319-1419	Residual Oil	Formaldehyde
7-Mtls	South Duct	2/24/90	1508-1717	Residual Oil	Metals
7-As	North Duct	2/24/90	1507-1716	Residual Oil	Arsenic
7C-Form	South Duct	2/24/90	1736-1804	Residual Oil	Formaldehyde
7-CEM	North Duct	2/24/90	1508-1717	Residual Oil	CEM (O_2, CO_2)
8-Vel/H_2O	North Duct	2/25/90	1055-1125	Natural Gas	Velocity Traverse & Moisture
8A-Benzene	North Duct	2/25/90	1100-1120	Natural Gas	Benzene
8B-Benzene	North Duct	2/25/90	1248-1308	Natural Gas	Benzene
8C-Benzene	South Duct	2/25/90	1400-1420	Natural Gas	Benzene
8A-Form	South Duct	2/25/90	1102-1132	Natural Gas	Formaldehyde
8B-Form	North Duct	2/25/90	1240-1310	Natural Gas	Formaldehyde
8C-Form	North Duct	2/25/90	1320-1350	Natural Gas	Formaldehyde
8-Vel/H_2O	South Duct	2/25/90	1309-1339	Natural Gas	Velocity Traverse & Moisture
8-CEM	North Duct	2/25/90	1055-1350	Natural Gas	CEM (O_2, CO_2)

SECTION 3.0

TEST DESCRIPTION

3.1 TEST DESCRIPTION AND SCHEDULE

The tests on El Segundo Generating Station Unit 1 were conducted with the boiler firing at or near full normal load, at normal operating conditions. Testing was conducted with the boiler firing both residual oil and natural gas fuels. Table 3-1 presents the tests that were conducted for each fuel type. Table 3-2 is a summary of the tests performed.

TABLE 3-1
TEST SUMMARY

Fuel	Species to be Measured by Source Test
Residual Oil	Benzene, Formaldehyde, PAH, Full Set of Metals, Arsenic, Chromium Also fuel analysis for Metals, Chloride
Natural Gas	Benzene, Formaldehyde

3.2 SAMPLE LOCATIONS

Samples were collected from ports installed in the exhaust ducts upstream of the exhaust stack. Figure 2-1 of Section 2 shows the location of the sample ports in the ducts in relationship to the boiler. Samples were collected using ports located in each of the two ducts. To obtain triplicate tests of each type, two tests were performed in one duct and one test was performed in the other duct. The procedures used to obtain average emission rates for any test method are listed below:

1. Average concentration = arithmetic average of the concentrations from the three test runs.

2. Total unit exhaust flow = sum of the average flow from Duct A and the average flow from Duct B.

3. Average mass emission rate = average concentration x total exhaust flow.

The sample port location meets the acceptability criteria given in EPA Method 1, Section 2.5 (alternate measurement site selection procedure). Figure 3-1 shows a diagram of the sample port location and sample point layout.

3.3 TEST PROCEDURES

The test procedures for air emissions tests and related information that were used at El Segundo Unit 1 are listed in Table 3-3. Descriptions of standard procedures are included in Appendix A. Additional information and modifications to standard procedures are presented below.

3.3.1 Benzene

Triplicate samples for benzene analysis were collected in Tedlar bags and analyzed by gas chromatography according to CARB Method 410A by Truesdail Laboratories in Tustin, California.

3.3.2 Formaldehyde

Triplicate formaldehyde samples were collected non-isokinetically using midget impingers in acidic 2,4-dinitrophenylhydrazine solution. The analysis for formaldehyde was performed by reverse phase HPLC by Radian Laboratories, in Research Triangle Park, North Carolina.

3.3.3 Polycyclic Aromatic Hydrocarbons (PAH)

Triplicate PAH samples were collected according to the sampling procedures of CARB Method 429. This method is known as semi-VOST or "Modified Method 5". Table 3-4 summarizes the pertinent information for these tests. In this procedure, a sample is collected isokinetically and passed through a heated Method 5 filter followed by an XAD-2 sorbent module in a water-cooled jacket. The sorbent module is followed by an impinger train to collect moisture and any PAH species that might pass through the resin.

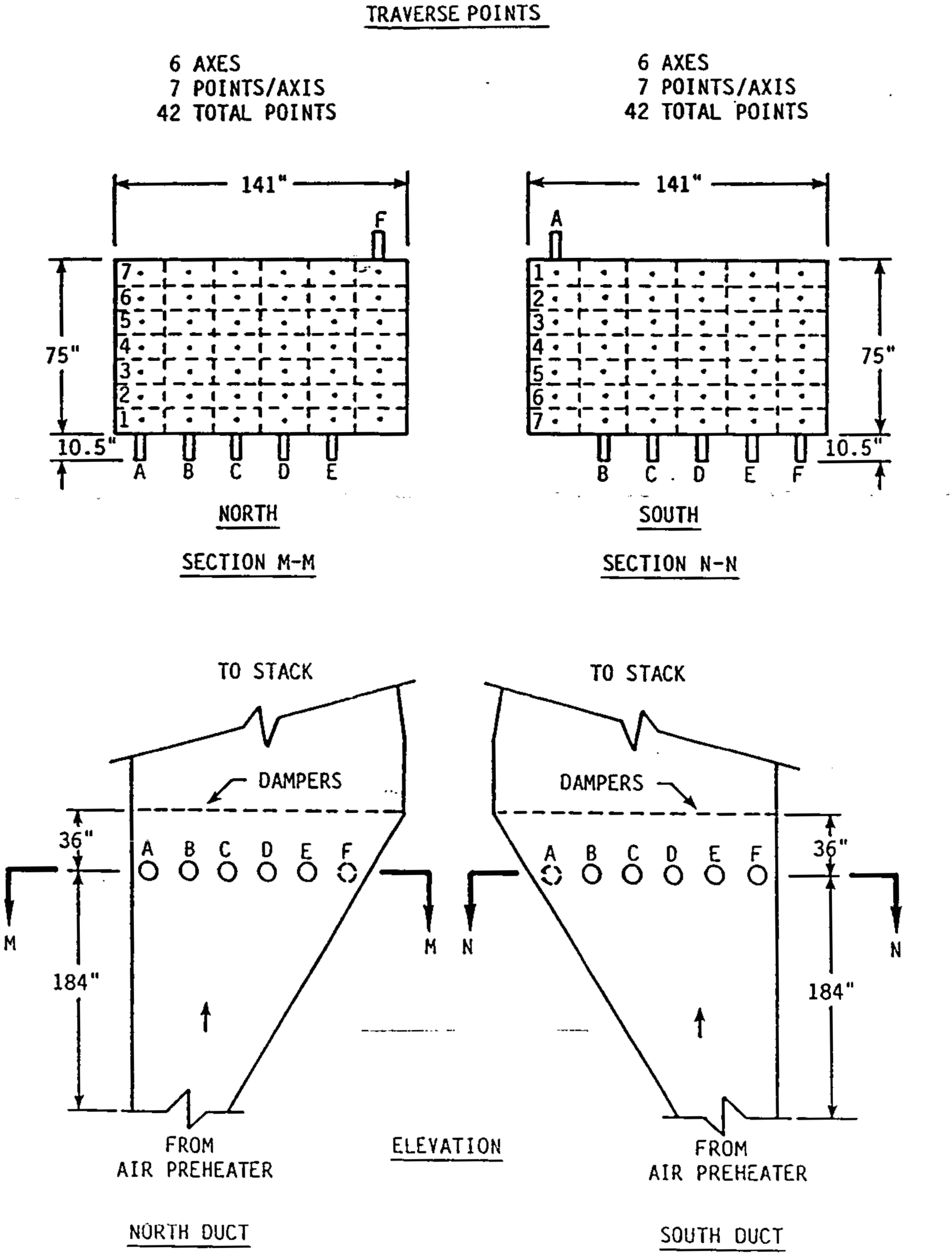


Figure 3-1. El Segundo, Unit 1 North & South Air Preheater Outlet Duct Test Locations.

TABLE 3-3
TEST PROCEDURES FOR EL SEGUNDO UNIT 1
AIR EMISSIONS TESTS

Parameter	No. Replicates	Duration of Test (min.)	Sample Rate	Measurement Principle	Reference Method	Test Detection Limit
Benzene	3	20	0.5 l/min	GC/PID	CARB 410A	1 ppb
Formaldehyde	3	30	1 l/min	HPLC	CARB 430	0.1 μg/m^3
PAH	3	189	1 m^3/hr	GC/MS	CARB 429	10 ng/m^3 per species*
Arsenic	3	84	1 m^3/hr	AAS	CARB 423	0.3 μg/m^3
Total Chromium	3	126	1 m^3/hr	AAS	CARB 425	0.3 μg/m^3
Hexavalent Chromium	3	126	1 m^3/hr	Ion chromatography	CARB 425	0.3 μg/m^3
Full Set of Metals:	3	84	1 m^3/hr	AAS	EPA Draft Metals Method	0.4-20 μg/m^3 per species excluding Hg
Arsenic Beryllium Cadmium Copper Lead Manganese Mercury Nickel Selenium Zinc						
Metals, Chloride	2	---	---	Fuel Analysis	---	---

* assume 3 m^3 samples

TABLE 3-4
PAH TEST INFORMATION

Sampling Method	CARB 429
Analytical Method	GC/MS
Analytical Laboratory	Zenon Environmental
Expected Levels	Less than 10 ng/m^3 per species
Analytical Detection Limit	10-100 ng per species
Sample Volumes	3 m^3 (3-hour sample)
Internal Standards	Added to post-test samples
Surrogate Standards	Added to resin prior to sampling
Blank	Full field blank train used
Fractions to be Analyzed	Probe wash, filter, sorbent module, connecting glassware rinse, and first impinger combined
Chain of Custody	Maintained by ESA and Zenon on all samples
Sample Train Assembly and Recovery	Performed in on-site clean room to minimize chance of contamination. All sample portions recovered with water, acetone, and hexane rinses.
Glassware Cleaning	Acid cleaning followed by DI H_2O, acetone, and hexane rinses and high temperature bake

Sample analysis was performed by Zenon Environmental in Burlington, Ontario. Zenon also prepared the resin, loaded the modules, and extracted the modules and other fractions according to CARB procedures. Appropriate pre- and post-test laboratory spikes were introduced to the samples by Zenon and the percent recovery is reported along with the results.

PAH species were analyzed using GC/MS with selective ion monitoring. This procedure provides the lowest detection limits possible for these samples. PAH species to be quantitated are listed in Appendix C-1 of "Emission Inventory Criteria and Guidelines". These compounds are listed below:

Acenaphthene
Acenaphthylene
Anthracene
Benz[a]anthracene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
Benzo[g,h,i]perylene
Chrysene
Dibenz[a,h]anthracene
Fluoranthene
Fluorene
Indeno[1,2,3,-cd]pyrene
Naphthalene
Phenanthrene
Pyrene

In addition to the samples, a full field blank was collected and analyzed for PAH. For a field blank, a separate sample train was assembled, transported, leak checked, rinsed, and recovered in the same way as the sample train. This provides a blank value not only for the analytical procedures but also for the reagents, filter, and any possible contamination introduced by sample handling.

3.3.4 Full Set of Metals

Table 3-5 summarizes the analytical methods and detection limits for trace metals tests. Reagent blanks and field blanks were analyzed for all trace metals. Per the Regulation, the full set of metals is defined as arsenic, beryllium, cadmium, total and hexavalent chromium, copper, lead, manganese, mercury, nickel, selenium and zinc. In addition, the California Air Resources Board

TABLE 3-5
FULL SET OF METALS ANALYSIS

Metal	Sampling Method	Analytical Method	Method Detection Limit µg/m^{3}*
Chromium	CARB 425	Graphite Furnace Atomic Absorption	0.3
Hexavalent Chromium	CARB 425 w/0.1 N NaOH	Ion Chromatography	0.3
Beryllium	EPA Draft Metals Method	ICP	0.08
Arsenic	EPA Draft Metals Method	Graphite Furnace Atomic Absorption	0.3
Arsenic	CARB 423	Graphite Furnace Atomic Absorption	0.2
Cadmium	EPA Draft Metals Method	ICP	0.03
Copper	EPA Draft Metals Method	ICP	0.8
Lead	EPA Draft Metals Method	ICP	2.2
Manganese	EPA Draft Metals Method	ICP	0.8
Mercury	EPA Draft Metals Method	Cold Vapor Atomic Absorption	34
Nickel	EPA Draft Metals Method	ICP	0.8
Selenium	EPA Draft Metals Method	ICP	2.2
Zinc	EPA Draft Metals Method	ICP	0.8

* Assumes 1.5 m^{3} samples for all metals except Chromium
Assumes 2 m^{3} samples for chromium train

selected arsenic tests to be performed by CARB Method 423 to support their metals method validation study. Arsenic tests were performed simultaneously with metals tests.

Samples for all of the metals identified above were collected by three different sample trains, as discussed in the following subsections. Triplicate sampling using each of the three sample trains was performed.

3.3.4.1 Full Set of Metals Train

Arsenic, beryllium, cadmium, copper, lead, manganese, mercury, nickel, selenium, and zinc were collected using the train proposed in the EPA Draft Metals Method. The sample train is of the same configuration as a CARB Method 5 train, with the following exceptions:

1. The filter is teflon-coated fiberglass to minimize interferences.
2. The first two impingers contain 5% nitric acid/10% hydrogen peroxide to collect any volatile metals which pass through the filter.
3. The third impinger contains an acidified potassium permanganate solution to collect any mercury that is not collected in the nitric acid impingers.

Analyses for these ten metals were performed by ICP, graphite furnace or cold vapor atomic absorption, depending upon the metal. Decomposition of each sample fraction is described in the EPA draft method. Whenever possible, decomposed sample portions were combined to achieve the lowest detection limits possible for these samples. Five percent of the decomposed probe wash/filter extract and 5% of the nitric acid/peroxide impinger catch was removed for mercury analysis. The remaining 95% of these sample portions was concentrated to a total volume of 50 ml and analyzed for metals. The probe wash/filter portion and the impinger catch portion of each train was analyzed separately. The $KMnO_4$ impinger portions was analyzed for mercury only. Curtis and Tompkins performed the analyses in their Los Angeles and Berkeley laboratories.

3.3.4.2 Arsenic Train

The probe wash, filter, and impinger portions from a separate sample train were collected and analyzed for arsenic according to CARB Method 423. Arsenic analyses were performed according to CARB Method 423 using graphite furnace atomic absorption by Curtis and Tompkins in Los Angeles.

3.3.4.3 Chromium Train

In order to achieve a lower detection limit for hexavalent chromium, it is necessary to use a separate sample train dedicated to collecting chromium.

Recently, CARB has accepted a proposed sample train configuration and an alternate procedure involving ion chromatography for analysis of hexavalent chromium. These changes to CARB Method 425 are summarized in Table 3-6.

The major differences of the modified method are use of a wet impingement train configuration, 0.1 N NaOH in the impingers to preserve the sample, and use of ion chromatography to measure hexavalent chromium. One half of the collected sample was analyzed for hexavalent chromium.

Total chromium was analyzed using the remaining half of the sample according to CARB Method 425. The analyses were performed by graphite furnace atomic absorption by Curtis and Tompkins in Los Angeles.

3.3.5 Residual Oil Samples

Two residual oil samples were collected by SCE and analyzed for:

- Btu/lb
- carbon, hydrogen, oxygen, nitrogen
- sulfur
- ash content
- chloride
- full set of metals to include:
  arsenic, beryllium, cadmium, total and hexavalent chromium, copper, lead, manganese, mercury, nickel, selenium and zinc.

These analyses were performed by Curtis and Tompkins in Los Angeles.

3.3.6 Natural Gas Analysis

Duplicate samples for natural gas analysis were collected at the El Segundo facility. Truesdail Laboratories analyzed these sample for composition and higher heating value.

TABLE 3-6
HEXAVALENT CHROMIUM MEASUREMENT TECHNIQUES

Method	CARB 425
Train configuration	Wet impingement
Filter Material	Teflon-coated fiberglass backup filter
Impingers	0.01 N NaOH
Analytical method	Ion chromatography
Hexchrome detection limit, μg/train	0.3
Specified maximum sample storage time	None

3.3.7 Gaseous Emissions

Gaseous emissions (O_2 and CO_2) were measured using Carnot's Continuous Emissions Monitor (CEM) described in Appendix A. This system meets EPA and CARB requirements for gaseous species. A preliminary traverse indicated that there was no significant stratification. Therefore, O_2 and CO_2 concentrations were determined at a single point.

O_2 and CO_2 were measured in conjunction with all tests according to EPA Method 3A to provide data for molecular weight and dilution calculations.

3.3.8 Velocity and Moisture

Velocity and moisture were determined in conjunction with all isokinetic tests according to EPA Methods 1, 2, and 4. For non-isokinetic single point tests, either separate velocity and moisture determinations were performed or the velocity measured during a simultaneous isokinetic test is used for emission calculations.

3.4 QUALITY ASSURANCE

Carnot has a rigorous ongoing QA program to ensure that high-quality data is obtained and to ensure full documentation of test details. The QA program includes:

1. Appointment of a Quality Assurance Officer for Carnot's Source Test Division
2. Preparation of a QA manual for internal use
3. Standardization of reporting and review procedures
4. Implementation of chain of custody procedures on all samples and data sheets
5. Scheduling of internal QA and training meetings
6. Complete documentation of instrument calibration and CEM performance data
7. Adherence to method-specific QA procedures for all testing
8. Personnel training
9. Monitoring of new and emerging methods and technologies.

Specific QA data which will be included in the final report are:

1. Equipment calibration data
2. CEM calibration data
3. CEM performance data
4. Chain of custody on all samples (see example form in Appendix B)

Carnot participates in EPA's audit programs for Methods 5, 6, and 7, and is certified by the California Air Resources Board under its Independent Source Tester's Approval program. Additional QA information is presented in Appendix B.

SECTION 4.0

RESULTS

This section presents the results of the air emissions tests performed at El Segundo Unit 1. Air emissions are presented on a concentration, mass emissions and lb/MMBtu basis. All data sheets, calculations, laboratory reports and quality assurance information are included in the Appendices.

The results of the tests are summarized in Tables 4-1 through 4-5. Table 4-6 summarizes test conditions. Detailed results of the tests are presented in the following subsections.

4.1 Benzene
4.2 Formaldehyde
4.3 Polycyclic Aromatic Hydrocarbons (PAH)
4.4 Metals
4.5 Chromium and Hexavalent Chromium
4.6 Arsenic
4.7 Fuel Analysis
4.8 Test Summary and Isokinetics

TABLE 4-1
SUMMARY OF AB2588 EMISSIONS TEST RESULTS
SCE/EL SEGUNDO UNIT 1
NATURAL GAS FUEL
February 25, 1990

Species	
Benzene:	
ppb	ND <1
lb/hr	ND $<5.18 \times 10^{-3}$
lb/MMBtu	ND $<2.81 \times 10^{-6}$
Formaldehyde	
ppb	204
lb/hr	4.07×10^{-1}
lb/MMBtu	2.22×10^{-4}

TABLE 4-2
SUMMARY OF AB2588 EMISSIONS TEST RESULTS
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL
February 20-24, 1990

Species	
Benzene:	
ppb	ND <1
lb/hr	ND <5.78 x 10^{-3}
lb/MMBtu	ND <3.00 x 10^{-6}
Formaldehyde	
ppb	ND <12
lb/hr	ND <2.60 x 10^{-2}
lb/MMBtu	ND <1.48 x 10^{-5}
Total PAH	
$\mu g/m^3$	<9.14
lb/hr	<1.63 x 10^{-2}
lb/MMBtu	<9.10 x 10^{-6}

TABLE 4-3
SUMMARY OF PAH EMISSION RESULTS
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL
February 20-24, 1990

Species	μg/m³	lb/hr	lb/MMBtu
Acenaphthene	<0.02	<4.12 x 10^{-5}	<2.12 x 10^{-8}
Acenaphthylene	ND <0.01	ND <1.31 x 10^{-5}	ND <6.92 x 10^{-9}
Anthracene	<0.02	<2.76 x 10^{-5}	<1.43 x 10^{-8}
Benz[a]anthracene	<0.11	<1.97 x 10^{-4}	<1.02 x 10^{-7}
Benzo[b+k]fluoranthene	<0.04	<6.52 x 10^{-5}	<3.65 x 10^{-8}
Benzo[a]pyrene	ND <0.01	ND <1.31 x 10^{-5}	ND <6.92 x 10^{-9}
Benzo[g,h,i]perylene	<0.07	<1.34 x 10^{-4}	<6.95 x 10^{-8}
Chrysene	<0.05	<8.87 x 10^{-5}	<4.55 x 10^{-8}
Dibenz[a,h]anthracene	<0.03	<4.78 x 10^{-5}	<2.47 x 10^{-8}
Fluoranthene	<0.08	<1.51 x 10^{-4}	<7.78 x 10^{-8}
Fluorene	<0.01	<2.16 x 10^{-5}	<1.12 x 10^{-8}
Indeno[1,2,3-cd]pyrene	<0.07	<1.20 x 10^{-4}	<6.25 x 10^{-8}
Naphthalene	8.43	1.51 x 10^{-2}	8.44 x 10^{-6}
Phenanthrene	<0.12	<2.06 x 10^{-4}	<1.08 x 10^{-7}
Pyrene	<0.08	<1.37 x 10^{-4}	<7.07 x 10^{-8}
TOTAL PAH	<9.14	<1.63 x 10^{-2}	<9.10 x 10^{-6}

TABLE 4-4
SUMMARY OF METALS EMISSION RESULTS
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL
February 20-24, 1990

Species	µg/m³	lb/hr	lb/MMBtu
Arsenic	10.55	1.82×10^{-2}	1.03×10^{-5}
Arsenic (CARB M 423)	1.76	2.98×10^{-3}	1.68×10^{-6}
Beryllium	<0.18	$<3.05 \times 10^{-4}$	$<1.71 \times 10^{-7}$
Cadmium	1.18	2.04×10^{-3}	1.16×10^{-6}
Chromium	6.74	1.19×10^{-2}	6.31×10^{-6}
Hexavalent Chromium	1.38	2.44×10^{-3}	1.31×10^{-6}
Copper	16.63	2.87×10^{-2}	1.65×10^{-5}
Lead	<2.56	$<4.43 \times 10^{-3}$	$<2.51 \times 10^{-6}$
Manganese	8.36	1.44×10^{-2}	8.11×10^{-6}
Mercury	ND <31.62	ND $<5.46 \times 10^{-2}$	ND $<3.08 \times 10^{-5}$
Nickel	346.5	5.99×10^{-1}	3.40×10^{-4}
Selenium	<4.12	$<7.12 \times 10^{-3}$	$<4.03 \times 10^{-6}$
Zinc*	29.68	5.13×10^{-2}	2.81×10^{-5}

* Duplicate sample: Test 7-Mtls excluded because of Zn contamination

TABLE 4-5
FUEL ANALYSIS SUMMARY
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL
February 20-24, 1990

Parameter	
Btu/lb (HHV)	19,166
Carbon, %	85.46
Hydrogen, %	12.58
Nitrogen, %	0.10
Oxygen, %	1.62
Sulfur, %	0.18
Ash, %	0.02
F factor, dscf/MMBtu @ 0% O_2 and 60°F	9,039
Chlorine, mg/l	132
Arsenic, mg/l	ND <1.1
Beryllium, mg/l	ND <0.22
Cadmium mg/l	ND <0.22
Chromium, mg/l	0.22
Hexavalent Chromium, mg/l	ND <0.50
Copper, mg/l	0.44
Lead, mg/l	ND <1.1
Mercury, mg/l	ND <0.10
Manganese, mg/l	<0.43
Nickel, mg/l	10
Selenium, mg/l	ND <1.0
Zinc, mg/l	0.97

ND - not detected

4.1 BENZENE

The results of the benzene sampling are presented in Table 4-6. Benzene was not detected in any of the samples. Appendix C.4 contains additional information. Benzene was not detectable at the 1 ppb level, corresponding to an emission rate of 5.18×10^{-3} while firing gas fuel or an emission rate of 5.78×10^{-3} while firing residual oil.

TABLE 4-6
BENZENE EMISSIONS
SCE/EL SEGUNDO UNIT 1

GAS FUEL

Test No.	8A-Benzene	8B-Benzene	8C-Benzene	Average
Date:	2/25/90	2/25/90	2/25/90	
Flow rate, dscfm (stack)	419,098	419,098	419,098	
O_2, %	7.92	7.92	7.92	
ppb	ND <1	ND <1	ND <1	ND <1
lb/hr				ND $<51.8 \times 10^{-3}$
lb/MMBtu				ND $<2.81 \times 10^{-6}$

RESIDUAL OIL

Test No.	6A-Benzene	6B-Benzene	6C-Benzene	Average
Date	2/24/90	2/24/90	2/24/90	
Flow rate, dscfm (stack)	467,928	467,928	467,928	
O_2, %	8.25	8.85	8.85	
ppb	ND <1	ND <1	ND <1	ND <1
lb/hr				5.78×10^{-3}
lb/MMBtu				3.00×10^{-6}

TABLE 4-7
FORMALDEHYDE EMISSIONS
SCE/EL SEGUNDO UNIT 1

GAS FUEL				
Test No.	8A-Form	8B-Form	8C-Form	Average
Date:	2/25/90	2/25/90	2/25/90	
Flow rate, dscfm (stack)	419,098	419,098	419,098	
O_2, %	7.40	8.43	8.43	
ppb	280	198	135	204
lb/hr				4.07×10^{-1}
lb/MMBtu	2.92×10^{-4}	2.23×10^{-4}	1.51×10^{-4}	2.22×10^{-4}

RESIDUAL OIL				
Test No.	6A-Form	6B-Form	7C-Form	Average
Date	2/24/90	2/24/90	2/24/90	
Flow rate, dscfm (stack)	464,484	464,484	464,484	
O_2, %	8.83	8.83	9.54	
ppb	ND <10	ND <17	ND <9	ND <12
lb/hr				2.60×10^{-2}
lb/MMBtu	ND $<1.20 \times 10^{-5}$	ND $<2.08 \times 10^{-5}$	ND $<1.16 \times 10^{-5}$	ND $<1.48 \times 10^{-5}$

4.2 FORMALDEHYDE

Formaldehyde results are presented in Table 4-7. Appendix C.5 presents additional data and Radian's Laboratory report. Both a field blank and field spike were collected and analyzed. Field spike recovery was 103% of nominal. Detectable formaldehyde levels were measured while firing natural gas. The average concentration was 204 ppb with an emission rate of 0.407 lb/hr. Formaldehyde was not detected while firing residual oil and a detection limit of 12 ppb.

4.3 POLYCYCLIC AROMATIC HYDROCARBONS (PAH)

PAH results are presented in Table 4-8. Complete results are in Appendix C.6. The analysis for the fifteen target PAH compounds indicated that the 92% of the total PAH detected is Naphthalene. Naphthalene has been found to be a decomposition product of the XAD-2 resin. Field blank analysis indicated 29 μg/train of Naphthalene. All species except Acenaphthylene and Benzo(a)pyrene were detected in at least one sample. The average concentration is 9.14 $\mu g/m^3$ and the average emission rate is 1.63 x 10^{-2} lb/hr.

TABLE 4-8
POLYCYCLIC AROMATIC HYDROCARBON EMISSIONS
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL

Test No.	2-PAH	3-PAH	6-PAH		Average	
Date	2/22/90	2/22/90	2/24/90			
Flow Rate, dscfm (stack)					478,051	
O_2, %	7.09	8.04				
Species	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	lb/hr	lb/MMBtu
Naphthalene	3.149	0.074	22.067	8.43	1.51×10^{-2}	8.44×10^{-6}
Acenaphthylene	ND <0.007	ND <0.007	ND <0.008	ND <0.01	ND $<1.31 \times 10^{-5}$	ND $<6.92 \times 10^{-9}$
Acenaphthene	0.054	ND <0.007	ND <0.008	<0.02	$<4.12 \times 10^{-5}$	$<2.12 \times 10^{-8}$
Fluorene	0.021	ND <0.007	ND <0.008	<0.01	$<2.16 \times 10^{-5}$	$<1.12 \times 10^{-8}$
Phenanthrene	0.240	ND <0.007	0.098	<0.12	$<2.06 \times 10^{-4}$	$<1.08 \times 10^{-7}$
Anthracene	0.031	ND <0.007	ND <0.008	<0.02	$<2.76 \times 10^{-5}$	$<1.43 \times 10^{-8}$
Fluoranthene	0.209	ND <0.007	0.037	<0.08	$<1.51 \times 10^{-4}$	$<7.78 \times 10^{-8}$
Pyrene	0.189	ND <0.007	0.034	<0.08	$<1.37 \times 10^{-4}$	$<7.07 \times 10^{-8}$
Benz(a)anthracene	0.278	ND <0.007	0.046	<0.11	$<1.97 \times 10^{-4}$	$<1.02 \times 10^{-7}$
Chrysene	0.126	ND <0.007	0.016	<0.05	$<8.87 \times 10^{-5}$	$<4.55 \times 10^{-8}$
Benzo(b+k)fluoranthene	ND <0.007	ND <0.007	0.095	<0.04	$<6.52 \times 10^{-5}$	$<3.65 \times 10^{-8}$
Benzo(a)pyrene	ND <0.007	ND <0.007	ND <0.008	ND <0.01	ND $<1.31 \times 10^{-5}$	ND $<6.92 \times 10^{-9}$
Indeno(1,2,3-cd)pyrene	0.152	ND <0.007	0.043	<0.07	$<1.20 \times 10^{-4}$	$<6.25 \times 10^{-8}$
Dibenzo(a,h)anthracene	0.060	ND <0.007	0.013	<0.03	$<4.78 \times 10^{-5}$	$<2.47 \times 10^{-8}$
Benzo(g,h,i)perylene	0.175	ND <0.007	0.043	<0.07	$<1.34 \times 10^{-4}$	$<6.95 \times 10^{-8}$
Total PAH						
$\mu g/m^3$	<4.706	<0.173	<22.53	<9.14		
lb/hr					$<1.63 \times 10^{-2}$	
lb/MMBtu	$<4.27 \times 10^{-6}$	$<1.59 \times 10^{-7}$	$<2.29 \times 10^{-5}$			$<9.10 \times 10^{-6}$

4.4 FULL SET OF METALS

Metals results obtained from the EPA Draft Metals Method are presented in Table 4-9. Results are in ~~Appendix C~~.7. Metals distribution using the EPA metals train was:

Mercury: Not detected in any sample fraction. However, detection limits are high because ~~aliquots analyzed~~ from the digested nitric acid/peroxide impinger catches have a detection limit of 45 µg/train. Detection limits of the probe/filter and $KMnO_4$ impinger portion are 2 µg/train.

Beryllium, Lead and Selenium: Detected at levels approximately equal to the detection limit of the method. Emission rates are $<3.05 \times 10^{-4}$ lb/hr for beryllium, $<4.43 \times 10^{-3}$ lb/hr for lead and $<7.12 \times 10^{-3}$ lb/hr for selenium.

Arsenic, Cadmium, Copper, Manganese and Zinc: These species were detected in all samples. Emission rates are:

Arsenic	1.82×10^{-2} lb/hr
Cadmium	2.04×10^{-5} lb/hr
Copper	2.87×10^{-2} lb/hr
Manganese	1.44×10^{-2} lb/hr
Zinc	5.13×10^{-2} lb/hr

The zinc analysis for Test 7-Mtls was excluded from the average. Zinc contamination in the laboratory is possible because the reported value of 6,564 µg/train would be equivalent to one half of the total particulate catch for that test.

Nickel: Nickel was detected in all samples and had an emission rate of 0.599 lb/hr.

TABLE 4-9
METALS EMISSIONS RESULTS FROM EPA DRAFT METHOD
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL

Test No.	4-Mtls	5-Mtls	7-Mtls			
Date	2/23/90	2/23/90	2/24/90		Average	
Flow rate, dscfm (stack)					461,621	
O_2, %	8.51	8.45	9.54			
Species	µg/m^3	µg/m^3	µg/m^3	µg/m^3	lb/hr	lb/MMBtu
Arsenic	12.11	8.36	11.18	10.55	1.82×10^{-2}	1.03×10^{-5}
Beryllium	<0.19	<0.23	<0.11	<0.18	$<3.05 \times 10^{-4}$	$<1.71 \times 10^{-7}$
Cadmium	0.73	1.35	1.46	1.18	2.04×10^{-3}	1.16×10^{-6}
Copper	10.33	14.16	25.41	16.63	2.87×10^{-2}	1.65×10^{-5}
Lead	<2.58	<2.63	<2.48	<2.56	$<4.43 \times 10^{-3}$	$<2.51 \times 10^{-6}$
Manganese	9.33	9.85	5.91	8.36	1.44×10^{-2}	8.11×10^{-6}
Mercury	ND <32.90	ND <34.06	ND <27.89	ND <31.62	ND $<5.4 \times 10^{-2}$	ND $<3.08 \times 10^{-5}$
Nickel	311.1	331.9	396.4	346.5	5.99×10^{-1}	3.40×10^{-4}
Selenium	<4.10	<4.32	<3.94	<4.12	$<7.12 \times 10^{-3}$	$<4.03 \times 10^{-6}$
Zinc*	24.96	34.40	4,170	29.68	5.13×10^{-2}	2.81×10^{-5}

* Average excludes Test 7-Mtls. Zinc contamination of this sample.

4.5 CHROMIUM AND HEXAVALENT CHROMIUM

Chromium and hexavalent chromium results are presented in Table 4-10. Complete results are in Appendix C.8. Chromium and hexavalent chromium were detected in all samples. The average hexavalent chromium to total chromium ratio is 21%. The average hexavalent chromium emission rate is 0.00244 lb/hr. The average chromium emission rate is 0.019 lb/hr.

TABLE 4-10
CHROMIUM AND HEXAVALENT CHROMIUM EMISSIONS
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL

Test No.	2-Cr	3-Cr	6-Cr	Average
Date	2/22/90	2/22/90	2/24/90	
Flow rate, dscfm (stack)				473,279
O_2, %	7.63	9.27	8.40	
Species				
Chromium				
μg/m^3	9.96	6.12	4.14	6.74
lb/hr				1.19×10^{-2}
lb/MMBtu	8.84×10^{-6}	6.20×10^{-6}	3.90×10^{-6}	6.31×10^{-6}
Hexavalent Chromium				
μg/m^3	1.60	1.76	0.77	1.38
lb/hr				2.44×10^{-3}
lb/MMBtu	1.42×10^{-6}	1.79×10^{-6}	7.30×10^{-7}	1.31×10^{-6}

4.6 ARSENIC BY CARB METHOD 423

Arsenic results are presented in Table 4-11. Results are located in Appendix C.9. Results for the simultaneous arsenic tests are appreciably lower (6 times) than those obtained using the EPA draft metals method. The emission rate using CARB 423 is 2.98 x 10^{-3} lb/hr.

TABLE 4-11
ARSENIC EMISSIONS RESULTS FROM CARB METHOD 423
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL

Test No.	4-As	5-As	7-As	Average
Date	2/23/90	2/23/90	2/24/90	
Flow rate, dscfm				453,456
O_2, %	9.08	8.86	8.33	
Arsenic				
$\mu g/m^3$	0.54	1.79	2.94	1.76
lb/hr				2.98×10^{-3}
lb/MMBtu	5.34×10^{-7}	1.76×10^{-6}	2.76×10^{-6}	1.68×10^{-6}

4.7 FUEL ANALYSIS

Residual oil analyses are presented in Table 4-12. Natural gas analysis is presented in Table 4-13. This analysis is used to calculate emissions as lb/MMBtu.

TABLE 4-12
SCE/EL SEGUNDO UNIT 1
RESIDUAL OIL ANALYSIS

Parameter	Sample No. 1 4/7/90	Sample No. 2 4/7/90	Average
Btu/lb (HHV)	19,189	19,142	19,166
Carbon, %	84.53	86.38	85.46
Hydrogen, %	12.40	12.75	12.58
Nitrogen, %	0.08	0.11	0.10
Oxygen, %	2.47	0.76	1.62
Sulfur, %	0.17	0.18	0.18
Ash, %	0.02	0.01	0.02
F factor, dscf/MMBtu @ 0% O_2 and 60°F			9,039
Chlorine, mg/l	107	156	132
Arsenic, mg/l	ND <1.1	ND <1.1	ND <1.1
Beryllium, mg/l	ND <0.22	ND <0.22	ND <0.22
Cadmium, mg/l	ND <0.22	ND <0.22	ND <0.22
Chromium, mg/l	0.22	0.21	0.22
Hexavalent Chromium, mg/l	ND <0.50	ND <0.50	ND <0.50
Copper, mg/l	0.47	0.41	0.44
Lead, mg/l	ND <1.1	ND <1.1	ND <1.1
Mercury, mg/l	ND <0.1	ND <0.1	ND <0.1
Manganese, mg/l	ND <0.43	ND <0.43	ND <0.43
Nickel, mg/l	10	10	10
Selenium, mg/l	ND <1.0	ND <1.0	ND <1.0
Zinc, mg/l	0.96	0.97	0.97

TABLE 4-13
SCE/EL SEGUNDO UNIT 1
NATURAL GAS ANALYSIS

Parameter	Sample No. 1 4/7/90	Sample No. 2 4/7/90	Average
Methane, %	86.5	85.6	86.05
Ethane, %	3.8	3.8	3.8
Propane, %	0.8	0.6	0.7
Butane, %	0.1	ND <0.1	<0.1
Iso-butane, %	ND <0.1	ND <0.1	ND <0.1
Carbon dioxide, %	1.0	1.0	1.0
Nitrogen, %	3.1	4.1	3.6
Oxygen, %	1.7	1.8	1.75
Higher Heating Value, Btu/scf at 60°F	965	948	957
F factor, dscf/MMBtu @ 0% O_2 and 60°F			8,487

4.8 TEST SUMMARY AND ISOKINETICS

A summary of the isokinetic tests performed is presented in Table 4-14. All tests were within the required range of 90-110% isokinetic.

TABLE 4-14
SUMMARY OF TEST CONDITIONS
SCE/EL SEGUNDO UNIT 1
February 22-25, 1990

Test No.	Stack Temp., °F	Stack O_2, %	Stack CO_2, %	Stack H_2O, %	Duct Flow Rate wacfm	Duct Flow Rate dscfm	Isokinetic %
2-PAH	327.2	7.27	10.1	8.8	419,941	256,245	91.08
2-Cr	323.0	7.5	10.0	8.8	378,736	233,608	104.88
3-PAH	328.9	7.66	9.77	8.2	400,676	246,762	94.96
3-Cr	329.6	7.7	9.73	8.6	375,788	230,188	99.25
4-Mtl	341.0	7.56	9.40	8.5	397,924	240,059	94.61
4-As	328.6	7.50	9.60	8.9	353,224	215,701	101.76
5-Mtl	347.0	7.36	9.86	8.8	397,006	236,977	94.06
5-As	323.0	7.36	9.86	9.5	356,910	218,118	103.02
6-PAH	336.5	7.45	9.7	8.4	373,450	226,547	96.23
6-Cr	343.5	7.55	9.0	7.4	397,058	241,381	93.39
7-As	342.0	7.70	9.68	8.6	393,398	236,546	94.08

APPENDIX A

MEASUREMENT PROCEDURES

Continuous Emissions Monitoring System

Oxygen (O_2) by Continuous Analyzer

Carbon Dioxide (CO_2) by Continuous Analyzer

Benzene by Gas Chromatography

Determination of Moisture in Stack Gases

Semi-Volatile Organic Sampling Train Procedures

Formaldehyde by HPLC

Arsenic by GFAAS

Total and Hexavalent Chromium by CARB Method 425

Determination of Metals by EPA Multi-metals Method

Continuous Emissions Monitoring System

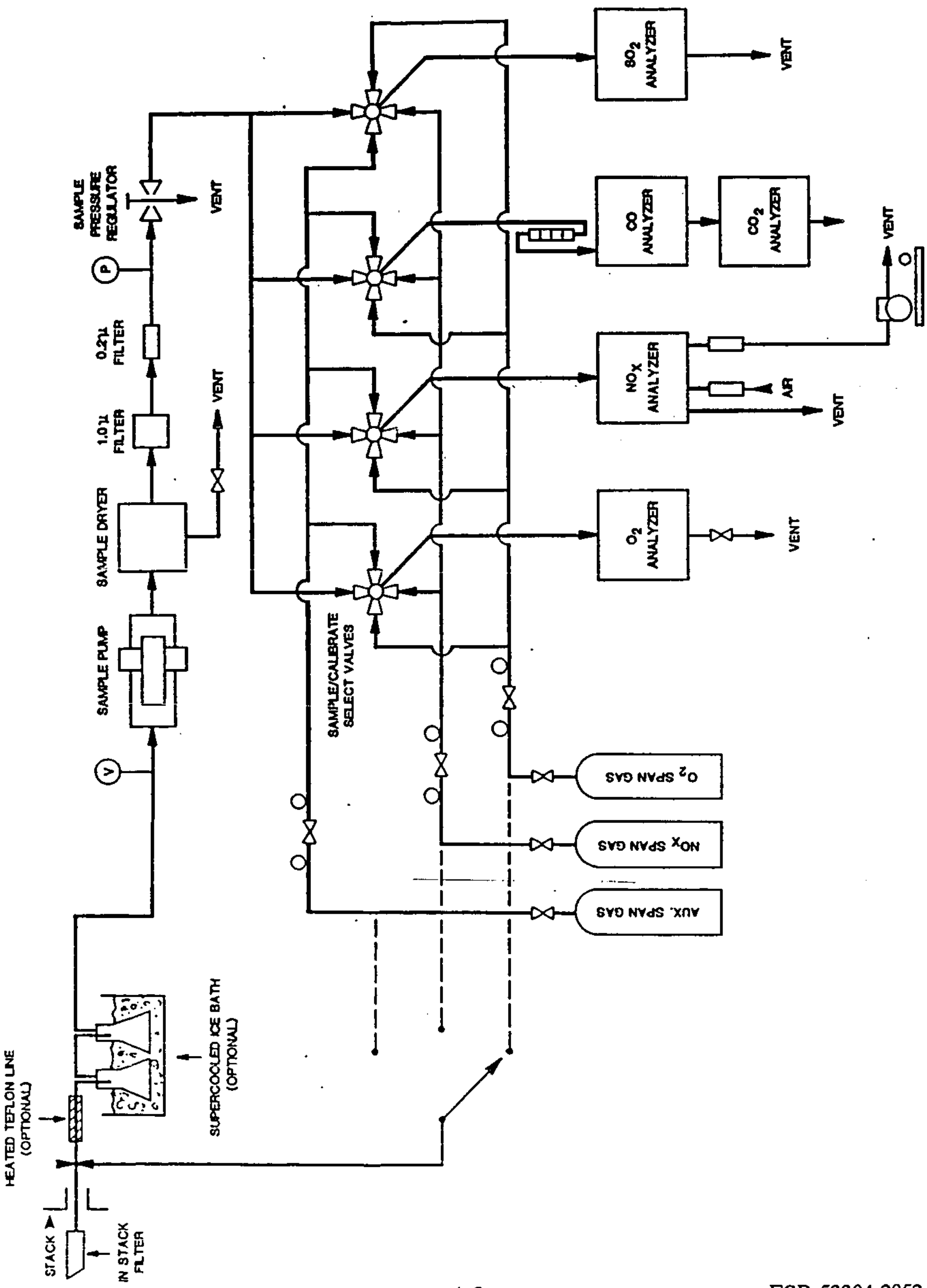
O_2, CO, CO_2, NO, NOx, and SO_2 are measured using an extractive continuous emissions monitoring (CEM) package, shown in the following figure. This package is comprised of three basic subsystems. They are: (1) the sample acquisition and conditioning system, (2) the calibration gas system, and (3) the analyzers themselves. This section presents a description of the sampling and calibration systems. Descriptions of the analyzers used in this program and the corresponding reference test methods follow. Information regarding quality assurance information on the system, including calibration routines and system performance data follows.

The sample acquisition and conditioning system contains components to extract a representative sample from the stack or flue, transport the sample to the analyzers, and remove moisture and particulate material from the sample. In addition to performing the tasks above, the system must preserve the measured species and deliver the sample for analysis intact. The sample acquisition system extracts the sample through a stainless steel probe. The probe is insulated or heated as necessary to avoid condensation. If the particulate loading in the stack is high, a sintered stainless steel filter is used on the end of the probe.

Where water soluble NO_2 and/or SO_2 are to be measured, the sample is drawn from the probe through a heated Teflon sample line into a supercooled (approximately -20 C) water removal trap. The trap consists of stainless steel flasks in a bath of dry ice and antifreeze. If dry ice is not locally available, ice and rock salt are used. This design removes the water vapor by condensation and freezes the liquid quickly. The contact between the sample and liquid water is minimized. Since the solubility of the NO_2 and SO_2 in ice is negligible, these species are conserved. This system meets the requirements of EPA Method 20. The sample is then drawn through a Teflon transport line and particulate filter, into the sample pump. The pump is a dual head, diaphragm pump. All sample-wetted components of the pump are stainless steel or Teflon. The pressurized sample leaving the pump flows through a stainless steel refrigerated (38 F) compressed air dryer for final moisture removal. A drain line and valve are provided to constantly expel any condensed moisture from the dryer. After the dryer, the sample is directed into a distribution manifold. Excess sample is vented through a back-pressure regulator, maintaining a constant pressure of 5-6 psig to the analyzers.

The calibration system is comprised of two parts: the analyzer calibration, and the system bias check (dynamic calibration). The analyzer calibration equipment includes pressurized cylinders of certified span gas. The gases used are, as a minimum, certified to 1% by the manufacturer where necessary, to comply with reference method requirements. EPA Protocol 1 gases are used. The cylinders are equipped with pressure regulators which supply the calibration gas to the analyzers at the same pressure and flow rate as the sample. The selection of zero, span, or sample gas directed to each analyzer is accomplished by operation of the sample/calibration selector valves.

The system bias check is accomplished by transporting the same gases used to zero and span the analyzers to the sample conditioner inlet (probe exit). The span gas is exposed to the same elements as the sample and the system response is documented. Where the supercooled moisture removal system is used, water is added to the knockout flasks before the pre-test check. The analyzer indications for the system calibration check must agree within 5% of the analyzer calibration. Values are adjusted and changes/repairs are made to the system to compensate for any difference in analyzer readings. Specific information on the analytical equipment and test methods used is provided in the following pages.



Continuous Emissions Monitoring System

Method:	Oxygen (O_2) by Continuous Analyzer
Applicable Ref. Methods:	EPA 3A, EPA 20, ARB 100, BA ST-14
Principle:	A sample is continuously drawn from the flue gas stream, conditioned, and conveyed to the instrument for direct readout of O_2 concentration.
Analyzer:	Teledyne Model 326A
Measurement Principle:	Electrochemical cell
Ranges:	0-5, 0-10, 0-25% O_2
Accuracy:	1% of full scale
Output:	0-100 mV, linear
Interferences:	Halogens and halogenated compounds will cause a positive interference. Acid gases will consume the fuel cell and cause a slow calibration drift.
Response Time:	90% <7 seconds
Sampling Procedure:	A representative flue gas sample is collected and conditioned using the CEM system described previously. If Method 20 is used, that method's specific procedures for selecting sample points are used. Otherwise, stratification checks are performed at the start of a test program to select single or multiple-point sample locations.
Analytical Procedure:	An electrochemical cell is used to measure O_2 concentration. Oxygen in the flue gas diffuses through a Teflon membrane and is reduced on the surface of the cathode. A corresponding oxidation occurs at the anode internally, and an electric current is produced that is proportional to the concentration of oxygen. This current is measured and conditioned by the instrument's electronic circuitry to give an output in percent O_2 by volume.
Special Calibration Procedure:	The measurement cells used with the O_2 instrument have to be replaced on a regular basis. After extended use, the cell tend to produce a nonlinear response. Therefore, a three-point calibration is performed at the start of each test day to check for linearity. If the response is not linear ($\pm$ 2% of scale), the cell is replaced.

Method: Carbon Dioxide (CO_2) by Continuous Analyzer

Applicable Ref. Methods: EPA 3A, ARB 100, BA ST-5

Principle: A sample is continuously drawn from the flue gas stream, conditioned, and conveyed to the instrument for direct readout of CO_2 concentration.

Analyzer: Horiba PIR 2000

Measurement Principle: Nondispersive infrared (NDIR)

Accuracy: 1% of full scale

Ranges: 0-5, 0-10, 0-25%

Output: 0-10 mV

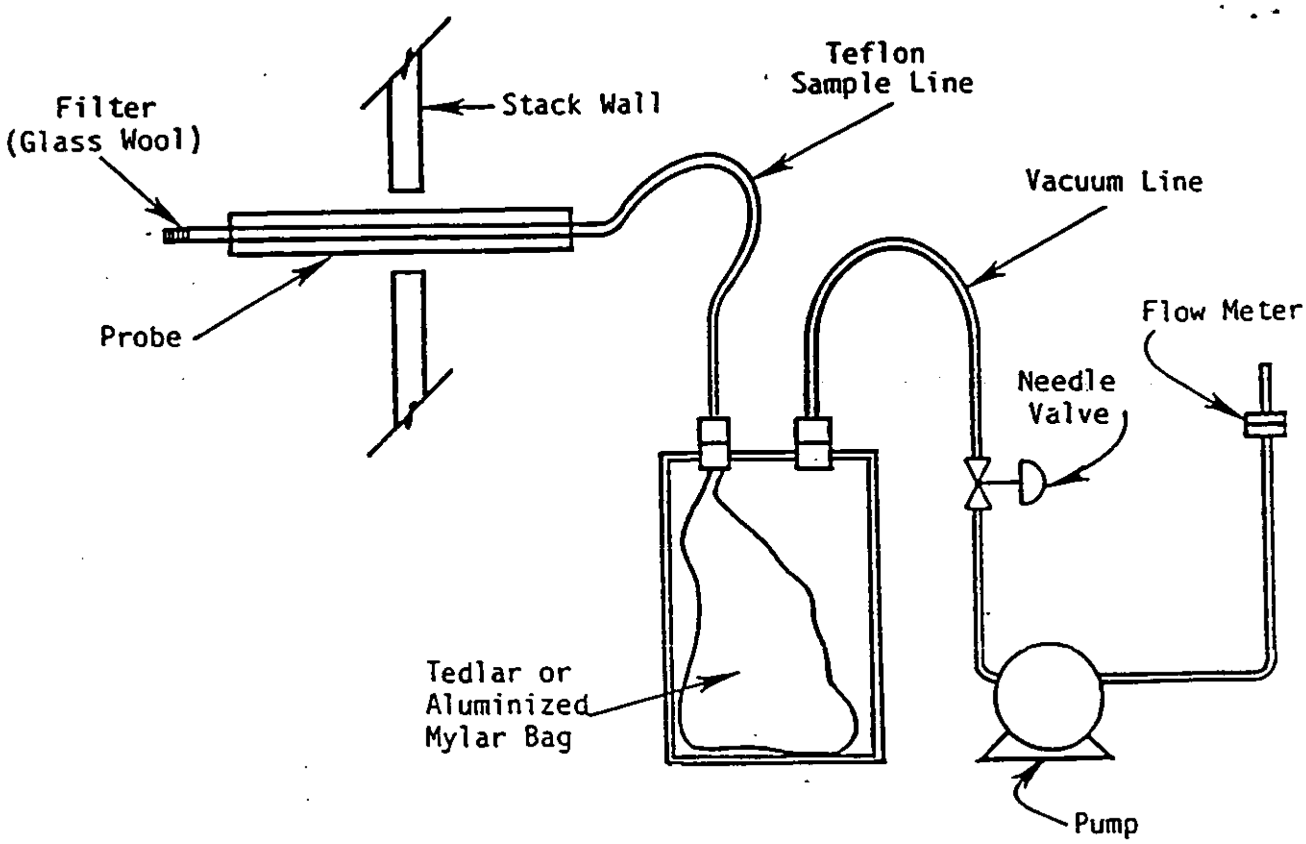
Interferences: A possible interference includes water. Since the instrument receives dried sample gas, this interference is not significant.

Response Time: 1.2 seconds

Sampling Procedure: A representative flue gas sample is collected and conditioned using the CEM system described previously.

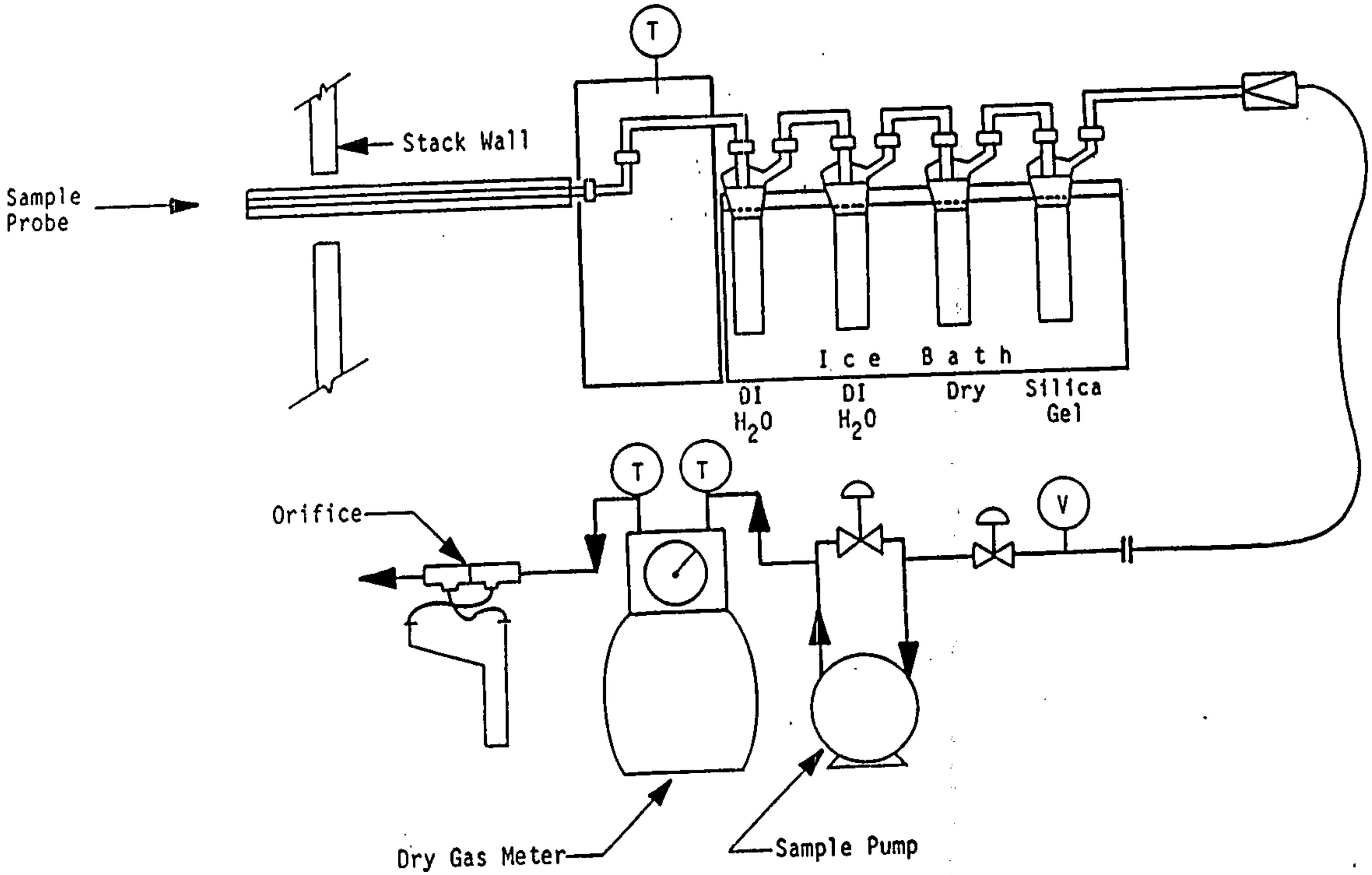
Analytical Procedure: Carbon dioxide concentrations are measured by short pathlength nondispersive infrared analyzers. These instruments measure the differential in infrared energy absorbed from energy beams passed through a reference cell (containing a gas selected to have minimal absorption of infrared energy in the wavelength absorbed by the gas component of interest) and a sample cell through which the sample gas flows continuously. The differential absorption appears as a reading on a scale of 0 to 100%.

Method:	Benzene by Gas Chromatography
Reference:	CARB Method 410, Modified EPA Method 601/602.
Principle:	A Tedlar bag is filled with flue gas at a constant rate. The bag contents are analyzed by gas chromatography/photo ionization detection for volatile organic compounds.
Sample Procedure:	Samples are collected using a lung-type sampling system shown in the attached figure. In this system, a bag is placed in a sealed container and the container is evacuated. Flue gas enters the bag as it expands to fill the container. Sampling rate is monitored by a rotameter on the container exhaust. This system allows sample collection without exposing the sample to pumps, flowmeters, oils, etc.
Analytical Procedure:	In the analytical phase, the contents of the Tedlar bags are injected directly on a capillary chromatographic column. Column type, instrument conditions and sample volume are optimized to obtain complete separation of all compounds of interest and detection limits of no more than 10 ppb.
	Carnot subcontracts these analyses to qualified local laboratories experienced in these analytical procedures.



Sample Train for Determination of Volatile Organic Compounds (VOC) by EPA 601/602

Method:	Determination of Moisture in Stack Gases
Applicable Ref. Methods:	EPA 4, ARB 1-4
Principle:	A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined volumetrically or gravimetrically.
Sampling Procedure:	The sample train used in the tests is shown in the following figure. The sample is drawn at a constant rate through a stainless steel probe. The probe is connected to an impinger train by Teflon tubing. The train consists of two Smith-Greenburg impingers which contain 100 ml water, an empty impinger as a knockout, and an impinger containing silica gel to protect the pump from moisture.
Sample Recovery and Analysis:	Following testing, moisture content is determined gravimetrically from initial and final impinger weights.



Sample Train for Determination of Moisture by EPA Method 4.

Method: Semi-volatile Organic Sampling Train (Semi-VOST)

References: CARB Method 429 (for PAH)
ASME Modified Method 5

Principle: A metered flue gas sample is collected isokinetically, and semi-volatile organic compounds are collected on a heated filter, on water-cooled XAD-2 resin module, and in an iced impinger bath. Depending upon the specific test requirements, the samples are then analyzed for polycyclic aromatic hydrocarbons (PAH) species. This section discusses the sampling and sample handling techniques for the semi-VOST method.

Sample Train Preparation: Because of the very low detection limits of the analytical techniques, thorough cleaning of sample train components prior to testing is vital. Prior to testing, all glassware is cleaned in Carnot's laboratory with high purity water, acetone, and hexane rinses, and then baked at high temperature. Resin modules are cleaned and loaded with purified resin by the contract laboratory within one week of the scheduled test date. Batches of Whatman 934AH fiberglass filters are toluene-rinsed and proofed by the contract laboratory. Individual filters are then tared and stored in petri dishes lined with hexane rinsed aluminum foil.

Sample train assembly is performed in an on-site clean room by experienced personnel.

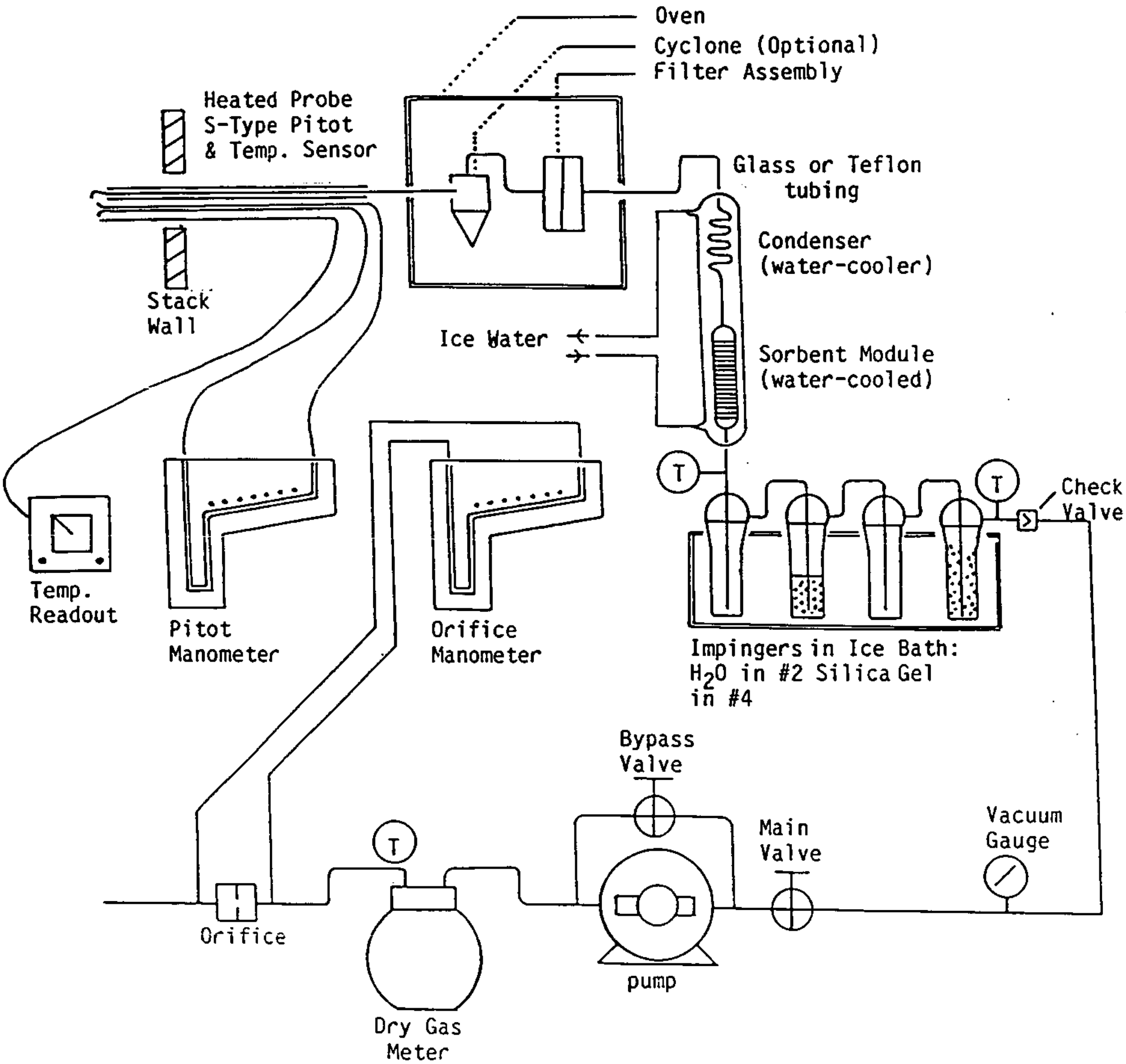
Sampling: The sample train is shown in the attached figure. Sample is pulled through the following components:

1. Glass or nickel-coated stainless steel nozzle
2. Heated glass probe (250 ± 15 F)
3. Optional cyclone in heated oven (250 ± 15 F)
4. Filter in heated oven
5. Glass or teflon tubing
6. Condenser/sorbent module cooled with circulating ice water from impinger bath
7. Dry impinger with stub stem
8. Smith-Greenburg impinger with 100 ml DI H_2O
9. Dry impinger as a knockout
10. Impinger containing silica gel
11. Leak-free vacuum pump
12. Calibrated dry gas meter

The pump, meter, manometers, and heater controllers are all contained in a single control box (Andersen Universal or equivalent).

During final sample train assembly and leak check procedures on the stack or duct, special precautions are taken to minimize the chance of contamination. Sample train components are open to the air for as short a time as possible; and during transport to and from the stack, all components are sealed with hexane rinsed aluminum foil.

Semi-VOST Sampling Train



Sample Recovery: All sample recovery is performed in Carnot's laboratory or an on-site clean room. Following sampling the resin module is sealed with glass caps and stored in a refrigerator or ice chest, the filter is placed in a light-proofed petri dish, and all glassware components are rinsed. The rinse consists of three rinses each of distilled water, acetone, hexane, and methylene chloride. All solvents are high purity GS/MC grade, the squirt bottles are teflon, and the sample bottles are amber glass with teflon-lined caps. Water fractions are placed in separate bottles from the solvent rinses to simplify extraction procedures for the contract laboratory.

Field Blank: At least once during each test series, a field blank sample is collected. This consists of assembling a sample train transporting it to and from the stack, leak checking it, and recovering it. This sample is analyzed using the same procedures as for the test samples.

Sample Custody: Full chain of custody is maintained on all reagents, sample trains, and samples by Carnot and by contract laboratories. In addition to formal documentation by the sample custodians, sample data sheets are initialed by the individuals who assemble and recover each sample train component.

Method:	Formaldehyde by HPLC
Reference:	CARB Method 430
Principle:	A metered gas sample is collected non-isokinetically in acidic 2,4-dinitrophenylhydrazine (DNPH) solution. Formaldehyde reacts with DNPH to form the 2,4-dinitrophenylhydrazone derivative. The concentration of this formaldehyde derivative is determined by reverse phase HPLC with an ultraviolet absorption detector.
Sampling Procedure:	A dry metered gas sample is collected through teflon tubing into an iced midget impinger train containing 20 ml of aqueous acidic DNPH solution. Samples are recovered with DNPH solution into precleaned glass bottles, refrigerated and analyzed within 7 days.
Analytical Procedure:	The concentration of the resulting formaldehyde derivative is quantitated after organic solvent extraction using reverse phase HPLC with an ultraviolet absorption detector. Formaldehyde in the sample is identified and quantitated by comparison of peak retention times and peak areas with those of standard solutions.

Method:	Arsenic by Graphite Furnace Atomic Absorption Spectrophotometry
Reference:	CARB Method 423
Principle:	A metered flue gas sample is collected isokinetically and arsenic is collected on a heated filter followed by a series of water filled impingers.

Sample Procedure:

The sample train used in the tests is shown in the following figure. The sample is drawn isokinetically through a glass nozzle, a glass probe and a filter in a 250°F temperature-controlled oven. This is followed by two Smith-Greenburg impingers which contain 100 ml each of distilled water, an empty impinger as a knock-out and an impinger containing silica gel. All glassware has been previously cleaned in hydrochloric acid, nitric acid, and distilled water.

EPA Method 4 (moisture) and Methods 1 and 2 (velocity) are performed in conjunction with the test. Stack velocity is measured during the test to maintain isokinetic sampling and to measure stack flow rate. Moisture concentration is determined by weighing the impingers before and after sampling to determine the amount of moisture collected.

Sample Recovery and Analysis:

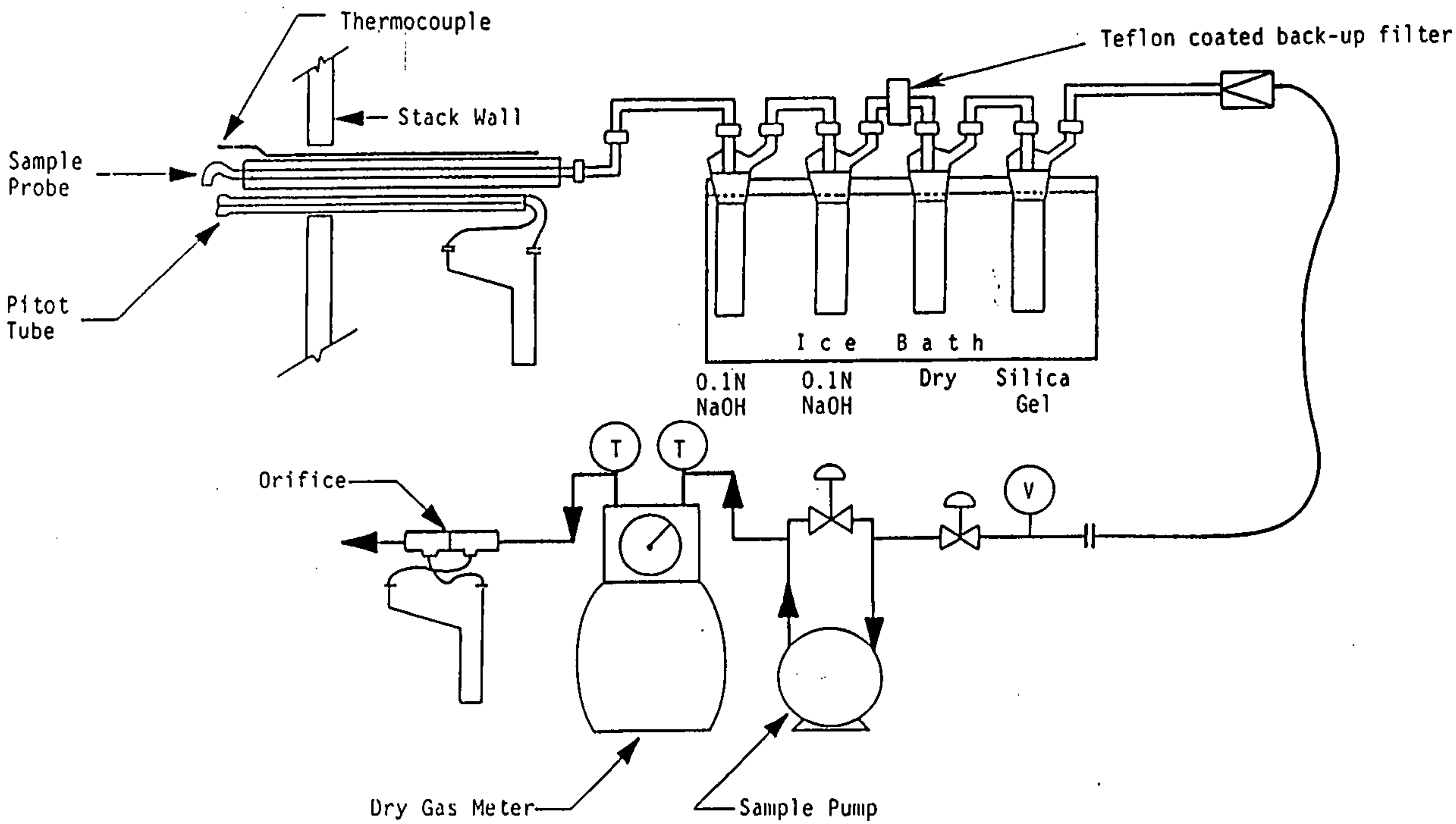
Following testing, the impingers are weighed for moisture determination and the following sample fractions are recovered:

1. Probe, nozzle and front-half glassware - 0.1 N NaOH wash and brushing.

2. Filter

3. Impingers and connecting glassware - 0.1 N NaOH wash.

The probe wash and impinger contents are evaporated, composited with the filter and decomposed in nitric acid and hydrogen peroxide. Aliquots of the final decomposed sample are analyzed for arsenic by graphite furnace atomic absorption spectrophotometry. Analyses of reagent blanks, spikes and duplicates are performed in addition to sample analyses.



Sample Train for Determination of Total and Hexavalent Chromium by Wet Impingement Method CARB Method 425

Method: Determination of Metals by EPA Multi-metals Method

Reference: EPA Draft Publication 8/28/89 "Methodology for the Determination of Metals Emissions in Exhaust Gases From Hazardous Waste Incineration and Similar Combustion Processes"

Principle: A metered flue gas sample is collected isokinetically and metal species are collected on a heated filter followed by a series of impingers.

Sampling Procedure: The sample train used in the tests is shown in the following figure. The sample is drawn isokinetically through a glass nozzle, a glass probe, and a Teflon coated filter in a 250°F temperature-controlled oven. This is followed by two Smith-Greenburg impingers which each contain 100 ml of 5% nitric acid/10% hydrogen peroxide, an impinger containing 100 ml 4% $KMnO_4$/10% H_2SO_4 to absorb excess mercury, and an impinger containing silica-gel. The impingers collect gaseous species while the filter collects any existing as particulate at 250°F. All glassware has been previously cleaned in hydrochloric acid, nitric acid and distilled water.

EPA Method 4 (moisture) and Methods 1 and 2 (velocity) are performed in conjunction with the test. Stack velocity is measured during the test to maintain isokinetic sampling and to measure stack flow rate. Moisture concentration is determined by weighing the impingers before and after sampling to determine the amount of moisture collected.

Sample Recovery and Analysis: Following testing, the impingers are weighed for moisture determination and the following sample fractions are recovered:

1. Probe, nozzle, and front-half glassware - nitric acid/peroxide wash and brushing

2. Filter

3. Nitric acid containing impingers - nitric acid/peroxide wash

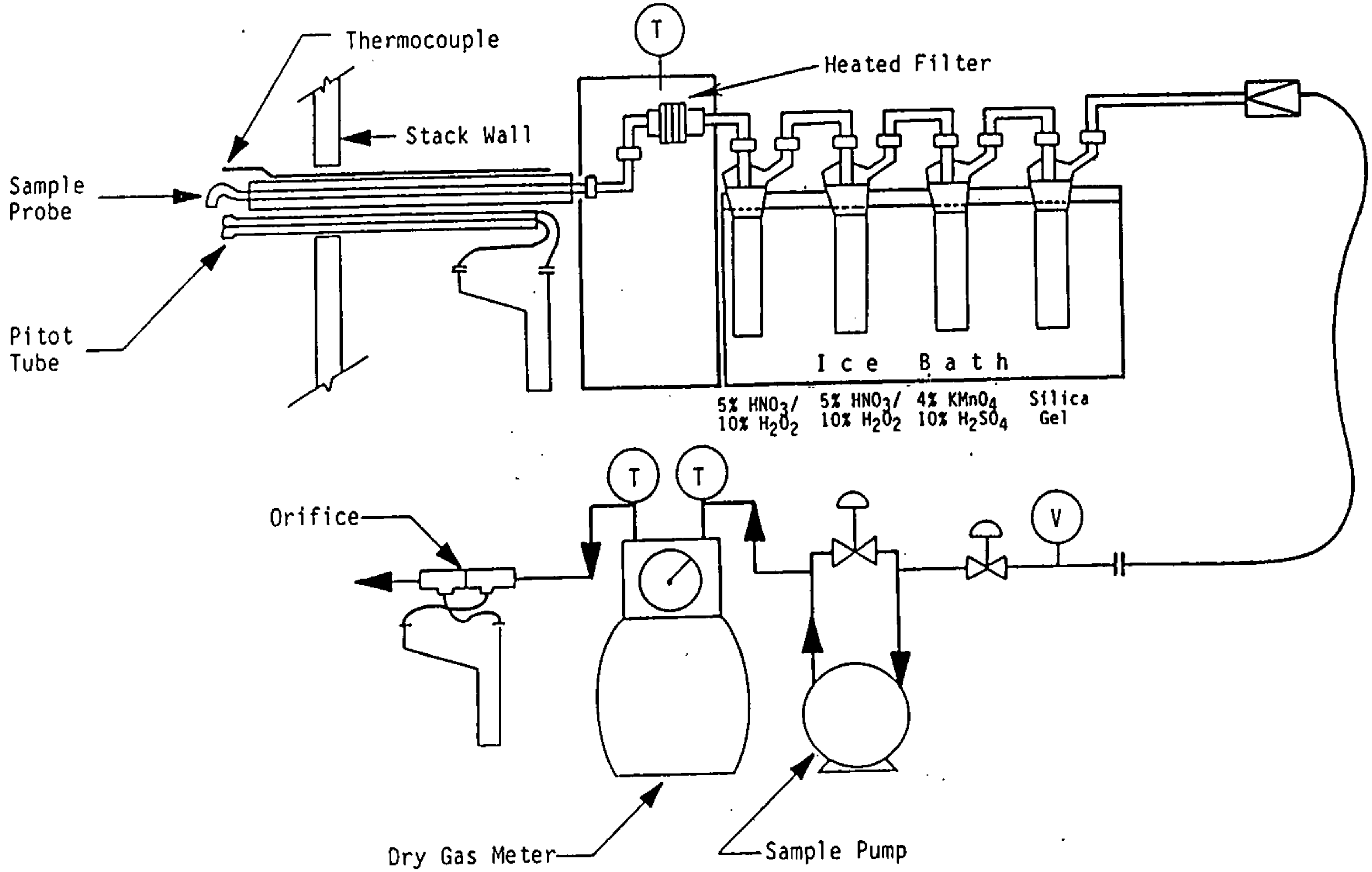
4. Permanganate containing impinger - wash with 4% $KMnO_4$/10% H_2SO_4

The probe wash, filter and the nitric acid/peroxide impinger catch is decomposed using a nitric acid/hydrofluoric acid Parr bomb digestion.

Aliquots of the decomposed probe wash, filter and impinger catch are analyzed for metals of interest by graphite furnace atomic absorption, cold vapor atomic absorption and ICP.

The permanganate impinger catch is decomposed with nitric acid and analyzed for mercury by cold vapor atomic absorption spectrophotometry.

Analyses of reagent blanks, spikes and duplicates are performed for each metal species.



Sample Train for Determination of Metals by EPA Multimetals Method

APPENDIX B

QUALITY ASSURANCE

Appendix B.1

Quality Assurance Program Summary and ARB Certification

QUALITY ASSURANCE PROGRAM SUMMARY AND ARB CERTIFICATION

Carnot ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by an internal QA Officer, and encompasses seven major areas:

1. Development and use of an internal QA manual.
2. QA reviews of reports, laboratory work, and field testing.
3. Equipment calibration and maintenance.
4. Chain of custody.
5. Training.
6. Knowledge of current test methods.
7. Agency certification.

Each of these areas is discussed individually below.

Quality Assurance Manual. Carnot has prepared a QA Manual according to EPA guidelines. The manual serves to document and formalize all of Carnot's QA efforts. The manual is constantly updated, and each member of the Source Test Division is required to read and understand its contents. The manual includes details on the other six QA areas discussed below.

QA Reviews. Carnot's review procedure includes review of each source test report by the QA Officer, and spot check reviews of laboratory and field work.

The most important review is the one that takes place before a test program begins. The QA Officer works closely with Source Test Division personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of any interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

Equipment Calibration and Maintenance. The equipment used to conduct the emissions measurements is maintained according to the manufacturer's instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined by the California Air Resources Board (CARB). The schedule for maintenance and calibrations are given in Tables B-1 and B-2. Quality control checks are also conducted in the field for each test program. The following is a partial list of checks made as part of each CEM system test series.

Sample acquisition and conditioning system leak check.

2-point analyzer calibrations (all analyzers)

3-point analyzer calibrations (analyzers with potential for linearity errors).

Complete system calibration check ("dynamic calibration" through entire sample system).

Periodic analyzer calibration checks (once per hour) are conducted at the start and end of each test run. Any change between pre- and post-test readings are recorded.

TABLE B-1.
SAMPLING INSTRUMENTS AND EQUIPMENT CALIBRATION SCHEDULE
As Specified by the CARB

Instrument Type	Frequency of Calibration	Standard of Comparison or Method of Calibration	Acceptance Limits
Orifice Meter (large)	12 months	Calibrated dry test meter	±2% of volume measured
Dry Gas Meter	12 months or when repaired	Calibrated dry test meter	±2% of volume measured
S-Type Pitot (for use with EPA type sampling train)	6 months	EPA Method 2	Cp constant (+5%) over working range. Difference between the average Cp for each leg must be less than 2%
Vacuum Gauges Pressure Gauges	6 months	Manometer	±3%
Field Barometer	6 months	Mercury barometer	± 0.2" Hg
Temperature Measurement	6 months	NBS mercury thermometer or NBS calibrated platinum RTD	± 4 F for <400°F ± 1.5% for >400°F
Temperature Readout Devices	6 months	Precision potentiometer	± 2% full scale reading
Analytical Balance	12 months (checked prior to each use)	Should be performed by manufacturer or qualified laboratory	± 0.3 mg of stated weight
Probe Nozzles	12 months	Nozzle diameter check micrometer	Range <± 0.10 mm for three measurements
Continuous Analyzers	Depends on use, frequency, and performance	As specified by manufacturers operating manuals, EPA NBS gases, and/or ref. methods	Satisfy all limits specified in operating specifications

TABLE B-2.
EQUIPMENT MAINTENANCE SCHEDULE
Based on Manufacturer's Specifications and Carnot Experience

Equipment	Performance Requirement	Maintenance Interval	Corrective Action
Pumps	1. Absence of leaks 2. Ability to draw mfr required vacuum and flow	Every 500 hrs of operation or 6 months whichever is less	1. Visual insp. 2. Clean 3. Replace worn parts 4. Leak check
Flow Measuring Device	1. Free mechanical movement 2. Absence of malfunction	Every 500 hrs of operation or 6 months whichever is less After each test, if used in H_2S sampling or other corrosive atmospheres	1. Visual insp. 2. Clean 3. Calibrate
Sampling Instruments	1. Absence of malfunction 2. Proper response to zero, span gas	As required by manufacturer	As recommended by manufacturer
Integrated Sampling Tanks	Absence of leaks	Depends on nature of use	1. Steam clean 2. Leak check
Mobile Van Sampling Systems	Absence of leaks	Depends on nature of use	1. Change filters 2. Change gas dryer 3. Leak check 4. Check for system contamination
Sampling Lines	Sample degradation less than two percent	After each test or test series	Blow filtered air thru line until dry

All calibrations are conducted using gases certified by the manufacturer to be + 1% of label value (NBS traceable).

Calibration and CEM performance data are fully documented, and are included in each source test report.

Chain of Custody. Carnot maintains full chain of custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Carnot documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.).

Samples are stored in a locked area to which only Source Test Division personnel have access. Neither other Carnot employees nor cleaning crews have keys to this area.

Data sheets are copied immediately upon return from the field, and this first generation copy is placed in locked storage. Any notes made on original sheets are initialed and dated.

Training. Personnel training is essential to ensure quality testing. Carnot has formal and informal training programs which include:

1. Attendance at EPA-sponsored training courses.
2. Enrollment in EPA correspondence courses.
3. A requirement for all technicians to read and understand Carnot's QA Manual.
4. In-house training and QA meetings on a regular basis.
5. Maintenance of training records.

Knowledge of Current Test Methods. With the constant updating of standard test methods and the wide variety of emerging test methods, it is essential that any qualified source tester keep abreast of new developments. Carnot subscribes to services which provide updates on EPA and CARB reference methods, and on EPA, CARB, and SCAQMD rules and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences. Carnot personnel maintain membership in the Air Pollution Control Association, the Source Evaluation Society, and the ASME Environmental Control Division.

AGENCY CERTIFICATION

Carnot is certified by the CARB as an independent source test contractor for gaseous and particulate measurements. Carnot also participates in EPA QA audit programs for Methods 5, 6, and 7.

Additionally, Carnot's QA Officer is actively participating on a Source Evaluation Society committee to develop a nationwide accreditation program for source testers.

STATE OF CALIFORNIA

George Deukmejian, Governor

AIR RESOURCES BOARD
1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812

June 21, 1989

Robert A. Finken
Director, Testing Services
Energy Systems Associates
15991 Red Hill Ave., Suite 110
Tustin, CA 92680

Dear Mr. Finken:

Testing Approval

We are pleased to inform you that we have renewed your approval to conduct the types of testing listed in the enclosed Executive Order. This approval is valid until June 30, 1990 during which time a field audit of your company's testing ability may be conducted.

If you have any questions regarding the approvals or other tests, please contact Ms. Kathryn Gugeler at (916) 327-1521 or Mr. Raak Veblen at (916) 327-1519. All correspondance should be addressed to me at the post office box above.

Sincerely,

James J. Morgester, Chief
Compliance Division

State of California
AIR RESOURCES BOARD

Executive Order G-482

WHEREAS, the Air Resources Board ("Board"), pursuant to Section 41512 of the California Health and Safety Code, has established the procedures contained in Section 91200-91220, Title 17, California Code of Regulations, to allow the use of independent testers for compliance tests required by the Board; and

WHEREAS, pursuant to Sections 91200-91220, Title 17, California Code of Regulations, the Executive Officer has determined that Energy Systems Associates meets the requirements of the Board for conducting ARB Test Methods 1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 1-8, 1-10, and 1-100 (NOx, and O2).

NOW, THEREFORE, BE IT ORDERED that Energy Systems Associates is granted an approval, from the date of execution of this order, until June 30, 1990 to conduct the tests listed above, subject to compliance with Section 91200-91220, Title 17, California Code of Regulations.

BE IT FURTHER ORDERED that during the approved period the Executive Officer or his or her authorized representative may field audit one or more tests conducted pursuant to this order for each type of testing listed above.

Executed at Sacramento, California, this 19TH day of JUNE 1989.

James J. Morgester, Chief
Compliance Division

Appendix B.2

Calibration Data

SPAN GAS RECORD

Date 2/22/90

Client/Location SCE/EL SEGUNDO U-1 By FINKEN

Gas	Span Cylinder		Aux. Span Cylinder	
	Cylinder No.	Concentration	Cylinder No.	Concentration
Zero	ALM 4242			
NOx	ALM 4242	223.5	^	
O2	AAL 7594	5.00	ALM 5692	8.00
CO	↓	275.0	↓	422.2
CO2	↓	15.00	↓	22.5
SO2				

INSTRUMENT LINEARITY

	Analyzer				
	O2	CO2	CO	NOx	SO2
Analyzer Range					
Set to High STD (80-90% of Range)					
As-Found Low STD (50-60% of Range)					
Actual Value of Low STD					
Difference in % of Full Scale					

Allowable deviation is 2% of full scale (2 squares on strip chart).

Scott Specialty Gases
a division of Scott Environmental Technology, Inc.
PLUMSTEADVILLE, PA 18949 PHONE: (215) 766-8861 TWX: 510-665-9344

Date: 6-8-89
Our Project No.: 01092
Your P.O. No.: 5118

ENERGY SYSTEMS
15991 REDHILL AVE #110
TUSTIN, CA 92680
ATTN: JIM MULLIGAN

Gentlemen:

Thank you for choosing Scott for your Specialty Gas needs. The analyses for the gases ordered, as reported by our laboratory, are listed below. Results are in volume percent, unless otherwise indicated.

ANALYTICAL REPORT

Cyl. No. AAL 13394 Analytical Accuracy ±1%*

Component	Concentration
OXYGEN	4.997%
CARBON MONOXIDE	55.00 PPM
CARBON DIOXIDE	15.00%
*GRAVIMETRIC MASTER	
NITROGEN	BALANCE

Cyl. No. AAL 13326 Analytical Accuracy ±1%*

Component	Concentration
OXYGEN	[illegible]00%
CARBON MONOXIDE	55.01 PPM
CARBON DIOXIDE	15.00%
*GRAVIMETRIC MASTER	
NITROGEN	BALANCE

Cyl. No. AAL 7594 Analytical Accuracy ±1%*

Component	Concentration
OXYGEN	5.000%
CARBON MONOXIDE	275.0 PPM
CARBON DIOXIDE	15.00%
*GRAVIMETRIC MASTER	
NITROGEN	BALANCE

Cyl. No. AAL 11798 Analytical Accuracy ±1%*

Component	Concentration
OXYGEN	12.50%
CARBON MONOXIDE	55.00 PPM
CARBON DIOXIDE	15.00%
*GRAVIMETRIC MASTER	
NITROGEN	BALANCE

CERTIFIED

*Certified to have been blended against NBS certified weights and verified correct by independent analysis.

Analyst ______________

Approved By R. Shealy

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

AUG 2 3 1989

TELEX: 510-100-8831 (ScotGas)
FAX: 714-887-0549
PHONE: 714-887-2571

Scott Specialty Gases

a division of
Scott Environmental Technology Inc. 2600 CAJON BLVD., SAN BERNARDINO, CA 92405

Date: 8-9-89
Our Project No.: 01858
Your P.O. No.: 5264

ENERGY SYSTEMS ASSOCIATES
15991 RED HILL AVE., SUITE 110
TUSTIN, CA 92680
ATTN: JIM MULLIGAN

Gentlemen:

Thank you for choosing Scott for your Specialty Gas needs. The analyses for the gases ordered, as reported by our laboratory, are listed below. Results are in volume percent, unless otherwise indicated.

ANALYTICAL REPORT

Cyl. No. ALM 5688 — Analytical Accuracy ±2% *

Component	Concentration
CARBON DIOXIDE	22.50%
CARBON MONOXIDE	422.6 PPM
OXYGEN	8.001%
*GRAVIMETRIC MASTER	
NITROGEN	BALANCE

Cyl. No. ALM 5692 — Analytical Accuracy ±2%*

Component	Concentration
CARBON DIOXIDE	22.50%
CARBON MONOXIDE	422.2 PPM
OXYGEN	8.000%
*GRAVIMETRIC MASTER	
NITROGEN	BALANCE

Cyl. No. ALM 5675 — Analytical Accuracy ±2%*

Component	Concentration
CARBON DIOXIDE	15.00%
CARBON MONOXIDE	54.56 PPM
OXYGEN	5.001%
*GRAVIMETRIC MASTER	
NITROGEN	BALANCE

Cyl. No. ALM 5598 — Analytical Accuracy ±2%*

Component	Concentration
CARBON DIOXIDE	15.00%
CARBON MONOXIDE	54.46 PPM
OXYGEN	5.000%
*GRAVIMETRIC MASTER	
NITROGEN	BALANCE

*Certified to have been blended against NBS certified weights and verified correct by independent analysis.

Analyst ______

Approved By [signature]

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Scott Specialty Gases a division of

TELEX: 510-100-8831 (ScotGas)
FAX: 714-887-0549
PHONE: 714-887-2571

Scott Environmental Technology Inc. 2600 CAJON BLVD., SAN BERNARDINO, CA 92405

ENERGY SYSTEMS ASSOCIATES
ATTN: MIKE SCHMIDT

Shipped From: Scott SAN BERNARDINO
Date Shipped 3-6-89
Our Project No: 416136
Your P.O. No: 4734
Page 1 of 1
Expiration Date: 9-6-90

CERTIFICATE OF ANALYSIS—EPA PROTOCOL GASES*

Certified Per Traceability Protocol No. 1 Procedure No. G1 Cylinder No. ALM-4242 Cylinder Pressure 1900 psig Certified Accuracy ± 1 % NBS Traceable

COMPONENTS	CERTIFIED CONC	REFERENCE STD SRM/CRM NO.	REFERENCE STD CYL. NO.	REFERENCE STD CONC.	GAS ANALYZER MAKE/MODEL/SERIAL NO.	GAS ANALYZER LAST CAL. DATE	GAS ANALYZER ANALYTICAL PRINCIPLE
Nitric Oxide	221.7 PPM	CRM 1685 B	AAL-5248	237.9 PPM	Thermo-Electron 10 AR S/N 14853-150	2-2-89	Chemi-Luminenscent
NOX	223.5 PPM						

BALANCE GAS Nitrogen

ANALYZER READINGS: Z = Zero Gas T = Test Gas R = Reference Gas

Component Nitric Oxide

First Analysis Date 2-22-89 Units PPM

Z	0.01	R	94.63	T	88.27
R	94.76	Z	0.01	T	88.11
Z	0.02	T	88.15	R	94.58

Mean Test Assay 221.6

Second Analysis Date 3-1-89 Units PPM

Z	0.00	R	94.72	T	88.18
R	94.65	Z	0.02	T	88.31
Z	0.02	T	88.27	R	94.73

Mean Test Assay 221.7

Component ______ Date ______ Units ______
Z ___ R ___ T ___
R ___ Z ___ T ___
Z ___ T ___ R ___
Mean Test Assay ______
Date ______ Units ______
Z ___ R ___ T ___
R ___ Z ___ T ___
Z ___ T ___ R ___
Mean Test Assay ______

Component ______ Date ______ Units ______
Z ___ R ___ T ___
R ___ Z ___ T ___
Z ___ T ___ R ___
Mean Test Assay ______
Date ______ Units ______
Z ___ R ___ T ___
R ___ Z ___ T ___
Z ___ T ___ R ___
Mean Test Assay ______

Chronology: Date ______
Assay ______

Analyst Doug Grant

Approved By: ______

E∫A

POST TEST DRY GAS METER CALIBRATION DATA

Calibrated By: L. Mulligan

Date: 3/11/90

Field Meter ID: ES-8

Barometric Press: 30-00

Test Meter ID: ES-13

Test Meter Y (Y_t): 1.00

Test Meter Last Cal: 12/14/89

Test Program Preceding Calibration Check ____________

Average ΔH from Test Runs ____________

Maximum Vacuum from Test Runs ____________

Field Meter								Test Meter				
				Temperature							Temperature	
ΔH	Final Volume	Initial Volume	Volume (V_{dg})	Inlet (t_i)	Outlet (t_o)	Vacuum	Time (0)	Final Volume	Initial Volume	Volume (V_{tm})	Inlet	Outlet
1.0	140.153	134.485	5.668	75	61	2	10:00	284.257	278.791	5.466	58	58
				83	64						58	58
1.0	145.851	140.153	5.698	84	66	2	10.00	289.703	284.257	5.446	58	58
				88	69						58	58
1.0	151.574	145.851	5.723	84	70	2	10.00	295.127	285.703	5.424	58	58
				92	73				289.703		58	58

ESA/MSC-165

DS-108
6/89

ENERGY SYSTEMS ASSOCIATES POST TEST DRY GAS METER CALIBRATION CHECK

CALIBRATED BY JJM　　DATA ENTRY BY JJM

DATE 03/11/90　　BAROMETRIC PRESSURE 30

FIELD GAS METER I.D. ES-8　　TEST METER ES-13

INITIAL Yd 0.990　　TEST METER Y (Yt) 1.000

INITIAL H@ 1.920　　TEST METER LAST CAL. 12/89

FIELD METER				TEST METER			RESULTS		
VOLUME cu.ft.	TEMP. IN	TEMP OUT	DELTA "H2O	TIME min.	VOLUM cu.ft	TEMP. 'F	Q cfm	Y	H@
5.67	77	62.5	1.00	10	5.46	58	0.57	0.984	1.81
5.70	86	67.5	1.00	10	5.44	58	0.57	0.988	1.81
5.72	88	71.5	1.00	10	5.42	58	0.57	0.985	1.81
						AVERAGES		0.986	1.81

PASS - INDIVIDUAL Yd VALUES ACCEPTABLE

PASS - INDIVIDUAL DELTA H@ VALUES ACCEPTABLE

PASS - POST TEST Yd WITHIN LIMITS

ENERGY SYSTEMS ASSOCIATES

DRY GAS METER CALIBRATION

'IELD GAS METER I.D. ES-8 TEST METER ES-13

)ATE 1/22/90 TEST METER LAST CAL. 1.000 = Yt

BAROMETRIC PRESSURE 30.17

FIELD METER			TEST METER				RESULTS				
/OLUME :u.ft.	TEMP. 'F	DELTA H "H2O	TIME min.	VOLUME cu.ft.	TEMP. 'F	PRESS. "H2O	Q cfm	Y	H@	AVE.Y	AVG. H@
4.55	90.5	0.4	13	4.55	64	0	0.35	1.050	1.71	1.0069	1.68
4.94	91.5	0.4	13	4.63	64	0	0.38	0.985	1.64		
4.91	93	0.4	13	4.59	64	0	0.38	0.986	1.67		
5.01	94	0.72	10	4.69	64.5	0	0.50	0.987	1.70	1.0046	1.63
4.98	96	0.72	10	4.87	64.5	0	0.50	1.035	1.57		
5.14	97	0.72	10	4.81	64.5	0	0.51	0.992	1.61		
4.66	97	1	8	4.37	65.5	0	0.58	0.992	1.74	0.9915	1.75
4.65	99	1	8	4.35	66.5	0	0.58	0.991	1.76		
4.68	100	1	8	4.38	67	0	0.59	0.992	1.73		
5.79	102	2	7	5.456	68	0	0.83	0.998	1.71	0.9981	1.71
5.85	102.	2	7	5.511	68	0	0.84	0.999	1.68		
5.77	102.	2	7	5.426	68	0	0.82	0.997	1.73		
6.77	103	4	6	6.414	68	0	1.13	1.000	1.82	1.0026	1.80
6.82	104.	4	6	6.459	68	0	1.14	1.003	1.79		
6.82	104.	4	6	6.468	68	0	1.14	1.004	1.78		
								AVERAGE		1.0007	1.71
										*******	*********

E∫A

DRY GAS METER CALIBRATION DATA

Date Jan 22, 1990 By SM

Field Dry Gas Meter ID ES-13

Barometric Pressure (P_b) 30.67 (in.Hg)

Test Meter ID. ES-8

Test Meter Y_d 0.9900

Date Last Calib. ______

Approx Flow Rate cfm	Field Dry Gas Meter: Final Volume	Initial Volume	Volume (V_{dg}) ft³	Temperatures, °F: Inlet (t_i)	Outlet (t_o)	Average (t_d)	Pressure (ΔH) in. H_2O	Time (θ) min.	Test Meter: Final Volume	Initial Volume	Volume (V_{tm}) ft³	Temperatures, °F: Inlet (t_i)	Outlet (t_o)	Average (t_{tm})	Pressure in. H_2O	Actual Flow Rate (Q) cfm
	736.085	731.535	4.55	97	84	90.5	0.40	13	008.221	003.946	4.27	64	64	64	0.0	0.35
0.40	741.030	736.085	4.94	97	86	91.5	0.40	13	012.851	008.221	4.63	64	64	64	0.0	0.37
	745.942	741.030	4.912	99	87	93.0	0.40	13	017.446	012.851	4.59	64	64	64	0.0	0.335
	756.038	751.027	5.01	100	88	94	0.72	10	026.509	022.210	4.29	65	64	64.5	0.0	0.501
0.60 .70	761.021	756.038	4.98	103	89	96	0.72	10	031.561	026.690	4.87	65	64	64.5	0.0	0.498
	766.167	761.071	5.14	104	90	97	0.72	10	036.371	031.561	4.81	65	64	64.5	0.0	0.514
	771.547	766.881	4.66	104	90	97	1.0	8	041.418	037.045	4.37	66	65	65.5	0.0	0.582
~~0.80~~ 1.0	776.203	771.547	4.65	107	91	99	1.0	8	045.774	041.418	4.35	67	66	66.5	0.0	0.581
	780.883	776.203	4.68	108	92	100	1.0	8	050.163	045.774	4.38	67	67	67	0.0	0.585
	787.103	781.305	5.79	111	93	102	2.0	7	056.017	050.561	5.456	68	68	68	0.0	0.827
~~1.00~~ 2.0	792.959	787.103	5.85	112	93	102.5	2.0	7	061.535	056.017	5.511	68	68	68	0.0	0.835
	798.726	792.959	5.767	113	94	102.5	2.0	7	066.954	061.528	5.426	68	68	68	0.0	0.823
	807.345	800.570	6.77	113	93	103	4.0	6	075.111	068.698	6.414	68	68	68	0.0	1.129
~~1.20~~ 4.0	814.163	807.345	6.818	115	94	104.5	4.0	6	081.571	075.112	6.459	68	68	68	0.0	1.136
	820.982	814.163	6.819	115	94	104.5	4.0	6	088.039	081.571	6.468	68	68	68	0.0	1.136

Yd =

ΔHe =

CFM @ ΔH = 1.0 = .570

ΔHe	min	Volume
1.0	3.	1.741
1.0	3	1.741
1.6	4	2.317

ESA DS-048 5700

ANDERSEN SAMPLERS INCORPORATED

4215 WENDELL DRIVE ◻ ATLANTA, GEORGIA 30336

CONTROL UNIT CALIBRATION

Date 1-20-84 Box No. 184-209 (ES-8)

Barometric pressure, P_b = 30.30 in. Hg Dry Gas Meter No. ______

Orifice manometer setting, ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °R	Temperature: Dry gas meter Inlet t_{di}, °R	Temperature: Dry gas meter Outlet t_{do}, °R	Temperature: Dry gas meter Average t_d, °R	Time θ, min	γ	$\Delta H@$
1.0	5	5.43	71/531	120	92	106/566	9.5	.982	1.88
2.0	5	5.42	71/531	127	93	110/570	6.8	.990	1.91
4.0	5	5.41	71/531	134	94	114/574	4.9	.999	1.97
								.990	1.92

Calculations

ΔH	$\frac{\Delta H}{13.6}$	$\gamma = \frac{V_w P_b (t_d)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w)}$	$\Delta H@ = \frac{0.0317 \Delta H}{P_b (t_d)} \left[\frac{(t_w)\theta}{V_w}\right]^2$
1.0	0.0735		
2.0	0.147		
4.0	0.294		

γ = 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_2O. Tolerance – ± 0.15

Calibrated by: MDC

ENERGY SYSTEMS ASSOCIATES

POST TEST DRY GAS METER CALIBRATION CHECK

DATE 3/1/90 BAROMETRIC PRESSURE 30.17

FIELD GAS METER I.D. ES-19 TEST METER ES-13

INITIAL Yd 1.000 TEST METER Y (Yt) 1.000

INITIAL H@ 1.830 TEST METER LAST CAL.12/14\89

FIELD METER				TEST METER			RESULTS		
VOLUME cu.ft.	TEMP. IN	TEMP OUT	DELTA "H2O	TIME min.	VOLUM cu.ft	TEMP. 'F	Q cfm	Y	H@
5.74	90	67	1.00	10	5.73	63	0.57	1.027	1.65
5.78	98	74	1.00	10	5.77	63	0.58	1.041	1.61
5.80	98	76	1.00	10	5.81	63	0.58	1.045	1.58
						AVERAGES		1.038	1.62

PASS - INDIVIDUAL Yd VALUES ACCEPTABLE

PASS - INDIVIDUAL DELTA H@ VALUES ACCEPTABLE

PASS - POST TEST Yd WITHIN LIMITS

E/A

POST TEST DRY GAS METER CALIBRATION DATA

alibrated By GWB

ate 2/16/90 -

ield Meter ID ES-19

arometric Press 30.17

Test Meter ID ES-43

Test Meter Y (Y_t) 1.000

Test Meter Last Cal 12/14/89

Test Program Preceding Calibration Check OBrieN

Average ΔH from Test Runs

Maximum Vacuum from Test Runs

	Field Meter							Test Meter				
				Temperature							Temperature	
H	Final Volume	Initial Volume	Volume (V_{dg})	Inlet (t_i)	Outlet (t_o)	Vacuum	Time (θ)	Final Volume	Initial Volume	Volume (V_{tm})	Inlet	Outlet
.0	1000.255	993.905	6.345	94 94	70 70	5	10	101.978	95.830	6.148	62 62	64 64
.0	6.623	0.250	6.373	95 96	72 73	5	10	108.111	101.978	6.133	62 62	64 64
.0	13.070	6.623	6.447	96 97	74 75	5	10	114.285	108.111	6.174	62 62	64 64

DS-108
6/89

ENERGY SYSTEMS ASSOCIATES

DRY GAS METER CALIBRATION

IELD GAS METER I.D. ES-19 TEST METER ES-13

ATE 1/19/90 TEST METER LAST CAL. 1.000 = Yt

BAROMETRIC PRESSURE 30.15

FIELD METER			TEST METER				RESULTS				
OLUME u.ft.	TEMP. 'F	DELTA H "H2O	TIME min.	VOLUME cu.ft.	TEMP. 'F	PRESS. "H20	Q cfm	Y	H@	AVE.Y	AVG. H@
6.01	84.5	0.4	15.5	5.759	65	0	0.39	0.993	1.54	0.9941	1.49
5.21	88	0.4	13	4.965	65	0	0.40	0.994	1.45		
5.18	91.5	0.4	13	4.907	65	0	0.40	0.995	1.47		
6.10	102	0.7	12	5.886	66	0	0.51	1.029	1.50	1.0306	1.49
5.12	106	0.7	10	4.898	66	0	0.51	1.029	1.49		
9.80	110	0.7	19	9.364	66	0	0.52	1.034	1.47		
5.44	99.5	1	9	5.198	66	0	0.60	1.014	1.55	0.9961	1.57
6.01	100	1	10	5.747	66	0	0.60	1.016	1.57		
5.71	100	1	9	5.153	66	0	0.63	0.958	1.58		
5.50	101	2	7	5.543	66	0	0.79	1.070	1.65	1.0276	1.68
4.97	101	2	6	4.73	66	0	0.83	1.010	1.66		
7.39	99.5	2	9	7.005	66	0	0.82	1.003	1.71		
6.83	102	4	6	6.467	65.5	0	1.14	1.003	1.77	1.0042	1.74
6.97	102	4	6	6.594	65.5	0	1.16	1.002	1.71		
8.05	102	4	7	7.66	65.5	0	1.15	1.008	1.72		
								AVERAGE		1.0105	1.59
										*******	*********

E∫A

DRY GAS METER CALIBRATION DATA

Test Meter ID. ES-13

Test Meter Y_d 1.000

Date Last Calib. 12-14-89

Date 1-19-90 By CF

Field Dry Gas Meter ID ES-19

Barometric Pressure (P_b) 30.15 (in.Hg)

Approx Flow Rate cfm	Field Dry Gas Meter Final Volume	Field Dry Gas Meter Initial Volume	Field Dry Gas Meter Volume (V_{dg}) ft³	Field Dry Gas Meter Temperatures, °F Inlet (t_i)	Field Dry Gas Meter Temperatures, °F Outlet (t_o)	Field Dry Gas Meter Temperatures, °F Average (t_d)	Pressure (ΔH) in.H_2O	Time (θ) min.	Test Meter Final Volume	Test Meter Initial Volume	Test Meter Volume (V_{tm}) ft³	Test Meter Temperatures, °F Inlet (t_i)	Test Meter Temperatures, °F Outlet (t_o)	Test Meter Temperatures, °F Average (t_{tm})	Pressure in.H_2O	Actual Flow Rate (Q) cfm
0.40	80.521	74.577	6.007	94	75	84.5	.40	15.5	80.544	74.785	5.759	65	65	65		
	85.772	80.521	5.208	97	79	88	.40	13	85.509	80.544	4.965	65	65	65		
	10.962	85.772	5.176	101	82	91.5	[illegible]	13	90.416	85.509	4.907	65	65	65		
0.60	20.488	14.786	6.102	102	75	88.5	.70	12	18.888	13.002	5.886	66	66	66		
	25.622	20.488	5.115	106	79	92.5	.70	10	23.788	18.888	4.898	66	66	66		
	35.[illegible]	25.622	9.795	100	84	97	.72	19	33.150	23.786	9.364	66	66	66		
0.80	40.242	35.298	5.442	113	86	99.5	1.0	9	[illegible]	33.150	5.198	66	66	66		
	46.846	40.842	6.006	113	87	100	1.0	10	44.095	38.348	5.747	66	66	66		
	52.556	46.846	5.710	113	87	100	1.0	9	49.242	44.095	5.153	66	66	66		
1.00	58.055	52.556	5.499	115	87	101	2.0	7	54.791	49.248	5.543	66	66	66		
	63.028	58.055	4.972	114	82	101	2.0	6	[illegible]9.521	54.791	4.730	66	66	66		
	70.418	63.028	7.390	112	87	99.5	2.0	9	66.521	59.521	7.005	66	66	66		
1.20	77.249	70.418	6.831	116	88	102	4.0	6	72.993	66.526		65	66	65.5		
	84.219	77.249	6.970	116	88	102	4.0	6	79.587	72.993		65	66	65.5		
	92.341			116	88	102	4.0	7	87.247			65	65			

ANDERSEN
SAMPLERS INCORPORATED

4215 WENDELL DRIVE ATLANTA, GEORGIA 30336

CONTROL UNIT CALIBRATION

Date 1-28-87 Unit Number 187-342 (ES-19

Barometric pressure, P_b = 29.98 in Hg. Model Number 90-800

Orifice manometer setting, ΔH in. H_2O	Gas volume, wet test meter V_w, ft^3	Gas volume, dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °R	Temperature: Dry gas meter Inlet t_{di}, °R	Temperature: Dry gas meter Outlet t_{do}, °R	Temperature: Dry gas meter Average t_d, °R	Time θ, min	Y	$\Delta H@$
1.0	5	5.42	76/536	132	102/562	117/577	9.18	.99	1.82
2.0	5	5.40	76/536	136	104/564	120/580	6.52	1.00	1.83
4.0	5	5.38	76/536	141	105/565	123/583	4.64	1.00	1.85
								1.00	1.83

Calculations

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w)}$	$\Delta H@$: $\frac{0.0317 \Delta H}{P_b (t_{do})}\left[\frac{(t_w)\theta}{V_w}\right]^2$
1.0	0.0735		
2.0	0.147		
4.0	0.294		

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_2O. Tolerance : ± 0.15

Calibrated by:

E∫A

PITOT TUBE DIMENSIONAL CALIBRATION

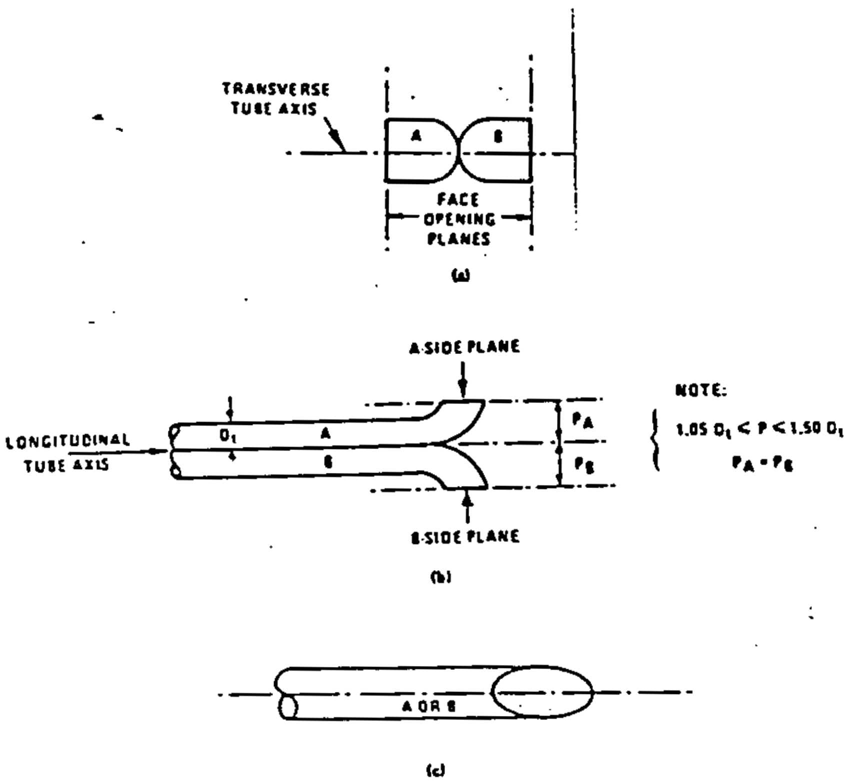
Pitot Tube I.D. A1 Date 2/21/90 By S. Mulligan

D_t ~~.377~~ .374 P_A .510 P_B .570

(a) Face opening plane angle = 90 deg (Y/N) A Y B Y

(b) Face opening planes parallel to longitudinal axis (Y/N) A Y B Y

(c) Both legs equal length and centerline coincident View (Y/N) A Y B Y



Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

Pitot Tube ID 1 Date 2/25/90 By Finkam

D_t .373 P_A .500 P_b .500

(a) Y Y

(b) Y Y

(c) Y Y

Appendix B.3

CEM Performance Data

E∫A

CEM PERFORMANCE DATA

By FINKEN Location SCE EL SEGUNDO U-1 Date 2/22/90

System Configuration

Analyzers in Service O_2, CO_2, HORIBA CO

Probe: Length 8' Liner Material SS. Heated (Y/N) N

Sample Line: Length ~100' Material Poly

On-Stack Conditioner: In Service (Y/N) N Coolant N/A

System Flow Rate (from file): ~1 cfm cfm

System Leak Check

Pre-Test: 0.0 cfh Post-Test: ______ cfh

$$\text{Leak Rate (\%)} = \frac{\text{Post Test (cfh)}}{\text{System Flow Rate (cfm)} \times 60} \times 100 = \_\_\_\_\_\%$$

System Response Time Check

	1	2	3	Avg
Upscale	30 sec	25 sec	25 sec	27 sec
Downscale	25 sec	25 sec	25 sec	25 sec

APPENDIX C

DATA SHEETS, CALCULATIONS, AND LABORATORY REPORTS

Appendix C.1

Sample Location

E/A

SAMPLING POINT LOCATION DATA
EPA Method 1

Plant SCE EL SEGUNDO Data by FINKEN

Date 2/20 →

Test Location PLAN VIEW of Ducts

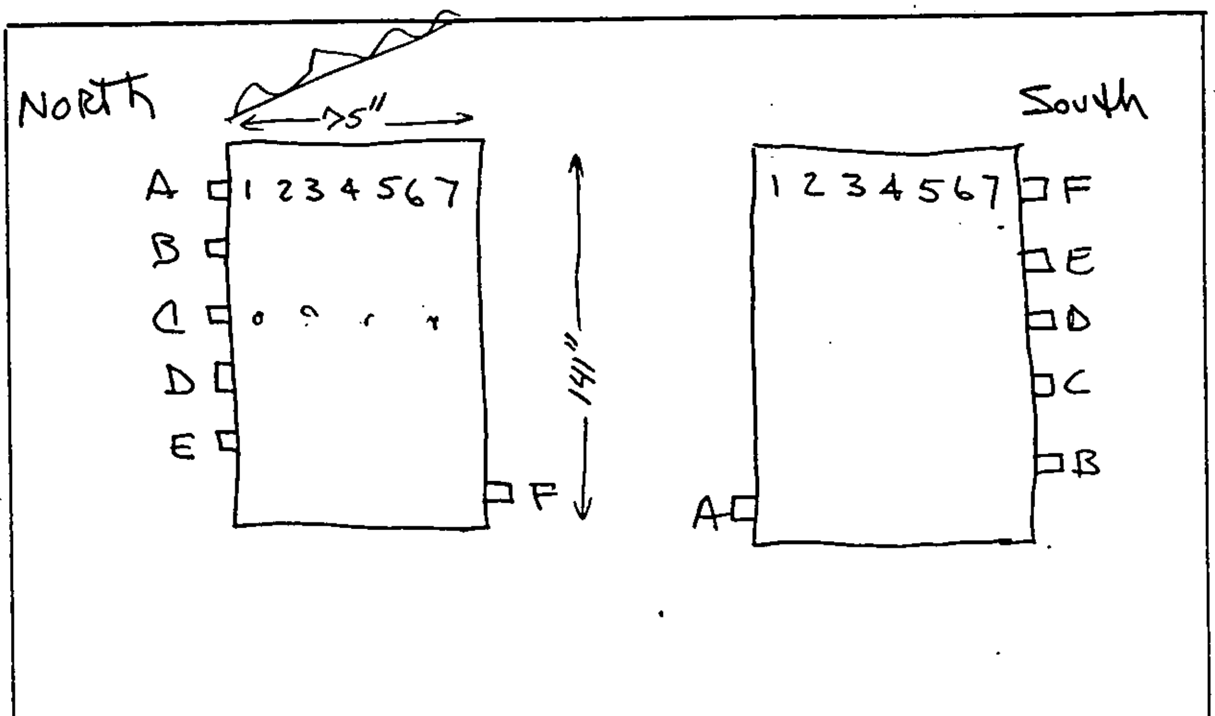


DIAGRAM OF SAMPLING LOCATION

Upstream Dist./Dia. ________

Downstream Dist./Dia. ________

Coupling Length 10.5"

No. of Sampling Pts. 42

Stack Dimension 75" x 141"

Stack Area, ft^2 7344

Sample Point	% of Diameter	In. from near Wall	In. from Nozzle*

*Inches from wall plus coupling length

ESA DS-009

Appendix C.2

Unit Operating Data

6269 TRAILER EL SEGUNDO 1-2 Data by: M. ESCARCEGA

TEST NUMBER		1	2	2	2	2,3	2,4
DATE		2/20/90	2/22/90	2/22/90	2/22/90	2/22/90	2/22
TIME			1100	1216	1330	1430	1530
FUEL		B	OIL	OIL	OIL	OIL	OIL
LOAD (Net)	Mw	L	173	171	172	174	174
AUX. LOAD	Mw	A	8.8	8.8	8.8	9.0	8.9
BURNERS O.O.S.		N	1,3,6,8	1,3,6,8	1,3,6,8	1,3,6,8	1,3,6
NOx PORTS		K	OPEN	→	→	→	
O_2 LEVEL		S	NORMAL	NORMAL	→	→	→
GAS RECIRCULATION			NORMAL	NORMAL	→	→	→
REGISTERS North		T	OPEN	OPEN	→	→	→
REGISTERS South		A	OPEN	OPEN	→	→	→
OIL TANK		K	NORTH	→	→	→	→
OIL TEMP.	°F	E	170	→	→	→	→
EXCESS O_2 (CH) N	%	N	1.2-2.0	1.2-2.0	2.9	2.9	3.0
EXCESS O_2 (CH) S	%		OOS	2.0-2.2	2.4	2.6	2.5
COMBUSTIBLES N	%	A	0	0	0	0	0
COMBUSTIBLES S	%	L	0	0	0	0	0
CONDENSER VACUUM	In.Hg	L	2.1	1.8	2.0	1.50	1.50
FEEDWATER FLOW	Klb/hr		1325	1275	1275	1300	1310
STEAM FLOW	Klb/hr	D	1225	1175	1175	1225	1225
STEAM TEMP.	°F	A	920	930	960	980	920
STEAM PRESSURE	PSIG	Y	1840	1700	1850	1850	1825
OIL FLOW (CHART)	Klb/hr		80	78	76	76	75
AIR FLOW (CORRECTED)	%		77	77	77	77	77
TOTAL FUEL FLOW	%		73	72	71	70	70
ACTUAL AIR FLOW	%		80	82	82	82	82
GAS FLOW	KCFH		0	0	0	0	0
GAS BURNER PRESS.	PSIG		0	0	0	0	0
GAS HEADER PRESS.	PSIG		0	0	0	0	0
S.H.TEMP. N	°F		970	985	980	970	970
S.H.TEMP. S	°F		940	960	910	900	900
R.H.TEMP. N	°F		900	900	910	910	910
R.H.TEMP. S	°F		OOS	OOS	OOS	OOS	OOS
EXCESS O_2 (DIAL) S	%		OOS	2.2	2.5	2.9	2.9
COMBUSTIBLES (DIAL) S	%		0	0	0	0	0
EXCESS O_2 (DIAL) N	%		1.5	2.6	3.0	2.5	2.5
COMBUSTIBLES (DIAL) N	%		0	0	0	0	0

EL SEGUNDO 1 2 Date by: M. ESCARCEGA

TEST NUMBER		1	2	2	2	2, ~~3~~	2, ~~3~~
SMOKE DENSITY			10	8	8	7	7
~~SMOKE DENSITY~~		B	—				
		L					
RMCS:		A					
MASTER STM.PRESS.	PSIG	N	27	27	26.5	26.5	26.5
MASTER AIR FLOW	PSIG	K	30	30	30	30	30
FUEL CONTROL(RET)	PSIG	S	20	19.5	19.0	19.0	19
FIRING RATIO	PSIG		7.6	7.6	7.6	7.6	7.6
FUEL SUPPLY	PSIG		26	24.2	23.1	23.0	23
FUEL GAS CONTROL	PSIG		0	0	0	0	0
S.H.ATTEMP. S	PSIG		0	0	0	0	0
S.H.ATTEMP. N	PSIG		0	0	0	0	0
GAS RECIRC. FAN	PSIG		0	0	0	0	0
R.H.ATTEMP. S	PSIG		0	0	0	0	0
R.H.ATTEMP. N	PSIG		0	0	0	0	0
I.D.FAN S	PSIG		28	28	27.8	28	28
I.D.FAN N	PSIG		29.5	29.5	29.2	29	29.5
F.D.FAN S	PSIG		26.8	26.9	26.5	26.9	26.8
F.D.FAN N	PSIG		27	27.	27.0	27.1	27.0
RETRACTORS-ROW 4	PSIG						
RETRACTORS-ROW 3	PSIG						
RETRACTORS-ROW 2	PSIG						
RETRACTORS-ROW 1	PSIG						
EXCESS OXYGEN	PSIG						
OIL SUPPLY FLOW	Klb/hr		115	115	115	115	115
OIL RETURN FLOW	Klb/hr		22	22	22	22	22
OIL SUPPLY PRESS.	PSIG		850	850	850	840	840
OIL RETURN PRESS.	PSIG		650	650	650	640	640
IGNITION GAS PRESS.	PSIG		6.5	6.5	6.5	6.5	6.5
I.D.FAN S	AMPS		160	160	160	160	162
I.D.FAN N	AMPS		170	173	173	176	172
F.D.FAN S	AMPS		56	55	55	55	55
F.D.FAN N	AMPS		66	66	66	65	65
GAS RECIRC. FAN	AMPS		215	220	240	246	240
Excess O_2	PSIG		21.4	21.7	21.7	21.[illegible]	21.5

NOx DATA SHEET "C"

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

	TEST NUMBER			1	2	2	2	2	2
	MAIN STM.PRESS.		PSIG		1850	1850	1870	1856	185
	DRUM PRESSURE		PSIG		005				
				B					
	RECIRC.FAN DIFF.		" H_2O	L	0	0	0	0	0
	AIR HTR.GAS OUT	S	" H_2O	A	-12	-12	-12	-12+	-12
	AIR HTR.GAS OUT	N	"	N	-12	-12	-12	-12	-12
	BLR OUTLET DRAFT		"	K	-6	-6	-6.1	-6.2	-6.1
	R.H. GAS OUT		"	S	-2.7	-2.7	-2.7	-2.7	-2.7
	S.H.GAS OUT		"		-0.4	-0.4	-0.3	-0.3	-0.4
	FURNACE DRAFT		"		-0.06	-0.05	-0.05	-0.06	-0.06
	W.B. TO FURNACE DIFF.		"		4.2	4.2	4.2	4.2	4.2
	A.H. AIR OUT		"		4.8	4.8	4.8	4.8	4.8
	F.D.FAN OUT	S	"		4.5	4.5	4.5	4.5	4.5
	F.D.FAN OUT	N	"		11.5	11.5	11.2	11.5	11.5
	BACK CHARTS:								
	R.H.STEAM	N	°F		1000	1010	1000	985	985
	R.H.STEAM	S	°F		990	1000	990	990	972
	S.H.STEAM(sec)	N	°F		960	975	972	960	960
	S.H.STEAM(sec)	S	°F		965	975	970	960	960
	MASS GAS FLOW		%		94	94	94	94	94
	SMOKE DENSITY		%		10.0	9.0	8.4	8.5	8.4
	~~SMOKE DENSITY~~		%						
	AUX. STEAM FLOW		Klb/hr		0	0	0	0	0
	FUEL OIL TEMP.		°F		—	—			
2	AIR ENTR.A.H.	N	°F		91	91	92	93	92
3	AIR ENTR. A.H.	S	°F		86	88	88	88	88
4	AIR LEAVING A.H.	N	°F		—	—	—	—	—
5	AIR LEAVING A.H.	S	°F		642	643	643	642	642
6	GAS ENTR. A.H.	N	°F		739	740	739	737	738
7	GAS ENTR. A.H.	S	°F		731	733	733	732	733
8	GAS LEAVING A.H.	N	°F		336	336	337	337	336
9	GAS LEAVING A.H.	S	°F		341	343	343	343	342
0	AVG.AIR IN-OUT	N	°F		310	310	311	311	311
	AVG.AIR IN-OUT	S	°F		305	307	307	307	307
	BLR.GAS RECIRC.DISCH.		°F		—	—			

NOX DATA SHEET "D"

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

TEST NUMBER		1	2	2	2, [illegible]	2, [illegible]	2, [illegible]
EDC NO	PPM						
AIR FLOW N	%						
AIR FLOW S	%						
STACK CONDITIONS							
KVB NOx MONITOR							
LOAD	NET MW		181	180	183	184	184
O_2	%		7.0	7.2	7.5	7.5	7.5
NO_x RAW	PPM		203.7	205.2	212.6	215.5	217.6
NO_x CORR.	PPM		262.1	268.3	283.6	288.7	291.5
OIL FLOW	KLB/HR		81.1	80.6	79.1	78.8	78.8

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

TEST NUMBER		3	3	3	4	4
DATE		2/22/90	2/22/90	2/22/90	2/23/90	2/23/90
TIME		1730	1845	2000	1000	1130
FUEL		OIL	OIL	OIL	OIL	OIL
LOAD(Net)	Mw	170	170	170	158*	156*
AUX. LOAD	Mw	8.8	8.8	8.8	8.6	8.6
BURNERS O.O.S.		1,3,6,8	1,3,6,8	1,3,6,8	1,3,6,8	1,3,6,8
NOx PORTS		OPEN	OPEN	→	→	→
O_2 LEVEL		NORMAL	NORMAL	→	→	→
GAS RECIRCULATION		NORMAL	NORMAL	→	→	→
REGISTERS North		OPEN	OPEN	→	→	→
REGISTERS South		OPEN	OPEN	→	→	→
OIL TANK		NORTH	NORTH	→	→	→
OIL TEMP.	°F	177	177	177	172	172
EXCESS O_2(CH) N	%	3.4	3.6	3.6	3.2-4.0	
EXCESS O_2(CH) S	%	3.0	3.0	3.0	4.0-4.4	
COMBUSTIBLES N	%	0	0	0	0	
COMBUSTIBLES S	%	0	0	0	0	
CONDENSER VACUUM	In.Hg	1.4	1.4	1.4	1.4	
FEEDWATER FLOW	Klb/hr	1250	1250	1260	1150	1150
STEAM FLOW	Klb/hr	1175	1175	1175	1050	1050
STEAM TEMP.	°F	920	920	920	925	925
STEAM PRESSURE	PSIG	1825	1825	1825	1810	1800
OIL FLOW	Klb/hr	75	75	75	70	70
AIR FLOW (CORRECTED)	%	76	76	76	72	71
TOTAL FUEL FLOW	%	68	68	68	65	64
ACTUAL AIR FLOW	%	82	82	81	76	75
GAS FLOW	KCFH	0	0	0	0	0
GAS BURNER PRESS.	PSIG	0	0	0	0	0
GAS HEADER PRESS.	PSIG	0	0	0	0	0
S.H.TEMP. N	°F	990	995	995	950	950
S.H.TEMP. S	°F	OOS	OOS	OOS	OOS	OOS
R.H.TEMP. N	°F	910	910	910	900	900
R.H.TEMP. S	°F	910	915	915	900	900
EXCESS O_2(DIAL) S	%	3.2	3.2	3.3	4.0	4.0
COMBUSTIBLES(DIAL) S	%	0	0	0	0	0
EXCESS O_2(DIAL) N	%	3.5	3.4	3.4	3.4	3.8
COMBUSTIBLES(DIAL) N	%	0	0	0	0	0

*MAX. LOAD BECAUSE OF 3RD PT. FEEDWATER HEATER OUT OF SERVICE

EL SEGUNDO 1 2 Date by: M. ESCARCEGA

TEST NUMBER		3	3	3	4	4
SMOKE DENSITY		7	7	7	6	7
~~SMOKE DENSITY~~						
RMCS:						
MASTER STM. PRESS.	PSIG	26.1	26.1	26	23.8	23.5
MASTER AIR FLOW	PSIG	25.2	24.0	23.5	20.0	19
FUEL CONTROL (RET)	PSIG	18.9	18.9	18.8	18.1	18
FIRING RATIO	PSIG	7.6	7.6	7.6	7.1	7.1
FUEL SUPPLY	PSIG	22.0	22.0	21.9	17.5	17.6
FUEL GAS CONTROL	PSIG	0	0	0	0	0
S.H.ATTEMP. S	PSIG	0	0	0	12.5	12.5
S.H.ATTEMP. N	PSIG	0	0	0	9.5	9.5
GAS RECIRC. FAN	PSIG	0	0	0	12.0	12.0
R.H.ATTEMP. S	PSIG	0	0	0	0	0
R.H.ATTEMP. N	PSIG	0	0	0	0	0
I.D.FAN S	PSIG	28	28	28	28	28
I.D.FAN N	PSIG	29.5	29.5	29.5	29.5	29.5
F.D.FAN S	PSIG	26.9	26.8	26.5	23.9	23.2
F.D.FAN N	PSIG	25.9	24.0	23.5	21.2	21.0
RETRACTORS-ROW 4	PSIG					
RETRACTORS-ROW 3	PSIG					
RETRACTORS-ROW 2	PSIG					
RETRACTORS-ROW 1	PSIG					
EXCESS OXYGEN	PSIG	21.8	21.9	21.8	21.7	21.8
OIL SUPPLY FLOW	Klb/hr	112	112	112	105	105
OIL RETURN FLOW	Klb/hr	24	24	25	24	24
OIL SUPPLY PRESS.	PSIG	820	820	825	675	675
OIL RETURN PRESS.	PSIG	625	625	625	525	525
IGNITION GAS PRESS.	PSIG	6.5	6.5	6.5	6.5	6.5
I.D.FAN S	AMPS	160	160	160	150	150
I.D.FAN N	AMPS	170	170	170	160	160
F.D.FAN S	AMPS	56	56	56	50	50
F.D.FAN N	AMPS	65	64	64	54	54
GAS RECIRC. FAN	AMPS	225	225	225	300	300

NOx DATA SHEET "C"

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

TEST NUMBER			3	3	3	4	4
MAIN STM.PRESS.		PSIG	1850	1850	1850	1850	1850
DRUM PRESSURE		PSIG	00S	00S	00S	00S	00S
RECIRC.FAN DIFF.		" H_2O	0	0	0	0.2	0.2
AIR HTR.GAS OUT	S	" H_2O	-12	-12	-12	-12	-12
AIR HTR.GAS OUT	N	"	-12	-12	-12	-12	-11.5
BLR OUTLET DRAFT		"	-6.2	-6.0	-5.9	-6.5	-6.5
R.H. GAS OUT		"	-2.7	-2.8	-2.8	-2.9	-2.7
S.H.GAS OUT		"	-0.4	-0.4	-0.4	-0.4	-0.4
FURNACE DRAFT		"	-0.05	-0.10	-0.08	-0.11	-0.08
W.B. TO FURNACE DIFF.		"	4.2	4.2	4.0	3.6	3.8
A.H. AIR OUT		"	4.8	4.9	4.8	4.0	4.0
F.D.FAN OUT	S	"	4.5	4.5	4.5	4.2	4.2
F.D.FAN OUT	N	"	11.5	11.5	11.5	9.5	9.5
BACK CHARTS:							
R.H.STEAM	N	°F	1000	1000	1000	980	980
R.H.STEAM	S	°F	1000	1000	1000	975	980
S.H.STEAM(sec)	N	°F	980	980	980	940	940
S.H.STEAM(sec)	S	°F	980	980	980	980	980
MASS GAS FLOW		%	94	94	94	97	97
SMOKE DENSITY		%	8.0	8.2	8.1	7.7	7.6
~~SMOKE DENSITY~~			[illegible]	—	—	—	—
AUX. STEAM FLOW		Klb/hr	0	0	0	0	0
FUEL OIL TEMP.		°F	145	145	145	145	145
AIR ENTR.A.H.	N	°F	92	92	91	95	92
AIR ENTR. A.H.	S	°F	86	86	86	91	88
AIR LEAVING A.H.	N	°F	—	—	—	—	—
AIR LEAVING A.H.	S	°F	643	644	644	666	666
GAS ENTR. A.H.	N	°F	740	741	741	747	746
GAS ENTR. A.H.	S	°F	735	736	736	744	744
GAS LEAVING A.H.	N	°F	338	339	339	350	349
GAS LEAVING A.H.	S	°F	341	342	342	355	354
AVG.AIR IN-OUT	N	°F	312	312	312	323	322
AVG.AIR IN-OUT	S	°F	306	306	306	318	317
BLR.GAS RECIRC.DISCH.		°F	—				

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

TEST NUMBER		3	3	3	4	4
EDC NO	PPM	/	/	/	/	/
AIR FLOW N	%					
AIR FLOW S	%					
STACK CONDITIONS						
KVB NO_x MONITOR						
LOAD	NMW	181	180	180	168	166
OIL FLOW	KLB/HR	77.0	77.0	76.9	71.6	71.1
O_2	%	7.9	7.8	7.9	8.1	8.1
NO_x RAW	PPM	216.7	219.4	218.0	179.4	174.3
NO_x CORR.	PPM	297.2	300.7	300.1	250.1	244.3

EL SEGUNDO (1)-2 Data by: M. ESCARCEGA

TEST NUMBER		5	5	6	6	6	6
DATE		2/23/90	2/23/90	2/24/90	2/24/90	2/24/90	2/24/9
TIME		1600	1700	0915	1045	1215	1330
FUEL		OIL	OIL	OIL	OIL	OIL	OIL
LOAD (Net)	Mw	158*	157*	156*	157*	157*	156
AUX. LOAD	Mw	8.8	8.6	8.4	8.4	8.5	8.4
BURNERS O.O.S.		1,3,6,8	1,3,6,8	1,3,6,8	1,3,6,8	1,3,6,8	→
NOx PORTS		OPEN	OPEN	OPEN	OPEN	→	→
O_2 LEVEL		NORMAL	NORMAL	→	→	→	→
GAS RECIRCULATION		NORMAL	NORMAL	→	→	→	→
REGISTERS North		OPEN	OPEN	→	→	→	→
REGISTERS South		OPEN	OPEN	→	→	→	→
OIL TANK		NORTH	NORTH	→	→	→	→
OIL TEMP.	°F	172	172	178	→	→	→
EXCESS O_2 (CH) N	%	3.2-3.4	3.2-3.6	3.4-3.9	3.3-3.8	3.4-3.9	3.4-3.
EXCESS O_2 (CH) S	%	3.0-3.3	3.2-3.6	3.8-4.2	3.8-4.2	3.8-4.2	3.9
COMBUSTIBLES N	%	0	0	0	0	0	0
COMBUSTIBLES S	%	0	0	0	0	0	0
CONDENSER VACUUM	In.Hg	1.4	1.4	1.5	1.4	1.4	1.4
FEEDWATER FLOW	Klb/hr	1125	1075	1050	1050	1050	1050
STEAM FLOW	Klb/hr	1050	1050	1050	1040	1040	1040
STEAM TEMP.	°F	950	930	940	940	940	950
STEAM PRESSURE	PSIG	1825	1830	1825	1825	1825	1825
OIL FLOW	Klb/hr	74	72	71	72	72	72
AIR FLOW (CORRECTED)	%	74	73	75	74	74	74
TOTAL FUEL FLOW	%	66	65	65	66	66	65
ACTUAL AIR FLOW	%	72	75	77	77	77	77
GAS FLOW	KCFH	0	0	0	0	0	0
GAS BURNER PRESS.	PSIG	0	0	0	0	0	0
GAS HEADER PRESS.	PSIG	0	0	0	0	0	0
S.H. TEMP. N	°F	990	980	995	1000	1000	1000
S.H. TEMP. S	°F	005	005	005	005	005	005
R.H. TEMP. N	°F	900	900	900	900	900	900
R.H. TEMP. S	°F	915	900	920	925	930	935
EXCESS O_2 (DIAL) S	%	3.4	3.4	4.0	4.2	4.0	3.9
COMBUSTIBLES (DIAL) S	%	0	0	0	0	0	0
EXCESS O_2 (DIAL) N	%	3.4	3.5	3.6	3.4	3.6	3.6
COMBUSTIBLES (DIAL) N	%	0	0	0	0	0	0

* MAX. LOAD BECAUSE OF 3RD PT. FEEDWATER HEATER OUT OF SERVICE

EL SEGUNDO 1 2 Date by: M. ESCARCEGA

TEST NUMBER		5	5	6	6	6	6
SMOKE DENSITY		8	8	7	7	7	6
~~SMOKE DENSITY~~		—	—	—	—	—	6
RMCS:							
MASTER STM.PRESS.	PSIG	24.5	24	23.8	24	24	24
MASTER AIR FLOW	PSIG	19	18.5	20	20.5	20.6	20
FUEL CONTROL(RET)	PSIG	18.9	18.5	19	19.2	19.2	19.1
FIRING RATIO	PSIG	7.1	7.1	6.8	6.8	6.8	6.8
FUEL SUPPLY	PSIG	18	17.8	16.9	17	17	17
FUEL GAS CONTROL	PSIG	0	0	0	0	0	0
S.H.ATTEMP. S	PSIG	12.5	12.5	11.8	11.9	12	12
S.H.ATTEMP. N	PSIG	9.5	9.5	13	13	13	13
GAS RECIRC. FAN	PSIG	12.0	12	14	14	14	14
R.H.ATTEMP. S	PSIG	0	0	0	0	0	0
R.H.ATTEMP. N	PSIG	3.0	4.0	3.5	3.0	3	3
I.D.FAN S	PSIG	28	28	28	28	28	28
I.D.FAN N	PSIG	29.5	29.5	29.5	29.5	29.5	29.5
F.D.FAN S	PSIG	21.8	21.8	21.6	22	22.3	21.9
F.D.FAN N	PSIG	19.5	19.5	21.5	21.8	22	21.5
RETRACTORS-ROW 4	PSIG						
RETRACTORS-ROW 3	PSIG						
RETRACTORS-ROW 2	PSIG						
RETRACTORS-ROW 1	PSIG						
EXCESS OXYGEN	PSIG	21.2	21.2	21.5	21.5	21.5	21.[illegible]
OIL SUPPLY FLOW	Klb/hr	106	106	102	102	102	102
OIL RETURN FLOW	Klb/hr	24	24	20	20	20	20
OIL SUPPLY PRESS.	PSIG	690	690	650	660	660	660
OIL RETURN PRESS.	PSIG	540	540	510	520	520	520
IGNITION GAS PRESS.	PSIG	6.5	6.5	6.5	6.5	6.2	6.5
I.D.FAN S	AMPS	150	152	150	155	155	155
I.D.FAN N	AMPS	160	158	160	162	160	160
F.D.FAN S	AMPS	50	50	50	50	50	50
F.D.FAN N	AMPS	52	53	56	56	56	56
GAS RECIRC. FAN	AMPS	300	300	275	275	275	275

NOx DATA SHEET "C"

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

	TEST NUMBER		5	5	6	6	6	6
	MAIN STM.PRESS.	PSIG	1850	1850	1850	1850	1850	1850
	DRUM PRESSURE	PSIG	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	
	RECIRC.FAN DIFF.	" H_2O	0.3	0.2	1.1	1.2	1.2	1.1
	AIR HTR.GAS OUT S	" H_2O	-12	-12	-12	-12	-12	-12
	AIR HTR.GAS OUT N	"	-12	-12	-12	-12	-12	-12
	BLR OUTLET DRAFT	"	-6.7	-6.5	-6.4	-6.5	-6.5	-6.4
	R.H. GAS OUT	"	-2.9	-3.0	-2.8	-2.8	-3.0	-3.0
	S.H.GAS OUT	"	-0.5	-0.5	-0.4	-0.4	-0.4	-0.4
	FURNACE DRAFT	"	-0.26	-0.18	-0.13	-0.10	-0.15	-0.10
	W.B. TO FURNACE DIFF.	"	3.4	3.5	3.7	3.8	3.5	3.5
	A.H. AIR OUT	"	4.0	4.0	4.2	4.2	4.2	4.2
	F.D.FAN OUT S	"	4.0	4.0	4.2	4.2	4.2	4.2
	F.D.FAN OUT N	"	9.0	9.5	10.0	10.0	10.0	10.0
	BACK CHARTS:							
	R.H.STEAM N	°F	990	980	990	995	995	990
	R.H.STEAM S	°F	1000	990	1000	1000	1000	1000
	S.H.STEAM(sec) N	°F	980	970	990	995	1000	990
	S.H.STEAM(sec) S	°F	1005	980	985	985	985	985
	MASS GAS FLOW	%	98	98	96	96	96	96
	SMOKE DENSITY ~~B~~	%	8.2	8.1	7.8	8.0	7.3	7.5
	~~SMOKE DENSITY~~ ~~8~~	~~%~~	—	—	—	—	—	
	AUX. STEAM FLOW	Klb/hr	**	**	**	**	**	**
	FUEL OIL TEMP.	°F	145	145	145	145	145	145
2	AIR ENTR.A.H. N	°F	93	93	93	94	94	94
3	AIR ENTR. A.H. S	°F	89	88	92	92	93	94
4	AIR LEAVING A.H. N	°F	—	—	—	—	—	—
5	AIR LEAVING A.H. S	°F	663	661	669	669	670	668
6	GAS ENTR. A.H. N	°F	752	746	748	749	749	749
7	GAS ENTR. A.H. S	°F	747	744	749	750	750	747
8	GAS LEAVING A.H. N	°F	353	356	349	349	348	348
9	GAS LEAVING A.H. S	°F	349	351	359	357	357	358
10	AVG.AIR IN-OUT N	°F	326	329	323	323	321	321
1	AVG.AIR IN-OUT S	°F	312	314	322	326	321	322
12	BLR.GAS RECIRC.DISCH.	°F	618	619	580	581	581	580

** AUX. STEAM BEING PROVIDED FOR UNIT 3 ALTHOUGH NOT INDICATED.
THIS IS CAUSING UNIT TO FIRE HARDER.

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

TEST NUMBER		5	5	6	6	6	6
EDC NO	PPM						
AIR FLOW N	%						
AIR FLOW S	%						
STACK CONDITIONS							
KVB NO_x MONITOR							
LOAD	MMW	168	168	167	167	167	166
OIL FLOW	KLB/HR	73.3	71.8	72.1	72.3	72.6	72.[illegible]
O_2	%	7.7	7.9	8.2	8.2	8.1	8.1
NO_x RAW	PPm	180.5	169.7	204.4	201.3	188.2	184.[illegible]
NO_x CORR	PPm	244.5	233.6	287.5	282.8	263.3	251.9

EL SEGUNDO 1..2 Data by: M. ESCARCEGA

TEST NUMBER		7	7				
DATE		2/24/90	2/24/90				
TIME		1500	1700				
FUEL		OIL	OIL				
LOAD (Net)	Mw	157*	157*				
AUX. LOAD	Mw	8.4	8.4				
BURNERS O.O.S.		1,3,6,8	→				
NOx PORTS		OPEN	→				
O_2 LEVEL		NORMAL	→				
GAS RECIRCULATION		NORMAL	→				
REGISTERS North		OPEN	→				
REGISTERS South		OPEN	→				
OIL TANK		NORTH	→				
OIL TEMP.	°F	176	→				
EXCESS O_2 (CH) N	%	3.4-3.8	3.4-3.9				
EXCESS O_2 (CH) S	%	3.6-4.0	3.6-4.0				
COMBUSTIBLES N	%	0	0				
COMBUSTIBLES S	%	0	0				
CONDENSER VACUUM	In.Hg	1.4	1.3				
FEEDWATER FLOW	Klb/hr	1060	1060				
STEAM FLOW	Klb/hr	1040	1050				
STEAM TEMP.	°F	960	955				
STEAM PRESSURE	PSIG	1825	1825				
OIL FLOW	Klb/hr	71	71				
AIR FLOW (CORR)	%	74	73				
TOTAL FUEL FLOW	%	65	65				
ACTUAL AIR FLOW	%	77	77				
GAS FLOW	KCFH	0	0				
GAS BURNER PRESS.	PSIG	0	0				
GAS HEADER PRESS.	PSIG	0	0				
S.H.TEMP. N	°F	1000	995				
S.H.TEMP. S	°F	005	005				
R.H.TEMP. N	°F	900	900				
R.H.TEMP. S	°F	930	925				
EXCESS O_2 (DIAL) S	%	3.9	4.0				
COMBUSTIBLES (DIAL) S	%	0	0				
EXCESS O_2 (DIAL) N	%	3.4	3.5				
COMBUSTIBLES (DIAL) N	%	0	0				

*MAX. LOAD BECAUSE OF 3RD PT. FEEDWATER HEATER OUT OF SERVICE

EL SEGUNDO 1 2 Date by: M. ESCARCEGA

TEST NUMBER		7	7				
SMOKE DENSITY	%	7	7				
SMOKE DENSITY	%	—	—				
RMCS:							
MASTER STM. PRESS.	PSIG	24	24				
MASTER AIR FLOW	PSIG	20	20.1				
FUEL CONTROL (RET)	PSIG	19.2	19.2				
FIRING RATIO	PSIG	6.8	6.8				
FUEL SUPPLY	PSIG	17	17				
FUEL GAS CONTROL	PSIG	0	0				
S.H. ATTEMP. S	PSIG	12	12				
S.H. ATTEMP. N	PSIG	13	13				
GAS RECIRC. FAN	PSIG	14	14				
R.H. ATTEMP. S	PSIG	0	0				
R.H. ATTEMP. N	PSIG	3	3				
I.D. FAN S	PSIG	28	28				
I.D. FAN N	PSIG	29.5	29.5				
F.D. FAN S	PSIG	22	22				
F.D. FAN N	PSIG	21.8	21.8				
RETRACTORS-ROW 4	PSIG						
RETRACTORS-ROW 3	PSIG						
RETRACTORS-ROW 2	PSIG						
RETRACTORS-ROW 1	PSIG						
EXCESS OXYGEN	PSIG	21.5	21.5				
OIL SUPPLY FLOW	Klb/hr	102	102				
OIL RETURN FLOW	Klb/hr	20	20				
OIL SUPPLY PRESS.	PSIG	660	660				
OIL RETURN PRESS.	PSIG	520	525				
IGNITION GAS PRESS.	PSIG	6.5	6.5				
I.D. FAN S	AMPS	150	150				
I.D. FAN N	AMPS	162	160				
F.D. FAN S	AMPS	50	50				
F.D. FAN N	AMPS	57	57				
GAS RECIRC. FAN	AMPS	275	275				

NOx DATA SHEET "C"

EL SEGUNDO (1) 2 Data by: M. ESCARCEGA

TEST NUMBER		7	7				
MAIN STM.PRESS.	PSIG	1050	1050				
DRUM PRESSURE	PSIG	—	—				
RECIRC.FAN DIFF.	" H_2O	1.1	1.1				
AIR HTR.GAS OUT S	" H_2O	-12	-12				
AIR HTR.GAS OUT N	"	-12	-12				
BLR OUTLET DRAFT	"	-6.5	-6.5				
R.H. GAS OUT	"	-2.8	-2.7				
S.H.GAS OUT	"	-0.3	-0.4				
FURNACE DRAFT	"	-0.07	-0.08				
W.B. TO FURNACE DIFF.	"	4.8	4.0				
A.H. AIR OUT	"	4.2	4.2				
F.D.FAN OUT S	"	4.2	4.0				
F.D.FAN OUT N	"	10.2	10				
BACK CHARTS:							
S.H.STEAM N	°F	990	990				
S.H.STEAM S	°F	990	990				
R.H.STEAM(sec) N	°F	995	995				
R.H.STEAM(sec) S	°F	980	980				
PASS GAS FLOW	%	96	97				
SMOKE DENSITY ~~N~~	%	7.3	7.7				
SMOKE DENSITY ~~S~~	~~%~~	—	—				
AUX. STEAM FLOW	Klb/hr	0	0				
FUEL OIL TEMP.	°F	145	145				
AIR ENTR.A.H. N	°F	93	92				
AIR ENTR. A.H. S	°F	94	93				
AIR LEAVING A.H. N	°F	—	—				
AIR LEAVING A.H. S	°F	668	668				
GAS ENTR. A.H. N	°F	750	750				
GAS ENTR. A.H. S	°F	747	747				
GAS LEAVING A.H. N	°F	347	347				
GAS LEAVING A.H. S	°F	359	359				
G.AIR IN-OUT N	°F	321	321				
G.AIR IN-OUT S	°F	322	323				
R.GAS RECIRC.DISCH.	°F	579	579				

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

TEST NUMBER		7	7			
EDC NO	PPM					
AIR FLOW N	%	/	/			
AIR FLOW S	%					
STACK CONDITIONS						
KVB NO_x MONITOR						
LOAD	NMW	166	167			
FUEL OIL FLOW	KLB/HR	72.4	72.4			
O_2	%	8.1	8.1			
NO_x RAW	ppm	180.4	180.3			
NO_x CORR.	ppm	252.3	252.0			

EL SEGUNDO 1-2 Data by: M. ESCARCEGA

TEST NUMBER		8	8	8
DATE		2/25/90	→	→
TIME		1100	1230	1330
FUEL		GAS	GAS	GAS
LOAD (Net)	Mw	152	150	151
AUX. LOAD	Mw	8.5	8.3	8.4
BURNERS O.O.S.		14,15	14,15	14,15
NOx PORTS		OPEN	OPEN	→
O_2 LEVEL		NORMAL	NORMAL	→
GAS RECIRCULATION		NORMAL	NORMAL	→
REGISTERS North		OPEN	OPEN	→
REGISTERS South		OPEN	OPEN	→
OIL TANK		—	—	—
OIL TEMP.	°F	—	—	—
EXCESS O_2 (CH) N	%	2.9-3.5	2.6-3.2	2.8-3.4
EXCESS O_2 (CH) S	%	1.8-2.6	2.0-2.8	1.8-2.4
COMBUSTIBLES N	%	0	0	0
COMBUSTIBLES S	%	0	0	0
CONDENSER VACUUM	In.Hg	1.4	1.4	1.4
FEEDWATER FLOW	Klb/hr	950	950	950
STEAM FLOW	Klb/hr	1010	1000	1000
STEAM TEMP.	°F	960	960	960
STEAM PRESSURE	PSIG	1825	1825	1825
OIL FLOW	Klb/hr	0	0	0
AIR FLOW (CORR)	%	75	73	73
TOTAL FUEL FLOW	%	65	64	64
ACTUAL AIR FLOW	%	72	71	71
GAS FLOW	KCFH	1550	1540	1540
GAS BURNER PRESS.	PSIG	12	12	12
GAS HEADER PRESS.	PSIG	29	29	29
S.H.TEMP. N	°F	1005	1005	1010
S.H.TEMP. S	°F	005	005	005
R.H.TEMP. N	°F	900	900	900
R.H.TEMP. S	°F	950	930	930
EXCESS O_2 (DIAL) S	%	2.4	2.6	2.5
COMBUSTIBLES (DIAL) S	%	0	0	0
EXCESS O_2 (DIAL) N	%	2.9	3.0	3.1
COMBUSTIBLES (DIAL) N	%	0	0	0

*MAX. LOAD BECAUSE OF 3RD & 4TH PT. FEEDWATER HEATERS

EL SEGUNDO 1 2 Date by: M. ESCARCEGA

TEST NUMBER		8	8	8			
SMOKE DENSITY	%	6	4	5			
~~SMOKE DENSITY~~							
RMCS:							
MASTER STM.PRESS.	PSIG	23.5	23.2	23.0			
MASTER AIR FLOW	PSIG	21.5	21	21.4			
FUEL CONTROL(RET)	PSIG	15.5	15.5	15.5			
FIRING RATIO	PSIG	6.8	6.8	6.8			
FUEL SUPPLY	PSIG	9	9	9			
FUEL GAS CONTROL	PSIG	19.6	19.5	19.5			
S.H.ATTEMP. S	PSIG	7	7	7			
S.H.ATTEMP. N	PSIG	3	3	3			
GAS RECIRC. FAN	PSIG	8.8	8.8	8.8			
R.H.ATTEMP. S	PSIG	0	0	0			
R.H.ATTEMP. N	PSIG	8	8	8			
I.D.FAN S	PSIG	28.2	28.1	28.2			
I.D.FAN N	PSIG	29.5	29.5	29.5			
F.D.FAN S	PSIG	22	21	21.5			
F.D.FAN N	PSIG	19	18	18.8			
RETRACTORS-ROW 4	PSIG						
RETRACTORS-ROW 3	PSIG						
RETRACTORS-ROW 2	PSIG						
RETRACTORS-ROW 1	PSIG						
EXCESS OXYGEN	PSIG	20	20	20.2			
OIL SUPPLY FLOW	Klb/hr	—	—	—			
OIL RETURN FLOW	Klb/hr	—	—	—			
OIL SUPPLY PRESS.	PSIG	—	—	—			
OIL RETURN PRESS.	PSIG	—	—	—			
IGNITION GAS PRESS.	PSIG	6.5	6.5	6.5			
I.D.FAN S	AMPS	145	145	148			
I.D.FAN N	AMPS	150	150	152			
F.D.FAN S	AMPS	50	49	49			
F.D.FAN N	AMPS	51	50	50			
GAS RECIRC. FAN	AMPS	250	250	250			

EL SEGUNDO (1) 2 Data by: [illegible]

TEST NUMBER		8	8	8			
EDC NO	PPM	/	/	/			
AIR FLOW N	%						
AIR FLOW S	%						
STACK CONDITIONS							
KVB NOx MONITOR							
LOAD	MMW	158	157	158			
FUEL GAS FLOW	KCFH	1576.0	1556.9	1552.7			
O_2	%	7.6	7.5	7.6			
NOx RAW	ppm	171.9	155.8	165.9			
NOx COR.	ppm	230.8	208.6	223.9			

NOx DATA SHEET "C"

EL SEGUNDO 1 2 Data by: M. ESCARCEGA

TEST NUMBER		8	8	8
MAIN STM.PRESS.	PSIG	1850	1850	1850
DRUM PRESSURE	PSIG	—	—	
RECIRC.FAN DIFF.	" H_2O	1.8	1.8	1.8
AIR HTR.GAS OUT S	" H_2O	-12	-12	-12
AIR HTR.GAS OUT N	"	-12	-12	-12
BLR OUTLET DRAFT	"	-6.2	-6.0	-6.2
R.H. GAS OUT	"	-2.7	-2.8	-2.6
S.H.GAS OUT	"	-0.5	-0.6	-0.4
FURNACE DRAFT	"	-0.10	-0.20	-.12
W.B. TO FURNACE DIFF.	"	3.7	3.5	3.5
A.H. AIR OUT	"	4.2	4.0	4.2
F.D.FAN OUT S	"	4.2	4.2	4.0
F.D.FAN OUT N	"	9.0	8.8	9.0
BACK CHARTS:				
R.H.STEAM N	°F	995	1010	995
R.H.STEAM S	°F	1030	1000	1005
S.H.STEAM(sec) N	°F	1000	1000	1000
S.H.STEAM(sec) S	°F	1000	1000	995
MASS GAS FLOW	%	93	93	93
SMOKE DENSITY	%	6.8	6.6	6.4
~~SMOKE DENSITY~~	~~%~~			
AUX. STEAM FLOW	Klb/hr	0	0	0
FUEL OIL TEMP.	°F	—	—	—
AIR ENTR.A.H. N	°F	89	90	91
AIR ENTR. A.H. S	°F	97	98	99
AIR LEAVING A.H. N	°F	—	—	—
AIR LEAVING A.H. S	°F	672	671	671
GAS ENTR. A.H. N	°F	748	749	748
GAS ENTR. A.H. S	°F	752	747	750
GAS LEAVING A.H. N	°F	366	376	371
GAS LEAVING A.H. S	°F	365	369	368
AVG.AIR IN-OUT N	°F	339	348	344
AVG.AIR IN-OUT S	°F	328	332	331
BLR.GAS RECIRC.DISCH.	°F	495	516	515

Appendix C.3

CEM Data

E/A

CONTINUOUS EMISSIONS MEASUREMENTS

ient SCE

te 2/22/90

st Location EL SEGUNDO Unit 1

bient Temperature, DB/WB ~68

erator FINKEN

Test No(s) 2-CEM-EL Seg-~~South~~ North

Barometric Pressure 30.28

Duct Static Pressure

Fuel #6 OIL

STRATIFICATION CHECK

Test No.	Sample Time	Point	Dry, Uncorrected O_2	CO_2	CO	NOx	NO	NO_2	SO_2	Corrected to ___ %, ___ Dry CO	NOx	SO_2
2	1032	North A-7	6.7	10.4	22							
		A-5	6.7	10.4	25							
		A-3	7.5	9.8	25							
	1043	A-1	8.4	9.1	30							
	1045	B-7	6.2	10.8	25							
		B-5	6.4	10.6	25							
		B-3	7.3	9.6	25							
	1057	B-1	8.4	9.0	30							
		C-7	6.2	10.8	25							
		C-5	6.3	10.8	25							
		C-3	7.8	9.5	25							
		C-1	8.3	9.1	30							
	1110	D-7	6.2	10.8	25							
		D-5	6.0	11.0	25							
n Gas Concentration												

ents: Lower unit load slightly

ESA DS-001

E/A

CONTINUOUS EMISSIONS MEASUREMENTS

Client SCE
Date 2/22/90
Test Location EL SEGUNDO U-1
Ambient Temperature, DB/WB
Operator FINKEN

Test No(s) 2-CEM-El Seg North
Barometric Pressure
Duct Static Pressure
Fuel

Test No.	Sample Time	Point	Dry, Uncorrected O_2	CO_2	CO	NOx	NO	NO_2	SO_2	Corrected to ___% ___, Dry CO	NOx	SO_2
2	1115	North D-3	7.6	9.6	30							
		D-1	8.6	8.9	30							
		E-7	6.1	10.8	22							
		E-5	6.1	10.8	25							
		E-3	8.1	9.3	28							
		E-1	8.6	8.8	30							
		F-7	5.9	11.0	25							
		F-5	5.8	11.3	25							
		F-3	6.9	10.3	30							
	1200	F-1	8.6	8.8	30							
AVERAGE			7.1									
Span Gas Concentration												

Comments: Monitor inlet at Point F-3 or B-3

ESA DS-001

E/A

CONTINUOUS EMISSIONS MEASUREMENTS

Client SCE / EL SEGUNDO U-1

Date 2/22/90

Test Location

Ambient Temperature, DB/WB

Operator

Test No(s) 2-CEM-El Seg-South

Barometric Pressure 30.28

Duct Static Pressure

Fuel #6 Oil

Test No.	Sample Time	Point	Dry, Uncorrected							Corrected to % , Dry		
			O_2	CO_2	CO	NOx	NO	NO_2	SO_2	CO	NOx	SO_2
2	1205	South A - 1	6.0	11.0	30							
		A - 3	5.9	11.0	30							
		A - 5	6.7	10.3	35							
		A - 7	8.0	9.4	40							
		B - 1	6.2	10.9	32							
		B - 3	6.3	10.8	30							
		B - 5	7.3	10.0	35							
		B - 7	8.1	9.4	32							
		C - 1	6.5	10.5	28							
		C - 3	6.5	10.5	32							
		C - 5	7.3	10.0	35							
		C - 7	8.1	9.4	35							
		D - 1	6.7	10.5	25							
	1305	D - 3	6.7	10.5	25							
Span Gas Concentration												

Comments:

E/A

CONTINUOUS EMISSIONS MEASUREMENTS

Client SCE
Date 2/22/90
Test Location EL SEGUNDO Unit 1
Ambient Temperature, DB/WB ~73
Operator FINKEN

Test No(s) 2-CEM-ELSEG-South
Barometric Pressure
Duct Static Pressure
Fuel #6 OIL.

Test No.	Sample Time	Point	Dry, Uncorrected O_2	CO_2	CO	NOx	NO	NO_2	SO_2	Corrected to ___% ___, Dry CO	NOx	SO_2
2	1305	South D-5	7.7	9.8	25							
		D-7	8.1	9.5	30							
		E-1	6.7	10.4	25							
		E-3	6.9	10.3	28							
		E-5	7.7	9.8	30							
		E-7	8.3	9.3	25							
		F-1	6.6	10.5	30							
		F-3	7.1	10.2	30							
		F-5	7.6	9.8	25							
	1325	F-7	8.1	9.4	25							
AVERAGE		South Duct.	7.1									
Span Gas Concentration												

Comments:

E/A

VELOCITY TRAVERSE DATA

Plant SCE / El Seg

Date 2/21/90

Boiler No.

Data Taken By J. Mulligan

Fuel Type oil

Test Description Velocity Traverse

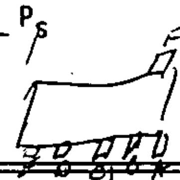
Test No. 2-Velocity-North

Baro. Press (in.Hg) 30.44

Pitot Tube Coefficient .84 Cp

Abs. Static Press in Stack (in.Hg) -.78 P_s

$$V_s = 2.90\ C_p \sqrt{\Delta P\ T_s} \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$



Time	Traverse Point Port	Traverse Point Depth	Velocity Head, in. H_2O, ΔP	Gas Temp °F	Gas Temp °R, T_s	Velocity, ft/sec	Comments	O_2,%
1330	A 7		1.1	327				
	6		1.2	331				
	5		1.4	333				
	4		1.2	333				
	3		1.3	333				
1333	2		1.6	332				
	1		2.1	329				
1335	E 7		0.76	340				
	6		1.7	341				
	5		2.1	339				
	4		2.6	334				
	3		2.6	327				
	2		2.4	322				
	1		1.4	321				

P_s, corrected ______ in.Hg

MW ______ lb/lb·mole

A_s ______ ft²

Q ______ WACFM

Q_s ______ WSCFM

Q_{sd} ______ DSCFM

Avg $\sqrt{x}$ = 1.5405

ESA DS-008
Rev. 9/86

E∫A

VELOCITY TRAVERSE DATA

Plant SCE/EISeg   Date 2/21/90
Boiler No. 1   Data Taken By S. Mulligan W. Osborn
Fuel Type Oil   Test Description
Test No. 2 - Vel. - North   Velocity
Baro. Press (in.Hg) 30.04   Pitot Tube Coefficient .84 Cp
Abs. Static Press in Stack (in.Hg) + 1.2 P_s

$$V_s = 2.90\ Cp\ \sqrt{\Delta P\ T_s}\ \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

Time	Traverse Point Port	Traverse Point Depth	Velocity Head, in. H_2O, ΔP	Gas Temp °F	Gas Temp °R, T_s	Velocity, ft/sec	Comments	O_2, %
1347	F 7		1.2	322				
	6		2.1	323				
	5		3.0	323			+ 4.2	
	4		4.2	321				
	3		2.5	340				
	2		1.1	340				
1354	1		.50	342				
1356	C 7		.76	312				
	6		.58	318				
	5		.96	325				
	4		1.6	330				
	3		1.7	327				
	2		1.1	326				
	1		1.0	322				

P_s, corrected ______ in.Hg   Q ______ WACFM
MW ______ lb/lb·mole Q_s ______ WSCFM
A_s ______ ft^2 Q_{sd} ______ DSCFM

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Appendix C.4

Benzene

CARNOT
Benzene Emissions

Client/Location: SCE/EL SEGUNDO

Reference Temp (F)	60		
F Factor, Gas	8487	F Factor, Oil	9039
O2,% Gas	7.92	O2,% Oil	8.85
Stack Flow Rate,Gas fuel(dscfm)	419098	Stack Flow Rate,Oil(dscfm)	467928

GAS FUEL		Benzene	Oil Fuel		Benzene
8A-BENZ-N,ppb	ND<	1	6A-BENZ-N,ppb	ND<	1
8B-BENZ-N,ppb	ND<	1	6B-BENZ-N,ppb	ND<	1
8C-BENZ-S,ppb	ND<	1	6C-BENZ-S,ppb	ND<	1
AVG, ppb	ND<	1	AVG, ppb	ND<	1
STACK AVG,lb/hr	ND<	5.18E-03	STACK AVG, lb/hr	ND<	5.78E-03
AVG, lb/MMbtu	ND<	2.81E-06	AVG, lb/MMbtu	ND<	3.00E-06

E/A

TEDLAR BAG DATA

Client/Project ELS.

Date 2/24/90 Unit 1 By W.O.

	Bag ID No.	Bag ID No.	Bag ID No.
Test No.	NORTH 6A-BENZ-ELS	NORTH 6B-BENZ-ELS	South 6C-BENZ-ELS
Sample Rate	1/2 L/min	1/2 L/min	1/2 L/min
Start Time	~~[illegible]~~ 10:17	10:40	11:22
Stop Time	~~[illegible]~~ 10:37	11:00	11:42
Sample Location	PORT D 5 min/pt Points 1,3,5,7	Port D 5 min/pt Points 1,3,5,7	Port C 5 min/pt Point 1,3,5,7

Date 2/25/90 Unit 1 By W.O.

	Bag ID No.	Bag ID No.	Bag ID No.
Test No.	NORTH 8A-BENZ-ELS	North 8B BEN-ELS	South 8C-BEN-ELS
Sample Rate	1/2 L/min	1/2 l/m	1/2 lpm
Start Time	11:00 AM	12:48	
Stop Time	11:20 am		
Sample Location	Port D 1,3,5,7 5 min/pt		Port 1,3,5,7

Notes:

ESA DS-070

REPORT

TRUESDAIL LABORATORIES, INC.

CHEMISTS - MICROBIOLOGISTS - ENGINEERS
RESEARCH - DEVELOPMENT - TESTING

14201 FRANKLIN AVENUE
TUSTIN, CALIFORNIA 92680
AREA CODE 714 • 730-6239
AREA CODE 213 • 225-1564
CABLE: TRUELABS

CLIENT	**Energy Systems Associates** 15991 Red Hill Ave., Suite 110 Tustin, California 92680-7388 Attention: Arlene Bell	DATE	April 6, 1990
		RECEIVED	February 26, 1990
SAMPLE	**Six (6) Tedlar bags** **labeled 6A, 6B, 6C, 8A, 8B and 8C** P.O. No.: 53304 Edison P.O. No.: C0138903	LABORATORY NO.	37992
INVESTIGATION			

Analyze for trace benzene by modified EPA Method 602

RESULTS

MODIFIED EPA 602 (Benzene)

Received: 2/26/90
Analyzed: 2/26/90

	Nanoliters per Liter (ppb) **Benzene**
6A-ELS	ND< 1
6B-ELS	ND< 1
6C-ELS	ND< 1
8A-ELS	ND< 1
8B-ELS	ND< 1
8C-ELS	ND< 1

ND = Not detected.

HIGHER HEAT VALUE (60 degrees fahrenheit)

	BTU's per Cubic Foot
#1-ELS	965
#2-ELS	948

Respectfully submitted,
TRUESDAIL LABORATORIES, INC.

Joe Bramblett

Joe Bramblett, Manager
Instrumental Methods

25.647C66F2S

CARNOT 05/01/90

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	SCE/ELS	Date......................	2/25/90
Test Number..............	8-VEL/H2O	Data By..................	AB
Test Method..............	1,4	Sample Location..........	N. DUCT
Fuel.....................	GAS	Reference Temp (F).......	60
Control Box #............	ES-8	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	0.9900
Stack Area (sq ft).......	73.44	Sample Time (Min)........	
Bar Press (in Hg)........	30.23	Nozzle Diam (in).........	

Meter Vol (acf)..........	18.130	Meter Temp (F)...........	92.8
Stack Press (iwg)........	0.30	Stack Temp (F)...........	368.7
Vel Head (iwg)...........	1.6530	O2 (%): from CEM........	8.60
		from portable...	8.43
Liquid Vol (ml)..........	62.8	CO2 (%): from CEM........	6.75
		calculated......	6.84
Meter Press (iwg)........	1.00	Start/Stop Time..........	1055/1125

Std Sample Vol (SCF)...................................	17.09
Metric Sample Vol (cubic meters).......................	0.48
Moisture Fraction......................................	0.146
Stack Gas Mol Wt.......................................	27.76
Stack Gas Velocity (ft/sec)............................	91.57
Stack Flow Rate (wacfm)................................	403,486
Stack Flow Rate (dscfm)................................	218,595

647C66F2S

CARNOT 05/01/90

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	SCE/ELS	Date......................	2/25/90
Test Number..............	8-VEL/H2O	Data By...................	AB
Test Method..............	1,4	Sample Location..........	S. DUCT
Fuel.....................	GAS	Reference Temp (F).......	60
Control Box #............	ES-19	Unit......................	1
Pitot Factor	0.840	Meter Cal Factor.........	1.0000
Stack Area (sq ft).......	73.44	Sample Time (Min)........	
Bar Press (in Hg)........	30.23	Nozzle Diam (in).........	

Meter Vol (acf)..........	18.233	Meter Temp (F)...........	92.8
Stack Press (iwg)........	0.30	Stack Temp (F)...........	348.5
Vel Head (iwg)...........	1.3400	O2 (%): from CEM........	8.60
		from portable...	7.40
Liquid Vol (ml)..........	60.1	CO2 (%): from CEM........	6.75
		calculated......	7.41
Meter Press (iwg)........	1.00	Start/Stop Time..........	1309/1339

Std Sample Vol (SCF)..	17.36
Metric Sample Vol (cubic meters)............................	0.49
Moisture Fraction...	0.139
Stack Gas Mol Wt..	27.89
Stack Gas Velocity (ft/sec).................................	81.25
Stack Flow Rate (wacfm).....................................	358,019
Stack Flow Rate (dscfm).....................................	200,503

E/A

1/3

VELOCITY TRAVERSE DATA

Plant SCE / EL SEGUNDO
Date 2/25/96
Boiler No. U-1
Data Taken By FINKEN
Fuel Type GAS
Test Description Velocity North Duct
Test No. 8-Vel-ELSEG
Baro. Press (in.Hg) 30.23
Pitot Tube Coefficient .84 Cp
Abs. Static Press in Stack (in.Hg) ________ P_s # 1

$$V_s = 2.90\ Cp \sqrt{\Delta P\ T_s} \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

Time	Traverse Point Port	Traverse Point Depth	Velocity Head, in.H_2O, ΔP	Gas Temp °F	Gas Temp °R, T_s	Velocity, ft/sec	Comments	O_2,%
1156	A	1	3.0	361				
		2	2.6	364				
		3	2.5	368				
		4	1.7	370				
		5	1.5	375				
		6	1.4	365				
		7	.82	374				
1201	B	1	1.5	337				
		2	1.7	358				
		3	2.0	364				
		4	1.7	368				
		5	.70	374				
		6	.50	369				
		7	.90	378				

P_s, corrected ________ in.Hg
Q ________ WACFM
MW ________ lb/lb-mole
Q_s ________ WSCFM
A_s ________ ft²
Q_{sd} ________ DSCFM

average $\Delta P = 1.653$ ✓
Temp = 368.7

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E/A

2/3

VELOCITY TRAVERSE DATA

Plant SCE/EL Segundo Date 2/25/90
Boiler No. 1 Data Taken By Finken
Fuel Type GAS Test Description Velocity
Test No. 8 North Duct
Baro. Press (in.Hg) 30.23 Pitot Tube Coefficient ______ Cp
Abs. Static Press in Stack (in.Hg) ______ P_s

$$V_s = 2.90\ Cp\ \sqrt{\Delta P\ T_s}\ \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

Time	Traverse Point Port	Traverse Point Depth	Velocity Head, in. H_2O, ΔP	Gas Temp °F	Gas Temp °R, T_s	Velocity, ft/sec	Comments	O_2,%
1204	C	1	1.0	331				
		2	1.3	362				
		3	2.6	366				
		4	1.7	371				
		5	~~.95~~ .90	376				
		6	.42	380				
		7	.49	378				
	D	1	.85	345				
		2	1.2	364				
		3	2.6	363				
		4	2.7	372				
		5	1.8	380				
		6	1.3	381				
		7	1.4	382				

P_s, corrected ______ in.Hg Q ______ WACFM
MW ______ lb/lb-mole Q_s ______ WSCFM
A_s ______ ft^2 Q_{sd} ______ DSCFM

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E/A

VELOCITY TRAVERSE DATA

Plant SCE/EL SEGUNDO Date 2/25/90

Boiler No. 1 Data Taken By FINKEN

Fuel Type GAS Test Description Velocity North Duct

Test No. 8-Vel-ELSeG

Baro. Press (in.Hg) 30.23 Pitot Tube Coefficient .84 Cp

Abs. Static Press in Stack (in.Hg) ______ P_s

$$V_s = 2.90\ C_p \sqrt{\Delta P\ T_s} \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

Time	Traverse Point Port	Traverse Point Depth	Velocity Head, in. H_2O, ΔP	Gas Temp °F	Gas Temp °R, T_s	Velocity, ft/sec	Comments	O_2,%
1210	E	1	.95	339				
		2	2.1	363				
		3	3.3	364				
		4	3.6	370				
		5	2.5	379				
		6	2.6	389				
		7	1.6	383				
	F	~~1~~ 7	.85	375				
		~~2~~ 6	1.6	382				
		~~3~~ 5	1.8	365				
		~~4~~ 4	3.2	378				
		~~5~~ 3	2.3	370				
		~~6~~ 2	2.6	368				
		~~7~~ 1	1.9	364				

P_s, corrected ______ in.Hg Q ______ WACFM

MW ______ lb/lb·mole Q_s ______ WSCFM

A_s ______ ft^2 Q_{sd} ______ DSCFM

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1

VELOCITY TRAVERSE DATA

Plant SCE/ELSEGUNDO Date 2/25/90

Boiler No. U-1 Data Taken By Finken

Fuel Type GAS Test Description Velocity

Test No. 8-Veloc-ELSEG South Duct

Baro. Press (in.Hg) 30.23 Pitot Tube Coefficient .84 Cp

Abs. Static Press in Stack (in.Hg) ______ P_s

$$V_s = 2.90\ Cp \sqrt{\Delta P\ T_s} \sqrt{\frac{29.92}{P_s} x \frac{28.95}{MW}}$$

Time	Traverse Point Port	Traverse Point Depth	Velocity Head, in.H_2O, ΔP	Gas Temp °F	Gas Temp °R, T_s	Velocity, ft/sec	Comments	O_2,%
1225	A	1	.62	360				
		2	1.5	362				
		3	1.8	360				
		4	3.2	355				
		5	3.0	350				
		6	2.5	339				
		7	2.1	309				
	F	1	.39	357				
		2	.95	357				
		3	1.2	352				
		4	2.0	351				
		5	~~2.1~~ 2.4	349				
		6	2.9	342				
		7	1.8	336				

P_s, corrected ______ in.Hg Q ______ WACFM

MW ______ lb/lb-mole Q_s ______ WSCFM

A_s ______ ft^2 Q_{sd} ______ DSCFM

average ΔP = 1.340 ✓

average Temp = 348.5

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1 [2]

VELOCITY TRAVERSE DATA

Plant SCE/El Segundo
Date 8/25/90
Boiler No. 1
Data Taken By BK/KF
Fuel Type Gas
Test Description Velocity South Duct
Test No. 8-141-El Seg
Baro. Press (in.Hg) 30.23
Pitot Tube Coefficient .84 Cp
Abs. Static Press in Stack (in. ~~Hg~~ H_2O) ~~1~~.35 P_s > close to ambient

$$V_s = 2.90\ Cp \sqrt{\Delta P\ T_s} \sqrt{\frac{29.92}{P_s} \times \frac{28.95}{MW}}$$

Time	Traverse Point Port	Traverse Point Depth	Velocity Head, in. H_2O, ΔP	Gas Temp °F	Gas Temp °R, T_s	Velocity, ft/sec	Comments	O_2,%
	C	1	.20	357				
		2	.36	359				
		3	.65	360				
		4	2.3	353				
		5	2.6	344				
		6	1.7	342				
		7	.45	341				
	B	1	1.3	360				
		2	1.6	359				
		3	2.4	356				
		4	3.7	348				
		5	3.4	342				
		6	2.2	340				
		7	.95	329				

P_s, corrected ______ in.Hg
Q ______ WACFM
MW ______ lb/lb·mole
Q_s ______ WSCFM
A_s ______ ft^2
Q_{sd} ______ DSCFM

E/A

1 3

VELOCITY TRAVERSE DATA

Plant SCE/EL SEGUNDO — Date 2/25/90

Boiler No. U-1 — Data Taken By FINKEN

Fuel Type GAS — Test Description Velocity at South

Test No. S-Vel-ELS09

Baro. Press (in.Hg) 30.23 — Pitot Tube Coefficient .84 Cp

Abs. Static Press in Stack (in.Hg) ______ P_s

$$V_s = 2.90\ Cp \sqrt{\Delta P\ T_s} \sqrt{\frac{29.92}{P_s} x \frac{28.95}{MW}}$$

Time	Traverse Point Port	Traverse Point Depth	Velocity Head, in. H_2O, ΔP	Gas Temp °F	Gas Temp °R, T_s	Velocity, ft/sec	Comments	O_2,%
	E	1	.60	357				
		2	.44	353				
		3	.48	354				
		4	1.1	349				
		5	1.6	346				
		6	1.4	343				
		7	.99	317				
	D	1	.34	357				
		2	.20	356				
		3	.36	356				
		4	1.6	350				
		5	2.3	345				
		6	1.2	343				
		7	.55	342				

P_s, corrected ______ in.Hg — Q ______ WACFM

MW ______ lb/lb·mole — Q_s ______ WSCFM

A_s ______ ft^2 — Q_{sd} ______ DSCFM

Client/Location SCE/El Segundo | Unit 1 | Test No. 8-H_2O-ELSEG | Method 4 | of

Sample Location North Duct | Fuel Gas | Ambient Temp., °F 70

Operators WO | Meter Vol. (Start/End) 887.287/905.417 | Date 7/25/90

Pre Test Data:

- Barometric Press, in. Hg 30.23
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press .4
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:

- Meter No. ES-8
- Meter, Yd ~~____~~ .9908
- Pitot, Cp ____
- CFM @ H = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	H_2O	639.4	- 583.0	= 56.4 ✓
#2	H_2O	600.1	- 597.6	= 2.5 ✓
#3	∅	496.2	- 495.7	= .5 ✓
#4	SG	779.0	- 775.6	= 3.4 ✓
Total			-	= 62.8

Impinger Box I.D. ____

Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.018	11	W.O		
Post-Test	.018	11	W.O		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
A/C	10:55		1.0	887.287			90	83			8.4	8	
	11:05		1.0	894.880			103	87			8.4	8	
	11:15		1.0	899.890			106	88			8.5	8	
	11:25		1.0	905.417									
											avg		
											O_2 = 8.43		
Total/Average													

Test Summary

- Initial RF ✓ RB
- Sample Vol., c.f. 18.13
- Stack Press, iwg ____
- ΔP ____ iwg ΔH 1.0 iwg
- Meter Temp., °F 92.83
- Stack Temp., °F ____
- Water Collected, g 62.8
- O_2/CO_2 Method ____
- Chain of Cust. Info (Init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

South duct

Client/Location Elsegundo
Sample Location Unit 1 South duct
Operators W.O.

Unit 1
Fuel GAS

Test No. 9-H2O-ELSEG
Ambient Temp., °F
Meter Vol. (Start/End) 487.543

Method
Page 1
of 1
Date 2/25/92

Pre Test Data:

- Barometric Press, in. Hg 30.23
- Stack Area, sq. ft.
- Sample Time/ Pt, min.
- Assumed Stack Press .3
- Assumed Moisture
- Assumed Molecular Wt

Equipment Info:

- Meter No. ES-19
- Meter, Yd 1.000
- Pitot, Cp
- CFM @ΔH = 1.0
- Probe I.D. 5-ID glass
- Nozzle No./Dia N/A
- Filter No. N/A

Imp.	Matl	Wt(End)		Weight (Start)		Weight (g)
#1	H_2O	649.1	-	595.6	=	53.5
#2	H_2O	613.0	-	611.7	=	1.3
#3	Ø	498.2	-	500.0	=	-1.8
#4	SG.	679.6	-	672.5	=	7.1
Total			-		=	60.1

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.01	10			
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
	13:09		1.0	487.543			93	82			7.4	5	
	13:19		1.0	493.520			105	84			7.4	5	
	13:29		1.0	499.900			108	85			7.4	5	
	13:39		1.0	505.776									
											7.4		
Total/Average													

Test Summary

- Initial KE / RB
- Sample Vol., c.f. 18.233
- Stack Press, iwg
- ΔP ____ iwg ΔH 1.0 iwg
- Meter Temp., °F 92.83
- Stack Temp., °F
- Water Collected, g 60.1
- O_2/CO_2 Method
- Chain of Cust. Info (init.):
  - Impingers Loaded
  - Impingers Recovered
  - Filter Loaded
  - Filter Recovered
  - Probe Wash
- Comments:

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Appendix C.5

Formaldehyde

FORMALDEHYDE EMISSION CALCULATIONS

CLIENT/LOCATION: SCE/EL SEGUNDO
FUEL: oil
F Factor: 9039
Reference Temp (F) 60

Test	ug/train	Vmstd	%O2	Qsd	ug/dscf	ug/m3	ppb	lb/hr	lb/MMbtu
6A-N	ND 0.47	1.35	8.83	241381	ND 0.3	ND 12.3	ND ND 10		ND1.20E-05
6B-N	ND 0.47	0.78	8.83	241381	ND 0.6	ND 21.3	ND ND 17		ND2.08E-05
7C-S	ND 0.47	1.48	9.54	223103	ND 0.3	ND 11.2	ND ND 9		ND1.16E-05
AVG					ND 0.4	ND 14.9	ND ND 12		ND1.48E-05
STACK TOTAL				464484				ND2.60E-02	

FORMALDEHYDE EMISSION CALCULATIONS

CLIENT/LOCATION: SCE/EL SEGUNDO
FUEL: gas
F Factor: 8487
Reference Temp (F) 60

Test	ug/train	Vmstd	%O2	Qsd	ug/dscf	ug/m3	ppb	lb/hr	lb/MMbtu
8A-S	13.9	1.38	7.4	200503	10.1	355.7	280	2.67E-01	2.92E-04
8B-N	7.4	1.04	8.43	218595	7.1	251.3	198	2.06E-01	2.23E-04
8C-N	7.3	1.51	8.43	218595	4.8	170.7	135	1.40E-01	1.51E-04
AVG					7.3	259.2	204		2.22E-04
STACK TOTAL				419098				4.07E-01	

:E5.647C66F2S

CARNOT 05/01/90

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	SCE/ELS	Date....................	2/24/90
Test Number..............	6A-FORM	Data By..................	AB
Test Method..............	430	Sample Location..........	N. DUCT
Fuel.....................	OIL	Reference Temp (F).......	60
Control Box #............	ES-8	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	0.9900
Stack Area (sq ft).......	73.44	Sample Time (Min)........	
Bar Press (in Hg)........	30.34	Nozzle Diam (in).........	
Meter Vol (acf)..........	1.390	Meter Temp (F)...........	78.0
Stack Press (iwg)..........		Stack Temp (F)................	
Vel Head (iwg)............		O2 (%): from CEM........	
		from portable...	8.83
Liquid Vol (ml)..........		CO2 (%): from CEM........	
		calculated......	0.00
Meter Press (iwg)........	0.01	Start/Stop Time..........	1311/1341

Std Sample Vol (SCF).. 1.35

Metric Sample Vol (cubic meters)............................ 0.04

Client/Location SCE / EL SEGUNDO
Sample Location North Duct #Port C
Operators M. Schmitt

Unit 1
Fuel OIL

Test No. 6A - Form
Method
Ambient Temp., °F
Meter Vol. (Start/End) /

Page 1
of 1
Date 2/24/90

Pre Test Data:

Barometric Press, in. Hg 30.34
Stack Area, sq. ft.
Sample Time/ Pt, min.
Assumed Stack Press
Assumed Moisture
Assumed Molecular Wt

Equipment Info:

Meter No. ES-8
Meter, Yd
Pitot, Cp
CFM @ΔH = 1.0
Probe I.D.
Nozzle No./Dia
Filter No.

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	DNTH	-	10ML	=
#2	DNTH	-	10ML	=
#3	—	-	—	=
#4		-		=
Total		-		=

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
C-1	1311		.01	826.785									
-2	1318.30			827.286									
-3	1326			827.770									
-4	1333.30			827.985									
-	1341			828.175									
Total/Average													

Test Summary

Initial KBB
Sample Vol., c.f. 1.39
Stack Press, iwg
ΔP ____ iwg ΔH .01 iwg
Meter Temp., °F assume 78°
Stack Temp., °F
Water Collected, g
O_2/CO_2 Method
Chain of Cust. Info (init.):
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash
Comments:

EST DS-022
Rev. 9/89

E5.647C66F2S

CARNOT 05/01/90

SAMPLE TRAIN TEST SUMMARY

Client/Location	SCE/ELS	Date	2/24/90
Test Number	6B-FORM	Data By	AB
Test Method	430	Sample Location	N. DUCT
Fuel	OIL	Reference Temp (F)	60
Control Box #	ES-8	Unit	1
Pitot Factor	0.840	Meter Cal Factor	0.9900
Stack Area (sq ft)	73.44	Sample Time (Min)	
Bar Press (in Hg)	30.34	Nozzle Diam (in)	

Meter Vol (acf)	0.803	Meter Temp (F)	78.0
Stack Press (iwg)		Stack Temp (F)	
Vel Head (iwg)		O2 (%): from CEM	
		from portable	8.83
Liquid Vol (ml)		CO2 (%): from CEM	
		calculated	0.00
Meter Press (iwg)	0.01	Start/Stop Time	1349/1419

Std Sample Vol (SCF) 0.78

Metric Sample Vol (cubic meters) 0.02

Client/Location SCE / EL SEGUNDO
Sample Location North Duct PORT E
Operators M. SCHMITT

Unit ____
Fuel ____

Test No. 6-B-Form
Method ____
Ambient Temp., °F ____
Meter Vol. (Start/End) /

Page 1
of 1
Date 2/24/90

Pre Test Data:
- Barometric Press, in. Hg 30.34
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ES-8
- Meter, Yd .990
- Pitot, Cp —
- CFM @ΔH = 1.0 .598
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	-	Weight (Start)	=	Weight (g)
#1	NATH		-	10mL	=	
#2	NATH		-	10ml	=	
#3			-	—	=	
#4			-		=	
Total			-		=	

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
E-1	1349		.01	828.175									
-2	1356,30			828.525							9.2		
-3	1404			828.674							8.9		
-4	1411,30			828.823							8.7		
—	1419			828.978							8.5		
											8.83		
Total/Average													

Test Summary

Initial
- Sample Vol., c.f. .803 ✓
- Stack Press, iwg ____
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F assume 78°
- Stack Temp., °F ____
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

E5.647C66F2S

CARNOT 05/01/90

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	SCE/ELS	Date....................	2/24/90
Test Number.............	7C-FORM	Data By.................	AB
Test Method.............	430	Sample Location..........	S. DUCT
Fuel....................	OIL	Reference Temp (F).......	60
Control Box #...........	ES-19	Unit....................	1
Pitot Factor	0.840	Meter Cal Factor.........	1.0000
Stack Area (sq ft).......	73.44	Sample Time (Min)........	
Bar Press (in Hg)........	30.37	Nozzle Diam (in).........	

Meter Vol (acf)..........	1.507	Meter Temp (F)...........	78.6
Stack Press (iwg)..........		Stack Temp (F)................	
Vel Head (iwg)............		O2 (%): from CEM........	
		from portable...	9.54
Liquid Vol (ml)..........		CO2 (%): from CEM........	
		calculated......	0.00
Meter Press (iwg)........	0.01	Start/Stop Time..........	1735/1804

Std Sample Vol (SCF)...................................	1.48
Metric Sample Vol (cubic meters)............................	0.04

Client/Location SCE / El Segundo
Sample Location South ED Fan Duct outlet
Operators S. Mulligan

Unit 1 Test No. DC-Foam-BS Method ____
Fuel #6 oil Ambient Temp., °F ____
Meter Vol. (Start/End) 484.527 / 486.032

Page 1 of 1 Date 2-24

Pre Test Data:

Barometric Press, in. Hg	30.37
Stack Area, sq. ft.	73.44
Sample Time/ Pt, min.	30
Assumed Stack Press	-.25
Assumed Moisture	9%
Assumed Molecular Wt	29

Equipment Info:

Meter No.	ES-15
Meter, Yd	1.00
Pitot, Cp	.84
CFM @ΔH = 1.0	.515
Probe I.D.	Teflon
Nozzle No./Dia	N/A
Filter No.	N/A

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1			10ml	
#2			10ml	
#3	∅		∅	
#4				
Total				

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
start	1736		.01	484.527			78	81		Dec		2	
	1743		.01	484.91			77	80				2	
	1750		.01	485.271			77	75					
	1757		.01	485.665			78	75				2	
stop	1804			486.032									
Total/Average													

Test Summary

Initial RB
Sample Vol., c.f. 1.507
Stack Press, iwg ____
ΔP ____ iwg ΔH ____ iwg
Meter Temp., °F 78.62
Stack Temp., °F ____
Water Collected, g ____
O_2/CO_2 Method ____
Chain of Cust. Info (init.):
Impingers Loaded ____
Impingers Recovered ____
Filter Loaded ____
Filter Recovered ____
Probe Wash ____
Comments: ____

E5.647C66F2S

CARNOT 05/01/90

SAMPLE TRAIN TEST SUMMARY

Client/Location	SCE/ELS	Date	2/25/90
Test Number	8A-FORM	Data By	AB
Test Method	430	Sample Location	S. DUCT
Fuel	GAS	Reference Temp (F)	60
Control Box #	ES-19	Unit	1
Pitot Factor	0.840	Meter Cal Factor	1.0000
Stack Area (sq ft)	73.44	Sample Time (Min)	
Bar Press (in Hg)	30.23	Nozzle Diam (in)	

Meter Vol (acf)	1.414	Meter Temp (F)	79.0
Stack Press (iwg)		Stack Temp (F)	
Vel Head (iwg)		O2 (%): from CEM	
		from portable	7.40
Liquid Vol (ml)		CO2 (%): from CEM	
		calculated	0.00
Meter Press (iwg)	0.01	Start/Stop Time	1102/1132

Std Sample Vol (SCF)	1.38
Metric Sample Vol (cubic meters)	0.04

Client/Location SCE/EL SEGUNDO
Sample Location South Duct
Operators FINKON/OSBORNE

Unit 1
Fuel GAS

Test No. 8A-Form-ES Method
Ambient Temp., °F
Meter Vol. (Start/End) /

Page 1
of 1
Date 2/25/90

Pre Test Data:

- Barometric Press, in. Hg 30.23
- Stack Area, sq. ft. 73.44
- Sample Time/ Pt, min. 7.5
- Assumed Stack Press .25
- Assumed Moisture 12
- Assumed Molecular Wt 28

Equipment Info:

- Meter No. ES-19
- Meter, Yd 1.0
- Pitot, Cp N/A
- CFM @ΔH = 1.0 .595
- Probe I.D. Teflon
- Nozzle No./Dia N/A
- Filter No. N/A

Imp.	Matl	Wt(End)	Weight ~~(Start)~~	Weight (g)
#1	DNPH		10ml	
#2	DNPH		10ml	
#3	—			
#4	SG			
Total				

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Field Blank = 15 ml DNPH
Field Spike = 15 ml DNPH + 1 ml 50,000X Formaldehyde soln
≈ 7.4 µg Formaldehyde

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
C-1	1102		.01	486.000			79	79					
-3	1109:30			486.350			79	79				0	
5	1117			486.710			79	79					
7	1124:30			487.10			79	79					
	1132			487.414			79	79					
Total/Average													

Test Summary

- Initial RB
- Sample Vol., c.f. 1.414
- Stack Press, iwg
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F 79
- Stack Temp., °F
- Water Collected, g
- O_2/CO_2 Method
- Chain of Cust. Info (init.):
  - Impingers Loaded AB
  - Impingers Recovered
  - Filter Loaded
  - Filter Recovered
  - Probe Wash

Comments:
O_2 dial 8.5 div.
~~= 8.43~~
= 7.40

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CARNOT 05/01/90

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	SCE/ELS	Date....................	2/25/90
Test Number..............	8B-FORM	Data By.................	AB
Test Method..............	430	Sample Location..........	N. DUCT
Fuel.....................	GAS	Reference Temp (F).......	60
Control Box #............	ES-8	Unit....................	1
Pitot Factor	0.840	Meter Cal Factor.........	0.9900
Stack Area (sq ft).......	73.44	Sample Time (Min)........	
Bar Press (in Hg)........	30.23	Nozzle Diam (in).........	

Meter Vol (acf)..........	1.103	Meter Temp (F)...........	90.0
Stack Press (iwg)..........		Stack Temp (F)................	
Vel Head (iwg)............		O2 (%): from CEM........	
		from portable...	8.43
Liquid Vol (ml)..........		CO2 (%): from CEM........	
		calculated......	0.00
Meter Press (iwg)........	0.01	Start/Stop Time..........	1240/1310

Std Sample Vol (SCF)..	1.04
Metric Sample Vol (cubic meters).............................	0.03

Client/Location SCE EL Seg
Sample Location North Duct
Operators Finken

Unit 1
Fuel GAS

Test No. 8 13 - Form - EL Seg
Method
Ambient Temp., °F ~70
Meter Vol. (Start/End) /

Page 1
of 1
Date 2/25/90

Pre Test Data:

Barometric Press, in. Hg 30.23
Stack Area, sq. ft.
Sample Time/ Pt, min.
Assumed Stack Press
Assumed Moisture
Assumed Molecular Wt

Equipment Info:

Meter No. ES-8
Meter, Yd 1.0
Pitot, Cp N/A
CFM @ΔH = 1.0 .598
Probe I.D. Teflon
Nozzle No./Dia N/A
Filter No. N/A

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	DNPH		- 10 ml	=
#2	DNPH		- 10 ml	=
#3	~~0~~		- ~~0~~	=
#4	SG		-	=
Total			-	=

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
north C-7	1240		0 ND	905.973									
5	1247:30		0	906.05			90	90					
3	1255		0	906.26			90	90					
1	1302:30		0	906.70			90	90					
	1310		0	907.076			90	90					
			.01										
Total/Average													

Test Summary

Initial
Sample Vol., c.f. 1.103 ✓
Stack Press, iwg
ΔP ___ iwg ΔH ___ iwg
Meter Temp., °F 90 ✓
Stack Temp., °F
Water Collected, g
O_2/CO_2 Method
Chain of Cust. Info (init.):
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash
Comments:
Ordered 8 Nakel
@ 8.43

EST DS-022
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'E5.647C66F2S

CARNOT 05/01/90

SAMPLE TRAIN TEST SUMMARY

Client/Location.......... SCE/ELS	Date.....................2/25/90
Test Number..............8C-FORM	Data By.................. AB
Test Method.............. 430	Sample Location.......... N. DUCT
Fuel..................... GAS	Reference Temp (F)....... 60
Control Box #............ ES-8	Unit..................... 1
Pitot Factor 0.840	Meter Cal Factor......... 0.9900
Stack Area (sq ft)....... 73.44	Sample Time (Min).........
Bar Press (in Hg)........ 30.23	Nozzle Diam (in)..........

Meter Vol (acf).......... 1.601	Meter Temp (F)........... 90.0
Stack Press (iwg)..........	Stack Temp (F)................
Vel Head (iwg)............	O2 (%): from CEM........
	from portable... 8.43
Liquid Vol (ml)..........	CO2 (%): from CEM........
	calculated...... 0.00
Meter Press (iwg)........ 0.01	Start/Stop Time..........1320/1350

Std Sample Vol (SCF).. 1.51

Metric Sample Vol (cubic meters)............................ 0.04

Client/Location SCE / E / Segundo
Sample Location North Pad
Operators RE

Unit 1
Fuel Gas

Test No. 8-Form-E/S Method 430
Ambient Temp., °F
Meter Vol. (Start/End) /

Page 1 of 1
Date 7/25/90

Pre Test Data:

Barometric Press, in. Hg	30.25
Stack Area, sq. ft.	
Sample Time/ Pt, min.	
Assumed Stack Press	
Assumed Moisture	
Assumed Molecular Wt	

Equipment Info:

Meter No.	ES-8
Meter, Yd	~~1.0~~ .9900
Pitot, Cp	N/A
CFM @ΔH = 1.0	.598
Probe I.D.	Teflon
Nozzle No./Dia	N/A
Filter No.	N/A

Imp.	Matl	Wt(End)	-	Weight (Start)	=	Weight (g)
#1	DNPH		-	10 ml	=	
#2	DNPH		-	10 ml	=	
#3	—		-		=	
#4	SG		-	—	=	
Total			-		=	

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
C 7	1320		N/A	907.079			90	90				0	
5	1327:30		N/A	907.600			90	90				0	
3	1335			908.15			90	90				0	
1	1342:30			908.68									
	1350												
			.01										
otal/Average													

Test Summary

Initial RB
Sample Vol., c.f. 1.601
Stack Press, iwg
ΔP ____ iwg ΔH ____ iwg
Meter Temp., °F 90
Stack Temp., °F
Water Collected, g
O_2/CO_2 Method
Chain of Cust. Info (init.):
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash
Comments:

SCE/El Segundo Project # 53304 5/7/90
Formaldehyde calculations A. Bell

Re Radian laboratory report # PO-02-112

Formaldehyde field blank = 16.3 μg
Field spike = 23.9 μg − 16.3 μg = 7.6 μg
7.6 μg = 103 % of nominal value of 7.4 μg

For samples subtract field blank to detection limit

Test # μg/sample − μg in blank

6A-Form	< 0.47 μg
6B-Form	< 0.47 μg
6C-Form	< 0.47 μg
8A-Form	13.9 μg
8B-Form	7.4 μg
8C-Form	7.3 μg

RADIAN
CORPORATION

Radian Work Order P0-02-112

Analytical Report
03/20/90

Energy Systems Associates

Energy Systems Associates
15991 Red Hill Ave, Suite 110
Tustin, CA 92680-7388

Arlene Bell

Customer Work Identification Energy Systems Associates
Purchase Order Number ~~5772~~ 5791

Contents:

Radian Analytical Services
900 Perimeter Park
Morrisville, NC 27560

919-481-0212

Client Services Coordinator: JFMCGAUGHEY

Certified by: ____________________

Previously Reported on 03/20/90.
First Reported on 03/19/90.

RADIAN CORPORATION

Analytical Data Summary

Energy Systems Associates
Radian Work Order: P0-02-112

Method: Aldehydes by HPLC (1)				
List: Aldehydes Analyte List				
Sample ID:	TEST 6A-FORM-- ELS (1&2)	TEST 6B-FORM-- ELS (1&2)	TEST 6C-FORM-- ELS (1&2)	TEST 8A-FORM-- ELS (A&B)
Factor:	0.53	0.53	0.53	0.53
Results in:	total ug	total ug	total ug	total ug
	01A	02A	03A	04A
Matrix:	AIR	AIR	AIR	AIR

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Formaldehyde	15.7	0.47	16.2	0.47	15.0	0.47	30.2	0.47

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

6A, 6B, 6C - residual oil
8A 8B 8C - gas fired

RADIAN CORPORATION

Analytical Data Summary

Energy Systems Associates
Radian Work Order: P0-02-112

Method:Aldehydes by HPLC (1)				
List:Aldehydes Analyte List				
Sample ID:	TEST 8B-FORM--ELS (A&B)	TEST 8C-FORM--ELS (A&B)	FIELD SPIKE	FORM BLANK
Factor:	0.53	0.53	0.53	0.53
Results in:	total ug	total ug	total ug	total ug
	05A	06A	07A	08A
Matrix:	AIR	AIR	AIR	AIR

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Formaldehyde	23.7	0.47	23.6	0.47	23.9	0.47	16.3	0.47

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

RADIAN CORPORATION

Analytical Data Summary

Energy Systems Associates
Radian Work Order: P0-02-112

Method:Aldehydes by HPLC (1)			
List:Aldehydes Analyte List			
Sample ID:	MATRIX SPIKE	MATRIX SPIKE DUP	METHOD BLANK
Factor:	0.53	0.53	1
Results in:	%	%	total ug
	09A	10A	11A
Matrix:	AIR	AIR	AIR

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Formaldehyde	97		116		ND	0.89		

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

Energy Systems Associates
Radian Work Order: P0-02-112

Sample Identifications and Dates

Sample ID	TEST 6A-FORM--ELS (1&2)	TEST 6B-FORM--ELS (1&2)	TEST 6C-FORM--ELS (1&2)	TEST 8A-FORM--ELS (A&B)	TEST 8B-FORM--ELS (A&B)	TEST 8C-FORM--ELS (A&B)
Date Sampled						
Date Received	02/28/90	02/28/90	02/28/90	02/28/90	02/28/90	02/28/90
Matrix	AIR	AIR	AIR	AIR	AIR	AIR
	01	02	03	04	05	06
Aldehydes by HPLC						
Prepared	03/08/90	03/08/90	03/08/90	03/08/90	03/08/90	03/09/90
Analyzed	03/13/90	03/15/90	03/15/90	03/13/90	03/13/90	03/13/90
Analyst	JS	JS	JS	JS	JS	JS
File ID	SUD15,ESA11	ESA2	ESA3	SUD16	SUD17	SUD18
Blank ID						
Instrument	V5000	V5000	V5000	V5000	V5000	V5000
Report as	received	received	received	received	received	received

Energy Systems Associates
Radian Work Order: P0-02-112

Sample Identifications and Dates

Sample ID	FIELD SPIKE	FORM BLANK	MATRIX SPIKE	MATRIX SPIKE DUP	METHOD BLANK
Date Sampled					
Date Received	02/28/90	02/28/90	02/28/90	02/28/90	02/28/90
Matrix	AIR	AIR	AIR	AIR	AIR
	07	08	09	10	11
ldehydes by HPLC					
Prepared	03/09/90	03/09/90	03/09/90	03/09/90	03/09/90
Analyzed	03/15/90	03/15/90	03/13/90	03/13/90	03/13/90
Analyst	JS	JS	JS	JS	JS
File ID	ESA8	ESA10	SUD19	SUD20	SVD14
Blank ID					
Instrument	V5000	V5000	V5000	V5000	V5000
Report as	received	received	received	received	received

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CORPORATION

Appendix A

Comments, Notes and Definitions

ND This flag (or <) is used to denote analytes which are not detected at or above the specified detection limit. The value to the right of the < symbol is the method specified detection limit for the sample.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), use of cleanup procedures, or dilution of extracts/digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion); liquids/water
	ug/Kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million); liquids/water
	mg/Kg	milligrams per kilogram (parts per million); soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

Appendix C.6

PAH

AVERAGE STACK PAH EMISSIONS

SPECIES		ug/dscm	lb/hr	lb/MMbtu
Naphthalene		8.43	1.51E-02	8.44E-06
Acenaphthylene	ND<	0.01	ND< 1.31E-05	ND< 6.92E-09
Acenaphthene	<	0.02	< 4.12E-05	< 2.12E-08
Fluorene	<	0.01	< 2.16E-05	< 1.12E-08
Phenanthrene	<	0.12	< 2.06E-04	< 1.08E-07
Anthracene	<	0.02	< 2.76E-05	< 1.43E-08
Fluoranthene	<	0.08	< 1.51E-04	< 7.78E-08
Pyrene	<	0.08	< 1.37E-04	< 7.07E-08
Chrysene	<	0.05	< 8.87E-05	< 4.55E-08
Benz(a)anthracene	<	0.11	< 1.97E-04	< 1.02E-07
Benzo(b+k)fluoranthene	<	0.04	< 6.52E-05	< 3.65E-08
Benzo(a)pyrene	ND<	0.01	ND< 1.31E-05	ND< 6.92E-09
Indeno(1,2,3-cd)pyrene	<	0.07	< 1.20E-04	< 6.25E-08
Dibenzo(a,h)anthracene	<	0.03	< 4.78E-05	< 2.47E-08
Benzo(g,h,i)perylene	<	0.07	< 1.34E-04	< 6.95E-08
Average Total PAH (UNIT TOTAL)	<	9.14	< 1.63E-02	< 9.10E-06

PAH CALCULATIONS

CLIENT:	SCE/EL SEGUNDO	INITIALS:	AB
		VMSTD(DSCF):	123.34
PROJECT NO:	53304	QSD(DSCF/MIN):	256245
TEST DATE:	2/22/90	CO2,%:	9.63
TEST NUMBER:	2-PAH-N	O2,%:	7.9
T REF (F)	60	F Factor	9039
Fuel: oil			

SPECIES		ug/train		ug/dscm	lb/hr	lb/MMbtu
Naphthalene		11.000		3.149	3.02E-03	2.85E-06
Acenaphthylene	ND<	0.025	ND<	0.007	ND< 6.86E-06	ND< 6.49E-09
Acenaphthene		0.190		0.054	5.22E-05	4.93E-08
Fluorene		0.075		0.021	2.06E-05	1.95E-08
Phenanthrene		0.840		0.240	2.31E-04	2.18E-07
Anthracene		0.110		0.031	3.02E-05	2.85E-08
Fluoranthene		0.730		0.209	2.00E-04	1.89E-07
Pyrene		0.660		0.189	1.81E-04	1.71E-07
Chrysene		0.440		0.126	1.21E-04	1.14E-07
Benz(a)anthracene		0.970		0.278	2.66E-04	2.52E-07
Benzo(b+k)fluoranthene	ND<	0.025	ND<	0.007	ND< 6.86E-06	ND< 6.49E-09
Benzo(a)pyrene	ND<	0.025	ND<	0.007	ND< 6.86E-06	ND< 6.49E-09
Indeno(1,2,3-cd)pyrene		0.530		0.152	1.46E-04	1.38E-07
Dibenzo(a,h)anthracene		0.210		0.060	5.77E-05	5.45E-08
Benzo(g,h,i)perylene		0.610		0.175	1.67E-04	1.58E-07
TOTAL PAH	<	16.44	<	4.706	< 4.51E-03	< 4.27E-06

RESULTS ARE FOR ONE DUCT ONLY

PAH CALCULATIONS

CLIENT:	SCE/EL SEGUNDO	INITIALS:	AB
		VMSTD(DSCF):	124.48
PROJECT NO:	53304	QSD(DSCF/MIN):	246762
TEST DATE:	2/22/90	CO2,%:	9.49
TEST NUMBER:	3-PAH-N	O2,%:	8.04
T REF (F)	60	F Factor	9039
Fuel: oil			

SPECIES	ug/train	ug/dscm	lb/hr	lb/MMbtu
Naphthalene	0.260	0.074	6.81E-05	6.76E-08
Acenaphthylene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Acenaphthene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Fluorene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Phenanthrene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Anthracene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Fluoranthene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Pyrene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Chrysene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Benz(a)anthracene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Benzo(b+k)fluoranthene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Benzo(a)pyrene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Indeno(1,2,3-cd)pyrene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Dibenzo(a,h)anthracene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
Benzo(g,h,i)perylene	ND< 0.025	ND< 0.007	ND< 6.55E-06	ND< 6.50E-09
TOTAL PAH	< 0.61	< 0.173	< 1.60E-04	< 1.59E-07

RESULTS ARE FOR ONE DUCT ONLY

PAH CALCULATIONS

CLIENT:	SCE/EL SEGUNDO	INITIALS:	AB
		VMSTD(DSCF):	115.21
PROJECT NO:	53304	QSD(DSCF/MIN):	226547
TEST DATE:	2/24/90	CO2,%:	8.37
TEST NUMBER:	6-PAH-S	O2,%:	9.29
T REF (F)	60	F Factor	9039
Fuel: oil			

SPECIES	ug/train	ug/dscm	lb/hr	lb/MMbtu
Naphthalene	72.000	22.067	1.87E-02	2.24E-05
Acenaphthylene	ND< 0.025	ND< 0.008	ND< 6.50E-06	ND< 7.78E-09
Acenaphthene	ND< 0.025	ND< 0.008	ND< 6.50E-06	ND< 7.78E-09
Fluorene	ND< 0.025	ND< 0.008	ND< 6.50E-06	ND< 7.78E-09
Phenanthrene	0.320	0.098	8.32E-05	9.95E-08
Anthracene	ND< 0.025	ND< 0.008	ND< 6.50E-06	ND< 7.78E-09
Fluoranthene	0.120	0.037	3.12E-05	3.73E-08
Pyrene	0.110	0.034	2.86E-05	3.42E-08
Chrysene	0.051	0.016	1.33E-05	1.59E-08
Benz(a)anthracene	0.150	0.046	3.90E-05	4.67E-08
Benzo(b+k)fluoranthene	0.310	0.095	8.06E-05	9.64E-08
Benzo(a)pyrene	ND< 0.025	ND< 0.008	ND< 6.50E-06	ND< 7.78E-09
Indeno(1,2,3-cd)pyrene	0.140	0.043	3.64E-05	4.36E-08
Dibenzo(a,h)anthracene	0.042	0.013	1.09E-05	1.31E-08
Benzo(g,h,i)perylene	0.140	0.043	3.64E-05	4.36E-08
TOTAL PAH	< 73.508	< 22.529	< 1.91E-02	< 2.29E-05

RESULTS ARE FOR ONE DUCT ONLY

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SAMPLE TRAIN TEST SUMMARY

Client/Location..........	ELSEG	Date....................	2/22/90
Test Number..............	2-PAH	Data By.................	RBB
Test Method..............	429	Sample Location..........	N.DUCT
Fuel.....................	OIL	Reference Temp (F).......	60
Control Box #............	ES-8	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	0.9900
Stack Area (sq ft).......	73.44	Sample Time (Min)........	189
Bar Press (in Hg)........	30.28	Nozzle Diam (in).........	0.194

Meter Vol (acf)..........	133.489	Meter Temp (F)...........	105.8
Stack Press (iwg)........	0.40	Stack Temp (F)...........	327.2
Vel Head (iwg)...........	1.9600	O2 (%): from CEM........	7.27
		from portable...	7.90
Liquid Vol (ml)..........	255.8	CO2 (%): from CEM........	10.10
		calculated......	9.63
Meter Press (iwg)........	1.68	Start/Stop Time..........	1200/1531

Std Sample Vol (SCF)..	123.34
Metric Sample Vol (cubic meters)............................	3.49
Moisture Fraction...	0.088
Stack Gas Mol Wt..	28.81
Stack Gas Velocity (ft/sec).................................	95.30
Stack Flow Rate (wacfm).....................................	419,941
Stack Flow Rate (dscfm).....................................	256,245
Isokinetic Ratio (%)..	91.08

Client/Location S.C.E / ELSEGUNDO Unit 1 Test No. 2-PAH-ELS. Method 429 Page 1
Sample Location NORTH DUCT Fuel oil Ambient Temp., °F 63 of 3
Operators M. Schmitt Meter Vol. (Start/End) ~~337.24~~ 340.460 / Date 2/22/90

Pre Test Data:
- Barometric Press, in. Hg 30.~~44~~ 28
- Stack Area, sq. ft. 73.44
- Sample Time/ Pt, min. 4.5
- Assumed Stack Press .5
- Assumed Moisture 9
- Assumed Molecular Wt 29

Equipment Info:
- Meter No. ES-8
- Meter, Yd .990
- Pitot, Cp .84
- CFM @ΔH = 1.0 .598
- Probe I.D. 10' Glass
- Nozzle No./Dia ~~.236~~ .194
- Filter No. 110-728 / Coil II ESA-107

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	∅	683.8	464.8	219.0
#2	H_2O	611.3	614.2	-2.9
#3	∅	490.8	489.0	1.8
#4	gel	824.5	786.6	37.9
Total			4.6	255.8

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	OK	8"	NS	OK	–
Post-Test	.014	9"	MS		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔH = .8091 ΔP

Sample Point	Time	ΔP	ΔH	Meter Reading	Stack	Probe	Meter In	Out	Oven	Coil ~~Imp.~~ Out	O_2	Vacuum	Static Press. iwg
A-7	1200	1.1	.89	340.460	332	255	99	92	257	50		3	.4
-6	1204.30	1.50	1.28	~~338~~.000	334	264	112	93	260	44	6.8	4	
-5	1209	2.1	1.70	345.710	327	271	114	92	260	40	7.3	5	
-4	1213.30	2.4	1.94	348.800	327	256	117	92	263	40	7.4	5	
-3	1218	3.1	2.51	352.281	321	253	119	93	265	39	8.1	7	
-2	1222.30	3.3	2.67	356.120	318	254	120	93	268	40	8.4	7	
-1	1227	2.9	2.35	360.100	312	256	122	95	271	39	8.6	7	
–	1232.30	~~1.0~~	~~.81~~	363.982									
B-7	1240	1.0	.81	363.982	334	241	104	96	275	49	7.0	3	
-6	1244.30	.53	.43	366.310	336	242	111	97	276	46	7.1	2	
-5	1249	.75	.61	368.177	334	248	110	97	273	44	7.3	3	
-4	1253.30	2.1	1.7	370.100	328	247	120	97	270	46	7.7	5	
-3	1258	2.0	1.62	373.402	321	252	123	97	274	46	8.3	5	
-2	1302.30	1.7	1.38	376.655	318	254	124	98	271	45	8.9	5	
-1	1307	2.1	1.7	380.405	316	258	122	99	272	45	9.2	5	
–	1311.30			383.161	~~3~~	~~247~~			~~260~~				
C-7	1315	.72	.58	383.161	336	247	103	98	260	56	7.2	3	
-6	1319.30	.45	.36	384.950	338	236	109	97	253	51	7.3	2	
Total/Average													

Test Summary
- Initial BF.
- Sample Vol., c.f. 133.989
- Stack Press, iwg .4
- ΔP 1.960 iwg ΔH 1.68 iwg
- Meter Temp., °F 105.8
- Stack Temp., °F 327.2
- Water Collected, g 255.8
- O_2/CO_2 Method
- Chain of Cust. Info (init.):
  - Impingers Loaded WO
  - Impingers Recovered W.O
  - Filter Loaded W.O
  - Filter Recovered W.O
  - Probe Wash BF.
- Comments:

checked by RB

91.96 8.22 H_2O

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Client/Location SCE EL SEGUNDO　Unit 1　Test No. 2-PAH-ELG　Method 429　Page 2 of 3
Sample Location North Duct　Fuel OIL　Ambient Temp., °F ____
Operators M. SCHMITT　Meter Vol. (Start/End) /　Date 2/22/90

Pre Test Data:
- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
Total		-	=	

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	COIL ~~Imp. Out~~	O_2	Vacuum	Static Press. iwg
~~C-5~~	1324	.85	.69	386.647	337	269	110	96	248	53	7.3	3	
C-4	1328.30	2.4	1.94	388.840	330	280	116	96	245	48	7.8	6	
-3	1333	3.1	2.51	391.931	324	243	119	96	245	46	8.8	7	
-2	1337.30	1.3	1.05	396.00	318	236	120	97	245	49	9.4	4	
-1	1348	1.0	.81	398.720	316	266	114	97	245	47	9.3	3	
-	1346.30	~~1.7~~	~~1.38~~	401.048	~~337~~	~~254~~			~~240~~	~~54~~		~~4~~	
D-7	1349	1.7	1.38	401.048	334	254	110	96	240	54	7.4	4	
-6	1353.30	2.0	1.67	404.100	336	245	116	97	244	46	6.8	5	
-5	1358	2.2	1.18	407.191	337	250	115	97	245	45	6.7	4	
-4	1402.30	2.9	2.35	410.100	333	255	117	97	246	47	7.0	7	
-3	1407	3.8	3.07	413.941	322	254	121	98	245	48	8.2	8	
-2	1411.30	1.7	1.38	419.133	318	257	122	98	246	48	9.0	5	
-1	1416	1.0	.81	421.770	317	259	115	98	246	50		3	
-	1420.30	~~2.9~~	~~2.35~~	424.143		?							
E-7	1423	2.9	2.35	424.143	338	258	105	96	246	53	6.7	7	
-6	1427.30	2.9	2.35	428.219	338	256	118	97	247	53	6.5	7	
-5	1432	2.7	2.18	431.455	340	255	118	98	248	47	6.8	7	
-4	1436.30	4.2	3.4	435.200	331	260	121	98	245	46		9	
Total/Average													

Test Summary

- Initial ____
- Sample Vol., c.f. ____
- Stack Press, iwg ____
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F ____
- Stack Temp., °F ____
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

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Client/Location: SCE EL SEGUNDO | Unit: 1 | Test No.: 2-PAH-ELS | Method: 429 | Page 3 of 3

Sample Location: North ~~&~~ Duct | Fuel: OIL | Ambient Temp., °F: ____

Operators: M. Schmitt | Meter Vol. (Start/End): / | Date: 2/22/90

Pre Test Data:
- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	- Weight (Start)	= Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ____

Integrated Bag I.D. ____

Leak Check:

Sample Train	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Coil ~~Imp. Out~~	O_2	Vacuum	Static Press. iwg
E-3	1441	4.0	3.24	439.679	320	267	123	99	249	48	8.9	9	~~+3.7~~
-2	1445.30	2.7	2.18	444.290	317	267	122	100	250	51	9.3	7	.32
-1	1450	1.3	1.05	448.068	317	267	117	100	251	45	9.3	3	
–	1454.30	~~2.0~~	~~1.62~~	450.770									
F-7	1500	2.0	1.62	450.770	315	238	108	96	248	53	9.4	5	
-6	1504.30	2.5	2.02	453.816	315	239	115	95	244	40	9.2	7	
-5	1509	2.7	2.18	457.711	319	245	117	95	243	39	8.7	7	
-4	1513.30	3.2	2.59	461.291	326	245	119	96	243	39	7.9	7	
-3	1518	2.5	2.02	465.325	335	245	119	97	243	39	7.9	7	
-2	1522.30	1.6	1.29	468.940	339	241	117	98	244	41	6.9	6	
-1	1527	.70	.57	471.900	339	234	110	97	243	44	6.5	4	
END	1531.30			473.949					243	47		2	
Total/Average							115.4	96.2					

105.8

Test Summary

Initial
- Sample Vol., c.f. 133.469
- Stack Press, iwg ____
- ΔP 1.960 iwg ΔH 1.68 iwg
- Meter Temp., °F ____
- Stack Temp., °F 327.2
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (Init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

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SAMPLE TRAIN TEST SUMMARY

Client/Location	ELSEG	Date	2/22/90
Test Number	3-PAH	Data By	RBB
Test Method	429	Sample Location	N. DUCT
Fuel	OIL	Reference Temp (F)	60
Control Box #	ES-8	Unit	1
Pitot Factor	0.840	Meter Cal Factor	0.9900
Stack Area (sq ft)	73.44	Sample Time (Min)	190
Bar Press (in Hg)	30.44	Nozzle Diam (in)	0.194

Meter Vol (acf)	132.500	Meter Temp (F)	99.3
Stack Press (iwg)	0.40	Stack Temp (F)	328.9
Vel Head (iwg)	1.7930	O2 (%): from CEM	7.66
		from portable	8.04
Liquid Vol (ml)	240.2	CO2 (%): from CEM	9.77
		calculated	9.49
Meter Press (iwg)	1.63	Start/Stop Time	1706/2041

Std Sample Vol (SCF)	124.48
Metric Sample Vol (cubic meters)	3.53
Moisture Fraction	0.082
Stack Gas Mol Wt	28.87
Stack Gas Velocity (ft/sec)	90.93
Stack Flow Rate (wacfm)	400,676
Stack Flow Rate (dscfm)	246,762
Isokinetic Ratio (%)	94.96

Client/Location SCE EL SEGUNDO | Unit 1 | Test No 3- PAH-EL1 | Method 429 | Page 1 of 3

Sample Location North Duct | Fuel OIL | Ambient Temp., °F ____

Operators M. SCHMITT | Meter Vol. (Start/End) / | Date 2/22/90

Pre Test Data:

- Barometric Press, in. Hg 30.44
- Stack Area, sq. ft. 13.44
- Sample Time/ Pt, min. 4 1/2
- Assumed Stack Press +.5
- Assumed Moisture 9
- Assumed Molecular Wt 28

Equipment Info:

- Meter No. ES-8
- Meter, Yd .990
- Pitot, Cp .84
- CFM @ΔH = 1.0 .598
- Probe I.D. 10' Glass
- Nozzle No./Dia .194
- Filter No. 110-729

Imp.	Mat'l	Wt(End)	Weight (Start)	Weight (g)
#1	∅	664.6	460.6	204.0
#2	[illegible]	621.1	626.0	-4.9
#3	∅	464.6	464.6	1.8
#4	SG.	797.5	758.2	39.3
Total				240.2

Impinger Box I.D. ____

Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	OK	7"	MS	OK	
Post-Test	.020	18	MS		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Toluene Rinsed

~~ΔH ΔP~~ ΔH = .84ΔP XAD MODULE # 3V29 ESA

Sample Point	Time	ΔP	ΔH	Meter Reading	Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
F-7	1706	1.8	1.46	474.985	322	244	90	91	225	66		8	0.4
-6	1710.30	2.4	1.94	477.900	321	252	114	92	236	43	9.5	12	
-5	1715	2.5	2.02	481.520	325	253	115	92	240	46	9.1	12	
-4	1719.30	3.2	2.59	484.741	332	251	116	92	243	42	8.1	12	
-3	1724	2.8	2.27	489.321	339	256	116	91	249	41	7.5	12	
-2	1728.30	1.3	1.05	492.779	343	247	113	92	253	45	7.0	8	
-1	1733	.70	.57	495.480	342	249	107	91	255	45		5	
—	1737.30	~~33~~		497.484		231						~~12~~	
E-7	1746	2.3	1.86	497.484	340	231	101	88	240	47	7.3	12	
-6	1750.30	2.8	2.27	500.800	340	256	111	89	254	48	7.2	12	
-5	1755	2.5	2.02	504.500	341	267	112	89	257	48	7.2	12	
-4	1759.30	4.0	3.24	507.976	330	258	114	89	259	48	7.0	14	
-3	1804	3.3	2.67	512.210	322	253	112	89	262	52	9.2	14	
-2	1808.30	2.7	2.26	516.005	318	246	111	89	265	54	9.3	14	
-1	1813	1.2	1.0	520.682	315	234	112	89	262	40	9.4	8	
—	1818.30	~~1.5~~	1	523.996									
D-7	18:22:30	1.5	1.26	523.996	333	236	104	89	265	41	7.6	9	
-6	18:27	2.2	1.84	527.000	335	238	110	89	266	40	7.4	12	
Total/Average													

Test Summary

- Initial BF
- Sample Vol., c.f. 132.500
- Stack Press, iwg 0.4
- ΔP 1.793 iwg ΔH 1.63 iwg
- Meter Temp., °F 99.29
- Stack Temp., °F 328.9
- Water Collected, g 240.2
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded BF
  - Impingers Recovered BF
  - Filter Loaded BF.
  - Filter Recovered BF
  - Probe Wash BF.
- Comments: ____

Checked by RA

96.39 8.28 H2O

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CARNOT

SAMPLE TRAIN TEST SUMMARY

Client/Location	ELSEG	Date	2/24/90
Test Number	6-PAH	Data By	RBB
Test Method	429	Sample Location	S. DUCT
Fuel	OIL	Reference Temp (F)	60
Control Box #	ES-19	Unit	1
Pitot Factor	0.840	Meter Cal Factor	1.0000
Stack Area (sq ft)	73.44	Sample Time (Min)	189
Bar Press (in Hg)	30.34	Nozzle Diam (in)	0.194

Meter Vol (acf)	121.777	Meter Temp (F)	98.9
Stack Press (iwg)	0.35	Stack Temp (F)	336.5
Vel Head (iwg)	1.5300	O2 (%): from CEM	7.45
		from portable	9.29
Liquid Vol (ml)	228.0	CO2 (%): from CEM	9.70
		calculated	8.37
Meter Press (iwg)	1.43	Start/Stop Time	0937/1322

Std Sample Vol (SCF)	115.21
Metric Sample Vol (cubic meters)	3.26
Moisture Fraction	0.084
Stack Gas Mol Wt	28.72
Stack Gas Velocity (ft/sec)	84.75
Stack Flow Rate (wacfm)	373,450
Stack Flow Rate (dscfm)	226,547
Isokinetic Ratio (%)	96.23

Client/Location: SCE / ... — Yumao   Unit: 1   Test No. 0-YAH-[illegible]   Method: 4/7   Page: 1
Sample Location: South I D FAN Duct outlet   Fuel: #6 oil   Ambient Temp., °F: 61   of: 3
Operators: J. Mulligan   Meter Vol. (Start/End): 301.682 / 423.459   Date: 2/24/90

Pre Test Data:

Barometric Press, in. Hg	30.34
Stack Area, sq. ft.	73.44
Sample Time/ Pt, min.	4.5
Assumed Stack Press	-.25
Assumed Moisture	9%
Assumed Molecular Wt	29

Equipment Info:

Meter No.	ES-15
Meter, Yd	1.00
Pitot, Cp	.84
CFM @ H = 1.0	.595
Probe I.D.	96"/Glass
Nozzle No./Dia	.194
Filter No.	110-732 Toluene Rinsed

XAD module ESA-105

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	Ø	660.6	465.5	195.1 ✓
#2	BaSH₂O	606.6	610.0	-3.4 ✓
#3	Ø	491.0	490.3	0.7 ✓
#4	SG.	790.9	755.3	35.6 ✓
Total				228 ✓

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.018	8	1m	ok	
Post-Test	.020	20	1m		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔH= .876

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Coil Imp. Out	O_2	Vacuum	Static Press. iwg
start	937	1.1	.963	301.682	346	266	98	83	242	Ice	8.9	8	.35
B - 7	941 30	1.6	1.4	303.421	344	258	107	82	241	50	8.9	10	
6	946	2.6	2.2	309.187	346	257	116	86	240	51	8.7	16	
5	950 30	3.5	3.0	310.563	340	257	116	87	241	53	8.9	18	
4	954 30	3.1	2.7	314.063	330	263	116	88	241	55	9.7	18	
3	959	2.0	1.75	317.843	325	262	117	89	240	56	10.0	16	
2	1003 30	.92	.80	320.987	327	261	116	90	240	59	10.0	11	
Stop 1	1008			323.777									
start	1011	.50	.43	323.777	344	240	23	86	237	67	9.4	5	
C - 7	1015 30	.75	.65	325.469	345	235	104	88	235	63	9.1	7	
6	1020	1.2	1.05	327.4351	343	233	107	88	236	54	9.1	9	
5	1024 30	2.6	2.2	330.098	339	238	114	88	234	46	9.0	18	
4	1029	3.0	2.6	333.856	334	238	115	89	232	45	9.6	18	
3	1033 30	2.8	2.4	337.873	329	235	116	89	238	46	9.5	18	
2	1038	.71	.62	341.483	326	235	111	90	241	50	10.0	7	
Stop 1	1042 30			343.648									
Total/Average				41.966									

Test Summary

Initial
Sample Vol., c.f. 121.777
Stack Press, iwg .35
ΔP 1.53 iwg ΔH 1.43 iwg
Meter Temp., °F 98.9
Stack Temp., °F 336.5
Water Collected, g 228
O_2/CO_2 Method ______
Chain of Cust. Info (Init.):
Impingers Loaded BF
Impingers Recovered ______
Filter Loaded WD
Filter Recovered ______
Probe Wash ______
Comments: ______

checked by RB

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Client/Location PG&E EL SEGUNDO Unit 1 Test No. 3-PAH-ELS Method 429 Page 2
Sample Location NO. DUCT Fuel OIL Ambient Temp., °F ____ of 3
Operators SCHMITT Meter Vol. (Start/End) ____ / ____ Date 2/22/92

Pre Test Data:
- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
Total		-	=	

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
D-5	1831.30	2.3	1.93	531.100	337	250	113	91	273	46		14	
-4	1836	2.5	2.09	534.297	333	243	112	89	270	43	7.8	14	
-3	1840.30	3.4	2.85	537.205	323	240	112	89	270	42	8.0	18	
-2	1845	1.6	1.34	541.123	315	239	109	89	267	46	9.3	15	
-1	1849.30	1.1	.92	544.150	317	231	107	89	266	47	9.2	7	
—	1854			546.627									
C-7	1856	.71	.59	546.627	335	250	97	87	267	48	7.4	6	
-6	1900.30	.53	.44	548.630	336	255	99	87	267	48	7.3	5	
-5	1905	1.0	.84	549.971	335	265	100	87	268	50	7.2	7	
-4	1909.30	2.0	1.67	552.800	331	265	106	88	267	50	7.4	12	
-3	1914	2.6	2.18	556.000	322	271	110	88	269	51	8.5	16	
-2	1918.30	1.1	.92	560.613	319	267	106	89	265	46	8.7	7	
-1	1923	1.1	.92	563.911	319	266	107	88	261	45	8.9	7	
—	1928.30			565.133									
A-7	1933	1.6	1.34	565.142	333	267	99	88	260	47	7.4	10	
-6	1937.30	1.2	1.0	568.251	332	266	110	88	262	49	7.4	8	
-5	1942	1.9	1.59	570.733	333	265	111	88	261	48	7.6	11	
-4	1946.30	2.3	1.93	573.986	327	264	113	89	263	42	7.9	13	
Total/Average													

Test Summary

Initial ____
Sample Vol., c.f. ____
Stack Press, iwg ____
ΔP ____ iwg ΔH ____ iwg
Meter Temp., °F ____
Stack Temp., °F ____
Water Collected, g ____
O_2/CO_2 Method ____
Chain of Cust. Info (init.):
- Impingers Loaded ____
- Impingers Recovered ____
- Filter Loaded ____
- Filter Recovered ____
- Probe Wash ____

Comments: ____

Client/Location SCE EL SEGUNDO
Sample Location North DUCT
Operators Schmitt

Unit 1
Fuel OIL

Test No. 3-PAH-ELS Method 429
Ambient Temp., °F ______
Meter Vol. (Start/End) /

Page 3 of 3
Date 2/22/90

Pre Test Data:
- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:
- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ΔH = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. ______

Imp.	Matl	Wt(End)	- Weight (Start)	= Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

Sample Train	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
A-3	1951	2.7	2.26	577.682	326	264	115	90	264	43	8.3	15	
-2	1955.30	3.0	2.51	580.973	320	260	113	90	262	41	8.2	16	
-1	2000	.29	2.43	584.745	319	260	112	91	261	44	9.0	16	
-	2004.30			588.430									
B-7	2010	1.0	.84	588.430	336	261	95	90	261	49	7.4	7	
-6	2014.30	.50	.42	590.910	338	266	106	90	258	45	7.0	5	
-5	2019	.67	.56	592.538	336	267	106	91	258	44	7.2	4	
-4	2023.30	2.0	1.67	594.454	331	264	114	91	261	42	7.8	11	
-3	2028	1.8	1.51	597.910	324	272	119	92	268	44	8.4	11	
-2	2033.30	2.0	1.67	600.831	320	272	118	93	262	44	8.8	11	
-1	2037	2.2	1.84	604.040	319	266	119	93	263	46	8.9	13	
-	2041.30			607.485									
Total/Average							109.2						

Test Summary
- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded ______
  - Impingers Recovered ______
  - Filter Loaded ______
  - Filter Recovered ______
  - Probe Wash ______
- Comments: ______

Client/Location SCE / El Segundo Unit 1 Test No. G-PAH-El Seg Method 429 Page 2

Sample Location Soul IP Fan Duct outlet Fuel #6 oil Ambient Temp., °F 61 of 3

Operators J. Mulligan Meter Vol. (Start/End) / Date 2/24/90

Pre Test Data:

- Barometric Press, in. Hg
- Stack Area, sq. ft.
- Sample Time/ Pt, min.
- Assumed Stack Press
- Assumed Moisture
- Assumed Molecular Wt

Equipment Info:

- Meter No.
- Meter, Yd
- Pitot, Cp
- CFM @ΔH = 1.0
- Probe I.D.
- Nozzle No./Dia
- Filter No.

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1			=	
#2			=	
#3			=	
#4		-	=	
Total		-	=	

Impinger Box I.D.

Integrated Bag I.D.

ONE PAGE

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Start	1047	.45	.37	343.648	341	265	92	89	246	66	9.4	4	
D - 7	1050 30	.35	.34	344.851	340	238	102	90	247	57	8.9	5	
6	1055	.75	.65	346.572	342	230	102	89	247	56	8.9	7	
5	1057 30	2.0	1.75	348.421	338	238	111	89	248	54	9.4	15	
4	1104	2.2	1.97	351.57	339	242	117	89	247	51	9.6	18	
3	1108 30	1.1	.96	355.525	329	244	114	90	244	45	10.0	5	
2	1113	.85	.74	358.218	328	233	110	90	247	52	9.8	8	
Stop 1	1117 30			360.509									
Start	1122	.98	.85	360.509	341	229	97	87	250	53	9.1	9	
E - 7	1126 30	.60	.52	362.931	340	235	105	86	252	53	9.0	7	
6	1131	.62	.54	365.050	330	242	104	86	254	54	9.4	7	
5	1135 30	1.1	.96	367.150	337	244	102	85	254	54	9.4	10	
4	1140	1.7	1.4	369.780	332	247	110	85	254	52	9.8	14	
3	1144 30	1.4	1.2	372.948	330	252	113	86	256	53	9.7	15	
2	1149	.98	.85	376.115	321	254	115	86	255	55		14	
Stop 1	1153 30			379.322									
Total/Average				35.674									

Test Summary

- Initial
- Sample Vol., c.f.
- Stack Press, iwg
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F
- Stack Temp., °F
- Water Collected, g
- O_2/CO_2 Method
- Chain of Cust. Info (init.):
  - Impingers Loaded
  - Impingers Recovered
  - Filter Loaded
  - Filter Recovered
  - Probe Wash

Comments: out of the last 55 deg I have been off 13°.

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Client/Location SCE / El Segundo   Unit 1   Test No. 6CAH-ESS4   Method 429   Page 2

Sample Location South E.P. Final outlet   Fuel #6 oil   Ambient Temp., °F 61   of 3

Operators J. Mulligan   Meter Vol. (Start/End) 423.459   Date 2/24/90

Pre Test Data:

- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:

- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM/ΘΔ H = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1		-		=
#2		-		=
#3		-		=
#4		-		=
Total		-		=

Impinger Box I.D. ____

Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out (coil)	O_2	Vacuum	Static Press. iwg
Start	1210	.81	.70	379.322	342	228	96	85	253	68	9.1	7	
F - 7	121430	1.3	1.13	381.457	343	225	108	84	253	62		11	
6	1215	1.7	1.4	383.782	339	242	111	86	255	41	1.3	14	
5	122330	1.9	1.66	387.438	339	244	115	87	254	63	9.4	16	
4	1228	2.6	2.27	390.821	336	245	117	87	252	55	9.0	18	
3	123230	3.0	2.62	394.585	331	240	115	88	250	47	9.8	18	
2	1237	2.3	2.0	398.442	330	247	115	89	245	47	10	18	
Stop 1	124130			402.165									
Start	125030	1.6	1.4	402.165	330	243	107	88	250	50	10.5	13	
A - 7	1255	2.6	2.27	405.187	332	251	114	89	238	48		13	
6	125530	3.1	2.71	408.241	337	266	115	89	245	50	9.5	13	
5	1304	2.8	2.45	411.095	341	262	114	88	275	51	8.6	14	
4	130830	1.8	1.57	414.318	345	261	116	90	265	52	7.6	15	
3	1313	1.6	1.40	417.485	340	256	119	91	263	55	8.0	15	
2	131730	.75	.65	420.621	347	256	115	92	253	60	8.0	8	
Stop 1	1322			423.459									
Total/Average				24.137									

Test Summary

- Initial ____
- Sample Vol., c.f. ____
- Stack Press, iwg ____
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F ____
- Stack Temp., °F ____
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

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Client/Location SCE / El Segundo Unit 1 Test No. PAH BLANK Method Dioxin VOST Pg. 1
Sample Location North ID Fan Exit Duct Fuel N/A Ambient Temp., ^oF ______ of 1
Operators Schmitt/mulligan Meter Vol. (Start/End) / Date 2/20/92

Pre Test Data:

- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:

- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ H = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. 110-727

Imp.	Matl	Wt(End)		Weight (Start)		Weight (g)
#1	—	464.0	-	464.0	=	
#2	H_2O	585.2	-	585.2	=	
#3	—	488.4	-	488.4	=	
#4	SG	786.6	-	786.6	=	
Total			-		=	

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.020	15	MS	N/A	
Post-Test	.028	15	MS		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, ^oF Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Total/Average													

Test Summary

- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., ^oF ______
- Stack Temp., ^oF ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded WO.
  - Impingers Recovered WO
  - Filter Loaded W.C
  - Filter Recovered W.A.
  - Probe Wash MS/JI

Comments: ______
XAD CARTRIDGE - 1 - PAH -

EST DS-022

ANALYTICAL RESULTS REPORT

CLIENT INFORMATION
Name: ENERGY SYSTEMS ASSOCIATES

LAB INFORMATION
Contact: HH
Project: AN898506
Date: Apr.09 1990

Note: "-" = Not Analysed
"<" = Less than MDL

		Client ID:	* FIELD BLANK (1-PAH)	2-PAH-ELS	3-PAH-ELS	6-PAH-ELS
		Lab ID:	00485290	00485390	00485490	00485590
Component	MDL	Units				
Naphthalene	0.025	ug	29	11	0.26	72
Acenaphthylene	0.025		<	<	<	<
Acenaphthene	0.025		0.48	0.19	<	<
Fluorene	0.025		0.07	0.075	<	<
Phenanthrene	0.025		0.11	0.84	<	0.32
Anthracene	0.025		0.058	0.11	<	<
Fluoranthene	0.025		0.057	0.73	<	0.12
Pyrene	0.025		0.055	0.66	<	0.11
Chrysene	0.025		<	0.44	<	0.051
Benz(a)anthracene	0.025		<	0.97	<	0.15
Benzo(b+k)fluoranthene	0.025		<	<	<	0.31
Benzo(a)pyrene	0.025		<	<	<	<
Indeno(1,2,3-cd)pyrene	0.025		0.31	0.53	<	0.14
Dibenzo(ah)anthracene	0.025		0.15	0.21	<	0.042
Benzo(ghi)perylene	0.025		0.36	0.61	<	0.14
Surrogate Recoveries %						
d10 Acenaphthene			17	7	<	40
d10 Anthracene			110	24	<	23
d12 Chysene			84	95	1	100
d12 Benzo(a)pyrene			<	<	20	<

* field blank values for many species greater than or same order of magnitude as samples. Do not subtract this blank.

Prepared by ZENON Environmental Inc.

FIELD SAMPLER
Name ______ Affiliation ______
Signature ______
Sample Storage ______
Comments ______

845 Harrington Court
Burlington, Ontario
L7N 3P3
(416)-639-6320

Sample Code	Date Collected	Sample Description	Container Seq. No.	Container Size	Container Type	Sample Size	PAH - MM5	Field Procedures pH	Field Procedures Elect. Cond.	Field Procedures Preservatives
004852	02/20/90	FIELD BLANK		XAD	TRAP		X			
		(1 - PAH)		~~250~~ 500	A ×2					
				FILTER						
004853	02/20/90	PAH-2-ELS		XAD	TRAP		X			
				500	A ×4					
				FILTER						
004854	02/20/90	3-PAH-ELS		XAD	TRAP		X			
				500	A ×3					
				FILTER						
004855	02/20/90	6-PAH-ELS		XAD	TRAP		X			
				500	A ×4					
				FILTER						

Custody Relinquished by ______ Date/Time ______
Received by ______ Affiliation ______
Sample Storage ______

Custody Relinquished by ______ Date/Time ______
Received by ______ Affiliation ______
Sample Storage ______

Client's Name: ESA
Address: ______

Appendix C.7

Metals

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: ARSENIC

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-MTLS-N	18.3	53.34	8.51	240059	12.11	1.09E-02	1.15E-05
5-MTLS-N	12.4	52.35	8.45	236977	8.36	7.42E-03	7.92E-06
7-MTLS-S	17.6	55.58	9.54	223103	11.18	9.34E-03	1.16E-05
AVG					10.55		1.03E-05
STACK TOTAL, WEIGHTED				461621		1.82E-02	

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: BERYLLIUM

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-MTLS-N	< 0.29	53.34	8.51	240059	< 0.19	< 1.72E-04	< 1.83E-07
5-MTLS-N	< 0.34	52.35	8.45	236977	< 0.23	< 2.03E-04	< 2.17E-07
7-MTLS-S	< 0.17	55.58	9.54	223103	< 0.11	< 9.02E-05	< 1.12E-07
AVG					< 0.18		< 1.71E-07
STACK TOTAL, WEIGHTED				461621		< 3.05E-04	

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: CADMIUM

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-MTLS-N	1.1	53.34	8.51	240059	0.73	6.54E-04	6.93E-07
5-MTLS-N	2.0	52.35	8.45	236977	1.35	1.20E-03	1.28E-06
7-MTLS-S	2.3	55.58	9.54	223103	1.46	1.22E-03	1.52E-06
AVG					1.18		1.16E-06
STACK TOTAL, WEIGHTED				461621		2.04E-03	

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: COPPER

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-MTLS-N	15.6	53.34	8.51	240059	10.33	9.28E-03	9.82E-06
5-MTLS-N	21.0	52.35	8.45	236977	14.16	1.26E-02	1.34E-05
7-MTLS-S	40.0	55.58	9.54	223103	25.41	2.12E-02	2.64E-05
AVG					16.63		1.65E-05
STACK TOTAL, WEIGHTED				461621		2.87E-02	

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: LEAD

Test		ug/train	Vmstd	%O2	Qsd		ug/m3		lb/hr		lb/MMbtu
4-MTLS-N	<	3.9	53.34	8.51	240059	<	2.58	<	2.32E-03	<	2.46E-06
5-MTLS-N	<	3.9	52.35	8.45	236977	<	2.63	<	2.33E-03	<	2.49E-06
7-MTLS-S	<	3.9	55.58	9.54	223103	<	2.48	<	2.07E-03	<	2.57E-06
AVG						<	2.56			<	2.51E-06
STACK TOTAL, WEIGHTED					461621			<	4.43E-03		

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: MANGANESE

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-MTLS-N	14.1	53.34	8.51	240059	9.33	8.39E-03	8.88E-06
5-MTLS-N	14.6	52.35	8.45	236977	9.85	8.73E-03	9.32E-06
7-MTLS-S	9.3	55.58	9.54	223103	5.91	4.93E-03	6.13E-06
AVG					8.36		8.11E-06
STACK TOTAL, WEIGHTED				461621		1.44E-02	

METALS EMISSION CALCULATIONS

Client/Location: SCE/EL SEGUNDO UNIT 1
F Factor: 9039
Reference Temp (F): 60
Fuel: Oil

BY: AB
DATE: 5/9/90

ELEMENT: MERCURY

Test		ug/train	Vmstd	%02	Qsd		ug/m3	lb/hr		lb/MMbtu
4-MTLS-N	ND	49.7	53.34	8.51	240059	ND	32.90	ND2.96E-02	ND	3.13E-05
5-MTLS-N	ND	50.5	52.35	8.45	236977	ND	34.06	ND3.02E-02	ND	3.22E-05
7-MTLS-S	ND	43.9	55.58	9.54	223103	ND	27.89	ND2.33E-02	ND	2.89E-05
AVG						ND	31.62		ND	3.08E-05
STACK TOTAL, WEIGHTED					461621			ND5.46E-02		

METALS EMISSION CALCULATIONS

Client/Location: SCE/EL SEGUNDO UNIT 1 BY: AB
F Factor: 9039 DATE: 5/9/90
Reference Temp (F): 60
Fuel: Oil

ELEMENT: NICKEL BY CARB 433

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-MTLS-N	470	53.34	8.51	240059	311.13	2.80E-01	2.96E-04
5-MTLS-N	492	52.35	8.45	236977	331.85	2.94E-01	3.14E-04
7-MTLS-S	624	55.58	9.54	223103	396.43	3.31E-01	4.11E-04
AVG					346.47		3.40E-04
STACK TOTAL, WEIGHTED				461621		5.99E-01	

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: SELENIUM

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-MTLS-N <	6.2	53.34	8.51	240059 <	4.10 <	3.69E-03 <	3.90E-06
5-MTLS-N <	6.4	52.35	8.45	236977 <	4.32 <	3.83E-03 <	4.09E-06
7-MTLS-S <	6.2	55.58	9.54	223103 <	3.94 <	3.29E-03 <	4.09E-06
AVG				<	4.12	<	4.03E-06
STACK TOTAL, WEIGHTED				461621	<	7.12E-03	

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: ZINC

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-MTLS-N	37.7	53.34	8.51	240059	24.96	2.24E-02	2.37E-05
5-MTLS-N	51.0	52.35	8.45	236977	34.40	3.05E-02	3.26E-05
7-MTLS-S	6564.0	55.58	9.54	223103	4170.11	3.48E+00	4.33E-03
AVG					1409.82		1.46E-03
STACK TOTAL, WEIGHTED				461621		2.44E+00	
					29.68		2.81E-05
STACK TOTAL EXCLUDING 7-MTLS				461621		5.13E-02	

CARNOT

SAMPLE TRAIN TEST SUMMARY

Client/Location	ELSEG	Date	2/23/90
Test Number	4-MTL	Data By	RBB
Test Method	EPA DRAFT	Sample Location	N. DUCT
Fuel	OIL	Reference Temp (F)	60
Control Box #	ES-8	Unit	1
Pitot Factor	0.840	Meter Cal Factor	0.9900
Stack Area (sq ft)	73.44	Sample Time (Min)	84
Bar Press (in Hg)	30.38	Nozzle Diam (in)	0.194

Meter Vol (acf)	56.650	Meter Temp (F)	96.8
Stack Press (iwg)	0.25	Stack Temp (F)	341.0
Vel Head (iwg)	1.7300	O2 (%): from CEM	7.56
		from portable	8.51
Liquid Vol (ml)	106.8	CO2 (%): from CEM	9.40
		calculated	8.73
Meter Press (iwg)	1.54	Start/Stop Time	0945/1200

Std Sample Vol (SCF)	53.34
Metric Sample Vol (cubic meters)	1.51
Moisture Fraction	0.085
Stack Gas Mol Wt	28.74
Stack Gas Velocity (ft/sec)	90.31
Stack Flow Rate (wacfm)	397,924
Stack Flow Rate (dscfm)	240,059
Isokinetic Ratio (%)	94.61

Client/Location SCE / EL SEGUNDO
Sample Location North DUCT
Operators M Schmitt

Unit 1 Test No. 4-Mtl Method EPA DRAFT Page 1 of 3
Fuel OIL Ambient Temp., °F
Meter Vol. (Start/End) 624.383 / Date 2/23/90

Pre Test Data:

Barometric Press, in. Hg	~~30.30~~ 30.38
Stack Area, sq. ft.	73.44
Sample Time/ Pt, min.	2
Assumed Stack Press	+.5
Assumed Moisture	8.1
Assumed Molecular Wt	28

Equipment Info:

Meter No.	ES-8
Meter, Yd	.990
Pitot, Cp	.84
CFM @ΔH = 1.0	.598
Probe I.D.	10' GLASS
Nozzle No./Dia	.194
Filter No.	T/10-83

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	NH_3/H_2O_2	681.5	628.7	58.8
#2	HNO_3/H_2O_2	625.3	595.9	29.4
#3	$KMnO_4$	630.8	~~623.7~~	7.1
#4	gel	702.8	690.7	11.5
Total				106.8

→ 623.7

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.020	7"	MS	OK	—
Post-Test	.017	7	MS	BF	—

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔY = .846 ΔP

Sample Point	Time	ΔP	ΔH	Meter Reading	Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
B-7	945	.97	.82	624.383	347	240	82	83	241	59			
-6	947	.56	.43	625.350	345	228	96	85	250	47	9.0	0	+.25
-5	949	.70	.59	626.300	345	233	98	85	250	47		0	
-4	951	1.0	.85	627.710	342	238	98	84	252	48	7.7	0	
-3	953	1.1	.93	628.160	337	239	102	85	253	49	7.5	0	
-2	955	1.8	1.52	629.273	334	239	105	86	253	50	8.2	0	
-1	957	2.2	1.76	630.600	331	239	109	86	854	51	8.9	0	
—	959			632.118							9.2	2	
C-7	1007	.60	.51	632.118	347	232	86	86	260	61			
6	1009	.35	.30	632.701	348	236	99	87	262	53	8.2	0	
5	1011	.71	.60	633.610	357	239	100	88	259	53	7.3	0	
4	1013	2.0	1.69	634.492	342	238	105	88	265	52	7.3	0	
3	1015	2.2	1.86	635.871	335	249	113	89	266	52	7.9	0	
2	1017	1.1	.93	637.390	329	252	116	90	269	53	8.6	2	
1	1019	1.3	1.10	638.633	329	257	112	90	270	54	9.1	0	
—	1021			639.682							9.2	0	
C-7.	1043	1.4	1.18	639.682	349	225	88	89	269	62			
-6	1045	1.6	1.35	641.000	347	225	106	91	271	44	8.2	0	
Total/Average											8.0	0	

Test Summary

Initial	BF
Sample Vol., c.f.	56.650
Stack Press, iwg	+.25
ΔP 1.73 iwg	ΔH 1.54 iwg
Meter Temp., °F	96.82
Stack Temp., °F	341.0
Water Collected, g	106.8
O_2/CO_2 Method	
Chain of Cust. Info (Init.):	
Impingers Loaded	W.O
Impingers Recovered	MS
Filter Loaded	W.O
Filter Recovered	MS
Probe Wash	BF
Comments:	

Checked by RB

96.02 8.42

EST DS-022
Rev. 9/89

Client/Location	SCE / EL SEGUNDO	Unit	1	Test No.	4-MTLS
Sample Location	NORTH DUCT	Fuel	OIL	Method	
Operators	M. SCHMITT			Ambient Temp., °F	
				Meter Vol. (Start/End)	/

Page 2 of 3 Date 2/23/90

Pre Test Data:

- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:

- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ΔH = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. ______

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ______

Integrated Bag I.D. ______

Leak Check:

Sample Train	CFM	Vac.	Init. Pitot	IBS
Pre-Test				
Post-Test				

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
C-5	1047	1.7	1.41	642.278	350	246	111	91	272	46	7.9	0	
-4	1049	2.6	2.16	643.573	348	251	112	92	271	44	7.9	2	
-3	1051	3.5	2.9	645.153	337	256	114	92	271	46	9.2	3	
-2	1053	1.6	1.33	646.982	333	262	114	92	271	46	9.8	0	
-1	1055	.95	.79	648.423	329	268	111	92	271	48	10.6	0	
—	1057			649.422									
E-7	1102	2.0	1.66	649.422	350	261	89	88	268	51	8.2	0	
6	1104	2.6	2.16	650.867	349	266	106	91	268	47	7.8	3	
5	1106	2.3	1.91	652.507	349	269	110	91	269	43	7.6	3	
4	1108	3.8	3.15	654.091	342	271	110	92	269	45	8.2	4	
3	1110	2.9	2.40	655.621	337	271	110	92	270	49	9.2	4	
2	1112	2.5	2.07	657.493	327	272	114	92	269	49	9.4	2	
1	1114	.83	.69	659.166	328	260	112	92	268	50	10.2	0	
—	1116			660.178									
A-7	1121	1.7	1.41	660.178	344	244	90	90	266	58	8.2	0	
-6	1123	1.7	1.41	661.491	344	245	105	92	266	44	8.2	0	
-5	1125	2.9	1.99	662.880	344	243	109	92	268	48	8.3	2	
-4	1127	3.0	2.49	664.483	338	245	111	92	267	48	8.7	3	
Total/Average													

Test Summary

- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded ______
  - Impingers Recovered ______
  - Filter Loaded ______
  - Filter Recovered ______
  - Probe Wash ______
- Comments: ______

EST DS-022
Rev. 9/89

Client/Location SCE / EL SEGUNDO
Sample Location NORTH DUCT
Operators M. SCHMITT

Unit 1
Fuel OIL
Test No. 4-MTLS
Method
Ambient Temp., °F
Meter Vol. (Start/End) /
Page 3
of 3
Date 2/23/90

Pre Test Data:
- Barometric Press, in. Hg
- Stack Area, sq. ft.
- Sample Time/ Pt, min.
- Assumed Stack Press
- Assumed Moisture
- Assumed Molecular Wt

Equipment Info:
- Meter No.
- Meter, Yd
- Pitot, Cp
- CFM @ΔH = 1.0
- Probe I.D.
- Nozzle No./Dia
- Filter No.

Imp.	Matl	Wt(End)	-	Weight (Start)	=	Weight (g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
Total			-		=	

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
A-3	1129	3.5	2.9	666.110	335	243	114	92	267	48	8.8	4	
-2	1131	2.3	1.91	667.971	329	242	116	92	268	48	9.3	3	
-1	1133	2.3	1.91	669.533	332	243	113	92	269	48	9.2	3	
—	1135			671.073									
F-7	1146	1.6	1.33	671.073	327	236	88	88	271	58	9.7	0	
6	1148	2.0	1.66	672.421	330	242	108	92	272	45	9.6	2	
5	1150	2.5	2.07	673.812	334	239	110	92	274	45	9.1	2	
4	1152	3.2	2.65	675.391	343	245	114	92	275	46	8.4	3	
3	1154	2.7	2.24	677.173	348	248	117	93	274	48	7.4	3	
2	1156	1.2	.99	678.874	353	245	116	93	275	49	7.1	3	
1	1158	.80	.66	680.050	352	246	110	93	272	50	7.2	0	
—	1200			681.033									
Total/Average							105.9						

Test Summary
- Initial
- Sample Vol., c.f.
- Stack Press, iwg
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F
- Stack Temp., °F
- Water Collected, g
- O_2/CO_2 Method
- Chain of Cust. Info (init.):
  - Impingers Loaded
  - Impingers Recovered
  - Filter Loaded
  - Filter Recovered
  - Probe Wash
- Comments:

CARNOT

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	ELSEG	Date.....................	2/23/90
Test Number..............	5-MTL	Data By..................	RBB
Test Method..............	EPA DRAFT	Sample Location..........	N. DUCT
Fuel.....................	OIL	Reference Temp (F).......	60
Control Box #............	ES-8	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	0.9900
Stack Area (sq ft).......	73.44	Sample Time (Min)........	84
Bar Press (in Hg)........	30.38	Nozzle Diam (in).........	0.194

Meter Vol (acf)..........	56.321	Meter Temp (F)...........	104.0
Stack Press (iwg)........	0.25	Stack Temp (F)...........	347.0
Vel Head (iwg)...........	1.7100	O2 (%): from CEM........	7.36
		from portable...	8.45
Liquid Vol (ml)..........	108.7	CO2 (%): from CEM........	9.86
		calculated......	9.07
Meter Press (iwg)........	1.51	Start/Stop Time..........	1531/1721

Std Sample Vol (SCF)..	52.35
Metric Sample Vol (cubic meters)............................	1.48
Moisture Fraction...	0.088
Stack Gas Mol Wt..	28.75
Stack Gas Velocity (ft/sec).................................	90.10
Stack Flow Rate (wacfm).....................................	397,006
Stack Flow Rate (dscfm).....................................	236,977
Isokinetic Ratio (%)..	94.06

Client/Location SCE EL SEGUNDO Unit 1 Test No. 5-MTL Method EPA DRAFT Page 1

Sample Location NORTH Fuel OIL Ambient Temp., °F ______ of 3

Operators M. SCHMITT Meter Vol. (Start/End) ______ / ______ Date 2/23/90

Pre Test Data:

Barometric Press, in. Hg	30.38
Stack Area, sq. ft.	73.44
Sample Time/ Pt, min.	2
Assumed Stack Press	0.3
Assumed Moisture	8.8
Assumed Molecular Wt	28

Equipment Info:

Meter No.	ES-8
Meter, Yd	.996
Pitot, Cp	.84
CFM @ΔH = 1.0	.598
Probe I.D.	10' GLASS
Nozzle No./Dia	.194
Filter No.	T-110-132

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	HNO3/H2O2	611.9	573.0	38.9 ✓
#2	"	655.2	613.0	42.2 ✓
#3	KMnO4	762.1	748.0	14.1 ✓
#4	SG.	806.5	793.0	13.5 ✓
Total				108.7 ✓

Impinger Box I.D. ______

Integrated Bag I.D. ______

Leak Check:

Sample Train	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	OK	7"	KH	OK	—
Post-Test	.020	7"	MS		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

.8304

Sample Point	Time	ΔP	ΔH	Meter Reading	Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
		Meter Conditions			Temperatures, °F								
E-7	1531	2.3	1.91	681.664	331	276	93	94	281	51	9.6	2	+.25
6	1533	3.1	2.57	683.250	332	273	115	95	270	46	9.3	3	
5	1535	2.8	2.32	685.000	338	270	117	97	285	46	9.1	3	
4	1537	3.2	2.65	686.700	344	276	119	97	273	44	8.1	3	
3	1539	3.0	2.49	688.481	352	272	119	97	258	48	7.2	3	
2	1541	1.5	1.24	690.257	354	268	120	98	253	47	6.8	0	
1	1543	.98	.81	691.670	354	265	116	98	259	53	6.9	0	
—	1545			692.735									
E-7	1551	1.8	1.49	692.735	354	262	95	96	245	57	7.2	0	
6	1553	2.2	1.82	694.150	357	244	117	98	244	57	7.0	0	
5	1555	2.1	1.74	695.821	356	245	119	99	243	57	7.1	0	
4	1557	3.5	2.90	697.211	349	246	120	99	243	59	8.0	0	
3	1559	2.7	2.24	698.581	338	243	120	100	242	61	8.9	3	
2	1601	2.0	1.66	700.237	336	240	123	100	242	61	9.4	2	
1	1603	1.0	.83	701.728	338	293	121	101	240	64		2	
—	1605			702.807									
D-7	1611	1.0	.83	702.807	357	227	98	98	234	57	7.7	0	
-6	1613	1.9	1.58	703.810	355	228	112	99	231	55	7.1	2	
Total/Average													

Test Summary

Initial	BF
Sample Vol., c.f.	56.32 ✓
Stack Press, iwg	.25 ✓
ΔP 2.71 iwg ΔH 1.51 iwg	✓
Meter Temp., °F	104 ✓
Stack Temp., °F	347.0 ✓
Water Collected, g	108.7 ✓
O_2/CO_2 Method	
Chain of Cust. Info (init.):	
Impingers Loaded	KH
Impingers Recovered	BF
Filter Loaded	KH
Filter Recovered	BF
Probe Wash	BF

Comments: ______

Checked by RB

95.3 8.7

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Client/Location SCE / EL SEGUNDO Unit 1 Test No. 5-MTLS Method MTLS Page 2
Sample Location NORTH DUCT Fuel OIL Ambient Temp., °F ______ of 3
Operators M. SCHMIT Meter Vol. (Start/End) / Date 2/23/90

Pre Test Data:

- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:

- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ΔH = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. ______

Imp.	Matl	Wt(End)	- Weight (Start)	= Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
D-5	1615	2.8	2.32	705.180	351	254	117	98	234	50	7.6	3	
-4	1617	3.0	2.49	706.885	341	265	120	98	241	51	8.8	3	
-3	1619	1.2	.99	708.683	336	273	122	99	245	51	9.4	2	
-2	1621	.85	.70	709.880	338	268	116	98	248	52	10.1	2	
-1	1623	.80	.66	710.900	337	265	113	98	249	54	10.1	2	
—	1625			711.853									
C-7	1629	.66	.55	711.853	351	255	95	95	255	65	8.3	2	
-6	1631	.47	.39	712.760	354	254	107	96	253	53	8.9	0	
-5	1633	.87	.72	713.550	354	257	107	96	253	51	8.3	0	
-4	1635	2.4	1.99	714.478	353	259	110	96	254	49	8.0	2	
-3	1637	2.4	1.99	716.030	344	261	116	96	256	49	7.9	2	
-2	1639	1.2	.99	717.593	339	262	117	96	257	51	9.3	2	
-1	1641	1.0	.83	718.800	338	264	112	96	257	53	9.8	0	
—	1643			719.880									
A-7	1647	1.1	.91	719.880	351	260	93	93	259	65	9.2	0	
-6	1649	1.5	1.24	721.100	353	260	108	95	261	53	8.0	0	
-5	1651	1.2	.99	722.244	355	261	112	95	261	53	8.0	0	
-4	1653	2.1	1.74	723.417	354	264	111	95	261	52	8.2	0	
Total/Average													

Test Summary

- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (Init.):
  - Impingers Loaded ______
  - Impingers Recovered ______
  - Filter Loaded ______
  - Filter Recovered ______
  - Probe Wash ______
- Comments: ______

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TEST DATA

Client/Location SCE / EL SEGUNDO   Unit 1   Test No. 5-MTLS   Method ____   Page 3
Sample Location NORTH DUCT   Fuel OIL   Ambient Temp., °F ____   of 3
Operators M. SCHMITT   Meter Vol. (Start/End) /   Date 2/23/90

Pre Test Data:
- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
Total		-	=	

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

	Sample Train CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
A-3	1655	2.7	2.24	724.900	348	262	115	95	261	53	8.8	3	
-2	1657	3.0	2.49	726.561	344	265	118	95	262	53	9.0	3	
-1	1659	2.6	2.16	728.335	339	265	120	95	263	56	9.2	3	
—	1701			730.095									
B-7	1707	.95	.79	730.095	355	258	91	91	264	68	9.0	0	
-6	1709	.55	.46	731.040	358	260	107	94	257	54	8.6	0	
-5	1711	.80	.66	731.890	355	259	107	94	254	55	8.6	0	
-4	1713	2.0	1.66	732.735	352	257	107	94	252	54	8.1	0	
-3	1715	2.0	1.66	733.640	345	256	107	94	249	54	8.2	0	
-2	1717	1.5	1.24	735.200	342	260	120	94	248	52	9.4	3	
-1	1719	1.7	1.41	736.650	342	259	116	94	245	53	9.4	2	
—	1721			737.985									
Total/Average							112.0						

Test Summary
- Initial ____
- Sample Vol., c.f. ____
- Stack Press, iwg ____
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F ____
- Stack Temp., °F ____
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

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CARNOT

SAMPLE TRAIN TEST SUMMARY

Client/Location	ELSEG	Date	2/24/90
Test Number	7-MTL	Data By	RBB
Test Method	EPA DRAFT	Sample Location	S. DUCT
Fuel	OIL	Reference Temp (F)	60
Control Box #	ES-19	Unit	1
Pitot Factor	0.840	Meter Cal Factor	1.0000
Stack Area (sq ft)	73.44	Sample Time (Min)	84
Bar Press (in Hg)	30.34	Nozzle Diam (in)	0.194

Meter Vol (acf)	58.390	Meter Temp (F)	95.5
Stack Press (iwg)	0.32	Stack Temp (F)	340.0
Vel Head (iwg)	1.5100	O2 (%): from CEM	7.70
		from portable	9.54
Liquid Vol (ml)	120.4	CO2 (%): from CEM	9.68
		calculated	8.33
Meter Press (iwg)	1.43	Start/Stop Time	1508/1717

Std Sample Vol (SCF)	55.58
Metric Sample Vol (cubic meters)	1.57
Moisture Fraction	0.091
Stack Gas Mol Wt	28.64
Stack Gas Velocity (ft/sec)	84.50
Stack Flow Rate (wacfm)	372,360
Stack Flow Rate (dscfm)	223,103
Isokinetic Ratio (%)	106.07

Client/Location SCE / El Segundo Unit 1 Test No. 7-MTL-ELSG Method EPA DRAFT Page 1
Sample Location South ID Fan Duct outlet Fuel #6 oil Ambient Temp., °F 70 of 3
Operators J. Mulligan Meter Vol. (Start/End) 425.992/484.385 Date 2/24/90

Pre Test Data:
- Barometric Press, in. Hg 30.34
- Stack Area, sq. ft. 23.44
- Sample Time/ Pt, min. 2/84
- Assumed Stack Press -.25
- Assumed Moisture 9
- Assumed Molecular Wt 27

Equipment Info:
- Meter No. ES-15
- Meter, Yd 1.00
- Pitot, Cp .84
- CFM @ H = 1.0 .575
- Probe I.D. 5'6"/3/85
- Nozzle No./Dia .194
- Filter No. T-110-139

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)	Leak Check
#1	H_2O	628.0	595.2	32.8	✓
#2	H_2O	664.9	614.0	50.9	✓
#3	$KMnO_4$	741.2	724.0	17.2	✓
#4	SG	786.1	766.6	19.5	✓
Total				120.4	✓

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.007	8	JM	ok	
Post-Test	.016	10	JM		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔH = 576

Sample Point	Time	ΔP	ΔH	Meter Reading	Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Start	15 08	1.1	.96	425.992	348	243	94	86	261	59	10.4	4	.32
A - 7	15 10	1.6	1.40	427.690	347	238	107	87	258	54	8.9	6	
6	15 12	2.1	1.83	428.654	350	240	111	87	256	52	8.7	7	
2	15 14	3.4	2.5	430.135	345	239	114	84	256	52	8.4	9	
11	15 16	3.2	2.8	432.020	345	241	116	88	256	56	9.8	9	
5	15 18	2.7	2.3	434.000	330	249	117	88	257	59	10.4	9	
6	15 20	2.1	1.8	435.895	328	256	117	85	257	65	10.2	8	
Stop 7	15 22			437.865									
Start	15 27	.67	.58	437.865	345	246	90	86	255	63	9.5	2	
F - 7	15 31	1.2	1.05	438.835	342	253	104	87	254	60	8.9	4	
6	15 33	1.5	1.3	440.015	343	258	108	87	257	58	9.1	5	
5	15 35	2.1	1.80	441.392	338	257	111	87	257	59	9.3	5	
4	15 37	2.5	2.19	442.975	337	257	113	87	255	61	9.5	8	
3	15 39	2.9	2.5	444.715	333	258	113	87	253	61	9.8	10	
2	15 41	1.9	1.66	446.568	331	253	114	87	254	62	10.1	8	
Stop 1	15 43			448.342									
Total/Average				22.35									

Test Summary

Initial
- Sample Vol., c.f. 58.39 ✓
- Stack Press, iwg .32 ✓
- ΔP 1.51 iwg ΔH 1.43 iwg
- Meter Temp., °F 95.5 ✓
- Stack Temp., °F 340 ✓
- Water Collected, g 120.4 ✓
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded BF
  - Impingers Recovered ______
  - Filter Loaded BF
  - Filter Recovered ______
  - Probe Wash ______

Comments: Hear I site watch the meter go around.

checked by RR

Client/Location SCE/El Segundo | Unit 1 | Test No. 7-ATL-E1sg | Method EPA-Draft | Page 2 of 3

Sample Location South ID Fan duct outlet | Fuel #6 oil | Ambient Temp., °F ______

Operators J. Milligan | Meter Vol. (Start/End) 1 | Date 2/24/90

Pre Test Data:

- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:

- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ΔH = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. ______

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ______

Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Start	1607	.88	.77	448.342	345	228	87	83	253	61	10.5	3	
E-7	1609	.65	.56	449.450	344	228	103	84	250	56	9.4	2	
6	1611	.90	.78	450.332	344	244	104	84	249	55	9.6	3	
5	1613	1.2	1.05	451.340	339	247	106	84	249	55	9.6	4	
4	1615	1.6	1.42	452.510	338	250	107	85	249	54	9.7	5	
3	1617	1.3	1.23	453.849	333	251	108	85	250	57	10.1	5	
2	1619	1.4	1.22	455.195	324	251	107	85	248	61	10.2	5	
Stop 1	1621			456.568									
Start	1625	.52	.45	456.568	344	256	88	84	250	60	10.0	2	
D-7	1627	.43	.37	457.361	347	256	97	85	249	59	9.1	2	
6	1629	.81	.709	458.128	346	257	100	85	251	59	8.9	3	
5	1631	2.2	1.9	459.155	348	260	102	85	252	59	9.2	7	
4	1633	1.7	1.48	460.698	335	258	108	85	251	57	9.7	6	
3	1635	1.1	.96	462.218	336	262	107	86	251	63	10.0	4	
2	1637	.90	.78	463.402	331	263	104	85	250	64		3	
Stop 1	1639			464.457									
Total/Average				16.11									

Test Summary

- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded ______
  - Impingers Recovered ______
  - Filter Loaded ______
  - Filter Recovered ______
  - Probe Wash ______
- Comments: ______

Client/Location SCE / EI Segundo Unit 1 Test No. 7-MH+EI34 Method EPA-ARAFL Page 2

Sample Location South I.D. Fan Duct outlet Fuel #6 oil Ambient Temp., °F ____ of 3

Operators L. Mulligan Meter Vol. (Start/End) ____ / ____ Date 2/24/98

Pre Test Data:

- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:

- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt (End)	-	Weight (Start)	=	Weight (g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
Total			-		=	

Impinger Box I.D. ____

Integrated Bag I.D. ____

See ONO

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Start	1643	.57	.44	464.457	345	266	88	84	252	65	9.6	2	
C - 7	16 45	.67	.58	465.298	348	262	98	85	253	63	8.6	2	
6	16 47	1.3	1.13	466.228	349	266	104	85	254	64	9.0	5	
5	16 49	2.9	2.54	467.650	341	267	106	85	254	65	8.6	5	
4	16 51	3.2	2.80	468.930	358	261	110	86	254	67	9.6	8	
3	16 53	1.2	1.05	471.286	331	236	110	85	254	65	10.	8	
2	16 55	.98	.85	472.687	331	236	106	86	254	65	10.0	4	
Stop 1	16 57			473.776									
Start	1703	1.2	1.05	473.776	346	236	86	84	254	65	9.4	4	
B - 7	1705	1.9	1.66	474.876	350	257	100	85	254	66	8.5	4	
6	17 07	2.3	2.01	475.267	345	255	108	87	254	66	8.7	8	
5	17 09	2.8	2.4	477.875	345	263	111	85	255	68	9.4	10	
4	17 11	2.6	2.2	479.763	333	265	113	86	253	68	10.0	10	
3	17 13	1.5	1.66	481.483	329	263	113	86	254	67	10.2	8	
2	17 15	.95	.83	483.168	329	260	109	86	253		10.4	4	
Stop 1	17 17			484.385									
Total/Average													

Test Summary

- Initial ____
- Sample Vol., c.f. ____
- Stack Press, iwg ____
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F ____
- Stack Temp., °F ____
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____

Comments: This is the END.

Client/Location SCE/ EL SEGUNDO
Sample Location South Duct
Operators Schmitt/ Mulligan

Unit 1 Test No. 1-INTL-GES Method EPA NEAT 1 of 1
Fuel N/A Ambient Temp., °F ______
Meter Vol. (Start/End) / Date 2/20/90

Pre Test Data:

- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:

- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ H = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. T110-81

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	H_2O_2/HNO_3	638.5	- 638.5	=
#2	H_2O_2/HNO_3	601.3	- 601.3	=
#3	$KMnO_4$	628.9	- 628.9	=
#4	gel	656.2	- 656.2	=
Total			-	=

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

	Sample Train CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.020	17	AS		
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Total/Average													

Test Summary

- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded W.O.
  - Impingers Recovered W.O.
  - Filter Loaded B.F.
  - Filter Recovered B.F.
  - Probe Wash A.S.
- Comments: ______

SCE/El Segundo Project # 53304 5/9/90
A. Bill

Metals by EPA Draft Multimetals Method

Re: Curtis and Tompkins lab # 25563

5% of decomposed aliquots removed for mercury analysis values reported for all metals except mercury represent 95% of sample.

$$\text{Total } \mu g = \frac{(\mu g, \text{ probe + filter} - \text{blank}) + (\mu g \text{ impinger} - \text{blank})}{.95}$$

Arsenic: by graphite furnace

Test	µg probe + filter	µg impinger	total µg
4-Mils	14.32	3.94	18.3
5-Mils	10.11	2.25	12.4
7-Mils	13.26	4.36	17.6
Beryllium: by ICP			
4-Mils	0.23	ND < 0.06	< 0.29
5-Mils	0.28	ND < 0.06	< 0.34
7-Mils	0.11	ND < 0.06	< 0.17
Cadmium: by ICP			
4-Mils	0.85	0.29	1.1
5-Mils	0.93	1.14	2.0
7-Mils	1.79	0.55	2.3

SCE/El Segundo Metals, p. 2

Test	ug probe & filter	ug impinger	ug, total
Copper: by ICP			
4-Mils	12.0	3.58	15.6
5-Mils	16.2	4.84	21.0
7-Mils	34.6	5.37	40.0
Lead: graphite furnace and ICP			
4-Mils	< 3.3	<0.6	<3.9
5-Mils	<3.3	<0.6	<3.9
7-Mils	<3.3	<0.6	<3.9
Manganese: by ICP			
4-Mils	9.8	4.3	14.1
5-Mils	14.0	<0.6	< 14.6
7-Mils	8.7	<0.6	< 9.3
Nickel: by ICP			
4-Mils	447.6	22.1	470
5-Mils	489.7	2.5	492
7-Mils	621.3	2.4	624
Selenium: by ICP			
4-Mils	< 3.3	ND <2.9	< 6.2
5-Mils	< 3.3	3.1	< 6.4
7-Mils	<3.3	ND <2.9	< 6.2
Zinc: by ICP			
4-Mils	31.6	6.1	37.7
5-Mils	44.2	6.8	51.0
7-Mils	6,558	6.5	6,564

SCT/El Segundo p. 3
Metals

Mercury by cold vapor a.a.

Test	µg, probe & filter	µg HNO_3/H_2O_2 impingers	µg $KMnO_4$ impinger	total µg Hg
4-Mtls	ND < 2.1	ND < 46	ND < 1.6	ND < 49.7
5-Mtls	ND < 2.7	ND < 45	ND < 2.8	ND < 50.5
7-Mtls	ND < 3.2	ND < 38	ND < 2.7	ND < 43.9

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
1250 S. Boyle Ave., Los Angeles, CA 90023, Phone (213) 269-7421, Fax (213) 268-5328

DATE RECEIVED: 03/07/90
DATE REPORTED: 04/17/90

LAB NUMBER: 25563

CLIENT: CARNOT

REPORT ON: FIVE SOURCE SAMPLES

PROJECT #: 5787

LOCATION: SUBMITTED BY CLIENT

RESULTS: SEE ATTACHED

Laboratory Director

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: ARSENIC IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
METHOD OF STANDARD ADDITIONS - EPA 7060

STANDARD INFORMATION
BLANK
STD1 = 10 ul SAMPLE + 10 ul 0.00 STD
STD2 = 10 ul SAMPLE + 10 ul 25.00 STD
STD3 = 10 ul SAMPLE + 10 ul 50.00 STD

C&T ID	SAMPLE ID			ARSENIC ug/SAMPLE
1	REAGENT BLANK	BLANK	0.0272	0.36
		STD1	0.0283	
		STD2	0.0922	
		STD3	0.1848	
		INSTRUMENT FACTOR:	1	
		CORRELATION FACTOR:	0.9944	
		SAMPLE VOLUME	0.05	
2	FIELD BLANK	BLANK	0.0272	0.65
		STD1	0.0316	
		STD2	0.1006	
		STD3	0.1594	
		INSTRUMENT FACTOR:	1	
		CORRELATION FACTOR:	0.9989	
		SAMPLE VOLUME	0.05	
3	4-MTLS	BLANK	0.0272	4.1
		STD1	0.0243	
		STD2	0.0344	
		STD3	0.0387	
		INSTRUMENT FACTOR:	1	
		CORRELATION FACTOR:	0.9740	
		DILUTION FACTOR:	0.05	
4	5-MTLS	BLANK	0.0272	2.5
		STD1	0.0291	
		STD2	0.0392	
		STD3	0.0558	
		INSTRUMENT FACTOR:	1	
		CORRELATION FACTOR:	0.9903	
		DILUTION FACTOR:	0.05	

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: ARSENIC IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
METHOD OF STANDARD ADDITIONS - EPA 7060

STANDARD INFORMATION

BLANK
STD1 = 10 ul SAMPLE + 10 ul 0.00 STD
STD2 = 10 ul SAMPLE + 10 ul 25.00 STD
STD3 = 10 ul SAMPLE + 10 ul 50.00 STD

C&T ID	SAMPLE ID			ARSENIC ug/SAMPLE
5	7-MTLS	BLANK	0.0247	4.5
		STD1	0.0284	
		STD2	0.0339	
		STD3	0.0433	

INSTRUMENT FACTOR: 1
CORRELATION FACTOR: 0.9888
SAMPLE VOLUME 0.05

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/29/90
DATE ANALYZED: 04/03/90
DATE REPORTED: 04/17/90

METAL: ARSENIC FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 7060

C&T ID	SAMPLE ID	SAMPLE VOLUME	ARSENIC ug/SAMPLE
1	REAGENT BLANK	50	1.4
2	FIELD BLANK	50	2.9
3	4-MTLS	50	16 use average
3D	4-MTLS	50	14
3S	4-MTLS	50	88%
4	5-MTLS	50	11
5	7-MTLS	50	14

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	9
SPIKE % RECOVERY:	88

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: BERYLLIUM IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010 - ELEMENT NOT RESPONSIVE BY GFAAS/STD ADD METHOD

C&T ID	SAMPLE ID	SAMPLE VOLUME	BERYLLIUM ug/SAMPLE
1	REAGENT BLANK	50	ND (0.06)
2	FIELD BLANK	50	ND (0.06)
3	4-MTLS	50	ND (0.06)
4	5-MTLS	50	ND (0.06)
5	7-MTLS	50	ND (0.06)
5D	7-MTLS	50	ND (0.06)
5S	7-MTLS	50	89%

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	89

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/22/90
DATE ANALYZED: 04/10/90
DATE REPORTED: 04/17/90

METAL: BERYLLIUM FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010 - ELEMENT NOT RESPONSIVE BY GFAAS/STD ADD METHOD

C&T ID	SAMPLE ID	SAMPLE VOLUME	BERYLLIUM ug/SAMPLE
1	REAGENT BLANK	50	0.28* do not subtract
2	FIELD BLANK	50	0.15
3	4-MTLS	50	0.22
4	5-MTLS	50	0.27
5	7-MTLS	50	0.10
5D	7-MTLS	50	0.10
5S	7-MTLS	50	80%

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	80

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/29/90
DATE ANALYZED: 04/05/90
DATE REPORTED: 04/17/90

METAL: CADMIUM IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	CADMIUM ug/SAMPLE
1	REAGENT BLANK	50	0.02
2	FIELD BLANK	50	1.2
3	4-MTLS	50	0.31
3D	4-MTLS	50	0.29
3S	4-MTLS	50	77%
4	5-MTLS	50	1.1
5	7-MTLS	50	0.54

Use average

METHOD DETECTION LIMIT = 0.02 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	8
SPIKE % RECOVERY:	77

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/22/90
DATE ANALYZED: 04/10/90
DATE REPORTED: 04/17/90

METAL: CADMIUM FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	CADMIUM ug/SAMPLE
1	REAGENT BLANK	50	ND (0.32)
2	FIELD BLANK	50	ND (0.36)
3	4-MTLS	50	0.81
4	5-MTLS	50	0.88
5	7-MTLS	50	1.7
5D	7-MTLS	50	1.7
5S	7-MTLS	50	73%

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	3
SPIKE % RECOVERY:	73

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: COPPER IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010 - ELEMENT NOT RESPONSIVE BY GFAAS/STD ADD METHOD

C&T ID	SAMPLE ID	SAMPLE VOLUME	COPPER ug/SAMPLE
1	REAGENT BLANK	50	1.6
2	FIELD BLANK	50	14
3	4-MTLS	50	5.0
4	5-MTLS	50	6.2
5	7-MTLS	50	6.7
5	7-MTLS	50	6.6
5	7-MTLS	50	89%

METHOD DETECTION LIMIT = 0.55 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	89

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/22/90
DATE ANALYZED: 04/10/90
DATE REPORTED: 04/17/90

METAL: COPPER FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010 - ELEMENT NOT RESPONSIVE BY GFAAS/STD ADD METHOD

C&T ID	SAMPLE ID	SAMPLE VOLUME	COPPER ug/SAMPLE
1	REAGENT BLANK	50	7.6
2	FIELD BLANK	50	120
3	4-MTLS	50	19
4	5-MTLS	50	23
5	7-MTLS	50	40
5	7-MTLS	50	41
5	7-MTLS	50	96%

Use average

METHOD DETECTION LIMIT = 0.60 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	3
SPIKE % RECOVERY:	96

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/03/90
DATE REPORTED: 04/17/90

METAL: LEAD IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
METHOD OF STANDARD ADDITIONS - EPA 7421

STANDARD INFORMATION
BLANK
STD1 = 10 ul SAMPLE + 10 ul 0.00 STD
STD2 = 10 ul SAMPLE + 10 ul 25.00 STD
STD3 = 10 ul SAMPLE + 10 ul 50.00 STD

C&T ID	SAMPLE ID			LEAD ug/SAMPLE
1	REAGENT BLANK	BLANK	0.007	14 subtract at d.l. of 0.6 ug/train
		STD1	0.1063	
		STD2	0.2284	
		STD3	0.3011	
	INSTRUMENT FACTOR:		10	
	CORRELATION FACTOR:		0.9895	
	SAMPLE VOLUME		0.05	
2	FIELD BLANK	BLANK	0.0070	7.3
		STD1	0.0687	
		STD2	0.2113	
		STD3	0.3186	
	INSTRUMENT FACTOR:		10	
	CORRELATION FACTOR:		0.9967	
	SAMPLE VOLUME		0.05	
3	4-MTLS	BLANK	0.0070	1.9
		STD1	0.0154	
		STD2	0.0270	
		STD3	0.0364	
	INSTRUMENT FACTOR:		1	
	CORRELATION FACTOR:		0.9982	
	DILUTION FACTOR:		0.05	
4	5-MTLS	BLANK	0.0070	13
		STD1	0.1210	
		STD2	0.2615	
		STD3	0.3667	
	INSTRUMENT FACTOR:		10	
	CORRELATION FACTOR:		0.9966	
	DILUTION FACTOR:		0.05	

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/03/90
DATE REPORTED: 04/17/90

METAL: LEAD IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
METHOD OF STANDARD ADDITIONS - EPA 7421

STANDARD INFORMATION

BLANK
STD1 = 10 ul SAMPLE + 10 ul 0.00 STD
STD2 = 10 ul SAMPLE + 10 ul 25.00 STD
STD3 = 10 ul SAMPLE + 10 ul 50.00 STD

C&T ID	SAMPLE ID			LEAD ug/SAMPLE
5	7-MTLS	BLANK	0.0070	3.2
		STD1	0.0693	
		STD2	0.1011	
		STD3	0.1235	

INSTRUMENT FACTOR: 1
CORRELATION FACTOR: 0.9950
SAMPLE VOLUME 0.05

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/22/90
DATE ANALYZED: 04/10/90
DATE REPORTED: 04/17/90

METAL: LEAD FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	LEAD ug/SAMPLE
1	REAGENT BLANK	50	46 * [illegible]
2	FIELD BLANK	50	47
3	4-MTLS	50	43
4	5-MTLS	50	41
5	7-MTLS	50	46
5	7-MTLS	50	48
5	7-MTLS	50	84%

METHOD DETECTION LIMIT = 3.1 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	4
SPIKE % RECOVERY:	84

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: MANGANESE INPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010 - ELEMENT NOT RESPONSIVE BY GFAAS/STD ADD METHOD

C&T ID	SAMPLE ID	SAMPLE VOLUME	MANGANESE ug/SAMPLE
1	REAGENT BLANK	50	1.2
2	FIELD BLANK	50	1.6
3	4-MTLS	50	5.3
4	5-MTLS	50	0.7
5	7-MTLS	50	1.1
5D	7-MTLS	50	1.1
5S	7-MTLS	50	86%

METHOD DETECTION LIMIT = 0.55 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	86

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: MANGANESE FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010 - ELEMENT NOT RESPONSIVE BY GFAAS/STD ADD METHOD

C&T ID	SAMPLE ID	SAMPLE VOLUME	MANGANESE ug/SAMPLE
1	REAGENT BLANK	50	6.7
2	FIELD BLANK	50	6.6
3	4-MTLS	50	16
4	5-MTLS	50	20
5	7-MTLS	50	15
5D	7-MTLS	50	15
5S	7-MTLS	50	83%

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	2
SPIKE % RECOVERY:	83

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/29/90
DATE ANALYZED: 03/29/90
DATE REPORTED: 04/17/90

METAL: MERCURY IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 7471

C&T ID	SAMPLE ID	SAMPLE VOLUME *	MERCURY ug/ALIQUOT *
1	REAGENT BLANK	SEE NOTE	ND (20)
2	FIELD BLANK	SEE NOTE	ND (41)
3	4-MTLS	SEE NOTE	ND (46)
3D	4-MTLS	SEE NOTE	ND (46)
3S	4-MTLS	SEE NOTE	98%
4	5-MTLS	SEE NOTE	ND (45)
5	7-MTLS	SEE NOTE	ND (38)

* NOTE: 5% v/v REMOVED AT 100 MLS FOR MERCURY; REMAINING 95 MLS REDUCED TO 50 ML FOR OTHER METAL ANALYSES.

* values are ug/train

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	98

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 04/05/90
DATE ANALYZED: 04/05/90
DATE REPORTED: 04/16/90

METAL: MERCURY FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 7471

C&T ID	SAMPLE ID	SAMPLE VOLUME *	MERCURY ug/ALIQUOT
1	REAGENT BLANK	SEE NOTE	ND (2.2)
2	FIELD BLANK	SEE NOTE	ND (1.7)
3	4-MTLS	SEE NOTE	ND (2.1)
4	5-MTLS	SEE NOTE	ND (2.7)
5	7-MTLS	SEE NOTE	ND (3.2)
5D	7-MTLS	SEE NOTE	ND (3.2)
5S	7-MTLS	SEE NOTE	93%

* NOTE: 5% v/v REMOVED AT 100 MLS FOR MERCURY; REMAINING 95 MLS REDUCED TO 50 ML FOR OTHER METAL ANALYSES.

values are ug/train

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	93

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/29/90
DATE ANALYZED: 03/29/90
DATE REPORTED: 04/16/90

METAL: MERCURY POTASSIUM PERMANGANATE IMPINGER
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 7471

C&T ID	SAMPLE ID	SAMPLE VOLUME	MERCURY ug/SAMPLE *
1	REAGENT BLANK	200	ND (2.0)
2	FIELD BLANK	100	ND (1.0)
3	4-MTLS	160	ND (1.6)
4	5-MTLS	275	ND (2.8)
4D	5-MTLS	275	ND (2.8)
4S	5-MTLS	275	99%
5	7-MTLS	270	ND (2.7)

* values are ug/train

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	99

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: NICKEL IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	NICKEL ug/SAMPLE
1	REAGENT BLANK	50	ND (0.63)
2	FIELD BLANK	50	2.9
3	4-MTLS	50	21
4	5-MTLS	50	2.4
5	7-MTLS	50	2.3
5D	7-MTLS	50	2.2
5S	7-MTLS	50	85%

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	4
SPIKE % RECOVERY:	85

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/22/90
DATE ANALYZED: 04/10/90
DATE REPORTED: 04/17/90

METAL: NICKEL FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	NICKEL ug/SAMPLE	
1	REAGENT BLANK	50	4.8	
2	FIELD BLANK	50	6.9	
3	4-MTLS	50	430	
4	5-MTLS	50	470	
5	7-MTLS	50	590	Use average
5D	7-MTLS	50	600	
5S	7-MTLS	50	99%	

METHOD DETECTION LIMIT = 0.60 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	1
SPIKE % RECOVERY:	99

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: SELENIUM IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	SELENIUM ug/SAMPLE
1	REAGENT BLANK	50	ND (3.1)
2	FIELD BLANK	50	ND (2.8)
3	4-MTLS	50	ND (2.8)
4	5-MTLS	50	2.9
5	7-MTLS	50	ND (2.8)
5D	7-MTLS	50	ND (2.8)
5S	7-MTLS	50	98%

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	98

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/22/90
DATE ANALYZED: 04/10/90
DATE REPORTED: 04/17/90

METAL: SELENIUM FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	SELENIUM ug/SAMPLE
1	REAGENT BLANK	50	7.9 * subjected to a dl of 3.3 µg/[illegible]
2	FIELD BLANK	50	15
3	4-MTLS	50	8.5
4	5-MTLS	50	5.7
5	7-MTLS	50	5.0
5	7-MTLS	50	5.1
5	7-MTLS	50	80%

METHOD DETECTION LIMIT = 3.1 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	<1
SPIKE % RECOVERY:	80

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/19/90
DATE ANALYZED: 04/02/90
DATE REPORTED: 04/17/90

METAL: ZINC IMPINGER CATCH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	ZINC ug/SAMPLE
1	REAGENT BLANK	50	2.3
2	FIELD BLANK	50	22
3	4-MTLS	50	8.1
4	5-MTLS	50	8.8
5	7-MTLS	50	8.5
5D	7-MTLS	50	8.4
5S	7-MTLS	50	79%

METHOD DETECTION LIMIT = 0.56 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	2
SPIKE % RECOVERY:	79

Appendix C.8

Chromium and Hexavalent Chromium

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: CHROMIUM BY CARB 425

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
2-CR-S	23.6	83.67	7.63	233608	9.96	8.71E-03	8.84E-06
3-CR-S	13.8	79.66	9.27	230188	6.12	5.27E-03	6.20E-06
6-CR-N	9.4	80.24	8.40	241381	4.14	3.74E-03	3.90E-06
AVG					6.74		6.31E-06
STACK TOTAL, WEIGHTED				473279		1.19E-02	

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	05/09/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: HEXAVALENT CHROMIUM

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
2-CR-S	3.79	83.67	7.63	233608	1.60	1.40E-03	1.42E-06
3-CR-S	3.98	79.66	9.27	230188	1.76	1.52E-03	1.79E-06
6-CR-N	1.76	80.24	8.40	241381	0.77	7.00E-04	7.30E-07
AVG					1.38		1.31E-06
STACK TOTAL, WEIGHTED				473279		2.44E-03	

CARNOT

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	ELSEG	Date.....................	2/22/90
Test Number..............	2-CR	Data By..................	RBB
Test Method..............	425	Sample Location..........	S.DUCT
Fuel.....................	OIL	Reference Temp (F).......	60
Control Box #............	ES-19	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	1.0000
Stack Area (sq ft).......	73.44	Sample Time (Min)........	126
Bar Press (in Hg)........	30.44	Nozzle Diam (in).........	0.191

Meter Vol (acf)..........	87.846	Meter Temp (F)...........	97.0
Stack Press (iwg)........	0.40	Stack Temp (F)...........	323.0
Vel Head (iwg)...........	1.6130	O2 (%): from CEM........	7.50
		from portable...	7.63
Liquid Vol (ml)..........	173.2	CO2 (%): from CEM........	10.00
		calculated......	9.90
Meter Press (iwg)........	1.42	Start/Stop Time..........	1350/1615

Std Sample Vol (SCF)..	83.67
Metric Sample Vol (cubic meters)............................	2.37
Moisture Fraction...	0.088
Stack Gas Mol Wt..	28.85
Stack Gas Velocity (ft/sec).................................	85.95
Stack Flow Rate (wacfm).....................................	378,736
Stack Flow Rate (dscfm).....................................	233,608
Isokinetic Ratio (%)..	104.88

Sample Location I D FAN OUTlet South   Site ____   Fuel Oil   Test No. ACR   Method 5K3   Page 1 of 3

Operators L. Mulligan   Ambient Temp., °F 67   Meter Vol. (Start/End) 017.523 / 105.365   Date 2/22/90

Pre Test Data:

- Barometric Press., in. Hg: 30.44
- Stack Area, sq. ft.: 73.44
- Sample Time/ Pt, min.: 3
- Assumed Stack Press: .5
- Assumed Moisture: 5%
- Assumed Molecular Wt: 29.

Equipment Info:

- Meter No.: ES-19
- Meter, Yd: 1.00
- Pitot, Cp: .84
- CFM @ H = 1.0: .579
- Probe I.D.: 96" glass
- Nozzle No./Dia: ~~.19~~
- Filter No.: .191 T-~~180~~-197 63

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1.	1N NaOH	728.9	596.2	132.7 ✓
#2.	1N NaOH	619.6	606.4	13.2 ✓
#3	—	501.6	495.6	6 ✓
#4	gel	719.7	698.4	21.3 ✓
Total				173.2

Impinger Box I.D. ____

Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.012	8	JM	OK	
Post-Test	.018	7	JM		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔH = 817262

South

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press iwg
Start	1350	1.9	1.5	017.523	311	268	83	83	N/A	Ice	4.4	2	.4
A-7	1353	2.3	1.87	019.762	313	275	108	84		66	4.0	2	
6	1356	3.0	2.4	022.028	314	228	112	86		66	8.9	3	
5	1359	3.1	2.53	024.905	318	242	112	86		60	8.0	4	
4	1402	3.2	2.6	027.489	319	243	112	87		59	7.4	5	
3	1405	2.0	1.6	030.387	321	259	112	88		57	6.9	3	
2	1408	1.5	1.22	032.799	294	257	110	89		57	6.9	2	
Stop 1	1411			034.925									
Start	1417	1.2	.98	034.925	334	275	93	87		59	7.0	2	
B-7	1420	2.7	2.2	036.719	336	275	109	88		60	6.8	4	
6	1423	2.4	1.96	039.510	335	260	112	85		60	7.2	4	
5	1426	3.5	2.8	041.891	325	275	112	85		60	7.5	5	
4	1429	3.8	3.1	044.	329	264	114	85		64	8.4	5	
3	1432	2.5	2.0	047.968	317	259	114	89		64	8.8	5	
2	1435	.85	.69	051.432	315		110	90		64		2	
Stop 1	1438			052.621									
Total/Average													

Test Summary

- Initial: BF/RB
- Sample Vol., c.f.: 87.846
- Stack Press, iwg: .4
- ΔP 1.663 iwg ΔH 1.42 iwg
- Meter Temp., °F: 96.96
- Stack Temp., °F: 323.
- Water Collected, g: 173.2
- O_2/CO_2 Method: ____
- Chain of Cust. Info (init.):
  - Impingers Loaded: BG/BF
  - Impingers Recovered: KH
  - Filter Loaded: BF
  - Filter Recovered: KH
  - Probe Wash: BF
- Comments: ____

CHECKED BY RB

Client/Location SCE / El Seg   Unit 1   Test No. 2Cr   Method ____   Page 2
Sample Location South I.R Fan Duct Exit   Fuel #6 Oil   Ambient Temp., °F 71   of 3
Operators J. Mulligan E. W. Osborn   Meter Vol. (Start/End) 1   Date 2/22/5x

Pre Test Data:
- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press 0.5?
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ ΔH 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	-	Weight (Start)	=	Weight (g)
#1	DI		-		=	
#2			-		=	
#3			-		=	
#4			-		=	
Total			-		=	

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
start	1441	0.44	.35	052.621	248		97	81		100	8.1	2	
C 7	1442	0.61	0.49	053.681	334		100	89		69	7.2	2	1.2
6	1447	1.0	0.81	054.915	337		105	86		69	7.2	2	
5	1450	2.8	2.2	056.612	334		110	89		68	7.6	4	
4	1453	3.2	2.6	059.683	327		113	89		65	8.2	4	
3	1456	2.0	1.6	061.681	322		112	90		65	8.6	3	
2	1459	.68	.55	064.167	316		109	90		64	8.8	2	
stop 1	1502			065.651									
start	1505	.60	.49	065.651	327		92	88		62	8.1	2	
D 7	1508	.38	.31	066.915	331		102	89		62	7.2	2	
6	1511	.85	.69	068.138	332		102	89		63	7.4	2	
5	1514	1.8	1.47	069.513	330		107	90		63	7.6	2	
4	1517	2.2	1.79	071.876	325		111	90		64	8.2	3	
3	1520	1.1	.89	074.265	321		110	90		64		2	
2	1523	.95	.77	075.986	320		106	90		64	8.6	2	
stop 1	1526			077.589									
Total/Average													

Test Summary

- Initial ____
- Sample Vol., c.f. ____
- Stack Press, iwg ____
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F ____
- Stack Temp., °F ____
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

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Client/Location SCE/ El Seg Unit 1 Test No. 2 CM/AH/S Method ____ Page 3
Sample Location South F.D. Fan Duct outlet Fuel #6 oil Ambient Temp., °F ____ of 3
Operators J. Mulligan & W. Osborn Meter Vol. (Start/End) / Date 2/24/90

Pre Test Data:
- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

See Page One

Imp.	Mat'l	Wt(End)	Weight (Start)	Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Start	1529	1.1	.89	077.589	334		94	88		[illegible]	7.6	2	
E 7	1532	.60	.41	079.215	334		104	89		64	7.5	2	
6	1535	.64	.52	080.412	331		102	88		63	7.6	2	
5	1538	1.3	1.06	081.892	331		104	88		63	7.8	2	
4	1541	1.2	.98	083.687	323		106	89		63	7.4	2	
3	1544	1.4	1.14	085.215	321		107	88		63	8.6	2	
2	1547	1.1	.89	087.563	318		107	88		63	8.7	2	
Stop 1	1550			089.259									
Start	1554	1.0	.81	089.359	332		89	86		65	7.5	2	
F 7	1557	1.5	1.22	091.025	351		105	87		65	7.6	2	
6	1600	1.8	1.47	093.122	331		107	87		65	7.6	3	
5	1603	2.1	1.71	095.341	330		108	87		65	7.9	3	
4	1606	2.6	2.12	097.698	328		110	87		62		3	
3	1609	2.9	2.36	100.212	324		111	88		62	8.0	4	
2	1612	1.9	1.55	103.087	318		110	89		62	8.6	3	
Stop 1	1615			105.369									
Total/Average							106.0						

Test Summary

Initial
- Sample Vol., c.f. 87.846
- Stack Press, iwg .3
- ΔP 1.613 iwg ΔH ____ iwg
- Meter Temp., °F 96.96
- Stack Temp., °F 323
- Water Collected, g 173.2
- O_2/CO_2 Method ____
- Chain of Cust. Info (Init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

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CARNOT

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	ELSEG	Date.....................	2/22/90
Test Number..............	3-CR	Data By..................	RBB
Test Method..............	425	Sample Location..........	S.DUCT
Fuel.....................	OIL	Reference Temp (F).......	60
Control Box #............	ES-19	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	1.0000
Stack Area (sq ft).......	73.44	Sample Time (Min)........	126
Bar Press (in Hg)........	30.44	Nozzle Diam (in).........	0.193

Meter Vol (acf)..........	83.161	Meter Temp (F)...........	93.7
Stack Press (iwg)........	0.30	Stack Temp (F)...........	329.6
Vel Head (iwg)...........	1.5680	O2 (%): from CEM........	7.70
		from portable...	9.27
Liquid Vol (ml)..........	161.7	CO2 (%): from CEM........	9.73
		calculated......	8.57
Meter Press (iwg)........	1.30	Start/Stop Time..........	1702/1936

Std Sample Vol (SCF)..	79.66
Metric Sample Vol (cubic meters)................................	2.26
Moisture Fraction...	0.086
Stack Gas Mol Wt..	28.73
Stack Gas Velocity (ft/sec).....................................	85.28
Stack Flow Rate (wacfm)...	375,788
Stack Flow Rate (dscfm)...	230,188
Isokinetic Ratio (%)..	99.25

Sample Location ~~North~~ South
Operators J. Mulligan

Unit 1 | Fuel oil #6 | Test No. 3CR-E/SQ | Method " | Ambient Temp., °F 69 | Page 1 of 5
Meter Vol. (Start/End) 105.883/189.044 | Date 3/22/8

Pre Test Data:
- Barometric Press., in. Hg 30.44
- Stack Area, sq. ft. 73.44
- Sample Time/ Pt, min. 3/126
- Assumed Stack Press
- Assumed Moisture 9%
- Assumed Molecular Wt 29

Equipment Info:
- Meter No. ES-19
- Meter, Yd 1.00
- Pitot, Cp .84
- CFM @ΔH = 1.0 .595
- Probe I.D. 92"/short
- Nozzle No./Dia .193
- Filter No. T63-121

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1.	1NAOH	742.2 -	610.5 =	131.7
#2.	1NAOH	608.0 -	598.7 =	9.3
#3	Ø	498.3 -	495.9 =	2.4
#4	S/G	776.0 -	757.7 =	18.3
Total		-		= 161.7

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.018	8	JM	ok	
Post-Test	.014	7	JM		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔH 7 68

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
start	1702	0.24	.18	105,883	328	0	91	86		Ice	10	2	.3
E - 7	1705	1.20	.92	106,521	331		103	86			8.2	2	
6	1708	1.40	1.07	108,263	330		105	87			8.7	2	
5	1711	2.2	1.68	110.198	328		107	87		62	8.8	4	
4	1714	2.8	2.15	112.225	326		109	86		60	9.1	5	
3	1717	3.1	2.38	114.876	323		110	87		61	10.1	6	
2	1720	2.0	1.5	117.258	323		111	87		62	10.3	4	
stop 1	1723			119.921									
start	1726	0.89	.68	119.923	335		88	86		63	10	2	
- 7	1729	0.56	.43	121.585	334		100	86		63	9.5	2	
6	1732	.68	.522	122.863	332		98	86		62	9.1	2	
5	1735	1.2	.92	124.165	329		100	85		62	9.4	2	
4	1738	1.4	1.07	125.776	328		102	85		60	10.0	3	
3	1741	1.1	.844	127.598	322		103	83		59	9.8	2	
2	1744	1.5	1.15	129.382	326		102	85		59	10.0	3	
stop 1	1747			131.265									
Total/Average													

Test Summary

- Initial BF.
- Sample Vol., c.f. 83.161
- Stack Press, iwg .3
- ΔP 1.568 iwg ΔH 1.3 iwg
- Meter Temp., °F 93.67
- Stack Temp., °F 329.6
- Water Collected, g 161.7
- O_2/CO_2 Method
- Chain of Cust. Info (init.):
  - Impingers Loaded JM
  - Impingers Recovered W.D.
  - Filter Loaded JM
  - Filter Recovered W.D.
  - Probe Wash BF.
- Comments:

99.46 8.6% H_2O

Checked by RB

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Client/Location SCE / E / S-5 Unit 1 Test No. 3 CK-south Method ______ Page 2

Sample Location South I.D. fan outlet Fuel #6 oil Ambient Temp., °F ______ of 3

Operators J. Mulligan Meter Vol. (Start/End) / Date 2/22/90

Pre Test Data:

- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

see page one

Equipment Info:

- Meter No. ______
- Meter, Yd ______
- Pitot Cp ______
- CFM @ΔH = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. ______

Imp.	Matl	Wt(End)	- Weight (Start)	= Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ______

Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
start	1750	.48	.26	131.265	334		90	84		57	9.1	2	
7	1753	.34	.26	132.487	334		93	84		59	8.5	2	
6	1756	.69	.52	133.328	334		95	84		58	8.6	2	
5	1759	1.5	1.15	134.632	331		100	83		56	9.0	3	
4	1802	1.9	1.45	136.350	324		103	83		53	9.5	3	
3	1805	1.2	.92	138.345	320		103	83		55	9.6	3	
2	1808	.98	.75	140.132	318		101	83		56	10.6	3	
Stop 1	1811			141.655									
Start	1824	.82	.62	141.735	334		95	82		57	8.0	3	
7	1827	.91	.69	143.822	329		100	83		54	8.1	2	
6	1830	1.6	1.22	144.938	335		101	83		55	8.5	2	
5	1833	2.5	1.92	147.187	331		106	83		54	8.5	5	
4	1836	2.7	2.0	149.263	323		107	83		54	9.5	5	
3	1839	1.9	1.45	151.738	319		107	84		56	9.8	5	
2	1842	.62	.47	154.053	317		105	84		57	10.0	5	
Stop 1	1845			155.341									
Total/Average													

Test Summary

Initial ______

- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded ______
  - Impingers Recovered ______
  - Filter Loaded ______
  - Filter Recovered ______
  - Probe Wash ______

Comments: - .80 from final vol broken nozzel L/C .005 @ 8" vac

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Client/Location SCE / E / S+g
Unit 1
Test No. 3 CR/E/S4 Method
Page 3 of 3

Sample Location South I.D FAN Duct outlet
Fuel #6 oil
Ambient Temp., °F
Date 2/22/90

Operators S. McMilligan
Meter Vol. (Start/End) 1189.049

Pre Test Data:
- Barometric Press, in. Hg
- Stack Area, sq. ft.
- Sample Time/ Pt, min.
- Assumed Stack Press
- Assumed Moisture
- Assumed Molecular Wt

Equipment Info:
- Meter No.
- Meter, Yd
- Pitot, Cp
- CFM @ΔH = 1.0
- Probe I.D.
- Nozzle No./Dia
- Filter No.

Page One

Imp.	Matl	Wt(End)	- Weight (Start)	= Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Start	1849	1.9	1.45	155.341	337		89	82		59	8.9	4	
B 7	1852	2.1	1.61	157.624	330		106	83		57	8.1	5	
6	1855	2.8	2.15	159.873	336		107	84		57	8.4	5	
5	1858	2.7	2.8	162.287	330		109	84		58	9.0	7	
4	1901	3.3	2.5	165.175	319		111	85		59	10.0	7	
3	1904	2.0	1.5	167.983	317		111	85		62	10.1	4	
2	1907	0.90	.69	170.483	315		108	86		62	10.1	2	
Stop 1	1910			171.962									
Start	1915	2.8	2.15	171.962	313		95	83		60	10.0	6	
A 7	1918	2.5	1.92	175.289	289		109	85		58	10.1	6	
6	1921	3.1	2.3	177.681	325		108	85		59	10.1	4	
5	1924	3.3	2.5	179.812	332		109	85		59	9.5	6	
4	1927	2.1	1.67	182.231	338		110	82		61	8.5	4	
3	1930	1.5	1.15	185.3	339		106	87		63	8.4	4	
2	1933	.97	.74	187.328	337		104	85		63	8.1	3	
Stop 1	1936			189.044									
Total/Average							102.1						

Test Summary
- Initial
- Sample Vol., c.f.
- Stack Press, iwg
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F
- Stack Temp., °F
- Water Collected, g
- O_2/CO_2 Method
- Chain of Cust. Info (init.):
  - Impingers Loaded
  - Impingers Recovered
  - Filter Loaded
  - Filter Recovered
  - Probe Wash
- Comments:

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CARNOT

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	ELSEG	Date......................	2/24/90
Test Number..............	6-CR	Data By..................	RBB
Test Method..............	CHROME	Sample Location..........	N. DUCT
Fuel.....................	OIL	Reference Temp (F).......	60
Control Box #............	ES-8	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	0.9900
Stack Area (sq ft).......	73.44	Sample Time (Min)........	126
Bar Press (in Hg)........	30.34	Nozzle Diam (in).........	0.195

Meter Vol (acf)..........	85.430	Meter Temp (F)...........	97.5
Stack Press (iwg)........	0.35	Stack Temp (F)...........	343.5
Vel Head (iwg)...........	1.7200	O2 (%): from CEM........	7.55
		from portable...	8.40
Liquid Vol (ml)..........	138.4	CO2 (%): from CEM........	9.00
		calculated......	8.43
Meter Press (iwg)........	1.54	Start/Stop Time..........	0900/1129

Std Sample Vol (SCF)...	80.24
Metric Sample Vol (cubic meters).............................	2.27
Moisture Fraction..	0.074
Stack Gas Mol Wt...	28.82
Stack Gas Velocity (ft/sec)..................................	90.11
Stack Flow Rate (wacfm)......................................	397,058
Stack Flow Rate (dscfm)......................................	241,381
Isokinetic Ratio (%)...	93.39

Client/Location SCE / EL SEGUNDO Unit 1 Test No. 6-Cr Method CHROME Page 1
Sample Location NORTH Duct Fuel OIL Ambient Temp., °F ____ of 3
Operators M. SCHMITT Meter Vol. (Start/End) 741.000/____ Date 2/24/90

Pre Test Data:

- Barometric Press, in. Hg 30.34
- Stack Area, sq. ft. 73.41
- Sample Time/ Pt, min. 3
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:

- Meter No. ES-8
- Meter, Yd .990
- Pitot, Cp .84
- CFM @ ΔH = 1.0 .598
- Probe I.D. 10' Glass
- Nozzle No./Dia .195
- Filter No. ____

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	NaOH	675.3	- 563.5	= 111.8 ✓
#2	NaOH	579.4	- 570.7	= 8.7 ✓
#3	—	497.0	- 495.5	= 1.5 ✓
#4	S.G	716.2	- 699.8	= 16.4 ✓
Total				= 138.4 ✓

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.006	7"	MS	OK	—
Post-Test	.016	8"	MS		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

$\Delta H = .846 \cdot \Delta P$

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	~~Probe~~ UNHEATED	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
B-7	900	1.1	.93	741.000	353	—	89	83	—	ICE	9.0	3	
-6	903	.57	.48	742.653	352		97	83			7.7	0	
-5	906	.70	.59	743.880	352		97	84			7.6	0	
-4	909	1.7	1.44	745.193	345		99	84			8.0	5	
-3	912	2.3	1.95	747.120	342		107	85			8.2	6	
-2	915	1.8	1.52	749.388	337		109	86			9.0	5	
-1	918	2.0	1.69	751.471	335		108	86			9.2	5	
—	921			753.642									
A-7	924	.72	.61	753.642	345		87	85			8.3	2	
-6	927	1.4	1.18	755.043	347		101	87			7.9	4	
-5	930	1.8	1.52	756.850	349		108	87			8.0	5	
-4	933	2.2	1.86	758.922	345		110	87			8.4	6	
-3	936	2.6	2.20	761.120	341		111	88			8.7	7	
-2	939	2.9	2.45	763.650	337		115	88			9.0	8	
-1	942	2.3	1.95	766.231	334		116	88			9.3	7	
—	945			768.615									
C-7	947	.60	.51	768.615	349		102	89			7.8	2	
-6	950	.40	.34	769.400	351		103	89			7.5	0	
Total/Average													

Test Summary

Initial
- Sample Vol., c.f. 85.43 ✓
- Stack Press, iwg .35 ✓
- ΔP 1.72 iwg ΔH 1.54 iwg ✓
- Meter Temp., °F 97.5 ✓
- Stack Temp., °F 343.5 ✓
- Water Collected, g 138.4 ✓
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

[illegible] by DB

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Client/Location SCE / EL SEGUNDO | Unit 1 | Test No. 6-CR | Method CHROME | Page 2 of 3

Sample Location North Duct | Fuel OIL | Ambient Temp., °F ____

Operators M. Schmitt | Meter Vol. (Start/End) / | Date 2/24/90

Pre Test Data:

- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:

- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia 0.195
- Filter No. ____

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
Total		-	=	

Impinger Box I.D. ____

Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
C-5	953	.78	.66	770.881	348	—	103	90	—				
-4	956	2.2	1.86	772.350	340		113	90			7.6	2	
-3	959	2.5	2.12	774.600	342		116	91			7.9	7	
-2	1002	1.1	.93	776.936	335		111	92			8.5	7	
-1	1005	.96	.81	778.627	334		108	91			9.2	3	
—	1008			780.216							9.4	3	
D-7	1010	1.0	.85	780.216	348		99	91					
-6	1013	1.4	1.18	781.884	348		106	91			8.1	3	
-5	1016	1.8	1.52	783.710	353		107	91			7.6	4	
-4	1019	2.3	1.95	785.600	349		108	90			7.6	4	
-3	1022	2.9	2.45	787.880	341		114	90			7.8	7	
-2	1025	1.8	1.52	790.771	335		113	90			8.5	10	
-1	1028	.86	.73	793.010	334		106	91			9.4	5	
—	1031			799.484							9.5	3	
E-7	1036	1.7	1.44	799.484	353		97	89					
-6	1039	2.5	2.12	796.542	351		107	89			7.9	5	
-5	1042	2.1	1.78	798.940	354		110	90			7.6	8	
-4	1045	3.50	2.96	801.300	345		111	90			7.5	6	
Total/Average											7.7	10	

Test Summary

- Initial ____
- Sample Vol., c.f. ____
- Stack Press, iwg ____
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F ____
- Stack Temp., °F ____
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

Client/Location SCE / EL SEGUNDO
Sample Location North Duct
Operators M. Schmitt

Unit 1
Fuel OIL

Test No. 6-CR
Meter Vol. (Start/End) /

Method CHROME
Ambient Temp., °F

Page 3 of 3
Date 2/24/90

Pre Test Data:
Barometric Press, in. Hg
Stack Area, sq. ft.
Sample Time/ Pt, min.
Assumed Stack Press
Assumed Moisture
Assumed Molecular Wt

Equipment Info:
Meter No.
Meter, Yd
Pitot, Cp
CFM @ΔH = 1.0
Probe I.D.
Nozzle No./Dia
Filter No.

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1		-	=	
#2		-	=	
#3		-	=	
#4		-	=	
Total		-	=	

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
E-3	1048	3.0	2.54	804.201	337	—	113	90	—	—	8.9	9	.35
-2	1051	2.3	1.95	806.780	332		111	90			9.4	7	
-3	1054	2.3	1.95	809.651	332		111	91			9.5	7	
-2	1057			811.559									
F-7	1108	1.5	1.27	811.559	329		98	88			10	4	
-6	1111	2.5	2.12	813.210	333		108	88			9.8	4	
-5	1114	2.1	1.78	815.506	337		109	88			9.5	6	
-4	1117	3.2	2.71	817.713	345		110	88			8.4	10	
-3	1120	2.3	1.95	820.470	351		112	89			7.7	7	
-2	1123	1.7	1.44	822.813	354		110	89			7.2	5	
-1	1126	.90	.76	824.910	352		105	88			7.2	3	
—	1129			826.432									
Total/Average											8.4 Avg.		

Test Summary

Initial
Sample Vol., c.f.
Stack Press, iwg
ΔP ____ iwg ΔH ____ iwg
Meter Temp., °F
Stack Temp., °F
Water Collected, g
O_2/CO_2 Method
Chain of Cust. Info (init.):
Impingers Loaded
Impingers Recovered
Filter Loaded
Filter Recovered
Probe Wash
Comments:

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SCE/El Segundo Project # 53304 5/7/90
A. Bell

Total Chromium by CARB 425
Curtis and Tompkins Laboratory Report # 25560
Method: Atomic absorption using standard additions
- Values represent 1/2 train
Reagent Blank = 1.53 μg : subtract reagent blank from each sample
Method d.l = .25 μg/1/2 train

Test No	μg/1/2 train	μg/1/2 train - blank	μg/train
2-Cr	13.34	11.81	23.6
3-Cr	8.44	6.91	13.8
6-Cr	6.22	4.69	9.4

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
1250 S. Boyle Ave., Los Angeles, CA 90023, Phone (213) 269-7421, Fax (213) 268-5328

DATE RECEIVED: 03/07/90
DATE REPORTED: 03/21/90

LAB NUMBER: 25560

CLIENT: CARNOT

REPORT ON: FOUR SOURCE TEST SAMPLES

PROJECT #: 53304-ELS

LOCATION: SUBMITTED BY CLIENT

RESULTS: SEE ATTACHED

NOTE: METHOD OF STANDARD ADDITIONS HAD TO BE RUN AS SPIKE RECOVERY ON INITIAL RUN WAS 60%.

Laboratory Director

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25560
CLIENT: CARNOT
PROJECT #: 53304-ELS
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/15/90
DATE ANALYZED: 03/19/90
DATE REPORTED: 03/21/90

METAL: *CHROMIUM IMPINGER CATCH*
METHOD: CARB 425
METHOD OF STANDARD ADDITIONS - EPA 7191

STANDARD INFORMATION
BLANK
STD1 = 10 ul SAMPLE + 10 ul 0.00 STD
STD2 = 10 ul SAMPLE + 10 ul 12.50 STD
STD3 = 10 ul SAMPLE + 10 ul 25.00 STD

C&T ID	SAMPLE ID			CHROMIUM ug/1/2 TRAIN
1	REAGENT BLANK	BLANK	0.0004	1.53
		STD1	0.0651	
		STD2	0.2029	
		STD3	0.3344	
	INSTRUMENT FACTOR:		10	
	CORRELATION FACTOR:		0.9999	
	SAMPLE VOLUME		0.025	
2	2-Cr-ELS	BLANK	0.0004	13.34
		STD1	0.1898	
		STD2	0.3251	
		STD3	0.4161	
	INSTRUMENT FACTOR:		25	
	CORRELATION FACTOR:		0.9937	
	SAMPLE VOLUME		0.025	
3	3-Cr-ELS	BLANK	0.0004	8.44
		STD1	0.1642	
		STD2	0.2938	
		STD3	0.4102	
	INSTRUMENT FACTOR:		20	
	CORRELATION FACTOR:		0.9995	
	DILUTION FACTOR:		0.025	
4	6-Cr-ELS	BLANK	0.0004	6.22
		STD1	0.2286	
		STD2	0.3385	
		STD3	0.4568	
	INSTRUMENT FACTOR:		10	
	CORRELATION FACTOR:		0.9998	
	DILUTION FACTOR:		0.025	

MDL = 0.25 ug/SAMPLE

SCE / El Segundo Project # 53304 5/7/90
A. Bell

Hexavalent Chromium by CARB 425
Re: RTI lab report # 2984
Reagent Blank ND at .0014 µg/ml = .28 µg/train

Test No	µg/probe wash	µg/impinger filter	µg/½ train	total µg/train
2-Cr	0.243	1.65	1.89	3.79
3-Cr	ND < 0.14	1.85	1.99	3.98
*6-Cr	0.88		0.88	1.76

* probe wash, impinger catch and filter combined on test 6-Cr

RESEARCH TRIANGLE INSTITUTE

Center for Environmental Measurements

March 13, 1990

Ms. Arlene C. Bell
Director, Laboratory Services
15991 Red Hill Avenue, Suite 110
Tustin, CA 92680-7388

Dear Ms. Bell,

Enclosed are the Cr(VI) analysis results as determined by ion chromatography for one spike sample and six impinger/probe rinse samples received on February 28, 1990 for RTI Project No. 2984, ESA Project No. 53304-ELS.

If you have any questions, please call me at 919-541-6569 or Peter Grohse at 919-541-6897.

Sincerely,

Kateluk

Kate K. Luk, Ph.D.

Ref: 2984
cc: W. Gutknecht
P. Grohse
J. Merricks

RTI Project No. : 2984
Company : ESA
ETS Poject No. : 53304-ELS
Samples : Probe wash and impinger samples
Analyte : Cr(VI)
Method of Analysis : IC
Sample received : 2-28-1990
Report Date : 3-13-1990

Sample *	Total Vol.(mL)	Cr(VI) ug/mL	Cr(VI) Tot.ug	Cr(VI) Spike Tot.ug Expected	Cr(VI) Spike Tot.ug Found	Cr(VI) % Spike Recovery
Reag.Blk	100	ND	ND			
2-Cr-ELS Probe	165	0.00147	0.243			
2-Cr-ELS Probe Spike				0.0100	0.00903	90.3
2-Cr-ELS Imp/Fil	350	0.00470	1.65			
3-Cr-ELS Probe	100	ND	ND			
3-Cr-ELS Imp/Fil	260	0.00711	1.85			
6-Cr-ELS Pro/Imp/Fil	310	0.00285	0.884			

Detection Limit 0.0014

ND : Non-detectable; less than detection limit

* Represent ½ of train

Appendix C.9

Arsenic

METALS EMISSION CALCULATIONS

Client/Location:	SCE/EL SEGUNDO UNIT 1	BY:	AB
F Factor:	9039	DATE:	5/9/90
Reference Temp (F):	60		
Fuel:	Oil		

ELEMENT: ARSENIC FOR CARB METALS VALIDATION STUDY

Test	ug/train	Vmstd	%O2	Qsd	ug/m3	lb/hr	lb/MMbtu
4-AS-S	0.8	52.78	9.08	215701	0.54	4.32E-04	5.34E-07
5-AS-S	2.6	51.16	8.86	218118	1.79	1.46E-03	1.76E-06
7-AS-N	4.4	52.81	8.33	236546	2.94	2.60E-03	2.76E-06
AVG					1.76		1.68E-06
STACK TOTAL, WEIGHTED				453456		2.98E-03	

CARNOT

SAMPLE TRAIN TEST SUMMARY

Client/Location..........	ELSEG	Date.....................	2/23/90
Test Number..............	4-AS	Data By..................	RBB
Test Method..............	423	Sample Location..........	S. DUCT
Fuel.....................	OIL	Reference Temp (F).......	60
Control Box #............	ES-19	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	1.0000
Stack Area (sq ft).......	73.44	Sample Time (Min)........	86
Bar Press (in Hg)........	30.38	Nozzle Diam (in).........	0.194

Meter Vol (acf)..........	55.263	Meter Temp (F)...........	94.2
Stack Press (iwg)........	0.50	Stack Temp (F)...........	328.6
Vel Head (iwg)...........	1.3825	O2 (%): from CEM........	7.50
		from portable...	9.08
Liquid Vol (ml)..........	110.7	CO2 (%): from CEM........	9.60
		calculated......	8.47
Meter Press (iwg)........	1.28	Start/Stop Time..........	0944/1159

Std Sample Vol (SCF)..................................	52.78
Metric Sample Vol (cubic meters)......................	1.49
Moisture Fraction.....................................	0.089
Stack Gas Mol Wt......................................	28.68
Stack Gas Velocity (ft/sec)...........................	80.16
Stack Flow Rate (wacfm)...............................	353,224
Stack Flow Rate (dscfm)...............................	215,701
Isokinetic Ratio (%)..................................	101.76

Client/Location SCE / El Segundo　Unit 1　Test No. 4-As　Method 423　Page 1
Sample Location South ID FAN Duct outlet　Fuel #6 oil　Ambient Temp., °F 66　of 3
Operators d. Mulligan　Meter Vol. (Start/End) 190.348/245.611　Date 2/23/90

Pre Test Data:
- Barometric Press, in. Hg 30.38
- Stack Area, sq. ft. 73.44
- Sample Time/ Pt, min. 2 / 84
- Assumed Stack Press .25
- Assumed Moisture 9%
- Assumed Molecular Wt 29

Equipment Info:
- Meter No. ES-19
- Meter, Yd 1.00
- Pitot, Cp .84
- CFM @ ΔH = 1.0 .595
- Probe I.D. 96'/2/A35
- Nozzle No./Dia .194
- Filter No. T118-84

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	DI H₂O	775.8	- 634.3	= 141.5
#2	DI H₂O	541.0	- 589.3	= -48.3
#3	~~0~~	499.5	- 495.3	= 4.2
#4	gel	698.5	- 685.2	= 13.3
Total			-	= 110.7

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.020	7	JM	OK	
Post-Test	.019	7	JM		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔH .856

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Start	944	2.0	1.71	190.348	320	245	93	79	239	63	10.2	3	1.50
A - 7	946	2.8	2.40	192.287	328	264	107	80	232	60	10.1	4	
6	948	3.5	3.0	193.942	327	274	110	81	245	58	9.6	5	
5	950	3.3	2.8	195.923	326	248	111	82	267	60	8.9	5	
4	952	1.9	1.6	197.836	331	262	110	83	270	61	8.1	3	
3	954	1.6	1.3	199.418	330	255	108	84	270	66	8.1	3	
2	956	1.1	.94	200.921	318	249	105	84	266	67	8.1	2	
stop 1	958			202.130									
start	1006	.79	.67	202.130	324	241	90	83	257	62	8.5	2	
F - 7	1008	1.1	.94	203.101	325	250	99	83	257	62	8.4	2	
6	1010	1.3	1.11	204.245	335	251	105	83	258	63	9.0	2	
5	1012	1.9	1.63	205.523	330	257	107	84	258	61	9.2	3	
4	1014	2.2	1.88	207.038	328	256	109	84	259	61	9.5	3	
3	1016	2.7	2.3	208.623	318	247	110	85	259	61	9.7	4	
2	1018	1.9	1.63	210.445	319	242	111	86	258	63	10.1	3	
stop 1	1020			212.074									
Total/Average													

Test Summary
- Initial BF
- Sample Vol., c.f. 55.263
- Stack Press, iwg .50
- ΔP 1.2825 iwg　ΔH 1.276 iwg
- Meter Temp., °F 94.15
- Stack Temp., °F 328.6
- Water Collected, g 110.7
- O_2/CO_2 Method
- Chain of Cust. Info (Init.):
  - Impingers Loaded W.O.
  - Impingers Recovered KH
  - Filter Loaded W.O.
  - Filter Recovered BF
  - Probe Wash BF
- Comments:

104.93　8.9

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Client/Location SCE / El Segundo
Sample Location South I.D. FAN Duct outlet
Operators J. Mulligan

Unit 1
Fuel #6 oil

Test No. 4 AS
Method ______
Ambient Temp., °F ______
Meter Vol. (Start/End) ______ / ______

Page 2
of 3
Date 3/23/86

Pre Test Data:
- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:
- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ΔH = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. ______

See Pg One

Imp.	Matl	Wt(End)		Weight (Start)		Weight (g)
#1			-		=	
#2			-		=	
#3			-		=	
#4			-		=	
Total			-		=	

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
start	1042	1.0	.85	212.074	335	225	93	85	253	62	8.9	2	
E 7	1044	.75	.64	213.172	335	228	102	85	253	57	8.5	2	
6	1046	.70	.60	214.129	335	226	103	86	251	56	8.6	2	
5	1048	1.1	.94	215.073	331	236	104	86	250	54	9.0	2	
4	1050	1.5	1.24	216.218	329	244	106	86	247	53	9.1	2	
3	1052	1.6	1.37	217.621	325	245	108	86	248	52	9.4	2	
2	1054	1.1	.94	219.081	320	244	106	86	242	53		2	
Stop 1	1056			220.262									
Start	1101	0.44	.37	220.262	337	233	88	85	243	60	8.9	2	
D 7	1103	.34	.29	221.049	336	236	96	85	242	57	8.6	2	
6	1105	.74	.63	221.766	335	239	99	85	243	57	8.9	2	
5	1107	1.5	1.28	222.405	332	245	100	85	243	56	9.0	3	
4	1109	1.9	1.63	223.768	327	248	104	85	241	52	8.7	3	
3	1111	1.1	.94	225.338	319	252	107	85	240	52	9.6	2	
2	1113	0.80	.68	226.442	322	253	105	85	242	55	9.6	2	
Stop 1	1115			227.692									
Total/Average													

Test Summary
- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded ______
  - Impingers Recovered ______
  - Filter Loaded ______
  - Filter Recovered ______
  - Probe Wash ______
- Comments: ______

Client/Location SCE / El Segundo   Unit 1   Test No. 1 AS   Method ____   Page 2
Sample Location South I.D Fan Duct outlet   Fuel #6 oil   Ambient Temp., °F ____   of 2
Operators J. Mulligan   Meter Vol. (Start/End) 1050.011   Date 2/23/86

Pre Test Data:
- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ____
- Meter Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

See page 1

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
start	11 20	0.25	.21	227.692	336	240	89	85	243	64	9.3	2	
C - 7	11 22	0.41	.35	228.347	338	250	96	85	247	61	8.9	2	
6	11 24	0.85	.72	229.081	337	257	100	85	245	59	8.8	2	
5	11 26	2.2	1.8	230.050	321	261	106	85	245	58	8.9	2	
4	11 28	2.7	2.3	231.653	318	264	110	86	245	55	9.4	4	
3	11 30	1.1	.94	233.536	323	258	108	86	246	56	9.6	2	
2	11 32	0.53	.45	234.769	328	254	104	86	246	58	9.8	2	
stop 1	11 34			235.664									
start	11 45	0.85	.72	235.665	338	232	92	86	251	68	9.0	2	
B - 7	11 47	1.7	1.45	236.623	331	236	106	86	252	61	8.5	3	
6	11 49	2.0	1.71	238.040	340	244	109	87	253	57	8.4	3	
5	11 51	2.5	2.18	239.587	336	247	110	87	253	57	8.6	5	
4	11 53	2.5	2.14	241.400	325	248	113	87	254	58	9.4	5	
3	11 55	1.7	1.45	243.218	321	249	111	87	254	59	9.8	3	
2	11 57	0.65	.55	244.698	326	248	107	87	255	61	9.6	2	
stop 1	11 59			245.611									
otal/Average							103.1						

Test Summary

Initial ____
Sample Vol., c.f. ____
Stack Press, iwg ____
ΔP ____ iwg ΔH ____ iwg
Meter Temp., °F ____
Stack Temp., °F ____
Water Collected, g ____
O_2/CO_2 Method ____
Chain of Cust. Info (Init.):
- Impingers Loaded ____
- Impingers Recovered ____
- Filter Loaded ____
- Filter Recovered ____
- Probe Wash ____

Comments: ____

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SAMPLE TRAIN TEST SUMMARY

Client/Location..........	ELSEG	Date.....................	2/23/90
Test Number..............	5-AS	Data By..................	RBB
Test Method..............	423	Sample Location..........	S. DUCT
Fuel.....................	OIL	Reference Temp (F).......	60
Control Box #............	ES-19	Unit.....................	1
Pitot Factor	0.840	Meter Cal Factor.........	1.0000
Stack Area (sq ft).......	73.44	Sample Time (Min)........	84
Bar Press (in Hg)........	30.38	Nozzle Diam (in).........	0.191

Meter Vol (acf)..........	53.950	Meter Temp (F)...........	98.0
Stack Press (iwg)........	0.50	Stack Temp (F)...........	323.0
Vel Head (iwg)...........	1.4200	O2 (%): from CEM........	7.36
		from portable...	8.86
Liquid Vol (ml)..........	115.0	CO2 (%): from CEM........	9.86
		calculated......	8.77
Meter Press (iwg)........	1.15	Start/Stop Time..........	1530/1720

Std Sample Vol (SCF)..	51.16
Metric Sample Vol (cubic meters)..................................	1.45
Moisture Fraction...	0.095
Stack Gas Mol Wt..	28.64
Stack Gas Velocity (ft/sec).......................................	81.00
Stack Flow Rate (wacfm)...	356,910
Stack Flow Rate (dscfm)...	218,118
Isokinetic Ratio (%)..	103.02

Client/Location SCE / El Segundo   Unit 1   Test No. 5-ARS.   Method 423   Page 1
Sample Location South ID FAN Duct outlet   Fuel #6 oil   Ambient Temp., °F 78   of 3
Operators J. Mulligan   Meter Vol. (Start/End) 246.853/300.803   Date 2/23/98

Pre Test Data:

Barometric Press, in. Hg	30.36
Stack Area, sq. ft.	73.44
Sample Time/ Pt, min.	2/84
Assumed Stack Press	-.25
Assumed Moisture	8.8%
Assumed Molecular Wt	29

Equipment Info:

Meter No.	ES-19
Meter, Yd	1.00
Pitot, Cp	.84
CFM @ΔH = 1.0	.595
Probe I.D.	9'6/5/435
Nozzle No./Dia	.191
Filter No.	T-110-122

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	DI H2O	648.5	582.8	65.7
#2	DI H2O	626.3	588.8	31.5
#3	—	503.0	496.9	6.1
#4	SG	774.7	763.0	11.7
Total				115.0

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.027	8	JM	ok	
Post-Test	.020	8	JM		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔH .806

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
start	1530	1.1	.86	246.853	337	243	95	83	275	64	8.9	2	.5
B 7	1532	1.6	1.2	248.015	338	251	104	89	254	61	8.0	~	
6	1534	2.0	1.6	249.359	333	254	112	90	249	57	8.1	2	
5	1536	2.9	2.33	250.861	328	256	114	90	262	56	8.0	4	
4	1538	3.2	2.57	252.658	321	261	115	90	266	56	9.0	4	
3	1540	2.0	1.6	254.535	320	264	115	91	266	58	9.4	3	
2	1542	.94	.75	256.148	318	260	111	91	261	62	9.6	2	
Stop 1	1544			257.244									
start	1550	.40	.32	257.244	307	240	91	89	249	62	8.9	2	
C- 7	1552	.48	.38	257.976	325	244	101	96	246	63	8.0	2	
6	1554	1.0	.80	258.718	333	245	105	90	246	63	8.3	2	
5	1556	2.2	1.7	259.823	330	247	110	90	241	64	8.5	3	
4	1558	2.9	2.33	261.365	320	250	113	91	238	64	8.9	4	
3	1600	1.4	1.12	263.238	318	247	113	91	236	65	9.4	2	
2	1602	.62	.49	264.641	320	243	109	91	235	66	9.5	2	
Stop 1	1604			265.527									
Total/Average											9.5%		

Test Summary

Initial	BF
Sample Vol., c.f.	53.950
Stack Press, iwg	.5
ΔP 1.420 iwg	ΔH 1.145 iwg
Meter Temp., °F	98.0
Stack Temp., °F	323.0
Water Collected, g	115.0
O_2/CO_2 Method	3A
Chain of Cust. Info (init.):	
Impingers Loaded	KH
Impingers Recovered	BF
Filter Loaded	KH
Filter Recovered	BF
Probe Wash	BF
Comments:	

1032.7

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Client/Location SCE / El Segundo Unit 1 Test No. 5ARS Method ______ Page 2
Sample Location South I.D. FAN Duct outlet Fuel #6 Oil Ambient Temp., °F ______ of 3
Operators J Mulligan Meter Vol. (Start/End) ______ / ______ Date 2/23/90

Pre Test Data:

- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:

- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ΔH = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. ______

SCE

Imp.	Matl	Wt(End)	- Weight (Start)	= Weight (g)
#1				
#2				
#3				
#4				
Total				

CAA NA

Impinger Box I.D. ______
Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
start	1610	.39	.31	265.527	332	227	92	89	252	ice	8.6	2	
O-7	1612	.35	.28	266.238	332	248	99	89	235	65	8.1	2	
6	1614	.68	.54	266.936	332	258	101	89	236	63	8.1	2	
5	1616	1.8	1.45	267.601	329	267	107	89	237	62	8.6	3	
4	1618	2.2	1.77	269.045	329	265	111	90	237	58	9.0	3	
3	1620	1.1	.88	270.637	311	265	110	90	237	58	9.4	2	
2	1622	.75	.60	271.758	309	263	107	90	237	58	9.1	2	
stop 1	1624			272.740									
start	1628	.68	.54	272.740	331	250	93	89	240	68	8.6	2	
E-7	1630	.53	.42	273.728	331	239	102	89	240	64	8.6	2	
6	1632	.59	.47	274.420	331	245	103	89	240	63	9.0	2	
5	1634	1.3	1.04	275.250	322	246	106	89	241	61	9.0	2	
4	1636	1.7	1.37	276.480	325	252	110	90	240	56	9.5	2	
3	1638	1.3	1.04	277.965	313	256	110	90	239	55	9.4	2	
2	1640	1.1	.88	279.174	306	255	108	90	239	57	9.5	2	
stop 1	1642			280.329									
Total/Average													

Test Summary

- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ______ iwg ΔH ______ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (Init.):
  - Impingers Loaded ______
  - Impingers Recovered ______
  - Filter Loaded ______
  - Filter Recovered ______
  - Probe Wash ______
- Comments: ______

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Client/Location SCE / El Segundo Unit 1 Test No. 5-AS-ELSeg Method ______ Page 3

Sample Location Seah. I.D Fan Duct outlet Fuel #6 oil Ambient Temp., °F ______ of 3

Operators J Mulligan Meter Vol. (Start/End) / Date 2/25/90

Pre Test Data:

- Barometric Press, in. Hg ______
- Stack Area, sq. ft. ______
- Sample Time/ Pt, min. ______
- Assumed Stack Press ______
- Assumed Moisture ______
- Assumed Molecular Wt ______

Equipment Info:

- Meter No. ______
- Meter, Yd ______
- Pitot, Cp ______
- CFM @ ΔH = 1.0 ______
- Probe I.D. ______
- Nozzle No./Dia ______
- Filter No. ______

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	NO	-		=
#2		-		=
#3		-		=
#4		-		=
Total		-		=

Impinger Box I.D. ______

Integrated Bag I.D. ______

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Start	1646	.46	.37	280.329	330	249	91	89	237	59	9.1	2	
F - 7	1648	.99	.79	281.152	331	247	99	89	236	59	8.7	2	
6	1650	1.6	1.28	281.775	331	252	105	89	235	60	8.6	2	
5	1652	2.1	1.68	283.125	330	256	110	89	233	60	8.9	3	
4	1654	2.6	2.09	284.687	321	257	112	89	231	60	9.0	3	
3	1656	2.9	2.33	286.371	318	256	113	90	230	60	9.4	4	
2	1658	1.9	1.52	288.189	303	254	112	90	233	61	9.5	3	
Stop 1	1700			289.771									
Start	1706	1.9	1.5	289.771	316	253	94	88	242	67	10.0	2	
A - 7	1708	2.6	2.09	291.285	365	260	110	89	243	59	9.8	2	
6	1710	3.4	2.72	293.48	326	261	111	89	244	58	9.3	4	
5	1712	2.9	2.33	294.831	331	263	113	90	244	58	8.9	4	
4	1714	2.1	1.68	296.705	30.5	258	113	90	244	59	8.1	3	
3	1716	1.5	1.2	298.355	314	249	116	90	245	59	8.0	2	
2	1718	.89	.717	299.974	321	242	107	90	245	61	8.0		
Stop 1	1720			300.803									
Total/Average							106.4						

Test Summary

- Initial ______
- Sample Vol., c.f. ______
- Stack Press, iwg ______
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F ______
- Stack Temp., °F ______
- Water Collected, g ______
- O_2/CO_2 Method ______
- Chain of Cust. Info (init.):
  - Impingers Loaded ______
  - Impingers Recovered ______
  - Filter Loaded ______
  - Filter Recovered ______
  - Probe Wash ______
- Comments: ______

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SAMPLE TRAIN TEST SUMMARY

Client/Location	ELSEG	Date	2/24/90
Test Number	7-AS	Data By	RBB
Test Method	423	Sample Location	N.DUCT
Fuel	OIL	Reference Temp (F)	60
Control Box #	ES-8	Unit	1
Pitot Factor	0.840	Meter Cal Factor	0.9900
Stack Area (sq ft)	73.44	Sample Time (Min)	84
Bar Press (in Hg)	30.34	Nozzle Diam (in)	0.195

Meter Vol (acf)	56.957	Meter Temp (F)	104.7
Stack Press (iwg)	0.30	Stack Temp (F)	342.0
Vel Head (iwg)	1.6900	O2 (%): from CEM	7.70
		from portable	8.33
Liquid Vol (ml)	106.8	CO2 (%): from CEM	9.68
		calculated	9.22
Meter Press (iwg)	1.50	Start/Stop Time	1507/1716

Std Sample Vol (SCF)	52.81
Metric Sample Vol (cubic meters)	1.50
Moisture Fraction	0.086
Stack Gas Mol Wt	28.79
Stack Gas Velocity (ft/sec)	89.28
Stack Flow Rate (wacfm)	393,398
Stack Flow Rate (dscfm)	236,546
Isokinetic Ratio (%)	94.08

Client/Location SCE / EL SEGUNDO   Unit 1 / 1   Test No. 7-As-EL89 Method ARSNIC   1 of 3

Sample Location North Duct   Fuel OIL   Ambient Temp., °F ____

Operators M. SCHMITT   Meter Vol. (Start/End) 1   Date 2/24/90

Pre Test Data:

Barometric Press, in. Hg	30.34
Stack Area, sq. ft.	73.44
Sample Time/ Pt, min.	2
Assumed Stack Press	-.25
Assumed Moisture	8.8
Assumed Molecular Wt	28

Equipment Info:

Meter No.	ES-4
Meter, Yd	.990
Pitot, Cp	.84
CFM @ H = 1.0	.598
Probe I.D.	10' GLASS
Nozzle No./Dia	.195
Filter No.	T-110-140

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	H_2O	658.2	596.7	67.5 ✓
#2	H_2O	627.0	602.7	24.3 ✓
#3	∅	501.5	500.0	1.5 ✓
#4	SG.	781.2	767.7	13.5 ✓
Total				106.8 ✓

Impinger Box I.D. ____

Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	OK	7"	MS		
Post-Test	.020	20	MS		

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

ΔH = .846ΔP

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
E-7	1507	1.6	1.35	829.207	328	245	92	93	225	68	9.7	10	.30
-6	1509	2.3	1.95	830.500	329	246	112	96	229	48	9.2	15	
-5	1511	2.3	1.95	832.050	334	253	115	96	232	47	8.6	15	
-4	1513	3.1	2.62	833.901	336	236	117	96	234	43	7.7	20	
-3	1515	2.1	1.78	835.364	340	252	118	97	239	45	7.7	15	
-2	1517	1.5	1.27	836.920	341	247	119	97	241	46	7.1	10	
-1	1519	.85	.72	838.223	340	244	118	97	242	47	7.0	5	
—	1521			839.283									
E-7	1528	1.6	1.34	839.283	347	228	109	97	249	48	7.3	9	
-6	1530	2.1	1.78	840.644	346	230	116	97	251	47	7.1	12	
-5	1532	2.1	1.78	842.053	343	236	121	98	252	44	7.2	12	
-4	1534	3.0	2.54	843.871	341	238	121	98	249	43	7.0	12	
-3	1536	3.2	2.71	844.870	338	240	122	98	248	44	8.8	20	
-2	1538	2.3	1.95	846.548		241	122	98	247	45	9.2	16	
-1	1540	.92	.78	848.165		240	122	98	246	44	9.2	5	
—	1542			849.248									
D-7	1606	1.1	.93	849.248	348	230	93	94	249	69	8.7	7	
-6	1608	1.5	1.27	850.431	353	240	113	96	248	46	8.0	8	
Total/Average													

Test Summary

Initial

Sample Vol., c.f. 56.957

Stack Press, iwg .30

ΔP 1.69 iwg ΔH 1.5 iwg

Meter Temp., °F 104.7

Stack Temp., °F 342

Water Collected, g 106.8

O_2/CO_2 Method ____

Chain of Cust. Info (Init.):

Impingers Loaded BF

Impingers Recovered BF

Filter Loaded BF

Filter Recovered BF

Probe Wash ____

Comments: ____

checked by RB

EST DS-022
Rev. 9/89

Client/Location SCE / EL SEGUNDO | Unit 1 | Test No. 7-AS-EC | Method ARSNIC | Page 2 of 3
Sample Location NORTH Duct | Fuel OIL | Ambient Temp., °F ____
Operators M. SCHMITT | Meter Vol. (Start/End) ____ / ____ | Date 2/24/90

Pre Test Data:
- Barometric Press, in. Hg ____
- Stack Area, sq. ft. ____
- Sample Time/ Pt, min. ____
- Assumed Stack Press ____
- Assumed Moisture ____
- Assumed Molecular Wt ____

Equipment Info:
- Meter No. ____
- Meter, Yd ____
- Pitot, Cp ____
- CFM @ΔH = 1.0 ____
- Probe I.D. ____
- Nozzle No./Dia ____
- Filter No. ____

Imp.	Matl	Wt(End)	- Weight (Start)	= Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D. ____
Integrated Bag I.D. ____

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
D-5	1610	1.6	1.35	851.649	352	280	118	96	237	45		8	
-4	1612	2.8	2.37	852.950	350	270	119	96	241	44	8.0	16	
-3	1614	3.1	2.62	854.550	340	265	122	96	244	41	9.0	14	
-2	1616	1.5	1.27	856.351	334	263	122	97	245	40	9.4	15	
-1	1618	.81	.69	857.691	331	240	119	97	247	42	9.7	9	
—	1620			859.016									
C-7	1624	.62	.52	859.016	348	235	96	95	246	54	8.6	4	
-6	1626	.45	.38	859.900	351	247	108	97	247	51	7.9	3	
-5	1628	.92	.78	860.651	349	247	111	97	247	49	8.1	5	
-4	1630	2.6	2.2	861.647	346	250	113	97	247	48	8.1	15	
-3	1632	2.5	2.12	863.264	341	248	120	97	246	43	8.7	15	
-2	1634	1.5	1.27	864.890	334	248	121	97	246	44	9.4	12	
-1	1636	1.2	1.02	866.190	332	260	117	97	245	44		8	
—	1638			867.437									
A-7	1642	1.1	.93	867.437	345	241	95	94	245	54	8.5	7	
6	1644	1.6	1.35	868.600	350	249	110	96	244	49	7.8	8	
5	1646	1.5	1.27	869.892	346	248	113	96	244	50	7.8	8	
4	1648	2.0	1.69	871.183	344	246	114	96	243	48		11	
Total/Average													

Test Summary

- Initial ____
- Sample Vol., c.f. ____
- Stack Press, iwg ____
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F ____
- Stack Temp., °F ____
- Water Collected, g ____
- O_2/CO_2 Method ____
- Chain of Cust. Info (init.):
  - Impingers Loaded ____
  - Impingers Recovered ____
  - Filter Loaded ____
  - Filter Recovered ____
  - Probe Wash ____
- Comments: ____

Client/Location SCE / EL SEGUNDO
Sample Location NORTH DUCT
Operators M. SCHMITT

Unit 1
Fuel OIL

Test No. 7-AS-EL
Method ARSNIC
Ambient Temp., °F
Meter Vol. (Start/End) /

Page 3
of 3
Date 2/24/90

Pre Test Data:

- Barometric Press, in. Hg
- Stack Area, sq. ft.
- Sample Time/ Pt, min.
- Assumed Stack Press
- Assumed Moisture
- Assumed Molecular Wt

Equipment Info:

- Meter No.
- Meter, Yd
- Pitot, Cp
- CFM @ΔH = 1.0
- Probe I.D.
- Nozzle No./Dia
- Filter No.

Imp.	Matl	Wt(End)	- Weight (Start)	= Weight (g)
#1				
#2				
#3				
#4				
Total				

Impinger Box I.D.
Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test					
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
A-3	1650	2.2	1.86	872.866	346	246	116	96	244	47	8.3	13	
-2	1652	3.1	2.62	874.110	339	245	116	96	243	45		20	
-1	1654	2.5	2.12	876.213	335	267	117	96	244	48	8.2	17	
–	1656			877.600									
B-7	1702	1.2	1.02	877.600	351	250	91	93	244	53	8.1	8	
-6	1704	.60	.51	878.841	350	255	109	94	243	51	7.8	4	
-5	1706	.71	.60	879.748	348	261	106	94	242	50	7.7	5	
-4	1708	1.3	1.1	880.683	344	265	111	94	242	50	8.2	8	
-3	1710	2.3	1.95	881.840	339	265	114	94	241	48	8.1	13	
-2	1712	1.7	1.44	883.360	335	263	119	94	240	46	9.3	12	
-1	1714	1.7	1.44	884.813	334	265	118	95	240	48	9.2	12	
–	1716			886.164									
Total/Average													

Test Summary

- Initial
- Sample Vol., c.f.
- Stack Press, iwg
- ΔP ____ iwg ΔH ____ iwg
- Meter Temp., °F
- Stack Temp., °F
- Water Collected, g
- O_2/CO_2 Method
- Chain of Cust. Info (init.):
  - Impingers Loaded
  - Impingers Recovered
  - Filter Loaded
  - Filter Recovered
  - Probe Wash
- Comments:

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Rev. 9/89

Client/Location SCE/EL SEGUNDO   Unit 1   Test No. 1-AS-ELSEG. Method 423   Page 1

Sample Location North Duct   Fuel N/A   Ambient Temp., °F ~65   of 1

Operators Schmitt   Meter Vol. (Start/End) /   Date 2/20/90

Pre Test Data:

Barometric Press, in. Hg	
Stack Area, sq. ft.	
Sample Time/ Pt, min.	
Assumed Stack Press	
Assumed Moisture	
Assumed Molecular Wt	

Equipment Info:

Meter No.	
Meter, Yd	
Pitot, Cp	
CFM @ΔH = 1.0	
Probe I.D.	
Nozzle No./Dia	
Filter No.	T-110-69

Imp.	Matl	Wt(End)	Weight (Start)	Weight (g)
#1	DI H_2O	619.2 -	619.2 =	
#2	DI H_2O	617.0 -	617.0 =	
#3	—	495.5 -	495.5 =	
#4	gel	698.5 -	698.5 =	
Total		-	=	

Impinger Box I.D.

Integrated Bag I.D.

Leak Check:

Sample Train

	CFM	Vac.	Init.	Pitot	IBS
Pre-Test	.005	15	M.S.		
Post-Test					

Pre-Test Calibration

	Time	ΔH	Meter Reading	Meter Temp. In	Meter Temp. Out
Init.					
Final					

Sample Point	Time	Meter Conditions ΔP	ΔH	Meter Reading	Temperatures, °F Stack	Probe	Meter In	Out	Oven	Imp. Out	O_2	Vacuum	Static Press. iwg
Total/Average													

Test Summary

Initial

Sample Vol., c.f.

Stack Press, iwg

ΔP ____ iwg ΔH ____ iwg

Meter Temp., °F

Stack Temp., °F

Water Collected, g

O_2/CO_2 Method

Chain of Cust. Info (init.):

- Impingers Loaded W.D.
- Impingers Recovered W.D.
- Filter Loaded M.S.
- Filter Recovered J.M.
- Probe Wash J.M.

Comments:

EST DS-022
Rev. 9/89

SCF / El Segundo Project # 53304 5/7/90
Arsenic by CARB 423 A. Ball

Re: Curtis and Tompkins laboratory report # 25562
Method: graphite furnace a.a. using method of standard additions
Detection limit: 0.25 µg/sample
Reagent blank: 0.48 µg/sample
Field blank = 0.42 µg/sample

Test No.	µg/sample	µg/sample - reagent blank
4-As	1.3	0.8
5-As	3.1	2.6
7-As	4.9	4.4

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
1250 S. Boyle Ave., Los Angeles, CA 90023, Phone (213) 269-7421, Fax (213) 268-5328

DATE RECEIVED: 03/07/90
DATE REPORTED: 04/18/90

LAB NUMBER: 25562

CLIENT: CARNOT

REPORT ON: FIVE SOURCE SAMPLES

PROJECT #: 5788

LOCATION: SUBMITTED BY CLIENT

RESULTS: SEE ATTACHED

Laboratory Director

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25562
CLIENT: CARNOT
PROJECT #: 5788
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/30/90
DATE ANALYZED: 04/09/90
DATE REPORTED: 04/18/90

METAL: ARSENIC
METHOD: CARB 423
METHOD OF STANDARD ADDITIONS - EPA 7060

STANDARD INFORMATION

BLANK
STD1 = 10 ul SAMPLE + 10 ul 0.00 STD
STD2 = 10 ul SAMPLE + 10 ul 50.00 STD
STD3 = 10 ul SAMPLE + 10 ul 100.00 STD

C&T ID	SAMPLE ID			ARSENIC ug/SAMPLE
1	REAGENT BLANK	BLANK	0.0190	0.48
		STD1	0.0345	
		STD2	0.2072	
		STD3	0.3837	
		INSTRUMENT FACTOR:	1	
		CORRELATION FACTOR:	1.0000	
		SAMPLE VOLUME	0.05	
2	FIELD BLANK	BLANK	0.0190	0.42
		STD1	0.0297	
		STD2	0.1887	
		STD3	0.3589	
		INSTRUMENT FACTOR:	1	
		CORRELATION FACTOR:	0.9998	
		SAMPLE VOLUME	0.05	
3	4-As	BLANK	0.0190	1.3
		STD1	0.0306	
		STD2	0.0719	
		STD3	0.1326	
		INSTRUMENT FACTOR:	1	
		CORRELATION FACTOR:	0.9940	
		DILUTION FACTOR:	0.05	
4	5-As	BLANK	0.0190	3.1
		STD1	0.0345	
		STD2	0.0657	
		STD3	0.1235	
		INSTRUMENT FACTOR:	2	
		CORRELATION FACTOR:	0.9854	
		DILUTION FACTOR:	0.05	

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25562
CLIENT: CARNOT
PROJECT #: 5788
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/30/90
DATE ANALYZED: 04/09/90
DATE REPORTED: 04/18/90

METAL: ARSENIC
METHOD: CARB 423
METHOD OF STANDARD ADDITIONS - EPA 7060

STANDARD INFORMATION

BLANK
STD1 = 10 ul SAMPLE + 10 ul 0.00 STD
STD2 = 10 ul SAMPLE + 10 ul 50.00 STD
STD3 = 10 ul SAMPLE + 10 ul 100.00 STD

C&T ID	SAMPLE ID			ARSENIC ug/SAMPLE
5	7-As	BLANK	0.0190	4.9
		STD1	0.0259	
		STD2	0.0459	
		STD3	0.0746	

INSTRUMENT FACTOR: 2
CORRELATION FACTOR: 0.9947
SAMPLE VOLUME 0.05

LIMIT OF DETECTION = 0.25 ug/SAMPLE

Appendix C.10

Fuel Analysis

EPA Fuel "F" factor calculations: El Segundo Unit 1

Reference temp, F:	60
Composition by wt, %:	
Carbon	85.46
Hydrogen	12.58
Nitrogen	0.10
Sulfur	0.18
Oxygen	1.62
Ash	0.02
Heating value, btu/lb:	19,166
F factor, dscf/mmbtu @ 0% O2:	9,039
Ash content, lb/mmbtu:	0.010

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
1250 S. Boyle Ave., Los Angeles, CA 90023, Phone (213) 269-7421, Fax (213) 268-5328

DATE RECEIVED: 03/07/90
DATE REPORTED: 04/18/90

LAB NUMBER: 25559

CLIENT: CARNOT

REPORT ON: TWO OIL SAMPLES

PROJECT #: 5789

LOCATION: SUBMITTED BY CLIENT

RESULTS: SEE ATTACHED

Laboratory Director

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25559-1
CLIENT: CARNOT
PROJECT #: 5789
LOCATION: 53304-ELS
SAMPLE ID: 1-FO

DATE RECEIVED: 03/07/90
DATE ANALYZED: 03/09/90
DATE REPORTED: 04/18/90

METHODS: EPA 6010/7000
CAC TITLE 22 METALS IN AQUEOUS SOLUTIONS

METAL	RESULT	REGULATORY LIMITS STLC
	--mg/L--	
Arsenic	ND (1.1)	5
Beryllium	ND (0.22)	0.75
Cadmium	ND (0.22)	1
Chromium (total)	0.22	560
Chromium (VI)	ND (0.50)	--
Copper	0.47	25
Lead	ND (1.1)	5
Mercury	ND (0.10)	0.2
Manganese	ND (0.43)	350
Nickel	10	20
Selenium	ND (1.0)	1
Zinc	0.96	250

ND = NOT DETECTED; LIMIT OF DETECTION IN PARENTHESES.

QA/QC DATA SUMMARY:

	RPD	SPIKE		RPD	SPIKE
Arsenic	10	83	Mercury	6	102
Beryllium	<1	88	Manganese	9	85
Cadmium	<1	88	Nickel	10	94
Chromium	2	84	Selenium	3	98
Copper	<1	88	Zinc	5	81
Lead	9	76			

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25559-2
CLIENT: CARNOT
PROJECT #: 5789
LOCATION: 53304-ELS
SAMPLE ID: 2-FO

DATE RECEIVED: 03/07/90
DATE ANALYZED: 03/09/90
DATE REPORTED: 04/18/90

METHODS: EPA 6010/7000
CAC TITLE 22 METALS IN AQUEOUS SOLUTIONS

METAL	RESULT	REGULATORY LIMITS STLC
	--mg/L--	
Arsenic	ND (1.1)	5
Beryllium	ND (0.22)	0.75
Cadmium	ND (0.22)	1
Chromium (total)	0.21	560
Chromium (VI)	ND (0.50)	--
Copper	0.41	25
Lead	ND (1.1)	5
Mercury	ND (0.10)	0.2
Manganese	ND (0.43)	350
Nickel	10	20
Selenium	ND (1.0)	1
Zinc	0.97	250

ND = NOT DETECTED; LIMIT OF DETECTION IN PARENTHESES.

QA/QC DATA SUMMARY:

	RPD	SPIKE		RPD	SPIKE
Arsenic	10	83	Mercury	6	102
Beryllium	<1	88	Manganese	9	85
Cadmium	<1	88	Nickel	10	94
Chromium	2	84	Selenium	3	98
Copper	<1	88	Zinc	5	81
Lead	9	76			

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25559-1
CLIENT: CARNOT
PROJECT #: 5789
LOCATION: #53304-ELS
SAMPLE ID: 1-FO

DATE RECEIVED: 03/07/90
DATE ANALYZED: 04/09/90
DATE REPORTED: 04/18/90

ULTIMATE AND PROXIMATE ANALYSIS

PARAMETER	AS RECEIVED BASIS (% by Weight)
ASH CONTENT	0.02
CARBON	84.53
HYDROGEN	12.40
NITROGEN	0.08
OXYGEN	2.47
SULFUR	0.17
CHLORINE BY X-RAY DIFF. (mg/L)	107
BTU/LB.	19,189

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25559-2
CLIENT: CARNOT
PROJECT #: 5789
LOCATION: #53304-ELS
SAMPLE ID: 2-FO

DATE RECEIVED: 03/07/90
DATE ANALYZED: 04/09/90
DATE REPORTED: 04/18/90

ULTIMATE AND PROXIMATE ANALYSIS

PARAMETER	AS RECEIVED BASIS (% by Weight)
ASH CONTENT	0.01
CARBON	86.38
HYDROGEN	12.75
NITROGEN	0.11
OXYGEN	0.76
SULFUR	0.18
CHLORINE BY X-RAY DIFF. (mg/L)	156
BTU/LB.	19,142

Subject: SCE/El Segundo Unit 1 — 5/6/90

A. Bell

Calculation of F factor from natural gas analysis

Re: Truesdail laboratories report # 37992

Use average composition of two samples

Component	Composition by volume Mole %	C (wt %)	H (wt %)	N (wt %)	O (wt %)
CH_4	86.05	10.33	3.47		
C_2H_6	3.8	0.91	0.23		
C_3H_8	0.7	0.25	0.06		
n- C_4H_{10}	0.1	0.05	0.01		
i- C_4H_{10}	∅	0	0		
CO_2	1.0	0.12			0.32
N_2	3.6			1.01	
O_2	1.75				0.56

MW = 11.66 + 3.77 + 1.01 + 0.88 = 17.32

% by wt = 67.32 21.77 5.83 5.08

$$Btu/lb = 957\ Btu/ft^3 \times \frac{379.5\ ft^3}{lb\text{-}mole} \times \frac{lb\text{-}mole}{17.32\ lb}$$

= 20,969

$$F_{68} = \frac{10^6 \left[3.64(21.77) + 1.53(67.32) + .14(5.83) - .46(5.08)\right]}{20,969}$$

= 8618 dscf/10^6 Btu

F_{60} : (8,618)(520/528) = 8487 dscf/10^6 Btu

APR 1 7 1990

REPORT

'RUESDAIL LABORATORIES, INC.

HEMISTS - MICROBIOLOGISTS - ENGINEERS

ESEARCH - DEVELOPMENT - TESTING

14201 FRANKLIN AVENUE
TUSTIN, CALIFORNIA 92680
AREA CODE 714 • 730-6239
AREA CODE 213 • 225-1564
CABLE: TRUELABS

:LIENT **Energy Systems Associates**
15991 Red Hill Avenue, Suite 110
Tustin, California 92680-7388
Attention: Arlene Bell

DATE April 6, 1990

RECEIVED February 26, 1990

LABORATORY NO. 37992

·AMPLE **Six (6) Tedlar bags**
labeled 6A, 6B, 6C, 8A, 8B and 8C
P.O. No. 53304
Edison P.O.: C0138903

NVESTIGATION

Analyze for trace benzene by modified EPA Method 602

RESULTS

MODIFIED EPA 602 (Benzene)

Received: 2/26/90
Analyzed: 2/26/90

	Nanoliters per Liter (ppb) **Benzene**
6A-ELS	ND< 1
6B-ELS	ND< 1
6C-ELS	ND< 1
8A-ELS	ND< 1
8B-ELS	ND< 1
8C-ELS	ND< 1

ND = Not detected.

COMPOSITION AND HEAT CONTENT (60 Degrees Fahrenheit)

#1-ELS

	Volume Percent (v/v)	**Specific Gravity**
Oxygen	1.7	0.019
Nitrogen	3.1	0.030
Methane	86.5	0.479
Carbon dioxide	1.0	0.015
Ethane	3.8	0.039
Propane	0.8	0.012
n-Butane	0.1	0.002
iso-Butane	ND< 0.1	NA
Total	**97.0**	**Total 0.596**

COMPOSITION AND HEAT CONTENT (60 Degrees Fahrenheit) (cont.)

#1-ELS

	BTU's per Cubic Foot
BTU's High	965
BTU's Low	872

#2-ELS

	Volume Percent (v/v)	Specific Gravity
Oxygen	1.8	0.020
Nitrogen	4.1	0.040
Methane	85.6	0.474
Carbon dioxide	1.0	0.002
Ethane	3.8	0.039
Propane	0.6	0.009
n-Butane	ND< 0.1	NA
iso-Butane	ND< 0.1	NA
Total	96.9	Total 0.584

	BTU's per Cubic Foot
BTU's High	948
BTU's Low	856

Respectfully submitted,
TRUESDAIL LABORATORIES, INC.

Joe Bramblett, Manager
Instrumental Methods

APPENDIX D

CALCULATIONS

Appendix D.1

General Emission Calculations

E/A

EMISSION CALCULATIONS

1. <u>Sample Volume and Isokinetics</u>

a. Sample gas volume, dscf

$$V_{m\,std} = 0.03342 V_m [P_{bar} + (H/13.6)](T_{ref}/T_m)(Y)$$

b. Water vapor volume, scf

$$V_{w\,std} = 0.0472\ V_{1c}\ (T_{ref}/528°R)$$

c. Moisture content, nondimensional

$$Bwo = V_{w\,std}/(V_{m\,std} + V_{w\,std})$$

d. Stack gas molecular weight, lb/lb mole

$$MW_{dry} = 0.44(\%\ CO_2) + 0.32(\%\ O_2) + 0.28(\%\ N_2)$$

$$MW_{wet} = MW_{dry}\ (1 - B_{wo}) + 18\ (B_{wo})$$

e. Absolute stack pressure, iwg

$$Ps = P_{bar} + P_{sg}/13.6$$

f. Stack velocity, ft/sec

$$V_s = 2.90\ C_p\ \sqrt{\Delta P Ts}\ \sqrt{\frac{29.92}{Ps} \times \frac{28.95}{MW_{wet}}}$$

g. Actual stack gas flow rate, wacfm

$$Q = (V_s)(A_s)(60)$$

h. Standard stack gas flow rate, dscfm

$$Q_{sd} = Q\ (1 - Bwo)(T_{ref}/Ts)(Ps/29.92)$$

i. Percent isokinetic

$$I = \frac{17.32 \times T_s\ (V_{m\,std})}{(1\text{-}Bwo)\theta \times V_s \times Ps \times Dn^2} \times \frac{528\ °R}{T_{ref}}$$

2. <u>Particulate Emissions</u>

a. Grain loading, gr/dscf

$$C = 0.01543\ (M_n/V_{m\,std})$$

b. Grain loading at 12% CO_2, gr/dscf

$$C_{12\%\ CO_2} = C\ (12/\%\ CO_2)$$

c. Mass emissions, lb/hr

$$M = C \times Qsd \times (60\ \text{min/hr})/(7000\ \text{gr/lb})$$

3. Gaseous Emissions, lb/hr

$$M = \text{ppm} \times 10^{-6}\ \frac{MW_i\ \text{lb/lb mole}}{SV} \times Qsd \times 60\ \text{min/hr}$$

where SV = specific molar volume of an ideal gas:

385.3 ft^3/lb mole for T_{ref} = 528 °R
379.5 ft^3/lb mole for T_{ref} = 520 °R

4. Emissions Rates, lb/10^6 Btu

a. Fuel factor at 68 °F, dscf/10^6 Btu at 0% O_2

$$F_{68} = \frac{10^6[3.64(\%H) + 1.53(\%C) + 0.14(\%N) + 0.57(\%S) - 0.46(\%O_2,\ \text{fuel})]}{\text{HHV, Btu/lb}}$$

b. Fuel factor at 60 °F

$$F_{60} = F_{68}\ (520\ °R/528\ °R)$$

c. Gaseous emission factor

$$\text{lb}/10^6\ \text{Btu}_i = \text{ppm}_i \times 10^{-6} \times \frac{MW_i\ \text{lb}}{\text{lb mole}} \times \frac{1}{SV} \times F \times \frac{20.9}{20.9 - \%O_2}$$

d. Particulate emission factor

$$\text{lb}/10^6\ \text{Btu} = C \times \frac{1\ \text{lb}}{7000\ \text{gr}} \times F \times \frac{20.9}{20.9 - \%O_2}$$

These calculations are routinely performed on ESA's computer.

Nomenclature:

A_s	=	stack area, ft^2
Bwo	=	flue gas moisture content
$C_{12\%\ CO_2}$	=	particulate grain loading, gr/dscf corrected to 12% CO_2
C	=	particulate grain loading, gr/dscf
C_p	=	pitot calibration factor, dimensionless
Dn	=	nozzle diameter, in.
F	=	fuel F factor, dscf/10^6 Btu at 0% O_2
H	=	orifice pressure differential, iwg
I	=	% isokinetics
M_n	=	mass of collected particulate, mg
M_i	=	mass emissions of species i, lb/hr
MW	=	molecular weight of flue gas
MW_i	=	molecular weight of species i:

NOx: 46

CO: 28

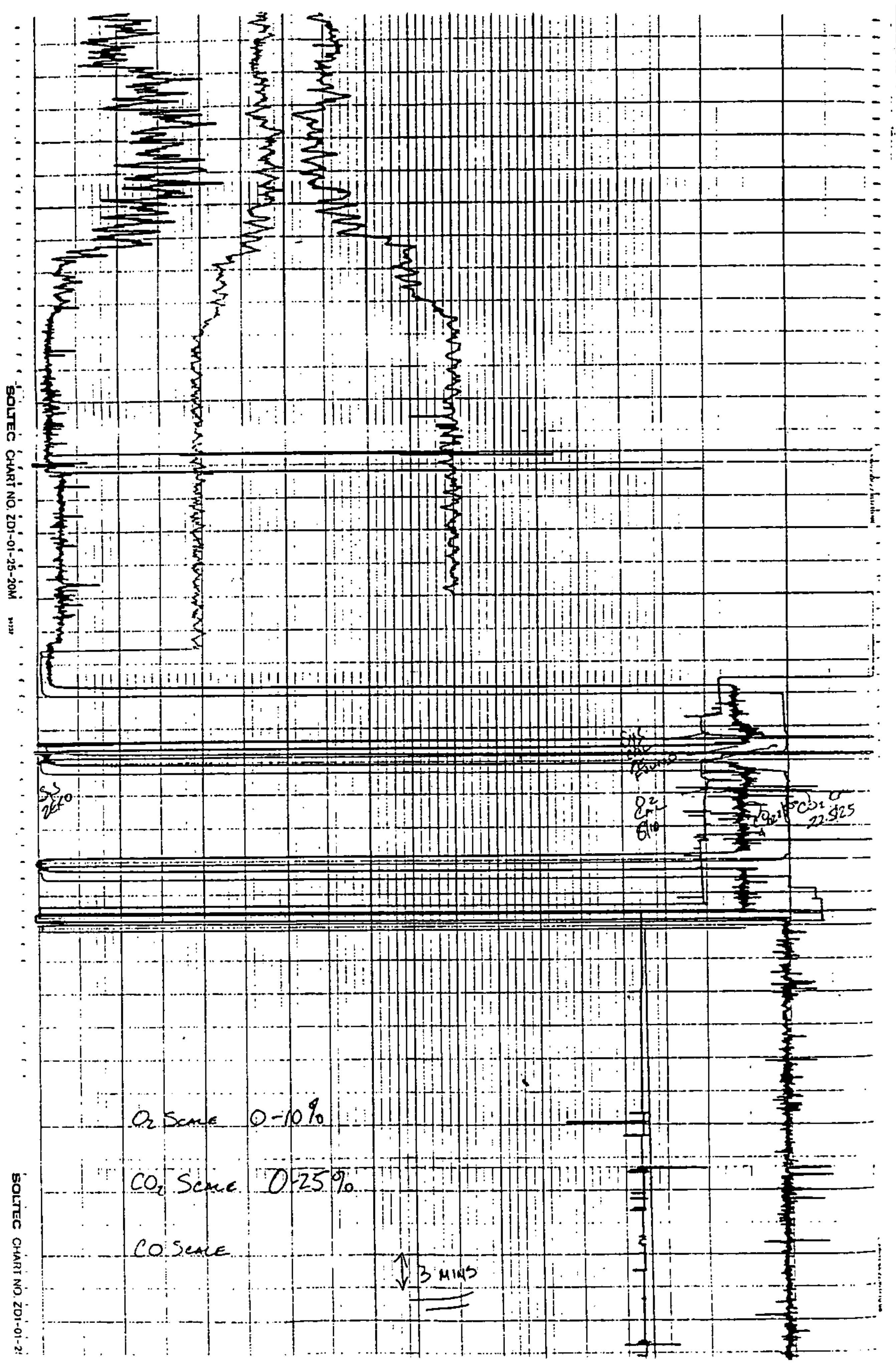
SO_2: 64

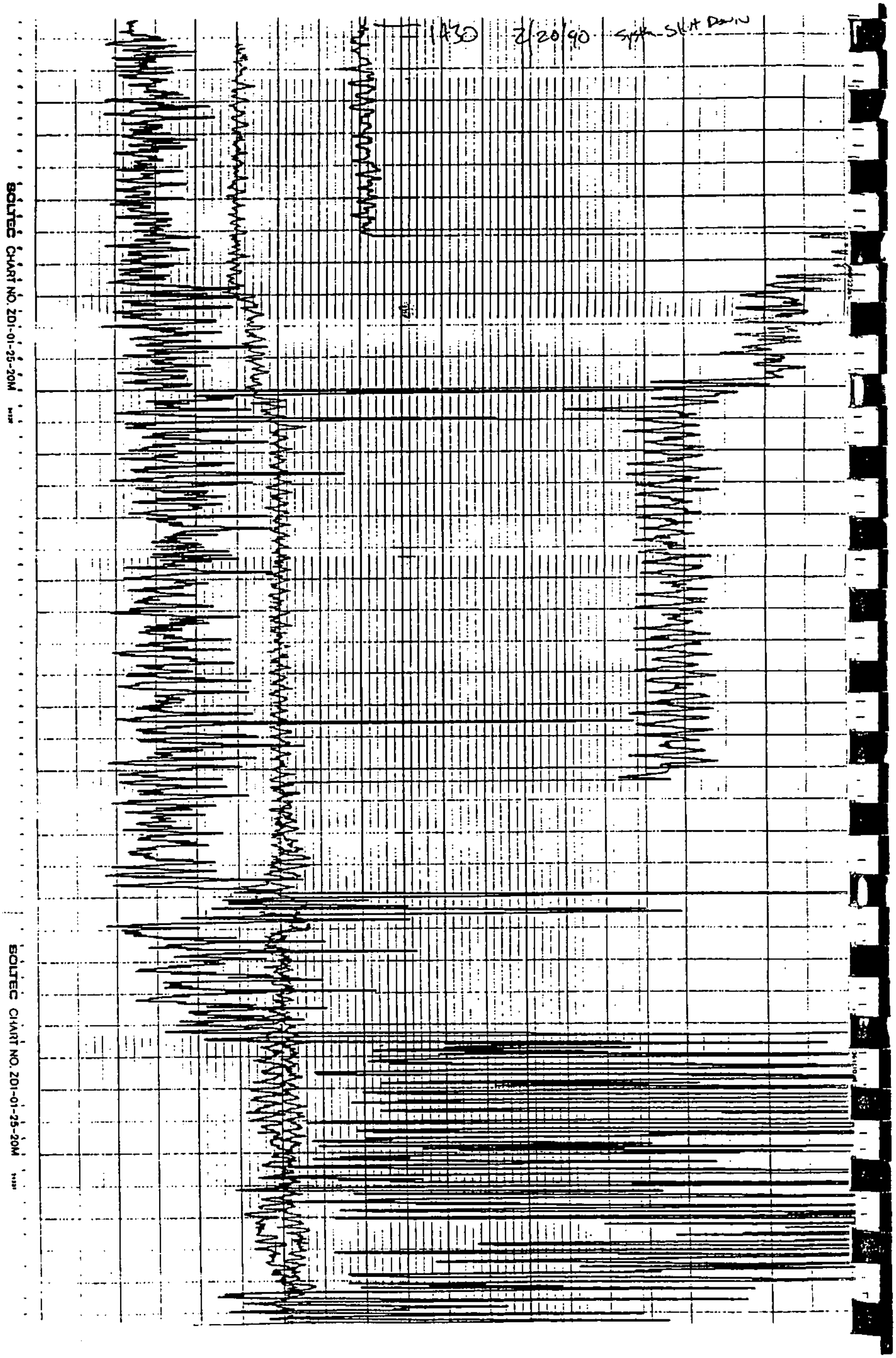
HC: 16

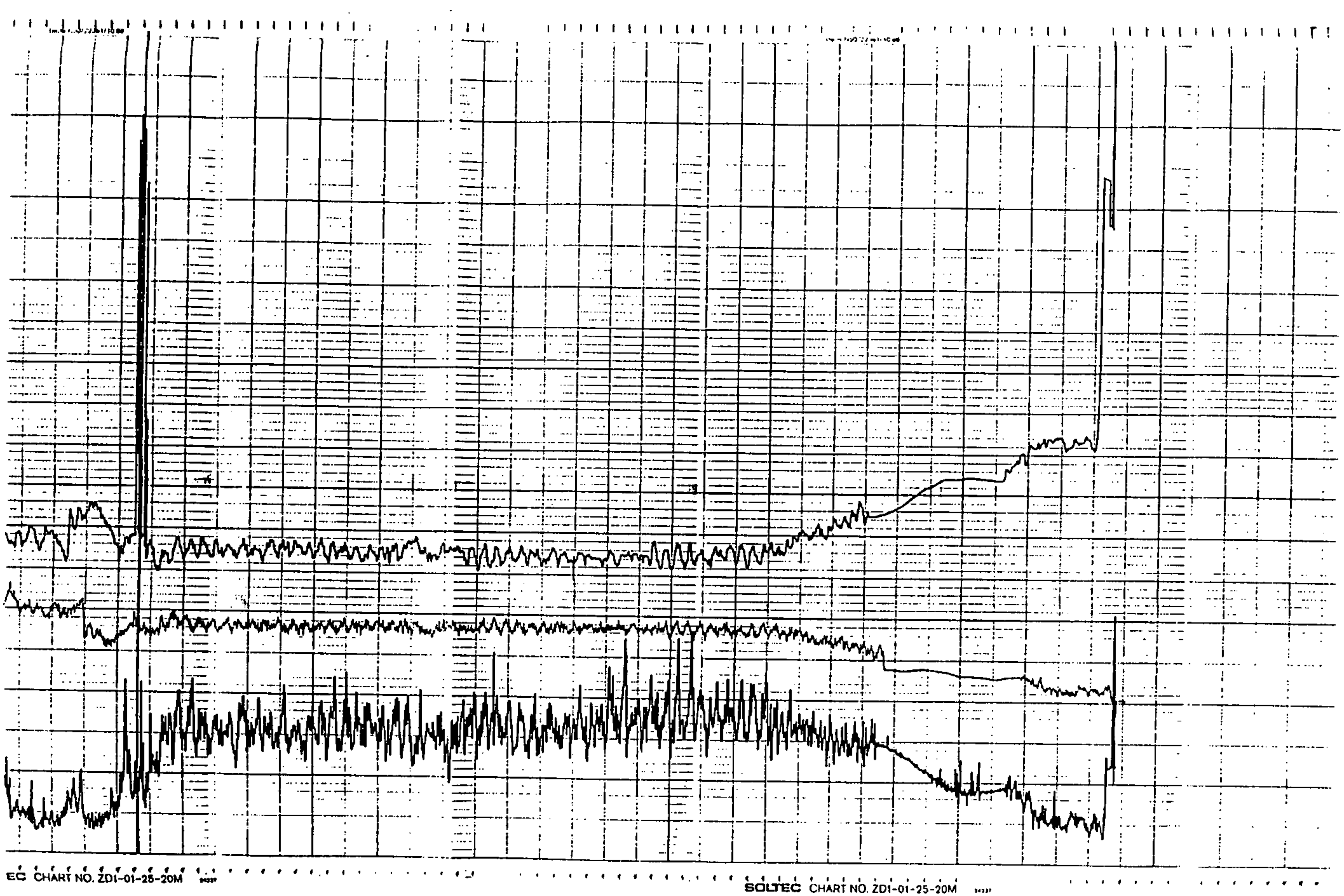
θ	=	sample time, min.
ΔP	=	average velocity head, iwg $= \left(\overline{\sqrt{\Delta P}}\right)^2$
P_{bar}	=	barometric pressure, in.Hg
Ps	=	stack absolute pressure, in.Hg.
Psg	=	stack static pressure, iwg
Q	=	wet stack gas flow rate at actual conditions, wacfm
Qsd	=	dry stack gas flow rate at standard conditions, dscfm
SV	=	specific molar volume of an ideal gas at std conditions, ft^3/lb mole
Tm	=	meter temperature, °R
T_{ref}	=	reference temperature, °R
Ts	=	stack temperature, °R
V_s	=	stack velocity, ft/sec
V_{lc}	=	volume of liquid collected in impingers, ml
Vm	=	dry meter volume uncorrected, dcf
$V_{m\ std}$	=	dry meter volume at standard conditions, dscf
$V_{w\ std}$	=	volume of water vapor at standard conditons, scf
Y	=	meter calibration coefficient

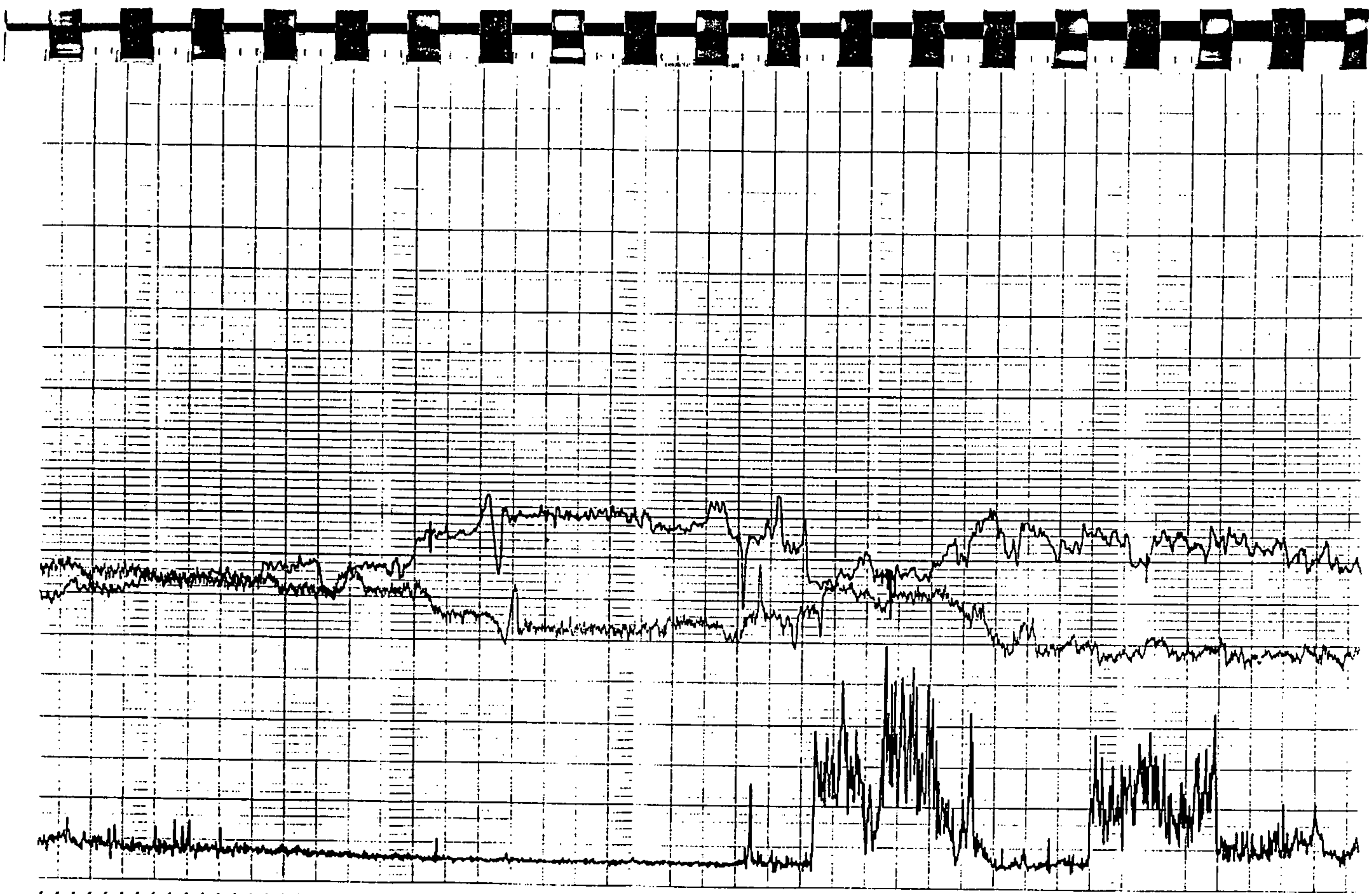
APPENDIX E

INSTRUMENT STRIP CHARTS


SOLTEC CHART NO. ZD1-01-25-20M
O_2 Scale 0-10%
CO_2 Scale 0-25%
CO Scale
3 MINS


1430 2/20/90 System Shut Down
SOLTEC CHART NO. ZD1-01-25-20M
SOLTEC CHART NO. ZD1-01-25-20M


EC CHART NO. ZD1-01-25-20M
SOLTEC CHART NO. ZD1-01-25-20M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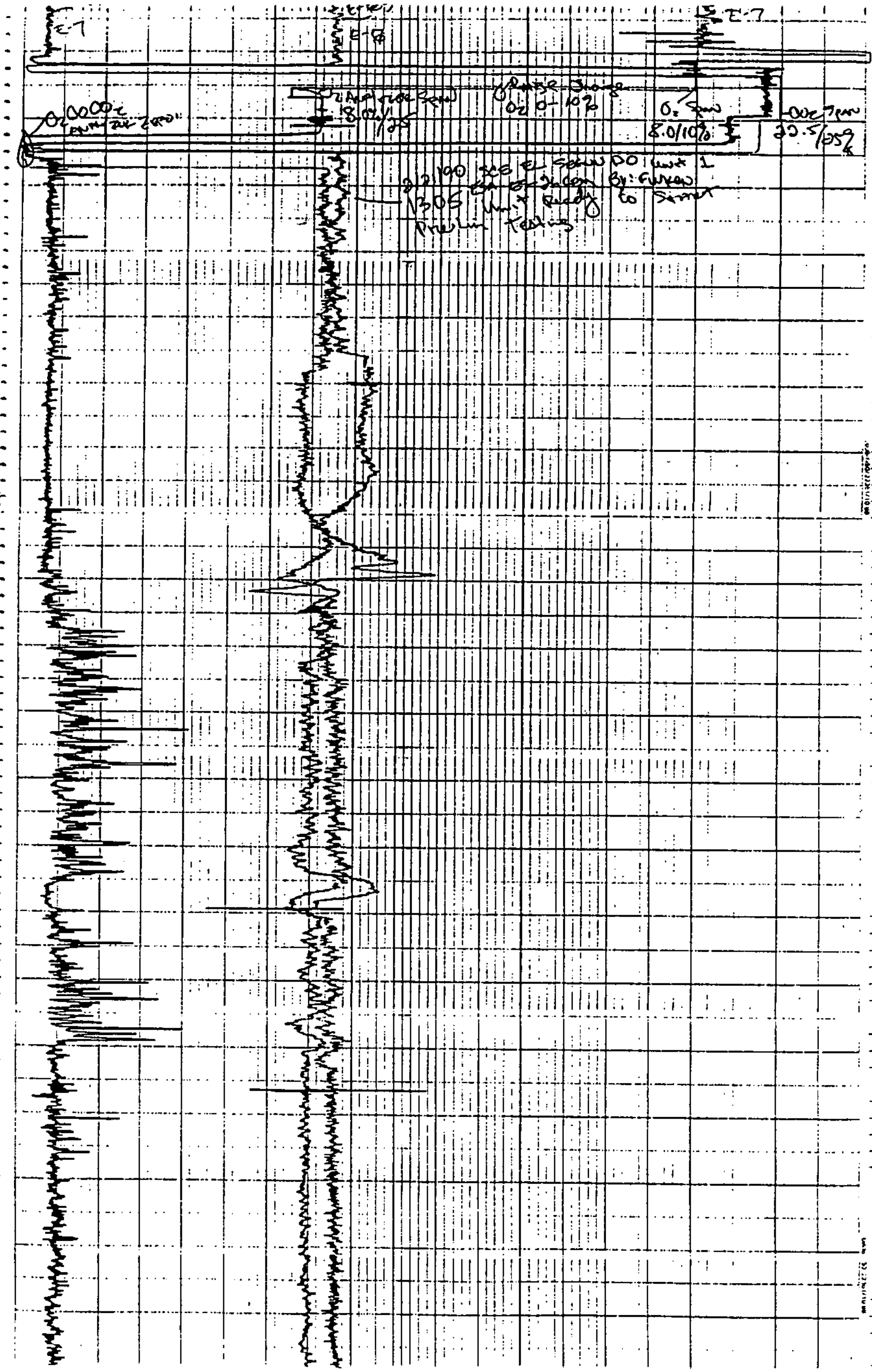
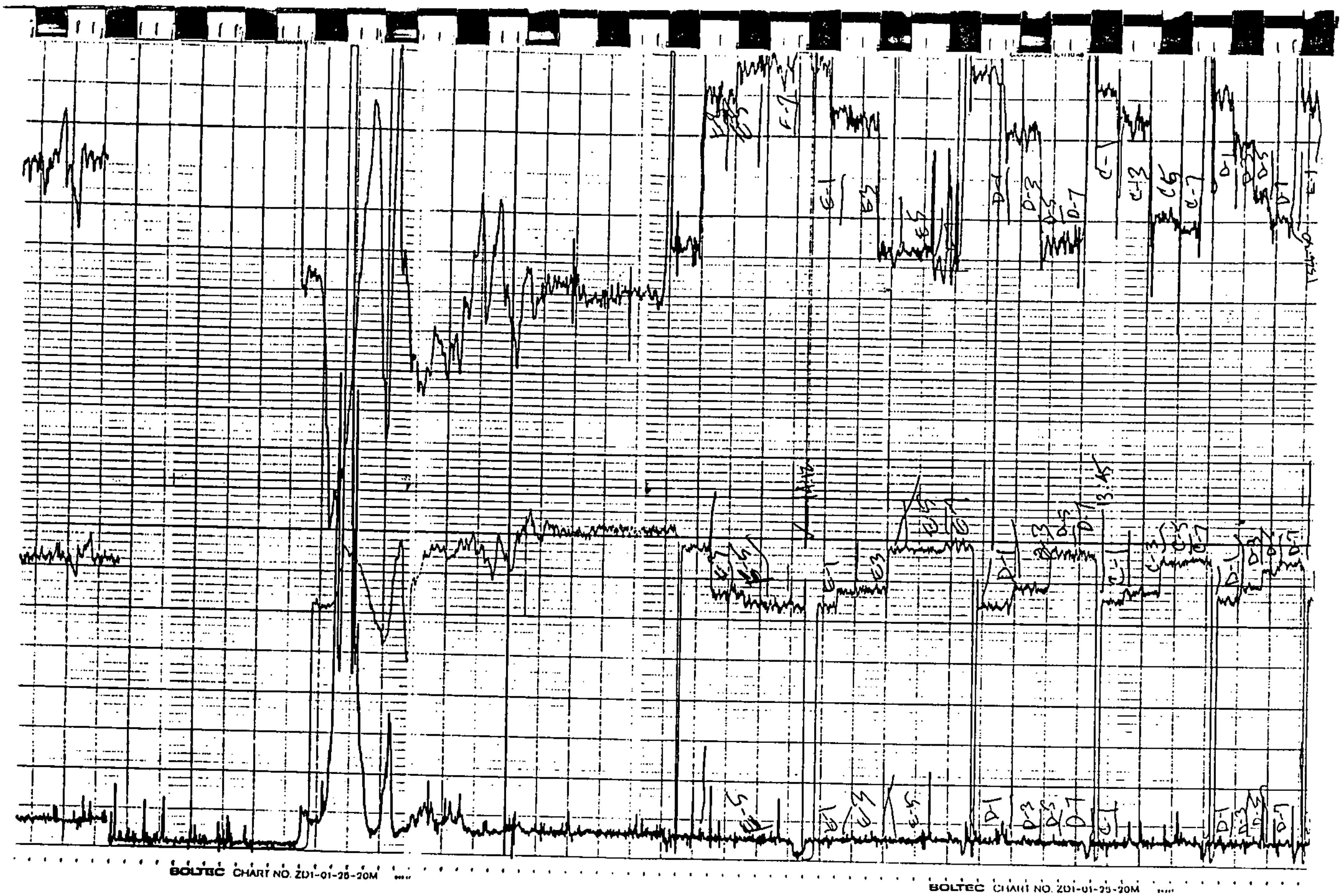
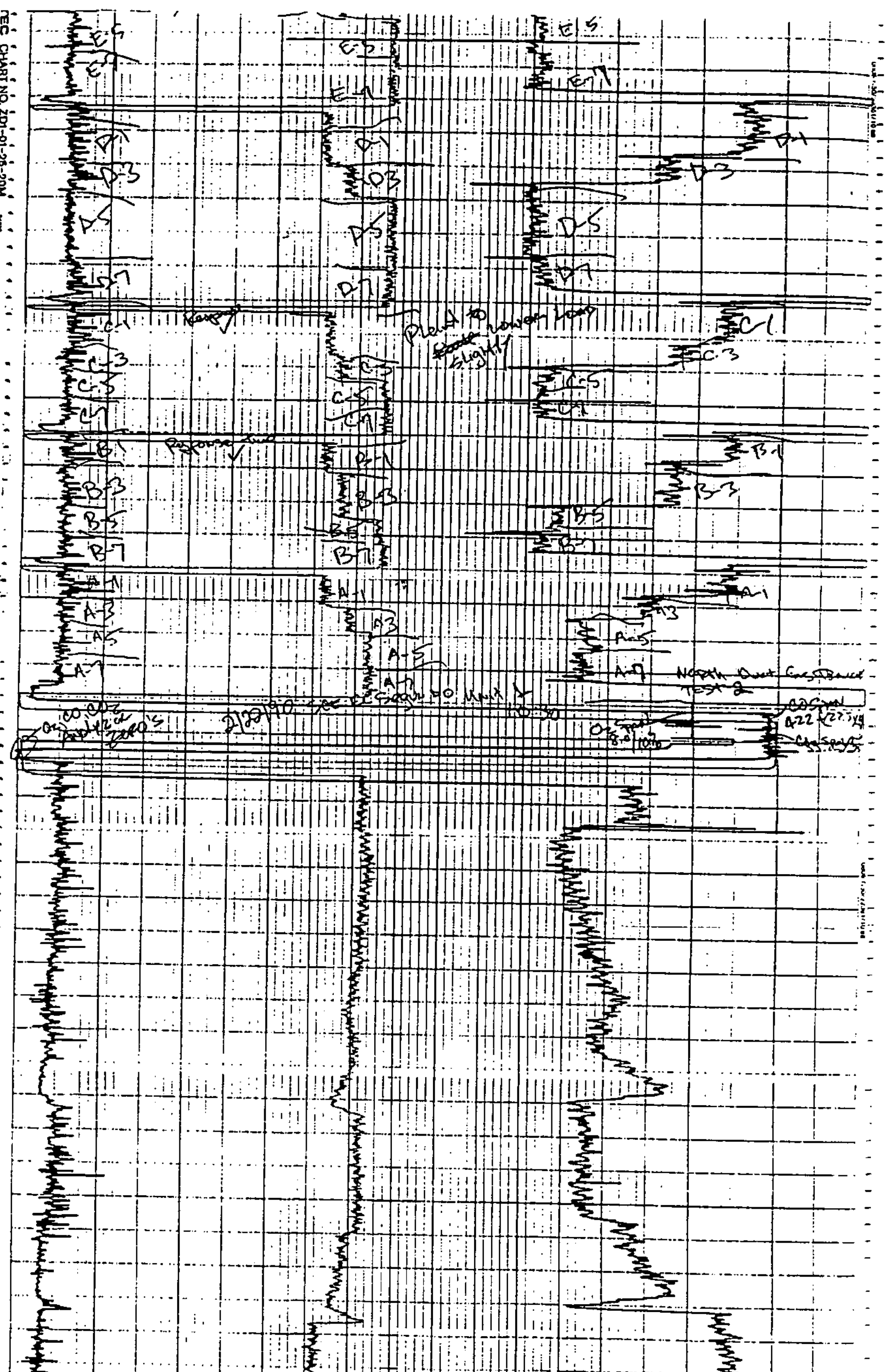


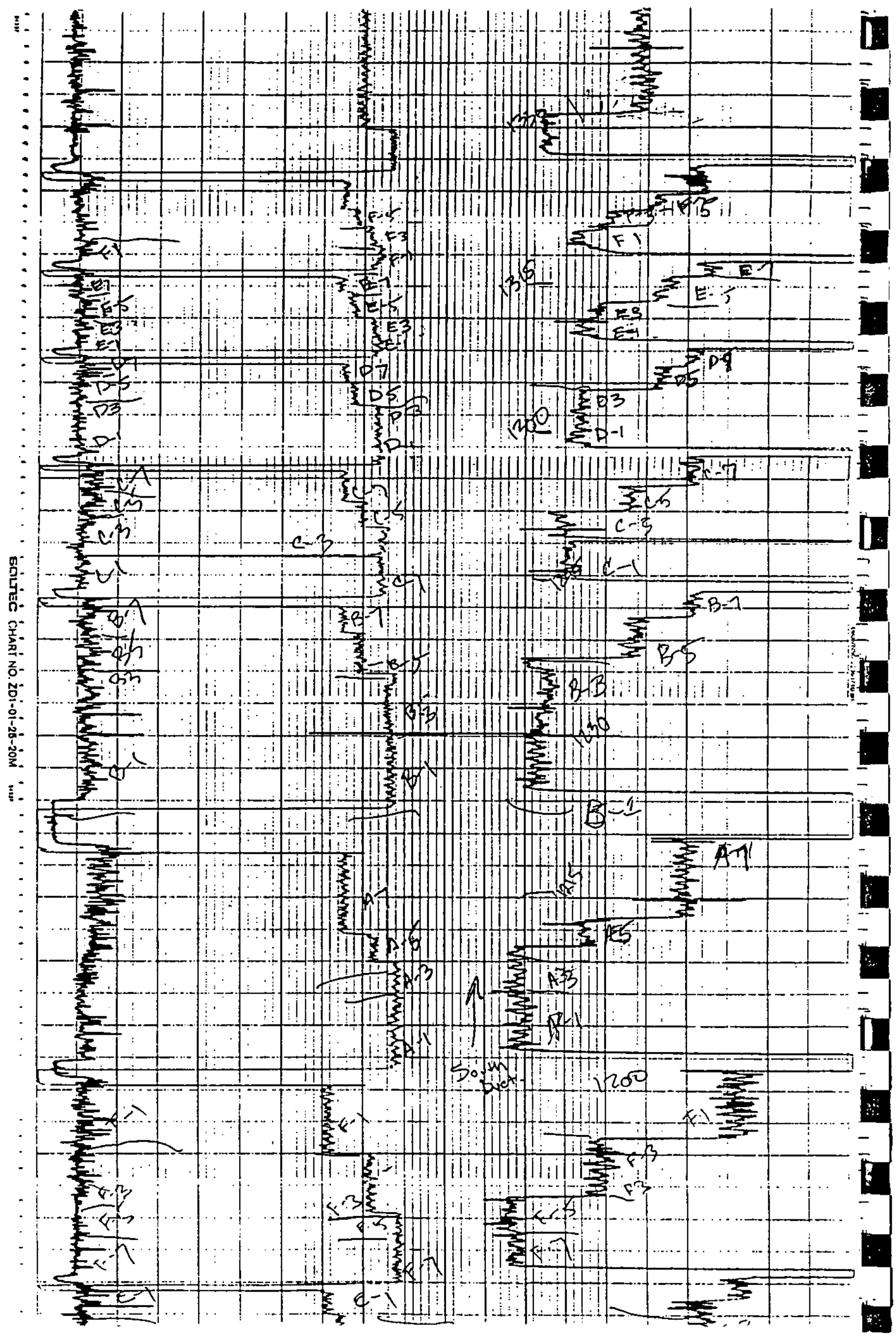
SOLTEC CHART NO. ZD1-01-25-20M

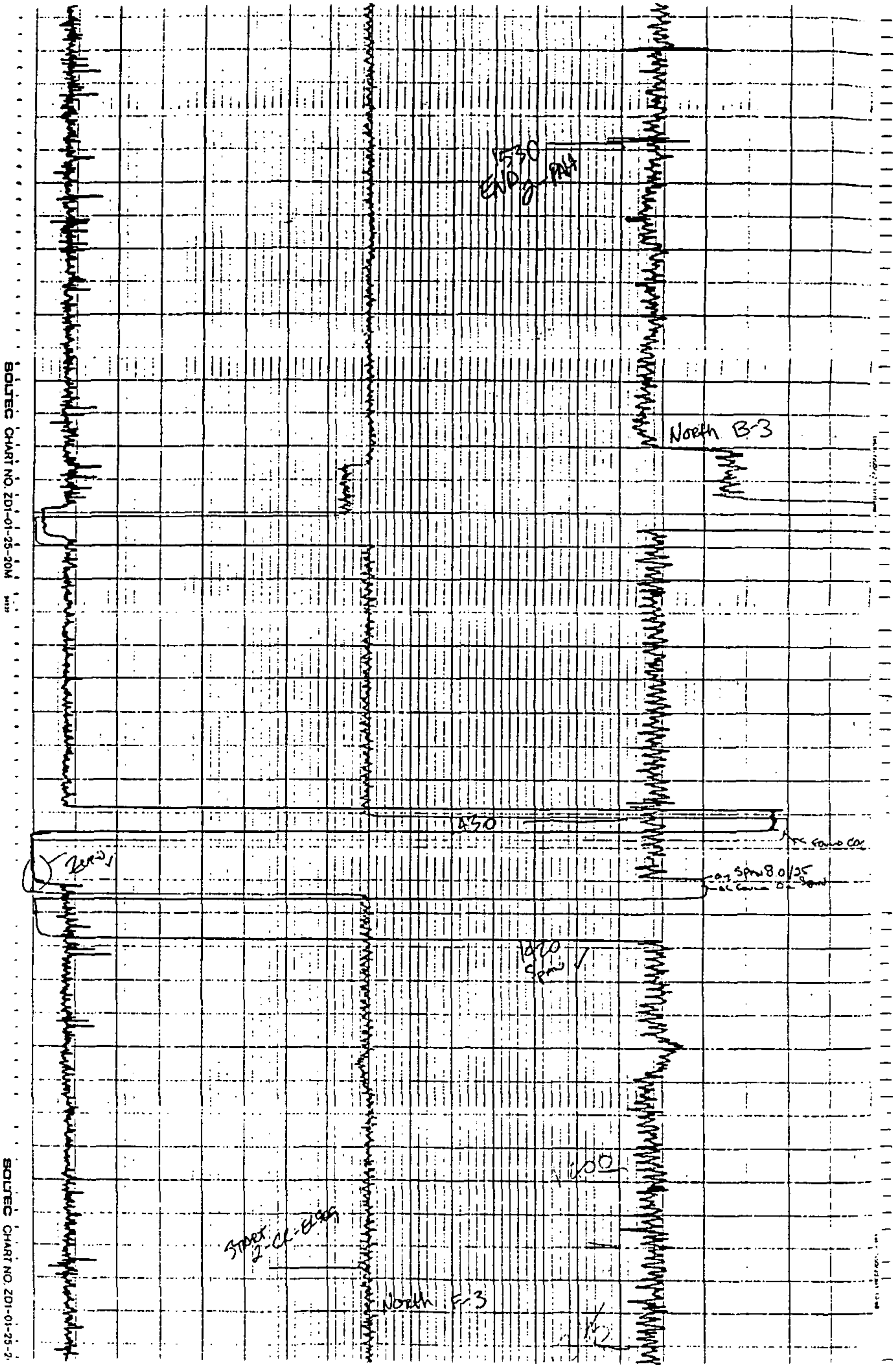
SOLTEC CHART NO. ZD1-01-25-20M



BOLTEC CHART NO. Z01-01-25-20M
BOLTEC CHART NO. Z01-01-25-20M
14:12
13:45


SOLTEC CHART NO. ZD1-01-25-20M
E-5
E-7
D-1
D-3
D-5
D-7
C-1
C-3
C-5
C-7
B-1
B-3
B-5
B-7
A-1
A-3
A-5
A-7
NORTH Duct Gas Balance
TEST 2
SOLTEC CHART NO. ZD1-01-25-20M


SOLTEC CHART NO. ZD1-01-25-20M
South Duct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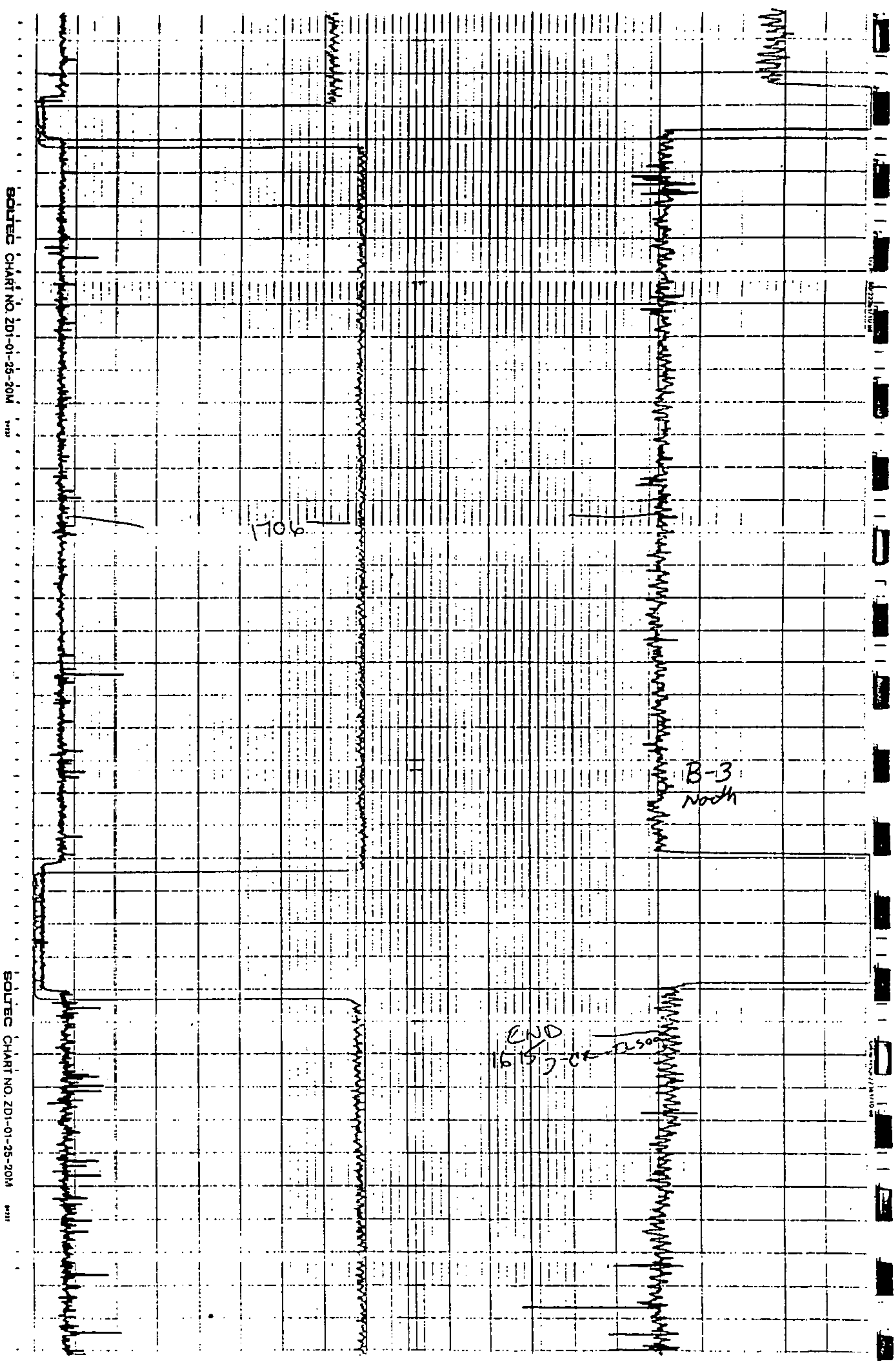
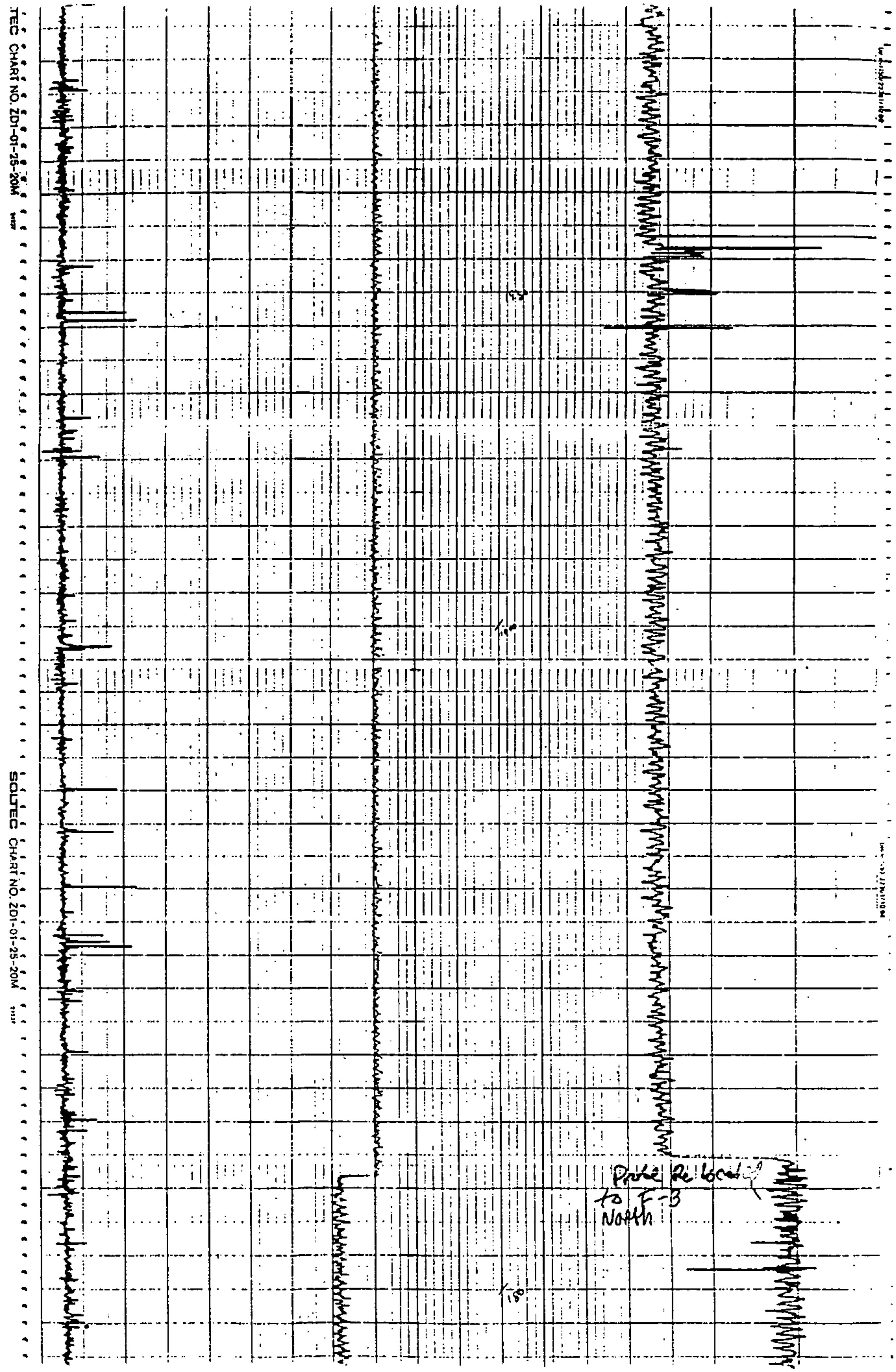
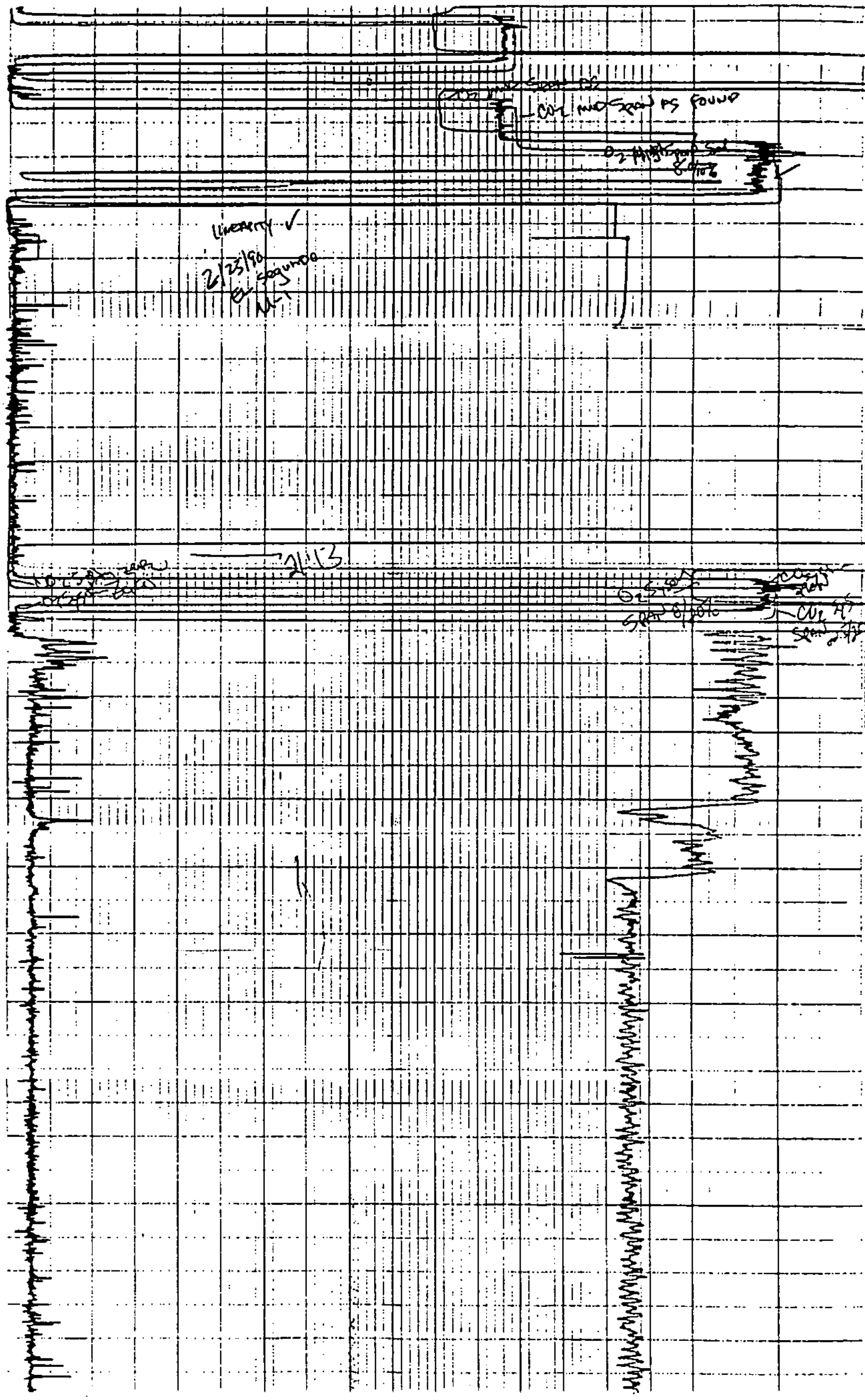
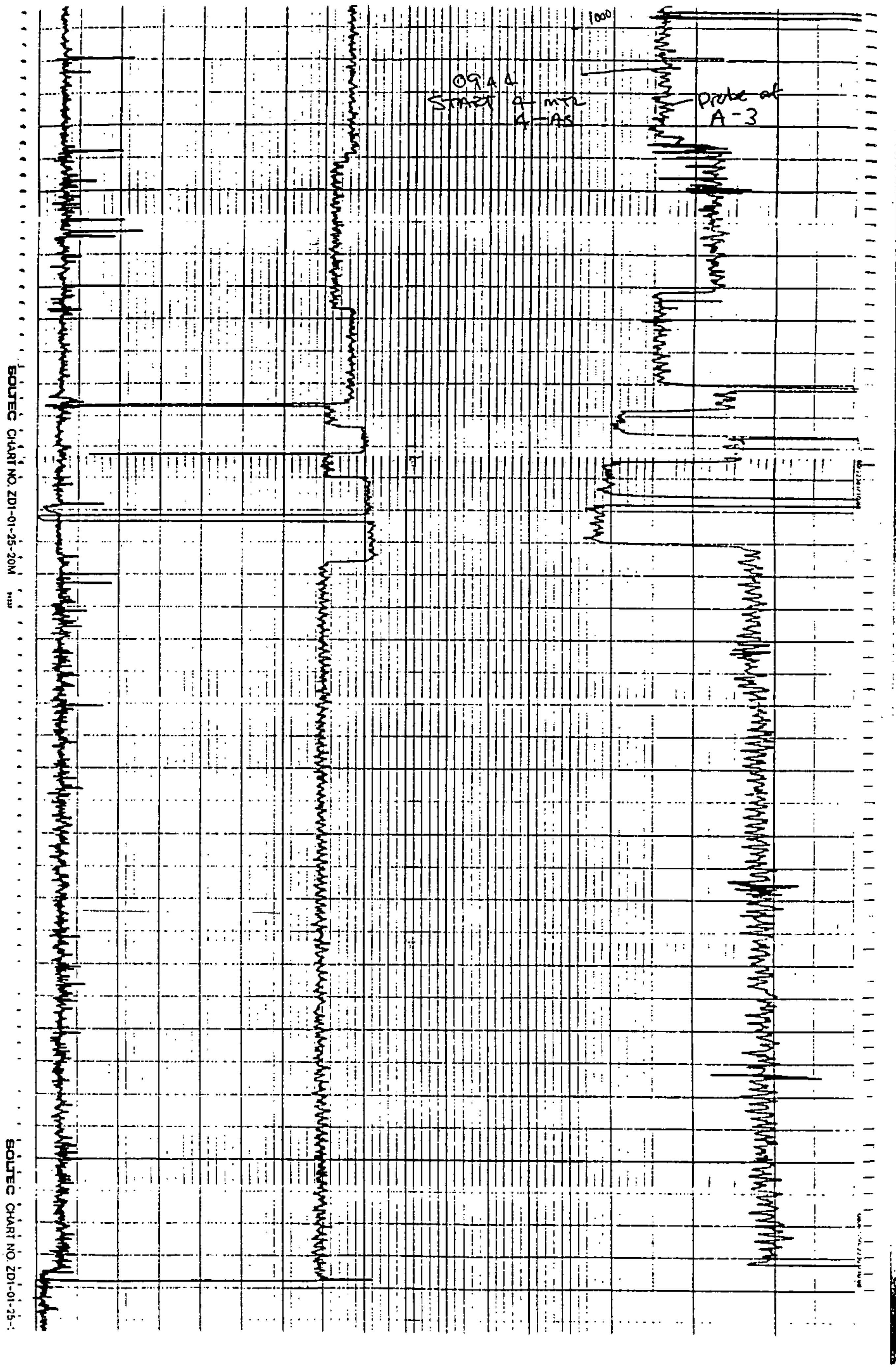
North B-3
1430
North F-3

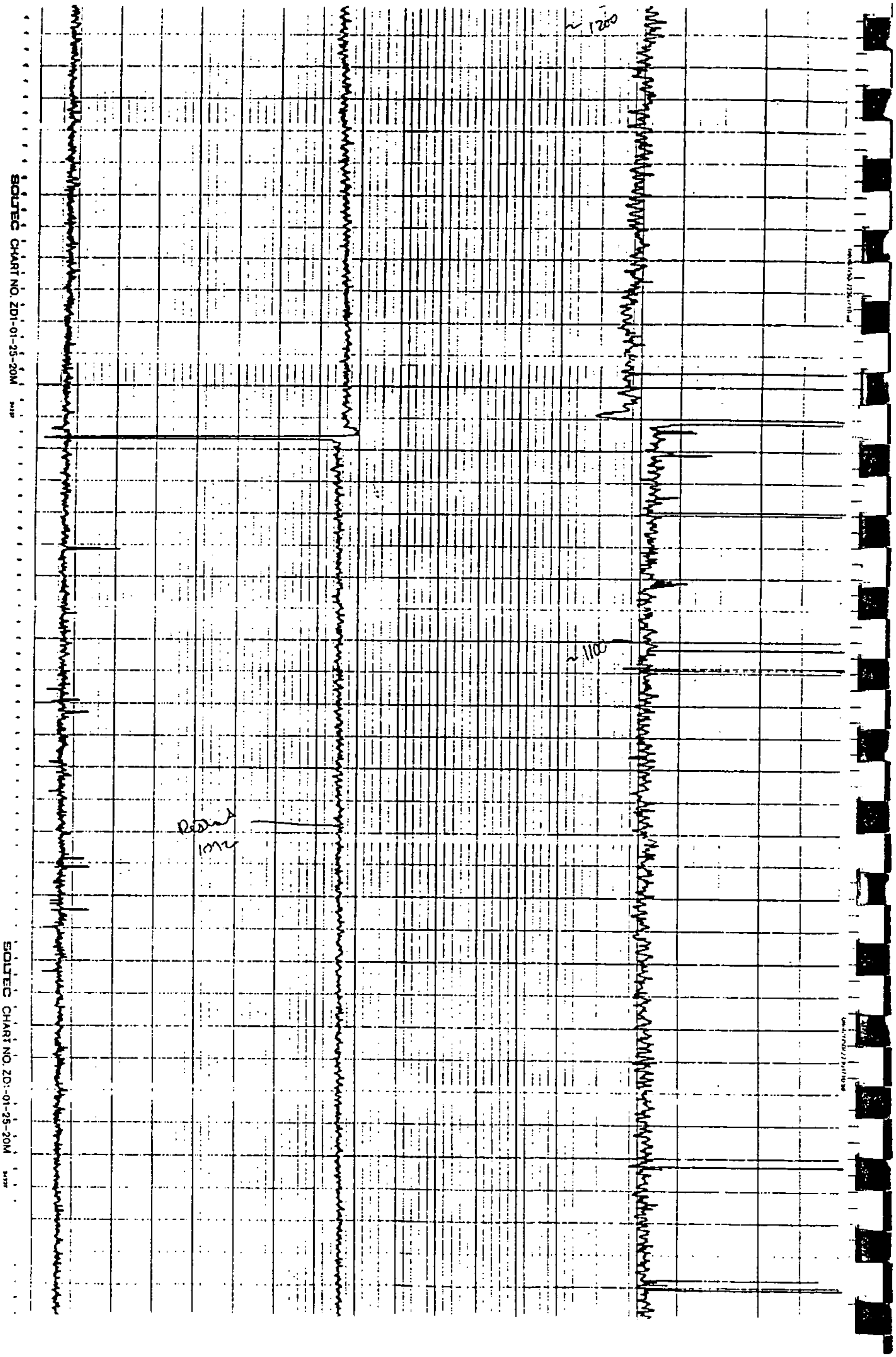

SOLTEC CHART NO. ZD1-01-25-20M
1706
B-3
North
END
1615
SOLTEC CHART NO. ZD1-01-25-20M

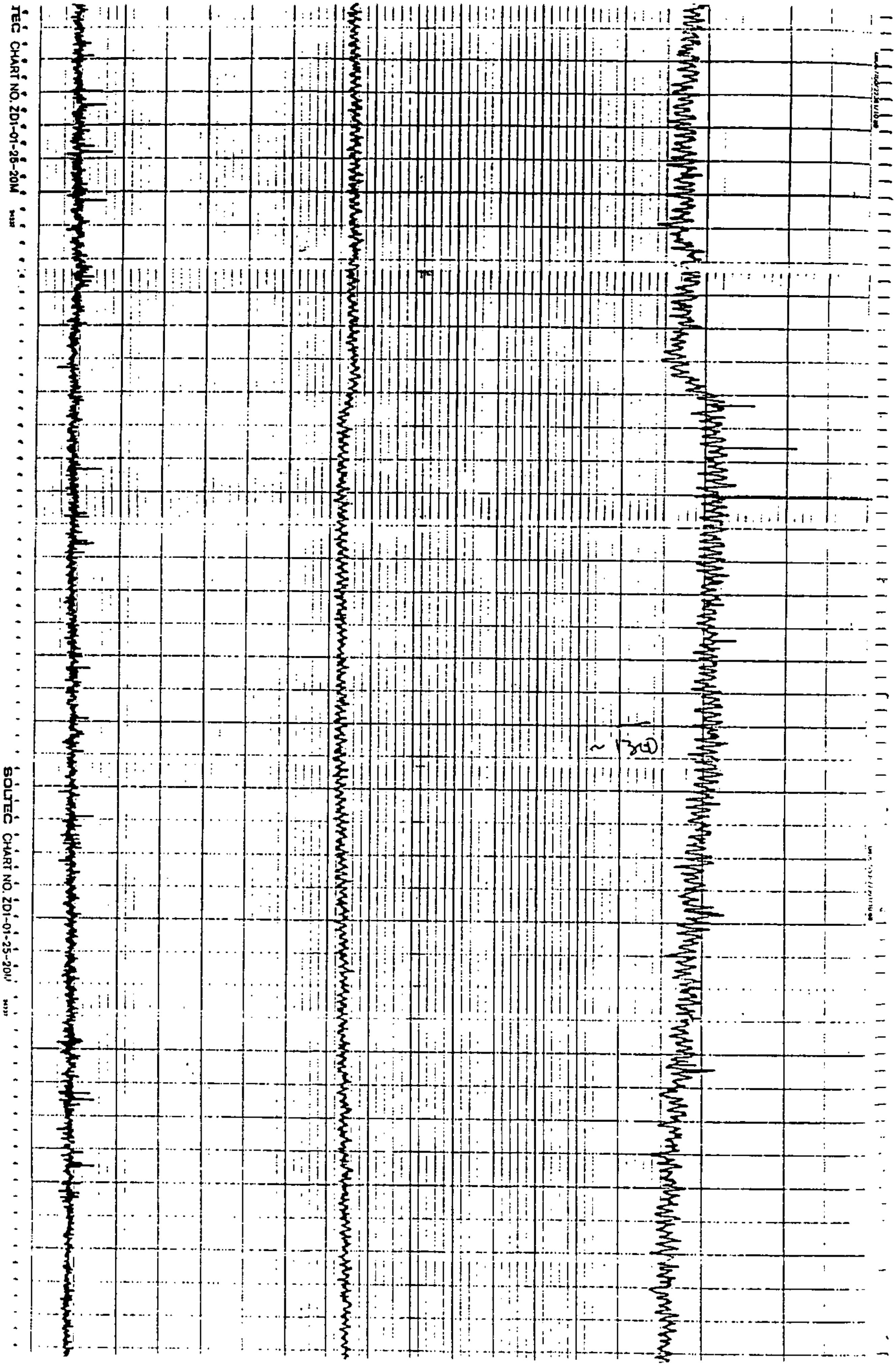

SOLTEC CHART NO. ZD1-01-25-20M
Probe Re-located to F-3 North

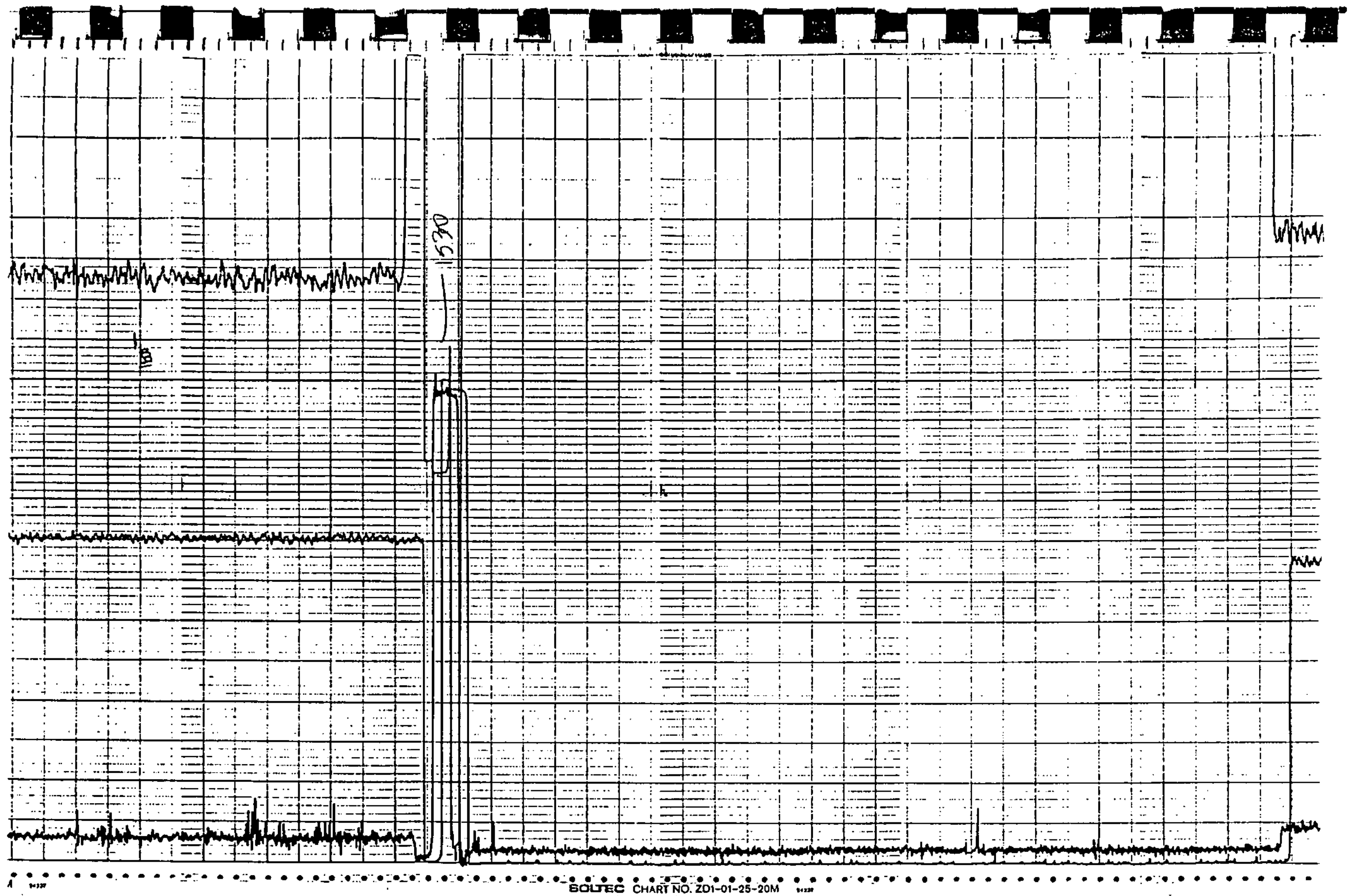


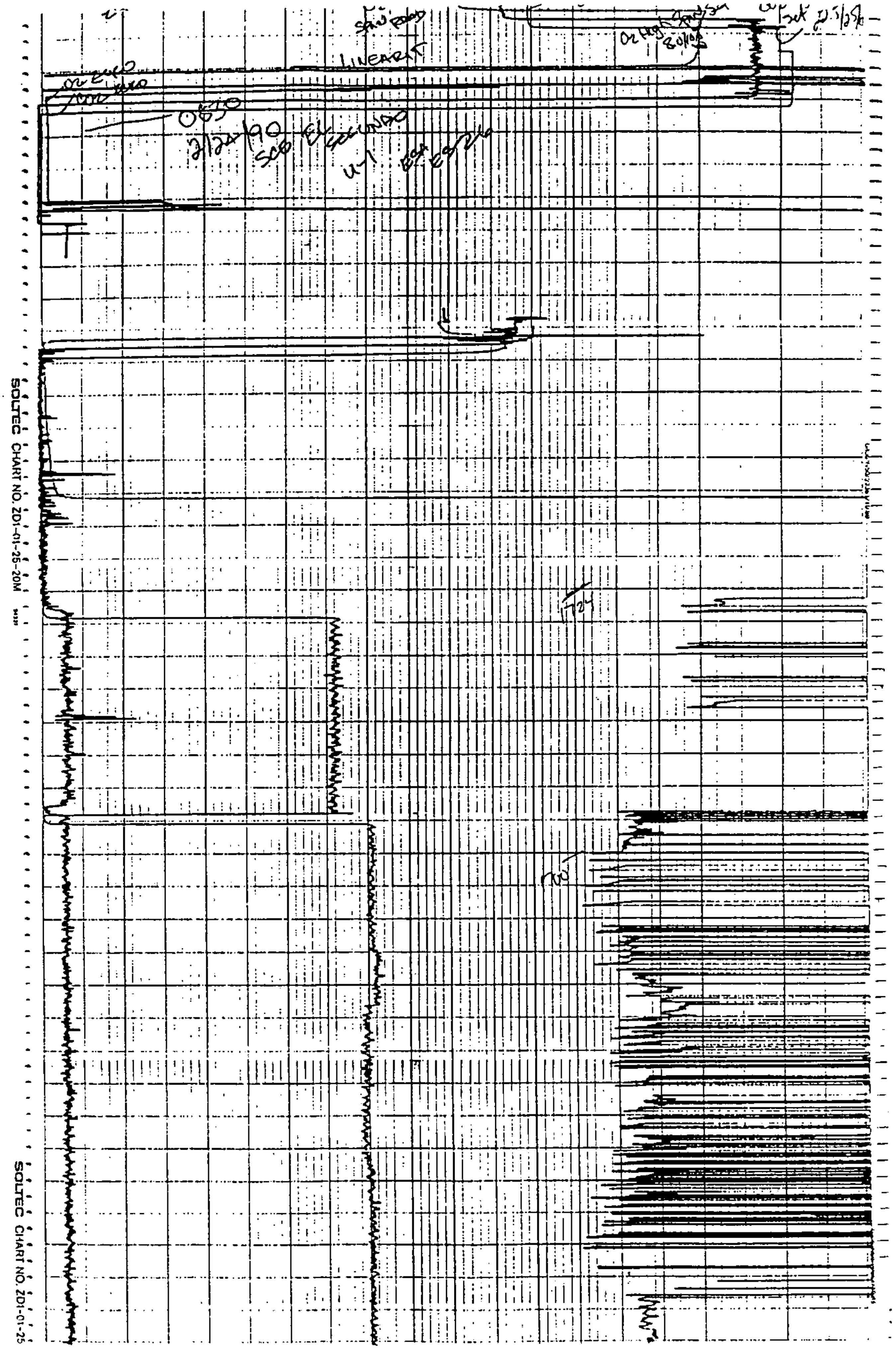
SOLTEC CHART NO. ZD1-01-25-20M

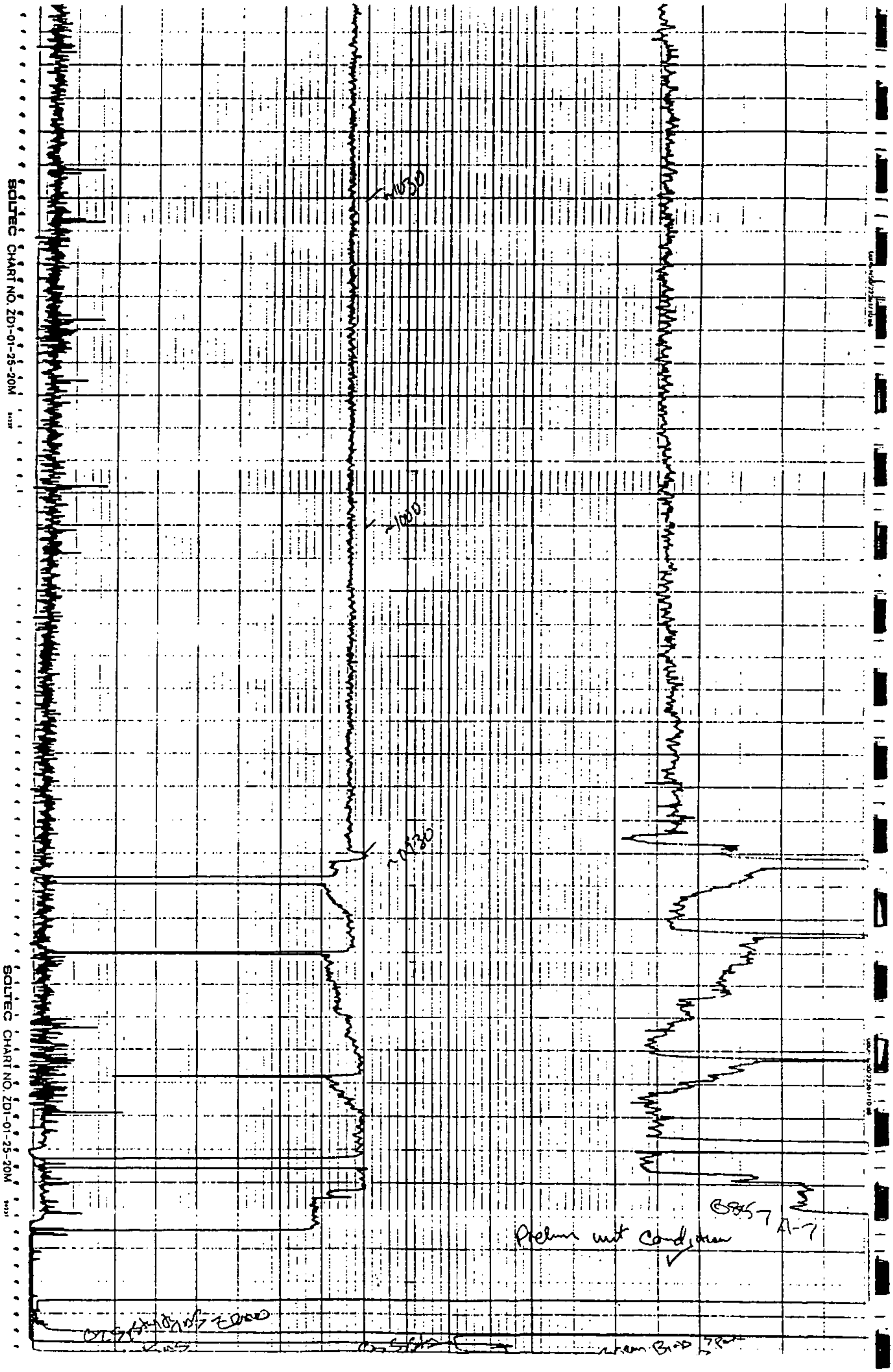

1000
0944
Start
probe at
A-3
SOLTEC CHART NO. ZD1-01-25-20M
SOLTEC CHART NO. ZD1-01-25-

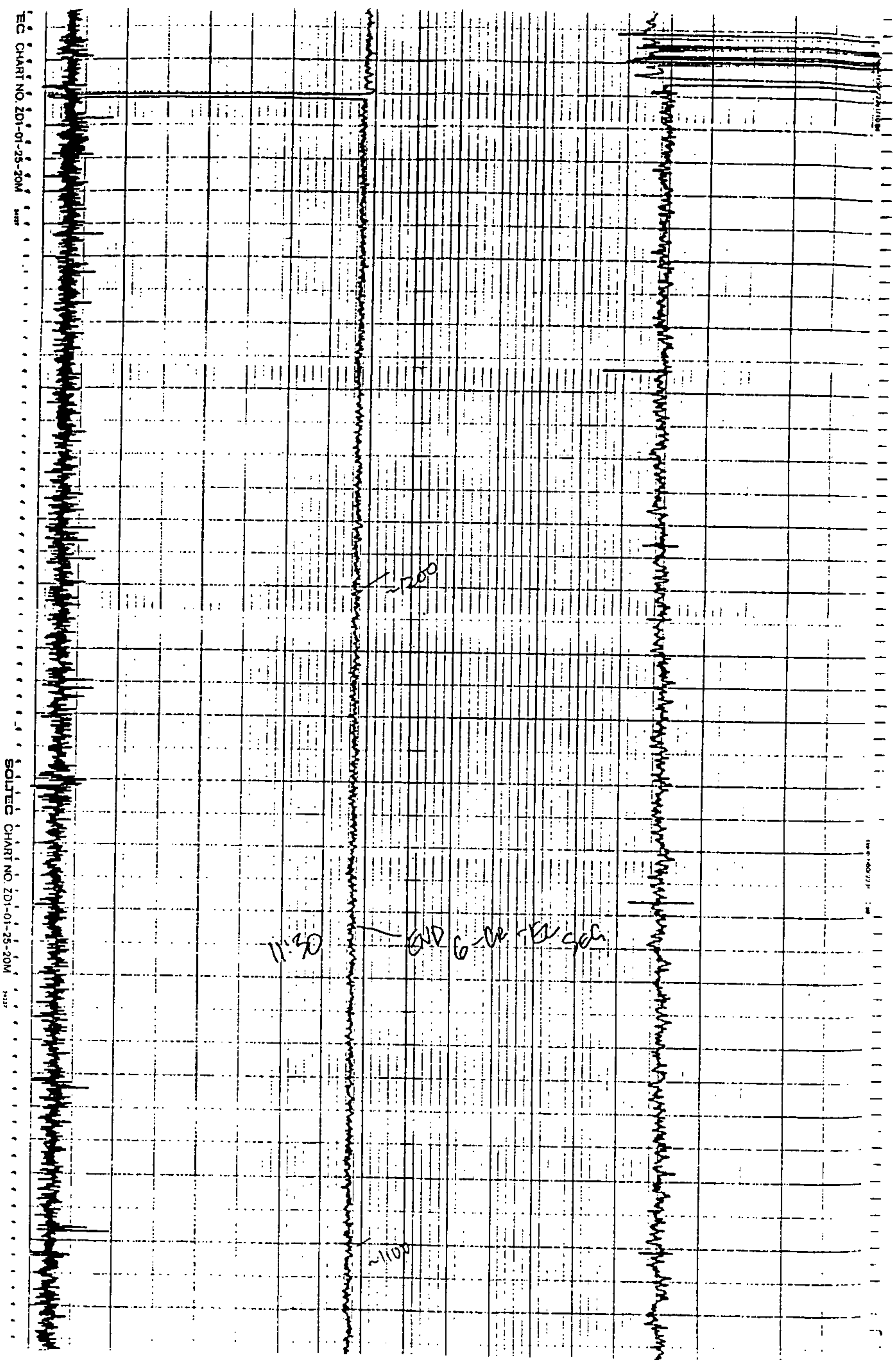

SOLTEC CHART NO. ZD1-01-25-20M
SOLTEC CHART NO. ZD1-01-25-20M
~1200
~1100

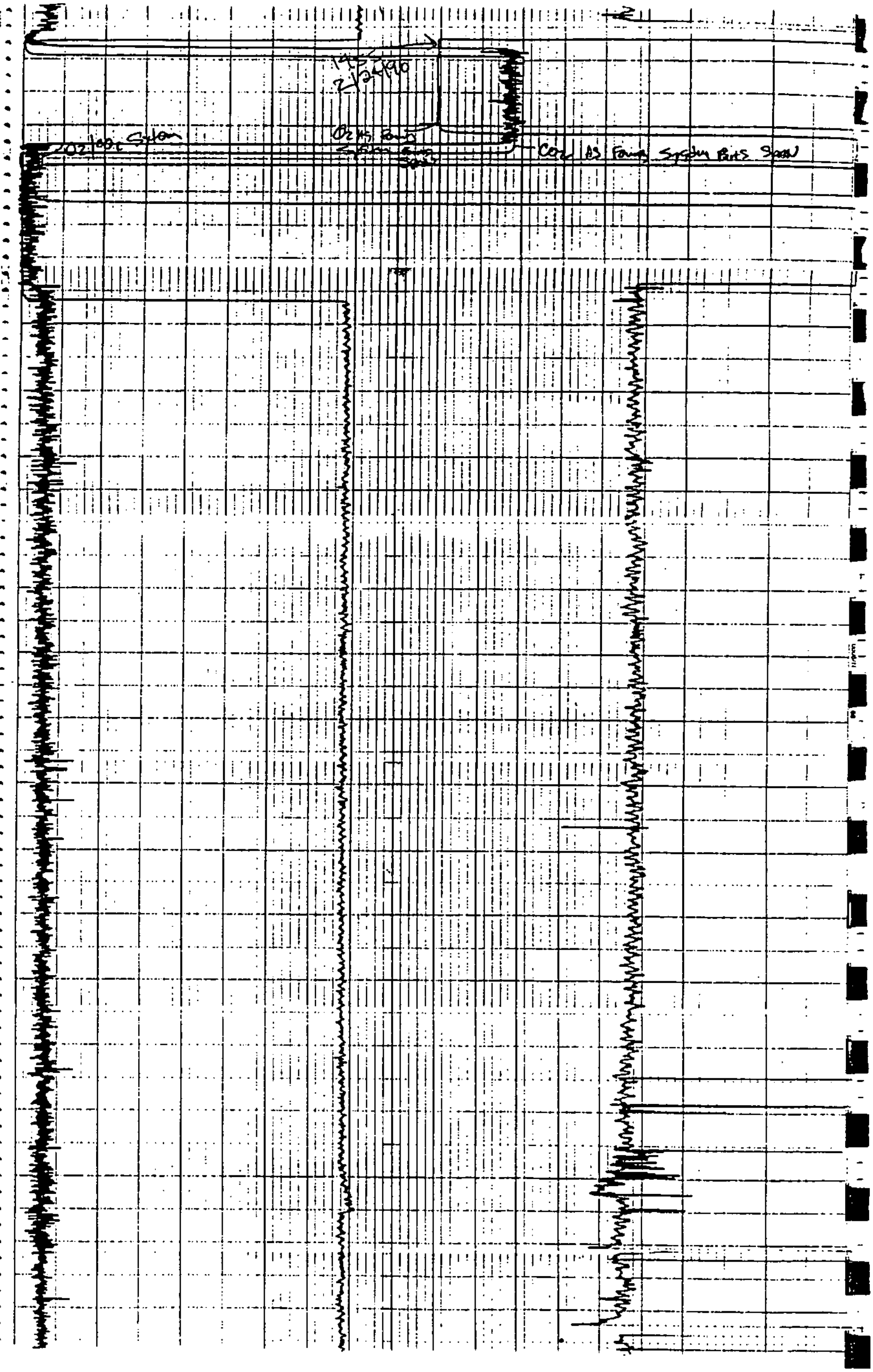

TEC CHART NO. ZD1-01-25-20M
SOLTEC CHART NO. ZD1-01-25-20M
~ 130


1530
SOLTEC CHART NO. ZD1-01-25-20M


SOLTEC CHART NO. ZD1-01-25-20M
SOLTEC CHART NO. ZD1-01-25
LINEARIT
0830
2/24/90
1724


SOLTEC CHART NO. ZD1-01-25-20M
~1030
~1000
SOLTEC CHART NO. ZD1-01-25-20M


SOLTEC CHART NO. ZD1-01-25-20M
~1200
11:30
~1100



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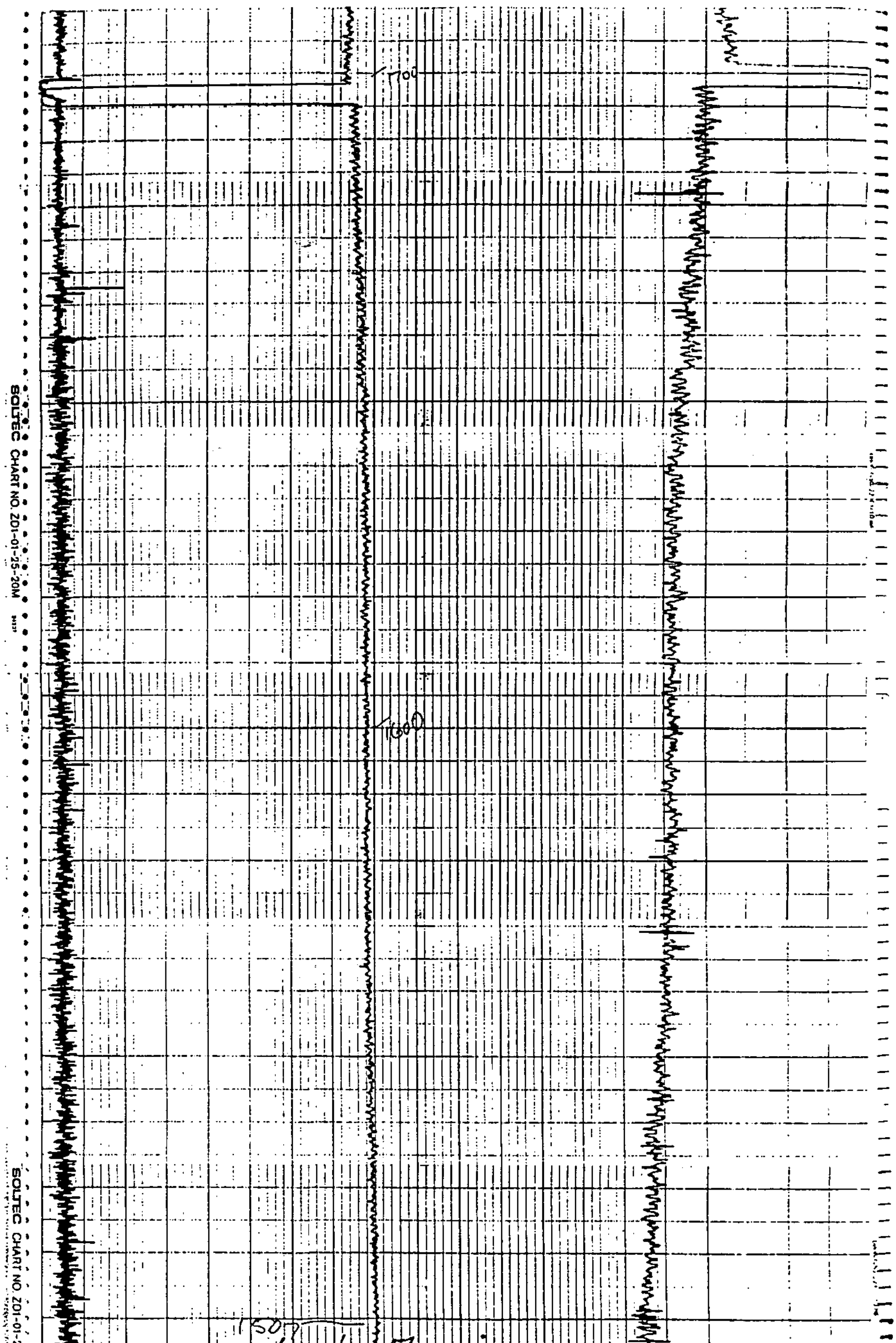
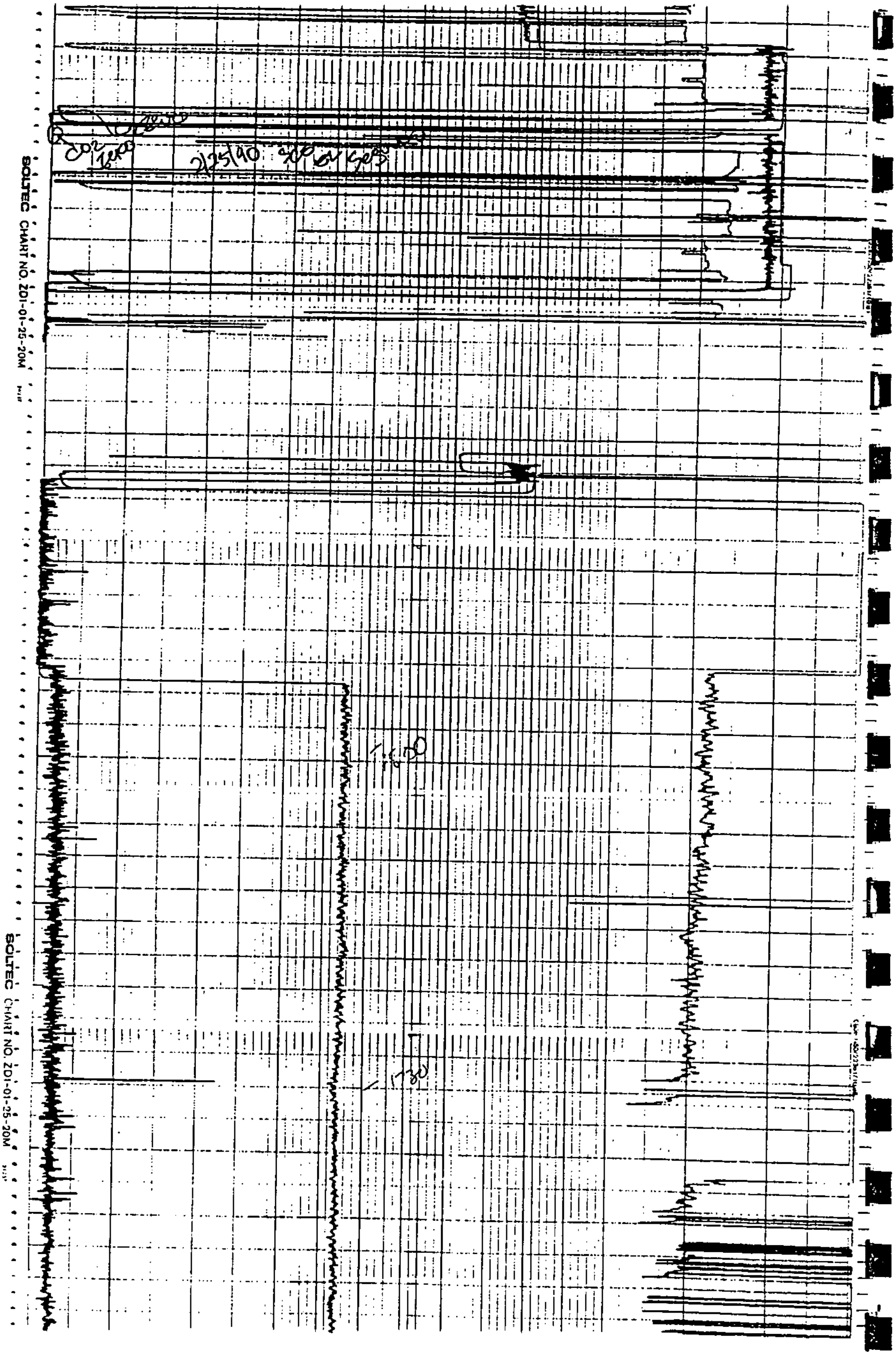

SOLTEC CHART NO. Z01-01-25-20M
1700
1600
1500


SOLTEC CHART NO. ZD1-01-25-20M

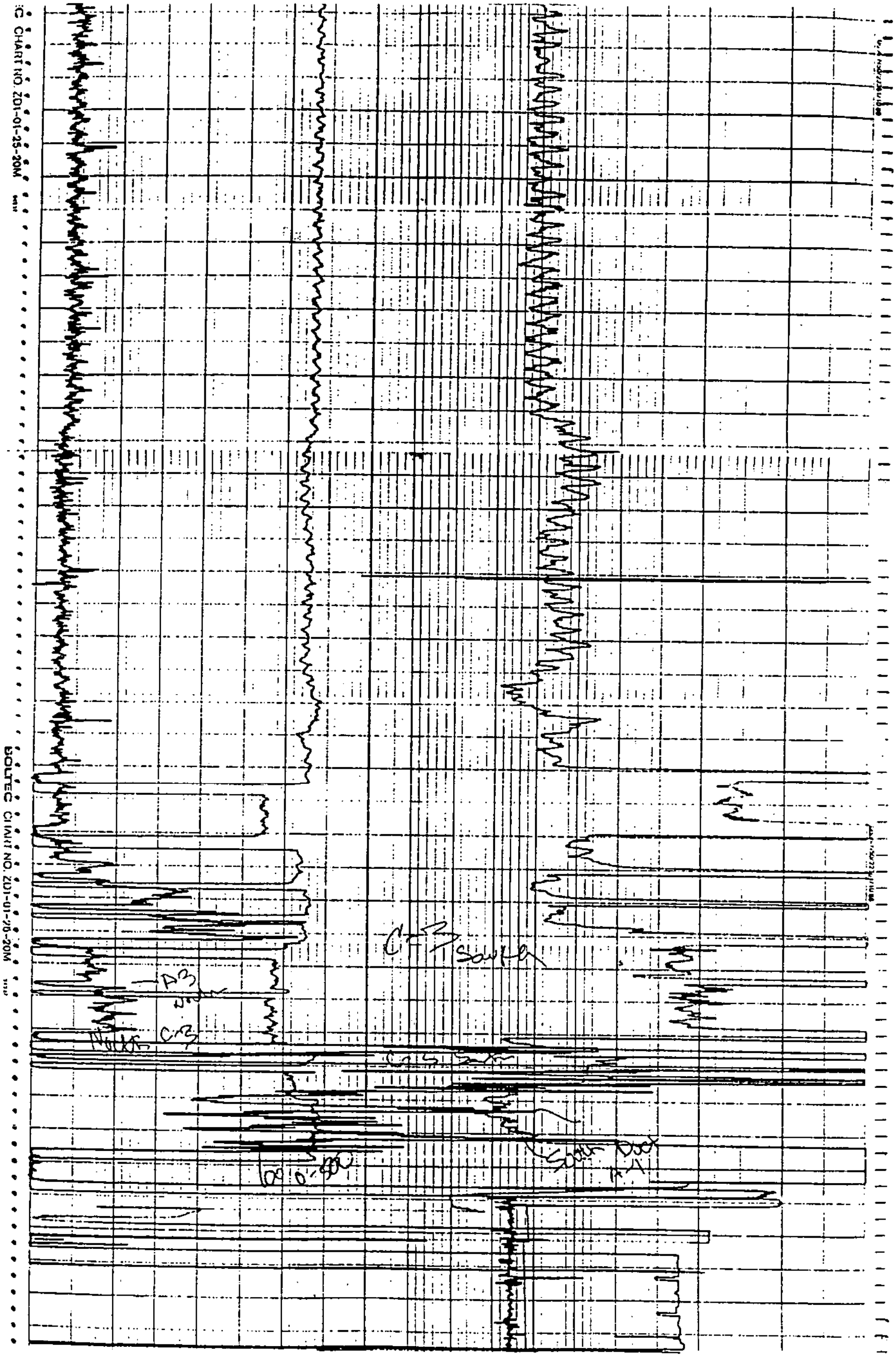
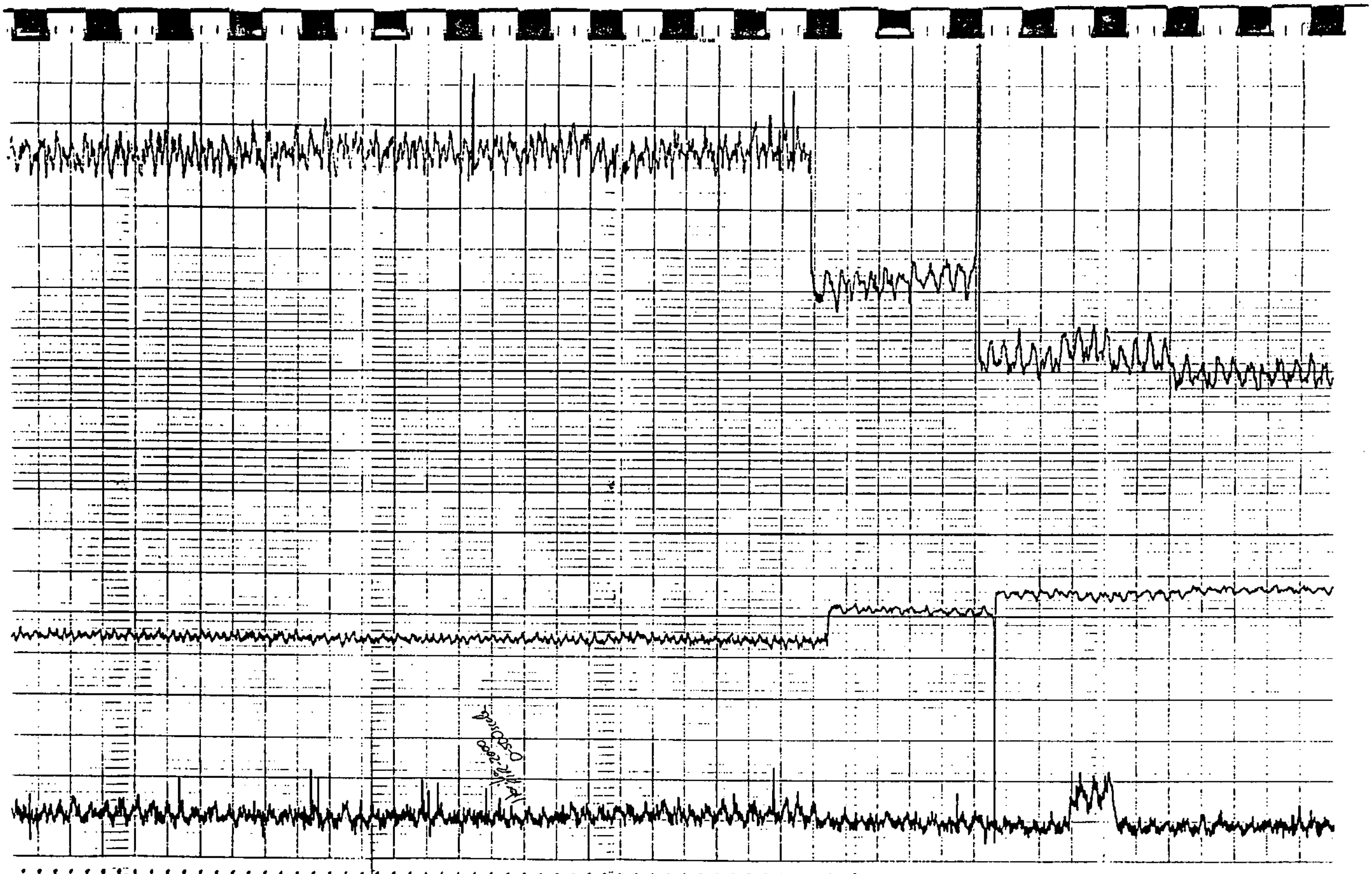
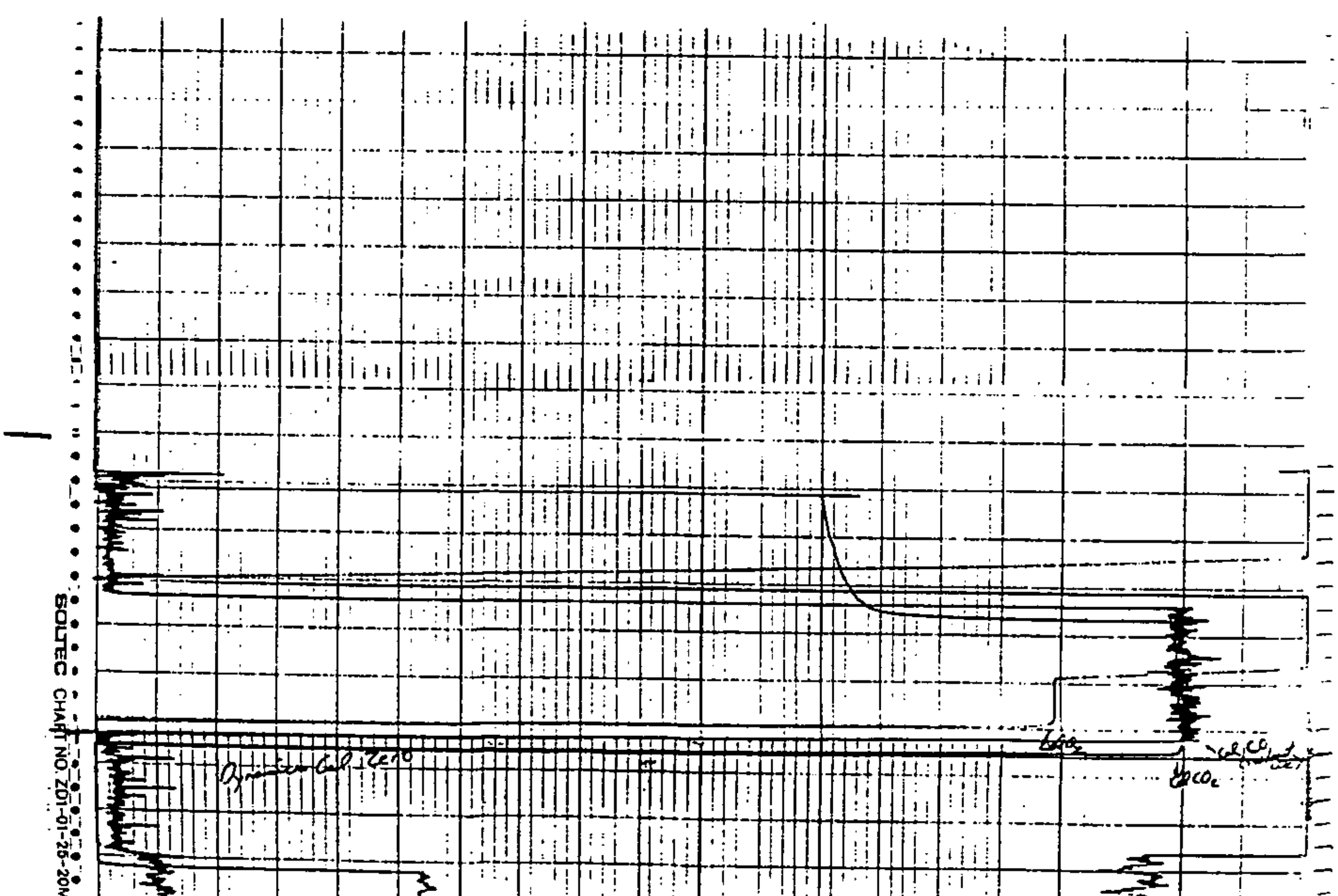


CHART NO. ZD1-01-25-20M
CHART NO. ZD1-01-25-20M
C-3 South
South Door



SOLTEC CHART NO. ZD1-01-25-20M


SOLTEC CHART NO. Z01-01-25-20M

APPENDIX F

CHAIN OF CUSTODY

E∫A Energy Systems Associates A CORPORATION

CERTIFICATION OF SAMPLE RECEIPT

Total Chromium by CARB 425 w/ modification 1/90

Samples:

Sample No. (Project No. Test No. — # 53304-ELS

Sample No. (Project No. Test No.	Complete Description
Reagent Blank	0.1 N NaOH (100 ml) + Filter T63-200
2-Cr-ELS	Probe Wash (1) Impinger Catch & Filter T63-197 (1)
3-Cr-ELS	Probe Wash (1), Impinger Catch w/ Filter T63-198 (1)
6-Cr-ELS	Probe Wash, Impinger Catch, Filter T63-199 (all combined)

→ Represents 1/2 of Cr Train

Chain of Custody Prior to Shipment:

Released by	Time and Date	Received by	Time and Date
[signature]	0800 2/27/90		

Samples shipped to: Curtis and Tompkins Los Angeles

Samples shipped from ESA by: Handcarried Date 2/27/90

Carrier: Air Bill No.

Samples received by: Paul [signature] Date 2/28/90

Company: Curtis & Tompkins

15991 RED HILL AVENUE, SUITE 110, TUSTIN, CA 92680-7388 / (714) 259-9520 / Telecopy: (714) 259-0372

ESA DS-057

E∫A Energy Systems Associates A CORPORATION

CERTIFICATION OF SAMPLE RECEIPT

Samples:

Sample No. #53304-ELS
(Project No.
Test No.

Test No.	Complete Description
✓ Reagent Blank	TV= 100 ml
✓ 2-Cr-ELS	Probe Wash (TV= 165 ml)
✓ 2-Cr-ELS	Impinger catch w/ filter T63-197 (TV= 350 ml)
✓ 3-Cr-ELS	Probe Wash (TV = 100 ml)
✓ 3-Cr-ELS	Impinger Catch w/ filter T63-198 (TV= 260 ml)
✓ 6-Cr-ELS	Probe Wash, Impinger catch w/ filter T63-199
	all portions combined TV= 310 ml

Chain of Custody Prior to Shipment:

Released by	Time and Date	Received by	Time and Date
[signature]	0800 2/27/90	[signature]	2:44pm 2/28/90

Samples shipped to: RTI
Research Triangle Park
North Carolina

Samples shipped from ESA by: USA Transfer Date 2/27/90
Carrier: Air Bill No.

Samples received by: Date
Company:

15991 RED HILL AVENUE, SUITE 110, TUSTIN, CA 92680-7388 / (714) 259-9520 / Telecopy: (714) 259-0372

ESA DS-057

E∫A Energy Systems Associates A CORPORATION

CERTIFICATION OF SAMPLE RECEIPT

Samples: #53304-ELS Arsenic (CARB 423)

Sample No. (Project No. Test No.	Complete Description
Reagent Blank	Filter # T110-134, 200 ml NaOH (.1 N)
Field Blank	Filter # T110-69, Front ½ (1), Back ½ (1)
4-As	Filter # T110-84, Front ½ (1), Back ½ (1)
5-As	Filter # T110-122, Front ½ (1), Back ½ (1)
7-As	Filter # T110-140, Front ½ (1), Back ½ (1)

Chain of Custody Prior to Shipment:

Released by	Time and Date	Received by	Time and Date
[signature]	0900 2/27/90		

Samples shipped to: Curtis and Tompkins

Samples shipped from ESA by: Hand carried Date 2/28/90

Carrier: C & T Air Bill No. ______

Samples received by: Paul Mood [signature] Date 2/28/90

Company: CURTIS & TOMPKINS

15991 RED HILL AVENUE, SUITE 110, TUSTIN, CA 92680-7388 / (714) 259-9520 / Telecopy (714) 259-0372

ESA DS-057

E∫A Energy Systems Associates A CORPORATION

CERTIFICATION OF SAMPLE RECEIPT

Samples:

Sample No. #53304- ELS

(Project No. Test No.	Complete Description
1-FO	Fuel Oil Sample
2-FO	↓

Chain of Custody Prior to Shipment:

Released by	Time and Date	Received by	Time and Date
[signature]	0800 2/22/80		

Samples shipped to: Curtis and Tompkins

Samples shipped from ESA by: Hand carried Date 2/23/80

Carrier: C & T Air Bill No.

Samples received by: Paul Mead Date 2/24/80

Company: Curtis & Tompkins

15991 RED HILL AVENUE, SUITE 110, TUSTIN, CA 92680-7388 / (714) 259-9520 / Telecopy: (714) 259-0372

ESA DS-057

E∫A Energy Systems Associates A CORPORATION

CERTIFICATION OF SAMPLE RECEIPT

EPA Draft Metals Method

Samples: # 53304-ELS

Sample No. (Project No. Test No.	Complete Description
Reagent Bl.	Filter T110-133, HNO_3/H_2O_2 soln (200 ml)
	$KMnO_4$ soln (200 ml)
Field Bl.	Filter T110-81, Probe Wash (1) Impinger Catch (1)
	$KMnO_4$ soln (100 ml)
4-Mtls	Filter T110-83, Probe Wash (1) Impinger Catch (1)
	$KMnO_4$ soln (160 ml)
5-Mtls	Filter T110-132, Probe Wash (1), Impinger Catch (1)
	$KMnO_4$ soln (275 ml)
7-Mtls	Filter T110-139, Probe Wash (1), Impinger Catch (1)
	$KMnO_4$ soln (270 ml)

Chain of Custody Prior to Shipment:

Released by	Time and Date	Received by	Time and Date
[signature]	0800 2/22/90		

Samples shipped to: Curtis and Tompkins

Samples shipped from ESA by: Handcarried Date 2/22/90

Carrier: C & T Air Bill No.

Samples received by: Paul Ward [signature] Date 2/22/90

Company: CURTIS & TOMPKINS

15991 RED HILL AVENUE, SUITE 110, TUSTIN, CA 92680-7388 / (714) 259-9520 / Telecopy: (714) 259-0372

ESA DS-057

E/A Energy Systems Associates A CORPORATION

CERTIFICATION OF SAMPLE RECEIPT

Samples: # 53504-ELS

Sample No. (Project No. Test No.	Complete Description
Field Blank (1-PAH)	XAD-2 module, Filter # 110-727, H_2O frac (1), Organic frac (1)*
2-PAH-ELS	XAD-2 module, Filter # 110-728, H_2O frac (2), Organic frac (2)*
3-PAH-ELS	XAD-2 module, Filter # 110-729
one H_2O sample broken ⇒	H_2O frac (2), Organic frac (2)*
6-PAH-ELS	XAD-2 module, Filter # 110-732, H_2O frac (2), Organic frac (2)*

Chain of Custody Prior to Shipment:

Released by	Time and Date	Received by	Time and Date
[signature]	1400 2/27/90		

Samples shipped to: Zenon Environmental

Samples shipped from ESA by: Fed-Ex Date 2/28/90

Carrier: Air Bill No. 400-7914-942 400-7914-942 LOgan

Samples received by: K Gilroy Date

Company: Zenon Environmental Inc

15991 RED HILL AVENUE, SUITE 110, TUSTIN, CA 92680-7388 / (714) 259-9520 / Telecopy: (714) 259-0372

* Organic portion arrived next afternoon as

ESA DS-057

MAR 3 1990

Analysis by CARB 430 for Formaldehyde, Acetaldehyde, Benzaldehyde

E/A Energy Systems Associates A CORPORATION

CERTIFICATION OF SAMPLE RECEIPT

Samples: II 53304- ELS

Sample No. (Project No. Test No.	Complete Description
Test 6A-Form-ELS	Vial #'s 1 and 2 combine oil fuel
6B-Form-ELS	
6C-Form-ELS	
Test 8A-Form-ELS	Vials A and B combine gas fuel
8B-Form-ELS	
8C-Form-ELS	
Field spike	Use one, save other for back-up
* Field blank	Use one, save other for backup.

Chain of Custody Prior to Shipment:

Released by	Time and Date	Received by	Time and Date
[signature]	1000 2/27/90		

Samples shipped to: Radian
North Carolina

Samples shipped from ESA by: Fed-Ex Date 2/27/90

Carrier: 496994009/ Air Bill No. 496994009/

Samples received by: [signature] Date 2-28-90

Company: Radian RF

* Rece'd two samples labeled form blank. RH

15991 RED HILL AVENUE, SUITE 110, TUSTIN, CA 92680-7388 / (714) 259-9520 / Telecopy: (714) 259-0372

E/A ENERGY SYSTEMS ASSOCIATES
15991 RED HILL AVENUE, SUITE 110, TUSTIN, CA 92680-7388
(714) 259-9520 / Telecopy: (714) 259-0372

Purchase Order

Vendor: Truesdail Labs

P.O. Number: Charge S.C.E.
Charge Number: 53304 - ELS
Date: 2-26-90

Phone: (   )
Code:

California Resale No: SR EA 24-816623

Date Required	Contact	Ship via	Terms	___ Resale — Non Taxable ___ Co Use — Taxable
	Joe Bramlett			

ITEM NO.	DESCRIPTION	QUANTITY	PRICE	TOTAL
	6 Tedlar Bags for Benzene Analysis Need 1 ppb detection limits (6A, 6B, 6C, 8A, 8B, 8C - Ben - ELS)	6	120.00	720.00
	2 Natural Gas Analysis full Breakdown, Higher H.V.	2	225.00	
	Send Original report to Mike Escorcega SCE and copy of report to Arlene Bell E.S.A.			

Process within 48 hrs.

Sub Total $
Sales Tax $
Freight $
TOTAL $

Craig Lee

PURCHASE ORDER NUMBER MUST APPEAR ON ALL INVOICES, SHIPPING MEMOS, BILLS OF LADING AND PACKAGES

REAGENT CHAIN OF CUSTODY

Client: SCE/AB2588

Project Manager: AB/RF

Charge No.: 53304

REGENTS - Enter quantity and circle description

✓	Water	5gal DI	B&J 2	Lot # ____
✓	Acetone	ACS	GC2 2	Lot # ____
✓	Hexane	ACS	GC2 - Optima 2	Lot # ____
____	IPA	ACS		Lot # ____
____	H_2O_2	30%	Other	Lot # ____
____	$MeCl_2$	ACS	GC2	Lot # ____

4l 5% HNO_3/10% H_2O_2

2l 4% $KMnO_4$/10% H_2SO_4

6l 0.1 N NaOH (for Cr train and As rinses)

500 ml DNPH solution

50,000X formaldehyde solution

FILTERS - Quantity and Description

____ Glass Fiber 110mm 63mm 47mm 45mm 37mm

____ Teflon 110mm T110 - 68, 69, 81, 83, 84, 104, 122, 132-134, 138-141

____ ~~Hexane~~ Toluene Rinsed 727-729, 732-733, 901

____ 6 XAD2 Resin modules

____

____

1

ESA MSC-136

BOTTLES - Quantity

2 1000ml Nalgene

___ 500ml Nalgene

___ 250ml Nalgene

4 cs 500ml I-chem

___ 1000ml Acid Washed

2 cs 500ml Acid Washed

2 cs 250ml Acid Washed

LAB SUPPLY CHECK LIST

4 Silica Gel

✓ Gloves (small and large)

4 Wash Bottles

✓ Foil

✓ Baggies

___ Sample Labels

✓ Pens

✓ Paper Towels

✓ Scissors

1 teflon
1 metal Tweezers

✓ Brushes

✓ 8 Tedlar bags

✓ 3 Teflon wash bottles

Teflon tape
✓ Parafilm
2 10 ml pipettes
1 1 ml pipette
1 Pipette bulb
Wheaton bottle w/ cap
4 midget impinger w/ fittings
Hexane rinsed foil
Tape

Released By [illegible] Date 2/15/90

Received By ___ Date ___

Returned By ___ Date ___

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 25563
CLIENT: CARNOT
PROJECT #: 5787
LOCATION: SUBMITTED BY CLIENT

DATE RECEIVED: 03/07/90
DATE DIGESTED: 03/22/90
DATE ANALYZED: 04/10/90
DATE REPORTED: 04/17/90

METAL: ZINC FRONT FILTER AND PROBE/NOZZLE WASH
METHOD: METALS EMISSIONS IN EXHAUST GAS PROCEDURE DATED 8/28/89
EPA METHOD 6010

C&T ID	SAMPLE ID	SAMPLE VOLUME	ZINC ug/SAMPLE
1	REAGENT BLANK	50	20
2	Field ~~TRIP~~ BLANK	50	63
3	4-MTLS	50	50
4	5-MTLS	50	62
5	7-MTLS	50	6,200
5D	7-MTLS	50	6,300
5S	7-MTLS	50	102%

possible contamination [illegible]

METHOD DETECTION LIMIT = 0.61 ug/SAMPLE.

QA/QC DATA INFORMATION:

RELATIVE % DIFFERENCE:	2
SPIKE % RECOVERY:	102