OCTOBER, 1990

GALSON PROJECT NO. SE-034

SOURCE TEST REPORT

SOURCE EMISSION TESTING OF THE INCINERATOR #2 EXHAUST STACK

AT THE

CENTRAL CONTRA COSTA SANITARY DISTRICT (CCCSD) MUNICIPAL WASTEWATER TREATMENT PLANT MARTINEZ, CALIFORNIA

Galson Technical Services

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ABSTRACT

This report summarizes the results of the source emission testing performed on the sewage sludge incinerator #2 exhaust stack at the Central Contra Costa Sanitary District facility in Martinez, California. Testing was conducted by Galson Technical Services, Inc. during the period from April 10 to 13, 1990 to determine emissions of hydrochloric acid, formaldehyde, benzene, vinyl chloride, particulate matter, twelve metals (including hexavalent chromium), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF), and polycyclic aromatic hydrocarbons (PAH). In addition, carbon monoxide (CO) and total hydrocarbon (THC) levels were continuously monitored throughout the testing. The primary purpose of the test program was to develop emission data, as required by the Bay Area Air Quality Management District (BAAQMD); in particular, as related to the California Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588). The CO and THC data were collected for in-house purposes.

Results of the test program are summarized below:

Parameter	Concentration	Mass Emission Rate	Emission Ratio
HCl	0.54 mg/dscm	18.0 gm/hr	10.8 gm/ton
Formaldehyde	50 ppb	2.1 gm/hr	1.2 gm/ton
Benzene	4.7 ppb	0.5 gm/hr	0.3 gm/ton
Vinyl Chloride	< 3 ppb	< 0.3 gm/hr	< 0.2 gm/ton
Particulate	0.004 gr/dscf	0.67 lbs/hr	0.42 lbs/ton
Metals:			
Arsenic	< 0.004 mg/dscm	0.14 gms/hr	0.09 gm/ton
Beryllium	< 0.001 mg/dscm	< 0.02 gms/hr	< 0.01 gm/ton
Cadmium	0.010 mg/dscm	0.33 gms/hr	0.21 gm/ton
Chromium			
- total	0.011 mg/dscm	0.37 gms/hr	0.24 gm/ton
- hexavalent	< 0.003 mg/dscm	< 0.1 gm/hr	< 0.06 gm/ton
Copper	0.045 mg/dscm	1.5 gms/hr	0.94 gm/ton
Lead	0.024 mg/dscm	0.8 gms/hr	0.50 gm/ton
Manganese	0.138 mg/dscm	4.5 gms/hr	2.7 gm/ton
Mercury	0.070 mg/dscm	2.3 gms/hr	1.5 gm/ton
Nickel	0.002 mg/dscm	0.06 gms/hr	0.04 gm/ton
Selenium	0.012 mg/dscm	0.39 gms/hr	0.24 gm/ton
Zinc	1.59 mg/dscm	53 gms/hr	35 gm/ton

Parameter	Concentration	Mass Emission Rate	Emission Ratio
PCDD/PCDF			
Total TCDD	< 0.03 ng/dscm	< 1.0 µg/hr	< 0.7 µg/ton
Total PeCDD	< 0.03 ng/dscm	< 1.0 µg/hr	< 0.7 µg/ton
Total HxCDD	< 0.03 ng/dscm	< 0.8 µg/hr	< 0.5 µg/ton
Total HpCDD	< 0.04 ng/dscm	< 1.2 µg/hr	< 0.8 µg/ton
Total OCDD	≤ 0.05 ng/dscm	≤ 1.6 µg/hr	≤1.1 µg/ton
Total PCDD	< 0.17 ng/dscm	< 5.7 µg/hr	< 3.8 µg/ton
Total TCDF	< 0.02 ng/dscm	< 0.7 µg/hr	< 0.4 µg/ton
Total PeCDF	< 0.03 ng/dscm	< 0.9 µg/hr	< 0.6 µg/ton
Total HxCDF	< 0.01 ng/dscm	< 0.5 µg/hr	< 0.3 µg/ton
Total HpCDF	< 0.03 ng/dscm	< 0.9 µg/hr	< 0.6 µg/ton
Total OCDF	≤ 0.03 ng/dscm	≤ 1.1 µg/hr	≤ 0.7 µg/ton
Total PCDF	< 0.12 ng/dscm	< 4.1 µg/hr	< 2.7 µg/ton
PAH Compounds			
Naphthalene[1]	0.17 ng/dscm	552 µg/hr	327 µg/ton
Others	<0.01-0.02ng/dscm	<0.4-0.6 µg/hr	<0.3-0.4 µg/ton
CO	50 ppm	4.3 lbs/hr	2.7 lb/ton
THC (as methane)	12 ppm	0.6 lbs/hr	0.4 lb/ton

Note: Emission Ratio data are presented on a per ton of sludge (dry) basis.

1 Background contamination suspected; refer to discussion in text.

PROJECT PERSONNEL

Central Contra Costa Sanitary District

William Brennan ..... Plant Operations Manager

Galson Technical Services, Inc.

Chuck Siu, CIH ..... Office Manager
Glenn Cass, PE ..... Mechanical Engineer
Mark Ludwiczak ..... Project Manager
Dale Roberts ..... Environmental Engineer
Claire Tanglao ..... Environmental Engineer
Kathy Pak ..... Environmental Technician
Ed Stuber ..... Laboratory Coordinator

Zenon Environmental Inc.

John Coburn ..... President
Rod Thomson ..... Project Manager
Henri Huneault ..... Head, GC/MS Services

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Mark Fesler ..... Analyst

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1.0 INTRODUCTION

This report summarizes the results of the source emission testing performed on the sewage sludge incinerator #2 exhaust stack at the Central Contra Costa Sanitary District facility in Martinez, California. Testing was conducted by Galson Technical Services, Inc. during the period from April 10 to 13, 1990 to determine emissions of hydrochloric acid, formaldehyde, benzene, vinyl chloride, particulate matter, twelve metals (including hexavalent chromium), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF), and polycyclic aromatic hydrocarbons (PAH). In addition, carbon monoxide (CO) and total hydrocarbon (THC) levels were continuously monitored throughout the testing. The primary purpose of the test program was to develop emission data, as required by the Bay Area Air Quality Management District (BAAQMD); in particular, as related to the California Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588). The CO and THC data were collected for in-house purposes.

William Brennan, plant operations manager with CCCSD, was present to coordinate testing activities with the boiler operations and observe test procedures. No representatives of either the BAAQMD or the Califorina Air Resources Board (CARB) were present to observe the testing.

2.0 SOURCE DESCRIPTION

The CCCSD's municipal wastewater treatment plant in Martinez, California is an activated sludge facility with a rated capacity of 45 million gallons per day (MGD). Wastewater flow through the plant averages approximately 38 MGD (dry weather flow), consisting of approximately 98 percent domestic and two percent industrial or commercial wastewater. The plant serves 350,000 people in Central Contra Costa County (California).

Primary and secondary sludge from the treatment plant are combined and gravity thickened, prior to dewatering; lime and a polymer material are added to the sludge during the thickening process to enhance its settling characteristics. The thickened sludge is dewatered by centrifuges to approximately 20-25 percent dry solids. Typically, 185 tons per day (wet basis) of sludge are generated.

The plant is equipped with two Envirotech/BSP multiple hearth incinerators, each with a design capacity of 10 tons/hr (wet basis). Only one of the incinerators is on-line at a given time, operating on a continual basis (24 hours/day). The incinerators contain 11 hearths each, with the top hearth serving as an afterburner. Ten of the hearths are equipped with burners (four per hearth), which can fire natural gas and/or landfill gas; fuel oil is utilized as a back-up fuel. The ash is disposed of in a landfill. Cooling air is provided to the rotating, center shaft of the incinerator to protect the shaft from heat-induced failure. The cooling air passes through the center of the shaft and is either discharged to atmosphere through the stack, or partially recycled to the Hearth #9 chamber as pre-heated combustion air. Use of the shaft cooling air for combustion air is modulated with a damper.

Exhaust gases from the incinerator are passed through an Envirotech multiple cyclone dry scrubber; collected ash is returned to the incinerator for further burning and/or discharge. After exiting the scrubber, the exhaust gases are passed through a Zurn waste heat boiler which produces steam for in-house use. Boiler exhaust gases are then passed through a wet scrubber manufactured by Krebs Engineers. The scrubber contains a venturi quench section followed by a spray baffle chamber. It utilizes a total of approximately 900 gallons per minute of treatment plant effluent (non-chlorinated) as the scrubbing medium, the majority of which is passed through both sections of the scrubber prior to disposal.

Scrubber exhaust gases then pass through an induced draft fan and are discharged to the atmosphere through the exhaust stack at a height of approximately 10 feet above the roof line. Schematic diagrams of the incinerator, the exhaust gas treatment system, and the wet scrubber water supply/disposal system are presented in Appendix I.

3.0 TEST PROGRAM/OPERATING CONDITIONS

Source emission testing was conducted on the incinerator #2 exhaust stack during the period from April 10 to 13, 1990. Testing was performed to determine emissions of the following pollutants:

- Hydrochloric Acid
- Formaldehyde
- Benzene
- Vinyl Chloride
- Particulate Matter
- Metals (12)
- PCDD/PCDF Compounds (15)
- PAH Compounds (16)
- Carbon Monoxide (CO)
- Total Hydrocarbons (THC)

Testing for each parameter was performed in triplicate, with the exception of the PCDD/PCDF/PAH compounds, for which four tests were conducted, and the CO and THC levels, which were monitored continuously during all tests. Specific test intervals are summarized in the test schedule presented in Table 1.

Testing was generally performed during normal incinerator operating conditions. Sludge feed rates typically averaged between 1.5 and 1.7 tons per hour (tph, dry basis) during the tests; the sludge contained between 21 and 25 percent solids. Landfill gas was utilized as the auxiliary fuel.

Unstable incinerator operations were observed during Test 8; in particular, variations in the moisture content of the sludge caused temperatures in the upper hearths of the incinerator to fluctuate considerably. An additional test (Test 10) was therefore performed on the following day during more stable operating conditions.

Incinerator operating data, including hearth temperatures, furnace draft, shaft rotation rate, and scrubber pressure drop were logged by plant personnel during the testing. In addition, stack gas opacity and furnace oxygen content were continuously monitored and recorded throughout the tests. Sludge feed rate and moisture content data were generally logged at two-hour intervals during the tests. These data are presented in Appendix I.

4.0 TEST METHODS

Testing was performed in accordance with Environmental Protection Agency (EPA) and California Air Resources Board (CARB) methods. The sampling and analytical techniques are described briefly below.

4.1 HCl Testing

HCl emission testing was performed in accordance with CARB Method 421. Sampling was performed isokinetically using 24-point traverses, per CARB Method 1 requirements. A one-hour sampling interval (per test run) was utilized to collect the samples. Once collected, the samples were analyzed for HCl using ion chromatography/conductivity detection.

4.2 Formaldehyde, Benzene, and Vinyl Chloride Testing

Formaldehyde emission testing was conducted in accordance with CARB Method 430. Sampling was performed at a single point near the center of the exhaust stack. Sampling was performed at a constant rate of approximately 0.5 liter per minute (lpm) using a high vacuum diaphragm pump/critical orifice assembly. Test durations of 60 minutes were employed. Collected samples were analyzed using high performance liquid chromatography; all samples were analyzed within seven days of collection.

Benzene and vinyl chloride emission testing was conducted in accordance with CARB Method 410A. Sampling was performed at a single point near the center of the exhaust stack. Exhaust gas samples were collected in a tedlar bag; sampling was performed continuously throughout a 50-minute (approximately) test duration at a sampling rate of approximately 0.1 lpm. Collected samples were analyzed for benzene and vinyl chloride using GC/MS; all samples were analyzed within 48 hours of collection.

The formaldehyde and benzene sampling was performed concurrently with the HCl sampling; supporting data collected during these tests (i.e., stack gas flow rate, molecular weight) were utilized to determine the formaldehyde and benzene emission rates (gm/hr).

4.3 Particulate/Metals Testing

Particulate and metals emission testing was performed in accordance with the EPA Draft Multiple Metals Method (dated August 28, 1989). Sampling was performed isokinetically using 24-point traverses, per CARB Method 1 requirements. A two-hour sampling interval (per test run) was utilized to collect the samples. Once collected, the front-half fraction (i.e., filter and probe rinse) of the samples was analyzed gravimetrically to determine total particulate emissions. The samples were then analyzed for the 11 metals listed below using inductively coupled plasma (ICP) or atomic absorption (AA) spectroscopy. Front- and back-half fractions were analyzed separately.

Arsenic	Beryllium
Cadmium	Chromium (Total)
Copper	Lead
Manganese	Mercury
Nickel	Selenium
Zinc	

Hexavalent chromium testing was performed in accordance with CARB Method 425 (draft; July 10, 1989). Sampling was performed isokinetically using 24-point traverses, per CARB Method 1 requirements. A two-hour sampling interval (per test run) was utilized to collect the samples. Once collected, the samples were analyzed for hexavalent chromium colorimetrically. The front- and back-half fractions were combined prior to analysis. The samples were analyzed within 48 hours of collection.

4.4 PCDD/PCDF and PAH Testing

PCDD/PCDF and PAH emission testing was performed in accordance with CARB Methods 428 and 429. Sampling was performed utilizing a Modified Method 5 sampling train, with XAD-2 resin employed as the sorbent. Front-half (probe rinse and filter) and back-half (condenser rinse and resin trap) samples were combined and analyzed utilizing high resolution gas chromatography/mass spectrometry (HRGC/MS). Quantification was provided for the following compounds:

PCDD/PCDF:

2,3,7,8 TCDD	2,3,7,8 TCDF
1,2,3,7,8 PeCDD	1,2,3,7,8 PeCDF
1,2,3,4,7,8 HxCDD	2,3,4,7,8 PeCDF
1,2,3,6,7,8 HxCDD	1,2,3,4,7,8 HxCDF
1,2,3,7,8,9 HxCDD	1,2,3,6,7,8 HxCDF
1,2,3,4,6,7,8 HpCDD	2,3,4,6,7,8 HxCDF
Total TCDD, TCDF	1,2,3,7,8,9 HxCDF
Total PeCDD, PCDF	1,2,3,4,6,7,8 HpCDF
Total HxCDD, PCDF	1,2,3,4,7,8,9 HpCDF
Total HpCDD, PCDF	
Total OCDD, PCDF	

PAH Compounds:

Naphthalene	Acenaphthylene
Acenapthene	Fluorene
Phenanthrene	Anthracene
Fluoranthene	Benzo(a)anthracene
Chrysene	Benzo(b)fluoranthene
Benzo(k)fluoranthene	Benzo(a)pyrene
Pyrene	Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene	Benzo(g,h,i)perylene

4.5 CO and THC Monitoring

CO and THC concentrations were monitored in accordance with California Air Resources Board (CARB) Method 100 using the following instrumentation:

CO	Thermo Electron Company (TECO) CO analyzer (Model 48)
THC	Ratfisch Instruments THC analyzer (Model RS-55)

Sampling was performed at a single point near the duct centroid. A condenser and glass wool filter were incorporated into the CO sampling train for conditioning of the sample gas (i.e., particulate and moisture removal). A heated sampling line was utilized in conjunction with the THC analyzer to prevent condensation of the gas stream upstream of the analyzer. THC concentrations were measured on a wet basis and corrected to dry conditions using the moisture content of the stack gas; THC levels were quantified as methane.

4.6 General

Integrated stack gas samples were collected and analyzed for $\%CO_2$, and $\%O_2$ utilizing an Orsat apparatus (CARB Method 3). These data were used to determine stack gas molecular weight.

Sampling ports were located in the 41 inch diameter stack at a point 16 feet (4.7 diameters) downstream of a bend in the duct and 5 feet (1.5 diameters) upstream of the stack discharge. The stack was equipped with two test ports which were suitable for isokinetic sampling (i.e., HCl, particulate/metals, PCDD/PCDF/PAH); the ports were positioned 90 degrees apart. A third port, used to collect the formaldehyde and benzene/vinyl chloride samples, was located approximately four feet upstream of the ports used for isokinetic sampling; this port was also used for the CO and THC monitoring.

A preliminary velocity/cyclonic flow traverse of the exhaust stack was conducted in accordance with CARB Methods 1 and 2, prior to the start of testing. These measurements,

as presented in Appendix II, confirmed the acceptability of the test sites (i.e., cyclonic flow was not present). Sketches of the stack configuration and traverse point locations are presented in Appendix II. A more detailed discussion of the test methods is presented in Appendix III.

4.7 Test Equipment Calibration

All test equipment was calibrated either prior to or during use in the field. The CO and THC monitors were calibrated with cylinder gases of known concentration immediately before and after each test period. The dry gas meter/orifice modules were calibrated immediately prior to and following the test program. Pitot tubes were also calibrated prior to use in the field and were visually inspected for damage during the test program. All thermometers, thermocouples, and temperature read-outs are routinely calibrated at six-month intervals, or immediately following any damage/repair. A post-test QA check of the thermocouples was also performed. Calibration data are presented in Appendix IV.

5.0 RESULTS AND DISCUSSION

Test results are summarized in Tables 2 through 8 and are discussed below. Supporting field data and calculations are presented in Appendix V, while laboratory data are summarized in Appendix VI.

5.1 HCl Emission Data (Table 2)

HCl emissions, as presented in Table 2, ranged from 15.5 to 20.3 gm/hr and averaged 18.0 gm/hr. Normalized to sludge feed rate, emissions averaged 10.8 gm/ton (dry).

5.2 Formaldehyde, Benzene, and Vinyl Chloride Emission Data (Table 3)

Referring to Table 3, formaldehyde emissions ranged from 0.9 to 3.2 gm/hr, averaging 2.1 gm/hr. Normalized to sludge feed rate, emissions averaged 1.2 gm/ton (dry). Benzene emissions averaged 0.5 gm/hr during Tests 2 and 3 and were less than 0.4 gm/hr during Test 1. Normalized to sludge feed rate, emissions averaged 0.3 gm/ton, dry (Tests 2 and 3). Vinyl chloride emissions were below the detection limit (0.3 gm/hr, or 0.2 gm/ton (dry)) during all three tests.

5.3 Particulate and Metals Emission Data (Tables 4 and 5)

As presented in Table 4, particulate emissions from the exhaust stack were relatively consistent from test to test, ranging from 0.63 to 0.69 lbs/hr and averaging 0.67 lbs/hr. Normalized to sludge feed rate, emissions averaged 0.42 lbs/ton (dry), or approximately 32 percent of the BAAQMD permissible rate (1.3 lbs/ton).

Referring to Table 5, emissions of the majority of metals averaged less than 1 gm/hr; exceptions included copper (1.5 gm/hr), manganese (4.5 gm/hr), mercury (2.3 gm/hr), and zinc (53 gms/hr) emissions. Beryllium and hexavalent chromium emissions were below detection limits during all three tests.

As expectected, the metals were collected predominantly in the front-half of the sampling train (i.e., on the filter or in the probe); chromium, zinc, manganese, and mercury were determined to be present in the back-half of the sampling train as well.

The blank sample contained some of the metals of interest (i.e., arsenic, chromium, manganese, selenium, and zinc). Blank quantities of arsenic, zinc, manganese, and selenium

were low with respect to sample quantities (i.e., less than 20 percent); the blank quantity of chromium averaged approximately 30 percent of sample quantities. The source of the blank-contained metals is not known, although it is believed to be attributable to background sources (e.g., the filter, reagents, solvents) and/or contamination. The data presented in Table 3 are not corrected for the blank-contained quantities.

As was noted in the particulate emission data, emissions of the metals were generally consistent from test to test. Manganese emissions were the most variable, ranging from less than 1 gm/hr (Test 6) to approximately 10 gm/hr (Test 4). The majority of the manganese was determined to be present in the back-half of the sampling train (i.e., Container D), particularly for the Test 1 sample. Considering that manganese is utilized in the back-half of the sampling train to collect mercury[1], it is possible that the source of the back-half manganese may be the impinger solution. Manganese was not determined to be present in the back-half fraction of the field blank.

Test 6 zinc emissions were approximately five times the Test 4 and 5 emissions. Review of the laboratory data (refer to Appendix VI) reveals that the majority of the zinc found in the Test 6 samples was in the Container B sample (the nitric acid rinse of the front-half of the sampling train); in contrast, the zinc quantity in the Test 6 Container A sample was not significantly higher than Tests 4 and 5. The Test 6 zinc emissions are therefore considered biased upward; contamination of the Test 6 B sample is suspected.

5.4 PCDD/PCDF and PAH Emission Data (Tables 6 and 7)

As presented in Tables 6A and 6B, emissions of all of the PCDD and PCDF compounds of interest were below detection limits during all four tests. Detection limits ranged from 0.3 (HxCDF) to 1.9 µg/hr (OCDD); normalized to sludge feed rate, the detection limits ranged from 0.2 to 1.2 µg/ton (dry). Total PCDD emissions averaged less than 5.7 µg/hr (3.8 µg/ton, dry), while total PCDF emissions averaged less than 4.1 µg/hr (2.7 µg/ton, dry). Blank quantities were also below detection limits for all compounds.

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[1] As per method specifications, 100 milliliters of potassium permanganate (KMnO4) in a sulfuric acid solution is placed in the fourth impinger of the sampling train (refer to Appendix III).

Similarly, emissions of all of the PAH compounds were below the detection limit (0.4 to 0.6 mg/hr, or 0.3 to 0.4 mg/ton) during all four test runs, with the exception of naphthalene (refer to Table 7). Relatively high levels of naphthalene were determined to be present in all four samples as well as the field blank[1]. The naphthalene data should therefore be considered suspect. Background quantities have been observed in similar blank samples previously submitted for analysis and although the source of the naphthalene is not known, it is suspected to be an impurity and/or a by-product of the break-down of the XAD-2 resin[2].

As previously noted, relatively unstable incinerator operating conditions were noted during Test 8 and therefore, an additional test (#10) was conducted during normal operations. Review of the data presented in Table 6 and 7 reveals that the unstable operating conditions did not impact observed emissions.

5.5 THC and CO Emission Data (Table 8)

As presented in Table 8, THC concentrations ranged from 9 to 17 ppm (as methane), averaging 12 ppm; corresponding THC emission rates averaged 0.6 lbs/hr (0.4 lbs/ton, dry). These data agree with published emission factors for these types of sources[3]. CO levels were more variable, ranging from 25 to 74 ppm and averaging 50 ppm; corresponding CO emission rates averaged 4.3 lbs/hr (2.7 lbs/ton, dry).

The data do not indicate that a correlation exists between the levels of THC and/or CO levels observed in the exhaust gas and emissions of the air toxics of interest (i.e., PCDD/PCDF, PAH, formaldehyde, benzene, vinyl chloride).

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1 The field blank sample contained 810 µg of naphthalene, while the quantities determined to be present in the Tests 1 through 4 samples ranged from 26 to 100 µg per sample (refer to the laboratory data presented in Appendix VI).

2 XAD is 1,4-divinyl benzene; 1,2-divinyl benzene (an impurity) can react to form naphthalene.

3 1 lb/ton (AP-42).

5.6 General

Other than noted, no sampling problems were encountered during the test program. Isokinetic sampling conditions were maintained during the HCl, metals, hexavalent chromium, and PCDD/PCDF/PAH tests, with isokinetic percentages within the allowable 100 ± 10% during all tests (refer to Appendix V). Calibrations of the monitors performed before and after each test period were in agreement (within 2 percent).

Table 1: Summary of the Test Schedule

Test ID - Date	Test Times	Parameters	Sludge Feed Rate (tph[1])
1 - 4/10/90	1138-1245 1138-1238 1139-1229	HCl, CO, THC Formaldehyde Benzene, Vinyl Chloride	1.7
2 - 4/10/90	1357-1505 1357-1457 1357-1447	HCl, CO, THC Formaldehyde Benzene, Vinyl Chloride	1.6
3 - 4/10/90	1554-1702 1554-1654	HCl, CO, THC Formaldehyde	1.7
3B - 4/10/90	1653-1730	Benzene, Vinyl Chloride	1.7
4 - 4/11/90	1027-1240	Particulate, Metals (11) Hex. Chromium, CO, THC	1.7
5 - 4/11/90	1410-1621	Particulate, Metals (11) Hex. Chromium, CO, THC	1.6
6 - 4/12/90	0833-1050	Particulate, Metals(11) Hex. Chromium, CO, THC	1.5
7 - 4/12/90	1219-1546	PCDD/PCDF, PAH, CO, THC	1.5
8 - 4/12/90	1645-2005	PCDD/PCDF, PAH, CO, THC	1.5
9 - 4/13/90	1010-1340	PCDD/PCDF, PAH, CO, THC	1.5
10 - 4/13/90	1455-1823	PCDD/PCDF, PAH, CO, THC	1.5

[1] Dry basis.

Table 2: Summary of Results - HCl Emissions

Test # (Date; Times)	Sludge Feed Rate (tph)[1]	HCl Emissions (mg/dscm)	(gm/hr)	(gm/ton)
1 (4/10/90; 1138-1245)	1.7	0.47	15.5	9.1
2 (4/10/90; 1357-1505)	1.6	0.55	18.3	11.4
3 (4/10/90; 1554-1702)	1.7	0.60	20.3	12.0
Average	1.7	0.54	18.0	10.8

[1] Dry basis.

Table 3: Summary of Results - Formaldehyde, Benzene, and Vinyl Chloride Emissions

Test # (Date; Times)	Sludge Feed Rate (tph)[1]	Parameter	Emissions (ppb)	(gm/hr)	(gm/ton)
1 (4/10/90; 1138-1238)	1.7	Formaldehyde	80	3.2	1.9
		Benzene	< 4	< 0.4	< 0.2
		Vinyl Chloride	< 4	< 0.3	< 0.2
2 (4/10/90; 1357-1457)	1.6	Formaldehyde	21	0.9	0.6
		Benzene	5.5	0.6	0.4
		Vinyl Chloride	< 4	< 0.3	< 0.2
3 (4/10/90; 1554-1654; 1653-1730)[2]	1.7	Formaldehyde	49	2.1	1.2
		Benzene	3.8	0.4	0.3
		Vinyl Chloride	< 2	< 0.2	< 0.1
Average	1.7	Formaldehyde	50	2.1	1.2
		Benzene[3]	4.7	0.5	0.3
		Vinyl Chloride	< 3	< 0.3	< 0.2

1 Dry Basis

2 Formaldehyde sampling was performed from 1554-1654, while the benzene and vinyl chloride sample was collected from 1653-1730.

3 Average values do not include Test 1 emissions, which were below the detection limit.

Table 4: Summary of Results - Particulate Emissions

Test # (Date; Times)	Sludge Feed Rate (tph)[1]	Particulate Emissions (gr/dscf)	(lbs/hr)	(lbs/ton)	Percent of Permissible[2]
4 (4/11/90; 1027-1240)	1.7	0.0043	0.69	0.41	32
5 (4/11/90; 1410-1621)	1.6	0.0041	0.69	0.43	33
6 (4/12/90; 0833-1050)	1.5	0.0037	0.63	0.42	32
Average	1.6	0.0040	0.67	0.42	32

[1] Dry basis.

[2] 1.30 lbs/ton(dry); BAAQMD Reg. 10, Rule 13.

Table 5: Summary of Results - Metals Emissions

Metal	Test 4			Test 5			Test 6			Average		
	mg/dscm	gms/hr	gms/ton[1]	mg/dscm	gms/hr	gm/ton[1]	mg/dscm	gms/hr	gm/ton[1]	mg/dscm	gm/hr	gm/ton[1]
Arsenic	0.006	0.18	0.10	0.003	0.11	0.07	0.004	0.15	0.10	0.004	0.14	0.09
Beryllium	<0.001	<0.02	<0.01	<0.001	<0.02	<0.01	<0.001	<0.02	<0.02	<0.001	<0.02	<0.01
Cadmium	0.008	0.25	0.15	0.010	0.34	0.22	0.012	0.39	0.26	0.010	0.33	0.21
Chromium:												
• Total	0.010	0.31	0.18	0.009	0.31	0.19	0.015	0.50	0.34	0.011	0.37	0.24
• Hexavalent[2]	<0.003	<0.10	<0.05	<0.003	<0.10	<0.06	<0.003	<0.10	<0.06	<0.003	<0.10	<0.06
Copper	0.037	1.19	0.70	0.043	1.42	0.89	0.054	1.84	1.23	0.045	1.49	0.94
Lead	0.018	0.57	0.34	0.026	0.88	0.55	0.027	0.91	0.61	0.024	0.79	0.50
Manganese	0.310[3]	9.95[3]	5.85[3]	0.080	2.66	1.66	0.023	0.76	0.51	0.138	4.46	2.67
Mercury	0.043	1.39	0.82	0.064	2.12	1.32	0.104	3.51	2.34	0.070	2.34	1.49
Nickel	0.002	0.07	0.04	0.001	0.05	0.03	<0.004	<0.12	<0.08	0.002[4]	0.06[4]	0.04[4]
Selenium	0.010	0.31	0.18	0.012	0.40	0.25	0.013	0.44	0.29	0.012	0.39	0.24
Zinc	0.648	20.8	12.2	0.716	23.7	14.8	3.40[3]	115[3]	76.6[3]	1.59	53.2	34.6

1 Dry Basis.
2 Hexavalent chromium emissions were determined using a separate sampling train; testing was performed concurrently with the other metals.
3 Data suspect; refer to discussion in text.
4 Average of Tests 4 and 5 data; Test 6 emissions were below the detection limit.

Table 6A: Summary of Results - PCDD Emissions

Test # (Date)	#7 4/12/90			#8 4/12/90			#9 4/13/90			#10 4/13/90			Average		
	(ng/ dscm)	(µg/ hr)	(µg/ ton)	(ng/ dscm)	(µg/ hr)	(µg/ ton)	(ng/ dscm)	(µg/ hr)	(µg/ ton)	(ng/ dscm)	(µg/ hr)	(µg/ ton)	(ng/ dscm)	(µg/ hr)	(µg/ ton)
2378 TCDD	<0.011	<0.4	<0.2	<0.028	<0.9	<0.6	<0.026	<0.9	<0.6	<0.047	<1.6	<1.0	<0.028	<0.9	<0.6
Total TCDD	<0.011	<0.4	<0.2	<0.028	<0.9	<0.6	<0.034	<1.1	<0.7	<0.054	<1.8	<1.2	<0.032	<1.0	<0.7
12378 PeCDD	<0.029	<1.0	<0.6	<0.024	<0.8	<0.5	<0.022	<0.7	<0.5	<0.028	<0.9	<0.6	<0.026	<0.9	<0.6
Total PeCDD	<0.029	<1.0	<0.6	<0.024	<0.8	<0.5	<0.023	<0.7	<0.5	<0.047	<1.6	<1.0	<0.031	<1.0	<0.7
123478 HxCDD	<0.024	<0.8	<0.5	<0.020	<0.7	<0.4	<0.028	<0.9	<0.6	<0.025	<0.8	<0.6	<0.024	<0.8	<0.5
123678 HxCDD	<0.024	<0.8	<0.5	<0.021	<0.7	<0.5	<0.029	<0.9	<0.6	<0.025	<0.8	<0.6	<0.025	<0.8	<0.5
123789 HxCDD	<0.024	<0.8	<0.5	<0.020	<0.7	<0.4	<0.029	<0.9	<0.6	<0.026	<0.9	<0.6	<0.025	<0.8	<0.5
Total HxCDD	<0.024	<0.8	<0.5	<0.021	<0.7	<0.5	<0.029	<0.9	<0.6	<0.026	<0.9	<0.6	<0.025	<0.8	<0.5
1234678 HpCDD	<0.026	<0.9	<0.6	<0.055	<1.8	<1.2	<0.025	<0.8	<0.6	<0.041	<1.4	<0.9	<0.037	<1.2	<0.8
Total HPCDD	<0.026	<0.9	<0.6	<0.055	<1.8	<1.2	<0.025	<0.8	<0.6	<0.044	<1.5	<1.0	<0.038	<1.3	<0.9
12346789 OCDD	<0.053	<1.8	<1.2	<0.046	<1.5	<1.0	<0.040	<1.3	<0.9	<0.056	<1.9	<1.2	<0.049	<1.6	<1.1
Total OCDD	<0.053	<1.8	<1.2	<0.046	<1.5	<1.0	<0.040	<1.3	<0.9	<0.056	<1.9	<1.2	<0.049	<1.6	<1.1
TOTAL PCDD	<0.14	<4.8	<3.2	<0.18	<5.8	<3.8	<0.15	<4.9	<3.3	<0.23	<7.5	<5.0	<0.17	<5.7	<3.8

Table 6B: Summary of Results - PCDF Emissions

Test # (Date)	#7 4/12/90			#8 4/12/90			#9 4/13/90			#10 4/13/90			Average		
	(ng/ dscm)	(µg/ hr)	(µg/ ton)	(ng/ dscm)	(µg/ hr)	(µg/ ton)	(ng/ dscm)	(µg/ hr)	µg/ ton	(ng/ dscm)	(µg/ hr)	(µg/ ton)	(ng/ dscm)	(µg/ hr)	(µg/ ton)
2378 TCDF	<0.006	<0.3	<0.2	<0.012	<0.4	<0.3	<0.012	<0.4	<0.3	<0.038	<1.2	<0.8	<0.017	<0.6	<0.4
Total TCDF	<0.006	<0.3	<0.2	<0.013	<0.4	<0.3	<0.012	<0.4	<0.3	<0.049	<1.6	<1.1	<0.020	<0.7	<0.4
12378 PeCDF	<0.021	<0.7	<0.5	<0.018	<0.6	<0.4	<0.025	<0.8	<0.5	<0.026	<0.9	<0.6	<0.023	<0.7	<0.5
23478 PECDF	<0.022	<0.7	<0.5	<0.019	<0.6	<0.4	<0.025	<0.8	<0.5	<0.026	<0.9	<0.6	<0.023	<0.8	<0.5
Total PeCDF	<0.022	<0.7	<0.5	<0.019	<0.6	<0.4	<0.043	<1.4	<0.9	<0.029	<1.0	<0.7	<0.028	<0.9	<0.6
123478 HxCDF	<0.013	<0.4	<0.3	<0.013	<0.4	<0.3	<0.012	<0.4	<0.3	<0.018	<0.6	<0.4	<0.014	<0.5	<0.3
123678 HxCDF	<0.013	<0.4	<0.3	<0.014	<0.5	<0.3	<0.012	<0.4	<0.3	<0.018	<0.6	<0.4	<0.014	<0.5	<0.3
234678 HxCDF	<0.013	<0.4	<0.3	<0.014	<0.5	<0.3	<0.012	<0.4	<0.3	<0.017	<0.6	<0.4	<0.014	<0.5	<0.3
123789 HxCDF	<0.013	<0.4	<0.3	<0.013	<0.4	<0.3	<0.012	<0.4	<0.3	<0.017	<0.6	<0.4	<0.014	<0.5	<0.3
Total HxCDF	<0.013	<0.4	<0.3	<0.014	<0.5	<0.3	<0.013	<0.4	<0.3	<0.018	<0.6	<0.4	<0.014	<0.5	<0.3
1234678 HPCDF	<0.017	<0.6	<0.4	<0.022	<0.7	<0.5	<0.017	<0.6	<0.4	<0.050	<1.7	<1.1	<0.027	<0.9	<0.6
1234789 HPCDF	<0.017	<0.6	<0.4	<0.023	<0.8	<0.5	<0.017	<0.5	<0.4	<0.053	<1.7	<1.2	<0.027	<0.9	<0.6
Total HPCDF	<0.017	<0.6	<0.4	<0.023	<0.8	<0.5	<0.017	<0.6	<0.4	<0.053	<1.7	<1.2	<0.027	<0.9	<0.6
1234678 OCDF	<0.031	<1.0	<0.7	<0.032	<1.1	<0.7	<0.031	<1.0	<0.7	<0.041	<1.4	<0.9	<0.034	<1.1	<0.7
Total OCDF	<0.031	<1.0	<0.7	<0.032	<1.1	<0.7	<0.031	<1.0	<0.7	<0.041	<1.4	<0.9	<0.034	<1.1	<0.7
TOTAL PCDF	<0.091	<3.0	<2.0	<0.10	<3.3	<2.2	<0.12	<3.8	<2.5	<0.19	<6.3	<4.2	<0.12	<4.1	<2.7

Table 7: Summary of Results - PAH Emissions

Test #	7			8			9			10			AVG		
PAH Compound	ng/ dscm	µg/ hr	µg/ ton	ng/ dscm	µg/ hr	µg/ ton	ng/ dscm	µg/ hr	µg/ ton	ng/ dscm	µg/ hr	µg/ ton	ng/ dscm	µg/ hr	µg/ ton
Naphthalene	14	464	309	14	455	303	31	1,020	679	8	270	18	17	552	327
Acenaphthylene	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4
Acenaphthene	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4
Fluorene	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4
Phenanthrene	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
Anthracene	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
Fluoranthene	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
Pyrene	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
Chrysene	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
B(a)A[1]	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
B(b)F[1]	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
B(k)F[1]	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
B(a)P[1]	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
I(c,d)P[1]	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3
D(a,h)A[1]	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4	<0.02	<0.6	<0.4
B(ghi)P[1]	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3	<0.01	<0.4	<0.3

1 B(a)A Benzo(a)anthracene
B(b)F Benzo(b)fluoranthene
B(k)F Benzo(k)fluoranthene
B(a)P Benzo(a)pyrene
I(c,d)P Indeno(1,2,3-cd)pyrene
D(a,h)A Dibenzo(a,h)anthracene
B(ghi)P Benzo(ghi)perylene

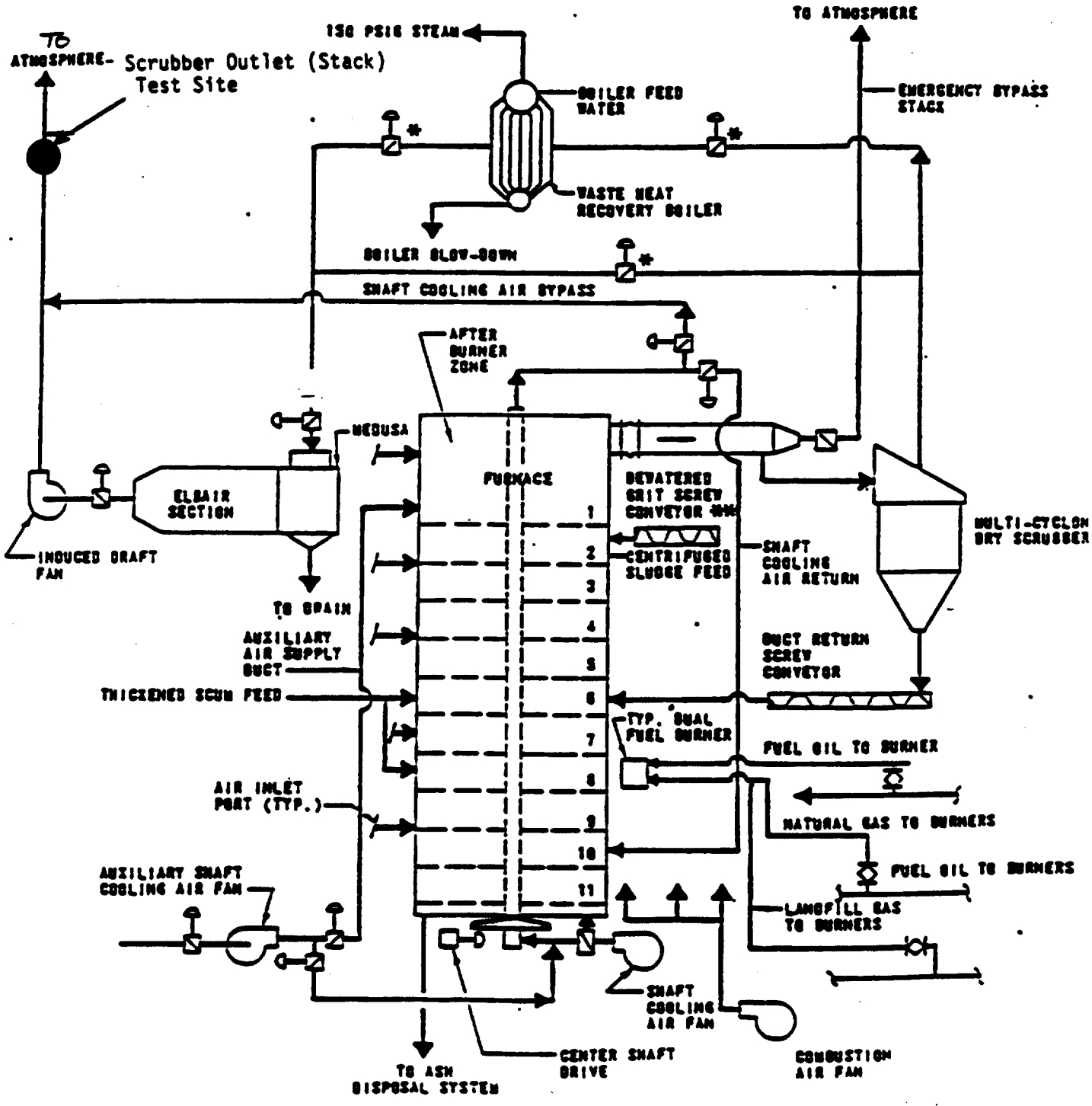
Table 8: Summary of Results - THC and CO Emissions

Test ID (Date; Times)	Sludge Feed Rate (tph)[2]	THC[1] ppm	THC[1] lbs/hr	THC[1] lbs/ton[2]	Carbon Monoxide ppm	Carbon Monoxide lbs/hr	Carbon Monoxide lbs/ton[2]
1 - 4/10/90 (1138-1245)	1.7	13	0.6	0.4	35	2.9	1.7
2 - 4/10/90 (1357-1505)	1.6	9	0.4	0.3	74	6.3	3.9
3 - 4/10/90 (1554-1702)	1.7	10	0.5	0.3	26	2.3	1.3
4 - 4/11/90 (1027-1240)	1.7	11	0.5	0.3	29	2.4	1.4
5 - 4/11/90 (1410-1621)	1.6	10	0.5	0.3	57	4.8	3.0
6 - 4/12/90 (0835-1050)	1.5	13	0.6	0.4	61	5.3	3.5
7 - 4/12/90 (1219-1546)	1.5	14	0.7	0.4	51	4.3	2.9
8 - 4/12/90 (1645-2005)	1.5	11	0.5	0.3	71	6.0	4.0
9 - 4/13/90 (1010-1340)	1.5	16	0.8	0.5	59	4.9	3.3
10 - 4/13/90 (1455-1823)	1.5	17	0.8	0.6	39[3]	3.3	2.2
Average	1.6	12	0.6	0.4	50	4.3	2.7

1 As methane.
2 Dry basis.
3 Average level monitored from 1455-1744; CO levels exceeded 200 ppm from 1744-1823.

APPENDIX I: PROCESS OPERATING DATA

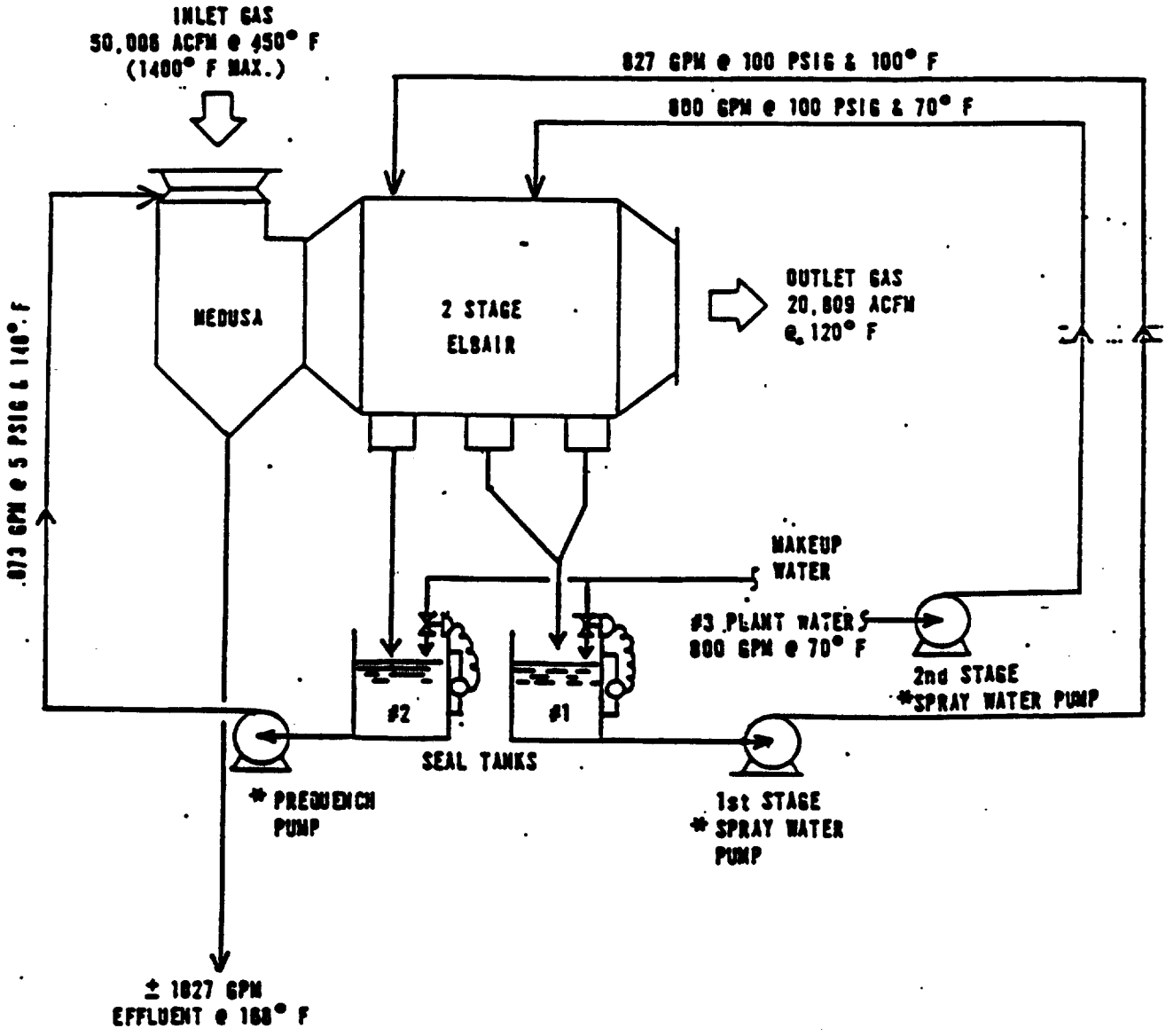
Figure I-1: The Multiple Hearth Incinerator System



* FUTURE BOILER BYPASS SYSTEM

** NO LONGER IN USE

Figure I-2: The Wet Scrubber Water Supply/Disposal System - Flow Diagram



NOTES: ABOVE VALUES DESIGN FLOW

* SECOND PUMP NOT

Table I-1: Summary of Incinerator Operating Data - Tests 1-6

Test# - Date (Times)	Sludge Data: Feed Rate[1] (tph)	Sludge Data: Solids Content (%)	Avg. Hearth Temperatures (°F): 1	2	3	4	5	Scrubber ΔP (in. H_2O)	Exhaust Gas Data: O_2 Content (%)	Exhaust Gas Data: Opacity (%)
HCl, Benzene, Vinyl Chloride, Formaldehyde Tests:										
1 - 4/10/90 (1138-1245)	1.7 (7.6)	22.5	1249	1243	1540	1567	1372	8.3	5.3	5.0
2 - 4/10/90 (1357-1505)	1.6 (7.7)	21.0	1253	1245	1506	1550	1333	8.4	7.2	5.2
3 - 4/10/90 (1554-1702)	1.7 (7.0)	23.5	1284	1269	1542	1567	1307	--[3]	5.8	5.6
3B[2] - 4/10/90 (1653-1730)	1.7 (7.4)	22.3	1431	1357	1823	1809	1271	--[3]	8.4	5.2
Average	1.7 (7.4)	22.3	1304	1278	1603	1623	1321	8.4	6.7	5.2
Metals, Hexavalent Chromium Tests:										
4 - 4/11/90 (1027-1243)	1.7 (7.7)	21.4	1284	1273	1531	1584	1216	7.5	5.6	4.6
5 - 4/11/90 (1410-1624)	1.6 (7.6)	21.6	1245	1228	1536	1614	1381	8.3	5.6	5.0
6 - 4/12/90 (0833-1052)	1.5 (6.8)	23.0	1268	1238	1559	1614	1095	7.9	7.4	5.0
Average	1.6 (7.4)	22.0	1266	1246	1542	1604	1231	7.9	6.2	4.9

[1] Dry basis; parenthetical values represent wet feed rates.

[2] Benzene and vinyl chloride testing (only) was performed during Test 3B; benzene and vinyl chloride testing was not performed during Test 3.

[3] No data were recorded.

Table I-2: Summary of Incinerator Operating Data - Tests 7 - 10

Test# - Date (Times)	Sludge Data: Feed Rate[1] (tph)	Sludge Data: Solids Content (%)	Avg. Hearth Temperatures (°F): 1	2	3	4	5	Scrubber ΔP (in. H_2O)	Exhaust Gas Data: O_2 Content (%)	Exhaust Gas Data: Opacity (%)
PCDD/PCDF, PAH Tests:										
7 - 4/12/90 (1219-1546)	1.5 (6.4)	24.0	1239	1194	1510	1552	1058	7.8	8.0	5.4
8 - 4/12/90 (1645-2005)	1.5 (6.3)	24.5	1254	1133	1531	1565	1061	7.8	6.5	5.2
9 - 4/13/90 (1010-1340)	1.5 (6.6)	24.0	1245	1072	1460	1492	1231	7.9	6.5	5.3
10 - 4/13/90 (1455-1823)	1.5 (6.4)	24.1	1197	1088	1509	1509	1193	7.4	6.7	5.5
Average	1.5 (6.4)	24.2	1233	1122	1503	1530	1136	7.7	6.9	5.4

[1] Dry basis; parenthetical values represent wet feed rates.

Incinerator Operating Data - HCl, Benzene, Vinyl Chloride, and Formaldehyde Tests (4/10/90)

SLUDGE FEED DATA SHEET

DATE: 4-10-90

Time (Example: 8% = .08)	Feed Concentration	Centrate Concentration (.4% = 0.004)	Cake Concentration (20% = 0.20)	Capture = (feed − centrate) × cake / (cake − centrate) × feed (.08 − .004) × .20 / (.20 − .004) × .08 = 0.95)	Centrifuge Flow gpm (85 gpm)	Dry Furnace Feed = flow × 8.34 × 60 × feed × capture (85 × 8.34 × 60 × .08 × .95 = 2424 lb/hr)	Wet Furnace Feed = Dry Feed / cake (2424 / .28 = 8,823 lb/hr)
2400	.062	.0046	.250	94	76	2223	8,895
		.0063	.235	92	73	2090	8,896 (17,792)
0200	.049	.0054	.223	91	74	1654	7,419
		.0034	.213	94	76	1654	7,967 (15,186)
0400	.046	.0019	.218	96	76	1691	7,761
		.0010	.217	98	73	1651	7,610 (15,371)
0600	.049	.0029	.190	95	77	1803	9,493
		.0010	.219	98	74	1785	8,153 (17,646)
0800	.045	.0046	.220	94	76	1616 3136	7345
		.0049	.210	91	74	1520	7290 14,585
1000	.047	.0051	.220	95	75	1671 3237	7596
		.0052	.210	91	73	1566	7456 15,052
1200	.048	.0040	.230	93	76	1703 3415	7404
		.0030	.220	95	75	1712 (1.71)	7783 (7.59) 15,187
1400	.046	.0057	.220	94	76	1636 3232	7437
		.0037	.200	94	74	1596 (1.62)	7779 (7.71) 15416
1600	.050	.0061	.24	88	75	1647 3358	6864
		.0044	.23	91	75	1711 (1.68)	7129 (7.00) 13993
1800	.047	.0046	.21	90	75	1591 3231	7577
		.0033	.20	93	75	1640 (1.62)	8200 (7.88) 15777
2000	.046	.0045	.21	90	75	1557	7414
		.0037	.23	92	75	1587	6902 14,316
2200	.046	.0042	.22	91	75	1568	7130
		.0036	.22	92	75	1591	7233 14,363

#1 #2

- Formaldehyde
- HCl
- Benzene

- Formaldehyde
2-HCl
Benzene

Formaldehyde
3-HCl

Benzene

4339 - 3/85

Test 1 1/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-10-90 @ 1145

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE %	AIR PORT POSITION	COMMENTS
1	1269	1200	1	0		
2	1271	1210	4	90%		
3	1594	1400	2	0		
4	1610	off ~~1400~~	0	0		
5	1471	1400	3	30		
6	1017	1000	3	25		
7	476	off ~~400~~	0	0	70%	
8	433	~~400~~	0	0		
9	506	~~400~~	0	0	70%	
10	453	~~400~~	0	0		
11	200		←	←		

SHAFT RECYCLE AIR: 0 I.D. FAN % 54% SCRUBBER DP 8.38

PERCENT OXYGEN: 6.4 DRAFT: -.25

SHAFT RPM: 2.2 OPACITY: 5.00%

Phil Huntsman

Test 1 2/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-10-90 @ 1200

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE %	AIR PORT POSITION %	COMMENTS
1	1254	1200	1	Ø		
2	1257	1210	4	95		
3	1576	1400	2	Ø		
4	1607	~~1400~~	Ø	Ø		
5	1390	1400	3	Ø		
6	948	900	3	25		
7	365	~~400~~	Ø	Ø	70	
8	294	~~400~~	Ø	Ø		
9	273	~~400~~	Ø	Ø	70	
10	261	~~400~~	Ø	Ø		
11	200		—	—		

SHAFT RECYCLE AIR: Ø I.D. FAN % 53% SCRUBBER DP 8.06

PERCENT OXYGEN: 5.7% DRAFT: -.27

SHAFT RPM: 2.2 OPACITY: 5.04

Chief Hunter

Test 1 3/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-10-90 1215

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE %	AIR PORT POSITION %	COMMENTS
1	1236	1200	1	Ø		
2	1232	1210	4	100		
3	1545	1400	2	Ø		
4	1582	~~1400~~	Ø	Ø		
5	1344	1400	2	Ø		
6	898	900	3	25		
7	354	~~400~~	Ø	Ø	70	
8	276	~~400~~	Ø	Ø		
9	256	~~400~~	Ø	Ø	70	
10	249	~~400~~	Ø	Ø		
11	200	—	—	-		

SHAFT RECYCLE AIR: Ø I.D. FAN % 54% SCRUBBER DP 8.21

PERCENT OXYGEN: 7.3 DRAFT: -.32

SHAFT RPM: 2.2 OPACITY: 4.80

Phil Huntsman

Test 1 4/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-10-90 1230

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1233	1200	1	0		
2	1209	1210	4	100		
3	1474	1400	2	0		
4	1527	~~1400~~	0	0		
5	1323	1400	2	0		
6	904	900	3	40		
7	366	~~400~~	0	0	70	
8	261	~~400~~	0	0	—	
9	233	~~400~~	0	0	75	
10	230	~~400~~	0	0		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 52% SCRUBBER DP 8.42

PERCENT OXYGEN: 3.8 DRAFT: -.22

SHAFT RPM: 2.2 OPACITY: 5.17

Phil Hamilton

Test 1 5/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-10-90 1245

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE %	AIR PORT POSITION	COMMENTS
1	1252	1200	1	0		
2	1246	1210	4	30		
3	1491	1400	2	0		
4	1541	~~1400~~	0	0		
5	1332	1400	2	~~50~~		
6	944	900	3	0		
7	541	~~400~~	0	0	70	
8	331	~~400~~	0	0		
9	235	~~400~~	0	0	75	
10	237	~~400~~	0	0		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 53 SCRUBBER DP 8.38

PERCENT OXYGEN: 3.4 DRAFT: -.28

SHAFT RPM: 2.2 OPACITY: 5.19

Chief Hunter

TEST 2 1/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-10-90 1400

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1254	1220	1	0		
2	1252	1220	4	32		
3	1560	1420	2	0		
4	1599	1380	—	0		
5	1334	1330	2	85		
6	895	900	3	15		
7	413	400	—	0	83	
8	258	380	—	0		
9	200	400	—	0	83	
10	206	380	—	0		
11	200					

SHAFT RECYCLE AIR: 0 I.D. FAN % 55.5 SCRUBBER DP 8.52

PERCENT OXYGEN: 6.3 DRAFT: 0.35

SHAFT RPM: 2.2 OPACITY: 5.5

TEST 2 4/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-20-90 1445

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1257	1220	1	0		
2	1242	1920	4	38		
3	1551	1420	2	0		
4	1592	1380	0	0		
5	1335	1720	2	35		
6	897	900	3	15		
7	390	400	0	0	80%	
8	243	380	0	0		
9	200	400	0	0	80%	
10	200	380	0	0		
11	200					

SHAFT RECYCLE AIR: 0 I.D. FAN % 54% SCRUBBER DP 8.17

PERCENT OXYGEN: 6.2 DRAFT: -36

SHAFT RPM: 2.2 OPACITY: 5.24

TEST 2 5/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-10-90 1500

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1250	1200	1	0		
2	1240	1210	4	50		
3	1409	1400	2	80		
4	1455	~~1400~~	0	0		
5	1326	1400	2	0		
6	897	900	3	20		
7	384	~~400~~	0	0	70	
8	286	~~400~~	0	0		
9	236	~~400~~	0	0	70	
10	200	~~400~~	0	0		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 52 SCRUBBER DP 8.33

PERCENT OXYGEN: 8.9 DRAFT: -.37

SHAFT RPM: 2.2 OPACITY: 4.84

Phil Huntsman

90.0462

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 7/10/90 1600

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1252	1250	1	0%		
2	1247	1225	4	30%		
3	1407	1400	2	90%		
4	1408	1400	Ø	0%		
5	1319	1300	2	0%		
6	910	900	3	0%		
7	460	400	Ø	0%	50%	
8	256	400	Ø	0%		
9	200	400	Ø	0%	60%	
10	200	400	Ø	0%		
11	200	400	Ø	0%		

SHAFT RECYCLE AIR: Ø I.D. FAN % 54 SCRUBBER DP _____

PERCENT OXYGEN: 3.4 DRAFT: -.35

SHAFT RPM: 2.2 OPACITY: 7.67

TEST 3 2/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/16/90 1615

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1252	1250	1	0%		
2	1249	1225	4	65%		
3	1504	1400	2	0%		
4	1530	1400	6	0%		
5	1312	1300	2	0%		
6	984	900	3	25%		
7	366	400	0	0%	100%	
8	218	400	0	0%		
9	200	400	0	0%	100%	
10	200	400	0	0%		
11	200	400	0	0%		

SHAFT RECYCLE AIR: 0 I.D. FAN % 56 SCRUBBER DP _____

PERCENT OXYGEN: 7.2 DRAFT: -.35

SHAFT RPM: 2.2 OPACITY: 4.87

TEST 3 3/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/10/90 1630

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1260	1250	1	0%		
2	1277	1225	4	40%		
3	1472	1400	2	15%		
4	1527	1400	Ø	0%		
5	1297	1300	2	35%		
6	890	900	3	25%		
7	361	400	Ø	0%	100%	
8	210	400	Ø	0%		
9	200	400	Ø	0%	100%	
10	200	400	Ø	0%		
11	200	400	Ø	0%		

SHAFT RECYCLE AIR: 0% I.D. FAN % 56 SCRUBBER DP _____

PERCENT OXYGEN: 5.39% DRAFT: -.35

SHAFT RPM: 2.2. OPACITY: 5.12

TEST 4 4/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/16/90 1645

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1284	1250	1	0%		
2	1260	1225	4	15%		
3	1591	1400	2	0%		
4	1612	1400	0	0%		
5	1309	1300	2	20%		
6	905	900	3	25%		
7	327	400	Ø	0%	100%	
8	200	400	Ø	0%		
9	200	400	Ø	0%	100%	
10	200	400	Ø	0%		
11	200	400	Ø	0%		

SHAFT RECYCLE AIR: 0 I.D. FAN % 54 SCRUBBER DP _____

PERCENT OXYGEN: analyzer failed DRAFT: -.35

SHAFT RPM: 2.2 OPACITY: 4.89

TEST 3 5/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/10/90 1700

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1372	1250	1	0%		
2	1311	1225	4	0%		
3	1741	1400	0	0%	30%	
4	1756	1400	0	0%		
5	1296	1300	2	55%		
6	908	900	3	30%		
7	325	400	Ø	0%	100%	
8	200	400	Ø	0%		
9	200	400	Ø	0%	100%	
10	200	400	Ø	0%		
11	200	400	Ø	0%		

SHAFT RECYCLE AIR: 0% I.D. FAN % 57 SCRUBBER DP _____

PERCENT OXYGEN: 7.3% DRAFT: -.35

SHAFT RPM: 2.2 OPACITY: <5-51

1/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD
Location Unit 2 stack
Date 4/10/98
Run Number 2-HCl
Operator DR/KP
Sample Box ID 2B-2
Meter Box ID 005
Probe ID 4' sheathed
Filter # —

Meter δ 1.006
Meter ΔH@ 1.72
Pilot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.313
C Factor 1.20
Ambient Temperature 75
Barometric Pressure 30.08
Silica Gel # —

Static Pressure:
Traverse Pt. B4
Pwake -0.22
Pstatic

Water Collected:
Impingers, ml. 216-200 = 16
Silica Gel, gms. 9.6
15.6

V_i = 257.922 Orsat # 09
CO_2 - 5.6 O_2 14.6

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
start 1:51 B1	2.5	122	0.30	0.46	258.9	82	90	240	244	82	2
2	5	123	0.33	0.49	260.0	83	89	242	242	85	2
3	7.5	123	0.34	0.52	—	85	89	243	226	86	2
* 4	10	128	0.38	0.59	262.1	89	89	240	221	89	2
5	12.5	128	0.37	0.57	—	91	89	241	222	87	2
6	15	136	0.41	0.62	—	91	89	239	223	88	2
7	17.5	169	0.52	0.80	265.7	91	89	238	224	84	2
8	20	174	0.57	0.86	267.0	91	89	236	223	80	2.5
9	22.5	176	0.61	0.94	268.4	91	89	234	225	78	3
10	25	177	0.64	0.98	269.8	92	89	234	222	79	3
stop 11	27.5	175	0.64	0.98	271.2	93	89	232	223	78	3
2:27 12	30	175	0.62	0.96	272.664	93	89	232	225	80	3

TEST 3B 2/3

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/10/90 1715

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1450	1250	1	0%		
2	1386	1225	4	0%		
3	1867	1400	Ø	0%	30%	
4	1821	1400	Ø	0%		
5	1256	1300	2	100%	30%	
6	906	900	3	30%		
7	311	400	Ø	0%	100%	
8	200	400	Ø	0%		
9	200	400	Ø	0%	100%	
10	200	400	Ø	0%		
11	200	400	Ø	0%		

SHAFT RECYCLE AIR: 0% I.D. FAN % 60% SCRUBBER DP _____

PERCENT OXYGEN: 7.6 DRAFT: -.35

SHAFT RPM: 2.2 OPACITY: 4.8

TEST 3B

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/10/90 1730

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1471	1250	1	0%		
2	1374	1225	4	0%		
3	1862	1400	0	0%	60%	
4	1850	1400	0	0%		
5	1262	1300	2	100%	60%	
6	879	900	3	60%		
7	299	400	Ø	0%	100%	
8	200	400	Ø	0%		
9	200	400	Ø	0%	100%	
10	200	400	Ø	0%		
11	200	400	Ø	0%		

SHAFT RECYCLE AIR: 0% I.D. FAN %: 63% SCRUBBER DP: _____

PERCENT OXYGEN: 10.4 DRAFT: -.35

SHAFT RPM: 2.2 OPACITY: 5.38

Test 2 2/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/10-90 1445

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1250	1220	1	&		
2	1248	1220	4	36		
3	1524	1420	2	&		
4	1580	1380	&	&		
5	1334	~~900~~ 1270	2	58		
6	899	900	3	&		
7	1101	1100	&	&	80%	
8	253	380	&	&		
9	200	400	&	&	80%	
10	202	380	&	&		
11	200			&		

SHAFT RECYCLE AIR: & I.D, FAN % [redacted]54 SCRUBBER DP 8.36

PERCENT OXYGEN: 7.0 DRAFT: -.35%

SHAFT RPM: 2.2 OPACITY: 5.64

TEST 2 3/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

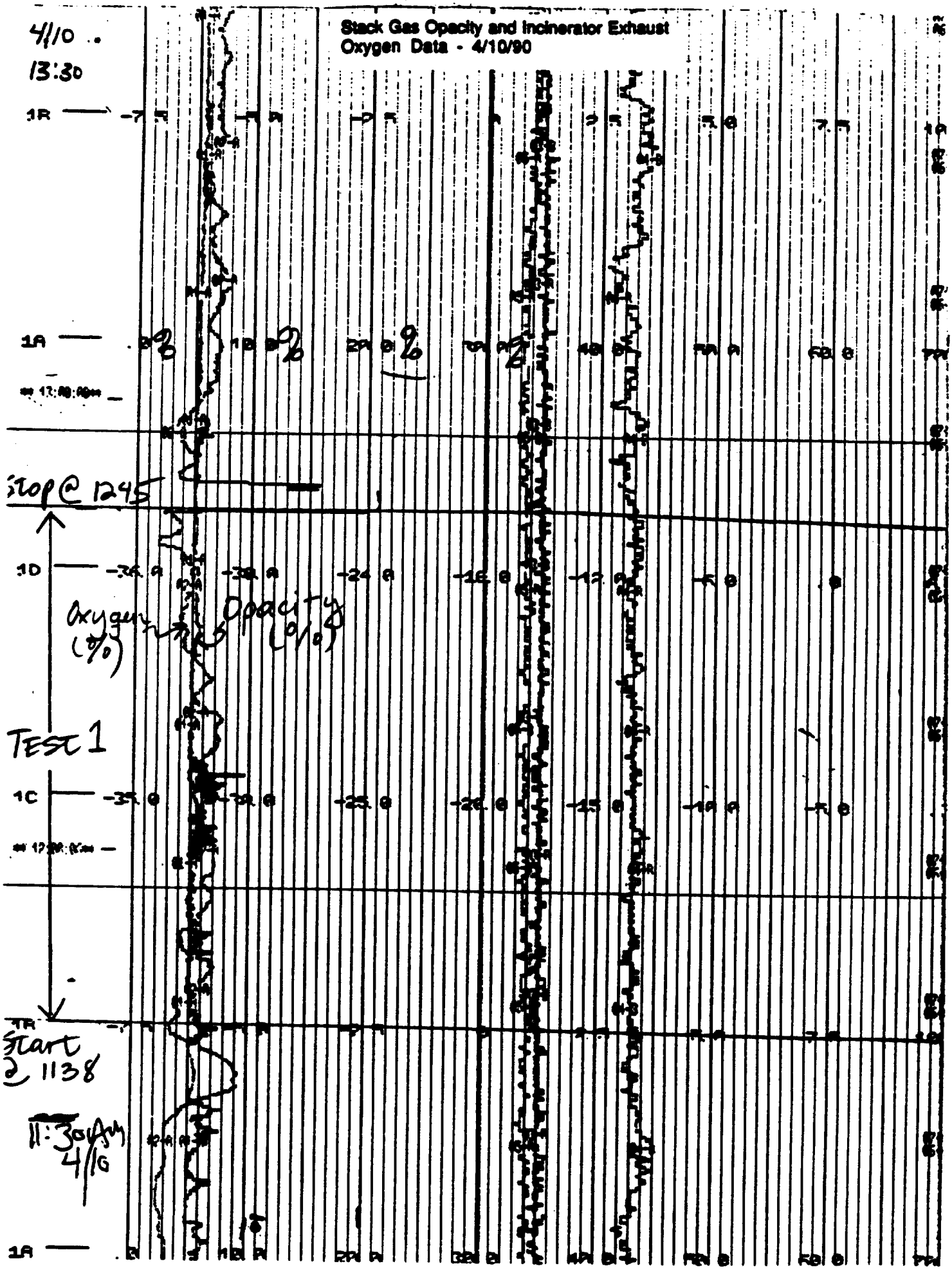
DATE/TIME: 4-10-90 1430

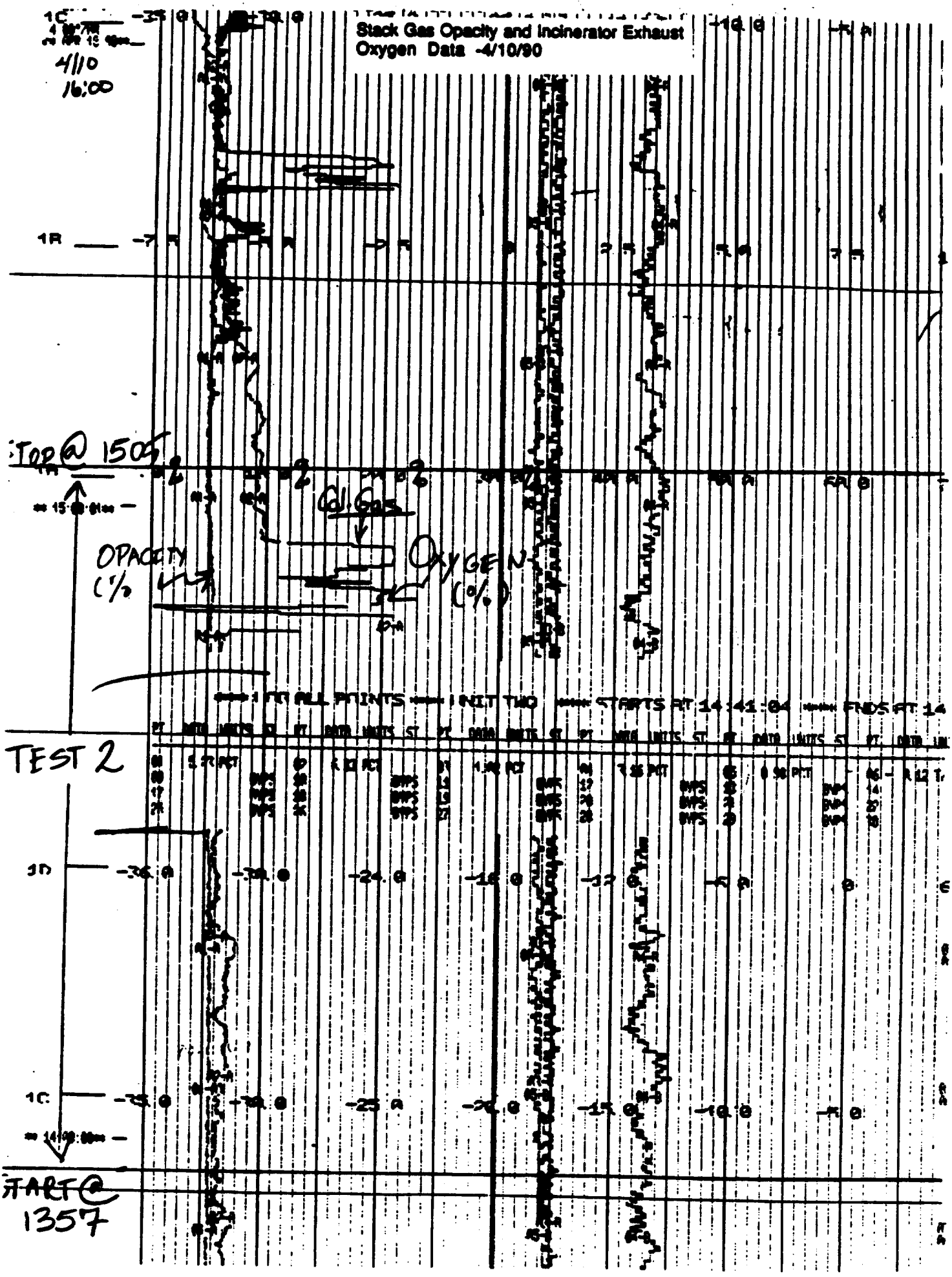
HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1252	1220	6	1		
2	1244	1220	36	4		
3	1484	1420	6	2		
4	1524	1350	6	6		
5	1374	1350	56	2		
6	900	900	6	3		
7	395	4100	6	6	80%	
8	248	380	6	6		
9	200	4100	6	6	80%	
10	201	380	6	6		
11	200					

SHAFT RECYCLE AIR: 0 I.D. FAN % 54 SCRUBBER DP 8.44

PERCENT OXYGEN: 7.4 DRAFT: -.36

SHAFT RPM: 3.2 OPACITY: 5.55


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/10/90
4/10 ..
13:30
1R
1A
1B
2A
2B
Stop @ 1245
1D
Oxygen (%)
Opacity (%)
TEST 1
1C
Start @ 1138
11:30 AM 4/16
1A


Stack Gas Opacity and Incinerator Exhaust Oxygen Data -4/10/90
4/10
16:00
TOP @ 1505
OPACITY (%)
Cal Gas
OXYGEN (%)
TEST 2
START @ 1357

Incinerator Operating Data - Metals and Hexavalent Chromium Tests (4/11,12/90)

SLUDGE FEED DATA SHEET

DATE: 4/1-90

Time	Feed Concentration	Centrate Concentration	Cake Concentration	Capture = (feed - centrate) × cake / (cake - centrate) × feed	Centrifuge Flow gpm	Dry Furnace Feed = flow × 8.34 × 60 × feed × capture	Wet Furnace Feed = Dry Feed / cake
Example	4% = .04	.4% = 0.004	28% = 0.28	(.04 - .004) × .28 / (.28 - .004) × .04 = 0.95	85 gpm	85 × 8.34 × 60 × .04 × .95 = 2424 lb/hr	2424 / .28 = 8,323 lb/hr
2400	.047	.0010	23.3	48	76	1751	7,517 (15,441)
		.0021	.208	96	73	1648	7,924
0200	.049	.0033	.215	94	76	1765	8,209
		.0064	.208	89	73	1605	7718 (15,927)
0400	.049	.0041	.239	89	75	1652	6912
		.0028	.194	95	73	1700	8,588 (15,500)
0600	.059	.0029	.244	96	76	2159	8,849
		.0018	.212	97	73	2108	10,434 (19,285)
0800 1		.0021	.227	95%	74	1688 3358	7438 15,548
2	.048	.0044	.206	94%	74	1670	8110
1000 1		.0051	.223	91%	76	1661 3326	7449 16079
2	.046	.0031	.193	95%	73	1665 (1.66)	8630 (8.04)
1200 1		.0055	.231	91%	75	1673 3283	7244 14,915
2	.049	.0060	.210	90%	73	1610 (1.64)	7671 (7.46)
1400 1		.0054	.232	91%	71	1584 3212	6828 14,972
2	.049	.0057	.200	91%	73	1628 (1.61)	8,144 (7.49)
1600	.050	.0049	.23	90	75	1692 3324	7359
		.0065	.20	87	75	1632 (1.66)	8162 15521 (7.76)
1800	.048	.0045	.23	91	75	1632	7098
		.0062	.22	87	75	1568	7130 14,228
2000	.045	.0045	.23	90	75	1519	6608
		.0063	.22	86	75	1452	6601 13,209
2200	.048	.0015	.23	97	75	1745	7587
		.0058	.23	88	75	1583	6885 14473

M. Mode 4 Heater

M. Mode 3 Heater

4339 - 3/95

SLUDGE FEED DATA SHEET

DATE: 4-12-90

Time	Feed Concentration	Centrate Concentration	Cake Concentration	Capture = (feed − centrate) × cake / (cake − centrate) × feed	Centrifuge Flow gpm	Dry Furnace Feed = flow × 8.34 × 60 × feed × capture	Wet Furnace Feed = Dry Feed / cake
Example	6% = .06	.4% = 0.004	28% = 0.28	(.06 − .004) × .28 / (.28 − .004) × .06 = 0.86	65 gpm	65 × 8.34 × 60 × .06 × .86 = 2424 lb/hr	2424 / .28 = 8,823 lb/hr
#1 2400	.047	.0058	.235	89	65	1372	5,846
#2		.0070	.242	87	62	1277	5280 (11,126)
0200	.047	.0070	.255	98	65	1502	5,890
		.0121	.216	96	62	1406	6,612 (12,402)
0400	.049	.0028	.233	95	65	1520	6,527
		.0117	.222	97	62	1478	6,66 (13,188)
0600	.051	.0045	.244	92	63	1493	6,118
		.0087	.239	94	65	1562	6,535 (12,653)
0800 1		.0052	.247	92%	65	1556	6299
2	.1052	.0075	.205	95%	62	1532 3088 (1.54)	7476 13,775 (6.89)
1000 1		.0027	.224	96%	65	1592	6805
2	.051	.0035	.220	94%	63	1511 3103 (1.55)	6486 13,291 (6.65)
1200 1		.0031	.238	95%	65	1575	6621
2	.051	.0041	.240	93%	62	1471 3046 (1.52)	6131 12,752 (6.38)
1400 1	.050	.0031	.250	.95	65	1545	6178
2		.0030	.220	.95	63	1502 3047 (1.53)	6828 13,006 (6.50)
1600	.051	.0032	.250	.95	65	1575	6700
		.0039	.240	.94	63	1509 3,084 (1.54)	6289 12,989 (6.49)
1800	.049	.0015	.260	.96	65	1546	5946
		.0021	.240	.96	63	1482 3028 (1.51)	6179 12,125 (6.06)
2000	.051		.230	.95	65	1545	6180
			.230	.95	63	1527 3072 (1.54)	6641 12,821 (6.41)
2200	.050		.250	.93	65	1512	6050
			.240	.94	63	1482	6173 12,223

4-Month Mix (A)

-PAH

-PAH

#2 Furn

TEST 4 1/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-11-90 1030 Start

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1292	1200	1	0		
2	1275	1200	4	50		
3	1560	~~1400~~	0	0		
4	1604	1400	3	0		
5	1243	~~1250~~	0	0		
6	937	900	2	0		
7	466	400	2	0	70	
8	368	~~400~~	0	0	—	
9	353	~~400~~	1	0	70	
10	270	~~400~~	0	0	—	
11	200	—	—			

SHAFT RECYCLE AIR: 0 I.D. FAN % 52% SCRUBBER DP 7.57

PERCENT OXYGEN: being repaired DRAFT: .25

SHAFT RPM: 1.9 OPACITY: 4.5%

Phil Huntsman

TEST 4 2/5

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-11-90 1100

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1289	1200	1	0		
2	1280	1220	4	50		
3	1521	1400	0	0		
4	1584	1400	3	0		
5	1210	~~1250~~	0	0		
6	937	900	2	0		
7	465	400	2	0	65	
8	334	~~400~~	0	0	—	
9	303	~~400~~	0	0	70	
10	261	~~400~~	0	0	—	
11	200	—	—	—	—	—

SHAFT RECYCLE AIR: 0 I.D. FAN %: 52% SCRUBBER DP: 7.50

PERCENT OXYGEN: Being Repaired DRAFT: .24

SHAFT RPM: 1.9 OPACITY: 4.51%

Phil Huntsman

TEST 4 3/5

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-11-90 1130

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1288	1200	1	0		
2	1279	1200	4	30		
3	1539	~~1400~~	0	0		
4	1589	1400	3	0		
5	1212	~~1250~~	0	0	—	
6	900	900	2	30	—	
7	437	400	2	0	65	
8	211	300	0	0	—	
9	200	200	0	0	65	
10	200	200	0	0	—	
11	200	—	—	—	/	

SHAFT RECYCLE AIR: 0 I.D. FAN % 51% SCRUBBER DP 7.43

PERCENT OXYGEN: Can't Explained DRAFT: .23

SHAFT RPM: 1.9 OPACITY:

4/5

TEST 4

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-11-90 1200

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	~~1278~~	1200	1	0		
2	1267	1200	4	50		
3	1516	~~1400~~	0	0		
4	1572	1400	3	0		
5	1205	~~1250~~	0	0		
6	905	900	2	50		
7	426	400	2	0	65	
8	200	~~400~~	0	0		
9	200	~~400~~	0	0	65	
10	200	~~400~~	0	0		
11	200	—	—	—	—	

SHAFT RECYCLE AIR: 0 I.D. FAN % 51% SCRUBBER DP 7.39

PERCENT OXYGEN: 5.3 DRAFT: .23

SHAFT RPM: 1.9 OPACITY: 4.72

TEST 4 5/5

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-11-90 1230

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1275	1200	1	0		
2	1265	1200	4	50		
3	1517	~~1400~~	0	0		
4	1573	1400	3	0		
5	1209	~~1250~~	0	0		
6	904	900	2	50		
7	429	400	2	0	65	
8	200	~~400~~	0	0	—	
9	200	~~400~~	0	0	65	
10	200	~~400~~	0	0		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 50% SCRUBBER DP 7.41

PERCENT OXYGEN: 5.9 DRAFT: .23

SHAFT RPM: 1.9 OPACITY: 4.77

TEST 5 1/5

#2.

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-11-90 1415

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1291	1200	1	Ø		
2	1276	1200	4	90		
3	1533	~~1375~~	Ø	Ø		
4	1630	1400	3	Ø		
5	1433	~~1400~~	Ø	Ø		
6	1070	1100	2	Ø		
7	640	600	2	Ø	70	
8	~~249~~	~~400~~	Ø	Ø		
9	200	~~400~~	Ø	Ø	70	
10	200	~~400~~	Ø	Ø		
11	200	—	—	—	—	

SHAFT RECYCLE AIR: Ø I.D. FAN % 57% SCRUBBER DP 8.93

PERCENT OXYGEN: 6.6 DRAFT: .30

SHAFT RPM: 1.9 OPACITY: 5.05

#2 TEST 5 2/3

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-11-90 1445

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1228	1200	1	0		
2	1218	1200	4	30		
3	1522	~~1400~~	0	0		
4	1596	1400	3	0		
5	1370	~~1400~~	0	0		
6	1076	1100	2	80		
7	560	600	2	0	70	
8	220	~~400~~	0	0	-	
9	200	400	0	0	70	
10	200	~~400~~	0	0		
11	200	—	—	—	-	

SHAFT RECYCLE AIR: 0 I.D. FAN % 53% SCRUBBER DP .792

PERCENT OXYGEN: 5.3 DRAFT: -.23

SHAFT RPM: 1.9 OPACITY: 5.0

TEST 5 3/3

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-11-90 1515

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1236	1200	1	0		
2	1214	1200	4	20		
3	1560	~~1400~~	0	0		
4	1625	1400	3	0		
5	1374	~~1400~~	0	0		
6	1077	1100	2	100		
7	538	600	2	0	70	
8	200	~~400~~	0	0	—	
9	200	~~400~~	0	0	70	
10	200	400	0	0		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 53 SCRUBBER DP 8.12

PERCENT OXYGEN: 4.8 DRAFT: .129

SHAFT RPM: 1.9 OPACITY: 5.04?

TEST 5 9/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/11/90 1545

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1242	1200	1	0%		
2	1215	1200	4	25%		
3	1547	1400	0	0%		
4	1619	1400	3	0%		
5	1374	1400	0	0%		
6	1077	1100	2	100%		
7	525	600	2	100%	70%	
8	200	400	0	0		
9	200	400	0	0	70%	
10	200	400	0	0		
11	200	400	0	0		

SHAFT RECYCLE AIR: 0 I.D. FAN % 53 SCRUBBER DP _____

PERCENT OXYGEN: 4.9 DRAFT: -.30

SHAFT RPM: 1.9 OPACITY: 4.96

TEST 5 5/5

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4/11/90 1615

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1230	1200	1	0%		
2	1216	1200	4	50%		
3	1520	1400	0	0%		
4	1599	1400	3	0%		
5	1352	1400	0	0%		
6	1037	1100	2	100%		
7	499	600	2	100%	70%	
8	260	400	0	0%		
9	260	400	0	0%	70%	
10	200	400	0	0%		
11	200	400	6	0%		

SHAFT RECYCLE AIR: 0 I.D. FAN % 54 SCRUBBER DP _____

PERCENT OXYGEN: 6.3 DRAFT: -.30

SHAFT RPM: 1.9 OPACITY: 4.96

TEST 6 1/5

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 0830

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1257	1200	1	0		
2	1217	1220	4	30		
3	1549	1400	0	0		
4	1628	~~1400~~	0	0		
5	1132	~~1400~~	0	0		
6	831	800	2	0		
7	420	400	2	0	90	
8	200	~~200~~	0	0		
9	200	~~200~~	0	0	90	
10	200	~~200~~	0	0		
11	200	—	—	—	—	

SHAFT RECYCLE AIR: 0 I.D. FAN % 56. SCRUBBER DP 8.47

PERCENT OXYGEN: 8.0 DRAFT: .31"

SHAFT RPM: 2.0 OPACITY: 5.16%

Phil Huntsman

TEST 6 2/5

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 0900

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1259	1200	1	0		
2	1231	1220	4	30		
3	1582	1400	0	0		
4	1630	~~1400~~	0	0		
5	1120	~~400~~	0	0		
6	798	800	2	0		
7	421	400	2	0	70	
8	200	~~200~~	0	0		
9	200	~~200~~	0	0	70	
10	200	~~200~~	0	0		
11	200		—	—	-	

SHAFT RECYCLE AIR: 0 I.D. FAN % 51% SCRUBBER DP 7.69

PERCENT OXYGEN: 6.4 DRAFT: .30 "

SHAFT RPM: 2.0 OPACITY: 4.96

Phil Hunter

TEST 6 3/5

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 0930

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1276	1200	1	Ø		
2	1254	1220	4	Ø		
3	1661	1400	2	Ø		
4	1692	~~1400~~	Ø	Ø		
5	1090	~~1100~~	Ø	Ø		
6	776	800	2	Ø		
7	408	400	2	Ø	65	
8	200	~~200~~	Ø	Ø		
9	200	~~200~~	Ø	Ø	65	
10	200	~~200~~	Ø	Ø		
11	200	—	—	—		

SHAFT RECYCLE AIR: Ø I.D. FAN % 52% SCRUBBER DP 7.76

PERCENT OXYGEN: 4.9 DRAFT: .30

SHAFT RPM: 2.0 OPACITY: 4.85

Phil Huntoon

TEST 6 4/5

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1000

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1300	1200	1	0		
2	1252	1220	4	0		
3	1606	1400	0	0		
4	1622	~~1400~~	0	0		
5	~~1094~~	~~400~~	0	0		
6	780	800	0	0		
7	410	400	2	0	65	
8	200	~~200~~	0	0		
9	200	~~200~~	0	0	65	
10	200	~~200~~	0	0		
11	200	—	—	—	-	

SHAFT RECYCLE AIR: 0 I.D. FAN % 52 SCRUBBER DP 7.70

PERCENT OXYGEN: 8.0 DRAFT: .30

SHAFT RPM: 2.0 OPACITY: 4.80

TEST 6 5/5.

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 / 1030

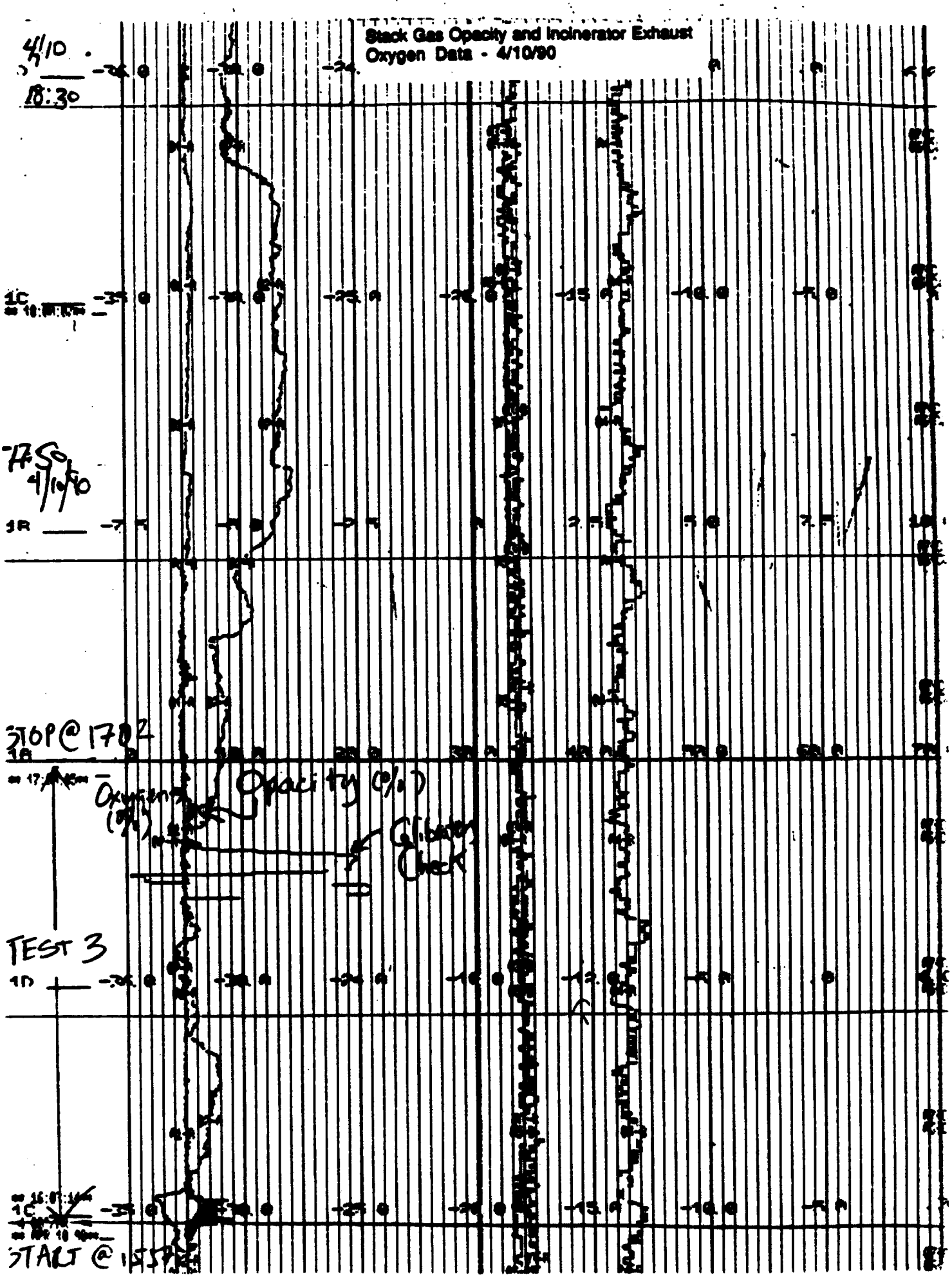
HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1246	1200	1	0		
2	1238	1220	4	60		
3	1396	~~1400~~	0	0		
4	1496	~~1400~~	0	0		
5	1038	~~1400~~	0	0		
6	720	800	0	0		
7	310	400	2	0	90	
8	~~300~~	~~200~~	0	0	—	
9	200	~~200~~	0	0	90	
10	200	~~200~~	0	0		
11	200	—	—	—	—	

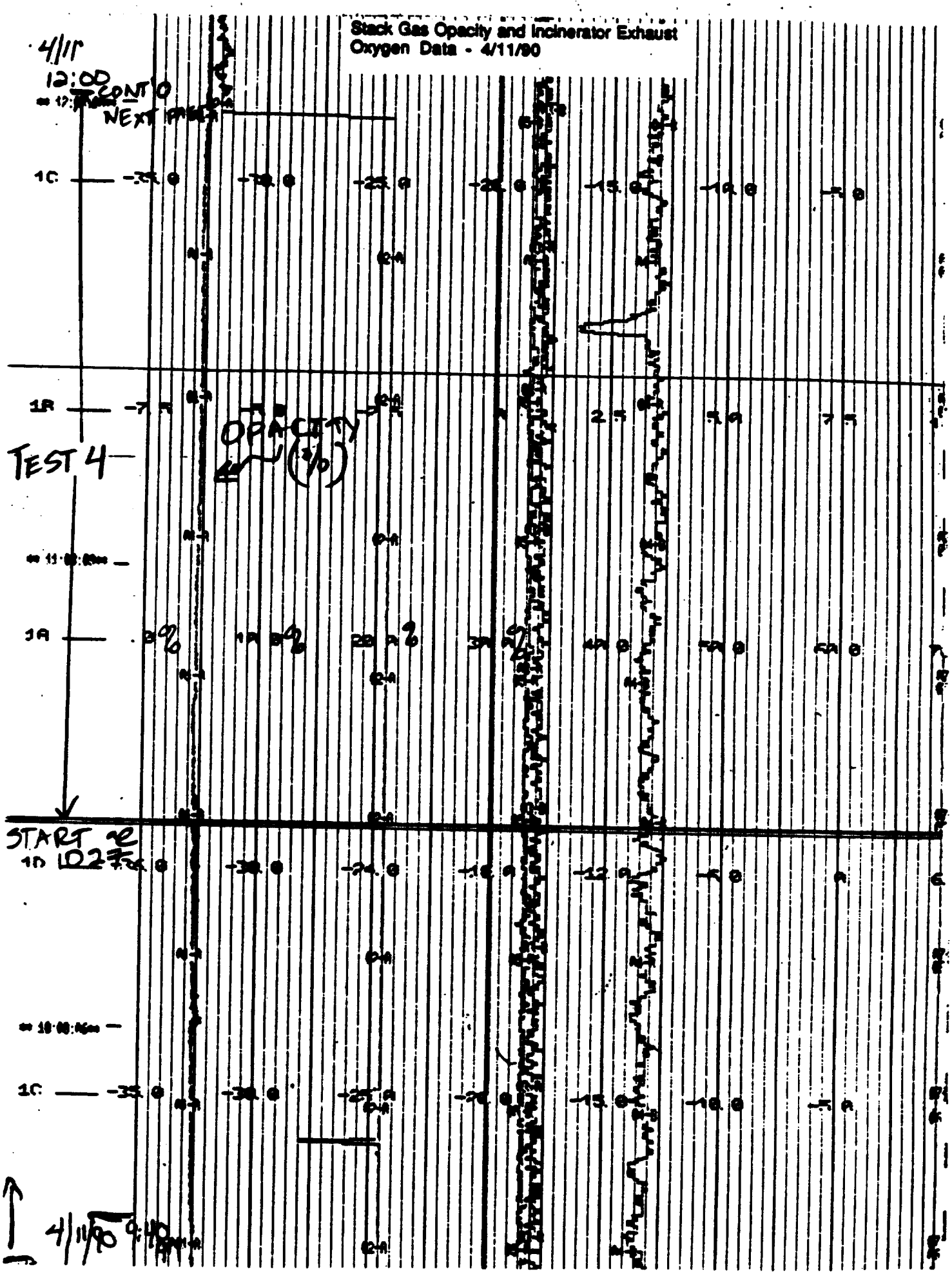
SHAFT RECYCLE AIR: 0 I.D. FAN % 53 SCRUBBER DP 7.96

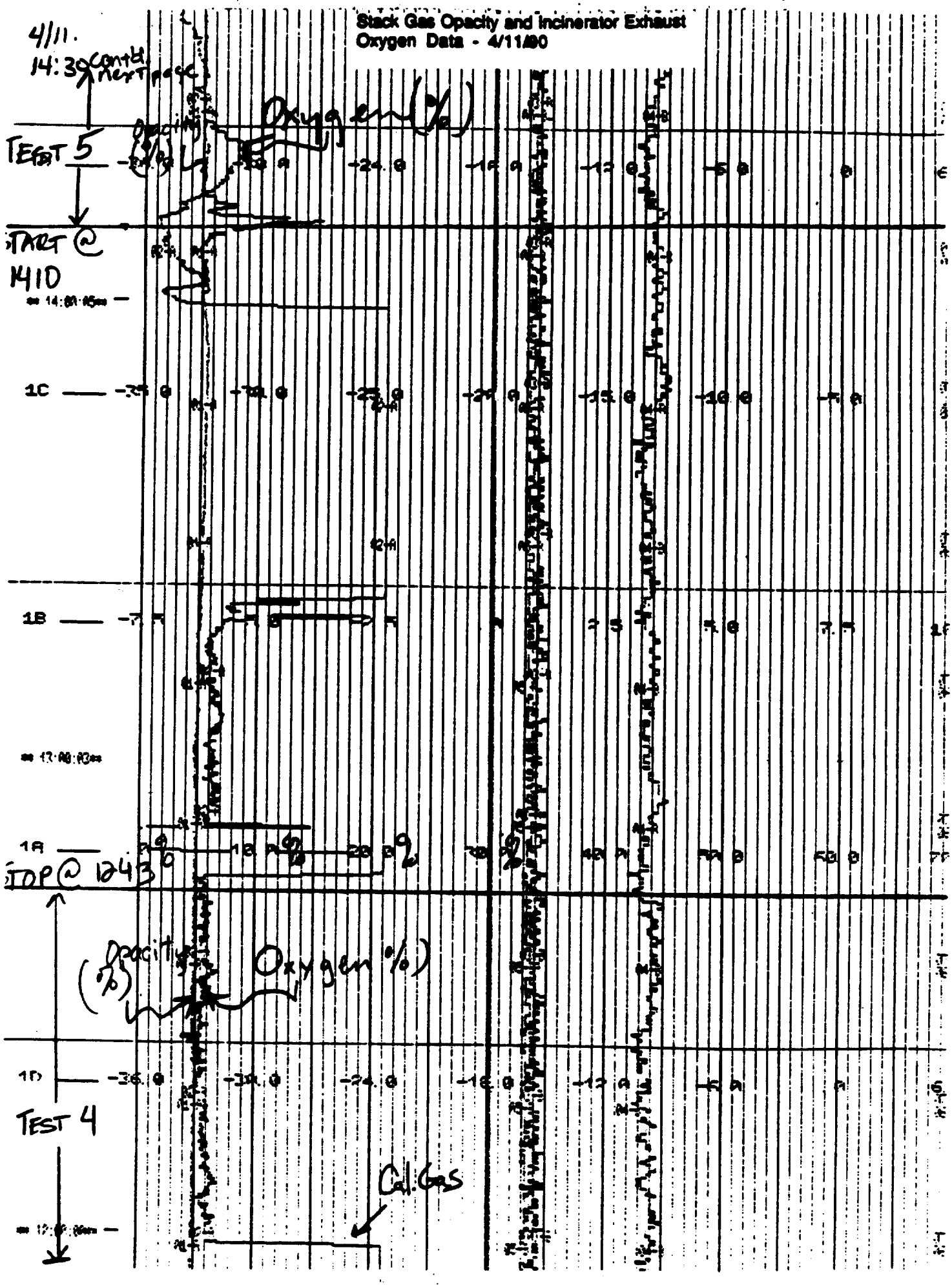
PERCENT OXYGEN: 9.8 DRAFT: .31

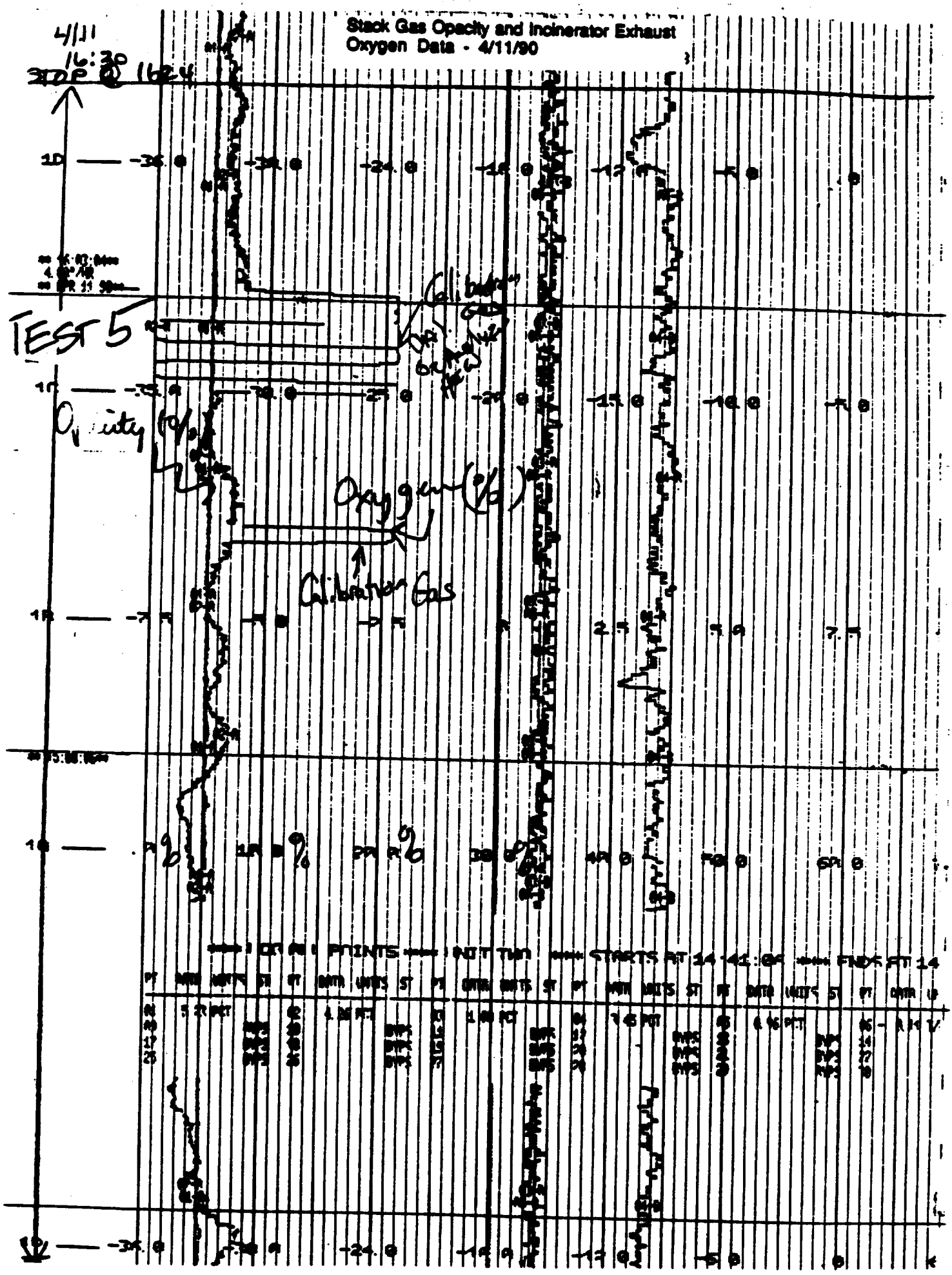
SHAFT RPM: 2.0 OPACITY: 5.42

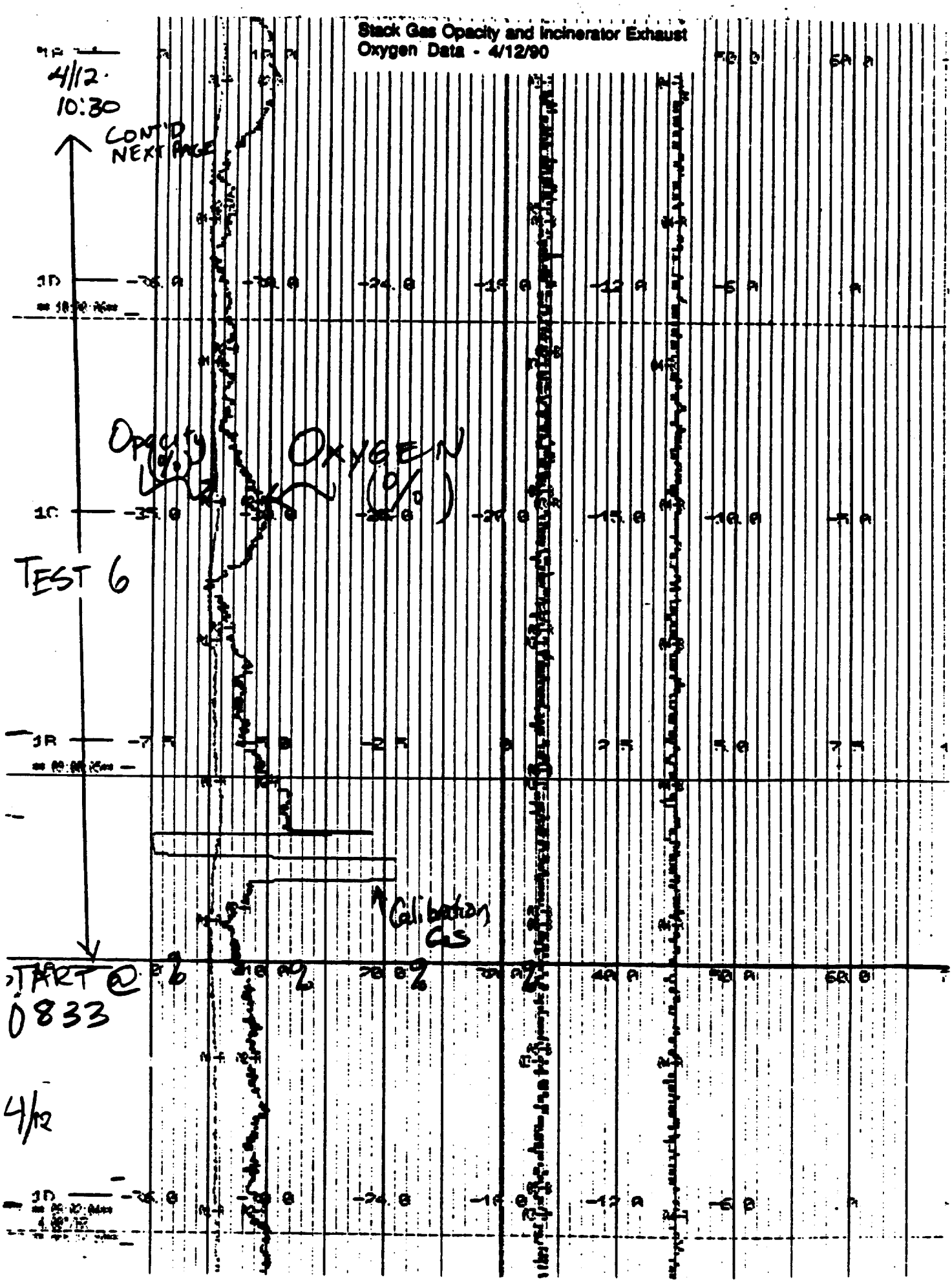
Phil Thurston

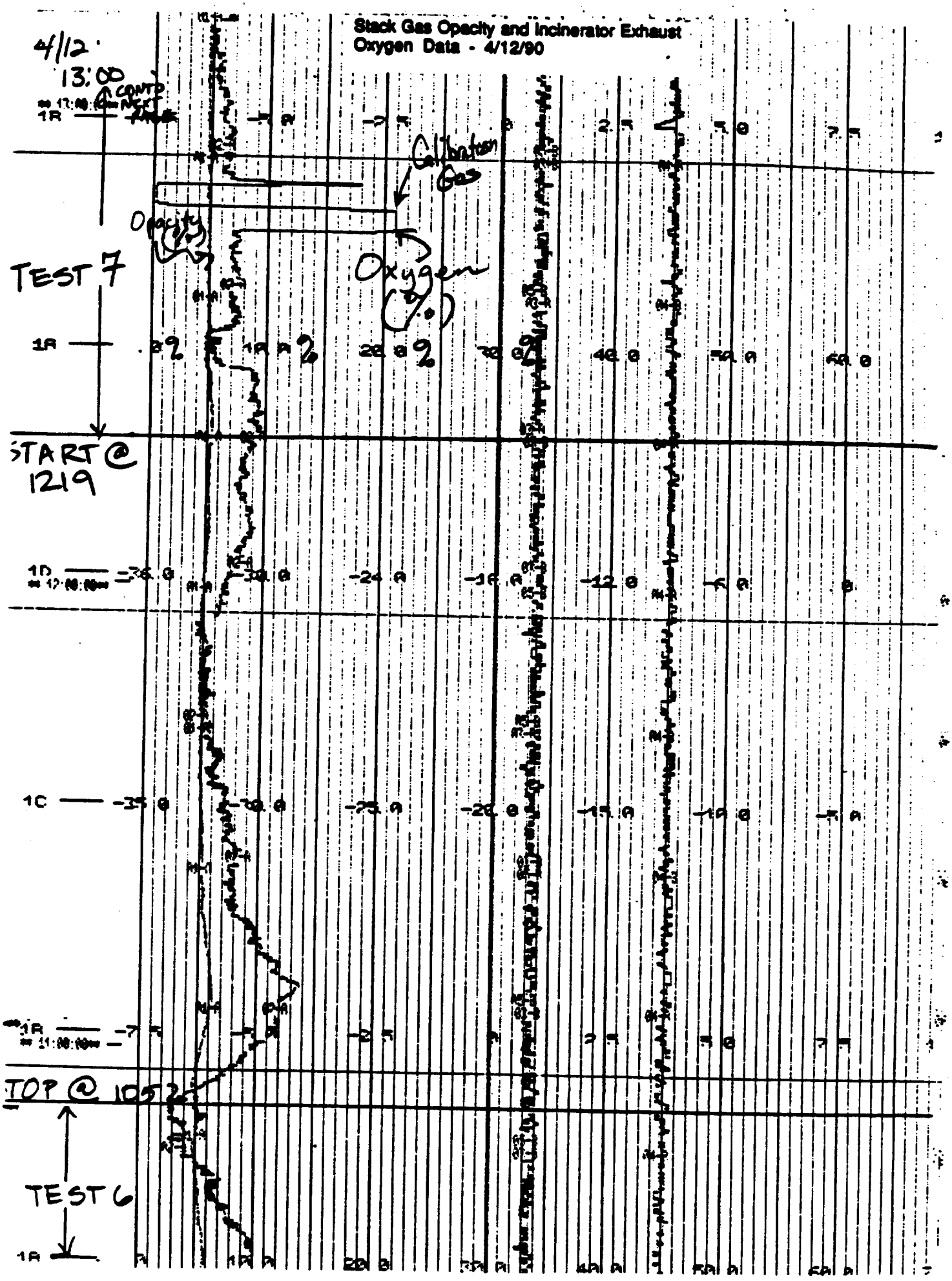

Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/10/90
4/10
18:30
1C
1750
4/10/90
1R
STOP @ 1702
1B
Opacity (%)
Oxygen (%)
Calibration Check
TEST 3
1D
1C
START @ 1553


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/11/90
4/11
12:00
CONT'D
NEXT PAGE
OPACITY (%)
TEST 4
START
4/11/90


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/11/90
4/11.
14:39 comb. interlock
TEST 5
START @ 1410
1C
1B
1A
TOP @ 1243
(% Opacity)
Oxygen %)
1D
TEST 4
Cal. Gas


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/11/90
4/11
16:30
TEST 5
Opacity (%)
Oxygen (%)
Calibration Gas


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/12/90
4/12
10:30
CONT'D NEXT PAGE
Opacity (%)
Oxygen (%)
TEST 6
Calibration Gas
START @ 0833
4/12


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/12/90
4/12
13:00
CONTD NEXT
1R
Calibration Gas
Opacity
Oxygen (%)
TEST 7
1R
START @ 1219
1D
1C
1R
TOP @ 1052
TEST 6
1R

Incinerator Operating Data - PCDD/PCDF and PAH Tests (4/12,13/90)

SLUDGE FEED DATA SHEET

DATE: 4-12-90

	Time	Feed Concentration	Centrate Concentration	Cake Concentration	Capture = (feed - centrate) × cake / (cake - centrate) × feed	Centrifuge Flow gpm	Dry Furnace Feed = flow × 8.34 × 60 × feed × capture	Wet Furnace Feed = Dry Feed / cake
	Example	5% = .05	.4% = 0.004	28% = 0.28	(.05 - .004) × .28 / (.28 - .004) × .05 = 0.85	65 gpm	65 × 8.34 × 60 × .05 × .85 = 2424 lb/hr	2424 / .28 = 8,323 lb/hr
#1	2400	.047	.0058	.235	89	65	1372	5,846
#2			.0070	.242	87	62	1277	5280 (11,126)
	0200	.047	.0070	.255	98	65	1502	5,890
			.0071	.216	96	62	1406	6,612 (12,402)
	0400	.049	.0028	.233	95	65	1520	6,527
			.0017	.222	97	62	1478	6,661 (13,188)
	0600	.051	.0045	.244	92	63	1493	6,118
			.0037	.239	94	65	1562	6,535 (12,653)
4-Methyl HEX (R	0800 1		.0052	.247	92%	65	1556	6299
	2	.0552	.0035	.205	95%	62	1532 3088 (1.54)	7476 13,775 (6.89)
	1000 1		.0027	.224	96%	65	1592	6805
	2	.051	.0038	.220	94%	63	1511 3103 (1.55)	6486 13,291 (6.65)
	1200 1		.0031	.238	95%	65	1575	6621
	2	.051	.0041	.240	93%	62	1471 3046 (1.52)	6131 12,752 (6.38)
1-PAH	1400 1	.050	.0031	.250	.95	65	1545	6178
	2		.0030	.220	.95	63	1502 3047 (1.52)	6828 13,006 (6.50)
	1600	.051	.0032	250	.95	65	1575	6300
			.0039	240	.94	63	1509 3,084 (1.54)	6289 12,589 (6.29)
-PAH	1800	.049	.0015	.260	.97	65	1526 3028	5946
			.0021	.240	.96	63	1502 (1.51)	6179 12,125 (6.06)
	2000	.051		.233	.95	65	1545 3072	.280
				.230	.95	63	1527 (1.54)	6641 13,187 (6.41)
	2200	.050		.250	.93	65	1545	5950
				.240	.94	63	1482	6173 12,123

SLUDGE FEED DATA SHEET

DATE: 4-13-90

Time	Feed Concentration	Centrate Concentration	Cake Concentration	Capture = (feed − centrate) × cake / (cake − centrate) × feed	Centrifuge Flow gpm	Dry Furnace Feed = flow × 8.34 × 60 × feed × capture	Wet Furnace Feed = Dry Feed / cake
Example	5% = .05	4% = 0.004	28% = 0.28	(.05 − .004) × .28 / (.28 − .004) × .05 = 0.85	65 gpm	65 × 8.34 × 60 × .05 × .85 = 2424 lb/hr	2424 / .28 = 8,223 lb/hr
2400	.054	.0063 .0061	.247 .234	91 92	65 61	1758 1657	7,121 (14,206) 7,085
0200	.052	.0038 .0037	.264 .259	94 94	65 61	1590 1495	6,025 5,774 (11,799)
0400	.050	.0024 .0017	.228 .263	96 97	65 61	1564 1483	6,862 (12,504) 5,642
0600	.053	.0038 .0070	.240 .236	94 89	68 70	1701 1660	7,087 7,036 (14,123)
0800 1 2	.051	.0028 .0052	.3351 .2160	.96 .92	64 66	1567 1549	6393 7171 13,564
1000		BUSY					
1200	.051	.0030 .0070	.2514 .2094	95 89	63 67	1527 3050 1521 (1.53)	6073 7263 13,336 (6.67)
1400	.052	.0041 .0077	.2497 .2454	.93 88	63 67	1524 3058 1534 (1.53)	6103 6175 12,278 (6.48)
1600	.051	.0042 .0058	.241 .246	93 91	63 67	1495 3051 1556 (1.53)	6214 6375 12,589 (6.25)
1800	.051	.0048 .0053	.232 .230	.92 92	65 66	1526 3076 1550 (1.54)	6577 6737 13,314 (6.56)
2000	.051	.0034 .0035	.234 .204	.94 .94	65 66	1559 1583	6663 7068 13,731
2200	.050	.0028 .0033	.236 .218	.93 .95	66 66	1567 1589	6643 7196 13,839

TEST 7 1/4

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1230

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1213	1200	1	0		
2	1205	~~1220~~	4	65		
3	1469	~~1400~~	0	0		
4	1527	~~1400~~	0	0		
5	1041	~~1400~~	0	0		
6	752	800	0	0		
7	360	400	2	0	70	
8	200	~~200~~	0	0		
9	~~200~~	~~200~~	0	0	70	
10	~~200~~	~~200~~	0	0		
11	200	—	—	-	—	

SHAFT RECYCLE AIR: 0 I.D. FAN %: 51% SCRUBBER DP: 7.80

PERCENT OXYGEN: 8.8 DRAFT: .29

SHAFT RPM: 2.0 OPACITY: 5.4

P. Gil Hunter

TEST 7 2/7

#2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1300

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1230	1200	1	0		
2	1215	1220	4	25		
3	1545	~~1400~~	0	0		
4	1575	~~1400~~	0	0		
5	1110	~~1400~~	0	0		
6	780	800	0	0		
7	383	400	2	0	60	
8	200	~~200~~	0	0	—	
9	200	~~200~~	0	0	60	
10	~~200~~	~~200~~	0	0	—	
11	200	—	—	—	—	

SHAFT RECYCLE AIR: 0 I.D. FAN % 50% SCRUBBER DP 7.45

PERCENT OXYGEN: 6.5 DRAFT: .29

SHAFT RPM: 2.0 OPACITY: 4.83

Phil Huntsman

#2 TEST 7 3/7

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1330

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1266	1200	1	ø		
2	1215	1220	4	40		
3	1627	OFF	ø	ø		
4	1629	OFF	ø	ø		
5	1059	OFF	ø	ø		
6	766	800	ø	ø		
7	363	400	2	ø	80	
8	200	OFF	ø	ø		
9	200	OFF	ø	ø	80	
10	200	OFF	ø	ø		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 52. SCRUBBER DP 7.74

PERCENT OXYGEN: 9.1 DRAFT: 30

SHAFT RPM: 2.0 -- OPACITY: 5 6 5

#2 TEST 7 4/7

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1400

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1210	1200	1	Ø		
2	1213	1220	4	48		
3	1441	OFF	Ø	Ø		
4	1509	OFF	Ø	Ø		
5	1006	OFF	Ø	2		
6	716	800	Ø	Ø		
7	327	400	2	Ø	80	
8	200	OFF	Ø	Ø		
9	200	OFF	Ø	Ø	80	
10	200	OFF	Ø	Ø		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 52.9 SCRUBBER DP 7.72

PERCENT OXYGEN: 9.0 DRAFT: 31

SHAFT RPM: 2.0 OPACITY: 5.59

TEST # 5/7

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1430

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1212	1200	1	0		
2	1214	1220	3	100		
3	1458	1400	2	83		
4	1523	OFF	ϕ	Ø		
5	1010	OFF	ϕ	2		
6	728	800	ϕ	Ø		
7	324	400	2	Ø	80	
8	200	OFF	ϕ	ϕ		
9	200	OFF	ϕ	ϕ	80	
10	200	OFF	ϕ	ϕ		
11	200	OFF	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 54.3 SCRUBBER DP 8.11

PERCENT OXYGEN: 7.1 DRAFT: 30

SHAFT RPM: 2.0 OPACITY: 5 38

TEST 7 6/4

4 2

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1500

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1300	1200	1	0		
2	1256	1220	3	100		
3	1650	1400	2	0		
4	1664	off	0	0		
5	1070	off	0	0		
6	747	800	0	0		
7	360	400	2	0	90	
8	200	~~200~~ off	0	0		
9	200	200	0	0	90	
10	200	off	0	0		
11	200	—	—	—	—	

SHAFT RECYCLE AIR: 0 I.D. FAN % 57% SCRUBBER DP 9.12

PERCENT OXYGEN: 8.6 DRAFT: .30

SHAFT RPM: 2.0 OPACITY: 6.1

Chuck Hunter

#2

TEST 7 9/4

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1530

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION %	COMMENTS
1	1208	1200	1	0		
2	1040	1200	3	100		
3	1380	OFF	—	0		
4	1438	OFF	—	0		
5	1107	OFF	—	0		
6	878	OFF	—	0		
7	523	700	2	100	60	
8	200	OFF	—	0		
9	200	OFF	—	0	45	
10	200	OFF	—	0		
11	200		—	0		

SHAFT RECYCLE AIR: 0 I.D. FAN % .25 SCRUBBER DP 6.87

PERCENT OXYGEN: 7.0 DRAFT: .25

SHAFT RPM: 2.0 OPACITY: 5.16

#2 TEST B 1/4

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1700

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1243	1200	1	0		
2	1148	1200	3	100		
3	1538	OFF	—	—		
4	1556	OFF	—	—		
5	1185	OFF	—	—		
6	924	OFF	—	—		
7	513	700	2	100	60	
8	200	OFF	—	—		
9	200	OFF	—	—	60	
10	200	OFF	—	—		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 51.4 SCRUBBER DP 7.58

PERCENT OXYGEN: 3.7 DRAFT: .25

SHAFT RPM: 2.0 OPACITY: 4.76

Carl Klingin

#2 TEST 8 2/7

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1730

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1277	1200	1	Ø		
2	1135	1200	3	100		
3	1583	~~OFF~~	—	—		
4	1635	~~OFF~~	—	—		
5	1070	~~OFF~~	—	—	50	
6	757	~~OFF~~	—	—		
7	358	~~OFF~~	—	—	100	
8	240	~~OFF~~	—	—		
9	336	500	2	100	100	
10	200	~~OFF~~	—	—		
11	200		—	—		

SHAFT RECYCLE AIR: Ø I.D. FAN %: 564 SCRUBBER DP: 8.65

PERCENT OXYGEN: 10.8 DRAFT: .26

SHAFT RPM: 1.8 OPACITY: 5.72 Rod Hyjna

#2 TEST 8 3/4

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1800

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1299	1200	1	0		
2	1256	1200	3	0		
3	1651	OFF	—	—		
4	1658	OFF	—	—		
5	1040	OFF	—	—	50	
6	846	OFF	—	—		
7	568	OFF	—	—	100	
8	602	600	2	100		
9	460	700	2	100	100	
10	255	OFF	—	—		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 56.6 SCRUBBER DP 8.45

PERCENT OXYGEN: 2.2 DRAFT: 23

SHAFT RPM: 1.8 OPACITY: 4.81

Hal Hazen

#2 TEST 8 9/7

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1830

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1204	1200	1	Ø		
2	1017	1200	3	100		
3	1372	OFF	—	—		
4	1421	OFF	—	—		
5	1047	OFF	—	—		
6	827	OFF	—	—		
7	460	OFF	—	—	50	
8	454	550	1	100		
9	461	500	2	52	50	
10	200	OFF	—	—		
11	200	—	—	—		

SHAFT RECYCLE AIR: Ø I.D. FAN % 49.4 SCRUBBER DP 6.92

PERCENT OXYGEN: 7.7 DRAFT: .23

SHAFT RPM: 1.8 OPACITY: 5.02

#2 TEST 8 5/4

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1900

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1299	1200	1	0		
2	1201	1200	3	82		
3	1689	OFF	—	—		
4	1689	OFF	—	—		
5	1038	OFF	—	—	80	
6	828	OFF	—	—		
7	484	OFF	—	—	100	
8	418	550	1	100		
9	468	500	2	91	100	
10	259	OFF	—	—		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 58 SCRUBBER DP 8.90

PERCENT OXYGEN: 8.9 DRAFT: .26

SHAFT RPM: 1.8 OPACITY: 5.76

#2 TEST 8 6/9

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 1930

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1260	1200	/	0		
2	1194	1200	3	100		
3	1566	OFF	—	—		
4	1618	OFF	—	—		
5	1038	OFF	—	—		
6	839	OFF	—	—		
7	495	OFF	—	—	90	
8	428	550	/	100		
9	463	500	2	75	90	
10	246	OFF	—	—		
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 54.3 SCRUBBER DP 8.07

PERCENT OXYGEN: 5.6 DRAFT: .24

SHAFT RPM: 1.8 OPACITY: 5.05 Rob Higgins

II 2 TEST 8 9/7

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 4-12-90 2000

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1195	1200	1	10		
2	983	1200	3	100		
3	1315	OFF	—	—		
4	1378	OFF	—	—		
5	1011	OFF	—	—		
6	816	OFF	—	—		
7	478	OFF	—	—	40	
8	463	500	—	100		
9	485	500	—	30	40	
10	253	OFF				
11	200	—	—	—		

SHAFT RECYCLE AIR: 0 I.D. FAN % 45.5 SCRUBBER DP 6.12

PERCENT OXYGEN: 6.5 DRAFT: .28

SHAFT RPM: 1.8 OPACITY: 4.95

Rob Higgins

(OVER)

Furnace has been unstable throughout the shift. Apparently cake is going from dry to moist enough to cause temps on upper hearths to increase & decrease considerably.

Tried switching from burners on hearth #7 to one burner on hearth #8 & 2 burners on hearth #9. Didn't seem to help much. Basically increased & decreased airport positions to control temps & control oxygen during testing period.

4/12/90 (20:00)

TEST 9 1/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1000 4-13-90

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1220	1200	1	0		
2	1040	1100	3	100		
3	1380	1400		[illegible]		
4	1420	1450	2	85%		
5	1200	1320			66%	
6	970	1080				
7	660	800	2	100%	100%	
8	580	560	1	0		
9	600	500	2	0		
10	200	300				
11						

SHAFT RECYCLE AIR: 0 I.D. FAN % 53% SCRUBBER DP 8.0

PERCENT OXYGEN: 6.7 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 5.3

TEST 9 2/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1030 · 4-8-80

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1260	1200	1	Ø		
2	1100	1160	3	40%		
3	1480					
4	1540	1450	2	Ø		
5	1220					
6	1000					
7	680	800	2	100%		
8	600	560	1	Ø		
9	600	500	2	Ø		
10	200					
11						

SHAFT RECYCLE AIR: Ø I.D, FAN %_____ SCRUBBER DP_____

PERCENT OXYGEN:_____ DRAFT:_____

SHAFT RPM: 1.7 OPACITY:_____

TEST 9 3/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 11:00 4-13-90

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1260	1200	1		Ø	
2	1100	1100	3		78%	
3	1540					
4	1570	1450	2			
5	1200					
6	1000					
7	680	800	2		100%	
8	600	560	1			
9	610	500	2			
10	20					
11						

SHAFT RECYCLE AIR: Ø I.D, FAN % 52% SCRUBBER DP 7.9

PERCENT OXYGEN: 5.4 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 5.0

TEST 9 4/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 11:30 4/3-90

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1200	1200	1	Ø		
2	1020	1100	3	100%		
3	1390					
4	1420	1450	2	30%		
5	1200					
6	1000					
7	660	800	2	100%		
8	600	560	1	[redacted]		
9	600	500	2	100%		
10	200					
11						

SHAFT RECYCLE AIR: Ø I.D. FAN % 57% SCRUBBER DP 7.6

PERCENT OXYGEN: 5.8 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 5.3

TEST 9 5/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1200 4-13-90

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1290	1200	1	Ø	Ø	
2	1120	1100	3	Ø		
3	1530					
4	1560	1450	2	Ø		
5	1280				62	
6	1030					
7	680	800	2	100%	100%	
8	600	560	1	Ø		
9	600	500	2	Ø		
10	200					
11						

SHAFT RECYCLE AIR: Ø I.D. FAN % 52% SCRUBBER DP 7.6

PERCENT OXYGEN: 7.1 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 5.1

TEST 9 6/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1230 4-13-90

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1260	1200	1	Ø		
2	1070	1100	3	100%		
3	1480					
4	1500	1450	2	Ø		
5	1210				88%	
6	1010					
7	680	800	2	100%	100%	
8	600	[redacted]560	1	Ø		
9	600	500	2	Ø		
10	200	[redacted]				
11						

SHAFT RECYCLE AIR: Ø I.D. FAN % 53 SCRUBBER DP 8.2

PERCENT OXYGEN: 7.3 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 5.4

TEST 9 7/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1300 4-13-88

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1250	1200	1	Ø	Ø	
2	1100	1100	3	100		
3	1480					
4	1570	1450	2	Ø		
5	1200				78	
6	1000					
7	680	800	2	100	100	
8	600	560	1	Ø		
9	600	500	2	Ø		
10	200					
11						

SHAFT RECYCLE AIR: Ø I.D. FAN % 53 SCRUBBER DP 8.0

PERCENT OXYGEN: 6.5 DRAFT: .25

SHAFT RPM: 1.7 OPACITY: 5.4

TEST 9 8/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1330 4-13-80

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMEN
1	1220	1200	1	Ø		
2	1030	1100	3	100%		
3	1400					
4	1420	1450	2	20%		
5	1220				75%	
6	1000					
7	680	800	2	100%	100%	
8	600	560	1	Ø		
9	600	580	2	Ø		
10	200					
11						

SHAFT RECYCLE AIR: Ø I.D. FAN % 53% SCRUBBER DP 7.8

PERCENT OXYGEN: 6.4 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 5.5

TEST 10 1/B

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1500 - 4-13-98

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1310	1200	1	Ø	Ø	
2	1180	1100	3	Ø		
3	1610					
4	1610					
5	1160				100%	
6	950					
7	680	800	2	100	100%	
8	600	560	1	Ø		
9	620	500	2	Ø		
10	700					
11						

SHAFT RECYCLE AIR: Ø I.D. FAN % 52. SCRUBBER DP 7.6

PERCENT OXYGEN: 5.7 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 4.9

TEST 10 2/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1530 4-13-90

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1260	1200	1	Ø	Ø	
2	1080	1100	2	15		
3	1050					
4	1550	1450	2	Ø		
5	1150				76%	
6	950					
7	650	800	2	100	100%	
8	600	560	1	Ø		
9	600	500	2	Ø		
10	200					
11						

SHAFT RECYCLE AIR: Ø I.D. FAN % 52. SCRUBBER DP 7.5

PERCENT OXYGEN: 5.6 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 5.2

TEST 10 3/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1600 - 4-13

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1209	1200	1	0		
2	1066		3	100	[illegible]	
3	1488		0			
4	1500		0			
5	1164		0		80	
6	960		0			
7	665		2	100	100	
8	602	550	1			
9	600	500	2			
10	200		0			
11						

SHAFT RECYCLE AIR: 0 I.D. FAN %: 55 SCRUBBER DP: 7.0

PERCENT OXYGEN: 6.5 DRAFT: .28

SHAFT RPM: 1.7 OPACITY: 5.4

TEST 10 4/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1630 4-13.

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1271	1200	1			
2	1174		3	0		
3	1610		0		40	
4	1500		0			
5	1203		0		100	
6	1017		0			
7	694		2	100%	100	
8	614	550	1			
9	636	500	2			
10	180		0			
11						

SHAFT RECYCLE AIR: 0 I.D, FAN %: 55 SCRUBBER DP: 7.2

PERCENT OXYGEN: 4.0 DRAFT: .25

SHAFT RPM: 1.7 OPACITY: 4.8

TEST 10 5/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1700 4-13

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1188	1200	1			
2	1045		3	100%	25	
3	1518					
4	1540	1450				
5	1194	145			100	
6	1009					
7	700		2	100%	100	
8	671	550	1			
9	635	500	2			
10	181					
11	307					

SHAFT RECYCLE AIR: 0 I.D. FAN % 52 SCRUBBER DP 7.0

PERCENT OXYGEN: 10.0 DRAFT: .2.7

SHAFT RPM: 1.7 OPACITY: 5.6

TEST 10 6/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1730 4-13-90

HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1263		1	0		
2	1158		3	0.		
3	1612					
4	1616					
5	1215					
6	1043					
7	715		2	100%		
8	618		1	0		
9	638		2	0.		
10	179					
11	305					

SHAFT RECYCLE AIR: 0 I.D. FAN % 52% SCRUBBER DP 7.6

PERCENT OXYGEN: 3-8 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 4%

TEST 10 7/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

DATE/TIME: 1800 4-13-90

HEARTH NO.	TEMP	TEMP SET POINT	NO.BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1080		3			
2	1047			100%		
3	1462					
4	1486					
5	1193					
6	1008					
7	694		2	100%		
8	614		1			
9	639		2			
10	180					
11	301					

SHAFT RECYCLE AIR: 0 I.D. FAN % 52% SCRUBBER DP 7.6

PERCENT OXYGEN: 8.3 DRAFT: .23

SHAFT RPM: 1.7 OPACITY: 6.0

TEST 10 8/8

DATA SHEET FURNACE STACK EMISSIONS TESTING

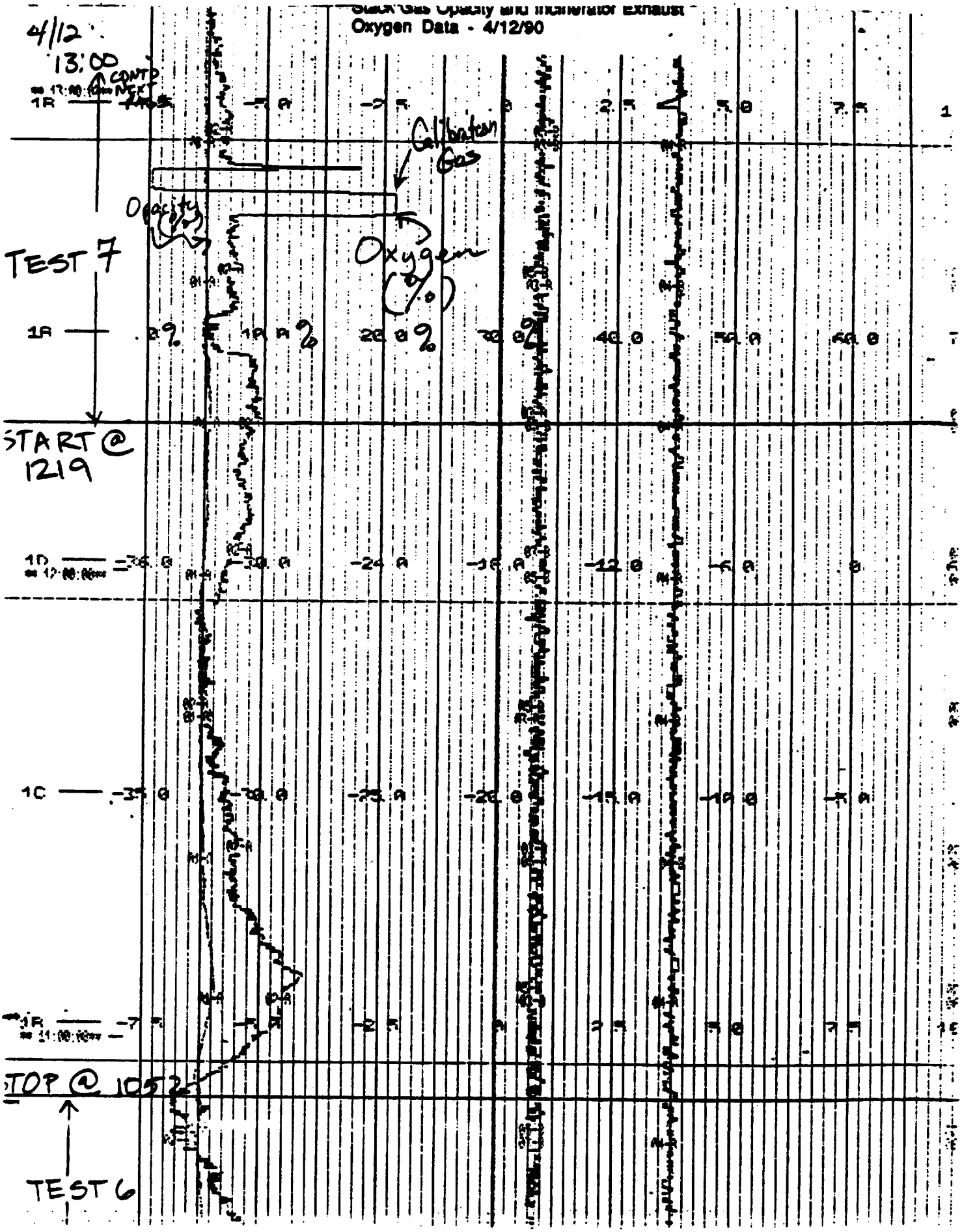
DATE/TIME: 1800 4-13-90

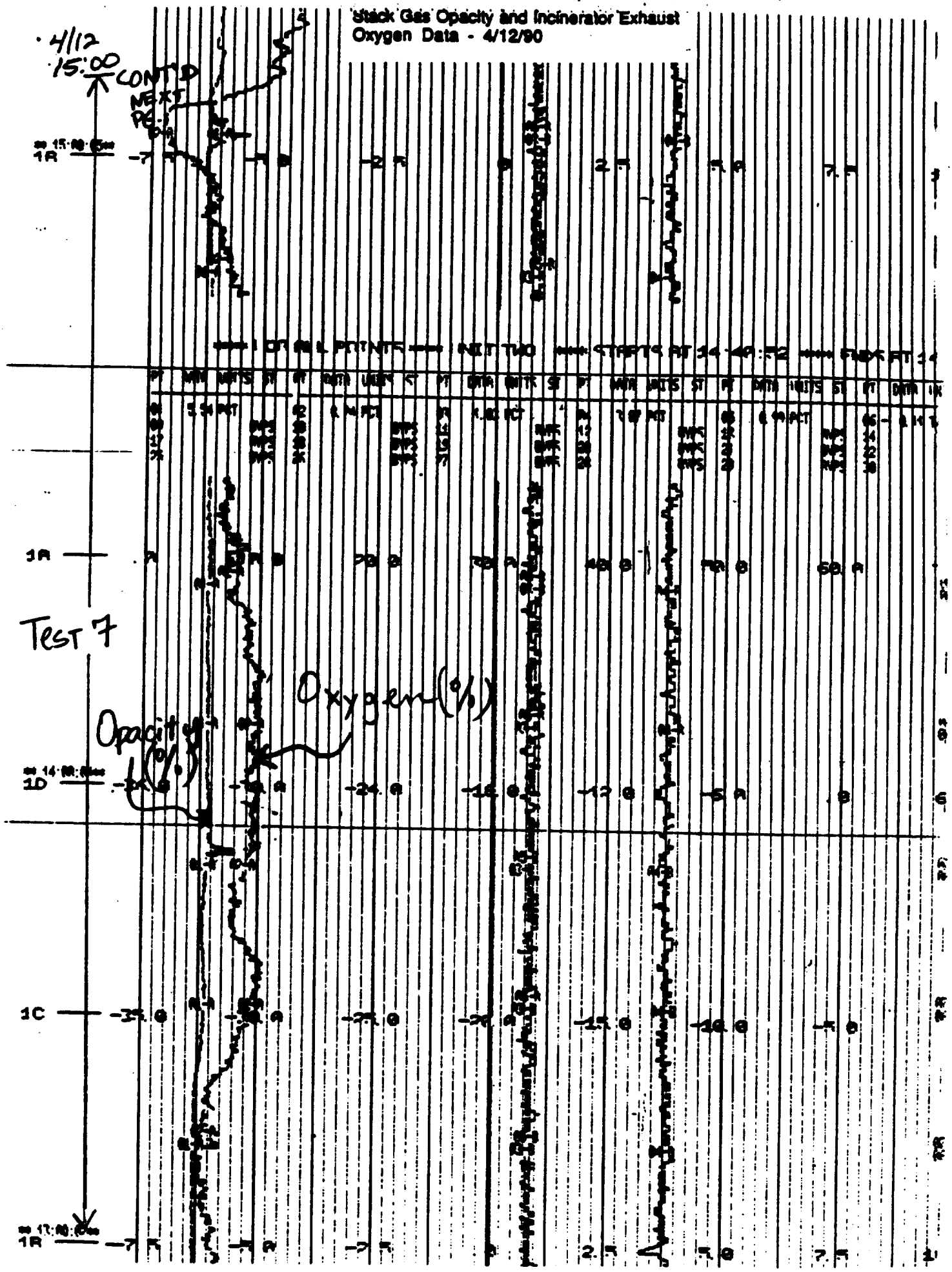
HEARTH NO.	TEMP	TEMP SET POINT	NO. BURNERS ON	BURNER FIRING RATE	AIR PORT POSITION	COMMENTS
1	1002		0			
2	951		3			
3	1221					
4	1269					
5	1262				100%	
6	1040					
7	706		2	100%	100%	
8	615		1			
9	641		2			
10	2000					
11	2000					

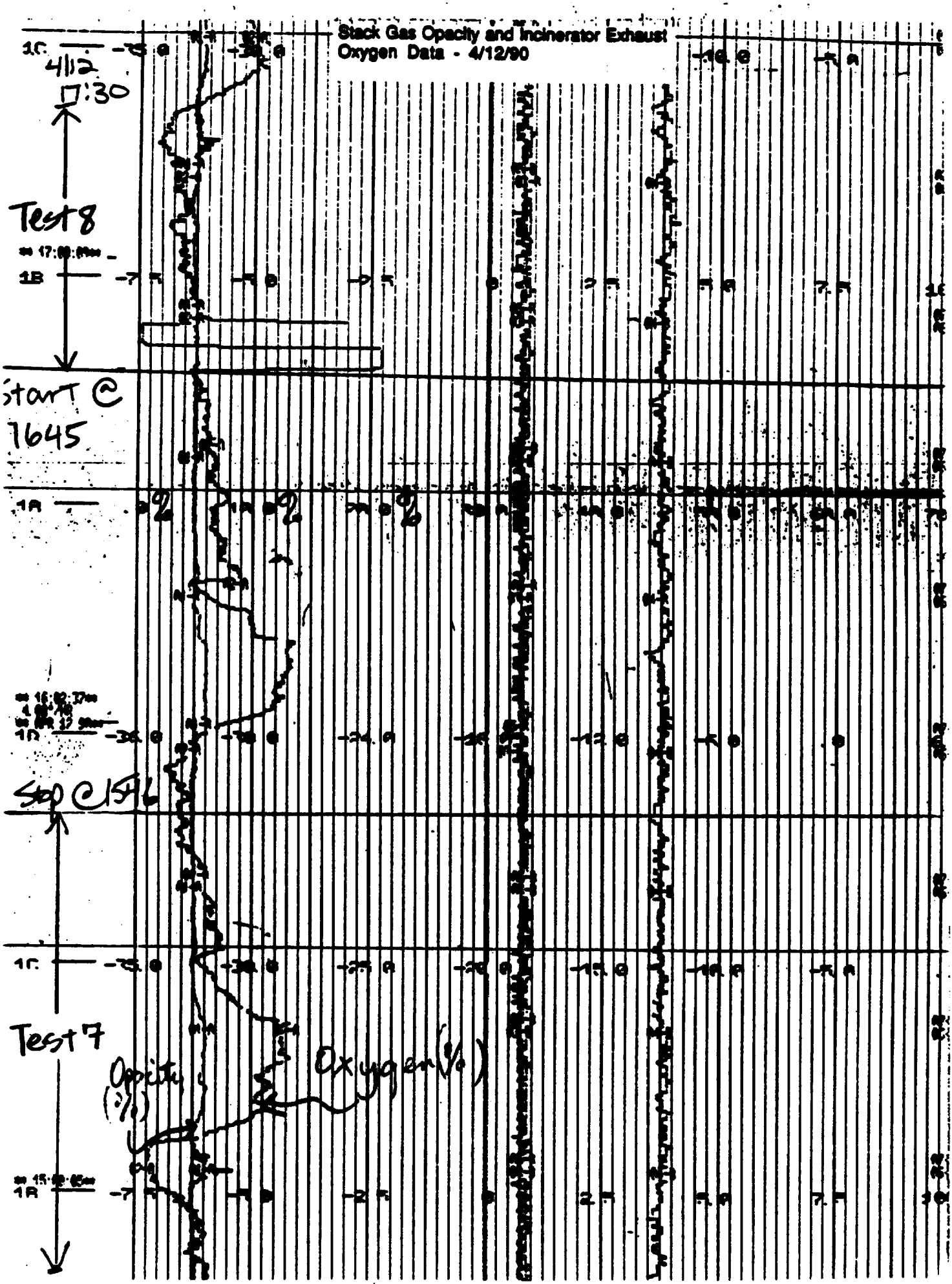
SHAFT RECYCLE AIR: 0. I.D. FAN % 52 SCRUBBER DP 7.8

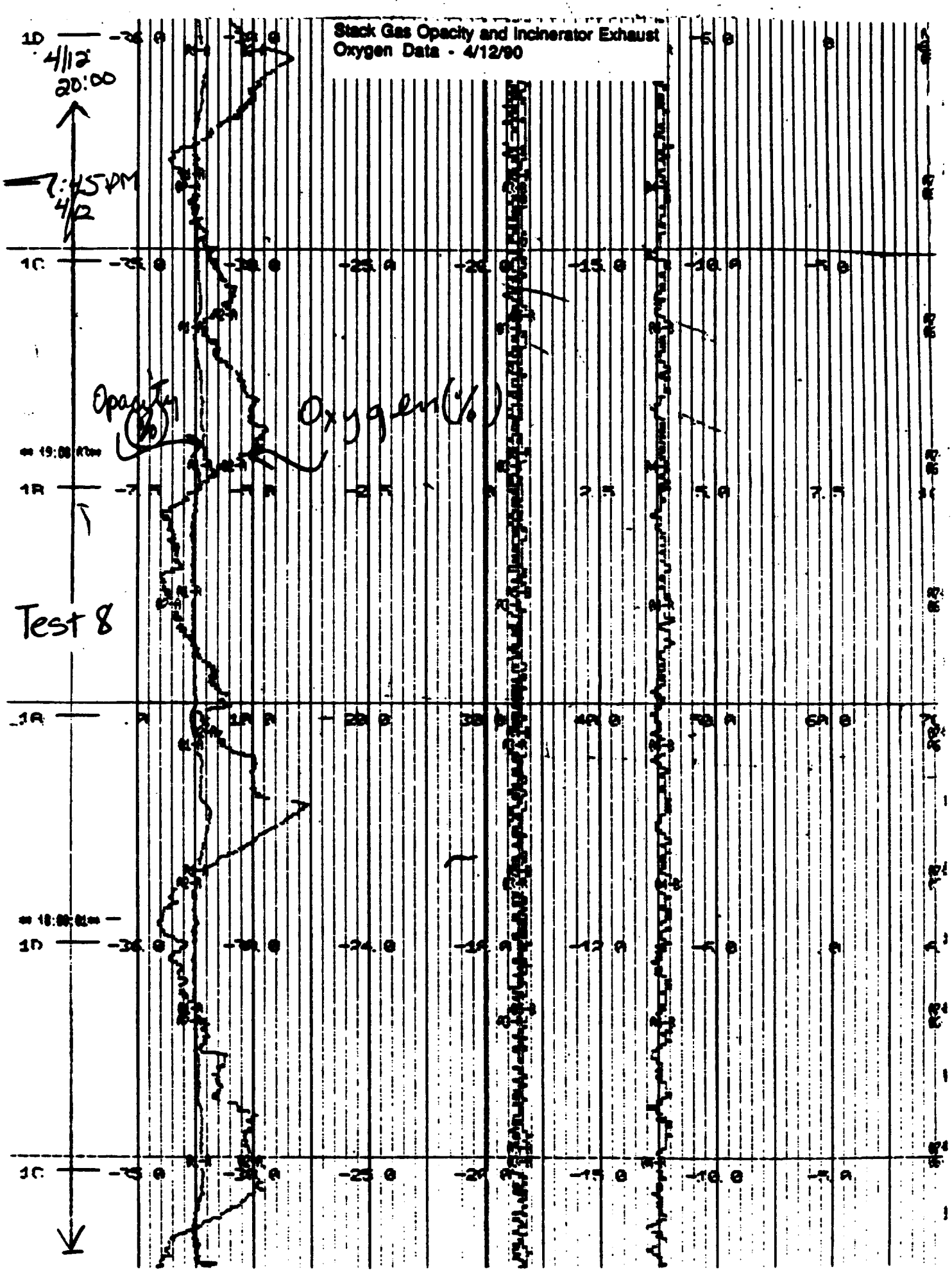
PERCENT OXYGEN: 9.8 DRAFT: .21

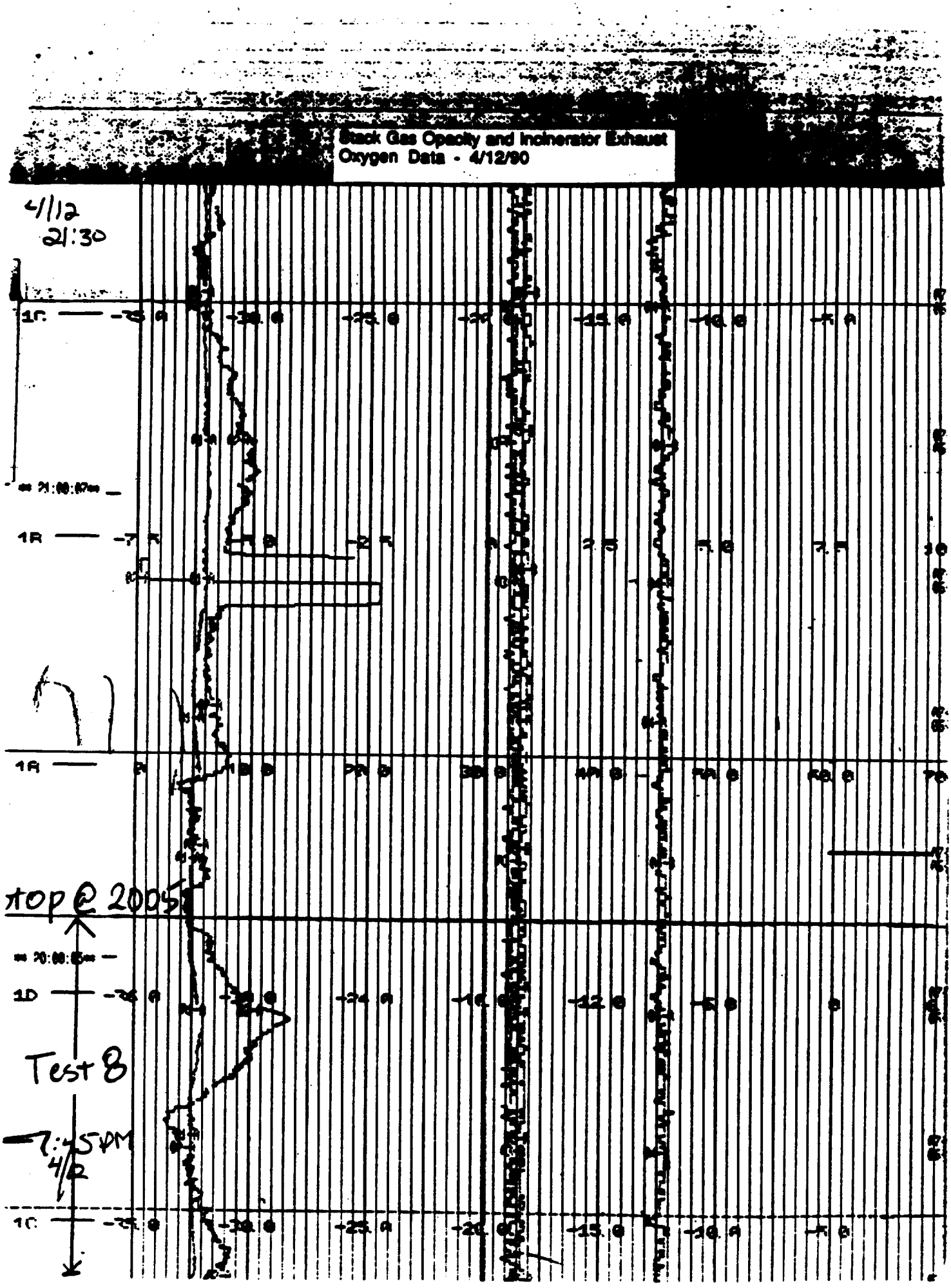
SHAFT RPM: 17 OPACITY: 6.8

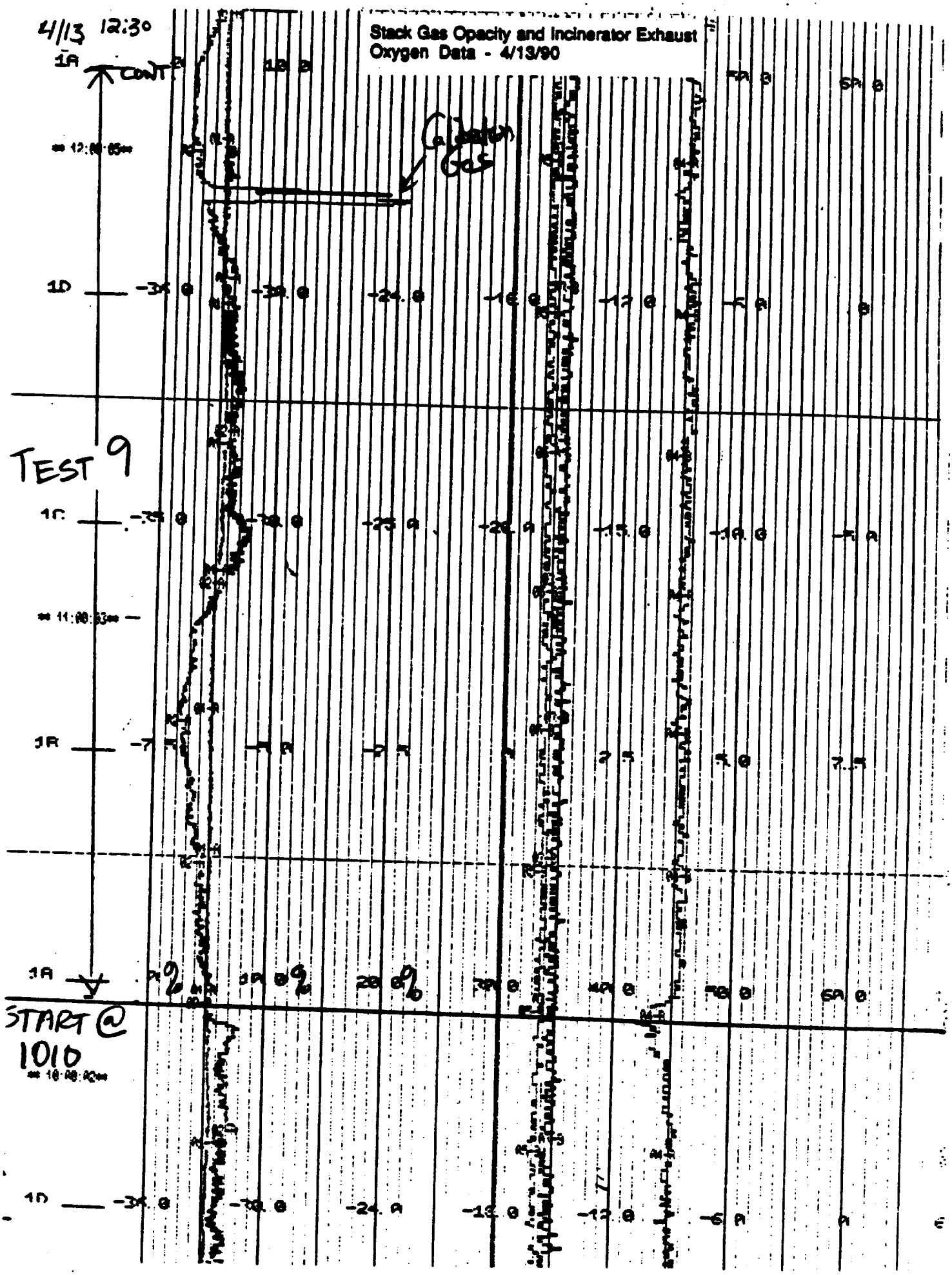

Oxygen Data - 4/12/90
4/12
13:00
CONTD NEXT
1R
Calibration Gas
Opacity
Oxygen (%)
TEST 7
1R
START @ 1219
1D
1C
1R
STOP @ 1052
TEST 6

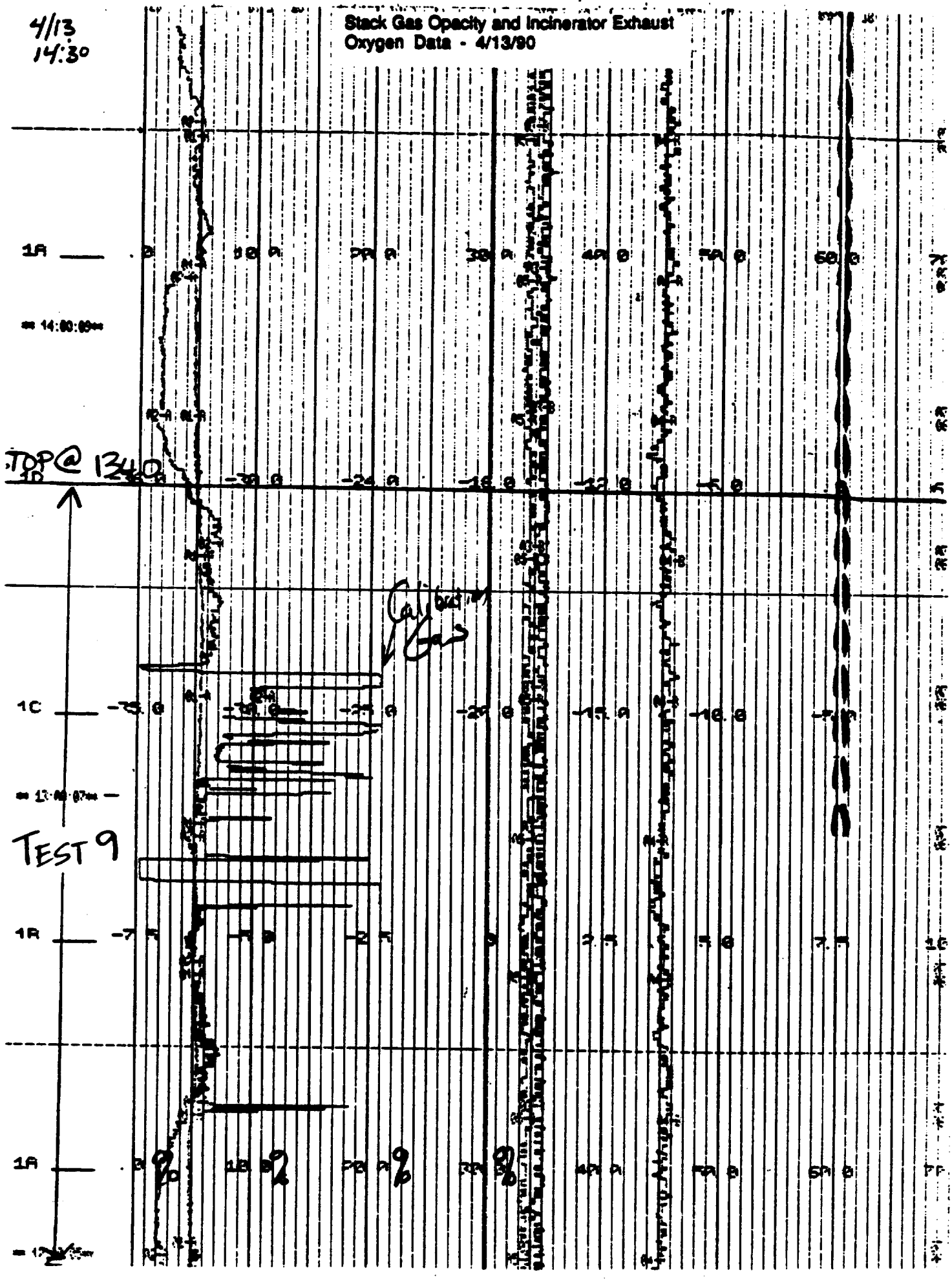

Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/12/90
4/12
15:00
CONT'D NEXT PG
Test 7
Oxygen (%)
Opacity (%)

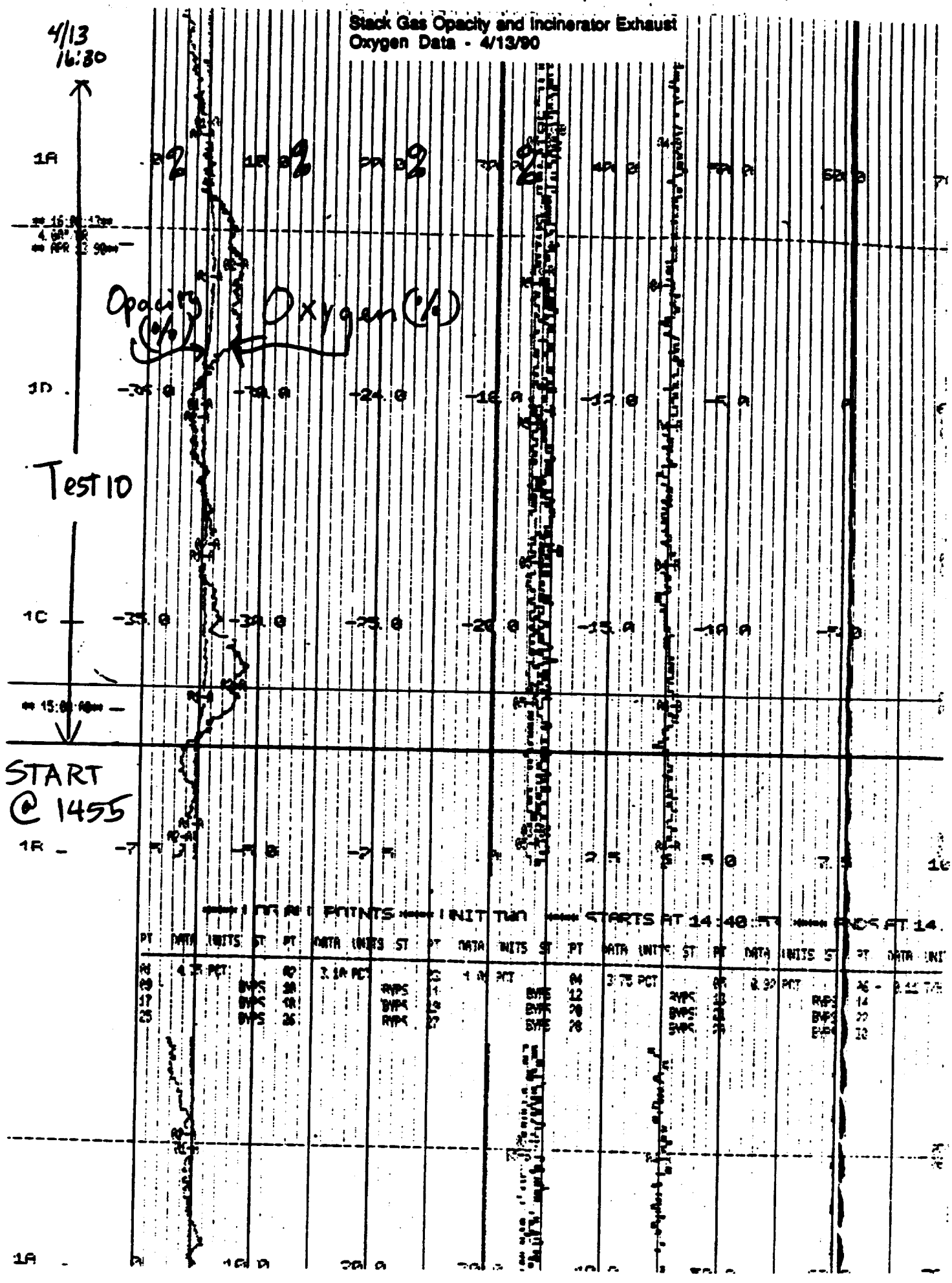

Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/12/90
4/12
1:30
Test 8
start @ 1645
stop @ 1916
Test 7
Opacity (%)
Oxygen (%)

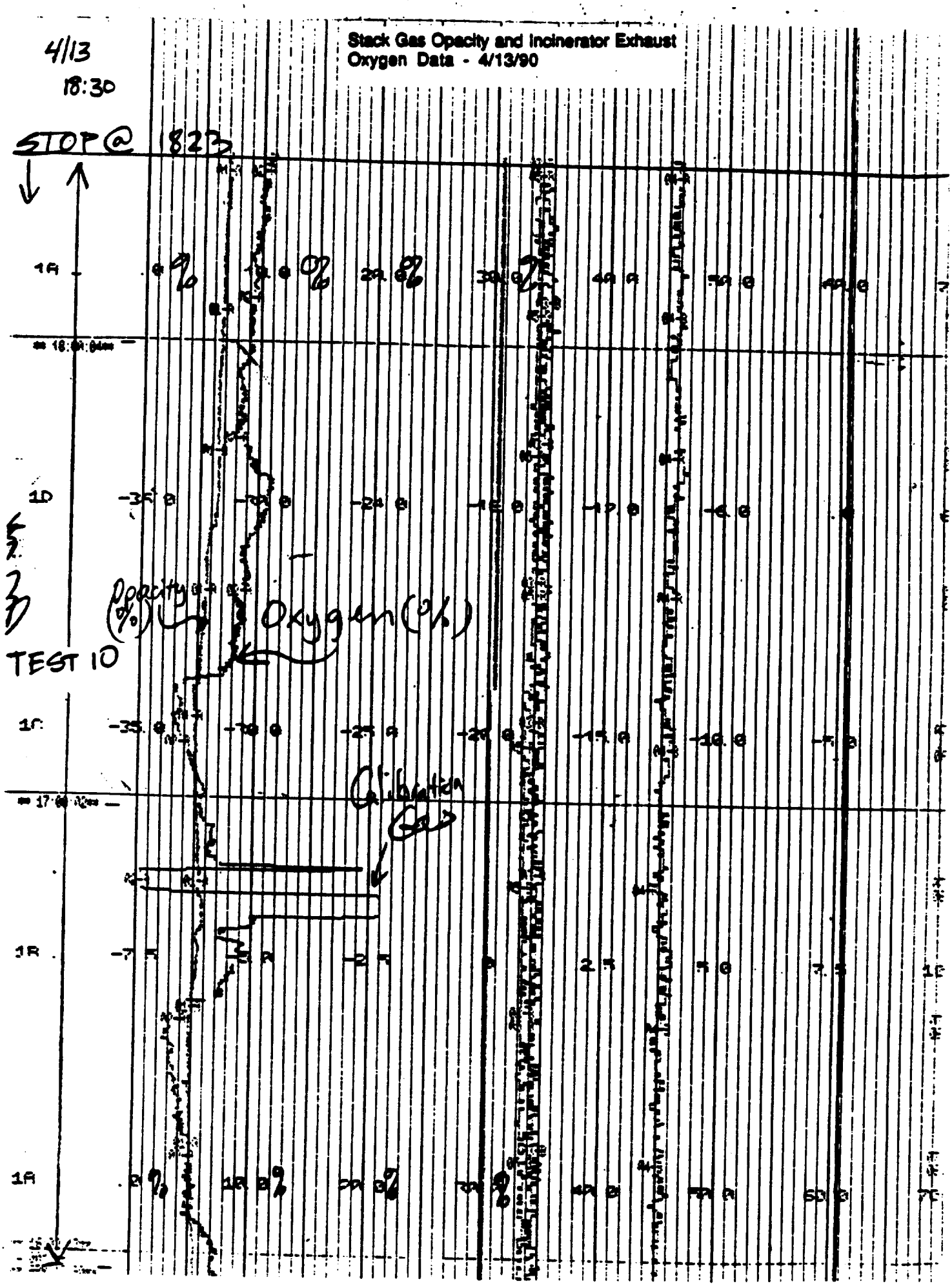

Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/12/90
4/12
20:00
7:45PM 4/12
Opacity (%)
Oxygen (%)
Test 8


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/12/90
4/12
21:30
top @ 2005
Test 8
7:45PM
4/12


4/13 12:30
Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/13/90
1A
CONT
1D
TEST 9
1C
1B
1A
START @ 1010
1D


4/13
14:30
Stack Gas Opacity and Incinerator Exhaust
Oxygen Data - 4/13/90
1A
TDP@ 1340
Calibrate
Gas
1C
TEST 9
1R
1A


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/13/90
4/13
16:30
Opacity (%)
Oxygen (%)
Test 10
START @ 1455


Stack Gas Opacity and Incinerator Exhaust Oxygen Data - 4/13/90
4/13
18:30
STOP @ 1823
TEST 10
(%) Opacity
Oxygen (%)
Calibration Gas

APPENDIX II: STACK CONFIGURATION AND TRAVERSE POINT LOCATIONS

SELECTION OF SAMPLING SITES AND

NUMBER OF TRAVERSE POINTS

PARTICULATE TRAVERSES

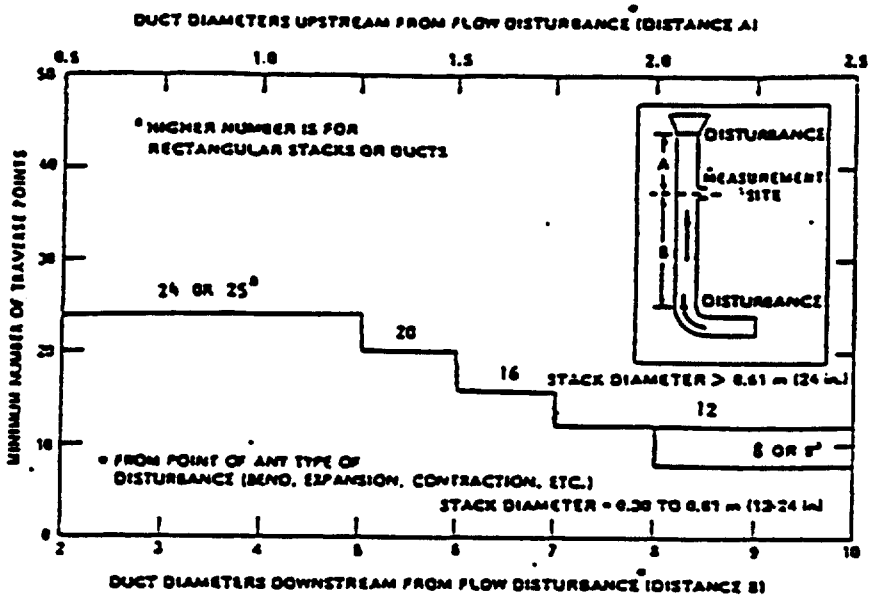


Figure 1-1. Minimum number of traverse points for particulate traverses.

[Method 1.— Figure 1-1 revised by 48 FR 45035, September 30, 1983]

Whenever sufficient straight stack or duct is available, the sampling site is located at least 8 stack diameters downstream and at least 2 stack diameters upstream from any flow disturbance such as a bend or an elbow or a fan. In situations where the above criteria cannot be met, the number of traverse points is increased according to the above graph.

For circular stacks, the traverse points are located on two diameters, the traverse axes dividing the stack cross-section into equal parts.

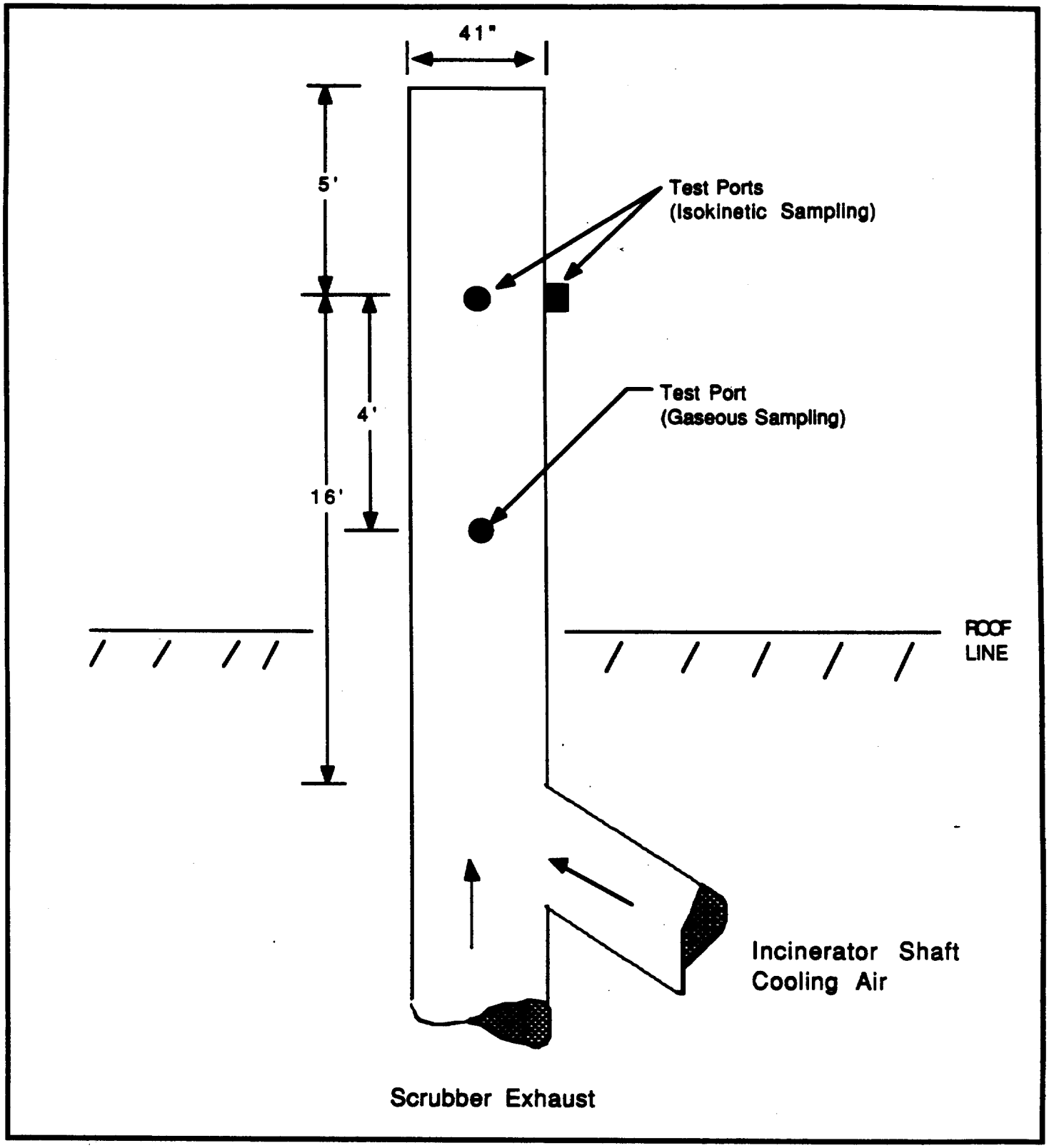
For rectangular stacks, the cross-section is divided into equal areas, such that the ratio of the length to width of the rectangles formed, is between 1 and 2. The traverse points are located at the center of each area.

Traverse Point Locations (Circular Stack):

Stack Identification:	Incinerator #2 Exhaust
Stack Diameter:	41 inches
Sampling Locations:	4.7 diameters downstream 1.5 diameters upstream
Minimum Number of Traverse Points as Specified by CARB Method 1:	24
Number of Traverse Points Sampled:	24

Traverse Point Number	Distance From Inside Wall (Inches)
1	1.0[1]
2	2.8
3	4.8
4	7.3
5	10.3
6	14.6
7	26.4
8	30.8
9	33.7
10	36.2
11	38.3
12	40.0[1]

1 Adjusted in accordance with CARB Method 1, Section 2.3.1.1.



Galson Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: N/A	JOB NUMBER: SE-034	Central Contra Costa Sanitary District	File: SE-034 THC
	DATE: 9/6/90	DRAWN: ML	Incinerator #2 Stack	Disk: SE034

CYCLONIC FLOW DETERMINATION

Plant: CCCSD Stack: Unit #2 Stack

Traverse Point No.	Velocity Head ΔP, inches H_2O	Degrees Deviation From Reference α	Traverse Point No.	Velocity Head ΔP, inches H_2O	Degrees Deviation From Reference α
A3	1.10	0°			
A5	1.15	2°			
A8	0.95	1°			
A10	0.80	0°			
B3	1.15	1°			
B5	1.20	1°			
B8	0.95	3°			
B10	0.90	6°			

12/14/88

Average | α | = 1°

APPENDIX III: SAMPLING AND ANALYTICAL METHODS

Galson Laboratories

6601 Kirkville Road
E. Syracuse, NY 13057
Tel. (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

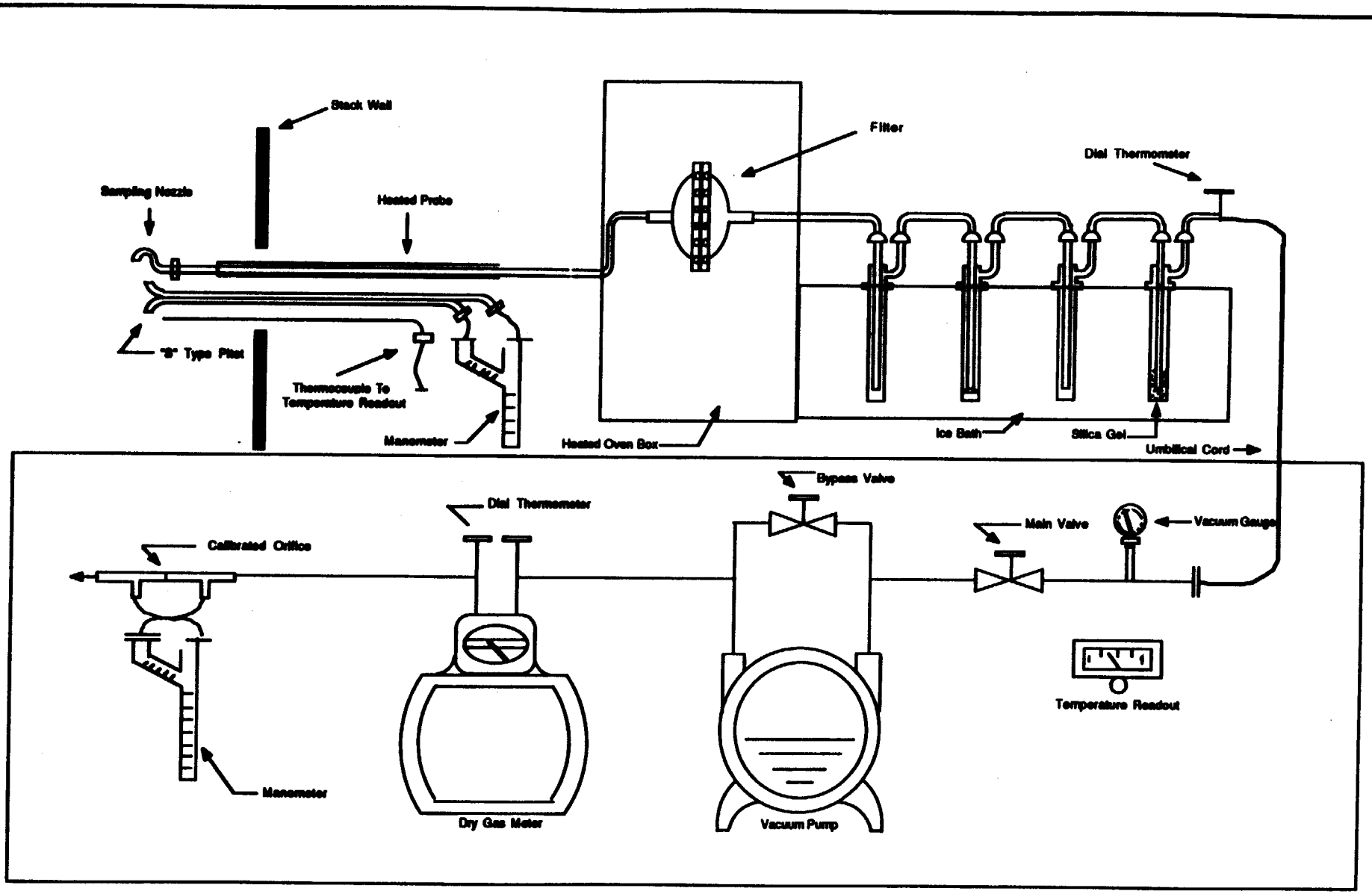
	Lab ID:	J9299AC	J9299B	J9299D	J9299E	
	Client ID:	TEST 6 CONTAINER A/C	TEST 6 CONTAINER B	TEST 6 CONTAINER D	TEST 6 CONTAINER E	TEST 6 TOTAL
MERCURY	TOTAL UG	<0.8	1.3	24	260	285.3

Method(s): EPA DRAFT METHOD 8/28/89 METHOD EMISSIONS FROM HAZARDOUS WASTE AND SIMILAR COMBUSTION PROCESSES.

Footnotes: NO BLANK CORRECTIONS NEEDED.

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: ES, DS, PH
Approved by: Mary G Wirthron
Date: 4-MAY-1990



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: SE-034	CENTRAL CONTRA COSTA SANITARY DISTRICT	File: HCl. Drwg
	DATE: 9/27/90	DRAWN BY: ML	HCl SAMPLING SYSTEM	Disk: SE034

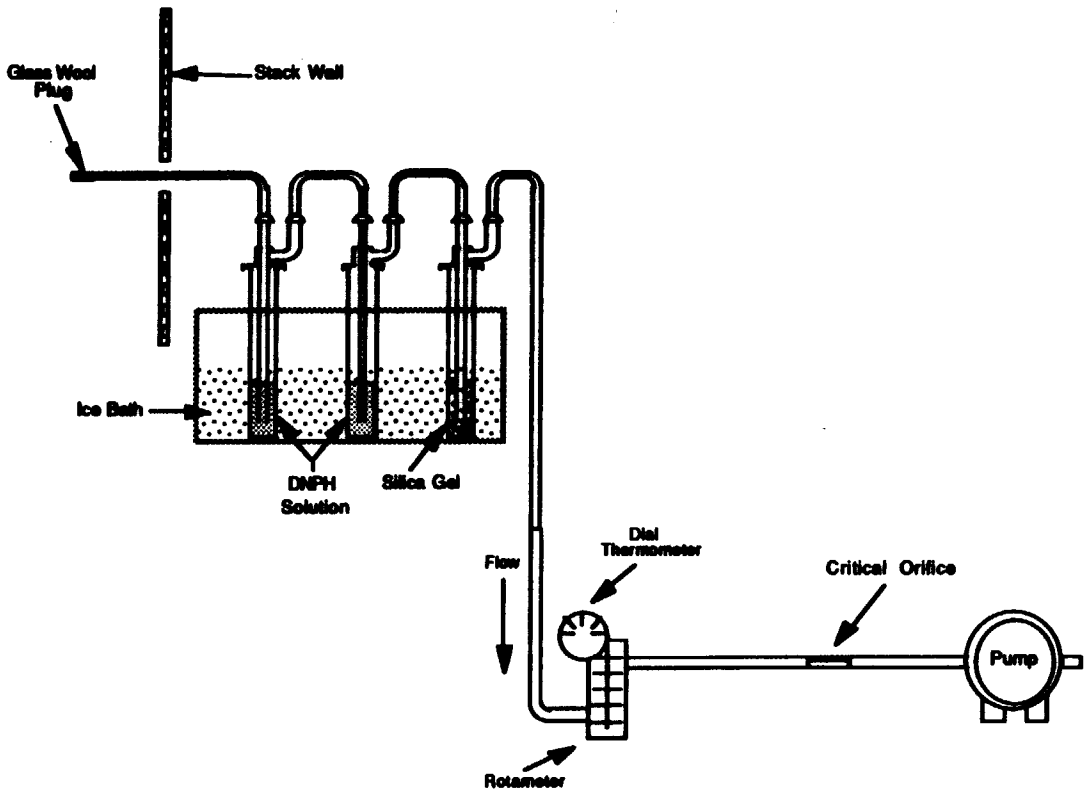
SAMPLING AND ANALYTICAL METHODS:
FORMALDEHYDE EMISSIONS - CARB METHOD 430

Formaldehyde emission testing was conducted in accordance with California Air Resources Board Method 430. The sampling train shown on the following page was utilized to collect the samples. Exhaust gases are drawn through a glass probe followed by two impingers containing 15 milliliters (each) of absorbing solution (2,4-dinitrophenylhydrazone, DNPH). Sample flow rate is regulated by a critical orifice/high vacuum pump assembly.

The DNPH solution is formulated within 48 hours of sampling. Sampling is performed at a single point in the exhaust stack/duct at a constant flow rate (i.e., approximately 1.0 liter per minute). The sampling rate is determined prior to each test period with a soap bubble flow meter; sample gas temperatures (at the critical orifice), rotameter readings, and pump vacuum are recorded at approximately 5 to 10 minute intervals during the testing.

At the end of the test interval, the sampling rate is again determined with the bubble meter. The solution is then transferred to a sample bottle, along with a small volume of rinse (approximately 5 milliliters of the DNPH). The samples are packaged (on ice) for shipment to the laboratory.

In the laboratory, the solution is extracted and the derivative is analyzed using high performance liquid chromatography (HPLC), coupled with ultraviolet (UV) absorption detector (at 360 nanometers). Quantification is provided by comparing the sample response with laboratory-prepared standards of formaldehyde. A field blank is prepared and analyzed in conjunction with the samples to determine if sample contamination occurred. The samples are extracted within seven days of collection.



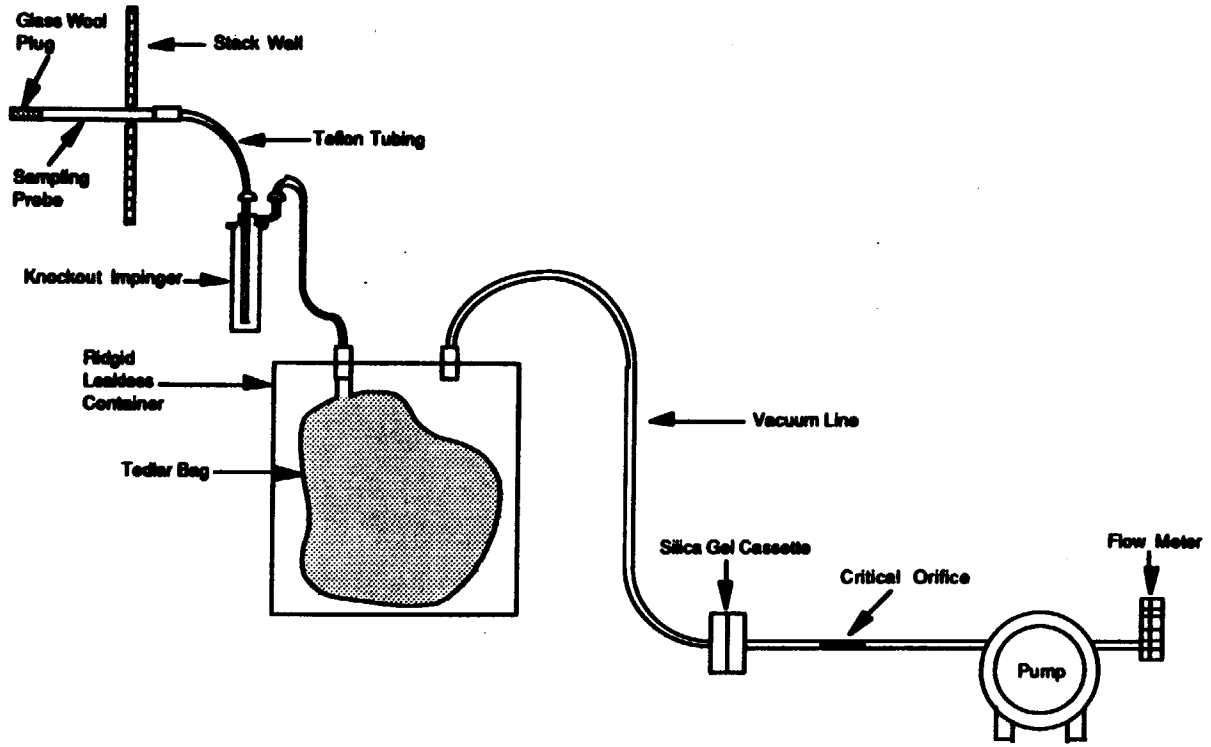
GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0368 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: SE-034	CENTRAL CONTRA COSTA SANITARY DISTRICT	File: Form. Drwg
	DATE: 6/14/90	DRAWN BY: ML	FORMALDEHYDE SAMPLING TRAIN	Disk: SE034

SAMPLING AND ANALYTICAL METHODS:
BENZENE AND VINYL CHLORIDE EMISSIONS -
CARB METHODS 410A AND 106

Benzene and vinyl chloride emission testing was conducted in accordance with California Air Resources Board Methods 410A and 106, respectively. The sampling train shown on the following page was utilized to collect the samples.

An integrated sample of the exhaust gas is collected in a tedlar bag. Sample gas is drawn through a stainless steel probe/integrated particulate filter (glass wool plug) assembly and through an empty impinger which serves to condense moisture. The gas then passes through teflon tubing and into a 10-liter tedlar bag. The bag is retained in a rigid, leak-free container (i.e., lung sampler) which is evacuated at a constant rate of approximately 0.2 lpm. The sampling system is leak tested prior to use.

Following sampling, the bag is labelled, sealed, and transferred to a storage container. Exposure to sunlight is minimized. The sample is then transferred to a laboratory where it is analyzed for benzene and vinyl chloride using gas chromatography/mass spectrometry (GC/MS). Quantification is provided by comparing the sample response with laboratory-prepared standards. A field blank (nitrogen) is prepared and analyzed in conjunction with the samples to determine if sample contamination occurred. Sample analyses are performed within 48 hours of collection.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0368 Fax: (415) 848-0638	SCALE: NA	JOB NUMBER: SE-034	CENTRAL CONTRA COSTA SANITARY DISTRICT	File: Benz/Vyl Cl. Drwg
	DATE: 9/27/90	DRAWN BY: ML	BENZENE/VINYL CHLORIDE SAMPLING TRAIN (CARB 410A)	Disk: SE034

SAMPLING AND ANALYTICAL METHODS:
DETERMINATION OF PARTICULATE AND METALS (11) EMISSIONS -
EPA MULTIPLE METALS METHOD (DRAFT: 8/28/89)

Particulate and metals emission testing was performed in accordance with the Environmental Protection Agency (EPA) Draft Multiple Metals Method (dated August 28, 1989), respectively. Sampling equipment manufactured by Research Appliance Corporation (RAC) and Nutech Corporation was utilized to collect the samples. A schematic of the sampling train is shown on the following page. Velocity pressure of the stack gas is measured with a Stausscheibe-type pitot tube connected to an inclined gauge manometer. Isokinetic sampling rates are calculated using a nomograph and sample flow rate is regulated accordingly by adjusting the pressure drop across a calibrated orifice. Total sample volume is measured with a dry gas meter. Direct thermocouple read-out is provided for stack gas, impinger effluent, probe, sampling box, and gas meter influent and effluent temperatures. Emissions of the following metals were determined:

Arsenic	Beryllium
Cadmium	Chromium (Total)
Copper	Lead
Manganese	Mercury
Nickel	Selenium
Zinc	

Stack gases are drawn through a glass nozzle and a heated, glass-lined sampling probe, prior to passing through a pre-weighed, 85 millimeter glass fiber filter (for particulate collection). The filter, which meets CARB specifications for removal efficiency, is maintained at 250°F. The gases are then bubbled through a series of five impingers in an ice bath. The first two impingers each contain 100 milliliters (mls) of a nitric acid/hydrogen peroxide solution[1]; the third impinger is empty; the fourth impinger contains 100 mls of a potassium permanganate/sulfuric acid solution[2]; the fifth impinger contains 200 grams of indicating-type silica gel.

Following the completion of sampling, the filter is recovered and transferred to a storage container (Container C); the probe, nozzle, and filter holder are rinsed (and brushed) with acetone (Container A), and then rinsed (only) with the nitric acid/hydrogen peroxide solution (Container B). The volume of solution in the first, second, and third impingers is measured and transferred to Container D; these impingers (and connecting glassware) are then rinsed with the nitric acid/hydrogen peroxide solution and the rinses are added to Container D. The volume of solution in the fourth impinger is measured and transferred to Container E; this impinger is then rinsed with the potassium permanganate/sulfuric acid solution and transferred to Container E. Lastly, the silica gel in the fifth impinger is transferred to Container F.

---

1 5%HNO_3/10%H_2O_2.

2 4%$KMnO_4$/10%H_2SO_4

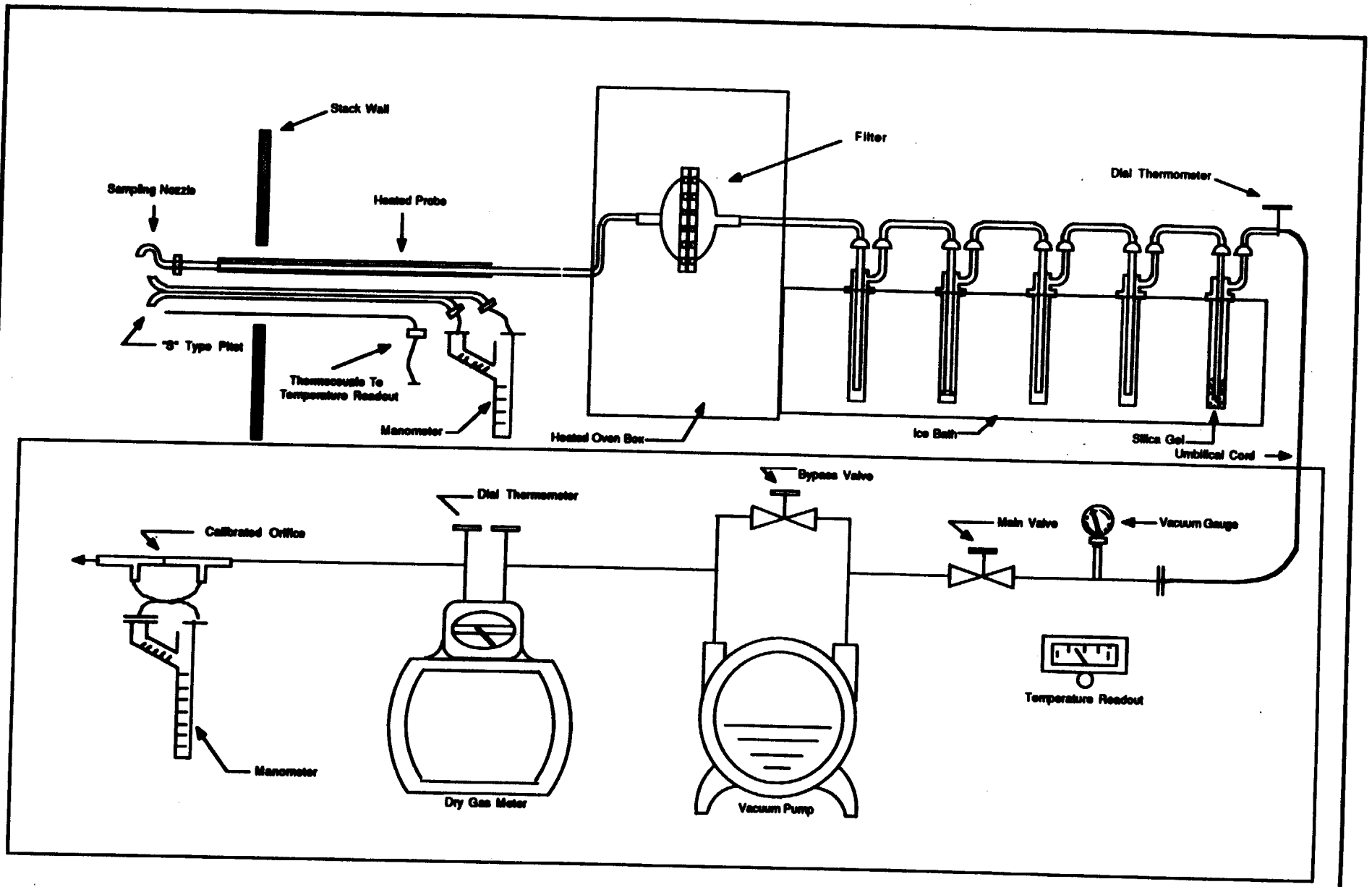
SAMPLING AND ANALYTICAL METHODS:
DETERMINATION OF PARTICULATE AND METALS (11) EMISSIONS -
EPA MULTIPLE METALS METHOD (DRAFT: 8/28/89)

In the laboratory, the acetone rinse sample (Container A) is poured into a pre-cleaned, pre-weighed beaker and evaporated to dryness. The filter (Container C) and beaker are then placed in a dessicator for conditioning, prior to weighing. After weighing, the filter is added to the beaker and the samples are digested; following digestion, the Container A/C, Container B, and Container D samples are concentrated and analyzed (separately) for each metal using the following instrumentation:

Metal	Instrument
Arsenic	Atomic Absorption (Graphite Furnace)
Beryllium	Inductively Coupled Plasma
Cadmium	Inductively Coupled Plasma
Chromium	Inductively Coupled Plasma
Copper	Inductively Coupled Plasma
Lead	Atomic Absorption (Graphite Furnace)
Manganese	Inductively Coupled Plasma
Mercury	Atomic Absorption (Cold Vapor)
Nickel	Inductively Coupled Plasma
Selenium	Atomic Absorption (Graphite Furnace)
Zinc	Inductively Coupled Plasma

The Container E sample (i.e., potassium permanganate/sulfuric acid solution) is first filtered and the filter is washed with permanganate. An aliquot of the filtrate is then analyzed for mercury (only) in accordance with CARB Method 101A (cold vapor atomic absorption), following the addition of potassium permanganate, nitric acid, and sodium chloride hydroxylamine.

The pre-weighed silica gel sample (Container F) is re-weighed and summed with the increase in impinger contents to determine the total volume of water condensed.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0836	SCALE: NA	JOB NUMBER: SE-034	CENTRAL CONTRA COSTA SANITARY DISTRICT	File: Metals. Drwg
	DATE: 9/27/90	DRAWN BY: ML	METALS SAMPLING TRAIN	Disk: SE034

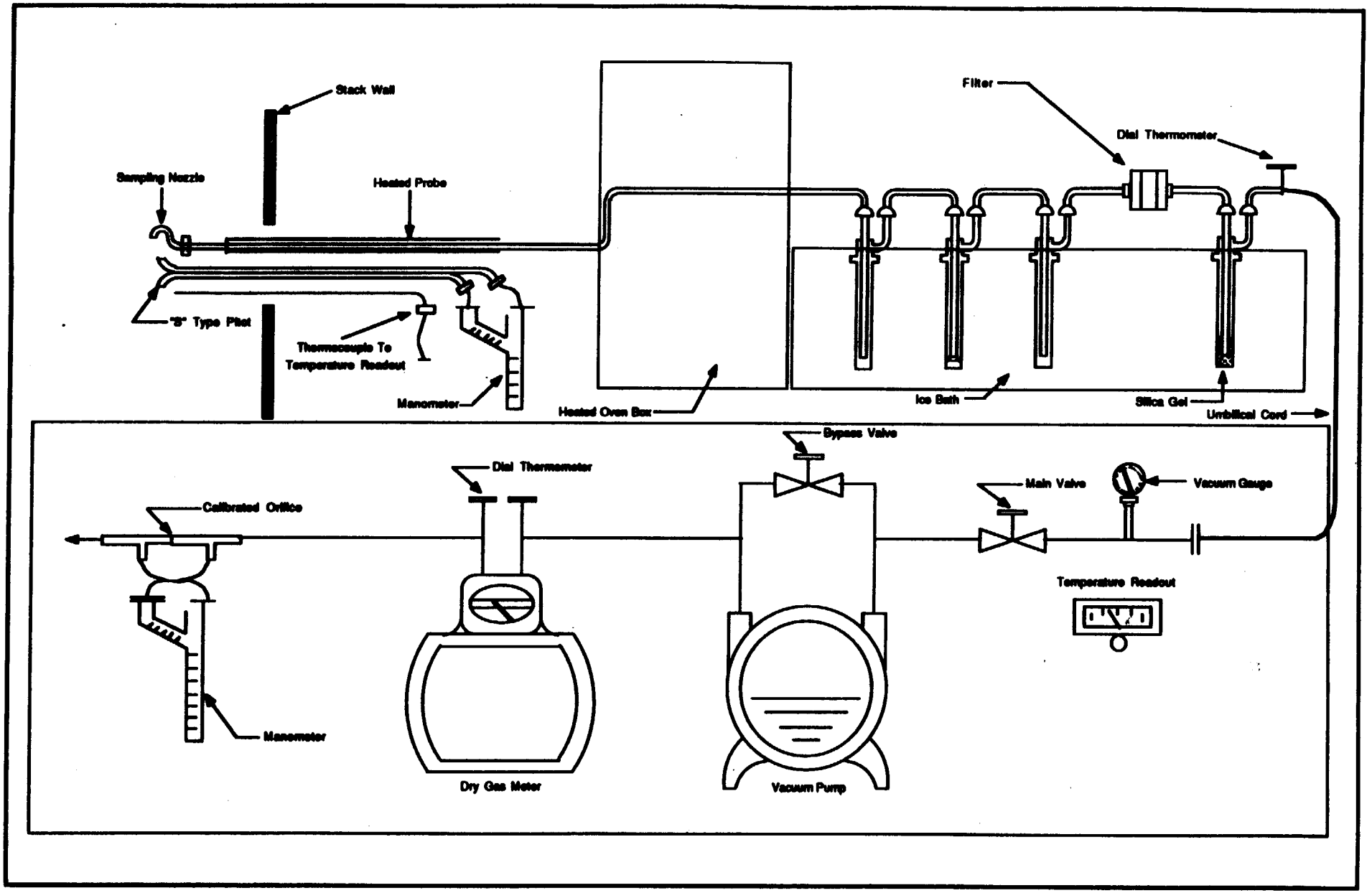
SAMPLING AND ANALYTICAL METHODS:
HEXAVALENT CHROMIUM EMISSIONS - CARB METHOD 425

Hexavalent chromium emission testing was performed in accordance with California Air Resources Board (CARB) Method 425 (amended, January 11, 1990). A schematic of the sampling train is presented on the following page. Velocity pressure of the stack gas is measured with a stausscheibe type pitot tube connected to an inclined gauge manometer. Isokinetic sampling rates are calculated using a nomograph and sample flow rate is regulated accordingly by adjusting the pressure drop across a calibrated orifice. Total sample volume is measured by a dry gas meter. Direct thermocouple read-out is provided for stack gas, impinger effluent, probe, sampling box, and the gas meter influent and effluent temperatures.

Stack gases are drawn through a glass nozzle, probe and oven assembly (non-heated) and bubbled through two impingers in series, each containing 100 milliliters of 0.1 N sodium hydroxide (NaOH) solution. Stack gases are then drawn through an empty impinger (for droplet/mist knockout) followed by an 85mm teflon-impregnated fiberglass filter (Pallflex Products #T60A20) meeting CARB specifications for removal efficiency. The sample gas then passes through a fourth impinger containing 300 grams of indicating silica gel, prior to entering the metering system.

Following the completion of sampling, the volume of the solution in the impingers is measured; the impinger contents and the rinse solution (0.1 N NaOH) are transferred to a storage container (Container #1). The filter is also removed and transferred to Container #1. The probe liner, sampling nozzle, filter holder, and connecting glassware are rinsed with 0.1 N NaOH, and the rinse is added to Container #1. The entire sampling train is then rinsed with 0.1 N nitric acid and the rinse is transferred to Container #2. Lastly, the silica gel in the fourth impinger is transferred to Container #3.

In the laboratory, the total volume of the Container #1 sample is measured. An aliquot of the sample is transferred to a beaker and acidified to a pH of approximately 1 (with 6 N sulfuric acid). After the addition of diphenylcarbazide (allowing approximately 10 minutes for color development), the sample is filtered and the absorbance is measured with a spectrophototmeter at a wavelength of 540 nm. The absorbance of the sample is compared with solutions of known amounts to determine sample quantities. Field and laboratory (internal) blank samples are prepared and analyzed in conjunction with the samples to account for potential contamination and/or background levels. A second aliquot of the Container #1 solution is analyzed for total chromium using flame atomic absorption spectroscopy (AAS). The Container #2 solution is similarly analyzed for total chromium using AAS. The pre-weighed silica gel sample (Container #3) is re-weighed and summed with the increase in impinger contents to determine the total volume of water condensed.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0388 Fax: (415) 848-0638	SCALE: NA	JOB NUMBER: SE-034	CENTRAL CONTRA COSTA SANITARY DISTRICT	File: Hex Chr. Drwg
	DATE: 9/7/90	DRAWN BY: ML	HEXAVALENT CHROMIUM SAMPLING TRAIN (CARB METHOD 425)	Disk: SE034

METHOD FOR THE DETERMINATION OF POLYCHLORINATED DIBENZO-P-DIOXINS/DIBENZOFURANS AND POLYCYCLIC AROMATIC HYDROCARBON EMISSIONS (CARB METHODS 428 AND 429)

Sampling and analysis for polychlorinated dibenzo-p-dioxins/dibenzofuran (PCDD/PCDF), and polycyclic aromatic hydrocarbon (PAH) emissions was performed in accordance with the California Air Resources Board (CARB) Methods 428 and 429. Stack gas samples were collected utilizing Modified Method 5 (MM5) procedures; a schematic of the train is shown on the following page. Velocity pressure of the stack gas is measured with an S-type pitot connected to an inclined gauge manometer. Isokinetic sampling rates are calculated using a nomograph, with sample flowrate regulated by adjusting the pressure drop across a calibrated orifice. Total sample volume is measured by a dry gas meter. Dial thermometers and/or thermocouples are employed to monitor stack gas, probe filter oven, XAD-2 trap effluent, impinger effluent and dry gas meter influent and effluent temperatures.

Stack gases are drawn isokinetically through a nozzle and heated borosilicate glass probe, and then through an 85 millimeter diameter glass fiber filter meeting CARB Method 5 specifications for particulate removal efficiency. Both probe and filter are maintained at 250 ± 25°F to avoid condensation. The sample gas is then drawn through teflon tubing and an ice water-cooled condenser/solid sorbent trap containing approximately 40 grams of XAD-2 resin. The resin trap is wrapped with aluminum foil (to avoid direct exposure to light) and the temperature of the sample gas is maintained below 68°F at the trap exit. Condensate percolates through the resin and is collected in a knock-out impinger; gases are then bubbled through a series of three impingers for additional moisture removal. The second and third impingers each contain 100 ml of deionized water and the fourth impinger contains approximately 300 grams of indicating silica gel; all impingers are pre-weighed on-site and placed in an ice bath to achieve a sample effluent temperature of less than 68°F.

Following the completion of sampling, the filter is removed and transferred to a storage bottle (Container #2). The probe liner, nozzle and all glassware preceding the filter are brushed and sequentially rinsed with methanol, benzene, and methylene chloride; the rinses are transferred to another storage bottle (Container #1). The teflon tubing, condenser, and glassware between the filter and resin trap are then rinsed with methanol, benzene, and methylene chloride; the rinses are transferred to a storage bottle (Container #3). The XAD-2 resin trap is next removed and sealed (Container #4). The impingers are then re-weighed to determine the quantity of moisture condensed; the contents of the knock-out impinger are transferred to a storage container (Container #5) along with the methanol, benzene, and methylene chloride rinse of the impinger. The contents of the second and third impinger are transferred to a storage bottle (Container #6)

along with a deionized water rinse of these impingers and all connecting glassware. Lastly, the silica gel in the final impinger is transferred to a storage bottle (Container #7), completing the sample recovery process.

Special precautions are taken to avoid sample contamination. All sampling train components upstream of the silical gel impinger are pre-cleaned in accordance with EPA's Manual of Analytical Methods for the Analysis of Pesticide Residues in Human and Environmental Samples, with special attention paid to removing silicon grease from the glassware joints. All glassware was then rinsed with methylene chloride prior to use. No grease is utilized in the sampling train and all gaskets coming in contact with the sample are teflon. Also, sample recovery is performed in a clean area away from the emission source (and other potential sources of contamination) being tested; all (pre-cleaned) sample storage containers have teflon-lined caps. Sampling reagents (filters and XAD-2 resin) are pre-cleaned via soxhlet extraction and spiked with surrogate standard compounds. Lastly, a blank train is assembled and recovered in the field; the blank train is analyzed in conjunction with the samples to document whether contamination occurred.

Sample containers 1-6 are analyzed for PCDD/PCDF and PAH compounds utilizing high resolution gas chromatography/mass spectrometry (HRGC/MS). The following homologue groups and isomers are quantified.

PCDD/PCDF:

2,3,7,8 TCDD	2,3,7,8 TCDF
Total TCDD	Total TCDF
1,2,3,7,8 PeCDD	1,2,3,7,8 PeCDF
Total PeCDD	2,3,4,7,8 PeCDF
1,2,3,4,7,8 HxCDD	Total PeCDF
1,2,3,6,7,8 HxCDD	1,2,3,4,7,8 HxCDF
1,2,3,7,8,9 HxCDD	1,2,3,6,7,8 HxCDF
Total HxCDD	2,3,4,6,7,8 HxCDF
1,2,3,4,6,7,8 HpCDD	1,2,3,7,8,9 HxCDF
Total HpCDD	Total HxCDF
Total OCDD	1,2,3,4,6,7,8 HpCDF
	1,2,3,4,7,8,9 HpCDF
	Total HpCDF
	Total OCDF

METHOD FOR THE DETERMINATION OF POLYCHLORINATED DIBENZO-P-DIOXINS/DIBENZOFURANS AND POLYCYCLIC AROMATIC HYDROCARBON EMISSIONS (CARB METHODS 428 AND 429)

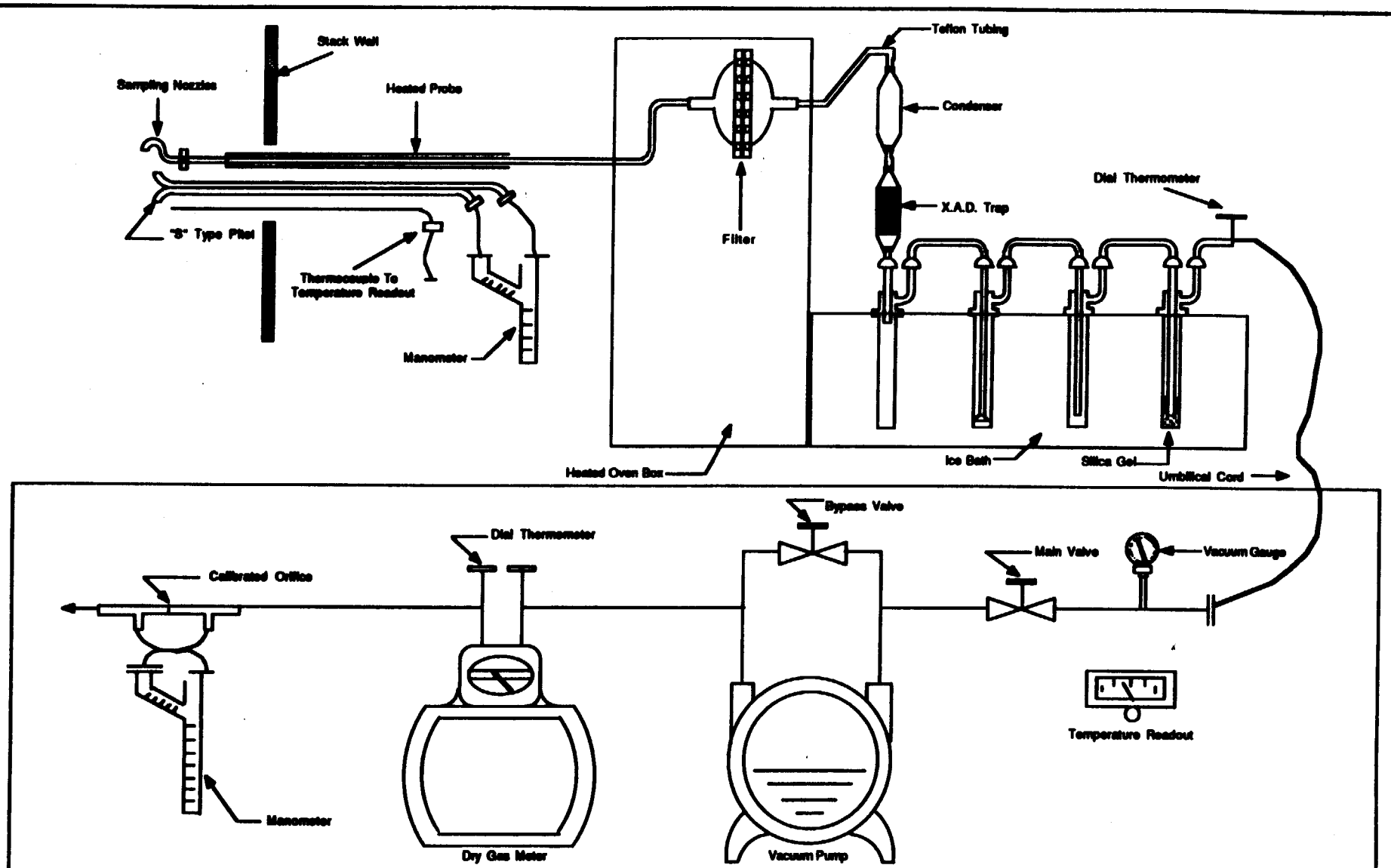
PAH Compounds:

Naphthalene	2-Methylnaphthalene
2-Chloronaphthalene	Acenaphthylene
Acenapthene	Fluorene
Phenanthrene	Anthracene
Fluoranthene	Benzo(a)anthracene
Chrysene	Benzo(b)fluoranthene
Benzo(k)fluoranthene	Benzo(a)pyrene
Perylene	Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene	Benzo(g,h,i)perylene

The silica gel sample (Container 7) was re-weighed and summed with the increase in impinger contents to determine the total volume of water condensed.

In the laboratory, the samples and/or extracts corresponding to Containers 1-6 are combined and prepared for analysis in accordance with CARB Method 428 procedures. All samples (including the blanks) are fortified with internal and surrogate standards prior to preparation. Following sample clean-up steps, the final residue is dissolved in 20 µl of toluene, containing carbon-labeled internal standards used for determining recovery efficiencies. The sample was then split; half of the solution was utilized for the PCDD/PCDF analysis, while the other half was used for the PAH analyses. The instruments and conditions utilized to perform the analyses are summarized on the folowing pages.

Prior to sample analyses, the mass spectrometer response was initially calibrated with several standard solutions containing known amounts of the PCDD/PCDF and PAH isomers of interest. In addition, a continuing calibration was demonstrated every 12 hours using one of the solutions. Response factors used for the calculation of the analyte concentrations were obtained from the daily continuing calibration checks.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0388 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: SE-034	CENTRAL CONTRA COSTA SANITARY DISTRICT	File: PAH. Drwg
	DATE: 5/11/90	DRAWN BY: MSL	PCDD/PCDF AND PAH SAMPLING TRAIN (CARB METHOD 429)	Disk: SE034

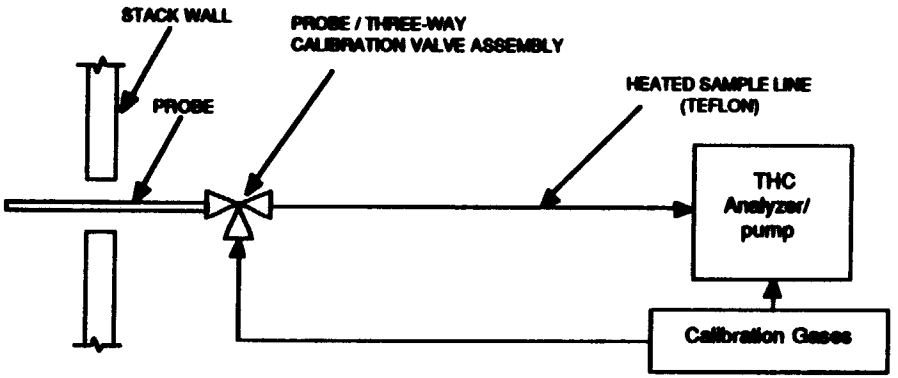
SAMPLING AND ANALYTICAL METHODS:
TOTAL HYDROCARBON EMISSIONS - EPA METHOD 25A
(CONTINUOUS MONITORING PROCEDURE)

Stack gas concentrations of total gaseous hydrocarbons (THC) were determined in accordance with the Environmental Protection Agency Method 25A. A Ratfisch Instruments, Ltd. (Model RS 55) THC analyzer was utilized to perform the testing. Data were recorded using a Linear Instruments strip chart recorder. A schematic of the sampling train is shown on the following page.

Stack gases are drawn through the probe and heated sampling line to the analyzer. The instrument is equipped with an integral heated filter/leak-free diaphram pump and a flame ionization detector (FID). The sampling rate of the analyzer is approximately 4 l/min. The FID is fueled with high purity hydrogen; hydrocarbon-free combustion air is also supplied to the analyzer. All materials in contact with the sample gas stream are either teflon or stainless steel.

Instrument outputs include an analog signal display and 0 to 1 volt recorder terminals; full scale responses are selectable in four ranges corresponding to THC concentrations spanning from 0-10 ppm to 0-500 ppm. The strip chart recorder is connected to the recorder terminals and continuously records the instantaneous output from the analyzer; subsequent data reduction includes converting voltage outputs to THC concentrations (based on instrument calibration) and averaging the concentration data for the time period of interest. Total hydrocarbons are measured on a wet basis, as methane; concentrations are corrected to dry conditions using the moisture content of the stack gas.

Instrument calibration is performed on-site utilizing zero air and methane (in air) certified gas standards. Prior to the start of testing, the instrument is calibrated directly by introducing each calibration gas directly to the instrument; a system bias check is then performed by introducing each gas at the probe/three-way valve assembly. The calibration check is repeated at the conclusion of the testing; acceptable performance specifications include a zero/calibration drift of up to ± 3%.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0360 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: SE-034	CENTRAL CONTRA COSTA SANITARY DISTRICT	File: THC. Drwg
	DATE: 9/27/90	DRAWN BY: ML	THC SAMPLING SYSTEM	Disk: SE034

SAMPLING AND ANALYTICAL METHODS: CARBON MONOXIDE - EPA METHOD 10 (CONTINUOUS MONITORING PROCEDURE)

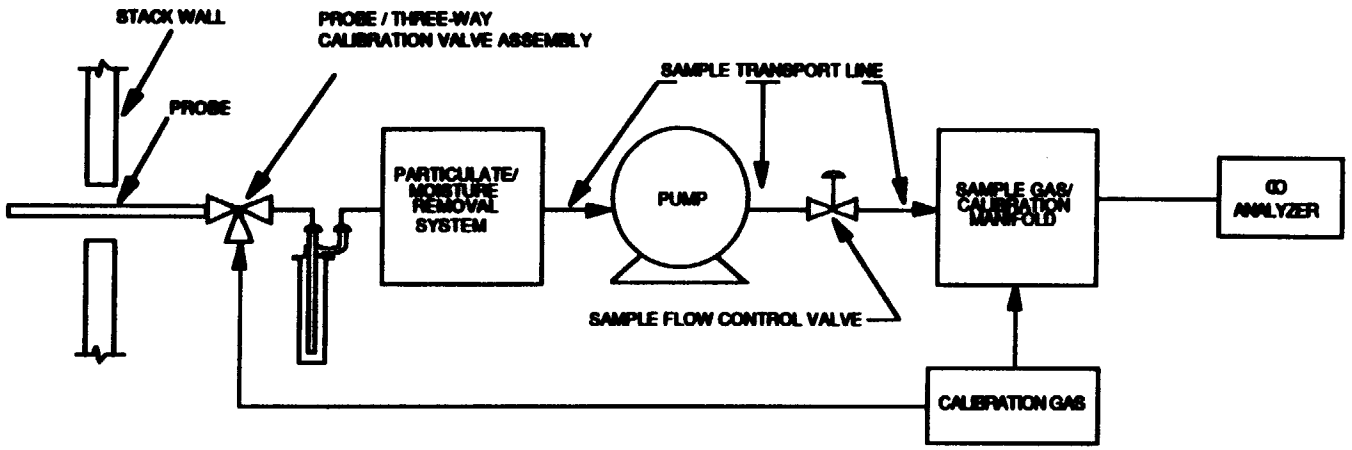
Stack gas concentrations of carbon monoxide were determined in accordance with the Environmental Protection Agency (EPA) Method 10. A gas correlation non-dispersive infrared analyzer manufactured by Thermo Electron Corporation (TECO Model 48) was utilized to perform the testing. The stack gas conditioning system consisted of a glass wool filter and a condenser/knock-out impinger for particulate and moisture removal. Data were recorded using a Linear Instruments strip chart recorder. A schematic of the sampling train is shown on the following page.

Stack gases are drawn through the probe/filter assembly and three-way valve, followed by the condenser/knock-out impinger. The sample gas then passes through teflon tubing and into the analyzer which is equipped with a leak-free diaphram pump; the sampling rate of the analyzer is approximately 1 l/min. All materials in contact with the sample gas stream are either teflon or stainless steel.

The TECO analyzer determines CO concentrations by measuring the absorbance of the sample in the infrared region. Gas filter correlation is employed to improve the specificity and sensitivity of the method. Instrument outputs include a digital readout and 0-1V recorder terminals; full scale responses are selectable in ten ranges corresponding to CO concentrations spanning from 0-1 ppm to 0-1,000 ppm. The strip chart recorder is connected to the recorder terminals and continuously records the instantaneous output from the analyzer; subsequent data reduction includes converting voltage outputs (i.e., chart recorder units) to CO concentrations (based on instrument calibration) and averaging concentrations for the time period of interest.

The instrument is periodically checked for interference from SO_2, NO_X, and CO_2, with a maximum response of 2% of full scale considered acceptable. Other gases are checked on a case-by-case basis if they are expected to be present and/or potential interferences.

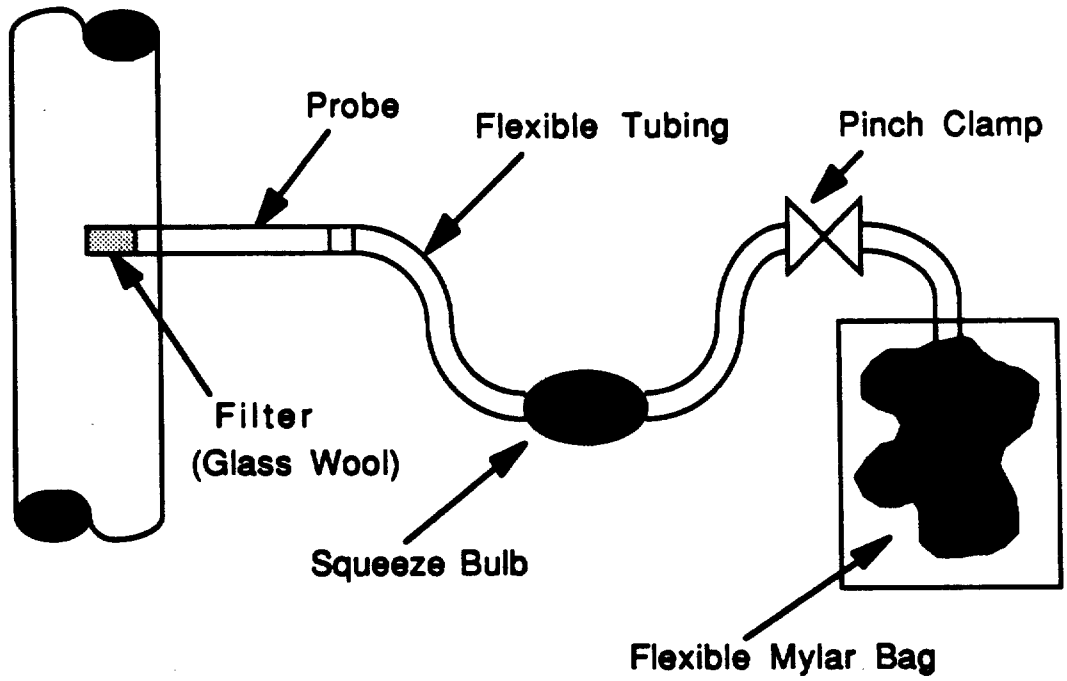
Instrument calibration is performed on-site utilizing zero air and a CO in nitrogen certified gas standard. Prior to the start of testing, the instrument is calibrated directly by introducing each calibration gas to the sample gas manifold; a system bias check is then performed by introducing each gas at the probe/three-way valve assembly. The calibration check is repeated at the conclusion of the testing; acceptable performance specifications include a zero/calibration drift of up to ± 3%.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0836	SCALE: NA	JOB NUMBER: SE-034	CENTRAL CONTRA COSTA SANITARY DISTRICT	File: CO. Drwg
	DATE: 5/14/90	DRAWN BY: MSL	CO SAMPLING SYSTEM	Disk: SE034

SAMPLING AND ANALYTICAL METHODS:CO2, O2, AND CO CONCENTRATIONS (PERCENT LEVELS) (CARB METHOD 3)

Stack gas concentrations of CO2, O2, and CO (percent levels) were determined in accordance with California Air Resources Board (CARB) Method 3. An integrated gas sample was collected utilizing the sampling train shown below. After evacuating the sampling bag, gas sample was drawn from the exhaust stack using a squeeze bulb. Multiple point sampling was performed and an equal volume of sample was collected at each point. A total sample volume of approximately 20 liters was collected during the sampling interval. Samples were analyzed for CO2, O2, and CO (percent levels) utilizing an Orsat apparatus; each sample was analyzed in duplicate (at minimum). Results are reported to the nearest 0.1 percent.



Galson Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: N/A	JOB NUMBER: SE-034	CO2 AND O2 ANALYSIS	File: CARB M3. Drwg
	DATE: 9/7/90	DRAWN: ML	CARB METHOD 3	Disk: SE034

APPENDIX IV: CALIBRATION DATA

PRE-TEST CALIBRATION DATA

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0388
Fax: (415) 848-0636

Calibration Data – Stack Sampling Train
Orifice and Dry Test Meters

Date 4/9/90 Wet Test Meter ID GTS #2
Meter Box ID 004 Barometric Pressure 30.14

ORIFICE READING (ΔH_D) in. H_2O	WET TEST METER: GAS VOLUME (V_W) ft³	WET TEST METER: TEMP. (T_W) °F	DRY GAS METER: GAS VOLUME (V_D) ft³	DRY GAS METER: TEMPERATURE DATA °F: Time	$T_{D\,in}$	$T_{D\,out}$	$T_{D\,avg}$	TIME Δt min.	γ	ΔH_a
0.56	3.0	66 (526)	933.745 930.867 3.078		86 88 90	78 78 78	83 (543)	7:35.5 (7.592)	1.005	1.92
1.0	4.0	66 (526)	938.064 933.945 4.119		96 99 103	79 80 81	89.7 (549.7)	7:20.0 (7.334)	1.012	1.78
2.0	6.0	66 (526)	944.295 938.064 6.231		108 113 115	82 84 85	97.8 (557.8)	8:03.5 (8.066)	1.016	1.89
4.0	8.0	66 (526)	952.646 944.295 8.351		119 123 125	88 91 91	106.2 (566.2)	7:38.2 (7.645)	1.021	1.88
								Average	1.014	1.87

$$\gamma = \frac{V_W}{V_D}\left(\frac{T_{D\,avg}+460}{T_W+460}\right)\frac{P_b}{\left(P_b+\frac{\Delta H_D}{13.6}\right)}$$

Technician: DR

$$\Delta H_a = 0.0317\,\Delta H_D\left(\frac{1}{V_W}\right)^2\frac{(T_W+460)^2}{P_b(T_D+460)}$$

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
Fax: (415) 848-0659

Calibration Data — Stack Sampling Train
Orifice and Dry Test Meters

Date 4-3-90 Wet Test Meter ID GTS#2
Meter Box ID 005 Barometric Pressure 30.26

ORIFICE READING (ΔH_D) in. H_2O	WET TEST METER: GAS VOLUME (V_W) ft³	WET TEST METER: TEMP. (T_W) °F	DRY GAS METER: GAS VOLUME (V_D) ft³	DRY GAS METER: TEMPERATURE DATA °F: Time	$T_{D\,in}$	$T_{D\,out}$	$T_{D\,avg}$	TIME Δt min.	γ	ΔH_a
0.5	3.0	68	18.043 14.972 3.071		80 84 86	78 79 79	81.0	(7:21.69) 7.36	1.000	1.62
1.0	4.0	68	23.128 19.000 4.128		90 93 95	82 83 84	87.8	(7:06.62) 7.11	1.004	1.68
2.0	6.0	68	30.011 23.803		99 102 104	86 88 89	94.7	(7:44.09) 7.73	1.010	1.75
4.0	8.0	68	40.326 32.000 8.326		106 109 111	91 92 94	100.5	(7:28.08) 7.47	1.011	1.82
								Average	1.006	1.72

$$\gamma = \frac{V_W}{V_D}\left(\frac{T_{D\,avg}+460}{T_W+460}\right)\frac{P_b}{\left(P_b+\frac{\Delta H_D}{13.6}\right)}$$

Technician: R. RAMER

$$\Delta H_a = 0.0317\,\Delta H_D\left(\frac{1}{V_W}\right)^2\frac{(T_W+460)^2}{P_b(T_D+460)}$$

Thermocouple Calibration Data

Type: M-5-I (DIAL)
M-5-O (DIAL)

ICE WATER BATH	Temp. °R
Standard	492
M-5-I	493
% Deviation	0.2
Standard	492
M-5-O	497
% Deviation	1.0
Standard	
% Deviation	

AMBIENT	Temp. °R
Standard	532
M-5-I	532
% Deviation	0.0
Standard	532
M-5-O	537
% Deviation	0.9
Standard	
% Deviation	

HOT WATER BATH	Temp. °R
Standard	672
M-5-I	668
% Deivation	0.6
Standard	672
M-5-O	669
% Deviation	0.4
Standard	
% Deviation	

Date: 7/6/89

Technician: [signature]

Thermocouple Calibration Data

Type: K (stack)

ICE WATER BATH	Temp. °R
Standard T-7 (4')	492
% Deviation	492
Standard T-8 (8')	492
% Deviation	492
Standard	
% Deviation	

AMBIENT	Temp. °R
Standard T-7	524
% Deviation	523
Standard T-8	524
% Deviation	523
Standard	
% Deviation	

HOT WATER BATH	Temp. °R
Standard T-7	672
% Deivation	672
Standard T-8	672
% Deviation	672
Standard	
% Deviation	

Date: 2/6/90

Technician: D. Roberts

Thermocouple Calibration Data

Type: Stack Thermocouples

ICE WATER BATH	Temp.°R
Standard	495
T-1	492
% Deviation	0.6
Standard	495
T-2	492
% Deviation	0.6
Standard	495
T-3	492
% Deviation	0.6

AMBIENT	Temp.°R
Standard	532
T-1	532
% Deviation	0.0
Standard	532
T-2	533
% Deviation	0.2
Standard	532
T-3	532
% Deviation	0.0

HOT WATER BATH	Temp.°R
Standard	672
T-1	671
% Deivation	0.1
Standard	672
T-2	670
% Deviation	0.3
Standard	672
T-3	671
% Deviation	0.1

Date: 7 Jul, 89

Technician: DR

Thermocouple Calibration Data

Type: Oven box

ICE WATER BATH	Temp. °R
Standard	492
OB-2	494
% Deviation	0.40
Standard	
% Deviation	
Standard	
% Deviation	

AMBIENT	Temp. °R
Standard	531
OB-2	527
% Deviation	0.75
Standard	
% Deviation	
Standard	
% Deviation	

HOT OVEN	Temp. °R
Standard	687
OB-2	688
% Deivation	0.15
Standard	
% Deviation	
Standard	
% Deviation	

Date: 10/17/89

Technician: D. Roberts

Thermocouple Calibration Data

Type: Oven Box Thermocouple

ICE WATER BATH	Temp. °R
Standard	492
OB-1	492
% Deviation	0.00
Standard	
% Deviation	
Standard	
% Deviation	

AMBIENT	Temp. °R
Standard	527
OB-1	525
% Deviation	0.38
Standard	
% Deviation	
Standard	
% Deviation	

HOT WATER BATH	Temp. °R
Standard	722
OB-1	721
% Deivation	0.14
Standard	
% Deviation	
Standard	
% Deviation	

Date: 9/12/89

Technician: D. Roberts

Thermocouple Calibration Data

Type: Impinger

ICE WATER BATH	Temp. °R
Standard	492
I-2	492
% Deviation	0.00
Standard	
% Deviation	
Standard	
% Deviation	

AMBIENT	Temp. °R
Standard	528
I-2	528
% Deviation	0.00
Standard	
% Deviation	
Standard	
% Deviation	

HOT WATER BATH	Temp. °R
Standard	672
I-2	668
% Deivation	0.60
Standard	
% Deviation	
Standard	
% Deviation	

Date: 9/12/89

Technician: D. Roberts

THERMOCOUPLE TEMPERATURE CALIBRATION

ICE WATER BATH	Temp. °R
Standard	492
Thermocouple I-4	493
% Deviation	0.20
Standard	
Thermocouple	
% Deviation	
Standard	
Thermocouple	
% Deviation	

AMBIENT	Temp. °F
Standard	531
Thermocouple I-4	529
% Deviation	0.38
Standard	
Thermocouple	
% Deviation	
Standard	
Thermocouple	
% Deviation	

HOT WATER BATH	Temp. °R
Standard	688
Thermocouple I-4	685
% Deviation	0.44
Standard	
Thermocouple	
% Deviation	
Standard	
Thermocouple	
% Deviation	

Date: 10/17/89

Technician: D. Robert

Thermocouple Calibration Data

Type: XAD TYPE

ICE WATER BATH	Temp.°R
Standard	492
P-5	492
% Deviation	0.0%
Standard	
% Deviation	
Standard	
% Deviation	

AMBIENT	Temp.°R
Standard	528
P-3	522
% Deviation	0.19%
Standard	
% Deviation	
Standard	
% Deviation	

HOT WATER BATH	Temp.°R
Standard	672
P-3	671
% Deivation	0.15%
Standard	
% Deviation	
Standard	
% Deviation	

Date: 7/23/90

Technician: T.E.

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
Fax: (415) 848-0836

PITOT TUBE CALIBRATION
VERIFICATION OF CONSTRUCTION SPECIFICATIONS

Pitot ID: P-2 (46") Date: 11/7/89

1. D_t - external tubing diameter
   $0.188" < D_t < 0.375"$*
   D_t = 0.371 inches

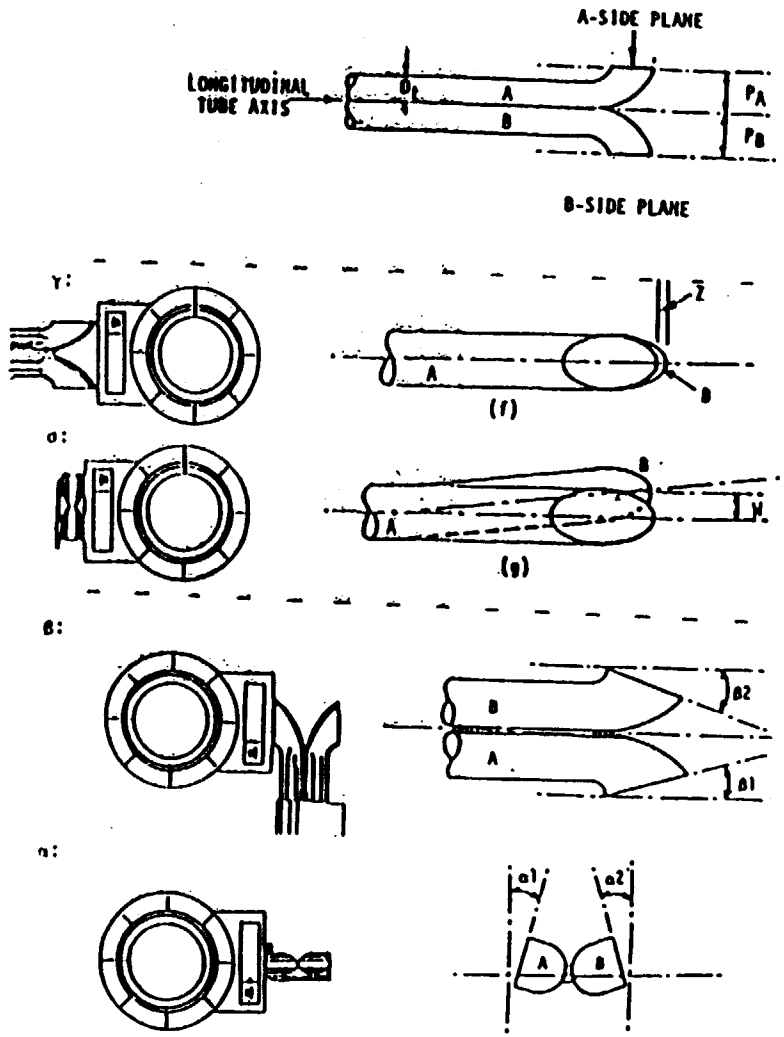
2. $P = (P_a+P_b)/2$
   $P_a + P_b$ = 1.034 inches
   $1.05\ D_t < P < 1.50\ D_t$*
   P = 0.517 inches

3. $Z = (P_A + P_B) \sin \gamma$
   $Z < 0.125"$ **
   γ = 1
   Z = 0.018 inches

4. $W = (P_A + P_B) \sin \sigma$
   $W < 0.031"$ **
   σ = 1
   W = 0.018 inches

5. $\beta_A, \beta_B < 5°$ **
   β_A = 1
   β_B = 1

6. $\alpha_A, \alpha_B < 10°$ **
   α_A = 2
   α_B = 1



*Acceptable limits; "Standards of Performance for New Stationary Sources," Federal Register, 36 (247), December 23, 1971.

**Acceptable limits; Vollaro, R. F., "The Effects of Impact Opening Misalignment on the Value of the Type-S Pitot Tube Coefficient", U.S. EPA Emission Measurement Branch, Research Triangle Park, NC, October 1976

Technician

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
Fax: (415) 848-0838

PITOT TUBE CALIBRATION
VERIFICATION OF CONSTRUCTION SPECIFICATIONS

Pitot ID: P-1 (2') Date: 11/14/84

1. D_t - external tubing diameter
   0.188" < D_t < 0.375"* D_t = 0.370 inches

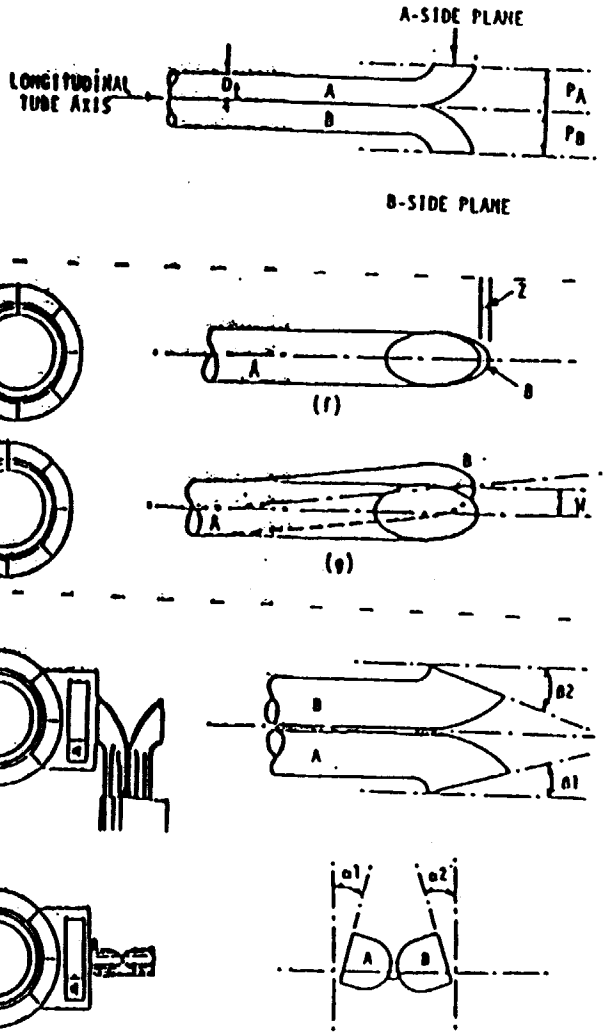
2. P = $(P_a+P_b)/2$ $P_a + P_b$ = 1.019 inches
   1.05 D_t < P < 1.50 D_t* P = 0.509 inches

3. Z = $(P_A + P_B) \sin \gamma$ γ = 1°
   Z < 0.125" ** Z = 0.018 inches

4. W = $(P_A + P_B) \sin \sigma$ σ = 1.5
   W < 0.031" ** W = 0.027 inches

5. β_A, β_B < 5° ** β_A = 0°
   β_B = 1°

6. α_A, α_B < 10° ** α_A = 1.5°
   α_B = 3.5°



*Acceptable limits; "Standards of Performance for New Stationary Sources," Federal Register, 36 (247), December 23, 1971.

**Acceptable limits; Vollaro, R. F., "The Effects of Impact Opening Misalignment on the Value of the Type-S Pitot Tube Coefficient", U.S. EPA Emission Measurement Branch, Research Triangle Park, NC, October 1976

Technician: D. Pelekis

POST-TEST CALIBRATION DATA

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389

POST TEST CALIBRATION - DRY GAS METER

Plant CCCSD-AB2588 Job # SE-034
Source Unit 2 - Stack IT Meter Box ID 004
Barometric Pressure, in Hg 29.94 Date 5/7/90

ORIFICE READING (ΔH_0) in. H2O	WET TEST METER GAS VOLUME (Vw) ft3	WET TEST METER TEMP. (Tw) °F	DRY GAS METER GAS VOLUME (Vd) ft3	DRY GAS METER TEMPERATURE DATA °F Time	$T_{D\,in}$	$T_{D\,out}$	$T_{D\,avg}$	TIME Δt min.	γ	$\Delta H_@$
2.4	7.01	70 (530)	266.417 / 259.267 / 7.150		81 / 91 / 97 / 99	75 / 76 / 77 / 80	84.5 (544.5)	8:40.71 (8.679)	1.001	2.02
2.4	7.0	70 (530)	273.624 / 266.417 / 7.207		100 / 102 / 106	82 / 82 / 82	92.3 (552.3)	8:42.22 (8.704)	1.006	2.00
2.4	7.0	70 (530)	280.898 / 273.624 / 7.274		98 / 106 / 112	84 / 85 / 87	95.3 (555.3)	8:44.62 (8.744)	1.002	2.01
								AVERAGE	1.003	2.01
								PRE-TEST γ	1.014	1.87

$$\gamma = \frac{V_w}{V_D}\left(\frac{T_{D\,avg}+460}{T_w+460}\right)\frac{P_b}{\left(P_b+\frac{\Delta H_@}{13.6}\right)}$$

Vacuum Setting, in. Hg: 5

$$\Delta H_@ = 0.0317\,\Delta H_0\left(\frac{t}{V_w}\right)^2\frac{(T_w+460)^2}{P_b(T_D+460)}$$

POST TEST CALIBRATION - TEMPERATURE SENSORS

	Ambient (°R)	% Diff.	Other (°R)	% Diff.
Reference	529	0.2%	671	0
Stack Thermocouple ID# T-2	530		671	
Reference	533	0.2%	671	0.1%
Gas Meter Inlet ID# M-4-I	532		669	
Reference	533	0.8%	492	0.8%
Gas Meter Outlet ID# M-4-O	537		496	
Reference	532	0	670	0.4%
Condenser Outlet ID# T-2	532		667	
Reference	529	0.2%	702	0.1%
Heated Oven Box ID# OB-2	527		701	

Technician: Dave Taylor Date: 5-7-90

NA = Not Applicable

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389

POST TEST CALIBRATION - DRY GAS METER

Plant CCSP-182588 Job # 56-034
Source Unit 2 Stack Meter Box ID 005
Barometric Pressure, in Hg 29.97 Date 5-8-90

ORIFICE READING ($\Delta H_@$) in.H2O	WET TEST METER GAS VOLUME (Vw) ft3	WET TEST METER TEMP. (Tw) °F	DRY GAS METER GAS VOLUME (Vd) ft3	DRY GAS METER TEMPERATURE DATA °F Time	$T_{D\,in}$	$T_{D\,out}$	$T_{D\,avg}$	TIME Δt min.	γ	$\Delta H_@$
1.8	6.05	71 (531)	951.396 945.113 6.263		91 96 102	89 90 90	93- (553)	8:00.36 (8.013)	1.002	1.70
1.8	60	70 (530)	93.0468 432.85 6.113		96 100 104	80 87 84	92.67 (552.67)	7:52.36 (7.973)	1.018	1.71
1.8	6.0	70 (530)	446.065 439.259 6.206		98 100 105	87 88 89	94.5 (554.5)	7:59.86 (7.998)	1.007	1.72
								AVERAGE	1.009	1.71
								PRE-TEST γ	1.006	1.72

$$\gamma = \frac{V_w}{V_D}\left(\frac{T_{D\,avg}+460}{T_w+460}\right)\frac{P_b}{\left(P_b+\frac{\Delta H_@}{13.6}\right)} \quad .1324$$

Vacuum Setting, in. Hg. 6.0-7.0

$$\Delta H_@ = 0.0317\,\Delta H_D\left(\frac{t}{V_w}\right)^2\frac{P_b\,(T_D+460)}{(T_w+460)^2}$$

(4-3-C10)

POST TEST CALIBRATION - TEMPERATURE SENSORS

	Ambient (°R)	% Diff.	Other (°R)	% Diff.
Reference	530	0.2%	669	0.1%
Stack Thermocouple ID# I-7	529		668	
Reference	530	0	671	0
Gas Meter Inlet ID# M-5-I	530		671	
Reference	530	1.1%	669	0.7%
Gas Meter Outlet ID# M-5-O	536		674	
Reference	530	0.8%	494	0
Condenser Outlet ID# I-4	526		494	
Reference	534	0	694	0
Heated Oven Box ID# OB1	534		694	

Technician: Claire Tanyi Date: 5-8-90

NA - Not Applicable

ON-SITE MONITOR CALIBRATION DATA

Galson -Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. CCSD — Project No. SF-034

Source Incinerator #2 — Operator [illegible]

Pollutant CO — Analyzer I. D. TECO-48

Run No. 1 — Date/Time 4/10/90 - 1138-1245

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	450	450	0.0	445	1.0	1.0

Run No. 2 — Date/Time 4/10/90 -1357-1505

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	450	450	0.0	446	0.8	0.8

Run No. 3 — Date/Time 4/10/90 -1554-1702

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	450	450	0.0	450	0.0	0.0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson -Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT

Plant I. D. CCSD — Project No. SE7034

Source Incinerator #2 — Operator RMK

Pollutant CO — Analyzer I. D. TECO-48

Run No. 4 — Date/Time 4/11/90 - 1027-1240

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	C	0.0	0.0	0.0	0.0	0.0
Mid-range	160	160	0.0	157	1.5	1.5

Run No. 5 — Date/Time 4/11/90 - 1410 - 1631

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0	0	0.0	0.0	0.0	0.0
Mid-range	160	160	0.0	154	0.6	0.6

Run No. 6 — Date/Time 4/12/90 - 0833-1050

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0	0	0			
Mid-range	160	160	0	157	1.5	1.5

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson -Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. CCCSD Project No. SE-034

Source Incin. #2 Operator MK

Pollutant CO Analyzer I. D. TECO-48

Run No. #7 Date/Time 4/12/90-1249-1546

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0	0	0	—	—	—
Mid-range	160	160	0.0	158	1.0	1.0

Run No. 8 Date/Time 4/12/90-1645-2005

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0	0	0	0	0	0
Mid-range	160	160	0.0	157	1.5	1.5

Run No. 9 Date/Time 4/13/90-1040-1340

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0	0	0	—	—	—
Mid-range	160	160	0	158	1.0	1.0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson
Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. CCCSD
Project No. SE-034
Source Incin #2
Operator TM
Pollutant CO
Analyzer I. D. TEC 48

Run No. 10
Date/Time 4/13/90 - 1455-1823

		Initial values		Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	160	160	0.0	160	0.0	0.0

Run No. _____ Date/Time _____

		Initial values		Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas						
Mid-range						

Run No. _____ Date/Time _____

		Initial values		Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas						
Mid-range						

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson
Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. CCCSD Project No. SE-034

Source Incinerator #2 Operator [illegible]

Pollutant THC Analyzer I. D. Rathsch RS-55

Run No. 1 Date/Time 4/10/90 - 1138 - 1245

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.5	0.5	0.5
Mid-range	45	45	0.0	46.5	1.5	1.5

Run No. 2 Date/Time 4/10/90 - 1357 - 1505

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	-0.5	0.5	0.5
Mid-range	45	45	0.0	44.5	0.5	0.5

Run No. 3 Date/Time 4/10/90 - 1554 - 1702

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.5	0.5	0.5
Mid-range	45	45	0.0	45	0.0	0.0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson
-Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. CCCSD Project No. SE-084

Source Incinerator #2 Operator TH

Pollutant THC Analyzer I. D. RAtech 55

Run No. 4 Date/Time 4/11/90 - 1027 - 1240

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	2.5	2.5	2.5
Mid-range	7.9	7.9	0.0	10	2.1	2.1

Run No. 5 Date/Time 4/11/90 - 1410 - 1621

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	45	45	0.0	44.5	154	0.5

Run No. 6 Date/Time 4/12/90 - 0853 - 1050

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Drift (% of span)
Zero gas	0	0	0	2	2	2
Mid-range	45	45	0.0	45	0	0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson -Technical Services

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. CCCSD Project No. SE-034

Source Incinerator #2 Operator [illegible]

Pollutant THC Analyzer I. D. Rattish RS-55

Comments:

Run No. #7 Date/Time 4/12/90 - 1219-1546

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0	0	0	2.5	2.5	2.5
Mid-range	45	45	0	44.5	0.5	0.5

Run No. #8 Date/Time 4/12/90 - 1645-2005

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0	0	0	0	0	0
Mid-range	45	45	0	45	0	0

Run No. 9 Date/Time 4/12/90 - 1016-1340

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0	0	0	—	—	—
Mid-range	45	45	0	46	1.0	1.0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson -Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. CCCSD Project No. SE-934

Source Incin. #2 Operator MH

Pollutant THC Analyzer I. D. Beckman RS-55

Run No. 10 Date/Time 4/13/93-1455-1823

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Drift (% of span)
Zero gas	0.0	—	—	-1.0	1.0	1.0
Mid-range	45	45	0.0	45	0.0	0.0

Run No. _____ Date/Time _____

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Drift (% of span)
Zero gas						
Mid-range						

Run No. _____ Date/Time _____

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Drift (% of span)
Zero gas						
Mid-range						

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

APPENDIX V: FIELD DATA AND CALCULATIONS

NOMENCLATURE

A(N)	= CROSS-SECTIONAL AREA OF NOZZLE, FT^2
CFH	= CUBIC FEET PER HOUR
CFM	= CUBIC FEET PER MINUTE
FT^2	= SQUARE FEET
FT^3	= CUBIC FEET
FPM	= FEET PER MINUTE
GAMMA	= DRY GAS METER CALIBRATION FACTOR
GMS	= GRAMS
GR/DSCF	= GRAINS PER DRY STANDARD CUBIC FOOT
HG	= MERCURY
ΔH	= PRESSURE DROP ACROSS THE ORIFICE METER, INCHES OF H_2O
IN HG	= INCHES OF MERCURY
P(BAR)	= BAROMETRIC PRESSURE, INCHES HG
P(BAR)+(ΔH/13.6)	= METER PRESSURE, INCHES HG
P(S)	= PRESSURE IN STACK, INCHES HG
P	= VELOCITY PRESSURE, INCHES H_2O
°R	= 460 + °F
SCF	= STANDARD CUBIC FOOT
SCFM	= STANDARD CUBIC FOOT PER MINUTE
T(M)	= AVERAGE DRY GAS METER TEMPERATURE, °R
THETA	= TOTAL SAMPLE TIME, MINUTES
T(S)	= AVERAGE STACK TEMPERATURE, °R
V(LC)	= TOTAL VOLUME OF LIQUID COLLECTED IN IMPINGERS AND SILICA GEL, ML
V(M)	= VOLUME OF GAS SAMPLED (METER CONDITIONS), FT^3
V(S)	= AVERAGE STACK GAS VELOCITY, FT/MIN
13.6	= SPECIFIC GRAVITY OF MERCURY

HCl Emission Data

SUMMARY OF TEST DATA - HCl EMISSIONS

PLANT: CCCSD

STACK #: INCINERATOR #2 EXHAUST

	RUN#1	RUN#2	RUN#3
NUMBER OF SAMPLING POINTS	24	24	24
DURATION OF THE RUN, MINUTES	60	60	60
SAMPLING NOZZLE DIAMETER, INCHES	0.213	0.213	0.213
PITOT CALIBRATION FACTOR (CF)	0.84	0.84	0.84
METER CALIBRATION FACTOR, GAMMA	1.006	1.006	1.006
STACK DIAMETER, INCHES	41	41	41
AMBIENT AIR TEMPERATURE, °F	65	75	70
BAROMETRIC PRESSURE, INCHES HG	30.08	30.08	30.08
AVG STATIC PRES IN FLUE, INCHES H_2O	-0.11	-0.11	-0.22
ABSOLUTE PRES IN FLUE (P(S)), INCHES HG	30.07	30.07	30.06
AVG STACK VELOCITY HEAD (SQRT(ΔP))	0.688	0.699	0.720
AVERAGE ORIFICE (ΔH), INCHES H_2O	0.74	0.76	0.81
VOL SAMPLED (V(M)), FT^3 (METER COND)	29.90	30.02	30.43
AVERAGE STACK TEMPERATURE (T(S)), °F	152	156	156
AVERAGE IMPINGER OUTLET TEMP, °F	73	85	74
AVERAGE METER TEMPERATURE, °F	93	89	82
AVERAGE METER VACUUM, INCHES HG	2.0	2.5	2.5
VOLUME OF WATER CONDENSED (V(LC)), ML	18.1	15.6	17.1
SPECIFIC GRAVITY OF FLUE GAS (SG)	1.004	1.009	1.007
HYDROGEN CHLORIDE COLLECTED, MG	0.39	0.46	0.51
ORSAT ANALYSIS:			
%CO_2	5.1	5.6	5.4
%O_2	14.7	14.6	14.6
%CO	0.0	0.0	0.0

SUMMARY OF TEST DATA - HCl EMISSIONS

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

	RUN#1	RUN#2	RUN#3
A. AREA OF STACK, FT^2	9.17	9.17	9.17
B. VOLUME SAMPLED (METER COND.), FT^3	29.90	30.02	30.43
C. VOLUME SAMPLED (STANDARD COND.), FT^3 $\frac{B*GAMMA*P(BAR)+(\Delta H/13.6)*530}{[(29.92) * T(M)]}$	29.02	29.36	30.14
D. VOLUME OF LIQUID WATER CONDENSED, ML	18.1	15.6	17.1
E. VAPOR VOLUME OF WATER CONDENSED, SCF (STD. CONDITIONS), D*0.04728	0.86	0.74	0.81
F. MOISTURE, %, (E/(E+C))*100	2.86	2.45	2.61
G. AVERAGE VELOCITY IN THE STACK, FPM 4005*(SQRT(ΔP))*CF* SQRT((T(S)*29.92*1.0)/(530*P(S)*SG))	2,475	2,518	2,597
H. STACK GAS FLOW RATE (STACK COND.), CFM A*G	22,694	23,085	23,806
J. STACK GAS FLOW RATE (STANDARD CONDITIONS, DRY STATE), DSCFM H*(1-(F/100))*(530/T(S))*(P(S)/29.92)	19,191	19,475	20,038
K. HYDROGEN CHLORIDE COLLECTED, MG	0.39	0.46	0.51
L. HYDROGEN CHLORIDE CONC., MG/DSCM (K*35.3/C)	0.474	0.553	0.597
M. HYDROGEN CHLORIDE EMISSION RATE, GM/HR $[(L*J*60)*10^{-3}]/35.3$	15.5	18.3	20.3
N. SLUDGE FEED RATE, TONS/HR (DRY)	1.7	1.6	1.7
O. HYDROGEN CHLORIDE EMISSION RATIO, GM/TON M / N	9.10	11.44	11.97

ORSAT DATA AND GAS DENSITY CALCULATIONS

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

	RUN #1		RUN #2		RUN #3	
PARAMETER	DRY BASIS	WET BASIS	DRY BASIS	WET BASIS	DRY BASIS	WET BASIS
CO_2	5.10	4.95	5.60	5.46	5.40	5.26
O_2	14.70	14.28	14.60	14.24	14.60	14.22
CO	0	0	0	0	0	0
N_2	80.20	77.90	79.80	77.84	80.00	77.91
H_2O	- -	2.86	- -	2.45	- -	2.61
MOLECULAR WEIGHT[1]	- -	29.08	- -	29.20	- -	29.15
SPECIFIC GRAVITY OF GAS[2]	- -	1.004	- -	1.009	- -	1.007

[1] CALCULATED FROM THE EQUATION:
MOLECULAR WEIGHT=0.44(%CO2)+0.32(%O2)+0.28(%N2+%CO)+0.18(%H2O)

[2] SG=MOLECULAR WEIGHT STACK GAS/MOLECULAR WEIGHT OF AIR (28.95 GM/MOLE)

ISOKINETIC VARIATION CALCULATION

PLANT: CCCSD

STACK #: INCINERATOR #2 EXHAUST

PARAMETER	RUN #1	RUN #2	RUN #3
T(S), °R	612	616	616
V(LC), ML	18.1	15.6	17.1
GAMMA	1.006	1.006	1.006
V(M), FT^3	29.90	30.02	30.43
T(M), °R	553	549	542
P(BAR)+(ΔH/13.6), IN HG	30.13	30.14	30.14
V(S), FPM	2,475	2,518	2,597
P(S), IN HG	30.07	30.07	30.06
A(N), FT^2	0.00025	0.00025	0.00025
THETA, MINUTES	60	60	60
I (PERCENT OF ISOKINETIC)[a]	93.4	93.1	92.9

[a] I = (T(S)(AVG)*100((0.00267*V(CL))+(V(M)/T(M))*GAMMA*(P(BAR)+(ΔH/13.6))))/(THETA*V(S)*P(S)*A(N))

1/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: Cf I
O 1.23 175
1.19 150
B 1.14 125
1.09 100

Plant CCCSD-AB2588
Location
Date 3/10/90
Run Number 1-HCl
Operator LT
Sample Box ID 02
Meter Box ID 05
Probe ID 4
Filter #

Meter δ 1.006
Meter ΔH@ 1.93
Pilot C.F. 0.84
Assumed Moisture % 5%
Nozzle Diameter in. 0.213
C Factor 1.20
Ambient Temperature 65
Barometric Pressure 30.08
Silica Gel #

Static Pressure:
Traverse Pt. *A4 *A10
Pwake -0.25 -0.29
Pstatic

Water Collected:
205-200
Impingers, ml. 5
Silica Gel, gms. 13.1 16.1

Vf = 22.793

CO2 - 5.1 O2 - 14.7

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
Start 11:38 A1	2.5	159	0.43	0.62	—	77	84	252	236	75	<2
2	5	158	0.47	0.71	230.2	79	84	252	230	75	<2
3	7.5	163	0.55	0.84	—	81	84	250	224	74	<2
* 4	10	168	0.51	0.79	—	84	84	250	222	72	<2
5	12.5	165	0.51	0.79	234.1	86	84	251	222	70	<2
6	15	165	0.53	0.81	235.5	89	84	250	223	70	<2
7	17.5	154	0.53	0.81	236.7	91	85	250	224	69	<2
8	20	154	0.53	0.81	—	94	86	250	226	69	<2
9	22.5	151	0.53	0.81	239.3	97	86	252	228	69	<2
* 10	25	151	0.50	0.76	240.6	98	88	250	230	67	<2
11	27.5	150	0.50	0.76	241.8	100	89	252	234	69	<2
Stop 12:08 12	30	153	0.49	0.76	243.097	100	90	250	236	68	<2
Averages											

2/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: Post Test Leak rate 0.006cfm @ 13in Hg

Plant CCCSD-AB2588 | Meter δ 1.006
Location Unit 2 | Meter ΔH@ 1.72
Date 4/10/90 | Pilot C.F. 0.84
Run Number 1-HG1 | Assumed Moisture % 5
Operator DR/KP | Nozzle Diameter in. 0.213
Sample Box ID SB-2 | C Factor 1.20
Meter Box ID 005 | Ambient Temperature 60
Probe ID 4' Stainless | Barometric Pressure 30.08
Filter # — | Silica Gel # — Orsat # 102

Static Pressure:
Traverse Pt. B5
Pwake -0.18
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
5 B1	32.5	118	0.20	0.34	—	90	91	250	200	75	<2
2	35	120	0.27	0.94	245.0	94	92	252	200	75	<2
3	37.5	124	0.34	0.52	—	96	92	252	214	79	<2
4	40	123	0.35	0.54	—	98	94	252	226	76	<2
* 5	42.5	128	0.38	0.58	248.2	100	94	252	235	76	<2
6	45	138	0.42	0.64	249.4	101	95	254	240	76	<2
7	47.5	164	0.51	0.80	—	103	96	254	244	76	<2
8	50	167	0.55	0.85	—	105	96	254	244	72	<2
9	52.5	158	0.58	0.89	253.4	107	97	256	246	74	<2
10	55	170	0.62	0.95	—	109	99	256	249	76	<2
11	57.5	168	0.64	0.98	256.3	111	100	256	250	78	<2
12	60	176	0.59	0.90	—	111	100	257	251	76	<2
				Vf = (257.692)							
Averages		151.88	0.688	0.74	29.90	93.23		252.25	230.58	73.21	2.0

1/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD
Location Unit 2 stack
Date 4/10/98
Run Number 2-HCl
Operator DR/KP
Sample Box ID 2B-2
Meter Box ID 005
Probe ID 4' sheathed
Filter # —

Meter δ 1.006
Meter ΔH@ 1.72
Pilot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.313
C Factor 1.20
Ambient Temperature 75
Barometric Pressure 30.08
Silica Gel # —

Static Pressure:
Traverse Pt. B4
Pwake -0.22
Pstatic

Water Collected:
Impingers, ml. 216-200 = 16
Silica Gel, gms. 9.6
15.6

V_i = 257.922 Orsat # 09
CO_2 - 5.6 O_2 14.6

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
start 1:51 B1	2.5	122	0.30	0.46	258.9	82	90	240	244	82	2
2	5	123	0.33	0.49	260.0	83	89	242	242	85	2
3	7.5	123	0.34	0.52	—	85	89	243	226	86	2
* 4	10	128	0.38	0.59	262.1	89	89	240	221	89	2
5	12.5	128	0.37	0.57	—	91	89	241	222	87	2
6	15	136	0.41	0.62	—	91	89	239	223	88	2
7	17.5	169	0.52	0.80	265.7	91	89	238	224	84	2
8	20	174	0.57	0.86	267.0	91	89	236	223	80	2.5
9	22.5	176	0.61	0.94	268.4	91	89	234	225	78	3
10	25	177	0.64	0.98	269.8	92	89	234	222	79	3
stop 11	27.5	175	0.64	0.98	271.2	93	89	232	223	78	3
2:27 12	30	175	0.62	0.96	272.664	93	89	232	225	80	3

2/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: Post Test Leak Rate 0.004 cfm @ 12 inHg

Plant CCCSD-1B2588
Location Unit 2 Stack
Date 4/10/90
Run Number 2-HK1
Operator DR/KP
Sample Box ID OB-2
Meter Box ID 005
Probe ID 4'
Filter #

Meter δ 1.006
Meter ΔH@ 1.72
Pitot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.213
C Factor 1.20
Ambient Temperature 75
Barometric Pressure 30.09
Silica Gel #

Static Pressure:
Traverse Pt. *B4 B7
Pwake -0.22 -0.30
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
start 2:35											
A1	32.5	135	0.38	0.53	273.8	83	89	232	227	80	2
A2	35	165	0.50	0.77	275.0	85	88	234	230	86	2
3	27.5	170	0.50	0.77	—	86	88	235	232	86	2
*4	40	174	0.46	0.71	277.5	89	89	236	233	88	2
5	42.5	172	0.44	0.65	278.7	89	89	236	234	88	2
6	45	166	0.53	0.81	280.0	89	89	237	234	86	2.5
* 7	47.5	162	0.58	0.90	—	90	89	236	233	87	3
8	50	161	0.57	0.88	282.6	91	89	237	234	88	3
9	52.5	159	0.57	0.88	284.0	91	89	238	234	88	3
10	55	158	0.56	0.86	285.3	91	89	238	234	86	3
stop 3:05 11	57.5	158	0.55	0.84	286.7	91	89	238	234	86	3
12	60	157	0.50	0.77	287.941	91	89	238	235	85	3
Averages		155.96	0.499	0.76	30.02	89.02		236.92	229.75	84.58	2.46

Galson Technical Services

Comments:

SAMPLE COLLECTION DATA

Plant CCCSD
Location Unit 2 Stack
Date 4/10/90
Run Number 3-HCl
Operator OR/KP
Sample Box ID OVB-2
Meter Box ID 002
Probe ID 4'
Filter # 288.088

Meter δ 1.006
Meter ΔH@ 1.72
Pitot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.213
C Factor 1.20
Ambient Temperature 70
Barometric Pressure 30.08
Silica Gel # —
Orsat # 06

Static Pressure:
Traverse Pt. #4 #1
Pwake -0.30 -0.50
Pstatic ____ ____

Water Collected:
210-200
Impingers, ml. 10
Silica Gel, gms. 7.1 17.1

CO2 = 5.6 O2 = 14.6

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
Start 3:54 A1	2.5	176	0.45	0.69	289.2	76	82	237	235	74	2
2	5	183	0.48	0.76	290.5	78	82	232	235	79	2
3	7.5	180	0.50	0.77	291.7	79	82	228	232	79	2
* 4	10	180	0.50	0.77	—	80	82	224	231	80	2
5	12.5	176	0.44	0.68	294.1	82	81	225	231	77	2
6	15	170	0.54	0.83	295.4	83	81	226	230	78	2
* 7	17.5	161	0.67	1.00	296.8	84	82	229	230	77	3
8	20	158	0.66	1.00	298.2	85	81	230	229	76	3
9	22.5	156	0.65	1.00	299.7	86	82	232	228	76	3
10	25	153	0.63	0.96	301.0	86	82	233	226	74	3
11	27.5	150	0.61	0.94	302.4	96	82	235	224	74	3
12 Stop 4:31	30	153	0.62	0.95	303.827	87	82	235	223	73	3
Averages											

Galson Technical Services

Comments: Post Test leak Rate 0.004cfm @ 9inHg

SAMPLE COLLECTION DATA 2/2

Plant CCISD
Location Unit 2 Stack
Date 4/10/90
Run Number 3 HCl
Operator DR/KP
Sample Box ID DB-2
Meter Box ID 005
Probe ID 4
Filter #

Meter ð 1.006
Meter ΔH@ 1.72
Pilot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.213
C Factor 1.20
Ambient Temperature 70
Barometric Pressure 30.09
Silica Gel # —

Static Pressure:
Traverse Pt. B6
Pwake -0.30
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
start 4:30 * 01	32.5	100	0.24	0.37	—	77	81	234	210	68	2
2	35	110	0.37	0.57	305.8	78	81	235	210	70	2
3	37.5	118	0.37	0.57	306.9	79	81	235	211	71	2
4	40	120	0.38	0.59	308.0	80	80	233	213	72	2
5	32.5	126	0.40	0.62	309.1	81	81	234	219	74	2
* 6	45	137	0.45	0.69	310.3	83	81	236	222	74	—
7	47.5	168	0.55	0.85	311.6	84	81	236	224	74	2
8	50	168	0.57	0.88	312.9	85	81	237	226	74	3
9	52.5	174	0.63	0.97	314.3	87	81	238	229	74	3
10	55	176	0.64	0.99	315.7	88	82	240	231	73	3
11	57.5	175	0.63	0.97	317.1	89	82	240	233	73	3
stop 5:02 * 12	60	175	0.64	0.99	318.517	90	82	241	233	72	3
Averages		156.17	0.72	0.81	30.43	82.25		233.54	225.63	74.42	2.48

FLUE GAS ANALYSES FIELD DATA

Plant ID: CCSD Date: 4/10/90

Quality Control

Leak check - all components must pass O_2/QC gas analysis results

Pre-test		Post-test
✓	CO_2 Pipette	
✓	02 pipette	
✓	CO pipette	
✓	Sample burette	

Gas ID	Run #	CO_2	CO_2+02	O_2	CO
	1				
	2				
	3				

ORSAT ANALYSES DATA

Sample Bag ID		CO_2 %	$CO_2 + B_2$	O_2 %	$CO_2 + O_2 + CO$	CO %	Fo
#102	a)	5.0	20.2				
(Test)		5.2 ✓	20.0 ✓	14.8			
	b)	5.1	19.8				
		5.0 ✓	19.6	14.6			
	c)						
		5.1 ✓	20.4				
		5.0 ✓	19.8	14.8			
		Avg 5.1		14.7			
#09	a)	5.6	20.1	14.5			
	b)	5.7	20.3	14.6			
	c)	5.6	20.2	14.6			
		Avg 5.6		14.6			
#06	a)	5.4	19.6	14.3			
	b)	5.4	20.0	14.6			
		5.4	20.1	14.7			
		Avg 5.4		14.6			

Formaldehyde, Benzene, and Vinyl Chloride Emission Data

SUMMARY OF TEST DATA - FORMALDEHYDE EMISSIONS

Plant: CCCSD — Stack: Incinerator #2 Exhaust

Sampling Data:	Run #1	Run #2	Run #3
Test Duration, minutes	60	60	60
Ambient Air Temperature, °F	65	65	65
Barometric Pressure (Pbar), Inches Hg	30.08	30.08	30.08
Avg Orifice Temp at Calibration (Toc), °F	67.0	67.5	67.0
Avg Orifice Temp at Test (To), °F	67.0	68.0	68.1
Avg Sampling Rate at Calibration, l/min	0.432	0.527	0.542
Stack Gas Flow Rate[1] (dscfm)	19,191	19,475	20,038
Formaldehyde Collected[2], µg	2.59	0.85	2.00
Calculations:			
A. Avg. Sampling Rate (Cal. Conditions), l/min	0.432	0.527	0.542
B. Avg. Sampling Rate (Test Conditions), l/min A*SQRT(To/Toc)	0.432	0.528	0.542
C. Volume Sampled (Test Conditions), l B*Test Duration	25.9	31.7	32.5
D. Volume Sampled (Std. Conditions), ft^3 (C/28.32)*(Pbar/29.92)*(528/To)	0.925	1.128	1.159
E. Stack Gas Flow Rate, dscfm	19,191	19,475	20,038
F. Formaldehyde Collected, µg	2.59	0.85	2.00
G. Formaldehyde Concentration, mg/dscm F*35.3/(D*1000)	0.099	0.027	0.061
H. Formaldehyde Concentration, ppm (G*24.13)/30[3]	0.080	0.021	0.049
I. Formaldehyde Emission Rate, gms/hr (G*E*60)/(1000*35.3)	3.22	0.88	2.07
J. Sludge Feed Rate, tons/hr (dry)	1.7	1.6	1.7
K. Formaldehyde Emission Ratio, gms/ton (dry), I / J	1.90	0.55	1.22

1 Based on flow rate data collected concurrently during the HCl testing.
2 Formaldehyde quantities are corrected for the blank; refer to the laboratory data presented in Appendix VI for details.
3 Molecular weight of formaldehyde = 30 gm/gm-mole.

FIELD DATA – CRITICAL ORIFICE

PLANT CCCSD | RUN No. #2 | AMBIENT TEMP. (°F) 65

LOCATION Unit 2 - Stack | CONTAMINANTS Formaldehyde | BARO. PRESS. (In. Hg) 30.08

DATE 4/10/90 | OPERATOR [illegible]

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)
PRE-TEST-1	150	67	16.39
2			16.48
3			16.47
Avg.			16.447

FLOW (l/min): 0.5472

POST-TEST-1	150	68	17.80
2			17.63
3			17.76
Avg.			17.730

FLOW (l/min): 0.5076

Average Flow (l/min)	0.5274

TEST DATA

	CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)
Start →	1:57		5.8	68
	2:07		5.8	68
	2:17		5.8	68
	2:27		5.8	68
	2:37		5.8	68
	2:55		5.8	68
Stop →	2:57			
		Total 60	5.8	Avg. 68

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COMMENTS: Yellowish/Orange Discoloration of Imp. Sol'n

FIELD DATA – CRITICAL ORIFICE

PLANT CCCSD | RUN No. #1 | AMBIENT TEMP. (°F) 65

LOCATION Unit #2 Stack | CONTAMINANTS Formaldehyde | BARO. PRESS. (In. Hg) 30.08

DATE 4/10/90 | OPERATOR DR

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)	Rotr
PRE-TEST-1	150	67	19.96	5.75
2			19.85	
3			19.90	
Avg.			19.90	

FLOW (L/min): 0.4522

POST-TEST-1	150	67	21.97	
2			21.80	5.75
3			21.84	
Avg.			21.87	

FLOW (L/min): 0.4115

Average Flow (L/min)	0.4319

TEST DATA

CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)	
11:38	–	5.75	67	START
11:48	–	5.75	67	
11:58	–	5.80	67	Coil Cool
12:05	–	5.9	67	Coil Cool
12:08	–	5.9	67	
12:16	–	5.8	67	
12:26	–	5.8	67	
12:36		5.8	67	
				STOP 12:38 PM
	Total 60	~5.	Avg. 67	

Galson Technical Services, Inc. Environmental Sciences Division

COMMENTS: Bag # 203

Q=

FIELD DATA – CRITICAL ORIFICE

PLANT CCCSD | RUN No. #3 | AMBIENT TEMP. (°F) 65

LOCATION Unit 2 Stack | CONTAMINANTS Formaldehyde | BARO. PRESS. (In. Hg) 30.06

DATE 4/10/90 | OPERATOR [illegible]

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)	
PRE-TEST-1	150	67	16.30	59
2			16.47	
3			16.40	
Avg.			16.390	

FLOW (L/min): 0.5491

POST-TEST-1	150	67	16.77	59
2			16.81	
3			16.93	
Avg.			16.837	

FLOW (L/min): 0.5345

Average Flow (L/min)	0.5418

TEST DATA

	CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)
Start C	3:54		1	~~57~~
	4:01		5.8	59
	4:15		5.8	68
	4:22		5.8	68
CAL	4:31		5.8	68
	4:37		5.7	68
	4:41		5.7	6[illegible]
	4:48		5.7	68
Stop	4:54		5.7	68
		Total 60	5.75	Avg. 68.1

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Environmental Sciences Division

COMMENTS: No Discoloration

SUMMARY OF TEST DATA- BENZENE AND VINYL CHLORIDE EMISSIONS

PLANT: CCCSD — STACK #: INCINERATOR #2 EXHAUST

		RUN #1	RUN #2	RUN#3B
A.	STACK GAS FLOW RATE[a], DSCFM	19,191	19,475	20,038
B.	CONCENTRATION, PPB			
	• BENZENE	< 4.0	5.5	3.8
	• VINYL CHLORIDE	< 4.0	< 4.0	< 2.0
C.	EMISSION RATE, GM/HR $(A*B*M^{b}*60)/(10^{6}*35.3*24.13)$			
	• BENZENE	< 0.4	0.59	0.42
	• VINYL CHLORIDE	< 0.3	< 0.3	< 0.2
D.	SLUDGE FEED RATE, TONS/HR (DRY)	1.7	1.6	1.7
E.	EMISSION RATIO, GM/TON (DRY) C / D			
	• BENZENE	< 0.2	0.37	0.25
	• VINYL CHLORIDE	< 0.2	< 0.2	< 0.1

a Based on data collected concurrently during the HCl emission tests.

b Molecular weight of benzene = 78 gm/gm-mole.
Molecular weight of vinyl chloride = 62.5 gm/gm-mole.

FIELD DATA – CRITICAL ORIFICE

PLANT CCCSD-AB2588 RUN No. 1 AMBIENT TEMP. (°F) 65

LOCATION Unit 2 stack CONTAMINANTS Benzene/ Vinyl Chloride BARO. PRESS. (In. Hg) 30.08

DATE _____ OPERATOR [illegible]

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)
PRE-TEST-1			
2			
3			
Avg.			

FLOW (l/min):

POST-TEST-1			
2			
3			
Avg.			

FLOW (l/min):

Average Flow (l/min)	

TEST DATA

	CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)
Start	11:39			
Stop	12:39			
	Total			Avg.

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COMMENTS: Bag # 203

FIELD DATA – CRITICAL ORIFICE

PLANT CCCSD-~~Stack #2~~ RUN No. #2 AMBIENT TEMP. (°F) 65

LOCATION Unit 2 Stack CONTAMINANTS Benzene/Vinyl Chloride BARO. PRESS. (In. Hg) 30.06

DATE 4/10/90 OPERATOR MP

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)
PRE-TEST-1			
2			
3			
Avg.			

FLOW (L/min):

POST-TEST-1			
2			
3			
Avg.			

FLOW (L/min):

Average Flow (L/min)	

TEST DATA

CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)
Start C – 1:57			
Stop D 2:47			
	Total		Avg.

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COMMENTS: Bag # 204

FIELD DATA – CRITICAL ORIFICE

PLANT CCCSD | RUN No. #3B | AMBIENT TEMP. (°F) 65

LOCATION Digit #2 Stack | CONTAMINANTS Benzene/VC | BARO. PRESS. (In. Hg) 30.08

DATE 4/10/90 | OPERATOR JMF

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)
PRE-TEST-1			
2			
3			
Avg.			

FLOW (l/min):

POST-TEST-1			
2			
3			
Avg.			

FLOW (l/min):

Average Flow (l/min)	

TEST DATA

	CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)
Start →	4:53			
Stop	5:30			
		Total		Avg.

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COMMENTS: Blank Bag #209 (Filled w/ N_2)

Particulate and Metals (11) Emission Data

SUMMARY OF TEST DATA - PARTICULATE AND METALS EMISSIONS

PLANT: CCCSD — STACK #: INCINERATOR #2

	RUN #4	RUN #5	RUN #6
NUMBER OF SAMPLING POINTS	24	24	24
DURATION OF THE RUN, MINUTES	120	120	120
SAMPLING NOZZLE DIAMETER, INCHES	0.268	0.268	0.268
PITOT CALIBRATION FACTOR (CF)	0.84	0.84	0.84
METER CALIBRATION FACTOR, GAMMA	1.006	1.006	1.006
STACK DIAMETER, INCHES	41	41	41
AMBIENT AIR TEMPERATURE, °F	65	70	60
BAROMETRIC PRESSURE, INCHES HG	30.14	30.14	30.11
AVG STATIC PRES IN FLUE, INCHES H_20	-0.20	-0.13	-0.13
ABSOLUTE PRES IN FLUE (P(S)), INCHES HG	30.13	30.13	30.10
AVG STACK VELOCITY HEAD, SQRT(ΔP)	0.673	0.696	0.703
AVERAGE ORIFICE (ΔH), INCHES H_2O	2.11	2.28	2.35
VOL SAMPLED (V(M)), FT^3 (METER COND)	95.96	100.09	99.91
AVERAGE STACK TEMPERATURE (T(S)), °F	154	153	142
AVERAGE IMPINGER OUTLET TEMP, °F	60	65	68
AVERAGE METER TEMPERATURE, °F	84	88	95
AVERAGE METER VACUUM, INCHES Hg	5.1	4.6	8.7
VOLUME OF WATER CONDENSED (V(LC)), ML	39.5	44.4	43.0
SPECIFIC GRAVITY OF FLUE GAS (SG)	1.011	1.010	1.008
WEIGHT COLLECTED:			
• AHEAD OF FILTER, GMS	0.0113	0.0079	0.0015
• ON THE FILTER, GMS	0.0152	0.0183	0.0217
• TOTAL, GMS	0.0265	0.0262	0.0232
ORSAT ANALYSIS:			
• % CO_2	5.7	5.8	5.2
• % O_2	14.3	14.0	14.8
• % CO	0.0	0.0	0.0

SUMMARY OF TEST DATA - PARTICULATE AND METALS EMISSIONS

PLANT: CCCSD STACK #: INCINERATOR #2

	RUN #4	RUN #5	RUN #6
A. AREA OF STACK, FT^2	9.17	9.17	9.17
B. VOLUME SAMPLED (METER COND.), FT^3	95.96	100.09	99.91
C. VOLUME SAMPLED (STANDARD COND.), SCF $\frac{B*GAMMA*[P(BAR)+(\Delta H/13.6)]*530}{(29.92) * [T(M)]}$	95.22	98.62	97.19
D. VOLUME OF LIQUID WATER CONDENSED, ML	39.5	44.4	43.0
E. VAPOR VOLUME OF WATER CONDENSED, SCF (STD. CONDITIONS), D*0.04728	1.87	2.10	2.03
F. MOISTURE, %, (E/(E+C))*100	1.92	2.08	2.05
G. AVERAGE VELOCITY IN THE STACK, FPM 4005*(SQRT(ΔP)*CF* SQRT((TS*29.92*1.0)/(530*P(S)*SG))	2,415	2,497	2,503
H. STACK GAS FLOW RATE (STACK COND.), CFM A*G	22,140	22,898	22,945
I. STACK GAS FLOW RATE (STD. COND., DRY), DSCFM H*(1-(F/100))*(530/T(S))*(P(S)/29.92)	18,886	19,506	19,906
J. TOTAL PARTICULATE COLLECTED, GMS	0.0265	0.0262	0.0232
K. PARTICULATE CONCENTRATION, GRAINS/DSCF (J*15.43)/C	0.0043	0.0041	0.0037
L. PARTICULATE EMISSION RATE, LBS/HR (K*I*60)/7000	0.69	0.69	0.63
M. SLUDGE FEED RATE, TONS (DRY)/HR	1.7	1.6	1.5
N. PARTICULATE EMISSION RATIO, LBS/TON-DRY L / M	0.41	0.43	0.42

SUMMARY OF TEST DATA - PARTICULATE AND METALS EMISSIONS

PLANT: CCCSD STACK #: INCINERATOR #2

	RUN #4	RUN #5	RUN #6
O. QUANTITY COLLECTED[1], MG			
Arsenic	0.015	0.009	0.012
Beryllium	< 0.002	< 0.002	< 0.002
Cadmium	0.021	0.029	0.032
Chromium (Total)	0.026	0.026	0.041
Copper	0.10	0.12	0.15
Lead	0.048	0.074	0.074
Manganese	0.836	0.224	0.062
Mercury	0.1169	0.1784	0.2853
Nickel	0.006	0.004	< 0.010
Selenium	0.026	0.034	0.036
Zinc	1.75	2.00	9.35
P. METALS CONCENTRATION, MG/DSCM (O * 35.3) / C			
Arsenic	0.006	0.003	0.004
Beryllium	< 0.001	< 0.001	< 0.001
Cadmium	0.008	0.010	0.012
Chromium (Total)	0.010	0.009	0.015
Copper	0.037	0.043	0.054
Lead	0.018	0.026	0.027
Manganese	0.310	0.080	0.023
Mercury	0.043	0.064	0.104
Nickel	0.002	0.001	< 0.004
Selenium	0.010	0.012	0.013
Zinc	0.648	0.716	3.396

[1] Quantities represent the sum of the front-half (i.e., filter, Containers A and B) and back-half (Container D) sample fractions. Mercury quantities also include the Container E samples. Data are not corrected for blank quantities. Non-detectable quantities represent the sum of the front-half sample detection limits. Refer to the laboratory data presented in Appendix VI for additional detail.

SUMMARY OF TEST DATA - PARTICULATE AND METALS EMISSIONS

PLANT: CCCSD

STACK #: INCINERATOR #2

	RUN #4	RUN #5	RUN #6
Q. METALS EMISSION RATE, GM/HR $(P*I*60)/(35.3*10^3)$			
Arsenic	0.18	0.11	0.15
Beryllium	< 0.02	< 0.02	< 0.02
Cadmium	0.25	0.34	0.39
Chromium (Total)	0.31	0.31	0.50
Copper	1.19	1.42	1.84
Lead	0.57	0.88	0.91
Manganese	9.95	2.66	0.76
Mercury	1.39	2.12	3.51
Nickel	0.07	0.05	< 0.12
Selenium	0.31	0.40	0.44
Zinc	20.81	23.73	114.90
R. METALS EMISSION RATIO, GM/TON (DRY) Q / M			
Arsenic	0.10	0.07	0.10
Beryllium	< 0.01	< 0.01	< 0.02
Cadmium	0.15	0.22	0.26
Chromium (Total)	0.18	0.19	0.34
Copper	0.70	0.89	1.23
Lead	0.34	0.55	0.61
Manganese	5.85	1.66	0.51
Mercury	0.82	1.32	2.34
Nickel	0.04	0.03	< 0.08
Selenium	0.18	0.25	0.29
Zinc	12.24	14.83	76.60

ORSAT DATA AND GAS DENSITY CALCULATIONS

PLANT: CCCSD STACK #: INCINERATOR #2

PARAMETER	RUN #4 DRY BASIS	RUN #4 WET BASIS	RUN #5 DRY BASIS	RUN #5 WET BASIS	RUN #6 DRY BASIS	RUN #6 WET BASIS
CO_2	5.70	5.59	5.80	5.68	5.20	5.09
O_2	14.30	14.02	14.00	13.71	14.80	14.50
CO	0.0	0.0	0.0	0.0	0.0	0.0
N_2	80.00	78.45	80.20	78.53	80.00	78.36
H_2O	- - -	1.94	- - -	2.08	- - -	2.05
MOLECULAR WEIGHT[1]	- - -	29.26	- - -	29.25	- - -	29.19
SPECIFIC GRAVITY OF GAS[2]	- - -	1.011	- - -	1.010	- - -	1.008

1 Calculated from the equation:
Molecular Weight $=0.44*(\%CO_2)+0.32*(\%O_2)+0.28*(\%N_2+\%CO)+0.18*(\%H_2O)$

2 SG= Molecular Weight of Stack Gas/ Molecular Weight of Air (28.95 gm/gm-mole)

ISOKINETIC VARIATION CALCULATION

PLANT: CCCSD STACK #: INCINERATOR #2

PARAMETER	RUN #4	RUN #5	RUN #6
T(S), °R	614	613	602
V(LC), ML	39.5	44.4	43.0
GAMMA	1.006	1.006	1.006
V(M), FT^3	95.96	100.09	99.91
T(M), °R	544	548	555
P(BAR)+(ΔH/13.6), IN HG	30.30	30.31	30.28
V(S), FPM	2,415	2,497	2,503
P(S), IN HG	30.13	30.13	30.10
A(N), FT^2	0.00039	0.00039	0.00039
THETA, MINUTES	120	120	120
I (PERCENT OF ISOKINETIC)[1]	98.4	98.6	95.2

[1] I = (T(S)*100((0.00267*V(CL))+(V(M)/T(M))*GAMMA*(P(BAR)+(ΔH/13.6))))/(THETA *V(S)*P(S)*A(N))

1/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:
100 / 0.37
T=150 / C=0.40

Plant CCSD
Location Unit 2 - Stack
Date 4/11/90
Run Number #4 - MM
Operator RR/MC
Sample Box ID
Meter Box ID 995
Probe ID 4' eff
Filter #

Meter δ 1.006
Meter ΔH@ 1.72
Pilot C.F. 0.84
Assumed Moisture % 4
Nozzle Diameter in. 0.268
C Factor 0.40
Ambient Temperature 65
Barometric Pressure 30.14
Silica Gel #

Static Pressure:
Traverse Pt. B5
Pwake -0.34
Pstatic

Water Collected:
212 + 102 → 314 - 300
Impingers, ml. 14
Silica Gel, gms. 25.5 (31.5)

318.78 Clear + 408 (02 - 5.7 CO - 14.3

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
Start Cp:.84 12	5	175	0.51	2.35	323.1	69	74	227	235	60	5.5
11	10	176	0.51	2.35	327.3	73	74	262	225	58	5
10	15	176	0.53	2.45	331.4	82	75	248	230	55	5.5
9	20	175	0.48	2.25	335.5	83	76	233	234	56	5.5
* 8	25	164	0.51	2.35	339.7	84	76	246	240	58	5.5
7	30	164	0.49	2.25	—	86	77	238	268	58	5.5
6	35	134	0.38	1.75	347.5	87	78	252	241	59	5
5	40	130	0.36	1.65	351.1	87	79	246	231	59	4.5
4	45	130	0.34	1.55	354.6	89	80	244	225	60	4
3	50	133	0.35	1.60	358.1	88	81	247	224	58	4
Stop 2	55	132	0.33	1.50	361.5	89	81	268	243	59	4
1	60	124	0.24	1.10	364.566	84	82	254	238	60	3.5
Averages											

2/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCSD
Location Unit 2 - Stack
Date 4/11/89
Run Number 1A4-HM
Operator TM
Sample Box ID
Meter Box ID 005
Probe ID
Filter # 137

Meter δ
Meter ΔH@
Pilot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

364.564

Static Pressure:
Traverse Pt. A-4 A-9
Pwake -0.36 -0.31
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
Start 11:40 A1	65	149	0.46	2.10	368.7	76	80	237	229	64	5
2	70	150	0.48	2.20		83	80	236	240	63	5
3	75	148	0.49	2.25	376.8	87	81	258	240	59	5.5
4	80	151	0.50	2.30	381.0	90	82	276	235	58	5.5
5	85	151	0.52	2.40	385.3	93	85	258	236	58	5.5
6	90	153	0.55	2.55	389.7	93	84	241	238	55	6
7	95	162	0.54	2.50	394.2	92	84	235	237	58	5.5
8	100	171	0.52	2.40	398.4	96	85	234	243	63	5.5
9	105	173	0.50	2.30	402.7	95	86	232	248	64	5.5
10	110	176	0.51	2.35	—	96	87	231	246	66	5.5
Stop 11	115	172	0.51	2.35	411.1	95	87	230	244	65	5.5
Pump 12	120	116	0.37	1.70	414.74	94	87	231	244	66	4.5
Averages		153.54	0.673	2.11	95.96	84.06		244.25	238.08	59.96	5.08

1/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: 100 | 0.37
150 | 0.40

Plant CCCSD
Location Unit 2
Date 4/11/90
Run Number 5 metals
Operator DR
Sample Box ID 013-2
Meter Box ID 005
Probe ID 4
Filter #

Meter δ 1.006
Meter ΔH@ 1.72
Pilot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.268
C Factor 0.40
Ambient Temperature 70
Barometric Pressure 30.14
Silica Gel #

Static Pressure:
Traverse Pt. #4
Pwake -0.33
Pstatic

Water Collected:
208+103=311-300
Impingers, ml. 11 11
Silica Gel, grms. 33.4 (0)-5.8 / 0-14.8 = 14.4

#1 415.029 #3 #2 #4

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
Start @ 2:10 A12	5	146	0.55	2.55	419.6	76	81	227	242	74	5
11	10	150	0.66	3.10	424.4	84	82	228	227	76	6
10	15	150	0.62	2.85	429.2	90	83	233	226	64	6
9	20	148	0.54	2.50	433.4	91	84	264	234	57	5
8	25	148	0.56	2.60	437.8	93	84	252	240	58	5
7	30	151	0.57	2.60	—	94	86	246	242	58	5
6	35	159	0.55	2.55	—	96	87	242	243	61	5
5	40	163	0.54	2.50	451.1	98	87	244	246	64	5
4	45	163	0.53	2.4	453.1	100	88	241	250	64	5
3	50	164	0.55	2.55	456.9	96	88	243	249	63	5
540 2	55	166	0.50	2.30	461.4	96	89	243	240	65	4
3:10 1	60	164	0.48	2.25	468.127	93	89	240	231	64	4
Averages											

2/2

Galson Technical Services

Comments: Post-Test Leak Rate = 0.006 CFM @ 8" Hg.

SAMPLE COLLECTION DATA

Plant CCCSD
Location Unit #2 Stack
Date 4/11/90
Run Number #5 - AM
Operator MF
Sample Box ID
Meter Box ID 005
Probe ID
Filter # B37

Meter δ
Meter ΔH@
Pitot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. B3
Pwake -.17
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

#1 468.127 OR SAT #06 #3 #2 #4

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B12	5	177	0.65	3.00		81	86	232	216	72	5.5
11	10	176	0.56	2.60	470.6	90	86	234	224	67	5
10	15	177	0.58	2.70	479.	92	86	232	236	66	5.0
9	20	173	0.52	2.41	483.1	91	86	231	235	64	5
8	25	174	0.5	2.34	487.6	90	86	230	233	64	5
7	30	168	0.48	2.25	491.7	90	86	235	233	64	4.5
6	35	137	0.39	1.80	496.2	90	86	226	231	63	3.75
5	40	130	0.35	1.64	499.3	89	86	226	229	63	3.75
4	45	125	0.32	1.50	503.3	88	85	233	228	66	3.5
3	50	124	0.31	1.45	506.2	89	86	234	230	66	3.2
2	55	125	0.29	1.35	509.7	88	86	235	230	66	3.0
1	60	123	0.22	1.03	513.1	88	85	231	230	66	2.8
STOP @ 4:21 pm				V=	515.114						
Averages		153.46	0.396	2.28	100.09	88.15		236.88	234.58	64.88	4.6

Comments:

Static Pressure:
Traverse Pt. 86
Pwake -0.29
Pstatic

Gdison Technical Services, Inc. 1/2 SAMPLE COLLECTION DATA

Plant CCC SO
Location Unit 2 Stack
Date 4/13/90
Run Number #6 - MM
Operator TK
Sample Box ID
Meter Box ID 005
Probe ID
Filter #

Meter 1.006
Meter ΔH@ 1.77
Pitot C.F. 0.84
Assumed Moisture % 11
Nozzle Diameter in. 0.268
C Factor 0.70
Ambient Temperature 60
Barometric Pressure 30.11
Silica Gel #

Impingers, ml. 21 Σ=43
1024 219 321 30
Silica Gel, gms 23
Orsat - Bag #
CO2 5.2
O2 14.8
CO

#1 Vi=515.72

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. Tin °F	Dry Gas Meter Temp. Tout °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
5 8:33 B1	5	150	0.72	3.35	520.5	62	66	231	239	59	12
2	10	153	0.72	3.35	526.5	75	68	234	217	65	12
3	15	154	0.65	3.05	531.2	85	69	238	218	61	12
4	20	153	0.62	2.89	535.6	92	72	242	225	62	11.1
5	25	156	0.61	2.85	540.1	95	74	246	228	61	10.8
* 6	30	153	0.61	2.85	546.1	94	77	247	228	59	10.6
7	35	131	0.47	2.19	549.2	100	80	248	231	57	8.2
8	40	120	0.40	1.87	553.1	100	81	249	237	60	7
9	45	108	0.38	1.77	556.5	99	83	249	239	62	6.7
10	50	110	0.36	1.65	560.4	100	85	249	240	66	6.2
11	55	120	0.27	1.26	563.0	99	87	251	248	67	4.3
5 9:33 12	60	98	0.21	.95	564.93	99	88	253	246	68	4.0
Averages											

P 2/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: Post Test Leak rate P 0.008cfm @12inHg

Plant CCSD
Location Unit 2 stack
Date 4-12-9
Run Number #6-MM
Operator CMT
Sample Box ID
Meter Box ID 005
Probe ID
Filter #

Meter δ
Meter ΔH@
Pitot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. # 4
Pwake -0.28
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

#1 V_i = 564.939 ORSAT 102 #3 #2 #4

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
START 9:59 A1	5	141	0.42	1.9	566.0	86	88	219	260	72	5.4
2	10	143	0.47	2.19	569.4	95	89	233	234	75	7.8
3	15	140	0.47	2.19	573.4	104	90	243	230	25	7.8
* 4	20	143	0.50	2.34	577.4	110	93	250	235	76	8.6
5	25	144	0.55	2.58	581.7	112	95	251	235	72	9.2
6	30	148	0.55	2.58	585.9	116	98	250	232	70	9.3
7	35	150	0.54	2.53	590.3	118	100	254	230	69	9.3
8	40	146	0.54	2.35	594.9	120	102	254	230	70	8.8
9	45	162	0.52	2.43	599.2	118	103	258	232	72	8.9
10	50	162	0.53	2.61	603.5	119	104	258	229	82	9.7
11	55	158	0.53	2.69	607.8	121	105	255	228	88	9.9
STOP 10:54 12	60	159	0.45	2.10	612.3	122	107	256	226	72	8.7
					V_f = 615.584						
Averages		142.00	0.503	2.35	99.91	94.75		246.50	233.08	68.33	8.68

Hexavalent Chromium Emission Data

SUMMARY OF TEST DATA - HEXAVALENT CHROMIUM EMISSIONS

PLANT: CCCSD — STACK #: INCINERATOR #2 EXHAUST

	RUN#4	RUN#5	RUN#6
NUMBER OF SAMPLING POINTS	24	24	24
DURATION OF THE RUN, MINUTES	120	120	120
SAMPLING NOZZLE DIAMETER, INCHES	0.268	0.268	0.268
PITOT CALIBRATION FACTOR (CF)	0.84	0.84	0.84
METER CALIBRATION FACTOR, GAMMA	1.014	1.014	1.014
STACK DIAMETER, INCHES	41	41	41
AMBIENT AIR TEMPERATURE, °F	60	70	60
BAROMETRIC PRESSURE, INCHES HG	30.14	30.14	30.11
AVG STATIC PRES IN FLUE, INCHES H_2O	-0.14	-0.13	-0.13
ABSOLUTE PRES IN FLUE (P(S)), INCHES HG	30.13	30.13	30.10
AVG STACK VELOCITY HEAD (SQRT(ΔP))	0.690	0.700	0.719
AVERAGE ORIFICE (ΔH), INCHES H_2O	2.36	2.44	2.58
VOL SAMPLED (V(M)), FT^3 (METER COND)	96.63	98.55	102.07
AVERAGE STACK TEMPERATURE (T(S)), °F	157	149	142
AVERAGE IMPINGER OUTLET TEMP, °F	70	79	70
AVERAGE METER TEMPERATURE, °F	91	92	96
AVERAGE METER VACUUM, INCHES HG	6.7	4.0	3.6
VOLUME OF WATER CONDENSED (V(LC)), ML	53.7	46.8	57.1
SPECIFIC GRAVITY OF FLUE GAS (SG)	1.008	1.010	1.006
HEXAVALENT CHROMIUM COLLECTED, µG	<7	<8	<8
ORSAT ANALYSIS:			
%CO_2	5.7	5.8	5.2
%O_2	14.3	14.0	14.8
%CO	0.0	0.0	0.0

SAMPLING DATA & CALCULATIONS - HEXAVALENT CHROMIUM EMISSIONS

PLANT: CCCSD

STACK #: INCINERATOR #2 EXHAUST

	RUN#4	RUN#5	RUN#6
A. AREA OF STACK, FT^2	9.17	9.17	9.17
B. VOLUME SAMPLED (METER COND.), FT^3	96.63	98.55	102.07
C. VOLUME SAMPLED (STANDARD COND.), FT^3 $\frac{B*GAMMA*P(BAR)+(\Delta H/13.6)*530}{[(29.92) * T(M)]}$	95.52	97.25	99.86
D. VOLUME OF LIQUID WATER CONDENSED, ML	53.7	46.8	57.1
E. VAPOR VOLUME OF WATER CONDENSED, SCF (STD. CONDITIONS), D*0.04728	2.54	2.21	2.70
F. MOISTURE, %, (E/(E+C))*100	2.59	2.22	2.63
G. AVERAGE VELOCITY IN THE STACK, FPM 4005*(SQRT(ΔP))*CF* SQRT((T(S)*29.92*1.0)/(530*P(S)*SG))	2,486	2,504	2,563
H. STACK GAS FLOW RATE (STACK COND.), CFM A*G	22,793	22,960	23,497
J. STACK GAS FLOW RATE (STANDARD CONDITIONS, DRY STATE), DSCFM H*(1-(F/100))*(530/T(S))*(P(S)/29.92)	19,201	19,660	20,259
K. HEXAVALENT CHROMIUM COLLECTED, µg	< 7	< 8	< 8
L. HEXAVALENT CHROMIUM CONC., µg/DSCM (K/C) * 35.3	< 3	< 3	< 3
M. HEXAVALENT CHROMIUM EMISSION RATE, GM/HR [(L*J*60)*10^{-6}]/35.3	< 0.1	< 0.1	< 0.1
N. SLUDGE FEED RATE, TONS/HR (DRY)	1.7	1.6	1.5
O. HEXAVALENT CHROMIUM EMISSION RATIO, GM/TON M / N	< 0.05	< 0.06	< 0.06

ORSAT DATA AND GAS DENSITY CALCULATIONS

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

	RUN #4		RUN #5		RUN #6	
PARAMETER	DRY BASIS	WET BASIS	DRY BASIS	WET BASIS	DRY BASIS	WET BASIS
CO_2	5.70	5.55	5.80	5.67	5.20	5.06
O_2	14.30	13.93	14.00	13.69	14.80	14.41
CO	0	0	0	0	0	0
N_2	80.00	77.93	80.20	78.42	80.00	77.89
H_2O	- -	2.59	- -	2.22	- -	2.63
MOLECULAR WEIGHT[1]	- -	29.19	- -	29.23	- -	29.12
SPECIFIC GRAVITY OF GAS[2]	- -	1.008	- -	1.010	- -	1.006

[1] CALCULATED FROM THE EQUATION:
MOLECULAR WEIGHT=0.44(%CO2)+0.32(%O2)+0.28(%N2+%CO)+0.18(%H2O)

[2] SG=MOLECULAR WEIGHT STACK GAS/MOLECULAR WEIGHT OF AIR (28.95 GM/MOLE)

ISOKINETIC VARIATION CALCULATION

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

PARAMETER	RUN #4	RUN #5	RUN #6
T(S), °R	617	609	602
V(LC), ML	53.7	46.8	57.1
GAMMA	1.014	1.014	1.014
V(M), FT^3	96.63	98.55	102.07
T(M), °R	551	552	556
P(BAR)+(ΔH/13.6), IN HG	30.31	30.32	30.30
V(S), FPM	2,486	2,504	2,563
P(S), IN HG	30.13	30.13	30.10
A(N), FT^2	0.00039	0.00039	0.00039
THETA, MINUTES	120	120	120
I (PERCENT OF ISOKINETIC)	97.0	96.5	96.1

$$I = (T(S)(AVG)*100((0.00267*V(CL))+(V(M)/T(M))*GAMMA*(P(BAR)+(\Delta H/13.6))))/(THETA*V(S)*P(S)*A(N))$$

APPENDIX VI: LABORATORY DATA

HCl Data

Galson Laboratories

6601 Kirkville Road
E. Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

HYDROCHLORIC ACID STACK

Sample ID	Lab ID	SAMPLE VOL (ML)	CHLORIDE CONC.(MG/L)	BLANK-CORRECTED CONC. (MG/L)	TOTAL CHLORIDE (MG)	TOTAL(1) HCL (MG)
TEST 1	J9301	255	1.9	1.5	0.38	0.39
TEST 2	J9302	295	1.9	1.5	0.45	0.46
TEST 3	J9303	275	2.2	1.8	0.50	0.51
BLANK	J9304BL	215	0.4	NA	NA	NA

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M3 - Cubic Meter
MG/M3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
G - Grams
WT - Weight

Method(s): CARB 421
Footnotes: (1) TOTAL HCL = TOTAL CHLORIDE X 36.5 / 35.5

Submitted by: NSA
Approved by:
Date: 4-MAY-1990

Formaldehyde, Benzene, and Vinyl Chloride Data

ALPHA CHEMICAL & BIOMEDICAL LABORATORIES

Joe E. Hodgkins, Ph.D.
Director

April 23, 1990

GALSON TECHNICAL SERVICES INC.
Attn: Chuck Siu
2116 Berkeley Way
Berkeley, CA. 94704

REPORT
FORMALDEHYDE ANALYSIS
PROJECT # SE-034

Sample Identification:

General Information: DNPH-Formaldehyde samples, see results for individual description.

Received in Lab : 4/11/90 9:25 am. See Chain of Custody.

Analysis:

Formaldehyde by High Performance Liquid Chromatography, CARB Method 430.
Sampling impinger solution preparation date: 4/9/90.
Extraction date: 4/16/90.
Analysis date: 4/20/90.

Instrument	:	Perkin-Elmer Series 4 HPLC.
Detector	:	Perkin-Elmer UV @ 360 nm.
Column	:	Brownlee ODS-224 RP-18 4.6 x 220 mm with ODGU guard column.
Mobile phase	:	30:70 ACN:H_2O to ACN
Conditions	:	Linear gradient for 20 min., 5 min. wash.
Flow rate	:	2.0 ml/min
Injection size	:	25 ul

Results:

Sample #	Galson #	Formaldehyde ug*
8482	SE03401	2.59
8483	SE03402	0.85
8484	SE03403	2.00
8485	SE03404 (Blank)	0.77

Method Detection Limit = 0.4 ug

*Results are compensated for the travel blank.

Mark S. Fesler
Analyst

Joe E. Hodgkins, Ph.D., C.T.
Laboratory Director

Enclosure (Chain of Custody)

AIR TOXICS LTD.

SAMPLE NAME: Test #1 Bag 203

ID#: 900405-01A

Stationary Source Test Method - Low Level Benzene/Vinyl Chloride

(CARB Method 410A/422)

Cryofocusing Full Scan GC/MS

File Name: 1041209

Dil. Factor: 3.87

Date of Collection: 4/11/90

Date of Analysis: 4/12/90

	MDL (ppbv)	Amount (ppbv)
Benzene	4.0	ND
Vinyl Chloride	4.0	ND

AIR TOXICS LTD.

SAMPLE NAME: Test #2 Bag 204

ID#: 900405-02A

Stationary Source Test Method - Low Level Benzene/Vinyl Chloride

(CARB Method 410A/422)

Cryofocusing Full Scan GC/MS

File Name:	1041210	Date of Collection: 4/11/90	
Dil. Factor:	3.87	Date of Analysis: 4/12/90	

	MDL (ppbv)	Amount (ppbv)
Benzene	[illegible]	[illegible]
Vinyl Chloride	4.0	ND

AIR TOXICS LTD.

SAMPLE NAME: Test #3

ID#: 900405-03A

Stationary Source Test Method - Low Level Benzene/Vinyl Chloride

(CARB Method 410A/422)

Cryofocusing Full Scan GC/MS

File Name:	1041211	Date of Collection:	4/11/90
Dil. Factor:	2	Date of Analysis:	4/12/90

	MDL (ppbv)	Amount (ppbv)
Benzene	2.0	5.8
Vinyl Chloride	2.0	ND

AIR TOXICS LTD.

SAMPLE NAME: Trip Blank

ID#: 900405-04A

Stationary Source Test Method - Low Level Benzene/Vinyl Chloride
(CARB Method 410A/422)
Cryofocusing Full Scan GC/MS

File Name:	1041205	Date of Collection:	NA
Dil. Factor:	2	Date of Analysis:	4/12/90

	MDL (ppbv)	Amount (ppbv)
Benzene	[illegible]	[illegible]
Vinyl Chloride	2.0	ND

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 900405-05A

Stationary Source Test Method - Low Level Benzene/Vinyl Chloride
(CARB Method 410A/422)
Cryofocusing Full Scan GC/MS

File Name:	1041203	Date of Collection:	NA
Dil. Factor:	2	Date of Analysis:	4/12/90

	MDL (ppbv)	Amount (ppbv)
Benzene	2.0	ND
Vinyl Chloride	2.0	ND

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 900405-05B

Stationary Source Test Method - Low Level Benzene/Vinyl Chloride

(CARB Method 410A/422)

Cryofocusing Full Scan GC/MS

File Name:	1041202	Date of Collection:	NA
Dil. Factor:	2	Date of Analysis:	4/12/90

	MDL (ppbv)	% Recovery
Benzene	[illegible]	[illegible]
Vinyl Chloride	2.0	110

Particulate and Metals (11) Data

Galson Technical Services

Galson Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
FAX: (415) 848-0838

PARTICULATE ANALYSIS REPORT - FILTER SAMPLES

Project Name: CCCSD
Project No.: SE-034

Sample ID	Filter ID	Sample Date	Tare (gm)	Final (gm)	Diff. (gm)	Blk-Correct Diff. (gm)
Blank	136	4/11/90	0.3703	0.3715	0.0012	NA
Test #4	137	4/11/90	0.3712	0.3876	0.0164	0.0152
Test #5	139	4/11/90	0.3668	0.3863	0.0195	0.0183
Test #6	140	4/12/90	0.3698	0.3927	0.0229	0.0217

Method: CARB 5
Date Analyzed: 4/19/90
Analyzed by: S. Valladolid

Approved by: M. Ludwiczak

Galson Technical Services

Galson Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
FAX: (415) 848-0838

PARTICULATE ANALYSIS REPORT - RINSE SAMPLES

Project Name: CCCSD
Project No.: SE-034

Sample ID	Lab ID	Sample Date	Tare (gm)	Final (gm)	Diff. (gm)	Blk-Correct Diff. (gm)
Blank	Z	4/11/90	106.4651	106.4720	0.0069	NA
Test #4	AA	4/11/90	97.7315	97.7497	0.0182	0.0113
Test #5	CC	4/11/90	99.2853	99.3001	0.0148	0.0079
Test #6	FF	4/12/90	100.3998	100.4082	0.0084	0.0015

Method: CARB 5
Date Analyzed: 4/19-20/1990
Analyzed by: S. Valladolid

Approved by: M. Ludwiczak

Galson Laboratories

6601 Kirkville Road
E. Syracuse, NY 13057
Tel. (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

		Lab ID:	J9297AC	J9297B	J9297D	
		Client ID:	TEST 4 CONTAINER A/C	TEST 4 CONTAINER B	TEST 4 CONTAINER D	TEST 4 TOTAL
LEAD	TOTAL MG		0.048	<0.04	<0.1	0.048
CADMIUM			0.021	<0.002	<0.005	0.021
CHROMIUM			0.012	<0.004	0.014	0.026
NICKEL			0.006	<0.008	<0.02	0.006
COPPER			0.10	<0.008	<0.02	0.10
ARSENIC			0.009	<0.002	0.006	0.015
ZINC			0.98	0.69	0.079	1.75
MANGANESE			0.016	<0.002	0.82	0.836
SELENIUM			0.023	0.003	<0.006	0.026
BERYLLIUM			<0.001	<0.001	<0.002	<0.002

Method(s): EPA DRAFT METHOD 8/28/89 METHOD EMISSIONS FROM HAZARDOUS WASTE AND SIMILAR COMBUSTION PROCESSES.

Footnotes:

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: ES, DS, PH
Approved by: Mary Durkin
Date: 4-MAY-1990

Galson Laboratories

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E Syracuse, NY 13057
Tel. (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

		Lab ID:	J9299AC	J9299B	J9299D	
		Client ID:	TEST 6 CONTAINER A/C	TEST 6 CONTAINER B	TEST 6 CONTAINER D	TEST 6 TOTAL
LEAD	TOTAL MG		0.074	<0.05	<0.1	0.074
CADMIUM			0.032	<0.002	<0.006	0.032
CHROMIUM			0.014	0.009	0.018	0.041
NICKEL			<0.005	<0.01	<0.03	<0.010
COPPER			0.15	<0.01	<0.03	0.15
ARSENIC			0.012	<0.002	<0.007	0.012
ZINC			1.1	8.1	0.15	9.35
MANGANESE			0.014	0.006	0.042	0.062
SELENIUM			0.033	0.003	<0.007	0.036
BERYLLIUM			<0.001	<0.001	<0.003	<0.002

Method(s): EPA DRAFT METHOD 8/28/89 METHOD EMISSIONS FROM HAZARDOUS WASTE AND SIMILAR COMBUSTION PROCESSES.

Footnotes: NO BLANK CORRECTIONS FOR CONTAINER B AND D REQUIRED.

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: ES, DS, PH
Approved by: Mary D Wirthmor
Date: 4-MAY-1990

Galson Laboratories

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E Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

		Lab ID:	J9298AC	J9298B	J9298D	
		Client ID:	TEST 5 CONTAINER A/C	TEST 5 CONTAINER B	TEST 5 CONTAINER D	TEST 5 TOTAL
LEAD	TOTAL MG		0.074	<0.06	<0.1	0.074
CADMIUM			0.029	<0.003	<0.006	0.029
CHROMIUM			0.007	0.006	0.013	0.026
NICKEL			0.004	<0.1	<0.02	0.004
COPPER			0.12	<0.01	<0.02	0.12
ARSENIC			0.009	<0.003	<0.006	0.009
ZINC			1.7	0.16	0.14	2.00
MANGANESE			0.014	<0.004	0.21	0.224
SELENIUM			0.028	0.006	<0.006	0.034
BERYLLIUM			<0.001	<0.001	<0.002	<0.002

Method(s): EPA DRAFT METHOD 8/28/89 METHOD EMISSIONS FROM HAZARDOUS WASTE AND SIMILAR COMBUSTION PROCESSES.

Footnotes:

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: ES, DS, PH
Approved by: Mary Gurthrie
Date: 4-MAY-1990

Galson Laboratories

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E Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

		Lab ID:	J9300ACBL	J9300BBL	J9300DBL
		Client ID:	BLANK CONTAINER A/C	BLANK CONTAINER B	BLANK CONTAINER D
LEAD	TOTAL MG		<0.02	<0.1	<0.03
CADMIUM			<0.001	<0.004	<0.001
CHROMIUM			0.010	<0.01	<0.003
NICKEL			<0.005	<0.02	<0.006
COPPER			<0.005	<0.02	<0.006
ARSENIC			0.002	<0.005	<0.002
ZINC			0.24	<0.03	<0.008
MANGANESE			0.012	<0.006	<0.002
SELENIUM			0.003	<0.005	<0.002
BERYLLIUM			<0.001	<0.002	<0.001

Method(s): EPA DRAFT METHOD 8/28/89 METHOD EMISSIONS FROM HAZARDOUS WASTE AND SIMILAR COMBUSTION PROCESSES.

Footnotes:

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: ES, DS, PH
Approved by: Mary Gwithrow
Date: 4-MAY-1990

Galson Laboratories

6601 Kirkville Road
E Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

	Lab ID:	J9297AC	J9297B	J9297D	J9297E	
	Client ID:	TEST 4 CONTAINER A/C	TEST 4 CONTAINER B	TEST 4 CONTAINER D	TEST 4 CONTAINER E	TEST 4 TOTAL
MERCURY	TOTAL UG	2.6	0.3	21	93	116.9

Method(s): EPA DRAFT METHOD 8/28/89 METHOD EMISSIONS FROM HAZARDOUS WASTE AND SIMILAR COMBUSTION PROCESSES.

Footnotes: NO BLANK CORRECTIONS NEEDED.

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(>) - Greater Than
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ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: PH
Approved by: Mary Kirkhorn
Date: 4-MAY-1990

Galson Laboratories

6601 Kirkville Road
E. Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: COCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

	Lab ID:	J9298AC	J9298B	J9298D	J9298E	
	Client ID:	TEST 5 CONTAINER A/C	TEST 5 CONTAINER B	TEST 5 CONTAINER D	TEST 5 CONTAINER E	TEST 5 TOTAL
MERCURY	TOTAL UG	1.8	0.60	16	160	178.4

Method(s): EPA DRAFT METHOD 8/28/89 METHOD EMISSIONS FROM HAZARDOUS WASTE AND SIMILAR COMBUSTION PROCESSES.
Footnotes: NO BLANK CORRECTIONS NEEDED.

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MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: ES, DS, PH
Approved by: Mary G Withrow
Date: 4-MAY-1990

Galson Laboratories

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E. Syracuse, NY 13057
Tel. (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90042315
Location: NS

Job Number: SE034LL
Date Sampled: 04/10-12/90

	Lab ID:	J9299AC	J9299B	J9299D	J9299E	
	Client ID:	TEST 6 CONTAINER A/C	TEST 6 CONTAINER B	TEST 6 CONTAINER D	TEST 6 CONTAINER E	TEST 6 TOTAL
MERCURY	TOTAL UG	<0.8	1.3	24	260	285.3

Method(s): EPA DRAFT METHOD 8/28/89 METHOD EMISSIONS FROM HAZARDOUS WASTE AND SIMILAR COMBUSTION PROCESSES.

Footnotes: NO BLANK CORRECTIONS NEEDED.

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: ES, DS, PH
Approved by: Mary G Wirthron
Date: 4-MAY-1990

Galson Technical Services

Galson Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
FAX: (415) 848-0838

SILICA GEL ANALYSIS REPORT

Project Name: CCCSD
Project No.: SE-034

Sample ID	Lab ID	Sample Date	Tare (gm)	Final (gm)	Diff. (gm)	Blk-Correct Diff. (gm)
Blank	1219	4/12/90	200.0	200.6	0.6	NA
1-HCl	1214	4/10/90	200.0	213.7	13.7	13.1
2-HCl	1210	4/10/90	200.0	210.2	10.2	9.6
3-HCl	1215	4/10/90	200.0	207.7	7.7	7.1
4-Hex Chrome	1207	4/11/90	200.0	230.3	30.3	29.7
5-Hex Chrome	1202	4/11/90	200.0	224.4	24.4	23.8
6-Hex Chrome	1209	4/12/90	200.0	225.7	25.7	25.1
4-Multi-Metals	1216	4/11/90	200.0	226.1	26.1	25.5
5-Multi-Metals	1198	4/11/90	200.0	234.0	34.0	33.4
6-Multi-Metals	1217	4/12/90	200.0	222.6	22.6	22.0
7-PAH	1221	4/12/90	200.0	234.6	34.6	34.0
8-PAH	1227	4/12/90	300.0	333.9	33.9	33.3
9-PAH	1211	4/13/90	200.0	235.7	35.7	35.1
10-PAH	1218	4/13/90	200.0	235.9	35.9	35.3

Method: CARB 5
Date Analyzed: 4/16/90
Analyzed by: S. Valladolid

Approved by: M. Ludwiczak

1/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:
100 / 0.34
150 / 0.375

Plant: CCCSD
Location: Unit 2 - Stack K
Date: 4/11/90
Run Number: #4, HC
Operator: RR/TM
Sample Box ID: NT-Sep.
Meter Box ID: 604
Probe ID:
Filter #:

Meter δ: 1.014
Meter ΔH@: 1.87
Pilot C.F.: 0.84
Assumed Moisture %: 4
Nozzle Diameter in.: 0.268
C Factor: Sep Stack #?
Ambient Temperature: 60
Barometric Pressure: 30.14
Silica Gel #:

Static Pressure:
Traverse Pt.: *A5
Pwake: -0.32
Pstatic:

Water Collected: 132+88=254-200
Impingers, ml.: 24
Silica Gel, gms.: 29.7 X 53.7

Vi: 953.605

CO2 - 5.7 / O2 - 14.3

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
Start 10:29 A1	5	174	0.52	2.60	957.7	70	75	—	233	65	8
2	10	169	0.61	3.00	962.1	82	75	—	230	63	8
3	15	184	0.63	3.10	966.8	90	76	—	225	68	9
4	20	185	0.56	2.75	—	95	77	—	233	68	9
* 5	25	173	0.55	2.70	975.2	97	78	—	230	67	8
6	30	168	0.52	2.60	979.4	99	79		230	67	7
7	35	154	0.50	2.45	983.5	100	81		226	67	7
8	40	155	0.50	2.45	987.6	104	82		217	67	7
9	45	152	0.49	2.45	—	104	83		246	68	7
10	50	151	0.46	2.25	995.7	103	84		240	68	6.5
11	55	145	0.44	2.15	999.7	104	85		220	69	6
11:29 12	60	148	0.43	2.10	1003.501	103	86		254	69	6
Averages											

Comments: Post Test LK Rate 0.010 cfm @ 10 inHg

Gaison Technical Services, Inc.

SAMPLE COLLECTION DATA

2/2

Static Pressure:
Traverse Pt. ___ ___
Pwake ___ ___
Pstatic ___ ___

Plant CCCSD
Location Unit 2 Stack
Date 4/12/90
Run Number 6 HexChr
Operator DR/KP
Sample Box ID Sep. box
Meter Box ID 004
Probe ID
Filter #

Meter 1.014
Meter ΔH@ 1.77
Pitot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.268
C Factor 0.375
Ambient Temperature 60
Barometric Pressure 30.11
Silica Gel # Orsat #1052

Impingers, ml. ___
Silica Gel, gms ___
Orsat - Bag # ___
CO2 ___
O2 ___
CO ___

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. Tin °F	Dry Gas Meter Temp. Tout °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
Start 9:52 B1	5	111	0.25	1.25	—	83	86	—	262	74	2
2	10	118	0.37	1.85	211.6	95	86		249	71	2
3	15	121	0.37	1.85	215.3	105	86		243	72	2
4	20	116	0.37	1.85	—	110	90		233	75	2
5	25	122	0.39	1.90	222.7	114	92		237	—	2
6	30	132	0.46	2.25	226.8	117	94		237	76	2
7	35	147	0.47	2.35	231.0	120	96		237	76	2
8	40	157	0.50	2.45	235.1	124	101		244	—	—
9	45	163	0.55	2.70	239.5	124	102		245	77	2
10	50	164	0.58	2.85	—	129	104		228	79	2
10:11	55	160	0.58	2.85	248.5	130	108		203	—	5
10:52	60	161	0.55	2.70	252.872	130	108		229	80	5
Averages		142.13	0.719	2.58	102.07		96.29	N/A	242.83	69.67	3.13

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: 100 0.34
150 0.375

Plant CCCSD 1/2
Location Unit 2 stack
Date 4/11/90
Run Number 5 Cr(VI)
Operator DRILL
Sample Box ID SCD box
Meter Box ID 007
Probe ID 4
Filter #

Meter δ - 1.014
Meter ΔH@ 1.87
Pitot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.368
C Factor 0.375
Ambient Temperature 70
Barometric Pressure 30.14
Silica Gel #

Static Pressure:
Traverse Pt *B4 *B1
Pwake -0.22 -0.30
Pstatic

Water Collected:
118 + 105 = 223 - 38
Impingers, ml. 185 x 6.8
Silica Gel, gms. 23.8

V_i = 51362

CO_2 - 5.8 / O_2 - 14.0

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
start 2:10 B1	5	97	0.18	0.84	53.8	78	82	—	240	—	—
2	10	105	0.35	1.70	57.2	85	82	—	237	75	—
3	15	127	0.42	2.05	61.1	91	80	—	231	80	—
* 4	20	126	0.38	1.85	64.8	96	83		236	79	—
5	25	123	0.39	1.90	68.5	99	84		228	79	—
6	30	131	0.43	2.05	—	100	85		235	80	—
7	35	143	0.43	2.35	76.5	101	86		244	78	—
8	40	162	0.52	2.55	80.6	106	88		249	78	—
* 9	45	167	0.58	2.75	—	107	89		252	78	—
10	50	167	0.58	2.85	89.4	106	90		270	78	—
stop 12 11	55	169	0.57	2.80	93.8	107	90		259	78	—
3:12 12	60	168	0.57	2.80	98.194	104	90		265	78	
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

272

Comments: Post Test Lk rate 0.015 cfm @ 10 in Hg

Plant CCCSD
Location Unit 2 Stack
Date 4/11/90
Run Number 5/Hg/CR
Operator DR/KP
Sample Box ID SP. Box
Meter Box ID #04
Probe ID
Filter #

Meter δ 1.014
Meter ΔH@ 1.84
Pilot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. .268
C Factor 0.375
Ambient Temperature 70
Barometric Pressure
Silica Gel # Orsat #06

Static Pressure:
Traverse Pt. ____ ____
Pwake ____ ____
Pstatic ____ ____

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
Start 3:07 A1	65	165	0.62	3.05	—	82	85	—	256	80	4
2	70	165	0.60	2.95	107.5	94	85	—	236	80	4
3	75	168	0.60	2.95	—	96	85	—	214	80	4
4	80	170	0.58	2.85		98	85		233	80	4
5	85	167	0.56	2.75	~~120.8~~	99	85		231	—	4
6	90	164	0.54	2.65	125.0	100	86		238	80	4
7	95	153	0.54	2.65	129.2	100	86		250	80	4
8	100	152	0.54	2.65	—	99	86		245	80	4
9	105	152	0.52	2.55	137.7	100	86		245	77	4
10	110	147	0.50	2.45	141.9	101	87		256	77	4
11	115	148	0.47	2.30	145.9	101	87		264	77	4
Stop 3:24 12	120	149	0.45	2.20	149.911	100	87		278	77	3.5
Averages		149.46	0.700	2.44	98.55	91.85		N/A	245.5	78.55	3.96

Comments:

Static Pressure:

Traverse Pt. #18

Pwake -0.30

Pstatic

Gdison Technical Services, Inc. — SAMPLE COLLECTION DATA

Plant CCSD 1/2
Location Unit 2 Stack
Date 4/12/90
Run Number #6-HC
Operator DR
Sample Box ID NTek-Sep
Meter Box ID
Probe ID
Filter #

Meter 1014
Meter ΔH@ 1.87
Pilot C.F. 0.84
Assumed Moisture % 4
Nozzle Diameter in. 0.268
C Factor 0.375
Ambient Temperature 60
Barometric Pressure 30.11
Silica Gel #

Impingers, ml. 32 (57.1)
Silica Gel, gms 25.1
Orsat - Bag #
CO2 5.2
O2 14.8
CO

Vi = 150.803

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. Tin °F	Dry Gas Meter Temp. Tout °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
A1	5	145	0.56	2.75	154.7	61	66		251	55	3.5
2	10	150	0.67	3.30	159.5	74	66		235	54	5.5
3	15	151	0.69	3.40	164.4	88	68		240	60	5.5
4	20	151	0.68	3.35	169.3	96	70		231	62	5.5
5	25	152	0.68	3.35	174.2	100	72		224	65	5.5
6	30	147	0.70	3.45	179.1	105	76		243	67	6
7	35	148	0.65	3.20	—	109	79		251	67	5
*8	40	139	0.59	2.90	—	109	82		245	69	4.5
9	45	140	0.57	2.80	—	108	83		255	70	4
10	50	136	0.47	2.30	169.9	107	85		261	70	4
11	55	141	0.44	2.15	200.8	106	86		268	72	3
12	60	139	0.45	2.20	204.860	106	86		277	72	3.5
Averages											

Galson Technical Services

Comments: Post Test leak rate 0.014cfm @12 in Hg

SAMPLE COLLECTION DATA

2/2

Plant CCCSD
Location Unit 2 stack
Date 4/11/90
Run Number 4 Hexchr.
Operator DR/ML
Sample Box ID Sco box
Meter Box ID 004
Probe ID 4'
Filter #

Meter δ 1.014
Meter ΔH@ 1.87
Pilot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.268
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. B-5 B-8
Pwake -0.23 -0.28
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

3.5 83 7

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B1	5	120	0.25	1.25	6.6	85	80	—	218	68	3
2	10	136	0.35	1.70	10.0	90	82	—	217	68	5
3	15	136	0.37	1.80	13.5	93	82	—	259	70	5
4	20	133	0.37	1.80	17.3	98	83	—	219	73	5
5	25	129	0.38	1.85		101	84	—	207	73	5.5
6	30	136	0.43	2.10	24.8	102	85	—	217	71	6
7	35	156	0.47	2.30	28.8	105	86	—	235	73	7
8	40	167	0.48	2.35	33.0	108	87	—	216	72	7
9	45	173	0.51	2.50	37.1	109	89	—	233	73	7.5
10	50	173	0.55	2.75	41.5	108	90	—	231	73	8
11	55	175	0.58	2.85	45.8	110	90	—	233	74	8.5
12	60	178	0.58	2.85	1050.230	109	91	—	240	74	8.5
Averages		157.17	0.69	2.36	96.63	90.81		N/A	229.54	69.5	6.73

1243

FLUE GAS ANALYSES FIELD DATA

Plant ID: CCCSD Date: 4/11/89

Quality Control

Leak check - all components must pass

Pre-test		Post-test
✓	CO_2 Pipette	✓
✓	O2 pipette	✓
—	CO pipette	—
✓	Sample burette	✓

O_2/QC gas analysis results

Gas ID	Run #	CO_2	CO_2+O2	O_2	CO
Ambient Air	3	0.0	20.8	20.8	

ORSAT ANALYSES DATA

Sample Bag ID		CO_2 %	$CO_2 + O_2$	O_2 %	$CO_2 + O_2 + CO$	CO %	Fo
#08 (Test 4)	a)	5.7	19.9	14.2			
	b)	5.4	19.7	14.3			
	c)	5.8	20.1	14.3			
	d)	5.6	19.8	14.2			
	Avg	5.7		14.3			
#06 (Test 5)		5.9	20.2	14.3			
		6.0	20.3	14.3			
		5.8	19.8	14.0			
		5.8	19.8	14.0			
	Avg	5.8		14.0			

FLUE GAS ANALYSES FIELD DATA

Plant ID: CCCSD Date: 4/12/90

Quality Control

Leak check - all components must pass

Pre-test		Post-test
✓	CO_2 Pipette	
✓	O2 pipette	
	CO pipette	
	Sample burette	

O_2/QC gas analysis results

Gas ID	Run #	CO_2	CO_2+O2	O_2	CO
	1				
	2				
	3				

ORSAT ANALYSES DATA

Sample Bag ID		CO_2 %	$CO_2 + B_2$	O_2 %	$CO_2 + O_2 + CO$	CO %	Fo
Test 6 mm Hg GTS #102		5.4	19.9	14.5			
hr		5.3	20.0	14.7			
AR		5.4	20.1	14.7			
	Avg	5.4		14.6			
Test GTS #102		5.2	20.0	14.8			
mm Hg Ex Chr		5.2	20.4	14.3			
		5.2	20.0	14.9			
Avg		5.2		14.8			
Test 7	a)	5.0	20.0	15.0			
#09	b)	5.1	20.3	15.2			
	c)	5.0	20.2	15.2			
Avg		5.0		15.2			
#101	a)	5.3	20.1	14.8			
(Test 8)	b)	5.4	20.0	14.6			
	c)	5.5	20.3	14.8			
Avg		5.4		14.7			

Galson Laboratories

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1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: CCCSD
Task Number: 90041304
Location: MARTINEZ, CA

Job Number: SE034LL
Date Sampled: 11-APR-1990

HEXAVALENT CHROMIUM STACK

Sample ID	Lab ID	TOTAL UG
TEST #4	J8601	<7
TEST #5	J8602	<8
TEST #6	J8603	<8
BLANK	J8604BL	<7

J8601 SPIKE 38% RECOVERY

Method(s): CARB 425
Footnotes:

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
NS - Not specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

Submitted by: DD
Approved by: J. Brakema
Date Analyzed: 13-APR-1990

PCDD/PCDF and PAH Emission Data

3.0 Analytical Results

The results generated for each of the sample trains submitted under this project are presented ahead.

Prior to analysis all glassware was thoroughly washed with soap followed by solvent rinses.The glassware was water rinsed again then soaked in chromic acid for one hour. This was followed by additional water rinses and the glassware then dried overnight at 300 °C. In addition all vials and rotary evaporation glassware were similarly cleaned. Unfortunately appreciable levels of naphthalene were still evident in our method blank. Subsequent to these analyses all glassware have been treated with nitric acid which has basically eliminated the problem.The travel blank itself gave the highest level of naphthalene at 810 ug. This in itself may be directly related to the particular XAD resin but cannot be ascertained with any certainty.The surrogate recovery for $^{13}C_{12}$ benzo(a)pyrene could not be determined due to a large co-eluting peak .No positives were noted for any PCDD/PCDF at the detection levels indicated in the data table. Test #7 and #9 had relatively lower recoveries of the field surrogate $^{37}Cl_4$-2,3,7,8-TCDF ,30 and 37% respectively, but in both cases the other field spike ,$^{13}C_{12}$-1,2,3,4,6,7,8-H7CDF recoverd well (89 and 110%).

ANALYTICAL RESULTS REPORT

CLIENT INFORMATION
Name: GALSON TECHNICAL SERVICES
LAB INFORMATION
Contact: QC
Project: AN898849
Date: May.24 1990

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

Component	MDL	Units	*Client ID:* TEST#7 04/17/90 *Lab ID:* 008519 90	TEST#8 4/17/90 008520 90	TEST#9 4/17/90 008521 90	TEST#10 04/17/90 008522 90	BLANK 04/17/90 008523 90
2,3,7,8-Tetrachlorodibenzofuran		ng	<0.026	<0.040	<0.038	<0.12	<0.10
2,3,7,8-Tetrachlorodibenzo-p-dioxin			<0.034	<0.090	<0.084	<0.15	<0.22
1,2,3,7,8-Pentachlorodibenzofuran			<0.068	<0.060	<0.080	<0.084	<0.090
2,3,4,7,8-Pentachlorodibenzofuran			<0.070	<0.061	<0.079	<0.090	<0.088
1,2,3,7,8-Pentachlorodibenzo-p-dioxin			<0.094	<0.079	<0.072	<0.088	<0.10
1,2,3,4,7,8-Hexachlorodibenzofuran			<0.042	<0.044	<0.038	<0.056	<0.058
1,2,3,6,7,8-Hexachlorodibenzofuran			<0.042	<0.045	<0.040	<0.056	<0.059
2,3,4,6,7,8-Hexachlorodibenzofuran			<0.041	<0.045	<0.040	<0.054	<0.059
1,2,3,7,8,9-Hexachlorodibenzofuran			<0.042	<0.044	<0.039	<0.054	<0.058
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin			<0.079	<0.065	<0.090	<0.080	<0.081
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin			<0.079	<0.067	<0.092	<0.080	<0.085
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin			<0.079	<0.065	<0.092	<0.082	<0.084
1,2,3,4,6,7,8-Heptachlorodibenzofuran			<0.055	<0.072	<0.055	<0.16	<0.11
1,2,3,4,7,8,9-Heptachlorodibenzofuran			<0.056	<0.075	<0.054	<0.17	<0.11
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin			<0.085	<0.18	<0.082	<0.13	<0.20
1,2,3,4,6,7,8,9-Octachlorodibenzofuran			<0.099	<0.11	<0.10	<0.13	<0.13
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin			<0.17	<0.15	<0.13	<0.18	<0.18
Total Cl4 Dibenzo-p-dioxins		ng	<0.034	<0.092	<0.11	<0.17	<0.23
Total Cl5 Dibenzo-p-dioxins			<0.094	<0.08	<0.073	<0.15	<0.1
Total Cl6 Dibenzo-p-dioxins			<0.079	<0.067	<0.092	<0.083	<0.084
Total Cl7 Dibenzo-p-dioxins			<0.085	<0.18	<0.082	<0.14	<0.2
Cl8 Dibenzo-p-dioxin			<0.17	<0.15	<0.13	<0.18	<0.18
Total Cl4 Dibenzofurans			<0.026	<0.042	<0.038	<0.16	0.1
Total Cl5 Dibenzofurans			<0.071	<0.061	<0.14	<0.094	<0.095
Total Cl6 Dibenzofurans			<0.042	<0.045	<0.041	<0.056	<0.059
Total Cl7 Dibenzofurans			<0.056	<0.075	<0.055	<0.17	<0.11
Cl8 Dibenzofuran			<0.099	<0.11	<0.10	<0.13	<0.13
Surrogate Recoveries %							
2,3,7,8-T4CDD 13C-12			86	75	110	140	140
2,3,7,8-T4CDD 37Cl-4			30	110	37	93	89
2,3,7,8-T4CDF 13C-12			120	75	110	81	99
1,2,3,7,8-P5CDD 13C-12			94	41	110	110	110
1,2,3,6,7,8-H6CDD 13C-12			100	100	100	100	100
1,2,3,4,6,7,8-H7CF 13C-12			89	87	110	64	70
1,2,3,4,6,7,8-H7CDD 13C12			90	110	110	92	86
OCDD 13C12			98	92	110	92	91

4.0 Quality Control /Quality Assurance (QA/QC)

A complete QA/QC program is employed by ZENON. The elements of this program and a brief discussion of each of the elements are presented below:

Sample Custody

Strict chain of custody is maintained for samples analysed in this project. Samples received from the field were signed off upon delivery and immediately entered into ZENON's lab information system. Prior to extraction, samples were stored under refrigeration in a secure area. All technologists working on this project have kept accurate records of all actions taken with the samples. ZENON also has a security system in place that ensures unauthorized entry into the lab area is immediately known and appropriate staff and police are contacted.

Method blanks

A method blank is an analysis incorporating all aspects of the analysis, excluding the sample. Its value is to identify the presence of glassware, reagent or instrumentation induced contamination. In this study, a method blank was processed for the group samples. The data generated are not corrected for lab blank.

Standards -Internal, Surrogate & External

ZENON uses both native and labelled PCDD/DF and PAH standards as identified in the CARB protocols. Every sample was fortified with surrogate standards from each contaminant group prior to the start of analysis and each extract was fortified with an internal standard just prior to injection. Three point calibrations were used to define the response curve characteristics.

Surrogate recoveries were generally acceptable, with the exception of $^{13}C_{12}$.No recoveries were available due to the presence of a large co-eluting peak which was not removed by tha alumina clean-up. Two samples gave marginally lower recoveries on one of the two dioxin surrogates (Test #7 and #9) yet in both cases the other surrogate gave good recoveries (89 and 110%).

SUMMARY OF TEST DATA - PCDD/PCDF AND PAH EMISSIONS

PLANT: CCCSD — STACK #: INCINERATOR #2 EXHAUST

	RUN #7	RUN #8	RUN #9	RUN #10
NUMBER OF SAMPLING POINTS	24	24	24	24
DURATION OF THE RUN, MINUTES	192	192	192	192
SAMPLING NOZZLE DIAMETER, INCHES	0.23	0.23	0.23	0.23
PITOT CALIBRATION FACTOR (CF)	0.84	0.84	0.84	0.84
METER CALIBRATION FACTOR, GAMMA	1.006	1.006	1.006	1.006
STACK DIAMETER, INCHES	41	41	41	41
AMBIENT AIR TEMPERATURE, °F	70	70	70	70
BAROMETRIC PRESSURE, INCHES HG	30.11	30.11	30.02	30.02
AVG STATIC PRES IN FLUE, INCHES H_2O	-0.18	-0.14	-0.09	-0.13
ABSOLUTE PRES IN FLUE (P(S)), INCHES HG	30.10	30.10	30.01	30.01
AVG STACK VELOCITY HEAD, SQRT(ΔP)	0.690	0.691	0.688	0.700
AVERAGE ORIFICE (ΔH), INCHES H_2O	1.21	1.21	1.19	1.26
VOL SAMPLED (V(M)), FT^3 (METER COND)	118.63	119.67	120.12	118.82
AVERAGE STACK TEMPERATURE (T(S)), °F	148	147	153	152
AVERAGE XAD-2 TEMPERATURE, °F				
AVERAGE IMPINGER OUTLET TEMP, °F	77	67	76	75
AVERAGE METER TEMPERATURE, °F	99	99	107	106
AVERAGE METER VACUUM, INCHES HG	6.9	9.5	9.9	6.7
VOLUME OF WATER CONDENSED (V(LC)), ML	20.2	57.4	46.5	68.1
SPECIFIC GRAVITY OF FLUE GAS (SG)	1.013	1.008	1.010	1.004
ORSAT ANALYSIS:				
• % CO_2	5.0	5.4	5.4	4.9
• % O_2	15.2	14.7	14.8	15.1
• % CO	0.0	0.0	0.0	0.0

SAMPLING DATA & CALCULATIONS - PCDD/PCDF AND PAH EMISSIONS

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

	RUN #7	RUN #8	RUN #9	RUN #10
A. AREA OF STACK, FT^2	9.17	9.17	9.17	9.17
B. VOLUME SAMPLED (METER COND.), FT^3	118.63	119.67	120.12	118.82
C. VOLUME SAMPLED (STANDARD COND.), SCF $\frac{B*GAMMA*[P(BAR)+(\Delta H/13.6)]*530}{(29.92) * [T(M)]}$	114.28	115.30	113.62	112.66
D. VOLUME OF LIQUID WATER CONDENSED, ML	20.2	57.4	46.5	68.1
E. VAPOR VOLUME OF WATER CONDENSED, SCF (STD. CONDITIONS), D*0.04728	0.96	2.71	2.20	3.22
F. MOISTURE, % (E/(E+C))*100	0.83	2.30	1.90	2.78
G. AVERAGE VELOCITY IN THE STACK, FPM 4005*(SQRT(DP)*CF* SQRT((TS*29.92*1.0)/(530*P(S)*SG))	2,464	2,471	2,474	2,521
H. STACK GAS FLOW RATE (STACK COND.), CFM (A*G)	22,594	22,652	22,680	23,113
I. STACK GAS FLOW RATE (STD. COND., DRY), DSCFM H*(1-(F/100))*(530/T(S))*(P(S)/29.92)	19,635	19,433	19,287	19,527
J. SLUDGE FEED RATE, TONS (DRY)/HOUR	1.5	1.5	1.5	1.5

SAMPLING DATA & CALCULATIONS - PCDD/PCDF AND PAH EMISSIONS

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

	Run #7	Run #8	Run #9	Run #10
K. PCDD/PCDF Collected, ng.				
2378 TCDD	<0.034	<0.090	<0.084	<0.15
Total TCDD	<0.034	<0.092	<0.11	<0.17
12378 PeCDD	<0.094	<0.079	<0.072	<0.088
Total PeCDD	<0.094	<0.080	<0.073	<0.150
123478 HxCDD	<0.079	<0.065	<0.090	<0.080
123678 HxCDD	<0.079	<0.067	<0.092	<0.080
123789 HxCDD	<0.079	<0.065	<0.092	<0.082
Total HxCDD	<0.079	<0.067	<0.092	<0.083
1234678 HpCDD	<0.085	<0.18	<0.082	<0.13
Total HpCDD	<0.085	<0.18	<0.082	<0.14
Total OCDD	<0.17	<0.15	<0.13	<0.18
Total PCDD	<0.46	<0.57	<0.49	<0.72
2378 TCDF	<0.026	<0.040	<0.038	<0.12
Total TCDF	<0.026	<0.042	<0.038	<0.16
12378 PeCDF	<0.068	<0.060	<0.080	<0.084
23478 PeCDF	<0.070	<0.061	<0.079	<0.090
Total PeCDF	<0.071	<0.061	<0.14	<0.094
123478 HxCDF	<0.042	<0.044	<0.038	<0.056
123678 HxCDF	<0.042	<0.045	<0.040	<0.056
234678 HxCDF	<0.041	<0.045	<0.040	<0.054
123789 HxCDF	<0.042	<0.044	<0.039	<0.054
Total HxCDF	<0.042	<0.045	<0.041	<0.056
1234678 HpCDF	<0.055	<0.072	<0.055	<0.16
1234789 HpCDF	<0.056	<0.075	<0.054	<0.17
Total HpCDF	<0.056	<0.075	<0.055	<0.17
Total OCDF	<0.099	<0.11	<0.10	<0.13
Total PCDF	<0.29	<0.33	<0.37	<0.61

SAMPLING DATA & CALCULATIONS - PCDD/PCDF AND PAH EMISSIONS

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

	Run #7	Run #8	Run #9	Run #10
L. PCDD/PCDF Concentration, ng/dscm (K*35.3)/C				
2378 TCDD	<0.011	<0.028	<0.026	<0.047
Total TCDD	<0.011	<0.028	<0.034	<0.054
12378 PeCDD	<0.029	<0.024	<0.022	<0.028
Total PeCDD	<0.029	<0.024	<0.023	<0.047
123478 HxCDD	<0.024	<0.020	<0.028	<0.025
123678 HxCDD	<0.024	<0.021	<0.029	<0.025
123789 HxCDD	<0.024	<0.020	<0.029	<0.026
Total HxCDD	<0.024	<0.021	<0.029	<0.026
1234678 HpCDD	<0.026	<0.055	<0.025	<0.041
Total HpCDD	<0.026	<0.055	<0.025	<0.044
Total OCDD	<0.053	<0.046	<0.040	<0.056
Total PCDD	<0.143	<0.175	<0.151	<0.225
2378 TCDF	<0.008	<0.012	<0.012	<0.038
Total TCDF	<0.008	<0.013	<0.012	<0.049
12378 PeCDF	<0.021	<0.018	<0.025	<0.026
23478 PeCDF	<0.022	<0.019	<0.025	<0.028
Total PeCDF	<0.022	<0.019	<0.043	<0.029
123478 HxCDF	<0.013	<0.013	<0.012	<0.018
123678 HxCDF	<0.013	<0.014	<0.012	<0.018
234678 HxCDF	<0.013	<0.014	<0.012	<0.017
123789 HxCDF	<0.013	<0.013	<0.012	<0.017
Total HxCDF	<0.013	<0.014	<0.013	<0.018
1234678 HpCDF	<0.017	<0.022	<0.017	<0.050
1234789 HpCDF	<0.017	<0.023	<0.017	<0.053
Total HpCDF	<0.017	<0.023	<0.017	<0.053
Total OCDF	<0.031	<0.032	<0.031	<0.041
Total PCDF	<0.091	<0.101	<0.116	<0.191

SAMPLING DATA & CALCULATIONS - PCDD/PCDF AND PAH EMISSIONS

PLANT: CCCSD

STACK #: INCINERATOR #2 EXHAUST

	Run #7	Run #8	Run #9	Run #10
M. PCDD/PCDF Emission Rate, µg/hr (L*I*60)/(35.3*1000)				
2378 TCDD	<0.4	<0.9	<0.9	< 1.6
Total TCDD	<0.4	<0.9	<1.1	<1.8
12378 PeCDD	<1.0	<0.8	<0.7	<0.9
Total PeCDD	<1.0	<0.8	<0.7	<1.6
123478 HxCDD	<0.8	<0.7	<0.9	<0.8
123678 HxCDD	<0.8	<0.7	<0.9	<0.8
123789 HxCDD	<0.8	<0.7	<0.9	<0.9
Total HxCDD	<0.8	<0.7	<0.9	<0.9
1234678 HpCDD	<0.9	<1.8	<0.8	<1.4
Total HpCDD	<0.9	<1.8	<0.8	<1.5
Total OCDD	<1.8	<1.5	<1.3	<1.9
Total PCDD	<4.8	<5.8	<4.9	<7.5
2378 TCDF	<0.3	<0.4	<0.4	<1.2
Total TCDF	<0.3	<0.4	<0.4	<1.6
12378 PeCDF	<0.7	<0.6	<0.8	<0.9
23478 PeCDF	<0.7	<0.6	<0.8	<0.9
Total PeCDF	<0.7	<0.6	<1.4	<1.0
123478 HxCDF	<0.4	<0.4	<0.4	<0.6
123678 HxCDF	<0.4	<0.5	<0.4	<0.6
234678 HxCDF	<0.4	<0.5	<0.4	<0.6
123789 HxCDF	<0.4	<0.4	<0.4	<0.6
Total HxCDF	<0.4	<0.5	<0.4	<0.6
1234678 HpCDF	<0.6	<0.7	<0.6	<1.7
1234789 HpCDF	<0.6	<0.8	<0.5	<1.7
Total HpCDF	<0.6	<0.8	<0.6	<1.7
Total OCDF	<1.0	<1.1	<1.0	<1.4
Total PCDF	<3.0	<3.3	<3.8	<6.3

SAMPLING DATA & CALCULATIONS - PCDD/PCDF AND PAH EMISSIONS

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

	Run #7	Run #8	Run #9	Run #10
N. PCDD/PCDF Emission Rate, µg/ton M / J				
2378 TCDD	<0.2	<0.6	<0.6	<1.0
Total TCDD	<0.2	<0.6	<0.7	<1.2
12378 PeCDD	<0.6	<0.5	<0.5	<0.6
Total PeCDD	<0.6	<0.5	<0.5	<1.0
123478 HxCDD	<0.5	<0.4	<0.6	<0.6
123678 HxCDD	<0.5	<0.5	<0.6	<0.6
123789 HxCDD	<0.5	<0.4	<0.6	<0.6
Total HxCDD	<0.5	<0.5	<0.6	<0.6
1234678 HpCDD	<0.6	<1.2	<0.6	<0.9
Total HpCDD	<0.6	<1.2	<0.6	<1.0
Total OCDD	<1.2	<1.0	<0.9	<1.2
Total PCDD	<3.2	<3.8	<3.3	<5.0
2378 TCDF	<0.2	<0.3	<0.3	<0.8
Total TCDF	<0.2	<0.3	<0.3	<1.1
12378 PeCDF	<0.5	<0.4	<0.5	<0.6
23478 PeCDF	<0.5	<0.4	<0.5	<0.6
Total PeCDF	<0.5	<0.4	<0.9	<0.7
123478 HxCDF	<0.3	<0.3	<0.3	<0.4
123678 HxCDF	<0.3	<0.3	<0.3	<0.4
234678 HxCDF	<0.3	<0.3	<0.3	<0.4
123789 HxCDF	<0.3	<0.3	<0.3	<0.4
Total HxCDF	<0.3	<0.3	<0.3	<0.4
1234678 HpCDF	<0.4	<0.5	<0.4	<1.1
1234789 HpCDF	<0.4	<0.5	<0.4	<1.2
Total HpCDF	<0.4	<0.5	<0.4	<1.2
Total OCDF	<0.7	<0.7	<0.7	<0.9
Total PCDF	<2.0	<2.2	<2.5	<4.2

SAMPLING DATA & CALCULATIONS - PAH EMISSIONS

PLANT: CCCSD — STACK #: INCINERATOR #2 EXHAUST

	RUN #7	RUN #8	RUN #9	RUN #10
O. PAH Quantities[1], µg				
Naphthalene	45	45	100	26
Acenaphthylene	< 0.06	< 0.06	< 0.06	< 0.06
Acenaphthene	< 0.06	< 0.06	< 0.06	< 0.06
Fluorene	< 0.06	< 0.06	< 0.06	< 0.06
Phenanthrene	< 0.04	< 0.04	< 0.04	< 0.04
Anthracene	< 0.04	< 0.04	< 0.04	< 0.04
Fluoranthene	< 0.04	< 0.04	< 0.04	< 0.04
Pyrene	< 0.04	< 0.04	< 0.04	< 0.04
Chrysene	< 0.04	< 0.04	< 0.04	< 0.04
Benzo(a)anthracene	< 0.04	< 0.04	< 0.04	< 0.04
Benzo(b)fluoranthene	< 0.04	< 0.04	< 0.04	< 0.04
Benzo(k)fluoranthene	< 0.04	< 0.04	< 0.04	< 0.04
Benzo(a)pyrene	< 0.04	< 0.04	< 0.04	< 0.04
Indeno(1,2,3-cd)pyrene	< 0.04	< 0.04	< 0.04	< 0.04
Dibenzo(a,h)anthracene	< 0.06	< 0.06	< 0.06	< 0.06
Benzo(g,h,i)perylene	< 0.04	< 0.04	< 0.04	< 0.04
P. PAH Concentration, µg/dscm (O * 35.3) / C				
Naphthalene	14	14	31	8
Acenaphthylene	< 0.02	< 0.02	< 0.02	<0.02
Acenaphthene	< 0.02	< 0.02	< 0.02	<0.02
Fluorene	< 0.02	< 0.02	< 0.02	<0.02
Phenanthrene	< 0.01	< 0.01	< 0.01	<0.01
Anthracene	< 0.01	< 0.01	< 0.01	<0.01
Fluoranthene	< 0.01	< 0.01	< 0.01	<0.01
Pyrene	< 0.01	< 0.01	< 0.01	<0.01
Chrysene	< 0.01	< 0.01	< 0.01	<0.01
Benzo(a)anthracene	< 0.01	< 0.01	< 0.01	<0.01
Benzo(b)fluoranthene	< 0.01	< 0.01	< 0.01	<0.01
Benzo(k)fluoranthene	< 0.01	< 0.01	< 0.01	<0.01
Benzo(a)pyrene	< 0.01	< 0.01	< 0.01	<0.01
Indeno(1,2,3-cd)pyrene	< 0.01	< 0.01	< 0.01	<0.01
Dibenzo(a,h)anthracene	< 0.02	< 0.02	< 0.02	<0.02
Benzo(g,h,i)perylene	< 0.01	< 0.01	< 0.01	<0.01

1 PAH quantities are not corrected for blank quantities. Naphthalene was the only compound determined to be present in the blank; refer to the laboratory data presented in Appendix VI for additional detail.

SAMPLING DATA & CALCULATIONS - PCDD/PCDF AND PAH EMISSIONS

PLANT: CCCSD — STACK #: INCINERATOR #2 EXHAUST

	RUN #7	RUN #8	RUN #9	RUN #10
Q. PAH Emission Rate, mg/hr (P*I*60)/(35.3*1000)				
Naphthalene	464	455	1020	270
Acenaphthylene	< 0.6	< 0.6	< 0.6	< 0.6
Acenaphthene	< 0.6	< 0.6	< 0.6	< 0.6
Fluorene	< 0.6	< 0.6	< 0.6	< 0.6
Phenanthrene	< 0.4	< 0.4	< 0.4	< 0.4
Anthracene	< 0.4	< 0.4	< 0.4	< 0.4
Fluoranthene	< 0.4	< 0.4	< 0.4	< 0.4
Pyrene	< 0.4	< 0.4	< 0.4	< 0.4
Chrysene	< 0.4	< 0.4	< 0.4	< 0.4
Benzo(a)anthracene	< 0.4	< 0.4	< 0.4	< 0.4
Benzo(b)fluoranthene	< 0.4	< 0.4	< 0.4	< 0.4
Benzo(k)fluoranthene	< 0.4	< 0.4	< 0.4	< 0.4
Benzo(a)pyrene	< 0.4	< 0.4	< 0.4	< 0.4
Indeno(1,2,3-cd)pyrene	< 0.4	< 0.4	< 0.4	< 0.4
Dibenzo(a,h)anthracene	< 0.6	< 0.6	< 0.6	< 0.6
Benzo(g,h,i)perylene	< 0.4	< 0.4	< 0.4	< 0.4
R. PAH Emission Ratio, mg/ton, dry Q / J				
Naphthalene	309	303	679	18
Acenaphthylene	< 0.4	< 0.4	< 0.4	< 0.4
Acenaphthene	< 0.4	< 0.4	< 0.4	< 0.4
Fluorene	< 0.4	< 0.4	< 0.4	< 0.4
Phenanthrene	< 0.3	< 0.3	< 0.3	< 0.3
Anthracene	< 0.3	< 0.3	< 0.3	< 0.3
Fluoranthene	< 0.3	< 0.3	< 0.3	< 0.3
Pyrene	< 0.3	< 0.3	< 0.3	< 0.3
Chrysene	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(a)anthracene	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(b)fluoranthene	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(k)fluoranthene	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(a)pyrene	< 0.3	< 0.3	< 0.3	< 0.3
Indeno(1,2,3-cd)pyrene	< 0.3	< 0.3	< 0.3	< 0.3
Dibenzo(a,h)anthracene	< 0.4	< 0.4	< 0.4	< 0.4
Benzo(g,h,i)perylene	< 0.3	< 0.3	< 0.3	< 0.3

ISOKINETIC VARIATION CALCULATION

PLANT: CCCSD STACK #: INCINERATOR #2 EXHAUST

PARAMETER	RUN #7	RUN #8	RUN #9	RUN #10
T(S), °R	608	607	613	612
V(LC), ML	20.2	57.4	46.5	68.1
GAMMA	1.006	1.006	1.006	1.006
V(M), FT^3	118.63	119.67	120.12	118.82
T(M), °R	559	559	567	566
P(BAR)+(ΔH/13.6), IN. HG	30.2	30.2	30.11	30.11
V(S), FPM	2,464	2,471	2,474	2,521
P(S), IN. HG	30.10	30.10	30.01	30.01
A(N), FT^2	0.0003	0.0003	0.0003	0.0003
THETA, MINUTES	192	192	192	192
I (PERCENT OF ISOKINETIC)[1]	96.3	98.2	97.5	95.5

[1] I = (T(S)*100((0.00267*V(CL))+(V(M)/T(M))*GAMMA*(P(BAR)+(ΔH)/13.6))))/(THETA *V(S)*P(S)*A(N))

ORSAT DATA AND GAS DENSITY CALCULATIONS

PLANT: CCCSD — STACK #: INCINERATOR #2 EXHAUST

PARAMETER	RUN #7 DRY BASIS	RUN #7 WET BASIS	RUN #8 DRY BASIS	RUN #8 WET BASIS	RUN #9 DRY BASIS	RUN #9 WET BASIS	RUN #10 DRY BASIS	RUN #10 WET BASIS
CO_2	5.00	4.96	5.40	5.28	5.40	5.30	4.90	4.76
O_2	15.20	15.07	14.70	14.36	14.80	14.52	15.10	14.68
CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N_2	79.80	79.14	79.90	78.06	79.80	78.29	80.00	77.78
H_2O	- - -	0.83	- - -	2.30	- - -	1.90	- - -	2.78
MOLECULAR WEIGHT[1]	- - -	29.31	- - -	29.19	- - -	29.24	- - -	29.07
SPECIFIC GRAVITY OF GAS[2]	- - -	1.013	- - -	1.008	- - -	1.010	- - -	1.004

1 Calculated from the equation:
Molecular Weight $= 0.44*(\%CO_2)+0.32*(\%O_2)+0.28*(\%N_2+\%CO)+0.18*(\%H_2O)$

2 SG= Molecular Weight of Stack Gas/ Molecular Weight of Air (28.95 gm/gm-mole)

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD 2/4
Location Unit 2 Stack
Date 4/12/90
Run Number 7-PAH
Operator DR
Sample Box ID OB-2
Meter Box ID 005
Probe ID 4
Filter #

Meter δ 1.006
Meter ΔH@
Pilot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor 0.74
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. *18 A-11*
Pwake -0.32 -.28
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
*6	60	147	0.50	1.25	655.2	104	93	246	248	78/57	7
6	64	150	0.57	1.40	657.8	105	94	247	248	80/62	7
9	68	148	0.55	1.35	660.5	104	95	247	247	81/58	7
9	72	147	0.55	1.35	663.1	105	95	247	245	80/51	7
10	76	146	0.55	1.35	665.8	104	95	245	245	79/51	7
10	80	143	0.55	1.35	668.5	104	95	245	244	78/51	7
11	84	142	0.52	1.30	671.1	105	95	244	245	76/48	7
*11	88	146	0.50	1.25	—	106	96	246	241	75/49	7
12	92	142	0.48	1.20	676.1	107	96	245	238	75/50	7
12	96	144	0.48	1.20	678.65	107	97	245	241	75/51	7
B1	4	115	0.26	0.64	680.7	91	96	253	230	80/59	5
B1	8	116	0.25	0.61		95	96	250	230	75/57	5
B2	12	120	0.27	0.66		98	96	251	237	74/53	6½
B2	16	121	0.27	0.66	683	99	96	252	246	75/62	5
Averages											

3/4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant: CCCSD
Location: Unit #2 Stack
Date: 4/12/99
Run Number: #7
Operator: TLK
Sample Box ID:
Meter Box ID: 025
Probe ID:
Filter #:

Meter δ:
Meter ΔH@:
Pitot C.F.:
Assumed Moisture %:
Nozzle Diameter in.:
C Factor:
Ambient Temperature:
Barometric Pressure:
Silica Gel #: 054 #09

Static Pressure:
Traverse Pt. B-5* B-9
Pwake -0.26 -0.46
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B3	20	118	0.30	0.73	688.1	101	96	252	250	74/52	5.5
B3	24	112	0.30	0.73		102	97	251	246	74/54	5.5
B4	28	112	0.34	0.83	692.3	102	96	248	241	76/57	6
B4	32	114	0.33	0.81		101	96	244	238	75/58	5.5
B5*	36	118	0.37	0.92	696.6	101	96	244	237	74/53	6
B5	40	118	0.37	0.92	698.6	101	96	245	236	73/52	6
B6	44	130	0.43	1.10	701.1	102	96	243	236	72/52	7
B6	48	130	0.43	1.10	703.6	104	96	244	237	72/53	7
B7	52	157	0.55	1.45	706.2	106	97	248	240	72/56	8
B7	56	147	0.53	1.40	—	106	97	247	238	73/56	
8	60	163	0.61	1.50	711.7	107	98	247	240	76/51	8
8	64	158	0.67	1.65	714.6	109	98	247	241	78/46	9
*9	68	158	0.75	1.85		109	99	244	240	78/46	9
9	72	170	0.60	1.50		110	99	247	241	79/48	8
Averages											

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: Post Test Lk Rate 0.008 cfm @ 11 in Hg

Plant CCCSP 1/4
Location Unit 2 Stack
Date
Run Number
Operator
Sample Box ID
Meter Box ID
Probe ID
Filter # 720.5

Meter Ø
Meter ΔH@
Pilot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel # Orsat 09

Static Pressure:
Traverse Pt. ____ ____
Pwake ____ ____
Pstatic ____ ____

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp.		Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
						T in °F	T out °F				
B10	76	177	0.65	1.60	723.4	111	99	246	246	80/52	8
10	80	183	0.55	1.35	726.1	110	99	248	249	80/58	7
11	84	184	0.56	1.40	728.8	112	99	248	252	82/64	8
11	88	175	0.59	1.45	731.6	112	101	252	253	84/71	8
12	92	174	0.59	1.45	734.4	112	101	252	251	—/62	7.5
Stop 12	96	174	0.60	1.50	737.189	112	101	254	250	77/48	8
3.46											
Averages		148.10	0.69	1.21	118.63	98.64		243.25	243.79	76.83/54.13	6.9

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:
CO2 – 5.4
O2 – 14.7

Plant CCCSD 1/4
Location Unit 2 stack
Date 4/12/90
Run Number 3 PAH
Operator DR
Sample Box ID OB-2
Meter Box ID 005
Probe ID 4'
Filter #

Meter Ø 1.006
Meter ΔH@ 1.72
Pitot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.230
C Factor 0.79
Ambient Temperature 70
Barometric Pressure 30.11
Silica Gel # orsat #101

Vi = 737.918

Static Pressure:
Traverse Pt. *B4
Pwake 0.18
Pstatic

Water Collected:
Impingers, ml. 24.1 > 574
Silica Gel, gms. 36.4 33.3

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
5 min 4:45 PM B1	4	126	0.22	0.52	—	87	93	273	211	65/67	5
1	8	128	0.22	0.52	741.2	89	93	257	220	79/61	5
B2	12	126	0.31	0.78	—	92	93	248	224	77/60	6
2	16	124	0.31	0.78	—	97	94	246	224	76/58	6
3	20	126	0.32	0.80	747.3	100	96	245	230	72/56	7
3	24	126	0.32	0.80	749.3	100	95	246	228	68/56	7
X 4	28	122	0.33	0.83	751.4	101	98	245	229	68/55	7
4	32	120	0.33	0.83	753.5	102	96	246	228	67/54	7
5	36	123	0.35	0.88	755.6	101	96	243	224	66/54	7.5
5	40	112	0.40	1.00	—	101	97	239	224	65/55	8.5
6	44	130	0.47	1.15	760.4	103	96	241	224	64/54	9.0
6	48	134	0.48	1.20	762.9	105	97	240	230	63/53	9.0
7	52	158	0.50	1.25	765.4	105	97	240	230	64/55	10.0
7	56	159	0.50	1.25		106	97	240	255	64/56	10.0
Averages											

2/4 SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD
Location Unit 3
Date 4/12/12
Run Number 3-PAH
Operator DR
Sample Box ID
Meter Box ID
Probe ID
Filter # 768.0

Meter ð
Meter ΔH@
Pitot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. *B8 *B9
Pwake -0.26 -0.25
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T In °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
					—	106	97	240	244	66/56	9.5
*B8	60	165	0.46	1.15	773.0	108	97	243	254	67/56	9.5
8	64	170	0.46	1.15	775.5	108	97	242	260	66/54	9.5
9	68	172	0.46	1.15	777.9	109	98	242	255	66/54	9.5
* 9	72	170	0.46	1.15	—	108	98	245	245	68/57	11
10	76	167	0.58	1.45	783.5	107	98	242	234	68/58	12
10	80	162	0.64	1.60	786.6	106	98	242	219	70/58	14
11	84	151	0.74	1.85	789.7	109	98	242	218	71/59	14
11	88	150	0.75	1.85	792.7	109	97	242	224	72/59	14
12	92	142	0.76	1.90	795.926	110	97	241	226	74/60	14.5
12	96	150	0.79	2.00	=796.007						
					798.3	90	93	230	221	75/67	8
A1	4	165	0.40	1.00	—	92	92	231	235	67/60	7.5
1	8	155	0.41	1.00		95	91	230	230	64/53	10.5
2	12	165	0.52	1.40							
Averages											

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant LCCSD 3/4
Location Unit 2 stack
Date 4/12/00
Run Number 3 PAH
Operator BR
Sample Box ID OB2
Meter Box ID 005
Probe ID
Filter # 803.2

Meter ð
Meter ΔH@
Pilot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. *A4 *A7
Pwake -0.31 -0.32
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
A2	16	168	0.53	1.30	805.9	97	91	230	228	63/52	10.5
A3	20	169	0.53	1.30	—	98	91	231	231	64/52	10.5
3	24	158	0.58	1.45	—	100	90	231	236	64/52	10.5
4	28	158	0.57	1.40	814.0	101	91	232	237	63/52	10.5
*4	32	157	0.61	1.50	816.8	103	91	232	238	64/52	10.5
5	36	151	0.65	1.60	819.6	105	92	234	239	64/53	11.5
5	40	159	0.60	1.50	822.4	105	92	235	240	66/54	11.0
6	44	159	0.48	1.20	824.9	105	92	235	241	64/52	9.5
6	48	157	0.42	1.05	827.3	103	92	235	242	63/48	8.5
7	52	146	0.42	1.05	—	101	91	235	241	62/47	8.5
*7	56	143	0.42	1.05	832.0	101	92	236	241	63/47	8.5
8	60	144	0.57	1.40	834.6	103	92	235	247	63/47	10.5
8	64	144	0.56	1.40		105	93	235	247	63/47	10.5
Averages											

4/4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD
Location Unit 2 Stack
Date 4/12/90
Run Number 8 PAH
Operator DR
Sample Box ID OTS-2
Meter Box ID 005
Probe ID
Filter # 837.3

Meter ð 1.006
Meter ΔH@ 1.72
Pitot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. ____ ____
Pwake ____ ____
Pstatic ____ ____

Water Collected:
Impingers, ml. ____
Silica Gel, gms. ____

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
A9	68	142	0.54	1.35	840.0	106	93	235	248	62/46	10.5
9	72	139	0.53	1.30	842.6	106	94	236	255	-146	10
10	76	144	0.52	1.30	—	106	94	235	258	62/47	10
10	80	142	0.58	1.45	847.9	105	94	235	250	62/47	10.5
11	84	148	0.55	1.35	850.5	107	93	236	250	63/47	10
11	88	148	0.53	1.35	853.2	108	94	237	262	62/47	10
12	92	147	0.35	0.88	855.4	109	94	238	263	62/47	8
12	96	151	0.34	0.84	857.485	109	95	238	281	62/50	8
					Post Test Lk Rate 0.002 cfm @ 15 in Hg						
Stop @ 805											
		147.23	0.691	1.21	119.67	98.53		238.25	237.52	66.65 / 53.69	9.50

1/4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:
CO2 - 5.4
O2 - 14.8

Plant CCCSD
Location Unit 2 Stack
Date 4/13/90
Run Number 9 PM H
Operator DR
Sample Box ID OB-2
Meter Box ID 205
Probe ID 4
Filter # —

Meter Ø 1.006
Meter ΔH@ 1.92
Pilot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.230
C Factor 0.77
Ambient Temperature 70
Barometric Pressure 30.02
Silica Gel # Orsat #06

858.626

Static Pressure:
Traverse Pt. *A4
Pwake 0.22
Pstatic

Water Collected:
Impingers, ml. 11.4 > 46.5
Silica Gel, gms. 35.1

1/4 1/2

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
A1	4	157	0.44	1.10	861.1	84	87	231	252	75/66	8
1	8	166	0.42	1.05	863.4	90	89	232	241	68/54	7.5
A2	12	165	0.56	1.40	866.0	97	90	235	237	69/53	9
2	16	168	0.56	1.40	868.5	103	92	238	235	72/54	9
A3	20	172	0.57	1.40	871.2	107	94	240	231	73/49	10.5
3	24	172	0.56	1.40	873.8	110	95	242	225	73/48	10.5
A4	28	170	0.52	1.30	876.4	112	98	245	232	74/51	10
4	32	170	0.52	1.30	879.0	114	99	246	234	73/51	10
5	36	169	0.50	1.25	881.6	116	101	248	239	70/51	10
5	40	168	0.49	1.25	884.2	117	104	250	238	70/51	10
6	44	162	0.47	1.20	886.7	115	104	251	232	71/54	10
6	48	160	0.49	1.25	889.3	116	105	252	232	72/54	10
7	52	152	0.49	1.25	891.9	117	106	250	237	74/56	10
7	56	152	0.49	1.25		113	106	252	230	75/57	10
Averages											

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD 2/4
Location Unit 2
Date 7/13/90
Run Number 9PMH
Operator DR
Sample Box ID
Meter Box ID
Probe ID
Filter # 894.5

Meter ð 1.006
Meter ΔH@ 1.72
Pitot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. *A8 *A9
Pwake -0.23 -0.20
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp.		Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
						T in °F	T out °F				
*A8	60	151	0.48	1.20	897.0	110	105	252	229	76/58	10
8	64	150	0.51	1.25	899.6	110	104	250	232	76/58	10
A9	68	148	0.49	1.20	902.1	111	104	250	238	78/58	10
9	72	148	0.47	1.15	904.6	111	104	251	242	78/60	10
*10	76	147	0.44	1.10	907.1	111	104	252	248	78/60	9.5
10	80	146	0.44	1.10	909.5	112	104	257	254	76/58	9.5
11	84	145	0.42	1.05	911.9	116	106	254	259	76/58	9
11	88	143	0.42	1.05	914.3	114	104	256	259	77/60	9
12	92	143	0.39	0.97	916.6	113	105	257	260	76/61	9
12	96	144	0.39	0.97	918.939	116	106	259	266	79/63	9
10 @ 11:46											
Averages											

3/4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD
Location UNIT # 2/STACK
Date 4/13/10
Run Number 9 PM-1
Operator DR
Sample Box ID
Meter Box ID
Probe ID
Filter # 918.099

Meter δ
Meter ΔH@
Pitot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. * B6
Pwake -0.18
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T In °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
Start 12:09 B1	4	138	0.29	0.72	921.0	98	104	263	270	86/71	6
1	8	132	0.28	0.70	922.9	100	104	265	256	81/62	7
B2	12	131	0.33	0.80	925.0	102	103	265	245	76/56	7.5
2	16	132	0.34	0.84	927.1	106	103	264	241	74/56	8
B3	20	130	0.35	0.87	929.3	107	103	263	247	74/56	8.5
3	24	129	0.35	0.87	931.5	109	104	261	236	74/57	8.5
B4	28	120	0.36	0.90	933.7	109	103	260	232	75/57	8.5
4	32	126	0.37	0.92	935.9	111	104	258	229	75/57	9
5	36	126	0.38	0.96	938.2	110	104	257	229	75/56	9
5	40	125	0.38	0.96	—	110	104	256	228	75/57	9
* 6	44	134	0.40	1.00	—	114	105	256	234	77/58	9
6	48	134	0.40	1.00		116	106	257	236	78/58	9.5
Averages											

4/4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: Post Test Leak rate 0.006cfm @15inHg

Plant CCCSD
Location Unit 2 Stack
Date 4/13/10
Run Number 4 PM
Operator DR
Sample Box ID
Meter Box ID
Probe ID
Filter # 945.2

Meter ŏ
Meter ΔH@
Pilot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. *B9*
Pwake -0.29
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Imp KAD

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B7	52	162	0.51	1.25	947.8	115	106	256	234	78/58	10.5
7	56	163	0.51	1.25	950.3	116	106	256	235	80/60	10.5
B8	60	170	0.55	1.35	953.0	116	107	257	236	80/60	11
8	64	168	0.55	1.35	955.6	117	107	256	237	79/59	11
* 9	68	172	0.59	1.45	958.4	116	107	255	235	78/57	11.5
9	72	172	0.60	1.50	961.2	115	107	256	232	79/58	12
10	76	171	0.61	1.50	964.0	118	107	259	230	79/58	12
10	80	170	0.62	1.55	966	121	107	257	222	80/59	13
11	84	172	0.66	1.65	—	121	108	258	225	80/60	13.5
11	88	172	0.66	1.65	972.8	120	108	258	226	82/63	13.5
12	92	171	0.69	1.70	—	120	109	258	226	84/67	14
12	96	171	0.68	1.70	978.742	121	109	258	225	84/69	14
Averages		153.31	0.688	1.19	120.12	107.23		253.31	238.02	71.29 / 57.75	9.91

S1 @ 1340

Y4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:
CO2 - 4.9
O2 - 15.1

Plant CCCSD
Location Unit 2 Stack
Date 4/13/10
Run Number 10 PM1
Operator
Sample Box ID 88-2
Meter Box ID 605
Probe ID 4
Filter # 9M913

Meter δ 1.006
Meter ΔH@ 1.72
Pilot C.F. 0.84
Assumed Moisture % 5
Nozzle Diameter in. 0.230
C Factor 0.84
Ambient Temperature 70
Barometric Pressure 30.02
Silica Gel #

Static Pressure:
Traverse Pt. B-5
Pwake -0.19
Pstatic

Water Collected:
Impingers, ml. 52.9 68.1
Silica Gel, gms. 35.3

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
B1	4	127	0.26	0.57	981.6	98	104	238	258	84/89	4
1	8	126	0.25	0.56	983.4	100	104	247	243	80/76	3.5
B2	12	130	0.32	0.80		103	104	247	246	80/78	4.5
2	16	131	0.31	0.78	987.6	106	104	250	240	78/78	4.5
3	20	128	0.36	0.90		108	104	251	235	80/76	5
3	24	128	0.35	0.88	992.0	110	105	253	234	81/76	5.5
4	28	124	0.35	0.88		111	105	252	235	75/73	5.5
4	32	128	0.35	0.86	996.3	110	105	255	232	76/76	5.5
5*	36	127	0.37	0.93		111	105	255	230	76/67	6
5	40	127	0.36	0.90	1002.9	109	105	251	229	77/72	6
6	44	133	0.38	0.95	1006.1	109	104	253	239	75/70	6
6	48	133	0.39	0.98	1008.7	109	104	252	241	74	6
7	52	160	0.48	1.20		109	104	252	244	74	6.3
7	56										
Averages											

Note: XAD-2 Temperatures read high suspect

2/4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD
Location Unit 2 Stack
Date 4/13/90
Run Number 10PAH
Operator
Sample Box ID
Meter Box ID
Probe ID
Filter #

Meter δ
Meter ΔH@
Pitot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. ____ ____
Pwake ____ ____
Pstatic ____ ____

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp.		Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
						T in °F	T out °F				
B7	52	160	0.48	1.20	1010.9	109	104	252	244	74	6.3
7	56	164	0.49	1.24	1013.5	109	104	249	245	75/72	6.5
✓ 8	60	170	0.56	1.41	1015.4	109	103	249	250	74/72	6.6
8	64	169	0.56	1.41	1017.7	109	103	247	258	75/72	6.8
9	68	171	0.60	1.50	1020.8	110	103	245	260	75/71	7.5
9	72	171	0.60	1.50	1024.0	111	103	254	24	72/70	7.5
10	76	171	0.63	1.66	1026.1	112	103	258	258	68/70	8.0
10	80	172	0.63	1.66	1029.6	112	103	256	264	74/71	8.0
11	84	172	0.69	1.75	1032.3	112	103	248	234	75/72	8
11	88	175	0.69	1.75	1035.0	113	103	252	236	73/73	8.4
12	92	175	.69	1.75	1037.120	113	103	253	240	73/74	8.5
12	96										
Averages											

3/4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant CCCSD
Location Unit 3 Stack
Date 4/13/90
Run Number #10
Operator MK
Sample Box ID
Meter Box ID
Probe ID
Filter # 1037.32

Meter δ
Meter ΔH@
Pitot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. A-3
Pwake -.03
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
1	4	150	0.45	1.10	1042.9	101	96	260	234	80/78	6
1	8	146	0.47	1.18	1043.0	100	100	250	184	73/72	6.3
2	12	165	0.62	1.56	1045.2	103	100	249	229	74/72	7.0
2	16	167	0.62	1.56	1047.9	106	100	252	266	74/71	7.0
3	20	167	0.61	1.52	1050.9	106	100	252	253	75/70	7.0
3	24	168	0.59	1.46	1053.6	106	100	250	239	76/73	7.5
4	28	168	0.53	1.35	—	109	100	250	235	76/71	6.8
4	32	169	0.54	1.37	1057.4	110	100	252	235	74/69	6.5
5	36 37	167	0.55	1.40		109	100	248	235	74/69	6.8
5	40 39	162	0.55	1.40		109	100	248	235	72/69	6.8
6	44 41	163	0.58	1.45	1061.7	110	101	247	235	72/70	8
6	46 35	164	0.58	1.45		112	102	250	236	72/70	8
7	52 51	156	0.52	1.30	1070.1	112	103	245	234	74/72	7.5
7	56 43	157	0.54	1.35		112	103	244	233	75	7.5
Averages											

4/4

SAMPLE COLLECTION DATA

Galson Technical Services

Comments: 2nd Post-Test Leak Rate 0.006 CFM @ 9" Hg

Plant
Location
Date 4/18/00
Run Number #10
Operator
Sample Box ID
Meter Box ID
Probe ID
Filter #

Meter Ō
Meter ΔH@
Pilot C.F.
Assumed Moisture %
Nozzle Diameter in.
C Factor
Ambient Temperature
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. A-8"
Pwake -.031
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
A8	60 44	151	0.61	1.55	1075.4	113	103	248	235	74/72	8
9	64 51	153	0.57	1.45		114	103	248	242	72/70	8
8	68 55	147	0.53	1.35	1080.75	115	104	247	244	74/72	7.5
7	72 59	143	0.54	1.35	1083.4	115	104	248	232	74/72	7.5
9	76 03	144	0.51	1.30		114	104	246	224	75/73	7.5
10	80 07	143	0.53	1.35	1088.5	113	104	243	229	74/74	7.5
10	84 11	143	0.49	1.20	1091.2	112	103	242	237	76/75	7
11	15	140	0.50	1.25	1093.7	111	102	241	248	77/76	7
11	19	134	0.47	1.15	1096.25	109	102	241	250	78/76	7
12	19	134	0.47	1.15	1098.732	109	101	238	251	74/72	7
12 Stop	6:23 22	141									
Averages		151.77	0.7	1.26	118.82	105.97		249.21	240.08	75.46 / 73.0	6.73

FLUE GAS ANALYSES FIELD DATA

Plant ID: CCCSD-Unit 2 Date: 4/13/90

Quality Control

Vol - HChrome (Test 6) = 5232

Leak check - all components must pass

O_2/QC gas analysis results

Pre-test		Post-test
_____	CO_2 Pipette	_____
_____	O2 pipette	_____
_____	CO pipette	_____
_____	Sample burette	_____

Gas ID	Run #	CO_2	CO_2+O2	O_2	CO
	1				
	2				
	3				

ORSAT ANALYSES DATA

Sample Bag ID		CO_2 %	$CO_2 + N_2$	O_2 %	$CO_2 + O_2 + CO$	CO %	Fo
06	a)	5.4	—	—			
Test 1	b)	~~5.4~~	19.8	14.7			
	c)	5.3	20.1	14.8			
CMT: GTS 06 Test #9		5.6	20.8	14.8			
		5.3	20.2	14.9			
		~~5.6~~					
	Avg	5.4		14.8			
TEGT #10							
GTS #08		~~1.0~~					
OR.							
GTSM 02		5.0	20.0	15.0			
Test 10		~~4.6~~ 5.0	20.0 20.2	15.2 15.2			
	Avg	4.9		15.1			

CO and THC Emission Data

SAMPLING DATA AND CALCULATIONS - CO AND THC EMISSIONS

Plant: CCCSD Stack: Unit #2 Exhaust

SAMPLING DATA:	Run #4	Run #5	Run #6
Stack Gas Moist Content[1] (%H_2O), %	2.3	2.2	2.3
Stack Gas Flow Rate[1], DSCFM	19,042	19,583	20,083
Sludge Feed Rate, TPH (dry)	1.7	1.6	1.5
CO Concentration, ppm (dry)	28.9	56.5	61.0
THC Concentration[2], ppm (wet)	10.5	9.6	12.2
CALCULATIONS:			
A. Stack Gas Flow Rate, DSCFM	19,042	19,583	20,083
B. Concentration, ppm (dry)			
• CO	28.9	56.5	61.0
• THC[3]	10.7	9.8	12.5
C. Sludge Feed Rate, tph (dry)	1.7	1.6	1.5
D. Emission Rate, lbs/hr (B*A*MW[4]*60)/(454,000*35.3*24.13)			
• CO	2.39	4.81	5.32
• THC	0.51	0.48	0.62
E. Emission Ratio, lbs/ton (dry) D/C			
• CO	1.4	3.0	3.5
• THC	0.3	0.3	0.4

1 Based on data collected during the concurrent metals and hexavalent chromium testing; average values were used.
2 As methane (CH_4)
3 Dry Basis = Wet Basis/(1-(%H_2O/100))
4 Molecular weight (CO) = 28 gm/gm-mole;
Molecular weight (CH_4) = 16 gm/gm-mole

SAMPLING DATA AND CALCULATIONS - CO AND THC EMISSIONS

Plant: CCCSD Stack: Unit #2 Exhaust

SAMPLING DATA:	Run #1	Run #2	Run #3
Stack Gas Moist Content[1] (%H_2O), %	2.9	2.5	2.6
Stack Gas Flow Rate[1], DSCFM	19,191	19,475	20,038
Sludge Feed Rate, TPH (dry)	1.7	1.6	1.7
CO Concentration, ppm (dry)	34.5	74.0	25.9
THC Concentration[2], ppm (wet)	12.3	8.9	9.6
CALCULATIONS:			
A. Stack Gas Flow Rate, DSCFM	19,191	19,475	20,038
B. Concentration, ppm (dry)			
• CO	34.5	74.0	25.9
• THC[3]	12.7	9.1	9.9
C. Sludge Feed Rate, tph (dry)	1.7	1.6	1.7
D. Emission Rate, lbs/hr $(B*A*MW^{4}*60)/(454,000*35.3*24.13)$			
• CO	2.88	6.26	2.26
• THC	0.61	0.44	0.49
E. Emission Ratio, lbs/ton (dry) D/C			
• CO	1.7	3.9	1.3
• THC	0.4	0.3	0.3

1 Based on data collected during the concurrent HCl testing.
2 As methane (CH_4)
3 Dry Basis = Wet Basis/(1-(%H_2O/100))
4 Molecular weight (CO) = 28 gm/gm-mole;
Molecular weight (CH_4) = 16 gm/gm-mole

SAMPLING DATA AND CALCULATIONS - CO AND THC EMISSIONS

Plant: CCCSD Stack: Unit #2 Exhaust

SAMPLING DATA:	Run #7	Run #8	Run #9	Run #10
Stack Gas Moist Content[1] (%H_2O), %	0.8	2.3	1.9	2.8
Stack Gas Flow Rate[1], DSCFM	19,635	19,433	19,287	19,527
Sludge Feed Rate, TPH (dry)	1.5	1.5	1.5	1.5
CO Concentration, ppm (dry)	50.9	70.8	58.6	39.4[2]
THC Concentration[3], ppm (wet)	13.5	10.4	15.4	16.8
CALCULATIONS:				
A. Stack Gas Flow Rate, DSCFM	19,635	19,433	19,287	19,527
B. Concentration, ppm (dry)				
• CO	50.9	70.8	58.6	39.4
• THC[4]	13.6	10.6	15.7	17.3
C. Sludge Feed Rate, tph (dry)	1.5	1.5	1.5	1.5
D. Emission Rate, lbs/hr (B*A*MW[5]*60)/(454,000*35.3*24.13)				
• CO	4.34	5.98	4.91	3.34
• THC	0.66	0.51	0.75	0.84
E. Emission Ratio, lbs/ton (dry) D/C				
• CO	2.9	4.0	3.3	2.2
• THC	0.4	0.3	0.5	0.6

1 Based on data collected during the concurrent PAH tests.
2 As methane (CH_4).
3 Based on the average concentration monitored during the period, 1455-1744; CO levels exceeded 200 ppm throughout the remainder of the test period (1744-1823).
4 Dry Basis = Wet Basis/(1-(%H20/100))
5 Molecular weight (CO) = 28 gm/gm-mole;
Molecular weight (CH_4) = 16 gm/gm-mole