Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Source category: Electroplating
Plant name : Naval Aviation Depot
Process : Electroplating, anodizing

Filename: REF-20.WQ1
Location: Pensacola, FL
Test date: Nov. 8-16, 1990

Date: 04/19/96
Ref. No.: 20
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Samp. time, min	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, ug	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ft2	Emission factor mg/hr-m2	Emission factor gr/hr-ft2	Rat.
Chromic acid anodizing	MPME	total Cr	1	CARB 425	240	101.6	222.58	41,408	4.20	2.91E-07	0.00010	100	0.0050	0.0072	
		total Cr	2		240	99.8	217.93	41,278	1.65	1.17E-07	4.1E-05	100	0.0020	0.0029	
		Average								2.04E-07			0.0035	0.0051	D
												A-hr	mg/A-hr	gr/A-hr	
Hard chrome	none	total Cr	1	CARB 425	60	79.5	45.00	13,985	702.60	0.00024	0.0289	3,495	3.7	0.058	
		total Cr	2		60	82.3	46.64	13,881	773.10	0.00026	0.0304	3,495	4.0	0.061	
		Average								0.00025			3.8	0.059	C
	AMA	total Cr	3	CARB 425	60	81.4	46.72	14,061	37.60	1.24E-05	0.00150	3,505	0.19	0.0030	
		total Cr	4		60	81.4	46.87	14,016	53.20	1.75E-05	0.00210	3,505	0.27	0.0042	
		Average								1.50E-05			0.23	0.0036	C
	MPME	total Cr	1	CARB 425	180	99.5	140.33	40,805	20.30	2.23E-06	0.00078	3,495	0.30	0.0047	
		total Cr	2		180	100.4	140.45	41,188	17.00	1.87E-06	0.00066	3,495	0.26	0.0040	
		Average								2.05E-06			0.28	0.0043	B
	MPME/ AM	total Cr	3	CARB 425	180	100.2	136.83	39,536	19.60	2.21E-06	0.00075	3,505	0.29	0.0045	
		total Cr	4		180	100.1	139.56	41,042	20.80	2.30E-06	0.00081	3,505	0.31	0.0048	
		Average								2.26E-06			0.30	0.0047	B
Cyanide copper plating tank	MPME	cyanide	1	CARB 426	192	98.7	163.76	45,003	27.00	2.54E-06	0.00098	25	57	0.88	
		cyanide	2		192	99.7	164.88	44,849	31.00	2.90E-06	0.00112	25	65	1.00	
		cyanide	3		60	101.9	51.93	44,248	9.40	2.79E-06	0.00106	25	19	0.30	
		Average								2.72E-06			47	0.73	C
Cadmium plating tank	MPME	cyanide	1	CARB 426	192	100.2	162.59	24,353	988	9.38E-05	0.01957	150	189	2.9	
		cyanide	2		192	99.5	157.89	23,799	1,078	1.05E-04	0.02149	150	208	3.2	
		cyanide	3		60	101.1	52.61	24,970	357	1.05E-04	0.02241	150	68	1.0	
		Average								9.96E-05			155	2.4	C
		cadmium	1	CARB 424	60	102.7	52.60	24,573	45.00		0.00278	150			
		cadmium	2		192	100.1	160.65	24,083	1.50	1.44E-07	0.000030	150	0.29	0.0044	
		cadmium	3		192	99.4	157.92	23,835	1.50	1.47E-07	0.000030	150	0.29	0.0045	
										1.44E-07			0.29	0.0045	C

Basis for rating: Lack of adequate documentation; plating line emissions combined

Problems noted:

Other notes: Cyanide copper plating–4 to 8 oz/gal of CUCN, 2 to 8 oz/gal NaCN; tank vol. 1,100 gal
Cadmium plating–3 oz/gal of Cd, 17 oz/gal of CdCN; tank vol. 224 and 1,100 gal.
For Cd plating, amperage determine as sum of two tanks–1,100 gal tank @ 100A, 224 gal tank @ 50A.
For Cd plating, Run No. 1 results discarded; catastrophic splash suspected.

UIC: 65889

NEESA 2-165 JANUARY 1991

CHROMIUM, CYANIDE, AND CADMIUM EMISSION TESTS RESULTS

BUILDING 604 PLATING FACILITY
SOURCE IDENTIFICATION: 10PEN17008406
NAVAL AVIATION DEPOT, PENSACOLA

By:

Drek A. Newton

Naval Energy And Environmental Support Activity
Port Hueneme, California 93043-5014

AUTOVON 551-3903 or Commercial (805) 982-3903

EXECUTIVE SUMMARY

The Naval Energy and Environmental Support Activity (NEESA) performed emission tests at Building 604 Plating Facility, Source Identification Number 10PEN17008406, Naval Aviation Depot, Pensacola, Florida. We measured chromium, cyanide, and cadmium emissions from several tank ventilation exhaust lines. Florida Department of Environmental Regulation (FDER) required cyanide and cadmium emission tests in condition 16 of Permit/Certification Number: A017-176300. Naval Aviation Depot requested the chromium emission tests. The emission test results are summarized and discussed below.

SUMMARY OF RESULTS
CHROMIUM, CYANIDE, AND CADMIUM EMISSION TEST RESULTS

EXHAUST LINE	PROCESS TESTED	ELEMENT MEASURED	CONTROLLED/ UNCONTROLLED EMISSIONS[a]	EMISSION CONC. (mg/m3)	EMISSION RATE (lb/hr)
1	CHROMIC ACID ANODIZE	CHROMIUM	CONTROLLED	0.00060	0.00009
3	HARD CHROME PLATE	CHROMIUM	UNCONTROLLED	0.56830	0.02966
		CHROMIUM	CONTROLLED	0.00469	0.00072
3	HARD CHROME PLATE[b]	CHROMIUM	UNCONTROLLED	0.03423	0.00180
		CHROMIUM	CONTROLLED	0.00516	0.00078
4	CYANIDE COPPER PLATE	CYANIDE	CONTROLLED	0.00628	0.00105
6	CADMIUM PLATE	CYANIDE	CONTROLLED	0.23176	0.02116
		CADMIUM	CONTROLLED	0.01029	0.00095
?	CYANIDE DESTRUCT	CYANIDE	UNCONTROLLED	0.02550	0.00012

[a] Controlled: measured after air pollution control device.
Uncontrolled: measured before control device or no control device.
[b] Fumetrol 101 anti-mist additive in plating tanks.

FDER does not have specific emission limits for cyanide and cadmium. For comparison purposes, minimum workplace exposure limits for cyanide and cadmium are 5 mg/m3, and 0.2 mg/m3, respectively.[1] Note: the exposure limits are not stack emission limits but ambient workplace concentration limits. Test results show all cyanide and cadmium stack emission concentrations are below minimum exposure limits.

The cyanide destruct results are from one sampling run. Refer to discussion. The cyanide destruct ventilation system was originally installed because chlorine gas was used to oxidize cyanide. As a safety improvement, the cyanide destruct system was modified to use sodium hypochlorite instead of chlorine gas. The cyanide destruct system should be reviewed by industrial hygiene and safety personnel to determine if the ventilation system is still necessary.

(Continued)

Chromium emission test results are usually expressed using unique emission factors. Chromium emissions from chrome plating and chromic acid anodizing tanks are directly proportional to the electrical consumption. Refer to discussion. Therefore, chromium emissions are best evaluated in terms of milligrams per Ampere-hour (mg/Amp-hr) of electrical consumption. The table below show average chromium emission factors and process conditions during the tests.

The chromic acid anodize line 1 chromium emission factor of 0.058 mg/Amp-hr complies with California's 0.15 mg/Amp-hr small facility chromium mass emission limit.[2] Line 1 would probably comply with California's medium and large facility limits by using anti-mist additives.

The Environmental Protection Agency (EPA) is developing national emission standards for chrome plating and chromic acid anodizing facilities.[3] EPA prefers to evaluate chromic acid anodizing emissions in terms of milligrams per hour per square meter of tank surface area (mg/hr-m2). In these terms, the chromium emission factor for chromic acid anodize line 1 is 4.53 mg/hr-m2 (0.058 mg/Amp-hr).

We did not measure uncontrolled (control device inlet) emissions from line 1. However, EPA research and testing indicates, the average chromic acid anodize uncontrolled emission factor is 600 mg/hr-m2. If the uncontrolled emission factor for line 1 is 600 mg/hr-m2, then the control device chromium removal efficiency exceeds 99%.

We measured control device inlet and outlet emissions on the hard chrome plating line. We performed tests with and without Fumetrol 101 anti-mist additive in the plating tanks. Results show that the control device chromium removal efficiency during typical process conditions (no anti-mist additive) is 97%. Comparison of the test data shows while the anti-mist additive reduces emissions generated by the plating tanks 94% (from 3.850 mg/m3 to 0.233 mg/m3), the outlet chromium emission rate is unchanged. Hard chrome plating line 3 also complies with California's small facility chromium emission limit.

AVERAGE CHROMIUM EMISSION TEST RESULTS AND PROCESS CONDITIONS

EXHAUST LINE	PROCESS	CONTROL DEVICE	CHROMIUM EMISSION FACTOR (mg/Amp-hr)	PROCESS CONDITIONS		
				AIR[a] AGITATION	FLOATING POLYBALLS	ANTI-MIST ADDITIVE
1	CRO3 ANODIZE	OUTLET	0.058	NO	NO	NO
3	HARD CHROME	INLET	3.850	NO	NO	NO
		OUTLET	0.094	NO	NO	NO
3	HARD CHROME	INLET	0.233	NO	NO	YES[b]
		OUTLET	0.101	NO	NO	YES[b]

[a] All chrome tanks are agitated using a recirculation system.
[b] Fumetrol 101 anti-mist additive, 2 gallons per tank.

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1.0 INTRODUCTION

The Naval Energy and Environmental Support Activity (NEESA) performed chromium, cyanide, and cadmium emission tests on tank ventilation exhaust lines at Building 604 Plating Facility, Naval Aviation Depot, Pensacola, Florida.

2.0 BACKGROUND

Florida Department of Environmental Regulation required cyanide and cadmium emission tests in condition 16 of Permit/Certification Number: A017-176300. Naval Aviation Depot Pensacola requested chromium emission tests be performed.

	08NOV90, Line 1 CrO3 Anodize		10NOV90, Line 3 Hard Chrome Plate			13NOV90, Line 4 Copper Cyanide		15NOV90, Line 6 Cadmium Plate		16NOV90, Line 6 Cadmium Plate		14DEC90 CN Destruct	15DEC90 CN Destruct
In/Out	Outlet		Inlet	Outlet		Outlet		Outlet		Outlet		N/A	N/A
0800													
0830													
0900	T	T	T	T	T			T	T	T	T		T
0930			Run										Run
1000			3-1										CD-2
1030			⊥					Run	Run	Run	Run		
1100	Run	Run		Run	Run	T	T	6-1	6-2	6-5	6-6		⊥
1130	1-1	1-2	T	3-1	3-2								
1200			Run					⊥	⊥	⊥	⊥		T
1230			3-2			Run	Run						
1300			⊥	⊥	⊥	4-1	4-2						Run
1330													CD-3
1400												T	
1430	⊥	⊥				⊥	⊥	T	T				⊥
1500												Run	
1530			T					Run	Run			CD-1	
1600			Run	T	T	T		6-3	6-4				
1630			3-3			Run		⊥	⊥			⊥	
1700			⊥			4-3							
1730						⊥							
1800			T	Run	Run								
1830			Run	3-3	3-4								
1900			3-4										
1930			⊥										
2000				⊥	⊥								

FIGURE 1: TEST SCHEDULE

3.0 SOURCE EMISSION TEST SCHEDULE

Figure 1 shows the emission test schedule. We tested the cyanide destruct line a month later than the other lines because the exhaust fan required repair.

In general we performed simultaneous test runs for longer periods of time in an attempt to obtain detectable emission levels. During tests where two probes were in the stack (in approximately the same plane), the minimum distance between one probe nozzle and the other probe was 6.5 inches.

Table 1 shows the exhaust lines which ventilate chromium, cyanide, or cadmium processes. All control devices are mesh-pad mist eliminators. Appendix E, page E-5, is a rough sketch of the mist eliminator cross section.

TABLE 1: EXHAUST LINES AND PROCESS TANKS

Exhaust Line	Control Device[a]	Tank	Gals	≈ Area (ft)	Process	Contents (oz/gal)
1	403758	341	7700	5 x 20	Chromic Acid Anodize	10-12 CrO3
3	403760	1303	800	3 x 10	Hard Chrome Plate	30-33 CrO3
		1305	715	3 x 10	Hard Chrome Plate	30-33 CrO3
		1306	715	3 x 10	Hard Chrome Plate	30-33 CrO3
		1400	715	3 x 10	Hard Chrome Plate	30-33 CrO3
		1404	715	3 x 10	Hard Chrome Plate	30-33 CrO3
4	403761	1190	180	3 x 3	Cyanide Copper Plate	4-8 CuCN, 2-8 NaCN
		384	300	3 x 5	Corrosive Oxidizer	5 CrO3
		406	300	3 x 5	Chromic Acid Dip	< 0.1 CrO3
6	403763	305	224	3 x 3	Cadmium Plate	3 Cd, 17 CdCN
		311	1100	4 x 10	Cadmium Plate	3 Cd, 17 CdCN
		1001	75	2 x 2	Cyanide Strip?	12 NaCN
		1004	90	2 x 2	Silver Strike?	1 Ag-KCN, 8 KCN
		1005	75	2 x 2	Silver Plate?	13 AgCN, 12 KCN
		314	300	3 x 5	Chromic Acid Dip	< 0.1 CrO3
?	N/A	EP-	[illegible]	[illegible]	[illegible] Destruct	N/A

[a] Mesh Pad Mist Elim[illegible]

We performed t[illegible]sts after the control device on exhaust li[illegible]nodizing tank 341.

We performed [illegible]nd after the control device on exhaust l[illegible]lating tanks 1303, 1305, 1306, 1400, a[illegible]formed with Fumetrol 101 anti-mist additive [illegible]s 1303, 1305, and 1306 were operated during the test to allow determi[illegible] control device efficiency. Three tank ventilation lines combine before entering the control

device. Appendix E, page E-2 is a sketch of the ventilation system. We performed the inlet tests in zone 3-2 which ventilates tanks 1303, 1305, and 1306. We used a DC clamp-on ammeter to verify that the amperage in each plating tank bus bar (the bar supporting the workpieces) was close to the tank rectifier ammeter reading.

We performed three cyanide emission tests on exhaust line 4 which ventilates cyanide copper plating tank 1190.

Exhaust line 4 also ventilates two tanks which contain chromic acid solutions. The corrosive oxidizer (tank 384) and chromic acid dip (tank 406) are non-electric, quick-dip processes. We did not perform chromium emission tests on line 4 because non-electric chromic acid process tanks do not generate significant emissions. The primary emission mechanism of the chrome plating process is the vigorous hydrogen and oxygen gassing which occurs during the electrolysis of water. Electrolysis consumes up to 90% of the applied current. The small gas bubbles break at the tank surface generating very small chromic acid mist particulate which is captured by the tank ventilation system. Air agitation bubbles will generate some emissions but small when compared to electrolysis gas bubbles. Mist particulate from air agitation bubbles are relatively large (and heavy) and most settle back into the tank. We did analyze a portion of the cyanide emission test sample for chromium to substantiate that the magnitude of emissions from non-electric chromic acid processes are not significant. The filter portion of the cyanide sample was consumed during cyanide analysis. We analyzed the remaining portion of the sample (which includes the probe wash and impinger solutions) for chromium.

We performed three cyanide and three cadmium emission tests on exhaust line 6 which ventilates cadmium plating tanks 305 and 311. Exhaust line 6 ventilates three other cyanide processes; cyanide strip (tank 1001), silver strike (tank 1004), and silver plate (tank 1005). We did not load the cyanide strip or silver plate tanks during the tests due to their small size and short process times.

Exhaust line 6 also ventilates chromic acid dip tank 314. This process is a 15 second dip used to color the cadmium plated parts. As previously discussed, we did not perform chromium emission tests because non-electric chromic acid processes do not generate significant chromium emissions. We did analyze the probe wash and impinger solutions (filter excluded) from the cyanide emission tests for chromium to determine the approximate magnitude of chromium emissions.

We performed three cyanide emission tests on the exhaust line which ventilates cyanide destruct tank EP-4. The cyanide destruct process oxidizes cyanide to cyanate using sodium hypochlorite. Contents of the cyanide plating drag-out tanks recirculate continuously through tank EP-4. Refer to any wastewater control and treatment book for a detailed description of the cyanide oxidation process.

Naval Aviation Depot personnel prepared quality assurance (QA) samples which we submitted to the lab along with the test samples. Note: the QA samples are not certified standards and were only used to give us confidence that lab analysis results were in the ballpark.

3.1 CHROMIUM EMISSION TEST PROCEDURE

Sampling procedures and equipment coincide with the Environmental Protection Agency (EPA) Methods 1, 2, 4, and 5 described in the Code of Federal Registrations, Volume 40, Part 60, Appendix A, of 1 July 1988 and California Air Resources Board (CARB) Method 425 (revised wet impingement method).

EPA Methods:
1: Sample and Velocity Traverses for Stationary Sources.
2: Determination of Stack Gas Velocity and Volumetric Flow Rate.
4: Determination of Moisture Content in Stack Gases.
5: Determination of Particulate Emissions From Stationary Sources.

CARB Method:
425: Determination of Total Chromium and Hexavalent Chromium Emissions From Stationary Sources.

The following comments briefly describe our test procedures and document any variations from the reference methods.

The CARB 425 sampling train is a modified EPA Method 5 train. The filter holder is unheated and is located between the third and fourth impingers. A teflon coated Pallflex T60A20 filter is used. The first and second impingers contain 0.1 N sodium hydroxide solution instead of water. The transition from the glass probe liner to the first impinger is either glass or flexible teflon tubing.

We do not heat the probe unless the stack gas dew point temperature is near ambient temperature.

For control device outlet emission tests, minimum total sample volume (corrected to standard conditions) is 120 cubic feet.

We do not presoak sampling equipment in 1:1 HNO_3 as described in Method 425 section 5.2. We initially wash the sampling train at our laboratory using the following procedure. After a detergent wash, we prerinse (not soak) all parts with 1:1 HNO_3, followed by deionized water, and finally with 0.1N NaOH solution. We do not analyze probe liner preparation rinses for chromium. The 0.1N NaOH sample recovery wash (post test) serves as the sample train wash (pre test) for the next test run.

We do not split the samples for both hexavalent and total chromium analysis. We assume all chromium emissions to be hexavalent and analyze samples for total chromium.

A third party laboratory analyzed the samples. In general the lab used a flame atomic absorption spectrophotometer which can detect chromium concentrations in the lower ppm range. For samples below the ppm range, the lab used a graphite furnace which can detect chromium concentrations in the lower ppb range. For the control device outlet samples, the lab analyzed the first impinger solution, the second impinger solution, and the probe wash separately. For some control device inlet samples, the two impinger solutions were combined and analyzed as a single sample.

3.2 CYANIDE EMISSION TEST PROCEDURE.

Sampling procedures and equipment is similar to the chromium test procedure except we will use California Air Resources Board (CARB) Method 426.

CARB Method:
426: Determination of Cyanide Emissions From Stationary Sources.

The CARB 426 sampling train is a modified EPA Method 5 train. The first and second impingers contain 0.1 N sodium hydroxide solution instead of water. The filter extract, probe wash, and impinger solution are analyzed for cyanide using a calorimetric procedure.

We do not heat the probe and filter unless the stack gas dew point temperature is near ambient temperature.

3.3 CADMIUM EMISSION TEST PROCEDURE

Sampling procedures and equipment is similar to the cyanide test procedure except we will use California Air Resources Board (CARB) Method 424.

CARB Method:
424: Determination of Inorganic Cadmium Emissions From Stationary Sources.

The CARB 424 sampling train is a modified EPA Method 5 train. The first and second impingers contain 0.1 N nitric acid solution instead of water. The filter extract, probe wash, and impinger solution are analyzed for cadmium using atomic absorption spectrometry.

We do not heat the probe and filter unless the stack gas dew point temperature is near ambient temperature.

4.0 CHAIN OF CUSTODY

LINES 1, 3, 4, 6

Sample Collection: Perez, Saunders, Newton, Ruf
Sample Recovery: Ruf
Sample Transport: Ruf, Newton

CYANIDE DESTRUCT LINE

Sample Collection: Cook, Boynton, Quil
Sample Recovery: Newton, Quil, Cook, Boynton
Sample Transport: Newton

Quality Assurance Sample Preparation: Gary Whitfield
Code 34200
Naval Aviation Depot

Florida Department of Environmental Regulation
15 NOV 90 Site Visit: Sava Varazo
Environmental Specialist
Northwest District
160 Government Center
Pensacola, FL 32501
(904) 436-8364

Sample Analysis: Analytical Technologies Incorporated
11 East Olive Road
Pensacola, FL 32514
(904) 474-1001
Attn: John Hawkins

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5.0 RESULTS

Table 1 (section 3.0) lists the chromium, cyanide, and cadmium processes ventilated by each exhaust line. Tables 2, 3, and 4 show chromium emission test results for exhaust lines 1 and 2. Table 5 summarizes the chromium emission test results. Tables 6 and 7 show cyanide emission test results for exhaust lines 4 and 6, respectively. Table 8 shows cadmium emission test results for exhaust line 6. Table 9 shows cyanide emission test results for the cyanide destruct system. Table 10 summarizes other relevant test data for all emission tests. Table 11 lists average tank load data. Table 12 summarizes all emission test results.

Appendix A contains analysis results for all emission test samples. Appendix B contains all field tank load data sheets and ampere-hour calculation sheets for hard chrome plating and chromic acid anodizing tests. Appendix C contains our field emission test data sheets. Appendix D summarizes the test results and contains sample calculations. Appendix E contains sketches of the ventilation exhaust lines. Appendix F lists our HP-41C calculator program "Nomokin" used instead of a nomograph to determine isokinetic sampling parameters during testing. Appendix G contains equipment calibration sheets. Appendix H contains resumes of NEESA test personnel.

TABLE 2: CHROMIUM EMISSION TEST RESULTS
CHROMIC ACID ANODIZE, LINE 1

TEST	CHROMIUM SAMPLE WEIGHT (mg)	CHROMIUM EMISSION CONC. (mg/m3)	CHROMIUM EMISSION RATE (lb/hr)	CHROMIUM EMISSION RATE (mg/hr)	AVERAGE AMPERES (Amp)	CHROMIUM EMISSION FACTOR (mg/Amp-hr)
1-1-OUT	0.0042	0.000663	0.000103	46.627	729.5	0.064
1-2-OUT	0.0033	0.000534	0.000083	37.478	729.5	0.051
AVERAGE		0.000599	0.000093	42.053		0.058

TABLE 3: CHROMIUM EMISSION TEST RESULTS
HARD CHROME PLATE, LINE 3
WITHOUT ANTI-MIST ADDITIVE

TEST	CHROMIUM SAMPLE WEIGHT (mg)	CHROMIUM EMISSION CONC. (mg/m3)	CHROMIUM EMISSION RATE (lb/hr)	CHROMIUM EMISSION RATE (mg/hr)	AVERAGE AMPERES (Amp)	CHROMIUM EMISSION FACTOR (mg/Amp-hr)
3-1-IN	0.7026	0.55130	0.02889	13100.63	3494.5	3.749
3-2-IN	0.7731	0.58530	0.03044	13805.21	3494.5	3.951
AVERAGE		0.56830	0.02966	13452.92		3.850
3-1-OUT	0.0203	0.00511	0.00078	354.48	3494.5	0.101
3-2-OUT	0.0170	0.00428	0.00066	299.35	3494.5	0.086
AVERAGE		0.00469	0.00072	326.92		0.094

TABLE 4: CHROMIUM EMISSION TEST RESULTS
HARD CHROME PLATE, LINE 3
WITH FUMETROL 101 ANTI-MIST ADDITIVE

TEST	CHROMIUM SAMPLE WEIGHT (mg)	CHROMIUM EMISSION CONC. (mg/m3)	CHROMIUM EMISSION RATE (lb/hr)	CHROMIUM EMISSION RATE (mg/hr)	AVERAGE AMPERES (Amp)	CHROMIUM EMISSION FACTOR (mg/Amp-hr)
3-3-IN	0.0376	0.02839	0.00150	678.32	3505.4	0.194
3-4-IN	0.0532	0.04006	0.00210	954.11	3505.4	0.272
AVERAGE		0.03423	0.00180	816.21		0.233
3-3-OUT	0.0196	0.00505	0.00075	339.57	3505.4	0.097
3-4-OUT	0.0208	0.00526	0.00081	366.95	3505.4	0.105
AVERAGE		0.00516	0.00078	353.26		0.101

TABLE 5: AVERAGE CHROMIUM EMISSIONS AND PROCESS CONDITIONS

LINE	PROCESS	CONTROL DEVICE	CHROMIUM EMISSION FACTOR (mg/Amp-hr)	PROCESS CONDITIONS		
				AIR[a] AGITATION	FLOATING POLYBALLS	ANTI-MIST ADDITIVE
1	CRO3 ANODIZE	OUTLET	0.058	NO	NO	NO
3	HARD CHROME	INLET	3.850	NO	NO	NO
		OUTLET	0.094	NO	NO	NO
3	HARD CHROME	INLET	0.233 ,233	NO	NO	YES[b]
		OUTLET	0.101	NO	NO	YES[b]

[a] All chrome tanks are agitated using a recirculation system.
[b] Fumetrol 101 anti-mist additive, 2 gallons per tank.

TABLE 6: CYANIDE EMISSION TEST RESULTS
CYANIDE COPPER PLATE, LINE 4

TEST	AIR SAMPLE VOLUME (m3)	CYANIDE SAMPLE WEIGHT (mg)	CYANIDE EMISSION CONC. (mg/m3)	CYANIDE EMISSION RATE (lb/hr)	CHROMIUM[a] SAMPLE WEIGHT (mg)	CHROMIUM[a] EMISSION CONC. (mg/m3)	CHROMIUM[a] EMISSION RATE (lb/hr)
4-1-OUT	4.638	0.0270	0.00582	0.00098	0.0027	0.00058	0.00010
4-2-OUT	4.670	0.0310	0.00664	0.00112	0.0037	0.00079	0.00013
4-3-OUT	1.471	0.0094	0.00639	0.00106	< 0.0005	< 0.00034	< 0.00006
AVERAGE			0.00628	0.00105		0.00057	0.00010

[a] Note: chromium results are not actual emissions. Chromium results include only the probe wash and impinger catch. The filter was consumed during cyanide analysis. Chromium results are presented only to indicate approximate magnitude of emissions.

TABLE 7: CYANIDE EMISSION TEST RESULTS
CADMIUM PLATE, LINE 6

TEST	AIR SAMPLE VOLUME (m3)	CYANIDE SAMPLE WEIGHT (mg)	CYANIDE EMISSION CONC. (mg/m3)	CYANIDE EMISSION RATE (lb/hr)	CHROMIUM[a] SAMPLE WEIGHT (mg)	CHROMIUM[a] EMISSION CONC. (mg/m3)	CHROMIUM[a] EMISSION RATE (lb/hr)
6-1-OUT	4.605	0.9880	0.21457	0.01958	< 0.0005	< 0.00011	< 0.00001
6-2-OUT	4.472	1.0780	0.24108	0.02150	< 0.0005	< 0.00011	< 0.00001
6-3-OUT	1.490	0.3570	0.23962	0.02242	< 0.0005	< 0.00034	< 0.00003
AVERAGE			0.23176	0.02116		< 0.00019	< 0.00002

[a] Note: chromium results are not actual emissions. Chromium results include only the probe wash and impinger catch. The filter was consumed during cyanide analysis. Chromium results are presented only to indicate approximate magnitude of emissions.

TABLE 8: CADMIUM EMISSION TEST RESULTS
CADMIUM PLATE, LINE 6

TEST	AIR SAMPLE VOLUME (m3)	CADMIUM SAMPLE WEIGHT (mg)	CADMIUM EMISSION CONC. (mg/m3)	CADMIUM EMISSION RATE (lb/hr)
6-4-OUT	1.490	0.0450	0.03021	0.00278
6-5-OUT	4.550	0.0015	0.00033	0.00003
6-6-OUT	4.472	0.0015	0.00034	0.00003
AVERAGE			0.01029	0.00095

TABLE 9: CYANIDE EMISSION TEST RESULTS
CYANIDE DESTRUCT SYSTEM

TEST	AIR SAMPLE VOLUME (m3)	CYANIDE SAMPLE WEIGHT (mg)	CYANIDE EMISSION CONC. (mg/m3)	CYANIDE EMISSION RATE (lb/hr)
CD-1	3.666	0.0935	0.02550	0.00012
CD-2[a]	2.582	0.0393	0.01524	0.00007
CD-3[a]	2.441	0.0370	0.01517	0.00007

[a] Results are conservative estimates. The lab destroyed filter before analysis. Refer to discussion section 6.5.

TABLE 10: EMISSION TEST DATA
CHROMIUM, CYANIDE, AND CADMIUM EMISSION TESTS

TEST	DATE	NOZZLE DIA. (in.)	SAMPLE TIME (min.)	AIR SAMPLE VOLUME (DSCF)	% H2O (%)	STACK FLOW RATE (DSCFM)	ISOKIN (%)
1-1-OUT	08NOV90	0.230	240	222.58	2.3	41408	101.6
1-2-OUT	08NOV90	0.230	240	217.93	2.3	41278	99.8
3-1-IN	10NOV90	0.268	60	45.00	0.3	13985	79.5
3-2-IN	10NOV90	0.269	60	46.64	1.4	13881	82.3
3-1-OUT	10NOV90	0.230	180	140.33	1.2	40805	99.5
3-2-OUT	10NOV90	0.228	180	140.45	1.3	41188	100.4
3-3-IN	10NOV90	0.269	60	46.72	1.2	14061	81.4
3-4-IN	10NOV90	0.270	60	46.87	1.2	14016	81.4
3-3-OUT	10NOV90	0.230	180	136.83	1.1	39536	100.2
3-4-OUT	10NOV90	0.228	180	139.56	1.1	41042	100.1
4-1-OUT	13NOV90	0.230	192	163.76	1.6	45003	98.7
4-2-OUT	13NOV90	0.230	192	164.88	1.6	44849	99.7
4-3-OUT	13NOV90	0.230	60	51.93	1.7	44248	101.9
6-1-OUT	15NOV90	0.271	192	162.59	1.9	24353	100.2
6-2-OUT	15NOV90	0.271	192	157.89	1.8	23799	99.5
6-3-OUT	15NOV90	0.271	60	52.61	2.2	24970	101.1
6-4-OUT	15NOV90	0.271	60	52.60	2.2	24573	102.7
6-5-OUT	16NOV90	0.271	192	160.65	1.9	24083	100.1
6-6-OUT	16NOV90	0.271	192	157.92	2.0	23835	99.4
CD-1	14DEC90	0.477	150	129.47	2.2	1223	100.4
CD-2	15DEC90	0.477	100	91.16	2.4	1295	100.2
CD-3	15DEC90	0.476	100	86.20	2.3	1241	99.3

TABLE 11: TANK LOAD DATA
CHROMIUM, CYANIDE, AND CADMIUM EMISSION TESTS

EXHAUST LINE	TANK	PROCESS	AVERAGE AMPERAGE	ESTIMATED WORKPIECE AREA (ft2)	TEMP. (F)
1	341	Chromic Acid Anodize	800	384	90
3	1303	Hard Chrome Plate	3500	10	140
	1305	Hard Chrome Plate			
	1306	Hard Chrome Plate			
	1400	Hard Chrome Plate			
	1404	Hard Chrome Plate			
4	1190	Cyanide Copper Plate	25	1	120
6	305	Cadmium Plate	50	1.5	AMB
	311	Cadmium Plate	100	4	AMB
	EP-4	Cyanide Destruct	N/A	N/A	AMB

TABLE 12: SUMMARY OF RESULTS
CHROMIUM, CYANIDE, AND CADMIUM EMISSION TEST RESULTS

EXHAUST LINE	PROCESS TESTED	ELEMENT MEASURED	CONTROLLED/ UNCONTROLLED EMISSIONS[a]	EMISSION CONC. (mg/m3)	EMISSION RATE (lb/hr)
1	CHROMIC ACID ANODIZE	CHROMIUM	CONTROLLED	0.00060	0.00009
3	HARD CHROME PLATE	CHROMIUM	UNCONTROLLED	0.56830	0.02966
		CHROMIUM	CONTROLLED	0.00469	0.00072
3	HARD CHROME PLATE[b]	CHROMIUM	UNCONTROLLED	0.03423	0.00180
		CHROMIUM	CONTROLLED	0.00516	0.00078
4	CYANIDE COPPER PLATE	CYANIDE	CONTROLLED	0.00628	0.00105
6	CADMIUM PLATE	CYANIDE	CONTROLLED	0.23176	0.02116
		CADMIUM	CONTROLLED	0.01029	0.00095
?	CYANIDE DESTRUCT	CYANIDE	UNCONTROLLED	0.02550	0.00012

[a] Controlled: measured after air pollution control device.
Uncontrolled: measured before control device or no control device.
[b] Fumetrol 101 anti-mist additive in plating tanks.

6.0 DISCUSSION

Results of plating shop emission test must be evaluated in context with site specific conditions. Factors which influence results include: tank ventilation performance, sampling site flow conditions, and control device maintenance. If tank ventilation is inadequate, tests will show lower emissions because some emissions escape into the ambient air in the shop. Flow conditions at most plating shop control device inlet test sites are poor due to insufficient length of straight ductwork. Control device efficiency will deteriorate without maintenance. Periodic wash down of mesh pads will help maintain control device performance.

The ventilation system at Building 604 is working well. During the inlet tests on hard chrome plating line 3, we operated our test equipment between two hard chrome plating tanks. We did not notice any fugitive chromic acid fumes. Very impressive! A 1985 ventilation survey shows all exhaust line flow rates exceed ventilation requirements.

All sampling sites locations met minimum EPA Method 1 requirements. Flow conditions were acceptable and did not exceed allowances for cyclonic flow. However, some flow distributions were concentrated towards one side of the ductwork.

Control device maintenance appears to be adequate. We observed maintenance crews washing down mesh pads on several occasions.

6.1 Chromic Acid Anodize, Line 1

Chromium emission test results are usually expressed using unique emission factors. Chromium emissions from chrome plating and chromic acid anodizing tanks are directly proportional to the electrical consumption. Up to 90% of the electric current applied to the tanks is consumed by the electrolysis of water. The vigorous hydrogen and oxygen gassing which results from water electrolysis is the primary chromium emission mechanism. Therefore, chromium emissions are best evaluated in terms of milligrams per Ampere-hour (mg/Amp-hr) of electrical consumption.

The average outlet chromium emission factor for chromic acid anodizing line 1 is 0.058 mg/Amp-hr. Refer to Table 2. For comparison purposes, Table 13 shows California standards for chrome plating and chromic acid anodizing facilities.[2] Line 1 complies with California's small facility chromium mass emission limit of 0.15 mg/Amp-hr and would probably meet medium and large facility limits by using anti-mist additives.

The Environmental Protection Agency (EPA) is developing national emission standards for chrome plating and chromic acid anodizing facilities.[3] EPA prefers to evaluate chromic acid anodizing emissions in terms of milligrams per hour per square meter of tank surface area (mg/hr-m2). In these terms, the chromium emission factor for chromic acid anodize line 1 is 4.53 mg/hr-m2 (0.058 mg/Amp-hr).

TABLE 13: CALIFORNIA AIR TOXIC CONTROL MEASURE FOR CHROME PLATING AND CHROMIC ACID ANODIZING FACILITIES

PROCESS	CONTROLLED Cr^{+6} EMISSIONS FACILITY-WIDE (lb/yr)	CONTROL EFFICIENCY		MASS EMISSION LIMIT (mg/amp-hr)
DECORATIVE CHROME	ALL	95%	OR	N/A
HARD CHROME & CrO_3 ANODIZE	2 OR LESS (SMALL)	95%	OR	0.15
HARD CHROME & CrO_3 ANODIZE	BTWN 2 AND 10 (MEDIUM)	95-99%	OR	0.03
HARD CHROME & CrO_3 ANODIZE	10 OR GREATER (LARGE)	99-99.8%	OR	0.006

We did not measure uncontrolled (control device inlet) emissions from line 1. However, EPA research and testing indicates, the average chromic acid anodize uncontrolled emission factor is 600 mg/hr-m2. If the uncontrolled emission factor for line 1 is 600 mg/hr-m2, then the control device chromium removal efficiency exceeds 99%.

6.2 Hard Chrome Plate, Line 3

The hard chrome plating tanks generate 3.850 mg/Amp-hr chromium emissions during typical plating process conditions (no anti-mist additive). Refer to Tables 3, 4, and 5. The air pollution control device chromium removal efficiency is 97% yielding an outlet chromium emission rate of 0.094 mg/Amp-hr. This complies with California's small facility chromium emission limit.

Control device efficiency decreases when anti-mist additives are used because the average particle size of the chromic acid mist that escapes the additives is smaller. We normally find that addition of an anti-mist additive reduces both the generated emissions and the control device outlet emission rate. However, these test results show that while anti-mist additive reduces the emissions generated by the plating tanks 94% (from 3.850 to 0.233 mg/Amp-hr), the outlet chromium emission rate is approximately the same.

We originally thought the results of outlet emission tests 3-1-OUT and 3-2-OUT were errant because the analytical concentrations of samples 18 and 14 were suspiciously low, see Appendix A, pages A-2 and A-9. The lab reanalyzed samples 18 and 14 looking for higher concentrations but found the original analysis to be accurate, see Appendix A, page A-12. We are confident that the analysis and emission test results are accurate. Note: the lab performed very well on spiked chromium quality assurance samples which we submitted with our test samples, see Appendix A, page A-7.

We suspect the emission test results for the tests using the anti-mist additive were influenced by minor carry over of chromic acid which was already coating the mesh pads. We should have washed the control device mesh pads prior to the anti-mist additive tests.

The average isokinetic sampling rate during the line 3 inlet tests was 80%. Test runs should be 100% ± 10% isokinetic. The low isokinetic sampling rate does not affect the test results. Sampling at 80% isokinetic either has no affect or biases the particulate weight high (more conservative). Appendix F, pages F-9 to F-12, contains an article discussing the physics involved. Adjusting the inlet test results according to Case 2 (page F-10) reduces the emission rates by 20%. For example, the 3.850 mg/Amp-hr uncontrolled emission rate becomes 3.080 mg/Amp-hr. This adjusted inlet result would reduce the calculated control device efficiency from 97.6% to 97.0%. To be conservative we did not adjust the inlet emission rates down but we did report the control device efficiency as 97%.

Note: the low isokinetic sampling rate was caused by two poor equipment calibrations. We used a new dry gas meter for the inlet runs and used the meter correction factor from the manufacturer's meter calibration sheet. Our post test calibration shows that the meter correction factor was 0.935 instead of 1.002. Compare Appendix G, pages G-6 and G-10. We also used a errant pitot tube coefficient. The pre and post test coefficients for pitot 3-100 were 0.722 and 0.822, respectively. Compare Appendix G, pages G-1 and G-2. The pretest calibration was obviously errant. Note: we wised-up before the cyanide destruct tests and assumed a 0.84 coefficient for pitot 3-100.

6.3 Cyanide Copper Plate, Line 4

Cyanide copper plating tank 1190 is the only cyanide process ventilated by exhaust line 4. Test results show the average cyanide emission concentration is 0.0063 mg/m3. Refer to Table 6. The stack emission concentration is well below the 5 mg/m3 cyanide permissible exposure limit. The average cyanide mass emission rate is 0.001 lb/hr.

We did not perform chromium emission tests on Line 4 for the reasons discussed in Section 3.0. However we analyzed the cyanide emission test probe wash and impinger solutions for chromium to substantiate that the magnitude of chromium emissions from non-electric chromic acid processes are not significant. Note: cyanide analysis consumed the filter and it was unavailable for chromium analysis. Chromium analysis indicates the chromium emission concentration is less than 0.001 mg/m3.

6.4 Cadmium Plate, Line 6

We performed cyanide and cadmium emission tests on the cadmium plating processes on exhaust line 6.

Test results show the average cyanide emission concentration is 0.232 mg/m3 and cyanide emission rate is 0.021 lb/hr. Refer to Table 7. The cyanide emission concentration is less than half of the 5 mg/m3 permissible exposure limit.

We analyzed the cyanide emission test probe wash and impinger solutions for chromium to substantiate that the magnitude of chromium emissions from non-electric chromic acid processes are not significant. Note: cyanide analysis consumed the filter and it was unavailable for chromium analysis. Chromium analysis indicates the chromium emission concentration is less than 0.001 mg/m3.

Test results show the average cadmium emission concentration is 0.01 mg/m3 and cadmium emission rate is 0.001 lb/hr. Refer to Table 8. These averages are influenced almost entirely by run 6-4-OUT which shows an emission concentration of 0.03 mg/m3. Run 6-4-OUT was a short 60 minute sample (52 cubic feet) and may have captured a catastrophic event such as a splash directly into the ventilation duct. The average emission concentration of runs 6-5-OUT and 6-6-OUT is 0.00033 mg/m3. These were long 192 minute samples (160 cubic feet). Note: the lab reanalyzed the sample from 6-4-OUT and the results were confirmed accurate. The emission concentration results are below the 0.2 mg/m3 cadmium permissible exposure limit.

6.5 Cyanide Destruct System

Tests results from run CD-1 show that the cyanide emission concentration from the cyanide destruct system is 0.026 mg/m3. Refer to Table 9. The emission concentration is below the 5 mg/m3 cyanide permissible exposure limit.

Runs CD-2 and CD-3 results must be qualified and used with discretion. A technician at the third-party lab threw away the filters before analysis. Appendix A, page A-6 shows the sample analysis results. Analysis of run CD-1 shows approximately 10% of the cyanide was collected on the filter. Most of the sample was probably collected in the probe wash. We assumed a filter catch of 50% for CD-2 and CD-3 to generate a conservative emission result. We recommend using only Run CD-1 for emission estimates.

The cyanide destruct ventilation system was originally installed because chlorine gas was used to oxidize cyanide. As a safety improvement, the cyanide destruct system was modified to use sodium hypochlorite instead of chlorine gas. The cyanide destruct system should be reviewed by industrial hygiene and safety personnel to determine if the ventilation system is still necessary.

7.0 REFERENCES

1. National Institute for Occupational Safety and Health, Pocket Guide to Chemical Hazards, June 1990.

2. California Air Resources Board, Proposed Airborne Toxic Control Measure for Emissions of Hexavalent Chromium from Chrome Plating and Chromic Acid Anodizing Operations, January 1988.

3. National Air Pollution Control Techniques Advisory Committee, Draft, Status Briefing, Chromium Electroplating and Chromic Acid Anodizing NESHAP, January 29-31, 1991.

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APPENDIX A

SAMPLE ANALYSIS RESULTS
LABORATORY ANALYSIS REPORTS

SAMPLE ANALYSIS RESULTS

CHROMIC ACID ANODIZE, EXHAUST LINE 1
CHROMIUM EMISSION TEST

SAMPLE NO.	SAMPLE IDENTIFICATION	ANALYSIS VOLUME (l)	CHROMIUM ANALYSIS (mg/l)	CHROMIUM WEIGHT (mg)	
1	1-1-OUT-PROBE	0.1155	0.014	0.0016	
3	1-1-OUT-IMP1	0.1735	0.008	0.0014	
4	1-1-OUT-IMP2	0.1467	0.008	0.0012	
				0.0042	<--TOTAL
2	1-2-OUT-PROBE	0.1257	0.009	0.0011	
5	1-2-OUT-IMP1	0.1787	0.008	0.0014	
6	1-2-OUT-IMP2	0.1474	0.005	0.0007	
				0.0033	<--TOTAL

SAMPLE ANALYSIS RESULTS

HARD CHROME PLATE, EXHAUST LINE 3
CHROMIUM EMISSION TEST

SAMPLE NO.	SAMPLE IDENTIFICATION	ANALYSIS VOLUME (l)	CHROMIUM ANALYSIS (mg/l)	CHROMIUM WEIGHT (mg)	
12	3-1-IN-PROBE	0.0910	7.500	0.6827	
9	3-1-IN-IMP1&2	0.2495	0.080	0.0200	
				0.7026	<--TOTAL
13	3-2-IN-PROBE	0.1325	5.700	0.7555	
10	3-2-IN-IMP1&2	0.2511	0.070	0.0176	
				0.7731	<--TOTAL
21	3-3-IN-PROBE	0.1359	0.170	0.0231	
20	3-3-IN-IMP1	0.1200	0.080	0.0096	
24	3-3-IN-IMP2	0.1569	0.031	0.0049	
				0.0376	<--TOTAL
22	3-4-IN-PROBE	0.1616	0.220	0.0356	
25	3-4-IN-IMP1	0.1203	0.120	0.0144	
26	3-4-IN-IMP2	0.1516	0.021	0.0032	
				0.0532	<--TOTAL
18	3-1-OUT-PROBE	0.1056	0.008	0.0008	
16	3-1-OUT-IMP1	0.1303	0.070	0.0091	
17	3-1-OUT-IMP2	0.1523	0.068	0.0104	
				0.0203	<--TOTAL
14	3-2-OUT-PROBE	0.1554	0.004	0.0006	
11	3-2-OUT-IMP1	0.1315	0.090	0.0118	
15	3-2-OUT-IMP2	0.1470	0.031	0.0046	
				0.0170	<--TOTAL
23	3-3-OUT-PROBE	0.1336	0.057	0.0076	
28	3-3-OUT-IMP1	0.1316	0.060	0.0079	
29	3-3-OUT-IMP2	0.1510	0.027	0.0041	
				0.0196	<--TOTAL
31	3-4-OUT-PROBE	0.1268	0.070	0.0089	
30	3-4-OUT-IMP1	0.1249	0.060	0.0075	
32	3-4-OUT-IMP2	0.1639	0.027	0.0044	
				0.0208	<--TOTAL

SAMPLE ANALYSIS RESULTS

CADMIUM PLATE, EXHAUST LINE 6
CADMIUM EMISSION TEST

SAMPLE NO.	SAMPLE IDENTIFICATION	ANALYSIS VOLUME (l)	CADMIUM ANALYSIS (mg)
54	6-4-OUT-FILTER		
47	6-4-OUT-PROBE,IMPS	0.5755	
54,47	COMBINED RESULTS		0.0450
55	6-5-OUT-FILTER		
49	6-5-OUT-PROBE,IMPS	0.6019	
55,49	COMBINED RESULTS		0.0015
56	6-6-OUT-FILTER		
50	6-6-OUT-PROBE,IMPS	0.6231	
56,50	COMBINED RESULTS		0.0015

SAMPLE ANALYSIS RESULTS

CADMIUM PLATE, EXHAUST LINE 6
CYANIDE EMISSION TEST

SAMPLE NO.	SAMPLE IDENTIFICATION	ANALYSIS VOLUME (l)	CYANIDE ANALYSIS (mg)	CHROMIUM ANALYSIS (mg)
36	6-1-OUT-FILTER			
43	6-1-OUT-PROBE,IMPS	0.5881		< 0.0005
36,43	COMBINED RESULTS		0.9880	
38	6-2-OUT-FILTER			
44	6-2-OUT-PROBE,IMPS	0.5691		< 0.0005
38,44	COMBINED RESULTS		1.0780	
37	6-3-OUT-FILTER			
45	6-3-OUT-PROBE,IMPS	0.5508		< 0.0005
37,45	COMBINED RESULTS		0.3570	

SAMPLE ANALYSIS RESULTS

CADMIUM PLATE, EXHAUST LINE 6
CADMIUM EMISSION TEST

SAMPLE NO.	SAMPLE IDENTIFICATION	ANALYSIS VOLUME (l)	CADMIUM ANALYSIS (mg)
54	6-4-OUT-FILTER		
47	6-4-OUT-PROBE,IMPS	0.5755	
54,47	COMBINED RESULTS		0.0450
55	6-5-OUT-FILTER		
49	6-5-OUT-PROBE,IMPS	0.6019	
55,49	COMBINED RESULTS		0.0015
56	6-6-OUT-FILTER		
50	6-6-OUT-PROBE,IMPS	0.6231	
56,50	COMBINED RESULTS		0.0015

SAMPLE ANALYSIS RESULTS

CYANIDE DESTRUCT SYSTEM
CYANIDE EMISSION TEST

SAMPLE NO.	SAMPLE IDENTIFICATION	ANALYSIS VOLUME (l)	CYANIDE ANALYSIS (mg/l)	CYANIDE WEIGHT (mg)
CD-1F	CD-1-FILTER			0.0092
CD-1R	CD-1-RECOVERY	0.7954	0.106	0.0843
				0.0935 <--TOTAL
CD-2F	CD-2-FILTER	LAB DESTROYED	FILTER	0.0197 (assumed)
CD-2R	CD-2-RECOVERY	0.5621	0.035	0.0197
				0.0393 <--TOTAL
CD-3F	CD-3-FILTER	LAB DESTROYED	FILTER	0.0185 (assumed)
CD-3R	CD-3-RECOVERY	0.7124	0.026	0.0185
				0.0370 <--TOTAL

SAMPLE ANALYSIS RESULTS

QUALITY ASSURANCE SAMPLE AND BLANK ANALYSIS

SAMPLE	IDENTIFICATION	ANALYSIS TARGET (mg/l)	ACCURACY SAMPLE (+-%)	ACCURACY LAB (+-%)	QA SAMPLE RANGE MIN (mg/l)	QA SAMPLE RANGE MAX (mg/l)	CHROMIUM ANALYSIS (mg/l)
7	CHROMIUM QA	0.50	20	10	0.360	0.660	0.650
8	CHROMIUM QA	0.01	20	10	0.007	0.013	0.011
CD-4R	CYANIDE QA	0.03	20	10	0.022	0.040	0.011[a]
48	CADMIUM QA	0.03	20	10	0.022	0.040	0.027
19	CHROMIUM BLANK (0.1N NaOH)	BDL					BDL
27	CHROMIUM BLANK (0.1N NaOH, FILTER)	BDL					0.009
42	CYANIDE BLANK (0.1N NaOH, FILTER)	BDL					BDL
51,57	CADMIUM BLANK (0.1N HNO3, FILTER)	BDL					BDL

[a] Lab reanalyzed sample CD-4R and results repeated.

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NEESA
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PORT HUENEME CA 00009-3043

Lab I.D.#: 90-6899
Order Number: P36400
Order Date: 11/13/90
Client: 14012
Sampled By: N/S
Sample Date: 11/8-10
Sample Time: N/S

N/S = Not Submitted

Project Number: N/S
Project Name: N/S
Sample Site: NAD BLDG 604
Sample Type: AIR

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
6899-1	1	CHROMIUM	PPM	0.014	0.003
6899-2	2	CHROMIUM	PPM	0.009	0.003
6899-3	3	CHROMIUM	PPM	0.008	0.003
6899-4	4	CHROMIUM	PMM	0.008	0.003
6899-5	5	CHROMIUM	PPM	0.008	0.003
6899-6	6	CHROMIUM	PPM	0.005	0.003
6899-7	9	CHROMIUM	PPM	0.08	0.01
6899-8	10	CHROMIUM	PPM	0.07	0.01
6899-9	11	CHROMIUM	PPM	0.09	0.01
6899-10	12	CHROMIUM	PPM	7.5	0.01
6899-11	13	CHROMIUM	PPM	5.7	0.01
6899-12	14	CHROMIUM	PPM	0.004	0.003
6899-13	15	CHROMIUM	PPM	0.031	0.003
6899-14	16	CHROMIUM	PPM	0.07	0.01
6899-15	17	CHROMIUM	PPM	0.068	0.003
6899-16	18	CHROMIUM	PPM	0.008	0.003
6899-17	19	CHROMIUM	PPM	BDL	0.003
6899-18	20	CHROMIUM	PPM	0.08	0.01
6899-19	21	CHROMIUM	PPM	0.17	0.01
6899-20	22	CHROMIUM	PPM	0.22	0.01
6899-21	23	CHROMIUM	PPM	0.057	0.003
6899-22	24	CHROMIUM	PPM	0.031	0.003
6899-23	25	CHROMIUM	PPM	0.12	0.01
6899-24	26	CHROMIUM	PPM	0.021	0.003
6899-25	27	CHROMIUM	PPM	0.009	0.003
6899-26	28	CHROMIUM	PPM	0.06	0.01
6899-27	29	CHROMIUM	PPM	0.027	0.003
6899-28	30	CHROMIUM	PPM	0.06	0.01
6899-29	31	CHROMIUM	PPM	0.07	0.01
6899-30	32	CHROMIUM	PPM	0.027	0.003

Comments: Method Reference: EPA 600/4-79-020, Revised March 1983.
(Samples were prepped according to C.A.R.B.
Method 425, but analyzed by EPA Method 200.7 per customer).

Approved By : John V Hawkins

end of report

A-9

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

QUALITY CONTROL DATA

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

Client Name: NEESA

Project No: N/S
Lab ID NO: 90-6899
QC Level: I

Lab I.D. No.	Client I.D.	Lab I.D. No.	Client I.D.	Lab I.D. No.	Client I.D.
90-6899-1	1	90-6899-11	13	90-6899-21	23
90-6899-2	2	90-6899-12	14	90-6899-22	24
90-6899-3	3	90-6899-13	15	90-6899-23	25
90-6899-4	4	90-6899-14	16	90-6899-24	26
90-6899-5	5	90-6899-15	17	90-6899-25	27
90-6899-6	6	90-6899-16	18	90-6899-26	28
90-6899-7	9	90-6899-17	19	90-6899-27	29
90-6899-8	10	90-6899-18	20	90-6899-28	30
90-6899-9	11	90-6899-19	21	90-6899-29	31
90-6899-10	12	90-6899-20	22	90-6899-30	32

Parameter Analysed	Preparation Date	Analysis Date	Batch Number	Method Number	Actual MDL	Blank Result	Sample Result	Duplicate Result	RPD Sample	Maximum RPD	MS Result	True MS Result	% Rec MS	Limits % Rec
Chromium	11-16-90	11-21-90	cra-316	200.7	0.01	BDL	0.01	0.01	0	12	0.46	0.50	92	80-122

A-11

Notes:
N/S = Not Submitted.
PPM = Parts per million, mg/l.
BDL = Below Detection Limit.
Results reported are blank corrected.
Control Limits are from internal quality assurance program and the referenced method.

Reference:
EPA 600/4-79-020, Revised March 1983.
(Samples were prepped according to C.A.R.B. Method 425, but analyzed by EPA Method 200.7 per customer).

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

NEESA
CODE 111C1
ATTN: DREK NEWTON
PORT HUENEME CA 93043-0000

Lab I.D.#: 90-6899A
Order Number: P37067
Order Date: 12/01/90
Client: 14012
Sampled By: N/S
Sample Date: 11/8&10
Sample Time: N/S

Project Number: N/S
Project Name: N/S
Sample Site: NAD BLDG 604
Sample Type: AIR

N/S = Not Submitted

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
6899A-1	14	CHROMIUM	PPM	0.01	0.01
6899A-2	18	CHROMIUM	PPM	BDL	0.01
6899A-3	27	CHROMIUM	PPM	N/R	0.5

RECHECKED

Comments: PPM = Parts Per Million, mg/l. Method Reference: EPA 600/4-79-020, Revised March 1983 and California Air Resource Board, Method 426.
N/R = Not Run

Approved By : John V Hawkins

end of report

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

QUALITY CONTROL DATA

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

Client Name: NEESA

Project No: N/S
Lab ID NO: 90-6899A
QC Level: I

Lab I.D. No.	Client I.D.
90-6899A-1	14
90-6899A-2	18

Parameter Analyzed	Preparation Date	Analysis Date	Batch Number	Method Number	Actual MDL	Blank Result	Sample Result	Duplicate Result	RPD Sample	Maximum RPD	MS Result	True MS Result	% Rec MS	Limits % Rec
Chromium	12-09-90	12-11-90	crw-331	218.2*	0.01	BDL	0.02	0.02	0	12	0.48	0.50	96	80-122

Notes:
N/S = Not submitted.
PPM = Parts Per Million (mg/l).
BDL = Below Detection Limit.
Results reported are blank corrected.
Control Limits are from ATI's internal quality assurance program and the referenced method.
*Sample preppped according to C.A.R.B. method 426 but analyzed by the EPA method.

Reference:
EPA 600/4-79-020, Revised March 1983 and
California Air Resource Board, Method 426.

A-14

CHAIN OF CUSTODY

PARAMETERS/SAMPLE BOTTLE/CONTAINER DESCRIPTION/PRESERVATIVES

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

LAB. I.D. # 90-6897

CLIENT NEESA

ADDRESS CODE 1101 PORT HUENEME

CITY

STATE CA ZIP 93043

PHONE NO. (805) 982-3903

PROJECT NUMBER

PROJECT NAME

SAMPLED BY

SAMPLE SITE NAD Bldg 604

A-15

PURCHASE ORDER NUMBER

PROJECT MANAGER (person to receive data) Drew Newton

REQUEST FAX DATA TO _____ (FAX #)

REQUEST VERBAL RESULTS BY _____ (DATE)

NEED DATA PACKAGE BY _____ (DATE)

QUALITY CONTROL REPORTING LEVEL

0 1 2 3 4 (circle one)

NEED _____ EXTRA COPIES OF REPORT

SAMPLE MATRIX

DW DRINKING WATER
WW WASTEWATER
GW GROUNDWATER
SW SURFACE WATER
SO SOIL
OL OIL
AR AIR
SL SLUDGE
HZ HAZARDOUS

SAMPLE I.D.	DATE	TIME	MATRIX										TOTAL	LAB USE ONLY
1	11/8		AIR											1
2	"													2
3	"													3
4	"													4
5	"													5
6	"													6
9	11/10													7
10	"													8
11	"													9
12	"													10
13	"													11
14	"													12
15	"													13
16	"													14
17	"													15
TOTAL NUMBER OF BOTTLES/CONTAINERS														

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
[illegible]	11/13		Jimmy Mills	11/13	1215

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TURN AROUND TIME
(NORMAL) ☐ 2 WEEKS
RUSH: ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 1 WEEK

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☒ Return

SPECIAL INSTRUCTIONS:
REPORT RESULTS mg/liter
TOTAL CHROME ONLY
NOTE #7, 8 will be delivered 11/14 or 11/15
(X) MAY NEED graphite furnace for lower detection limit per memo).

FORM #82490 — METRO PRINTING, INC. HUNTSVILLE, ALABAMA 35801

WHITE — LAB CANARY — CLIENT PINK — REPORT

CHAIN OF CUSTODY

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

LAB. I.D. # 90-6879

CLIENT NEESA

ADDRESS 1101

CITY PORT HUENEME

STATE CA ZIP 93043

PHONE NO. (805) 982-3903

PROJECT NUMBER

PROJECT NAME

SAMPLED BY

SAMPLE SITE NAD Bldg 604

A-16

PURCHASE ORDER NUMBER

PROJECT MANAGER (person to receive data)
Drek Newton

REQUEST FAX DATA TO _____ (FAX #)

REQUEST VERBAL RESULTS BY _____ (DATE)

NEED DATA PACKAGE BY _____ (DATE)

QUALITY CONTROL REPORTING LEVEL
0 1 2 3 4 (circle one)

[redacted]

SAMPLE MATRIX

DW DRINKING WATER
WW WASTEWATER
GW GROUNDWATER
SW SURFACE WATER
SO SOIL
OL OIL
AR AIR
SL SLUDGE
HZ HAZARDOUS

PARAMETERS/SAMPLE BOTTLE/CONTAINER DESCRIPTION/PRESERVATIVES

SAMPLE I.D.	DATE	TIME	MATRIX										TOTAL	LAB USE ONLY
18	11/10		AIR											16
19	"													17
20	"													18
21	"													19
22														20
23														21
24														22
25														23
26														24
27														25
28														26
29														27
30														28
31														29
32														30

TOTAL NUMBER OF BOTTLES/CONTAINERS

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
[signature]	11/13		Jimmy Mills	11/13	1215

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TURN AROUND TIME
(NORMAL) ☐ 2 WEEKS
RUSH: ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 1 WEEK

SAMPLE DISPOSAL INSTRUCTIONS
☐ ATI Disposal @ $5.00 each ☒ Return

SPECIAL INSTRUCTIONS:
REPORT RESULTS mg/liter
TOTAL CHROME ONLY
(X) MAY NEED graphite furnace for lower detect. limit
Per memo

[redacted]

FORM #B2490 — METRO PRINTING, INC. HUNTSVILLE, ALABAMA 35801
WHITE — LAB CANARY — CLIENT PINK — REPORT

AnalyticalTechnologies,Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

NEESA
CODE 111C1
ATTN: DREK NEWTON
PORT HUENEME CA 00009-3043

Lab I.D.#: 90-6925
Order Number: P36430
Order Date: 11/14/90
Client: 14012
Sampled By: N/S
Sample Date: 11/14/90
Sample Time: N/S

N/S = Not Submitted

Project Number: N/S
Project Name: N/S
Sample Site: NAD BLDG 604
Sample Type: AIR

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
6925-1	7	CHROMIUM	PPM	0.65	0.01
6925-2	8	CHROMIUM	PPM	0.011	0.003

Comments: Method Reference: EPA 600/4-79-020, Revised March 1983.
(Samples were prepped according to C.A.R.B.
Method 425, But analyzed by EPA Method 200.7 per customer).

Approved By : John U Hawkins

end of report

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

QUALITY CONTROL DATA

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

Client Name: NEESA

Project No: N/S
Lab ID NO: 90-6925
QC Level: I

Lab I.D. No.	Client I.D.
90-6925-1	7
90-6925-2	8

Parameter Analysed	Preparation Date	Analysis Date	Batch Number	Method Number	Actual MDL	Blank Result	Sample Result	Duplicate Result	RPD Sample	Maximum RPD	MS Result	True MS Result	% Rec MS	Limits % Rec
Chromium	11-16-90	11-21-90	cra-316	200.7	0.01	BDL	0.01	0.01	0	12	0.46	0.50	92	80-122

A-19

Notes:
N/S = Not Submitted.
PPM = Parts per million, mg/l.
BDL = Below Detection Limit.
Results reported are blank corrected.
Control Limits are from internal quality assurance program and the referenced method.

Reference:
EPA 600/4-79-020, Revised March 1983.
(Samples were prepped according to C.A.R.B. Method 425, but analyzed by EPA Method 200.7 per customer).

CHAIN OF CUSTODY

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

LAB. I.D. # 96-6925

CLIENT NEESA

ADDRESS CCDE111C1

CITY PORT HUENEME

STATE CA ZIP 93043

PHONE NO. (805) 982 3903

PROJECT NUMBER

PROJECT NAME

SAMPLED BY

SAMPLE SITE NAD BLDG 604

A-20

PURCHASE ORDER NUMBER

PROJECT MANAGER (person to receive data)
DAREK NEWTON

REQUEST FAX DATA TO ______ (FAX #)

REQUEST VERBAL RESULTS BY ______ (DATE)

NEED DATA PACKAGE BY ______ (DATE)

QUALITY CONTROL REPORTING LEVEL
0 1 2 3 4 (circle one)

NEED ______ EXTRA COPIES OF REPORT

SAMPLE MATRIX

DW DRINKING WATER
WW WASTEWATER
GW GROUNDWATER
SW SURFACE WATER
SO SOIL
OL OIL
AR AIR
SL SLUDGE
HZ HAZARDOUS

PARAMETERS/SAMPLE BOTTLE/CONTAINER DESCRIPTION/PRESERVATIVES

SAMPLE I.D.	DATE	TIME	MATRIX											TOTAL	LAB USE ONLY
7	11/14		AIR												
8	11/14		AIR												

TOTAL NUMBER OF BOTTLES/CONTAINERS

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
[signature]	11/14	515pm	Joseph Pope	10/14	1715

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TURN AROUND TIME
(NORMAL) ☐ 2 WEEKS
RUSH: ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 1 WEEK

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ Return

SPECIAL INSTRUCTIONS:
LAST TWO SAMPLES FOR TOTAL CHROMIUM ANALYSIS.

FORM #82490 — METRO PRINTING, INC. HUNTSVILLE, ALABAMA 35801

WHITE — LAB CANARY — CLIENT PINK — REPORT

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

NEESA
CODE 111C1
ATTN: DREK NEWTON
PORT HUENEME CA 93043-0000

Lab I.D.#: 90-7037A
Order Number: P36611
Order Date: 11/19/90
Client: 14012
Sampled By: NEESA
Sample Date: 11/13&15
Sample Time: N/S

N/S = Not Submitted

Project Number: 91M0808
Project Name: N/S
Sample Site: NAD BLDG 604
Sample Type: AIR

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
7037A-1	PAIR 33,40	CYANIDE,TOTAL	UG	27	2.5
7037A-2	PAIR 34,39	CYANIDE,TOTAL	UG	31	2.5
7037A-3	PAIR 35,41	CYANIDE,TOTAL	UG	9.4	2.5
7037A-4	PAIR 36,43	CYANIDE,TOTAL	UG	988	2.5
7037A-5	PAIR 38,44	CYANIDE,TOTAL	UG	1078	2.5
7037A-6	PAIR 37,45	CYANIDE,TOTAL	UG	357	2.5
7037A-7	CN BLANK 42	CYANIDE,TOTAL	UG	BDL	2.5

Comments: UG = Micrograms. BDL = Below Detection Limits. Method Ref: California Air Resource Board, Method 426 and EPA 600/4-79-020, Revised March 1983.

Approved By : John V Hawkins

end of report

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

QUALITY CONTROL DATA

AnalyticalTechnologies,Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

Client Name: NEESA

Project No: N6258391M0808
Lab ID NO: 90-7037A
QC Level: I

Lab I.D. No.	Client I.D.	Lab I.D. No.	Client I.D.
90-7037A-1	Pair 33,40	90-7037A-5	Pair 38,44
90-7037A-2	Pair 34,39	90-7037A-6	Pair 37,45
90-7037A-3	Pair 35,41	90-7037A-7	CN Blank 42
90-7037A-4	Pair 36,43		

Parameter Analysed	Preparation Date	Analysis Date	Batch Number	Method Number	Actual MDL	Blank Result	Sample Result	Duplicate Result	RPD Sample	Maximum RPD	MS Result	True MS Result	% Rec MS	Limits % Rec
Cyanide,Total	11-27-90	11-27-90	tcn-25	335.3*	0.005	BDL	BDL	BDL	N/C	20	0.058	0.05	116	27-153

A-23

Notes: N/C= Noncalculable - at least one result = BDL.
Results reported in ug.
BDL = Below Detection Limit.
Results reported are blank corrected.
Control Limits are from internal quality assurance program and the referenced method.
*Sample prepped according to C.A.R.B. method 426 but analyzed by the EPA method.

Reference: EPA 600/4-79-020, Revised, March 1983 and California Air Resource Board, Method 426.

CHAIN OF CUSTODY

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

LAB. I.D. # 90-7037 A+B

CLIENT NEESA

ADDRESS CODE 111C

CITY PORT HUENEME

STATE CA ZIP 93043

PHONE NO. (805) 982 3903

PROJECT NUMBER

PROJECT NAME

SAMPLED BY NEESA

SAMPLE SITE NAD BLDG 604

PURCHASE ORDER NUMBER N62583910M0808

PROJECT MANAGER (person to receive data) DREK NEWTON

REQUEST FAX DATA TO _____ (FAX #)

REQUEST VERBAL RESULTS BY _____ (DATE)

NEED DATA PACKAGE BY _____ (DATE)

QUALITY CONTROL REPORTING LEVEL

0 1 2 3 4 (circle one)

NEED [redacted] EXTRA COPIES OF REPORT

FORM #82100 METRO PRINTING, INC. HUNTSVILLE, ALABAMA 35801

SAMPLE MATRIX

DW DRINKING WATER
WW WASTEWATER
GW GROUNDWATER
SW SURFACE WATER
SO SOIL
OL OIL
AR AIR
SL SLUDGE
HZ HAZARDOUS

PARAMETERS/SAMPLE BOTTLE/CONTAINER DESCRIPTION/PRESERVATIVES

SAMPLE I.D.	DATE	TIME	MATRIX	TOTAL	LAB USE ONLY
PAIR [33, 40]	11/13		AIR		
PAIR [34, 39]					
PAIR [35, 41]					
PAIR [36, 43]	11/15				
PAIR [38, 44]					
PAIR [37, 45]					
CN BLANK 42					
				TOTAL NUMBER OF BOTTLES/CONTAINERS	

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE
Drek Newton	11/19	1330	John Hawkins	11/19

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TURN AROUND TIME

(NORMAL) ☐ 2 WEEKS

RUSH: ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 1 WEEK

SAMPLE DISPOSAL INSTRUCTIONS

☐ [redacted] Disp[redacted] $5.0[redacted]n [redacted] [redacted] ☒ [redacted]n [redacted]

SPECIAL INSTRUCTIONS:

~~BOR~~ PAIRS ARE TO BE COMBINED AND ANALYZED FOR CYANIDE PER CARB METHOD 426

ALSO TOTAL CHROMIUM PER CARB 425

AnalyticalTechnologies,Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

NEESA
CODE 111C1
ATTN: DREK NEWTON
PORT HUENEME CA 93043-0000

Lab I.D.#: 90-7037B
Order Number: P36612
Order Date: 11/19/90
Client: 14012
Sampled By: NEESA
Sample Date: 11/13&15
Sample Time: N/S

N/S = Not Submitted

Project Number: 91M0808
Project Name: N/S
Sample Site: NAD BLDG 604
Sample Type: AIR

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
7037B-1	~~PAIR 33~~,40	CHROMIUM	UG	2.7	0.5
7037B-2	~~PAIR 34~~,39	CHROMIUM	UG	3.7	0.5
7037B-3	~~PAIR 35~~,41	CHROMIUM	UG	BDL	0.5
7037B-4	~~PAIR 36~~,43	CHROMIUM	UG	BDL	0.5
7037B-5	~~PAIR 38~~,44	CHROMIUM	UG	BDL	0.5
7037B-6	~~PAIR 37~~,45	CHROMIUM	UG	BDL	0.5
7037B-7	CN BLANK 42	CHROMIUM	UG	BDL	0.5

* NOTE FILTER SAMPLES 33-37 WERE NOT ANALYZED FOR CHROMIUM. THEY WERE CONSUMED DURING CYANIDE ANALYSIS.

Comments: UG = Micrograms. BDL = Below Detection Limits. Method References: EPA 600/4-79-020, Revised March 1983 and California Air Resource Board, Method 426.

Approved By : John V Hawkins

end of report

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

QUALITY CONTROL DATA

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

Client Name: NEESA

Project No: N6258391M0808
Lab ID NO: 90-7037B
QC Level: I

Lab I.D. No.	Client I.D.	Lab I.D. No.	Client I.D.
90-7037B-1	PAIR 33,40	90-7037B-5	PAIR 38,44
90-7037B-2	PAIR 34,39	90-7037B-6	PAIR 37,45
90-7037B-3	PAIR 35,41	90-7037B-7	CN BLANK 42
90-7037B-4	PAIR 36,43		

Parameter Analysed	Preparation Date	Analysis Date	Batch Number	Method Number	Actual MDL	Blank Result	Sample Result	Duplicate Result	RPD Sample	Maximum RPD	MS Result	True MS Result	% Rec MS	Limits % Rec
Chromium	11-29-90	12-07-90	crG-13	218.2*	0.5	0.8	BDL	BDL	N/C	20	52	50	104	75-125

Note:
N/C = Not Calculable - at least one result = BDL.
BDL = Below Detection Limit.
Results reported in ug.
Results reported are blank corrected.
*Sample prepped according to C.A.R.B. method 426 but analyzed by EPA method.
Control Limits are from ATI's internal quality assurance program and the referenced method.

Reference:
EPA 600/4-79-020, Revised March 1983 and
California Air Resource Board, Method 426.

A-27

CHAIN OF CUSTODY

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

LAB. I.D. # 90-7037 A+B

CLIENT NEESA
ADDRESS CODE 111C
CITY PORT HUENEME
STATE CA ZIP 93043
PHONE NO. (805) 982 3903

PROJECT NUMBER
PROJECT NAME
SAMPLED BY NEESA
SAMPLE SITE NAD BLDG 604

PURCHASE ORDER NUMBER
N62583910M0808

PROJECT MANAGER (person to receive data)
DREK NEWTON

REQUEST FAX DATA TO _____ (FAX #)
REQUEST VERBAL RESULTS BY _____ (DATE)
NEED DATA PACKAGE BY _____ (DATE)

QUALITY CONTROL REPORTING LEVEL
0 1 2 3 4 (circle one)

[redacted] EXTRA COPIES OF REPORT

SAMPLE MATRIX

DW DRINKING WATER
WW WASTEWATER
GW GROUNDWATER
SW SURFACE WATER
SO SOIL
OL OIL
AR AIR
SL SLUDGE
HZ HAZARDOUS

PARAMETERS/SAMPLE BOTTLE/CONTAINER DESCRIPTION/PRESERVATIVES

SAMPLE I.D.	DATE	TIME	MATRIX	TOTAL	LAB USE ONLY
PAIR [33, 40]	11/13		AIR		
PAIR [34, 39]					
PAIR [35, 41]					
PAIR [36, 43]	11/15				
PAIR [38, 44]					
PAIR [37, 45]					
CN BLANK 42					

TOTAL NUMBER OF BOTTLES/CONTAINERS

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
Drek Newton	11/19	1330	John V Hawkins	11/19	1330

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TURN AROUND TIME
(NORMAL) ☐ 2 WEEKS
RUSH: ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 1 WEEK

SAMPLE DISPOSAL INSTRUCTIONS
☐ [redacted] Dispo[redacted] $5.00 [redacted] ☒ [redacted]

SPECIAL INSTRUCTIONS:
~~BOR~~ PAIRS ARE TO BE COMBINED AND ANALYZED FOR CYANIDE PER CARB METHOD 426
ALSO TOTAL CHROMIUM PER CARB 425

A-28

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

NEESA
CODE 111C1
ATTN: DREK NEWTON
PORT HUENEME CA 93043-0000

Lab I.D.#: 90-7038
Order Number: P36607
Order Date: 11/19/90
Client: 14012
Sampled By: NEESA
Sample Date: 11/15&16
Sample Time: N/S

Project Number: 91-M-0808
Project Name: N/S
Sample Site: NAD BLDG 604
Sample Type: AIR

N/S = Not Submit d

Lab ID	Sample ID	Parameter	Units	Results	Detect n Limit
7038-1	PAIR 54,47	CADMIUM	UG	45	0.01
7038-2	PAIR 55,49	CADMIUM	UG	1.5	0.01
7038-3	PAIR 56,50	CADMIUM	UG	1.5	0.01
7038-4	PAIR 51,57	CADMIUM	UG	0.02	0.01

Comments: Method References: EPA 600/4-79-020, Revised March 1983.

Approved By :

end of repo t

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

QUALITY CONTROL DATA

AnalyticalTechnologies,Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

Client Name: Neesa

Project No: N6258391M0808
Lab ID NO: 90-7038
QC Level: 1

Lab I.D. No.	Client I.D.
90-7038-1	Pair 54,47
90-7038-2	Pair 55,49
90-7038-3	Pair 56,50
90-7038-4	Pair 51,57

Parameter Analyzed	Preparation Date	Analysis Date	Batch Number	Method Number	Actual MDL	Blank Result	Sample Result	Duplicate Result	RPD Sample	Maximum RPD	MS Result	True MS Result	% Rec MS	Limits % Rec
Cadmium	11-29-90	12-03-90	cds-223	426	0.01	BDL	BDL	BDL	N/C	13	0.45	0.50	90	75-114

A-31

Notes:
N/C = Noncalculable - at least one result = BDL.
PPM = Parts Per Million (mg/l).
BDL = Below Detection Limit.
Results reported are blank corrected.
Control Limits are from ATI's internal quality assurance program and the referenced method.

Reference: California Air Resources Board, Iorganic Section 1988.

CHAIN OF CUSTODY

PARAMETERS/SAMPLE BOTTLE/CONTAINER DESCRIPTION/PRESERVATIVES

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

LAB. I.D. # 962-7038 ~~962-7039 A+B~~

CLIENT NEESA

ADDRESS CODE 111C

CITY PORT HUENEME

STATE CA ZIP 93043

PHONE NO. (805) 982-3903

PROJECT NUMBER

PROJECT NAME

SAMPLED BY NEESA

SAMPLE SITE NAD BLDG 604

PURCHASE ORDER NUMBER N62583911M0808

PROJECT MANAGER (person to receive data)

REQUEST FAX DATA TO _____ (FAX #)

REQUEST VERBAL RESULTS BY _____ (DATE)

NEED DATA PACKAGE BY _____ (DATE)

QUALITY CONTROL REPORTING LEVEL

0 1 2 3 4 (circle one)

NEED _____ EXTRA COPIES OF REPORT

SAMPLE MATRIX

DW DRINKING WATER
WW WASTEWATER
GW GROUNDWATER
SW SURFACE WATER
SO SOIL
OL OIL
AR AIR
SL SLUDGE
HZ HAZARDOUS

SAMPLE I.D.	DATE	TIME	MATRIX	TOTAL	LAB USE ONLY
PAIR [54	11/15		AIR		1
47	↓				
PAIR [55	11/16				2
49					
PAIR [56					3
50					
PAIR [51					4
BLANK 57					
TOTAL NUMBER OF BOTTLES/CONTAINERS					

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
[signature]	11/19	1130	John Hawkins	11/19	1211
					13

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TURN AROUND TIME

(NORMAL) ☐ 2 WEEKS

RUSH: ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 1 WEEK

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ [redacted]n

SPECIAL INSTRUCTIONS:
ANALYZE PAIRS FOR CADMIUM PER CARB METHOD 424

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AnalyticalTechnologies,Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

NEESA
CODE 111C1
ATTN: DREK NEWTON
PORT HUENEME CA 93043-0000

Lab I.D.#: 90-7837
Order Number: P37775
Order Date: 12/17/90
Client: 14012
Sampled By: NEESA
Sample Date: 12/14/90
Sample Time: N/S

N/S = Not Submitted

Project Number: N/S
Project Name: N/S
Sample Site: NAD PENSACOLA
Sample Type: AIR

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
7837-1	48	CADMIUM	PPM	0.0270	0.0002

Comments: PPM = Parts Per Million, mg/l. Method Reference: EPA 600/4-79-020, Revised March 1983 and California Air Resource Board, Method 424.

Approved By : John V Hawkins

end of report

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

QUALITY CONTROL DATA

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

Client Name: NEESA

Project No: N/S
Lab ID NO: 90-7837
QC Level: 1

Lab I.D. No.	Client I.D.
90-7837-1	48

Parameter Analyzed	Preparation Date	Analysis Date	Batch Number	Method Number	Actual MDL	Blank Result	Sample Result	Duplicate Result	RPD Sample	Maximum RPD	MS Result	True MS Result	% Rec MS	Limits % Rec
Cadmium	12-24-90	12-28-90	Cd-142	213.2	0.0002	BDL	0.0006	0.0005	18*	15	0.0018	0.0020	90	68-134

Notes:
* = Sample duplicated < 5x the detection limit.
PPM = Parts Per Million (mg/l).
BDL = Below Detection Limit.
Results reported are blank corrected.
Control Limits are from ATI's internal quality assurance program and the referenced method.
N/S = Not Submitted.

Reference: EPA 600/4-79-020, Revised March 1983 and the California Resource Board, Method 424.

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CHAIN OF CUSTODY

AnalyticalTechnologies,Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

LAB. I.D. # 90-7837

CLIENT NEESA

ADDRESS CODE 111C1

CITY PORT HUENEME CA

STATE CA ZIP 93043

PHONE NO. (805 982-3903

PROJECT NUMBER ______

PROJECT NAME ______

SAMPLED BY NEESA

SAMPLE SITE NAD PENSACOLA

PURCHASE ORDER NUMBER
N6258391MØ8Ø8

PROJECT MANAGER (person to receive data)
DREK NEWTON

REQUEST FAX DATA TO ~~5383~~ 805 982 5388 (FAX #)

REQUEST VERBAL RESULTS BY ______ (DATE)

NEED DATA PACKAGE BY ______ (DATE)

QUALITY CONTROL REPORTING LEVEL

0 1 2 3 4 (circle one)

[redacted] NEED [redacted] EXTRA COPIES OF [redacted]

SAMPLE MATRIX

DW DRINKING WATER
WW WASTEWATER
GW GROUNDWATER
SW SURFACE WATER
SO SOIL
OL OIL
AR AIR
SL SLUDGE
HZ HAZARDOUS

PARAMETERS/SAMPLE BOTTLE/CONTAINER DESCRIPTION/PRESERVATIVES

SAMPLE I.D.	DATE	TIME	MATRIX										TOTAL	LAB USE ONLY
48	12/14		AIR											

TOTAL NUMBER OF BOTTLES/CONTAINERS

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
[signature]	12/17	0900	[signature] Jimmy Mills	12/17	0900

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TURN AROUND TIME

(NORMAL) ☐ 2 WEEKS

RUSH: ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 1 WEEK

SAMPLE DISPOSAL INSTRUCTIONS

☐ [redacted] Disp[redacted] $5.0[redacted]n ☐ [redacted]n

SPECIAL INSTRUCTIONS:
ANALYZE FOR CADMIUM PER CARB #424

FORM #82490

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

NEESA
CODE 111C1
ATTN: DREK NEWTON
PORT HUENEME CA 93043-0000

Lab I.D.#: 90-7836
Order Number: P37777
Order Date: 12/17/90
Client: 14012
Sampled By: N/S
Sample Date: 12/14-16
Sample Time: N/S

Project Number: 91M0808
Project Name: N/S
Sample Site: N/S
Sample Type: AIR

N/S = Not Submitted

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
7836-1	CD-1F	CYANIDE,TOTAL	UG	9.2	2.5
7836-2	CD-1R	CYANIDE,TOTAL	PPM	0.106	0.005
7836-3	CD-2F	CYANIDE,TOTAL	UG	ND	2.5
7836-4	CD-2R	CYANIDE,TOTAL	PPM	0.035	0.005
7836-5	CD-3F	CYANIDE,TOTAL	UG	ND	2.5
7836-6	CD-3R	CYANIDE,TOTAL	PPM	0.026	0.005
7836-7	CD-4F	CYANIDE,TOTAL	UG	ND	2.5
7836-8	CD-4R	CYANIDE,TOTAL	PPM	0.011	0.005

Comments: PPM = Parts Per Million, mg/l. UG = Micrograms. ND = Not Detected, Sample was Prepared Improperly During Distillation Process. Method Ref: California Air Resource Board Method 426.

Approved By : E. Michelatti

end of report

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

QUALITY CONTROL DATA

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

Client Name: NEESA

Project No: 91M0808
Lab ID NO: 90-7836
QC Level: I

Lab I.D. No.	Client I.D.
90-7836-1	CD-1F
90-7836-3	CD-2F
90-7836-5	CD-3F
90-7836-7	CD-4F

Parameter Analyzed	Preparation Date	Analysis Date	Batch Number	Method Number	Actual MDL	Blank Result	Sample Result	Duplicate Result	RPD Sample	Maximum RPD	MS Result	True MS Result	% Rec MS	Limits % Rec
Cyanide,T	12-20-90	12-31-90	cyn-A33	426	0.005	BDL	BDL	BDL	N/C	20	11.6	10.0	116	42-136

Notes:
N/C = Not Calculable due to at least one result = BDL.
PPM = Parts Per Million (mg/l).
BDL = Below Detection Limit.
Results reported are blank corrected.
Control Limits are from ATI's internal quality assurance program and the referenced method.

Reference: California Air Resource Board, Inorganic Section, January 1987.

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CHAIN OF CUSTODY

AnalyticalTechnologies, Inc.
11 EAST OLIVE ROAD
PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

LAB. I.D. # 90-7836

CLIENT NEESA

ADDRESS CODE 111C1

CITY PORT HUENEME

STATE CALIF ZIP 93043

PHONE NO. (805) 982-3903

PROJECT NUMBER

PROJECT NAME

SAMPLED BY

SAMPLE SITE

PURCHASE ORDER NUMBER
N6258391M0808

PROJECT MANAGER (person to receive data)
DREK NEWTON

REQUEST FAX DATA TO 805 982 5388 (FAX #)

REQUEST VERBAL RESULTS BY _____ (DATE)

NEED DATA PACKAGE BY _____ (DATE)

QUALITY CONTROL REPORTING LEVEL
0 1 2 3 4 (circle one)

[redacted] _____ EXTRA COPIES OF REPORT

FORM #82490 — METRO PRINTING, INC. HUNTSVILLE, ALABAMA 35804

SAMPLE MATRIX

DW DRINKING WATER
WW WASTEWATER
GW GROUNDWATER
SW SURFACE WATER
SO SOIL
OL OIL
AR AIR
SL SLUDGE
HZ HAZARDOUS

PARAMETERS/SAMPLE BOTTLE/CONTAINER DESCRIPTION/PRESERVATIVES

SAMPLE I.D.	DATE	TIME	MATRIX		TOTAL	LAB USE ONLY
CD-1F	12/14		AIR	RUN 1 FILTER		
CD-1R*	"		"	RUN 1 FRONT & BACK HALF RECOVERY		
*(795.3 g)	NET					
CD-2F	12/15		"	RUN 2 FILTER		
CD-2R*	"		"	ETCETERA		
*(562.13 g)	NET					
CD-3F	12/15		"	RUN 3		
CD-3R*	"		"			
*(712.37 g)	NET					
CD-4F	12/16		"	RUN 4		
CD-4R*	"		"			
*(516.9 g)	NET					
				TOTAL NUMBER OF BOTTLES/CONTAINERS		

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
[signature]	12/17	0900	Jimmy Mills	12/17	0900

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TURN AROUND TIME
(NORMAL) ☐ 2 WEEKS
RUSH: ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 1 WEEK

SAMPLE DISPOSAL INSTRUCTIONS

[redacted] ☐ [redacted] spos[redacted] $5.00 [redacted] ☐ [redacted]

SPECIAL INSTRUCTIONS:
ANALYZE FOR CYANIDE PER CARB 426

Sample Log

Lab ID	NEESA ID	Date collect
1	Line1 Run1 outlet front 1/2	11/8
2	1-2 outlet front 1/2	11/8
3	1-1 Imp1	11/8
4	1-1 Imp 2,3, glass filter	11/8
5	1-2 imp1	11/8
6	1-2 imp 2-3 glass filter	11/8
7	QA ✓ 0.5ppm ± 10%	11/8
8	QA ✓ 0.01ppm ± 20%?	11/8
9	Line3 run1 IN IMP1,2,3 glass filter	11/10
10	Lin 3 run2 IN imp1,2,3 glass filter	11/10
11	Line3 Run2 out imp1	11/10
12	Line 3 run1 Inlet front 1/2	11/10
13	Lin 3 run 2 Inlet front probe	11/10
14	Lin 3 run 2 Out front probe	11/10
15	Lin 3 run 2 out imp 2,3 glass filter	11/10
16	Line 3 run1 out imp 1	11/10

Lab ID	NEESA ID	Date collect
17	Lin3 Run1 Out imp 2,3, glass filter	11/10
18	Lin 3 Run1 out front probe	11/10
19	NaOH Blank 0.1N	11/10
20	3-3 IN IMP1	11/10
21	3-3 IN Probe front	11/10
22	3-4 IN probe front	11/10
23	3-3 Out Probe front	11/10
24	3-3 IN imp 2,3, glass filter	11/10
25	3-4 IN IMP1	11/10
26	3-4 IN 2,3, glass, filter	11/10
27	NaOH W/ FILTER BLANK.	11/10
28	3-3 out imp 1	11/10
29	3-3 out imp 2,3, glass filter	11/10
30	3-4-OUT IMP 1	11/10
31	3-4 Out probe front	11/10
32	3-4-Out imp 2,3, glass filter	11/10

LAB ID	NEESA ID	Date collect
33	4-1-OUT filter	11/13
✓34	4-2-OUT filter	11/13
✓35	4-3-OUT filter	11/13
✓36	6-1-OUT filter	11/15
✓37	~~[illegible]~~ 6-3 OUT filter	11/15
✓38	6-2-OUT filter	11/15
✓39	4-2-OUT front probe BACK	11/13
40	Probe front + BACK 4-1-OUT	11/13
✓41	4-3-OUT front probe BACK	11/13
✓42	BLANK. one filter 0.1N NaOH + 2 575ml	11/13
✓43	6-1-OUT Probe front BACK	11/15
✓44	6-2-OUT Probe front BACK	11/15
45	6-3-OUT Probe front BACK	11/15
46	CA Spike	11/16?

CAN (ACIDS)

Lab ID	NEESA ID	Date collect
47	6-4-OUT CAD front probe BACK	11/15
48	CD Spike	11/16
49	6-5-OUT front probe BACK	11/16
50	6-6-OUT front BACK	11/16
51	0.1N HNO_3 BLANK	
52		
53		
54	6-4-OUT PETRI CAD filter	11/15
55	6-5-OUT petri filter	11/16
56	6-6-OUT petri filter	11/16
57	petri BLANK.	11/16

CHROMIUM EMISSION TEST
RECOVERY SHEET

1-1-OUT

[.] 1. Preweigh container #1.
[✓] 2. Rinse the front half using 0.1N NaOH into container #1.
[✓] 3. Weigh container #1.
[✓] 4. Record sample identification here #1 (1-1 front½)

Tare Weight	Final Weight	Total Weight
53.1	168.56	115.46

[✓] 5. Preweigh container #2.
[✓] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[✓] 7. Weigh container #2.
[✓] 8. Record sample identification here #3 (1-1 imp 1)

Tare Weight	Final Weight	Total Weight
53.2	226.65	173.45

[✓] 9. Preweigh container #3.
[✓] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[✓] 11. Weigh container #3.

Tare Weight	Final Weight	Total Weight
52.9	199.55	146.65

[✓] 12. Carefully place the filter into container #3.
[✓] 13. Record sample identification here #4 (1-1 imp2, 3, glass, filter)
[✓] 14. Mark the fluid levels on the containers.
[✓] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

1-2-OUT

[✓] 1. Preweigh container #1.
[✓] 2. Rinse the front half using 0.1N NaOH into container #1.
[✓] 3. Weigh container #1.
[✓] 4. Record sample identification here 2# (1-2 front)

Tare Weight	Final Weight	Total Weight
53.07	178.81	125.74

[ ] 5. Preweigh container #2.
[ ] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[ ] 7. Weigh container #2.
[ ] 8. Record sample identification here #5 (1-2 imp 1)

Tare Weight	Final Weight	Total Weight
53.27	231.93	178.66

[ ] 9. Preweigh container #3.
[ ] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[ ] 11. Weigh container #3.

Tare Weight	Final Weight	Total Weight
52.88	200.25	147.37

[ ] 12. Carefully place the filter into container #3.
[ ] 13. Record sample identification here #6 (1-2 imp 2, 3 glass, filter)
[ ] 14. Mark the fluid levels on the containers.
[ ] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

3-1-1N

[✓] 1. Preweigh container #1.
[✓] 2. Rinse the front half using 0.1N NaOH into container #1.
[✓] 3. Weigh container #1.
[✓] 4. Record sample identification here #12 front & probe noz TUBE

Tare Weight	Final Weight	Total Weight
53.14	144.16	91.02

[✓] 5. Preweigh container #2.
[✓] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[✓] 7. Weigh container #2.
[✓] 8. Record sample identification here #9 imp 1, 2, 3, glass, filter

Tare Weight	Final Weight	Total Weight
53.45	302.98	249.53

[✓] 9. Preweigh container #3.
[ ] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[✓] 11. Weigh container #3.

Tare Weight	Final Weight	Total Weight

[ ] 12. Carefully place the filter into container #3.
[ ] 13. Record sample identification here _____
[ ] 14. Mark the fluid levels on the containers.
[ ] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

3-2-1N

[ ] 1. Preweigh container #1.
[ ] 2. Rinse the front half using 0.1N NaOH into container #1.
[ ] 3. Weigh container #1.
[ ] 4. Record sample identification here #13 probe wash & front

Tare Weight	Final Weight	Total Weight
53.14	185.68	132.54

[ ] 5. Preweigh container #2.
[ ] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[ ] 7. Weigh container #2.
[ ] 8. Record sample identification here #10 imp 1 2, 3 glassware

Tare Weight	Final Weight	Total Weight
53.27	304.37	251.10

[ ] 9. Preweigh container #3.
[ ] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[ ] 11. Weigh container #3.

Tare Weight	Final Weight	Total Weight

[ ] 12. Carefully place the filter into container #3.
[ ] 13. Record sample identification here _____
[ ] 14. Mark the fluid levels on the containers.
[ ] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

3-3-1N

[ ] 1. Preweigh container #1.
[ ] 2. Rinse the front half using 0.1N NaOH into container #1.
[ ] 3. Weigh container #1.
[ ] 4. Record sample identification here #21 Run 3 Run 3 inlet Probe front,

Tare Weight	Final Weight	Total Weight
53.37	189.26	135.89

[ ] 5. Preweigh container #2.
[ ] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[ ] 7. Weigh container #2.
[ ] 8. Record sample identification here #20 3-3 1N IMP1

Tare Weight	Final Weight	Total Weight
53.27	173.27	120.00

[ ] 9. Preweigh container #3.
[ ] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[ ] 11. Weigh container #3.

caps [illegible] w/ filter

Tare Weight	Final Weight	Total Weight
52.71	209.58	156.87

[ ] 12. Carefully place the filter into container #3. #24 3-3 1N imp2, 3 glass filter
[ ] 13. Record sample identification here
[ ] 14. Mark the fluid levels on the containers.
[ ] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

3-4-1N

[✓] 1. Preweigh container #1.
[✓] 2. Rinse the front half using 0.1N NaOH into container #1.
[✓] 3. Weigh container #1.
[✓] 4. Record sample identification here #22 3-4 in probe front.

Tare Weight	Final Weight	Total Weight
53.29	214.93	161.64

[✓] 5. Preweigh container #2.
[✓] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[✓] 7. Weigh container #2.
[✓] 8. Record sample identification here #25 3-4 1N IMP 1

Tare Weight	Final Weight	Total Weight
53.36	173.67	120.31

[✓] 9. Preweigh container #3.
[✓] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[✓] 11. Weigh container #3.

Tare Weight	Final Weight	Total Weight
53.32	204.89	151.57

[✓] 12. Carefully place the filter into container #3.
[✓] 13. Record sample identification here #26 IMP 2,3 glass filter
[✓] 14. Mark the fluid levels on the containers.
[✓] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

3-1-OUT

[ ] 1. Preweigh container #1.
[ ] 2. Rinse the front half using 0.1N NaOH into container #1.
[ ] 3. Weigh container #1.
[ ] 4. Record sample identification here #18 probe front

Tare Weight	Final Weight	Total Weight
53.21	158.76	105.55

[ ] 5. Preweigh container #2.
[ ] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[ ] 7. Weigh container #2.
[ ] 8. Record sample identification here #16 imp 1

Tare Weight	Final Weight	Total Weight
52.59	182.87	130.28

[ ] 9. Preweigh container #3.
[ ] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[ ] 11. Weigh container #3.

Tare Weight	Final Weight	Total Weight
53.06	205.32	152.26

coupe wt w/ filter

[✓] 12. Carefully place the filter into container #3. #17
[ ] 13. Record sample identification here
[✓] 14. Mark the fluid levels on the containers.
[ ] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

3-2-OUT

[ ] 1. Preweigh container #1.
[ ] 2. Rinse the front half using 0.1N NaOH into container #1.
[ ] 3. Weigh container #1.
[ ] 4. Record sample identification here #14 Probe front

Tare Weight	Final Weight	Total Weight
53.16	168.54	115.38

[ ] 5. Preweigh container #2.
[ ] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[ ] 7. Weigh container #2.
[ ] 8. Record sample identification here #11 imp 1

Tare Weight	Final Weight	Total Weight
52.78	184.28	131.5

[ ] 9. Preweigh container #3.
[ ] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[ ] 11. Weigh container #3.

Tare Weight	Final Weight	Total Weight
53.43	200.41	146.98

[X] 12. Carefully place the filter into container #3.
[ ] 13. Record sample identification here #15 imp 2, 3, glass filter
[ ] 14. Mark the fluid levels on the containers.
[ ] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

3-3-OUT

[ ] 1. Preweigh container #1.
[ ] 2. Rinse the front half using 0.1N NaOH into container #1.
[ ] 3. Weigh container #1.
[ ] 4. Record sample identification here 23 probe front

Tare Weight	Final Weight	Total Weight
53.20	~~186.98~~ 186.83	133.63

[ ] 5. Preweigh container #2.
[ ] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[ ] 7. Weigh container #2.
[ ] 8. Record sample identification here 28 3-3-OUT IMP 1

Tare Weight	Final Weight	Total Weight
53.05	184.61	131.56

[ ] 9. Preweigh container #3.
[ ] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[ ] 11. Weigh container #3.

oops w/ filter.

Tare Weight	Final Weight	Total Weight
52.86	203.86	151.0

[ ] 12. Carefully place the filter into container #3.
[ ] 13. Record sample identification here ~~3XX~~ 29 imp 2, 3, glass water
[ ] 14. Mark the fluid levels on the containers.
[ ] 15. Save 200 ml 0.1N NaOH for blank.

CHROMIUM EMISSION TEST
RECOVERY SHEET

3-4-OUT

[ ] 1. Preweigh container #1.
[ ] 2. Rinse the front half using 0.1N NaOH into container #1.
[ ] 3. Weigh container #1.
[ ] 4. Record sample identification here 31 probe front.

Tare Weight	Final Weight	Total Weight
53.38	~~[illegible]~~ 180.21	~~[illegible]~~ 126.83

[ ] 5. Preweigh container #2.
[ ] 6. Shake the first impinger well and drain through the arm into container #2. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #2.
[ ] 7. Weigh container #2.
[ ] 8. Record sample identification here #30 3-4 -OUT IMP 1

Tare Weight	Final Weight	Total Weight
53.06	177.98	124.92

[ ] 9. Preweigh container #3.
[ ] 10. Shake the second impinger well and drain through the arm into container #3. DO NOT SEPARATE THE IMPINGERS. Add NaOH rinse, shake well and drain through the arm into container #3.
[ ] 11. Weigh container #3.

Tare Weight	Final Weight	Total Weight
53.63	217.48	163.85

[ ] 12. Carefully place the filter into container #3.
[ ] 13. Record sample identification here #32 3-4-OUT Imp 2, 3 filter glass
[ ] 14. Mark the fluid levels on the containers.
[ ] 15. Save 200 ml 0.1N NaOH for blank.

4-1-OUT

CYANIDE EMISSION TEST RECOVERY SHEET

FILTER

[✓] 1. Carefully place the filter in glass sample container #1 containing 50 ml of 0.1N NaOH.
[✓] 2. Test a drop of the sample (container #1) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[✓] 3. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[✓] 4. Mark the fluid level on the container.
[✓] 5. Record sample identification here #33 filter 4-1-OUT

NO TREAT

FRONT HALF

[✓] 1. Preweigh container #2.
[✓] 2. Rinse front half (including filter holder inlet) with 0.1N NaOH.
[✓] 3. Weigh container #2 final.
[ ] 4. Test a drop of the solution (container #2) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 5. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[ ] 6. Mark the fluid level on the container.
[ ] 7. Record sample identification here #40 4-1-OUT Probe front and back
[ ] 8. Rinse the glassware with water before next use.

$\frac{2}{1000} = \frac{X}{50}$ X = 0.1 ml ≈ 2 drops

NO TREAT

Tare Weight	Final Weight	Total Weight
445.09	537.52	92.43

BACK HALF

[ ] 1. Preweigh sample container #4.
[ ] 2. Check the pH of the impingers to ascertain that the pH is still basic.
[ ] 3. Shake each impinger well and drain through the arm into container #4. DO NOT SEPARATE THE IMPINGERS.
[✓] 4. Weigh container #4.
[✓] 5. Rinse each impinger with 30 ml of 0.1N NaOH, shake well and drain through the arm.
[✓] 6. Weigh container #4.
[✓] 7. REPEAT steps 5 and 6.
[✓] 8. Rinse each glass connection twice into container #4.
[✓] 9. Weigh container #4.
[✓] 10. Test a drop of the sample (container #4) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[✓] 11. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[✓] 12. Mark the fluid level on the container.
[ ] 13. Record sample identification here #40
[ ] 14. Rinse the glassware with water before next use.

$\frac{2}{1000} = \frac{X}{533.82}$ X = 1.067 ml ≈ 20 drops

978.91 − 445.09 = 533.82

Tare Weight	Impinger Weight (MS 1,2)	Weight After First Rinse (Rinse MP 1,2,3)	Weight After Second Rinse (Rinse MP 1,2,3)	Weight After Third Rinse (Glassware)	Final Weight
537.52	158.20	941.70	926.59	978.91	533.82

BLANK

[ ] 1. Place one blank filter and 0.1 N NaOH equal to the total volume of containers 1+2+4 in container 5 (blank).

4-2-OUT

CYANIDE EMISSION TEST RECOVERY SHEET

FILTER

[ ] 1. Carefully place the filter in glass sample container #1 containing 50 ml of 0.1N NaOH.
[ ] 2. Test a drop of the sample (container #1) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 3. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[ ] 4. Mark the fluid level on the container.
[ ] 5. Record sample identification here #34 4-2-OUT filter

NO TREAT
No need to treat
2 drops 10N

FRONT HALF

[ ] 1. Preweigh container #2.
[ ] 2. Rinse front half (including filter holder inlet) with 0.1N NaOH.
[ ] 3. Weigh container #2 final.
[ ] 4. Test a drop of the solution (container #2) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 5. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[ ] 6. Mark the fluid level on the container.
[ ] 7. Record sample identification here #39 4-2-OUT front filter & BACK
[ ] 8. Rinse the glassware with water before next use.

Tare Weight	Final Weight	Total Weight
445.89	535.89	

X = 1,070 ml

$\frac{2}{1000} = \frac{X}{535.40}$

≈ 20 drops.

BACK HALF

[ ] 1. Preweigh sample container #4.
[ ] 2. Check the pH of the impingers to ascertain that the pH is still basic.
[ ] 3. Shake each impinger well and drain through the arm into container #4. DO NOT SEPARATE THE IMPINGERS.
[ ] 4. Weigh container #4.
[ ] 5. Rinse each impinger with 30 ml of 0.1N NaOH, shake well and drain through the arm.
[ ] 6. Weigh container #4.
[ ] 7. REPEAT steps 5 and 6.
[ ] 8. Rinse each glass connection twice into container #4.
[ ] 9. Weigh container #4.
[ ] 10. Test a drop of the sample (container #4) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 11. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[ ] 12. Mark the fluid level on the container.
[ ] 13. Record sample identification here #39 4-2-OUT front & BACK
[ ] 14. Rinse the glassware with water before next use.

NO TREAT

710.29
981.29
445.89
5354.0

Tare Weight	Impinger Weight (imp 1,2)	Weight After First Rinse (rinse imp 1,2,3)	Weight After Second Rinse (rinse imp 1,2,3)	Weight After Third Rinse (rinse imp 1,2,3)	Final Weight
535.89	757.54	841.71	922.73	981.29	535.40

BLANK

[ ] 1. Place one blank filter and 0.1 N NaOH equal to the total volume of containers 1+2+4 in container 5 (blank).

A-53

BLANK

[ ] 1. Place one blank filter and 0.1 N NaOH equal to the total volume of containers 1+2+4 in container 5 (blank).

A-55

4-3-OUT

CYANIDE EMISSION TEST RECOVERY SHEET

FILTER

6-2-OUT

CYANIDE EMISSION TEST RECOVERY SHEET

FILTER

[ ] 1. Carefully place the filter in glass sample container #1 containing 50 ml of 0.1N NaOH.
[ ] 2. Test a drop of the sample (container #1) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume. NO TREAT
[ ] 3. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH $\geq$12).
[ ] 4. Mark the fluid level on the container.
[ ] 5. Record sample identification here #38 6-2.OUT filter 2 drops

FRONT HALF

[ ] 1. Preweigh container #2.
[ ] 2. Rinse front half (~~including filter holder inlet~~) with 0.1N NaOH.
[ ] 3. Weigh container #2 final.
[ ] 4. Test a drop of the solution (container #2) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 5. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH $\geq$12).
[ ] 6. Mark the fluid level on the container.
[ ] 7. Record sample identification here #44
[ ] 8. Rinse the glassware with water before next use.

Tare Weight	Final Weight	Total Weight
445.30	554.93	

BACK HALF

[ ] 1. Preweigh sample container #4.
[ ] 2. Check the pH of the impingers to ascertain that the pH is still basic.
[ ] 3. Shake each impinger well and drain through the arm into container #4. DO NOT SEPARATE THE IMPINGERS.
[ ] 4. Weigh container #4.
[ ] 5. Rinse each impinger with 30 ml of 0.1N NaOH, shake well and drain through the arm.
[ ] 6. Weigh container #4.
[ ] 7. REPEAT steps 5 and 6.
[ ] 8. Rinse each glass connection twice into container #4. NO TREAT
[ ] 9. Weigh container #4.
[ ] 10. Test a drop of the sample (container #4) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 11. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH $\geq$12).
[ ] 12. Mark the fluid level on the container.
[ ] 13. Record sample identification here #44
[ ] 14. Rinse the glassware with water before next use.

$\frac{2}{1000} = \frac{x}{569.08}$
$x = 1.138$
$\approx$ 2 drops

Tare Weight	Impinger Weight 1,2	Weight After First Rinse 1,2,3	Weight After Second Rinse 1,2,3	Weight After Third Rinse	Final Weight
554.93	784.50	875.65	969.93	1014.38	569.08

BLANK

[ ] 1. Place one blank filter and 0.1 N NaOH equal to the total volume of containers 1+2+4 in container 5 (blank).

6-3-OUT

CYANIDE EMISSION TEST RECOVERY SHEET

FILTER

[ ] 1. Carefully place the filter in glass sample container #1 containing 50 ml of 0.1N NaOH.
[ ] 2. Test a drop of the sample (container #1) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 3. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH $\geq$12).
[ ] 4. Mark the fluid level on the container.
[ ] 5. Record sample identification here #37

2 drops
NO TREAT

FRONT HALF

[ ] 1. Preweigh container #2.
[ ] 2. Rinse front half (in~~cluding filter holder in~~let) with 0.1N NaOH.
[ ] 3. Weigh container #2 final.
[ ] 4. Test a drop of the solution (container #2) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 5. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH $\geq$12).
[ ] 6. Mark the fluid level on the container.
[ ] 7. Record sample identification here #45
[ ] 8. Rinse the glassware with water before next use.

missed it. can be backed out from front pg.

Tare Weight	Final Weight	Total Weight
445.67	—	

BACK HALF

[ ] 1. Preweigh sample container #4.
[ ] 2. Check the pH of the impingers to ascertain that the pH is still basic.
[ ] 3. Shake each impinger well and drain through the arm into container #4. DO NOT SEPARATE THE IMPINGERS.
[ ] 4. Weigh container #4.
[ ] 5. Rinse each impinger with 30 ml of 0.1N NaOH, shake well and drain through the arm.
[ ] 6. Weigh container #4.
[ ] 7. REPEAT steps 5 and 6.
[ ] 8. Rinse each glass connection twice into container #4.
[ ] 9. Weigh container #4.
[ ] 10. Test a drop of the sample (container #4) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 11. Preserve the sample with 2 ml of 10 N NaOH per liter of sample (pH $\geq$12).
[ ] 12. Mark the fluid level on the container.
[ ] 13. Record sample identification here #45
[ ] 14. Rinse the glassware with water before next use.

NO TREAT

996.50
445.67
550.83

$\frac{2}{1000} = \frac{X}{550.83}$

X = 1.101 ml
≈ 18 drop

Tare Weight	Impinger Weight 1,2	Weight After First Rinse Rinse 2,3	Weight After Second Rinse Rinse 2,3	Weight After Third Rinse glass	Final Weight
—	702.06	855.45	957.84	996.50	550.83

BLANK

1. Place one blank filter and 0.1 N NaOH equal to the total volume of containers 1+2+4 in container 5 (blank).

CADMIUM EMISSION TEST
RECOVERY SHEET

6-4-OUT

[ ] 1. Carefully place the filter in the glass petri dish. Label.

[ ] 2. Record sample identification here #54 filter 6-4-OUT

FRONT HALF

[ ] 1. Preweigh sample container #2 ±0.5 grams.
[ ] 2. Rinse the front half (~~including filter holder inlet~~) with 0.1 N HNO3.
[ ] 3. Weigh container #2 ±0.5 grams.
[ ] 4. Mark the fluid level on the container.

[ ] 5. Record sample identification here #47

Tare Weight	Final Weight	Total
447.12	546.11	

BACK HALF

[ ] 1. Preweigh sample container #4 ±0.5 grams.
[ ] 2. Shake each impinger well and empty through the arm into the sample container. DO NOT SEPARATE THE IMPINGERS.
[ ] 3. Weigh container #4.
[ ] 4. Rinse each impinger with 30 ml of 0.1N HNO3, shake well and drain through the arm.
[ ] 5. Weigh container #4.
[ ] 6. REPEAT steps 4 and 5.
[ ] 7. Rinse connecting glassware twice and add to container #4. Record final weight.
[ ] 8. Mark the fluid level on the container.

[ ] 9. Record sample identification here #47
[ ] 10. Save 200 ml 0.1N HNO3 for blank.

Tare Weight	imp 1,2 First Weight of Impingers	rinse 1,2,3 Weight After 1st Rinse	rinse 1,2,3 Weight After 2nd Rinse	~~Final Weight~~ Weight glassware	final
346.11	754.49	842.19	947.30	1022.60	575.48

9112.86
7082.86
447.12
575.48

CADMIUM EMISSION TEST
RECOVERY SHEET

[ ] 1. Carefully place the filter in the glass petri dish. Label.

[ ] 2. Record sample identification here #55 6-5-OUT filter

FRONT HALF

[ ] 1. Preweigh sample container #2 ±0.5 grams.
[ ] 2. Rinse the front half (~~including filter holder in~~let) with 0.1 N HNO3.
[ ] 3. Weigh container #2 ±0.5 grams.
[ ] 4. Mark the fluid level on the container.

[ ] 5. Record sample identification here 49. 6-5-OUT front probe back

Tare Weight	Final Weight	Total
445.95	551.18	—

BACK HALF

[ ] 1. Preweigh sample container #4 ±0.5 grams.
[ ] 2. Shake each impinger well and empty through the arm into the sample container. DO NOT SEPARATE THE IMPINGERS.
[ ] 3. Weigh container #4.
[ ] 4. Rinse each impinger with 30 ml of 0.1N HNO3, shake well and drain through the arm.
[ ] 5. Weigh container #4.
[ ] 6. REPEAT steps 4 and 5.
[ ] 7. Rinse connecting glassware twice and add to container #4. Record final weight.
[ ] 8. Mark the fluid level on the container.

[ ] 9. Record sample identification here # 49
[ ] 10. Save 200 ml 0.1N HNO3 for blank.

Tare Weight	imp 1,2 First Weight of Impingers	Rinse 1,2,3 Weight After 1st Rinse	Rinse 1,2,3 Weight After 2nd Rinse	~~Final~~ glass wash Weight	final
551.18	785.11	868.47	990.16	1047.85	601.9

6-6-OUT

CADMIUM EMISSION TEST RECOVERY SHEET

[ ] 1. Carefully place the filter in the glass petri dish. Label.

[ ] 2. Record sample identification here #56

FRONT HALF

[ ] 1. Preweigh sample container #2 ±0.5 grams.
[ ] 2. Rinse the front half (including filter holder inlet) with 0.1 N HNO3.
[ ] 3. Weigh container #2 ±0.5 grams.
[ ] 4. Mark the fluid level on the container.

[ ] 5. Record sample identification here #50 6-6-OUT

Tare Weight	Final Weight	Total
448.06	540.34	

front Probe Back

BACK HALF

[ ] 1. Preweigh sample container #4 ±0.5 grams.
[ ] 2. Shake each impinger well and empty through the arm into the sample container. DO NOT SEPARATE THE IMPINGERS.
[ ] 3. Weigh container #4.
[ ] 4. Rinse each impinger with 30 ml of 0.1N HNO3, shake well and drain through the arm.
[ ] 5. Weigh container #4.
[ ] 6. REPEAT steps 4 and 5.
[ ] 7. Rinse connecting glassware twice and add to container #4. Record final weight.
[ ] 8. Mark the fluid level on the container.

[ ] 9. Record sample identification here #50
[ ] 10. Save 200 ml 0.1N HNO3 for blank.

Tare Weight	1,2 First Weight of Impingers	Rinse 2,3 Weight After 1st Rinse	Rinse 1,2,3 Weight After 2nd Rinse	glass ~~Final~~ Weight	final
540.34	778.56	867.60	1007.29	1071.18	623.12

RUN CD-1

CYANIDE EMISSION TEST RECOVERY SHEET

FILTER

[✓] 1. Carefully place filter in glass sample container #1 w/ 50ml 0.1N NaOH.
[ ] 2. Test a drop of the sample (container #1) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 3. Preserve w/2ml of 10N NaOH per liter of sample (≈2 drops). NO TREAT NEEDED
[ ] 4. Mark the fluid level on the container.
[✓] 5. Record sample identification here CD-1F

FRONT HALF

[✓] 1. Preweigh glass container #2. Weigh with label on and cap off.
[✓] 2. Rinse front half (including filter holder inlet) with 0.1N NaOH.
[✓] 3. Weigh container #2 final.
[ ] 4. ~~Test a drop of~~ the solution (container #2) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 5. ~~Preserve~~ sample with 2ml of 10N NaOH per liter of sample (pH ≥12).
[ ] 6. Mark the fluid level on the container.
[ ] 7. Record sample identification here CD-1R
[ ] 8. Rinse the glassware with water before next use.

Tare Weight	Final Weight	Net Sample Weight
443.69g	707.97g	continue

BACK HALF

[✓] 1. Preweigh sample container #4. (or continue with container #2)
[✓] 2. Check the pH of the impingers to ascertain that the pH is still basic.
[✓] 3. Shake each impinger well and drain through the arm into container #4. DO NOT SEPARATE THE IMPINGERS.
[✓] 4. Weigh container #4.
[✓] 5. Rinse each impinger with 30 ml of 0.1N NaOH, shake well and drain through the arm.
[✓] 6. Weigh container #4.
[✓] 7. REPEAT steps 5 and 6.
[✓] 8. Rinse each glass connection twice into container #4.
[✓] 9. Weigh container #4.
[✓] 10. Test a drop of the sample (container #4) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[✓] 11. Preserve sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[✓] 12. Mark the fluid level on the container.
[✓] 13. Record sample identification here CD-1R
[✓] 14. Rinse the glassware with water before next use.

NO TREAT

$\frac{2}{1000} = \frac{x}{795}$ $x = 1.59$ ml ≈ 26 DROPS

Tare Weight	Step 4 Impinger Weight	Step 6a Weight After First Rinse	Step 6b Weight After Second Rinse	Step 9 Weight After Final Rinse	Net Sample Weight
707.97g	949.59	1043.11	1141.93	1238.95	795.26

RUN
CD-2

CYANIDE EMISSION TEST RECOVERY SHEET

FILTER

[✓] 1. Carefully place filter in glass sample container #1 w/ 50ml 0.1N NaOH.
[✓] 2. Test a drop of the sample (container #1) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[✓] 3. Preserve w/2ml of 10N NaOH per liter of sample (≈2 drops).
[✓] 4. Mark the fluid level on the container.
[✓] 5. Record sample identification here CD-2F

FRONT HALF

[✓] 1. Preweigh glass container #2. Weigh with label on and cap off.
[✓] 2. Rinse front half (including filter holder inlet) with 0.1N NaOH.
[✓] 3. Weigh container #2 final.
[-] 4. ~~Test a drop of the solution~~ (container #2) with iodide starch paper. ~~A blue color~~ indicates the need for treatment. Add ascorbic acid, a ~~crystal at a~~ time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[-] 5. ~~Preserve~~ sample with 2ml of 10N NaOH per liter of sample (pH ≥12).
[-] 6. ~~Mark the fluid~~ level on the container.
[ ] 7. Record sample identification here CD-2R
[✓] 8. Rinse the glassware with water before next use.

Tare Weight	Final Weight	Net Sample Weight
445.56	566.43	

BACK HALF

[✓] 1. ~~Preweigh sample container #4~~. (or continue with container #2)
[✓] 2. Check the pH of the impingers to ascertain that the pH is still basic.
[✓] 3. Shake each impinger well and drain through the arm into container #4. DO NOT SEPARATE THE IMPINGERS.
[✓] 4. Weigh container #4.
[✓] 5. Rinse each impinger with 30 ml of 0.1N NaOH, shake well and drain through the arm.
[✓] 6. Weigh container #4.
[✓] 7. REPEAT steps 5 and 6.
[✓] 8. Rinse each glass connection twice into container #4.
[✓] 9. Weigh container #4.
[✓] 10. Test a drop of the sample (container #4) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[✓] 11. Preserve sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[✓] 12. Mark the fluid level on the container.
[✓] 13. Record sample identification here CD-2R
[ ] 14. Rinse the glassware with water before next use.

$\frac{2}{100m} = \frac{X}{562.13}$

$X = 1.124$

Tare Weight	Step 4 Impinger Weight	Step 6a Weight After First Rinse	Step 6b Weight After Second Rinse	Step 9 Weight After Final Rinse	Net Sample Weight
566.43	803.14	FORGOT	954.49	1007.69	562.13

RUN CD-3

CYANIDE EMISSION TEST RECOVERY SHEET

FILTER

[✓] 1. Carefully place filter in glass sample container #1 w/ 50ml 0.1N NaOH.
[✓] 2. Test a drop of the sample (container #1) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[✓] 3. Preserve w/2ml of 10N NaOH per liter of sample (≈2 drops).
[✓] 4. Mark the fluid level on the container.
[✓] 5. Record sample identification here CD-3F

FRONT HALF

[✓] 1. Preweigh glass container #2. Weigh with label on and cap off.
[✓] 2. Rinse front half (including filter holder inlet) with 0.1N NaOH.
[✓] 3. Weigh container #2 final.
[ ] 4. ~~Test a drop of~~ the solution (container #2) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[ ] 5. ~~Preserve~~ sample with 2ml of 10N NaOH per liter of sample (pH ≥12).
[ ] 6. ~~Mark the~~ fluid level on the container.
[✓] 7. Record sample identification here CD-3R
[✓] 8. Rinse the glassware with water before next use.

Tare Weight	Final Weight	Net Sample Weight
446.50	616.16	

BACK HALF

[✓] 1. ~~Preweigh sample container #4.~~ (or continue with container #2)
[✓] 2. Check the pH of the impingers to ascertain that the pH is still basic.
[✓] 3. Shake each impinger well and drain through the arm into container #4. DO NOT SEPARATE THE IMPINGERS.
[✓] 4. Weigh container #4.
[✓] 5. Rinse each impinger with 30 ml of 0.1N NaOH, shake well and drain through the arm.
[✓] 6. Weigh container #4.
[✓] 7. REPEAT steps 5 and 6.
[✓] 8. Rinse each glass connection twice into container #4.
[✓] 9. Weigh container #4.
[-] 10. Test a drop of the sample (container #4) with iodide starch paper. A blue color indicates the need for treatment. Add ascorbic acid, a crystal at a time, till no color change is indicated. Then add 0.6 grams ascorbic acid per liter of sample volume.
[✓] 11. Preserve sample with 2 ml of 10 N NaOH per liter of sample (pH ≥12).
[✓] 12. Mark the fluid level on the container.
[✓] 13. Record sample identification here CD-3R
[✓] 14. Rinse the glassware with water before next use.

NO TREAT

$\frac{2}{1000} = \frac{x}{712.37}$

$x = 1.42$

≈ 25 DROPS

Tare Weight	Step 4 Impinger Weight	Step 6a Weight After First Rinse	Step 6b Weight After Second Rinse	Step 9 Weight After Final Rinse	Net Sample Weight
616.16	876.68	985.56	1079.36	1158.87	712.37

APPENDIX B

AMPERE-HOUR CALCULATION SHEETS
FIELD TANK LOAD DATA

AMPERE-HOUR CALCULATION SHEET
NAVAL AVIATION DEPOT, PENSACOLA
BUILDING 604, TANK 341
CHROMIC ACID ANODIZE
11/8/90 LINE 1

TIME	DELTA-T MIN.	AMPS	AVG AMPS	AMP-HOURS
TESTS 1-1-OUT, 1-2-OUT				
855		300		
910	15	250	275	68.8
925	15	200	225	56.3
935	10	200	200	33.3
CHANGE TANK LOAD				
1000		850		
1015	15	850	850	212.5
1030	15	800	825	206.3
1045	15	800	800	200.0
1100	15	800	800	200.0
1115	15	800	800	200.0
1130	15	800	800	200.0
CHANGE TANK LOAD				
1230		950		
1245	15	850	900	225.0
1300	15	800	825	206.3
1315	15	800	800	200.0
1330	15	800	800	200.0
1345	15	800	800	200.0
1400	15	850	825	206.3
1415	15	850	850	212.5
1430	15	850	850	212.5
END TEST				
TOTALS	250			3039.58

TOTAL AMPERE-HOURS	3039.6
TOTAL DELTA-T (HOURS)	4.2
AVERAGE AMPERES DURING TEST	729.5

AMPERE-HOUR CALCULATION SHEET
NAVAL AVIATION DEPOT, PENSACOLA
BUILDING 604, TANKS 1303, 1305, 1306
HARD CHROME PLATE, NO FUMETROL 101
11/10/90 LINE 3

TIME	DELTA-T MIN.	TOTAL AMPS	AVG AMPS	AMP-HOURS
TESTS 3-1, 3-2 (IN & OUT)				
900		3350		
930	30	3350	3350	1675.0
1010	40	3470	3410	2273.3
1040	30	3600	3535	1767.5
1125	45	3500	3550	2662.5
1210	45	3570	3535	2651.3
1240	30	3570	3570	1785.0
TOTALS	220			12814.5

TOTAL AMPERE-HOURS	12814.6
TOTAL DELTA-T (HOURS)	3.7
AVERAGE AMPERES DURING TEST	3494.9

AMPERE-HOUR CALCULATION SHEET
NAVAL AVIATION DEPOT, PENSACOLA
BUILDING 604, TANKS 1303, 1305, 1306
HARD CHROME PLATE, FUMETROL 101
11/10/90 LINE 3

TIME	DELTA-T MIN.	TOTAL AMPS	AVG AMPS	AMP-HOURS
ADD 2 GALS FUMETROL 101 TO EACH TANK				
TESTS 3-3, 3-4 (IN & OUT)				
1545		3540		
1630	45	3620	3580	2685.0
1705	35	3590	3605	2102.9
1750	45	3475	3533	2649.4
1835	45	3650	3563	2671.9
1855	20	1600	2625	875.0
1900	5	3650	2625	218.8
1930	30	3710	3680	1840.0
2000	30	3710	3710	1855.0
TOTALS	255			14897.9

TOTAL AMPERE-HOURS	14897.9
TOTAL DELTA-T (HOURS)	4.3
AVERAGE AMPERES DURING TEST	3505.4

TANK LOAD DATA SHEET

DATE: 08NOV90
BASE: NAD PENSACOLA
BUILDING NO: 604

RUN NO: 1-1 & 1-2
CrO_3 ANODIZE/LINE 1

TANK NO.	WORKPIECE DESCRIPTIONS
0855/9:35	2 small (1½/t) Spindles w/ 35 small pieces each aluminum
1000 - 1130	4x12' aluminum sheets (4 each)
12:30 - 2:15	4x12 al sheet (4 each)

AMPERES OR AMPERE-HOURS

	TANK NO. 341				
TIME (INIT)	VOLTS/AMPS	TIME	VOLTS/AMPS	TIME	VOLTS/AMPS
08:55	42/300	1:00	40/800		
09:10	43/250	1:15	40/800		
09:25	42/200	1:30	40/800		
09:35	42/200	1:45	40/800		
10:00	31/850	2:00	40/850		
10:15	41/850	2:15	40/850		
10:30	41/800	2:30	40/850		
10:45	41/800	2:35			
11:00	41/800				
11:15	41/800				
11:30	41/800				
12:30	39/950				
12:45	40/850				

down time till 10:00 9:55 on

down time 12:25 on

TANK LOAD DATA SHEET

DATE: 10 NOV 90
BASE: NAD PENSACOLA
BUILDING NO: 604

RUN NO: ALL HARD CHROME LINE 3

TANK NO.	WORKPIECE DESCRIPTIONS
1303-1	DUMMY LOAD (NOT ACTUAL PRODUCTION PARTS)
	STEEL STRAPS
1303-2	
1305-1	LANDING GEARS @ 600 IN² SURAREA
1305-2	
1306	~~600 IN² AE~~ DUMMY LOAD (AL STRAPS)
	(REVERSERACK SYSTEM)

AMPERES OR AMPERE-HOURS

>1000 500 400 800 550

TIME (INIT)	TANK NO. 1303 AMP 1	1303 AMP 2	1305 AMP 1	1305 AMP 2	1306 AMP 1	1306 AMP 2		
0900	1100	500	500	750	~~380~~ 300			
DC CLAMP-ON AMETER (HELD)	>1000	500	400	800	550			
0930	1100	500	500	750	500			
1010	1150	520	500	800	500			
1040	1150	550	500	900	500			
1125	1150	550	500	850	450			
1210	1170	550	500	900	450			
1240	1170	550	500	900	450			
(ADD	2 gal	FUMATROL			101	)		
TO EACH	TANK							
1545	1120	420	600	900	500			
1630	1120	440	600	960	500			
1705	1120	420	600	950	500			

TANK LOAD DATA SHEET (CONTINUED)

DATE: 10 NOV 90
RUN NO: ALL HARD CHROME LINE 3

AMPERES OR AMPERE-HOURS

	TANK NO.							
TIME (INIT)	1303		1305		1306 ~~1200~~			
	AMP 1	AMP 2	AMP 1	AMP 2	AMP 1	AMP 2		
1750	1150	425	600	800	500			
1835	1150	450	600	950	500			
1855	0	500	600	0	500			
1900	1150	500	600	900	500			
1930	1160	500	600	950	500			
2000	1160	500	600	950	500			
2000 CLAMP ON AMMETER V	1000	460	500	920	540		MEASURED ON TANK BUSBAR	

TANK LOAD DATA SHEET

DATE: 13NOV90
BASE: NAD PENSACOLA
BUILDING NO: 604

RUN NO: LINE 4
ALL RUNS
CYANIDE COPPER

TANK NO.	WORKPIECE DESCRIPTIONS
1190	1 ALUMINUM STRAP ≈ 1 FT² SURF AREA
	PROCESS IS TYPICALLY USED AS A
	FLASH COPPER LAYER BEFORE ENTERING
	ACID COPPER PLATE TANKS
	TYPICAL PROCESS TIME IS 15 MINUTES
	VISIBLE GASSING FROM WORKPIECE

	TANK NO. 1190			
TIME (INIT)	V Amp	~~TIME~~		
1010am	3.7 25			
1045	3.5 25			
1115	3.5 25			
1230	3.5 25			
1300	3.4 25			
1330	3.4 25			
1410	3.4 25			
1530	3.5 25			
1645	3.5 25			
1715	3.5 25			

TANK LOAD DATA SHEET

DATE: 15NOV90
BASE: NAD PENSACOLA
BUILDING NO: 604

RUN NO: LINE G
CADMIUM PLATE
TEST DAY 1

TANK NO.	WORKPIECE DESCRIPTIONS
311	4EA 3"X 24" STRAPS 0700
	GASSING OFF PART
305	1EA ~~[illegible]~~ ~~[illegible]~~ 3"X24" STRAP
	RAPID GASING OF PART & RACK
	OCCASIONAL 3 MINUTE PRODUCTION PART RUN

AMPERES OR AMPERE-HOURS

	TANK NO.				
TIME (INIT)	311	305			
0730	3V 100A	3.3V 110A			
0805	3V 100A	2.6V 30A			
0843	3V 100A	2.6V 30A			
0945	3V 100A	2.6V 70A			
0948	3V 100A	2.6V 30A			
1030	3V 100A	2.8V 30A			
1145	3V 100A	2.8V 35A			
1335	3V 100A	2.6V 35A			
1520	3V 100A	2.6V 40A			
1605	3V 100A	2.6V 46A			
1642	3V 100A	2.4V 20A			

TANK LOAD DATA SHEET

DATE: 16 NOV 90
BASE: NAD PENSACOLA
BUILDING NO: 604

RUN NO: LINE 6
CADMIUM PLATE
TEST DAY 2

TANK NO.	WORKPIECE DESCRIPTIONS
311	4EA 3" X 24" METAL STRAPS
305	2EA 3" X 24" METAL STRIPS

AMPERES OR AMPERE-HOURS

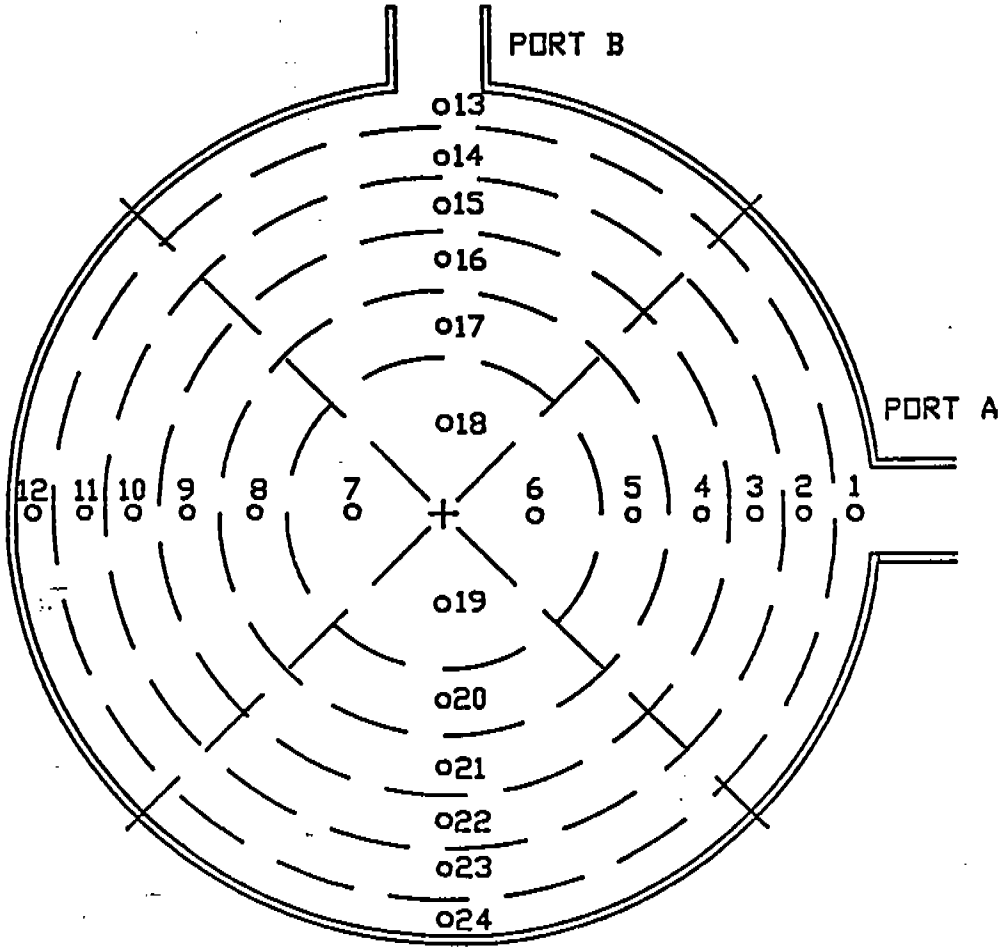
	TANK NO.				
TIME (INIT)	311	305			
0815	3V 115A	2.9V 45A			
0830	3V 115A	3V 70A			
0930	3V 110A	3V 70A	1030-1120 PRODUCTION PARTS		
1120	3V 120A	3V ØA	RUN ≈65 AMPS INTERMITTENT		
1125	3V 120A	3V 85A	~~3EA 3"X24" METAL STRIPS~~		
1235	3V 120A	3V 65A			

RUN LOADS 3 MIN EACH LOAD

APPENDIX C

FIELD SAMPLING DATA

24 POINT SAMPLE TRAVERSE



LINE 1 OUTLET, CHROMIC ACID ANODIZE

TRAVERSE POINT	EPA METHOD 1 (% OF DIA)	TRAVERSE POINT LOCATION (DISTANCES FROM I.D.) DUCT DIAMETER (IN.) 49
1 & 13	2.1	1.0
2 & 14	6.7	3.3
3 & 15	11.8	5.8
4 & 16	17.7	8.7
5 & 17	25.0	12.3
6 & 18	35.6	17.4
7 & 19	64.4	31.6
8 & 20	75.0	36.8
9 & 21	82.3	40.3
10 & 22	88.2	43.2
11 & 23	93.3	45.7
12 & 24	97.9	48.0

TRAVERSE DATA SHEET

(REV 8/86)

DIA 49"

Vertical stack flow

PLANT: Plate shop

LOCATION: NADEP Pensacola

DATE: Nov 7, 1990

OPERATOR: Newton, Bryl

RUN #: Traverse Line 1

CIRCULAR, DIA. 49 in

RECTANGULAR, LxW in

Length from upstream disturbance		ft
Diameter from upstream disturbance		dia
Length from downstream disturbance		ft
Diameters from downstream disturbance		dia
Required number of traverse points	24	ea
Number of traverse points used	24	ea

POINT # n	STACK PRESSURE (in H_2O) ΔPvel	Pstatic	$\sqrt{\Delta P}$	LOCATION (in) L	W	POINT # n	STACK PRESSURE (in H_2O) ΔPvel	Pstatic	$\sqrt{\Delta P}$	LOCATION (in) L	W
1	1.5		1.22			26					
2	1.6		1.26			27					
3	1.55		1.24	5° cyclonic		28					
4	1.6		1.26			29					
5	1.6		1.26			30					
6	1.5		1.22			31					
7	0.75		0.87			32					
8	0.65		0.81			33					
9	0.66		0.81			34					
10	0.71		0.84			35					
11	0.67		0.82			36					
12	0.56		0.75	2° cyclonic		37					
13	1.5		1.22			38					
14	1.5		1.22			39					
15	1.4		1.18	10° cyclonic		40					
16	1.2		1.1			41					
17	1.1		1.05			42					
18	1.05		1.02			43					
19	1.0	0.75	1.0			44					
20	0.76		0.87			45					
21	0.65		0.81			46					
22	0.65		0.81			47					
23	0.71		0.84			48					
24	0.74		0.86	2° cyclonic		49					
25						50					

$$\Delta P_{ave} = \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]^2 = \left(\frac{24.34}{24}\right)^2 = \underline{\underline{1.03}}$$

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 8NOV90

LINE NO: #1 chromic acid anodize

BASE: NAD PENSACOLA

RUN NO: #1

BUILDING NO: 604

CONTROL DEVICE: INLET (OUTLET)

PREP BY: [illegible]

IMPINGER BOX NO: 1

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.
[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.
[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
1-1	1. 100ml 0.1N NaOH		565.39	614.87	49.48
1-2	2. 100ml 0.1N NaOH		551.40	564.85	13.45
1-3	3. Empty		452.98	453.77	0.79
1-4	4. 500ml silica gel		784.60	830.67	46.07
				Net Weight Gain	109.79

Filter No: —

New

Silica gel condition after test: Spent

Nozzle No: Q-14-11 Calibrated by: DMC

					Average
ID Before Test:	0.230	0.230	0.230	0.230	0.230
ID After Test:	0.230	0.230	0.230	0.230	0.230

CR

-0.75 STATIC AVE

Leak √ thru Box 0.008 ft³/min

SOURCE EMISSION TESTING DATA SHEET

A = 1886 in² MW = 28.95 lb/lbmole

(SJS rev11/88, #0251Q)

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.02		METER BOX #: 17	PROBE # (PITOT #): S-12	NOZZLE #: Q #11
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: ≈60		METER ΔH@: 1.969	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: ϕ.211
DATE: 08NOV90	AVE STATIC PRESSURE, in H_2O: 0.75		METER γ: 1.032	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: ϕ.230
OPERATOR: PEREZ. M.	AVE VEL HEAD, in H_2O: 1.03		SAMPLE BOX #: 1	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: STEADY
RUN #: 1-1	ASSUMED MOISTURE, %: 1	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .015@24" Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft³	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE #1 (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER #6 Inlet (Tm in) °F	#7 Outlet (Tm out) °F	IMPINGER TEMPERATURE #4 °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
854dm 12	0	121.574	1.56	0.56	88	67°	66°	44°		4.5				
11	10	127.700	2.00	0.72	84°	68°	67°	44°		5				
10	20	135.600	2.08	0.74	81°	70°	68°	47°		5				
9	30	143.600	1.85	0.66	84°	72°	68°	49°		5				
8	40	150.600	1.71	0.61	83°	71°	68°	47°		4.8				
7	50	158.500	2.00	0.71	83°	73°	67°	43°		4.0				
6	60	164.200	4.22	1.5	83°	73°	69°	48°		9.				
5	70	175.800	4.53	1.6	84°	78°	70°	54°		9.5				
4	80	185.300	4.83	1.7	83°	79°	72°	53°		10				
3	90	197.100	4.55	1.6	84°	80°	73°	56°		10				
2	100	207.500	4.85	1.7	83°	81°	74	59°		10				
1	110	220.500	3.74	1.3	79°	82°	75°	53°		8				
Change Nozzle 11 to 19mm	120	230.862												
TOTAL								PRETEST pitot	Steady @ 7.7"					
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #) S-12	NOZZLE #
LOCATION	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 05NOV90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR	AVE VEL HEAD, in H_2O		SAMPLE BOX # 1	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # 1-1 (CONT.)	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS)(A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start-up 12:35 secondport														
13	120	230.862	4.25	1.5	75°	69°	68°	47°		9				
14	130	240.500	4.53	1.6	77°	71°	69°	44°		10				
15	140	251.500	4.22	1.5	84°	74°	70°	52°		9.5				
16	150	264.000	3.67	1.3	84°	76°	71°	52°		9				
17	160	272.300	3.10	1.1	84°	76°	71°	53°		7				
18	170	281.700	3.10	1.1	83°	75°	72°	52°		7				
19	180	290.900	2.83	1.0	84°	77°	72°	52°		6				
20	190	299.900	2.24	0.79	84°	78°	73°	53°		6				
21	200	308.100	2.24	0.79	84°	79°	74°	53°		6				
22	210	316.400	2.07	0.73	84°	80°	75°	52°		5				
23	220	324.500	2.24	0.79	84°	79°	76°	53°		6				
24	230	331.800	2.22	0.78	86°	82°	78°	54°		6				
2:35 stop	240	339.963												
TOTAL														
AVERAGE														

Final Leak ck → NOZZLE = .007 CFM@ 11 inch Hg = PASS

→ pitot tubes = Good @ 6 in H2O = PASS

SJ7

```
METHOD 5 HOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          1.    RUN
RUN NO.=?
          1.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
      1.969     RUN
METER GAMMA = ?
      1.032     RUN
STACK AREA
IN. SQ. = ?
  1,886.000     RUN
STACK STATIC
P IN H2O=?
       -.750    RUN
PBAR IN HG=?
     30.020     RUN
% H2O=?
      1.000     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.950     RUN
AVG STACK
TEMP DEG F=?
     82.000     RUN
AVG DELTA-P
IN. H2O=?
      1.030     RUN
AMBIENT
TEMP F=?
     60.000     RUN
PITOT TUBE
CSUBP=?
       .790     RUN

AVG STACK
VELOCITY FPM=
  3,246.806
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.211

ACTUAL NOZZLE
DIA INCHES=?
       .230     RUN

SAMPLE CFM = 0.888
```

(out)

```
*******
INITIAL METER
VOLUME FT3 =?
    121.574     RUN
*******
POINT NO. 1.
          .56 STO 01
        83.00 STO 02
        67.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.56
*******
POINT NO. 2.
          .72 STO 01
        84.00 STO 02
        68.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.00
*******
POINT NO. 3.
          .74 STO 01
        81.00 STO 02
        70.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.08
*******
POINT NO. 4.
          .66 STO 01
        84.00 STO 02
        72.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.85
*******
POINT NO. 5.
          .61 STO 01
        83.00 STO 02
        71.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.71
*******
POINT NO. 6.
          .71 STO 01
        73.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.00
*******
POINT NO. 7.
        1.50 STO 01
              RUN
DELTA H=
IN. H2O....
             4.22
*******
POINT NO. 8.
        1.60 STO 01
        84.00 STO 02
        78.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.53
*******
POINT NO. 9.
        1.70 STO 01
        83.00 STO 02
        79.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.83
*******
POINT NO. 10.
        1.60 STO 01
        84.00 STO 02
        80.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.55
*******
POINT NO. 11.
        1.70 STO 01
        83.00 STO 02
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.85
*******
POINT NO. 12.
        1.30 STO 01
        79.00 STO 02
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.74
*******
POINT NO. 13.
        1.50 STO 01
        75.00 STO 02
        69.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.25
*******
POINT NO. 14.
        1.60 STO 01
        77.00 STO 02
        71.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.53
*******
POINT NO. 15.
        1.50 STO 01
        84.00 STO 02
        74.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.22
*******
POINT NO. 16.
        1.30 STO 01
        76.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.67
*******
POINT NO. 17.
        1.10 STO 01
              RUN
DELTA H=
IN. H2O....
             3.10
*******
POINT NO. 18.
        83.00 STO 02
        75.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.10
*******
POINT NO. 19.
        1.00 STO 01
        84.00 STO 02
        77.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.03
*******
POINT NO. 20.
         .79 STO 01
        78.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.24
*******
POINT NO. 21.
        79.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.24
*******
POINT NO. 22.
         .73 STO 01
        80.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.07
*******
POINT NO. 23.
         .79 STO 01
        84.00 STO 02
        79.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.24
*******
POINT NO. 24.
         .78 STO 01
        86.00 STO 02
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.22
*******
POINT NO. 25.
        0.00    RUN
======

ISOKIN
AVG VALUES
KV=24.024
TMETER F=75.417
DELTA-H=3.108
DELTA P=1.064
FINAL METER
VOLUME FT3=?
    339.963     RUN
INITIAL=121.574
SAMPLE TIME
MIN. =?
    240.000     RUN
PSTACK ABS
IN HG=29.965
TSTACK F=82.792

======
```

```
SOURCE TYPE?
0=OTHER
1=BOILER
      0.000     RUN
% CO2 =?
      0.000     RUN
% O2 =?
     20.900     RUN
H2O GAIN KNOWN?
1=YES 0=NO
      1.000     RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                RUN
H2O GAIN=?
    109.790     RUN
NET METER
VOL. FT3=
          225.377
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
          222.575
MOLE FRACT. DRY
GAS, (1-BWS) =
            0.977
% H2O =
              2.3
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
           28.590
AVG VELOCITY
FPM =
        3,322.047
STACK DRY GAS
FLOW QS  SCFM=
       41,408.358
ACFM =
       43,509.593


**********

ISOKINETIC %I =101.6

*********
```

C-6

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 08NOV90 LINE NO: #1 chromic acid anodize

BASE: NAD PENSACOLA RUN NO: #2

BUILDING NO: 604 CONTROL DEVICE: INLET OUTLET

PREP BY: CR. IMPINGER BOX NO: 2

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.
[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.
[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
2-1	1. 100ml 0.1N NaOH	454.56	553.20	604.92	51.72
2-2	2. 100ml 0.1N NaOH	444.64	545.41	554.80	9.39
2-3	3. Empty	500.34	500.34	501.88	1.54
2-4	4. 500ml silica gel		802.62	847.26	44.64
				Net Weight Gain	107.29 CR.

Filter No: —

New Silica gel condition after test: Spent 100%

Nozzle No: 2-1-10 Calibrated by: JVC

					Average
ID Before Test:	0.230	0.230	0.230	0.230	0.230
ID After Test:	0.230	0.230	0.230	0.231	0.230 — CR.

Avg Delta P = 1.03

"Spare" 0.75

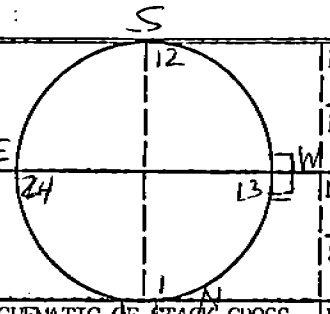
Cp S-12 = 0.79
S-7 = 0.79
$A = \frac{\pi (49)^2}{4} = 1886 \text{ IN}^2$

$MW_{STACK} = 28.95$

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.020		METER BOX #: #14	PROBE # (PITOT #): S-7	NOZZLE #: Q #10
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 60°		METER ΔH@: 2.080	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.211
DATE: 8 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.75		METER γ: 1.000 ~~0.992~~	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.230
OPERATOR: Manuel Perez	AVE VEL HEAD, in H_2O: 1.03		SAMPLE BOX #: 2	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: PRETEST SEE BELOW
RUN #: 1-2	ASSUMED MOISTURE, %: 1	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: PRETEST 0.005 @ 15" Hg



TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (A) (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE (C) AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
9:00 13	0	363.636	4.14	1.40 ~~1.64~~	82°	75°	72°	44°		7				
14	10	373.300	3.15 (SHOULD BE 4.75)	1.60 ~~1.66~~	81°	76°	76°	42°		4.5				
Stop change 1040 15	20	383.400	4.46	1.5	83°	79°	77°	50°		7.5				
9:56 10:00 16	30	394.300	3.89	1.3	84°	83°	79°	50°		6.5				
Start-up 17	40	403.700	3.29	1.1	83°	80°	82°	47°		5.5				
18	50	413.500	3.00	1.0	83°	84°	82°	48°		5				
19	60	422.900	3.31	1.1	83°	86°	83°	50°		5				
20	70	431.300	2.36	0.78	84°	89°	85°	50°		4				
21	80	440.000	2.31	0.76	83°	90°	89°	51°		4				
22	90	448.500	2.22	0.74	82°	84.	83°	49°		4				
23	100	456.700	2.44	0.81	83°	85°	84°	49°		4				
24	110	464.800	2.37	0.79	82°	84°	82°	46°		4				
Change Point 11:30 am	120	473.284												
TOTAL									PRETEST point stuck at 84					
AVERAGE														

EU 325

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT	BAROMETRIC PRESSURE, in Hg		METER BOX # 14	PROBE # (PITOT #) 5-7	NOZZLE #
LOCATION	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 08 NOV 90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR	AVE VEL HEAD, in H_2O		SAMPLE BOX # 2	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # 1-2 CONTINUED	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME	GAS METER READING	ORIFICE PRESSURE (CALC)	VELOCITY HEAD (MEAS)	STACK TEMPERATURE	GAS SAMPLE TEMPERATURE AT DRY GAS METER		IMPINGER TEMPERATURE	SAMPLE BOX TEMPERATURE	SAMPLE VACUUM	O_2	CO_2	CO	NOX
						Inlet	Outlet							
start-up 12:30	min	(Vm) ft^3	(ΔH) in H_2O	(ΔP) in H_2O	(Ts) °F	(Tm in) °F	(Tm out) °F	°F	°F	in Hg	%	%	ppm	ppm
12	120	473.284	1.72	0.59	84°	70°	69°	54°		3				
11	130	480.200	1.81	0.62	85°	71°	70°	46°		3				
10	140	487.000	1.93	0.66	85°	73°	70°	49°		3				
9	150	494.300	1.85	0.63	85°	73°	70°	50°		3				
8	160	501.300	1.80	0.61	84°	75°	71°	51°		3				
7	170	508.800	2.09	0.71	84°	74°	71°	51°		4				
6	180	516.000	4.43	1.5	83°	75°	71°	54°		8				
5	190	527.200	5.03	1.7	85°	78°	73°	55°		9				
4	200	538.100	4.77	1.6	84°	81°	73°	57°		9				
3	210	548.000	4.77	1.6	84°	81°	74°	55°		9				
2	220	562.100	4.77	1.6	84°	81°	75°	55°		8.5				
1	230	573.900	4.75	1.6	86°	81°	75°	56°		8				
2:30 stop	240	585.995												
TOTAL		Final Leak Ck		Nozzle = .012 CFM @ 10 in Hg				PASS						
				pitots = GOOD @ 6 in H_2O →				PASS!						
AVERAGE								MPB						

C-6

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          1.    RUN
RUN NO.=?
          2.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
      2.060     RUN
METER GAMMA = ?
      1.000     RUN
STACK AREA
IN. SQ. = ?
  1,886.000     RUN
STACK STATIC
P IN H2O=?
       -.750    RUN
PBAR IN HG=?
     30.020     RUN
% H2O=?
      1.000     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.950     RUN
AVG STACK
TEMP DEG F=?
     82.000     RUN
AVG DELTA-P
IN. H2O=?
      1.030     RUN
AMBIENT
TEMP F=?
     60.000     RUN
PITOT TUBE
CSUBP=?
       .790     RUN

AVG STACK
VELOCITY FPM=
          3,246.806
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.211

ACTUAL NOZZLE
DIA INCHES=?
       .230     RUN

SAMPLE CFM = 0.888
```

OUT

```
******
INITIAL METER
VOLUME FT3 =?
     52.500     X*2
    363.636     RUN
*******
POINT NO. 1.
          1.40 STO 01
         82.00 STO 02
         75.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 4.14
*******
POINT NO. 2.
          1.60 STO 01
         81.00 STO 02
         76.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 4.75
*******
POINT NO. 3.
          1.50 STO 01
         83.00 STO 02
         79.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 4.46
*******
POINT NO. 4.
          1.30 STO 01
         84.00 STO 02
         83.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 3.89
*******
POINT NO. 5.
          1.10 STO 01
         83.00 STO 02
         80.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 3.28
*******
POINT NO. 6.
          1.00 STO 01
         84.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 3.00
```

```
*******
POINT NO. 7.
          1.10 STO 01
         86.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 3.31
*******
POINT NO. 8.
           .78 STO 01
         84.00 STO 02
         89.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 2.36
*******
POINT NO. 9.
           .76 STO 01
         83.00 STO 02
         90.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 2.31
*******
POINT NO. 10.
           .74 STO 01
         82.00 STO 02
         84.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 2.22
*******
POINT NO. 11.
           .81 STO 01
         83.00 STO 02
         85.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 2.44
*******
POINT NO. 12.
           .79 STO 01
         82.00 STO 02
         84.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 2.37
*******
```

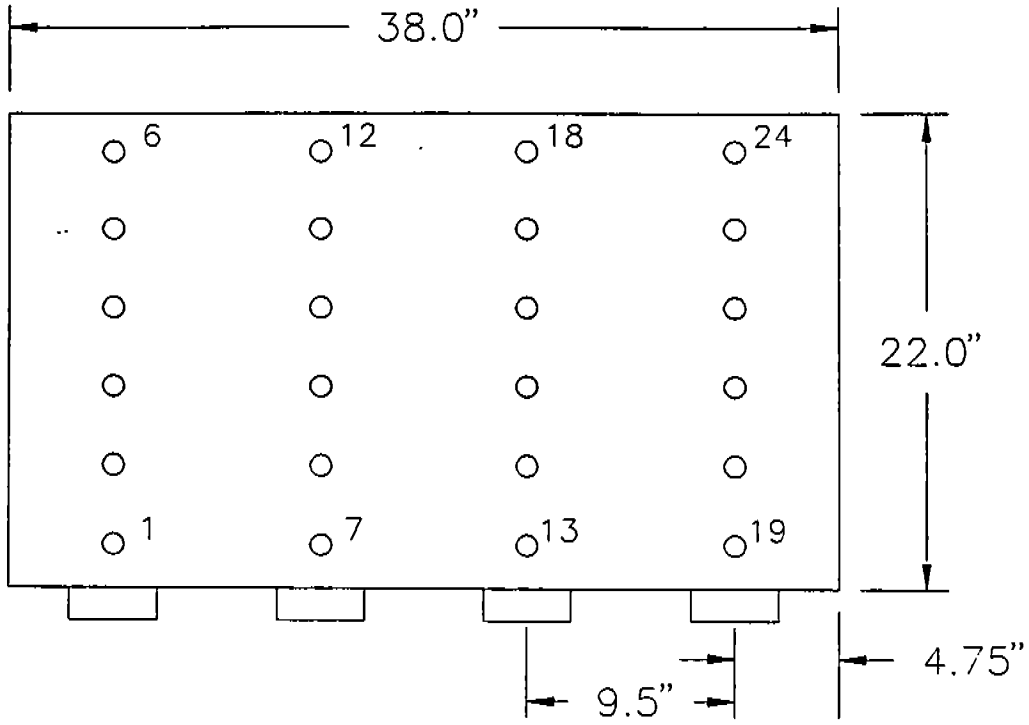
```
POINT NO. 13.
           .59 STO 01
         84.00 STO 02
         70.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 1.72
*******
POINT NO. 14.
           .62 STO 01
         85.00 STO 02
         71.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 1.81
*******
POINT NO. 15.
           .66 STO 01
         73.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 1.93
*******
POINT NO. 16.
           .63 STO 01
                   RUN
DELTA H=
IN. H2O....
                 1.85
*******
POINT NO. 17.
           .61 STO 01
         84.00 STO 02
         75.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 1.80
*******
POINT NO. 18.
           .71 STO 01
         74.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 2.09
*******
POINT NO. 19.
          1.50 STO 01
         83.00 STO 02
         75.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 4.43
```

```
*******
POINT NO. 20.
          1.70 STO 01
         85.00 STO 02
         78.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 5.03
*******
POINT NO. 21.
          1.60 STO 01
         84.00 STO 02
         81.00 STO 03
                   RUN
DELTA H=
IN. H2O....
                 4.77
*******
POINT NO. 22.
                   RUN
DELTA H=
IN. H2O....
                 4.77
*******
POINT NO. 23.
                   RUN
DELTA H=
IN. H2O....
                 4.77
*******
POINT NO. 24.
         86.00 STO 02
                   RUN
DELTA H=
IN. H2O....
                 4.75
*******
POINT NO. 25.
          0.00     RUN
======

ISOKIN
AVG VALUES
KV=23.983
TMETER F=79.500
DELTA-H=3.259
DELTA P=1.050
FINAL METER
VOLUME FT3=?
     595.995     RUN
INITIAL=363.636
SAMPLE TIME
MIN. =?
     240.000     RUN
```

```
PSTACK ABS
IN HG=29.965
TSTACK F=83.583

======

SOURCE TYPE?
0=OTHER
1=BOILER
          0.000     RUN
% CO2 =?
          0.000     RUN
% O2 =?
         20.900     RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000     RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                    RUN
H2O GAIN=?
        107.290     RUN
NET METER
VOL. FT3=
                 222.359
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
                 217.932
MOLE FRACT. DRY
GAS, (1-BWS) =
                   0.977
% H2O =
                     2.3
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
                  28.590
AVG VELOCITY
FPM =
              3,316.311
STACK DRY GAS
FLOW QS  SCFM=
             41,278.479
ACFM =
             43,434.459


**********

ISOKINETIC %I =99.8

**********
```

C-10

24 POINT SAMPLE TRAVERSE



LINE 3 INLET, HARD CHROME PLATE

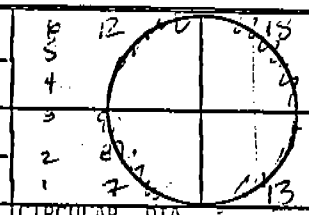
TRAVERSE POINT	TRAVERSE POINT LOCATION (DISTANCES FROM WALL) DUCT SIZE (IN.) 38 X 22
1,7,13,19	1.8
2,8,14,20	5.5
3,9,15,21	9.2
4,10,16,22	12.8
5,11,17,23	16.5
6,12,18,24	20.2

836 in 2

TRAVERSE DATA SHEET

(REV 8/86)

PLANT: NAD PLATING SHOP
LOCATION: NAS, PENSACOLA, FL
DATE: 9 NOV. 90
OPERATOR: HP
RUN #: 1 Line 3 inlet
Zone 3-2



CIRCULAR, DIA. ____ in
RECTANGULAR, LxW 38 X 22 = 836 in

Length from upstream disturbance: 128"
Diameter from upstream disturbance: De = 27.87"
Length from downstream disturbance: MORE THAN ENOUGH
Diameters from downstream disturbance: SAME
Required number of traverse points: 24
Number of traverse points used: 24

POINT # n	STACK PRESSURE (in H_2O) ΔPvel	Pstatic	$\sqrt{\Delta P}$	LOCATION (in) L	W	POINT # n	STACK PRESSURE (in H_2O) ΔPvel	Pstatic	$\sqrt{\Delta P}$	LOCATION (in) L	W
1	0.29		.54			26					
2	0.43		.66			27					
3	0.64		.80			28					
4	0.72	7.4	.85			29					
5	0.85		.92			30					
6	0.72		.85			31					
7	0.31		.56			32					
8	0.35	7.4	.59			33					
9	0.46		.68			34					
10	0.49		.70			35					
11	0.53		.73			36					
12	0.56		.75			37					
13	0.31		.56			38					
14	0.32		.57			39					
15	0.37		.61			40					
16	0.39	7.4	.62			41					
17	0.46		.68	0° cyclone		42					
18	0.49		.70			43					
19	0.44		.66			44					
20	0.44		.66			45					
21	0.53		.73			46					
22	0.55		.74			47					
23	0.56	4.5	.75			48					
24	0.54		.73			49					
25						50					

$$\Delta P_{ave} = \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]^2 \rightarrow \left(\frac{16.63}{24}\right)^2 \rightarrow 0.48$$

C-12

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 10 NOV 90

LINE NO: #3 hard chrome plate

BASE: NAD PENSACOLA

RUN NO: #1

BUILDING NO: 604

CONTROL DEVICE: INLET OUTLET

PREP BY: ck

IMPINGER BOX NO: 5

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.

[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.

[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.

[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.

[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.

[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.

[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
5-1	1. 100ml 0.1N NaOH	442.52	541.61	542.31	0.70
5-2	2. 100ml 0.1N NaOH	460.92	560.42	561.58	1.16
5-3	3. Empty	450.61	450.66	450.66	0.05
5-4	4. 500ml silica gel	442.99	723.64	724.49	0.85
				Net Weight Gain	2.76

Filter No: —

New

Silica gel condition after test: 1/2 Spent

Nozzle No: Box #9 Calibrated by: CV

					Average
ID Before Test:	0.267	0.267	0.270	0.268	0.268
ID After Test:	.269	.270	.268	.270	0.269

SOURCE EMISSION TESTING DATA SHEET 38" 11-030 IN

(SJS rev11/88, #02510) 22" MW 28.6

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 29.90	6 12 18 24	METER BOX #: 18	PROBE # (PITOT #): 3-NU	NOZZLE #: 9
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 74		METER ΔH@: 1.880	PITOT COEF: 0.722	IDEAL NOZZLE DIA, in.: 0.263
DATE: 10/NOV/90	AVE STATIC PRESSURE, in H_2O: -1.4		METER γ: 1.002	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: 0.268
OPERATOR: C. RUF	AVE VEL HEAD, in H_2O: 0.48	1 7 13 19	SAMPLE BOX #: 5	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: (GOOD) @ 6" Hg
RUN #: 3-1-IN	ASSUMED MOISTURE, %: 2	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: 0.008 @ 10

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (A) (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
915 Start 1	0	187.337	2.15	0.52	73	74	73	60			20.9	0		
2	2.5		2.59	0.63	74	74	73	60		7				
3	5.0		2.71	0.66	74	73	73	55						
4	7.5		3.42	0.83	74	75	73	59						
5	10.0		3.52	0.85	74	77	73	61		9				
STOP 932 6	12.5	198.995	3.29	0.79	74	80	74	58						
CHG PORT 932 7	15.0	201.4910	1.66	0.40	74	79	74	68						
8	17.5	203.2	1.75	0.42	74	80	75	57		5				
9	20.0		1.71	0.41	74	81	75	53		5				
10	22.5		2.00	0.48	74	81	75	52		6				
11	25.0	208.52	2.26	0.54	75	83	75	52		6				
12	27.5	210.68	2.47	0.59	75	84	76	52		6				
STOP 949	30.0	212.744	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~						
TOTAL														
AVERAGE														

C-14

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE: 10 NOV 90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR: C. RUF	AVE VEL HEAD, in H_2O		SAMPLE BOX # 5	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # CONTINUED 3-1-IN	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
@48 13	30.0	212.744	1.79	0.43	75	82	77	61		5				
14	32.5		1.76	0.42	75	83	77	50		5				
15	35.0	216.4	1.81	0.43	74	85	77	49		5				
16	37.5		1.89	0.45	75	85	78	49		5				
17	40.0	220.1	1.98	0.47	75	86	78	50		5				
STOP 18	42.5		2.06	0.49	75	86	78	50		5				
CHANGE PORT	45.0	223.048	~~2.34~~	~~0.56~~	~~74~~	~~81~~	~~79~~	~~66~~		~~6~~				
START 19	45.0	223.048	2.34	0.56	74	81	79	66		6				
20	47.5		2.27	0.54	73	83	79	49		6				
21	50.0		2.52	0.60	74	84	79	49		6				
22	52.5		2.52	0.60	75	86	79	50		6½				
23	55.0		2.44	0.58	75	87	80	49		6				
24	57.5		2.44	0.58	76	88	80	51		6				
STOP 25 TOTAL	60.0	236.860					POSTEST	.007 cfm Probe leak check @ 11" Hg						
AVERAGE						POSTEST	Pitots leak check			OK @ 4.7"				

C-15

CORRECTED RUN

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          3.      RUN
RUN NO.=?
          1.      RUN
FILTER NO=?
          0.      RUN

DELTA-H*AT = ?

          2.182   RUN
METER GAMMA = ?
          .935    RUN
STACK AREA
IN. SQ. = ?
        836.000   RUN
STACK STATIC
P IN H2O=?
         -1.400   RUN
PBAR IN HG=?
         29.900   RUN
% H2O=?
          2.000   RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
         28.600   RUN
AVG STACK
TEMP DEG F=?
         73.000   RUN
AVG DELTA-P
IN. H2O=?
          .480    RUN
AMBIENT
TEMP F=?
         74.000   RUN
PITOT TUBE
CSUBP=?
          .822    RUN

AVG STACK
VELOCITY FPM=
       2,387.425
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.247

ACTUAL NOZZLE
DIA INCHES=?
          .268    RUN
```

INLET

```
*******
INITIAL METER
VOLUME FT3 =?
        187.327   RUN
*******
POINT NO. 1.
          .52 STO 01
        73.00 STO 02
        74.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.23
*******
POINT NO. 2.
          .63 STO 01
        74.00 STO 02
              RUN
DELTA H=
IN. H2O....
          3.90
*******
POINT NO. 3.
          .66 STO 01
        73.00 STO 03
              RUN
DELTA H=
IN. H2O....
          4.00
*******
POINT NO. 4.
          .83 STO 01
        75.00 STO 03
              RUN
DELTA H=
IN. H2O....
          5.15
*******
POINT NO. 5.
          .85 STO 01
        77.00 STO 03
              RUN
DELTA H=
IN. H2O....
          5.30
*******
POINT NO. 6.
          .79 STO 01
        80.00 STO 03
              RUN
DELTA H=
IN. H2O....
          4.95
*******
POINT NO. 7.
          .48 STO 01
        79.00 STO 03
              RUN
DELTA H=
IN. H2O....
          2.50
*******
POINT NO. 8.
          .42 STO 01
        80.00 STO 03
              RUN
DELTA H=
IN. H2O....
          2.63
*******
POINT NO. 9.
          .41 STO 01
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
          2.57
*******
POINT NO. 10.
          .48 STO 01
              RUN
DELTA H=
IN. H2O....
          3.01
*******
POINT NO. 11.
          .54 STO 01
        75.00 STO 02
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.40
*******
POINT NO. 12.
          .59 STO 01
        84.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.72
*******
POINT NO. 13.
          .43 STO 01
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
          2.70
*******
POINT NO. 14.
          .42 STO 01
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
          2.64
*******
POINT NO. 15.
          .43 STO 01
        74.00 STO 02
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
          2.72
*******
POINT NO. 16.
          .45 STO 01
        75.00 STO 03
              RUN
DELTA H=
IN. H2O....
          2.79
*******
POINT NO. 17.
          .47 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
          2.98
*******
POINT NO. 18.
          .49 STO 01
              RUN
DELTA H=
IN. H2O....
          3.10
*******
POINT NO. 19.
          .56 STO 01
        74.00 STO 02
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.51
*******
POINT NO. 20.
          .54 STO 01
        73.00 STO 02
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.41
*******
POINT NO. 21.
          .60 STO 01
        74.00 STO 02
        84.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.79
*******
POINT NO. 22.
        75.00 STO 02
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.79
*******
POINT NO. 23.
          .58 STO 01
        87.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.67
*******
POINT NO. 24.
        76.00 STO 02
        88.00 STO 03
              RUN
DELTA H=
IN. H2O....
          3.67
*******
POINT NO. 25.
          0.00    RUN
======

ISOKIN
AVG VALUES
KV=17.062
TMETER F=81.125
DELTA-H=3.467
DELTA P=0.546
FINAL METER
VOLUME FT3=?
        236.860   RUN
INITIAL=187.327
SAMPLE TIME
MIN. =?
         60.000   RUN
PSTACK ABS
IN HG=29.797
TSTACK F=74.250

======
```

```
SOURCE TYPE?
0=OTHER
1=BOILER
          0.000   RUN
% CO2 =?
          0.000   RUN
% O2 =?
         20.900   RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000   RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                  RUN
H2O GAIN=?
          2.760   RUN
NET METER
VOL. FT3=
         46.313
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
         45.002
MOLE FRACT. DRY
GAS, (1-BWS) =
          0.997
% H2O =
            0.3
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
         28.805
AVG VELOCITY
FPM =
      2,455.491
STACK DRY GAS
FLOW QS  SCFM=
     13,984.821
ACFM =
     14,255.492

**********

ISOKINETIC %I =79.5

**********
```

C-16

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 10 NOV 90

LINE NO: #3 hard chrome plate

BASE: NAD PENSACOLA

RUN NO: #2

BUILDING NO: 604

CONTROL DEVICE: INLET OUTLET

PREP BY: ok

IMPINGER BOX NO: 6

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.
[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.
[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial ok	Final	Condensate
6-1	1. 100ml 0.1N NaOH	495.18	578.05	594.34	2.31
6-2	2. 100ml 0.1N NaOH	467.08	564.19	564.74	0.55
6-3	3. Empty	458.23	458.20	458.31	0.11
6-4	4. 500ml silica gel	468.35	752.63	763.94	11.31
				Net Weight Gain	14.28

Filter No: —

New Silica gel condition after test: 40% SPENT

Nozzle No: Pyrex #8 Calibrated by: [illegible]

					Average
ID Before Test:	0.269	0.265	0.270	0.268	0.269
ID After Test:	0.269	0.269	0.268	0.270	0.269

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q) 836 IN 2

PLANT NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg 29.90	6 12 / 18 24	METER BOX # 18	PROBE # (PITOT #) 3-NU	NOZZLE # PYREX #9
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F 74		METER ΔH@ 1.580	PITOT COEF 0.722	IDEAL NOZZLE DIA, in.
DATE 10 NOV 90	AVE STATIC PRESSURE, in H_2O -1.4		METER γ 1.002	PROBE LENGTH, in. 36	ACTUAL NOZZLE DIA, in. 0.269
OPERATOR NEWTON	AVE VEL HEAD, in H_2O 0.55	1 7 / 13 19	SAMPLE BOX # IMP 6	PROBE LINER MATERIAL GLASS	LEAK CHECK @ PITOT'S
RUN # 3-2-IN	ASSUMED MOISTURE, % 20.3	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING N/A	PROBE HEATER SETTING N/A	LEAK RATE CFM@ in Hg .008 ft³/min @ 13

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft³	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START 11:30am 1	0	237.127	1.97	0.45	73	79	77	62		5	20.9	0	0	0
2	2.5	239.1	2.57	0.59	74	77	78	54		6				
3	5.0	241.23	3.27	0.75	74	78	77	50		7				
4	7.5	—	3.68	0.84	74	81	77	49		8				
5	10.0	246.3	3.78	0.86	74	83	77	49		9				
6	12.5	—	3.49	0.79	74	85	78	51		8				
STOP 11:45 7	15.0	251.61												
START 1:30 7	15.0	251.61	1.64	0.37	74	86	78	51		4				
8	17.5	253.3	1.94	0.44	74	83	78	51		5				
9	20.0	255.25	2.12	0.48	74	84	78	49		5				
10	22.5	257.3	2.12	0.48	75	85	78	49		5				
11	25.0	259.25	2.34	0.53	75	86	78	49		6				
12	27.5	—	2.61	0.59	75	87	78	49		6				
STOP 2:05 TOTAL	30.0	263.585												
AVERAGE														

81-3

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NAD Pensacola	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 10 Nov 90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR NEWTON	AVE VEL HEAD, in H_2O		SAMPLE BOX # 6	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # (CONT) 3-P-IN	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (A) (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START 1200														
13	30.0	263.585	2.02	0.46	75	83	79	49		5				
14	32.5	265.5	1.90	0.43	74	85	80	49		4.5				
15	35.0	—	1.86	0.42	74	86	80	49		4.5				
16	37.5	269.3	1.77	0.40	74	87	80	49		4.5				
17	40.0	271.18	1.86	0.42	74	86	80	50		4.5				
STOP 1223 18	42.5	273.12	2.22	0.50	74	87	80	49		5.0				
18	45.0	275.1												
START 1225 19	45.0	275.1	2.34	0.53	74	84	80	49		5.5				
20	47.5	277.5	2.60	0.59	74	85	80	49		6				
21	50.0	279.5	2.75	0.62	74	87	81	49		6.5				
22	52.5	281.7	2.75	0.62	74	88	81	49		6.5				
23	55.0	284.05	2.62	0.59	74	88	81	50		6				
24	57.5	286.37	2.62	0.59	74	89	81	50		6				
STOP 1240 TOTAL	60.0	288.785												
AVERAGE														

Post leak Pat @ 10" Hg .008 Pitots Ck (✓) Std

C-19

CORRECTED RUN

```
RUN
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          3.    RUN
RUN NO.=?
          2.    RUN
FILTER NO=?
          8.    RUN

DELTA-H@AT =?
      2.182     RUN
METER GAMMA = ?
       .935     RUN
STACK AREA
IN. SQ. = ?
    836.000     RUN
STACK STATIC
P IN H2O=?
     -1.400     RUN
PBAR IN HG=?
     29.900     RUN
% H2O=?

      1.000     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.800     RUN
AVG STACK
TEMP DEG F=?
     74.000     RUN
AVG DELTA-P
IN. H2O=?
       .550     RUN
AMBIENT
TEMP F=?
     74.000     RUN
PITOT TUBE
CSUBP=?
       .822     RUN
AVG STACK
VELOCITY FPM=
          2,463.668
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.238

ACTUAL NOZZLE
DIA INCHES=?
       .269     RUN
```

INLET

```
*******
INITIAL METER
VOLUME FT3 =?
    237.127     RUN
*******
POINT NO. 1.
          .45 STO 01
        73.00 STO 02
        79.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.92
*******
POINT NO. 2.
          .59 STO 01
        74.00 STO 02
        77.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.01
*******
POINT NO. 3.
        78.00 STO 03
          .75 STO 01
              RUN
DELTA H=
IN. H2O....
             4.85
*******
POINT NO. 4.
          .84 STO 01
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
             5.46
*******
POINT NO. 5.
          .86 STO 01
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
             5.61
*******
POINT NO. 6.
          .79 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             5.17
*******
POINT NO. 7.
          .37 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.43
*******
POINT NO. 8.
          .44 STO 01
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.87
*******
POINT NO. 9.
          .48 STO 01
        84.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.14
*******
POINT NO. 10.
        75.00 STO 02
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.14
*******
POINT NO. 11.
          .53 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.47
*******
POINT NO. 12.
          .59 STO 01
        87.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.87
*******
POINT NO. 13.
          .46 STO 01
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.00
*******
POINT NO. 14.
          .43 STO 01
        74.00 STO 02
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.02
*******
POINT NO. 15.
          .42 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.76
*******
POINT NO. 16.
          .40 STO 01
        87.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.63
*******
POINT NO. 17.
          .42 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.76
*******
POINT NO. 18.
          .50 STO 01
        87.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.29
*******
POINT NO. 19.
          .53 STO 01
        84.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.46
*******
POINT NO. 20.
          .59 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.86
*******
POINT NO. 21.
          .62 STO 01
        87.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.08
*******
POINT NO. 22.
        88.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.08
*******
POINT NO. 23.
          .59 STO 01
              RUN
DELTA H=
IN. H2O....
             3.89
*******
POINT NO. 24.
        89.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.89
*******
POINT NO. 25.
          0.00      RUN
======

ISOKIN
AVG VALUES
KV=17.110
TMETER F=84.542
DELTA-H=3.635
DELTA P=0.548
FINAL METER
VOLUME FT3=?
    288.785     RUN
INITIAL=237.127
SAMPLE TIME
MIN. =?
     60.000     RUN
PSTACK ABS
IN HG=29.797
TSTACK F=74.125
------
SOURCE TYPE?
0=OTHER
1=BOILER
          0.000     RUN
% CO2 =?
          0.000     RUN
% O2 =?
         20.900     RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000     RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                    RUN
H2O GAIN=?
         14.200     RUN
NET METER
VOL. FT3=
                48.300
CORRECTED
SAMPLE VOL.
VMSTD SCF=
                46.638
MOLE FRACT. DRY
GAS, (1-BWS) =
                 0.986
% H2O =
                   1.4
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
                28.682
AVG VELOCITY
FPM =
             2,464.717
STACK DRY GAS
FLOW QS SCFM=
            13,881.021
ACFM =
            14,389.050


**********

ISOKINETIC %I =82.3

*********
```

C-20

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 10 NOV 90

LINE NO: Hard chrome Line 3

BASE: NAD PENSACOLA

RUN NO: # 3

BUILDING NO: 604

CONTROL DEVICE: (INLET) OUTLET

PREP BY: [illegible]

IMPINGER BOX NO: 5

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.
[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.
[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
5-1	1. 100ml 0.1N NaOH	443.85	541.02	541.45	0.43
5-2	2. 100ml 0.1N NaOH	461.42	559.03	560.09	1.06
5-3	3. Empty	457.85	457.85	457.43	0.42
5-4	4. 500ml silica gel		783.00	794.16	11.16
				Net Weight Gain	12.23

Filter No: —

Silica gel condition after test: Before ≈ 1/4 Spent After 1/2 Spent.

Nozzle No: Pyrex #8 Calibrated by: [illegible]

					Average
ID Before Test:	0.269	0.269	0.268	0.270	0.2[illegible]
ID After Test:	0.269	0.270	0.270	0.269	0.2695

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510) AP856ne

PLANT: NAD KENSHILK	BAROMETRIC PRESSURE, in Hg: 29.90		METER BOX #: 18	PROBE # (PITOT #): S-N(1)	NOZZLE #: PYREX #8
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 74		METER ΔH@: 1.880	PITOT COEF: 0.722	IDEAL NOZZLE DIA, in.: 0.254
DATE: 10 NOV 90	AVE STATIC PRESSURE, in H_2O: -1.9		METER γ: 1.002	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: 0.269
OPERATOR: NEWTON	AVE VEL HEAD, in H_2O: 0.548		SAMPLE BOX #: 2	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: OK INTEST
RUN #: 3-3-IN1	ASSUMED MOISTURE, %: 1.3	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .013 cfm@11

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START 1549														
1	0	289.094	2.01	0.47	75	80	77	50		6	20.9	0	0	0
2	2.5	291.1	2.40	0.56	74	80	74	43		7				
3	5.0	293.1	3.06	0.72	74	76	74	41		8				
4	7.5	—	3.64	0.85	74	79	74	42		9				
5	10.0	—	3.69	0.86	74	80	74	43		9				
STOP 1604 6	12.5	—	3.52	0.82	74	81	74	45		9				
START 1607 7	15.0	303.33	1.84	0.43	74	79	74	50		6				
8	17.5	305.3	1.98	0.46	74	81	74	47		6				
9	20.0	307.35	2.08	0.47	74	82	76	46		6				
10	22.5	309.25	2.11	0.49	74	83	76	46		6				
11	25.0	311.27	2.16	0.50	74	83	76	46		6				
12	27.5	313.3	2.51	0.58	74	85	76	47		7				
STOP 1622	30.0	315.4												
TOTAL														
AVERAGE														

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SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION: BLDG 664	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE: 16/NOV/90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR: NEWTON	AVE VEL HEAD, in H_2O		SAMPLE BOX # 5	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # FUNT 3-3-IN	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START 1629														
13	30.0	315.4	2.38	0.55	74	85	78	48		6.5				
14	32.5	~	1.85	0.43	74	82	78	46		6.0				
15	35.0	~	1.90	0.44	74	83	78	46		6.0				
16	37.5	321.35	1.81	0.42	74	83	78	48		5.5				
17	40.0	323.3	1.99	0.46	74	85	78	48		6.0				
18	42.5	325.1	2.21	0.51	74	85	78	46		6.0				
STOP 1644														
19	45.0	327.075	2.62	0.61	74	82	79	49		7.0				
START 1647														
20	47.5	329.35	2.59	0.60	74	84	79	47		7.0				
21	50.0	331.55	2.77	0.64	74	86	79	47		8.0				
22	52.5	~	2.60	0.60	74	86	79	48		7.5				
23	55.0	336.3	2.52	0.58	74	88	79	49		7.0				
24	57.5	338.52	2.44	0.56	74	88	79	50		7.0				
STOP 1702	60	340.674												
TOTAL							POST TEST .012@ 1" Hg Cl							
AVERAGE					POST TEST Pitot (OK) 5.7" H_2O									

C-23

CORRECTED RUN

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S   INLET

TEST NO=?
          3.    RUN
RUN NO.=?
          3.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*DT =?
      2.182     RUN
METER GAMMA = ?
       .935     RUN
STACK AREA
IN. SQ. = ?
    836.000     RUN
STACK STATIC
P IN H2O=?
     -1.400     RUN
PBAR IN HG=?
     29.900     RUN
% H2O=?
      1.300     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.600     RUN
AVG STACK
TEMP DEG F=?
     74.000     RUN
AVG DELTA-P
IN. H2O=?
       .548     RUN
AMBIENT
TEMP F=?
     74.000     RUN
PITOT TUBE
CSUBP=?
       .822     RUN
AVG STACK
VELOCITY FPM=
      2,467.768
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.238

ACTUAL NOZZLE
DIA INCHES=?
       .269     RUN
```

```
*******
INITIAL METER
VOLUME FT3 =?
    289.094     RUN
*******
POINT NO. 1.
          .47 STO 01
        75.00 STO 02
        80.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.03
*******
POINT NO. 2.
          .56 STO 01
        74.00 STO 02
        80.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.61
*******
POINT NO. 3.
          .72 STO 01
        76.00 STO 03
              RUN
DELTA H=
IN. H2O....
         4.61
*******
POINT NO. 4.
          .85 STO 01
        79.00 STO 03
              RUN
DELTA H=
IN. H2O....
         5.47
*******
POINT NO. 5.
          .86 STO 01
        80.00 STO 03
              RUN
DELTA H=
IN. H2O....
         5.55
*******
POINT NO. 6.
          .82 STO 01
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
         5.30
*******
```

```
POINT NO. 7.
          .43 STO 01
        79.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.77
*******
POINT NO. 8.
          .46 STO 01
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.97
*******
POINT NO. 9.
      ~~.46 STO 01~~
          .47 STO 01
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.04
*******
POINT NO. 10.
          .49 STO 01
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.18
*******
POINT NO. 11.
          .50 STO 01
              RUN
DELTA H=
IN. H2O....
         3.24
*******
POINT NO. 12.
          .58 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.78
*******
POINT NO. 13.
          .55 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.58
```

```
*******
POINT NO. 14.
          .43 STO 01
      ~~82.00 STO 02~~
        74.00 STO 02
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.70
*******
POINT NO. 15.
          .44 STO 01
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.85
*******
POINT NO. 16.
          .42 STO 01
              RUN
DELTA H=
IN. H2O....
         2.72
*******
POINT NO. 17.
          .46 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.99
*******
POINT NO. 18.
          .51 STO 01
              RUN
DELTA H=
IN. H2O....
         3.32
*******
POINT NO. 19.
          .61 STO 01
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.95
*******
POINT NO. 20.
          .60 STO 01
        84.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.90
```

```
*******
POINT NO. 21.
          .64 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
         4.17
*******
POINT NO. 22.
          .60 STO 01
              RUN
DELTA H=
IN. H2O....
         3.91
*******
POINT NO. 23.
          .58 STO 01
        88.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.80
*******
POINT NO. 24.
          .56 STO 01
              RUN
DELTA H=
IN. H2O....
         3.67
*******
POINT NO. 25.
        0.00    RUN
======

ISOKIN
AVG VALUES
KV=17.300
TMETER F=82.750
DELTA-H=3.675
DELTA P=0.560
FINAL METER
VOLUME FT3=?
    340.674     RUN
INITIAL=289.094
SAMPLE TIME
MIN. =?
     60.000     RUN
PSTACK ABS
IN HG=29.797
TSTACK F=74.042
------
```

```
SOURCE TYPE?
0=OTHER
1=BOILER
        0.000   RUN
% CO2 =?
        0.000   RUN
% O2 =?
       20.900   RUN
H2O GAIN KNOWN?
1=YES 0=NO
        1.000   RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                RUN
H2O GAIN=?
       12.230   RUN
NET METER
VOL. FT3=
       48.227
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
       46.721
MOLE FRACT. DRY
GAS, (1-BWS) =
        0.988
% H2O =
          1.2
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
       28.704
AVG VELOCITY
FPM =
    2,491.150
STACK DRY GAS
FLOW QS  SCFM=
   14,061.085
ACFM =
   14,462.512

**********

ISOKINETIC %I =81.4

*********
```

C-24

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 10 NOV 90

LINE NO: #3 hard chrome plate

BASE: NAD PENSACOLA

RUN NO: #4

BUILDING NO: 604

CONTROL DEVICE: INLET / OUTLET

PREP BY: CK

IMPINGER BOX NO: 6

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.

[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.

[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.

[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.

[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.

[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.

[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
6-1	1. 100ml 0.1N NaOH	496.71	594.23	594.90	0.67
6-2	2. 100ml 0.1N NaOH	467.93	565.08	565.47	0.39
6-3	3. Empty	458.95	458.94	458.31	—
6-4	4. 500ml silica gel		805.42	816.91	11.49
				Net Weight Gain	12.55

1 dribble spilled

Filter No: —

Silica gel condition after test: ½ spent

1/4 spent

Nozzle No: Pyrex #9 Calibrated by: [illegible]

					Average
ID Before Test:	0.271	0.269	0.270	0.269	0.270
ID After Test:	0.271	0.269	0.270	0.269	0.270

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

836 IN 2

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 29.9		METER BOX #: 18	PROBE # (PITOT #): 3-N6	NOZZLE #: PYREX #9
LOCATION: BLDG 664	AMBIENT TEMPERATURE, °F: 74		METER ΔH@: 1.880	PITOT COEF: 0.722	IDEAL NOZZLE DIA, in.: 0.254
DATE: 10 NOV 90	AVE STATIC PRESSURE, in H_2O: -1.4		METER γ: 1.002	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: 0.270
OPERATOR: NEWTON	AVE VEL HEAD, in H_2O: 0.55		SAMPLE BOX #: 6	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: GOOD (PRETEST)
RUN #: 3-4-IN	ASSUMED MOISTURE, %: 1.3	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .008 cfm @ 13"

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (A) (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: Inlet (Tm in) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START 1759														
1	0	341.087	2.43	0.56	74	78	78	58		7.0	20.9	0	0	0
2	2.5		2.51	0.58	74	77	77	52		7.5				
3	5.0	345.48	3.16	0.73	74	77	77	49		9.0				
4	7.5	347.82	3.75	0.86	74	81	77	47		10.5				
5	10.0	350.47	3.80	0.87	74	82	77	48		11.0				
STOP 1814 6	12.5		3.43	0.78	74	85	77	52		10.0				
START 1816 7	15.0	355.737	1.83	0.42	74	82	77	56		6.0				
8	17.5		1.97	0.45	74	84	77	54		6.5				
9	20.0	359.57	2.02	0.46	74	84	78	53		6.5				
10	22.5	361.6	2.06	0.47	74	85	78	54		6.5				
11	25.0	363.5	2.20	0.50	74	86	79	52		7.0				
STOP 1831 12	27.5	365.525	2.38	0.54	74	87	80	52		7.0				
	30.0	367.59												
TOTAL														
AVERAGE														

C-26

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NADFENSACOLA	BAROMETRIC PRESSURE, in Hg	METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F	METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 10 NOV 90	AVE STATIC PRESSURE, in H_2O	METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR RUF	AVE VEL HEAD, in H_2O	SAMPLE BOX # 6	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # 3-4-CONT	ASSUMED MOISTURE, %	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O (A)	STACK TEMPERATURE (Ts) °F (B)	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
63 13	30.0	367.59	2.49	0.57	75	84	79	63						
14	32.5	369.7	1.93	0.44	75	84	79	52		6				
15	35.0	371.69	1.84	0.42	75	84	80	52						
16	37.5	373.665	1.75	0.40	75	85	79	54		6				
17	40.0	375.40	1.93	0.44	75	86	80	53		6				
65 18	42.5	377.39	2.11	0.48	75	86	80	54		6½				
65 19	45.0	379.355	2.67	0.61	75	85	80	56		7				
20	47.5	381.57	2.59	0.59	75	86	80	53		8				
21	50.0	383.77	2.82	0.64	75	87	80	53		8				
22	52.5	—	2.64	0.60	75	88	81	53		8				
23	55.0	388.40	2.61	0.59	75	89	81	54		8				
24	57.5	—	2.43	0.55	75	89	81	54		8				
109	60.0	392.974												
TOTAL							Post	leak	.004 @ 10" Hg					
AVERAGE						PITOTS OK @			5" H2O					

C-27

CORRECTED RUN

```
METHOD 5 NOMO
ENTER DATA
THEN PUSH R/S

TEST NO=?
          3.    RUN
RUN NO.=?
          4.    RUN
FILTER NO=?
          0.    RUN

DELTA-H@AT = ?
      2.182     RUN
METER GAMMA = ?
       .935     RUN
STACK AREA
IN. SQ. = ?
    836.000     RUN
STACK STATIC
P IN H2O=?
     -1.400     RUN
PBAR IN HG=?
     29.900     RUN
% H2O=?
      1.300     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.600     RUN
AVG STACK
TEMP DEG F=?
     74.000     RUN
AVG DELTA-P
IN. H2O=?
       .550     RUN
AMBIENT
TEMP F=?
     74.000     RUN
PITOT TUBE
CSUBP=?
       .822     RUN

AVG STACK
VELOCITY FPM=
      2,472.267
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.238

ACTUAL NOZZLE
DIA INCHES=?
       .270     RUN
```

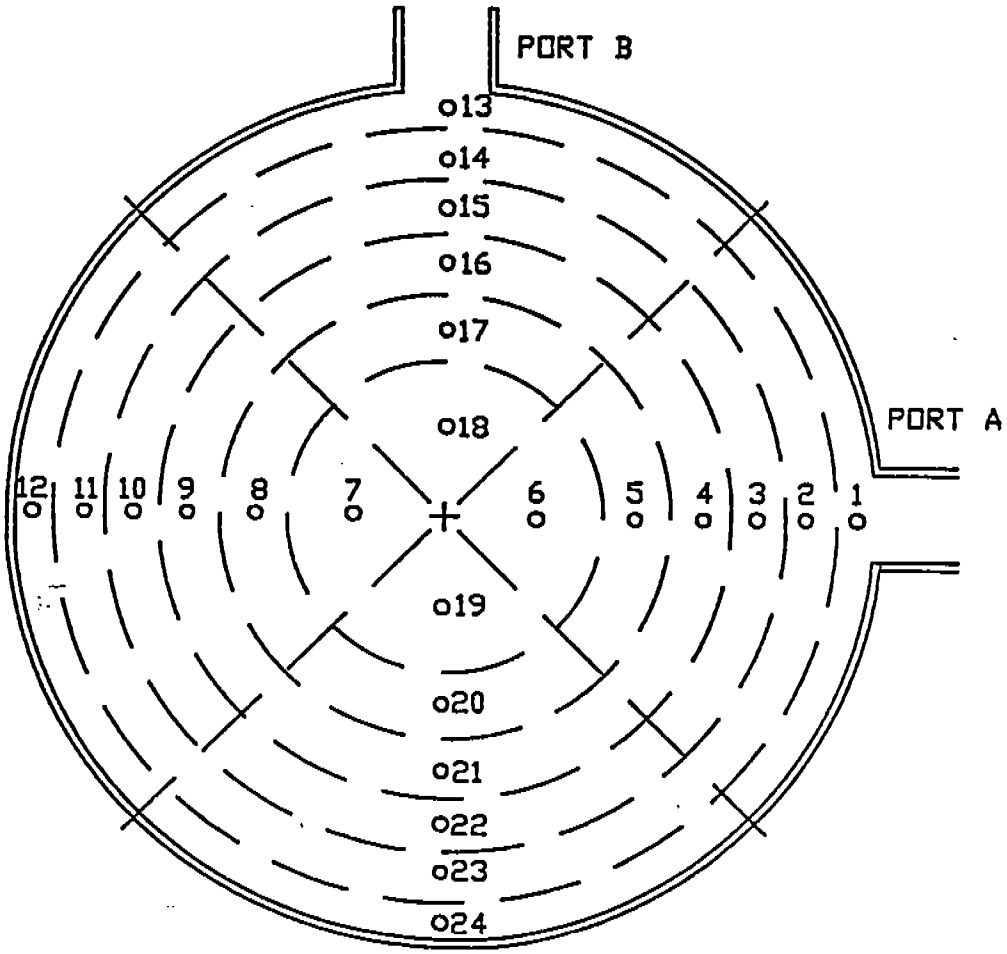
INLET

```
*******
INITIAL METER
VOLUME FT3 =?
    341.087     RUN
*******
POINT NO. 1.
          .56 STO 01
        74.00 STO 02
        78.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.65
*******
POINT NO. 2.
          .58 STO 01
        77.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.78
*******
POINT NO. 3.
          .73 STO 01
              RUN
DELTA H=
IN. H2O....
             4.75
*******
POINT NO. 4.
          .86 STO 01
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
             5.64
*******
POINT NO. 5.
          .87 STO 01
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
             5.72
*******
POINT NO. 6.
          .78 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             5.15
*******
POINT NO. 7.
          .42 STO 01
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.76
*******
POINT NO. 8.
          .45 STO 01
        84.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.97
*******
POINT NO. 9.
          .46 STO 01
              RUN
DELTA H=
IN. H2O....
             3.03
*******
POINT NO. 10.
          .47 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.11
*******
POINT NO. 11.
          .50 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.31
*******
POINT NO. 12.
          .54 STO 01
        87.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.58
*******
POINT NO. 13.
          .57 STO 01
        75.00 STO 02
        84.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.75
*******
POINT NO. 14.
          .44 STO 01
              RUN
DELTA H=
IN. H2O....
             2.90
*******
POINT NO. 15.
          .42 STO 01
              RUN
DELTA H=
IN. H2O....
             2.76
*******
POINT NO. 16.
          .40 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.64
*******
POINT NO. 17.
          .44 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.91
*******
POINT NO. 18.
          .48 STO 01
              RUN
DELTA H=
IN. H2O....
             3.17
*******
POINT NO. 19.
          .61 STO 01
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.02
*******
POINT NO. 20.
          .59 STO 01
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.90
*******
POINT NO. 21.
          .64 STO 01
        87.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.24
*******
POINT NO. 22.
          .60 STO 01
        88.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.98
*******
POINT NO. 23.
          .59 STO 01
        89.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.92
*******
POINT NO. 24.
          .55 STO 01
              RUN
DELTA H=
IN. H2O....
             3.65
*******
POINT NO. 25.
          0.00      RUN
======

ISOKIN
AVG VALUES
KV=17.263
TMETER F=84.288
DELTA-H=3.720
DELTA P=0.558
FINAL METER
VOLUME FT3=?
    392.974     RUN
INITIAL=341.087
SAMPLE TIME
MIN. =?
     60.000     RUN
PSTACK ABS
IN HG=29.797
TSTACK F=74.500

======
```

```
SOURCE TYPE?
0=OTHER
1=BOILER
          0.000     RUN
% CO2 =?
          0.000     RUN
% O2 =?
         20.900     RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000     RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                    RUN
H2O GAIN=?
         12.550     RUN
WET METER
VOL. FT3=
                 48.514
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
                 46.873
MOLE FRACT. DRY
GAS, (1-BWS) =
                  0.988
% H2O =
                    1.2
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
                 28.701
AVG VELOCITY
FPM =
              2,485.928
STACK DRY GAS
FLOW @S  SCFM=
             14,015.677
ACFM =
             14,432.193


**********

ISOKINETIC %I =81.4

*********
```

82-7

24 POINT SAMPLE TRAVERSE



LINE 3 OUTLET, HARD CHROME PLATE
LINE 4 OUTLET, COPPER CYANIDE PLATE

TRAVERSE POINT	EPA METHOD 1 (% OF DIA)	TRAVERSE POINT LOCATION (DISTANCES FROM I.D.) DUCT DIAMETER (IN.) 52.5
1 & 13	2.1	1.1
2 & 14	6.7	3.5
3 & 15	11.8	6.2
4 & 16	17.7	9.3
5 & 17	25.0	13.1
6 & 18	35.6	18.7
7 & 19	64.4	33.8
8 & 20	75.0	39.4
9 & 21	82.3	43.2
10 & 22	88.2	46.3
11 & 23	93.3	49.0
12 & 24	97.9	51.4

LINE 3 OUTLET

TPT

(REV 8/86)

TRAVERSE DATA SHEET

W 2165 IN²

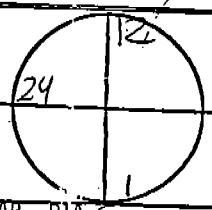
PLANT NAD PENSACOLA

LOCATION BLDG 604

DATE 08 NOV 90

OPERATOR NEWTON

RUN # LINE 3 HARD CHROME OUTLET



CIRCULAR, DIA. E 52.5 in

RECTANGULAR, LxW in

Length from upstream disturbance ft

Diameter from upstream disturbance 2 ea

Length from downstream disturbance ft

Diameters from downstream disturbance 3 ea

Required number of traverse points 24 ea

Number of traverse points used 24 ea

POINT # n	STACK PRESSURE (in H2O) ΔPvel	Pstatic	√ΔP	LOCATION (in) L	W	POINT # n	STACK PRESSURE (in H2O) ΔPvel	Pstatic	√ΔP	LOCATION (in) L	W
1	0.64		0.80	1.5		26					
2	0.72		0.85	3.5		27					
3	0.74		0.86	6.2		28					
4	0.75		0.87	9.3		29					
5	0.82	-0.5	0.91	13.1		30					
6	1.0		1.0	18.7		31					
7	0.74	-0.51	0.86	33.8		32					
8	0.61		0.78	39.4		33					
9	0.56		0.75	43.2		34					
10	0.54	0.39	0.74	46.3		35					
11	0.54		0.74	49.0		36					
12	0.49		0.70	51.0		37					
13	0.80		0.89			38					
14	0.89		0.94			39					
15	0.92		0.96			40					
16	0.91		0.95			41					
17	0.89		0.94			42					
18	0.87	-0.58	0.93			43					
19	0.77		0.88			44					
20	0.63		0.79			45					
21	0.59		0.77			46					
22	0.56		0.75			47					
23	0.59		0.77			48					
24	0.54		0.74			49					
25						50					

$$\Delta P_{ave} = \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]^2 = 0.705$$

AVE STATIC -0.5

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 10 NOV 90

LINE NO: #3 Hard Chrome

BASE: NAD PENSACOLA

RUN NO: #1

BUILDING NO: 604

CONTROL DEVICE: INLET (OUTLET)

PREP BY: CK

IMPINGER BOX NO: 3

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.
[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.
[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
3-1	1. 100ml 0.1N NaOH	512.27	611.33	620.17	8.84
3-2	2. 100ml 0.1N NaOH	522.17	619.56	620.93	1.37
3-3	3. Empty	457.52	457.52	458.56	1.04
3-4	4. 500ml silica gel		749.64	775.67	26.03
				Net Weight Gain	37.28

Filter No: —

New Silica gel condition after test: 1/2 Spent

Nozzle No: #14 Calibrated by: [illegible]

					Average
ID Before Test:	0.230	0.230	0.229	0.230	0.230
ID After Test:	0.231	0.230	0.230	0.230	0.230

D=52.5" SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510) A=216 SIN 9 W USE ΔH @ (2.04H) M_W = 28.6 lb/lb-mole

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 29.90		METER BOX #: 14 N0447	PROBE # (PITOT #): 5-12	NOZZLE #: QTZ #14
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 50		METER ΔH@: 2.049	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.234
DATE: 10 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.5		METER γ: 1.005	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.230
OPERATOR: PEREZ	AVE VEL HEAD, in H_2O: 0.705		SAMPLE BOX #: 3	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: 5000 @ 6" H_2O
RUN #: 3-1-OUT	ASSUMED MOISTURE, %: 2	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .004 cfm @ 15 in Hg

TRAVERSE POINT #	SAMPLING TIME (Start Time 9:05) min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
12	0	592.549	1.26	0.45	78°	54°	54°	49°		3				
11	7.5	597.500	1.31	0.47	79°	56°	56°	45°		4				
10	15.0	601.800	1.37	0.49	79°	57°	55°	43°		4				
9	22.5	605.800	1.50	0.53	78°	60°	58°	43°		4				
8	30.0	611.000	1.64	0.58	79°	62°	57°	42°		4				
7	37.5	617.000	2.07	0.73	79°	64°	59°	43°		5				
6	45.0	622.500	3.14	1.1	79°	67°	60°	46°		7				
5	52.5	627.800	2.78	0.97	79°	69°	62°	45°		6				
4	60.0	636.000	2.44	0.85	78°	69°	62°	45°		5				
3	67.5	641.400	2.41	0.84	79°	70°	63°	46°		5				
2	75.0	648.000	2.35	0.82	80°	70°	63°	46°		5				
1	82.5	655.000	1.93	0.67	79°	71°	64°	47°		5				
(Hang Pitts 0830)	90.0	659.272												
TOTAL														
AVERAGE														

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SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 10NOV90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR PEREZ	AVE VEL HEAD, in H_2O		SAMPLE BOX # 3	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # CONTINUED 3-1-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS)(A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start Time 10:10														
13	90	659.272	2.77	0.98	80°	62°	61°	45°		6				
14	97.5	665.200	3.12	1.1	79°	63°	62°	38°		6				
15	105.0	672.400	3.14	1.1	79°	67°	62°	43°		7				
16	112.5	678.700	3.45	1.2	79°	71°	63°	45°		7				
17	120.0	686.700	3.17	1.1	79°	72°	64°	46°		6				
18	127.5	692.700	2.87	0.99	78°	73°	66°	46°		6.5				
19	135.0	699.500	2.68	0.93	80°	72°	66°	46°		6				
20	142.5	705.500	2.34	0.81	80°	74°	67°	46°		5				
21	150.0	712.000	1.76	0.61	79°	73°	67°	46°		4.5				
22	157.5	717.000	1.53	0.53	79°	73°	68°	45°		4				
23	165.0	—	1.44	0.50	79°	72°	68°	44°		4				
24	172.5	727.11	1.50	0.52	79	72	68	44		4				
Stop 12:41	180.0	732.241												
TOTAL														
AVERAGE														

Final Leak Ck NOZZLE = .012 CFM@ 10in Hg = PASS!

Pitot Lines = GOOD @ 6in H_2O = PASS!

MXB

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```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          3.    RUN
RUN NO.=?
          1.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
      2.049     RUN
METER GAMMA = ?
      1.005     RUN
STACK AREA
IN. SQ. = ?
  2,165.000     RUN
STACK STATIC
P IN H2O=?
     -.500      RUN
PBAR IN HG=?

     29.908     RUN
% H2O=?
      2.000     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.600     RUN
AVG STACK
TEMP DEG F=?
     75.000     RUN
AVG DELTA-P
IN. H2O=?
       .705     RUN
AMBIENT
TEMP F=?
     50.000     RUN
PITOT TUBE
CSUBP=?
       .790     RUN

AVG STACK
VELOCITY FPM=
  2,689.604
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.234

ACTUAL NOZZLE
DIA INCHES=?
       .238     RUN

SAMPLE CFM = 0.724
```

OUT

```
******
INITIAL METER
VOLUME FT3 =?
    592.549     RUN
*******
POINT NO. 1.
          .45 STO 01
        78.00 STO 02
         8.00    CLX
        54.00 STO 03
              RUN
DELTA H=
IN. H2O....
         1.26
*******
POINT NO. 2.
          .47 STO 01
        79.00 STO 02
        56.00 STO 03
              RUN
DELTA H=
IN. H2O....
         1.31
*******
POINT NO. 3.
          .49 STO 01
        57.00 STO 03
              RUN
DELTA H=
IN. H2O....
         1.37
*******
POINT NO. 4.
          .53 STO 01
        78.00 STO 02
        60.00 STO 03
              RUN
DELTA H=
IN. H2O....
         1.50
*******
POINT NO. 5.
          .58 STO 01
        79.00 STO 02

        62.00 STO 03
              RUN
DELTA H=
IN. H2O....
         1.64
*******
POINT NO. 6.
          .73 STO 01
        64.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.07
*******
POINT NO. 7.
         1.10 STO 01
        79.00 STO 02
        67.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.14
*******
POINT NO. 8.
          .97 STO 01
        69.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.78
*******
POINT NO. 9.
          .85 STO 01
        76.00 STO 02
              RUN
DELTA H=
IN. H2O....
         2.44
*******
POINT NO. 10.
          .84 STO 01
        79.00 STO 02
        70.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.41
*******
POINT NO. 11.
          .82 STO 01
        80.00 STO 02
              RUN
DELTA H=
IN. H2O....
         2.35
*******
POINT NO. 12.
          .67 STO 01
        79.00 STO 02
        71.00 STO 03
              RUN
DELTA H=
IN. H2O....
         1.93
*******
POINT NO. 13.
          .98 STO 01
        80.00 STO 02
        62.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.77
*******
POINT NO. 14.
         1.10 STO 01
        79.00 STO 02
        63.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.12
*******
POINT NO. 15.
        67.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.14
*******
POINT NO. 16.
         1.20 STO 01
        71.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.45
*******
POINT NO. 17.
         1.10 STO 01
        72.00 STO 03
              RUN
DELTA H=
IN. H2O....
         3.17
*******
POINT NO. 18.
          .99 STO 01
        78.00 STO 02
        73.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.87
*******
POINT NO. 19.
          .93 STO 01
        80.00 STO 02
        72.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.60
*******
POINT NO. 20.
          .81 STO 01
        74.00 STO 03
              RUN
DELTA H=
IN. H2O....
         2.34
*******
POINT NO. 21.
          .61 STO 01
        79.00 STO 02
        73.00 STO 03
              RUN
DELTA H=
IN. H2O....
         1.76
*******
POINT NO. 22.
          .53 STO 01
              RUN
DELTA H=
IN. H2O....
         1.53
*******
POINT NO. 23.
          .50 STO 01
        72.00 STO 03
              RUN
DELTA H=
IN. H2O....
         1.44
*******
POINT NO. 24.
          .52 STO 01
              RUN
DELTA H=
IN. H2O....
         1.50
*******
POINT NO. 25.
          0.00    RUN
======

ISOKIN
AVG VALUES
KV=20.339
TMETER F=67.200
DELTA-H=2.249
DELTA P=0.767
FINAL METER
VOLUME FT3=?
    732.244     RUN
INITIAL=592.549
SAMPLE TIME
MIN. =?
    180.000     RUN
PSTACK ABS
IN HG=29.863
TSTACK F=79.000

======
```

```
SOURCE TYPE?
0=OTHER
1=BOILER
          0.000     RUN
% CO2 =?
          0.000     RUN
% O2 =?
         20.900     RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000     RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                    RUN
H2O GAIN=?
         37.200     RUN
NET METER
VOL. FT3=
        140.393
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
        140.329
MOLE FRACT. DRY
GAS, (1-BWS) =
          0.988
% H2O =
            1.2
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
         28.702
AVG VELOCITY
FPM =
      2,811.717
STACK DRY GAS
FLOW QS  SCFM=
     40,804.988
ACFM =
     42,273.386


**********

ISOKINETIC %I =99.5

*********
```

C-34

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 10 NOV 90

LINE NO: #3 Hard Chrome

BASE: NAD PENSACOLA

RUN NO: #2

BUILDING NO: 604

CONTROL DEVICE: INLET (OUTLET)

PREP BY: CK

IMPINGER BOX NO: 4

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.
[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.
[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
4-1	1. 100ml 0.1N NaOH	470.21	568.37	577.37	9.0
4-2	2. 100ml 0.1N NaOH	511.22	608.91	610.65	1.74
4-3	3. Empty	502.61	502.60	502.69	0.09
4-4	4. 500ml silica gel		826.42	853.35	26.93
				Net Weight Gain	37.74

Filter No: —

New

Silica gel condition after test: 50% Spent

Nozzle No: Q-11 Calibrated by: [illegible]

					Average
ID Before Test:	0.228	0.228	0.229	0.228	0.228
ID After Test:	0.230	0.230	0.230	0.230	0.230

D=52.5in SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510) A=2165IN² W USE 4H@(2.04H) M_W=28.6 lb/lb-mole

PLANT: NAP PONSICUH	BAROMETRIC PRESSURE, in Hg: 29.90		METER BOX #: Box 17 N0450	PROBE # (PITOT #): 5-7	NOZZLE #: Qtz #11
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 50°		METER ΔH@: 1.988	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.234
DATE: 10 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.5		METER γ: 1.032	PROBE LENGTH, in.: 6.0	ACTUAL NOZZLE DIA, in.: 0.228
OPERATOR: PEREZ	AVE VEL HEAD, in H_2O: 0.705		SAMPLE BOX #: 4	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: GOOD @ 6in H_2O
RUN #: 3-2-OUT	ASSUMED MOISTURE, %: 2	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS): 12, 13, 14, 5, 1	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .009CFM@15 in Hg

TRAVERSE POINT #	SAMPLING TIME	GAS METER READING	ORIFICE PRESSURE (CALC)	VELOCITY HEAD (MEAS)	STACK TEMPERATURE	GAS SAMPLE TEMPERATURE AT DRY GAS METER		IMPINGER TEMPERATURE	SAMPLE BOX TEMPERATURE	SAMPLE VACUUM	O_2	CO_2	CO	NOX
						Inlet	Outlet							
start time 9:09	min	(Vm) ft³	(ΔH) in H_2O	(ΔP) in H_2O	(Ts) °F	(Tm in) °F	(Tm out) °F	°F	°F	in Hg	%	%	ppm	ppm
13	0	340.692	2.49	0.93	66°	55°	55°	49°		5				
14	7.5	346.400	2.94	1.1	69°	57°	56°	46°		6				
15	15.0	352.200	2.93	1.1	78°	63°	57°	47°		6				
16	22.5	358.300	2.94	1.1	78°	66°	59°	46°		6				
17	30.0	365.900	2.69	1.0	79°	69°	60°	46°		6				
18	37.5	374.400	2.59	0.96	79°	71°	62°	47°		5				
19	45.0	378.000	2.22	0.82	79°	72°	64°	46°		5				
20	52.5	383.700	1.84	0.68	79°	73°	65°	48°		4				
21	60.0	390.100	1.62	0.60	79°	72°	66°	46°		3.5				
22	67.5	395.000	1.51	0.56	79°	72°	66°	44°		3				
23	75.0	400.600	1.51	0.56	79°	71°	66°	44°		3				
24	82.5	406.500	1.51	0.56	79°	72°	67°	45°		3				
9:40 end time	90.0	410.159												
TOTAL														
AVERAGE														

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SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg	METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION BDG 604	AMBIENT TEMPERATURE, °F	METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 10 NOV 90	AVE STATIC PRESSURE, in H_2O	METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR PEREZ-M	AVE VEL HEAD, in H_2O	SAMPLE BOX # 4	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # CONTINUED 3-2-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING / LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
12	90.0	410.159	1.41	0.53	79°	63°	63°	50°		3				
11	97.5	414.600	1.44	0.54	78°	63°	62°	41°		3				
10	105.0	419.600	1.47	0.55	79°	66°	63°	44°		4				
9	112.5	424.100	1.58	0.59	79°	68°	63°	43°		4				
8	120.0	429.400	1.73	0.64	78°	70°	64°	44°		4				
7	127.5	434.500	2.13	0.79	79°	71°	65°	45°		5				
6	135.0	440.000	3.24	1.2	79°	72°	66°	46°		6				
5	142.5	446.400	2.60	0.96	79°	73°	66°	47°		5				
4	150.0	453.300	2.25	0.83	79°	74°	67	49°		5				
3	157.5	459.800	2.30	0.85	79°	74°	68°	49°		5				
2	165.0	465.6	2.25	0.83	78	74	68	49°		5				
1	172.5	471.55	2.18	0.78	78	75	68	50		5				
stop 12:45	180.0	477.309												
TOTAL														
AVERAGE														

NOZZLE = .009 CFM@ 10 in Hg = PASS!

Final Leak Ck

Pitot Lines = GOOD @ 6 in H_2O PASS!

MAR

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```
XEQ "NOMOKIN-
METHOD 5 NOMO
ENTER DATA
THEN PUSH R/S
TEST NO=?
3.  RUN
RUN NO.=?
2.  RUN
FILTER NO=?
0.  RUN
DELTA-H*AT = ?
1.988  RUN
METER GAMMA = ?
1.032  RUN
STACK AREA
IN. SQ. = ?
2,165.000  RUN
STACK STATIC
P IN H2O=?
-.500  RUN
PBAR IN HG=?
29.900  RUN
% H2O=?
2.000  RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
28.600  RUN
AVG STACK
TEMP DEG F=?
75.000  RUN
AVG DELTA-P
IN. H2O=?
.705  RUN
AMBIENT
TEMP F=?
50.000  RUN
PITOT TUBE
CSUBP=?
.798  RUN
AVG STACK
VELOCITY FPM=
2,699.604
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.234
ACTUAL NOZZLE
DIA INCHES=?
.220  RUN
SAMPLE CFM = 0.712
```

OUTLET

```
******
INITIAL METER
VOLUME FT3 =?
340.692  RUN
*******
POINT NO. 1.
.93 STO 01
66.00 STO 02
55.00 STO 03
RUN
DELTA H=
IN. H2O....
2.49
*******
POINT NO. 2.
1.10 STO 01
69.00 STO 02
57.00 STO 03
RUN
DELTA H=
IN. H2O....
2.94
*******
POINT NO. 3.
78.00 STO 02
63.00 STO 03
RUN
DELTA H=
IN. H2O....
2.93
*******
POINT NO. 4.
66.00 STO 03
RUN
DELTA H=
IN. H2O....
2.94
*******
POINT NO. 5.
1.00 STO 01
79.00 STO 02
69.00 STO 03
RUN
DELTA H=
IN. H2O....
2.69
*******
POINT NO. 6.
.96 STO 01
71.00 STO 03
RUN
DELTA H=
IN. H2O....
2.59
*******
POINT NO. 7.
.82 STO 01
72.00 STO 03
RUN
DELTA H=
IN. H2O....
```

```
*******
POINT NO. 8.
.68 STO 01
73.00 STO 03
RUN
DELTA H=
IN. H2O....
1.84
*******
POINT NO. 9.
.60 STO 01
72.00 STO 03
RUN
DELTA H=
IN. H2O....
1.62
*******
POINT NO. 10.
.56 STO 01
79.00 STO 02
RUN
DELTA H=
IN. H2O....
1.51
*******
POINT NO. 11.
71.00 STO 03
RUN
DELTA H=
IN. H2O....
1.51
*******
POINT NO. 12.
72.00 STO 03
RUN
DELTA H=
IN. H2O....
1.51
*******
POINT NO. 13.
.53 STO 01
79.00 STO 02
63.00 STO 03
RUN
DELTA H=
IN. H2O....
1.41
*******
POINT NO. 14.
.54 STO 01
78.00 STO 02
RUN
DELTA H=
IN. H2O....
1.44
*******
POINT NO. 15.
.55 STO 01
79.00 STO 02
66.00 STO 03
RUN
DELTA H=
IN. H2O....
1.47
```

```
*******
POINT NO. 16.
.59 STO 01
68.00 STO 03
RUN
DELTA H=
IN. H2O....
1.58
*******
POINT NO. 17.
.64 STO 01
78.00 STO 02
70.00 STO 03
RUN
DELTA H=
IN. H2O....
1.73
*******
POINT NO. 18.
.79 STO 01
79.00 STO 02
71.00 STO 03
RUN
DELTA H=
IN. H2O....
2.13
*******
POINT NO. 19.
1.20 STO 01
79.00 STO 02
72.00 STO 03
RUN
DELTA H=
IN. H2O....
3.24
*******
POINT NO. 20.
.96 STO 01
73.00 STO 03
RUN
DELTA H=
IN. H2O....
2.60
*******
POINT NO. 21.
.83 STO 01
74.00 STO 03
RUN
DELTA H=
IN. H2O....
2.25
*******
POINT NO. 22.
.85 STO 01
RUN
DELTA H=
IN. H2O....
2.30
```

```
POINT NO. 23.
.83 STO 01
78.00 STO 02
RUN
DELTA H=
IN. H2O....
2.25
*******
POINT NO. 24.
.78 STO 01
78.00 STO 02
75.00 STO 03
RUN
DELTA H=
IN. H2O....
2.12
*******
POINT NO. 25.
0.00  RUN
======
ISOKIN
AVG VALUES
KV=20.486
TMETER F=69.000
DELTA-H=2.138
DELTA P=0.781
FINAL METER
VOLUME FT3=?
477.309  RUN
INITIAL=340.692
SAMPLE TIME
MIN. =?
180.000  RUN
PSTACK ABS
IN HG=29.863
TSTACK F=77.792
======
SOURCE TYPE?
0=OTHER
1=BOILER
0.000  RUN
% CO2 =?
0.000  RUN
% O2 =?
20.900  RUN
H2O GAIN KNOWN?
1=YES 0=NO
1.000  RUN
AWAITING
RECOVERY DATA
```

```
HIT R/S
TO CONTINUE...
RUN
H2O GAIN=?
37.760  RUN
WET METER
VOL. FT3=
140.989
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
140.447
MOLE FRACT. DRY
GAS, (1-BWS) =
0.987
% H2O =
1.3
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
28.700
AVG VELOCITY
FPM =
2,832.156
STACK DRY GAS
FLOW @S  SCFM=
41,187.829
ACFM =
42,588.673
*********
ISOKINETIC %I =100.4
*********
```

C-38

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 10 NOV 90

LINE NO: #3 hard chrome plate

BASE: NAD PENSACOLA

RUN NO: #3

BUILDING NO: 604

CONTROL DEVICE: INLET OUTLET

PREP BY: CK.

IMPINGER BOX NO: 2

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.
[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.
[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
2-1	1. 100ml 0.1N NaOH	455.83	554.36	559.25	4.69
2-2	2. 100ml 0.1N NaOH	445.29	542.90	544.35	1.45
2-3	3. Empty	501.70	501.69	502.07	0.38
2-4	4. 500ml silica gel		849.01	874.93	25.92
				Net Weight Gain	32.44

Filter No: —

New Silica gel condition after test: 1/2 Spent

Nozzle No: QTE #14 Calibrated by: DN

					Average
ID Before Test:	0.231	0.230	0.230	0.230	0.230
ID After Test:	0.231	0.230	0.230	0.230	0.230

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510) D = 52.5 Area = 2165 in² MW = 28.6

PLANT: NADYNS HOLT	BAROMETRIC PRESSURE, in Hg: 29.863	METER BOX #: N 14	PROBE # (PITOT #): 5-7	NOZZLE #: QTZ #14
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 60°	METER ΔH@: 2.049	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.224
DATE: 16/NOV/00	AVE STATIC PRESSURE, in H_2O: -0.5	METER γ: 1.005	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.230
OPERATOR: M. Perry	AVE VEL HEAD, in H_2O: 0.767	SAMPLE BOX #: 2	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: GOOD @ 6.5 in H2O
RUN #: 3-3-OUT	ASSUMED MOISTURE, %: 1.5	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: 1.012 CFM @ 15 in Hg

SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft³	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start Time 4:00 pm														
13	0	733.479	2.67	0.92	72°	63°	63°	45°		4				
14	7.5	740.600	2.56	0.88	74°	67°	64°	47°		4				
15	15.0	746.300	3.16	1.1	83°	69°	64°	47°		5				
16	22.5	752.000	3.21	1.1	78°	72°	65°	50°		5				
17	30.0	759.500	3.22	1.1	79°	74°	66°	51°		5				
18	37.5	767.700	2.84	0.97	80°	76°	68°	48°		5				
19	45.0	774.300	2.72	0.93	80°	76°	68°	47°		5				
20	52.5	780.600	2.20	0.75	79°	76°	69°	48°		4				
21	60.0	785.700	1.58	0.54	80°	75°	69°	48°		3				
22	67.5	790.900	1.36	0.47	83°	74°	69°	49°		2				
23	75.0	795.300	1.31	0.45	80°	72°	68°	46°		2				
24	82.5	800.000	1.42	0.49	82°	73°	69°	48°		3				
Port Change 5:30 pm	90.0	805.100												
TOTAL														
AVERAGE														

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 10 NOV 90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR PEREZ	AVE VEL HEAD, in H_2O		SAMPLE BOX # 2	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # (CONTINUED) 3-3-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start 6:00 pm														
12	90.0	805.100	1.20	0.42	79°	61°	61°	50°		2				
11	97.5	809.400	1.23	0.43	79°	61°	61°	42°		2				
10	105.0	813.000	1.32	0.46	79°	64°	61°	44°		2				
9	112.5	817.800	1.41	0.49	79°	65°	61°	44°		3				
8	120.0	823.000	1.56	0.54	79°	67°	61°	45°		3				
7	127.5	827.600	1.59	0.55	79°	68°	62°	45°		4				
6	135.0	833.100	2.86	0.99	79°	68°	62°	46°		5				
5	142.5	839.300	2.79	0.97	85°	71°	63°	45°		5				
4	150.0	846.600	2.53	0.87	79°	71°	64°	46°		4.5				
3	157.5	852.900	2.47	0.85	79°	71°	64°	47°		4				
2	165.0	858.700	2.38	0.82	78°	70°	64°	46°		4				
1	172.0	864.800	1.89	0.65	78°	70°	64°	47°		3				
Stop Test 7:30 pm	180.0	870.351												
TOTAL														
AVERAGE														

Final LEAK Test ck → NOZZLE = 0.014 CFM @ 10 in Hg = PASS!

Pitot = GOOD @ 5 in H2O = PASS!

H-3

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S
TEST NO=?
          3.    RUN
RUN NO.=?
          3.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
       2.049    RUN
METER GAMMA = ?
       1.005    RUN
STACK AREA
IN. SQ. = ?
   2,165.000    RUN
STACK STATIC
P IN H2O=?
        -.500   RUN
PBAR IN HG=?
      29.900    RUN
% H2O=?
       1.500    RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
      28.600    RUN
AVG STACK
TEMP DEG F=?
      75.000    RUN
AVG DELTA-P
IN. H2O=?
        .767    RUN
AMBIENT
TEMP F=?
      69.000    RUN
PITOT TUBE
CSUBP=?
        .790    RUN

AVG STACK
VELOCITY FPM=
   2,805.379
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.224

ACTUAL NOZZLE
DIA INCHES=?
        .230    RUN

SAMPLE CFM = 0.737
```

OUT

```
******
INITIAL METER
VOLUME FT3 =?
     733.479    RUN
*******
POINT NO. 1.
              .92 STO 01
            72.00 STO 02
            63.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    2.67
*******
POINT NO. 2.
              .88 STO 01
            74.00 STO 02
            67.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    2.56
*******
POINT NO. 3.
             1.10 STO 01
            83.00 STO 02
            69.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    3.16
*******
POINT NO. 4.
            78.00 STO 02
            72.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    3.21
*******
POINT NO. 5.
            79.00 STO 02
            74.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    3.22
*******
POINT NO. 6.
              .97 STO 01
            80.00 STO 02
            76.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    2.84
*******
POINT NO. 7.
              .93 STO 01
                     RUN
DELTA H=
IN. H2O....
                    2.72
*******
POINT NO. 8.
              .75 STO 01
            79.00 STO 02
                     RUN
DELTA H=
IN. H2O....
                    2.20
*******
POINT NO. 9.
              .54 STO 01
            80.00 STO 02
            75.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.58
*******
POINT NO. 10.
              .47 STO 01
            83.00 STO 02
            74.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.36
*******
POINT NO. 11.
              .45 STO 01
            80.00 STO 02
            72.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.31
*******
POINT NO. 12.
              .49 STO 01
            82.00 STO 02
            73.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.42
*******
POINT NO. 13.
              .42 STO 01
            79.00 STO 02
            61.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.20
*******
POINT NO. 14.
              .43 STO 01
                     RUN
DELTA H=
IN. H2O....
                    1.23
*******
POINT NO. 15.
              .46 STO 01
            64.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.32
*******
POINT NO. 16.
              .49 STO 01
            65.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.41
*******
POINT NO. 17.
              .54 STO 01
            67.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.56
*******
POINT NO. 18.
            55.00 STO 01
            68.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                  158.99
*******
POINT NO. 19.
           -55.00 STO 01
           -68.00 STO 03
           -79.00 STO 02
                     RUN
CORRECTING
DELTA H=
IN. H2O....
                 -158.99
*******
POINT NO. 18.
              .55 STO 01
            79.00 STO 02
            68.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    1.59
*******
POINT NO. 19.
              .99 STO 01
                     RUN
DELTA H=
IN. H2O....
                    2.86
*******
POINT NO. 20.
              .97 STO 01
            85.00 STO 02
            71.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    2.79
*******
POINT NO. 21.
              .87 STO 01
            79.00 STO 02
                     RUN
DELTA H=
IN. H2O....
                    2.53
*******
POINT NO. 22.
              .85 STO 01
                     RUN
DELTA H=
IN. H2O....
                    2.47
*******
POINT NO. 23.
              .82 STO 01
            78.00 STO 02
            70.00 STO 03
                     RUN
DELTA H=
IN. H2O....
                    2.38
*******
POINT NO. 24.
              .65 STO 01
                     RUN
DELTA H=
IN. H2O....
                    1.89
*******
POINT NO. 25.
          0.00      RUN
======

ISOKIN
AVG VALUES
KV=19.694
TMETER F=69.750
DELTA-H=2.145
DELTA P=0.719
FINAL METER
VOLUME FT3=?
     870.351    RUN
INITIAL=733.479
SAMPLE TIME
MIN. =?
     180.000    RUN
PSTACK ABS
IN HG=29.863
TSTACK F=79.250

======

SOURCE TYPE?
0=OTHER
1=BOILER
          0.000    RUN
% CO2 =?
          0.000    RUN
% O2 =?
         20.900    RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000    RUN
H2O GAIN=?
         32.440    RUN
NET METER
VOL. FT3=
                 137.556
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
                 136.834
MOLE FRACT. DRY
GAS, (1-BWS) =
                   0.989
% H2O =
                     1.1
STACK GAS WET
MOL. WT. MS,
LB/LB MOL=
                  28.716
AVG VELOCITY
FPM =
               2,721.892
STACK DRY GAS
FLOW QS  SCFM=
              39,535.662
ACFM =
              40,922.892

*********

ISOKINETIC %I =100.2
```

C-42

CHROMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 10 NOV 90

BASE: NAD PENSACOLA

BUILDING NO: 604

PREP BY: CR

LINE NO: #3 hard chrome plate

RUN NO: #4

CONTROL DEVICE: ~~INLET~~ OUTLET

IMPINGER BOX NO: 1

[✓] 1. Initially wash all glassware as follows; detergent wash, deionized water rinse, 1:1 HNO3 solution rinse, deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution in the first two impingers (standard Greenburg-Smith impingers). Record initial weights.
[✓] 3. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 4. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 5. Place teflon coated filter into filter holder and install between the third and fourth impingers. Record filter number. It is not necessary to weigh filter.
[✓] 6. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 7. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
1-1	1. 100ml 0.1N NaOH	448.32	564.92	~~553.76~~ 568.66	3.74
1-2	2. 100ml 0.1N NaOH	454.94	552.08	553.76	1.68
1-3	3. Empty	455.16	455.16	455.62	0.46
1-4	4. 500ml silica gel		855.04	881.43	26.39
				Net Weight Gain (g)	32.27

Filter No: —

New Silica gel condition after test: 1/2 spent

Nozzle No: V72#11 Calibrated by: _____

					Average
ID Before Test:	0.228	0.228	0.229	0.228 (PERET)	0.228
ID After Test:	0.231	0.231	0.231	0.230 (NEWTON)	0.231

D = 52.5 in
A = 2165 in² W

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

MW = 28.6 LB/LB mole

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 29.90		METER BOX #: 17	PROBE # (PITOT #): 5-3	NOZZLE #: Qtz #11
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 69°		METER ΔH@: 1.988	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.223
DATE: 20 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.5		METER γ: 1.032	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.228
OPERATOR: PEREZ	AVE VEL HEAD, in H_2O: 0.781		SAMPLE BOX #: 1	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: Good @ 6 in H2O
RUN #: 3-4-OUT	ASSUMED MOISTURE, %: 1.5	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .008cfm @ 15 in Hg

TRAVERSE POINT #	SAMPLING TIME (Start time: 1:00 pm) min	GAS METER READING (Vm) ft³	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
12	0	477.700	1.40	0.52	78°	65°	64°	46°		2				
11	7.5	482.400	1.34	0.50	79°	63°	63°	43°		2				
10	15.0	487.000	1.46	0.54	79°	67°	64°	43°		2				
9	22.5	491.300	1.52	0.56	78°	69°	65°	46°		3				
8	30.0	496.400	1.71	0.63	80°	71°	66°	46°		3				
7	37.5	500.900	2.08	0.76	78°	73°	67°	43°		4				
6	45.0	506.900	3.29	1.2	79°	74°	67°	43°		5				
5	52.5	513.600	2.58	0.94	79°	76°	68	44°		5				
4	60.0	519.400	2.31	0.84	80°	76°	68°	45°		4				
3	67.5	527.100	2.28	0.83	79°	76°	69°	45°		4				
2	75.0	532.100	2.28	0.83	79°	75°	69°	43°		4				
1	82.5	537.600	1.84	0.67	79°	75°	69°	44°		4				
	90.0	543.624												
TOTAL	Point change S=34													
AVERAGE														

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SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT: NAD PERKACIT	BAROMETRIC PRESSURE, in Hg	METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F	METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE: 10/NOV/90	AVE STATIC PRESSURE, in H_2O	METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR: PEREZ	AVE VEL HEAD, in H_2O	SAMPLE BOX # 1	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # CONTINUED 3-4-OUT	ASSUMED MOISTURE, %	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (A) (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start Time 6:19 pm														
13	90.0	543.624	2.54	0.94	77°	64°	65°	47°		4.5				
14	97.5	550.300	2.71	1.0	72°	61°	61°	40°		5				
15	105.0	555.200	2.97	1.1	79°	66°	62°	43°		5				
16	112.5	561.800	2.98	1.1	79°	69°	62°	46°		5				
17	120.0	569.500	3.27	1.2	79°	71°	63°	47°		6				
18	127.5	575.800	2.72	1.0	80°	71°	64°	47°		5				
19	135.0	583.800	2.21	0.81	79°	72°	64°	48°		4				
20	142.5	589.500	1.91	0.70	80°	72°	65°	48°		3				
21	150.0	594.400	1.64	0.60	78°	71°	65°	48°		3				
22	157.5	599.400	1.50	0.55	79°	70°	65°	48°		2				
23	165.0	604.000	1.53	0.56	78°	70°	65°	48°		3				
24	172.5	609.000	1.52	0.56	78°	69°	64°	47°		3				
End Test 7:40 pm	180.0	613.778												
TOTAL														
AVERAGE														

NOZZLE = .012 CFM@ 10 in Hg = PASS!

LEAK TEST OK

PITOTS = GOOD @ 7 in H2O = PASS!

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```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          3.    RUN
RUN NO.=?
          4.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
      1.988     RUN
METER GAMMA = ?
      1.032     RUN
STACK AREA
IN. SQ. = ?
  2,165.000     RUN
STACK STATIC
P IN H2O=?
       -.500    RUN
PBAR IN HG=?
     29.900     RUN
% H2O=?
      1.500     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.600     RUN
AVG STACK
TEMP DEG F=?
     75.000     RUN
AVG DELTA-P
IN. H2O=?
       .781     RUN
AMBIENT
TEMP F=?
     69.000     RUN
PITOT TUBE
CSUBP=?
       .790     RUN

AVG STACK
VELOCITY FPM=
  2,830.866
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.223

ACTUAL NOZZLE
DIA INCHES=?
       .228     RUN

SAMPLE CFM = 0.781
```

OUT

```
******
INITIAL METER
VOLUME FT3 =?
    477.700     RUN
POINT NO. 1.
          .52 STO 01
        78.00 STO 02
        65.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.40
*******
POINT NO. 2.
          .50 STO 01
        79.00 STO 02
        63.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.34
*******
POINT NO. 3.
          .54 STO 01
        67.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.46
*******
POINT NO. 4.
          .56 STO 01
        78.00 STO 02
        69.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.52
*******
POINT NO. 5.
          .63 STO 01
        80.00 STO 02
        71.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.71
*******
POINT NO. 6.
          .76 STO 01
        78.00 STO 02
        73.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.08
*******
POINT NO. 7.
         1.20 STO 01
        79.00 STO 02
        74.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.29
*******
POINT NO. 8.
          .94 STO 01
        76.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.58
*******
POINT NO. 9.
          .84 STO 01
        80.00 STO 02
              RUN
DELTA H=
IN. H2O....
             2.31
*******
POINT NO. 10.
          .83 STO 01
        79.00 STO 02
              RUN
DELTA H=
IN. H2O....
             2.20
*******
POINT NO. 11.
        75.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.20
*******
POINT NO. 12.
          .67 STO 01
              RUN
DELTA H=
IN. H2O....
             1.84
*******
POINT NO. 13.
          .94 STO 01
        77.00 STO 02
        64.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.54
*******
POINT NO. 14.
         1.00 STO 01
        72.00 STO 02
        61.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.71
*******
POINT NO. 15.
         1.10 STO 01
        79.00 STO 02
        66.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.97
*******
POINT NO. 16.
        69.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.98
*******
POINT NO. 17.
         1.20 STO 01
        71.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.27
*******
POINT NO. 18.
         1.00 STO 01
        80.00 STO 02
              RUN
DELTA H=
IN. H2O....
             2.72
*******
POINT NO. 19.
          .31 STO 01
        79.00 STO 02
        72.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.21
*******
POINT NO. 20.
          .70 STO 01
        80.00 STO 02
              RUN
DELTA H=
IN. H2O....
             1.91
*******
POINT NO. 21.
          .60 STO 01
        78.00 STO 02
        71.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.64
*******
POINT NO. 22.
          .55 STO 01
        79.00 STO 02
        70.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.50
*******
POINT NO. 23.
          .56 STO 01
        78.00 STO 02
              RUN
DELTA H=
IN. H2O....
             1.53
*******
POINT NO. 24.
        69.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.52
*******
POINT NO. 25.
         0.00     RUN
======

ISOKIN
AVG VALUES
KV=20.413
TMETER F=70.250
DELTA-H=2.149
DELTA P=0.774
FINAL METER
VOLUME FT3=?
    613.778     RUN
INITIAL=477.700
SAMPLE TIME
MIN. =?
    180.000     RUN
PSTACK ABS
IN HG=29.863
TSTACK F=78.542
======

SOURCE TYPE?
0=OTHER
1=BOILER
        0.000   RUN
% CO2 =?
        0.000   RUN
% O2 =?
       20.900   RUN
H2O GAIN KNOWN?
1=YES 0=NO
        1.000   RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                RUN
H2O GAIN=?
       32.270   RUN
NET METER
VOL. FT3=
             140.432
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
             139.563
MOLE FRACT. DRY
GAS, (1-BWS) =
               0.989
% H2O =
                 1.1
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
              28.719
AVG VELOCITY
FPM =
           2,821.090
STACK DRY GAS
FLOW QS  SCFM=
          41,041.612
ACFM =
          42,414.311


**********

ISOKINETIC %I =100.1

*********
```

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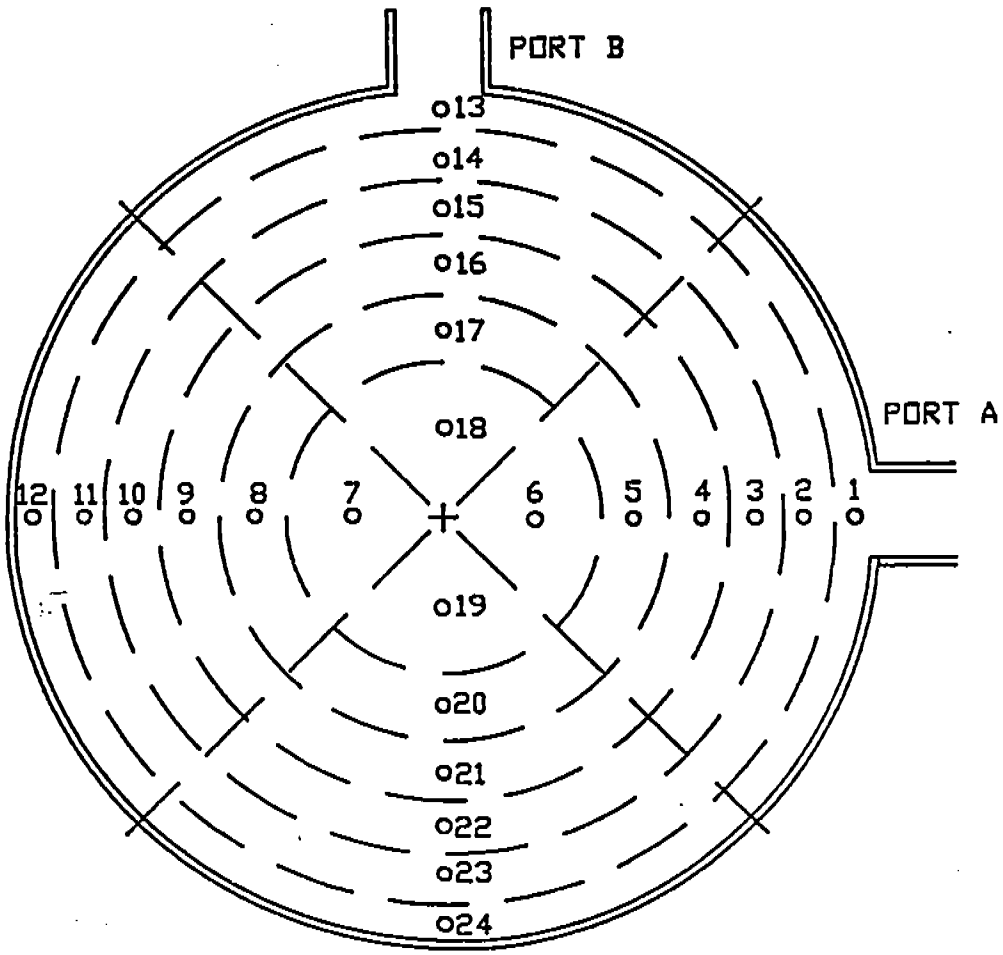
24 POINT SAMPLE TRAVERSE



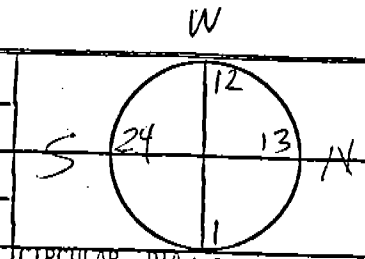
LINE 3 OUTLET, HARD CHROME PLATE
LINE 4 OUTLET, COPPER CYANIDE PLATE

		TRAVERSE POINT LOCATION (DISTANCES FROM I.D.)
TRAVERSE POINT	EPA METHOD 1 (% OF DIA)	DUCT DIAMETER (IN.) 52.5
1 & 13	2.1	1.1
2 & 14	6.7	3.5
3 & 15	11.8	6.2
4 & 16	17.7	9.3
5 & 17	25.0	13.1
6 & 18	35.6	18.7
7 & 19	64.4	33.8
8 & 20	75.0	39.4
9 & 21	82.3	43.2
10 & 22	88.2	46.3
11 & 23	93.3	49.0
12 & 24	97.9	51.4

TRAVERSE DATA SHEET

(REV 8/86)

PLANT: NAD PENSACOLA
LOCATION: BLDG 604
DATE: 12 NOV 90
OPERATOR: PEREZ
RUN #: LINE 4
COPPER CYANIDE



CIRCULAR, DIA 57.5 in
RECTANGULAR, LxW in

Length from upstream disturbance ft
Diameter from upstream disturbance 2 dia
Length from downstream disturbance ft
Diameters from downstream disturbance dia
Required number of traverse points 24
Number of traverse points used 24

POINT # n	STACK PRESSURE (in H_2O) ΔPvel	Pstatic	$\sqrt{\Delta P}$	LOCATION (in) L	W	POINT # n	STACK PRESSURE (in H_2O) ΔPvel	Pstatic	$\sqrt{\Delta P}$	LOCATION (in) L	W
1	0.49		0.70			26					
2	0.54		0.73			27					
3	0.62		0.78			28					
4	0.74		0.86			29					
5	1.2		1.09			30					
6	1.4		1.18			31					
7	0.96		0.97			32					
8	0.79		0.88			33					
9	0.71	-0.53	0.84			34					
10	0.65		0.80			35					
11	0.63		0.79			36					
12	0.60		0.77			37					
13	1.3		1.14			38					
14	1.4		1.18			39					
15	1.4		1.18			40					
16	1.4		1.18			41					
17	1.3	-0.78	1.14			42					
18	1.2		1.09			43					
19	1.0		1.00			44					
20	0.91		0.95			45					
21	0.84		0.91			46					
22	0.74		0.86			47					
23	0.71		0.84		0° cyclonic -10	48					
24	0.70		0.83			49					
25						50					

$$\Delta P_{ave} = \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]^2 = 0.9011$$

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CYANIDE EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 13NOV90

LINE NO: #4 copper cyanide plate

BASE: NAD PENSACOLA

RUN NO: ~~#~~ #1

BUILDING NO: 604

CONTROL DEVICE: INLET OUTLET

PREP BY: OK

IMPINGER BOX NO: 1

[✓] 1. Initially wash all glassware as follows; deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use. DI rinse
[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (~~modified~~ STANDARD Greenburg-Smith impinger). Record initial weight.
[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.
[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.
[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
1-1	1. 100ml 0.1N NaOH	468.31	565.93	582.88	16.95
1-2	2. 100ml 0.1N NaOH	455.58	555.45	562.08	6.63
1-3	3. Empty	455.11	455.10	456.18	1.08
1-4	4. 500ml silica gel	~~###~~	847.00	880.25	33.25
				Net Weight Gain	57.91

Filter No: —

Silica gel condition after test: 75% Spent.

new

Nozzle No: QTZ #11 Calibrated by: [illegible]

					Average
ID Before Test	0.230	0.230	0.231	0.230	0.230
ID After Test:	0.231	0.230	0.230	0.230	.230

SOURCE EMISSION TESTING DATA SHEET

mol/wt = 28.6

stack area = 2165

(SJS rev11/88, #0251Q)

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.250		METER BOX #: #14	PROBE # (PITOT #): S-7	NOZZLE #: OTZ #11
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 69		METER ΔH@: 2.049	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.217
DATE: 13 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.65 ~~0.9011~~		METER γ: 1.005	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: 0.230
OPERATOR: M. PEREZ	AVE VEL HEAD, in H_2O: ~~0.65~~ 0.9011		SAMPLE BOX #: #1	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: GOOD @ 5 in H2O
RUN #: 24-1-OUT	ASSUMED MOISTURE, %: 1.3	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .007CFM@15in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Short Time 10:35														
13	0	871.000	3.80	1.3	81°	74°	76°	49°		6.5				
14	8	878.2	4.39	1.5	80°	73°	72°	40°		7				
15	16	886.8	4.13	1.4	81°	79°	73°	44°		7				
16	24	895.3	4.15	1.4	82°	83°	74°	49°		7				
17	32	904.2	4.18	1.4	81°	85°	76°	49°		7				
18	40	912.9	4.17	1.4	82°	85°	77°	48°		7				
19	48	922.1	3.89	1.3	81°	86°	78°	50°		7				
20	56	929.1	3.29	1.1	82°	87°	79°	49°		6				
21	64	937.0	2.81	0.94	82°	87°	79°	49°		5				
22	72	944.0	2.51	0.84	82°	87°	80°	48°		5				
23	80	951.0	2.12	0.73	81°	86°	80°	48°		4				
24	88	957.0	2.12	0.71	82°	86°	80°	49°		4				
Change Imp 12:11	96	962.664												
TOTAL														
AVERAGE														

05-2

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT: NADVENSHOLA	BAROMETRIC PRESSURE, in Hg	METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F	METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE: 13 NOV 90	AVE STATIC PRESSURE, in H_2O	METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR: PEREZ	AVE VEL HEAD, in H_2O	SAMPLE BOX # 1	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN #: 4-1-OUT	ASSUMED MOISTURE, %	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)

TRAVERSE POINT # (Start Time 12:35)	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: Inlet (Tm in) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
12	96	962.664	1.85	0.63	81°	77°	79°	48°		3				
11	104	968.1	1.88	0.64	83°	78°	78°	42°		4				
12:55 STOP 10	112	973.7	1.81	0.61	82°	82°	78°	42°		4				
11:10 START 9	120	979.4	1.82	0.62	83°	78°	78°	45°		4				
CALCULATOR PICKED 8	128	984.7	1.98	0.67	83°	83°	79°	43°		4				
7	136	991.1	2.76	0.93	84°	85°	80°	45°		5				
6	144	998.7	4.48	1.5	83°	88°	80°	46°		8				
5	152	1007.0	3.60	1.2	84°	91°	82°	48°		6				
4	160	1015.4	2.40	0.80	83°	91°	83°	49°		5				
3	168	1021.7	1.97	0.66	85°	90°	84°	48°		3				
2	176	1027.8	1.62	0.54	84°	90°	83°	47°		3				
1	184	1033.0	1.18	0.39	78°	89°	84°	46°		2				
Time stop 2:26	192	1037.373												
TOTAL	FINAL	LEAK CK												
AVERAGE														

NOZZLE = .002 cfm @ 10" Hg. C

Pittotubes = STEADY @ 6¼" C

```
          MEC 'NONOKIN'
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S
```

OUT

```
TEST NO=?
          4.    RUN
RUN NO.=?
          1.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
        2.043   RUN
METER GAMMA = ?
        1.005   RUN
STACK AREA
IN. SQ. = ?
      2,165.000 RUN
STACK STATIC
P IN H2O=?
        -.650   RUN
PBAR IN HG=?
       30.250   RUN
% H2O=?
        1.300   RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
       28.600   RUN
AVG STACK
TEMP DEG F=?
       75.000   RUN
AVG DELTA-P
IN. H2O=?
        .9011   RUN
AMBIENT
TEMP F=?
       65.000   RUN
PITOT TUBE
CSUBP=?
         .798   RUN

AVG STACK
VELOCITY FPM=
      3,023.636
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.217

ACTUAL NOZZLE
DIA INCHES=?
         .230   RUN

SAMPLE CFM = 0.344
```

```
******
INITIAL METER
VOLUME FT3 =?
      871.000   RUN
*******
POINT NO. 1.
          1.30 STO 01
         81.00 STO 02
         74.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.00
*******
POINT NO. 2.
          1.50 STO 01
         80.00 STO 02
         73.00 STO 03
               RUN
DELTA H=
IN. H2O....
          4.39
*******
POINT NO. 3.
          1.40 STO 01
         81.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          4.13
*******
POINT NO. 4.
         82.00 STO 02
         83.00 STO 03
               RUN
DELTA H=
IN. H2O....
          4.15
*******
POINT NO. 5.
         81.00 STO 02
         85.00 STO 03
               RUN
DELTA H=
IN. H2O....
          4.10
*******
POINT NO. 6.
         82.00 STO 02
               RUN
DELTA H=
IN. H2O....
          4.17
*******
POINT NO. 7.
          1.30 STO 01
         81.00 STO 02
         86.00 STO 03
               RUN
DELTA H=
IN. H2O....
```

```
*******
POINT NO. 8.
          1.10 STO 01
         82.00 STO 02
         87.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.29
*******
POINT NO. 9.
          .94 STO 01
               RUN
DELTA H=
IN. H2O....
          2.81
*******
POINT NO. 10.
          .84 STO 01
         82.00 STO 02
         87.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.51
*******
POINT NO. 11.
          .73 STO 01
         81.00 STO 02
         86.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.18
*******
POINT NO. 12.
          .71 STO 01
         82.00 STO 02
               RUN
DELTA H=
IN. H2O....
          2.12
*******
POINT NO. 13.
          .63 STO 01
         81.00 STO 02
         77.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.85
*******
POINT NO. 14.
          .64 STO 01
         83.00 STO 02
         78.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.82
```

```
*******
POINT NO. 15.
          .61 STO 01
         82.00 STO 02
         82.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.81
*******
POINT NO. 16.
          .62 STO 01
         83.00 STO 02
         78.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.82
*******
POINT NO. 17.
          .67 STO 01
         83.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.98
*******
POINT NO. 18.
          .93 STO 01
         84.00 STO 02
         85.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.76
*******
POINT NO. 19.
          1.50 STO 01
         83.00 STO 02
         88.00 STO 03
               RUN
DELTA H=
IN. H2O....
          4.48
*******
POINT NO. 20.
          1.20 STO 01
         84.00 STO 02
         91.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.60
*******
POINT NO. 21.
          .80 STO 01
         83.00 STO 02
               RUN
DELTA H=
IN. H2O....
```

```
*******
POINT NO. 22.
          .66 STO 01
         85.00 STO 02
         90.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.97
*******
POINT NO. 23.
          .54 STO 01
         84.00 STO 02
               RUN
DELTA H=
IN. H2O....
          1.62
*******
POINT NO. 24.
          .39 STO 01
         78.00 STO 02
         89.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.18
*******
POINT NO. 25.
          0.00   RUN
======

ISOKIN
AVG VALUES
KV=22.507
TMETER F=84.167
DELTA-H=2.874
DELTA P=0.935
FINAL METER
VOLUME FT3=?
      1,037.373   RUN
INITIAL=871.000
SAMPLE TIME
MIN. =?
        192.000   RUN
PSTACK ABS
IN HG=30.202
TSTACK F=82.083

======

SOURCE TYPE?
0=OTHER
1=BOILER
          0.000   RUN
% CO2 =?
          0.000   RUN
% O2 =?
         20.900   RUN
H2O GAIN KNOWN?
1=YES 0=NO
```

```
                 RUN
AWRITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                 RUN
H2O GAIN=?
        57.910   RUN
WET METER
VOL. FT3=
              167.205
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
              163.758
MOLE FRACT. DRY
GAS. (1-BWS) =
                0.984
% H2O =
                  1.6
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
               28.658
AVG VELOCITY
FPM =
            3,096.312
STACK DRY GAS
FLOW QS  SCFM=
           45,082.559
ACFM =
           46,552.186

**********

ISOKINETIC %I =98.7

*********
```

C-52

CYANIDE EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 13 NOV 90

LINE NO: #4 copper cyanide plate

BASE: NAD PENSACOLA

RUN NO: #2

BUILDING NO: 604

CONTROL DEVICE: INLET OUTLET

PREP BY: RUF

IMPINGER BOX NO: 2

[✓] 1. Initially wash all glassware as follows; deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use. DI Rinse

[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (~~modified~~ Greenburg-Smith impinger). Record initial weight. STM-DD

[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.

[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.

[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.

[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.

[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.

[✓] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
2-1	1. 100ml 0.1N NaOH	455.84	556.88	575.41	18.53
2-2	2. 100ml 0.1N NaOH	446.41	542.39	548.66	6.27
2-3	3. Empty	502.60	502.60	504.05	1.45
2-4	4. 500ml silica gel		857.13	882.25	31.12
				Net Weight Gain	57.37

Filter No: ——

New. Silica gel condition after test: 70% Spent

Nozzle No: QTZ #14 Calibrated by: [illegible]

					Average
ID Before Test:	0.230	0.230	0.229	0.230	0.230
ID After Test:	0.230	0.231	0.230	0.230	0.230

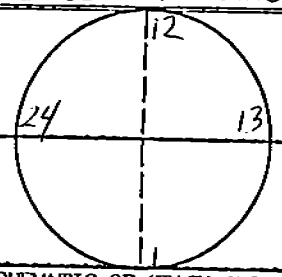
SOURCE EMISSION TESTING DATA SHEET

MOL/WT = 28.6

STACK AREA = 2.165

(SJS rev11/88, #02510)

PLANT: NAD PENSICOLA	BAROMETRIC PRESSURE, in Hg: 30.250		METER BOX #: #17	PROBE # (PITOT #): 5-12'	NOZZLE #: QTZ # 14
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 69°		METER ΔH@: 1.988	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.216
DATE: 13 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.65		METER γ: 1.032	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: 0.230
OPERATOR: M. PEREZ	AVE VEL HEAD, in H_2O: 0.9011		SAMPLE BOX #: 2	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: 6000 @ 6 in H2O
RUN #: 4-2-OUT	ASSUMED MOISTURE, %: 1.3	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .005 CFM @ 15 in



TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start Time 10:39														
12	0	614.177	1.73	0.61	79°	71°	72°	41°		3				
11	8	619.1	1.79	0.63	79°	72°	72°	45°		4				
10	16	624.7	1.78	0.62	80°	78°	74°	46°		4				
9	24	631.0	1.84	0.64	81°	80°	75°	48°		4				
8	32	635.8	1.99	0.69	80°	81°	76°	50°		4				
7	40	642.5	2.53	0.88	80°	81°	76°	49°		5				
6	48	648.8	4.02	1.4	80°	83°	79°	50°		7				
5	56	657.1	3.48	1.2	81°	86°	78°	49°		7				
4	64	665.3	2.61	0.90	81°	86°	79°	50°		5				
3	72	670.6	2.09	0.72	80°	85°	79°	53°		4				
2	80	678.1	1.76	0.61	81°	84°	79°	53°		3.5				
1	88	682.3	1.42	0.49	81°	84°	81°	53°		3				
Change Port 12:15	96	687.526												
TOTAL														
AVERAGE														

4-2

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg	METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F	METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE: 13 NOV 90	AVE STATIC PRESSURE, in H_2O	METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR: PEREZ	AVE VEL HEAD, in H_2O	SAMPLE BOX # 2	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN #: 4-2-OUT	ASSUMED MOISTURE, %	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS)(A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start 12:31														
13	96	687.586	4.08	1.4	81°	78°	78°	49°		7				
14	104	696.0	3.70	1.3	85°	80°	78°	53°		7				
15	112	704.5	4.30	1.5	83°	82°	78°	47°		8				
1235 STOP 16	120	712.0	4.05	1.4	82°	86°	79°	50°		7				
START 1:10 17	128	721.4	4.01	1.4	83°	81°	78°	46°		7				
TO FIX CALCULATOR PROBLEM 18	136	729.4	4.04	1.4	83°	85°	79°	50°		7				
19	144	737.6	3.18	1.1	83°	87°	79°	51°		6				
20	152	746.1	3.18	1.1	83°	87°	80°	51°		6				
21	160	752.9	2.42	0.84	84°	86°	80°	51°		5				
22	168	759.3	2.08	0.72	83°	86°	81°	53°		4				
23	176	765.5	1.99	0.69	83°	86°	81°	53°		4				
24	184	770.9	1.97	0.68	82°	85°	80°	52°		4				
Stop 2:22	192	776.812												
TOTAL	Final	Leak Ck												
AVERAGE														

Nozzle = .005 cfm @ 10" Hg

Pitot tubes = Steady @ 6" Hg

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          4.    RUN
RUN NO.=?
          2.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
       1.988    RUN
METER GAMMA = ?
       1.032    RUN
STACK AREA
IN. SQ. = ?
   2,165.000    RUN
STACK STATIC
P IN H2O=?
       -.650    RUN
PBAR IN HG=?
      30.250    RUN
% H2O=?
       1.300    RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
      28.600    RUN
AVG STACK
TEMP DEG F=?
      75.000    RUN
AVG DELTA-P
IN. H2O=?
       .9011    RUN
AMBIENT
TEMP F=?
      69.000    RUN
PITOT TUBE
CSUBP=?

        .798    RUN

AVG STACK
VELOCITY FPM=
   3,023.636
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.216

ACTUAL NOZZLE
DIA INCHES=?
        .230    RUN

SAMPLE CFM = 0.850
```

OUT

```
******
INITIAL METER
VOLUME FT3 =?
     614.177    RUN
*******
POINT NO. 1.
          .61 STO 01
        79.00 STO 02
        71.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.73
*******
POINT NO. 2.
          .63 STO 01
        72.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.79
*******
POINT NO. 3.
          .62 STO 01
        80.00 STO 02
        78.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.78
*******
POINT NO. 4.
          .64 STO 01
        81.00 STO 02
        80.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.84
*******
POINT NO. 5.
          .69 STO 01
        80.00 STO 02
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.99
*******
POINT NO. 6.
          .88 STO 01
              RUN
DELTA H=
IN. H2O....
             2.53
*******
POINT NO. 7.
         1.40 STO 01
        83.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.05
*******
POINT NO. 8.
         1.20 STO 01
        81.00 STO 02
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.48
*******
POINT NO. 9.
          .90 STO 01
              RUN
DELTA H=
IN. H2O....
             2.61
*******
POINT NO. 10.
          .72 STO 01
        80.00 STO 02
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.09
*******
POINT NO. 11.
          .61 STO 01
        81.00 STO 02
        84.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.76
*******
POINT NO. 12.
          .49 STO 01
              RUN
DELTA H=
IN. H2O....
             1.42
*******
POINT NO. 13.
         1.40 STO 01
        78.00 STO 03
        81.00 STO 02
              RUN
DELTA H=
IN. H2O....
             4.03
*******
POINT NO. 14.
         1.30 STO 01
        85.00 STO 02
        88.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.70
*******
POINT NO. 15.
         1.50 STO 01
        83.00 STO 02
        82.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.30
*******
POINT NO. 16.
         1.40 STO 01
        82.00 STO 02
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.05
*******
POINT NO. 17.
        83.00 STO 02
        81.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.01
*******
POINT NO. 18.
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             4.04
*******
POINT NO. 19.
         1.10 STO 01
        87.00 STO 03
              RUN
DELTA H=
IN. H2O....
             3.18
*******
POINT NO. 20.
              RUN
DELTA H=
IN. H2O....
             3.18
*******
POINT NO. 21.
          .84 STO 01
        84.00 STO 02
        86.00 STO 03
              RUN
DELTA H=
IN. H2O....
             2.42
*******
POINT NO. 22.
          .72 STO 01
        83.00 STO 02
              RUN
DELTA H=
IN. H2O....
             2.08
*******
POINT NO. 23.
          .69 STO 01
              RUN
DELTA H=
IN. H2O....
             1.99
*******
POINT NO. 24.
          .68 STO 01
        82.00 STO 02
        85.00 STO 03
              RUN
DELTA H=
IN. H2O....
             1.97
*******
POINT NO. 25.
         0.00    RUN
======

ISOKIN
AVG VALUES
KV=22.405
TMETER F=82.500
DELTA-H=2.749
DELTA P=0.927
FINAL METER
VOLUME FT3=?
     776.812    RUN
INITIAL=614.177
SAMPLE TIME
MIN. =?
     192.000    RUN
PSTACK ABS
IN HG=30.202
TSTACK F=81.583
======

SOURCE TYPE?
0=OTHER
1=BOILER
         0.000    RUN
% CO2 =?
         0.000    RUN
% O2 =?
        20.900    RUN
H2O GAIN KNOWN?
1=YES 0=NO
         1.000    RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                  RUN
H2O GAIN=?
        57.370    RUN
NET METER
VOL. FT3=
            167.839
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
            164.884
MOLE FRACT. DRY
GAS, (1-BWS) =
              0.984
% H2O =
                1.6
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
             28.661
AVG VELOCITY
FPM =
          3,082.121
STACK DRY GAS
FLOW QS  SCFM=
         44,849.489
ACFM =
         46,338.833

*********

ISOKINETIC %I =99.7

*********
```

C-56

CYANIDE EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 13NOV90

LINE NO: #4 copper cyanid plate

BASE: NAD PENSACOLA

RUN NO: #3

BUILDING NO: 604

CONTROL DEVICE: INLET OUTLET

PREP BY: CR

IMPINGER BOX NO: 3

[✓] 1. Initially wash all glassware as follows; deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use. DI Rinse

[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (~~mo~~dified Greenburg-Smith impinger). Record initial weight. Standard

[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.

[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.

[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.

[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.

[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.

[ ] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
3-1	1. 100ml 0.1N NaOH	514.76	612.46	618.55	6.09
3-2	2. 100ml 0.1N NaOH	592.52	623.77	626.11	2.34
3-3	3. Empty	459.44	459.41	460.13	0.72
3-4	4. 500ml silica gel		534.29	544.77	10.48
				Net Weight Gain	19.63

New Filter No: ——

Silica gel condition after test: 60% SPENT

Nozzle No: #14 Calibrated by: DN

					Average
ID Before Test:	0.230	0.231	0.230	0.230	0.230
ID After Test:	0.231	0.231	0.230	0.231	0.231

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

A = 216 IN² Mw = 28.7

PLANT: NAPONSACOT	BAROMETRIC PRESSURE, in Hg: 30.25		METER BOX #: #17	PROBE # (PITOT #): 5-12	NOZZLE #: Q#11
LOCATION: BLPG 604	AMBIENT TEMPERATURE, °F: 78		METER ΔH@: 1.988	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.215
DATE: 13 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.65		METER γ: 1.082	PROBE LENGTH, in.: 6.0	ACTUAL NOZZLE DIA, in.: 0.230
OPERATOR: M. PEREZ	AVE VEL HEAD, in H_2O: 0.927		SAMPLE BOX #: 3	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: GOOD @ 6 in H_2O
RUN #: 4-3-OUT	ASSUMED MOISTURE, %: 1.3	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .002 CFM @ 15 in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft³	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start Test 3:55 pm														
1	0	777.200	1.06	0.37	79°	75°	75°	51°		3				
2	2.5	778.8	1.50	0.53	82°	74°	75°	50°		4				
3	5.0	780.3	1.87	0.66	83°	74°	75°	48°		5				
4	7.5	781.5	2.38	0.84	83°	75°	75°	46°		6				
5	10.0	783.5	3.40	1.2	83°	76°	75°	45°		7				
6	12.5	786.0	3.98	1.4	83°	77°	75°	44°		9				
7	15.0	788.8	4.00	1.4	83°	80°	75°	44°		10				
8	17.5	790.1	2.11	0.74	84°	81°	76°	43°		5				
9	20.0	792.7	1.78	0.62	83°	82°	76°	46°		4				
10	22.5	794.7	1.81	0.63	83°	82°	76°	46°		5				
11	25.0	796.8	1.69	0.59	84°	81°	77°	47°		4				
12	27.5	798.3	1.69	0.59	83°	81°	77°	46°		4				
Pod change 4:25 pm	30.0	800.000			~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~						
TOTAL														
AVERAGE														

85-7

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 13NOV90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR PEREZ	AVE VEL HEAD, in H_2O		SAMPLE BOX # 3	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # 4-3-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT # Inside Test 4:35	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS)(A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
13	30.0	800.000	3.42	1.2	82°	77°	76°	46°		8				
14	32.5	802.9	3.97	1.4	83°	76°	76°	46		9				
15	35.0	805.3	4.56	1.6	82°	77°	76°	41°		10				
16	37.5	808.9	3.99	1.4	83°	78°	76°	41°		9				
17	40.0	811.3	4.02	1.4	82°	81°	77°	43°		9				
18	42.5	814.0	3.44	1.2	82°	81°	76°	44°		8				
19	45.0	816.38	3.16	1.1	82°	81°	77°	44°		8				
20	47.5	818.6	2.61	0.91	82	81	76	44		7				
21	50.0	—	2.12	0.74	82	81	76	44		6				
22	52.5	822.9	1.90	0.66	82°	82°	76°	45°		5				
23	55.0	824.6	1.95	0.68	82°	82°	76°	44°		5				
24	57.5	826.9	1.98	0.69	83°	82°	76°	44°		5				
4:55	60.0	828.090	NOZZLE = .002 CFM @ 12 in Hg = PASS!											
TOTAL	FINAL	LEAK CK												
AVERAGE			Pittot tubes = GOOD @ 6 in H2O = PASS!											

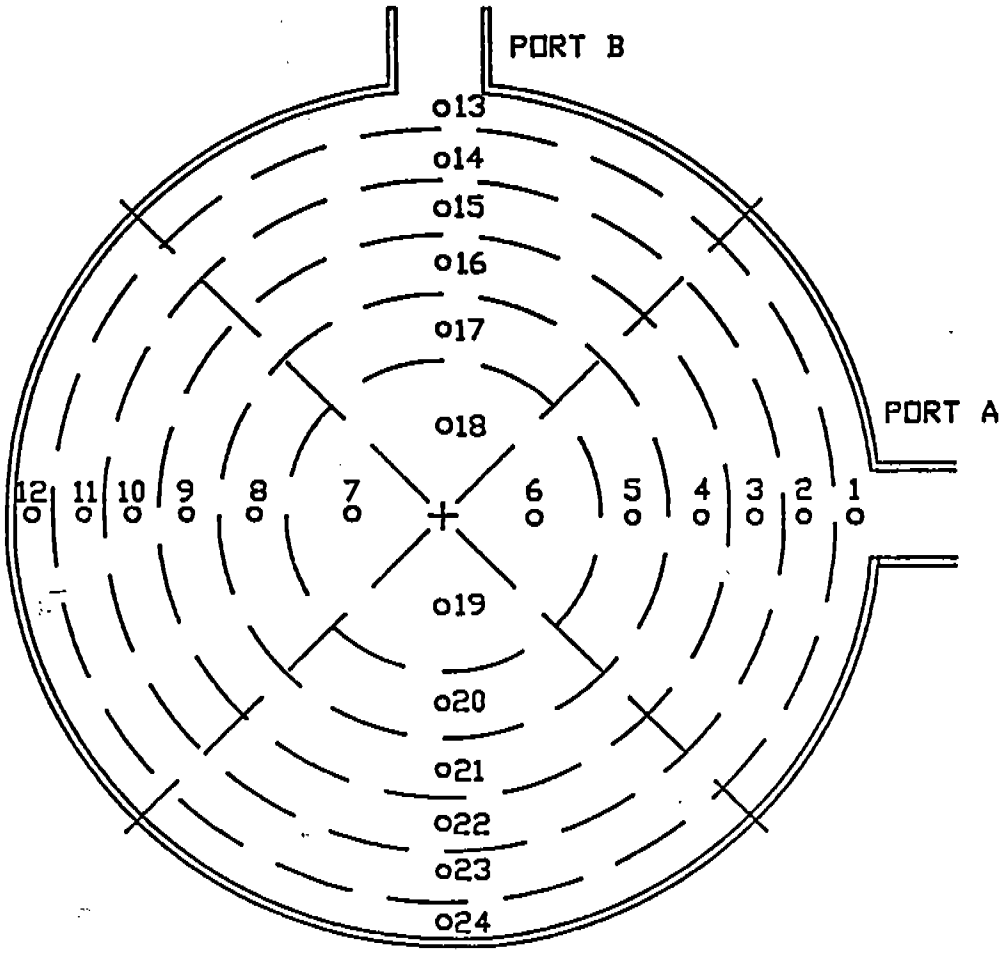
```
METHOD 5 HOMC

ENTER DATA
THEN PUSH R/S
TEST NO=?
          4.    RUN
RUN NO.=?
          3.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
      1.988     RUN
METER GAMMA = ?
       .000     CLX
      1.032     RUN
STACK AREA
IN. SQ. = ?
  2,165.000     RUN
STACK STATIC
P IN H2O=?
      -.650     RUN
PBAR IN HG=?
     30.250     RUN
% H2O=?
      1.300     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.700     RUN
AVG STACK
TEMP DEG F=?
     78.000     RUN
AVG DELTA-P
IN. H2O=?
       .927     RUN
AMBIENT
TEMP F=?
     70.000     RUN
PITOT TUBE
CSUBP=?
       .790     RUN

AVG STACK
VELOCITY FPM=
          3,070.005
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.215

ACTUAL NOZZLE
DIA INCHES=?
       .230     RUN

SAMPLE CFM = 0.860
```

OUT

```
******
INITIAL METER
VOLUME FT3 =?
     777.200    RUN
*******
POINT NO. 1.
          .37 STO 01
        79.00 STO 02
        75.00 STO 03
                RUN
DELTA H=
IN. H2O....
                1.06
*******
POINT NO. 2.
          .53 STO 01
        82.00 STO 02
        74.00 STO 03
                RUN
DELTA H=
IN. H2O....
                1.50
*******
POINT NO. 3.
          .66 STO 01
        83.00 STO 02
                RUN
DELTA H=
IN. H2O....
                1.87
*******
POINT NO. 4.
          .84 STO 01
        75.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.38
*******
POINT NO. 5.
         1.20 STO 01
        76.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.40
*******
POINT NO. 6.
         1.40 STO 01
        77.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.98
*******
POINT NO. 7.
        80.00 STO 03
                RUN
DELTA H=
IN. H2O....
                4.00
*******
POINT NO. 8.
         .74 STO 01
        84.00 STO 02
        81.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.11
*******
POINT NO. 9.
         .62 STO 01
        83.00 STO 02
        82.00 STO 03
                RUN
DELTA H=
IN. H2O....
                1.78
*******
POINT NO. 10.
         .63 STO 01
                RUN
DELTA H=
IN. H2O....
                1.81
*******
POINT NO. 11.
         .59 STO 01
        84.00 STO 02
        81.00 STO 03
                RUN
DELTA H=
IN. H2O....
                1.69
*******
POINT NO. 12.
        83.00 STO 02
        81.00 STO 03
                RUN
DELTA H=
IN. H2O....
                1.69
*******
POINT NO. 13.
         1.20 STO 01
        82.00 STO 02
        77.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.42
*******
POINT NO. 14.
         1.40 STO 01
        83.00 STO 02
        76.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.97
*******
POINT NO. 15.
         1.60 STO 01
        82.00 STO 02
        77.00 STO 03
                RUN
DELTA H=
IN. H2O....
                4.56
*******
POINT NO. 16.
         1.40 STO 01
        83.00 STO 02
        78.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.99
*******
POINT NO. 17.
        82.00 STO 02
        81.00 STO 03
                RUN
DELTA H=
IN. H2O....
                4.02
*******
POINT NO. 18.
         1.20 STO 01
                RUN
DELTA H=
IN. H2O....
                3.44
*******
POINT NO. 19.
         1.10 STO 01
                RUN
DELTA H=
IN. H2O....
                3.16
*******
POINT NO. 20.
          .91 STO 01
                RUN
DELTA H=
IN. H2O....
                2.61
*******
POINT NO. 21.
          .74 STO 01
                RUN
DELTA H=
IN. H2O....
                2.12
*******
POINT NO. 22.
          .66 STO 01
        82.00 STO 03
                RUN
DELTA H=
IN. H2O....
                1.98
*******
POINT NO. 23.
          .68 STO 01
                RUN
DELTA H=
IN. H2O....
                1.95
*******
POINT NO. 24.
          .69 STO 01
        83.00 STO 02
                RUN
DELTA H=
IN. H2O....
                1.98
*******
POINT NO. 25.
          0.00  RUN
======

ISOKIN
AVG VALUES
KV=22.167
TMETER F=79.042
DELTA-H=2.682
DELTA P=0.906
FINAL METER
VOLUME FT3=?
       828.090  RUN
INITIAL=777.200
SAMPLE TIME
MIN. =?
        60.000  RUN
PSTACK ABS
IN HG=30.202
TSTACK F=82.500

======

SOURCE TYPE?
0=OTHER
1=BOILER
          0.000  RUN
% CO2 =?
          0.000  RUN
% O2 =?
         20.900  RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000  RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                 RUN
H2O GAIN=?
         19.630  RUN
NET METER
VOL. FT3=
                52.518
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
                51.925
MOLE FRACT. DRY
GAS, (1-BWS) =
                 0.983
% H2O =
                  1.7
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
                28.646
AVG VELOCITY
FPM =
            3,050.187
STACK DRY GAS
FLOW QS  SCFM=
            44,249.879
ACFM =
            45,858.720

**********

ISOKINETIC %I =101.9

*********
```

C-60

24 POINT SAMPLE TRAVERSE



LINE 6 OUTLET, CADMIUM PLATE

TRAVERSE POINT	EPA METHOD 1 (% OF DIA)	TRAVERSE POINT LOCATION (DISTANCES FROM I.D.) DUCT DIAMETER (IN.) 46
1 & 13	2.1	1.0
2 & 14	6.7	3.1
3 & 15	11.8	5.4
4 & 16	17.7	8.1
5 & 17	25.0	11.5
6 & 18	35.6	16.4
7 & 19	64.4	29.6
8 & 20	75.0	34.5
9 & 21	82.3	37.9
10 & 22	88.2	40.6
11 & 23	93.3	42.9
12 & 24	97.9	45.0

Box # 17
Probe #

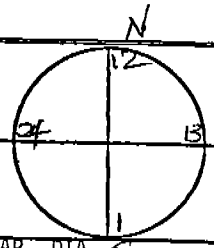
A = 1661.9 IN²

TRAVERSE DATA SHEET

(REV 8/86)

DIA = 46"

PLANT: NAS Pensacola
LOCATION: Bldg 604
DATE: 11-14-90
OPERATOR: CR
RUN #: Traverse Line 6 Cad plt



CIRCULAR, DIA. 46 in
RECTANGULAR, LxW in

Length from upstream disturbance ft
Diameter from upstream disturbance 2 dia
Length from downstream disturbance ft
Diameters from downstream disturbance 1.5 dia
Required number of traverse points 24
Number of traverse points used 24

POINT # n	STACK PRESSURE (in H2O) ΔPvel	Pstatic	√ΔP	LOCATION (in) L	W	POINT # n	STACK PRESSURE (in H2O) ΔPvel	Pstatic	√ΔP	LOCATION (in) L	W
1	0.48		.69	1.0		26					
2	0.49		.70	3.08		27					
3	0.47		.69	5.43		28					
4	0.44		.66	8.14		29					
5	0.41		.64	11.50		30					
6	0.35	0.17	.59	16.38		31					
7	0.38		.62	29.62		32					
8	0.40		.63	34.50		33					
9	0.45	0.19	.67	37.86		34					
10	0.52		.72	40.57		35					
11	0.58		.76	42.92		36					
12	0.65	0.24	.81	45.0	Nocyclonic	37					
13	0.33		.57	1.0		38					
14	0.40		.63	3.08		39					
15	0.47	0.19	.69	5.43		40					
16	0.46		.68	8.14		41					
17	0.47		.69	11.50		42					
18	0.44	0.20	.66	16.38		43					
19	0.45		.67	29.62		44					
20	0.54		.73	34.50		45					
21	0.59		.77	37.86		46					
22	0.62	0.27	.79	40.57		47					
23	0.63		.79	42.92		48					
24	0.65		.81	45.0	NO CYC	49					
25						50					

$$\Delta P_{ave} = \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]^2 = \left(\frac{16.66}{24}\right)^2 = 0.48$$

C-62

CYANIDE EMISSION TEST
IMPINGER BOX ~~SET UP~~ & NOZZLE CALIBRATION SHEET

DATE: 15NOV90 LINE NO: #6 cadmium plate

BASE: NAD PENSACOLA RUN NO: #1

BUILDING NO: 604 CONTROL DEVICE: INLET / OUTLET

PREP BY: O. IMPINGER BOX NO: 4

[✓] 1. Initially wash all glassware as follows; deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use. DI Rinse

[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (~~modified~~ STANDARD Greenburg-Smith impinger). Record initial weight.

[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.

[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.

[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.

[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.

[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.

[ ] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
4-1	1. 100ml 0.1N NaOH	471.45	570.45	596.07	25.62
4-2	2. 100ml 0.1N NaOH	512.33	609.33	615.05	5.72
4-3	3. Empty	503.68	503.68	506.21	2.53
4-4	4. 500ml silica gel		883.68	916.06	32.38
				Net Weight Gain	66.25

Filter No: —

New Silica gel condition after test: 65% Spent

Nozzle No: #7 Calibrated by: DN

					Average
ID Before Test:	0.272	0.272	0.270	0.271	.271
ID After Test:	0.270	0.269	0.271	0.269	0.270

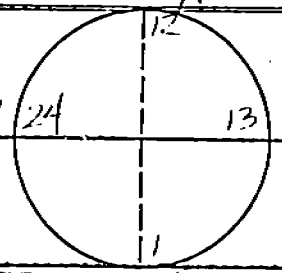
Pretest pitots STEADY at 6"

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

area = 1661.9 in² Mw = 28.7

PLANT: M.G. Rancho	BAROMETRIC PRESSURE, in Hg: 30.36		METER BOX #: 17	PROBE # (PITOT #): 5-7	NOZZLE #: PYREX #7
LOCATION: Alby 604	AMBIENT TEMPERATURE, °F: 65		METER ΔH@: 1.988	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.255
DATE: 15 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.20		METER γ: 1.032	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.271
OPERATOR: PEREZ	AVE VEL HEAD, in H_2O: 0.48		SAMPLE BOX #: 4	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: STEADY @ 6"
RUN #: 6-1-OUT	ASSUMED MOISTURE, %: 1.5	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .007 @12.5" Hg



TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft³	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER @ Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START 8:24														
13	0	835.168	2.11	0.39	75°	64°	64°	47°		6	20.9	0	0	0
14	8	841.1	2.37	0.44	76°	62	61	45°		6				
15	16	847.6	2.56	0.47	76°	68	63	48		7				
16	24	854.0	2.62	0.48	76	70	64	50		7				
17	32	860.2	2.63	0.48	76	72	65	53		7				
18	40	867.3	2.47	0.45	77°	73	66	54		7				
19	48	874.0	2.36	0.43	75	71	66	52		7				
20	56	879.9	3.06	0.56	77	72	67	52		7				
21	64	886.5	3.29	0.60	76	72	67	44		8				
22	72	894.2	3.45	0.63	78	74	68	44		9				
23	80	901.2	3.58	0.65	77	75	69	45		9				
24	88	909.7	3.57	0.65	79	76	70	45		9				
STOP 8:00	96	917.439												
TOTAL														
AVERAGE														

29-7

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION ELPC 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 15 NOV 90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR PEREZ	AVE VEL HEAD, in H_2O		SAMPLE BOX # 4	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # 6-1-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START 10:19														
12	96	917.439	3.43	0.62	72	73	73	45		9				
11	104	924.3	3.19	0.58	78	75	73	42		9				
10	112	932.3	2.66	0.48	78	80	75	47		8				
9	120	938.9	2.28	0.41	78	82	76	50		6				
8	128	945.8	1.95	0.35	78	83	77	51		5				
7	136	950.9	1.84	0.33	79	84	78	49		5				
6	144	956.8	1.68	0.30	78	85	79	50		5				
5	152	962.5	1.84	0.33	80	85	81	52		5				
4	160	968.2	2.12	0.38	79	85	81	51		5				
3	168	975.0	2.32	0.42	84	83	82	52		6				
2	176	980.5	2.22	0.41	78	81	80	53		6				
1	184	985.4	1.93	0.35	79	78	77	54		6				
STOP 11:55	192	992.258												
TOTAL		POST TEST	PROBE: .005 CFM @ 12 "Hg = PASS!											
AVERAGE		LEAK CHECK	PITOT'S: GOOD @ 6 in H_2O = PASS!											

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```
METHOD 5 MOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          6.      RUN
RUN NO.=?
          1.      RUN
FILTER NO=?
          0.      RUN

DELTA-H*AT = ?
      1.988       RUN
METER GAMMA = ?
      1.032       RUN
STACK AREA
IN. SQ. = ?
   1,661.900      RUN
STACK STATIC
P IN H2O=?
     -8.280       RUN
PBAR IN HG=?
     30.360       RUN
% H2O=?
      1.500       RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.700       RUN
AVG STACK
TEMP DEG F=?
     78.000       RUN
AVG DELTA-P
IN. H2O=?
      0.400       RUN
AMBIENT
TEMP F=?
     65.000       RUN
PITOT TUBE
CSUBP=?
      0.798       RUN

AVG STACK
VELOCITY FPM=
      2,203.900
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.255

ACTUAL NOZZLE
DIA INCHES=?
      0.271       RUN

SAMPLE CFM = 0.849
```

007

```
*******
INITIAL METER
VOLUME FT3 =?
    835.168       RUN
                  RUN
*******
POINT NO. 1.
          0.39 STO 01
         75.00 STO 02
         64.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.11
*******
POINT NO. 2.
          0.44 STO 01
         76.00 STO 02
         62.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.37
*******
POINT NO. 3.
          0.47 STO 01
         76.00 STO 02
         68.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.56
*******
POINT NO. 4.
          0.48 STO 01
         76.00 STO 02
         70.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.62
*******
POINT NO. 5.
          0.48 STO 01
         76.00 STO 02
         72.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.63
*******
POINT NO. 6.
          0.45 STO 01
         77.00 STO 02
         73.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.47
```

```
*******
POINT NO. 7.
          0.43 STO 01
         75.00 STO 02
         71.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.36
*******
POINT NO. 8.
          0.56 STO 01
         77.00 STO 02
         72.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                3.06
*******
POINT NO. 9.
          0.60 STO 01
         76.00 STO 02
         72.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                3.29
*******
POINT NO. 10.
          0.63 STO 01
         78.00 STO 02
         74.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                3.45
*******
POINT NO. 11.
          0.65 STO 01
         77.00 STO 02
         75.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                3.58
*******
POINT NO. 12.
          0.65 STO 01
         79.00 STO 02
         76.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                3.57
*******
```

```
*******
POINT NO. 13.
          0.62 STO 01
         72.00 STO 02
         73.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                3.43
*******
POINT NO. 14.
          0.58 STO 01
         78.00 STO 02
         75.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                3.19
*******
POINT NO. 15.
          0.48 STO 01
         78.00 STO 02
         80.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.66
*******
POINT NO. 16.
          0.41 STO 01
         78.00 STO 02
         82.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.28
*******
POINT NO. 17.
          0.35 STO 01
         78.00 STO 02
         83.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                1.95
*******
POINT NO. 18.
          0.33 STO 01
         79.00 STO 02
         84.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                1.84
*******
```

```
POINT NO. 19.
          0.30 STO 01
         78.00 STO 02
         85.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                1.68
*******
POINT NO. 20.
          0.33 STO 01
         80.00 STO 02
         85.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                1.84
*******
POINT NO. 21.
          0.38 STO 01
         79.00 STO 02
         85.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.12
*******
POINT NO. 22.
          0.42 STO 01
         84.00 STO 02
         83.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.32
*******
POINT NO. 23.
          0.41 STO 01
         78.00 STO 02
         81.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                2.28
*******
POINT NO. 24.
          0.35 STO 01
         79.00 STO 02
         78.00 STO 03
                  RUN
DELTA H=
IN. H2O....
                1.93
*******
POINT NO. 25.
          0.00      RUN
```

```
ISOKIN
AVG VALUES
KV=15.726
TMETER F=75.958
DELTA-H=2.565
DELTA P=0.460
FINAL METER
VOLUME FT3=?
    992.858       RUN
INITIAL=835.168
SAMPLE TIME
MIN. =?
    192.000       RUN
PSTACK ABS
IN HG=30.345
TSTACK F=77.458
SOURCE TYPE?
0=OTHER
1=BOILER
          0.000   RUN
% CO2 =?
          0.000   RUN
% O2 =?
         20.900   RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000   RUN
H2O GAIN=?
         66.250   RUN
NET METER
VOL. FT3=
                162.736
CORRECTED
SAMPLE VOL.
VASTD  SCF=
                162.589
MOLE FRACT. DRY
GAS, (1-BWS) =
                  0.981
% H2O =
                    1.9
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
                 28.632
AVG VELOCITY
FPM =
              2,159.324
STACK DRY GAS
FLOW QS  SCFM=
             24,352.828
ACFM =
             24,920.698

**********

ISOKINETIC %I =100.2
```

C-66

CYANIDE EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 15NOV90 LINE NO: #6 cadmium plate

BASE: NAD PENSACOLA RUN NO: #2

BUILDING NO: 604 CONTROL DEVICE: INLET / OUTLET

PREP BY: [illegible] IMPINGER BOX NO: 5

[✓] 1. Initially wash all glassware as follows; deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use. DI Rinse
[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (~~modified~~ Greenburg-Smith STANDARD impinger). Record initial weight.
[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.
[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.
[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
5-1	1. 100ml 0.1N NaOH	444.28	544.07	568.28	24.21
5-2	2. 100ml 0.1N NaOH	462.03	558.62	566.35	7.73
5-3	3. Empty	452.02	452.01	454.18	2.17
5-4	4. 500ml silica gel		795.20	824.13	28.93
				Net Weight Gain	63.04

Filter No: ——

Silica gel condition after test: 60% Spent

Nozzle No: #9 Calibrated by: DN

					Average
ID Before Test:	0.271	0.270	0.271	0.270	~~0.2705~~ .271
ID After Test:	0.269	0.270	0.271	0.270	0.270

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

N A = 1661.9 in² Mw = 28.7

PLANT: M.D. Pinnacle	BAROMETRIC PRESSURE, in Hg: 30.36		METER BOX #: 14	PROBE # (PITOT #): S-12	NOZZLE #: PYREX #9
LOCATION: Bldg 604	AMBIENT TEMPERATURE, °F		METER ΔH@: 2.049	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.
DATE: 15 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.20		METER γ: 1.005	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.271
OPERATOR	AVE VEL HEAD, in H_2O: 0.48		SAMPLE BOX #: 5	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: STEMO @ 6 in H_2O
RUN #: 6-2-OUT	ASSUMED MOISTURE, %: 1.5	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .007 @ 12 in Hg

W 24 13 E 12 1

TRAVERSE POINT # START 8:20	SAMPLING TIME min	GAS METER READING (Vm) ft³	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
12	0	044.494	3.51	0.63	75°	64	64	47		6	20.9	0	0	0
11	8	052.3	3.38	0.61	76°	62°	61°	40		6				
10	16	060.4	2.98	0.53	76°	69°	63°	46°		5				
9	24	067.0	2.65	0.47	76	71°	64	48		5				
8	32	073.6	2.32	0.41	76	73	65	51		4				
7	40	080.0	2.14	0.38	78	73	66	51		4				
6	48	084.6	1.99	0.35	75	74	67	47		4				
5	56	091.5	2.26	0.40	77	72	~~72~~ 67	45		4				
4	64	098.4	2.49	0.44	76	73	67	47		4				
3	72	104.6	2.60	0.46	78	74	68	47		4				
2	80	110.4	2.61	0.46	77	76	70	48		4				
1	88	118.0	2.22	0.39	79°	79	72	48		4				
STOP 9:56	96	124.122												
TOTAL														

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SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE: 15 NOV 90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR	AVE VEL HEAD, in H_2O		SAMPLE BOX # 5	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # 6-2-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT # START 10:15	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
13	96	124.122	1.84	0.32	72	76	75	48		3				
14	104	129.1	1.87	0.33	78	77	75	45		3				
15	112	135.3	2.11	0.37	78	79	76	47		4				
16	120	141.4	2.35	0.41	78	81	77	48		4				
17	128	147.5	2.36	0.41	78	84	78	48		4				
18	136	154.5	2.47	0.43	79	85	80	48		4				
19	144	160.7	2.14	0.37	78	86	81	50		4				
20	152	166.9	2.19	0.38	80	87	82	49		4				
21	160	172.9	2.67	0.46	79	89	84	50		5				
22	168	181.0	2.93	0.51	84	89	84	50		5				
23	176	186.9	3.16	0.55	78	83	83	49		5				
24	184	195.1	3.21	0.56	79	83	81	51		5				
STOP 12:51	192	202.184												
TOTAL		POST TEST	PROBE: .007		CFM @	10	IN Hg =	PASS!						
AVERAGE		LEAK CHECK	PITOTS: GOOD @		6 in	H2O =	PASS!							

6-2

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          6.     RUN
RUN NO.=?
          2.     RUN
FILTER NO=?
          0.     RUN

DELTA-H*AT = ?
        2.049    RUN
METER GAMMA = ?
        1.005    RUN
STACK AREA
IN. SQ. = ?
      1,661.980  RUN
STACK STATIC
P IN H2O=?
       -0.200    RUN
PBAR IN HG=?
       30.360    RUN
% H2O=?
        1.500    RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
       28.780    RUN
AVG STACK
TEMP DEG F=?
       78.000    RUN
AVG DELTA-P
IN. H2O=?
        0.480    RUN
AMBIENT
TEMP F=?
       65.000    RUN
PITOT TUBE
CSUBP=?
        0.790    RUN

AVG STACK
VELOCITY FPM=
      2,203.988
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.255

ACTUAL NOZZLE
DIA INCHES=?
        0.271    RUN

SAMPLE CFM = 0.848
```

OUT

```
******
INITIAL METER
VOLUME FT3 =?
      844.494    RUN
*******
POINT NO. 1.
        0.63 STO 01
       75.00 STO 02
       64.00 STO 03
             RUN
DELTA H=
IN. H2O....
        3.51
*******
POINT NO. 2.
        0.61 STO 01
       76.00 STO 02
       62.00 STO 03
             RUN
DELTA H=
IN. H2O....
        3.38
*******
POINT NO. 3.
        0.53 STO 01
       76.00 STO 02
       69.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.98
*******
POINT NO. 4.
        0.47 STO 01
       76.00 STO 02
       71.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.65
*******
POINT NO. 5.
        0.41 STO 01
       76.00 STO 02
       73.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.32
*******
POINT NO. 6.
        0.38 STO 01
       78.00 STO 02
       73.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.14
*******
POINT NO. 7.
        0.35 STO 01
       75.00 STO 02
       74.00 STO 03
             RUN
DELTA H=
IN. H2O....
        1.99
*******
POINT NO. 8.
        0.40 STO 01
       77.00 STO 02
       72.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.26
*******
POINT NO. 9.
        0.44 STO 01
       76.00 STO 02
       73.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.49
*******
POINT NO. 10.
        0.46 STO 01
       78.00 STO 02
       74.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.60
*******
POINT NO. 11.
        0.46 STO 01
       77.00 STO 02
       76.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.61
*******
POINT NO. 12.
        0.39 STO 01
       79.00 STO 02
       79.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.22
*******
POINT NO. 13.
        0.32 STO 01
       72.00 STO 02
       76.00 STO 03
             RUN
DELTA H=
IN. H2O....
        1.84
*******
POINT NO. 14.
        0.33 STO 01
       78.00 STO 02
       77.00 STO 03
             RUN
DELTA H=
IN. H2O....
        1.87
*******
POINT NO. 15.
        0.37 STO 01
       78.00 STO 02
       79.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.11
*******
POINT NO. 16.
        0.41 STO 01
       78.00 STO 02
       81.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.35
*******
POINT NO. 17.
        0.41 STO 01
       78.00 STO 02
       84.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.36
*******
POINT NO. 18.
        0.43 STO 01
       79.00 STO 02
       85.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.47
*******
POINT NO. 19.
        0.37 STO 01
       78.00 STO 02
       86.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.14
*******
POINT NO. 20.
        0.38 STO 01
       80.00 STO 02
       87.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.19
*******
POINT NO. 21.
        0.46 STO 01
       79.00 STO 02
       89.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.67
*******
POINT NO. 22.
        0.51 STO 01
       84.00 STO 02
       89.00 STO 03
             RUN
DELTA H=
IN. H2O....
        2.93
*******
POINT NO. 23.
        0.55 STO 01
       78.00 STO 02
       83.00 STO 03
             RUN
DELTA H=
IN. H2O....
        3.16
*******
POINT NO. 24.
        0.56 STO 01
       79.00 STO 02
       83.00 STO 03
             RUN
DELTA H=
IN. H2O....
        3.21
```

```
ISOKIN
AVG VALUES
KV=15.365
TMETER F=77.458
DELTA-H=2.519
DELTA P=0.439
FINAL METER
VOLUME FT3=?
      202.184    RUN
INITIAL=44.494
SAMPLE TIME
MIN. =?
      192.000    RUN
PSTACK ABS
IN HG=30.345
TSTACK F=77.500

======

SOURCE TYPE?
0=OTHER
1=BOILER
        0.000    RUN
% CO2 =?
        0.000    RUN
% O2 =?
       20.900    RUN
H2O GAIN=?
       63.040    RUN
WET METER
VOL. FT3=
            158.478
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
            157.893
MOLE FRACT. DRY
GAS, (1-BWS) =
                0.982
% H2O =
                  1.8
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
                 28.636
AVG VELOCITY
FPM =
            2,109.564
STACK DRY GAS
FLOW QS  SCFM=
           23,798.828
ACFM =
           24,346.425


**********

ISOKINETIC %I =99.5
```

C-70

CYANIDE EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 15 NOV 90

LINE NO: 6 CADMIUM PLATE

BASE: NAD PENSACOLA

RUN NO: #3

BUILDING NO: 604

CONTROL DEVICE: INLET / OUTLET

PREP BY: [illegible]

IMPINGER BOX NO: 6

[✓] 1. Initially wash all glassware as follows; deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (modified Greenburg-Smith impinger). Record initial weight.
[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.
[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.
[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
6-1	1. 100ml 0.1N NaOH	496.97	592.70	602.87	10.17
6-2	2. 100ml 0.1N NaOH	468.23	526.37	528.43	2.06
6-3	3. Empty	460.13	460.15	460.37	0.22
6-4	4. 500ml silica gel		835.09	847.48	12.39
				Net Weight Gain	24.84

Filter No: —

New Silica gel condition after test: 26% spent

Nozzle No: P#7 Calibrated by: [illegible]

					Average
ID Before Test:	0.272	0.272	0.270	0.271	0.271
ID After Test:	0.270	0.270	0.269	0.270	0.270

CYANIDE

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510) A=1661.9 N MW 28.7

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.36		METER BOX #: 17	PROBE # (PITOT #): 5-7	NOZZLE #: P#7
LOCATION: B2DC-604	AMBIENT TEMPERATURE, °F: 70		METER ΔH@: 1.988	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.256
DATE: 15 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.2		METER γ: 1.032	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.271
OPERATOR: PEREZ	AVE VEL HEAD, in H_2O: 0.46		SAMPLE BOX #: 6	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: GOOD @ 6 in HGO
RUN #: 6-3-OUT	ASSUMED MOISTURE, %: 1.5	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS): 12, 24, 13, 1, W, E, S	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .005 CFM @ 15 in Hg

TRAVERSE POINT # (Start Time 2:12)	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (A) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
12	0	993.300	3.79	0.69	74°	71°	71°	65°		8				
11	2.5	995.7	3.48	0.64	79°	71°	72	58°		8				
10	5	998.0	2.99	0.55	80°	72°	72	56		7				
9	7.5	1000.4	2.61	0.48	81°	73°	71°	52		6				
8	10	1002.5	2.39	0.44	81°	73°	71°	52		5				
7	12.5	1004.1	2.18	0.40	80°	74°	72	59		5				
6	15	1006.0	1.97	0.36	80°	74°	71°	56		4.5				
5	17.5	1008.3	2.19	0.40	80	75°	72°	57		5				
4	20	1009.8	2.41	0.44	80°	75	72	57		5				
3	22.5	1011.9	2.69	0.49	80°	76	72	56		6				
2	25	1013.9	2.63	0.48	81°	76	72	56°		5.5				
1	27.5	1016.2	2.19	0.40	81°	77	72	56		5				
	30	1018.330												
TOTAL														

C-22

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NAPFONSHOLT	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 15/16/90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR FERE	AVE VEL HEAD, in H_2O		SAMPLE BOX # 6	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # CONTINUED 6-3-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start Time 405 pm														
13	30	1018.330	1.90	0.35	80	71	70	58		4				
14	32.5	1020.5	2.18	0.40	30	73	71	57		5				
15	35	1021.6	2.44	0.45	81	72	71	54		5				
16	37.5	1023.6	2.55	0.47	81	71	70	53		6				
17	40	1025.6	2.60	0.48	82	72	70	53		6				
18	42.5	1028.0	2.26	0.42	81	73	71	53		5				
19	45	1029.7	2.46	0.45	80	74	71	55		5				
20	47.5	1031.8	2.89	0.53	80	74	71	49		6				
21	50	1034.6	3.28	0.60	80	74	71	49		7				
22	52.5	1036.5	3.39	0.62	80	75	71	49		7				
23	55	1038.8	3.50	0.64	81	75	71	50		7.5				
24	57.5	1042.2	3.61	0.66	81	76	71	50		8				
435 pm	60	1044.100												
TOTAL		Final Leak												
AVERAGE														

NOZZLE .004 CFM @ 12 in Hg = PASS!

Pitot Leak = GOOD @ 6 in of H2O = PASS!

C-23

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          6.    RUN
RUN NO.=?
          3.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
      1.988     RUN
METER GAMMA = ?
      1.032     RUN
STACK AREA
IN. SQ. = ?
  1,661.900     RUN
STACK STATIC
P IN H2O=?
     -0.200     RUN
PBAR IN HG=?
     30.360     RUN
% H2O=?
      1.500     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.700     RUN
AVG STACK
TEMP DEG F=?
     80.000     RUN
AVG DELTA-P
IN. H2O=?
      0.460     RUN
AMBIENT
TEMP F=?
     70.000     RUN
PITOT TUBE
CSUBP=?
      0.790     RUN

AVG STACK
VELOCITY FPM=
  2,161.512
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.257

ACTUAL NOZZLE
DIA INCHES=?
      0.271     RUN

SAMPLE CFM = 0.937
```

OUT

```
*******
INITIAL METER
VOLUME FT3 =?
    993.300     RUN
*******
POINT NO. 1.
          0.69 STO 01
         74.00 STO 02
         71.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          3.79
*******
POINT NO. 2.
          0.64 STO 01
         79.00 STO 02
         71.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          3.48
*******
POINT NO. 3.
          0.55 STO 01
         80.00 STO 02
         72.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.99
*******
POINT NO. 4.
          0.43 STO 01
         81.00 STO 02
         73.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.61
*******
POINT NO. 5.
          0.44 STO 01
         81.00 STO 02
         73.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.39
*******
POINT NO. 6.
          0.40 STO 01
         80.00 STO 02
         74.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.18
```

```
*******
POINT NO. 7.
          0.36 STO 01
         80.00 STO 02
         74.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          1.97
*******
POINT NO. 8.
          0.40 STO 01
         80.00 STO 02
         75.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.19
*******
POINT NO. 9.
          0.44 STO 01
         80.00 STO 02
         75.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.41
*******
POINT NO. 10.
          0.49 STO 01
         80.00 STO 02
         76.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.69
*******
POINT NO. 11.
          0.48 STO 01
         81.00 STO 02
         76.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.63
*******
POINT NO. 12.
          0.40 STO 01
         81.00 STO 02
         77.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.19
*******
```

```
POINT NO. 13.
          0.35 STO 01
         80.00 STO 02
         71.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          1.90
*******
POINT NO. 14.
          0.40 STO 01
         80.00 STO 02
         73.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.18
*******
POINT NO. 15.
          0.45 STO 01
         81.00 STO 02
         72.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.44
*******
POINT NO. 16.
          0.47 STO 01
         81.00 STO 02
         71.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.55
*******
POINT NO. 17.
          0.48 STO 01
         82.00 STO 02
         72.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.60
*******
POINT NO. 18.
          0.42 STO 01
         81.00 STO 02
         73.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.29
*******
POINT NO. 19.
          0.45 STO 01
         80.00 STO 02
         74.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.46
```

```
*******
POINT NO. 20.
          0.53 STO 01
         80.00 STO 02
         74.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          2.89
*******
POINT NO. 21.
          0.60 STO 01
         80.00 STO 02
         74.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          3.28
*******
POINT NO. 22.
          0.62 STO 01
         80.00 STO 02
         75.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          3.39
*******
POINT NO. 23.
          0.64 STO 01
         81.00 STO 02
         75.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          3.50
*******
POINT NO. 24.
          0.66 STO 01
         81.00 STO 02
         76.00 STO 03
                 RUN
DELTA H=
IN. H2O....
          3.61
*******
POINT NO. 25.
          0.00    RUN
======

ISOKIN
AVG VALUES
KV=16.245
TMETER F=73.625
DELTA-H=2.692
```

```
DELTA P=0.489
FINAL METER
VOLUME FT3=?
  1,044.100     RUN
INITIAL=993.300
SAMPLE TIME
MIN. =?
     60.000     RUN
PSTACK ABS
IN HG=30.345
TSTACK F=80.167

======

SOURCE TYPE?
0=OTHER
1=BOILER
          0.000    RUN
% CO2 =?
          0.000    RUN
% O2 =?
         20.900    RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000    RUN
H2O GAIN=?
         24.040    RUN
NET METER
VOL. FT3=
         52.426
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
         52.607
MOLE FRACT. DRY
GAS, (1-BWS) =
          0.978
% H2O =
            2.2
STACK GAS WET
MOL. WT. MS,
LB/LB MOL=
         28.600
AVG VELOCITY
FPM =
      2,231.877
STACK DRY GAS
FLOW QS  SCFM=
     24,970.205
ACFM =
     25,758.032

**********

ISOKINETIC %I =101.1
```

C-74

CADMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 15 NOV 90

BASE: NAD PENSACOLA

BUILDING NO: 604

PREP BY: CL

LINE NO: #6 cadmium plate

RUN NO: #4

CONTROL DEVICE: INLET OUTLET

IMPINGER BOX NO: 1

[X] 1. Initially wash all glassware as follows; deionized water rinse, 6N HNO3 solution rinse, and deionized water rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N HNO3 solution to the first impinger (~~modified~~ STANDARD Greenburg-Smith impingers). Record initial weights.
[✓] 3. Add 100ml 0.1N HNO3 soltuion to the second impinger (standard Greenburg-Smith impinger). Record initial weight.
[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.
[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[✓] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
1-1	1. 100ml 0.1N HNO3	468.34	566.61	575.85	9.24
1-2	2. 100ml 0.1N HNO3	455.83	553.33	554.95	1.62
1-3	3. Empty	455.92	455.89	456.92	1.03
1-4	4. 500ml silica gel	470.81	842.21	855.31	13.1
				Net Weight Gain	24.99

Filter No: —

New. Silica gel condition after test: ≈25% spent

Nozzle No: P #9 Calibrated by: [signature]

					Average
ID Before Test:	0.271	0.270	0.271	0.270	0.271
ID After Test:	0.270	0.270	0.269	0.269	0.270

CAD TEST

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.345		METER BOX #: 14	PROBE # (PITOT #): 5-12	NOZZLE #: P-9
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 70		METER ΔH@: 2.049	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.259
DATE: 15 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.2		METER γ: 1.00445	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: 0.271
OPERATOR: ~~[illegible]~~ NEWTON	AVE VEL HEAD, in H_2O: 0.439		SAMPLE BOX #: 1	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: PASS @ 6 IN H_2O
RUN #: 6-4-OUT	ASSUMED MOISTURE, %: 1.5	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: 0.003@15

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	(A) VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (B) (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START 2:10pm														
13	0	202.773	2.16	0.38	74	74	74	65		5	20.9	0	0	0
14	2.5	—	2.37	0.42	79	74	73	59		6				
STOP 2:17pm START 2:21	TOILET 5	OTHER RUN GET AHEAD												
15			2.70	0.48	80	75	74	62		6				
16	7.5	—	2.70	0.48	81	75	74	55		6.5				
17	10	210.89	2.77	0.49	80	76	74	55		7.0				
18	12.5	—	2.60	0.46	80	77	74	54		7.0				
19	15	215.2	2.61	0.46	80	78	74	54		7.0				
20	17.5	217.4	2.95	0.52	80	79	75	56		7.0				
21	20	219.65	3.24	0.57	80	80	75	57		8.0				
22	22.5	222.125	3.36	0.59	80	80	75	57		8.0				
23	25	224.55	3.42	0.60	81	82	76	57		8.0				
24	27.5	226.83	3.54	0.62	81	83	76	58		8.0				
Final meter Volume	30	229.433												
STOP 2:44pm TOTAL														
AVERAGE														

CADTEST

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

Area 1661.9 Mw 28.67

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.345		METER BOX #: 14	PROBE # (PITOT #): 5-12	NOZZLE #: P#9
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 70°		METER ΔH@: 2.049	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.
DATE: 15 NOV 90	AVE STATIC PRESSURE, in H_2O: -0.2		METER γ: 1.005	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.
OPERATOR: Perry	AVE VEL HEAD, in H_2O: 0.439		SAMPLE BOX #: 1	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S
RUN #: ~~CB~~ CONTINUED 6-4-OUT	ASSUMED MOISTURE, %: 1.5	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg

TRAVERSE POINT #	SAMPLING TIME	GAS METER READING	ORIFICE PRESSURE (CALC)	VELOCITY HEAD (MEAS)	STACK TEMPERATURE	GAS SAMPLE TEMPERATURE AT DRY GAS METER		IMPINGER TEMPERATURE	SAMPLE BOX TEMPERATURE	SAMPLE VACUUM	O_2	CO_2	CO	NOX
						Inlet	Outlet							
3:18	min	(Vm) ft^3	(ΔH) in H_2O	(ΔP) in H_2O	(Ts) °F	(Tm in) °F	(Tm out) °F	°F	°F	in Hg	%	%	ppm	ppm
12	30	229.433	3.55	0.63	80	75	78	60°		8				
11	32.5	232.1	3.21	0.57	80	74	75°	60°		7				
10	35	235.2	2.82	0.50	81	76	75	54		7				
9	37.5	237.3	2.49	0.44	80	77	75	56		6				
8	40	239.1	2.15	0.38	80	77	75	54		5				
7	42.5	241.1	2.10	0.37	81	79	75	58		6				
6	45	243.1	1.87	0.33	80	79	75	59		5				
5	47.5	245.0	2.15	0.38	81	79	75	60		5				
4	50	246.8	2.44	0.43	80	79	76	61		6				
3	52.5	248.8	2.67	0.47	80	79	76	62		6				
2	55	250.7	2.56	0.45	80	79	76	62		6				
1	57.5	253.0	2.39	0.42	80	80°	76	61		6				
	60	255.381												
Test 3:49 TOTAL														
AVERAGE														

Nozzle = .000 CFM@ 16 in Hg = PASS!

Final Leak ck

Pitot tubes = GOOD @ 6 in H_2O = PASS!

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          6.    RUN
RUN NO.=?
          4.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
      2.049     RUN
METER GAMMA = ?
      1.005     RUN
STACK AREA
IN. SQ. = ?
   1,661.900    RUN
STACK STATIC
P IN H2O=?
     -0.200     RUN
PBAR IN HG=?
     30.345     RUN
% H2O=?
      1.500     RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.700     RUN
AVG STACK
TEMP DEG F=?
     80.000     RUN
AVG DELTA-P
IN. H2O=?
      0.439     RUN
AMBIENT
TEMP F=?
     70.000     RUN
PITOT TUBE
CSUBP=?
      0.798     RUN

AVG STACK
VELOCITY FPM=
   2,112.119
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.260

ACTUAL NOZZLE
DIA INCHES=?
      0.271     RUN

SAMPLE CFM = 0.818
```

OUT

```
*******
INITIAL METER
VOLUME FT3 =?
    202.773     RUN
*******
POINT NO. 1.
          0.38 STO 01
         74.00 STO 02
         74.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.16
*******
POINT NO. 2.
          0.42 STO 01
         79.00 STO 02
         74.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.37
*******
POINT NO. 3.
          0.48 STO 01
         75.00 STO 02
         81.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.76
*******
POINT NO. 4.
          0.48 STO 01
         81.00 STO 02
         75.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.70
*******
POINT NO. 5.
          0.49 STO 01
         80.00 STO 02
         76.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.77
*******
POINT NO. 6.
          0.46 STO 01
         80.00 STO 02
         77.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.60
```

```
POINT NO. 7.
          0.46 STO 01
         80.00 STO 02
         78.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.61
*******
POINT NO. 8.
          0.52 STO 01
         80.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.95
*******
POINT NO. 9.
          0.57 STO 01
         80.00 STO 02
         80.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.24
*******
POINT NO. 10.
          0.59 STO 01
         80.00 STO 02
         80.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.36
*******
POINT NO. 11.
          0.60 STO 01
         81.00 STO 02
         82.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.42
*******
POINT NO. 12.
          0.62 STO 01
         81.00 STO 02
         83.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.54
*******
POINT NO. 13.
          0.63 STO 01
         80.00 STO 02
         75.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.55
```

```
POINT NO. 14.
          0.57 STO 01
         80.00 STO 02
         74.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.21
*******
POINT NO. 15.
          0.50 STO 01
         81.00 STO 02
         76.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.82
*******
POINT NO. 16.
          0.44 STO 01
         80.00 STO 02
         77.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.49
*******
POINT NO. 17.
          0.38 STO 01
         80.00 STO 02
         77.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.15
*******
POINT NO. 18.
          0.37 STO 01
         81.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.10
*******
POINT NO. 19.
          0.33 STO 01
         80.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.87
*******
POINT NO. 20.
          0.38 STO 01
         81.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.15
```

```
*******
POINT NO. 21.
          0.43 STO 01
         80.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.44
*******
POINT NO. 22.
          0.47 STO 01
         80.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.67
*******
POINT NO. 23.
          0.45 STO 01
         80.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.56
*******
POINT NO. 24.
          0.42 STO 01
         80.00 STO 02
         80.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.39
*******
POINT NO. 25.
          0.00     RUN
======

ISOKIN
AVG VALUES
KV=15.900
TMETER F=78.000
DELTA-H=2.705
DELTA P=0.473
FINAL METER
VOLUME FT3=?
    255.381     RUN
INITIAL=202.773
SAMPLE TIME
MIN. =?
     60.000     RUN
PSTACK ABS
IN HG=30.338
TSTACK F=79.750
======
```

```
SOURCE TYPE?
0=OTHER
1=BOILER
          0.000     RUN
% CO2 =?
          0.000     RUN
% O2 =?
         20.900     RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000     RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

               RUN
H2O GAIN=?
         24.990     RUN
WET METER
VOL. FT3=
          52.871
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
          52.597
MOLE FRACT. DRY
GAS, (1-BWS) =
           0.978
% H2O =
             2.2
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
          28.599
AVG VELOCITY
FPM =
       2,196.048
STACK DRY GAS
FLOW QS  SCFM=
      24,572.824
ACFM =
      25,344.526

**********

ISOKINETIC %I =102.7

*********
```

C-78

CADMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 16NOV90 LINE NO: #6 cadmium plate

BASE: NAD PENSACOLA RUN NO: # 5

BUILDING NO: 604 CONTROL DEVICE: INLET (OUTLET)

PREP BY: [illegible] IMPINGER BOX NO: 2

[✓] 1. Initially wash all glassware as follows; deionized water rinse, 6N HNO3 solution rinse, and deionized water rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N HNO3 solution to the first impinger (modified Greenburg-Smith impingers). Record initial weights.
[✓] 3. Add 100ml 0.1N HNO3 soltuion to the second impinger (standard Greenburg-Smith impinger). Record initial weight.
[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.
[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[ ] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
2-1	1. 100ml 0.1N HNO3	455.78	555.48	582.92	27.4
2-2	2. 100ml 0.1N HNO3	446.25	545.66	552.28	6.6
2-3	3. Empty	501.64	501.53	503.61	2.1
2-4	4. 500ml silica gel	490.52	853.97	884.39	30.4
				Net Weight Gain	66.5

Filter No: —

Silica gel condition after test: 40% Spent

Nozzle No: 7 Calibrated by: _____

					Average
ID Before Test:	0.271	0.271	0.272	0.271	0.271
ID After Test:	0.271	0.271	0.270	0.271	0.271

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q) Stack Area 1661.9² MW: 28.7

PLANT: MAD Remodel	BAROMETRIC PRESSURE, in Hg: 30.28		METER BOX #: 17	PROBE # (PITOT #): 5-12 /	NOZZLE #: P-7
LOCATION: Bldg 604	AMBIENT TEMPERATURE, °F: 65		METER ΔH@: 1.988	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.256
DATE: 11-16-90	AVE STATIC PRESSURE, in H_2O: -0.2		METER γ: 1.032	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.271
OPERATOR:	AVE VEL HEAD, in H_2O: 0.48		SAMPLE BOX #: 2	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: STEADY @ 6" H_2O
RUN #: 6-5-OUT	ASSUMED MOISTURE, %: 2	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: 0.006 @ 12" Hg

TRAVERSE POINT #	SAMPLING TIME	GAS METER READING	ORIFICE PRESSURE (CALC)	VELOCITY HEAD (MEAS) (A)	STACK TEMPERATURE (B)	GAS SAMPLE TEMPERATURE AT DRY GAS METER (C) Inlet	Outlet	IMPINGER TEMPERATURE	SAMPLE BOX TEMPERATURE	SAMPLE VACUUM	O_2	CO_2	CO	NOX
Start Time 8:36	min	(Vm) ft^3	(ΔH) in H_2O	(ΔP) in H_2O	(Ts) °F	(Tm in) °F	(Tm out) °F	°F	°F	in Hg	%	%	ppm	ppm
13	0	044.504	1.86	0.35	79°	63	62	48		5				
14	8	049.9	2.06	0.39	82°	63	62	38		5				
15	16	055.9	2.39	0.45	82	66	63	40		6				
16	24	061.4	2.62	0.49	80	68	63	43		6				
17	32	068.5	2.67	0.50	82	69	64	44		6				
18	40	075.1	2.47	0.46	80	70	65	45		6				
19	48	082.0	2.36	0.44	81	71	65	45		6				
20	56	088.4	2.63	0.49	80	71	66	45		6				
21	64	094.9	2.96	0.55	81	73	67	45		7				
22	72	102.3	3.14	0.58	80	75	68	46		7				
23	80	109.7	3.14	0.58	82	77	70	47		7				
24	88	117.3	3.22	0.59	81	80	72	48		7				
	96	124.414												
TOTAL														
AVERAGE														

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #) 5 1/2'	NOZZLE # #7
LOCATION	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR	AVE VEL HEAD, in H_2O		SAMPLE BOX #	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # 6-5-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT # Start Test 10:39	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
12	96	124.414	3.35	0.62	79	73	72	46		8				
11	104	131.6	3.03	0.56	80	74	72	43		7				
10	112	139.1	2.61	0.48	79	77	72	49		6.5				
9	120	145.6	2.23	0.41	82	79	74	50		5				
8	128	151.7	1.96	0.36	81	80	74	52		5				
7	136	157.4	1.85	0.34	82	80	76	50		5				
6	144	163.4	1.75	0.32	81	81	76	50		5				
5	152	169.6	2.01	0.37	83	80	77	50		5				
4	160	175.4	2.30	0.42	81	81	77	51		6				
3	168	181.2	2.46	0.45	82	82	77	53		6				
2	176	188.4	2.35	0.43	81	82	78	52		6				
1	184	194.2	2.03	0.37	81	83	78	55		5				
final meter volume	192	200.425												
12-17 TOTAL		Final Leak Ck												
AVERAGE														

NOZZLE = .008 CFM @ 13 in Hg = PASS!

Pitot tubes = GOOD steady @ 6 in H2O = PASS!

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          6.    RUN
RUN NO.=?
          5.    RUN
FILTER NO=?
          0.    RUN

DELTA-H*AT = ?
      1.988     RUN
METER GAMMA = ?
      1.032     RUN
STACK AREA
IN. SQ. = ?
   1.661.900    RUN
STACK STATIC
P IN H2O=?
     -0.200     RUN
PBAR IN HG=?
     30.200     RUN
% H2O=?
      2.000     RUN
STACK GAS WET
MOL WT. MS,
LB/LB MOL=?
     28.700     RUN
AVG STACK
TEMP DEG F=?
     80.000     RUN
AVG DELTA-P
IN. H2O=?
      0.400     RUN
AMBIENT
TEMP F=?
     65.000     RUN
PITOT TUBE
CSUBP=?
      0.790     RUN

AVG STACK
VELOCITY FPM=
      2,210.917
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.256

ACTUAL NOZZLE
DIA INCHES=?
      0.271     RUN

SAMPLE CFM = 0.843
```

```
******
INITIAL METER
VOLUME FT3 =?
     044.594    RUN
*******
POINT NO. 1.
          0.35 STO 01
         79.00 STO 02
         63.00 STO 03
               RUN
DELTA H=
IN. H20....
          1.86
*******
POINT NO. 2.
          0.39 STO 01
         82.00 STO 02
         63.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.86
*******
POINT NO. 3.
          0.45 STO 01
         82.00 STO 02
         66.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.39
*******
POINT NO. 4.
          0.49 STO 01
         80.00 STO 02
         68.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.62
*******
POINT NO. 5.
          0.50 STO 01
         82.00 STO 02
         69.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.67
*******
POINT NO. 6.
          0.46 STO 01
         80.00 STO 02
         70.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.47
```

```
*******
POINT NO. 7.
          0.44 STO 01
         81.00 STO 02
         71.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.36
*******
POINT NO. 8.
          0.49 STO 01
         80.00 STO 02
         71.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.63
*******
POINT NO. 9.
          0.55 STO 01
         81.00 STO 02
         73.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.96
*******
POINT NO. 10.
          0.58 STO 01
         80.00 STO 02
         75.00 STO 03
               RUN
DELTA H=
IN. H20....
          3.14
*******
POINT NO. 11.
          0.58 STO 01
         82.00 STO 02
         77.00 STO 03
               RUN
DELTA H=
IN. H20....
          3.14
*******
POINT NO. 12.
          0.59 STO 01
         81.00 STO 02
         80.00 STO 03
               RUN
DELTA H=
IN. H20....
          3.22
*******
POINT NO. 13.
          0.62 STO 01
         79.00 STO 02
         73.00 STO 03
               RUN
DELTA H=
IN. H20....
          3.35
```

```
*******
POINT NO. 14.
          0.56 STO 01
         80.00 STO 02
         74.00 STO 03
               RUN
DELTA H=
IN. H20....
          3.03
*******
POINT NO. 15.
          0.48 STO 01
         79.00 STO 02
         77.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.61
*******
POINT NO. 16.
          0.41 STO 01
         82.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.23
*******
POINT NO. 17.
          0.36 STO 01
         81.00 STO 02
         80.00 STO 03
               RUN
DELTA H=
IN. H20....
          1.96
*******
POINT NO. 18.
          0.34 STO 01
         82.00 STO 02
         80.00 STO 03
               RUN
DELTA H=
IN. H20....
          1.85
*******
POINT NO. 19.
          0.32 STO 01
         81.00 STO 02
         81.00 STO 03
               RUN
DELTA H=
IN. H20....
          1.75
*******
POINT NO. 20.
          0.37 STO 01
         83.00 STO 02
         80.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.01
```

```
*******
POINT NO. 21.
          0.42 STO 01
         81.00 STO 02
         81.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.30
*******
POINT NO. 22.
          0.45 STO 01
         82.00 STO 02
         82.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.46
*******
POINT NO. 23.
          0.43 STO 01
         81.00 STO 02
         82.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.35
*******
POINT NO. 24.
          0.37 STO 01
         81.00 STO 02
         83.00 STO 03
               RUN
DELTA H=
IN. H20....
          2.03
*******
POINT NO. 25.
          0.00    RUN
======

ISOKIN
AVG VALUES
KV=15.676
TMETER F=74.917
DELTA-H=2.477
DELTA P=0.454
FINAL METER
VOLUME FT3=?
     200.425    RUN
INITIAL=44.594
SAMPLE TIME
MIN. =?
     192.000    RUN
PSTACK ABS
IN HG=30.265
TSTACK F=80.917

======
```

```
SOURCE TYPE?
0=OTHER
1=BOILER
          0.000    RUN
% CO2 =?
          0.000    RUN
% O2 =?
         20.900    RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000    RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                   RUN
H2O GAIN=?
         66.500    RUN
NET METER
VOL. FT3=
        160.910
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
        168.653
MOLE FRACT. DRY
GAS, (1-BWS) =
          0.981
% H2O =
            1.9
STACK GAS WET
MOL. WT. MS,
LB/LB MOL=
         28.629
AVG VELOCITY
FPM =
      2,155.471
STACK DRY GAS
FLOW QS  SCFM=
     24,083.079
ACFM =
     24,876.231

**********

ISOKINETIC %I =100.1

*********
```

C-82

CADMIUM EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 16 NOV 90

LINE NO: #6 cadmium plate

BASE: NAD PENSACOLA

RUN NO: #6

BUILDING NO: 604

CONTROL DEVICE: INLET, OUTLET

PREP BY: [illegible]

IMPINGER BOX NO: 3

[✓] 1. Initially wash all glassware as follows; deionized water rinse, 6N HNO3 solution rinse, and deionized water rinse. Sample recovery preps glassware for next use.
[✓] 2. Add 100ml 0.1N HNO3 solution to the first impinger (modified Greenburg-Smith impingers). Record initial weights.
[✓] 3. Add 100ml 0.1N HNO3 soltuion to the second impinger (standard Greenburg-Smith impinger). Record initial weight.
[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.
[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.
[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.
[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.
[ ] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
3-1	1. 100ml 0.1N HNO3	514.54	614.94	641.3	26.4
3-2	2. 100ml 0.1N HNO3	522.72	624.10	630.35	6.3
3-3	3. Empty	459.58	459.54	461.32	1.8
3-4	4. 500ml silica gel	453.49	792.70	825.44	32.7
				Net Weight Gain	67.2

Filter No: —

Silica gel condition after test: 50% Spent

Nozzle No: P #9 Calibrated by: MP

					Average
ID Before Test:	0.270	0.271	0.271	0.271	0.271
ID After Test:	0.270	0.270	0.271	0.269	0.271

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT: NAS Pensacola	BAROMETRIC PRESSURE, in Hg: 30.28		METER BOX #: 14	PROBE # (PITOT #): 5-7	NOZZLE #: P-9
LOCATION: Bldg 604	AMBIENT TEMPERATURE, °F:		METER ΔH@: 2.049	PITOT COEF: 0.79	IDEAL NOZZLE DIA, in.: 0.254
DATE: 11-16-90	AVE STATIC PRESSURE, in H_2O: -0.2		METER γ: 1.005	PROBE LENGTH, in.: 60	ACTUAL NOZZLE DIA, in.: 0.271
OPERATOR:	AVE VEL HEAD, in H_2O: 0.48		SAMPLE BOX #: 3	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: [illegible] @ 6 in H_2O
RUN #: 6-6-OJT	ASSUMED MOISTURE, %: 2	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .001 CFM @ 15 in Hg

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
Start Test 3:52														
12	0	256.200	3.62	0.66	79°	65°	64°	45°	AMB	6.5	20.9	0	0	0
11	8	263.5	3.40	0.62	82	67	64	41		6.5				
10	16	271.0	2.91	0.53	82	69	64	42		5				
9	24	278.3	2.60	0.47	80	71	65	45		5				
8	32	285.0	2.21	0.40	82	71	65	44		5				
7	40	291.1	2.11	0.38	80	72	67	45		4				
6	48	297.6	1.83	0.33	81	72	66	44		3.5				
5	56	303.3	2.00	0.36	80	72	67	46		4				
4	64	309.2	2.28	0.41	81	73	68	47		4				
3	72	315.2	2.52	0.45	80	76	70	49		4.8				
2	80	321.9	2.40	0.43	82	77	71	48		4.5				
1	88	329.0	2.02	0.36	81	80	73	50		4				
Stop Test 10:07	96	334.652												
TOTAL														
AVE														

Page 2 of 4

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #) 5-7	NOZZLE # 9
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 16 NOV 90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR	AVE VEL HEAD, in H_2O		SAMPLE BOX # 3	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN # 6-6-OUT	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg

TRAVERSE POINT # Start Time 10:35	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
13	96	334.652	1.67	0.30	79	74	75	47		3				
14	104	340.6	1.62	0.29	80	75	74	46		3				
15	112	345.2	2.19	0.39	79	77	74	49		4				
16	120	351.5	2.41	0.43	82	79	75	50		4.5				
17	128 8	357.9	2.48	0.44	81	81	76	51		4.5				
18	136 16	364.5	2.43	0.43	82	83	77	52		4.5				
19	144 24	370.9	2.15	0.38	81	83	78	54		4				
20	152 32	377.3	2.65	0.47	85	83	79	53		5				
21	160 40	384.2	3.06	0.54	81	84	79	54		5.5				
22	168 48	390.6	3.17	0.56	82	85	80	55		6				
23	176 56	399.7	3.35	0.59	81	86	80	56		6				
24	184 64	406.9	3.41	0.60	81	86	81	56		6.5				
Final meter Volume	192 72	414.111												
12:13 TOTAL														
AVERAGE														

NOZZLE = .002 CFM @ 10 in Hg = PASS!

Final Leak ck

Pitot tubes = GOOD steady @ 7 in H2O = PASS!

C-85

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
          6.     RUN
RUN NO.=?
          6.     RUN
FILTER NO=?
          0.     RUN

DELTA-H*AT = ?
      2.049      RUN
METER GAMMA = ?
      1.005      RUN
STACK AREA
IN. SQ. = ?
   1.661.900     RUN
STACK STATIC
P IN H2O=?
     -0.200      RUN
PBAR IN HG=?
     30.280      RUN
% H2O=?
      2.000      RUN
STACK GAS WET
MOL WT, MS.
LB/LB MOL=?
     28.700      RUN
AVG STACK
TEMP DEG F=?
     75.000      RUN
AVG DELTA-P
IN. H2O=?
       .400      RUN
AMBIENT
TEMP F=?
     68.000      RUN
PITOT TUBE
CSUBP=?
      0.790      RUN

AVG STACK
VELOCITY FPM=
      2,200.658
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.254

ACTUAL NOZZLE
DIA INCHES=?
      0.271      RUN

SAMPLE CFM = 0.852
```

OUT

```
*******
INITIAL METER
VOLUME FT3 =?
    256.200      RUN
*******
POINT NO. 1.
          0.66 STO 01
         79.00 STO 02
         65.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.62
*******
POINT NO. 2.
          0.62 STO 01
         82.00 STO 02
         67.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.40
*******
POINT NO. 3.
          0.53 STO 01
         82.00 STO 02
          9.00    CLX
         69.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.91
*******
POINT NO. 4.
          0.47 STO 01
         80.00 STO 02
         71.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.60
*******
POINT NO. 5.
          0.40 STO 01
         82.00 STO 02
         71.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.21
*******
POINT NO. 6.
          0.38 STO 01
         80.00 STO 02
         72.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.11
```

```
*******
POINT NO. 7.
          0.33 STO 01
         81.00 STO 02
         72.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.83
*******
POINT NO. 8.
          0.36 STO 01
         80.00 STO 02
         72.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.00
*******
POINT NO. 9.
          0.41 STO 01
         81.00 STO 02
         73.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.28
*******
POINT NO. 10.
          0.45 STO 01
         80.00 STO 02
         76.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.52
*******
POINT NO. 11.
          0.43 STO 01
         82.00 STO 02
         77.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.40
*******
POINT NO. 12.
          0.36 STO 01
         81.00 STO 02
         80.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.02
*******
```

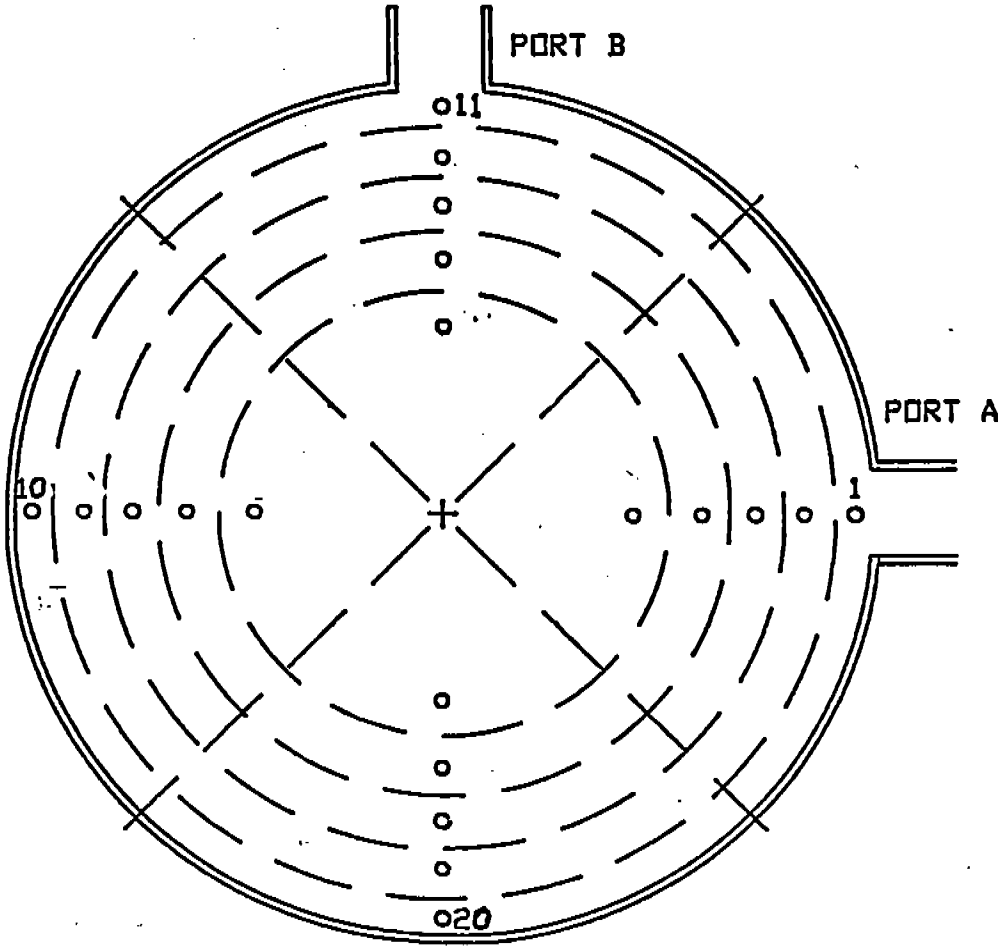
```
POINT NO. 13.
          0.30 STO 01
         79.00 STO 02
         74.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.67
*******
POINT NO. 14.
          0.29 STO 01
         80.00 STO 02
         75.00 STO 03
               RUN
DELTA H=
IN. H2O....
          1.62
*******
POINT NO. 15.
          0.39 STO 01
         79.00 STO 02
         77.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.19
*******
POINT NO. 16.
          0.43 STO 01
         82.00 STO 02
         79.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.41
*******
POINT NO. 17.
          0.44 STO 01
         81.00 STO 02
         81.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.48
*******
POINT NO. 18.
          0.43 STO 01
         82.00 STO 02
         83.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.43
*******
POINT NO. 19.
          0.38 STO 01
         81.00 STO 02
         83.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.15
```

```
POINT NO. 20.
          0.47 STO 01
         83.00 STO 02
         83.00 STO 03
               RUN
DELTA H=
IN. H2O....
          2.65
*******
POINT NO. 21.
          0.54 STO 01
         81.00 STO 02
         84.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.06
*******
POINT NO. 22.
          0.56 STO 01
         82.00 STO 02
         85.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.17
*******
POINT NO. 23.
          0.59 STO 01
         81.00 STO 02
         86.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.35
*******
POINT NO. 24.
          0.60 STO 01
         81.00 STO 02
         86.00 STO 03
               RUN
DELTA H=
IN. H2O....
          3.41
*******
POINT NO. 25.
          0.00     RUN
======

ISOKIN
AVG VALUES
KV=15.522
TMETER F=76.708
DELTA-H=2.521
DELTA P=0.445
FINAL METER
VOLUME FT3=?
    414.111      RUN
```

```
INITIAL=256.200
SAMPLE TIME
MIN. =?
    192.000      RUN
PSTACK ABS
IN HG=30.265
TSTACK F=88.917

======

SOURCE TYPE?
0=OTHER
1=BOILER
          0.000  RUN
% CO2 =?
          0.000  RUN
% O2 =?
         20.900  RUN
H2O GAIN KNOWN?
1=YES 0=NO
          1.000  RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                 RUN
H2O GAIN=?
         67.200  RUN
NET METER
VOL. FT3=
            158.701
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
            157.918
MOLE FRACT. DRY
GAS. (1-BWS) =
              0.980
% H2O =
                2.0
STACK GAS WET
MOL. WT. MS.
LB/LB MOL=
             28.623
AVG VELOCITY
FPM =
          2,134.452
STACK DRY GAS
FLOW QS  SCFM=
         23,835.463
ACFM =
         24,633.657

**********

ISOKINETIC %I =99.4
```

C-86

20 POINT SAMPLE TRAVERSE



CYANIDE DESTRUCT LINE

TRAVERSE POINT	EPA METHOD 1 (% OF DIA)	TRAVERSE POINT LOCATION (DISTANCES FROM I.D.) DUCT DIAMETER (IN.) 18
1 & 11	2.6	0.5 (1.0)
2 & 12	8.2	1.5
3 & 13	14.6	2.6
4 & 14	22.6	4.1
5 & 15	34.2	6.2
6 & 16	65.8	11.8
7 & 17	77.4	13.9
8 & 18	85.4	15.4
9 & 19	91.8	16.5
10 & 20	97.4	17.5 (17.0)

NOTE: ENDPOINTS WERE ADJUSTED TO MAINTAIN A MINIMUM 1.0 INCH CLEARANCE FROM STACK WALL.

PRELIMINARY

TRAVERSE DATA SHEET

(REV 8/86)

PLANT: NAD PENSACOLA
LOCATION: BLDG 604
DATE: 14 NOV 90
OPERATOR:
RUN #: CYANIDE DESTRUCT LINE

CIRCULAR, DIA. 18 in
RECTANGULAR, LxW in

Length from upstream disturbance ft
Diameter from upstream disturbance 6 dia
Length from downstream disturbance ft
Diameters from downstream disturbance 4 dia
Required number of traverse points 16-20 ea
Number of traverse points used 20 ea

POINT # n	STACK PRESSURE (in H_2O) ΔPvel	Pstatic	$\sqrt{\Delta P}$	~~LOCATION~~ α CYCLONIC °		POINT # n	STACK PRESSURE (in H_2O) ΔPvel	Pstatic	$\sqrt{\Delta P}$	LOCATION (in) L	W
1	.07	-.05	.265	9		26					
2	.08	-.05	.283	9		27					
3	.07	-.045	.265	6		28					
4	.08	-.055	.283	0		29					
5	.08	-.045	.283	0		30					
6	.06	-.045	.245	17		31					
7	.04	-.035	.2	20		32					
8	.04	-.02	.2	32		33					
9	.04	-.01	.2	34		34					
10	.045	-.001	.212	40		35					
11	.045	-.025	.212	19		36					
12	.050	-.025	.224	21		37					
13	.055	-.021	.235	10		38					
14	.042	-.025	.205	3		39					
15	.046	-.031	.214	12		40					
16	.037	-.02	0.192	3		41					
17	.04	-.012	0.2	10		42					
18	.045	-.0	0.212	35		43					
19	.052	-.0	0.228	32		44					
20	.055	+.05	.235	36		45					
AVG 21		-0.03		17.2°		46					
22						47					
23						48					
24						49					
25						50					

11-20

1-10

$$\Delta P_{ave} = \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]^2 = \left[\frac{4.593}{20}\right]^2 = 0.053$$

AVE STATIC -0.03 in H_2O

CYANIDE EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 14 DEC 90 LINE NO: CYANIDE DESTRUCT

BASE: NAD PENSACOLA RUN NO: 1

BUILDING NO: 604 CONTROL DEVICE: ~~INLET OUTLET~~ N/A

PREP BY: B. QUIL IMPINGER BOX NO: 4

[✓] 1. Initially wash all glassware as follows; 6N HNO3 RINSE deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.

[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (modified Greenburg-Smith impinger). Record initial weight.

[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.

[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.

[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.

[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.

[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.

[✓] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
4-1	1. 100ml 0.1N NaOH	469.99g	574.15g	599.38	25.23g
4-2	2. 100ml 0.1N NaOH	511.34g	616.16g	621.45g	5.38g
4-3	3. Empty	503.38g	503.38g	507.43g	4.05g
4-4	4. 500ml silica gel 98% Spent	509.05g	858.67g	887.09g	28.42g
				Net Weight Gain	63.08g

Filter No: CD-1

Silica gel condition after test: BEFORE NEW 98% SPENT

CD-1F
CD-1R
LAB IDS.

Nozzle No: Q#2 Calibrated by: DRV

					Average
ID Before Test:	.476	.477	.478	.477	.477
ID After Test:	.476	.478	.477	.476	.477

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

AREA 254.5

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.20	METER BOX #: 15	PROBE # (PITOT #): 3-100	NOZZLE #: Q #2
LOCATION: BLDG 664	AMBIENT TEMPERATURE, °F: 73	METER ΔH@: 1.663	PITOT COEF: 0.84	IDEAL NOZZLE DIA, in.: .426
DATE: 14DEC90	AVE STATIC PRESSURE, in H_2O: -0.03	METER γ: .992	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: .477
OPERATOR: CB	AVE VEL HEAD, in H_2O: 0.053	SAMPLE BOX #: 4	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S: #2 5.8 OK in H_2O; #4 5.7 OK in H_2O
RUN #: CD-1	ASSUMED MOISTURE, %: 2	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .007 @ 22

SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)

TRAVERSE POINT #	SAMPLING TIME	GAS METER READING	ORIFICE PRESSURE (CALC)	VELOCITY HEAD (MEAS)	STACK TEMPERATURE	GAS SAMPLE TEMPERATURE AT DRY GAS METER		IMPINGER TEMPERATURE	SAMPLE BOX TEMPERATURE	SAMPLE VACUUM	O_2	CO_2	CO	NOX
START 1:21 PM	min	(Vm) ft^3	(ΔH) in H_2O	(ΔP) in H_2O	(Ts) °F	Inlet (Tm in) °F	Outlet (Tm out) °F	°F	°F	in Hg	%	%	ppm	ppm
1	0	562.447	1.99	.04	77	77	77	47	77	4.5	20.9	0	0	0
2	7.5	568.56	2.09	.042	79	81	77	41	79	4.85				
3	15.0	574.70	2.51	.050	79	86	78	47	81	4.85				
4	22.5	581.4	2.38	.047	80	90	81	49	83	6				
5	30.0	588.5	2.03	.040	80	92	82	50	81	5.85				
6	37.5	595.4	1.67	.033	81	93	84	51	80	4.0				
7	45.0	601.6	1.52	.030	80	92	84	51	80	4.0				
8	52.5	606.8	1.62	.032	80	92	85	51	80	4.0				
9	60.0	612.875	2.03	.040	81	94	86	51	82	4.85				
10	67.5	618.900	2.03	.040	82	95	87	52	84	4.85				
2:36 PM	75.0	625.183												
STOP														
TOTAL														
AVERAGE														

CD-1

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION BLDG 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE 14/DEC/90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR CL	AVE VEL HEAD, in H_2O		SAMPLE BOX #	PROBE LINER MATERIAL POST	LEAK CHECK @ PITOT'S #2 5.7 in H_2O OK #4 3.7 in H_2O OK
RUN # CD-1	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING POST	LEAK RATE CFM@ in Hg .001 @ 20

TRAVERSE POINT #	SAMPLING TIME	GAS METER READING	ORIFICE PRESSURE (CALC)	VELOCITY HEAD (MEAS)	STACK TEMPERATURE	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet	Outlet	IMPINGER TEMPERATURE	SAMPLE BOX TEMPERATURE	SAMPLE VACUUM	O_2	CO_2	CO	NOX
START 2:59 PM	min	(Vm) ft^3	(ΔH) in H_2O	(ΔP) in H_2O	(Ts) °F	(Tm in) °F	(Tm out) °F	°F	°F	in Hg	%	%	ppm	ppm
11	75.0	625.472	3.00	.06	79	83	83	52	77	8.0				
12	82.5	632 (?)	3.01	.06	80	86	83	47	77	8.0				
13	90.0	640.80	3.65	.072	80	92	84	54	77	8.0				
14	97.5	649.00	3.06	.06	80	94	84	56	76	8.65				
15	105.0	657.35	3.06	.06	80	94	85	55	74	8.50				
16	112.5	665.0 (?)	2.19	.043	81	94	84	55	75	6.50				
17	120.0	672.140	1.99	.039	81	95	86	55	75	5.85				
18	127.5	678.60	1.58	.031	81	95	88	55	74	4.45				
19	135.0	684.350	1.78	.035	81	93	87	55	73	5.0				
20	142.5	689.90	2.54	.050	81	93	87	55	73	6.95				
4:14 PM	150.0	697.286												
STOP														
TOTAL														
AVERAGE														

16-C

```
        XEQ "NOMOKIN"
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
CD4.      RUN
RUN NO.=?
        1.      RUN
FILTER NO=?
        1.      RUN

DELTA-H*AT = ?
        1.663   RUN
METER GAMMA = ?
        0.992   RUN
STACK AREA
IN. SQ. = ?
      254.469   RUN
STACK STATIC
P IN H2O=?
      -.030     RUN
PBAR IN HG=?
       30.200   RUN
% H2O=?
        2.000   RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
       28.600   RUN
AVG STACK
TEMP DEG F=?
       79.000   RUN
AVG DELTA-P
IN. H2O=?
         .853   RUN
AMBIENT
TEMP F=?
       73.000   RUN
PITOT TUBE
CSUBP=?
         .840   RUN

AVG STACK
VELOCITY FPM=
              782.676
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.426

ACTUAL NOZZLE
DIA INCHES=?
         .477   RUN

SAMPLE CFM = 0.941
```

```
*******
INITIAL METER
VOLUME FT3 =?
      562.447   RUN
*******
POINT NO. 1.
          .04 STO 01
        77.00 STO 02
        77.00 STO 03
              RUN

DELTA H=
IN. H2O....
         1.99
*******
POINT NO. 2.
         .042 STO 01
        79.00 STO 02
        81.00 STO 03
              RUN

DELTA H=
IN. H2O....
         2.09
*******
POINT NO. 3.
          .05 STO 01
        86.00 STO 03
              RUN

DELTA H=
IN. H2O....
         2.51
*******
POINT NO. 4.
         .047 STO 01
        88.00 STO 02
        90.00 STO 03
              RUN

DELTA H=
IN. H2O....
         2.30
*******
POINT NO. 5.
          .04 STO 01
        92.00 STO 03
              RUN

DELTA H=
IN. H2O....
         2.03
*******
POINT NO. 6.
         .033 STO 01
        81.00 STO 02
        93.00 STO 03
              RUN

DELTA H=
IN. H2O....
         1.67
*******
```

```
POINT NO. 7.
          .03 STO 01
        80.00 STO 02
        92.00 STO 03
              RUN

DELTA H=
IN. H2O....
         1.52
*******
POINT NO. 8.
         .032 STO 01
              RUN

DELTA H=
IN. H2O....
         1.62
*******
POINT NO. 9.
          .04 STO 01
        81.00 STO 02
        94.00 STO 03
              RUN

DELTA H=
IN. H2O....
         2.03
*******
POINT NO. 10.
        82.00 STO 02
        95.00 STO 03
              RUN

DELTA H=
IN. H2O....
         2.03
*******
POINT NO. 11.
          .06 STO 01
        79.00 STO 02
        83.00 STO 03
              RUN

DELTA H=
IN. H2O....
         3.00
*******
POINT NO. 12.
        80.00 STO 02
        86.00 STO 03
              RUN

DELTA H=
IN. H2O....
         3.01
*******
POINT NO. 13.
         .072 STO 01
        92.00 STO 03
              RUN

DELTA H=
IN. H2O....
         3.65
*******
```

```
POINT NO. 14.
          .06 STO 01
        94.00 STO 03
              RUN

DELTA H=
IN. H2O....
         3.06
*******
POINT NO. 15.
              RUN

DELTA H=
IN. H2O....
         3.06
*******
POINT NO. 16.
         .043 STO 01
        81.00 STO 02
              RUN

DELTA H=
IN. H2O....
         2.19
*******
POINT NO. 17.
         .039 STO 01
        95.00 STO 03
              RUN

DELTA H=
IN. H2O....
         1.99
*******
POINT NO. 18.
         .031 STO 01
              RUN

DELTA H=
IN. H2O....
         1.58
*******
POINT NO. 19.
         .035 STO 01
        93.00 STO 03
              RUN

DELTA H=
IN. H2O....
         1.78
*******
POINT NO. 20.
        2.00    CLX
         .05 STO 01
              RUN

DELTA H=
IN. H2O....
         2.54
*******
POINT NO. 21.
        0.00    RUN
======
```

```
ISOKIN
AVG VALUES
KV=4.902
IMETER F=90.550
DELTA-H=2.287
DELTA P=0.044
FINAL METER
VOLUME FT3=?
      697.286   RUN
INITIAL=562.447
SAMPLE TIME
MIN. =?
      150.000   RUN
PSTACK ABS
IN HG=30.198
TSTACK F=80.150

======

SOURCE TYPE?
0=OTHER
1=BOILER
        0.000   RUN
% CO2 =?
        0.000   RUN
% O2 =?
       20.900   RUN
H2O GAIN KNOWN?
1=YES 0=NO
        1.000   RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                RUN
H2O GAIN=?
       63.000   RUN
NET METER
VOL. FT3=
             133.760
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
             129.465
```

```
MOLE FRACT. DRY
GAS, (1-BWS) =
                0.978
% H2O =
                  2.2
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
               28.533
AVG VELOCITY
FPM =
             717.975
STACK DRY GAS
FLOW QS  SCFM=
           1,223.171
ACFM =
           1,268.766

**********

ISOKINETIC % =100.4

*********
```

C-92

CYANIDE EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 14 DEC 96

LINE NO: CYANIDE DESTRUCT

BASE: NAD PENSACOLA

RUN NO: 2

BUILDING NO: 604

CONTROL DEVICE: ~~INLET OUTLET~~ N/A

PREP BY: B. Qu

IMPINGER BOX NO: 5

[✓] 1. Initially wash all glassware as follows; 6N HNO3 RINSE deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.

[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (modified Greenburg-Smith impinger). Record initial weight.

[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.

[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.

[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.

[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.

[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.

[✓] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
5-1	1. 100ml 0.1N NaOH	443.24	552.23	574.45	22.22
5-2	2. 100ml 0.1N NaOH	461.05	563.00	566.90	3.90
5-3	3. Empty	452.61	452.61	453.99	1.38
5-4	4. 500ml silica gel	442.12	780.61	800.29	19.68
				Net Weight Gain	47.18

Filter No: CD-2

Silica gel condition after test: START NEW FINAL: 60% SPENT

CD-2F CD-2R LABELED

Nozzle No: Q #2 Calibrated by: QM

					Average
ID Before Test:	.476	.477	.478	.477	.477
ID After Test:	.476	.478	.477	.476	.477

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q) MW = 28.6 AREA = 254.5 STACK TEMP = 76°F

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.18		METER BOX #: 15	PROBE # (PITOT #): 3-100	NOZZLE #: Q #2
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 68		METER ΔH@: 1.663	PITOT COEF: 0.84	IDEAL NOZZLE DIA, in.: 0.426
DATE: 15DEC90	AVE STATIC PRESSURE, in H_2O: -0.03		METER γ: 0.992	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: 0.477
OPERATOR: D. COOK	AVE VEL HEAD, in H_2O: 0.044		SAMPLE BOX #: 15	PROBE LINER MATERIAL: GLASS PRE	LEAK CHECK @ PITOT'S: BOTH RACK STEADY @ 5" H_2O
RUN #: CD-2	ASSUMED MOISTURE, %: 2.2	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A PRE	LEAK RATE CFM@ in Hg: 0.003 @ 21

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START TIME: 843														
1	0	698.67	2.45	0.050	76	72	70	55	71	15.5	20.9	0	0	0
2	5	—	2.65	0.054	76	72	70	42	71	16.0				
3	10	706.47	2.63	0.053	76	77	71	47	70	9.9				
4	15	711.51	2.49	0.050	76	80	72	49	70	8.9				
5	20	716.21	2.00	0.040	77	82	73	48	71	8.0				
6	25	720.79	2.00	0.040	78	84	74	48	71	6.6				
7	30	725.01	2.10	0.042	78	85	75	49	71	6.2				
8	35	730.22	3.16	0.063	78	86	76	48	72	6.4				
9	40	734.87	2.77	0.055	79	89	78	49	72	8.9				
10	45	739.847	2.5	0.050	78	88	79	46	73	6.4				
1	50	744.438												
STOP TIME 9:33														
TOTAL														
AVERAGE														

16-2

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #0251Q)

PLANT: NAP PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION: BLD 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE: 15 DEC 1990	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR: D. COOK	AVE VEL HEAD, in H_2O		SAMPLE BOX #	PROBE LINER MATERIAL	LEAK CHECK @ PITOT'S
RUN #: CD-2 (CONT)	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	LEAK RATE CFM@ in Hg: 0.011 @ 7.2 in Hg

TRAVERSE POINT # (START TIME 10:03)	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
11	50	744.438 ~~739.897~~	3.47	0.070	79	80	80	48	76	8.9				
12	55	749.98	3.38	0.068	79	82	80	44	76	9.0				
13	60	754.48	3.47	0.069	80	89	81	50	78	9.0				
14	65	761.09	3.13	0.062	81	92	82	52	79	9.2				
15	70	766.43	2.94	0.058	82	95	84	53	80	8.9				
16	75	771.676	2.03	0.040	83	98	86	54	83	6.8				
17	80	776.43	1.53	0.030	83	99	88	54	84	7.0				
18	85	780.67	1.78	0.035	84	100	89	54	85	5.4				
19	90	784.69	2.04	0.040	84	101	92	55	87	5.5				
20	95	788.82	2.20	0.043	84	102	93	55	88	6.0				
	100	793.177												
STOP TIME 10:53														
TOTAL														
AVERAGE														

567

```
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
        CD 4.     RUN
RUN NO.=?
          2.      RUN
FILTER NO=?
          2.      RUN

DELTA-H*AT = ?
      1.663       RUN
METER GAMMA = ?
      9.000       CLX
      0.992       RUN
STACK APER
IN. SQ. = ?
    254.500       RUN
STACK STATIC
P IN H2O=?
       -.030      RUN
PBAR IN HG=?
     30.100       RUN
% H2O=?
      2.200       RUN
STACK GAS WET
MOL WT. MS,
LB/LB MOL=?
     28.600       RUN
AVG STACK
TEMP DEG F=?
     76.000       RUN
AVG DELTA-P
IN. H2O=?
       .044       RUN
AMBIENT
TEMP F=?
     68.000       RUN
PITOT TUBE
CSUBP=?
       .840       RUN

AVG STACK
VELOCITY FPM=
            711.302
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.448

ACTUAL NOZZLE
DIA INCHES=?
       .477       RUN

SAMPLE CFM = 0.850
*******
INITIAL METER
VOLUME FT3 =?
    698.670       RUN
*******
POINT NO. 1.
          .05 STO 01
        76.00 STO 02
        72.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.45
*******
POINT NO. 2.
         .054 STO 01
                RUN
DELTA H=
IN. H2O....
                2.65
*******
POINT NO. 3.
         .053 STO 01
        77.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.63
*******
POINT NO. 4.
          .05 STO 01
        80.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.49
*******
POINT NO. 5.
          .04 STO 01
        77.00 STO 02
        82.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.00
*******
POINT NO. 6.
        78.00 STO 02
        84.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.00
*******
POINT NO. 7.
         .042 STO 01
        85.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.10
*******
POINT NO. 8.
         .063 STO 01
        86.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.16
*******
POINT NO. 9.
         .055 STO 01
        79.00 STO 02
        89.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.77
*******
POINT NO. 10.
          .05 STO 01
        78.00 STO 02
        83.00 STO 03
        88.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.52
*******
POINT NO. 11.
          .07 STO 01
        79.00 STO 02
        80.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.47
*******
POINT NO. 12.
         .060 STO 01
        82.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.30
*******
POINT NO. 13.
         .069 STO 01
        80.00 STO 02
        89.00 STO 03
                RUN
DELTA H=
IN. H2O....
*******
POINT NO. 14.
         .062 STO 01
        81.00 STO 02
        92.00 STO 03
                RUN
DELTA H=
IN. H2O....
                3.13
*******
POINT NO. 15.
         .050 STO 01
        82.00 STO 02
        95.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.94
*******
POINT NO. 16.
          .04 STO 01
        83.00 STO 02
        98.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.03
*******
POINT NO. 17.
          .03 STO 01
        99.00 STO 03
                RUN
DELTA H=
IN. H2O....
                1.53
*******
POINT NO. 18.
         .035 STO 01
        84.00 STO 02
       100.00 STO 03
                RUN
DELTA H=
IN. H2O....
                1.78
*******
POINT NO. 19.
          .04 STO 01
       101.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.04
*******
POINT NO. 20.
         .043 STO 01
       102.00 STO 03
                RUN
DELTA H=
IN. H2O....
                2.20
*******
POINT NO. 21.
          0.00  RUN
======

ISOKIN
AVG VALUES
KV=5.190
TMETER F=87.650
DELTA-H=2.536
DELTA P=0.050
FINAL METER
VOLUME FT3=?
    793.177       RUN
INITIAL=698.670
SAMPLE TIME
MIN. =?
    100.000       RUN
PSTACK ABS
IN HG=30.178
TSTACK F=79.550

======

SOURCE TYPE?
0=OTHER
1=BOILER
      0.000       RUN
% CO2 =?
      0.000       RUN
% O2 =?
     20.900       RUN
H2O GAIN KNOWN?
1=YES 0=NO
      1.000       RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...
                RUN
H2O GAIN=?
     47.100       RUN
NET METER
VOL. FT3=
                93.751
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
                91.160
MOLE FRACT. DRY
GAS, (1-BWS) =
                 0.976
% H2O =
                   2.4
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
                28.578
AVG VELOCITY
FPM =
               760.580
STACK DRY GAS
FLOW QS  SCFM=
             1,294.687
ACFM =
             1,344.219

**********

ISOKINETIC %I =100.2

*********
```

C-96

CYANIDE EMISSION TEST
IMPINGER BOX SET UP & NOZZLE CALIBRATION SHEET

DATE: 15 DEC90

LINE NO: CYANIDE DESTRUCT

BASE: NAD PENSACOLA

RUN NO: 3

BUILDING NO: 604

CONTROL DEVICE: ~~INLET OUTLET~~ N/A

PREP BY: [illegible]

IMPINGER BOX NO: 4

[✓] 1. Initially wash all glassware as follows; deionized water rinse, and 0.1N NaOH solution rinse. Sample recovery preps glassware for next use.

[✓] 2. Add 100ml 0.1N NaOH solution to the first impinger (modified Greenburg-Smith impinger). Record initial weight.

[✓] 3. Add 100ml 0.1N NaOH solution to the second impinger (standard Greenburg-Smith impinger). Record initial weight.

[✓] 4. The third impinger (modified Greenburg-Smith) is dry. Record initial weight.

[✓] 5. The fourth impinger (modified Greenburg-Smith) contains about 1 liter of indicating type silica gel. Record initial weight.

[✓] 6. Place quartz filter into filter holder. Record filter number. It is not necessary to weigh filter.

[✓] 7. Assemble impinger bottles and glass elbows (180s) so that air flows from a smaller to larger holes (if applicable). Do not use grease on balljoint fittings.

[✓] 8. Calibrate nozzle by measuring four IDs with a micrometer.

Impinger No.	Contents	Tare	Initial	Final	Condensate
4-1	1. 100ml 0.1N NaOH	469.81	575.39	591.79	16.40
4-2	2. 100ml 0.1N NaOH	511.55	647.79	653.48	5.69
4-3	3. Empty	502.21	—	504.24	2.23
4-4	4. 500ml silica gel	506.72	851.34	870.76	19.42
				Net Weight Gain	43.74

Filter No: CD--3

Silica gel condition after test: BEFORE NEW AFTER 80% SPENT

CD-BF
CD-3R LAB ID

Nozzle No: Q#2 Calibrated by: [illegible]

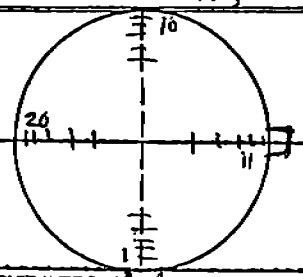
					Average
ID Before Test:	.477	.477	.476	.475	0.476
ID After Test:	.478	.476	.477	.476	0.477

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510) MW=28.6 AREA 254.5

PLANT: NAD PENSACOLA	BAROMETRIC PRESSURE, in Hg: 30.15	METER BOX #: 15	PROBE # (PITOT #): 3-100	NOZZLE #: Q #2
LOCATION: BLDG 604	AMBIENT TEMPERATURE, °F: 74	METER ΔH@: 1.663	PITOT COEF: 0.84	IDEAL NOZZLE DIA, in.: 0
DATE: 15 DEC 90	AVE STATIC PRESSURE, in H_2O: -0.63	METER γ: 0.992	PROBE LENGTH, in.: 36	ACTUAL NOZZLE DIA, in.: 0.476
OPERATOR: C.R	AVE VEL HEAD, in H_2O: 0.050	SAMPLE BOX #: 15	PROBE LINER MATERIAL: GLASS	LEAK CHECK @ PITOT'S #3 @ 3.9 in H2O OK, #4 @ 5.6 in H2O OK
RUN #: C.D-3	ASSUMED MOISTURE, %: 2.2	HEATER BOX SETTING: N/A	PROBE HEATER SETTING: N/A	LEAK RATE CFM@ in Hg: .000 @ 20

SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)



TRAVERSE POINT # (START TIME 11:56AM)	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
1	0	793.800	2.23	.045	78	83	82	67	80	7.0				
2	5	798.030	2.21	.045	82	84	83	54	80	8.3				
3	10	802.553	2.47	.050	82	87	83	53	81	7.8				
4	15	807.262	2.59	.052	82	90	84	59	80	7.2				
5	20	812.060	2.00	.040	82	92	84	62	80	5.5				
6	25	816.470	1.75	.035	82	92	84	62	80	5.0				
7	30	—	2.50	.050	82	93	85	63	80	6.5				
8	35	824.940	2.00	.040	82	94	86	61	79	5.65				
9	40	829.270	3.00	.060	83	94	86	63	79	6.70				
10	45	833.910	2.75	.055	83	94	87	62	79	6.71				
STOP TIME 12:46PM	50	838.590												
TOTAL														
AVE														

867

SOURCE EMISSION TESTING DATA SHEET

(SJS rev11/88, #02510)

PLANT: NAS PENSACOLA	BAROMETRIC PRESSURE, in Hg		METER BOX #	PROBE # (PITOT #)	NOZZLE #
LOCATION: BLDG. 604	AMBIENT TEMPERATURE, °F		METER ΔH@	PITOT COEF	IDEAL NOZZLE DIA, in.
DATE: 15 DEC 90	AVE STATIC PRESSURE, in H_2O		METER γ	PROBE LENGTH, in.	ACTUAL NOZZLE DIA, in.
OPERATOR: C.B	AVE VEL HEAD, in H_2O		SAMPLE BOX #	PROBE LINER MATERIAL	Post LEAK CHECK @ PITOTS #2 OK @ 5.6 in H_2O #4 OK @ 5.6 in H_2O
RUN #: CO-3	ASSUMED MOISTURE, %	SCHEMATIC OF STACK CROSS SECTION (SHOW TRAVERSE PTS)	HEATER BOX SETTING	PROBE HEATER SETTING	Post LEAK RATE CFM@ in Hg: .01 @ 20

TRAVERSE POINT #	SAMPLING TIME min	GAS METER READING (Vm) ft^3	ORIFICE PRESSURE (CALC) (ΔH) in H_2O	VELOCITY HEAD (MEAS) (ΔP) in H_2O	STACK TEMPERATURE (Ts) °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER Inlet (Tm in) °F	Outlet (Tm out) °F	IMPINGER TEMPERATURE °F	SAMPLE BOX TEMPERATURE °F	SAMPLE VACUUM in Hg	O_2 %	CO_2 %	CO ppm	NOX ppm
START TIME 1:06 PM														
11	50	838.540	2.97	.06	79	85	85	56	80	7.8				
12	55	843.525	2.99	.06	80	88	85	46	80	7.8				
13	60	848.750	2.99	.06	81	90	85	49	81	7.8				
14	65	—	4.01	.08	81	93	85	51	81	9				
15	70	859.32	2.71	0.054	82	95	86	52	83	11.0				
16	75	864.75	1.76	0.035	82	96	87	54	82	7.8				
17	80	869.287	1.26	.025	81	96	87	53	82	5.0				
18	85	~~871.710~~	1.40	.028	82	94	87	51	81	4.01				
19	90	876.220	1.50	.030	82	94	88	50	81	4.10				
20	95	879.840	1.75	.035	82	94	88	50	81	4.85				
STOP TIME 1:56 PM	100	883.780												
TOTAL														
AVERAGE														

66-7

```
                    RUN
METHOD 5 NOMO

ENTER DATA
THEN PUSH R/S

TEST NO=?
      CD 4          RUN
RUN NO.=?
          3.        RUN
FILTER NO=?
          3.        RUN

DELTA-H*AT = ?
      1.663         RUN
METER GAMMA = ?
      0.992         RUN
STACK AREA
IN. SQ. = ?
    254.500         RUN
STACK STATIC
P IN H2O=?
     -.030          RUN
PBAR IN HG=?
     30.180         RUN
% H2O=?
      2.200         RUN
STACK GAS WET
MOL WT, MS,
LB/LB MOL=?
     28.600         RUN
AVG STACK
TEMP DEG F=?
     79.550         RUN
AVG DELTA-P
IN. H2O=?
       .050         RUN
AMBIENT
TEMP F=?
     73.000         RUN
PITOT TUBE
CSUBP=?
       .840         RUN

AVG STACK
VELOCITY FPM=
            760.842
FOR 0.75 CFM
IDEAL NOZZLE
DIA INCHES= 0.433

ACTUAL NOZZLE
DIA INCHES=?
       .476         RUN

SAMPLE CFM = 0.900
```

```
INITIAL METER
VOLUME FT3 =?
    793.000         RUN
*******
POINT NO. 1.
          .045 STO 01
        78.00 STO 02
        83.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.23
*******
POINT NO. 2.
        82.00 STO 02
        84.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.21
*******
POINT NO. 3.
           .05 STO 01
        87.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.47
*******
POINT NO. 4.
          .052 STO 01
        90.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.59
*******
POINT NO. 5.
           .04 STO 01
        92.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.00
*******
POINT NO. 6.
          .035 STO 01
                RUN
DELTA H=
IN. H2O....
          1.75
*******
POINT NO. 7.
           .05 STO 01
        93.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.50
```

```
*******
POINT NO. 8.
           .04 STO 01
        94.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.00
*******
POINT NO. 9.
           .06 STO 01
        83.00 STO 02
                RUN
DELTA H=
IN. H2O....
          3.00
*******
POINT NO. 10.
          .055 STO 01
                RUN
DELTA H=
IN. H2O....
          2.75
*******
POINT NO. 11.
           .06 STO 01
        79.00 STO 02
        85.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.97
*******
POINT NO. 12.
        80.00 STO 02
        88.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.99
*******
POINT NO. 13.
        81.00 STO 02
        90.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.99
*******
POINT NO. 14.
           .08 STO 01
        81.00 STO 02
        93.00 STO 03
                RUN
DELTA H=
IN. H2O....
          4.01
```

```
*******
POINT NO. 15.
          .054 STO 01
        82.00 STO 02
        95.00 STO 03
                RUN
DELTA H=
IN. H2O....
          2.71
*******
POINT NO. 16.
          .035 STO 01
        96.00 STO 03
                RUN
DELTA H=
IN. H2O....
          1.76
*******
POINT NO. 17.
          .025 STO 01
        81.00 STO 02
                RUN
DELTA H=
IN. H2O....
          1.26
*******
POINT NO. 18.
          .020 STO 01
        82.00 STO 02
        94.00 STO 03
                RUN
DELTA H=
IN. H2O....
          1.40
*******
POINT NO. 19.
           .03 STO 01
                RUN
DELTA H=
IN. H2O....
          1.50
*******
POINT NO. 20.
          .035 STO 01
                RUN
DELTA H=
IN. H2O....
          1.75
*******
POINT NO. 21.
          0.00      RUN
======

ISOKIN
AVG VALUES
KV=4.990
TMETER F=91.400
DELTA-H=2.343
DELTA P=0.046
```

```
FINAL METER
VOLUME FT3=?
    883.780         RUN
INITIAL=793.000
SAMPLE TIME
MIN. =?
    100.000         RUN
PSTACK ABS
IN HG=30.178
TSTACK F=81.500

======

SOURCE TYPE?
0=OTHER
1=BOILER
      0.000         RUN
% CO2 =?
      0.000         RUN
% O2 =?
     20.900         RUN
H2O GAIN KNOWN?
1=YES 0=NO
      1.000         RUN
AWAITING
RECOVERY DATA.

HIT R/S
TO CONTINUE...

                    RUN
H2O GAIN=?
     43.740         RUN
WET METER
VOL. FT3=
            89.260
CORRECTED
SAMPLE VOL.
VMSTD  SCF=
            86.203
```

```
MOLE FRACT. DRY
GAS, (1-BWS) =
                0.977
% H2O =
                  2.3
STACK GAS WET
MOL. WT, MS,
LB/LB MOL=
            28.583
AVG VELOCITY
FPM =
           731.189
STACK DRY GAS
FLOW QS  SCFM=
         1,248.754
ACFM =
         1,292.275

**********

ISOKINETIC %I =99.3

*********
```

C-100

APPENDIX D

TEST RESULTS
SAMPLE CALCULATIONS

TEST RESULTS
CHROMIC ACID ANODIZE, LINE 1

TEST	CHROMIUM SAMPLE WEIGHT (mg)	AIR SAMPLE VOLUME (m3)	CHROMIUM EMISSION CONC. (mg/m3)	CHROMIUM EMISSION RATE (lb/hr)	AVERAGE AMPERES (Amp)	CHROMIUM EMISSION FACTOR (mg/Amp-hr)
1-1-OUT	0.0042	6.303	0.000663	0.000103	729.5	0.064
1-2-OUT	0.0033	6.172	0.000534	0.000083	729.5	0.051
AVERAGE		6.238	0.000599	0.000093		0.058

TEST	DATE	NOZZLE DIA. (in.)	SAMPLE TIME (min.)	AIR SAMPLE VOLUME (DSCF)	% H2O (%)	STACK FLOW RATE (DSCFM)	ISOKIN (%)
1-1-OUT	08NOV90	0.230	240	222.58	2.3	41408	101.6
1-2-OUT	08NOV90	0.230	240	217.93	2.3	41278	99.8

TEST RESULTS
HARD CHROME PLATE, LINE 3

TEST	CHROMIUM SAMPLE WEIGHT (mg)	AIR SAMPLE VOLUME (m3)	CHROMIUM EMISSION CONC. (mg/m3)	CHROMIUM EMISSION RATE (lb/hr)	AVERAGE AMPERES (Amp)	CHROMIUM EMISSION FACTOR (mg/Amp-hr)
3-1-IN	0.7026	1.274	0.55130	0.02889	3494.5	3.749
3-2-IN	0.7731	1.321	0.58530	0.03044	3494.5	3.951
AVERAGE		1.298	0.56830	0.02966		3.850
3-3-IN	0.0376	1.323	0.02839	0.00150	3505.4	0.194
3-4-IN	0.0532	1.327	0.04006	0.00210	3505.4	0.272
AVERAGE		1.325	0.03423	0.00180		0.233
3-1-OUT	0.0203	3.974	0.00511	0.00078	3494.5	0.101
3-2-OUT	0.0170	3.977	0.00428	0.00066	3494.5	0.086
AVERAGE		3.976	0.00469	0.00072		0.094
3-3-OUT	0.0196	3.875	0.00505	0.00075	3505.4	0.097
3-4-OUT	0.0208	3.952	0.00526	0.00081	3505.4	0.105
AVERAGE		3.914	0.00516	0.00078		0.101

TEST	DATE	NOZZLE DIA. (in.)	SAMPLE TIME (min.)	AIR SAMPLE VOLUME (DSCF)	% H2O (%)	STACK FLOW RATE (DSCFM)	ISOKIN (%)
3-1-IN	10NOV90	0.268	60	45.00	0.3	13985	79.5
3-2-IN	10NOV90	0.269	60	46.64	1.4	13881	82.3
3-3-IN	10NOV90	0.269	60	46.72	1.2	14061	81.4
3-4-IN	10NOV90	0.270	60	46.87	1.2	14016	81.4
3-1-OUT	10NOV90	0.230	180	140.33	1.2	40805	99.5
3-2-OUT	10NOV90	0.228	180	140.45	1.3	41188	100.4
3-3-OUT	10NOV90	0.230	180	136.83	1.1	39536	100.2
3-4-OUT	10NOV90	0.228	180	139.56	1.1	41042	100.1

TEST RESULTS
CYANIDE COPPER PLATE, LINE 4

TEST	CYANIDE SAMPLE WEIGHT (mg)	AIR SAMPLE VOLUME (m3)	CYANIDE EMISSION CONC. (mg/m3)	CYANIDE EMISSION RATE (lb/hr)
4-1-OUT	0.0270	4.638	0.00582	0.00098
4-2-OUT	0.0310	4.670	0.00664	0.00112
4-3-OUT	0.0094	1.471	0.00639	0.00106
AVERAGE			0.00628	0.00105

TEST	CHROMIUM SAMPLE WEIGHT (mg)	AIR SAMPLE VOLUME (m3)	CHROMIUM EMISSION CONC. (mg/m3)	CHROMIUM EMISSION RATE (lb/hr)
4-1-OUT	0.0027	4.638	0.00058	0.00010
4-2-OUT	0.0037	4.670	0.00079	0.00013
4-3-OUT	< 0.0005	1.471	< 0.00034	< 0.00006
AVERAGE			0.00057	0.00010

TEST	DATE	NOZZLE DIA. (in.)	SAMPLE TIME (min.)	AIR SAMPLE VOLUME (DSCF)	% H2O (%)	STACK FLOW RATE (DSCFM)	ISOKIN (%)
4-1-OUT	13NOV90	0.230	192	163.76	1.6	45003	98.7
4-2-OUT	13NOV90	0.230	192	164.88	1.6	44849	99.7
4-3-OUT	13NOV90	0.230	60	51.93	1.7	44248	101.9

Note: Chromium emission results are based on only probe wash and impinger solution analysis. Refer to Discussion.

TEST RESULTS
CADMIUM PLATE, LINE 6

TEST	CYANIDE SAMPLE WEIGHT (mg)	AIR SAMPLE VOLUME (m3)	CYANIDE EMISSION CONC. (mg/m3)	CYANIDE EMISSION RATE (lb/hr)
6-1-OUT	0.9880	4.605	0.21457	0.01958
6-2-OUT	1.0780	4.472	0.24108	0.02150
6-3-OUT	0.3570	1.490	0.23962	0.02242
AVERAGE			0.23176	0.02116

TEST	CHROMIUM SAMPLE WEIGHT (mg)	AIR SAMPLE VOLUME (m3)	CHROMIUM EMISSION CONC. (mg/m3)	CHROMIUM EMISSION RATE (lb/hr)
6-1-OUT	< 0.0005	4.605	< 0.00011	< 0.00001
6-2-OUT	< 0.0005	4.472	< 0.00011	< 0.00001
6-3-OUT	< 0.0005	1.490	< 0.00034	< 0.00003
AVERAGE			< 0.00019	< 0.00002

TEST	CADMIUM SAMPLE WEIGHT (mg)	AIR SAMPLE VOLUME (m3)	CADMIUM EMISSION CONC. (mg/m3)	CADMIUM EMISSION RATE (lb/hr)
6-4-OUT	0.0450	1.490	0.03021	0.00278
6-5-OUT	0.0015	4.550	0.00033	0.00003
6-6-OUT	0.0015	4.472	0.00034	0.00003
AVERAGE			0.01029	0.00095

TEST	DATE	NOZZLE DIA. (in.)	SAMPLE TIME (min.)	AIR SAMPLE VOLUME (DSCF)	% H2O (%)	STACK FLOW RATE (DSCFM)	ISOKIN (%)
6-1-OUT	15NOV90	0.271	192	162.59	1.9	24353	100.2
6-2-OUT	15NOV90	0.271	192	157.89	1.8	23799	99.5
6-3-OUT	15NOV90	0.271	60	52.61	2.2	24970	101.1
6-4-OUT	15NOV90	0.271	60	52.60	2.2	24573	102.7
6-5-OUT	16NOV90	0.271	192	160.65	1.9	24083	100.1
6-6-OUT	16NOV90	0.271	192	157.92	2.0	23835	99.4

Note: Chromium emission results are based on only probe wash and impinger solution analysis. Refer to Discussion.

TEST RESULTS
CYANIDE DESTRUCT SYSTEM

TEST	CYANIDE SAMPLE WEIGHT (mg)	AIR SAMPLE VOLUME (m3)	CYANIDE EMISSION CONC. (mg/m3)	CYANIDE EMISSION RATE (lb/hr)
CD-1	0.0935	3.666	0.02550	0.00012
CD-2	0.0393	2.582	0.01524	0.00007
CD-3	0.0370	2.441	0.01517	0.00007

TEST	DATE	NOZZLE DIA. (in.)	SAMPLE TIME (min.)	AIR SAMPLE VOLUME (DSCF)	% H2O (%)	STACK FLOW RATE (DSCFM)	ISOKIN (%)
CD-1	14DEC90	0.477	150	129.47	2.2	1223	100.4
CD-2	15DEC90	0.477	100	91.16	2.4	1295	100.2
CD-3	15DEC90	0.476	100	86.20	2.3	1241	99.3

Note: Results for runs CD-2 and CD-3 are conservative estimates. Refer to Discussion.

EMISSION RESULTS
SAMPLE CALCULATIONS
TEST 3-1-OUTLET (TOTAL CHROMIUM)

CHROMIUM WEIGHT = Σ_n [analysis volume (l) * lab analysis (mg/l)]
Where: n = probe, impinger 1, and impinger 2

Note: Lab reported cyanide and cadmium results as total weight.

Example:
Emission Weight = [0.1056 (l) * 0.008 (mg/l)] + [0.1303 (l) * 0.070 (mg/l)] + [0.1523 (l) * 0.068 (mg/l)] = 0.0203 (mg)

EMISSION CONCENTRATION = chromium weight (mg) / air sample volume (DSCF)

Example:
Emission Concentration = 0.0203 (mg) / 140.33 (DSCF)
= 1.448E-4 (mg/DSCF)

EMISSION CONCENTRATION = chromium emission conc. (mg/DSCF) / 0.02832 (m3/CF)

Example:
Emission Concentration = 1.448E-4 (mg/DSCF) / 0.02832 (m3/CF)
= 0.0051 (mg/m3)

EMISSION RATE = emission concentration (mg/DSCF) * stack flow rate (DSCFM) * 60 (min/hr)

Example:
Emission Rate = 1.448E-4 (mg/DSCF) * 40805 (DSCFM) * 60 (min/hr) = 354.5 (mg/hr)

EMISSION RATE = emission rate (mg/hr) * 2.205E-6 (lb/mg)

Example:
Emission Rate = 354.5 (mg/hr) * 2.205E-6 (lb/mg) = 0.00078 (lb/hr)

EMISSION RATE = emission rate (mg/hr) / average amperes (Amp)

Example:
Emission Rate = 354.5 (mg/hr) / 3494.5 (Amp) = 0.101 (mg/Amp-hr)

APPENDIX E

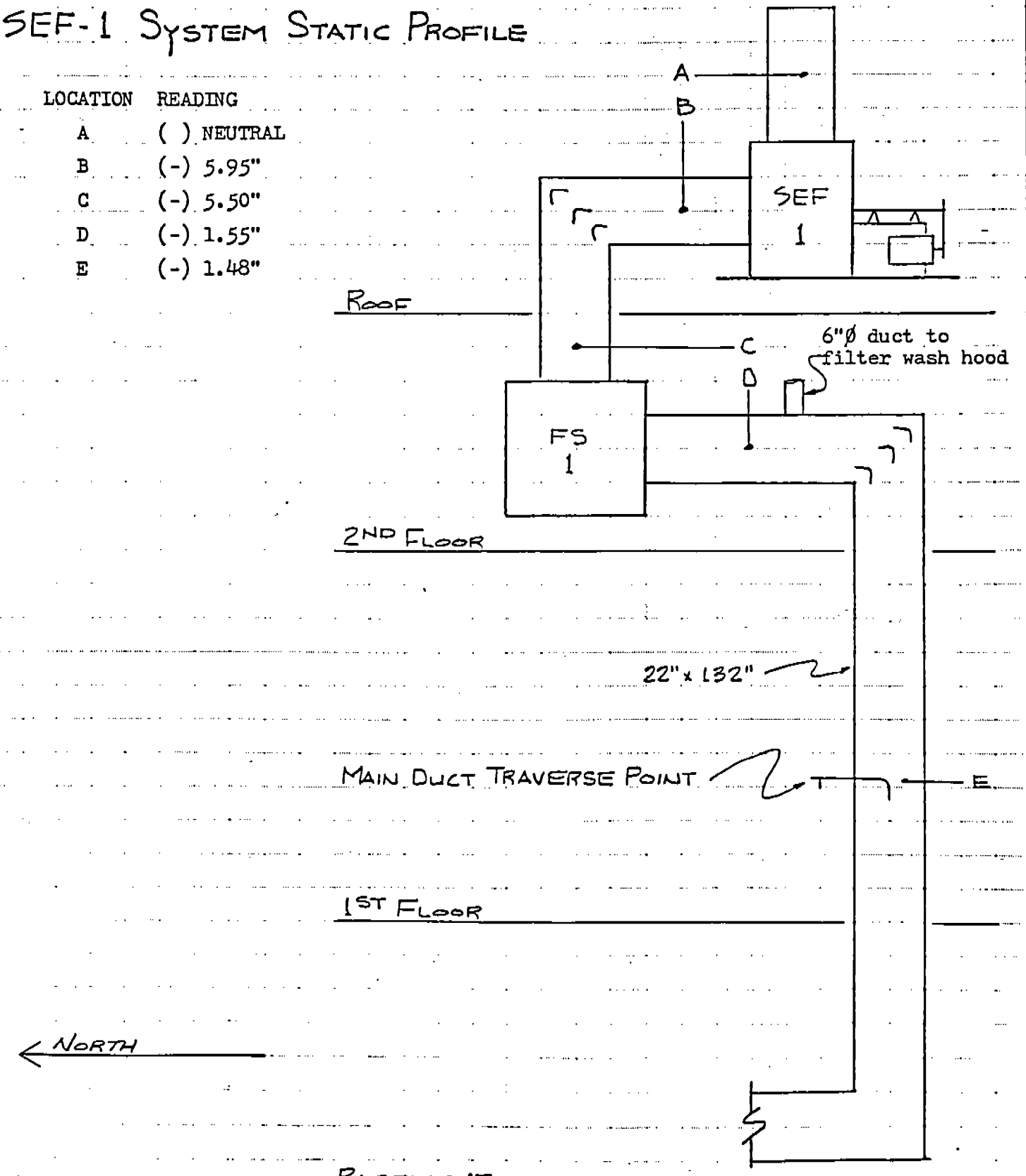
MISCELLANEOUS DOCUMENTS

SOUTHERN BALANCE, INC.
P. O. Box 1544
PENSACOLA, FLORIDA 32597
Phone 433-8933

JOB PLATING S[illegible] - BLDG. 604
SHEET NO 1 OF 1
CALCULATED BY G. LANG DATE 3/22/85
CHECKED BY G. LANG DATE 3/22/85
SCALE NONE

SEF-1 System Static Profile

LOCATION	READING
A	( ) NEUTRAL
B	(-) 5.95"
C	(-) 5.50"
D	(-) 1.55"
E	(-) 1.48"



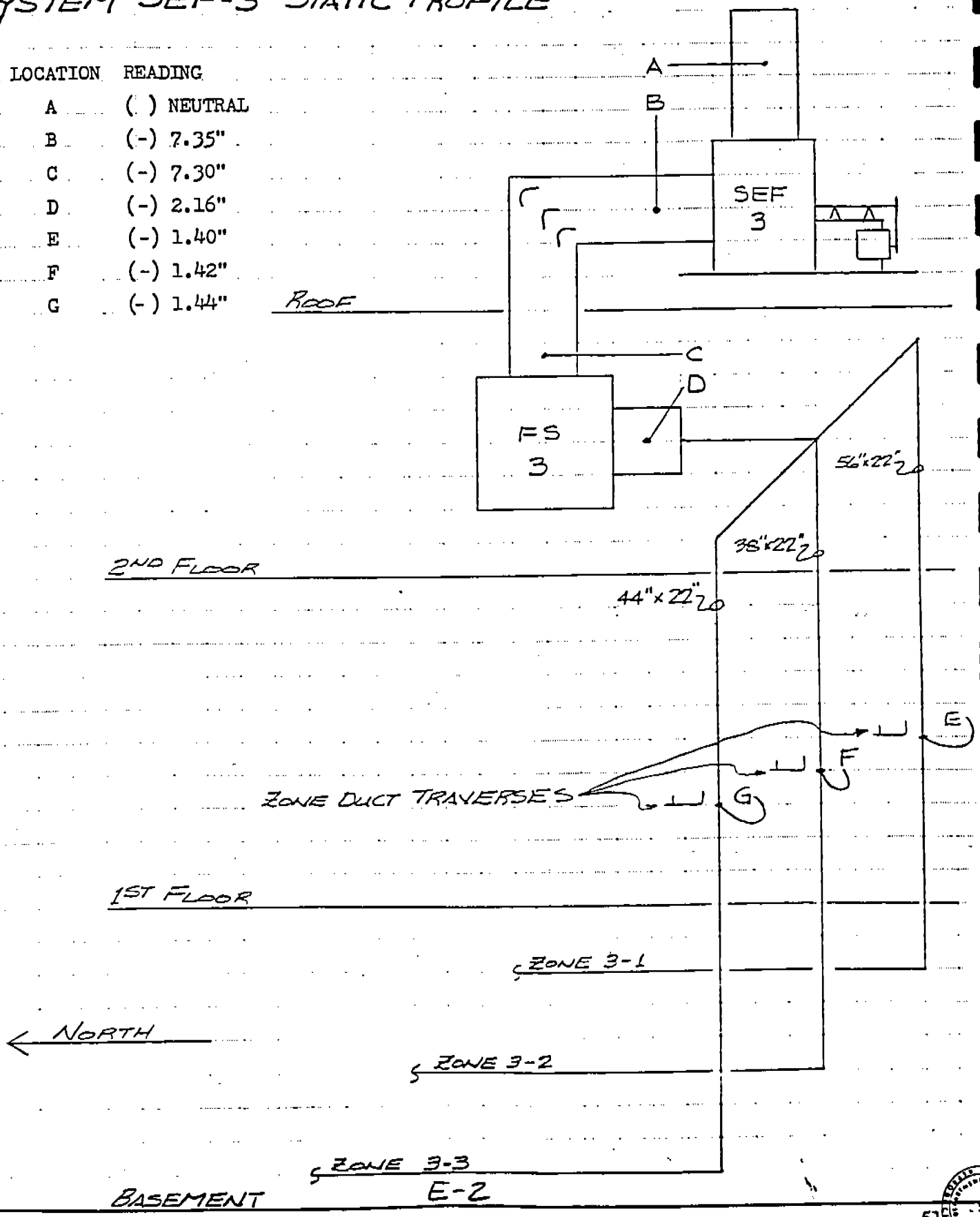
E-1

SOUTHERN BALANCE, INC.
P. O. Box 1544
PENSACOLA, FLORIDA 32597
Phone 433-8933

JOB PLATING S[illegible] - BLDG. 604
SHEET NO. 1 OF 1
CALCULATED BY G. LANG DATE 8/5/85
CHECKED BY G. LANG DATE 8/5/85
SCALE NONE

SYSTEM SEF-3 STATIC PROFILE

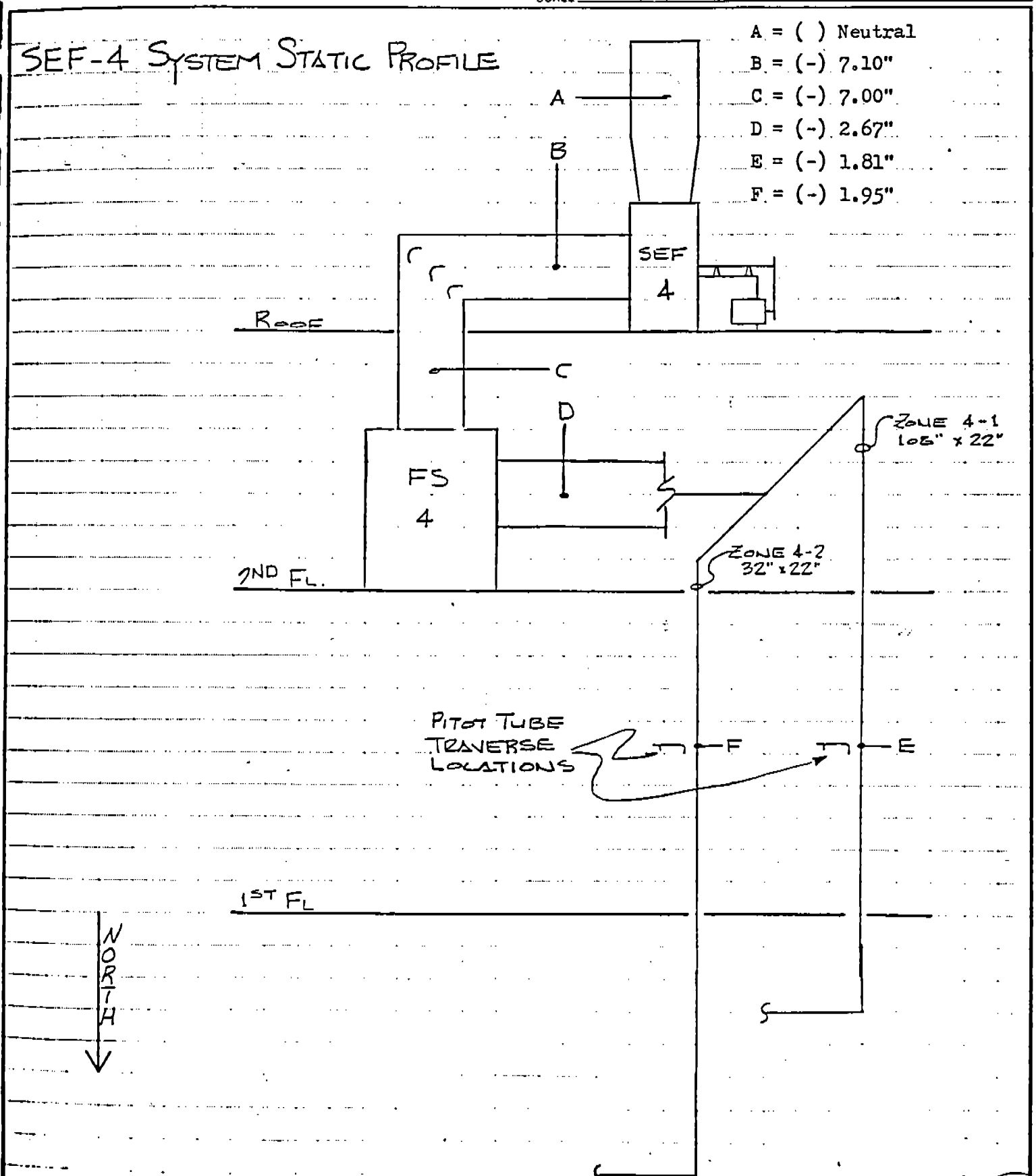
LOCATION	READING
A	( ) NEUTRAL
B	(-) 7.35"
C	(-) 7.30"
D	(-) 2.16"
E	(-) 1.40"
F	(-) 1.42"
G	(-) 1.44"



E-2

SOUTHERN BALANCE, INC.
P. O. Box 1544
PENSACOLA, FLORIDA 32597
Phone 433-8933

JOB PLATING SHOP - BLDG. 604
SHEET NO. 1 OF 1
CALCULATED BY L. POSEY DATE 5/29/85
CHECKED BY G. LANG DATE 5/29/85
SCALE NONE

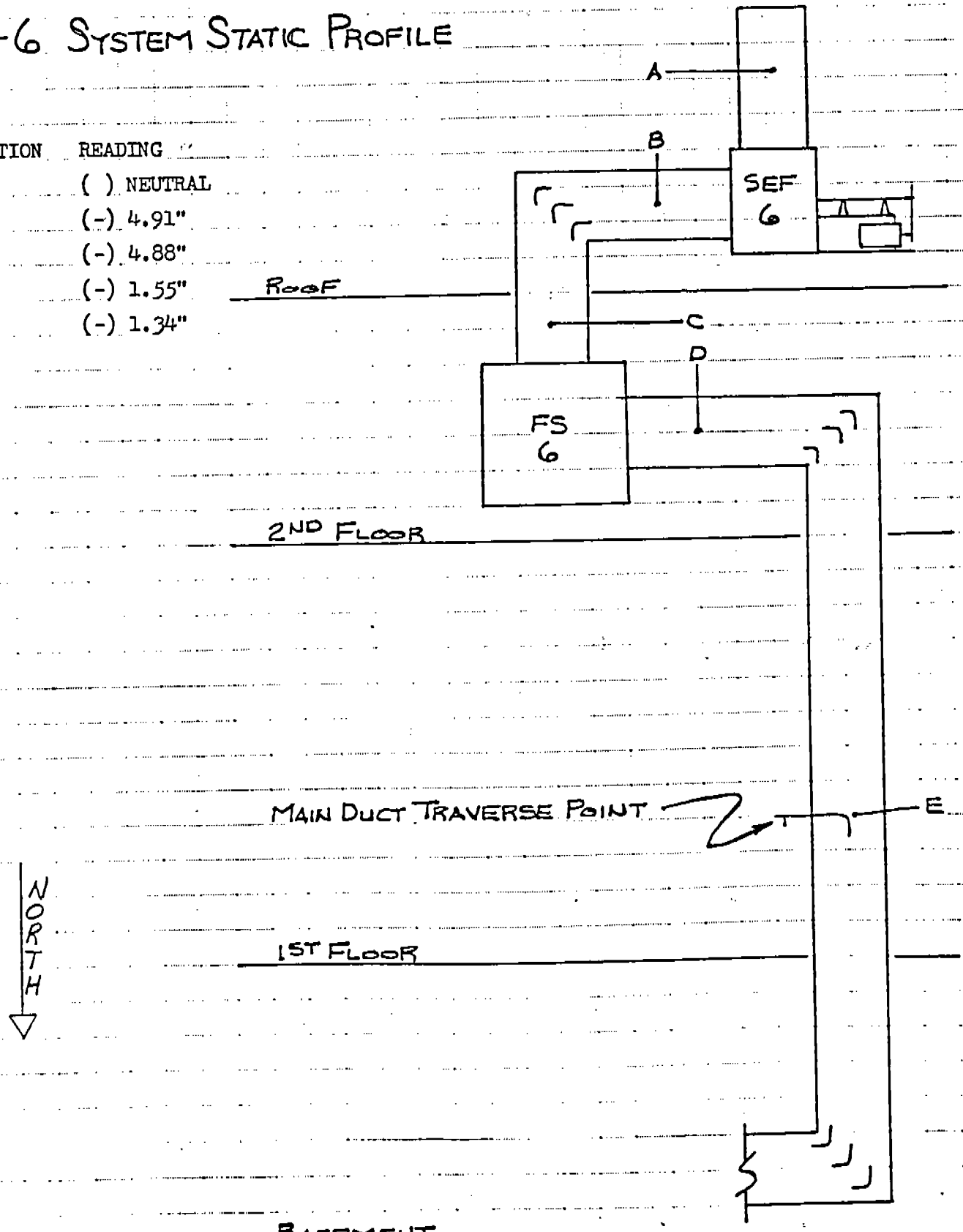


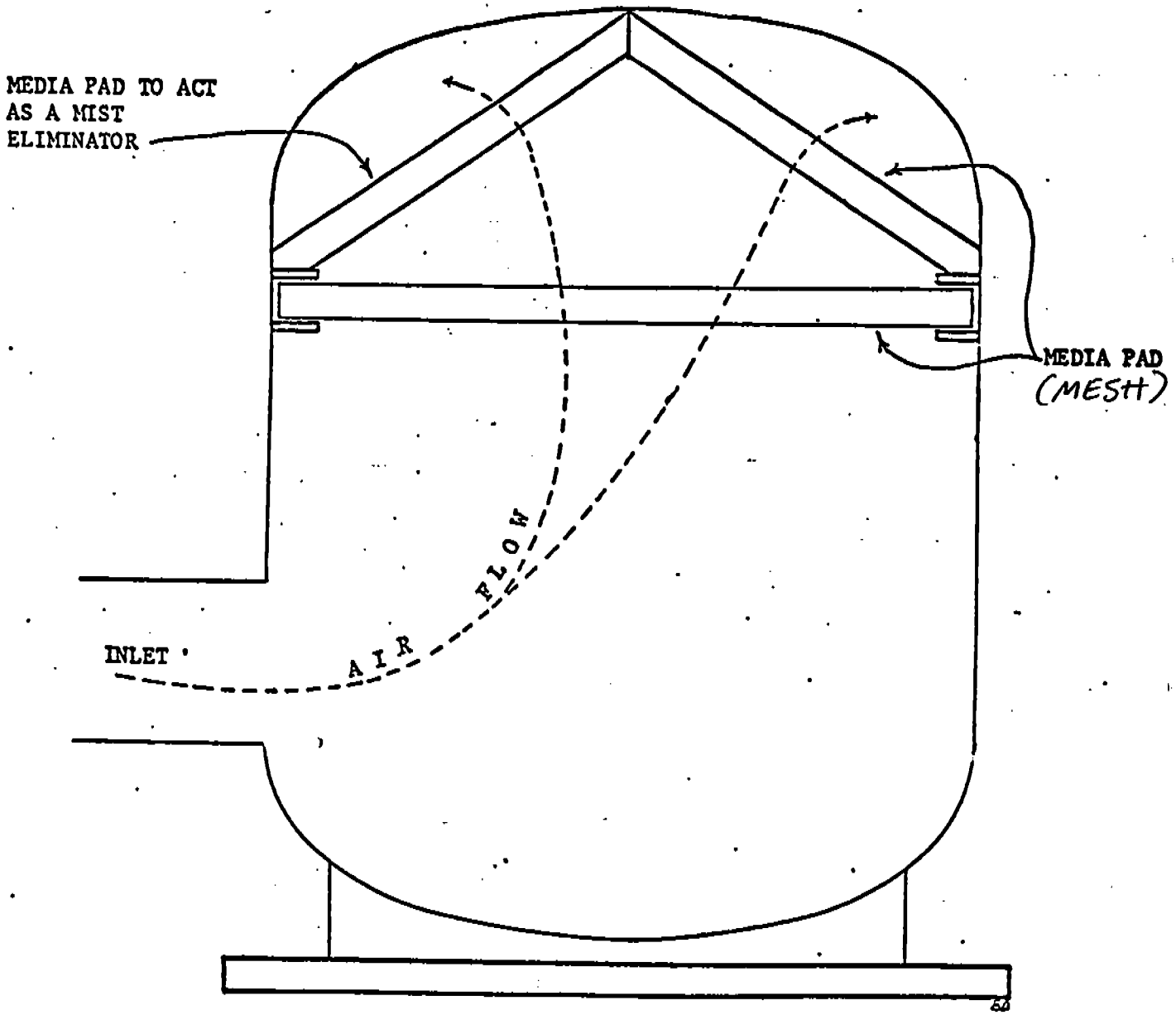
SOUTHERN BALANCE, INC.
P. O. Box 1544
PENSACOLA, FLORIDA 32597
Phone 433-8933

JOB PLATING SHOP - BLDG. 604
SHEET NO. 1 OF 1
CALCULATED BY L. POSEY DATE 5/31/85
CHECKED BY G. LANG DATE 5/31/85
SCALE NONE

SEF-6 System Static Profile

LOCATION	READING
A	( ) NEUTRAL
B	(-) 4.91"
C	(-) 4.88"
D	(-) 1.55"
E	(-) 1.34"





SKETCH:
MIST ELIMINATOR CROSS-SECTION

APPENDIX F

"NOMOKIN" SAMPLING PROGRAM
EPA CONSTANTS AND EQUATIONS

E P A METHOD 5 HP/41CX CALCULATOR PROGRAM

```
01♦LBL "NOMOKIN"
02 CLRG
03 FIX 0
04 "METHOD 5 NOMO"
05 AVIEW
06 ADV
07 "ENTER DATA"
08 AVIEW
09 "THEN PUSH R/S"
10 AVIEW
11 ADV
12 "TEST NO.=?"
13 PROMPT
14 "RUN NO.=?"
15 PROMPT
16 "FILTER NO.=?"
17 PROMPT
18 FIX 3
19 "INITIAL METER"
20 AVIEW
21 "VOLUME FT3=?"
22 PROMPT
23 STO 22
24 "DELTA-H*AT = ?"
25 PROMPT
26 STO 12
27 "METER GAMMA = ?"
28 PROMPT
29 STO 13
30 "STACK AREA"
31 AVIEW
32 "IN. SQ. = ?"
33 PROMPT
34 STO 25
35 "STACK STATIC"
36 AVIEW
37 "P IN H2O=?"
38 PROMPT
39 13.6
40 /
41 "PBAR IN HG=?"
42 PROMPT
43 STO 27
44 +
45 STO 26
46 1
47 "% H2O=?"
48 PROMPT
49 100
50 /
51 -
52 STO 28
53 "STACK GAS WET"
54 AVIEW
55 "MOL WT, MS,"
56 AVIEW
57 "LB/LB MOL=?"
58 PROMPT
59 STO 05
60 "AVG STACK"
61 AVIEW
62 "TEMP DEG F=?"
63 PROMPT
64 460
65 +
66 STO 06
67 "AVG DELTA-P"
68 AVIEW
69 "IN. H2O=?"
70 PROMPT
71 STO 24
72 "AMBIENT"
73 AVIEW
74 "TEMP F=?"
75 PROMPT
76 460
77 +
78 STO 08
79 "PITOT TUBE"
80 AVIEW
81 "CSUBP=?"
82 PROMPT
83 STO 09
84 ADV
85 "AVG STACK"
86 AVIEW
87 "VELOCITY FPM="
88 AVIEW
89 RCL 06
90 RCL 24
91 *
92 RCL 26
93 /
94 RCL 05
95 /
96 SQRT
97 5123.2
98 *
99 *
100 STO 10
101 VIEW X
102 "FOR 0.75 CFM"
103 AVIEW
104 "IDEAL NOZZLE"
105 AVIEW
106 "DIA INCHES= "
107 432
108 RCL 06
109 *
110 RCL 27
111 *
112 PI
113 RCL 28
114 *
115 RCL 10
116 *
117 RCL 08
118 *
119 RCL 26
120 *
121 /
122 SQRT
123 ARCL X
124 AVIEW
125 ADV
126 X↑2
127 "ACTUAL NOZZLE"
128 AVIEW
129 "DIA INCHES=?"
130 PROMPT
131 STO 11
132 X↑2
133 /
134 1/X
135 .75
136 *
137 ADV
138 "SAMPLE CFM = "
139 ARCL X
140 AVIEW
141 1/X
142 30
143 *
144 ADV
145 "MINIMUM RUN"
146 AVIEW
147 "TIME, MIN. = "
148 ARCL X
149 AVIEW
150 ADV
151 "******"
152 AVIEW
153 "--BEGIN RUN--"
154 AVIEW
155 ADV
156 "ENTER DATA AS:"
157 AVIEW
158 ADV
159 "STO A = DELTA-P"
160 AVIEW
161 "STO B = T-STACK"
162 AVIEW
163 "STO C = T-METER"
164 AVIEW
165 ADV
166 "TO CORRECT"
167 AVIEW
168 "ERROR, RE-ENTER"
169 AVIEW
170 "ALL VALUES AS"
171 AVIEW
172 "NEGATIVES"
173 AVIEW
174 ADV
175 "TO CHECK"
176 AVIEW
177 "ISOKIN, HIT"
178 AVIEW
179 "500, R/S"
180 AVIEW
181 ADV
182 "TO END RUN,"
183 AVIEW
184 "HIT 0, R/S"
185 AVIEW
186 ADV
187 "******"
188 AVIEW

189♦LBL 01
190 ADV
191 RCL 07
192 1
193 +
194 FIX 0
195 "POINT NO. "
196 ARCL X
197 AVIEW
198 FIX 2
199 STOP
200 500
201 X=Y?
202 GTO 40
203 RDN
204 0
205 X>Y?
206 GTO 30
207 X<>Y
208 X=0?
209 GTO 02
210 1
211 ST+ 07
212 RCL 02
213 460
214 +
215 ST+ 20
216 STO 16
217 RCL 03
218 ST+ 17
219 460
220 +
221 STO 18
222 RCL 01
223 SQRT
224 ST+ 19
225 RCL 01
226 RCL 16
227 *
228 SQRT
229 ST+ 23

230♦LBL 31
231 "DELTA H="
232 AVIEW
233 "IN. H2O...."
234 AVIEW
235 S51
236 RCL 09
237 RCL 28
```

```
238 *
239 X↑2
240 *
241 RCL 12
242 *
243 RCL 26
244 *
245 RCL 27
246 /
247 RCL 18
248 *
249 RCL 16
250 /
251 RCL 11
252 4
253 Y↑X
254 *
255 RCL 01
256 *
257 ST+ 15
258 VIEW X
259 "*******"
260 AVIEW
261 GTO 01

262♦LBL 30
263 "CORRECTING"
264 AVIEW
265 1
266 ST- 07
267 RCL 02
268 CHS
269 460
270 +
271 ST- 20
272 STO 16
273 RCL 03
274 CHS
275 ST- 17
276 460
277 +
278 STO 18
279 RCL 01
280 CHS
281 SQRT
282 ST- 19
283 RCL 01
284 CHS
285 RCL 16
286 *
287 SQRT
288 ST- 23
289 GTO 31

290♦LBL 40
291 "LAST MTR VOL ?"
292 PROMPT
293 RCL 22
294 -
295 RCL 13
296 *
297 RCL 17
298 RCL 07
299 /
300 460
301 +
302 /
303 "TIME ?"
304 PROMPT
305 /
306 RCL 20
307 *
308 RCL 28
309 /
310 RCL 11
311 X↑2
312 /
313 RCL 23
314 /
315 RCL 09
316 /
317 RCL 05
318 RCL 26
319 *
320 SQRT
321 *
322 3.579
323 *
324 ADV
325 "PRESENT ISOKIN="
326 ARCL X
327 AVIEW
328 ADV
329 "CONTINUE RUN .."
330 AVIEW
331 ADV
332 "******"
333 AVIEW
334 GTO 01

335♦LBL 02
336 "======"
337 AVIEW
338 ADV
339 "ISOKIN"
340 AVIEW
341 "AVG VALUES"
342 AVIEW
343 FIX 3
344 RCL 23
345 RCL 07
346 /
347 STO 23
348 "KV="
349 ARCL X
350 AVIEW
351 RCL 17
352 RCL 07
353 /
354 "TMETER F="
355 ARCL X
356 AVIEW
357 460
358 +
359 STO 17
360 RCL 15
361 RCL 07
362 /
363 STO 04
364 "DELTA-H="
365 ARCL X
366 AVIEW
367 RCL 19
368 RCL 07
369 /
370 X↑2
371 STO 19
372 "DELTA P="
373 ARCL X
374 AVIEW
375 "FINAL METER"
376 AVIEW
377 "VOLUME FT3=?"
378 PROMPT
379 STO 21
380 "INITIAL="
381 ARCL 22
382 AVIEW
383 "SAMPLE TIME"
384 AVIEW
385 "MIN. =?"
386 PROMPT
387 STO 14
388 "PSTACK ABS"
389 AVIEW
390 "IN HG="
391 ARCL 26
392 AVIEW
393 RCL 20
394 RCL 07
395 /
396 STO 20
397 460
398 -
399 "TSTACK F="
400 ARCL X
401 AVIEW
402 ADV
403 "======"
404 AVIEW
405 ADV
406 "SOURCE TYPE?"
407 AVIEW
408 "0=OTHER"
409 AVIEW
410 "1=BOILER"
411 PROMPT
412 STO 06
413 "% CO2 =?"
414 PROMPT
415 STO 01
416 "% O2 =?"
417 PROMPT
418 STO 02
419 "H2O GAIN KNOWN?"
420 AVIEW
421 "1=YES 0=NO"
422 PROMPT
423 STO 00
424 X=0?
425 GTO C
426 "AWAITING"
427 AVIEW
428 "RECOVERY DATA."
429 AVIEW
430 ADV
431 "HIT R/S"
432 AVIEW
433 "TO CONTINUE..."
434 AVIEW
435 ADV
436 STOP
437 "H2O GAIN=?"
438 PROMPT
439 STO 29

440♦LBL C
441 "NET METER "
442 AVIEW
443 "VOL. FT3="
444 AVIEW
445 RCL 21
446 RCL 22
447 -
448 RCL 13
449 *
450 VIEW X
451 "CORRECTED"
452 AVIEW
453 "SAMPLE VOL."
454 AVIEW
455 "VMSTD  SCF="
456 AVIEW
457 RCL 26
458 RCL 17
459 /
460 17.646
461 *
462 *
463 STO 22
464 VIEW X
465 "MOLE FRACT. DRY"
466 AVIEW
467 "GAS, (1-BWS) ="
468 AVIEW
469 RCL 00
470 X=0?
471 GTO 03
472 RCL 29
473 RCL 22
```

```
474 .0471
475 /
476 RCL 29
477 +
478 /
479 CHS
480 1
481 +
482 STO 28
483 VIEW X

484♦LBL 04
485 "% H2O = "
486 AVIEW
487 1
488 -
489 CHS
490 100
491 *
492 FIX 1
493 VIEW X
494 FIX 3
495 GTO 11

496♦LBL 03
497 RCL 28
498 VIEW X
499 GTO 04

500♦LBL 11
501 "STACK GAS WET"
502 AVIEW
503 "MOL. WT, MS,"
504 AVIEW
505 "LB/LB MOL="
506 AVIEW
507 RCL 01
508 .44
509 *
510 RCL 02
511 .32
512 *
513 +
514 100
515 RCL 01
516 RCL 02
517 +
518 -
519 .28
520 *
521 +
522 RCL 28
523 *
524 1
525 RCL 28
526 -
527 18
528 *
529 +
530 VIEW X
531 "AVG VELOCITY "
532 AVIEW
533 "FPM ="
534 AVIEW
535 RCL 26
536 *
537 1/X
538 SQRT
539 RCL 23
540 *
541 RCL 09
542 *
543 5123.2
544 *
545 STO 10
546 VIEW X
547 "STACK DRY GAS"
548 AVIEW
549 "FLOW QS  SCFM="
550 AVIEW
551 RCL 10
552 .1225
553 *
554 RCL 25
555 *
556 RCL 28
557 *
558 RCL 26
559 *
560 RCL 20
561 /
562 VIEW X
563 "ACFM ="
564 AVIEW
565 RCL 10
566 RCL 25
567 *
568 144
569 /
570 VIEW X
571 RCL 06
572 X=0?
573 GTO 08
574 "EXCESS AIR % ="
575 AVIEW
576 100
577 RCL 02
578 -
579 RCL 01
580 -
581 .264
582 *
583 RCL 02
584 -
585 1/X
586 RCL 02
587 *
588 100
589 *
590 VIEW X
591♦LBL 08
592 ADV
593 "**********"
594 ADV
595 AVIEW
596 RCL 22
597 RCL 20
598 *
599 1039
600 *
601 RCL 28
602 /
603 RCL 26
604 /
605 RCL 14
606 /
607 RCL 10
608 /
609 RCL 11
610 X12
611 /
612 FIX 1
613 ADV
614 "ISOKINETIC %I ="
615 ARCL X
616 AVIEW
617 ADV
618 "*********"
619 AVIEW
620 .END.
```

MEMORY REGISTER ASSIGNMENTS FOR NOMOKIN CALCULATOR PROGRAM

		ASSIGNED				2ND		

-- STANDARD EPA PARTICULATE CALCULATIONS --

1. Volume of dry gas in cubic feet sampled at standard conditions.*

$$V_{m_{std}} = V_m \left(\frac{T_{std}}{t_m + 460} \right) \left[\frac{P_b + \frac{\Delta H}{13.6}}{P_{std}} \right]$$

$$V_{m_{std}} = 17.646\ V_m \left(\frac{P_b + \frac{\Delta H}{13.6}}{t_m + 460} \right) = \text{ft.}^3$$

2. Volume of water vapor in cubic feet collected at standard conditions.*

By volume measurement:

$$V_{w_{gas}} = \frac{(V_w)\ \rho_{H_2O}\ R\ T_{std}}{P_{std}\ MW_{H_2O}\ 453.59237}$$

$$V_{w_{gas}} = 0.0471\ V_w$$

By mass measurement:

$$V_{w_{gas}} = \frac{(m_w)\ R\ T_{std}}{P_{std}\ MW_{H_2O}\ 453.59237}$$

$$V_{w_{gas}} = 0.0472\ m_w$$

3. Percent moisture in stack gas

$$\%M = \frac{V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} \times 100$$

4. Mole fraction of dry gas

$$M_d = \frac{100 - \%M}{100}$$

* 528°R, 29.92126 in. Hg

5. Average molecular weight of dry stack gas.

$$MW_d = \left[0.44\ (\%CO_2)\right] + \left[0.32\ (\%O_2)\right] + \left[0.28(100 - \%O_2 - \%CO_2)\right] = \text{lb/lb mole}$$

6. Molecular weight of stack gas.

$$MW = MW_d \times M_d + 18\ (1-M_d) = \frac{\text{lb}}{\text{lb-mole}}$$

7. Stack pressure, "Hg Absolute

$$P_s = P_b + \frac{\text{stack pressure "}H_2O}{13.6}$$

8. Stack velocity at stack conditions, fpm

$$V_s = C_p\ 60 \left[\frac{(2G)(\rho H_2O)(P_{std})(MW_{air})(ts + 460)(\Delta P)}{12\ (\rho_{air})(P_s)(MW)(T_{std})}\right]^{\frac{1}{2}}$$

$$V_s = 5123.2\ C_p \left[\frac{(t_s + 460)\ \ (\Delta P_s)}{(P_s)\ (MW)}\right]^{\frac{1}{2}} = \text{fpm}$$

9. Stack gas volume at standard conditions, SCFM*

$$Q_s = \frac{V_s\ A_s\ M_d\ T_{std}\ P_s}{144\ (t_s + 460)\ P_{std}}$$

$$Q_s = \frac{0.1225\ V_s\ A_s\ M_d\ Ps}{t_s + 460} = \text{DSCFM}$$

10. Percent isokinetic

$$\%I = \frac{V_{m_{std}}(t_s + 460)\ P_{std}\ 100}{M_d\ T_{std}\ P_s\ T_t\ V_s\left[\frac{\pi\ (D_n)^2}{4\ (144)}\right]}$$

$$\%I = \frac{1039\ V_{m_{std}}\ (t_s + 460)}{M_d\ P_s\ T_t\ V_s\ D_n^{\ 2}}$$

* 528°R, 29.92126 "Hg

be done because of anisokinetic sampling conditions.

Procedure

1. Check or calculate the percent isokinetic (I) and the particulate

11. Particulate - probe, cyclone, and filter, grains/SCF.

$$C_{an} = \left[\frac{m_f}{V_{m_{std}}}\right]\left[\frac{15.432\ gr}{gram}\right]$$

$$C_{an} = 15.432\ \frac{m_f}{\quad} = gr/SCF$$

.2

matter concentration (c_s) according to the procedure outlined in Method 5. Note that c_s must be calculated using the volume of effluent gas actually sampled (in units of dry standard cubic feet, corrected for leakage). Calculate the emission rate (E), i.e. convert c_s to the units of the standard. For the purposes of this guideline, it is assumed that all inputs for calculating E are correct and other specifications of Method 5 are met.

2. Compare E to the standard. Then accept or reject c_s using the criteria outlined below. (A summary is given in Table I):

a. Case 1 - I is between 90 and 110 percent. The concentration c_s must be considered acceptable. A variation of $\pm$ 10 percent from 100 percent isokinetic is permitted by Method 5.

b. Case 2 - I is less than 90 percent.

(1) If E meets the standard, c_s should be accepted, since c_s can either be correct (if all particulate matter are less than about 5 micrometers in diameter) or it can be biased high (if larger than 5 micrometer particulate matter is present) relative to the true concentration; one has the assurance that c_s is yielding an E which is definitely below the standard.

(2) If E is above the standard, multiply c_s by the factor (I/100) and recalculate E. If, on the one hand, this adjusted E is still higher than the standard, the adjusted c_s should be accepted; a maximum adjustment which accounts for the inertial effects of particulate matter has been made and E still exceeds the standard. On the other hand, if the

adjusted E is lower than the standard, a retest should be done.

c. Case 3 - I is greater than 110 percent.

(1) If E exceeds the standard, c_s should be accepted, since c_s can either be equal to the true concentration or biased low relative to it; one has the assurance that E is definintely over the standard.

(2) If E is below the standard, multiply c_s by the factor (I/100) and recalculate E. If, on the one hand, this adjusted E is still lower than the standard, the adjusted c_s should be accepted; a maximum adjustment which accounts for the inertial effects of particulate matter has been made and E still meets the standard. On the other hand, if the adjusted E exceeds the standard, a retest should be done.

Table I. Summary of Procedure

Case	I	Category	Decision
1	90 - 110		Accept
2	< 90	$E \leq$ Em. Std.	Accept
		$c_s(I/100) \rightarrow E_{adj}$ > Em. Std.	Accept
		$c_s(I/100) \rightarrow E_{adj} \leq$ Em. Std.	Retest
3	> 110	E > Em. Std.	Accept
		$c_s(I/100) \rightarrow E_{adj} \leq$ Em. Std.	Accept
		$c_s(I/100) \rightarrow E_{adj}$ > Em. Std.	Retest

Summary

A procedure for accepting or rejecting particulate matter test results based on percent isokinetic has been outlined. It provides a mechanism for accepting all data except where anisokinetic sampling might affect the validity of the test results. This procedure is one of several useful tools for evaluating testing results.

References

1. Method 5 - Determination of Particulate Emissions from Stationary Sources. Federal Register. 42(160):41776-41782, August 18, 1977.

2. Smith, W. S., R. T. Shigehara, and W. F. Todd. A Method for Interpreting Stack Sampling Data. Stack Sampling News. 1(2):8-17, August 1973.

APPENDIX G

EQUIPMENT CALIBRATION SHEETS

S-TYPE PITOT TUBE CALIBRATION WORKSHEET PRETEST 17OCT90
CALIBRATED BY: MCCALLISTER TEMP: 73 F PBAR: 29.98 in Hg

S-TYPE PITOT NO.	SIDE	RUN NO.	VELOCITY PRESSURES ORI-STD* (IN H2O)	S-TYPE (IN H2O)	CP(S)	CP(S) MEAN	DEV.	COMMENTS
~~3-NU~~ 3-100	A	1	0.240	0.200	0.712	0.722	-0.010	1/4" NOZZLE
		2	0.500	0.400	0.727		0.005	ERROR
		3	0.740	0.600	0.722		0.000	POST TEST
		4	0.990	0.800	0.723		0.001	Cp=0.822 USED FOR
		5	2.000	1.600	0.727		0.005	LINE 3 INLET RUNS DATA WAS CORRECTED
3-1	A	1	0.310	0.220	0.772	0.767	0.004	1/4" NOZZLE
		2	0.560	0.400	0.769		0.002	
		3	0.840	0.610	0.763		-0.005	NOT USED
		4	1.250	0.900	0.766		-0.001	
5-12	A	1	0.295	0.200	0.789	0.790	-0.001	1/4" NOZZLE
		2	0.575	0.390	0.789		-0.001	
		3	0.870	0.590	0.789		-0.001	
		4	1.250	0.840	0.793		0.003	
5-7	A	1	0.285	0.205	0.766	0.782	-0.016	1/4" NOZZLE
		2	0.570	0.390	0.786		0.003	
		3	0.920	0.630	0.785		0.003	
		4	1.350	0.910	0.792		0.009	

* Calibrated Orifice Standard (Cp=0.65)

ORIFICE CALIBRATION CHECK

	RUN NO.	VELOCITY PRESSURES NBS-STD (IN H2O)	ORI-STD (IN H2O)	CP(S)	MEAN	DEV.	COMMENTS
ORIFICE	1	0.080	0.195	0.641	0.645	-0.004	
	2	0.190	0.450	0.650		0.005	
	3	0.400	0.970	0.642		-0.003	
	4	0.585	1.400	0.646		0.002	

S-TYPE PITOT TUBE CALIBRATION WORKSHEET POST TEST 18JAN91

CALIBRATED BY: R.T.M. TEMP: 68 F PBAR: 30.19 in Hg

S-TYPE PITOT NO.	SIDE	RUN NO.	VELOCITY PRESSURES ORI-STD* (IN H2O)	S-TYPE (IN H2O)	CP(S)	CP(S) MEAN	DEV.	COMMENTS
3-100	A	1	0.245	0.150	0.831	0.822	0.009	
		2	0.505	0.315	0.823		0.001	
		3	0.740	0.465	0.820		-0.002	
		4	0.990	0.630	0.815		-0.007	
		5	2.000	1.250	0.822		0.000	
5-12	A	1	0.300	0.190	0.817	0.810	0.006	1/4" NOZZLE
		2	0.480	0.310	0.809		-0.002	
		3	0.870	0.560	0.810		0.000	
		4	2.000	1.300	0.806		-0.004	
5-7	A	1	0.290	0.190	0.803	0.804	-0.001	1/4" NOZZLE
		2	0.530	0.350	0.800		-0.004	
		3	0.910	0.590	0.807		0.003	
		4	2.000	1.300	0.806		0.002	

* Calibrated Orifice Standard (Cp=0.65)

DRY GAS METER CALIBRATION

BOX NUMBER: 14
DATE: 03-09-1990
BAROMETRIC PRESSURE: 29.830
OPERATOR: dP

LEAKRATE (CFM): 0.000

Delta-H	5.00	3.00	2.00	1.00	0.50
Avg Dry Gas Mtr Temp.	79.2	81.3	82.7	80.3	81.2
Avg Wet Test Mtr Temp	68.0	68.0	68.0	70.0	70.0
Init Dry Gas Mtr Vol.	327.550	333.645	339.749	351.978	357.070
Final Dry Gas Mtr Vol	332.633	338.733	344.838	357.070	362.177
Net Dry Gas Mtr Vol..	5.083	5.088	5.089	5.092	5.107
Net Wet Test Mtr Vol.	5.000	5.000	5.000	5.000	5.000
Run Time (min.sec)...	4.21	5.36	6.51	9.27	12.56
GAMMA	0.992	1.000	1.005	0.999	0.998
DH@	2.080	2.060	2.049	1.973	1.845

DRY GAS METER CALIBRATION

BOX NUMBER: 17
DATE: 02-21-1990
BAROMETRIC PRESSURE: 30.240
OPERATOR: R.T.M.

LEAKRATE (CFM): 0.000

Delta-H	5.00	3.00	2.00	1.00	0.50
Avg Dry Gas Mtr Temp.	79.3	83.0	85.2	83.8	82.8
Avg Wet Test Mtr Temp	70.0	70.0	70.0	70.0	70.0
Init Dry Gas Mtr Vol.	91.350	97.273	103.186	109.135	115.070
Final Dry Gas Mtr Vol	96.285	102.202	108.147	114.076	120.040
Net Dry Gas Mtr Vol..	4.935	4.929	4.961	4.941	4.970
Net Wet Test Mtr Vol.	5.000	5.000	5.000	5.000	5.000
Run Time (min.sec)...	4.18	5.30	6.47	9.18	13.02
GAMMA	1.019	1.032	1.032	1.036	1.029
DH@	2.019	1.969	1.988	1.873	1.843

DRY GAS METER CALIBRATION

BOX NUMBER: 15
DATE: 11-28-1990
BAROMETRIC PRESSURE: 30.260
OPERATOR: dP

LEAKRATE (CFM): 0.000

Delta-H	5.00	3.00	2.00	1.00	0.50
Avg Dry Gas Mtr Temp.	82.0	83.2	85.8	82.7	80.2
Avg Wet Test Mtr Temp	79.0	80.0	81.0	81.0	81.0
Init Dry Gas Mtr Vol.	410.714	416.792	428.929	435.009	441.060
Final Dry Gas Mtr Vol	415.785	421.837	433.992	440.054	446.114
Net Dry Gas Mtr Vol..	5.071	5.045	5.063	5.045	5.054
Net Wet Test Mtr Vol.	5.010	5.000	5.000	5.000	5.000
Run Time (min.sec)...	3.51	4.58	6.05	8.20	11.38
GAMMA	0.982	0.990	0.992	0.992	0.987
DH@	1.658	1.665	1.663	1.569	1.536

NUTECH CORPORATION

18

CALIBRATION SHEET

Customer : U.S. NAVY Serial : 80264
Date : 01929-90

CALCULATION DATA FOR RUN :	1	2	3
1. Barometric Pressure, P(B):	30.20	30.20	30.20
2. Orifice Setting, Delta H :	2.00	0.75	6.00
3. Finial Reading (Test) :	762.347	773.756	785.594
4. Initial Reading (Test) :	751.617	763.050	774.815
5. Volume, V(T) Cubic Feet :	10.730	10.706	10.779
6. Temp Initial T(T(I)) F :	71	71	70
7. Temp Finial T(T(F)) F :	71	70	70
8. Finial Reading (Box) :	143.263	154.754	166.622
9. Initial Reading (Box) :	132.505	143.951	155.809
10. Volume, V(B) Cubic Feet :	10.758	10.803	10.813
11. Temp Initial T(B(I)) F :	75	76	77
12. Temp Final T(B(F)) F :	77	76	81
13. Elapsed Time, Minutes :	14.0	22.0	8.0
Delta H(a) :	1.8800	1.7455	1.8080
Gamma :	1.0019	0.9995	0.9992

Calibration Performed By : William S. Ballard

DRY GAS METER CALIBRATION

BOX NUMBER: 14
DATE: 01-16-1991
BAROMETRIC PRESSURE: 30.120
OPERATOR: dP

LEAKRATE (CFM): 0.000

Delta-H	5.00	3.00	2.00	1.00	0.50
Avg Dry Gas Mtr Temp.	83.2	84.0	84.7	83.8	83.2
Avg Wet Test Mtr Temp	80.0	80.0	80.0	80.0	80.0
Init Dry Gas Mtr Vol.	465.021	471.110	477.207	483.320	489.436
Final Dry Gas Mtr Vol	470.086	476.188	482.295	488.415	494.539
Net Dry Gas Mtr Vol..	5.065	5.078	5.088	5.095	5.103
Net Wet Test Mtr Vol.	5.000	5.000	5.000	5.000	5.000
Run Time (min.sec)...	4.21	5.34	6.52	9.26	13.05
GAMMA	0.981	0.985	0.986	0.986	0.984
DH@	2.138	2.098	2.125	2.009	1.934

DRY GAS METER CALIBRATION

BOX NUMBER: 17
DATE: 01-17-1991
BAROMETRIC PRESSURE: 30.210
OPERATOR: rtm

LEAKRATE (CFM): 0.000

Delta-H	5.00	3.00	2.00	1.00	0.50
Avg Dry Gas Mtr Temp.	82.3	83.7	84.0	80.2	82.0
Avg Wet Test Mtr Temp	78.0	79.0	79.0	81.0	83.0
Init Dry Gas Mtr Vol.	260.891	266.905	272.914	282.926	288.926
Final Dry Gas Mtr Vol	265.906	271.913	277.932	287.925	293.939
Net Dry Gas Mtr Vol..	5.015	5.008	5.018	4.999	5.013
Net Wet Test Mtr Vol.	5.000	5.000	5.000	5.000	5.000
Run Time (min.sec)...	4.18	5.32	6.42	9.19	13.00
GAMMA	0.993	1.000	1.001	0.996	0.994
DH@	2.071	2.060	2.012	1.974	1.929

DRY GAS METER CALIBRATION

BOX NUMBER: 15
DATE: 12-31-1990
BAROMETRIC PRESSURE: 30.250
OPERATOR: dP

LEAKRATE (CFM): 0.000

Delta-H	5.00	3.00	2.00	1.00	0.50
Avg Dry Gas Mtr Temp.	86.5	85.5	86.3	86.2	85.0
Avg Wet Test Mtr Temp	89.0	89.0	88.0	88.0	86.0
Init Dry Gas Mtr Vol.	64.985	71.078	77.067	83.178	89.289
Final Dry Gas Mtr Vol	69.953	76.062	82.170	88.265	94.365
Net Dry Gas Mtr Vol..	4.968	4.984	5.103	5.087	5.076
Net Wet Test Mtr Vol.	5.000	5.000	5.000	5.000	5.000
Run Time (min.sec)...	3.52	4.56	6.03	8.24	11.28
GAMMA	0.990	0.990	0.972	0.977	0.982
DH@	1.728	1.691	1.687	1.626	1.507

DRY GAS METER CALIBRATION

BOX NUMBER: 18
DATE: 01-18-1991
BAROMETRIC PRESSURE: 30.190
OPERATOR: rtm

LEAKRATE (CFM): 0.000

Delta-H	5.00	3.00	2.00	1.00	0.50
Avg Dry Gas Mtr Temp.	78.0	77.3	77.5	76.7	76.0
Avg Wet Test Mtr Temp	68.0	69.0	70.0	71.0	72.0
Init Dry Gas Mtr Vol.	409.723	416.147	422.614	430.167	436.659
Final Dry Gas Mtr Vol	415.084	421.528	428.012	435.582	442.098
Net Dry Gas Mtr Vol..	5.361	5.381	5.398	5.415	5.439
Net Wet Test Mtr Vol.	5.000	5.000	5.000	5.000	5.000
Run Time (min.sec)...	4.28	5.44	7.03	9.49	13.23
GAMMA	0.939	0.937	0.935	0.931	0.925
DH@	2.171	2.157	2.182	2.127	1.986

APPENDIX H

RESUMES OF TEST PERSONNEL

RESUME

DREK A. NEWTON	Mechanical Engineer
1984	B.S. Mechanical Engineering Cal Poly State University San Luis Obispo, CA
1984-1986	Research and Development Engineer VETCO Offshore, Inc. Ventura, CA
1987-Present	Mechanical Engineer Coal/Air Department Naval Energy and Environmental Support Activity Port Hueneme, CA

RESUME

MANUEL L. PEREZ	Engineering Technician
1979-1980	Engineering Technician Aid Frequency Management Division Point Mugu, CA
1981-1983	Student Aid Energy Office Navy Energy Support Office Port Hueneme, CA
1983-1984	Engineering Aid Coal/Air Department Naval Energy and Environmental Support Activity Port Hueneme, CA
1985-Present	Engineering Technician Coal/Air Department Naval Energy and Environmental Support Activity Port Hueneme, CA

RESUME

CYNTHIA HELEN RUF	Mechanical Engineer
1987	B.S. Mechanical Engineering University of Illinois Champaign-Urbana, IL
1987-1988	Mechanical Engineer Professional Development Program Naval Facilities Engineering Command Alexandria, VA
1989-Present	Mechanical Engineer Coal/Air Department Naval Energy and Environmental Support Activity Port Hueneme, CA

RESUME

ROBERT W. SAUNDERS	Mechanical Engineer
1985-Present	Mechanical Engineer Coal/Air Department Naval Energy and Environmental Support Activity Port Hueneme, CA
1984	B.S. Civil and Environmental Engineering New Jersey Institute of Technology Newark, NJ
1983-1984	Structural Design Draftsman Research Cottrel, Inc. Somerville, NJ
1979-1982	Field Service Engineer Research-Cottrell, Inc. Somerville, NJ
1971	A.A.S. Electrical Engineering Technology Middlesex County College Edison, NJ

RESUME

BRIAN Y. QUIL, P.E.	Mechanical Engineer
1985	B.S. Engineering and Chemistry California State University Northridge Northridge, CA
1985-1987	Mechanical Engineer Mobile Utilities Support Equipment Office Naval Energy and Environmental Support Activity Port Hueneme, CA
1987-Present	Mechanical Engineer Coal/Air Department Naval Energy and Environmental Support Activity Port Hueneme, CA

RESUME

DAVID J. COOK	Environmental Engineer
1990	B.S. Environmental Engineering Cal Poly State University San Luis Obispo, CA
1990-Present	Environmental Engineer Coal/Air Department Naval Energy and Environmental Support Activity Port Hueneme, CA

RESUME

CHRISTOPHER P. BOYNTON	ENGINEERING AIDE
6/90-12/90	Engineering Co-op Coal/Air Department Naval Energy and Environmental Support Activity Port Hueneme, CA
1988-Present	Mechanical Engineering Student University of the Pacific School of Engineering Stockton, CA