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.

Background Report Reference

AP-42 Section Number: 12.20

Background Chapter: 4

Reference Number: 78

Title: Source Test Report 5640-01

Lockheed Missiles and Space Company

January 1991

AP-42 Section 12.20
Reference
Report Sect. 4
Reference 78

INTRODUCTION

Scrubber efficiency and emissions of total and hexavalent chromium will be determined on the Lockheed magnesium anodize process tank 68, building 103. On each of three consecutive days CARB Method 425s will be performed simultaneously at the inlet and the outlet of the scrubber. During the sampling a series of 12 steel panels will be anodized. Each sheet will be subjected to anodizing for 7 minutes at 20 amps per square foot. Another 5 minutes per panel is required to remove the panel from the tank, spray it off and load the next panel. Since some emissions are expected from the spraying sampling will not be halted between panels unless some upset condition will cause plate turn-around to exceed 15 minutes. [redacted] The LMSC operator will be instructed to notify the Field Engineer immediately of any such condition. Additionally, the LMSC operator will log power usage and calculate the total amperage utilized for each panel and for each test.

SOURCE TEST INFORMATION

Description of operations

The magnesium anodizing process, known as the DOW 17 Anodize treatment, also known as the Modified Acid Fluoride Anodize Process is operated to anodize magnesium parts. 4X6 foot sheet metal panels are dipped into tank 68 which holds 5450 gallons of solution. The tank is held at approximately 180 degrees Fahrenheit and is mechanically stirred. Nominal solution makeup is as follows:

Phosphoric acid	9-14	oz/gal
Sodium dichromate	11-15	oz/gal
Ammonium bifluoride	40-60	oz/gal

The rectifier used is rated at 2000 amperes DC at 100 volts. Production current averages 1500 amps. The unit has a DC ammeter and DC volt meter both [redacted] Each panel is [redacted]. It takes another [redacted] the panel from the tank and spray it off.

AP-42 Section 12.20
Reference
Report Sect. 4
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INTRODUCTION

Scrubber efficiency and emissions of total and hexavalent chromium will be determined on the Lockheed magnesium anodize process tank 68, building 103. On each of three consecutive days CARB Method 425s will be performed simultaneously at the inlet and the outlet of the scrubber. During the sampling a series of 12 steel panels will be anodized. Each sheet will be subjected to anodizing for 7 minutes at 20 amps per square foot. Another 5 minutes per panel is required to remove the panel from the tank, spray it off and load the next panel. Since some emissions are expected from the spraying sampling will not be halted between panels unless some upset condition will cause plate turn-around to exceed 15 minutes. ~~Each sample run will be approximately 4 hours in duration.~~ The LMSC operator will be instructed to notify the Field Engineer immediately of any such condition. Additionally, the LMSC operator will log power usage and calculate the total amperage utilized for each panel and for each test.

SOURCE TEST INFORMATION

Description of operations

The magnesium anodizing process, known as the DOW 17 Anodize treatment, also known as the Modified Acid Fluoride Anodize Process is operated to anodize magnesium parts. 4X6 foot sheet metal panels are dipped into tank 68 which holds 5450 gallons of solution. The tank is held at approximately 180 degrees Fahrenheit and is mechanically stirred. Nominal solution makeup is as follows:

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The rectifier used is rated at 2000 amperes DC at 100 volts. Production current averages 1500 amps. The unit has a DC ammeter and DC volt meter both ~~calibrated by LMSC~~. Each panel is ~~anodized for 7 minutes~~. It takes another ~~5 minutes to remove the~~ panel from the tank and spray it off.

ations Parameters (appx)

Plate area	48	sq ft
Current density	20	amps/sq ft
Total current	970	amps (incl holders)
Anodizing time	7	minutes
Plate turnaround	5	minutes
charge/plate	113.2	amp-hr
Total plates per run	12	
Total charge per run	1358	amp-hr
Total run time	144	min
	2.4	hr

Table One. Source Test Constituents and Methods

Pollutant	Sampling Method	Analytical method
Total chromium	CARB 425	AA
Hexavalent chromium	CARB 425	diphenylcarbazide colorimetric analysis

Detection limit calculation: $\frac{3\mu g}{1000 mg/\mu g}$

Lab Detection limit is 1 microgram (ug) per each of two fractions.

2 ug/1000ug/mg/108cuft*22000cuft/min*60min/hr*2.4hr = 58.67 mg

58.67 mg/1358 amp-hr = 0.043 mg/amp-hr method detection limit

KEY for tab e ne:

CARB	California Air Resources Board
AA	Atomic Absorption

METHOD DEVIATIONS

Approved EPA or CARB sampling methods will be followed with the following exceptions:

NONE

SOURCE TEST REPORT 5640-01

BC Analytical
23-JAN-91

B C Analytical

Testing Information

Facility:	Lockheed Missiles and Space Co. Building 103 Tank 68
Type of Unit:	Magnesium Anodize Process DOW 17, S-330
Purpose of Test:	Compliance with BAAQMD Regulation 11, Rule 8.

Test Procedure: CARB 425

Test Date: 11,12,13-DEC-90

Client Information

Company:	Lockheed Missiles and Space Co. 1111 Lockheed Way Sunnyvale, CA 94089-3504
Contact:	Joseph Allin and Mark Gordon (408) 742-0295

Testing Firm Information

Company:	BC Analytical 2000 Powell Street Suite 1240 Emeryville, California 94608
Contact:	Scott Chesnut Air Emissions and Toxics Program (415) 658-9367

2000 Powell Street
Suite 1240
Emeryville, CA
94608
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Fax 415 658 2721

SOURCE TEST REPORT 5640-01

BC Analytical
23-JAN-91

Testing Information

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Contact:	Scott Chesnut Air Emissions and Toxics Program (415) 658-9367

BC Analytical
2000 Powell Street
Suite 1240
Emeryville, California 94608

Project Number: 5640-01

Report Date: 21-JAN-91

Report Prepared By:

Scott Chesnut
Project Engineer

Report Reviewed By:

Tom Stucker, Manager
Air Emissions and Toxics Program

CONTENTS Project 5640-01

Introduction 4
Summary of Results 5
Field Test Data 6

APPENDIX -
Field Data. A-01
Laboratory Results A-02
Calibration Data. A-03

INTRODUCTION

On December 11, 12 and 13, 1990 a BC Analytical source test team conducted a source test for Lockheed Missiles and Space, Inc.. Triplicate total and hexavalent chromium samples were collected at Building 103, Magnesium Anodize Process DOW 17, S-330, by the California Air Resources Board (CARB) Method-425.

Simultaneous inlet and outlet tests were conducted and the results are presented in the following tables. The tests were as follows:

Test 1-Run 1 inlet, & Run 2 outlet;
Test 2-Run 3 inlet, & Run 4 outlet;
Test 3 Run 5 inlet, & Run 6 outlet

Run data is found on pages 8-25.

SUMMARY OF RESULTS Project 5640-01

Building 103
Magnesium Anodize Process DOW 17, S-330
Scrubber Inlet

	Test 1	Test 2	Test 3	Avg
SDCFM	20,900	21,300	21,300	21,200
Stack Temp. F	75	66	62	64
Moisture, % H2O	1.4	1.2	1.0	1.2
Total DC Amps	1358.4	1245.2	1358.4	1320.7
Hexavalent Chromium				
g/hr	0.060	0.057	0.013	0.043
mg/amp-hr	0.192 ok	0.111	0.024	0.109
Total Chromium				
g/hr	0.072	0.145	0.066	0.094
mg/amp-hr	0.231	0.283	0.122	0.212
% Isokinetic	99.8	97.4	99.1	98.8

$Cr^{+6} \rightarrow 5\mu g$

$Cr \rightarrow 6\mu g$

$$M_1 = \frac{60\times10^{-6}(W_{Cr^{+6}\mu g})\,Q_{STD}}{V_{m\,STD}} = \frac{60\times10^{-6}(5\mu g)(20{,}900\,SCFM)}{104.5\,SDCF}$$

$M_1 = 0.060\,g/HR$

$$M_A = \frac{1000 \cdot M}{I}$$

$$I = \frac{1358.4\,AMPS}{264\,MIN} = \frac{1358.4\,AMPS}{4.4\,HR} = 308.7\,AMPS/IN/HR$$

$$M_A = \frac{1000 \cdot 0.060}{308.7} = 0.194\,mg/AMP\text{-}HR$$

ok

Building 103
Magnesium Anodize Process DOW 17, S-330
Scrubber Outlet

	Test 1	Test 2	Test 3	Avg
SDCFM	21,100	21,000	21,800	21,300
Stack Temp. F	76	65	61	67
Moisture, % H2O	1.3	1.2	1.0	1.2
Total DC Amps	1358.4	1245.2	1358.4	1320.7
Hexavalent Chromium				
g/hr	<0.012	<0.010	<0.010	<0.011
mg/amp-hr	<0.039	<0.019	<0.017	<0.025
Total Chromium				
g/hr	0.068	0.012	0.030	0.037
mg/amp-hr	0.220	0.021	0.053	0.098
% Isokinetic	99.2	97.8	99.7	98.9

$Cr^{+6} \rightarrow < 1\mu g$

$Cr \rightarrow < 5.6\mu g$

FIELD TEST DATA

PARTICULATE EMISSIONS TEST MONITOR DATA

DATE:	12/11/90	Pbar(in. Hg):	30.25	Nozzle	0003	Diameter (mm):	3.940
CLIENT:	LMSC	Pstat(in.H2O):	-2.5	Probe Length, in.	72	Pitot Cp:	0.840
UNIT:	BUILDING 103	Pduct(in. Hg):	30.29	LCD Meter	1288	Cor.Fact.:	0.9927
SITE:	INLET	Initial MW:	28.0	Impinger Bkt	1	Orifice Km:	0.60
RUN #:	1	Initial %H2O:	2.0			Probe Liner:	
PYREX						Filter Holder:	
PYREX							

PORT SIDE #	TP	Hour	Minute	DATA Td	DP	Tm	Vm	Vacuum	CALCULATIONS Vd	DH	Qm	%ISO
1	12	10	26	78	0.84	61	498.093	*	52.4	0.84	0.39	
2	11	10	37	76	0.83	61		*	52.0	0.83	0.39	
3	10	10	48	76	0.80	63		*	51.1	0.81	0.38	
4	9	10	59	78	0.82	65		*	51.8	0.83	0.39	
5	8	11	10	76	0.84	67		*	52.3	0.85	0.40	
6	7	11	21	78	0.80	68		*	51.2	0.81	0.39	
7	6	11	32	76	0.74	69		*	49.1	0.76	0.37	
8	5	11	43	76	0.76	69		*	49.8	0.78	0.38	
9	4	11	54	76	0.75	69		*	49.4	0.77	0.38	
10	3	12	5	76	0.70	67		*	47.8	0.72	0.36	
11	2	12	16	76	0.80	72		*	51.1	0.82	0.39	
12	1	12	27	76	0.80	72		*	51.1	0.82	0.39	
		12	38				549.921					
Sample Time =			132	77	0.79	67	51.450		50.8	0.80		101.7

PORT TOP #	TP	Hour	Minute	DATA Td	DP	Tm	Vm	Vacuum	CALCULATIONS Vd	DH	Qm	%ISO
1	12	13	30	74	0.85	71	549.921	*	52.5	0.87	0.40	
2	11	13	41	74	0.87	71		*	53.2	0.88	0.41	
3	10	13	52	74	0.92	73		*	54.7	0.93	0.42	
4	9	14	3	74	0.86	75		*	52.9	0.88	0.41	
5	8	14	14	74	0.84	75		*	52.2	0.86	0.40	
6	7	14	25	74	0.82	75		*	51.6	0.84	0.40	
7	6	14	36	74	0.82	76		*	51.6	0.85	0.40	
8	5	14	47	74	0.85	78		*	52.5	0.87	0.41	
9	4	14	58	74	0.85	79		*	52.5	0.88	0.41	
10	3	15	9	74	0.84	80		*	52.2	0.87	0.41	
11	2	15	20	74	0.78	78		*	50.3	0.81	0.39	
12	1	15	31	74	0.82	78		*	51.6	0.85	0.40	
		15	42				604.222					
Sample Time =			132	74	0.84	76	53.905		52.3	0.87		101.2

Post-Test Leak Rate 0.019 CFM at 5 in. Hg.

Test Summary

Sample Time = 264	75	71	105.354 NET CU. FT.	51.5	0.83		101.5

PARTICULATE EMISSIONS

Data and Results:

Date:	12/11/90	Run #:	1
Client:	LMSC	Time:	10:26
Unit:	BUILDING 103	Project SC	
Site:	INLET	Project 5640-01	

Liquid Analysis:

Absorber Type	Contents	Final	Tare	Net
Mod. Grnbg.	0.1 N NaoH	597.20	592.80	4.40
Lg. Grnbg.	0.1 N NaoH	594.80	585.20	9.60
Mod. Grnbg.	EMPTY	461.00	460.50	0.50
Mod. Grnbg.	SILICA GEL	764.70	748.30	16.40
				0.00
			Total	30.90

Gas Composition:

%CO2 volume	0.0
%O2 volume	20.9
%CO volume	0.0
%N2 volume	79.1
%H2O volume	1.4

Selected Results:

Wet MW	28.70
Excess Air	
[illegible]	104.501
%Isokinetic	99.8
Standard T	60

Chromium Analysis

Filter Sample Type: EPA GLASS FIBER MAT

Sample Fraction		mg Net	gr/SDCF
Hexavalent Cr		0.0050	7.37E-07
Hexavalent Blank	Less than	0.0010	1.47E-07
Net Hexavalent Chromium		0.0050	7.37E-07
Total Cr		0.0060	8.84E-07
Blank	Less than	0.0011	1.62E-07
Net Total Chromium		0.0060	8.84E-07

Particulate Results:

Concentration: grains/SDCF @ STP

Hexavalent Cr	7.37E-07
Total Cr	8.84E-07

Emission Rate, lbs/hr

Hexavalent Cr	1.32E-04
Total Cr	1.59E-04

VELOCITY TRAVERSE & VOLUME FLOW RATE

CLIENT: LMSC

DATE: 12/11/90 TIME: 10:26 -15:42
UNIT: BUILDING 103
SAMPLE: INLET OUTLET RUN #: 1

Duct Diameter (in.) 36.0
Rectangular Duct 0.0
Area (sq.ft.) 7.1

Duct Press. (in.Hg) 30.29
Vol. Per Cent H2O 1.36
Molecular Wt. (wet) 28.70
Standard Temp. (F) 60
Std Press. (in.Hg) 29.92
Pitot Coeff. 0.840

Pt.	In. From Edge	SIDE			TOP		
		Td	Dp	Vd	Td	Dp	Vd
1	0.8	78	0.84	51.8	74	0.85	51.9
2	2.4	76	0.83	51.4	74	0.87	52.5
3	4.3	76	0.80	50.4	74	0.92	54.0
4	6.4	78	0.82	51.2	74	0.86	52.2
5	9.0	76	0.84	51.7	74	0.84	51.6
6	12.8	78	0.80	50.5	74	0.82	51.0
7	23.2	76	0.74	48.5	74	0.82	51.0
8	27.0	76	0.76	49.2	74	0.85	51.9
9	29.6	76	0.75	48.8	74	0.85	51.9
10	31.7	76	0.70	47.2	74	0.84	51.6
11	33.6	76	0.80	50.4	74	0.78	49.7
12	35.2	76	0.80	50.4	74	0.82	51.0

RESULTS:

Avg. Vel. (Vd) 50.9 FPS @ 75 F and 30.3 in. Hg

Volume Flow Rate Qd 21.6 x 1000 ACFM
Qstd (wet) 21.2 x 1000 SCFM
Qstd (dry) 20.9 x 1000 SDCFM

PARTICULATE EMISSIONS TEST MONITOR DATA

DATE:	12/11/90	Pbar(in. Hg):	30.25	Nozzle	P0014	Diameter (mm):	3.940
CLIENT:	LMSC	Pstat(in.H2O):	0.6	Probe Length, in.	72	Pitot Cp:	0.840
UNIT:	BUILDING 103	Pduct(in. Hg):	30.29	LCD Meter	789	Cor.Fact.:	1.0009
SITE:	OUTLET	Initial MW:	28.0	Impinger Bkt	2	Orifice Km:	0.60
RUN #:	2	Initial %H2O:	2.0			Probe Liner:	
PYREX							
						Filter Holder:	
PYREX							

PORT South				DATA					CALCULATIONS			
#	TP	Hour	Minute	Td	DP	Tm	Vm	Vacuum	Vd	DH	Qm	%ISO
1	12	10	27	76	0.72	54	186.229	*	48.5	0.73	0.36	
2	11	10	38	76	0.81	56		*	51.4	0.81	0.38	
3	10	10	49	76	0.85	61		*	52.6	0.85	0.39	
4	9	11	0	76	0.87	63		*	53.3	0.87	0.40	
5	8	11	11	76	0.91	65		*	54.5	0.91	0.41	
6	7	11	22	76	0.92	66		*	54.8	0.92	0.41	
7	6	11	33	76	1.02	67		*	57.7	1.01	0.44	
8	5	11	44	76	0.89	70		*	53.9	0.90	0.41	
9	4	11	55	76	0.75	69		*	49.4	0.77	0.37	
10	3	12	6	76	0.76	68		*	49.8	0.78	0.38	
11	2	12	17	76	0.78	70		*	50.4	0.80	0.38	
12	1	12	28	76	0.75	67		*	49.4	0.77	0.37	
		12	39				238.481					
Sample Time =		132		76	0.84	65	52.299		52.1	0.84		101.0

PORT North				DATA					CALCULATIONS			
#	TP	Hour	Minute	Td	DP	Tm	Vm	Vacuum	Vd	DH	Qm	%ISO
1	12	13	32	76	0.92	64	238.481	*	54.8	0.92	0.41	
2	11	13	43	76	0.92	66		*	54.8	0.92	0.41	
3	10	13	54	76	0.93	68		*	55.1	0.93	0.42	
4	9	14	5	76	0.92	69		*	54.8	0.92	0.42	
5	8	14	16	76	0.89	69		*	53.9	0.90	0.41	
6	7	14	27	76	0.90	71		*	54.2	0.91	0.41	
7	6	14	38	76	0.86	72		*	53.0	0.87	0.40	
8	5	14	49	76	0.83	73		*	52.0	0.85	0.40	
9	4	15	0	76	0.75	74		*	49.4	0.78	0.38	
10	3	15	11	76	0.72	74		*	48.5	0.75	0.37	
11	2	15	22	76	0.66	72		*	46.4	0.69	0.35	
12	1	15	33	76	0.66	71		*	46.4	0.69	0.35	
		15	44				290.171					
Sample Time =		132		76	0.83	70	51.737		51.9	0.84		99.3

Post-Test Leak Rate 0.018 CFM at 2 in. Hg.

Test Summary

Sample Time =		264		76		67	104.036		52.0	0.84		100.1
							NET CU. FT.					

PARTICULATE EMISSIONS

Data and Results:

Date:	12/11/90	Run #:	2
Client:	LMSC	Time:	10:27
Unit:	BUILDING 103	Project SC	
Site:	OUTLET	Project 5640-01	

Liquid Analysis:

Absorber Type	Contents	Final	Tare	Net
Mod. Grnbg.	0.1 N NaoH	581.70	568.50	13.20
Lg. Grnbg.	0.1 N NaoH	601.50	600.50	1.00
Mod. Grnbg.	EMPTY	498.30	497.70	0.60
Mod. Grnbg.	SILICA GEL	750.70	735.70	15.00
				0.00
			Total	29.80

Gas Composition:

%CO2 volume	0.0
%O2 volume	20.9
%CO volume	0.0
%N2 volume	79.1
%H2O volume	1.3

Selected Results:

Wet MW	28.69
Excess Air	
Vm Standard	103.941
%Isokinetic	99.2
Standard T	60

Chromium Analysis

Filter Sample Type: EPA GLASS FIBER MAT

Sample Fraction		mg Net	gr/SDCF
Hexavalent Cr	Less than	0.0010	1.48E-07
Hexavalent Blank	Less than	0.0010	1.48E-07
Net Hexavalent Chromium		0.0010	1.48E-07
Total Cr		0.0056	8.30E-07
Blank		0.0001	1.48E-08
Net Total Chromium		0.0056	8.30E-07

Particulate Results:

Concentration: grains/SDCF @ STP

Hexavalent Cr	<	1.48E-07
Total Cr		8.30E-07

Emission Rate, lbs/hr

Hexavalent Cr	<	2.69E-05
Total Cr		1.50E-04

VELOCITY TRAVERSE & VOLUME FLOW RATE

CLIENT: LMSC

DATE: 12/11/90 TIME: 10:27 -15:44
UNIT: BUILDING 103
SAMPLE: OUTLET RUN #: 2

Duct Diameter (in.)	36.0
Rectangular Duct	0.0
Area (sq.ft.)	7.1
Duct Press. (in.Hg)	30.29
Vol. Per Cent H2O	1.32
Molecular Wt. (wet)	28.69
Standard Temp. (F)	60
Std Press. (in.Hg)	29.92
Pitot Coeff.	0.840

Pt.	In. From Edge	South			North		
		Td	Dp	Vd	Td	Dp	Vd
1	0.8	76	0.72	47.8	76	0.92	54.1
2	2.4	76	0.81	50.8	76	0.92	54.1
3	4.3	76	0.85	52.0	76	0.93	54.4
4	6.4	76	0.87	52.6	76	0.92	54.1
5	9.0	76	0.91	53.8	76	0.89	53.2
6	12.8	76	0.92	54.1	76	0.90	53.5
7	23.2	76	1.02	57.0	76	0.86	52.3
8	27.0	76	0.89	53.2	76	0.83	51.4
9	29.6	76	0.75	48.8	76	0.75	48.8
10	31.7	76	0.76	49.2	76	0.72	47.8
11	33.6	76	0.78	49.8	76	0.66	45.8
12	35.2	76	0.75	48.8	76	0.66	45.8

RESULTS:

Avg. Vel. (Vd) 51.4 FPS @ 76 F and 30.3 in. Hg

Volume Flow Rate	Qd	21.8	x 1000 ACFM
	Qstd (wet)	21.4	x 1000 SCFM
	Qstd (dry)	21.1	x 1000 SDCFM

PARTICULATE EMISSIONS TEST MONITOR DATA

DATE:	12/12/90	Pbar(in. Hg):	30.10	Nozzle	P0003	Diameter (mm):	5.600
CLIENT:	LOCKHEED	Pstat(in.H2O):	-2.5	Probe Length, in.	6FT	Pitot Cp:	0.840
UNIT:	BUILDING 103	Pduct(in. Hg):	30.14	LCD Meter	1288	Cor.Fact.:	0.9927
SITE:	INLET	Initial MW:	28.0	Impinger Bkt	1	Orifice Km:	0.60
RUN #:	3	Initial %H2O:	2.0			Probe Liner:	PYREX
						Filter Holder:	PYREX

PORT SIDE #	TP	Hour	Minute	DATA Td	DP	Tm	Vm	Vacuum	CALCULATIONS Vd	DH	Qm	%ISO
1	12	7	42	67	0.74	50	605.395	*	48.8	2.58	0.73	
2	11	7	48	67	0.80	52		*	50.8	2.78	0.77	
3	10	7	54	65	0.79	55		*	50.4	2.77	0.77	
4	9	8	25	65	0.84	51		*	51.9	2.91	0.79	
5	8	8	31	65	0.86	54		*	52.5	2.98	0.80	
6	7	8	37	65	0.88	56		*	53.1	3.06	0.81	
7	6	8	43	64	0.75	58		*	49.0	2.66	0.75	
8	5	8	49	65	0.74	59		*	48.7	2.63	0.75	
9	4	8	55	65	0.78	61		*	50.0	2.76	0.77	
10	3	9	1	65	0.81	62		*	51.0	2.86	0.79	
11	2	9	7	65	0.78	63		*	50.0	2.77	0.77	
12	1	9	13	65	0.81	64		*	51.0	2.87	0.79	
		9	19				660.366					
Sample Time =			72	65	0.80	57	54.570		50.6	2.80		72.9

PORT TOP #	TP	Hour	Minute	DATA Td	DP	Tm	Vm	Vacuum	CALCULATIONS Vd	DH	Qm	%ISO
1	12	9	53	65	0.89	58	660.366	*	53.4	3.10	0.82	
2	11	9	59	65	0.98	58		*	56.1	3.39	0.86	
3	10	10	5	65	0.92	60		*	54.3	3.21	0.84	
4	9	10	11	66	0.90	61		*	53.8	3.14	0.83	
5	8	12	30	67	0.88	65		*	53.2	3.09	0.82	
6	7	12	36	67	0.84	67		*	52.0	2.97	0.81	
7	6	12	42	66	0.85	69		*	52.3	3.02	0.82	
8	5	12	48	66	0.86	71		*	52.6	3.06	0.82	
9	4	12	54	66	0.78	72		*	50.1	2.81	0.79	
10	3	13	0	66	0.86	73		*	52.6	3.07	0.83	
11	2	13	10	66	0.86	74		*	52.6	3.08	0.83	
12	1	13	16	66	0.73	73		*	48.5	2.65	0.76	
		13	22				719.356					
Sample Time =			72	66	0.86	67	58.559		52.6	3.05		34.0

Post-Test Leak Rate 0.015 CFM at 12 in. Hg.

Test Summary

Sample Time =	144	66		62	113.129	51.6	2.93	45.8
					NET CU. FT.			

PARTICULATE EMISSIONS

Data and Results:

Date:	12/12/90	Run #:	3
Client:	LOCKHEED	Time:	07:42
Unit:	BUILDING 103	Project	SC
Site:	INLET	Project	5640-01

Liquid Analysis:

Absorber Type	Contents	Final	Tare	Net
Mod. Grnbg.	0.1 N NaoH	591.80	586.00	5.80
Lg. Grnbg.	0.1 N NaoH	598.10	596.00	2.10
Mod. Grnbg.	EMPTY	462.00	460.80	1.20
Mod. Grnbg.	SILICA GEL	772.70	752.20	20.50
				0.00
			Total	29.60

Gas Composition:

%CO2 volume	0.0
%O2 volume	20.9
%CO volume	0.0
%N2 volume	79.1
%H2O volume	1.2

Selected Results:

Wet MW	28.71
Excess Air	
Vm Standard	114.270
%Isokinetic	97.4
Standard T	60

Chromium Analysis

Filter Sample Type: EPA GLASS FIBER MAT

Sample Fraction		mg Net	gr/SDCF
Hexavalent Cr		0.0051	6.87E-07
Hexavalent Blank	Less than	0.0010	1.35E-07
Net Hexavalent Chromium		0.0051	6.87E-07
Total Cr		0.0130	1.75E-06
Blank		0.0011	1.48E-07
Net Total Chromium		0.0130	1.75E-06

Particulate Results:

Concentration:	grains/SDCF @ STP
Hexavalent Cr	6.87E-07
Total Cr	1.75E-06

Emission Rate,	lbs/hr
Hexavalent Cr	1.26E-04
Total Cr	3.20E-04

VELOCITY TRAVERSE & VOLUME FLOW RATE

CLIENT: LOCKHEED

DATE: 12/12/90 TIME: 07:42 -13:22
UNIT: BUILDING 103
SAMPLE: INLET RUN #: 3

Duct Diameter (in.)	36.0
Rectangular Duct	0.0
Area (sq.ft.)	7.1
Duct Press. (in.Hg)	30.14
Vol. Per Cent H2O	1.19
Molecular Wt. (wet)	28.71
Standard Temp. (F)	60
Std Press. (in.Hg)	29.92
Pitot Coeff.	0.840

Pt.	In. From Edge	SIDE			TOP		
		Td	Dp	Vd	Td	Dp	Vd
1	0.8	67	0.74	48.2	65	0.89	52.8
2	2.4	67	0.80	50.1	65	0.98	55.4
3	4.3	65	0.79	49.7	65	0.92	53.7
4	6.4	65	0.84	51.3	66	0.90	53.1
5	9.0	65	0.86	51.9	67	0.88	52.6
6	12.8	65	0.88	52.5	67	0.84	51.4
7	23.2	64	0.75	48.4	66	0.85	51.6
8	27.0	65	0.74	48.1	66	0.86	51.9
9	29.6	65	0.78	49.4	66	0.78	49.4
10	31.7	65	0.81	50.3	66	0.86	51.9
11	33.6	65	0.78	49.4	66	0.86	51.9
12	35.2	65	0.81	50.3	66	0.73	47.8

RESULTS:

Avg. Vel. (Vd) 51.0 FPS @ 66 F and 30.1 in. Hg

Volume Flow Rate	Qd	21.6	x 1000 ACFM
	Qstd (wet)	21.5	x 1000 SCFM
	Qstd (dry)	21.3	x 1000 SDCFM

PARTICULATE EMISSIONS TEST MONITOR DATA

DATE:	12/12/90	Pbar(in. Hg):	30.10	Nozzle	P0004	Diameter (mm):	6.000
CLIENT:	LOCKHEED	Pstat(in.H2O):	-2.5	Probe Length, in.	6FT	Pitot Cp:	0.840
UNIT:	BUILDING 103	Pduct(in. Hg):	30.14	LCD Meter	789	Cor.Fact.:	1.0009
SITE:	OUTLET	Initial MW:	28.0	Impinger Bkt	2	Orifice Km:	0.60
RUN #:	4	Initial %H2O:	2.0			Probe Liner:	PYREX
						Filter Holder:	PYREX

PORT SIDE

#	TP	Hour	Minute	DATA Td	DP	Tm	Vm	Vacuum	CALCULATIONS Vd	DH	Qm	%ISO
1	12	7	43	67	0.75	45	290.386	*	49.2	3.33	0.84	
2	11	7	49	66	0.82	47		*	51.3	3.64	0.88	
3	10	7	55	64	0.85	50		*	52.2	3.81	0.91	
4	9	8	26	64	0.93	48		*	54.6	4.14	0.94	
5	8	8	32	64	0.93	51		*	54.6	4.16	0.95	
6	7	8	38	64	0.92	54		*	54.3	4.14	0.95	
7	6	8	44	63	0.92	56		*	54.2	4.16	0.95	
8	5	8	50	64	0.91	58		*	54.0	4.13	0.95	
9	4	8	56	64	0.89	59		*	53.4	4.04	0.94	
10	3	9	2	64	0.87	59		*	52.8	3.96	0.93	
11	2	9	8	64	0.89	59		*	53.4	4.04	0.94	
12	1	9	14	64	0.89	61		*	53.4	4.06	0.95	
		9	20				355.210					
Sample Time =			72	64	0.88	54	64.882		53.1	3.97		72.5

PORT TOP

#	TP	Hour	Minute	DATA Td	DP	Tm	Vm	Vacuum	CALCULATIONS Vd	DH	Qm	%ISO
1	12	9	55	64	0.55	56	355.210	*	42.0	2.57	0.74	
2	11	10	1	64	0.77	60		*	49.7	3.52	0.88	
3	10	10	7	64	0.79	63		*	50.3	3.63	0.89	
4	9	10	13	65	0.73	64		*	48.4	3.37	0.86	
5	8	12	31	66	0.71	68		*	47.8	3.30	0.86	
6	7	12	37	66	0.71	68		*	47.8	3.30	0.85	
7	6	12	43	65	0.68	68		*	46.7	3.17	0.84	
8	5	12	49	65	0.71	70		*	47.7	3.32	0.86	
9	4	12	55	65	0.79	71		*	50.4	3.67	0.91	
10	3	13	1	65	0.79	71		*	50.4	3.68	0.91	
11	2	13	11	65	0.79	68		*	50.4	3.65	0.90	
12	1	13	17	65	0.82	70		*	51.3	3.80	0.92	
		13	23				417.225					
Sample Time =			72	65	0.74	66	62.071		48.6	3.41		34.5

Post-Test Leak Rate 0.010 CFM at 5 in. Hg.

Test Summary

Sample Time =			144	65		60	126.953		50.8	3.69		47.2
							NET CU. FT.					

PARTICULATE EMISSIONS

Data and Results:

Date:	12/12/90	Run #:	4
Client:	LOCKHEED	Time:	07:43
Unit:	BUILDING 103	Project SC	
Site:	OUTLET	Project 5640-01	

Liquid Analysis:

Absorber Type	Contents	Final	Tare	Net
Mod. Grnbg.	0.1 N NaoH	580.60	570.00	10.60
Lg. Grnbg.	0.1 N NaoH	604.10	601.60	2.50
Mod. Grnbg.	EMPTY	498.60	498.20	0.40
Mod. Grnbg.	SILICA GEL	762.80	741.80	21.00
				0.00
			Total	34.50

Gas Composition:

%CO2 volume	0.0
%O2 volume	20.9
%CO volume	0.0
%N2 volume	79.1
%H2O volume	1.2

Selected Results:

Wet MW	28.70
Excess Air	
Vm Standard	128.873
%Isokinetic	97.8
Standard T	60

Chromium Analysis

Filter Sample Type: EPA GLASS FIBER MAT

Sample Fraction		mg Net	gr/SDCF
Hexavalent Cr	Less than	0.0010	1.19E-07
Hexavalent Blank	Less than	0.0010	1.19E-07
Net Hexavalent Chromium		0.0010	1.19E-07
Total Cr		0.0012	1.43E-07
Blank		0.0011	1.31E-07
Net Total Chromium		0.0012	1.43E-07

Particulate Results:

Concentration: grains/SDCF @ STP

Hexavalent Cr	1.19E-07
Total Cr	1.43E-07

Emission Rate, lbs/hr

Hexavalent Cr	2.15E-05
Total Cr	2.58E-05

VELOCITY TRAVERSE & VOLUME FLOW RATE

CLIENT: LOCKHEED

DATE: 12/12/90 TIME: 07:43 -13:23
UNIT: BUILDING 103
SAMPLE: OUTLET RUN #: 4

Duct Diameter (in.)	36.0
Rectangular Duct	0.0
Area (sq.ft.)	7.1
Duct Press. (in.Hg)	30.14
Vol. Per Cent H2O	1.23
Molecular Wt. (wet)	28.70
Standard Temp. (F)	60
Std Press. (in.Hg)	29.92
Pitot Coeff.	0.840

Pt.	In. From Edge	SIDE			TOP		
		Td	Dp	Vd	Td	Dp	Vd
1	0.8	67	0.75	48.5	64	0.55	41.4
2	2.4	66	0.82	50.7	64	0.77	49.0
3	4.3	64	0.85	51.5	64	0.79	49.7
4	6.4	64	0.93	53.9	65	0.73	47.8
5	9.0	64	0.93	53.9	66	0.71	47.2
6	12.8	64	0.92	53.6	66	0.71	47.2
7	23.2	63	0.92	53.6	65	0.68	46.1
8	27.0	64	0.91	53.3	65	0.71	47.1
9	29.6	64	0.89	52.7	65	0.79	49.7
10	31.7	64	0.87	52.1	65	0.79	49.7
11	33.6	64	0.89	52.7	65	0.79	49.7
12	35.2	64	0.89	52.7	65	0.82	50.7

RESULTS:

Avg. Vel. (Vd) 50.2 FPS @ 65 F and 30.1 in. Hg

Volume Flow Rate	Qd	21.3	x 1000 ACFM
	Qstd (wet)	21.3	x 1000 SCFM
	Qstd (dry)	21.0	x 1000 SDCFM

VELOCITY TRAVERSE & VOLUME FLOW RATE

CLIENT: LMSC

DATE: 12/13/90 TIME: 07:36 -11:11
UNIT: BUILDING 103
SAMPLE: INLET RUN #: 5

Duct Diameter (in.)	36.0
Rectangular Duct	0.0
Area (sq.ft.)	7.1
Duct Press. (in.Hg)	30.40
Vol. Per Cent H2O	0.99
Molecular Wt. (wet)	28.73
Standard Temp. (F)	60
Std Press. (in.Hg)	29.92
Pitot Coeff.	0.840

Pt.	In. From Edge	SIDE			TOP		
		Td	Dp	Vd	Td	Dp	Vd
1	0.8	58	0.84	50.7	64	0.91	53.1
2	2.4	58	0.79	49.2	65	0.93	53.7
3	4.3	59	0.82	50.1	64	0.92	53.4
4	6.4	60	0.82	50.2	64	0.86	51.6
5	9.0	59	0.84	50.7	64	0.85	51.3
6	12.8	60	0.86	51.4	64	0.84	51.0
7	23.2	60	0.84	50.8	65	0.86	51.6
8	27.0	60	0.79	49.2	65	0.88	52.2
9	29.6	61	0.79	49.3	64	0.88	52.2
10	31.7	61	0.74	47.7	65	0.78	49.2
11	33.6	61	0.76	48.4	65	0.58	42.4
12	35.2	62	0.78	49.0	65	0.61	43.5

RESULTS:

Avg. Vel. (Vd) 50.1 FPS @ 62 F and 30.4 in. Hg

Volume Flow Rate	Qd	21.2	x 1000 ACFM
	Qstd (wet)	21.5	x 1000 SCFM
	Qstd (dry)	21.3	x 1000 SDCFM

p 20+21
missing

PARTICULATE EMISSIONS TEST MONITOR DATA

DATE:	12/13/90	Pbar(in. Hg):	30.36	Nozzle	P0004	Diameter (mm):	6.000
CLIENT:	LMSC	Pstat(in.H2O):	0.6	Probe Length, in.	6FT	Pitot Cp:	0.840
UNIT:	BUILDING 103	Pduct(in. Hg):	30.40	LCD Meter	789	Cor.Fact.:	1.0009
SITE:	OUTLET	Initial MW:	28.0	Impinger Bkt	2	Orifice Km:	0.60
RUN #:	6	Initial %H2O:	2.0			Probe Liner:	PYREX
						Filter Holder:	PYREX

PORT SOUTH				DATA					CALCULATIONS			
#	TP	Hour	Minute	Td	DP	Tm	Vm	Vacuum	Vd	DH	Qm	%ISO
1	12	7	37	57	0.77	38	418.195	*	49.1	3.44	0.84	
2	11	7	43	57	0.72	40		*	47.5	3.24	0.82	
3	10	7	59	58	0.79	43		*	49.8	3.54	0.86	
4	9	8	5	59	0.80	45		*	50.2	3.59	0.87	
5	8	8	11	58	0.82	49		*	50.7	3.71	0.89	
6	7	8	17	59	0.85	52		*	51.7	3.85	0.91	
7	6	8	23	59	0.88	55		*	52.6	4.01	0.93	
8	5	8	29	59	0.84	57		*	51.4	3.84	0.91	
9	4	8	35	60	0.78	58		*	49.6	3.58	0.88	
10	3	8	41	60	0.76	60		*	48.9	3.51	0.87	
11	2	8	47	60	0.73	61		*	48.0	3.38	0.86	
12	1	8	57	61	0.80	60		*	50.3	3.68	0.89	
		9	3				481.371					
Sample Time =			72	59	0.80	51	63.233		50.0	3.62		84.5

PORT NORTH				DATA					CALCULATIONS			
#	TP	Hour	Minute	Td	DP	Tm	Vm	Vacuum	Vd	DH	Qm	%ISO
1	12	9	58	63	0.99	66	481.371	*	56.0	4.56	1.00	
2	11	10	4	64	0.99	68		*	56.1	4.57	1.01	
3	10	10	10	63	0.96	69		*	55.2	4.44	0.99	
4	9	10	16	63	0.93	69		*	54.3	4.31	0.98	
5	8	10	22	63	0.92	70		*	54.0	4.27	0.97	
6	7	10	28	63	0.91	70		*	53.7	4.22	0.97	
7	6	10	34	64	0.89	70		*	53.2	4.12	0.96	
8	5	10	40	64	0.89	71		*	53.2	4.13	0.96	
9	4	10	49	63	0.88	68		*	52.8	4.07	0.95	
10	3	10	55	64	0.83	70		*	51.3	3.85	0.93	
11	2	11	1	64	0.85	70		*	52.0	3.94	0.94	
12	1	11	7	64	0.89	70		*	53.2	4.12	0.96	
		11	13				551.176					
Sample Time =			72	64	0.91	69	69.868		53.7	4.22		96.3

Post-Test Leak Rate 0.020 CFM at 6 in. Hg.

Test Summary

Sample Time =			144	61		60	133.101		51.9	3.92		90.3
							NET CU. FT.					

PARTICULATE EMISSIONS

Data and Results:

Date:	12/13/90	Run #:	6
Client:	LMSC	Time:	07:37
Unit:	BUILDING 103	Project SC	
Site:	OUTLET	Project 5640-01	

Liquid Analysis:

Absorber Type	Contents	Final	Tare	Net
Mod. Grnbg.	0.1 N NaoH	576.00	570.20	5.80
Lg. Grnbg.	0.1 N NaoH	602.40	601.70	0.70
Mod. Grnbg.	EMPTY	499.10	498.50	0.60
Mod. Grnbg.	SILICA GEL	779.30	756.60	22.70
				0.00
			Total	29.80

Gas Composition:

%CO2 volume	0.0
%O2 volume	20.9
%CO volume	0.0
%N2 volume	79.1
%H2O volume	1.0

Selected Results:

Wet MW	28.73
Excess Air	
Vm Standard	136.334
%Isokinetic	99.7
Standard T	60

Chromium Analysis

Filter Sample Type: EPA GLASS FIBER MAT

Sample Fraction		mg Net	gr/SDCF
Hexavalent Cr	Less than	0.0010	1.13E-07
Hexavalent Blank	Less than	0.0010	1.13E-07
Net Hexavalent Chromium	_____	0.0010	1.13E-07
Total Cr		0.0031	3.50E-07
Blank		0.0011	1.24E-07
Net Total Chromium	_____	0.0031	3.50E-07

Particulate Results:

Concentration: grains/SDCF @ STP

Hexavalent Cr	<	1.13E-07
Total Cr		3.50E-07

Emission Rate, lbs/hr

Hexavalent Cr	<	2.11E-05
Total Cr		6.55E-05

VELOCITY TRAVERSE & VOLUME FLOW RATE

CLIENT: LMSC

DATE: 12/13/90 TIME: 07:37 -11:13
UNIT: BUILDING 103
SAMPLE: OUTLET RUN #: 6

Duct Diameter (in.) 36.0
Rectangular Duct 0.0
Area (sq.ft.) 7.1

Duct Press. (in.Hg) 30.40
Vol. Per Cent H2O 1.01
Molecular Wt. (wet) 28.73
Standard Temp. (F) 60
Std Press. (in.Hg) 29.92
Pitot Coeff. 0.840

Pt.	In. From Edge	SOUTH			NORTH		
		Td	Dp	Vd	Td	Dp	Vd
1	0.8	57	0.77	48.5	63	0.99	55.3
2	2.4	57	0.72	46.9	64	0.99	55.3
3	4.3	58	0.79	49.2	63	0.96	54.4
4	6.4	59	0.80	49.5	63	0.93	53.6
5	9.0	58	0.82	50.1	63	0.92	53.3
6	12.8	59	0.85	51.0	63	0.91	53.0
7	23.2	59	0.88	51.9	64	0.89	52.5
8	27.0	59	0.84	50.7	64	0.89	52.5
9	29.6	60	0.78	48.9	63	0.88	52.1
10	31.7	60	0.76	48.3	64	0.83	50.7
11	33.6	60	0.73	47.3	64	0.85	51.3
12	35.2	61	0.80	49.6	64	0.89	52.5

RESULTS:

Avg. Vel. (Vd) 51.2 FPS @ 61 F and 30.4 in. Hg

Volume Flow Rate Qd 21.7 x 1000 ACFM
Qstd (wet) 22.0 x 1000 SCFM
Qstd (dry) 21.8 x 1000 SDCFM

FIELD DATA
AO-1

C:\Symph\methods\5600-01

FIELD DATA CARB METHOD 425 for Cr+Cr6+

Project Lockheed
Client "
City, State Sunnyvale, CA
Site Building 103

Date 12-11-90
Run Number 1
Stack Diameter, in. 36
Coupling Length, in. 4
Number of Ports C/R 2
Points per Port 12
Minutes per Point 11

Ambient Temp ____ deg F
Barometric (Pbar) 30.25 in Hg
Static (Pstat) -2.54 in H2O
Pitot Tube (Cp) .84
Probe Length 6 ft
Probe Liner Glass
Probe Heater — deg F
Assumed Moisture 2 % H2O
Train ID 1 Operator DG
LCD Meter No. 1288 Avg Y .9927
Pump No. ____
Heater Box No. — Temp — deg F

Nozzle ID No. Q003
Nozzle Diameter 3.94 mm
Initial Leak .018 CFM @ 10 in Hg
Final Leak 0.019 CFM @ 5 in Hg
Filter Type QMA No. ____
Target: 111 CF in 264 min
Remarks: Panel #1 - 10:26; #2 10:46; #3 11:06, #4 -, #5 11:50, #6 12:11.

Trav Point No.	Time Clock (24 hr)	Time Sample (θ, min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Last Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
Side 1	10:26	0-11	4.0	78	61	61	.84	.46 (.40)	.48	46	Amb	Amb	498.093
2	10:37	11-22	3.0	76	63	58	.83	.49 (.39)	.46	46			
3	11:48	22-33	3.0	76	67	59	.80	.44 (.39)	.43	46			
4	10:59	33-44	3.0	76	67	63	.82	.45 (.39)	.44	47			
5	11:10	44-55	3.0	78	76	71	.84	.47 (.40)	.46	47			
6	11:21	55-66	3.0	78	72	63	.80	.45 (.39)	.44	47			
7	11:32	66-77	3.0	76	73	64	.74	.41 (.38)	.41	50			
8	11:43	77-88	3.0	76	73	64	.76	.42 (.38)	.42	51			
9	11:54	88-99	3.0	76	73	65	.75	.42 (.38)	.42	51			
10	12:05	99-110	3.0	76	74	60	.70	.38 (.37)	.38	50			
11	12:16	110-121	3.0	76	76	67	.80	.46 .39	.46	52			
12	12:27	121-132	3.0	76	76	68	.80	.46 (.39)	.46	52			549.921

Field Data, Continued

Project Lockheed 03 Run Number 1

Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Condenser /Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
Top 13	13:30	132-143	3.0	74	71	71	.85	.49 (.41)	.49	53	Amb.	Amb.	
14	13:41	143-154	3.0	74	73	69	.87	.51 (.41)	.49	49			
15	13:52	154-165	3.5	74	76	70	.92	.54 .42	.52	50			
16	14:03	165-176	3.5	74	76	71	.86	.51 .41	.50	51			
17	14:14	176-187	3.2	74	78	71	.84	.49 .41	.48	51			
18	14:25	187-198	3.2	74	79	71	.82	.48 .40	.47	53			
19	14:36	198-209	3.0	74	81	71	.82	.48 .40	.46	56			
20	14:47	209-220	3.0	74	82	73	.85	.51 .41	.46	58			
21	14:58	220-231	3.0	74	83	74	.85	.51 .41	.46	58			
22	15:09	231-242	3.0	74	84	75	.84	.50 .41	.46	56			
23	15:20	242-253	3.0	74	82	74	.78	.46 .39	.43	56			
24	15:31	253-264	3.0	74	81	74	.82	.49 .40	.46	55			
													604,222
Total 24		Total 264	Max 4.0	Avg	Avg			Avg	Avg	Avg	Avg	Avg	Net 106,129

TRAIN 1	Contents	Final	Initial	Net Wt.
Inlet Impinger 1	100ml 0.1N NaOH	597.2 g	592.8 g	4.4 g
Impinger 2	"	594.8 g	585.2 g	9.6 g
Impinger 3	MT KO	461.0 g	461.5 g	0.5 g
Impinger 4	Silica	764.7 g	748.3 g	16.4 g
Impinger 5		g	g	g
Impinger 6		g	g	g
	Total:	2417.7 g	2386.8 g	30.9 g

RINSES

ORSAT

CO2 ____ %

O2 (____) ____ %

CO (____) ____ %

N2 ____ %

ISOKINETICS

Mini 1 ____ %

Mini 2 ____ %

Sample Numbers (Chain-of-Custody) ____

FIELD DATA CARB METHOD 425 for Cr + Cr^{6+}

Project Lockheed
Client "
City, State Sunnyvale, CA
Site Building

Date 12-11-90
Run Number 2
Stack Diameter, in. 36
Coupling Length, in. 4
Number of Ports C/R 2
Points per Port 12
Minutes per Point 11

Ambient Temp ____ deg F
Barometric (Pbar) 20.25 in Hg
Static (Pstat) .59 in H2O
Pitot Tube (Cp) .84
Probe Length 6 ft
Probe Liner Glass
Probe Heater — deg F
Assumed Moisture 2 % H2O
Train ID 2 Operator JT
LCD Meter No. 789 Avg Y 1.0009
Pump No. ____
Heater Box No. — Temp — deg F

Nozzle ID No. P0014
Nozzle Diameter 3.94 mm
Initial Leak .018 CFM @ 10 in Hg
Final Leak .018 CFM @ 2 in Hg
Filter Type QMA No. ____
Target: 110 CF in 264 min
Remarks:
Lost power at ~ 13:48 to 13:50

Trav Point No.	Time Clock (24 hr)	Time Sample (θ, min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Last Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
South Side 12	10:27	0-11	1.0	76	54	54	.37	.37 (.36)	.42	54	Amb	Amb	186.229
11	10:38	11-22	1.1	76	58	54	.81	.44 (.38)	.46	50			
10	10:49	22-33	1.1	76	65	56	.85	.48 (.39)	.48	51			
9	11:00	33-44	1.2	76	68	58	.87	.40 (.50)	.51	53			
8	11:11	44-55	1.3	76	71	59	.91	.53 (.41)	.53	55			
7	11:22	55-66	1.3	76	71	61	.92	.54 (.42)	.56	53			
6	11:33	66-77	1.5	76	72	62	1.02	.61 (.44)	.63	55			
5	11:44	77-88	1.3	76	75	64	.89	.53 (.41)	.53	57			
4	11:55	88-99	1.1	76	73	64	.75	.42 (.36)	.44	55			
3	12:06	99-110	1.1	76	72	64	.76	.43 (.38)	.44	56			
2	12:17	110-121	1.1	76	74	65	.78	.45 (.35)	.44	57			
1	12:28	121-132	1.1	76	70	64	.75	.42 (.38)	.45	54			238.481

Field Data, Continued Project Lockheed 103 Run Number 2 Page 2 of 2

Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Condenser /Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
north 12	13:32	132-143	1.5	76	64	64	.92	.54 (.41)	.52	58	Amb.	Amb.	
11	13:43	143-154	1.5	76	68	64	.92	.54 (.42)	.53	55	↓	↓	
10	13:56	154-165	1.5	76	71	64	.93	.55 .42	.53	57			
9	14:07	165-176	1.5	76	73	65	.92	.55 .42	.55	55			
8	14:18	176-187	1.4	76	73	65	.89	.53 .41	.50	54			
7	14:29	187-198	1.4	76	75	67	.90	.54 .41	.50	60			
6	14:40	198-209	1.3	76	76	68	.86	.51 .41	.52	58			
5	14:51	209-220	1.2	76	77	68	.83	.49 .40	.49	57			
4	15:02	220-231	1.0	76	78	70	.75	.43 .38	.44	57			
3	15:13	231-242	1.0	76	77	70	.72	.41 .37	.41	53			
2	15:24	242-253	1.0	76	74	69	.66	.36 .36	.39	53			
1	15:35	253-264	1.0	76	74	68	.66	.35 .35	.35	52	↓	↓	
													290,171
Total		Total 264	Max	Avg	Avg			Avg	Avg	Avg	Avg	Avg	Net 103,942

TRAIN 2	Contents	Final	Initial	Net Wt.
Outlet Impinger 1	0.1N NaOH	581.7 g	568.5 g	13.2 g
Impinger 2	"	601.5 g	600.5 g	1.0 g
Impinger 3	M.T. KO	498.3 g	497.7 g	0.6 g
Impinger 4	Silica	750.7 g	735.7 g	15.0 g
Impinger 5		g	g	g
Impinger 6		g	g	g
	Total:	2432.2 g	2402.2 g	29.8 g

RINSES

ORSAT

CO2 %

O2 (____) %

CO (____) %

N2 %

ISOKINETICS

Mini 1

Mini 2

Sample Numbers (Chain-of-Custody)

FIELD DATA CARB METHOD 425 for Cr + Cr 6+

Project Lockheed
Client LMSC
City, State Sunnyvale, CA
Site Building 103

Date 12-12-90
Run Number 3
Stack Diameter, in. 36
Coupling Length, in. 4
Number of Ports C/R 2
Points per Port 12
Minutes per Point 6

Ambient Temp ____ deg F
Barometric (Pbar) 30.10 in Hg
Static (Pstat) -2.54 in H2O
Pitot Tube (Cp) .84
Probe Length 6 ft
Probe Liner
Probe Heater ____ deg F
Assumed Moisture 2 % H2O
Train ID ~~Orc~~ 1 Operator DG
LCD Meter No. 1288 Avg Y .9927
Pump No.
Heater Box No. — Temp ____ deg F

Nozzle ID No. P0003
Nozzle Diameter 5.60 mm
Initial Leak .02 CFM @ 10 in Hg
Final Leak .015 CFM @ 12 in Hg
Filter Type QMA No.
Target: 102.5 CF in 144 min
Remarks: Start Anchorim #1 7:46
stop 9:00 to 8:25 computer problem
#3-8:39, #4 —, #5 9:07

Only 11 panels anodized

Trav Point No.	Time Clock (24 hr)	Time Sample (θ, min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Last Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
12	7:42	0-6	7.0	67	58	50	.74	1.38 .65	1.30	44	Amb	Amb	605.395
11	7:48	6-12	7.5	67	50	53	.80	1.51 .68	1.50	44			
10	7:54	12-18	7.5	65	58	51	.79	1.51 .68	1.50	45			607.660
9	8:25	18-24	10.2	65	51	51	.84	2.07 .79	2.00	42			
8	8:31	24-30	10.5	65	55	52	.86	2.13 .81	2.10	42			
7	8:37	30-36	11.0	65	59	52	.88	2.19 .82	2.15	46			
6	8:43	36-42	9.7	64	62	53	.75	1.91 .76	1.85	49			
5	8:49	42-48	9.5	65	61	57	.74	1.87 .76	1.86	49			
4	8:55	48-54	10.0	65	66	55	.78	2.00 .78	1.98	50			
3	9:01	54-60	10.5	65	67	56	.81	2.07 .80	2.05	51			
2	9:07	60-66	10.0	65	68	57	.78	2.01 .78	1.95	51			
1	9:13	66-72	10.5	65	69	58	.81	2.09 .80	2.05	53			610.366

FIELD DATA CARB METHOD 425 for Cr + Cr^{6+}

Project Lockheed
Client LMSC
City, State Sunnyvale, CA
Site Building 103

Date 12-12-90
Run Number 4
Stack Diameter, in. 36
Coupling Length, in. 4
Number of Ports C/R 2
Points per Port 12
Minutes per Point 6

Ambient Temp ____ deg F
Barometric (Pbar) 30.10 in Hg
Static (Pstat) .56 in H2O
Pitot Tube (Cp) .84
Probe Length 6 ft
Probe Liner ____
Probe Heater — deg F
Assumed Moisture 2 % H2O
Train ID ~~7892~~ Operator JT
LCD Meter No. 789 Avg Y 1.0009
Pump No. ____
Heater Box No. — Temp — deg F

Nozzle ID No. P0004
Nozzle Diameter 6.0 mm
Initial Leak .018 CFM @ 10 in Hg
Final Leak .010 CFM @ 5 in Hg
Filter Type QMA No. ____
Target: 116.7 CF in 144 min
Remarks:
Only 11 panels anodized

Trav Point No.	Time Clock (24 hr)	Time Sample (θ, min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Last Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
Pscan 12	7:43	0-6	2.4	67	45	45	.75	~~1.71~~ .74	1.81	46	Amb	Amb	290.386
11	7:49	6-12	2.6	66	48	46	.82	~~1.93~~ .77	1.96	45			
10	7:55	12-18	2.7	64	54	46	.85	~~1.88~~ .80	2.10	46			303.928
9	8:26	18-24	3.6	64	48	48	.93	~~2.93~~ .95	2.95	47			
8	8:32	24-30	3.9	64	53	49	.93	~~2.96~~ .95	3.00	47			
7	8:38	30-36	3.9	64	58	49	.92	~~2.96~~ .95	3.00	49			
6	8:44	36-42	4.0	63	61	50	.92	~~2.98~~ .96	3.10	51			
5	8:50	42-48	4.0	64	64	52	.91	~~2.97~~ .96	3.10	52			
4	8:56	48-54	3.9	64	64	53	.89	~~2.92~~ .95	2.93	53			
3	9:02	54-60	3.9	64	64	54	.87	~~2.86~~ .94	2.92	54			
2	9:08	60-66	3.9	64	65	53	.89	~~2.92~~ .95	2.98	54			
1	9:14	66-72	3.9	64	66	56	.89	~~3.04~~ .95	3.00	55			355.210

Field Data, Continued Project LMSC Run Number 3 Page 2 of 2

	Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Condenser /Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
P top	12	9:53	72-78	11.5	65	58	58	.89	2.23 .83	2.25	45	Amb	Amb	
	11	9:59	78-84	12.5	65	58	57	.98	2.42 .87	2.40	49			
	10	10:05	84-90	12.2	65	62	57	.92	2.31 .85	2.30	51			
	9	10:11	90-96	12.0	66	64	58	.90	2.27 .84	2.27	51			680.650
	8	12:30	96-102	11.5	67	65	65	.88	2.25 .83	2.24	54			
	7	12:36	102-108	11.0	67	68	65	.84	2.17 .82	2.15	53			
	6	12:42	108-114	11.0	66	71	66	.85	2.21 .83	2.20	57			
	5	12:48	114-120	11.0	66	74	67	.86	2.25 .83	2.20	58			
	4	12:54	120-126	10.8	66	76	68	.78	2.07 .80	2.07	55			
	3	13:00	126-132	10.8	66	77	69	.86	2.27 .84	2.25	54			710.171
	2	13:06	132-138	10.2	66	78	69	.86	2.24 .83	2.24	54			
	1	13:12	138-144	10.0	66	76	70	.73	1.96 .77	1.95	54			719.356
	Total		Total 144	Max	Avg	Avg			Avg	Avg	Avg	Avg	Avg	Net 113.961

TRAIN 1 Inlet	Contents	Final	Initial	Net Wt.
Impinger 1	0.1 NaOH	591.8 g	586.0 g	5.8 g
Impinger 2	"	598.1 g	596.0 g	2.1 g
Impinger 3	M.T.	462.0 g	460.8 g	1.2 g
Impinger 4	Silica Gel	772.7 g	752.2 g	20.5 g
Impinger 5		g	g	g
Impinger 6		g	g	g
	Total:	2424.6 g	2395.0 g	29.6 g

RINSES

ORSAT
CO2 ____
O2 (____) ____
CO (____) ____
N2 ____

ISOKINETICS
Mini 1 ____
Mini 2 ____

Sample Numbers (Chain-of-Custody) ____

Field Data, Continued Project LMSC Run Number 4 Page 2 of 2

Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Condenser /Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
north 12	9:55	72-78	2.5	64	56	56	.55	1.73 .94	1.80	54	Amb	Amb	
11	10:01	78-84	3.4	64	62	57	.77	2.55 .88	2.55	48			
10	10:06	84-90	3.6	64	67	58	.79	2.64 .90	2.65	49			
9	10:17	90-96	3.2	65	69	58	.73	2.45 .86	2.45	50			375.213
8	12:31	96-102	3.3	66	68	68	.81	2.42 .85	2.50	53			
7	12:37	102-108	3.3	66	68	67	.71	2.41 .86	2.45	52			
6	12:43	108-114	3.1	65	70	66	.68	2.31 .84	2.30	53			
5	12:49	114-120	3.2	65	73	67	.71	2.44 .86	2.40	54			
4	12:55	120-126	3.5	65	74	67	.79	2.72 .91	2.72	54			
3	13:01	126-132	3.5	65	75	67	.79	2.72 .91	2.72	58			406.342
2	13:07	132-138	3.5	65	68	67	.79	2.69 .91	2.70	60			
1	13:17	138-144	3.6	65	73	67	.82	2.81 .93	2.82	60			417.225
Total		Total 144	Max	Avg	Avg			Avg	Avg	Avg	Avg	Avg	Net 126.839

TRAIN 2 Outlet

	Contents	Final	Initial	Net Wt.
Impinger 1	0.1 N NaOH	580.6 g	570.0 g	10.6 g
Impinger 2	"	604.1 g	601.6 g	2.5 g
Impinger 3	M.T.	498.6 g	498.2 g	0.4 g
Impinger 4	Silica Gel	762.8 g	741.8 g	21.0 g
Impinger 5		g	g	g
Impinger 6		g	g	g
	Total:	2446.1 g	2411.6 g	34.5 g

RINSES

ORSAT

CO2 %

O2 ( ) 20.9 %

CO ( ) %

N2 78 %

ISOKINETICS

Mini 1

Mini 2

Sample Numbers (Chain-of-Custody)

FIELD DATA CARB METHOD 425 for Cr+Cr6+ Page 1 of 2

Project Lockheed
Client LMSC
City, State Sunnyvale, CA
Site Building 103

Date 12-13-90
Run Number ~~6~~ 5
Stack Diameter, in. 36
Coupling Length, in. 4
Number of Ports C/R 2
Points per Port 12
Minutes per Point 6

Ambient Temp ____ deg F
Barometric (Pbar) 30.36 in Hg
Static (Pstat) .56 in H2O
Pitot Tube (Cp) .84
Probe Length 6 ft
Probe Liner Pyrex
Probe Heater — deg F
Assumed Moisture 2 % H2O
Train ID 2 Operator DG
LCD Meter No. 1288 Avg Y .9927
Pump No. ____
Heater Box No. — Temp — deg F

Nozzle ID No. P0004
Nozzle Diameter 5.6 mm
Initial Leak .02 CFM @ 10 in Hg
Final Leak .02 CFM @ 10 in Hg
Filter Type QMA No. ____
Target: 1 CF in 144 min
Remarks: Panel #1 in @ 7:36
Process stopped @ 7:48 – ~~[illegible]~~ sampling also.
Panel #7 @ 9:57; #8 10:10, #9 10:22; #10 @ 10:35, #11 @ 10:47, #12 10:57

Trav Point No.	Time Clock (24 hr)	Time Sample (θ, min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Last Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
Side 12	7:36	0-6	4.0	58	42	42	.84	2.01 .78	2.05	34	Amb	Amb	720.715
11	7:42	6-12	4.0	58	45	42	.79	1.91 .76	1.95	36			
10	7:58	12-18	4.0	59	50	43	.82	1.99 .78	1.95	37			731.731
9	8:04	18-24	4.0	60	49	44	.82	1.99 .78	1.95	38			
8	8:10	24-30	4.0	59	54	44	.84	2.06 .79	2.05	39			
7	8:16	30-36	4.0	60	58	46	.86	2.12 .81	2.12	40			
6	8:22	36-42	4.0	60	60	48	.84	2.09 .80	2.10	41			
5	8:28	42-48	4.0	60	61	46	.79	1.97 .77	1.99	41			
4	8:34	48-54	4.0	61	62	48	.79	1.98 .78	2.00	41			
3	8:40	54-60	3.5	61	63	49	.74	1.87 .75	1.82	42			
2	8:46	60-66	3.5	61	64	50	.76	1.92 .76	1.90	42			Stop for ~4 min
1	8:56	66-72	3.8	62	58	51	.78	1.95 .77	1.91	41			777.025

Field Data, Continued Project LMSC Run Number #5 Page 2 of 2

Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Condenser /Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
top 12	9:57	72-78	4.2	64	49	49	.91	2.19 .82	2.20	37	Amb	Amb.	
11	10:03	78-84	4.2	65	53	50	.93	2.25 .83	2.25	37			
10	10:09	84-90	4.2	64	58	50	.92	2.25 .83	2.25	42			
9	10:15	90-96	4.2	64	61	51	.86	2.13 .81	2.09	45			
8	10:21	96-102	4.2	64	63	52	.85	2.12 .81	2.09	46			
7	10:27	102-108	4.0	64	65	53	.84	2.11 .80	2.15	46			
6	10:33	108-114	4.2	65	66	54	.86	2.16 .81	2.15	46			
5	10:39	114-120	4.5	65	67	55	.88	2.21 .83	2.25	46			
4	10:47	120-126	4.5	64	61	55	.88	2.19 .82	2.20	43			Stopped 10:46 for ~2 min.
3	10:53	126-132	4.0	65	64	56	.78	1.98 .78	1.90	43			
2	10:59	132-138	3.0	65	66	56	.58	1.48 .67	1.38	46			
1	11:05	138-144	3.0	65	66	57	.61	1.56 .69	1.52	45	✓	✓	833.940
Total		Total	Max	Avg	Avg			Avg	Avg	Avg	Avg	Avg	Net 113,225

TRAIN 1	Contents	Final	Initial	Net Wt.
Impinger 1 (Inlet)	0.1N NaOH	591.1 g	585.9 g	5.2 g
Impinger 2	"	597.5 g	596.6 g	0.9 g
Impinger 3	M.T.	462.3 g	461.8 g	0.5 g
Impinger 4	Silica Gel	783.6 g	765.3 g	18.3 g
Impinger 5		g	g	g
Impinger 6		g	g	g
	Total:	2434.5 g	2409.6 g	24.9 g

RINSES

ORSAT

CO2 ____ %

O2 (____) ____ %

CO (____) ____ %

N2 ____ %

ISOKINETICS

Mini 1 ____ %

Mini 2 ____ %

Sample Numbers (Chain-of-Custody) ____

Field Data, Continued Project LMSC Run Number 6 Page 2 of 2

Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Condenser /Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
Pnorth 12	9:58	72-78	5.5	63	66	65	.99	3.25 1.01	3.40	47	Amb	Amb	
11	10:04	78-84	6.0	64	71	65	.99	3.30 1.01	3.40	46			
10	10:10	84-90	5.7	63	72	65	.96	3.22 1.00	3.42	49			
9	10:16	90-96	5.3	63	72	66	.93	3.13 .98	3.22	51			
8	10:22	96-102	5.6	63	73	66	.92	3.11 .98	3.24	51			
7	10:28	102-106	6.1	63	73	66	.91	3.08 .97	3.17	50			
6	10:34	108-114	4.3	64	73	66	.89	3.01 .96	3.17	51			
5	10:40	114-120	4.3	64	74	67	.89	3.02 .96	3.17	50			
4	10:49	120-126	4.0	63	70	66	.88	2.97 .95	3.00	50			
3	10:55	126-132	4.0	64	73	66	.83	2.82 .93	2.97	51			
2	11:01	132-138	4.0	64	73	66	.85	2.88 .94	3.00	51			
1	11:07	138-144	4.0	64	73	66	.89	3.01 .96	3.09	52			
													551.176
Total		Total	Max	Avg	Avg			Avg	Avg	Avg	Avg	Avg	Net 132,981

TRAIN 2	Contents	Final	Initial	Net Wt.
Impinger 1 (Outlet)	0.1 N NaOH	576.0 g	570.2 g	5.8 g
Impinger 2	"	602.4 g	601.7 g	0.7 g
Impinger 3	M.T.	499.1 g	498.5 g	0.6 g
Impinger 4	Silica Gel	779.3 g	756.6 g	22.7 g
Impinger 5		g	g	g
Impinger 6		g	g	g
	Total:	2456.8 g	2427.0 g	29.8 g

RINSES

ORSAT

CO2 ____ %

O2 (____) ____ %

CO (____) ____ %

N2 ____ %

ISOKINETICS

Mini 1 ____ %

Mini 2 ____ %

Sample Numbers (Chain-of-Custody) ____

5-2-16

FIELD DATA CARB METHOD 425 for Cr + Cr^{6+} Page 1 of 2

Project Lockheed
Client LMSC
City, State Sunnyvale, CA
Site Building 103

Date 12-13-90
Run Number 6
Stack Diameter, in. 36
Coupling Length, in. 4
Number of Ports C/R 2
Points per Port 12
Minutes per Point 6

Ambient Temp ____ deg F
Barometric (Pbar) 30.36 in Hg
Static (Pstat) ~~0~~ -2.54 in H2O
Pitot Tube (Cp) .84
Probe Length 6 ft
Probe Liner Pyrex
Probe Heater — deg F
Assumed Moisture 2 % H2O
Train ID 1 Operator JT
LCD Meter No. 789 Avg Y 1.0009
Pump No. ____
Heater Box No. — Temp — deg F

Nozzle ID No. P0003
Nozzle Diameter 6.0 mm
Initial Leak .014 CFM @ 9 in Hg
Final Leak .02 CFM @ 6.1 in Hg
Filter Type QMA No. ____
Target: 1 CF in 144 min
Remarks: Pump #1 in @ 7:36; #3 8:10; #4 @ 8:24

Trav Point No.	Time Clock (24 hr)	Time Sample (θ, min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Last Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
12	7:37	0-6	3.5	57	38	38	.77	2.35 .85	2.45	42	Amb.	Amb.	478.195
11	7:43	6-12	3.3	57	41	38	.72	2.20 .82	2.30	41			
10	7:59	12-18	3.5	58	46	39	.79	2.45 .87	2.55	47			428.953
9	8:05	18-24	3.6	59	48	41	.80	2.50 .87	2.56	47			
8	8:11	24-30	3.6	58	55	43	.82	2.61 .89	2.67	49			
7	8:17	30-36	3.8	59	59	44	.85	2.73 .91	2.85	48			
6	8:23	36-42	3.9	59	62	47	.88	2.85 .93	2.93	49			
5	8:29	42-48	3.9	59	64	49	.84	2.75 .92	2.91	53			
4	8:35	48-54	3.5	60	66	50	.78	2.56 .86	2.62	55			
3	8:41	54-60	3.5	60	67	52	.76	2.51 .88	2.62	54			Stop for ~4
2	8:47	60-66	3.4	60	68	53	.73	2.42 .86	2.59	54			
1	8:57	66-72	3.5	61	65	55	.80	2.64 .90	2.70	54			481.371

Field Data, Continued Project LMSC Run Number 6 Page 2 of 2

Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Condenser /Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
Pnorth 12	9:58	72-78	5.5	63	66	65	.99	3.26 1.01	3.40	47	Amb	Amb	
11	10:04	78-84	6.0	64	71	65	.99	3.30 1.01	3.40	46			
10	10:10	84-90	5.7	63	72	65	.96	3.22 1.00	3.42	49			
9	10:16	90-96	5.3	63	72	66	.93	3.13 .98	3.22	51			
8	10:22	96-102	5.6	63	73	66	.92	3.11 .98	3.24	51			
7	10:28	102-108	6.1	63	73	66	.91	3.08 .97	3.17	50			
6	10:34	108-114	4.3	64	73	66	.89	3.01 .96	3.17	51			
5	10:40	114-120	4.3	64	74	67	.89	3.02 .96	3.17	50			
4	10:49	120-126	4.0	63	70	66	.88	2.97 .95	3.00	50			
3	10:55	126-132	4.0	64	73	66	.83	2.82 .93	2.97	51			
2	11:01	132-138	4.0	64	73	66	.85	2.88 .94	3.00	51			
1	11:07	138-144	4.0	64	73	66	.89	3.01 .96	3.09	52			[illegible]
													551.176
Total		Total	Max	Avg	Avg			Avg	Avg	Avg	Avg	Avg	Net 132.981

TRAIN 2

	Contents	Final	Initial	Net Wt.	RINSES
Ocatlet Impinger 1	0.1 N NaOH	576.0 g	570.2 g	5.8 g	
Impinger 2	"	602.4 g	601.7 g	0.7 g	
Impinger 3	M.T.	499.1 g	498.5 g	0.6 g	
Impinger 4	Silica Gel	779.3 g	756.6 g	22.7 g	
Impinger 5		g	g	g	
Impinger 6		g	g	g	
	Total:	2456.8 g	2427.0 g	29.8 g	

ORSAT

CO2 ____ %

O2 (____) ____ %

CO (____) ____ %

N2 ____ %

ISOKINETICS

Mini 1 ____ %

Mini 2 ____ %

Sample Numbers (Chain-of-Custody) ____

FIELD DATA CARB METHOD 425 for Cr & Cr^{6+}

Project Lockheed
Client LMSC
City, State Sunnyvale, CA
Site Building 107

Date 12-13-90
Run Number 100
Stack Diameter, in. 0
Coupling Length, in. 0
Number of Ports C/R 0
Points per Port 0
Minutes per Point 0

Ambient Temp _____ deg F
Barometric (Pbar) _____ in Hg
Static (Pstat) _____ in H2O
Pitot Tube (Cp) _____
Probe Length _____ ft
Probe Liner _____
Probe Heater _____ deg F
Assumed Moisture _____ % H2O
Train ID _____ Operator _____
LCD Meter No. _____ Avg Y _____
Pump No. _____
Heater Box No. _____ Temp _____ deg F

Nozzle ID No. _____
Nozzle Diameter _____ mm
Initial Leak ____ CFM @ ____ in Hg
Final Leak ____ CFM @ ____ in Hg
Filter Type _____ No. _____
Target: ____ CF in ____ min
Remarks: Blank train

Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Last Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)

Field Data, Continued Project Lockheed Run Number 100 Page 2 of 2

Trav Point No.	Time Clock (24 hr)	Time Sample (θ,min)	Vacuum ("Hg)	Stack Temp (deg F)	Meter Temp (deg F) In	Meter Temp (deg F) Out	Delta P ("H2O)	Delta H ("H2O) Calc	Delta H ("H2O) Act	Condenser /Impinger (deg F)	Probe Temp (F)	Filter Temp (F)	Meter Volume (CF)
Total		Total	Max	Avg	Avg			Avg	Avg	Avg	Avg	Avg	Net

TRAIN 3

	Contents	Final	Initial	Net Wt.	RINSES
Impinger 1	0.1N NaOH	g	583.9 g	g	
Impinger 2	"	g	581.7 g	g	
Impinger 3	M.T.	g	468.9 g	g	
Impinger 4	Silica Gel	g	756.4 g	g	
Impinger 5		g	g	g	
Impinger 6		g	g	g	
	Total:	g	g	g	

ORSAT

CO2 %

O2 ( ) %

CO ( ) %

N2 %

ISOKINETICS

Mini 1

Mini 2

Sample Numbers (Chain-of-Custody) Blank Train

LMSC B103 SUNNYVALE
TANK #68
EMISSION TEST
LMSC SPEC # 020700 Anodize Time 7 min ± 5 sec at 20 amp/ft²
PANELS 4 x 6 ft = 48 ft² + 0.5 ft² for equipt

DATE/RUN #	TIME OF DAY	TANK TEMP °F	VOLTAGE START	VOLTAGE END	AMP START	AMP END	ELAPED TIME MIN	AMP-HOUR
12-11 / A1	10:19	165°F	50	90	970	970	7	113.2
2	10:44	165	50	92	970	970	7	113.2
3	11:04	165	50	92	970	970	7	113.2
4	11:20	165	50	92	970	970	7	113.2
5	11:43	165°F	50	92	970	970	7	113.2
— Strip. 6	12:03	165°F	50	92	970	970	7	113.2
7	1:19	165°F	50	92	970	970	7	113.20
8	1:39	165°F	50	92	970	970	7	113.20
9	2:01	166°F	50	92	970	970	7	113.20
10	2:35	166°F	50	92	970	970	7	113.20
11	3:07	166°F	50	92	970	970	7	113.20
12	3:35	166°F	50	92	970	970	7	113.20

AMP IS CONSTAN

AMP-HOUR = $\frac{\text{AMP} \times \text{ELAPS TIME}}{60}$

49.5 x 2 = 970 amp

$\frac{970 \times 7}{60} = 113.2$
113.17

12/11/90
PROCESSOR
X [signature]

LMSC B103 SUNNYVALE
TANK #68
EMISSION TEST
LMSC SPEC # 020700 Anodize Time 7 min ± 5 sec at 20 amp/ft²
PANELS 4 x 6 ft = 48 ft² + 1.5 ft² for equipt

DATE/RUN #		TIME OF DAY	TANK TEMP °F	VOLTAGE START	VOLTAGE END	AMP START	AMP END	ELAPED TIME MIN	AMP-HOUR
2/12	1	7:43	174°F	48	90	970	970	7	113.2
	2	8:23	174	48	90	970	970	7	113.2
	3	8:37	174	48	90	970	970	7	113.2
	4	8:50	174	48	90	970	970	7	113.2
	5	9:02	174	46	91	970	970	7	113.2
STRIP	6	9:50	173	46	91	970	970	7	113.2
	7	10:04	173	46	91	970	970	7	113.2
	8	10:23	173	46	92	970	970	7	113.2
	9	12:40	174	47	92	970	970	7	113.2
	10	12:55	174	47	92	970	970	7	113.2
	11	1:08	174	48	92	970	970	7	113.2
	~~12~~	~~1:22~~	~~174~~	~~47~~	~~92~~	~~970~~	~~970~~	~~7~~	~~113.2~~

AMP IS CONSTANT

AMP-HOUR = $\frac{\text{AMP} \times \text{ELAPS TIME}}{60}$

12/12/90

PROCESSOR

x [signature]

LMSC B103 SUNNYVALE
TANK #68
EMISSION TEST
LMSC SPEC # 020700 Anodize Time 7 min ± 5 sec at 20 amp/ft²
PANELS 4 x 6 ft = 48 ft² + 1.5 ft² for equipt

DATE/RUN # 12/13/90	TIME OF DAY	TANK TEMP °F	VOLTAGE START	VOLTAGE END	AMP START	AMP END	ELAPED TIME MIN	AMP-HOUR
1	7:35	166	48	92	970	970	7	113.2
2	7:55	166°F	48	92	970	970	7	113.2
3	8:10	166	50	92	970	970	7	113.2
4	8:23	166	50	92	970	970	7	113.2
5	8:37	166	50	92	970	970	7	113.2
6	8:49	166	50	92	970	970	7	113.2
7	9:54	166	50	92	970	970	7	113.2
8	10:09	166	50	92	970	970	7	113.2
9	10:21	166	51	92	970	970	7	113.2
10	10:33	166	50	92	970	970	7	113.2
11	10:45	166	50	92	970	970	7	113.2
12	10:55	166	50	92	970	970	7	113.2

AMP IS CONSTANT

AMP-HOUR = $\frac{\text{AMP} \times \text{ELAPS TIME}}{60}$

PROCESSOR

X

LABORATORY RESULTS
AO-2

Analytical Report

LOG NO: E90-12-261

Received: 11 DEC 90
Reported: 27 DEC 90

Mr. Scott Chesnut
BC Analytical, Air Monitoring Program
2000 Powell Street
Emeryville, California 94608

Project: 5640-01

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, VAPOR OR AIR SAMPLES	DATE SAMPLED
12-261-1	R1-1, R1-2, R1-3	11 DEC 90
12-261-2	R2-1, R2-2, R2-3	11 DEC 90

PARAMETER	12-261-1	12-261-2
Chromium, Hexavalent, ug	5.0	<1
Chromium, ug	6.0	5.6
Digestion for Air Samples, Date	12.18.90	12.18.90

Sim D. Lessley, Ph.D., Laboratory Director

1255 Powell Street
Emeryville, CA 94608

415/428-2300
Fax: 415/547-3643

BCA B C Analytical

Analytical Report

LOG NO: E90-12-303

Received: 13 DEC 90
Reported: 27 DEC 90

Mr. Scott Chestnut
BC Analytical, Air Monitoring Program
2000 Powell Street
Emeryville, California 94608

Project: 5640.01

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, VAPOR OR AIR SAMPLES	DATE SAMPLED
12-303-1	R5-1, R5-2, R5-3	13 DEC 90
12-303-2	R6-1, R6-2, R6-3	13 DEC 90

PARAMETER	12-303-1	12-303-2
Chromium, Hexavalent, ug	1.2	<1
Chromium, ug	6.1	3.1
Digestion for Air Samples, Date	12.18.90	12.18.90

Sim D. Lessley, Ph.D, Laboratory Director

1255 Powell Street
Emeryville, CA 94608

415/428-2300
Fax: 415/547-3643

BCA B C Analytical

Analytical Report

LOG NO: E90-12-261

Received: 11 DEC 90
Reported: 27 DEC 90

Mr. Scott Chesnut
BC Analytical, Air Monitoring Program
2000 Powell Street
Emeryville, California 94608

Project: 5640-01

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, VAPOR OR AIR SAMPLES	DATE SAMPLED
12-261-1	R1-1, R1-2, R1-3	11 DEC 90
12-261-2	R2-1, R2-2, R2-3	11 DEC 90

PARAMETER	12-261-1	12-261-2
Chromium, Hexavalent, ug	5.0	<1
Chromium, ug	6.0	5.6
Digestion for Air Samples, Date	12.18.90	12.18.90

Sim D. Lessley, Ph.D., Laboratory Director

1255 Powell Street
Emeryville, CA 94608

415/428-2300
Fax: 415/547-3643

BCA B C Analytical

Analytical Report

LOG NO: E90-12-285

Received: 12 DEC 90
Reported: 27 DEC 90

Ms. Scott Chestnut
BC Analytical, Air Monitoring Program
2000 Powell Street
Emeryville, California 94608

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, VAPOR OR AIR SAMPLES	DATE SAMPLED
12-285-1	R3-1, R3-2, R3-3	12 DEC 90
12-285-2	R4-1, R4-2, R4-3	12 DEC 90
12-285-3	R100-1, R100-2, R100-3	12 DEC 90

PARAMETER	12-285-1	12-285-2	12-285-3
Chromium, Hexavalent, ug	5.1	<1	<1
Chromium, ug	13	1.2	1.1
Digestion for Air Samples, Date	12.18.90	12.18.90	12.18.90

Sim D. Lessley, Ph.D., Laboratory Director

1255 Powell Street
Emeryville, CA 94608

415/428-2300
Fax: 415/547-3643

BCA B C Analytical

LOG NO: E90-12-102
B C Analytical

Received: 05 DEC 90
Reported: 27 DEC 90

Mr. Scott Chestnut
BC Analytical, Air Monitoring Program
2000 Powell Street
Emeryville, California · 94608

Project: 5640-01

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, AQUEOUS SAMPLES	DATE SAMPLED
12-102-1	Solution with Precipitate	05 DEC 90

PARAMETER	12-102-1
Chromium, Hexavalent, mg/L	23000
Chromium, mg/L	40000
Nitric Acid Digestion, Date	12.17.90

This report has been revised to correct the total chromium result. The original result did not account for dilution digestion. January 17, 1991. B. Bowman.

Sim D. Lessley, Ph.D., Laboratory Director

2000 Powell Street
Suite 1210
Emeryville, CA
94608
415/658-9367
Fax: 415/658-2724

CALIBRATION DATA
AO-3

PUMP METER ASSEMBLY CALIBRATION DATA

DATE 12/3/90
OPERATOR JT

PUMP NUMBER 0486
ASSEMBLY NUMBER 789-3122
AVERAGE Y 1.0009
AVERAGE %Dev. 0.91

	RUN #1	RUN #2	RUN #3
Pbar (in.Hg) 30.55			
RUN TIME (MIN.)	20	20	20
WET METER DATA			
Mi	00.021	00.025	00.011
Mf	08.175	11.117	13.094
Tm (F)	(67.5)(67.8)(67.9)(67.9)(67.5)	(67.9)(67.8)(67.9)(67.9)(67.9)	(67.9)(67.9)(68.0)(68.0)(68.0)
DH (in.)	0.44	0.65	0.83
DRY METER DATA			
Mi	030.225	038.336	049.587
Mf	038.336	049.587	062.980
Tm (F)	(60.0)(61.5)(62.0)(65.0)(65.0)	(66.5)(66.5)(67.0)(67.5)(67.0)	(69.0)(68.0)(68.5)(70.0)(61.0)
DH (in.)	0.5	1.0	1.50
RESULTS			
RATE	0.41	0.57	0.68
Y	1.0151	0.9956	0.9920
%DEV.	-1.51	0.44	0.80
Tol.	0.01	0.01	0.01

PUMP METER ASSEMBLY CALIBRATION DATA

DATE 12-3-90
OPERATOR VT

PUMP NUMBER 0488
ASSEMBLY NUMBER 1288-3185
AVERAGE Y 0.9927
AVERAGE %Dev. 0.73

	RUN #1	RUN #2	RUN #3
Pbar (in.Hg) 30.55			
RUN TIME (MIN.)	20	20	20
WET METER DATA			
Mi	00.068	00.046	00.001
Mf	08.240	11.2001	13.4795
Tm (F)	(58.0)(58.0)(58.0)(57.5)(57.5)	(57.5)(57.5)(57.5)(57.5)(57.5)	(57.5)(57.5)(57.5)(57.5)(57.5)
DH (in.)	0.5	0.66	0.91
DRY METER DATA			
Mi	329.650	337.915	349.326
Mf	337.915	349.326	363.162
Tm (F)	(59.0)(61.0)(63.0)(64.0)(65.0)	(62.0)(64.5)(66.5)(67.0)(67.0)	(62.5)(66.5)(68.0)(68.5)(69.5)
DH (in.)	0.5	1.0	1.5
RESULTS			
RATE	0.42	0.58	0.70
Y	0.9977	0.9916	0.9888
%DEV.	0.23	0.84	1.12
Tol	0.01	0.00	0.00

PUMP METER ASSEMBLY CALIBRATION DATA

PUMP NUMBER 0386-02
ASSEMBLY NUMBER 789-3122
AVERAGE Y 1.0095
AVERAGE %Dev. 1.50

DATE 12/18/90
OPERATOR JT

	RUN #1	RUN #2	RUN #3
Pbar (in.Hg) 30.26			
RUN TIME (MIN.)	20	20	20
WET METER DATA			
Mi	00.026	00.039	00.088
Mf	07.839	10.989	13.2905
Tm (F)	(58.4)(58.4)(58.4)(58.4)(58.4)	-(58.4)(58.0)(58.0)(58.0)(58.0)	-(58.0)(58.0)(58.0)(58.0)(58.0)
DH (in.)	0.42	0.66	0.88
DRY METER DATA			
Mi	562.003	569.667	580.585
Mf	569.667	580.585	594.025
Tm (F)	(57.5)(60.5)(61.5)(62.0)(62.0)	-(57.5)(63.5)(64.0)(65.5)(66.0)	-(60.0)(62.5)(64.0)(66.0)(66.5)
DH (in.)	0.5	1.0	1.5
RESULTS			
RATE	0.39	0.55	0.68
Y	1.0238	1.0129	0.9917
%DEV.	-2.38	-1.29	0.83
	0.01	0.00	0.02

PUMP METER ASSEMBLY CALIBRATION DATA

DATE 12/18/90
OPERATOR JT

PUMP NUMBER 0386-02
ASSEMBLY NUMBER 1288-3105
AVERAGE Y 1.0044
AVERAGE %Dev. 0.97

	RUN #1	RUN #2	RUN #3
Pbar (in.Hg) 30.26			
RUN TIME (MIN.)	20	20	20
WET METER DATA			
Mi	00.089	00.060	00.082
Mf	08.360	11.382	13.385
Tm (F)	(58.5)(58.5)(58.5)(58.5)(58.5)	(58.6)(58.6)(58.6)(58.7)(58.7)	(58.7)(58.8)(58.9)(58.9)(58.9)
DH (in.)	0.44	0.65	0.82
DRY METER DATA			
Mi	837.614	845.916	857.338
Mf	845.916	857.338	871.050
Tm (F)	(62.5)(64.5)(66.0)(67.5)(68.0)	(66.0)(69.5)(70.5)(70.5)(71.0)	(70.0)(70.0)(72.0)(72.5)(72.5)
DH (in.)	0.5	1.0	1.5
RESULTS			
RATE	0.42	0.57	0.18
Y	1.0100	1.0112	0.9921
%DEV.	~~0.01~~ -1.00	-1.12	0.79
	0.01	0.01	0.01

Source category: Electroplating
Plant name : Lockheed Missiles & Space Inc.
Process : Magnesium anodizing

Filename: REF_4-78.WQ1
Location: Sunnyvale, CA
Test date: December 11-13, 1990

Date: 04/19/96
Ref. No.: 4-78
Process rate basis: Tank surface area

Tank type	Type of control	Pollutant	Run No.	Test Meth.	Samp. time, min	Isokin. %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, ug	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ft2	Emission factor g/hr-m2	Emission factor gr/hr-ft2	Rat.
Magnesium anodizing tank	none	total Cr	1	CARB 425	264	99.8	104.51	20,900	6.00	8.86E-07	0.00016	102	0.0076	0.011	
		total Cr	2		144	97.4	114.27	21,300	13.00	1.76E-06	0.00032	102	0.015	0.022	
		total Cr	3		144	99.1		21,300	6.10		0.00015	102	0.0070	0.010	
		Average								1.32E-06			0.010	0.014	C
		Cr+6	1	CARB 425	264	99.8	104.51	20,900	5.00	7.38E-07	0.00013	102	0.0063	0.0091	
		Cr+6	2		144	97.4	114.27	21,300	5.10	6.89E-07	0.00013	102	0.0060	0.0086	
		Cr+6	3		144	99.1		21,300	1.20		2.9E-05	102	0.0014	0.0020	
		Average								7.14E-07			0.0046	0.0066	NR
	WS	total Cr	1	CARB 425	264	99.2	103.94	21,100	1.00	1.48E-07	2.7E-05	102	0.0013	0.0018	
		total Cr	2		144	97.8	128.87	21,000	1.00	1.20E-07	2.2E-05	102	0.0010	0.0015	
		total Cr	3		144	99.7	136.33	21,800	1.00	1.13E-07	2.1E-05	102	0.0010	0.0015	
		Average								1.27E-07			0.0011	0.0016	C
		Cr+6	1	CARB 425	264	99.2	103.94	21,100	5.60	8.31E-07	1.5E-04	102	0.0072	0.0103	
		Cr+6	2		144	97.8	128.87	21,000	1.20	1.44E-07	2.6E-05	102	0.0012	0.0018	
		Cr+6	3		144	99.7	136.33	21,800	3.10	3.51E-07	6.6E-05	102	0.0031	0.0045	
		Average								4.42E-07			0.0039	0.0055	NR

(a) WS = wet scrubber

Notes: Modified acid fluoride anodizing process; used to anodize magnesium parts, using solution of H2PO4, NaCr2, and NH4F2.
Cr+6 data below quantification limit.
Liquid surface area not given for tank; estimated based on volume of 5450 gal specified in report. Assuming L = 2W and D = W,
5450/7.48 = 728.3 ft3 = (2W)(W)(W)
W = 7.14 ft, A = (2)(7.14(7.14) = 102 ft2