1/1 - Gr

3.1

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

Project No. 1685

SOURCE EVALUATION REPORT

Oregon Steel Mills
Portland, Oregon

Electric Arc Furnace Baghouse
Particulate, CO, NO_x, SO_2, VOC, Lead and Opacity

November 7.2001

Prepared for
Oregon Steel Mills
14400 N. Rivergate Blvd.
Portland, Oregon 97203

by Michele R. Kinney &
David R. Rossman, P.E.

RECEIVED
FEB 8 2002
DEQ/ENVIRONMENTAL QUALITY
NORTHWEST REGION

REGISTERED PROFESSIONAL ENGINEER
8913
OREGON
12/20/01
July 30, 1976
DAVID R. ROSSMAN

Expires 12/31/02

TABLE OF CONTENTS

	Page Number
1. Certification	**4**
2. Introduction	**5**
3. Summary of Results	**6**
4. Source Description and Operation	**10**
5. Sampling and Analytical Procedures	**12**
6. Discussion	**17**

APPENDIX

	Page Number
Nomenclature & Drift Correction Documentation	**18**
Particulate and Lead Calculation Sheets	**20**
Emission Calculation Worksheets and Field Data Sheets	
Blank Correction and Filter Rinse Allocation	
Laboratory Results, Worksheets, Chain of Custody & Filter Tare Weights	
Baghouse Sampling Diagram	
Volume Flow Rate Determination	**50**
Flow Rate Determinations and Field Data	
Traverse Point Location – Inlet & Outlet	
Visible Emissions	**61**
Field Data and Certification	
Gaseous Emissions	**65**
Gaseous Emissions and Molecular Weight Determinations	
Analyzer Calibration Data, Manual Data and Bias Checks	
Data Logger Gas Charts	
Strip Charts	
Production/Process Data	**77**
Furnace Heat Logs	
MSDS Sheet	
Baghouse Pressure Drop Field Data	
Calibration Information	**107**
High-Volume Sampler Calibrations	
Pitots	
Thermocouples and Indicators	
Shortridge Micro manometer	
Magnehelic	
Barometer	
NOx Converter Efficiency Test	
Calibration Gas Certificates	
Audit Sample Results, reporting forms and instructions	
QA/QC Documentation	**141**
Correspondence	**144**
Source Test Plan and Correspondence	

1. CERTIFICATIONS

1.1 Test Team Leader

I hereby certify that the test detailed in this report, to the best of my knowledge, was accomplished in conformance with applicable rules and good practices. The results submitted herein are accurate and true to the best of my knowledge.

Name: Michael J. Eisele, E.I.T.

Signature Mike Eisele Date 12/17/01

1.2 Report Reviewer

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with applicable rules and good practices, to the best of my knowledge.

Name: David R. Rossman, P.E.

Signature David Rossman Date 12/20/01

2. INTRODUCTION

2.1 Client: Oregon Steel Mills

2.2 Physical Location: 14400 N. Rivergate Blvd., Portland, OR 97203

2.3 Mailing Location: P. O. Box 2760, Portland, OR 97208

2.4 Test Log

Test Date	Source Name	Pollutants
November 7, 2001	Electric Arc Furnace Baghouse	Particulate, CO, NO_x, SO_2, VOC, Lead and Opacity

2.5 Test Purpose: Required by Title V Permit No. 26-1865, conditions 37, 38 and 39, issued by the Oregon Department of Environmental Quality (ODEQ).

2.6 Background Information: The expired ACDP Permit required testing for particulate, lead, CO, and opacity on a quarterly basis. The new Title V Permit requires the list above annually.

2.7 Participants:

Horizon Personnel:

Michael J. Eisele, E.I.T., Team Leader
Ryan S. Smith, Field Technician
Tim J. Hertel, Field Technician
Dharma Cole, E.I.T., Field Technician
Brian Galvin, Field Technician
Jay Griffith, Field Technician
Michael E. Wallace, Calculations and QA/QC
David R. Rossman, P.E., Report Review
Michele R. Kinney, Technical Writer

Test Arranged by: Debbie Deetz Silva, Oregon Steel Mills
Source Operator: Mike Anderson
Test Plan Sent to: Jack Herbert, ODEQ

3. SUMMARY OF RESULTS

3.1 Table(s) of Results

Particulate and Lead Test Results

Test Date: November 7, 2001

	Units	Run 1	Run 2	Run 3	Average
Start Time		10:31	12:09	13:50	
End Time		12:05	13:33	15:17	
Sampling Time	min	70	65	60	65
Sampling Results					
Particulate Conc.(Actual)	gr/scfd	0.00069	0.00083	0.00106	0.00086
Particulate Rate	lb/hr	3.1	3.7	4.7	3.9
Based on Cold Charge	lb/ton	0.0227	0.0268	0.0344	0.0280
Sample Volume	dscf	2,214	1,978	1,870	2,021
Sample Weight, Total	mg	98.6	106.6	128.3	111.2
Percent Isokinetic	%	98	100	100	98
Lead Rate	lb/hr	0.036	0.043	0.054	0.044
Based on Cold Charge	lb/ton	0.00026	0.00031	0.00039	0.00032
% of Total Particulate	%	1.14	1.16	1.15	1.15
Opacity	%	0	0	0	0
Source Parameters					
Inlet Flow Rate	dscf/min				389,000
Outlet Flow Rate	dscf/min	530,000	525,000	522,000	526,000
Temperature, Outlet	°F	143	158	155	152
Process Data					
Cold Charge Production	tons/hr	137.36	139.40	137.82	138.20
Baghouse Press. Drop, Avg.	in H_2O	4.5	5.5	6.0	5.3

Table 2

Gaseous Emissions Test Results

Test Date: November 7, 2001

		Units	Run 1	Run 2	Run 3	Average
Start Time			10:31	12:09	13:50	
End Time			12:05	13:33	15:17	
Sampling Time		min	70	65	60	65
Sampling Results						
O_2		%	20.5	20.5	20.5	20.5
CO_2		%	0.6	0.5	0.6	0.6
CO	Concentration	ppmv	202	135	124	154
	Rate	lb/hr	341.6	229.6	210.8	260.7
	Based on Cold Charge	lb/ton	2.49	1.65	1.53	1.89
NO_x	Concentration	ppmv	11	12	11	11
	Rate	lb/hr	30.5	32.9	29.5	31.0
	Based on Cold Charge	lb/ton	0.22	0.24	0.21	0.22
SO_2	concentration[1]	ppmv	5	5	4	4
	Rate	lb/hr	19.1	21.2	14.9	18.4
	Based on Cold Charge	lb/ton	0.14	0.15	0.11	0.13
TGOC	Concentration	ppmvC	29	21	21	24
	Rate	lbC/hr	21.1	15.2	15.1	17.1
	Based on Cold Charge	lbC/ton	0.15	0.11	0.11	0.12
TGNMOC[2]	Concentration	ppmvC	9	9	12	10
	Rate	lbC/hr	6.7	6.4	9.1	7.4
	Based on Cold Charge	lbC/ton	0.049	0.046	0.066	0.053

[1] SO2 results may be slightly high due to excessive drift during the testing. The results are drift corrected.
[2] VOC emissions as total gaseous non-methane organic compounds

3.2 Description of Collected Samples:

See Blank Correction and Rinse Allocation in Appendix.

3.3 Discussion of Errors and Quality Assurance Procedures

This table is taken from a paper entitled "Significance of Errors in Stack Sampling Measurements", by R.T. Shigahara, W.F. Todd and W.S. Smith. It summarizes the maximum error expressed in percent, which may be introduced into the particulate test procedures by equipment or instrument limitations.

Measurement	% Max Error
Stack Temperature Ts	1.4
Meter Temperature Tm	1.0
Stack Gauge Pressure Ps	0.42
Meter Gauge Pressure Prn	0.42
Atmospheric Pressure Patm	0.21
Dry Molecular Weight Md	0.42
Moisture Content Bws (Absolute)	1.1
Differential Pressure Head AP	10.0
Orifice Pressure Differential AH	5.0
Pitot Tube Coefficient Cp	2.4
Orifice Meter Coefficient Km	1.5
Diameter of Probe Nozzle Dn	0.80

QA procedures outlined in the test methods were followed, including 'equipment specifications and operation, calibrations, sample recovery and handling, calculations and performance tolerances.

Analyzer system checks performed are noted on the Calibration Field Record sheet, with procedures documented in the QA/QC section in the Appendix. All calibration standards used in the testing were EPA Protocol 1 or traceable to NIST standards. Certificates for the gases are in the Appendix. Tables 3a and 3b summarize the quantifiable QA checks for the continuous emissions monitors.

Table 3a

QA/QC Checks – Continuous Analyzers, Daily Checks

	Cal. Error <2% span or <5% span[3]	System Bias <5%	Cylinder value, % of span[4]	Instrument Span
O_2:				25%
high	0%	--	84%	
mid	0%	0%	46%	
zero	0%	0%	0%	
CO_2:				25%
high	0%	--	87%	
mid	1%	1%	50%	
zero	0%	0%	0%	
CO:				2000 ppmv
high	0%	--	44%	
mid	0%	1%	25%	
mid	0%	0%	4%	
zero	0%	0%	0%	
NO_x:				200 ppmv
high	1%	1%	92%	
mid	1%	0%	45%	
mid	0%	0%	13%	
zero	0%	0%	0%	
SO_2 :				30 ppmv
high	0%	--	88%	
mid	1%	3%	51%	
zero	0%	1%	0%	
VOC #1:				100 ppmv
high	NA[5]	0%	89%	
mid	NA	0%	52%	
mid	NA	0%	30%	
mid	NA	0%	9%	
zero	NA	0%	0%	
VOC #2:				100 ppmv
high	NA[6]	0%	89%	
mid	NA	0%	52%	
mid	NA	0%	29%	
mid	NA	0%	9%	
zero	NA	0%	0%	
Response Time:	45 seconds			

[3] Calibration Error specifications: 2% for Methods 3A, 6C, and 7E; 5% for Method 25A.
[4] Acceptable values for all calibration gases except VOC: High-level=80-100% of span, mid-level=40-60% of span; for VOC calibration gases: high-level=80-90%, mid-level=45-55%, low-level=25-35%.
[5] Method 25A requires system bias checks as in Method 6C, but calls them calibration error checks.
[6] Method 25A requires system bias checks as in Method 6C, but calls them calibration error checks.

Table 3b

QA/QC Checks – Continuous Analyzers Individual Run Checks

	O_2	CO_2	CO	NO_x	SO_2	VOC 1 & 2
Zero Drift (<3% span)						
Run 1-3	0%	0%	0%	0%	19%[7]	2% 2%
Calibration Drift <3% span						
Mid-Range						
Run 1-3	1%	0%	0%	0%	15%[7]	3% 3%
Mid-Range						
Run 1-3	--	--	1%	1%	--	6%[7] 3%
Mid-Range						
Run 1-3	--	--	--	--	--	11%[7] 2%
High-range						
Run 1-3	--	--	1%	1%	0%	--% --%

Four audit samples (two liquid samples and two filter samples), prepared by EPA in accordance with Method 12 and provided to Jack Herbert of ODEQ, were submitted to Environmental Services Laboratory November 21, 2001 along with the particulate samples to be analyzed for lead.

On December 11, 2001, Horizon Engineering notified Jack Herbert via fax of the audit sample lab results, and he assured us that the lab results were acceptable. The audit sample lab results are in the Calibration Information section of the Appendix. We have no knowledge of the actual EPA numbers.

4. SOURCE DESCRIPTION AND OPERATION

4.1 Process and Control Device Description and Operation:

The EAF baghouse at Oregon Steel Mills cleans particulate from two significant sources in the melt shop. The main furnace, No. 3, normally produces between 100 and 115 tons of steel per heat from two charges of scrap metal, plus some molten

[7] More drift than normally allowable was anticipated because of the long duration of the sampling and was addressed in the Test Plan prior to sampling. Analyzer results have been drift corrected.

"pour back" material left over from casting. Records for each heat during the testing times are in the Production-Process Data Section of the Appendix.

The main furnace dust control system is a "fourth hole" duct connection to the top of the furnace, and a series of three openings in the roof above the main furnace that can open into the duct to the baghouse. Each of these pick-up points has a damper that is controlled automatically by certain furnace operations. Generally, the roof vents are open for several minutes following charging of the furnace.

The ladle metallurgy furnace is between the main furnace and the casting area and is used to fine-tune the content and temperature of the molten steel before being cast. Charging is only of molten steel and alloying material and is the minor contributor to the baghouse system. The exhaust from this furnace enters the duct system downstream from the main furnace and roof vents.

All of the pick-up points are evacuated into an 11 foot-diameter duct by two 1250-Hp fans. The fans have automatically controlled dampers on the inlets.

Particulate control is by a 16-compartment, (21 ft. by 14 ft. each) Industrial Clean Air, reverse-air type, baghouse with seamless tube polyester bags. Magnehelic gauges on each of the compartments showed pressure drops averaging 5.3 inches of water.

4.2 Test Ports: Ports and traverse points are described and diagrammed on the Field Data sheets.

4.3 Test Duct Characteristics:

Cyclonic Flow: No Cyclonic flow expected. The inlet (flow traverse) location has been checked for cyclonic flow in the past and it was not cyclonic.
Meets EPA M-1 Criteria: No.

4.4 Process & Control Equipment Flow Diagram: See Process/Sampling Equipment Flow Diagram in Appendix.

4.5 Operating Parameters: See Production/Process Data section of Appendix.

4.6 Process Startups/Shutdowns or Other Operational Changes During Tests: Process was not continuous during testing. The process was stopped for approximately 10 minutes between Runs 2 and 3 for patching of the furnace walls.

5. SAMPLING AND ANALYTICAL PROCEDURES

5.1 Sampling Procedures

5.1.1 Sampling and Analytical Methods

Testing was conducted in accordance with EPA Methods in Title 40 Code of Federal Regulations Part 60 (40 CFR 60), Appendix A, July 1, 2000; and Oregon Department of Environmental Quality (ODEQ) methods in Source Sampling Manual Volume 1, January 1992.

Inlet tests:

Flow Rate: EPA Methods 1 and 2 (at BH inlet, twice on test day)
Moisture: ODEQ Method 4 (wet bulb and dry bulb temperatures)
CO_2 and O_2: EPA Method 3A
SO_2: EPA Method 6C
NO_x: EPA Method 7E
CO: EPA Method 10
VOC: EPA Method 25A, (heated sample line and two analyzers, one with simultaneous VOC "cutter" for back-out of CH_4 content)

Outlet tests:

Flow Rate: EPA Methods 1 and 2 (at each compartment, as done in past)
Particulate: ODEQ Method 8 (High Volume sampler)
Lead: Analysis of M-8 catch, with audit sample analysis
Opacity: EPA Method 9 (six minutes per test)

5.1.2 Sampling Notes:

Flow Rates There are openings at the tube-sheet level of the baghouse where ambient air enters for temperature control around the bags. This means that the

baghouse outlet flow rate is higher than the inlet duct flow rate. Because CO is measured in the duct before dilution takes place, the inlet flow is applied to that parameter. Particulate is measured in the diluted outlet compartments, so separate flow measurements were made at those locations. According to plant personnel, closing off the ambient air openings is not feasible.

Inlet Flow Measurement

The baghouse inlet duct volume flow rate was determined from pitot traverses before and after the baghouse testing according to EPA Methods 1 and 2. Velocity pressure was taken using an S-type pitot with a Shortridge "Airdata" 870 digital micromanometer, and temperature measurements with an attached k-type thermocouple and a Fluke Model 52 digital thermocouple indicator. The traverses included 48 points (24 on each diameter) through ports located off the platform on the melt shop roof. Leak checks were made on the pitot system after each of the traverses.

A check for cyclonic flow at the measurement points was done in December 1991 and was found to be well within the criteria specified in EPA Method 1, Section 2.4, which calls for an average of less than 20°.

Outlet Flow asi

The velocity was also measured at the outlet of each compartment using an S-type pitot and the micromanometer with attached thermocouple. The micromanometer has a resolution of 0.0001 inches of water. The flow was determined from 5-point pitot traverses through one port per compartment. Flow was measured in the same ports as particulate.

Because one of the compartments is always shut off for cleaning, outlet flow rates used for calculating emissions are based on one less compartment than the total available.

Particulate and Lead Three test runs were made each lasting through two complete furnace heat cycles. The sampler running times ranged from 60 to 70 minutes in length; each test was started and stopped while the main furnace was being tapped. Although there is some emission to the furnace room during this

operation, the concentration going to the baghouse system is relatively low compared to that when the furnace is in melting mode.

Sampling was done in the area above the bags where the flow is angled diagonally up to the cupola centered on the top of the baghouse. A diagram of the top of the baghouse, showing where the sampler was positioned, is in the Appendix. The location of the particulate sampling nozzle during testing was at velocity traverse point two. The sampling was done isokinetically, using the velocity found from the outlet velocity traverse done just before the particulate sampling run.

Each compartment was sampled for five minutes. Near the end of each sampling interval, the orifice temperature was recorded as well as the temperature of the outlet gas stream. A new sampler flow rate was calculated based on the pre-survey data of the next compartment. At the end of the interval, the sampler was shut off, moved to the next compartment and restarted.

Sample volume calculations were based on the orifice pressure drops combined with the orifice temperatures and the calibration curve for the sampler. Emission rates were calculated using the flow rates measured at the baghouse outlet.

Gases Gas sample for the analyzers was taken from a fixed sampling point in the baghouse inlet duct below the baghouse, approximately below compartment No. 14.

5. Sample Analysis

Analyte	**Laboratory**
Particulate	Antech
Lead and Audit Samples	Environmental Services Laboratory

5.2 Sampling Train Diagrams

Figure 1

EPA Methods 3A, 6C, 7E & 10 Analyzer Sample System Diagram

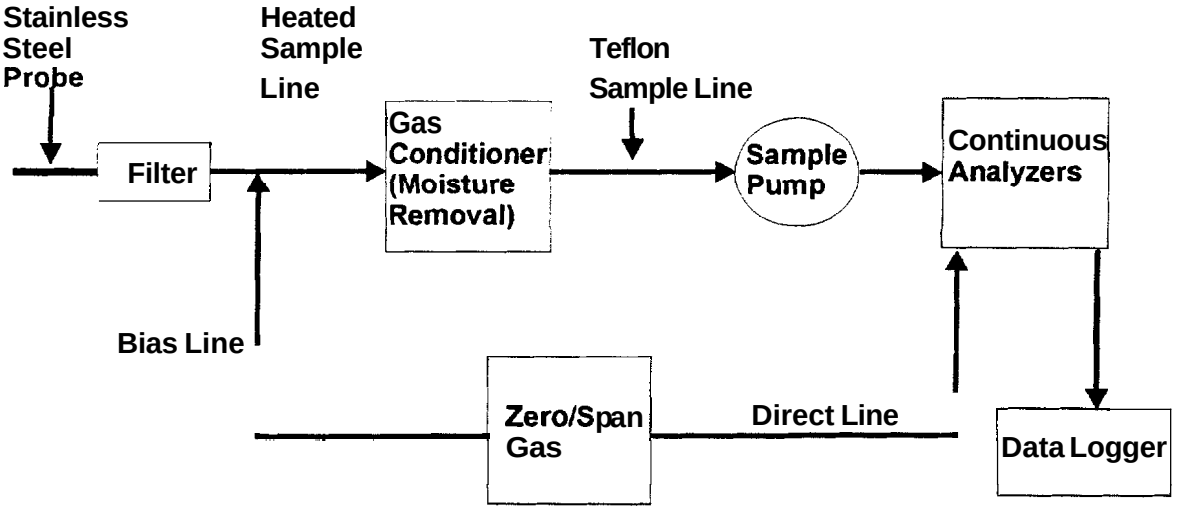
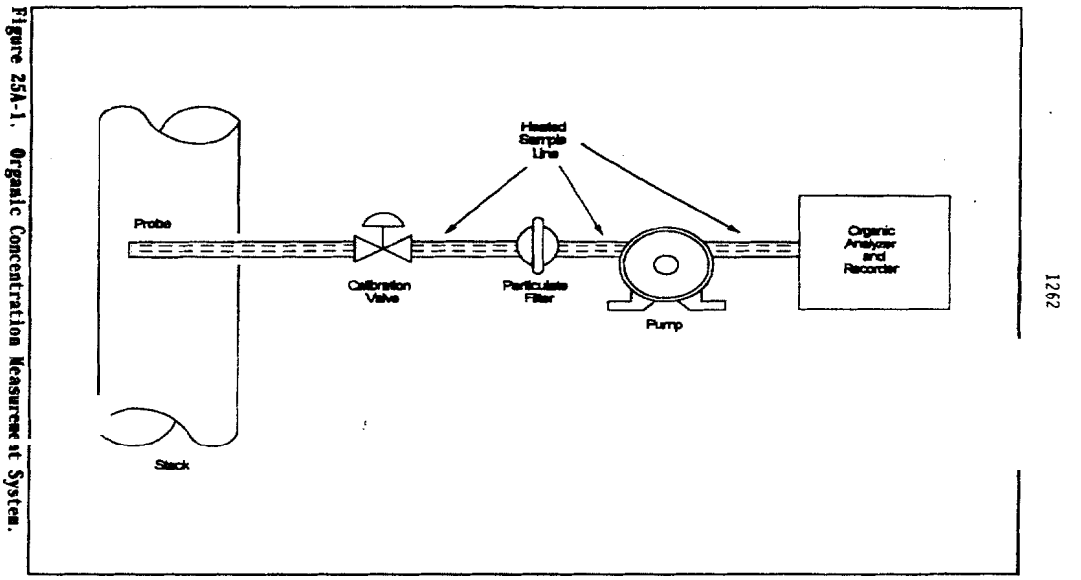


Figure 2

EPA Method 25A VOC Analyzer Sample System Diagram



5.3 Horizon Test Equipment

5.3.1 Manual Methods

Equipment Name	Equipment Identification
Hi Volume Orifice	Horizon No. 1192
Pitots and Thermocouples	11-S, 14-S
Magnehelic Gauge	0-1F (orifice AH)
Micro manometer	Shortridge No. 2
Barometer	Test Van II

5.3.2 Continuous Emissions Monitors and Methods

Gas	Brand	Model	Range	Measurement Method	Method
O_2	Servomex	1400	0-25%	Paramagnetic	3A
CO_2	Servomex	1400	0-25%	Choppertess NDIR	3A
CO	Thermo Env	48	0-2000 ppm	Gas Filter Correlation	10
TGOC	J.U.M.	VE-7	0-100 ppm	Flame Ionization	25A
NO_x	Thermo Env	42H	0-200 ppm	Chemiluminescent	7E
SO_2	West. Resch	721M	0-30 ppm	Non Disp. Ultra-violet	6C

5.3.3 Continuous Emissions Monitors Sampling Setup

Sampling:	Above listed gases except TGOC.
Probe:	Stainless Steel with sintered stainless and polyester filters.
Sample Line(s):	Teflon (heated)
Conditioning:	Refrigerated M & C Cooler
Data Logger:	ESC Model 8816

Sampling:	TGOC.
Probe:	Stainless
Conditioning:	none
Sample Line(s):	Teflon (heated)
Pump:	heated, internal to analyzer
Data Logger:	ESC Model 8816

6. DISCUSSION

The results of the testing should be valid in all respects. All quality assurance checks including leak checks, instrument checks, and calibrations, were within method-allowable tolerances.

As previously noted, drift on the SO_2 and VOC analyzer systems was higher than in normal specifications. The possibility of this issue was discussed in the Test Plan in Paragraph 18. The numbers in the results table have been corrected for that drift.

Nomenclature & Drift Correction Documentation

Nomenclature

Constants	Value	Units	Definition	Ref
Pstd(1)	29 92126	inHg	Standard Preooure	CRC
Pstd(2)	2116.22	lbf / ft²		CRC
Tstd	527.67	'R	Standard Temperature	CRC
R	1545.33	ft lbf / lbmol °R	Ideal Gar Constant	CRC
MWatm	28.965	lbm / lbmole	Atmospheric (20 946 %O2, 0 033% C02, Balance N2+Ar)	
MWc	12.011	Ibm / lbmole	Carbon	CRC
MWco	28.010	lbm / lbmole	Carbon Monoxide	CRC
MWco2	44.010	lbm / lbmole	Carbon Dioxide	CRC
MWh2o	18.015	Ibm / lbmole	Water	CRC
MWno2	46.006	lbm / lbmole	Nitrogen Dioxide	CRC
MWo2	31.999	lbm / lbmole	Oxygen	CRC
MWso2	64.063	lbm / lbmole	Sulfur Dioxide	CRC
MWn2+ar	28.154	lbm / lbmole (Balance with 98 82% N2 & I 18% Ar)	Emission balance	
C1	385.3211	ft³ I lbmol	Ideal Gas Constant @ Standard Conditions	
C2	816.5455	inHg in²/ °R ft²	Isokentics units correction constant	
Kp	5129.4	ft I min [(inHg lbm/mole) / (°R inH2O)] ^½	Pitot tube constant	Ref 2.5 1
Symbol	**Units**	**Definition**	**Calculating Equation or Source of Data**	**EPA**
AS	in²	Area. Stack		
An	in²	Area. Nozzle		
Bws	%	Moisture, % Stack yas	[100 Vw(std) / [Vw(std)+Vm(std)]]	Eq. 5-3
C	ppmv-C	Carbon (General Reporting Basis for Organics)		
C1	ft3/lbmol	Gas Constant @ Standard Conditions	[R Tstd / Pstd(2)]	
C2	inHg in²/ °R ft²		[14.400 Pstd / Tstd)	
Cd	lbm-GAS / MMdscf	Mass of gas per unit volume	[Cgas MWgas / C1]	
cg	grldscf	Gran Loading, Actual	[15 432 mn / Vm(std) 1.000]	Eq. 5-6
cg @ X%CO2	grldscf	Grain Loading Corrected to X% Carbon Dioxide	[X% / CO2%]	
cg @ X%O2	gr/dscf	Grain Loading Corrected to X% Oxygen	[(20 946-X) / (20 946-O2)]	
Cgas	ppmv, %	Gar Concentration. (Corrected)		
Cgas @ X%CO2	pprnv	Gas Concentration Correction to X% Carbon Dioxide	[X% / CO2%]	
Cgas @ X%O2	pprnv	Gas Concentration Correction to X% Oxygen	[(20.946-X%) / (20.946-O2%)]	
CO	ppmv	Carbon Monoxide		
Co	ft	Outer Circumference of Circular Stack		
Ci	ft	Inner Circumference of Circular Stack		
C02	%	Carbon Dioxide		
Cp		Pitot tube coefficient		
Ct	lb/hr	Particulate Mass Emissions	[60 cg Qsd/ 7,000]	
dH	in H2O	Pressure differential across orifice		
Dn	in	Diameter, Nozzle		
dp^A%		Average square root of velocity pressure		
Ds	in	Diameter, Stack		
E	lb / MMBtu	Pollutant Emission Rate	Cgas Fd MWgas (20.946 / (20.946-O2)) / (1,000,000 C1)	
Fd	dscf / MMBtu	F Factor for Various Fuels		Table 19-1
I	%	Percent Isokinetic	[C2 Ts(abs) Vm(std) / (vs Ps mfg An O)]	Eq. 5-8*
Md	Ibrn I lbmole	Molecular weight, Dry Stack Gas	[(1-%O2-%CO2)(MWn2+ar)+(%O2 MWo2)+(%CO2 MWco2)]	Eq. 3-1*
mfg		Mole fraction of dry stack gar	[1-Bws/100]	
Mgas	lbm/hr	Gareous Mass Emisisons	[60 Cgas(ppmv) MW Pstd(2) Qsd / 1,000,000 R Tstd]	
mn	mg	Particulate lab sample weight		
Ms	Ibrn / lbmole	Molecular weight, Wet Stack	[Md mfg +MWh2o (1-mfg)]	Eq. 2-5
MW	Ibm / lbmole	Molecular Weight		
NO2	ppmv-NO2	Nitrogen Dioxide (General Reporting Basis for NOx)		
NOx	ppmv-NO2	Nitrogen Oxides (Reported as NO2)		
02	%	Oxygen		
OPC	%	Opacity		
Pbar	in Hg	Pressure. Barometric		
Pg	in H20	Pressure. Static Stack		
Po	in Hg	Pressure, Absolute across Orifice	[Pbar + dH / 13.5951]	
Ps	in Hg	Pressure, Absolute Stack	[Pbar + Pg / 135951]	Eq 2-6*
Qa	act/min	Volumetric Flowrate, Actual	[As vs / 144]	
Qsd	dscf/min	Volumetric Flowrate, Dry Standard	[Qa Tstd mfg Ps] / [Pstd(1) Ts(abs)]	Eq 2-10*
Rf	MMBtu/hr		1,000,000 Mgas (20 946-02)] / [Cd Fd 20 946]	
SO2	ppmv-SO2	Sulfur Dioxrde		
t	in	Wall thickness of a stack or duct		
TGOC	ppmv-C	Total Gaseous Organic Concentration (Reported as C)		
Tm	°F	Temperature. Dry gas meter		
Tm(abs)	°R	Temperature, Absolute Dry Meter	[Tm + 459.67]	
Ts	T:	Temperature. Stack gas		
Ts(abs)	°R	Temperature. .Absolute Stack gas	[Ts + 459.67]	
Vlc	ml	Volume of condensed water		
Vm	dcf	Volume, Gas sample		
Vm(std)	dscf	Volume, Dry standard gas sample	[Y Vm Tstd Po]/[Pstd(I) Tm(abs)]	Eq 5-1
vs	fpm	Velocity, Stack gas	Kp Cp dp^½ [Ts(abs) / (Ps Ms)]^½	Eq 2-9*
Vw(std)	scf	Volume, Water Vapor	0.04707 Vlc	Eq 5-2
Y		Dry gas meter calibration factor		Fig. 5 6
Ø	min	Time, Total sample		

* Based on equation

HORIZON ENGINEERING
13585 N E Whitaker Way • Portlond. OR 97230
Phone (503)255-5050 . Fox (503)255-0505
horizone@teleport com

DRIFT CORRECTION DOCUMENTATION

EPA Drift Eauations:

- **Method 3A:** Oxygen and Carbon Dioxide

$$C_{gas} = \frac{(C_{ma} - C_{oa})(C - C_m) + C_{ma}}{(C_m - C_o)} \qquad \text{(Eq. 3A-1)}$$

- Method 6C: Sulfur Dioxide

$$C_{gas} = \frac{C_{ma}(C - C_o)}{(C_m - C_o)} \quad \text{where } C_{oa} = 0 \qquad \text{(Eq. 6C-1)}$$

- Method 7E: Nitrogen Oxides, Section 8 of Method 7E states: "Follow Section 8 of Method 6C (Eq. 6C-1)"
- Method 10: Carbon Monoxide, the EPA does not currently address Gas Filter Correlation instruments, therefore there are no current standards.
- Method 25A: Total Gaseous Organic Concentration (TGOC), this method does not mention correcting for drift although there are established limits.

Horizon **Engineering** Drift Correction Eauations:

$$C_{gas} = \frac{(C_{id} - Z_x)(C_{ma} - C_{oa})}{(S_x - Z_x)} \qquad S_x = \frac{(C_{mf} - C_{mi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} + C_{mi}$$

$$Z_x = \frac{(C_{of} - C_{oi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} + C_{oi} \qquad T_x = \frac{(T_{te} - T_{ts})}{2} + T_{ts}$$

EPA	Definition	Horizon
C_{gas}	Effluent gas concentration, dry basis	C_{gas}
C_{ma}	Actual upscale calibration gas concentration	C_{ma}
C_{oa}	Actual zero/low calibration gas concentration	C_{oa}
C_m	Average of initial and final system upscale calibration bias responses	
	Initial system upscale calibration bias response	C_{mi}
	Final system upscale calibration bias response	C_{mf}
C_o	Average of initial and final system zero/low calibration bias responses	
	Initial system zero/low calibration bias response	C_{oi}
	Final system zero/low calibration bias response	C_{of}
C	Average gas concentration indicated by gas analyzer, dry basis	C_{id}
	Starting test time	T_{ts}
	Ending test time	T_{te}
	Initial system bias calibration response time	T_{ci}
	Final system bias calibration response time	T_{cf}
	Mid-point of test time or gas sampling interval to be analyzed	T_x
	Approximate upscale response at mid-point test time	S_x
	Approximate zero/low response at mid-point test time	Z_x

Notes or exceptions:
TGOC is first recorded on a wet basis, then corrected to a dry basis
The TGOC instruments used by Horizon have some historic data on instrument response to different hydrocarbons. For propane the response is 1 to 1 molecule while methane is 1.037 to 1 molecule. We correct for the instrument's "over response ` to methane.

Particulate and Lead Calculation Sheets

Emission Calculation Worksheets and
Blank Correction and Filter Rinse Allocation
Laboratory Results, Worksheets, & Chain of Custody
Filter Tare Weights
Baghouse Sampling Diagram

Particulate and Lead Emissions

Plant	Oregon Steel Mills								File	1685	
Source	ICA Haghouse-EAF								Tester	MJE/TJH/CDB	
Date	07-Nov-2001								Analysis/QA	MEW	
Run#	1	Wt(mg)	98.579	Stack Area	As=	969.6	sqft	Mol Wt. Dry	Md=	29.01	molwt
Points		Lead (mg)	1.126	Stack Temp.	Tdb=	143	°F	Mol Wt. Wet	Ms=	28.80	molwt
				Stack Temp.	Twb=	85	°F	Barometeric	Pb=	30.50	in H2O
Hivol ID	SN#	1192		Moisture	bws=	1.91	%	Static Pres.	Pstat=	0.04	in H20
Orifice	A=	47.8947		Nozzle Dia.	Dn=	3.109	in	Stack Pres.	Ps=	29.60	in Hg
Constants	B=	0.4763		Nozzle Area	An=	7.59	sqin	Pitot	Cp=	0.8029	

TIME	Compartment POINT #	t	Velocity Pressure dP inH2O	Velocity vs f m	Orifice in H2O dHo Calc	Pressure in H20 dHo	Temp (F) Orifice	Temp (F) Stack Tso	Time min	Rate cfm Standard 68°F	Volume cuft Standard @68°F	Volume cuft Orifice Tor
10:31												
10:37	1	3	0.0392	685.6	0.4524	0.4600	110.0	143.0	5.0	31.90	159.5	172.2
10:44	2	3	0.0248	539.0	0.2968	0.2800	130.0	129.0	5.0	24.77	123.9	138.4
10:51	3	3	0.0361	647.5	0.4441	0.4200	130.0	124.0	5.0	30.05	150.3	167.9
10:58	4	3	0.0615	851.6	0.7775	0.7300	140.0	133.0	5.0	38.79	194.0	220.4
11:04	5	3	0.0456	731.5	0.5748	0.5400	144.0	130.0	5.0	33.50	167.5	191.6
11:11	6	3	0.0358	654.1	0.4286	0.4200	132.0	141.0	5.0	30.00	150.0	168.2
11:18	7	3	0.0336	636.3	0.4002	0.4000	136.0	146.0	5.0	29.22	146.1	164.9
11:25	8	3	0.0310	606.7	0.3749	0.3700	138.0	137.0	5.0	28.11	140.5	159.2
11:31	9	3	0.0353	646.3	0.4297	0.4200	136.0	135.0	5.0	29.91	149.5	168.8
11:38	10	3	0.0450	737.6	0.5456	0.5300	140.0	148.0	5.0	33.30	166.5	189.2
11:45	11	3	0.0509	784.5	0.6313	0.6000	150.0	148.0	5.0	35.05	175.3	202.5
11:52	12	3	0.0342	652.5	0.4020	0.3900	148.0	166.0	5.0	28.60	143.0	164.7
11:58	13	3	0.0484	777.5	0.5807	0.5600	152.0	168.0	5.0	33.87	169.3	196.3
12:05	14	3	0.0528	799.0	0.6475	0.6200	142.0	148.0	5.0	35.83	179.2	204.3
Time weighting used in averaging. =>			696.4		0.4990	0.4814	137.7	142.6	70.00	31.64	2,214.5	2,508.6

				Run#	1	2	3	Average
Sample Volume	V@68 (Pb/29.92)(1-bws/100)	dscf	Vd		2,214.2	1,978.4	1,870.0	2,020.9
Total Flowrate	Oultet Flow	dscf/min	Qsd		530,486	524,781	522.453	525,906
Particulate								
Grain loading	0.01543 Wt/Vd	gr/dscf	Cg		0.00069	0.00083	0.00106	0.00086
		ug/m3			1572	1902	2423	1966
Emissions	0.00857 Cg Qs	lbm/hr	Ct		3.1237	3.7387	4.7426	3.8683
		lbm/ton			0.0227	0.0268	0.0344	0.0280
LEAD								
Grain loading	0.01543 Lead/Vd	gr/dscf	Cg		0.0000078	0.0000096	0.0000121	0.0000099
		ug/m3			18.0	22.0	27.8	22.6
Emissions	0.00857 Cg Qs	lbm/hr	Ct		0.0357	0.0433	0.0543	0.0444
		lbm/ton			0.00026	0.00031	0.00039	0.00032
Avg Sample Rate	V@Tor / t	acf/min	Qan		35.84	36.16	36.19	36.06
Avg Velocity @ Sample Point	vs=Qa/As	fpm	vs		696.42	697.33	686.91	693.55
Avg Orifice temp		°R	Tor		597.38	610.05	613.25	606.90
Avg Stack temp		°R	Ts		602.24	617.36	614 59	611.40
Avg Nozzle Velocity	Qan*Ts / An*Tor	fpm	vn		685.31	694.19	687.99	689.16
% ISOKINETIC	100 vn/vs		%I		98.4	99 6	100.2	99.4
Percent Lead of Total Particulate			%		1.14	116	1 15	1 15

The baghouse has 16 compartments. One is always cycling.
Each Compartment is 52"x179"

Particulate and Lead Emissions

Plant	Oregon Steel Mills								File	1685	
Source	ICA Baghouse-EAF								Tester	MJE/TJH/CDB	
Date	07-Nov-2001										
Run#	2		Wt(mg)	106.572	Stack Area	As=	969.6	sqft	Mol Wt. Dry	Md=	29.02 molwt
Points	10		Lead(mg)	1.234	Stack Temp.	Tdb=	137	°F	Mol Wt. Wet	Ms=	28.52 molwt
					Stack Temp.	Twb=	98	°F	Barometeric	Pb=	30.50 in H20
Hivol ID		SN#	1192		Moisture	bws=	4.53	%	Static Pres.	Pstat=	0.03 in H2O
Orifice		A=	47.8947		Nozzle Dia.	Dn=	3.109	in	Stack Pres.	Ps=	30.50 in Hg
Constants		B=	0.4763		Nozzle Area	An=	7.59	sqin	Pitot	Cp=	0.8029

TIME	Compartment POINT #	pt	Velocity Pressure dP inH2O	Correct fpm Vs	Orifice in H20 dHo Calc	Pressure in H2O dHo Act	Temp (F) Orifice Tor	Temp (F) Stack Ts	Time min t	Rate cfm Standard Q@68°F	Volume cuft Standard @68°F	Volume cuft Orifice @Tor
12:09												
12:15	15	3	0.0286	576.83	0.3338	0.3400	132.0	137.0	5.0	27.13	135.6	152.1
12:22	1	3	0.0432	726.54	0.5037	0.5000	150.0	167.0	5.0	32.14	160.7	185.7
12:28	2	3	0.0412	706.11	0.4841	0.4800	150.0	161.0	5.0	31.52	157.6	182.1
12:35	3	3	0.0508	784.08	0.6042	0.6000	151.0	161.0	5.0	35.03	175.1	202.7
12:41	4	3	0.0535	807.88	0.6440	0.6300	162.0	166.0	5.0	35.55	177.7	209.4
12:48	5	3	0.0326	629.12	0.3805	0.3700	155.0	163.0	5.0	27.74	138.7	161.5
12:54	6	3	0.0324	629.70	0.3736	0.3700	153.0	168.0	5.0	27.78	138.9	161.3
13:01	7	3	0.0384	686.62	0.4451	0.4400	153.0	170.0	5.0	30.17	150.8	175.1
13:07	8	3	0.0454	732.82	0.5436	0.5500	144.0	147.0	5.0	33.79	168.9	193.3
13:14	9	3	0.0500	768.42	0.6007	0.6100	142.0	146.0	5.0	35.55	177.8	202.7
13:20	10	3	0.0365	656.54	0.4374	0.4300	150.0	146.0	5.0	29.91	149.6	172.8
13:27	11	3	0.0326	627.10	0.3830	0.3700	155.0	159.0	5.0	27.74	138.7	161.5
13:33	12	3	0.0446	733.49	0.5349	0.5200	158.0	159.0	5.0	32.54	162.7	190.5
Time weighting used in averaging. =>				697.33	0.4822	0.4777	150.38	157.69	65.00	31.28	2,032.9	2,350.7

			Run#	2
Sample Volume	V@68 (Pb/29.92)(1-bws/100)	dscf	Vd	1,978.4
Total Flowrate	Oultet Flow	dscf/min	Qs	524,781
Particulate				
Grain loading	0.01543 Wt/Vd	gr/dscf	Cg	0.00083
Emissions	0.00857 Cg Qs	lb/hr	Ct	3.739
LEAD				
Grain loading	0.01543 Lead/Vd	gr/dscf	Cg	9.62E-06
Emissions	0.00857 Cg Qs	lb/hr	Ct	0.04327852995
Avg Sample Rate	V@Tor / t	acf/min	Qan	36.16
Avg Velocity @ Sample Point	vs=Qa/As	fpm	vs	697.33
Avg Orifice temp		°R	Tor	610.05
Avg Stack temp		°R	Ts	617.36
Avg Nozzle Velocity	Qan*Ts / An*Tor	fpm	vn	694.19
% ISOKINETIC	100 vn/vs		%I	99.55

Particulate and Lead Emissions

Plant	Oregon Steel Mills								File	1685	
Source	ICA Baghouse-EAF								Tester	MJE/TJH/CDB	
Date	07-Nov-2001										
Run#	3	Wt(mg)	128.349	Stack Area	As=	969 6	sqft	Mol Wt. Dry	Md=	29.02	molwt
Points	11	Lead(mg)	1.471	Stack Temp.	Tdb=	141	°F	Mol Wt. Wet	Ms=	28.82	molwt
				Stack Temp	Twb=	84	°F	Barometeric	Pb=	30.50	in H20
Hivol ID	SN#	1192		Moisture	bws=	1 83	%	Static Pres	Pstat=	0.01	in H2O
Orifice	A=	47 8947		Nozzle Dia.	Dn=	3.109	in	Stack Pres.	Ps=	30.50	in Hg
Constants	B=	0.4763		Nozzle Area	An=	7.59	sqin	Pitot	Cp=	0.8029	

TIME	Compartment POINT #	pt	Velocity Pressure dP inH2O	Correct fpm Vs	Orifice in H2O dHo Calc	Pressure in H2O dHo Act	Temperature (F) Orifice Tor	(F) Stack Ts	Time min t	Rate cfm Standard Q@68°F	Volume cut? Standard @68øF	Orifice @Tor
13:50												
13:57	13	3	0.0426	717.19	0.4935	0.4900	152.0	166.0	5.0	31.78	158.9	184.2
14:04	14	3	0.0423	698.49	0.5123	0.5200	150.0	138.0	5.0	32.74	163.7	189.2
14:11	15	3	0.0352	637.18	0.4210	0.4300	148.0	138.0	5.0	29.96	149.8	172.5
14:19	1	3	0.0396	674.70	0.4781	0.4800	148.0	136.0	5.0	31.57	157.8	181.8
14:26	2	3	0.0460	741.68	0.5439	0.5400	156.0	160.0	5.0	33.18	165.9	193.6
14:33	3	3	0.0483	760.00	0.5631	0.5700	146.0	160.0	5.0	34.32	171.6	196.9
14:41	4	3	0.0480	759.47	0.5658	0.5600	156.0	163.0	5.0	33.76	168.8	197.0
14:48	5	3	0.0313	612.79	0.3642	0.3600	160.0	162.0	5.0	27.27	136.4	160.1
14:55	6	3	0.0430	718.25	0.5115	0.5100	164.0	162.0	5.0	32.09	160.5	189.7
15:03	7	3	0.0371	667.15	0.4339	0.4300	158.0	162.0	5.0	29.73	148.6	174.0
15:10	8	3	0.0337	630.20	0.3977	0.4000	155.0	151.0	5.0	28.79	143.9	167.7
15:17	9	3	0.0327	625.84	0.3758	0.3900	150.0	161.0	5.0	28.55	142.8	164.9
Time weighting used in averaging. =>				686.91	0.4717	04733	153.58	154.92	60.00	31.14	1,868.7	2,171.5

					Run#	3
Sample Volume		V@68 (Pb/29.92)(1-bws/100)		dscf	Vd	1,870.0
Total Flowrate		Oultet Flow		dscf/min	Qs	522,453
Particulate						
Grain loading		0.01543 Wt/Vd		gr/dscf	Cg	0.00106
Emissions		0.00857 Cg Qs		lb/hr	Ct	4.743
LEAD						
Grain loading		0.01543 Lead/Vd		gr/dscf	Cg	1.21E-05
Emissions		0.00857 Cg Qs		lb/hr	Ct	0.05434628801
Avg Sample Rate		V@Tor / t		acf/min	Qan	36.19
Avg Velocity @ Sample Point		vs=Qa/As		fpm	vs	686.91
Avg Orifice temp				°R	Tor	613.25
Avg Stack temp				°R	Ts	614.59
Avg Nozzle Velocity		Qan*Ts / An*Tor		fpm	vn	687.99
% ISOKINETIC		100 vn/vs			%I	100.16

Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230
503/255-5050 FAX 503/255-0505

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Baghouse Outlet
Date: 11/7/01 P_b: 30.5
T_{db}: 143 T_{wb}: 85 %H_2O: 1.97 D_n: 3.009
Magn Ranges, DP:0- 1 DH:0-

Leak Rates @ 100%, DH in H_2O

Run #	Pretest	Post-test
1	0 in h_2o	0 in H_2O

Run #	Filter #
Blank	6776163
R1	6776164

Orifice No. 182
Cal. No. (0.1) 15.99
(1.0) 47.89

DP's from: Presurvey
During test

Diagram of Outlet

Run #	Process Rate

Run #	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H_2O"	DH Orif Pres "H_2O"	Ts Stack Temp °F	To Orif Temp °F	Notes
1	1	5	1031	0.0392	.46	143	110	
	2	10		0.0248	.28	129	130	
	3	15		0.0361	.42	124	130	
	4	20		0.0615	.73	133	140	
	5	25		0.0456	.54	130	144	
	6	30		.0358	.42	141	132	
	7	35		.0336	.40	146	136	
	8	40		.0310	.37	137	138	
	9	45		.0353	.42	135	136	
	10	50		.0450	.53	148	140	
	11	55		.0509	.60	148	150	
	12	60		.0342	.39	166	148	
	13	65		.0484	.56	168	152	
	14	70	1205	.0528	.62	198	142	
	~~15~~	~~75~~		~~.0377~~	~~.46~~	~~127~~		

*****Horizon Engineering*****

Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230
503/255-5050 FAX 503/255-0505

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Baghouse Outlet
Date: 11/7/01 P_b: 30.5
T_{db}: 137 T_{wb}: 98 $\%H_2O$: _____ D_n: 3.109
Magn Ranges, DP:0- 1 DH:0- _____
Leak Rates @ 100%, DH in H_2O

Run #	Pretest	Post-test
2	0 in H_2O	0 in H_2O

Run #	Filter #
2	6276159

Orifice No. 1192
Cal. No. (0.1) 15.99
(1.0) 47.99

, Diagram of Outlet

Run #	Process Rate

DP's from: Presurvey _____
During test _____

Run #	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H_2O"	DH Orif Pres "H_2O"	Ts Stack Temp °F	To Orif Temp °F	Notes
2	~~A~~	~~5~~		~~.0399~~	~~.46~~	~~139~~		
	15	5	1209	.0286	.34	137	132	
	1	10		.0432	.50	167	150	
	2	15		.0412	.48	161	150	
	3	20		.0508	.60	161	151	
	4	25		.0535	.63	166	162	
	5	30		.0326	.37	163	155	
	6	35		.0324	.37	168	153	
	7	40		.0384	.44	170	153	
	8	45		.0454	.55	147	144	
	9	50		.0500	.61	146	142	
	10	55		.0365	.43	146	150	
	11	60		.0326	.37	159	155	
	12	65	1333	.0446	.52	159	158	

■■orizon ■■ngineering
13585 NE Whitaker Way
Portland, OR 97230
503/255-5050 FAX 503/255-0505

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Baghouse Outlet
Date: 11 7 01 P_b: 30.5
T_{db}: 141 T_{wb}: 84 %H_2O: ____ D_n: 3.109
Magn Ranges, DP:0- 1 DH:0- ____
Leak Rates @ 100%, DH in H_2O

Run #	Pretest	Post-test
3	0 in h2o	0 in h2o
Blank #2	0 in h2o	0 in h2o

Run #	Filter #
3	G 276161
Blank #2	G 276160

Orifice No. 1192
Cal. No. (0.1) 15.99
(1.0) 47.89

DP's from: Presurvey ____
During test ____

, Diagram of Outlet

Run #	Process Rate

Run #	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H_2O"	DH Orif Pres "H_2O"	Ts Stack Temp °F	To Orif Temp °F	Notes
3	13	5	1350	.0426	.49	166	152	
	14	10		.0423	.52	138	150	
	15	15		.0352	.43	138	148	
	1	20		.0396	.48	136	148	
	2	25		.0460	.54	160	156	
	3	30		.0483	.57	160	146	
	4	35		.0480	.56	163	156	
	5	40		.0313	.36	162	166	
	6	45		.0430	.51	162	164	
	7	50		.0371	.43	162	158	
	8	55		.0337	.40	151	155	
	9	60	1517	.0327	.39	161	150	
	10	65		~~.0269~~	~~.31~~	~~164~~		
	11	70						

Blank Correction and Filter Rinse Allocation

Oregon Steel Mills	Plant	1685	0.00%
ICA Baghouse-EAF	Source	Tester	0.00%
07-Nov-2001	Date		

PARTICULATE RUN I.D.	FILTER #	Filter Sample Wt mg	Wt less Filter Blank mg	Fraction of total	Rinse Residue Contribution mg	Filter Residue Contribution mg	TOTAL mg
1	6776164	85.6	85.1	29.56%	13.479	0.000	98.579
2	6776159	92.5	92.0	31.96%	14.572	0.000	106.572
3	6776161	111.3	110.8	38.49%	17.549	0.000	128.349
	TOTALS	289.40	287.90	100.00%	45.600	0.000	333.500

Runs 1, 2, & 3					
Sampler rinse residue		715 ml	45.60 mg		
Blank Acetone		275 ml	-0.10 mg		
Blank correct residue			45.60 mg		
Sampler filter residue	999		0.0000 mg	System Blank	
Blank correct residue			0.0000 mg		
Blank Filter	6776163/60		0.50 mg	Lab Blank	

*LEAD RUN I.D.	FILTER #	Filter Sample Wt mg	Wt less Filter Blank mg (Corrected)	Fraction of total	Rinse Residue Contribution mg	Filter Residue Contribution mg	TOTAL mg
1	6776164	1.0500	1.0445	29.39%	0.0814	0.0000	1.1259
2	6776159	1.1500	1.1445	32.21%	0.0892	0.0000	1.2337
3	6776161	1.3700	1.3645	38.40%	0.1063	0.0000	1.4708
	TOTALS	3.5700	3.5535	100.00%	0.2768	0.0000	3.8303

Runs 1, 2, & 3					
Sampler rinse residue		715 ml	0.2790 mg		
Blank Acetone		275 ml	0.0008 mg		
Blank correct residue			0.2768 mg		
Sampler filter residue	999		0.0000 mg	System Blank	
Blank correct residue			0.0000 mg		
Blank Filter	6776163/60		0.0055 mg	Lab Blank	

ANTECH

Analysis/Technology

11-28-01

Mr. David Rossman
HORIZON ENGINEERING
13585 NE Whitaker
Portland OR 97220

November 26,2001
Job# 0131400-06

Identification: OSM (Horizon # 1685)
Received: 11/10101

Samule #	31400	31404
Identification	**OSM** Baghouse **Rinse (Runs** 1-3)	**OSM blanks**
Front acetone rinse:		
Volume (mls)	715	275
Residue (g)	0.0456	-0.0001

Sample #	31401	31402	31403	31405	31406
Identification	Baghouse **Run** 1	Baghouse **Run** 2	Baghouse **Run** 3	#1 **blank**	#2 **blank**
Filters: numbers	6776164	6776159	6776161	6776163	6776160
Residue (g)	0.0856	0.0925	0.1113	0.0009	0.0001

Respectfully submitted:
ANTECH

Diana Tracy

Diana Tracy
president

ANTECH
SAMPLE DATA: EPA 315 RESIDUES
Analyst: MJ reviewer:
Job# 31401-06 Identification: 25m 1638

HOUSE BLANKS:

	ACETONE:		IMPINGER [illegible]ER:		DCM:	
Sample #	3					
Sample ID						
vol mark						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		[illegible]e/time [illegible]eighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

	FILTER:		FILTER:		EMPTY:	
Sample #			lab blank			
Sample ID			2776162			
vol mark						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)			4.2243	11-15 9A		
GWt2(g)			4.2233	11-16 9A		
GWt3(g)			4.2239	11-19 11A		
GWt4(g)			4.2237	11-20 9A		
GWt5(g)						
GWt6(g)						
Average			4.2238			
Tare (g)			4.2241			
Net (g)			-.0003			

ANTECH
SAMPLE DATA: EPA **RESIDUES**
Analyst: MD reviewer: _____
Job# 31400-06 Identification: OSM # 1638

FRONT ACETONE:

Sample #	31400					
Sample ID	Bayhouse R1-3					
vol mark	✓✓					
Date/time	11/14 9:50P					
Into dessicator						
Vol(mls)	715	date/time weighed		date/time weighed		date/time weighed
GWt1(g)	141.5161	11-15 9A				
GWt2(g)	141.5156	11-16 9A				
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average	141.5159					
Tare (g)	141.4703	11/13 3:50P				
Net (g)	.0456					

BACK ACETONE:

Sample #						
Sample ID						
vol mark						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

ANTECH
SAMPLE DATA: EPA 315 **RESIDUES**
Analyst: MJS **reviewer:** _____
Job# 31400-06 **Identification:** OSM &

BLANKS:

ACETONE:			IMPINGER WATER:		DCM:	
Sample#	31404					
Sample ID	OSM-all runs					
vol mark	✓					
Date/time	11/14 4:50P					
Into dessicator						
Vol(mls)	275	**date/time weighed**		**date/time weighed**		**date/time weighed**
GWt1(g)	116.1804	11-15 9A				
GWt2(g)	116.1803	11-16 9A				
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average	116.1804					
Tare (g)	116.1805	11/13 3:50P				
Net(g)	-.0001					

FILTER:			**FILTER:**			
Sample #	31405		31406		314...	
Sample ID	Blank #1		Blank #2		EMPTY	
filter #	6776163		6776160			
Date/time	11/11 9:00A		11/11 9:00A		11/14 9:50P	
Into dessicator						
Vol(mls)		**date/time weighed**		**date/time weighed**		**date/time weighed**
GWt1(g)	4.2089	[illegible]	4.3038	4-15 9A	107.8571	11-15 9A
GWt2(g)	4.2081	11-16 9A	4.2023	4-16 9A	107.8569	11-16 9A
GWt3(g)	4.2088	11-19 11A	4.2024	4-19 11A		
GWt4(g)	4.2089	11-20 8A				
GWt5(g)						
GWt6(g)						
Average	4.2089		4.2024		107.8570	
Tare (g)	4.2080	10-24-01	4.2023	6-1-01	107.8575	11/13 3:50P
Net (g)	.0009		.0001		-.0005	

ANTECH
SAMPLE DATA: EPA **RESIDUES** (page 3)

FLTERS:

Sample #	31401	31402	31403
Sample ID	BHR1 6776164	BH R2 6776159	BH R3 6776161
Date/time	11/11/01 9:00A	11/11/01 9:00A	11/11/01 9:50A
In dessicator			

		Date/time		Date/time		Datdtime
GWt1(g)	4.2953	11-15 9A	4.3149	11-15 9A	4.3277	11-15 9A
GWt2(g)	4.2945	11-16 9A	4.3139	11-16 9A	4.3265	11-16 9A
GWt3(g)	4.2941	11-18 11A	4.3140	11-19 11A	4.3267	11-19 11A
GWt4(g)						
Average	4.2944		4.3140		4.3266	
Tare (g)	4.2088	10-24-01	4.2215	6-3-01	4.2153	6-1-01
Net (g)	.0856		.0925		.1113	

FILTERS:

Sample #			
Sample ID			
Date/time			
In dessicator			

		Date/time		Date/time		Date/time
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
Average						
Tare (g)						
Net (g)						

QC DATA:

Date/time	11-13	11-15	11-16	11-18	11-19	11-20
Balance calibrated	✓	✓	✓	✓	✓	✓
(NTIS cert wts)	✓	✓	✓	✓	✓	✓
Date/time		9A	11P	1P	10A	8A
Temp/temp		69/63	72/63	68/61	68/61	67/59
Relative humidity (%)		78	61	67	67	62

ANALYTICAL BALANCE CALIBRATION FORM

Balance name Sartorius **Number** _____

Classification *of* standard weights _____

Date	0.1000 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
9-17-01	0.1000g	1.0000g			100.0000g	[illegible]
9-18-01	0.0999g	1.0001g			100.0000g	[illegible]
9-19-01	0.1000g	1.0001g			100.0001g	[illegible]
9-20-01	0.0999g	1.0001g			100.0001g	[illegible]
9-23-01	0.1000g	1.0001g			100.0000g	[illegible]
9-24-01	0.1000g	1.0000g			100.0000g	[illegible]
9-25-01	0.1000g	1.0000g			100.0001g	[illegible]
9-26-01	0.1001g	1.0000g			100.0001g	[illegible]
9-27-01	0.1000g	1.0001g			100.0000g	[illegible]
9-28-01	0.0999g	1.0000g			100.0001g	[illegible]
10-18-01	0.0999g	1.0000g			100.0000g	[illegible]
10-24-01	0.0998g	.9998g			100.0001g	[illegible]
10-25-01	0.0999g	1.0000g			100.0000g	[illegible]
11-15-01	0.0999g	1.0000g			100.0000g	[illegible]
11-16-01	0.1000g	1.0000g			100.0000g	[illegible]
11-19-01	0.0999	0.9999g			100.0000g	[illegible]
11-20-01	0.1000g	1.0000g			100.0000g	[illegible]

ANALYTICAL BALANCE CALIBRATION FORM

Balance name Sartorius **Number** _____

classification of standard weights _____

Date	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
9-26-01	0.0999 g	1.00010 g			100.0000 g	[illegible]
	0.[illegible]	1.0000 g			100.0000 g	[illegible]
9-28-01	0.1000 g	1.00000 g			100.0000 g	[illegible]
	0.1000 g	1.00000 g			100.0000 g	[illegible]
	0.09999 g	1.0001 g			100.0001 g	[illegible]
10-[illegible]-01	[illegible]	1.0001 g			[illegible]	[illegible]
	0.0999 g	1.0000 g			100.0001 g	[illegible]
10-4-01	0.1000 g	1.0000 g			100.0001 g	[illegible]
10-5-01	0.1000 g	1.0000 g			100.0001 g	[illegible]
10-7-01	0.1000 g	1.0000 g			[illegible]	[illegible]
10-8-01	0.1000 g	1.0000 g			100.0001 g	[illegible]
10-9-01	0.1000 g	1.0001 g			100.0001 g	[illegible]
10-[illegible]-01	[illegible]	1.0000 g			100.0001 g	[illegible]
10-16-01	0.0999 g	1.0000 g			100.0001 g	[illegible]
10-17-01	0.0999 g	1.0000 g			100.0000 g	[illegible]
10-31-01	0.1000	1.0000 g			[illegible]	[illegible]
[illegible]-01	0.0999 g	1.0001 g			100.0001 g	[illegible]
10-23-01	0.1000 g	1.0001 g			100.0001 g	[illegible]
10-24-01	0.1000 g	1.0001 g			100.0001 g	[illegible]
10-[illegible]-01	0.0999	1.0001 g			100.0001 g	[illegible]
10-[illegible]-01	0.0999 g	1.0001 g			100.0001 g	[illegible]
10-[illegible]-01	0.1000 g	1.0000 g			100.0001 g	[illegible]
10-29-01	0.1000 g	1.0000 g			100.0001 g	[illegible]
10-30-01	0.1000 g	1.0000 g			100.0001 g	DLT
10-31-01	0.1000 g	1.0000 g			100.0001 g	DLT
11-1-01	0.1000 g	1.0000 g			100.0000 g	DLT
11-[illegible]-01	[illegible]	1.0001 g			[illegible]	[illegible]
[illegible]	[illegible]	[illegible]			100.0001 g	DLT
11-7-01	[illegible]	[illegible]			100.0001 g	DLT
11-8-01	0.1000 g	1.0000 g			[illegible]	[illegible]
11-13-01	0.1000 g	1.0000 g			[illegible]	[illegible]
11-15-01	0.0999 g	[illegible]			[illegible]	[illegible]
11-16-01	0.1000 g	1.0001 g			[illegible]	[illegible]
11-18-01	0.1000 g	1.0001 g			100.0000 g	[illegible]

HORIZON ENGINEERING
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

Date Sent to Lab: 11/8/01

Chain of Custody Form

Client: CSM
Horizon Job No.: 1685
Field Personnel Contact: Mike Eisele
Source: Baghouse
Office Contact: Kate K

Laboratory: Antech 501 N. E. Thompson Mil Rd. Corbett, Oregon 97019	Antech Job No.:	Return Samples to Horizon ASAP for Further Analysis? (Yes) / No	Rush Normal X

Sample I. D.	Date Sampled	Acetone	Filter					
Run	11/7/01	✓						
Run 1	11/7/01		✓					
Run 2	11/7/01		✓					
Run 3	11/7/01		✓					
Run								
Run								
Run								
Run								
Run								
Run								
Run								
Run								
Blank	11/7/01	✓						
Blank-	11/7/01		✓					
Blank	11/7/01		✓					
Blank								

Relinquished by:	Received by:	Relinquished by:	Received by:
Signature/ Date/ Time	Signature/ Date/ Time	Signature/ Date/ Time	Signature1Date/ Time

Horizon Tarek

These filters are stored in the dessicator.

	5-31-01	6-1-01	6-3-01	6-4-01
6776137	4.2798	4.2805	4.2801	
138	4.2596	4.2602	4.2595	4.2597
139	4.2361	4.2375	4.2362	4.2363
140	4.2577	4.2585	4.2577	4.2576
141	4.2556	4.2571	4.2557	4.2558
6776142	4.2596	4.2603	4.2595	4.2598
143	4.2384	4.2394	4.2382	4.2384
144	4.2341	4.2349	4.2348	
145	4.2205	4.2233	4.2227	4.2222
146	4.2308	4.2314	4.2310	
6776147	4.2549	4.2555	4.2552	
148	4.2324	4.2335	4.2330	
149	4.2392	4.2399	4.2397	
150	4.2392	4.2398	4.2398	
151	4.2329	4.2334		
6776152	4.2251	4.2259	4.2257	
153	4.2224	4.2232	4.2228	
154	4.2045	4.2051	4.2051	
155	4.2268	4.2279	4.2278	
156	4.2307	4.2314	4.2314	
6776157	4.2271	4.2278	4.2278	
158	4.2381	4.2389	4.2386	
✓159	4.2210	4.2215	4.2215	
✓160	4.2026	4.2023		
✓161	4.2179	4.2153		

22-141 500 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

Dec 18 01 10:24p Diana Tracy 5036952139 p.1

Horizon Fibres

These filters are kept in the Accountant

	10-18-01	10-24-01	10-25-01
~~6776163~~ ✓	~~4.2061~~	~~4.2082~~	
~~164~~ ✓	~~4.2090~~	~~4.2088~~	
165	4.2409	4.2404	
166	4.2224	4.2223	
167	4.2286	4.2290	
6776168	4.2261	4.2259	
169	4.1966	4.1966	
170	4.1837	4.1835	
171	4.2647	4.2645	
172	4.2580	4.2581	
6776173	4.2680	4.2679	
174	4.2340	4.2337	
175	4.2230	4.2229	
176	4.2462	4.2458	
177	4.2396	4.2400	
6776178	4.2336	4.2338	
179	4.2233	4.2234	
180	2248	4.2248	
181	4.2192	4.2192	
182	4.	4.2383	
6776183	4.2263	4.2266	
184	4.2059	4.2056	
6856201	4.2988	4.2980	4.2983
202	4.3266	4.3268	
203	4.3183	4.3181	
6856204	4.3160	4.3160	
205	4.3174	4.3176	
206	4.3775	4.3775	
207	4.3876	4.3874	
208	4.3307	4.3308	
6856209	4.2982	4.2982	
210	4.3124	4.3122	
211	4.3089	4.3088	
212	4.2979	4.2976	
213	4.3405	4.3403	
6856214	4.3669	4.3672	
215	4.3529	4.3530	
216	4.3478	4.3478	
217	4.3120	4.3108	
218	4.3454	4.3452	

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

Dec 18 01 10:24p Diana Tracy 5036952139 p.3

Environmental Services Laboratory, Inc.

E S L

17400 SW Upper Boones Ferry Road, Suite 270 • Portland, OR 97224 • (503) 670-8520

December 07, 2001

Nichole Karl
Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230
TEL: (503) 255-5050
FAX (503) 255-0505

RE: 1685 Audit/ OSM Audit Samples Order No.: 0111195

Dear Nichole Karl,

Environmental Services Laboratory received 8 samples on 11/26/01 for the analyses presented in the following report.

The Samples were analyzed for the following tests:
ICP Metals (EPA 6010B)

There were no analytical problems encountered, and all data met laboratory QC criteria, unless noted in a Case Narrative. Results apply only to the samples analyzed. Reproduction of this report is permitted only in its entirety, without the written approval of the Laboratory.
The following checked data sections are included in this report, and numbered to indicate total pages within each report section.

✓ Base Sample Report _/Method Blank Report __Sample Duplicate Report
__Matrix Spike/Matrix Spike Duplicate Report ✓ Laboratory Control Spike/Spike Duplicate Report Continuing Calibration Verification Report ✓ Initial Calibration Verification Report

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Leslie Rush
Project Manager

Keith Hunter
Technical Review

001

12/11/2001 10:00 FAX

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	**Client Sample ID:**	Filter Run 1(6776164)
Lab Order:	0111195	**Tag Number:**	
Project:	1685 Audit/ OSM Audit Samples	**Collection Date:**	11/21/01
Lab ID:	0111195-01A	**Matrix:**	FILTER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				Analyst: lmr
Lead	1.050	*0.500*		ug	*1*	12/3/01

Qualifiers:

- ND - Nor Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Z00

12/11/2001 10:00 FAX

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	**Client Sample ID:**	Filter Run 2(6776159)
Lab Order:	0111195	**Tag Number:**	
Project:	1685 Audit/ OSM Audit Samples	**Collection Date:**	11121101
Lab ID:	0111195-02A	**Matrix:**	FILTER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				Analyst: lmr
Lead	1,150	0.500		ug	1	12/3/01

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

C00

12/11 2001 10:00 FAX

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	Client Sample ID:	Filter Run 3(6776161)
Lab Order:	0111195	Tag Plumber:	
Project:	1685 Audit/ OSM Audit Samples	Collection Date:	11/21/01
Lab ID:	0111195-03A	Matrix:	FILTER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
E P METALS		**EPA 6010B**				Analyst: **lmr**
Lead	1.370	*0.500*		ug	1	12/3/01

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	**Client Sample ID:**	Filter blank 1(6776163)
Lab Order:	0111195	**Tag Number:**	
Project:	1685 Audit/ OSM Audit Samples	**Collection Date:**	11/21/01
Lab ID:	0111195-04A	**Matrix:**	FILTER

Analyses	Result	LIB& Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60108**			**Analyst: lmr**
Lead	3.30	*0.500*	ug	1	12/3/01

Qualifiers:

ND - Not Detected at the Reparting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

- Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

005

12/11/2001 10:01 FAX

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	**Client Sample ID:**	Filter blank 2(6776160)
Lab Order:	0111195	**Tag Number:**	
Project:	1685 Audit.OSM Audit Samples	**Collection Date:**	11/21/01
Lab ID:	0111195-05A	**Matrix:**	FILTER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		EPA 6010B				Analyst: lmr
Lead	7.70	0.500		ug	1	12/3/01

Qualifiers:

ND - Nor Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

006

12/11/2001 10:01 FAX

Environmental Services Laboratory

Date: *07-Dee-01*

CLIENT:	Horizon Engineering	Client Sample ID:	31400 Acetone rinse
Lab Order:	0111195	Tag Number:	
Project:	1685 Audit/ OSM Audit Samples	Collection Date:	11/21/01
Lab ID:	0111195-06A	Matrix:	SOLID

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		EPA 6010B				Analyst: lmr
Lead	279	*0.500*		ug	1	12/3/01

Qualifiers:

NO - Nor Detected a the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Muimum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

007

12/11/2001 10:01 FAX

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	Client Sample ID:	31404 Acetone blank
Lab Order:	0111195	Tog Number:	
Project:	1685 Audit/ OSM Audit Samples	Collection Date:	11/21/01
Lab ID:	0111195-07A	Matrix:	SOLID

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		EPA 6010B				Analyst: lmr
Lead	0.840	0.500		ug	1	12/3/01

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
- Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation ranee

12/11/2001 10:01 FAX 008

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	Client Sample ID:	314 Lab blank
Lab Order:	0111195	Tag Number:	
Project:	1685 Audit/ OSM Audit Samples	Collection Date:	11/21/01
Lab ID:	0111195-08A	Matrix:	SOLID

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		EPA 6010B				Analyst lmr
Lead	ND	0.500		ug	1	12/3/01

Qualifiers:

NO - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - value above quantitation range

Environmental Services Laboratory

Date: 07-Dec-01

CLIENT: Horizon Engineering
Work Order: 0111195
Project: 1685 Audit/ OSM Audit Samples

QC SUMMARY REPORT
Method Blank

Sample ID: MB-3578 Batch ID: 3578 Test Code: EPA 6010B Units: mg/Kg Analysis Date: 12/3/01 Prep Date: 11/30/01

Client ID: 0111195 Run ID: ICP_011203A SeqNo: 98967

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	1									

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT: Horizon Engineering
Work Order: 0111195
Project: 1685 Audit/ OSM Audit Samples

QC SUMMARY REPORT
Laboratory Control Spike - generic

Sample ID: LCS-3578 **Batch ID.** 3578 **Test Code:** EPA 6010B **Units:** mg/Kg **Analysis Date:** 12/3/01 **Prep Date.** 11130101
Client ID: 0111195 **Run ID:** ICP_011203A **SeqNo:** 98968

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	49.4	1	50	0	98.8%	80	120	*0*			

Qualifiers:
ND - Not Detected at the Reporting *Limit*
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

12/11/2001 10:02 FAX

Environmental Services Laboratory

Date: 07-Dec-01

CLIENT: Horizon Engineering
Work Order: 0111195
Project: 1685 Audit/ OSM Audit Samples

QC SUMMARY REPORT
Minerals ICV for ICP

Sample ID: ICVHI	Batch ID: 3578	Test Code: EPA 6010B	Units: mg/L	Analysis Date: 12/3/01	Prep Date 11/30/01
Client ID	0111195	Run ID: ICP_011203A		SeqNo. 98966	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	9.98	0.005	10	0	99.8%	90	110	0			

Sample ID: ICVLOW	Batch ID: 3578	Test Code: EPA 6010B	Units: mg/L	Analysis Date: 12/3/01	Prep Dale: 11130101
Client ID	0111195	Run ID: ICP_011203A		SeqNo: 98965	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	.513	0.005	0.5	0	102.6%	90	110	0			

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

12/11/2001 10:02 FAX

TO: ESL

HORIZON ENGINEERING
13585 N.E. Whitaker Way
Portland, OR 97230
Ph. (503)255-5050
Fax (503)255-0505
horizone@teleport.com

CHAIN OF CUSTODY REPORT

Work Order # [redacted]

REPORT TO: Horizon Engineering
ATTENTION Mike Wallace
ADDRESS 13585 NE Whitaker Way
Portland, OR 97230
PHONE 503-255-5050 FAX 503-255-0505
PROJECT NAME OSM
PROJECT NUMBER 1685
SAMPLED BY

INVOICE TO: Horizon Engineering
ATTENTION Penny Rossman
ADDRESS same
P.O. NUMBER: QUOTE #

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: [X] Standard | 7 | 5 | 4 | 3 | 2 | 1 | Same Day
Fuels & Hydrocarbon Analyses: 5 Standard | 3-4 | 2 | 1 | Same Day
OTHER Specify
* Turnaround Requests less than standard may incur Rush Charges

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	[redacted]	Analysis Request: lead	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1 Filter Run 1 (6776164)			X			
2 Filter Run 2 (6776159)			X			
3 Filter Run 3 (6776161)			X			
4 Filter blank 1 (6776163)			X			
5 Filter blank 2 (6776160)			X			
6 31400 Acetone rinse			X			
7 31404 Acetone blank			X			
8 314 lab blank			X			
9						
10						

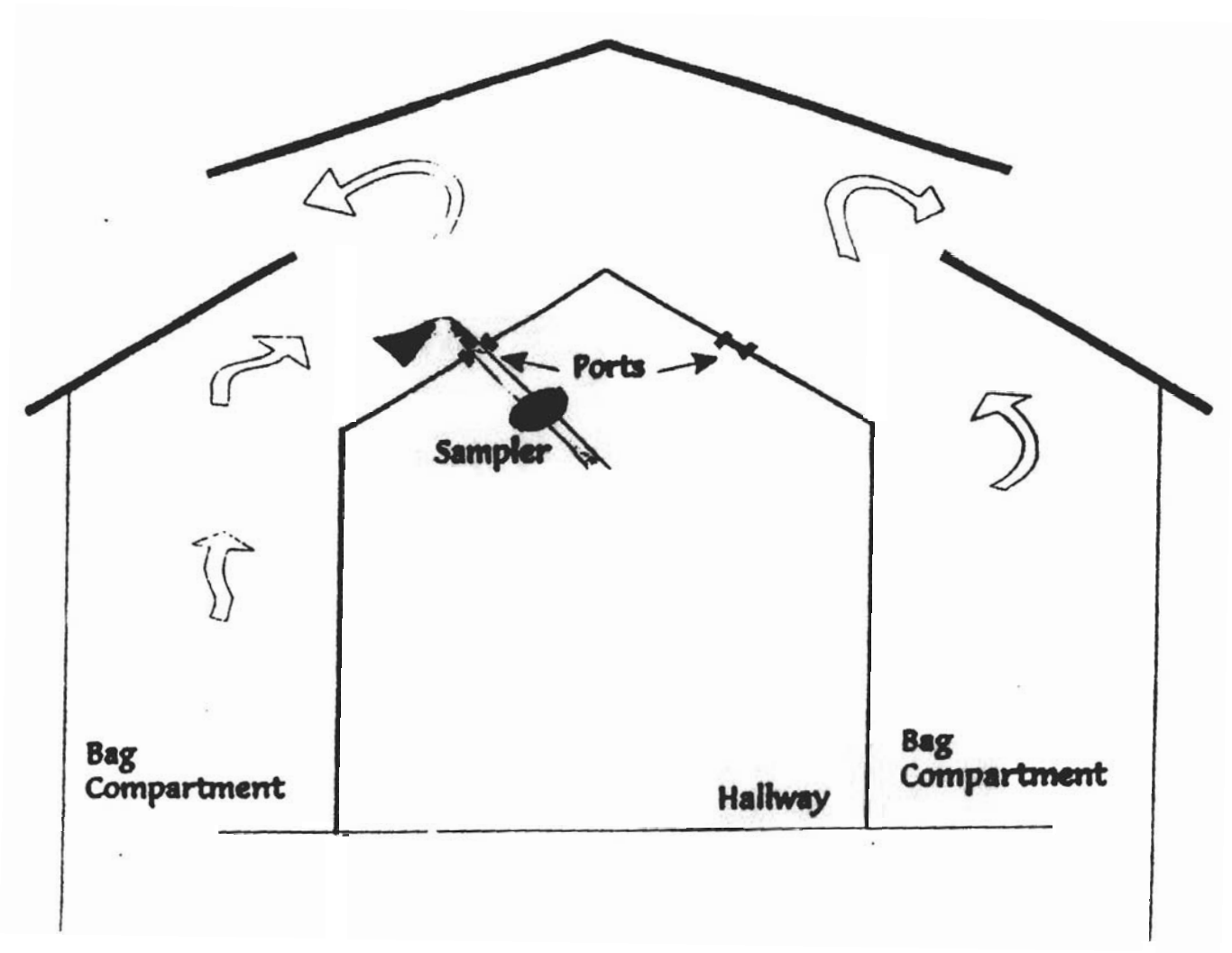
RELINQUISHED BY: Nichole Karl DATE 11/20/01
PRINT NAME Nichole Karl FIRM horizon TIME
RELINQUISHED BY: DATE
PRINT NAME FIRM TIME

RECEIVED BY: DATE 11/21/01
PRINT NAME: S MACLEOD FIRM ESL TIME 1300
RECEIVED BY: DATE
PRINT NAME FIRM TIME

ADDITIONAL REMARKS: Analysis by EPA 6010 (ICP). Digest complete filters, reporting units should be (ug). Please analyze audit samples at the same time. Similar to previous ESL job # 0101063 Please call if you have

12/11/2001 10:02 FAX

Bayhouse Sampling Diagram



.....Horizon Engineering"""

Volume Flow Rate Determination

Flow Rate Determinations and Field Data

Traverse Point Location – Inlet & Outlet

Outlet Flow Rate Determination

Client	Oregon Steel Mills	Compan	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	
Source	ICA Baghouse-EAF	Point									HI-VOL RUN #1									
Location	Portland, OR	K	0.0363	0.0061	0.0087	0.0173	0.0308	0.0160	0.0213	0.0023	A	0.0268	0.0177	0.0190	0.0302	0.0392	0.0392	*0.01*8*		
Date	07-Nov-2001	L	0.0352	0.0160	0.0270	0.0620	0.0484	0.0374	0.0271	0.0374	B	0.0291	0.0343	0.0452	0.0388	0.0630	0.0406	*0.020*		
Testers	MJE/TJH/CDB	*M	0.0381	0.0270	0.0322	0.0592	0.0407	0.0382	0.0342	0.0187	*C	0.0286	0.0380	0.0528	0.0421	0.0592	0.0429	*0.0195*		
File	1685	N	0.0468	0.0389	0.0481	0.0675	0.0512	0.0451	0.0426	0.0352	D	0.0357	0.0478	0.0535	0.0394	0.0493	0.0510	*0.035*		
Analysis/QA	MEW	O	0.0396	0.0355	0.0643	0.1015	0.0570	0.0424	0.0427	0.0615	E	0.0561	0.0871	0.0839	0.0205	0.0512	0.0902	*0.0492*		
Equipment	ShortRidge,11s	K									A									
Total Runs	Run #1	L									B									
Pts per Run		*M									*C									
		N									D									
		O									E									
All Points	SQRT(dP)	0.1953	0.1977	0.1509	0.1820	0.2404	0.2125	0.1867	0.1817	0.1627		0.1858	0.2054	0.2202	0.1835	0.2281	0.2266	*0.1655*		0.1953	
Standard Deviation	STD(SQRT(dP))	0.1018	0.0991	0.0816	0.0987	0.1277	0.1074	0.0959	0.0924	0.0943		0.0948	0.1093	0.1154	0.0932	0.1148	0.1164	*0.0863*		0.1018	
Symbol	Definitions, Units	Method/Notes	1	2	3	4	5	6	7	8		9	10	11	12	13	14	*15*	16	Avg/Total	14.0625
	Time																			15	Compart
As	Cross Section	in²	9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		9,308	9,308	9,308	9,308	9,308	9,308	*9,308*			
Cp	Pitot Coef		0.8029	0.8029	0.8029	0.8029	0.8029	0.8029	0.8029	0.8029		0.8029	0.8029	0.8029	0.8029	0.8029	0.8029	*0.8029*			
Ts	Duct temperature	°F	143.0	129.0	124.0	133.0	130.0	141.0	146.0	137.0		135.0	148.0	148.0	166.0	168.0	148.0	*13*.0*		142.2	
Ts	Duct temperature	°R	602.7	588.7	583.7	592.7	589.7	600.7	605.7	596.7		594.7	607.7	607.7	625.7	627.7	607.7	*596.*			
Tdb	Dry bulb temp	°F	143.0																		
Twb	Wet bulb temp	°F	85.0																		
Pbar	Barometric Pressure	in Hg	30.50	30.50	30.50	30.50	30.50	30.50	30.50	30.50		30.50	30.50	30.50	30.50	30.50	30.50	*30.50*			
Pg	Static Pressure	in H2O	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		0.04	0.04	0.04	0.04	0.04	0.04	*0.04*			
Ps	Duct Pressure	in Hg	30.50	30.50	30.50	30.50	30.50	30.50	30.50	30.50		30.50	30.50	30.50	30.50	30.50	30.50	*30.50*			
dp^½			0.1977	0.1509	0.1820	0.2404	0.2125	0.1867	0.1817	0.1627		0.1858	0.2054	0.2202	0.1835	0.2281	0.2266	*0.1655*			
Bws	Moisture, % Stack		1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91		1.91	1.91	1.91	1.91	1.91	1.91	*1.91*			
mfg	Mole fraction dry gas		98.1%	98.1%	98.1%	98.1%	98.1%	98.1%	98.1%	98.1%		98.1%	98.1%	98.1%	98.1%	98.1%	98.1%	*98.1%*			
Oxygen	Outlet-Estimated		20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.62		20.62	20.62	20.62	20.62	20.62	20.62	*20.62*			
Carbon Dioxide	Outlet-Estimated		0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40		0.40	0.40	0.40	0.40	0.40	0.40	*0.40*			
Md	Molecular weight Dry		29.01	29.01	29.01	29.01	29.01	29.01	29.01	29.01		29.01	29.01	29.01	29.01	29.01	29.01	*29.01*			
Ms	Molecular weight Wet		28.80	28.80	28.80	28.80	28.80	28.80	28.80	28.80		28.80	28.80	28.80	28.80	28.80	28.80	*28.80*			
vs	Velocity stack	fpm	674.5	508.8	610.9	813.4	716.9	635.9	621.4	552.4		629.7	703.5	754.4	637.9	794.2	776.0	*561.9*		666.1	
Qa	Flowrate actual	acf/min	43,600.6	32,887.5	39,490.6	52,577.5	46,338.3	41,104.3	40,166.5	35,705.7		40,705.7	45,476.0	48,763.7	41,232.2	51,334.1	50,162.6	*36,319.3*		43,058	605,498
Qsd (5-pt)	Flowrate @std	dscf/min	38,173.1	29,478.5	35,700.3	46,809.4	41,464.6	36,107.5	34,992.4	31,575.5		36,118.1	39,487.6	42,342.4	34,772.6	43,154.0	43,557.1	*32,118.1*		37,723	530,486
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

Outlet Flow Rate Determination

Client	Oregon Steel Mills	Compart	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16		
Source	ICA Baghouse-EAF	Point									HI-VOL RUN #2										
Location	Portland, OR	K	0 0376	0 0297	0 0420	0.0304	0 0130	00280	0 0207	00239	A	00332	00192	00195	00349	00452	00392	00178			
Date	07-Nov-2001	L	0 0390	0 0356	0 0440	0.0511	0 0262	00283	0 0363	0 0302	B	00457	00268	0 0277	0.0295	0.0336	0.0406	0 0207			
Testers	MJE TJH CDB	*M	00337	00348	00262	0.0416	0 0362	00324	00339	00375	*C	00342	0.0275	00226	0 0406	0.0332	0.0429	00195			
File	1685	N	0 0422	00338	00537	00812	0 0408	00336	00411	00428	D	0 0513	0 0342	0.0292	0 0629	0 0491	0.0510	0 0357			
Analysis QA	MEW	O	00635	0 0720	0 0882	00633	0 Mb7	0 03%	00602	00928	E	00858	0 0748	0 0642	0 0550	0.0528	0 0902	0 0492			
Equipment	ShortRidge, Hs	K									A										
Total Runs	Run #2	L									B										
Pts per Run		*M									*C										
		N									D										
		O									E										
All Points	SQRT(dP)	0.2000	0 2065	0.1999	0.2211	0.2282	0 1768	0.1796	0.1933	0.2067		0 2201	0.1853	0.1761	0.2091	0.2053	0.2266	0.1655		0 2000	
Standard Deviation	STD(SQRT(dP))	01032	01056	0 1029	0.1149	01172	00920	0 0902	0.0994	0.1097		01136	00983	0.0925	01066	0.103	0.1164	0 0863		0 1032	
Symbol	Definitions, Units	Method/Notes	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Avg/Total	14 0625
	Time																			15	Compart
As	Cross Section	in²	9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		9,308	9,308	9,308	9,308	9,308	9,308	9,308			
Cp	Pitot Coef		0 8029	0 8029	0 8029	0 8029	0 8029	0 8029	0.8029	0.8029		0.8029	0.8029	0.8029	0 8029	0.8029	0.8029	0 8029			
Ts	Duct temperature	°F	167 0	161 0	161.0	166.0	163.0	168.0	170 0	147.0		146.0	146.0	159 0	159 0	166.0	148.0	137 0		157 6	
Ts	Duct temperature	°R	626 7	620.7	620.7	625.7	622.7	627.7	629.7	606.7		605 7	605 7	618 7	618 7	625.	60	596 7			
Tdb	Dry bulb temp	°F	137 0																		
Twb	Wet bulb temp	°F	98 0																		
Pbar	Barometric Pressure	in Hg	30 50	30 50	30.50	30.50	30.50	30 50	30.50	30.50		30 50	30.50	30 50	30.50	30.50	30.50	30 50			
Pg	Static Pressure	in H2O	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		0.03	0.03	0.03	0 03	0.03	0 03	0 03			
Ps	Duct Pressure	in Hg	30.50	30 50	30.50	30.50	30.50	30 50	30.50	30.50		30 50	30.50	30 50	30.50	30.50	30.50	30 50			
dp^½			0 2065	0.1999	0.2211	0.2282	0 1768	0.1796	0.1933	0.2067		0.2201	0.1853	0.1761	0 2091	0.2053	0.2266	0 1655			
Bws	Moisture, % Stack		4 52	4 52	4 52	4.52	4 52	4.52	4.52	4.52		4.52	4.52	4.52	4 52	4.52	4.52	4 52			
mfg	Mole fraction dry gas		95 5%	95.5%	95.5%	95.5%	95 5%	95.5%	95.5%	95.5%		95.5%	95 5%	95 5%	95.5%	95.5%	95.5%	95 5%			
Oxygen	Outlet-Estimated		20.58	20.58	20.58	20 58	20.58	20.58	20.58	20 58		20.58	20 58	20.58	20.58	20.58	20.58	20 58			
Carbon Dioxide	Outlet-Estimated		0 47	0 47	0.47	0.47	0 47	0.47	0 47	0.47		0 47	0.47	0 47	0 47	0 4	0.4	0 47			
Md	Molecular weight Dry		29 02	29.02	29.02	29.02	29 02	29.02	29.02	29.02		29 02	29.02	29.02	29 02	29.02	29.02	29 02			
Ms	Molecular weight Wet		28 52	28.52	28.52	28.52	28.52	28 52	28.52	28.52		28 52	28 52	28.52	28 52	28.52	28.52	28 52			
vs	Velocity stack	fpm	721 7	695.6	769.0	797 0	616 2	628 2	677.4	710 9		756 3	636 8	611.7	726 2	7	79.8	564 6		693 9	
Qa	Flowrate actual	acf/min	46,653 1	44,961.1	49,707.6	51,516.6	39,830.6	40,606.2	43,785.1	45,953.9		48,883.2	41,162 0	39,542.1	46,938 0	46,360.	50,40 .6	36,496 7		44,854	630,754
Qsd (5-pt)	Flowrate @std	dscf/min	38,234.1	37,203.6	41,131.2	42,287.4	32,852.4	33,225 4	35,712.7	38,902 6		41,450 8	34,903 6	32,825.4	38,965 0	38,055.2	42,602.	31,414.4		37,318	524,781
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

Outlet Flow Rate Determination

Client	Oregon Steel Mills	Compart Point	1	2	3	4	5	6	7	8	HI-VOL RUN #3	9	10	11	12	13	14	15	16		
Source	ICA Baghouse-EAF	K	0.0312	0.0371	0.0371	0.0328	0.0344	0.0277	0.0351	0.0137	A	0.0113	0.0116	0.0195	0.0349	0.0452	0.0191	0.0175			
Location	Portland, OR	L	0.0302	0.0352	0.0452	0.0312	0.0337	0.0303	0.0352	0.0283	B	0.0339	0.0265	0.02[illegible]	0.0295	0.0326	0.0438	0.0363			
Date	07-Nov-2001	*M	0.0373	0.0424	0.0421	0.0420	0.0267	0.0474	0.0378	0.0291	*C	0.0373	0.0285	0.0226	0.0406	0.0332	0.0377	0.0339			
Testers	MJE/TJH/CDB	N	0.0472	0.0555	0.0534	0.0553	0.0323	0.0542	0.0422	0.0445	D	0.0418	0.0324	0.0292	0.0629	0.0491	0.0490	0.0436			
File	1685	O	0.0519	0.0596	0.0636	0.0787	0.0292	0.0552	0.0352	0.0529	E	0.0393	0.0354	0.0642	0.0550	0.0528	0.0618	0.0448			
Analysis/QA	MEW	K									A										
Equipment	ShortRidge,11s	L									B										
Total Runs	Run #3	*M									*C										
Pts per Run		N									D										
		O									E										
All Points	SQRT(dP)	0.1944	0.1977	0.2132	0.2187	0.2157	0.1766	0.2052	0.1925	0.1794		0.1772	0.1615	0.1761	0.2091	0.2053	0.2023	0.1855		0.1944	
Standard Deviation	STD(SQRT(dP))	0.0994	0.1000	0.1078	0.1104	0.1112	0.0885	0.1047	0.0964	0.0938		0.0922	0.0832	0.0925	0.1066	0.1037	0.1044	0.0949		0.0994	
Symbol	Definitions, Units	Method/Notes	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Avg/Total	14.0625
	Time																			15	Compart
As	Cross Section	in²	9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		9,308	9,308	9,308	9,308	9,308	9,308	9,308			
Cp	Pitot Coef.		0.8029	0.8029	0.8029	0.8029	0.8029	0.8029	0.8029	0.8029		0.8029	0.8029	0.8029	0.8029	0.8029	0.8029	0.8029			
Ts	Duct temperature	°F	136.0	160.0	160.0	163.0	152.0	162.0	162.0	151.0		161.0	164.0	159.0	159.0	166.0	138.0	138.0		156.1	
Ts	Duct temperature	°R	595.7	619.7	619.7	622.7	621.7	621.7	621.7	610.7		620.7	623.7	618.[illegible]	618.[illegible]	625.7	597.7	597.7			
Tdb	Dry bulb temp.	°F	141.0																		
Twb	Wet bulb temp.	°F	84.0																		
Pbar	Barometric Pressure	in Hg	30.50	30.50	30.50	30.50	30.50	30.50	30.50	30.50		30.50	30.50	30.50	30.50	30.50	30.50	30.50			
Pg	Static Pressure	in H2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01			
Ps	Duct Pressure	in Hg	30.50	30.50	30.50	30.50	30.50	30.50	30.50	30.50		30.50	30.50	30.50	30.50	30.50	30.50	30.50			
dp^½			0.1977	0.2132	0.2187	0.2157	0.1766	0.2052	0.1925	0.1794		0.1772	0.1615	0.1761	0.2091	0.2053	0.2023	0.1855			
Bws	Moisture, % Stack		1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83		1.83	1.83	1.83	1.83	1.83	1.83	1.83			
mfg	Mole fraction dry gas		98.2%	98.2%	98.2%	98.2%	98.2%	98.2%	98.2%	98.2%		98.2%	98.2%	98.2%	98.2%	98.2%	98.2%	98.2%			
Oxygen	Outlet-Estimated		20.61	20.61	20.61	20.61	20.61	20.61	20.61	20.61		20.61	20.61	20.61	20.61	20.61	20.61	20.61			
Carbon Dioxide	Outlet-Estimated		0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46		0.46	0.46	0.46	0.46	0.46	0.46	0.46			
Md	Molecular weight Dry		29.02	29.02	29.02	29.02	29.02	29.02	29.02	29.02		29.02	29.02	29.02	29.02	29.02	29.02	29.02			
Ms	Molecular weight Wet		28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82		28.82	28.82	28.82	28.82	28.82	28.82	28.82			
vs	Velocity stack	fpm	670.4	737.2	756.4	747.6	686.7	710.7	666.7	615.7		613.4	560.3	608.6	722.4	713.5	687.1	629.9		670.1	
Qa	Flowrate actual	acf/min	43,332.5	47,649.8	48,893.4	48,326.0	3[illegible]1.0	45,940.7	43,095.5	39,800.2		39,652.1	36,214.3	39,338.9	46,696.8	46,122.4	44,414.5	40,717.3		43,316	609.127
Qsd (5-pt)	Flowrate @std	dscf/min	38,414.6	40,605.8	41,665.5	40,983.7	3[illegible]7.3	39,023.4	36,606.6	34,416.5		33,736.0	30,662.9	33,57[illegible]	39,858.1	38,927.3	39,242.0	35,975.4		37,152	522,453
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

52

Inlet Flow Rate Determination

Client	Oregon Steel Mills	Compartment
Source	EAF Baghouse INLET	Point
Location	Portland. OR	
Date	07-Nov-2001	
Testers	MJE/TJH/CDB	
File	1685	
Analysis/QA	MEW	
Equipment	ShortRidge #2,pitot 14	
Total Runs	2	
Pts per Run	48	

		Pre-test				Post-Test			
		dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)
	1	1.9310	na	2.5280	na	1.4460	na	2.3840	na
	2	1.8160	na	2.3310	na	1.5850	na	1.5680	na
	3	1.8070	na	2.0890	na	1.5460	na	1.4240	na
	4	2.0110	na	2.5850	na	1.3370	na	1.8360	na
	5	1.9830	na	2.5450	na	1.6230	na	2.3140	na
	6	1.9680	na	2.4990	na	1.9090	na	2.0890	na
	7	1.9240	na	2.4750	na	1.5210	na	2.2170	na
	8	1.2860	na	2.5220	na	1.4840	na	1.6570	na
	9	1.7780	na	2.6850	na	1.2260	na	2.1340	na
	10	1.4420	na	2.3380	na	1.2560	na	1.8200	na
	11	1.4500	na	1.8420	na	1.3480	na	2.0460	na
	12	1.2990	na	2.0850	na	2.0160	na	1.8150	na
	13	2.3330	na	2.1250	na	2.1670	na	1.5960	na
	14	2.3450	na	2.0510	na	2.3300	na	1.3260	na
	15	2.4040	na	1.9520	na	2.4080	na	1.7700	na
	16	2.6280	na	1.6260	na	2.2150	na	1.2500	na
	17	2.2770	na	1.9780	na	2.6950	na	1.5900	na
	18	2.9890	na	2.3570	na	2.1530	na	1.4700	na
	19	2.6280	na	2.0780	na	2.6940	na	1.5400	na
	20	2.6130	na	2.5070	na	2.4360	na	1.7870	na
	21	2.6580	na	2.4340	na	2.4760	na	1.7750	na
	22	3.0220	na	2.4080	na	2.2940	na	1.8880	na
	23	2.6840	na	2.4890	na	2.6330	na	1.9970	na
	24	2.2980	na	2.3180	na	2.7820	na	1.9140	na
All Points	SQRT(dP)	1.4824	sqrt(dP)	0.0	(°F)	1.3666	sqrt(dP)	0.0	(°F)

Symbol	Definitions, Units	Method/Notes	Pre-test	Post-Test	Average
	Time		09:50	15:20	
As	Cross Section	in^2	13,685	13,685	
Cp	Pitot Coef.		0.8237	0.8237	
Ts	Duct temperature	°F	162.0	212.0	187.0
Twb	Duct temperature	°F	88.0	109.0	
Ts	Duct temperature	°R	621.7	671.7	
Pbar	Barometric Pressure	in Hg	30.25	30.25	
Pg	Static Pressure	in H20	*-16.00*	-700	
Ps	Duct Pressure	in Hg	29.07	29.74	
dp^½			1.4824	1.3666	
Bws	Moisture, % Stack	(inlet)	1.95	4.85	3.40
Bws	Moisture, % Stack	(outlet)	1.91	1.83	1.87
mfg	Mole fraction dry gas		98.1%	95.1%	
Md (inlet)	Molecular weight Dry		29.03	29.03	
Ms (inlet)	Molecular weight Wet		28.82	28.50	
vs	Velocity stack	fpm	5,395	5,141	5,268
Qa	Flowrate actual	acf/min	512,722	488.535	500,628
Qsd (Inlet)	Flowrate @std	dscf/min	414,631	362.910	388,771
Qsd(Outlet)	Flowrate @std	dscf/min			525,906
	Difference	(Out-In)/In			35.3%

HORIZON ENGINEERING INC.
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant OS
sampling Location Baghouse Outlet
Test Conditions NoAmal
Date 11/7/01 Time
Duct Dimensions
Duct Area in²
Gauge I.D. SR2 in H20 By FJH
Post Test Leak Check 0 in H2O

Cyclonic Flow ? Yes— No X Avg Null Angle
P_o = Barometric Pressure 30.5 in Hg
C_p = Pitot Coefficient 0.8029
Pitot I.D. 115

Run #	1									
Time	1015									
Pt/ 1	0.0363		6 1	0.0308		9 1	.0268		1B-1	.0392
2	0.0352	143F	2	.0484	130F	2	.0291		2	.0630
3	0.0381		3	.0407		3	.0286		3	.0592
4	0.0468		4	.0512		4	.0357		4	.0493
5	0.0396	.0392	5	.0570	.0456	5	.0561	.0353	5	.0512
2 1	.0061		6 1	.0160		10 1	.0177		141	.0392
2	.0160		2	.0374		2	.0343		2	.0406
3	.0276	129F	3	.0382		3	.0380		3	.0429
4	.0389		4	.0451		4	.0478		4	.0510
5	.0358	.0248	5	.0424	.0358	5	.0871	.0450	5	.0902
3 1	.0087		7 1	.0213		11 1	.0190			
2	.0270		2	.0271		2	.0152			
3	.0322	124F	3	.0342		3	.0528			
4	.0481		4	.0426		4	.0535			
5	.0643	.0361	5	.0427	.0336	5	.0839	.0509		
# 1	.0173		8 1	.0623		12 1	.0302			
2	.0620		2	.0374		2	.0389			
3	.0592	133F	3	.0187		3	.0421			
4	.0675		4	.0352		4	.0394			
5	.1015	.0615	5	.0615	.0310	5	.0205	.0342		

Avg $\sqrt{\Delta P}$

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		143			
T_{wb}	Wet bulb temp., °F		85			
P_{stat}	Static press., in H_2O		-0.6441			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in Hg	$P_o \pm P_{stat}/13.6$				
S		Avg $\sqrt{\Delta P}$ x $\sqrt{T_s}$				
mv	% H_2O in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5126s $(1/P_sM_s)^{1/2}$ (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

HORIZON ENGINEERING
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant 05M
Sampling Location Baghouse Outlet
Test Conditions Normal
Date 11/7/01 Time
Duct Dimensions
Duct Area in²
Gauge I.D. SR 2 in H20 By KJA
Post Test Leak Check ✓ 0 in H20

Cyclonic Flow ? Yes__ No X Avg Null Angle ____
P_o = Barometric Pressure 30.5 in Hg
C_p = Pitot Coefficient 0.80294
Pitot I.D. 11-5

Run #	2									
Time	1159									
Pt/ 1	~~.0143~~		3 1	.0420		7 1	.0207		11 1	.0195
2	~~.0371~~		2	.0440		2	.0363		2	.0277
3	~~.0352~~		3	.0262		3	.0339		3	.0226
4	~~.0493~~		4	.0537		4	.0411		4	.0292
5	.0528	~~.0387~~	5	.0882	.0508	5	.0602	.0364	5	.0642
1 1	.0178		4 1	.0304		8 1	.0239		R 1	.0349
2	.0207		2	.0511		2	.0302		2	.0295
3	.0195		3	.0416		3	.0375		3	.0406
4	.0357		4	.0812		4	.0428		4	.0629
5	.0492	.0286	5	.0633	.0535	5	.0928	.0454	5	.0550
1 1	.0376		5 1	.0130		9 1	.0332			
2	.0390		2	.0262		2	.0457			
3	.0537		3	.0362		3	.0342			
4	.0422		4	.0409		4	.0513			
5	.0635	.0432	5	.0467	.0326	5	.0858	0.0500		
2 1	.0297		6 1	.0280		10 1	.0192			
2	.0356		2	.0283		2	.0268			
3	.0348		3	.0324		3	.0275			
4	.0338		4	.0336		4	.0342			
5	.0720	.0412	5	.0396	.0324	5	.0748	.0365		
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		137			
T_{wb}	Wet bulb temp., °F		98			
P_{stat}	Static press., in H_2O		ao348			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in H_g	$P_o \pm Pstat/13.6$				
S		Avg √ΔP x √ T_s				
mv	% H_2O in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s $(1/PsMs)^{1/2}$ (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond. scfm	qs = 0.123 VsAs md Ps ▮ Ts				

HORIZON ENGINEERING
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant OSM

Sampling Location Baghouse Outlet

Test Conditions Normal

Date 11/7/01 Time

Duct Dimensions

Duct Area in²

Gauge I.D. SR 2 in H2O By TJH

Post Test Leak Check ✓ 0 in H2O

Cyclonic Flow ? Yes__ No X Avg Null Angle ____

P_o = Barometric Pressure 30.5 in Hg

C_p = Pitot Coefficient 0.80294

Pitot I.D. 11-5

Run #	3									
Time										
PM 1	.0452		2 1	.0371		6 1	.0277		1	0116
2	.0326		2	.0352		2	.0303		2	0265
3	.0332		3	.0424		3	.0474		3	0285
4	.0491		4	.0555		4	.0542		4	0324
5	.0528	.0426	5	.0596	.0460	5	.0552	.0430	5	0354
14 1	0191		3 1	.0371		7 1	0351			
2	0439		2	.0452		2	0352			
3	.0377		3	.0421		3	0378			
4	0490		4	.0534		4	0422			
5	0619	.0423	5	.0636	.0483	5	0352	.0371		
15 1	0175		9 1	.0329		8 1	0137			
2	0363		2	.0312		2	0283			
3	0339		3	.0420		3	0291			
4	0436		4	.0553		4	0445			
5	0479	.0352	5	.0787	.0480	5	0525	.0337		
16 1	0312		5 1	.0344		9 1	0113			
2	0302		2	.0337		2	0339			
3	0373		3	.0267		3	0373			
4	0472		4	.0323		4	0418			
5	0619	.0396	5	.0292	.0313	5	0393	.0327		
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F					
T_{wb}	Wet bulb temp., °F					
P_{stat}	Static press., in H_2O		0132			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in H_g	P_o ± Pstat/13.6				
S		Avg √ΔP x √ T_s				
mv	% H_2O in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s (1/PsMs)$^{1/2}$ (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

HORIZON ENGINEERING
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant OSM
Sampling Location Bag house Inlet start
Test Conditions Normal
Date 11/7/01 Time
Duct Dimensions
Duct Area in²
Gauge I.D. S2#2 in H2O By RSS / BBG
Post Test Leak Check 0 in H2O (min

Cyclonic Flow ? Yes__ No X Avg Null Angle ____
P_o = Barometric Pressure 30.25 in Hg
C_p = Pitot Coefficient 0.82367
Pitot I.D. 14-S

Run #	1 start of Runs									
Time	950									
Pt 1	1,931	Pt 22	3,622	19	2,078					
2	1,816	23	2,684	20	2,507					
3	1,807	24	2,298	21	2,434					
4	2,011	1	2,528	22	2,408					
5	1,983	2	2,331	23	2,489					
6	1,968	3	2,089	24	2,318					
7	1,924	4	2,585							
8	1,286	5	2,545							
9	1,778	6	2,499							
10	1,442	7	2,475							
11	1,460	8	2,622							
12	1,299	9	2,695							
13	2,339	10	2,338							
14	2,345	11	1,842							
15	2,404	12	2,085							
16	2,628	13	2,125							
17	2,277	14	2,051							
18	2,989	15	1,952							
19	2,628	16	1,626							
20	2,613	17	1,978							
21	2,658	18	2,357							
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		162			
T_{wb}	Wet bulb temp., °F		98			
P_{stat}	Static press., in H_2O		-16			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in Hg	$P_o \pm Pstat/13.6$				
S		Avg √ΔP x √ T_s				
mv	% H_2O in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	$Vs = 5125s\ (1/PsMs)^{1/2}\ (Cp)$				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

plant OSM
Sampling Location Baghouse Inlet End Of R
Test Conditions Normal
Date 11.7.01 Time
Duct Dimensions
Duct Area in²
Gauge I.D. SR2 in H2O By BPG
Post Test Leak Check 0 in H2O

Cyclonic Flow ? Yes__ No X Avg Null Angle ____
P_o = Barometric Pressure 30.5 in Hg
C_p = Pitot Coefficient 0.82367
Pitot I.D. 145

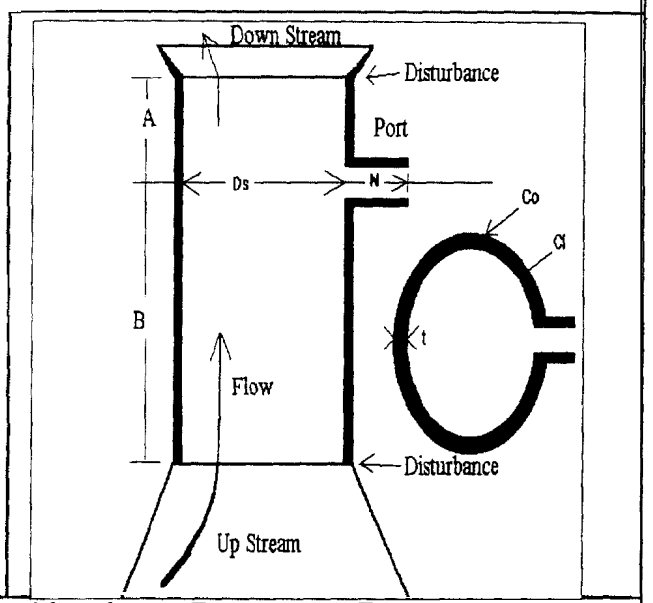
Run #	End of Runs									
Time	1520									
Pt/										
1	1.446		21	2.476		41	1.590			
2	1.585		22	2.294		42	1.470			
3	1.546		23	2.693		43	1.540			
4	1.537		24	2.782		44	1.787			
5	1.623		25	2.384		45	1.775			
6	1.909		26	1.668		46	1.888			
7	1.521		27	1.424		47	1.997			
8	1.484		28	1.836		48	1.914			
9	1.226		29	2.314						
10	1.256		30	2.089						
11	1.348		31	2.217						
12	2.016		32	1.657						
13	2.167		33	2.134						
14	2.330		34	1.820						
15	2.406		35	2.046						
16	2.215		36	1.915						
17	2.69		37	1.696						
18	2.153		38	1.326						
19	2.694		39	1.770						
20	2.436		40	1.250						
Avg $\sqrt{\Delta P}$										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Averag
T_{db}	Dry bulb temp., °F			212		
T_{wb}	Wet bulb temp., °F			109		
P_{stat}	Static press., in H_2O					
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in Hg	$P_o \pm P_{stat}/13.6$				
S		Avg $\sqrt{\Delta P}$ x $\sqrt{T_s}$				
mv	% H_2O in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	$Vs = 5125 s (1/PsMs)^{1/2} (Cp)$				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

Traverse Point Location

Client	Oregon Steel Mills			Portland. OR	Date
Location	Portland, OR			MJE/TJH/CDB	By
EPA Method #1	Baghouse Inlet			1685	File

Outer Circumference	(ft) [Co]		'
Wall thickness	(in) [t]		"
Inner Circumference	(ft) [Ci]		'
INSIDE of FAR WALL to OUTSIDE of Nipple	(in) [F]	134.00	"
INSIDE of NEAR WALL to OUTSIDE of Nipple	(in) [N]	2.00	"
DOWNstream Disturb	(in) [A]	128.0	"
UPstream Disturb	(in) [B]	516.0	"
Inner Diameter	(in) [Ds]	132.00	"
Area	(sqin) [As]	13,685	
DOWNstream Ratio	[A/Ds]	1.0	
UPstream Ratio	[B/Ds]	3.91	
Traverse (Particulate) Recommended #Pts/Diameter		24 12	
Traverse (NON-Particulate) Recommended #Pts/Diameter		16 8	
Actual Points per Diameter		24	



Trav Pt #No	Fract Stk ID (f)	Stack ID (Ds)	Actual Points (Dsxf)	Nearest 8ths (TP)	Adjusted Points (TP)*	Traverse Points (TP + N)	Traverse Points (TP + N)
1	1.05%	132.0	1.4	1.375	1.375	3.375	3 3 / 8
2	3.23%	132.0	4.3	4.250	4.250	6.250	6 1 / 4
3	5.51%	132.0	7.3	7.250	7.250	9.250	9 1 / 4
4	7.92%	132.0	10.5	10.500	10.500	12.500	12 1 / 2
5	10.47%	132.0	13.8	13.875	13.875	15.875	15 7 / 8
6	13.20%	132.0	17.4	17.375	17.375	19.375	19 3 / 8
7	16.15%	132.0	21.3	21.375	21.375	23.375	23 3 / 8
8	19.38%	132.0	25.6	25.625	25.625	27.625	27 5 / 8
9	23.00%	132.0	30.4	30.375	30.375	32.375	32 3 / 8
10	27.18%	132.0	35.9	35.875	35.875	37.875	37 7 / 8
11	32.32%	132.0	42.7	42.625	42.625	44.625	44 5 / 8
12	39.79%	132.0	52.5	52.500	52.500	54.500	54 1 / 2
13	60.21%	132.0	79.5	79.500	79.500	81.500	81 1 / 2
14	67.68%	132.0	89.3	89.375	89.375	91.375	91 3 / 8
15	72.82%	132.0	96.1	96.125	96.125	98.125	98 1 / 8
16	77.00%	132.0	101.6	101.625	101.625	103.625	103 5 / 8
17	80.62%	132.0	106.4	106.375	106.375	108.375	108 3 / 8
18	83.85%	132.0	110.7	110.625	110.625	112.625	112 5 / 8
19	86.80%	132.0	114.6	114.625	114.625	116.625	116 5 / 8
20	89.53%	132.0	118.2	118.125	118.125	120.125	120 1 / 8
21	92.08%	132.0	121.5	121.500	121.500	123.500	123 1 / 2
22	94.49%	132.0	124.7	124.750	124.750	126.750	126 3 / 4
23	96.77%	132.0	127.7	127.750	127.750	129.750	129 3 / 4
24	98.95%	132.0	130.6	130.625	130.625	132.625	132 5 / 8

Traverse Point Location

Client	Oregon Steel Mills			Portland, OR	Date
Location	Portland, OR			MJE/TJH/CDB	By
EPA Method #1	Outlet			*1685*	File
Number of PORTS	P	#	*5*		
INSIDE of FAR WALL to OUTSIDE of Nipple	F	in	52.0		
INSIDE of NEAR WALL to OUTSIDE of Nipple	N		0.00		
Stack/Duct WIDTH	Dw	in	179.0		
DOWNstream Disturb	A	in			
UPstream Disturb	B	in			
Stack/Duct DEPTH	Dh	in	52.0		
Equivalent Diameter	De	in	80.6		
Area	As	sqin	9308.0		
DOWNstream Ratio	A/De		0.00		
UPstream Ratio	B/De		0.00		
Traverse (Particulate)			25		
Recommended #Pts/Port		5	5		
Traverse (NOR-Particulate)			16		
Recommended #Pts/Port		3	4		
Actual Points used per Port			5		
Actual Number of Points			*25*		

Trav Pt #No	Fract Depth (f)	Stack Depth (Dp)	Actual Points (Dpxf)	Nearest 8ths (TP)	Adjusted Points (TP)	Traverse Points (TP+N)	Traverse Points (TP+N)
1	10.00%	52.0	5.2	5.250	5.250	5.250	5 1 / 4
2	30.00%	52.0	15.6	15.625	15.625	15.625	15 5 / 8
3	50.00%	52.0	26.0	26.000	26.000	26.000	26
4	70.00%	52.0	36.4	36.375	36.375	36.375	36 3 / 8
5	90.00%	52.0	46.8	46.750	46.750	46.750	46 3 / 4

Visible Emission Data
Field Data
Certifications

HORIZON ENGINEERING
13866 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-9060 • Fax (503) 255-0505
www.horizonengineering.com

Run 1

VISIBLE EMISSION OBSERVATION FORM

SOURCE INFORMATION	
Company Name	OSM
Address	Portland OR
Phone #	

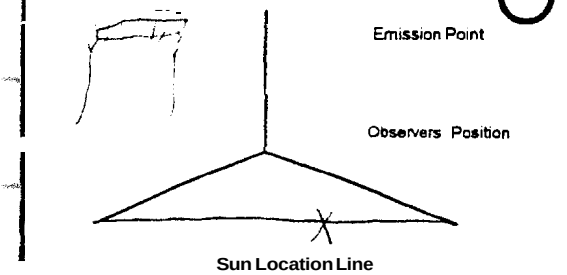
OBSERVATION RECORD	
DATE	11/7/01
TIME: Start	11:12
End	11:18

Source Description	ID #
EAF	
Operating Mode/Output Rate	
Normal Max	
Control Equipment	Operating Mode
Baghouse	Normal

PLUME INFORMATION	@ Start	@ End
Emission Point Description	Metal	–
Height Above Ground	75'	–
Height Relative to Observer	70'	–
Distance from Observer	300'	–
Direction from Observer	Northwest	–
Plume Type: Continuous	Yes	–
Intermittent	–	–
Fugitive	–	–
Plume Color	–	–
Water Droplets Present?	NO	–
Attached Plume?	–	–
Detached Plume?	–	–
Point in the Plume at Which Opacity was Observed	Top of BH	–
Description of Background	Sky	–
Color of Background	Blue	–
Condition of Sky	Clear	–
Wind Speed (mph)	0-2	–
Wind Direction (from)	South	–
Ambient Temperature (°F)	~70	–
Relative Humidity (%)	> 50%	–

Seconds					Seconds				
MIN	0	15	30	45	MIN	0	15	30	45
1	0	0	0	0	31				
2	0	0	0	0	32				
3	0	0	0	0	33				
4	0	0	0	0	34				
5	0	0	0	0	35				
6	0	0	0	0	36				
7	0				37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				

Source Layout Sketch — Draw North Arrow



Range of Opacity Readings	Max	%
	Min	%
Number of Readings Above ____ %		
Average Opacity for ___ Readings =		%

Observer's Name (print)	Certification No.
Mike Eisele	1224
Organization: Horizon Engineering, Portland, Oregon	

Certified By: ODEQ	Date:
Observer's Signature: Mike Eisele	Date: 11/7/01

Comments

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-6050 • Fax (503) 255-0505
www.horizonengineering.com

RUN 2

VISIBLE EMISSION OBSERVATION FORM

SOURCE INFORMATION	
Company Name	OSM
Address	Portland OR
Phone #	

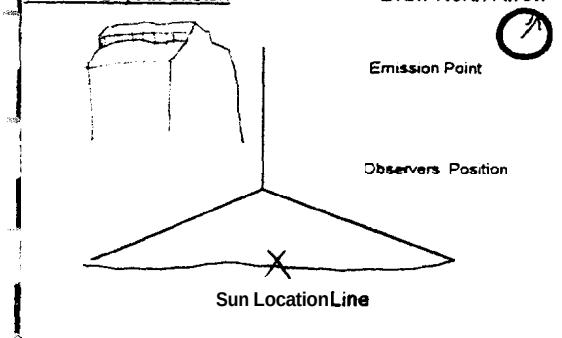
OBSERVATION RECORD	
DATE	11/7/01 TIME: Start 1219 End 1225

Source Description	ID #
EAF	
Operating Mode/Output Rate	Normal Max
Control Equipment	Operating Mode
Baghouse	Normal

PLUME INFORMATION	@ Start	@ End
Emission Point Description	Meta	–
Height Above Ground	75'	–
Height Relative to Observer	70'	–
Distance from Observer	300'	–
Direction from Observer	NW	–
Plume Type: Continuous	Yes	–
Intermittent	–	–
Fugitive	–	–
Plume Color	–	–
Water Droplets Present?	NO	–
Attached Plume?	–	–
Detached Plume?	–	–
Point in the Plume at Which Opacity was Observed	TOP of BH	–
Description of Background	SKY	–
Color of Background	Blue	–
Condition of Sky	Clear	–
Wind Speed (MPH)	Calm	–
Wind Direction (from)	–	–
Ambient Temperature (°F)	55	–
Relative Humidity (%)	50%	–

Seconds					Seconds				
MIN	0	15	30	45	MIN	0	15	30	45
1	0	0	0	0	31				
2	0	0	0	0	32				
3	0	0	0	0	33				
4	0	0	0	0	34				
5	0	0	0	0	35				
6	0	0	0	0	36				
7	0				37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				

Source Layout Sketch



Range of Opacity Readings	Max	%
	Min	%
Number of Readings Above ___ %		
Average Opacity for ___ Readings =		%

Observer's Name (print)	Certification No.
Mike E. Sole	1224
Organization: Horizon Engineering, Portland. Oregon	

Certified By: ODEQ	Date:
Observer's Signature: Mike Sole	Date: 11/7/01

Comments

HORIZON ENGINEERING
13565 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Run 3

VISIBLE EMISSION OBSERVATION FORM

SOURCE INFORMATION
Company Name OSM
Address Portland OR
Phone #

OBSERVATION RECORD
DATE 11/7/01 TIME: Start 1409 End 1415

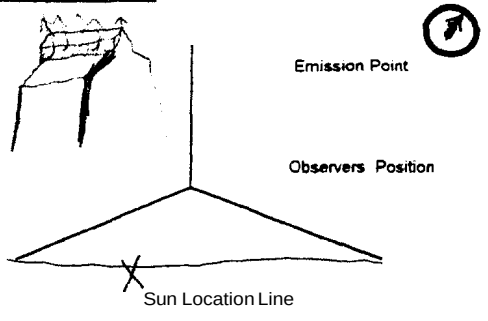
Source Description	ID #
EAP	
Operating Mode/Output Rate	
Nor Ma Max	
Control Equippent	Operating Mode
Baghouse	Normal

PLUME INFORMATION	@ Start	@ End
Emission Point Description	Metal	–
Height Above Ground	75'	–
Height Relative to Observer	10'	–
Distance from Observer	300'	–
Direction from Observer	NW	–
Plume Type: Continuous	Yes	–
Intermittent	–	–
Fugitive	–	–
Plume Color	–	–
Water Droplets Present?	NO	–
Attached Plume?	–	–
Detached Plume?	–	–
Point in the Plume at Which Opacity was Observed	Top of Baghouse	–
Description of Background	sky	–
Color of Background	Blue	–
Condition of Sky	clear	–
Wind Speed ( )	calm	–
Wind Direction (from)	–	–
Ambient Temperature(°F)	60	–
Relative Humidity(Pb)	~50%	–

Seconds					Seconds				
MIN	0	15	30	45	MIN	0	15	30	45
1	0	0	0	0	31				
2	0	0	0	0	32				
3	0	0	0	0	33				
4	0	0	0	0	34				
5	0	0	0	0	35				
6	0	0	0	0	36				
7	0				37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				

Source Layout Sketch

Draw North Arrow



Range of Opacity Readings	Max	%
	Min	%
Number of Readings Above ___%		
Average Opacity for ___ Readings =		%

Observer's Name (print)	Certification No.
Mike Eisele	1224
Organization: Horizon Engineering. Portland, Oregon	

Certified By: ODEQ	Date:
Observer's Signature: Mike Eisele	Date: 11/7/01

Comments

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland. OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY CONTROL DIVISION

CERTIFICATION OF COMPLETION

PLUME EVALUATION TRAINING

Michael Eisele

CERTIFICATION NO. 1224 EXPIRATION DATE 3/29/2002

Mary M Abrams
ADMINISTRATOR

Gaseous Emissions

Gaseous Emissions Determinations
Molecular Weight Determinations
Analyzer Calibration Data, Manual Data
Bias Checks
Data Logger Gas Charts
Strip Charts

Gaseous Emissions

Client	Oregon Steel Mills	MJE/TJWCDB			Testers
Source	ICA Baghouse-EAF Inlet	1685			File
Location	Portland, OR	MEW			Analysis/QA
Date	07-Nov-2001				

Number of Completed Runs Date Tested			Combined	Run 1	Run 2	Run 3	Average
System Calibration Time - Initial		Tci	08:35	08:35	08:35	08:35	
Test Time-Starting		Tts	10:31	10:31	12:09	13:50	
Test Time-Ending		Tte	15:14	12:05	13:33	15:17	
System Calibration Time - Final		Tcf	15:20	15:20	15:20	15:20	
Test Mid-point Time		Tx	12:52	11:18	12:51	14:33	
Volumetric Flowrate, Dry Standard	dscf/min	Qsd	388,771	388,771	388,771	388,771	
Production	Tons/hr		138.2	137.4	139.4	137.8	138.2
Oxygen	%	0 2	20.51	20.51	20.45	20.49	
Carbon Dioxide	%	C02	0.55	0.55	0.53	0.62	
Carbon Monoxide	CO	Span	1,000	1,000	1,000	1,000	
Indicated average - Dry	ppmv	Cid	143.1	198.0	133.7	123.6	151.8
Cylinder Value - High Range calibration gas	ppmv	Cma	880.0	880.0	880.0	880.0	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.0	0.0	0.0	0.0	
System Calibration Response - High Range gas - Initia	ppmv	Cmi	857.4	857.4	857.4	857.4	
System Calibration Response - Low Range gas - Initial	ppmv	Coi	-0.8	-0.8	-0.8	-0.8	
System Calibration Response - Low Range gas - Final	ppmv	Cof	-0.9	-0.9	-0.9	-0.9	
System Calibration Response - High Range gas - Final	ppmv	Cmf	883.3	883.3	883.3	883.3	
Actual average - Dry (Corrected for Drift)	ppmv-CO	Cgas	144.8	201.5	135.4	124.3	153.7
Mass Emissions	lbm / hr	Mgas	245.6	341.6	229.6	210.8	260.7
Mass Emissions on Production Basis	lbm/Ton		1.777	2.487	1.647	1.530	1.888
Nitrogen Oxides	NOx	span	250	250	250	250	
Indicated average-Dry	ppmv	Cid	10.22	10.88	11.53	10.15	10.85
Cylinder Value - High Range calibration gas	ppmv	Crna	89.80	89.80	89.80	89.80	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initia	ppmv	Cmi	88.29	88.29	88.29	88.29	
System Calibration Response - Low Range gas - Initial	ppmv	Coi	0.48	0.48	0.48	0.48	
System Calibration Response - Low Range gas - Final	ppmv	Cof	-0.17	-0.17	-0.17	-0.17	
System Calibration Response - High Range gas - Final	ppmv	Cmf	86.46	86.46	86.46	86.46	
Actual average - Dry (Corrected for Drift)	ppmv-NO2	Cgas	10.47	10.96	11.82	10.60	11.13
Mass Emissions	lbm-NO2 / hr	Mgas	29.17	30.53	32.92	29.53	30.99
Mass Emissions on Production Basis	lbm/Ton		0.211	0.222	0.236	0.214	0.224
Sulfur Dioxide	SO2	Span	30	30	30	30	
Indicated average-Dry	ppmv	Cid	8.11	7.11	8.80	8.71	8.21
Cylinder Value - High Range calibration gas	ppmv	Sc	15.27	15.27	15.27	15.27	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initia	ppmv	Sbs	14.73	14.73	14.73	14.73	
System Calibration Response - Low Range gas - Initial	ppmv	Zbs	0.35	0.35	0.35	0.35	
System Calibration Response - Low Range gas - Final	ppmv	Zbe	5.99	5.99	5.99	5.99	
System Calibration Response - High Range gas - Final	ppmv	Sbe	19.22	19.22	19.22	19.22	
Actual average - Dry (Corrected for Drift)	ppmv-SO2	Cgas	4.67	4.93	5.46	3.85	4.75
Mass Emissions	lbm-SO2 1 hr	Mgas	18.11	19.11	21.19	14.92	18.41
Mass Emissions on Production Basis	lbm/Ton		0.131	0.139	0.152	0.108	0.133

TGOC Emissions

Client	Oregon Steel Mills		MJE/TJH/CDB	Testers
Source	ICA Baghouse-EAF Inlet		1685	File
Location	Portland, OR		MEW	Analysis/QA
Date	07-Nov-2001			

Number of Completed Runs Date Tested			Combined	Run 1	Run2	Run 3	Average
System Calibration Time - Initial		Tci	08:35	08:35	08:35	08:35	
Test Time-Starting		Tts	10:31	10:31	12:09	13:50	
Test Time-Ending		Tte	15:14	12:05	13:33	15:17	
System Calibration Time - Final		Tcf	15:20	15:20	15:20	15:20	
Test Mid-point Time		Tx	12:52	11:18	12:51	14:33	
Volumetric Flowrate. Dry Standard	dscf/min	Qsd	388.771	388,771	388,771	388,771	
Production	Tons/hr		138.2	137.4	139.4	137.8	138.2
Oxygen	%	O2	20.51	20.51	20.45	20.49	
Carbon Dioxide	%	C02	0.55	0.53	0.62	0.61	
Moisture. Mole Fraction dry Gas		mfg	96.60%	96.60%	96.60%	96.60%	
Total Gaseous Organic Concentration	**(TGOC-1)**	Span	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	C3H8	1.oo	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K	3				
Cylinder Value - High Range calibration gas	ppmv-C3		27.79	27.79	27.79	27.79	
Cylinder Value - Low Range (Zero) calibration gas	ppmv-C3	Coa	0.00	0.00	0.00	0.00	
Indicated average- Wet	ppmv-C3	Ciw	9.84	11.32	9.11	9.73	10.05
Span Gas Concentration- Equivalent	ppmv-C3	Sc	28.69	28.69	28.69	28.69	
Zero Gas Concentration- Equivalent	ppmv-C3	Zc	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initial	ppmv-C3	Ss	28.82	28.82	28.82	28.82	
System Calibration Response - Low Range gas - Initial	ppmv-C3	Zs	0.59	0.59	0.59	0.59	
System Calibration Response - Low Range gas - Final	ppmv-C3	Ze	2.27	2.27	2.27	2.27	
System Calibration Response - High Range gas - Final	ppmv-C3	Se	34.57	34.57	34.57	34.57	
Actual average - Wet (Corrected for Drift & Response)	ppmv-C3		7.62	9.66	6.95	6.90	7.83
Actual average - Dry (Corrected for Drift & Response)	ppmv-C3		7.88	10.00	7.19	7.14	8.11
Actual average - Dry	ppmv-C	Cgas	22.91	29.05	20.90	20.75	23.56
Mass Emissions	lbm-C / hr		16.66	21.12	15.19	15.09	17.13
Mass Emissions on Production Basis	lbm-C/Ton		0.121	0.154	0.109	0.109	0.124
TGNMOC (TGOC less Methane)	**(TGOC-2)**	Span	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	C3H8	1.oo	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K	3				
Cylinder Value - High Range calibration gas	ppmv-C3		27.79	27.79	27.79	27.79	
Cylinder Value - Low Range (Zero) calibration gas	ppmv-C3	Coa	0.00	0.00	0.00	0.00	
Indicated average- Wet	ppmv-C3'	Ciw	5.02	4.26	4.65	6.47	5.13
Span Gas Concentration- Equivalent	ppmv-C3	Sc	28.69	28.69	28.69	28.69	
Zero Gas Concentration- Equivalent	ppmv-C3	Zc	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initial	ppmv-C3	Ss	27.32	27.32	27.32	27.32	
System Calibration Response - Low Range gas - Initial	ppmv-C3	Zs	0.42	0.42	0.42	0.42	
System Calibration Response - Low Range gas - Final	ppmv-C3	Ze	2.68	2.68	2.68	2.68	
System Calibration Response - High Range gas - Final	ppmv-C3	Se	30.81	30.81	30.81	30.81	
Actual average - Wet (Corrected for Drift & Response)	ppmv-C3		3.28	3.07	2.90	4.15	3.37
Actual average - Dry (Corrected for Drift & Response)	ppmv-C3		3.39	3.18	3.01	4.30	3.49
Actual average - Dry	ppmv-C	Cgas	9.86	9.23	8.74	12.49	10.15
Mass Emissions	lbm-C / hr		7.17	6.71	6.35	9.08	7.38
Mass Emissions on Production Basis	lbm-C/Ton		0.052	0.049	0.046	0.066	0.053
METHANE							
Actual average - Wet (Corrected for Drift & Response)	ppmv-C3		-1.34	6.59	4.04	2.75	4.46
Actual average - Dry (Corrected for Drift & Response)	ppmv-C3		4.49	6.82	4.18	2.84	4.62
Actual average - Dry	ppmv-C		13.05	19.82	12.16	8.26	13.41
Mass Emissions	lbm-C / hr		9.49	14.41	8.84	6.01	9.75
Mass Emissions on Production Basis	lbm-C/Ton		0.069	0.105	0.063	0.044	0.071

Molecular Emissions

Client	Oregon Steel Mills		MJE/TJH/CDB			Testers	
Source	ICA Baghouse-EAF Inle		1685			File	
Location	Portland, OR		MEW			Analysis/QA	
Date	07-Nov-2001						
			Combined	Run 1	Run 2	Run 3	Avg
System Calibration Time - Initial		Tci	08:35	08:35	08:35	08:35	
Test Time-Starting (Hivol Interval)		Tts	10:31	10:31	12:09	13:50	
Test Time-Ending (Hivol Interval)		Tte	15:14	12:05	13:33	15:17	
System Calibration Time - Final		Tcf	15:20	15:20	15:20	15:20	
Test Mid-point Time		Tx	12:52	11:18	12:51	14:33	
Volumetric Flowrate, Dry Standard - Inlet Average	dscf/min	Qsd	388,771	388,771	388,771	388,771	
Production Rate	Ton/hr		138.20	137.36	139.40	137.82	
Molecular weight, Dry Stack	lbm/lb-mole	Md	29.03	29.03	29.04	29.04	
Oxygen-Inlet	0 2	Span	25	25	25	25	
Indicated average - Dry	%	Cid	20.17	20.26	20.11	20.04	20.14
Cylinder Value - High Range calibration gas	%	Cma	11.60	11.60	11.60	11.60	
Cylinder Value - Low Range (Zero) calibration gas	%	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initia	%	Cmi	11.57	11.57	11.57	11.57	
System Calibration Response - Low Range gas - Initia	%	Coi	0.03	0.03	0.03	0.03	
System Calibration Response - Low Range gas - Final	%	Cof	0.05	0.05	0.05	0.05	
System Calibration Response - High Range gas - Final	%	Cmf	11.34	11.34	11.34	11.34	
Actual average - Dry (Corrected for Drift)	%	Cgas	20.51	20.51	20.45	20.49	20.48
Carbon Dioxide-Inlet	CO2	Span	25	25	25	25	
Indicated average - Dry	%	Cid	0.57	0.58	0.64	0.60	0.61
Cylinder Value - High Range calibration gas	%	Cma	12.41	12.41	12.41	12.41	
Cylinder Value - Low Range (Zero) calibration gas	%	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initia	%	Cmi	12.37	12.37	12.37	12.37	
System Calibration Response - Low Range gas - Initia	%	Coi	0.10	0.10	0.10	0.10	
System Calibration Response - Low Range gas - Final	%	Cof	-0.02	-0.02	-0.02	-0.02	
System Calibration Response - High Range gas - Final	%	Crnf	12.35	12.35	12.35	12.35	
Actual average - Dry (Corrected for Drift)	%	Cgas	0.550	0.533	0.620	0.609	0.587

Calibration Field Record

Client _____ Tester _____

Date 11/7/[illegible] Observer _____

Source _____ Data Logger ID _____

Leak Checks Pre-OK / Post-OK Response Time 1:35	Valve Position		Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	Start Run 1 System Calibration Response (SCRx)	End Run 1 Start Run 2 System Calibration Response (SCRx)	End Run 2 Start Run 3 System Calibration Response (SCRx)	End Run 3 System Calibration Response (SCRx)	
Times										
CO2 % ch___			CO2			2.178				
Range		27	CO2	12.41		2.37				
Analyzer Model 41C		0-1	N2	0.0		0.10	0.02			
Analyzer SN:										
CO ppm ch___			CO	880	871.5	857.4	883.3			
Range		27/R12	CO	499/85.7	496/85.22	478.1/82.7	496.1/85.2			
Analyzer Model 48		0-9	N2	0.00		0.75	-0.93			
Analyzer SN:										
O2% ch___		AMB	O2	AMB	20.95	20.88				
Range		0-9	O2	11.60	11.62	11.57	11.34			
Analyzer Model 14C		27	N2	0.00	0.00	0.03	0.05			
Analyzer SN:										
NOx ppm ch___			NOx	183.2	184.5	181.7	179.2			
0-200 ppm		27/N7	NOx	89.1/5.25	88.72/24.3	88.29/24.21	86.46/23.72			
Analyzer Model 42H		0-1		0.00	0.0	0.48	0.17			
Analyzer SN:										
TGOC ppm ch___		P22	C3H8	39.1	38.5	87.5				
VOC Cutter		P19		91.6	92.3	51.5	52.19			
Range 0-100 C3H8		P18/		29.69/761	29.69/761	28.52/902	34.57	0.96/		
Analyzer Model 3HM										
Analyzer SN:		Zero Air	Air	0.00	0.36	2.51	2.27			
TGOC ch___		P22	C3H8	39.0	89.01	87.31				
Range		P19		91.6	51.[illegible]	49.[illegible]	51.[illegible]			
Analyzer Model 3HM		P18/		29.69/	28.32/	27.32/1.[illegible]	33.[illegible]			
Analyzer SN:		Zero Air		0.00	0.[illegible]	0.42	2.[illegible]			

Check	Performance Specs			
Analyzer Calibration Error	|ACR-CV| / SPAN	2 (25A @ 5%)	Hot Line Temp	250
Sampling System Bias	(SRCx-ACR) /SPAN	5	Hot Line Temp	249
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3		127

Test Times	Run 1	Run 2	Run 3
Start Time	1:3[illegible]		
End Time	2:[illegible]		

CH4 25 ppm with cutter 9 ppm without cutter 11 ppm

Calibration Field Record

Client _____ Tester _____

Date _____ Observer _____

Source _____ Data Logger ID _____

Leak Checks Pre-OK / Post-OK Response Time 45sec	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	Start Run 1 System Calibration Response (SCR1)	End Run _ Start Run _ System Calibration Response (SCR2)	End Run _ Start Run _ System Calibration Response (SCR3)	End Run _ System Calibration Response (SCR4)	
Times					3:47	3:52	15:22			
CO2 % ch___			CO2							
Range			CO2							
Analyzer Model			N2							
Analyzer SN:										
CO ppm ch___			CO							
Range			CO							
Analyzer Model			N2							
Analyzer SN:										
O2% ch___			O2							
Range			O2							
Analyzer Model			N2							
Analyzer SN:										
NOx ppm ch___			NOx							
Range			NOx							
Analyzer Model			N2							
Analyzer SN:										
TGOC ppm ch___										
Range										
Analyzer Model										
Analyzer SN:			Air							
SO2 ch___										
Range 0-30 PPM		22		29.47	26.45					
Analyzer Model Beval		57		15.27	15.51	-.73	19.22			
Analyzer SN:		[illegible]		0.00	0.01	.55	5.[illegible]			

Check		Performance Specs		
Analyzer Calibration Error	| ACR-CV | / SPAN	2 (25A @ 5%)	Hot Line Temp	250 F
Sampling System Bias	(SRC1-ACR) /SPAN	5	Hot Line Temp	[illegible]
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3		

Test Times	Run 1	Run 2	Run 3
Start Time	[illegible]		
End Time	[illegible]		

13595 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-6030 • Fax (503) 255-6035
www.horizonengineering.com

OSM Manual gas values

DATE 11/7/01

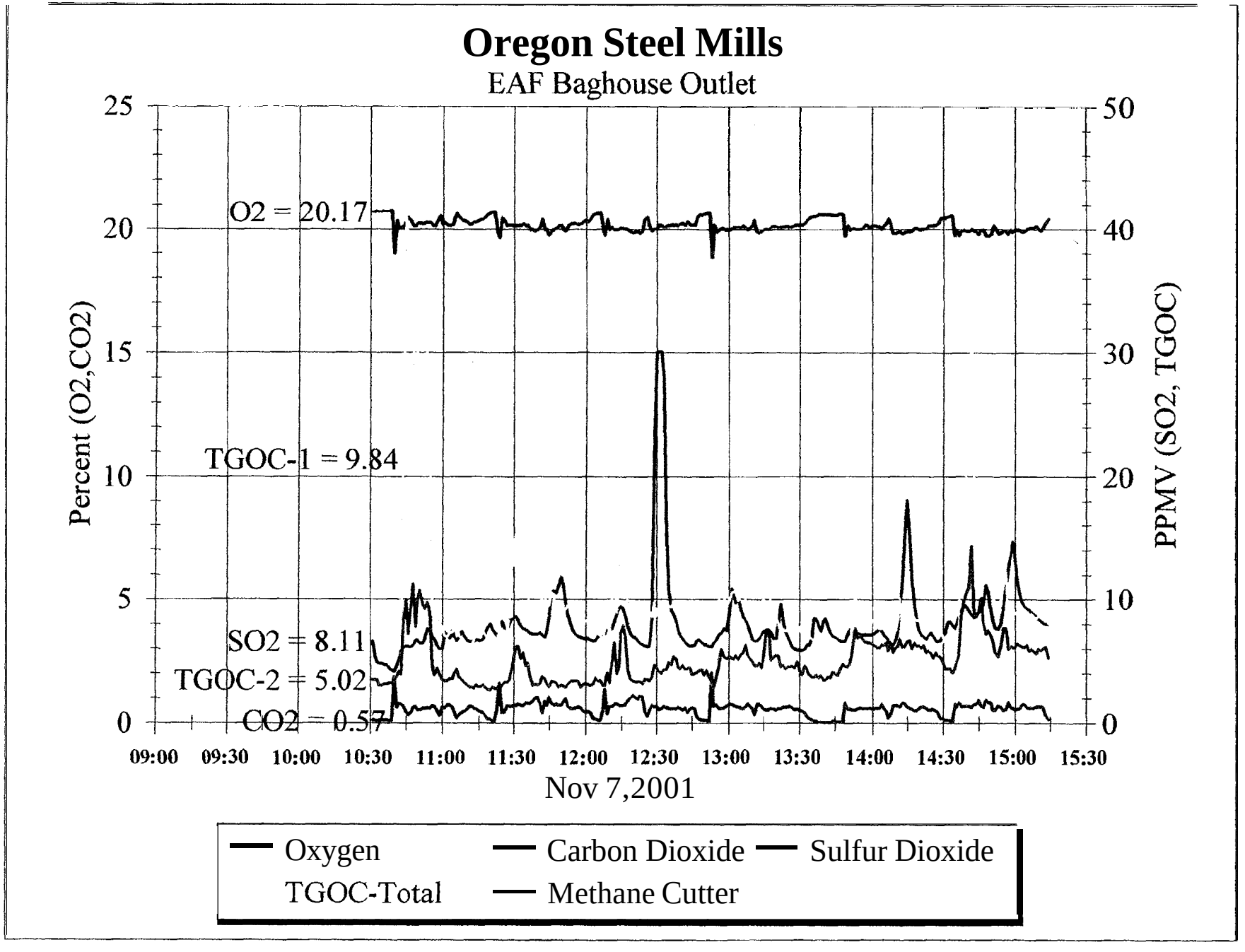
	13:59:00	13:59:15	13:59:30	13:59:45
O_2 %	20.18	20.05	20.03	20.[illegible]
CO_2 %	0.54	0.6	0.67	0.69
CO, PPM	[illegible]	[illegible]	[illegible]	[illegible]
NO_x PPM	[illegible]	[illegible]	1.72	[illegible]
SO_2 PPM	7.08	[illegible]	7.17	[illegible]
C_3H_8 VOC, PPM	6.98	6.6	6.1	6.[illegible]
C_3H_8 VOC 2 PPM	8.72	8.9	6.47	8.5

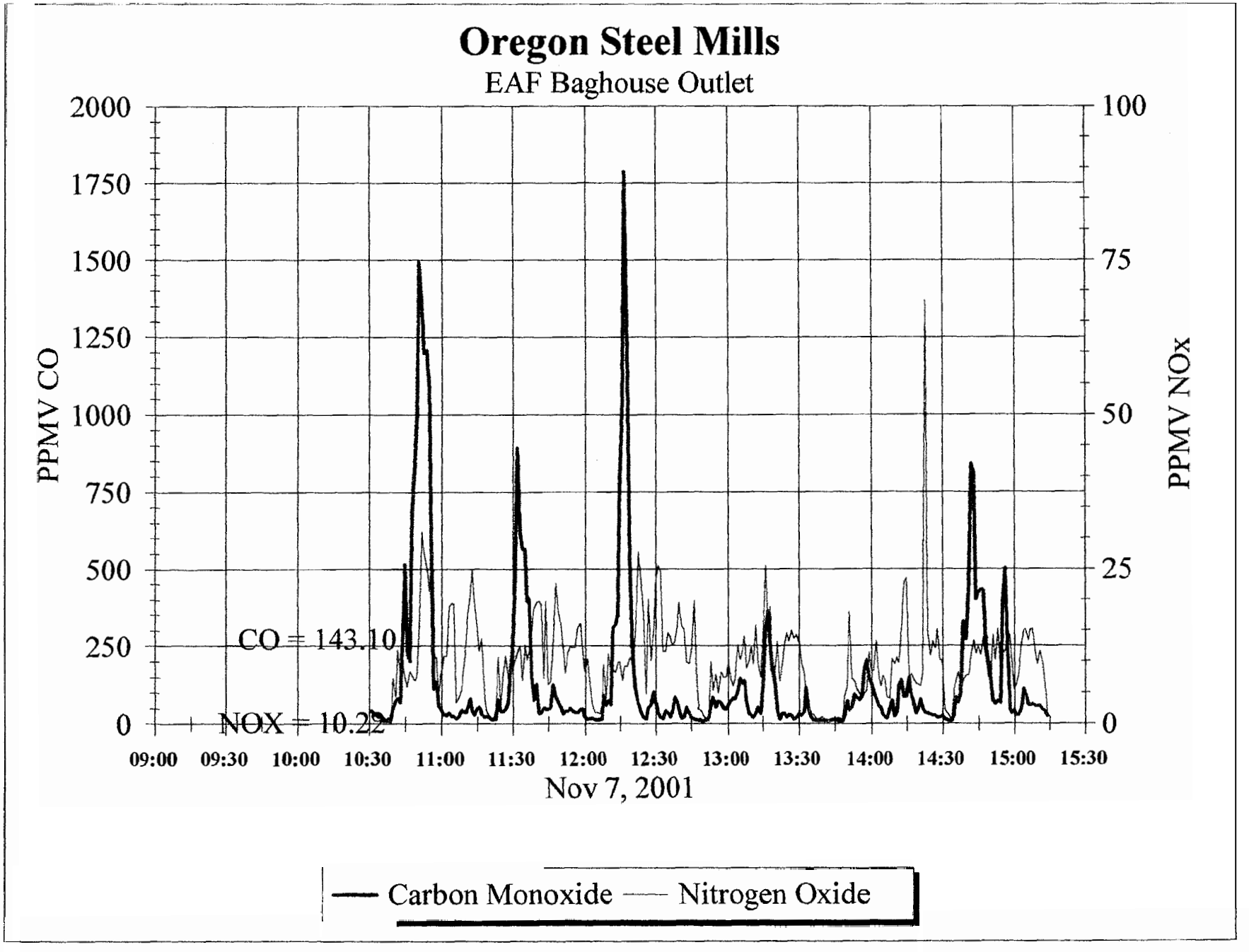
Bias Check

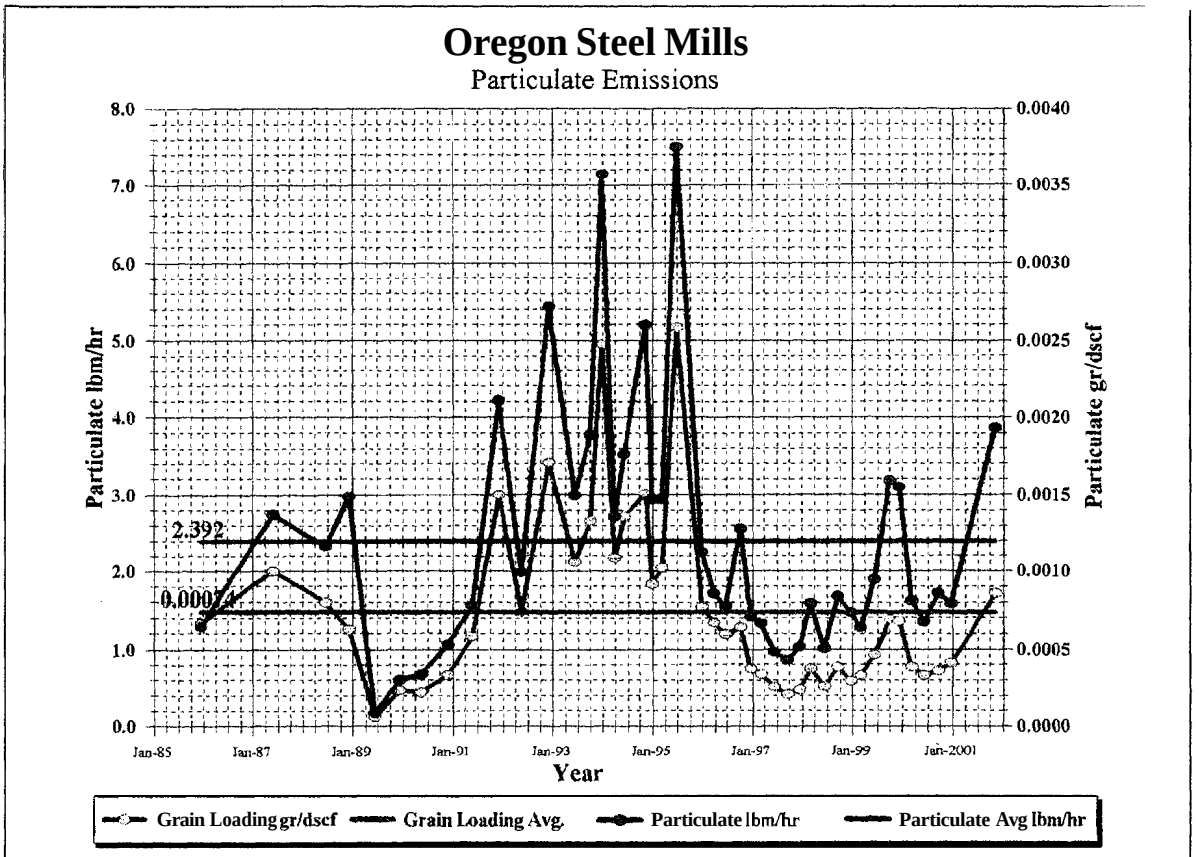
Oregon Steel Mills
EAF Baghouse
7-November-2001

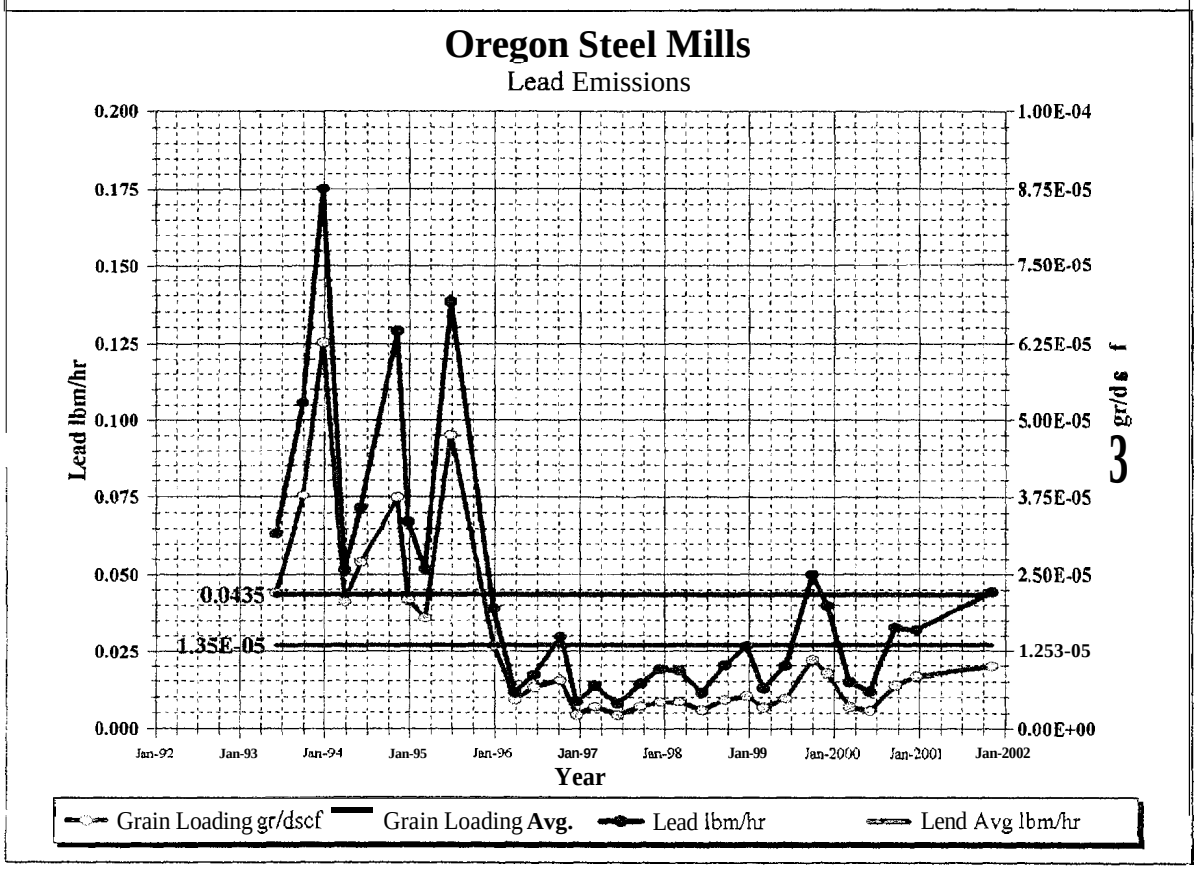
		Span	Cylinder Value CV	Analyzer Calibration Response ACR	Initial System Calibration Response SCRi	Final System Calibration Response SCRf	Cylinder Value Percent of Span	Difference < 2%	Initial System Calibration Bias < 5%	Final System Calibration Bias < 5%	Drift < 3%
OXYGEN											
Run 1-3	High Range	25	20.95	20.95	20.88		84%	0%			
	Mid-Range	25	11.60	11.62	11.57	11.34	46%	0%	0%	1%	1%
	Zero	25	0.00	0.00	0.03	0.05	0%	0%	0%	0%	0%
CARBON DIOXIDE											
Run 1-3	High Range	25	21.83	21.85	21.78	21.46	87%	0%			
	Mid-Range	25	12.41	12.55	12.37	12.35	50%	1%	1%	1%	0%
	Zero	25	0.00	0.00	0.10	-0.02	0%	0%	0%	0%	0%
CARBON MONOXIDE											
Run 1-3	High Range	2000	880.00	871.50	857.40	883.30	44%	0%	1%	1%	1%
	Mid-Range	2000	499.00	496.00	478.10	498.00	25%	0%	1%	0%	1%
	Mid-Range	2000	85.90	85.22	84.70	87.20	4%	0%	0%	0%	0%
	Zero	2000	0.00	-0.45	-0.75	-0.93	0%	0%	0%	0%	0%
NITROGEN OXIDES											
Run 1	High Range	200	183.20	184.50	181.70	179.20	92%	1%	1%	3%	1%
	Mid-Range	200	89.80	88.72	88.29	86.46	45%	1%	0%	1%	1%
	Mid-Range	200	25.25	24.37	24.21	23.52	13%	0%	0%	0%	0%
	Zero	200	0.00	0.00	0.48	-0.17	0%	0%	0%	0%	0%
SULFUR DIOXIDE											
Run 1	High Range	30	26.47	26.43			88%	0%			0%
	Mid-Range	30	15.27	15.51	14.73	19.22	51%	1%	3%	12%	15%
	Zero	30	0.00	0.08	0.35	5.99	0%	0%	1%	20%	19%
TOTAL GASEOUS ORGANIC CONCENTRATION #1											
Run 1	High Range	C3H8	100	88.85	87.55		89%				
	Mid-#1	CH4	100	52.32	51.53	62.18	52%				11%
	Mid-#2	CH4	100	29.89	28.82	34.57	30%				6%
	Mid-#3	CH4	100	9.49	9.02	12.51	9%				3%
	Zero	N2	100	0.36	0.59	2.27	0%				2%
TOTAL GASEOUS ORGANIC CONCENTRATION #2											
Run 1	High Range	C3H8	100	89.01	87.51		89%				
	Mid-#1	CH4	100	51.90	49.65	51.96	52%				2%
	Mid-#2	CH4	100	28.82	27.32	30.81	29%				3%
	Mid-#3	CH4	100	8.71	8.32	11.26	9%				3%
	Zero	N2	100	-0.07	0.42	2.68	-0%				2%

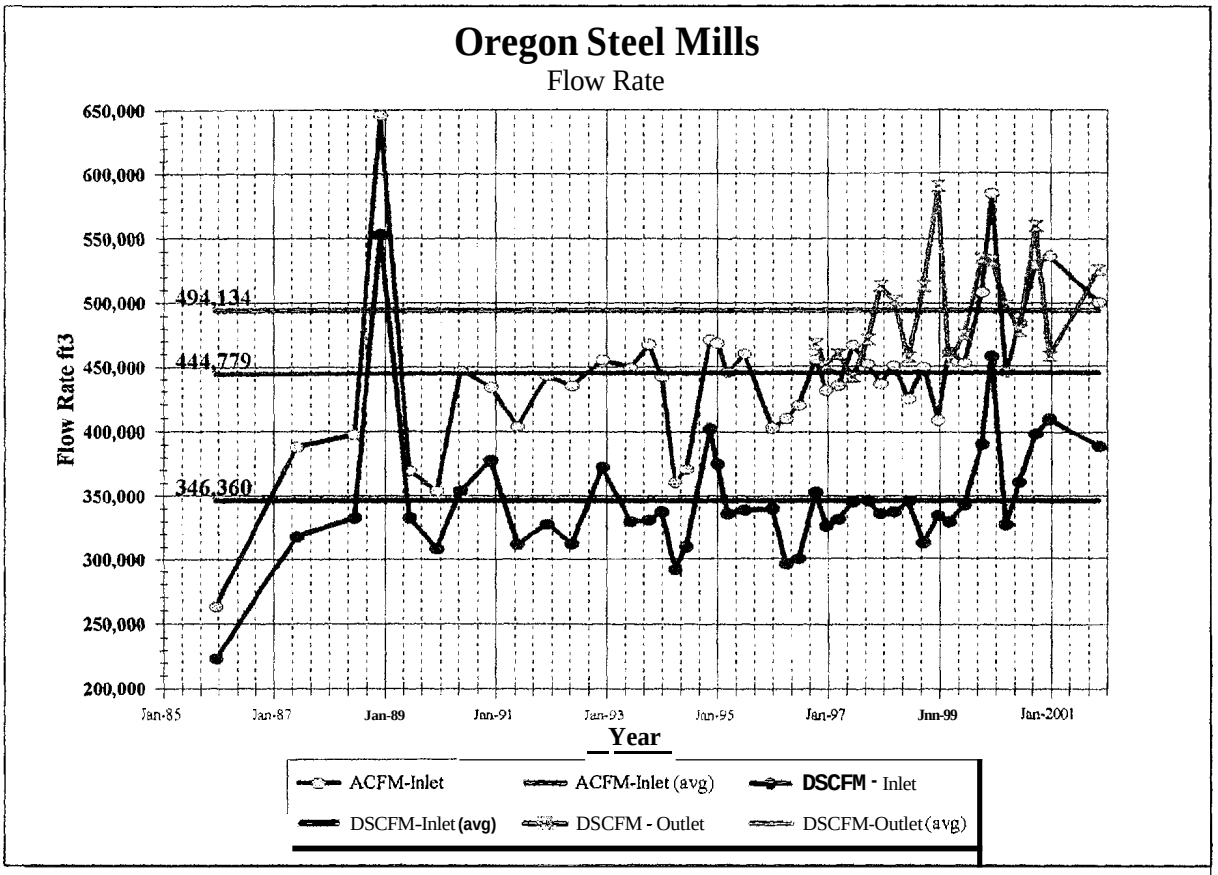
Part 60, Appendix A, Method 6C, Figures 6C-3 to 6C-5

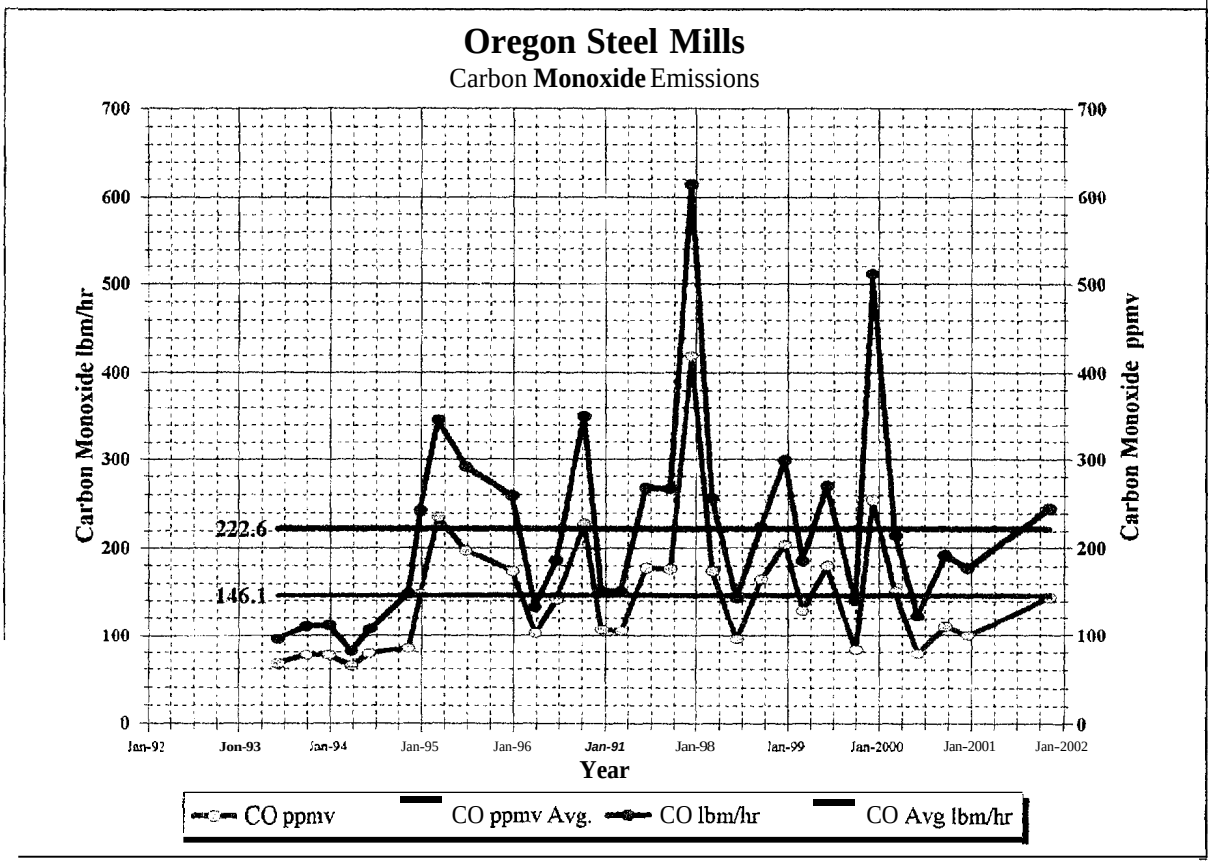

Oregon Steel Mills
EAF Baghouse Outlet
Percent (O2,CO2)
PPMV (SO2, TGOC)
O2 = 20.17
TGOC-1 = 9.84
SO2 = 8.11
TGOC-2 = 5.02
CO2 = 0.57
09:00 09:30 10:00 10:30 11:00 11:30 12:00 12:30 13:00 13:30 14:00 14:30 15:00 15:30
Nov 7,2001
Oxygen
Carbon Dioxide
Sulfur Dioxide
TGOC-Total
Methane Cutter

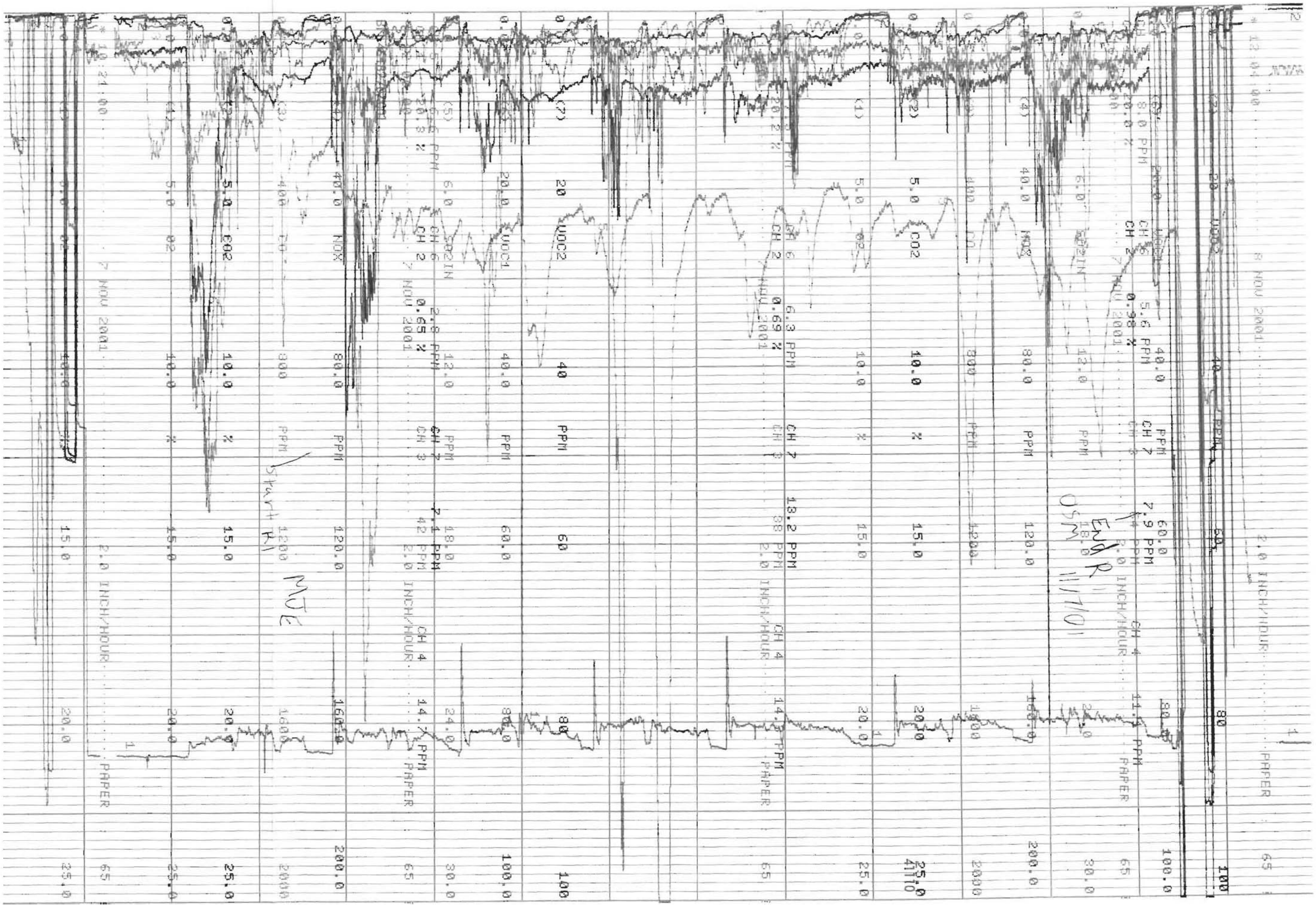

Oregon Steel Mills
EAF Baghouse Outlet
PPMV CO
PPMV NOx
2000
1750
1500
1250
1000
750
500
250
0
100
75
50
25
0
CO = 143.10
NOX = 10.22
09:00
09:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
Nov 7, 2001
Carbon Monoxide
Nitrogen Oxide


Oregon Steel Mills
Particulate Emissions
Particulate lbm/hr
Particulate gr/dscf
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
2.392
0.00074
Jan-85
Jan-87
Jan-89
Jan-91
Jan-93
Jan-95
Jan-97
Jan-99
Jan-2001
Year
Grain Loading gr/dscf
Grain Loading Avg.
Particulate lbm/hr
Particulate Avg lbm/hr


Oregon Steel Mills
Lead Emissions
Lead lbm/hr
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
1.00E-04
8.75E-05
7.50E-05
6.25E-05
5.00E-05
3.75E-05
2.50E-05
1.253-05
0.00E+00
0.0435
1.35E-05
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-2000
Jan-2001
Jan-2002
Year
Grain Loading gr/dscf
Grain Loading Avg.
Lead lbm/hr
Lend Avg lbm/hr


Oregon Steel Mills
Flow Rate
650,000
600,000
550,000
500,000
450,000
400,000
350,000
300,000
250,000
200,000
Flow Rate ft3
494,134
444,779
346,360
Jan-85
Jan-87
Jan-89
Jan-91
Jan-93
Jan-95
Jan-97
Jnn-99
Jan-2001
Year
ACFM-Inlet
ACFM-Inlet (avg)
DSCFM - Inlet
DSCFM-Inlet (avg)
DSCFM - Outlet
DSCFM-Outlet (avg)


Oregon Steel Mills
Carbon Monoxide Emissions
700
600
500
400
300
200
100
0
Carbon Monoxide lbm/hr
Carbon Monoxide ppmv
222.6
146.1
Jan-92
Jon-93
Jan-94
Jan-95
Jan-96
Jan-91
Jan-98
Jan-99
Jan-2000
Jan-2001
Jan-2002
Year
CO ppmv
CO ppmv Avg.
CO lbm/hr
CO Avg lbm/hr


END RUN
11/7/01
OSM
MTE
Start RUN
NOV 2001
PAPER
CH 2
CH 4
CH 6
CH 7
NOX
SO2IN
VOC1
VOC2
CO
CO2
NO2
O2
PPM
%
INCH/HOUR

Production/Process Data

Furnace Heat Logs

MSDS Sheet

Baghouse Pressure Drop Field Data

Production Data

OSM #3 Furnace Heat Log Data Reduction

07-Nov-2001

	Heat	Last Tap	Start Charge	Finish Tap	C-T mins	T-T mins	First Charge lbms	Second Charge lbms	Total Charge lbms	Run Total lbms	Total Time mins	Down Time mins	Run Time mins	Tons/hr
	114,406													
	114,407	08:21	09:51	10:36	45.0	135.0	137,900	25,300	163,200					
Run 1	114,408	10:36	10:41	11:21	40.0	45.0	139,400	61,000	200,400	384,600	84		84	137.36
	114,409	11:21	11:26	12:05	39.0	44.0	139,200	45,000	184,200					
Run 2	114,410	12:05	*12:10*	12:49	39.0	44.0	139,500	60,400	199,900	399,600	86		86	139.40
	114,411	12:49	12:54	13:36	42.0	47.0	138,800	60,900	199,700					
Run 3	114,412	13:36	13:50	14:32	42.0	56.0	139,800	60,000	199,800	390,500	85		85	137.82
	114,413	14:32	14:36	15:15	39.0	43.0	140,800	49,900	190,700					
Average					40.2	46.5	139,583	56,200	195,783					
Total										1,174,700	255		255	138.20

OSM #3 FURNACE HEAT LOG

HEAT **SUMMARY**

Heat Number: 114407 Grade: X-60-1 Grade No: 7168

Crew No : 1 Heat Tap Date: 11/07/2001 Charge Time: 951
Tap Time: 1036

Heats on Delta: 402 Last Heat Tapped: 821

Total Charge Wt	: 215.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 45.0	Oxygen Batch	0
Pour Back	: 24.0	Nat. Gas Batch	: 127
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 34.3
Charge to Tap Time	45	Avg. MW	: 60.6
Tap to Tap Time	: 135	KWH/Ton	: 403.5
Total Delay Time	: 101.2	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 137,900
2nd - 25,300

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 114407 BOH 11/07 at 08:21 Product Code 7168
Melter 1 1st Helper 1 Ladle Temp 0 187 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
08:25	3.95	0.00	3.95	0	0.00			0.00	0.00	Lime—#—
09:50	89.27	0.00	85.32	0	0.00			0.00	0.00	
09:51	89.47	0.00	0.20	0	0.00			0.00	0.00	CHG 1 140.
09:52	90.86	1.38	0.00	2	56.37	0.774	I S M	1.30	72.12	Bore In
09:54	92.76	1.90	0.00	4	56.26	0.827	1 L M	3.08	64.10	Bore In
09:57	95.95	3.20	0.00	7	55.71	0.820	1 L M	6.05	63.98	Melt
10:02	100.97	5.01	0.00	11	59.02	0.837	1 L M	10.98	63.23	Refine
10:05	103.64	2.67	0.00	14	59.75	0.851	1 L M	13.64	61.60	
10:07	105.60	0.00	1.97	13	0.00			13.64	0.00	CHG 2 30.0
10:07	105.85	0.00	0.25	13	0.00			13.64	0.00	
10:08	107.34	1.48	0.00	15	61.83	0.798	1 S M	15.17	73.51	
10:13	112.35	5.02	0.00	18	59.74	0.845	1 L M	20.16	62.01	
10:16	115.40	3.05	0.00	21	61.50	0.863	1 L M	23.29	60.57	
10:19	118.18	2.78	0.00	22	64.83	0.816	1 S M	26.29	71.29	
10:19	118.27	0.08	0.00	22	38.45	0.846	1 L M	26.35	48.72	
10:22	121.07	0.00	2.80	22	0.00			26.35	0.00	P'back 21.0
10:27	126.03	4.97	0.00	25	64.83	0.815	1 S M	31.71	71.59	P'back 24.0
10:29	128.45	2.42	0.00	26	64.85	0.807	1 S M	34.33	71.64	
10:29	128.47	0.02	0.00	26	6.48	0.707	1 L M	34.33	11.88	
10:36	135.15	0.00	6.68	25	0.00			34.33	0.00	Tap T

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 127

cold charge weight 170.0
hot charge weight 45.0
total charge weight 215.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 114407 Time: 10:36

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MIA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floor
UNDEF	1 S	11.6	34.3	21.59	64.45	46.42	79.43	0.811	11.3	11.6	11.6	72.5
UNDEF	1 L	8.2	24.0	22.35	60.07	36.94	70.52	0.852	8.2	8.2	8.2	62.C
BOREIN	1 S	1.4	4.1	21.75	56.37	46.09	72.82	0.774	1.3	1.4	1.4	71.5
BOREIN	1 L	1.9	5.6	22.33	56.26	38.29	68.05	0.827	1.9	1.9	1.9	65.1
MELT	1 L	3.2	9.4	22.28	55.71	38.83	67.91	0.820	3.2	3.2	3.2	64.C
REFINE	1 L	7.7	22.6	22.27	59.27	38.03	70.43	0.842	7.7	7.7	7.7	63.5
		34.0		22.04	60.62	41.06	73.22	0.828	33.6	34.0	34.0	66.4

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 114407 Date: 11-07-01 Shift: 2
Melter: 1 First Helper: 1 Product Code: 7168
Tap Time: 10:36 Prev Heat Tapped: 08:21 Time Tap to Tap: 2 hr. 15 -

CHARGE	TIME	WEIGHT
1	09:51	140.0
2	10:07	30.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		215.0
TOTAL(tons)		107.5

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	34.33
KWH/TON:	319.3

HEATS ON LIN
DELTA LIFE
CHG WT(klbs

Chemistry File Heat Number 114407 has incorrect number of characters

OSM #3 FURNACE HEAT LOG

HEAT SUMMARY

Heat Number: 114408 Grade: X-60-1 Grade No: 7168

Crew No : 1 Heat Tap Date: 11/07/2001 Charge Time: 1041
Tap Time: 1121

Heats on Delta: 403 Last Heat Tapped: 1336

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 122
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 29.2
Charge to Tap Time	: 40	Avg. MW	: 60.6
Tap to Tap Time	: 45	KWH/Ton	: 208.6
Total Delay Time	: 16.1	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st = 139,400
2nd = 61,000

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 114408 BOH 11/07 at 10:36 Product Code 7168
Melter 1 1st Helper 1 Ladle Temp 0 188 heats on lance 8

CLOCK TIME	---TIME TOTAL	(MINUTES)-- ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
10:41	5.12	0.00	5.12	0	0.00			0.00	0.00	Inspect_Fce
10:41	5.15	0.00	0.03	0	0.00			0.00	0.00	CHG_1__140.
10:41	5.30	0.00	0.15	0	0.00			0.00	0.00	
10:43	7.28	1.98	0.00	27	61.28	0.790	I S M	2.03	73.87	Bore_In
10:44	8.28	1.00	0.00	36	55.83	0.833	1 L M	2.95	62.71	Bore_In
10:45	8.97	0.00	0.68	33	0.00			2.95	0.00	Slip_A
10:45	9.03	0.00	0.07	33	0.00			2.95	0.00	Slip_B
10:47	10.80	0.00	1.77	28	0.00			2.95	0.00	Slip_C
10:47	10.95	0.15	0.00	29	32.92	0.723	1 L M	3.04	54.39	Bore_In
10:50	14.05	3.10	0.00	44	57.87	0.831	1 L M	6.03	64.00	Melt
10:54	17.98	3.93	0.00	57	58.50	0.840	1 L M	9.86	61.87	Lime_#_
10:57	21.71	3.73	0.00	64	58.28	0.848	1 L M	13.49	60.49	
10:59	23.58	0.00	1.87	59	0.00			13.49	0.00	CHG_2__140.i
11:00	24:45	0.87	0.00	60	61.73	0.797	1 S M	14.38	72.22	
11:04	28.69	4.25	0.00	66	59.19	0.843	1 L M	18.57	60.88	
11:07	30.91	0.00	2.22	62	0.00			18.57	0.00	
11:12	35.88	4.97	0.00	67	64.20	0.814	1 S M	23.88	70.53	
11:17	40.81	4.93	0.00	71	64.92	0.810	1 S M	29.22	70.88	
11:17	40.84	0.03	0.00	71	39.96	0.849	1 L M	29.24	45.37	
11:21	45.03	0.00	4.18	64	0.00			29.24	0.00	Tap_T

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 122

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 114408 Time: 11:21

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floor
UNDEF	1 S	10.8	37.2	21.65	64.33	46.42	79.33	0.811	10.7	10.8	10.8	70.8
UNDEF	1 L	4.3	14.8	22.32	59.04	37.68	70.04	0.843	4.3	4.3	4.3	61.9
BOREIN	1 S	2.0	6.8	21.78	61.28	47.50	77.53	0.790	1.9	2.0	2.0	74.3
BOREIN	1 L	1.1	4.0	22.46	52.84	36.30	64.11	0.824	1.1	1.1	1.1	6C.E
MELT	1 L	3.1	10.7	22.36	57.87	38.81	69.68	0.831	3.1	3.1	3.1	63.8
REFINE	1 L	7.7	26.5	22.18	58.40	37.08	69.18	0.844	7.7	7.7	7.7	62.7
		28.9		22.01	60.62	41.51	73.47	0.825	28.8	28.9	28.9	66.4

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 114408 Date: 11-07-01 Shift: 2
Melter: 1 First Helper: 1 Product Code: 7168
Tap Time: 11:21 Prev Heat Tapped: 10:36 Time Tap to Tap: 0 hr. 45 m

CHARGE	TIME	WEIGHT
1	10:41	140.0
2	10:59	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	29.24
KWH/TON:	208.9

HEATS ON LIN

DELTALIFE

CHG WT(klbs)

Chemistry File Heat Number 114408 has incorrect number of characters

OSM #3 FURNACE HEAT LOG

HEAT SUMMARY

Heat Number: 114409 Grade: X-60-1 Grade No: 7168

Crew No : 1 Heat Tap Date: 11/07/2001 Charge Time: 1125
Tap Time: 1205
Heats on Delta: 404 Last Heat Tapped: 1121

Total Charge Wt	: 199.2	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 133
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 33.8
Charge to Tap Time	39	Avg. MW	: 60.1
Tap to Tap Time	44	KWH/Ton	: 339.4
Total Delay Time	: 10.6	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st = 139,200
2nd = 45,000

Oregon Steel Mills, Portland Oregon
* * * * * * H E A T L O G * * * * * *

Heat No. 114409 BOH 11/07 at 11:21 Product Code 7168
Melter 1 1st Helper 1 Ladle Temp 0 189 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTIOK
11:25	4.75	0.00	4.75	0	0.00			0.00	0.00	Inspect_Fce
11:26	4.83	0.00	0.08	0	0.00			0.00	0.00	CHG_1 — 139.
11:27	5.98	1.15	0.00	19	60.76	0.786	I S M	1.16	72.99	Bore_In
11:27	6.08	0.10	0.00	21	60.84	0.786	1 L M	1.27	72.56	
11:29	7.98	1.90	0.00	39	55.52	0.830	1 L M	3.02	61.96	Bore-In
11:32	11.08	3.10	0.00	56	58.60	0.842	1 L M	6.05	62.06	Melt
11:37	16.10	5.02	0.00	70	57.20	0.841	1 L M	10.83	60.32	Refine
11:41	20.61	4.52	0.00	77	58.11	0.862	1 L M	15.21	58.05	
11:43	22.78	0.00	2.17	69	0.00			15.21	0.00	CHG_2__ 60.
11:43	22.85	0.07	0.00	69	17.28	0.696	1 S M	15.23	41.72	
11:45	24.28	1.43	0.00	71	63.02	0.801	1 S M	16.73	73.67	
11:50	29.30	5.01	0.00	76	57.60	0.833	1 L M	21.55	62.69	
11:52	31.56	2.27	0.00	78	59.17	0.857	1 L M	23.78	59.62	
11:57	36:58	5.02	0.00	81	66.14	0.819	1 S M	29.31	71.06	
12:01	40.74	4.17	0.00	83	65.27	0.812	1 S M	33.84	70.91	
12:01	40.81	0.07	0.00	83	45.36	0.823	1 L M	33.89	55.35	
12:05	44.43	0.00	3.62	76	0.00			33.89	0.00	Tap_T

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 133

cold charge weight 199.2
hot charge weight 0.0
total charge weight 199.2

** HEAT ELECTRICAL SUMMARY **
Heat No.: 114409 Time: 12:05

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floor
UNDEF	1 S	10.7	31.6	21.69	65.07	46.55	80.01	0.813	10.7	10.7	10.7	71.6
UNDEF	1 L	7.3	21.7	22.40	57.98	37.31	68.94	0.841	7.3	7.3	7.3	63.4
BOREIN	1 S	1.1	3.4	21.62	60.76	47.86	77.35	0.786	1.1	1.1	1.1	72.7
BOREIN	1 L	2.0	5.9	22.51	55.78	37.88	67.43	0.827	2.0	2.0	2.0	62.5
MELT	1 L	3.1	9.2	22.45	58.60	37.62	69.64	0.842	3.1	3.1	3.1	62.1
REFINE	1 L	9.5	28.2	22.30	57.63	35.56	67.72	0.851	9.5	9.5	9.5	58.2
		33.8		22.13	60.14	40.16	72.32	0.832	33.8	33.8	33.8	64.9

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 114409 Date: 11-07-01 Shift: 2
Melter: 1 First Helper: 1 Product Code: 7168
Tap Time: 12:05 Prev Heat Tapped: 11:21 Time Tap to Tap: 3 hr. 44 -

CHARGE	TIME	WEIGHT
1	11:26	139.2
2	11:43	60.0
3	none	none
4	none	none
TOTAL(klbs)		199.2
TOTAL(tons)		99.6

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	33.89
KWH/TON:	340.3

HEATS ON LIN

DELTA LIFE

CHG WT(klbs

Chemistry-File Heat Number 114409 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 114410 Grade: X-60-1 Grade No: 7168

Crew No : 1 Heat Tap Date: 11/07/2001 Charge Time: 0
Tap Time: 1249

Heats on Delta: 405 Last Heat Tapped: 1243

Total Charge Wt	0.0	Furnace Lime Lbs	0
Hot Metal Wt	0.0	Oxygen Batch	0
Pour Back	0.0	Nat. Gas Batch	132
		Tap Temp	0
Melt Efficiency Rating	0.00	Total MWH	3.2
Charge to Tap Time	769	Avg. MW	64.3
Tap to Tap Time	6	KWH/Ton	++.0
Total Delay Time	3.0	Avg. Pwr. Factor	0.80

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st = 139,500
2nd = 60,400

Oregon Steel Mills, Portland Oregon
* * * * * * H E A T L O G * * * * * *

Heat No. 114410 BOH 11/07 at 12:43 Producr Code 7168
Melter 1 1st Helper 1 Ladle Temp 0 190 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
12:43	0.00	0.00	0.00	0	0.00			0.00	0.00	Inspect_Fce
12:43	0.12	0.12	0.00	100	63.66	0.816	1 S M	0.12	69.27	Holding___
12:46	2.92	2.80	0.00	100	64.57	0.804	1 S M	3.14	71.11	Bore_I-
12:46	3.03	0.12	0.00	100	61.93	0.815	1 S M	3.26	68.05	Melt_____
12:46	3.05	0.02	0.00	100	43.20	0.876	1 L M	3.27	43.92	Melt_____
12:49	6.02	0.00	2.97	51	0.00			3.27	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 132

cold charge weight 0.0
hot charge weight 0.0
total charge weight 0.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 114410 Time: 12:49

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. WAR	Avg. MVA	Avg. F.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floor
BOREIN	1 S	2.9	95.6	21.57	64.53	47.71	80.25	0.804	2.9	2.9	2.9	71.3
MELT	1 S	0.1	3.8	21.93	61.93	44.06	76.01	0.815	0.1	0.1	0.1	67.8
MELT	1 L	0.0	0.5	23.38	43.20	23.76	49.30	0.376	0.0	0.0	0.0	43.2
		3.0		21.59	64.32	47.44	79.92	0.805	3.1	3.1	3.1	71.1

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 114410 Date: 11-07-01 Shift: 2
Melter: 1 First Helper: 1 Product Code: 7168
Tap Time: 12:49 Prev Heat Tapped: 12:43 Time Tap to Tap: 0 hr. 6 m

CHARGE	TIME	WEIGHT
1	none	none
2	none	none
3	none	none
4	none	none
******		******
TOTAL(klbs)		0.0
TOTAL(tons)		0.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	3.27
KWH/TON:	0.0

* HEATS ON LIN
* DELTA LIFE
* CHG WT(klbs)

Chemistry File Heat Number 114410 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 114411 Grade: X-60-1 Grade No: 7168

Crew No : 1 Heat Tap Date: 11/07/2001 Charge Time: 1254
Tap Time: 1336

Heats on Delta: 406 Last Heat Tapped: 1249

Total Charge Wt	: 200.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 142
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 35.7
Charge to Tap Time	42	Avg. MW	: 59.7
Tap to Tap Time	47	KWH/Ton	: 357.0
Total Delay Time	: 11.4	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE **ADDITIONS**:

1st = 138,800
2nd = 60,900

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 114411 BOH 11/07 at 12:49 Product Code 7168
Melter 1 1st Helper 1 Ladle Temp 0 191 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY CESCRIPTION
12:54	5.03	0.00	5.03	0	0.00			0.00	0.00	Inspect_Fce
12:54	5.12	0.00	0.08	0	0.00			0.00	0.00	CHG_1__140.
12:56	7.08	1.97	0.00	28	62.05	0.797	1 S M	2.03	72.77	Bore_In_____
12:57	8.18	1.10	0.00	37	55.98	0.833	1 L M	3.06	62.60	Bore_In_____
13:00	11.28	3.10	0.00	55	57.15	0.842	1 L M	6.01	61.76	Melt_____
13:05	16.22	4.93	0.00	68	57.22	0.845	1 L M	10.72	60.95	Refine_____
13:10	21.14	4.92	0.00	76	59.38	0.858	1 L M	15.59	60.34	_____
13:10	21.15	0.02	0.00	76	30.24	0.894	1 L M	15.59	29.30	_____
13:12	22.74	0.00	1.58	71	0.00			15.59	0.00	CHG_2__ 60.0
13:13	23.82	1.08	0.00	72	57.85	0.782	**1** S M	16.64	71.17	_____
13:18	28.74	4.92	0.00	77	53.94	0.823	**1** L M	21.06	61.86	_____
13:21	32.29	3.55	0.00	79	58.46	0.847	1 L M	24.52	60.93	_____
13:26	37.20	4.92	0.00	82	65.97	0.816	**1** S M	29.92	71.26	_____
13:31	42:12	4.92	0.00	84	65.88	0.814	1 S M	35.32	71.23	_____
13:32	42-49	0.37	0.00	84	60.09	0.807	**1** S M	35.69	68.12	_____
13:32	42.55	0.07	0.00	84	35.64	0.838	1 L M	35.73	47.11	_____
13:36	47.20	0.00	4.65	76	0.00			35.73	0.00	Tap-T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 142

cold charge weight 200.0
hot charge weight 0.0
total charge weight 200.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 114411 Time: 13:36

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floor
UNDEF	**1** S	11.3	31.5	21.66	64.96	46.67	79.99	0.812	11.2	11.3	11.3	71.4
UNDEF	**1** L	8.5	23.8	22.42	55.67	36.94	66.81	0.833	8.4	8.5	8.5	62.C
BOREIN	**1** S	2.0	5.5	21.70	62.05	47.03	77.86	0.797	1.9	2.0	2.0	73.E
BOREIN	**1** L	**1.1**	3.1	22.52	55.98	37.20	67.21	0.833	1.1	1.1	1.1	62.7
MELT	1 L	3.1	8.6	22.44	57.15	36.68	67.91	0.842	3.1	3.1	3.1	61.2
REFINE	**1** L	9.9	27.5	22.34	58.25	35.85	68.40	0.852	9.9	9.9	9.9	61.7
		35.9		22.13	59.79	40.24	72.07	0.830	35.7	35.9	35.9	65.5

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 114411 Date: 11-07-01 Shift: 2
Melter: 1 First Helper: 1 Product Code: 7168
Tap Time: 13:36 Prev Heat Tapped: 12:49 Time Tap to Tap: 0 hr. 47 m

CHARGE	TIME	WEIGHT
1	12:54	140.0
2	13:12	60.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		200.0
TOTAL(tons)		100.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	35.73
KWH/TON:	357.3

HEATS ON LIN.

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 114411 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 114412 Grade: X-60-1 Grade No: 7168

Crew No : 1 Heat Tap Date: 11/07/2001 Charge Time: 1350
Tap Time: 1432

Heats on Delta: 407 Last Heat Tapped: 1336

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 143
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 36.7
Charge to Tap Time	: 42	Avg. MW	: 59.8
Tap to Tap Time	56	KWH/Ton	: 262.1
Total Delay Time	: 19.7	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st = 139,800
2nd = 140,000

Oregon Steel Mills, Portland Oregon
* * * * * * H E A T L O G * * * * * *

Heat No. 114412 BOH 11/07 at 13:36 Product Code 7168
Melter 1 1st Helper 1 Ladle Temp 0 192 heats on lance 8

CLOCK TIME	TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
13:50	14.12	0.00	14.12	0	0.00			0.00	0.00	Inspect_Fce
13:50	14.18	0.00	0.07	0	0.00			0.00	0.00	CHG_1__140.
13:50	14.25	0.07	0.00	0	15.66	0.649	1 S M	0.02	41.29	Bore_In_____
13:51	15.15	0.90	0.00	6	60.67	0.779	1 S M	0.93	73.64	Bore_In_____
13:54	17.45	2.30	0.00	19	56.03	0.832	1 L M	3.08	62.07	Bore_In_____
13:57	20.55	3.10	0.00	31	57.93	0.839	1 L M	6.07	61.91	Melt_____
14:02	25.47	4.92	0.00	44	56.87	0.844	1 L M	10.73	60.67	Refine_____
14:06	30.19	4.72	0.00	53	57.41	0.850	1 L M	15.24	60.49	_____
14:08	32.00	0.00	1.82	50	0.00			15.24	0.00	CHG_2__140.
14:09	32.45	0.45	0.00	51	53.42	0.804	1 S M	15.64	67.56	_____
14:13	36.80	4.35	0.00	57	56.73	0.830	1 L M	19.76	64.29	_____
14:17	41.40	4.60	0.00	61	58.52	0.845	1 L M	24.24	61.17	_____
14:22	46.34	4.93	0.00	65	66.09	0.813	1 S M	29.68	71.66	_____
14:27	51.25	4.92	0.00	69	66.74	0.821	1 S M	35.15	71.68	_____
14:28	52.42	1.17	0.00	69	64.02	0.815	1 S M	36.39	70.10	_____
14:28	52.49	0.07	0.00	70	40.40	0.812	1 L M	36.44	53.50	_____
14:30	53.75	0.00	1.27	68	0.00			36.44	0.00	_____
14:30	53.84	0.08	0.00	68	35.86	0.879	1 L M	36.49	38.03	_____
14:30	53.95	0.12	0.00	68	58.32	0.840	1 S M	36.60	62.11	_____
14:30	54.07	0.12	0.00	68	50.61	0.845	1 L M	36.70	55.51	_____
14:32	56.45	0.00	2.38	65	0.00			36.70	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 143

cold charge weight 285.0
hot charge weight 0.2
total charge weight 283.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 114412 Time: 14:32

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floor
UNDEF	1 S	11.6	31.5	2i.70	65.59	46.42	80.35	0.816	11.5	11.6	11.6	71.4
UNDEF	1 L	9.2	25.0	22.46	57.24	37.25	68.30	0.838	9.2	9.2	9.2	64.3
BOREIN	1 S	1.0	2.6	21.87	57.57	46.69	74.12	0.777	0.9	1.0	1.0	73.2
BOREIN	1 L	2.3	6.2	22.59	56.03	37.33	67.33	0.832	2.3	2.3	2.3	62.4
MELT	1 L	3.1	8.4	22.51	57.93	37.57	69.05	0.839	3.1	3.1	3.1	61.9
REFINE	1 L	9.6	26.2	22.27	57.13	35.85	67.45	0.847	9.6	9.6	9.6	61.3
		36.8		22.17	59.83	40.05	72.00	0.831	36.7	35.8	36.8	65.6

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 114412 Date: 11-07-01 Shift: 2
Melter: 1 First Helper: 1 Product Code: 7168
Tap Time: 14:32 Prev Heat Tapped: 13:36 Time Tap to Tap: 0 hr. 56 m

CHARGE	TIME	WEIGHT
1	13:50	140.0
2	14:08	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLETEMP:	0
MWH USED:	36.70
KWH/TON:	262.1

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 114412 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

HEAT *SUMMARY*

Heat Number: 114413 Grade: OR 500-2 Grade No: 9138

Crew No : 1 Heat Tap Date: 11/07/2001 Charge Time: 1436
Tap Time: 1515

Heats on Delta: 408 Last Heat Tapped: 1432

Total Charge Wt	: 190.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 136
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 35.6
Charge to Tap Time	39	Avg. MW	: 61.3
Tap to Tap Time	43	KWH/Ton	: 374.7
Total Delay Time	: 8.6	Avg. Pwr. Factor	: 0.84

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st = 140,800
2nd = 49,900

Oregon Steel Mills, Portland Oregon

* * * * * * HEAT LOG * * * * * *

Heat No. 114413 BOH 11/07 at 14:32 Product Code 9108

Melter 1 1st Helper 1 Ladle Temp 0 193 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU #	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTICS
14:36	3.70	0.00	3.70	0	0.00			0.00	0.00	Inspect_Fce
14:36	3.92	0.00	0.22	0	0.00			0.00	0.00	CHG_1__140.
14:36	4.00	0.00	0.08	0	0.00			0.00	0.00	
14:37	4.87	0.87	0.00	18	62.13	0.786	1 S M	0.90	74.06	Bore_In
14:39	7.17	2.30	0.00	44	56.56	0.836	1 L M	3.07	61.87	Bore_In
14:39	7.28	0.12	0.00	45	58.32	0.826	1 L M	3.18	65.07	Lime_#_
14:42	10.28	3.00	0.00	61	58.20	0.847	1 L M	6.09	61.30	Melt
14:47	15.20	4.92	0.00	74	59.61	0.864	1 L M	10.97	59.99	Refine
14:51	18.40	3.20	0.00	78	60.16	0.868	1 L M	14.18	59.41	
14:52	19.90	0.00	1.50	72	0.00			14.18	0.00	CHG_2__ 50
14:54	21.77	1.87	0.00	75	58.86	0.803	1 S M	16.01	71.70	
14:59	26.68	4.92	0.00	79	57.53	0.850	1 L M	20.73	60.67	
15:00	27.98	1.30	0.00	80	60.12	0.864	1 L M	22.03	59.15	
15:05	32:90	4.92	0.00	83	66.58	0.822	1 S M	27.49	71.22	
15:10	37.82	4.92	0.00	85	68.37	0.834	1 S M	33.09	71.78	
15:11	39.09	1.27	0.00	86	66.44	0.811	1 S M	34.49	71.71	
15:11	39.30	0.22	0.00	86	55.78	0.837	1 L M	34.69	59.90	
15:11	39.55	0.00	0.25	85	0.00			34.69	0.00	
15:13	40.64	1.08	0.00	86	52.31	0.714	2 L M	35.64	71.82	
15:15	43.52	0.00	2.88	80	0.00			35.64	0.00	Tap_T

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 136

cold charge weight 190.0
hot charge weight 0.0
total charge weight 190.0

** HEAT ELECTRICAL SUMMARY **

Heat No.: 114413 Time: 15:15

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Flocr
UNDEF	1 S	13.0	37.2	21.72	66.13	45.67	80.37	0.823	12.8	13.0	13.0	72.
UNDEF	1 L	6.4	18.4	22.37	57.99	35.58	68.04	0.852	6.4	6.4	6.4	60.
UNDEF	2 L	1.1	3.1	21.42	52.31	51.24	73.22	0.714	1.1	1.1	1.1	72.
BOREIN	1 S	0.9	2.5	21.75	62.13	48.84	79.03	0.786	0.9	0.9	0.9	73.5
BOREIN	1 L	2.3	6.6	22.58	56.56	37.10	67.64	0.836	2.3	2.3	2.3	63.
MELT	1 L	3.1	8.9	22.49	58.20	36.72	68.82	0.846	3.1	3.1	3.1	62.
REFINE	1 L	8.1	23.3	22.33	59.83	34.58	69.10	0.866	8.1	8.1	8.1	60.
		34.9		22.10	61.30	40.12	73.26	0.837	34.7	34.9	34.9	66.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 114413 Date: 11-07-01 Shift: 3
Melter: 1 First Helper: 1 Product Code: 9108
Tap Time: 15:15 Prev Heat Tapped: 14:32 Time Tap to Tap: 0 hr. 44 m

CHARGE	TIME	WEIGHT
1	14:36	140.0
2	14:52	50.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		190.0
TOTAL(tons)		95.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	35.64
KWH/TON:	375.2

* HEATS ON LIN
* DELTA LIFE
* CHG WT(klbs

Chemistry File Heat Number 114413 has incorrect number of characters

MATERIAL SAFETY DATA SHEET

'MSDS ISSUE DATE: AUGUST 17, 1995

SECTION I CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: ELECTRIC ARC FURNACE DUST (K061)

ORGANIZATION MSDS: #: SAFETY DATA FILE K061 95. SAFETY FILE INDEX #2.14.4.1

MANUFACTURER'S NAME: OREGON STEEL MILLS, INC.

EMERGENCY PHONE NUMBER: 503-286-9651

ADDRESS: PO BOX 2750 PORTLAND, OREGON 97208

HMIS CODES
HEALTH: 2
FIRE: 0
REACTIVITY: 0
CHRONIC EFFECTS: 4

MANUFACTURER'S CODE: NE

CHEMICAL NAME/CLASSIFICATION: DUST CONTAINING METALS & INORGANICS

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

METALS LISTED BELOW ARC PRESENT MOSTLY AS OXIDES. IN ADDITION, FREE METALS MAY ALSO BE PRESENT BUT IN SMALL AND VARYING AMOUNTS.

INGREDIENT	CAS#	PERCENT (AS OXIDE)	OSHA PEL (MG/M3)	ACGIH TLV (MG/M3)
IRON OXIDE-FExOy FERRIC OXIDE FERROUS OXIDE	 1309-37-1 1345-25-1	35-55	1C	5
ZINC OXIDE-ZnO	1314-13-2	14-25	15 TOTAL DUST 5 RESPIRABLE FRACTION	10 DUST, 5 FUME
CALCIUM OXIDE-CaO	1305-78-8	5-16	5	2
MANGANESE OXIDE-MnxOy		3-5	5	0.2 (PROPOSED)

MANGANESE OXIDE	1317-35-7			
MANGANESE DIOXIDE	1313-13-9			
SILICA OXIDE-SixOy		1-5	30mg/m3 / %SiO2+2	0.1 RESPIRABLE
SILICON DIOXIDE	7631-86-9			
MAGNESIUM OXIDE-MgO	1309-48-4	2-4	15	10 FUME
LEAD OXIDE-PbxOy	1309-60-0	1.8-3.3	0.05	0.05
LEAD DIOXIDE				
SODIUM OXIDE Na20	1313-59-3	1-6	15(1)	10(2)
SULFUR - S	7704-34-9*	1-3	15(1)	10(2)
ALUMINUM OXIDE-A1203	1344-28-1	1-2	15 DUST RESPIRABLE	10 DUST
POTASSIUM OXIDE-KxO		0.5-2	15(1)	10(2)
CHROME OXIDE-CrxOy		0.3-0.5		
CHROMIC OXIDE	1308-38-9		0.5	0.5
CHROMIUM METAL	-		1	0.5
Cr(VI) COMPOUNDS	-		0.1	0.01
ZOPPER OXIDE-CuxOy		0.2-0.4	1 DUST, 0.1FUME	1 DUST, 0.2FUME
CUPRIC OXIDE	1317-38-0			
ZALCIUM OXIDE-CdO	1306-19-0	0.05-0.15	0.005	0.01 DUST, 0.002 RESPIRABLE

'INDICATES CAS% FOR THE METAL. CALC. STANDS FOR CALCULATION. C = CEILING LEVEL STEL = SHORT TERM EXPOSURE LIMIT.

(1) NUISANCE DUST LIMIT APPLIED TO PARTICULATE NOT OTHERWISE REGULATED.

(2) PARTICULATES NOT OTHERWISE CLASSIFIED.

SECTION 3 HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE: WILL CAUSE IRRITATION TO THE EYES.

SKIN: PROLONGED OR EXTENDED CONTACT WITH THE DUST IRRITATE THE SKIN. ARSENIC IS CAPABLE OF PRODUCING KERTOSES, ESPECIALLY OF THE PALMS AND

SOLES. ECZEMATOUS DERMATITIS HAS BEEN REPORTED FOR TRIVALENT CHROMIUM (III) COMPOUNDS. CHROME (VI) MAY CAUSE IRRITANT AND ALLERGIC CONTACT DERMATITIS.

INGESTION: CADMIUM IS HIGHLY IRRITATING TO THE STOMACH LINING. SWALLOWING THE DUST MAY CAUSE SORE THROAT, NAUSEA, VOMITING, ABDOMINAL PAIN, DIARRHEA, AND PAIN IN THE EXTREMITIES AND JOINTS. ACUTE ENCEPHALOPATHY IS ALSO ASSOCIATED WITH EXTREMELY HIGH LEAD DOSES. HIGH DOSES OF ARSENIC CAN BE FATAL.

INHALATION: ACUTE EFFECTS ARE THE SAME AS THOSE OF INGESTION. ADDITIONALLY, MAY CAUSE DRY THROAT, COUGH, HEADACHE, SHORTNESS OF BREATH, CHEST PAINS AND CHILLS. INHALATION OF ZINC, MAGNESIUM AND MANGANESE MAY RESULT IN METAL FUME FEVER. EXTREME OVEREXPOSURE TO CADMIUM MAY RESULT IN SEVERE LUNG IRRITATION AND PULMONARY EDEMA THAT CAN BE FATAL. THIS IS PRECEDED BY A SENSATION OF THROAT CONSTRICTION, METALLIC TASTE, AND COUGH. SYMPTOMS MAY PROGRESS TO SHORTNESS OF BREATH, CHEST PAIN, FLU-LIKE SYMPTOMS, WITH WEAKNESS, FEVER, HEADACHE, AND CHILLS.

CHRONIC (AND CANCER) INFORMATION: PROLONGED EXPOSURE TO LEAD MAY CAUSE FATIGUE, GASTROINTESTINAL PAIN, ANEMIA, POSSIBLE CENTRAL NERVOUS SYSTEM AND KIDNEY DAMAGE. LEAD AND LEAD COMPOUNDS ARE LISTED BY INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) AS POSSIBLE CARCINOGENS. REPEATED OR LONG-TERM EXPOSURE TO CADMIUM MAY RESULT IN KIDNEY DAMAGE AND INCREASED RISK OF PROSTRATE, RESPIRATORY AND GENITOURINARY CANCERS. LONG-TERM EXPOSURE TO ARSENIC IS ASSOCIATED WITH LUNG CANCER. BOTH CADMIUM AND ARSENIC ARE DESIGNATED AS CARCINOGENS BY OSHA. THE IARC AND THE NATIONAL TOXICOLOGY PROGRAM (NTP) CONSIDER CHROME (VI) AS CARCINOGENIC TO HUMANS AND CRYSTALLIZED SILICON DIOXIDE AS PROBABLY CARCINOGENIC TO HUMANS. CRYSTALLINE SILICON DIOXIDE MAY CAUSE SILICOSIS. MANGANESE MAY RESULT IN DAMAGE TO THE LUNGS, KIDNEYS, BLOOD, AND CENTRAL NERVOUS SYSTEM.

TERATOGENIC/MUTAGENIC INFORMATION: MUTAGENIC EFFECTS DATA HAS BEEN CITED FOR LEAD IN RTECS.

REPRODUCTION INFORMATION: REPRODUCTIVE EFFECTS DATA HAS BEEN CITED FOR LEAD IN RTECS.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: PERSONS WITH PRE-EXISTING HEART CONDITIONS OR IMPAIRED RESPIRATORY FUNCTION.

EYE CONTACT: IMMEDIATELY FLUSH WITH WATER FOR AT LEAST 15 MINUTES, CAREFULLY LIFTING EYELID TO EXPOSE THE EYE TO CONTACT WITH THE WATER, REMOVE CONTACT LENS, IF PRESENT, AND REPEAT WITH AN ADDITIONAL 15 MINUTE FLUSH. IF IRRITATION DEVELOPS OR SYMPTOMS PERSIST, GET MEDICAL ASSISTANCE.

SKIN CONTACT: WASH TSOROUGHLY WITH SOAP AND WATER AFTER SKIN CONTACT.

INHALATION: IF AFFECTED, REMOVE TO FRESH AIR. GIVE CPR/ARTIFICIAL RESPIRATION IF NOT BREATHING. PROVIDE OXYGEN IF BREATHING IS DIFFICULT. IF IRRITATION DEVELOPS OR SYMPTOMS PERSIST, GET MEDICAL ASSISTANCE.

IF SWALLOWED: DO NOT INDUCE VOMITING. IF PERSON IS ALERT AND NOT CONVULSING, ADMINISTER 6 TO 8 GLASS OF WATER TO DILUTE THE MATERIAL. THEN CALL CLOSEST POISON CONTROL CENTER. IF SPONTANEOUS VOMITING OCCURS, HAVE PERSON LEAN FORWARD TO AVOID BREATHING IN OF EMESIS. RINSE MOUTH AND ADMINISTER MORE WATER.

NOTES TO PHYSICIAN: NONE GIVEN.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) 29 CE'R 1910.1000 (AIR CONTAMINANTS), 29 CFR 1910.1025 (LEAD), 29CFR 1910.1027 (CADMIUM), 29 CFR 1910.1200 (HAZARD COMMUNICATION) AND 40 CFR 262 ET AL. (HAZARDOUS WASTE).

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: THIS MATERIAL IS COMPLETELY NON-COMBUSTIBLE. FOR FIRE IN CLOSE PROXIMITY, USE CO2, FOAM, DRY CHEMICAL OR WATER SPRAY.

SPECIAL FIREFIGHTING METHODS: FIREFIGHTERS SHOULD USE SELF-CONTAINED BREATHING APPARATUS.

UNUSUAL FIRE & EXPLOSION HAZARDS: NONE KNOWN

SECTION 6 ACCIDENTAL RELEASE MEASURES

SPILL/CLEANUP PROCEDURE: PROMPTLY CLEAN UP MATERIAL SPILLS, USE WATER TO WET DOWN TO MINIMIZE DUST DURING CLEANUP. SEE SECTION 8 FOR EXPOSURE CONTROL AND PERSONAL PROTECTION INFORMATION. THIS MATERIAL IS A CERCLA AND SARA TITLE III HAZARDOUS SUBSTANCE. SPILLS OF THIS MATERIAL IN EXCESS OF THE REPORTABLE QUANTITY OF 10 LBS (40 CFR 302 AND 40 CFR 355) MAY REQUIRE NOTIFICATION OF FEDERAL, STATE, AND/OR LOCAL AGENCIES.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) 29 CE'R 1910.1000 (AIR CONTAMINANTS), 29 CFR 1910.1025 (LEAD), 29 CE'R 1310.1027 (CADMIUM) AND 29 CFR 1910.1200 (HAZARD COMMUNICATION), 40 CFR 262 ET AL. (HAZARDOUS WASTE).

SECTION 7 HANDLING AND STORAGE

DO NOT BREATHE DUST.

IF USED OR HANDLED IN A MANNER WHICH GENERATES DCST, SEE SECTION 8 FOR

SPECIFIC PERSONAL PROTECTION INFORMATION.

PREVENT SKIN CONTACT, INGESTION AND INHALATION WHEN HANDLING MATERIAL.

STORE ONLY IN ACCORDANCE WITH THE PROVISIONS OF RCRA (INCLUDING BUT NOT LIMITED TO 40 CFR 260-268) AND APPLICABLE STATE REGULATIONS.

PROMPTLY CLEAN UP MATERIAL SPILLS, USE WATER TO WET DOWN TO MINIMIZE DUST DURING CLEANUP. SEE SECTION 6 FOR ACCIDENTAL RELEASE MEASURES.

REFER TO SECTION 11 FOR DISPOSAL INFORMATION.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) 29 CFR 1910.1000 (AIR CONTAMINANTS), 29 CFR 1910.1025 (LEAD), 29 CFR 1910.1027 (CADMIUM) AND 29 CFR 1910.1200 (HAZARD COMMUNICATION), 40 CFR 262 ET AL. (HAZARDOUS WASTE).

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

RESPIRATORY PROTECTION: DO NOT BREATHE DUST.

IF CONCENTRATIONS IS GREATER THAN THE PEL, BUT LESS THAN 10 TIMES PEL, USE A NIOSH APPROVED HALF-MASK RESPIRATOR WITH HEPA CARTRIDGE.

FOR CONCENTRATIONS ABOVE 10 TIMES PEL, BUT LESS THAN 50 TIMES PEL USE A NIOSH APPROVED FULL FACE RESPIRATOR WITH HEPA CARTRIDGE.

WHERE AIRBORNE CONCENTRATION MAY EXCEED 50 TIMES PEL, USE A SUPPLIED-AIR RESPIRATOR.

VENTILATION: USE LOCAL OR GENERAL VENTILATION TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE PEL. IF VENTILATION FAILS TO MAINTAIN CONCENTRATIONS BELOW THE PEL, RESPIRATORY PROTECTION IS REQUIRED BY FEDERAL AND/OR STATE REGULATIONS; SEE RESPIRATORY PROTECTION INFORMATION ABOVE.

RECOMMENDED GLOVES: RUBBER GLOVES ARE RECOMMENDED

EYE PROTECTION: CHEMICAL SAFETY GOGGLES ARE REQUIRED IF FULL FACE RESPIRATORY PROTECTION IS NOT WORN.

OTHER PROTECTION: EYE WASH AND SAFETY SHOWER SHOULD BE NEARBY AND READY FOR USE.

WEAR COVERALLS AND GLOVES AS NECESSARY TO PROVIDE PROTECTION; CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT WHICH HAS COME IN CONTACT WITH THIS MATERIAL MAY REQUIRE SPECIAL HANDLING AS SPECIFIED IN THE REGULATIONS REFERENCED BELOW.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) 29 CFR 1910.1000 (AIR CONTAMINANTS), 29 CFR 1910.1023 (LEAD), 29 CFR 1910.1027 (CADMIUM) AND 29 CFR 1910.1200 (HAZARD COMMUNICATION), 40 CFR 262 ET AL. (HAZARDOUS WASTE).

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: FINE, GRAY DUST

ODOR: NONE

BOILING POINT: NA DEG F.

VAPOR PRESSURE (mm HG): NA mm AT DEG F.

VAPOR DENSITY (AIR = 1): NA

SPECIFIC GRAVITY: 1.3 (WATER = 1)

PERCENT VOLATILE: NA %

EVAPORATION RATE: NA REFERENCE: NA

WATER SOLUBILITY: N (C = COMPLETE, P = PARTIAL, N = NEGLIGIBLE, D = DISPERSION)

FLASH POINT: NA DEG F. METHOD.

AUTO IGNITION TEMPERATURE: NG DEG F.

EXPLOSION LIMITS:
LEL: NA UEL: NA

SECTION 10 STABILITY AND REACTIVITY

STABILITY: STABLE

INCOMPATIBILITY: NONE KNOWN

CONDITIONS TO AVOID: NONE KNOWN.

HAZARDOUS DECOMPOSITION PRODUCTS: NONE

HAZARDOUS POLYMERIZATION: NO

SECTION 11 DISPOSAL CONSIDERATIONS

EPA WASTE CODES: K061

DOT NUMBER: OTHER REGULATED MATERIAL (ORM)

30T HAZARD CLASS/HAZARD LABEL: LABEL IN ACCORDANCE WITH 49 CFR 173.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) 29 CFR 1910.1000 (AIR CONTAMINANTS), 29 CFR 1910.1023 (LEAD),29 CFR 1910.1027 (CADMIUM) AND 29 CFR 1910.1200 (HAZARD COMMUNICATION), 40 CFR 262 ET AL. (HAZARDOUS WASTE).

OREGON STEEL MILLS HAS PREPARED THIS INFORMATION BASED ON ITS REASONABLE REVIEW OF AVAILABLE INFORMATION RELATING TO THE CHEMICALS THAT MAKE UP THE PRODUCT WHICH UNDERLYING INFORMATION WAS NOT CREATED OR PREPARED BY OREGON STEEL MILLS. ALTHOUGH OREGON STEEL MILLS PROVIDES THIS INFORMATION AS A PUBLIC SERVICE, IT DOES NOT REPRESENT OR WARRANT HE ACCURACY, COMPLETENESS OR APPLICABILITY OF THE INFORMATION CONTAINED HEREIN. OREGON STEEL MILLS DOES NOT WARRANT THE FITNESS OF THE PRODUCT FOR ANY PARTICULAR USE AND HAS NOT EVALUATED THE HAZARDS ASSOCIATED WITH ANY PARTICULAR USES OF THE PRODUCT. ALL EMPLOYERS USING THE PRODUCT SHOULD PERFORM ALL REVIEW AND TESTING AND TAKE ALL PRECAUTIONS REQUIRED TO PROTECT THEIR EMPLOYEES FROM ANY HAZARDS ASSOCIATED WITH THEIR USE OF THE PRODUCT.

N = NO
Y = YES
UN = UNKNOWN
NA = NOT APPLICABLE
NRG = NOT REGULATED
NE = NOT ESTABLISHED
NG = NOT GIVEN
NR = NOT REQUIRED

PDXI. 196499.1 1956S 0007

HORIZON ENGINEERING
13566 NE Whitaker Way • Portland, OR 97230
Phone (503) 256-6060 • Fax (503) 256-0505
www.horizonengineering.com

OSM Baghouse ΔP in inches of H_2O

11/17/01

Time	~11:03	12:30	
Row #	R1	R2	R3
1	5.1	4.9	5.9
2	4.3	–	4.9
3	5.1	6.1	5.5
4	4.6	5.5	4.8
5	4.9	5.9	–
6	4.5	5.5	5.4
7	3.9	5.2	5.3
8	4.5	5.7	6.3
9	4.0	5.4	6.5
10	3.9	5.0	6.0
11	4.0	5.5	6.6
12	–	5.5	7.1
13	4.5	5.1	6.0
14	5.0	5.6	6.5
15	5.0	5.6	6.2
16	4.7	5.4	6.1

Calibration Information

High-Volume Sampler Calibrations

Pitots

Thermocouples and indicators

Shortridge Micro manometer

Magnehelic Gauges

Barometer

NO_x Converter Efficiency Data

Calibration Gas Certificates

Audit Sample Results, reporting forms & instructions

High Volume Orifice Calibration Data

File	oct2001	#1192	A=	47.895		#1032	A=	45.260
Date	10-08-01	10-08-01	B=	0.476		10-08-01	B=	0.481
Tester	DBC	Last	A=	47.008		Last	A=	45.507
Analysis	DBC		B=	0.452			B=	0.456
		CHANGE	A=	1.9%		CHANGE	A=	-0.5%
			B=	5.4%			B=	5.5%

General Form Of Solution: Q(68F)=A*(dHo*T68/T)^B ; A= Q(68) @ T68F,dHo=1.00

Q=A(dHo)^B

1] ln(Q)=ln(A)+B*ln(dHo)

2] Z=ln(Q)
W=ln(dHo)
C1=ln(A)
C2=B

3] Z=C1+C2(W)

N	W	C1	Z
W	W²	C2	WZ

Point	dHo (in H2O)	Q (cfm) @To=68F	Q (cfm) Calculated	Difference %
1	0.100	15.82	15.99	1.1%
2	0.100	15.86	15.99	0.9%
3	0.100	16.50	15.99	-3.0%
4	0.200	22.23	22.25	0.1%
5	0.200	22.07	22.25	0.8%
6	0.200	21.65	22.25	2.8%
7	0.400	31.33	30.96	-1.2%
8	0.410	31.65	31.32	-1.0%
9	0.410	31.80	31.32	-1.5%
10	0.600	37.48	37.55	0.2%
11	0.600	37.47	37.55	0.2%
12	0.610	37.69	37.85	0.4%
13	0.800	43.34	43.07	-0.6%
14	0.800	43.03	43.07	0.1%
15	0.790	43.05	42.81	-0.6%
16	1.000	47.39	47.89	1.1%
17	1.000	47.44	47.89	1.0%
18	1.000	48.12	47.89	-0.5%

Point	dHo (in H2O)	Q (cfm) @To=68F	Q (cfm) Calculated	Difference %
1	0.100	14.93	14.96	0.2%
2	0.100	14.97	14.96	-0.1%
3	0.100	15.71	14.96	-4.8%
4	0.200	19.81	20.87	5.4%
5	0.200	20.59	20.87	1.4%
6	0.200	20.43	20.87	2.2%
7	0.400	29.41	29.13	-0.9%
8	0.400	29.39	29.13	-0.9%
9	0.400	29.30	29.13	-0.6%
10	0.600	35.45	35.40	-0.1%
11	0.600	35.67	35.40	-0.7%
12	0.600	35.88	35.40	-1.3%
13	0.800	40.50	40.65	0.4%
14	0.800	40.22	40.65	1.1%
15	0.800	40.39	40.65	0.6%
16	1.000	46.22	45.26	-2.1%
17	1.000	44.86	45.26	0.9%
18	1.000	45.32	45.26	-0.1%

Average

No#	W	W²	Z	WZ
1	-2.30	5.3019	2.7613	-6.3582
2	-2.30	5.3019	2.7637	-6.3637
3	-2.30	5.3019	2.8031	-6.4543
4	-1.61	2.5903	3.1016	-4.9918
5	-1.61	2.5903	3.0943	-4.9801
6	-1.61	2.5903	3.0751	-4.9492
7	-0.92	0.8396	3.4446	-3.1562
8	-0.89	0.7949	3.4547	-3.0802
9	-0.89	0.7949	3.4595	-3.0845
10	-0.51	0.2609	3.6239	-1.8512
11	-0.51	0.2609	3.6235	-1.8510
12	-0.49	0.2443	3.6294	-1.7940
13	-0.22	0.0498	3.7691	-0.8411
14	-0.22	0.0498	3.7618	-0.8394
15	-0.24	0.0556	3.7623	-0.8869
16	0.00	0.0000	3.8584	0.0000
17	0.00	0.0000	3.8594	0.0000
18	0.00	0.0000	3.8736	0.0000

Average

No#	W	W²	Z	WZ
1	-2.30	5.3019	2.7034	-6.2248
2	-2.30	5.3019	2.7063	-6.2314
3	-2.30	5.3019	2.7544	-6.3423
4	-1.61	2.5903	2.9861	-4.8059
5	-1.61	2.5903	3.0247	-4.8681
6	-1.61	2.5903	3.0172	-4.8560
7	-0.92	0.8396	3.3813	-3.0983
8	-0.92	0.8396	3.3807	-3.0977
9	-0.92	0.8396	3.3776	-3.0948
10	-0.51	0.2609	3.5683	-1.8228
11	-0.51	0.2609	3.5742	-1.8258
12	-0.51	0.2609	3.5800	-1.8288
13	-0.22	0.0498	3.7012	-0.8259
14	-0.22	0.0498	3.6943	-0.8244
15	-0.22	0.0498	3.6987	-0.8253
16	0.00	0.0000	3.8335	0.0000
17	0.00	0.0000	3.8034	0.0000
18	0.00	0.0000	3.8138	0.0000

No#	W		W²	Z	WZ
18	-16.63		27.0274	61.7193	-51.4816
18	-16.63	C1	61.72		
-16.63	27.03	C2	-51.48		
1	-0.92	C1	3.43	C1=	3.86901
0	11.66	C2	5.55	C2=	0.47632
1	-0.92	C1	3.43	A=	47.89474
0	1	C2	0.48	B=	0.47632
1	0	C1	3.87	@1.00	47.89
0	1	C2	0.48	@0.10	15.99

No#	W		W²	Z	WZ
18	-16.69		27.13	60.60	-50.5722
18	-16.69	C1	60.60		
-16.69	27.13	C2	-50.57		
1	-0.93	C1	3.37	C1=	3.81242
0	11.66	C2	5.61	C2=	0.48088
1	-0.93	C1	3.37	A=	45.25972
0	1	C2	0.48	B=	0.48088
1	-0	C1	3.81	@1.00	45.26
0	1	C2	0.48	@0.10	14.96

Pitot Calibration Calculations

Date 8-Oct-01 Pb= 30.25 in Hg File 12-Dec-01 Ta= 520.0 R

Method 2 section 4, Horizon Shop

Pitot	Tested Last	[Cp] New	[S]
ss7-4	8-Oct-01	**0.81562**	0.00456
ss7-5	9-Oct-01	**0.81041**	0.00771
ss7-6	9-Oct-01	**0.78745**	0.00880
ss7-7	9-Oct-01	**0.83171**	0.00588
ss9-1	9-Oct-01	0.78734	0.00768
ss10-1	10-Dec-01	**0.83477**	0.00193
ss10-2	9-Oct-01	**0.79742**	0.00299
ss10-3	9-Oct-01	**0.80118**	0.00534
3s-1	11-Dec-01	**0.82465**	0.00653
3s-2			
5s-1	9-Oct-01	**0.84199**	0.00913
5s-2			

Pitot	Tested Last	[Cp] New	[S]
9s-1			
6s-1	8-Oct-01	**0.83139**	0.00557
6s-2			
HT-4	10-Dec-01	**0.83782**	0.00469
SR-18	8-Oct-01	**0.82637**	0.00708
SR-36	8-Oct-01	**0.82937**	0.00769
SR-48	8-Oct-01	**0.81569**	0.00000
10-s	10-Dec-01	**0.82809**	0.00625
11-s	10-Oct-01	**0.80294**	0.00539
14-s1	10-Oct-01	**0.82367**	0.00494
14-S2	9-Oct-01	**0.81017**	0.00764
WC 3-5	8-Oct-01	**0.81561**	0.00470

	dPp	dPs	Cp	dS	Avg Cp	S
ss7-4	0.375	0.555	0.81377	0.00184	**0.81562**	0.00456
Pass	0.845	1.230	0.82056	0.00494		
10/8/01	1.200	1.750	0.81980	0.00418		
JKG	1.300	1.950	0.80833	0.00728		
ss7-5	0.385	0.575	0.81009	0.00033	**0.81041**	0.00771
Pass	0.835	1.200	0.82583	0.01541		
10/9/01	1.200	1.800	0.80833	0.00208		
JKG	1.330	2.050	0.79741	0.01300		
ss7-6	0.390	0.640	0.77282	0.01464	**0.78745**	0.00880
Pass	0.795	1.250	0.78952	0.00207		
10/9/01	1.250	1.900	0.80300	0.01554		
JKG	1.350	2.150	0.78448	0.00297		
ss7-7	0.390	0.550	0.83366	0.00195	**0.83171**	0.00588
Pass	0.830	1.200	0.82335	0.00836		
10/9/01	1.250	1.730	0.84153	0.00982		
JKG	1.330	1.900	0.82829	0.00341		
ss9-1	0.390	0.640	0.77282	0.01452	**0.78734**	0.00768
Pass	0.770	1.220	0.78650	0.00084		
10/9/01	1.250	1.950	0.79263	0.00529		
JKG	1.330	2.050	0.79741	0.01007		
ss10-1	0.350	0.495	0.83247	0.00230	**0.83477**	0.00193
Pass	0.850	1.200	0.83321	0.00156		
12/10/01	1.000	1.400	0.83670	0.00193		
JKG	1.250	1.750	0.83670	0.00193		
ss10-2	0.370	0.575	0.79415	0.00327	**0.79742**	0.00299
Pass	0.825	1.280	0.79480	0.00262		
10/9/01	1.200	1.850	0.79733	0.00008		
JKG	1.350	2.050	0.80339	0.00597		
ss10-3	0.380	0.585	0.79790	0.00328	**0.80118**	0.00534
Pass	0.795	1.200	0.80580	0.00462		
10/9/01	1.230	1.850	0.80724	0.00606		
JKG	1.350	2.100	0.79377	0.00741		
3s-1	0.350	0.495	0.83247	0.00782	**0.82465**	0.00653
Pass	0.715	1.050	0.81695	0.00770		
12/11/01	1.130	1.650	0.81928	0.00537		
JKG	1.300	1.850	0.82989	0.00525		
3s-2	na	na	#VALUE!	#VALUE!	**#VALUE!**	#VALUE!
#VALUE!	na	na	#VALUE!	#VALUE!		
na	na	na	#VALUE!	#VALUE!		
na	na	na	#VALUE!	#VALUE!		
5s-1	0.385	0.525	0.84779	0.00579	**0.84199**	0.00913
Pass	0.765	1.050	0.84503	0.00304		
10/9/01	1.250	1.690	0.85143	0.00943		
JKG	1.350	1.950	0.82373	0.01826		

	dPp	dPs	Cp	dS	Avg Cp	S
6s-1	0.371	0.530	0.82829	0.00310	**0.83139**	0.00557
Pass	0.830	1.200	0.82335	0.00804		
10/08/01	1.180	1.650	0.83721	0.00582		
JKG	1.350	1.890	0.83670	0.00531		
HT-4	0.330	0.470	0.82955	0.00827	**0.83782**	0.00469
Pass	0.750	1.050	0.83670	0.00111		
12/10/01	1.150	1.600	0.83931	0.00150		
JKG	1.350	1.850	0.84570	0.00788		
SR-18	0.380	0.545	0.82666	0.00029	**0.82637**	0.00708
Pass	0.850	1.180	0.84024	0.01387		
10/08/01	1.100	1.610	0.81831	0.00806		
JKG	1.270	1.850	0.82026	0.00611		
SR-36	0.371	0.540	0.82059	0.00878	**0.82937**	0.00583
Pass	0.820	1.150	0.83598	0.00661		
10/08/01	1.150	1.650	0.82650	0.00287		
JKG	1.300	1.830	0.83441	0.00504		
SR-48	0.365	0.545	0.81018	0.00550	**0.81569**	0.00769
Pass	0.795	1.200	0.80580	0.00988		
10/08/01	1.150	1.650	0.82650	0.01081		
JKG	1.270	1.850	0.82026	0.00457		
10-s	0.310	0.430	0.84059	0.01249	**0.82809**	0.00625
Pass	0.870	1.250	0.82592	0.00217		
12/10/01	1.100	1.600	0.82087	0.00723		
JKG	1.250	1.800	0.82500	0.00309		
11-s ✓	0.405	0.625	0.79694	0.00601	**0.80294**	0.00539
Pass	0.900	1.350	0.80833	0.00539		
10/10/01	1.300	2.000	0.79816	0.00478		
JKG	1.400	2.100	0.80833	0.00539		
14-s1 ✓	0.390	0.560	0.82618	0.00251	**0.82367**	0.00494
Pass	0.775	1.100	0.83098	0.00731		
10/10/01	1.250	1.850	0.81378	0.00989		
JKG	1.350	1.950	0.82373	0.00006		
14-S2	0.385	0.565	0.81722	0.00706	**0.81017**	0.00764
Pass	0.820	1.200	0.81837	0.00821		
10/09/01	1.200	1.830	0.80168	0.00849		
JKG	1.350	2.050	0.80339	0.00678		
WC 3-5	0.380	0.555	0.81918	0.00357	**0.81561**	0.00470
Pass	0.810	1.200	0.81337	0.00224		
10/08/01	1.210	1.750	0.82321	0.00760		
JKG	1.300	1.900	0.81890	0.00329		

Date: 02-Oct-01	Deviation	@60 F	7.8	Allowable Diff.		Pb=	29.60 in Hg		BPG		
Next Calibration: 03-Oct-01	Limit	@212 F	10.1	Allowable Diff.		Ta=	60.0 oF		980324tc		
24-Oct-01		@325 F	11.8	Allowable Diff.							

		Ambient			Boiling. Water			Boiling. Oil			Average
	Probe/ID	Standard. F	Measured, F	Difference %	Standard, F	Measured, F	Difference %	Standard. F	Measured, F	Difference %	Difference %
Probe	3-1	70.4	70.6	0.0%	212.2	212.2	0.0%	530.2	523.6	0.7%	0.2%
Probe	3-2	70 6	70.4	0.0%	212.2	212.2	0.0%	534.2	531.2	0.3%	0.1%
Probe	3-3										
Probe	wc3-4										
Probe	3-5	70.4	70.4	0.0%	211.6	212.2	-0.1%	527.4	522.8	0.5%	0 1%
Probe	3-6	70.2	70.0	0.0%	212.2	213.2	-0.1%	536.4	538.4	-0.2%	-0.1%
Probe	3-7	70.2	71.2	-0.2%	212.2	212.0	0.0%	532.0	529.0	0.3%	0.0%
Probe	3-8	57.8	56.8	0.2%	212.2	212.0	0.0%	584.0	578.0	0.6%	0.3%
Probe	4-1	70.8	70.8	0.0%	211.6	211.8	0.0%	546.0	548.0	-0.2%	-0.1%
Probe	4-2	70.6	70.8	0 0%	211.4	212.0	-0.1%	548.0	550.0	-0.2%	-0.1%
Probe	4-3	58.6	56.8	0.3%	211.4	212.2	-0.1%	574.0	574.0	0.0%	0.1%
Probe	4-4	58.4	56.2	0.4%	211.4	213.0	-0.2%	575.0	571.0	0.4%	0.2%
Probe	4-5	70.6	70.6	0.0%	211.4	211.6	0.0%	548.0	547.0	0.1%	0.0%
Probe	4-6	70.4	70.6	0.0%	211.4	212.0	-0.1%	545.0	540.0	0.5%	0.1%
Probe	4-7	70.6	71.4	-0.2%	211.6	212.0	-0.1%	543.0	537.0	0.6%	0.1%
Probe	5-2	58.8	56.2	0.5%	211.0	212.2	-0.2%	569.0	567.0	0.2%	0.2%
Probe	5-3	70.8	71.2	-0.1%	212.2	213.8	-0.2%	546.0	543.0	0.3%	0.0%
Probe	5-4	71.0	72.2	-0.2%	211.8	211.4	0.1%	543.0	539.0	0.4%	0.1%
Probe	5-5	70.8	71.2	-0.1%	212.4	211.8	0.1%	545.0	545.0	0.0%	0.0%
Probe	5-6	70.8	71.2	-0.1%	211.6	211.6	0.0%	546.0	548.0	-0.2%	-0.1%
Probe	5-7	70.8	71.4	-0.1%	211.8	211.6	0.0%	545.0	544.0	0.1%	0.0%
Probe	5-8	70.8	72.0	-0.2%	211.6	211.6	0.0%	542.0	543.0	-0.1%	-0.1%
Probe	5-9	70.4	71.4	-0.2%	211.8	212.4	-0.1%	542.0	543.0	-0.1%	-0.1%
Probe	7-1	71.1	71.8	-0.1%	212.0	211.6	0.1%	533.0	530.0	0.3%	0.1%
Probe	7-2	71.4	73.4	-0.4%	211.8	211.8	0.0%	543.0	540.0	0.3%	-0.0%
Probe	7-3	71.2	72.8	-0.3%	211.4	213.0	-0.2%	538.0	538.0	0.0%	-0.2%
Robe	7-4	71.4	71.8	-0.1%	212.0	212.0	0.0%	543.0	544.0	-0.1%	-0.1%
Probe	7-5	71.4	75.0	-0.7%	212.2	212.2	0.0%	543.0	540.0	0.3%	-0.1%
Probe	7-6	71.6	72.4	-0.2%	211.2	213.0	-0.3%	544.0	544.0	0.0%	-0.2%
Probe	9-1	70.6	71.8	-0.2%	211.2	212.2	-0.1%	533.0	534.0	-0.1%	-0.1%
Probe	10-1	71.6	71.6	0.0%	212.0	212.6	-0.1%	532.0	533.0	-0.1%	-0.1%
Probe	10-2	71.6	72.2	-0.1%	211.2	212.6	-0.2%	545.0	542.0	0.3%	0.0%
Probe	10-3	71.4	71.4	0.0%	211.2	212.8	-0.2%	549.0	546.0	0.3%	0.0%
FS Pitot	10-S			0.0%			0.0%			0.0%	0.0%
FS Pitot	11-S	75.0	75.4	-0.1%	211.0	211.2	0.0%	542.0	541.0	0.1%	0.0%
	14-S	75.4	75.2	0.0%	211.0	213.6	-0.4%	510.0	511.0	-0.1%	4.2%
	14-2	75.8	75.8	0.0%	211.2	211.4	0.0%	525.0	523.0	0.2%	0.1%
	A1										
	A2			0.0%			0.0%			0.0%	0.0%
	A3	62.8	62.4	0.1%	211.6	214.0	-0.4%	337.8	349.0	-1.4%	-0.6%
	A4	63.0	63.4	-0.1%	211.4	211.0	0.1%	353.0	354.0	-0.1%	-0.0%
	A5			0.0%			0.0%			0.0%	0.0%
	A6	63.0	63.8	-0.2%	211.8	210.2	0.2%	353.0	349.0	0.5%	0.2%
	F3	72.4	70.8	0.3%	212.2	209.4	0.4%	563.2	560.6	0.3%	0.3%
	F4	73.2	71.4	0.3%	211.6	211.2	0.1%	538.2	539.2	-0.1%	0.1%
	F5			0.0%			0.0%			0.0%	0.0%
	F6	70.8	71.4	-0.1%	211.8	210.8	0.1%	525.0	525.8	-0.1%	-0.0%
	F9	63.0	63.2	0.0%	211.6	214.0	-0.4%	345.6	342.0	0.4%	0.0%
	F11	62.6	65.2	-0.5%	212.2	214.2	-0.3%	355.2	357.2	-0.2%	-0.3%
	F14	73.0	71.8	0.2%	211.8	211.8	0.0%	551.2	549.6	0.2%	0.1%
	F12	71.0	71.6	-0.1%	212.0	213.0	-0.1%	547.6	546.2	0.1%	-0.0%
	F13	72.8	72.0	0.2%	211.8	213.4	-0.2%	584.2	583.4	0.1%	0.0%
	F73	70.8	70.4	0.1%	211.6	212.4	-0.1%	550.4	550.2	0.0%	0.0%
	F23	62.8	63.2	-0.1%	211.8	212.8	-0.1%	360.0	355.0	0.6%	0 1%
	F51										
	F84	62.8	63.2	-0.1%	211.4	214.0	-0.4%	353 0	345.8	0.9%	0.1%
	F81	72.0	71.4	0.1%	211.8	212.8	-0.1%	553.4	552.8	0.1%	0.0%
	F85	72.6	71.2	0.3%	212.0	313.2	-0.2%	386.0	392.0	-0.7%	-0.2%
	6S-2										
Probe											
Probe	w/c 4			0.0%			0.0%			0.0%	0.0%
	BI										
	B3			0.0%			0.0%			0.0%	0.0%
	B4	63.0	63.0	0 0%	211.6	216.0	-0.7%	357 2	356.0	0.1%	-0.2%
	B7	70 4	71.6	-0.2%	211.0	111.0	0.0%	473.4	475.0	-0.2%	-0.1%
	BIO			0.0%			0.0%			0.0%	0.0%
	B11	71.0	71.4	-0.1%	212.2	210.6	0.2%	473 0	480.0	-0.8%	-0.2%
	B15	73.2	71.2	0.4%	212.0	311.8	0.0%	389.0	383.0	0.7%	0.4%
	816	73.0	71.6	0.3%	212.0	211.6	0.1%	576.0	564.8	1.1%	0.5%
	B17	70.8	71.4	-0.1%	212.0	211.8	0.0%	552.0	550.0	0.2%	0 0%
AVERAGE		69 2	69 4	0 0%	211.7	212.3	-0 1%	5102	509 3	0 1%	-0 0%

Thermocouple Indicator Calibration

Date: 02/20/01 | Deviation Limit @32 F 7.4 | @212 F 10.1 | @400 F 12.9 | Pb= 30.05 in Hg | Ta= 55.0 oF | TJH / MJE/DLR | TCINDm00.WB1

Next Calibration: 06-01

Thermocouple Indicator	Channel	Measured, F	Standard, F	Deviation % absolute	Measured, F	Standard, F	Deviation % absolute	Measured, F	Standard, F	Deviation % absolute	Average Deviation, %
Dial multi-indicator	1	139.0	139.6	-0.1	602.0	604.0	-0.2	1255.0	1253.6	0.1	-0.07
	2	158.0	154.0	0.7	591.0	587.4	0.3	1280.0	1295.6	-0.9	0.04
	3	107.0	104.0	0.5	523.0	517.0	0.6	1307.0	1307.2	-0.0	0.38
	4	113.0	100.0	2.3	525.0	524.4	0.1	1353.0	1354.8	-0.1	0.76
	5	126.0	116.2	1.7	524.0	521.2	0.3	1271.0	1270.4	0.0	0.67
	6	116.0	117.0	-0.2	523.0	527.4	-0.4	1279.0	1271.6	0.4	-0.06
	7	144.0	153.2	-1.5	743.0	752.0	-0.7	1388.0	1369.2	1.0	-0.41
	8	132.0	135.0	-0.5	532.0	533.6	-0.2	1281.0	1296.8	-0.9	-0.52
	9	113.0	108.8	0.7	560.0	560.2	-0.0	1264.0	1277.0	-0.7	-0.01
	10	114.0	111.4	0.5	513.0	527.0	-1.4	1328.0	1316.4	0.7	-0.10
Omega trendicator	1	94.0	90.6	0.6	510.0	509.2	0.1	1215.0	1214.4	0.0	0.25
	2	102.0	101.4	0.1	520.0	519.0	0.1	1215.0	1214.8	0.0	0.07
	3	103.0	102.0	0.2	546.0	547.0	-0.1	1213.0	1215.0	-0.1	-0.01
	4	101.0	100.4	0.1	498.0	500.0	-0.2	1213.0	1215.0	-0.1	-0.07
	5	101.0	99.8	0.2	537.0	538.0	-0.1	1213.0	1213.8	-0.0	0.02
Fluke 6393007		60.8	61.6	-0.2	428.6	428.0	0.1	1208.8	1209.4	-0.0	-0.04
Fluke 7029062		22.6	21.0	0.3	453.8	452.0	0.2	1211.0	1209.2	0.1	0.21
Fluke 72760077	1			0.0			0.0			0.0	0.00
	2			0.0			0.0			0.0	0.00
Meter Box 4	1	84.0	84.6	-0.1	508	509.2	-0.1	1175	1176.6	-0.1	-0.11
	2	93.0	95.2	-0.4	512	512.8	-0.1	1183	1184.6	-0.1	-0.19
	3	93.0	94.0	-0.2	514.0	515.4	-0.1	1196.0	1197.0	-0.1	-0.13
	4	82.0	82.8	-0.1	517.0	518.4	-0.1	1189.0	1190.0	-0.1	-0.12
	5	82.0	82.2	-0.0	510.0	511.4	-0.1	1178.0	1179.8	-0.1	-0.10
Meter Box 5	1	109.0	108.4	0.1	538.0	540.2	-0.2	1241.0	1240.8	0.0	-0.03
	2	104.0	113.0	-1.6	494.0	498.0	-0.4	1405.0	1406.6	-0.1	-0.69
	3	138.0	142.2	-0.7	530.0	532.4	-0.2	1077.0	1081.0	-0.3	-0.40
	4	104.0	107.4	-0.6	516.0	516.6	-0.1	1125.0	1124.4	0.0	-0.21
	5	-	-	0.0	-	-	0.0	-	-	0.0	0.00
Meter Box 6	1	105.0	104.6	0.1	506.0	506.0	0.0	1212.0	1212.6	-0.0	0.01
	2	107.0	105.8	0.2	507.0	505.4	0.2	1212.0	1211.0	0.1	0.15
	3	105.0	103.0	0.4	503.0	501.6	0.1	1212.0	1211.8	0.0	0.17
	4	105.0	102.8	0.4	502.0	501.0	0.1	1212.0	1211.4	0.0	0.18
	5	105.0	104.0	0.2	503.0	501.0	0.2	1212.0	1211.2	0.0	0.14
Meter Box 7	1	102.0	101.6	0.1	506.0	504.6	0.1	1215.0	1215.2	-0.0	0.07
	2	112.0	111.2	0.1	503.0	502.2	0.1	1214.0	1212.8	0.1	0.10
	3	103.0	101.0	0.4	510.0	509.4	0.1	1217.0	1216.2	0.0	0.16
	4	103.0	101.4	0.3	510.0	508.8	0.1	1218.0	1217.6	0.0	0.14
	5	104.0	102.4	0.3	510.0	508.4	0.2	1218.0	1217.2	0.0	0.17
Meter Box 8	1	103.0	102.0	0.2	523.0	521.8	0.1	1222.0	1220.2	0.1	0.14
	2	104.0	101.8	0.4	526.0	524.6	0.1	1219.0	1217.8	0.1	0.20
	3	102.0	102.4	-0.1	506.0	505.0	0.1	1220.0	1218.0	0.1	0.05
	4	112.0	110.8	0.2	513.0	511.0	0.2	1220.0	1218.4	0.1	0.17
	5	112.0	110.6	0.2	518.0	516.6	0.1	1220.0	1218.6	0.1	0.16
Meter Box 9	1	100.0	101.6	-0.3	507.0	503.0	0.4	1259.0	1260.0	-0.1	0.02
	2	100.0	97.2	0.5	498.0	497.2	0.1	1270.0	1267.6	0.1	0.24
	3	101.0	96.8	0.8	511.0	509.0	0.2	1300.0	1300.0	0.0	0.32
	4	150.0	156.4	-1.0	515.0	517.0	-0.2	1321.0	1321.4	-0.0	-0.42
	5	123.0	126.6	-0.6	506.0	501.6	0.5	1281.0	1281.6	-0.0	-0.06
temp. control box 1	1	80.6	81.0	-0.1	226.8	227.8	-0.1	1216.0	1216.2	-0.0	-0.08
	2	98.0	99.0	-0.2	532.3	533.0	-0.1	1233.0	1233.2	-0.0	-0.09
	3	59.7	60.0	-0.1	495.4	494.8	0.1	1252.0	1251.6	0.0	0.01
	4	91.1	92.0	-0.2	521.2	521.4	-0.0	1216.0	1216.0	0.0	-0.06
	5	78.2	78.8	-0.1	504.2	504.6	-0.0	1216.0	1215.8	-0.0	-0.05
	6	76.9	77.8	-0.2	593.1	593.2	-0.0	1215.0	1215.2	0.1	-0.02
temp. control box 2	1	102.0	100.6	0.2	445.0	445.8	-0.1	1212.0	1209.8	0.1	0.10
	2	106.0	104.8	0.2	554.0	556.4	-0.2	1214.0	1214.2	-0.0	-0.01
	3	73.0	72.8	0.0	417.0	418.4	-0.2	1213.0	1212.4	0.0	-0.03
	4	72.0	70.8	0.2	522.0	524.4	-0.2	1210.0	1211.6	-0.1	-0.04
	5	84.0	84.2	-0.0	497.0	498.8	-0.2	1212.0	1212.0	0.0	-0.07
	6	83.0	83.6	-0.1	504.0	507.4	-0.4	1208.0	1209.6	-0.1	-0.19
Van II Heater Contmls	1	108.0	119.6	-2.0	507.0	515.8	-0.9	1217.0	1212.8	0.3	-0.88
	2	122.0	124.6	-0.4	525.0	534.0	-0.9	1220.0	1209.6	0.6	-0.24
degrees C	3	130.0	131.2	-0.2	282.0	286.5	-0.6	659.0	656.3	0.2	-0.19
degrees C	4	77.0	78.6	-0.3	304.0	307.0	-0.4	708.0	704.7	0.3	-0.13
Van III Heater Control	1	101.0	108.4	-1.3	500.0	510.2	-1.1	1213.0	1208.0	0.3	-0.68
	2	98.0	102.8	-0.9	506.0	522.0	-1.6	1223.0	1218.6	0.3	-0.74
	3	107.0	109.4	-0.4	508.0	518.6	-1.1	1218.0	1219.2	-0.1	-0.53
	4	108.0	112.6	-0.8	515.0	524.2	-0.9	1223.0	1221.8	0.1	-0.56
AVERAGE		**100.73**	**100.93**	**-0.03**	**498.66**	**500.02**	**-0.14**	**1197.55**	**1197.23**	**0.02**	**-0.05**

Standard used: Fluke 5832139 calibrated 1-26-00 by Grant Edgle Co.

Magnehelic Calibrations

Date	**07-feb-01**						**mgo20220**	File
Testers	**cdb**						**65.0**	Temp.(F)
Location	**Whitaker Shop**						**30.50**	Pb(in H20)
							Dwyer/bx#1	Manometer
Magnehelic ID	15 sec. High	leak check Low	Scale Inches	Guage in H20	Manometer in H20	Difference in H20	Difference %	**Difference Average**
SR#1	OK	OK	electronic	0.000	0.000	0.000	0.0%	
				1.000	1.000	0.000	0.0%	
				10.100	10.130	0.030	0.3%	
				28.200	28.150	-0.050	-0.2%	
				33.500	33.700	0.200	0.6%	**0.1%**
SR#2	OK	OK	electronic	0.000	0.000	-0.000	0.00%	
				1.000	1.039	0.039	3.75%	
				4.200	4.287	0.087	2.0%	
				22.500	22.640	0.140	0.62%	
				35.500	35.550	0.050	0.14%	**1.3%**
Dwyer #1	OK	OK	electronic	0.000	0.000	-0.000	0.00%	
				7.600	7.700	0.100	1.30%	
				15.000	15.020	0.020	0.1%	
				22.200	22.180	-0.020	-0.09%	
				35.500	35.640	0.140	0.39%	**0.3%**

Horizon Engineering ***5031255-5050*** **Fax** ***5031255-0505***

Magnehelic Calibrations

Date	10-Oct-01						08-Feb-1	File
Testers	PTH						65.0	Temp.(F)
Location	Whitaker Shop						30.50	Pb(in H2O)
							0-3inc/MB-1	Manometer
Magnehelic ID	15 sec. High	leak check Law	Scale Inches	Magnehelic in H2O	Manometer in H2O	Differance in H2O	Differance %	Differance Average
1-A	OK	OK	1	0.000	0.000	0.000	0.0%	
				0.180	0.160	-0.020	-12.5%	
				0.320	0.320	0.000	0.0%	
				1.000	1.020	0.020	2.0%	-2.6%
1-C	n/a	nla	1	0.000	0.000	0.000	0.0%	
21-sept-99				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
1-E	ok	ok	1	0.000	0.000	0.000	0.0%	
				0.080	0.080	0.000	0.0%	
				0.600	0.620	0.020	3.2%	
				0.800	0.800	0.000	0.0%	0.8%
1-F	OK	OK	1	0.000	0.000	0.000	0.0%	
				0.100	0.100	0.000	0.0%	
				0.400	0.400	0.000	0.0%	
				0.790	0.800	0.010	1.3%	0.3%
1-G	OK	OK	1	0.000	0.000	0.000	0.0%	
				0.200	0.200	0.000	0.0%	
				0.420	0.440	0.020	4.5%	
				0.840	0.880	0.040	4.5%	2.3%
1-H	n/a	n/a	1	0.000	0.000	0.000	0.0%	
02-Feb-00				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
1-I	n/a	n/a	1	0.000	0.000	0.000	0.0%	
21-sept-99				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
1-J	OK	OK	1	0.000	0.000	0.000	0.0%	
				0.250	0.240	-0.010	-4.2%	
				0.750	0.740	-0.010	-1.4%	
				1.000	1.040	0.040	3.8%	-0.4%
1-K	OK	OK	1	0.000	0.000	0.000	0.0%	
				0.360	0.360	0.000	0.0%	
				0.540	0.540	0.000	0.0%	
				0.940	0.930	-0.010	-1.1%	-0.3%
1-L	OK	OK	1	0.000	0.000	0.000	0.0%	
				0.200	0.200	0.000	0.0%	
				0.600	0.620	0.020	3.2%	
				0.980	1.020	0.040	3.9%	1.8%
2-A	n/a	n/a	2	0.000	0.000	0.000		
02-Feb-00				0.000	0.000	0.000		
				0.000	0.000	0.000		
				0.000	0.000	0.000	ERR	
2-B	OK	OK	2	0.000	0.000	0.000	0.0%	
02-Feb-00				0.250	0.240	-0.010	-4.2%	
				0.950	0.940	-0.010	-1.1%	
				1.900	1.900	0.000	0.0%	-1.3%
2-C	OK	OK	2	0 m	0.000	0.000	0.0%	
02-Feb-00				0.550	0.600	-0.050	-8.3%	
				1.500	1.500	0.000	0.0%	
				2.C00	2.400	0.400	16.7%	2.1%
2-D	OK	OK	2	0.000	0.000	0.000	0.0%	
10-Feb-99				0.450	0.470	0.020	4.3%	
				1.050	1.000	-0.050	-5.0%	
				1.700	1.660	-0.040	-2.4%	-0.8%
2-E	nla	n/a	2	3.000	0.000	0.000	0.0%	
02-Feb-00				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
3-A	OK	OK	3	0.000	0.000	0.000	0.0%	
				1.000	0.980	-0.020	-2.0%	
				1.500	1.520	0.020	1.3%	
				2.900	2.920	0.020	0.7%	-0.0%
3-H	n/a	n/a	3	0.000	0.000	0.000	0.0%	
10-Feb-99				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR

HORIZON ENGINEERING LLC

13585 NE Whitaker Way • Portland, OR **97230**
Phone **(503)255-5050** • **Fax (503)255-0505**
www.horizonengineering.com

February 8, 2001
Horizon Engineering shop
Barometer Calibration

The Barometric pressure reported at Portland Troutdale airport was 30.06" Hg as corrected to the altitude of the Horizon Engineering shop. The barometer reading in TVIII was 30.25"Hg. The barometer reading in TVII was 29.95" Hg. The barometer reading in TVI was 30.15" Hg. The FSL independent barometer was 30.29" Hg. All pressures are absolute, read at the Horizon Engineering shop.

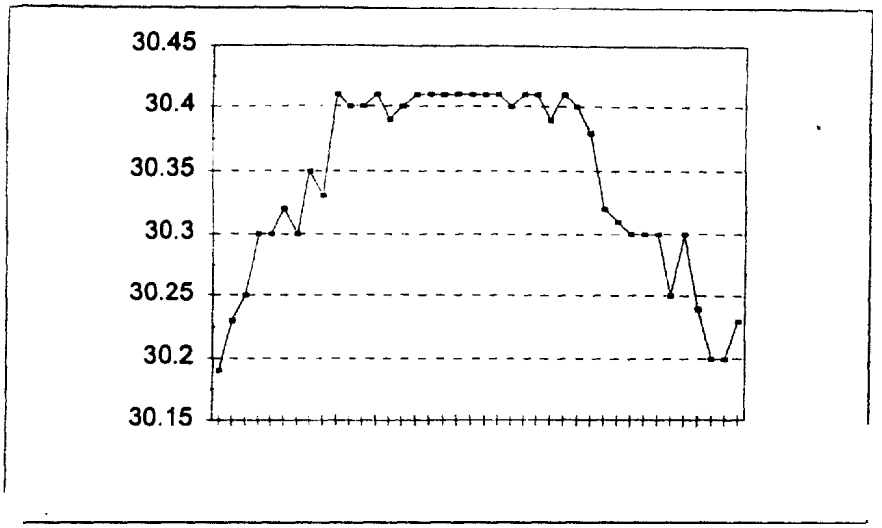
DLR

NOx Converter Efficiency Test 02/12/2001

Thermo Environmental Model 42H #2

Readings	Time
30.2	12:16
30.19	12:17
30.23	12:18
30.25	12:19
30.30	12;20
30.30	12:21
30.32	12:22
30.30	12:23
30.35	12:24
30.33	12:25
30.41	12:26
30.40	12:27
30.40	12:28
30.41	12:29
30.39	12:30
30.40	12:31
30.41	12:32
30.41	12:33
30.41	12:34
30.41	12:35
30.41	12:36
30.41	12:37
30.41	12:38
30.40	12:39
30.41	12:40
30.41	12:41
30.39	12:42
30.41	12:43
30.40	12:44
30.38	12:45
30.32	12:46
30.31	12:47
30.3	12:48
30.3	12:49
30.3	12:50
30.25	12:51
30.3	12:52
30.24	12:53
30.2	12:54

	Pretest	Post test
Zero	0.00	0.00
Span	100.00	100.00
Mid	n/a	n/a
Time	12:16	12:51



Percent Loss= 0.723

PASS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

E 3b
P1 F 303
9/25/00

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01
TO: DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND OR 97230

DATE: September 21 2000

CUSTOMER ORDER NUMBER: 003070

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO:	**CC53845**					
			VARIAN MODEL 1860 TCD		09/21/00	
Carbon Dioxide	✓21.83 ± 0.05 %	GMIS	S/N NONE	09/21/02	21.83 %	
		CYLINDER #:	THERMAL CONDUCTIVITY		21.83 %	
		CC122859	GAS CHROMATOGRAPHY		21.84 %	
		@ 17.93 %	LAST CAL DATE: 09/21/00	MEAN:	21.83 %	
			BOVAR MODEL 922M		09/13/00	09/20/00
Nitric Oxide	✓ 183.2 ± 0.9 ppm	GMIS	S/N VD92284844	09/20/02	183.3 ppm	183.1 ppm
NOx	183.2 ppm	CYLINDER #:	CONTINUOUS		182.9 ppm	183.5 ppm
		CC72078	UV PHOTOMETRY		183.0 ppm	183.3 ppm
		@ 258.5 ppm	LAST CAL DATE: 09/13/00	MEAN:	183.1 ppm	183.3 ppm
			CARLE INST MODEL 8000		09/05/00	09/14/00
Carbon Monoxide	✓ 880 ± 9 ppm	GMIS	S/N 8249	09/14/02	880 ppm	880 ppm
		CYLINDER #:	METHANATION/FID		880 ppm	879 ppm
		CC108729	GAS CHROMATOGRAPHY		881 ppm	881 ppm
		@ 1106 ppm	LAST CAL DATE: 08/15/00	MEAN:	880 ppm	880 ppm
			VARIAN MODEL 1860 FID		09/07/00	
Propane	86.7 ± 1.1 ppm	GMIS	S/N NONE	09/07/02	86.9 ppm	
		CYLINDER #:	FLAME IONIZATION		86.7 ppm	
O2-free Nitrogen	Balance	CC51261	GAS CHROMATOGRAPHY		86.6 ppm	
CYLINDER PRESSURE:	2000 psig	@ 104.1 ppm	LAST CAL DATE: 09/05/00	MEAN:	86.7 ppm	

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: M.S. CALHOUN APPROVED: G.T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE. CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENGØ1

TO:

DATE : 06/07/01

David Rossman
Horizon Eng'g/Infrared NW
13585 NE Whitaker Way
Portland, OR 97230-

CUSTOMER ORDER NUMBER: 003241

PAGE 1

COMPONENT	CONCENTRATION (v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CA04567					
			Varian Model 1860 #27		05/23/01	
Carbon dioxide	✓12.41 ±.02 %	GMIS	S/N None	05/23/03	12.39 %	
		Cylinder #,	Thermal Conductivity		12.40 %	
		CC122859	Gas Chromatography		12.44 %	
		@ 17.93 %	Last Cal Datn: 05/89/81		Mean: 12.41 %	
			Bovar West Res Model 922		05/15/01	05/23/01
Nitric oxide	✓ 89.8 ±1.2 ppm	GMIS	S/N VD92284841	05/23/03	89.6 ppm	89.6 ppm
NOx	89.8 ppm	Cylinder #	Continuous		89.7 ppm	89.5 ppm
		CA03823	W Photometry		89.7 ppm	90.3 ppm
		1 181.6 ppm	Last Cal Date: 05/82/81		Mean: 89.7 ppm	89.8 ppm
			Carle Instr Model 8088		05/15/01	06/07/01
Carbon monoxide	✓499 ±5 ppm	mas	S/N 8249	06/07/03	499 ppm	499 ppm
		Cylinder #,	Methanation/FID		498 ppm	499 ppm
		CC278	Gas Chromatography		499 ppm	500 ppm
		@ 539 ppm	Last Cal Date: 86/06/81		Mean: 499 ppm	499 ppm
			Varian Model 1860		85/17/01	
Propane	50.2 ±.4 ppm	mas	S/N None	85/17/03	50.1 ppm	
		Cylinder #	Flame Ionization		58.2 ppm	
Nitrogen,O2-Free Balance		CC121986	Gas Chromatography		58.2 ppm	
Cylinder Pressure: 2000 peig		@ 50.6 ppm	Last Cal Data: 05/17/01		Mean: 58.2 ppm	

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF *ANALYSIS*
EPA PROTOCOL GAS MIXTURES

TO: HENG01
David Rossman
Horizon Eng'g/Infrared NW
13585 Whitaker Way
Portland, OR 97230-

DATE : 06/07/01

CUSTOMER ORDER NUMBER: 003255

PAGE 1

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSISDATA
CYLINDER NO.:	CA04488				
			Varian Model 1860		05/30/01
Oxygen	✓ 11.60 +.13 %	GMIS	S/N None	85/38/04	11.62 %
		Cylinder #	Thermal conductivity		11.58 8
Nitrogen	Balance	CC50175	Gas Chromatography		11.59 %
Cylinder Preseure: 2000 psig		@ 25.69 %	Last Cal Date: 85/24/81	Mean:	11.60 8

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

01-24-0

#117

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01

TO:

DAVID ROSSMAN
HORIZON ENGINEERING
13585 NE WHITAKER *WAY*
PORTLAND, OR 97230-

DATE : 01/20/00

CUSTOMER ORDER NUMBER: 2809

PAGE 1

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS *DATA*	
CYLINDER NO.: CA03076						
			Monitor Labs Model 8440		01/04/08	01/11/0
Nitric oxide ✓	25.25 ±.25 ppm	GMIS	S/N 136	01/11/02	25.30 ppm	25.33 pp
NOx	25.25 ppm	Cylinder #	Continuous		25.16 ppm	25.23 pp
Nitrogen,O2-Free Balance		CC114770	Chemiluminescence		25.13 ppm	25.30 pp
Cylinder Pressure: 2000 psig		@ 19.88 ppm	Last Cal Date: 01/10/00		Mean: 25.20 ppm	25.29 pp

ppm = umole/mole % = mole-$

The above analyses were performed in accordance *with* Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: Steve Kozy
S.B. Kozy

Approved:
J.T. Marrin

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

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

P22

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: October 3 2001

CUSTOMER ORDER NUMBER: 003351

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINM	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO:	CA05171				
			VARIAN MODEL 1860 PID		10/01/01
Propane	✓ 89.0 ± 0.9 ppm	GMIS	S/N NONE	10/01/04	89.1 ppm
		CYUNDER #:	FLAME IONIZATION		89.0 ppm
Zero Air	Balance	CC51261	GAS CHROMATOGRAPHY		89.0 ppm
CYLINDER PRESSURE:	2000 psig	@ 104 ppm	LAST CAL DATE: 09/11/01	MEAN:	89.0 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: _____ APPROVED: _____
M.S.CALHOUN J.T.MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6513 PEBBLE RD. • RIVERSIDE, CA 92509 • (909) 653-7877

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

P19

HENG01

TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: October 3 2001

CUSTOMER ORDER NUMBER: 003351

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO:	CA05193				
			VARIAN MODEL 1860 PID		10/01/01
Propane	✓ 51.6 ± 0.5 ppm	GMIS	S/N NONE	10/01/04	51.4 ppm
		CYLINDER #:	FLAME IONIZATION		51.6 ppm
Ultrapure Air	Balance	CC121986	GAS CHROMATOGRAPHY		51.7 ppm
CYLINDER PRESSURE:	2000 psig	@ 50.6 ppm	LAST CAL DATE: 09/11/01	MEAN:	51.6 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: _____ APPROVED: _____
M.S. CALHOUN J.T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

For Technical Information Call
1-800-752-1597

R12

AIR PRODUCTS

Air Products and Chemicals, Inc. * 12722 S. Wentworth Avenue, Chicago, IL 60628

ISO CERTIFICATION: 9002

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS STANDARD

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS
1680 OAK TREE RD.
EDISON NJ 08820-

Order No: SRP-410911-04
Batch No: 861-67867
PO:
Release:

Cylinder No: SG9152832BAL
Bar Code No: DGY894
Cylinder Pressure*: 2000 psig
Certification Date: 03/27/2000
Expiration Date: 03/27/2003

CERTIFIED CONCENTRATION		REFERENCE STANDARDS			ANALYTICAL INSTRUMENTATION			
Component	Certified Concentration	Cylinder Number	Standard Type	Standard Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
CARBON MONOXIDE	85.9 ±0.57 PPM	SG9159515BAL	NTRM	99.90 PPM	HORIBA VIA-510	405079	03/15/00	NON DISPERSIVE INFRARED
NITROGEN	Balance Gas							

*** STANDARD SHOULD NOT BE USED BELOW 150 PSIG**

12-1

Analyst: _____ HOLLY HATTENDORF

Approved By: _____ RICHARD FRY

(16921)

SCOTT-MARRIN, INC.
653 E. BOX 5 P.O. 6531-0780 , RIVERSIDE, 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

P18

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: October 3 2001

CUSTOMER ORDER NUMBER: 003351

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO: CA05167			VARIAN MODEL 1860 FID		09/21/01
Propane	✓ 28.69 ± 0.28 ppm	GMIS	S/N NONE	09/21/04	28.62 ppm
		CYLINDER #:	FLAME IONIZATION		28.77 ppm
Ultrapure Air	Balance	CC121986	GAS CHROMATOGRAPHY		28.68 ppm
CYLINDER PRESSURE: 2000 psig		@ 50.6 ppm	LAST CAL DATE: 09/17/01	MEAN:	28.69 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: _____ APPROVED: _____
M.S. CALHOUN J.T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.

[illegible] P.O. BOX 1908, RIVERSIDE, CA 92502-1908 (909) 653-2700

01-25-99

REPORT OF *ANALYSIS*
EPA PROTOCOL GAS MIXTURES

P-12
PO 2396 of 11-23-98

HENGØ1

TO:

DATE : 01/15/99

DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

CUSTOMER ORDER NUMBER: 2396

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CAØ3475				
			Varian Model 1860		Ø1/14/99
Propane	✓8.61 ± .Ø1 ppm	GMIS	S/N None	01/14/02	8.62 ppm
		Cylinder #	Flame Ionization		8.60 ppm
Ultrapure Air	Balance	CC659	Gas Chromatography		8.62 ppm
Cylinder Pressure: 2ØØØ psig		@ 10.11 ppm	Last Cal Date: 81/14/99	Mean:	8.61 ppm

ppm = umole/mole % = mole-%

The above analysee were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not b used if the pressure is less than 150 psig.

Analyst: _____ Approved: _____

M.S. Calhoun J.T. Marrin

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

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD • RIVERSIDE CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

S 3
P.O 3088
9/25/00

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01
TO: DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND OR 97230

DATE: September 21 2000

CUSTOMER ORDER NUMBER: 003088

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA 09/12/00	09/21/00
CYLINDER NO:	CC49351		BOVAR MODEL 922M			
Sulfur Dioxide ✓	26.47 ± 0.27 ppm	GMISR	S/N VD92284844	03/01/01	26.38 ppm	26.37 ppm
		CYLINDER #:	CONTINUOUS		26.48 ppm	26.47 ppm
Nitrogen	Balance	CC68759	UV PHOTOMETRY		26.56 ppm	26.55 ppm
CYLINDER PRESSURE:	2000 psig	@ 25.64 ppm	LASTCALDATE: 09/08/00	MEAN:	26.47 ppm	26.46 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol Report Number EPA-600/R93/224, dated September 1993
This cylinder should not be used if the pressure is less than 150 psig

ANALYST: Mark Monson
M.J.MONSON

APPROVED:
J.T.MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01

TO:

DATE : 09/13/01

David Rossman
Horizon Eng'g / Infrared NW
13585 NE Whitaker Way
Portland, OR 97230-

CUSTOMER ORDER NUMBER: *003329*

PAGE 1

COMPONENT	CONCENTRATION (v/v) +/- EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CC25763	S4			
			Bovar West Res Model 922		09/04/01 09/12/81
Sulfur dioxide	15.27 ±.16 ppm	GMIS	S/N 922M8379-1	03/12/02	15.23 ppm 15.14 ppm
		Cylinder #	Continuous		15.34 ppm 15.24 ppm
Nitrogen	Balance	CC28050	W Photometry		15.38 ppm 15.26 ppm
Cylinder pressure: 2000 psig		@ 26.72 ppm	Last Cal Date: 08/28/01	Mean:	15.32 ppm 15.21 ppm
CYLINDER NO.:	CC53849	S9			
			Bovar West Res Modal 922		89/84/81 09/12/81
Sulfur dioxide	26.96 ±.29 ppm	GMIS	S/N 922M8379-1	83/12/02	26.78 ppm 26.98 ppm
		Cylinder #	Continuous		27.01 ppm 26.95 ppm
Nitrogen	Balance	CC28050	UV Photometry		27.07 ppm 27.05 ppm
Cylinder Pressure: 2000 psig		@ 26.72 ppm	Last Cal Date: 08/28/01	Mean:	26.95 ppm 26.97 ppm

ppm = umole/mole 4 = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: Mark Monson
M.J. Monson

Approved:
E.T. Marrin

The only liability of this company tor gas which fails to comply with this analysis ~ h a l be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

Environmental Services Laboratory, Inc.

E S L

17400 SW Upper Boones Ferry Road, Suite 270 • Portland, OR 97224 • (503) 670-8520

December 07, 2001

Nichole Karl
Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230
TEL: (503)255-5050
FAX (503)255-0505

RE: 1685 Audit / OSM Audit Samples Order No.: 0111194

Dear Nichole Karl,

Environmental Services Laboratory received 5 samples on 11/26/01 for the analyses presented in the following report.

The Samples were analyzed for the following tests:
ICP Metals (EPA 6010B)

There were no analytical problems encountered, and all data met laboratory QC criteria, unless noted in a Case Narrative. Results apply only to the samples analyzed. Reproduction of this report is permitted only in its entirety, without the written approval of the Laboratory.
The following checked data sections are included in this report, and numbered to indicate total pages within each report section.

✓ Base Sample Report ✓ Method Blank Report — Sample Duplicate Report
— Matrix Spike/Matrix Spike Duplicate Report ✓ Laboratory Control Spike/Spike Duplicate Report — Continuing Calibration Verification Report ✓ Initial Calibration Verification Report

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Leslie Rush
Project Manager

Keith Hunter
Technical Review

Method 12 Compliance Audit Material
(Lead Spiked Aqueous Solution)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M29-0482-01 I AMH2-123 Date Issued: 11109101

Concentration Level: High

Auditee:

Company: 0

Address; 0

Attention of: 0 Phone:

Requestor:

Agency: OR DEQ / NW Region

Address; 2020 SW 4th Ave. Suite 400, Portland, OR 97230

Atlention of: Jack Herbert Phone: (503) 229-5579

Project Name: Oregon Steel Mills

Audit Results (Results in µg/mL)

Compound	Result
Lead	49.7

12/11/2001 09:58 FAX 010

Method 12 Compliance Audit Material
(Lead Spiked Aqueous Solution)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M29-0482-02 / AMM2-122 Date Issued: 11/09/01

Concentration Level: Medium

Auditee:

Company: 0

Address: 0

Attention of: 0 Phone:

Requestor:

Agency: OR DEQ / NW Region

Address: 2020 SW 4th Ave, Suite 400, Portland, OR 97230

Attention of; Jack Herbert Phone; (503) 229-5579

Project Name: Oregon Steel Mills

Audit Results (Results in µg/mL)

Compound	Result
Lead	5.93

12/11/2001 09:58 FAX 011

Method 12 Compliance Audit Material
(Lead Spiked Filter)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M29-0480-01 ▮ FMH1-109 Date Issued: 11109101

Concentration Level: High

Auditee:

Company: 0

Address: 0

Attention of: 0 Phone:

Requestor:

Agency: OR DEQ / NW Region

Address: 2020 SW 4th Ave, Suite 400, Portland, OR 97230

Attention of: Jack Herbert Phone: (503) 229-5579

Project Name: Oregon Steel Mills

Audit Results (Results In µg)

Compound	Result
Lead	888

12/11/2001 09:58 FAX 012

Method 12 Compliance Audit Material
(Lead Spiked Filter)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M29-0480-02 1Fil-1590 Date Issued: 11/09/01

Concentration Level: Medium

Audltee:

Company: 0

Address: 0

Attention of: 0 Phone:

Requestor:

Agency: OR DEQ / NW Region

Address: 2020 SW 4th Ave, Suite 400, Portland, OR 97230

Attention of: Jack Herbert Phone: (503) 229-5579

Project Name: Oregon Steel Mills

Audit Results (Results in µg)

Compound	Result
Lead	104

12/11/2001 09:58 FAX 013

Environmental Services Laboratory

Date: 07-Dec-01

CLIENT:	Horizon Engineering	**Client Sample ID:**	AMH2-123
Lab Order:	0111194	**Tag Number:**	
Project:	1685 Audit / OSM Audit Samples	**Collection Date:**	11/21/01
Lab ID:	0111194-01A	**Matrix:**	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				Analyst: **imr**
Lead	49.7	*0.00500*		ug/ml	1	12/4/01

Qualifiers:

ND - Nor Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

002

12/11/2001 09:58 FAX

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	**Client Sample ID:**	AMM2-122
Lab Order:	011 1194	**Tag Number:**	
Project:	1685 Audit / OSM Audit Samples	**Collection Dote:**	11/21/01
Lab ID:	0111194-02A	**Matrix:**	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		EPA 6010 8				Analyst: lmr
Lead	5.93	0.00500		ug/ml	1	12/4/01

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

- Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

C00

12/11/2001 09:57 FAX

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	**Client Sample ID:**	FMH1-109
Lab Order:	0111194	**Tag Number:**	
Project:	1685 Audit / OSM Audit Samples	**Collection Date:**	11/21/01
Lab ID:	0111194-03A	**Matrix:**	FILTER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				Analyst. **lmr**
Lead	888	*0.500*		ug	1	12/3/01

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

12/11/2001 09:57 FAX 004

Environmental Services Laboratory

Date: *07-Dee-01*

CLIENT:	Horizon Engineering	**Client Sample ID:**	FIL-1590
Lab Order:	0111194	**Tag Number:**	
Project:	1685 Audit / OSM Audit Samples	**Collection Date:**	11/21/01
Lab ID:	0111194-04A	**Matrix:**	FILTER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60108**				Analyst: **lmr**
Lead	104	*0.500*		ug	1	12/3/01

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - WD outside accepted recovery limits
- E - Value above quantitation range

12/11/2001 09:57 FAX 005

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT:	Horizon Engineering	Client Sample ID:	BLANK
Lab Order:	0111194	Tag Number:	
Project:	1685 Audit / OSM Audit Samples	Collection Date:	*1121101*
Lab ID:	*01*11194-05A	Matrix:	FILTER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		EPA 6010*8*				Analyst: lmr
Lead	0.540	0.500		ug	1	12/3/01

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

- Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

12/11/2001 09:57 FAX 008

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT: Horizon Engineering
Work Order: 0111194
Project: 1685 Audit / OSM Audit Samples

QC SUMMARY REPORT

Method Blank

Sample ID: MB-3578	Batch ID: 3578	Test Code: EPA 6010B	Units: mg/Kg	Analysis Date: 12/3/01	Prep Date: 11/30/01
Client ID:	0111194	Run ID: ICP_011203A		SeqNo: 98967	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	1									

Sample ID: MB-3579	Batch ID: 3579	Test Code: EPA 6010B	Units: mg/L	Analysis Date: 12/4/01	Prep Date: 11/30/01
Client ID:	0111194	Run ID: ICP_011204B		SeqNo: 98951	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.005									

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT: Horizon Engineering
Work Order: 0111194
Project: 1685 Audit / OSM Audit Samples

QC SUMMARY REPORT
Laboratory Control Spike - generic

Sample ID: LCS-3578	Batch ID: 3578	Test Code: EPA 6010B	Units: mg/Kg	Analysis Date: 12/3/01	Prep Date: 11130101
Client ID:	0111194	Run ID: ICP_011203A		SeqNo: 98968	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	49.4	1	50	0	98.8%	80	120	0			

Sample ID: LCS-3579	Batch ID: 3579	Test Code: EPA 6010B	Units: mg/L	Analysis Date: 1214101	Prep Date: 11/30/01
Client ID	0111194	Run ID: ICP_011204B		SeqNo: 98952	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	.494	0.005	0.5	0	98.8%	80	120	0			

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

12/11/2001 09:57 FAX

Environmental Services Laboratory

Date: *07-Dec-01*

CLIENT: Horizon Engineering
Work Order: 0111194
Project: 1685 Audit / OSM Audit Samples

QC SUMMARY REPORT

Minerals ICV for ICP

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sample ID: ICVHI	Batch ID: 3578	Test Code: EPA 6010B	Units: mg/L		Analysis Date: 12/3/01			Prep Date: 11/30/01			
Client ID:	0111194	Run ID: ICP_011203A			SeqNo: 98966						
Lead	9.98	0.005	10	0	99.8%	90	110	0			
Sample ID: ICVLOW	Batch ID: 3578	Test Code: EPA 6010B	Units: mg/L		Analysis Date: 12/3/01			Prep Date: 11/30/01			
Client ID	0111194	Run ID: ICP_011203A			SeqNo: 98965						
Lead	.513	0.005	0.5	0	102.6%	90	110	0			
Sample ID: ICVHI	Batch ID: 3579	Test Code: EPA 6010B	Units: mg/L		Analysis Date: 12/4/01			Prep Date: 11/30/01			
Client ID	0111194	Run ID: ICP_011204B			SeqNo: 98950						
Lead	9.79	0.005	10	0	97.9%	90	110	0			
Sample ID: ICVLOW	Batch ID: 3579	Test Code: EPA 6010B	Units: mg/L		Analysis Date: 12/4/01			Prep Date: 11/30/01			
Client ID:	0111194	Run ID: ICP_011204B			SeqNo: 98949						
Lead	.504	0.005	0.5	0	100.8%	90	110	0			

Qualifiers: ND - Not Detected at the Reporting Limit; J - Analyte detected below quantitation limits; S - Spike Recovery outside accepted recovery limits; R - RPD outside accepted recovery limits; B - Analyte detected in the

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way
Portland, OR 97230
Ph. (503)255-5050
Fax (503)255-0505
horizone@teleport.com

CHAIN OF CUSTODY REPORT

Work Order # 01117

REPORT TO: Horizon Engineering
ATTENTION: Nichole Karl
ADDRESS: 13585 NE Whitaker Way
Portland, OR 97230
PHONE: 503-255-5050 FAX: 503-255-0505
PROJECT NAME: OSM Audit Samples
PROJECT NUMBER: 1685 Audit
SAMPLED BY: Mike Eisele

INVOICE TO: SAME
ATTENTION: Penny Rossman
ADDRESS: Same
P.O. NUMBER: QUOTE #:

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: [X] Standard 7 5 4 3 2 1 Same Day
Fuels & Hydrocarbon Analyses: 5 Standard 3-4 2 1 Same Day
OTHER Specify
* Turnaround Requests less than standard may incur Rush Charges

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	MATRIX (W, S, A, O)	# OF CONTAINERS	Lead	COMMENTS
1. AMH2-123 (AQ)	[redacted]			X	
2. AMM2-122 (AQ)				X	
3. FMH1-109 (filter)				X	
4. Fil-1590 (filter)				X	
5. Blank (filter)				X	
6.					
7.					
8.					
9.					
10.					

RELINQUISHED BY: Nichole Karl DATE:
PRINT NAME: Nichole Karl FIRM: H.E. TIME:
RECEIVED BY: S. MacLeod DATE: 11/21/0
PRINT NAME: S. MACLEOD FIRM: ESL TIME: 1300

RELINQUISHED BY: DATE:
PRINT NAME: FIRM: TIME:
RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS: Please analyses these same lead as OSM 1685 field samples. Please follow instructions provided & fill out reporting form also. Similar to previous ESL job # 0101063, please call if there are questions.

PAGE 01

12/11/2001 09:58 FAX 001

Dave Rossman

From: HERBERT.Jack@deq.state.or.us
Sent: Monday, December 17,2001 6:47 PM
To: info@horizonengineering.com; drossman@horizonengineering.com
Subject: Attn Michelle: Thank you for the info for the Or Steel audit samples. Audit passed.

The lab passed the audit according to the EPA's database response

Jack Herbert
Source Test Coordinator
Oregon Department of Environmental Quality, Northwest Region
(503)229-5579
(503)229-5265 fax
herbert.jack@deq.state.or.us

140

QA/QC Documentation

Introduction The QA procedures outlined in the U. S. Environmental Protection Agency (EPA) test methods are followed, including procedures, equipment specifications, calibrations, sample extraction and handling, calculations, and performance tolerances. Many of the checks performed have been cited in the Sampling section of the report text. The results of those checks are on the applicable field data sheets in the Appendix.

Continuous Analyzer Methods Field crews operate the continuous analyzers according to the test method requirements, and Horizon's additional specifications. On site quality control procedures include:

- calibrations with EPA Protocol 1 gases or NIST traceable gases
- pre-test zero and span checks and linearity test
- bias checks (introducing calibration gas as near to the probe tip as possible)
- calibration error (linearity) checks if any analyzer adjustments are made
- leak checks on the gas sampling system
- correction of problems that show up as the results of checks
- strip chart recordings for backup to the electronic data acquisition system

Manual Equipment **QC** Procedures On site quality control procedures include pre- and post-test leak checks on trains and pitot systems. If pre-test checks indicate problems, the system is fixed and rechecked before starting testing. If post-test leak checks are not acceptable, the test run is voided and the run is repeated. Thermocouples and readouts are verified in the field to read ambient prior to the start of any heating or cooling devices. Nozzles are checked for nicks or dents and are measured on three diameters twice each year.

Sample Handling Samples taken during testing are handled to prevent contamination from other runs and ambient conditions. Sample containers are glass, Teflon™, or polystyrene (filter petri dishes) and are pre-cleaned by the laboratory and in the Horizon Engineering shop. Sample levels are marked on containers and are verified by the laboratory. All particulate sample containers are kept upright and are delivered to the laboratory by Horizon personnel.

Data Processing Personnel performing data processing double-check that data entry and calculations are correct. Results include corrections for field blanks and analyzer drift. Any abnormal values are verified with testing personnel and the laboratory, if necessary.

After results are obtained, the data processing supervisor validates the data with the following actions:

- verify data entry
- check for variability within replicate runs
- account for variability that is not within performance goals (check the method, testing, and operation of the plant)
- verify field quality checks

Equipment Calibrations Periodic calibrations are performed on each piece of measurement equipment according to manufacturers' specifications and applicable test method requirements. The Oregon Department of Environmental Quality (ODEQ) Source Testina Calibration Requirements sheet is used as a guideline. Calibrations are performed using primary standard references and calibration curves where applicable.

Thermocouples Thermocouples are calibration checked against an NIST traceable thermocouple and indicator system every six months at three points. Thermocouple indicators and temperature controllers are checked using a NIST traceable signal generator. Readouts are checked over their usable range and are adjusted if necessary (which is very unusual).

Pitots Every six months, S-type pitots are checked for misalignment, angles, lengths, and proximity to thermocouples. They are then calibrated in a wind tunnel at four points against a standard pitot using inclined manometers. They are examined for dents or distortion before each test. Pitots are protected with covers during storage and handling until they are ready to be inserted in the sample ports.

Dry Gas Meters Dry gas meters used in the manual sampling trains are calibrated at five rates using a standard dry gas meter that is never taken into the field. The standard meter is calibration verified by the Northwest Natural Gas meter shop once every year. Dry gas meters are post-test calibrated with documentation provided in test reports.

High Volume Sampler Orifice The orifice for the High Volume sampler is calibrated annually against a positive displacement (Roots type) flow meter, two or more trials at six flow rates. The Roots meter came with a manufacturer's calibration curve and has been calibration checked by the Northwest Natural Gas meter shop.

Correspondence

Source Test Plan and Correspondence

TO: Debbie Silva

DEPT:

CO: OSM

FAX: 503-240-5775

HP FAX

FROM: Nichole Karl

DATE: 10/16/01

19

HORIZON ENGINEERING LLC

13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

FAXED 10/16/01

October 15, 2001

Mr. Jack Herbert
Oregon Department of Environmental Quality
2020 SW 4th, Suite #400
Portland, OR 97201-4987

Re: Source Testing: Oregon Steel Mills
14400 N Rivergate Boulevard
Portland, Oregon 97203

This correspondence is notice that Horizon Engineering is to do source testing for the above-referenced facility, scheduled for November 5 through 8, 2001. This will serve as the Source Test Plan unless changes are requested prior to the start of testing.

1. **Source(s) to be Tested:** ICA Baghouse (EAF) System and Reheat Furnace.

2. **Purpose of the Testing:** Compliance with Title V Permit No. 26-1865 conditions 37,38, and 39.

3. **Source Description:** 16-compartment baghouse controlling particulate emissions from the EAF.

4. **Pollutants to be Tested:** Particulate, CO, NO_x, SO_x, VOC, Lead and Opacity.

5. **Test Methods to be Used:** Testing will be conducted in accordance with EPA Methods in Title 40 Code of Federal Renulations Part 60 (40 CFR 60), Appendix A, July 1, 1999; and Oregon Department of Environmental Quality (ODEQ) methods in Source Sampling Manual Volume 1, January 1992.

Source: ICA Baghouse (EAF system)

Inlet tests:

Flow Rate:	EPA Methods 1 and 2 (at BH inlet, twice on test day)
CO, and O_2:	EPA Method 3A (NDIR and paramagnetic analyzers)
Moisture:	ODEQ Method 4 (wet bulb and dry bulb temperatures, inlet)
SO_2:	EPA Method 6C (non-dispersive ultraviolet analyzer)
NO_x:	EPA Method 7E (chemiluminescent analyzer)
CO:	EPA Method 10 (gas filter correlation analyzer)
VOC:	EPA Method 25A, (heated sample line and two analyzers, one with simultaneous VOC "cutter" for back-out of CH_4 content)

14

Outlet tests:

Flow Rate:	EPA Methods 1 and 2 (at each compartment, as done in past)
Particulate:	ODEQ Method 8 (High Volume sampler)
Lead:	Analysis of M-8 catch, with audit sample analysis (3 expected)
Opacity:	EPA Method 9 (six minutes per test)

Source: Reheat Furnace

Flow Rate:	EPA Methods 1 and 2 (traversing)
Flow Rate:	EPA Method 19 (gas fuel meter and O_2 in exhaust)
CO_2 and O_2:	EPA Method 3A (NDIR and paramagnetic analyzers)
Moisture:	EPA Method 4 (impinger train, traversing)
NO_X:	EPA Method 7E (chemiluminescent analyzer)
CO:	EPA Method 10 (gas filter correlation analyzer)
VOC:	EPA Method 25A, (heated sample line and two analyzers, one with simultaneous VOC "cutter" for back-out of CH_4 content)

6. **Continuous Analyzer Data Recording:** Data acquisition system (DAS) with strip chart records as backup. Either 10-second data points or one-minute averages of one-second readings are logged. Run averages, the graphic outputs from the DAS, annotated strip charts, and a few minutes of manually recorded data will be included in the test reports.

7. **Continuous Analyzer Gas Sampling:** Fixed point in the baghouse inlet. Reheat gas sampling probes will be traversed with the moisture probe.

8. **Quality Assurance /Quality Control (QA/QC)**: Documentation of the procedures and results will be presented in the source test report for review. This documentation will include at least the following:

   Continuous Analyzer QC Procedures: Field crews will operate the analyzers according to the manufacturer's specification, the test method's requirements, and Horizon's additional specifications. On-site quality control procedures include:
   - daily calibration (zero and span) and calibration error (linearity) checks
   - pre- and post-test zero bias and span bias checks
   - checks performed with EPA Protocol 1 or NIST traceable gases
   - data acquisition systems record 10-second data points or one-minute averages of one second readings
   - strip chart recordings
   - manual readings for a few minutes

   Manual Equioment QC Procedures: Operators will perform pre- and post-test leak checks on the sampling system and pitot lines. Thermocouple systems are checked for ambient temperature before heaters are started. Nozzles and pitots are inspected for nicks or dents before each test. Pre- and post-test calibrations on the meter boxes will be included with the report, along with semi-annual calibrations on the pitots, thermocouples, and nozzles. Blank reagents (water, acetone and filter) are submitted to the laboratory with

the samples. Liquid levels are marked on sample jars in the field and are verified by the laboratory.

Laboratory QC Procedures: EPA audit samples for lead will be analyzed with the field samples if they are provided by ODEQ prior to when samples are submitted to the laboratories. The laboratory will perform normal laboratory QC procedures. The laboratory will follow EPA Method 12 with special attention to sections 11.2.1: digestion of complete filter, 11.2.4 and 11.2.5: field blanks, one solvent and two filters, 11.4.1: sample concentrations brought into the linear analytical range, and 11.5: a single spike, method-of-standard-additions recovery check. Also the particulate filter tare weights will be weighed to a constant weight and the records submitted with the final report.

9. Number of Sampling Replicates and their Duration: Three test runs of at least two heats each are to be made on the baghouse. Three test runs of at least one hour each are to be made on the reheat furnace exhaust. In no case will sampling replicates be separated by twenty-four (24) or more hours unless prior authorization is granted by the Department.

10. Reporting Units for Results: Particulate – gr/dscf, lb/hr, and lb/ton cold charge. Gases – ppmv, lb/hr, and lb/ton cold charge.

11. Horizon Engrg. Contacts: David Rossman or
Michael Eisele
(503) 255-5050
Fax (503) 255-0505

12. Source Site Personnel: Debbie Deetz Silva
(503) 978-6044
Fax (503) 240-5775

13. Regulatory Contacts: Jack Herbert
(503) 229-5579
Fax (503) 229-5265

14. **Applicable Process/Production** Information: Process operating data and production information that characterizes the source operation is considered to be: Heat charge weights and materials, tap weights and materials, heat times. Process information is normally gathered by the Source-site personnel and provided to Horizon for inclusion in the report.

Reheat: Gas use - Time/wt. of slabs in

The sources must operate at normal maximum rates or other rates that may be specified in the Title V Permit. Rates not in agreement with those stipulated in the Permit can result in test rejection for application to determine compliance or emission factor verification. Imposed process limitations could also result from atypical rates.

15. Control Device Operating Parameters: Baghouse pressure drops.

16. Opacity Readings to be Taken By: Horizon Engineering

17. Certified Plume Evaluator: Yes (x) No ( ) N/A ( )

18. **Other Considerations,** including sampling site configurations, equipment limitations, special methods, etc.:

    Particulate: Each Oregon Method **8** test shall encompass two complete heat cycles with samples collected for **5** minutes from as many as possible of the 16 compartments. The next test shall begin in the next compartment after the final compartment sampled in the previous test. Particulate is to be sampled in the gas stream above the bags in the slot shaped area where gas flows up and toward the center of the baghouse. This allows the sampler nozzle to be inserted through ports in the ceiling of the breezeway at the top of the baghouse. As in the past, sampling will be isokinetic at a single point at the outlet of each compartment.

    Flow Rate Measurements: Velocities will be measured at five points through each port, giving 5 velocities per compartment, 80 points for the baghouse. Velocity pressure determinations will be by use of an S-type pitot and a micro-manometer. Past testing has shown that traversing this single port adequately characterizes the outlet flow rate.

    Gaseous Pollutant Measurements: Gas analyzer readings at the baghouse inlet will be continuous through all of the M-8 tests with calibrations only at the beginning and end of the test day. Instrument drift may exceed normal run allowances for the entire period. Instrument results will be corrected for drift.

    Timing: The testers will synchronize their watches to record times in sync with the OSM heat log in the arc furnace control pulpit.

19. **Administrative:** Unless notified prior to the start of testing, this test plan is considered approved for compliance testing of this source. A letter acknowledging receipt of this plan and agreement on the content (or changes as necessary) would be appreciated.

The Department will be notified of any changes in source test plans prior to testing. It is recognized that significant changes not acknowledged, which could affect accuracy and reliability of the results, could result in test report rejection.

Source test reports will be prepared by Horizon Engineering and will include all results and example calculations, field sampling and data reduction procedures, laboratory analysis reports, and QA/QC documentation. Source test reports will be submitted to you within **45** days of the completion of the field work, unless another deadline has been stipulated. Oregon Steel Mills will send two (2) copies of the completed Source Test Report to you at the address above.

Any questions or comments relating to this test plan should be directed to me.

Sincerely,

David Rossman

David R. Rossman, P. E.

cc: Debbie Deetz Silva, Oregon Steel Mills

TO: Debbie Silva

DEPT:

CO: OSM

FAX: 503-240-5775

HP FAX

FROM: Nichole Kar

DATE: 11/5/01

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone8teleport.com

November 5, 2001

Mr. Jack Herbert
Oregon Department of Environmental Quality
'Northwestern Region – Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987

Dear Mr. Herbert,

This correspondence is to notify you that the Source Testing for the Reheat Furnace at Oregon Steel Mills has been postponed due to technical difficulties. Testing on the Baghouse will be as scheduled with set-up on Tuesday, November 6 and testing on Wednesday, November 7th. Testing on the Reheat Furnace scheduled for November 8, will now take place on a date yet to be determined. ODEQ will be notified once the testing has been rescheduled. If you have any questions or concerns about these arrangements please feel free to call me. Thank you for your time.

Sincerely,

Nichole Karl

Nichole Karl,
Project Coordinator

cc: Debbie Dietz Silva, Oregon Steel Mills

143

Oregon
John A. Kitzhaber, M.D. Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

November 6, 2001

Oregon Steel Mills, Inc
Attn: Debbie Deetz Silva
PO Box 2760
Portland, Oregon 97208

11-09-01

Horizon Engineering
Attn: David R Rossman and C David Bagwell
13585 NE Whitaker Way
Portland, Oregon 97230

Re: AQ Multnomah County
Title V Permit No 26-1865
Oregon Steel Mills
Source-test plan for electric-arc and ladle-metallurgy furnaces' annual baghouse test for emission-factor verification and PM and SO_2 concentrations' compliance

Dear Ms Silva and Messrs Rossman and Bagwell:

On October 16, 2001, I received your test plan for Oregon Steel Mills' ICA baghouse's and reheat furnace's emissions. The baghouse test will measure particulate, lead, and visible emissions from the baghouse and carbon-monoxide (CO), nitrogen-oxide (NO_x), sulfur-dioxide (SO_2), and volatile-organic-compound (VOC) emissions in the baghouse inlet. You will calculate emission factors based on cold charges to the electric-arc furnace. You will test compliance of filterable-particulate and sulfur-dioxide concentrations. You plan to test on November 7, 2001.

Oregon Steel Mills' Title V Operating Permit Conditions require annual emissions tests:

37. Verify emission factors for filterable particulate matter, lead, carbon monoxide, nitrogen oxides, and volatile organic compounds.

38. Measure filterable particulate grain loading.

39. Measure sulfur-dioxide concentrations, at least during the permit's first two years.

I approve your test plan for the baghouse with these conditions:

1. Tell me the lead sample solutions' volumes for analysis. I will then order audit samples. Send only filter audit samples with field samples for particulate-analysis.

2. Use analyzer ranges and calibrations corresponding to expected measurements.

   Check most measurement levels with non-zero calibration gases. December 2000 results suggest about 50, 150, and 500 ppm CO, 5 to 10 and 20 to 50 ppm NO_x, 2 to

5 and 7 to 15 ppm SO_2, and 1 to 3,3 to 8, and 8 to 30 ppm propane.

3. Check non-VOC analyzers for interferences. Sections 6.2 in EPA Methods **3A** and 7E require doing so before first field use and whenever you change analyzers in ways that could affect interference responses. Follow Section 5.4 in Method 20. Document in all test reports.

4. Oregon Method 8 requires two blank filters.

5. The laboratory performing lead analyses should identify the digestion, analytical, and quality-control procedures that they follow and record the analytical sample volumes.

6. Have the laboratories read and perform the quality control in Section ***8*** in your plan.

7. In the future, send laboratory quality-assurance plans with test plans. See 40 **CFR** 63.7(c). List quality-control procedures and their frequency.

8. Oregon Steel Mills is to document any significant furnace production delays.

9. Oregon Steel Mills is to send me one (1) test report within seventy-five (75) days after testing.

Please call me at 503-229-5579 if you have questions or change the test schedule or plan. My fax number is 229-5265. Herbert.jack@deq.state.or.us is my email address.

Sincerely,

Jack Herbert
Source Testing Coordinator

JHH

c: Greg Grunow:NWR

1/2 - Greg
Jack

3.2

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

Project No. 1536

SOURCE EVALUATION REPORT

Oregon Steel Mills
Portland, Oregon

Electric Arc Furnace Baghouse
Total Suspended Particulate (TSP), CO, NO_x, SO_2, VOC, Lead and Opacity

December 27,2000

Prepared for
Oregon Steel Mills
14400 N. Rivergate Blvd.
Portland, Oregon 97203

by Michele R. Kinney &
David R. Rossman, P.E.

REGISTERED PROFESSIONAL ENGINEER
8913
David R. Rossman
OREGON
2/12/01
July 30, 1976
DAVID R. ROSSMAN

Expires 12/31/02

TABLE OF CONTENTS

	Paae Number
1. Certification	4
2. Introduction	5
3. Summary of Results	6
4. Source Description and Operation	9
5. Sampling and Analytical Procedures	11
6. Discussion	14

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

FEB 15 2001

NORTHWEST REGION

APPENDIX

	Page Number
Nomenclature & Drift Correction Documentation	**15**
Particulate and Lead Calculation Sheets	**17**
Emission Calculation Worksheets	
Field Data Sheets	
Blank Correction and Filter Rinse Allocation	
Laboratory Results and Worksheets	
Baghouse Sampling Diagram	
Volume Flow Rate Determination	**46**
Flow Rate Determinations and Field Data	
Traverse Point Location – Inlet & Outlet	
Visible Emission Data	**59**
Gaseous Emissions	**60**
Gaseous Emissions	
Molecular Weight Determinations	
Analyzer Calibration Data and Bias Checks	
Data Logger Gas Charts	
Strip Charts	
Production/Process Data	**72**
Furnace Heat Logs	
Baghouse Pressure Drop Field Data	
Calibration Information	**80**
High-Volume Sampler Calibrations	
Pitots	
Thermocouples and Indicators	
Shortridge Micro manometer	
Magnehelic	
Barometer	
Filter Tare Weights	
NOx Converter Efficiency Test	
Calibration Gas Certificates	
Audit Sample Results, reporting forms and instructions	
QA/QC Documentation	**111**
Correspondence	**114**
Source Test Plan and Correspondence	
Permit (Selected Pages)	

1. CERTIFICATIONS

1.1 Test Team Leader

I hereby certify that the test detailed in this report, to the best of my knowledge, was accomplished in conformance with applicable rules and good practices. The results submitted herein are accurate and true to the best of my knowledge.

Name: C. David Bagwell

Signature C. David Bagwell Date 2/5/01

1.2 Report Reviewer

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with applicable rules and good practices, to the best of my knowledge.

Name: David R. Rossman, P.E.

Signature David Rossman Date 2/12/01

2. INTRODUCTION

2.1 Client: Oregon Steel Mills

2.2 Physical Location: 14400 N. Rivergate Blvd., Portland, OR 97208

2.3 Mailing Location: P. O. Box 2760, Portland, OR 97208

2.4 Test Log

Test Date	Source Name	Pollutants
December 27, 2000	Electric Arc Furnace Baghouse	Particulate, CO, NO_x, SO_x, VOC, Lead and Opacity

2.5 Test Purpose: Emission factor verification as required by Title V Permit No. 26-1865 issued by the Oregon Department of Environmental Quality (ODEQ).

2.6 Background Information: None.

2.7 Participants

Horizon Personnel:

C. David Bagwell, Team Leader
Brian T. Fallon, Field Technician
Michael J. Eisele, Field Technician
Tim J. Hertel, Field Technician
Michael E. Wallace, QA/QC Officer
David R. Rossman, P.E., Report Review
Michele R. Kinney, Technical Writer

Test Arranged by: Debbie Deetz Silva, Oregon Steel Mills
Test Plan Sent to: Jack Herbert, ODEQ.

3. SUMMARY OF RESULTS

3.1 Table(s) of Results

Table 1

Particulate and Lead Test Results

Test Date: December 27,2000

	Units	Run 1	Run 2	Run 3	Average
Start Time		11:39	13:18	14:55	
End Time		13:16	14:52	16:29	
Sampling Time	min	80	82	80	81
Sampling Results					
Particulate Conc.(Actual)	grlscfd	0.00038	0.00054	0.00031	0.00041
Particulate Rate	lb/hr	1.5	2.0	1.2	1.6
Based on Cold Charge	lblton	0.0093	0.0161	0.0089	0.0114
Sample Volume	dscf	2,276	2,082	2,247	2,202
Sample Weight, Total	mg	55.3	73.4	44.5	57.8
Percent Isokinetic	%	98	99	99	99
Lead Rate	lb/hr	0.026	0.046	0.024	0.032
Based on Cold Charge	lblton	0.00015	0.00037	0.00017	0.00023
% of Total Particulate	%	1.67	2.33	1.91	1.97
Opacity	%	0	0	0	0
Source Parameters					
Inlet Flow Rate	dscf/min				410,000
Outlet Flow Rate	dscflmin	477,000	426,000	473,000	459,000
Inlet Velocity	ft/min				5,650
Outlet Velocity	ft/min	656	599	668	641
Temperature, Outlet	°F	160	171	180	170
Process Data					
Cold Charge Production	tonslhr	166	124	139	141
Baghouse Press. Drop, Avg.	in H_2O	5.2	5.1	5.5	5.3

Table 2

Gaseous Emissions Test Results

Test Date: December 27,2000

		Units	Run 1	Run 2	Run 3	Average
Start Time			11:39	13:18	14:55	
End Time			13:16	14:52	16:29	
Sampling Time		min	80	82	80	81
Sampling Results						
O_2		%	20.5	20.4	20.4	20.4
CO_2		%	0.4	0.5	0.5	0.5
CO	Concentration	ppmv	126	76	97	100
	Rate	lb/hr	225	136	174	178
	Based on Cold Charge	lb/ton	1.36	1.09	1.25	1.23
NO_x	Concentration	ppmv	8	9	11	9
	Rate	lb/hr	22.3	25.0	33.0	26.8
	Based on Cold Charge	lb/ton	0.14	0.20	0.24	0.19
SO_2	Concentration	ppmv	4	3	3	3
	Rate	lb/hr	16.8	11.1	11.4	13.1
	Based on Cold Charge	lb/ton	0.10	0.09	0.08	0.09
TGOC	Concentration	ppmv	16	10	8	11
	Rate	lb/hr	12.4	7.8	5.8	8.7
	Based on Cold Charge	lb/ton	0.08	0.06	0.04	0.06
TGNMOC	Concentration	ppmv				27'
	Rate	lb/hr				1.7'
	Based on Cold Charge	lb/ton				0.01[1]

3.2 Description of Collected Samples:

See Blank Correction and Rinse Allocation in Appendix.

[1] Total Gaseous Non-Methane Organic Compounds (TGNMOC) numbers were figured using the VOC Methane component of 80.2% from the October 20, 1998 testing.

3.3 Discussion of Errors and Quality Assurance Procedures

This table is taken from a paper entitled "Significance of Errors in Stack Sampling Measurements", by R.T. Shigahara, W.F. Todd and W.S. Smith. It summarizes the maximum error expressed in percent, which may be introduced into the Method 5 particulate test procedures by equipment or instrument limitations.

Measurement	% Max Error
Stack Temperature Ts	1.4
Meter Temperature Tm	1.0
Stack Gauge Pressure Ps	0.42
Meter Gauge Pressure Pm	0.42
Atmospheric Pressure Patm	0.21
Dry Molecular Weight Md	0.42
Moisture Content Bws (Absolute)	1.1
Differential Pressure Head AP	10.0
Orifice Pressure Differential AH	5.0
Pitot Tube Coefficient Cp	2.4
Orifice Meter Coefficient Km	1.5
Diameter of Probe Nozzle Dn	0.80

QA procedures outlined in the test methods are followed, including procedures, equipment specifications, calibrations, sample recovery and handling, calculations and performance tolerances. Many of the checks performed have been noted on the Field Data Sheets.

Three audit samples (two liquid samples and one filter sample), prepared by EPA in accordance with Method 12 and provided to Jack Herbert of ODEQ, were submitted to the particulate analysis laboratory (Antech) along with the filter and acetone samples collected during the source test. The particulate analysis laboratory is responsible for drying and weighing of the samples prior to Environmental Services Laboratory (ESL) performing the lead analysis. Following the instructions from ODEQ, the two sealed liquid audit samples were also opened and dried along with the source test and audit filter samples. It should be noted that EPA

instructions with the audit samples do not specify any drying of the audit samples prior to analysis.

From the particulate analysis laboratory, the samples were submitted to ESL for lead analysis. It is Horizon's understanding that ESL re-dissolved the samples with nitric acid and analyzed for lead content consistent with EPA lead analysis methods.
On January 25, 2001, Horizon Engineering notified Jack Herbert via e-mail of the audit sample lab results. Horizon has been not informed of the actual EPA audit sample values. According to Mr. Herbert, two of the three audit samples (the spiked filter and one of the liquid samples) were acceptable and within the Method 29 allowed range of plus or minus 25%. The remaining liquid audit sample was outside that range.

The audit sample lab results are in the Calibration Information section of the Appendix.

4. SOURCE DESCRIPTION AND OPERATION

4.1 Process and Control Device Description and Operation:

The EAF baghouse at Oregon Steel Mills cleans particulate from two significant sources in the melt shop. The main furnace, No. 3, normally produces between 100 and 115 tons of steel per heat from two charges of scrap metal, plus some molten "pour back" material left over from casting. Records for each heat during the testing times are in the Production-Process Data Section of the Appendix.

The main furnace dust control system is a "fourth hole" duct connection to the top of the furnace, and a series of three openings in the roof above the main furnace that can open into the duct to the baghouse. Each of these pick-up points has a damper that is controlled automatically by certain furnace operations. Generally, the roof vents are open for several minutes following charging of the furnace.

The ladle metallurgy furnace is between the main furnace and the casting area and is used to fine-tune the content and temperature of the molten steel before being cast. Charging is only of molten steel and alloying material and is the minor contributor to the baghouse system. The exhaust from this furnace enters the duct system downstream from the main furnace and roof vents.

All of the pick-up points are evacuated into an 11 foot-diameter duct by two 1250-Hp fans. The fans have automatically controlled dampers on the inlets.

Particulate control is by a 16-compartment, (21 ft. by **14** ft. each) Industrial Clean Air, reverse-air type, baghouse with seamless tube polyester bags. Magnehelic gauges on each of the compartments showed pressure drops averaging 5.3 inches of water.

4.2 Test Ports:

Ports and traverse points are described and diagrammed on the Field Data sheets.

4.3 Test Duct Characteristics:

Cyclonic Flow: No Cyclonic flow expected.
Meets EPA M-1 Criteria: No.

4.4 Process & Control Equipment Flow Diagram: See Process-Sampling Equipment Flow Diagram in Appendix

4.5 Operating Parameters: See Production/Process Data section of Appendix

4.6 Process Startups/Shutdowns or Other Operational Changes During Tests: The process was continuous during testing.

5. SAMPLING AND ANALYTICAL PROCEDURES

5.1 Sampling Procedures

5.1.1 Sampling and Analytical Methods

Flow Rate:	EPA Methods 1 and 2 (S-type pitot flow traverses)
CO_2 and O_2:	EPA Method 3A (NDIR and paramagnetic analyzers)
Moisture:	ODEQ Method 4 (psychrometry – wet bulb / dry bulb)
Particulate:	ODEQ Method 8 (High Volume sampler)
Lead:	Analysis of the filters and sampler residue for lead. Residue allocated to the runs according to Method 8 procedure 11.2.1. Analysis by EPA 6010 (ICP).
SO_2:	EPA Method 6C (non-dispersive ultraviolet analyzer)
NO_x:	EPA Method 7E (chemiluminescent analyzer)
CO:	EPA Method 10 (gas filter correlation analyzer)
VOC as total	gaseous organic compounds (TGOC) by EPA Method 25A, (heated flame ionization analyzer and sample line)
Opacity:	EPA Method 9 (six minutes per run)

5.1.2 Sample Analysis

Analyte	Laboratory
Particulate and Audit Sample-volume determination	Antech
Lead and Audit Samples	Environmental Services Laboratory

5.2 Sampling Train Diagrams

Figure 1

EPA Methods 3A, 6C, 7E & 10 Analyzer Sample System Diagram

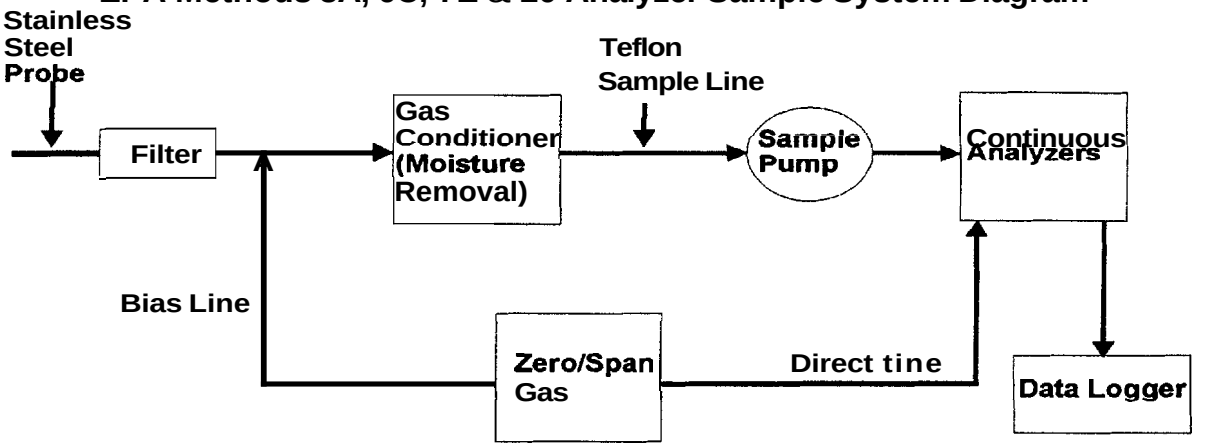
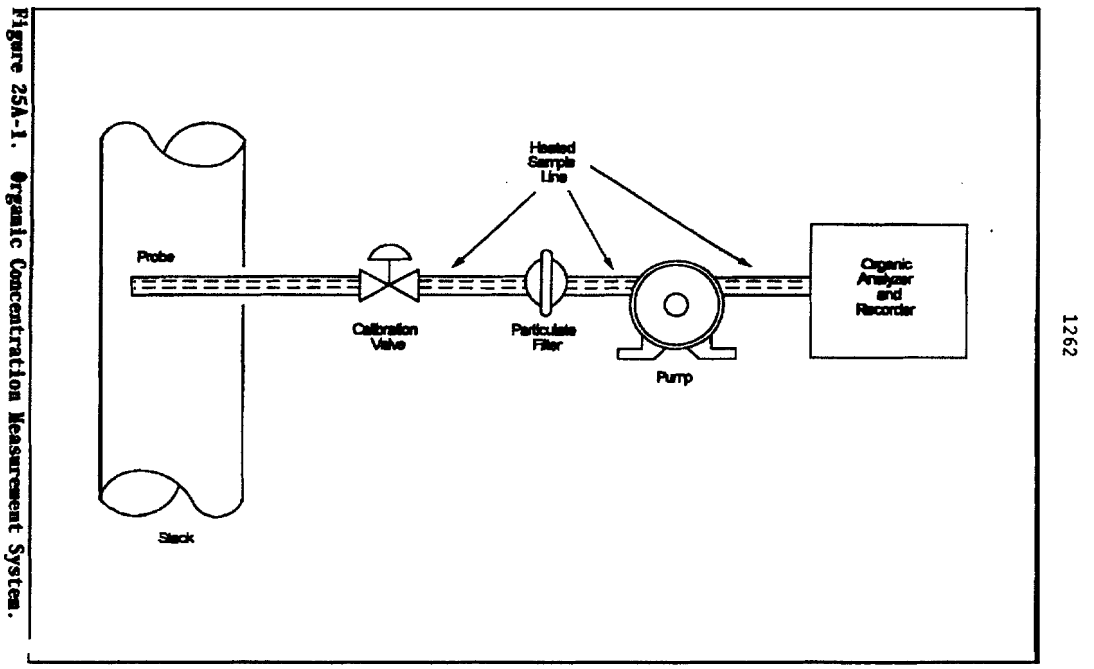


Figure 2

EPA Method 25A VOC Analyzer Sample System Diagram



5.3 Horizon Test Equipment

5.3.1 Manual Methods

Equipment Name	Equipment ifi
Hi Volume Orifice	Horizon No. 1192
Manometer	Shortridge Manometers No. 1 & 2
Pitots and Thermocouples	1-S, 14-S1
Magnehelic Gauge	0-1F (orifice AH)
Barometer	Test Van III

5.3.2 Continuous Analyzers and Methods)

Gas	Brand	Model	Range	Measurement Method	Method
O_2	Servomex	1400	0-25%	Paramagnetic	3A
CO_2	Servomex	1400	0-25%	Chopperless NDIR	3A
CO	Therrno Env	48	0-1000 pprn	Gas Filter Correlation	10
TGOC	J.U.M.	VE-7	0-100 ppm	Flame Ionization	25A
NO_x	Thermo Env	42C	0-250 pprn	Chemiluminescent	7E
SO,	West. Resch	721M	0-30 ppm	Non Disp. Ultra-violet	6C

5.3.3 Continuous Emissions Monitors Sampling Setup

Sampling:	Above listed gases except TGOC
Probe:	Stainless Steel with sintered stainless and polyester filters
Sample Line(s):	Teflon (heated)
Conditioning:	Refrigerated M & C Cooler
Data Logger:	Keithley

Sampling:	TGOC.
Probe:	Stainless
Conditioning:-	none
Sample Line(s):	Teflon (heated)
Pump:	heated, internal to analyzer
Data Logger:	Keithley

6. DISCUSSION

The results of the testing should be valid in all respects. All quality assurance checks including leak checks, instrument checks and calibrations, were within method-allowable tolerances.

As mentioned in Section 3.3, two of the three EPA audit samples were acceptable and with-in the Method 29 allowed range of plus or minus 25%. The third audit sample that was not in the acceptable range, was rechecked by the laboratory for all dilution and QA procedures. Prior to Environmental Services Laboratory receiving the audit samples, per Jack Herbert of ODEQ's request, the two liquid audit samples were evaporated to dryness along with the particulate samples. Antech reported the audit-solution volume upon submitting the samples to ESL for lead analysis.

The VOC values reported in this work are total gaseous organic compounds (TGOC) and include methane, which is not a VOC, in the value. It is likely that a high fraction of the total is methane because it is used for heat in the furnace.

APPENDIX

NOMENCLATURE & DRIFT CORRECTION DOCUMENTATION

Nomenclature

Constants	Value	Units	Definition	Ref
	29 92126	inHg	Standard Pressure	CRC
Pstd(2)	2116.22	lbf / ft²		CRC
Tstd	527 67	°R	Standard Temperature	CRC
R	1545.33	ft lbf / lbmol °R	Ideal Gas Constant	CRC
MWatm	28.965	lbm I lbmole	Atmospheric (20.946 %O2, 0.033% CO2, Balance N2+Ar)	
MWc	12.011	lbm I lbmole	Carbon	CRC
MWco	28.010	lbm / lbmole	Carbon Monoxide	CRC
MWco2	44.010	lbm I lbmole	Carbon Dioxide	CRC
MWh2o	18.015	lbm / lbmole	Water	CRC
MWno2	46.006	lbm I lbmole	Nitrogen Dioxide	CRC
MWo2	31.999	lbm I lbmole	Oxygen	CRC
MWso2	64.063	lbm I lbmole	Sulfur Dioxide	CRC
MWn2+ar	28.154	lbm / lbmole (Balance with 98.82% N2 & 1.18% Ar)	Emission balance	
C1	385.3211	ft³ I lbmol	Ideal Gar Constant @ Standard Conditions	
C2	816.5455	inHg in²/ °R ft²	Isokentics units correction constant	
Kp	5129.4	ft / min [(inHg lbm/mole) / (°R inH2O)]^½	Pitot lube constant	Ref 2.5.1

Symbol	Units	Definition	Calculating Equation or Source of Data	EPA
As	in²	Area. Stack		
An	in²	Area, Nozzle		
Bws	%	Moisture. % Stack gas	[100 Vw(std) / [Vw(std)+Vm(std)]]	Eq. 5-3
C	ppmv-C	Carbon (General Reporting Basis for Organics)		
C1	ft3/lbmol	Gar Constant @ Standard Conditions	[R Tstd / Pstd(2)]	
C2	inHg in²/ °R ft²		[14,400 Pstd / Tstd]	
Cd	lbm-GAS I MMdscf	Mass of gas per unit volume	[Cgas MWgas / C1]	
cg	grldrf	Grain Loading, Actual	[15.432 mn ■ Vm(std) 1,000]	Eq. 5-6
cg @ X%CO2	gr/dscf	Grain Loading Corrected to X% Carbon Dioxide	[X% / CO2%]	
cg @ X%O2	gr/dscf	Grain Loading Corrected to X% Oxygen	[(20.946-X) / (20.946-O2)]	
Cgas	ppmv. %	Gar Concentration, (Corrected)		
Cgas @ X%CO2	ppmv	Gas Concentration Correction to X% Carbon Dioxide	[X% / CO2%]	
Cgas @ X%O2	ppmv	Gas Concentration Correction to X% Oxygen	[(20.946-X%) / (20.946-O2%)]	
CO	ppmv	Carbon Monoxide		
Co	ft	Outs Circumference of Circular Stack		
Ci	ft	Inner Circumference of Circular Stack		
C02	%	Carbon Dioxide		
Cp		Pitot tube coefficient		
Ct	lb/hr	Particulate Mass Emissions	[60 cg Qsd/ 7,000]	
dH	in H2O	Pressure differential across orifice		
Dn	in	Diameter, Nozzle		
dp^½		Average square root of velocity pressure		
Ds	in	Diameter, Stack		
E	lb / MMBtu	Pollutant Emission Rate	Cgas Fd MWgas (20.946 / (20.946-O2)) / (1,000,000 C1)	
Fd	dscf / MMBtu	F Factor for Various Fuels		Table 19-1
I	%	Percent Isokinetic	[C2 Ts(abs) Vm(std) / (vs Ps mfg An Ø)]	Eq. 5-8*
Md	lbm / lbmole	Molecular weight, Dry Stack Gas	[(1-%O2-%CO2)(MWn2+ar)+(%O2 MWo2)+(%CO2 MWco2)]	Eq. 3-1*
mfg		Mole fraction of dry stack gas	[1-Bws/100]	
Mgas	lbm/hr	Gaseous Mass Emisisons	[60 Cgas(ppmv) MW Pstd(2) Qsd / 1,000,000 R Tstd]	
mn	mg	Particulate lab sample weight		
Ms	lbm / lbmole	Molecular weight, Wet Stack	[Md mfg +MWh2o (1-mfg)]	Eq. 2-5
MW	lbm 1lbmole	Molecular Weight		
NO2	ppmv-NO2	Nitrogen Dioxide (General Reporting Basis for NOx)		
NOx	ppmv-NO2	Niuogm Oxides (Reported ⊔ NO2)		
0 2	%	Oxygen		
OPC	%	Opacity		
Pbar	in Hg	Pressure, Barometric		
Pg	in H2 0	Pressure, Static Stack		
Po	in Hg	Pressure. Absolute across Orifice	[Pbar + dH / 13.5951]	
Ps	in Hg	Pressure, Absolute Stack	[Pbar + Pg / 13.5951]	Eq. 2-6*
Qa	acf/min	Volumetric Flowrate, Actual	[As vs / 144]	
Qsd	dscf/min	Volumetric Flowrate, Dry Standard	[Qa Tstd mfg Ps] / [Pstd(1) Ts(abs)]	Eq 2-10,
Rf	MMBtu/hr		1,000,000 Mgas (20.946-O2)] / [Cd Fd 20.946]	
SO2	ppmv-SO2	Sulfur Dioxide		
t	in	Wall thickness of a stack or duct		
TGOC	ppmv-C	Total Gaseous Organic Concentration (Reported ⊔ C)		
Tm	°F	Temperature. Dry gas meter		
Tm(abs)	°R	Temperature, Absolute Dry Meter	[Tm + 459 67]	
Ts	°F	Temperature, Stack gas		
Ts(abs)	°R	Temperature, Absolute Stack gas	[T ■ + 459.67]	
Vlc	ml	Volume of condensed water		
Vm	dcf	Volume. Gas sample		
Vm(std)	dscf	Volume. Dry standard gar sample	[Y Vm Tnd Po]/ [Pstd(1) Tm(abs)]	Eq. 5-1
vs	fpm	Velocity, Stack gas	Kp Cp dpⁿH[Ts(abs) / (Pa M■]^ H	Eq. 2-9*
Vw(std)	scf	Volume. Water Vapor	0 04707 Vlc	Eq. 5-2
Y		Dry gas meter calibration factor		Fig. 5 6
O	mtn	Time, Total sample		

* Based on equation

HORIZON ENGINEERING
13585 N.E. Whitoker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@ieleport.com

DRIFT CORRECTION DOCUMENTATION

EPA Drift Equations:

- Method 3A: Oxygen and Carbon Dioxide

$$C_{gas} = \frac{(C_{ma} - C_{oa})(C - C_m) + C_{ma}}{(C_m - C_o)} \qquad \text{(Eq. 3A-1)}$$

- Method 6C: Sulfur Dioxide

$$C_{gas} = \frac{C_{ma}(C - C_o)}{(C_m - C_o)} \qquad \text{where } C_{oa} = 0 \qquad \text{(Eq. 6C-1)}$$

- Method 7E: Nitrogen Oxides, Section 8 of Method 7E states: "Follow Section 8 of Method 6C (Eq. 6C-I)"
- Method 10: Carbon Monoxide, the EPA does not currently address Gas Filter Correlation instruments, therefore there are no current standards.
- Method 25A: Total Gaseous Organic Concentration (TGOC), this method does not mention correcting for drift although there are established limits.

Horizon Engineering Drift Correction Eauations:

$$C_{gas} = \frac{(C_{id} - Z_x)(C_{ma} - C_{oa})}{(S_x - Z_x)} \qquad S_x = \frac{C_{mf} - C_{mi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} + C_{mi}$$

$$Z_x = \frac{(C_{of} - C_{oi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} - + C_{oi} \qquad T_x = \frac{(T_{te} - T_{ts})}{2} + T_{ts}$$

EPA	Definition	Horizon
C_{gas}	Effluent gas concentration, dry basis	C_{gas}
C_{ma}	Actual upscale calibration gas concentration	C_{ma}
C_{oa}	Actual zero/low calibration gas concentration	C_{oa}
C_m	Average of initial and final system upscale calibration bias responses	
	Initial system upscale calibration bias response	C_{mi}
	Final system upscale calibration bias response	C_{mf}
C_o	Average of initial and final system zero/low calibration bias responses	
	lnitial system zero/low calibration bias response	C_{oi}
	Final system zero/low calibration bias response	C_{of}
Ç	Average gas concentration indicated by gas analyzer, dry basis	C_{id}
	Starting test time	T_{ts}
	Ending test time	T_{te}
	Initial system bias calibration response time	T_{ci}
	Final system bias calibration response time	T_{cf}
	Mid-point of test time or gas sampling interval to be analyzed	T_x
	Approximate upscale response at mid-point test time	S_x
	Approximate zero/low response at mid-point test time	Z_x

Notes or exceptions:
TGOC is first recorded on a wet basis. then corrected to a dry basis
The TGOC instruments used by Horizon have some historic data on instrument response to different hydrocarbons. For propane the response is l to l molecule while methane is 1.037 to 1 molecule. We correct for the instrument's "over response" to methane.

PARTICULATE AND LEAD CALCULATION SHEETS

Emission Calculation Worksheets
Field Data Sheets
Blank Correction and Filter Rinse Allocation
Laboratory Results and Worksheets
Baghouse Sampling Diagram

Plant	Oregon Steel Mills							File	osm1536	
Source	ICA Baghouse-EAF							Tester	MJE/BTF/TJH/CDB	
Date	27-Dec-2000							Analysis/QA	MJE/MEW	
Run#	1	Wt(mg)	[illegible]	Stack Area	As=	[illegible] sqft	Mol Wt. Dry	Md=	29.60	molwt
Points		Lead (mg)	0.923	Stack Temp.	Tdb=	155 °F	Mol Wt. Wet	Ms=	28.68	molwt
				Stack Temp.	Twb=	93 °F	Barometeric	Pb=	30.49	in H2O
Hivol ID	SN#	1192		Moisture	bws=	2.88 %	Static Pres.	Pstat=	0.03	in H2O
Orifice	A=	47.9956		Node Dia.	Dn=	3.109 in	Stack Pres.	Ps=	29.60	in Hg
Constants	B=	0.4623		Nozzle Area	An=	7.59 sqin	Pitot	Cp=	0.7802	

	TIME	Compartment POINT #	pt	Velocity Pressure dP inH2O	Velocity vs fpm	Orifice in H2O dHo Calc	Pressure in H2O dHo Act	Temp (F) Orifice Tor	Temp (F) Stack Tso	Time min t	Rate cfm Standard Q@68°F	Volume cuft Standard @68°F	Volume cuft Orifice @Tor
0	11:39												
0	11:44	1	3	0.0462	722.9	0.4849	0.4700	96.0	140.0	5.0	33.05	165.3	174.0
1	11:50	2	3	0.0374	649.3	0.3956	0.3900	108.0	138.0	5.0	30.02	150.1	161.5
1	11:56	3	3	0.0361	652.2	0.3636	0.3700	109.0	165.0	5.0	29.28	146.4	157.8
1	12:02	4	3	0.0436	719.6	0.4561	0.4300	127.0	170.0	5.0	30.94	154.7	172.0
1	12:08	5	3	0.0489	757.2	0.5209	0.5000	124.0	162.0	5.0	33.25	166.2	183.9
0	12:13	6	3	0.0325	622.3	0.3269	0.3200	120.0	172.0	5.0	27.14	135.7	149.1
2	12:20	7	3	0.0430	709.0	0.4627	0.4400	134.0	160.0	5.0	31.10	155.5	174.9
1	12:26	8	3	0.0133	392.7	0.1285	0.1200	122.0	155.0	5.0	17.22	86.1	94.9
1	12:32	9	3	0.0397	686.1	0.3953	0.3900	102.0	169.0	5.0	30.17	150.9	160.6
0	12:37	10	3	0.0452	735.0	0.4542	0.4500	106.0	174.0	5.0	32.13	160.7	172.2
2	12:44	11	3	0.0269	554.4	0.2750	0.2600	112.0	146.0	5.0	24.81	124.1	134.4
0	12:49	13	3	0.0382	666.1	0.3947	0.3600	112.0	156.0	5.0	28.84	144.2	156.2
2	12:56	14	3	0.0395	680.6	0.4022	0.3800	108.0	162.0	5.0	29.67	148.3	159.6
1	13:02	15	3	0.0336	624.7	0.3412	0.4000	108.0	156.0	5.0	30.38	151.9	163.4
3	13:10	16	3	0.0257	547.6	0.2576	0.3300	116.0	159.0	5.0	27.61	138.1	150.6
1	13:16	1	3	0.0499	769.2	0.5188	0.2500	116.0	169.0	5.0	24.29	121.4	132.5
Time weighting used in averaging. =>					655.6	0.3861	0.3663	113.8	159.6	80.00	28.74	2,299.5	2,497.6

					Run#	1	2	3	Average
Sample Volume	V@68 (Pb/29.92)(1-bws/100)	dscf	Vd	2,275.8	2,082.0	2,246.7	2201.5
Total Flowrate	Oultet Flow	dscf/min	Qsd	476,850	426,494	472,546	458,630
Particulate							
Grain loading	0.01543 Wt/Vd	gr/dscf	Cg	0.00038	0.00054	0.00031	0.00041
		ug/m3		859	1245	700	935
Emissions	0.00857 Cg Qs	lbm/hr	Ct	1.5335	1.9897	1.2384	1.5872
		lbm/ton		0.0093	0.0161	0.0089	0.0114
LEAD							
Grain loading	0.01543 Lead/Vd	gr/dscf	Cg	0.0000063	0.0000127	0.0000058	0.0000083
		ug/m3		14.3	29.0	13.3	18.9
Emissions	0.00857 Cg Qs	lbm/hr	Ct	0.0256	0.0464	0.0236	0.0319
		lbm/ton		0.00015	0.00037	0.00017	0.00023
Avg Sample Rate	V@Tor / t	acf/min	Qan	31.22	28.81	31.75	30.59
Avg Velocity @ Sample Point	vs=Qa/As	fpm	vs	655.56	598.73	667.51	640.60
Avg Orifice temp		°R	Tor	573.42	584.72	580.67	579.60
Avg Stack temp		°R	Ts	619.23	631.04	639.61	629.96
Avg Nozzle Velocity	Qan*Ts / An*Tor	fpm	vn	639.51	589.77	663.40	630.89
% ISOKINETIC	100 vn/vs		%I	97.6	98.5	99.4	98.5
Percent Lead of Total Particulate			%	1.67	2.33	1.91	1.97
Opacity -	cdb #979		%	0.0	0.0	0.0	0.0

*The baghouse bas 16 compartments. One is always cycling.

* Each Compartment is 52"x179".

Particulate and Lead Emissons

Plant	Oregon Steel Mills								File	osm1536	
Source	ICA Baghouse-EAF								Tester	MJL/BTE/TJH/CDB	
Date	27-Dec-2000										
Run#		Wt(mg)	23.442	Stack Area	As=	969.6	sqft	Mol Wt. Dry	Md=	29.01	molwt
Points	10	Lead(mg)	1.713	Stack Temp.	Tdb=	164	°F	Mol Wt. Wet	Ms=	34.55	molwt
				Stack Temp.	Twb=	101	°F	Barometeric	Pb=	30.49	in H20
Hivol ID	SN#	1192		Moisture	bws=	4.25	%	Static Pres.	Pstat=	0.00	in H20
Orifice	A=	47.9056		Nozzle Dia.	Dn=	3.169	in	Stack Pres.	Ps=	30.49	in Hg
Constants	B=	0.4623		Nozzle Area	An=	7.59	sqin	Pitot	Cp=	0.7802	

TIME	Compartment POINT #	pt	Velocity Pressure dP inH2O	Correct fpm Vs	Orifice in H2O dHo Calc	Pressure in H2O dHo Act	Temp (F) Orifice Tor	Temp (F) Stack Ts	Time min t	Rate cfm Standard Q@68°F	Volume cuft Standard @68°F	Volume cuft Orifice @Tor
13:18												
13:23	2	3	0.0497	760.61	0.5029	0.4900	120.0	173.0	5.0	33.05	165.2	181.5
13:29	3	3	0.0411	685.64	0.4043	0.4000	102.0	162.0	5.0	30.53	152.6	162.5
13:35	4	3	0.0404	683.59	0.4061	0.4000	122.0	169.0	5.0	30.04	150.2	165.6
13:40	5	3	0.0348	630.90	0.3558	0.3400	132.0	162.0	5.0	27.65	138.2	155.0
13:46	6	3	0.0322	612.71	0.3183	0.3100	128.0	174.0	5.0	26.57	132.9	148.0
13:52	7	3	0.0438	713.47	0.4500	0.4300	134.0	172.0	5.0	30.77	153.8	173.1
13:57	8	3	0.0264	553.03	0.2594	0.2500	130.0	170.0	5.0	24.02	120.1	134.2
14:03	9	3	0.0377	663.50	0.3742	0.3700	124.0	175.0	5.0	28.93	144.6	160.0
14:09	10	3	0.0320	616.08	0.3103	0.3100	128.0	185.0	5.0	26.57	132.9	148.0
14:15	11	3	0.0254	548.03	0.2384	0.2300	118.0	183.0	5.0	23.33	116.7	127.7
14:21	13	3	0.0344	639.76	0.3287	0.3300	118.0	187.0	5.0	27.57	137.8	150.9
14:27	14	3	0.0125	375.68	0.1172	0.1100	122.0	154.0	5.0	16.54	82.7	91.2
14:33	15	3	0.0111	355.74	0.1044	0.1000	136.0	160.0	5.0	15.65	78.3	88.3
14:38	15	3	0.0111	355.74	0.1034	0.1000	130.0	160.0	5.0	15.73	78.6	87.9
14:44	16	3	0.0281	570.11	0.2780	0.2700	130.0	169.0	5.0	24.89	124.4	139.1
14:50	1	3	0.0497	766.59	0.5012	0.4800	128.0	183.0	5.0	32.52	162.6	181.1
14:52	2	3	0.0440	720.17	0.4363	0.4300	122.0	181.0	2.0	31.06	62.1	68.5
Time weighting used in averaging. =>				598.73	0.3187	0.3105	125.05	171.37	82.00	26.02	2,133.9	2,362.4

			Run#	2	
Sample Volume	V@68 (Pb/29.92)(1-bws/100)	dscf	Vd	2,082.0	
Total Flowrate	Oultet Flow	dscf/min	Qs	426.494	
Particulate					
Grain loading	0.01543 Wt/Vd	gr/dscf	Cg	0.00054	
Emissions	0.00857 Cg Qs	lb/hr	Ct	1.9896940658	
LEAD					
Grain loading	0.01543 Lead/Vd	gr/dscf	Cg	1.27E-05	
Emissions	0.00857 Cg Qs	lb/hr	Ct	0.04640656693	
Avg Sample Rate	V@Tor / t	acf/min	Qan	28.81	
Avg Velocity @ Sample Point	vs=Qa/As	fpm	vs	598.73	
Avg Orifice temp		°R	Tor	584.72	
Avg Stack temp		°R	Ts	631.04	
Avg Nozzle Velocity	Qan*Ts / An*Tor	fpm	vn	589.77	
6 ISOKINETIC	100 vn/vs		%I	98.50	

Plant	Oregon Steel Mills									File	osm1	
Source	ICA Baghouse-LAF									Tester	MJE/BTE/TJH/CDB	
Date	27-Dec-2000											
Run#		Wt(mg)	44.521	Stack Area	As=	9696	sqft	Mol Wt Dry	Md=	29.01	molwt	
Points	11	Lead(mg)	0.848	Stack Temp.	Tdb=	180	°F	Mol Wt. Wet	Ms=	28.52	molwt	
				Stack Temp.	Twb=	104	°F	Barometeric	Pb=	30.49	in H2O	
Hivol ID	SN#		1192	Moisture	bws=	4.41	%	Static Pres.	Pstat=	003	in H20	
Orifice	A=		47.9956	Nozzle Dia.	Dn=	3.169	in	Stack Pres.	Ps=	30.49	in Hg	
Constants	B=		0.4623	Nozzle Area	An=	7.59	sqin	Pitot	Cp=	0.7802		

TIME	Compartment POINT #	pt	Velocity Pressure dP inH2O	Correct fpm Vs	Orifice in H20 dHo Calc	Pressure in H20 dHo Act	Temperature (F) Orifice Tor	(F) Stack Ts	Time min t	Rate cfm Standard Q@68°F	Volume cuft Standard @68øF	Orifice @Tor
14:55												
15:00	2	3	0.0440	720.46	0.4262	0.4300	108.0	181.0	5.0	31.41	157.1	169.0
15:07	3	3	0.0354	648.24	0.3464	0.3400	128.0	185.0	5.0	27.73	138.7	154.4
15:14	4	3	0.0318	617.25	0.3012	0.3000	120.0	191.0	5.0	26.34	131.7	144.7
15:19	5	3	0.0597	845.73	0.5974	0.5800	122.0	191.0	5.0	35.67	178.3	196.6
15:24	6	3	0.0625	858.66	0.6471	0.6200	130.0	181.0	5.0	36.55	182.8	204.2
15:29	7	3	0.0397	683.28	0.3988	0.3800	132.0	179.0	5.0	29.10	145.5	163.2
15:35	8	3	0.0246	533.63	0.2393	0.2300	126.0	169.0	5.0	23.18	115.9	128.7
15:42	9	3	0.0382	668.67	0.3780	0.3700	122.0	176.0	5.0	28.97	144.9	159.7
15:47	10	3	0.0309	605.64	0.2960	0.2900	122.0	185.0	5.0	25.89	129.4	142.7
15:53	11	3	0.0145	414.55	0.1281	0.1300	110.0	184.0	5.0	18.04	90.2	97.4
15:58	13	3	0.0466	728.60	0.4793	0.4700	118.0	159.0	5.0	32.47	162.3	177.7
16:04	14	3	0.0461	728.18	0.4753	0.4700	126.0	165.0	5.0	32.26	161.3	179.0
16:11	15	3	0.0461	726.43	0.4745	0.4700	122.0	162.0	5.0	32.36	161.8	178.4
16:16	16	3	0.0266	561.92	0.2465	0.2500	110.0	185.0	5.0	24.41	122.0	131.7
16:23	1	3	0.0362	658.57	0.3418	0.3400	112.0	191.0	5.0	28.09	140.4	152.2
16:29	2	3	0.0384	680.36	0.3720	0.3700	128.0	195.0	5.0	28.84	144.2	160.6
Time weighting used in averaging. =>				667.51	0.3842	0.3775	121.00	179.94	80.00	28.83	2,306.6	2,540.1

					Run#	3
Sample Volume		V@68 (Pb/29.92)(1-bws/100)	dscf	Vd	2,246.7
Total Flowrate		Oultet Flow	dscf/min	Qs	472.546
Particulate					
Grain loading		0.01543 Wt/Vd	gr/dscf	Cg	0.00031
Emissions		0.00857 Cg Qs	lb/hr	Ct	1.23844339583
LEAD					
Grain loading		0.01543 Lead/Vd	gr/dscf	Cg	5.82E-06
Emissions		0.00857 Cg Qs	lb/hr	Ct	0.02359294533
Avg Sample Rate		V@Tor / t	acf/min	Qan	31.75
Avg Velocity @ Sample Point		vs=Qa/As	fpm	vs	667.51
Avg Orifice temp			°R	Tor	580.67
Avg Stack temp			°R	Ts	639.61
Avg Nozzle Velocity		Qan*Ts / An*Tor	fpm	vn	663.40
% ISOKINETIC		100 vn/vs		%I	99.38

Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230
503/255-5050 FAX 503/255-0505

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Baghouse
Date: 12/27/00 P_b: 30.49
T_{db}: 155 T_{wb}: 33 %H_2O: D 1.309
Magn Ranges, DP:0-1 DH:0-1 #/-F

Leak Rates @ 100%, DH in H_2O

Run #	Pretest	Post-test
1	✓	✓

Run #	Filter #
Blank	6655687
1	6655683

DP's from: Presurvey
During test ✓

Diagram of Outlet

Run #	Process Rate
1	Norm.
2	
3	

Run #	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H_2O"	DH Orif Pres "H_2O"	Ts Stack Temp °F	To Orif Temp °F	Notes
1	1	5	11:44	.0416	.4733	140	96	
	2	10	1150	.0374	.39	138	106	
	3	15	1156	.0361	.37	165	109	
	4	20	1202	0.0436	0.43	170	127	
	5	25	1208	0.0489	0.50	162	124	
	6	30	1213	0.0325	0.32	172	120	
	7	35	1220	.0430	.44	160	134	
	8	40	1226	.0133	.12	153	122	
	9	45	1232	0.0397	0.39	169	152	
	10	50	1237	0.0452	0.45	174	106	
	11	55	1243	0.0269	0.26	146	112	
	13	60	1249	0.0373	0.36	150	112	*skipped #12
	14	65	1256	0.0382	0.38	156	108	Port was obstructed
	15	70	1302	0.0398	0.398	162	108	
	16	75	1310	0.0336	0.33	156	116	
	9	80	1316	0.0257	0.25	159	116	
	1							
	2							

Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230
503/255-5050 FAX 503/255-0505

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Baghouse
Date: 12/27/00 P_b: 30.44
T_{db}: ____ T_{wb}: ____ %H_2O: ____ D_i: 1.309
Magn Ranges, DP:0-1 DH:0-1 #1 C

Leak Rates @ 100%, DH in H_2O

Run #	Pretest	Post-test
2		

Run #	Filter #
2	6855688

DP's from: Presurvey ____
During test ✓

Diagram of Outlet

Run #	Process Rate
2	Normal

Run # 2	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H_2O"	DH Orif Pres "H_2O"	Ts Stack Temp °F	To Orif Temp °F	Notes
2	2	0-5	1323	0.0497	.49	173	120	
	3	10	1329	0.0411	.40	162	107	
	4	15	1335	0.0404	.40	169	122	
	5	20	1340	0.0348	.34	162	132	
	6	25	1346	0.0322	.31	174	128	
	7	30	1352	0.0438	.43	172	134	
	8	35	1357	0.0264	.25	170	130	
	9	40	1403	0.0377	.37	175	124	
	10	45	1409	0.0320	.31	185	128	
	11	50	1415	0.0254	0.23	183	118	
	13	55	1421	0.0344	0.33	187	118	
	14	60	1427	0.0125	0.11	154	122	
	15	65	1433	0.0111	0.10	160	136	
	15	70	1438	0.0111	0.10	160	130	
	16	75	1444	0.2981	0.27	169	130	
	1	80	1450	0.0490	.45	183	128	
	2	82	1456	0.0445	.43	--	122	
	3		1458					

Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230
503/255-5050 FAX 503/255-0505

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Baghouse
Date: 12/27/00 P_b: 30.49
T_{db}: ____ T_{wb}: ____ $\%H_2O$: ____ D_n: 1.309
Magn Ranges, DP:0-1 DH:0-1 #1F

Leak Rates @ 100%, DH in H_2O

Run #	Pretest	Post-test
3		✓

Run #	Filter #
3	6655589

DP's from: Presurvey ____
During test ✓

Diagram of Outlet

Run #	Process Rate
3	Norm

Run #	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H_2O"	DH Orif Pres "H_2O"	Ts Stack Temp °F	To Orif Temp °F	Notes
3	2	5	1500	.0490	0.43	181	108	
	3	10	1507	.0354	0.34	185	124	
	4	15	1514	.0318	0.3?	191	120	
	5	20	1519	.0547	0.58	191	122	
	6	25	1524	.0625	0.62	181	130	
	7	30	1529	.0397	0.38	179	132	
	8	35	1535	.0243	0.23	169	126	
	9	40	1542	.0382	0.37	176	122	
	10	45	1547	.0308	0.29	185	122	
	11	50	1553	.0145	0.13	184	110	
	13	55	1558	.0466	0.47	159	118	
	14	60	1604	0.0461	0.47	165	126	
	15	65	1611	0.0461	0.47	162	122	
	16	70	1616	0.0266	0.25	185	110	
	1	75	1623	0.0562	0.54	191	112	
	2	80	1629	0.0371	0.37	195	128	← LAST POINT
			1632	0.0545		181		
				0.0426		177		
				0.0165		175		

*****Horizon Engineering*****

Blank Correction and Filter Rinse Allocation

Oregon Steel Mills	Plant	osm1536	0.00%
ICA Baghouse-EAF	Source	Tester	0.00%
27-[kc-3000	Date		

PARTICULATE RUN I.D.	FILTER #	Filter Sample Wt mg	Wt less Filter Blank mg	Fraction of total	Rinse Residue Contribution mg	Filter Residue Contribution mg	TOTAL mg
1	6555863	46.9	48.6	31.93%	6.195	0.543	55.338
2	6855688	62.8	64.5	42.38%	8.221	0.720	73.442
3	6855689	37.4	39.1	25.69%	4.984	0.437	44.521
	TOTALS	147.10	152.20	100.00%	19.400	1.700	173.300

Runs 1, 2, & 3				
Sampler rinse residue	238 ml	19.40 mg		
Blank Acetone	191 ml	-0.5 mg		
Blank correct residue		19.40 mg		
Sampler filter residue	999	0.0000 mg	System Blank	
Blank correct residue		1.7000 mg		
Blank Filter	6855687173	-1.70 mg	Lab Blank	

*LEAD RUN I.D.	FILTER #	Filter Sample Wt mg	Wt less Filter Blank mg (Corrected)	Fraction of total	Rinse Residue Contribution mg	Filter Residue Contribution mg	TOTAL mg
1	6555863	0.9260	0.9037	26.49%	0.0190	0.0000	0.9227
2	6855688	1.7000	1.6777	49.17%	0.0352	0.0000	1.7129
3	6555689	0.8530	0.8307	24.35%	0.0174	0.0000	0.8481
	TOTALS	3.4790	3.4121	100.00%	0.0716	0.0000	3.4837

Runs 1, 2, & 3				
Sampler rinse residue	238 ml	0.0725 mg		
Blank Acetone	191 ml	0.0007 mg		
Blank correct residue		0.0716 mg		
Sampler filter residue	999	0.0000 mg	System Blank	
Blank correct residue		0.0000 mg		
Blank Filter	6855687173	0.0223 mg	Lab Blank	

ANTECH

Analysis/Technology

Mr. David Rossman
HORIZON ENGINEERING
13585 NE Whitaker
Portland OR 97220

01-25-01

January 23,2001
Job# 0026402-03

Identification: OSM (Horizon # 1536)
Received: 12/30/00

Sample #	36400	36401
Identification	OSM Rinse (Runs 1-3)	OSM blanks
Front acetone rinse:		
Volume (mls)	238	191
Residue (g)	0.0194	-0.0005

Sample #	36400	36400	36400	36401	36401
Identification	Run 1	Run 2	Run 3	blank	blank
Filters. numbers	6555863	6855688	6855689	6855687	6855673
Residue (g)	0.0469	0.0628	0.0374	-0.0007	-0.0027

Respectfully submitted:
ANTECH

Diana Tracy
president

501 N.E. THOMPSON MILL ROAD
CORBETT, OREGON 97019
503/695-2135
FAX 503/695-2139

ANTECH
SAMPLE DATA: EPA RESIDUES
Analyst: MD reviewer:
Job# 364 Identification: DSM 1536

FRONT ACETONE:

Sample #	36400					
Sample ID	✓					
vol mark						
Date/time	1-1 9P					
Into dessicator						
Vol (mls)	238ml	date/time weighed		date/time weighed		date/time weighed
GWt1(g)	148.1166	1-2 9A				
GWt2(g)	148.1170	1-3 9A				
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average	148.1168					
Tare (g)	148.0974	12-31 1P				
Net (g)	.0194					

BACK ACETONE:

Sample #						
Sample ID						
vol mark						
Date/time						
Into dessicator						
Vol (mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

ANTECH
SAMPLE DATA: EPA RESIDUES

Analyst: MD reviewer:
Job# 364 Identification: OSM 1536

BLANKS:

	ACETONE:		IMPINGER WATER:		DCM:	
Sample#	36401					
Sample ID						
vol mark	✓					
Date/time	1-1 2P					
Into dessicator						
Vol(mls)	191 ml	dateltime weighed		date/time weighed		dateltime weighed
GWt1(g)	130.3012	1-2 9A				
GWt2(g)	130.3008	1-3 9A				
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average	130.3010					
Tare (g)	130.3015	12-31 1P				
Net (g)	-.0005					

	FILTER:		FILTER:		
Sample #	36401		36401		
Sample ID	OSM 685 5687		OSM 4855673		
vol mark					
Date/time	12-29 9A		12-29 9A		
Into dessicator					
Vol(mls)		dateltime weighed		dateltime weighed	dateltime weighed
GWt1(g)	4.2101	1-2 9A	4.2874	1-2 9A	
GWt2(g)	4.2102	1-3 9A	4.2875	1-3 9A	
GWt3(g)					
GWt4(g)					
GWt5(g)					
GWt6(g)					
Average	4.2102		4.2875		
Tare (g)	4.2109	9-27-00	4.2902	9-26-00	
Net (g)	-.0007		-.0027		

ANTECH
SAMPLE DATA: EPA RESIDUES (page **3)**

FLTERS:

Sample #	36400		36400		36400	
Sample ID	05m R1	6855683	05m R2	6855688	05m R2	6855689
Date/time	12-29 9A		12-29 9A		12-29 9A	
In dessicator						
		Date/time		Date/time		Date/time
GWt1(g)	4.2884	1-2 9A	4.3261	1-2 9A	4.2561	1-2 9A
GWt2(g)	4.2886	1-3 9A	4.3260	1-3 9A	4.2568	1-3 9A
GWt3(g)					4.2588	1-4 8A
GWt4(g)					4.2585	1-5 8A
Average	4.2885		4.3261		4.2587	
Tare (g)	4.2416	9-27-00	4.2633	9-27-00	4.2213	9-27-00
Net (g)	.0469		.0628		.0374	

FILTERS:

Sample #						
Sample ID						
Dateltime						
In dessicator						
		Dateltime		Date/time		Date/time
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
Average						
Tare (g)						
Net (g)						

QC DATA:

Date/time	1-2	1-3	1-4	1-5	1-7	1-8
Balance calibrated	✓	✓	✓	✓	✓	✓
(NTIS cert wts)	✓	✓	✓	✓	✓	✓
Date/time	9A	9A	8A	8A	10A	8A
Temp/temp	71/59	70/58	70/59	70/58	71/58	70/57
Relative humidity (%)	49	48	52	48	45	44

ANTECH
SAMPLE DATA: EPA RESIDUES

Analyst: MD _____ reviewer: _____
Job# 364 _____ Identification: 05m _____ 1536 _____

HOUSE BLANKS:

	ACETONE:		IMPINGER WATER:		DCM:	
Sample #	_____		_____		_____	
Sample ID	_____		_____		_____	
vol mark	_____		_____		_____	
Dateltime	_____		_____		_____	
Into dessicator						
Vol(mls)	_____	date, time weighed	_____	date/time weighed	_____	date, time weighed
GWt1(g)	_____	_____	_____	_____	_____	_____
GWt2(g)	_____	_____	_____	_____	_____	_____
GWt3(g)	_____	_____	_____	_____	_____	_____
GWt4(g)	_____	_____	_____	_____	_____	_____
GWt5(g)	_____	_____	_____	_____	_____	_____
GWt6(g)		_____	_____	_____	_____	_____
Average	_____	_____	_____	_____	_____	_____
Tare (g)	_____		_____		_____	
Net (g)	_____		_____		_____	

	FILTER:		FILTER		EMPTY:	
Sample #	_____		_____		364	
Sample ID	lab blank		_____		lab blank	
volmark	_____	6855659	_____		_____	
Dateltime	_____		_____		_____	
Into dessicator						
Vol(mls)	_____	date, time weighed	_____	date/time weighed	empty	date, time weighed
GWt1(g)	4.2940	1-2 7A	_____	_____	104.9108	1-2 9A
GWt2(g)	4.2946	1-3 9A	_____	_____	104.9109	1-3 9A
GWt3(g)	4.2962	1-4 8A	_____	_____	104.9111	1-4 8A
GWt4(g)	4.2962	1-5 8A	_____	_____	104.9113	1-5 8A
GWt5(g)	_____	_____	_____	_____	104.9113	1-7 10A
GWt6(g)	_____	_____	_____	_____	104.9113	1-8 10A
Average	4.2962	_____	_____	_____	_____	_____
Tare (g)	4.2960		_____		104.9113	12-31 1P
Net (g)	.0028		_____		.0000	

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

Date Sent to Lab: 12/28/00

Particulate Chain of Custody Form

Client: OSM
Source Lin-50

Horizon Job No. 53

Field Personnel Contact: David Bagwell
Office (Secondary) Contact: Emily Bagwell

Laboratory: Antech
501 N.E. Thompson Mill Road
Corbett, Oregon 97019

Antech Job No. _____

Check boxes to indicate samples sent to **lab**

Sample Type	Acetone-Front	Acetone-Back	Imp. H20	Filter-Front	Filter-Back			
Run 1	✓			✓				
Run 2	✓ Allocate			✓				
Run 3	✓			✓				
Run								
Run								
Run								
Run								
Run								
Blank	✓			✓				

Return **Sample** to Horizon ASAP for Further Analysis?	Rush ___ Normal ✓
✓	

Relinquished by: David Bagwell 12/28/00 1106

62 ★ Need Samples Returned to Horizon ★

Environmental Services Laboratory, Inc. E S L

17400 SW Upper Boones Ferry Road • Suite 270 • Portland, OR 97224 • (503) 670-8520

January 25,2001

01-30-01

Mike Wallace
Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230
TEL: (503) 255-5050
FAX (503) 255-0505

RE: OSM-1536 Order No.: 0101063

Dear Mike Wallace,

Environmental Services Laboratory received 13 samples on 1/12/01 for the analyses presented in the following report.

The Samples were analyzed for the following tests:
ICP Metals (EPA 601OB)

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative. Results apply only to the samples analyzed. Reproduction of this report is permitted only in its entirety, without the written approval from the Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Nichole Karl

Nichole Karl
Project Manager

Keith Hunter

Technical Review

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**Filter Run 1(6855683)**
Lab Order:	**0101063**	**Tag Number:**	
Project:	**OSM-1536**	**Collection Date:**	**1/11/01**
Lab ID:	**0101063-01A**	**Matrix:**	**SOLID**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60106**				**Analyst: lmc**
Lead	926	1.00		ug	I	1/22/01

Qualifiers:	**ND - Not Detected at the Reporting Limit**	**S - Spike Recovery outside accepted recovery limits**
	J - Analyte detected below quantitation limits	**R - RPD outside accepted recovery limits**
	B - Analyte detected in the associated Method Blank	**E - Value above quantitation range**
	*** - Value exceeds Maximum Contaminant Level**	

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**Filter Run 2(6855688)**
Lab Order:	**0101063**	**Tag Number:**	
Project:	**OSM-1536**	**Collection Date:**	**1/11/01**
Lab ID:	**0101063-02A**	**Matrix:**	**SOLID**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60106**				**Analyst: lmc**
Lead	*1,700*	*1.00*		ug	*1*	*1/22/01*

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- • - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**Filter Run 3(6855689)**
Lab Order:	**0101063**	**Tag Number:**	
Project:	**OSM-1536**	**Collection Date:**	**1/11/01**
Lab ID:	**0101063-03A**	**Matrix:**	**SOLID**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60108**				**Analyst: lmc**
Lead	853	1.00		ug	1	1/22/01

Qualifiers:	ND - Not Detected at the Reporting Limit	S - Spike Recovery outside accepted recovery limits
	J - Analyte detected below quantitation limits	R - RPD outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range
	* - Value exceeds Maximum Contaminant Level	

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**Filter Blank(6855687)**
Lab Order:	**0101063**	**Tag Number:**	
Project:	**OSM-1536**	**Collection Date:**	1/11/01
Lab ID:	**0101063-04A**	**Matrix:**	**SOLID**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				**Analyst: Imc**
Lead	37.0	1.00		ug	1	1/22/01

Qualifiers:

ND - Not Detected *at* the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

• - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**Filter End Blank(6855673)**
Lab Order:	**0101063**	**Tag Number:**	
Project:	**OSM-1536**	**Collection Date:**	1/11/01
Lab ID:	**0101063-05A**	**Matrix:**	**SOLID**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60108**				**Analyst: Imc**
Lead	7.60	1.00		ug	1	1/22/01

Qualifiers:	**ND - Not Detected at the Reporting Limit**	**S - Spike Recovery outside accepted recovery limits**
	J - Analyte detected below quantitation limits	**R - RPD outside accepted recovery limits**
	B - Analyte detected in the associated Method Blank	**E - Value above quantitation range**
	• - Value exceeds Maximum Contaminant Level	

Environmental Services Laboratory

Date: 25-Jan-01

CLIENT:	Horizon Engineering	**Client Sample ID:**	36400 Acetone
Lab Order:	0101063	**Tag Number:**	
Project:	OSM-1536	**Collection Date:**	1/11/01
Lab ID:	0101063-06A	**Matrix:**	SOLID

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				Analyst: lmc
Lead	72.5	0.500		ug	1	1/22/01

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analytc detected in the associated Method Blank
- • - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**36401 Acetone**
Lab Order:	**0101063**	**Tag Number:**	
Project:	**OSM-1536**	**Collection Date:**	**1/11/01**
Lab ID:	**0101063-07A**	**Matrix:**	**SOLID**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60108**				**Analyst: lmc**
Lead	0.700	0.500		ug	1	1/22/01

Qualifiers:

- **ND** - Not Detected at the Reporting Limit
- **J** - Analyte detected below quantitation limits
- **B** - Analyte detected in the associated Method Blank
- ***** - Value exceeds Maximum Contaminant Level
- **S** - Spike Recovery outside accepted recovery limits
- **R** - RPD outside accepted recovery limits
- **E** - Value above quantitation range

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	Horizon Engineering	**Client Sample ID:**	364 Lab Blank
Lab Order:	0101063	**Tag Number:**	
Project:	OSM-1536	**Collection Date:**	1/11/01
Lab ID:	0101063-10A	**Matrix:**	SOLID

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				**Analyst: lmc**
Lead	ND	0.500		ug	1	1/22/01

Qualifiers:

- **ND** - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- • - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT: Horizon Engineering
Work Order: **0101063**
Project: **OSM-1536**

QC SUMMARY REPORT
Method Blank

Sample ID: ME-2273 | Batch ID: 2273 | Test Code: EPA **6010B** | Units: ug | Analysis Date **1/22/01** | Prep Date: **1/22/01**
Client **ID**: 0101063 | Run ID: **ICP_010122C** | **SeqNo:** 64372

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.5									

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT: **Horizon Engineering**
Work Order: **0101063**
Project: **OSM-1536**

QC SUMMARY REPORT
Sample Duplicate

Sample ID: **0101063-04A** DUP Batch ID: **2273** Test Code: **EPA 60108** Units: **ug** Analysis Date **1/22/01** Prep Date: **1/22/01**

Client **ID:** **Filter** Blank **(6855** **0101063** Run **ID:** **ICP_010122C** **SeqNo:** **64378**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	34.1		0	0	0.0%	0	0	37	8.2%	20	

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

Environmental Services Laboratory

Date: 25-Jan-01

CLIENT: Horizon Engineering
Work Order: 0101063
Project: OSM-1536

QC SUMMARY REPORT
Sample Matrix Spike

Sample ID: **0101063-05A** MS Batch ID: **2273** Test Code: **EPA 6010B** Units: **ug** Analysis Date **1122101** Prep Date: **1/22/01**
Clint ID: Filter End **Blank(6** **0101063** Run ID: **ICP_010122C** SeqNo: **64375**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	26.8	1	25	7.6	76.8%	75	125	0			

Sample ID: **0101063-05A** MSD Batch ID: **2273** Test Code: **EPA 6010B** Units: **ug** Analysis Date **1122101** Prep Date: **1122101**
Client ID: Filter End **Blank(6** **0101063** Run ID: **ICP_010122C** SeqNo: **64376**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	**27.3**	1	**25**	**7.6**	78.8%	**75**	**125**	26.8	1.8%	**20**	

Qualifiers:
ND - Not Detected at the Reporting Limit
J - **Analyte** detected below **quantitation** limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT: Horizon Engineering
Work Order: 0101063
Project: OSM-1536

QC SUMMARY REPORT
Laboratory Control Spike - generic

Sample ID: LCS-2273 | Batch ID: 2273 | Test Code: EPA 60108 | Units: ug | Analysis Date 1122101 | Prep Date: 1122101
Client ID: 0101063 | Run ID: ICP_010122C | SeqNo: 64373

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	25.8	0.5	25	0	103.2%	80	120	0			

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT: Horizon Engineering
Work Order: 0101063
Project: OSM-1536

QC SUMMARY REPORT

Minerals ICV for ICP

Sample ID: ICVHI	Batch ID: 2273	Test Code: EPA 6010B	Units: mg/L	Analysis Date 1/22/01	Prep Date: 1/22/01
Client ID:	0101063	Run ID: ICP_010122C		SeqNo: 64371	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	10.2	0.005	10	0	102.0%	90	110	0			

Sample ID: ICVLOW	Batch ID: 2273	Test Code: EPA 6010B	Units: mg/L	Analysis Date 1/22/01	Prep Date: 1/22/01
Client ID:	0101063	Run ID: ICP_010122C		SeqNo: 64370	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	.532	0.005	0.5	0	106.4%	90	110	0			

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

3

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way
Portland, OR 97230
Ph. (503)255-5050
Fax (503)255-0505
horizone@teleport.com

ENVIRONMENTAL SERVICES LAB
503-670-8520

CHAIN OF CUSTODY REPORT

Work Order #

REPORT TO:	HORIZON ENGINEERING
ATTENTION	MIKE WALLACE
ADDRESS	13585 NE WHITAKER WAY, PORTLAND, OR 97230
PHONE	503-255-5050 FAX: 503-255-0505
PROJECT NAME:	OSM
PROJECT NUMBER	1536
SAMPLED BY	DAVID BAGWELL
INVOICE TO:	HORIZON ENGINEERING
ATTENTION:	PENNY ROSSMAN
ADDRESS:	-SAME-
P.O. NUMBER:	QUOTE #:

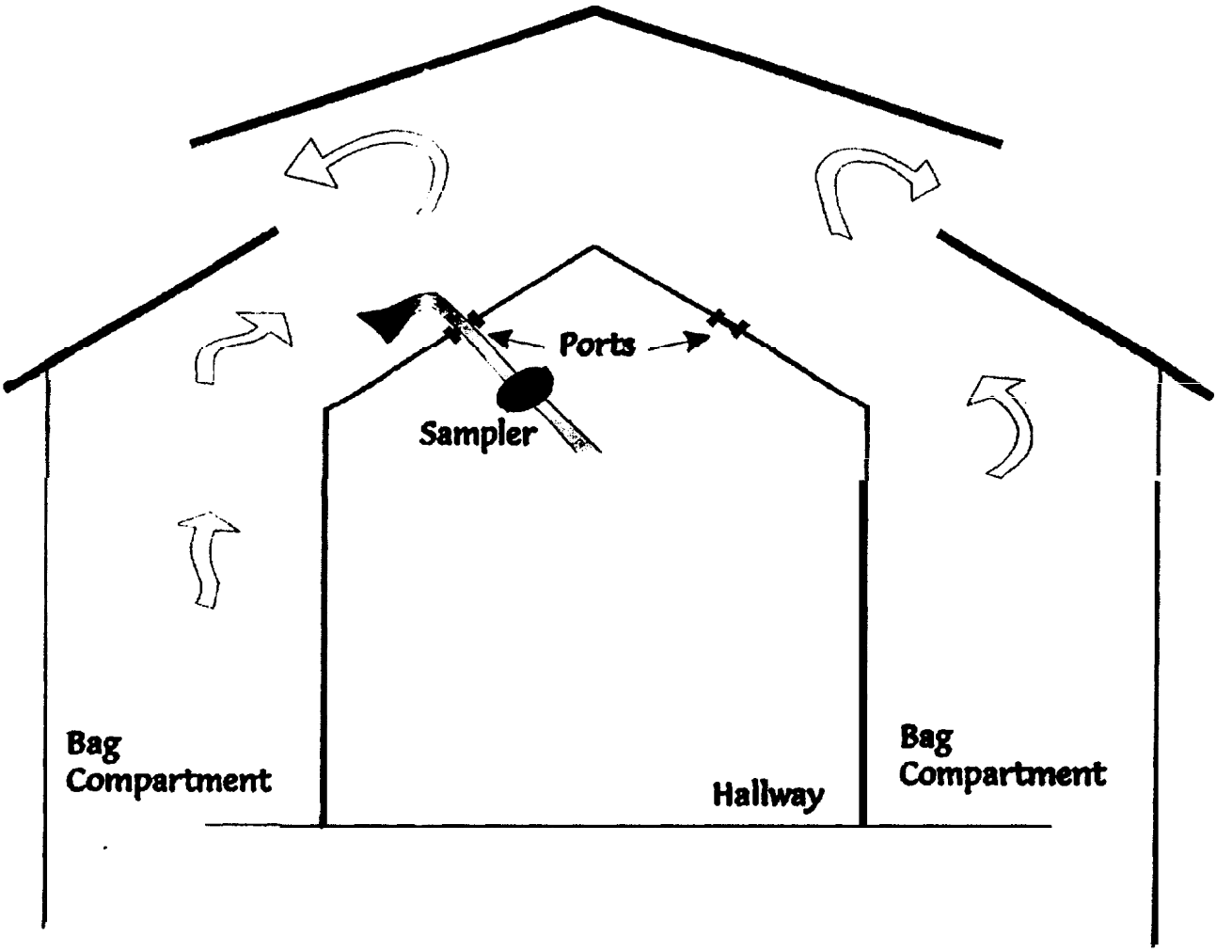
TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day
Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day
OTHER Specify
* Turnaround Requests less than standard may incur Rush Charges

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	SAMPLE ID (Laboratory Use Only)	Analysis Request: LEAD	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1 FILTER RUN 1 (6855683)		0101063-01	X			
2 FILTER RUN 2 (6855688)		02	X			
3 FILTER RUN 3 (6855689)		03	X			
4 FILTER BLANK (6855687)		04	X			
5 FILTER END BLANK (6855673)		05	X			
6 36400 ACETONE		06	X			
7 36401 ACETONE		07	X			
8 36402 H_2O		08	X			
9 36403 H_2O		09	X			
10 364 LAB BLANK		10	X			

RELINQUISHED BY: Yolanda Gutierrez	DATE: 1/1/01	RECEIVED BY:	DATE 1/1/01
PRINT NAME:	FIRM: TIME:	PRINT NAME: JEREMY TOOMEY	FIRM: ESL TIME 2:45
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE
PRINT NAME	FIRM: TIME:	PRINT NAME:	FIRM: TIME

ADDITIONAL REMARKS: ANALYSIS BY EPA 6010 (ICP). DIGEST COMPLETE FILTERS. PERFORM A SINGLE SPIKE METHOD OF STANDARD ADDITIONS PER LAB CHECK

Bayhouse Sampling Diagram



*******Horizon Engineering*******

VOLUME FLOW RATE DETERMINATION

Flow Rate Determinations and Field Data

Traverse Point Location – Inlet & Outlet

Outlet Flow Rate Determination

Client	Oregon Steel Mills	Compart.	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	it,		
Source	ICA Baghouse-EAF	Point									HI-VOL RUN #1										
Location	Portland, OR	K	0.0399	0.0167	0.0012	0.0053	0.0004	0.0060	0.0101	0.0025	A	0.0059	0.0193	0.0336	0.0344	0.0445	0.0091	0.0160	0.0058		
Date	27-Dec-2000	L	0.0472	0.0115	0.0391	0.0473	0.0483	0.0330	0.0462	0.0113	B	0.0447	0.0436	0.0223	0.0313	0.0422	0.0350	0.0285	00238		
Testers	MJE/BTF/TJH/CDB	*M	0.0462	0.0374	0.0361	0.0436	0.0489	0.0325	0.0430	0.0133	*C	0.0397	0.0452	0.0269	0.0363	0.0382	0.0395	0.0336	00257		
File	osm1536	N	0.0450	0.0400	0.0381	0.0377	0.0474	0.0355	0.0587	0.0126	D	0.0562	0.0507	0.0389	0.0348	0.0384	0.0375	0.0391	0.0260		
Analysis/QA	MJE/MEW	O	0.0450	0.0325	0.0372	0.0259	0.0422	0.0406	0.0582	0.0143	E	0.0540	0.0473	0.0397	00217	0.0454	00318	0.0130	0.0314		
Equipment	ShortRidge,1 Is	K	0.0241								A										
Total Runs	Run #1	L	0.0351								B										
Pts per Run		*M	0.0499								*C										
		N	0.0471								D										
		O	0.0410								E										
All Points	SQRT(dP)	0.1732	0.2042	0.1620	0.1621	0.1708	0.1768	0.1659	0.2013	0.1007		0.1914	0.2006	0.1786	0.1774	0.2042	0.1706	0.1581	0.1458	0.1732	
Standard Devation	STD(SQRT(dP))	0.0861	0.0191	0.0851	0.0927	0.0932	0.1044	0.0888	0.1072	0.0535		0.1044	0.1027	0.0904	0.0894	0.1022	0.0895	0.0823	0.0772	0.0864	
Symbol	Definitions, Units	Method/Notes	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Avg/Total	15 of 16
	Time																			16	Compart.
As	Cross Section	in²	9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308	148,928	139,620
Cp	Pitot Coef.		0.7802	0.7802	0.7802	0.7802	0.7802	0.7802	0.7802	0.7802		0.7802	0.7802	0.7802	0.7802	0.7802	0.7802	0.7802	0.7802		
Ts	Duct temperature	°F	154.5	138.0	165.0	170.0	162.0	172.0	160.0	155.0		169.0	174.0	146.0	150.0	156.0	162.0	156.0	159.0	159.3	
Ts	Duct temperature	°R	614.2	597.7	624.7	629.7	621.7	631.7	619.7	614.7		628.7	633.7	605.7	609.7	615.7	621.7	615.7	618.7		
Tdb	Dry bulb temp.	°F	155.0																		
Twb	Wet bulb temp.	°F	93.0																		
Pbar	Barometric Pressure	in Hg	30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		
Pg	Static Pressure	in H2O	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		
Ps	Duct Pressure	in Hg	30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		
dp^½			0.2042	0.1620	0.1621	0.1708	0.1768	0.1659	0.2013	0.1007		0.1914	0.2006	0.1786	0.1774	0.2042	0.1706	0.1581	0.1458		
Bws	Moisture, % Stack		2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88		2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88		
mfg	Mole fraction dry gas		97.1%	97.1%	97.1%	97.1%	97.1%	97.1%	97.1%	97.1%		97.1%	97.1%	97.1%	97.1%	97.1%	97.1%	97.1%	97.1%		
Oxygen	Outlet-Estimated		20.58	20.58	20.58	20.58	20.58	20.58	20.58	20.58		20.58	20.58	20.58	20.58	20.58	20.58	20.58	20.58		
Carbon Dioxide	Outlet-Estimated		0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33		0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33		
Md	Molecular weight Dry		29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00		29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00		
Ms	Molecular weight Wet		28.68	28.68	28.68	28.68	28.68	28.68	28.68	28.68		28.68	28.68	28.68	28.68	28.68	28.68	28.68	28.68		
vs	Velocity stack	fpm	684.7	536.0	548.2	580.1	596.5	564.1	678.0	337.8		649.3	683.3	594.9	592.6	685.5	575.7	530.8	490.9	583.0	
Qa	Flowrate actual	acf/min	44,257.5	34,647.3	35,434.7	37,496.7	38,560.0	36,462.0	43,823.1	21,835.7		41,973.2	44,168.0	38,451.4	38,303.7	44,311.8	37,214.4	34,307.1	31,728.5	37,686	565,289
Qsd (5-pt)	Flowrate @std	dscf/min	37,634.3	30,275.6	29,625.4	31,100.4	32,393.8	30,146.4	36,934.1	18,552.8		34,868.6	36,402.4	33,156.0	32,811.9	37,588.7	31,263.4	29,102.0	26,784.1	31,790	476,850
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

Outlet Flow Rate Determination

Client	Oregon Steel Mills	Compart.	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15			
Source	ICA Baghouse-EAF	Point									HI-VOL RUN #2										
Location	Portland, OR			00259	0.0005	0.0071	0.0071	0.0310	0.0298	0.0213	A	0.0064	0.0026	0.0068	0.0122	0.0086	0.0035	0.0030	0.0071		
Date	27-Dec-2000			0.0506	00291	0.0431	0.0389	00335	0.0430	00277	B	0.0367	0.0334	0.0338	0.0398	0.0350	0.0009	0.0070	0.0050		
Testers	MJE/BTF/TJH/CDB			00497	0.0411	0.0404	0.0348	0.0332	0.0438	0.0261	*C	0.0377	0.0320	0.0254	0.0355	0.0344	0.0125	0.0111	0.0281		
Fib	osm1536			00470	0.0419	00374	0.0470	00362	0.0410	00282	D	0.0361	0.0306	0.0357	0.0246	0.0450	0.0114	0.0079	0.0088		
Analysis/QA	MJE/MEW	O		0.0241	0.0345	0.0050	0.0395	0.0312	0.0413	0.0298	E	0.0329	0.0337	0.0575	0.0221	0.0566	0.0046	0.0011	0.0035		
Equipment	ShortRidge,11s	K	00604	0.0400							A										
Total Runs	Run #2		0.0675	0.0496							B										
Pts per Run		*M	0.0497	0.0440							*C										
			0.0490	0.0435							D										
		O	0.0472	0.0165							E										
All Points	SQRT(dP)	0.1586	0.2334	0.1950	0.1572	0.1514	0.1767	0.1816	0.1990	0.1631		0.1674	0.1542	0.1709	0.1608	0.1831	0.0751	0.0732	0.0951	0.1586	
Standard Devation	STD(SQRT(dP))	0.0802	0.1173	0.0324	0.0924	0.0870	0.0945	0.0909	0.1000	0.0818		0.0893	0.0853	0.0928	0.0834	0.0979	0.0434	0.0409	0.0547	0.0802	
Symbol	Definitions, Units	Method/Notes	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Avg/Total	15 of 16
	Time																			16	Compart.
As	Cross Section	in²	9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308	148,928	139,620
Cp	Pitot Coef		0.7802	0.7802	0.7802	0.7802	0.7802	0.7802	0.7802	0.7802		0.7802	0.7802	0.7802	0.7802	0.7802	0.7802	0.7802	0.7802		
Ts	Duct temperature	°F	163.0	173.0	162.0	169.0	162.0	174.0	172.0	170.0		175.0	185.0	183.0	186.0	187.0	154.0	160.0	169.0	172.8	
Ts	Duct temperature	°R	622.7	632.7	621.7	628.7	621.7	633.7	631.7	629.7		634.7	644.7	642.7	645.7	646.7	613.7	619.7	628.7		
Tdb	Dry bulb temp.	°F	164.0																		
Twb	Wet bulb temp	°F	101.0																		
Pbar	Barometric Pressure	in Hg	30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		
Pg	Static Pressure	in H2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Ps	Duct Pressure	in Hg	30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		
dp^½			0.2334	0.1950	0.1572	0.1514	0.1767	0.1816	0.1990	0.1631		0.1674	0.1542	0.1709	0.1608	0.1831	0.0751	0.0732	0.0951		
Bws	Moisture, % Stack		4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25		4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25		
mfg	Mole fraction dry gas		95.8%	95.8%	95.8%	95.8%	95.8%	95.8%	95.8%	95.8%		95.8%	95.8%	95.8%	95.8%	95.8%	95.8%	95.8%	95.8%		
Oxygen	Outlet-Estimated		20.41	20.41	20.41	20.41	20.41	20.41	20.41	20.41		20.41	20.41	20.41	20.41	20.41	20.41	20.41	20.41		
Carbon Dioxide	Outlet-Estimated		0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47		0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47		
Md	Molecular weight Dry		29.01	29.01	29.01	29.01	29.01	29.01	29.01	29.01		29.01	29.01	29.01	29.01	29.01	29.01	29.01	29.01		
Ms	Molecular weight Wet		28.55	28.55	28.55	28.55	28.55	28.55	28.55	28.55		28.55	28.55	28.55	28.55	28.55	28.55	28.55	28.55		
vs	Velocity stack	fpm	802.7	665.4	531.7	514.9	597.6	620.2	678.4	555.1		572.1	531.1	587.6	554.1	631.4	252.4	247.1	323.5	541.6	
Qa	Flowrate actual	acf/min	51,882.5	43,011.1	34,369.8	33,281.2	38,631.1	40,089.1	43,850.3	35,879.5		36,980.5	34,332.9	37,981.9	35,818.1	40,816.0	16,313.8	15,969.3	20,909.2	35,007	525,109
Qsd (5-pt)	Flowrate @std	dscf/min	41,565.4	35,002.7	28,465.3	27,256.8	31,994.5	32,573.3	35,742.1	29,338.1		30,000.2	27,420.3	30,428.9	28,562.2	32,497.2	13,687.4	13,268.6	17,124.4	28,433	426,494
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

Outlet Flow Rate Determination

Client	Oregon Steel Mills	Compart	1		3	4		6	7	8		9	10	11	12	13	14	15	16		
Source	ICA Baghouse-EAF	Point									HI-VOL RUN #3										
Location	Portland, OR	K		00400	0.0488	00175	00092	0.0046	0.0069	0.0165	A	0.0061	0.0057	0.0072	0.0120	0.0586	0.0181	0.0201	0.0030		
Date	27-Dee2000	L		00496	0.0390	00340	00486	0.0416	0.0404	00199	B	0.0361	0.0330	0.0257	0.0318	0.0524	0.0399	0.0431	0.0276		
Testers	MJE/BTF/TJH/CDB	4M		00440	0.0354	00318	0.0597	0.0625	0.0397	0.0246	*C	0.0382	0.0309	0.0145	0.0309	0.0466	0.0461	0.0461	0.0266		
File	osm1536	N		00435	00387	00334	0.0547	0.0488	00531	0.0323	D	0.0360	0.0308	0.0271	0.0255	0.0496	0.0420	0.0428	0.0349		
Analysis/QA	MJE/MEW	O		0.0165	00476	0.0724	0.0468	0.0295	0.0440	0.0295	E	0.0442	0.0235	0.0271	0.0072	0.0431	0.0422	0.0347	0.0363		
Equipment	ShortRidge.11s	K	0 0321	0.0028							A										
Total Runs	Run #3	L	0 0301	00330							B										
Pts per Run		*M	00362	00384							*C										
		N	0.0388	0.0401							D										
		O	0.0382	00354							E										
All Points	SQRT(dP)	0 1766	01871	0.1788	02043	01655	02022	0.1829	0.1847	01556		0.1727	0.1523	0.1390	0.1416	0.2234	0.1919	0.1914	0.1523	0.1766	
Standard Devation	STD(SQRT(dP))	0.0894	00938	00484	0.1026	0.0840	0.1081	0.1017	0.0994	0.0789		0.0928	0.0812	0.0730	0.0757	0.1120	0.0981	0.0976	0.0839	0.0894	
Symbol	Definitions, Units	Method/Notes	1			4		6	7	8		9	10	11	12	13	14	15	16	Avg/Total	15 of 16
	Time																			16	Compart.
As	Cross Section	in²	9,308	9 308	9 308	9 308	9 308	9 308	9 708	9 308		9,308	9,308	9.308	9,308	9,308	9,308	9 308	9,308	148,928	139,620
Cp	Pitot Coef.		0 7802	0 7802	0 7802	0 7802	0 7802	0 7802	0 7302	0 7802		0 7802	0 7802	0 7802	0 7802	0 7802	0 7802	0 7802	0 7802		
Ts	Duct temperature	°F	191 0	188 6	185.0	191 6	1010	181.0	179.0	169 0		176 0	185 0	184 0	186.0	159 0	165 0	162 6	185 6	179.8	
Ts	Duct temperature	°R	650 7	647 7	644.7	650.7	650 7	640 7	638.7	628.7		645 7	644 7	643 7	645 7	618 7	621 7	621 7	641 7		
Tdb	Dry bulb temp	°F	1800																		
Twb	Wet bulb temp	°F	1040																		
Pbar	Barometric Pressure	in Hg	3049	3049	3049	3049	3049	3049	3049	3049		30.49	30.49	30.49	30.49	30.49	30.49	30.49	30 49		
Pg	Static Pressure	in H2O	005	005	005	005	005	005	005	0.05		0 05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
Ps	Duct Pressure	in Hg	3049	3049	3049	30 49	3049	3049	3049	3049		30.49	30.49	30.49	30.49	30.49	30.49	30.49	30.49		
dp^½			01871	01788	02043	01655	02022	01829	01847	01556		0.1727	0.1523	0.1390	0.1416	0.2234	0.1919	0.1914	0.1523		
Bws	Moisture, % Stack		441	441	441	441	441	441	441	441		4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41		
mfg	Mole fraction dry gas		95 6%	95 6%	95 6%	95 6%	95 6%	95 6%	95 6%	95 6%		95.6%	95.6%	95.6%	95.6%	95.6%	95.6%	95.6%	95.6%		
Oxygen	Outlet-Estimated		2047	2047	20 47	2047	2047	2047	2047	2047		20.47	20.47	20.47	20.47	20.47	20.47	20.47	20 47		
Carbon Dioxide	Outlet-Estimated		041	041	041	041	041	0.41	041	041		0.41	0.41	0.41	0.41	0 41	0.41	0.41	0 41		
Md	Molecular weight Dry		2901	2901	2901	2901	2901	2901	2901	2901		29.01	29.01	29.01	29.01	29.01	29.01	29.01	29.01		
Ms	Molecular weight Wet		28 52	28 52	28 52	28 52	28 52	28 52	28 52	28 52		28.52	28.52	28.52	28.52	28.52	28.52	28.52	28.52		
vs	Velocity stack	fpm	647 5	617 6	703 8	572 8	699 8	628 1	633 4	529 3		590.8	524.9	478.4	488.4	754.1	650.7	647.7	524.6	605.7	
Qa	Flowrate actual	acf/min	41,853 0	39,920 1	45,494 1	37,024 1	45,234 7	40,602 2	40,940 5	34,211 8		38,191.4	33,927.2	30,922.9	31,566.9	48,744.2	42,061.2	41,867.7	33,909.5	39,154	587,317
Qsd (5-pt)	Flowrate @std	dscf/min	33,064 9	31,683 8	36,275 9	29,249 9	35,736 4	32,577 4	32.951 6	27.974 0		30,884.0	27,052.7	24,695.4	25,131.7	40,500.9	34,612.3	34,619.4	27,038.6	31,503	472,546
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

Inlet Flow Rate Determination

Client	Oregon Steel Mills	Compartment	Pre-test				Post-Test			
Source	EAF Baghouse - NLET	Point								
Location	Portland, OR		dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)
Date	27-Dec-2000	1	2.1240	180.0	1.2690	221.0	2.0860	199.0	1.6300	242.0
Testers	MJE,BTE,TTB,CDB	2	1.9740	192.0	1.1830	228.0	2.1400	173.0	1.9800	257.0
File	osm1536	3	2.3680	202.0	1.2110	233.0	2.9400	162.0	2.1200	268.0
Analysis/QA	MJE,MEW	4	2.4180	189.0	1.3210	236.0	2.7500	156.0	2.3700	278.0
Equipment	ShortRidge #2,pitot 14 s	5	2.1980	185.0	1.2500	229.0	2.7400	153.0	2.7600	283.0
Total Runs	2	6	2.4560	186.0	1.4050	239.0	2.5200	150.0	2.9400	281.0
Pts per Run	48	7	2.2460	186.0	1.7470	233.0	2.3500	146.0	2.8800	285.0
		8	2.2350	186.0	1.8930	235.0	1.8300	146.0	2.9900	282.0
		9	2.0960	187.0	2.1360	224.0	1.8910	145.0	3.2100	282.0
		10	2.2890	192.0	2.4370	213.0	2.0000	144.0	2.8700	282.0
		11	1.9930	195.0	2.3280	207.0	2.2000	142.0	2.9600	280.0
		12	1.9650	201.0	2.6550	203.0	1.4200	140.0	2.5300	270.0
		13	2.0150	207.0	2.6480	200.0	3.4400	130.0	1.7000	261.0
		14	1.6710	218.0	2.4100	199.0	3.5100	124.0	1.5500	251.0
		15	1.8190	220.0	2.6160	205.0	3.8100	121.0	1.5300	249.0
		16	2.0070	218.0	2.5520	205.0	3.7300	120.0	1.7900	249.0
		17	2.2190	230.0	2.3790	205.0	3.4700	118.0	1.7600	254.0
		18	2.1190	244.0	2.6180	193.0	3.6300	117.0	2.1900	258.0
		19	2.3890	244.0	1.9890	200.0	3.6300	115.0	1.5500	261.0
		20	2.0880	247.0	2.2290	199.0	3.3800	115.0	2.1000	269.0
		21	2.2360	243.0	2.3630	203.0	3.5200	114.0	2.0600	262.0
		22	2.4180	244.0	2.5710	209.0	3.5100	114.0	2.0300	258.0
		23	2.1160	252.0	2.4150	211.0	3.3800	114.0	2.1800	258.0
		24	1.8980	250.0	2.2090	208.0	3.4600	114.0	1.9000	269.0
All Points	SQRT(dP)		1.4448 sqrt(dP)		213.3 (°F)		1.5846 sqrt(dP)		201.3 (°F)	

Symbol	Definitions, Units	Method/Notes	Pre-test	Post-Test	Average
	Time		11:00	16:35	
As	Cross Section	in²	13.685	13.685	
Cp	Pitot Coef.		0.8242	0.8242	
Ts	Duct temperature	°F	213.3	201.3	207.3
Ts	Duct temperature	°R	672.9	660.9	
Pbar	Barometric Pressure	in Hg	30.49	30.49	
Pg	Static Pressure	in H2O	-7.32	-7.22	
Ps	Duct Pressure	in Hg	29.95	29.96	
dp^½			1.4448	1.5846	
Bws	Moisture, % Stack	(outlet)	2.88	4.41	3.64
mfg	Mole fraction dry gas		97.1%	95.6%	
Md (inlet)	Molecular weight Dry		29.01	29.01	
Ms (inlet)	Molecular weight Wet		28.69	28.52	
vs	Velocity stack	fpm	5,405	5,891	5,648
Qa	Flowrate actual	acf/min	513,635	559,873	536,754
Qsd (Inlet)	Flowrate @std	dscf/min	391,573	427,802	409,688
Qsd(Outlet)	Flowrate @std	dscf/min			458,630
	Difference	(Out-In)/In			11.9%

HORIZON ENGINEERING llc
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant OSM
Sampling Location Baghouse outlet
Test Conditions
Date 2/27/03 Time
Duct Dimensions
Duct Area in²
Gauge I.D. in H2O By
Post Test Leak Check Good

Cyclonic Flow ? Yes__ No X Avg Null Angle
P_o = Barometric Pressure 30.47 in Hg
C_p = Pitot Coefficient .8515
Pitot I.D. S

Run #	1									
Time	ΔP	Temp °F		ΔP	Temp °F		ΔP	Temp °F		ΔP
Pt 1-1	0.0399		5-1	0.0004		1-1	0.0059		13-	0.0445
2	0.0472		2	0.0483		2	0.0447		2	0.0422
3	0.0462	140	3	0.0489	162	3	0.0397	159	3	0.0382
4	0.0450		4	0.0474		4	0.0562		4	0.0387
5	0.0450		5	0.0422		5	0.0540		5	0.0452
6-1	0.0167		6-1	0.0060		10-1	0.0193		14-1	0.0091
2	0.0115		2	0.0330		2	0.0436		2	0.0350
3	0.0374	138	3	0.0325	172	3	0.0452	174	3	0.0375
4	0.0400		4	0.0355		4	0.0507		4	0.0375
5	0.0325		5	0.0466		5	0.0473		5	0.0318
7-1	0.0012		7-1	0.0101		11-1	0.0336		15-1	0.0150
2	0.0391		2	0.0462		2	0.0223		2	0.0285
3	0.0361	165	3	0.0430	160	3	0.0269	146	3	0.0336
4	0.0378		4	0.0587		4	0.0389		4	0.0391
5	0.0372		5	0.0582		5	0.0397		5	0.0130
8-1	0.0053		8-1	0.0025		12-1	0.0344		16-1	0.0058
2	0.0473		2	0.0113		2	0.0313		2	0.0238
3	0.0436	170	3	0.0133	155	3	0.0363	150	3	0.0257
4	0.0377		4	0.0126		4	0.0348		4	0.0260
5	0.0259		5	0.0143		5	0.0217		5	0.0314
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		155			
T_{wb}	Wet bulb temp., °F		a-			
P_{stat}	Static press.. in H_2O		0.0251			
T_s	**Duct**	T_{db} + 460				
P_s	Duct press., In H_g	P_o ± PslaV13.6				
S		Avg √ΔP x √T_s				
mv	% H_2O in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s $(1/PsMs)^{1/2}$ (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

HORIZON ENGINEERING llc
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant [illegible]
Sampling Location Baghouse Outlet
Test Conditions [illegible]
Date 12/27/00 Time [illegible]
Duct Dimensions [illegible]
Duct Area [illegible] in²
Gauge I.D. SR-1 in H20 By [illegible]
Post Test Leak Check [illegible]

Cyclonic Flow ? Yes__ No X Avg Null Angle [illegible]
P_o = Barometric Pressure 30.49 in Hg
C_p = Pitot Coefficient 0.85
Pitot I.D. 11-5

Run #	1										
Time	ΔP	SqMP									
Pt 1	0.0241										
2	0.0361										
3	0.0499	169									
4	0.0471										
5	0.0410										
Avg √ΔP											

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		15[illegible]			
T_{wb}	Wet bulb temp., °F		93			
P_{stat}	Static press., in H_2O		0.0[illegible]			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in H_g	$P_o \pm$ PslaU13.6				
S		Avg √ AP x √ T_s				
mv	% H_2O in gas stream	Psychrometry				
md	Mole fraclion dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s (1/PsMs)$^{1/2}$ (Cp)				
qa	Actual flowrale, acfm	qa = VsAs/144				
qs	Flowrale @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

HORIZON ENGINEERING llc
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME **FLOWRATE MEASUREMENT**

Plant CSM

Sampling Location Baghouse Inlet

Test Conditions Normal

Date 2/27/00 Time —

Duct Dimensions

Duct Area in²

Gauge I.D. 3R-1 in H20 By MTE/BTF/TH

Post Test Leak Check

Cyclonic Flow ? Yes__ No X Avg Null Angle —

P_o = Barometric Pressure 30.41 in Hg

C_p = Pitot Coefficient 0.75

Pitot I.D. 11-5

Run #	2									
Time	ΔP	Temp °F		ΔP	Temp °F		ΔP	Temp °F		ΔP
Pt 1-1	[illegible]		6-1	0.0312		10-1	0.0026		14-1	0.0035
2	[illegible]		2	0.0395		2	0.0334		2	0.0009
3	[illegible]	173	3	0.0322	174	3	0.0320	185	3	0.0125
4	[illegible]		4	0.0362		4	0.0306		4	0.0114
5	0.024		5	0.0312		5	0.0327		5	0.0046
6-1	0.0005		7-1	0.0298		11-1	0.0068		15-1	0.0030
2	0.0291		2	0.0430		2	0.0338		2	0.0070
3	0.0411	162	3	0.0438	172	3	0.0254	183	3	0.0111
4	0.0419		4	0.0410		4	0.0357		4	0.0079
5	0.0345		5	0.0413		5	0.0575		5	0.0011
4-1	0.0071		8-1	0.0213		12-1	0.0122		16-1	0.0071
2	0.0431		2	0.0277		2	0.0398		2	0.0050
3	0.0404	169	3	0.0264	170	3	0.0355	186	3	0.0281
4	0.0374		4	0.0282		4	0.0246		4	0.0088
5	0.0050		5	0.0298		5	0.0221		5	0.0035
5-1	0.0071		9-1	0.0064		13-1	0.0086		1-1	0.0604
2	0.0389		2	0.0367		2	0.0350		2	0.0675
3	0.0348	162	3	0.0377	175	3	0.0344	187	3	0.0497
4	0.0470		4	0.0361		4	0.0450		4	0.0490
5	0.0393		5	0.0329		5	0.0566		5	0.0473
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		164			
T_{wb}	Wet bulb temp., °F		101			
P_{stat}	Static press., in H_2O		0.016			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in Hg	P_o ± Pstat/13.6				
S		Avg √ΔP x √T_s				
mv	% H_2O in gas stream	Psychrornelry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis'				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
vs	Velocity, fpm	Vs = 5125s (1/PsMs)$^{1/2}$ (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

HORIZON ENGINEERING llc
13585 N.E. Whittaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME **FLOWRATE** MEASUREMENT

Plant U.P.M.

Sampling Location Baghouse Unit 2

Test Conditions Normal

Date 12-27-96 Time

Duct Dimensions

Duct Area in²

Gauge I.D. SR-1 in H20 By B.E./M.E.T.

Post Test Leak Check

Cyclonic Flow ? Yes__ No X Avg Null Angle

P_o = Barometric Pressure 30.[illegible] in Hg

C_p = Pitot Coefficient 0.84[illegible]

Pitot I.D. 11-5

Run #	1			2			3			Avg
Time	ΔP	Temp°F		ΔP	Temp°F		ΔP	Temp°F		ΔP
Pt 1-1	0.0400		5-1	0.0446		10-1	0.0357		14-1	0.0181
2	0.0492		2	0.0416		2	0.0330		2	0.0394
3	0.0420	191	3	0.0625	181	3	0.0389	185	3	0.0461
4	0.0435		4	0.0488		4	0.0308		4	0.0420
5	0.0165		5	0.0295		5	0.0235		5	0.0422
3-1	0.0488		7-1	0.0069		11-1	0.0072		15-1	0.0201
2	0.0390		2	0.0404		2	0.0257		2	0.0431
3	0.0354	185	3	0.0397	179	3	0.0145	184	3	0.0461
4	0.0387		4	0.0531		4	0.0271		4	0.0428
5	0.0476		5	0.0440		5	0.0271		5	0.0347
1-1	0.0175		8-1	0.0165		12-1	0.0120		16-1	0.0230
2	0.0340		2	0.0199		2	0.0318		2	0.0276
3	0.0315	191	3	0.0246	169	3	0.0309	186	3	0.0266
4	0.0334		4	0.0323		4	0.0255		4	0.0349
5	0.0224		5	0.0295		5	0.0272		5	0.0363
5-1	0.0092		9-1	0.0061		13-1	0.0586		17-1	0.0321
2	0.0486		2	0.0361		2	0.0524		2	0.0301
3	0.0597	191	3	0.0382	176	3	0.0466	189	3	0.0362
4	0.0547		4	0.0360		4	0.0496		4	0.0385
5	0.0468		5	0.0442		5	0.0431		5	0.0382
Avg √ΔP										

Symbol	Delinition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		180			
T_{wb}	Wet bulb temp., °F		[illegible]			
P_{stat}	Static press.. in H_2O		0.051C			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press.. in H_g	P_o ± Pstat/13.6				
S		Avg √ AP x √ T_s				
mv	% H_2O in gas stream	Psychromelry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s (1/PsMs)$^{1/2}$ (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps ▮ Ts				

HORIZON ENGINEERING llc
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant [illegible]
Sampling Location Baghouse outlet
Test Conditions Normal
Date 12/27/00 Time —
Duct Dimensions —
Duct Area — in²
Gauge I.D. SR-1 in H20 By MES
Post Test Leak Check Good

Cyclonic Flow ? Yes — No X Avg Null Angle —
P_o = Barometric Pressure 30.49 in Hg
C_p = Pitot Coefficient 0.8515
Pitot I.D. 11-5

Run #	3										
Time	ΔP	TEMP									
Pt 1-1	0.0028										
2	0.0333										
3	0.0354	195									
4	0.0401										
5	0.0354										
2-1	0.0029										
2	0.0347										
3	0.0345	181									
4	0.0378										
5	0.0375										
3-1	0.0190										
2	0.0314										
3	0.0426	177									
4	0.0455										
5	0.0189										
4-1	0.0146										
2	0.0243										
3	0.0165	175									
4	0.0168										
5	0.0152										
Avg √ΔP											

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		150			
T_{wb}	Wet bulb temp., °F		[illegible]			
P_{stat}	Static press.. in H_2O		[illegible]			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in Hg	$P_o \pm P_{stat}/13.6$				
S		Avg √ΔP x √T_s				
mv	% H_2O in gas slrearn	Psychrometry				
md	Mole fraclion dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysts				
Ms	Molecular wt of acl. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s (1/PsMs)$^{1/2}$ (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond. scfm	qs = 0.123 VsAs md Ps / Ts				

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant OSM
Sampling Location Baghouse Inlet
Test Conditions Normal
Date 12/27/00 Time
Duct Dimensions
Duct Area in²
Gauge I.D. SR in H20 By
Post Test Leak Check Good

Cyclonic Flow ? Yes__ No / Avg Null Angle /
P_o = Barometric Pressure 30.49 in Hg
C_p = Pitot Coefficient 0.82415
Pitot I.D. 4-1

Run #	1			1			2			2			
Time	ΔP	Temp	11AM	Δp	Temp		ΔP	Temp	1100	ΔP	Temp		
Pt 1	2.124	180	1-22	2.18	244	2-1	1.269	221	2-22	2.571	206		
2	1.974	182	23	2.16	252	2	1.183	228	23	2.415	211		
3	2.368	202	24	1.898	250	3	1.211	233	24	2.209	208		
4	2.418	189				4	1.321	236					
5	2.197	185				5	1.260	229					
6	2.456	186				6	1.405	239					
7	2.246	186				7	1.417	233					
8	2.235	186				8	1.893	235					
9	2.096	187				9	2.136	224					
10	2.289	192				10	2.437	213					
11	1.993	195				11	2.328	207					
12	1.965	201				12	2.655	203					
13	2.015	207				13	2.648	200					
14	1.671	218				14	2.410	199					
15	1.819	220				15	2.616	205					
16	2.007	218				16	2.562	205					
17	2.259	230				17	2.379	205					
18	2.119	244				18	2.618	193					
19	2.389	247				19	1.989	200					
20	2.082	247				20	2.229	199					
21	2.236	243				21	2.363	203					
Avg √ΔP													

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp.. °F					
T_{wb}	Wet bulb temp., °F					
P_{stat}	Static press., in H_2O		-7.32			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in H_g	P_o ± Pstat/13.6				
S		Avg √ΔP x √T_s				
mv	% H_2O	Psychromelry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s (1/PsMs)$^{1/2}$ (Cp)				
qa	Actual flow rate, acfm	qa = VsAs/144				
qs	Flowrate std cond, scfm	qs = 0.123 VsAs md Ps ▮ Ts				

HORIZON ENGINEERING llc
13585 N.E. Whitaker Way
Portland, OR 97230
Phone (503)255-5050
Fax (503)255-0505

VOLUME FLOWRATE MEASUREMENT

Plant CSM

Sampling Location Baghouse Inlet

Test Conditions Normal

Date 12/2- 20 Time —

Duct Dimensions —

Duct Area — in²

Gauge I.D. SR-1 in H20 By MT / FTP

Post Test Leak Check Good

Cyclonic Flow ? Yes__ No__ Avg Null Angle —

P_o = Barometric Pressure — in Hg

C_p = Pitot Coefficient —

Pitot I.D. 14-51

Run #	2									
Time	ΔP	Temp °F	1635	ΔP	Temp °F	1635	ΔP	Temp °F		
Pt 1-1	2.086	199	22	2.-	114	19		-		
2	2.14	17-	23	- .-	114	20		-		
3	2.94	1--	24	3.43	114	21		-		
4	2.-	1-6	1-1	1.92	242	22		-3-		
5	3.-4	153	2	1.92	2--	23	.--	-37		
6	3.--	150	3	2.12	268	2"	.92	259		
7	2.35	146	4	2.37	278					
8	1.83	146	5	2.76	28-					
9	1.8-	145	6	2.9-	281					
10	2.00	144	7	2.8-	2-5					
11	2.2-	142	8	2.9-	2--					
12	1.42	140	9	3.21	282					
13	3.44	150	10	2.87	282					
14	3.51	124	11	2.95	280					
15	3.81	121	12	2.53	270					
16	3.73	120	13	1.79	261					
17	3.47	118	14	1.--	251					
18	3.--	117	15	.-3	249					
19	3.63	115	16	1.79	249					
20	3.38	115	17	1.76	254					
21	3.52	114	18	2.19	259					
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		[illegible]			
T_{wb}	Wet bulb temp., °F		-			
P_{stat}	Static press., in H_2O		-7.22			
T_s	Duct temp., °R	T_{db} + 460				
P_s	Duct press., in H_g	$P_o \pm P_{stat}/13.6$				
S		Avg $\sqrt{\Delta P} \times \sqrt{T_s}$				
mv	% H_2O in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	$Vs = 5125s\ (1/PsMs)^{1/2}\ (Cp)$				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

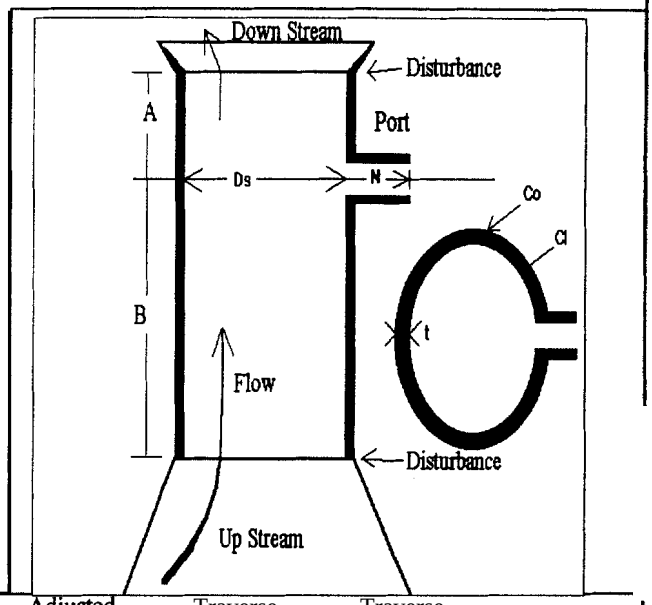
Traverse Point Location - Outlet

Client	Oregon Steel Mills			Portland, OR	Date
Location	Portland, OR			MJE/BTF/TJH C	By
EPA Method #1	Outlet			osm1536	File
Number of PORTS	P	#	5		
INSIDE of FAR WALL to OUTSIDE of Nipple	F	in	52.0		
INSIDE of NEAR WALL to OUTSIDE of Nipple	N		0.00		
Stack/Duct WIDTH	Dw	in	179.0		
DOWNstream Disturb	A	in			
UPstream Disturb	B	in			
Stack/Duct DEPTH	Dh	in	52.0		
Equivalent Diameter	De	in	80.6		
Area	As	sqin	9308.0		
DOWNstream Ratio	A/De		0.00		
UPstream Ratio	B/De		0.00		
Traverse (Particulate)			25		
Recommended #Pts/Port		5	5		
Traverse (NON-Particulate)			16		
Recommended #Pts/Port		3	4		
Actual Points used per Port			5		
Actual Number of Points			25		

Trav Pt #No	Fract Depth (f)	Stack Depth (Dp)	Actual Points (Dpxf)	Nearest 8ths (TP)	Adjusted Points (TP)	Traverse Points (TP+N)	Traverse Points (TP+N)
1	10.00%	52.0	5.2	5.250	5.250	5.250	5 1 / 4
2	30.00%	52.0	15.6	15.625	15.625	15.625	15 5 / 8
3	50.00%	52.0	26.0	26.000	26.000	26.000	26
4	70.00%	52.0	36.4	36.375	36.375	36.375	36 3 / 8
5	90.00%	52.0	46.8	46.750	46.750	46.750	46 3 / 4

Traverse Point Location - Baghouse Inlet

Client	Oregon Steel Mills			Portland. OR	Date
Location	Portland. OR			MJE/BTF/TJH/CD	By
EPA Method #1	Baghouse Inlet			osm1536	File
Outer Circumference		(ft) [Co]			
Wall thickness		(in) [t]			
Inner Circumference		(ft) [Ci]			
INSIDE of FAR WALL to OUTSIDE of Nipple		(in) [F]	134.00 "		
MSIDE of NEAR WALL to OUTSIDE of Nipple		(in) [N]	2.00 "		
DOWNstream Disturb		(in) [A]	128.0 "		
UPstream Disturb		(in) [B]	516.0 "		
Inner Diameter		(in) [Ds]	132.00 "		
Area		(sqin) [As]	13,685		
DOWNstream Ratio		[A/Ds]	1.0		
UPstream Ratio		[B/Ds]	3.91		
Traverse (Particulate) Recommended #Pts/Diameter			24 12		
Traverse (NON-Particulate) Recommended #Pts/Diameter			16 8		
Actual Points per Diameter			24		



Trav Pt #No	Fract Stk ID (f)	Stack ID (Ds)	Actual Points (Dsxf)	Nearest 8ths (TP)	Adjusted Points (TP)*	Traverse Points (TP + N)	Traverse Points (TP + N)
1	1.05%	132.0	1.4	1.375	1.375	3.375	3 3 / 8
2	3.23%	132.0	4.3	4.250	4.250	6.250	6 1 / 4
3	5.51%	132.0	7.3	7.250	7.250	9.250	9 1 / 4
4	7.92%	132.0	10.5	10.500	10.500	12.500	12 1 / 2
5	10.47%	132.0	13.8	13.875	13.875	15.875	15 7 / 8
6	13.20%	132.0	17.4	17.375	17.375	19.375	19 3 / 8
7	16.15%	132.0	21.3	21.375	21.375	23.375	23 3 / 8
8	19.38%	132.0	25.6	25.625	25.625	27.625	27 5 / 8
9	23.00%	132.0	30.4	30.375	30.375	32.375	32 3 / 8
10	27.18%	132.0	35.9	35.875	35.875	37.875	37 7 / 8
11	32.32%	132.0	42.7	42.625	42.625	44.625	44 5 / 8
12	39.79%	132.0	52.5	52.500	52.500	54.500	54 1 / 2
13	60.21%	132.0	79.5	79.500	79.500	81.500	81 1 / 2
14	67.68%	132.0	89.3	89.375	89.375	91.375	91 3 / 8
15	72.82%	132.0	96.1	96.125	96.125	98.125	98 1 / 8
16	77.00%	132.0	101.6	101.625	101.625	103.625	103 5 / 8
17	80.62%	132.0	106.4	106.375	106.375	108.375	108 3 / 8
18	83.85%	132.0	110.7	110.625	110.625	112.625	112 5 / 8
19	86.80%	132.0	114.6	114.625	114.625	116.625	116 5 / 8
20	89.53%	132.0	118.2	118.125	118.125	120.125	120 1 / 8
21	92.08%	132.0	121.5	121.500	121.500	123.500	123 1 / 2
22	94.49%	132.0	124.7	124.750	124.750	126.750	126 3 / 4
23	96.77%	132.0	127.7	127.750	127.750	129.750	129 3 / 4
24	98.95%	132.0	130.6	130.625	130.625	132.625	132 5 / 8

VISIBLE EMISSION DATA

HORIZON ENGINEERING
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

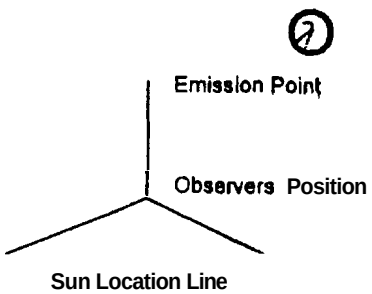
VISIBLE EMISSION OBSERVATION FORM

SOURCE INFORMATION	
Company Name	OSM
Address	Portland, OR
Phone #	

Source Description	ID #
Backhouse Throat	—
Operating Mode/Output Rate	Normal
Control Equipment: Baghouse	Operating Mode: Normal

PLUME INFORMATION	@ Start	@ End
Emission Point Description	RH Throat	
Height Above Ground	~ 70'	/
Height Relative to Observer	65'	/
Distance from Observer	~ 300'	/
Direction from Observer	N	/
Plume Type: Continuous		
Intermittent	/	/
Fugitive		
Plume Color	none	/
Water Droplets Present?	NO	/
Attached Plume?		
Detached Plume?		
Point in the Plume at Which Opacity was Observed	RH Throat	/
Description of Back round	Throat left Canopy	
Color of Back round	Blue	/
Condition of Sky	Cldy	/
Wind Speed (0-3)	—	/
Wind Direction from	N	/
Ambient Temperature (°F)	50	/

Source Layout Sketch — Draw North Arrow



Comments

OBSERVATION RECORD

DATE 12/27/41 TIME: Start 1203 End 1510

MIN	Seconds 0	15	30	45	Time / Comments
1	0	0	0	0	1203
2	0	0	0	0	R1
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0				1209
8					
9	0	0	0	0	1340
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	R2
13	0	0	0	0	
14	0	0	0	0	
15	0				1346
16					
17					
18	0	0	0	0	1504
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	R3
22	0	0	0	0	
23	0	0	0	0	
24	0				1510
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Observer's Name (print): David Bennett — Certification No. 779

Organization: Horizon Engineering. Portland, Oregon (503) 255-5050

Certified By: Oregon DEQ — Date:

Observers Signature: David Bennett — Date: 12/27/00

GASEOUS EMISSIONS

Emissions Determination
Molecular Weight Determinations
Analyzer Calibration Data and Bias Checks
Data Logger Gas Charts
Strip Charts

Gaseous Emissions

Client	Oregon Steel Mills	MJE/BTF/TJH/CDB			Testers
Source	ICA Baghouse-EAF Inlet	osm 1536			File
Location	Portland, OR	MJE/MEW			Analysis/QA
Date	27-Dec-2000				

Number of Completed Runs Date Tested			Combined	Run 1	Run 2	Run 3	Average
System Calibration Time - Initial		Tci	11:10	11:10	11:10	11:10	
Test Time-Starting		Tts	12:00	12:00	13:23	15:00	
Test Time-Ending		Tte	16:42	13:16	14:56	16:29	
System Calibration Time - Final		Tcf	16:43	16:43	16:43	16:43	
Test Mid-point Time		Tx	14:21	12:38	14:09	15:44	
Volumetric Flowrate, Dry Standard	dscf/min	Qsd	409,688	409,688	409,688	409,688	
Production	Tons/hr		141.0	165.6	123.8	138.8	142.8
Oxygen	%	O2	20.46	20.52	20.39	20.40	
Carbon Dioxide	%	CO2	0.43	0.43	0.37	0.49	
Carbon Monoxide	CO	Span	1,000	1,000	1,000	1,000	
Indicated average - Dry	ppmv	Cid	91.7	125.0	75.1	96.1	98.7
Cylinder Value - High Range calibration gas	ppmv	Cma	898.0	898.0	898.0	898.0	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.0	0.0	0.0	0.0	
System Calibration Response - High Range gas - Initia	ppmv	Cmi	898.0	898.0	898.0	898.0	
System Calibration Response - Low Range gas - Initial	ppmv	Coi	-0.3	-0.3	-0.3	-0.3	
System Calibration Response - Low Range gas - Final	ppmv	Cof	-0.3	-0.3	-0.3	-0.3	
System Calibration Response - High Range gas - Final	ppmv	Cmf	887.1	887.1	887.1	887.1	
Actual average - Dry (Corrected for Drift)	ppmv-CO	Cgas	92.6	125.6	75.8	97.3	99.6
Mass Emissions	lbm / hr	Mgas	165.5	224.5	135.5	173.9	178.0
Mass Emissions on Production Basis	lbm/Ton		1.174	1.355	1.094	1.253	1.234
Nitrogen Oxides	NOx	Span	250	250	250	250	
Indicated average-Dry	ppmv	Cid	8.77	7.59	8.43	11.01	9.01
Cylinder Value - High Range calibration gas	ppmv	Cma	90.30	90.30	90.30	90.30	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initia	ppmv	Cmi	87.50	87.50	87.50	87.50	
System Calibration Response - Low Range gas - Initial	ppmv	Coi	0.30	0.30	0.30	0.30	
System Calibration Response - Low Range gas - Final	ppmv	Cof	0.10	0.10	0.10	0.10	
System Calibration Response - High Range gas - Final	ppmv	Cmf	87.50	87.50	87.50	87.50	
Actual average - Dry (Corrected for Drift)	ppmv-NO2	Cgas	8.88	7.60	8.52	11.24	9.12
Mass Emissions	lbm-NO2 / hr	Mgas	26.06	22.30	25.01	32.99	26.77
Mass Emissions on Production Basis	lbm/Ton		0.185	0.135	0.202	0.238	0.191
Sulfur Dioxide	SO2	Span	30	30	30	30	
Indicated average-Dry	ppmv	Cid	4.31	5.24	3.92	4.23	4.46
Cylinder Value - High Range calibration gas	ppmv	Sc	26.40	26.40	26.40	26.40	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initia	ppmv	Sbs	29.32	29.32	29.32	29.32	
System Calibration Response - Low Range gas - Initial	ppmv	Zbs	0.56	0.56	0.56	0.56	
System Calibration Response - Low Range gas - Final	ppmv	Zbe	1.34	1.34	1.34	1.34	
System Calibration Response - High Range gas - Final	ppmv	Sbe	29.85	29.85	29.85	29.85	
Actual average - Dry (Corrected for Drift)	ppmv-SO2	Cgas	3.05	4.12	2.71	2.80	3.21
Mass Emissions	lbm-SO2 / hr	Mgas	12.45	16.82	11.08	11.44	13.11
Mass Emissions on Production Basis	lbm/Ton		0.088	0.102	0.089	0.082	0.091

TGOC Emissions

Client	Oregon Steel Mills		MJE/BTF/TJH/CDB			Testers	
Source	ICA Baghouse-EAF Inlet		osm1536			File	
Location	Portland, OR		MJE/MEW			Analysis/QA	
Date	27-Dec-2000						
Number of Completed Runs			Combined	Run 1	Run 2	Run 3	Average
Date Tested							
System Calibration Time - Initial		Tci	11:10	11:10	11:10	11:10	
Test Time-Starting		Tts	12:00	12:00	13:23	15:00	
Test Time-Ending		Tte	16:42	13:16	14:56	16:29	
System Calibration Time - Final		Tcf	16:43	16:43	16:43	16:43	
Test Mid-point Time		Tx	14:21	12:38	14:09	15:44	
Volumetric Flowrate, Dry Standard	dscf/min	Qsd	409,688	409,688	409,688	409,688	
Production	Tons/hr		141.0	165.6	123.8	138.8	142.8
Oxygen	%	O2	20.46	20.52	20.39	20.40	
Carbon Dioxide	%	CO2	0.43	0.37	0.49	0.47	
Moisture, Mole Fraction dry Gas		mfg	96.36%	96.36%	96.36%	96.36%	
Total Gaseous Organic Concentration	**(TGOC)**	Span	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	C3H8	1.00	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K	3				
Cylinder Value - High Range calibration gas	ppmv		27.79	27.79	27.79	27.79	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.00	0.00	0.00	0.00	
Indicated average- Wet	ppmv-C3H8	Ciw	2.93	4.83	2.74	1.79	3.12
Span Gas Concentration- Equivalent	ppmv	Sc	27.79	27.79	27.79	27.79	
Zero Gas Concentration- Equivalent	ppmv	Zc	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initial	ppmv	Ss	28.18	28.18	28.18	28.18	
System Calibration Response - Low Range gas - Initial	ppmv	Zs	-0.37	-0.37	-0.37	-0.37	
System Calibration Response - Low Range gas - Final	ppmv	Ze	-0.67	-0.67	-0.67	-0.67	
System Calibration Response - High Range gas - Final	ppmv	Se	26.55	26.55	26.55	26.55	
Actual average - Wet (Corrected for Drift & Response)	ppmv-C3H8		3.47	5.20	3.27	2.44	3.64
Actual average - Dry (Corrected for Drift & Response)	ppmv-C3H8		3.60	5.40	3.39	2.53	3.77
Actual average - Dry	ppmv-C	Cgas	10.81	16.20	10.17	7.59	11.32
Mass Emissions	lbm / hr		8.28	12.41	7.79	5.81	8.67
Mass Emissions on Production Basis	lbm/Ton		0.059	0.075	0.063	0.042	0.060

Molecular Weight Determination

Client	Oregon Steel Mills		MJE/BTF/TJH/CDB			Testers	
Source	ICA Baghouse-EAF Inle		osm1536			File	
Location	Portland, OR		MJE/MEW			Analysis/QA	
Date	27-Dec-2000						
			Combined	Run 1	Run 2	Run 3	Avg
System Calibration Time - Initial		Tci	11:10	11:10	11:10	11:10	
Test Time-Starting (Hivol Interval)		Tts	12:00	12:00	13:23	15:00	
Test Time-Ending (Hivol Interval)		Tte	16:42	13:16	14:56	16:29	
System Calibration Time - Final		Tcf	16:43	16:43	16:43	16:43	
Test Mid-point Time		Tx	14:21	12:38	14:09	15:44	
Volumetric Flowrate, Dry Standard - Inlet Average	dscf/min	Qsd	409,688	409,688	409,688	409,688	
Production Rate	Ton/hr		141.04	165.65	123.82	138.82	
Molecular weight, Dry Stack	lbm/lb-mole	Md	29.01	29.00	29.02	29.01	
Oxygen-Inlet	0 2	Span	25	25	25	25	
Indicated average - Dry	%	Cid	20.62	20.67	20.55	20.57	20.60
Cylinder Value - High Range calibration gas	%	Cma	11.61	11.61	11.61	11.61	
Cylinder Value - Low Range (Zero) calibration gas	%	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initia	%	Cmi	11.70	11.70	11.70	11.70	
System Calibration Response - Low Range gas - Initia	%	Coi	0.02	0.02	0.02	0.02	
System Calibration Response - Low Range gas - Final	%	Cof	0.04	0.04	0.04	0.04	
System Calibration Response - High Range gas - Final	%	Cmf	11.73	11.73	11.73	11.73	
Actual average - Dry (Corrected for Drift)	%	Cgas	20.46	20.52	20.39	20.40	20.43
Carbon Dioxide-Inlet	C02	Span	25	25	25	25	
Indicated average - Dry	%	Cid	0.40	0.36	0.46	0.43	0.42
Cylinder Value - High Range calibration gas	%	Cma	12.52	12.52	12.52	12.52	
Cylinder Value - Low Range (Zero) calibration gas	%	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initia	%	Cmi	12.52	12.52	12.52	12.52	
System Calibration Response - Low Range gas - Initia	%	Coi	0.00	0.00	0.00	0.00	
System Calibration Response - Low Range gas - Final	%	Cof	-0.05	-0.05	-0.05	-0.05	
System Calibration Response - High Range gas - Final	%	Cmf	12.42	12.42	12.42	12.42	
Actual average - Dry (Corrected for Drift)	%	Cgas	0.430	0.374	0.488	0.473	0.445

HORIZON ENGINEERING
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@telecom.com

Calibration Field Record

Client: OSM
Date: 12/27/00
Source: BH Exhaust
Tester: CDB
Observer: —
Data Logger ID: K-HL

Leak Checks Pre-OK — Post-OK — Response Time 60 sec	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	Start Run 1 System Calibration Response (SCRx)	End Run 3 ~~Start Run~~ System Calibration Response (SCRx)	End Run — Start Run — System Calibration Response (SCRx)	End Run — System Calibration Response (SCRx)
Times					10:58	11:10	16:43		
CO2 % ch 2		35	CO2	21.86	21.75	21.65	21.51		
Range 0-25%		22	CO2	12.52	12.49	12.52	12.42		
Analyzer Model 400		Z6	N2	0.0	-0.01	0.0	-0.05		
Analyzer SN: 1		CO→C1		49.8	49.6	51.1	49.1		
CO ppm ch 3		35	CO	898	891.5	898.0	897.1		
Range 0-1000		22	CO	508	500.9	504.8	502.8		
Analyzer Model 48		Z6	N2	0.0	0.1	-0.3	-0.3		
Analyzer SN: 10		CO→C2		84.9	87.6	87.4	86.8		
O2% ch 1		Air	O2	20.95	20.98				
Range 0-25%		0-2	O2	11.61	11.85	11.70	11.73		
Analyzer Model 400		Z6	N2	0.0	0.02	0.02	0.04		
Analyzer SN: 1									
NOx ppm ch 4		35	NOx	183	183.3	180.3	177.8		
Range 0-250		22	NOx	90.3	88.3	87.5	87.5		
Analyzer Model 42C		Z6	N2	00	0.3	0.3	0.1		
Analyzer SN: 3	50% → 51			45	46.2	45.36	45.49		
~~TGOC ppm~~ ch 6 (SO2)		R9		26.4	28.29	29.32	29.85		
Range 0-30		R14		9.39	9.86	10.94	11.56		
Analyzer Model 72M		Z6		0.0	0.12	0.56	1.34		
~~Analyzer SN:~~			Air						
TGOC ch 5		35	C_3H_7	86.5	86.5	88.23	91.56		
Range 0-100		22	"	49.5	49.5	45.07	45.32		
Analyzer Model VE7		15	"	27.79	27.79	28.18	26.55		
Analyzer SN: 2		A3	"	0.0	0.0	-0.37	-0.67		

Check	Performance Specs			
Analyzer Calibration Error	|ACRCV| / SPAN	2 (25A @ 5%)	Hot Line Temp	263
Sampling System Bias	(SRCx-ACR)/SPAN	5	Hot Line Temp	280
Zero and Cal Drift	(SRC2-SRC1)/SPAN	3		

★ 30+ min
Sample split T...

Test Times	Run 1	Run 2	Run 3
Start Time	1200		
End Time	1642		

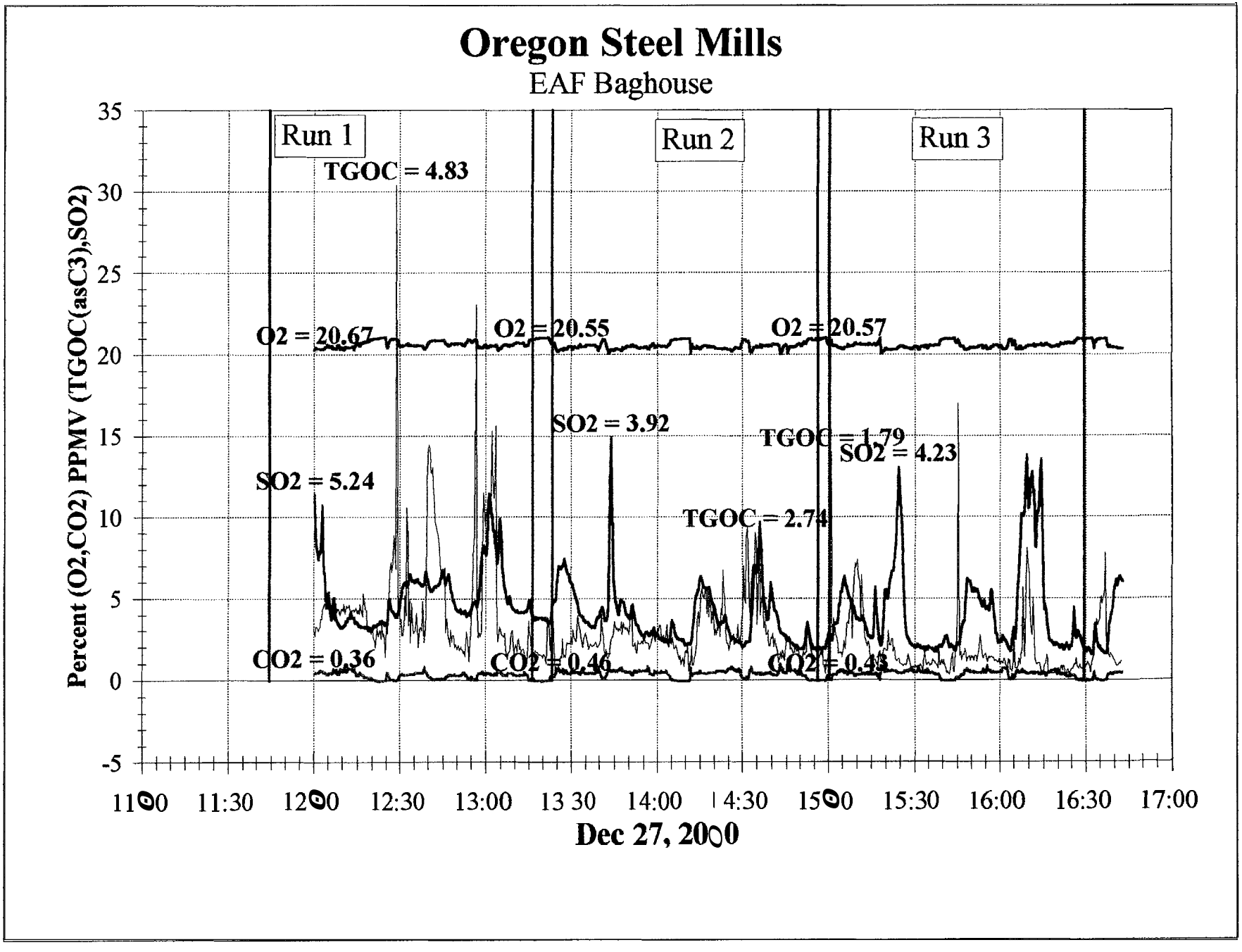
★. Start Gases until 1200 Last Cal Gas C...

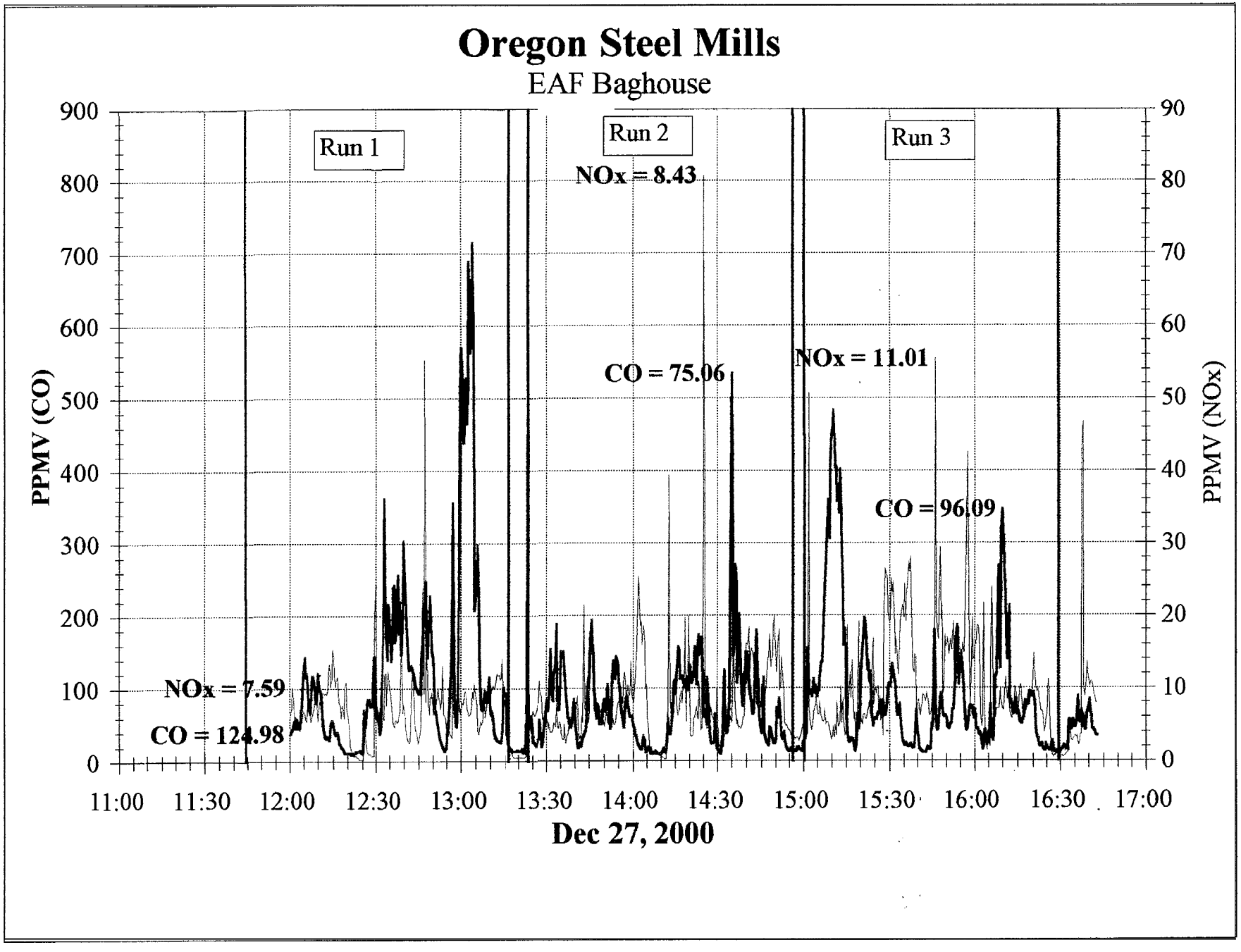
Bias Check

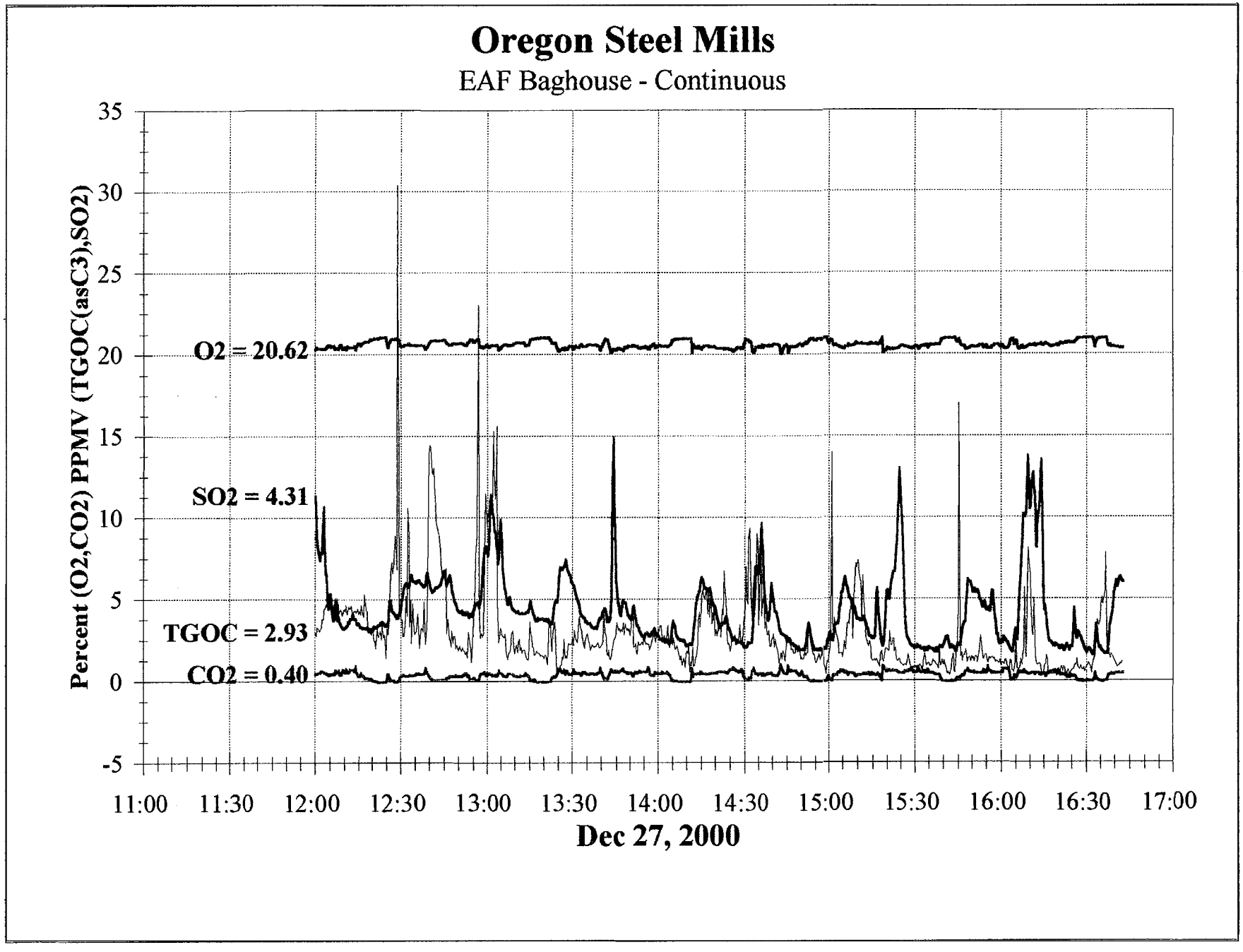
Oregon Steel Mills
EAF **Baghouse**
27-December-2000

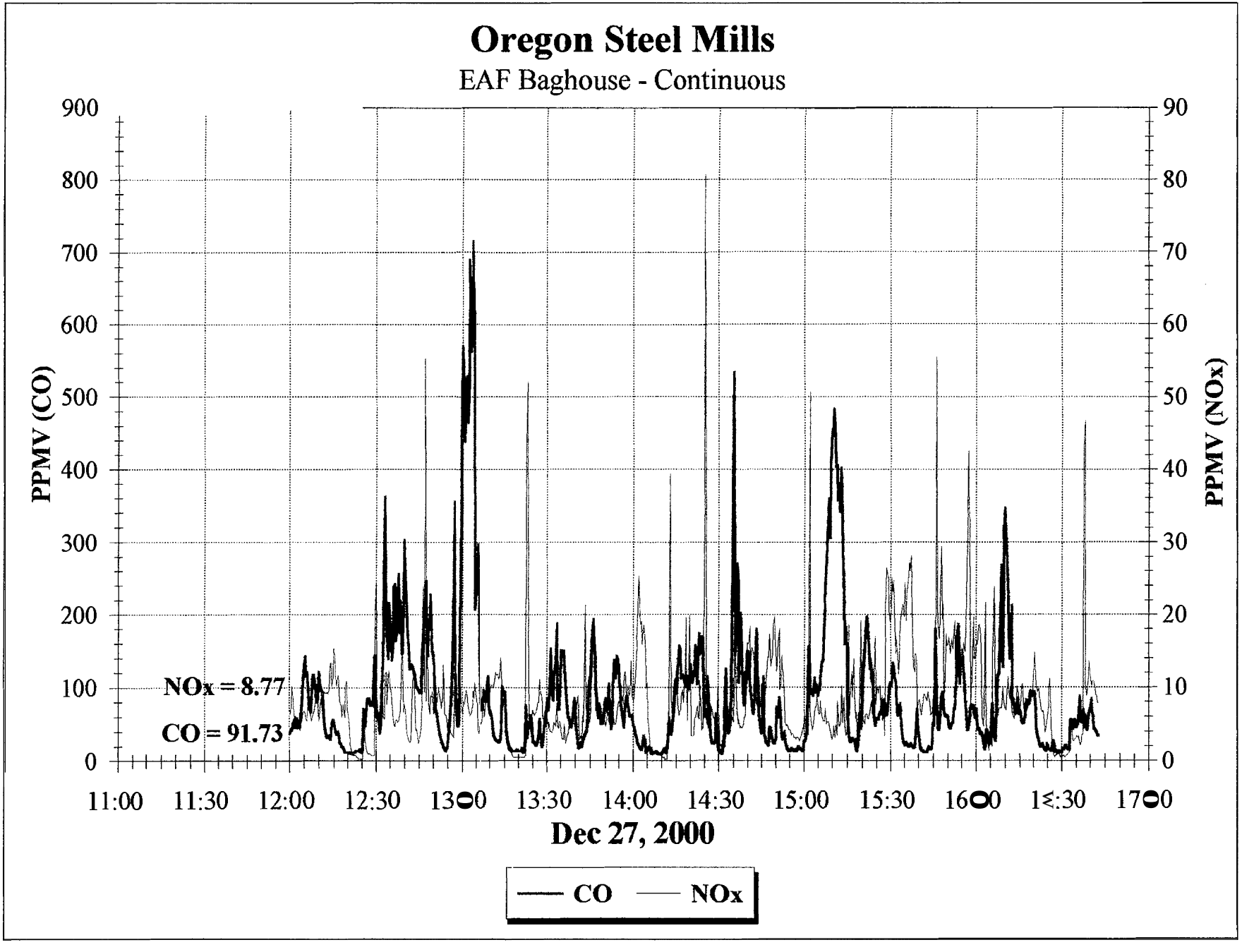
		Span	Cylinder Value CV	Analyzer Calibration Response ACR	Initial System Calibration Response SCRi	Final System Calibration Response SCRf	Cylinder Value Percent of Span	Difference < 2%	Initial System Calibration Bias < 5%	Final System Calibration Bias < 5%	Drift < 3%
OXYGEN											
Run 1-3	High Range	25	20.95	20.98			84%	0%			0%
	Mid-Range	25	11.61	11.85	11.70	11.73	46%	1%	1%	0%	0%
	Zero	25	0.00	0.02	0.02	0.04	0%	0%	0%	0%	0%
CARBON DIOXIDE											
Run 1-3	High Range	25	21.86	21.75	21.65	21.51	87%	0%			
	Mid-Range	25	49.80	49.60	51.10	49.10	199%	1%	6%	2%	8%
	Mid-Range	25	12.52	12.49	12.52	12.42	50%	0%	0%	0%	0%
	Zero	25	0.00	-0.01	0.00	-0.05	0%	0%	0%	0%	0%
CARBON MONOXIDE											
Run 1-3	High Range	1000	898.00	891.30	898.00	887.10	90%	1%			
	Mid-Range	1000	508.00	500.90	504.80	502.80	51%	1%	0%	0%	0%
	Mid-Range	1000	84.90	87.60	87.40	86.80	8%	0%	0%	0%	0%
	Zero	1000	0.00	0.10	-0.30	-0.30	0%	0%	0%	0%	0%
NITROGEN OXIDES											
Run 1	High Range	250	183.00	183.30	180.30	177.80	73%	0%	1%	2%	1%
	Mid-Range	250	90.30	88.30	87.50	87.50	36%	1%	0%	0%	0%
	Mid-Range	250	45.00	46.20	45.36	45.49	18%	0%	0%	0%	0%
	Zero	250	0.00	0.30	0.30	0.10	0%	0%	0%	0%	0%
SULFUR DIOXIDE											
Run 1	High Range	30	26.40	28.29	29.22	29.85	88%	6%	3%	5%	2%
	Mid-Range	30	9.39	9.86	10.94	11.56	31%	2%	4%	6%	2%
	Zero	30	0.00	0.12	0.56	1.34	0%	0%	1%	4%	3%
TOTAL GASEOUS ORGANIC CONCENTRATION											
Run 1	High Range	C3H8	100	86.50	88.23	91.56	87%				3%
	Mid-#1	CH4	100	49.50	45.07	45.38	50%				0%
	Mid-#2	CH4	100	27.79	28.18	26.55	28%				2%
	Zero	N2	100	0.00	-0.37	-0.67	0%				0%

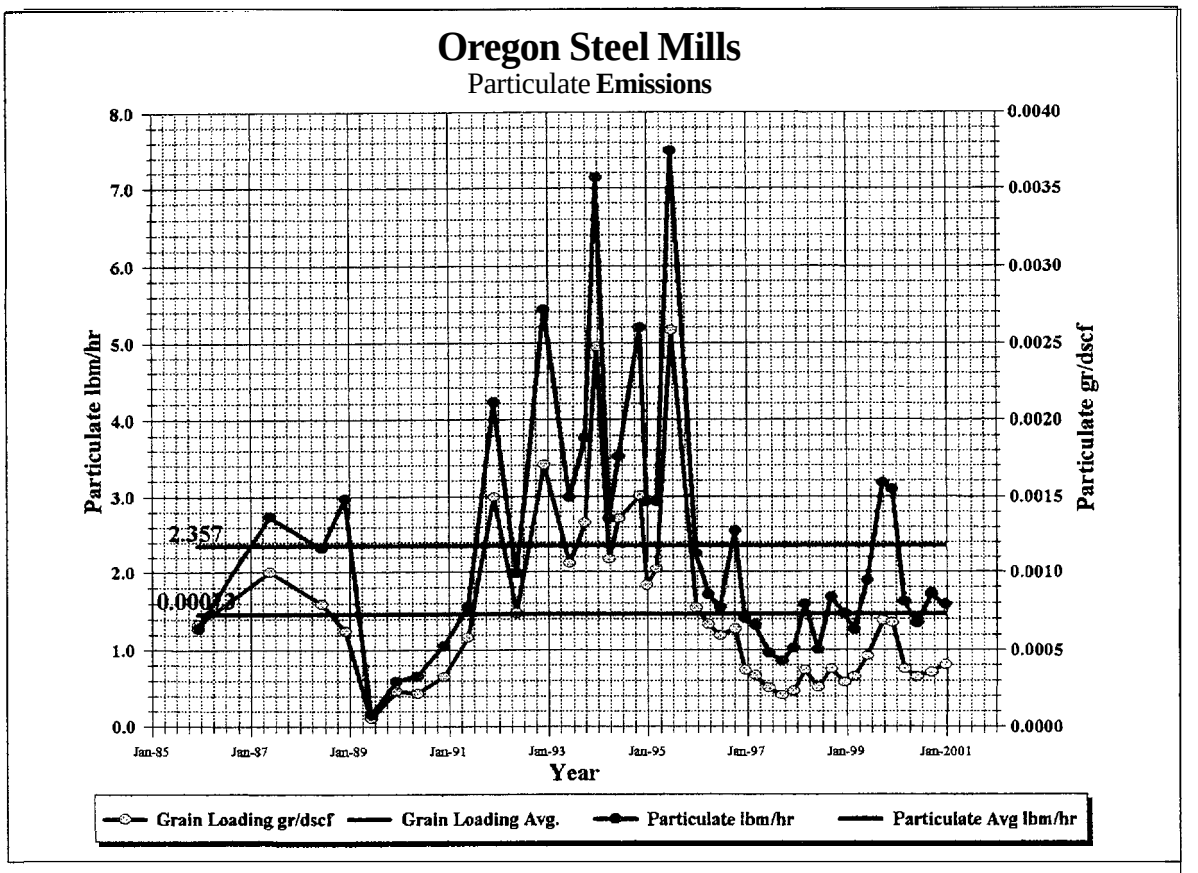
Part 60, Appendix **A,** Method 6C, Figures 6C-3 to 6C-5

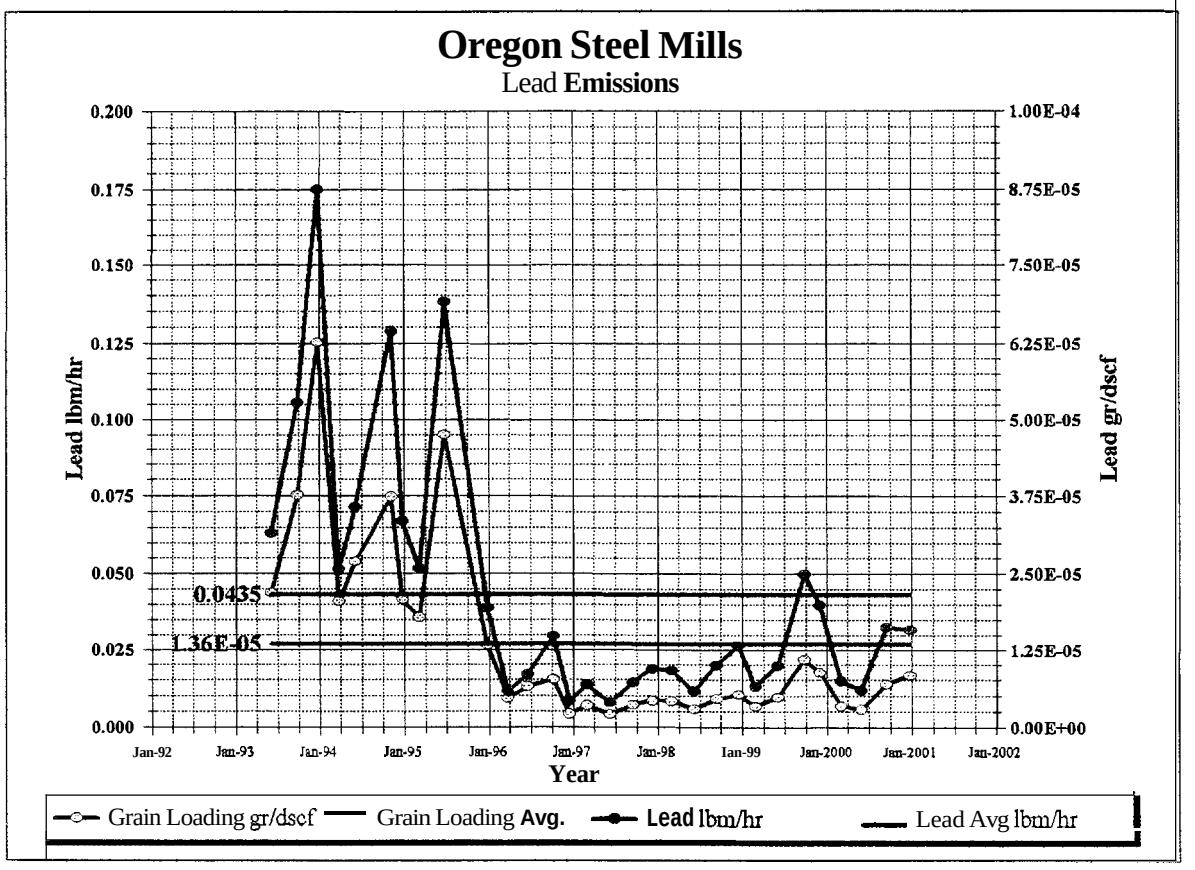

Oregon Steel Mills
EAF Baghouse
Run 1
Run 2
Run 3
TGOC = 4.83
O2 = 20.67
O2 = 20.55
O2 = 20.57
SO2 = 3.92
TGOC = 1.79
SO2 = 4.23
SO2 = 5.24
TGOC = 2.74
CO2 = 0.36
CO2 = 0.46
CO2 = 0.43
Percent (O2,CO2) PPMV (TGOC(asC3),SO2)
35
30
25
20
15
10
5
0
-5
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Dec 27, 2000

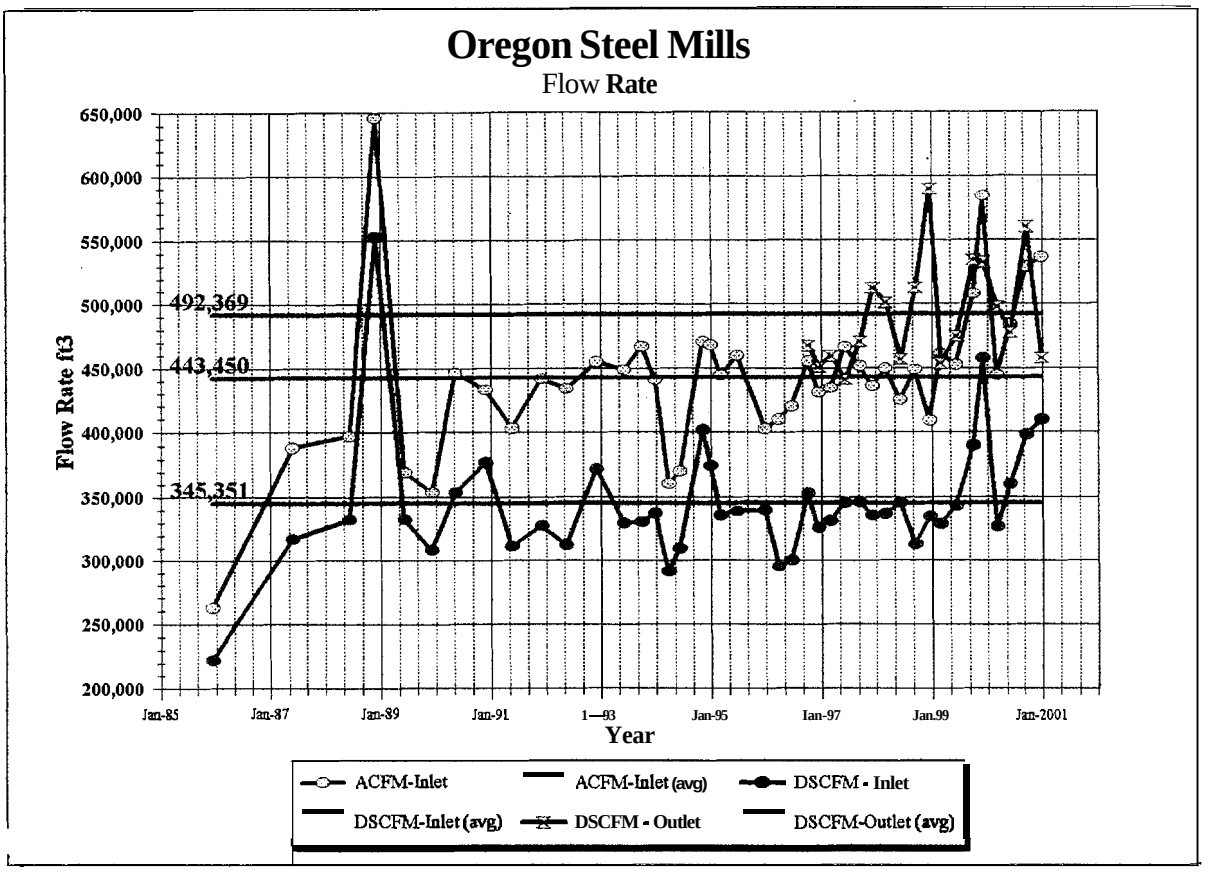

Oregon Steel Mills
EAF Baghouse
Run 1
Run 2
Run 3
NOx = 8.43
CO = 75.06
NOx = 11.01
CO = 96.09
NOx = 7.59
CO = 124.98
PPMV (CO)
PPMV (NOx)
900
800
700
600
500
400
300
200
100
0
90
80
70
60
50
40
30
20
10
0
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Dec 27, 2000

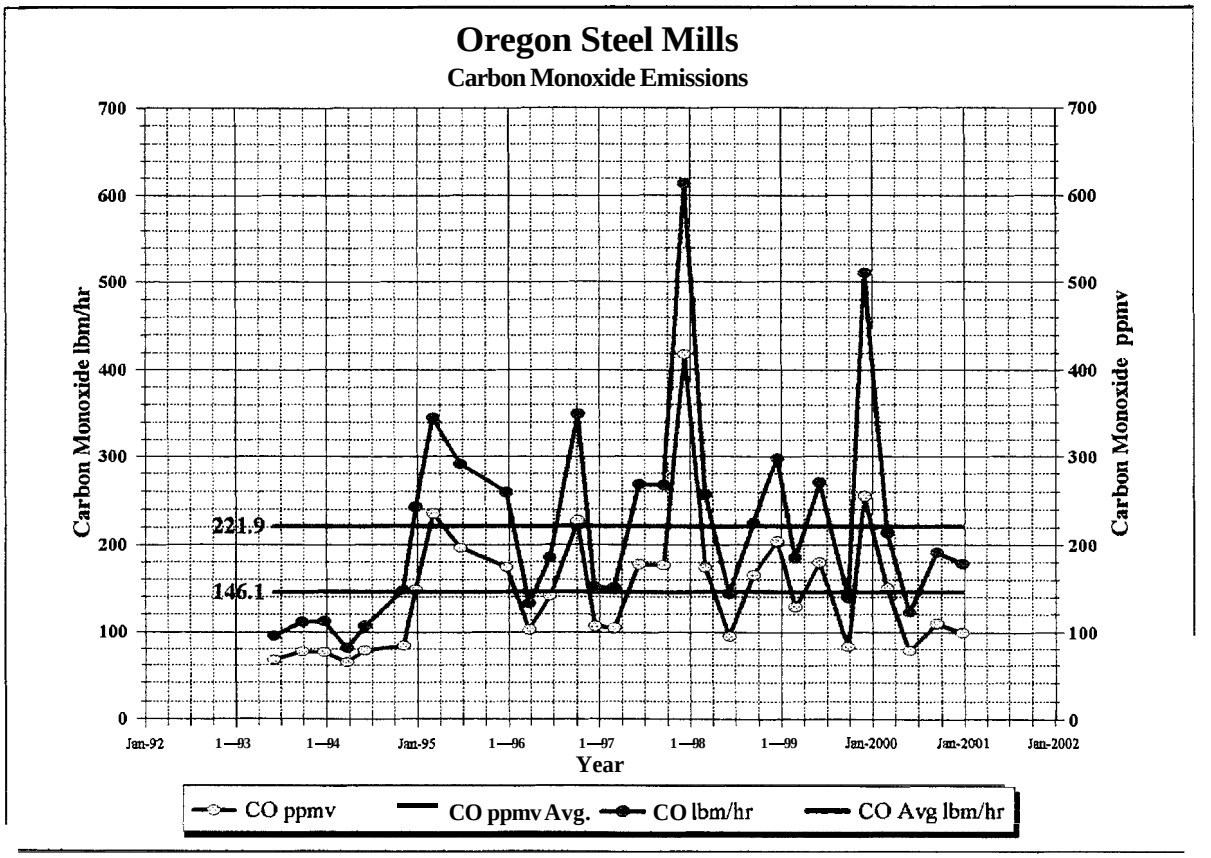

Oregon Steel Mills
EAF Baghouse - Continuous
Percent (O2,CO2) PPMV (TGOC(asC3),SO2)
35
30
25
20
15
10
5
0
-5
O2 = 20.62
SO2 = 4.31
TGOC = 2.93
CO2 = 0.40
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Dec 27, 2000

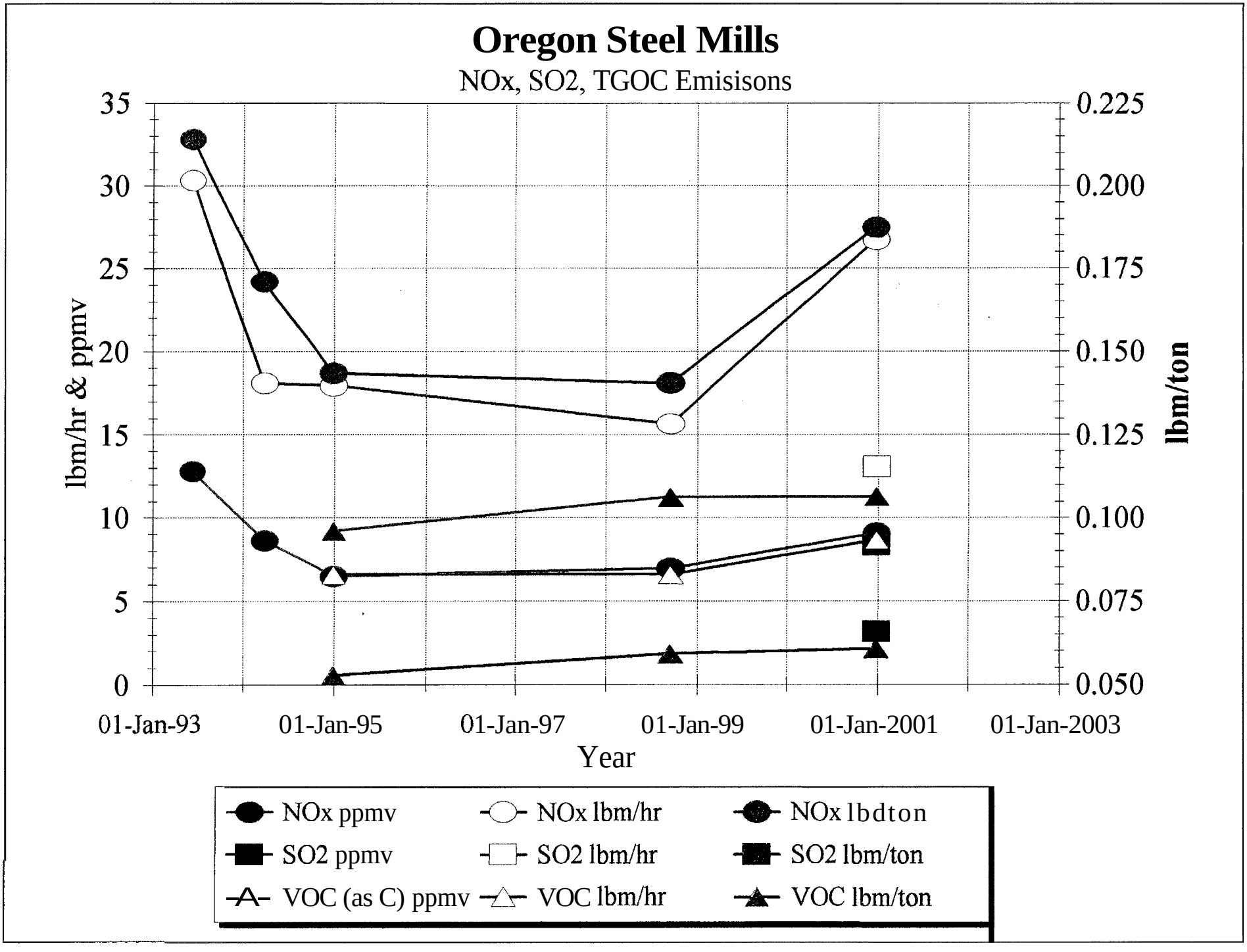

Oregon Steel Mills
EAF Baghouse - Continuous
PPMV (CO)
PPMV (NOx)
900
800
700
600
500
400
300
200
100
0
90
80
70
60
50
40
30
20
10
0
NOx = 8.77
CO = 91.73
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Dec 27, 2000
CO
NOx

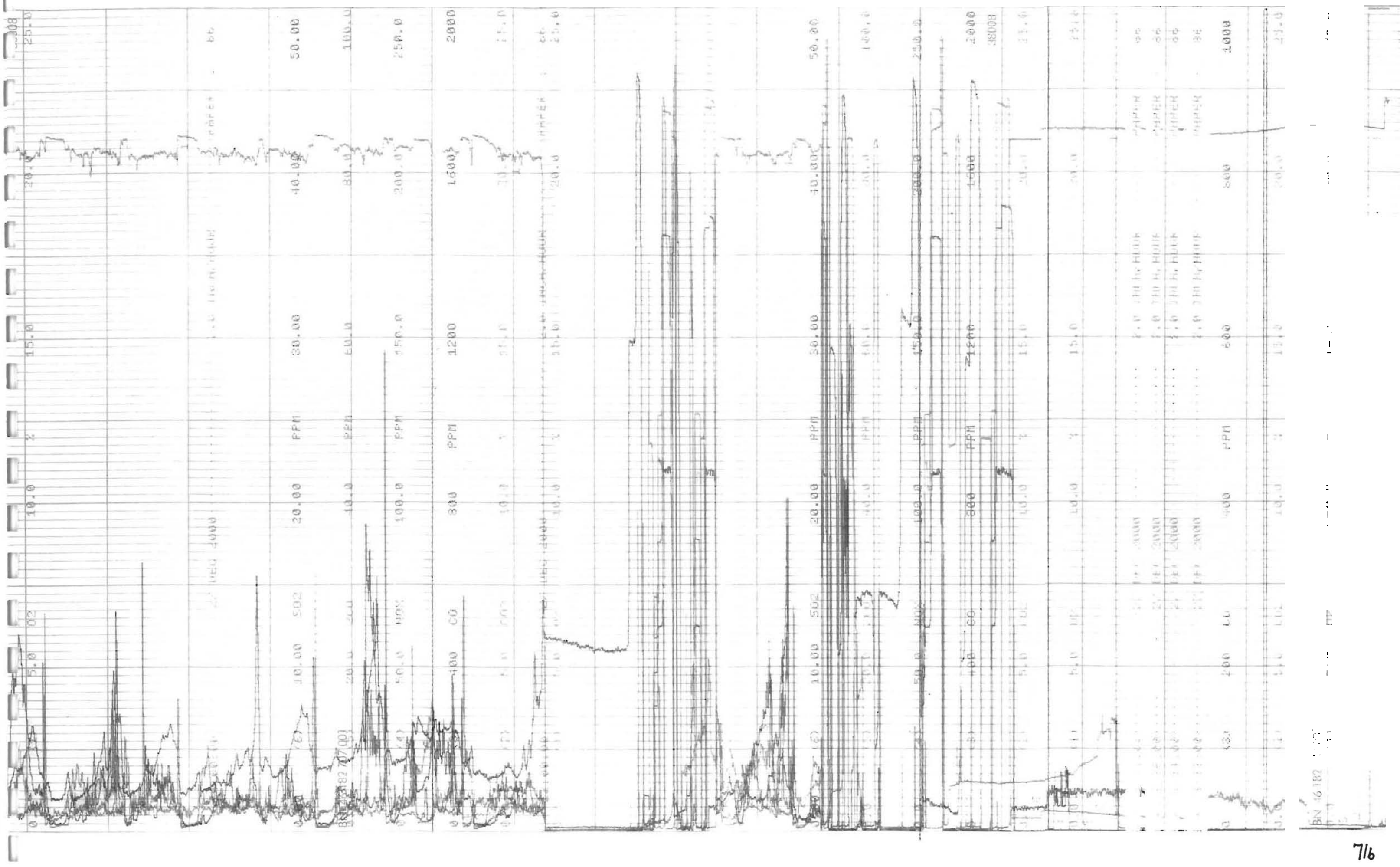

Oregon Steel Mills
Particulate Emissions
Particulate lbm/hr
Particulate gr/dscf
2.357
0.00073
Year
Grain Loading gr/dscf
Grain Loading Avg.
Particulate lbm/hr
Particulate Avg lbm/hr


Oregon Steel Mills
Lead Emissions
Lead lbm/hr
Lead gr/dscf
0.0435
1.36E-05
Year
Grain Loading gr/dscf
Grain Loading Avg.
Lead lbm/hr
Lead Avg lbm/hr


Oregon Steel Mills
Flow Rate
650,000
600,000
550,000
500,000
450,000
400,000
350,000
300,000
250,000
200,000
Flow Rate ft3
492,369
443,450
345,351
Jan-85
Jan-87
Jan-89
Jan-91
1—93
Jan-95
Ian-97
Jan.99
Jan-2001
Year
ACFM-Inlet
ACFM-Inlet (avg)
DSCFM - Inlet
DSCFM-Inlet (avg)
DSCFM - Outlet
DSCFM-Outlet (avg)


Oregon Steel Mills
Carbon Monoxide Emissions
700
600
500
400
300
200
100
0
Carbon Monoxide lbm/hr
Carbon Monoxide ppmv
221.9
146.1
Jan-92
1—93
1—94
Jan-95
1—96
1—97
1—98
1—99
Jan-2000
Jan-2001
Jan-2002
Year
CO ppmv
CO ppmv Avg.
CO lbm/hr
CO Avg lbm/hr


Oregon Steel Mills
NOx, SO2, TGOC Emisisons
lbm/hr & ppmv
lbm/ton
Year
35
30
25
20
15
10
5
0
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
01-Jan-93
01-Jan-95
01-Jan-97
01-Jan-99
01-Jan-2001
01-Jan-2003
NOx ppmv
NOx lbm/hr
NOx lbdton
SO2 ppmv
SO2 lbm/hr
SO2 lbm/ton
VOC (as C) ppmv
VOC lbm/hr
VOC lbm/ton



PRODUCTION/PROCESS DATA

Furnace Heat Logs

Baghouse Pressure Drop Field Data

OSM #3 FURNACE HEAT LOG

HEAT SUMMARY

Heat Number: 109390 Grade: A572-50-3-71 Grade No: 5437

Crew No : 1 Heat Tap Date: 12/27/2000 Charge Time: 1139
Tap Time: 1222

Heats on Delta: 788 Last Heat Tapped: 1135

Total Charge Wt	: 280.0	Furnace Line Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	: 0
Pour Back	: 0.0	Nat. Gas Batch	: 146
		Tap Temp	: 0

Melt Efficiency Rating	: 0.00	Total MWH	: 39.2
Charge to Tap Time	: 43	Avg. MW	: 61.2
Tap to Tap Time	: 47	KWH/Ton	: 280.0
Total Delay Time	: 9.6	Avg. Pwr. Factor	: 0.85

CHEMISTRY SUMMARY

LADLE ADDITIONS:

132,100 First Charge
70,100 2nd Charge

OST #3 FURNACE HEAT LOG

HEAT SUMMARY

Heat Number: 109391 Grade: A572-50-3-71 Grade No: 5437

Crew No : 1 Heat Tap Date: 12/27/2000 Charge Time: 1229
Tap Time: 1318

Heats on Delta: 789 Last Heat Tapped: 1222

Total Charge Wt	: 280.0	Furnace Line Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 136
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total KWH	: 34.9
Charge to Tap Time	: 49	kvg. MW	: 58.8
Tap to Tap Time	: 56	KWH/Ton	: 249.3
Total Delay Time	: 20.6	Avg. Pwr. Factor	: 0.84

CHEMISTRY SUMMARY

LADLE ADDITIONS:

135,600 1st Charge
70,800 2nd Charge

D S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 109392 Grade: A572-50-3-71 Grade No: 5437

Crew No : 1 Heat Tap Date: 12/27/2000 Charge Time: 1322
Tap Time: 1410

Heats on Delta: 790 Last Heat Tapped: 1318

Total Charge Wt	: 280.0	Furnace Line Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	: 0
Pour Back	: 0.0	Nat. Gas Batch	: 140
		Tap Temp	: 0
Melt Efficiency Rating	: 0.00	Total MWH	: 40.0
Charge to Tap Time	: 48	Avg. MW	: 59.7
Tap to Tap Time	: 52	KWH/Ton	: 285.7
Total Delay Time	: 11.9	Avg. Pwr. Factor	: 0.84

CHEMISTRY SUMMARY

LADLE ADDITIONS:

136,700 1st Charge
60,900 2nd Charge

O S T #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 109393 Grade: A572-50-3-71 Grade No: 5437

Crew No : 1 Heat Tap Date: 12/27/2000 Charge Time: 1412
Tap Time: 1457

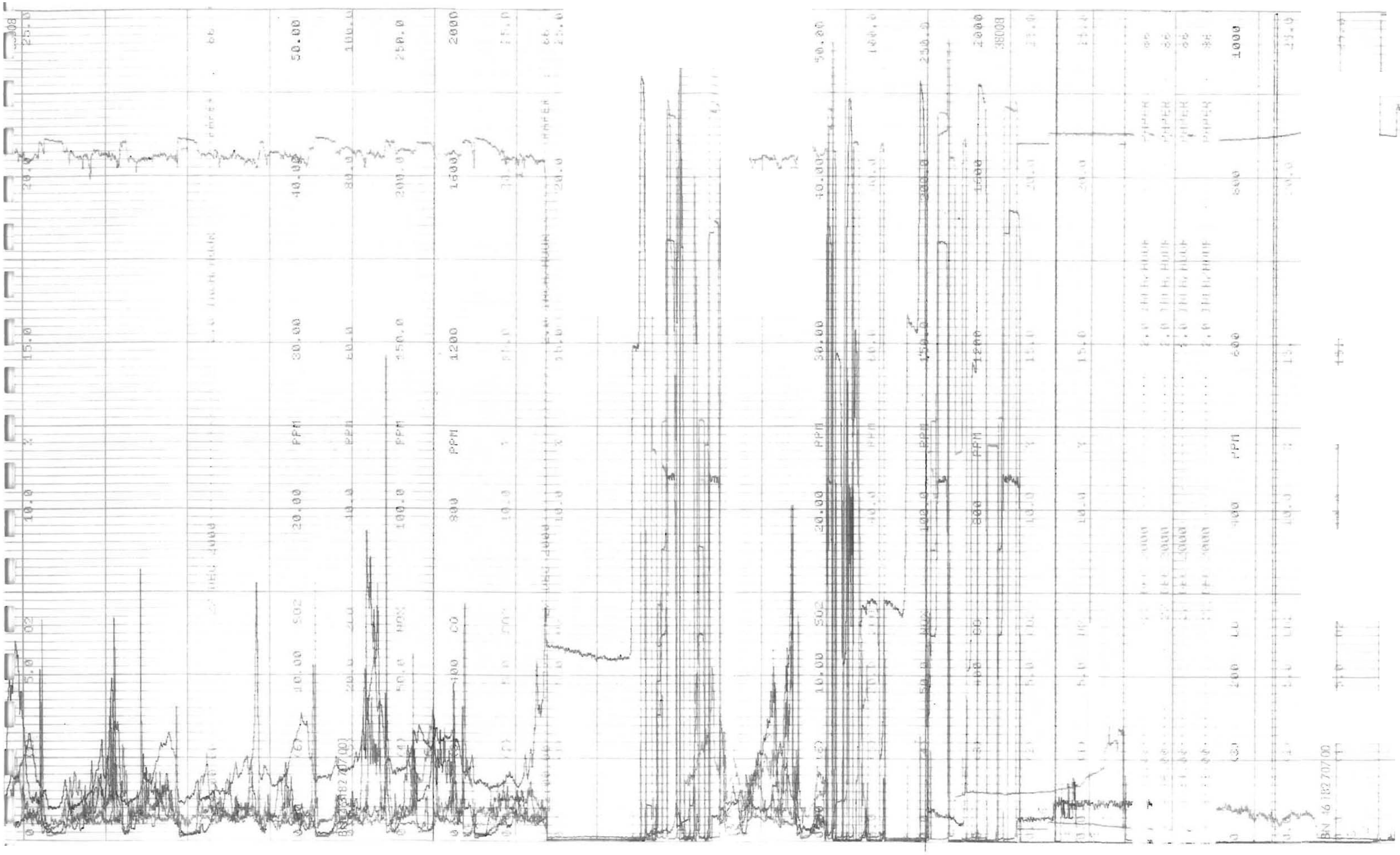
Heats on Delta: 791 Last Heat Tapped: 1410

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	: 0
Pour Back	: 0.0	Nat. Gas Batch	: 121
		Tap Temp	: 0
Melt Efficiency Rating	: 0.00	Total MWH	: 37.1
Charge to Tap Time	: 45	Avg. MW	: 59.6
Tap to Tap Time	: 47	KWH/Ton	: 265.0
Total Delay Time	: 9.8	Avg. Pwr. Factor	: 0.84

CHEMISTRY SUMMARY

LADLE ADDITIONS:

137,500 1st Charge.
57,000 2nd Charge



D S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 109394 Grade: A572-50-3-71 Grade No: 5437

Crew No : 2 Heat Tap Date: 12/27/2000 Charge Time: 1501
Tap Time: 1542

Heats on Delta: 792 Last Heat Tapped: 1457

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	: 0
Pour Back	: 0.0	Nat. Gas Batch	: 136
		Tap Temp	: 0
Melt Efficiency Rating	: 0.00	Total MWH	: 37.2
Charge to Tap Time	: 41	Avg. MW	: 60.7
Tap to Tap Time	: 45	KWH/Ton	: 265.7
Total Delay Time	: 9.4	Avg. Pwr. Factor	: 0.85

CHEMISTRY SUMMARY

LADLE ADDITIONS:

134,130 1st Charge
60,500 2nd Charge

OSM #3 FURNACE HEAT LOG

HEAT SUMMARY

Heat Number: 109395 Grade: A572-50-3-71 Grade No: 5437

Crew No : 2 Heat Tap Date: 12/27/2000 Charge Time: 1546
Tap Time: 1630

Heats on Delta: 793 Last Heat Tapped: 1543

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	: 0
Pour Back	: 0.0	Sat. Gas Batch	: 143
		Tap Temp	: 0
Melt Efficiency Rating	: 0.00	Total MWH	: 37.9
Charge to Tap Time	: 44	Avg. MW	: 60.5
Tap to Tap Time	: 57	KWH/Ton	: 270.7
Total Delay Time	: 10.5	Avg. Pwr. Factor	: 0.85

CHEMISTRY SUMMARY

LADLE ADDITIONS:

134,400 1st Charge
59,500 2nd Charge

OSM #3 Furnace Heat Log Data Reduction

27-Dec-2000

	Heat	Last Tap	Start Charge	Finish Tap	C-T mins	T-T mins	First Charge lbms	Second Charge lbms	Total Charge lbms	Run Total lbms	Total Time mins	Down Time mins	Run Time mins	Tons/hr
	109,389													
Run 1	109,390	11:35	11:39	12:22	43.0	47.0	132,100	70,100	202,200	408,600	99	25	74	165.65
	109,391	12:22	12:29	13:18	49.0	56.0	135,600	70,800	206,400					
Run 2	109,392	13:18	13:22	14:10	48.0	52.0	136,700	60,900	197,600	392,100	95		95	123.82
	109,393	14:10	14:12	14:57	45.0	47.0	137,500	57,000	194,500					
Run 3	109,394	14:57	15:01	15:42	41.0	45.0	134,300	60,500	194,800	388,700	89	5	84	138.82
	109,395	15:42	15:46	16:30	44.0	48.0	134,400	59,500	193,900					
Average					46.3	50.5	135,475	64,700	200,175					
Total										1,189,400	283	30	253	141.04

OSM Bagho-so 12/27/00

Compartment Press Drops

R1 1152

1	2	3	4	5	6	7	8
6"	5"	6"	5"	5.5"	5"	4.9"	5.5

9	10	11	12	13	14	15	16
5"	5"	5"	5"	5"	5"	—	5.5

R2 1350

1	2	3	4	5	6	7	8
5"	4"	5"	—	5.5"	5"	4.5"	5"

9	10	11	12	13	14	15	16
5"	5"	5"	5.5"	5.5"	5.5"	6"	4.5"

R3 1502

1	2	3	4	5	6	7	8
6"	5"	5.5"	5"	5.5"	4.5"	4"	5"

9	10	11	12	13	14	15	16
—	5.5"	6"	6"	6"	6"	6.5"	5.5"

CALIBRATION INFORMATION

High –Volume Sampler Calibrations

Pitots

Thermocouples and Indicators

Shortridge Micro manometer

Barometer

Filter Tare Weights

Nox Converter Efficiency Data

Calibration Gas Certificates

Audit Sample Results, reporting forms and instructions

High Volume Orifice Calibration Data

File	cal1192	#1192	A	47.996		#1032	A=	44.898
Date	02-03-00	02-03-00	B=	0.462	✓	02-03-00	B=	0.454
Tester	cdb	Last	A=	48.643		Last	A=	45.958
Analysis	cdb/mew		B=	0.440			B=	0.441
		CHANGE	A=	-1.3%		CHANGE	A=	-2.3%
			B=	5.1%			B=	3.0%

General Form Of Solution: $Q(68F)=A*(dHo*T68/T)^B$; $A=Q(68)@T68F,dHo=1.00$

$Q=A(dHo)^B$

1] $\ln(Q)=\ln(A)+B*\ln(dHo)$

2] $Z=\ln(Q)$

$W=\ln(dHo$

$C1=\ln(A)$

$C2=B$

3] $Z=C1+C2(W)$

N	W	C1	Z
W	W²	C2	WZ

Point	dHo (in H2O)	Q (cfm) @To=68F	Q (cfm) Calculated	Difference %	Point	dHo (in H2O)	Q (cfm) @To=68F	Q (cfm) Calculated	Difference %
1	0.130	19.01	18.69	-1.7%					
2	0.150	20.19	19.97	-1.1%	2	0.090	15.20	15.03	-1.1%
3	0.160	20.61	20.57	-0.2%	3	0.090	15.42	15.03	-2.5%
4	0.210	23.43	23.33	-0.4%	4	0.220	22.23	22.57	1.5%
5	0.220	23.74	23.83	0.4%	5	0.210	21.90	22.09	0.9%
6	0.230	23.91	24.33	1.7%	6	0.210	21.82	22.09	1.2%
7	0.420	31.51	32.14	2.0%	7	0.420	29.73	30.27	1.8%
8	0.420	31.83	32.14	1.0%	8	0.420	29.87	30.27	1.3%
9	0.420	31.84	32.14	1.0%	9	0.420	30.01	30.27	0.9%
10	0.650	39.36	39.33	-0.1%	10	0.620	36.18	36.13	-0.1%
11	0.670	39.59	39.88	0.7%	11	0.630	36.40	36.40	-0.0%
12	0.670	39.84	39.88	0.1%	12	0.640	36.61	36.66	0.1%
13	0.820	44.24	43.79	-1.0%	13	0.820	41.13	41.03	-0.2%
14	0.860	44.90	44.76	-0.3%	14	0.820	41.41	41.03	-0.9%
15	0.870	44.88	45.00	0.3%	15	0.830	41.41	41.25	-0.4%
16	1.000	48.50	48.00	-1.0%	16	1.000	45.51	44.90	-1.3%
17	1.000	48.50	48.00	-1.0%	17	1.000	45.15	44.90	-0.6%
18	1.000	48.10	48.00	-0.2%	18	1.000	45.14	44.90	-0.5%

Average No#	W	W²	Z	WZ	Average No#	W	W²	Z	WZ
1	-2.04	4.1625	2.9447	-6.0079					
2	-1.90	3.5991	3.0054	-5.7016	2	-2.41	5.7982	2.7211	-6.5522
3	-1.83	3.3584	3.0259	-5.5453	3	-2.41	5.7982	2.7356	-6.5872
4	-1.56	2.4356	3.1539	-4.9222	4	-1.51	2.2926	3.1014	-4.6959
5	-1.51	2.2926	3.1671	-4.7953	5	-1.56	2.4356	3.0867	-4.8172
6	-1.47	2.1599	3.1745	-4.6655	6	-1.56	2.4356	3.0829	-4.8114
7	-0.87	0.7526	3.4502	-2.9930	7	-0.87	0.7526	3.3922	-2.9428
8	-0.87	0.7526	3.4604	-3.0019	8	-0.87	0.7526	3.3969	-2.9468
9	-0.87	0.7526	3.4606	-3.0021	9	-0.87	0.7526	3.4016	-2.9509
10	-0.43	0.1856	3.6726	-1.5821	10	-0.48	0.2285	3.5885	-1.7154
11	-0.40	0.1604	3.6785	-1.4732	11	-0.46	0.2135	3.5945	-1.6608
12	-0.40	0.1604	3.6848	-1.4757	12	-0.45	0.1992	3.6002	-1.6067
13	-0.20	0.0394	3.7897	-0.7521	13	-0.20	0.0394	3.7166	-0.7376
14	-0.15	0.0227	3.8044	-0.5738	14	-0.20	0.0394	3.7234	-0.7389
15	-0.14	0.0194	3.8040	-0.5298	15	-0.19	0.0347	3.7236	-0.6938
16	0.00	0.0000	3.8817	0.0000	16	0.00	0.0000	3.8178	0.0000
17	0.00	0.0000	3.8815	0.0000	17	0.00	0.0000	3.8099	0.0000
18	0.00	0.0000	3.8733	0.0000	18	0.00	0.0000	3.8097	0.0000

No#	W		W²	Z	WZ	No#	W		W²	Z	WZ
18	-14.64		20.8536	62.9132	-47.0213	17	-14.02		21.7726	58.3029	-43.4577
18	-14.64	C1	62.91			17	-14.02	C1	58.30		
-14.64	20.85	C2	-47.02			-14.02	21.77	C2	-43.46		
1	-0.81	C1	3.50	C1=	3.87111	0.9444	-0.82	C1	3.43	C1=	3.80440
0	8.95	C2	4.14	C2=	0.46230	-0.7791	10.20	C2	4.64	C2=	0.45438
1	-0.81	C1	3.50	A=	47.99563	0.9444	-0.82	C1	3.43	A=	44.89831
0	1	C2	0.46	B=	0.46230	-0.087	1	C2	0.45	B=	0.45438
1	0	C1	387	@1.00	48.00	0.8737	0	C1	3.80	@1.00	44.90
0	1	C2	0.46	@0.10	16.55	-0.087	1	C2	0.45	@0.10	15.77

F 8163 NS

NORTHWEST NATURAL GAS COMPANY

TRANSFER PROVER DATA SHEET

Date 5/12/00

Customer Horizon

Location Fuel Meter Shop A.L.

Usage _____ c.f. _____ sec.

Metering Pr. _____ psi

Time by pass _____ hrs.

Total usage on bypass _____ s.c.f.

Reading—as found _____

Reading—as left _____

Plat No. _____

Turb. Gears _____ A.F.

Turb. Gears _____ A.L.

Meter Data: Type Roots 3M. No. Ser.# 9019232 Temp. Control: Yes ☐ No ☒ Index Proof Circle 10' Paint Cond. _____

FLOW RANGE SELECTOR	INDICATED FLOW RATE CFH	PROVER PRESET COUNT	RUNNING TIME SECONDS	CALCULATED FLOW RATE CFH	UNCORR PROOF PERCENT	A P PERCENT	A T PERCENT	CORRECTED PROOF PERCENT	ACCURACY PERCENT	AVERAGE ERROR		GAS TEMP	PROOF TARGET	PROOF PERCENT	PERCENT ERROR	AVERAGE ERROR
5m	3600	11		3533		-1.0	-0.2	100.2	**-0.2**		IF METER IS CONTROLLED, FILL IN REMAINING SPACES					
				3571		-1.0	0.2	100.4	-0.4							
				3566		+1.0	-0.1	100.0	✓	-0.2						
5m	3000	11		3015		-0.7	-0.4	99.4	+0.6							
				3018		-0.7	0.4	99.3	+0.7							
				3030		-0.7	-0.4	99.6	+0.4	+0.5						
5m	2000	11		2073		-0.3	-0.3	99.7	+0.3							
				1996		-0.3	**-0.3**	99.6	+0.4							
				1996		3	**0.3**	99.4	+0.6	+0.4						
5m	1000	13		1038		-0.1	-0.3	99.9	+0.1							
				1034		-0.1	-0.3	99.9	+0.1							
				1001		**-8.1**	**-0.3**	99.9	+0.1	+0.1						

COMMENTS:

2 LB. SET DATA

Regulator Set Press. A.F. _____ A.L. _____

Relief Set Press. A.F. _____ A.L. _____

Truck No. _____ Total Man Hours _____ Crew Leader Rey Beck

Filter/Strainer Checked? Yes ☐ No ☐

Pitot Calibration Calculations

Date 19-Sep-00 Pb= 29.73 in Hg
File Sep-00 Ta= 520.0 R
Method Y2 sec 4 Location Whitaker Shop
Who TJH,DLR

Pitot	Tested Last	[Cp] New	[S]	[Cp] Old	[%] Change
ss7-4	8-Sep-00	0.79741	0.00382	0.80179	-0.5%
ss7-5	18-Sep-00	0.81845	0.00478	0.79189	3.4%
ss7-6	11-Sep-00	0.78783	0.00725	0.81115	-2.9%
ss10-1	6-Sep-00	0.80365	0.00551	0.81671	-1.6%
ss10-2	18-Sep-00	0.80589	0.00680	0.80973	-0.5%
ss10-3	8-Sep-00	0.80521	0.00655	0.79971	0.7%
3s-1	11-Sep-00	0.83017	0.00654	0.83568	-0.7%
3s-2	04/02/98	0.83734	0.00642	0.83734	0.0%
5s-1	11-Sep-00	0.83856	0.00681	0.83579	0.3%
5s-2	23-Mar-99	0.83403	0.00741	0.83403	0.0%
	Average	0.81585	0.00619	0.81738	-0.18%

Pitot	Tested Last	[Cp] New	[S]	[Cp] Old	[%] Change
6s-1	19-Sep-00	0.82519	0.00735	0.84417	-2.20%
6s-2	15-Feb-00	0.82451	0.00569	0.80373	2.60%
HT-4	8-Sep-00	0.80791	0.00908	0.84367	-4.20%
SR-18	11-Sep-00	0.82139	0.00505	0.83573	-1.70%
SR-36	11-Sep-00	0.80674	0.00850	0.83797	-3.70%
SR-48	11-Sep-00	0.81766	0.00000	0.84270	-1.40%
10-s	7-Sep-00	0.83016	0.00023	0.8421	-4.20%
11-s	19-Sep-00	0.78015	0.00252	0.8144	-4.20%
14-s	19-Sep-00	0.82415	0.00389	0.82054	0.40%
14-2S	19-Sep-00	0.80192	0.00653		#DIV/0!
WC 3-5	19-Sep-00	0.82072	0.00000		#DIV/0!
	Average	0.81975	0.00679	0.83167	-2.07%

	dPp	dPs	Cp	dS	Avg Cp	S
ss7-4	1.290	1.970	0.80112	0.00371	0.79741	0.00382
Pass	1.200	1.860	0.79519	0.00222		
9/8/00	0.800	1.250	0.79200	0.00541		
TJH	0.380	0.580	0.80133	0.00392		
ss7-5	1.300	1.920	0.81462	0.00383	0.81845	0.00478
Pass	1.200	1.750	0.81980	0.00135		
9/18/00	0.775	1.150	0.81271	0.00574		
DLR	0.380	0.545	0.82666	0.00821		
ss7-6	1.280	2.000	0.79200	0.00417	0.78783	0.00725
Pass	1.190	1.850	0.79400	0.00617		
9111/00	0.800	1.250	0.79200	0.00417		
TJH	0.360	0.590	0.77332	0.01451		
ss10-1	1.250	1.950	0.79263	0.01101	0.80365	0.00551
Pass	1.200	1.820	0.80388	0.00023		
9/6/00	0.810	1.200	0.81337	0.00972		
TJH	0.370	0.560	0.80472	0.00107		
ss10-2	1.250	1.900	0.80300	0.00289	0.80589	0.00680
Pass	1.220	1.850	0.80395	0.00194		
9/18/00	0.765	1.180	0.79712	0.00877		
DLR	0.370	0.540	0.81948	0.01359		
ss10-3	1.260	1.930	0.79991	0.00530	0.80521	0.00655
Pass	1.180	1.780	0.80606	0.00085		
9/8/00	0.785	1.210	0.79740	0.00781		
TJH	0.375	0.550	0.81747	0.01226		
3 s1	1.250	1.780	0.82962	0.00055	0.83017	0.00654
Pass	1.160	1.660	0.82758	0.00259		
9/11/00	0.810	1.180	0.82023	0.00994		
TJH	0.370	0.510	0.84324	0.01307		
3s-2	1.200	1.650	0.84428	0.00694	0.83734	0.00642
Pass	0.690	0.980	0.83071	0.00663		
04/02/98	0.585	0.830	0.83114	0.00620		
btf	0.370	0.510	0.84324	0.00590		
5s-1	1.250	1.740	0.83910	0.00054	0.83856	0.00681
Pass	1.160	1.650	0.83008	0.00848		
9111/00	0.815	1.150	0.83342	0.00514		
TJH	0.370	0.500	0.85163	0.01307		
5s-2	1.300	1.850	0.82989	0.00414	0.83403	0.00741
Pass	1.100	1.500	0.84779	0.01376		
3/23/99	0.830	1.200	0.82335	0.01068		
kds	0.370	0.520	0.83509	0.00106		

Note: ** Not calibrated. will calibrate when needed.

	dPp	dPs	Cp	dS	Avg Cp	S
6s-1	1.300	1.900	0.81890	0.00629	0.82519	0.00735
Pass	1.230	1.750	0.82998	0.00479		
09/19/00	0.810	1.190	0.81678	0.00841		
DLR	0.370	0.520	0.83509	0.00990		
6s-2	1.240	1.770	0.82863	0.00412	0.82451	0.00569
Pass	1.150	1.660	0.82401	0.00050		
02/15/00	0.770	1.140	0.81363	0.01088		
MJE	0.360	0.510	0.83177	0.00726		
HT-4	1.240	1.800	0.82169	0.01378	0.80791	0.00908
P m	1.150	1.710	0.81187	0.00396		
09/08/00	0.770	1.210	0.78975	0.01816		
TJH	0.360	0.540	0.80833	0.00042		
SR-18	1.230	1.750	0.82998	0.00859	0.82139	0.00505
Pass	1.140	1.650	0.82290	0.00150		
09111/00	0.810	1.190	0.81678	0.00462		
TJH	0.360	0.530	0.81592	0.00547		
SR-36	1.230	1.800	0.81837	0.01163	0.80674	0.00780
Pass	1.140	1.700	0.81071	0.00397		
09/11/00	0.810	1.250	0.79694	0.00981		
TJH	0.360	0.550	0.80095	0.00579		
SR-48	1.220	1.750	0.82660	0.00894	0.81766	0.00850
Pass	1.120	1.610	0.82572	0.00805		
09/11/00	0.810	1.210	0.81000	0.00766		
TJH	0.360	0.540	0.80833	0.00933		
10-s	1.300	1.850	0.82989	0.00027	0.83016	0.00023
Pass	1.230	1.750	0.82998	0.00018		
09/07/00	0.830	1.180	0.83030	0.00013		
TJH	0.380	0.540	0.83048	0.00032		
11-s ✓	1.300	2.100	0.77893	0.00122	0.78015	0.00252
Pus	1.240	2.000	0.77953	0.00063		
09119/00	0.850	1.380	0.77697	0.00318		
DLR	0.390	0.620	0.78518	0.00503		
14-r ✓	1.300	1.850	0.82989	0.00575	0.82415	0.00389
Pass	1.240	1.820	0.81717	0.00698		
09/19/00	0.830	1.200	0.82335	0.00080		
DLR	0.390	0.560	0.82618	0.00203		
14-2S	1.300	2.000	0.79816	0.00376	0.80192	0.00653
Pass	1.230	1.880	0.80077	0.00115		
09119/00	0.820	1.210	0.81499	0.01306		
DLR	0.360	0.560	0.79377	0.00816		
WC 3-5	1.280	1.820	0.83024	0.00952	0.82072	
Pass	1.220	1.720	0.83378	0.01306		
09/19/00	0.850	1.250	0.81638	0.00434		
DLR	0.365	0.520	0.82943	0.00871		

Thermocouple Calibration

Date:	16-Mar-00	Deviation	@60 F	7.8	Allowable Diff.		Pb=	29.60	in Hg	cdb		
Next Calibration:	16-Mar--01	Limit	@212 F	10.1	Allowable Diff.		Ta=	60.0	oF	980324tc		
			@325 F	11.8	Allowable Diff.							

		Ambient			Boiling, Water			Boiling, Oil			Average
	Probe/ID	Standard. F	Measured. F	Difference F	Standard. F	Measured. F	Difference F	Standard. F	Measured. F	Difference F	Difference F
Probe	3-1	58.2	58.0	0.2	177.6	178.2	-0.6	340.1	340.2	-0.1	-0.17
Probe	3-2	58.0	57.6	0.4	210.2	212	-1.8	337.8	338.8	-1.0	-0.80
Probe	3-3	58.0	58.6	-0.6	207.4	208.6	-1.2	336.4	336.8	-0.4	-0.73
Probe	wc3-4	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0.00
Probe	3-5	57.6	58.4	-0.8	208	210	-2.0	336.2	336.4	-0.2	-1.00
Probe	3-6	58.0	58.4	-0.4	210.6	213.6	-3.0	322.8	323.0	-0.2	-1.20
Probe	3-7	58.2	58.6	-0.4	179.4	180.2	-0.8	340.6	341.8	-1.2	-0.80
Probe	3-8	57.6	58.8	-1.0	209.6	209.4	0.2	335.0	336.0	-1.0	-0.60
Probe	4-1	58.6	58.8	-0.2	203	204.4	-1.4	337.6	336.6	1.0	-0.20
Probe	4-2	58.6	58.4	0.2	205.6	206.8	-1.2	351.2	351.8	-0.6	-0.53
Probe	4-3	58.2	59.0	-0.8	203.6	205	-1.4	340.6	340.8	-0.2	-0.80
Probe	4-4	58.2	58.8	-0.6	203.6	206	-2.4	329.4	330.4	-1.0	-1.33
Probe	4-5	59.4	60.2	-0.8	203.8	205.2	-1.4	340.2	341.0	-0.8	-1.00
Probe	4-6	58.4	57.4	1.0	206.4	207.8	-1.4	339.0	335.2	3.8	1.13
Probe	4-7	58.4	58.6	-0.2	204.4	205	-0.6	338.6	338.8	-0.2	-0.33
Probe	5-2	59.0	59.8	-0.8	211	214	-3.0	326.8	328.9	-2.1	-1.97
Probe	5-3	58.8	59.2	-0.4	204.2	206.4	-2.2	341.0	344.0	-3.0	-1.87
Probe	5-4	58.8	59.2	-0.4	211.2	212.2	-1.0	335.0	334.6	0.4	-0.33
Probe	5-5	59.0	61.2	-2.2	208.8	210	-1.2	365.4	365.0	0.4	-1.00
Probe	5-6	59.0	59.4	-0.4	203.8	204.6	-0.8	337.0	336.0	1.0	-0.07
Probe	5-7	59.0	59.2	-0.2	203.6	204.6	-1.0	329.2	329.2	0.0	-0.40
Probe	5-8	59.0	59.6	-0.6	211.2	213.2	-2.0	337.0	338.4	-1.4	-1.33
Probe	5-9	58.8	59.2	-0.4	211	212.4	-1.4	342.0	340.8	1.2	-0.20
Probe	7-1	59.2	59.8	-0.6	207.6	208.2	-0.6	328.0	326.4	1.6	0.13
Probe	7-2	59.2	59.6	-0.4	210.6	212.6	-2.0	343.6	342.0	1.6	-0.27
Probe	7-3	59.4	59.4	0.0	210.6	213.6	-3.0	331.4	333.8	-2.4	-1.80
Probe	7-4	59.2	59.6	-0.4	211	213	-2.0	335.2	336.4	-1.2	-1.20
Probe	7-5	59.2	60.2	-1.0	210.6	212.6	-2.0	341.0	342.2	-1.2	-1.40
Probe	7-6	59.6	59.4	0.2	210.6	212.4	-1.8	338.4	339.4	-1.0	-0.87
Probe	10-1	59.4	59.6	-0.2	211.2	213.2	-2.0	345.6	346.6	-1.0	-1.07
Probe	10-2	59.6	59.6	0.0	211	213	-2.0	346.0	347.2	-1.2	-1.07
Probe	10-3	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0.00
FS Pitot	10-S	54.0	53.8	0.2	210.8	212.8	-2.0	344.0	344.8	-0.8	-0.87
FS Pit	11-S	59.6	59.8	-0.2	210.8	213.4	-2.6	346.0	346.0	0.0	-0.93
	14-S	60.0	60.2	-0.2	210.8	212.6	-1.8	346.4	349.6	-3.2	-1.73
	F3	60.2	60.6	-0.4	209.8	210.6	-1.0	345.2	345.8	-0.6	-0.67
	F23	61.2	60.8	0.4	210.8	212.6	-1.8	344.2	345.2	-1.0	-0.80
	F51	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0.00
	F84	60.2	60.4	-0.2	209.4	210.8	-1.4	345.2	346.0	-0.8	-0.80
	F85	54.0	54.2	-0.2	210.8	213.4	-2.6	347.2	347.4	-0.2	-1.00
	A1	60.0	60.2	-0.2	210.8	212.6	-1.8	341.0	334.8	6.2	1.40
	A2	60.4	60.4	0.0	210.8	212.8	-2.0	346.6	346.6	0.0	-0.67
	A3	60.0	60.0	0.0	210.4	212.4	-2.0	346.2	346.8	-0.6	-0.87
	A5	54.2	54.2	0.0	209.6	210.4	-0.8	343.6	343.4	0.2	-0.20
	A6'	60.0	60.8	-0.8	209.4	207.4	2.0	343.8	344.1	-0.3	0.30
	B10	60.8	61.4	-0.6	211	213.6	-2.6	347.2	359.0	-11.8	-5.00
	B4	54.0	54.2	-0.2	209	214	-5.0	340.2	355.2	-15.0	-6.73
	F9	60.0	60.2	-0.2	210.4	213.2	-2.8	345.2	345.0	0.2	-0.93
	F73	61.0	61.8	-0.8	210.8	212.8	-2.0	347.8	346.6	-0.8	-1.20
	F4	60.6	60.8	-0.2	210.4	212	-1.6	348.0	347.6	0.4	-0.47
	F83	61.2	61.4	-0.2	210.8	212.4	-1.6	347.8	347.8	0.0	-0.60
	B7	60.6	61.0	-0.4	211	213.2	-2.2	340.0	342.2	-2.2	-1.60
	B15	60.4	60.6	-0.2	210.8	212	-1.2	332.0	332.4	-0.4	-0.60
	6S-2	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0.00
Probe	14-2	60.2	61.0	-0.8	210.8	211.6	-0.8	346.6	344.8	1.8	0.07
Probe	w/c 4	58.2	58.4	-0.2	210.6	212.2	-1.6	335.4	332.0	3.4	0.53
	A4	60.0	60.2	-0.2	210.6	212.6	-2.0	342.6	343.6	-1.0	-1.07
	B1	60.2	60.6	-0.4	210.4	211.2	-0.8	344.0	344.4	-0.4	-0.53
	B3	60.2	60.4	-0.2	210.6	211.6	-1.0	338.6	339.4	-0.8	-0.67
	B11	60.8	61.0	-0.2	210.4	210.2	0.2	341.2	333.4	7.8	2.60
AVERAGE		**55.1**	**55.4**	**-0.3**	**194.2**	**195.7**	**-1.5**	**318.1**	**318.6**	**-0.5**	**-0.8**
				-0.06%			**-0.23%**			**-0.06%**	
Hivol Dial Gauges											
D20				0.0	211.2	208	3.2			0.0	
D1				0.0	211.2	205	6.2			0.0	
D13				0.0	211	210	1.0			0.0	
9142				0.0	210.8	200	10.8			0.0	
D4				0.0	210.6	210	0.6			0.0	
1032				0.0	205	200	5.0	338.4	335.0	3.4	

Standard Used Fluke 5895570

Date: 8-7-00 | Deviation | @32 F | 7.4 | Pb= | 30.05 in Hg | TJR / MJE/DLR
Next Calibration: 06-01 | Limit | @212 F | 10.1 | Ta= | 55.0 oF | TCINDm00.WB1
@400 F 12.9

Thermocouple Indicator	Channel	Measured, F	Standard, F	Deviation % absolute	Measured, F	Standard, F	Deviation % absolute	Measured, F	Standard, F	Deviation % absolute	Average Deviation, %
Dial multi-indicator	1	122.0	120.0	0.3	510.0	510.0	0.0	1030.0	1029.0	0.1	0.14
	2	117.0	115.0	0.3	510.0	510.0	0.0	1030.0	1029.0	0.1	0.14
	3	117.0	115.0	0.3	510.0	510.0	0.0	1030.0	1029.0	0.1	0.14
	4	117.0	115.0	0.3	510.0	509.0	0.1	1030.0	1029.0	0.1	0.17
	5	117.0	115.0	0.3	510.0	510.0	0.0	1030.0	1029.0	0.1	0.14
	6	117.0	115.0	0.3	510.0	510.0	0.0	1030.0	1029.0	0.1	0.14
	7	110.0	108.0	0.4	510.0	510.0	0.0	1040.0	1040.0	0.0	0.12
	8	119.0	117.0	0.3	511.0	511.0	0.0	1030.0	1029.0	0.1	0.14
	9	119.0	117.0	0.3	511.0	510.0	0.1	1029.0	1029.0	0.0	0.15
	10	119.0	117.0	0.3	511.0	511.0	0.0	1030.0	1029.0	0.1	0.14
Omega trendicator	1	119.0	116.0	0.5	510.0	510.0	0.0	1026.0	1026.0	0.0	0.17
	2	119.0	116.0	0.5	510.0	510.0	0.0	1026.0	1026.0	0.0	0.17
	3	119.0	116.0	0.5	510.0	510.0	0.0	1026.0	1026.0	0.0	0.17
	4	119.0	116.0	0.5	510.0	510.0	0.0	1026.0	1026.0	0.0	0.17
	5	118.0	116.0	0.3	510.0	510.0	0.0	1026.0	1026.0	0.0	0.12
Fluke 6393007		98.0	99.0	-0.2	492.0	493.0	-0.1	1012.0	1013.0	-0.1	-0.12
Fluke 7029062		104.0	102.0	0.4	509.0	508.0	0.1	1025.0	1024.0	0.1	0.18
Fluke 72760077	1	102.0	100.2	0.3	501.0	498.6	0.3	1009.0	1007.8	0.1	0.22
	2	99.0	100.2	-0.2	498.4	498.6	-0.0	1006.4	1007.8	-0.1	-0.11
Meter Box 4	1	90.0	90.0	0.0	505.0	506.0	-0.1	1003.0	1003.0	0.0	-0.03
	2	97.0	98.0	-0.2	512.0	513.0	-0.1	1003.0	1003.0	0.0	-0.09
	3	97.0	97.0	0.0	512.0	513.0	-0.1	1012.0	1012.0	0.0	-0.03
	4	86.0	86.0	0.0	503.0	503.0	0.0	1011.0	1011.0	0.0	0.00
	5	85.0	85.0	0.0	502.0	502.0	0.0	1005.0	1005.0	0.0	0.00
Meter Box 5	1	95.0	97.0	-0.4	502.0	503.0	-0.1	1006.0	1005.0	0.1	-0.13
	2	94.0	95.0	-0.2	508.0	508.0	0.0	986.0	986.0	0.0	-0.06
	3	104.0	104.0	0.0	522.0	522.0	0.0	1000.0	1000.0	0.0	0.00
	4	97.0	98.0	-0.2	516.0	517.0	-0.1	1019.0	1018.0	0.1	-0.07
	5	88.0	90.0	-0.4	505.0	509.0	-0.4	1010.0	1010.0	0.0	-0.26
Meter Box 6	1	102.0	103.0	-0.2	502.0	502.0	0.0	1011.0	1011.0	0.0	-0.06
	2	99.0	98.0	0.2	501.0	501.0	0.0	1011.0	1011.0	0.0	0.06
	3	98.0	98.0	0.0	498.0	499.0	-0.1	1008.0	1009.0	-0.1	-0.06
	4	102.0	101.0	0.2	498.0	499.0	-0.1	1008.0	1009.0	-0.1	0.00
	5	102.0	102.0	0.0	502.0	502.0	0.0	1010.0	1011.0	-0.1	-0.02
Meter Box 7	1	98.0	97.0	0.2	497.0	497.0	0.0	1019.0	1018.0	0.1	0.08
	2	97.0	96.0	0.2	496.0	496.0	0.0	1018.0	1018.0	0.0	0.06
	3	98.0	97.0	0.2	497.0	497.0	0.0	1019.0	1018.0	0.1	0.08
	4	98.0	97.0	0.2	497.0	497.0	0.0	1019.0	1018.0	0.1	0.08
	5	98.0	97.0	0.2	497.0	497.0	0.0	1019.0	1018.0	0.1	0.08
Meter Box 8	1	101.0	101.0	0.0	501.0	500.0	0.1	1009.0	1008.0	0.1	0.06
	2	101.0	100.0	0.2	500.0	500.0	0.0	1008.0	1008.0	0.0	0.06
	3	101.0	100.0	0.2	501.0	500.0	0.1	1008.0	1008.0	0.0	0.09
	4	101.0	100.0	0.2	501.0	501.0	0.0	1009.0	1009.0	0.0	0.06
	5	100.0	100.0	0.0	500.0	500.0	0.0	1009.0	1009.0	0.0	0.00
Meter Box 9	1	100.0	101.0	-0.2	510.0	512.0	-0.2	1000.0	1000.0	0.0	-0.13
	2	101.0	102.0	-0.2	511.0	513.0	-0.2	1001.0	1000.0	0.1	-0.10
	3	101.0	103.0	-0.4	511.0	513.0	-0.2	1001.0	1000.0	0.1	-0.16
	4	100.0	102.0	-0.4	511.0	513.0	-0.2	1001.0	1000.0	0.1	-0.16
	5	100.0	102.0	-0.4	511.0	513.0	-0.2	1001.0	1000.0	0.1	-0.16
temp. control box 1	1	104.0	103.0	0.2	505.0	507.0	-0.2	997.0	992.0	0.3	0.11
	2	106.0	105.0	0.2	518.0	520.0	-0.2	1012.0	1007.0	0.3	0.10
	3	105.0	104.0	0.2	505.0	509.0	-0.4	1007.0	1003.0	0.3	0.01
	4	102.0	100.0	0.4	507.0	510.0	-0.3	1005.0	1001.0	0.3	0.11
	5	103.0	102.0	0.2	497.0	499.0	-0.2	997.0	993.0	0.3	0.08
	6	99.0	99.0	0.0	497.0	500.0	-0.3	1003.0	999.0	0.3	-0.01
temp. control box 2	1	97.0	99.0	-0.4	497.0	502.0	-0.5	988.0	990.0	-0.1	-0.34
	2	96.0	98.0	-0.4	497.0	502.0	-0.5	986.0	989.0	-0.2	-0.36
	3	97.0	98.0	-0.2	497.0	501.0	-0.4	986.0	989.0	-0.2	-0.27
	4	98.0	100.0	-0.4	498.0	503.0	-0.5	986.0	988.0	-0.1	-0.34
	5	97.0	94.0	0.5	497.0	501.0	-0.4	986.0	987.0	-0.1	0.02
	6	96.0	98.0	-0.4	499.0	503.0	-0.4	985.0	988.0	-0.2	-0.33
Van II Heater Controls	1	95.0	94.0	0.2	491.0	496.0	-0.5	1018.0	1090.8	-4.7	-1.68
	2	93.0	92.0	0.2	490.0	498.0	-0.8	1020.0	1021.0	-0.1	-0.24
	3	37.0	35.0	0.4	258.0	259.0	-0.1	548.0	548.0	0.0	0.09
	4	37.0	34.0	0.8	255.0	258.0	-0.4	549.0	549.0	0.0	0.06
											0.00
											0.00
											0.00
											0.00
AVERAGE		**100.98**	**100.42**	**0.10**	**496.78**	**497.93**	**-0.12**	**997.05**	**997.76**	**-0.04**	**-0.02**

Standard used, fluke 5895570 calibrated 4-1-98 by Grant Edgle Co.

HORIZON ENGINEERING

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

(Serial No. M94064)

On June 20, 2000, the Shortridge SR1 digital manometer was calibrated against a zero to three-inch incline manometer. The table below shows the results.

Incline Manometer	Shortridge 1
0.00	0.0000
0.05	0.0504
0.10	01075
0.15	0.1515
0.20	0.2030
0.30	0.3037
0.40	0.4030
0.50	0.5060
0.70	0.7040
0.90	0.9030
1.10	1.1010
1.50	1.500
2.00	1.948
2.50	2.501
2.90	2.895

TJH

HORIZON ENGINEERING

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

a No. M961010)

On June 20, 2000, the Shortridge SR2 digital manometer was calibrated against a zero to three-inch incline manometer. The table below shows the results.

Incline Manometer	Shortridge 2
0.00	0.0000
0.05	0.0450
0.10	01047
0.15	0.1495
0.20	0.2049
0.30	0.3085
0.40	0.4145
0.50	0.5177
0.70	0.7107
0.90	0.9162
1.10	1.090
1.50	1.511
2.00	2.010
3.00	2.911

TJH

Magnehelic Calibrations

Date	02-Feb-00							MG020220	File
Testers	cdb							00.0	Temp.(F)
Location	Whitaker Shop							30.60	Pb(in H2O)
								0-3Inc/MB-1	Manometer
Magnehelic ID	**15 sec. High**	**leak check Low**	**Scale Inches**	**Magnehelic in H2O**	**Manometer in H2O**	**Differance in H2O**	**Differance %**		**Difference Average**
1-A	OK	OK	1	0.000	0.000	0.000	0.0%		
				0.300	0.300	0.000	0.0%		
				0.600	0.590	-0.010	-1.7%		
				0.940	0.940	0.000	0.0%		**-0.4%**
1-C	n/a	n/a	1	0.000	0.000	0.000	0.0%		
21-sept-99				0.000	0.000	0.000	ERR		
				0.000	0.000	0.000	ERR		
				0.000	0.000	0.000	ERR		**ERR**
1-E	ok	ok	1	0.000	0.000	0.000	0.0%		
				0.130	0.140	0.010	7.1%		
				0.440	0.440	0.000	0.0%		
				0.820	0.840	0.020	2.4%		**2.4%**
1-F ✓	OK	OK	1	0.000	0.000	0.000	0.0%		
				0.220	0.240	0.020	8.3%		
				0.460	0.470	0.010	2.1%		
				0.740	0.760	0.020	2.6%		**3.3%**
1-G	OK	OK	1	0.000	0.000	0.000	0.0%		
				0.190	0.190	0.000	0.0%		
				0.480	0.460	-0.020	-4.3%		
				0.840	0.790	-0.050	-6.3%		**-2.7%**
1-H	OK	OK	1	0.000	0.000	0.000	0.0%		
				0.600	0.590	-0.010	-1.7%		
				0.800	0.800	0.000	0.0%		
				1.000	1.020	0.020	2.0%		**0.1%**
1-I	OK	OK	1	0.000	0.000	0.000	0.0%		
21-sept-99				0.920	0.950	0.030	3.2%		
				0.670	0.670	0.000	0.0%		
				0.300	0.290	-0.010	-3.4%		**-0.1%**
1-K	OK	OK	1	0.000	0.000	0.000	0.0%		
				0.210	0.220	0.010	4.5%		
				0.330	0.340	0.010	2.9%		
				0.800	0.780	-0.020	-2.6%		**1.2%**
1-L	OK	OK	1	0.000	0.000	0.000	0.0%		
				0.120	0.120	0.000	0.0%		
				0.510	0.510	0.000	0.0%		
				0.940	0.980	0.040	4.1%		**1.0%**
2-A	OK	OK	2	0.000	0.000	0.000	0.0%		
				0.850	0.850	0.000	0.0%		
				0.450	0.450	0.000	0.0%		
				1.600	1.600	0.000	0.0%		**0.0%**
2-B	OK	OK	2	0.000	0.000	0.000	0.0%		
				0.500	0.480	-0.020	-4.2%		
				0.870	0.870	0.000	0.0%		
				1.400	1.400	0.000	0.0%		**-1.0%**
2-C	OK	OK	2	0.000	0.000	0.000	0.0%		
				0.400	0.400	0.000	0.0%		
				0.720	0.720	0.000	0.0%		
				1.500	1.500	0.000	0.0%		**0.0%**
2-D	OK	OK	2	0.000	0.000	0.000	0.0%		
10-Feb-99				0.450	0.470	0.020	4.3%		
				1.050	1.000	-0.050	-5.0%		
				1.700	1.660	-0.040	-2.4%		**-0.8%**
2-E	OK	OK	2	0.000	0.000	0.000	0.0%		
				0.350	0.350	0.000	0.0%		
				0.750	0.740	-0.010	-1.4%		
				1.750	1.800	0.050	2.8%		**0.4%**
3-A	OK	OK	3	0.000	0.000	0.000	0.0%		
10-Feb-99				0.550	0.550	0.000	0.0%		
				1.500	1.500	0.000	0.0%		
				2.980	3.000	0.020	0.7%		**0.2%**
3-H	OK	OK	3	0.000	0.000	0.000	0.0%		
10-Feb-99				0.500	0.500	0.000	0.0%		
				1.500	1.530	0.030	2.0%		
				2.500	2.510	0.010	0.4%		**0.6%**

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

October 27, 2000
Horizon Engineering shop
Barometer Calibration

The Barometric pressure reported at Portland Troutdale airport was 29.83" Hg and was corrected to the altitude of the Horizon Engineering shop. The barometer reading in TVIII was 29.89"Hg. The barometer reading in TVII was 29.61" Hg. The barometer reading in TVI was 29.92" Hg. All pressures are absolute read at the horizon engineering shop.

DLR

n.s | Morgan Wiest

These filters are stored in the desiccator

	9-25-00	9-26-00	9-27-00	9-28-00
6855673 ✓	4.2900	4.2902		
674	4.2865	4.2867		
675	4.2859	4.2861		
676	4.2995	4.2994		
677	4.2824	4.2825		
6855678	4.3026	4.3029		
679	4.2872	4.2875		
680	4.2569	4.2571		
681	4.2463	4.2464		
682	4.2518	4.2521		
6855683 ✓	4.2405	4.2413	4.2416	
684	4.2435	4.2439		
685	4.2228	4.2231		
686	4.2506	4.2510		
687 ✓	4.2098	4.2107	4.2109	
6855688 ✓	4.2623	4.2630	4.2633	
689 ✓	4.2208	4.2215	4.2213	
690	4.2323	4.2331	4.2328	
691	4.2318	4.2328	4.2326	
692	4.2400	4.2417	4.2413	
6855693	4.2549	4.2563	4.2561	
694	4.2627	4.2638	4.2633	
695	4.2418	4.2430	4.2427	
696	4.2732	4.2741	4.2738	
6855697	4.2348	4.2355	4.2355	
698	4.2693	4.2707	4.2703	
699	4.2918	4.2938	4.2930	4.2936
700	4.2785	4.2785		
6776126	4.2571	4.2575		
6776127	4.2424	4.2433	4.2434	
128	4.2352	4.2363	4.2360	
129	4.2691	4.2700	4.2693	4.2696
130	4.2512	4.2521	4.2518	
131	4.2336	4.2347	4.2346	
6776132	4.2556	4.2570	4.2562	4.2561
133	4.2400	4.2409	4.2405	
134	4.2330	4.2343	4.2335	4.2338
135	4.2531	4.2544	4.2536	4.2535
136	4.2689	4.2703	4.2696	4.2697

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

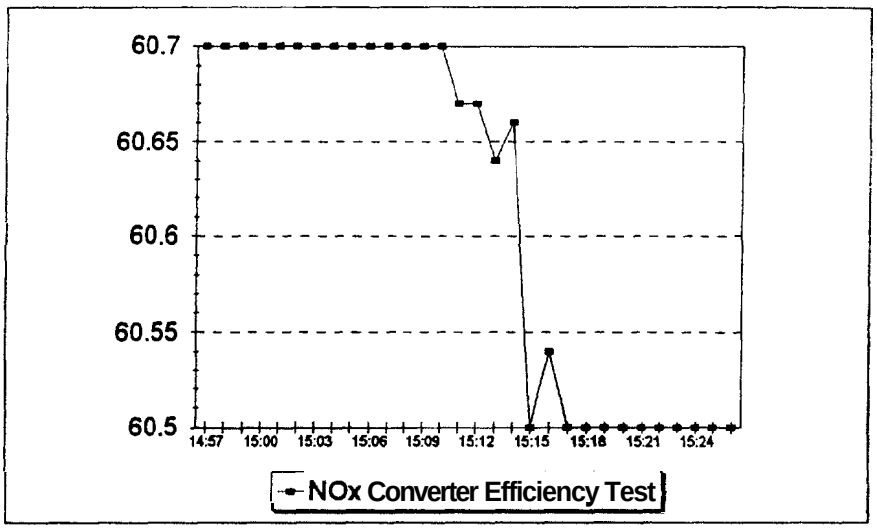
NOx Converter Efficiency Data

Thermo Environmental Model 42C

Date 11-Jan-2000

	Pretest	Post test
Zero	0.06	0.26
Span	182.60	182.40
Mid	89.10	89.32
Time	14:39	15:35

Readings	Time
60.7	14:57
60.7	14:58
60.7	14:59
60.7	15:00
60.7	15:01
60.7	15:02
60.7	15:03
60.7	15:04
60.7	15:05
60.7	15:06
60.7	15:07
60.7	15:08
60.7	15:09
60.7	15:10
60.67	15:11
60.67	15:12
60.64	15:13
60.66	15:14
60.5	15:15
60.54	15:16
60.5	15:17
60.5	15:18
60.5	15:19
60.5	15:20
60.5	15:21
60.5	15:22
60.5	15:23
60.5	15:24
60.5	15:25
60.5	15:26



Percent Loss= 0.329

PASS

Cyl #	EPA Value	Conc.
32	182.5	ppm
25	91.3	ppm
R4	0	ppm

06-23-00

SCOTT-MARRIN, INC.

6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

#15

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01
TO: DAVID ROSSMAN
HORIZON ENGINEERING/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND OR 97230

DATE: June 15 2000

CUSTOMER ORDER NUMBER: 002945

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO:	CC97886					
			VARIAN MODEL 1860 TCD		06/07/00	
Carbon Dioxide	6.02 ± 0.07 %	GMIS	S/N NONE	06/07/02	6.05 %	
		CYUNDER#:	THERMAL CONDUCTIVITY		6.01 %	
		CC86199	GAS CHROMATOGRAPHY		6.00 •	
		@7.25 •	LAST CAL DATE: 05/25/00	MEAN:	6.02 •	
			BOVAR MODEL 922M		06/07/00	06/15/00
Nitric Oxide	50.0 ± 0.3 ppm	GMIS	S/N VD92284844	06/15/02	49.6 ppm	50.1 ppm
NOx	50.0 ppm	CYUNDER#:	CONTINUOUS		49.8 ppm	50.5 ppm
		CC108765	W PHOTOMETRY		49.8 ppm	50.1 ppm
		@50.3 ppm	LAST CAL DATE: 05/18/00	MEAN:	49.7 ppm	50.2 ppm
			CARLE INST MODEL 8000		06/07/00	06/15/00
Carbon Monoxide	304 ± 3 ppm	GMIS	S/N 8249	06/15/02	303 ppm	304 ppm
		CYLINDER#:	METHANATION/FID		304 ppm	304 ppm
		CC42843	GAS CHROMATOGRAPHY		304 ppm	305 ppm
		@286.7 ppm	LAST CAL DATE: 06/13/00	MEAN:	304 ppm	304 ppm
			VARIAN MODEL 1860 FID		06/06/00	
Propane .	27.79 ± 0.22 ppm	GMIS	S/N NONE	06/06/02	27.79 ppm	
		CYLINDER#:	FLAME IONIZATION		27.80 ppm	
02-free Nitrogen	Balance	CC121986	GAS CHROMATOGRAPHY		27.77 ppm	
CYLINDER PRESSURE:	2000 psig	@50.6 ppm	LAST CAL DATE: 06/02/00	MEAN:	27.79 ppm	

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: M.S. CALHOUN APPROVED: J.D. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

#22
PO#303

SCOTT-MARRIN, INC.

6541 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507 (909) 653-7080 • FAX (909) 653-7087

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01
TO: DAVID ROSSMAN
HORIZON ENGINEERING/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230

DATE: September 5 2000

CUSTOMER ORDER NUMBER: 003030

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, YODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO:	**CC1859**					
			VARIAN MODEL 1860 TCD		08/23/00	
Carbon Dioxide	12.52 ± 0.05%	GMIS	S/N NONE	08/23/02	12.51 %	
		CYLINDER #:	THERMAL CONDUCTIVITY		12.53 %	
		CC122859	GAS CHROMATOGRAPHY		12.51 %	
		@ 17.93%	LAST CAL DATE: 08/21/00	MEAN:	12.52 %	
			BOVAR MODEL 922M		08/16/00	08/23/00
Nitric Oxide	90.3 ± 1.1 ppm	GMIS	S/N VD92284844	08/23/02	90.5 ppm	89.7 ppm
NOx	90.3 ppm	CYLINDER I:	CONTINUOUS		90.1 ppm	90.8 ppm
		CA01327	UV PHOTOMETRY		90.0 ppm	90.6 ppm
		@ 98.6 ppm	LAST CAL DATE: 08/16/00	MEAN:	90.2 ppm	90.4 ppm
			CARLE INST MODEL 8000		08/17/00	08/30/00
Carbon Monoxide	508 ± 5 ppm	GMIS	S/N 8249	08/30/02	507 ppm	506 ppm
		CYLINDER #:	METHANATION/FID		507 ppm	508 ppm
		CC278	GAS CHROMATOGRAPHY		508 ppm	509 ppm
		@ 539 ppm	LAST CAL DATE: 08/15/00	MEAN:	507 ppm	508 ppm
			VARIAN MODEL 1860 FID		09/05/00	
Propane	49.5 ± 0.5 ppm	GMIS	S/N NONE	09/05/02	49.2 ppm	
		CYLINDER #:	FLAME IONIZATION		49.7 ppm	
Nitrogen, 02-free	Balance	CC121986	GAS CHROMATOGRAPHY		49.6 ppm	
CYLINDER PRESSURE: 2000 psig		@ 50.6 ppm	LAST CAL DATE: 09/05/00	MEAN:	49.5 ppm	

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: M.S. CALHOUN APPROVED: J.T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

E 35 ppm
9/25/00

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01
TO: DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND OR 97230

DATE: September 21 2000

CUSTOMER ORDER NUMBER: 003073

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO:	CC53889					
			VARIAN MODEL 1860 TCD		09/21/00	
Carbon Dioxide	21.86 ± 0.06 %	GMIS	S/N NONE	09/21/02	21.84 %	
		CYLINDER#:	THERMAL CONDUCTIVITY		21.84 %	
		CC122859	GAS CHROMATOGRAPHY		21.89 %	
		@17.93 %	LAST CAL DATE: 09/21/00	MEAN:	21.86 %	
			BOVAR MODEL 92W		09/13/00	09/20/00
Nitric Oxide	183.0 ± 1.1 ppm	GMIS	S/N VD92284844	09/20/02	183.1 ppm	182.7 ppm
NOx	183.0 ppm	CYLINDER #:	CONTINUOUS		183.4 ppm	182.9 ppm
		CC72078	UV PHOTOMETRY		182.7 ppm	183.2 ppm
		@258.5 ppm	LAST CAL DATE: 09/13/00	MEAN:	183.1 ppm	182.9 ppm
			CARLE INST MODEL 8000		09/06/00	09/21/00
Carbon Monoxide	898 ± 9 ppm	GMIS	S/N 8249	09/21/02	897 ppm	900 ppm
		CYLINDER #:	METHANATION/FID		899 ppm	899 ppm
		CC108729	GAS CHROMATOGRAPHY		896 ppm	899 ppm
		@1106 ppm	LAST CAL DATE: 09/20/00	MEAN:	897 ppm	899 ppm
			VARIAN MODEL 1860 FID		09/07/00	
Propane	86.5 ± 0.9 ppm	GMIS	S/N NONE	09/07/02	86.9 ppm	
		CYLINDER #:	FLAME IONIZATION		86.6 ppm	
02-free Nitrogen	Balance	CC51261	GAS CHROMATOGRAPHY		86.1 ppm	
CYLINDER PRESSURE: 2000 psig		@104.1 ppm	LAST CAL DATE: 09/05/00	MEAN:	86.5 ppm	

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: M.S. CALHOUN APPROVED: J.T. MARRIN

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

SCOTT-MARRIN, INC.

TELEPHONE (909) 653-7780 RIVERSIDE, CA 92507-2460

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

#02
P.O. 3096

HENG01

TO: DAVID ROSSMAN
HORIZON ENGINEERING/
INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

DATE : 09/28/00

CUSTOMER ORDER NUMBER: 003096

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CC53843				
			Varian Model 1860		09/28/00
Oxygen	11.61 ±.28 %	GMIS Cylinder #	S/N None Thermal Conductivity	09/28/03	11.52 % 11.70 %
Nitrogen	Balance	CC50175	Gas Chromatography		11.60
Cylinder Pressure: 2000 psig		@ 25.69 s	Last Cal Date: 09/27/00		Mean: 11.61 %

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.

This cylinder should not be used if the pressure is less than 150 psig.

Analyst: _____ M.S. Calhoun

Approved: _____ J.T. Marrin

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

E#R9 Temp.
002774 of
For: BF Job #113
Ft. Jame

BYRNE SPECIALTY GASES

206.621.8400

Certificate of Analysis: E.P.A. Protocol Gas Mixture

Customer	Airgas West	**P.O.**	700794/BYRNE
Cylinder No :	CC44545	**Order No.**	538395-00
Cylinder Pressure:	2000	**Expiration Date:**	5/1/00
Certification Date	1111/99	**Laboratory:**	LOS ANGELES

Reference Standard Information:

Type	Comvonent	Cvl. Number	Concentration
GMIS	Sulfur Dioxide	CC38281	51.1 PPM

Instrumentation:

Instrument/Model/Serial No.	Analytical Principle
Seimens/Ultramat 5E	NDIR

Analytical Methodology does not require correction for analytical interferences.

Certified Concentrations:

Component	Concentration	Accuracy	Procedure
Sulfur Dioxide	26.4 PPM	+/- 1%	G1
Nitrogen	Balance		

Analytical Results:

1st Component: Sulfur Dioxide

1st Analysis Date: 10125199

R	98.000	S	50.800	Z	0.000	Conc	26.489 PPM
S	50.800	Z	0.000	R	98.000	Conc	26.489 PPM
Z	0.000	R	98.000	S	56.800	Conc	26.489 PPM
						AVG:	26.489 PPM

2nd Analysis Oate: 1111199

R	98.500	S	50.800	Z	0.000	Conc	26.354 PPM
S	50.800	Z	0.000	R	98.500	Conc	26.354 PPM
Z	0.000	R	98.500	S	50.800	Conc	26.354 PPM
						AVG:	26.354 PPM

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed.

Do not *use* **cylinder below 150 psig.**

Approved for Release

Airgas
Specialty Gases
11711 S. Alameda Street
Los Angeles, CA 90059-2130
(323) 357-6891
FAX. (323) 567-3686

R14

Certificate of Analysis: E.P.A. Protocol Gas Mixture

Customer:	Airgas Pacific	P.O.	94987
Cylinder No :	CC66028	Order No.	895310-00
Cylinder Pressure:	1900	Expiration Date:	1/22/01
Certification Date	7/22/00	Laboratory:	LOS ANGELES

Reference Standard Information:

Type	Component	Cyl. Number	Concentration
GMIS	Sulfur Dioxide	CC49561	50.6 PPM

Instrumentation:

Instrument/Model/Serial No.	Analytical Principle
Siemens/Ultramat 5E	NDIR

Analytical Methodology does not require correction for analytical interferences.

Certified Concentrations:

Component	Concentration	Accuracy	Procedure
Sulfur Dioxide	9.39 PPM	+/- 1%	G1
Nitrogen	Balance		

Analytical Results:

1st Component: Sulfur Dioxide

1st Analysis Date: 7/15/00

R	97.500	S	18.100	Z	0.000	Conc	9.393 PPM
S	18.100	Z	0.000	R	97.500	Conc	9.393 PPM
Z	0.000	R	97.500	S	18.100	Conc	9.393 PPM
						AVG:	3.393 PPM

2nd Analysis Date: 7/22/00

R	97.500	S	18.100	Z	0.000	Conc	9.393 PPM
S	18.100	Z	0.000	R	97.500	Conc	9.393 PPM
Z	0.000	R	97.500	S	18.100	Conc	9.393 PPM
						AVG:	9.393 PPM

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed.

Do not use cylinder below 150 psig.

Approved for Release

9(

Polar Cryogenics Inc.

■ Specialty Gas ■ Cryogenics ■ Bulk Gases ■ Liquid Helium

A3

Certificate of Analysis

Customer: Horizon Engineering 5-31-2000
Product: Air
Grade: Ultra Zero
Cylinder Number: cc101218
Lot Number: E3101302

Purity Analysis

Component	Specification	Actual Concentration	Analytical Method
Air	Ultra Zero grade	Ultra Zero grade	
Oxygen	<21 %	20.7%	GC-TCD
H_2O	< 2.0 ppm	1.6 pprn	Meeko Aquamatic
THC	< 0.1 pprn	0.01 ppm	Varian GC/MS
CO	< 1.0 pprn	0.23 pprn	Varian GC/MS
C02	< 1.0 pprn	0.12 pprn	Varian GC/MS
NO	< 0.1 pprn	<0.1 pprn	Varian GC/MS

I certify the above referenced cylinder was analyzed and found to contain the listed concentrations.

Stephanie Dazer

Stephanie Dazer, Chemist

5.31.00
Date

Shipping Address: 2734 SE Raymond ■ Portland. Oregon 97202
PO. Box 82039 ● Portland, Oregon 97282 ■ (503)239-5252 ■ (800)426-0689 ● Fax (503)236-0486

Polar Cryogenics Inc.

■ Specialty Gas ■ Cryogenics ■ Bulk Gases ■ Liquid Helium

Certificate of Analysis

16

Customer: Horizon Engineering **Date: 5-10-00**
Product: Nitrogen
Grade: Zero, 99.998% Purity
Cylinder Number: cc180290
Lot Number: E08013

Purity Analysis

Component	Specification	Actual Concentration	Analytical Method
Nitrogen	99.998%	>99.998%	Difference
H_2O	< 5.0 ppm	0.8 ppm	Meeko Tracer
THC	< 0.5 ppm	0.1 ppm	Varian GC/MS
CO	< 1.0 ppm	0.3 ppm	Varian GC/MS
C02	< 1.0 ppm	0.1 ppm	Varian GC/MS
NO	< 0.1 ppm	< 0.1 ppm	Varian GC/MS

I certify the above referenced cylinder was analyzed and found to contain the listed concentrations.

Stephanie Dazer
Stephanie Dazer, Chemist

5.10.00
Date

Shipping Address: 2734 SE Raymond ■ Portland, Oregon 97202
P.O. Box 82039 ■ Portland, Oregon 97282 ■ (503) 239-5252 ■ (800) 426-0689 ■ Fax (503) 236-0486

01-22-01

ANTECH

Analysis/Technology

Mr. David Rossman
HORIZON ENGINEERING
13585 NE Whitaker
Portland OR 97220

Jaunuary 15, 2001 Identification: OR-DEQ
Job# 0036402-04 Received: 12/30/00 (Horizon # ?)

Sample #	36402	36403	36404
Identification	AMM1-113	AML2-124	FMH1-101
Aqueous nitric Acid solution:			
Volume (mls)	11.0	10.9	
Residue (g)	0.0023	0.0002	
Filters:			
Number:			FMH1-101
Residue (g)			0.6087*

*avg-no tare Weight available

Respectfully submitted:
ANTECH

Diana Tracy, president

501 N.E. THOMPSON MILL ROAD
CORBETT, OREGON 97019
503/695-2135
FAX 503/695-2139

ANTECH
SAMPLE DATA: EPA RESIDUES

Analyst: mm reviewer:
Job: 364 Identification: OR-DEQ

[redacted]: Aqueous nitric acid solution

Sample #	36402		36403			
Sample ID	AMM1-113		AML2-124			
vol mark						
Date/time	1-1-01 9A		1-1-01 9A			
Into dessicator						
Vol(mls)	11.0 mL	date/time weighed	10.9 mL	date/time weighed		date/time weighed
GWt1(g)	111.7357	1-2 9A	87.9813	1-2 9A		
GWt2(g)	111.7356	1-3 9A	87.9815	1-3 9A		
GWt3(g)	111.7360	1-5 9A	87.9814	1-5 9A		
GWt4(g)			87.9821	1-7 11A		
GWt5(g)			87.9816	1-8 10A		
GWt6(g)						
Average	111.7357		87.9819			
Tare (g)	111.7334	12-31 1P	87.9817	12-31 1P		
Net (g)	.0023		.0002			

BACK ACETONE.

Sample #						
Sample ID						
vol mark						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

ANTECH
SAMPLE DATA: EPA RESJDUES (page 3)

FLTERS:

Sample #	36404							
Sample ID	FM11-101							
Date/time	12-29 9A							
In dessicator								
		Date/time			Date/time			Date/time
GWt1(g)	.6106	1-2 9A						
GWt2(g)	.6093	1-3 9A						
GWt3(g)	.6088	1-4 8A						
GWt4(g)	.6086	1-5 9A						
Average	.6087							
Tare (g)	*							
Net (g)								

FILTERS:

Sample #								
Sample ID								
Date/time								
In dessicator								
		Date/time			Date/time			Date/time
GWt1(g)								
GWt2(g)								
GWt3(g)								
GWt4(g)								
Average								
Tare (g)								
Net (g)								

QC DATA:

Date/time	1-2	1-3	1-4	1-5	1-7	1-8
Balance calibrated	✓	✓	✓	✓	✓	✓
(NTIS cert wts)	✓	✓	✓	✓	✓	✓
Date/time	9A	9A	8A	8A	10A	8A
Temp/temp	71/59	70/58	70/59	7	71/58	70/57
Relative humidity (%)	49	48	50	48	45	44

* I have no tare wt for this filter no

Case Narrative

ESL Job: 0101063 **January 25, 2001**
Run Batch: ICP_010122C
Prep Batch: 2273

The two Lead Spiked Aqueous Solution samples numbered 0036402 and 0036403 were brought in two 400ml beakers. The aqueous samples were evaporated off and only the residue was left in the beakers. The Audit directions for these samples requested 1:2 and 1:5 time dilutions respectively. Since the samples had gone dry, I brought them up to a volume of 10 ml of dilute Nitric Acid (as per the approximate initial volume) and then proceeded to perform the requested dilutions prior to running.

Please do not hesitate to call if there are any questions, or if we can be of further assistance in this project. Thank you.

Leslie Crow, Chemist

01/25/2001 03:29 FAX

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**FMH1-101 (Filter)**
Lab Order:	**0101063**	**Tag Number:**	
Project:	**OSM-1536**	**Collection Date:**	1/11/01
Lab ID:	**0101063-11A**	**Matrix:**	**SOLID**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				**Analyst: lmc**
Lead	947	1.00		ug	1	1/22/01

Qualifiers:

- **ND** - Not Detected at the Reporting Limit
- **J** - Analyte detected below quantitation limits
- **B** - Analyte detected in the associated Method Blank
- **•** - Value exceeds Maximum Contaminant Level
- **S** - Spike Recovery outside accepted recovery limits
- **R** - RPD outside accepted recovery limits
- **E** - Value above quantitation range

Environmental Services Laboratory

Date: 25-Jan-01

CLIENT:	Horizon Engineering	Client Sample ID:	36402 H20
Lab Order:	0101063	Tag Number:	
Project:	OSM-1536	Collection Date:	1/11/01
Lab ID:	0101063-08A	Matrix:	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60108**				**Analyst: lmc**
Lead	21.6	0.00500		ug/ml	1	1/22/01

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- • - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Environmental Services Laboratory

Date: *25-Jan-01*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**36403 H2O**
Lab Order:	**0101063**	**Tag Number:**	
Project:	**OSM-1536**	**Collection Date:**	**1/11/01**
Lab ID:	**0101063-09A**	**Matrix:**	**AQUEOUS**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**				**Analyst: lmc**
Lead	0.290	0.00500		ug/ml	1	1/22/01

Qualifiers:

- **ND** - Not Detected at the Reporting Limit
- **J** - Analyte detected below quantitation limits
- **B** - Analyte detected in the associated Method Blank
- **•** - Value exceeds Maximum Contaminant Level
- **S** - Spike Recovery outside accepted recovery limits
- **R** - RPD outside accepted recovery limits
- **E** - Value above quantitation range

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way
Portland, OR 97230
Ph. (503)255-5050
Fax (503)255-0505
horizone@teleport.com

ENVIRONMENTAL SERVICES LAB.
503-670-8520

CHAIN OF CUSTODY REPORT

Work Order #

REPORT TO:	HORIZON ENGINEERING
ATTENTION	MIKE WALLACE
ADDRESS	13585 NE WHITAKER WAY PORTLAND, OREGON 97230
PHONE	503-255-5050 FAX: 503-255-0505
PROJECT NAME:	OSM AUDIT SAMPLES
PROJECT NUMBER	1536
SAMPLED BY	

INVOICE TO:	HORIZON ENGINEERING
ATTENTION:	PENNY ROSSMAN
ADDRESS:	- SAME -
P.O. NUMBER:	QUOTE #:

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day

OTHER Specify

* Turnaround Requests less than standard may incur Rush Charges

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	SAMPLE ID (Laboratory Use Only)	Analysis Request: LEAD	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1 FMH1-101 (FILTER)		0101063-11	X			
2 AML2-124 (LIQ)		-12	X			
3 AMM1-113 (LIQ)		-13	X			
4						
5						
6						
7						
8						
9						
10						

RELINQUISHED BY: Monika Kutrzuz	DATE: 1/11/01	RECEIVED BY:	DATE 1/11/01
PRINT NAME	FIRM: TIME:	PRINT NAME: JEREMY ROMEY	FIRM: ESL TIME 2:45
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE
PRINT NAME	FIRM: TIME:	PRINT NAME:	FIRM: TIME

ADDITIONAL REMARKS PLEASE ANALYZE THESE AT THE SAME TIME AS THE OSM 1536 SAMPLES. PLEASE FOLLOW INSTRUCTION SHEETS AND PROVIDE RESULTS ALSO ON REPORTING FORMS.

0036405
0101063-08 A

Method 12 Compliance Audit Material
(Lead Spiked Aqueous Solution)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M12 - 0020 - 01 / AMM1 - 113 Date Issued: 12/06/00

Concentration Level: Medium

Auditee:

Company: Horizon Engineering, LLC

Address: 13585 NE Whitaker Way, Portland, OR, 97230

Attention of: Michelle Kinney Phone: (503) 255-5050

Requestor:

Agency: OR - DEQ

Address: 2020 SW 4th Street, Suite 400, Portland, OR, 97201

Attention of: Jack Herbert Phone: (503) 229-5579

Project Name: OR Steel Mills

Audit Results (Results in µg/mL)

Compound	Result
Lead	21.6 µg/ml

36403
0101063-09A

Method 12 Compliance Audit Material
(Lead Spiked Aqueous Solution)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M12 - 0020 - 02 / AML2 - 124 Date Issued: 12/06/00

Concentration Level: Low

Auditee:

Company: Horizon Engineering, LLC

Address: 13585 NE Whitaker Way, Portland, OR, 97230

Attention of: Michelle Kinney Phone: (503) 255-5050

Requestor:

Agency: OR - DEQ

Address: 2020 SW 4th Street, Suite 400, Portland, OR, 97201

Attention of: Jack Herbert Phone: (503) 229-5579

Project Name: OR Steel Mills

Audit Results (Results in µg/mL)

Compound	Result
Lead	0.29 µg/ml

D0360404
0101063-10A

Method 12 Compliance Audit Material
(Lead Spiked Filter)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M12 - 0017 - 01 / FMHI - 101 Date Issued: 12/06/00

Concentration Level: High1

Auditee:

Company: Horizon Engineering, LLC

Address: 13585 NE Whitaker Way, Portland, OR, 97230

Attention of: Michelle Kinney Phone: (503)255-5050

Requestor:

Agency: OR - DEQ

Address: 2020 SW 4th Street, Suite 400, Portland, OR, 97201

Attention of: Jack Herbert Phone: (503)229-5579

Project Name: OR Steel Mills

Audit Results (Results in µg)

Compound	Result
Lead	947 ug

The three tests earlier this year found 10 to 700 ppm carbon monoxide. 19.8 to 20.6 percent oxygen, and 0.1 to 1.8 percent carbon dioxide.

For carbon monoxide, accurate calibrations from about 20 to about 300 or 500 ppmv have been important to obtain accurate total emissions. Horizon's analyzer with two ranges seems capable of giving more reliable calibrations over this entire range of significant emissions than a single upscale calibration would. You would need to measure the analyzer linearity and the system bias of each range.

With one carbon-monoxide range, corrected low readings should be similar with low or high upscale calgases. Please check upscale system biases with a low level (20 to 50 ppmv) and a high level (probably 200 to 500 ppmv, or as high as necessary). Check linearity with three suitable non-zero calgases.

3. The EPA Emission Measurement Center has sent lead audit samples to Horizon Engineering. Send the lead audit samples with the field samples to your two laboratories for side-by-side processing. The laboratory that measures particulate samples must accurately report each audit-solution volume. The audit is of the lead concentration. The volumes are about 10 mL -- about five percent of field-rinse volumes. Total lead may also be much smaller.

4. The laboratory performing lead analyses should record how they treat samples and perform quality control. Section 8 in your plan identifies essential quality control.

5. Leak checks and system bias checks are before and after each run. See Section 6.

6. Reports include field charts of analyzer readings. Please change Section 6.

7. Oregon Steel Mills is to document any significant furnace production delays.

8. Oregon Steel Mifls is to send me one (1) test report within seventy-five (75) days after testing.

Please call me at 503-229-5579 if you have questions or change the lest schedule or plan. My fax number is 229-5265. Herbert.jack@deq.state.or.us is my email address.

Sincerely,

Jack Herbert
Source Testing Coordinator

JHH

c: Greg Grunow:NWR

QUALITY ASSURANCE AND QUALITY CONTROL DOCUMENTATION

Introduction The QA procedures outlined in the U. S. Environmental Protection Agency (EPA) test methods are followed, including procedures, equipment specifications, calibrations, sample extraction and handling, calculations, and performance tolerances. Many of the checks performed have been cited in the Sampling section of the report text. The results of those checks are on the applicable field data sheets in the Appendix.

Continuous Analyzer Methods Field crews operate the continuous analyzers according to the test method requirements, and Horizon's additional specifications. On site quality control procedures include:

- calibrations with EPA Protocol 1 gases or NIST traceable gases
- pre-test zero and span checks and linearity test
- bias checks (introducing calibration gas as near to the probe tip as possible)
  calibration error (linearity) checks if any analyzer adjustments are made
  leak checks on the gas sampling system
- correction of problems that show up as the results of checks
- strip chart recordings for backup to the electronic data acquisition system

Manual Equipment QC Procedures On site quality control procedures include pre- and post-test leak checks on trains and pitot systems. If pre-test checks indicate problems, the system is fixed and rechecked before starting testing. If post-test leak checks are not acceptable, the test run is voided and the run is repeated. Thermocouples and readouts are verified in the field to read ambient prior to the start of any heating or cooling devices. Nozzles are checked for nicks or dents and are measured on three diameters twice each year.

Sample Handling Samples taken during testing are handled to prevent contamination from other runs and ambient conditions. Sample containers are glass, Teflon™, or polystyrene (filter petri dishes) and are pre-cleaned by the laboratory and in the Horizon Engineering shop. Sample levels are marked on containers and are verified by the laboratory. All particulate sample containers are kept upright and are delivered to the laboratory by Horizon personnel.

Data Processing Personnel performing data processing double-check that data entry and calculations are correct. Results include corrections for field blanks and analyzer drift. Any abnormal values are verified with testing personnel and the laboratory, if necessary.

After results are obtained, the data processing supervisor validates the data with the following actions:

- verify data entry
- check for variability within replicate runs
- account for variability that is not within performance goals (check the method, testing, and operation of the plant)
- verify field quality checks

Equipment Calibrations Periodic calibrations are performed on each piece of measurement equipment according to manufacturers' specifications and applicable test method requirements. The Oregon Department of Environmental Quality (ODEQ) Source Testina Calibration Requirements sheet is used as a guideline. Calibrations are performed using primary standard references and calibration curves where applicable.

Thermocouples Thermocouples are calibration checked against an NIST traceable thermocouple and indicator system every six months at three points. Thermocouple indicators and temperature controllers are checked using a NIST traceable signal generator. Readouts are checked over their usable range and are adjusted if necessary (which is very unusual).

Pitots Every six months, S-type pitots are checked for misalignment, angles, lengths, and proximity to thermocouples. They are then calibrated in a wind tunnel at four points against a standard pitot using inclined manometers. They are examined for dents or distortion before each test. Pitots are protected with covers during storage and handling until they are ready to be inserted in the sample ports.

Dry Gas Meters Dry gas meters used in the manual sampling trains are calibrated at five rates using a standard dry gas meter that is never taken into the field. The standard meter is calibration verified by the Northwest Natural Gas meter shop once every year. Dry gas meters are post-test calibrated with documentation provided in test reports.

High **Volume Sampler Orifice** The orifice for the High Volume sampler is calibrated annually against a positive displacement (Roots type) flow meter, two or more trials at six flow rates. The Roots meter came with a manufacturer's calibration curve and has been calibration checked by the Northwest Natural Gas meter shop.

CORRESPONDENCE
Source Test Plan and Correspondence
Permit (Selected Pages)

FAXED 12/13/2K

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

December 13,2000

Mr. Jack Herbert
Oregon Department of Environmental Quality
2020 SW 4th, Suite #400
Portland, OR 97201-4987

Re: Source Testing: Oregon Steel Mills
Portland, OR

This correspondence is notice that Horizon Engineering is to do source testing for the above-referenced facility, scheduled for December 27, 2000. This will serve as the Source Test Plan unless changes are requested prior to the start of testing.

1. **Source(s) to be Tested:** Electric Arc Furnace (EAF) Baghouse.

2. **Purpose of the Testing:** Emission factor verification as required by Title V Permit No. 26-1865.

3. **Source Description:** 16-compartment baghouse controlling particulate emissions from the EAF.

4. **Pollutants to be Tested:** Total Suspended Particulate (TSP), CO, NO_x, SO_x, Lead, VOC and Opacity.

5. **Test Methods to be Used:** Testing will be conducted in accordance with EPA Methods in Title 40 Code of Federal Regulations Part 60 (40 CFR 60), Appendix A, July 1, 1999; and Oregon Department of Environmental Quality (ODEQ) methods in Source Sampling Manual Volume 1, January 1992.

Flow Rate:	EPA Methods 1 and 2 (S-type pitot flow traverses)
CO, and O_2:	EPA Method 3A (NDIR and paramagnetic analyzers)
Moisture:	ODEQ Method 4 (psychrometry – wet bulb / dry bulb)
SO_2:	EPA Method 6C (non-dispersive ultraviolet analyzer)
NO_x:	EPA Method 7E (chemiluminescent analyzer)
Particulate:	ODEQ Method 8 (High Volume sampler)
Opacity:	EPA Method 9 (six minutes per run)
CO:	EPA Method 10 (gas filter correlation analyzer)
Lead:	Analysis of the filters and sampler residue for lead. Residue allocated to the runs according to Method 8 procedure 11.2.1. Analysis by EPA 6010 (ICP).
VOC (TGOC):	VOC as total gaseous organic compounds (TGOC) by EPA Method 25A, (heated flame ionization analyzer and sample line)

6. Continuous Analyzer Data Recording: Data acquisition system (DAS) with strip chart records as backup. Either 10-second data points or one-minute averages of one-second readings are logged. Normally only run averages and the graphic outputs from the DAS are included in the test reports.

7. Continuous Analyzer Gas Sampling: Fixed point in the baghouse inlet.

8. Quality Assurance /Quality Control (QA/QC): Documentation of the procedures and results will be presented in the source test report for review. This documentation will include at least the following:

   Continuous Analyzer QC Procedures: Field crews will operate the analyzers according to the manufacturer's specification, the test method's requirements, and Horizon's additional specifications. On-site quality control procedures include:
   - daily calibration (zero and span) and calibration error (linearity) checks
   - pre- and post-test zero bias'and span bias checks
   - checks performed with EPA Protocol 1 or NIST traceable gases
   - data acquisition systems record 10-second data points or one-minute averages of one second readings
   - strip chart recordings taken for backup to the electronic data acquisition system

   Manual Equipment QC Procedures: Operators will perform pre- and post-test leak checks on the sampling system and pitot lines. Thermocouple systems are checked for ambient temperature before heaters are started. Nozzles and pitots are inspected for nicks or dents before each test. Pre- and post-test calibrations on the meter boxes will be included with the report, along with semi-annual calibrations on the pitots, thermocouples, and nozzles. Blank reagents (water, acetone and filter) are submitted to the laboratory with the samples. Liquid levels are marked on sample jars in the field and are verified by the laboratory.

   Laboratorv QC Procedures: EPA audit samples for lead will be analyzed with the field samples. The Laboratory will perform normal laboratory QC procedures. The Laboratory will follow EPA Method 12 with special attention to sections 11.2.1: digestion of complete filter, 11.2.4 and 11.2.5: field blanks, one solvent and two filters, 11.4.1: sample concentrations brought into the linear analytical range, and 11.5: a single spike, method-of-standard-additions recovery check. Also the particulate filter tare weights will be weighed to a constant weight and the records submitted with the final report.

9. Number of Sampling Replicates and their Duration: Three (3): Each Oregon Method 8 run will be during two complete furnace heat cycles. Gaseous sampling will be continuous through all of the particulate tesitng. Opacity tests will be a minimum of 6 minutes with 24 observations during each TSP run while furnace is in melting and refining mode. Inlet duct flow measurements shall be made before the first and after the third Oregon Method 8 test. Baghouse outlet flow measurements will be made three times, measuring five points through the sampling port on each compartment outlet (five points per compartment). In no case will sampling replicates be separated by a time duration of twenty-four (24) or more hours unless prior authorization is granted by the Department.

10. **Reporting Units for Results:** Particulate – gr/dscf, lb/hr, and lb/ton cold charge. Gases – ppmv, lb/hr, and lb/ton cold charge.

11. **Horizon Engrg. Contacts:** David Rossman or
David Bagwell
(503) 255-5050
Fax (503) 255-0505

12. **Source Site Personnel:** Debbie Deetz Silva
(503) 978-6044
Fax (503) 240-5775

13. **Regulatory Contacts:** Jack Herbert
(503) 229-5579
Fax (503) 229-5265

14. **Applicable Process/Production Information:** Process operating data and production information that characterizes the source operation is considered to be: Heat charge weights and materials, tap weights and materials, heat times. Process information is normally gathered by the Source-site personnel and provided to Horizon for inclusion in the report.

    The source must operate at a normal maximum rate during testing. Rates not in agreement with those stipulated in the Permit can result in test rejection for application to determine emission factor verification. Imposed process limitations could also result from atypical rates.

15. **Control Device Operating Parameters:** Baghouse pressure drops.

16. **Opacity Readings to be Taken By:** Horizon Engineering

17. **Certified Plume Evaluator:** Yes (x) No ( ) N/A ( )

18. **Other Process Considerations,** including sampling site configurations, equipment limitations, special methods, etc.:

    Particulate: Each Oregon Method 8 test shall encompass two complete heat cycles with samples collected for 5 minutes from as many as possible of the 16 compartments. The next test shall begin in the next compartment after the final compartment sampled in the previous test. Particulate is to be sampled in the gas stream above the bags in the slot shaped are where gas flows up and toward the center of the baghouse. This allows the sampler nozzle to be inserted through ports in the ceiling of the breezeway at the top of the baghouse. As in the past, sampling will be isokinetic at a single point at the outlet of each compartment.

    Flow Rate Measurements: Velocities will be measured at five points through each port, giving 5 velocities per compartment, 80 points for the baghouse. Velocity pressure determinations will be by use of an S-type pitot and a micro-manometer. Past testing has shown that traversing this single port adequately characterizes the outlet flow rate.

Gaseous Pollutant Measurements: Gas analyzer readings at the baghouse inlet will be continuous through all of the M-8 tests.

Timing: The testers will synchronize their watches to record times in sync with the OSM heat log in the arc furnace control pulpit.

19. **Administrative:** Unless notified prior to the start of testing, this test plan is considered approved for compliance testing of this source. A letter acknowledging receipt of this plan and agreement on the content (or changes as necessary) would be appreciated.

The Department will be notified of any changes in source test plans prior to testing. It is recognized that significant changes not acknowledged, which could affect accuracy and reliability of the results, could result in test report rejection.

Source test reports will be prepared by Horizon Engineering and will include all results and example calculations, field sampling and data reduction procedures, laboratory analysis reports, and QA/QC documentation. Source test reports will be submitted to you within 75 days of the completion of the field work, unless another deadline has been stipulated. Oregon Steel Mills will send two (2) copies of the completed Source Test Report to you at the address above.

Any questions or comments relating to this test plan should be directed to me.

Sincerely,

Emily U. Bagwell,
Project Coordinator

cc: Debbie Deetz Silva, Oregon Steel Mills

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

December 22, 2000

Oregon Steel Mills, Inc
Attn: Debbie Deetz Silva
PO Box 2760
Portland, Oregon 97208

Horizon Engineering
Attn: David R Rossman and David Bagwell
13585 NE Whitaker Way
Portland, Oregon 97230

Re: AQ Multnomah County
Title V Permit No 26-1865
Oregon Steel Mills
Source-test plan for electric-arc and ladle-metallurgy furnaces' annual baghouse tests for emission-factor verification and PM and SO_2 concentrations' compliance

Dear Ms Silva and Messrs Rossman and Bagwell:

On December 13, 2000, I received your test plan for Oregon Steel Mills' ICA baghouse's emissions. The test will measure particulate, lead, and visible emissions from the baghouse and carbon-monoxide, nitrogen-oxide, sulfur-dioxide, volatile-organic-compounds emissions in the baghouse inlet. You will calculate emission factors based on cold charges to the electric-arc furnace. You will test compliance of filterable-particulate and sulfur-dioxide concentrations. You plan to test on December 27, 2000.

Oregon Steel Mills' Title V Operating Permit' Conditions require annual emissions tests:

37. Verify emission factors for filterable particulate matter, lead, carbon monoxide, nitrogen oxides, and volatile organic compounds.

38. Measure filterable particulate grain loading.

39. Measure sulfur-dioxide concentrations, at least during the permit's first two years.

I approve your test plan with these conditions:

1. Use analyzer ranges corresponding closely to expected measurements.

2. Use non-zero calibration concentrations bracketing measurements as much as possible. As we discussed, these may deviate from published methods' instructions. To address your concern in this matter, I contacted Paul Boys of EPA's Region-10 office. He agreed that this was within the Department's authority and that we (the Department) may require and approve such modifications to published test methods.

The three tests earlier this year found 10 to 700 ppm carbon monoxide, 19.8 to 20.6 percent oxygen, and 0.1 to 1.8 percent carbon dioxide.

For carbon monoxide, accurate calibrations from about 20 to about 300 or 500 ppmv have been important to obtain accurate total emissions. Horizon's analyzer with two ranges seems capable of giving more reliable calibrations over this entire range of significant emissions than a single upscale calibration would. You would need to measure the analyzer linearity and the system bias of each range.

With one carbon-monoxide range, corrected low readings should be similar with low or high upscale calgases. Please check upscale system biases with a low level (20 to 50 ppmv) and a high level (probably 200 to 500 ppmv, or as high as necessary). Check linearity with three suitable non-zero calgases.

3. The EPA Emission Measurement Center has sent lead audit samples to Horizon Engineering. Send the lead audit samples with the field samples to your two laboratories for side-by-side processing. **The laboratory that measures particulate samples must accurately report each audit-solution volume.** The **audit** is of the **lead concentration.** The volumes are about 10 mL -- about five percent of field-rinse volumes. Total lead may also be much smaller.

4. The laboratory performing lead analyses should record how they treat samples and perform quality control. Section 8 in your plan identifies essential quality control.

5. Leak checks and system bias checks are before and after each run. See Section 6.

6. Reports include field charts of analyzer readings. Please change Section 6.

7. Oregon Steel Mills is to document any significant furnace production delays.

8. Oregon Steel Mills is to send me one (1) test report within seventy-five (75) days after testing.

Please call me at 503-229-5579 if you have questions or change the test schedule or plan. My fax number is 229-5265. Herbert.jack@deq.state.or.us is my email address.

Sincerely,

Jack Herbert
Source Testing Coordinator

JHH

c: Greg Grunow:NWR

37. The permittee shall conduct emission factor verification tests in accordance with the Department's Source Sampling Manual for the following: PM/PM_{10}, CO, NO_x, VOC and Pb emission factors listed for emissions units EU-4, EU-5, EU-7, EU-8 and EU-10 and monitoring points CDP-1, CDP-2, CDP-4, CDP-5 and CDP-7 in condition 36.c using the following test methods and minimum test frequencies, unless otherwise approved in writing by the Department:

Monitoring Point	Pollutant	Test Method	Minimum Frequency
CDP-1 (EU-4)	PM/PM_{10}	ODEQ Method 8	Annual
	CO	EPA Method 10	Annual
	NO_x	EPA Method 7E	Annual
	VOC	EPA Method 25A	Annual
	Pb	EPA Method 12*	Annual
CDP-2(EU-5)	CO	EPA Method 10	1 time per permit term
	NO_x	EPA Method 7E	1 time per permit term
CDP-4 (EU-7)	PM/PM_{10}	ODEQ Method 8	1 time per permit term
CDP-5 (EU-8)	PM/PM_{10}	ODEQ Method 8	1 time per permit term
CDP-7 (EU-10)	CO	EPA Method 10	Annual
	NO_x	EPA Method 7E	Annual
	VOC	EPA Method 25A	1 time per permit term

Note: All PM emissions are assumed to be PM_{10} for chis permit.
* modified by sampling according to ODEQ method 8
For CDP-1, CDP-4 and CDP-5 flow rate must be measured according to EPA methods 1, 2, 3, or 3A, and ODEQ method 4. For CDP-2 flow rates must be measured using EPA methods 1, 2, 3, or 3A. ODEQ method 4, and EPA method 19. For CDP-7 flow rates must be measured using EPA methods 1, 2, 3, or 3A, and EPA method 19.

37.a. When more than one test is required during the permit term, the tests shall be separated by a minimum period of ten (10) months.

37.b. The testing required in condition 38 may be used to satisfy this requirement in part.

37.c. The permittee shall notify the Department at least 15 days prior to conducting any emission factor verification tests by submitting a source test plan in accordance with the Department's Source Sampling Manual. The permittee is not required to submit a source test plan if a plan has already been approved for the emissions unit and the pollutant to be tested. Notification of the proposed source test is required even if a plan is not needed.

37.d. The permittee shall submit a summary of ail emission factor verification tests to the Department within 75 days of any test. The summary shall include the following information:
37.d.i. Emissions unit and monitoring point identification;
37.d.ii. Emission results in pounds per hour and in units of emission factor:
37.d.iii. Process parameters during the test (e.g. material throughput, types and amounts of fuels. hear input, etc.); and
37.d.iv. Control device operating parameters.

37.e. The emissions Factors listed in condition 36.c are not enforceable limits unless otherwise specified in this permit. Compliance with PSELs shall only be determined by the calculations contained in condition 36.b of this permit using the monitored parameters recorded during the reporting period in condition 36.a and the emission factors contained in condition 36.c.

TEST METHODS AND PROCEDURES [OAR340-218-0050(1)]

38. The following procedures and test methods shall be used to conduct monitoring pertaining to condition 13 limiting particulate grain loading for EU-4 from compliance demonstration point CDP-4.1, for EU-7 from compliance demonstration point CDP-7.1, and for EU-8 from compliance demonstration point CDP 8.1;

38.a. All source testing shall be performed in accordance with the Department's Source Sampling Manual and the source test plan submitted to the Department prior to the scheduled test.

38.b. Unless otherwise approved by the Department, ODEQ Method 8 shall be used to measure PM emissions. EPA Methods 1, 2, 3 or 3A and ODEQ method 4 shall be used to determine the volumetric flow rate during each ODEQ Method 8 test run.

38.c. During each test for EU-4, the permittee shall record the following information:
38.c.i. date and time of each furnace tap;
38.c.ii. total tons of scrap charged in each heat;
38.c.iii. baghouse operating parameters; and
38.c.iv. any significant furnace production delays.

38.d. During each test for EU-7 and 8, the permittee shall record the following information:
38.d.i. Process parameters; and
38.d.ii. baghouse operating parameters; and

38.e. The arithmetic average of at least 3 test runs shall be used.

38.f. Source testing shall be performed at compliance demonstration point CDP-4.1(EU-4) annually. Source testing shall be performed at compliance demonstration points CDP-7.I (EU-7) and CDP-8.1 (EU-8) once per permit term.

38.g. The Department shall be notified. in writing, at least 15 days prior to any source test. The written notification shall include an identification of the testing company performing the tests, if other than the permittee and the testing protocol if not on file with the Department or changed since the last source test.

39. The following procedures and test methods shall be used to conduct monitoring pertaining to condition 15 limiting the SO_2 concentration for EU-4 from compliance demonstration point CDP-1; This condition is State-only enforceable.

39.a. All source testing shall be performed in accordance with the Department's Source Sampling Manual and the source test plan submitted to the Department prior to the scheduled test.

39.b. Unless otherwise approved by the Department, EPA Method 6C shall be used to measure the SO_2 concentration. EPA Methods 1 and 2 shall be used to determine the volumetric flow rate, and ODEQ method 4 to determine moisture. during each EPA Method 6C test run.

39.c. During each test. the permittee shall record the following information:
39.c.i. date and time of each furnace tap;
39.c.ii. total tons of scrap charged in each heat;

39.c.iii. baghouse operating parameters; and
39.c.iv. any significant furnace production delays.

39.d. The arithmetic average of at least 3 test runs shall be used.

9 . Source testing shall be performed at compliance demonstration point CDP-1 (EU-4) annually. If two consecutive source test results indicate emissions are below 75% of the specified limit. no further testing is required for that emissions unit/pollutant combination for the remaining duration of this permit. The permitter may use the last source tests conducted on tach of the emission points as one o i the required consecutive tests. if they were conducted during the 1998 calendar year or after and are considered valid tests by the Department. to comply with this condition.

39.f. The Department shall be notified, in writing, at least 15 days prior to any source test. The written notification shall include an identification of the testing company performing the tests, if other than the permittee and the testing protocol if not on file with the Department or changed since the last source test.

40. Although source testing is not required by this permit for the permit conditions listed below. if testing is conducted in addition to the monitoring specified in this permit, the permittee shall use the following test methods and averaging times to measure the pollutant emissions:

Permit Condition	Test Method	Averaging Time	Special Conditions
19, 20	Modified EPA Method 9 in accordance with the Department's Source Sampling Manual	aggregate of three minutes in any 60 minute period for condition 19; aggregate of thirty seconds in any 60 minute period for condition 20	Each Method 9 observation shall represent a period o f 15 seconds for the purpose of determining the aggregate amount of time in a 60 minute period that the visible emissions are greater than the opacity limit. The test duration may be less than 60 minutes if a violation of the standard is documented before the full 60 minute observation period is completed.
11, 12, 13. 18, 21, 22	ODEQ Methods 5, 7, or 8	average of three one-hour test runs	ODEQ Method 8 is for sources with exhaust gases at essentially ambient conditions (e.g. material handling cyclones); ODEQ Method 7 is for direct contact combustion sources (e.g. particle and veneer dryers); ODEQ Method 5 is for indirect contact fuel burning equipment (e.g. boilers) and any other source.

All testing shall be conducted in accordance with the Department's Source Sampling Manual unless otherwise specified in the special conditions column of the table above.

RECORDKEEPING REQUIREMENTS [OAR 340-218-050(3)(B)]

41. The permittee shall maintain the following general records of required monitoring information:

41.a. the date, place as defined in the permit. and time of sampling or measurements;
41.b. the date(s) analyses were performed;
41.c. the company or entity that performed the analyses;
41.d. the analytical techniques or methods used;

3.3

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

Project No. 1862 and 1906

SOURCE EVALUATION REPORT

Oregon Steel Mills
Portland, Oregon

ICA Baghouse System
Particulate, CO, NO_x, SO_2, VOC, Lead, and Opacity

November 6, 2002
December 5, 2002

FEB 14 2003

Prepared for
Oregon Steel Mills
14400 N. Rivergate Blvd.
Portland, Oregon 97203

By
Michele R. Kinney &
David R. Rossman, P.E.

REGISTERED PROFESSIONAL ENGINEER
8913
David Rossman
OREGON
12/03
July 30, 1976
DAVID R. ROSSMAN

Expires 12/31/04

Air Pollution Emission Testing • Mechanical Engineering

TABLE OF CONTENTS

	Pase Number
1. Certification	4
2. Introduction	5
3. Summary of Results	7
4. Source Description and Operation	10
5. Sampling and Analytical Procedures	11
6. Discussion	16

APPENDIX Page Number

Nomenclature & Drift Correction Documentation **17**

Particulate and Lead Calculation Sheets **19**

Emission Calculation Worksheets, Field Data Sheets and Sample Calculations
Blank Correction and Filter Rinse Allocation
Laboratory Results, Worksheets, Chain of Custody & Filter Tare Weights
Baghouse Sampling Diagram

Volume Flow Rate Determination (1116 and 12/5, 2002) **61**

Flow Rate Determinations and Field Data
Traverse Point Location – Inlet & Outlet

Visible Emissions **73**

Field Data and Certification

Gaseous Emissions (1116 and 1215,2002) **75**

Gaseous Emissions, Molecular Weight Determinations and Sample Calculations
Analyzer Calibration Data, Manual Data and Bias Checks
Data Logger Gas Charts and Strip Charts

Production/Process Data **95**

Furnace Heat Logs
MSDS Sheet
Baghouse Pressure Drop Field Data
Historical Data

Calibration Information **152**

High-Volume Sampler Calibrations
Pitots
Thermocouples and Indicators
Shortridge Micro manometer and Magnehelic Calibrations
Barometer
Calibration Gas Certificates

QA/QC Documentation **169**

Procedures
Gaseous Emissions Testing
NO_x Converter Efficiency Data
Interference Response Data
Audit Sample Results

Correspondence **206**

Source Test Plan and Correspondence

1. CERTIFICATIONS

1.1 Test Team Leader

I hereby certify that the test detailed in this report, to the best of my knowledge, was accomplished in conformance with applicable rules and good practices. The results submitted herein are accurate and true to the best of my knowledge.

Name: C. David Bagwell

Signature C. David Bagwell Date 12/18/02

1.2 Report Review

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with applicable rules and good practices, to the best of my knowledge.

Name: David R. Rossman, P.E.

Signature David Rossman Date 12/16/02

1.3 Report Review

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with applicable rules and good practices, to the best of my knowledge.

Name: Michael E. Wallace, P.E.

Signature Michael Wallace Date 12/16/02

2. INTRODUCTION

2.1 Client: Oregon Steel Mills

2.2 Physical Location: 14400 N. Rivergate Blvd., Portland, OR 97203

2.3 Mailing Location: P. O. Box 2760, Portland, OR 97208-2760

2.4 Test Log

ICA **Baghouse** System serving the EAF
Particulate, CO, NO_X, VOC, Lead and Opacity

Test Date	Run No.	Test Time
November 6,2002	1	11:09 - 12:45
	2	12:45 - 14:28
	3	14:31 - 16:00

Summary: Three valid runs.

ICA **Baghouse** System serving the EAF
SO_2

December 5,2002	1	11:09 - 15:58

Summary: Continuous five hour run.

2.5 Test Purpose: To meet requirements in the Title V Permit No. 26-1865 for EU-4 (the EAF baghouse) in conditions 37(for verifying emission factors), 38 (showing compliance with grain loading requirement from condition 13; < 0.1 g/dscf), 39 (showing compliance with the SO_2 limit from condition 15; <1000 ppm.), issued by the Oregon Department of Environmental Quality (ODEQ).

2.6 Background Information: None.

2.7 Participants:

Horizon Personnel:

C. David Bagwell, Team Leader
Steffan M. Johnson, Field Technician
Michael J. Eisele, E.I.T., Field Technician
Tim J. Hertel, Field Technician
Dharma Cole, E.I.T., Field Technician
Paul Heffernan, Field Technician
Thomas Rhodes, E.I.T., Field Technician
Michael E. Wallace, P. E., Calculations and QA/QC
David R. Rossman, P.E., Report Review
Michele R. Kinney, Technical Writer

Test Arranged by: Debbie Deetz Silva, Oregon Steel Mills

Observers:

Plant Personnel: Debbie Deetz Silva
Agency Personnel: Jack Herbert, ODEQ

Test Plan Sent to: Jack Herbert, ODEQ

3. SUMMARY OF RESULTS

3.1 Table(s) of Results

Particulate and Lead Test Results

Test Date: November 6,2002

	Units	Run 1	Run 2	Run 3	Average
Start Time		11:09	12:45	14:31	
End Time		12:45	14:28	16:00	
Sampling Time	minutes	76	82.5	73	77
Sampling Results					
Particulate Conc.(Actual)	gr/scfd	0.00063	0.00070	0.00058	0.00064
Particulate Rate	lb/hr	2.7	3.0	2.6	2.8
Based on Cold Charge	lb/ton	0.022	0.026	0.020	0.022
Sample Volume	dscf	2268	2282	2167	2239
Sample Weight, Total	mg	92.6	103.7	81.8	92.7
Sample Weight, Lead	mg	2.0	2.3	2.3	2.2
Percent Isokinetic	%	99	99	99	99
Lead Rate	lb/hr	0.06	0.07	0.07	0.07
Based on Cold Charge	lb/ton	0.0005	0.0006	0.0006	0.0005
% of Total Particulate	%	2.2	2.2	2.8	2.4
Opacity	%	0	0	0	0
Source Parameters					
Inlet Flow Rate (11/6/2002)	dscf/min				385,000
Outlet Flow Rate (11/6/2002)	dscf/min	507,000	496,000	511,000	505,000
Inlet Flow Rate (12/5/2002)	dscf/min				354,000
Temperature, Outlet	°F	154	160	164	160
Process Data					
Cold Charge Production	tons/hr	125.4	115.6	129.9	123.6
Baghouse Press. Drop, Avg.	in H_2O	5.4	5.7	5.7	5.6

Table 2

Gaseous Emissions Test Results

Test Date: November 6.2002

		Units	Run 1	Run 2	Run 3	Average
Start Time			11:09	12:45	14:31	
End Time			12:45	14:28	15:58	
Sampling Time		minutes	76	82.5	73	77
Sampling Results						
O_2		%	20.3	20.2	20.2	20.3
CO_2		%	0.6	0.7	0.7	0.6
CO	Concentration	ppmv	117	130	118	122
	Rate	lblhr	197.3	217.7	197.8	204.3
	Based on Cold Charge	lb/ton	1.57	1.88	1.52	1.66
NO_x	Concentration	ppmv	6	6	6	6
	Rate	lblhr	17.2	17.2	17.0	17.1
	Based on Cold Charge	lb/ton	0.14	0.15	0.13	0.14
SO_2	concentration'	ppmv				2
	Rate	lblhr				8.2
	Based on Cold Charge	lblton				0.08
TGOC	Concentration	ppmvC	17	21	25	21
	Rate	lbC/hr	12.3	15.0	18.1	15.1
	Based on Cold Charge	lbC/ton	0.098	0.130	0.139	0.122
TGNMOC	Concentration	ppmvC	5	8	10	8
	Rate	lbC/hr	3.6	5.7	7.0	5.5
	Based on Cold Charge	lbC/ton	0.029	0.050	0.054	0.044

[1] SO_2 testing on November 6 did not meet QA requirements (bias checks were low). SO_2 testing was repeated on December 5, 2002. Data was collected for a continuous five-hour test run. See Appendix for the retest times.

3.2 Description of Collected Samples:

See Blank Correction and Rinse Allocation in Appendix.

3.3 Discussion of Errors and Quality Assurance Procedures

This table is taken from a paper entitled "Significance of Errors in Stack Sampling Measurements", by R.T. Shigahara, W.F. Todd and W.S. Smith. It summarizes the maximum error expressed in percent, which may be introduced into the particulate test procedures by equipment or instrument limitations.

Measurement	% Max Error
Stack Temperature Ts	1.4
Meter Temperature Tm	1.0
Stack Gauge Pressure Ps	0.42
Meter Gauge Pressure Pm	0.42
Atmospheric Pressure Patm	0.21
Dry Molecular Weight Md	0.42
Moisture Content Bws (Absolute)	1.1
Differential Pressure Head AP	10.0
Orifice Pressure Differential AH	5.0
Pitot Tube Coefficient Cp	2.4
Orifice Meter Coefficient Km	1.5
Diameter of Probe Nozzle Dn	0.80

QA procedures outlined in the test methods were followed, including equipment specifications and operation, calibrations, sample recovery and handling, calculations and performance tolerances. On-site quality control procedures include pre- and post-test leak checks on trains and pitot systems. If pre-test checks indicate problems, the system is fixed and rechecked before starting testing. If post-test leak checks are not acceptable, the test run is voided and the run is repeated. Thermocouples and readouts are verified in the field to read ambient prior to the start of any readings. The results of the quantifiable QA checks for the test runs are on the Field Data sheets.

Analyzer system checks performed are noted on the Calibration Field Record sheet, with procedures documented in the QA/QC section in the Appendix. All calibration

standards used in the testing were EPA Protocol 1 or traceable to NIST standards. Certificates for the gases are in the Appendix.

Three audit samples (one liquid sample, one filter sample and one blank filter sample), prepared by EPA in accordance with Method 12 and provided to Jack Herbert of ODEQ, were submitted to Environmental Services Laboratory November 15, 2002 along with the particulate samples to be analyzed for lead.

On December 10, 2002, Horizon Engineering notified Jack Herbert via fax and email of the audit sample lab results, and he assured us that the lab results were acceptable. The audit sample lab results are in the Calibration Information section of the Appendix. We have no knowledge of the actual EPA numbers.

4. SOURCE DESCRIPTION AND OPERATION

4.1 Process and Control Device Description and Operation:

The EAF baghouse at Oregon Steel Mills cleans particulate from two significant sources in the melt shop. The main furnace, No. 3, normally produces between 100 and 115 tons of steel per heat from two charges of scrap metal, plus some molten "pour back" material left over from casting. Records for each heat during the testing times are in the Production-Process Data Section of the Appendix.

The main furnace dust control system is a "fourth hole" duct connection to the top of the furnace, and a series of three openings in the roof above the main furnace that can open into the duct to the baghouse. Each of these pick-up points has a damper that is controlled automatically by certain furnace operations. Generally, the roof vents are open for several minutes following charging of the furnace.

The ladle metallurgy furnace is between the main furnace and the casting area and is used to fine-tune the content and temperature of the molten steel before being cast. Charging is only of molten steel and alloying material and is the minor contributor to the baghouse system. The exhaust from this furnace enters the duct system downstream from the main furnace and roof vents.

All of the pick-up points are evacuated into an 11 foot-diameter duct by two 1250-Hp fans. The fans have automatically controlled dampers on the inlets.

Particulate control is by a 16-compartment, (21 ft. by 14 ft. each) Industrial Clean Air, reverse-air type, baghouse with seamless tube polyester bags. Magnehelic gauges on each of the compartments showed pressure drops averaging 5.6 inches of water.

4.2 Test Ports: Ports and traverse points are described and diagrammed on the Field Data sheets.

4.3 Test Duct Characteristics:

Cyclonic Flow: The inlet (flow traverse) location has been checked for cyclonic flow in the past and was not cyclonic.
Meets EPA M-1 Criteria: No.

4.4 Process & Control Equipment Flow Diagram: See Baghouse Sampling Diagram in Appendix.

4.5 Operating Parameters: See Production/Process Data section of Appendix.

4.6 Process Startups/Shutdowns or Other Operational Changes During Tests: Process was continuous during the testing.

5. SAMPLING AND ANALYTICAL PROCEDURES

5.1 Sampling Procedures

5.1.1 Sampling and Analytical Methods

Testing was conducted in accordance with EPA Methods in Title 40 Code of Federal Resulations Part 60 (40 CFR 60), Appendix A, July 1, 2000; and Oregon Department of Environmental Quality (ODEQ) methods in Source Sampling Manual Volume 1, January 1992.

Inlet tests:

Flow Rate:	EPA Methods 1 and 2 (at BH inlet, twice on test day)
Moisture:	ODEQ Method 4 (wet bulb and dry bulb temperatures)
CO_2 and O_2:	EPA Method 3A
SO_2:	EPA Method 6C
NO_x:	EPA Method 7E
CO:	EPA Method 10
VOC:	EPA Method 25A, (heated sample line and two analyzers, one with simultaneous VOC "cutter" for back-out of CH_4 content)

Outlet tests:

Flow Rate:	EPA Methods 1 and 2 (at each compartment, as done in past)
Particulate:	ODEQ Method 8 (High Volume sampler)
Lead:	Analysis of M-8 catch per EPA Method 12, with audit sample analysis
Opacity:	EPA Method 9 (six minutes per test)

5.1.2 Sampling Notes:

Flow Rates There are openings at the tube-sheet level of the baghouse where ambient air enters for temperature control around the bags. This means that the baghouse outlet flow rate is higher than the inlet duct flow rate. Because CO is measured in the duct before dilution takes place, the inlet flow is applied to that parameter. Particulate is measured in the diluted outlet compartments, so separate flow measurements were made at those locations. According to plant personnel, closing off the ambient air openings is not feasible.

Inlet Flow Measurement

The baghouse inlet duct volume flow rate was determined from pitot traverses before and after the baghouse testing according to EPA Methods 1 and 2. Velocity pressure was taken using an S-type pitot with a Shortridge "Airdata" 870 digital micro manometer, and temperature measurements with an attached k-type thermocouple and a Fluke Model 52 digital thermocouple indicator. The traverses included 48 points (24 on each diameter) through ports located off the platform on the melt shop roof. Leak checks were made on the pitot system after each of the traverses.

A check for cyclonic flow at the measurement points was done in December 1991 and was found to be well within the criteria specified in EPA Method 1, Section 2.4, which calls for an average of less than 20°.

~~Outlet Flow~~ Measurement

The velocity was also measured at the outlet of each compartment using an S-type pitot and the micro manometer with attached thermocouple. The micro manometer has a resolution of 0.0001 inches of water. The flow was determined from 5-point pitot traverses through one port per compartment. Flow was measured in the same ports as particulate.

Because one of the compartments is always shut off for cleaning, outlet flow rates used for calculating emissions are based on one less compartment than the total available.

Particulate and Lead Three test runs were made each lasting through two complete furnace heat cycles. The sampler running times ranged from 73 to 82.5 minutes in length; each test was started and stopped while the main furnace was being tapped. Although there is some emission to the furnace room during this operation, the concentration going to the baghouse system is relatively low compared to that when the furnace is in melting mode.

Sampling was done in the area above the bags where the flow is angled diagonally up to the cupola centered on the top of the baghouse. A diagram of the top of the baghouse, showing where the sampler was positioned, is in the Appendix. The location of the particulate sampling nozzle during testing was at velocity traverse point two. The sampling was done isokinetically, using the velocity found from the outlet velocity traverse done just before the particulate sampling run.

Each compartment was sampled for five minutes. Near the end of each sampling interval, the orifice temperature was recorded as well as the temperature of the outlet gas stream. A new sampler flow rate was calculated based on the pre-survey data of the next compartment. At the end of the interval, the sampler was shut off, moved to the next compartment and restarted.

Sample volume calculations were based on the orifice pressure drops combined with the orifice temperatures and the calibration curve for the sampler. Emission rates were calculated using the flow rates measured at the baghouse outlet.

Gases Gas sample for the analyzers was taken from a fixed sampling point in the baghouse inlet duct below the baghouse, approximately below compartment No. 14.

5.1.3 Sample Analysis

Analyte	**Laboratory**
Particulate	Antech
Lead and Audit Samples	Environmental Services Laboratory

5.2 Sampling Train Diagrams

Figure

EPA Methods 3A, 6C, 7E & 10 Analyzer Sample System Diagram

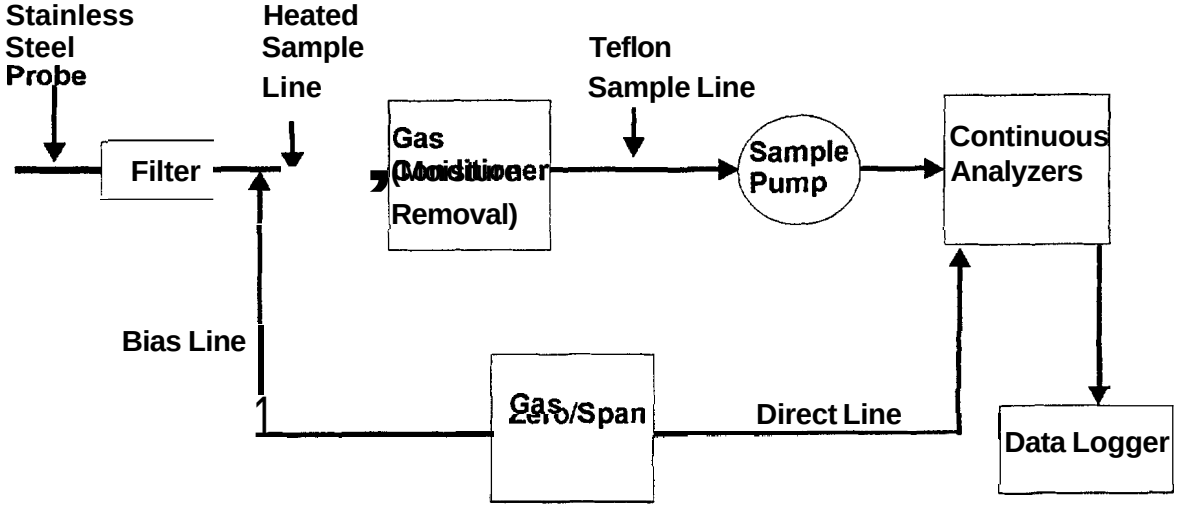
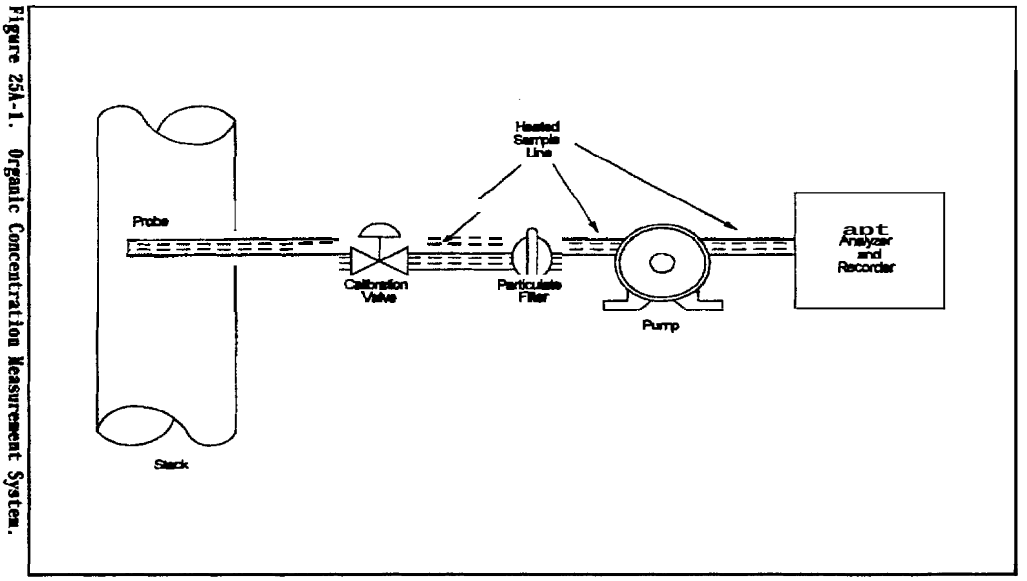


Figure 2

EPA Method 25A VOC Analyzer Sample System Diagram



5.3 Horizon Test Equipment

5.3.1 Manual Methods

Equipment Name	Equi Identification
Hi Volume Orifice	Horizon No. 1192
Pitots and Thermocouples	1-S, 14s-1S
Magnehelic Gauge	0-1G (orifice AH)
Micro manometer	Shortridge No. 1
Barometer	Test Van III

5.3.2 Continuous Emissions Monitors and Methods

Gas	Brand	Model	Range	Measurement Method	Method
O_2	Servomex	1400	0-25%	Paramagnetic	3A
CO_2	Servomex	1400	0-25%	Chopperless NDIR	3A
CO	Therrno Env	48	0-2000 pprn	Gas Filter Correlation	10
TGOC	J.U.M. Engrg.	VE-7	0-100 ppm	Flame Ionization	25A
NO_x	Thermo Env	42C	0-200 pprn	Cherniluminescent	7E
SO_2	West. Resch	721M	0-30 ppm	Non Disp. Ultra-violet	6C
CH_4	Calif. Analytical	300M	0-100 pprn	Catalytic Oxidation	25A

5.3.3 Continuous Emissions Monitors Sampling Setup

Sampling:	Above listed gases except TGOC.
Probe:	Stainless Steel with sintered stainless and polyester filters.
Sample Line(s):	Teflon (heated)
Conditioning:	Refrigerated M & C Cooler
Data Logger:	Rustrak Ranger and Keithley

Sampling:	TGOC.
Probe:	Stainless
Conditioning:	None
Sample Line(s):	Teflon (heated)
Pump:	Heated, internal to analyzer
Data Logger:	Rustrak Ranger and Keithley

6. DISCUSSION

The results of the testing should be valid in all respects. All quality assurance checks including leak checks, instrument checks, and calibrations, were within method-allowable tolerances.

APPENDIX

Nomenclature & Drift Correction Documentation

Nomenclature

Constants	Value	Units	Definition	Ref
Pstd(1)	29.92126	inHg	Standard Pressure	CRC
Pstd(2)	2116.22	lbf / ft²		CRC
Tstd	527.67	°R	Standard Temperature	CRC
R	1545.33	ft lbf / lbmol °R	Ideal Gas Constant	CRC
MWatm	28.965	lbm / lbmole	Atmospheric (20.946 %O2, 0.033% CO2, Balance N2+Ar)	
MWc	12.011	lbm / lbmole	Carbon	CRC
MWco	28.010	lbm / lbmole	Carbon Monoxide	CRC
MWco2	44.010	lbm / lbmole	Carbon Dioxide	CRC
MWh2o	18.015	lbm / lbmole	Water	CRC
MWno2	46.006	lbm / lbmole	Nitrogen Dioxide	CRC
MWo2	31.999	lbm / lbmole	Oxygen	CRC
MWso2	64.063	lbm / lbmole	Sulfur Dioxide	CRC
MWn2+ar	28.154	lbm / lbmole (Balance with 98.82% N2 & 1.18% Ar)	Emission balance	
C1	385.3211	ft³ / lbmol	Ideal Gas Constant @ Standard Conditions	
C2	816.5455	inHg in³/ °R ft²	Isokentics units correction constant	
Kp	5129.4	ft / min [(inHg lbm/mole) / (°R inH2O)] ^½	Pitot tube constant	Ref 2.5.1

Symbol	Units	Definition	Calculating Equation or Source of Data	EPA
As	in'	Area. Stack		
An	in'	Area, Nozzle		
Bws	%	Moisture. %Stack gas	[100 Vw(std) / [Vw(std)+Vm(std)]]	Eq. 5-3
C	ppmv-C	Carbon (General Reporting Basis for Organics)		
C1	ft3/lbmol	Gas Constant @ Standard Conditions	[R Tstd / Pstd(2)]	
C2	inHg in²/ °R ft²		[14,400 Pstd / Tstd]	
Cd	lbm-GAS / MMdscf	Mass of gas per unit volume	[Cgas MWgas / C1]	
cg	gr/dscf	Grain Loading, Actual	[15.432 mn I Vm(std) 1,000]	Eq. 5-6
cg @ X%CO2	gr/dscf	Grain Loading Corrected to X% Carbon Dioxide	[X% / CO2%]	
cg @ X%O2	gr/dscf	Grain Loading Corrected to X% Oxygen	[(20.946-X) / (20.946-O2)]	
Cgas	pprnv, %	Gas Concentration, (Corrected)		
Cgas @ X%CO2	pprnv	Gas Concentration Correction to X% Carbon Dioxide	[X% / CO2%]	
Cgas @ X%O2	pprnv	Gas Concentration Correction to X% Oxygen	[(20.946-X%) / (20.946-O2%)]	
CO	ppmv	Carbon Monoxide		
Co	ft	Outer Circumference of Circular Stack		
Ci	ft	Inner Circumference of Circular Stack		
C02	%	Carbon Dioxide		
Cp		Pitot tube coefficient		
Ct	lb/hr	Particulate Mass Emissions	[60 cg Qsd/ 7,000]	
dH	in H2O	Pressure differential across orifice		
Dn	in	Diameter. Nozzle		
dp^½		Average square root of velocity pressure		
Ds	in	Diameter. Stack		
E	lb / MMBtu	Pollutant Emission Rate	Cgas Fd MWgas (20.946 1 (20.946-O2)) / (1,000,000 C1)	
Fd	dscf / MMBtu	F Factor for Various Fuels		Table 19-1
I	%	Percent Isokinetic	{ C2 Ts(abs) Vm(std) / (vs Ps mfg An O)]	Eq. 5-8*
Md	lbm / lbmole	Molecular weight, Dry Stack Gas	[(1-%O2-%CO2)(MWn2+ar)+(%O2 MWo2)+(%CO2 MWco2)]	Eq. 3-1*
mfg		Mole fraction of dry stack gas	[1-Bws/100]	
Mgas	lbm/hr	Gaseous Mass Emisisons	{ 60 Cgas(ppmv) MW Pstd(2) Qsd 1 1,000,000 R Tstd]	
mn	mg	Particulate lab sample weight		
Ms	lbm / lbmole	Molecular weight, Wet Stack	[Md mfg +MWh2o (1-mfg)]	Eq. 2-5
MW	lbm / lbmole	Molecular Weight		
NO2	ppmv-NO2	Nitrogen Dioxide (General Reporting Basis for NOx)		
NOx	ppmv-NO2	Nitrogen Oxides (Reported as N02)		
0 2	%	Oxygen		
OPC	%	Opacity		
Pbar	in Hg	Pressure, Barometric		
Pg	in H2O	Pressure, Static Stack		
Po	in Hg	Pressure. Absolute across Orifice	[Pbar + dH / 13.5951]	
Ps	in Hg	Pressure, Absolute Sack	[Pbar + Pg / 13.5951]	Eq. 2-6*
Qa	acf/min	Volumenic Flowrate, Actual	[As vs / 144]	
Qsd	dscf/min	Volumenic Flowrate,!&Standard	[Qa Tstd mfg Ps] / { Pstd(1) Ts(abs)]	Eq 2-10.
Rf	MMBtu/hr		1,000,000 Mgas (20.946-02)] / [Cd Fd 20.946]	
SO2	ppmv-SO2	Sulfur Dioxide		
t	in	Wall thickness of a stack or duct		
TGOC	ppmv-C	Total Gaseous Organic Concentration (Reported as C)		
Tm	°F	Temperature. Dry gas meter		
Tm(abs)	°R	Temperature, Absolute Dry Meter	[Tm + 459.67]	
Ts	°F	Temperature. Stack gas		
Ts(abs)	°R	Temperature. Absolute Stack gas	[Ts + 459.67]	
Vlc	ml	Volume of condensed water		
Vm	dcf	Volume. Gas sample		
Vm(std)	dscf	Volume. Dry standard gas sample	[Y Vm Tstd Po]/ [Pstd(1) Tm(abs)]	Eq. 5-1
vs	fpm	Velocity. Stack gas	Kp Cp dp^½ [Ts(abs) / (Ps Ms)]^ ½	Eq. 2-9*
Vw(std)	scf	Volume, Water Vapor	0.04707 Vlc	Eq. 5-2
Y		Dry gas meter calibration factor		Fig. 5.6
Ø	min	Time. Total sample		

• Based on equation.

HORIZON ENGINEERING LLC
13585 NE Whitaker Way. Portland.OR 97230
Phone (503) 255-5050. Fax (503) 255-0505
www horizonengineering.com

DRIFT CORRECTION DOCUMENTATION

EPA Drift Equations:

- Method 3A: Oxygen and Carbon Dioxide

$$C_{gas} = \frac{(C_{ma} - C_{oa})(C - C_m) + C_{ma}}{(C_m - C_o)} \qquad \text{(Eq. 3A-1)}$$

- Method 6C: Sulfur Dioxide

$$C_{gas} = \frac{C_{ma}(C - C_o)}{(C_m - C_o)} \quad \text{where } C_{oa} = 0 \qquad \text{(Eq. 6C-1)}$$

- Method 7E: Nitrogen Oxides, Section 8 of Method 7E states: "Follow Section 8 of Method 6C (Eq. 6C-1)"
- Method 10: Carbon Monoxide, the EPA does not currently address Gas Filter Correlation instruments, therefore there are no current standards.
- Method 25A: Total Gaseous Organic Concentration (TGOC), this method does not mention correcting for drift although there are established limits.

Horizon Engineering Drift Correction Equations:

$$C_{gas} = \frac{(C_{id} - Z_x)(C_{ma} - C_{oa})}{(S_x - Z_x)} \qquad S_x = \frac{C_{mf} - C_{mi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} + C_{mi}$$

$$Z_x = \frac{(C_{of} - C_{oi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} - + C_{oi} \qquad T_x = \frac{(T_{te} - T_{ts})}{2} + T_{ts}$$

EPA	Definition	Horizon
C_{gas}	Effluent gas concentration, dry basis	C_{gas}
C_{ma}	Actual upscale calibration gas concentration	C_{ma}
C_{oa}	Actual zero/low calibration gas concentration	C_{oa}
C_m	Average of initial and final system upscale calibration bias responses	
	Initial system upscale calibration bias response	C_{mi}
	Final system upscale calibration bias response	C_{mf}
C_o	Average of initial and final system zero/low calibration bias responses	
	Initial system zerollow calibration bias response	C_{oi}
	Final system zero/low calibration bias response	C_{of}
C	Average gas concentration indicated by gas analyzer, dry basis	C_{id}
	Starting test time	T_{ts}
	Ending test time	T_{te}
	Initial system bias calibration response time	T_{ci}
	Final system bias calibration response time	T_{cf}
	Mid-point of test time or gas sampling interval to be analyzed	T_x
	Approximate upscale response at mid-point test time	S_x
	Approximate zerollow response at mid-point test time	Z_x

Notes or exceptions:
TGOC is first recorded on a wet basis, then corrected to a dry basis
The TGOC instruments used by Horizon have some historic data on instrument response to different hydrocarbons. For propane the response is 1 to 1 molecule while methane is 1.037 to 1 molecule. We correct for the instrument's "over response" to methane.

Particulate and Lead Calculation Sheets

Emission Calculation Worksheets, Field Data Sheets and Sample Calculations

Blank Corrections and Filter Rinse Allocation

Laboratory Results, Worksheets, Chain of Custody & Filter Tare Records

Baghouse Sampling Diagram

Particulate Emissions

Plant	Oregon Steel Mills								File	1862–02	
Source	CA Baghouse-EAF								Tester	MJE/TJH/CDB/dc/ph	
Date	06-Nov-2002								Analysis/QA	MEW,DBC	
Run#	1		Wt(mg)	92 624	Stack Area	As=	969 6 sqft	Mol Wt. Dry	Md=	29 02 molwt	
Points			Lead (mg)	2.041	Stack Temp.	Tdb=	152 °F	Mol Wt Wet	Ms=	18 92 molwt	
					Stack Temp	Twb=	80 °F	Barometeric	Pb=	30 12 in HZ0	
Hivol ID	SN#		1192		Moisture	bws=	089 %	Static Pres	Pstat=	-0 0046 in HZ0	
Orifice	A=		47.8947		Nozzle Dia.	Dn=	3.158 in	Stack Pres.	Ps=	29.60 in Hg	
Constants	B=		0.4763		Nozzle Area	An=	7.83 sqin	Pitot	Cp=	0.7970	

TIME	Compartment POINT #	pt	Velocity Pressure dP inH2O	Velocity vs fpm	Orifice in H2O dHo Calc	Pressure in H2O dHo Act	Temp (F)' Orifice Tor	Temp (F) Stack Tso	Time min t	Rate cfm Standard Q@68°F	Volume cuft Standard @68°F	Volume cuft Orifice @Tor
11:09	1	3	0.0514	780.5	0.6326	0.6370	118.0	147.5	5.0	37.01	185.0	202.6
11:15	2	3	0.0582	813.6	0.7617	0.7200	125.0	123.0	5.0	39.00	195.0	216.1
11:21	3	3	0.0597	826.8	0.7967	0.7600	140.0	127.0	5.0	39.54	197.7	224.7
11:31	4	3	0.0356	656.7	0.4430	0.4300	149.0	161.0	5.0	29.93	149.7	172.6
11:36	5	3	0.0352	657.2	0.4269	0.4200	142.0	169.0	5.0	29.76	148.8	169.7
11:41	6	3	0.0386	683.3	0.4886	0.4700	156.0	160.0	5.0	31.06	155.3	181.2
11:46	7	3	0.0330	633.8	0.4057	0.4000	147.0	164.0	5.0	28.97	144.8	166.5
11:52	8	3	0.0336	642.1	0.4025	0.4100	136.0	169.0	5.0	29.56	147.8	166.9
11:58	9	3	0.0299	605.7	0.3538	0.3600	132.0	169.0	5.0	27.88	139.4	156.3
12:05	10	3	0.0332	622.9	0.4227	0.4000	142.0	139.0	5.0	29.08	145.4	165.8
12:10	11	3	0.0410	692.8	0.5265	0.5100	142.0	140.0	5.0	32.65	163.2	186.1
12:16	12	3	0.0086	320.7	0.0996	0.1000	140.0	153.0	5.0	15.05	75.2	85.5
12:23	13	3	0.0127	390.4	0.1494	0.1400	140.0	155.0	5.0	17.66	88.3	100.4
12:30	14	3	0.0420	712.8	0.5218	0.5100	142.0	160.0	5.0	32.65	163.2	186.1
12:37	15	3	0.0354	656.0	0.4374	0.4200	147.0	163.0	5.0	29.65	148.2	170.4
12:43	16	3	0.0266	570.9	0.3214	0.3100	147.0	168.0	1.0	25.65	25.7	29.5
12:45												
Time weighting used in averaging. =>				645.4	0.4561	0.4440	140.0	153.5	76.00	29.91	2,272.9	2,580.4

					Run#	1	2	3	Average
Sample Volume	V@68 (Pb/29.92)(1-bws/100)	dscf	Vd	2,267.7	2,281.7	2,166.5	2,238.7
Total Flowrate	Oultet Flow	dscf/min	Qsd	506,818	495,769	510,966	504,518
Particulate							
Grain loading	0.01543 Wt/Vd	gr/dscf	Cg	0.00063	0.00070	0.00058	0.00064
		ug/m3		1442	1604	1333	1460
Emissions	0.00857 Cg Qs	lbm/hr	Ct	2.738	2.979	2.552	2.756
		lbm/ton		0.0218	0.0258	0.0196	0.0224
LEAD							
Grain loading	0.01543 Lead/Vd	gr/dscf	Cg	0.0000139	0.0000155	0.0000164	0.0000153
		ug/m3		31.8	35.4	37.6	34.9
Emissions	0.00857 Cg Qs	lbm/hr	Ct	0.0603	0.0658	0.0720	0.0660
		lbm/ton		0.0005	0.0006	0.0006	0.0005
Avg Sample Rate	V@Tor / t	acf/min	Qan	33.95	32.56	34.54	33.69
Avg Velocity @ Sample Point	vs=Qa/As	fpm	vs	645.37	614.48	655.67	638.51
Avg Orifice temp		°R	Tor	599.63	609.73	609.26	606.21
Avg Stack temp		°R	Ts	613.16	620.31	623.19	618.89
Avg Nozzle Velocity	Qan*Ts / An*Tor	fpm	vn	638.49	609.20	649.76	632.49
% ISOKINETIC	100 vn/vs		%I	98.9	99.1	99.1	99.1
Percent Lead of Total Particulate			%	2.20	2.21	2.82	2.41

*The baghouse has 16 compartments. One is always cycling.
* Each Compartment is 52"x179".

Particulate Emissions

Plant	Oregon Steel Mills								File	1862_02	
Source	ICA Baghouse-EAF								Tester	MJE/TJH/CDB/dc/ph	
Date	06-Nov-2002										
Run#	3	Wt(mg)	103.658	Stack Area	As=	969.6	sqft	Mol Wt. Dry	Md=	29.02	molwt
Points	10	Lead(mg)	2.289	Stack Temp.	Tdb=	145	°F	Mol Wt. Wet	Ms=	28.75	molwt
				Stack Temp.	Twb=	89	°F	Barometeric	Pb=	30.12	in H2O
Hivol ID	SN#	1192		Moisture	bws=	2.47	%	Static Pres.	Pstat=	0.00	in H2O
Orifice	A=	47.8947		Nozzle Dia.	Dn=	3.158	in	Stack Pres.	Ps=	30.12	in Hg
Constants	B=	0.4763		Nozzle Area	An=	7.83	sqin	Pitot	Cp=	0.7970	

TIME	Compartment POINT #	pt	Velocity Pressure dP inH2O	Correct fpm Vs	Orifice in H2O dHo Calc	Pressure in H2O dHo Act	Temp (F) Orifice Tor	Temp (F) Stack Ts	Time min t	Rate cfm Standard Q@68°F	Volume cuft Standard @68°F	Volume cuft Orifice @Tor
12:45												
12:51	16	3	0.0286	588.57	0.3471	0.3100	155.0	168.0	5.0	25.49	127.5	148.5
12:57	1	3	0.0331	635.70	0.4020	0.3900	156.0	173.0	5.0	28.42	142.1	165.8
13:03	2	3	0.0325	619.87	0.4118	0.3800	162.0	153.0	5.0	27.94	139.7	164.6
13:10	3	3	0.0116	371.84	0.1358	0.1300	150.0	158.0	5.0	16.92	84.6	97.7
13:16	4	3	0.0109	362.77	0.1255	0.1200	150.0	166.0	5.0	16.29	81.4	94.1
13:22	5	3	0.0686	896.90	0.8938	0.8900	151.0	148.0	5.0	42.26	211.3	244.6
13:28	6	3	0.0551	801.83	0.7174	0.7100	154.0	145.0	5.0	37.86	189.3	220.2
13:34	7	3	0.0425	703.04	0.5419	0.5400	147.0	143.0	5.0	33.42	167.1	192.1
13:41	8	3	0.0267	569.59	0.3140	0.3200	140.0	170.0	5.0	26.19	130.9	148.8
13:47	9	3	0.0287	591.00	0.3393	0.3400	142.0	171.0	5.0	26.91	134.6	153.4
13:53	10	3	0.0281	584.79	0.3302	0.3400	139.0	171.0	5.0	26.98	134.9	153.0
13:59	11	3	0.0270	567.75	0.3253	0.3200	143.0	159.0	5.0	26.13	130.6	149.2
14:06	12	3	0.0328	627.79	0.4009	0.3900	150.0	163.0	5.0	28.55	142.8	164.9
14:12	13	3	0.0366	665.29	0.4468	0.4400	150.0	167.0	5.0	30.24	151.2	174.7
14:18	14	3	0.0387	679.17	0.4841	0.4700	154.0	158.0	5.0	31.11	155.5	180.9
14:24	15	3	0.0353	648.13	0.4411	0.4300	155.0	157.0	5.0	29.79	149.0	173.5
14:28	16	3	0.0169	449.91	0.2025	0.2000	156.0	161.0	2.5	20.68	51.7	60.3
Time weighting used in averaging. =>				614.48	0.4096	0.4012	150.06	160.64	82.50	28.17	2,324.2	2,686.4

				Run#	2
Sample Volume	V@68 (Pb/29.92)(1-bws/100)		dscf	Vd	2,281.7
Total Flowrate	Oultet Flow		dscf/min	Qs	495,769
Particulate					
Grain loading	0.01543 Wt/Vd		gr/dscf	Cg	0.00070
Emissions	0.00857 Cg Qs		lb/hr	Ct	2.979
LEAD					
Grain loading	0.01543 Lead/Vd		gr/dscf	Cg	1.55E-05
Emissions	0.00857 Cg Qs		lb/hr	Ct	0.0658
Avg Sample Rate	V@Tor / t		acf/min	Qan	32.56
Avg Velocity @ Sample Point	vs=Qa/As		fpm	vs	614.48
Avg Orifice temp			°R	Tor	609.73
Avg Stack temp			°R	Ts	620.31
Avg Nozzle Velocity	Qan*Ts / An*Tor		fpm	vn	609.20
% ISOKINETIC	100 vn/vs			%I	99.14

Particulate Emissions

Plant	Oregon Steel Mills								File	1862_(	
Source	ICA Baghouse-EAF								Tester	MJE/TJH/CDB/dc/ph	
Date	06-Nov-2002										
Run#	3	Wt(mg)	81.801	Stack Area	As=	969 6	sqft	Mol Wt. Dry	Md=	29.03	molwt
Points	11	Lead(mg)	2.309	Stack Temp.	Tdb=	162	°F	Mol Wt. Wet	Ms=	18.87	molwt
				Stack Temp.	Twb=	86	°F	Barometeric	Pb=	30.12	in H20
Hivol ID	SN#	1192		Moisture	bws=	1.45	%	Static Pres.	Pstat=	0.01	in H2O
Orifice	A=	47.8947		Nozzle Dia.	Dn=	3.158	in	Stack Pres.	Ps=	30.12	in Hg
Constants	B=	0.4763		Nozzle Area	An=	7.83	sqin	Pitot	Cp=	0.7970	

TIME	Compartment POINT #	pt	Velocity Pressure dP inH2O	Correct fpm Vs	Orifice in H2O dHo Calc	Pressure in H2O dHo Act	Temperature (F) Orifice Tor	(F) Stack Ts	Time min t	Rate cfm Standard Q@68°F	Volume cut? Standard @68øF	Orifice @,Tor
14:31												
14:37	16	3	0 0169	449.00	0.1964	0.2000	140.0	161.0	5.0	20.94	104.7	119.0
14: 43	I	3	0.0492	775.91	0.5871	0.5900	140.0	177.0	5.0	35.05	175.2	199.2
14:49	2	3	0.0460	748.49	0.5526	0.5400	143.0	174.0	5.0	33.52	167.6	191.4
14:55	3	3	0.0503	781.45	0.6069	0.6000	141.0	172.0	5.0	35.30	176.5	200.9
15:02	4	3	0.0385	680.42	0.4715	0.4500	152.0	166.0	5.0	30.52	152.6	176.9
15:08	5	3	0.0340	639.42	0.4125	0.4000	150.0	166.0	5.0	28.90	144.5	166.9
15: 14	6	3	0.0398	692.92	0.4906	0.4700	157.0	168.0	5.0	31.04	155.2	181.4
15:20	7	3	0.0406	699.29	0.4888	0.4900	141.0	167.0	5.0	32.06	160.3	182.5
15:26	8	3	0.0303	602.66	0.3577	0.3600	135.0	164.0	5.0	27.81	139.1	156.7
15:33	9	3	0.0260	557.37	0.3103	0.3100	144.0	162.0	5.0	25.71	128.6	147.1
15:39	10	3	0.0367	650.37	0.4704	0.4500	154.0	140.0	5.0	30.47	152.4	177.2
15:45	11	3	0.0283	573.96	0.3549	0.3500	155.0	146.0	5.0	27.01	135.1	157.3
15:51	12	3	0.0299	592.40	0.3794	0.3700	166.0	151.0	5.0	27.50	137.5	163.1
15:57	13	3	0.0448	735.74	0.5635	0.5500	167.0	169.0	5.0	33.19	166.0	197.1
16:00	14	3	0.0353	655.68	0.4338	0.4300	165.0	174.0	3.0	29.57	88.7	105.0
Time weighting used in averaging. =>				655.67	0.4454	0.4375	149.59	163.52	73.00	29.92	2,183.8	2.521.6

Run# 3

Sample Volume	V@68 (Pb/29.92)(1-bws/100)	dscf	Vd	2,166.5
Total Flowrate	Oultet Flow	dscf/min	Qs	510,966
Particulate				
Grain loading	0.01543 Wt/Vd	gr/dscf	Cg	0.00058
Emissions	0.00857 Cg Qs	lb/hr	Ct	2.552
LEAD				
Grain loading	0.01543 Lead/Vd	gr/dscf	Cg	1.64E-05
Emissions	0.00857 Cg Qs	lb/hr	Ct	0.0720
Avg Sample Rate	V@Tor / t	acf/min	Qan	34.54
Avg Velocity @ Sample Point	vs=Qa/As	fpm	vs	655.67
Avg Orifice temp		°R	Tor	609.26
Avg Stack temp		°R	Ts	623.19
Avg Nozzle Velocity	Qan*Ts / An*Tor	fpm	vn	649.76
% ISOKINETIC	100 vn/vs		%I	99.10

High Volume Sample Calculations

Client: OREGON STEEL MILLS Source: ICA BAGHOUSE

Test Date: 11-6-2002 Run #: 2 Page 1 of 2

Filter #	Sampler ID:		
mn (mg) 103.658	A 47.8947	B 0.4763	H_2O % 2.47%
$Ps = P_{barometric} + (P_{static}/13.6)$ = 30.12			Pstd 29.92129
Q_{std} (from Method 1&2 flow rate determination) 495.769			

Pt.	Rate, cfm =A x $[\Delta Ho \times 527.67\ °R/To\ °R]^B$	Time	V@68°F, scf =Rate x time
1	$47.8947 \left(\frac{0.3100 \times 527.67^{\circ}R}{614.67^{\circ}R}\right)^{0.4763} = 25.49$	5	127.47
2	$47.8947 \left(\frac{0.3900 \times 527.67^{\circ}R}{615.67^{\circ}R}\right)^{0.4763} = 28.42$	5	142.09
3	$47.8947 \left(\frac{0.3800 \times 527.67^{\circ}R}{621.67}\right)^{0.4763} = 27.94$	5	139.70
4	$47.8947 \left(\frac{0.1300 \times 527.67^{\circ}R}{609.67^{\circ}R}\right)^{0.4763} = 16.92$	5	84.59
5	$47.8947 \left(\frac{0.1200 \times 527.67^{\circ}R}{609.67^{\circ}R}\right)^{0.4763} = 16.29$	5	81.43
6	$47.8947 \left(\frac{0.8900 \times 527.67^{\circ}R}{610.67^{\circ}R}\right)^{0.4763} = 42.26$	5	211.32
7	$47.8947 \left(\frac{0.7100 \times 527.67^{\circ}R}{613.67^{\circ}R}\right)^{0.4763} = 37.86$	5	189.31
8	$47.8947 \left(\frac{0.5400 \times 527.67^{\circ}R}{606.67^{\circ}R}\right)^{0.4763} = 33.42$	5	167.08
9	$47.8947 \left(\frac{0.3200 \times 527.67^{\circ}R}{599.67^{\circ}R}\right)^{0.4763} = 26.19$	5	130.95
10	$47.8947 \left(\frac{0.3400 \times 527.67^{\circ}R}{601.67^{\circ}R}\right)^{0.4763} = 26.91$	5	134.57
11	$47.8947 \left(\frac{0.3400 \times 527.67^{\circ}R}{598.67}\right)^{0.4763} = 26.98$	5	134.89
12	$47.8947 \left(\frac{0.3200 \times 527.67^{\circ}R}{602.67^{\circ}R}\right)^{0.4763} = 26.13$	5	130.63
13	$47.8947 \left(\frac{0.3900 \times 527.67^{\circ}R}{609.67^{\circ}R}\right)^{0.4763} = 28.55$	5	142.76
14	$47.8947 \left(\frac{0.4400 \times 527.67^{\circ}R}{609.67^{\circ}R}\right)^{0.4763} = 30.24$	5	151.20
15	$47.8947 \left(\frac{0.4700 \times 527.67^{\circ}R}{613.67^{\circ}R}\right)^{0.4763} = 31.10$	5	155.54
16	$47.8947 \left(\frac{0.4300 \times 527.67^{\circ}R}{614.67^{\circ}R}\right)^{0.4763} = 29.79$	5	148.97
17	$47.8947 \left(\frac{0.2000 \times 527.67^{\circ}R}{615.67^{\circ}R}\right)^{0.4763} = 20.68$	2.5	51.69
	Total	82.5	2324.19

Client: OREGON STEEL MILLS Page 2 of 2

Sample Volume, Vm (std) = (Total V@68°F) x (Ps/Pstd) x (1-H_2O/100)

= $(2324.19 \text{ @ } 68°F)\left(\frac{30.12}{29.92129}\right)\left(1-\left(\frac{2.47\%}{100}\right)\right) = 2281 \text{ dscf/min}$

Grain Loading, gr/dscf = [15.432 x mg] / [Vm (std) x 1000]

= $\frac{(15.432)(103.658 \text{ mg})}{(2281 \text{ dscf/min})(1000)} = 0.00070 \text{ gr/dscf}$

Emissions Rate, lb/hr = [60 x Grain Loading x Q_{std}] 17000

= $\left[(60)(0.00070 \text{ gr/dscf})(495,769)\right] \div 7000 = 2.97 \text{ lb/hr}$

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Baghouse
Date: 11/6/02 Pb: 30.12
Tdb: ____ Twb: ____ %H2O: ____ Dn: 3,1575
Magn Ranges, DP: 0- 1 [redacted] 16

Leak Rates @ 100%, DH in H20

Run #	Pretest	Post-test
Pre Blank	0.0 inH2O	0.0 inH2O
1	0.0 inH2O	0.0 inH2O

Run #	Filter #
Pre Blank	6856 244
R1	6856 233

Orifice No. 1192
Cal.No.(0.1) 15.99
(1.0) 47.89

DP's from: Presurvey ____
During test ____

115 = 0.79697
134

Diagram of Outlet

Run #	Process Rate
1	Normal

Run #	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H2O"	DH Orif Pres "H2O"	Ts Stack Temp F	To Orif Temp F	Notes
1	1	5	1109	.0514	.637	147.5	118	
	2	10		.0562	.72	123	125	
	3	15	1121	.0597	.76	127	140	
	4	20	1136	.0356	.43	161	149	
	5	25	1136	.0352	.42	169	142	
	6	30		.0386	.47	160	156	
	7	35	11:46	.0330	.40	164	147	
	8	40		.0336	.41	169	136	
	9	45		.0299	.36	169	132	
	10	50	1205	.0332	.40	139	142	
	11	55		.0410	.51	140	142	
	12	60	1216	.0086	.10	153	140	
	13	65		.0127	.14	155	140	
	14	70		.0420	.51	160	142	
	15	75		.0354	.42	163	147	
	16	76	End 1245	.0266	.31	168	147	
		75						
		80						

HORIZON ENGINEERING
13565 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Baghouse
Date: 11/6/02 Pb: 30.12
Tdb: ____ Twb: ____ %H2O: ____ Dn: 3.1575
Magn Ranges, DP: 0- 1 ~~DH: 0-~~ 16

Leak Rates @ 100%, DH in H2O

Run #	Pretest	Post-test
2	0.10 in H2O	0.01 in H2O

Run	Filter #
2	6986249

Orifice NO. 11.9
Cal.No.(0.1) 15.99
(1.0) 47.89

DP's from: Presurvey ____
During test ____

Diagram of Outlet

Run #	Process Rate
2	Normal

1/s = 0.79697

Run #	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H2O"	DH Orif Pres "H2O"	Ts Stack Temp F	To Orif Temp F	Notes
2	16	5	1245	.0266	.31	168	155	
	1	10		.0331	.39	173	156	
	2	15		.0325	.38	153	162	
	3	20		.0116	.13	158	150	
	4	25		.0109	.12	166	150	
	5	30		.0686	.89	156	151	
	6	35		.0551	.71	145	154	
	7	40		.0425	.54	143	147	
	8	45		.0267	.32	170	130	
	9	50		.0287	.34	171	142	
	10	55		.0281	.34	171	139	
	11	60		.0270	.32	159	143	
	12	65		.0328	.39	163	150	
	13	70		.0366	.44	167	150	
	14	75		.0387	.47	158	154	
	15	80		.0353	.43	157	155	
	16	825	1428	.0169	.20	161	156	
				.0492	.59			

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

HIGH VOLUME EMISSION TESTS

Plant: OSM
Source: Bachouse
Date: 11/6/02 Pb: 30.12
Tdb: ____ Twb: ____ %H2O: ____ Dn: 3.1575
Magn Ranges, DP: 0- 1 [redacted] 0- 16

Leak Rates @ 100%, DH in H20

Run #	Pretest	Post-test
3	0.01 inH20	0.0 inH20

Run #	Filter #
3	6856245

Orifice No. 1192
Cal. No. (0.1) 15.99
(1.0) 47.89

DP's from: Presurvey ____
During test ____



Diagram of Outlet

Run #	Process Rate
3	Normal

Run #	Traverse Point	t Sample Time Min.	24 Hour Time	DP Velo Pres "H2O"	DH Orif Pres "H2O"	Ts Stack Temp F	To Orif Temp F	Notes
3	16	5	1431	.0169	.20	161	140	
	1	10		.0492	.59	177	140	
	2	15		.0460	.54	174	143	
	3	20		.0503	.60	172	141	
	4	25		.0385	.45	166	152	
	5	30		.0340	.40	166	150	
	6	35		.0398	.47	168	157	
	7	40		.0406	.49	167	141	
	8	45		.0303	.36	164	135	
	9	50		.0260	.31	162	144	
	10	55		.0367	.45	160	154	
	11	60		.0283	.35	146	155	
	12	65		.0299	.37	151	166	
	13	70		.0448	.55	169	167	
	14	73	15:58	.0353	.43	174		
	15	8		.0485	.60	173		

Blank Correction and Filter Rinse Allocation

Oregon Steel Mills	Plant	1862–02	
ICA Baghouse-EAF	Source	Tester	
06-Nov-2002	Date		

PARTICULATE RUN I.D.	FILTER #	Filter Sample Wt mg	Wt less Filter Blank mg	Fraction of total	Rinse Residue Contribution mg	Filter Residue Contribution mg	TOTAL mg
1	6856232	85.2	87.3	33.31%	4.624	0.699	92.624
2	6856249	95.6	97.7	37.28%	5.175	0.783	103.658
3	6856245	75.0	77.1	29.42%	4.084	0.618	81.802
	TOTALS	255.80	262.10	100.00%	13.883	2.100	278.082

Runs 1, 2, & 3				
Sampler rinse residue	186 ml	14.90 mg		
Blank Acetone	128 ml	0.70 mg		
Blank correct residue		13.88 mg		
Sampler filter residue	*999*	0.0000 mg	System Blank	
Blank correct residue		2.1000 mg		
Blank Filter	6776163160	-2.10 mg	Lab Blank	

"LEAD RUN I.D.	FILTER #	Filter Sample Wt mg	Wt less Filter Blank mg (Corrected)	Fraction of total	Rinse Residue Contribution mg	Filter Residue Contribution mg	TOTAL mg
1	6856232	1.9800	1.9800	30.75%	0.0612	0.0000	2.0412
2	6856249	2.2200	2.2200	34.47%	0.0687	0.0000	2.2887
3	6856245	2.2400	2.2400	34.78%	0.0693	0.0000	2.3093
	TOTALS	6.4400	6.4400	100.00%	0.1992	0.0000	6.6392

Runs 1, 2, & 3				
Sampler rinse residue	186 ml	0.2000 mg		
Blank Acetone	128 ml	0.0006 mg		
Blank correct residue		0.1992 mg		
Sampler filter residue	*999*	0.0000 mg	System Blank	
Blank correct residue		0.0000 mg		
Blank Filter	6776163160	0.0000 mg	Lab Blank	

11-21-02

ANTECH

Analysis/Technology

Mr. David Rossman
HORIZON ENGINEERING
13585 NE Whitaker
Portland, OR 97230

November 18,2002 **Identification:** Oregon Steel Mills (Horizon #1862)
Job # 023 1204-09 **Date received:** 11/8/02

Sample #	31204	31500
Identification:	Baghouse all runs	blank
Acetone rinse:		
volume (mls)	186	128
residue (g)	0.0149	0.0007

Sample #	31205	31206	31207	31208	31209
Identification:	OSM pretest Blank	OSM run I	OSM Run 2	OSM Run 3	Post test Blank
Filter #	6856244	6856232	6856249	6856245	6856246
Residue (g)	-0.0019	0.0852	0.0956	0.0750	-0.0023

Respectfully submitted:
ANTECH

Diana Tracy

Diana Tracy
president

501 N.E. THOMPSON MILL ROAD
CORBETT, OREGON 97019
503/695-2135
FAX: 503/695-2139
E-mail: antech@cascadeaccess.com

ANTECH
SAMPLE DATA: EPA RESIDUES

COPY

Analyst: LD reviewer:
Job# 02312054-09 Identification: Oregon Steel. Miles 1862

FRONT ACETONE:

Sample #	31204					
Sample ID	All runs; BH					
vol mark	✓					
Date/time	11-10 11A					
Into dessicator						
Vol(mls)	186 ml	date/time weighed		date/time weighed		date/time weighed
GWt1(g)	180.2728	11-11 10A				
GWt2(g)	180.2716	11-12 9A				
GWt3(g)	180.2729	11-12 4P				
GWt4(g)	180.2724	11-13 12N				
GWt5(g)						
GWt6(g)						
Average	180.2737					
Tare (g)	180.2578	11-8 12N				
Net (g)	.0149					

BACK ACETONE:

Sample #						
Sample ID						
vol mark						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

ANTECH
SAMPLE DATA: EPA RESIDUES

Analyst: [illegible] reviewer:
Job# 023120A-09 Identification: Oregon Steel. Miles 1862

BLANKS:

	ACETONE:		IMPINGER WATER.		DCM:	
Sample #						
Sample ID						
vol mark						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

	FILTER:		FILTER:			
Sample#	31205		31209			
Sample ID	pre-test bl.		post-test BL			
Filter #	6856244		6856246			
Date/time	11-8 11A		11-8 11A			
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)	4.2737	11-10 11A	4.2610	11-10 11A		
GWt2(g)	4.2736	11-11 10A	4.2609	11-11 10A		
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average	4.2737		4.2610			
Tare (g)	4.2756	7-10-02	4.2633	7-10-02		
Net (g)	-.0019		-.0023			

ANTECH
SAMPLE DATA: EPA RESIDUES (page 3)

COPY

FLTERS:

Sample #	31206	31207	31208
Sample ID	OSM R1	OSM R2	OSM R3
Filter#	68562232	68562249	68562245
Date/time	11-8 11A	11-8 11A	11-8 11A
In dessicator			

		Date/time		Date/time		Date/time
GWt1(g)	4.4203	11-10 11A	4.3448	11-10 11A	4.3482	11-10 11A
GWt2(g)	4.4206	11-11 10A	4.3447	11-11 10A	4.3480	11-11 10A
GWt3(g)						
GWt4(g)						
Average	4.4202		4.3448		4.3481	
Tare (g)	4.3350	7-10-02	4.2492	7-12-02	4.2731	7-12-02
Net (g)	.0852		.0956		.0750	

FILTERS:

Sample #			
Sample ID			
Filter #			
Date/time			
In dessicator			

		Date/time		Date/time		Date/time
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
Average						
Tare (g)						
Net (g)						

QC DATA:

Date/time					
Balance calibrated					
(NTIS cert wts)					
Date/time					
Temp/temp					
Relative humidity (%)					

SAMPLE DATA: EPA RESIDUES

Analyst: _____ reviewer: _____

Job# 0231500 Identification: OSM 1862

COPY

HOUSE BLANKS:

	ACETONE:		IMPINGER WATER:		DCM:	
Sample #						
Sample ID						
vol mark						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

	FILTER:		FILTER:		EMPTY:	
Sample #					315	
Sample ID					lab blank	
Filter #						
Date/time					11-12 8A	
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed	empty	date/time weighed
GWt1(g)					86.2257	11-12 4P
GWt2(g)					86.2252	11-13 12N
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average					86.2255	
Tare (g)					86.2255	11-11 10A
Net (g)					.0000	

SAMPLE DATA: EPA RESIDUES

Analyst: MD reviewer: _____

Job# 02 31204-09 Identification: Oregon Steel Mills 1862

HOUSE **BLANKS:**

ACETONE:			IMPINGER WATER:		**DCM:**	
Sample #						
Sample ID						
vol mark						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

COPY

FILTER:			FILTER:		**EMPTY:**	
Sample #					312	
Sample ID	lab blank				lab blank	
Filter #	776162					
Date/time					11-10 11M	
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed	empty	date/time weighed
GWt1(g)	4.2166	11-10 11M			97.7948	11-11 10A
GWt2(g)	4.2170	11-11 10A			97.7944	11-12 9A
GWt3(g)					97.7947	11-12 4P
GWt4(g)					97.7948	11-13 12D
GWt5(g)						
GWt6(g)						
Average	4.2168				97.7948	
Tare (g)	4.2166				97.7948	11-8 12D
Net (g)	.0002				.0000	

ANTECH
SAMPLE DATA: EPA RESIDUES

Analyst: [illegible] reviewer:
Job# 0231500 Identification: OSM 1862

BLANKS:

COPY

	ACETONE:		IMPINGER WATER:		DCM:	
Sample#	31500					
Sample ID	Blank					
vol mark						
Date/time	11-12 8A					
Into dessicator						
Vol(mls)	128 ml.	date/time weighed		date/time weighed		date/time weighed
GWt1(g)	119.0919	11-12 4P				
GWt2(g)	119.0916	11-13 12D				
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average	119.0918					
Tare (g)	119.0911	11-11 10A				
Net (g)	.0007					

	FILTER:		FILTER:			
Sample #						
Sample W						
Filter #						
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed		date/time weighed
GWt1(g)						
GWt2(g)						
GWt3(g)						
GWt4(g)						
GWt5(g)						
GWt6(g)						
Average						
Tare (g)						
Net (g)						

ANTECH

Analysis/Technology

~~ANALYTICAL BALANCE CALIBRATION FORM~~

Balance **name** Sartorius **Number** _____

Classification of standard weights _____

Date	~~0.500~~ 0.1000 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
10-29-02	0.0999g	1.0000g			100.0000g	
10-30-02	0.1000g	1.0001g			100.0001g	
10-31-02	0.0999g	1.0000g			100.0000g	
11-1-02	0.1000g	1.0000g			100.0000g	
11-3-02	0.0999g	1.0001g			100.0001g	
11-4-02	0.0999g	1.0000g			100.0001g	
11-5-02	0.0999g	1.0000g			100.0000g	
11-6-02	0.1000g	1.0001g			100.0000g	
11-7-02	0.1000g	1.0001g			100,0000g	
11-8-02	0.1000g	1.0001g			100.0000g	
11-10-02	0.1000g	1.0000g			100.0000g	
11-11-02	0.1000g	1.0000g			100.0000g	
11-12-02	0.1000g	1.0000g			100.0000g	
11-13-02	0.1000g	1.0000g			100.0000g	

501 N.E. THOMPSON MILL ROAD
CORBETT, OREGON 97019
503/695-2135
FAX: 5031695-2139
E-mail: antech@cascadeaccess.com

ANTECH
Analysis/Technology

ANALYTICAL BALANCE CALIBRATION FORM

Balance name Sauter **Number** _____

classification of standard weights _____

Date	0.~~500~~ 1000 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
4-19-02	0.1000g	1.0000g			99.9991	
4-20-02	0.0999g	1.0000g			99.9992	
5-3-02	0.1000g	1.0000g			99.9991	
5-5-02	0.1000g	1.0000g			99.9993	
7-9-02	0.1000g	1.0000g			99.9991	
7-10-02	0.1000g	1.0000g			99.9991	
7-11-02	0.1000g	1.0000g			99.9991	
7-12-02	0.1000g	1.0000g			99.9991	
8-7-02	0.1000g	1.0000g			99.9991	
8-8-02	0.1000g	1.0000g			99.9992	
8-9-02	0.1000g	1.0000g			99.9992	
8-11-02	0.1000g	1.0000g			99.9990	
8-12-02	0.1000g	1.0000g			99.9991	
8-13-02	0.1000g	1.0000g			99.9993	
8-14-02	0.1000g	1.0000g			99.9992	
8-15-02	0.1000g	1.0000g			99.9993	
8-16-02	0.1000g	1.0000g			99.9991	
8-18-02	0.1000g	1.0000g			99.9990	
8-19-02	0.1000g	1.0000g			99.9993	
8-22-02	0.1000g	1.0000g			99.9990	
8-23-02	0.1000g	1.0000g			99.9990	
8-26-02	0.1000g	1.0000g			99.9990	
8-27-02	0.1000g	1.0000g			99.9990	
8-28-02	0.1000g	1.0000g			99.9993	
10-29-02	0.1000g	1.0000g			99.9990	
10-30-02	0.1000g	1.0000g			99.9991	
10-31-02	0.1000g	1.0001g			99.9991	
11-1-02	0.1000g	1.0001g			99.9987	
11-3-02	0.1000g	1.0000g			99.9991	
11-4-02	0.1001g	1.0001g			99.9989	
11-6-02	0.1000g	1.0001g			99.9988	
11-7-02	0.1000g	1.0000g			99.9989	
11-8-02	0.1000g	1.0000g			99.9988	
11-10-02	0.1000g	1.0001g			99.9988	
11-11-02	0.1000g	1.0000g				

501 N.E. THOMPSON **MILL** ROAD
CORBETT, OREGON **9701**9
503/695-2135
FAX: 5031695-2139
E-mail: antech@cascadeaccess.com

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505

Date Sent to Lab: 11/7/02

COPY

Particulate Chain of Custody Form

client: Oregon Steel Mills (OSM) Horizon Job No. 1862 Field Personnel Contact: CDB
Source Baghouse Office (Secondary) Contact: MJE

Laboratory: Antech Antech Job No. _____
501 N.E. Thompson Mill Road
Corbett, Oregon 97019

Check boxes to indicate samples sent to lab

Sample Type	Acetone-Front	Acetone-Back	Imp. H_2O	Filter-Front	Filter-Back			
Run 1				Hi vol filter				
Run 2				"				
Run 3				"				
Run r1,2,3 rinse	X							
Run								
Run								
Run								
Run								
Blank pre test				X				
Blank post test				X				

Return Sample to Horizon ASAP for Further Analysis? yes, for lead	Rush X Normal _____

11-8-02 9A

Unity Jars

These filters are kept (stored) in the dessicator @ RT

	7-9-02	7-10-02	7-11-02	7-12-02
6856220	4.2861	4.2861		
6221	4.3257	4.3255		
6222	4.3163	4.3161		
6223	4.3613	4.3611		
6224	4.3340	4.3336		
6856225	4.3530	4.3527		
6226	4.3044	4.3047		
6227	4.2988	4.2987		
6228	4.3356	4.3357		
6229	4.3189	4.3187		
6856230	4.4048	4.3422	4.3431	4.3429
6231	4.3531	4.3529		
6232 ✓	4.3349	4.3350		
6233	4.3369	4.3367		
6234	4.2942	4.2938		
6856235	4.2820	4.2820		
6236	4.2686	4.2685		
6237	4.2712	4.2711		
6238	4.2912	4.2910		
6239	4.2585	4.2582		
6856240	4.2650	4.2646		
6241	4.2678	4.2674		
6242	4.2560	4.2551	4.2564	4.2568
6243	4.2510	4.2508		
6244 ✓	4.2758	4.2756		
6856245 ✓	4.2722	4.2715	4.2727	4.2731
6246 ✓	4.2627	4.2619	4.2630	4.2633
6247	4.2455	4.2449	4.2463	4.2463
6248	4.2184	4.2178	4.2191	4.2190
6249 ✓	4.2492	4.2482	4.2496	4.2492

Environmental Services Laboratory, Inc. E S L

17400 S W Upper Boones Ferry Road, Suite 270 • Portland, OR 97224 • (503) 670-8520

December 09,2002

Mike Wallace
Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230

TEL: (503) 255-5050
FAX (503) 255-0505

RE: 1862/OSM

Order No.: 0211155

Dear Mike Wallace:

Environmental Services Laboratory received 10 samples on 11/18/02 for the analyses presented in the following report.

There were no analytical problems encountered and all associated QC data met EPA or laboratory specifications except where noted in a Case Narrative. Results apply only to the samples analyzed. Reproduction of this report is permitted only in its entirety, without the written approval of the laboratory. The following checked data sections are included in this report, and numbered to indicate total pages contained within each report section.

✓ Base Sample Report ✓ Method Blank Report ✓ Sample Duplicate Report ✓ Matrix Spike/Matrix Spike Duplicate Report ✓ Laboratory Control Spike/Spike Duplicate Report ✓ Continuing Calibration Verification Report ✓ Initial Calibration Verification Report

If you have any questions regarding these tests results, please feel free to call.

Project Manager

Technical Review

Environmental Services Laboratory

Date: *09-Dec-02*

CLIENT:	Horizon Engineering	**Client Sample ID:**	Filter Run 1 (6856232)
Lab Order:	0211155	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	11/6/02
Lab ID:	0211155-01A	**Matrix:**	FILTER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**		**(30508)**		**Analyst: mal**
Lead	1.98	0.800		mg/filter	1	11/22/02

Qualifiers:

- **ND** - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- • - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Environmental Services Laboratory

Date: *09-Dee-02*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**Filter Run 2 (6856249)**
Lab Order:	**0211155**	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	**11/6/02**
Lab ID:	**0211155-02A**	**Matrix:**	**FILTER**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**		**(30508)**		**Analyst: mal**
Lead	2.22	0.800		mg/filter	1	11/22/02

Qualifiers:

- **ND** - Not Detected at the Reporting Limit
- **J** - Analyte detected below quantitation limits
- **B** - Analyte detected in the associated Method Blank
- ***** - Value exceeds Maximum Contaminant Level
- **S** - Spike Recovery outside accepted recovery limits
- **R** - RPD outside accepted recovery limits
- **E** - Value above quantitation range

Environmental Services Laboratory

Date: *09-Dec-02*

CLIENT:	Horizon Engineering	**Client Sample ID:**	Filter **Run 3 (6856245)**
Lab Order:	**0211155**	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	**11/6/02**
Lab ID:	0211155-03A	**Matrix:**	**FILTER**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010 8**		**(30508)**		**Analyst: mal**
Lead	2.24	0.800		mg/filter	1	11/22/02

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

• - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

Environmental Services Laboratory

Date: *09-Dec-02*

CLIENT:	Horizon Engineering	**Client Sample ID:**	Filter **Blank** 1 (Pre Test)
Lab Order:	**0211155**	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	11/6/02
Lab ID:	**0211155-04A**	**Matrix:**	**FILTER**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**		**(3050B)**		**Analyst: mal**
Lead	ND	**0.800**		mg/filter	**1**	**11/22/02**

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- • - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Environmental Services Laboratory

Date: *09-Dec-02*

CLIENT:	Horizon Engineering	**Client Sample ID:**	**Filter Blank 2** (Post **Test)**
Lab Order:	**0211155**	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	**11/6/02**
Lab ID:	**0211155-05A**	**Matrix:**	**FILTER**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**		**(3050B)**		**Analyst: mal**
Lead	ND	0.800		mg/filter	1	11/22/02

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

Environmental Services Laboratory

Date: *09-Dec-02*

CLIENT:	Horizon Engineering	**Client Sample ID:**	31204 Acetone Rinse
Lab Order:	0211155	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	11/6/02
Lab ID:	0211155-06A	**Matrix:**	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**		**(3005A)**		**Analyst: mal**
Lead	0.20	0.00025		mg	1	1215102

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

Environmental Services Laboratory

Date: *09-Dee-02*

CLIENT:	Horizon Engineering	**Client Sample** ID:	31500 Acetone Blank
Lab Order:	0211155	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	11/6/02
Lab ID:	0211155-07A	**Matrix:**	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**		**(3005A)**		**Analyst: mal**
Lead	0.00056	0.00025		mg	1	12/5/02

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

CLIENT: **Horizon** Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPA

Sample ID: MB-5148	SampType: MBLK	TestCode: 02 ICPA	Units: mg/L	Prep Date: 11126102	Run ID: ICP_021126B
Client ID: ZZZZZ	Batch ID: 5148	TestNo: EPA 6010B	(3005A)	Analysis Date: 11/26/02	SeqNo: 149289

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	XRPD	RPDLimit	Qual
Lead	ND	0.0056									

Sample ID: MB-5168	SampType: MBLK	TestCode: 02 ICPA	Units: mg/L	Prep Date: 12/3/02	Run ID: ICP_021205D
Client ID: 27777	Batch ID: 5168	TestNo: EPA 6010B	(3005A)	Analysis Date: 12/5/02	SeqNo: 150358

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	ND	0.0050									
Arsenic	ND	0.0050									
Barium	ND	0.0050									
Beryllium	ND	0.0020									
Cadmium	ND	0.0020									
Chromium	ND	0.0050									
Copper	ND	0.0050									
Imn	ND	0.010									
Lead	ND	0.0050									
Manganese	ND	0.0050									
Nickel	ND	0.0050									
Selenium	ND	0.015									
Silver	ND	0.0050									
Thallium	ND	0.010									
Zinc	ND	0.0050									

Sample ID: LCS-5148	SampType: LCS	TestCode: 02 ICPA	Units: mg/L	Prep Date: 11126102	Run ID: ICP_021126B
Client ID: ZZZZZ	Batch ID: 5148	TestNo: EPA 6010B	(3005A)	Analysis Date: 11126102	SeqNo: 149288

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.592	0.0056	0.556	0	107	80	120	0	0		

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: Horizon **Engineering**
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPA

Sample ID: LCS-5168 SampType: LCS TestCode: 02 **ICPA** Units: **mg/L** Prep Date: 12/3/02 Run ID: **ICP_021205D**
Client ID: ZZZZZ Batch ID: 5168 TestNo: EPA **6010B** **(3005A)** Analysis Date: 12/5/02 SeqNo: 150359

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.489	0.0050	0.5	0	97.8	80	120	0	0		
Arsenic	0.481	0.0050	0.5	0	96.2	80	120	0	0		
Barium	0.49	0.0050	0.5	0	98	80	120	0	0		
Beryllium	0.506	0.0020	0.5	0	101	80	120	0	0		
Cadmium	0.465	0.0020	0.5	0	93	80	120	0	0		
Chromium	0.506	0.0050	0.5	0	101	80	120	0	0		
Copper	0.506	0.0050	0.5	0	101	80	120	0	0		
Iron	4.76	0.010	5	0	95.2	80	120	0	0		
Lead	0.501	0.0050	0.5	0	100	80	120	0	0		
Manganese	0.495	0.0050	0.5	0	99	80	120	0	0		
Nickel	0.513	0.0050	0.5	0	103	80	120	0	0		
Selenium	0.511	0.015	0.5	0	102	80	120	0	0		
Silver	0.492	0.0050	0.5	0	98.4	80	120	0	0		
Thallium	0.492	0.010	0.5	0	98.4	80	120	0	0		
Zinc	0.492	0.0050	0.5	0	98.4	80	120	0	0		

Sample ID: 021157-01A MS SampType: MS TestCode: 02 **ICPA** Units: **mg/L** Prep Date: 11/26/02 Run ID: **ICP_021126B**
Client ID: ZZZZZ Batch ID: 5148 TestNo: EPA 60108 **(3005A)** Analysis Date: 11/26/02 SeqNo: 149291

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead, Diss	0.535	0.0056	0.562	0	95.2	75	125	0	0		

Sample ID: 0211277-01A MS SampType: MS TestCode: 02 ICPA Units: **mg/L** Prep Date: 12/3/02 Run ID: **ICP_021205D**
Client ID: ZZZZZ Batch ID: 5168 TestNo: EPA **6010B** **(3005A)** Analysis Date: 12/5/02 SeqNo: 150361

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.482	0.0050	0.5	0	96.4	75	125	0	0		
Arsenic	0.482	0.0050	0.5	0	96.4	75	125	0	0		
Barium	0.602	0.0050	0.5	0.101	100	75	125	0	0		
Beryllium	0.508	0.0020	0.5	0	102	75	125	0	0		
Cadmium	0.464	0.0020	0.5	0	92.8	75	125	0	0		

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

CLIENT: Horizon Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPA

Sample ID: 0211277-01A MS	SampType: MS	TestCode: 02 ICPA	Units: mg/L	Prep Date: 12/3/02	Run ID: ICP_021205D
Client ID: ZZZZZ	Batch ID: 5168	TestNo: EPA 6010B	(3005A)	Analysis Date: 12/5/02	SeqNo: 150361

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	0.508	0.0050	0.5	0	102	75	125	0	0		
Copper	0.511	0.0050	0.5	0	102	75	125	0	0		
Iron	5.43	0.010	5	0	109	75	125	0	0		
Lead	0.501	0.0050	0.5	0	100	75	125	0	0		
Manganese	0.869	0.0050	0.5	0.378	98.2	75	125	0	0		
Nickel	0.526	0.0050	0.5	0.009	103	75	125	0	0		
Selenium	0.493	0.015	0.5	0	98.6	75	125	0	0		
Silver	0.491	0.0050	0.5	0	98.2	75	125	0	0		
Thallium	0.484	0.010	0.5	0	96.8	75	125	0	0		
Zinc	0.536	0.0050	0.5	0.0314	101	75	125	0	0		

Sample ID: 0211157-01A MSD	SampType: MSD	TestCode: 02 ICPA	Units: mg/L	Prep Date: 11/26/02	Run ID: ICP_021126B
Client ID: ZZZZZ	Batch ID: 5148	TestNo: EPA 6010B	(3005A)	Analysis Date: 11/26/02	SeqNo: 149292

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead, Diss	0.538	0.0056	0.562	0	95.8	75	125	0.535	0.628	20	

Sample ID: 0211277-01A MSD	SampType: MSD	TestCode: 02 ICPA	Units: mg/L	Prep Date: 12/3/02	Run ID: ICP_021205D
Client ID: ZZZZZ	Batch ID: 5168	TestNo: EPA 6010B	(3005A)	Analysis Date: 12/5/02	SeqNo: 150362

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.489	0.0050	0.5	0	97.8	75	125	0.482	1.44	20	
Arsenic	0.489	0.0050	0.5	0	97.8	75	125	0.482	1.44	20	
Barium	0.61	0.0050	0.5	0.101	102	75	125	0.602	1.32	20	
Beryllium	0.511	0.0020	0.5	0	102	75	125	0.508	0.589	20	
Cadmium	0.468	0.0020	0.5	0	93.6	75	125	0.464	0.858	20	
Chromium	0.508	0.0050	0.5	0	102	75	125	0.508	0	20	
Copper	0.52	0.0050	0.5	0	104	75	125	0.511	1.75	20	
Iron	5.47	0.010	5	0	109	75	125	5.43	0.734	20	
Lead	0.502	0.0050	0.5	0	100	75	125	0.501	0.199	20	
Manganese	0.865	0.0050	0.5	0.378	97.4	75	125	0.869	0.461	20	

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: Horizon Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPA

Sample ID: **0211277-01A** MSD | SampType: MSD | TestCode: 02 **ICPA** | Units: **mg/L** | Prep Date: 12/3/02 | Run ID: **ICP_021205D**
Client ID: 77777 | Batch ID: 5168 | TestNo: EPA 60106 **(3005A)** | Analysis Date: 1215102 | SeqNo: 150362

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nickel	0.53	0.0050	0.5	0.009	104	75	125	0.526	0.758	20	
Selenium	0.503	0.015	0.5	0	101	75	125	0.493	2.01	20	
Silver	0.502	0.0050	0.5	0	100	75	125	0.491	2.22	20	
Thallium	0.503	0.010	0.5	0	101	75	125	0.484	3.85	20	
Zinc	0.539	0.0050	0.5	0.0314	102	75	125	0.536	0.558	20	

Sample ID: **0211157-02A** DUP | SampType: DUP | TestCode: 02 **ICPA** | Units: **mg/L** | Prep Date: 11126102 | Run ID: **ICP_021126B**
Client ID: 27777 | Batch ID: 5148 | TestNo: EPA **6010B** **(3005A)** | Analysis Date: 11126102 | SeqNo: 149294

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead. Diss	ND	0.0056	0	0	0	0	0	0	0	20	

Sample ID: **0211257-01A** DUP | SampType: DUP | TestCode: 02 **ICPA** | Units: **mg/L** | Prep Date: 12/3/02 | Run ID: **ICP_021205D**
Client ID: ZZZZZ | Batch ID: 5168 | TestNo: EPA 6010**B** **(3005A)** | Analysis Date: 12/5/02 | SeqNo: 150364

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	ND	0.0050	0	0	0	0	0	0	0	20	
Arsenic, TCLP	ND	0.050	0	0	0	0	0	0	0	20	
Barium, TCLP	0.554	0.050	0	0	0	0	0	0.538	2.93	20	
Beryllium	ND	0.0020	0	0	0	0	0	0	0	20	
Cadmium, TCLP	ND	0.050	0	0	0	0	0	0	0	20	
Chromium. TCLP	0.159	0.050	0	0	0	0	0	0.155	2.55	20	
Copper, TCLP	0.0717	0.050	0	0	0	0	0	0.0698	2.69	20	
Iron	52.6	0.010	0	0	0	0	0	51.1	2.89	20	
Lead. TCLP	ND	0.050	0	0	0	0	0	0	0	20	
Manganese	1.24	0.0050	0	0	0	0	0	1.2	3.28	20	
Nickel, TCLP	5.51	0.050	0	0	0	0	0	5.34	3.13	20	
Selenium, TCLP	ND	0.050	0	0	0	0	0	0	0	20	
Silver, TCLP	ND	0.050	0	0	0	0	0	0	0	20	
Thallium	ND	0.010	0	0	0	0	0	0	0	20	
Zinc. TCLP	3.66	0.050	0	0	0	0	0	3.56	2.77	20	

Qualifiers: ND - Not Detected at the Reporting Limit | S - Spike Recovery outside accepted recovery limits | B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits | R - RPD outside accepted recovery limits

CLIENT: Horizon Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPA

Sample ID: CCV	SampType: CCV	TestCode: 02 ICPA	Units: mg/L	Prep Date: 11/26/02	Run ID: ICP_021126B
Client ID: 77777	Batch ID: 5148	TestNo: EPA 60108		Analysis Date: 11/26/02	SeqNo: 149303

Analyte	Result	POL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.506	0.0050	0.5	0	101	90	110	0	0		

Sample ID: CCV	SampType: CCV	TestCode: 02 ICPA	Units: mg/L	Prep Date: 12/3/02	Run ID: ICP_021205D
Client ID: ZZZZZ	Batch ID: 5168	TestNo: EPA 60108		Analysis Date: 12/5/02	SeqNo: 150378

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	0.498	0.0050	0.5	0	99.6	90	110	0	0		
Barium	0.508	0.0050	0.5	0	102	90	110	0	0		
Beryllium	0.506	0.0020	0.5	0	101	90	110	0	0		
Cadmium	0.504	0.0020	0.5	0	101	90	110	0	0		
Chromium	0.506	0.0050	0.5	0	101	90	110	0	0		
Copper	0.505	0.0050	0.5	0	101	90	110	0	0		
Iron	0.504	0.010	0.5	0	101	90	110	0	0		
Lead	0.504	0.0050	0.5	0	101	90	110	0	0		
Manganese	0.499	0.0050	0.5	0	99.8	90	110	0	0		
Nickel	0.519	0.0050	0.5	0	104	90	110	0	0		
Selenium	0.497	0.0050	0.5	0	99.4	90	110	0	0		
Silver	0.502	0.0050	0.5	0	100	90	110	0	0		
Thallium	0.504	0.010	0.5	0	101	90	110	0	0		
Zinc	0.497	0.0050	0.5	0	99.4	90	110	0	0		

Sample ID: ICVLOW	SampType: ICV	TestCode: 02 ICPA	Units: mg/L	Prep Date: 11/20/02	Run ID: ICP_021122C
Client ID: ZZZZZ	Batch ID: 5122	TestNo: EPA 60108		Analysis Date: 11/22/02	SeqNo: 149067

Analyte	Result	POL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	0.504	0.0050	0.5	0	101	90	110	0	0		
Cadmium	0.504	0.0020	0.5	0	101	90	110	0	0		
Chromium	0.486	0.0050	0.5	0	97.2	90	110	0	0		
Lead	0.508	0.0050	0.5	0	102	90	110	0	0		
Nickel	0.502	0.0050	0.5	0	100	90	110	0	0		
Zinc	0.51	0.040	0.5	0	102	90	110	0	0		

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: **Horizon** Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPA

Sample ID: **ICVLOW**	SampType: **ICV**	TestCode: **02 ICPA**	Units: **mg/L**	Prep Date: **11/26/02**	Run ID: **ICP_021126B**
Client ID: **27777**	Batch ID: **5148**	TestNo: **EPA 6010B**		Analysis Date: **11/26/02**	SeqNo: **149287**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.508	0.0050	0.5	0	102	90	110	0	0		

Sample ID: **ICVLOW**	SampType: **ICV**	TestCode: **02 ICPA**	Units: **mg/L**	Prep Date: **11/21/02**	Run ID: **ICP_021126C**
Client ID: **ZZZZZ**	Batch ID: **5130**	TestNo: **EPA 60108**		Analysis Date: **11/26/02**	SeqNo: **149309**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	0.488	0.0050	0.5	0	97.6	90	110	0	0		
Barium	0.5	0.0050	0.5	0	100	90	110	0	0		
Cadmium	0.509	0.0020	0.5	0	102	90	110	0	0		
Chromium	0.49	0.0050	0.5	0	98	90	110	0	0		
Lead	0.504	0.0050	0.5	0	101	90	110	0	0		
Selenium	0.507	0.0050	0.5	0	101	90	110	0	0		
Silver	0.496	0.0050	0.5	0	99.2	90	110	0	0		

Sample ID: **ICVLOW**	SampType: **ICV**	TestCode: **02 ICPA**	Units: **mg/L**	Prep Date: **12/3/02**	Run ID: **ICP_021205D**
Client ID: 77777	Batch ID: **5168**	TestNo: **EPA 6010B**		Analysis Date: **12/5/02**	SeqNo: **150357**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.504	0.0050	0.5	0	101	90	110	0	0		
Arsenic	0.494	0.0050	0.5	0	98.8	90	110	0	0		
Barium	0.502	0.0050	0.5	0	100	90	110	0	0		
Beryllium	0.509	0.0020	0.5	0	102	90	110	0	0		
Cadmium	0.506	0.0020	0.5	0	101	90	110	0	0		
Chromium	0.506	0.0050	0.5	0	101	90	110	0	0		
Copper	0.507	0.0050	0.5	0	101	90	110	0	0		
Iron	0.476	0.010	0.5	0	95.2	90	110	0	0		
Lead	0.509	0.0050	0.5	0	102	90	110	0	0		
Manganese	0.504	0.0050	0.5	0	101	90	110	0	0		
Nickel	0.517	0.0050	0.5	0	103	90	110	0	0		
Selenium	0.512	0.015	0.5	0	102	90	110	0	0		
Silver	0.502	0.0050	0.5	0	100	90	110	0	0		

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: Horizon **Engineering**
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPA

Sample ID: **ICVLOW**	SampType: **ICV**	TestCode: **02 ICPA**	Units: **mg/L**	Prep Date: **12/3/02**	Run ID: **ICP_021205D**
Client ID: **27777**	Batch ID: **5168**	TestNo: **EPA 60106**		Analysis Date: **12/5/02**	SeqNo: **150357**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Thallium	0.512	0.010	0.5	0	102	90	110	0	0		
Zinc	0.499	0.0050	0.5	0	99.8	90	110	0	0		

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

CLIENT: Horizon Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPS

Sample ID: MB-5122	SampType: MBLK	TestCode: 02 ICPS	Units: mg/Kg	Prep Date: 11120102	Run ID: ICP_021122C
Client ID: ZZZZZ	Batch ID: 5122	TestNo: EPA 60108	(30508)	Analysis Date: 11/22/02	SeqNo: 149068

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	ND	1.0									
Cadmium	ND	1.0									
Chromium	ND	1.0									
Lead	ND	1.0									
Nickel	ND	1.0									
Zinc	ND	4.0									

Sample ID: MB-5130	SampType: MBLK	TestCode: 02 ICPS	Units: mg/Kg	Prep Date: 11121102	Run ID: ICP_021126C
Client ID: ZZZZZ	Batch ID: 5130	TestNo: EPA 60108	(30508)	Analysis Date: 11/26/02	SeqNo: 149310

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	ND	1.0									
Barium	ND	1.0									
Cadmium	ND	1.0									
Chromium	ND	1.0									
Lead	ND	1.0									
Selenium	ND	1.0									
Silver	ND	1.0									

Sample ID: LCS-5122	SampType: LCS	TestCode: 02 ICPS	Units: mg/Kg	Prep Date: 11/20/02	Run ID: ICP_021122C
Client ID: ZZZZZ	Batch ID: 5122	TestNo: EPA 6010B	(3050B)	Analysis Date: 11/22/02	SeqNo: 149069

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	XRPD	RPDLimit	Qual
Arsenic	50.8	1.0	50	0	102	80	120	0	0		
Cadmium	51.1	1.0	50	0	102	80	120	0	0		
Chromium	49.8	1.0	50	0	99.6	80	120	0	0		
Lead	53.5	1.0	50	0	107	80	120	0	0		
Nickel	50.7	1.0	50	0	101	80	120	0	0		
Zinc	59.8	4.0	50	0	120	80	120	0	0		

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: Horizon Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPS

Sample ID: LCS-5130 SampType: LCS TestCode: 02 ICPS Units: mg/Kg Prep Date: 11/21/02 Run ID: ICP_021126C
Client ID: ZZZZZ Batch ID: 5130 TestNo: EPA 60108 (30508) Analysis Date: 11/26/02 SeqNo: 149311

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	49.5	1.0	50	0	99	80	120	0	0		
Barium	50.9	1.0	50	0	102	80	120	0	0		
Cadmium	53.9	1.0	50	0	108	80	120	0	0		
Chromium	50.2	1.0	50	0	100	80	120	0	0		
Lead	55	1.0	50	0	110	80	120	0	0		
Selenium	51.4	1.0	50	0	103	80	120	0	0		
Silver	57.4	1.0	50	0	115	80	120	0	0		

Sample ID: 0211178-01A MS SampType: MS TestCode: 02 ICPS Units: mg/Kg Prep Date: 11/20/02 Run ID: ICP_021122C
Client ID: ZZZZZ Batch ID: 5122 TestNo: EPA 60108 (30508) Analysis Date: 11/22/02 SeqNo: 149071

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	62.6	1.0	50	17.1	91	75	125	0	0		
Cadmium	124	1.0	50	82.8	82.4	75	125	0	0		
Chromium	482	1.0	50	496	-28	75	125	0	0		S,M
Lead	52	1.0	50	4.81	94.4	75	125	0	0		
Nickel	288	1.0	50	276	24	75	125	0	0		S,M
Zinc	78600	200	50	58600	40000	75	125	0	0		S,M

Sample ID: 0211198418 MS SampType: MS TestCode: 02 ICPS Units: mg/Kg Prep Date: 11/21/02 Run ID: ICP_021126C
Client ID: ZZZZZ Batch ID: 5130 TestNo: EPA 6010B (30508) Analysis Date: 11/26/02 SeqNo: 149313

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	Highlimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	48.6	1.0	50	4.75	87.7	75	125	0	0		
Barium	99.9	1.0	50	61.1	77.6	75	125	0	0		
Cadmium	49.6	1.0	50	0	99.2	75	125	0	0		
Chromium	92.3	1.0	50	50.6	83.4	75	125	0	0		
Lead	62.8	1.0	50	15	95.6	75	125	0	0		
Selenium	44.7	1.0	50	0	89.4	75	125	0	0		
Silver	53.7	1.0	50	0	107	75	125	0	0		

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: Horizon Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPS

Sample ID: 0211178-01A MSD	SampType: MSD	TestCode: 02 ICPS	Units: mg/Kg	Prep Date: 11120102	Run ID: ICP_021122C
Client ID: ZZZZZ	Batch ID: 5122	TestNo: EPA 6010B	(30508)	Analysis Date: 11/22/02	SeqNo: 149072

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	62.8	1.0	50	17.1	91.4	75	125	62.6	0.319	20	
Cadmium	52	1.0	50	82.8	-61.6	75	125	124	81.8	20	S,R,M,Q
Chromium	544	1.0	50	496	96	75	125	482	12.1	20	
Lead	49.5	1.0	50	4.81	89.4	75	125	52	4.93	20	
Nickel	326	1.0	50	276	100	75	125	288	12.4	20	
Zinc	70700	200	50	58600	24200	75	125	78600	10.6	20	S,M

Sample ID: 0211198-01B MSD	SampType: MSD	TestCode: 02 ICPS	Units: mg/Kg	Prep Date: 11/21/02	Run ID: ICP_021126C
Client ID: ZZZZZ	Batch ID: 5130	TestNo: EPA 6010B	(3050B)	Analysis Date: 11126102	SeqNo: 149314

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	48.1	1.0	50	4.75	86.7	75	125	48.6	1.03	20	
Barium	102	1.0	50	61.1	81.8	75	125	99.9	2.08	20	
Cadmium	47.2	1.0	50	0	94.4	75	125	49.6	4.96	20	
Chromium	94.6	1.0	50	50.6	88	75	125	92.3	2.46	20	
Lead	60.5	1.0	50	15	91	75	125	62.8	3.73	20	
Selenium	44.4	1.0	50	0	88.8	75	125	44.7	0.673	20	
Silver	50.6	1.0	50	0	101	75	125	53.7	5.94	20	

Sample ID: 0211178-02A DUP	SampType: DUP	TestCode: 02 ICPS	Units: mg/Kg	Prep Date: 11/20/02	Run ID: ICP_021122C
Client ID: ZZZZZ	Batch ID: 5122	TestNo: EPA 6010B	(30508)	Analysis Date: 11/22/02	SeqNo: 149074

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	49.3	1.0	0	0	0	0	0	40.9	18.6	20	
Cadmium	34.5	1.0	0	0	0	0	0	30.6	12.0	20	
Chromium	1440	10	0	0	0	0	0	1230	15.7	20	
Lead	5.75	1.0	0	0	0	0	0	5.4	6.28	20	
Nickel	814	1.0	0	0	0	0	0	699	15.2	20	
Zinc	18000	100	0	0	0	0	0	30900	52.8	20	R,Q

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

CLIENT: Horizon Engineering
Work Order: 0211155
Project: 1862/OSM

ANALYTICAL QC SUMMARY REPORT

TestCode: 02 ICPS

Sample ID: 0211198-026DUP SampType: DUP TestCode: 02 ICPS Units: mg/Kg Prep Date: 11121102 Run ID: ICP_021126C
Client ID: 77777 Batch ID: 5130 TestNo: EPA 60106 (30508) Analysis Date: 11126102 SeqNo: 149316

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	1.37	1.0	0	0	0	0	0	2.24	48.2	20	R,T
Barium	36.3	1.0	0	0	0	0	0	33.7	7.43	20	
Cadmium	ND	1.0	0	0	0	0	0	0	0	20	
Chromium	55.1	1.0	0	0	0	0	0	41.8	27.5	20	R,Q
Lead	6.05	1.0	0	0	0	0	0	5.86	3.19	20	
Selenium	ND	1.0	0	0	0	0	0	0	0	20	
Silver	ND	1.0	0	0	0	0	0	0	0	20	

Sample ID: CCV SampType: CCV TestCode: 02 ICPS Units: mg/L Prep Date: 11120102 Run ID: ICP_021122C
Client ID: 77777 Batch ID: 5122 TestNo: EPA 60106 Analysis Date: 11122102 SeqNo: 149092

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	0.493	0.0050	0.5	0	98.6	90	110	0	0		
Cadmium	0.502	0.0050	0.5	0	100	90	110	0	0		
Chromium	0.485	0.0050	0.5	0	97	90	110	0	0		
Lead	0.503	0.0050	0.5	0	101	90	110	0	0		
Nickel	0.499	0.0050	0.5	0	99.8	90	110	0	0		
Zinc	0.504	0.0050	0.5	0	101	90	110	0	0		

Sample ID: CCV SampType: CCV TestCode: 02 ICPS Units: mg/Kg Prep Date: 11121102 Run ID: ICP_021126C
Client ID: 72277 Batch ID: 5130 TestNo: EPA 60108 Analysis Date: 11126102 SeqNo: 149325

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	0.488	1.0	0.5	0	97.6	90	110	0	0		
Barium	0.494	1.0	0.5	0	98.8	90	110	0	0		
Cadmium	0.509	1.0	0.5	0	102	90	110	0	0		
Chromium	0.482	1.0	0.5	0	96.4	90	110	0	0		
Lead	0.503	1.0	0.5	0	101	90	110	0	0		
Selenium	0.496	1.0	0.5	0	99.2	90	110	0	0		
Silver	0.495	1.0	0.5	0	99	90	110	0	0		

Qualifiers: ND - Not Dctected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

ENVIRONMENTAL SERVICES LABORATORY – GLOSSARY OF FLAGS

QUALIFIER	DESCRIPTION
AA	This sample was analyzed after the holding time had expired.
AB	The hydrocarbon pattern in this sample is not typical of gasoline.
AC	The hydrocarbon pattern in this sample is not typical of diesel.
AD	The hydrocarbon pattern in this sample is not typical of oil.
AE	The hydrocarbon pattern in this sample extends into the gasoline range.
AF	The hydrocarbon pattern in this sample extends into the diesel range.
AG	The hydrocarbon pattern in this sample extends into the oil range.
A	This analysis was performed on a VOA sample containing headspace.
B	Analyte detected in the Method Blank above the reporting level.
C	The Relative Percent Difference (RPD) for the primary result and confirmation result was greater than 40%. The higher result was reported.
D	The sample was supplied in an inappropriate container according to method criteria.
E	This value is above the quantitation limit. It is considered an estimate.
H	The Matrix Spike/Matrix Spike Duplicate (MS/MSD) result was outside control limits. The Laboratory Control Standard/Duplicate (LCS/LCSD) result was in control validating the batch.
J	The result is above the Method Detection Limit (MDL) and below the Reporting level (RL). It is considered an estimate.
M	The MS/MSD recoveries are not calculable due to a high amount of analyte in sample.
MI	This indicates a high level of matrix interference affecting the spike or surrogate recovery.
N	See case narrative.
O	Detection Limits are elevated due to sample dilution. See case narrative.
Q	Further inspection of the sample confirms a non-homogenous sample matrix affecting RPD result.
R	The RPD result is outside method control limits. See other qualifiers or case narrative.
S	The spike recovery is outside method control limits. See other qualifiers or case narrative.
T	The RPD between the sample result and duplicate result was greater than 20%. The original result was less than three times the reporting level, therefore the RPD is not applicable.
X	Unable to quantitate surrogate recovery due to sample dilution.

02115,

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

CLIENT: OSM EAF Baghouse JOB # 1862

DATE SENT TO LAB: 11/15

CHAIN OF CUSTODY REPORT

SENT TO LAB:	INVOICE TO:	REPORT TO:
ATTENTION: Environmental Services Laboratory	ATTENTION: PENNY ROSSMAN	ATTENTION: Mike Wallace,
ADDRESS: 17400 SW Upper Boones Ferry Suite 270, Portland OR 97224	ADDRESS: 13585 NE WHITAKER WAY PORTLAND, OR 97230	ADDRESS. 13585 NE WHITAKER WAY PORTLAND, OR 97230
PHONE: 503 670-8520 FAX:	PHONE: 503-0255-5050 FAX: 503-255-0505	

PROJECT NAME: OSM
PROJECT NUMBER: 1862
SAMPLED BY: Dave Bagwell

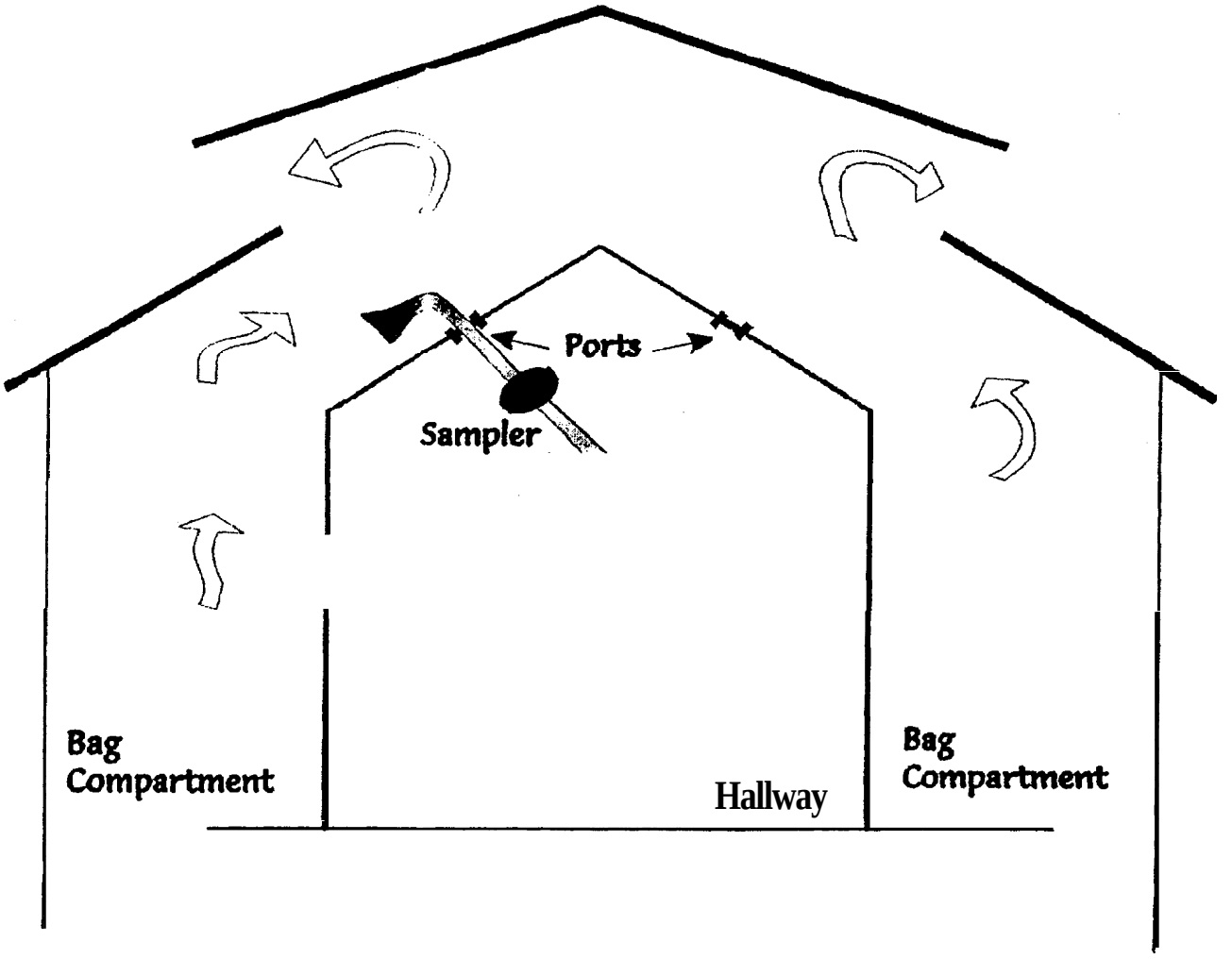
TURN AROUND TIME:
<R> RUSH - 24-72 HRS <S> SPECIAL - _____
(<N>) NORMAL - 10 WORKING DAYS

CLIENT SAMPLE IDENTIFICATION	SAMPLE ID (LAB USE ONLY)	SAMPLING DATE/TIME	Lead	MATRIX (W.S.A.O)	# OF CONTAINERS	COMMENTS
Filter Run 1 (6856232	01	11/6	✓		1	
✓ Run 2 (6856249)	02	11/6	✓		1	
✓ Run 3 (6856245)	03	11/6	✓		1	
✓ blank 1 (Pre test)	04	11/6	✓		1	6856244
✓ blank 2 (Post test)	05	11/6	✓		1	6856246
31204 Acetone Rinse	06		✓		1	
31500 Acetone Blank	07		✓		1	
Audit No. Fil 2123 (filter)	08		✓		1	
Audit blank filter	09		✓		1	
Audit AM-002265	10		✓		1	

RELINQUISHED BY: Dharma Cole	DATE: 11/15/02	RECEIVED BY: Steven T. Hardt	DATE: 11/15/02
PRINT NAME: Dharma Cole	TIME: 3pm	PRINT NAME: STEVEN T. Hardt	TIME: 3pm
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
PRINT NAME:	TIME:	PRINT NAME:	TIME:

ADDITIONAL REMARKS:

Bayhouse Sampling Diagram



*******Horizon Engineering*******

Volume Flow Rate Determination
(11/6 and 12/5, 2002)

Flow Rate Determinations and Field Data

Traverse Point Location – Inlet & Outlet

Outlet Flow Rates

Client	Oregon Steel Mills	Compart.	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	
Source	ICA Baghouse-EAF	Point									HI-VOL RUN #1									
Location	Portland, OR	K										0.0273	0.0057	0.0218	0.0079	0.0206	0.0088	0.0432	0.0039	
Date	06-Nov-2002	L	0.0511	0.0409	0.0128	0.0498	0.0400					0.0209	0.0342	0.0307	0.0130	0.0162	0.0359	0.0383	0.0159	
Testers	MJE/TJH/CDB/dc/ph	*M	0.0514	0.0582	0.0597	0.0356	0.0352	0.0386	0.0330			0.0299	0.0332	0.0410	0.0086	0.0127	0.0420	0.0354	0.0266	
File	1862_02	N	0.0597	0.0716	0.0544	0.0352	0.0451	0.0444	0.0416	0.0358		0.0275	0.0275	0.0466	0.0034	0.0012	0.0314	0.0377	0.0268	
Analysis/QA	MEW,DBC	O	00598	0.0747	0.0450	0.0185	0.0404	0.3600	0.0395	00250		0.0257	0.0245	0.0368	0.0061	0.0080	0.0305	0.0269	0.0287	
Equipment	ShortRidge1,11s	K									A									
Total Runs	Run #1	L																		
Pts per Run		*M									*C									
		N									D									
		O									E									
All Points	SQRT(dP)	0.1774	0.2375	0.2368	0.2215	0.1749	0.1764	0.2579	0.1825	0.1666		0.1618	0.1530	0.1866	0.0864	0.1015	0.1680	0.1900	0.1370	0.1774	
Standard Devation	STD(SQRT(dP))	0.0944	0.1189	0.1204	0.1112	0.0905	0.0946	0.1794	0.0928	0.0850		0.0812	0.0816	0.0948	0.0451	0.0574	0.0883	0.0955	0.0742	0.0944	
Symbol	Definitions, Units	Method/Notes	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Avg/Total 16	15 Compart
	Time																				
As	Cross Section	in²	9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		
Cp	Pitot Coef		0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970		0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970		
Ts	Duct temperature	°F	147.5	123.0	127.0	161.0	169.0	160.0	164.0	169.0		169.0	139.0	140.0	153.0	155.0	160.0	163.0	168.0	154.2	
Ts	Duct lemperature	°R	607.2	582.7	586.7	620.7	628.7	619.7	623.7	628.7		628.7	598.7	599.7	612.7	614.7	619.7	622.7	627.7		
Tdb	Dry bulb temp.	°F	152.0																		
Twb	Wet bulb temp.	°F	80.0																		
Pbar	Barometric Pressure	in Hg	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		
Pg	Static Pressure	in H2O	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00		-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00		
Ps	Duct Pressure	in Hg	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		
dp^½			0.2375	0.2368	0.2215	0.1749	0.1764	0.2579	0.1825	0.1666		0.1618	0.1530	0.1866	0.0864	0.1015	0.1680	0.1900	0.1370		
Bws	Moisture, % Suck		0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89		0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89		
mfg	Mole fraction dry gas		99.1%	99.1%	99.1%	99.1%	99.1%	99.1%	99.1%	99.1%		99.1%	99.1%	99.1%	99.1%	99.1%	99.1%	99.1%	99.1%		
Oxygen	Outlet-Estimated		20.42	20.42	20.42	20.42	20.42	20.42	20.42	20.42		20.42	20.42	20.42	20.42	20.42	20.42	20.42	20.42		
Carbon Dioxide	Outlet-Estimated		0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51		0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51		
Md	Molecular weight Dry		29.02	29.02	29.02	29.02	29.02	29.02	29.02	29.02		29.02	29.02	29.02	29.02	29.02	29.02	29.02	29.02		
Ms	Molecular weight Wet		28.92	28.92	28.92	28.92	28.92	28.92	28.92	28.92		28.92	28.92	28.92	28.92	28.92	28.92	28.92	28.92		
vs	Velocity suck	fpm	810.5	791.6	743.1	603.4	612.7	889.1	631.3	578.4		561.8	518.5	632.9	296.2	348.6	579.3	656.6	475.2	608.1	
Qa	Flowrate actual	acf/min	52,389.3	51,168.8	48,033.3	39,005.4	39,607.4	57,467.7	40,809.3	37,388.5		36,313.6	33,515.0	40,911.7	19,148.4	22,532.8	37,443.7	42,440.7	30,717.8	39,306	589,587
Qsd (5-pt)	Flowrate @std	dscf/min	45,425.1	46,232.4	43,103.5	33,084.7	33,167.8	48,823.3	34,448.3	31,309.7		30,409.5	29,472.4	35,917.0	16,453.9	19,299.1	31,811.4	35,883.0	25,764.5	33,788	506,818
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

Outlet Flow Rates

Client	Oregon Steel Mills	Compart.	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16		
Source	ICA Baghouse-EAF	Point	HI-VOL RUN #2																		
Location	Portland, OR	K	0.0398	0.0371	0.0125	0.0107	0.0412	0.0343	0.0077	0.0098	A	0.0113	0.0276	0.0128	0.0284	0.0524	0.0413	0.0268	0.0152		
Date	06-Nov-2002	L	0.0411	0.0474	0.0123	0.0059	0.0621	0.0530	0.0353	0.0278	B	0.0256	0.0289	0.0223	0.0505	0.0463	0.0418	0.0265	0.0157		
Testers	MJE/TJH/CDB/dc/ph	*M	0.0331	0.0325	0.0116	0.0109	0.0686	0.0551	0.0425	0.0267	*C	0.0287	0.0281	0.0270	0.0328	0.0366	0.0387	0.0353	0.0169		
File	1862_02	N	0.0366	0.0420	0.0344	0.0372	0.0637	0.0520	0.0374	0.0286	D	0.0284	0.0392	0.0292	0.0366	0.0439	0.0448	0.0384	0.0243		
Analysis/QA	MEW,DBC	O	0.0311	0.0363	0.0016	0.0082	0.0647	0.0473	0.0367	0.0292	E	0.0300	0.0314	0.0263	0.0770	0.0426	0.0370	0.0314	0.0325		
Equipment	ShortRidge1,11s	K									A										
Total Runs	Run #2	L									B										
Pts per Run		*M									*C										
		N									D										
		O									E										
All Points	SQRT(dP)	0.1768	0.1920	0.1972	0.1112	0.1136	0.2442	0.2191	0.1734	0.1538		0.1555	0.1758	0.1520	0.2086	*0.2103*	*0.2017*	0.1775	0.1430	0.1768	
Standard Deviation	STD(SQRT(dP))	0 0906	0.0962	0.0990	0.0644	0.0637	0.1230	0.1103	0.0919	0.0793		0.0797	0.0883	0.0774	0.1079	*0.1055*	*0.1010*	0.0892	0.0732	0.0906	
Symbol	Definitions, Units	Method/Notes	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Avg/Total 16	15 Compart.
	Time																				
As	Cross Section	in'	9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		9,308	9,308	9,308	9,308	*9,308*	*9.308*	9,308	9,308		
Cp	Pitot Coef.		0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970		0.7970	0.7970	0.7970	0.7970	*0.7970*	*0.7970*	0.7970	0.7970		
Ts	Duct temperature	°F	173.0	153.0	158.0	166.0	148.0	145.0	143.0	170.0		171.0	171.0	159.0	163.0	*167.0*	*158.0*	157.0	161.0	160.2	
Ts	Duct temperature	°R	632.7	612.7	617.7	625.7	607.7	604.7	602.7	629.7		630.7	630.7	618.7	622.7	*626.7*	*617.7*	616.7	620.7		
Tdb	Dry bulb temp.	°F	145.0																		
Twb	Wet bulb temp.	°F	88.5																		
Pbar	Barometric Pressure	in Hg	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		30.12	30.12	30.12	30.12	*30.12*	*30.12*	30.12	30.12		
Pg	Static Pressure	in H2O	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01	*-0.01*	*-0.01*	-0.01	-0.01		
Ps	Duct Pressure	in Hg	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		30.12	30.12	30.12	30.12	*30.12*	*30.12*	30.12	30.12		
dp^½			0.1920	0.1972	0.1112	0.1136	0.2442	0.2191	0.1734	0.1538		0.1555	0.1758	0.1520	0.2086	*0.2103*	*0.2017*	0.1775	0.1430		
Bws	Moisture, % Slack		2.47	2.47	2.47	2.47	2.47	2.47	2.47	2.47		2.47	2.47	2.47	2.47	*2.47*	*2.47*	2.47	2.47		
mfg	Mole fraction dry gas		97.5%	97.5%	97.5%	97.5%	97.5%	97.5%	97.5%	97.5%		97.5%	97.5%	97.5%	97.5%	*97.5%*	*97.5%*	97.5%	97.5%		
Oxygen	Outlet-Estimated		20.36	20.36	20.36	20.36	20.36	20.36	20.36	20.36		20.36	20.36	20.36	20.36	*20.36*	*20.36*	20.36	20.36		
Carbon Dioxide	Outla-Estimated		0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55		0.55	0.55	0.55	0.55	*0.55*	*0.55*	0.55	0.55		
Md	Molecular weight Dry		29.02	29.02	29.02	29.02	29.02	29.02	29.02	29.02		29.02	29.02	29.02	29.02	*29.02*	*29.02*	29.02	29.02		
Ms	Molecular weight Wet		28.75	28.75	28.75	28.75	28.75	28.75	28.75	28.75		28.75	28.75	28.75	28.75	*28.75*	*28.75*	28.75	28.75		
vs	Velocity stack	fpm	671.0	678.1	383.8	394.8	836.1	748.6	591.2	536.2		542.4	613.3	525.1	723.2	*731.2*	*696.3*	612.3	494.7	611.2	
Qa	Flowrate actual	acf/min	43,371.1	43,832.9	24,810.8	25,518.9	54,047.1	48,386.0	38,213.1	34,660.3		35,062.8	39,641.1	33,941.4	46,747.2	*47,264.1*	*45,008.5*	39,581.5	31,978.9	39,504	592,562
Qsd (5-pt)	Flowrate @std	dscf/min	35,511.5	37,061.2	20,808.0	21,128.2	46,073.4	41,452.1	32,845.7	28,514.4		28,799.8	32,560.3	28,419.5	38,890.5	*39,069.5*	*37,747.1*	33,249.5	26,690.0	33,051	495,769
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

Outlet Flow *Rates*

Client	Oregon Steel Mills	Compart.	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16		
Source	ICA Baghouse-EAF	Point									HI-VOL RUN #3										
Location	Portland, OR	K	0.0418	0.0498	0.0153	0.0154	0.0131	0.0122	0.0136	0.0204	A	0.0031	0.0147	0.0227	0.0267	0.0464	0.0391	0.0294	0.0152		
Date	06-Nor-2002	L	0.0427	0.0569	0.0546	0.0407	0.0390	0.0355	0.0436	0.0299	B	0.0322	0.0395	0.0261	0.0349	0.0435	0.0410	0.0568	0.0157		
Testers	MJE/TJH/CDB/dc/ph	*M	0.0492	0.0460	0.0503	0.0385	0.0340	0.0398	0.0406	0.0303	*C	0.0260	0.0367	0.0283	0.0299	0.0448	0.0353	0.0485	0.0169		
File	1862–02	N	0.0448	0.0446	0.0575	0.0269	0.0379	0.0375	0.0371	0.0273	D	0.0327	0.0350	0.0254	0.0219	0.0414	0.0373	0.0563	0.0243		
Analysis/QA	MEW,DBC	O	0.0597	0.0513	0.0529	0.0189	0.0319	0.0349	0.0358	0.0240	E	0.0327	0.0189	0.0280	0.0138	0.0400	0.0296	0.0447	0.0325		
Equipment	ShortRidge,11s	K									A										
Total Runs	Run #3	L									B										
Pts per Run		*M									*C										
		N									D										
		O									E										
All Points	SQRT(dP)	0.1815	0.2178	0.2228	0.2103	0.1647	0.1739	0.1758	0.1817	0.1620		0.1516	0.1672	0.1614	0.1577	0.2078	0.1907	0.2157	0.1430	0.1815	
Standard Devation	STD(SQRT(dP))	0.0928	0.1094	0.1116	0.1096	0.0852	0.0896	0.0909	0.0939	0.0814		0.0832	0.0865	0.0808	0.0806	0.1040	0.0956	0.1092	0.0732	0.0928	
Symbol	Definitions. Units	Method/Notes	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Avg/Total	15
	Time																			16	Compart.
As	Cross Section	in²	9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		9,308	9,308	9,308	9,308	9,308	9,308	9,308	9,308		
Cp	Pitot Coef.		0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970		0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970	0.7970		
Ts	Dud temperature	°F	177.0	174.0	172.0	166.0	166.0	168.0	167.0	164.0		162.0	140.0	146.0	151.0	169.0	174.0	173.0	161.0	164.4	
Ts	Dud temperature	°R	636.7	633.7	631.7	625.7	625.7	627.7	626.7	623.7		621.7	599.7	605.7	610.7	628.7	633.7	632.7	620.7		
Tdb	Dry bulb temp.	°F	162.0																		
Twb	Wet bulb temp.	°F	86.0																		
Pbar	Barometric Pressure	in Hg	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		
Pg	Static Pressure	in H2O	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		
Ps	Duct Pressure	in Hg	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12		
dp^½			0.2178	0.2228	0.2103	0.1647	0.1739	0.1758	0.1817	0.1620		0.1516	0.1672	0.1614	0.1577	0.2078	0.1907	0.2157	0.1430		
Bws	Moisture, % Slack		1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45		1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45		
mfg	Mole fraction dry gas		98.6%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%		98.6%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%		
Oxygen	Outlet-Estimated		20.34	20.34	20.34	20.34	20.34	20.34	20.34	20.34		20.34	20.34	20.34	20.34	20.34	20.34	20.34	20.34		
Carbon Dioxide	Outlet-Estimated		0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57		0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57		
Md	Molecular weight Dry		29.03	29.03	29.03	29.03	29.03	29.03	29.03	29.03		29.03	29.03	29.03	29.03	29.03	29.03	29.03	29.03		
Ms	Molecular weight Wet		28.87	28.87	28.87	28.87	28.87	28.87	28.87	28.87		28.87	28.87	28.87	28.87	28.87	28.87	28.87	28.87		
vs	Velocity slack	fpm	761.8	777.4	732.7	571.1	603.1	610.5	630.7	560.8		524.0	567.7	550.8	540.3	722.4	665.3	752.3	493.7	629.0	
Qa	Flowrate actual	acf/min	49,240.9	50,250.7	47,359.5	36,918.2	38,983.6	39,459.7	40,770.1	36,251.3		33,872.6	36,695.1	35,600.4	34,925.1	46,693.0	43,006.7	48,627.2	31,912.9	40,660	609,907
Qsd (5-pt)	Flowrate @std	dscf/min	40,491.3	41,517.3	39,252.4	30,891.9	32,620.2	32,913.3	34,060.6	30,431.1		28,525.8	32,036.5	30,772.9	29,942.0	38,884.7	35,532.2	40,239.4	26,918.8	34,064	510,966
	Average Flow During Hi-vol testing																				

* High volume sampler tested these points (in BOLD)

Inlet Flow Rate Determination

Client	Oregon Steel Mills	Compartment	Pre-test				Post-Test			
' Source '	EAF Baghouse INLET	Point								
Location	Portland, OR		dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)
Date	06-Nov-2002	1	1.1740	156.0	2.4760	110.0	1.8870	277.0	1.6080	243.0
Testers	MJE/TJH/CDB/dc/ph	2	1.1800	170.0	2.5090	114.0	2.0650	292.0	1.1850	257.0
File	1862–02	3	1.6600	179.0	2.7090	115.0	2.0870	297.0	1.3950	253.0
Analysis/QA	MEW,DBC	4	1.6840	183.0	2.9220	115.0	2.0950	299.0	1.2830	253.0
Equipment	ShortRidge #2,pitot 14 s	5	1.4790	187.0	2.9010	115.0	2.1040	295.0	1.0820	249.0
Total Runs	2	6	1.4470	189.0	3.1730	115.0	2.0570	289.0	1.3030	245.0
Pts per Run	48	7	1.1260	189.0	3.0420	113.0	2.0210	281.0	1.0490	243.0
		8	1.1090	191.0	2.9530	121.0	2.1720	275.0	1.0740	243.0
		9	1.1850	192.0	3.0490	121.0	2.0570	271.0	1.0680	241.0
		10	1.1040	191.0	3.0030	120.0	2.1310	272.0	1.2670	244.0
		11	1.5610	179.0	3.0770	119.0	1.8160	272.0	0.9770	243.0
		12	2.3640	159.0	2.8070	118.0	2.0990	270.0	1.9000	249.0
		13	2.8480	141.0	2.6860	116.0	1.9030	262.0	1.7860	273.0
		14	2.9420	133.0	2.6650	114.0	1.8080	259.0	2.1200	249.0
		15	3.1030	130.0	2.7000	110.0	1.6930	250.0	2.1060	250.0
		16	2.8760	125.0	2.5720	108.0	1.9240	237.0	2.2260	241.0
		17	3.1590	124.0	2.8030	107.0	1.6150	225.0	2.1170	240.0
		18	3.0420	121.0	2.6050	107.0	1.9330	150.0	2.0550	243.0
		19	3.0750	120.0	2.5810	107.0	2.9700	155.0	2.2830	245.0
		20	3.3080	120.0	2.3600	105.0	2.8280	170.0	2.1820	244.0
		21	3.3940	119.0	2.3570	105.0	3.0840	167.0	2.2810	240.0
		22	3.1060	116.0	2.4360	105.0	3.1490	164.0	2.3800	230.0
		23	3.1930	115.0	2.3050	105.0	3.2710	159.0	2.0200	219.0
		24	3.1120	114.0	2.4040	104.0	3.2370	153.0	1.6180	214.0
All Points	SQRT(dP)		1.5585	sqrt(dP)	131.9	(°F)	1.3872	sqrt(dP)	241.5	(°F)

Symbol	Definitions, Units	Method/Notes	Pre-test	Post-Test	Average
	Time		10:21	16:20	
As	Cross Section	in²	13,685	13,685	
Cp	Pitot Coef.		0.7826	0.7826	
Ts	Duct temperature	°F	163.0	227.0	195.0
Twb	Duct temperature	°F	84.5	101.0	92.8
Ts	Duct temperature	°R	622.7	686.7	
Pbar	Barometric Pressure	in Hg	30.10	30.10	
Pg	Static Pressure	in H2O	-10.00	-8.10	-9.05
Ps	Duct Pressure	in Hg	29.36	29.50	
dp^½			1.5585	1.3872	
Bws	Moisture, % Stack	(inlet)	1.28	2.27	1.77
Bws	Moisture, % Stack	(outlet)	0.89	1.45	1.17
mfg	Mole fraction dry gas		98.7%	97.7%	
Md (inlet)	Molecular weight Dry		29.04	29.04	
Ms (inlet)	Molecular weight Wet		28.90	28.79	
vs	Velocity stack	fpm	5,359	5,007	5,183
Qa	Flowrate actual	acf/min	509,318	475,851	492,584
Qsd (Inlet)	Flowrate @std	dscf/min	418,178	352,399	385,288
Qsd(Outlet)	Flowrate @std	dscf/min			472,985
	Difference	(Out-In)/In			22.8%

Flow Rate Determination

Client	OSM	Compartment	Pre-test				Post-Test			
Source	ICA Baghouse INLET	Point								
Location	Portland, OR		dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)
Date	05-Dec-2002	1	2.9500	160.6	1.1620	262.0	1.5070	183.6	0.9799	251.8
Testers	smj	2	3.4310	141.6	1.0150	269.8	1.4610	213.2	1.3180	256.2
File	retest	3	4.2570	143.6	0.9024	272.4	1.4250	234.6	1.5520	256.4
Analysis/QA	mew	4	3.9340	147.8	1.0160	272.0	1.2530	242.2	2.0360	260.8
Equipment	ShortRidge #2,pitot 14 s	5	4.4150	203.6	0.9468	266.4	1.5810	246.6	2.4120	268.6
Total Runs	2	6	4.8030	217.4	0.8769	262.2	1.2360	251.0	2.4060	273.2
Pts per Run	48	7	3.9270	240.0	0.8149	262.6	1.1670	253.4	2.3180	273.4
		8	3.9280	267.4	0.9158	263.8	0.9421	253.2	2.3130	272.2
		9	3.9320	274.6	0.9778	263.6	1.0870	253.6	2.0890	268.8
		10	2.9680	278.8	0.9818	262.0	1.4070	255.4	2.2850	264.2
		11	2.5220	275.2	1.1770	257.0	1.5750	259.2	2.4050	249.6
		12	2.0510	274.2	1.9270	253.2	1.9240	259.8	2.5400	242.2
		13	0.6290	274.6	2.2770	243.6	1.6280	259.6	1.9930	239.0
		14	0.0468	306.0	2.1460	246.6	2.3310	263.6	2.1670	240.4
		15	2.4280	280.8	2.1130	237.2	2.3200	253.2	2.1360	241.4
		16	2.3390	279.8	2.3750	229.6	2.2350	247.4	2.1750	234.0
		17	2.5720	279.6	2.3100	226.2	2.0550	235.6	2.1140	232.0
		18	2.3850	278.4	2.5200	224.2	2.3700	224.6	2.1270	231.6
		19	2.3420	277.8	2.2860	220.8	2.4220	217.6	2.0460	231.6
		20	2.0780	278.2	2.1400	220.8	2.1880	212.6	2.1720	232.2
		21	1.9140	274.8	2.1500	219.6	2.2470	196.8	1.9610	233.8
		22	1.3990	271.0	2.7330	216.6	4.4900	167.2	2.0920	228.2
		23	1.3950	265.0	2.1500	227.4	3.7320	134.4	2.0840	227.2
		24	1.2940	258.6	1.8800	227.8	3.4830	131.6	1.8570	227.2
All Points	SQRT(dP)		1.4161	sqrt(dP)	247.0	(°F)	1.4091	sqrt(dP)	237.2	(°F)

Symbol	Definitions, Units Time	Method/Notes	Pre-test	Post-Test	Average
As	Cross Section	in²	13,685	13,685	
Cp	Pitot Coef.		0.7826	0.7826	
Ts	Duct temperature	°F	*227.8*	*227.8*	*227.8*
Twb	Duct temperature	°F	96.8	107.6	102.2
Ts	Duct temperature	°R	706.7	696.9	
Pbar	Barometric Pressure	in Hg	30.21	30.21	
Pg	Static Pressure	in H2O	-7.53	-9.49	-8.51
Ps	Duct Pressure	in Hg	29.66	29.51	
dp^½			1.4161	1.4091	
Bws	Moisture, % Stack	(inlet)	1.24	3.97	2.60
mfg	Mole fraction dry gas		98.8%	96.0%	
Md (inlet)	Molecular weight Dry		29.04	29.04	
Ms (inlet)	Molecular weight Wet		28.90	28.60	
vs	Velocity stack	fpm	5,162	5,140	5,151
Qa	Flowrate actual	acf/min	490,565	488,454	489,509
Qsd (Inlet)	Flowrate @std	dscf/min	358,553	350,317	354,435

VOLUME FLOWRATE MEASUREMENT

* 2 mins Behind pulpit

HORIZON ENGINEERING LLC
13585 NE Whitaker Way ▪ Portland. OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

R1

Cyclonic Flow? Y___ N N Avg Null Angle_____
Po = Barometric Pressure 30.12 in Hg
Cp = Pitot Coefficient 0.7969 7
Pitot I.D. 11 5
Gauge I.D. 5R' in H20 By TJH/MJE/PTH/DBC
Post Test Leak Check 0.0 in h20

Plant OSM
Sampling Location Baghouse
Test Conditions Normal
Date 11/6/02 Time_____
Duct Dimentions_____
Duct Area_____ in2_____

Port

Run#	1	2	3	4	5	6	7	8	9	10
Time	1105	1110	1112	1116	1118	1130	1132	1140	1142	1200
Pt #1	0.0664	.0398	.0445	0193	.0086	.0082	.0189	.0152	.0273	.0057
2	0.0511	.0409	.0428	0498	.0400	.0367	.0344	.0326	.0209	.0342
3	.0514	.0582	.0597	0356	.0352	.0386	.0330	.0336	.0299	.0332
4	.0597	.0716	.0544	0352	.0451	.0444	.0416	.0356	.0275	.0275
5	.0596	.0747	.0450	0185	.0404	.0360	.0395	.0250	.0257	.0245
Tdb	147.5	123	127	161	169	160	164	169	169	139
Twb										
Static										-0.0646
Point	11	12	13	14	15	16	1	2	3	4
TIME	1201	1213	1214	1220	1222	1230				
1	.0218	.0079	.0206	.0088	.0432	.0039				
2	.0307	.0130	.0162	.0359	.0383	.0159				
3	.0410	.0086	.0127	.0420	.0354	.0268				
4	.0466	.0034	.0012	.0314	.0377	.0268				
5	.0368	.0061	.0080	.0305	.0269	.0287				
Tdb	140	153	155	160	163	168				
Twb										
Port	5									
Time										
1										
2										
3										
4										
5										

Tdb										
Twb										
Pstat										

VOLUME FLOWRATE MEASUREMENT

HORIZON ENGINEERING LLC
13585 NE Whitaker Way. Portland, OR 97230
Phone (503) 255-5050. Fax (503) 255-0505
www.horizonengineering.com

R2

Cyclonic Flow? Y___ N X Avg Null Angle_____
Po = Barometric Pressure 30.12 in Hg
Cp = Pitot Coefficient 0.7697
Pitot I.D. 115
Gauge I.D SRI in H2O By TGH/MJE/PTH/DBC
Post Test Leak Check 0.00 in h2o

Plant OSM
Sampling Location Baghouse
Test Conditions Normal
Date 11/6/02 Time_____
Duct Dimentions_____
Duct Area_____ in2_____

Port

~~Run #~~	16	1	2	3	4	5	6	7	8	9
Time	1250	1232	1250	1252	1255	1307	1308	1309	1326	1327
Pt #1	.0639	.0348	.0371	.0125	.0107	.0412	.0343	.0077	.0098	.0113
2	.0159	.0411	.0474	.0123	.0059	.0621	.0530	.0353	.0278	.0256
3	.0256	.0331	.0325	.0116	.0109	.0686	.0551	.0425	.0267	.0287
4	.0268	.0366	.0426	.0344	.0377	.0637	.0520	.0374	.0286	.0284
5	.0287	.0341	.0363	.0016	.0082	.0647	.0473	.0367	.0292	.0300
145 Tdb	168	173	153	158	166	148	145	143	170	171
Twb										
Static										-0.0125

Port	10	11	12	13	14	15	16	1	2	3
Time	1328	1345	1346	1347	1406	1407	1408	1422	1422	1428
1	.0276	.0128	.0264	.0524	.0413	.0268	.0152	0.0419	.0498	.0183
2	.0289	.0223	.0505	.0463	.0418	.0265	.0157	0.0427	.0569	.0346
3	.0281	.0270	.0328	.0366	.0387	.0353	.0169	0.0492	.0460	.0583
4	.0392	.0292	.0366	.0439	.0448	.0384	.0243	0.0448	.0446	.0575
5	.0314	.0263	.0077	.0426	.0370	.0314	.0325	.0597	.0513	.0529
Tdb	171	159	163	167	158	157	161	177	174	172

Tdb										
Twb										
Pstat										

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 2555050 • Fax (503) 2550505
www haizmongimorlng.com

VOLUME FLOWRATE MEASUREMENT

Plant 05M
Sampling Location Baghou54
Test Conditions Normal
Date 11/16/02 Time
Duct Dimentions
Duct Area in2
Gauge I.D. SR1 in H20 By MTE/DBC
Post Test Leak Check 0.0 in h20

R3

Cyclonic Flow? Y__ N X Avg Null Angle
Po = Barometric Pressure 30.12 in Hg
Cp = Pitot Coefficient .79697
Pitot I.D. 115

~~Run #~~	16	1	2	3	4	5	6	7	8	9
Time	1408	1421	1422	1423	1446	1449	1450	1505	1506	1507
P 1	.0152	.0419	.0498	.0153	.0154	.0131	.0122	.0136	.0204	.0031
2	.0157	.0427	.0569	.0546	.0407	.0390	.0355	.0436	.0299	.0322
3	.0169	.0492	.0460	.0503	.0385	.0340	.0398	.0406	.0303	.0260
4	.0248	.0448	.0446	.0575	.0269	.0379	.0375	.0371	.0273	.0327
5	.0325	.0597	.0513	.0529	.0189	.0319	.0349	.0358	.0240	.0327
Tdb	161	177	174	172	166	166	168	167	164	162
Twb										
Static										

Port	10	11	12	13	14	15	16			
Time	1524	1525	1526	1541	1542	1543				
1	.0197	.0227	.0267	.0464	.0391	.0294				
2	.0345	.0261	.0349	.0435	.0410	.0568				
3	.0367	.0283	.0299	.0448	.0353	.0485				
4	.0350	.0254	.0219	.0414	.0373	.0563				
5	.0189	.0280	.0138	.0460	.0296	.0447				
Tdb	140	146	151	169	176	173				
Twb										
Static			+0.6391							
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run2	Run 3	Average
Tdb	Dry bulb temp., F					
Twb	Wet bulb temp., F					
Pstat	Static press., in H2O					
Ts	Duct temp., R	Tdb + 460				
Pstat	Duct press., Hg	Po ± Pstat/13.6				
S		Avg√ΔP x √Ts				
mv	% H2O in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. Gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s (1/PsMs)1/2 (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond. S c f m	qs = 0.123 VsAs md Ps / Ts				

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

VOLUME FLOWRATE MEASUREMENT

Plant OSM
Sampling Location BAGHOUSE INLET
Test Conditions NORMAL
Date 11/06/02 Time
Duct Dimentions
Duct Area in2
Gauge I.D. SR in H20 By MIKE ROBERTS
Post Test Leak Check

Cyclonic Flow? Y___ N X Avg Null Angle
Po = Barometric Pressure 30.1 in Hg
Cp = Pitot Coefficient 0.78261
Pitot I.D. 143-1

Run #	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb		
Time	10:21	10:21	10:21	10:21	16:20	16:20	16:20	16:20		
P / 1	1.174	156	2.476	110	1.887	277	1.608	243		
2	1.180	170	2.504	114	2.065	292	1.185	257		
3	1.666	179	2.709	115	2.087	297	1.395	253		
4	1.684	183	2.992	115	2.045	299	1.283	253		
5	1.479	187	2.901	115	2.104	295	1.082	249		
6	1.447	184	3.173	115	2.057	289	1.303	245		
7	1.126	184	3.042	113	2.021	281	1.049	243		
8	1.109	191	2.953	121	2.172	275	1.074	243		
9	1.185	192	3.049	121	2.057	271	1.068	241		
10	1.104	191	3.003	120	2.131	272	1.267	244		
11	1.561	179	3.077	114	1.816	272	0.9770	243		
12	2.364	159	2.807	118	2.099	270	1.900	249		
13	2.846	141	2.686	116	1.903	262	1.786	273		
14	2.942	133	2.665	114	1.808	259	2.120	249		
15	3.103	130	2.700	110	1.693	250	2.106	250		
16	2.876	125	2.572	106	1.924	237	2.226	241		
17	3.159	124	2.803	107	1.615	225	2.117	240		
18	3.042	121	2.605	107	1.933	150	2.055	243		
19	3.075	120	2.581	107	2.970	155	2.283	245		
20	3.308	120	2.360	105	2.828	170	2.182	244		
21	3.394	119	2.357	105	3.084	167	2.281	240		
22	3.106	116	2.436	105	3.149	164	2.380	230		
23	3.103	115	2.305	105	3.271	159	2.020	219		
24	3.112	114	2.404	104	3.237	153	1.618	214		
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	pre Run 1	post Run2	Run 3	Average
Tdb	Dry bulb temp., F		163	227		
Twb	Wet bulb temp., F		84.5	101		
Pstat	Static press., in H2O		-10.0	-8.1		
Ts	Duct temp., R	Tdb + 460				
Pstat	Duct press., Hg	Po ± Pstat/13.6				
S		Avg√ΔP x √Ts				
mv	% H20 in gas stream	Psychrometry				
md	Mole fraction dry gas	1.00 - mv/100				
Md	Molecular weight of dry gas	Gas analysis				
Ms	Molecular wt of act. Gas	Ms = mdMd + 18 (1-md)				
Vs	Velocity, fpm	Vs = 5125s (1/PsMs)1/2 (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond. Scfm	qs = 0.123 VsAs md Ps / Ts				

VOLUME **FLOWRATE** MEASUREMENT

13585 N E Whitaker Way. Portland, OR **97230**
Phone **(503) 255-5050.** Fax **(503) 255-0505**
www.horizonengineering.com

Cyclonic Flow? Y N Avg Null Angle_____
Po = Barometric Pressure 30.21 in Hg
Cp = Pitot Coefficient_____
Pitot I.D. 14.5
Gauge I.D. SR-2 in H2O By SM
Post Test Leak Check_____

Plant OSM
Sampling Location EAF R.H. Inlet
Test Conditions Normal
Date 12/5/02 Time_____
Duct Dimentions ϕ =
Duct Area 13,685 in2

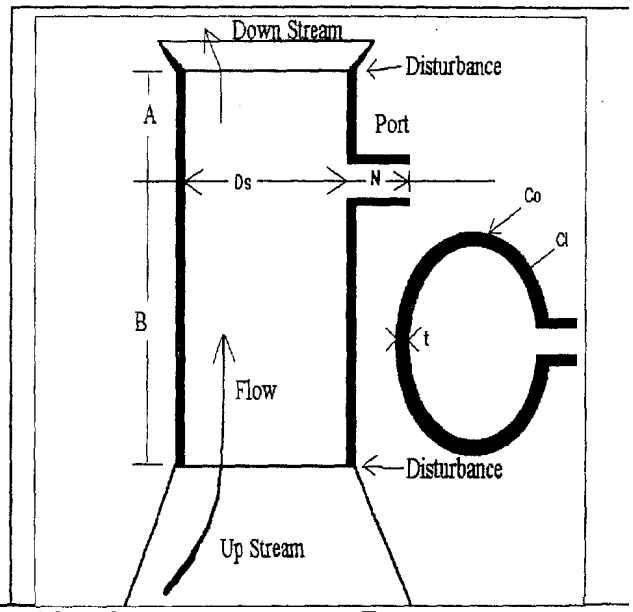
Run #	1					2				
Time	T °F	ΔP	T °F	ΔP		ΔT	ΔP	T	ΔP	
Pt #					1					
1	160.6	2.450	262.0	1.167	2	183.6	1.507	251.8	0.9799	
2	141.6	3.431	269.8	1.015	3	213.2	1.461	256.2	1.313	
3	143.6	4.257	272.4	0.9024	4	234.6	1.425	256.4	1.552	
4	147.8	3.934	272.0	1.016	5	242.2	1.253	260.2	2.036	
5	203.6	4.415	266.4	0.9468	6	246.6	1.581	268.6	2.412	
6	217.4	4.803	262.2	0.8769	7	251.0	1.736	273.2	2.406	
7	240	3.927	262.6	0.8149	8	253.4	1.167	273.4	2.318	
8	267.4	3.928	263.8	0.9158	9	253.2	0.9421	272.2	2.313	
9	274.6	3.932	263.6	0.9778	10	253.6	1.087	268.2	2.089	
10	278.2	2.968	262.0	0.9818	11	255.4	1.407	264.2	2.285	
11	275.2	2.522	257.0	1.177	12	259.2	1.575	249.6	2.405	
12	274.2	2.051	253.2	1.922	13	259.8	1.924	242.2	2.540	
13	294.6	0.629	248.6	2.277	14	259.6	1.628	239.0	1.993	
14	306	0.0463	246.6	2.146	15	263.6	2.331	240.4	2.167	
15	290.2	2.428	237.2	2.113	16	253.2	2.320	241.4	2.136	
16	279.8	2.339	229.6	2.375	17	247.4	2.235	241.0	2.175	
17	279.6	2.572	226.2	2.310	18	235.6	2.055	232.0	2.114	
18	278.4	2.385	224.2	2.520	19	224.6	2.370	231.6	2.127	
19	277.2	2.342	220.8	2.286	20	217.6	2.422	231.6	2.046	
20	278.2	2.078	220.8	2.140	21	212.6	2.180	232.2	2.172	
21	274.8	1.914	219.6	2.150	22	196.8	2.247	233.2	1.961	
22	271.0	1.399	216.6	2.233	23	167.2	4.490	228.2	2.092	
23	265.0	1.395	227.4	2.150	24	134.4	3.732	227.2	2.034	
24	258.6	1.244	227.8	1.880		131.6	3.483	227.2	1.857	

Tdb										
Twb			46.8			107.6				
Pstat		-7.529						-9.49		

Traverse Point Location

Client	Oregon Steel Mills			Portland, OR	Date
Location	Portland, OR			MJE/TJH/CDB/dc/pl	By
EPA Method #1	Baghouse inlet			1862–02	File

Outer Circumference	(ft) [Co]		'
Wall thickness	(in) [t]		"
Inner Circumference	(ft) [Ci]		'
INSIDE of FAR WALL to OUTSIDE of Nipple	(in) [F]	134.00	"
INSIDE of NEAR WALL to OUTSIDE of Nipple	(in) [N]	2.00	"
DOWNstream Disturb	(in) [A]	128.0	"
UPstream Disturb	(in) [B]	516.0	"
Inner Diameter	(in) [Ds]	132.00	"
Area	(sqin) [As]	13,685	
DOWNstream Ratio	[A/Ds]	1.0	
UPstream Ratio	[B/Ds]	3.91	
Traverse (Particulate) Recommended #Pts/Diameter		24 12	
Traverse (NON-Particulate) Recommended #Pts/Diameter		16 8	
Actual Points per Diameter		24	



Trav Pt #No	Fract Stk ID (f)	Stack ID (Ds)	Actual Points (Dsxf)	Nearest 8ths (TP)	Adjusted Points (TP)*	Traverse Points (TP + N)	Traverse Points (TP + N)
1	1.05%	132.0	1.4	1.375	1.375	3.375	3 3 / 8
2	3.23%	132.0	4.3	4.250	4.250	6.250	6 1 / 4
3	5.51%	132.0	7.3	7.250	7.250	9.250	9 1 / 4
4	7.92%	132.0	10.5	10.500	10.500	12.500	12 1 / 2
5	10.47%	132.0	13.8	13.875	13.875	15.875	15 7 / 8
6	13.20%	132.0	17.4	17.375	17.375	19.375	19 3 / 8
7	16.15%	132.0	21.3	21.375	21.375	23.375	23 3 / 8
8	19.38%	132.0	25.6	25.625	25.625	27.625	27 5 / 8
9	23.00%	132.0	30.4	30.375	30.375	32.375	32 3 / 8
10	27.18%	132.0	35.9	35.875	35.875	37.875	37 7 / 8
11	32.32%	132.0	42.7	42.625	42.625	44.625	44 5 / 8
12	39.79%	132.0	52.5	52.500	52.500	54.500	54 1 / 2
13	60.21%	132.0	79.5	79.500	79.500	81.500	81 1 / 2
14	67.68%	132.0	89.3	89.375	89.375	91.375	91 3 / 8
15	72.82%	132.0	96.1	96.125	96.125	98.125	98 1 / 8
16	77.00%	132.0	101.6	101.625	101.625	103.625	103 5 / 8
17	80.62%	132.0	106.4	106.375	106.375	108.375	108 3 / 8
18	83.85%	132.0	110.7	110.625	110.625	112.625	112 5 / 8
19	86.80%	132.0	114.6	114.625	114.625	116.625	116 5 / 8
20	89.53%	132.0	118.2	118.125	118.125	120.125	120 1 / 8
21	92.08%	132.0	121.5	121.500	121.500	123.500	123 1 / 2
22	94.49%	132.0	124.7	124.750	124.750	126.750	126 3 / 4
23	96.77%	132.0	127.7	127.750	127.750	129.750	129 3 / 4
24	98.95%	132.0	130.6	130.625	130.625	132.625	132 5 / 8

Traverse Point Location

Client	Oregon Steel Mills			Portland, OR	Date
Location	Portland, OR			MJE/TJH/CDB/dc	By
EPA Method #1	Outlet			1862_02	File
Number of PORTS	P	#	5		
INSIDE of FAR WALL to OUTSIDE of Nipple	F	in	52.0		
INSIDE of NEAR WALL to OUTSIDE of Nipple	N		0.00		
Stack/Duct WIDTH	Dw	in	179.0		
DOWNstream Disturb	A	in			
UPstream Disturb	B	in			
Stack/Duct DEPTH	Dh	in	52.0		
Equivalent Diameter	De	in	80.6		
Area	As	sqin	9308.0		
DOWNstream Ratio	A/De		0.00		
UPstream Ratio	B/De		0.00		
Traverse (Particulate)			25		
Recommended #Pts/Port		5	5		
Traverse (NON-Particulate)			16		
Recommended #Pts/Port		3	4		
Actual Points used per Port			5		
Actual Number of Points			25		

Trav Pt #No	Fract Depth (f)	Stack Depth (Dp)	Actual Points (Dpxf)	Nearest 8ths (TP)	Adjusted Points (TP)	Traverse Points (TP+N)	Traverse Points (TP+N)
1	10.00%	52.0	5.2	5.250	5.250	5.250	5 1 / 4
2	30.00%	52.0	15.6	15.625	15.625	15.625	15 5 / 8
3	50.00%	52.0	26.0	26.000	26.000	26.000	26
4	70.00%	52.0	36.4	36.375	36.375	36.375	36 3 / 8
5	90.00%	52.0	46.8	46.750	46.750	46.750	46 3 / 4

Visible Emissions
Field Data and Certifications

HORIZON ENGINEERING
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

VISIBLE EMISSION OBSERVATION FORM

SOURCE INFORMATION

Company Name OSM
Address Portland, OR
Phone # —

Source Description: #AF
ID #: —
Operating Mode/Output Rate: —
Control Equipment
Operating Mode

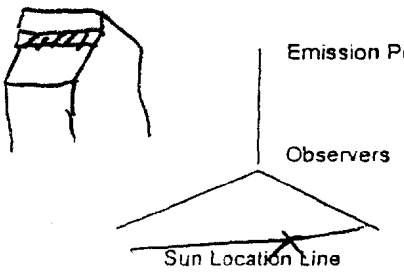
OBSERVATION RECORD

DATE 11/6/02 TIME: Start 1155 End 1453

PLUME INFORMATION	@ Start	@ End
Emission Point Description	Exhaust	
Height Above Ground	~ [illegible]'	✓
Height Relative to Observer	~ [illegible]'	✓
Distance from Observer	~ 500'	✓
Direction from Observer	NW	✓
Plume Type: Continuous	✓	✓
Intermittent		
Fugitive		
Plume Color	None	✓
Water Droplets Present?	No	✓
Attached Plume?	✓	✓
Detached Plume?		
Point in the Plume at Which Opacity was Observed	Real Exit	✓
Description of Background	Sky	✓
Color of Background	Gray	✓
Condition of Sky	Overcast	✓
Wind Speed (0-2)	✓	✓
Wind Direction (from)	N	✓
Ambient Temperature (°F)	~ 55°	✓

MIN	Seconds 0	15	30	45	Time / Comments
1	0	0	0	0	1155
2	0	0	0	0	
3	0	0	0	0	A1
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0				1201
8					
9	0	0	0	0	1324
10	0	0	0	0	
11	0	0	0	0	R2
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0				1330
16					
17	0	0	0	0	1447
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	R3
21	0	0	0	0	
22	0	0	0	0	
23	0				1453
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					

Source Layout Sketch — Draw North Arrow



Comments

Observer's Name (print): David Bagwell
Certification No.: 979
Organization: Horizon Engineering, Portland, Oregon (503) 255-5050

Certified By: Oregon DEQ
Observers Signature: [signature]
Date: 11/6/02

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY CONTROL DIVISION

CERTIFICATION OF COMPLETION

PLUME EVALUATION TRAINING

C. David Bagwell

CERTIFICATION NO. 979 EXPIRATION DATE 3/7/2003

Mary M Abrams
ADMINISTRATOR

Gaseous Emissions *(1116* and *1215, 2002)*

Gaseous Emissions
Molecular Weight Determinations
Sample Calculations
Analyzer Calibration Data
Manual Data and Bias Checks
Data Logger Gas Charts
Strip Charts

Gaseous Emissions

Client	Oregon Steel Mills	MJE/TJH/CDB/dc/ph			Testers
Source	ICA Baghouse-EAF Inlet I	1862–02			File
Location	Portland, OR	MEW,DBC			Analysis/QA
Date	06-Nov-2002				

Number of Completed Runs / Date Tested			Combined	Run 1	Run 2	Run 3	Average
System Calibration Time - Initial		Tci	9:04	9:04	9:04	9:04	
Test Time-Starting		Tts	11:09	11:09	12:45	14:31	
Test Time-Ending		Tte	15:58	12:45	14:28	15:58	
System Calibration Time - Final		Tcf	16:02	16:02	16:02	16:02	
Test Mid-point Time		Tx	13:33	11:57	13:36	15:14	
Volumetric Fiowrate, Dry Standard	dscf/min	Qsd	385,288	385,288	385,288	385,288	
Production	Tons/hr		123.3	125.4	115.6	129.9	123.6
Oxygen	%	02	20.25	20.30	20.24	20.20	
Carbon Dioxide	%	C02	0.66	0.63	0.66	0.70	
Carbon Monoxide	CO	Span	2,000	2,000	2,000	2,000	
Indicated average - Dry	ppmv	Cid	122.6	118.8	131.2	119.3	123.1
Cylinder Value - High Range calibration gas	ppmv	Cma	555.0	555.0	555.0	555.0	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.0	0.0	0.0	0.0	
System Calibration Response - High Range gas - Initial	ppmv	Cmi	560.7	560.7	560.7	560.7	
System Calibration Response - Low Range gas - Initial	ppmv	Coi	0.0	0.0	0.0	0.0	
System Calibration Response - Low Range gas - Final	ppmv	Cof	0.0	0.0	0.0	0.0	
System Calibration Response - High Range gas - Final	ppmv	Cmf	562.9	562.9	562.9	562.9	
Actual average - Dry (Corrected for Drift)	ppmv-CO	Cgas	121.0	117.4	129.5	117.7	121.6
Mass Emissions	lbm / hr	Mgas	203.4	197.3	217.7	197.8	204.3
Mass Emissions on Production Basis	lbm/Ton		1.650	1.573	1.883	1.523	1.660
Nitrogen Oxides	NOx	Span	200	200	200	200	
Indicated average-Dry	ppmv	Cid	6.40	6.50	6.45	6.36	6.44
Cylinder Value - High Range calibration gas	ppmv	Cma	90.30	90.30	90.30	90.30	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initial	ppmv	Cmi	86.80	86.80	86.80	86.80	
System Calibration Response - Low Range gas - Initial	ppmv	Coi	0.60	0.60	0.60	0.60	
System Calibration Response - Low Range gas - Final	ppmv	Cof	0.60	0.60	0.60	0.60	
System Calibration Response - High Range gas - Final	ppmv	Cmf	84.80	84.80	84.80	84.80	
Actual average - Dry (Corrected for Drift)	ppmv-NO2	Cgas	6.17	6.24	6.22	6.16	6.21
Mass Emissions	lbm-NO2 / hr	Mgas	17.02	17.22	17.17	17.00	17.13
Mass Emissions on Production Basis	lbm/Ton		0.138	0.137	0.149	0.131	0.139

TGOC Emissions

Client	Oregon Steel Mills	MJE/TJH/CDB/dc/ph			Testers
Source	ICA Baghouse-EAF Inlet	1862–02			File
Location	Portland, OR	MEW,DBC			Analysis/QA
Date	06-Nov-2002				

Number of Completed Runs Date Tested			Combined	Run 1	Run 2	Run 3	Average
System Calibration Time - Initial		Tci	9:04	9:04	9:04	9:04	
Test Time-Starting		Tts	11:09	11:09	12:45	14:31	
Test Time-Ending		Tte	15:58	12:45	14:28	15:58	
System Calibration Time - Final		Tcf	16:02	16:02	16:02	16:02	
Test Mid-point Time		Tx	13:33	11:57	13:36	15:14	
Volumetric Flowrate, Dry Standard	dscf/min	Qsd	385,288	385,288	385,288	385,288	
Production	Tons/hr		123.3	125.4	115.6	129.9	123.6
Oxygen	%	O2	20.25	20.30	20.24	20.20	
Carbon Dioxide	%	CO2	0.66	0.63	0.66	0.70	
Moisture, Mole Fraction dry Gas		mfg	98.23%	98.23%	98.23%	98.23%	
Total Gaseous Organic Concentration	**(TGOC-1)**	Span	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	C3H8	1.00	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K	3				
Cylinder Value - High Range calibration gas	ppmv-C3		15.21	15.21	15.21	15.21	
Cylinder Value - Low Range (Zero) calibration gas	ppmv-C3	Coa	0.00	0.00	0.00	0.00	
Indicated average- Wet	ppmv-C3	Ciw	4.70	4.31	4.70	5.23	4.75
Span Gas Concentration- Equivalent	ppmv-C3	Sc	15.21	15.21	15.21	15.21	
Zero Gas Concentration- Equivalent	ppmv-C3	Zc	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initial	ppmv-C3	Ss	15.24	15.24	15.24	15.24	
System Calibration Response - Low Range gas - Initial	ppmv-C3	Zs	0.07	0.07	0.07	0.07	
System Calibration Response - Low Range gas - Final	ppmv-C3	Ze	-2.75	-2.75	-2.75	-2.75	
System Calibration Response - High Range gas - Final	ppmv-C3	Se	11.30	11.30	11.30	11.30	
Actual average - Wet (Corrected for Drift & Response:	ppmv-C3		6.79	5.59	6.81	8.22	6.87
Actual average - Dry (Corrected for Drift & Response)	ppmv-C3		6.91	5.69	6.94	8.37	7.00
Actual average - Dry	ppmv-C	Cgas	20.73	17.08	20.81	25.10	20.99
Mass Emissions	lbm-C / hr		14.94	12.31	14.99	18.08	15.13
Mass Emissions on Production Basis	lbm-C/Ton		0.121	0.098	0.130	0.139	0.122
METHANE	**(TGOC-2)**	Span	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	CH4	1.00	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K	1				
Cylinder Value - High Range calibration gas	ppmv-C		25.14	25.14	25.14	25.14	
Cylinder Value - Low Range (Zero) calibration gas	ppmv-C	Coa	0.00	0.00	0.00	0.00	
Indicated average- Wet	ppmv-C	Ciw	8.68	9.10	8.31	9.01	8.81
Span Gas Concentration- Equivalent	ppmv-C	Sc	25.14	25.14	25.14	25.14	
Zero Gas Concentration- Equivalent	ppmv-C	Zc	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initial	ppmv-C	Ss	24.63	24.63	24.63	24.63	
System Calibration Response - Low Range gas - Initial	ppmv-C	Zs	-0.06	-0.06	-0.06	-0.06	
System Calibration Response - Low Range gas - Final	ppmv-C	Ze	-4.70	-4.70	-4.70	-4.70	
System Calibration Response - High Range gas - Final	ppmv-C	Se	16.95	16.95	16.95	16.95	
Actual average - Wet (Corrected for Drift & Response:	ppmv-C		12.98	11.89	12.62	15.07	13.19
Actual average - Dry (Corrected for Drift & Response)	ppmv-C		13.21	12.10	12.84	15.34	13.43
Actual average - Dry	ppmv-C	Cgas	13.21	12.10	12.84	15.34	13.43
Mass Emissions	lbm-C / hr		9.52	8.72	9.25	11.05	9.68
Mass Emissions on Production Basis	lbm-C/Ton		0.077	0.070	0.080	0.085	0.078
TGNMOC (TGOC less Methane)							
Actual average - Wet (Corrected for Drift & Response:	ppmv-C3						
Actual average - Dry (Corrected for Drift & Response)	pprnv-C3						
Actual average - Dry	ppmv-C		7.52	4.98	7.97	9.76	7.57
Mass Emissions	lbm-C / hr		5.42	3.59	5.74	7.03	5.45
Mass Emissions on Production Basis	lbm-C/Ton		0.044	0.029	0.050	0.054	0.044

Gaseous Emissions

Client		OSM	
Source		ICA Baghouse INLET	
Location		Portland, OR	
Date		05-Dec-2002.	
System Calibration Time - Initial		Tci	08:55
Test Time-Starting (Hivol Interval)		Tts	10:54
Test Time-Ending (Hivol Interval)		Tte	15:54
System Calibration Time - Final		Tcf	15:56
Test Mid-point Time		Tx	13:24
Volumetric Flowrate, Dry Standard - Inlet Average	dscf/min	Qsd	354,435
Production Rate	Ton/hr		106.79
Molecular weight, Dry Stack	lbm/lb-mole	Md	29.04
Oxygen-Inlet	O2	Span	25
Indicated average - Dry	%	Cid	20.38
Cylinder Value - High Range calibration gas	%	Cma	20.95
Cylinder Value - Low Range (Zero) calibration gas	%	Coa	0.00
System Calibration Response - High Range gas - Initia	%	Cmi	21.01
System Calibration Response - Low Range gas - Initia	%	Coi	0.12
System Calibration Response - Low Range gas - Final	%	Cof	0.17
System Calibration Response - High Range gas - Fina	%	Cmf	20.80
Actual average - Dry (Corrected for Drift)	%	Cgas	20.45
Carbon Dioxide-Inlet	CO2	Span	25
Indicated average - Dry	%	Cid	0.58
Cylinder Value - High Range calibration gas	%	Cma	6.00
Cylinder Value - Low Range (Zero) calibration gas	%	Coa	0.00
System Calibration Response - High Range gas - Initia	%	Cmi	5.67
System Calibration Response - Low Range gas - Initia	%	Coi	0.06
System Calibration Response - Low Range gas - Final	%	Cof	-0.01
System Calibration Response - High Range gas - Fina	%	Cmf	5.59
Actual average - Dry (Corrected for Drift)	%	Cgas	0.605
Sulfur Dioxide	SO2	Span	50
Indicated average-Dry	ppmv	Cid	2.90
Cylinder Value - High Range calibration gas	ppmv	Sc	26.96
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.00
System Calibration Response - High Range gas - Initia	ppmv	Sbs	24.60
System Calibration Response - Low Range gas - Initia	ppmv	Zbs	0.00
System Calibration Response - Low Range gas - Final	ppmv	Zbe	1.30
System Calibration Response - High Range gas - Fina	ppmv	Sbe	24.90
Actual average - Dry (Corrected for Drift)	ppmv-SO2	Cgas	2.33
Mass Emissions	lbm-SO2 / hr	Mgas	8.23
Mass Emissions on Production Basis	lbm/Ton		0.077

Molecular Weight Determination

Client	Oregon Steel Mills		MJE/TJH/CDB/dc/ph			Testers	
Source	ICA Baghouse-EAF Inlet		1862–02			File	
Location	Portland, OR		MEW,DBC			Analysis/QA	
Date	06-Nov-2002						
			Combined	Run I	Run 2	Run 3	Avg
System Calibration Time - Initial		Tci	9:04	9:04	9:04	9:04	
Test Time-Starting (Hivol Interval)		Tts	11:09	11:09	12:45	14:31	
Test Time-Ending (Hivol Interval)		Tte	15:58	12:45	14:28	15:58	
System Calibration Time - Final		Tcf	16:02	16:02	16:02	16:02	
Test Mid-point Time		Tx	13:33	11:57	13:36	15:14	
Volumetric Flowrate, Dry Standard - Inlet Average	dscf/min	Qsd	385,288	385,288	385,288	385,288	
Production Rate	Ton/hr		123.29	125.44	115.62	129.88	
Molecular weight, Dry Stack	lbm/lb-mole	Md	29.04	29.03	29.04	29.04	
Oxygen-Inlet	02	Span	25	25	25	25	
Indicated average - Dry	%	Cid	20.29	20.35	20.28	20.22	20.28
Cylinder Value - High Range calibration gas	%	Cma	11.71	11.71	11.71	11.71	
Cylinder Value - Low Range (Zero) calibration gas	%	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initial	%	Cmi	11.80	11.80	11.80	11.80	
System Calibration Response - Low Range gas - Initial	%	Coi	0.10	0.10	0.10	0.10	
System Calibration Response - Low Range gas - Final	%	Cof	0.10	0.10	0.10	0.10	
System Calibration Response - High Range gas - Final	%	Cmf	11.76	11.76	11.76	11.76	
Actual average - Dry (Corrected for Drift)	%	Cgas	20.25	20.30	20.24	20.20	20.25
Carbon Dioxide-Inlet	C02	Span	25	25	25	25	
Indicated average - Dry	%	Cid	0.64	0.61	0.64	0.68	0.64
Cylinder Value - High Range calibration gas	%	Cma	12.54	12.54	12.54	12.54	
Cylinder Value - Low Range (Zero) calibration gas	%	Coa	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Initial	%	Cmi	12.28	12.28	12.28	12.28	
System Calibration Response - Low Range gas - Initial	%	Coi	0.00	0.00	0.00	0.00	
System Calibration Response - Low Range gas - Final	%	Cof	0.00	0.00	0.00	0.00	
System Calibration Response - High Range gas - Final	%	Cmf	12.18	12.18	12.18	12.18	
Actual average - Dry (Corrected for **Drift)**	%	Cgas	0.657	0.625	0.657	0.699	0.661

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Example Calculations- Gaseous Emission rate, lb/hr

Client: OREGON STEEL MILLS Source ICA BAGHOUSE
Date 11-6-2002 Project # 1862 Run # 3

Equation:

$$E\frac{lb}{hr} = \frac{GasMeasured(ppmv)}{10^6} \times Qsd \times 60\frac{\min}{hr} \times \frac{1}{385.3211} \times GasMolWt\frac{lb}{lbmol}$$

where Molecular Weights (lb/lbmol):

CO=28	SO_2=64
NO_x=46	TGOC as C=12

Calculations:

$FlowRate = 385,288 \frac{dscf}{\min}$

$GasConcentration$ NOx $= 6.16$ $ppmv$

$$E\frac{lb}{hr} = \frac{6.16\ ppmv}{10^6} \times 385288\frac{dscf}{\min} \times 60\frac{\min}{hr} \times \frac{1}{385.3211} \times 46\frac{lb}{lbmol}$$

$0.00000616 \times 385288 \times 60 \times 0.00259524 \times 46 = 17.00$ lb/hr

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Calibration Field Record

Client: OSM
Test Date: 11/06/02
Source: BAGHOUSE

Tester: CDB/MJG/TH/DC/A
Observer: Jack H.-Ko.-T
Logger ID: KEITHLEY + Rust--

Leak Checks: Pre-OK / Post-OK / Response Time	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	Start Run / Start Run / System Calibration Response (SCRx)	End Run / Start Run / System Calibration Response (SCRx)	End Run / Start Run / System Calibration Response (SCRx)	End Run / System Calibration Response (SCRx)	
Times					840	904	1602			
CO2 % ch 2		31 ✓	CO2	21.74	21.73					
Range 0-25%		26 ✓	CO2	12.54	12.47	12.28	12.18			
Analyzer Model SERVO.		0-3 ✓	N2	0.0	0.0	0.0	0.0			
Analyzer SN: 37										
CO ppm ch 3		31 ✓	CO	880	887.2					
Range 0-2000ppm		26 ✓	CO	555	569.4	560.7	562.9			
Analyzer Model TKO46		0-3 ✓	N2	0.0	0.0	0.0	0.0			
Analyzer SN: 49										
O2% ch 1		Air	O2	20.95	20.93					
Range 0-25%		0-3 ✓	O2	11.71	11.87	11.80	11.76			
Analyzer Model SERVO.		26	N2	0.0	-0.02	0.10	0.10			
Analyzer SN: 13										
NOx ppm ch 4		31 ✓	NOx	185.3	185.5					
Range 0-200ppm		26 ✓	NOx	90.3	89.6	86.8	84.8			
Analyzer Model TKO42C		0-3	N2	0.0	0.0	0.6	0.6			
Analyzer SN: 39										
TGOC ppm ch 5		P23 ✓	CH_4	85.8	85.8	85.71	75.87			
Range 0-100ppm		P19 ✓	"	51.6	51.6	51.38	45.25			
Analyzer Model JUM		P11 ✓	"	15.21	15.21	15.24	11.30			
Analyzer SN: 90		A3	Air	0.0	0.0	0.07	-2.75			
CH_4 ch 8			CH_4 ✓	25.14	—	24.63	16.95			
Range 0-100ppm			C_2H_4	21	—	4.79	0.30			
Analyzer Model CALIFERNIA			C_2H_6 ✓	85.8	—	0.10	-4.5			
Analyzer SN: 114			A3	0.0	—	-0.06	-4.7			
			P11	15.21	—	-0.16	-4.7			
Check			Performance Specs	51.6	—	-0.02	-4.6			
Analyzer Calibration Error		| ACR-CV | / SPAN		2 (25A @ 5%)				Hot Line Temp	258°F	
Sampling System Bias		(SRCx-ACR) /SPAN		5				Hot Line Temp	266°F	
Zero and Cal Drift		(SRC2-SRC1) /SPAN		3						

OSM Time 2 min faster than Keithley
Rust-ek 2 min faster than Keithley — Keithley Time

Test Times	Run 1	Run 2	Run 3
Start Time	1109		
End Time	1558		

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Calibration Field Record

Client: OSM
Test Date 11/6/02
Source Boiler Stack

Tester MIKE TI
Observer
Logger ID: Kaibab / Houston R

Leak Checks: Pre-OK Post-OK Response Time	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	Start Run 1 System Calibration Response (SCR1)	End Run 1 Start Run 2 System Calibration Response (SCR2)	End Run 2 Start Run 3 System Calibration Response (SCR3)	End Run 3 System Calibration Response (SCR3)
Times					840	904	1602		
CO2 % ch___			CO2						
Range			CO2						
Analyzer Model			N2						
Analyzer SN:									
CO ppm ch___			CO						
Range			CO						
Analyzer Model			N2						
Analyzer SN:									
O2% ch___			O2						
Range			O2						
Analyzer Model			N2						
Analyzer SN:									
NOx ppm ch___			NOx						
Range			NOx						
Analyzer Model			N2						
Analyzer SN:									
TGOC ppm ch___									
Range									
Analyzer Model									
Analyzer SN:			Air						
							→ Direct from Ins		
SO2 ch 6									
Range 0-30ppm		59	SO2	26.96	26.96				
Analyzer Model 80VAR		52	"	15.15	14.76	14.76	14.49		
Analyzer SN: 3		26	N2	0.0	-0.01	0.08	-0.54		

Check	Performance Specs	
Analyzer Calibration Error	|ACR-CV| / SPAN	2 (25A @ 5%)
Sampling System Bias	(SRC1-ACR) /SPAN	5
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3

Hot Line Temp 258°F
Hot Line Temp 266°F

Test Times	Run 1	Run 2	Run 3
Start Time	1109		
End Time	1558		

HORIZON ENGINEERING
13685 NE Whitaker Way • Portland, OR 97230
Phone (503) 256-5050 • Fax (503) 256-0505
www.horizonengineering.com

Client DSM

Date 12/5/02

Source CAF B.H. Inlet

Calibration Field Record

Tester SAM/TAR

Observer D. Silva

Data Logger ID RAILJER I

Leak Check: Pre-OK / Post-OK / Response Time 95 sec.	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	scan Run 1 System Calibration Response (SCRx)	End Run 3 Start Run System Calibration Response (SCRx)	End Run __ Start Run __ System Calibration Response (SCRx)	End Run __ System Calibration Response (SCRx)	
Times					1:50	9:55	15:53			
CO2 % ch 1		34	CO2	21.69	21.69					
Range 0-25%		1	CO2	6.00	5.79	5.67	5.59			
Analyzer Model 1400		2-4	N2	0.00	0.00	+.06	-.01			
Analyzer SN: 50										
CO ppm ch __			CO							
Range			CO							
Analyzer Model			N2							
Analyzer SN:										
O2% ch 3		A;5	O2	20.95	20.95	20.21.0	20.80			
Range 0-25%		0-2	O2	11.65	11.74	11.56	11.53			
Analyzer Model 1400		2-4	N2	0.00	0.00	+.12	+.17			
Analyzer SN: 38										
NOx ppm ch __			NOx							
Range			NOx							
Analyzer Model			N2							
Analyzer SN:										
TGOC pp ch __										
Range										
Analyzer Model										
Analyzer SN:			Air							
SO2 ch 6		5-1	SO2	43.6	43.6					
Range 0-50 ppm		5-9	SO2	26.96	~~25.5~~ 26.0	24.6	24.9			
Analyzer Model 921		5-2	SO2	15.15	~~15.8~~ 15.4	14.0*	see below			
Analyzer SN: 4		2-4	N2	0.0	0.0	0.0	+1.3			

Check	Performance Specs			
Analyzer Calibration Error	|ACR-CV| / SPAN	2 (25A @ 5%)	Hot Line Temp	320 °F
Sampling System Bias	(SRCx-ACR) /SPAN	5	Hot Line Temp	
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3		

Test Times	Run 1	Run 2	Run 3
Start rims	1107		
End Time	1554		

* Low SO_2 bottle went empty on beginning bias check

OSM 11/6/02 BH In

Time	O_2	CO_2	CO	NOx	VOC	SO_2	CH_4
113406	20.20	0.74	312.7	6.0	6.83	-0.16	17.28
113426	20.20	0.71	280.3	4.8	7.98	-0.42	19.47
113506	20.20	0.74	240.5	4.8	7.11	-0.44	19.83
113526	20.19	0.82	233.2	4.8	6.83	-0.41	14.97
113606	20.19	0.74	208.2	6.6	6.22	-0.25	17.64
132005	20.08	1.10	473.4	3.4	2.68	-0.49	6.09
132025	19.97	1.15	365.6	4.6	1.63	-0.71	4.86
132045	20.08	0.98	153.1	5.4	1.41	-0.58	4.64

Bias Check

Oregon Steel Mills
EAF Baghouse
6-November-2002

		Span	Cylinder Value CV	Analyzer Calibration Response ACR	Initial System Calibration Response SCRi	Final System Calibration Response SCRf	Cylinder Value Percent of Span	Difference < 2%	Initial System Calibration Bias < 5%	Final System Calibration Bias < 5%	Drift < 3%
OXYGEN											
Run 1-3	High Range	25	20.95	20.93			84%	0%			
	Mid-Range	25	11.71	11.87	11.80	11.76	47%	1%	0%	0%	0%
	Zero	25	0.00	-0.02	0.10	0.10	0%	0%	0%	0%	0%
CARBON DIOXIDE											
Run 1-3	High Range	25	21.74	21.73			87%	0%			
	Mid-Range	25	12.54	12.47	12.28	12.18	50%	0%	1%	1%	0%
	Zero	25	0.00	0.00	0.00	0.00	0%	0%	0%	0%	0%
CARBON MONOXIDE											
Run 1-3	High Range	2000	880.00	887.20			44%	0%	44%	44%	0%
	Mid-Range	2000	555.00	569.40	560.70	562.90	28%	1%	0%	0%	0%
	Zero	2000	0.00	0.00	0.00	0.00	0%	0%	0%	0%	0%
NITROGEN OXIDES											
Run 1-3	High Range	200	185.30	185.50			93%	0%	93%	93%	0%
	Mid-Range	200	90.30	89.60	86.80	84.80	45%	0%	1%	2%	1%
	Zero	200	0.00	0.00	0.60	0.60	0%	0%	0%	0%	0%
TOTAL GASEOUS ORGANIC CONCENTRATION											
Run 1	High Range	C3H8	100	85.80	85.71	75.87	86%				
	Mid# 1	CH4	100	51.60	51.38	45.25	52%				6%
	Mid-#2	CH4	100	15.21	15.24	11.30	15%				4%
	Zero	N2	100	0.00	0.07	-2.75	0%				3%

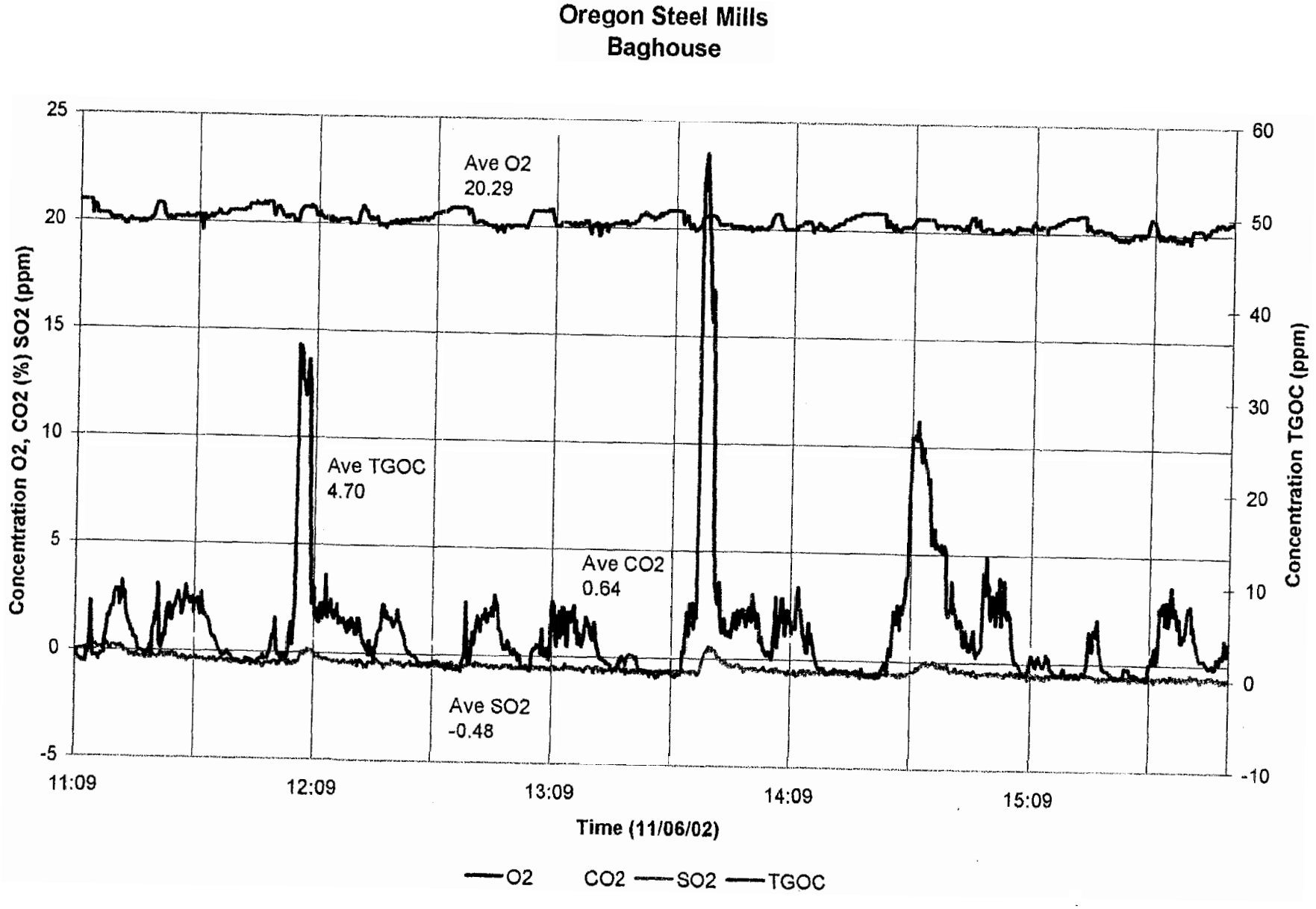
Part 60, Appendix A, Method 6C, Figures 6C-3 to 6C-5

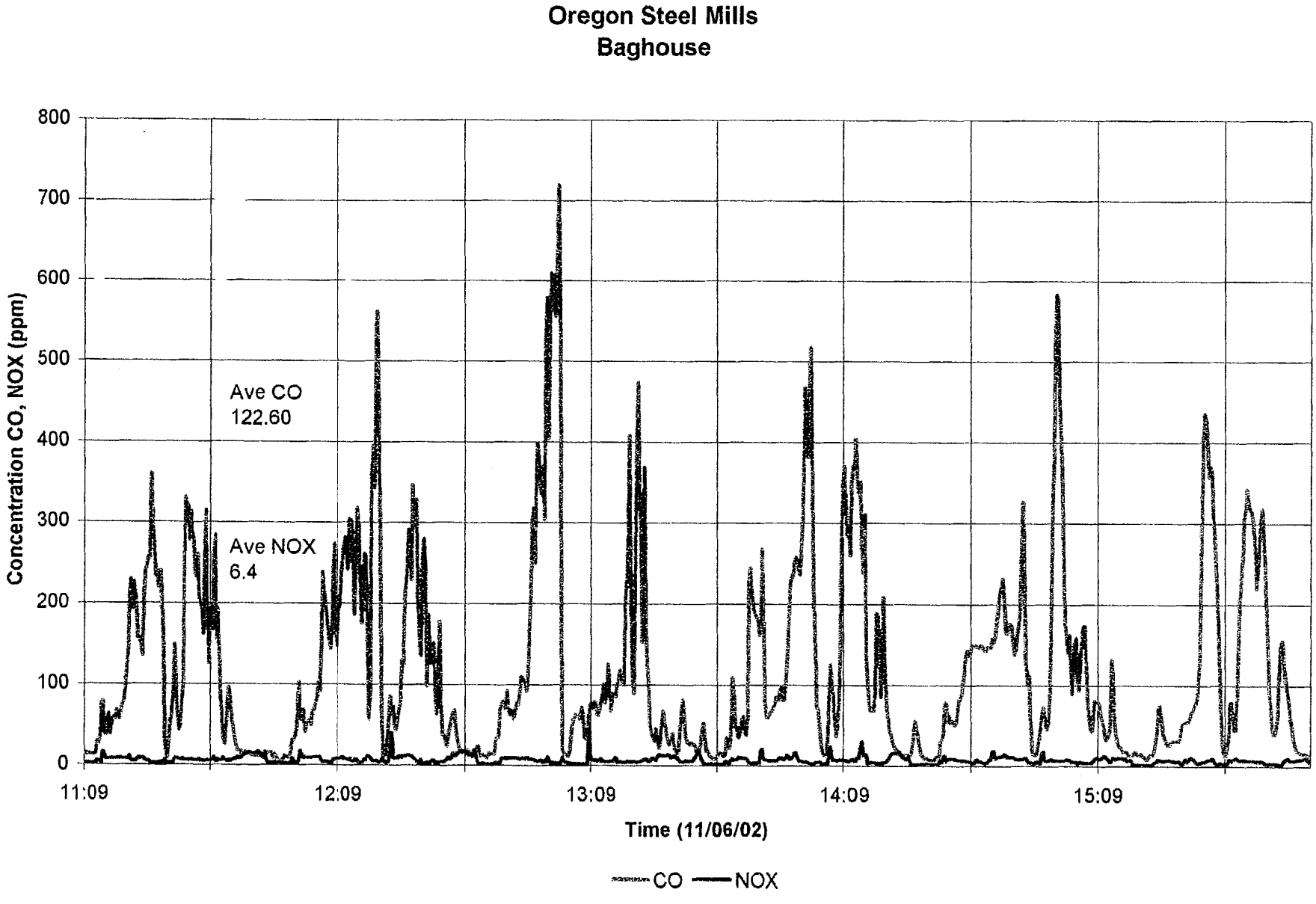
Bias Check

Oregon Steel Mills
EAF Baghouse
05-Dec-2002

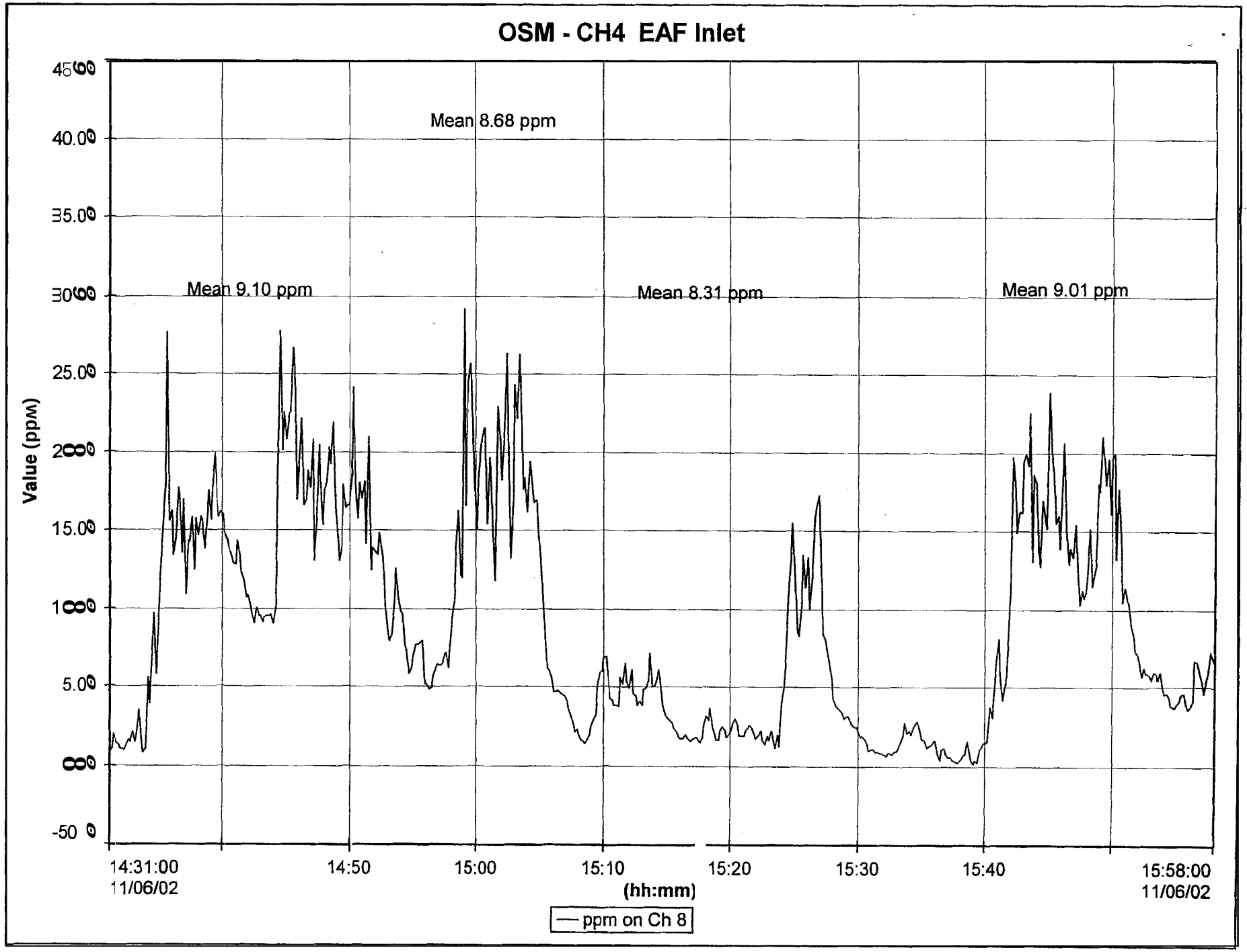
		Span	Cylinder Value CV	Analyzer Calibration Response ACR	Initial System Calibration Response SCRi	Final System Calibration Response SCRf	Cylinder Value *Percent of Span	Difference < 2%	Initial System Calibration Bias < 5%	Final System Calibration Bias < 5%	Drift < 3%
OXYGEN											
Run 1-3	High Range	25	20.95	20.95	21.01	20.80	84%	0%	0%	1%	1%
	Mid-Range	25	11.65	11.74	11.56	11.53	47%	0%	1%	1%	0%
	Zero	25	0.00	0.00	0.12	0.17	0%	0%	0%	1%	0%
CARBON DIOXIDE											
Run 1-3	High Range	25	21.69	21.69			87%	0%			
	Mid-Range	25	6.00	5.79	5.67	5.59	24%	1%	0%	1%	0%
	Zero	25	0.00	0.00	0.06	-0.01	0%	0%	0%	0%	0%
SULFUR DIOXIDE											
Run 1-3	High Range	50	43.60	43.60			87%	0%			0%
	Mid-Range	50	26.96	26.00	24.60	24.90	54%	2%	3%	2%	1%
	Mid-Range	50	15.15	15.40	14.00	na	30%	1%	3%		
	Zero	50	0.00	0.00	0.00	1.30	0%	0%	0%	3%	3%

Part 60, Appendix A, Method 6C, Figures 6C-3 to 6C-5


Oregon Steel Mills
Baghouse
Ave O2
20.29
Ave TGOC
4.70
Ave CO2
0.64
Ave SO2
-0.48
Concentration O2, CO2 (%) SO2 (ppm)
Concentration TGOC (ppm)
25
20
15
10
5
0
-5
60
50
40
30
20
10
0
-10
11:09
12:09
13:09
14:09
15:09
Time (11/06/02)
O2
CO2
SO2
TGOC


Oregon Steel Mills
Baghouse
800
700
600
500
400
300
200
100
0
Concentration CO, NOX (ppm)
Ave CO
122.60
Ave NOX
6.4
11:09
12:09
13:09
14:09
15:09
Time (11/06/02)
CO
NOX

View1



Rustrak Ranger

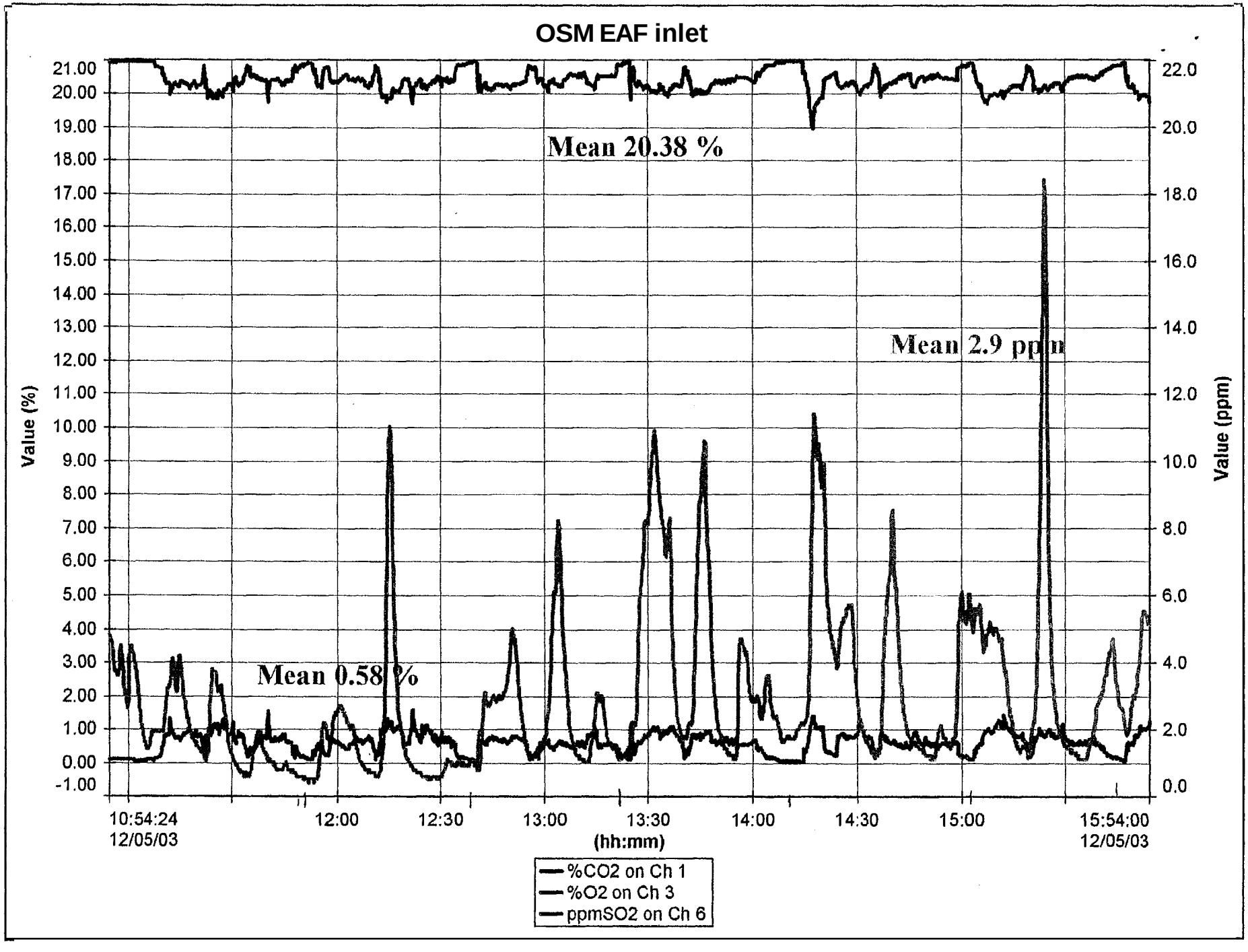
47110
11/6/02 OSM
SHARKI 1109

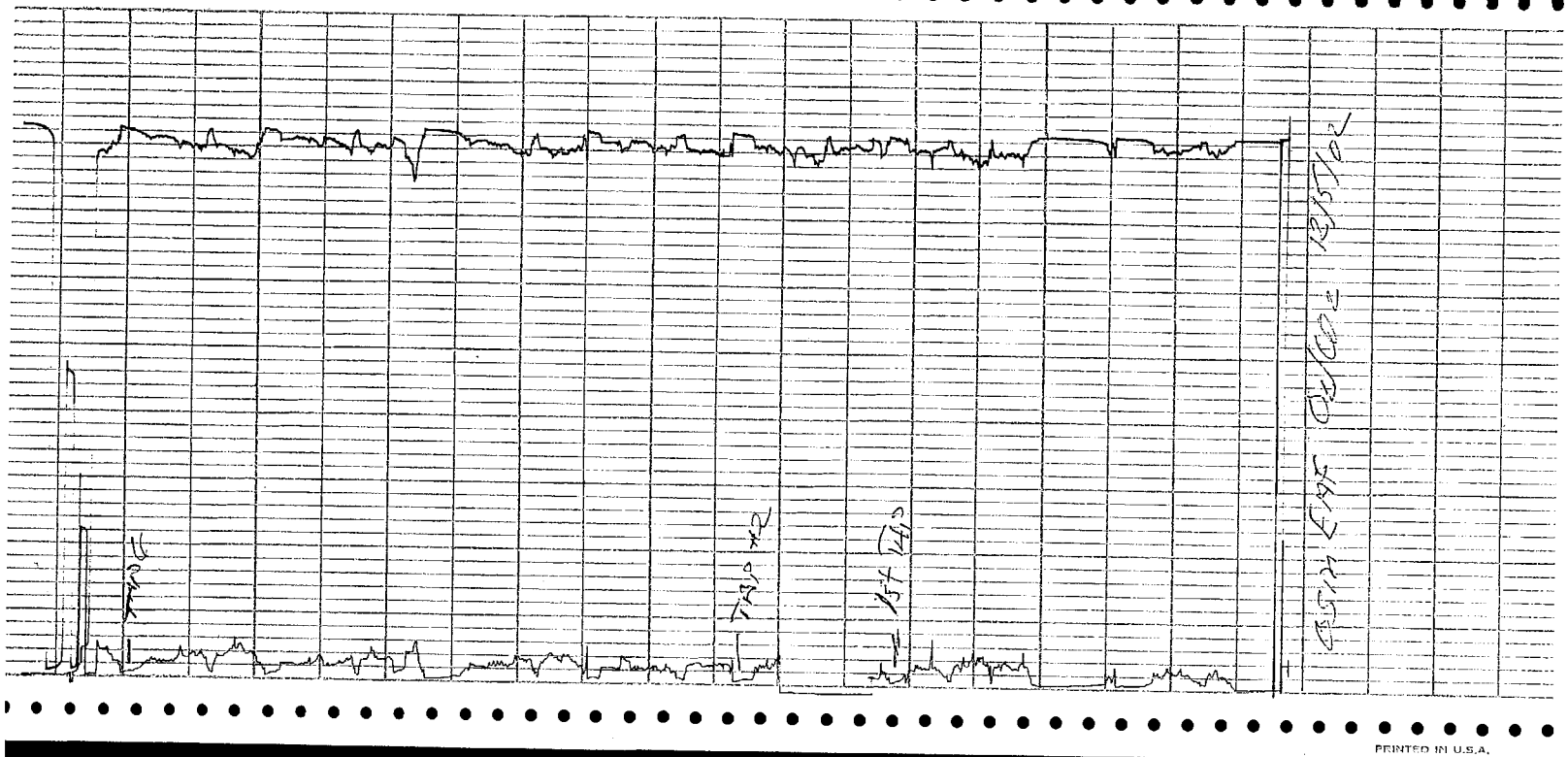
41110
BN 6170270700

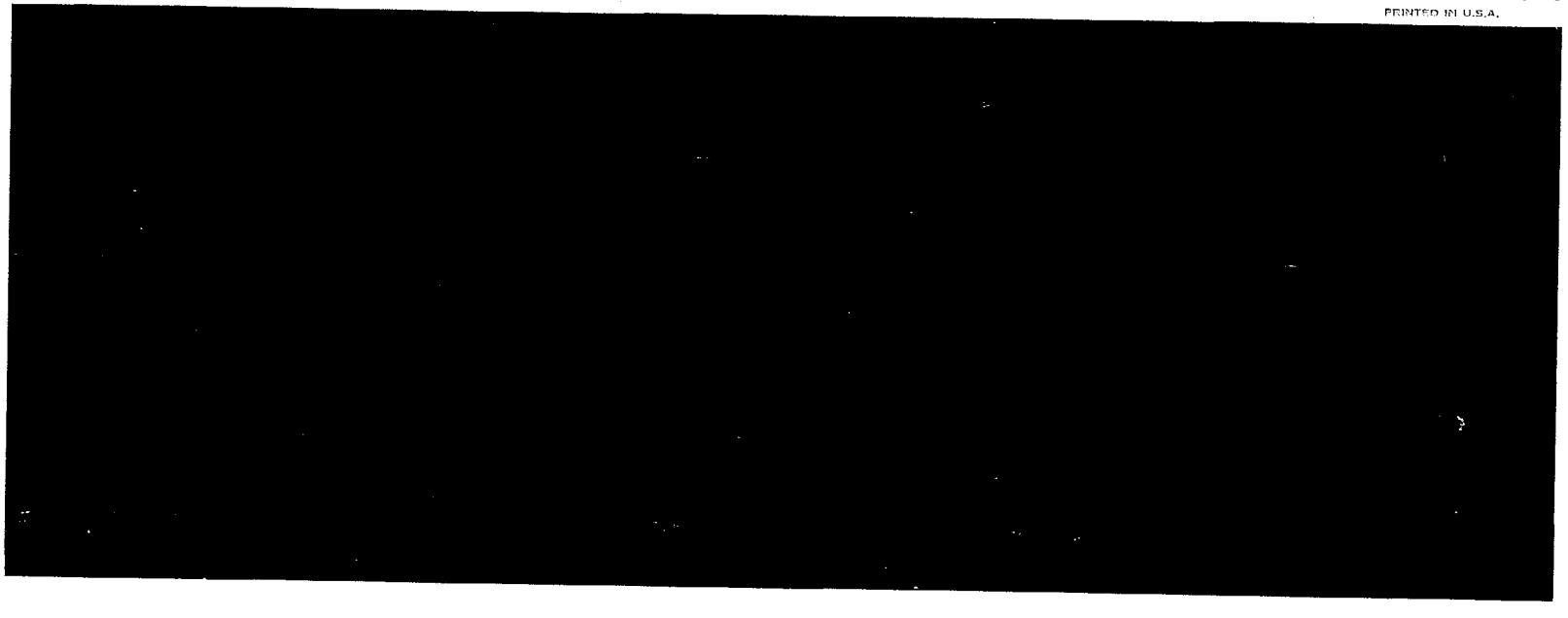
[redacted]

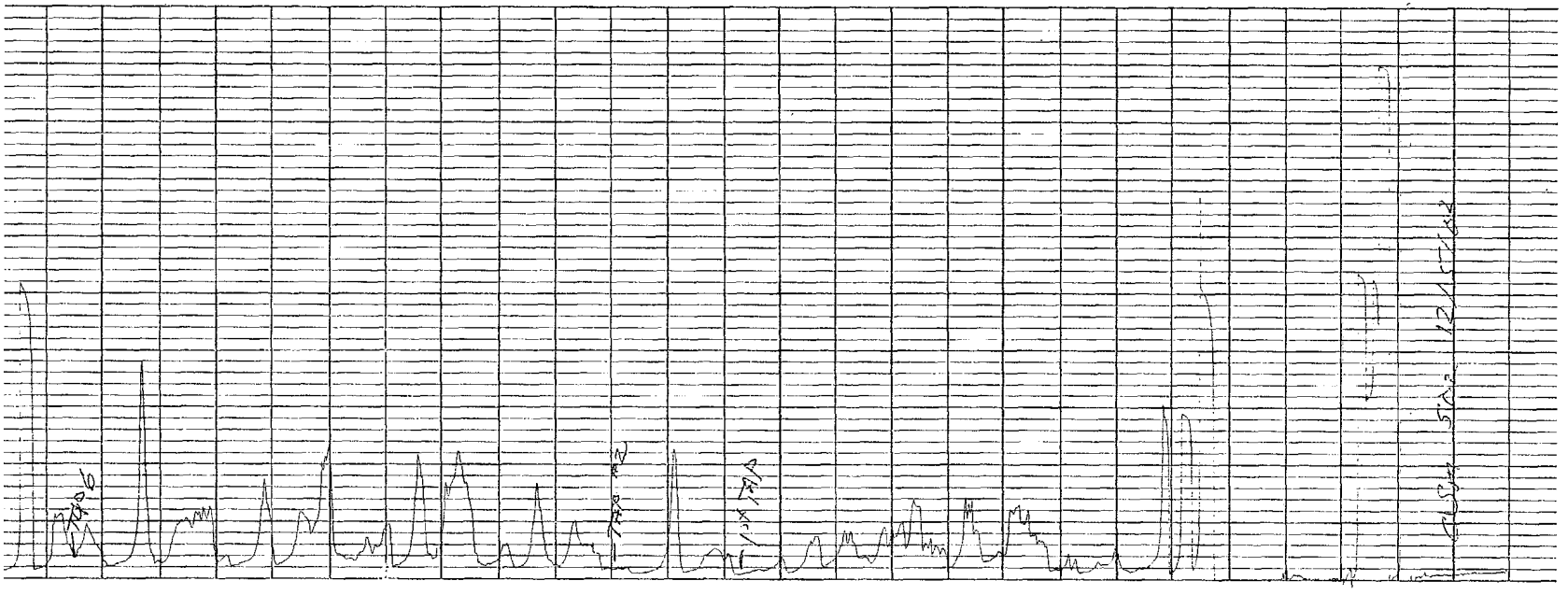
BN 46782-07/03

End RI 15582


OSM EAF inlet
Mean 20.38 %
Mean 2.9 ppm
Mean 0.58 %
Value (%)
Value (ppm)
21.00
20.00
19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
10:54:24
12/05/03
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:54:00
12/05/03
(hh:mm)
%CO2 on Ch 1
%O2 on Ch 3
ppmSO2 on Ch 6


PRINTED IN U.S.A.





ONTROLS CORPORATION BUFFALO, NEW YORK PRINTED IN U.S.A.

Production/Process Data
Furnace Heat **Logs**
MSDS Sheet
Baghouse Pressure Drop Field Data
Historical Data

OSM #3 Furnace Heat Log Data Reduction

06-Nov-2002

	Heat	Last Tap	Start Charge	Finish Tap	C-T mins	T-T mins	First Charge lbms	Second Charge lbms	Total Charge lbms	Run Total lbms	Total Time mins	Down Time mins	Run Time mins	Tons/hr
	120,187													
	120,188	08:49		11:11			125,200	40,200	165,400					
Run 1	120,189	11:11	11:16	11:58	42.0	47.0	135,600	45,000	180,600	380,500	91		91	125.44
	120,190	11:58	12:02	12:47	45.0	49.0	139,000	60,900	199,900					
Run2	120,191	12:47	12:50	13:41	51.0	54.0	137,800	60,700	198,500	393,100	102		102	115.62
	120,192	13:41	13:45	14:32	47.0	51.0	138,400	56,200	194,600					
Run 3	120,193	14:32	14:35	15:23	48.0	51.0	139,100	55,500	194,600	385,300	89		89	129.88
	120,194	15:23	15:25	16:04	39.0	41.0	140,800	49,900	190,700					
Average					45.3	48.8	138,450	54,700	193,150					
Total										1,158,900	282		282	123.29

Production Data

OSM #3 Furnace Heat **Log** Data Reduction

05-Dec-2002

Heat	Last Tap	Start Charge	Finish Tap	C-T mins	T-T mins	First Charge lbms	Second Charge lbms	Total Charge lbms	Run Total lbms	Total Time mins	Down Time mins	Run Time mins	Tons/hr
120,631	10:40	10:44	11:49	65.0	69.0	136,800	40,900	177,700	349,400				
120,632	11:49	11:52	12:36	44.0	47.0	141,200	30,500	171,700					
120,633	12:36	12:40	13:22	42.0	46.0	139,200	36,300	175,500	351,600				
120,634	13:22	13:25	14:04	39.0	42.0	135,900	40,200	176,100					
120,635	14:04	14:14	15:00	46.0	56.0	135,700	35,300	171,000	342,200				
120,636	15:00	15:03	15:44	41.0	44.0	136,100	35,100	171,200					
120,637	15:44	15:46	16:27	41.0	43.0	137,700	40,100	177,800	177,800				
Average				46.2	50.7	137,483	36,383	173,867					
Total				318.0	347.0				1,221,000	343.0		343	106.79

O S M #3 F U R N A C E H E A T L O G

11-21-02

HEAT SUMMARY

Heat Number: 120188 Grade: A514-B Grade No: 8818

Crew No : 1 Heat Tap Date: 11/06/2002 Charge Time: 0
Tap Time: 1111

Heats on Delta: 937 Last Heat Tapped: 849

Total Charge Wt	: 140.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 234
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 39.9
Charge to Tap Time	: 671	Avg. MW	: 58.3
Tap **to** Tap Time	: 142	KWH/Ton	: 570.0
Total Delay Time	: 100.5	Avg. Pwr. Factor	: 0.81

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 125,200

2nd - 410,200

Oregon Steel Mills, Portland Oregon
* * * * * * H E A T L O G * * * * * *

Heat No. 120188 BOH 11/06 at 08:49 Product Code 8818
Melter 1 1st Helper 1 Ladle Temp 0 1 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU a	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELA DESCRIPTIO
08:57	7.75	0.00	7.75	0	0.00			0.00	0.00	Inspect_Fc
08:57	7.82	0.07	0.00	1	30.24	0.807	1 L M	0.03	45.88	Holding
08:57	8.00	0.18	0.00	3	28.28	0.816	1 L M	0.12	41.82	Bore_In
08:57	8.10	0.10	0.00	4	30.60	0.812	1 L M	0.17	44.89	Bore_In
10:01	71.76	0.00	63.67	0	0.00			0.17	0.00	
10:02	72.41	0.65	0.00	1	49.02	0.777	1 S M	0.70	66.65	Bore_In
10:02	72.51	0.10	0.00	2	62.64	0.788	1 L M	0.81	74.60	
10:04	74.93	2.42	0.00	5	56.25	0.821	1 L M	3.07	64.51	Bore_In
10:07	78.15	3.22	0.00	9	55.50	0.820	1 L M	6.05	64.59	Melt
10:10	80.26	2.12	0.00	11	54.94	0.817	1 L M	7.98	64.01	Lime_#_
10:15	85.28	5.02	0.00	16	54.64	0.792	1 L M	12.55	67.36	
10:15	85.41	0.13	0.00	16	24.03	0.534	1 L M	12.61	64.29	
10:15	85.53	0.12	0.00	17	16.35	0.694	1 L M	12.64	38.28	
10:19	89.64	4.11	0.00	20	55.42	0.815	1 L M	16.44	64.47	
10:40	110.86	0.00	21.21	16	0.00			16.44	0.00	CHG_2__140.
10:41	111.56	0.70	0.00	17	59.46	0.782	1 S M	17.13	73.66	
10:46	116.57	5.02	0.00	21	61.03	0.838	1 L M	22.23	64.25	
10:47	118.01	1.43	0.00	22	61.12	0.857	1 L M	23.69	62.78	
10:50	121.16	0.00	3.15	21	0.00			23.69	0.00	
10:53	123.91	2.75	0.00	23	61.06	0.862	1 L M	26.49	61.98	
10:58	128.84	4.93	0.00	26	67.68	0.822	1 S M	32.06	73.27	
11:01	131.76	2.92	0.00	27	65.84	0.804	1 S M	35.26	73.47	
11:01	131.96	0.20	0.00	27	54.36	0.835	1 L M	35.44	60.39	
11:02	132.84	0.00	0.88	27	0.00			35.44	0.00	
11:03	133.96	1.12	0.00	28	58.35	0.801	1 S M	36.52	69.41	
11:03	134.01	0.05	0.00	28	43.92	0.824	1 L M	36.56	56.42	
11:04	134.89	0.00	0.88	28	0.00			36.56	0.00	
11:08	138.60	3.72	0.00	30	54.38	0.714	2 L M	39.93	74.18	
11:11	141.52	0.00	2.92	29	0.00			39.93	0.00	Tap_T

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 234

cold charge weight 140.0
hot charge weight 0.0
total charge weight 140.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120188 Time: 11:11

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	9.7	23.5	21.58	65.45	47.06	80.61	0.812	9.7	9.6	9.7	73.
UNDEF	1 L	9.4	23.0	22.23	60.82	38.06	71.75	0.848	9.3	9.4	9.4	63.
UNDEF	2 L	3.7	9.1	21.22	54.38	53.34	76.17	0.714	3.7	3.7	3.7	74.
BOREIN	1 S	0.6	1.6	22.32	49.02	39.66	63.05	0.777	0.6	0.6	0.6	63.
BOREIN	1 L	2.9	7.0	22.47	53.18	37.22	64.92	0.819	2.9	2.5	2.9	64.
MELT	1 L	3.2	7.8	22.45	55.50	38.68	67.65	0.820	3.2	3.2	3.2	65.
REFINE	1 L	11.5	28.0	22.36	54.23	40.20	67.51	0.803	11.5	11.5	11.5	64.
		41.1		22.06	58.35	42.18	71.99	0.810	40.9	40.6	41.1	67.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120188 Date: 11-06-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 8818
Tap Time: 11:11 Prev Heat Tapped: 08:49 Time Tap to Tap: 2 hr. 22 m

CHARGE	TIME	WEIGHT
1	none	none
2	10:40	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		140.0
TOTAL(tons)		70.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	39.93
KWH/TON:	570.4

* HEATS ON LIN
* DELTA LIFE
* CHG WT(klbs)

Chemistry File Heat Number 120188 has incorrect number of characters

OSM #3 FURNACE HEAT LOG

HEAT SUMMARY

Heat Number: 120189 Grade: A514-B Grade No: 8818

Crew No : 1 Heat Tap Date: 11/06/2002 Charge Time: 1116
Tap Time: 1158

Heats on Delta: 938 Last Heat Tapped: 1111

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 110
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 37.1
Charge to Tap Time	42	Avg. MW	: 62.0
Tap to Tap Time	: 47	KWH/Ton	: 265.0
Total Delay Time	: 12.1	Avg. Pwr. Factor	: 0.84

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 135,600

2nd - 45,000

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Meat No. 120189 BOH 11/06 at 11:11 Product Code 8818
Melter 1 1st Helper 1 Ladle Temp 0 2 heats on lance 8

CLOCK TIME	---TIME TOTAL	(MINUTES)-- ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELA DESCRIPTIOP
11:12	1.50	0.00	1.50	0	0.00			0.00	0.00	Lime_#_
11:16	5.15	0.00	3.65	0	0.00			0.00	0.00	
11:16	5.33	0.00	0.18	0	0.00			0.00	0.00	CHG_1__140.
11:19	8.18	2.85	0.00	35	59.55	0.788	I S M	2.83	74.15	Bore_In____
11:19	8.28	0.10	0.00	36	65.88	0.794	1 L M	2.94	76.91	
11:19	8.38	0.10	0.00	36	61.92	0.840	1 L M	3.04	66.77	Bore_In____
11:22	11.38	3.00	0.00	53	59.94	0.830	1 L M	6.04	66.17	Melt_____
11:27	16.31	4.93	0.00	67	59.21	0.836	1 L M	10.90	64.56	Refine_____
11:30	19.78	3.47	0.00	73	61.17	0.843	1 L M	14.44	65.04	
11:33	22.21	0.00	2.43	65	0.00			14.44	0.00	CHG_2__140.
11:33	22.58	0.37	0.00	66	42.02	0.772	1 S M	14.69	62.43	
11:38	27.59	5.01	0.00	72	58.61	0.837	1 L M	19.59	64.18	
11:43	32.61	5.02	0.00	76	62.50	0.858	1 L M	24.82	64.51	
11:46	35.92	3.32	0.00	78	62.75	0.860	1 L M	28.28	62.78	
11:51	40.94	5.02	0.00	81	67.95	0.827	1 S M	33.97	73.11	
11:54	43.54	2.60	0.00	82	69.89	0.839	1 S M	36.99	73.46	
11:54	43.64	0.10	0.00	82	64.44	0.848	1 L M	37.10	68.29	
11:58	47.97	0.00	4.33	75	0.00			37.10	0.00	Tap_T_____

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 110

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120189 Time: 11:58

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	8.0	22.3	21.61	67.39	45.32	81.21	0.830	7.8	8.0	8.0	73.5
UNDEF	1 L	13.4	37.5	22.21	61.13	37.74	71.84	0.851	13.4	13.4	13.4	64.(
BOREIN	1 S	2.8	7.9	21.70	59.55	46.51	75.56	0.788	2.7	2.8	2.8	75.8
BOREIN	1 L	0.2	0.6	21.97	63.90	45.18	78.26	0.817	0.2	0.2	0.2	71.4
MELT	1 L	3.0	8.4	22.22	59.94	40.28	72.22	0.830	3.0	3.0	3.0	66.2
REFINE	1 L	8.4	23.4	22.18	60.02	38.91	71.53	0.839	8.4	8.4	8.4	63.9
		35.9		22.03	62.05	40.65	74.18	0.836	35.6	35.9	35.9	67.(

Oregon Steel Mills; Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120189 Date: 11-06-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 8818
Tap Time: 11:58 Prev Heat Tapped: 11:11 Time Tap to Tap: 0 hr. 48

CHARGE	TIME	WEIGHT
1	11:16	140.0
2	11:33	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	37.10
KWH/TON:	265.0

HEATS ON LIN

DELTA LIFE

CHG WT(klbs

Chemistry File Heat Number 120189 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 120190 Grade: A514-B Grade No: 8818

Crew No : 1 Heat Tap Date: 11/06/2002 Charge Time: 1202
Tap Time: 1247

Heats on Delta: 939 Last Heat Tapped: 1158

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 106
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 4.7
Charge to Tap Time	45	Avg. MW	: 7.4
Tap to Tap Time	49	KWH/Ton	: 33.6
Total Delay Time	: 13.1	Avg. Pwr. Factor	: 0.04

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 139,000

2nd - 60,900

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 120190 BOH 11/06 at 11:58 Product Code 8818
Melter 1 1st Helper 1 Ladle Temp 0 3 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
12:01	2.35	0.00	2.35	0	0.00			0.00	0.00	Lime_#_
12:02	3.92	0.00	1.57	0	0.00			0.00	0.00	
12:02	4.22	0.00	0.30	0	0.00			0.00	0.00	CHG_1__140.
12:03	4.52	0.30	0.00	7	26.52	0.753	1 S M	0.13	48.99	Bore_In____
12:03	4.60	0.08	0.00	8	52.27	0.777	1 S M	0.21	70.15	Bore_In____
12:06	7.60	3.00	0.00	45	57.46	0.836	1 L M	3.08	64.96	Bore_In____
12:07	9.05	1.45	0.00	53	56.99	0.844	1 L M	4.45	62.60	Melt_____
12:10	12.16	0.00	3.12	40	0.00			4.45	0.00	
12:10	12.27	0.00	0.10	39	0.00			4.45	0.00	
12:12	14.01	1.75	0.00	47	53.70	0.828	1 L M	6.02	62.72	Melt_____
12:17	18.93	4.92	0.00	61	57.46	0.824	1 L M	10.73	65.69	Refine____
12:22	23.86	4.93	0.00	69	61.81	0.852	1 L M	15.81	63.99	
12:22	24.03	0.17	0.00	69	59.40	0.859	1 L M	15.97	60.85	
12:24	25.86	0.00	1.83	64	0.00			15.97	0.00	CHG_2__140.
12:25	26.73	0.87	0.00	65	53.09	0.775	1 S M	16.74	70.37	
12:29	30.86	4.13	0.00	70	54.88	0.821	1 L M	20.52	64.38	
12:34	35.84	4.98	0.00	74	60.27	0.841	1 L M	25.52	64.37	
12:34	36.11	0.27	0.00	74	62.45	0.849	1 L M	25.80	63.94	
12:39	41.13	5.02	0.00	77	66.78	0.808	1 S M	31.38	73.63	
12:43	47.14	6.01	0.00	80	-1.00	-1.000	1 S M	4.52	114.69	
12:43	47.32	0.18	0.00	80	60.28	0.843	1 S M	4.71	66.99	
12:43	47.35	0.03	0.00	80	16.20	0.882	1 L M	4.71	22.36	
12:47	51.20	0.00	3.85	74	0.00			4.71	0.00	Tap_T_____

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 106

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120190 Time: 12:47

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	12.1	31.7	20.02	0.00	473.48	473.48	0.000	9.8	9.7	9.8	0.
UNDEF	1 L	9.4	24.7	22.22	57.81	38.38	69.39	0.833	9.4	9.4	9.4	64.
BOREIN	1 S	0.4	1.0	23.14	32.12	27.33	42.17	0.762	0.1	0.4	0.4	65.
BOREIN	1 L	3.0	7.9	22.43	57.46	37.74	68.75	0.836	3.0	3.0	3.0	65.
MELT	1 L	3.2	8.4	22.49	55.19	36.30	66.06	0.835	3.2	3.2	3.2	62.
REFINE	1 L	10.0	26.3	22.24	59.63	38.65	71.06	0.839	10.0	10.0	10.0	65.
		38.1		21.60	7.43	176.08	176.24	0.042	35.5	35.7	35.8	53.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120190 Date: 11-06-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 8818
Tap Time: 12:47 Prev Heat Tapped: 11:58 Time Tap to Tap: 0 hr. 51 m

CHARGE	TIME	WEIGHT
1	12:02	140.0
2	12:24	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	4.71
KWH/TON:	33.7

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120190 has incorrect number of characters

OSM #3 FURNACE HEAT LOG

HEAT SUMMARY

Heat Number: 120191 Grade: A514-B Grade No: 8818

Crew No : 1 Heat Tap Date: 11/06/2002 Charge Time: 1250
Tap Time: 1341

Heats on Delta: 940 Last Heat Tapped: 1247

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 120
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 38.3
Charge to Tap Time	51	Avg. MW	: 61.1
Tap to Tap Time	54	KWH/Ton	: 273.6
Total Delay Time	: 16.4	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 137,800

2nd - 60,700

Oregon Steel Mills, Portland Oregon
* * * * * * H E A T L O G * * * * * *

Heat No. 120191 BOH 11/06 at 12:47 Product Code 8818
Melter 1 1st Helper 1 Ladle Temp 0 4 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
12:50	3.03	0.00	3.03	0	0.00			0.00	0.00	Inspect_Fce
12:50	3.25	0.00	0.22	0	0.00			0.00	0.00	CHG_1__140.
12:50	3.58	0.33	0.00	9	45.47	0.774	I S M	0.25	64.47	Lime-#-
12:51	4.17	0.58	0.00	22	60.97	0.804	1 S M	0.85	72.46	Bore_In____
12:53	6.48	2.32	0.00	50	56.16	0.826	1 L M	3.01	65.04	Bore_In____
12:56	9.50	3.02	0.00	66	59.92	0.836	1 L M	6.03	66.02	Melt_____
13:01	14.51	5.02	0.00	78	58.58	0.839	1 L M	10.92	63.77	Refine_____
13:05	18.01	3.50	0.00	82	62.67	0.860	1 L M	14.58	63.32	_____
13:09	22.50	0.00	4.48	66	0.00			14.58	0.00	CHG_2__140.
13:11	24.03	0.00	1.53	61	0.00			14.58	0.00	_____
13:11	24.66	0.63	0.00	62	53.23	0.774	1 S M	15.14	71.06	_____
13:16	29.65	4.98	0.00	69	59.41	0.838	1 L M	20.07	64.93	_____
13:21	34.58	4.93	0.00	73	61.70	0.856	1 L M	25.14	64.09	_____
13:26	39.59	5.02	0.00	77	66.32	0.813	1 S M	30.69	73.28	_____
13:31	44.53	4.93	0.00	79	66.17	0.816	1 S M	36.13	72.65	_____
13:32	44.96	0.43	0.00	79	63.80	0.817	1 S M	36.59	70.97	_____
13:35	48.38	0.00	3.42	74	0.00			36.59	0.00	_____
13:37	49.88	1.50	0.00	75	58.02	0.861	1 L M	38.04	59.97	_____
13:38	51.29	0.00	1.42	73	0.00			38.04	0.00	_____
13:38	51.73	0.43	0.00	73	41.37	0.875	1 L M	38.34	46.16	_____
13:41	54.02	0.00	2.30	70	0.00			38.34	0.00	Tap_T_____

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 120

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120191 Time: 13:41

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	11.0	29.3	21.42	65.40	46.88	80.47	0.813	11.0	10.9	11.0	73.
UNDEF	1 L	11.8	31.5	22.32	59.53	36.98	70.08	0.849	11.8	11.8	11.8	63.
BOREIN	1 S	0.9	2.4	22.22	55.34	42.22	69.60	0.795	0.9	0.9	0.9	72.
BOREIN	1 L	2.3	6.2	22.42	56.16	38.30	67.98	0.826	2.3	2.3	2.3	65.
MELT	1 L	3.0	8.0	22.41	59.92	39.26	71.64	0.836	3.0	3.0	3.0	65.
REFINE	1 L	8.5	22.6	22.37	60.26	37.64	71.05	0.848	8.5	8.5	8.5	63.
		37.6		22.08	61.13	40.42	73.29	0.834	37.6	37.4	37.6	67.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120191 Date: 11-06-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 8818
Tap Time: 13:41 Prev Heat Tapped: 12:47 Time Tap to Tap: 0 hr. 54 m

CHARGE	TIME	WEIGHT
1	12:50	140.0
2	13:09	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLETEMP:	0
MWH USED:	38.34
KWH/TON:	273.8

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120191 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 120192 Grade: A514-B Grade No: 8818

Crew No : 1 Heat Tap Date: 11/06/2002 Charge Time: 1345
Tap Time: 1432

Heats on Delta: 941 Last Heat Tapped: 1341

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 122
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 34.6
Charge to Tap Time	: 47	Avg. MW	: 58.1
Tap to Tap Time	: 51	KWH/Ton	: 247.1
Total Delay Time	: 16.3	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 138,400

2nd - 56,200

Oregon Steel Mills, Portland Oregon

* * * * * * HEAT LOG * * * * * *

Heat No. 120192 BOH 11/06 at 13:41 Product Code 8818

Melter 1 1st Helper 1 Ladle Temp 0 5 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
13:45	3.88	0.00	3.88	0	0.00			0.00	0.00	Inspect-Fce
13:45	4.05	0.00	0.17	0	0.00			0.00	0.00	CHG_1__140.
13:45	4.72	0.67	0.00	14	50.45	0.779	1 S M	0.56	67.45	Bore_In____
13:45	4.82	0.10	0.00	16	59.04	0.788	1 L M	0.66	72.29	_____
13:46	4.97	0.15	0.00	18	54.24	0.826	1 L M	0.79	63.48	Lime_#_____
13:48	7.46	2.50	0.00	46	54.51	0.825	1 L M	3.06	63.76	Bore_In____
13:48	7.75	0.28	0.00	48	49.30	0.836	1 L M	3.30	58.96	Melt_____
13:52	11.28	0.00	3.53	33	0.00			3.30	0.00	_____
13:55	14.58	3.30	0.00	48	50.04	0.806	1 L M	6.05	61.55	Melt_____
14:00	19.59	5.02	0.00	61	55.85	0.824	1 L M	10.72	64.51	Refine_____
14:05	24.54	4.95	0.00	69	54.93	0.828	1 L M	15.25	63.55	_____
14:06	25.11	0.57	0.00	70	60.99	0.863	1 L M	15.82	62.05	_____
14:08	27.51	0.00	2.40	64	0.00			15.82	0.00	CHG_2__140.
14:09	28.46	0.95	0.00	65	54.65	0.791	1 S M	16.69	69.55	_____
14:14	33.48	5.02	0.00	70	58.98	0.839	1 L M	21.62	64.43	_____
14:19	38.41	4.93	0.00	74	60.73	0.844	1 L M	26.61	64.55	_____
14:19	38.77	0.37	0.00	74	60.68	0.848	1 L M	26.98	62.55	_____
14:24	43.71	4.93	0.00	77	66.50	0.809	1 S M	32.45	73.39	_____
14:26	45.66	1.95	0.00	78	66.29	0.827	1 S M	34.60	71.86	_____
14:26	45.71	0.05	0.00	78	20.16	0.881	1 L M	34.62	29.37	_____
14:32	52.06	0.00	6.35	69	0.00			34.62	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 122

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **

Heat No.: 120192 Time: 14:32

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	7.8	21.9	21.55	65.01	46.80	80.10	0.812	7.8	7.7	7.8	73.2
UNDEF	1 L	10.4	29.0	22.18	59.69	38.30	70.92	0.842	10.4	10.4	10.4	63.5
BOREIN	1 S	0.7	1.9	22.17	50.45	40.56	64.73	0.779	0.7	0.5	0.7	71.4
BOREIN	1 L	2.7	7.7	22.42	54.66	37.63	66.36	0.824	2.7	2.7	2.7	64.3
MELT	1 L	3.6	10.0	22.52	49.98	36.46	61.86	0.808	3.6	3.6	3.6	61.3
REFINE	1 L	10.5	29.5	22.26	55.69	37.69	67.25	0.828	10.5	10.5	10.5	63.7
		35.7		22.12	58.14	39.79	70.45	0.825	35.7	35.5	35.7	66.1

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120192 Date: 11-06-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 8818
Tap Time: 14:32 Prev Heat Tapped: 13:41 Time Tap to Tap: 0 hr. 52 m

CHARGE	TIME	WEIGHT
1	13:45	140.0
2	14:08	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLETEMP:	0
MWH USED:	34.62
KWH/TON:	247.3

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120192 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 120193 Grade: A514-B Grade No: 8818

Crew No : 1 Heat Tap Date: 11/06/2002 Charge Time: 1435
Tap Time: 1523

Heats on Delta: 942 Last Heat Tapped: 1432

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 112
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 36.0
Charge to Tap Time	: 48	Avg. MW	: 60.0
Tap to Tap Time	51	KWH/Ton	: 257.1
Total Delay Time	: 14.7	Avg. Pwr. Factor	: 0.82

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 139,100

2nd - 55,500

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 120193 BOH 11/06 at 14:32 Product Code 8818
Melter 1 1st Helper 1 Ladle Temp 0 6 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
14:35	2.32	0.00	2.32	0	0.00			0.00	0.00	Lime-#-
14:35	2.52	0.00	0.20	0	0.00			0.00	0.00	
14:35	2.78	0.00	0.27	0	0.00			0.00	0.00	CHG_1__140.
14:36	3.38	0.60	0.00	18	51.06	0.782	I S M	0.51	68.59	Bore_In
14:38	6.10	2.72	0.00	54	56.47	0.826	1 L M	3.07	64.82	Bore_In
14:41	9.22	3.12	0.00	70	57.27	0.820	1 L M	6.04	64.01	Melt
14:42	9.35	0.13	0.00	70	39.69	0.801	1 L M	6.13	50.62	Refine
14:47	14.51	0.00	5.17	45	0.00			6.13	0.00	
14:52	19.48	4.97	0.00	59	56.23	0.834	1 L M	10.78	62.11	
14:55	22.91	3.43	0.00	65	60.09	0.846	1 L M	14.22	63.54	
14:58	25.58	0.00	2.67	58	0.00			14.22	0.00	CHG_2__140.
14:58	25.68	0.00	0.10	58	0.00			14.22	0.00	
14:59	27.33	1.65	0.00	61	57.23	0.781	1 S M	15.79	71.75	
15:04	32.34	5.01	0.00	67	59.47	0.827	1 L M	20.76	65.82	
15:07	35.27	2.93	0.00	70	60.90	0.854	1 L M	23.74	62.52	
15:10	38.32	3.05	0.00	72	65.96	0.805	1 S M	27.09	72.93	
15:11	39.49	1.17	0.00	73	61.25	0.857	1 L M	28.28	61.86	
15:12	40.22	0.73	0.00	73	65.39	0.809	1 S M	29.08	71.87	
15:13	41.12	0.90	0.00	74	62.42	0.850	1 L M	30.02	63.14	
15:18	46.14	5.02	0.00	77	64.63	0.798	1 S M	35.42	72.69	
15:19	46.70	0.57	0.00	77	64.18	0.807	1 S M	36.03	71.41	
15:19	46.77	0.07	0.00	77	45.90	0.826	1 L M	36.08	57.23	
15:23	50.79	0.00	4.02	71	0.00			36.08	0.00	Tap_T

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 112

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120193 Time: 15:23

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	11.0	30.5	21.53	63.92	48.12	80.01	0.799	11.0	11.0	11.0	72.
UNDEF	1 L	10.1	28.0	22.15	60.27	38.79	71.67	0.841	10.1	10.1	10.1	63.
BOREIN	1 S	0.6	1.7	21.98	51.06	40.68	65.28	0.782	0.6	0.4	0.6	72.
BOREIN	1 L	2.7	7.5	22.37	56.47	38.57	68.38	0.826	2.7	2.7	2.7	65.
MELT	1 L	3.1	8.6	22.23	57.27	39.91	69.80	0.820	3.1	3.1	3.1	63.
REFINE	1 L	8.5	23.7	22.04	57.52	37.32	68.57	0.839	8.5	8.5	8.5	61.
		36.1		21.96	60.04	41.40	72.93	0.823	36.1	35.9	36.0	65.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120193 Date: 11-06-02 , Shift: 3
Melter: 1 First Helper: , 1 Product Code: 8818
Tap Time: 15:23 Prev Heat Tapped: 14:32 Time Tap to Tap: 0 hr. 51 m

CHARGE	TIME	WEIGHT
1	14:35	140.0
2	14:58	140.0
3	none	none
4	none	none
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLETEMP:	0
MWH USED:	36.08
KWH/TON:	257.7

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120193 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

HEAT SUMMARY

Heat Number: 120194 Grade: A514-B Grade No: 8818

Crew No : 1 Heat Tap Date: 11/06/2002 Charge Time: 1525
Tap Time: 1604

Heats on Delta: 943 Last Heat Tapped: 1523

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 117
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 35.9
Charge to Tap Time	: 39	Avg. MW	: 61.3
Tap to Tap Time	: 41	KWH/Ton	: 256.4
Total Delay Time	: 6.8	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 139,400

2nd - 55,500

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Meat No. 120194 BOH 11/06 at 15:23 Product Code 8818
Melter 1 1st Helper 1 Ladle Temp 0 7 heats on lance 8

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
15:24	1.40	0.00	1.40	0	0.00			0.00	0.00	Lime_#_
15:25	2.72	0.00	1.32	0	0.00			0.00	0.00	
15:25	2.85	0.00	0.13	0	0.00			0.00	0.00	CHG_1__140.
15:26	3.38	0.53	0.00	16	54.91	0.778	I S M	0.49	71.10	Bore_In_____
15:28	6.08	2.70	0.00	53	56.72	0.819	1 L M	3.04	65.32	Bore In_____
15:32	9.18	3.10	0.00	69	57.74	0.820	1 L M	6.02	65.63	Melt-_____
15:37	14.20	5.02	0.00	80	59.72	0.839	1 L M	11.01	63.67	Refine_____
15:40	17.59	3.40	0.00	84	61.12	0.857	1 L M	14.48	62.46	
15:42	19.83	0.00	2.23	74	0.00			14.48	0.00	CHG_2__140.
15:43	20.64	0.82	0.00	75	59.93	0.784	1 S M	15.29	73.70	
15:48	25.59	4.95	0.00	80	59.51	0.841	1 L M	20.20	63.72	
15:51	29.11	3.52	0.00	83	58.68	0.845	1 L M	23.64	62.99	
15:56	34.04	4.93	0.00	85	65.46	0.804	1 S M	29.02	72.70	
16:01	38.97	4.93	0.00	87	67.82	0.820	1 S M	34.59	73.28	
16:02	40.22	1.25	0.00	87	65.64	0.812	1 S M	35.96	72.54	
16:03	40.27	0.05	0.00	87	31.68	0.835	1 L M	35.99	46.31	
16:04	42.02	0.00	1.75	84	0.00			35.99	0.00	Tap_T_____

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 117

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120194 Time: 16:04

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floor
UNDEF	1 S	11.9	33.9	21.53	66.08	47.81	81.56	0.810	11.9	11.9	11.9	72.7
UNDEF	1 L	8.5	24.2	22.27	59.00	37.69	70.01	0.843	8.5	8.5	8.5	63.2
BOREIN	1 S	0.5	1.5	21.84	54.91	44.38	70.60	0.778	0.5	0.5	0.5	73.4
BOREIN	1 L	2.7	7.7	22.34	56.72	39.77	69.27	0.819	2.7	2.7	2.7	65.2
MELT	1 L	3.1	8.8	22.17	57.74	40.36	70.45	0.820	3.1	3.1	3.1	65.1
REFINE	1 L	8.4	23.9	22.16	60.29	37.93	71.23	0.846	8.4	8.4	8.4	63.1
		35.2		21.99	61.36	41.68	74.17	0.827	35.2	35.2	35.1	67.1

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120194 Date: 11-06-02 Shift: 3
Melter: 1 First Helper: 1 Product Code: 8818
Tap Time: 16:04 Prev Heat Tapped: 15:23 Time Tap to Tap: 0hr. 42m

CHARGE	TIME	WEIGHT
1	15:25	140.0
2	15:42	140.0
3	none	none
4	none	none
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP: 0
LADLE TEMP: 0
MWH USED: 35.99
KWH/TON: 257.1

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120194 has incorrect number of characters

OSM #3 FURNACE HEAT LOG

12-23-02

HEAT SUMMARY

Heat Number: 120631 Grade: ABS CFQ Grade No: 4317

Crew No : 1 Heat Tap Date: 12/05/2002 Charge Time: 1044
Tap Time: 1149

Heats on Delta: 87 Last Heat Tapped: 1040

Total Charge Wt	: 288.0	Furnace Lime Lbs	: 5
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 148
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 37.0
Charge to Tap Time	65	Avg. MW	: 59.8
Tap to Tap Time	: 69	KWH/Ton	: 256.9
Total Delay Time	: 31.9	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 136,800
2nd - 40,900

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 120631 BOH 12/05 at 10:40 Product Code 4317
Melter 1 1st Helper 1 Ladle Temp 0 103 heats on lance la

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
10:42	1.78	0.00	1.78	0	0.00			0.00	0.00	Lime_#_
10:44	3.75	0.00	1.97	0	0.00			0.00	0.00	
10:44	4.02	0.00	0.27	0	0.00			0.00	0.00	CHG_1__140.
10:44	4.52	0.50	0.00	11	58.48	0.771	1 S M	0.49	73.94	Bore_In____
10:45	5.48	0.97	0.00	27	53.19	0.809	1 L M	1.34	63.34	Bore_In____
11:06	26.25	0.00	20.77	6	0.00			1.34	0.00	
11:08	28.30	2.05	0.00	12	48.97	0.787	1 L M	3.02	62.47	Bore_In____
11:11	31.52	3.22	0.00	21	55.81	0.820	1 L M	6.01	64.36	Melt_____
11:16	35.47	4.95	0.00	32	57.10	0.823	1 L M	10.72	64.60	Refine_____
11:20	39.75	3.28	0.00	38	61.33	0.863	1 L M	14.08	61.91	
11:21	41.42	0.00	1.67	36	0.00			14.08	0.00	CHG_2__140.
11:22	42.15	0.73	0.00	37	59.30	0.792	1 S M	14.80	72.07	
11:27	47.17	5.02	0.00	44	59.66	0.839	1 L M	19.79	64.14	
11:32	52.10	4.93	0.00	49	63.20	0.865	1 L M	24.98	62.55	
11:32	52'35	0.25	0.00	49	60.54	0.871	1 L M	25.24	60.11	
11:35	54.77	0.00	2.42	47	0.00			25.24	0.00	CHG_3__ 8.
11:35	55.10	0.33	0.00	48	42.88	0.882	1 L M	25.48	49.04	
11:40	60.12	5.02	0.00	52	66.78	0.831	1 S M	31.06	72.35	
11:44	64.25	4.13	0.00	55	64.91	0.810	1 S M	35.53	72.14	
11:44	64.28	0.03	0.00	55	8.64	0.848	1 L M	35.53	13.50	
11:44	64.48	0.00	0.20	55	0.00			35.53	0.00	
11:46	66.18	1.70	0.00	56	53.15	0.713	2 L M	37.04	73.09	
11:49	69.05	0.00	2.87	54	0.00			37.04	0.00	Tap_T_____

total lime weight 4.7
total coke weight 0.0
total oxygen 0
total gas 148

cold charge weight 288.0
hot charge weight 0.0
total charge weight 288.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120631 Time: 11:49

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	9.9	26.6	21.30	65.44	45.74	79.84	0.820	9.9	9.9	9.9	72.6
UNDEF	1 L	10.6	28.5	22.17	60.64	37.03	71.05	0.853	10.5	10.6	10.6	62.4
UNDEF	2 L	1.7	4.6	21.10	53.15	52.26	74.54	0.713	1.7	1.7	1.7	72.
BOREIN	1 S	0.5	1.3	21.58	58.48	48.33	75.87	0.771	0.5	0.5	0.5	73.8
BOREIN	1 L	3.0	8.1	22.07	50.32	38.41	63.31	0.795	3.0	3.0	3.0	62.9
MELT	1 L	3.2	8.7	22.01	55.81	38.93	68.04	0.820	3.2	3.2	3.2	64.2
REFINE	1 L	8.2	22.2	21.96	58.79	37.97	69.99	0.840	8.2	8.2	8.2	63.5
		37.1		21.82	59.88	40.69	72.39	0.827	37.1	37.1	37.1	66.3

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120631 Date: 12-05-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 4317
Tap Time: 11:49 Prev Heat Tapped: 10:40 Time Tap to Tap: 1 hr. 9 m

CHARGE	TIME	WEIGHT
1	10:44	140.0
2	11:21	140.0
3	11:35	8.0
4	none	none
******		******
TOTAL(klbs)		288.0
TOTAL(tons)		144.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	37.04
KWH/TON:	257.2

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120631 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

12-23-02

HEAT SUMMARY

Heat Number: 120632 Grade: ABS CFQ Grade No: 4317

Crew No : 1 Heat Tap Date: 12/05/2002 Charge Time: 1152
Tap Time: 1236

Heats on Delta: 88 Last Heat Tapped: 1149

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 138
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 37.2
Charge to Tap Time	44	Avg. MW	: 61.8
Tap to Tap Time	47	KWH/Ton	: 265.7
Total Delay Time	: 11.1	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 141,200
2nd - 30,500

Oregon Steel Mills, Portland Oregon

* * * * * * HEAT LOG * * * * * *

Heat No. 120632 BOH 12/05 at 11:49 Product Code 4317

Melter 1 1st Helper 1 Ladle Temp 0 104 heats on lance la

CLOCK TIME	TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
11:52	3.62	0.00	3.62	0	0.00			0.00	0.00	Inspect_Fce
11:52	3.87	0.00	0.25	0	0.00			0.00	0.00	CHG_1__140.
11:53	4.72	0.85	0.00	18	52.04	0.780	1 S M	0.74	68.92	Bore_In____
11:54	5.80	1.08	0.00	33	60.11	0.827	1 L M	1.82	66.57	Bore-In____
11:56	7.62	0.00	1.82	25	0.00			1.82	0.00	_____
11:58	8.98	1.37	0.00	37	55.86	0.811	1 L M	3.09	64.10	Bore-In____
12:01	12.18	3.20	0.00	53	55.57	0.810	1 L M	6.06	64.29	Melt_____
12:06	17.13	4.95	0.00	67	59.06	0.827	1 L M	10.93	64.90	Refine_____
12:09	20.65	3.52	0.00	72	59.19	0.834	1 L M	14.40	64.13	_____
12:11	22.90	0.00	2.25	65	0.00			14.40	0.00	CHG_2__140.
12:12	23.48	0.58	0.00	66	53.51	0.787	1 S M	14.92	69.12	_____
12:17	28.42	4.93	0.00	72	62.17	0.846	1 L M	20.03	64.52	_____
12:19	30.45	2.03	0.00	74	64.21	0.862	1 L M	22.21	63.20	_____
12:19	30.50	0.05	0.00	74	67.68	0.859	1 S M	22.27	67.81	_____
12:20	31.77	1.27	0.00	75	63.94	0.861	1 L M	23.62	63.59	_____
12:25	36.70	4.93	0.00	78	68.48	0.826	1 S M	29.25	73.49	_____
12:30	41.65	4.95	0.00	81	67.79	0.821	1 S M	34.84	73.11	_____
12:31	42.99	1.33	0.00	82	65.44	0.807	1 S M	36.29	72.30	_____
12:31	43.02	0.03	0.00	82	12.90	0.864	1 L M	36.30	20.58	_____
12:32	43.25	0.00	0.23	81	0.00			36.30	0.00	_____
12:33	44.30	1.05	0.00	82	53.01	0.706	2 L M	37.23	73.37	_____
12:36	47.24	0.00	2.93	77	0.00			37.23	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 138

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **

Heat No.: 120632 Time: 12:36

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	11.9	32.8	21.63	67.11	46.83	81.83	0.820	11.8	11.9	11.9	72.
UNDEF	1 L	8.3	22.9	22.35	62.74	38.44	73.58	0.853	8.3	8.3	8.3	63.
UNDEF	2 L	1.0	2.9	21.44	53.01	53.11	75.03	0.706	1.0	1.0	1.0	72.
BOREIN	1 S	0.8	2.4	22.01	52.04	41.78	66.74	0.780	0.7	0.8	0.8	69.
BOREIN	1 L	2.5	6.8	22.22	57.74	40.52	70.54	0.819	2.5	2.5	2.4	65.
MELT	1 L	3.2	8.9	22.15	55.57	40.29	68.64	0.810	3.2	3.2	3.2	63.
REFINE	1 L	8.5	23.4	22.19	59.11	39.76	71.24	0.830	8.5	8.5	8.5	64.
		36.1		22.02	61.81	42.31	74.91	0.825	35.9	36.1	36.1	67.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120632 Date: 12-05-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 4317
Tap Time: 12:36 Prev Heat Tapped: 11:49 Time Tap to Tap: 0 hr. 47 m

CHARGE	TIME	WEIGHT
1	11:52	140.0
2	12:11	140.0
3	none	none
4	none	none
******		******
TOTAL (klbs)		280.0
TOTAL (tons)		140.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	37.23
KWH/TON:	265.9

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120632 has incorrect number of characters

OSM #3 FURNACE HEAT LOG

12-23-02 HEAT SUMMARY

Heat Number: 120633 Grade: ABS CFQ Grade No: 4317

Crew No : 1 Heat Tap Date: 12/05/2002 Charge Time: 1240
Tap Time: 1322
Heats on Delta: 89 Last Heat Tapped: 1236

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 117
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 36.8
Charge to Tap Time	42	Avg. MW	: 61.4
Tap to Tap Time	46	KWH/Ton	: 262.9
Total Delay Time	: 10.5	Avg. Pwr. Factor	: 0.82

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 139,200
2nd - 34,300

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 120633 BOH 12/05 at 12:36 Product Code 4317
Melter 1 1st Helper 1 Ladle Temp 0 105 heats on lance la

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELA DESCRIPTIO
12:40	4.52	0.00	4.52	0	0.00			0.00	0.00	Inspect_Fc
12:40	4.72	0.00	0.20	0	0.00			0.00	0.00	CHG_1__140.
12:41	5.13	0.42	0.00	8	52.53	0.781	1 S M	0.36	68.55	Bore_In____
12:43	7.95	2.82	0.00	41	57.82	0.816	1 L M	3.08	65.44	Bore_In____
12:46	10.95	3.00	0.00	57	58.57	0.824	1 L M	6.01	64.84	Melt_____
12:51	15.97	5.02	0.00	70	60.42	0.839	1 L M	11.06	65.43	Refine____
12:53	17.98	2.02	0.00	74	62.28	0.850	1 L M	13.15	63.20	_____
12:57	21.12	0.00	3.13	63	0.00			13.15	0.00	CHG_2__140.
12:57	21.98	0.87	0.00	64	62.46	0.787	1 S M	14.06	74.94	_____
13:02	27.00	5.02	0.00	71	60.47	0.843	1 L M	19.11	64.04	_____
13:06	30.87	3.87	0.00	75	62.00	0.847	1 L M	23.11	64.22	_____
13:11	35.78	4.92	0.00	78	69.19	0.828	1 S M	28.78	73.69	_____
13:14	39.08	3.30	0.00	80	67.63	0.826	1 S M	32.50	72.80	_____
13:14	39.18	0.10	0.00	80	55.08	0.812	1 L M	32.59	64.28	_____
13:15	39.42	0.00	0.23	79	0.00			32.59	0.00	_____
13:19	44.08	4.67	0.00	82	55.14	0.712	2 L M	36.88	74.67	_____
13:22	46.48	0.00	2.40	77	0.00			36.88	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 117

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120633 Time: 13:22

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	9.1	25.2	21.59	67.98	46.85	82.56	0.823	9.1	9.1	9.1	73.
UNDEF	1 L	9.0	25.0	22.33	61.07	38.73	72.31	0.845	9.0	9.0	9.0	63.
UNDEF	2 L	4.7	13.0	21.14	55.14	54.36	77.43	0.712	4.7	4.7	4.7	74.
BOREIN	1 S	0.4	1.2	22.16	52.53	41.99	67.25	0.781	0.4	0.4	0.4	69.
BOREIN	1 L	2.8	7.8	22.41	57.82	40.90	70.82	0.816	2.8	2.8	2.8	65.
MELT	1 L	3.0	8.3	22.43	58.57	40.25	71.06	0.824	3.0	3.0	3.0	64.
REFINE	1 L	7.0	19.5	22.39	60.95	39.03	72.38	0.842	7.0	7.0	7.0	64.
		36.0		22.02	61.46	43.20	75.12	0.818	36.0	36.0	36.0	68.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120633 Date: 12-05-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 4317
Tap Time: 13:22 Prev Heat Tapped: 12:36 Time Tap to Tap: 0 hr. 46 m

CHARGE	TIME	WEIGHT
1	12:40	140.0
2	12:57	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	36.88
KWH/TON:	263.4

HEATS ON LIN

DELTALIFE

CHG WT(klbs)

Chemistry File Heat Number 120633 has incorrect number of characters

OSM #3 FURNACE HEAT LOG

12-23-02

HEAT SUMMARY

Heat Number: 120634 Grade: ABS CFQ Grade No: 4317

Crew No : 1 Heat Tap Date: 12/05/2002 Charge Time: 1325
Tap Time: 1404
Heats on Delta: 90 Last Heat Tapped: 1322

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 112
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 34.2
Charge to Tap Time	39	Avg. MW	: 62.7
Tap to Tap Time	: 42	KWH/Ton	: 244.3
Total Delay Time	: 10.1	Avg. Pwr. Factor	: 0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 135,900
2nd - 40,200

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 120634 BOH 12/05 at 13:22 Product Code 4317
Melter 1 1st Helper 1 Ladle Temp 0 106 heats on lance la

CLOCK TIME	TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
13:25	2.93	0.00	2.93	0	0.00			0.00	0.00	Inspect_Fce
13:25	3.13	0.00	0.20	0	0.00			0.00	0.00	CHG_1__140.
13:25	3.63	0.50	0.00	14	54.65	0.779	I S M	0.46	70.90	Bore_In____
13:28	6.35	2.72	0.00	51	57.20	0.825	1 L M	3.05	64.60	Bore_In____
13:31	9.37	3.02	0.00	67	58.80	0.827	1 L M	6.00	64.81	Melt_____
13:36	14.30	4.93	0.00	78	58.92	0.827	1 L M	10.85	64.98	Refine____
13:38	16.85	2.55	0.00	81	63.71	0.863	1 L M	13.55	62.67	_____
13:41	19.37	0.00	2.52	71	0.00			13.55	0.00	CHG_2__140.
13:41	19.70	0.33	0.00	71	62.53	0.816	1 S M	13.90	73.21	_____
13:46	24.63	4.93	0.00	77	61.36	0.844	1 L M	18.95	64.66	_____
13:49	27.78	3.15	0.00	80	64.08	0.862	1 L M	22.31	63.08	_____
13:49	27.85	0.07	0.00	80	64.26	0.865	1 L M	22.38	62.70	_____
13:54	32.78	4.93	0.00	83	69.31	0.832	1 S M	28.08	73.62	_____
13:59	37.72	4.93	0.00	85	66.65	0.810	1 S M	33.56	73.06	_____
14:00	38.33	0.62	0.00	85	63.98	0.801	1 S M	34.22	71.82	_____
14:00	38.35	0.02	0.00	85	6.48	0.832	1 L M	34.22	11.88	_____
14:04	42.79	0.00	4.43	76	0.00			34.22	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 112

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120634 Time: 14:04

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	10.8	33.1	21.58	67.58	47.18	82.42	0.820	10.8	10.8	10.8	73.
UNDEF	1 L	8.2	25.0	22.39	62.32	38.43	73.21	0.851	8.2	8.2	8.2	64.
BOREIN	1 S	0.5	1.5	21.78	54.65	43.99	70.15	0.779	0.4	0.5	0.5	73.
BOREIN	1 L	2.7	8.3	22.20	57.20	39.11	69.29	0.825	2.7	2.7	2.7	64.
MELT	1 L	3.0	9.2	22.22	58.80	40.03	71.14	0.827	3.0	3.0	3.0	64.
REFINE	1 L	7.5	22.9	22.35	60.55	39.11	72.09	0.840	7.5	7.5	7.5	64.
		32.7		22.07	62.79	41.77	75.41	0.833	32.7	32.7	32.7	67.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120634 Date: 12-05-02 Shift: 2
Melter: 1 First Helper: 1 Product Code: 4317
Tap Time: 14:04 Prev Heat Tapped: 13:22 Time Tap to Tap: 0 hr. 43 m

CHARGE	TIME	WEIGHT
1	13:25	140.0
2	13:41	140.0
3	none	none
4	none	none
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLETEMP:	0
MWH USED:	34.22
KWH/TON:	244.4

* HEATS ON LIN
* DELTA LIFE
* CHG WT(klbs)

Chemistry File Heat Number 120634 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

12-23-02

HEAT SUMMARY

Heat Number: 120635 Grade: ABS CFQ Grade No: 4317

Crew No : 1 Heat Tap Date: 12/05/2002 Charge Time: 1414
Tap Time: 1500

Heats on Delta: 91 Last Heat Tapped: 1404

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen. Batch	0
Pour Back	: 0.0	Nat. Gas Batch .	: 146
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 38.3
Charge to Tap Time	46	Avg. MW	: 60.4
Tap to Tap Time	56	KWH/Ton	: 273.6
Total Delay Time	: 17.7	Avg. Pwr. Factor	: 0.82

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 135,700
2nd - 35,300

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 120635 BOH 12/05 at 14:04 Product Code 4317
Melter 1 1st Helper 1 Ladle Temp 0 107 heats on lance la

CLOCK TIME	TIME TOTAL	(MINUTES) ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG'. KA	EVENT/DELAY DESCRIPTION
14:14	9.58	0.00	9.58	0	0.00			0.00	0.00	Inspect-FCC
14:14	9.78	0.00	0.20	0	0.00			0.00	0.00	CHG_1 — 140.
14:14	9.88	0.10	0.00	1	33.12	0.775	1 S M	0.06	53.15	Bore_In____
14:17	13.08	3.20	0.00	25	55.82	0.821	1 L M	3.03	64.57	Bore_In____
14:19	14.82	1.73	0.00	34	55.97	0.818	1 L M	4.65	64.32	Melt_____
14:22	18.40	0.00	3.58	27	0.00			4.65	0.00	_____
14:23	18.52	0.12	0.00	28	10.18	0.676	1 L M	4.67	28.34	Melt_____
14:24	20.07	1.55	0.00	33	53.79	0.803	1 L M	6.06	64.10	Melt_____
14:29	25.00	4.93	0.00	47	58.43	0.831	1 L M	10.86	63.90	Refine____
14:32	27.92	2.92	0.00	52	62.59	0.859	1 L M	13.91	63.34	_____
14:33	28.68	0.77	0.00	53	67.38	0.818	1 S M	14.77	73.31	_____
14:33	28.92	0.23	0.00	54	60.17	0.850	1 L M	15.00	63.16	_____
14:35	30.95	0.00	2.03	50	0.00			15.00	0.00	CHG_2__140.
14:35	31.08	0.00	0.13	50	0.00			15.00	0.00	_____
14:36	31.72	0.63	0.00	51	53.29	0.792	1 S M	15.56	67.01	_____
14:41	36.72	5.00	0.00	58	60.37	0.843	1 L M	20.59	64.26	_____
14:44	40.12	3.40	0.00	61	64.59	0.872	1 L M	24.25	62.69	_____
14:49	45.05	4.93	0.00	66	69.39	0.837	1 S M	29.96	73.52	_____
14:52	47.87	2.82	0.00	68	67.09	0.820	1 L M	33.11	72.89	_____
14:52	48.05	0.00	0.18	67	0.00			33.11	0.00	_____
14:57	53.02	4.97	0.00	70	55.20	0.716	2 L M	37.68	74.36	_____
14:57	53.72	0.70	0.00	71	54.36	0.715	2 L M	38.31	73.82	_____
15:00	55.73	0.00	2.02	68	0.00			38.31	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 146

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120635 Time: 15:00

Mode	Tap/ Arc	Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	5.6	14.6	21.70	67.56	44.92	81.13	0.833	5.6	5.6	5.6	73.
UNDEF	1 L	11.2	29.5	22.05	63.34	39.95	74.88	0.846	11.2	11.2	11.2	66.
UNDEF	2 L	5.7	14.9	21.14	55.09	53.77	76.99	0.716	5.7	5.7	5.7	74.
BOREIN	1 S	0.1	0.3	22.85	33.12	27.00	42.73	0.775	0.1	0.1	0.1	61.
BOREIN	1 L	3.2	8.4	22.15	55.82	38.85	68.01	0.821	3.2	3.2	3.2	64.
MELT	1 L	3.4	8.9	22.37	53.40	38.63	65.91	0.810	3.4	3.4	3.4	63.
REFINE	1 S	0.8	2.0	21.46	67.38	47.43	82.40	0.818	0.8	0.8	0.8	74.
REFINE	1 L	8.1	21.3	22.17	59.98	38.37	71.21	0.842	8.1	8.1	8.1	63.
		38.0		21.92	60.49	42.31	73.82	0.819	38.0	38.0	38.0	68.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120635 Date: 12-0%-02 Shift: 3
Melter: 1 First Helper: 1 Product Code: 4317
Tap Time: 15:00 Prev Heat Tapped: 14:04 Time Tap to Tap: 0 hr. 56 m

CHARGE	TIME	WEIGHT
1	14:14	140.0
2	14:35	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	38.31
KWH/TON:	273.7

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120635 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

12-23-02

HEAT SUMMARY

Heat Number: 120636 Grade: ABS CFQ Grade No: 4317

Crew No : 1 Heat Tap Date:.12/05/2002 Charge Time: 1503
Tap Time: 1544

Heats on Delta: 92 Last Heat Tapped: 1500

Total Charge Wt	: 280.0	Furnace Lime Lbs	: 0
Hot Metal Wt	: 0.0	Oxygen Batch	0
Pour Back	: 0.0	Nat. Gas Batch	: 115
		Tap Temp	0
Melt Efficiency Rating	: 0.00	Total MWH	: 78.2
Charge to Tap Time	: 41	Avg. MW	: 139.5
Tap to Tap Time	: 44	KWH/Ton	: 558.6
Total Delay Time	: 10.5	Avg. Pwr. Factor	: 1.00

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 136,100
2nd - 35,100

Oregon Steel Mills, Portland Oregon
* * * * * * H E A T L O G * * * * * *

Heat No. 120636 BOH 12/05 at 15:00 Product Code 4317
Melter 1 1st Helper 1 Ladle Temp 0 108 heats on lance la

CLOCK TIME	---TIME (MINUTES)-- TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
15:02	2.91	0.00	2.91	0	0.00			0.00	0.00	Inspect_Fce
15:03	2.98	0.00	0.07	0	0.00			0.00	0.00	CHG_1__140.
15:04	4.04	1.07	0.00	26	57.81	0.784	1 S M	1.03	72.71	Bore_In____
15:06	6.14	2.10	0.00	52	56.43	0.825	1 L M	3.00	65.01	Bore_In____
15:09	9.24	3.10	0.00	68	59.55	0.838	1 L M	6.08	65.27	Melt_____
15:14	14.17	4.93	0.00	79	60.75	0.844	1 L M	11.07	64.29	Refine_____
15:17	17.61	3.43	0.00	83	59.59	0.854	1 L M	14.48	61.79	_____
15:19	19.82	0.00	2.22	74	0.00			14.48	0.00	CHG_2__140.
15:19	19.89	0.07	0.00	74	21.06	0.689	1 S M	14.51	45.69	_____
15:20	20.31	0.42	0.00	74	57.07	0.795	1 S M	14.90	70.45	_____
15:25	25.24	4.93	0.00	79	61.91	0.847	1 L M	19.99	63.94	_____
15:28	28.97	3.73	0.00	82	62.29	0.857	1 L M	23.87	62.51	_____
15:33	33.90	4.93	0.00	85	66.66	0.816	1 S M	29.35	72.66	_____
15:38	38.78	4.87	0.00	87	601.33	1.000	1 S M	78.20	120.15	_____
15:38	38.86	0.08	0.00	87	60.05	0.842	1 L M	78.29	64.49	_____
15:44	44.20	0.00	5.33	76	0.00			78.29	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 115

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120636 Time: 15:44

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	10.3	30.6	21.12	319.26	0.00	319.26	1.000	10.2	10.2	10.2	73.
UNDEF	1 L	8.7	26.0	22.25	62.06	38.23	72.89	0.851	8.7	8.7	8.7	63.
BOREIN	1 S	1.1	3.2	21.67	57.81	45.75	73.72	0.784	1.1	1.1	1.1	74.
BOREIN	1 L	2.1	6.2	22.20	56.43	38.68	68.41	0.825	2.1	2.1	2.1	65.
MELT	1 L	3.1	9.2	22.18	59.55	38.73	71.04	0.838	3.1	3.1	3.1	65.
REFINE	1 L	8.4	24.8	22.02	60.27	37.69	71.09	0.848	8.4	8.4	8.4	63.
		33.7		21.82	139.50	0.00	139.50	1.000	33.6	33.6	33.6	67.

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120636 Date: 12-05-02 Shift: 3
Melter: 1 First Helper: 1 Product Code: 4317
Tap Time: 15:44 Prev Heat Tapped: 15:00 Time Tap to Tap: 0 hr. 44 m

CHARGE	TIME	WEIGHT
1	15:03	140.0
2	15:19	140.0
3	none	none
4	none	none
******		******
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	78.29
KWH/TON:	559.2

HEATS ON LIN

DELTA LIFE

CHG WT(klbs)

Chemistry File Heat Number 120636 has incorrect number of characters

O S M #3 F U R N A C E H E A T L O G

12-23-02

HEAT SUMMARY

Heat Number: 120637 Grade: ABS CFQ Grade No: 4317

Crew No : 1 Heat Tap Date: 12/05/2002 Charge Time: 1546
Tap Time: 1627

Heats on Delta: 93 Last Heat Tapped: 1544

Total Charge Wt	280.0	Furnace Lime Lbs	0
Hot Metal Wt	0.0	Oxygen Batch	0
Pour Back	0.0	Nat. Gas Batch	113
		Tap Temp	0
Melt Efficiency Rating	0.00	Total *MWH*	35.2
Charge to Tap Time	41	Avg. MW	61.5
Tap to Tap Time	43	KWH/Ton	251.4
Total Delay Time	9.5	Avg. Pwr. Factor	0.83

CHEMISTRY SUMMARY

LADLE ADDITIONS:

1st - 137,200
2nd - 40,100

Oregon Steel Mills, Portland Oregon
* * * * * * HEAT LOG * * * * * *

Heat No. 120637 BOH 12/05 at 15:44 Product Code 4317
Melter 1 1st Helper 1 Ladle Temp 0 109 heats on lance la

CLOCK TIME	TOTAL	ON	OFF	TU %	AVG. MW	AVG. P.F.	TAP/ ARC	ACC. MWHR	AVG. KA	EVENT/DELAY DESCRIPTION
15:46	2.72	0.00	2.72	0	0.00			0.00	0.00	Inspect_Fce
15:46	2.87	0.00	0.15	0	0.00			0.00	0.00	CHG_1__140.
15:47	3.62	0.75	0.00	21	55.96	0.779	1 S M	0.70	71.64	Bore_In____
15:50	6.13	2.52	0.00	53	55.49	0.819	1 L M	3.03	64.60	Bore_In____
15:53	9.25	3.12	0.00	69	58.86	0.829	1 L M	6.08	64.28	Melt_____
15:58	14.18	4.93	0.00	80	57.57	0.828	1 L M	10.81	64.13	Refine____
16:03	19.19	5.01	0.00	85	60.91	0.839	1 L M	15.90	64.18	_____
16:03	19.44	0.25	0.00	85	59.84	0.863	1 L M	16.15	59.94	_____
16:05	21.91	0.00	2.47	76	0.00			16.15	0.00	CHG_2__140.
16:07	23.16	1.25	0.00	77	58.36	0.797	1 S M	17.37	71.15	_____
16:11	28.17	5.02	0.00	81	61.33	0.848	1 L M	22.50	63.91	_____
16:15	31.81	3.63	0.00	83	62.73	0.860	1 L M	26.29	62.71	_____
16:20	36.74	4.93	0.00	85	68.61	0.824	1 S M	31.93	73.46	_____
16:23	39.29	2.55	0.00	86	68.69	0.827	1 S M	34.85	73.27	_____
16:23	39.34	0.05	0.00	86	49.68	0.849	1 L M	34.89	56.94	_____
16:23	39.95	0.00	0.62	85	0.00			34.89	0.00	_____
16:24	40.34	0.38	0.00	85	55.31	0.877	1 L M	35.25	56.39	_____
16:27	43.94	0.00	3.60	78	0.00			35.25	0.00	Tap_T_____

total lime weight 0.0
total coke weight 0.0
total oxygen 0
total gas 113

cold charge weight 280.0
hot charge weight 0.0
total charge weight 280.0

** HEAT ELECTRICAL SUMMARY **
Heat No.: 120637 Time: 16:27

Mode	Tap/ Arc	--Power On- Min.	Pct.	Avg. KV	Avg. MW	Avg. MVAR	Avg. MVA	Avg. P.F.	--Arc Time Min.-- Floor	Ctr.	Pit	Floo
UNDEF	1 S	8.7	25.4	21.65	67.17	46.60	81.75	0.822	8.7	8.7	8.7	73.9
UNDEF	1 L	9.1	26.4	22.20	61.58	37.50	72.09	0.854	9.1	9.1	9.1	63.2
BOREIN	1 S	0.7	2.2	21.55	55.96	45.01	71.81	0.779	0.7	0.7	0.7	73.t
BOREIN	1 L	2.5	7.3	22.14	55.49	38.83	67.73	0.819	2.5	2.5	2.5	65.2
MELT	1 L	3.1	9.1	22.03	58.86	39.71	71.00	0.829	3.1	3.1	3.1	63.1
REFINE	1 L	10.2	29.6	22.11	59.27	39.18	71.05	0.834	10.2	10.2	10.2	63.1
		34.4		22.00	61.50	40.77	73.78	0.833	34.4	34.3	34.4	66.9

Oregon Steel Mills, Portland Oregon

** CHEMISTRY REPORT **

Heat No.: 120637 Date: 12-05-02 Shift: 3
Melter: 1 First Helper: 1 Product Code: 4317
Tap Time: 16:27 Prev Heat Tapped: 15:44 Time Tap to Tap: 0 hr. 44 m

CHARGE	TIME	WEIGHT
1	15:46	140.0
2	16:05	140.0
3	none	none
4	none	none
TOTAL(klbs)		280.0
TOTAL(tons)		140.0

TAP TEMP:	0
LADLE TEMP:	0
MWH USED:	35.25
KWH/TON:	251.8

* HEATS ON LIN
* DELTA LIFE
* CHG WT(klbs)

Chemistry File Heat Number 120637 has incorrect number of characters

MATERIAL SAFETY DATA SHEET

MSDS ISSUE DATE: AUGUST 17, 1995

SECTION I CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: ELECTRIC ARC FURNACE DUST (KO61)

ORGANIZATION MSDS: #: SAFETY DATA FILE K061 95. SAFETY FILE INDEX #2.14.4

MANUFACTURER'S NAME: OREGON STEEL MILLS, INC.

EMERGENCY PHONE NUMBER: 503-286-9651

ADDRESS: PO BOX 2750 PORTLAND, OREGON 97208

HMIS CODES
HEALTH: 2
FIRE: 0
REACTIVITY: 0
CHRONIC EFFECTS: 4

MANUFACTURER'S CODE: NE

CHEMICAL NAME/CLASSIFICATION: DUST CONTAINING METALS & INORGANICS

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

METALS LISTED BELOW ARC PRESENT MOSTLY AS OXIDES. IN ADDITION, FREE METALS MAY ALSO BE PRESENT BUT IN SMALL AND VARYING AMOUNTS.

INGREDIENT	CAS#	PERCENT (AS OXIDE)	OSHA PEL (MG/M3)	ACGIH TLV (MG/M3)
IRON OXIDE-FExOy FERRIC OXIDE FERROUS OXIDE	 1309-37-1 1345-25-1	35-55	1C	5
ZINC OXIDE-ZnO	1314-13-2	14-25	15 TOTAL DUST 5 RESPIRABLE FRACTION	10 DUST, 5 FUM
CALCIUM OXIDE-CaO	1305-78-8	5-16	5	2
MANGANESE OXIDE-MnxOy		3-5	5	0.2 (PROPOSED

MANGANESE OXIDE MANGANESE DIOXIDE	1317-35-7 1313-13-9			
SILICA OXIDE-SixOy SILICON DIOXIDE	7631-86-9	1-5	30mg/m3 / %SiO2+2	0.1 RESPIRABI
MAGNESIUM OXIDE-MgO	1309-48-4	2-4	15	10 FUME
LEAD OXIDE-PbxOy LEAD DIOXIDE	1309-60-0	1.8-3.3	0.05	0.05
SODIUM OXIDE Na2O	1313-59-3	1-6	15(1)	10(2)
SULFUR - S	7704-34-9*	1-3	15(1)	10(2)
ALUMINUM OXIDE-A1203	1344-28-1	1-2	15 DUST RESPIRABLE	10 DUST
POTASSIUM OXIDE-KxO		0.5-2	15(1)	10(2)
CHROME OXIDE-CrxOy		0.3-0.5		
CHROMIC OXIDE	1308-38-9		0.5	0.5
CHROMIUM METAL	-		1	0.5
Cr(VI) COMPOUNDS	-		0.1	0.01
COPPER OXIDE-CuxOy CUPRIC OXIDE	1317-38-0	0.2-0.4	1 DUST, 0.1FUME	1 DUST, 0.2FUM
CALCIUM OXIDE-CdO	1306-19-0	0.05-0.15	0.005	0.01 DUST, 0.002 RESPIRABL

*INDICATES CAS% FOR THE METAL. CALC. STANDS FOR CALCULATION. C = CEILING LEVEL STEL = SHORT TERM EXPOSURE LIMIT.

(1) NUISANCE DUST LIMIT APPLIED TO PARTICULATE NOT OTHERWISE REGULATED.

(2) PARTICULATES NOT OTHERWISE CLASSIFIED.

SECTION 3 HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE: WILL CAUSE IRRITATION TO THE EYES.

SKIN: PROLONGED OR EXTENDED CONTACT WITH THE DUST IRRITATE THE SKIN. ARSENIC IS CAPABLE OF PRODUCING KERTOSES, ESPECIALLY OF THE PALMS AND

SOLES. ECZEMATOUS DERMATITIS HAS BEEN REPORTED FOR TRIVALENT CHROMIUM (III

COMPOUNDS. CHROME (VI) MAY CAUSE IRRITANT AND ALLERGIC CONTACT DERMATITIS.

INGESTION: CADMIUM IS HIGHLY IRRITATING TO THE STOMACH LINING. SWALLOWING THE DUST MAY CAUSE SORE THROAT, NAUSEA, VOMITING, ABDOMINAL PAIN, DIARRHEA AND PAIN IN THE EXTREMITIES AND JOINTS. ACUTE ENCEPHALOPATHY IS ALSO ASSOCIATED WITH EXTREMELY HIGH LEAD DOSES. HIGH DOSES OF ARSENIC CAN BE FATAL.

INHALATION: ACUTE EFFECTS ARE THE SAME AS THOSE OF INGESTION. ADDITIONALLY MAY CAUSE DRY THROAT, COUGH, HEADACHE, SHORTNESS OF BREATH, CHEST PAINS AN CHILLS. INHALATION OF ZINC, MAGNESIUM AND MANGANESE MAY RESULT IN METAL FUME FEVER. EXTREME OVEREXPOSURE TO CADMIUM MAY RESULT IN SEVERE LUNG IRRITATION AND PULMONARY EDEMA THAT CAN BE FATAL. THIS IS PRECEDED BY A SENSATION OF THROAT CONSTRICTION, METALLIC TASTE, AND COUGH. SYMPTOMS MAY PROGRESS TO SHORTNESS OF BREATH, CHEST PAIN, FLU-LIKE SYMPTOMS, WITH WEAKNESS, FEVER, HEADACHE, AND CHILLS.

CHRONIC (AND CANCER) INFORMATION: PROLONGED EXPOSURE TO LEAD MAY CAUSE FATIGUE, GASTROINTESTINAL PAIN, ANEMIA, POSSIBLE CENTRAL NERVOUS SYSTEM ANI KIDNEY DAMAGE. LEAD AND LEAD COMPOUNDS ARE LISTED BY INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) AS POSSIBLE CARCINOGENS. REPEATED OR LONG-TERM EXPOSURE TO CADMIUM MAY RESULT IN KIDNEY DAMAGE AND INCREASED RISK OF PROSTRATE, RESPIRATORY AND GENITOURINARY CANCERS. LONG-TERM EXPOSURE TO ARSENIC IS ASSOCIATED WITH LUNG CANCER. BOTH CADMIUM AND ARSENIC ARE DESIGNATED AS CARCINOGENS BY OSHA. THE IARC AND THE NATIONAL TOXICOLOGY PROGRAM (NTP) CONSIDER CHROME (VI) AS CARCINOGENIC TO HUMANS AND CRYSTALLIZED SILICON DIOXIDE AS PROBABLY CARCINOGENIC TO HUMANS. CRYSTALLINE SILICON DIOXIDE MAY CAUSE SILICOSIS. MANGANESE MAY RESULT IN DAMAGE TO THE LUNGS, KIDNEYS, BLOOD, AND CENTRAL NERVOUS SYSTEM.

TERATOGENIC/MUTAGENIC INFORMATION: MUTAGENIC EFFECTS DATA HAS BEEN CITED FOR LEAD IN RTECS.

REPRODUCTION INFORMATION: REPRODUCTIVE EFFECTS DATA HAS BEEN CITED FOR LEAI

IN RTECS.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: PERSONS WITH PRE-EXISTING HEART CONDITIONS OR IMPAIRED RESPIRATORY FUNCTION.

EYE CONTACT: IMMEDIATELY FLUSH WITH WATER FOR AT LEAST 15 MINUTES, CAREFULLY LIFTING EYELID TO EXPOSE THE EYE TO CONTACT WITH THE WATER. REMOVE CONTACT LENS, IF PRESENT, AND REPEAT WITH AN ADDITIONAL 15 MINUTE FLUSH. IF IRRITATION DEVELOPS OR SYMPTOMS PERSIST, GET MEDICAL ASSISTANCE.

SKIN CONTACT: WASH THOROUGHLY WITH SOAP AND WATER AFTER SKIN CONTACT.

INHALATION: IF AFFECTED, REMOVE TO FRESH AIR. GIVE CPR/ARTIFICIAL RESPIRATION IF NOT BREATHING. PROVIDE OXYGEN IF BREATHING IS DIFFICULT. I IRRITATION DEVELOPS OR SYMPTOMS PERSIST, GET MEDICAL ASSISTANCE.

IF SWALLOWED: DO NOT INDUCE VOMITING. IF PERSON IS ALERT AND NOT CONVULSING, ADMINISTER 6 TO 8 GLASS OF WATER TO DILUTE THE MATERIAL. THEN CALL CLOSEST POISON CONTROL CENTER. IF SPONTANEOUS VOMITING OCCURS, HAVE PERSON LEAN FORWARD TO AVOID BREATHING IN OF EMESIS. RINSE MOUTH' AND ADMINISTER MORE WATER.

NOTES TO PHYSICIAN: NONE GIVEN.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) 29 CFR 1910.1000 (AIR CONTAMINANTS), 29 CFR 1910.1025 (LEAD), 29CFR 1910.1027 (CADMIUM), 29 Œ'R 1910.1200 (HAZARD COMMUNICATION) AND 40 CFR 262 ET AL. (HAZARDOUS WASTE).

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: THIS MATERIAL IS COMPLETELY NON-COMBUSTIBLE. FOR FIRE IN CLOSE PROXIMITY, USE C02, FOAM, DRY CHEMICAL OR WATER SPRAY.

SPECIAL FIREFIGHTING METHODS: FIREFIGHTERS SHOULD USE SELF-CONTAINED BREATHING APPARATUS.

UNUSUAL FIRE & EXPLOSION HAZARDS: NONE KNOWN

SECTION 6 ACCIDENTAL RELEASE MEASURES

SPILL/CLEANUP PROCEDURE: PROMPTLY CLEAN UP MATERIAL SPILLS, USE WATER TO WET DOWN TO MINIMIZE DUST DURING CLEANUP. SEE SECTION 8 FOR EXPOSURE CONTROL AND PERSONAL PROTECTION INFORMATION. THIS MATERIAL IS A CERCLA AND SARA TITLE III HAZARDOUS SUBSTANCE. SPILLS OF THIS MATERIAL IN EXCESS OF THE REPORTABLE QUANTITY OF 10 LBS (40 CFR 302 AND 40 Œ'R 355) MAY REQUIRE NOTIFICATION OF FEDERAL, STATE, AND/OR LOCAL AGENCIES.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) 29 CFR 1910.1000 (AIR CONTAMINANTS), 29 CFR 1910.1025 (LEAD), 29 CFR 1910.1027 (CADMIUM) AND 29 CFR 1910.1200 (HAZARD COMMUNICATION), 40 CFR 262 ET AL. (HAZARDOUS WASTE).

SECTION 7 HANDLING AND STORAGE

DO NOT BREATHE DUST.

IF USED OR HANDLED IN A MANNER WHICH GENERATES DUST, SEE SECTION 8 FOR

SPECIFIC PERSONAL PROTECTION INFORMATION.

PREVENT SKIN CONTACT, INGESTION AND INHALATION WHEN HANDLING MATERIAL.

STORE ONLY IN ACCORDANCE WITH THE PROVISIONS OF RCRA (INCLUDING BUT NOT LIMITED TO 40 CFR 260-268) AND APPLICABLE STATE REGULATIONS.

PROMPTLY CLEAN UP MATERIAL SPILLS, USE WATER TO WET DOWN TO MINIMIZE DUST DURING CLEANUP. SEE SECTION 6 FOR ACCIDENTAL RELEASE MEASURES.

REFER TO SECTION 11 FOR DISPOSAL INFORMATION.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) 29 CFR 1910.1000 (AIR CONTAMINANTS), 29 CFR 1910.1025 (LEAD), 29 CFR 1910.1027 (CADMIUM) AND 29 CFR 1910.1200 (HAZARD COMMUNICATION), 40 CFR 262 ET AL. (HAZARDOUS WASTE).

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

RESPIRATORY PROTECTION: DO NOT BREATHE DUST.

IF CONCENTRATIONS IS GREATER THAN THE PEL, BUT LESS THAN 10 TIMES PEL, USE A NIOSH APPROVED HALF-MASK RESPIRATOR WITH HEPA CARTRIDGE.

FOR CONCENTRATIONS ABOVE 10 TIMES PEL, BUT LESS THAN 50 TIMES PEL USE A NIOSH APPROVED FULL FACE RESPIRATOR WITH HEPA CARTRIDGE.

WHERE AIRBORNE CONCENTRATION MAY EXCEED 50 TIMES PEL, USE A SUPPLIED-AIR RESPIRATOR.

VENTILATION: USE LOCAL OR GENERAL VENTILATION TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE PEL. IF VENTILATION FAILS TO MAINTAIN CONCENTRATIONS BELOW THE PEL, RESPIRATORY PROTECTION IS REQUIRED BY FEDERAL AND/OR STATE REGULATIONS; SEE RESPIRATORY PROTECTION INFORMATION ABOVE.

RECOMMENDED GLOVES: RUBBER GLOVES ARE RECOMMENDED

EYE PROTECTION: CHEMICAL SAFETY GOGGLES ARE REQUIRED IF FULL FACE RESPIRATORY PROTECTION IS NOT WORN.

OTHER PROTECTION: EYE WASH AND SAFETY SHOWER SHOULD BE NEARBY AND READY FOR USE.

WEAR COVERALLS AND GLOVES AS NECESSARY TO PROVIDE PROTECTION; CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT WHICH HAS COME IN CONTACT WITH THIS MATERIAL MAY REQUIRE SPECIAL HANDLING AS SPECIFIED IN THE REGULATIONS REFERENCED BELOW.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) **29** CFR 1910.1000 (AIR CONTAMINANTS), **29** CFR 1910.1023 (LEAD), **29** CFR 1910.1027 (CADMIUM) AND **29** CFR 1910.1200 (HAZARD COMMUNICATION), **40** CFR **262** ET AL. (HAZARDOUS WASTE).

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: FINE, G M Y DUST

ODOR: NONE

BOILING POINT: NA DEG F.

VAPOR PRESSURE (mm HG): NA mm AT DEG F.

VAPOR DENSITY (AIR = 1): NA

SPECIFIC GRAVITY: **1.3** (WATER = **1)**

PERCENT VOLATILE: NA %

EVAPORATION RATE: NA REFERENCE: NA

WATER SOLUBILITY: N (C = COMPLETE, P = PARTIAL, N = NEGLIGIBLE, D = DISPERSION)

FLASH POINT: NA DEG F. METHOD.

AUTO IGNITION TEMPEMTURE: NG DEG F.

EXPLOSION LIMITS:
LEL: NA UEL: NA

SECTION 10 STABILITY AND REACTIVITY

STABILITY: STABLE

INCOMPATIBILITY: NONE KNOWN

CONDITIONS TO AVOID: NONE KNOWN.

HAZARDOUS DECOMPOSITION PRODUCTS: NONE

HAZARDOUS POLYMERIZATION: NO

SECTION 13 DISPOSAL CONSIDERATIONS

EPA WASTE CODES: K061

DOT NUMBER: OTHER REGULATED MATERIAL (ORM)

DOT HAZARD CLASS/HAZARD LABEL: LABEL IN ACCORDANCE WITH 49 CFR 173.

USERS SHOULD COMPLY WITH APPLICABLE OSHA AND RCRA AND OTHER STATE AND FEDERAL REGULATIONS INCLUDING (BUT NOT LIMITED TO) **29** CFR **1910.1000** (AIR CONTAMINANTS), **29** CFR **1910.1023** (LEAD),29 CFR **1910.1027** (CADMIUM) AND **29** CFR 1910.1200 (HAZARD COMMUNICATION), **40** CFR 262 ET AL. (HAZARDOUS WASTE).

OREGON STEEL MILLS HAS PREPARED THIS INFORMATION BASED ON ITS REASONABLE REVIEW OF AVAILABLE INFORMATION RELATING TO THE CHEMICALS THAT MAKE UP THE PRODUCT WHICH UNDERLYING INFORMATION WAS NOT CREATED OR PREPARED BY OREGON STEEL MILLS. ALTHOUGH OREGON STEEL MILLS PROVIDES THIS INFORMATION AS A PUBLIC SERVICE, IT DOES NOT REPRESENT OR WARRANT HE ACCURACY, COMPLETENESS OR APPLICABILITY OF THE INFORMATION CONTAINED HEREIN. OREGON STEEL MILLS DOES NOT WARRANT THE FITNESS OF THE PRODUCT FOR ANY PARTICULAR USE AND HAS NOT EVALUATED THE HAZARDS ASSOCIATED WITH ANY PARTICULAR USES OF THE PRODUCT. ALL EMPLOYERS USING THE PRODUCT SHOULD PERFORM ALL REVIEW AND TESTING AND TAKE ALL PRECAUTIONS REQUIRED TO PROTECT THEIR EMPLOYEES FROM ANY HAZARDS ASSOCIATED WITH THEIR USE OF THE PRODUCT.

N = NO
Y = YES
UN = UNKNOWN
NA = NOT APPLICABLE
NRG = NOT REGULATED
NE = NOT'ESTABLISHED
NG = NOT GIVEN
NR = NOT REQUIRED

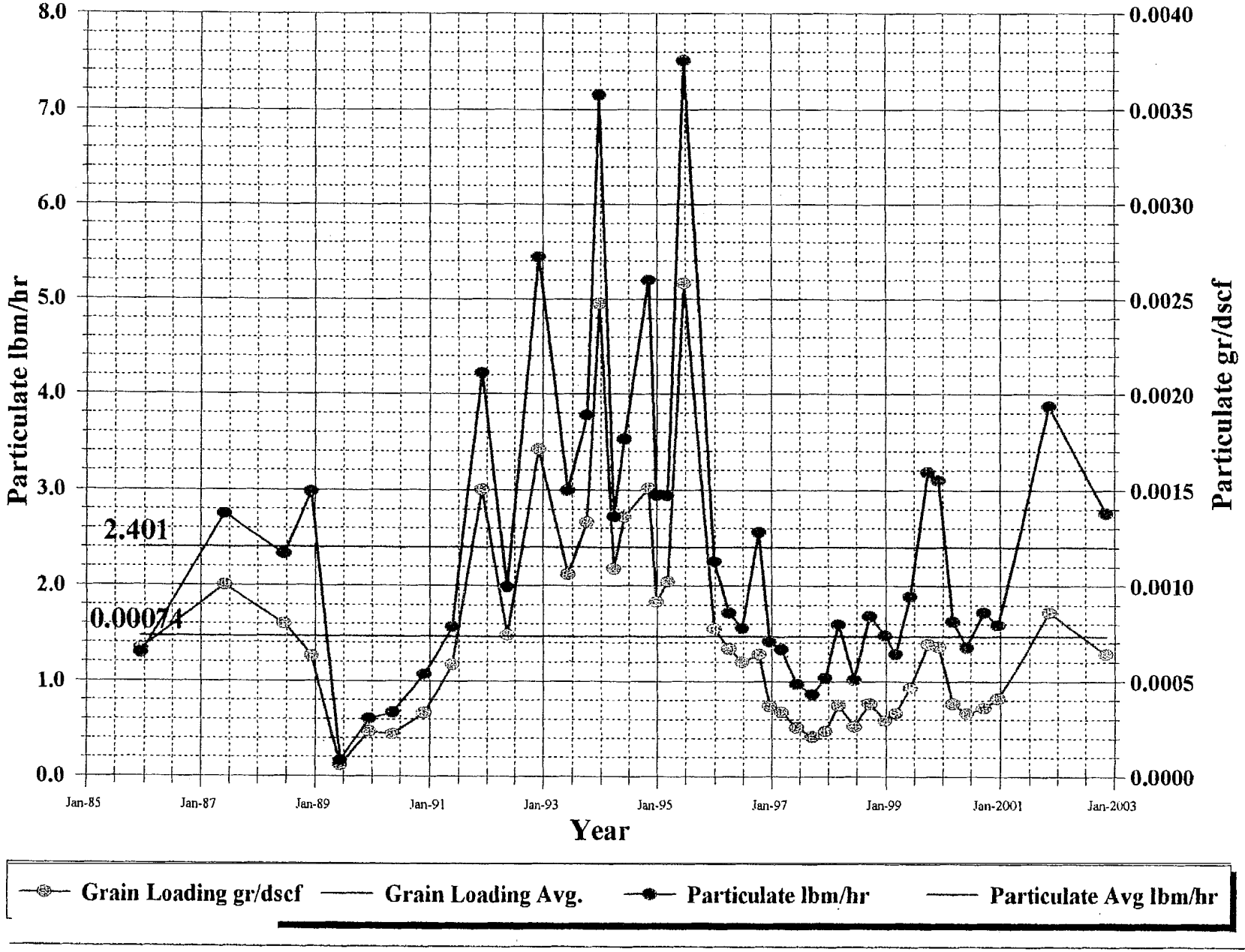
PDXI. **196499.1** 1956S **0007**

OSM EAF 11/6/02 BH Press Drops

	Compartment #	1	2	3	4	5	6	7	8	9	10	11	12
R1		5.0" H_2O	5.0	5.1	5.0	5.0	4.5	—	6.0	5.5	5.5	5.5	5.5
1210		13	14	15	16								
		6.0	5.5	6.0	6.0								
R2		1	2	3	4	5	6	7	8	9	10	11	12
1313		6.0	5.5	6.0	6.0	6.0	5.5	5.0	6.0	5.5	6.0	5.5	5.5
		13	14	15	16								
		6.0	5.5	—	6.5								
R3		1	2	3	4	5	6	7	8	9	10	11	12
1445		—	5.5	6.0	5.5	5.5	5.0	5.0	6.0	6.0	6.0	5.5	6.0
		13	14	15	16								
		6.0	5.5	6.0	5.5								

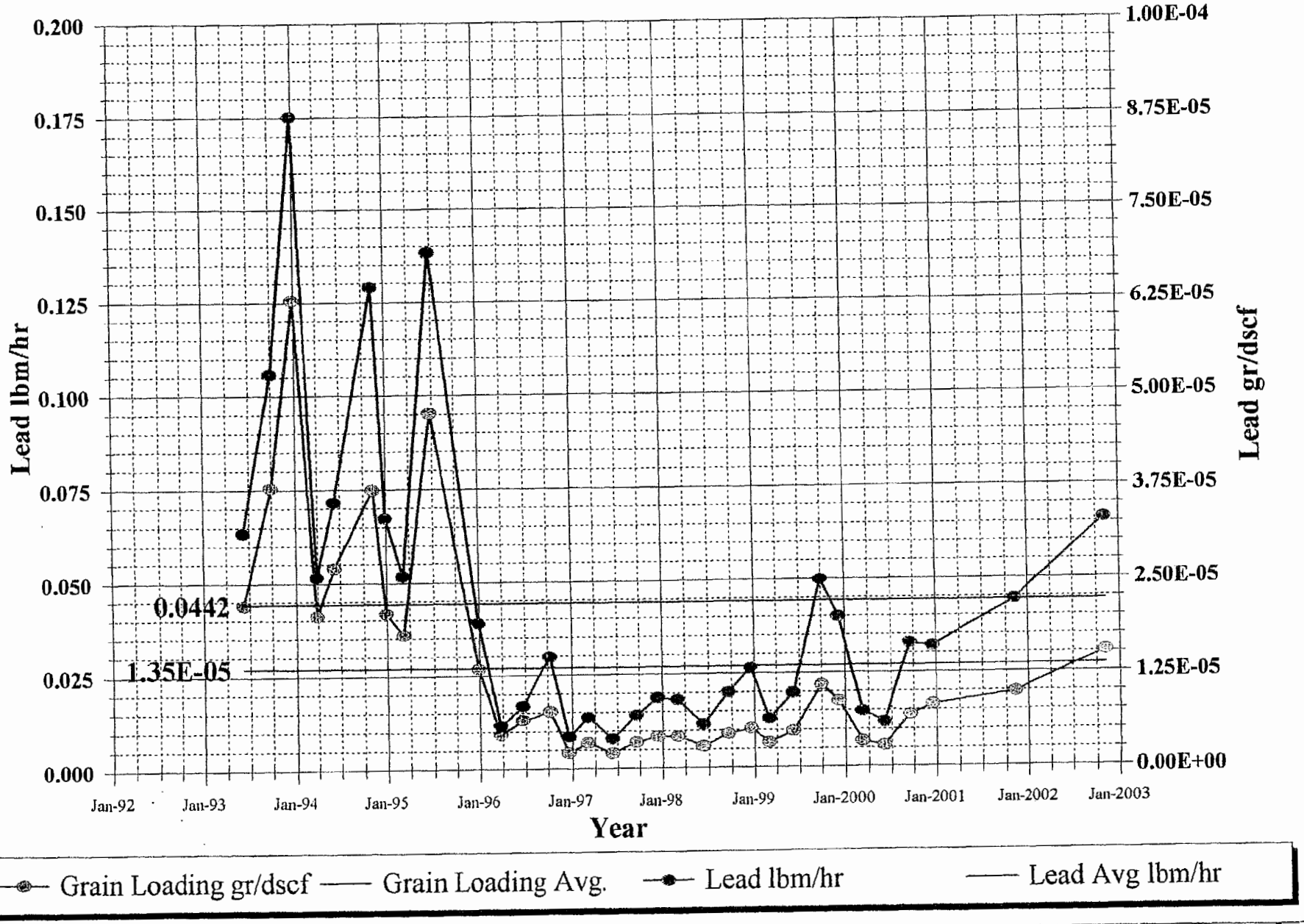
Oregon Steel Mills

Particulate Emissions



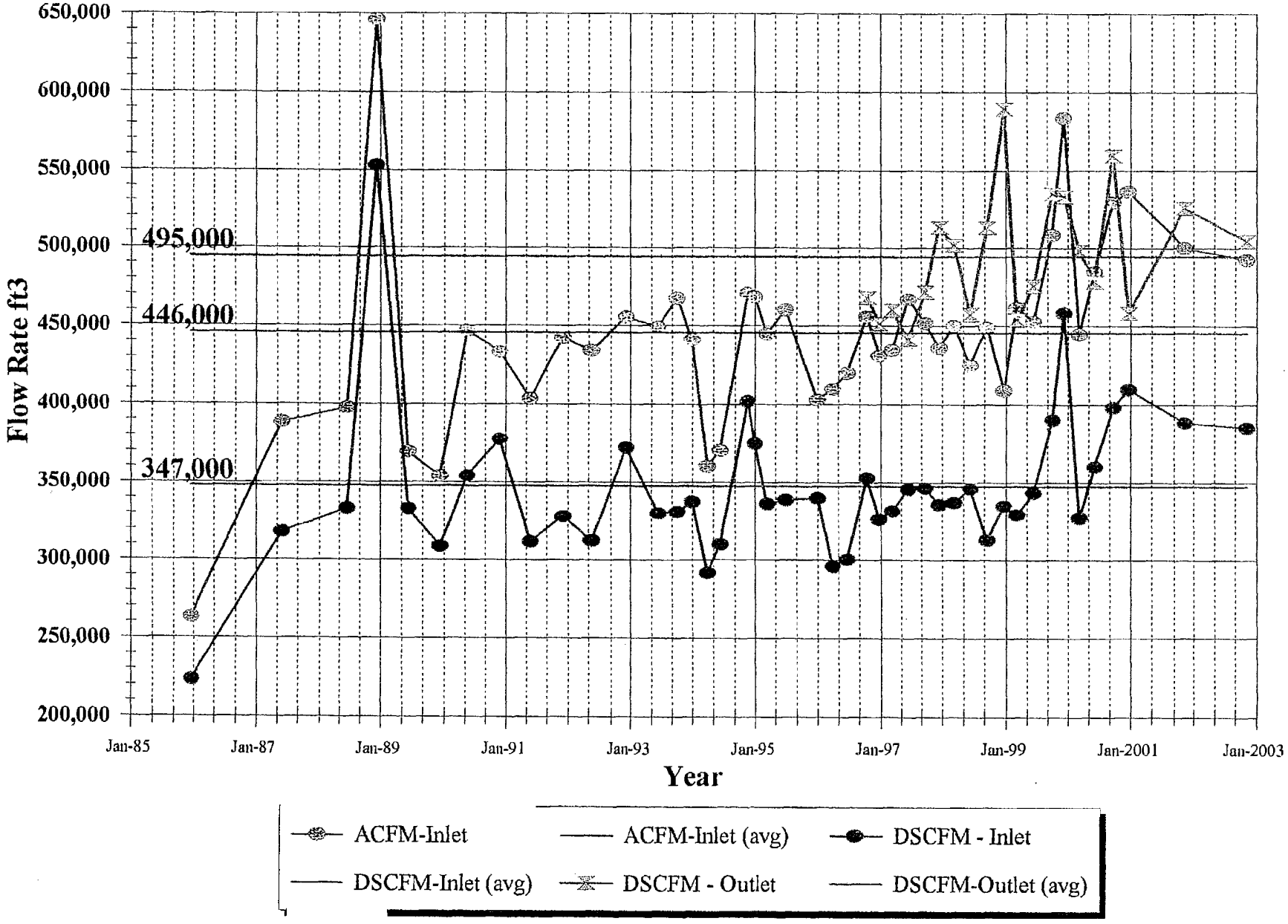
Oregon Steel Mills

Lead Emissions



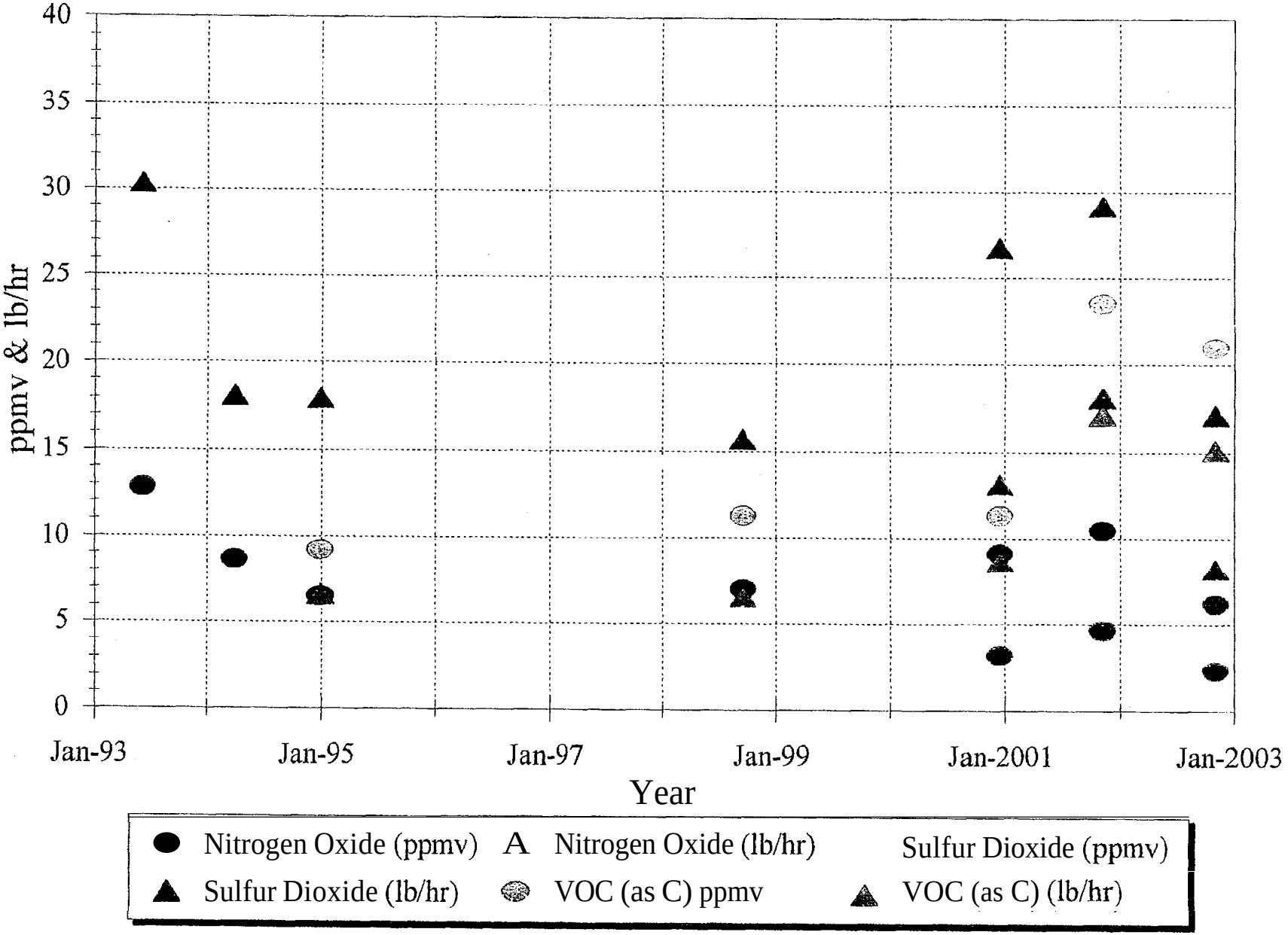
Oregon Steel Mills

Flow Rate



Oregon Steel Mills

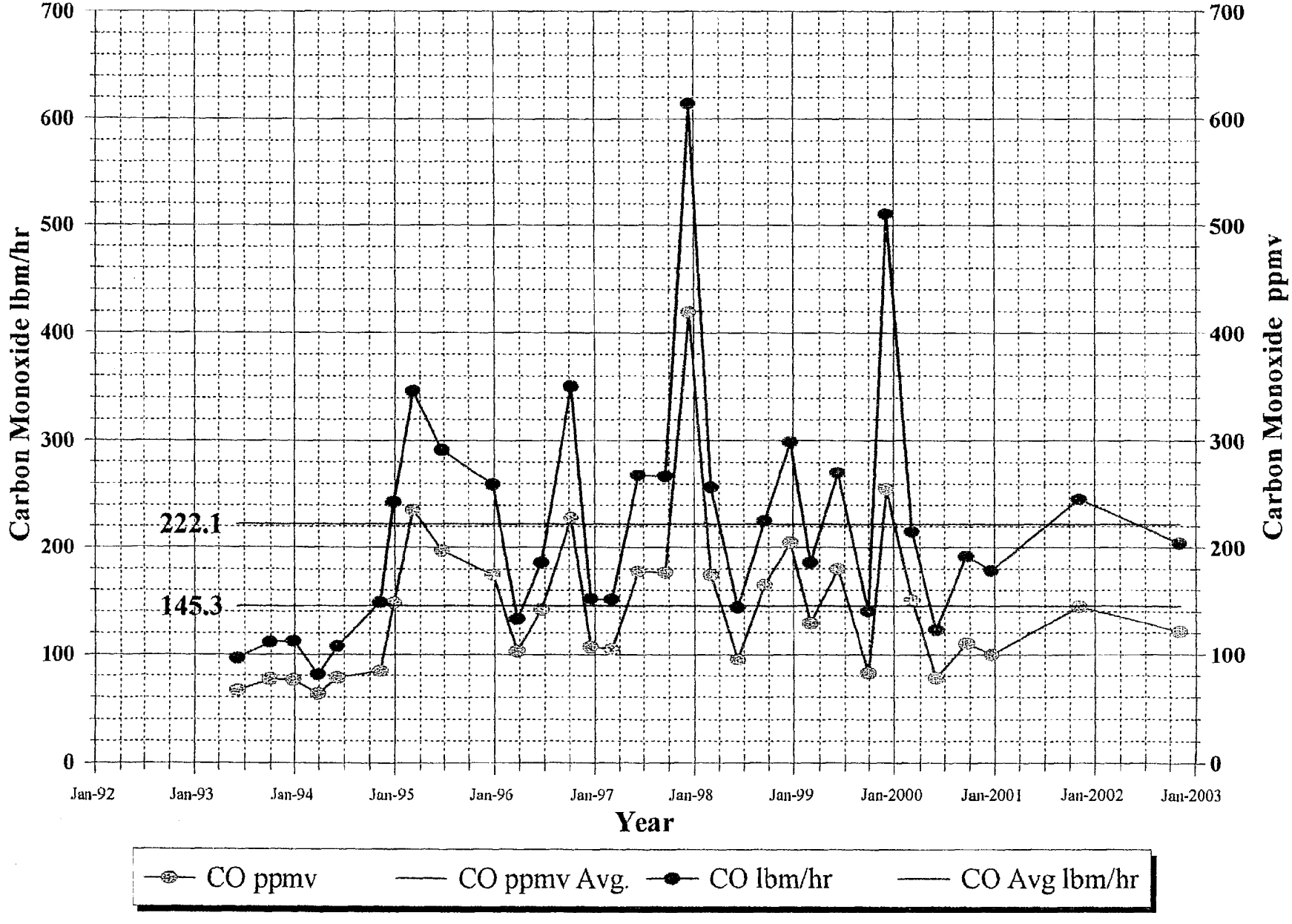
Gaseous Emissions



OSL

Oregon Steel Mills

Carbon Monoxide Emissions



Calibration Information

High-Volume Sampler Calibrations

Pitots

Thermocouples and Indicators

Shortridge Micro manometer

Magnehelic Calibrations

Barometer

Calibration Gas Certificates

High Volume Orifice Calibration Data

Orifice Identification #1192 ✓
Date 11/20/02
Calibration Personal tar
Barometric Pressure 30.35 in Hg
Ambient Temperature 65 F (Tdb)
F (Twb)
Moisture %
Moisture @ Saturation 2.14 %
Leak check cfm

Pressure Drop Across Orifice in H2O dHo	Pressure Meter in H20 Pstat	Orifice Vac.	Inlet System Temperature Ti	Outlet System Temperature To	Average System Temperature Ts	Tstd/Ts Ratio	Pm/Pstd Ratio	Starting Meter Reading cuft	Ending Meter Reading cuft	Time min	Orifice Flow @Ts acf/min Q@Ts	Orifice Flow @STD wscf/min Q@STD (wet)	Orifice Flow @STD dscf/min Q@STD (dry)
0.100	0.20	-0.1	64.2	66.0	65.1	1.0055	1.0148	122.950	123,030	4.90	16.33	16.66	16.30
0.100	0.20	-0.11	64.0	66.2	65.1	1.0055	1.0148	123,040	123,120	4.95	16.16	16.49	16.14
0.200	0.34	-0.2	64.2	66.0	65.1	1.0055	1.0152	123,140	123,240	4.53	22.06	22.52	22.04
0.200	0.34	-0.2	64.8	66.8	65.8	1.0042	1.0152	123,250	123.350	4.45	22.47	22.91	22.42
0.400	0.60	-0.37	65.0	67.4	66.2	1.0034	1.0158	123,390	123,530	4.55	30.77	31.36	30.69
0.400	0.59	-0.36	65.2	67.6	66.4	1.0030	1.0158	123.540	123,680	4.58	30.55	31.12	30.46
0.600	0.85	-0.52	65.2	68.2	66.7	1.0025	1.0164	123,720	123,900	4.82	37.37	38.08	37.26
0.600	0.86	-0.53	65.4	68.6	67.0	1.0019	1.0164	123.920	124,100	4.82	37.37	38.06	37.24
0.800	1.20	-0.7	65.4	69.4	67.4	1.0011	1.0173	124,140	124,340	4.65	43.01	43.80	42.87
0.800	1.20	-0.69	65.8	70.0	67.9	1.0002	1.0173	124.360	124,560	4.65	43.01	43.76	42.83
1.000	1.30	-0.84	65.8	70.8	68.3	0.9994	1.0175	124,610	124,810	4.15	48.19	49.01	47.96
1.000	1.30	-0.84	66.0	71.2	68.6	0.9989	1.0175	124.830	125.030	4.15	48.19	48.98	47.93

Orifice Identification #1032
Date 11/20/02
Calibration Personal tar
Barometric Pressure 30.35 in Hg
Ambient Temperature 65 F (Tdb)
F (Twb)
Moisture %
Moisture @ Saturation 2.14 %

Pressure Drop Across Orifice in H2O dHo	Pressure Meter in H20 Pstat	Orifice Vac.	Inlet System Temperature Ti	Outlet System Temperature To	Avenge System Temperature Ts	Tstd/Ts Ratio	Pm/Pstd Ratio	Starting Meter Reading cuft	Ending Meter Reading cuft	Time min	Orifice Flow @Ts acf/min Q@Ts	Orifice Flow @STD wscf/min Q@STD (wet)	Orifice Flow @STD dscf/min Q@STD (dry)
0.100	0.19	-0.10	62.0	64.0	63.0	1.0096	1.0148	120,700	120,780	5.15	15.53	15.91	15.57
0.100	0.19	-0.10	62.2	63.8	63.0	1.0096	1.0148	120,790	120,870	5.18	15.43	15.81	15.47
0.200	0.32	-0.19	62.2	63.8	63.0	1.0096	1.0151	120,930	121,030	4.73	21.13	21.65	21.19
0.200	0.33	-0.20	62.2	64.0	63.1	1.0094	1.0151	121,040	121,140	4.72	21.20	21.72	21.26
0.400	0.56	-0.35	62.4	64.4	63.4	1.0088	1.0157	121,190	121,320	4.52	28.78	29.49	28.86
0.400	0.56	-0.35	62.8	64.6	63.7	1.0082	1.0157	121,350	121,480	4.48	29.00	29.69	29.06
0.600	0.74	-0.51	62.6	65.4	64.0	1.0076	1.0161	121,600	121,770	4.83	35.17	36.01	35.24
0.600	0.75	-0.52	63.0	65.8	64.4	1.0069	1.0162	121,790	121,960	4.82	35.29	36.11	35.34
0.800	0.97	-0.68	63.4	66.6	65.0	1.0057	1.0167	122,020	122,180	3.97	40.34	41.24	40.36
0.800	0.97	-0.68	63.2	67.0	65.1	1.0055	1.0167	122,200	122,360	3.95	40.51	41.41	40.53
1.000	1.20	-0.84	63.4	67.6	65.5	1.0048	1.0173	122,430	122,620	4.22	45.06	46.06	45.07
1.000	1.20	-0.84	63.2	68.0	65.6	1.0046	1.0173	122,640	122,830	4.20	45.24	46.23	45.24

Orifice Identification #1072
Date 11121102
Calibration Personal tar
Barometric Pressure 30.20 in Hg
Ambient Temperature 65 F (Tdb)
F (Twb)
Moisture %
Moisture @ Saturation 2.15 %

Pressure Drop Across Orifice in H2O dHo	Pressure Meter in H2O Pstat	Orifice Vac.	Inlet System Temperature Ti	Outlet System Temperature To	Average System Temperature Ts	Tstd/Ts Ratio	Pm/Pstd Ratio	Starting Meter Reading cuft	Ending Meter Reading cuft	Time min	Orifice Flow @Ts acf/min Q@Ts	Orifice Flow @STD wscf/min Q@STD (wet)	Orifice Flow @STD dscf/min Q@STD (dry)
0.100	0.21	-0.09	64.4	64.2	64.3	1.0071	1.0148	125.170	125,250	4.87	16.44	16.80	16.44
0.100	0.21	-0.09	64.4	64.6	64.5	1.0067	1.0148	125.260	125,340	4.82	16.61	16.97	16.61
0.200	0.36	-0.16	64.6	65.0	64.8	1.0061	1.0152	125,380	125,480	4.42	22.64	23.13	22.63
0.200	0.36	-0.16	64.6	65.4	65.0	1.0057	1.0152	125.490	125,590	4.37	22.90	23.38	22.88
0.400	0.61	-0.29	64.6	66.2	65.4	1.0050	1.0158	125,630	125.760	4.22	30.83	31.47	30.80
0.400	0.61	-0.29	64.6	67.0	65.8	1.0042	1.0158	125.770	125.910	4.52	31.00	31.62	30.94
0.600	0.88	-0.42	65.2	68.2	66.7	1.0025	1.0165	126,000	126.160	4.28	37.35	38.06	37.25
0.600	0.88	-0.42	65.4	68.2	66.8	1.0023	1.0165	126.170	126,330	4.27	37.50	38.21	37.39
0.800	1.20	-0.55	65.8	68.8	67.3	1.0013	1.0173	126.380	126,580	4.68	42.70	43.50	42.57
0.800	1.20	-0.54	65.8	69.4	67.6	1.0008	1.0173	126.600	126,800	4.70	42.55	43.32	42.39
1.000	1.35	-0.68	66.2	70.6	68.4	0.9992	1.0176	126,850	127.050	4.18	47.81	48.62	47.58
1.000	1.35	-0.68	66.4	71.0	68.7	0.9987	1.0176	127.060	127.260	4.18	47.81	48.59	47.55

Pitot Calibration Calculations

Date 8-Aug-02 Pb= 30 00 in Hg File 12-Dec-01 Ta= 530 0 R

Method 2 section 4, Horizon Shop

Pitot	Tested Last	[Cp] New	[S]	
3s-1	26-Jul-02	0.83359	0.00667	
3s-3	7-Aug-02	0.83013	0.00492	
5s-1	26-Jul-02	0.83661	0.00936	
5s-2	26-Jul-02	0.82210	0.00665	
5s-3	26-Jul-02	0.82414	0.00529	<< New in July 2002
6s-1	8-Mar-02	0.81681	0.00268	
6s-2	7-Aug-02	0.80074	0.00585	
6s-3	7-Aug-02	0.80083	0.00684	<< New in July 2002
6s-4	7-Aug-02	0.79947	0.00240	<< New in July 2002

Pitot	Tested Last	[Cp] New	[S]	
HT-4	6-Aug-02	0.82870	0 00757	
SR-18	26-Jul-02	0.82201	0.00767	
SR-36	26-Jul-02	0.82816	0.00934	
SR-48	26-Jul-02	0.82594	0.00977	
8s-1	7-Aug-02	0.80575	0.00563	<< New in July 2002
10-s	6-Aug-02	0.78842	0.00661	
11-s	6-Aug-02	0.79697	0.00503	
14s-I	7-Aug-02	0.78261	0.00988	
14s-2	7-Aug-02	0.78200	0.00262	

	dPp	dPs	Cp	dS	Avg Cp	S
3s-1	0.380	0.540	0.83048	0.00311	0.83359	0.00667
Pass	0.830	1.200	0.82335	0.01024		
7/26/2002	0.950	1.320	0.83987	0.00628		
PTH	1.370	1.900	0.84066	0.00707		
3s-2						
3s-3	0.345	0495	0.82650	000363	0.83013	0.00492
Pass	0.845	1 220	0 82392	0.00621		
8/7/2002	0.990	1.400	0.83251	0 00238		
PTH	1.360	1.900	0.83758	0 00746		
5s-1	0.380	0520	0.84630	0.00969	0.83661	0.00936
Pass	0.845	1.200	0.83076	0.00585		
7/26/2002	0.985	1.350	0.84564	0.00903		
PTH	1.350	1.950	0.82373	0.01288		
5s-2	0.375	0.540	0.82500	0.00290	0.82210	0.00665
Pass	0.850	1.250	0.81638	0.00573		
7/26/2002	0.990	1.400	0.83251	0.01041		
PTH	1.320	1.950	0.81453	0.00758		
5s-3	0.375	0.548	0.81896	0.00518	0.82414	0.00529
Pass	0.850	1.220	0.82635	0.00221		
7/26/2002	0.990	1.400	0.83251	0.00837		
PTH	1.320	1.930	0.81874	0.00540		
6s-1	0.372	0.550	0.81419	0.00262	0.81681	0.00268
Pass	0.880	1.290	0.81768	0.00086		
03/08/02	1.170	1.700	0.82130	0.00449		
PTH	1.420	2.100	0.81409	0.00273		
6s-2	0.345	0.530	0.79874	0.00200	0.80074	0.00585
Pass	0.830	1.300	0.79105	0.00969		
8/7/2002	0.995	1.480	0.81174	0.01100		
PTH	1.350	2.060	0.80144	0.00069		
6s-3	0.330	0.515	0.79248	0.00835	0.80083	0.00684
Pass	0.820	1.270	0.79550	0.00533		
8/7/2002	0.980	1.450	0.81389	0.01306		
PTH	1.350	2.060	0.80144	0.00061		
6s-4	0.345	0.530	0.79874	0.00073	0.79947	0.00240
Pass	0.845	1.300	0.79816	0.00131		
8/7/2002	0.990	1.500	0.80428	0.00481		
PTH	1.360	2.100	0.79670	0.00277		

	dPp	dPs	Cp	dS	Avg Cp	S
HT-4	0.345	0.490	0.83071	0.00200	0.82870	0.00757
Pass	0.810	1.180	0.82023	0.00847		
08/06/02	0.940	1.300	0.84184	0.01313		
PTH	1.310	1.900	0.82204	0.00666		
SR-18	0.365	0.528	0.82312	0.00112	0.82201	0.00767
Pass	0.810	1.220	0.80667	0.01533		
07/26/02	0.990	1.430	0.82373	0.00172		
PTH	1.350	1.900	0.83450	0.01249		
SR-36	0.380	0.535	0.83435	0.00619	0.82816	0.00934
Pass	0.830	1.230	0.81325	0.01492		
07/26/02	0.950	1.370	0.82440	0.00377		
PTH	1.370	1.900	0.84066	0.01249		
SR-48	0.365	0.529	0.82234	0.00360	0.82594	0.00977
Pass	0.810	1.210	0.81000	0.01594		
07/26/02	0.990	1.400	0.83251	0.00656		
PTH	1.350	1.880	0.83893	0.01298		
8s-1	0.345	0.520	0.80639	0.00064	0.80575	0.00563
Pass	0.845	1.290	0.80125	0.00449		
08/07/02	0.990	1.520	0.79897	0.00677		
PTH	1.360	2.000	0.81638	0.01063		
10-s	0.335	0.540	0.77976	0.00866	0.78842	0.00661
Pass	0.815	1.300	0.78387	0.00455		
08/06/02	0.960	1.480	0.79733	0.00892		
PTH	1.340	2.090	0.79271	0.00429		
11-s ✓	0.335	0.525	0.79082	0.00615	0.79697	0.00503
Pass	0.815	1.270	0.79307	0.00390		
08/06/02	0.960	1.450	0.80554	0.00857		
PTH	1.340	2.060	0.79846	0.00149		
14s-1 ✓	0.350	0.555	0.78618	0.00357	0.78261	0.00988
Pass	0.860	1.370	0.78438	0.00177		
08/07/02	0.950	1.600	0.76285	0.01976		
PTH	1.400	2.160	0.79703	0.01442		
14s-2	0.355	0.565	0.78474	0.00274	0.78200	0.00262
Pass	0.835	1.350	0.77860	0.00340		
08/07/02	0.975	1.570	0.78017	0.00183		
PTH	1.350	2.150	0.78448	0.00249		

Thermocouple Calibration

Date:	29-Aug-02	Deviation	@60 F	7.8	Allowable Diff.	Pb=	29.60	in Hg	cdb
Next Calibration:	28-Feb-03	Limit	@212 F	10.1	Allowable Diff.	Ta=	74.8	oF	980324tc
			@325 F	11.8	Allowable Diff.				

			Ambient			Boiling, Water			Boiling, Oil		Average
	Probe/ID	Standard, F	Measured, F	Difference %	Standard, F	Measured, F	Difference %	Standard, F	Measured, F	Difference %	Difference %
Probe	3-1	74.8	74.4	0.1%	200.4	203.0	-0.4%	474.8	474.8	0.0%	-0.1%
Probe	3-2	75.2	74.8	0.1%	203.8	204.6	-0.1%	482.0	482.2	0.0%	0.0%
Probe	3-3			0.0%			0.0%			0.0%	0.0%
Probe	wc3-4			0.0%			0.0%			0.0%	0.0%
Probe	3-5	75.4	75.2	0.0%	202.6	203.6	-0.2%	485.0	488.4	-0.4%	-0.2%
Probe	3-6	75.0	74.4	0.1%	200.6	202.4	-0.3%	467.2	465.8	0.2%	0.0%
Probe	3-7	75.0	74.8	0.0%	205.4	205.6	0.0%	493.0	498.4	-0.6%	-0.2%
Probe	3-8	75.0	74.6	0.1%	202.6	201.0	0.2%	490.0	492.8	-0.3%	0.0%
Probe	3-9	76.0	75.6	0.1%	145.0	145.2	0.0%	358.0	362.6	-0.6%	-0.2%
Probe	3-10	76.6	76.0	0.1%	170.8	172.0	-0.2%	346.0	341.0	0.6%	0.2%
Probe	4-1	75.2	75.0	0.0%	205.2	207.2	-0.3%	490.4	493.0	-0.3%	-0.2%
Probe	4-2	76.8	77.2	-0.1%	206.2	206.6	-0.1%	485.4	483.4	0.2%	0.0%
Probe	4-3	84.0	83.0	0.2%	207.0	207.6	-0.1%	484.0	485.6	-0.2%	-0.0%
Probe	4-4	77.2	77.2	0.0%	207.0	208.4	-0.2%	485.2	492.0	-0.7%	-0.3%
Probe	4-5	77.2	77.4	0.0%	196.2	197.6	-0.2%	416.8	420.0	-0.4%	-0.2%
Probe	4-6	75.2	75.0	0.0%	205.2	207.0	-0.3%	484.6	490.4	-0.6%	-0.3%
Probe	4-7	84.2	83.0	0.2%	208.5	205.4	0.5%	488.4	491.0	-0.3%	0.1%
Probe	4-8	76.2	75.2	0.2%	148.6	149.2	-0.1%	476.8	478.8	-0.2%	-0.0%
Probe	4-9	76.0	75.2	0.1%	152.6	153.8	-0.2%	479.2	485.0	-0.6%	-0.2%
Probe	5-2	75.0	75.6	-0.1%	171.0	172.8	-0.3%	432.2	436.0	-0.4%	-0.3%
Probe	5-3	75.2	75.6	-0.1%	178.4	178.2	0.0%	431.4	430.8	0.1%	0.0%
Probe	5-4	75.2	75.4	0.0%	198.0	199.8	-0.3%	479.0	482.2	-0.3%	-0.2%
Probe	5-5	69.8	69.6	0.0%	213.2	213.0	0.0%	491.4	469.4	2.3%	0.8%
Probe	5-6	69.8	68.0	0.3%	213.2	212.8	0.1%	491.8	488.4	0.4%	0.3%
Probe	5-7	69.8	70.2	-0.1%	213.2	213.8	-0.1%	488.8	494.8	-0.6%	-0.3%
Probe	5-8	76.0	75.2	0.1%	176.2	177.7	-0.2%	451.2	458.0	-0.7%	-0.3%
Probe	5-9	70.6	70.2	0.1%	213.2	212.8	0.1%	514.2	518.4	-0.4%	-0.1%
Probe	5-10	76.0	75.0	0.2%	157.6	158.6	-0.2%	483.0	480.0	0.3%	0.1%
Probe	6-1	76.0	75.4	0.1%	161.0	161.4	-0.1%	372.2	382.0	-1.2%	-0.4%
Probe	7-1	74.6	74.8	0.0%	209.0	208.0	0.1%	488.4	485.0	0.4%	0.2%
Probe	7-2	75.0	75.0	0.0%	209.8	220.0	-1.5%	487.0	491.0	-0.4%	-0.6%
Probe	7-3	76.4	75.2	0.2%	167.0	168.2	-0.2%	391.2	393.6	-0.3%	-0.1%
Probe	7-4	75.0	74.6	0.1%	201.8	202.8	-0.2%	487.6	489.4	-0.2%	-0.1%
Probe	7-5	75.0	76.0	-0.2%	209.6	209.4	0.0%	484.2	477.0	0.8%	0.2%
Probe	7-6			0.0%			0.0%			0.0%	0.0%
Probe	7-8	76.4	75.8	0.1%	183.0	184.0	-0.2%	465.0	465.0	0.0%	-0.0%
Probe	9-1	70.6	69.4	0.2%	213.4	213.8	-0.1%	513.8	523.8	-1.0%	-0.3%
Probe	10-1	69.8	67.2	0.5%	213.2	213.2	0.0%	500.4	503.4	-0.3%	0.1%
Probe	10-2	70.4	69.2	0.2%	213.2	214.0	-0.1%	501.8	504.6	-0.3%	-0.1%
Probe	10-3	70.8	70.4	0.1%	213.2	214.8	-0.2%	509.0	522.2	-1.4%	-0.5%
Probe	10-4	76.2	75.2	0.2%	189.0	189.8	-0.1%	416.4	419.2	-0.3%	-0.1%
Probe	10-5	76.0	75.4	0.1%	192.8	192.6	0.0%	420.6	431.2	-1.2%	-0.4%
Probe	10-6	76.0	75.4	0.1%	194.8	194.6	0.0%	406.8	411.0	-0.5%	-0.1%
FS Pitot	10-S	75.6	77.2	-0.3%	207.8	210.2	-0.4%	472.8	475.2	-0.3%	-0.3%
FS Pitot	11-S	75.6	78.0	-0.4%	205.6	207.8	-0.3%	484.6	482.6	0.2%	-0.2%
	14-S1	75.6	75.2	0.1%	209.8	214.8	-0.7%	482.2	487.4	-0.6%	-0.4%
	14-S2	75.4	75.2	0.0%	208.4	210.8	-0.4%	488.2	494.0	-0.6%	-0.3%
	7-7	74.6	74.8	0.0%	208.8	207.2	0.2%	489.2	515.4	-2.8%	-0.9%
AVERAGE		75.1	74.7	0.1%	195.8	196.8	-0.1%	466.9	469.7	-0.3%	-0.1%

Thermocouple Calibration

Date: 29-Aug-02	Deviation	@60 F	7.8	Allowable Diff.	Pb=	29.6 in Hg	cdb				
Next Calibration: 28-Feb-03	Limit	@212 F	10.08	Allowable Diff.	Ta=	74.8 oF	980324tc				
		@325 F	11.775	Allowable Diff.							

			Ambient			Boiling, Water			Boiling, Oil		Average
	Probe/ID	Standard, F	Measured, F	Difference %	Standard, F	Measured, F	Difference %	Standard, F	Measured, F	Difference %	Difference %
	A2	83.6	83.2	0.1%	199.0	199.2	0.0%	488.5	499.8	-1.2%	-0.4%
	A3	83.6	83.4	0.0%	201.2	200.0	0.2%	479.6	494.4	-1.6%	-0.5%
	A4	83.6	83.4	0.0%	201.2	203.6	-0.4%	482.0	501.6	-2.1%	-0.8%
	A5	76.0	76.8	-0.1%	169.8	168.2	0.3%	427.2	432.6	-0.6%	-0.1%
	A6	83.8	83.2	0.1%	197.6	195.6	0.3%	491.4	496.6	-0.5%	-0.0%
	F3	83.6	84.0	-0.1%	200.6	202.6	-0.3%	478.4	493.4	-1.6%	-0.7%
	F4	74.8	74.0	0.1%	201.8	201.2	0.1%	502.8	522.6	-2.1%	-0.6%
	F5	75.0	74.2	0.1%	196.8	194.0	0.4%	498.6	502.6	-0.4%	0.0%
*	F6	76.0	75.6	0.1%	140.0	139.8	0.0%	328.4	334.0	-0.7%	-0.2%
	F9	75.2	75.4	0.0%			0.0%	485.0	489.0	-0.4%	-0.1%
	F11	83.6	83.4	0.0%	202.2	203.8	-0.2%			0.0%	-0.1%
	F14	75.2	74.8	0.1%	199.0	197.4	0.2%	471.6	485.8	-1.5%	-0.4%
	F12	83.6	83.6	0.0%	203.0	204.2	-0.2%	482.4	495.4	-1.4%	-0.5%
	F13			0.0%			0.0%			0.0%	0.0%
	F73	75.2	74.0	0.2%	199.4	200.8	-0.2%	481.8	482.0	0.0%	0.0%
	F23	83.6	83.6	0.0%	208.2	205.8	0.4%	489.6	500.0	-1.1%	-0.2%
	F51										
	F84	83.6	83.2	0.1%	199.2	204.2	-0.8%	493.6	499.2	-0.6%	-0.4%
	F81	75.6	75.4	0.0%	198.0	198.6	-0.1%	490.6	494.0	-0.4%	-0.2%
	F85	76.0	77.0	-0.2%	164.6	165.8	-0.2%			0.0%	-0.1%
	6S-2	75.8	76.0	0.0%	206.0	209.0	-0.5%	472.9	477.6		
	P1			0.0%			0.0%			0.0%	0.0%
	P2	75.0	74.2	0.1%	198.4	199.4	-0.2%	483.0	487.6	-0.5%	-0.2%
	P3	75.0	74.4	0.1%	198.4	200.2	-0.3%	479.0	480.4	-0.1%	-0.1%
	P4	75.2	74.2	0.2%	201.2	202.4	-0.2%	476.2	473.2	0.3%	0.1%
Probe	w/c 4			0.0%			0.0%			0.0%	0.0%
	B1										
	B3	75.0	74.4	0.1%	200.8	199.8	0.2%	492.6	492.8	0.0%	0.1%
	B4	75.0	75.0	0.0%	199.2	199.4	0.0%	451.4	457.4	-0.7%	-0.2%
	B7			0.0%			0.0%			0.0%	0.0%
	B10			0.0%			0.0%			0.0%	0.0%
	B11			0.0%			0.0%	468.6	444.0	2.7%	
	B15	77.0	77.4	-0.1%			0.0%	485.6	494.0	-0.9%	-0.3%
	B16	75.0	74.2	0.1%	197.6	195.4	0.3%	481.2	474.0	0.8%	0.4%
	B17	75.0	75.0	0.0%	199.0	198.2	0.1%	472.2	469.0	0.3%	0.1%
CST	AVERAGE	78.1	77.9	0.0%	195.3	195.5	0.0%	474.4	479.7	-0.6%	-0.2%

Manometer Calibrations

Date	3/8/02	0302	File
Testers	TJH	55	Temp.(F)
Location	SHOP	30.5	Pb(in H20)
		Dwyer/bx#1	Manometer

Magnehelic ID	15 sec. High	leak check Low	Scale Inches	Guage in H20	Manometer in H20	Difference in H20	Difference %	Difference Average
SR#1 ✓	OK	OK	electronic	0.000	0.000	0.000	0.0%	
				1.000	1.000	0.000	0.0%	
				10.100	10.130	0.030	0.3%	
				28.200	28.150	-0.050	-0.2%	
				33.500	33.700	0.200	0.6%	**0.1%**
SR#2	OK	OK	electronic	0.000	0.000	-0.000	0.00%	
				1.000	1.039	0.039	3.75%	
				4.200	4.287	0.087	2.0%	
				22.500	22.640	0.140	0.62%	
				35.500	35.550	0.050	0.14%	**1.3%**
Dwyer #1	OK	OK	electronic	0.000	0.000	-0.000	0.00%	
				7.600	7.700	0.100	1.30%	
				15.000	15.020	0.020	0.1%	
				22.200	22.180	-0.020	-0.09%	
				35.500	35.640	0.140	0.39%	**0.3%**

Horizon Engineering *5031255-5050* Fax *5031255-0505*

Magnehelic Calibrations

Date	3/8/02						0302	File
Testers	TJH						55	Temp.(F)
Location	SHOP						30.5	Pb(in H2O)
							0-3Inc/MB-1	Manometer
Magnehelic ID	**15 sec. High**	**leak check Low**	**Scale Inches**	**Magnehelic in H2O**	**Manometer in H2O**	**Differance in H2O**	**Differance %**	**Differance Average**
1-A	OK	OK	1	0.300	0.300	0.000	0.0%	
				0.870	0.890	0.020	2.2%	
				0.560	0.580	0.020	3.4%	
				0.440	0.440	0.000	0.0%	1.4%
1-C	nla	n/a	1	0.000	0.000	0.000	0.0%	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
1-E	ok	ok	1	0.410	0.410	0.000	0.0%	
3/8/02				0.580	0.590	0.010	1.7%	
				0.820	0.830	0.010	1.2%	
				0.920	0.950	0.030	3.2%	1.5%
1-F	OK	OK	1	0.250	0.250	0.000	0.0%	
3/8/02				0.400	0.420	0.020	4.8%	
				0.600	0.610	0.010	1.6%	
				0.930	0.930	0.000	0.0%	1.6%
1-G	OK	OK	1	0.210	0.210	0.000	0.0%	
3/8/02				0.700	0.700	0.000	0.0%	
				0.540	0.540	0.000	0.0%	
				0.960	0.960	0.000	0.0%	0.0%
1-H	n/a	nla	1	0.000	0.000	0.000	0.0%	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
1-I	nla	nla	1	0.000	0.000	0.000	0.0%	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
1-J	OK	OK	1	0.450	0.460	0.010	0.0%	
				0.800	0.840	0.040	4.8%	
				0.670	0.690	-0.010	-1.4%	
				0.250	0.260	0.010	3.8%	1.8%
1-K	OK	OK	1	0.000	0.000	0.000	0.0%	
				0.360	0.360	0.000	0.0%	
				0.540	0.540	0.000	0.0%	
				0.940	0.930	-0.010	-1.1%	-0.3%
1-L	OK	OK	1	0.000	0.000	0.000	0.0%	
				0.200	0.200	0.000	0.0%	
				0.600	0.620	0.020	3.2%	
				0.980	1.020	0.040	3.9%	1.8%
2-A	n/a	n/a	2	0.000	0.000	0.000	0.0%	
				0.000	1.000	1.000	100.0%	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
2-B	OK	OK	2	0.900	0.910	0.010	0.0%	
				1.600	1.600	0.000	0.0%	
				1.800	1.800	0.000	0.0%	
				0.600	0.590	-0.010	-1.7%	-0.4%
2-C	OK	OK	2	0.000	0.000	0.000	0.0%	
				0.650	0.600	-0.050	-8.3%	
				1.500	1.500	0.000	0.0%	
				2.000	2.400	0.400	16.7%	2.1%
2-D	OK	OK	2	0.000	0.000	0.000	0.0%	
				0.450	0.470	0.020	4.3%	
				1.050	1.000	-0.050	-5.0%	
				1.700	1.660	-0.040	-2.4%	-0.8%
2-E	n/a	n/a	2	0.000	0.000	0.000	0.0%	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	
				0.000	0.000	0.000	ERR	ERR
2-F	OK	OK	2	0.880	0.870	-0.010	0.0%	
				1.500	1.500	0.000	0.0%	
				0.625	0.630	0.005	0.8%	
				1.780	1.750	-0.030	-1.7%	-0.2%
2-G	OK	OK	2	0.540	0.560	0.020	0.0%	
				0.930	0.960	0.030	3.1%	
				1.250	1.300	0.050	3.8%	
				1.925	2.000	0.075	3.7%	2.7%

HORIZON ENGINEERING LLC

13585 NE Whitaker Way ▪ Portland, **OR 97230**
Phone **(503) 255-5050.** Fax **(503) 255-0505**
www.horizonenqineerinq.com

January 3,2002
Horizon Engineering shop
Barometer Calibration

The Barometric pressure reported by the National Weather Service for the city of Portland was 30.28" Hg as corrected to the altitude of the Horizon Engineering shop. The barometer reading in TVIII was 30.35"Hg. The barometer reading in TVI was 30.45" Hg. The FSL independent barometer was 30.47" Hg. All pressures are absolute, read at the Horizon Engineering shop.

PTH

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD • RIVERSIDE CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

#31

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Hay
Portland OR 97230

DATE: March 5 2002

CUSTOMER ORDER NUMBER: 003427

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO:	CC70105					
			VARIAN MODEL 1860 TCD		02/14/02	
Carbon Dioxide ✓	21.74 ± 0.07%	CHIS	S/N NONE	02/14/04	21.769	
		CYUNDER #:	THERMAL CONDUCTIVITY		21.769	
		CC122859	GAS CHROMATOGRAPHY		21.709	
		@ 17.93%	LAST CAL DATE: 02/14/02	MEAN:	21.74%	
			CARLE INST MODEL 8000		02/14/02	03/01/02
Carbon Monoxide ✓	880 ± 9 ppm	GMIS	S/N 8249	03/01/04	877 ppm	819 ppm
		CYUNDER #:	METHANATION/FID		878 ppm	879 ppm
		CC28433	GAS CHROMATOGRAPHY		884 ppm	879 ppm
		@ 1107 ppm	LAST CAL DATE: 02/20/02	MEAN:	880 ppm	879 ppm
			BOVAR MODEL 922M		02/19/02	03/04/02
Nitric Oxide ✓	185.3 ± 0.9 ppm	GMIS	S/N VD92284844	03/04/04	185.9 ppm	183.7 ppm
NOx	185.3 ppm	CYUNDER #:	CONTINUOUS		186.5 ppm	184.8 ppm
Nitrogen,O2-Free	Balance	CC1839	UV PHOTOMETRY		186.3 ppm	184.6 ppm
CYLINDER PRESSURE:	2000 psig	@ 245 ppm	LAST CAL DATE: 02/19/02	MEAN:	186.2 ppm	184.4 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: _____ APPROVED: _____
B.M.MARRIN J.T.MARRIN

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE. CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

24

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: October 3 2001

CUSTOMER ORDER NUMBER: 003329

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO:	**CA03931**					
			VARIAN MODEL 1860 TCD		09/10/01	
Carbon Dioxide ✓	12.54 ± 0.06 %	GMIS	S/N NONE	09/10/03	12.53 %	
		CYLINDER #	THERMAL CONDUCTIVITY		12.59 %	
		CC122859	GAS CHROMATOGRAPHY		12.49 %	
		@ 17.93 %	LAST CAL DATE: 09/04/01	MEAN:	12.54 %	
			CARLE INST MODEL 8000		09/11/01	09/25/01
Carbon Monoxide ✓	555 ± 6 ppm	GMIS	S/N 8249	09/10/03	554 ppm	554 ppm
		CYLINDER #:	METHANATION/FID		555 ppm	556 ppm
		CC278	GAS CHROMATOGRAPHY		556 ppm	554 ppm
		@ 539 ppm	LAST CAL DATE: 09/14/01	MEAN:	555 ppm	555 ppm
			BOVAR MODEL 922M		09/18/01	10/02/01
Nitric Oxide ✓	90.3 ± 1.1 ppm	GMIS	S/N VD92284844	09/10/03	89.8 ppm	90.2 ppm
NOx	90.3 ppm	CYUNDER #:	CONTINUOUS		90.0 ppm	90.4 ppm
Nitrogen, O2-Free	Balance	CA03023	W PHOTOMETRY		90.4 ppm	90.6 ppm
CYLINDER PRESSURE:	2000 psig	@ 101.7 ppm	LAST CAL DATE: 09/18/01	MEAN:	90.1 ppm	90.4 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: Steve Kozy APPROVED:
S.B.KOZY J.T.MARRIN

The only liability of this company for gar which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

05-14,02

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: April 26 2002

#03

CUSTOMER ORDER NUMBER: 003489

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPUCATE ANALYSIS DATA
CYLINDER NO:	CC59772				
			VARIAN MODEL 1860 TCD		04/25/02
Oxygen	✓11.71 ± 0.11%	GMIS	S/N NONE	04/25/05	11.642
		CYLINDER #:	THERMAL CONDUCTIVITY		11.772
Nitrogen	Balance	CC122669	GAS CHROMATOGRAPHY		11.722
CYLINDER PRESSURE:	2000 psig	@ 10.05%	LAST CAL DATE: 04/22/02	MEAN:	11.712

ppm = µmole/mole 2 = mole-2

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: M.S.CALHOUN APPROVED: J.T.MARRIN

The only liability of this company tor gar which fails to comply with this analysis shall be replacement or reanalysis thereof by tho company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

#P11

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: August 14 2002.

CUSTOMER ORDER NUMBER: 3566

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE. MODEL. S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO: CA03454			VARIAN MODEL 1860 FID		08/05/02
Propane ✓	15.11 ± 0.13 ppm	GMIS	S/N NONE	08/05/05	15.21 ppm
		CYLINDER #:	FLAME IONIZATION		15.21 ppm
Ultrapure Air	Balance	CC122885	GAS CHROMATOGRAPHY		15.21 ppm
CYLINDER PRESSURE: 2000 psig		@ 18.01 ppm	LAST CAL DATE: 08/05/02	MEAN:	15.21 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: _____ APPROVED: _____
M.S.CALHOUN J.T.MARRIN

The only liability of this company for gas which falls to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

P19

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: October 3 2001

CUSTOMER ORDER NUMBER: 003351

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO:	CA05193				
			VARIAN MODEL 1860 FID		10/01/01
Propane	✓ 51.6 ± 0.5 ppm	GMIS	S/N NONE	10/01/04	51.4 ppm
		CYLINDER #:	FLAME IONIWTION		51.6 ppm
Ultrapure Air	Balance	CC121986	GAS CHROMATOGRAPHY		51.7 ppm
CYLINDER PRESSURE: 2000 psig		@ 50.6 ppm	LAST CAL DATE: 09/11/01	MEAN:	51.6 ppm

ppm = μmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: _____ APPROVED: _____
M.S. CALHOUN J.T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.

[illegible] RIVERSIDE, CA 92507 (909) 653-7667

REPORT OF ANALYSIS
EPA PROTOCOL GAS **MIXTURES**

*R23

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: June 5 2002

CUSTOMER ORDER NUMBER: 003515

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO:	CA05187				
			VARIAN MODEL 1860 PID		05/30/02
Propane	✓ 85.8 ± 0.9 ppm	GMIS	S/N NONE	05/30/05	85.8 ppm
		CYLINDER #:	FLAME IONIZATION		85.9 ppm
Zero Air	Balance	CC51261	GAS CHROMATOGRAPHY		85.6 ppm
CYLINDER PRESSURE:	2000 psig	@104 ppm	LAST CAL DATE: 05/30/02	MEAN:	85.8 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol. Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: _____ APPROVED: _____
M.S.CALHOUN J.T.MARRIN

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

Polar Cryogenics Inc.

Specialty Gas ■ Cryogenics Bulk Gases Liquid Helium

Certificate of Analysis

Customer: Horizon Engineering 08-12-02
Product: Air
Grade: Ultra Zero
Cylinder Number: cc101218
Lot Number: H0721301

Purity Analysis

Component	Specification	Actual Concentration	Analytical Method
Air	Ultra Zero grade	Ultra Zero grade	
Oxygen	<21 %	20.9%	GC-TCD
H_2O	< 2.0 ppm	1.9 ppm	Meeko Aquamatic
THC	< 0.1 ppm	0.08 ppm	Varian GC/MS
CO	< 1.0 ppm	0.03 ppm	Varian GC/MS
CO2	< 1.0 ppm	0.05 ppm	Varian GC/MS
NO	< 0.1 ppm	<0.1 ppm	Varian GC/MS

I certify the above referenced cylinder was analyzed and found to contain the listed concentrations.

Pamela Albert
Pamela Albert, Chemist

8-12-02
Date

Shipping Address: 2734 SE Raymond ■ Portland, Oregon 97202

FRM001-15
12-20-2000 P.O. Box 82039 ■ Portland, Oregon 97282 ■ (503) 239-5252 ■ (800)4260689 ■ Fax (503)236-0486

SCOTT-MARRIN, INC. 12-04-98

653 E BOX ELDER RD. • (909) 653-6780 • RIVERSIDE, CA 92507

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

HENGØ1

TO:

DATE: 11/38/98

STEF JOHNSON
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

CUSTOMER ORDER NUMBER: ØØ2364 of 11/3/98 = #1113

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDAR
CAØ3659	Methane	✓ 25.14 ± Ø.25 ppm	GF 5ØØ2
	Nitrogen	Balance	

ppm = umole/mole % = mole-%

The above analysis is traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed above. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analyte, NIST Weight Report No. MMAP 232.09/202491.

Analyst: H.S. Calhoun

Approved: J.T. Marrin

The only liability of this company for any which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

*52

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: March 20 2002

CUSTOMER ORDER NUMBER: 3455

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA 03/12/02	03/20/02
CYLINDER NO:	JJ12446					
			BOVAR MODEL 922M			
Sulfur Dioxide	✓ 15.15 ± 0.16 ppm	GMIS	S/N VD92284844	09/20/02	15.11 ppm	15.13 ppm
		CYLINDER #:	CONTINUOUS		15.08 ppm	15.15 ppm
Nitrogen	Balance	CC28050	W PHOTOMETRY		15.16 ppm	15.22 ppm
CYLINDER PRESSURE:	2000 psig	@ 26.71 ppm	LASTCALDATE: 03/18/02	MEAN:	15.12 ppm	15.17 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: Mark J Monson APPROVED:
M.J.MONSON J.T.MARRIN

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01

TO:

DATE : 09/13/01

David Rossman
Horizon Eng'g / Infrared NW
13585 NE Whitaker Way
Portland, OR 97230-

CUSTOMER ORDER NUMBER: 003329

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC25763	54				
			Bovar West Res Model 922		09/04/01	89/12/91
Sulfur dioxide	15.27 ±.16 ppm	GMIS	S/N 922M8379-1	03/12/02	15.23 ppm	15.14 ppm
		cylinder #	Continuous		15.34 ppm	15.24
Nitrogen	Balance	CC28050	W Photometry		15.38 ppm	15.26 ppm
Cylinder Pressure: 2002 psig		@ 26.72 ppm	Last Cal Date: 08/28/01		Mean: 15.32 ppm	15.21 ppm
CYLINDER NO.:	CC53849 [redacted]					
			Bovar West Res Model 922		09/04/01	09/12/01
Sulfur dioxide	26.96 ±.29 ppm	GMIS	S/N 922M8379-1	03/12/02	26.78 ppm	26.90 ppm
		Cylinder #	Continuous		27.01 ppm	26.95 ppm
Nitrogen	Balance	CC28050	UV Photometry		27.07 ppm	27.05 ppm
Cylinder Pressure: 2000 psig		@ 26.72 ppm	Last Cal Date: 08/28/01		Mean: 26.95 ppm	26.97 ppm

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: Mark Monson
M.J. Monson

Approved:
J.T. Marrin

The only liability of this company tor gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

QA/QC Documentation

Procedures

Gaseous Emissions Testing

NO_x Converter Efficiency Data

Interference Response Data

Audit Sample Results

Introduction The QA procedures outlined in the U. S. Environmental Protection Agency (EPA) test methods are followed, including procedures, equipment specifications, calibrations, sample extraction and handling, calculations, and performance tolerances. Many of the checks performed have been cited in the Sampling section of the report text. The results of those checks are on the applicable field data sheets in the Appendix.

Continuous Analyzer Methods Field crews operate the continuous analyzers according to the test method requirements, and Horizon's additional specifications. On site quality control procedures include:

- calibrations with EPA Protocol 1 gases or NIST traceable gases
- pre-test zero and span checks and linearity test
- bias checks (introducing calibration gas as near to the probe tip as possible)
- calibration error (linearity) checks if any analyzer adjustments are made leak checks on the gas sampling system
- correction of problems that show up as the results of checks
- strip chart recordings for backup to the electronic data acquisition system

Manual Equipment QC Procedures On site quality control procedures include pre- and post-test leak checks on trains and pitot systems. If pre-test checks indicate problems, the system is fixed and rechecked before starting testing. If post-test leak checks are not acceptable, the test run is voided and the run is repeated. Thermocouples and readouts are verified in the field to read ambient prior to the start of any heating or cooling devices. Nozzles are checked for nicks or dents and are measured on three diameters twice each year.

Sample Handling Samples taken during testing are handled to prevent contamination from other runs and ambient conditions. Sample containers are glass, Teflon™, or polystyrene (filter petri dishes) and are pre-cleaned by the laboratory and in the Horizon Engineering shop. Sample levels are marked on containers and are verified by the laboratory. All particulate sample containers are kept upright and are delivered to the laboratory by Horizon personnel.

Data Processing Personnel performing data processing double-check that data entry and calculations are correct. Results include corrections for field blanks and analyzer drift. Any abnormal values are verified with testing personnel and the laboratory, if necessary.

After results are obtained, the data processing supervisor validates the data with the following actions:

- verify data entry
- check for variability within replicate runs
- account for variability that is not within performance goals (check the method, testing, and operation of the plant)
- verify field quality checks

Equipment Calibrations Periodic calibrations are performed on each piece of measurement equipment according to manufacturers' specifications and applicable test method requirements. The Oregon Department of Environmental Quality (ODEQ) Source Testing Calibration Requirements sheet is used as a guideline. Calibrations are performed using primary standard references and calibration curves where applicable.

Thermocouples Thermocouples are calibration checked against an NIST traceable thermocouple and indicator system every six months at three points. Thermocouple indicators and temperature controllers are checked using a NIST traceable signal generator. Readouts are checked over their usable range and are adjusted if necessary (which is very unusual).

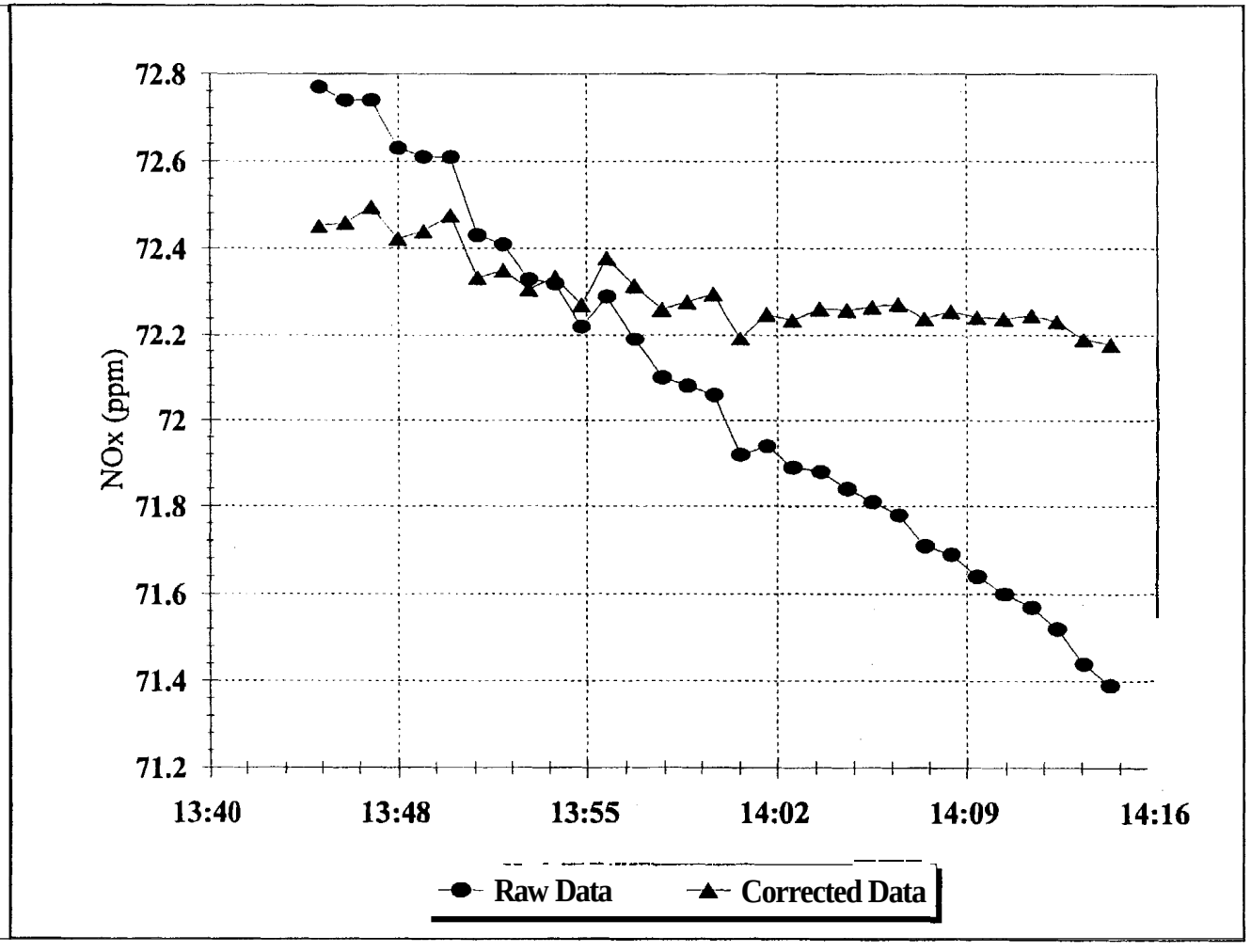
Pitots Every six months, S-type pitots are checked for misalignment, angles, lengths, and proximity to thermocouples. They are then calibrated in a wind tunnel at four points against a standard pitot using inclined manometers. They are examined for dents or distortion before each test. Pitots are protected with covers during storage and handling until they are ready to be inserted in the sample ports.

Dry Gas Meters Dry gas meters used in the manual sampling trains are calibrated at five rates using a standard dry gas meter that is never take'n into the field. The standard meter is calibration verified by the Northwest Natural Gas meter shop once every year. Dry gas meters are post-test calibrated with documentation provided in test reports.

High Volume Sampler **Orifice** The orifice for the High Volume sampler is calibrated annually against a positive displacement (Roots type) flow meter, two or more trials at six flow rates. The Roots meter came with a manufacturer's calibration curve and has been calibration checked by the Northwest Natural Gas meter shop.

NOx Converter Efficiency Data

NOx Converter Efficiency Test
Thermo Environmental Model 42C
13-Mar-2002
bg



	Raw Data	Corrected
Percent Loss=	1.90	0.44
	PASS	PASS

Bottle Value		Pretest	Post test
	Time	13:45	14:16
182.30	Span	183.10	180.19
89.4	Mid	91.55	86.78
0.00	Zero	0.00	0.02
200	Scale		

Day	time	NOx	NOx Corrected
03/13	13:45	72.77	72.45
03/13	13:46	72.74	72.46
03/13	13:47	72.74	72.50
03/13	13:48	72.63	72.42
03/13	13:49	72.61	72.44
03/13	13:50	72.61	72.48
03/13	13:51	72.43	72.33
03/13	13:52	72.41	72.35
03/13	13:53	72.33	72.31
03/13	13:54	72.32	72.33
03/13	13:55	72.22	72.27
03/13	13:56	72.29	72.38
03/13	13:57	72.19	72.31
03/13	13:58	72.1	72.26
03/13	13:59	72.08	72.28
03/13	14:00	72.06	72.30
03/13	14:01	71.92	72.19
03/13	14:02	71.94	72.25
03/13	14:03	71.89	72.24
03/13	14:04	71.88	72.26
03/13	14:05	71.84	72.26
03/13	14:06	71.81	72.27
03/13	14:07	71.78	72.27
03/13	14:08	71.71	72.24
03/13	14:09	71.69	72.26
03/13	14:10	71.64	72.24
03/13	14:11	71.6	72.24
03/13	14:12	71.57	72.25
03/13	14:13	71.52	72.23
03/13	14:14	71.44	72.19
03/13	14:15	71.39	72.18

HORIZON ENGINEERING
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Calibration Field Record

Client: Internal
Test Date: 3.13.02
Source: 42-C

Tester: TH / BG
Observer: ME
Logger ID: ESC-1

GO STOP

Cart ~ ME: Pre-OK Post-OK Response Tin.	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	Start Run / System Calibration Response (SCRs)	End Run / Start Run / System Calibration Response (SCRs)	End Run / Start Run / System Calibration Response (SCRs)	End Run / System Calibration Response (SCRs)
Times					13:19	13:26		14:21	
CO2 % ch___			CO2						
Range			CO2						
Analyzer Model			N2						
Analyzer SN:									
CO ppm ch___			CO						
Range			CO						
Analyzer Model			N2						
Analyzer SN:									
O2% ch___			O2						
Range			O2						
Analyzer Model			N2						
Analyzer SN:									
NO ppm ch___		0-5	NOx	192.3	181.6			179	
Range 0-200		Z4	NOx	89.4	97.7			86.79	
Analyzer Model 42C		Z6	N2	0.0	0.1747			0.02	
Analyzer SN: 39									
TGOC ppm ch___									
Range									
Analyzer Model									
Analyzer SN:			Air						
NO2 ch___									
Range 0-200		25		1.0	1.5			1.192	
Analyzer Model 42-C		Z4		1.0	0.85			-0.015	
Analyzer SN: 39		Z5		0.0	0			-0.005	

Check		Performance Specs	
Analyzer Calibration Error	|ACR-CV| / SPAN	2 (25A @ 5%)	Hot Line Temp
Sampling System Bias	(SRC1-ACR) /SPAN	5	Hot Line Temp
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3	

Test Times	Run 1	Run 2	Run 3
Start Time			
End Time			

HORIZON ENGINEERING LLC

13585 NE Whitaker Way • Portland, OR **97230**
Phone **(503) 255-5050** • **Fax (503) 255-0505**
www.horizonengineering.com

INTERFERENCE RESPONSE TEST

Date of Test :3/04/02 & 4/01/02 Name: Brian Galvin, Tim Hertel
Analyzer: Type / Model: TGOC Calif. Analytical 300M Serial Number: 000114

Results:

Test Gas	Concentration, ppmv or % (specify)	Analyzer Output Response, ppmv	% of analyzer span
SO_2	170.3 ppmv	-1.0	0.3
O_2	20.95%	0.0	0.0
*CO_2	10.3%	1.9	0.6
**CO	540 ppmv	0	0

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N_2 to get a concentration of 10.3% CO_2.

*Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of CO to be about 540 ppm.

Attachments:
Field Data
Calibration Gas Certificates

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO, was slightly lower than listed; 170.3 ppm was the closest concentration cylinder available at the time of the interference checks.

Calibration Field Record

Client Internal
Date 3.4.02
Source shop

Tester BG / LH
Observer
Data Logger ID Gilf 300M HF #114

CO Ambient SO_2

Leak Checks: Pre-CK / Post-CK / Response Time	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	R12 Start Run / System Calibration Response (SCRs)	End Run / Start Run / System Calibration Response (SCRs)	End Run / Start Run / System Calibration Response (SCRs)	CO_2 End Run / System Calibration Response (SCRs)	En.
Times					12:04	85.9 ppm	20.95%	170.3 ppm	10%	
CO2 % ch___			CO2			12:06	12:07	12:09	12:11	12:1
Range			CO2							
Analyzer Model			N2							
Analyzer SN:										
CO ppm ch___			CO							
Range			CO							
Analyzer Model			N2							
Analyzer SN:										
O2% ch___			O2							
Range			O2							
Analyzer Model			N2							
Analyzer SN:										
NOx ppm ch___			NOx							
Range			NOx							
Analyzer Model			N2							
Analyzer SN:										
TGOC ppm ch___										
Range										
Analyzer Model										
Analyzer SN:			Air							
HFID ch___				THC						
Range 0-300		P23	Fuel	267.6	267					266
Analyzer Model Gilf						-1.0	0.0	-1.0	1.9	
Analyzer SN: 114		A-4	Air	20.95%	0.0					-.8

Check	Performance Specs			
Analyzer Calibration Error	|ACR-CV| / SPAN	2 (25A @ 5%)	Hot Line Temp	
Sampling System Bias	(SRCs-ACR) /SPAN	5	Hot Line Temp	
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3		

Test Times	Run 1	Run 2	Run 3
Start Time			
End Time			

HORIZON ENGINEERING

Interference Checks

Date 4/1/02				CO2	CO	SO2	O2	
Tester TJH			Pre-	#5-100% mix	C3-5%mix	S5	A3	Post-
		Cylinder	Direct	w/nitrogen	w/nitrogen			Direct
	Cylinder #	Value	Instrument		540	170.3	20.9	Instument
Time			1240		1252			1305
Gas: NO_x Range 0-200	37	183	183.0					183.1
Model 42H					0.62			
Serial # 001	ZZ	0.0	0.51					0.61
Gas: NOC Range 0-100	P22	89.0	89					89
Model VE7					0.5			
Serial # 089	A4	0	0					0
Gas: NOC Range 0-100	P22	266.0	266					266
Model 300M					0			
Serial # 414	A4	0	0					0
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								

HORIZON ENGINEERING LLC
13585 NE Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

INTERFERENCE RESPONSE TEST

Date of Test : 1/09/02& 4/1/02 Name: Mike Eisele & Jay Griffith
Analyzer: Type / Model: VOC / J.U.M. VE-7 Serial Number: 000090

Test Gas	Concentration, ppmv or % (specify)	Analyzer Output Response, ppm	% of span
SO_2	170.3ppm	0	0
O_2	20.95%	0	0
*CO_2	9.7%	0	0
**CO	540	1.0	1

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N_2 to get a concentration of 10% CO_2.

*Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of CO to be about 540 ppm.

Attachments:
Field Data
Calibration Gas Certificates

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO_2 was slightly lower than listed; 170.3ppm was the closest concentration cylinder available at the time of the interference checks.

Gas Interference Checks
BG/MJE
01/09/2002

System Calibration Time - Initial		Tci	14:00	14:00	14:00	14:00
Test rime-Starring		Tts	14:03	14:05	14:20	15:04
Test rime-Ending		Tte	14:04	14:06	14:21	15:05
System Calibration Time - Final		Tcf	15:18	15:18	15:18	15:18
Test Mid-point Time		Tx	14:03	14:05	14:20	15:04
Interferent Gas			SO2	CO	O2%	CO2%
Interferent Gas Concentration			170.30	85.90	20.95	10.00
JUM #000089		Span	100	100	100	100
Indicated average - Dry	ppmv-C3	Cid	0	0	0	1
Cylinder Value - High Range calibration gas	pprnv-C3	Cma	27.95	27.95	27.95	27.95
Cylinder Value - Low Range (Zero) calibration gas	ppmv-C3	Coa	0	0	0	0
System Calibration Response - High Range gar, - Initial	ppmv-C3	Crni	28	28	28	28
System Calibration Response - Low Range gas - Initial	ppmv-C3	Coi	0	0	0	0
System Calibration Response - Low Range gar, - Final	ppmv-C3	Cof	1	1	1	1
System Calibration Response - High Range gar, - Final	ppmv-C3	Cmf	27.5	27.5	27.5	27.5
Actual average - Dry (Corrected for Drift)-Interference	ppmv-C3	Cgas	**-0**	**-0**	**-0**	**0**
JUM #000090		Span	100	100	100	100
Indicared average - Dry	ppmv-C3	Cid	0	0	0	1
Cylinder Value - High Range calibration gas	ppmv-C3	Cma	27.95	27.95	27.95	27.95
Cylinder Value - Low Range (Zero) calibration gas	ppmv-C3	Coa	0	0	0	0
System Calibration Response - High Range gas - Initial	ppmv-C3	Cmi	28	28	28	28
System Calibration Response - Low Range gas - Initial	ppmv-C3	Coi	0	0	0	0
System Calibration Response - Low Range gas - Final	ppmv-C3	Cof	1	1	1	1
System Calibration Response - High Range gas - Final	ppmv-C3	Cmf	28	28	28	28
Actual average - Dry (Corrected for Drift)-Interference	ppmv-C3	Cgas	**-0**	**-0**	**-0**	**0**
NOx VIA 500		Span	500	500	500	500
Indicated average - Dry	ppmv-NOx	Cid	0.0	0.0	1.0	1.0
Cylinder Value - High Range calibration gas	ppmv-NOx	Cma	49.9	49.9	49.9	49.9
Cylinder Value - Low Range (Zero) calibration gas	ppmv-NOx	Coa	0	0	0	0
System Calibration Response - High Range gas - Initial	ppmv-NOx	Crni	50	50	50	50
System Calibration Response - Low Range gas - Initial	ppmv-NOx	Coi	0	0	0	0
System Calibration Response - Low Range gas - Final	ppmv-NOx	Cof	0	0	0	0
System Calibration Response - High Range gas - Final	ppmv-NOx	Cmf	49	49	49	49
Actual average - Dry (Corrected for Drift)-Interference	ppmv-NOx	Cgas	**0**	**0**	**1**	**1**
NOx Beckman 951a		Span	~~500~~ 250	~~500~~ 250	~~250~~ 250	~~500~~ 250
Indicated average - Dry	ppmv-NOx	Cid	0.0	0.0	0.0	0.5
Cylinder Value - High Range calibration gas	ppmv-NOx	Cma	49.9	49.9	49.9	49.9
Cylindcr Value - Low Range (Zero) calibration gar,	ppmv-NOx	Coa	0.0	0.0	0.0	0.0
System Calibration Response - High Range gas - Initial	ppmv-NOx	Crni	50.0	50.0	50.0	50.0
System Calibration Response - Low Range gar, - Initial	ppmv-NOx	Coi	0.0	0.0	0.0	0.0
System Calibration Response - Low Range gar, - Final	ppmv-NOx	Cof	0.0	0.0	0.0	0.0
System Calibration Response - High Range gas - Final	ppmv-NOx	Cmf	49.5	49.5	49.5	49.5
Actual average - Dry (Corrected for Drift)-Interference	ppmv-NOx	Cgas	**0.0**	**0.0**	**0.0**	**0.5**
TECO 51 #000091		Span	100	100	100	100
Indicated average - Dry	pprnv-C3	Cid	0.5	0.6	0.7	1.1
Cylinder Value - High Range calibration gas	ppmv-C3	Cma	28.0	28.0	28.0	28.0
Cylinder Value - Low Range (Zero) calibration gas	ppmv-C3	Coa	0.0	0.0	0.0	0.0
System Calibration Response - High Range gas - Initial	ppmv-C3	Crni	29.6	29.6	29.6	29.6
System Calibration Response - Low Range gas - Initial	ppmv-C3	Coi	0.7	0.7	0.7	0.7
System Calibration Response - Low Range gas - Final	ppmv-C3	Cof	0.5	0.5	0.5	0.5
System Calibration Response - High Range gas - Final	ppmv-C3	Crnf	28.3	28.3	28.3	28.3
Actual average - Dry (Corrected for Drift)-Interference	ppmv-C3	Cgas	**-0.2**	**-0.1**	**0.1**	**0.6**

Calibration Field Record

Client Internal Gas Interference Checks
Date 1.9.02
Source SRP

Tester BG/MJE
Observer
Data Logger ID BG/MJE

Leak Checks: Pre-OK Post-OK Response Time	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	14:03 Start Run / System Calibration Response (SCRs)	14:55 End Run / Start Run / System Calibration Response (SCRs)	15:20 End Run / Start Run / System Calibration Response (SCRs)	15:04 End Run / System Calibration Response (SCRs)	15:19 En
Times					1400	SC_2 170.3	CO 95.9	O_2 20.95	CO_2 1.03	
CO2 ch___		13	[illegible]	27.95	28					27.
Range C-1.0			CO2			0	0	0	1	
Analyzer Model Thm		26	N2	0	0					1
Analyzer SN: 000089										
CO ch___		13	[illegible]	27.95	28					28
Range C-100			CO			0	0	0	1	
Analyzer Model Thm		26	N2	0	0					1
Analyzer SN: 000090										
NOx ch___ VIA 300		13	O2	49.9	50					49
Range 0-500			O2			0	0	1	1	
Analyzer Model [illegible]		26	N2							0
Analyzer SN:										
NOx ppm ch___ Beckman 951A		13	NOx	49.9	50					49.
Range 0-250			NOx			0	0	0	.5	0
Analyzer Model Beckman		26	N2	0	0					0
Analyzer SN:										
TGOC ppm ch___		13		27.95	29.6					29.
Range Teco 51 C-100						0.5	0.6	0.7	1.1	
Analyzer Model Teco 51										.5
Analyzer SN: 000091		26	Air	C	0.7					
ch___										
Range										
Analyzer Modal										
Analyzer SN:										

Check		Performance Specs	
Analyzer Calibration Error	|ACR-CV| / SPAN	2 (25A @ 5%)	Hot Line Temp
Sampling System Bias	(SRCx-ACR) /SPAN	5	Hot Line Temp
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3	

Test Times	Run 1	Run 2	Run 3
Start Time			
End Time			

HORIZON ENGINEERING

12965 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-6050 • Fax (503) 255-0505
www.horizonengineering.com

Interference Checks

Date	3/27/02				C02	CO	SO2	O2	
Tester	JKG			Pre-Direct Instrument	#5-100% mix w/nitrogen	C3-5%mix w/nitrogen	S5	(A3	Post-Direct Instument
		Cylinder #	Cylinder Value			540 ppm	170.31	20.9	
Time	1310								
Gas: Range	100	A-4	0.0	0.0		1.0			0.0
Model	VE7	P22	89.0	89.0					89.0
Serial #	90								
Gas: Hange									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Hange									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Kange									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Range									
Model									
Serial #									
Gas: Range									
Model									
Serial #									

HORIZON ENGINEERING LLC

13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

INTERFERENCE RESPONSE TEST

Date of Test : 3/13/02 Name: Tim Hertel
Analyzer: Type / Model: NO_x Thermo Env. 42C Serial Number: 000039

Results:

Test Gas	Concentration, ppmv or % (specify)	Analyzer Output Response, ppmv	% of analyzer span
SO_2	170.3 ppmv	0.08	0.0
O_2	20.9%	0.07	0.0
*CO_2	9.1%	0.13	0.0
**CO	540 ppmv	0.07	0.0

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N_2 to get a concentration of 9.1% CO_2.

**Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of CO to be about 540 ppm.

Attachments:
Field Data
Calibration Gas Certificates

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO_2 was slightly lower than listed; 170.3 ppm was the closest concentration cylinder available at the time of the interference checks.

HORIZON ENGINEERING
13665 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-6030 • Fax (503) 255-0505
www.horizonengineering.com

Interference Checks

				CO2	CO	SO2	O2	
Date 3/13								
Tester DH			Pre-	#5-100% mix	C3-5%mix	S5	A3	Post-
		Cylinder	Direct	w/nitrogen	w/nitrogen			Direct
	Cylinder #	Value	Instrument	9.1%	5.40	170.3	20.9	Instument
Time			1242	1254	1256	1304	1302	1306
Gas: CO Range 1000	32	867	872					865
Model 48				-0.7	5.40	-0.5	0.0	
Serial # 60	26	0	0.3					-0.0
Gas: Nox Range 200	32	182.3	179.0					178.5
Model 42C				0.13	0.07	0.08	0.07	
Serial # 39	26	0	0.29					0.03
Gas: O2 Range 25	A3	20.9	20.9					
Model 1400				0.0	0.0	0.0	20.9	
Serial # 36	26	0	0.0					0.0
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								

HORIZON ENGINEERING LLC
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

INTERFERENCE RESPONSE TEST

Date of Test : 3/07/02 Name: Tim Hertel
Analyzer: Type / Model: O_2/Servomex 1400 Serial Number: 000013

Results:

Test Gas	Concentration, ppmv or % (specify)	Analyzer Output Response, %	% of analyzer span
SO_2	170.3 ppmv	0.0	0
O_2	20.95%	20.9	0
**CO_2	10%	0.0	0
*CO	512 ppmv	0.0	0

*Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of CO to be about 512 ppm.

**Used bottle of CO, at 100% concentration and diluted it with 100% N_2 to get a concentration of 10% CO_2.

Attachments:
Field Data
Calibration Gas Certificates

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO, was slightly lower than listed; 170.3 ppm was the closest concentration cylinder available at the time of the interference checks.

HORIZON ENGINEERING

13555 NE Whitaker Way • Portland, OR 97230
Phone (503) 256-6200 • Fax (503) 256-6205
www.horizonengineering.com

Interference Checks

Date 3/7/02 Tester TJH				CO2	CO	SO2	O2	
			Pre-	#5-100% mix	C3-5%mix	S5	A3	Post-
		Cylinder	Direct	w/nitrogen	w/nitrogen			Direct
	Cylinder #	Value	Instrument			170.3	20.9	Instument
Time			1256					1320
Gas: O2 Range 0-25%	A3	20.9	20.9					20.9
Model 1400					0.0			
Serial # 113	27	0	0.0					0.0
Gas: CO2 Range 0-25	37	21.66	21.7					21.6
Model 1400					0.0			
Serial # 166	27	0	0.0					0.1
Gas: CO Range 0-1000	37	882	889					886
Model 5E					545			
Serial # 115	27	0	1.0					6.0
Gas: CO Range 0-1000	37	882	882					882
Model PIR 2000					523			
Serial # 005	27	0	0					-1.0
Gas: CO Range 0-1000	33	881	882					883
Model 48				0.1	512	0.5	0.5	
Serial # 010	23	0	0.4					0.5
Gas: SO2 Range 180	55	170.3	170.8					170.9
Model 721M				0.1	0.8	170.9	0.3	
Serial # 003	23	0	0.1					0.6
Gas: O2 Range 25%	33	21.73	21.7					21.7
Model 1400				9.9	0.0	0.0	0.0	
Serial # 037	23	0	0.0					0.0
Gas: O2 Range 25	A3	20.9	20.9					20.9
Model 1400				0.0	0.0	0.0	20.9	
Serial # 013	23	0	0.0					0.0
Gas: SO2 Range 180	55	170.3	170.0					170.0
Model 900				0.0	0.6	170.0	0.0	
Serial # 004	23	0	0.1					0.1
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								

HORIZON ENGINEERING LLC

13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

INTERFERENCE RESPONSE TEST

Date of Test : 1/25/02 Name: Mike Eisele
Analyzer: Type / Model: CO / Thermo Env. 48 Serial Number: 000049

Test Gas	Concentration, ppmv or % (specify)	Analyzer Output Response, ppm	% of span
SO_2	170.3 ppm	0	0.0
O_2	20.95 %	-0.1	0.01
*CO_2	9.7%	0	0.0

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N_2 to get a concentration of 9.7% CO_2.

Attachments:
Field Data
Calibration Gas Certificates

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO, was slightly lower than listed; 170.3 ppm was the closest concentration cylinder available at the time of the interference checks.

Calibralion Field Record

Client HORIZON ENG
Date 11/25/02
Source T8

Tester JE
Observer
Data Logger ID

Leak Checks: Pre-OK / Post-OK / Response Time	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	12:45 Start Run / System Calibration Response (SCRx)	12:50 End Run / Start Run / System Calibration Response (SCRx)	2:54 End Run / Start Run / System Calibration Response (SCRx)	End Run / System Calibration Response (SCRx)	1307
Times					12:20	O2 AFO	SO2 170.3	CO2 42 CO% CO, 36 NO% N2	CO	
CO2 % ch___			CO2							
Range			CO2							
Analyzer Model			N2							
Analyzer SN:										
CO ppm ch___		34	CO	780	875					872
Range 0-1000			CO			1.5	1.6	1.6	NA	
Analyzer Model Teco 48		26	N2	0.0	1.7					1.6
Analyzer SN: 0000479										
O2% ch___			O2							
Range			O2							
Analyzer Model			N2							
Analyzer SN:										
NOx ppm ch___			NOx							
Range			NOx							
Analyzer Model			N2							
Analyzer SN:										
TGOC ppm ch___										
Range										
Analyzer Model										
Analyzer SN:			Air							
ch___										
Range										
Analyzer Model										
Analyzer SN:										

Check	Performance Specs		
Analyzer Calibration Error	| ACR-CV | / SPAN	2 (25A @ 5%)	Hot Line Temp ____
Sampling System Bias	(SRCx-ACR) /SPAN	5	Hot Line Temp ____
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3	

Test Times	Run 1	Run 2	Run 3
Start Time			
End Time			

Gas Interference Checks
BG/MJE
01/25/2002

System Calibration Time - Initial		Tci	12:20	12:20	12:20
Test Time-Starting		Tts	12:45	12:50	12:54
Test Time-Ending		Tte	12:47	12:52	12:56
System Calibration Time - Final		Tcf	13:07	13:07	13:07
Test Mid-point Time		Tx	12:46	12:51	12:55
Jnterferent Gas			O2	SO2	CO2%
Interferent Gas Concentration			20.95	170.30	10% ???????
TECO 48 **#TV1**		Span	880	880	880
Indicated average - **Dry**	ppmv-co	Cid	1.5	1.6	1.6
Cylinder Value - High Range calibration gas	ppmv-CO	Cma	880.0	880.0	880.0
Cylinder Value - Low Range (Zero) calibration gas	ppmv-CO	Coa	0.0	0.0	0.0
System Calibration Response - High Range gas - Initia	ppmv-CO	Cmi	875.0	875.0	875.0
System Calibration Response - Low Range gas - Initia	ppmv-CO	Coi	1.7	1.7	1.7
System Calibration Response - Low Range gas - Final	ppmv-CO	Cof	1.6	1.6	1.6
System Calibration Response - High Range gas - Final	ppmv-CO	Cmf	872.0	872.0	872.0
Actual average - Dry (Corrected for Drift)-Interferenc	ppmv-CO	Cgas	**-0.1**	**-0.0**	**-0.0**

HORIZON ENGINEERING LLC

13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

INTERFERENCE RESPONSE TEST

Date of Test : 3/07/02 Name: Tim Hertel
Analyzer: Type / Model: CO_2/Servomex 1400 Serial Number: 000037
Results:

Test Gas	Concentration, ppmv or % (specify)	Analyzer Output Response, %	% of analyzer span
SO_2	170.3ppmv	0.0	0
O_2	20.95%	0.0	0
**CO_2	10%	9.9	0.4
*CO	512 ppmv	0.0	0

*Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of CO to be about 512 ppm.

**Used bottle of CO, at 100% concentration and diluted it with 100% N_2 to get a concentration of 10% CO_2.

Attachments:
Field Data
Calibration Gas Certificates

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO, was slightly lower than listed; 170.3 ppm was the closest concentration cylinder available at the time of the interference checks.

HORIZON ENGINEERING
13555 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-6050 • Fax (503) 255-0505
www.horizonengineering.com

Interference Checks

Date 3/7/02				CO2	CO	SO2	O2	
Tester KJH			Pre-	#5-100% mix	C3-5%mix	S5	A3	Post-
		Cylinder	Direct	w/nitrogen	w/nitrogen			Direct
	Cylinder #	Value	Instrument			170.3	20.9	Instument
Time			1256					1320
Gas: O2 Range 0-25%	A3	20.9	20.9					20.9
Model 1400					0.0			
Serial # 113	27	0	0.0					0.0
Gas: CO2 Range 0-25	37	21.66	21.7					21.6
Model 1400					0.0			
Serial # 166	27	0	0.0					0.1
Gas: CO Range 0-1000	37	442	449					886
Model 5E					545			
Serial # 115	27	0	1.0					6.0
Gas: CO Range 0-1000	37	442	442					442
Model PIR 2000					523			
Serial # 005	27	0	0					-1.0
Gas: CO Range 0-1000	33	881	882					883
Model 48				0.1	512	0.5	0.5	
Serial # 010	23	0	0.4					0.5
Gas: SO2 Range 180	55	170.3	170.8					170.9
Model 721M				0.1	0.8	170.9	0.3	
Serial # 003	23	0	0.1					0.6
Gas: O2 Range 26%	33	21.73	21.7					21.7
Model 1400				9.9	0.6	0.0	0.0	
Serial # 037	23	0	0.0					0.0
Gas: O2 Range 25	A3	20.9	20.9					20.9
Model 1400				0.0	0.0	0.0	20.9	
Serial # 013	23	0	0.0					0.0
Gas: SO2 Range 180	55	170.3	170.6					170.0
Model 900				0.0	0.6	170.0	0.0	
Serial # 004	23	0	0.1					0.1
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Range								
Model								
Serial #								
Gas: Hange								
Model								
Serial #								

SCOTT-MARRIN, INC.
6[illegible] RIVERSIDE, CA 92507-2780 • RIVERSIDE (909) 653-2530

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

#33

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: October 3 2001

CUSTOMER ORDER NUMBER: 003329

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO:	CC114966					
			VARIAN MODEL 1860 TCD		09/11/01	
Carbon Dioxide	21.73 ± 0.04 %	GMIS	S/N NONE	09/11/03	21.70 %	
		CYLINDER #:	THERMAL CONDUCTIVITY		21.75 %	
		CC122859	GAS CHROMATOGRAPHY		21.74 %	
		@ 17.93 %	LAST CAL DATE: 09/04/01	MEAN:	21.73 %	
			CARLE INST MODEL 8000		09/17/01	09/25/0
Carbon Monoxide	881 ± 9 ppm	GMIS	S/N 8249	09/11/03	884 ppm	878 ppm
		CYLINDER #:	METHANATION/FID		881 ppm	881 ppm
		CC108729	GAS CHROMATOGRAPHY		878 ppm	883 ppm
		@ 1107 ppm	LAST CAL DATE: 09/14/01	MEAN:	881 ppm	881 ppm
			BOVAR MODEL 922W		09/18/01,	10/02/0
Nitric Oxide	182.7 ± 0.9 ppm	GMIS	S/N VD92284844	09/11/03	183.2 ppm	182.2 pp
NOx	182.7 ppm	CYLINDER&	CONTINUOUS		183.2 ppm	182.1 pp
Nitrogen,O2-Free	Balance	CC104211	UV PHOTOMETRY		183.4 ppm	182.0 pp
CYLINDER PRESSURE:	2000 psig	@ 299.2 ppm	LAST CAL DATE: 09/18/01	MEAN:	183.3 ppm	182.1 pp

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: Steve Kozy S.B.KOZY APPROVED: J.T.MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

#55

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01

TO:

DATE : 12/20/01

David Rossman
Horizon Engineering/InfraredNW
13585 NE Whitaker way
Portland, OR 97230-

CUSTOMER ORDER NUMBER: 083392

PAGE 1

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	XC006167B				
			Bovar West Res Model 922		12111 12/18/
sulfur dioxide	178.3 ±1.7 ppm	GMIS	S/N 922M8379-1	12/18/03	178.4 ppm 169.9 p
		Cylinder #	Continuous		171.4 ppm 171.2 p
Nitrogen	Balance	CC78121	UV Photometry		178.7 ppm 178.3 p
Cylinder Pressure: 2000 paig		@ 277.2 ppm	Last Cal Date: 12/11/11		Mean: 178.5 ppm 178.1 p

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with procedure G1 of the EPA Traceabilit
Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: Mark J Monson

M.J. Monson

Approved:

J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

#C-3
Very
High

MIXTURE Serial # CC42756

DOT Shipping Name: Compressed Gasses, N.O.S., UN1956
(Carbon Monoxide, Nitrogen)

Grade: Certified Standard
5% Carbon Monoxide
95% Nitrogen

Filled for Horizon Engineering 5/23/95 Vers. 1.2

Pacific Airgas Inc. Portland Oregon

SCOT MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

#E34

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01

TO:

10-30-01

DATE : 10/24/00

DAVID ROSSMAN
HORIZON ENGINEERING
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

CUSTOMER ORDER NUMBER: 003106

COMPONENT	CONCENTRATION (v/v) +/- EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DAT
CYLINDER NO.:	CC53888				
			Varian Model 1860		10/24/00
Carbon dioxide	21.70 ±.04 %	GMIS	S/N None	10/24/02	21.68 %
		Cylinder #	Thermal Conductivity		21.69 %
		CC122859	Gas Chromatography		21.74 %
		@ 17.93 %	Last Cal Date: 09/26/00	Mean:	21.70 %
			Bovar West Res Model 922		10/16/00
Nitric oxide	182.2 ±.9 ppm	GMIS	S/N VD92284841	10/24/02	182.7 ppm
NOx	182.2 ppm	Cylinder #	Continuous		182.8 ppm
		CC72878	UV Photometry		182.5 ppm
		@ 258.5 ppm	Last Cal Date: 10/16/00	Mean:	182.7 ppm
			Carle Instr Model 8000		10/11/00
Carbon monoxide	880 ±10 ppm	GMIS	S/N 8249	10/20/02	878 ppm
		Cylinder #	Methanation/FID		880 ppm
		CC108729	Gas Chromatography		882 ppm
		@ 1U7 ppm	Last Cal Date: 10/19/00	Mean:	880 ppm
			Varian Model 1860		10/13/00
Propane	87.3 ±1 ppm	GMIS	S/N None	10/13/02	87.5 ppm
		Cylinder #	Flame Ionization		87.2 ppm
Nitrogen, O2-Free Balance		CC51261	Gas Chromatography		87.2 ppm
Cylinder Pressure: 2000 psig		@ 184.1 ppm	Last Cal Date: 10/12/00	Mean:	87.3 ppm

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceabilit
Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: _____ Approved: _____

M.S. Calhoun J.T. Marrin

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

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

#32

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Wry
Portland OR 97230

DATE: October 3 20(

CUSTOMER ORDER NUMBER: *003303*

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DAT	
CYUNDER NO:	CC70025					
			VARIAN MODEL 1160 TCD		09/11/01	
Carbon Dioxide	21.72 ± 0.04 %	GMIS	S/N NONE	09/11/03	21.72 %	
		CYUNDER #:	THERMAL CONDUCTIVITY		21.72 %	
		CC122859	GAS CHROMATOGRAPHY		21.72 %	
		@ 17.93 1	LAST CAL DATE: 09/04/01	MEAN:	21.72 %	
			CARLE INST MODEL 8000		09/17/01	09/25
Carbon Monoxide	867 ± 9 ppm	GMIS	S/N 8249	09/11/03	868 ppm	868 1
		CYLINDER #:	METHANATION/FID		866 ppm	867 1
		CC108729	GAS CHROMATOGRAPHY		868 ppm	865 1
		@ 1107 ppm	LAST CAL DATE: 09/14/01	MEAN:	867 ppm	867 1
			BOVAR MODEL 922M		09/18/01	10/02
Nitric Oxide	182.3 ± 1.0 ppm	GMIS	S/N VD92284844	09/11/03	182.1 ppm	182.0
NOx	182.3 ppm	CYLINDER #:	CONTINUOUS		182.4 ppm	182.3
Nitrogen,O2-Free	Balance	CC104211	UV PHOTOMETRY		182.8 ppm	182.3
CYLINDER PRESSURE:	2000 psig	@ 299.2 ppm	LAST CAL DATE: 09/18/01	MEAN:	182.4 ppm	182.2 1

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used it the pressure is less than 150 psig.

ANALYST: Steve Kozy S.B.KOZY APPROVED: T.T.MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or refractyals thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

P22

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: October 3 2001

CUSTOMER ORDER NUMBER: 003351

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYUNDER NO: CA05171					
			VARIAN MODEL 1860 FID		10/01/01
Propane	89.0 ± 0.9 ppm	GMIS	S/N NONE	10/01/04	89.1 ppm
		CYLINDER #:	FLAME IONIZATION		89.0 ppm
Zero Air	Balance	CC51261	GAS CHROMATOGRAPHY		89.0 ppm
CYLINDER PRESSURE: 2000 psig		@ 104 ppm	LAST CAL DATE: 09/11/01	MEAN:	89.0 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: M.S. CALHOUN APPROVED: J.T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
4531 SOUTH SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-8780 • FAX (909) 653-2430

#13

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01
TO: DAVID ROSSMAN
HORIBA ENGINEERING
INFRARED NORTHWEST
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

DATE : 11/16/00

CUSTOMER ORDER NUMBER: 003147

PAGE 1

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CA01182					
			Varian Model 1868		11/08/00	
Carbon dioxide	6.05 ± .07 %	CMIS	S/N None	11/08/02	6.08 %	
		Cylinder #	Thermal Conductivity		6.02 %	
		CC42814	Gas Chromatography		6.04 %	
		@ 8.81 %	Last Cal Date: 10/23/00	Mean:	6.05 %	
			Rosemount Model 922		11/09/00	11/16/00
Nitric oxide	49.9 ±.4 ppm	CMIS	S/N WOS2204841	11/16/02	50.1 ppm	50.2 ppm
NOx	49.9 ppm	Cylinder #	Continuous		49.3 ppm	49.7 ppm
		CC180765	UV Photometry		50.1 ppm	49.8 ppm
		@ 50.3 ppm	Last Cal Date: 11/09/00	Mean:	49.8 ppm	49.9 ppm
			Carle Insts Model 8000		11/08/00	11/15/00
Carbon monoxide	295.4 ±3 ppm	CMIS	S/N 8149	11/15/02	294.6 ppm	295.5 ppm
		Cylinder #	Methanation/FID		294.7 ppm	295.4 ppm
		CC42843	Gas Chromatography		296.0 ppm	296.1 ppm
		@ 296.7 ppm	Last Cal Date: 10/19/00	Mean:	295.1 ppm	295.7 ppm
			Varian Model 1868		11/07/00	
Propane	27.95 ±.26 ppm	CMIS	S/N None	11/07/02	27.97 ppm	
		Cylinder #	Flame Ionization		28.01 ppm	
Nitrogen,O2-Free Balance		CC121986	Gas Chromatography		27.86 ppm	
Cylinder Pressure: 2000 psig		@ 58.6 ppm	Last Cal Date: 10/12/00	Mean:	27.95 ppm	

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost. STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

For Technical Information Call
1-800-752-1597

R12

AIR PRODUCTS

Air Products and Chemicals, Inc. * 12722 S. Wentworth Avenue, Chicago, IL 60628

ISO CERTIFICATION: 9002

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS STANDARD

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS
1680 OAK TREE RD.
EDISON NJ 08820-

Order No: SRP-410911-04
Batch No: 861-67867
PO:
Release:

cylinder No: SG9152832BAL
Bar Code No: DGY894
Cylinder Pressure*: 2000 psig
Certification Date: 03/27/2000
Expiration Date: 03/27/2003

CERTIFIED CONCENTRATION		REFERENCE STANDARDS			ANALYTICAL INSTRUMENTATION			
Component	Certified Concentration	Cylinder Number	Stsndsrd Type	Standard Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
CARBON MONOXIDE	85.9 t0.57 PPM	SG9159515BAL	NTRM	99.90 PPM	HORIBA VIA-510	405079	03/15/00	NON DISPERSIVE INFRARED
NITROGEN	Balance Gar							

* STANDARD SHOULD NOT BE USED BELOW 150 PSIG

197

SCOTTMARRIN, INC.
5535 BOX ELDER BLVD. • FAX (503) 639-2437

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

P23

HENG01
TO: David Rossman
Horizon Engineering / Infrared NW
13585 NE Whitaker Way
Portland OR 97230

DATE: October 3 2001

CUSTOMER ORDER NUMBER: 003351

COMPONENT	CONCENTRATION(v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO:	CA05187				
			VARIAN MODEL 1860 TID		10/01/01
Propane	89.2 ± 0.9 ppm	GMIS	S/N NONE	10/01/04	89.4 ppm
		CYLINDER #:	FLAME IONIZATION		88.9 ppm
Zero Air	Balance	CC51261	GAS CHROMATOGRAPHY		89.2 ppm
CYLINDER PRESSURE:	2000 psig	@ 104 ppm	LAST CAL DATE: 09/11/01	MEAN:	89.2 ppm

ppm = µmole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997.
This cylinder should not be used if the pressure is less than 150 psig.

ANALYST: _____ M.S. CALHOUN APPROVED: _____ J.T. MARRIN

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.
STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

Environmental Services Laboratory, *Inc.* E S L

17400 SW Upper Boones Ferry Road, Suite 270 • Portland, OR 97224 • (503) 670-8520

December 09, 2002

Mike Wallace
Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230

TEL: (503) *255-5050*
FAX (503) *255-0505*

RE: 1862/OSM

Order No.: 0211155

Dear Mike Wallace:

Environmental Services Laboratory received 10 samples on 11/18/02 for the analyses presented in the following report.

There were no analytical problems encountered and all associated QC data met EPA or laboratory specifications *except* where noted in a Case Narrative. Results apply only to the samples analyzed. Reproduction of this report is permitted only in its entirety, without the written approval of the laboratory. The following checked *data* sections are included in this report, and numbered to indicate total pages contained within each report section.

✓Base Sample Report /Method Blank Report /Sample Duplicate Report ✓Matrix Spike/Matrix Spike Duplicate Report ✓Laboratory Control Spike/Spike Duplicate Report ✓Continuing Calibration Verification Report ✓Initial Calibration Verification Report

If you have any questions regarding these tests results, please feel free to call.

Project Manager

Technical Review

room

12/10/2002 15:41 FAX

Environmental Services Laboratory

Date: *09-Dec-02*

CLIENT:	**Horizon Engineering**	**Client Sample ID:**	**Audit No.Fil 2123 (filter)**
Lab Order:	**0211155**	**Tag Number:**	
Project:	**1862/OSM**	**Collection Date:**	**11/6/02**
Lab ID:	**0211155-08A**	**Matrix:**	**FILTER**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**		**(30508)**		**Analyst: mal**
Lead	338	1.00		ug/filter	1	11/26/02

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- • - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Environmental Services Laboratory

Date: 09-Dec-02

CLIENT:	Horizon Engineering	**Client Sample ID:**	Audit **Blank** Filter
Lab Order:	**0211155**	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	**11/6/02**
Lab ID:	**0211155-09A**	**Matrix:**	**FILTER**

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 60108**		**(30508)**		**Analyst: mal**
Lead	ND	1.00		ug/filter	1	11/26/02

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below **quantitation** limits

B - Analyte detected in the associated Method Blank

* - **Value exceeds** Maximum Contaminant **Level**

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

Environmental Services Laboratory

Date: *09-Dec-02*

CLIENT:	Horizon Engineering	**Client Sample ID:**	Audit **AM** - 00265
Lab Order:	0211155	**Tag Number:**	
Project:	1862/OSM	**Collection Date:**	11/6/02
Lab ID:	0211155-1OA	**Matrix:**	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS		**EPA 6010B**		**(3005A)**		**Analyst: mal**
Lead	2.55	0.00500		mg/L	I	11/26/02

Qualifiers:

- **ND** - Not Detected at the Reporting Limit
- **J** - Analyte detected below quantitation limits
- **B** - Analyte dctccted in the associated Method Blank
- **•** - Value cxcccds Maximum Contaminant Level
- **S** - Spike Recovery outside accepted recovery limits
- **R** - RPD outside accepted recovery limits
- **E** - Value above quantitation range

021155 08

Method 12 Compliance Audit Material
(Lead Spiked Filter)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M12-1015-01 / Fil-2123 Date Issued: 11/01/02

Auditee:

Company: 0

Address: 0

Attention of: 0 Phone:

Requestor:

Agency: OR - DEQ / NW Region

Address: *2020* SW 4th Ave., *Suite* 400, Portland, OR 97201

Attention of: Jack Herbert Phone: (503) 229-5579

Project Name: Oregon Steel Mills

Audit Results (Results in µg)

Compound	Result
Lead	338

203

021 1155 10

Method 12 Compliance Audit Material
(Lead Spiked Aqueous Solution)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M12-1015-02 / AM-00265 Date Issued: 11/01/02

Auditee:

Company: 0

Address: 0

Attention of: 0 Phone:

Requestor:

Agency: OR - OEQ / NW Region

Address: 2020 SW 41h Ave.. Suite 400. Portland. OR 97201

Attention of: Jack Herbert Phone: (503) 229-5579

Project Name: Oregon Steel Mills

Audit Results (Results in µg/mL)

Compound	Result
Lead	2550

204

ERG

www.erg.com

November 1, 2002

Jack Herbert
Oregon DEQ/Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5579

Dear Mr. Herbert:

Eastern Research Group (ERG) has been directed by the U.S. EPA to provide the following audit material for a Method 12 Lead Metals Audit; Numbers M12-1015-01 and -1015-02. These samples are for an audit at Oregon Steel Mills in Portland, OR and are being sent directly to Steffan Johnson of Horizon Engineering, LLC in Portland, OR per your automated database request.

Method 12

request M12-1015-01:
- one each spiked Method 12 lead filter sample; Sample No. Fil - 2123

request M12-1015-02:
- one each spiked Method 12 aqueous lead sample; Sample No. AM - 00265

one blank filter; no sample number

Please note that each sample is individually labeled and shipped with an instruction sheet and a REPORTING FORM for reporting the laboratory audit results. All results are to be reported by the requestor to the automated computerized database.

You are urged to instruct the laboratory to analyze the audit samples along with the designated field samples. The audit sample should be analyzed as a routine field sample according to the specifications of the Test Method and using the supplied instructions. The audit results are to be reported to you, the reauestor, by the analyst, using the Reporting Form, in the units specified in the instructions. You then will use the automated database to enter the results into the SSAP database.

We would like to thank you for your participation in the Stationary Source Audit Program. If you have any questions about the samples, please contact either Judi McCartney (919) 468-7920 or myself at (919) 468-7927. My fax number is (919) 468-7803.

Sincerely,

Rob Martz

Robert F. Martz
cc: sent with audit sample

1600 Perimeter Park, Morrisville, NC 27560-8421, Telephone (919) 468-7800, Fax (919) 468-7801

Arlington, VA • Austin, TX • Boston, MA • Chantilly, VA • Chicago, IL • Lexington, MA • Portland, ME • Morrisville, NC • Sacramento, CA

Correspondence

Source Test Plan and Correspondence

HORIZON ENGINEERING LLC

13585 NE Whitaker Way ▪ Portland, OR 97230
Phone (503) 255-5050. Fax (503) 255-0505
www.horizonengineering.com

FAXED 11/5/02

November 5,2002

Mr. Jack Herbert
Oregon Department of Environmental Quality
2020 SW 4th, Suite #400
Portland, OR 97201-4987

Re: Source Testing: Oregon Steel Mills
14400 N Rivergate Boulevard
Portland, Oregon 97203

This correspondence is notice that Horizon Engineering is to do source testing for the above-referenced facility, scheduled for November 6, 2002. This will serve as the Source Test Plan unless changes are requested prior to the start of testing.

1. **Source(s) to be Tested:** ICA Baghouse System.

2. **Purpose of the Testing:** To meet requirements for EU-4 (the EAF baghouse) in conditions 37(for verifying emission factors), 38 (showing compliance with grain loading requirement from condition 13; < 0.1 g/dscf), 39 (showing compliance with the SO_2 limit from condition 15,; <1000 ppm.).

3. **Source Description:** 16-compartment ICA baghouse controlling particulate emissions from the electric arc furnace (EAF) and ladle metallurgy furnace.

4. **Pollutants to be Tested:** Particulate, CO, NO_x, SO_2, VOC, lead and opacity.

5. **Test Methods to be Used:** Testing will be conducted in accordance with EPA Methods in Title 40 Code of Federal Regulations Part 60 (40 CFR 60), Appendix A, July 1, 2001; and Oregon Department of Environmental Quality (ODEQ) methods in Source Sampling Manual Volume 1, January 1992.

   Inlet tests:

Flow Rate:	EPA Methods 1 and 2 (at BH inlet, twice on test day)
CO_2 and O_2:	EPA Method 3A (NDIR and paramagnetic analyzers)
Moisture:	ODEQ Method 4 (wet bulb and dry bulb temperatures)
SO_2:	EPA Method 6C (non-dispersive ultraviolet analyzer)
NO_X:	EPA Method 7E (chemiluminescent analyzer)
CO:	EPA Method 10 (gas filter correlation analyzer)
VOC:	EPA Method 25A, (heated sample line and two analyzers, one with simultaneous VOC "cutter" for back-out of CH_4 content)

Outlet tests:

Flow Rate:	EPA Method 2 (at each compartment, as done in past)
Particulate:	ODEQ Method 8 (High Volume sampler)
Lead:	Analysis of M-8 catch per EPA Method 12, with audit sample analysis (3 expected)
Opacity:	EPA Method 9 (six minutes per test)

6. **Continuous Analyzer Data Recording:** Data acquisition system (DAS) with strip chart records as backup. Either 10-second data points or one-minute averages of one-second readings are logged. Run averages, the graphic outputs from the DAS, annotated strip charts, and a few minutes of manually recorded data will be included in the test reports.

7. **Continuous Analyzer Gas Sampling:** Fixed point in the baghouse inlet.

8. **Quality Assurance /Quality Control (QA/QC)**: Documentation of the procedures and results will be presented in the source test report for review. This documentation will include at least the following:

   Continuous Analyzer QC Procedures: Field crews will operate the analyzers according to the manufacturer's specification, the test method's requirements, and Horizon's additional specifications. On-site quality control procedures include:
   - Daily calibration (zero and span) and calibration error (linearity) checks
   - Pre- and post-test zero bias and span bias checks
   - Checks performed with EPA Protocol 1 or NIST traceable gases
     Data acquisition systems record 10-second data points or one-minute averages of one second readings
   - Strip chart recordings
   - Manual readings for a few minutes

   Manual Equipment QC Procedures: Operators will perform pre- and post-test leak checks on the sampling system and pitot lines. Thermocouple systems are checked for ambient temperature before tests are started. Nozzles and pitots are inspected for nicks or dents before each test. Blank reagents (acetone and filter) are submitted to the laboratory with the samples. Liquid levels are marked on sample jars in the field and are verified by the laboratory.

   Laboratory QC Procedures: EPA audit samples for lead will be analyzed with the field samples if they are provided by ODEQ prior to when samples are submitted to the laboratories. The laboratory will perform normal laboratory QC procedures. The laboratory will follow, and document performance of, EPA Method 12 with special attention to sections 11.2.1: digestion of complete filter, 11.2.4 and 11.2.5: field blanks, one solvent and two filters, 11.4.1: sample concentrations brought into the linear analytical range, and 11.5: a single spike, method-of-standard-additions recovery check. Also the particulate filter tare weights will be weighed to a constant weight and the records submitted with the final report.

9. **Number of Sampling Replicates and their Duration:** Three test runs of at least two heats each are to be made for particulate and lead. The gaseous

6. **Continuous Analyzer Data Recording:** Data acquisition system (DAS) with strip chart records as backup. Either 10-second data points or one-minute averages of one-second readings are logged. Run averages, the graphic outputs from the DAS, annotated strip charts, and a few minutes of manually recorded data will be included in the test reports.

7. **Continuous Analyzer Gas Sampling:** Fixed point in the baghouse inlet.

8. **Quality Assurance /Quality Control (QAIQC):** Documentation of the procedures and results will be presented in the source test report for review. This documentation will include at least the following:

   Continuous Analyzer QC Procedures: Field crews will operate the analyzers according to the manufacturer's specification, the test method's requirements, and Horizon's additional specifications. On-site quality control procedures include:
   - Daily calibration (zero and span) and calibration error (linearity) checks
   - Pre- and post-test zero bias and span bias checks
   - Checks performed with EPA Protocol 1 or NIST traceable gases
   - Data acquisition systems record 10-second data points or one-minute averages of one second readings
   - Strip chart recordings
   - Manual readings for a few minutes

   Manual Equipment QC Procedures: Operators will perform pre- and post-test leak checks on the sampling system and pitot lines. Thermocouple systems are checked for ambient temperature before tests are started. Nozzles and pitots are inspected for nicks or dents before each test..

   Laboratory QC Procedures: N/A

9. **Number of Sampling Replicates and their Duration:** Three test runs of at least two heats each are to be made. The gaseous emission analyzers will operate throughout the testing period without calibration checks. In no case will sampling replicates be separated by twenty-four (24) or more hours unless prior authorization is granted by the Department.

10. **Reporting Units for Results:** Gases – ppmv, lb/hr, and lb/ton cold charge.

11. **Horizon Engrg. Contacts:** David Rossman or
    Steffan Johnson
    (503) 255-5050
    Fax (503) 255-0505
    E-mail drossman@horizonengineering.com
    sjohnson@horizonengineering.com

12. **Source Site Personnel:** Debbie Deetz Silva
    (503) 978-6044
    Fax (503) 978-6042
    deetzd@osm.com

emission analyzers will operate throughout the testing period without calibration checks. In no case will sampling replicates be separated by twenty-four (24) or more hours unless prior authorization is granted by the Department.

10. Reporting Units for Results: Particulate and lead – gr/dscf, lb/hr, and lb/ton cold charge. Gases – ppmv, lb/hr, and lb/ton cold charge.

11. Horizon Engrg. Contacts: David Rossman or
Steffan Johnson
(503) 255-5050
Fax (503) 255-0505
E-mail drossman@horizonengineering.com

12. Source Site Personnel: Debbie Deetz Silva
(503) 978-6044
Fax (503) 978-6042

13. Regulatory Contacts: Jack Herbert
(503) 229-5579
Fax (503) 229-5265
E-mail herbert.jack@deq.state.or.us

14. **Applicable Process/Production** Information: Process operating data and production information that characterizes the source operation is considered to be: Heat charge weights and materials, tap weights and materials, heat times. Process information is normally gathered by the Source-site personnel and provided to Horizon for inclusion in the report.

The sources must operate at normal maximum rates or other rates that may be specified in the Title V Permit. Rates not in agreement with those stipulated in the Permit can result in test rejection for application to determine compliance or emission factor verification. Imposed process limitations could also result from atypical rates.

15. Control Device Operating Parameters: Baghouse pressure drops.

16. Opacity Readings to be Taken By: Horizon Engineering

17. Certified Plume Evaluator: Yes (x) No ( ) N/A ( )

18. Other Considerations, including sampling site configurations, equipment limitations, special methods, etc.:

Particulate: Each Oregon Method 8 test shall encompass two complete heat cycles with samples collected for 5 minutes from as many as possible of the 16 compartments. The next test shall begin in the next compartment after the final compartment sampled in the previous test. Particulate is to be sampled in the gas stream above the bags in the slot shaped area where gas flows up and toward the center of the baghouse. This allows the sampler nozzle to be inserted through ports in the ceiling of the breezeway at the top of the baghouse. As in the past, sampling will be isokinetic at a single point at the outlet of each compartment.

Flow Rate Measurements: Velocities will be measured at five points through each port, giving 5 velocities per compartment, 80 points for the baghouse. Velocity pressure determinations will be by use of an S-type pitot and a micro-manometer. Past testing has shown that traversing this single port adequately characterizes the outlet flow rate.

Gaseous Pollutant Measurements: Gas analyzer readings at the baghouse inlet will be continuous through all of the M-8 tests with calibrations only at the beginning and end of the test day. Instrument drift may exceed normal run allowances for the entire period. Instrument results will be corrected for drift.

Timing: The testers will synchronize their watches to record times in sync with the OSM heat log in the arc furnace control pulpit.

19. **Administrative:** Unless notified prior to the start of testing, this test plan is considered approved for compliance testing of this source. A letter acknowledging receipt of this plan and agreement on the content (or changes as necessary) would be appreciated.

The Department will be notified of any changes in source test plans prior to testing. It is recognized that significant changes not acknowledged, which could affect accuracy and reliability of the results, could result in test report rejection.

Source test reports will be prepared by Horizon Engineering and will include all results and example calculations, field sampling and data reduction procedures, laboratory analysis reports, and QA/QC documentation. Source test reports will be submitted to you within 45 days of the completion of the field work, unless another deadline has been stipulated. Oregon Steel Mills will send one copy of the completed Source Test Report to you at the address above.

Any questions or comments relating to this test plan should be directed to me.

Sincerely,

David Rossman

David R. Rossman, P. E.

cc: Debbie Deetz Silva, Oregon Steel Mills

Post-it® Fax Note 7671	Date 12-3-02	# of pages ▶ 4
To Debbie Dacta Silva	From Ged Johnson	
Co./Dept. OSM - Environmental	Co. Horizon	
Phone # 503-978-6044	Phone # 503-255-5050	
Fax # 503 978-6042	Fax # -0505	

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

December 3, 2002

FAXED 12/3/02

Mr. Jack Herbert
Oregon Department of Environmental Quality
2020 SW 4th, Suite #400
Portland, OR 97201-4987

Re: Source Testing: Oregon Steel Mills
14400 N Rivergate Boulevard
Portland, Oregon 97203

This correspondence is notice that Horizon Engineering is to do source testing for the above-referenced facility, scheduled for December 5, 2002. This will serve as the Source Test Plan unless changes are requested prior to the start of testing.

1. **Source(s) to be Tested:** ICA Baghouse System.

2. **Purpose of the Testing:** To meet requirements for EU-4 (the EAF baghouse) in condition 39 (showing compliance with the SO_2 limit from condition 15,; <1000 ppm.).

3. **Source Description:** 16-compartment ICA baghouse controlling particulate emissions from the electric arc furnace (EAF) and ladle metallurgy furnace.

4. **Pollutants to be Tested:** SO_2.

5. **Test Methods to be Used:** Testing will be conducted in accordance with EPA Methods in Title 40 Code of Federal Resulations Part 60 (40 CFR 60), Appendix A, July 1, 2001; and Oregon Department of Environmental Quality (ODEQ) methods in Source Sampling Manual Volume 1, January 1992.

   Inlet tests:

Flow Rate:	EPA Methods 1 and 2 (at BH inlet, twice on test day)
CO_2 and O_2:	EPA Method 3A (NDIR and paramagnetic analyzers)
Moisture:	ODEQ Method 4 (wet bulb and dry bulb temperatures)
SO_2:	EPA Method 6C (non-dispersive ultraviolet analyzer)

13. Regulatory Contacts:

Jack Herbert
(503) 229-5579
Fax (503) 229-5265
E-mail herbert.jack@deq.state.or.us

14. Applicable **Process/Production** Information: Process operating data and production information that characterizes the source operation is considered to be: Heat charge weights and materials, tap weights and materials, heat times. Process information is normally gathered by the Source-site personnel and provided to Horizon for inclusion in the report.

    The sources must operate at normal maximum rates or other rates that may be specified in the Title V Permit. Rates not in agreement with those stipulated in the Permit can result in test rejection for application to determine compliance or emission factor verification. Imposed process limitations could also result from atypical rates.

15. Control Device Operating Parameters: N/A

16. Opacity Readings.to **be** Taken **By:** NIA

17. Certified Plume Evaluator: Yes() No ( ) N/A (X)

18. Other Considerations, including sampling site configurations, equipment limitations, special methods, etc.:

    Flow Rate Measurements: Velocities will be measured at 48 points through two ports (24 points per port) at the baghouse inlet. Velocity pressure determinations will be by use of an S-type pitot and a micro-manometer.

    Gaseous Pollutant Measurements: Gas analyzer readings at the baghouse inlet will be continuous through all of the M-8 tests with calibrations only at the beginning and end of the test day. Instrument drift may exceed normal run allowances for the entire period. Instrument results will be corrected for drift.

    Timing: The testers will synchronize their watches to record times in sync with the OSM heat log in the arc furnace control pulpit.

19. **Administrative:** Unless notified prior to the start of testing, this test plan is considered approved for compliance testing of this source. A letter acknowledging receipt of this plan and agreement on the content (or changes as necessary) would be appreciated.

The Department will be notified of any changes in source test plans prior to testing. It is recognized that significant changes not acknowledged, which could affect accuracy and reliability of the results, could result in test report rejection.

Source test reports will be prepared by Horizon Engineering and will include all results and example calculations, field sampling, data reduction procedures, and QA/QC documentation. Source test reports will be submitted to you within 45 days of the completion of the field work, unless another deadline has been stipulated. Oregon Steel Mills will send one copy of the completed Source Test Report to you at the address above.

Any questions or comments relating to this test plan should be directed to me.

Sincerely,

Steffan M. Johnson
Operations Manager
Horizon Engineering
siohnson@horizonengineering.com

cc: Debbie Deetz Silva, Oregon Steel Mills

Michele

From: GRUNOW Greg [GRUNOW.Greg@deq.state.or.us]
Sent: Tuesday, December 17,2002 4:47 PM
To: Debbie Deetz Silva
Cc: Stef Johnson (E-mail); Michele Kinney (E-mail); HERBERT Jack
Subject: RE: Source Test Report Submission Deadlines

Debbie,

We will ignore the 45 day report submission indicated in the test plan and expect the report to be submitted within 75 days as allowed by OSM's TV permit.

Greg Grunow
(503)229-5571
grunow.greg@deq.state.or.us

-----Original Message-----
From: Debbie Deetz Silva [mailto:DeetzD@osm.com]
Sent: Tuesday, December 17, 2002 3:46 PM
To: GRUNOW Greg; HERBERT Jack
Cc: Stef Johnson (E-mail); Michele Kinney (E-mail)
Subject: Source Test Report Submission Deadlines

Greg,

Horizon sent a source test plan to Jack Herbert at DEQ for the **ICA Baghouse** System source testing that was conducted on November 6, 2002. The source test plan stated that source test reports would be submitted to the Department within 45 days of the completion of the field work. **As** you are aware, OSM's Title V permit allows for 75 days with which to submit the final source test report to the Department.

I would like to request that OSM be given 75 days (till January 18,2002) with which to submit the source test report for the **ICA Baghouse** System testing that was conducted on November 6,2002.

If you have any questions please give me a call. Thanks.

Debbie Deetz Silva
Environmental Specialist
Phone: 503-978-6044
Fax: 503-978-4922

214