AP32 Section:	12.5.1
Background Chapter	3
Reference:	37
Title:	Source Evaluation Report, Oregon Steel Mills, Portland, OR, Electric Arc Furnace Baghouse. December 27, 2000. Prepared for Oregon Steel Mills, Portland, OR by Michele R. Kinney & David R. Rossman, P.E. Project No. 1536.

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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

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APPENDIX

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 R 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_2, 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)	gr/scfd	0.00038	0.00054	0.00031	0.00041
Particulate Rate	lb/hr	1.5	2.0	1.2	1.6
Based on Cold Charge	lb/ton	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	lb/ton	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	dscf/min	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	tons/hr	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[1]
	Rate	lb/hr				1.7[1]
	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 ΔP	10.0
Orifice Pressure Differential ΔH	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

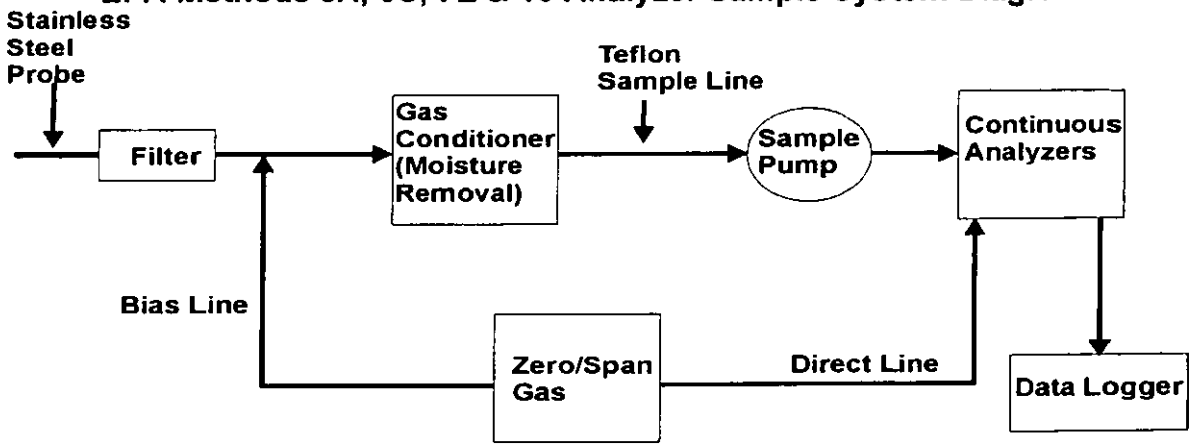
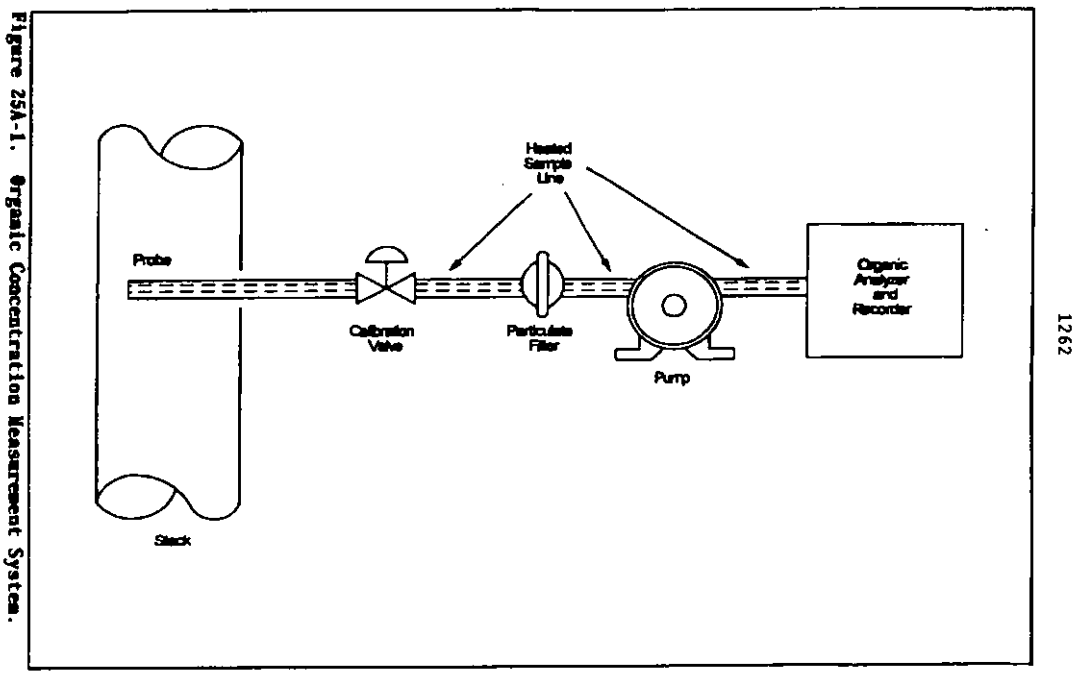


Figure 2

EPA Method 25A VOC Analyzer Sample System Diagram



5.3 Horizon Test Equipment

5.3.1 Manual Methods

Equipment Name	Equipment Identification
Hi Volume Orifice	Horizon No. 1192
Manometer	Shortridge Manometers No. 1 & 2
Pitots and Thermocouples	11-S, 14-S1
Magnehelic Gauge	0-1F (orifice ΔH)
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	Thermo Env	48	0-1000 ppm	Gas Filter Correlation	10
TGOC	J.U.M.	VE-7	0-100 ppm	Flame Ionization	25A
NO_x	Thermo Env	42C	0-250 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:	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
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	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	Gas Constant @ Standard Conditions	[R Tstd / Pstd(2)]	
C2	inHg in³/ °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 / 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, %	Gas 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	Outer Circumference of Circular Stack		
Ci	ft	Inner Circumference of Circular Stack		
CO2	%	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 Emissions	[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 / lbmole	Molecular Weight		
NO2	ppmv-NO2	Nitrogen Dioxide (General Reporting Basis for NOx)		
NOx	ppmv-NO2	Nitrogen Oxides (Reported as NO2)		
O2	%	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 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 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

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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-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 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
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=	29.00 molwt
Points		Lead (mg)	0.923	Stack Temp.	Tdb=	155 °F	Mol Wt. Wet	Ms=	28.98 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		Nozzle 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	12:43	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	2,201.5
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 has 16 compartments. One is always cycling.

* Each Compartment is 52"x179".

Particulate and Lead Emissons

Plant	Oregon Steel Mills								File	osm1536	
Source	BOF Baghouse-EAF								Tester	MJE BTE EHL CDB	
Date	27-Dec-2000										
Run#	2	Wt(mg)	73.442	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=	28.55	molwt
				Stack Temp.	Twb=	101	°F	Barometeric	Pb=	30.49	in H2O
Hivol ID	SN#			Moisture	bws=	4.25	%	Static Pres.	Pstat=	0.00	in H2O
Orifice	A=			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
% ISOKINETIC		100 vn/vs			%I	98.50

Particulate and Lead Emissons

Plant	Oregon Steel Mills								File	osm1	
Source	EAF Baghouse Outlet								Tester	MJF BTE TJH CDB	
Date	27-Dec-2000										
Run#	3	Wt(mg)	11.521	Stack Area	As=	[illegible]	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=	[illegible]	in H2O
Orifice	A=	17.0956		Nozzle Dia.	Dn=	[illegible]	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	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}: 93 %H_2O: ____ D_n: 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	Normal
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	.4233	140	96	
	2	10	1150	.0374	.39	138	106	
	3	15	1156	.0361	.37	165	109	
	4	20	1202	.0436	.43	170	127	
	5	25	1208	.0489	.50	162	124	
	6	30	1213	.0325	.32	172	120	
	7	35	1220	.0430	.44	160	134	
	8	40	1226	.0133	.12	153	122	
	9	45	1232	.0397	.39	159	107	
	10	50	1237	.0452	.45	174	106	
	11	55	1243	.0259	.26	146	112	
	13	60	1249	.0339	.33	155	112	*skipped #12
	14	65	1256	.0382	.38	155	108	Pos. was obstructed
	15	70	1302	.0398	.39	162	108	
	16	75	1310	.0332	.33	156	116	
	17	80	1316	.0287	.28	154	116	
2	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: 30.49
T_{db}: ____ T_{wb}: ____ $\%H_2O$: ____ D_n: 1.309
Magn Ranges, DP:0-1 ____ DH:0-1 ____ #1 E
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	0.0259	0.25	183	118	
	13	55	1421	0.0344	0.33	187	118	
	14	60	1427	0.0125	0.11	15[illegible]	122	
	15	65	1433	0.0111	0.10	160	136	
	15	70	1438	0.0111	0.10	160	130	
	16	75	1444	0.281	0.27	169	130	
	1	80	1450	0.0490	.45	183	128	
	2	82	1456	[illegible]	[illegible]	-	122	
	3		1458					
✓								

*****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
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	685567

DP's from: Presurvey ____
During test ✓

Diagram of Outlet

Run #	Process Rate
	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	.0440	0.13	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	.0[illegible]	0.23	167	126	
	9	40	1542	.0382	0.37	170	122	
	10	45	1547	.0305	0.29	165	122	
	11	50	1553	.0145	0.13	154	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	1618	[illegible]	0.25	185	110	
	1	75	1623	[illegible]	0.34	191	112	
	2	80	1629	[illegible]	0.37	195	118	← 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-Dec-2000	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	6855687/73		-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	6855689	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	6855687/73		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: mp reviewer:
Job# 364 Identification: 05 m 1536

FRONT ACETONE:

Sample #	36402					
Sample ID	✓					
vol mark						
Date/time	1-1 9P					
Into dessicator						
Vol(mls)	238l	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	Blank					
vol mark	✓					
Date/time	1-1 2P					
Into dessicator						
Vol(mls)	191 ml	date/time weighed		date/time weighed		date/time 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	685-687	OSM	685673	
vol mark					
Date/time	12-29 9A		12-29 9A		
Into dessicator					
Vol(mls)		date/time weighed		date/time weighed	date/time 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	OSM R1	6855683	OSM R2	6855688	OSM 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						
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	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: 056m _____ 1536 _____

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 #					364	
Sample ID	lab blank				lab blank	
vol mark	6855659					
Date/time						
Into dessicator						
Vol(mls)		date/time weighed		date/time weighed	empty	date/time weighed
GWt1(g)	4.2970	1-2 9A			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)	4.2970				104.9113	12-31 IP
Net (g)	-.0028				-.0000	

HORIZON ENGINEERING INC
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 Bayhouse

Horizon Job No. 1536

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. H_2O	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 ✓

★ Need Samples Retried to Horizon ★

Relinquished by: David Bagwell 12/28/00 1106

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 6010B)

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 6010B**				Analyst: **lmc**
Lead	926	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 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 6010B**				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 6010B**				Analyst: lmc
Lead	853	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 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: lmc
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 6010B**				Analyst: lmc
Lead	7.60	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:**	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 - 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:**	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 6010B**				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: **MB-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 6010B** 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	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 1/22/01	Prep Date: 1/22/01
Client 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 1/22/01	Prep Date: 1/22/01
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 6010B	Units: ug	Analysis Date 1/22/01	Prep Date: 1/22/01
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

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 #:

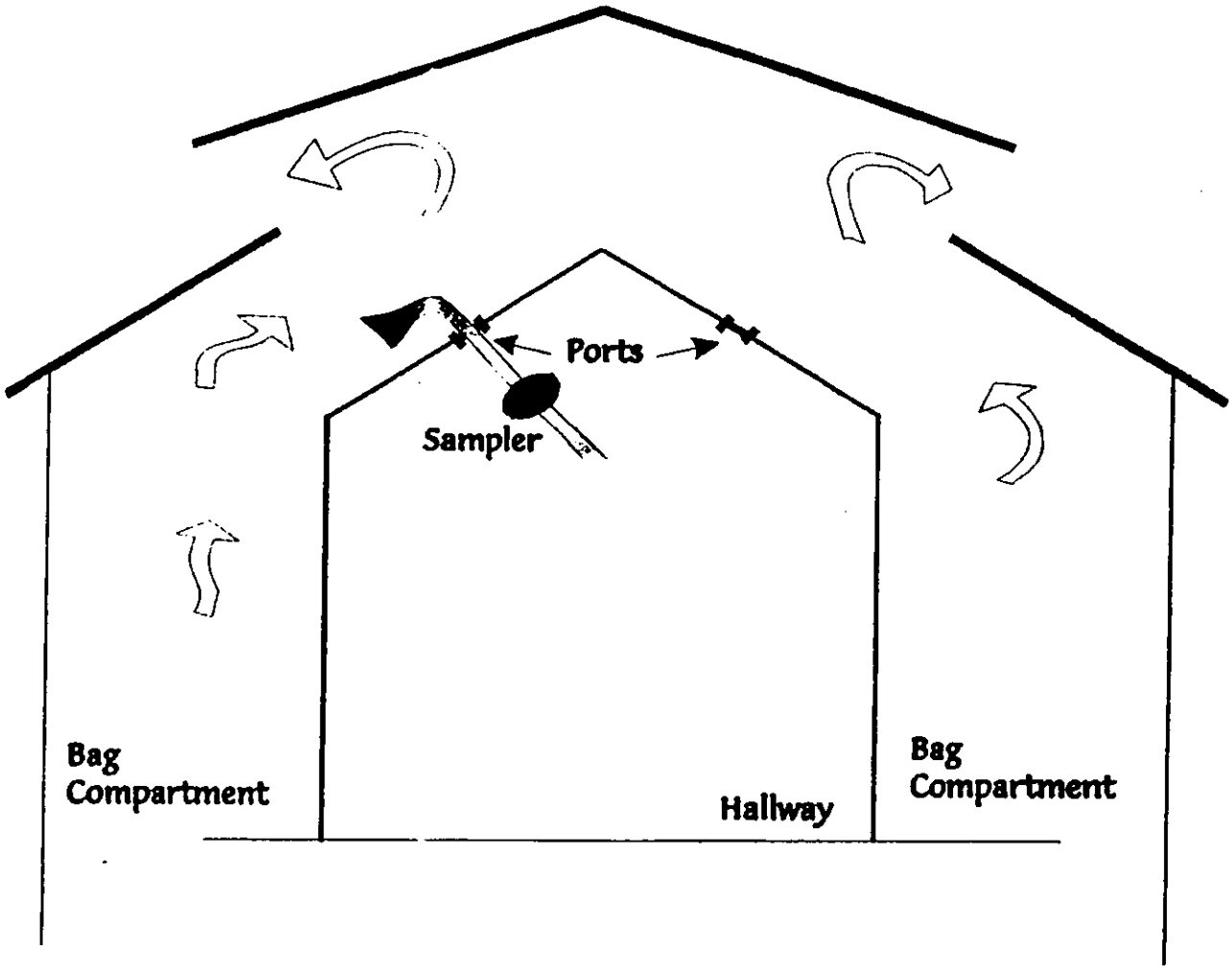
TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day
Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day
OTHER Specify
* Turnaround Requests less than standard may incur Rush Charges

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	SAMPLE ID (Laboratory Use Only)	Analysis Requests: LEAD	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
FILTER RUN 1 (6855683)		010103-01	X			
FILTER RUN 2 (6855688)		02	X			
FILTER RUN 3 (6855689)		03	X			
FILTER BLANK (6855687)		04	X			
FILTER END BLANK (6855673)		05	X			
32400 ACETONE		06	X			
36401 ACETONE		07	X			
36402 H_2O		08	X			
36403 H_2O		09	X			
364 LAB BLANK		10	X			

RELINQUISHED BY: Monika Gutierrez	DATE: 1/11/01	RECEIVED BY:	DATE 1/11/01
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 RECOVERY CHECK.

Baghouse 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	16		
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	0.0238		
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	0.0257		
File	osm153o	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	0.0217	0.0454	0.0318	0.0130	0.0314		
Equipment	ShortRidge,11s	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 Deviation	STD(SQRT(dP))	0.0864	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	156.0	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	615.7	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
Qad (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	16		
Source	ICA Baghouse-EAF	Point									HI-VOL RUN #2										
Location	Portland, OR	K		0 0259	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	L		0 0506	0 0291	0 0431	0 0389	0 0335	0 0430	0 0277	B	0 0367	0 0334	0 0338	0 0398	0 0350	0 0009	0 0070	0 0050		
Testers	MJE-BTF/TJH-CDB	*M		0 0497	0 0411	0 0404	0 0348	0 0332	0 0438	0 0264	*C	0 0377	0 0320	0 0254	0 0355	0 0344	0 0125	0 0111	0 0281		
File	osm1536	N		0 0470	0 0419	0 0374	0 0470	0 0362	0 0410	0 0282	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	0 0604	0 0400							A										
Total Runs	Run #2	L	0 0675	0 0496							B										
Pts per Run		*M	0 0497	0 0440							*C										
		N	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 16	15 of 16 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	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	183 0	175 0	162 0	169 0	162 0	124 0	172 0	170 0		175 0	185 0	183 0	186 0	187 0	185 0	168 0	169 0	172 8	
Ts	Duct temperature	°R	642 7	634 7	621 7	628 7	621 7	583 7	631 7	629 7		634 7	644 7	642 7	645 7	646 7	645 7	627 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	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		0.0400	0.0488	0.0175	0.0092	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-Dec-2000	L		0.0496	0.0390	0.0340	0.0486	0.0416	0.0404	0.0199	B	0.0361	0.0330	0.0257	0.0318	0.0524	0.0399	0.0431	0.0276		
Testers	MJE/BTF/TJH/CDB	*M		0.0440	0.0354	0.0318	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		0.0435	0.0387	0.0334	0.0547	0.0488	0.0531	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	0.0476	0.0224	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	0.0330							B										
Pts per Run		*M	0.0362	0.0384							*C										
		N	0.0388	0.0401							D										
		O	0.0382	0.0354							E										
All Points	SQRT(dP)	0.1766	0.1871	0.1788	0.2043	0.1655	0.2022	0.1829	0.1847	0.1556		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	0.0938	0.0484	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	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Avg/Total 16	15 of 16 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	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	191.0	188.0	185.0	191.0	191.0	181.0	179.0	169.0		176.0	185.0	184.0	186.0	189.0	165.0	162.0	185.0	179.8	
Ts	Duct temperature	°R	650.7	647.7	644.7	650.7	650.7	640.7	638.7	628.7		635.7	644.7	643.7	645.7	648.7	624.7	621.7	644.7		
Tdb	Dry bulb temp.	°F	180.0																		
Twb	Wet bulb temp.	°F	104.0																		
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	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
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			0.1871	0.1788	0.2043	0.1655	0.2022	0.1829	0.1847	0.1556		0.1727	0.1523	0.1390	0.1416	0.2234	0.1919	0.1914	0.1523		
Bws	Moisture, % Stack		4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41		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		20.47	20.47	20.47	20.47	20.47	20.47	20.47	20.47		20.47	20.47	20.47	20.47	20.47	20.47	20.47	20.47		
Carbon Dioxide	Outlet-Estimated		0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41		0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41		
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		28.52	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	[illegible] Steel Mills	Compartment	Pre-test				Post-Test			
Source	[illegible]	Point								
Location	Portland, OR		dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)	dP (inH2O)	Ts (°F)
Date	[illegible]	1	2.1240	180.0	1.2690	221.0	2.0860	199.0	1.6300	242.0
Testers	[illegible]	2	1.9740	192.0	1.1830	228.0	2.1400	173.0	1.9800	257.0
File	[illegible]	3	2.3680	202.0	1.2110	233.0	2.9400	162.0	2.1200	268.0
Analysis/QA	[illegible]	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%

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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 H20 By
Post Test Leak Check

Cyclonic Flow ? Yes__ No X Avg Null Angle
P_o = Barometric Pressure 28.47 in Hg
C_p = Pitot Coefficient
Pitot I.D.

Run #	1									
Time	ΔP	Temp °F		ΔP	T		ΔP			ΔP
Pt 1-1	0.0399		5-1	0.0004		1-1	.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	174	3	0.0552
4	0.0450		4	0.0474		4	0.0562		4	0.0531
5	0.0450		5	0.0422		5	0.0540		5	0.0475
6-1	0.0157		5-1	0.0060		10-1	0.0193		14-1	0.0209
2	0.0115		2	0.0330		2	0.0430		2	0.0350
3	0.0374	138	3	0.0325	172	3	0.0452	174	3	0.0375
4	0.0420		4	0.0345		4	0.0507		4	0.0375
5	0.0325		5	0.0466		5	0.0473		5	0.0313
7-1	0.0012		7-1	0.0101		11-1	0.0336		15-1	0.0152
2	0.0391		2	0.0462		2	0.0223		2	0.0285
3	0.0361	165	3	0.0430	160	3	0.0269	176	3	0.0336
4	0.0344		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	0.0472		2	0.0113		2	0.0313		2	0.0235
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	0.0351		5	0.0143		5	0.0217		5	0.0514
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					
P_{stat}	Static press., in H_2O		0.0251			
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	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				

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VOLUME FLOWRATE MEASUREMENT

Plant [illegible]
Sampling Location [illegible]
Test Conditions [illegible]
Date 12/27/[illegible] Time [illegible]
Duct Dimensions [illegible]
Duct Area _____ in^2
Gauge I.D. [illegible] in H20 By [illegible]
Post Test Leak Check [illegible]

Cyclonic Flow ? Yes__ No X Avg Null Angle ____
P_o = Barometric Pressure [illegible] in Hg
C_p = Pitot Coefficient [illegible]
Pitot I.D. [illegible]

Run #	1									
Time	ΔP [illegible]	[illegible]								
Pt /	[illegible]									
	0.03[illegible]									
	[illegible]	1.9								
	[illegible]									
	0.04[illegible]									
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		19[illegible]			
T_{wb}	Wet bulb temp., °F		9[illegible]			
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 ± 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				

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VOLUME FLOWRATE MEASUREMENT

Plant DSM

Sampling Location Baghouse

Test Conditions Normal

Date 2/27/00 Time —

Duct Dimensions

Duct Area in²

Gauge I.D. in H20 By

Post Test Leak Check

Cyclonic Flow ? Yes__ No Avg Null Angle —

P_o = Barometric Pressure in Hg

C_p = Pitot Coefficient

Pitot I.D.

Run #										
Time	ΔP	Temp °F		ΔP	Temp °F		ΔP	Temp °F		ΔP
Pt 1			6-1			10-1	0.0026		14-1	0.0035
2			2			2	0.0334		2	
3		173	3		174	3	0.0326	185	3	0.0125
4			4			4	0.0366		4	0.0114
5	0.024		5			5	0.0527		5	0.0046
6-1	0.0005		7-1	0.0298		11-1	0.0668		15-1	0.0036
2	0.0291		2	0.0436		2	0.0338		2	0.0076
3	0.024	162	3	0.0438	172	3	0.0254	183	3	0.0111
4	0.0243		4	0.0416		4	0.0357		4	0.0077
5	0.0341		5	0.0413		5	0.0575		5	0.0011
7-1	0.0017		8-1	0.0213		12-1	0.0122		16-1	0.0071
2	0.0121		2	0.0277		2	0.0398		2	0.0050
3	0.0401	169	3	0.0264	170	3	0.0355	182	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
8-1	0.0071		9-1	0.0064		13-1	0.0086		F1	0.0641
2	0.0389		2	0.0367		2	0.0350		2	0.0674
3	0.0345	162	3	0.0377	175	3	0.0344	187	5	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		-.016			
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				

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VOLUME FLOWRATE MEASUREMENT

Plant [illegible]
Sampling Location Bag House Outlet
Test Conditions Normal
Date 12/[illegible]/96 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__ Avg Null Angle ____
P_o = Barometric Pressure [illegible] in Hg
C_p = Pitot Coefficient [illegible]
Pitot I.D. 11-5

Run #										
Time	ΔP	Temp		ΔP	Temp		ΔP	Temp		ΔP
Pt 1	0.0430		1	0.0496		1	0.0357		1	0.0519
2	0.0491		2	0.0416		2	0.0330		2	0.0534
3	0.0423	151	3	0.0425	151	3	0.0309	155	3	0.0446
4	0.0432		4	0.0488		4	0.0308		4	0.0420
5	0.0165		5	0.0295		5	0.0235		5	0.0422
5-1	0.0432		5-1	0.0069		5-1	0.0072		5-1	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
5-1	0.0175		5-1	0.0165		5-1	0.0120		5-1	0.0030
2	0.0342		2	0.0199		2	0.0318		2	0.0276
3	0.0515	191	3	0.0246	179	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	0.0072		5	0.0363
5-1	0.0092		5-1	0.0061		5-1	0.0586		5-1	0.0321
2	0.0496		2	0.0361		2	0.0254		2	0.0391
3	0.0597	191	3	0.0382	176	3	0.0466	159	3	0.0362
4	0.0524		4	0.0360		4	0.0496		4	0.0385
5	0.0465		5	0.0442		5	0.0431		5	0.0382
Avg √ΔP										

Symbol	Definition, Units	Method/Equation	Run 1	Run 2	Run 3	Average
T_{db}	Dry bulb temp., °F		185			
T_{wb}	Wet bulb temp., °F		161			
P_{stat}	Static press., in H_2O		0.054C			
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	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				

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VOLUME FLOWRATE MEASUREMENT

Plant [illegible]
Sampling Location Baghouse outlet
Test Conditions Normal
Date 12/3/92 Time —
Duct Dimensions —
Duct Area — in²
Gauge I.D. SR-1 in H2O By [illegible]
Post Test Leak Check [illegible]

Cyclonic Flow ? Yes__ No X Avg Null Angle —
P_o = Barometric Pressure 30.[illegible] in Hg
C_p = Pitot Coefficient 0.[illegible]
Pitot I.D. 11-5

Run #	3										
Time	ΔP	Temp °F									
Pt 1	[illegible]										
2	[illegible]										
3	[illegible]	195									
4	0.04[illegible]										
5	[illegible]										
5-1	0.00[illegible]										
2	0.03[illegible]										
3	[illegible]	191									
4	0.0378										
5	0.0575										
5-1	0.0190										
2	0.03[illegible]4										
3	0.0426	177									
4	0.0455										
5	0.0159										
5-1	0.0[illegible]4										
2	0.0243										
	0.0163	175									
	0.0180										
	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 $\sqrt{\Delta P} \times \sqrt{T_s}$				
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 $(1/P_sM_s)^{1/2}$ (Cp)				
qa	Actual flowrate, acfm	qa = VsAs/144				
qs	Flowrate @ std cond, scfm	qs = 0.123 VsAs md Ps / Ts				

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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

Cyclonic Flow ? Yes__ No / Avg Null Angle /
P_o = Barometric Pressure 30.42 in Hg
C_p = Pitot Coefficient 0.8415
Pitot I.D. S-1

Run #	1											
Time	ΔP	Temp	11AM	Δp	Temp		ΔP	Temp	1100	ΔP	Temp	
Pt 1	2.154	189	1-22	2.418	244	2-1	1.269	221	2-22	2.571	208	
2	1.774	182	23	2.16	252	2	1.183	228	23	2.415	211	
3	2.36	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	1.250	229				
6	2.435	186				6	1.405	229				
7	2.245	186				7	1.747	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	2.555	203				
13	2.015	207				13	2.649	200				
14	1.671	218				14	2.410	199				
15	1.819	220				15	2.616	205				
16	2.007	218				16	2.552	205				
17	2.279	230				17	2.379	205				
18	2.119	244				18	2.618	193				
19	2.389	240				19	1.989	200				
20	2.027	227				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					
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	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				

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VOLUME FLOWRATE MEASUREMENT

Plant OSM

Sampling Location Baghouse Inlet

Test Conditions Normal

Date 12/2[illegible] Time [illegible]

Duct Dimensions [illegible]

Duct Area [illegible] in²

Gauge I.D. SR-1 in H20 By MC TT

Post Test Leak Check Good

Cyclonic Flow ? Yes__ No__ Avg Null Angle ____

P_o = Barometric Pressure [illegible] in Hg

C_p = Pitot Coefficient [illegible]

Pitot I.D. 14-5

Run #	2									
Time	ΔP	Temp	1635	ΔP	Temp	1635	ΔP	Temp		
Pt/1-1	2.096	199	22	2.[illegible]	114	19		[illegible]		
2	2.14	17[illegible]	23	[illegible]	114	20		[illegible]		
3	2.[illegible]	[illegible]	24	[illegible]	114	21		[illegible]		
4	[illegible]	[illegible]	1-1	1.[illegible]	24[illegible]	22		[illegible]		
[illegible]	[illegible]	155	2	1.9[illegible]	[illegible]	23	[illegible]	[illegible]		
[illegible]	[illegible]	150	3	2.12	268	24	[illegible]	[illegible]		
7	2.35	146	4	2.37	278					
8	1.23	126	5	2.76	28[illegible]					
9	1.6[illegible]	145	6	[illegible]	28[illegible]					
10	2.[illegible]	144	7	[illegible]	[illegible]					
11	2.[illegible]	[illegible]	8	[illegible]	[illegible]					
12	1.42	146	9	3.21	282					
13	3.[illegible]	150	10	2.87	282					
14	3.[illegible]	124	11	2.9[illegible]	280					
15	3.81	121	12	2.[illegible]	270					
16	3.7[illegible]	120	13	1.7[illegible]	261					
17	3.47	118	14	1.[illegible]	261					
18	3.[illegible]	117	15	.[illegible]	249					
19	3.[illegible]	115	16	1.7[illegible]	249					
20	3.38	115	17	1.76	23[illegible]					
21	3.52	114	18	2.19	23[illegible]					
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.[illegible]			
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	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

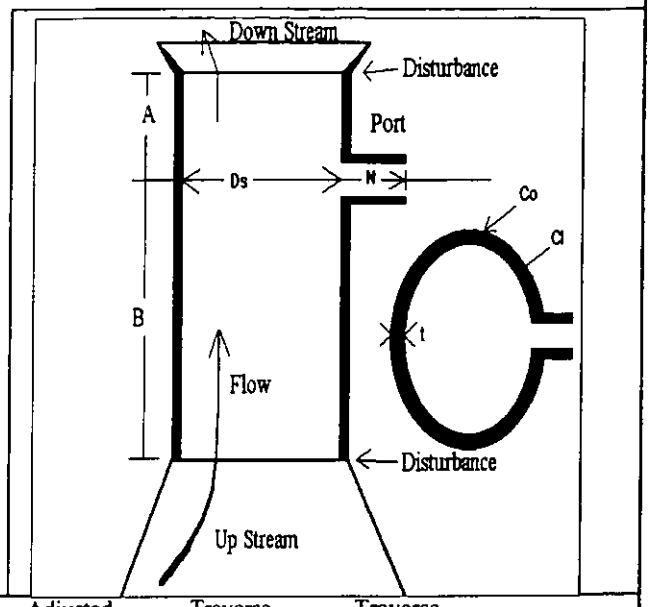
Client	Oregon Steel Mills			Portland, OR	Date
Location	Portland, OR			MJE/BTF/TJH C	By
EPA Method #1	Outlet			osm1536	File
Number of PORTS	P	#	5		
INSIDE of FAR WALL to OUTSIDE of Nipple	F	in	52.0		
INSIDE of NEAR WALL to OUTSIDE of Nipple	N		0.00		
Stack/Duct WIDTH	Dw	in	179.0		
DOWNstream Disturb	A	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			MJB: 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	"
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)		24	
Recommended #Pts/Diameter		12	
Traverse (NON-Particulate)		16	
Recommended #Pts/Diameter		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

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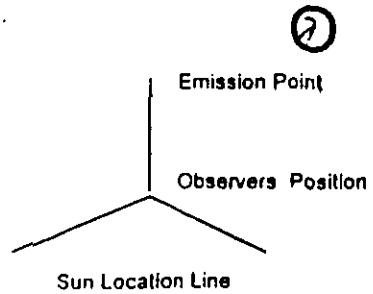
VISIBLE EMISSION OBSERVATION FORM

SOURCE INFORMATION	
Company Name	OSM
Address	Portland, OR
Phone #	

Source Description: Exhaust Throat	ID #: —
Operating Mode/Output Rate: Normal	
Control Equipment: Exhaust	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?	NC	/
Attached Plume?		
Detached Plume?		
Point in the Plume at Which Opacity was Observed	RH Throat	/
Description of Background	Throat Exit + Cowl	
Color of Background	Blue	/
Condition of Sky	Cloudy	/
Wind Speed (0-3)	—	/
Wind Direction (from)	N	/
Ambient Temperature (°F)	50	/

Source Layout Sketch — Draw North Arrow



Comments

OBSERVATION RECORD

DATE 12/27/99 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	1346
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. 279
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	osm1536			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	15:08	
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	12:08	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	O2	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	CO2	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

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Calibration Field Record

Client: OSM
Date: 12/27/00
Source: 8H [illegible]

Tester: CDB
Observer: ——
Data Logger ID: K-[illegible]

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					1058	1110	1643		
CO2 % ch 2		35	CO2	21.76	21.75	21.65	21.51		
Range 0-25%		22	CO2	12.52	12.49	12.52	12.42		
Analyzer Model 1400		26	N2	0.0	-0.01	0.0	-0.05		
Analyzer SN: 1		cc-721		49.8	49.6	51.1	49.1		
CO ppm ch 3		35	CO	898	891.3	898.0	887.1		
Range 0-1000		22	CO	503	500.9	504.8	502.8		
Analyzer Model 48		26	N2	0.0	0.1	-0.3	-0.3		
Analyzer SN: 10		cc-7 62		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 1400		26	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		26	N2	0.0	0.3	0.3	0.1		
Analyzer SN: 3	50% -> 51			45	46.2	45.36	45.49		
~~TGOC pp~~ SO_2 ch 6		R9		26.4	28.29	29.32	29.85		
Range 0-30		R14		9.39	9.26	10.94	11.56		
Analyzer Model 721M		26		0.0	0.12	0.56	1.34		
~~Analyzer SN:~~			~~Air~~						
TGOC ch 5		25	C_3H_8	86.5	86.5	88.23	91.56		
Range 0-100		22	"	49.5	49.5	45.07	45.38		
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	| ACR-CV | / 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	

Test Times	Run 1	Run 2	Run 3
Start Time	1200		
End Time	1642		

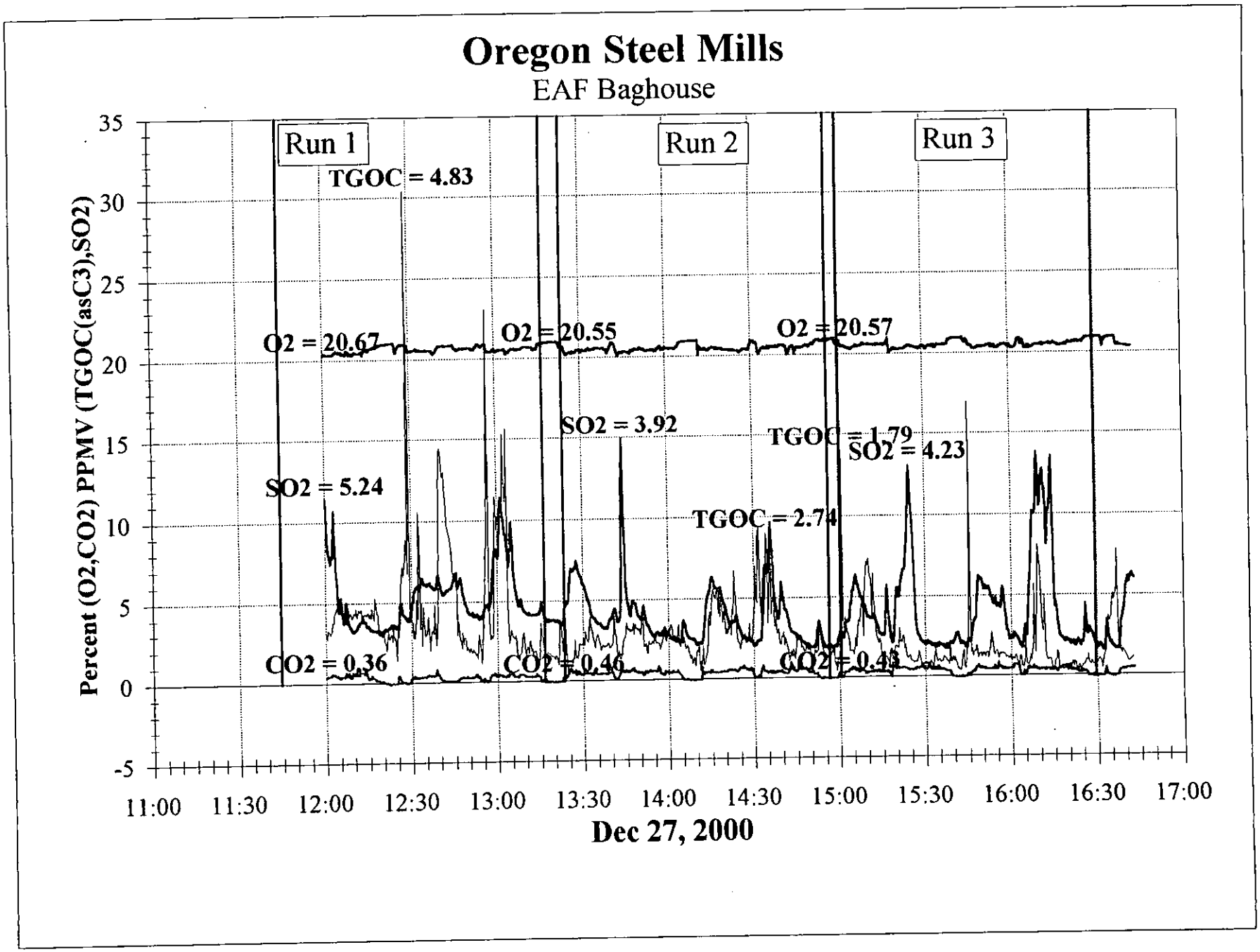
★ 3.5 min
[illegible]

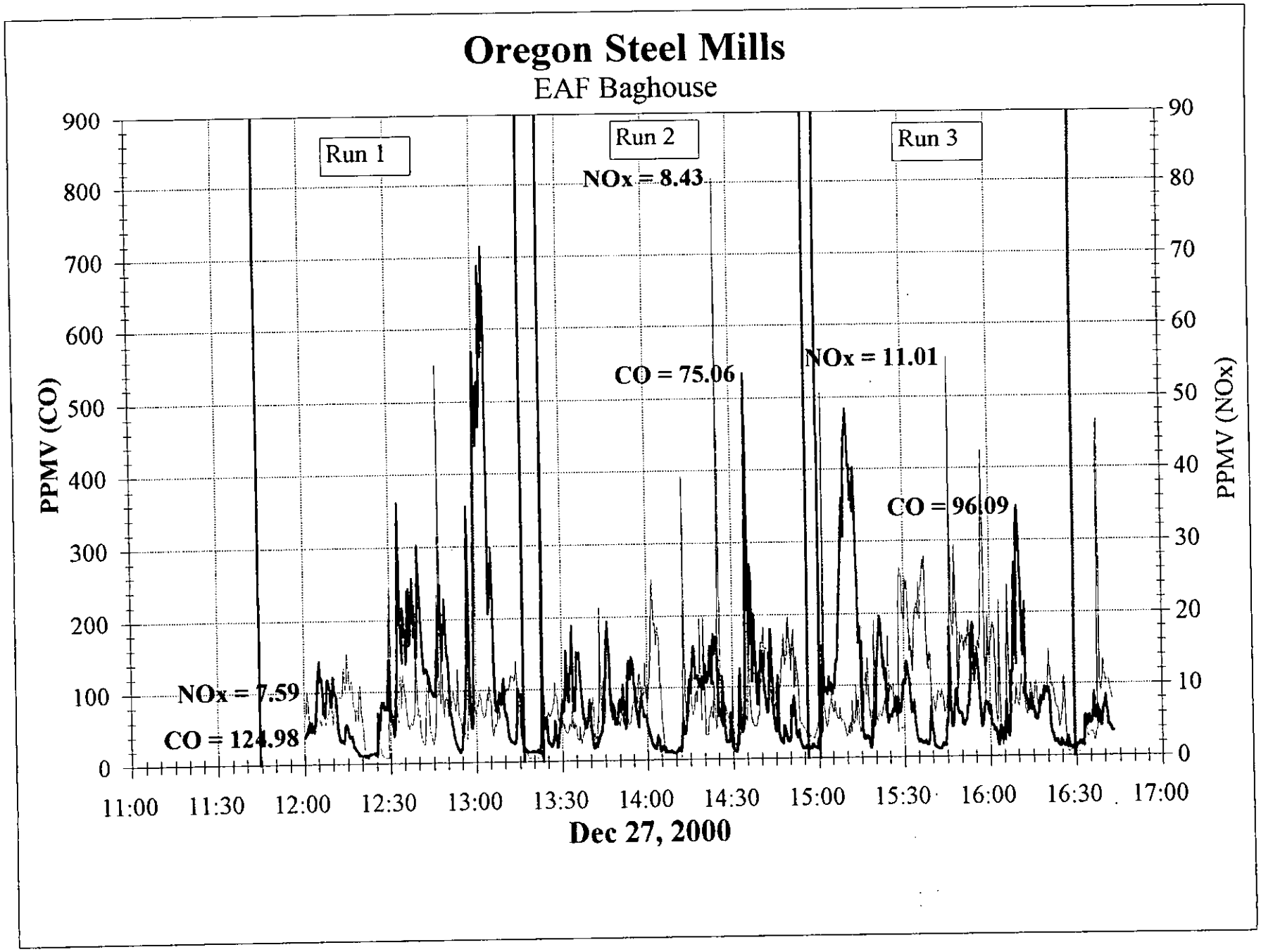
★ Didn't start gases until 1200 [illegible] Cal Gas [illegible]

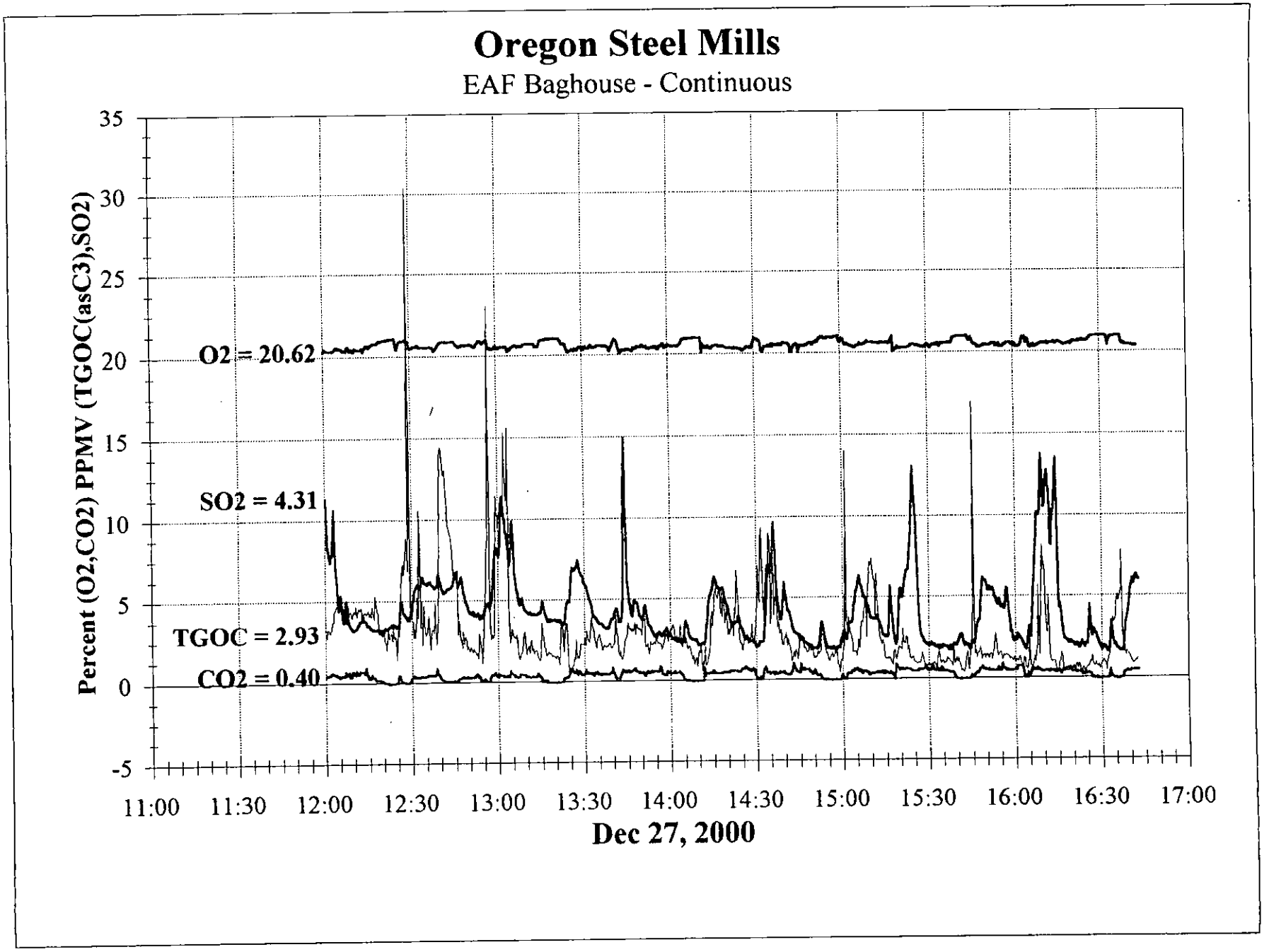
Bias Check

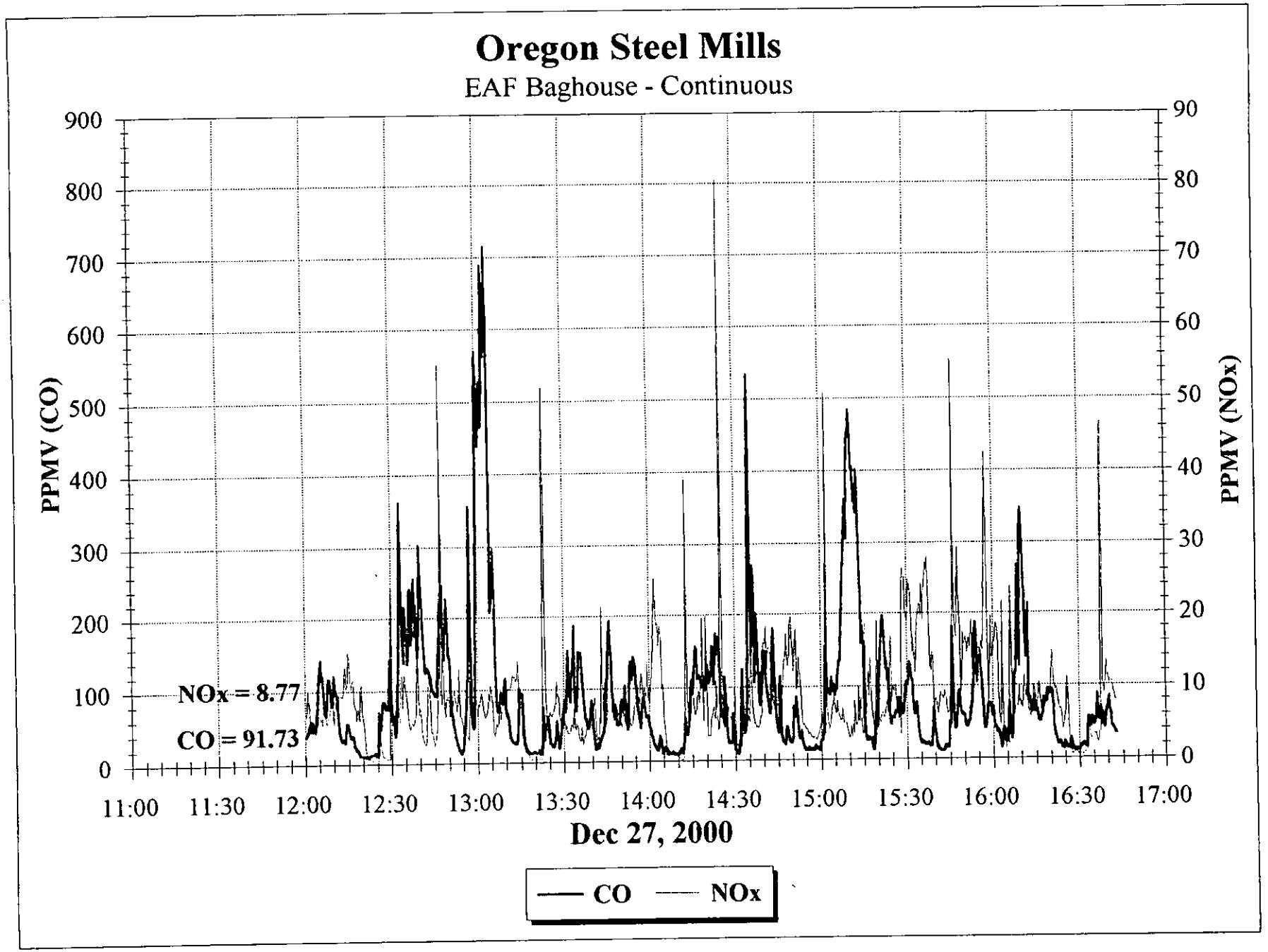
Oregon Steel Mills EAF Baghouse 27-December-2000		Span	Cylinder Value CV	Analyzer Calibration Response ACR	Initial System Calibration Response SCRi	Final System Calibration Response SCRf	Cylinder Value Percent of Span	Difference < 2%	Initial System Calibration Bias < 5%	Final System Calibration Bias < 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%

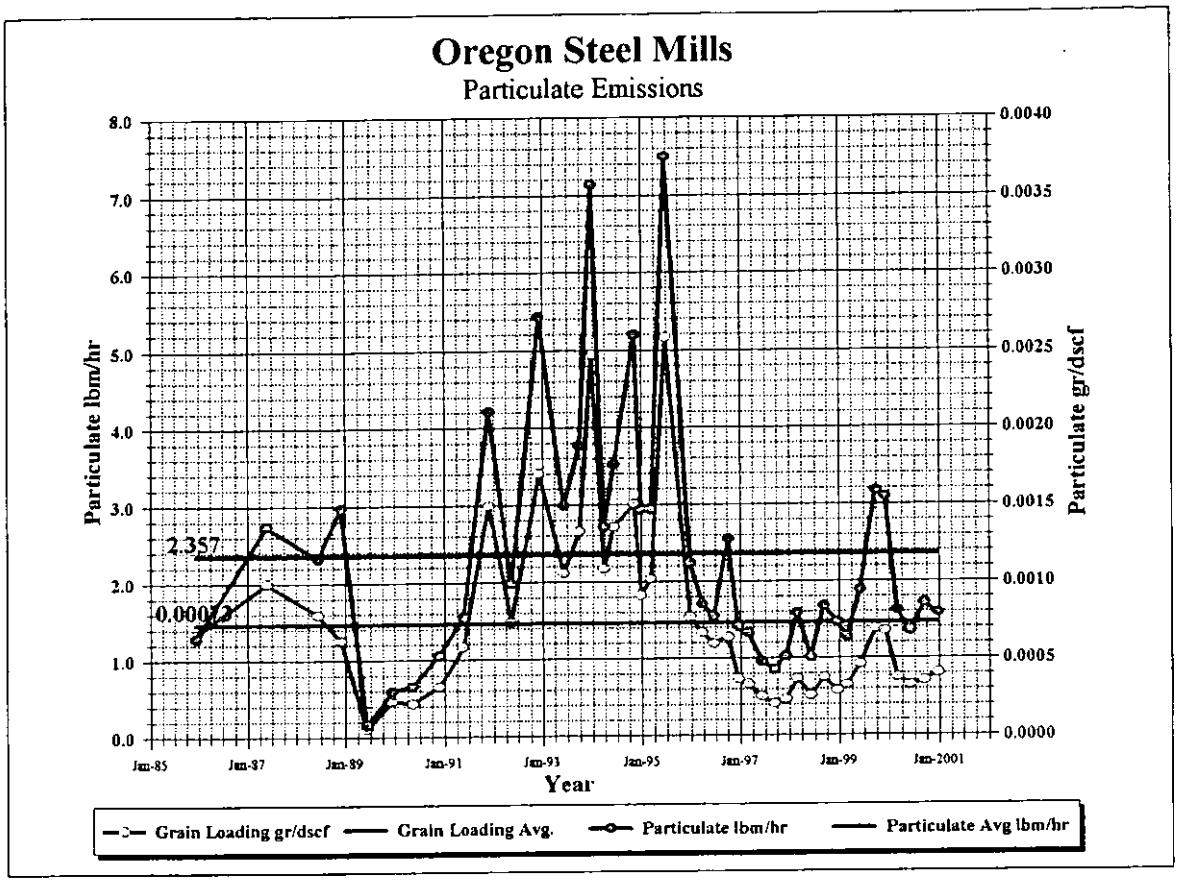
Part 60, Appendix A, Method 6C, Figures 6C-3 to 6C-5

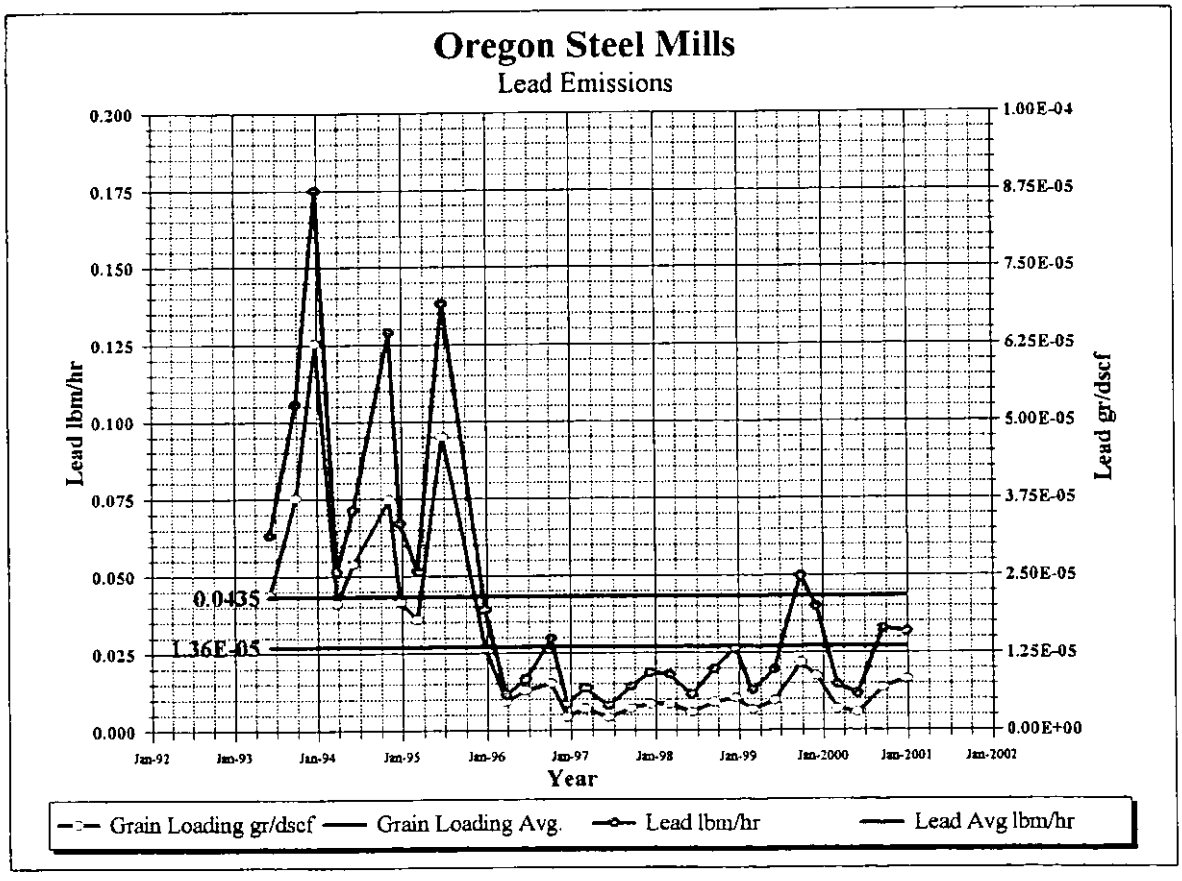

Oregon Steel Mills
EAF Baghouse
Run 1
Run 2
Run 3
TGOC = 4.83
O2 = 20.67
O2 = 20.55
O2 = 20.57
SO2 = 3.92
TGOC = 1.79
SO2 = 4.23
SO2 = 5.24
TGOC = 2.74
CO2 = 0.36
CO2 = 0.46
CO2 = 0.48
Percent (O2,CO2) PPMV (TGOC(asC3),SO2)
35
30
25
20
15
10
5
0
-5
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Dec 27, 2000

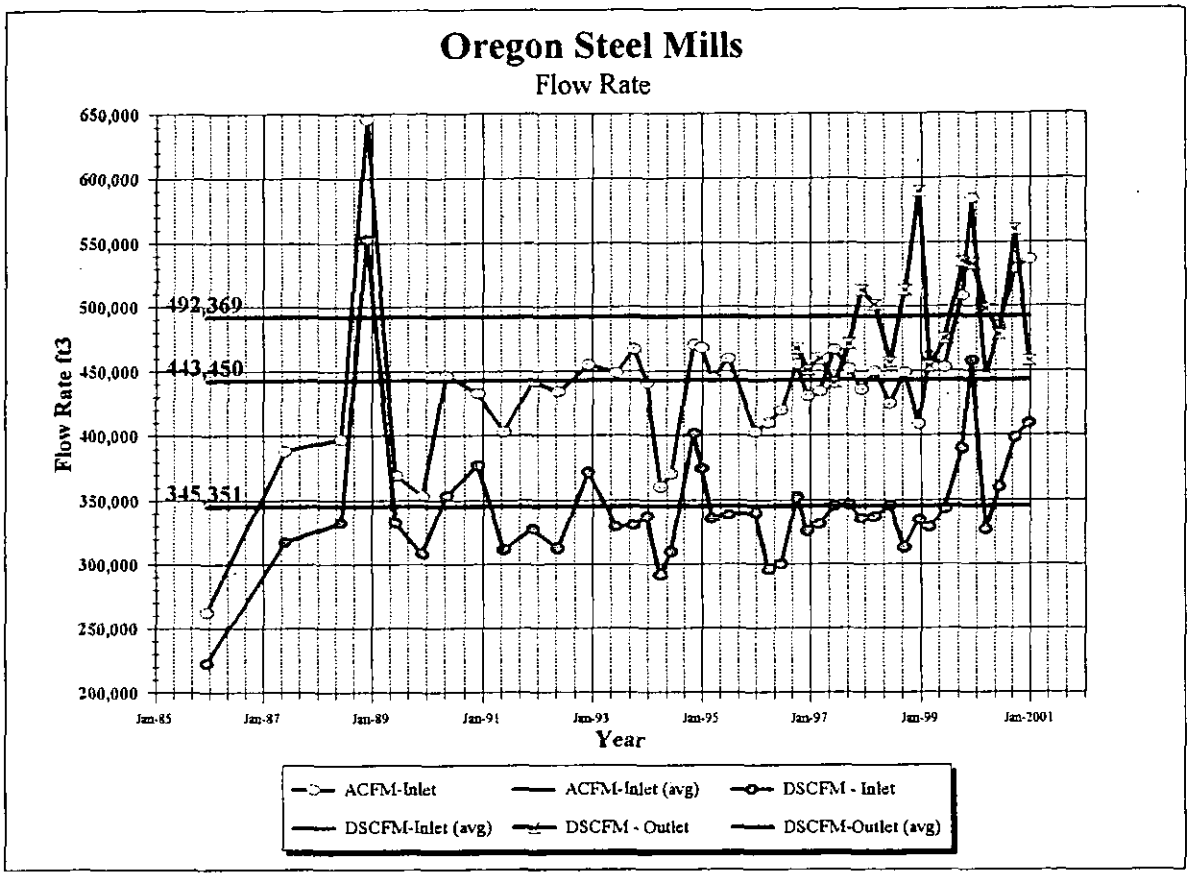

Oregon Steel Mills
EAF Baghouse
Run 1
Run 2
Run 3
NOx = 8.43
CO = 75.06
NOx = 11.01
CO = 96.09
NOx = 7.59
CO = 124.98
PPMV (CO)
PPMV (NOx)
900
800
700
600
500
400
300
200
100
0
90
80
70
60
50
40
30
20
10
0
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Dec 27, 2000

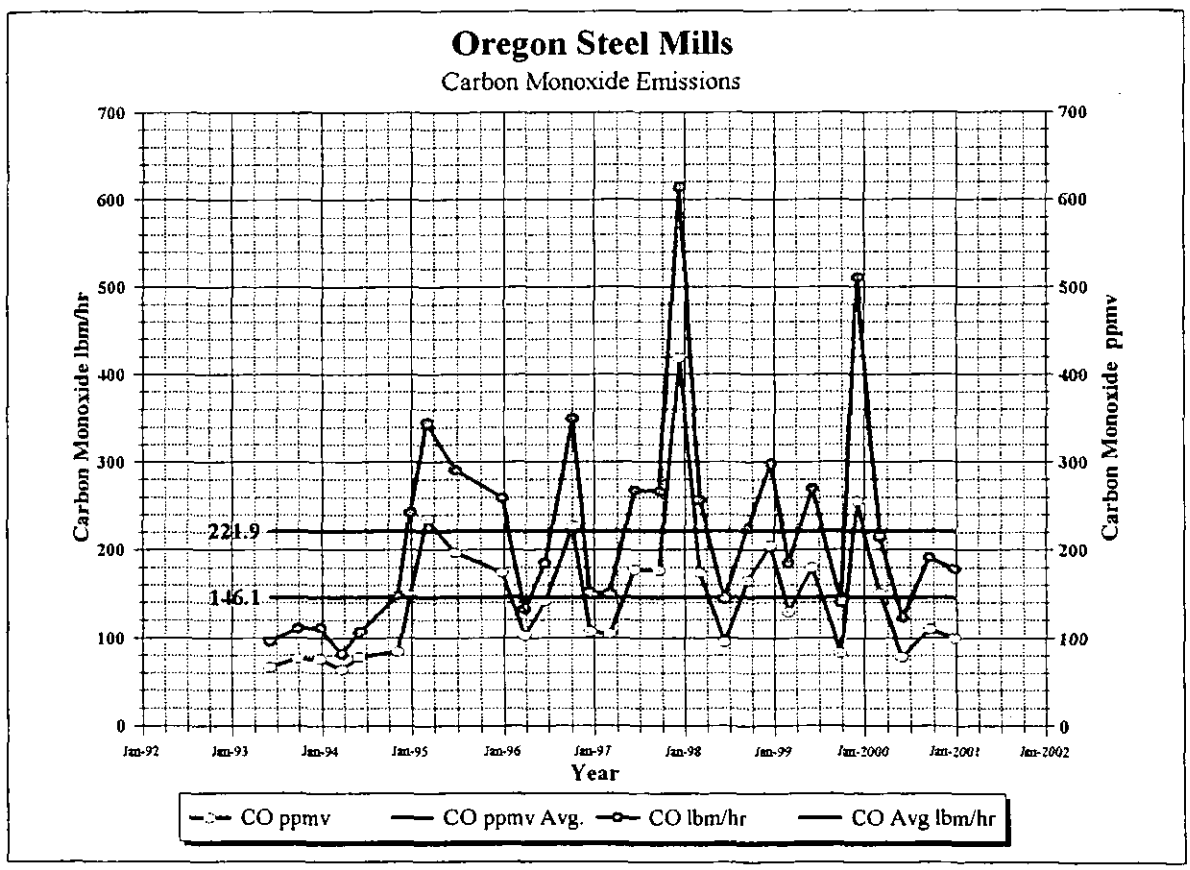

Oregon Steel Mills
EAF Baghouse - Continuous
Percent (O2,CO2) PPMV (TGOC(asC3),SO2)
35
30
25
20
15
10
5
0
-5
O2 = 20.62
SO2 = 4.31
TGOC = 2.93
CO2 = 0.40
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Dec 27, 2000


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
Year
2.357
0.00073
Grain Loading gr/dscf
Grain Loading Avg.
Particulate lbm/hr
Particulate Avg lbm/hr

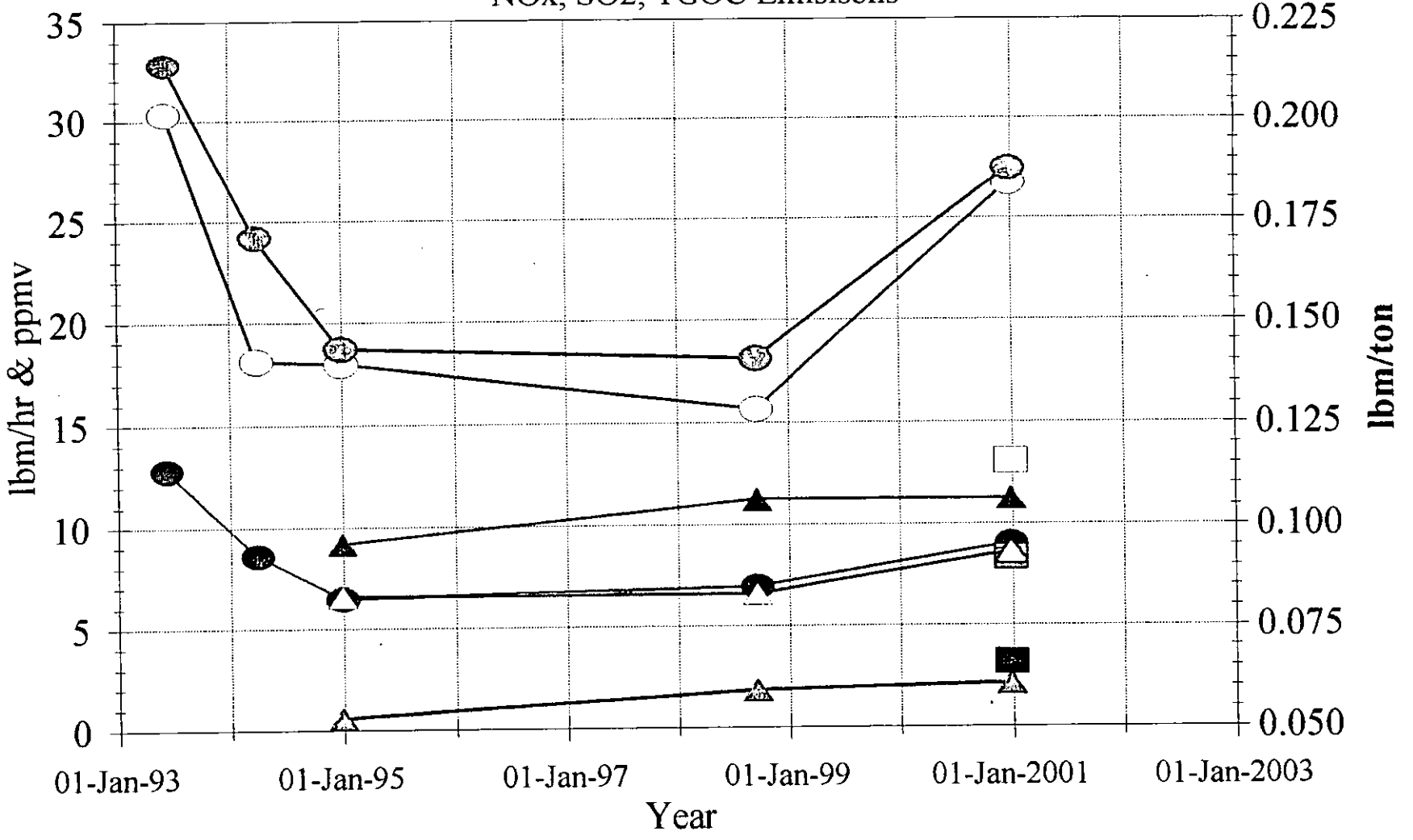

Oregon Steel Mills
Lead Emissions
Lead lbm/hr
Lead gr/dscf
Year
0.0435
1.36E-05
Grain Loading gr/dscf
Grain Loading Avg.
Lead lbm/hr
Lead Avg lbm/hr

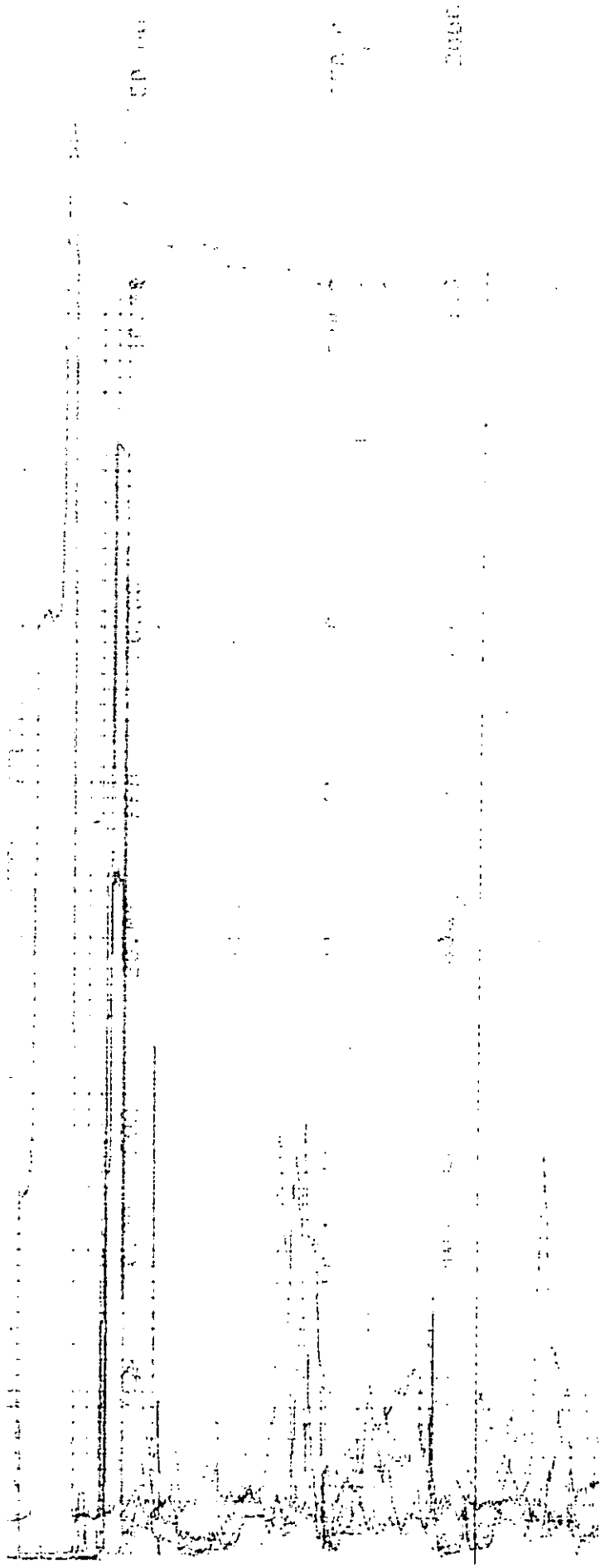

Oregon Steel Mills
Flow Rate
650,000
600,000
550,000
500,000
450,000
400,000
350,000
300,000
250,000
200,000
492,369
443,450
345,351
Flow Rate ft3
Jan-85
Jan-87
Jan-89
Jan-91
Jan-93
Jan-95
Jan-97
Jan-99
Jan-2001
Year
ACFM-Inlet
ACFM-Inlet (avg)
DSCFM - Inlet
DSCFM-Inlet (avg)
DSCFM - Outlet
DSCFM-Outlet (avg)


Oregon Steel Mills
Carbon Monoxide Emissions
700
600
500
400
300
200
100
0
221.9
146.1
Carbon Monoxide lbm/hr
Carbon Monoxide ppmv
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-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





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 KWH	: 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

DST #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: 769 Last Heat Tapped: 1222

Total Charge Wt	: 280.0	Furnace Line Los	: 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	Avg. 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

GST #3 FURNACE HEAT LOG

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 Loss	: 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 KWH	: 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

EAF #3 FURNACE HEAT LOG

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

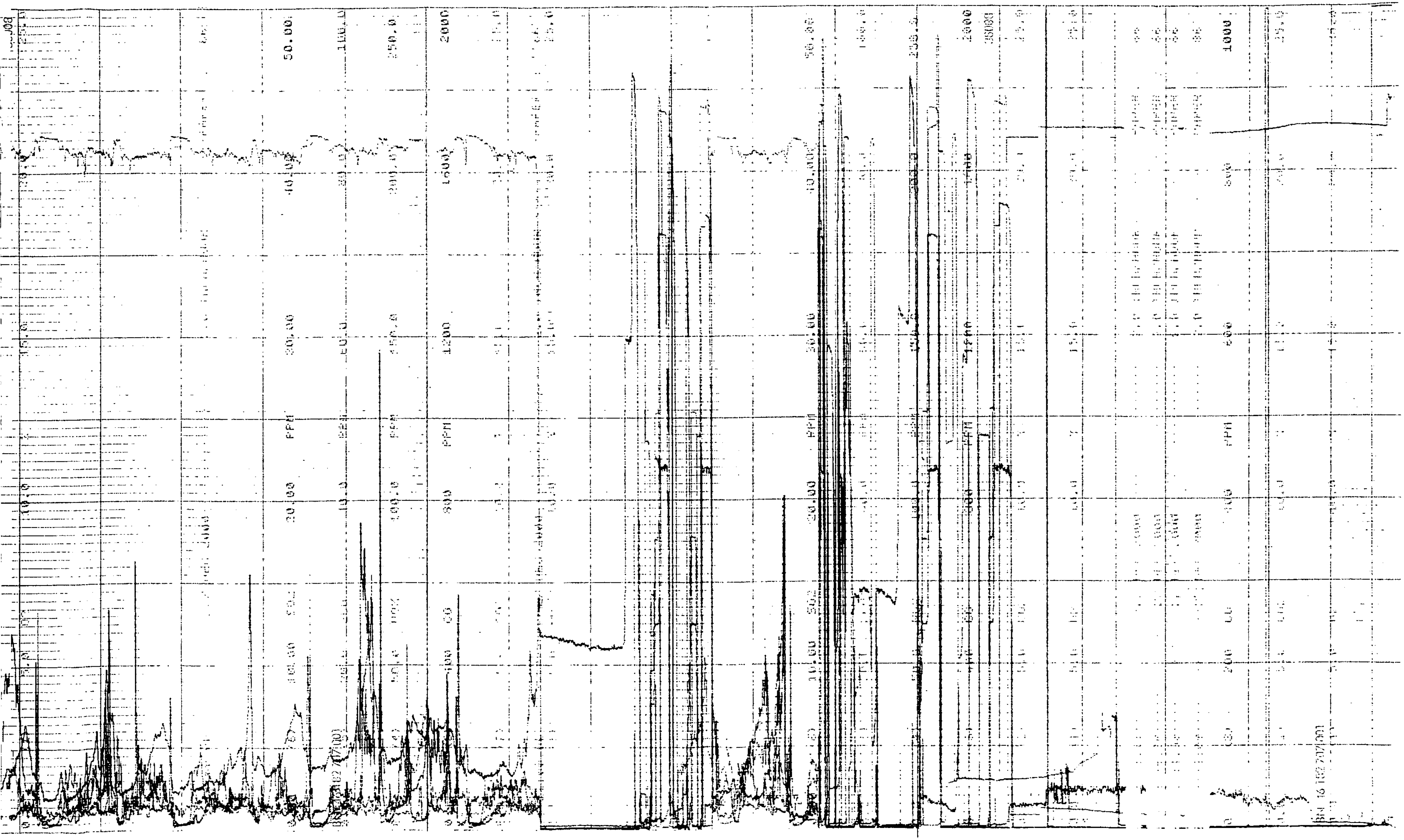
Heats on Delta: 791 Last Heat Tapped: 1410

Total Charge Wt	: 280.0	Furnace Line 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 KWH	: 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



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DSM #3 FURNACE HEAT LOG

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 KWH	: 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:

134,30 1st Charge
60,500 2nd Charge

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

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	Nat. 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	: 47	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 Bagbouse 12/27/00

Compression Press Drops

	1	2	3	4	5	6	7	8
R1	6"	5"	5"	5"	5.5"	5"	4.9"	5.5
1152	9	10	11	12	13	14	15	16
	5"	5"	5"	5"	5"	5"	—	5.5

	1	2	3	4	5	6	7	8
R2	5"	4"	5"	—	5.5"	5"	4.5"	5"
1350	9	10	11	12	13	14	15	16
	5"	5"	5"	5.5"	5.5"	5.5"	6"	4.5"

	1	2	3	4	5	6	7	8
R3	6"	5"	5.5"	5"	5.5"	4.5"	4"	5"
1502	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
1	-2.04	4.1625	2.9447	-6.0079
2	-1.90	3.5991	3.0054	-5.7016
3	-1.83	3.3584	3.0259	-5.5453
4	-1.56	2.4356	3.1539	-4.9222
5	-1.51	2.2926	3.1671	-4.7953
6	-1.47	2.1599	3.1745	-4.6655
7	-0.87	0.7526	3.4502	-2.9930
8	-0.87	0.7526	3.4604	-3.0019
9	-0.87	0.7526	3.4606	-3.0021
10	-0.43	0.1856	3.6726	-1.5821
11	-0.40	0.1604	3.6785	-1.4732
12	-0.40	0.1604	3.6848	-1.4757
13	-0.20	0.0394	3.7897	-0.7521
14	-0.15	0.0227	3.8044	-0.5738
15	-0.14	0.0194	3.8040	-0.5298
16	0.00	0.0000	3.8817	0.0000
17	0.00	0.0000	3.8815	0.0000
18	0.00	0.0000	3.8733	0.0000

Average

No#	W	W²	Z	WZ
2	-2.41	5.7982	2.7211	-6.5522
3	-2.41	5.7982	2.7356	-6.5872
4	-1.51	2.2926	3.1014	-4.6959
5	-1.56	2.4356	3.0867	-4.8172
6	-1.56	2.4356	3.0829	-4.8114
7	-0.87	0.7526	3.3922	-2.9428
8	-0.87	0.7526	3.3969	-2.9468
9	-0.87	0.7526	3.4016	-2.9509
10	-0.48	0.2285	3.5885	-1.7154
11	-0.46	0.2135	3.5945	-1.6608
12	-0.45	0.1992	3.6002	-1.6067
13	-0.20	0.0394	3.7166	-0.7376
14	-0.20	0.0394	3.7234	-0.7389
15	-0.19	0.0347	3.7236	-0.6938
16	0.00	0.0000	3.8178	0.0000
17	0.00	0.0000	3.8099	0.0000
18	0.00	0.0000	3.8097	0.0000

No#	W		W²	Z	WZ
18	-14.64		20.8536	62.9132	-47.0213
18	-14.64	C1	62.91		
-14.64	20.85	C2	-47.02		
1	-0.81	C1	3.50	C1=	3.87111
0	8.95	C2	4.14	C2=	0.46230
1	-0.81	C1	3.50	A=	47.99563
0	1	C2	0.46	B=	0.46230
1	0	C1	3.87	@1.00	48.00
0	1	C2	0.46	@0.10	16.55

No#	W		W²	Z	WZ
17	-14.02		21.7726	58.3029	-43.4577
17	-14.02	C1	58.30		
-14.02	21.77	C2	-43.46		
0.9444	-0.82	C1	3.43	C1=	3.80440
-0.7791	10.20	C2	4.64	C2=	0.45438
0.9444	-0.82	C1	3.43	A=	44.89831
-0.087	1	C2	0.45	B=	0.45438
0.8737	0	C1	3.80	@1.00	44.90
-0.087	1	C2	0.45	@0.10	15.77

F 8163 NS

NORTHWEST NATU..AL GAS COMPANY

TRANSFER PROVER DATA SHEET

Date 5/12/00

Customer Horizon

Location Tucel 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	ΔP PERCENT	ΔT PERCENT	CORRECTED PROOF PERCENT	ACCURACY PERCENT	AVERAGE ERROR	IF METER IS TEMP. CONTROLLED, FILL IN REMAINING SPACES	GAS TEMP.	PROOF TARGET	CORRECTED PROOF PERCENT	PERCENT ERROR	AVERAGE ERROR
5m	3600	11		3533		-1.0	-0.2	100.2	-0.2							
				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		-0.3	-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		-0.1	-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 Ray 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 #2 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		
9/11/00	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		
3s-1	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		
9/11/00	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
Pass	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		
09/11/00	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
Pass	1.240	2.000	0.77953	0.00063		
09/19/00	0.850	1.380	0.77697	0.00318		
DLR	0.390	0.620	0.78518	0.00503		
14-s ✓	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		
09/19/00	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	57.8	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	59.8	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 Pitot	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	210.8	-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	348.6	-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
	8S-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	210.8	212.2	-1.6	335.4	332.0	3.4	0.53
	A4	60.0	60.2	-0.2	210.8	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%	
Rivol 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	336.0	3.4	

Standard Used Fluke 5895570

Date: 8-7-00	Deviation	@32 F	7.4	Pb=	30.05 in Hg					TJR7 MJE/DLR	
Next Calibration: 08-01	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	0.6	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

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(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

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(Serial No. M96 1010)

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						60.0	Temp.(F)
Location	Whitaker Shop						30.50	Pb(in H2O)
							0-3Inc/MB-1	Manometer

Magnehelic ID	15 sec. High	leak check Low	Scale Inches	Magnehelic in H2O	Manometer in H2O	Difference in H2O	Difference %	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	2.9%	**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%	**0.8%**

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

Morgan Jones

These filters are stored in the dessicator

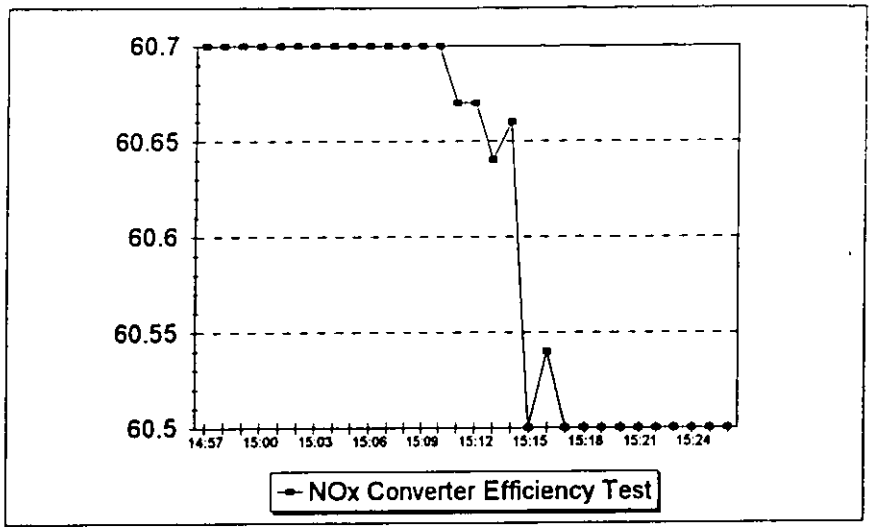
	9-25-00	9-26-00	9-27-00	9-28-00
6855673 ✓	4.2900	4.2902		
674	4.2865	4.2867		
675	4.2859	4.2861		
676	4.2995	4.2994		
677	4.2824	4.2825		
6855678	4.3026	4.3029		
679	4.2872	4.2875		
680	4.2569	4.2571		
681	4.2463	4.2464		
682	4.2518	4.2521		
6855683 ✓	4.2405	4.2413	4.2416	
684	4.2435	4.2439		
685	4.2228	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

NOx Converter Efficiency Test
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 %	
		CYLINDER #:	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	CYLINDER #:	CONTINUOUS		49.8 ppm	50.5 ppm
		CC108765	UV 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	
O2-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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

#22
PO#303

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: 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, MODEL, 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 #:	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,O2-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

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 psig
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 922M		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	
O2-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

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

#02
P.O. 3096

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01
TO: DAVID ROSSMAN
HORIZON ENGINEERING/
INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

DATE : 09/28/00

CUSTOMER ORDER NUMBER: 003096

PAGE 1

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	S/N None	09/28/03	11.52 %
		Cylinder #	Thermal Conductivity		11.70 %
Nitrogen	Balance	CC50175	Gas Chromatography		11.60 %
Cylinder Pressure: 2000 psig		@ 25.69 %	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: _____ Approved: _____

M.S. Calhoun J.T. Marrin

BYRNE SPECIALTY GASES
206.621.8400

E # R 9 Temp.
002774 of 4
For: BF Job # 113
Ft. James

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	11/1/99	Laboratory:	LOS ANGELES

Reference Standard Information:

Type	Component	Cyl. 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:		10/25/99					
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	50.800	Conc	26.489 PPM
						AVG:	26.489 PPM
2nd Analysis Date:		11/1/99					
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:	9.393 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

96

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 ppm	Meeko Aquamatic
THC	< 0.1 ppm	0.01 ppm	Varian GC/MS
CO	< 1.0 ppm	0.23 ppm	Varian GC/MS
CO2	< 1.0 ppm	0.12 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

5.31.00
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

Polar Cryogenics Inc.

■ Specialty Gas ■ Cryogenics ■ Bulk Gases ■ Liquid Helium

Certificate of Analysis

Z6

Customer: Horizon Engineering
Product: Nitrogen
Grade: Zero, 99.998% Purity
Cylinder Number: cc180290
Lot Number: E08013

Date: 5-10-00

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
CO2	< 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
Job# 0036402-04

Identification: OR-DEQ
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

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)	11.0L	date/time weighed	10.9L	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 RESIDUES (page 3)

FLTERS:
Sample # 36404
Sample ID FM1-101
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	70/58	71/58	70/57
Relative humidity (%)	49	48	50	48	45	44

* Have no Tare wt for this filter #2

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

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 H2O
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 6010B**				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 Gutierrez	DATE: 1/11/01	RECEIVED BY:	DATE 1/11/01
PRINT NAME	FIRM: TIME:	PRINT NAME: JEREMY ROSMAN	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.

PAGE 2 OF 2

101

00364OC
0101063-08A

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

20364O4
0101063-10A

Method 12 Compliance Audit Material
(Lead Spiked Filter)

REPORTING FORM: To be completed by laboratory

Request Number/Sample Number: M12 - 0017 - 01 / FMH1 - 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 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

Jack Herbert
Source Testing Coordinator

JHH

c: Greg Grunow:NWR

Diana, J.H. wants you to dry down the [illegible] audit just as you do for the test sample. Leave Fi[illegible] & R[illegible] to H[illegible] Call [illegible] Q[illegible]

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 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 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_2, 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_2 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.

   Laboratory 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 this 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 all 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, heat 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 [OAR 340-218-0050(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-7.1 (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.

39.e. 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 permittee may use the last source tests conducted on each of the emission points as one of 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 of 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;