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

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

AP-42 Section Number: 9.10.1.2

Reference Number: 11

Title: Emissions Survey Conducted at Western Sugar Company's Billings, Montana, Production Facility

American Environmental Testing Company, Inc.

American Environmental Testing Company, Inc.

December 1988

AP-42 Section 9.12.2
Reference 11
Report Sect.
Reference

1988-89

"EMISSIONS SURVEY CONDUCTED AT

WESTERN SUGAR COMPANY'S BILLINGS, MONTANA

PRODUCTION FACILITY"

American Environmental Testing Company Inc.

801-266-7111

"EMISSIONS SURVEY CONDUCTED AT WESTERN SUGAR COMPANY'S BILLINGS, MONTANA PRODUCTION FACILITY"

Principal Chemists:

V. Brent Benson

Paul Tayler, PhD.

Technicians:

J. Paul Benson
Scott A. Staley
John R. Talcott

Test Dates: (Boiler)

12-6-88 and 12-7-88

(Pulp Dryer)

12-8-88 and 12-9-88

Prepared For: Mr. Randy A. Mielke, Regional Engineer

Western Sugar Company
P. O. Box 30878
Billings, Montana 59107

Prepared By: V. Brent Benson, Technical Director

American Environmental Testing, Inc.
565 South Birch Drive
Spanish Fork, Utah 84660

CERTIFICATION OF REPORT INTEGRITY

American Environmental Testing, Inc., (AET) certifies that this report represents the truth as well as can be derived by the methods employed. Every effort was made to obtain accurate and representative data and to comply with procedures set forth in the Federal Register.

V. Brent Benson 12/27-88

V. Brent Benson
Technical Director

American Environmental Testing, Inc.
565 South Birch Drive
Spanish Fork, Utah 84660

801-266-7111

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D. Cyclonic Flow Determination

"EMISSIONS SURVEY CONDUCTED AT WESTERN SUGAR COMPANY'S BILLINGS, MONTANA PRODUCTION FACILITY"

I. INTRODUCTION:

At the request of Western Sugar Company's Mr. Randy A. Mielke, American Environmental Testing, Inc., conducted the following emissions tests at their Billings, Montana production facility.

1. Coal fired boiler

   Combined EPA Methods 5 and 8 for particulate matter and SO_2 emissions from the exhaust stack and the SO_2 from the scrubber inlet.

2. Beet pulp dryer

   EPA Method 5 for particulate matter from the dryer combustion and pelletizing circuit.

The tests on the boiler were conducted on December 6 and 7, 1988. The pulp dryer tests were run on December 8 and 9, 1988. The tests were observed by Mr. Harry Keltz and Mr. Jim Hughes from the Montana State Air Quality Bureau.

II. SUMMARY:

The results of the compliance tests are summarized in Table I. The allowable emission rate on the boiler for particulate matter and SO_2 during the test period was 87.67 #/hr. and 2.0 #/10^6 Btu's respectively. The allowable ceiling level for particulate matter from the pulp dryer was 109.67 lbs/hr. during the testing period. (See Appendix "D" - Allowable emission rate calculations).

Using the production rates supplied by Western Sugar the coal fired boiler emitted 94.41% of the allowable particulate emissions and 7.62% of the allowable SO_2 rate. The east pulp dryer bank emissions were 11.15% of the allowable rate during the testing period.

TABLE 1-A

(Data Summary - Boiler)

Description	Test No. 1	Test No. 2	Test No. 3	Ave.
I. Boiler Exhaust				
A. Method 5 - Particulate Emissions				
1. Sample Volume Collected (DSCF)	57.234	54.398	55.184	55.605
2. Particulate matter collected (mg)	334.4	318.1	321.5	324.67
3. Emission Rate				
a) lbs/DSCF(x 10^{-5})	1.288	1.289	1.284	1.287
b) lbs/hr.	81.55	82.63	84.13	82.77
c) grain/DSCF	0.0902	0.0902	0.0899	0.0901
d) % of allowable	93.02	94.25	95.96	94.41
B. Method 8 SO_2 Emission				
1. Final sample volume/ml (ft.^{3})	0.0572	0.0544	0.0552	0.0556
2. Emission rate (lbs $SO_2/10^6$ Btu's)	0.137	0.150	0.178	0.155
a) % of allowable	6.85	7.50	8.50	7.62
II. Boiler Inlet				
Method 8 SO_2 Emission				
1. Final sample volume/ml (ft.^{3})	0.0260	0.0239	0.0245	0.0248
2. Emission rate (lbs $SO_2/10^6$ Btu's)	0.46	0.43	0.49	0.46
a) % Scrubber Effic.	70.1	65.2	63.7	66.3

17% total out Stack 83%

1.8 ton per Da 53%

3.5 SO_2 30% ash

TABLE I-B

(Data Summary - Pulp Dryer)

		Test 1	Test 2	Test 2	Ave.
I.	North Dryer Method 5 Particulate Emissions				
	a) Sample Volume collected (DSCF)	61.698	47.350	47.713	52.254
	b) Particulate matter collected (mg)	131.1	135.0	145.1	137.1
	c) Emission rate (lbs/hr)	5.59	7.35	7.74	6.89
	1. lbs/dscf x 10^{-6}	4.685	6.286	6.704	5.892
	2. grains/dscf	0.0328	0.0440	0.0469	0.0412
II.	South Dryer Method 5 Particulate Emissions				
	a) Sample Volume collected (dscf)	48.783	46.022	45.157	46.654
	b) Particulate matter collected (mg)	80.0	139.5	80.2	99.9
	c) Emission rate (lbs/hr)	4.47	7.27	4.25	5.33
	1. lbs/dscf x 10^{-6}	3.615	6.683	3.915	4.738
	2. grains/dscf	0.0253	0.0468	0.0274	0.0332
III.	Total Emissions				
	a) lbs/hr.	10.06	14.63	11.99	12.23
	b) % of allowable	9.17	13.34	10.93	11.15

III. PROCEDURES AND METHODS:

A. Plant Operations.

Plant production levels for pulp dryer and boiler firing rates are given in Appendix "D". Boiler run sheets are also included in Appendix "D" with 15 minutes parameter readings recorded during the testing period by Western Sugar production personnel.

B. Emissions Testing:

All of the test procedures employed were as specified in 40 CFR 60.424 (7-1-85 and as ammended) and in the "Quality Assurance Handbook for Air Pollution Measurement Systems". The standard Method 5 train was modified to allow for a Method 8 to be run concurrently with the particulate tests.

1. Calibrations:

   Calibration data and forms are included as Appendix "A".

2. Traverse Points:

   a) Pulp Dryer

   Figure I, is a diagram of the exhaust stacks from the East beet pulp dryer. With this geometry, it was necessary to use twenty-four (24) traverse points for each of the six Method 5 compliance tests. One complete test consisted of a test on each of the North and South exhaust stacks with the particulate loading from each being added for compliance criteria.

The distance from the inside wall of the stack to each point is given in Table II.

b) Boiler Exhaust Stack

Figure II, is a diagram of the exhaust stack from the coal-fired boiler. With this geometry, it was necessary to use twenty-four (24) traverse points for each of the three tests.

The distance from the inside wall of the stack to each point is given in Table III.

c) Boiler Scrubber Inlet Duct

Figure III, is a diagram of the inlet duct to the boiler scrubber. This point was analyzed for sulfur emissions only. With this geometry, it was necessary to use twenty-seven (27) traverse points on a 9 X 3 grid. A cross-section of the sample port area is shown in Figure IV along with the distance from the inside of the duct wall to each of the points.

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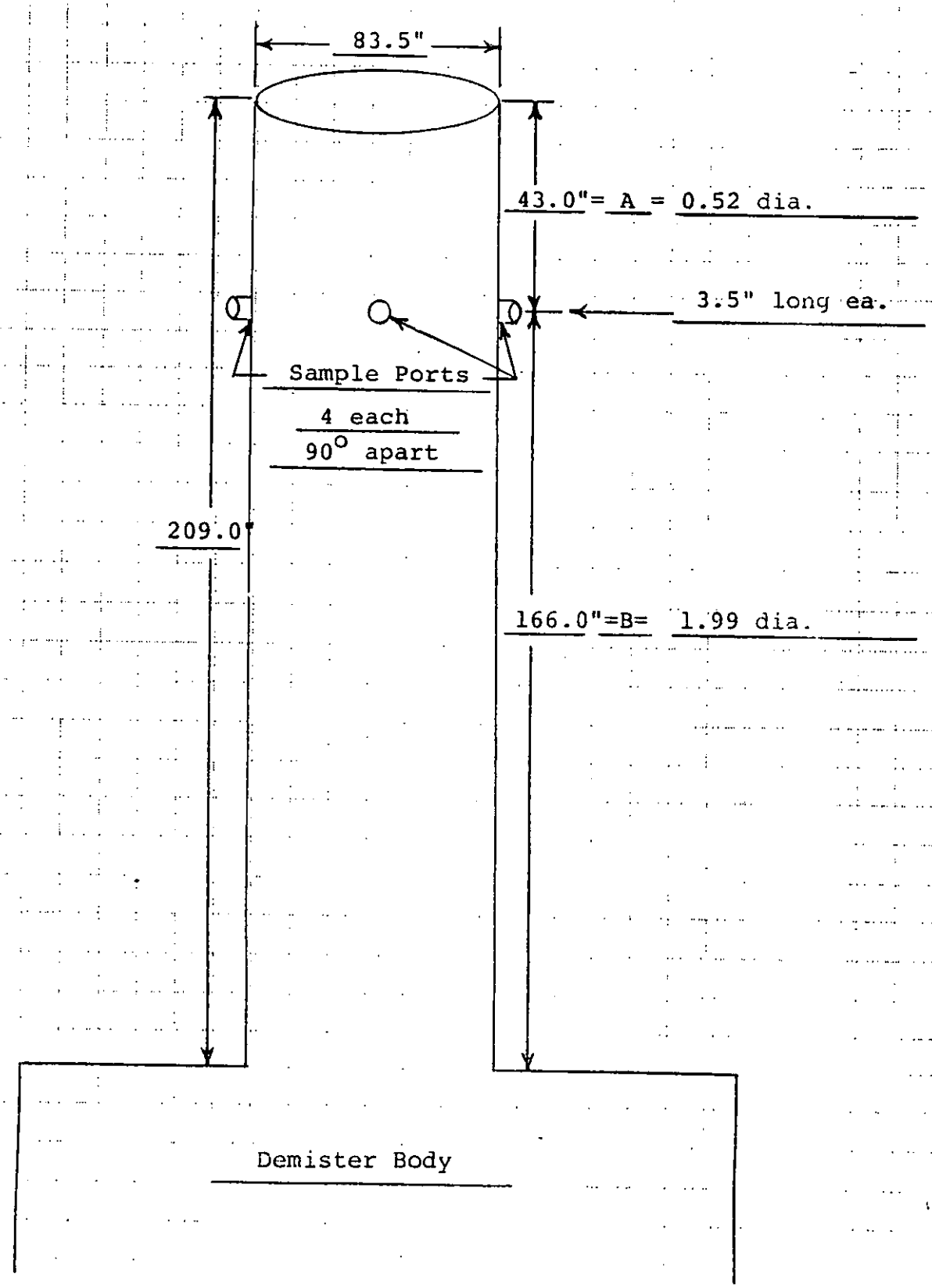
(801) 266-7111

JOB Western Sugar Company
SHEET NO. 1 OF 1
CALCULATED BY VB Benson DATE 10-13-88
CHECKED BY DATE
SCALE Billings, Montana

Figure I

(Beet Pulp Dryer Stack)



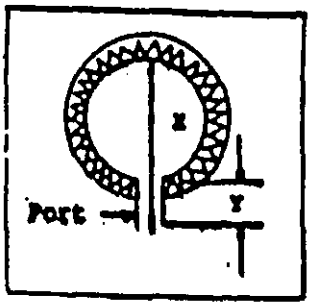
PRODUCT 704-1 NEBS Inc. Groton Mass. 01471

American Analytical & Environmental Lab.
5739 South 300 West
Sandy, Utah 84070

Table II.

TRAVERSE POINT CALCULATIONS.

Plant Western Sugar Co.
Date 10/23-88
Sampling location Silicon-Pulp Dryer.
Inside of far wall to outside of port (distance, X) 87.0
Inside of near wall to outside of port (distance, Y) 3.5
Stack I.D. 83.5" = 38.028 ft²



schematic of sampling location.

1 traverse point number	2 percent of stack I.D.	3 stack I.D. inches	4 product of col. 2 & 3 (to 1/8 in)	5 distance Y	6 traverse point location from outside of ports. (sum of columns 4 & 5)
1 + 13.	2.1	83.5"	1.754	3.5"	5.254 = 5 1/4"
2 + 14.	6.7	"	5.595	"	9.095 = 9 1/8"
3 + 15.	11.8	"	9.853	"	13.353 = 13 3/8"
4 + 16.	17.7	"	14.780	"	18.280 = 18 1/4"
5 + 17.	25.0	"	20.875	"	24.375 = 24 3/8"
6 + 18.	35.6	"	29.726	"	33.226 = 33 1/4"
7 + 19.	64.4	"	53.774	"	57.274 = 57 1/4"
8 + 20.	75.0	"	61.790	"	65.290 = 65 1/4"
9 + 21.	82.3	"	68.721	"	72.221 = 72 1/4"
10 + 22.	88.2	"	73.647	"	77.147 = 77 1/8"
11 + 23.	93.3	"	77.906	"	81.406 = 81 3/8"
12 + 24.	97.9	"	81.747	"	85.247 = 85 1/4"

☐ 1/2 inch rule for = 24 inch I.D. stacks.
☐ 1.0 inch rule for = 24 inch I.C. stacks.
} N/A

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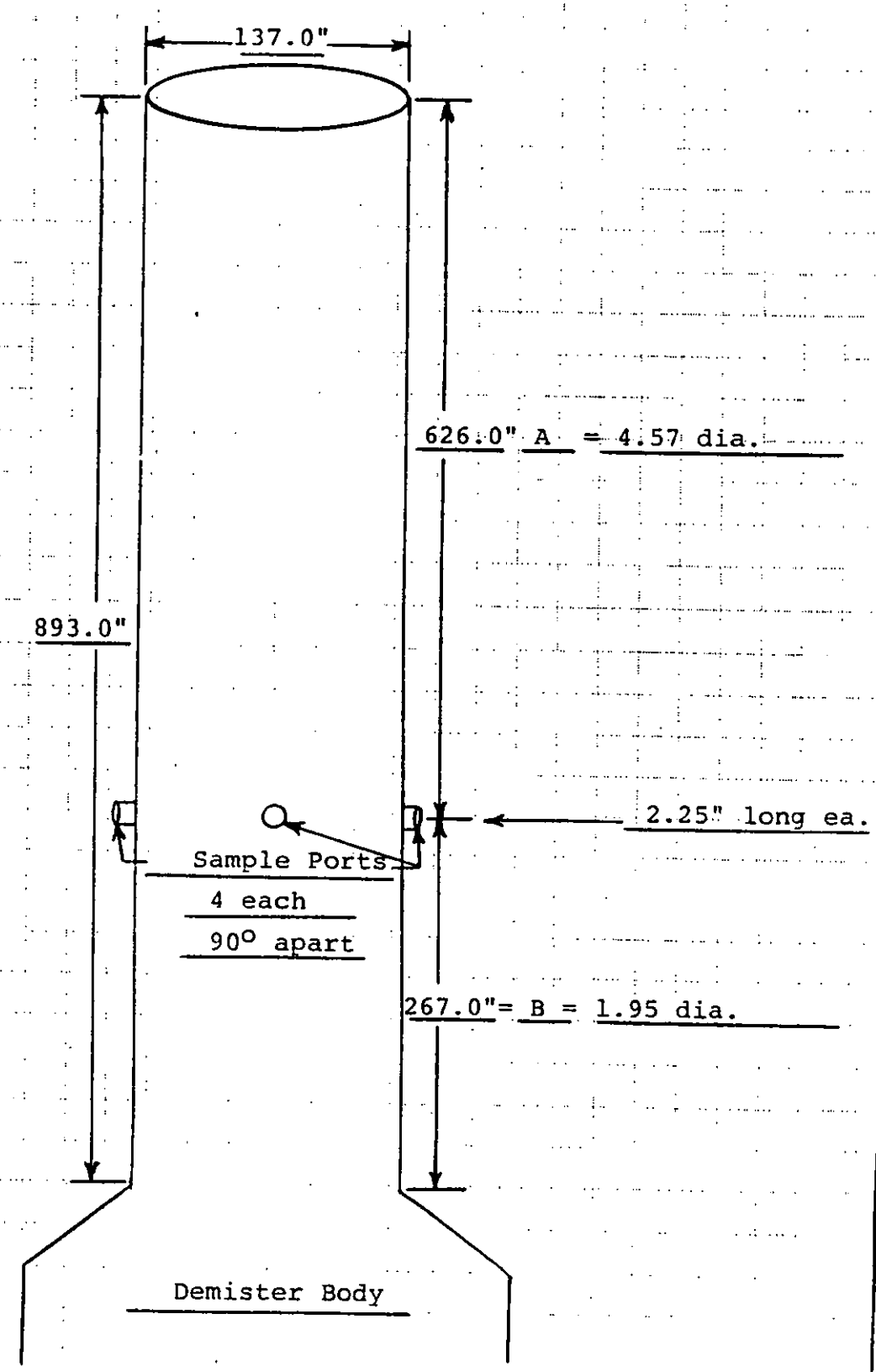
JOB Western Sugar Company
SHEET NO. 1 OF 1
CALCULATED BY VB Benson DATE 10-13-88
CHECKED BY DATE
SCALE Billings, Montana

Figure II

(Bolier Exhaust Stack)



PRODUCT 204-1 NETS Inc. Golden, Mont. 61071

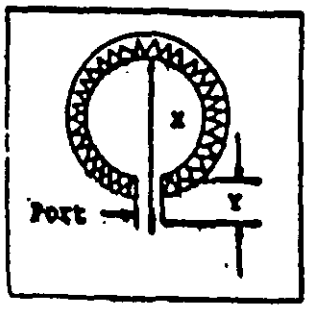
American Analytical & Environmental Lab.

Table III.

5739 South 900 West
Sandy, Utah 84070

TRAVERSE POINT CALCULATIONS.

Plant Western Sugar Co.
Date 10/23-88
Sampling location Billings-Boiler.
Inside of far wall to outside of port (distance, X) 11' 7 1/4"
Inside of near wall to outside of port (distance, Y) 2 1/4"
Stack I.D. 11' 5" = 102.4 ft².



schematic of sampling location.

1 traverse point number	2 percent of stack I.D.	3 stack I.D. inches	4 product of col. 2 & 3 (to 1/8 in)	5 distance Y	6 traverse point location from outside of ports. (sum of columns 4 & 5)
1 x 13.	2.1	137.0"	2.877	2.25"	5.127 = 5 1/8"
2 x 14.	6.7	"	9.179	"	11.429 = 11 3/8"
3 x 15.	11.8	"	16.166	"	18.416 = 18 3/8"
4 x 16.	17.7	"	24.249	"	26.499 = 26 1/2"
5 x 17.	25.0	"	34.250	"	36.500 = 36 1/2"
6 x 18.	35.6	"	48.772	"	51.022 = 51"
7 x 19.	64.4	"	88.228	"	90.478 = 90 1/2"
8 x 20.	75.0	"	102.750	"	105.000 = 105"
9 x 21.	82.3	"	112.751	"	115.001 = 115"
10 x 22.	88.2	"	120.834	"	123.084 = 123 1/8"
11 x 23.	93.3	"	127.821	"	130.071 = 130 1/8"
12 x 24.	97.9	"	134.123	"	136.373 = 136 3/8"

☐ 1/2 inch rule for = 24 inch I.D. stacks.
☐ 1.0 inch rule for = 24 inch I.C. stacks.
} NA [illegible]

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JOB Western Sugar - Billings, Montana
SHEET NO. 1 OF 1
CALCULATED BY V. B. Benson DATE 12-5-88
CHECKED BY - DATE -
SCALE Boiler - Inlet to scrubber

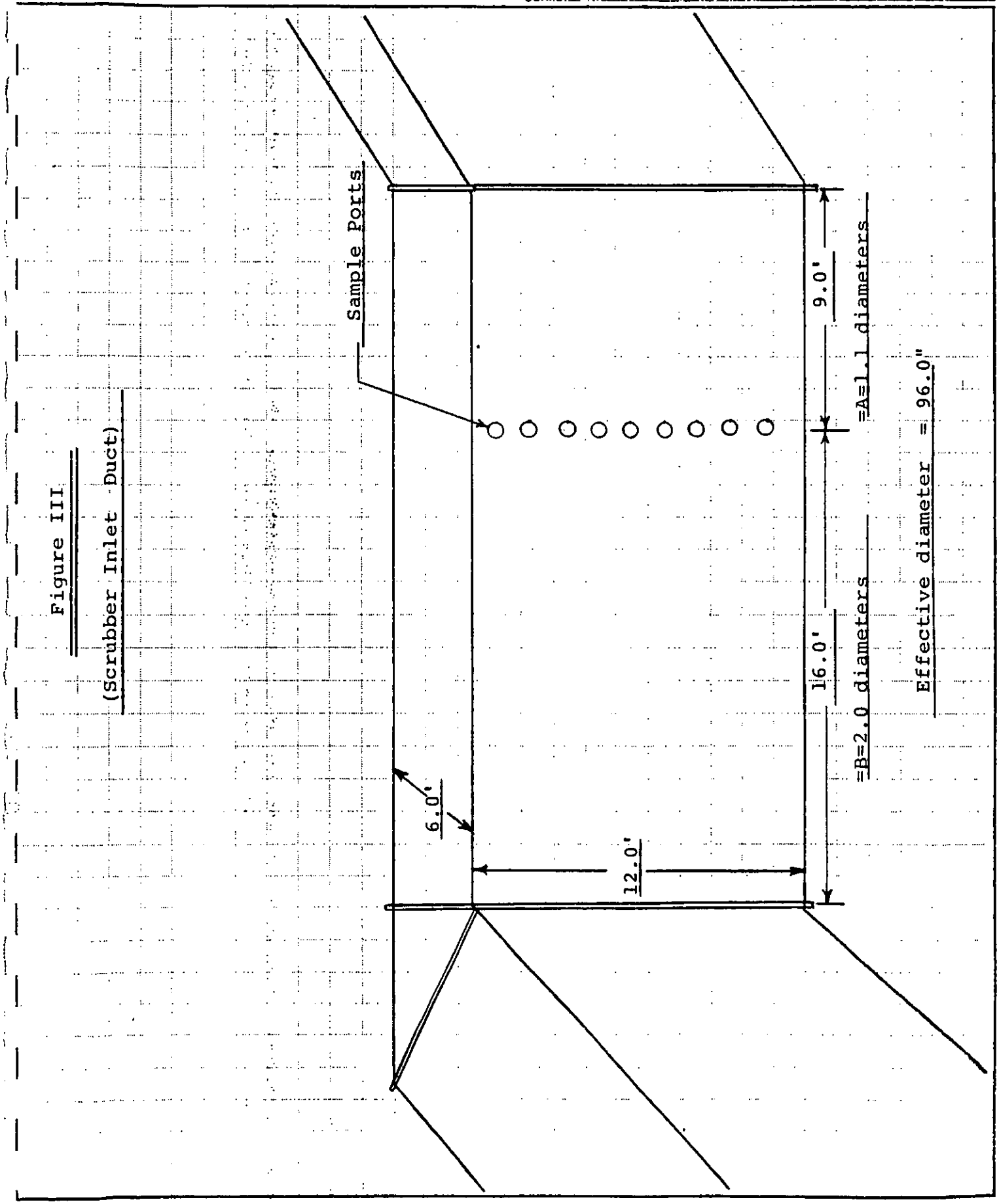

Figure III
(Scrubber Inlet Duct)

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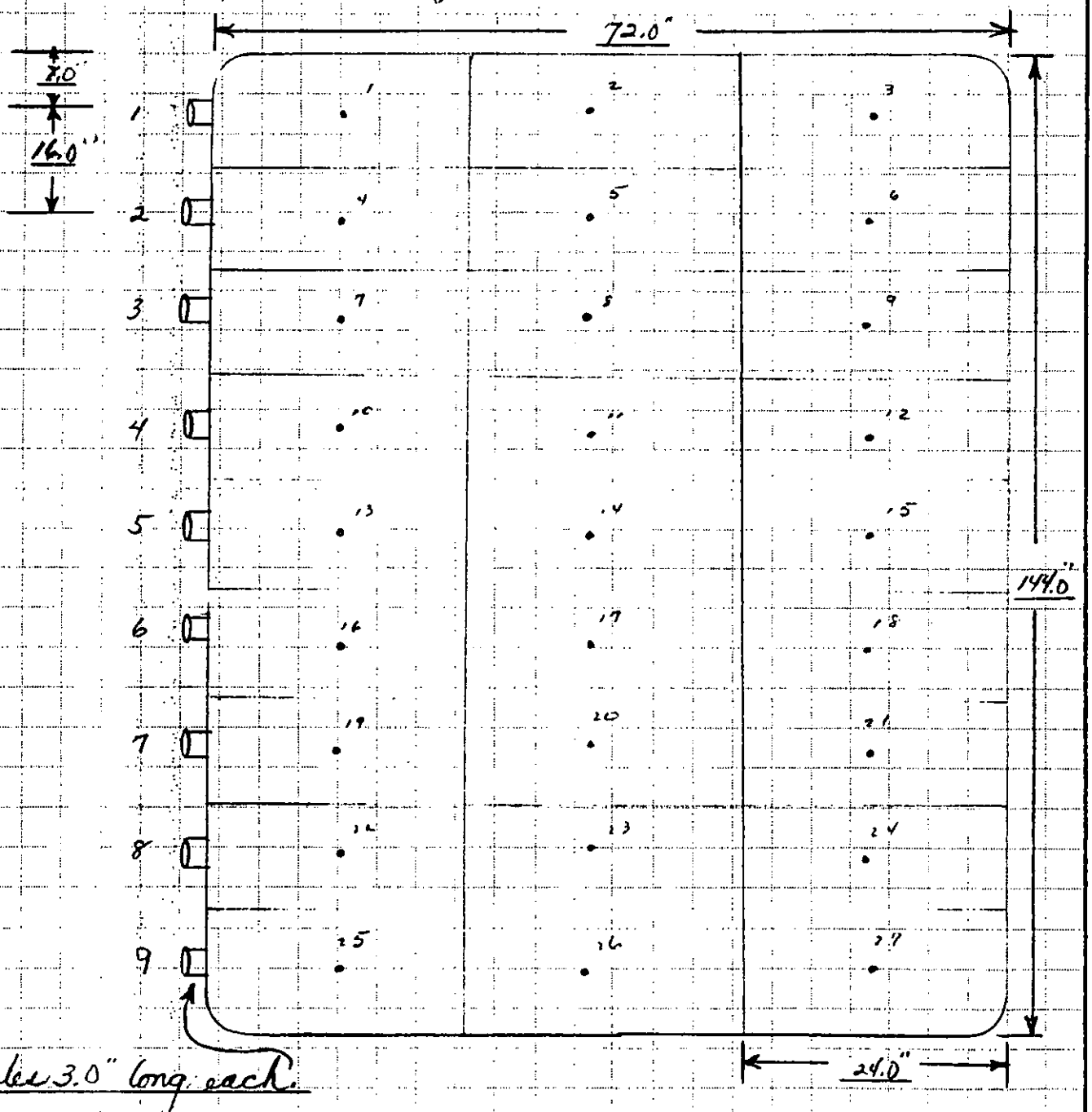
Spanish Fork, Utah 84660
(801) 266-7111

JOB Western Sugar Co. (Billings)
SHEET NO. 1 OF 1
CALCULATED BY VSB DATE 12/5-88
CHECKED BY DATE
SCALE Poiler XS (Billings, Mont.)

Figure IV.



Sample Points	dist.	+ Port	= final dist.
1, 4, 7, 10, 13, 16, 19, 22, 25	12.0"	3.0"	15.0"
2, 5, 8, 11, 14, 17, 20, 23, 26	36.0"	"	39.0"
3, 6, 9, 12, 15, 18, 21, 24, 27	60.0"	"	63.0"

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IV. RESULTS AND CONCLUSIONS:

A. Compliance Testing - General

All original field and laboratory data work sheets for each test are included in Appendix "B". This includes:

1. Nozzle measurement forms.
2. Particulate field data forms.
3. Moisture and filter weight forms.
4. Orsat analysis forms.
5. Acetone wash and blank sheet.
6. SO_3 and H_2SO_4 and SO_2 analysis sheets.
7. SO_2 calculation forms.

B. East Dryer Bank

Due to the fact that the dryer was being fired with natural gas during the testing it was not required that SO_2 emissions be measured at this time. The EPA Method 5 particulate data was collected from the north and south stacks alternately for a total of three (3) tests on each, or a total of three (3) complete tests comprising of a test on both the north and south stack. The total emission rate reflects the addition of one south and one north stack test particulate loading.

The data from these tests are summarized in Tables IV a) and b).

Compliance data calculated from the raw data in Table IV, are given in Table V a) and b). The average particulate loading for all of the tests was 12.23 lbs/hr., which is 11.15% of the allowable set by the Montana Air Quality Bureau (109.67 lbs/hr. for 135 tons/day feed rate).

C. Boiler Exhaust Stack

Table VI, summarizes the data collected on the field and laboratory data forms (see Appendix "B" for original forms) during compliance testing. The calculated compliance data from Table VI, is given in Table VII.

The average particulate matter eimission rate was 82.77 lbs/hr. which is 94.41% of the allowable ceiling level set by the Montana Air Quality Bureau for this source.

D. Boiler Scrubber Inlet Duct

At the pretest protocol meeting for the Western Sugar Plant in Billings, a requirement was placed on the inlet duct to conduct both particulate and sulfur testing. Preliminary tests on site showed that the heavy particulate loading in this duct would make it impossible to conduct a isokinetic particulate sampling at this location. The State observers dropped the Method 5 requirement on site due to this problem. However, in order to provide data to allow SO_2 removal rates through the scrubber a Method 8 test was conducted simultaneously on this inlet duct with each of the three (3) boiler exhaust stack tests.

Field and Laboratory data for the inlet duct to the boiler scrubber are summarized on Table VIII. The SO_2 concentration is calculated from the field data and presented on Table IX.

SO_2 removal efficiencies given in Table I, were calculated using the inlet and exhaust concentrations.

Table IV a)

FIELD AND LABORATORY DATA.

Plant or Job Description: Western Sugar - Billings, Montana

East Dryer - North and South Stacks Bank

RUN NO. Compl. #5

DATE 12-8-88

SYMBOL	DESCRIPTION	UNITS	N#1 1	S#1 2	N#2 3
V_m	volume dry gas sampled @ meter conditions	ft^3	61.145	47.330	45.745
P_b	barometric pressure	"Hg abs	26.52	26.33	26.30
ΔH	average pressure drop across the orifice meter	in H_2O	1.788	2.04	1.878
T_m	average gas meter temperature	°F	57.4	42.9	40.2
Y_i	meter coefficient		1.116	1.116	1.116
V_w	total H_2O collected, impingers & silica gel	ml	539.8	398.1	385.6
CO_2		%	3.6	2.3	3.3
O_2		%	11.4	10.8	11.3
N_2+ CO		%	85.0	86.9	85.4
R_n	nozzle dia.	in.	0.492	0.492	0.492
T_s	stack temperature	°F	168.5	162.7	167.1
$\sqrt{\Delta P}$	velocity head of stack gas	in H_2O	0.2253	0.2284	0.2175
C_p	pitot tube coefficient		0.8955	0.8955	0.8555
P_s	static pressure	in H_2O	+0.02	+0.02	+0.02
A_s	area stack	$ft.^2$	38.028	38.028	38.028
T_t	net time of test	min.	96.0	72.0	72.0
Mg_p	Total particulates	mg	131.1	80.0	135.0

Table IV b)

FIELD AND LABORATORY DATA.

Plant or Job Description: Western Sugar Company - Billings, Montana
East Bank of Pulp Dryers

RUN NO. Part. Compliance

DATE 12-9-88

SYMBOL	DESCRIPTION	UNITS	#2 S 1	#3 N 2	#3 S 3
V_m	volume dry gas sampled @ meter conditions	ft^3	45.681	47.496	44.687
P_b	barometric pressure	"Hg abs	26.33	26.28	26.22
ΔH	average pressure drop across the orifice meter	in H_2O	1.755	1.931	1.726
T_m	average gas meter temperature	°F	54.5	55.0	50.8
Y_i	meter coefficient		1.116	1.116	1.116
V_w	total H_2O collected, impingers & silica gel	ml	428.0	422.8	413.6
CO_2		%	2.6	3.4	2.6
O_2		%	10.7	11.0	10.8
N_2+ CO		%	86.7	85.6	86.6
R_n	nozzle dia.	in.	0.492	0.492	0.492
T_s	stack temperature	°F	170.2	173.1	170.8
$\sqrt{\Delta P}$	velocity head of stack gas	in H_2O	0.2091	0.2203	0.2082
C_p	pitot tube coefficient		0.8955	0.8955	0.8955
P_s	static pressure	in H_2O	26.332 +0.02	26.282 +0.02	26.222 +0.02
A_s	area stack	$ft.^2$	38.028	38.028	38.028
T_t	net time of test	min.	72.0	72.0	72.0
Mg_p	Total particulates	mg	139.5	145.1	80.2

DATA SUMMARY.

Table V a)

Plant or Job Description: Western Sugar - Billings, Montana

East Dryer Bank - North and South Stack

Date 12-8-88

SYMBOL	DESCRIPTION	UNITS	N #1 1	S #1 2	N #2 3
$V_{m\ std}$	volume dry gas sampled @ standard conditions*	dscf	61.698	48.783	47.350
$V_{w\ gas}$	volume water vapor collected @ standard conditions*	scf	25.408	18.739	18.150
B_{wp}	proportion by volume of water vapor in gas steam dimensionless		0.2917	0.2775	0.2771
M_d	dry molecular weight	lb/lb mole	29.032	28.80	28.980
M_s	wet molecular weight	lb/lb. mile	25.814	25.803	25.937
V_s	stack gas velocity	ft/sec	16.526	16.739	15.965
Q_s	volumetric flow rate dry basis, standard conditions*	ft^3/hr	1.1933403×10^6	1.2344225×10^6	1.1694386×10^6
Iso	isokinetic variation	%	93.45	95.21	97.6
C_s	conc. particulate matter in stack gas, dry basis	lb/scf	4.6844495×10^{-6}	3.615334×10^{-6}	6.285513×10^{-6}
Em_4	emission rate	lb/hr gr/dscf	5.59 0.0328	4.47 0.0253	7.35 0.0440
				Comb. 10.06 #/hr.	Comb. 14.62 #/hr.

* 70° F & 29.92 "Hg

DATA SUMMARY.

Table V b)

Plant or Job Description: Western Sugar Company - Billings, Montana

East Dryer Bank

Date 12-9-88

SYMBOL	DESCRIPTION	UNITS	S #2 1	N #3 2	S #3 3
$V_{m\ std}$	volume dry gas sampled @ standard conditions*	dscf	46.022	47.713	45.157
$V_{w\ gas}$	volume water vapor collected @ standard conditions*	scf	20.146	19.901	19.468
B_{wp}	proportion by volume of water vapor in gas steam dimensionless		0.3045	0.2943	0.3013
M_d	dry molecular weight	lb/lb mole	28.844	28.984	28.848
M_s	wet molecular weight	lb/lb. mile	25.542	25.751	25.580
V_s	stack gas velocity	ft/sec	15.496	16.312	15.457
Q_s	volumetric flow rate dry basis, standard conditions*	ft^3/hr	1.08792859×10^6	1.1544942×10^6	1.0845970×10^6
Iso	isokinetic variation	%	101.93	99.63	100.31
C_s	conc. particulate matter in stack gas, dry basis	lb/scf	6.682449×10^{-6}	$6.704364551 \times 10^{-6}$	$3.915400937 \times 10^{-6}$
Em_4	emission rate	lb/hr gr/dscf	7.27 0.0468	7.74 0.0469	4.25 0.0274

* 70° F & 29.92 "Hg

Table VI

FIELD AND LABORATORY DATA.

Plant or Job Description: Western Sugar - Billings, Montana

Boiler Exhaust Stack

RUN NO. Compliance 5 & 8

DATE 12-6-88

SYMBOL	DESCRIPTION	UNITS	1	2	3
V_m	volume dry gas sampled @ meter conditions	ft^3	56.883	52.325	52.666
P_b	barometric pressure	"Hg abs	26.23	26.22	26.40
ΔH	average pressure drop across the orifice meter	in H_2O	7.576	2.516	2.493
T_m	average gas meter temperature	°F	53.2	36.5	36.0
Y_i	meter coefficient		1.116	1.116	1.116
V_w	total H_2O collected, impingers & silica gel	ml	218.8	187.8	159.1
CO_2		%	5.2	6.1	5.4
O_2		%	7.2	7.3	7.2
N_2+ CO		%	87.6	86.7	87.4
R_n	nozzle dia.	in.	0.366	9.366	0.366
T_s	stack temperature	°F	117.0	118.2	117.3
$\sqrt{\Delta P}$	velocity head of stack gas	in H_2O	0.3683	0.3698	0.3683
C_p	pitot tube coefficient		0.8955	0.8955	0.8955
P_s	static pressure	in H_2O	26.245 +0.2	26.235 +0.2	26.415 +0.2
A_s	area stack	$ft.^2$	102.4	102.4	102.4
T_t	net time of test	min.	72	72	72
Mg_p	Total particulates	mg	334.4	318.1	321.5

DATA SUMMARY.

Table VII

Plant or Job Description: Western Sugar - Billings, Montana

Boiler Exhaust Stack

Date 12-6-88

SYMBOL	DESCRIPTION	UNITS	1	2	3
$V_{m\ std}$	volume dry gas sampled @ standard conditions*	dscf	57.234	54.398	55.184
$V_{w\ gas}$	volume water vapor collected @ standard conditions*	scf	10.299	8.840	7.489
B_{wp}	proportion by volume of water vapor in gas steam dimensionless		0.1525	0.1398	0.1195
M_d	dry molecular weight	lb/lb mole	29.12	29.296	29.152
M_s	wet molecular weight	lb/lb. mile	2.742	27.717	27.819
V_s	stack gas velocity	ft/sec	25.247	25.245	24.991
Q_s	volumetric flow rate dry basis, standard conditions*	ft^3/hr	6.331331332×10^6	6.40991965×10^6	6.54993278×10^6
Iso	isokinetic variation	%	106.27	99.76	99.05
C_s	conc. particulate matter in stack gas, dry basis	lb/scf	$1.28806898 \times 10^{-5}$	$1.28916258 \times 10^{-5}$	$1.28438361 \times 10^{-5}$
Em_4	emission rate	lb/hr	81.55	82.63	84.13
		gr/dscf	0.0902	0.0902	0.0899
C_{SO3} & H_2SO_4		lbs/dscf	0	0	0
C_{SO2}	emission rate	lb/dscf	7.2702×10^{-6}	7.8109×10^{-6}	9.0802×10^{-6}
$SO_2/10^6$ Btu's/% efficiency			0.137/70.1	0.150/65.2	0.178/63.7

Table VIII

FIELD AND LABORATORY DATA.

Plant or Job Description: Billings, Montana Western Sugar Boiler Inlet

RUN NO. Compliance 5 & 8

DATE 12-6-88

SYMBOL	DESCRIPTION	UNITS	1	2	3
V_m	volume dry gas sampled @ meter conditions	ft^3	30.26	27.79	27.96
P_b	barometric pressure	"Hg abs	26.23	26.22	26.40
ΔH	average pressure drop across the orifice meter	in H_2O	0.53	0.5	0.5
T_m	average gas meter temperature	°F	67.5	65.0	59.4
Y_i	meter coefficient		0.978	0.978	0.978
V_w	total H_2O collected, impingers & silica gel	ml	21.5	35.0	31.6
CO_2		%	5.3	5.2	5.1
O_2		%	7.1	7.4	7.2
N_2+ CO		%	87.6	87.4	87.7
R_n	nozzle dia.	in.	0.306	0.306	0.306
T_s	stack temperature	°F	653	668	669.9
$\sqrt{\Delta P}$	velocity head of stack gas	in H_2O	0.768	0.822	0.817
C_p	pitot tube coefficient		0.8512	0.8512	0.8512
P_s	static pressure	in H_2O	26.098 -1.8	26.088 -1.8	26.268 -1.8
A_s	area stack	$ft.^2$	72.0	72.0	72.0
T_t	net time of test	min.	81.0	72.0	72.0

Table IX

DATA SUMMARY

Description

Run No. Western Sugar Company, Billings, Montana - Boiler Inlet

Date: 12-6-88

Compliance

Symbol			1	2	3
V_m std	volume dry gas sampled @ standard conditions*	dscf	25.959	23.944	24.518
V_w gas	volume water vapor collected @ standard conditions*	scf	1.0120	1.6475	1.4874
B_{wo}	porportion by volume of water vapor in gas steam dimensionless		0.0375	0.0644	0.0572
M_d	dry molecular weight	mole lb/lb	29.132	29.128	29.104
M_s	wet molecular weight	mole lb/lb	28.715	28.411	28.469
V_s	stack gas velocity	mole ft/sec	68.108	73.792	73.079
Q_s	volumetric flow rate dry basis, standard conditions*	ft^3/hr	7.0310188 X 10^6	7.3036258 X 10^6	7.3266678 X 10^6
Iso	isokinetic variations	%	38.6	38.6	39.4
$H_2SO_4 + SO_3$		lb/dscf	0	0	0
Em_{SO_2}	emission rate	lb/dscf	2.1899 X 10^{-5}	1.9875 X 10^{-5}	2.2350 X 10^{-5}
Em_r		lbs $SO_2/10^6$ Btu's	0.46	0.43	0.49

E. Visible Opa Determinations:

During the Method 5 and 8 compliance tests a number of opacity readings (EPA Method 9) were taken by AET's staff to determine compliance with the 20.0% VEO maximum set by the Montana State Air Quality Bureau.

Adverse weather conditions prevented regular VEO readings with each of the Method 5 compliance tests. All VEO field data sheets are included in Appendix "C" along with the observers current certification registration.

F. Method 8 SO_2 Emissions Tests:

SO_2 levels were determined via modification of the EPA Method 5 train to include an 80% isopropanol solution in impinger number one and a fresh 3% solution of hydrogen peroxide in impingers 2 and 3. Methods of standard additions and unknowns were used to insure quality of the procedure.

G. Cyclonic Flow Determinations:

Prior to the compliance testing for particulate emissions on both dryer stacks and the boiler exhaust stack, a cyclonic flow determination was conducted on each of the sampling sites. The average cyclonic flow angle (α) for the north and south dryer stacks and the boiler exhaust stack was 2.1 degrees and 5.2 degrees respectively.

The field data forms for cyclonic flow are included in Appendix "D".

APPENDIX "A"

(Calibration Data)

American Analytical
&
Environmental Laboratory, Inc.
8739 South 300 West
Sandy, Utah 84070
801 566-4023

Pitot Tube Identification Number: 6'B (SS liner) Date 8/5-83

Calibrated By: [illegible], [illegible] + [illegible]

	"A" Side Calibration			
Run No.	ΔPstd cm H_2O (in. H_2O)	ΔPs cm H_2O (in. H_2O)	Cp (S)	Dev.
1	0.081	0.101	0.8955	0.0019
2	0.081	0.100	0.9000	0.0025
3	0.082	0.102	0.8966	0.0008
		Average	0.8974	

ave. 0.8956

	"B" Side Calibration			
Run No.	ΔPstd. cm H_2O (in. H_2O)	ΔPs cm H_2O (in. H_2O)	Cp (S)	Dev.
1	0.080	0.100	0.8955	0.0018
2	0.080	0.101	0.8900	0.0037
3	0.081	0.101	0.8955	0.0018
		Average	0.8937	

$$C_p\ (2) = C_p\ (std) \sqrt{\frac{\Delta P_{std}}{\Delta P_s}}$$

Dev. = C_p (s) - C_p (S) (avg.) (Must be $\leq$ 0.01)

C_p Difference: $A_{avg.} - B_{avg.}$ = 0.0037 (must be $\leq$ 0.01)

American Analytical
&
Environmental Laboratory, Inc.
8739 South 300 West
Sandy, Utah 84070
801 566-4023

Pitot Tube Identification Number: 6'A (Allima) Date 8/5-88

Calibrated By: [illegible], [illegible], + [illegible]

"A" Side Calibration

Run No.	ΔP_{std} cm H_2O (in. H_2O)	ΔP_s cm H_2O (in. H_2O)	Cp (S)	Dev.
1	0.080	0.110	0.8528	0.0005
2	0.081	0.111	0.8542	0.0009
3	0.080	0.110	0.8528	0.0005
		Average	0.8533	

(ave. = 0.8512)

"B" Side Calibration

Run No.	ΔP_{std} cm H_2O (in. H_2O)	ΔP_s cm H_2O (in. H_2O)	Cp (S)	Dev.
1	0.072	0.100	0.8485	0.0006
2	0.072	0.100	0.8485	0.0006
3	0.073	0.101	0.8502	0.0011
		Average	0.8491	

$$C_p\ (2) = C_p\ (std) \sqrt{\frac{\Delta P_{std}}{\Delta P_s}}$$

Dev. = C_p (s) - C_p (S) (avg.) (Must be $\leq$ 0.01)

C_p Difference: $A_{avg.} - B_{avg.}$ = 0.004 (must be $\leq$ 0.01)

565 South Birch Dr.

Spanish Fork, Utah 84660

801/266-7111

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date: 8/25-85 Thermocouple #: 6'A+B Digital

Ambient Temperature: 82 °C Barometric Pressure 25.60 in. Hg

Calibrator: [illegible] Reference: mercury-in-glass: ERTCO ASTM-1105 End.

OTHER:

Reference Point Number	Source[a] (specify)	Reference Thermometer Temperature °C	Test Thermocouple Potentiometer Temperature °C	Temperature difference[b] %
① 6'A a)	Ice H_2O	33	33	0
b)	Hot H_2O	107	108	+ 0.917
c)	Boiling H_2O	193	195.t	- 1.036
d)	Hot Oil	235	236	- 0.425
e)	Hot Oil	310	310	0
f)	Boiling Oil.	454	482	+ 0.913
② 6'B a)	Ice H_2O.	33	33	0
b)	Hot H_2O.	107	109	0
c)	Boiling H_2O.	193	192	+ 0.518
d)	Hot Oil.	235	236	- 0.424
e)	Hot Oil.	310	308	0.645
f)	Boiling Oil	484	481	0.620

[a]Type of calibration system used.

[b] $$\left[\frac{(\text{ref temp, }^{o}C + 273) - (\text{test thermom temp, }^{o}C + 273)}{\text{ref temp, }^{o}C + 273}\right] 100 \leq 1.5\%$$

505 South Birch Dr.
Spanish Fork, Utah 84660
801/266-7111

Balance name Sartorius 1702 + MA8 (ABal. Toploader) Number 13471.06

Classification of standard weights Type "S" NBS

Date	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
1702 ABal.						
4/1-86	0.5001	0.9999	10.0001	50.0001	100.0001	VBB[illegible]
4/1-87	0.5000	1.0000	10.0001	49.9999	100.0001	VBB[illegible]
1/7-88	0.5000	1.0001	10.0000	50.0000	100.0000	VBB[illegible]
8/5-88	0.5001	1.0000	10.0001	49.9999	100.0001	VBB[illegible]
MA8 Toploader						
4/1-86	0.5	1.0	10.0	50.0	100.0	VBB[illegible]
4/1-87	0.5	1.0	10.0	49.9	100.1	VBB[illegible]
1/7-88	0.5	1.1	10.0	50.0	100.0	VBB[illegible]
8/5-88	0.5	1.0	10.1	50.0	100.0	VBB[illegible]

AMERICAN ANALYTICAL & ENVIRONMENTAL LABORATORY

TEMPERATURE CHECKS:

Date: 12/7-88
RAC #1

REFERENCE:	SOURCE:		
	Control Box 2		
64		Meter In	64
64		Meter Out	64
	Control Box 1		
65		Meter In	64
64		Meter Out	64
	Box 1A		
65		Impinger In	64
65		Impinger Out	65
65		Oven	65
	Box 2A		
65		Impinger In	65
65		Impinger Out	65
65		Oven	66
	Box 3A		
66		Impinger In	66
65		Impinger Out	66
66		Oven	66

AMERICAN ANALYTICAL & ENVIRONMENTAL LABORATORY

TEMPERATURE CHECKS:

Date: 12/7-88

REFERENCE:	SOURCE:	
	Control Box 2	
64	Meter In	65
64	Meter Out	64
	Control Box 1	
64	Meter In	64
65	Meter Out	64
	Box 1A	
65	Impinger In	65
65	Impinger Out	65
66	Oven	66
	Box 2A	
65	Impinger In	66
66	Impinger Out	66
66	Oven	66
	Box 3A	
66	Impinger In	66
67	Impinger Out	67
66	Oven	67

SAMPLE BOX TEMPERATURE SENSOR CALIBRATION

Date 11/10-88 Sample Box No. RAC #1

Ambient temperature 67°F Barometric pressure 24.95 in. Hg

Calibrator [illegible] Reference thermometer #1 ERICO-1055

Thermocouple location	Reference point	Temperature source	Reference thermometer temperature	Thermocouple temperature	Temperature difference %
Oven	N/A	Oven on	230	231	-0.434
Probe	"	"	228	228	0
Imp. Out	"	"	60	60	0
Meter in	"	Meter on	65	65	0
Meter out	"	"	65	65	0

SAMPLE BOX TEMPERATURE SENSOR CALIBRATION

Date 5/6-88 Sample Box No. C24iA

Ambient temperature 82°F Barometric pressure 25.65 in. Hg

Calibrator [illegible] Reference thermometer #1820 1055 NBS.

Thermocouple location	Reference point	Temperature source	Reference thermometer temperature	Thermocouple temperature	Temperature difference %
① Oven.	3	Oven on.	248	248	0
② Probe ext.	4	"	246	247	-0.407
③ Imp. in.	6	"	60	60	0
④ Imp Out.	5	"	49	49	0
⑤ Meter in	1	Meter on	80	81	-1.25
⑥ Meter Out	2	"	80	80	0

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 8/6 88 Meter box number CR#1 (097)

Barometric pressure, P_b = 25.65 in. Hg Calibrated by [illegible]

Vac. adj. 25.6 during these tests. JOB.

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter: Inlet (t_{d_i}), °F	Temperatures: Dry gas meter: Outlet (t_{d_o}), °F	Temperatures: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5.031 / 5	4.628	71	84	84	84	12.68	1.112	2.035
1.0	5.028 / 5	4.619	71	84	85	84.5	9.19	1.113	2.138
1.5	10.041 / 10	9.158	72	85	85	85	14.89	1.119	2.117
2.0	10.034 / 10	9.124	72	85	85	85	12.74	1.121	2.069
3.0	10.029 / 10	9.113	73	84	85	84.5	10.51	1.115	2.124
4.0	10.123 / 10	9.194	72	85	86	85.5	9.25	1.116	2.142
							Avg	1.116	2.104

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368	$\frac{5.031}{(4.628)} \frac{(25.65)\ 544}{25.[illegible]\ ([illegible])} = \frac{70[illegible]}{([illegible])}$	$\frac{(0.0317)\ 0.5}{25.65\ (544)} \left[\frac{531\ (12.68)}{5.031}\right]^2 = \frac{[illegible]}{[illegible]}$
1.0	0.0737	$\frac{5.028}{(4.619)} \frac{(25.65)\ 544.5}{25.[illegible]\ ([illegible])} = \frac{70[illegible]}{([illegible])}$	$\frac{(0.0317)\ 1.0}{25.65\ (544.5)} \left[\frac{531\ (9.19)}{5.028}\right]^2 = \frac{[illegible]}{[illegible]}$
1.5	0.110	$\frac{10.041}{(9.158)} \frac{(25.65)\ 545}{25.760\ ([illegible])} = \frac{[illegible]}{[illegible]}$	$\frac{(0.0317)\ 1.5}{25.65\ (545)} \left[\frac{532\ (14.89)}{10.041}\right]^2 = \frac{[illegible]}{[illegible]}$
2.0	0.147	$\frac{10.034}{(9.124)} \frac{(25.65)\ 545}{25.799\ ([illegible])} = \frac{[illegible]}{[illegible]}$	$\frac{(0.0317)\ 2.0}{25.65\ (545)} \left[\frac{532\ (12.74)}{10.034}\right]^2 = \frac{[illegible]}{[illegible]}$
3.0	0.221	$\frac{10.029}{(9.113)} \frac{(25.65)\ 544.5}{25.871\ ([illegible])} = \frac{140[illegible]}{[illegible]}$	$\frac{(0.0317)\ 3.0}{25.65\ (544.5)} \left[\frac{533\ (10.51)}{10.029}\right]^2 = \frac{[illegible]}{[illegible]}$
4.0	0.294	$\frac{10.123}{(9.194)} \frac{(25.65)\ 545.5}{25.[illegible]\ ([illegible])} = \frac{[illegible]}{[illegible]}$	$\frac{(0.0317)\ 4.0}{25.65\ (545.5)} \left[\frac{532\ (9.25)}{10.123}\right]^2 = \frac{[illegible]}{[illegible]}$

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

American Analytical

1200 hrs. start

Western Sugar

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English Units)

Test Numbers Boiler & Beet Pulp Dryer Date 12/10-88 Meter Box Number CM#4 (97 meter) Plant Billings, Mont.

Barometric Pressure, P_b = 26.08 in Hg. Dry Gas Meter Number 097-CM Box. Pretest Y 1.116

Vac.	Orifice Manometer setting, (ΔH), in. H_2O	Gas Volume: Wet test meter (V_w), ft^3	Gas Volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry Gas Meter: Inlet (t_{d_i}), °F	Temperature: Dry Gas Meter: Outlet (t_{d_o}), °F	Temperature: Dry Gas Meter: Average (t_d),[a] °F	Time (θ), min.	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d P_b + \frac{\Delta H}{13.6}(t_w + 460)}$
5.0	2.0	283.22 10 10.008	~~685~~ 8.993	68.5 67 66.5 67.13 66.5	68 70 69 72	66 68 69 70	529.25 69.25	13.12	5.0	1.112	10.008(26.08)(529.25) / (8.993)26.227(527.13) = 138138.8227 / 124328.5713
5.0	2.0	283.2 10 10.008	9.076	66.7 525.85 65.3 62.825	73 73 73 74	72 72 72 72.5	533.25 73.25	13.03	5.0	1.112	10.008(26.08)(533.25) / (9.076)26.227(525.85) = 139,182.8573 / 125,171.3631
10.0	~~2.0~~ 2.5	10 10.206	9.202	66.2 66.2 66.4 66.2	73 73 73 73	73 73 73 73	73.125	12.15	10.0	1.116	(10.206)(26.08)(533.125) / (9.202)(26.263)(526.225) = 141,903.2034 / 127,173.9145
										Y =	3.34/3 = 1.113 = Vac.

range = 1.066 to 1.166

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, $ft.^3$.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y

P_b = Barometric pressure, in. Hg.

θ = Time of calibration

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 11/10-88 Meter box number RAC #1

Barometric pressure, P_b = 24.95 in. Hg Calibrated by JPB-SAS

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter: Inlet (t_{d_i}), °F	Temperatures: Dry gas meter: Outlet (t_{d_o}), °F	Temperatures: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5.11	5.392	67.0	77.2	73.7	75.5	12.77	0.96	2.06
1.0	5.00	5.155	66.9	84.6	77.5	81.1	8.85	0.99	2.04
1.5	10.068	10.545	66.0	95.3	81.6	88.5	14.90	0.99	2.10
2.0	9.999	10.674	65.4	104.8	89.0	96.9	12.75	0.99	2.04
3.0	10.003	10.801	65.3	115.3	87.0	101.2	10.68	0.98	2.13
4.0	10.003	10.907	64.5	102.0	88.3	95.2	9.23	0.96	2.14
							Avg	0.978	2.085

0.9586 0.998

✓ ± 0.02% ✓ 68.

✓ ± 0.15 ✓ 68

1.935 to 2.235

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368	$\frac{5.11(24.95)\,535.5}{(5.392)\,24.987(527)} = \frac{68273.3047\,5}{71002.65941}$	$\frac{0.0317(0.5)}{24.95(535.5)}\left[\frac{529 \times 12.77}{5.1}\right]^2 = \frac{27490.99703}{13360.775}$
1.0	0.0737	$\frac{5.00\,(24.95)\,541.1}{(5.155)\,25.024(526.8)} = \frac{67502.275}{67969.42557}$	$\frac{0.0317(1.0)}{24.95(541.1)}\left[\frac{526.9 \times 8.85}{5.00}\right]^2 = \frac{27576.61415}{13500.445}$
1.5	0.110	$\frac{10.068(24.95)\,548.5}{(10.545)\,25.060(526.0)} = \frac{137781.3351}{138499.5502}$	$\frac{0.0317(1.5)}{24.95(548.5)}\left[\frac{526 \times 14.9}{10.068}\right]^2 = \frac{28814.30393}{13685.075}$
2.0	0.147	$\frac{9.999\,(24.95)\,556.9}{(10.674)\,25.097(525.4)} = \frac{138932.6553}{140916.9776}$	$\frac{0.0317(2.0)}{24.95(556.9)}\left[\frac{524.5 \times 12.75}{9.999}\right]^2 = \frac{28658.7[illegible]}{13894.155}$
3.0	0.221	$\frac{10.003\,(24.95)\,561.2}{(10.801)\,25.171(525.3)} = \frac{140061.4258}{142814.3464}$	$\frac{0.0317(3.0)}{24.95(561.2)}\left[\frac{525.3 \times 10.68}{10.003}\right]^2 = \frac{29914.19266}{14001.94}$
4.0	0.294	$\frac{10.003\,(24.95)\,555.2}{(10.907)\,25.244(524.5)} = \frac{139563.9567}{144413.8935}$	$\frac{0.0317(4.0)}{24.95(555.2)}\left[\frac{524.5 \times 9.23}{10.003}\right]^2 = \frac{29699.77116}{13857.24}$

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

American Analytical
&
Environmental Laboratory, Inc.
8130 South 300 West
Sandy, Utah 84070
801 566-4023

Western Sugar POSTTEST DRY GAS METER CALIBRATION DATA FORM (English Units)

Test Numbers Boiler Inlet Date 12/7-88 Meter Box Number RAC #1 Plant Billings, Mont

Barometric Pressure, P_b = 26.42 in Hg. Dry Gas Meter Number RAC #1 Pretest Y 0.998

Orifice Manometer setting, (ΔH), in. H_2O	Gas Volume: Wet test meter (V_w), ft^3	Gas Volume: Dry gas meter (V_d) ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry Gas Meter: Inlet (t_{d_i}), °F	Temperature: Dry Gas Meter: Outlet (t_{d_o}), °F	Temperature: Dry Gas Meter: Average[a] (t_d), °F	Time (θ), min.	Vacuum setting, in. Hg	Y_i	Y_i $\frac{V_w P_b (t_d + 460)}{V_d P_b + \frac{\Delta H}{13.6}(t_w + 460)}$
2.0	109.998	10.632	67 66.75 66 67 526.75 67	77 76 76 77	71 71 72 72	74 534	13.11	5.0	0.948	141054.5834 / 148802.7874
2.0	10,003	10.579	67 67.25 67 68 527.25 67	82 81 82 83	76 76 77 76	79.125 532.425	13.15	5.0	0.961	142479.5560 / 148201.5548
2.0	10,003	10.701	67 67.5 67 68 527.5 68	93 93 93 94	79 80 80 80	86.5 546.5	13.09	5.0	0.963	144428.6156 / 149981.7382
									Y =	Ave = 0.957

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, $ft.^3$.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

American Environmental

801 266-7111

Billings, Mont - Western Sugar
East Bank
Dryers

NOZZLE CALIBRATION

Date 12/8-98 Calibrated by [signature]

	Nozzle identification number	D_1, mm, (in.) Φ	D_2, mm, (in.) Ø	D_3, mm, (in.) Ø	ΔD, mm, (in.)	D_{avg}
North ①	#2 - 1/2"	0.492	0.493	0.492	0.001	0.492 ~~0.001~~
South ①	#2 - 1/2"	0.492	0.493	0.492	0.001	0.492
North ②	#2 - 1/2"	0.493	0.493	0.492	0.001	0.493
South ②	#2 - 1/2"	0.492	0.492	0.492	-	0.492
North ③	#2 - 1/2"	0.493	0.493	0.491	0.002	0.492
South ③	#2 - 1/2"	0.492	0.492	0.492	-	0.492

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, mm (in.). Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.). Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

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Salt Lake City, Utah 84107
801 266-7111

NOZZLE CALIBRATION

Date 12/6-88 Calibrated by UBB-FPB-SAS-PT-JT

Nozzle identification number	D_1, mm, (in.)	D_2, mm, (in.)	D_3, mm, (in.)	ΔD, mm, (in.)	D_{avg}
Run # ① 5/16 5	.306	.305	.306	0.001	0.306
② 5/16 5	0.306	0.306	0.305	0.001	0.306
③ 5/16 5	0.306	0.305	0.306	0.001	0.306

where:

$D_{1'2'3'}$ = nozzle diameter measured on a different diameter, mm (in.).
Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.).
Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

Western Sugar Co.
Billings, Mont.
Boiler Inlet - 12/6-88
Compliance - SO_2 + Part.

American Environmental & Analytical Laboratory, Inc.

6175 South Stratler Avenue
Salt Lake City, Utah 84107
801 266-7111

NOZZLE CALIBRATION

Date 12/6-88 Calibrated by [illegible]

Nozzle identification number	D_1, mm, (in.)	D_2, mm, (in.)	D_3, mm, (in.)	ΔD, mm, (in.)	D_{avg}
Run #① 3/8 3	0.365	0.366	0.366	0.001	0.366
② 3/8 3	0.367	0.366	0.365	0.002	0.366
③ 3/8 3	0.366	0.366	0.366	–	0.366

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, mm (in.). Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.). Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

Western Sugar Company.
Billings, Mont.
Boiler Exhaust Stack (12/6-88)
Compliance (SO_2 + Part.)

APPENDIX "B".

(Field and Laboratory Forms).

I - Meter Gas Leak

Boiler Exhaust Stack.

II - Post-test leak Checks.

A - Pitot. 6 - Meter Sys.

American Analytical & Environmental Laboratory, Inc.

A = ✓ St. = 2418.153
B = ✓ Fin. = 2422.155

0 at 22" Hg

EPA Method 5 + 8 Comb.

PARTICULATE FIELD DATA FORM

A - Pitot. A = ✓ α B = ✓ α NB.

6 - Meter System Fin. = 2479.750 Sto = 2471.652 1.0 Cfm 22" Hg α

Plant Western Sugar Co
City Billings, Mont.
Location Bldr. Outlet
Operator 2/Bo-FT + TPB.
Date 12/6-88
Run Number #1 Compl
Stack Diam, mm(in.) 11'5" = 102.4 ft²
Sample Box Number CD #1 A
Meter Box Number CD #1 (97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 6'B = 0.8955 (0.8955)
Probe Length 6' Tf.
Probe Liner Material Glass.
Probe Heater Setting Fin. Cont.
Ambient Temperature 48° Start
Barometric Pressure (P_b) 26.23 mm (in.)Hg
Assumed Moisture 11.0 %
Static Pressure (P_s) +0.2 mm (in.)H_2O
C Factor
Reference ΔP 0.890 mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number 3/8" A Iso Start 2nd.
Nozzle Diameter 0.366 mm (in.)
Thermometer Number 6' B dig.
Final Leak Rate ____ m^3/min (cfm)
Vacuum During Leak Check ____ mm (in.) Hg
Filter Number 056-B0 #1 Tot: -
Remarks

CO = <0.1 %
CO_2 = 8 %
O_2 = 7 %
N_2 = 85 %

Traverse Point Number	Sampling Time, (θ) Min.	Starting Clock Time (24hr) = 1546	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Starting Gas Sample Volume(V_m) @ 24.22.159 m^3(ft^3)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	5.0 (20)	1549	6.0	113	0.09	0.3000	1.712	2424.23	236	47	51	52	231
2		1552	7.4	115	0.12	0.3464	2.207	426.48	241	43	53	51	230
3		1555	8.0	118	0.12	0.3464	2.265	428.73	241	42	52	51	233
4		1558	8.3	119	0.13	0.3606	2.449	431.03	237	47	52	51	236
5		1601	8.6	112	0.13	0.3606	2.477	433.44	251	46	52	51	242
6		1604	9.0	117	0.13	0.3606	2.458	2435.85	247	49	52	52	246
7		1619	6.8	115	0.11	0.3317	2.089	438.95	244	50	53	52	247
8		1622	8.2	116	0.13	0.3606	2.464	440.22	228	53	53	52	241
9		1625	10.4	118	0.14	0.3742	2.645	442.68	264	50	53	52	245
10		1628	9.2	120	0.13	0.3606	2.447	445.01	246	47	53	52	249
11		1631	9.2	114	0.13	0.3606	2.473	447.26	251	47	53	52	246
12		1634	8.4	120	0.12	0.3464	2.259	2449.466	258	48	53	52	263
13		1648	8.4	114	0.12	0.3464	2.283	452.1	234	43	53	52	246
14		1651	11	115	0.16	0.4000	3.035	454.42	241	42	52	52	228
15		1654	11.8	118	0.16	0.4000	3.025	456.79	246	42	53	53	229
16		1657	11.5	120	0.15	0.3873	2.824	459.26	243	41	53	52	230
17		1660	12.8	115	0.16	0.4000	3.035	461.83	254	43	52	52	236
18		1703	13.0	122	0.16	0.4000	2.999	2464.404	263	44	52	52	250
19		1712	12.4	118	0.15	0.3873	2.841	466.86	267	42	52	52	240
20		1715	12.6	118	0.15	0.3873	2.881	469.34	261	41	52	52	258

Start ② 1/2 of NS - 1616 — 1st of EW - 1646 - Start Wet part at 1709

Boiler Exhaust stack.

American Analytical & Environmental Laboratory, Inc.

HK 12/6/88

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co.
City Billings, Mont.
Location Boiler Outlet.
Operator WBB-JT & JPB.
Date 12/6-88
Run Number #1 Comp.
Stack Diam, mm(in.) 11'5" = 102.4 ft².
Sample Box Number CR#1A
Meter Box Number CR#1(97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 6'B - 0.8955
Probe Length 6' Ff.
Probe Liner Material Glass
Probe Heater Setting Var Cont.
Ambient Temperature 48°F Start.
Barometric Pressure (P_b) 26.23 mm (in.)Hg
Assumed Moisture 11.0%
Static Pressure (P_s) +0.2 mm (in.)H_2O
C Factor –
Reference ΔP 0.890 mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number 3/8A
Nozzle Diameter 0.366 mm (in.)
Thermometer Number 6'B Dig.
Final Leak Rate ____ m³/min (cfm)
Vacuum During Leak Check ____ mm (in.) Hg
Filter Number WSB-BO#1 Twt =
Remarks

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) $m^3(ft^3)$	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
21	3.0 (20)	1718	12.5	120	0.15	0.3873	2.821	471.82	266	42	52	52	264
22	"	1721	12.2	120	0.15	0.3873	2.821	474.31	259	42	52	52	258
23	"	1724	10.8	116	0.14	0.3742	2.651	476.71	258	41	52	52	271
24	"	1727	10.3	116	0.14	0.3742	2.449	2479.042	254	42	51	52	248
Total =	72.0			2807		8.84	61.83	56.883			25	53	
Ave =	3.0			117.0		0.3683	2.576	0.790 DACFM			53	188	

Pnt no.

E.W

577.0°R

63.481 iso

513.2°R

Billings, Mont.

LABORATORY DATA

Company Western Sugar Co. Run No. #1 Comp. (SO_2 + Part.)

Sampling Loaction Boiler Exhaust Stack Date 12/6-88

MOISTURE COLLECTED

		~~GM/ML~~	Water Weight/~~Volume Gain~~ ~~GM/ML~~
IMPINGER 1	Final Weight/Volume	684.6	
	Initial Weight/Vol. Increase	561.8	+122.8
IMPINGER 2	Final Weight/Volume	590.3	
	Initial Weight/Vol. Increase	557.6	+32.7
IMPINGER 3	Final Weight/Volume	634.1	
	Initial Weight/Vol. Increase	587.1	+47.0
IMPINGER 4	Final Weight/Volume	697.4	
	Initial Weight/Vol. Increase	681.1	+16.3

PARTICULATE COLLECTED +218.8 g total.

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1) Filter & Particulates 1.1389
(2) Filter Tare Weight 0.8437 gm WSB-60#1
(3) Net Dry Particulates (1-2) 0.2952 = 295.2 mg.
(4) Particulates Caught in Nozzle, Probe & Glassware 32.2 mg.
(5) Total Front Catch (3 & 4) 327.4

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1) Particulate caught in impingers evaporated down at less than 120° F. 7.0 mg

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

334.4 mg

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Sandy, Utah 84070
801 566-4023

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#1 Western Sugar.	87.6	7.2	5.2	<0.1%
Billings, Mont.	87.6	7.2	5.2	<0.1%
Boiler Exhaust Stack.	87.6	7.2	5.2	<0.1%
(12/6-88) AVERAGE	87.6	7.2	5.2	<0.1%

Pre-test leak check

A-Pitot B-Meter System

A= ✓ Fin.: 2488.00
B= ✓ St.: 2488.00
VBD 0.02 at 22" Hg VBD

American Analytical & Environmental Laboratory, Inc.

Method 5+8 Comb.

PARTICULATE FIELD DATA FORM

II - Post-test leak check

A-Pitot B-Meter System

A: ✓ Fin.: 2540.725
B: ✓ St.: 2540.72
VBD. 0.025 ✓ at 22 Hg VBD

Field ico Cal Ann

Plant Western Sugar Co.
City Billings, Mont.
Location Expand Stack, Boiler
Operator VBB-JTB-SAB
Date 12/6-88
Run Number #2 Coupl.
Stack Diam, mm(in) 115" = 102.4 ft²
Sample Box Number C/2#1A
Meter Box Number C/2#1 (97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 0.8955 - 6'6
Probe Length 6 ft.
Probe Liner Material Stainless
Probe Heater Setting Non Cont.
Ambient Temperature 45°F Stab.
Barometric Pressure (P_b) 24.22 mm (in.)Hg
Assumed Moisture 11.0 %
Static Pressure (P_s) -0.2 mm (in.)H_2O
C Factor —
Reference ΔP 0.890 mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number 3/8.3
Nozzle Diameter 0.366 mm (in.)
Thermometer Number 63B dig.
Final Leak Rate ___ m^3/min (cfm)
Vacuum During Leak Check ___ mm (in.) Hg
Filter Number VBB-60# Tot. = 0.8278
Remarks

CO = <0.1 %
CO_2 = 8.0 %
O_2 = 7.0 %
N_2 = 85.0 %

Traverse Point Number	Sampling Time, (θ) Min.	Starting: Clock Time =10:20pm (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Starting: Gas Sample Volume(V_m) =2488.041 m^3(ft^3) 490.20	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	3.00	1023	7.4	118	0.13	0.3606	2.391	~~2.54~~	265	34	34	34	271
2		1026	8.9	119	0.14	0.3742	2.544	492.51	271	37	34	35	270
① 3		1029	9.8	120	0.16	0.4000	2.901	495.03	268	39	35	34	264
4		1032	9.9	119	0.16	0.4000	2.911	497.26	263	39	35	34	263
5		1035	9.9	116	0.16	0.4000	2.911	499.57	264	39	35	34	265
6		1038	8.0	116	0.13	0.3606	2.381	2501.76	252	40	36	34	249
② 7		1049	9.9	115	0.17	0.4123	3.11	504.15	249	40	37	36	241
8		1051	9.8	120	0.16	0.4000	2.915	506.52	247	39	37	35	236
9		1054	9.6	119	0.15	0.3873	2.738	508.41	241	35	37	35	240
10		1057	12.7	112	0.18	0.4243	3.329	511.21	255	42	37	36	251
11		1060	10.6	114	0.16	0.4000	2.949	513.72	260	43	37	36	253
12		1103	7.9	117	0.12	0.3464	2.205	2515.561	264	44	38	37	257
13		1113	6.3	114	0.10	0.3162	1.850	517.50	243	40	35	36	251
③ 14		1116	6.4	119	0.13	0.3606	2.377	519.62	242	41	35	36	253
E-W 15		1119	8.7	120	0.14	0.3742	2.561	521.79	244	42	34	37	249
16		1122	8.8	121	0.14	0.3742	2.557	523.95	248	42	39	37	248
17		1125	7.6	122	0.13	0.3606	2.370	525.89	251	44	39	37	251
18		1128	7.5	120	0.12	0.3464	2.197	2527.921	253	45	40	37	255
④ 19		1135	6.9	116	0.11	0.3317	2.022	530.00	260	40	37	37	256
20		1138	6.9	118	0.12	0.3464	2.198	532.08	261	41	37	37	255

② Start 45 — ③ Start 1110 ④ Start 1133

American Analytical & Environmental Laboratory, Inc.

EPA Method 5 & Cont.

PARTICULATE FIELD DATA FORM

Plant: Western Sugar
City: Billings, Montana
Location: Boiler Exhaust
Operator: TWB - TJB - AHB
Date: 12/6-88
Run Number: #2 Comp.
Stack Diam, mm(in.): 115" = 102.4 ft²
Sample Box Number: CR#14
Meter Box Number: CR#(97)
Meter ΔH@: 2.107

Meter Calibration (Y): 1.116
Pitot Tube (C_p): 0.8955 - 6'B
Probe Length: 6' 4"
Probe Liner Material: Stainless
Probe Heater Setting: Var.
Ambient Temperature: 30°F Standard
Barometric Pressure (P_b): 26.22 mm (in.) Hg
Assumed Moisture: 14.0%
Static Pressure (P_s): ±0.2 mm (in.) H_2O
C Factor:
Reference ΔP: 0.390 mm (in.) H_2O

Sheet 2 of 2
Nozzle Identification Number: 3/8-3
Nozzle Diameter: 0.366 mm (in.)
Thermometer Number: 6'B dig.
Final Leak Rate: m³/min (cfm)
Vacuum During Leak Check: mm (in.) Hg
Filter Number: 45B-40#2 0.8275 Tot.
Remarks:

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) $m^3(ft^3)$	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
21	3.0 (2)	1141	8.3	119	0.13	0.3606	2.377	534.18	265	40	37	35	246
22	"	1144	7.8	120	0.12	0.3464	2.190	536.26	263	41	38	37	260
23	"	1147	7.7	120	0.12	0.3464	2.193	538.36	265	41	38	37	260
24	"	1150	7.6	120	0.12	0.3464	2.197	2240.366	259	40	39	38	255
T+H = 72.0				283.7		8.8758	60.373	52.325			175.4		
Avg = 3.0				118.2		0.3698	2.516	0.7267			36.5		

°R: 578.2

V_m = 58.395
P_s = 26.235

496.5°R

Billings, Mont.

LABORATORY DATA

Company Western Sugar Co. Run No. #2 Comp. (SO_2 + Part.)

Sampling Loaction Boiler Exhaust Stack Date 12/6-88

MOISTURE COLLECTED

		GM/ML	Water Weight/Volume Gain GM/ML
IMPINGER 1	Final Weight/Volume	668.0	
	Initial Weight/Vol.		
	Increase	565.1	+102.9
IMPINGER 2	Final Weight/Volume	602.3	
	Initial Weight/Vol.		
	Increase	556.0	+ 46.3
IMPINGER 3	Final Weight/Volume	611.1	
	Initial Weight/Vol.		
	Increase	587.0	+ 24.1
IMPINGER 4	Final Weight/Volume	692.5	
	Initial Weight/Vol.		
	Increase	678.0	+ 14.5

PARTICULATE COLLECTED (+187.8 g tot.)

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1) Filter & Particulates 1.1018
(2) Filter Tare Weight 0.8278 g. WSB-BO #2
(3) Net Dry Particulates (1-2) 0.2740 = 274.0 mg.
(4) Particulates Caught in Nozzle, Probe & Glassware 35.0
(5) Total Front Catch (3 & 4) 309.1

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1) Particulate caught in impingers evaporated down at less than 120° F. 9.0

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

318.1 mg.

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Sandy, Utah 84070
801 566-4023

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#2 Western Sugar.	86.7	7.3	6.0	<0.1
Billings Mont.	86.6	7.3	6.1	<0.1
Boiler Exhaust Stack.	86.7	7.2	6.1	<0.1
(12/6-85) AVERAGE	86.67	7.27	6.07	<0.1

I Pre-test leak check — Boiler Exhaust Stack

A - Pitots
A = √K
B = √K
VBB

B Meter Sys
Fin = 2548.066
st = 2548.061
0.005 √0.5 22" Hg VBB

II Pretest leak checks

A Pitots
A = √K
B = √K
VBB

B Meter Sys
Fin = 2601.357
st. = 2601.342
0.011 √K at 22" Hg VBB

American Analytical & Environmental Laboratory, Inc.

EPA Method 5+8 Comb.

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co
City Billings Mont
Location Boiler Outlet
Operator VBB - JT + JPB
Date 12/7/88
Run Number #3 Compl
Stack Diam, mm(in.) 11'5" = 102.4 ft²
Sample Box Number CR#1A
Meter Box Number CR#1(97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 6'A = 0.8955
Probe Length 6' eff
Probe Liner Material stainless
Probe Heater Setting low cont
Ambient Temperature 32° start
Barometric Pressure (P_b) 26.40 mm (in.)Hg
Assumed Moisture 11.0
Static Pressure (P_s) +0.2 mm (in.)H_2O
C Factor —
Reference ΔP 0.890 mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number 3/8
Nozzle Diameter 0.366 mm (in.)
Thermometer Number 6' B dig
Final Leak Rate ____ m^3/min (cfm)
Vacuum During Leak Check ____ mm (in.) Hg
Filter Number WSB-BO#3 Tut=
Remarks

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr) (starting = 0140)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) (starting 2548.271) m^3(ft^3)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	3.0 (ea)	0143	8.2	114	0.14	0.3742	2.572	2550.50	38	246	36	34	254
2		0146	8.0	116	0.13	0.3606	2.380	552.62	37	245	36	34	263
3		0149	11.4	120	0.16	0.4000	2.909	554.93	36	243	36	34	261
4		0152	12.8	123	0.17	0.4123	3.078	557.31	36	240	37	34	265
5		0155	12.7	120	0.16	0.4000	2.915	559.64	38	243	37	35	260
6		0158	11.9	117	0.15	0.3873	2.747	2561.915	40	246	37	35	254
7		0208	11.9	118	0.15	0.3873	2.740	564.24	42	240	37	34	251
8		0211	13.0	116	0.16	0.4000	2.929	566.47	42	242	36	34	253
9		0.214	14.0	115	0.17	0.4123	3.102	568.83	42	244	36	34	255
10		0.217	12.0	116	0.14	0.3742	2.563	571.49	42	247	36	34	251
11		0.220	11.3	115	0.13	0.3606	2.384	573.68	42	249	36	34	246
12		0223	10.4	112	0.12	0.3464	2.212	2575.796	43	246	37	34	244
13		0232	8.8	114	0.11	0.3317	2.025	577.80	34	258	37	35	261
14		0235	9.3	115	0.12	0.3464	2.208	579.86	38	266	37	36	260
15		0238	11.8	117	0.13	0.3606	2.383	581.99	39	263	37	36	262
16		0241	11.7	120	0.13	0.3606	2.373	584.12	40	266	35	36	264
17		0244	11.5	120	0.13	0.3606	2.376	586.28	40	259	35	37	260
18		0247	10.6	118	0.12	0.3464	2.196	2588.372	40	247	37	36	254
19		0256	9.3	116	0.10	0.3162	1.836	590.22	36	256	36	37	250
20		0259	10.5	115	0.12	0.3464	2.208	592.39	37	254	36	37	248

Port No. N-S ① ② ③ EW ④

② Start 0205 ③ Start at 0229 ④ Start 0253

American Analytical & Environmental Laboratory, Inc.

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co
City Billings Mont.
Location Boiler Outlet
Operator VBB-JT + JPB
Date 12/2/88
Run Number #3 Comp
Stack Diam, mm(in.) 11'5" = 102.4 ft²
Sample Box Number CR#1A
Meter Box Number CR#1(97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 6'B - 0.8955
Probe Length 6' left
Probe Liner Material Stainless
Probe Heater Setting Vor Cant
Ambient Temperature 32° F
Barometric Pressure (P_b) 26.40 mm (in.)Hg
Assumed Moisture 11%
Static Pressure (P_s) +0.2 mm (in.)H_2O
C Factor -
Reference ΔP 0.890 mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number 3/8 A
Nozzle Diameter 0.366 mm (in.)
Thermometer Number 6'B Dig
Final Leak Rate m³/min (cfm)
Vacuum During Leak Check mm (in.) Hg
Filter Number WSB-BO#3 Tot
Remarks

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) $m^3(ft^3)$	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
21	3.0 (ea)	0262	11.5	117	0.13	0.3606	2.353	594.51	247	37	37	36	251
22	"	0305	13.6	115	0.15	0.3873	2.745	596.78	241	36	37	37	254
23	"	0308	11.4	120	0.13	0.3606	2.376	598.92	246	36	38	37	257
24	"	0311	10.6	119	0.12	0.3464	2.197	2600.937	249	36	37	38	261
Total =	120			2814		8.839	59.84	52.666			1730		
Avg =	30			117.3		0.3683	2.493	0.7315			36.002		

°R = 577.3 P_s = 26.415 i_{co} = 58.775 °R = 496.0

Billings, Mont.

LABORATORY DATA

Company Western Sugar Co. Run No. #3 Comp. (SO_2 + Part.)

Sampling Loaction Boiler Exhaust Stack Date 12/6-88

MOISTURE COLLECTED

		GM/ML	Water Weight/Volume Gain GM/ML
IMPINGER 1	Final Weight/Volume	642.0	
	Initial Weight/Vol.		
	Increase	565.9	+76.1
IMPINGER 2	Final Weight/Volume	602.3	
	Initial Weight/Vol.		
	Increase	554.7	+47.6
IMPINGER 3	Final Weight/Volume	587.2	
	Initial Weight/Vol.		
	Increase	564.6	+22.6
IMPINGER 4	Final Weight/Volume	663.5	
	Initial Weight/Vol.		
	Increase	650.7	+12.8

PARTICULATE COLLECTED 159.1 g total

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1) Filter & Particulates 0.0987
(2) Filter Tare Weight 0.8138 g. WSB-60 #3
(3) Net Dry Particulates (1-2) 0.2849 = 284.9 g
(4) Particulates Caught in Nozzle, Probe & Glassware 284.9
(5) Total Front Catch (3 & 4) 26.6

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1) Particulate caught in impingers evaporated down at less than 120° F. 311.5

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

321.5

American Analytical
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8739 South 300 West
Sandy, Utah 84070
801 566-4023

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#3 Western Sugar.	87.4	7.2	5.4	<0.1
Billings, Mont.	87.4	7.1	5.5	<0.1
Boiler Exhaust Stack.	87.4	7.2	5.4	<0.1
(12/6-88) AVERAGE	87.4	7.17	5.43	<0.1

Pre-test leak check

A-Pitot. B-Meter System.

American Analytical & Environmental Laboratory, Inc.

II-Post-test leak checks.

A-Pitot. B-Meter System.

A = ok. Fin. = 475.137
B = ok. Sto = 475.187
0 at 15" Hg

EPA Method 5+8 Cont.

PARTICULATE FIELD DATA FORM

A = ok
B = ok
PT

Fin. = 505.501
Sto = 505.501
0 at 22" Hg

Inc. Gas Anal. Start. ok.

Plant Western Sugar Co
City Billings, Mont.
Location Mill-Dry Stack
Operator Kylen Lobit
Date 12/6/88
Run Number #1 Comp
Stack Diam, mm(in.) 96.0" Eff dia = 72.0 ft²
Sample Box Number PAC #1
Meter Box Number PAC 1051
Meter ΔH@ 2.085

Meter Calibration (Y) 0.978
Pitot Tube (C_p) 6' A = 0.8512
Probe Length 6' Eff.
Probe Liner Material Glass-Qtz.
Probe Heater Setting Yes Cont.
Ambient Temperature 72° in plant
Barometric Pressure (P_b) 26.23 mm (in.)Hg
Assumed Moisture 5.0%
Static Pressure (P_s) -1.8 mm (in.)H_2O
C Factor -
Reference ΔP mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number 5/16.5
Nozzle Diameter 0.306 mm (in.)
Thermometer Number 6' A dig.
Final Leak Rate m³/min (cfm)
Vacuum During Leak Check mm (in.) Hg
Filter Number WSB-BT #1 Tot.
Remarks

CO = <0.1%
CO_2 = 8%
O_2 = 7%
N_2 = 85%

top to bot. / out No.

	Traverse Point Number	Sampling Time, (θ) Min.	Starting Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter (ΔH) (in)H_2O	Starting Gas Sample Volume (V_m) = 475.137 m³(ft³)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	1	3.0 Sec	3:45	5	633	.46	0.678	.6				60	65	248
	2		3:48	5	650	.45	0.671	.6	477.61			60	68	
	3		3:51	7	658	.44	0.663	.6	478.86			64	65	
	4		3:54	10	660	.43	0.656	.6	480.10			70	60	
2	5		3:57	11	668	.63	0.794	.6	481.33			72	60	
	6		4:00	13	670	.62	0.787	.6	482.56			74	62	
	7		4:03	14	666	.64	0.800	.6	485.81			75	62	
3	8		4:06	15	452	.67	0.819	.6	485.07			76	62	
	9		4:19	15	448	.47	0.686	.6	486.52			70	62	
	10		4:22		449	.50	0.707	.5				72	62	
4	11			air sample										
	12		4:35	16	443	.52	0.722	.5	491.65			78	66	
	13		4:35	16	446	.48	0.693	.45	492.21					
5	14		4:50	17	455	.70	0.837	.5	493.42			78	66	
	15		4:53	17	654	.67	0.819	.5	494.58					
	16		4:56	18	660	.65	0.806	.5	495.74			70	66	
6	17		4:59	18	659	.65	0.806	.5	496.92			72	66	
	18		5:02	19	656	.64	0.800	.5	498.08			74	68	
	19		5:05	20	662	.64	0.800	.5	499.65			76	68	
7	20		5:06 off											

Boiler Inlet

American Analytical & Environmental Laboratory, Inc.

EPA Method 5+8 Comb.

PARTICULATE FIELD DATA FORM

Plant: Western Sugar Co.
City: Billings, Mont.
Location: 3rd & 4th St. & Lab.
Operator: Boiler Inlet
Date: 12/6-88
Run Number: #1 Compl
Stack Diam, mm(in.): 96.0" Eff dia. = 72.0 ft²
Sample Box Number: RAC #1
Meter Box Number: RAC 1051
Meter ΔH@: 2.085

Meter Calibration (Y): 0.978
Pitot Tube (C_p): 6' A = 0.8512
Probe Length: 6' Eff.
Probe Liner Material: Fused Qtz.
Probe Heater Setting: Var. Cont.
Ambient Temperature: 72°F in plant.
Barometric Pressure (P_b): 26.23 mm (in.)Hg
Assumed Moisture: 5.0%
Static Pressure (P_s): -1.8 mm (in.)H_2O
C Factor: –
Reference ΔP: mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number: 5/16-5
Nozzle Diameter: 0.306 mm (in.)
Thermometer Number: 6' A dig.
Final Leak Rate: m³/min (cfm)
Vacuum During Leak Check: mm (in.) Hg
Filter Number: 2056-BI #1 T.N.:
Remarks:

Port.	Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) m³(ft³)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
7	21	3.0	5:13	19	653	.64	0.800	.5	498.65			70	64	
	22		5:16	20	641	.65	0.806	.5	500.43			74	68	
8	23		5:19	22	642	.64	0.800	.5	502.06			76	68	
	24		5:22	22	648	.65	0.806	.5	503.23			80	68	
	25		5:25	23	646	.66	0.812	.47	504.20			80	68	
9	26		5:28	23 "	644	.68	0.825	.46	505.36			80	68	
	27		5:28	23 "	644	.68	0.825	.45	505.40			80	68	
Total =		68			16,325		19.203	13.23	30.26			3104		
Stc =		25			653°F		0.7682	0.53	0.445 ACFM			67.5°F		
					1,113 R				29.57 in			527.5°F		

P_s = 26.09

Billings, Mont.

LABORATORY DATA

Company Western Sugar Co. Run No. #1 Comp. (Part + SO_2)

Sampling Loaction Boiler Inlet. Date 12/6-88

MOISTURE COLLECTED

		GM/ML	Water Weight/~~Volume Gain~~ GM/ML
IMPINGER 1	Final Weight/Volume	531.2 ~~[illegible]~~	
	Initial Weight/Vol.		
	Increase	557.8	-25.9
IMPINGER 2	Final Weight/Volume	590.1	
	Initial Weight/Vol.		
	Increase	#3 582.5	+7.6
IMPINGER 3	Final Weight/Volume	608.8	
	Initial Weight/Vol.		
	Increase	#2 581.7	+27.1
IMPINGER 4	Final Weight/Volume	635.1	
	Initial Weight/Vol.		
	Increase	622.4	+12.7

PARTICULATE COLLECTED 21.5g total

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1) Filter & Particulates 0.4092
(2) Filter Tare Weight 0.1990g. WSB-BI #1
(3) Net Dry Particulates (1-2) 0.2102 = 210.2 mg.
(4) Particulates Caught in Nozzle, Probe & Glassware _____
(5) Total Front Catch (3 & 4) _____

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1) Particulate caught in impingers evaporated down at less than 120° F. _____

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

_____

American Analytical
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Sandy, Utah 84070
801 566-4023

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#1 Western Sugar.	87.5	7.1	5.4	<0.1
Billings, Mont.	87.6	7.1	5.3	<0.1
Boiler Inlet (12/6-88)	87.5	7.2	5.3	<0.1
AVERAGE	87.53	7.13	5.33	<0.1

I - Pretest Leak Checks

A - Pitot B - Meter System

A: OK Fin. = 516.442

B: OK Pit St. = 516.442

0 ... at 24" Hg Pit

Boiler Inlet

American Analytical & Environmental Laboratory, Inc.

EPA Method 5 + 8 Comb.

PARTICULATE FIELD DATA FORM

II - Post-test Leak Checks

A - Pitot B - Meter System

A: OK Fin. = 544.344

B: OK Pit St. = 544.344

0 ... at 24" Hg Pit

Plant Western Sugar Co.
City Billings, Mont.
Location EPA - PT + SAL
Operator Boiler Inlet
Date 12/6-88
Run Number #2 Compl.
Stack Diam, mm(in.) 96.0" Eff dia = 72.0 ft²
Sample Box Number DAC #1
Meter Box Number DAC 1051
Meter ΔH@ 2.085

Meter Calibration (Y) 0.978
Pitot Tube (C_p) 6' A - 0.8512
Probe Length 6' Eff.
Probe Liner Material Glass - Qtz.
Probe Heater Setting Var Cont.
Ambient Temperature 72°F in plant
Barometric Pressure (P_b) 26.22 mm (in.)Hg
Assumed Moisture 5.0%
Static Pressure (P_s) -1.8 mm (in.)H_2O
C Factor —
Reference ΔP mm (in.)H_2O

Sheet 1 of 1
Nozzle Identification Number 5/16 - Iso. Gas Anal.
Nozzle Diameter mm (in.) Start Est.
Thermometer Number 63 A deg.
Final Leak Rate m³/min (cfm)
Vacuum During Leak Check mm (in.) Hg
Filter Number WSB-BT #2 Tot. =
Remarks

CO = <0.1%
CO_2 =
O_2 =
N_2 =

Top to Bot Pit No	Traverse Point Number	Sampling Time, (θ) Min.	Starting = Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Starting = Gas Sample Volume(V_m) = 516.442 m³(ft³)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
							0.875							
1	1	9.0	10:23	4	669	.77	0.831	.5	518.69			58	56	248
	2		10:29	6	670	.69	—	.5	520.48			60	56	
	3		10:35	7	675	.68	0.825	.5	523.25			64	54	
	4		10:41	8	656	.69	0.831	.5				68	58	
	5		break						523.25					
2	6		10:46	9	652	.54	0.735	.5	525.60			66	58	
	7		10:52	10	659	.49	0.7000	.5	527.85			68	60	
3	8		10:58	11	664	.66	0.812	.5	530.20			70	60	
	9		11:04	12	676	.70	0.837	.5				72	62	
	10		break						530.20					
4	11		11:09	11	680	.65	0.806	.5	532.51			68	62	
	12		11:15	12	666	.70	0.837	.5	534.83			68	64	
	13		11:21	14	665	.72	0.849	.5	537.16			70	64	
5	14		11:27	15	662	.71	0.843	.5				74	66	
	15		break						537.16					
	16		11:32	15	670	.69	0.831	.5	539.50			70	66	
6	17		11:38	16	674	.68	0.825	.5	541.86			72	68	
	18		11:44	18	681	.75	0.866	.5	544.23			74	66	
	19		11:50	20	667	.72	0.849	.5				76	66	
7	20													
			72 min		668		13.155	0.5	27.79			65		
							0.822		0.386 ...					
									27.15 ...					

Billings, Mont.

LABORATORY DATA

Company Western Sugar Co. Run No. #2 Comp. (Port + SO_2)

Sampling Loaction Boiler Inlet. Date 12/6-58

MOISTURE COLLECTED

		GM/ML	~~Water Weight/Volume Gain~~ GM/ML
IMPINGER 1	Final Weight/Volume	536.9	
	Initial Weight/Vol.		
	Increase	559.4	-22.5
IMPINGER 2	Final Weight/Volume	616.7	
	Initial Weight/Vol.	583.1	
	Increase		+33.6
IMPINGER 3	Final Weight/Volume	596.6	
	Initial Weight/Vol.		
	Increase	584.1	+12.5
IMPINGER 4	Final Weight/Volume	631.2	
	Initial Weight/Vol.	619.8	
	Increase		+11.4

35.0g total.

PARTICULATE COLLECTED

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1)	Filter & Particulates	0.4109
(2)	Filter Tare Weight	0.1925g. 256-61 #2
(3)	Net Dry Particulates (1-2)	0.2184 = 218.4mg
(4)	Particulates Caught in Nozzle, Probe & Glassware	
(5)	Total Front Catch (3 & 4)	

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1) Particulate caught in impingers evaporated down at less than 120° F.

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

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8739 South 300 West
Sandy, Utah 84070
801 566-4023

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#2 Western Sugar	87.4	7.4	5.2	0.11
Billings, Mont.	87.5	7.3	5.2	<0.1
Boiler Inlet (12/6-88).	87.4	7.4	5.2	0.1
AVERAGE	87.43	7.37	5.2	0.1

Boiler Inlet

American Analytical & Environmental Laboratory, Inc.

EPA Method 1 5 & 8 Cond

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co.
City Billings Mont
Location
Operator Boiler Inlet
Date 12/6-88
Run Number #3 Cond
Stack Diam, mm(in.)
96.0" dia = 72.0 ft²
Sample Box Number RAC#1
Meter Box Number RAC 1051
Meter ΔH@ 2.085

Meter Calibration (Y) 0.978
Pitot Tube (C_p) A=0.8512
Probe Length 6' 4"
Probe Liner Material Glass Pyrex
Probe Heater Setting Var Cont
Ambient Temperature 72°F in plant
Barometric Pressure (P_b) 26.40 mm (in.)Hg
Assumed Moisture 5.0%
Static Pressure (P_s) -1.8 mm (in.)H_2O
C Factor
Reference ΔP mm (in.)H_2O

Sheet 1 of 1
Nozzle Identification Number 5/16-5
Nozzle Diameter 0.306 mm (in.)
Thermometer Number 63Ad
Final Leak Rate m³/min (cfm)
Vacuum During Leak Check mm (in.) Hg
Filter Number WSB-BI #3 Tot
Remarks

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) 549.58 m³(ft³)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	start at	1:40	3"	667	.78	0.883	.5	551.72			52	50	
2	every 5	1:46	4"	665	.76	0.872	.5	554.04			54	50	
3	min	1:52	5"	658	.72	0.849	.5	556.39			58	52	
4		1:58	7"	658	.52	0.721	.5				60	52	
5		break						556.39					
6		2:03	6"	679	.52	0.721	.5	558.72			60	50	
7		2:09	7"	685	.71	0.843	.5	561.09			62	52	
8		2:15	9"	682	.71	0.843	.5	563.47			66	54	
9		2:21	9"	680	.68	0.825	.5				68	56	
10		break						563.47					
11		2:26	9"	682	.67	0.819	.5	565.78			66	56	
12		2:32	10"	683	.67	0.819	.5	568.12			[illegible]	[illegible]	
13		2:38	11"	685	.70	0.837	.5	570.48			66	58	
14		2:44	12"	667	.63	0.794	.5				68	60	
15		break						570.48					
16		2:49	11"	669	.72	0.849	.5	572.81			64	58	
17		2.55	12"	654	.73	0.854	.5	575.17			66	60	
18		3.01	14"	643	.67	0.819	.5	577.54			68	60	
19		3:07	15"	659	.52	0.721	.5				70	60	
				10719		13.069					1902		
				669.9							59.4		
				°R = 1129.9							°R = 519.4		

0.517 P_s = 26.27 0.5 0.34 Stack 27.96 27.345

Fin 549.426
St 549.42
0.006 ✓ of acceptability

Fin 577.623
St 577.632
0.001 ✓
at 24" Hg

Billings, Mont.

LABORATORY DATA

Company Western Sugar Co. Run No. #3 Comp. (Part + SO_2)

Sampling Loaction Boiler Inlet Date 12/6-88

MOISTURE COLLECTED

		GM/ML	Water Weight/Volume Gain GM/ML
IMPINGER 1	Final Weight/Volume	534.3	
	Initial Weight/Vol.	558.8	
	Increase		-24.5
IMPINGER 2	Final Weight/Volume	615.3	
	Initial Weight/Vol.	581.7	
	Increase		+33.6
IMPINGER 3	Final Weight/Volume	593.9	
	Initial Weight/Vol.	581.8	
	Increase		+12.1
IMPINGER 4	Final Weight/Volume	603.9	
	Initial Weight/Vol.	593.5	
	Increase		+10.4

PARTICULATE COLLECTED +31.6g total

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1) Filter & Particulates 0.4231
(2) Filter Tare Weight 0.1876g. 456-6I #3
(3) Net Dry Particulates (1-2) ~~0.2355~~ = 235.5mg.
(4) Particulates Caught in Nozzle, Probe & Glassware
(5) Total Front Catch (3 & 4)

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1) Particulate caught in impingers evaporated down at less than 120° F.

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

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801 566-4023

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#3 Western Sugar,	87.7	7.3	5.0	<0.10
Billings, Mont.	87.7	7.2	5.1	<0.10
Boiler Inlet (12/6-88)	87.7	7.2	5.1	<0.10
AVERAGE	87.7	7.23	5.07	<0.1

I - Pretest leak checks

A = Pitot B - Meter System

A = ✓ FIN = 2610.038

B = ✓ St = 2610.037

0.001 ✓ at 23.5 in/Hg

American Analytical & Environmental Laboratory, Inc.

EPA Method 5.

PARTICULATE FIELD DATA FORM

II - Post-test Leak checks

A - Pitot B - Meter System

A = FIN = 2672.896

B = St = 2672.890

0.006 ✓ at 23.5 in/Hg

Field use only

Plant Western Sugar

City Billings, Montana

Location East Main Street

Operator JLB - JLP - SHE

Date 12/8-88

Run Number #1 Compliance.

Stack Diam, mm(in.) 83.5" Dia = 38.078 ft²

Sample Box Number C.P. #1 A.

Meter Box Number C.P. #1 A (97).

Meter ΔH@ 2.107

Meter Calibration (Y) 1.116

Pitot Tube (C_p) 6'B = 0.8955

Probe Length 6' Eff.

Probe Liner Material Stainless.

Probe Heater Setting Var. Cont.

Ambient Temperature 23°F Start

Barometric Pressure (P_b) 26.52 mm (in.)Hg

Assumed Moisture 34.0%

Static Pressure (P_s) +0.02 mm (in.)H_2O

C Factor

Reference ΔP 0.6600 mm (in.)H_2O

Sheet 1 of 2

Nozzle Identification Number 1/2A

Nozzle Diameter 0.492 mm (in.)

Thermometer Number B6 Dig.

Final Leak Rate m³/min (cfm)

Vacuum During Leak Check mm (in.) Hg

Filter Number WSP#1 = 0.7699 g Tot.

Remarks

CO = <0.8%

CO_2 = @3.5%

O_2 = @12.0%

N_2 = 84.5%

Traverse Point Number	Sampling Time, (θ) Min.	Starting Clock Time = 1026 (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Starting Gas Sample Volume(V_m) = 2610.617 m³(ft³)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	4.0 @	1030	2.1	152	0.03	0.1732	1.923	2612.66	272	35	58	43	266
2		1034	1.8	156	0.02	0.1414	0.69	614.60	252	35	47	42	260
3		* 1038	3.9	155	0.06	0.2450	2.09	617.03	270	35	49	52	269
4		1042	4.1	152	0.06	0.2450	2.11	619.81	269	36	54	48	272
5		1044	4.2	156	0.06	0.2450	2.10	622.59	259	38	56	50	271
6		1048	4.3	157	0.06	0.2450	2.13	625.36	248	37	58	53	259
7		1052	4.2	166	0.06	0.2450	2.08	628.13	242	37	58	53	272
8		1056	4.2	174	0.06	0.2450	2.06	-	246	37	61	56	270
9		1060	3.8	176	0.05	0.2236	1.72	633.56	232	39	62	57	239
10		1104	4.8	176	0.07	0.2646	2.40	636.50	239	43	63	57	246
11		1108	4.2	178	0.06	0.2450	2.05	639.16	249	50	63	58	261
12		1112	4.0	179	0.07	0.2646	2.46	2642.004	252	50	63	60	271
13		1147	2.9	172	0.03	0.1732	1.04	644.15	263	51	64	63	237
14		1147	3.2	170	0.04	0.2000	1.39	646.25	265	43	63	62	272
15		1151	4.1	174	0.04	0.2000	1.34	648.73	269	44	63	62	270
16		1155	4.0	169	0.05	0.2236	1.75	651.28	260	46	63	62	252
17		1154	3.4	173	0.04	0.2000	1.40	653.59	241	48	62	62	243
18		1203	4.2	166	0.05	0.2236	1.75	656.13	258	47	60	61	258
19		1207	4.8	167	0.06	0.2450	2.09	658.91	262	44	60	60	247
20		1211	4.1	176	0.05	0.2236	1.72	661.48	268	42	59	60	243

Port

N.S.

E-W

* Bot. of + closed on pitots. down @ 3 min.

American Analytical & Environmental Laboratory, Inc.

EPA Method 5.

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co.
City Billings, Mont.
Location East Drier - South
Operator VGB - JPB - SAB
Date 12/8-88.
Run Number #2 Compliance.
Stack Diam, mm(in.)
83.5" dia = 38.028 ft²
Sample Box Number CR#14.
Meter Box Number CR#1(97).
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 6' B = 0.8955
Probe Length 6' Eff.
Probe Liner Material Stainless.
Probe Heater Setting Var. Cont.
Ambient Temperature 40°F Fin
Barometric Pressure (P_b) 24.52 mm (in.)Hg
Assumed Moisture 34.0 %
Static Pressure (P_s) +0.02 mm (in.)H_2O
C Factor —
Reference ΔP 0.6600 mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number 1/2 A
Nozzle Diameter 0.492 mm (in.)
Thermometer Number 6' B Dry
Final Leak Rate m³/min (cfm)
Vacuum During Leak Check mm (in.) Hg
Filter Number WSP#1 = 0.7699g Tuto
Remarks

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) $m^3(ft^3)$	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
21	4.0 @	1215	4.1	176	0.05	0.2236	1.71	2663.95	265	45	58	59	271
22	"	1219	4.0	178	0.05	0.2236	1.71	666.34	270	42	58	59	270
23	"	1223	4.3	178	0.06	0.2450	2.05	669.10	268	44	57	59	265
24	"	1227	4.6	179	0.06	0.2450	2.05	2671.762	265	37	58	58	260
Total L =	96.0			4050		5.4096	42.903	61.145			27	54	
AVG =	4.0			168.5		0.2253	1.788	0.6369 ACFM			57.375		

Portna

E-W

628.8°R

iso = 68.238

°R 517.375

EPA Method 5.

LABORATORY DATA

Company Western Sugar Billings Run No. Comp #1

Sampling Loaction East Pulp Dryer Date 12/8-88

~~South~~ North VBB.

MOISTURE COLLECTED

		~~GM/ML~~	~~Water Weight/Volume Gain GM/ML~~
IMPINGER 1	Final Weight/Volume	747.4	
	Initial Weight/Vol.		
	Increase	570.6	+176.8
IMPINGER 2	Final Weight/Volume	750.7	
	Initial Weight/Vol.		
	Increase	587.6	+163.1
IMPINGER 3	Final Weight/Volume	572.9	
	Initial Weight/Vol.		
	Increase	454.2	+128.7
IMPINGER 4	Final Weight/Volume	768.6	
	Initial Weight/Vol.		
	Increase	697.4	+71.2

PARTICULATE COLLECTED (+539.8g total)

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1)	Filter & Particulates	0.8587
(2)	Filter Tare Weight	0.7699 - 6258-1
(3)	Net Dry Particulates (1-2)	0.0888 = 88.8 mg
(4)	Particulates Caught in Nozzle, Probe & Glassware	25.3 mg
(5)	Total Front Catch (3 & 4)	114.1 mg

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1)	Particulate caught in impingers evaporated down at less than 120° F.	17.0 mg.

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

131.1 mg.

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ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO.	~~South~~ North DESCRIPTION	VOLUME PERCENT - DRY			
		NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#1	Billings, Mont.	86.9 %	10.8%	2.3 %	<0.1
	Western Sugar Co.	86.9 %	10.7%	2.4 %	<0.1
	Beet Pulp Dryer.	86.9 %	10.8%	2.3 %	<0.1
	AVERAGE	86.9 %	10.76%	2.33 %	<0.1

I- Pretest leak checks — 2 Pass — II- Post-test leak checks

A-Pitot. B-Meter System — **American Analytical & Environmental Laboratory, Inc.** — A-Pitot. B-Meter System.

A=✓ok Fin.= 2726.641 — Method 5 Only. — A=✓ok Fin.= 2773.144

B=✓ok. Sto = 2726.630 — B=✓ok Sto = 2773.141

0.011 ✓ok at 23" Hg vac. — 001013

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co.
City Billings, Mont.
Location East Dryer Back Vent
Operator Vob - JB - SHB
Date 12/8-88
Run Number #2 Comp
Stack Diam, mm(in.) 83.5" ID = 38.028/12
Sample Box Number PC2#1
Meter Box Number PD#1(97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 0.8955 = 5'B
Probe Length 6' ft.
Probe Liner Material Stainless
Probe Heater Setting Var. Cont.
Ambient Temperature 37°F Start.
Barometric Pressure (P_b) 26.30 mm (in.)Hg
Assumed Moisture 28%
Static Pressure (P_s) ±0.02 mm (in.)H_2O
C Factor
Reference ΔP 0.720 mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number 1/2 A-2
Nozzle Diameter 0.492 mm (in.)
Thermometer Number 6 B dg.
Final Leak Rate m³/min (cfm)
Vacuum During Leak Check mm (in.) Hg
Filter Number WSP #3 - 0.7712 g Tot.
Remarks

Field Dry gas added.
CO = <0.0%
CO_2 = 3.0%
O_2 = 12.0%
N_2 = 85.0%

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr) = 1835	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) = 2726.722 m³(ft³)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	3.0	1838	3.1	155	0.05	0.2236	1.99	2728.69	244	33	39	38	250
2		1841	4.3	159	0.06	0.2450	2.35	730.83	263	32	39	33	261
3		1844	4.4	165	0.06	0.2450	2.33	733.00	260	32	39	38	264
4		1847	5.3	162	0.07	0.2646	2.74	735.34	258	33	40	38	266
5		1850	4.5	163	0.06	0.2450	2.34	737.45	263	33	40	38	268
6		1853	4.4	166	0.06	0.2450	2.33	739.58	266	32	40	38	271
7		1856	4.3	161	0.06	0.2450	2.35	741.69	260	36	41	39	256
8		1859	3.0	167	0.05	0.2236	1.94	743.50	266	37	41	39	259
9		1862	2.3	168	0.04	0.2000	1.55	745.21	262	38	41	39	260
10		1905	1.9	171	0.03	0.1732	1.16	746.66	266	39	41	39	263
11		1908	2.4	172	0.04	0.2000	1.54	745.46	[illegible]	38	42	40	264
12		1911	2.4	170	0.04	0.2000	1.55	2750.229	270	39	43	40	261
13		1926	3.1	166	0.04	0.2000	1.50	2752.02	268	34	41	41	268
14	2	1929	3.1	168	0.04	0.2000	1.54	2754.81	264	31	41	41	264
15		1932	3.1	173	0.03	0.1732	1.57	2755.61	254	35	42	41	262
16	4	1935	3.1	171	0.04	0.2000	1.55	2757.39	251	37	42	41	260
17		1938	4.1	168	0.05	0.2236	1.94	2759.36	248	34	42	41	257
18	6	1941	4.9	169	0.06	0.2449	2.33	2762.27	249	32	43	41	255
19		1944	4.9	170	0.06	0.2449	2.32	276 —	245	31	41	40	257
20	8	1947	4.0	166	0.05	0.2236	1.95	2765.75	250	31	41	40	255

#2 Plant

American Analytical & Environmental Laboratory, Inc.

EPA Method 5 Only

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co.
City Billings Mont.
Location East Sugar - North
Operator VBB-JTB-SHS
Date 12/8-88
Run Number #2 Compl.
Stack Diam, mm(in.) 83.5" ID = 38.028 ft²
Sample Box Number CP#1A
Meter Box Number CP#1(97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) CP = 0.8455
Probe Length 6' EP.
Probe Liner Material Stainless
Probe Heater Setting Yes Cont.
Ambient Temperature 33°F Start.
Barometric Pressure (P_b) 26.30 mm (in.)Hg
Assumed Moisture 28%
Static Pressure (P_s) +0.02 mm (in.)H_2O
C Factor — —
Reference ΔP 0.720 mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number 1/2 A-2
Nozzle Diameter 0.492 mm (in.)
Thermometer Number 65 dig.
Final Leak Rate ____ m^3/min (cfm)
Vacuum During Leak Check ____ mm (in.) Hg
Filter Number WSP#3-0.7712g Tot.
Remarks

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) m^3(ft^3)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
21	3.0 (20)		3.0	173	0.2000	0.04	1.54	2767.43	252	32	41	40	261
22	"		3.0	167	0.2000	0.04	1.55	2769.98	265	31	40	40	267
23	"		3.5	169	0.2000	0.04	1.55	2770.74	268	33	40	39	268
24	"		3.5	171	0.2000	0.04	1.54	2772.467	261	34	40	39	263
Total:	24.0			4010		5.2204	45.04	45.745			1928		
Ave:	3.0			167.1		0.2175	1.878	0.6354			40.2		

627.1 DR P_s = 26.302 iso = 51.051 °R = 500.2

EPA Method 5

LABORATORY DATA

Company Western Sugar Billings. Run No. Compliance #2

Sampling Loaction East Pulp Dryer. Date 12/8-88

~~South~~ North

MOISTURE COLLECTED

		GM/ML	~~Water Weight/Volume Gain~~ GM/ML
IMPINGER 1	Final Weight/Volume	764.9	
	Initial Weight/Vol.		
	Increase	571.2	+193.7
IMPINGER 2	Final Weight/Volume	765.1	
	Initial Weight/Vol.		
	Increase	590.1	+175.1
IMPINGER 3	Final Weight/Volume	460.3	
	Initial Weight/Vol.		
	Increase	454.7	+5.6
IMPINGER 4	Final Weight/Volume	706.1	
	Initial Weight/Vol.		
	Increase	694.9	+11.2

PARTICULATE COLLECTED +385.6g total

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1) Filter & Particulates 0.8679
(2) Filter Tare Weight 0.7762 WSP-3
(3) Net Dry Particulates (1-2) 0.0967 = 96.7mg.
(4) Particulates Caught in Nozzle, Probe & Glassware 26.3mg.
(5) Total Front Catch (3 & 4) 123.0mg.

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1) Particulate caught in impingers evaporated down at less than 120° F. 12.0mg.

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

135.0 mg.

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Billings, Mont.
East Butt Dryer Bank
North Stack - Run #2 Compl.

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#2 (North)	85.5	11.3	3.2	<0.1
12/8-88.	85.3	11.4	3.3	<0.1
	85.4	11.3	3.3	<0.1
AVERAGE	85.4	11.33	3.27	<0.1

I - Initial leak check.

#3 North

II - Post test leak check.

A - Pitot B - Meter System

A = ✓ok
B = ✓ok

Fin. = 2820.250
Ini. = 2820.241
0.009 ✓ok
22.2" Hg

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A - Pitot B - Meter System

A = ✓ok
B = ✓ok

Fin = 2868.152
Ini = 2868.141
0.011 ✓ok
22" Hg.

EPA Method 5 Only.

PARTICULATE FIELD DATA FORM

Plant: Western Sugar Co.
City: Billings Mont.
Location: Cat Duck (North)
Operator: Will-TB-SDS
Date: 12/9-88
Run Number: #3 Compl.
Stack Diam, mm(in.): 83.5" ID = 38.028/12.
Sample Box Number: #7#1A
Meter Box Number: #7#1(99)
Meter ΔH@: 2.107

Meter Calibration (Y): 1.116
Pitot Tube (C_p): CB = 0.8950
Probe Length: 6' Std.
Probe Liner Material: Stainless
Probe Heater Setting: Full Cool.
Ambient Temperature: 46°F Stack.
Barometric Pressure (P_b): 26.28 mm (in.)Hg
Assumed Moisture: 28.0%
Static Pressure (P_s): +0.02 mm (in.)H_2O
C Factor:
Reference ΔP: 0.700 mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number: 1/2A-2 Filter #2 Stainless Steel
Nozzle Diameter: 0.498 mm (in.)
Thermometer Number: 625 Dig.
Final Leak Rate: m³/min (cfm)
Vacuum During Leak Check: mm (in.) Hg
Filter Number: WS P#5 - 0.7709g tot.
Remarks:

CO = <0.1%
CO_2 = 3.0%
O_2 = 12.0%
N_2 = 85.0%

Traverse Point Number	Sampling Time, (θ) Min.	Starting Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Starting Gas Sample Volume(V_m) = 2820.515 $m^3(ft^3)$	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
Port No. 1	3 (Min)	1430	3.0	167	0.04	0.2000	1.60	2822.39	254	47	55	53	260
2		1436	3.5	168	0.05	0.2236	1.99	2824.40	248	42	55	53	255
3		1442	3.6	170	0.05	0.2236	1.99	2826.47	250	41	55	54	244
4		1448	4.1	171	0.06	0.2450	2.38	2829.67	251	44	55	54	244
5		1454	4.1	171	0.06	0.2450	2.38	2831.86	242	45	55	54	241
6		1500	3.5	172	0.05	0.2236	1.98	2833.90	240	47	55	54	251
7		1506	3.5	174	0.05	0.2236	1.99	2834.87	254	49	55	54	243
8		1512	3.5	175	0.05	0.2236	1.99	2836.85	256	49	56	54	251
9		1518	4.5	176	0.06	0.2450	2.37	2839.02	248	49	56	54	241
10		1524	3.8	176	0.05	0.2236	1.97	2841.05	254	50	56	54	238
11		1530	3.4	175	0.05	0.2236	1.98	2843.04	254	51	57	55	234
12		1536	3.1	174	0.04	0.2000	1.59	2844.900	257	53	54	55	251
13		1542	3.0	171	0.04	0.2000	1.59	2846.62	238	50	55	53	247
14	2	1548	3.9	172	0.05	0.2236	1.99	2848.63	244	47	55	53	251
15		1554	4.0	173	0.05	0.2236	1.98	2850.68	262	47	55	54	235
16	4	1600	4.1	173	0.05	0.2236	1.98	2852.76	264	47	56	54	258
17		1606	4.5	172	0.06	0.2450	2.38	2854.93	266	47	55	55	264
18	6	1612	3.9	174	0.05	0.2236	1.99	2856.91	259	48	56	55	263
19		1618	3.1	175	0.04	0.2000	1.58	2858.71	212	50	56	55	267
20	8	1624	3.2	175	0.04	0.2000	1.58	2859.48	265	51	51	55	258

#3 North.

American Analytical & Environmental Laboratory, Inc.

- EPA Method 5 Only.

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co.
City Billings, Mont.
Location East Vim Mill C. Stack
Operator MB-JHB-BAK
Date 12/9-88
Run Number #3 Compliance
Stack Diam, mm(in.) 83.5 ID = 38.028 ft²
Sample Box Number CD #1
Meter Box Number CD #1 (97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 0.8955 6'B
Probe Length 6' ft.
Probe Liner Material Stainless
Probe Heater Setting Van Lost
Ambient Temperature 45°F
Barometric Pressure (P_b) 26.28 mm (in.)Hg
Assumed Moisture 28.0%
Static Pressure (P_s) -0.02 mm (in.)H_2O
C Factor –
Reference ΔP 0.7200 mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number 1/2A-2
Nozzle Diameter ____ mm (in.)
Thermometer Number 6 B dig.
Final Leak Rate ____ m^3/min (cfm)
Vacuum During Leak Check ____ mm (in.) Hg
Filter Number W/SPES = 0.7709 g tot.
Remarks

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) m^3(ft^3)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
Pt No. E-W													
21	3.0	1630	4.1	176	0.05	0.2236	1.97	2862.44	237	49	56	55	243
22	"	1636	4.1	175	0.05	0.2236	1.98	2864.46	230	53	56	55	238
23	"	1642	3.4	175	0.04	0.2000	1.58	2866.25	228	54	56	56	232
24	"	1648	3.5	175	0.04	0.2000	1.58	2868.011	254	55	56	56	244
TOTAL =	72.0			4155		5.2868	46.35	47.496			2639		
AVG. =	3.0			173.1		0.2203	1.931	0.6597 ACFM			55.0		
				PC = 653.1		Pc = 76.282		53.006			CT = 515		

EPA Method 5.

LABORATORY DATA

Company Western Sugar, Billings. Run No. #3 Compliance

Sampling Loaction East Pulp Drier. Date 12/9-88

~~North~~ ~~South~~ North

MOISTURE COLLECTED

		GM/ML	Water Weight/Volume Gain GM/ML
IMPINGER 1	Final Weight/Volume	779.1	
	Initial Weight/Vol.		
	Increase	569.4	+209.7
IMPINGER 2	Final Weight/Volume	745.5	
	Initial Weight/Vol.		
	Increase	587.4	+158.1
IMPINGER 3	Final Weight/Volume	494.8	
	Initial Weight/Vol.		
	Increase	454.9	+39.9
IMPINGER 4	Final Weight/Volume	694.4	
	Initial Weight/Vol.		
	Increase	679.3	+15.1

PARTICULATE COLLECTED

+422.8g total

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1) Filter & Particulates 0.8789
(2) Filter Tare Weight 0.7680 WSP-6
(3) Net Dry Particulates (1-2) 0.1109 = 110.9 mg.
(4) Particulates Caught in Nozzle, Probe & Glassware 22.2 mg
(5) Total Front Catch (3 & 4) 133.1 mg

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1) Particulate caught in impingers evaporated down at less than 120° F. 12.0 mg.

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

145.1 mg.

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801 566-4023

12/9-88 Western Sugar.

ORSAT ANALYSIS

#3 North. (Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#2 Boiler Stack -	+85.7	10.9	3.4	<0.1
Bulk Pulp Dryer.	85.6	11.0	3.4	<0.1
Billings, Mont.	+85.7	10.9	3.4	<0.1
AVERAGE	85.67	10.97	3.4	<0.1

I - Pretest leak checks

A - Pitots B - Meter System

A = VOK Fin. = 2678.310

B = VOK Sto = 2678.302

0.010 VOK at 23" Hg VBB

#1 South

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EPA Method 5.

PARTICULATE FIELD DATA FORM

II - Post-test leak checks

A - Pitots B - Meter System

A = VOK Fin. = 2726.022

B = VOK Sto = 2726.011

0.011 VOK at 23" Hg

Field Gas Gas Anal.

Plant Western Sugar Co.
City Billings, Mont.
Location East Drier - South
Operator VBB - JPB - SAS
Date 12/8-88
Run Number #1 Compliance
Stack Diam, mm(in.) 83.5" dia = 38.028 ft²
Sample Box Number CO #1A
Meter Box Number CC #1 (97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 6'B = .8955
Probe Length 6' Eff.
Probe Liner Material Stainless
Probe Heater Setting Var. Cont.
Ambient Temperature 30F Start
Barometric Pressure (P_b) 26.33 mm (in.)Hg
Assumed Moisture 29.0%
Static Pressure (P_s) +0.02 mm (in.)H_2O
C Factor —
Reference ΔP 0.705 mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number 1/2A
Nozzle Diameter 0.492 mm (in.)
Thermometer Number B-36' dig.
Final Leak Rate ___ m³/min (cfm)
Vacuum During Leak Check ___ mm (in.) Hg
Filter Number WSP#1 = 0.8559 Two.
Remarks

CO = <0.1
CO_2 = 3.5%
O_2 = 12.0%
N_2 = 84.5%

Traverse Point Number	Starting = Sampling Time, 1530 (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Starting = Gas Sample Volume(V_m) = 2678.480 m^3(ft^3)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	3.1 (ea)	1533	4.5	158	0.08	0.2828	3.05	2680.87	265	36	41	41	253
2		1536	4.8	163	0.08	0.2828	3.02	683.26	257	34	42	41	263
3		1539	4.6	166	0.07	0.2636	2.64	685.61	254	34	42	41	265
4		1542	4.6	167	0.07	0.2636	2.64	687.80	263	36	42	42	268
5		1546	4.6	168	0.07	0.2636	2.63	690.10	264	36	44	42	261
6		1549	4.7	173	0.07	0.2636	2.61	692.29	254	35	43	41	249
7		1552	4.2	167	0.06	0.2450	2.26	694.39	244	40	43	42	256
8		1555	4.1	166	0.06	0.2450	2.26	696.41	246	41	43	42	253
9		1558	2.0	160	0.03	0.1732	1.15	697.79	243	41	44	42	267
10		1601	2.8	161	0.03	0.1732	1.14	699.26	237	40	44	42	264
11		1604	3.0	161	0.03	0.1732	1.14	2700.78	240	39	44	42	271
12		1607	3.3	161	0.04	0.2000	1.53	2702.638	245	39	44	43	258
13		1618	3.0	163	0.03	0.1732	1.14	704.22	265	36	44	43	263
14		1621	3.0	164	0.03	0.1732	1.14	705.28	253	36	44	43	261
15		1624	3.1	163	0.03	0.1732	1.14	707.36	267	37	44	43	260
16		1627	3.4	162	0.04	0.2000	1.52	709.05	263	36	44	43	272
17		1630	3.3	162	0.04	0.2000	1.52	710.75	261	36	44	43	271
18		1633	4.0	160	0.05	0.2236	1.91	712.71	260	36	44	43	266
19		1636	4.9	158	0.06	0.2450	2.30	714.84	254	37	44	43	259
20		1639	5.0	159	0.06	0.2450	2.30	2716.98	257	37	44	43	262

Port No

N.S.

E.W

American Analytical & Environmental Laboratory, Inc.

PARTICULATE FIELD DATA FORM

Plant: Western Sugar Co.
City: Billings, Mont.
Location: Lockwood - South
Operator: [illegible]
Date: 12/8-88
Run Number: #1 Compliance.
Stack Diam, mm(in.): 83.5" dia. = 38.028 ft²
Sample Box Number: CB#1A.
Meter Box Number: CB#1 (97)
Meter ΔH@: 2.107

Meter Calibration (Y): 1.116
Pitot Tube (C_p): 6'B = 0.8955
Probe Length: 6' Elb.
Probe Liner Material: Stainless.
Probe Heater Setting: Var. Cont.
Ambient Temperature: 32°F Fair.
Barometric Pressure (P_b): 26.33 mm (in.)Hg
Assumed Moisture: 34.0%
Static Pressure (P_s): +.002 mm (in.)H_2O
C Factor: –
Reference ΔP: 0.705 mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number: 1/2A.
Nozzle Diameter: 0.492 mm (in.)
Thermometer Number: 6'Bdig.
Final Leak Rate: m³/min (cfm)
Vacuum During Leak Check: mm (in.) Hg
Filter Number: WSP#1 = 0.8559 Tot.
Remarks:

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) $m^3(ft^3)$	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
21	3.0	1642	5.2	160	0.06	0.2450	2.24	719.26	267	35	44	43	243
22	"	1645	5.4	161.0	0.07	0.2646	2.67	721.46	263	37	44	43	254
23	"	1648	5.4	161	0.07	0.2646	2.67	723.75	265	39	44	43	263
24	"	1651	5.2	161	0.06	0.2450	2.29	2725.810	261	40	44	43	260
Total =	72.0	-		3907		5.480	48.96	47.330			2061		
Avg. =	3.0			162.7		0.2284	2.04	0.6574			42.9		

Port no. 2.W

°R = 622.7 θ = 26.332 ΔΘ = 57.820 °R = 502.9

EPA Method 5

LABORATORY DATA

Company Western Sugar Billings. **Run No.** Compliance #1 VOC.

Sampling Loaction East Pulp Dryer (South). **Date** 12/8-88

MOISTURE COLLECTED

		GM/ML	Water Weight/Volume Gain GM/ML
IMPINGER 1	Final Weight/Volume	758.4	
	Initial Weight/Vol.	~~570.4~~	
	Increase	570.4	+188.0
IMPINGER 2	Final Weight/Volume	730.2	
	Initial Weight/Vol.		
	Increase	582.5	+147.7
IMPINGER 3	Final Weight/Volume	500.9	
	Initial Weight/Vol.		
	Increase	455.0	+45.8
IMPINGER 4	Final Weight/Volume	727.9	
	Initial Weight/Vol.		
	Increase	711.3	+16.6

PARTICULATE COLLECTED +398.1 g total.

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1)	Filter & Particulates	0.8986
(2)	Filter Tare Weight	0.8559 WSV-2
(3)	Net Dry Particulates (1-2)	0.0427 = 42.7 mg.
(4)	Particulates Caught in Nozzle, Probe & Glassware	14.3
(5)	Total Front Catch (3 & 4)	57.0 mg.

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1)	Particulate caught in impingers evaporated down at less than 120° F.	23.0 mg.

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

80.0 mg.

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ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO.	DESCRIPTION	VOLUME PERCENT - DRY			
		NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#1	North Dryer Stack	85.0	11.4	3.6	<0.1
	East Bank at Western	85.0	11.5	3.5	<0.1
	Sugar - Billings, Mont	85.0	11.4	3.6	<0.1
	AVERAGE	85.0	11.43	3.57	<0.1

I - Initial leak check

II - Post test leak checks

A - Pitot B - Meter System

A: ✓ Fm: 2773.369
B: ✓ Sf: 2773.360
0.009 Vac. at 10" Hg

American Analytical & Environmental Laboratory, Inc

EPA Method 5 Only

PARTICULATE FIELD DATA FORM

A - Pitot B - Meter System

A: ✓ Fm: 2819.627
B: ✓ Sf: 2819.620
0.007 Vac. at 22" Hg, 25" Hg

Plant: Western Sugar Co.
City: Billings, Montana
Location: Sulphur Burner Stack
Operator: TOD-JTB-BHB
Date: 12/9/88
Run Number: #2 Compl.
Stack Diam, mm(in.): 83.5" ID = 38.078 ft²
Sample Box Number: EPA #1A
Meter Box Number: EPA #1(47)
Meter ΔH@: 2.107

Meter Calibration (Y): 1.116
Pitot Tube (C_p): 0.8455 6' B
Probe Length: 6 ft.
Probe Liner Material: Stainless
Probe Heater Setting: 32°F Stack Var.
Ambient Temperature: 45°F Stack
Barometric Pressure (P_b): 26.33 mm (in.)Hg
Assumed Moisture: 28.0%
Static Pressure (P_s): -0.02 mm (in.)H_2O
C Factor:
Reference ΔP: 0.7200 mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number: 1/2 A2 Starting Field
Nozzle Diameter: 0.492 mm (in.) Dino Int.
Thermometer Number: G Bdg.
Final Leak Rate: m³/min (cfm)
Vacuum During Leak Check: mm (in.) Hg
Filter Number: WSP #B - 0.7800 g Int.
Remarks:

CO < 0.1%
CO_2 = 3.0%
O_2 = 12.0%
N_2 = 85.0%

Traverse Point Number	Sampling Time, (θ) Min.	Starting Clock Time 1030 (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Starting Gas Sample Volume(V_m) = 2773.814 m^3(ft^3)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
1	3.0	1033	2.8	163	0.04	0.2000	1.59	2775.62	265	47	51	50	253
2		1036	3.0	165	0.04	0.2000	1.59	2777.43	260	46	51	50	251
3		1039	3.7	168	0.05	0.2236	1.99	2779.42	240	41	52	50	247
4		1042	3.8	170	0.05	0.2236	1.99	2781.46	236	42	52	50	242
5		1045	4.4	173	0.06	0.2450	2.36	2783.62	239	41	52	50	251
6		1048	3.8	171	0.05	0.2236	1.99	2785.63	240	41	53	51	253
7		1051	4.5	174	0.06	0.2450	2.36	2789.99	232	41	52	51	248
8		1054	3.4	172	0.04	0.2000	1.59	2789.63	230	41	52	52	245
9		1057	3.7	172	0.04	0.2000	1.58	2791.41	248	43	53	52	258
10		1100	2.8	170	0.03	0.1732	1.19	2792.99	249	45	53	52	241
11		1103	3.2	170	0.04	0.2000	1.59	2794.77	241	47	54	52	232
12		1106	3.5	165	0.04	0.2000	1.59	2796.519	245	48	54	52	252
13		1126	2.9	167	0.03	0.1732	1.20	2798.17	227	44	57	55	231
14		1132	3.5	166	0.04	0.2000	1.60	2800.01	251	41	57	55	242
15		1138	3.9	171	0.04	0.2000	1.59	2801.92	254	41	57	55	247
16		1144	3.0	173	0.03	0.1732	1.19	2803.55	264	41	57	56	270
17		1150	3.7	172	0.04	0.2000	1.59	2805.33	261	42	58	51	265
18		1156	3.4	170	0.04	0.2000	1.60	2807.23	264	42	59	56	261
19		1202	4.7	171	0.05	0.2236	2.00	2809.30	260	42	59	56	255
20		1208	4.6	173	0.05	0.2236	1.99	2811.41	238	45	59	57	248

#2 South

American Analytical & Environmental Laboratory, Inc.

EPA Method 5 only

PARTICULATE FIELD DATA FORM

Plant: Western Sugar Co.
City: Billings, Mont.
Location: East Dryer Stack
Operator: Mark Tilo & S.
Date: 12/9-88
Run Number: #2 Comp.
Stack Diam, mm(in.): 83.5" I.D. = 38.025 ft²
Sample Box Number: #1A
Meter Box Number: #1(47)
Meter ΔH@: 2.00"

Meter Calibration (Y): 1.116
Pitot Tube (C_p): 0.8955-6'B
Probe Length: 6' SS
Probe Liner Material: Stainless
Probe Heater Setting: Ign. Cont.
Ambient Temperature: 45°F Stat.
Barometric Pressure (P_b): 26.33 mm (in.)Hg
Assumed Moisture: 28.0%
Static Pressure (P_s): +0.02 mm (in.)H_2O
C Factor: –
Reference ΔP: 0.7200 mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number: 1/2 A-2
Nozzle Diameter: 0.497 mm (in.)
Thermometer Number: 6615 dial
Final Leak Rate: ___ m³/min (cfm)
Vacuum During Leak Check: ___ mm (in.) Hg
Filter Number: 1115 PFE-0.7088 g Tur.
Remarks:

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter (ΔH) (in)H_2O	Gas Sample Volume (V_m) $m^3(ft^3)$	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
21	3.0 (Ex)	1214	5.2	171	0.06	0.2450	2.40	2813.66	238	47	59	57	250
22	"	1220	5.1	172	0.06	0.2450	2.39	2815.92	238	49	59	58	238
23	"	1226	3.5	172	0.04	0.2000	1.60	2817.70	239	51	60	58	239
24	"	1232	3.6	171	0.04	0.2000	1.60	2819.495	243	52	60	58	259
Totals	72.0			170.5		5.0176	42.12	45.681			76	57	
Avg.	3.0			170.2		0.2091	1.755	0.6345 ft³/min			54.5		

°R = 630.2 P_s = 26.332 acfm = 50.880 °K = 514.5

Sol 7/20
E.W.

EPA Method 5

LABORATORY DATA

Company Western Sugar Billings Run No. #2 Compliance.

Sampling Location East Pulp Dryer Date 12/9-88.

~~North~~ South

MOISTURE COLLECTED

		GM/ML	Water Weight/Volume Gain GM/ML
IMPINGER 1	Final Weight/Volume	779.6	
	Initial Weight/Vol.		
	Increase	567.8	+211.8
IMPINGER 2	Final Weight/Volume	754.2	
	Initial Weight/Vol.		
	Increase	585.9	+168.3
IMPINGER 3	Final Weight/Volume	487.6	
	Initial Weight/Vol.		
	Increase	454.6	+33.0
IMPINGER 4	Final Weight/Volume	701.2	
	Initial Weight/Vol.		
	Increase	686.3	+14.9

PARTICULATE COLLECTED 428.0g total.

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1)	Filter & Particulates	0.8589
(2)	Filter Tare Weight	0.7727. WSP-4
(3)	Net Dry Particulates (1-2)	0.0862 = 86.2 mg
(4)	Particulates Caught in Nozzle, Probe & Glassware	26.3 mg
(5)	Total Front Catch (3 & 4)	112.5 mg.

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1)	Particulate caught in impingers evaporated down at less than 120° F.	27.0 mg.

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

139.5 mg.

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#25.

Western Sugar.
Billings, Mont.
East Dryer Bank.

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO. DESCRIPTION	VOLUME PERCENT - DRY			
	NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#2 S Compl.	86.7	2.6	10.7	<0.1
12/9-88.	86.6	2.6	10.8	<0.1
	86.9	2.5	10.6	<0.1
AVERAGE	86.73	2.57	10.7	<0.1
		CO_2	O_2	

II- Pre-test leak system.

A- Pitot. B- Meter System.
A = Ok Fin. = 2868.647
B = Ok Ini. = 2868.635
0.012

(#3 South)

American Analytical & Environmental Laboratory, Inc.

Method 5 Only

PARTICULATE FIELD DATA FORM

II- Post-test Meter leak check.

A- Pitot. B- Meter System
A = Ok Fin. = 2913.961
B = Ok Ini. = 2913.951
22" Hg. 0.010

Plant: Western Sugar Co.
City: Billings Mont.
Location: East Wing South
Operator: JBB-JMB-JHB.
Date: 12/9-88
Run Number: #3 Compliance.
Stack Diam, mm(in): 83.5" Dia = 38.025 M²
Sample Box Number: CP #1 A
Meter Box Number: CP #1 (97)
Meter ΔH@: 2.107

Meter Calibration (Y): 1.116
Pitot Tube (C_p): 16 B = 0.8455
Probe Length: 6' 8"
Probe Liner Material: Stainless.
Probe Heater Setting: Max. Cont.
Ambient Temperature: 41°F Start.
Barometric Pressure (P_b): 26.72 mm (in.)Hg
Assumed Moisture: 0.0280
Static Pressure (P_s): ±0.02 mm (in.)H_2O
C Factor:
Reference ΔP: mm (in.)H_2O

Sheet 1 of 2
Nozzle Identification Number: 1/2 A Field Isp. Lab. anal.
Nozzle Diameter: mm (in.)
Thermometer Number: 63 B
Final Leak Rate: m³/min (cfm)
Vacuum During Leak Check: mm (in.) Hg
Filter Number: WSD #3 = 0.9680 Tare 0.9709
Remarks:

CO = <0.1%
CO_2 = 3.5%
O_2 = 12.0%
N_2 = 84.5%

Traverse Point Number	Sampling Time, (θ) Min.	Starting Clock Time (24hr) = 1800	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter (ΔH) (in)H_2O	Starting Gas Sample Volume (V_m) = 2868.448 m³(ft³)	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
Pot. 1	3.0	1800	3.1	166	0.04	0.2000	1.59	2870.71	259	53	50	49	258
2		1802	3.1	167	0.04	0.2000	1.59	2872.58	260	52	50	49	264
3		1818	2.7	168	0.03	0.1732	1.19	2874.19	261	44	51	50	259
4		1824	3.2	170	0.04	0.2000	1.58	2876.02	254	44	51	50	253
N.S 5		1830	3.2	171	0.04	0.2000	1.58	2877.96	250	44	51	50	249
6		1836	4.0	173	0.05	0.2236	1.96	2879.93	246	42	51	50	247
7		1842	4.0	171	0.05	0.2236	1.97	2881.81	238	43	51	50	236
8		1848	4.8	170	0.06	0.2450	2.37	2884.00	241	42	51	50	252
9		1854	4.1	170	0.05	0.2236	1.97	2886.05	262	41	51	50	268
10		1900	3.4	171	0.04	0.2000	1.58	2887.81	266	41	51	50	269
11		1906	2.1	172	0.03	0.1732	1.18	2889.24	266	41	51	50	262
12		1912	3.2	170	0.04	0.2000	1.58	2890.941	242	40	51	50	257
13		1918	3.1	171	0.04	0.2000	1.54	2892.81	232	40	51	50	240
14		1924	3.4	173	0.04	0.2000	1.57	2894.63	235	41	51	50	242
15		1930	3.5	174	0.04	0.2000	1.57	2896.48	226	42	52	50	237
16		1936	4.1	171	0.05	0.2236	1.97	2898.43	241	43	52	50	252
S.W. 17		1942	4.2	170	0.05	0.2236	1.98	2900.42	268	42	52	50	264
18		1948	5.6	169	0.06	0.2450	2.38	2902.61	266	44	52	51	268
19		1954	5.8	171	0.06	0.2450	2.37	2904.83	241	44	52	51	255
20		2000	4.2	171	0.05	0.2236	1.97	2906.82	258	46	52	51	244

American Analytical & Environmental Laboratory, Inc.

Method 5 Only.

PARTICULATE FIELD DATA FORM

Plant Western Sugar Co.
City Billings, Mont
Location East Stack Scott
Operator [illegible]
Date 12/9-88
Run Number #3 Compliance
Stack Diam, mm(in.) 825 IA = 38.028 ft²
Sample Box Number CR#1A
Meter Box Number CR#1(97)
Meter ΔH@ 2.107

Meter Calibration (Y) 1.116
Pitot Tube (C_p) 0.8955-6'B
Probe Length 6' 7ft.
Probe Liner Material Stainless
Probe Heater Setting Var. Cont.
Ambient Temperature 46°F Stack
Barometric Pressure (P_b) 26.22 mm (in.)Hg
Assumed Moisture 28.0%
Static Pressure (P_s) 10.02 mm (in.)H_2O
C Factor –
Reference ΔP 0.7200 mm (in.)H_2O

Sheet 2 of 2
Nozzle Identification Number 1A
Nozzle Diameter ____ mm (in.)
Thermometer Number Cg Bdg
Final Leak Rate ____ m³/min (cfm)
Vacuum During Leak Check ____ mm (in.) Hg
Filter Number AS P73 = Tube 9
Remarks 0.77091.

Port A (C-W)

Traverse Point Number	Sampling Time, (θ) Min.	Clock Time (24hr)	Vacuum (in)Hg	Stack Temp. (T) °C(°F)	Velocity Head (ΔP_s) (in)H_2O	$\sqrt{\Delta P_s}$	Pressure Differential Across Orifice Meter(ΔH) (in)H_2O	Gas Sample Volume(V_m) $m^3(ft^3)$	Temperature of Gases Leaving Probe (°F)	Temperature of Gases at Impingers Outlet °C(°F)	Temperature of Gases Leaving Meter °C(°F) IN	OUT	Filter Temperature °C(°F)
21	2.0	2006	3.1	173	0.04	0.2000	1.57	2908.83	234	47	52	51	241
22	"	2012	2.8	172	0.03	0.1732	1.18	2910.00	240	42	52	51	250
23	"	2018	4.1	171	0.04	0.2000	1.58	2911.74	243	41	52	51	251
24	"	2024	4.0	170	0.04	0.2000	1.58	2913.535	255	41	52	51	266
Totals	72.0			170.8		4.9962	41.03	44.689			24.37		
Avg	3.0			170.8		0.2082	1.724	0.6209 Acfm			51.8		
				630.8°R		26.222		49871			°R = 510.8		

EPA Method 5.

LABORATORY DATA

Company Western Sugar Billings Run No. #3 Compliance

Sampling Location East Pulp Dryer Date 12/9-88.

~~North~~ South MOISTURE COLLECTED

		GM/ML	Water Weight/~~Volume~~ Gain GM/ML
IMPINGER 1	Final Weight/Volume	762.0	
	Initial Weight/Vol.	575.3	+186.7
	Increase		
IMPINGER 2	Final Weight/Volume	773.8	
	Initial Weight/Vol.	590.3	+183.5
	Increase		
IMPINGER 3	Final Weight/Volume	486.8	
	Initial Weight/Vol.	455.0	+31.8
	Increase		
IMPINGER 4	Final Weight/Volume	655.2	
	Initial Weight/Vol.	643.6	+11.6
	Increase		

PARTICULATE COLLECTED +413.6g total

FRONT-HALF ANALYSIS (Nozzle, Probe, Filter and Hot Box Glassware)

(1)	Filter & Particulates	0.8062
(2)	Filter Tare Weight	0.7709g. WSP-5
(3)	Net Dry Particulates (1-2)	0.0353 = 35.3mg.
(4)	Particulates Caught in Nozzle, Probe & Glassware	15.9mg.
(5)	Total Front Catch (3 & 4)	51.2mg.

BACK-HALF ANALYSIS (Impingers, Connecting Glassware)

(1)	Particulate caught in impingers evaporated down at less than 120° F.	29.0mg.

TOTAL PARTICULATE CATCH (Sum of Front and Back-Half Catches)

80.2mg.

American Analytical
&
Environmental Laboratory, Inc.
8739 South 300 West
Sandy, Utah 84070
801 566-4023

Western Sugar Company
Billings, Montana.

ORSAT ANALYSIS

(Ave. of 3 Analyses Each)

TEST NO.	DESCRIPTION	VOLUME PERCENT - DRY			
		NITROGEN	OXYGEN	CARBON DIOXIDE	CARBON MONOXIDE
#3 Compliance		86.7	10.8	2.5	<0.1
South Exhaust Stack.		86.7	10.8	2.5	<0.1
Back Bankol Dryer.		86.6	10.8	2.6	<0.1
AVERAGE		86.63	10.8	2.57	<0.1

Chain of Custody: Billings - Boiler Inlet.

Plant Western Sugar

Date Sampled 12/6-7-88 Test Number SO_2 + Part Compl.

Run Number 1, 2 + 3

Sample Recovery Container Code

1) 17825 Run #3 H_2O_2 2) 17832 Run #3 ISO

2) 17834 Run #2 H_2O_2

3) 17865 Run #1 H_2O_2

4) 17827 Run #2 ISO

5) 17865 Run #1 ISO

Person engaged in sample recovery

Signature & Title Scott A Staley / Paul Benson: Tech

Location at which recovery was done Billings, Mont lab trailer, Western Sugar

Date and time of recovery 12/6,7-88

Sample(s) recipient, upon recovery if not recovery person

Signature & Title Same

Date and time of receipt 12/6,7-88

Sample storage Spanish Fork Ut. - lab office

Laboratory person receiving sample

Signature & Title Same

Date and time of receipt —

Sample storage —

ANALYSIS

Container Code	Method of analysis	Date & time	Signature
#3 1 → 6	Barium Thorin Titration	12-8-88 / 1000hr	PBenson

Chain of Custody: Billings - Boiler Exhaust.

Plant Western Sugar

Date Sampled 12/6-88

Test Number SO_2 & Part.

Run Number #1, 2 & 3

Sample Recovery Container Code

1) 17824 Run #1 H_2O_2
2) 17826 Run #2 H_2O_2
3) 17867 Run #3 H_2O_2
4) 17823 Run #1 ISO
5) 17836 Run #2 ISO
6) 17861 Run #3 ISO
7) 1789 Run #2 Acetone Wash
8) 1790 Run #1 " "
9) 1791 Run #3 " "

Person engaged in sample recovery

Signature & Title Scott A Staley, J Paul Benson: Tech

Location at which recovery was done Billings, Mont lab trailer, Western Sugar

Date and time of recovery 12/6, 7-88

Sample(s) recipient, upon recovery if not recovery person

Signature & Title same

Date and time of receipt 12/6 & 7-88

Sample storage Spanish Fork, Ut - lab office

Laboratory person receiving sample

Signature & Title same

Date and time of receipt —

Sample storage —

ANALYSIS

Container Code	Method of analysis	Date & time	Signature
#5 1 → 6	Barium, Thorin: Titration	12/9-88, 1000 hrs	[illegible]
#5 7 → 9	Gravimetric	12/9-88, 1000 hrs	[illegible]

Acetone Washes - Billings, Montana (Western Sugar) and back-half:

I. Boiler Stack (Particulate Only on Exhaust Stack)

A. Acetone Blank (300 mls)

Final Wt.	93.4222
Twt.	93.4219
	0.0003 g/300 mls = 0.9 mg/l

B. Exhaust Stack

Vol. = 300 mls	Run #1	Run #2	Run #3
Final Wt. =	96.6572	110.1401	107.0739
Twt.	96.6247	110.1148	107.0470
Net.	0.0325	0.0353	0.0269
Mg	32.5	35.3	26.9
- blank	0.3	0.3	0.3
	32.2	35.0	26.6

C. Inlet Duct

SO_2 only (no back-half of acetone wash) Filters were weighed back, however cyclone materials, probe rinse and filter holder rinses were added to the isopropanol impinger for SO_3 and H_2SO_4 Titration.

D. Back 1/2 (100 mls) from 1 liter (exhaust stack)

	Run #1	Run #2	Run #3
Final Wt. =	109.1423	112.0847	94.2985
Twt.	109.1416	112.0838	94.2975
Net.	0.0007	0.0009	0.0010
Mg	0.7	0.9	1.0
(dif (f) X 10	7.0	9.0	10.0

Acetone washes and back half weights for Western Sugars Beet Plup Dryers
Billings, Montana - East bank of Dryers:

I. Acetone Blank:

Same as on boiler (0.9 mg/l) = 0.3 mg/300 mls.
All samples were adjusted to 300 mls. before evaporation.

II. North Stack

a) Acetone		Run #1	Run #2	Run #3
Final Wt.	=	96.6797	110.1657	107.1005
Twt.		96.6572	110.1401	107.0739
Net.		0.0225	0.0256	0.0266
- blank		0.0003	0.0003	0.0003
Mg total		22.2	25.3	26.3

b) Back 1/2				
Final Wt.	=	102.9436	98.2378	121.4162
Twt.		102.9424	98.2361	121.4150
Net.		0.0012	0.0017	0.0012
X 10 = Mg total		12.0	17.0	12.0

III. South Stack

a) Acetone		Run #1	Run #2	Run #3
Final Wt.	=	96.6959	110.1923	107.1151
Twt.		96.6797	110.1657	107.1005
Net.		0.0162	0.0266	0.0146
- blank		0.0003	0.0003	0.0003
Mg total		1.59	26.3	14.3

b) Back 1/2				
Final Wt.	=	113.7554	100.3398	98.4214
Twt.		113.7531	100.3371	98.4185
Net.		0.0023	0.0027	0.0029
X 10 = Mg total		23.0	27.0	29.0

SAMPLE RECOVERY AND INTEGRITY DATA

Plant Western Sugar Sample location Boiler Inlet

Field Data Checks Paul Taylor & John Talcott

Sample recovery personnel [illegible] - Scott Staley - Paul Brown

Person with direct responsibility for recovered samples _____

Sample number	Sample identification number		Date of recovery	Liquid level marked		Stored in locked container	
	H_2SO_4	SO_2		H_2O	H_2O_2	H_2O	H_2O_2
1 H_2O	WSB-BI #1	WSB-BI #1	12/7-8-88	✓	✓	✓	✓
2 H_2O	WSB-BI #2	WSB-BI #2	"	✓	✓	✓	✓
3 H_2O	WSB-BI #3	WSB-BI #3	"	✓	✓	✓	✓
Blanks	80% H_2O	3.0% H_2O_2	"	✓	✓	✓	✓

Remarks Ran all H_2O to 500 mls. w/filter addition

Signature of field sample trustee [illegible] 12/8-88

Laboratory Data Checks

Lab person with direct responsibility for recovered samples [illegible]

Date recovered samples received 12/8-88

Analyst [illegible]

Sample number	Sample identification number		Date of analysis	Liquid at marked level		Sample identified	
	H_2SO_4	SO_2		H_2O	H_2O_2	H_2O	H_2O_2
1 H_2O	WSB-BI #1	WSB-BI #1	12/9-88	"	"	"	"
2 H_2O	WSB-BI #2	WSB-BI #2	"	"	"	"	"
3 H_2O	WSB-BI #3	WSB-BI #3	"	"	"	"	"
Blanks	80% H_2O	3% H_2O_2	"	"	"	"	"

Remarks

Signature of lab sample trustee [illegible] 12/9-88 (12/10 - 2nd one on bottle)

METHOD 8 ANALYTICAL DATA FORM

Plant Western Sugar-Billings Date 12/9-88

Sample location Boiler Inlet Analyst V. B. Benson

Volume and normality of barium perchlorate

1. 12.0 ml $Ba(ClO_4)_2$
2. 12.1 ml $Ba(ClO_4)_2$ N = 0.008299

Blank 0 ml $Ba(ClO_4)_2$

I-SO3 Needs (f) of 2
*dil to 500 mls.

Sulfur Trioxide Analysis

		Run 1	Run 2	Run 3
V_{soln} - Total volume of solution in which the sulfuric acid sample is contained, ml		500	500	500
V_a - Volume of sample aliquot, ml		100	100	100
V_t - Volume of barium perchlorate titrant used for sample, ml	1st titration	0	0	0
	2nd titration	0	0	0
	Average	–	–	–
V_{tb}* - Volume of barium perchlorate titrant used for blank, ml	1st titration	0		
	2nd titration	0		
	Average	0		

$\frac{\text{1st titration}}{\text{2nd titration}}$ = 0.99 to 1.01 or |1st titration - 2nd titration| ≤ 0.2 ml

Sulfur Dioxide Analysis

II-SO2

		Run 1	Run 2	Run 3
V_{soln} - Total volume of solution in which the sulfur dioxide sample is contained, ml		1000	1000	1000
V_a - Volume of sample aliquot, ml		10	10	10
V_t - Volume of barium perchlorate titrant used for sample, ml	1st titration	9.8	8.1	9.3
	2nd titration	9.6	8.2	9.4
	Average	9.7	8.12	9.35
V_{tb}* - Volume of barium perchlorate titrant used for blank, ml	1st titration	0		
	2nd titration	0		
	Average	0		

$\frac{\text{1st titration}}{\text{2nd titration}}$ = 0.99 to 1.01 or |1st titration - 2nd titration| ≤ 0.2 ml

Signature of analyst V. B. Benson 12/9+10-88

Signature of reviewer or supervisor —

* Volume of blank and sample titrated should be the same; otherwise a volume correction must be made.

Sulfur Dioxide Calculation Form
(English units)

Sample Volume

used $V_{m(std)}$ data from Method 5 tests.

V_m = _ _._ _ _ ft^3, T_m = _ _ _._ ^oR, P_{bar} = _ _._ _ in. Hg

Y = _._ _ _, ΔH = _._ _ in. H_2O

Equation 6-1

$$V_{m_{std}} = 17.64\ V_m\ Y\left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right] = \_\_.\_\_\ ft^3$$

#1 = 25.959
#2 = 23.944
#3 = 24.518

Sulfuric Acid Mist (Including SO_3) Concentrations

#1 = 9.7
#2 = 8.12
#3 = 9.35

N = .0083 g-eg/ℓ, V_t = _ _._ _ ml, V_{tb} = _._0_ ml

V_{soln} = 1000.0 ml, V_a = 10.0 ml,

Equation 6-2

$$C_{SO_2} = 7.061 \times 10^{-5}\left[\frac{N(V_t - V_{tb})\ \left(\frac{V_{soln}}{V_a}\right)}{V_{m_{std}}}\right] = \_.\_\_\_ \times 10^{-4}\ lb/dscf$$

#1 = $7.061 \times 10^{-5}\left[\frac{0.0083(9.7-0)\left(\frac{1000}{10}\right)}{25.959}\right] = 2.1899 \times 10^{-5}$

#2 = $7.061 \times 10^{-5}\left[\frac{0.0083(8.12-0)\left(\frac{1000}{10}\right)}{23.944}\right] = 1.9875 \times 10^{-5}$

#3 = $7.061 \times 10^{-5}\left[\frac{(0.0083(9.35-0)\left(\frac{1000}{10}\right)}{24.518}\right] = 2.2350 \times 10^{-5}$

Sample Recovery and Integrity Data

Plant Western Sugar-Bill _ Sample location Boiler Outlet

ata Checks

Sample recovery personnel VBBenson - Paul Benson - Scott Staley

Person with direct responsibility for recovered samples VBBenson.

Sample number	Sample identification number H_2SO_4	Sample identification number SO_2	Date of recovery	Liquid level marked	Stored in locked container
			12/7 + 8-88	Iso H_2O_2	Lab trailer. VBBenson.
1	Iso WSBO #1	H_2O_2 WSB-BO #1	"	✓ ✓	in box.
2	Iso WBBO #2	H_2O_2 WSB-BO #2	"	✓ ✓	"
3	Iso WSBO #3	H_2O_2 WSB-BO #3	"	✓ ✓	"
Blanks	-80% Iso	" 30%	"	"	"

Remarks Rain all Iso to 500 mls.

Signature of field sample trustee VBBenson

Laboratory Data Checks

Lab person with direct responsibility for recovered samples VBBenson

Date recovered samples received - maintained

Analyst VBBenson

Sample number	Sample identification number H_2SO_4	Sample identification number SO_2	Date of analysis	Liquid at marked level	Sample identified
				Iso H_2O_2	iso H_2O_2
1	Iso WSBO #1	H_2O_2 WSB-BO #1	12/9-88	✓ ✓	✓ ✓
2	Iso WSBO #1	H_2O_2 WSB-BO #2	"	✓ ✓	✓ ✓
3	Iso WSB-BO #3	H_2O_2 WSB-BO #2	"	✓ ✓	✓ ✓
Blanks	-80% Iso	30% H_2O_2	"	✓ ✓	✓ ✓

Remarks

Signature of lab sample trustee VBBenson

METHOD 8 ANALYTICAL DATA FORM

Plant Western Sugar - Billings Date 12/9-88

Sample location Boiler Outlet Analyst T.B. Benson

Volume and normality of barium perchlorate
1. 12.0 ml $Ba(ClO_4)_2$
2. 12.1 ml $Ba(ClO_4)_2$ N = 0.008299
Blank 0 ml $Ba(ClO_4)_2$

I Needs (8)2 SO_3 *dilute to 500 mls.

Sulfur Trioxide Analysis

		Run 1	Run 2	Run 3
V_{soln} - Total volume of solution in which the sulfuric acid sample is contained, ml		500	500	500
V_a - Volume of sample aliquot, ml		100	100	100
V_t - Volume of barium perchlorate titrant used for sample, ml	1st titration	0 ~~11.52~~	0	0
	2nd titration	0 ~~11.52~~	0	0
	Average			
V_{tb}* - Volume of barium perchlorate titrant used for blank, ml	1st titration	–		
	2nd titration	–		
	Average	–		

discarded prob. some H_2O_2 leak back on vac. leak check.

$\frac{\text{1st titration}}{\text{2nd titration}}$ = 0.99 to 1.01 or |1st titration - 2nd titration| ≤ 0.2 ml

Sulfur Dioxide Analysis

II - SO_2

		Run 1	Run 2	Run 3
V_{soln} - Total volume of solution in which the sulfur dioxide sample is contained, ml		1000	1000	1000
V_a - Volume of sample aliquot, ml		10	10	10
V_t - Volume of barium perchlorate titrant used for sample, ml	1st titration	7.10	7.3	8.6
	2nd titration	7.10	7.2	8.5
	Average	7.1	7.25	8.55
V_{tb}* - Volume of barium perchlorate titrant used for blank, ml	1st titration	0		
	2nd titration	0		
	Average	0		

$\frac{\text{1st titration}}{\text{2nd titration}}$ = 0.99 to 1.01 or |1st titration - 2nd titration| ≤ 0.2 ml

Signature of analyst T.B. Benson 12/9+10-88

Signature of reviewer or supervisor –

* Volume of blank and sample titrated should be the same; otherwise a volume correction must be made.

Sulfur Dioxide Calculation Form
(English units)

Sample Volume *Used $V_{m(std)}$ data from Method 5.*

V_m = _ _._ _ _ ft^3, T_m = _ _ _._ °R, P_{bar} = _ _._ _ in. Hg

Y = _._ _ _, ΔH = _._ _ in. H_2O

Equation 6-1

$$V_{m_{std}} = 17.64\ V_m\ Y\left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right] = ____\ ft^3$$

#1 = 57.234

#2 = 54.398

#3 = 55.184

Sulfuric Acid Mist (Including SO_3) Concentrations

N = .0083 g-eq/ℓ, V_t = #1: 7.1, #2: 7.25, #3: 8.55 ml, V_{tb} = _.0 ml

V_{soln} = 1000.0 ml, V_a = 10.0 ml,

Equation 6-2

$$C_{SO_2} = 7.061 \times 10^{-5}\left[\frac{N(V_t - V_{tb})\ (\frac{V_{soln}}{V_a})}{V_{m_{std}}}\right] = _.___ \times 10^{-4}\ lb/dscf$$

#1 $7.061\times10^{-5}\left[\frac{0.0083(7.1-0)\left(\frac{1000}{10}\right)}{57.234}\right] = 7.2702\times10^{-6}$ #/dscf.

#2 $7.061\times10^{-5}\left[\frac{0.0083(7.25-0)\left(\frac{1000}{10}\right)}{54.398}\right] = 7.8109\times10^{-6}$ #/dscf.

#3 $7.061\times10^{-5}\left[\frac{0.0083(8.55-0)\left(\frac{1000}{10}\right)}{55.184}\right] = 9.0802\times10^{-6}$ #/dscf.

APPENDIX "C".

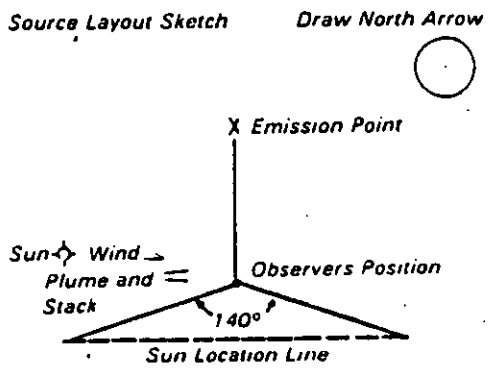
(VEO Data Sheets).

Visible Emission Observation Form

SOURCE NAME		
ADDRESS		
CITY	STATE	ZIP
PHONE	SOURCE ID NUMBER	
PROCESS EQUIPMENT	OPERATING MODE	
CONTROL EQUIPMENT	OPERATING MODE	
DESCRIBE EMISSION POINT START STOP		
HEIGHT ABOVE GROUND LEVEL START STOP	HEIGHT RELATIVE TO OBSERVER START STOP	
DISTANCE FROM OBSERVER START STOP	DIRECTION FROM OBSERVER START STOP	
DESCRIBE EMISSIONS START STOP		
EMISSION COLOR START STOP	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☐ YES ☐	IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START STOP		
DESCRIBE BACKGROUND START STOP		
BACKGROUND COLOR START STOP	SKY CONDITIONS START STOP	
WIND SPEED START STOP	WIND DIRECTION START STOP	
AMBIENT TEMP. START STOP	WET BULB TEMP.	RH.percent

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

Source Layout Sketch *Draw North Arrow*



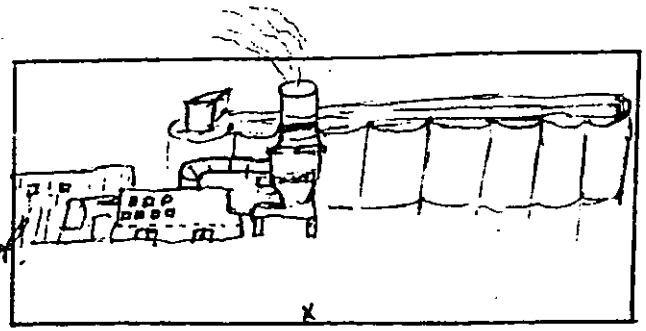
AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT)	
OBSERVER'S SIGNATURE	DATE
ORGANIZATION	
CERTIFIED BY	DATE
VERIFIED BY	DATE

COMMENTS	
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	DATE

American Environmental Testing Company, Inc.

Record of Visual Determination of Opacity

Company Western Sugar
Location Billings Mont.
Test Number Boiler Exhaust (1)
Date 12/8-88
Type Facility Boiler
Control Device Multiclone + Wet Scrubber



Hours of Observation 6 min (Compl.)
Observer [illegible]
Observer Certification Date 11/15-88
Observer Affiliation Am Env Test
Point of Emissions after steam plume
Height of Discharge Point @ 120'

	Initial			Final
CLOCK TIME				
OBSERVER LOCATION Distance to Discharge	300'			
Direction from Discg.	East			
Hgt. of Observ. Pt.	120'			
BACKGROUND DESCRIPTION	Partly Cloudy Sky			
WEATHER CONDITIONS Wind Direction	North East (From)			
Wind Speed	0 → 5 gusts			
Ambient Temperature	26 °F			
SKY CONDITIONS (clear, overcast, %clouds, Et)	Pty Overcast			
PLUME DESCRIPTION Color	White steam plume with gray blue HC			
Distance Visible	No.			
OTHER INFORMATION	[illegible]			

Min. 15 30 45 60

Set Number	Time Start-End				Opacity Sum	Opacity Average
1	15	20	15	15	65	16.25
2	10	10	10	15	45	11.25
3	15	15	15	20	65	16.25
4	20	20	15	15	70	17.5
5	20	20	10	10	60	15.0
6	10	10	10	10	40	10.0
Tot.						
Avg.						14.375

Readings ranged from 10 to 20 %Opacity

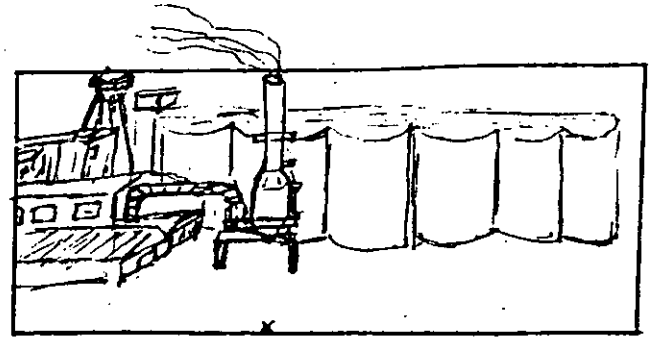
The source was/was not in compliance with ____ at the time evaluation was made.

American Environmental Testing Company, Inc.

Record of Visual Determination of Opacity

Page 1 of 1

Company Western Sugar
Location Billings, Mont.
Test Number Boiler Exhaust (2)
Date 12/8-88
Type Facility Boiler
Control Device Multiclone & Wet Scrub.



Hours of Observation 6 min (Compl)
Observer [illegible]
Observer Certification Date 11/15-88
Observer Affiliation Am. Env. Test.
Point of Emissions after steam plume
Height of Discharge Point @ 120'

	Initial			Final
CLOCK TIME				
OBSERVER LOCATION Distance to Discharge	300'			
Direction from Discg.	East			
Hgt. of Observ. Pt.	120'			
BACKGROUND DESCRIPTION	Partly cloudy Sky			
WEATHER CONDITIONS Wind Direction	North East (From)			
Wind Speed	0 → 5 gusts			
Ambient Temperature	77°F			
SKY CONDITIONS (clear, overcast, %clouds, Et)	Partly overcast			
PLUME DESCRIPTION Color	White Steam with blue grey HC trail			
Distance Visible	N/A			
OTHER INFORMATION	90% visible [illegible] Hydrocarbon trail			

min 15 30 45 60

Set Number	Time Start-End				Opacity Sum	Opacity Average
1	10	10	15	10	45	11.25
2	10	15	15	15	55	13.75
3	20	20	20	15	75	18.75
4	15	10	10	20	55	13.75
5	25	10	10	20	65	16.25
6	20	10	10	10	50	12.5
Tot.						
Ave.						14.375

Readings ranged from 10 to 25 %Opacity

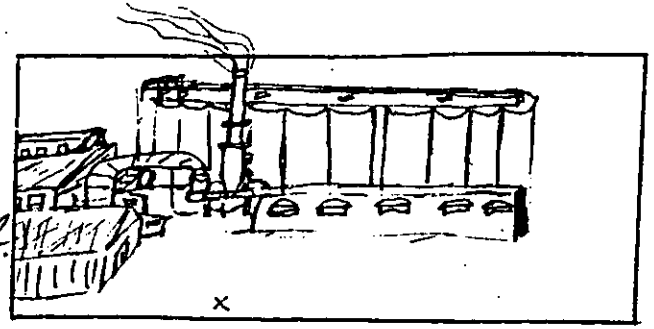
The source was/was not in compliance with ____ at the time evaluation was made.

American Environmental Testing Company, Inc
[illegible] South Birch Drive
Spanish Fork, Utah [illegible]
[illegible]

Record of Visual Determination of Opacity

Page 1 of 1

Company Western Sugar Co
Location Billings, Mont.
Test Number Boiler Exhaust (3)
Date 12/8-88
Type Facility Boiler
Control Device Multiclone + Wet Scrub.



Hours of Observation 6 min (Compl.)
Observer J. Benson
Observer Certification Date 11/15-88
Observer Affiliation Am. Env. Test.
Point of Emissions after plume Stack
Height of Discharge Point @ 120'

	Initial			Final
CLOCK TIME				
OBSERVER LOCATION Distance to Discharge	300'			
Direction from Discg.	East			
Hgt. of Observ. Pt.	120'			
BACKGROUND DESCRIPTION	Partly Cloudy			
WEATHER CONDITIONS Wind Direction	From North East			
Wind Speed	0→5 mph gusts			
Ambient Temperature	27°F			
SKY CONDITIONS (clear, overcast, %clouds, Et)	Partly overcast (Hazy.)			
PLUME DESCRIPTION Color	White steam plume with grey blue H.C.			
Distance Visible	No.			
OTHER INFORMATION	90% [illegible] is [illegible] tail			

Min. 15 30 45 60

Set Number	Time Start-End				Opacity Sum	Opacity Average
1	10	10	10	15	45	11.25
2	20	25	20	20	85	21.25
3	15	25	25	10	75	18.75
4	10	15	15	20	60	15.0
5	25	10	25	20	80	20.0
6	20	15	10	10	55	13.75
Total.						
Ave						16.67

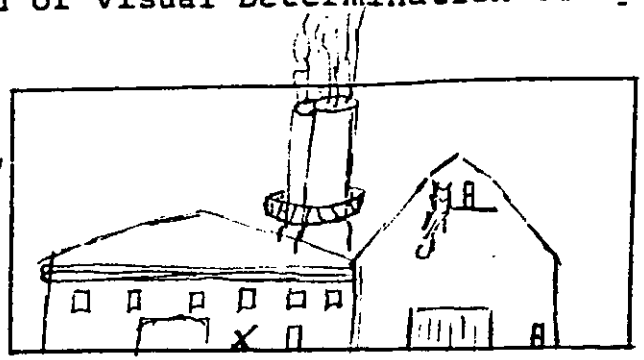
Readings ranged from 10 to 25 %Opacity

The source was/was not in compliance with ____ at the time evaluation was made.

American Environmental Testing Company, Inc.

Record of Visual Determination of Opacity

Company Western Sugar Co.
Location Billings Montana
Test Number Fuller Exhaust Stack #1
Date 12/9-88
Type Facility Beat Dryer
Control Device Wet Scrubber



Hours of Observation 0006
Observer [illegible]
Observer Certification Date 11/15-88
Observer Affiliation Am. Env. Testing
Point of Emissions after steam plume
Height of Discharge Point 75'

	Initial			Final
CLOCK TIME	1600			1606
OBSERVER LOCATION Distance to Discharge	200'ft			
Direction from Discg.	East			
Hgt. of Observ. Pt.	75'			
BACKGROUND DESCRIPTION				
WEATHER CONDITIONS Wind Direction	From North			
Wind Speed	0→5	mph gusts		
Ambient Temperature	22°F			
SKY CONDITIONS (clear, overcast, %clouds, Et)	overcast			
PLUME DESCRIPTION Color	Steam plume (white)			
Distance Visible	NA			
OTHER INFORMATION	[illegible]			

Set Number	Time Start-End	Opacity Sum	Opacity Average
1	0 5 5 5	15	3.75
2	10 5 5 5	25	6.25
3	5 5 5 5	20	5.0
4	5 10 5 5	25	6.25
5	5 5 10 5	25	6.25
6	5 0 0 5	10	2.5
Total			
Ave.			7.5

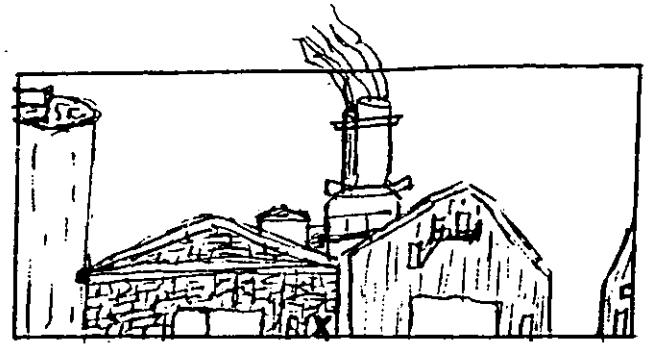
Readings ranged from 0 to 10 %Opacity

The source was/was not in compliance with ____ at the time evaluation was made.

American Environmental Testing Company, Inc.

Record of Visual Determination of Opacity

Company Western Sugar Co.
Location Billings Montana
Test Number Hood Exhaust #2
Date 12/8-86
Type Facility Beet Sugar
Control Device Wet Scrubber



Hours of Observation 08:06
Observer Neal Burton
Observer Certification Date 4/15-86
Observer Affiliation Am Env Testing
Point of Emissions Steam plume
Height of Discharge Point 75'

	Initial			Final
CLOCK TIME	1610			1616
OBSERVER LOCATION Distance to Discharge	200'			
Direction from Discg.	East			
Hgt. of Observ. Pt.	75'			
BACKGROUND DESCRIPTION				
WEATHER CONDITIONS Wind Direction	From North East.			
Wind Speed	0→5	mph.		
Ambient Temperature	29°F			
SKY CONDITIONS (clear, overcast, %clouds, Et)	overcast			
PLUME DESCRIPTION Color	Steam	plume.		
Distance Visible	N/A			
OTHER INFORMATION				

Set Number	Time Start-End				Opacity Sum	Opacity Average
1	5	5	10	5	25	6.25
2	5	5	5	5	20	5.0
3	5	0	0	0	5	1.25
4	0	5	10	10	25	6.25
5	10	5	5	5	25	6.25
6	0	5	5	10	20	5.0
						7.5

Readings ranged from 0 to 10 %Opacity

The source was/was not in compliance with ____ at the time evaluation was made.

American Environmental Testing Company, Inc.

Record of Visual Determination of Opacity

Company Western Sugar Co.
Location Billings, Mont.
Test Number 1st compliance
Date 12/8+9-88
Type Facility Sugar Plant
Control Device Wet scrubber

Hours of Observation 0006
Observer [illegible]
Observer Certification Date 5/31-88
Observer Affiliation Am. Envi. Testing
Point of Emissions stack
Height of Discharge Point 75'

	Initial			Final
CLOCK TIME	1620			1626
OBSERVER LOCATION Distance to Discharge	200'			
Direction from Discg.	East			
Hgt. of Observ. Pt.	75'			
BACKGROUND DESCRIPTION				
WEATHER CONDITIONS Wind Direction	From North East			
Wind Speed	0→5 mph			
Ambient Temperature	22°F			
SKY CONDITIONS (clear, overcast, %clouds, Et)	overcast			
PLUME DESCRIPTION Color	Steam Plume			
Distance Visible	N/A			
OTHER INFORMATION				

Set Number	Time Start-End	Opacity Sum	Opacity Average
1	0 0 5 10	15	3.75
2	5 5 5 5	20	6.0
3	10 10 10 10	40	10.0
4	10 15 10 10	45	11.25
5	0 0 5 5	10	2.5
6	5 5 5 10	25	6.25
Total			
Ave.			6.46

Readings ranged from 0 to 15 %Opacity

The source was/was not in compliance with ____ at the time evaluation was made.

STATE OF UTAH
DIVISION OF ENVIRONMENTAL HEALTH

This certifies that BRENT BENSON

has successfully completed the Visible Emissions Evaluation Course conducted by the Bureau of Air Quality and has met the minimum requirements necessary to evaluate visible emissions.

Director, Bureau of Air Quality

Valid until MAY 31, 1989

STATE OF UTAH
DIVISION OF ENVIRONMENTAL HEALTH

This certifies that J. PAUL BENSON

has successfully completed the Visible Emissions Evaluation Course conducted by the Bureau of Air Quality and has met the minimum requirements necessary to evaluate visible emissions.

Director, Bureau of Air Quality

Valid until MAY 31, 1989

APPENDIX "D".

(Miscellaneous Data).

American Analytical
&
Environmental Laboratory, Inc.
8739 South 300 West
Sandy, Utah 84070
801 566 4023

METHOD 2
CYCLONIC FLOW DETERMINATION DATA FORM

Billings, Mont.

Plant Western Sugar Co. Run No. Pretest

Location Boiler Inlet. Operator [illegible]

Date 12/5-88 Amb. Temp. °F 60°F

Bar. Press. ("Hg) 26.16 Static Press. ("H_2O) -1.80

Pitot Tube (Cp) 0.8512 Stack Dimensions 72" x 144" = 96" Eff Dia. = 72 ft² xs

Port. No. Bot → Top	Traverse point number	Velocity head (Δp_s), in. H_2O	Stack temp., °F	Cyclonic flow determination: Δp_s at 0° reference	Cyclonic flow determination: Angle (α) which yields a null Δp
	1	0.23	396	+0.03	5
1	2	0.50	398	0.02	3
	3	0.45	425	-0.01	1
	4	0.28	425	+0.03	6
2	5	0.36	429	0.01	4
	6	0.40	433	0	0
	7	0.29	440	-0.04	9
3	8	0.24	441	0.02	4
	9	0.30	465	0.02	4
	10	0.48	434	-0.04	5
4	11	0.30	441	0.03	4
	12	0.26	453	0.02	2
	13	0.67	422	+0.06	11
5	14	0.34	436	0.04	7
	15	0.23	451	0.03	2
	16	0.77	455	-0.06	10
6	17	0.38	464	0.04	7
	18	0.24	500	0.03	6
	19	0.80	507	+0.06	9
7	20	0.56	519	0.05	10
	21	0.32	542	0.04	5
	22	0.80	556	0.03	3
8	23	0.65	569	0.03	4
	24	0.48	575	0.02	4
	25	0.74	580	0.04	6
9	26	0.75	586	0.03	2
	27	0.61	592	0.01	1
	Total/Avg.	12.49/0.46	12924/480	Average angle (α)[a]	134/4.96

<20 OK. [illegible]

[a] Average of α must be <20 degrees to be acceptable

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8739 South 300 West
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801 566 4023

METHOD 2
CYCLONIC FLOW DETERMINATION DATA FORM

Billings, Mont.

Plant Western Sugar Co. Run No. Pretest

Location Boiler Exhaust. Operator VBB-JPB-SAS-PT+JT

Date 12/5-88 Amb. Temp. °F 58°F

Bar. Press. ("Hg) 26.16 Static Press. ("H_2O) +0.2

Pitot Tube (Cp) 0.8512-6'A Stack Dimensions 11'5" = 102.4 ft².

Traverse point number	Velocity head (Δp_s), in. H_2O	Stack temp., °F	Cyclonic flow determination: Δp_s at 0° reference	Cyclonic flow determination: Angle (α) which yields a null Δp
1	0.07	120	-2	5
2	0.12	121	-3	6
3	0.14	122	-4	9
4	0.13	124	-5	11
5	0.12	126	-4	10
6	0.11	123	-2	4
7	0.11	120	-1	3
8	0.10	122	×0	0
9	0.12	119	1	0-1
10	0.14	119	2	-2
11	0.12	124	3	-4
12	0.11	126	4	-3
13	0.09	120	4	-2
14	0.11	122	5	-5
15	0.13	124	6	-7
16	0.15	126	3	-8
17	0.12	128	2	-5
18	0.12	124	1	2
19	0.11	125	-2	3
20	0.13	124	-3	5
21	0.14	122	-5	10
22	0.12	120	-4	11
23	0.11	122	-3	6
24	0.10	123	-2	3
Total/Ave.	2.82/0.12	2946/123	–	127/5.3

Port No. A-S E-W

Average angle (α)[a] 5.2 ← >20% VBB

[a] Average of α ...

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8739 South 300 West
Sandy, Utah 84070
801 566 4023

METHOD 2
CYCLONIC FLOW DETERMINATION DATA FORM

Plant Western Sugar - Billings, Mont. Run No. Pitot.

Location North Stack - East Bank Operator [illegible]

Date 12/5-88 Amb. Temp. °F 0°F

Bar. Press. ("Hg) 26.16 Static Press. ("H_2O) -10.02

Pitot Tube (Cp) 6"A = 0.8512 Stack Dimensions 83.5" ID = 38.028 ft²

Traverse point number	Velocity head (Δp_s), in. H_2O	Stack temp., °F	Cyclonic flow determination: Δp_s at 0° reference	Cyclonic flow determination: Angle (α) which yields a null Δp
1	0.04	154	0.01	2
2	0.03	159	0.01	3
3	0.05	161	0	0
4	0.06	166	0.02	5
5	0.07	172	0.03	6
6	0.07	177	0.02	4
7	0.06	174	0	0
8	0.06	170	0	0
9	0.06	169	0	0
10	0.07	171	0.01	2
11	0.07	170	0.01	3
12	0.05	172	0.02	4
13	0.05	163	0.03	5
14	0.07	165	0.04	9
15	0.06	168	0.02	8
16	0.03	171	0.01	2
17	0.04	172	0	0
18	0.04	175	0	0
19	0.04	174	0	0
20	0.05	172	0	0
21	0.06	169	0.02	3
22	0.06	168	0.03	5
23	0.06	172	0.02	4
24	0.04	175	0.01	2
Total/Avg =	1.29/0.054	4059/169.1	—	67

Average angle (α)[a] 2.79 ✓ 6 = 0% 2.9

Point No

N-S

EW

[a] [illegible]

American Analytical
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Environmental Laboratory, Inc.
5730 South 300 West
Sandy, Utah 84070
801 566 4023

METHOD 2
CYCLONIC FLOW DETERMINATION DATA FORM

Plant Western Sugar Co. Run No. Pitot

Location East Dryer Bank - South Operator RB-JRB-AAS-RT+JT.

Date 12/5-88 Amb. Temp. °F 60°F

Bar. Press. ("Hg) 26.16 Static Press. ("H_2O) +0.02

Pitot Tube (Cp) 0.8512 6'A Stack Dimensions 83.5' ID = 38.028 ft²

Traverse point number	Velocity head (Δp_s), in. H_2O	Stack temp., °F	Cyclonic flow determination: Δp_s at 0° reference	Cyclonic flow determination: Angle (α) which yields a null Δp
1	0.07	155	0.01	1
2	0.07	160	0.02	2
3	0.06	162	0.03	2
4	0.07	164	0.02	4
5	0.06	166	0.02	2
6	0.05	169	0.01	1
7	0.04	174	0	0
8	0.03	174	0	0
9	0.03	172	0	0
10	0.03	164	0.01	0
11	0.04	162	0	0
12	0.04	161	0.02	2
13	0.04	160	0.03	4
14	0.04	161	0.02	3
15	0.05	162	0.01	1
16	0.06	164	0.02	2
17	0.06	168	0	0
18	0.05	165	0	0
19	0.06	166	0	0
20	0.07	165	0	0
21	0.07	164	0.01	3
22	0.06	160	0.02	4
23	0.05	160	0.02	6
24	0.04	160	0	0
TOTAL = / AVE =	1.24 / 0.052	3938 / 164.1	—	37
			Average angle (α)[a]	1.54° VOK

Pit. No.

N-S

E-W

-0 +

<20% 02 RB 12/5-88

BOILER no. 2						BO... no ...					...LER 4												S...BBER	B.	...G-1		...RNG-2			GEN. TURBINE			DATE
TIME	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUTLET DRAFT	ASH DEPTH	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUTLET DRAFT	ASH DEPTH	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUTLET DRAFT	ASH DEPTH	STACK DRAFT	FAN INLET PRESSURE	FAN OUTLET PRESSURE	N. SCRUBBER PRESS. DROP	S. SCRUBBER PRESS. DROP	CHEVRON PRESS. DROP	STACK COLOR •	OIL TEMP. 120-130°F	OIL PRESS. 8-16 PSI	OIL LEVEL TO POINTER	WARM TO TOUCH	COOLING WATER IN SIGHT GLASS	OIL LEVEL	WARM TO TOUCH	COOLING WATER IN SIGHT GLASS	OIL LEVEL	OIL TEMP. 60°C	OIL LEVEL TO POINTER	OIL LEVEL VISIBLE IN ALL GLASSES
1:30	80	.1	.2	.9	1	88	.1	.12	.7	1	84	.1	.15	.7	1	1.7	2.4	5.0	4.7	4.6	.5	W												
45	83	.2	.12	.8	1	84	.1	.15	.7	1	88	.1	.15	.8	1	1.7	2.3	5.1	4.8	4.7	.5	W												
200	84	.2	.18	.8	1	82	.1	.12	.7	1	82	.1	.15	.8	1	1.8	2.3	5.0	4.7	4.7	.5	W												
15	78	.1	.2	.9	1	72	0	.15	.6	1	74	.0	.2	.7	1	2.0	2.5	4.6	4.3	4.3	.5	W												
230	76	.1	.15	.8	1	84	.0	.1	.7	1	78	.1	.15	.7	1	1.8	2.3	4.7	4.4	4.4	.5	W												
245	86	.3	0	.6	1	86	.1	.08	.7	1	92	.2	.12	.8	1	1.4	2.0	5.1	4.7	4.8	.5	W												
00	82	.1	.2	.9	1	84	.0	.15	.7	1	80	.1	.15	.7	1	2.1	2.6	4.8	4.4	4.4	.5	W												
1:15	74	.1	.2	.8	1	84	.1	.15	.7	1	76	.1	.15	.7	1	1.9	2.4	4.7	4.4	4.3	.5	W												
130	78	.1	.15	.8	1	82	.1	.1	.7	1	84	.1	.15	.7	1	1.7	2.3	4.8	4.5	4.6	.5	W												
145	92	.2	.08	.7	1	86	.1	.1	.7	1	90	.2	.1	.8	1	1.6	2.2	5.1	4.7	4.8	.5	W												
200	90	.2	.1	.7	1	82	.1	.1	.7	1	90	.2	.15	.8	1	1.7	2.2	5.1	4.7	4.7	.5	W												
2:15	83	.1	.2	.9	1	84	.1	.15	.7	1	82	.1	.15	.7	1	2.1	2.6	5.0	4.7	4.7	.5	W												
230	82	.1	.2	.8	1	84	.1	.15	.7	1	82	.1	.15	.7	1	1.9	2.4	5.0	4.5	4.5	.5	W												
245	88	.2	.15	.8	1	90	.1	.1	.7	1	92	.2	.15	.8	1	1.7	2.2	5.0	4.7	4.8	.5	W												
3:00	84	.1	.18	.9	1	86	.1	.15	.7	1	84	.1	.15	.7	1	1.9	2.4	5.0	4.7	4.8	.5	W												
315	78	.1	.2	.9	1	82	.0	.15	.7	1	78	.1	.15	.7	1	1.9	2.4	4.8	4.4	4.4	.5	W												
330	73	.1	.2	.8	1	81	.1	.1	.6	1	78	.1	.15	.6	1	1.8	2.3	4.7	4.4	4.4	.5	W												
345	80	.1	.18	.8	1	90	.1	.15	.7	1	82	.1	.15	.7	1	1.9	2.4	4.8	4.5	4.6	.5	W												
4:00	86	.03	0	.6	1	86	.0	1	.7	1	90	.02	1.5	.8	1	1.4	2	5	4.7	4.8	.5	W												
4:15	88	.02	1.5	.9	1	86	.01	.05	.4	1	88	.02	1	.7	1	1.8	2.4	5	4.8	4.8	.5	W												
4:30	78	.01	2	.9	1	86	.01	1	.7	1	82	.02	1.5	.7	1	1.9	2.4	5	4.7	4.8	.5	W												
4:45	76	.01	.05	.7	1	86	.01	1	.7	1	86	.02	1	.8	1	1.6	2.2	5	4.7	4.8	.5	W												
5:00	86	.03	.05	.6	1	86	.01	1	.7	1	90	.02	1	.9	1	1.4	2	5	4.8	4.8	.5	W												
5:15	88	.02	1	.8	1	82	.01	1	.7	1	76	.02	1	.8	1	1.7	2.2	5	4.7	4.8	.5	W												

• W- WHITE
G- GRAY
B-BLACK

8 - 4 SHIFT

BOILER	ALK.		PO_4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER ____________

NALCO 756 ____________

SO_3 ____________

4-12 SHIFT

BOILER	ALK.		PO_4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER ____________

NALCO 756 ____________

SO_3 ____________

12-8 SHIFT

BOILER	ALK.		PO_4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER ____________

NALCO 756 ____________

SO_3 ____________

BO[illegible] no						[illegible]ILE[illegible] 3					BO[illegible] nc												SCRUBBER TURB.			SCR[illegible] FAN BRNG-1		BRNG-2		GEN. TURBINE		
TIME	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUTLET DRAFT	ASH DEPTH	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUTLET DRAFT	ASH DEPTH	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUTLET DRAFT	ASH DEPTH	STACK DRAFT	FAN INLET PRESSURE	FAN OUTLET PRESSURE	N. SCRUBBER PRESS. DROP	S. SCRUBBER PRESS. DROP	CHEVRON PRESS. DROP	STACK COLOR •	OIL TEMP 120-130°F	OIL PRESS. 8-16 PSI	OIL LEVEL TO POINTER	COOLING WATER WARM TO TOUCH	OIL LEVEL IN SIGHT GLASS	COOLING WATER WARM TO TOUCH	OIL LEVEL IN SIGHT GLASS	OIL TEMP. 60°C	OIL LEVEL TO POINTER	OIL LEVEL VISIBLE IN ALL GLASSES
5:30	80	.02	1	.7	1	86	.01	1	.7	1	78	.02	1	.8	1	1.7	2.2	5	4.8	4.8	.5	W										
5:45	98	.03	0	.6	1	82	.01	.05	.7	1	92	.02	1	.9	1	1.3	2	5.1	4.9	4.9	.5	W										
6:00	92	.03	.05	.7	1	78	.01	1	.7	1	86	.02	1.5	.8	1	1.6	2.2	5	4.9	4.8	.5	W										
6:15	92	.02	1	.7	1	84	.01	1.5	.7	1	84	.02	1.5	.8	1	1.7	2.2	5	4.8	4.8	.5	W										
6:30	84	.02	1.5	.8	1	82	0	1.5	.8	1	82	.01	1.5	.8	1	1.9	2.4	5.1	4.8	4.8	.5	W										
6:45	78	.02	1	.8	1	88	.01	1	.7	1	80	.02	1.5	.8	1	1.7	2.2	5	4.8	4.8	.5	W										
7:00	84	.02	.05	.8	1	86	.01	1	.7	1	82	.02	1.5	.8	1	1.7	2.2	5	4.9	4.8	.5	W										
7:15	90	.03	0	.6	1	80	.01	1	.7	1	86	.02	1.5	.8	1	1.6	2.2	5.1	4.9	4.8	.5	W										
7:30	84	.03	1.5	.8	1	84	.01	1.5	.8	1	82	.02	1.5	.8	1	1.8	2.3	5	4.7	4.7	.5	W										
7:45	84	.02	1	.8	1	84	.01	1	.7	1	82	.02	1.5	.8	1	1.8	2.2	5	4.8	4.8	.5	W										
8:00	84	.03	0	.6	1	82	.01	1	.7	1	84	.02	1.5	.9	1	1.5	2	5	4.9	4.9	.5	W										
8:15	86	.02	.05	.7	1	82	.01	1	.7	1	84	.02	1.5	.8	1	1.6	2.3	5	4.8	4.8	.5	W										
8:30	88	.02	1	.8	1	86	.01	1	.7	1	80	.02	1.5	.8	1	1.7	2.2	5	4.7	4.8	.5	W										
8:45	82	.01	1.5	.8	1	80	.01	1	.7	1	78	.02	1.5	.8	1	1.8	2.4	5	4.8	4.9	.5	W										
9:00	84	.02	2	.9	1	84	.01	1.5	.7	1	80	.02	1.5	.8	1	1.9	2.4	5	4.9	4.8	.5	W										
9:15	86	.02	1	.7	1	86	.01	1	.7	1	82	.02	1.5	.8	1	1.6	2.2	5	4.9	4.8	.5	W										
9:30	88	.03	.05	.7	1	82	.01	1	.7	1	84	.02	1.5	.9	1	1.6	2.2	5	4.8	4.8	.5	W										
9:45	80	.02	1.5	.8	1	84	.01	1	.7	1	82	.02	1.5	.8	1	1.7	2.2	5	4.8	4.9	.5	W										
10:00	82	.02	1	.7	1	88	.01	1	.7	1	84	.02	1	.8	1	1.6	2.	5	4.9	4.8	.5	W										
10:15	92	.03	.05	.7	1	86	.01	1	.7	1	84	.02	1.5	.9	1	1.5	2	5	4.9	4.8	.5	W										
10:30	82	.02	2	.9	1	80	.01	1.5	.7	1	78	.02	1	.8	1	2	2.4	5	4.9	4.9	.5	W										
10:45	78	.02	1.5	.9	1	86	.01	1.5	.7	1	78	.02	1	.8	1	1.8	2.2	5	4.9	4.9	.5	W										
11:00	88	.03	.05	.7	1	86	.01	1	.7	1	82	.02	1.5	.8	1	1.6	2.5	5	4.8	4.9	.5	W										
11:15	84	.03	.1	.7	1	84	.01	1	.7	1	84	.02	1.5	.8	1	1.7	2.2	5	4.9	4.9	.5	W										

DATE____

• W- WHITE
G- GRAY
B- BLACK

8-4 SHIFT

BOILER	ALK.		PO4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER ____
NALCO 756 ____
SO_3 ____

4-12 SHIFT

BOILER	ALK.		PO4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER ____
NALCO 756 ____
SO_3 ____

12-8 SHIFT

BOILER	ALK.		PO4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER ____
NALCO 756 ____
SO_3 ____

	BOILER no. 2					BOILER no. 3					BOILER #											SCRUBBER		SCRUBBER FAN NG-2				GEN. TURBINE				DATE
TIME	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUT-LET DRAFT	ASH DEPTH	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUT-LET DRAFT	ASH DEPTH	STEAM FLOW	UNDERGRATE PRESSURE	FURNACE DRAFT	BOILER OUT-LET DRAFT	ASH DEPTH	STACK DRAFT	FAN INLET PRESSURE	FAN OUTLET PRESSURE	N. SCRUBBER PRESS. DROP	S. SCRUBBER PRESS. DROP	CHEVRON PRESS. DROP	STACK COLOR •	OIL TEMP. 120-130°F	OIL PRESS. 8-16 PSI	OIL LEVEL TO POINTER	COOLING WATER WARM TO TOUCH	OIL LEVEL IN SIGHT GLASS	COOLING WATER WARM TO TOUCH	OIL LEVEL IN SIGHT GLASS	OIL TEMP. 60°C	OIL LEVEL TO POINTER	OIL LEVEL VISIBLE IN ALL GLASSES	
00																																
05																																
10	87	.2	.15	.8	1	86	.1	.15	.7	1	80	.1	.15	.8	1	1.7	2.2	5	4.7	4.7	.5	w										
15	95	.2	.02	.6	1	88	.1	.1	.7	1	90	.2	.15	.9	1	1.4	2.0	5	4.7	4.7	.5	w										
20	93	.3	.02	.6	1	86	.1	.2	.7	1	88	.2	.15	.9	1	1.4	2.0	5.1	4.8	4.8	.5	w										
25	89	.3	0	.6	1	82	.1	.1	.7	1	89	.2	.12	.9	1	1.4	2.0	5.1	4.8	4.8	.5	w										
30	88	.2	.1	.7	1	83	.1	.1	.7	1	86	.2	.15	.9	1	1.5	2.1	5	4.7	4.8	.5	w										
35	94	.3	0	.5	1	88	.2	.05	.7	1	97	.2	.1	.9	1	1.3	1.9	5	4.8	4.8	.5	w										
40	87	.3	0	.5	1	77	.2	.05	.7	1	88	.2	.1	.9	1	1.3	1.9	5.1	4.8	4.9	.5	w										
45	96	.2	.1	.7	1	80	.1	.1	.7	1	84	.1	.15	.9	1	1.6	2.1	5.1	4.7	4.8	.5	w										
00	87	.1	.2	.9	1	80	.1	.15	.7	1	82	.1	.1	.8	1	1.9	2.4	5.1	4.7	4.8	.5	w										
05	97	.3	0	.5	1	90	.1	.05	.7	1	94	.2	.1	.9	1	1.3	1.9	5.1	4.7	4.8	.5	w										
	96	.3	0	.5	1	85	.1	.05	.7	1	87	.2	.1	.9	1	1.3	1.9	5.1	4.8	4.8	.5	w										
	94	.2	.05	.7	1	85	.1	.1	.7	1	88	.1	.1	.8	1	1.5	2.9	5	4.7	4.8	.5	w										
00	82	.1	.2	.9	1	82	0	.15	.7	1	78	0	.15	.8	1	2.1	2.6	5	4.7	4.7	.5	w										
05	94	.3	0	.5	1	91	.2	.05	.7	1	99	.2	.1	.9	1	1.2	1.8	5	4.7	4.8	.5	w										
30	92	.3	.02	.6	1	82	.1	.1	.7	1	93	.1	.1	.9	1	1.4	2.0	5	4.7	4.7	.5	w										
45	99	.2	.1	.7	1	83	.1	.15	.7	1	88	.1	.15	.8	1	1.5	2.1	5	4.7	4.7	.5	w										
00																																
00																																
00																																
00																																
00																																
00																																

• W- WHITE
G- GRAY
B- BLACK

8-4 SHIFT

BOILER	ALK.		PO_4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER _____
NALCO 756 _____
SO_3 _____

4-12 SHIFT

BOILER	ALK.		PO_4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER _____
NALCO 756 _____
SO_3 _____

12-8 SHIFT

BOILER	ALK.		PO_4	SOLIDS	INCHES WATER BLOWDOWN
1					
2					
3					
4					
5					

LBS. CAUSTIC: BOILER _____
NALCO 756 _____
SO_3 _____

Western Sugar Company

Billings, Montana

I. ALLOWABLE EMISSION RATES:

A. Boiler

1. SO_2 $2\#/10^6$ Btu's

fired 427 TPD = 17.792 TPH = (35583.3333 #/hr)

@ 9404 Btu's/lb = 334.6256667×10^6 Btu's/hr.

669.25 #/hr.

or 1.057×10^{-4} #/dscf on run #1

2. Particulate 0.262 or 0.254 $\#/10^6$ Btu's

fired 427 TPD = 17.792 TPH = (35583.33334 #/hr)

X 9404 Btu's/hr = 334.6256667×10^6 Btu's/hr.

= 85.0 #.hr. to 87.67 #.hr.

B. Pulp Dryers (200 TPH feed)

1. Particulate

$$Em_r = \left[4.1\ (P)^{0.67}\right] = 10\ (\%S) = 3\#/1000 \text{ gal (fuel oil)}$$

on Nat. gas so = $Em_r = 4.1\ (p)^{0.67}$

where P = process wt. in tons/hr.

E_{mr} = lbs/hr.

Ran 135 TPH = allowable = 109.67 lbs/hr.

American Environmental Testing Co.
565 South Birch Drive
Spanish Fork, Utah 84660
(801) 266-7111

JOB Western Sugar Co., Billing Mont.
SHEET NO. _____ OF _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

East Dryer Production Rates.

#1

12/8-88

Tons/Hr. @ = 135 Tons.

24/Hr = 3240 Tons.

#2

12/9-88

Tons/Hr. @ = 135 Tons.

24/Hr. = 3240 Tons.

: received from Joe Moore on 12/11-88.

W.B.

PRODUCT 204-1 NEBS Inc., Groton, Mass. 01471