TEST REPORT

SCOPE: EMISSIONS AND OUTPUT

FUEL: EPA TEST FUEL (CRIBS)

TEST STANDARD: EPA

MODEL: OPTIMA WOOD STOVE

Notice to reader: Our Optima wood stove was tested as part of our S-27X Series firebox. Therefore, the S-27X Series is referenced throughout the attached test report.

ENERGY AND ENVIRONMENTAL
MEASUREMENT
CORPORATION

(206) 859-8318 ■ 1315 S. Central Avenue ■ Unit C ■ Kent, WA 98032

United States
Environmental Protection Agency
Woodheater Certification
Test Report

HAUGH'S PRODUCTS
BRAMPTON, ONTARIO, CANADA
S-27X SERIES
NONCATALYTIC WOODHEATER

REPORT BY:

BILL NOWAK

TIM KELLY

CONFIDENTIAL

RELEASED ONLY BY
AUTHORIZED PERSONNEL

DATE June 19, 1992

EEMC/BILLINGS
1744 Mullowney Lane
Billings, Montana 59101
(406) 252-4450

EEMC/TUCSON
3925 Placita de la Escarpa
Tucson, Arizona 85715
(602) 290-8965

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The data and information in this test report is confidential, proprietary information and is not to be released to and/or discussed with any party who is not authorized by the manufacturer or the testing laboratory to receive such data.

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B - Installation Description and Operating Instructions

REPORT CERTIFICATION

The sampling and analysis for the woodstove described in this report w carried out under my direction and supervision. I have also reviewed a of the testing data and results found in this test report and here certify that the test report is authentic and accurate.

Date__________ Signature Bill Mounk

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TEST SERIES INFORMATION

Unit name and model number: S-27X Series

Type: Cat __ Non-cat XX Pellet __

Manufacturer: HAUGH'S PRODUCTS

Address: 10 ATLAS COURT
BRAMPTON, ONTARIO, CANADA L6T 5C1

Contact: TOM DAVEY
RBERNIE CAPSTICK

Phone #: 416-792-8000

Observers: NONE

Date Recvd: 4/10/92 Aged: 4/20/92 Tested: 5/13-19/92

Tested by: EEMC using EPA Methods 28 and 5H
Test Location: 1315 S. Central, Unit C, Kent, WA 98032
Test Site Elevation: 42 feet

EEMC Field Team:

Supervisor: Bill Nowak
Other Members: Tim Kelly
Jerry Stoddard
Darla Kingman

The following pages contain (1) test unit storage information, (2) a diagram showing the height and location of the stack components and sampling ports, and (3) copies of the certification test notices and cancellations sent to the EPA.

STOVE STORAGE INFORMATION

The tested unit was returned to the manufacturer via common carrier, and is being stored and held in custody by the manufacturer, unless otherwise noted.

A. Temporary storage at EEMC until certification is granted

A single strap of steel banding is placed around the stove, crossing the door horizontally, and making it impossible to open the door on the unit. If it is necessary to break the banding to check some internal dimension or component, the banding is immediately replaced after work on the unit has been completed.

B. Permanent storage after certification has been granted

The following measures are taken to seal the unit against tampering: Steel banding is placed around the stove in a manner which prevents the stove from being opened. At least two lengths cross at right angles. An EEMC address label is placed over each crossing point, and is taped to the stove with 2" clear packing tape. These labels have the name of the stove written on them.

C. The stored unit is identified as follows:

In addition to the EEMC labels mentioned above, warning labels are affixed to the sides and top of the unit clearly identifying it as a test stove being stored pursuant to 40 CFR Part 60. These labels also have the name of the stove written on them. A sample label follows below.

WARNING

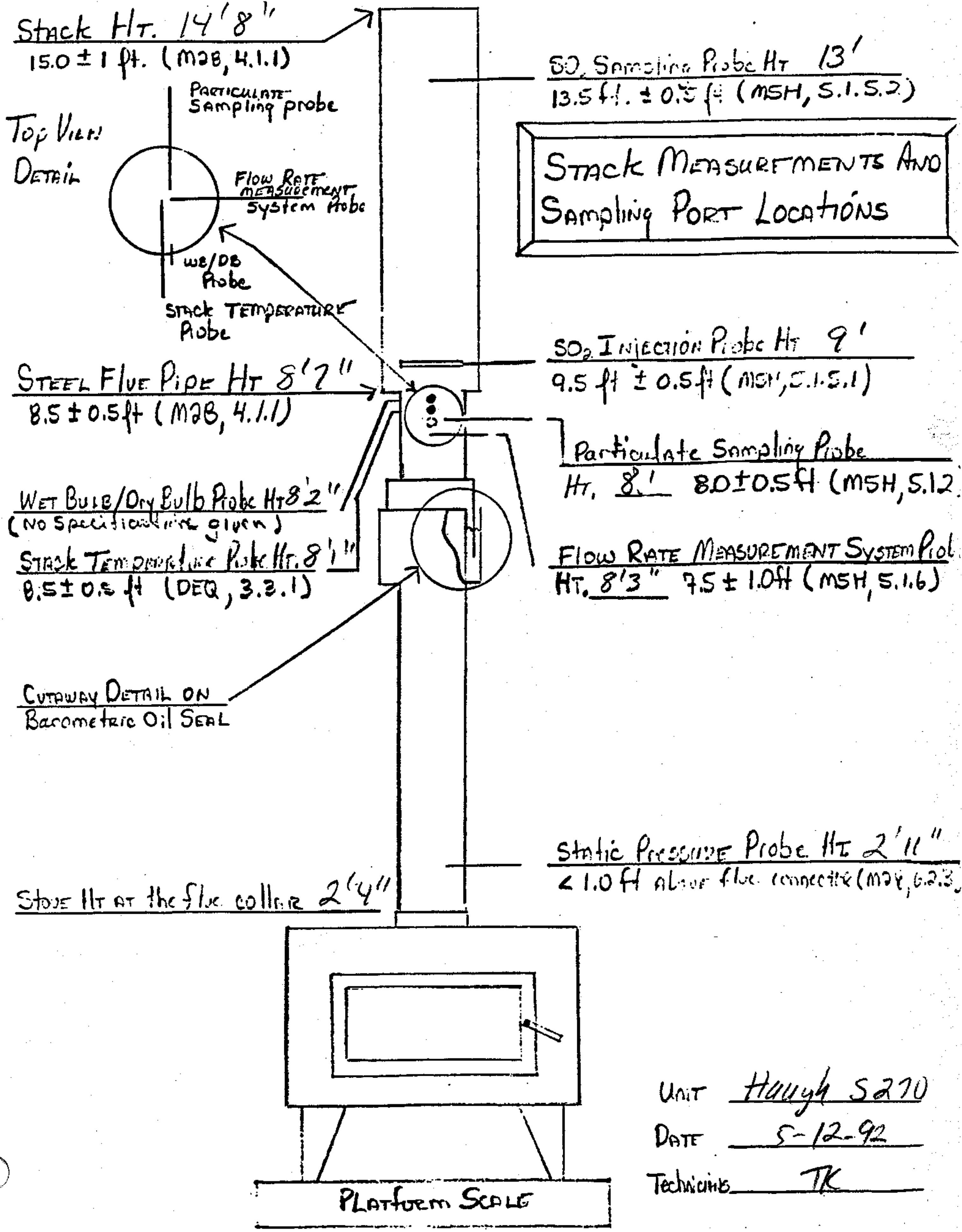
SEALED EPA TEST STOVE

DO NOT TAMPER WITH THE SEALS AND PACKAGING ON THIS STOVE

TO DO SO WILL VOID THE CERTIFICATION ON THIS STOVE

UNIT NAME

S-27X SERIES


Stack Ht. 14'8"
15.0 ± 1 ft. (M28, 4.1.1)
Top View Detail
Particulate Sampling probe
Flow Rate Measurement System Probe
WB/DB Probe
Stack Temperature Probe
SO2 Sampling Probe Ht 13'
13.5 ft. ± 0.5 ft (M5H, 5.1.5.2)
Stack Measurements And Sampling Port Locations
SO2 Injection Probe Ht 9'
9.5 ft ± 0.5 ft (M5H, 5.1.5.1)
Steel Flue Pipe Ht 8'2"
8.5 ± 0.5 ft (M28, 4.1.1)
Particulate Sampling Probe
Ht. 8' 8.0 ± 0.5 ft (M5H, 5.1.2)
Wet Bulb/Dry Bulb Probe Ht 8'2"
(No Specification given)
Stack Temperature Probe Ht. 8'1"
8.5 ± 0.5 ft (DEQ, 3.3.1)
Flow Rate Measurement System Probe
Ht. 8'3" 7.5 ± 1.0 ft (M5H, 5.1.6)
Cutaway Detail on Barometric Oil Seal
Static Pressure Probe Ht 2'11"
< 1.0 ft above flue connector (M28, 6.2.3)
Stove Ht at the flue collar 2'4"
Platform Scale
Unit Haugh S270
Date 5-12-92
Technician TK

===

Wood Heater Emission Test Summary

Laboratory/Wood Heater Information

Stove Manufacturer: HAUGHS PRODUCTS
Model Identification: S-27X SERIES
Stove Type> 1=cat,
2=noncat, 3=pellet: 2

Laboratory Name: EEMC
Laboratory Contact: Bill Nowak
Telephone no.: 206-859-8318

Test Dates: 5/13-19/92

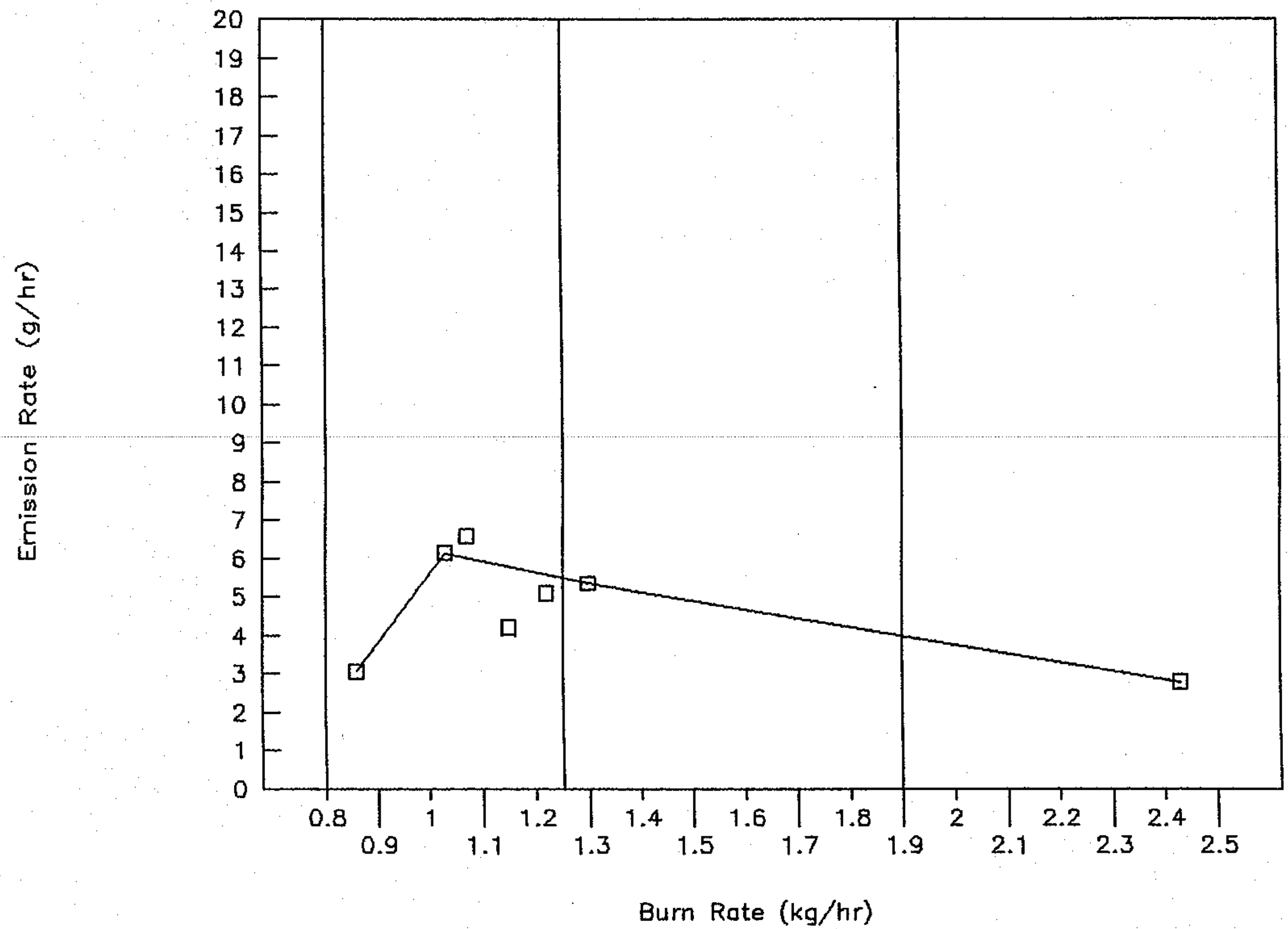
Test Methods Used
Method 28/Other:
Sampling Method: 5H

===

	Run no.	Burn Rate (kg/hr)	Emission Rate (g/hr)	Heat Output (Btu/hr)	Wtd Avg (g/hr) 4.4
L	3	0.86	3.07	10370	
ML	2	1.03	6.14	12420	S12034
MH	4	1.30	5.34	15676	Door
H	1	2.43	2.78	29301	
	5	1.15	4.21	fan confirmation run	
	6	1.22	5.09	door confirmation run S12033 Door	
	7	1.07	6.58	door confirmation run S12032 Door	

HAUGHS PRODUCTS

S–27X SERIES



Woodstove Data Summary

Run #	3	2	4	1		5	6	7	
Particulate Emissions:									
Concentration: grains/dscf:	.1169	.2078	.1442	.0446		.1302	.1491	.1945	
grams/m^3:									
Emission Rate: grams/hr:	3.07	6.14	5.34	2.78		4.21	5.09	6.58	
Emission Factor: gms/kg: (dry fuel weight basis)									
Front Half Catch: % of total	30.39	35.26	33.58	66.23		25.05	26.19	23.14	%
Total Mass Captured: Frt & Bck Halves:	.6860	1.1913	.5836	.0909		.6224	.6855	.9627	mg
Efficiency Valves:									
Overall Appliance Efficiency									%
Combustion Efficiency									%
Heat Transfer Efficiency									%
Heat Output:									
Avg. BTU/hr for test cycle									BTU/h
Fuel Burn Rates:									
Avg Kg/hr for test cycle (Wet basis)									Kg/hr
Avg Kg/hr for test cycle (Dry basis)	.86	1.03	1.30	2.43		1.15	1.22	1.07	Kg/hr

RUN #	3	2	4	1		5	6	7	
Fuel Moisture Content:									
Kindling (Wet basis)	4.000	N/A	4.153	4.610		4.153	N/A	3.846	%
Pretest Fuel (Wet basis)	16.574	18.145	16.897	16.620		16.620	16.874	16.690	%
Test Fuel (Wet basis)	17.752	18.279	18.306	18.256		17.582	17.167	17.207	%
Air/Fuel Ratio:									
lbs air/lbs fuel									
Average Stack Gas Composition:									
Avg. % CO_2	5.21	5.82	6.10	7.29		6.18	6.21	5.38	%
Avg. % O_2									%
Avg. % CO	1.07	.96	.76	.45		.80	.78	.70	%
Avg. % Excess Air									%
Avg. % Moisture	6.52	6.70	7.29	7.94		6.91	6.62	6.26	%
Average Stack Gas Flow Rate:									
Stack flow rate - EPA CMB	6.75	7.60	9.52	16.08		8.31	8.78	8.70	dscfm
CHO balance									dscfm
Tracer Gas	5.981	6.628	7.875	8.555		6.157	6.725	7.317	dscfm
Draft (Static)	-.036	-.041	-.048	-.064		-.049	-.048	-.044	in.H_2O
Proportionality - Average	100	100	100	100		100	100	100	
Average Stack Gas Emission Factors:									
CO - g/Kg	169.89	142.24	111.79	59.77		115.71	113.71	113.71	
g/hr	145.43	145.94	145.10	145.05		133.06	138.27	122.01	

RUN #	3	2	4	1		5	6	7	
Average Temperatures:									
Stack Gas	241	271	274	385		268	228	211	^{o}F
Primary Combustion Chamber Gas	734	801	861	1114		820	864	810	^{o}F
Secondary Combustion Chamber Gas	781	813	974	1157		910	898	825	^{o}F
Catalytic Combustor Exit Gas	---	---	---	---	---	---	---	---	^{o}F
Stove Top	272	297	349	469		382	363	323	^{o}F
Stove Left Sidewall	316	319	360	472		369	359	332	^{o}F
Stove Back	217	236	247	377		417	251	225	^{o}F
Stove Right Sidewall	247	264	274	349		274	272	330	^{o}F
Stove Bottom	332	359	371	444		362	353	341	^{o}F
Stove Temperature Change	-95	-33	-91	-74		-78	-47	-90	^{o}F
Test Chamber Environment:									
Avg. Barometric Pressure	30.01	30.11	30.12	30.14		30.08	30.01	30.03	in Hg
Avg. Temperature	78	79	74	82		78	82	75	^{o}F
Avg. % Ambient Moisture	1.20	1.10	1.20	1.15		1.35	1.30	1.25	% H_2O
Avg. % Relative Humidity	44	37	49	44		56	42	54	%RH
Avg. Air Velocity	0---	---	---	---	---	---	---	---	m/sec
Avg. Dilution Tunnel Draft (If Applicable)	0---	---	---	---	---	---	---	---	in/H_2O
Test Fuel Weight and Burn Time:									
Density (Dry basis)	.6561	.6171	.4732	.5604		.4693	.4934	.6599	gm/cm
Coal Bed Weight	2.4	2.6	2.6	2.5		2.2	2.3	2.2	lbs.
Pre Test Fuel Wt (Inc Kindling)	25.3	9.2	27.3	25.6		23.8	11.3	25.2	lbs.
Test Fuel Load Weight	10.7	10.6	10.5	10.9		10.5	9.7	10.7	lbs.
Total Test Cycle Burn Time	280	230	180	100		205	180	225	min.

Unit [illegible]
Date 4/20/92
Technicians BJ TK DK JS
Page 1 of 1
WST5-Form3

CATALYTIC COMBUSTOR AGING DATA
OR
STOVE AGING DATA
WOODSTOVE TEST DATA SHEET #25

		T/C#	8	9			
Hr. #	Date	Time	Firebox Temp	Secondary Burn Temp	Post Cat	In Cat	Comments
1	4/20/92	0800	930	1246			STARTED 0700
2		0900	1067	905			ADD FUEL
3		1000	1183	1095			
4		1100	945	849			ADD FUEL
5		1200	1041	1034			
6		1300	1188	896			
7		1400	430	464			ADD FUEL
8		1500	668	1096			
9		1600	874	903			
10		1700	746	673			

CLIENT : HAUGHS PRODUCTS TEST No. : 3

MODEL: S-27X DATE: 5/14/92

****

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	529.200	0.150	82	0.77	3.00	575
5	530.700	0.310	82	0.65	3.70	400
10	532.903	0.120	83	0.63	2.00	650
15	534.264	0.130	84	0.55	3.00	625
20	535.686	0.120	85	0.67	3.10	650
25	537.057	0.150	85	0.72	5.60	575
30	538.608	0.160	86	0.59	6.00	550
35	540.235	0.160	87	0.72	6.10	550
40	541.868	0.180	88	0.44	7.40	525
45	543.584	0.220	88	0.37	6.00	475
50	545.481	0.220	89	0.31	7.80	475
55	547.385	0.240	89	0.24	9.60	450
60	549.394	0.240	90	0.15	10.10	450
65	551.413	0.220	90	0.23	10.00	475
70	553.325	0.220	91	0.26	10.40	475
75	555.244	0.240	91	0.23	10.60	450
80	557.269	0.240	91	0.29	10.80	450
85	559.295	0.240	92	0.28	9.80	450
90	561.328	0.210	92	0.33	9.50	475
95	563.254	0.210	92	0.29	9.80	475
100	565.180	0.210	93	0.28	8.80	475
105	567.113	0.190	93	0.37	8.00	500
110	568.950	0.170	93	0.43	7.60	525
115	570.699	0.190	93	0.47	7.50	500
120	572.536	0.170	93	0.62	7.20	525
125	574.287	0.160	93	1.25	5.60	550
130	575.959	0.130	93	1.70	4.80	600
135	577.492	0.130	93	1.86	4.60	600
140	579.025	0.130	93	1.87	4.40	600
145	580.558	0.130	93	1.81	4.10	600
150	582.091	0.120	93	1.86	3.90	625
155	583.563	0.120	93	1.83	3.80	625
160	585.035	0.120	93	1.77	3.60	625
165	586.507	0.120	93	1.72	3.50	625
170	587.979	0.120	93	1.60	3.20	625
175	589.450	0.120	93	1.58	3.10	625
180	590.922	0.110	93	1.51	2.80	650
185	592.337	0.110	93	1.49	2.70	650
190	593.753	0.110	93	1.57	2.70	650
195	595.168	0.100	93	1.59	2.70	675
200	596.531	0.100	92	1.63	2.70	675
205	597.889	0.100	93	1.70	2.70	700
210	599.203	0.100	92	1.69	2.70	700
215	600.512	0.100	92	1.78	2.70	700
220	601.822	0.100	93	1.33	3.50	700
225	603.136	0.100	92	1.28	4.20	700

230	604.445	0.100	92	1.27	4.10	700
235	605.755	0.100	92	1.39	3.90	700
240	607.064	0.100	92	1.29	4.00	700
245	608.374	0.100	92	1.32	3.90	700
250	609.683	0.100	92	1.39	3.80	700
255	610.993	0.100	92	1.50	3.70	700
260	612.302	0.100	92	1.55	3.50	700
265	613.612	0.100	92	1.47	3.50	700
270	614.921	0.100	92	1.47	3.30	700
275	616.231	0.100	92	1.55	3.10	700
280	617.540	0.100	92	1.61	3.00	700
285			92			

TABLE 2 ----- FIELD DATA

CLIENT : HAUGHS PRODUCTS TEST No. : 3

MODEL: S-27X DATE: 5/14/92

****

METER CAL. FACTOR (Y) -------	1.066	Wt. WOOD BURNED(LB) :-------	10.7	Lbs
BAROMETRIC PRESS.(Pb) -------	30.01 in Hg	WET, FUEL MOISTURE % :-------	17.752	%
LEAK RATE POST (Lp) -------	0.002 cfm	Wt. PART. COLLECTED :-------	0.686	g
WATER VOL. (V1c) -------	134.3 Ml	METER VOLUME Vm :-------	88.34	mcf
TEST TIME (MIN) -------	280 min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : HAUGHS PRODUCTS TEST No. : 3

MODEL: S-27X DATE: 5/14/92

****

AVG DELTA H	-------	0.15 in H_2O	AVG PRCNT CO	-------	1.07	%
AVG METER TEMP. Tm	-------	91 deg F	AVG PRCNT CO_2	-------	5.21	%
AVG PPM SO_2	-------	595 PPM				

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS   TEST No. : 3

MODEL: S-27X   DATE: 5/14/92

****

STD SAMPLE VOL. Vm(std) ------	90.57	dscf	STACK GAS FLOW Qsd -------	404.988 6.75	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) -----	6.322	scf	PARTICULATE CONCTRT. C s ------	0.0076	g/dscf
PRCNT MSTR Bws -------	6.52	%	PARTC.EMISS. RATE E -------	3.07	g/Hr
BURN RATE BR -------	0.86	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.56	Lb-mole/Lb
CO EMISSION RATE -------	145.43 169.89	g/Hr & g/Kgdry fuel	PART.EMISS. RATE ------	3.58	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS TEST No. : 3

S-27X DATE: 5/14/92

****

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE		
5	898.9	96		100		
10	917.9	98				
15	919.3	98				
20	921.9	99				
25	923.5	99				
30	923.4	99				
35	924.9	99				
40	926.6	99				
45	928.7	99				
50	928.1	99				
55	930.7	100				
60	929.5	99				
65	933.3	100				
70	932.0	100				
75	934.6	100				
80	934.3	100				
85	934.0	100				
90	936.3	100				
95	936.3	100				
100	935.4	100				
105	938.0	100				
110	938.3	100				
115	937.9	100				
120	938.3	100				
125	939.0	100				
130	939.3	100				
135	939.5	101				
140	939.5	101				
145	939.5	101				
150	939.5	101				
155	939.6	101				
160	939.6	101				
165	939.6	101				
170	939.6	101				
175	939.0	100				
180	939.6	101				
185	939.4	100				
190	940.0	101				
195	939.4	100				
200	940.5	101				
205	937.0	100				
210	940.2	101				
215	937.5	100				
220	937.4	100				
225	940.2	101				
230	937.5	100				

235	938.2	100
240	937.5	100
245	938.2	100
250	937.5	100
255	938.2	100
260	937.5	100
265	938.2	100
270	937.5	100
275	938.2	100
280	937.5	100
285		
290		

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client Haugh's Products

Client Address 10 Atlas Court

Brampton, Ontario, Canada L6T 5C1

Client Phone 416-792-8000

Project No. ____ Model No. S210X

Run No. 3 Date of Test 5/14/92 Est Grams/Hr ____

Stove Type: Cat ____ Non Cat X Pellet ____

Data To Be Submitted To: Oregon X Colorado ____ EPA X

Burn Category: Low (<0.8 Kg/Hr) ____ Med Hi (1.26 - 1.90 Kg/Hr) ____
Med Low (0.8 - 1.25 Kg/Hr) .856 Max (>1.9 Kg/Hr) ____

Fuel % Moisture (dry) 21.583 %(wet) 17.752 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.036 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.01 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 78 oF
(00) (Data Sheet #14)

Flue Gas Moisture 6.5851 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.2 %
(0.00) (Data Sheet #8)

Stove Weight 237 lbs
(000) (Data Sheet #8)

Stove Temperature Change -95 oF
(000) (Data Sheet #14)

Particulate Emission .1169 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) ____ BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ____

Total Fuel Consumed During Burn 19.7 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .6860 g
(0.0000) (Data Sheet #6)

H_2O Captured 134.3 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 88.340 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 4J-1.066 Post Test Leak Rate .002 CFM

Meter Box Data Sheet Page # 2

Meter Box 4J Y Factor 1.066

Leak Checks: 15 " Hg @ .002 cfm
15 " Hg @ .002 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Unit: HAUGHS S27X

Run: 3 Date: 5/14/92

Operator(s): BN SS

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .18			Sampling Ratio : 20 : 1				BAROMETER: 30.05		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1115	529.200		6.091	.15	82	575	75	0
05	20	530.700		8.756	.31	82	400	75	.5
10	25	532.903		5.389	.12	83	650	75	1.5
15	30	534.264		5.594	.13	84	625	76	0
20	35	535.686		5.378	.12	85	650	76	0
25	40	537.057		6.069	.15	85	575	77	0
30	45	538.608		6.345	.16	86	550	77	.5
35	50	540.235		6.345	.16	87	550	77	1.0
40	55	541.868		6.634	.18	88	525	78	1.0
45	1200	543.584		7.333	.22	88	475	78	1.0
50	5	545.481		7.333	.22	89	475	78	1.5
55	10	547.385		7.240	.24	89	450	78	1.5
ROTO PRESS: .18			TOTALS	79.007	2.16	1022	BAROMETER: 30.03		
60	15	549.394		7.735	.24	90	450	78	1.5
65	20	551.413		7.308	.22	90	475	78	2.0
70	25	553.305		7.308	.22	91	475	78	1.5
75	30	555.244		7.735	.24	91	450	78	1.5
80	35	557.269		7.735	.24	91	450	78	1.5
85	40	559.295		7.221	.24	92	450	79	1.5
90	45	561.328		7.314	.21	92	475	79	1.5
95	50	563.254		7.301	.21	92	475	80	1.5
100	55	565.180		7.287	.21	93	475	81	1.5
105	1300	567.113		6.923	.19	93	500	81	1.5
110	5	568.950		6.593	.17	93	525	81	1.5
115	10	570.699		6.923	.19	93	500	81	1.0
			TOTALS:	87.923	2.58	1101	MAX VACC =		
TOTAL CU FT			TOTALS:	166.930	4.74	2129	AV BP:		

60.08

Meter Box Data Sheet Page # 2

Meter Box 45 Y Factor 1.066

Unit: HAUGHS SD2X

Run: 3 Date: 5/14/92

Leak Checks: 15 " Hg @ .002 cfm
13 " Hg @ .002 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): BN JS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .18			Sampling Ratio : 20 : 1				BAROMETER: 29.99		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	15	572.536		6.572	.17	93	585	82	1.0
125	20	574.287		6.273	.16	93	580	82	1.0
130	25	575.959		5.751	.13	93	600	82	1.0
135	30	577.492		5.751	.13	93	600	82	1.0
140	35	579.025		5.751	.13	93	600	82	1.0
145	40	580.558		5.751	.13	93	600	82	1.0
150	45	582.091		5.521	.12	93	625	82	1.0
155	50	583.563		5.521	.12	93	625	82	1.0
160	55	585.035		5.521	.12	93	625	82	1.0
165	1400	586.507		5.521	.12	93	625	82	1.0
170	5	587.979		5.521	.12	93	625	82	1.0
175	10	589.450		5.521	.12	93	625	82	1.0
ROTO PRESS: .18			TOTALS :	68.975	1.57	1116	BAROMETER: 29.99		
180	15	590.922		5.308	.11	93	650	82	1.0
185	20	592.337		5.308	.11	93	650	82	.5
190	25	593.753		5.308	.11	93	650	82	.5
195	30	595.168		5.112	.10	93	675	82	.5
200	35	596.531		5.112	.10	92	675	82	.5
205	40	597.889		4.909	.10	93	700	82	.5
210	45	599.203		4.909	.10	92	700	82	.5
215	50	600.512		4.909	.10	92	700	82	.5
220	55	601.822		4.909	.10	93	700	82	.5
225	1500	603.136		4.909	.10	92	700	82	.5
230	5	604.445		4.909	.10	92	700	82	.5
235	10	605.755		4.909	.10	92	700	82	.5
			TOTALS:	60.651	1.23	1110	MAX VACC =		
TOTAL CU FT	—		TOTALS:	129.626	2.80	2226	AV BP:		

896.556 7.54 4355 100.06

Meter Box Data Sheet Page # 2

Meter Box 4J Y Factor 1.066

Leak Checks: 15 " Hg @ .002 cfm
15 " Hg @ .002 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Page 3 of 3

Unit: HAUGHS SO2X

Run: 3 Date: 5/14/92

Operator(s): BN JS

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .12			Sampling Ratio : 20 : 1				BAROMETER: 29.99		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
240	15	607.064		4.909	.10	92	700	82	5
245	20	608.374		4.909	.10	92	700	82	5
250	25	609.683		4.909	.10	92	700	82	5
255	30	610.993		4.909	.10	92	700	82	5
260	35	612.302		4.909	.10	92	700	82	5
265	40	613.612		4.909	.10	92	700	82	5
270	45	614.921		4.909	.10	92	700	82	.5
275	50	616.231		4.909	.10	92	700	82	.5
280	55	617.540		4.909	.10	92	700	82	.5
285	1600			44.361	.90	828			
290	5								
295	10			340.417	8.44	5183	57½		
ROTO PRESS:			TOTALS :				BAROMETER:		
300				5.981	.148	91			
305									
310						551			
315									
320									
325									
330									
335									
340									
345									
350									
355									
			TOTALS:				MAX VACC = 20		
TOTAL CU FT		88.340	TOTALS:				AV BP: 30.01		

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance Level	Balance Zeroed
Initial:	✓	✓
Final:	✓	✓

Unit: Haughs S270X
Run: 3
Date: 5/14/92
Technician(s): Initial: TK
Final: JS
Approved By: TK

IMPINGER #1

Final Weight 682.9 grams
Initial Weight 575.2 grams
Net 107.7 ✓ grams

IMPINGER #2

Final Weight 584.0 grams
Initial Weight 576.1 grams
Net 7.9 ✓ grams

IMPINGER #3

Final Weight 495.6 grams
Initial Weight 494.4 grams
Net 1.2 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 863.0 grams
Initial Weight 845.5 grams
Net 17.5 ✓ grams

TOTAL MASS OF H_2O CAPTURED 134.300 ✓ grams

Scale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 262F
#
Back Half Filter # 262B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ✓ Back Half ____

Manufacturer: S & S Size: 110 mm Lot. No.: ZB882 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261 F	0.6987	3/20	1608	DK	.6991	3/23	1300	[illegible]				
262 F	0.7014		1610		.7017		1301		HAUGHS	R3		
263 F	0.6988		1612		.6985		1302					
264 F	0.6893		1614		.6894		1303					
265 F	0.6912		1616		.6917		1304					
266 F	0.6934		1618		.6936		1305					
267 F	0.6936		1620		.6937		1306					
268 F	0.7015		1622		.7010		1307					
269 F	0.6933		1624		.6936		1308					
270 F	0.6965		1626		.6965		1309					
271 F	0.6953	3/20	1628	DK	.6951		1330					
272 F	0.7002		1630		.7005		1331					
273 F	0.6978		1632		.6980		1332					
274 F	0.6900		1634		.6903		1333					
275 F	0.6975		1636		.6975		1334					
276 F	0.6978		1638		.6973		1335					
277 F	0.6975		1640		.6974		1336					
278 F	0.6992		1642		.6991		1337					
279 F	0.6901		1644		.6900		1338					
280 F	0.6994		1646		.6997		1339					

Checked by [illegible] Date: 3/24/91 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1606	DK
59	73	43	3/23	1300	[illegible]

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ______ Back Half ✓

Manufacturer: S&S Size: 8.2 cm Lot.No.: ZB 901 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261B	0.3846	3/20	1526	DK	.3849	3/23	1341	JB				
262B	0.3822		1528		.3827		1342		Hauck's RN 3			
263B	0.3805		1530		.3810		1343					
264B	0.3811		1532		.3818		1344					
265B	0.3821		1534		.3824		1345					
266B	0.3822		1536		.3824		1346					
267B	0.3817		1538		.3822		1347					
268B	0.3772		1540		.3770		1348					
269B	0.3875		1542		.3870		1349					
270B	0.3813		1544		.3809		1350					
271B	0.3884	3/20	1546	DK	.3882		1351					
272B	0.3818		1548		.3813		1352					
273B	0.3825		1550		.3821		1353					
274B	0.3856		1552		.3853		1354					
275B	0.3832		1554		.3830		1355					
276B	0.3862		1556		.3864		1356					
277B	0.3836		1558		.3832		1357					
278B	0.3801		1600		.3800		1358					
279B	0.3827		1602		.3822		1359					
280B	0.3821		1604		.3818		1400					

Checked by [signature] Date: 3/24/92 Time 0400

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1524	DK
59	73	43	3/23	1340	JB

INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 4/17/92 Time: 1000 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
501	96.8870	4/20	1004	DK	96.8874	4/21	1332	[illegible]				
502	98.5625		1006		98.5630		1334					
503	91.2041		1008		91.2044		1336					
504	95.0582		1010		95.0584		1338					
505	106.4506		1012		106.4504		1340					
506	94.1600	4/20	1014	DK	94.1604		1342					
507	88.9867		1016		88.9870		1344					
508	103.1077		1018		103.1077		1346		HAUGHS R3			
509	95.7024		1020		95.7026		1348					
510	104.8758		1022		104.8757		1350					
511	107.7742	4/20	1024	DK	107.7745		1352					
512	106.3852		1026		106.3855		1354					
513	99.2412		1028		99.2417		1356					
514	108.6340		1030		108.6344		1358					
515	106.2259		1032		106.2264		1400					
516	105.6750	4/20	1034	DK	105.6745		1402					
517	94.7160		1036		94.7160		1404					
518	103.8296		1038		103.8300		1406					
519	100.0063		1040		100.0063		1408					
520	98.6266		1042		98.6267		1410					
521	97.7535	4/20	1044	DK	97.7537		1412					
522	103.9227		1046		103.9229		1416					
523	94.9397		1048		94.9402		1418					
524	106.8567		1050		106.8571		1420					
525	95.1170		1052		95.1173		1422					

Checked By: [illegible signature] Date: 4/21/92 Time: 1415

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
59	72	46	4/20	1002	DK
60	74	44	4/21	1330	[illegible]

WST5-Form9,Pg1,Rev4/90
Unit HAWKS 507K
Run # 3
Date: 5/14/96

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
506		5/15	0900	DK	94.2410	5/18	938	DK	94.2407	5/18	1526	[illegible]				
507		5/15	0900	DK	89.1641	5/18	940	DK	89.1643	5/18	1528	[illegible]				
508		5/18	0900	DK	103.1823	5/19	932	DK	103.1821	5/19	1711	[illegible]				
509		5/18	0900	DK	95.8094	5/19	934	DK	95.8093	5/19	1713	[illegible]				
510		5/15	0900	DK	104.9182	5/18	942	DK	104.9180	5/18	1530	[illegible]				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
D62F		5/14	1635	[illegible]	.8385	5/15	1246	BN	0.8307	5/18	944	DK	.8303	5/18	1534	[illegible]
[illegible]		5/14	1635	[illegible]	.4637	5/15	1244	BN	0.4614	5/18	946	DK	.4615	5/18	1536	[illegible]

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	5/15	1200	BN	60	74	44
2	5/18	936	DK	58	71	45
3	5/18	1510	[illegible]	59	73	43
4	5/19	930	DK	57	70	44
5	5/19	1700	[illegible]	[illegible]	70	41

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 4/23/92

Through ____________

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9996	10.0000	0.9997	0.1001			DK	4/23	1600	70	56	41
99.9996	10.0000	.9997	.1000			[illegible]	4/24	1130	74	57	24
99.9996	10.0000	.9998	.1000			[illegible]	4/24	1830	70	57	46
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	.9998	.0999			[illegible]	4/28	1330	71	59	49
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			TK	4/30	0846	77	64	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	950	77	61	39
99.9997	9.9999	1.000	.1000			[illegible]	5/1	1500	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/4	930	78	62	40
100.0002	10.0002	1.0001	.1000			[illegible]	5/5	1010	75	60	41
100.0000	10.0001	1.0000	.1001			[illegible]	5/5	1505	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9997	10.0000	1.0001	.1000			[illegible]	5/6	1640	70	59	46
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			TK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	.1001			[illegible]	5/8	1105	65	54	48
99.9998	10.0001	.9999	.0999			[illegible]	5/8	1650	68	56	47
99.9996	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			TK	5/12	0900	74	60	44
99.9997	10.0001	1.0000	.0999			[illegible]	5/12	1345	77	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	950	74	59	40
100.0002	10.0002	1.0000	.1001			[illegible]	5/14	1636	70	56	41
99.9998	9.9999	.9997	.0999			BJ	5/15	1200	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.000	.1001			JS	5/18	1500	73	59	45
99.9998	9.9997	0.9996	0.0997			DK	5/19	0920	70	57	44
99.9998	10.0000	.9999	.0999			[illegible]	5/19	1707	70	56	41

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 2/6/92

Through 3/11/92

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0000	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9998	10.0003	1.0001	.1001			[illegible]	2/6	1315	68	56	47
99.9999	10.0000	1.0000	.1000			[illegible]	2/7	0915	65	54	48
100.0001	9.9999	1.0001	.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	.1000			TK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	75	62	48
100.0000	10.0000	1.0000	.1000			[illegible]	2/10	1100	72	59	47
99.9997	10.0001	1.0000	.1001			[illegible]	2/11	0930	74	64	47
100.0001	10.0000	1.0001	.1000			TK	2/12	0920	68	56	47
100.0003	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9997	10.0000	1.0000	.1000			[illegible]	2/12	0850	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0001	1.0001	0.1000			TK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			[illegible]	2/13	1535	75	62	45
100.0000	9.9999	1.0000	0.1000			DK	2/14	930	77	63	46
100.0000	10.0000	1.0000	0.1000			TK	2/14	1240	76	62	45
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	45
100.0000	10.0001	1.0000	.0999			TK	2/17	0820	65	54	48
99.9997	10.0000	1.0001	.1000			[illegible]	2/17	1035	68	56	47
99.9999	10.0000	.9999	.1000			TK	2/18	0856	65	54	48
99.9999	10.0001	1.0000	.1000			[illegible]	2/18	1000	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	945	71	58	45
100.0000	9.9999	1.0000	0.1000			TK	2/24	0800	71	59	49
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	.9999	.0999			TK	2/26	1025	72	59	46
99.9999	9.9998	1.0000	0.0999			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.0999			TK	2/28	1230	78	64	46
99.9998	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			TK	3/4	1130	72	59	46
99.9996	10.0000	1.0000	.1000			[illegible]	3/5	0935	70	58	48
99.9996	10.0000	.9999	0.0999			TK	3/6	0830	73	60	47
99.9998	10.0000	.9999	.0998			[illegible]	3/6	1400	76	63	45
99.9998	10.0000	.9999	.1000			GK	3/9	0850	71	59	49
99.9996	10.000	.9999	.1000			[illegible]	3/9	1340	70	59	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0930	75	60	41
99.9996	10.0000	1.000	.0998			[illegible]	3/11	1605	70	57	44

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 3/12
Through 4/03

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9998	10.0000	1.0000	0.0998			TK	3-12	1257	73	60	47
99.9995	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	.1000			JWD	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0002	10.0001	1.0000	0.1001			JWD	3/17	1607	71	59	46
99.9997	10.0001	1.0000	.1000			JWD	3/19	1715	74	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0002	.9999	0.0998			JWD	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9999	10.0001	1.0001	.1002			JWD	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3/26	1045	73	59	43
100.0001	9.9996	1.0002	.1001			JWD	3/27	1140	77	60	40
99.9997	9.9999	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9996	10.0000	1.0001	.1000			JWD	3/30	1500	71	57	41
99.9999	10.0004	1.0001	.1002			JWD	3/31	1016	73	59	43
100.0003	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9995	10.0000	1.0000	.1000			JWD	4/6	0900	73	59	43
99.9998	9.9997	0.9997	0.1000			DK	4/3	0900	72	59	46
99.9997	10.0001	0.9999	0.0999			DK	4/3	1630	70	58	48
99.9999	10.0001	0.9999	.0999			TK	4/6	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	56	41
99.9999	9.9998	0.9999	.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	.9999	.0998			JWD	4/8	1545	69	56	44
100.0000	9.9998	.9999	.0999			TK	4/9	1025	68	55	43
100.0000	10.0001	1.0000	.1000			JWD	4/10	0935	70	56	41
100.0000	9.9999	.9999	.0999			JK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	945	72	58	42
100.0002	10.0003	1.0001	.0998			JWD	4/14	1030	72	59	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	56	47
99.9997	9.9999	.9998	.0998			JWD	4/16	1006	70	58	48
100.0001	9.9999	1.0000	0.1001			DK	4/17	915	70	57	44
99.9996	9.9999	1.0000	.1000			JWD	4/17	1545	70	58	48
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0002	1.0002	.1001			JWD	4/21	1040	74	60	44
100.0000	10.0000	1.0000	0.0999			DK	4/22	900	73	59	43
99.9995	10.0003	1.0000	.1001			JWD	4/23	1007	76	60	38

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAWKINS SD20X
Run: 3 Date: 5/14/92
Technician(s): JS

FRONT HALF

FILTER #: 262F		BEAKER #: 506		FINAL WT: 94.2407	g
FINAL WT: .8303	g	ml: 200		TARE WT: 94.1604	g
TARE WT: .7017	g	desc: ACETONE		NET WT: .0803	g
NET WT: .1286	g				
FILTER #:		BEAKER #:		FINAL WT:	g
FINAL WT:	g	ml:		TARE WT:	g
TARE WT:	g	desc: ACETONE		NET WT:	g
NET WT:	g				

TOTAL VOLUME OF ACETONE USED IN WASH 200 ml

BACK HALF

FILTER #: 262B		BEAKER #: 507		FINAL WT: 89.1643	g
FINAL WT: .4615	g	ml: 200		TARE WT: 88.9870	g
TARE WT: .3827	g	desc: ACETONE		NET WT: .1773	g
NET WT: .0788	g				
FILTER #:		BEAKER #: 508		FINAL WT: 103.1821	g
FINAL WT:	g	ml: 75		TARE WT: 103.1077	g
TARE WT:	g	desc: METHCHLOR		NET WT: .0744	g
NET WT:	g				
		BEAKER #: 509		FINAL WT: 95.8093	g
		ml: 200		TARE WT: 95.7026	g
		desc: H2O		NET WT: .1067	g
		BEAKER #: 510		FINAL WT: 104.9180	g
		ml: 100		TARE WT: 104.8757	g
		desc: H2O		NET WT: .0423	g
		BEAKER #:		FINAL WT: .1490	g
		ml:		TARE WT:	g
		desc:		NET WT:	g
		BEAKER #:		FINAL WT:	g
		ml:		TARE WT:	g
		desc:		NET WT:	g

TOTAL VOLUME OF ACETONE USED IN WASH 200 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 300 ml

Unit: HAUGHS 527X
Run: 3
Date: 5/14/92
Technician(s): TK TK
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Tim Kelly Date: 5/18/92

Blank Calculations:

Acetone: .0004 g ÷ 200 ml = .000002 g/ml

Dichloromethane: .0004 g ÷ 75 ml = .00000533 g/ml

Distillted Water: .0008 g ÷ 200 ml = .000004 g/ml

Front Half Catch:

Filters: .1086 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1086 g (Net Catch)

Beakers: .0803 g (Total Catch) - 200 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0799 g (Net Catch)

Total Front Half Catch .2085 g

Back Half Catch:

Filters: .0788 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0788 g (Net Catch)

Beakers:

1. Acetone/Impingers:
.1773 g (Total Catch) - 200 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .1769 g (Net Catch)

2. Extract/Impingers:
.0744 g (Total Catch) - 75 (ml. of Dichloromethane) (.00000533 g) (Blank Value/ml of Dichloromethane) = .0740 g (Net Catch)
.0004

3. Water/Impingers:
.1490 g (Total Catch) - 300 (ml. of water) (.000004 g) (Blank Value/ml of water) = .1478 g (Net Catch)

Total Back Half Catch .4775 g
Total Catch .6860 g
% Front Half 30.39 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HAUGHS 527X

Run: 3 Date: 5/14/92

Technician(s): JS TK

WST3-Form 1 8/28/91

1) Vm(std): (88.340 Vm)(17.65)(1.066 mcf)(30.01 " Hg + (.148 " H2O / 13.6)) / (551 TmA) = 90.5589 (000.0000) dscf

2) Vw(std): (.04707)(134.300 ml H2O) = 6.3215 (00.0000) scf

3) Bsw: (6.3215 scf) / (6.3215 scf + 90.5589 dscf) = .0653 (.0000) Bws X 100 = 6.5251 (00.0000) % H2O

4) Cs: (.16860 g.) / (90.5589 dscf) (15.43) = .1169 (0.0000) gr/dscf

5) Estimated g/hr: (____ g.) / (____ dscf) (____ (00.000) dscfm)(60) = ____ (00.0000) g/hr

5.98

Vm	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf)
" Hg	average barometric pressure during the test	(p. 2)	(00.00 " Hg)
" H2O	average delta H for the test	(p. 2)	(.000 " H2O)
TmA	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA)
ml H2O	total water caught during the test	(p. 3)	(000.0 ml H2O)
g.	total particulate catch for the test	(p. 6)	(00.0000 g.)
dscfm	average stack flow during the test	(computer printout)	(00.000 dscfm)

Unit [illegible]
Run # 3
Date 5/14/92
Technician BN TK DK JS
WST6-Form1,Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft^3

Dilution Tunnel Draft (If applicable): Start 0 Stop 0

Test Chamber Air Velocity: Start: 0 Stop: 0 Avg: 0

Wet Bulb/ Start: WB: 60 °F DB: 70 °F 1.4 % Amb Moisture 56 %RH

Dry Bulb Stop: WB: 59 °F DB: 78 °F 1.0 % Amb Moisture 32 %RH

$\bar{X}$ = 1.2 % Ambient Moisture $\bar{X}$ = 44 % Relative Humidity (RH)

Empty Stove Wt: 237 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 305.2 lbs. Dry: 304.3 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 0 lbs.

Kindling Wt. Paper: .3 lbs. Wood: 6.2 lbs.

Pre Burn Fuel Wt. 8.2 + 9.4 + 1.5 Total: 19.1 lbs.

Total Kindling and Pre Burn Fuel Wt 25.3 lbs.

Coal Bed Wt-lbs: Range (2.6 - 2.2) 306.9 - 306.5 lbs. Actual: 2.4 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\left(\frac{2.6}{\text{Upper Wt.}} + \frac{2.2}{\text{Lower Wt.}} \Big/ 2\right) .25 =$ .6 lbs.

Test Fuel Wt-lbs: Ideal 10.3 lbs. Range: 11.3 - 9.3 lbs. Actual: 10.7 lbs.

Test Fuel Size (pcs.)(.75 x 1.5 x 5" Flanges) 14 Pcs.

2 x 4's x	18 3/4 "	4 Pcs	10.7 lbs.	100 %
4 x 4's x	N/A "	N/A Pcs	N/A lbs.	N/A %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.7 - (10.7 \times .17752)}{2.2025} \times \frac{60}{280} =$ .856 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) $(19{,}140) \times \frac{63}{100} \times .856 =$ 10324.7 Est Heat Output (HO_E) BTU's/Hr

Comments: 240 = .999
195 = 1.229

Unit: HAUGHS S27X Run: 3 Date: 5/14/92

WOODSTOVE OPERATING DATA

FIRE STARTED: 0745 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges, then set to CLOSED at start of preburn.

SECONDARY AIR: N/A CAT BYPASS: N/A

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 13 sec.

TEST: Door Wide Open during loading 0 min 41 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of CLOSED .

SECONDARY AIR: N/A CAT BYPASS: N/A

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ________________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 10 or 18 inches.

1st warm up/preburn fuel charge (8.2 lbs) added at 0845 .

2nd warm up/preburn fuel charge (9.4 lbs) added at 0945 .

3rd warm up/preburn fuel charge (1.5 lbs) added at 1040 .

4th warm up/preburn fuel charge (________ lbs) added at __________ .

5th warm up/preburn fuel charge (________ lbs) added at __________ .

Unit: [illegible]
Run: 3
Date: 5/14/92
Technician: BN TK DK JS
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 70 °F

Correction Factor: 0

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes____. No ✓.
Time Test Fuel Moisture Readings taken at: 0930
Calibration Checks: X ✓ Y ✓ 12.0 12.3 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	4.0	4.0	4.5	4.5	4.0	4.0	4.167
2									
3									
4	2x4x8	P	18.0	19.6	18.0	19.6	18.5	20.1	19.767
5	2x4x8	P	18.0	19.6	18.0	19.6	19.0	20.7	19.967
6									39.733
7									
8									
9	2x4x18 3/4	T	19.5	21.3	19.5	21.3	19.0	20.7	21.100
10	2x4x18 3/4	T	20.0	21.8	21.0	22.9	21.0	22.9	22.533
11	2x4x18 3/4	T	19.5	21.3	18.5	20.1	18.5	20.1	20.500
12	2x4x18 3/4	T	20.0	21.8	21.5	23.5	19.5	21.3	22.200
13									86.333
14									
15									
16									
17									
18									
19	FEET	T	19.5	21.3	19.5	21.3	19.0	20.7	21.100
20									

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	4.167 %	19.867 %	21.583 % ✓
% Moisture - Wet Basis:	4.000 %	16.574 %	17.752 % ✓

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: [illegible]
Run#: 3
Date: 5/14/92
Technician: BN TK DK JS
WST2-form11-Rev 6/90

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Wood Piece: Nominal Dimensions: 2 x 4 x 3½

Depth (D): 3.91 cm

Width (W): 9.00 cm

Length (L): 8.30 cm
8.30 cm
8.30 cm
8.30 cm

Length $\bar{X}$ = 8.30 cm

Volume: 292.077 cm^3
(D X W X L)

MOISTURE: Room Temperature: 71 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	19.5	21.3 %
Bottom:	20.5	22.4 %
Side:	20.0	21.8 %
$\bar{X}$:		21.833 %

Avg % Moisture (Dry) 21.833 %
Aug % Moisture (Wet) 17.920 %

Scale: Leveled In ✓ Out ✓
Zeroed: In ✓ Out ✓

Wet Weight: 226.4 g Dry Weight: 191.63 g

% Moisture Dried Basis: 15.358 % ✓
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp	
Into Dryer	5/14/92	1000	246	°F
Out of Dryer	5/20/92	1445	209	°F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 191.63 g (dry wt) ÷ 292.077 cm^3 (volume) = .6561 g/cm^3 ✓

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ________ g

Wet Wt: ________ g ÷ ________ g = ________ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ________ g ÷ ________ g = ________ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ________ %
[1 - (Net Dry Wt - Net Wet Wt.)] X 100

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGHS S270 Serus Date: 5/14/92
Run: 3
Page: 1 of 3
Technician(s): BN, JS, TK, DK

306.7

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 V.	1 CO_2 %CO_2	2 O_2 V.	2 O_2 %O_2	2 Tel	3 CO V.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	4 SO_2 PPM	Static Press.	Comm
0 / 1115	317.4	10.7	Ø	.120	3.0	.664	16.8	16.8	.076	.77	3.9	122	159	11.5	131	270	.23	575	-.038	Flow
05 / 20	317.4	16.7	Ø	.147	3.7	.650	16.5	16.5	.064	.65	5.7	129	175	13.5	139	336	.16	400	-.042	SO_2
10 / 25	317.2	10.5	.2	.079	2.0	.719	18.2	18.2	.062	.63	3.2	129	157	13.5	133	231	.26	650	-.040	CO_2
15 / 30	316.9	10.2	.3	.118	3.0	.679	17.2	17.2	.054	.55	5.4	125	150	13.0	130	221	.25	625	-.038	O_2
20 / 35	316.7	10.0	.2	.123	3.1	.676	17.1	17.1	.066	.67	4.6	121	145	11.2	127	214	.26	650	-.037	CO
25 / 40	316.3	9.6	.4	.225	5.6	.580	14.7	14.7	.071	.72	7.8	126	154	13.2	135	272	.23	575	-.035	
30 / 45	315.9	9.2	.4	.240	6.0	.563	14.3	14.3	.058	.59	10.1	125	154	13.0	135	284	.22	550	-.046	
35 / 50	315.4	8.7	.5	.247	6.1	.567	14.4	14.4	.071	.72	8.5	126	153	13.2	135	274	.22	550	-.046	
40 / 55	315.0	8.3	.4	.297	7.4	.503	12.7	12.7	.044	.44	16.8	126	158	13.2	138	317	.21	525	-.049	
45 / 1200	314.5	7.8	.5	.281	6.0	.535	13.5	13.5	.037	.37	18.9	124	158	12.5	136	315	.19	475	-.052	
50 / 05	314.1	7.4	.4	.314	7.8	.498	12.6	12.6	.031	.31	25.2	124	160	12.5	136	327	.19	475	-.052	
55 / 10	313.6	6.9	.5	.385	9.6	.433	10.9	10.9	.024	.24	39.8	126	164	13.0	138	342	.18	450	-.053	
																3403			-.528	Flow
60 / 15	313.0	6.3	.6	.406	10.1	.425	10.7	10.7	.015	.15	67.1	127	165	13.3	139	346	.18	450	-.054	SO_2
65 / 20	312.5	5.8	.5	.405	10.0	.415	10.5	10.5	.023	.23	43.7	126	166	13.0	139	348	.19	475	-.054	CO_2
70 / 25	312.1	5.4	.4	.418	10.4	.404	10.2	10.2	.026	.26	39.9	126	166	13.0	139	353	.19	475	-.055	O_2
75 / 30	311.6	4.9	.5	.429	10.6	.399	10.1	10.1	.023	.23	46.2	124	162	12.5	138	355	.18	450	-.056	CO
80 / 35	311.0	4.3	.6	.436	10.8	.385	9.7	9.7	.029	.29	37.3	119	151	11.2	136	355	.18	450	-.055	
85 / 40	310.5	3.8	.5	.395	9.8	.423	10.7	10.7	.028	.28	35.0	115	143	9.1	131	343	.18	450	-.054	
90 / 45	310.2	3.5	.3	.381	9.5	.429	10.8	10.8	.033	.33	28.6	111	138	8.1	129	329	.19	475	-.052	
95 / 50	309.8	3.1	.4	.396	9.8	.419	10.6	10.6	.029	.29	33.9	110	136	7.7	127	327	.19	475	-.052	
100 / 55	309.5	2.8	.3	.353	8.8	.459	11.6	11.6	.028	.28	31.3	108	137	7.3	126	313	.19	475	-.049	
105 / 1300	309.2	2.5	.3	.321	8.0	.485	12.3	12.3	.037	.37	21.5	107	137	7.0	124	298	.20	500	-.047	
110 / 05	309.1	2.4	.1	.304	7.6	.499	12.6	12.6	.043	.43	17.6	106	139	6.7	121	288	.21	525	-.045	
115 / 1310	308.9	2.2	.2	.300	7.5	.504	12.8	12.8	.047	.47	15.9	106	139	6.7	120	285	.20	500	-.044	
																3940			-.617	
																7343			-1.145	

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGHS S270 SERIES Date: 5/14/92
Run: 3 Technician(s): BN, JS, TK, DK
Page: 2 of 3

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 V.	%CO_2	2 O_2 V.	%O_2	Tel	3 CO V.	%CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	PPM	Static Press.	Comm
	306.7																			
120 / 1315	308.7	2.0	.2	.288	7.2	.512	13.0	13.0	.061	.62	11.5	106	141	6.7	120	285	.21	525	-.044	Flow
125 / 20	308.6	1.9	.1	.223	5.6	.562	14.2	14.2	.123	1.25	4.4	105	138	6.4	119	266	.22	550	-.042	SO_2
130 / 25	308.5	1.8	.1	.193	4.8	.576	14.6	14.6	.167	1.70	2.8	107	139	7.0	119	249	.24	600	-.039	CO_2
135 / 30	308.4	1.7	.1	.183	4.6	.583	14.8	14.8	.183	1.86	2.5	108	139	7.3	118	239	.24	600	-.036	O_2
140 / 35	308.3	1.6	.1	.175	4.4	.592	15.0	15.0	.184	1.87	2.3	109	138	7.5	118	232	.24	600	-.036	CO
145 / 40	308.2	1.5	.1	.165	4.1	.602	15.3	15.3	.178	1.81	2.3	109	137	7.5	118	225	.24	600	-.034	
150 / 45	308.1	1.4	.1	.157	3.9	.609	15.4	15.4	.183	1.86	2.1	109	136	7.5	118	218	.25	625	-.033	
155 / 50	308.0	1.3	.1	.151	3.8	.616	15.6	15.6	.180	1.83	2.1	109	135	7.5	117	214	.25	625	-.032	
160 / 55	307.9	1.2	.1	.143	3.6	.624	15.8	15.8	.174	1.77	2.0	109	134	7.5	117	207	.25	625	-.031	
165 / 1400	307.9	1.2	Ø	.138	3.5	.631	16.0	16.0	.169	1.72	2.0	108	132	7.3	116	203	.25	625	-.030	
170 / 05	307.8	1.1	.1	.126	3.2	.645	16.3	16.3	.157	1.60	2.0	108	131	7.3	116	198	.25	625	-.029	
175 / 10	307.8	1.1	Ø	.122	3.1	.650	16.5	16.5	.155	1.58	1.9	107	129	7.2	115	192	.25	625	-.027	
																2728			-.413	Flo
180 / 15	307.7	1.0	.1	.113	2.8	.658	16.7	16.7	.149	1.51	1.9	106	127	7.1	114	187	.26	650	-.027	SO_2
185 / 20	307.7	1.0	Ø	.107	2.7	.666	16.9	16.9	.147	1.49	1.8	105	125	6.8	111	183	.26	650	-.026	CO_2
190 / 25	307.7	1.0	Ø	.108	2.7	.663	16.8	16.8	.154	1.57	1.7	104	124	6.6	110	180	.26	650	-.025	O_2
195 / 30	307.6	.9	.1	.108	2.7	.663	16.8	16.8	.156	1.59	1.7	104	123	6.6	110	178	.27	675	-.024	CO
200 / 35	307.6	.9	Ø	.108	2.7	.663	16.8	16.8	.160	1.63	1.7	104	123	6.6	110	176	.27	675	-.024	
205 / 40	307.6	.9	Ø	.107	2.7	.663	16.8	16.8	.167	1.70	1.6	103	122	6.5	110	173	.28	700	-.023	
210 / 45	307.5	.8	.1	.106	2.7	.664	16.8	16.8	.166	1.69	1.6	103	121	6.5	110	171	.28	700	-.023	
215 / 50	307.5	.8	Ø	.108	2.7	.660	16.7	16.7	.175	1.78	1.5	102	120	6.3	109	169	.28	700	-.022	
220 / 55	307.4	.7	.1	.141	3.5	.639	16.2	16.2	.131	1.33	2.7	102	120	6.3	109	168	.28	700	-.021	
225 / 1500	307.3	.6	.1	.168	4.2	.615	15.6	15.6	.126	1.28	3.3	103	120	6.5	110	171	.28	700	-.022	
230 / 05	307.3	.6	Ø	.166	4.1	.619	15.7	15.7	.125	1.27	3.3	103	120	6.5	110	172	.28	700	-.021	
235 / 1510	307.2	.5	.1	.157	3.9	.624	15.8	15.8	.137	1.39	2.8	103	121	6.5	110	174	.28	700	-.022	
																2102			-.280	
																12173			-1.938	

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGHS S270 SERIES Date: 5/14/92
Run: 3 Technician(s): BN, JS, TK
Page: 3 of 3 DK

306.7

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 V.	1 CO_2 %CO_2	2 O_2 V.	2 O_2 %O_2	Tel	3 CO V.	3 CO %CO	Bal	T/C(1) Wet Bulb	T/C(2) Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	4 SO_2 PPM	Static Press.	Comm
240 / 1515	307.2	.5	Ø	.158	4.0	.625	15.8	15.8	.127	1.29	3.1	103	121	6.5	110	174	.28	700	-.023	Flow
245 / 20	307.1	.4	.1	.155	3.9	.629	15.9	15.9	.130	1.32	2.9	103	121	6.5	110	174	.28	700	-.023	SO_2
250 / 25	307.1	.4	Ø	.153	3.8	.628	15.9	15.9	.137	1.39	2.8	103	121	6.5	110	176	.28	700	-.023	CO_2
255 / 30	307.0	.3	.1	.148	3.7	.631	16.0	16.0	.148	1.50	2.5	103	122	6.5	110	177	.28	700	-.023	O_2
260 / 35	306.9	.2	.1	.140	3.5	.638	16.2	16.2	.153	1.55	2.3	103	122	6.5	110	178	.28	700	-.023	CO
265 / 40	306.9	.2	Ø	.138	3.5	.642	16.3	16.3	.145	1.47	2.4	103	122	6.5	110	176	.28	700	-.023	
270 / 45	306.8	.1	.1	.132	3.3	.648	16.4	16.4	.145	1.47	2.3	103	122	6.5	110	177	.28	700	-.024	
275 / 50	306.8	.1	Ø	.125	3.1	.652	16.5	16.5	.153	1.55	2.0	103	122	6.5	110	176	.28	700	-.023	
280 / 55	306.7	Ø	.1	.120	3.0	.655	16.6	16.6	.158	1.61	1.9	103	121	6.5	110	176	.28	700	-.022	
																1584			-.207	
																13757			-2.045	57
																241			-.036	
																				Flow
																				SO_2
																				CO_2
																				O_2
																				CO

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

+1#

Unit: HAUGHS S270 SERIES Date: 5/14/92
Run: 3 Technician(s): BN, JS, TK, DK
Page: 1 of 1

306.9-306.5

			T/C#-3	4	5	6	7	8	9	10	11		
Minute Time	Scale Weight	Burn Rate	Stack	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Static	Comments
0 / 1010	307.9	Ø	573	665	511	363	367	457	1263	1584	78	-.073	Primary Air Set at CLOSED
05 / 15	307.3	.6	400	587	515	341	371	455	1221	1356	78	-.064	Secondary Air Set at NA
10 / 20	307.0	.3	353	519	506	324	381	454	1167	1188	78	-.057	Fan: ON HIGH
15 / 25	306.9	.1	309	440	488	309	367	453	1103	1024	78	-.052	
20 / 30	306.8	.1	286	390	469	298	349	450	.1055	961	77	-.042	
25 / 35	306.7	.1	272	362	453	285	337	447	1026	923	77	-.038	376.8
30 / 40	308.1	.1	291	333	433	271	326	444	978	792	78	-.034	+1.5# 1040 Pumps turned on at: 1045
35 / 45	307.8	.3	299	362	417	262	311	444	941	1176	78	-.049	
40 / 50	307.5	.3	294	385	403	253	305	440	932	1081	78	-.048	
45 / 55	307.3	.2	282	375	393	248	303	435	916	997	78	-.046	Check WB/DB: 129/166
50 / 1100	307.1	.2	274	359	383	241	292	426	903	1021	78	-.044	
55 / 05	306.9	.2	270	347	375	237	282	424	896	1019	78	-.043	
60 / 10	306.8	.1	265	343	371	234	285	419	891	986	77	-.042	
65 / 15	306.7	.1	270	320	367	228	281	414	824	716	77	-.038	322.0

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS SJ70 Sano Date: 5/14/92
Run: 3 Technician(s): BN, JS, TK, DK
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T/C# Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tube Furnace	13 Sample Box	14 Impinger Out	15 C. Gas Box	16 C. Gas Impinger	17 SO_2 Impinger
0 / 1115	320	367	228	281	414	824	716	77	1448	248	34	241	35	36
05 / 20	255	352	322	280	411	1117	357	77	1448	248	34	241	35	36
10 / 25	243	333	321	275	409	610	545	77	1447	248	34	241	35	36
15 / 30	231	315	313	270	401	568	559	77	1446	248	34	241	35	36
20 / 35	220	297	307	257	394	532	599	77	1445	248	34	241	35	36
25 / 40	230	283	305	246	384	526	883	77	1444	248	34	241	35	36
30 / 45	247	273	308	243	376	527	1001	77	1443	248	34	241	35	36
35 / 50	282	266	203	232	365	531	929	76	1442	248	34	241	35	36
40 / 55	294	266	191	231	358	571	1268	76	1441	248	34	241	35	36
45 / 1200	320	265	189	234	351	592	1029	77	1441	248	34	241	35	36
50 / 05	330	265	188	238	344	631	1138	77	1441	248	34	241	35	36
55 / 10	350	269	193	248	338	696	1251	77	1441	248	34	241	35	36
	3322	3551	3068	3035	4545	7725	10275	922						
60 / 15	400	289	203	256	333	764	1224	78	1441	248	34	242	35	36
65 / 20	406	307	214	272	329	804	1262	78	1441	248	34	242	35	36
70 / 25	413	318	222	271	327	826	1284	79	1441	248	34	243	35	36
75 / 30	420	332	233	274	326	858	1254	79	1441	248	34	243	35	36
80 / 35	426	347	244	287	325	905	1289	79	1441	248	34	244	35	36
85 / 40	426	358	258	295	325	952	1220	79	1441	248	34	245	35	36
90 / 45	415	364	263	297	325	996	1229	79	1441	248	34	246	35	36
95 / 50	409	368	265	306	325	1016	1254	79	1441	248	34	247	35	36
100 / 55	410	374	271	305	326	1029	1118	79	1441	248	34	248	35	36
105 / 1300	402	383	268	313	329	958	1077	79	1441	248	34	248	35	36
110 / 05	381	390	262	307	330	935	1016	79	1442	248	35	248	35	36
115 / 1310	370	395	255	310	332	918	955	79	1444	248	35	248	35	36
	4878	4225	2958	3493	3932	10961	14182	946						
	8200	7776	6026	6528	8477	18686	24457	1868						

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S270 SERIES Date: 5/14/92
Run: 3 Technician(s): BN, JS, TK
Page: 2 of 3 OK

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalytic	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
120 / 1315	367	400	248	301	336	929	873	80	1448	248	35	248	35	36
125 / 20	345	401	241	296	339	914	828	80	1448	248	35	248	35	36
130 / 25	317	396	230	289	339	891	794	80	1448	248	35	247	35	36
135 / 30	296	387	222	284	341	870	771	80	1448	248	35	247	35	36
140 / 35	282	378	214	278	340	861	749	80	1448	248	35	247	35	36
145 / 40	269	367	208	273	340	852	725	80	1448	248	35	247	35	36
150 / 45	258	357	203	267	340	816	699	80	1448	248	35	248	35	36
155 / 50	251	349	200	265	340	800	682	80	1448	248	35	248	35	36
160 / 55	244	341	195	260	339	782	660	80	1448	248	35	248	35	36
165 / 1400	236	334	192	257	336	764	639	79	1448	248	35	248	35	36
170 / 05	227	328	189	252	335	747	598	79	1448	248	35	248	35	36
175 / 10	217	318	187	238	333	726	586	79	1447	247	35	248	35	36
	3309	4356	2529	3260	4058	9952	8604	957						
180 / 15	211	311	183	234	330	711	569	79	1447	247	35	248	35	36
185 / 20	203	301	178	229	326	690	549	79	1448	247	35	248	35	36
190 / 25	198	294	176	223	323	676	535	79	1448	246	35	248	35	36
195 / 30	195	289	174	220	321	663	526	78	1448	247	35	248	35	36
200 / 35	191	284	173	219	319	654	520	78	1447	246	35	248	35	36
205 / 40	186	277	171	213	315	640	512	78	1448	246	35	248	35	36
210 / 45	184	274	169	214	313	633	508	78	1448	246	35	248	35	36
215 / 50	181	270	168	212	310	623	505	78	1448	246	35	248	35	36
220 / 55	180	267	169	206	308	624	525	79	1448	246	35	247	35	36
225 / 1500	181	265	176	203	304	636	557	79	1447	246	35	247	35	36
230 / 05	184	266	184	198	302	641	565	79	1446	246	35	247	35	36
235 / 1510	187	268	187	198	300	639	567	79	1444	246	35	247	35	36
	2281	3366	2108	2569	3771	7830	6438	943						
	13790	15498	10663	12357	16306	36468	39499	3768						

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S270 SERIES Date: 5/14/92
Run: 3 Technician(s): BN, JS, TK
Page: 3 of 3 DK

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16 322.0	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalytic	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
240 / 1515	188	269	188	195	298	625	571	79	1444	246	35	247	35	36
245 / 20	189	272	190	195	296	617	569	78	1446	247	35	247	35	36
250 / 25	190	273	192	194	296	615	570	78	1447	247	35	247	35	36
255 / 30	192	275	192	192	295	608	564	78	1447	247	35	247	35	36
260 / 35	193	277	192	192	294	600	551	78	1447	247	35	247	35	36
265 / 40	193	280	190	193	293	592	559	78	1447	247	35	247	35	36
270 / 45	193	282	188	190	292	581	556	78	1447	247	35	247	35	36
275 / 50	192	285	186	188	290	569	548	78	1447	247	35	247	35	36
280 / 55	191	285	183	188	289	562	542	78	1447	247	35	247	35	36
	1721	2498	1701	1727	2643	5369	5030	703						
	15511	17996	12364	14084	18949	41837	44529	4471						
	272	316	217	247	332	734	781	78						
								ΔT	START	322.0				
									STOP	227.2				
										-94.8				

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/14/92 Analyte: CO_2 (15-1)

Source: HAUGH'S S270 SERIES Run #: 3

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.6 % CO_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ______

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: DK Time: 1035 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	49.9	.499	12.363	-.237	-1.879

Comments:

Post Run Audit: By: DK Time: 1610 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	49.9	.499	12.363	-.237	-1.879

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/14/92 Analyte: O_2 (15-2)

Source: HAUGHS S270 Series Run #: 3

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.4 % O_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = ± 2.5% of 25.0% O_2 = ± 0.625% O_2

Pre Run Audit: By: DK Time: 1045 Temp: 78 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.003	-.028	-.028	-.114
Span	12.4	.496	12.4	12.4	.496	12.548	.148	1.192

Comments: Teledyne #2 Cyl % ___ Exp % ___ Act % ___ Adj to ___ ± Δ % ___

Post Run Audit: By: DK Time: 1620 Temp.: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.002	-.054	-.054	-.216
Span	12.4	.496	12.4	12.4	.493	12.471	.071	.575

Comments: Teledyne #2 Cyl % ___ Exp % ___ Act % ___ Adj to ___ ± Δ % ___

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/14/92 Analyte: CO (15-3)

Source: HAUGHS S270 SERIES Run #: 3

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 4.96 % CO Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: DK Time: 1050 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.3	.493	5.018	-.058	1.174

Comments:

Post Run Audit: By: DK Time: 1625 Temp.: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.2	.002	.016	.016	.160
Span	49.6	.496	4.96	48.8	.488	4.967	.007	.147

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/14/92 Analyte: SO_2 (15-4)

Source: HAUGHS S270 SERIES Run #: 3

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: AL2892 Conc. 1232 ppm SO_2 Cyl Press: 450 psi

Certified by: LIQUID AIR Date: 9/24/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ______

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: DK Time: 1030 Temp: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	+ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.2	.002	8.432	8.432	.337
Span	49.3	.493	1232	49.3	.493	1234.000	2.000	.162

Comments:

Post Run Audit: By: DK Time: 1605 Temp: 78 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	+ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.1	.001	5.936	5.936	.237
Span	49.3	.493	1232	49.1	.491	1229.008	-2.992	-.243

Comments:

+ Conc. Difference = Act ppm - Exp (Std) ppm

Zero % Differece = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

Run: 3
Date: 5/14/92
Technicians: BN TK DK JS
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 61.2 °F T/C#30: 63.3 °F

Thermocouple Check (at ambient): T/C#1: 64.1 °F; T/C#2: 64.3 °F;

T/C #3: 64.5 °F;	T/C #4: 63.0 °F;	T/C #5: 62.2 °F;
T/C #6: 62.2 °F;	T/C #7: 62.0 °F;	T/C #8: 61.6 °F;
T/C #9: 63.0 °F;	T/C #10: 63.1 °F;	T/C #11: 61.2 °F;
T/C #12: 65.5 °F;	T/C #13: 64.4 °F;	T/C #14: 64.9 °F;
T/C #15: 64.6 °F;	T/C #16: 59.3 °F;	T/C #17: 61.4 °F;
T/C #18: 68.1 °F;	T/C #19: ____ °F;	T/C #20: ____ °F;
T/C #21: ____ °F;	T/C #22: ____ °F;	T/C #23: ____ °F;
T/C #24: ____ °F;	T/C #25: ____ °F;	T/C #26: ____ °F;

Comments: ____

Thermocouple Readout:
Pretest Zero/Span Check and Calibration:

Zero (0°F): .2 °F	Adj to: 0 °F	Post Test Check Zero (0°F): .9 °F	% Difference .045
Span (2000°F): 1999.7 °F	Adj to: 2000. °F	Span (2000°F): 2005.0 °F	.250

(Allowable % Difference = 1.5%. Use formulas on Woodstove Data Sheet #15 to calculate % Difference)

Thermocouple Readout Pretest Linearity Check

0°F = 0.0 °F;	200°F = 201.1 °F;	400°F = 399.6 °F;
600°F = 601.2 °F;	800°F = 801.2 °F;	1000°F = 1000.3 °F;
1200°F = 1197.8 °F;	1400°F = 1398.8 °F;	1600°F = 1599.1 °F
1800°F = 1799.6 °F;	2000°F = 2000.0 °F	

Tracer Gas (SO_2) Injection Train Leak Check:	Pre ✓	Post ✓
Combustion Gas (CO_2, O_2, CO) Train Leak Check:	Pre ✓	Post ✓
Tracer Gas (SO_2) Analyzer Train Leak Check:	Pre ✓	Post ✓
Draft (Static) Guage Zero Check:	Pre ✓	Post ✓

Scale Check Pre (Wt, #'s): 315.2 - 305.2 = 10
Post (Wt, #'s): 316.0 306.5 = 10.0

Stack cleaned prior to the run: Yes ____ No ✓.

CLIENT : HAUGHS PRODUCTS TEST No. : 2

MODEL: S-27X DATE: 5/13/92

****

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	443.500	0.150	80	1.14	4.60	625
5	445.000	0.370	80	0.66	2.50	400
10	447.377	0.150	81	0.55	2.80	625
15	448.906	0.140	82	0.60	2.80	650
20	450.382	0.140	82	0.67	3.00	650
25	451.858	0.150	83	0.63	3.80	625
30	453.398	0.140	83	0.72	3.80	650
35	454.879	0.140	84	0.72	3.90	650
40	456.365	0.160	85	0.67	5.90	600
45	457.981	0.190	85	0.71	6.30	550
50	459.744	0.210	85	0.73	8.00	525
55	461.591	0.210	86	0.68	8.60	525
60	463.444	0.230	86	0.53	9.70	500
65	465.391	0.230	86	0.39	9.90	500
70	467.338	0.260	87	0.37	10.00	475
75	469.395	0.260	87	0.37	9.70	475
80	471.452	0.260	88	0.32	10.20	475
85	473.516	0.260	88	0.30	10.00	475
90	475.581	0.260	88	0.27	10.10	475
95	477.645	0.260	89	0.25	9.70	475
100	479.717	0.260	88	0.28	9.90	475
105	481.781	0.260	89	0.35	8.50	475
110	483.853	0.230	89	0.57	7.60	500
115	485.822	0.230	89	0.73	7.00	500
120	487.790	0.230	89	0.76	6.60	500
125	489.760	0.230	89	0.82	6.30	500
130	491.730	0.230	89	0.53	7.10	500
135	493.700	0.230	88	1.08	5.90	500
140	495.663	0.230	88	1.13	5.60	500
145	497.625	0.230	88	0.99	5.80	500
150	499.588	0.210	88	1.47	5.20	525
155	501.457	0.210	88	1.40	5.10	525
160	503.327	0.210	88	1.40	5.00	525
165	505.196	0.210	88	1.52	4.70	525
170	507.066	0.210	88	1.62	4.60	525
175	508.935	0.210	88	1.62	4.40	525
180	510.805	0.210	88	1.64	4.00	525
185	512.675	0.210	88	1.64	4.00	525
190	514.546	0.210	87	1.74	3.70	525
195	516.410	0.210	87	1.69	3.50	525
200	518.274	0.190	87	1.62	3.50	550
205	520.053	0.190	87	1.66	3.40	550
210	521.832	0.190	87	1.64	3.40	550
215	523.612	0.190	87	1.47	3.40	550
220	525.391	0.190	87	1.42	3.40	550
225	527.170	0.170	87	1.38	3.30	575

230	528.872	0.170	87	1.44	3.20	575
235			87			

TABLE 2 ----- FIELD DATA

CLIENT : HAUGHS PRODUCTS TEST No. : 2

MODEL: S-27X DATE: 5/13/92

****

METER CAL. FACTOR (Y) -------	1.066	Wt. WOOD BURNED(LB) -------	10.6 Lbs
BAROMETRIC PRESS.(Pb) -------	30.11 in Hg	WET,FUEL MOISTURE % -------	18.279 %
LEAK RATE POST (Lp) -------	0.006 cfm	Wt. PART. COLLECTED -------	1.1913 g
WATER VOL. (V1c) -------	135 Ml	METER VOLUME Vm -------	85.372 mcf
TEST TIME (MIN) -------	230 min	HC MOLE FRACTION -------	0.0132

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : HAUGHS PRODUCTS TEST No. : 2

MODEL: S-27X DATE: 5/13/92

****

AVG DELTA H	-------	0.21 in H_2O	AVG PRCNT CO	-------	0.96	%
AVG METER TEMP. Tm	-------	87 deg F	AVG PRCNT CO_2	-------	5.82	%
AVG PPM SO_2	-------	532 PPM				

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS | TEST No. : 2

MODEL: S-27X | DATE: 5/13/92

****

STD SAMPLE VOL. Vm(std) ------	88.53	dscf	STACK GAS FLOW Qsd -------	456.275 & 7.60	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) -----	6.354	scf	PARTICULATE CONCTRT. C s ------	0.0135	g/dscf
PRCNT MSTR Bws -------	6.70	%	PARTC.EMISS. RATE E -------	6.14	g/Hr
BURN RATE BR -------	1.03	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.52	Lb-mole/Lb
CO EMISSION RATE -------	145.94 & 142.24	g/Hr & g/Kgdry fuel	PART.EMISS. RATE ------	5.98	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS TEST No. : 2

S-27X DATE: 5/13/92

****

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE		
5	983.9	97		100		
10	997.5	99				
15	1000.1	99				
20	1003.1	99				
25	1002.2	99				
30	1004.6	99				
35	1003.8	99				
40	1005.3	99				
45	1008.3	100				
50	1008.4	100				
55	1007.6	100				
60	1009.9	100				
65	1010.6	100				
70	1009.7	100				
75	1012.6	100				
80	1011.7	100				
85	1014.2	100				
90	1014.7	100				
95	1013.2	100				
100	1017.2	101				
105	1013.2	100				
110	1016.2	100				
115	1016.5	100				
120	1016.0	100				
125	1017.0	101				
130	1017.0	101				
135	1017.9	101				
140	1015.2	100				
145	1014.7	100				
150	1015.2	100				
155	1014.9	100				
160	1015.4	100				
165	1014.9	100				
170	1015.4	100				
175	1014.9	100				
180	1015.4	100				
185	1015.4	100				
190	1016.9	101				
195	1014.0	100				
200	1014.0	100				
205	1013.8	100				
210	1013.8	100				
215	1014.4	100				
220	1013.8	100				
225	1013.8	100				
230	1014.0	100				

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client Haughs Products

Client Address 10 Atlas Court
Brampton, Ontario, Canada L6T 5C1

Client Phone 416-792-8000

Project No. ______ Model No. S 210X

Run No. 2 Date of Test 5/13/92 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon X Colorado ______ EPA X

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) 1.006 Max (>1.9 Kg/Hr) ______

Fuel % Moisture (dry) 22.367 %(wet) 18.279 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.041 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.11 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 79 oF
(00) (Data Sheet #14)

Flue Gas Moisture 6.7018 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.1 %
(0.00) (Data Sheet #8)

Stove Weight 237 lbs
(000) (Data Sheet #8)

Stove Temperature Change -33 oF
(000) (Data Sheet #14)

Particulate Emission .2078 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) ______ BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 10.6 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch 1.1913 g
(0.0000) (Data Sheet #6)

H_2O Captured 135.0 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 85.372 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 4J-1.066 Post Test Leak Rate .006 CFM

Meter Box Data Sheet Page # 2

Page 1 of 2

Meter Box 45 Y Factor 1.066

Unit: HAUGHS 5D7X

Run: 2 Date: 5/13/92

Leak Checks: 15 " Hg @ .002 cfm
16.0 " Hg @ .006 cfm
____ " Hg @ ____ cfm
____ " Hg @ ____ cfm

Operator(s): JS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1500

ROTO PRESS: .32			Sampling Ratio : 185 : 1				BAROMETER: 30.14		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1410	443.500		5.602	.15	80	625	77	0
05	15	445.000		8.753	.37	80	400	77	5
10	20	447.377		5.602	.15	81	625	77	1.5
15	25	448.906		5.396	.14	82	650	77	.5
20	30	450.382		5.396	.14	82	650	77	0
25	35	451.858		5.602	.15	83	625	77	0
30	40	453.398		5.386	.14	83	650	77	5
35	45	454.879		5.386	.14	84	650	77	0
40	50	456.365		5.804	.16	85	600	78	0
45	55	457.981		6.354	.19	85	550	78	5
50	1500	459.744		6.656	.21	85	525	78	1.0
55	5	461.591		6.656	.21	86	525	78	1.5
ROTO PRESS: .32			TOTALS :	72.593	2.15	996	BAROMETER: 30.12		
60	10	463.444		6.985	.23	86	500	78	1.5
65	15	465.391		6.985	.23	86	500	78	1.5
70	20	467.338		7.352	.26	87	475	78	1.5
75	25	469.395		7.352	.26	87	475	78	2.0
80	30	471.452		7.352	.26	88	475	78	2.0
85	35	473.516		7.352	.26	88	475	78	2.0
90	40	475.591		7.352	.26	88	475	78	2.0
95	45	477.645		7.352	.26	89	475	78	2.0
100	50	479.717		7.352	.26	88	475	78	2.0
105	55	481.781		7.352	.26	89	475	78	2.0
110	1600	483.853		6.985	.23	89	500	78	2.0
115	5	485.822		6.985	.23	89	500	78	2.0
			TOTALS:	86.756	3.00	1054	MAX VACC =		
TOTAL CU FT			TOTALS:	159.349	5.15	2050	AV BP:		

60.26

Meter Box Data Sheet Page # 2

Page 2 of 2

Meter Box 45 Y Factor 1.066

Unit: HAUGHS SO2X

Run: 2 Date: 5/13/92

Leak Checks: 15 " Hg @ .002 cfm
16.0 " Hg @ .006 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): JJ

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1500

ROTO PRESS: .32			Sampling Ratio : 185 : 1				BAROMETER: 30.10		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	10	487.790		6.980	.23	89	500	78	2.0
125	15	489.760		6.980	.23	89	500	78	2.0
130	20	491.730		6.980	.23	89	500	78	2.0
135	25	493.700		6.980	.23	88	500	78	2.0
140	30	495.663		6.980	.23	88	500	78	2.0
145	35	497.625		6.980	.23	88	500	78	2.0
150	40	499.588		6.648	.21	88	505	78	2.0
155	45	501.457		6.648	.21	88	505	78	1.5
160	50	503.327		6.648	.21	88	505	78	1.5
165	55	505.196		6.648	.21	88	505	78	1.5
170	1700	507.066		6.648	.21	88	505	78	1.5
175	5	508.935		6.648	.21	88	505	78	1.5
ROTO PRESS: .32			TOTALS :	81.768	2.64	1059	BAROMETER: 30.08		
180	10	510.805		6.643	.21	88	505	78	1.5
185	15	512.675		6.643	.21	88	505	78	1.5
190	20	514.546		6.643	.21	87	505	78	1.5
195	25	516.410		6.643	.21	87	505	78	1.5
200	30	518.274		6.341	.19	87	550	78	1.5
205	35	520.053		6.341	.19	87	550	78	1.5
210	40	521.832		6.341	.19	87	550	78	1.5
215	45	523.612		6.341	.19	87	550	78	1.5
220	50	525.391		6.341	.19	87	550	78	1.5
225	55	527.170		6.066	.17	87	575	78	1.5
230	1800	528.872		6.066	.17	87	575	78	1.5
235	5			70.409	2.13	959			
			TOTALS:	311.576	9.92	4068	MAX VACC =		2.0
TOTAL CU FT		85.372	TOTALS:	6.698	.211	87	AV BP: 30.11		
						547			

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance Level	Balance Zeroed
Initial:	✓	✓
Final:	✓	✓

Unit: HAUGHS S27Y
Run: 2
Date: 5/13/92
Technician(s): Initial: BJ
Final: SS
Approved By: TK

IMPINGER #1

Final Weight 682.4 grams
Initial Weight 574.4 grams
Net 108.0 ✓ grams

IMPINGER #2

Final Weight 579.9 grams
Initial Weight 572.0 grams
Net 7.9 ✓ grams

IMPINGER #3

Final Weight 495.6 grams
Initial Weight 494.5 grams
Net 1.1 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 845.9 grams
Initial Weight 827.9 grams
Net 18.0 ✓ grams

TOTAL MASS OF H_2O CAPTURED 135.0 ✓ grams

Scale Check: 295.0g = 295.00 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 261 F
#
Back Half Filter # 261 B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ✓ Back Half ____

Manufacturer: S&S Size: 110 mm Lot.No.: ZB882 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261 F	0.6987	3/20	1608	DK	.6941	3/23	1300	[illegible]	[illegible]	RN	[illegible]	
262 F	0.7014		1610		.7017		1301					
263 F	0.6988		1612		.6985		1302					
264 F	0.6893		1614		.6894		1303					
265 F	0.6912		1616		.6917		1304					
266 F	0.6934		1618		.6936		1305					
267 F	0.6936		1620		.6937		1306					
268 F	0.7015		1622		.7010		1307					
269 F	0.6933		1624		.6936		1308					
270 F	0.6965		1626		.6965		1309					
271 F	0.6953	3/20	1628	DK	.6951		1330					
272 F	0.7002		1630		.7005		1331					
273 F	0.6978		1632		.6980		1332					
274 F	0.6900		1634		.6903		1333					
275 F	0.6975		1636		.6975		1334					
276 F	0.6978		1638		.6978		1338					
277 F	0.6975		1640		.6974		1336					
278 F	0.6992		1642		.6991		1337					
279 F	0.6901		1644		.6900		1338					
280 F	0.6994		1646		.6997		1339					

Checked by [illegible] Date: 3/24/91 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1606	DK
59	73	43	3/23	1300	[illegible]

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ______ Back Half ✓

Manufacturer: S&S Size: 8.2 cm Lot.No.: ZB 901 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261B	0.3846	3/20	1526	DK	.3849	3/23	1341	[illegible]	HALVALS END			
262B	0.3822		1528		.3827		1342					
263B	0.3805		1530		.3810		1343					
264B	0.3811		1532		.3812		1344					
265B	0.3821		1534		.3824		1345					
266B	0.3822		1536		.3824		1346					
267B	0.3817		1538		.3822		1347					
268B	0.3772		1540		.3770		1348					
269B	0.3875		1542		.3870		1349					
270B	0.3813		1544		.3809		1350					
271B	0.3884	3/20	1546	DK	.3882		1351					
272B	0.3818		1548		.3813		1352					
273B	0.3825		1550		.3821		1353					
274B	0.3856		1552		.3853		1354					
275B	0.3832		1554		.3830		1355					
276B	0.3862		1556		.3864		1356					
277B	0.3836		1558		.3832		1357					
278B	0.3801		1600		.3804		1358					
279B	0.3827		1602		.3822		1359					
280B	0.3821		1604		.3818		1400					

Checked by [signature] Date: 3/24/92 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1524	DK
59	73	43	3/23	1340	[illegible]

WOODSTOVE DATA SHEET #4-2.

INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 4/17/92 Time: 1000 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
501	96.8870	4/20	1004	DK	96.8874	4/21	1332	[illegible]				
502	98.5625		1006		98.5630		1334					
503	91.2041		1008		91.2044		1336		HAWKINS RD			
504	95.0582		1010		95.0584		1338					
505	106.4506		1012		106.4504		1340					
506	94.1600	4/20	1014	DK	94.1604		1342					
507	88.9867		1016		88.9870		1344					
508	103.1077		1018		103.1077		1346					
509	95.7024		1020		95.7026		1348					
510	104.8758		1022		104.8757		1350					
511	107.7742	4/20	1024	DK	107.7745		1352					
512	106.3852		1026		106.3855		1354					
513	99.2412		1028		99.2417		1356					
514	108.6340		1030		108.6344		1358					
515	106.2259		1032		106.2264		1400					
516	105.6750	4/20	1034	DK	105.6745		1402					
517	94.7160		1036		94.7160		1404					
518	103.8296		1038		103.8300		1406					
519	100.0063		1040		100.0063		1408					
520	98.6266		1042		98.6267		1410					
521	97.7535	4/20	1044	DK	97.7537		1412					
522	103.9227		1046		103.9229		1416					
523	94.9397		1048		94.9402		1418					
524	106.8567		1050		106.8571		1420					
525	95.1170		1052		95.1173		1422					

Checked By: [signature] Date: 4/21/92 Time: 1415

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITION

WB	DB	%RH	Date	Time	By
59	72	46	4/20	1002	DK
60	74	44	4/21	1330	[illegible]

WST5-Form9,Pg1,Rev4/90
Unit HAUGHS SD7X
Run # 2
Date: 5/13/90

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
501		5/14	0900	DK	96.9931	5/15	1242	BD	96.9923	5/18	924	DK	96.9923	5/18	1514	[illegible]
502		5/15	0900	DK	98.8082	5/18	926	DK	98.8079	5/18	1516	[illegible]				
503		5/15	0900	DK	91.3306	5/18	928	DK	91.3307	5/18	1500	[illegible]				
504		5/14	1635	[illegible]	95.2141	5/18	930	DK	95.2144	5/18	1500	[illegible]				
505		5/14	1635	[illegible]	106.5290	5/18	932	DK	106.5291	5/19	1504	[illegible]				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
261F		5/13	1850	[illegible]	1.0143	5/14	1736	[illegible]	1.0135	5/15	1225	BN	1.0146	5/18	934	DK
					1.0146	5/18	1532	[illegible]								
261B		5/13	1850	[illegible]	.5528	5/14	1730	[illegible]	.5524	5/15	1220	BN				

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	5/14	1718	[illegible]	54	70	41
2	5/15	1200	BN	60	74	44
3	5/18	922	DK	58	71	45
4	5/18	1600	[illegible]	59	73	43
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WST7-Form1-Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 4/23/92

Through ____________

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9996	10.0000	0.9997	0.1001			DK	4/23	1600	70	56	41
99.9996	10.0000	.9997	.1000			JAO	4/24	1130	74	57	34
99.9996	10.0000	.9998	.1000			JAO	4/24	1830	70	57	44
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	.9998	.0999			JAO	4/28	1330	71	55	45
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			TK	4/30	0846	77	64	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	950	77	61	39
99.9997	9.9999	1.000	.1000			JAO	5/1	1500	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/4	930	78	62	40
100.0002	10.0002	1.0001	.1000			JAO	5/5	1010	75	60	41
100.0000	10.0001	1.0000	.1001			JAO	5/5	1505	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9997	10.0000	1.0001	.1000			JAO	5/6	1540	78	59	42
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			TK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	.1001			JAO	5/8	1105	65	54	48
99.9998	10.0001	.9999	.0999			JAO	5/8	1600	68	56	47
99.9996	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			TK	5/12	0900	74	60	44
99.9997	10.0001	1.0000	.0999			JAO	5/12	1315	74	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	950	74	59	40
100.0002	10.0002	1.0000	.1001			JAO	5/14	1636	70	56	41
99.9998	9.9999	.9997	.0999			JB	5/15	1200	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.000	.1001				5/18	1500	73	59	45

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 3/12

Through 4/23

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9998	10.0000	1.0000	0.0998			TK	3/12	1254	73	60	47
99.9995	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	.1000			RWD	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0002	10.0001	1.0000	0.1001			RWD	3/17	1607	71	59	46
99.9997	10.0001	1.0000	.1000			RWD	3/19	1715	74	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	.9999	0.0998			RWD	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9999	10.0001	1.0001	.1002			RWD	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3/26	1045	73	59	43
100.0001	9.9996	1.0000	.1001			RWD	3/27	1140	77	62	40
99.9997	9.9999	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9996	10.0000	1.0001	.1000			RWD	3/30	1500	71	57	41
99.9999	10.0004	1.0001	.1002			RWD	3/31	1016	73	59	43
100.0003	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9995	10.0000	1.0000	.1000			RWD	4/1	0900	73	59	43
99.9998	9.9997	0.9997	0.1000			DK	4/3	0900	72	59	46
99.9997	10.0001	0.9999	0.0999			DK	4/3	1630	70	58	48
99.9999	10.0001	0.9999	.0999			TK	4/6	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	56	41
99.9999	9.9998	0.9999	.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	.9999	.0998			RWD	4/8	1545	69	56	44
100.0000	9.9998	.9999	.0999			TK	4/9	1025	68	55	43
100.0000	10.0001	1.0000	.1000			RWD	4/10	0935	70	56	41
100.0000	9.9999	.9999	.0999			TK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	945	73	58	42
100.0002	10.0003	1.0001	.0998			RWD	4/14	1030	78	59	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	56	47
99.9997	9.9999	.9998	.0998			RWD	4/16	1006	70	58	42
100.0001	9.9999	1.0000	0.1001			DK	4/17	915	70	57	44
99.9996	9.9999	1.0000	.1000			RWD	4/17	1545	70	58	42
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0000	1.0002	.1001			RWD	4/21	1040	74	60	41
100.0000	10.0000	1.0000	0.0999			DK	4/22	900	73	59	43
99.9995	10.0003	1.0000	.1001			RWD	4/23	1007	76	60	38

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 2/6/92

Through 3/11/92

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0000	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9998	10.0003	1.0001	.1001			JWS	2/6	1315	68	56	47
99.9999	10.0000	1.0000	.1000			JWS	2/7	0915	65	54	48
100.0001	9.9999	1.0001	.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	.1000			TK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	75	62	48
100.0000	10.0000	1.0000	.1000			JWS	2/10	[illegible]	72	59	47
99.9997	10.0001	1.0000	.1001			JWS	2/11	[illegible]	72	61	47
100.0001	10.0000	1.0001	.1000			TK	2/12	0920	68	56	47
100.0003	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9997	10.0000	1.0000	.1000			JWS	2/12	0850	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0001	1.0001	0.1000			TK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			JWS	2/13	1535	75	62	48
100.0000	9.9999	1.0000	0.1000			DK	2/14	930	77	63	46
100.0000	10.0000	1.0000	0.1000			TK	2/17	1240	76	62	45
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	45
100.0000	10.0001	1.0000	.0999			TK	2/17	0820	65	54	48
99.9997	10.0000	1.0001	.1000			JWS	2/17	1035	68	56	47
99.9999	10.0000	.9999	.1000			TK	2/18	0856	65	54	48
99.9999	10.0001	1.0000	.1000			JWS	2/18	1000	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	945	71	58	45
100.0000	9.9999	1.0000	0.1000			TK	2/24	0800	71	59	44
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	.9999	.0999			TK	2/26	1025	72	59	46
99.9999	9.9998	1.0000	0.0999			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.0999			TK	2/28	1230	78	64	46
99.9998	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			TK	3/4	1130	72	59	46
99.9996	10.0000	1.0000	.1000			JWS	3/5	0935	70	58	48
99.9996	10.0000	.9999	0.0999			TK	3/6	0830	73	60	47
99.9998	10.0000	.9999	.0998			JWS	3/6	1400	76	62	45
99.9998	10.0000	.9999	.1000			TK	3/9	0850	71	59	49
99.9996	10.000	.9999	.1000			JWS	3/9	1340	70	58	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0900	75	60	41
99.9996	10.0000	1.0000	.0998			JWS	3/11	1635	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAUGHS SD7X
Run: 2 Date: 5/13/92
Technician(s): JS

FRONT HALF

FILTER #: 261F
FINAL WT: 1.0146 g
TARE WT: .6991 g
NET WT: .3155 g

BEAKER #: 501
ml: 200
desc: ACETONE

FINAL WT: 96.9923 g
TARE WT: 96.8874 g
NET WT: .1049 g

FILTER #: ________
FINAL WT: ____________ g
TARE WT: ____________ g
NET WT: ____________ g

BEAKER #: ________
ml: ________
desc: ACETONE

FINAL WT: ____________ g
TARE WT: ____________ g
NET WT: ____________ g

TOTAL VOLUME OF ACETONE USED IN WASH 200 ml

BACK HALF

FILTER #: 261B
FINAL WT: .5524 g
TARE WT: .3849 g
NET WT: .1675 g

BEAKER #: 502
ml: 225
desc: ACETONE

FINAL WT: 98.8079 g
TARE WT: 98.5630 g
NET WT: .2449 g

FILTER #: ________
FINAL WT: ____________ g
TARE WT: ____________ g
NET WT: ____________ g

BEAKER #: 503
ml: 75
desc: METHCHLOR

FINAL WT: 91.3307 g
TARE WT: 91.2044 g
NET WT: .1263 g

BEAKER #: 504
ml: 200
desc: H2O

FINAL WT: 95.2144 g
TARE WT: 95.0584 g
NET WT: .1560 g

BEAKER #: 505
ml: 100
desc: H2O

FINAL WT: 106.5291 g
TARE WT: 106.4504 g
NET WT: .0787 g

BEAKER #: ________
ml: ________
desc: ________

FINAL WT: .2347 g
TARE WT: ____________ g
NET WT: ____________ g

BEAKER #: ________
ml: ________
desc: ________

FINAL WT: ____________ g
TARE WT: ____________ g
NET WT: ____________ g

TOTAL VOLUME OF ACETONE USED IN WASH 225 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 300 ml

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: HAUGHS 507 X
Run: 2 Date: 5/13/92
Technician(s): JS DK TK

BLANKS DONE: 5/11/92

BEAKER #: D	FINAL WT: 106.2239 g		
200 ml ACETONE	TARE WT: 106.2235 g		
FISHER OPTIMA LOT #: 913996	NET WT: .0004 g		
BEAKER #: E	FINAL WT: 96.8428 g		
75 ml DICHLOROMETHANE	TARE WT: 96.8424 g		
FISHER OPTIMA LOT #: 916306	NET WT: .0004 g		
BEAKER #: F	FINAL WT: 96.5114 g		
200 ml DISTILLED WATER	TARE WT: 96.5106 g		
BONNEAU CERTIFIED	NET WT: .0008 g		

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 3/17/92

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
D	106.2238	1306	106.2235	1036				
E	96.8424	1308	96.8424	1038				
F	96.5109	1330	96.5106	1040				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
3/23	1300	JWS	59	73	43
3/24	1034	DK	58	72	42

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	DK	59	74	40
5/14	1636	JWS	56	70	41
5/15	1200	BN	60	74	44

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
D	5/12	0900	106.2243	5-13 1048	106.2239	5-14 1659		
E	5/12	0900	96.8431	5-13 1050	96.8428	5-14 1701		
F	5/12	1330	96.5112	5-14 1700	96.5114	5-15 1230		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: HAUGHS 527X
Run: 2
Date: 5/13/92
Technician(s): TK TK
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Tim Kelly Date: 5/18/92

Blank Calculations:

Acetone: .0004 g ÷ 200 ml = .000002 g/ml

Dichloromethane: .0004 g ÷ 75 ml = .00000533 g/ml

Distillted Water: .0008 g ÷ 200 ml = .000004 g/ml

Front Half Catch:

Filters: .3155 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .3155 g (Net Catch)

Beakers: .1049 g (Total Catch) - 200 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .1045 g (Net Catch)

Total Front Half Catch .4200 g

Back Half Catch:

Filters: .1675 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1675 g (Net Catch)

Beakers:

1. Acetone/Impingers: .2449 g (Total Catch) - 205 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .2445 g (Net Catch)

2. Extract/Impingers: .1063 g (Total Catch) - 75 (ml. of Dichloromethane) (.00000533 g) (Blank Value/ml of Dichloromethane) .0004 = .1059 g (Net Catch)

3. Water/Impingers: .0347 g (Total Catch) - 300 (ml. of water) (.000004 g) (Blank Value/ml of water) = .0334 g (Net Catch)

Total Back Half Catch .7713 g
Total Catch 1.1913 g
% Front Half 35.26 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HAUGHS 507X

Run: 2 Date: 5/13/90

Technician(s): TK JS

WST3-Form 1 8/28/91

1) Vm(std): (85.372 Vm)(17.65)(1.066 mcf)(30.11 " Hg + .011 " H2O / 13.6) / (547 TmA) = 88.4636 / 000.0000 dscf

2) Vw(std): (.04707)(135.0 ml H2O): 6.3545 / 00.0000 scf

3) Bws: (6.3545 scf) / (6.3545 scf + 88.4636 dscf) = .0670 / .0000 Bws X 100 = 6.7019 / 00.0000 % H2O

4) Cs: (1.1913 g.) / (88.4636 dscf) (15.43): .2078 / 0.0000 gr/dscf

5) Estimated g/hr: (______ g.) / (______ dscf) (6.698 / 00.000 dscfm)(60): ______ / 00.0000 g/hr 6.25

Vm :	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf :	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf)
" Hg :	average barometric pressure during the test	(p. 2)	(00.00 " Hg)
" H2O :	average delta H for the test	(p. 2)	(.000 " H2O)
TmA :	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA)
ml H2O :	total water caught during the test	(p. 3)	(000.0 ml H2O)
g. :	total particulate catch for the test	(p. 6)	(00.0000 g.)
dscfm :	average stack flow during the test	(computer printout)	(00.000 dscfm)

Unit HAU6AS S21X
Run # 2
Date 5/13/92
Technician BN TK DK JS
WST6-Form1,Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft^3

Dilution Tunnel Draft (If applicable): Start 0 Stop 0

Test Chamber Air Velocity: Start: 0 Stop: 0 Avg: 0

Wet Bulb/ Start: WB: 59 °F DB: 76 °F 1.1 % Amb Moisture 37 %RH

Dry Bulb Stop: WB: 59 °F DB: 76 °F 1.1 % Amb Moisture 37 %RH

$\bar{X}$ = 1.1 % Ambient Moisture $\bar{X}$ = 37 % Relative Humidity (RH)

Empty Stove Wt: 237.3 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: lbs. Dry: 304.5 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 304.5 lbs.

Kindling Wt. HOT START Paper: 0 lbs. Wood: 0 lbs.

Pre Burn Fuel Wt. 7.9 + 1.3 Total: 9.2 lbs.

Total Kindling and Pre Burn Fuel Wt 9.2 lbs.

Coal Bed Wt-lbs: Range (2.6 - 2.2) 307.1 - 306.7 lbs. Actual: 2.6 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\left(\frac{2.6}{\text{Upper Wt.}} + \frac{2.2}{\text{Lower Wt.}} / 2\right)$ .25 = .6 lbs.

Test Fuel Wt-lbs: Ideal lbs. Range: lbs. Actual: 10.6 lbs.

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Flanges) 14 Pcs.

2 x 4's x 18 3/4 " 4 Pcs 10.6 lbs. 100.0 %

4 x 4's x N/A " N/A Pcs N/A lbs. N/A %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.6 - (10.6 \times 18.278)}{2.2025} \times \frac{60}{230}$ = 1.026 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) x $\frac{63}{100}$ x 1.026 = 12371.9 Est Heat Output (HO_E) BTU's/Hr

Comments: 240 = .983
190 = 1.242

Unit: HAUGHS S27X Run: 2 Date: 5/13/92

WOODSTOVE OPERATING DATA

FIRE STARTED: HOT START PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges, then set to CLOSED at start of preburn.

SECONDARY AIR: N/A CAT BYPASS: N/A

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 12 sec.

TEST: Door Wide Open during loading 0 min 39 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of CLOSED .

SECONDARY AIR: N/A CAT BYPASS: N/A

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: NA

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 10 or 18 inches.

1st warm up/preburn fuel charge (7.9 lbs) added at 1220 .

2nd warm up/preburn fuel charge (1.3 lbs) added at 1309 .

3rd warm up/preburn fuel charge (______ lbs) added at ________ .

4th warm up/preburn fuel charge (______ lbs) added at ________ .

5th warm up/preburn fuel charge (______ lbs) added at ________ .

Unit: [illegible]
Run: 2
Date: 5/13/92
Technician: BN TK DK JS
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 72 °F

Correction Factor: 0

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes ____. No ✓.
Time Test Fuel Moisture Readings taken at: 1300
Calibration Checks: X ✓ Y ✓ 12.0 12.3 22.0 22.0

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg Corrected
			Uncor	Cor	Uncor	Cor	Uncor	Cor	
1				HOT	START				
2									
3									
4	2x4x8	P	18.5	20.1	21.0	22.9	21.5	23.5	22.167
5									
6									
7									
8									
9	2x4x18 3/4	T	21.0	22.9	22.0	24.1	21.5	23.5	23.500
10	2x4x18 3/4	T	19.5	21.3	21.0	22.9	20.0	21.8	22.000
11	2x4x18 3/4	T	20.5	22.4	21.0	22.9	18.5	20.1	21.800
12	2x4x18 3/4	T	21.0	22.9	21.0	22.9	19.0	20.7	22.167
13									89.467
14									
15									
16									
17									
18									
19	FEET	T	20.0	21.8	20.5	22.4	19.5	21.3	21.833
20									

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	N/A %	22.167 %	22.367 %
% Moisture - Wet Basis:	N/A %	18.145 %	18.279 %

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: [illegible]
Run#: 2
Date: 5/13/92
Technician: BN TK DK JS
WST2-form11-Rev 6/90

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Wood Piece: Nominal Dimensions: 2 x 4 x 3½

Depth (D): 3.95 cm

Width (W): 9.00 cm

Length (L): 8.48 cm
8.48 cm
8.45 cm
8.50 cm

Length $\bar{X}$ = 8.478 cm

Volume: 301.375 cm³
(D X W X L)

MOISTURE: Room Temperature: 73 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	19.5	21.3 %
Bottom:	19.0	20.7 %
Side:	20.0	21.8 %
$\bar{X}$:		21.267 %

Avg % Moisture (Dry) 21.267 %

Aug % Moisture (Wet) 17.537 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 221.5 g Dry Weight: 185.99 g

% Moisture Dried Basis: 16.032 % ✓
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp	
Into Dryer	5/13/92	1200	231	°F
Out of Dryer	5/20/92	1445	229	°F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 185.99 g ÷ 301.375 cm³ = .6171 g/cm³ ✓
(dry wt) (volume)

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ________________ g

Wet Wt: ____________ g ÷ ____________ g = ________________ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ____________ g ÷ ____________ g = ________________ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ________________________________ %
[1 - (Net Dry Wt - Net Wet Wt.)] X 100

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGHS S27 Stove Date: 5/13/92
Run: 2 Technician(s): BN, JS, TK, DK
Page: 1 of 2

Minute / Time	Scale Wt (307.1)	lbs left	Burn Rate	1 CO_2 V.	1 CO_2 %CO_2	2 O_2 V.	2 O_2 %O_2	2 Tel	3 CO V.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	4 SO_2 PPM	Static Press.	Comm
0 / 1410	317.7	10.6	Ø	.184	4.6	.604	15.3	15.3	.112	1.14	4.0	107	136	7.0	120	259	.25	625	-.034	Flow
05 / 15	317.7	10.6	Ø	.100	2.5	.700	17.8	17.8	.065	.66	3.8	101	130	5.7	115	251	.16	400	-.037	SO_2
10 / 20	317.5	10.4	.2	.110	2.8	.689	17.5	17.5	.054	.55	5.0	102	124	6.1	113	214	.25	625	-.035	CO_2
15 / 25	317.3	10.2	.2	.111	2.8	.691	17.5	17.5	.059	.60	4.7	103	122	6.4	112	205	.26	650	-.034	O_2
20 / 30	317.1	10.0	.2	.119	3.0	.683	17.3	17.3	.066	.67	4.5	107	125	7.3	115	201	.26	650	-.033	CO
25 / 35	316.9	9.8	.2	.150	3.8	.656	16.6	16.6	.062	.63	6.0	112	132	8.5	120	217	.25	625	-.035	
30 / 40	316.6	9.5	.3	.152	3.8	.652	16.5	16.5	.071	.72	5.3	114	134	9.1	121	214	.26	650	-.035	
35 / 45	316.3	9.2	.3	.156	3.9	.647	16.4	16.4	.071	.72	5.4	115	135	9.3	122	218	.26	650	-.036	
40 / 50	316.0	8.9	.3	.235	5.9	.573	14.5	14.5	.066	.67	8.7	117	141	10.0	127	259	.24	600	-.040	
45 / 55	315.5	8.4	.5	.254	6.3	.559	14.2	14.2	.070	.71	8.9	120	150	11.0	131	292	.22	550	-.044	
50 / 1500	315.0	7.9	.5	.322	8.0	.492	12.4	12.4	.072	.73	11.0	123	157	12.0	136	329	.21	525	-.048	
55 / 05	314.5	7.4	.5	.347	8.6	.468	11.8	11.8	.067	.68	12.7	121	151	11.3	135	332	.21	525	-.049	
																2991			-.460	Flo
60 / 10	313.8	6.7	.7	.392	9.7	.428	10.8	10.8	.052	.53	18.3	124	159	12.3	138	360	.20	500	-.052	SO_2
65 / 15	313.3	6.2	.5	.399	9.9	.423	10.7	10.7	.039	.39	25.4	124	160	12.3	138	365	.20	500	-.053	CO_2
70 / 20	312.8	5.7	.5	.405	10.0	.421	10.6	10.6	.037	.37	27.1	121	153	11.3	137	369	.19	475	-.054	O_2
75 / 25	312.2	5.1	.6	.393	9.7	.432	10.9	10.9	.037	.37	26.3	118	149	10.3	135	364	.19	475	-.053	CO
80 / 30	311.7	4.6	.5	.412	10.2	.413	10.4	10.4	.032	.32	31.9	117	146	10.0	134	364	.19	475	-.053	
85 / 35	311.3	4.2	.4	.404	10.0	.417	10.5	10.5	.030	.30	33.4	116	144	9.6	134	365	.19	475	-.053	
90 / 40	310.8	3.7	.5	.406	10.1	.417	10.5	10.5	.027	.27	37.3	112	135	8.5	131	362	.19	475	-.053	
95 / 45	310.4	3.3	.4	.392	9.7	.426	10.8	10.8	.025	.25	38.9	109	130	7.6	130	365	.19	475	-.053	
100 / 50	310.0	2.9	.4	.399	9.9	.415	10.5	10.5	.028	.28	35.3	106	125	7.1	130	371	.19	475	-.053	
105 / 55	309.7	2.6	.3	.343	8.5	.466	11.8	11.8	.035	.35	24.3	102	119	6.1	126	352	.19	475	-.053	
110 / 1600	309.4	2.3	.3	.305	7.6	.500	12.7	12.7	.056	.57	13.3	99	113	5.7	121	333	.20	500	-.051	
115 / 1605	309.2	2.1	.2	.282	7.0	.519	13.1	13.1	.072	.73	9.6	96	110	5.4	120	312	.20	500	-.047	
																4282			-.628	
																7773			-1.099	

JOHN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGH S270 Series Date: 5/13/92 12
Run: 2 Technician(s): BN, JS, TK
Page: 2 of 2 OK

Minute	Time	Scale Wt (307.1)	lbs left	Burn Rate	1 CO_2 V.	1 $\%CO_2$	2 O_2 V.	2 $\%O_2$	Tel	3 CO V.	3 %CO	Bal	T/C(1) Wet Bulb	T/C(2) Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	4 SO_2 PPM	Static Press.	Comm
120	1610	308.9	1.8	.3	.265	6.6	.533	13.5	13.5	.075	.76	8.7	93	105	4.8	117	296	.20	500	-.045	Flow
125	15	308.8	1.7	.1	.254	6.3	.543	13.7	13.7	.081	.82	7.7	92	103	4.7	116	287	.20	500	-.044	SO_2
130	20	308.6	1.5	.2	.284	7.1	.517	13.1	13.1	.052	.53	13.3	92	114	4.3	114	280	.20	500	-.043	CO_2
135	25	308.4	1.3	.2	.237	5.9	.549	13.9	13.9	.106	1.08	5.5	91	111	4.2	112	269	.20	500	-.042	O_2
140	30	308.4	1.3	Ø	.225	5.6	.559	14.2	14.2	.111	1.13	5.0	90	122	3.6	110	264	.20	500	-.040	CO
145	35	308.3	1.2	.1	.232	5.8	.552	14.0	14.0	.098	.99	5.8	96	129	4.6	111	260	.20	500	-.039	
150	40	308.2	1.1	.1	.207	5.2	.568	14.4	14.4	.145	1.47	3.5	98	131	5.0	112	254	.21	525	-.039	
155	45	308.1	1.0	.1	.204	5.1	.573	14.5	14.5	.138	1.40	3.6	100	133	5.3	113	250	.21	525	-.039	
160	50	308.0	.9	.1	.201	5.0	.577	14.6	14.6	.138	1.40	3.6	100	133	5.3	113	248	.21	525	-.037	
165	55	307.9	.8	.1	.189	4.7	.586	14.8	14.8	.150	1.52	3.1	101	133	5.6	113	244	.21	525	-.037	
170	1700	307.8	.7	.1	.184	4.6	.589	14.9	14.9	.159	1.62	2.8	101	132	5.6	112	239	.21	525	-.036	
175	05	307.8	.7	Ø	.175	4.4	.598	15.2	15.2	.159	1.62	2.7	101	132	5.6	112	237	.21	525	-.036	
																	3128			-.477	Flo
180	10	307.7	.6	.1	.161	4.0	.611	15.5	15.5	.161	1.64	2.5	102	131	5.9	112	231	.21	525	-.035	SO_2
185	15	307.6	.5	.1	.161	4.0	.611	15.5	15.5	.161	1.64	2.5	102	130	5.9	112	226	.21	525	-.034	CO_2
190	20	307.6	.5	Ø	.149	3.7	.621	15.7	15.7	.171	1.74	2.1	101	129	5.7	111	222	.21	525	-.034	O_2
195	25	307.5	.4	.1	.141	3.5	.629	15.9	15.9	.166	1.69	2.1	100	127	5.5	111	218	.21	525	-.033	CO
200	30	307.4	.3	.1	.139	3.5	.633	16.0	16.0	.159	1.62	2.2	100	126	5.5	111	213	.22	550	-.033	
205	35	307.4	.3	Ø	.136	3.4	.636	16.1	16.1	.163	1.66	2.1	99	125	5.4	110	211	.22	550	-.033	
210	40	307.3	.2	.1	.134	3.4	.638	16.2	16.2	.161	1.64	2.0	99	124	5.4	110	207	.22	550	-.032	
215	45	307.3	.2	Ø	.135	3.4	.641	16.2	16.2	.145	1.47	2.3	98	122	5.3	109	204	.22	550	-.032	
220	50	307.2	.1	.1	.135	3.4	.642	16.3	16.3	.140	1.42	2.4	98	121	5.3	109	201	.22	550	-.031	
225	55	307.2	.1	Ø	.133	3.3	.647	16.4	16.4	.136	1.38	2.4	97	120	5.2	109	199	.23	575	-.030	4
230	1800	307.1	Ø	.1	.127	3.2	.650	16.5	16.5	.142	1.44	2.2	97	119	5.2	109	198	.23	575	-.030	
235																					
																	2330			-.357	
																	12731			-1.922	
																	271			-.041	

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S27 Series Date: 5/13/92
Run: 2 Technician(s): BN, JS, TK, DK
Page: 1 of 2

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalytic	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
0 / 1410	249	333	209	266	385	777	602	79	1448	248	34	243	35	36
05 / 15	221	323	302	259	383	588	350	79	1448	248	34	247	35	36
10 / 20	211	305	302	257	380	512	480	79	1448	248	34	248	35	36
15 / 25	207	288	297	248	376	507	480	79	1447	248	34	248	35	36
20 / 30	201	274	292	240	370	490	492	79	1446	248	34	248	35	36
25 / 35	201	262	289	225	364	466	503	78	1444	248	34	248	35	36
30 / 40	201	251	288	219	358	467	549	78	1444	248	34	248	35	36
35 / 45	206	242	189	214	351	471	640	78	1446	248	34	248	35	36
40 / 50	216	235	176	214	345	495	965	78	1446	248	34	248	35	36
45 / 55	247	230	176	212	340	541	850	78	1446	248	34	248	35	36
50 / 1500	279	227	178	212	335	659	1121	78	1447	248	34	248	35	36
55 / 05	310	230	187	217	334	772	1105	78	1448	248	34	248	35	36
	2749	3200	2885	2783	4321	6745	8137	941						
60 / 10	346	243	201	240	332	887	1227	78	1448	248	34	248	35	36
65 / 15	385	257	213	251	333	953	1180	79	1448	248	34	248	35	36
70 / 20	393	271	220	262	332	981	1231	79	1448	248	34	248	35	36
75 / 25	399	289	234	282	333	1050	1189	80	1448	248	34	248	35	36
80 / 30	408	302	242	287	335	1069	1202	80	1448	248	34	248	35	36
85 / 35	422	317	248	301	337	1101	1221	81	1448	248	34	248	35	36
90 / 40	429	334	259	317	340	1117	1201	81	1448	248	35	248	35	36
95 / 45	436	348	266	327	343	1115	1189	81	1447	248	35	248	35	36
100 / 50	452	359	273	319	347	1110	1077	81	1446	248	35	248	35	36
105 / 55	440	369	275	327	351	1094	993	81	1445	248	35	248	35	36
110 / 1600	415	375	273	317	356	1074	957	81	1444	248	35	248	35	36
115 / 1605	393	378	268	316	359	1052	928	81	1444	248	35	248	35	36
	4918	3842	2972	3546	4098	12603	13595	963						
	7667	7042	5857	6329	8419	19348	21732	1904						

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S270 Sirc Date: ____
Run: 2 Technician(s): BN, JS, TK, DK
Page: 2 of 2

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16 288.4	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
120 / 1610	363	377	264	313	365	1026	881	81	1444	248	35	248	35	36
125 / 15	352	374	260	310	367	1011	852	81	1445	248	35	248	35	36
130 / 20	340	370	257	299	371	968	938	81	1446	248	35	248	35	36
135 / 25	327	369	254	303	373	939	862	81	1447	248	35	247	35	36
140 / 30	318	369	249	298	375	923	848	80	1448	248	35	246	35	36
145 / 35	306	369	244	293	378	906	815	80	1448	248	35	245	35	36
150 / 40	297	370	242	286	380	886	784	80	1448	248	35	245	35	36
155 / 45	293	369	235	284	381	866	759	80	1447	247	35	244	35	36
160 / 50	285	367	232	282	381	848	746	80	1448	246	35	244	35	36
165 / 55	277	364	229	276	379	829	729	80	1448	246	35	244	35	36
170 / 1700	271	360	225	274	378	814	719	80	1448	245	35	243	35	36
175 / 05	269	355	221	260	376	795	697	80	1448	245	35	244	35	36
	3698	4413	2912	3478	4504	10811	9630	964						
180 / 10	263	349	218	256	373	772	677	79	1448	245	35	244	35	36
185 / 15	255	343	217	257	371	757	671	79	1448	245	35	244	35	36
190 / 20	249	338	214	252	368	738	657	79	1448	245	35	244	35	36
195 / 25	243	332	214	248	365	716	640	78	1448	245	35	245	35	36
200 / 30	238	326	213	241	363	696	629	78	1448	246	35	245	35	36
205 / 35	234	321	210	235	360	678	616	78	1448	246	35	245	35	36
210 / 40	230	316	209	233	356	662	609	78	1448	247	35	246	35	36
215 / 45	226	312	208	229	352	646	601	78	1448	247	35	246	35	36
220 / 50	223	308	208	223	348	631	598	78	1448	247	35	246	35	36
225 / 55	220	303	206	219	343	617	585	78	1448	247	35	246	35	36
230 / 1800	217	300	205	213	340	595	570	78	1448	247	35	246	35	36
235	2598	3548	2322	2606	3939	7508	6853	861	ΔT START		288.4			
	13963	15003	11091	12413	16862	37667	38215	3729	STOP		255.0			
	297	319	236	264	359	801	813	79			-33.4			

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/13/92 Analyte: CO_2 (15-1)

Source: HAUGHS S270 SERIES Run #: 2

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.6 % CO_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: DK Time: 1325 Temp: 81 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	50.2	.502	12.437	-.163	-1.292

Comments:

Post Run Audit: By: DK Time: 1815 Temp: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	50.0	.500	12.388	-.212	-1.683

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/13/92 Analyte: O_2 (15-2)

Source: HAUGHS S270 Series Run #: 2

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.4 % O_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: DK Time: 1335 Temp: 79 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.004	-.003	-.003	-.012
Span	12.4	.496	12.4	12.4	.499	12.624	.224	1.809

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

Post Run Audit: By: DK Time: 1825 Temp.: 77 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.003	-.028	-.028	-.114
Span	12.4	.496	12.4	12.3	.490	12.395	-.005	-.042

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

+ Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/13/92 Analyte: CO (15-3)

Source: HAUGHS S270 SERIES Run #: 2

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 4.96 % CO Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: DK Time: 1340 Temp: 80 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.4	.494	5.028	.068	1.380

Comments:

Post Run Audit: By: DK Time: 1830 Temp.: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.1	.491	4.998	.038	.764

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/13/92 Analyte: SO_2 (15-4)

Source: HAUGHS S270 SERIES Run #: 2

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: AL2892 Conc. 1232 ppm SO_2 Cyl Press: 450 psi

Certified by: LIQUID AIR Date: 9/24/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: DK Time: 1320 Temp: 81 °F

Audit Results

Point #	Expected Response Meter	DVM	ppm	Actual Response Meter	DVM	ppm	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.2	.002	8.432	8.432	.337
Span	49.3	.493	1232	49.3	.493	1234.000	2.000	.162

Comments:

Post Run Audit: By: DK Time: 1810 Temp: 77 °F

Audit Results

Point #	Expected Response Meter	DVM	ppm	Actual Response Meter	DVM	ppm	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.1	.001	5.936	5.936	.237
Span	49.3	.493	1232	49.1	.491	1229.008	-2.992	-.243

Comments:

± Conc. Difference = Act ppm - Exp (Std) ppm

Zero % Differece = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

Run: 2
Date: 5/13/92
Technicians: BN TK DK JS
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 79 °F T/C#30: 78.5 °F

Thermocouple Check (at ambient): T/C#1: 83.3 °F; T/C#2: 87.6 °F;

T/C #3: 594.3 °F;	T/C #4: 411.1 °F;	T/C #5: 372.6 °F;
T/C #6: 229.8 °F;	T/C #7: 296.0 °F;	T/C #8: 402.5 °F;
T/C #9: 1051.8 °F;	T/C #10: 1213.2 °F;	T/C #11: 78.6 °F;
T/C #12: 1268.1 °F;	T/C #13: 122.6 °F;	T/C #14: 84.3 °F;
T/C #15: 188.1 °F;	T/C #16: 54.7 °F;	T/C #17: 61.6 °F;
T/C #18: 90.1 °F;	T/C #19: ___ °F;	T/C #20: ___ °F;
T/C #21: ___ °F;	T/C #22: ___ °F;	T/C #23: ___ °F;
T/C #24: ___ °F;	T/C #25: ___ °F;	T/C #26: ___ °F;

Comments: HOT START

Thermocouple Readout:
Pretest Zero/Span Check and Calibration:

Zero (0°F): .4 °F	Adj to: .0 °F	Post Test Check Zero (0°F): .4 °F	% Difference .020
Span (2000°F): 2003.9 °F	Adj to: 2000.0 °F	Span (2000°F): 2003.9 °F	.195

(Allowable % Difference = 1.5%. Use formulas on Woodstove Data Sheet #15 to calculate % Difference)

Thermocouple Readout Pretest Linearity Check

0°F = .0 °F;	200°F = 202.2 °F;	400°F = 399.9 °F;
600°F = 602.5 °F;	800°F = 803.0 °F;	1000°F = 1002.3 °F;
1200°F = 1200.3 °F;	1400°F = 1401.7 °F;	1600°F = 1603.8 °F
1800°F = 1803.5 °F;	2000°F = 2000.0 °F	

Tracer Gas (SO_2) Injection Train Leak Check:	Pre ✓	Post ✓
Combustion Gas (CO_2, O_2, CO) Train Leak Check:	Pre ✓	Post ✓
Tracer Gas (SO_2) Analyzer Train Leak Check:	Pre ✓	Post ✓
Draft (Static) Guage Zero Check:	Pre ✓	Post ✓

Scale Check Pre (Wt, #'s): 321.5 - 311.5 = 10.0
Post (Wt, #'s): 317.0 - 307.0 = 10.0

Stack cleaned prior to the run: Yes ___ No ✓.

CLIENT : HAUGHS PRODUCTS TEST No. : 4

MODEL: S-27X DATE: 5/15/92

****

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	617.800	0.150	77	0.78	5.10	475
5	619.300	0.210	77	0.67	3.20	400
10	621.099	0.150	77	0.69	2.90	475
15	622.615	0.120	78	0.75	3.20	525
20	623.992	0.120	79	0.89	3.20	525
25	625.374	0.150	80	0.64	6.20	475
30	626.907	0.200	83	0.15	8.20	400
35	628.747	0.200	84	0.19	7.80	400
40	630.593	0.180	85	0.19	10.30	425
45	632.338	0.180	85	0.12	10.40	425
50	634.083	0.180	88	0.09	10.40	425
55	635.847	0.260	84	0.10	11.00	350
60	637.957	0.260	84	0.07	10.00	350
65	640.067	0.260	86	0.12	9.10	350
70	642.192	0.230	86	0.09	9.70	375
75	644.176	0.260	87	0.09	10.00	350
80	646.310	0.220	86	0.14	8.60	375
85	648.294	0.220	86	0.33	8.00	375
90	650.278	0.200	86	0.28	8.50	400
95	652.138	0.200	86	0.25	8.30	400
100	653.999	0.200	86	0.33	6.70	400
105	655.859	0.160	86	0.70	5.90	450
110	657.513	0.140	86	0.79	5.70	475
115	659.080	0.130	86	1.09	5.60	500
120	660.569	0.130	86	1.40	4.70	500
125	662.058	0.130	86	1.29	4.40	500
130	663.547	0.130	86	1.40	4.20	500
135	665.035	0.130	86	1.35	3.90	500
140	666.524	0.120	86	1.48	3.70	525
145	667.942	0.120	86	1.48	3.50	525
150	669.360	0.120	86	1.46	3.30	525
155	670.778	0.120	86	1.50	3.20	525
160	672.196	0.120	85	1.46	3.10	525
165	673.609	0.120	85	1.46	3.10	525
170	675.022	0.110	85	1.45	3.40	550
175	676.370	0.110	85	1.39	3.60	550
180	677.719	0.110	85	1.40	3.50	550
185			85			

TABLE 2 ----- FIELD DATA

CLIENT : HAUGHS PRODUCTS TEST No. : 4

MODEL: S-27X DATE: 5/15/92

****

METER CAL. FACTOR (Y) -------	1.066	Wt. WOOD BURNED(LB) -------	10.5	Lbs
BAROMETRIC PRESS.(Pb) -------	30.12 in Hg	WET,FUEL MOISTURE % -------	18.306	%
LEAK RATE POST (Lp) -------	0.005 cfm	Wt. PART. COLLECTED -------	0.5836	g
WATER VOL. (Vlc) -------	104.2 Ml	METER VOLUME Vm -------	59.919	mcf
TEST TIME (MIN) -------	180 min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : HAUGHS PRODUCTS TEST No. : 4

MODEL: S-27X DATE: 5/15/92

****

AVG DELTA H	-------	0.17 in H_2O	AVG PRCNT CO	-------	0.76	%
AVG METER TEMP. Tm	-------	84 deg F	AVG PRCNT CO_2	-------	6.10	%
AVG PPM SO_2	-------	457 PPM				

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS TEST No. : 4

MODEL: S-27X DATE: 5/15/92

****

STD SAMPLE VOL. Vm(std) ------	62.40 dscf	STACK GAS FLOW Qsd -------	571.338 dscf/Hr & 9.52 dscf/min
VOL. WATER VAPOR Vw(std) -----	4.905 scf	PARTICULATE CONCTRT. C s ------	0.0094 g/dscf
PRCNT MSTR Bws -------	7.29 %	PARTC.EMISS. RATE E -------	5.34 g/Hr
BURN RATE BR -------	1.30 Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.52 Lb-mole/Lb
CO EMISSION RATE -------	145.10 g/Hr & 111.79 g/Kgdry fuel	PART.EMISS. RATE ------	4.12 g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS | TEST No. : 4

S-27X | DATE: 5/15/92

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE		
5	752.2	98		100		
10	759.8	99				
15	759.5	99				
20	761.0	99				
25	762.4	99				
30	762.3	99				
35	767.8	100				
40	768.9	100				
45	771.5	100				
50	769.4	100				
55	778.5	101				
60	769.8	100				
65	768.4	100				
70	772.4	100				
75	771.9	100				
80	775.0	101				
85	772.6	100				
90	772.6	100				
95	772.6	100				
100	773.0	100				
105	772.6	100				
110	772.8	100				
115	772.8	100				
120	773.0	100				
125	773.0	100				
130	773.0	100				
135	772.5	100				
140	773.0	100				
145	772.9	100				
150	772.9	100				
155	772.9	100				
160	773.6	100				
165	771.6	100				
170	771.6	100				
175	771.1	100				
180	771.7	100				
185						
190						

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client: Haugh's Products

Client Address: 10 Atlas Court
Brampton, Ontario, Canada L6T 5C1

Client Phone: 416-792-8000

Project No. ______ Model No. S 270X

Run No. 4 Date of Test 5/15/92 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon X Colorado ______ EPA X

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) 1.2992
Med Low (0.8 - 1.25 Kg/Hr) ______ Max (>1.9 Kg/Hr) ______

Fuel % Moisture (dry) 22.408 %(wet) 18.306 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.048 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.12 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 74 °F
(00) (Data Sheet #14)

Flue Gas Moisture 7.2824 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.0 %
(0.00) (Data Sheet #8)

Stove Weight 237 lbs
(000) (Data Sheet #8)

Stove Temperature Change -91 °F
(000) (Data Sheet #14)

Particulate Emission .1442 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) ______ BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 10.5 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .5836 g
(0.0000) (Data Sheet #6)

H_2O Captured 104.2 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 59.919 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 4J-1.066 Post Test Leak Rate .005 CFM

Meter Box Data Sheet Page # 2

Meter Box 4J Y Factor 1.066

Leak Checks: 15.0 " Hg @ .005 cfm
15.0 " Hg @ .005 cfm
____ " Hg @ ____ cfm
____ " Hg @ ____ cfm

Inject SO_2 @ 100 cc/min

Page 1 of 2

Unit: HAUGHS S27X

Run: 4 Date: 5/15/92

Operator(s): TK

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .18			Sampling Ratio : 25 : 1			BAROMETER: 30.12		
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1005	617.800	7.433	.15	77	475	72	0.0
05	10	619.300	8.826	.21	77	400	72	0.5
10	15	621.099	7.433	.15	77	475	72	0.5
15	20	622.615	6.725	.12	78	525	72	0.5
20	25	623.992	6.725	.12	79	525	72	0.5
25	30	625.374	7.433	.15	80	475	72	0.5
30	35	626.907	8.826	.20	83	400	72	0.5
35	40	628.747	8.826	.20	84	400	72	1.0
40	45	630.593	8.291	.18	85	425	73	1.0
45	50	632.338	8.291	.18	85	425	73	1.0
50	55	634.083	8.291	.18	88	425	73	1.5
55	1100	635.847	10.068	.26	87	350	73	1.5
ROTO PRESS: .18			TOTALS : 97.168	2.10	977	BAROMETER: 30.12		
60	5	637.957	10.068	.26	87	350	73	2.0
65	10	640.067	10.049	.26	86	350	74	2.0
70	15	642.192	9.379	.23	86	375	74	2.0
75	20	644.176	10.049	.26	87	350	74	2.0
80	25	646.310	9.379	.22	86	375	74	2.0
85	30	648.294	9.379	.22	86	375	74	2.0
90	35	650.278	8.793	.20	86	400	74	2.0
95	40	652.138	8.777	.20	86	400	75	2.0
100	45	653.999	8.777	.20	86	400	75	2.0
105	50	655.854	7.802	.16	86	450	75	2.0
110	55	657.513	7.391	.14	86	475	75	1.5
115	1200	659.080	7.021	.13	86	500	75	1.0
			TOTALS: 106.864	2.48	1031	MAX VACC =		—
TOTAL CU FT		—	TOTALS: 204.032	4.58	2008	AV BP: —		

Meter Box Data Sheet Page # 2

Meter Box 45 Y Factor 1.066

Leak Checks: 15.0 " Hg @ .005 cfm
15.0 " Hg @ .005 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Page 2 of 2

Unit: Haughi S270X

Run: 4 Date: 5/15/92

Operator(s): TK

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .18 | Sampling Ratio : 25 : 1 | BAROMETER: 30.12

MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	1205	660.569	7.021	.13	86	500	75	1.0
125	10	662.058	7.021	.13	86	500	75	0.5
130	15	663.547	7.021	.13	86	500	75	0.5
135	20	665.035	7.021	.13	86	500	75	0.5
140	25	666.527	6.687	.12	86	525	75	0.5
145	30	667.942	6.687	.12	86	525	75	0.5
150	35	669.360	6.687	.12	86	525	75	0.5
155	40	670.778	6.687	.12	86	525	75	0.5
160	45	672.196	6.687	.12	85	525	75	0.5
165	50	673.609	6.687	.12	85	525	75	0.5
170	55	675.022	6.383	.11	85	550	75	0.5
175	1300	676.390	6.383	.11	85	550	75	0.5
ROTO PRESS:		TOTALS :	080.972	1.46	1028	BAROMETER: 30.12		
180	5	677.719	6.383	.11	85	550	75	0.5
185								
190			87.355	1.57	1113			
195						37		
200								
205								
210								
215								
220								
225								
230								
235								
		TOTALS:				MAX VACC =		2.0
TOTAL CU FT		59.919	TOTALS: 291.387	6.150	3121	AV BP: 30.12		
			7.875	.166	87 / 544			

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance Level	Balance Zeroed
Initial:	✓	✓
Final:	✓	✓

Unit: Haugh's 5220X
Run: 4
Date: 5/15/92
Technician(s): Initial: TK
Final: TK
Approved By: TK

IMPINGER #1

Final Weight 658.2 grams
Initial Weight 573.5 grams
Net 84.7 ✓ grams

IMPINGER #2

Final Weight 590.0 grams
Initial Weight 583.4 grams
Net 6.6 ✓ grams

IMPINGER #3

Final Weight 495.2 grams
Initial Weight 494.4 grams
Net .8 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 874.8 grams
Initial Weight 862.7 grams
Net 12.1 ✓ grams

TOTAL MASS OF H_2O CAPTURED 104.2 ✓ grams

Scale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 263F
#
Back Half Filter # 263B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ✓ Back Half ______

Manufacturer: S&S Size: 110 mm Lot.No.: ZB882 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261 F	0.6987	3/20	1608	DK	.6941	3/23	1300	[illegible]				
262 F	0.7014		1610		.7017		1301					
263 F	0.6988		1612		.6985		1302		HAUCHS RN 4			
264 F	0.6893		1614		.6894		1303					
265 F	0.6912		1616		.6917		1304					
266 F	0.6934		1618		.6936		1305					
267 F	0.6936		1620		.6937		1306					
268 F	0.7015		1622		.7010		1307					
269 F	0.6933		1624		.6936		1308					
270 F	0.6965		1626		.6965		1309					
271 F	0.6953	3/20	1628	DK	.6951		1330					
272 F	0.7002		1630		.7005		1331					
273 F	0.6978		1632		.6980		1332					
274 F	0.6900		1634		.6903		1333					
275 F	0.6975		1636		.6975		1334					
276 F	0.6978		1638		.6978		1335					
277 F	0.6975		1640		.6974		1336					
278 F	0.6992		1642		.6991		1337					
279 F	0.6901		1644		.6900		1338					
280 F	0.6994		1646		.6997		1339					

Checked by [illegible] Date: 3/24/91 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1606	DK
59	73	43	3/23	1300	[illegible]

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ____ Back Half √

Manufacturer: S&S Size: 8.2 cm Lot.No.: ZB 901 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261B	0.3846	3/20	1526	DK	.3849	3/23	1341					
262B	0.3822		1528		.3827		1342					
263B	0.3805		1530		.3810		1343		HAULKS	RUN 4		
264B	0.3811		1532		.3818		1344					
265B	0.3821		1534		.3824		1345					
266B	0.3822		1536		.3824		1346					
267B	0.3817		1538		.3822		1347					
268B	0.3772		1540		.3770		1348					
269B	0.3875		1542		.3878		1349					
270B	0.3813		1544		.3809		1350					
271B	0.3884	3/20	1546	DK	.3882		1351					
272B	0.3818		1548		.3813		1352					
273B	0.3825		1550		.3821		1353					
274B	0.3856		1552		.3853		1354					
275B	0.3832		1554		.3830		1355					
276B	0.3862		1556		.3864		1356					
277B	0.3836		1558		.3832		1357					
278B	0.3801		1600		.3804		1358					
279B	0.3827		1602		.3822		1359					
280B	0.3821		1604		.3818		1400					

Checked by [signature] Date: 3/24/92 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1524	DK
59	73	43	3/23	1340	

INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 4/17/92 Time: 1000 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
501	96.8870	4/20	1004	DK	96.8874	4/21	1332	[illegible]				
502	98.5625		1006		98.5630		1334					
503	91.2041		1008		91.2044		1336					
504	95.0582		1010		95.0584		1338					
505	106.4506		1012		106.4504		1340					
506	94.1600	4/20	1014	DK	94.1604		1342					
507	88.9867		1016		88.9870		1344					
508	103.1077		1018		103.1077		1346					
509	95.7024		1020		95.7026		1348					
510	104.8758		1022		104.8757		1350					
511	107.7742	4/20	1024	DK	107.7745		1352					
512	106.3852		1026		106.3855		1354					
513	99.2412		1028		99.2417		1356		HAUGHS RN4			
514	108.6340		1030		108.6344		1358					
515	106.2259		1032		106.2264		1400					
516	105.6750	4/20	1034	DK	105.6745		1402					
517	94.7160		1036		94.7160		1404					
518	103.8296		1038		103.8300		1406					
519	100.0063		1040		100.0063		1408					
520	98.6266		1042		98.6267		1410					
521	97.7535	4/20	1044	DK	97.7537		1412					
522	103.9227		1046		103.9229		1416					
523	94.9397		1048		94.9402		1418					
524	106.8567		1050		106.8571		1420					
525	95.1170		1052		95.1173		1422					

Checked By: [illegible] Date: 4/21/92 Time: 1415

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
59	72	46	4/20	1002	DK
60	74	44	4/21	1330	[illegible]

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Unit HAUGHS S27Y
Run # 4
Date: 5/15/92

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
511		5/18	0900	DK	107.8712	5/19	938	DK	107.8717	5/19	1715	[illegible]				
512		5/18	0900	DK	106.5011	5/19	940	DK	106.5009	5/19	1717	[illegible]				
513		5/18	0900	DK	99.2960	5/19	942	DK	99.2955	5/19	1719	[illegible]				
514		5/18	0900	DK	108.7011	5/19	944	DK	108.7011	5/19	1721	[illegible]				
515		5/18	0900	DK	106.2875	5/19	946	DK	106.2871	5/19	1723	[illegible]				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
263F		5/15	1330	BN	0.7982	5/15	1605	DK	0.7976	5/18	950	BN	.7975	5/18	1538	[illegible]
263B		5/15	1330	BN	0.4767	5/15	1610	DK	0.4736	5/18	952	BN	.4740	5/18	1540	[illegible]

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	5/15	1600	DK	60	74	44
2	5/18	948	BN	58	71	45
3	5/19	1800	[illegible]	59	73	43
4	5/19	936	DK	57	70	44
5	5/[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WST7-Form1-Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 4/23/92

Through ____________

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9996	10.0000	0.9997	0.1001			DK	4/23	1600	70	56	41
99.9996	10.0000	.9997	.1000			[illegible]	4/24	1130	74	57	34
99.9996	10.0000	.9998	.1000			[illegible]	4/24	1830	70	57	44
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	.9998	.0999			[illegible]	4/28	1330	71	59	45
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			TK	4/30	0846	77	64	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	950	77	61	39
99.9997	9.9999	1.000	.1000			[illegible]	5/1	1500	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/4	930	78	62	40
100.0002	10.0002	1.0001	.1000			[illegible]	5/5	1010	75	60	41
100.0000	10.0001	1.0000	.1001			[illegible]	5/6	1505	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9997	10.0000	1.0001	.1000			[illegible]	5/6	1540	72	59	46
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			TK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	.1001			[illegible]	5/8	1105	65	54	48
99.9998	10.0001	.9999	.0990			[illegible]	5/8	1650	68	56	47
99.9996	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			TK	5/12	0900	74	60	44
99.9997	10.0001	1.0000	.0999			[illegible]	5/12	1345	77	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	950	74	59	40
100.0002	10.0002	1.0000	.1001			[illegible]	5/14	1636	70	56	41
99.9998	9.9999	.9997	.0999			BJ	5/15	1200	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.000	.1001			JS	5/18	1500	73	59	45
99.9998	9.9997	0.9996	0.0997			DK	5/19	0920	70	57	44
99.9998	10.0000	.9999	.0999			[illegible]	5/19	1707	70	56	41

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 3/12
Through 4/23

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9998	10.0000	1.0000	0.0998			TK	3/12	1257	73	60	47
99.9995	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	.1000			[illegible]	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0002	10.0001	1.0000	0.1001			[illegible]	3/17	1607	71	59	46
99.9997	10.0001	1.0000	.1000			[illegible]	3/19	1715	74	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	.9999	0.0998			[illegible]	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9999	10.0001	1.0001	.1002			[illegible]	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3/26	1045	73	59	43
100.0001	9.9996	1.0000	.1001			[illegible]	3/27	1140	77	60	40
99.9997	9.9999	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9996	10.0000	1.0001	.1000			[illegible]	3/30	1300	71	57	41
99.9999	10.0004	1.0001	.1002			[illegible]	3/31	1016	73	59	43
100.0003	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9995	10.0000	1.0000	.1000			[illegible]	4/2	0900	73	59	43
99.9998	9.9997	0.9997	0.1000			DK	4/3	0900	72	59	46
99.9997	10.0001	0.9999	0.0999			DK	4/3	1630	70	58	48
99.9999	10.0001	0.9999	.0999			TK	4/6	0936	68	54	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	56	41
99.9999	9.9998	0.9999	.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	.9999	.0998			[illegible]	4/8	1545	69	56	44
100.0000	9.9998	.9999	.0999			TK	4/9	1025	68	55	43
100.0000	10.0001	1.0000	.1000			[illegible]	4/10	0935	70	56	41
100.0000	9.9999	.9999	.0999			TK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	945	72	58	42
100.0002	10.0003	1.0001	.0998			[illegible]	4/14	1030	72	59	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	56	47
99.9997	9.9999	.9998	.0998			[illegible]	4/16	1006	80	58	42
100.0001	9.9999	1.0000	0.1001			DK	4/17	915	70	57	44
99.9996	9.9999	1.0000	.1000			[illegible]	4/17	1525	70	58	48
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0002	1.0002	.1001			[illegible]	4/21	1010	74	60	41
100.0000	10.0000	1.0000	0.0999			DK	4/22	900	73	59	43
99.9995	10.0003	1.0000	.1001			[illegible]	4/23	1007	76	60	38

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 2/6/92

Through 3/11/92

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0000	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9998	10.0003	1.0001	.1001			[illegible]	2/6	1315	68	56	47
99.9999	10.0000	1.0000	.1000			[illegible]	2/7	0915	65	51	48
100.0001	9.9999	1.0001	.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	.1000			TK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	75	62	48
100.0000	10.0000	1.0000	.1000			[illegible]	2/10	[illegible]	72	59	47
99.9997	10.0001	1.0000	.1001			[illegible]	2/11	[illegible]	74	61	47
100.0001	10.0000	1.0001	.1000			TK	2/12	0920	68	56	47
100.0003	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9997	10.0000	1.0000	.1000			[illegible]	2/12	0850	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0001	1.0001	0.1000			TK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			[illegible]	2/13	1535	75	62	48
100.0000	9.9999	1.0000	0.1000			DK	2/14	930	77	63	46
100.0000	10.0000	1.0000	0.1000			TK	2/14	1240	76	62	45
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	45
100.0000	10.0001	1.0000	.0999			TK	2/17	0820	65	54	48
99.9997	10.0000	1.0001	.1000			[illegible]	2/17	1035	68	56	47
99.9999	10.0000	.9999	.1000			TK	2/18	0856	65	54	48
99.9999	10.0001	1.0000	.1000			[illegible]	2/18	1000	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	945	71	58	45
100.0000	9.9999	1.0000	0.1000			TK	2/24	0800	71	59	44
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	.9999	.0999			TK	2/26	1025	72	59	46
99.9999	9.9998	1.0000	0.0999			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.0999			TK	2/28	1230	78	64	46
99.9998	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			TK	3/4	1130	72	59	46
99.9996	10.0000	1.0000	.1000			[illegible]	3/5	0935	70	58	48
99.9996	10.0000	.9999	0.0999			TK	3/6	0830	73	60	47
99.9998	10.0000	.9999	.0998			[illegible]	3/6	1400	76	63	45
99.9998	10.0000	.9999	.1000			TK	3/9	1050	71	59	49
99.9996	10.000	.9999	.1000			[illegible]	3/9	1340	78	59	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0900	75	60	41
99.9996	10.0000	1.000	.0999			[illegible]	3/11	1605	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: Haugh, S290X
Run: 4 Date: 5/15/92
Technician(s): L

FRONT HALF

FILTER #:	263F	BEAKER #:	511	FINAL WT:	107.8717 g
FINAL WT:	.7975 g	ml:	100	TARE WT:	107.7745 g
TARE WT:	.6985 g	desc:	ACETONE	NET WT:	.0972 g
NET WT:	.0990 g				
FILTER #:		BEAKER #:		FINAL WT:	g
FINAL WT:	g	ml:		TARE WT:	g
TARE WT:	g	desc:	ACETONE	NET WT:	g
NET WT:	g				

TOTAL VOLUME OF ACETONE USED IN WASH 100 ml

BACK HALF

FILTER #:	263B	BEAKER #:	512	FINAL WT:	106.5009 g
FINAL WT:	.4740 g	ml:	180	TARE WT:	106.3855 g
TARE WT:	.3810 g	desc:	ACETONE	NET WT:	.1154 g
NET WT:	.0930 g				
FILTER #:		BEAKER #:	513	FINAL WT:	99.0955 g
FINAL WT:	g	ml:	75	TARE WT:	99.2417 g
TARE WT:	g	desc:	METHCHLOR	NET WT:	.0538 g
NET WT:	g				
		BEAKER #:	514	FINAL WT:	108.7011 g
		ml:	150	TARE WT:	108.6344 g
		desc:	H2O	NET WT:	.0667 g
		BEAKER #:	515	FINAL WT:	106.2871 g
		ml:	150	TARE WT:	106.2264 g
		desc:	H2O	NET WT:	.0607 g
		BEAKER #:		FINAL WT:	.1274 g
		ml:		TARE WT:	g
		desc:		NET WT:	g
		BEAKER #:		FINAL WT:	g
		ml:		TARE WT:	g
		desc:		NET WT:	g

TOTAL VOLUME OF ACETONE USED IN WASH 180 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 300 ml

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: HAUGHS 507 X
Run: 4 Date: 5/15/92

BLANKS DONE: 5/11/92

Technician(s): JS DK TK

BEAKER #: D
200 ml ACETONE
FISHER OPTIMA LOT #: 913996

FINAL WT: 106.2239 g
TARE WT: 106.2235 g
NET WT: .0004 g

BEAKER #: E
75 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 916306

FINAL WT: 96.8428 g
TARE WT: 96.8424 g
NET WT: .0004 g

BEAKER #: F
200 ml DISTILLED WATER
BONNEAU CERTIFIED

FINAL WT: 96.5114 g
TARE WT: 96.5106 g
NET WT: .0008 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 3/17/92

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
D	106.2238	1306	106.2235	1036				
E	96.8424	1308	96.8424	1038				
F	96.5109	1330	96.5106	1040				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
3/23	1300	JS	59	73	43
3/24	1034	DK	58	72	42

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	DK	59	74	40
5/14	1636	JS	56	70	41
5/15	1200	BN	60	74	44

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
D	5/12	0900	106.2243	5-13 1048	106.2239	5-14 1659		
E	5/12	0900	96.8431	5-13 1050	96.8428	5-14 1701		
F	5/12	1330	96.5112	5-14 1700	96.5114	5-15 1230		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: HAUGHS 527X
Run: 4
Date: 5/15/92
Technician(s): TK TK
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NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Tim Kelly Date: 5/18/92

Blank Calculations:

Acetone: .0004 g ÷ 200 ml = .000002 g/ml

Dichloromethane: .0004 g ÷ 75 ml = .00000533 g/ml

Distillted Water: .0008 g ÷ 200 ml = .000004 g/ml

Front Half Catch:

Filters: .0990 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0990 g (Net Catch)

Beakers: .0972 g (Total Catch) - 100 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0970 g (Net Catch)

Total Front Half Catch .1960 g

Back Half Catch:

Filters: .0930 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0930 g (Net Catch)

Beakers:

1. Acetone/Impingers: .1154 g (Total Catch) - 180 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .1150 g (Net Catch)

2. Extract/Impingers: .0538 g (Total Catch) - 75 (ml. of Dichloromethane) (.00000533 g) .0004 (Blank Value/ml of Dichloromethane) = .0534 g (Net Catch)

3. Water/Impingers: .1274 g (Total Catch) - 300 (ml. of water) (.000004 g) (Blank Value/ml of water) = .1262 g (Net Catch)

Total Back Half Catch .3876 g
Total Catch .5836 g
% Front Half 33.58 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HAUGHS SD7K
Run: 4 Date: 5/15/90
Technician(s): JS TK

WST3-Form 1 8/28/91

1) Vm(std): $\dfrac{(59.919\ \text{Vm})(17.65)(1.066\ \text{mcf})(30.18\ \text{" Hg} + \frac{.166\ \text{" H2O}}{13.6})}{(544\ \text{TmA})}$ = $\dfrac{62.4451}{000.0000}$ dscf

2) Vw(std): (.04707)(104.2 ml H2O): $\dfrac{4.9047}{00.0000}$ scf

3) Asw: $\dfrac{(4.9047\ \text{scf})}{(4.9047\ \text{scf} + 62.4451\ \text{dscf})}$ = $\dfrac{.0728}{.0000}$ Bws X 100 = $\dfrac{7.2824}{00.0000}$ % H2O

4) Cs: $\dfrac{(.5836\ \text{g.})}{(62.4451\ \text{dscf})}$ (15.43): $\dfrac{.1442}{0.0000}$ gr/dscf

5) Estimated g/hr: $\dfrac{(\quad\quad \text{g.})}{(\quad\quad \text{dscf})}$ ($\dfrac{\quad}{00.000}$ dscfm)(60): $\dfrac{\quad}{00.0000}$ g/hr

Vm	=	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf	=	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf)
" Hg	=	average barometric pressure during the test	(p. 2)	(00.00 " Hg)
" H2O	=	average delta H for the test	(p. 2)	(.000 " H2O)
TmA	=	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA)
ml H2O	=	total water caught during the test	(p. 3)	(000.0 ml H2O)
g.	=	total particulate catch for the test	(p. 6)	(00.0000 g.)
dscfm	=	average stack flow during the test	(computer printout)	(00.000 dscfm)

Run # 4
Date 5/15/92
Technician BY, JS, TK, DK
WST6-Form1,Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft^3

Dilution Tunnel Draft (If applicable): Start 0 Stop 0

Test Chamber Air Velocity: Start: 0 Stop: 0 Avg: 0

Wet Bulb/ Start: WB: 56 °F DB: 66 °F 1.2 % Amb Moisture 54 %RH

Dry Bulb Stop: WB: 58 °F DB: 72 °F 1.2 % Amb Moisture 44 %RH

$\bar{X}$ = 1.2 % Ambient Moisture $\bar{X}$ = 49 % Relative Humidity (RH)

Empty Stove Wt: 237 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 305.2 lbs. Dry: 304.4 lbs.

Empty Stove Wt with Stack and Ash Ash: Ø lbs. Total: Ø lbs.

Kindling Wt. Paper: .3 lbs. Wood: 8.0 lbs.

Pre Burn Fuel Wt. 10.0 + 9.3 Total: 19.3 lbs.

Total Kindling and Pre Burn Fuel Wt 27.3 lbs.

Coal Bed Wt-lbs: Range (2.6 - 2.1) 307.0 - 306.5 lbs. Actual: 2.6 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\left(\frac{2.6}{\text{Upper Wt.}} + \frac{2.1}{\text{Lower Wt.}} / 2\right) .25 = .5$ lbs.

Test Fuel Wt-lbs: Ideal lbs. Range: lbs. Actual: 10.5 lbs.

Test Fuel Size (pcs.)(.75 x 1.5 x 5" Flanges) 14 Pcs.

2 x 4's x	18 3/4	"	4	Pcs	10.5	lbs.	100	%
4 x 4's x	NA	"	NA	Pcs	NA	lbs.	NA	%

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.5 - (10.5 \times .18306)}{2.2025} \times \frac{60}{180} = 1.0982$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) $(19,140) \times \frac{63}{100} \times 1.0980 = 15653$ Est Heat Output (HO_E) BTU's/Hr

Comments: 125 = 1.869
185 = 1.263

Unit: HAUGHS S27X Run: 4 Date: 5/15/92

WOODSTOVE OPERATING DATA

FIRE STARTED: 0725 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges, then set to .380" at start of preburn.

SECONDARY AIR: NA CAT BYPASS: NA

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 10 sec.

TEST: Door Wide Open during loading 4 min 30 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of .380 .

SECONDARY AIR: NA CAT BYPASS: NA

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: NA

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 10 or 18 inches.

1st warm up/preburn fuel charge (10.0 lbs) added at 0752 .

2nd warm up/preburn fuel charge (9.3 lbs) added at 0850 .

3rd warm up/preburn fuel charge (______ lbs) added at ________ .

4th warm up/preburn fuel charge (______ lbs) added at ________ .

5th warm up/preburn fuel charge (______ lbs) added at ________ .

Unit: [illegible]
Run: 4
Date: 5/15/92
Technician: BN, JS, TK, DK
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 70 °F

Correction Factor: Ø

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes ____. No ✓.
Time Test Fuel Moisture Readings taken at: 0900
Calibration Checks: X ✓ Y ✓ 12.0 12.3 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	4.5	4.5	4.5	4.5	4.0	4.0	4.333
2									
3									
4	2x4x8	P	18.0	19.6	18.5	20.1	18.0	19.6	19.767
5	2x4x8	P	19.0	20.7	19.5	21.3	19.0	20.7	20.900
6									40.667
7									
8									
9	2x4x18 3/4	T	21.5	23.5	21.5	23.5	21.0	22.9	23.300
10	2x4x18 3/4	T	19.0	20.7	20.0	21.8	19.0	20.7	21.067
11	2x4x18 3/4	T	21.5	23.5	21.0	22.9	21.0	22.9	23.100
12	2x4x18 3/4	T	21.0	22.9	21.0	22.9	19.0	20.7	22.167
13									89.633
14									
15									
16									
17									
18									
19	FEET	T	19.5	21.3	20.0	21.8	19.0	20.7	21.267
20									

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	4.333 %	20.333 %	22.408 % ✓
% Moisture - Wet Basis:	4.153 %	16.897 %	18.306 % ✓

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: HAUGHS 327 A
Run#: 4
Date: 5/15/92
Technician: BN, JS, TK, DK
WST2-form11-Rev 6/90

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Wood Piece: Nominal Dimensions: 2 x 4 x 3½

Depth (D): 4.20 cm

Width (W): 9.15 cm

Length (L): 8.68 cm
8.65 cm
8.70 cm
8.65 cm

Length $\bar{X}$ = 8.670 cm

Volume: 333.188 cm^3
(D X W X L)

MOISTURE: Room Temperature: 71 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	21.0	22.9 %
Bottom:	21.5	23.5 %
Side:	21.0	22.9 %
$\bar{X}$:		23.100 % ✓

Avg % Moisture (Dry) 23.100 ✓ %

Aug % Moisture (Wet) 18.765 ✓ %

Scale: Leveled In ✓ Out ✓
Zeroed: In ✓ Out ✓

Wet Weight: 187.23 g Dry Weight: 157.68 g

% Moisture Dried Basis: 15.783 % ✓
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp	
Into Dryer	5/15/92	0815	231	°F
Out of Dryer	5/20/92	1445	229	°F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 157.68 g (dry wt) ÷ 333.188 cm^3 (volume) = .4732 ✓ g/cm^3 ✓

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ______ g

Wet Wt: ______ g ÷ ______ g = ______ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ______ g ÷ ______ g = ______ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ______ %
[1 - (Net Dry Wt - Net Wet Wt.)] X 100

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGH S27X Date: 5/15/92
Run: 4 Technician(s): BN TK
Page: 1 of 2 DK JS

307.0

Minute Time	Scale Wt	lbs left	Burn Rate	1 CO_2 V.	1 CO_2 %CO_2	2 O_2 V.	2 O_2 %O_2	Tel	3 CO V.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc M/B	T/C(3) Stack	4 SO_2 V.	4 SO_2 PPM	Static Press.	Comm
00 1005	317.5	10.5	0	.206	5.1	.595	15.1	15.1	.077	.78	6.6	112	141	8.3	124	278	.19	475	-.046	Flow
05 10	317.4	10.4	.1	.129	3.2	.685	17.4	17.4	.066	.67	4.8	116	146	9.4	129	299	.16	400	-.051	SO_2
10 15	316.9	9.9	.5	.117	2.9	.695	17.6	17.6	.068	.69	4.3	117	144	10.0	126	259	.19	475	-.048	CO_2
15 20	316.5	9.5	.4	.126	3.2	.688	17.4	17.4	.074	.75	4.2	115	138	9.3	123	230	.21	525	-.044	O_2
20 25	316.2	9.2	.3	.129	3.2	.682	17.3	17.3	.088	.89	3.6	114	133	9.0	122	225	.21	525	-.044	CO
25 30	315.8	8.8	.4	.249	6.2	.572	14.5	14.5	.063	.64	9.7	115	134	9.4	126	262	.19	475	-.048	
30 35	315.3	8.3	.5	.329	8.2	.502	12.7	12.7	.015	.15	54.5	120	142	11.0	132	320	.16	400	-.056	
35 40	314.7	7.7	.6	.313	7.8	.516	13.1	13.1	.019	.19	40.9	120	144	11.0	133	328	.16	400	-.057	
40 45	314.0	7.0	.7	.417	10.3	.416	10.5	10.5	.019	.19	54.4	123	150	12.5	139	360	.17	425	-.062	
45 50	313.4	6.4	.6	.420	10.4	.412	10.4	10.4	.012	.12	86.8	124	152	13.0	140	369	.17	425	-.063	
50 55	312.7	5.7	.7	.419	10.4	.409	10.3	10.3	.009	.09	115.4	123	152	12.5	139	370	.17	425	-.063	
55 1100	312.0	5.0	.7	.445	11.0	.384	9.7	9.7	.010	.10	110.3	122	152	12.0	138	373	.14	350	-.063	
																3673			-.645	Flo
60 05	311.5	4.5	.5	.404	10.0	.421	10.6	10.6	.007	.07	143.1	120	148	11.0	135	368	.14	350	-.062	SO_2
65 10	311.0	4.0	.5	.365	9.1	.455	11.5	11.5	.012	.12	75.5	114	142	8.9	131	349	.14	350	-.061	CO_2
70 15	310.6	3.6	.4	.390	9.7	.432	10.9	10.9	.009	.09	107.5	113	141	8.6	130	347	.15	375	-.060	O_2
75 20	310.2	3.2	.4	.403	10.0	.420	10.6	10.6	.009	.09	111.1	112	138	8.3	130	352	.14	350	-.059	CO
80 25	309.8	2.8	.4	.348	8.6	.473	12.0	12.0	.014	.14	61.7	108	132	7.4	128	330	.15	375	-.057	
85 30	309.4	2.4	.4	.321	8.0	.493	12.5	12.5	.033	.33	24.2	104	129	6.4	123	311	.15	375	-.054	
90 35	309.1	2.1	.3	.344	8.5	.474	12.0	12.0	.028	.28	30.5	103	128	6.2	122	311	.16	400	-.054	
95 40	308.8	1.8	.3	.334	8.3	.482	12.2	12.2	.025	.25	33.2	101	125	5.8	120	306	.16	400	-.053	
100 45	308.6	1.6	.2	.268	6.7	.540	13.7	13.7	.033	.33	20.2	97	124	5.0	117	285	.16	400	-.051	
105 50	308.5	1.5	.1	.235	5.9	.565	14.3	14.3	.069	.70	8.4	98	128	5.1	115	269	.18	450	-.048	
110 55	308.4	1.4	.1	.227	5.7	.573	14.5	14.5	.078	.79	7.2	101	130	5.7	116	261	.19	475	-.046	
115 1200	308.3	1.3	.1	.223	5.6	.570	14.4	14.4	.107	1.09	5.1	102	131	5.9	116	255	.20	500	-.044	
																3744			-.649	
																7417			-1.294	

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGHS 27X Date: 5/15/92
Run: 4 Technician(s): BW TK
Page: 2 of 2 DK JS

307.0

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 V.	%CO_2	2 O_2 V.	%O_2	Tel	3 CO V.	%CO	Bal	T/C(1) Wet Bulb	T/C(2) Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	PPH	Static Press.	Comm
120 / 1205	308.1	1.1	.2	.189	4.7	.598	15.2	15.2	.138	1.40	3.4	104	131	6.3	116	241	.20	500	-.043	Flow
125 / 10	308.0	1.0	.1	.178	4.4	.611	15.5	15.5	.127	1.29	3.4	103	129	6.1	114	236	.20	500	-.042	SO_2
130 / 15	307.9	.9	.1	.168	4.2	.618	15.7	15.7	.138	1.40	3.0	104	129	6.4	115	229	.20	500	-.041	CO_2
135 / 20	307.8	.8	.1	.157	3.9	.630	16.0	16.0	.133	1.35	2.9	103	128	6.1	114	225	.20	500	-.040	O_2
140 / 25	307.8	.8	Ø	.149	3.7	.636	16.1	16.1	.146	1.48	2.5	103	127	6.1	114	217	.21	525	-.038	CO
145 / 30	307.7	.7	.1	.138	3.5	.646	16.4	16.4	.146	1.48	2.3	103	126	6.1	112	212	.21	525	-.037	
150 / 35	307.6	.6	.1	.133	3.3	.653	16.6	16.6	.144	1.46	2.3	103	125	6.1	112	207	.21	525	-.036	
155 / 40	307.5	.5	.1	.127	3.2	.657	16.7	16.7	.148	1.50	2.1	102	123	5.9	111	202	.21	525	-.035	
160 / 45	307.4	.4	.1	.122	3.1	.662	16.8	16.8	.144	1.46	2.1	101	122	5.7	110	198	.21	525	-.035	
165 / 50	307.3	.3	.1	.123	3.1	.661	16.8	16.8	.144	1.46	2.1	100	120	5.8	110	194	.21	525	-.033	
170 / 55	307.2	.2	.1	.136	3.4	.651	16.5	16.5	.143	1.45	2.4	101	120	6.0	110	191	.22	550	-.032	
175 / 1300	307.1	.1	.1	.143	3.6	.645	16.3	16.3	.137	1.39	2.6	101	120	6.0	110	190	.22	550	-.031	
																2542			-.443	Flo
180 / 05	307.0	Ø	.1	.141	3.5	.645	16.3	16.3	.138	1.40	2.5	101	119	6.0	110	189	.22	550	-.031	SO_2
185																189			-.031	CO_2
190																2731			-.474	O_2
195																10148			-1.768	CO
200																274			-.048	
205																			✓	
210																			37	
215																				
220																				
225																				
230																				
235																				

76

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

Unit: HAUGHS S27X
Run: 4
Page: 1 of 1

Date: 5/15/92
Technician(s): BJ TK
DK JS

307.0 - 306.5

Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Comments
00 0900	313.0	0	616	540	441	425	344	474	1141	1367	75	-.068	Primary Air Set at .380
05 05	312.6	.4	492	551	440	363	347	472	1128	1291	75	-.065	Secondary Air Set at N/A
10 10	311.7	.9	454	512	433	307	359	463	1172	1384	74	-.064	Fan: ON HIGH
15 15	311.0	.7	452	502	429	294	361	456	1216	1393	74	-.064	
20 20	310.2	.8	453	503	429	292	369	448	1252	1431	75	-.064	
25 25	309.4	.8	453	525	433	295	363	440	1280	1392	76	-.064	
30 30	308.8	.6	435	515	440	297	367	434	1241	1350	77	-.063	Pumps turned on at: 935
35 35	308.3	.5	414	489	445	293	365	429	1224	1211	77	-.062	
40 40	307.9	.4	400	459	448	292	358	426	1191	1164	77	-.061	
45 45	307.6	.3	387	434	448	288	350	424	1173	1073	77	-.059	Check WB/DB: 116/145
50 50	307.4	.2	308	405	447	277	342	423	1117	998	76	-.056	
55 55	307.2	.2	297	379	440	271	334	423	1081	967	76	-.052	
60 1000	307.1	.1	280	354	428	265	323	422	1048	928	75	-.051	
65 05	307.0	.1	278	336	417	262	316	421	982	868	74	-.046	350.4
70 10													
75 15													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S27X Date: 5/15/92
Run: 4 Technician(s): BN TK
Page: 1 of 2 DK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16 350.4	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
00 / 1005	336	417	262	316	421	982	868	74	1441	248	34	248	35	36
05 / 10	301	403	376	307	420	674	720	73	1441	248	34	248	35	36
10 / 15	304	386	378	297	422	615	668	73	1441	248	34	248	35	36
15 / 20	270	355	360	275	416	574	614	73	1441	248	34	248	35	36
20 / 25	259	340	350	262	410	566	617	72	1441	248	34	248	35	36
25 / 30	270	324	341	249	402	554	1166	72	1441	248	34	248	35	36
30 / 35	347	314	341	239	394	560	1245	72	1441	248	34	248	35	36
35 / 40	399	311	220	239	385	591	1244	72	1444	248	34	248	35	36
40 / 45	447	311	204	242	376	653	1451	72	1448	248	34	248	35	36
45 / 50	496	325	213	250	371	725	1451	73	1448	248	34	248	35	36
50 / 55	511	344	222	258	363	835	1394	73	1448	248	34	248	35	36
55 / 1100	521	361	232	269	357	940	1406	73	1448	248	34	248	35	36
	4461	4191	3499	3203	4737	8269	12844	872						
60 / 05	520	371	239	277	354	1003	1399	74	1448	248	34	248	35	36
65 / 10	486	383	244	286	351	1028	1368	74	1448	248	34	248	35	36
70 / 15	474	388	248	290	352	1058	1449	74	1448	248	34	248	35	36
75 / 20	491	394	255	295	352	1138	1441	74	1448	248	34	248	35	36
80 / 25	476	398	262	300	352	1179	1207	75	1448	248	34	248	35	36
85 / 30	430	401	263	308	354	1180	1201	75	1448	248	34	248	35	36
90 / 35	415	400	264	311	357	1162	1228	76	1448	248	34	248	35	36
95 / 40	419	398	266	314	359	1125	1159	76	1447	248	35	248	35	36
100 / 45	392	400	261	314	361	1070	1010	75	1446	248	35	248	35	36
105 / 50	358	398	253	313	364	1047	970	75	1448	248	35	248	35	36
110 / 55	334	395	244	305	366	1005	924	75	1448	248	35	248	35	36
115 / 1200	319	390	237	301	367	983	888	76	1448	248	35	248	35	36
	5114	4716	3036	3614	4289	12978	14244	899						
	9575	8907	6535	6817	9026	21247	27088	1771						

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S27X
Run: 4
Page: 2 of 2

Date: 5/15/92
Technician(s): BN TK
DK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16 350.4	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
120 / 1205	297	383	226	290	368	946	811	75	1448	248	35	247	35	36
125 / 10	286	376	223	286	370	916	792	76	1447	248	35	245	35	36
130 / 15	273	368	214	280	369	894	771	76	1448	247	35	243	35	36
135 / 20	267	361	210	273	370	882	744	75	1448	246	35	242	35	36
140 / 25	257	353	206	266	368	853	716	75	1448	244	35	241	35	36
145 / 30	248	345	202	260	367	828	698	75	1447	243	35	241	35	36
150 / 35	238	335	197	258	364	804	673	75	1447	242	35	241	35	36
155 / 40	242	327	194	250	361	784	652	74	1446	241	35	241	35	36
160 / 45	253	322	190	243	359	763	636	74	1446	241	35	241	35	36
165 / 50	247	316	189	238	355	745	620	74	1446	241	35	241	35	36
170 / 55	241	312	188	236	351	735	614	74	1446	241	35	241	35	36
175 / 1300	237	307	188	227	347	729	612	74	1446	241	35	241	35	36
	3086	4105	2427	3107	4349	9879	8339	897						
180 / 05	234	307	189	225	343	718	605	74	1446	241	35	241	35	36
185	234	307	189	225	343	718	605	74						
190	3320	4412	2616	3332	4692	10597	8944	971					37	
195	12895	13319	9151	10149	13718	31844	36032	2742						
200	349	360	247	274	371	861	974	74	ΔT START		350.4			
205										STOP	259.6			
210											-90.8			
215														
220														
225														
230														
235														

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/15/92 Analyte: CO_2 (15-1)

Source: HAUGH'S S270 SERIES Run #: 4

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.6 % CO_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: BU Time: 0930 Temp: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	+ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	49.6	.496	12.289	-.311	-2.466

Comments:

Post Run Audit: By: DK Time: 1320 Temp: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	+ Conc Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	50.0	.500	12.388	-.212	-1.683

Comments:

+ Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/15/92 Analyte: O_2 (15-2)

Source: HAUGHS S270 Series Run #: 4

Zero Cyl #: T 132257 Conc. 00.0 % O_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.4 % O_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: BW Time: 940 Temp: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	0.0	.001	-.079	-.079	-.318
Span	12.4	.496	12.4	12.4	.494	12.497	.097	.781

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ ± Δ % ____

Post Run Audit: By: DK Time: 1330 Temp.: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.002	-.054	-.054	-.216
Span	12.4	.496	12.4	12.5	.498	12.599	.199	1.604

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ ± Δ % ____

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/15/92 Analyte: CO (15-3)

Source: HAUGHS S270 SERIES Run #: 4

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 4.96 % CO Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: BN Time: 945 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.1	.491	4.998	.038	.764

Comments:

Post Run Audit: By: DK Time: 1335 Temp.: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.4	.494	5.028	.068	1.380

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/15/92 Analyte: SO_2 (15-4)

Source: HAUGHS S270 SERIES Run #: 4

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: AL2892 Conc. 1232 ppm SO_2 Cyl Press: 450 psi

Certified by: LIQUID AIR Date: 9/24/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ______

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: BL Time: 0925 Temp: 76 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	0.1	.001	5.936	5.936	.237
Span	49.3	.493	1232	49.5	.495	1238.992	6.992	.568

Comments:

Post Run Audit: By: DK Time: 1315 Temp: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.2	.002	8.432	8.432	.337
Span	49.3	.493	1232	49.4	.494	1236.496	4.496	.365

Comments:

± Conc. Difference = Act ppm - Exp (Std) ppm

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

Run: 4
Date: 5/15/92
Technicians: BN, JS, TK, DK
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 58.9 °F T/C#30: 59.5 °F

Thermocouple Check (at ambient): T/C#1: 60.2 °F; T/C#2: 60.3 °F;

T/C #3: 60.2 °F;	T/C #4: 59.7 °F;	T/C #5: 59.4 °F;
T/C #6: 59.4 °F;	T/C #7: 59.4 °F;	T/C #8: 58.9 °F;
T/C #9: 60.1 °F;	T/C #10: 60.0 °F;	T/C #11: 58.9 °F;
T/C #12: 63.5 °F;	T/C #13: 60.9 °F;	T/C #14: 61.2 °F;
T/C #15: 61.5 °F;	T/C #16: 57.9 °F;	T/C #17: 59.3 °F;
T/C #18: 64.4 °F;	T/C #19: _____ °F;	T/C #20: _____ °F;
T/C #21: _____ °F;	T/C #22: _____ °F;	T/C #23: _____ °F;
T/C #24: _____ °F;	T/C #25: _____ °F;	T/C #26: _____ °F;

Comments: _____

Thermocouple Readout:
Pretest Zero/Span Check and Calibration:

Zero (0°F): -.2 °F	Adj to: 0 °F	Post Test Check Zero (0°F): 1.1 °F	% Difference .055
Span (2000°F): 1999.2 °F	Adj to: 2000.0 °F	Span (2000°F): 2001.3 °F	.065

(Allowable % Difference = 1.5%. Use formulas on Woodstove Data Sheet #15 to calculate % Difference)

Thermocouple Readout Pretest Linearity Check

0°F = 0 °F;	200°F = 201.3 °F;	400°F = 398.6 °F;
600°F = 600.8 °F;	800°F = 800.9 °F;	1000°F = 999.9 °F;
1200°F = 1197.5 °F;	1400°F = 1398.4 °F;	1600°F = 1599.0 °F
1800°F = 1799.2 °F;	2000°F = 2000.0 °F	

Tracer Gas (SO_2) Injection Train Leak Check: Pre ✓ Post ✓
Combustion Gas (CO_2, O_2, CO) Train Leak Check: Pre ✓ Post ✓
Tracer Gas (SO_2) Analyzer Train Leak Check: Pre ✓ Post ✓
Draft (Static) Guage Zero Check: Pre ✓ Post ✓

Scale Check Pre (Wt, #'s): 315.1 - 305.1 = 10
Post (Wt, #'s): 316.8 306.8 - 10.0

Stack cleaned prior to the run: Yes _____ No ✓.

CLIENT : HAUGHS PRODUCTS   TEST No. : 1

MODEL: S-27X   DATE: 5/13/92

****

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	412.600	0.150	80	0.25	5.10	400
5	414.100	0.170	79	0.64	8.70	375
10	415.718	0.150	80	0.30	8.90	400
15	417.241	0.170	80	0.06	10.00	375
20	418.865	0.150	82	0.06	11.40	400
25	420.399	0.150	82	0.09	12.10	400
30	421.933	0.150	83	0.20	12.90	400
35	423.473	0.130	84	0.28	13.10	425
40	424.927	0.150	85	0.15	12.90	400
45	426.478	0.150	86	0.10	7.30	400
50	428.029	0.150	87	0.13	6.80	400
55	429.592	0.130	87	0.25	6.30	425
60	431.063	0.130	87	0.51	5.50	425
65	432.535	0.130	87	0.59	5.30	425
70	434.007	0.130	87	0.77	4.90	425
75	435.479	0.130	87	0.86	4.30	425
80	436.951	0.130	87	0.87	3.70	425
85	438.423	0.130	87	0.85	3.50	425
90	439.895	0.130	87	0.83	3.30	425
95	441.368	0.130	86	0.84	3.50	425
100	442.834	0.130	86	0.80	3.50	425
105			86			

TABLE 2 ----- FIELD DATA

CLIENT : HAUGHS PRODUCTS TEST No. : 1

MODEL: S-27X DATE: 5/13/92

****

METER CAL. FACTOR (Y) -------	1.066	Wt. WOOD BURNED(LB) -------	10.9	Lbs
BAROMETRIC PRESS.(Pb) -------	30.14 in Hg	WET,FUEL MOISTURE % -------	18.256	%
LEAK RATE POST (Lp) -------	0.004 cfm	Wt. PART. COLLECTED -------	0.0909	g
WATER VOL. (V1c) -------	57.7 Ml	METER VOLUME Vm -------	30.234	mcf
TEST TIME (MIN) -------	100 min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : HAUGHS PRODUCTS   TEST No. : 1

MODEL: S-27X   DATE: 5/13/92

****

AVG DELTA H	-------	0.14 in H_2O	AVG PRCNT CO	-------	0.45 %
AVG METER TEMP. Tm	-------	85 deg F	AVG PRCNT CO_2	-------	7.29 %
AVG PPM SO_2	-------	411 PPM			

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS   TEST No. : 1

MODEL: S-27X   DATE: 5/13/92

****

STD SAMPLE VOL. Vm(std) ------	31.49	dscf	STACK GAS FLOW Qsd -------	964.573 & 16.08	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) -----	2.716	scf	PARTICULATE CONCTRT. C s ------	0.0029	g/dscf
PRCNT MSTR Bws -------	7.94	%	PARTC.EMISS. RATE E -------	2.78	g/Hr
BURN RATE BR -------	2.43	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.47	Lb-mole/Lb
CO EMISSION RATE -------	145.05 & 59.77	g/Hr & g/Kgdry fuel	PART.EMISS. RATE ------	1.15	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS TEST No. : 1

S-27X DATE: 5/13/92

****

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE		
5	630.9	98		100		
10	638.0	99				
15	640.0	99				
20	638.6	99				
25	642.2	100				
30	641.6	100				
35	643.0	100				
40	643.8	100				
45	645.2	100				
50	644.0	100				
55	648.4	101				
60	648.3	101				
65	648.8	101				
70	648.8	101				
75	648.8	101				
80	648.8	101				
85	648.8	101				
90	648.8	101				
95	649.8	101				
100	647.3	100				
105						
110						

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client Haugh's Products

Client Address 10 Atlas Court

Brampton, Ontario, Canada L6T 5C1

Client Phone 416-792-8000

Project No. ______ Model No. S 270X

Run No. 1 Date of Test 5/13/92 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon X Colorado ______ EPA X

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) ______ Max (>1.9 Kg/Hr) 2.407

Fuel % Moisture (dry) 22.333 %(wet) 18.256 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.064 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.14 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 82 °F
(00) (Data Sheet #14)

Flue Gas Moisture 7.9446 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.15 %
(0.00) (Data Sheet #8)

Stove Weight 237 lbs
(000) (Data Sheet #8)

Stove Temperature Change -74 °F
(000) (Data Sheet #14)

Particulate Emission .0446 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) ______ BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 10.9 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .0909 g
(0.0000) (Data Sheet #6)

H_2O Captured 57.7 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 30.234 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 4J-1.066 Post Test Leak Rate .004 CFM

Meter Box Data Sheet Page # 2

Meter Box 4J Y Factor 1.066

Leak Checks: 16.0 " Hg @ .003 cfm
16.0 " Hg @ .004 cfm
_____ " Hg @ _____ cfm
_____ " Hg @ _____ cfm

Inject SO2 @ 100 cc/min

Page 1 of 1

Unit: HAUGHS S27X

Run: 1 Date: 5/13/92

Operator(s): JS

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .26			Sampling Ratio : 29 : 1				BAROMETER: 30.15		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1030	412.600		8.804	.15	80	400	74	0
05	35	414.100		9.391	.17	79	375	74	.5
10	40	415.718		8.804	.15	80	400	74	0
15	45	417.241		9.391	.17	80	375	74	0
20	50	418.865		8.804	.15	82	400	74	.5
25	55	420.399		8.804	.15	82	400	74	0
30	1100	421.933		8.787	.15	83	400	75	0
35	5	423.473		8.255	.13	84	405	76	.5
40	10	424.997		8.771	.15	85	400	76	.5
45	15	426.478		8.771	.15	86	400	76	1.0
50	20	428.029		8.771	.15	87	400	76	1.0
55	25	429.592		8.255	.13	87	405	76	1.0
ROTO PRESS: .26			TOTALS :	105.608	1.80	995	BAROMETER: 30.12		
60	30	431.063		8.231	.13	87	405	77	1.0
65	35	432.535		8.231	.13	87	405	77	1.0
70	40	434.007		8.216	.13	87	405	78	1.0
75	45	435.479		8.216	.13	87	405	78	1.0
80	50	436.951		8.216	.13	87	405	78	1.0
85	55	438.423		8.216	.13	87	405	78	1.0
90	1200	439.895		8.231	.13	87	405	77	1.0
95	5	441.368		8.247	.13	86	405	76	1.0
100	10	442.834		8.247	.13	86	405	75	
105	15			74.051	1.17	781			
110	20								
115	25			179.659	2.97	1776	21		
			TOTALS:			85	MAX VACC =		1.0
TOTAL CU FT	30.234		TOTALS:	8.555	.141	545	AV BR: 30.14		

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance Level	Balance Zeroed
Initial:	✓	✓
Final:	✓	✓

Unit: HAUGHS S27X
Run: 1
Date: 5/13/92
Technician(s): Initial: BW
Final: JS/BW
Approved By: TK

IMPINGER #1

Final Weight 640.8 grams
Initial Weight 593.4 grams
Net 47.4 ✓ grams

IMPINGER #2

Final Weight 591.3 grams
Initial Weight 588.4 grams
Net 0.9 ✓ grams

IMPINGER #3

Final Weight 479.4 grams
Initial Weight 479.3 grams
Net .1 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 827.9 grams
Initial Weight 820.6 grams
Net 7.3 ✓ grams

TOTAL MASS OF H_2O CAPTURED 57.7 ✓ grams ✓

Scale Check: 295.0g = 295.00 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 260F
#
Back Half Filter # 260B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/9/92 Time 0900 By DK Front Half √ Back Half ______

Manufacturer: S&S Size: 110 mm Lot.No.: ZB882 Grade: #25 glass

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
241F	.6927	3/11	1640	Jas	0.6926	3/13	1604	DK				
242F	.6952		1641		0.6955		1606					
243F	.7027		1642		0.7023		1608					
244F	.6906		1643		0.6905		1610					
245F	.7000		1644		0.6996		1612					
246F	.6930		1645		0.6932		1614					
247F	.7000		1646		0.7004		1616					
248F	.6941		1647		0.6938		1618					
249F	.6920		1648		0.6920		1620					
250F	.6963		1649		0.6960		1622					
251F	.6977		1650		0.6974	3/13	1624	DK				
252F	.6981		1651		0.6978		1626					
253F	.7011		1652		0.7014		1628					
254F	.6911		1653		0.6913		1630					
255F	.6970		1654		0.6965		1632					
256F	.6965		1655		0.6963		1634					
257F	.6947		1656		0.6950		1636					
258F	.7008		1657		0.7007		1638					
259F	.6983		1658		0.6980		1640					
260F	.6942		1659		0.6943		1642		HAUGHS	RNI		

Checked by [signature] Date: 3/13/92 Time 1700

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
57	70	44	3/11	1640	Jas
60	74	44	3/13	1602	DK

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/9/92 Time 0900 By DK Front Half ____ Back Half ✓

Manufacturer: S&S Size: 8.2cm Lot.No.: ZB901 Grade: #25 glass

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
241B	.3811	3/11	1700	[illegible]	0.3812	3/13	1522	DK				
242B	.3789		1701		0.3792		1524					
243B	.3767		1702		0.3764		1526					
244B	.3810		1703		0.3807		1528					
245B	.3822		1704		0.3819		1530					
246B	.3880		1705		0.3819		1532					
247B	.3850		1706		0.3847		1534					
248B	.3810		1707		0.3810		1536					
249B	.3830		1708		0.3826		1538					
250B	.3813		1709		0.3811		1540					
251B	.3817		1710		0.3817	3/13	1542	DK				
252B	.3821		1711		0.3822		1544					
253B	.3810		1712		0.3808		1546					
254B	.3826		1713		0.3824		1548					
255B	.3764		1714		0.3761		1550					
256B	.3850		1715		0.3848		1552					
257B	.3760		1716		0.3762		1554					
258B	.3830		1717		0.3826		1556					
259B	.3812		1718		0.3813		1558					
260B	.3870		1719		0.3872		1600		HAUGHS	RN 1		

Checked by [illegible] Date: 3/13/92 Time 1700

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
57	70	44	3/11	1700	[illegible]
60	74	44	3/13	1520	DK

INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 4/10/92 Time: 1000 By: Jas

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
476	106.2307	4/13	958	DK	106.2312	4/14	1041	Jas	✓			
477	104.8297		1000		104.8301		1043		✓			
478	108.8855		1002		108.8859		1045		✓			
479	109.8650		1004		109.8653		1047		✓			
480	107.7999		1006		107.7998		1049		✓			
481	96.1065	4/13	1008	DK	96.1070		1051		✓			
482	106.3740		1010		106.3744		1053		✓			
483	107.0673		1012		107.0678		1055		✓			
484	104.1716		1014		104.1720		1057		✓			
485	105.3500		1016		105.3502		1059		✓			
486	106.3125	4/13	1018	DK	106.3129		1101		✓			
487	101.1758		1020		101.1758		1103		✓			
488	95.5598		1022		95.5593		1105		✓			
489	97.1357		1024		97.1357		1107		✓			
490	108.2140		1026		108.2144		1109		✓			
491	105.7272	4/13	1028	DK	105.7273		1111		✓			
492	108.3612		1030		108.3607		1113		✓			
493	106.9751		1032		106.9746		1115		✓			
494	98.8124		1034		98.8122		1117		✓			
495	94.9435		1036		94.9440		1119		✓			
496	106.7929	4/13	1038	DK	106.7934		1121		✓			
497	104.8081		1040		104.8076		1123		✓			
498	103.8566		1042		103.8565		1125		✓ HAUGHS RN 1			
499	107.3436		1044		107.3439		1127		✓			
500	98.3558		1046		98.3561		1129		✓			

Checked By: Bill Nowak Date: 4/15/92 Time: 0745

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITI

WB	DB	%RH	Date	Time	I
58	72	42	4/13	956	DK
59	72	46	4/13	1040	[illegible]

WST5-Form9,Pg1,Rev4/90
Unit Hawaiis 507X
Run # 1
Date: 5/13/92

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	~~Third~~	Date	Time	By
496		5/14	0900	DK	106.8092	5/15	1232	BN	106.8081	5/18	912	DK	106.8080	5/18	1504	[illegible]
497		5/14	0900	DK	104.8201	5/15	1234	BN	104.8195	5/18	914	DK	104.8200	5/18	1506	[illegible]
498		5/14	0900	DK	103.8624	5/15	1236	BN	103.8618	5/18	916	DK	103.8619	5/18	1508	[illegible]
499		5/14	0900	DK	107.3492	5/15	1238	BN	107.3486	5/18	918	DK	107.3490	5/18	1510	[illegible]
500		5/14	0900	DK	98.3610	5/15	1240	BN	98.3601	5/18	920	DK	98.3603	5/18	1512	[illegible]

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
D60F		5/13	1555	[illegible]	.7408	5/14	1732	[illegible]	.7403	5/15	1227	BN				
D60B		5/13	1555	[illegible]	.3929	5/14	1734	[illegible]	.3926	5/15	1223	BN				

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	5/14	1718	[illegible]	56	70	41
2	5/15	1200	BN	60	74	44
3	5/18	910	DK	58	71	45
4	5/18	1500	[illegible]	59	73	43
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WST7-Form1-Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 4/23/92

Through ________

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9996	10.0000	0.9997	0.1001			DK	4/23	1600	70	56	41
99.9996	10.0000	.9997	.1000			JAD	4/24	1130	74	57	34
99.9996	10.0000	.9998	.1000			JAD	4/24	1830	70	57	46
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	.9998	.0999			JAD	4/28	1330	71	59	49
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			TK	4/30	0846	77	64	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	950	77	61	39
99.9997	9.9999	1.000	.1000			JAD	5/1	1800	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/4	930	78	62	40
100.0002	10.0002	1.0001	.1000			JAD	5/5	1010	75	60	41
100.0000	10.0001	1.0000	.1001			JAD	5/5	1505	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9997	10.000C	1.0001	.1000			JAD	5/6	1540	72	59	46
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			TK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	.1001			JAD	5/8	1105	65	54	46
99.9998	10.0001	.9999	.0990			JAD	5/8	1650	68	56	47
99.9996	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			TK	5/12	0900	74	60	44
99.9997	10.0001	1.0000	.0999			JAD	5/12	1315	74	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	950	74	59	40
100.0002	10.0002	1.0000	.1001			JAD	5/14	1636	70	56	41
99.9998	9.9999	.9997	.0999			BJ	5/15	1200	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.000	.1001				5/18	1500	73	59	45

Dates: From 3/12

Through 4/23

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9998	10.0000	1.0000	0.0998			TK	3-12	1257	73	60	42
99.9995	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	.1000			JWD	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0002	10.0001	1.0000	0.1001			JWD	3/17	1607	71	59	46
99.9997	10.0001	1.0002	.1000			JWD	3/19	1715	74	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	.9999	0.0998			JWD	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9999	10.0001	1.0001	.1002			JWD	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3/26	1045	73	59	43
100.0001	9.9996	1.0002	.1001			JWD	3/27	1140	77	62	42
99.9997	9.9999	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9996	10.0000	1.0001	.1000			JWD	3/30	1200	71	57	41
99.9999	10.0004	1.0001	.1002			JWD	3/31	1016	73	59	43
100.0003	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9995	10.0000	1.0000	.1000			JWD	4/2	0900	73	59	43
99.9998	9.9997	0.9997	0.1000			DK	4/3	0900	72	59	46
99.9997	10.0001	0.9999	0.0999			DK	4/3	1630	70	58	48
99.9999	10.0001	0.9999	.0999			TK	4/6	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	56	41
99.9999	9.9998	0.9999	.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	.9999	.0998			JWD	4/8	1545	69	56	44
100.0000	9.9998	.9999	.0999			TK	4/9	1035	68	55	43
100.0000	10.0001	1.0000	.1000			JWD	4/10	0935	70	56	41
100.0000	9.9999	.9999	.0999			TK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	945	72	58	42
100.0002	10.0003	1.0001	.0998			JWD	4/14	1030	72	59	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	56	47
99.9997	9.9999	.9998	.0999			JWD	4/16	1006	70	58	48
100.0001	9.9999	1.0000	0.1001			DK	4/17	915	70	57	44
99.9996	9.9999	1.0000	.1000			JWD	4/17	1525	70	58	42
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0002	1.0002	.1001			JWD	4/21	1040	74	60	44
100.0000	10.0000	1.0000	0.0999			DK	4/22	900	73	59	43
99.9995	10.0003	1.0000	.1001			JWD	4/23	1007	76	60	38

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 2/6/92

Through 3/11/92

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0000	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9998	10.0003	1.0001	.1001			[illegible]	2/6	1315	68	56	47
99.9999	10.0000	1.0000	.1000			[illegible]	2/7	0915	65	54	48
100.0001	9.9999	1.0001	.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	.1000			TK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	75	62	48
100.0000	10.0000	1.0000	.1000			[illegible]	2/10	[illegible]	72	59	47
99.9997	10.0001	1.0000	.1001			[illegible]	2/11	[illegible]	74	61	47
100.0001	10.0000	1.0001	.1000			TK	2/12	0920	68	56	47
100.0003	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9997	10.0000	1.0000	.10000			[illegible]	2/12	0850	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0001	1.0001	0.1000			TK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			[illegible]	2/13	1535	75	62	45
100.0000	9.9999	1.0000	0.1000			DK	2/14	930	77	63	46
100.0000	10.0000	1.0000	0.1000			TK	2/14	1240	76	62	45
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	45
100.0000	10.0001	1.0000	.0999			TK	2/17	0820	65	54	48
99.9997	10.0000	1.0001	.1000			[illegible]	2/17	1035	68	56	47
99.9999	10.0000	.9999	.1000			TK	2/18	0856	65	54	48
99.9999	10.0001	1.0000	.1000			[illegible]	2/18	1000	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	945	71	58	45
100.000	9.9999	1.0000	0.1000			TK	2/24	0800	71	59	44
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	.9999	.0999			TK	2/26	1035	72	59	46
99.9999	9.9998	1.0000	0.0999			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.0999			TK	2/28	1230	78	64	46
99.9998	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			TK	3/4	1130	72	59	46
99.9996	10.0000	1.0000	.1000			[illegible]	3/5	0935	70	58	48
99.9996	10.0000	.9999	0.0999			TK	3/6	0830	73	60	42
99.9998	10.0000	.9999	.0998			[illegible]	3/6	1400	76	63	45
99.9998	10.0000	.9999	.1000			TK	3/9	0850	71	59	49
99.9996	10.000	.9999	.1000			[illegible]	3/9	1340	70	59	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0930	75	60	41
99.9996	10.0000	1.0000	.0998			[illegible]	3/11	1605	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAUGHS S 27X
Run: 1 Date: 5/13/92
Technician(s): BN JS

FRONT HALF

FILTER #: 260 F
FINAL WT: .7403 ✓ g
TARE WT: .6943 ✓ g
NET WT: .0460 ✓ g

BEAKER #: 496
ml: 210
desc: ACETONE

FINAL WT: 106.8080 ✓ g
TARE WT: 106.7934 ✓ g
NET WT: .0146 ✓ g

FILTER #: ________
FINAL WT: ________ g
TARE WT: ________ g
NET WT: ________ g

BEAKER #: ________
ml: ________
desc: ACETONE

FINAL WT: ________ g
TARE WT: ________ g
NET WT: ________ g

TOTAL VOLUME OF ACETONE USED IN WASH 210 ✓ ml

BACK HALF

FILTER #: 260 B
FINAL WT: .3926 ✓ g
TARE WT: .3872 ✓ g
NET WT: .0054 ✓ g

BEAKER #: 497
ml: 165
desc: ACETONE

FINAL WT: 104.8200 ✓ g
TARE WT: 104.8076 ✓ g
NET WT: .0124 ✓ g

FILTER #: ________
FINAL WT: ________ g
TARE WT: ________ g
NET WT: ________ g

BEAKER #: 498
ml: 75
desc: METHCHLOR

FINAL WT: 103.8619 ✓ g
TARE WT: 103.8565 ✓ g
NET WT: .0054 ✓ g

BEAKER #: 499
ml: 150
desc: H2O

FINAL WT: 107.3490 ✓ g
TARE WT: 107.3439 ✓ g
NET WT: .0051 ✓ g

BEAKER #: 500
ml: 75
desc: H2O

FINAL WT: 98.3603 ✓ g
TARE WT: 98.3561 ✓ g
NET WT: .0042 ✓ g

BEAKER #: ________
ml: ________
desc: ________

FINAL WT: .0093 ✓ g
TARE WT: ________ g
NET WT: ________ g

BEAKER #: ________
ml: ________
desc: ________

FINAL WT: ________ g
TARE WT: ________ g
NET WT: ________ g

TOTAL VOLUME OF ACETONE USED IN WASH 165 ✓ ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 225 ✓ ml

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: HAUGHS 507 X
Run: 1 Date: 5/13/92
Technician(s): JS DK TK

BLANKS DONE: 5/11/92

BEAKER #: D
200 ml ACETONE
FISHER OPTIMA LOT #: 913996

FINAL WT: 106.2239 g
TARE WT: 106.2235 g
NET WT: .0004 g

BEAKER #: E
75 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 916306

FINAL WT: 96.8428 g
TARE WT: 96.8424 g
NET WT: .0004 g

BEAKER #: F
200 ml DISTILLED WATER
BONNEAU CERTIFIED

FINAL WT: 96.5114 g
TARE WT: 96.5106 g
NET WT: .0008 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 3/17/92

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
D	106.2238	1326	106.2235	1036				
E	96.8424	1328	96.8424	1038				
F	96.5109	1330	96.5106	1040				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
3/23	1300	JWS	59	73	43
3/24	1034	DK	58	72	42

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	DK	59	74	40
5/14	1636	JWS	56	70	41
5/15	1200	BN	60	74	44

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
D	5/12	0900	106.2243	5-13 1048	106.2239	5-14 1659		
E	5/12	0900	96.8431	5-13 1050	96.8428	5-14 1701		
F	5/12	1330	96.5112	5-14 1700	96.5114	5-15 1230		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: HAUGHS 527X
Run: 1
Date: 5/13/92
Technician(s): TC TK
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Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Tim Kelly Date: 5/18/92

Blank Calculations:

Acetone:	.0004 g	÷	200 ml	=	.000002 g/ml
Dichloromethane:	.0004 g	÷	75 ml	=	.00000533 g/ml
Distilled Water:	.0008 g	÷	200 ml	=	.000004 g/ml

Front Half Catch:

Filters: .0460 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0460 g (Net Catch)

Beakers: .0146 g (Total Catch) - 210 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0142 g (Net Catch)

Total Front Half Catch .0602 g

Back Half Catch:

Filters: .0054 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0054 g (Net Catch)

Beakers:

1. Acetone/Impingers:
.0164 g (Total Catch) - 165 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .0161 g (Net Catch)

2. Extract/Impingers:
.0054 g (Total Catch) - 75 (ml. of Dichloromethane) (.00000533 g) .0004 (Blank Value/ml of Dichloromethane) = .0050 g (Net Catch)

3. Water/Impingers:
.0093 g (Total Catch) - 275 (ml. of water) (.000004 g) (Blank Value/ml of water) = .0082 g (Net Catch)

Total Back Half Catch .0307 g
Total Catch .0909 g
% Front Half 66.23 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HAUGHS SD7X

Run: 1 Date: 5/13/92

Technician(s): TKJS

WST3-Form 1 8/28/91

1) Vm(std): (30.234 Vm)(17.65)(1.066 mcf)(30.14 " Hg + .141 " H2O / 13.6) / (545 TmA) = 31.4698 dscf
000.0000

2) Vw(std): (.04707)(57.7 ml H2O): 2.7159 scf
00.0000

3) Asw: (2.7159 scf) / (2.7159 scf + 31.4698 dscf) = .0794 Bws X 100 = 7.9446 % H2O
.0000 00.0000

4) Cs: (.0909 g.) / (31.4698 dscf) (15.43): .0446 gr/dscf
0.0000

5) Estimated g/hr: (______ g.) / (______ dscf) (______ dscfm)(60): ______ g/hr
00.000 00.0000

Vm :	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf :	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf)
" Hg :	average barometric pressure during the test	(p. 2)	(00.00 " Hg)
" H2O :	average delta H for the test	(p. 2)	(.000 " H2O)
TmA :	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA)
ml H2O :	total water caught during the test	(p. 3)	(000.0 ml H2O)
g. :	total particulate catch for the test	(p. 6)	(00.0000 g.)
dscfm :	average stack flow during the test	(computer printout)	(00.000 dscfm)

Unit [illegible]
Run # 1
Date 5/13/92
Technician BN TK PK JS
WST6-Form1,Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft^3

Dilution Tunnel Draft (If applicable): Start 0 Stop 0

Test Chamber Air Velocity: Start: 0 Stop: 0 Avg: 0

Wet Bulb/ Start: WB: 58 °F DB: 71 °F 1.2 % Amb Moisture 46 %RH

Dry Bulb Stop: WB: 58 °F DB: 73 °F 1.1 % Amb Moisture 42 %RH

$\bar{X}$ = 1.15 % Ambient Moisture $\bar{X}$ = 44 % Relative Humidity (RH)

Empty Stove Wt: 237.3 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 305.0 lbs. Dry: 304.5 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: lbs.

Kindling Wt. Paper: .3 lbs. Wood: 6.0 lbs.

Pre Burn Fuel Wt. 10.0 + 9.6 Total: 19.6 lbs.

Total Kindling and Pre Burn Fuel Wt 25.6 lbs.

Coal Bed Wt-lbs: Range(2.7 - 2.2) 307.2-306.7 lbs. Actual: 2.5 lbs. ✓

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\left(\underset{\text{Upper Wt.}}{2.7} + \underset{\text{Lower Wt.}}{2.2} / 2 \right)$ .25 = .6 lbs.

Test Fuel Wt-lbs: Ideal 10.3 lbs. Range: 11.3 - 9.3 lbs. Actual: 10.9 lbs. ✓

Test Fuel Size (pcs.)(.75 x 1.5 x 5" Flanges) 14 Pcs.

2 x 4's x 18 3/4 " 4 Pcs 10.9 lbs. 100 %

4 x 4's x N/A " N/A Pcs N/A lbs. N/A %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.9 - (10.9 \times .1256)}{2.2025} \times \frac{60}{100}$ = 2.427 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output(HO_E) (Avg BTU's/Hr) (19,140) x $\frac{2.427}{100}$ x 63 = 29268 Est Heat Output (HO_E) BTU's/Hr

Comments: 190 = 127

Unit: HAUGHS S27X Run: 1 Date: 5/13/92

WOODSTOVE OPERATING DATA

FIRE STARTED: 0730 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges, then set to WIDE OPEN at start of preburn.

SECONDARY AIR: N/A CAT BYPASS: N/A

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 19 sec.

TEST: Door Wide Open during loading 0 min 32 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of WIDE OPEN .

SECONDARY AIR: N/A CAT BYPASS: N/A

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: NA

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 10 or 18 inches.

1st warm up/preburn fuel charge (10.0 lbs) added at 0825 .

2nd warm up/preburn fuel charge (9.6 lbs) added at 0930 .

3rd warm up/preburn fuel charge (________ lbs) added at __________ .

4th warm up/preburn fuel charge (________ lbs) added at __________ .

5th warm up/preburn fuel charge (________ lbs) added at __________ .

Unit: [illegible]
Run: 1
Date: 5/13/92
Technician: BN TK DK JS
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 69 °F

Correction Factor: 0

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes____. No ✓.
Time Test Fuel Moisture Readings taken at: 0900
Calibration Checks: X ✓ Y ✓ 12.0 12.3 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	5.5	5.5	4.5	4.5	4.5	4.5	4.833
2									
3									
4	2x4x18	P	18.5	20.1	18.5	20.1	18.0	19.6	19.933
5	2x4x18	P	18.5	20.1	18.0	19.6	18.5	20.1	19.933
6									39.867
7									
8									
9									
10	2x4x18 3/4	T	19.0	20.7	19.0	20.7	18.5	20.1	20.500
11	2x4x18 3/4	T	21.0	22.9	21.5	23.5	19.0	20.7	22.367
12	2x4x18 3/4	T	22.0	24.1	21.5	23.5	21.0	22.9	23.500
13	2x4x18 3/4	T	22.0	24.1	22.0	24.1	19.0	20.7	22.967
14									89.333
15									
16									
17									
18									
19									
20	FEET	T	19.5	21.3	20.0	21.8	19.5	21.3	21.467

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	4.833 %	19.933 %	22.333 %
% Moisture - Wet Basis:	4.616 %	16.620 %	18.256 %

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: [illegible]
Run#: 1
Date: 5/13/92
Technician: BH TK DK JS
WST2-form11-Rev 6/90

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Wood Piece: Nominal Dimensions: 2 x 4 x 3½

Depth (D): 3.90 cm

Width (W): 9.00 cm

Length (L): 8.60 cm
8.60 cm
8.60 cm
8.60 cm

Length $\bar{X}$ = 8.60 cm

Volume: 301.860 cm^3
(D X W X L)

MOISTURE: Room Temperature: 70 °F Correction Factor: Ø

Uncorrected Meter Readings Corrected for temperature: Yes___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	22.0	24.1 %
Bottom:	20.0	21.8 %
Side:	18.5	20.1 %
$\bar{X}$:		22.000 %

Avg % Moisture (Dry) 22.000 %

Aug % Moisture (Wet) 18.033 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 202.9 g Dry Weight: 169.17 g

% Moisture Dried Basis: 16.624 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	5/13/92	0900	233 °F
Out of Dryer	5/[illegible]/92	1445	[illegible] °F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 169.17 g (dry wt) ÷ 301.860 cm^3 (volume) = .5604 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ____________ g

Wet Wt: ____________ g (Gross Wet Wt.) ÷ ____________ g (Tare Beaker Wt.) = ____________ g (Net Wet Wt.)

Dry Wt: ____________ g (Gross Dry Wt.) ÷ ____________ g (Tare Beaker Wt.) = ____________ g (Net Dry Wt.)

% Moisture Dried Basis: ____________ %
[1 - (Net Dry Wt - Net Wet Wt.)] X 100

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGHS 527X Date: 5/13/92
Run: 1 Technician(s): BN TK DK JS
Page: 1 of 1

Minute Time	Scale Wt (307.0)	lbs left	Burn Rate	1 CO_2 V.	$\%CO_2$	2 O_2 V.	$\%O_2$	Tel	3 CO V.	%CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	PPM	Static Press.	Comm
00 1030	317.9	10.9	0	.204	5.1	.629	15.9	15.9	.025	.25	21.3	106	145	6.5	123	321	.16	400	-.062	Flow
05 35	317.6	10.6	.3	.349	8.7	.454	11.5	11.5	.063	.64	13.5	108	148	6.7	126	343	.15	375	-.044	SO_2
10 40	316.2	9.2	1.4	.359	8.9	.473	12.0	12.0	.030	.30	29.7	123	166	12.0	141	428	.16	400	-.068	CO_2
15 45	315.3	8.3	.9	.404	10.0	.434	11.0	11.0	.006	.06	16.7	120	175	10.0	139	455	.15	375	-.071	O_2
20 50	314.0	7.0	1.3	.460	11.4	.381	9.6	9.6	.006	.06	19.0	130	184	13.5	146	485	.16	400	-.073	CO
25 55	313.0	6.0	1.0	.489	12.1	.349	8.8	8.8	.009	.09	13.5	133	190	15.0	149	501	.16	400	-.075	
30 1100	311.7	4.7	1.3	.520	12.9	.310	7.8	7.8	.020	.20	64.4	135	194	16.0	151	518	.16	400	-.076	
35 05	310.7	3.7	1.0	.528	13.1	.297	7.5	7.5	.028	.28	46.7	134	191	15.5	150	515	.17	425	-.076	
40 10	309.7	2.7	1.0	.521	12.9	.293	7.4	7.4	.015	.15	86.0	131	184	14.0	148	502	.16	400	-.076	
45 15	308.8	1.8	.9	.294	7.3	.522	13.2	13.2	.010	.10	73.1	121	169	10.5	139	433	.16	400	-.071	
50 20	308.6	1.6	.2	.272	6.8	.551	14.0	14.0	.013	.13	52.0	116	161	8.9	134	404	.16	400	-.067	
55 25	308.3	1.3	.3	.254	6.3	.564	14.3	14.3	.025	.25	26.3	111	153	7.6	131	381	.17	425	-.065	
																52861			-.824	Flow
60 30	308.1	1.1	.2	.220	5.5	.591	15.0	15.0	.050	.51	10.7	107	146	6.6	127	356	.17	425	-.063	SO_2
65 35	307.9	.9	.2	.213	5.3	.597	15.1	15.1	.058	.59	9.0	105	143	6.3	125	345	.17	425	-.061	CO_2
70 40	307.8	.8	.1	.197	4.9	.611	15.5	15.5	.076	.77	6.4	103	140	5.9	122	333	.17	425	-.060	O_2
75 45	307.6	.6	.2	.171	4.3	.634	16.1	16.1	.085	.86	5.0	102	137	5.8	121	321	.17	425	-.058	CO
80 50	307.5	.5	.1	.147	3.7	.656	16.7	16.7	.086	.87	4.2	101	134	5.6	120	306	.17	425	-.056	
85 55	307.4	.4	.1	.140	3.5	.664	16.8	16.8	.084	.85	4.1	99	132	5.1	119	296	.17	425	-.055	
90 1200	307.3	.3	.1	.133	3.3	.671	17.0	17.0	.082	.83	4.0	98	129	5.0	117	286	.17	425	-.054	
95 05	307.1	.1	.2	.140	3.5	.668	16.9	16.9	.083	.84	4.2	96	125	4.8	115	281	.17	425	-.053	
100 10	307.0	.0	.1	.140	3.5	.670	17.0	17.0	.079	.80	4.4	96	124	4.8	115	275	.17	425	-.052	
105 15																2799			-.512	
110 20																8085			-1.336	
115 1225																385			-.064	21

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

Unit: HOUGHS S27X
Run: 1
Page: 1 of 1

Date: 5/13/92
Technician(s): BN TK
DK JS

307.2 - 306.7

Minute / Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Comments
00 / 930	315.7		249	313	449	431	320	452	621	576	77	-.043	Primary Air Set at OPEN
05 / 35	314.9	.8	324	345	421	299	308	458	723	1277	78	.063	Secondary Air Set at N/A
10 / 40	314.0	.9	424	425	408	278	294	456	723	1276	76	.067	Fan: HIGH
15 / 45	312.9	1.1	469	489	408	287	296	451	869	1389	76	.070	
20 / 50	311.6	1.3	501	580	419	307	310	445	1111	1578	77	.074	
25 / 55	310.4	1.2	489	616	442	323	326	441	1276	1588	78	.073	412
30 / 1000	309.2	1.2	516	628	470	346	347	441	1321	1475	80	.073	Pumps turned on at: 1000
35 / 5	308.5	.7	463	582	496	353	368	441	1325	1337	81	.071	
40 / 10	307.9	.6	430	531	507	357	388	445	1315	1284	80	.066	
45 / 15	307.5	.4	402	500	512	357	381	449	1274	1313	81	.066	Check WB/DB: 108/157
50 / 20	307.2	.3	372	459	506	350	328	454	1220	1044	80	.064	429
55 / 25	307.0	.2	351	417	493	341	368	458	1162	1002	81	.062	
60 / 30	307.0	0	321	392	482	332	360	461	1083	887	80	.062	405.4
65 / 35													
70 / 40													
75 / 45													
80 / 50													
85 / 55													
90 / 1100													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S27X Date: 5/13/92
Run: 1 Technician(s): BN TK
Page: 1 of 1 DK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16 405.4	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalytic	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
00 / 1030	392	482	332	360	461	1083	887	80	1448	241	34	241	35	36
05 / 35	334	467	448	351	462	1053	924	81	1448	241	34	241	35	36
10 / 40	443	445	471	335	465	976	1406	80	1447	241	34	241	35	36
15 / 45	519	439	489	338	462	1027	1458	80	1448	241	34	243	35	36
20 / 50	591	446	519	334	455	1085	1512	80	1448	241	34	245	35	36
25 / 55	630	458	546	337	449	1142	1594	80	1448	243	34	247	35	36
30 / 1100	676	478	583	346	442	1241	1640	81	1448	246	34	247	35	36
35 / 05	697	495	415	353	439	1275	1671	82	1448	248	34	248	35	36
40 / 10	711	520	397	368	437	1380	1631	82	1448	248	35	248	35	36
45 / 15	630	541	391	385	437	1288	1252	84	1448	248	35	248	35	36
50 / 20	560	543	377	393	439	1249	1151	84	1448	248	35	248	35	36
55 / 25	503	534	359	383	442	1212	1097	85	1448	248	35	248	35	36
	6686	5848	5327	4283	5390	14011	16223	979						
60 / 30	444	515	337	373	443	1169	1052	85	1447	248	35	248	35	36
65 / 35	413	497	325	362	443	1159	1007	84	1446	248	35	248	35	36
70 / 40	388	483	312	359	442	1122	978	84	1447	248	35	247	35	36
75 / 45	367	466	297	347	442	1077	921	84	1445	248	35	245	35	36
80 / 50	342	452	285	341	440	1036	878	82	1445	248	35	243	35	36
85 / 55	327	436	273	326	437	995	842	82	1445	248	35	244	35	36
90 / 1200	308	419	260	320	431	961	803	80	1445	248	35	244	35	36
95 / 05	293	403	252	310	425	933	785	78	1445	248	35	244	35	36
100 / 10	286	392	252	304	422	926	798	78	1445	248	35	244	35	36
105 / 15	3168	4063	2593	3042	3925	9378	8064	737						
110 / 20	9854	9911	7920	7325	9315	23389	24287	1716	ΔT START		405.4			21
115 / 1225	469	472	377	349	444	1114	1157	82		STOP	331.2			
											-74.2			

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/13/92 Analyte: CO_2 (15-1)

Source: HAUGH'S S270 SERIES Run #: 1

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.6 % CO_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: BN Time: 1000 Temp: 80 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	50.0	.500	12.388	-.212	-1.683

Comments:

Post Run Audit: By: DK Time: 1225 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	50.2	.502	12.437	-.163	-1.292

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/13/92 Analyte: O_2 (15-2)

Source: HAUGHS S270 SERIES Run #: 1

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.4 % O_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: BW Time: 1010 Temp: 80 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	0.5	.005	.023	.023	.090
Span	12.4	.496	12.4	12.5	.501	12.675	.275	2.221

Comments: Teledyne #2 Cyl % Exp % Act % Adj to ± Δ %

Post Run Audit: By: DK Time: 1235 Temp.: 78 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.4	.004	-.003	-.003	-.012
Span	12.4	.496	12.4	12.5	.504	12.752	.352	2.838

Comments: Teledyne #2 Cyl % Exp % Act % Adj to ± Δ %

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/13/92 Analyte: CO (15-3)

Source: HAUGHS S270 SERIES Run #: 1

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 4.96 % CO Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: BN Time: 1015 Temp: 81 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.4	.494	5.028	.068	1.380

Comments:

Post Run Audit: By: DK Time: 1240 Temp.: 78 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.4	.494	5.028	.068	1.380

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/13/92 Analyte: SO_2 (15-4)

Source: HAUGHS S270 SERIES Run #: 1

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: AL2892 Conc. 1232 ppm SO_2 Cyl Press: 450 psi

Certified by: LIQUID AIR Date: 9/24/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: BN Time: 955 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	0.2	.002	8.432	8.432	.337
Span	49.3	.493	1232	49.4	.494	1236.496	4.496	.365

Comments:

Post Run Audit: By: DK Time: 1220 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	00.2	.002	8.432	8.432	.337
Span	49.3	.493	1232	49.3	.493	1234.000	2.000	.162

Comments:

+ Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

Unit: [illegible]
Run: 1
Date: 5/13/92
Technicians: BN TK DK JS
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 65.3 °F T/C#30: 66.6 °F

Thermocouple Check (at ambient): T/C#1: 65.1 °F; T/C#2: 65.2 °F;

T/C #3: 65.8 °F;	T/C #4: 65.9 °F;	T/C #5: 65.9 °F;
T/C #6: 65.8 °F;	T/C #7: 65.5 °F;	T/C #8: 65.4 °F;
T/C #9: 65.7 °F;	T/C #10: 65.6 °F;	T/C #11: 65.3 °F;
T/C #12: 66.0 °F;	T/C #13: 65.6 °F;	T/C #14: 65.5 °F;
T/C #15: 65.8 °F;	T/C #16: 62.7 °F;	T/C #17: 64.3 °F;
T/C #18: 68.0 °F;	T/C #19: ____ °F;	T/C #20: ____ °F;
T/C #21: ____ °F;	T/C #22: ____ °F;	T/C #23: ____ °F;
T/C #24: ____ °F;	T/C #25: ____ °F;	T/C #26: ____ °F;

Comments: ____

Thermocouple Readout:
Pretest Zero/Span Check and Calibration:

Zero (0°F): -.3 °F	Adj to: 0 °F	Post Test Check Zero (0°F): .6 °F	% Difference .030
Span (2000°F): 2000.7 °F	Adj to: 2000.0 °F	Span (2000°F): 2004.2 °F	.21

(Allowable % Difference = 1.5%. Use formulas on Woodstove Data Sheet #15 to calculate % Difference)

Thermocouple Readout Pretest Linearity Check

0°F = 0 °F;	200°F = 201.6 °F;	400°F = 398.8 °F;
600°F = 601.2 °F;	800°F = 801.4 °F;	1000°F = 1000.5 °F;
1200°F = 1198.2 °F;	1400°F = 1399.4 °F;	1600°F = 1600.1 °F
1800°F = 1800.5 °F;	2000°F = 2000.0 °F	

Tracer Gas (SO_2) Injection Train Leak Check:	Pre ✓	Post ✓
Combustion Gas (CO_2, O_2, CO) Train Leak Check:	Pre ✓	Post ✓
Tracer Gas (SO_2) Analyzer Train Leak Check:	Pre ✓	Post ✓
Draft (Static) Guage Zero Check:	Pre ✓	Post ✓

Scale Check Pre (Wt, #'s): 315.2 - 305.2 = 10
Post (Wt, #'s): 316.8 - 306.8 = 10.0

Stack cleaned prior to the run: Yes ✓ No ____.

CLIENT : HAUGHS PRODUCTS TEST No. : 5

MODEL: S-27X DATE: 5/18/92

****

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	678.000	0.150	77	1.17	4.90	625
5	679.500	0.260	77	0.52	3.40	475
10	681.495	0.170	79	0.55	2.50	600
15	683.086	0.170	81	0.63	2.90	600
20	684.690	0.160	82	0.64	3.10	600
25	686.299	0.180	83	0.52	5.60	575
30	687.985	0.190	84	0.53	6.80	550
35	689.753	0.190	85	0.52	7.30	550
40	691.528	0.230	86	0.08	10.80	500
45	693.487	0.230	87	0.08	11.00	500
50	695.454	0.230	87	0.11	11.70	500
55	697.420	0.230	88	0.11	12.00	500
60	699.394	0.230	88	0.11	11.90	500
65	701.369	0.230	88	0.07	10.10	500
70	703.344	0.230	89	0.06	10.50	500
75	705.326	0.210	90	0.06	10.30	525
80	707.221	0.210	90	0.18	9.80	525
85	709.116	0.210	90	0.15	9.80	525
90	711.011	0.210	90	0.13	9.40	525
95	712.908	0.190	91	0.31	7.90	550
100	714.721	0.190	91	0.44	6.80	550
105	716.537	0.170	91	0.79	5.80	575
110	718.274	0.170	91	0.88	5.60	575
115	720.010	0.170	91	0.91	5.50	575
120	721.747	0.160	91	1.18	5.30	600
125	723.412	0.160	91	1.10	5.20	600
130	725.076	0.160	90	1.34	5.00	600
135	726.734	0.160	90	1.27	4.80	600
140	728.393	0.170	89	1.39	4.70	575
145	730.117	0.160	90	1.39	4.60	600
150	731.775	0.160	90	1.40	4.50	600
155	733.434	0.160	90	1.41	4.30	600
160	735.092	0.160	90	1.38	4.10	600
165	736.751	0.150	90	1.43	3.90	625
170	738.343	0.150	90	1.49	3.70	625
175	739.935	0.150	90	1.47	3.50	625
180	741.527	0.150	90	1.36	3.50	625
185	743.119	0.150	90	1.34	3.60	625
190	744.712	0.150	91	1.27	3.40	625
195	746.310	0.140	91	1.25	3.30	650
200	747.847	0.130	91	1.24	3.40	650
205	749.383	0.130	91	1.20	3.40	650
210			91			

TABLE 2 ----- FIELD DATA

CLIENT : HAUGHS PRODUCTS — TEST No. : 5

MODEL: S-27X — DATE: 5/18/92

****

METER CAL. FACTOR (Y) -------	1.066	Wt. WOOD BURNED(LB) -------	10.5	Lbs
BAROMETRIC PRESS.(Pb) -------	30.08 in Hg	WET,FUEL MOISTURE % -------	17.582	%
LEAK RATE POST (Lp) -------	0.002 cfm	Wt. PART. COLLECTED -------	0.6224	g
WATER VOL. (V1c) -------	116.2 Ml	METER VOLUME Vm -------	71.383	mcf
TEST TIME (MIN) -------	205 min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : HAUGHS PRODUCTS TEST No. : 5

MODEL: S-27X DATE: 5/18/92

****

AVG DELTA H	-------	0.18 in H_2O	AVG PRCNT CO	-------	0.80	%
AVG METER TEMP. Tm	-------	88 deg F	AVG PRCNT CO_2	-------	6.18	%
AVG PPM SO_2	-------	573 PPM				

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS   TEST No. : 5

MODEL: S-27X   DATE: 5/18/92

****

STD SAMPLE VOL. Vm(std) ------	73.73 dscf	STACK GAS FLOW Qsd -------	498.754	dscf/Hr
			&	
			8.31	dscf/min
VOL. WATER VAPOR Vw(std) -----	5.470 scf	PARTICULATE CONCTRT. C s ------	0.0084	g/dscf
PRCNT MSTR Bws -------	6.91 %	PARTC.EMISS. RATE E -------	4.21	g/Hr
BURN RATE BR -------	1.15 Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.51	Lb-mole/Lb
CO EMISSION RATE -------	133.06 g/Hr & 115.71 g/Kgdry fuel	PART.EMISS. RATE ------	3.66	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS | TEST No. : 5

S-27X | DATE: 5/18/92

****

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE		
=========	=========	=========	=========	=========	=========	=========
5	988.4	97		100		
10	997.5	98				
15	1000.9	98				
20	1006.3	99				
25	1007.5	99				
30	1009.9	99				
35	1011.2	99				
40	1013.3	99				
45	1014.9	100				
50	1018.1	100				
55	1016.7	100				
60	1019.9	100				
65	1020.4	100				
70	1019.5	100				
75	1021.2	100				
80	1024.3	100				
85	1024.3	100				
90	1024.3	100				
95	1024.4	100				
100	1024.7	100				
105	1026.4	101				
110	1026.3	101				
115	1025.7	101				
120	1026.3	101				
125	1026.5	101				
130	1026.8	101				
135	1024.1	100				
140	1025.6	101				
145	1021.4	100				
150	1024.1	100				
155	1024.7	100				
160	1024.1	100				
165	1024.7	100				
170	1024.2	100				
175	1024.2	100				
180	1024.2	100				
185	1024.2	100				
190	1023.9	100				
195	1026.2	101				
200	1026.5	101				
205	1025.8	101				
210						
215						

QSP 8151

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client: Haugh's Products

Client Address: 10 Atlas Court
Brampton, Ontario, Canada L6T 5C1

Client Phone: 416-792-8000

Project No. ______ Model No. S270X

Run No. 5 Date of Test 5/18/92 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon X Colorado ______ EPA X

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) 1.1500 Max (>1.9 Kg/Hr) ______

Fuel % Moisture (dry) 21.333 %(wet) 17.582 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.049 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.08 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 78 °F
(00) (Data Sheet #14)

Flue Gas Moisture 6.9039 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.35 %
(0.00) (Data Sheet #8)

Stove Weight 237 lbs
(000) (Data Sheet #8)

Stove Temperature Change -78 °F
(000) (Data Sheet #14)

Particulate Emission .1302 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) ______ BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 10.5 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .6224 g
(0.0000) (Data Sheet #6)

H_2O Captured 116.0 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 71.383 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 4J-1.066 Post Test Leak Rate .002 CFM

FAN CONF

Meter Box Data Sheet Page # 2

Meter Box 4J Y Factor 1.066

Leak Checks: 15.0 " Hg @ .001 cfm
16.0 " Hg @ .002 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Page 1 of 2

Unit: HAUGHS S 27X

Run: 5 Date: 5/18/92

Operator(s): JS

Nozzle: Probe @ 3/8 " od

Initial Volume: 1500

ROTO PRESS: .20			Sampling Ratio : 18.5 : 1				BAROMETER: 30.10		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1035	678.000		5.645	.15	77	625	72	0
05	40	679.500		7.414	.26	77	475	73	.5
10	45	681.495		5.869	.17	79	600	73	1.0
15	50	683.086		5.869	.17	81	600	73	.5
20	55	684.690		5.869	.16	82	600	73	.5
25	1100	686.299		6.185	.18	83	575	73	.5
30	5	687.985		6.391	.19	84	550	74	1.0
35	10	689.753		6.391	.19	85	550	74	1.0
40	15	691.508		7.030	.23	86	500	74	1.0
45	20	693.487		7.030	.23	87	500	74	1.0
50	25	695.454		7.030	.23	87	500	74	1.0
55	30	697.426		7.030	.23	88	500	74	1.0
ROTO PRESS: .20			TOTALS :	77.643	2.39	946	BAROMETER: 30.08		
60	35	699.394		7.026	.23	88	500	74	1.0
65	40	701.369		7.026	.23	88	500	74	1.0
70	45	703.344		7.012	.23	89	500	75	1.0
75	50	705.306		6.679	.21	90	525	75	1.5
80	55	707.221		6.679	.21	90	525	75	1.0
85	1200	709.116		6.679	.21	90	525	75	1.0
90	5	711.011		6.679	.21	90	525	75	1.0
95	10	712.908		6.363	.19	91	550	76	1.0
100	15	714.821		6.363	.19	91	550	76	1.0
105	20	716.537		6.086	.17	91	575	76	1.0
110	25	718.274		6.086	.17	91	575	76	1.0
115	30	720.010		6.086	.17	91	575	76	1.0
			TOTALS:	78.764	2.42	1080	MAX VACC =		1.5
TOTAL CU FT			TOTALS:	156.457	4.81	2026	AV BP:		

60.18

Meter Box Data Sheet Page # 2

Meter Box 4J Y Factor 1.066

Leak Checks: 15.0 " Hg @ .001 cfm
16.0 " Hg @ .002 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Page 2 of 8

Unit: Haughs 507X

Run: 5 Date: 5/18/92

Operator(s): JS

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .20			Sampling Ratio : 18.5 : 1				BAROMETER: 30.06		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	35	721.747		5.807	.16	91	600	78	1.0
125	40	723.412		5.807	.16	91	600	78	1.0
130	45	725.076		5.818	.16	90	600	77	1.0
135	50	726.734		5.818	.16	90	600	77	1.0
140	55	728.393		6.071	.17	89	575	77	1.0
145	1300	730.117		5.818	.16	90	600	77	1.0
150	5	731.775		5.818	.16	90	600	77	1.0
155	10	733.434		5.818	.16	90	600	77	1.0
160	15	735.092		5.818	.16	90	600	77	1.0
165	20	736.751		5.585	.15	90	625	77	1.0
170	25	738.343		5.585	.15	90	625	77	1.0
175	30	739.935		5.585	.15	90	625	77	1.0
ROTO PRESS: .20			TOTALS :	69.348	1.90	1081	BAROMETER: 30.06		
180	35	741.527		5.575	.15	90	625	78	1.0
185	40	743.119		5.575	.15	90	625	78	1.0
190	45	744.712		5.575	.15	91	625	78	1.0
195	50	746.310		5.361	.14	91	650	78	1.0
200	55	747.847		5.351	.13	91	650	79	1.0
205	1400	749.383		5.351	.13	91	650	79	1.0
210	5			32.782	.85	544			
215	10								
220	15			058.593	2.56	3701	42÷		
225	20					88			
230	25			6.157	.180	548			
235	30								
			TOTALS:		✓	✓	MAX VACC =		1.5
TOTAL CU FT		71.383	TOTALS:				AV BP: 30.08		

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

Initial: Balance Level ✓ Balance Zeroed ✓ Unit: Hampton S220X

Final: ✓ ✓ Run: 5

Date: 5/18/92

Technician(s): Initial: TK

Final: TK/JS

Approved By: TK

IMPINGER #1

Final Weight 673.8 grams

Initial Weight 580.0 grams

Net 93.8 ✓ grams

IMPINGER #2

Final Weight 592.3 grams

Initial Weight 585.5 grams

Net 6.8 ✓ grams

IMPINGER #3

Final Weight 500.2 grams

Initial Weight 498.4 grams

Net 1.8 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 202.3 grams

Initial Weight 188.5 grams

Net 13.8 ✓ grams

TOTAL MASS OF H_2O CAPTURED 116.0 ✓ grams

Scale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 264F
#
Back Half Filter # 264B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ✓ Back Half ____

Manufacturer: S & S Size: 110mm Lot.No.: ZB882 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261 F	0.6987	3/20	1608	DK	.6991	3/23	1300	[illegible]				
262 F	0.7014		1610		.7017		1301					
263 F	0.6988		1612		.6985		1302					
264 F	0.6893		1614		.6894		1303		HAUGHS RNS			
265 F	0.6912		1616		.6917		1304					
266 F	0.6934		1618		.6936		1305					
267 F	0.6936		1620		.6937		1306					
268 F	0.7015		1622		.7010		1307					
269 F	0.6933		1624		.6936		1308					
270 F	0.6965		1626		.6965		1309					
271 F	0.6953	3/20	1628	DK	.6951		1330					
272 F	0.7002		1630		.7005		1331					
273 F	0.6978		1632		.6980		1332					
274 F	0.6900		1634		.6903		1333					
275 F	0.6975		1636		.6975		1334					
276 F	0.6978		1638		.6978		1335					
277 F	0.6975		1640		.6974		1336					
278 F	0.6992		1642		.6991		1337					
279 F	0.6901		1644		.6900		1338					
280 F	0.6994		1646		.6997		1339					

Checked by [signature] Date: 3/24/92 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1606	DK
59	73	43	3/23	1300	[illegible]

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ____ Back Half ✓

Manufacturer: S&S Size: 8.2 cm Lot.No.: ZB 901 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261B	0.3846	3/20	1526	DK	.3849	3/23	1341	JB				
262B	0.3822		1528		.3827		1342					
263B	0.3805		1530		.3810		1343					
264B	0.3811		1532		.3812		1344		HALLWAYS RUNS			
265B	0.3821		1534		.3824		1345					
266B	0.3822		1536		.3824		1346					
267B	0.3817		1538		.3822		1347					
268B	0.3772		1540		.3770		1348					
269B	0.3875		1542		.3878		1349					
270B	0.3813		1544		.3809		1350					
271B	0.3884	3/20	1546	DK	.3882		1351					
272B	0.3818		1548		.3813		1352					
273B	0.3825		1550		.3821		1353					
274B	0.3856		1552		.3853		1354					
275B	0.3832		1554		.3830		1355					
276B	0.3862		1556		.3864		1356					
277B	0.3836		1558		.3832		1357					
278B	0.3801		1600		.3802		1358					
279B	0.3827		1602		.3822		1359					
280B	0.3821		1604		.3818		1400					

Checked by [signature] Date: 3/24/92 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1524	DK
59	73	43	3/23	1340	JB

WST5-Form9,Pg1,Rev4/90
Unit HAUGHS SD7X
Run # 5
Date: 5/19/91

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
516		5/19	0900	DK	105.7142	5/20	956	DK	105.7145	5/21	1007	[illegible]				
517		5/19	1445	[illegible]	94.9163	5/21	1005	[illegible]	94.9154	5/22	1012	DK	94.9153	5/22	1521	[illegible]
518		5/19	0900	DK	103.8672	5/20	958	DK	103.8673	5/21	1009	[illegible]				
519		5/19	1445	[illegible]	100.0743	5/21	1007	[illegible]	100.0731	5/22	1014	DK	100.0734	5/22	1503	[illegible]
520		5/19	900	DK	98.6557	5/20	1000	DK	98.6558	5/21	1011	[illegible]				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
264F		5/18	1445	[illegible]	0.8053	5/19	950	DK	.8056	5/19	1725	[illegible]				
264B		5/18	1445	[illegible]	0.5193	5/19	952	DK	.5182	5/19	1727	[illegible]	0.5171	5/20	1002	DK
					.5170	5/21	1017	[illegible]								

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	5/19	948	DK	57	70	44
2	5/19	1707	[illegible]	56	70	41
3	5/20	954	DK	56	70	41
4	5/21	1005	[illegible]	60	74	44
5	5/22	1010	DK	60	73	47

SCALE ROOM ENVIRONMENTAL CONDITIONS

6	5/22	1515	[illegible]	57	70	44
7						
8						
9						

Comments

WST7-For.

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 4/23/92

Through ____________

Scale Sartori

Model A1265

SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9996	10.0000	0.9997	0.1001			DK	4/23	1600	70	56	41
99.9996	10.0000	.9997	.1000			JAD	4/24	1130	74	57	34
99.9996	10.0000	.9998	.1000			JAD	4/24	1830	70	57	44
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	.9998	.0999			JAD	4/28	1330	71	59	45
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			TK	4/30	0846	72	64	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	950	77	61	39
99.9997	9.9999	1.000	.1000			JAD	5/1	1520	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/4	930	78	62	40
100.0002	10.0002	1.0001	.1000			JAD	5/5	1010	75	60	41
100.0000	10.0001	1.0000	.1001			JAD	5/6	1525	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9997	10.0000	1.0001	.1000			JAD	5/6	1640	70	59	46
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			TK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	.1001			JAD	5/8	1105	65	54	46
99.9998	10.0001	.9999	.0990			JAD	5/8	1650	68	56	47
99.9996	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			TK	5/12	0900	74	60	44
99.9997	10.0001	1.0000	.0999			JAD	5/12	1345	77	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	950	74	59	40
100.0002	10.0002	1.0000	.1001			JAD	5/14	1636	70	56	41
99.9998	9.9999	.9997	.0999			BJ	5/15	1200	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.000	.1001			JS	5/18	1800	73	59	45
99.9998	9.9997	0.9996	0.0997			DK	5/19	0920	70	57	44
99.9998	10.0000	.9999	.0999			JAD	5/19	1707	70	56	41
100.0001	10.0003	1.0002	0.1003			DK	5/20	945	70	56	41
99.9996	9.9998	.999	.1000			JAD	5/21	1005	74	60	44
99.9998	10.0000	0.9998	0.0997			DK	5/22	1000	73	60	47
100.0000	10.0000	1.0001	.1001			JAD	5/22	1515	70	57	44

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 3/12

Through 4/23

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9998	10.0000	1.0000	0.0998			TK	3/12	1254	73	60	42
99.9998	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	.1000			JWD	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0002	10.0001	1.0000	0.1001			JWD	3/17	1607	71	59	46
99.9997	10.0001	1.0000	.1000			JWD	3/19	1715	74	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	.9999	0.0998			JWD	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9999	10.0001	1.0001	.1002			JWD	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3/26	1045	73	59	43
100.0001	9.9996	1.0000	.1001			JWD	3/27	1140	77	68	40
99.9997	9.9999	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9996	10.0000	1.0001	.1000			JWD	3/30	1000	71	57	41
99.9999	10.0004	1.0001	.1002			JWD	3/31	1016	73	59	43
100.0003	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9995	10.0000	1.0000	.1000			JWD	4/2	0900	73	59	43
99.9998	9.9997	0.9997	0.1000			DK	4/3	0900	72	59	46
99.9997	10.0001	0.9999	0.0999			DK	4/3	1630	70	58	48
99.9999	10.0001	0.9999	.0999			TK	4/6	0936	68	54	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	56	41
99.9999	9.9998	0.9999	.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	.9999	.0998			JWD	4/8	1545	69	56	44
100.0000	9.9998	.9999	.0999			TK	4/9	1025	68	55	43
100.0000	10.0001	1.0000	.1000			JWD	4/10	0935	70	56	41
100.0000	9.9999	.9999	.0999			TK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	945	72	58	42
100.0002	10.0003	1.0001	.0998			JWD	4/14	1030	72	59	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	56	47
99.9997	9.9999	.9998	.0999			JWD	4/16	1006	80	58	48
100.0001	9.9999	1.0000	0.1001			DK	4/17	915	70	57	44
99.9996	9.9999	1.0000	.1000			JWD	4/17	1525	70	58	48
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0000	1.0002	.1001			JWD	4/21	1040	74	60	44
100.0000	10.0000	1.0000	0.0999			DK	4/23	900	73	59	43
99.9995	10.0003	1.0000	.1001			JWD	4/23	1007	76	60	38

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 2/6/92

Through 3/11/92

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0000	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9998	10.0003	1.0001	.1001			[illegible]	2/6	1315	68	56	47
99.9999	10.0000	1.0000	.1000			[illegible]	2/7	0915	65	51	48
100.0001	9.9999	1.0001	.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	.1000			TK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	75	62	48
100.0000	10.0000	1.0000	.1000			[illegible]	2/11	1100	72	59	47
99.9997	10.0001	1.0000	.1001			[illegible]	2/11	[illegible]	74	61	47
100.0001	10.0000	1.0001	.1000			TK	2/12	0920	68	56	47
100.0003	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9997	10.0000	1.0000	.1000			[illegible]	2/12	0850	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0001	1.0001	0.1000			TK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			[illegible]	2/13	1535	75	62	48
100.0000	9.9999	1.0000	0.1000			DK	2/14	930	77	63	46
100.0000	10.0000	1.0000	0.1000			TK	2/14	1240	76	62	45
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	45
100.0000	10.0001	1.0000	.0999			TK	2/17	0820	65	54	48
99.9997	10.0000	1.0001	.1000			[illegible]	2/17	1035	68	56	47
99.9999	10.0000	.9999	.1000			TK	2/18	0856	65	54	48
99.9999	10.0001	1.0000	.1000			[illegible]	2/18	1300	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	945	71	58	45
100.0000	9.9999	1.0000	0.1000			TK	2/24	0800	71	59	49
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	.9999	.0999			TK	2/26	1025	72	59	46
99.9999	9.9998	1.0000	0.0999			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.0999			TK	2/28	1230	78	64	46
99.9998	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			TK	3/4	1130	72	59	46
99.9996	10.0000	1.0000	.1000			[illegible]	3/5	0935	70	58	48
99.9996	10.0000	.9999	0.0999			TK	3/6	0830	73	60	47
99.9998	10.0000	.9999	.0998			[illegible]	3/6	1400	76	60	45
99.9998	10.0000	.9999	.1000			TK	3/9	0850	71	59	49
99.9996	10.000	.9999	.1000			[illegible]	3/9	1340	70	59	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0900	75	60	41
99.9996	10.0000	1.000	.0999			[illegible]	3/11	1605	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: Hawaiis SD7V
Run: 5 Date: 5/18/90
Technician(s): JS

FRONT HALF

FILTER #:	064F	BEAKER #:	516	FINAL WT:	105.7145 g
FINAL WT:	.8056 g	ml:	150	TARE WT:	105.6745 g
TARE WT:	.6894 g	desc:	ACETONE	NET WT:	.0400 g
NET WT:	.1162 g				

FILTER #:		BEAKER #:		FINAL WT:	g
FINAL WT:	g	ml:		TARE WT:	g
TARE WT:	g	desc:	ACETONE	NET WT:	g
NET WT:	g				

TOTAL VOLUME OF ACETONE
USED IN WASH 150 ml

BACK HALF

FILTER #:	064B	BEAKER #:	517	FINAL WT:	94.9153 g
FINAL WT:	.5170 g	ml:	250	TARE WT:	94.7160 g
TARE WT:	.3812 g	desc:	ACETONE	NET WT:	.1993 g
NET WT:	.1358 g				

FILTER #:		BEAKER #:	518	FINAL WT:	103.8673 g
FINAL WT:	g	ml:	75	TARE WT:	103.8300 g
TARE WT:	g	desc:	METHCHLOR	NET WT:	.0373 g
NET WT:	g				

BEAKER #:	519	FINAL WT:	100.0734 g
ml:	200	TARE WT:	100.0063 g
desc:	H2O	NET WT:	.0671 g

BEAKER #:	520	FINAL WT:	98.6558 g
ml:	100	TARE WT:	98.6467 g
desc:	H2O	NET WT:	.0091 g

BEAKER #:		FINAL WT:	.0962 g
ml:		TARE WT:	g
desc:		NET WT:	g

BEAKER #:		FINAL WT:	g
ml:		TARE WT:	g
desc:		NET WT:	g

TOTAL VOLUME OF ACETONE
USED IN WASH 250 ml
TOTAL VOLUME OF DICHLOROMETHANE
USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED
WATER DRIED 300 ml

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: HAUGHS 507 X
Run: 5 Date: 5/18/92
Technician(s): JS DK TK

BLANKS DONE: 5/11/92

BEAKER #: D
200 ml ACETONE
FISHER OPTIMA LOT #: 913886

FINAL WT: 106.2239 g
TARE WT: 106.2235 g
NET WT: .0004 g

BEAKER #: E
75 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 916306

FINAL WT: 96.8428 g
TARE WT: 96.8424 g
NET WT: .0004 g

BEAKER #: F
200 ml DISTILLED WATER
BONNEAU CERTIFIED

FINAL WT: 96.5114 g
TARE WT: 96.5106 g
NET WT: .0008 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 3/17/92

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
D	106.2238	1306	106.2235	1036				
E	96.8424	1308	96.8424	1038				
F	96.5109	1330	96.5106	1040				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
3/23	1300	[illegible]	59	73	43
3/24	1034	DK	58	72	42

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	DK	59	74	40
5/14	1636	[illegible]	56	70	41
5/15	1200	BN	60	74	44

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
D	5/12	0900	106.2243	5-13 1048	106.2239	5-14 1659		
E	5/12	0900	96.8431	5-13 1050	96.8428	5-14 1701		
F	5/12	1330	96.5112	5-14 1700	96.5114	5-15 1230		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: HAUGHS 32IX
Run: 5
Date: 5/12/92
Technician(s): TX TK
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Tim Kelly Date: 5/12/92

Blank Calculations:

Acetone: .0004 g ÷ 200 ml = .000002 g/ml

Dichloromethane: .0004 g ÷ 75 ml = .00000533 g/ml

Distillted Water: .0008 g ÷ 200 ml = .000004 g/ml

Front Half Catch:

Filters: .1162 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1162 g (Net Catch)

Beakers: .0400 g (Total Catch) - 150 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0397 g (Net Catch)

Total Front Half Catch .1559 g

Back Half Catch:

Filters: .1358 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1358 g (Net Catch)

Beakers:

1. Acetone/Impingers: .1993 g (Total Catch) - 250 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .1988 g (Net Catch)

2. Extract/Impingers: .0373 g (Total Catch) - 75 (ml. of Dichloromethane) .0004 (.00000533 g) (Blank Value/ml of Dichloromethane) = .0369 g (Net Catch)

3. Water/Impingers: .0962 g (Total Catch) - 300 (ml. of water) (.000004 g) (Blank Value/ml of water) = .0950 g (Net Catch)

Total Back Half Catch .4665 g
Total Catch .6224 g
% Front Half 25.05 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HAUGHS 507X

Run: 5 Date: 5/18/91

Technician(s): JS TK

WST3-Form 1 8/28/91

1) Vm(std): (71.383 Vm)(17.65)(1.066 mcf)(30.08 " Hg + (.180 " H2O / 13.6)) / (548 TmA) = 73.7539 dscf (000.0000)

2) Vw(std): (.04707)(116.2 ml H2O): 5.4695 scf (00.0000)

3) Bws: (5.4695 scf) / (5.4695 scf + 73.7539 dscf) = .0690 (.0000) Bws X 100 = 6.9039 (00.0000) % H2O

4) Cs: (.6224 g.) / (73.7539 dscf) (15.43): .1302 (0.0000) gr/dscf

5) Estimated g/hr: (____ g.) / (____ dscf) (6.16 (00.000) dscfm)(60): ____ (00.0000) g/hr

---

Vm	:	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf	:	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf)
" Hg	:	average barometric pressure during the test	(p. 2)	(00.00 " Hg)
" H2O	:	average delta H for the test	(p. 2)	(.000 " H2O)
TmA	:	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA)
ml H2O	:	total water caught during the test	(p. 3)	(000.0 ml H2O)
g.	:	total particulate catch for the test	(p. 6)	(00.0000 g.)
dscfm	:	average stack flow during the test	(computer printout)	(00.000 dscfm)

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: Hawkins S27X
Run: 5
Page: 1 of 2

Date: 5/18/92
Technician(s): BN TK
DK JS

T/C# Minute Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn Catalytic	11 Room Temp	12 Tube Furnace	13 Sample Box	14 Impinger Out	15 C. Gas Box	16 C. Gas Impinger	17 SO_2 Impinger
00 1035	358	383	453	296	414	866	724	76	1441	241	35	241	35	36
05 40	334	376	424	288	412	623	657	75	1441	241	35	241	35	36
10 45	313	360	386	275	412	552	567	76	1441	241	35	241	35	36
15 50	294	341	360	260	405	523	566	76	1441	241	35	243	35	36
20 55	283	325	345	248	399	516	599	76	1441	244	35	245	35	36
25 1100	295	310	335	242	390	520	883	76	1441	248	35	247	35	36
30 05	347	307	337	227	380	528	862	76	1443	248	35	248	35	36
35 10	363	310	340	227	370	546	1254	76	1446	248	35	248	35	36
40 15	461	318	357	229	361	596	1400	76	1446	248	35	248	35	36
45 20	530	331	379	239	352	743	1412	76	1447	248	35	248	35	36
50 25	564	348	399	247	346	836	1482	77	1448	248	35	248	35	36
55 30	594	366	423	263	340	910	1481	77	1448	248	35	248	35	36
	4736	4075	4538	3041	4581	7759	11887	913						
60 35	606	390	449	277	336	886	1476	78	1448	248	35	248	35	36
65 40	591	404	464	290	334	897	1474	79	1448	248	35	248	35	36
70 45	574	416	473	297	333	930	1414	79	1448	248	35	248	35	36
75 50	558	430	485	302	333	968	1307	80	1448	248	35	248	35	36
80 55	525	439	496	304	334	1038	1131	80	1448	248	36	248	35	36
85 1200	500	444	504	308	335	1067	1145	80	1448	248	36	248	35	36
90 05	490	448	512	314	338	1070	1132	80	1448	248	36	248	35	36
95 10	468	450	511	317	342	1132	1002	80	1448	248	36	248	35	36
100 15	434	444	503	323	348	1059	942	80	1448	248	36	248	35	36
105 20	407	435	487	320	353	1009	872	80	1448	248	36	248	35	36
110 25	387	423	470	321	357	989	849	81	1448	248	36	247	35	36
115 1230	371	412	455	310	362	970	833	81	1448	248	36	246	35	36
	5911	5135	5809	3683	4105	12015	13577	958						
	10647	9210	10347	6724	8686	19774	25464	1871						

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: Haughs S27X
Date: 5/18/92
Run: 5
Technician(s): BN TK DK JS
Page: 2 of 2

T/C# Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tube Furnace	13 Sample Box	14 Impinger Out	15 C. Gas Box	16 380.8 C. Gas Impinger	17 SO_2 Impinger
120 / 1235	359	401	440	301	365	940	827	81	1448	248	36	245	35	36
125 / 40	351	393	430	295	367	927	815	81	1448	248	36	245	35	36
130 / 45	342	386	421	293	368	905	794	80	1447	248	36	245	35	36
135 / 50	331	379	416	288	369	891	775	79	1447	248	36	245	35	36
140 / 55	321	371	411	285	369	874	762	79	1448	248	36	245	35	36
145 / 1300	314	364	407	275	368	858	766	79	1448	248	35	245	35	36
150 / 05	309	359	404	277	368	853	758	79	1448	248	35	245	35	36
155 / 10	305	354	402	268	366	832	738	79	1448	247	35	246	35	36
160 / 15	300	349	400	267	366	817	727	79	1448	246	35	246	35	36
165 / 20	295	344	397	259	364	806	712	79	1448	245	35	247	35	36
170 / 25	289	340	393	262	363	789	693	79	1448	246	35	247	35	36
175 / 30	283	335	389	255	361	775	672	79	1448	246	35	247	35	36
	3801	4375	4910	3325	4394	10267	9039	953						
180 / 35	275	329	384	251	358	761	646	79	1448	246	35	247	35	36
185 / 40	270	326	381	248	357	751	638	79	1448	246	35	247	35	36
* 190 / 45	265	322	378	243	353	738	622	79	1448	246	35	247	35	36
195 / 50	262	319	375	242	348	730	610	79	1448	246	35	247	35	36
200 / 55	258	315	371	235	345	716	601	78	1448	246	35	247	35	36
205 / 1400	254	312	370	234	342	711	594	78	1448	246	35	247	35	36
210	1584	1923	2259	1453	2103	4407	3711	472						
215	5385	6298	7169	4778	6497	14674	12750	1425						42
220	16032	15508	17516	11502	15183	34448	38214	3296	ΔT START		380.8			
225	382	369	417	274	362	820	910	78		STOP	302.4			
230											-78.4			
235														

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: CO_2 (15-1)

Source: HAUGHS S270 SERIES Run #: 5

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.6 % CO_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: BN Time: 1005 Temp: 76 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	50.0	.500	12.388	-.212	-1.683

Comments:

Post Run Audit: By: DK Time: 1415 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	49.9	.499	12.363	-.237	-1.879

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

Unit [illegible]
Run # 5
Date 5/18/92
Technician BN TK DK JS
WST6-Form1,Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft^3

Dilution Tunnel Draft (If applicable): Start 0 Stop 0

Test Chamber Air Velocity: Start: 0 Stop: 0 Avg: 0

Wet Bulb/ Start: WB: 59 °F DB: 66 °F 1.4 % Amb Moisture 68 %RH

Dry Bulb Stop: WB: 62 °F DB: 77 °F 1.3 % Amb Moisture 44 %RH

$\bar{X}$ = 1.35 % Ambient Moisture $\bar{X}$ = 56 % Relative Humidity (RH)

Empty Stove Wt: 237.3 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 305.4 lbs. Dry: 304.4 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 304.4 lbs.

Kindling Wt. Paper: .3 lbs. Wood: 6.5 lbs.

Pre Burn Fuel Wt. 7.2 + 8.6 + 1.5 Total: 17.3 lbs.

Total Kindling and Pre Burn Fuel Wt 23.8 lbs.

Coal Bed Wt-lbs: Range (2.6 - 2.1) 307.0 - 306.5 lbs. Actual: 2.2 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\left(\frac{2.6}{\text{Upper Wt.}} + \frac{2.1}{\text{Lower Wt.}} \Big/ 2 \right) .25 = .6$ lbs.

Test Fuel Wt-lbs: Ideal 10.3 lbs. Range: 11.3-9.3 lbs. Actual: 10.5 lbs.

Test Fuel Size (pcs.)(.75 x 1.5 x 5" Flanges) 14 Pcs.

2 x 4's x 18 3/4 " 4 Pcs 10.5 lbs. 100.0 %

4 x 4's x N/A " N/A Pcs N/A lbs. N/A %

Est. Dry Burn Rate (Kg/Hr.) $\frac{105 - (10.5 \times .17582)}{2.2025} \times \frac{60}{105} = 1.1500$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) $(19,140) \times \frac{63}{100} \times 1.1500 = 13867$ Est Heat Output (HO_E) BTU's/Hr

Comments: 190 = 1.240

Unit: Haughs S27X Run: 5 Date: 5/18/92

WOODSTOVE OPERATING DATA

FIRE STARTED: 0745 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges, then set to .300 at start of preburn.

SECONDARY AIR: N/A CAT BYPASS: N/A

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 14 sec.

TEST: Door Wide Open during loading 4 min 30 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of .300 .

SECONDARY AIR: N/A CAT BYPASS: N/A

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first —— minutes of test ON/OFF balance of test run
Fan speed set at FAN CONFIRMATION .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ________________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 10 or 18 inches.

1st warm up/preburn fuel charge (7.2 lbs) added at 0815 .

2nd warm up/preburn fuel charge (8.6 lbs) added at 0858 .

3rd warm up/preburn fuel charge (1.5 lbs) added at 1051 .

4th warm up/preburn fuel charge (________ lbs) added at __________ .

5th warm up/preburn fuel charge (________ lbs) added at __________ .

Unit: HAUGHS [illegible]
Run: 5
Date: 5/8/92
Technician: BN, JS, TK, DK
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 70 °F

Correction Factor: Ø

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes____. No ✓.
Time Test Fuel Moisture Readings taken at: 0900
Calibration Checks: X ✓ Y ✓ 12.0 12.3 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	4.5	4.5	4.5	4.5	4.0	4.0	4.333
2									
3									
4	2x4x8	P	18.5	20.1	18.0	19.6	18.5	20.1	19.933
5	2x4x8	P	18.5	20.1	18.5	20.1	18.0	19.6	19.933
6									39.866
7									
8									
9	2x4x18¾	T	21.0	22.9	21.5	23.5	19.5	21.3	22.567
10	2x4x18¾	T	18.5	20.1	19.0	20.7	18.0	19.6	20.133
11	2x4x18¾	T	21.0	22.9	21.0	22.9	20.0	21.8	22.533
12	2x4x18¾	T	18.5	20.1	18.5	20.1	18.5	20.1	20.100
13									85.333
14									
15									
16									
17									
18									
19	feet	T	19.5	21.3	19.0	20.7	19.0	20.7	20.900
20									

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	4.333%	19.933 %	21.333 % ✓
% Moisture - Wet Basis:	4.153%	16.620 %	17.582 % ✓

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: [illegible]
Run#: 5
Date: 5/18/92
Technician: BW TK DK JS

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3½

Depth (D): 4.1 cm

Width (W): 9.15 cm

Length (L): 9.15 cm
9.12 cm
9.12 cm
9.15 cm

Length $\bar{X}$ = 9.135 cm

Volume: 342.700 cm^3
(D X W X L)

MOISTURE: Room Temperature: 72 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	18.5	20.1 %
Bottom:	18.5	20.1 %
Side:	18.5	20.1 %
$\bar{X}$:		20.100 ✓ %

Avg % Moisture (Dry) 20.100 ✓ %

Aug % Moisture (Wet) 16.736 ✓ %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 186.3 g Dry Weight: 160.82 g

% Moisture Dried Basis: 13677 % ✓
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	5/18/92	1008	234 °F
Out of Dryer	5/20/92	1445	229 °F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 160.82 g (dry wt) ÷ 342.700 cm^3 (volume) = .4693 ✓ g/cm^3 ✓

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ______ g

Wet Wt: ______ g ÷ ______ g = ______ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ______ g ÷ ______ g = ______ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ______ %
[1 - (Net Dry Wt - Net Wet Wt.)] X 100

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUGHS S27X
Run: 5
Page: 1 of 2
Date: 5/18/92
Technician(s): BN TK DK JS

Minute Time	Scale Wt (306.6)	lbs left	Burn Rate	1 CO_2 V.	1 CO_2 %CO_2	2 O_2 V.	2 O_2 %O_2	2 O_2 Tel	3 CO V.	3 CO %CO	Bal	T/C(1) Wet Bulb	T/C(2) Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	4 SO_2 PPM	Static Press.	Comm
00 1035	317.1	10.5	Ø	.197	4.9	.593	15.0	15.0	.115	1.17	4.2	107	136	7.1	120	256	.25	625	-.044	Flow
05 40	316.9	10.3	.2	.135	3.4	.677	17.2	17.2	.051	.52	6.5	113	139	8.6	126	287	.19	475	-.053	SO_2
10 45	316.6	10.0	.3	.099	2.5	.709	18.0	18.0	.054	.55	4.5	110	128	8.0	120	226	.24	600	-.044	CO_2
15 50	316.4	9.8	.2	.114	2.9	.695	17.6	17.6	.062	.63	4.6	107	124	7.6	117	214	.24	600	-.043	O_2
20 55	316.2	9.6	.2	.123	3.1	.686	17.4	17.4	.063	.64	4.8	106	123	7.3	117	210	.24	600	-.042	CO
25 1100	315.8	9.2	.4	.226	5.6	.591	15.0	15.0	.051	.52	10.8	109	126	7.9	121	254	.23	575	-.049	
30 05	315.2	8.6	.6	.274	6.8	.550	13.9	13.9	.052	.53	12.9	111	128	8.4	124	276	.22	550	-.052	
35 10	314.8	8.2	.4	.295	7.3	.522	13.2	13.2	.051	.52	14.1	112	130	8.6	126	289	.22	550	-.054	
40 15	314.1	7.5	.7	.437	10.8	.400	10.1	10.1	.008	.08	135.4	118	137	10.2	133	351	.20	500	-.061	
45 20	313.4	6.8	.7	.444	11.0	.392	9.9	9.9	.008	.08	137.6	119	137	10.5	135	367	.20	500	-.064	
50 25	312.8	6.2	.6	.472	11.7	.364	9.2	9.2	.011	.11	106.3	117	135	10.0	135	379	.20	500	-.066	
55 30	312.1	5.5	.7	.483	12.0	.350	8.8	8.8	.011	.11	108.8	113	131	9.0	133	385	.20	500	-.067	
																3494			-.639	Flow
60 35	311.3	4.7	.8	.482	11.9	.348	8.8	8.8	.011	.11	108.6	110	127	8.1	132	381	.20	500	-.066	SO_2
65 40	310.8	4.2	.5	.406	10.1	.414	14.5	14.5	.007	.07	143.8	108	124	7.8	130	365	.20	500	-.064	CO_2
70 45	310.4	3.8	.4	.422	10.5	.400	10.1	10.1	.006	.06	174.4	108	123	7.8	130	361	.20	500	-.063	O_2
75 50	309.9	3.3	.5	.417	10.3	.402	10.2	10.2	.006	.06	172.3	107	122	7.6	129	351	.21	525	-.062	CO
80 55	309.5	2.9	.4	.395	9.8	.410	10.4	10.4	.018	.18	54.4	104	118	6.8	126	335	.21	525	-.060	
85 1200	309.2	2.6	.3	.397	9.8	.413	10.4	10.4	.015	.15	65.6	101	114	6.2	124	327	.21	525	-.058	
90 05	308.8	2.2	.4	.378	9.4	.438	11.1	11.1	.013	.13	72.1	98	109	5.9	121	318	.21	525	-.056	
95 10	308.6	2.0	.2	.317	7.9	.491	12.4	12.4	.031	.31	25.4	95	106	5.1	119	303	.22	550	-.054	
100 15	308.4	1.8	.2	.273	6.8	.530	13.4	13.4	.044	.44	15.4	92	99	4.8	118	287	.22	550	-.053	
105 20	308.3	1.7	.1	.232	5.8	.562	14.2	14.2	.078	.79	7.3	88	100	4.1	113	271	.23	575	-.050	
110 25	308.2	1.6	.1	.224	5.6	.569	14.4	14.4	.087	.88	6.3	86	103	3.6	110	264	.23	575	-.048	
115 1230	308.1	1.5	.1	.220	5.5	.573	14.5	14.5	.090	.91	6.0	85	106	3.3	109	256	.23	575	-.046	
																3819			-.680	
																7313			-1.319	

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: HAUBHS S27X
Run: 5
Page: 2 of 2
Date: 5/18/92
Technician(s): BN TL DK JS

306.6

Minute Time	Scale Wt	lbs left	Burn Rate	1 CO_2 V.	$\%CO_2$	2 O_2 V.	$\%O_2$	Tel	3 CO V.	%CO	Bal	T/C(1) Wet Bulb	T/C(2) Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	PPM	Static Press.	Comm
120 1235	307.9	1.3	.2	.211	5.3	.576	14.6	14.6	.116	1.18	4.5	84	109	3.0	107	249	.24	600	-.046	Flow
125 40	307.8	1.2	.1	.210	5.2	.579	14.7	14.7	.108	1.10	4.8	84	111	3.0	106	246	.24	600	-.044	SO_2
130 45	307.7	1.1	.1	.200	5.0	.586	14.8	14.8	.132	1.34	3.7	90	112	4.0	109	242	.24	600	-.044	CO_2
135 50	307.6	1.0	.1	.194	4.8	.593	15.0	15.0	.125	1.27	3.8	92	112	4.4	109	237	.24	600	-.043	O_2
140 55	307.5	.9	.1	.188	4.7	.596	15.1	15.1	.137	1.39	3.4	92	112	4.4	109	233	.23	575	-.043	CO
145 1300	307.4	.8	.1	.183	4.6	.599	15.2	15.2	.137	1.39	3.3	93	113	4.6	109	229	.24	600	-.043	
150 05	307.4	.8	Ø	.182	4.5	.601	15.2	15.2	.138	1.40	3.2	93	113	4.6	109	227	.24	600	-.043	
155 10	307.3	.7	.1	.173	4.3	.610	15.5	15.5	.139	1.41	3.1	94	113	4.7	109	223	.24	600	-.041	
160 15	307.2	.6	.1	.165	4.1	.617	15.6	15.6	.136	1.38	3.0	94	113	4.7	109	221	.24	600	-.040	
165 20	307.1	.5	.1	.157	3.9	.625	15.8	15.8	.141	1.43	2.7	94	113	4.7	109	218	.25	625	-.040	
170 25	307.0	.4	.1	.147	3.7	.632	16.0	16.0	.147	1.49	2.5	94	113	4.7	109	215	.25	625	-.039	
175 30	307.0	.4	Ø	.139	3.5	.640	16.2	16.2	.145	1.47	2.4	94	112	4.7	109	210	.25	625	-.038	
																2750			-.504	Flo
180 35	306.9	.3	.1	.141	3.5	.642	16.3	16.3	.134	1.36	2.6	94	112	4.7	108	207	.25	625	-.037	SO_2
185 40	306.9	.3	Ø	.142	3.6	.641	16.2	16.2	.132	1.34	2.7	94	111	4.7	108	204	.25	625	-.037	CO_2
* 190 45	306.8	.2	.1	.137	3.4	.647	16.4	16.4	.125	1.27	2.7	94	111	4.7	108	202	.25	625	-.037	O_2
195 50	306.7	.1	.1	.133	3.3	.650	16.5	16.5	.123	1.25	2.7	94	111	4.7	108	200	.26	650	-.036	CO
200 55	306.7	.1	Ø	.134	3.4	.651	16.5	16.5	.122	1.24	2.7	94	110	4.7	107	197	.26	650	-.036	
205 1400	306.6	Ø	.1	.134	3.4	.651	16.5	16.5	.118	1.20	2.8	94	110	4.7	107	196	.26	650	-.036	
210																1206			-.219	
215																3956			-.723	
220																11269			-2.042	
225																268			-.049	
230																				
235																				

+1.0

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

Unit: HAUGHS S27X
Run: 5
Page: 1 of ____

Date: 5/18/92
Technician(s): BN TK
DK JS

307.0 - 306.5

Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Comments
00 0935	308.0	0	437	601	527	399	386	441	1258	1216	77	-.068	Primary Air Set at .300
05 0940	307.7	.3	346	545	517	494	381	445	1188	1162	78	-.060	Secondary Air Set at N/A
10 45	307.4	.3	321	494	497	511	374	448	1127	1089	78	-.058	Fan: OFF
15 50	307.2	.2	306	462	479	508	355	448	1076	1002	77	-.055	ADD 1.5 lbs 1051
20 55	308.4	.3	335	453	468	500	347	446	.1054	1420	77	-.060	
25 1000	307.9	.5	333	514	456	508	334	444	1059	1231	76	-.058	
30 05	307.6	.3	318	496	443	503	331	438	1049	1180	76	-.056	Pumps turned on at: 1000
35 10	307.2	.4	304	468	425	489	320	431	1028	1230	76	-.055	
40 15	307.0	.2	302	455	414	480	316	426	1011	1230	77	-.055	
45 20	306.8	.2	291	450	404	476	310	421	978	1148	76	-.054	Check WB/DB: 107/140
50 25	306.7	.1	269	413	395	471	306	418	936	916	76	-.052	
55 30	306.6	.1	256	375	387	461	302	416	916	888	76	-.048	
60 35	306.6	Ø	256	358	383	453	296	414	866	724	76	-.044	380.8
65 40													
70 50													
75 55													
80 1100													
85 05													
90 10													

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: O_2 (15-2)

Source: HAUGHS S270 Series Run #: 5

Zero Cyl #: T 132257 Conc. 00.0 % O_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.4 % O_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: BN Time: 1015 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	.3	.005	.023	.023	.090
Span	12.4	.496	12.4	12.5	.501	12.675	.275	2.221

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

Post Run Audit: By: OK Time: 1425 Temp.: 77 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.004	-.003	-.003	-.012
Span	12.4	.496	12.4	12.4	.494	12.497	.097	.781

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

+ Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: CO (15-3)

Source: HAUGHS S270 SERIES Run #: 5

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 4.96 % CO Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: BN Time: 1020 Temp: 76 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.3	.493	5.018	.058	1.174

Comments:

Post Run Audit: By: DK Time: 1430 Temp.: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.2	.492	5.008	.048	.969

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032   Date: 5/16/92   Analyte: SO_2 (15-4)

Source: HAUGHS S270 SERIES   Run #: 5

Zero Cyl #: T132257   Conc. 00.0 ppm SO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR   Date: 10/7/91

Span Cyl #: AL2892   Conc. 1232 ppm SO_2 Cyl Press: 450 psi

Certified by: LIQUID AIR   Date: 9/24/91

Analyzer: Make: Horiba   Model: PIR-2000   SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH   Measured by: Rotameter: X   Flowmeter: ____

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: BN   Time: 1000   Temp: 76 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	3.440	3.440	.138
Span	49.3	.493	1232	49.5	.495	1238.992	6.992	.568

Comments:

Post Run Audit: By: DK   Time: 1410   Temp: 78 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.3	.003	10.928	10.928	.437
Span	49.3	.493	1232	49.3	.493	1234.000	2.000	.162

Comments:

± Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

Unit: [illegible]
Run: 5
Date: 5/18/92
Technicians: BN TK DK JS
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 72.2 °F T/C#30: 73.4 °F

Thermocouple Check (at ambient): T/C#1: 72.4 °F; T/C#2: 72.4 °F;

T/C #3: 73.2 °F;	T/C #4: 73.0 °F;	T/C #5: 72.8 °F;
T/C #6: 72.8 °F;	T/C #7: 72.6 °F;	T/C #8: 72.7 °F;
T/C #9: 72.9 °F;	T/C #10: 72.9 °F;	T/C #11: 72.2 °F;
T/C #12: 73.2 °F;	T/C #13: 72.6 °F;	T/C #14: 72.7 °F;
T/C #15: 73.3 °F;	T/C #16: 71.7 °F;	T/C #17: 72.1 °F;
T/C #18: 73.0 °F;	T/C #19: ____ °F;	T/C #20: ____ °F;
T/C #21: ____ °F;	T/C #22: ____ °F;	T/C #23: ____ °F;
T/C #24: ____ °F;	T/C #25: ____ °F;	T/C #26: ____ °F;

Comments: ____

Thermocouple Readout:
Pretest Zero/Span Check and Calibration:

Zero (0°F): .1 °F	Adj to: 0 °F	Post Test Check Zero (0°F): .6 °F	% Difference .030
Span (2000°F): 2001.4 °F	Adj to: 2000.0 °F	Span (2000°F): 2003.6 °F	.180

(Allowable % Difference = 1.5%. Use formulas on Woodstove Data Sheet #15 to calculate % Difference)

Thermocouple Readout Pretest Linearity Check

0°F = 0 °F;	200°F = 201.8 °F;	400°F = 399.1 °F;
600°F = 601.6 °F;	800°F = 801.8 °F;	1000°F = 1001.2 °F;
1200°F = 1198.8 °F;	1400°F = 1399.9 °F;	1600°F = 1600.6 °F
1800°F = 1801.0 °F;	2000°F = 2000.0 °F	

Tracer Gas (SO_2) Injection Train Leak Check: Pre ✓ Post ✓
Combustion Gas (CO_2, O_2, CO) Train Leak Check: Pre ✓ Post ✓
Tracer Gas (SO_2) Analyzer Train Leak Check: Pre ✓ Post ✓
Draft (Static) Guage Zero Check: Pre ✓ Post ✓

Scale Check Pre (Wt, #'s): 316.2 - 306.2 = 10
Post (Wt, #'s): 316.4 - 306.4 = 10.0

Stack cleaned prior to the run: Yes ____ No ✓.

CLIENT : HAUGHS PRODUCTS TEST No. : 6

MODEL: S-27X DATE: 5/18/92

****

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	750.000	0.150	87	0.84	4.90	625
5	751.500	0.260	87	0.45	2.80	475
10	753.537	0.160	88	0.50	2.40	600
15	755.156	0.160	89	0.49	3.20	600
20	756.780	0.160	90	0.53	3.20	600
25	758.411	0.180	90	0.51	3.90	575
30	760.113	0.190	91	0.57	5.10	550
35	761.898	0.190	91	0.69	6.00	550
40	763.683	0.210	91	0.58	8.90	525
45	765.553	0.240	92	0.27	10.20	500
50	767.524	0.260	92	0.23	10.60	475
55	769.598	0.260	92	0.22	10.90	475
60	771.672	0.260	93	0.18	10.60	475
65	773.754	0.260	93	0.39	11.70	475
70	775.836	0.240	93	0.31	11.90	500
75	777.815	0.260	93	0.21	10.00	475
80	779.897	0.260	94	0.13	9.70	475
85	781.986	0.260	94	0.14	9.00	475
90	784.076	0.260	94	0.15	8.50	475
95	786.166	0.260	94	0.37	7.70	475
100	788.256	0.240	94	0.59	7.10	500
105	790.241	0.240	94	0.77	6.10	500
110	792.226	0.240	94	0.96	5.90	500
115	794.212	0.240	94	1.03	5.60	500
120	796.197	0.240	94	1.09	5.60	500
125	798.185	0.240	93	1.13	5.30	500
130	800.165	0.230	94	1.16	5.00	500
135	802.153	0.230	94	1.37	4.80	500
140	804.140	0.230	95	1.39	4.60	500
145	806.135	0.230	95	1.39	4.30	500
150	808.129	0.230	95	1.44	4.00	500
155	810.124	0.210	95	1.47	3.80	525
160	812.024	0.210	95	1.54	3.40	525
165	813.924	0.210	95	1.49	3.30	525
170	815.824	0.190	95	1.48	3.20	550
175	817.638	0.190	95	1.50	3.30	550
180	819.451	0.190	95	1.45	3.10	550
185			95			

TABLE 2 ----- FIELD DATA

CLIENT : HAUGHS PRODUCTS TEST No. : 6

MODEL: S-27X DATE: 5/18/92

****

METER CAL. FACTOR (Y)	1.066	Wt. WOOD BURNED(LB)	9.7	Lbs
BAROMETRIC PRESS.(Pb)	30.01 in Hg	WET,FUEL MOISTURE %	17.167	%
LEAK RATE POST (Lp)	0.004 cfm	Wt. PART. COLLECTED	0.6855	g
WATER VOL. (Vlc)	106.8 Ml	METER VOLUME Vm	69.451	mcf
TEST TIME (MIN)	180 min	HC MOLE FRACTION	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : HAUGHS PRODUCTS TEST No. : 6

MODEL: S-27X DATE: 5/18/92

****

AVG DELTA H	-------	0.22 in H2O	AVG PRCNT CO	-------	0.78 %
AVG METER TEMP. Tm	-------	93 deg F	AVG PRCNT CO2	-------	6.21 %
AVG PPM SO2	-------	516 PPM			

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS   TEST No. : 6

MODEL: S-27X   DATE: 5/18/92

****

STD SAMPLE VOL. Vm(std) ------	70.97 dscf		STACK GAS FLOW Qsd -------	526.627 & 8.78	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) -----	5.027 scf		PARTICULATE CONCTRT. C s ------	0.0097	g/dscf
PRCNT MSTR Bws -------	6.62 %		PARTC.EMISS. RATE E -------	5.09	g/Hr
BURN RATE BR -------	1.22 Kg/Hr		MOLES OF GAS PER Lb WOOD Nt ----	0.51	Lb-mole/Lb
CO EMISSION RATE -------	138.27 g/Hr & 113.71 g/Kgdry fuel		PART.EMISS. RATE ------	4.18	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS TEST No. : 6

S-27X DATE: 5/18/92

****

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE		
5	968.1	96		100		
10	998.5	99				
15	1000.4	99				
20	1001.6	99				
25	1005.0	100				
30	1004.2	99				
35	1006.5	100				
40	1006.5	100				
45	1005.6	100				
50	1008.7	100				
55	1008.3	100				
60	1007.4	100				
65	1010.4	100				
70	1010.4	100				
75	1010.9	100				
80	1009.5	100				
85	1012.0	100				
90	1012.5	100				
95	1012.5	100				
100	1012.5	100				
105	1012.1	100				
110	1012.1	100				
115	1012.7	100				
120	1012.1	100				
125	1014.6	101				
130	1010.5	100				
135	1013.7	100				
140	1012.2	100				
145	1015.4	101				
150	1014.9	101				
155	1015.4	101				
160	1015.3	101				
165	1015.3	101				
170	1015.3	101				
175	1015.5	101				
180	1014.9	101				
185						
190						

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client: Haugh's Products

Client Address: 10 Atlas Court
Brampton, Ontario, Canada L6T 5C1

Client Phone: 416-792-8000

Project No. ______ Model No. S 270X

Run No. 6 Date of Test 5/18/92 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon X Colorado ______ EPA X

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) 1.016 Max (>1.9 Kg/Hr) ______

Fuel % Moisture (dry) 20.725 %(wet) 17.167 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.048 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.01 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 88 °F
(00) (Data Sheet #14)

Flue Gas Moisture 6.6165 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.3 %
(0.00) (Data Sheet #8)

Stove Weight 237 lbs
(000) (Data Sheet #8)

Stove Temperature Change -47 °F
(000) (Data Sheet #14)

Particulate Emission .1491 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) ______ BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 9.7 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .6855 g
(0.0000) (Data Sheet #6)

H_2O Captured 106.8 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 69.451 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 4J-1.066 Post Test Leak Rate .004 CFM

DOOR CONF #1

Meter Box Data Sheet Page # 2

Page 1 of 2

Meter Box 4J Y Factor 1.066

Unit: HAWKINS SO7X

Run: 6 Date: 5/18/92

Leak Checks: 15.0 " Hg @ .001 cfm
16.0 " Hg @ .004 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): JS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .20			Sampling Ratio : 18 : 1				BAROMETER: 30.03		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1605	750.000		5.518	.15	87	625	83	0
05	10	751.500		7.061	.26	87	475	83	0.5
10	15	753.537		5.748	.16	88	600	83	1.0
15	20	755.156		5.748	.16	89	600	83	.5
20	25	756.780		5.748	.16	90	600	83	.5
25	30	758.411		5.998	.18	90	575	83	.5
30	35	760.113		6.071	.19	91	550	83	1.0
35	40	761.898		6.071	.19	91	550	83	1.0
40	45	763.623		6.569	.21	91	525	83	1.0
45	50	765.553		6.898	.24	92	500	83	1.0
50	55	767.524		7.061	.26	92	475	83	1.0
55	1700	769.598		7.061	.26	92	475	83	1.5
ROTO PRESS: .20			TOTALS :	76.552	2.42	1080	BAROMETER: 30.02		
60	5	771.672		7.072	.26	93	475	82	1.5
65	10	773.754		7.072	.26	93	475	82	1.5
70	15	775.836		6.909	.24	93	500	82	1.5
75	20	777.815		7.085	.26	93	475	81	1.5
80	25	779.897		7.085	.26	94	475	81	1.5
85	30	781.986		7.085	.26	94	475	81	1.5
90	35	784.076		7.085	.26	94	475	81	1.5
95	40	786.166		7.085	.26	94	475	81	1.5
100	45	788.256		6.921	.24	94	500	81	1.5
105	50	790.241		6.921	.24	94	500	81	1.5
110	55	792.226		6.921	.24	94	500	81	1.5
115	1800	794.212		6.921	.24	94	500	81	1.5
			TOTALS:	85.561	3.02	1124	MAX VACC =		
TOTAL CU FT		—	TOTALS:	162.113	5.44	2204	AV BP:		

60.05

Meter Box Data Sheet Page # 2

Page 2 of D

Meter Box 45 Y Factor 1.066

Unit: HAUGHS SO2

Run: 6 Date: 5/18/92

Leak Checks: 15.0 " Hg @ .001 cfm
16.0 " Hg @ .001 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): SS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 20			Sampling Ratio : 18 : 1				BAROMETER: 29.99		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	5	796.197		6.914	.24	94	500	81	1.5
125	10	798.185		6.914	.24	93	500	81	1.5
130	15	800.165		6.901	.23	94	500	82	1.5
135	20	802.153		6.901	.23	94	500	82	1.5
140	25	804.140		6.888	.23	95	500	83	1.5
145	30	806.135		6.888	.23	95	500	83	1.5
150	35	808.109		6.888	.23	95	500	83	1.5
155	40	810.104		6.560	.21	95	505	83	1.5
160	45	812.094		6.548	.21	95	505	84	1.5
165	50	813.984		6.548	.21	95	505	84	1.5
170	55	815.844		6.051	.19	95	550	84	1.5
175	1900	817.638		6.051	.19	95	550	84	1.0
ROTO PRESS: 20			TOTALS :	80.452	2.64	1135	BAROMETER: 29.95		
180	5	819.451		6.051	.19	95	550	84	1.0
185	10			6.051	.19	95			
190	15								
195	20			248.816	8.07	3434	37		
200	25								
205	30			6.725	.204	93			
210	35								
215	40					553			
220	45								
225	50								
230	55								
235	2000								
			TOTALS:				MAX VACC =	1.5	
TOTAL CU FT		69.451	TOTALS:				AV BP:	30.01	

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

Initial: Balance Level ✓ Balance Zeroed ✓

Final: ✓ ✓

Unit: Hough S290X

Run: 6

Date: 5/18/92

Technician(s): Initial: TK

Final: JS

Approved By: TK

IMPINGER #1

Final Weight 665.8 grams

Initial Weight 580.8 grams

Net 85.0 ✓ grams

IMPINGER #2

Final Weight 598.1 grams

Initial Weight 591.5 grams

Net 6.6 ✓ grams

IMPINGER #3

Final Weight 499.9 grams

Initial Weight 499.6 grams

Net .3 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 817.2 grams

Initial Weight 802.3 grams

Net 14.9 ✓ grams

TOTAL MASS OF H_2O CAPTURED 106.8 ✓ grams

Scale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 265F
#
Back Half Filter # 265B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ✓ Back Half ____

Manufacturer: S&S Size: 110 mm Lot. No.: ZB882 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261 F	0.6987	3/20	1608	DK	.6991	3/23	1300	[illegible]				
262 F	0.7014		1610		.7017		1301					
263 F	0.6988		1612		.6985		1302					
264 F	0.6893		1614		.6894		1303					
265 F	0.6912		1616		.6917		1304		Hawkes	RNL		
266 F	0.6934		1618		.6936		1305					
267 F	0.6936		1620		.6937		1306					
268 F	0.7015		1622		.7010		1307					
269 F	0.6933		1624		.6936		1308					
270 F	0.6965		1626		.6965		1309					
271 F	0.6953	3/20	1628	DK	.6951		1330					
272 F	0.7002		1630		.7005		1331					
273 F	0.6978		1632		.6980		1332					
274 F	0.6900		1634		.6903		1333					
275 F	0.6975		1636		.6975		1334					
276 F	0.6978		1638		.6978		1335					
277 F	0.6975		1640		.6974		1336					
278 F	0.6992		1642		.6991		1337					
279 F	0.6901		1644		.6900		1338					
280 F	0.6994		1646		.6997		1339					

Checked by [illegible] Date: 3/24/91 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1606	DK
59	73	43	3/23	1300	[illegible]

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ____ Back Half √

Manufacturer: S&S Size: 8.2 cm Lot.No.: ZB 901 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261B	0.3846	3/20	1526	DK	.3849	3/23	1341	[illegible]				
262B	0.3822		1528		.3827		1342					
263B	0.3805		1530		.3810		1343					
264B	0.3811		1532		.3812		1344					
265B	0.3821		1534		.3824		1345		HAUAHS	RN6		
266B	0.3822		1536		.3824		1346					
267B	0.3817		1538		.3822		1347					
268B	0.3772		1540		.3770		1348					
269B	0.3875		1542		.3872		1349					
270B	0.3813		1544		.3809		1350					
271B	0.3884	3/20	1546	DK	.3882		1351					
272B	0.3818		1548		.3813		1352					
273B	0.3825		1550		.3821		1353					
274B	0.3856		1552		.3853		1354					
275B	0.3832		1554		.3830		1355					
276B	0.3862		1556		.3864		1356					
277B	0.3836		1558		.3832		1357					
278B	0.3801		1600		.3802		1358					
279B	0.3827		1602		.3822		1359					
280B	0.3821		1604		.3818		1400					

Checked by [signature] Date: 3/24/92 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1524	DK
59	73	43	3/23	1340	[illegible]

INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 4/17/92 Time: 1000 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
501	96.8870	4/20	1004	DK	96.8874	4/21	1332	[illegible]				
502	98.5625		1006		98.5630		1334					
503	91.2041		1008		91.2044		1336					
504	95.0582		1010		95.0584		1338					
505	106.4506		1012		106.4504		1340					
506	94.1600	4/20	1014	DK	94.1604		1342					
507	88.9867		1016		88.9870		1344					
508	103.1077		1018		103.1077		1346					
509	95.7024		1020		95.7026		1348					
510	104.8758		1022		104.8757		1350					
511	107.7742	4/20	1024	DK	107.7745		1352					
512	106.3852		1026		106.3855		1354					
513	99.2412		1028		99.2417		1356					
514	108.6340		1030		108.6344		1358					
515	106.2259		1032		106.2264		1400					
516	105.6750	4/20	1034	DK	105.6745		1402					
517	94.7160		1036		94.7160		1404					
518	103.8296		1038		103.8300		1406					
519	100.0063		1040		100.0063		1408					
520	98.6266		1042		98.6267		1410					
521	97.7535	4/20	1044	DK	97.7537		1412					
522	103.9227		1046		103.9229		1416					
523	94.9397		1048		94.9402		1418		HAUGHS RNG			
524	106.8567		1050		106.8571		1420					
525	95.1170		1052		95.1173		1422					

Checked By: [illegible] Date: 4/21/92 Time: 1415

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITION

WB	DB	%RH	Date	Time	By
59	72	46	4/20	1002	DK
60	74	44	4/21	1330	[illegible]

WST5-Form9,Pg1,Rev4/90
Unit HAWKS SD7X
Run # 6
Date: 5/19/90

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
5D1		5/19	0900	DK	97.8084	5/20	1006	DK	97.8087	5/21	1013	[illegible]				
5D2		5/19	1445	[illegible]	104.1434	5/21	1029	[illegible]	104.1419	5/22	1018	DK	104.1424	5/22	1505	[illegible]
5D3		5/19	0900	DK	94.9862	5/20	1008	DK	94.9859	5/21	1015	[illegible]				
5D4		5/19	1445	[illegible]	106.9200	5/21	1031	[illegible]	106.9186	5/22	1020	DK	106.9189	5/22	1507	[illegible]
5D5		5/19	1445	[illegible]	95.1621	5/21	1033	[illegible]	95.1611	5/22	1022	DK	95.1610	5/22	1509	[illegible]

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
265F		5/18	1448	[illegible]	0.8163	5/19	956	DK	.8165	5/19	1729	[illegible]				
265B		5/18	1448	[illegible]	~~0.5218~~	5/19	958	DK	.5210	5/19	1731	[illegible]	0.5195	5/20	1010	DK
					.5198	5/21	1019	[illegible]								

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	5/19	954	DK	57	70	44
2	5/19	1707	[illegible]	56	70	41
3	5/20	1004	DK	56	70	41
4	5/21	1005	[illegible]	60	74	44
5	[illegible]	[illegible]	DK	[illegible]	73	[illegible]

SCALE ROOM ENVIRONMENTAL CONDITIONS

6	5/22	1515	[illegible]	57	70	44
7						
8						
9						

Comments

WST7-For.

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 4/23/92

Through ______

Scale Sartori
Model A1265
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9996	10.0000	0.9997	0.1001			DK	4/23	1600	70	56	41
99.9996	10.0000	.9997	.1000			JAD	4/24	1130	74	57	24
99.9996	10.0000	.9998	.1000			JAD	4/24	1830	70	57	44
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	.9998	.0999			JAD	4/28	1330	71	59	45
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			TK	4/30	0846	72	64	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	950	77	61	39
99.9997	9.9999	1.000	.1000			JAD	5/1	1200	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/4	930	78	62	40
100.0002	10.0002	1.0001	.1000			JAD	5/6	1010	75	60	41
100.0000	10.0001	1.0000	.1001			JAD	5/6	1505	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9997	10.000C	1.0001	.1000			JAD	5/6	1640	72	59	46
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			TK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	.1001			JAD	5/8	1105	65	54	48
99.9998	10.0001	.9999	.0990			JAD	5/8	1650	68	56	47
99.9996	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			TK	5/12	0900	74	60	44
99.9997	10.0001	1.0000	.0999			JAD	5/12	1315	74	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	950	74	59	40
100.0002	10.0002	1.0000	.1001			JAD	5/14	1636	70	56	41
99.9998	9.9999	.9997	.0999			BJ	5/15	1200	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.000	.1001			JS	5/18	1800	73	59	45
99.9998	9.9997	0.9996	0.0997			DK	5/19	0920	70	57	44
99.9998	10.0000	.9999	.0999			JAD	5/19	1707	70	56	41
100.0001	10.0003	1.0002	0.1003			DK	5/20	945	70	56	41
99.9996	9.9998	.9999	.1000			JAD	5/21	1005	74	60	44
99.9998	10.0000	0.9998	0.0997			DK	5/22	1000	73	60	47
100.0000	10.0000	1.0001	.1001			JAD	5/22	1515	70	57	44

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 3/12

Through 4/23

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9998	10.0000	1.0000	0.0998			TK	3-12	1254	73	60	42
99.9998	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	.1000			JWD	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0002	10.0001	1.0000	0.1001			JWD	3/17	1607	71	59	46
99.9997	10.0001	1.0000	.1000			JWD	3/19	1715	74	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	.9999	0.0998			JWD	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9999	10.0001	1.0001	.1002			JWD	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3/26	1045	73	59	43
100.0001	9.9996	1.0000	.1001			JWD	3/27	1140	77	62	42
99.9997	9.9999	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9996	10.0000	1.0001	.1000			JWD	3/30	1600	71	57	41
99.9999	10.0004	1.0001	.1002			JWD	3/31	1016	73	59	43
100.0003	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9995	10.0000	1.0000	.1000			JWD	4/2	0900	73	59	43
99.9998	9.9997	0.9997	0.1000			DK	4/3	0900	72	59	46
99.9997	10.0001	0.9999	0.0999			DK	4/3	1630	70	58	48
99.9999	10.0001	0.9999	.0999			TK	4/6	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	56	41
99.9999	9.9998	0.9999	.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	.9999	.0998			JWD	4/8	1545	69	55	44
100.0000	9.9998	.9999	.0999			TK	4/9	1025	68	55	43
100.0000	10.0001	1.0000	.1000			JWD	4/10	0935	70	56	41
100.0000	9.9999	.9999	.0999			TK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	945	72	58	42
100.0002	10.0003	1.0001	.0998			JWD	4/14	1030	72	59	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	56	47
99.9997	9.9999	.9998	.0998			JWD	4/16	1006	80	58	48
100.0001	9.9999	1.0000	0.1001			DK	4/17	915	70	57	44
99.9996	9.9999	1.0000	.1000			JWD	4/17	1525	70	58	48
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0002	1.0002	.1001			JWD	4/21	1440	74	60	44
100.0000	10.0000	1.0000	0.0999			DK	4/22	900	73	59	43
99.9999	10.0003	1.0000	.1001			JWD	4/23	1007	76	60	38

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WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 2/6/92
Through 3/11/92

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0000	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9998	10.0003	1.0001	.1001			[illegible]	2/6	1315	68	56	47
99.9999	10.0000	1.0000	.1000			[illegible]	2/7	0915	65	54	48
100.0001	9.9999	1.0001	.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	.1000			TK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	75	62	48
100.0000	10.0000	1.0000	.1000			[illegible]	2/10	1100	72	59	47
99.9997	10.0001	1.0000	.1001			[illegible]	2/11	0920	71	61	47
100.0001	10.0000	1.0001	.1000			TK	2/12	0920	68	56	47
100.0003	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9997	10.0000	1.0000	.1000			[illegible]	2/12	0850	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0001	1.0001	0.1000			TK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			[illegible]	2/13	1535	75	62	45
100.0000	9.9999	1.0000	0.1000			DK	2/14	930	77	63	46
100.0000	10.0000	1.0000	0.1000			TK	2/17	1240	76	62	45
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	45
100.0000	10.0001	1.0000	.0999			TK	2/17	0820	65	54	48
99.9997	10.0000	1.0001	.1000			[illegible]	2/17	1035	68	56	47
99.9999	10.0000	.9999	.1000			TK	2/18	0856	65	54	48
99.9999	10.0001	1.0000	.1000			[illegible]	2/18	1800	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	945	71	58	45
100.0000	9.9999	1.0000	0.1000			TK	2/24	0800	71	59	44
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	.9999	.0999			TK	2/26	1025	72	59	46
99.9999	9.9998	1.0000	0.0999			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.0999			TK	2/28	1230	78	64	46
99.9998	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			TK	3/4	1130	72	59	46
99.9996	10.0000	1.0000	.1000			[illegible]	3/5	0935	70	58	48
99.9996	10.0000	.9999	0.0999			TK	3/6	0830	73	60	47
99.9998	10.000	.9999	.0998			[illegible]	3/6	1400	76	62	45
99.9998	10.0000	.9999	.1000			TK	3/9	0850	71	59	49
99.9996	10.000	.9999	.1000			[illegible]	3/9	1340	70	59	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0900	75	60	41
99.9996	10.0000	1.0000	.0998			[illegible]	3/11	1605	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAWKINS SOX
Run: 6 Date: 5/18/92
Technician(s): SS

FRONT HALF

FILTER #:	265F	BEAKER #:	521	FINAL WT:	97.8087 g
FINAL WT:	.8165 g	ml:	125	TARE WT:	97.7537 g
TARE WT:	.6917 g	desc:	ACETONE	NET WT:	.0550 g
NET WT:	.1248 g				
FILTER #:		BEAKER #:		FINAL WT:	g
FINAL WT:	g	ml:		TARE WT:	g
TARE WT:	g	desc:	ACETONE	NET WT:	g
NET WT:	g				

TOTAL VOLUME OF ACETONE USED IN WASH: 125 ml

BACK HALF

FILTER #:	265B	BEAKER #:	522	FINAL WT:	104.1404 g
FINAL WT:	.5198 g	ml:	240	TARE WT:	103.9209 g
TARE WT:	.3824 g	desc:	ACETONE	NET WT:	.0195 g
NET WT:	.1374 g				
FILTER #:		BEAKER #:	523	FINAL WT:	94.9859 g
FINAL WT:	g	ml:	75	TARE WT:	94.9402 g
TARE WT:	g	desc:	METHCHLOR	NET WT:	.0457 g
NET WT:	g				
		BEAKER #:	504	FINAL WT:	106.9189 g
		ml:	200	TARE WT:	106.8571 g
		desc:	H2O	NET WT:	.0618 g
		BEAKER #:	505	FINAL WT:	95.1610 g
		ml:	105	TARE WT:	95.1173 g
		desc:	H2O	NET WT:	.0437 g
		BEAKER #:		FINAL WT:	.1055 g
		ml:		TARE WT:	g
		desc:		NET WT:	g
		BEAKER #:		FINAL WT:	g
		ml:		TARE WT:	g
		desc:		NET WT:	g

TOTAL VOLUME OF ACETONE USED IN WASH: 240 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION: 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED: 305 ml

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: HAUGHS 507 X
Run: 6 Date: 5/18/92
BLANKS DONE: 5/11/92
Technician(s): JS DK TK

BEAKER #: D
200 ml ACETONE
FISHER OPTIMA LOT #: 913996
FINAL WT: 106.2239 g
TARE WT: 106.2235 g
NET WT: .0004 g

BEAKER #: E
75 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 916306
FINAL WT: 96.8428 g
TARE WT: 96.8424 g
NET WT: .0004 g

BEAKER #: F
200 ml DISTILLED WATER
BONNEAU CERTIFIED
FINAL WT: 96.5114 g
TARE WT: 96.5106 g
NET WT: .0008 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 3/17/92

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
D	106.2238	1326	106.2235	1036				
E	96.8424	1328	96.8424	1038				
F	96.5109	1330	96.5106	1040				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
3/23	1300	JS	59	73	43
3/24	1034	DK	58	72	42

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	DK	59	74	40
5/14	1636	JS	56	70	41
5/15	1200	BN	60	74	44

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
D	5/12	0900	106.2243	5-13 1048	106.2239	5-14 1659		
E	5/12	0900	96.8431	5-13 1050	96.8428	5-14 1701		
F	5/12	5-13 1330	96.5112	5-14 1700	96.5114	5-15 1230		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: HHUGHS 527X
Run: 6
Date: 5/18/92
Technician(s): TK TK
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Tim Kelly Date: 5/18/92

Blank Calculations:

Acetone: .0004 g ÷ 200 ml = .000002 g/ml

Dichloromethane: .0004 g ÷ 75 ml = .00000533 g/ml

Distillted Water: .0008 g ÷ 200 ml = .000004 g/ml

Front Half Catch:

Filters: .1048 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1048 g (Net Catch)

Beakers: .0550 g (Total Catch) - 175 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0547 g (Net Catch)

Total Front Half Catch .1795 g

Back Half Catch:

Filters: .1374 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1374 g (Net Catch)

Beakers:

1. Acetone/Impingers: .0195 g (Total Catch) - 240 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .0190 g (Net Catch)

2. Extract/Impingers: .0457 g (Total Catch) - 75 (ml. of Dichloromethane) .0004 (.00000533 g) (Blank Value/ml of Dichloromethane) = .0453 g (Net Catch)

3. Water/Impingers: .1055 g (Total Catch) - 305 (ml. of water) (.000004 g) (Blank Value/ml of water) = .1043 g (Net Catch)

Total Back Half Catch .5060 g
Total Catch .6855 g
% Front Half 26.19 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HAUGHS 5027X

Run: 6 Date: 5/18/92

Technician(s): JSTK

WST3-Form 1 8/28/91

1) Vm(std): $\dfrac{(69.451 \text{ Vm})(17.65)(1.066 \text{ mcf})(30.01 \text{ " Hg} + \dfrac{.004 \text{ " H2O}}{13.6})}{(553 \text{ TmA})}$ = $\dfrac{70.9512}{000.0000}$ dscf

2) Vw(std): (.04707)(106.8 ml H2O): $\dfrac{5.0271}{00.0000}$ scf

3) Asw: $\dfrac{(5.0271 \text{ scf})}{(5.0271 \text{ scf} + 70.9512 \text{ dscf})}$ = $\dfrac{.0662}{.0000}$ Bws X 100 = $\dfrac{6.6165}{00.0000}$ % H2O

4) Cs: $\dfrac{(.6855 \text{ g.})}{(70.9512 \text{ dscf})}$ (15.43): $\dfrac{.1491}{0.0000}$ gr/dscf

5) Estimated g/hr: $\dfrac{(\_\_\_\_\_ \text{ g.})}{(\_\_\_\_\_ \text{ dscf})}$ ($\dfrac{6.73}{00.000}$ dscfm)(60): $\dfrac{\_\_\_\_\_}{00.0000}$ g/hr

Vm :	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf :	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf)
" Hg :	average barometric pressure during the test	(p. 2)	(00.00 " Hg)
" H2O :	average delta H for the test	(p. 2)	(.000 " H2O)
TmA :	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA)
ml H2O :	total water caught during the test	(p. 3)	(000.0 ml H2O)
g. :	total particulate catch for the test	(p. 6)	(00.0000 g.)
dscfm :	average stack flow during the test	(computer printout)	(00.000 dscfm)

Unit [illegible]
Run # 6
Date 5/18/92
Technician BN TK DK JS
WST6-Form1,Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft^3

Dilution Tunnel Draft (If applicable): Start 0 Stop 0

Test Chamber Air Velocity: Start: 0 Stop: 0 Avg: 0

Wet Bulb/ Start: WB: 63 °F DB: 79 °F 1.4 % Amb Moisture 42 %RH

Dry Bulb Stop: WB: 60 °F DB: 75 °F 1.2 % Amb Moisture 42 %RH

$\bar{X}$ = 1.3 % Ambient Moisture $\bar{X}$ = 42 % Relative Humidity (RH)

Empty Stove Wt: 237.3 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: — lbs. Dry: 311.8 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 311.8 lbs.

Kindling Wt. HOT START Paper: 0 lbs. Wood: 0 lbs.

Pre Burn Fuel Wt. 10.0 + 1.3 Total: 11.3 lbs.

Total Kindling and Pre Burn Fuel Wt 11.3 lbs.

Coal Bed Wt-lbs: Range(2.4 -2.0) 314.2 - 313.8 lbs. Actual: 2.3 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\left(\frac{2.4}{\text{Upper Wt.}} + \frac{2.0}{\text{Lower Wt.}} \Big/ 2 \right)$ .25 = .5 lbs.

Test Fuel Wt-lbs: Ideal 10.3 lbs. Range: 11.3 - 9.3 lbs. Actual: 9.7 lbs.

Test Fuel Size (pcs.)(.75 x 1.5 x 5" Flanges) 14 Pcs.

2 x 4's x	18 3/4 "	4 Pcs	9.7 lbs.	100.0 %
4 x 4's x	N/A "	N/A Pcs	N/A lbs.	N/A %

Est. Dry Burn Rate (Kg/Hr.) $\frac{9.7 - (9.7 \times .17167)}{2.2025} \times \frac{60}{180} = 1.216$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output(HO_E) (Avg BTU's/Hr) $(19,140) \times \frac{63}{100} \times 1.216 = 14663$ Est Heat Output (HO_E) BTU's/Hr

Comments: 180 = 1.216

Unit: Haughs S27X Run: 6 Date: 5/18/92

WOODSTOVE OPERATING DATA

FIRE STARTED: Hot Start PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges, then set to .380 at start of preburn.

SECONDARY AIR: N/A CAT BYPASS: N/A

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 15 sec.

TEST: Door Wide Open during loading 4 min 30 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of .380 .

SECONDARY AIR: N/A CAT BYPASS: N/A

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at 1776H .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ________________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 10 or 18 inches.

1st warm up/preburn fuel charge (10.0 lbs) added at 1420 .

2nd warm up/preburn fuel charge (1.3 lbs) added at 1527 .

3rd warm up/preburn fuel charge (________ lbs) added at __________ .

4th warm up/preburn fuel charge (________ lbs) added at __________ .

5th warm up/preburn fuel charge (________ lbs) added at __________ .

Unit: [illegible]
Run: 6
Date: 5/18/92
Technician: BN, JS, TK, DK
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 70 °F

Correction Factor: Ø

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes ____. No ✓.
Time Test Fuel Moisture Readings taken at: 1430
Calibration Checks: X ✓ Y ✓ 12.0 12.3 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K		HOT	START				
2									
3									
4	2x4x8	P	18.5	20.1	18.5	20.1	19.0	20.7	20.300
5	~~2x4x8~~	~~P~~							20.300
6									
7									
8									
9	2x4x18 3/4	T	18.5	20.1	19.0	20.7	19.0	20.7	20.500
10	2x4x18 3/4	T	18.5	20.1	19.0	20.7	19.0	20.7	20.500
11	2x4x18 3/4	T	18.5	20.1	18.5	20.1	18.5	20.1	20.100
12	2x4x18 3/4	T	20.0	21.8	20.0	21.8	20.0	21.8	21.800
13									82.900
14									
15									
16									
17									
18									
19	FEET	T	19.5	21.3	21.5	23.5	19.5	21.3	22033
20									

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	N/A %	20.300 %	20.725 % ✓
% Moisture - Wet Basis:	N/A %	16.874 %	17.167 % ✓

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: [illegible]
Run#: 6
Date: 5/18/92
Technician: BN TK, DK, JS
WST2-form11-Rev 6/90

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Wood Piece: Nominal Dimensions: 2 x 4 x 3½

Depth (D): 4.0 cm

Width (W): 9.0 cm

Length (L): 8.50 cm
8.50 cm
8.50 cm
8.50 cm

Length $\bar{X}$ = 8.50 cm

Volume: 306.000 cm^3
(D X W X L)

MOISTURE: Room Temperature: 71 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	18.5	20.1 %
Bottom:	18.5	20.1 %
Side:	18.0	19.6 %
$\bar{X}$:		19.933 %

Avg % Moisture (Dry) 19.933 %

Avg % Moisture (Wet) 16.620 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 174.4 g Dry Weight: 150.98 g

% Moisture Dried Basis: 13.409 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp	
Into Dryer	5/18/92	1430	229	°F
Out of Dryer	5/20/92	1445	229	°F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 150.98 g (dry wt) ÷ 306.000 cm^3 (volume) = .4934 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ________ g

Wet Wt: ________ g ÷ ________ g = ________ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ________ g ÷ ________ g = ________ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ________ %
[1 - (Net Dry Wt - Net Wet Wt.)] X 100

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
NST2-Form 14 Rev 1/88

Unit: HAUGHS S27X   Date: 5/18/92
Run: 6   Technician(s): BN TK
Page: 1 of 2   DK JS

Minute	Time	Scale Wt (314.1)	lbs left	Burn Rate	1 CO_2 V.	%CO_2	2 O_2 V.	%O_2	Tel	3 CO V.	%CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	PPM	Static Press.	Comm
00	1605	323.8	9.7	Ø	.197	4.9	.599	15.2	15.2	.083	.84	5.9	86	104	3.6	105	214	.25	625	-.041	Flow
05	10	323.8	9.7	Ø	.112	2.8	.692	17.5	17.5	.045	.45	6.3	86	106	3.5	106	226	.19	475	-.046	SO_2
10	15	323.6	9.5	.2	.094	2.4	.711	18.0	18.0	.049	.50	4.7	91	109	4.4	106	195	.24	600	-.042	CO_2
15	20	323.3	9.2	.3	.127	3.2	.681	17.3	17.3	.048	.49	6.5	95	111	5.0	106	186	.24	600	-.041	O_2
20	25	323.1	9.0	.2	.126	3.2	.682	17.3	17.3	.052	.53	6.0	98	112	5.7	108	181	.24	600	-.039	CO
25	30	322.9	8.8	.2	.156	3.9	.652	16.5	16.5	.050	.51	7.7	101	117	6.2	110	183	.23	575	-.041	
30	35	322.5	8.4	.4	.205	5.1	.608	15.4	15.4	.056	.57	9.0	106	123	7.3	116	202	.22	550	-.044	
35	40	321.9	7.8	.6	.240	6.0	.575	14.6	14.6	.068	.69	8.7	109	125	7.8	118	216	.22	550	-.047	
40	45	321.5	7.4	.4	.359	8.9	.460	11.6	11.6	.057	.58	15.4	113	133	8.9	122	242	.21	525	-.054	
45	50	320.7	6.6	.8	.410	10.2	.421	10.6	10.6	.027	.27	37.7	115	137	9.3	129	284	.20	500	-.061	
50	55	320.0	5.9	.7	.426	10.6	.403	10.2	10.2	.023	.23	45.9	112	134	8.6	127	295	.19	475	-.061	
55	1700	319.4	5.3	.6	.438	10.9	.391	9.9	9.9	.022	.22	49.4	107	128	7.4	124	302	.19	475	-.063	
																	2726			-.580	Flow
60	05	318.7	4.6	.7	.426	10.6	.395	10.0	10.0	.018	.18	58.7	104	125	6.5	122	303	.19	475	-.063	SO_2
65	10	318.1	4.0	.6	.471	11.7	.344	8.7	8.7	.039	.39	29.9	102	120	6.1	122	312	.19	475	-.066	CO_2
70	15	317.5	3.4	.6	.480	11.9	.335	8.4	8.4	.031	.31	38.4	99	115	5.7	121	312	.20	500	-.065	O_2
75	20	317.0	2.9	.5	.405	10.0	.410	10.4	10.4	.021	.21	47.8	98	111	5.6	120	295	.19	475	-.064	CO
80	25	316.6	2.5	.4	.391	9.7	.426	10.8	10.8	.013	.13	74.6	97	109	5.5	119	280	.19	475	-.062	
85	30	316.3	2.2	.3	.361	9.0	.453	11.5	11.5	.014	.14	64.0	95	106	5.1	115	269	.19	475	-.057	
90	35	315.9	1.8	.4	.344	8.5	.466	11.8	11.8	.015	.15	56.9	94	103	5.0	114	258	.19	475	-.055	
95	40	315.7	1.6	.2	.308	7.7	.495	12.5	12.5	.037	.37	20.7	94	102	5.0	113	250	.19	475	-.054	
100	45	315.5	1.4	.2	.285	7.1	.513	13.0	13.0	.058	.59	12.0	93	99	5.0	112	242	.20	500	-.052	
105	50	315.4	1.3	.1	.246	6.1	.546	13.8	13.8	.076	.77	8.0	92	99	4.8	110	233	.20	500	-.050	
110	55	315.2	1.1	.2	.235	5.9	.553	14.0	14.0	.095	.96	6.1	91	101	4.6	109	224	.20	500	-.047	
115	1800	315.1	1.0	.1	.225	5.6	.560	14.2	14.2	.101	1.03	5.4	90	103	4.3	109	218	.20	500	-.045	
																	3196			-.680	
																	5922			-1.21.0	

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: Hearthstone S27X Date: 5/18/92
Run: 6 Technician(s): BN TK
Page: 2 of 2 DK JS

Minute Time	Scale Wt (314.1)	lbs left	Burn Rate	1 CO_2 V.	%CO_2	2 O_2 V.	%O_2	Tel	3 CO V.	%CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	PPM	Static Press.	Comm
120 1805	314.9	.8	.2	.224	5.6	.560	14.2	14.2	.107	1.09	5.1	89	103	4.0	106	213	.20	500	-.045	Flow
125 10	314.8	.7	.1	.212	5.3	.570	14.4	14.4	.111	1.13	4.7	87	103	3.8	105	210	.20	500	-.044	SO_2
130 15	314.8	.7	Ø	.202	5.0	.580	14.7	14.7	.114	1.16	4.3	86	104	3.6	104	207	.20	500	-.043	CO_2
135 20	314.7	.6	.1	.191	4.8	.586	14.8	14.8	.135	1.37	3.5	86	105	3.6	104	204	.20	500	-.042	O_2
140 25	314.6	.5	.1	.183	4.6	.593	15.0	15.0	.137	1.39	3.3	85	106	3.3	103	202	.20	500	-.040	CO
145 30	314.6	.5	Ø	.171	4.3	.606	15.4	15.4	.137	1.39	3.1	85	107	3.3	102	198	.20	500	-.040	
150 35	314.5	.4	.1	.161	4.0	.612	15.5	15.5	.142	1.44	2.8	84	107	3.1	101	196	.20	500	-.039	
155 40	314.4	.3	.1	.151	3.8	.622	15.8	15.8	.145	1.47	2.6	84	107	3.1	100	192	.21	525	-.038	
160 45	314.4	.3	Ø	.134	3.4	.637	16.1	16.1	.152	1.54	2.2	83	107	3.0	100	188	.21	525	-.036	
165 50	314.3	.2	.1	.130	3.3	.642	16.3	16.3	.147	1.49	2.2	83	107	3.0	100	184	.21	525	-.036	
170 55	314.2	.1	.1	.129	3.2	.643	16.3	16.3	.146	1.48	2.2	83	107	3.0	109	181	.22	550	-.035	
175 1900	314.2	.1	Ø	.133	3.3	.640	16.2	16.2	.148	1.50	2.2	83	107	3.0	109	178	.22	550	-.034	
																2353			-.472	Flo
☆ 180 05	314.1	Ø	.1	.122	3.1	.651	16.5	16.5	.143	1.45	2.1	82	106	2.9	109	175	.22	550	-.033	SO_2
185																175			.033	CO_2
190																2528			-.505	O_2
195																8450			-1.765	CO
200																228			-.048	
205																				
210																				
215																				
220																			37	
225																				
230																				
235																				

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

Unit: HUGHS S27X
Run: 6
Page: 1 of 1

Date: 5/18/92
Technician(s): BN TK
DK JS

314.2 - 313.8

Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Comments
00 1505	315.2	0	374	599	505	626	380	380	1238	1128	85	-.063	Primary Air Set at .380
05 10	315.0	.2	289	538	508	375	386	389	1194	1068	87	-.060	Secondary Air Set at N/A
10 15	314.8	.2	259	469	495	324	381	400	1139	1008	87	-.056	Fan: ON HIGH
15 20	314.6	.2	243	424	477	298	369	408	1092	967	87	-.052	
20 25	314.5	.1	231	391	454	279	355	411	.1051	908	86	-.050	+ 1.3 1527
25 30	315.5	.3	237	381	433	263	343	413	982	1132	86	-.052	
30 35	315.3	.2	235	385	418	253	333	413	962	1046	86	-.051	Pumps turned on at: 1535
35 40	315.0	.3	230	380	406	249	325	410	954	978	86	-.050	
40 45	314.7	.3	224	366	396	244	314	407	936	976	86	-.048	
45 50	314.5	.2	221	358	389	242	308	403	923	938	85	-.047	Check WB/DB: 92/107
50 55	314.3	.2	217	348	384	241	302	400	920	893	85	-.046	
55 1600	314.2	.1	209	333	379	236	286	398	896	810	83	-.043	
60 05	314.1	.1	214	319	374	231	272	396	832	703	82	-.041	318.4
65													
70													
75													
80													
85													
90													
95													
100													
105													
113													
120													
125													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S27X Date: 5/18/92
Run: 6 Technician(s): BN TK
Page: 1 of 2 DK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
00 / 1605	319	374	231	272	396	832	703	82	1448	248	34	247	35	36
05 / 10	300	364	329	263	394	547	582	81	1448	248	34	247	35	36
10 / 15	291	344	334	258	392	542	635	81	1448	248	34	248	35	36
15 / 20	276	322	325	238	388	530	658	80	1448	248	34	248	35	36
20 / 25	268	306	320	231	379	547	606	80	1448	248	34	248	35	36
25 / 30	257	291	314	228	371	558	656	81	1448	248	34	248	35	36
30 / 35	269	279	315	226	361	555	843	81	1442	248	34	248	35	36
35 / 40	294	275	199	225	348	660	750	81	1441	248	34	248	35	36
40 / 45	334	275	191	227	341	760	1263	81	1441	248	34	248	35	36
45 / 50	434	279	199	240	332	861	1331	80	1441	248	34	248	35	36
50 / 55	468	291	211	255	325	918	1389	80	1442	248	34	248	35	36
55 / 1700	499	303	222	268	320	956	1398	81	1444	248	34	248	35	36
	4009	3703	3190	2931	4347	8266	10814	969						
60 / 05	517	324	239	283	317	1054	1336	81	1447	248	34	248	35	36
65 / 10	532	338	250	293	317	1128	1440	81	1448	248	34	248	35	36
70 / 15	549	359	265	304	318	1179	1324	82	1448	248	34	248	35	36
75 / 20	536	374	278	313	320	1174	1247	82	1448	248	34	248	35	36
80 / 25	516	386	283	326	324	1163	1224	82	1448	248	34	248	35	36
85 / 30	493	401	287	327	329	1143	1154	82	1448	248	35	248	35	36
90 / 35	467	411	284	322	333	1139	1121	82	1448	248	35	248	35	36
95 / 40	448	417	280	317	339	1093	974	81	1448	248	35	248	35	36
100 / 45	428	423	272	316	346	1044	912	81	1448	248	35	248	35	36
105 / 50	404	428	264	311	351	1016	872	82	1448	248	35	248	35	36
110 / 55	378	428	258	306	357	986	847	83	1448	248	35	248	35	36
115 / 1800	357	423	250	299	360	966	817	83	1448	248	35	248	35	36
	5625	4712	3210	3717	4011	13085	13268	982						
	9634	8415	6400	6648	8358	21351	24082	1951						

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S27X Date: 5/18/92
Run: 6 Technician(s): BN TK
Page: 2 of 2 DK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16 318.4	17
Minute Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalytic	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
120 1805	339	414	244	292	365	953	806	83	1448	248	35	248	35	36
125 10	331	408	239	290	366	943	792	83	1448	248	35	248	35	36
130 15	323	403	237	283	367	914	774	83	1448	247	35	248	35	36
135 20	314	396	234	278	369	885	758	83	1447	247	35	247	35	36
140 25	306	390	230	272	368	843	742	83	1446	247	35	247	35	36
145 30	298	384	225	272	366	822	718	82	1447	247	35	247	35	36
150 35	292	377	222	262	366	800	703	82	1448	248	35	247	35	36
155 40	285	368	217	258	365	781	682	82	1448	248	36	247	35	36
160 45	276	360	213	261	362	761	661	82	1448	248	36	247	35	36
165 50	268	352	209	251	359	748	648	82	1448	248	36	248	35	36
170 55	261	344	206	243	357	737	629	82	1448	248	36	248	35	36
175 1900	255	336	263	238	354	731	619	82	1448	248	36	248	35	36
	3548	4532	2679	3200	4364	9918	8532	989						
180 05	248	327	198	234	350	705	601	82	1448	248	36	248	35	36
185	248	327	198	234	350	705	601	82						
190	3796	4859	2877	3434	4714	10623	9133	1071	ΔT START		318.4			
195	13430	13274	9277	10082	13072	31974	33215	3022		STOP	271.4			
200	363	359	251	272	353	864	898	82			-47.0			
205														
210														
215														
220													37	
225														
230														
235														

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: CO_2 (15-1)

Source: HAUGH'S S270 SERIES Run #: 6

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.6 % CO_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: DK Time: 1535 Temp: 86 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	49.9	.499	12.363	-.237	-1.879

Comments:

Post Run Audit: By: DK Time: 1920 Temp: 82 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	49.9	.499	12.363	-.237	-1.879

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: O_2 (15-2)

Source: HAUGHS S270 Series Run #: 6

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.4 % O_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: DK Time: 1545 Temp: 86 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.004	-.003	-.003	-.012
Span	12.4	.496	12.4	12.4	.494	12.497	.097	.781

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

Post Run Audit: By: DK Time: 1930 Temp.: 82 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.1	.005	.023	.023	.090
Span	12.4	.496	12.4	12.4	.491	12.420	.020	.164

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

+ Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: CO (15-3)

Source: HAUGHS S270 SERIES Run #: 6

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 4.96 % CO Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: DK Time: 1550 Temp: 85 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.2	.492	5.008	.048	.969

Comments:

Post Run Audit: By: DK Time: 1935 Temp.: 82 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.1	.001	.006	.006	.058
Span	49.6	.496	4.96	48.9	.489	4.978	.018	.353

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: SO_2 (15-4)

Source: HAUGHS S270 SERIES Run #: 6

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: AL2892 Conc. 1232 ppm SO_2 Cyl Press: 450 psi

Certified by: LIQUID AIR Date: 9/24/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: DK Time: 1530 Temp: 86 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	00.3	.003	10.928	10.928	.437
Span	49.3	.493	1232	49.3	.493	1234.000	2.000	.162

Comments:

Post Run Audit: By: DK Time: 1915 Temp: 82 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	00.3	.003	10.928	10.928	.437
Span	49.3	.493	1232	49.2	.492	1231.504	-.496	-.040

Comments:

± Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

Run: 6
Date: 5/18/92
Technicians: BN, TK, DK, JS
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 79 °F T/C#30: 80.9 °F

Thermocouple Check (at ambient): T/C#1: 82.0 °F; T/C#2: 87.4 °F;

T/C #3: 232.6 °F;	T/C #4: 249.8 °F;	T/C #5: 302.2 °F;
T/C #6: 357.7 °F;	T/C #7: 214.4 °F;	T/C #8: 331.0 °F;
T/C #9: 700.6 °F;	T/C #10: 765.8 °F;	T/C #11: 78.8 °F;
T/C #12: 675.4 °F;	T/C #13: 111.7 °F;	T/C #14: 85.3 °F;
T/C #15: 162.6 °F;	T/C #16: 52.6 °F;	T/C #17: 60.4 °F;
T/C #18: 89.3 °F;	T/C #19: ____ °F;	T/C #20: ____ °F;
T/C #21: ____ °F;	T/C #22: ____ °F;	T/C #23: ____ °F;
T/C #24: ____ °F;	T/C #25: ____ °F;	T/C #26: ____ °F;

Comments: HOT START

Thermocouple Readout:
Pretest Zero/Span Check and Calibration:

		Post Test Check	% Difference
Zero (0°F): .6 °F	Adj to: .0 °F	Zero (0°F): .6 °F	.030
Span (2000°F): 2003.5 °F	Adj to: 2000.0 °F	Span (2000°F): 2004.4 °F	.220

(Allowable % Difference = 1.5%. Use formulas on Woodstove Data Sheet #15 to calculate % Difference)

Thermocouple Readout Pretest Linearity Check

0°F = .0 °F;	200°F = 202.4 °F;	400°F = 400.0 °F;
600°F = 602.6 °F;	800°F = 803.0 °F;	1000°F = 1002.3 °F;
1200°F = 1200.3 °F;	1400°F = 1401.6 °F;	1600°F = 1602.5 °F
1800°F = 1803.2 °F;	2000°F = 2000.0 °F	

	Pre	Post
Tracer Gas (SO_2) Injection Train Leak Check:	✓	✓
Combustion Gas (CO_2, O_2, CO) Train Leak Check:	✓	✓
Tracer Gas (SO_2) Analyzer Train Leak Check:	✓	✓
Draft (Static) Guage Zero Check:	✓	✓

Scale Check Pre (Wt, #'s): 333.1 - 323.1 = 10.0
Post (Wt, #'s): 324.0 - 314.0 = 10.0

Stack cleaned prior to the run: Yes ____ No ✓.

CLIENT : HAUGHS PRODUCTS TEST No. : 7

MODEL: S-27X DATE: 5/19/92

****

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
=========	=========	=========	=========	=========	=========	=========
0	819.700	0.150	78	0.47	5.20	500
5	821.200	0.240	78	0.46	3.00	400
10	823.102	0.140	79	0.46	2.60	525
15	824.557	0.130	79	0.46	2.60	550
20	825.946	0.130	80	0.49	2.70	550
25	827.340	0.130	81	0.54	2.80	550
30	828.740	0.120	81	0.66	2.80	575
35	830.078	0.220	81	0.33	7.40	425
40	831.888	0.180	82	0.55	7.20	475
45	833.514	0.220	83	0.20	8.60	425
50	835.338	0.220	84	0.11	9.50	425
55	837.168	0.220	84	0.17	10.70	425
60	838.998	0.220	85	0.25	11.20	425
65	840.836	0.250	85	0.18	10.40	400
70	842.788	0.220	85	0.17	9.70	425
75	844.626	0.220	85	0.18	9.60	425
80	846.463	0.220	86	0.18	10.20	425
85	848.308	0.200	86	0.29	9.10	450
90	850.050	0.220	86	0.25	8.60	425
95	851.894	0.220	86	0.18	8.60	425
100	853.739	0.190	87	0.26	7.90	450
105	855.487	0.190	87	0.30	7.00	450
110	857.236	0.160	87	0.79	6.10	500
115	858.810	0.140	88	1.01	5.20	525
120	860.314	0.140	88	1.10	4.70	525
125	861.819	0.160	88	1.07	4.40	500
130	863.400	0.160	88	1.09	4.10	500
135	864.980	0.160	89	1.16	3.90	500
140	866.566	0.160	89	1.13	3.70	500
145	868.152	0.160	89	1.14	3.50	500
150	869.738	0.160	89	1.08	3.40	500
155	871.324	0.160	89	0.96	3.50	500
160	872.910	0.150	90	1.01	3.50	500
165	874.504	0.150	89	1.01	3.70	500
170	876.088	0.150	89	1.01	3.70	500
175	877.674	0.150	89	0.99	3.70	500
180	879.260	0.160	89	0.99	3.60	500
185	880.847	0.160	88	0.93	3.70	500
190	882.429	0.160	88	0.93	3.60	500
195	884.011	0.160	88	1.01	3.40	500
200	885.593	0.160	88	1.07	3.10	500
205	887.175	0.160	88	1.06	3.20	500
210	888.756	0.160	87	1.14	3.10	500
215	890.332	0.160	87	1.07	3.00	500
220	891.909	0.160	87	1.09	3.10	500
225	893.485	0.160	87	1.12	3.10	500

230

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TABLE 2 ----- FIELD DATA

CLIENT : HAUGHS PRODUCTS   TEST No. : 7

MODEL: S-27X   DATE: 5/19/92

****

METER CAL. FACTOR (Y) -------	1.066	Wt. WOOD BURNED(LB) -------	10.7	Lbs
BAROMETRIC PRESS.(Pb) -------	30.03 in Hg	WET,FUEL MOISTURE % -------	17.207	%
LEAK RATE POST (Lp) -------	0.003 cfm	Wt. PART. COLLECTED -------	0.9627	g
WATER VOL. (V1c) -------	108.5 Ml	METER VOLUME Vm -------	73.785	mcf
TEST TIME (MIN) -------	225 min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : HAUGHS PRODUCTS TEST No. : 7

MODEL: S-27X DATE: 5/19/92

****

AVG DELTA H	-------	0.17 in H2O	AVG PRCNT CO	-------	0.70 %
AVG METER TEMP. Tm	-------	86 deg F	AVG PRCNT CO2	-------	5.38 %
AVG PPM SO2	-------	482 PPM			

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS TEST No. : 7

MODEL: S-27X DATE: 5/19/92

****

STD SAMPLE VOL. Vm(std) ------	76.41	dscf
STACK GAS FLOW Qsd -------	522.083 & 8.70	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) -----	5.107	scf
PARTICULATE CONCTRT. C s ------	0.0126	g/dscf
PRCNT MSTR Bws -------	6.26	%
PARTC.EMISS. RATE E -------	6.58	g/Hr
BURN RATE BR -------	1.07	Kg/Hr
MOLES OF GAS PER Lb WOOD Nt ----	0.57	Lb-mole/Lb
CO EMISSION RATE -------	122.01 & 113.71	g/Hr & g/Kgdry fuel
PART.EMISS. RATE ------	6.13	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS TEST No. : 7

S-27X DATE: 5/19/92

****

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE		
5	787.9	97		100		
10	798.7	98				
15	801.0	99				
20	800.3	99				
25	801.7	99				
30	804.4	99				
35	803.7	99				
40	803.1	99				
45	804.8	99				
50	806.3	99				
55	808.2	100				
60	807.5	100				
65	810.3	100				
70	810.0	100				
75	810.3	100				
80	809.1	100				
85	811.9	100				
90	811.6	100				
95	811.4	100				
100	811.1	100				
105	812.9	100				
110	813.3	100				
115	812.5	100				
120	814.4	100				
125	814.9	100				
130	815.4	101				
135	814.1	100				
140	816.4	101				
145	816.4	101				
150	816.4	101				
155	816.4	101				
160	815.7	101				
165	819.8	101				
170	815.4	101				
175	816.4	101				
180	816.4	101				
185	817.7	101				
190	815.9	101				
195	815.9	101				
200	815.9	101				
205	815.9	101				
210	816.1	101				
215	814.3	100				
220	814.8	100				
225	814.3	100				
230						

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client Haughs Products

Client Address 10 Atlas Court

Brampton, Ontario, Canada L6T 5C1

Client Phone 416-792-8000

Project No. ______ Model No. S 270X

Run No. 7 Date of Test 5/19/92 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon X Colorado ______ EPA X

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) 1.076 Max (>1.9 Kg/Hr) ______

Fuel % Moisture (dry) 20.783 %(wet) 17.207 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.044 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.03 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 75 °F
(00) (Data Sheet #14)

Flue Gas Moisture ~~6.2453~~ 6.2669 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.05 %
(0.00) (Data Sheet #8)

Stove Weight 237 lbs
(000) (Data Sheet #8)

Stove Temperature Change -90 °F
(000) (Data Sheet #14)

Particulate Emission ~~.1938~~ .1945 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) ______ BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 10.7 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .9627 g
(0.0000) (Data Sheet #6)

H_2O Captured 108.5 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 73.785 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 4J-1.066 Post Test Leak Rate .003 CFM

DOOR CONF#2

Meter Box Data Sheet Page # 2

Meter Box 45 Y Factor 1.066

Leak Checks: 15.0 " Hg @ .001 cfm
14.0 " Hg @ .003 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Initial Volume: 1.500

Page 1 of 2

Unit: Haughts S27X

Run: 7 Date: 5/19/92

Operator(s): JS

Nozzle: Probe @ 3/8 " od

ROTO PRESS: .19			Sampling Ratio : 205 : 1				BAROMETER: 30.05		
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP		SO2 PPM	ROTO TEMP	PUMP VACC
00	1030	819.700	6.889	.15	78		500	73	0
05	35	821.200	8.618	.24	78		400	73	.5
10	40	823.102	6.561	.14	79		525	73	1.0
15	45	824.557	6.263	.13	79		550	73	.5
20	50	825.946	6.416	.13	80		550	71	.5
25	55	827.340	6.416	.13	81		550	71	.5
30	1100	828.740	6.137	.12	81		575	71	.5
35	5	830.078	8.304	.22	81		425	71	.5
40	10	831.888	7.409	.18	82		475	71	1.0
45	15	833.514	8.304	.22	83		425	71	1.0
50	20	835.338	8.304	.22	84		425	71	1.0
55	25	837.168	8.304	.22	84		425	71	1.0
ROTO PRESS: .19			TOTALS :	87.434	2.10	970	BAROMETER: 30.04		
60	30	838.998	8.270	.22	85		425	73	1.0
65	35	840.836	8.786	.25	85		400	73	1.0
70	40	842.788	8.270	.22	85		425	73	1.5
75	45	844.626	8.270	.22	85		425	73	1.0
80	50	846.463	8.270	.22	85		425	73	1.0
85	55	848.308	7.810	.20	86		450	73	1.0
90	1200	850.050	8.270	.22	86		425	73	1.0
95	5	851.894	8.270	.22	86		425	73	1.5
100	10	853.739	7.781	.19	87		450	75	1.0
105	15	855.487	7.781	.19	87		450	75	1.0
110	20	857.236	7.003	.16	87		500	75	1.0
115	25	858.810	6.669	.14	88		525	75	.5
			TOTALS:	95.450	2.45	1033	MAX VACC =		1.5
TOTAL CU FT		———	TOTALS:	183.384	4.55	2003	AV BP:		

60.09

Meter Box Data Sheet Page # 2

Meter Box 45 Y Factor 1.066

Leak Checks: 15.0 " Hg @ .001 cfm
10.0 " Hg @ .003 cfm
_____ " Hg @ _____ cfm
_____ " Hg @ _____ cfm

Inject SO2 @ 100 cc/min

Page 2 of 2

Unit: HAUGHS SO2X

Run: 7 Date: 5/19/92

Operator(s): JS

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: .19			Sampling Ratio : .005 : 1				BAROMETER: 30.03		
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	30	860.314		6.667	.14	88	505	75	.5
125	35	861.819		7.001	.16	88	500	75	.5
130	40	863.400		6.988	.16	88	500	76	.5
135	45	864.980		6.988	.16	89	500	76	.5
140	50	866.566		6.988	.16	89	500	76	.5
145	55	868.152		6.975	.16	89	500	77	.5
150	1300	869.738		6.975	.16	89	500	77	.5
155	5	871.324		6.975	.16	89	500	77	.5
160	10	872.910		6.962	.15	90	500	78	.5
165	15	874.504		6.962	.15	89	500	78	.5
170	20	876.088		6.962	.15	89	500	78	.5
175	25	877.674		6.962	.15	89	500	78	.5
ROTO PRESS: .19			TOTALS :	83.405	1.86	1066	BAROMETER: 30.00		
180	30	879.260		6.981	.16	89	500	76	.5
185	35	880.847		6.981	.16	88	500	76	.5
190	40	882.429		6.981	.16	88	500	76	.5
195	45	884.011		6.981	.16	88	500	76	.5
200	50	885.593		6.981	.16	88	500	76	.5
205	55	887.175		6.981	.16	88	500	76	.5
210	1400	888.756		6.981	.16	87	500	76	.5
215	5	890.332		6.981	.16	87	500	76	.5
220	10	891.909		6.981	.16	87	500	76	.5
225	15	893.485		6.981	.16	87	500	76	.5
230	20			69.810	1.60	877			
235	25			336.604	8.01	3946	46		
			TOTALS:			86	MAX VACC =		1.5
TOTAL CU FT		73.785	TOTALS:	7.317	.174	546	AV BP: 30.03		

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance Level	Balance Zeroed	
Initial:	✓	✓	Unit: Haugh S270
Final:	✓	✓	Run: 7
			Date: 5/19/92

IMPINGER #1

Final Weight 663.5 grams

Initial Weight 576.4 grams

Net 87.1 ✓ grams

Technician(s): Initial: TK

Final: JS

Approved By: TK

IMPINGER #2

Final Weight 590.6 grams

Initial Weight 584.8 grams

Net 5.8 ✓ grams

IMPINGER #3

Final Weight 499.9 grams

Initial Weight 498.5 grams

Net 1.4 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 831.0 grams

Initial Weight 816.8 grams

Net 14.2 ✓ grams

TOTAL MASS OF H_2O CAPTURED 108.5 ✓ grams

Scale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 266F
#
Back Half Filter # 266B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ✓ Back Half ____

Manufacturer: S&S Size: 110 mm Lot.No.: ZB882 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261 F	0.6987	3/20	1608	DK	.6941	3/03	1300	[illegible]				
262 F	0.7014		1610		.7017		1301					
263 F	0.6988		1612		.6985		1302					
264 F	0.6893		1614		.6894		1303					
265 F	0.6912		1616		.6917		1304					
266 F	0.6934		1618		.6936		1305		HALLWAYS RNA			
267 F	0.6936		1620		.6937		1306					
268 F	0.7015		1622		.7010		1307					
269 F	0.6933		1624		.6936		1308					
270 F	0.6965		1626		.6965		1309					
271 F	0.6953	3/20	1628	DK	.6951		1330					
272 F	0.7002		1630		.7005		1331					
273 F	0.6978		1632		.6980		1332					
274 F	0.6900		1634		.6903		1333					
275 F	0.6975		1636		.6975		1334					
276 F	0.6978		1638		.6972		1335					
277 F	0.6975		1640		.6974		1336					
278 F	0.6992		1642		.6991		1337					
279 F	0.6901		1644		.6900		1338					
280 F	0.6994		1646		.6997		1339					

Checked by [illegible] Date: 3/24/91 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1606	DK
59	73	43	3/03	1300	[illegible]

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half ____ Back Half ✓

Manufacturer: S&S Size: 8.2 cm Lot.No.: ZB 901 Grade: #25 GLASS

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
261B	0.3846	3/20	1526	DK	.3849	3/23	1341	JB				
262B	0.3822		1528		.3827		1342					
263B	0.3805		1530		.3810		1343					
264B	0.3811		1532		.3812		1344					
265B	0.3821		1534		.3824		1345					
266B	0.3822		1536		.3824		1346		HAUGHS RN 7			
267B	0.3817		1538		.3822		1347					
268B	0.3772		1540		.3770		1348					
269B	0.3875		1542		.3870		1349					
270B	0.3813		1544		.3809		1350					
271B	0.3884	3/20	1546	DK	.3882		1351					
272B	0.3818		1548		.3813		1352					
273B	0.3825		1550		.3821		1353					
274B	0.3856		1552		.3853		1354					
275B	0.3832		1554		.3830		1355					
276B	0.3862		1556		.3864		1356					
277B	0.3836		1558		.3832		1357					
278B	0.3801		1600		.3804		1358					
279B	0.3827		1602		.3822		1359					
280B	0.3821		1604		.3818		1400					

Checked by ____ Date: 3/24/92 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
60	74	44	3/20	1524	DK
59	73	43	3/23	1340	JB

INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 4/22/92 Time: 0945 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
526	106.0504	4/27	1130	DK	106.0506	4/28	1417	[illegible]				
527	104.1494		1132		104.1497		1419					
528	106.6814		1134		106.6818		1421		[illegible]			
529	100.9086		1136		100.9088		1423					
530	105.0427		1138		105.0431		1425					
531	95.5983	4/27	1140	DK	95.5979		1427					
532	103.7918		1142		103.7920		1429					
533	98.4393		1144		98.4397		1431					
534	106.7326		1146		106.7329		1433					
535	99.9873		1148		99.9878		1435					
536	96.3688	4/27	1150	DK	96.3692		1437					
537	105.5585		1152		105.5587		1439					
538	105.4849		1154		105.4852		1441					
539	107.4790		1156		107.4794		1443					
540	107.3581		1158		107.3581		1445					
541	97.6250	4/27	1200	DK	97.6249		1447					
542	100.2292		1202		100.2291		1449					
543	96.6807		1204		96.6808		1451					
544	99.9736		1206		99.9735		1453					
545	107.5087		1208		107.5091		1455					
546	96.7157	4/27	1210	DK	96.7159		1457					
547	97.4338		1212		97.4343		1459					
548	107.5893		1214		107.5898		1501					
549	107.3100		1216		107.3105		1503					
550	106.1514		1218		106.1517		1505					

Checked By: [illegible] Date: 4/29/92 Time: 1350

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITION

WB	DB	%RH	Date	Time	By
60	73	47	4/27	1128	DK
59	[illegible]	46	4/28	1415	[illegible]

WST5-Form9,Pg1,Rev4/90
Unit HAUGHS SOZX
Run # 7
Date: 5/19/92

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
506		5/20	0900	DK	106.1072	5/21	1035	Jas	106.1064	5/22	1026	DK	106.1059	5/22	1531	Jas
507		5/20	0900	DK	104.4096	5/21	1037	Jas	104.4071	5/22	1028	DK	104.4069	5/22	1533	Jas
508		5/21	0900	DK	106.7704	5/22	1030	DK	106.7699	5/22	1535	Jas				
509		5/21	0900	DK	101.0232	5/22	1032	DK	101.0030	5/22	1537	Jas				
530		5/20	0900	DK	105.0917	5/21	1039	Jas	105.0904	5/22	1034	DK	105.0906	5/22	1539	Jas

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
DLLF		5/19	1445	Jas	0.8612	5/20	1014	DK	.8615	5/21	1021	Jas				
DLLB		5/19	1445	Jas	0.6172	5/20	1016	DK	.6174	5/21	1023	Jas				

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	5/20	1012	DK	56	70	41
2	5/21	1005	Jas	60	74	44
3	5/22	1024	DK	60	73	47
4	5/22	1515	Jas	57	70	44
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WST7-For.

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 4/23/92

Through ____________

Scale Sartori
Model A1265
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9996	10.0000	0.9997	0.1001			DK	4/23	1600	70	56	41
99.9996	10.0000	.9997	.1000			JAD	4/24	1130	74	57	34
99.9996	10.0000	.9998	.1000			JAD	4/24	1830	70	57	44
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	.9998	.0999			JAD	4/28	1330	71	59	49
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			TK	4/30	0846	77	64	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	950	77	61	39
99.9997	9.9999	1.000	.1000			JAD	5/1	1500	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/4	930	78	62	40
100.0002	10.0002	1.0001	.1000			JAD	5/6	1010	75	60	41
100.0000	10.0001	1.0000	.1001			JAD	5/6	1505	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9997	10.0000	1.0001	.1000			JAD	5/6	1640	74	59	46
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			TK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	.1001			JAD	5/8	1105	65	54	48
99.9998	10.0001	.9999	.0990			JAD	5/8	1600	68	56	47
99.9996	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			TK	5/12	0900	74	60	44
99.9997	10.0001	1.0000	.0999			JAD	5/12	1345	74	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	950	74	59	40
100.0002	10.0002	1.0000	.1001			JAD	5/14	1636	70	56	41
99.9998	9.9999	.9997	.0999			BJ	5/15	1200	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.000	.1001			JS	5/18	1500	73	59	45
99.9998	9.9997	0.9996	0.0997			DK	5/19	0920	70	57	44
99.9998	10.0000	.9999	.0999			JAD	5/19	1707	70	56	41
100.0001	10.0003	1.0002	0.1003			DK	5/20	945	70	56	41
99.9996	9.9998	.9999	.1000			JAD	5/21	1005	74	60	44
99.9998	10.0000	0.9998	0.0997			DK	5/22	1000	73	60	47
100.0000	10.0000	1.0001	.1001			JAD	5/22	1515	70	57	44

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 3/12

Through 4/23

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9998	10.0000	1.0000	0.0998			TK	3/12	1257	73	60	47
99.9995	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	.1000			JWD	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0002	10.0001	1.0002	0.1001			JWD	3/17	1607	71	59	46
99.9997	10.0001	1.0002	.1000			JWD	3/19	1715	74	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0002	.9999	0.0998			JWD	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9999	10.0001	1.0001	.1002			JWD	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3/26	1045	73	59	43
100.0001	9.9996	1.0002	.1001			JWD	3/27	1140	77	60	40
99.9997	9.9999	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9996	10.0000	1.0001	.1000			JWD	3/30	1000	71	57	41
99.9999	10.0004	1.0001	.1002			JWD	3/31	1016	73	59	43
100.0003	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9995	10.0000	1.0000	.1000			JWD	4/2	0900	73	59	43
99.9998	9.9997	0.9997	0.1000			DK	4/3	0900	72	59	46
99.9997	10.0001	0.9999	0.0999			DK	4/3	1630	70	58	48
99.9999	10.0001	0.9999	.0999			TK	4/6	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	56	41
99.9999	9.9998	0.9999	.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	.9999	.0998			JWD	4/8	1545	69	56	44
100.0000	9.9998	.9999	.0999			TC	4/9	1025	68	55	43
100.0000	10.0001	1.0000	.1000			JWD	4/10	0935	70	56	41
100.0000	9.9999	.9999	.0999			JK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	945	73	58	42
100.0002	10.0003	1.0001	.0998			JWD	4/14	1030	72	59	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	56	47
99.9997	9.9999	.9998	.0998			JWD	4/16	1006	80	58	48
100.0001	9.9999	1.0000	0.1001			DK	4/17	915	70	57	44
99.9996	9.9999	1.0000	.1000			JWD	4/19	1545	70	58	42
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0002	1.0002	.1001			JWD	4/21	1010	74	60	44
100.0000	10.0000	1.0000	0.0999			DK	4/22	900	73	59	43
99.9995	10.0003	1.0000	.1001			JWD	4/23	1007	76	60	38

WST7-Form Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 2/6/92
Through 3/11/92

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0000	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9998	10.0003	1.0001	.1001			[illegible]	2/6	1315	68	56	47
99.9999	10.0000	1.0000	.1000			[illegible]	2/7	0915	65	51	48
100.0001	9.9999	1.0001	.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	.1000			TK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	75	62	48
100.0000	10.0000	1.0000	.1000			[illegible]	2/10	[illegible]	72	59	47
99.9997	10.0001	1.0000	.1001			[illegible]	2/11	[illegible]	71	61	47
100.0001	10.0000	1.0001	.1000			TK	2/12	0920	68	56	47
100.0003	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9997	10.0000	1.0000	.1000			[illegible]	2/12	0850	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0001	1.0001	0.1000			TK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			[illegible]	2/13	1535	75	62	[illegible]
100.0000	9.9999	1.0000	0.1000			DK	2/14	930	77	63	46
100.0000	10.0000	1.0000	0.1000			TK	2/14	1240	76	62	45
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	45
100.0000	10.0001	1.0000	.0999			TK	2/17	0820	65	54	48
99.9997	10.0000	1.0001	.1000			[illegible]	2/17	1035	68	56	47
99.9999	10.0000	.9999	.1000			TK	2/18	0856	65	54	48
99.9999	10.0001	1.0000	.1000			[illegible]	2/18	1600	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	945	71	58	45
100.0000	9.9999	1.0000	0.1000			TK	2/24	0800	71	59	49
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	.9999	.0999			TK	2/26	1025	72	59	46
99.9999	9.9998	1.0000	0.0999			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.0999			TK	2/28	1230	78	64	46
99.9998	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			TK	3/4	1130	72	59	46
99.9996	10.0000	1.0000	.1000			[illegible]	3/5	0935	70	58	48
99.9996	10.0000	.9999	0.0999			[illegible]	3/6	0830	73	60	47
99.9998	10.0000	.9999	.0998			[illegible]	3/6	1400	76	63	45
99.9998	10.0000	.9999	.1000			TK	3/9	0850	71	59	49
99.9996	10.000	.9999	.1000			[illegible]	3/9	1340	70	59	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0900	75	60	41
99.9996	10.0000	1.0000	.0998			[illegible]	3/11	[illegible]	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAUGHS S07X
Run: 7 Date: 5/19/90
Technician(s): JS

FRONT HALF

FILTER #:	066F	BEAKER #:	506	FINAL WT:	106.1059 g
FINAL WT:	.8615 g	ml:	200	TARE WT:	106.0506 g
TARE WT:	.6936 g	desc:	ACETONE	NET WT:	.0553 g
NET WT:	.1679 g				
FILTER #:		BEAKER #:		FINAL WT:	g
FINAL WT:	g	ml:		TARE WT:	g
TARE WT:	g	desc:	ACETONE	NET WT:	g
NET WT:	g				

TOTAL VOLUME OF ACETONE USED IN WASH 200 ml

BACK HALF

FILTER #:	066B	BEAKER #:	507	FINAL WT:	104.4069 g
FINAL WT:	.6174 g	ml:	250	TARE WT:	104.1497 g
TARE WT:	.3824 g	desc:	ACETONE	NET WT:	.0572 g
NET WT:	.0350 g				
FILTER #:		BEAKER #:	508	FINAL WT:	106.7699 g
FINAL WT:	g	ml:	75	TARE WT:	106.6818 g
TARE WT:	g	desc:	METHCHLOR	NET WT:	.0881 g
NET WT:	g				
		BEAKER #:	509	FINAL WT:	101.0230 g
		ml:	200	TARE WT:	100.9088 g
		desc:	H2O	NET WT:	.1142 g
		BEAKER #:	530	FINAL WT:	105.0906 g
		ml:	100	TARE WT:	105.0431 g
		desc:	H2O	NET WT:	.0475 g
		BEAKER #:		FINAL WT:	.1617 g
		ml:		TARE WT:	g
		desc:		NET WT:	g
		BEAKER #:		FINAL WT:	g
		ml:		TARE WT:	g
		desc:		NET WT:	g

TOTAL VOLUME OF ACETONE USED IN WASH 250 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 300 ml

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: HAUGHS 537 X
Run: 7 Date: 5/19/92
BLANKS DONE: 5/11/92
Technician(s): JS DK TK

BEAKER #: D
200 ml ACETONE
FISHER OPTIMA LOT #: 913886
FINAL WT: 106.2239 g
TARE WT: 106.2235 g
NET WT: .0004 g

BEAKER #: E
75 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 916306
FINAL WT: 96.8408 g
TARE WT: 96.8404 g
NET WT: .0004 g

BEAKER #: F
200 ml DISTILLED WATER
BONNEAU CERTIFIED
FINAL WT: 96.5114 g
TARE WT: 96.5106 g
NET WT: .0008 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 3/17/92

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
D	106.2238	1326	106.2235	1036				
E	96.8404	1328	96.8424	1038				
F	96.5109	1330	96.5106	1040				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
3/23	1300	JWS	59	73	43
3/24	1034	DK	58	72	42

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	DK	59	74	40
5/14	1636	JWS	56	70	41
5/15	1200	BN	60	74	44

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
D	5/12	0900	106.2243	5-13 1048	106.2239	5-14 1659		
E	5/12	0900	96.8431	5-13 1050	96.8428	5-14 1701		
F	5/12	5-13 1330	96.5112	5-14 1700	96.5114	5-15 1230		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: HAUGHS 521X
Run: 7
Date: 5/19/92
Technician(s): TK TK
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Tim Kelly Date: 5/18/92

Blank Calculations:

Acetone: .0004 g ÷ 200 ml = .000002 g/ml

Dichloromethane: .0004 g ÷ 75 ml = .00000533 g/ml

Distillted Water: .0008 g ÷ 200 ml = .000004 g/ml

Front Half Catch:

Filters: .1679 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1679 g (Net Catch)

Beakers: .0553 g (Total Catch) - 200 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0549 g (Net Catch)

Total Front Half Catch .2228 g

Back Half Catch:

Filters: .0350 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0350 g (Net Catch)

Beakers:

1. Acetone/Impingers: .0572 g (Total Catch) - 250 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .0567 g (Net Catch)

2. Extract/Impingers: .0881 g (Total Catch) - 75 (ml. of Dichloromethane) .0004 (.00000533 g) (Blank Value/ml of Dichloromethane) = .0877 g (Net Catch)

3. Water/Impingers: .1617 g (Total Catch) - 300 (ml. of water) (.000004 g) (Blank Value/ml of water) = .1605 g (Net Catch)

Total Back Half Catch .3399 g
Total Catch .5627 g
% Front Half 23.14 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HAUGHS 507X

Run: 7 Date: 5/19/96

Technician(s): JS TK

WST3-Form 1 8/28/91

1) Vm(std): $\dfrac{(73.785\ \text{Vm})(17.65)(1.066\ \text{mcf})(30.03\ \text{" Hg} + \frac{.174\ \text{" H2O}}{13.6})}{(546\ \text{TmA})}$ = $\dfrac{76.3867}{000.0000}$ dscf

2) Vw(std): (.04707)(108.5 ml H2O): $\dfrac{5.1071}{00.0000}$ scf

3) Bws: $\dfrac{(5.1071\ \text{scf})}{(5.1071\ \text{scf} + 76.3867\ \text{dscf})}$: $\dfrac{.0627}{.0000}$ Bws X 100 : $\dfrac{6.2669}{00.0000}$ % H2O

4) Cs: $\dfrac{(.9627\ \text{g.})}{(76.3867\ \text{dscf})}$ (15.43): $\dfrac{.1945}{0.0000}$ gr/dscf

5) Estimated g/hr: $\dfrac{(\quad\ \text{g.})}{(\quad\ \text{dscf})}$ ($\dfrac{7.317}{00.000}$ dscfm)(60): $\dfrac{\quad}{00.0000}$ g/hr

---

Vm :	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf :	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf)
" Hg :	average barometric pressure during the test	(p. 2)	(00.00 " Hg)
" H2O :	average delta H for the test	(p. 2)	(.000 " H2O)
TmA :	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA)
ml H2O :	total water caught during the test	(p. 3)	(000.0 ml H2O)
g. :	total particulate catch for the test	(p. 6)	(00.0000 g.)
dscfm :	average stack flow during the test	(computer printout)	(00.000 dscfm)

Run # 7
Date 5/19/92
Technician BN TK DK JS
WST6-Form1,Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft^3

Dilution Tunnel Draft (If applicable): Start 0 Stop 0

Test Chamber Air Velocity: Start: 0 Stop: 0 Avg: 0

Wet Bulb/ Start: WB: 58 °F DB: 65 °F 1.4 % Amb Moisture 66 %RH

Dry Bulb Stop: WB: 59 °F DB: 74 °F 1.1 % Amb Moisture 42 %RH

$\bar{x}$ = 1.25 % Ambient Moisture $\bar{x}$ = 54 % Relative Humidity (RH)

Empty Stove Wt: 237.3 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 305.4 lbs. Dry: 304.9 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: lbs.

Kindling Wt. Paper: 3 lbs. Wood: 6.4 lbs.

Pre Burn Fuel Wt. 8.4 + 8.9 + 1.5 Total: 18.8 lbs.

Total Kindling and Pre Burn Fuel Wt 25.2 lbs.

Coal Bed Wt-lbs: Range (2.6 - 2.2) 307.5 - 307.1 lbs. Actual: 2.2 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range (2.6 (Upper Wt.) + 2.2 (Lower Wt.) / 2) .25 = .6 lbs.

Test Fuel Wt-lbs: Ideal 10.3 lbs. Range: 11.3 - 9.3 lbs. Actual: 10.7 lbs.

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Flanges) 14 Pcs.

2 x 4's x 18 3/4 " 4 Pcs 10.7 lbs. 100.0 %

4 x 4's x N/A " N/A Pcs N/A lbs. N/A %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.7 - (10.7 \times .17207)}{2.2025} \times \frac{60}{\cancel{205}}$ = 1.0726 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) x $\frac{63}{100}$ x 1.0726 = 12933 Est Heat Output (HO_E) BTU's/Hr

Comments: 195 = 1.238

Unit: Hawghs S27X Run: 7 Date: 5/19/92

WOODSTOVE OPERATING DATA

FIRE STARTED: 0745 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges, then set to .300 at start of preburn.

SECONDARY AIR: N/A CAT BYPASS: N/A

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 15 sec.

TEST: Door Wide Open during loading 4 min 30 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of .300 .

SECONDARY AIR: N/A CAT BYPASS: N/A

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 10 or 18 inches.

1st warm up/preburn fuel charge (8.4 lbs) added at 0815 .

2nd warm up/preburn fuel charge (8.9 lbs) added at 0905 .

3rd warm up/preburn fuel charge (15 lbs) added at 0946 .

4th warm up/preburn fuel charge (________ lbs) added at ________ .

5th warm up/preburn fuel charge (________ lbs) added at ________ .

Unit: [illegible]
Run: 7
Date: 5/19/92
Technician: BN, JS, TK, DK
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 70 °F

Correction Factor: Ø

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes____. No ✓.
Time Test Fuel Moisture Readings taken at: 0900
Calibration Checks: X ✓ Y ✓ 12.0 12.3 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	4.5	4.5	3.5	3.5	4.0	4.0	4.000
2									
3									
4	2x4x8	P	18.0	19.6	18.5	20.1	18.5	20.1	19.933
5	2x4x8	P	19.0	20.7	18.5	20.1	18.0	19.6	20.133
6									40.067
7									
8									
9	2x4x18 3/4	T	19.0	20.7	19.5	21.3	19.0	20.7	20.900
10	2x4x18 3/4	T	18.5	20.1	19.0	20.7	18.5	20.1	20.300
11	2x4x18 3/4	T	18.5	20.1	21.0	22.9	18.5	20.1	21.033
12	2x4x18 3/4	T	19.0	20.7	19.5	21.3	19.0	20.7	20.900
13									83.133
14									
15									
16									
17									
18									
19	FEET	T	19.5	21.3	19.5	21.3	19.0	20.7	21.100
20									

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	4.000 %	20.033 %	20.783 %
% Moisture - Wet Basis:	3.846 %	16.690 %	17.207 %

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: [illegible]
Run#: 7
Date: 5/19/92
Technician: BN TK DK JS

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3½

Depth (D): 3.92 cm

Width (W): 8.85 cm

Length (L): 8.80 cm
8.72 cm
8.79 cm
8.85 cm

Length $\bar{X}$ = 8.79 cm

Volume: 304.943 cm^3
(D X W X L)

MOISTURE: Room Temperature: 71 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	18.5	20.1 %
Bottom:	18.5	20.1 %
Side:	18.0	19.6 %
$\bar{X}$:		19.933 %

Avg % Moisture (Dry) 19.933 %

Aug % Moisture (Wet) 16.620 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 234.4 g Dry Weight: 201.23 g

% Moisture Dried Basis: 14.151 % ✓
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	5/19/92	0830	225 °F
Out of Dryer	5/20/92	1445	225 °F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 201.23 g (dry wt) ÷ 304.943 cm^3 (volume) = .6599 g/cm^3 ✓

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ________ g

Wet Wt: ________ g ÷ ________ g = ________ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ________ g ÷ ________ g = ________ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ________ %
[1 - (Net Dry Wt - Net Wet Wt.)] X 100

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: Haughs S27X Date: 5/19/92
Run: 7 Technician(s): BW TK
Page: 1 of 2 DK JS

307.1

Minute Time	Scale Wt	lbs left	Burn Rate	1 CO_2 V.	%CO_2	2 O_2 V.	%O_2	Tel	3 CO V.	%CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 V.	PPM	Static Press.	Comm
00 1030	317.8	10.7	0	.209	5.2	.598	15.2	15.2	.047	.47	11.1	93	144	3.5	105	216	.20	500	-.042	Flow
05 35	317.6	10.5	.2	.118	3.0	.693	17.6	17.6	.046	.46	6.4	107	154	6.4	124	225	.16	400	-.048	SO_2
10 40	317.3	10.2	.3	.103	2.6	.708	18.0	18.0	.046	.46	5.6	110	144	7.5	115	192	.21	525	-.043	CO_2
15 45	317.2	10.1	.1	.102	2.6	.707	17.9	17.9	.046	.46	5.6	109	139	7.2	114	182	.22	550	-.041	O_2
20 50	317.0	9.9	.2	.109	2.7	.702	17.8	17.8	.048	.49	5.6	110	136	7.3	113	177	.22	550	-.040	CO
25 55	316.7	9.6	.3	.111	2.8	.699	17.7	17.7	.053	.54	5.2	108	132	7.4	112	172	.22	550	-.038	
30 1100	316.5	9.4	.2	.111	2.8	.696	17.7	17.7	.065	.66	4.2	108	130	7.4	112	169	.23	575	-.036	
35 05	316.0	8.9	.5	.299	7.4	.515	13.0	13.0	.033	.33	22.5	115	145	9.0	122	230	.17	425	-.050	
40 10	315.5	8.4	.5	.289	7.2	.525	13.3	13.3	.054	.55	13.1	119	146	10.2	126	225	.19	475	-.051	
45 15	314.8	7.7	.7	.345	8.6	.480	12.1	12.1	.020	.20	42.8	122	152	11.8	131	264	.17	425	-.057	
50 20	314.3	7.2	.5	.382	9.5	.430	10.9	10.9	.011	.11	86.2	123	156	12.1	133	284	.17	425	-.059	
55 25	313.6	6.5	.7	.430	10.7	.394	9.9	9.9	.017	.17	62.7	125	159	12.4	134	295	.17	425	-.062	
																2631			-.567	Flow
60 30	312.8	5.7	.8	.451	11.2	.366	9.2	9.2	.025	.25	44.7	127	163	13.0	136	307	.17	425	-.064	SO_2
65 35	312.2	5.1	.6	.419	10.4	.414	10.5	10.5	.018	18	57.7	124	160	12.7	135	296	.16	400	-.064	CO_2
70 40	311.7	4.6	.5	.393	9.7	.418	10.6	10.6	.017	.17	57.3	121	157	11.4	132	283	.17	425	-.062	O_2
75 45	311.2	4.1	.5	.387	9.6	.431	10.9	10.9	.018	.18	53.3	120	158	10.8	130	280	.17	425	-.061	CO
80 50	310.6	3.5	.6	.412	10.2	.410	10.4	10.4	.018	.18	56.8	119	157	10.2	130	284	.17	425	-.061	
85 55	310.2	3.1	.4	.365	9.1	.457	11.6	11.6	.029	.29	31.2	114	151	8.5	124	273	.18	450	-.058	
90 1200	309.8	2.7	.4	.345	8.6	.479	12.1	12.1	.025	.25	34.3	109	140	7.3	121	265	.17	425	-.057	
95 05	309.5	2.4	.3	.348	8.6	.470	11.9	11.9	.018	.18	48.0	105	131	6.6	119	258	.17	425	-.056	
100 10	309.2	2.1	.3	.318	7.9	.506	12.8	12.8	.026	.26	30.4	101	127	5.8	116	251	.18	450	-.054	
105 15	309.0	1.9	.2	.280	7.0	.532	13.5	13.5	.030	.30	23.2	97	124	4.9	113	242	.18	450	-.053	
110 20	308.8	1.7	.2	.245	6.1	.568	14.4	14.4	.078	.79	7.7	92	123	3.9	109	231	.20	500	-.050	
115 1125	308.7	1.6	.1	.210	5.2	.584	14.8	14.8	.100	1.01	5.2	89	125	3.3	105	220	.21	525	-.047	
																3190			-.687	
																5821			-1.2511	

RECORD SHEET #13
BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Run: 7
Unit: Hearthstone S 27X
Date: 5/19/92
Run: 7
Technician(s): BN TK DK JS
Page: 2 of 2

307.1

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 V.	$\%CO_2$	2 O_2 V.	$\%O_2$	Tel	3 CO V.	%CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	Calc M/B	T/C(3) Stack	4 SO_2 V.	PPM	Static Press.	Comm
120 / 1130	308.6	1.5	.1	.188	4.7	.605	15.3	15.3	.108	1.10	4.3	87	127	2.9	104	210	.21	525	-.046	Flow
125 / 35	308.5	1.4	.1	.178	4.4	.613	15.5	15.5	.105	1.07	4.2	87	127	2.9	102	205	.20	500	-.045	SO_2
130 / 40	308.4	1.3	.1	.164	4.1	.627	15.9	15.9	.107	1.09	3.8	87	127	2.9	101	199	.20	500	-.042	CO_2
135 / 45	308.3	1.2	.1	.154	3.9	.634	16.1	16.1	.114	1.16	3.3	87	126	2.9	101	193	.20	500	-.041	O_2
140 / 50	308.2	1.1	.1	.146	3.7	.643	16.3	16.3	.111	1.13	3.2	88	125	3.2	101	189	.20	500	-.039	CO
145 / 55	308.1	1.0	.1	.139	3.5	.650	16.5	16.5	.112	1.14	3.1	88	125	3.2	101	187	.20	500	-.038	
150 / 1200	308.1	1.0	Ø	.137	3.4	.650	16.5	16.5	.106	1.08	3.2	87	123	2.9	100	182	.20	500	-.038	
155 / 05	308.0	.9	.1	.140	3.5	.652	16.5	16.5	.095	.96	3.7	87	122	2.9	100	178	.20	500	-.037	
160 / 10	307.9	.8	.1	.141	3.5	.646	16.4	16.4	.100	1.01	3.5	87	122	2.9	100	176	.20	500	-.036	
165 / 15	307.8	.7	.1	.146	3.7	.643	16.3	16.3	.100	1.01	3.6	87	120	3.2	98	173	.20	500	-.035	
170 / 20	307.8	.7	Ø	.147	3.7	.642	16.3	16.3	.100	1.01	3.6	87	120	3.2	96	171	.20	500	-.034	
175 / 25	307.7	.6	.1	.148	3.7	.643	16.3	16.3	.098	.99	3.7	87	118	3.3	98	169	.20	500	-.033	
																2232			-.464	Flow
180 / 30	307.6	.5	.1	.145	3.6	.645	16.3	16.3	.098	.99	3.7	86	117	3.1	96	168	.20	500	-.034	SO_2
185 / 35	307.6	.5	Ø	.146	3.7	.645	16.3	16.3	.092	.93	3.9	86	117	3.1	96	168	.20	500	-.034	CO_2
190 / 40	307.5	.4	.1	.142	3.6	.650	16.5	16.5	.092	.93	3.8	86	117	3.1	96	167	.20	500	-.034	O_2
#195 / 45	307.5	.4	Ø	.136	3.4	.659	16.7	16.7	.100	1.01	3.4	85	116	3.0	95	165	.20	500	-.033	CO
200 / 50	307.4	.3	.1	.123	3.1	.665	16.9	16.9	.105	1.07	2.9	84	115	2.8	93	163	.20	500	-.032	
205 / 55	307.3	.2	.1	.126	3.2	.662	16.8	16.8	.104	1.06	3.0	84	114	2.8	93	162	.20	500	-.032	
210 / 1400	307.3	.2	Ø	.123	3.1	.662	16.8	16.8	.112	1.14	2.7	84	114	2.8	93	161	.20	500	-.031	
215 / 05	307.2	.1	.1	.121	3.0	.666	16.9	16.9	.105	1.07	2.8	84	114	2.8	93	160	.20	500	-.031	
220 / 10	307.2	.1	Ø	.123	3.1	.663	16.8	16.8	.107	1.09	2.8	84	114	2.8	93	159	.20	500	-.030	
225 / 15	307.1	Ø	.1	.124	3.1	.662	16.8	16.8	.110	1.12	2.8	84	114	2.8	93	159	.20	500	-.029	
230																1632			-.320	
235																3864			.784	
																9685			-2.038	46
																[illegible]			[illegible]	

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

Unit: H[illegible]45 S-27[illegible] Date: [illegible]/9/[illegible]
Run: 7
Page: 1 of 1
Technician(s): [illegible] TK
D[illegible] JS

+1

307.5 - 307.1

Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Comments
00 / 0930	308.5	0	372	634	529	371	497	427	1270	1399	76	-.065	Primary Air Set at .300
05 / 35	308.2	.3	330	610	528	333	500	429	1243	1294	76	-.065	Secondary Air Set at N/A
10 / 40	307.8	.4	296	549	518	309	493	433	1226	1193	76	-.060	Fan: ON HIGH
15 / 45	307.5	.3	272	496	505	297	481	435	1186	1113	76	-.058	ADD 1.5 0946
20 / 50	308.5	.5	273	501	483	290	464	437	1116	1311	76	-.058	
25 / 55	308.2	.3	261	481	469	282	452	435	1077	1163	76	-.056	
30 / 1000	307.9	.3	250	450	456	275	439	431	1057	1080	75	-.054	Pumps turned on at: 1000
35 / 05	307.6	.3	242	423	442	268	428	426	1039	1059	76	-.053	
40 / 10	307.5	.1	233	406	432	261	418	421	1037	994	76	-.051	
45 / 15	307.4	.1	219	373	418	252	409	417	1006	887	76	-.048	Check WB/DB: 93/146
50 / 20	307.3	.1	212	347	406	241	398	413	981	853	76	-.046	
55 / 25	307.2	.1	206	330	396	233	389	411	956	835	75	-.045	
60 / 30	307.1	.1	216	315	386	226	378	408	904	669	74	-.042	342.6
65 / 35													
70 / 40													
75 / 45													
80 / 50													
85 / 55													
90 / 1100													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAUGHS S27X Date: 5/19/92
Run: 7 Technician(s): BU TK
Page: 1 of 2 DK JJ

T/C# Minute Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tube Furnace	13 Sample Box	14 Impinger Out	15 C. Gas Box	16 C. Gas Impinger	17 SO_2 Impinger
00 1030	315	386	226	378	408	904	669	74	1441	241	34	241	35	36
05 35	291	374	331	368	404	651	643	74	1441	241	34	241	35	36
10 40	275	353	333	350	400	578	563	73	1441	241	34	241	35	36
15 45	264	336	324	334	397	550	543	73	1442	241	34	241	35	36
20 50	250	317	314	316	392	529	545	72	1441	242	34	241	35	36
25 55	243	299	305	298	382	508	527	72	1441	243	34	241	35	36
30 1100	233	285	298	283	373	490	523	72	1441	244	34	243	35	36
35 05	266	275	187	270	364	510	925	71	1441	245	34	245	35	36
40 10	295	276	175	264	355	646	1109	71	1441	246	34	246	35	36
45 15	400	278	179	275	346	720	1324	72	1445	247	34	248	35	36
50 20	447	283	183	287	340	780	1353	73	1448	248	34	248	35	36
55 25	480	295	195	305	335	864	1378	73	1448	248	34	248	35	36
	3759	3757	3050	3728	4496	7730	10102	870						
60 30	526	311	214	326	330	886	1420	73	1448	248	34	248	35	36
65 35	508	328	225	339	325	935	1193	74	1448	248	35	248	35	36
70 40	480	343	234	353	324	1013	1185	74	1448	248	35	248	35	36
75 45	468	357	242	367	323	1046	1165	75	1448	248	35	248	35	36
80 50	478	368	246	381	323	1090	1175	76	1448	248	35	248	35	36
85 55	499	374	255	395	325	1119	1178	76	1448	248	35	248	35	36
90 1200	489	378	263	402	326	1178	1156	76	1448	248	35	248	35	36
95 05	461	385	265	410	327	1210	1170	76	1448	248	35	248	35	36
100 10	450	393	263	413	329	1117	1058	77	1448	248	35	248	35	36
105 15	430	395	256	414	333	1103	991	77	1448	248	35	248	35	36
110 20	400	397	248	408	336	1087	936	78	1447	248	35	248	35	36
115 1125	365	392	239	401	339	1055	890	78	1445	247	35	248	35	36
	5548	4421	2950	4609	3940	12839	13517	910						
	9307	8178	6000	8337	8436	20569	23619	1780						

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: HAWGHS S27X Date: 5/19/92
Run: 7 Technician(s): BN TK
Page: 2 of 2 PK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16 342.6	17
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	~~2nd Burn Catalytic~~	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	SO_2 Impinger
120 / 1130	335	379	228	389	343	982	825	77	1442	247	35	248	35	36
125 / 35	320	373	222	384	344	952	800	77	1442	247	35	248	35	36
130 / 40	309	366	217	377	346	919	771	77	1445	247	35	248	35	36
135 / 45	294	357	209	362	346	879	735	77	1446	247	35	248	35	36
140 / 50	283	349	204	350	346	843	709	77	1445	247	35	248	35	36
145 / 55	274	344	200	342	344	813	693	77	1445	247	35	248	35	36
150 / 1200	264	335	195	334	340	792	673	77	1444	247	35	248	35	36
155 / 05	257	329	192	324	337	773	659	77	1446	247	35	247	35	36
160 / 10	251	324	192	316	335	757	652	77	1447	247	36	247	35	36
165 / 15	244	316	194	311	332	744	647	76	1448	247	36	247	35	36
170 / 20	238	310	195	302	328	733	636	76	1448	247	36	247	35	36
175 / 25	235	308	195	299	327	727	629	76	1448	247	36	247	35	36
	3304	4090	2443	4090	4068	9914	8429	921						
180 / 30	232	305	195	293	324	713	622	75	1447	247	36	247	35	36
185 / 35	232	305	196	289	323	697	615	75	1448	247	36	247	35	36
190 / 40	229	304	195	284	321	687	608	75	1448	247	36	247	35	36
195 / 45	227	304	196	282	320	676	595	75	1448	247	36	248	35	36
200 / 50	223	301	193	277	319	671	588	75	1448	248	36	248	35	36
205 / 55	222	299	191	274	318	674	583	75	1447	248	36	248	35	36
210 / 1400	219	296	189	272	317	662	577	75	1448	248	36	248	35	36
215 / 05	216	293	186	267	315	673	572	75	1448	248	36	248	35	36
220 / 10	214	291	185	266	314	671	570	75	1448	248	36	248	35	36
225 / 15	213	289	185	263	314	653	559	75	1448	248	36	248	35	36
230	2227	2987	1911	2767	3185	6777	5889	750						
235	5531	7077	4354	6857	7253	16691	14318	1671	AT START		342.6			46
	14838	15255	10354	15194	15689	37260	37937	3451	STOP		252.8			
	323	332	225	330	341	810	825	75			-89.8			

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/19/92 Analyte: CO_2 (15-1)

Source: HAUGHS S270 SERIES Run #: 7

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.6 % CO_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: BN Time: 1005 Temp: 76 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	49.8	.498	12.339	-.261	-2.075

Comments:

Post Run Audit: By: DK Time: 1430 Temp: 75 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.054	.054	.217
Span	50.4	.504	12.6	49.7	.497	12.314	-.286	-2.271

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/19/92 Analyte: O_2 (15-2)

Source: HAUGHS S270 Series Run #: 7

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 12.4 % O_2 Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: BN Time: 1015 Temp: 76 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	0.3	.004	-.003	-.003	-.012
Span	12.4	.496	12.4	12.5	.497	12.573	.173	1.398

Comments: Teledyne #2 Cyl % Exp % Act % Adj to + Δ %

Post Run Audit: By: DK Time: 1440 Temp.: 75 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.001	-.079	-.079	-.318
Span	12.4	.496	12.4	12.4	.494	12.497	.097	.781

Comments: Teledyne #2 Cyl % Exp % Act % Adj to + Δ %

+ Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/19/92 Analyte: CO (15-3)

Source: HAUGHS S270 SERIES Run #: 7

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: 29004 Conc. 4.96 % CO Cyl Press: 900 psi

Certified by: MATHESON Date: 10/31/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: BN Time: 1020 Temp: 76 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.6	.496	5.049	.089	1.791

Comments:

Post Run Audit: By: DK Time: 1445 Temp.: 75 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.004	-.004	-.044
Span	49.6	.496	4.96	49.2	.492	5.008	.048	.969

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 5/19/92 Analyte: SO_2 (15-4)

Source: HAUGHS S270 SERIES Run #: 7

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 800 psi

Certified by: LIQUID AIR Date: 10/7/91

Span Cyl #: AL2892 Conc. 1232 ppm SO_2 Cyl Press: 450 psi

Certified by: LIQUID AIR Date: 9/24/91

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: BN Time: 1000 Temp: 75 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	+ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	3.440	3.440	.138
Span	49.3	.493	1232	49.5	.495	1238.992	6.992	.568

Comments:

Post Run Audit: By: DK Time: 1425 Temp: 75 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	+ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	3.440	3.440	.138
Span	49.3	.493	1232	49.3	.493	1234.000	2.000	.162

Comments:

+ Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

Unit: [illegible]
Run: 7
Date: 5/19/92
Technicians: BM TK DK JS
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 69.4 °F T/C#30: 71.0 °F

Thermocouple Check (at ambient): T/C#1: 71.1 °F; T/C#2: 71.3 °F;

T/C #3: 71.3 °F;	T/C #4: 71.5 °F;	T/C #5: 71.6 °F;
T/C #6: 71.6 °F;	T/C #7: 70.5 °F;	T/C #8: 71.3 °F;
T/C #9: 71.4 °F;	T/C #10: 69.6 °F;	T/C #11: 69.4 °F;
T/C #12: 72.3 °F;	T/C #13: 70.5 °F;	T/C #14: 70.8 °F;
T/C #15: 71.4 °F;	T/C #16: 64.0 °F;	T/C #17: 67.0 °F;
T/C #18: 73.3 °F;	T/C #19: ____ °F;	T/C #20: ____ °F;
T/C #21: ____ °F;	T/C #22: ____ °F;	T/C #23: ____ °F;
T/C #24: ____ °F;	T/C #25: ____ °F;	T/C #26: ____ °F;

Comments: ____

Thermocouple Readout:
Pretest Zero/Span Check and Calibration:

Zero (0°F): .3 °F	Adj to: 0 °F	Post Test Check Zero (0°F): .6 °F	% Difference .030
Span (2000°F): 1999.9 °F	Adj to: 2000.0 °F	Span (2000°F): 2003.0 °F	.150

(Allowable % Difference = 1.5%. Use formulas on Woodstove Data Sheet #15 to calculate % Difference)

Thermocouple Readout Pretest Linearity Check

0°F = 0 °F;	200°F = 201.8 °F;	400°F = 399.0 °F;
600°F = 601.2 °F;	800°F = 801.3 °F;	1000°F = 1000.3 °F;
1200°F = 1198.0 °F;	1400°F = 1398.9 °F;	1600°F = 1599.5 °F
1800°F = 1799.9 °F;	2000°F = 2000.0 °F	

Tracer Gas (SO_2) Injection Train Leak Check:	Pre ✓	Post ✓
Combustion Gas (CO_2, O_2, CO) Train Leak Check:	Pre ✓	Post ✓
Tracer Gas (SO_2) Analyzer Train Leak Check:	Pre ✓	Post ✓
Draft (Static) Guage Zero Check:	Pre ✓	Post ✓

Scale Check Pre (Wt, #'s): 318.6 - 308.6 = 10
Post (Wt, #'s): 317.0 307.0 = 10.0

Stack cleaned prior to the run: Yes ____ No ✓.

Phillips SCALE COMPANY, INC.

Certificate of Inspection

For:

Co. EEMC At: Kent WA.

Make Weight-Tronix S/N 016 409

Inspected By Kenneth L Jackson Date 1-20-87

This certifies that the above scale met all State Highway Weighing Requirements when tested on the above date with 875. lbs. of test wts.

Next Inspection Due → Date 6-20-87

LITHO U.S.A.

Initial Scale Calibration

Phillips SCALE COMPANY, INC.

Certificate of Inspection For:

Co. EEMC At: KENT WA.

Make WeighTRONIX S/N 016409

Inspected By Ken Jackson Date 1-2-92

This certifies that the above listed device met all Weighing Requirements when tested on the above date.

Load	Reading	Load	Reading	Load	Reading
50 Lbs	50	200 Lbs	200	350 Lbs	350
100 Lbs	100	250 Lbs	250	400 Lbs	400
150 Lbs	150	300 Lbs	300	450 Lbs	450
				500	500

Next Inspection Due → Date 7-2-92

LITHO USA

Phillips SCALE COMPANY, INC.

Certificate of Inspection
For:

Co. EEMC At: KenT WA.

Make WeighTRONix - WI-110 S/N 016409

Inspected By Ken Jackson - Phillips Scale Co. Date 7-3-91

This certifies that the above listed device met all Weighing Requirements when tested on the above date.

Load		Reading	Load		Reading	Load		Reading
50	Lbs	50	200	Lbs	200	350	Lbs	350
100	Lbs	100	250	Lbs	250	400	Lbs	400
150	Lbs	150	300	Lbs	300	450	Lbs	450

500 4 500

Next Inspection Due → Date 01-3-92

LITHO U.S.A.

State of Washington
Department of Agriculture
Weights & Measures Section
406 Gen. Admin. Bldg., AX-41
Olympia, WA 98504-0641

CERTIFICATE OF ACCURACY

(2nd copy)

Page .... of ....

SUBMITTED BY COUNTY OF	DATE	CODE NO.	SET	CERTIFICATE NO.
	8/20/90	42923	B	

IMPORTANT

The items described below have been compared with the Standards of the State of Washington in accordance with National Institution of Standards and Technology recommendations and requirements. The comparisons will result in appropriate action to insure tolerance compliance.

TO:

Phillips Scale Co.
Attn: Ken Jackson
934 Elliott Ave. W
Seattle WA 98119

MASS			DESCRIPTION																			CLASS	NOMINAL VALUE OR RANGE
I.D. NUMBER	NO. OF ITEMS IN SET	NO. OF LINE ITEMS	BLOCK	CYLINDER	CUBE	KNOB	GRIP	HANGER	SLOT	CAST IRON	STAINLESS STEEL	BRASS	ALUMINUM	GLASS	TANTALUM	AVOIRDUPOIS	METRIC	TROY	GRAIN	CARAT	EGG		
Toledo s/n015057	20	1								X												F	50#
s/n205057																							
s/n215057	1	1								X												F	25#

REMARKS

Principal State Metrologist (Signature) James H Cammel /jk Date: 10-19-90

AGR 2437-B (Rev. 6/90)

DEPARTMENT OF AGRICULTURE
DAIRY AND FOOD DIVISION
WEIGHTS AND MEASURES SECTION

Certificate of Accuracy

STATE OF WASHINGTON

CERTIFICATE NO.	NBS Sets A & B Test #42923
DATE	RECALL DATE
7/27/89	
	CODE NO.

SUBMITTED BY COUNTY OF

FOR GOVERNMENTAL AGENCY/FIRM

Phillips Scale

ADDRESS (Number — Street) CITY STATE ZIP

934 Elliott Ave. W., Seattle, WA 98119

THE ITEMS DESCRIBED BELOW HAVE BEEN COMPARED WITH THE *STANDARDS OF THE STATE OF WASHINGTON* IN ACCORDANCE WITH *NATIONAL BUREAU OF STANDARDS* RECOMMENDATIONS AND REQUIREMENTS.

THE COMPARISONS RESULT IN APPROPRIATE ACTION TO INSURE TOLERANCE COMPLIANCE.

MASS

I. D. NO.	NO. OF ITEMS IN SET	NO. OF LINE ITEMS	DESCRIPTION (BLOCK, CYLINDER, CUBE, KNOB, GRIP, HANGER, SLOT, CAST IRON, STAINLESS STEEL, BRASS, ALUMINUM, GLASS, TANTALUM, AVOIRDUPOIS, METRIC, TROY, GRAIN, CARAT, EGG)	CLASS	NOMINAL VALUE OR RANGE
(20) Cast Iron Test Wts			SERVICE TRUCK # 5057-01 THRU 20	F	50 lbs.
) Cast Iron Test Wt			SERVICE TRUCK # 5057-21	F	25 lbs.
(1) Ride Lake Wt Set - 22 pcs			SERVICE TRUCK # 5057-	F	10 mg - 5 kg
(1) Ride Lake Wt Set - 32 pcs			SERVICE TRUCK # 5057	F	.001 lb - 5 lb

REMARKS:

INSPECTED BY

James H. Cammel, Metrologist

PRINCIPAL STATE METROLOGIST

James H Cammel

PAGE ____ OF ____

SEE ATTACHED DATA ☐

AGR 020-2437B

QUALITY CONTROL SERVICES

SALES AND SERVICE OF ANALYTICAL & PRECISION BALANCES AND SCALES

CERTIFICATE OF CALIBRATION

THE FOLLOWING BALANCES HAVE BEEN SERVICED
BY
Q.C. SERVICES

SERVICE CONSISTS OF ACCURACY TESTS, CLEANING, LUBRICATION, COMPLETE CALIBRATION AND ADJUSTING TO ORIGINAL MANUFACTURERS' SPECIFICATIONS.

ALL TEST WEIGHTS ARE CLASS "S", OR BETTER, AND ARE TRACEABLE TO WEIGHTS CERTIFIED BY THE NATIONAL BUREAU OF STANDARDS CERTIFICATES #737/233864 AND #737/228509.

DATE OF SERVICE	TYPE	MAKE	SERIAL NO.	TECHNICIAN
1-20-88	A1205	Sart	39010004	(KB)

QUALITY CONTROL SERVICES

SALES AND SERVICE OF ANALYTICAL & PRECISION BALANCES AND SCALES

REPORT OF SERVICE AND CALIBRATION

CUSTOMER FEMC DATE 1-20-89

ADDRESS 1315 S. CENTRAL UNIT K AMBIENT TEMP 78°

KENT WA. 98032 Make SAUT Model A120S S/N 37010004

Function Tested	As Found	Manufacturer's Tolerance	After Service
Cornerload	+/- .6 MG	+/- .2 MG	+/- .0 MG
Optical Range	-	-	-
Optical Range with Tare	-	-	-
Linearity or 50-50	+/- .2 MG	+/- .2 MG	+/- .0 MG
Hysterisis	+/- .2 MG	+/- .0 MG	+/- .0 MG
Calibration	+/- .1 MG	+/- .2 MG	+/- .0 MG

Individual Wt. Readings	As Found	Manufacturer's Tolerance	After Service
30 MG	29.9 MG	+/- .2 MG	+/- .1 MG
50 MG	50.1 MG	+/- .2 MG	+/- .0 MG
500 MG	500.0 MG	+/- .2 MG	+/- .0 MG
1 GM	1.0002 GM	+/- .2 MG	+/- .0 MG
10 GM	10.0001 GM	+/- .2 MG	+/- .0 MG
100 GM	100.0001 GM	+/- .2 MG	+/- .0 MG

One or more of the following standards were used as references for this calibration. Their calibration is traceable to the National Reference Standards maintained by the National Bureau of Standards. Our N.B.S. Certificate numbers are 737/233864 and 737/228509.

Manufacturer	Serial Number	Date of Last Calibration	Next Calibration
Rice Lake	5735	1/5/87	1/88
Rice Lake	5736	1/5/87	1/88
Rice Lake	5737	1/5/87	1/88
Rice Lake	6023	3/3/87	1/88
Troemner	3916	3/3/87	3/88

See attached service/maintenance procedure for complete description of service and calibration.

Technician: [signature] Date: 1-20-89

For other information pertaining to this calibration, see other side.

WEIGHT CALIBRATION CERTIFICATE

Purchase Order Number	00247
ompany	Q C SERVICES
ddress	P.O. BOX 14831
City & State	PORTLAND, OR 97214
Report Number	0465
Density	7.95 g/cm³
Temperature	22.1°C
RH	55%
mmHg	734.8 Not Corrected
Date	1-5-87
Description Of Weights	S/N 5735, Class "S", 1mg-100g

Tested With Weights Certified By NBS Certificate Number 737/233864
Calibrated By Deb Heldstab Weighing Design double substitution
Weights Used: 82104

NOMINAL MASS VALUE	AS FOUND vs. 8.0 g/cm³	CORRECTION IN MG AM vs. 8.0 g/cm³	CORRECTION IN MG AM vs. 8.3909 g/cm³	UNCERTAINTY MILLIGRAMS	TOLERANCE	TR MA
1 mg		0.0025	0.0025	0.007	0.014	0.0
2 mg		0.0050	0.0050	0.006	0.014	0.0
2 mg w/dot		0.0040	0.0040	0.006	0.014	0.
5 mg		0.0055	0.0054	0.006	0.014	0.0
10 mg		0.0055	0.0054	0.010	0.014	0.0
20 mg		0.0005	0.0004	0.006	0.014	0.0
20 mg w/dot		0.0045	0.0044	0.006	0.014	0.0
50 mg		0.0020	0.0016	0.006	0.014	0.0
100 mg		0.0054	0.0047	0.007	0.025	0.0
200 mg		0.0128	0.0114	0.007	0.025	0.0
200 mg w/dot		0.0053	0.0039	0.007	0.025	0.0
500 mg		-0.0049	-0.0084	0.008	0.025	-0.
1 g		0.0195	0.0125	0.010	0.054	0.0
2 g		0.0036	-0.0104	0.011	0.054	0.0
2 g w/dot		0.0201	0.0061	0.011	0.054	0.0
5 g		0.0242	-0.0107	0.016	0.054	0.0
10 g		0.0200	-0.0499	0.023	0.074	0.0
20 g		0.0249	-0.1149	0.023	0.074	0.0
20 g w/dot		0.0288	-0.1110	0.023	0.074	0.0
50 g		0.0645	-0.2875	0.105	0.12	0.1
100 g		0.1727	-0.5262	0.115	0.25	0.2

Mettler M5 Balance: 1mg - 20g
Mettler H51AR Balance: 50g - 100g

Prepared By:

RICE LAKE WEIGHING SYSTEMS
DIVISION OF RICE LAKE BEARING INC.
Metrology Lab
230 West Coleman
P.O. Box 272
Rice Lake, WI 54868
715-234-9171

Dated 1-5-87

Richard Calkins
Metrologist
Weight Division Supervisor

TRACEABLE CERTIFICATE

Sold To Q C SERVICES
P.O. BOX 14831
PORTLAND, OR 97214

Ship To Q C SERVICES
516 SE MORRISON SUITE 213
PORTLAND, OR 97214

Purchase Order Number
Traceable Certificate Number 2076
Traceable To NBS Through NBS Report Number 737/233864

DESCRIPTION	NOMINAL VALUE	VS 8.0g/cm³ AS FOUND	TOLERANCE
1 only Special 1 kg - 5 kg Kit........................Consisting of:			
1 only 1 kg Weight		+2.4 mg	
1 only 1 kg Weight W/Dot		-.6 mg	
1 only 2 kg Weight		+18 mg	
1 only 5 kg Weight		+34 mg	
1 only 5 kg Weight W/Dot		+32 mg	

Serial No.: 6023

Temperature: 22.2°C
RH: 55%
mmHg: 743.6 Not Corrected
Date: 3-3-87
Balances Used: Mettler H315 - 1 kg
Voland J3000 - 2 kg
Voland HCE25 - 5 kg
Last Date STD were Calibrated: 11-84
Last Date Working STD were Calibrated: 9-16-86
Tolerance Tested By: Russ Schnacky

Comply to MIL STD 45662

Prepared By:

RICE LAKE WEIGHING SYSTEMS
DIVISION OF RICE LAKE BEARING INC.
Metrology Lab
230 West Coleman
P.O. Box 272
Rice Lake, WI 54868
715-234-9171

Dated 3-3-87

Richard Calkins
Metrologist
Weight Division Supervisor

QUALITY CONTROL SERVICES

LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

CUSTOMER:

EEMC
1315 S. Central-Unit C
Kent, Wa. 98032
Attn: Ben Myron/Jerry Stoddard

CERTIFICATE OF CALIBRATION

THE FOLLOWING BALANCES HAVE BEEN SERVICED & CALIBRATED

BY

QUALITY CONTROL SERVICES

SERVICE CONSISTS OF ACCURACY TESTS, CLEANING, LUBRICATION, COMPLETE CALIBRATION AND ADJUSTING TO ORIGINAL MANUFACTURERS' SPECIFICATIONS.

One or more of the following standards were used as references for this calibration. Their calibration is traceable to the National Reference Standards maintained by the National Institute of Standards and Technology. Our N.I.S.T. Certificate Reference Number is 523/240932.

Manufacturer	Description	Serial No.	Date of Last Calibration	Next Calibration Due
Rice Lake	1kg-5kg	C4488	6/13/91	6/92
Rice Lake	1mg-100g	A45	7/16/91	7/92
Rice Lake	2kg-5g	3275	7/22/91	7/92

DATE OF SERVICE	TYPE	MAKE	SERIAL NO.	TECHNICIAN
1-9-92	A120S	Sartorius	37010004	L. Lawrence
"	G4000D	Ohaus	4163	"

516 S.E. MORRISON, SUITE 213 • P.O. BOX 14831 • PORTLAND, OREGON 97214 • (503) 236-2712

QUALITY CONTROL SERVICES
LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

REPORT OF SERVICE AND CALIBRATION

CUSTOMER EEMC
ADDRESS 1315 S Central Unit C
Kent, WA 98032

Make Sartorius
Model A120S
S/N 37010004

Date of This Service 1-9-92 Date of Last Service 7-22-91 Next Service Due 7/92

Function Tested	As Found	Manufacturer's Tolerance	After Service
Cornerload	±0.2mg	±0.2mg	±0.0mg
Optical Range	N/A	N/A	N/A
Optical Range with Tare			
Linearity or 50-50	±0.0mg	±0.2mg	±0.0mg
Hysteresis	±0.1mg	±0.1mg	±0.1mg
Calibration	±0.4mg	±0.1mg	±0.1mg

Individual Wt. Readings	As Found	Manufacturer's Tolerance	After Service
100g	-0.4mg	±0.1mg	±0.1mg
50g	-0.2mg	±0.1mg	±0.1mg
20g	-0.1mg	±0.1mg	±0.0mg
10g	-0.1mg	±0.1mg	±0.0mg
5g	±0.1mg	±0.1mg	±0.0mg

OTHER INFORMATION AND COMMENTS PERTAINING TO THIS SERVICE AND CALIBRATION:

Ambient Temp Lab Ambient
Balance Location Lab
Contact Person Terry Stoddard

Other Comments:

INFORMATION ON STANDARDS USED IN THIS SERVICE AND CALIBRATION:

One or more of the following standards were used as references for this calibration. Their calibration is traceable to the National Reference Standards maintained by the National Institute of Standards and Technology. Our N.I.S.T. Certificate Reference Number is 523/240932.

Manufacturer	Description	Serial Number	Date of Last Calibration	Next Calibration Due
Rice Lake	1mg - 5kg	7764	1/9/89	1/94

TECHNICIAN: Landon Lawrence DATE: 1-9-92

516 S.E. MORRISON, SUITE 213 • P.O. BOX 14831 • PORTLAND, OREGON 97214 • (503) 236-2712

QUALITY CONTROL SERVICES
LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

REPORT OF SERVICE AND CALIBRATION

CUSTOMER EEMC
ADDRESS 1315 S Central Unit C
Kent, WA 98032

Make Ohaus
Model G4000D
S/N 4163

Date of This Service 1-9-92 Date of Last Service 7-22-91 Next Service Due 7/92

Function Tested	As Found	Manufacturer's Tolerance	After Service
Cornerload	±0.2g	± 0.2g	±0.1g
Optical Range	N/A	N/A	N/A
Optical Range with Tare			
Linearity or 50-50	-0.1g	±0.1g	±0.1g
Hysteresis	±0.1g	±0.1g	±0.1g
Calibration	+0.05g / +0.4g	±0.01g / ±0.1g	±0.01g / ±0.1g

Individual Wt. Readings	As Found	Manufacturer's Tolerance	After Service
4kg	+0.4g	± 0.1g	± 0.1g
2kg	+0.2g	± 0.1g	± 0.1g
1kg	+ 0.1g	± 0.1g	± 0.1g
300g	+0.04g	± 0.01g	± 0.01g
200g	+0.03g	± 0.01g	± 0.01g
100g	+0.01g	± 0.01g	± 0.01g

OTHER INFORMATION AND COMMENTS PERTAINING TO THIS SERVICE AND CALIBRATION:

Ambient Temp Lab Ambient
Balance Location Upper Lab
Contact Person Jerry Stoddard

Other Comments: Lab has Vibrations
1000g, 100g, 10g & 1g place decimal starting to fade

INFORMATION ON STANDARDS USED IN THIS SERVICE AND CALIBRATION:

One or more of the following standards were used as references for this calibration. Their calibration is traceable to the National Reference Standards maintained by the National Institute of Standards and Technology. Our N.I.S.T. Certificate Reference Number is 523/240932.

Manufacturer	Description	Serial Number	Date of Last Calibration	Next Calibration Due
Rice Lake	1mg - 5kg	7764	1/9/89	1/94

TECHNICIAN: Landon Lawrence DATE: 1-9-92

WOODSTOVE DATA SHEET #33

Thermocouple Calibration Record

TC #	Location	Ice Water Bath (°F)	Boiling Water (°F)	TC #	Location	Ice Water Bath (°F)	Boiling Water (°F)
1	Wet Bulb	32.4	211.7	21			
2	Dry Bulb	32.5	211.6	22			
3	Stack	32.7	211.9	23			
4	Stove Top	32.5	211.6	24			
5	Left Side	32.7	211.5	25			
6	Back	32.4	211.6	26			
7	Right Side	32.3	211.4	27			
8	Bottom	32.5	211.5	28			
9	Firebox	32.2	211.8	29	Oven	32.4	211.7
	2nd Burn			30	N/A-Calibrator		
10	Catalytic	32.4	211.7	31			
11	Room	32.3	211.3	32			
12	Tube Furnace	32.6	211.5	33			
13	Sample Box	32.5	211.8	34			
14	Impinger Out	32.5	211.4	35	Rear Top		
15	C Gas Box	32.6	211.6	36	Reat L Side		
16	C Gas Out	32.9	211.5	37	Rear R Side		
17	SO_2 Gas Out	32.3	211.4	38	Rear Firebox		
18	Extra			39	Rear 2nd/cat		
19	Extra			40			
20	Extra						

Thermocouples checked against

Reference Thermometer #: FISHER # 9183454

Ice Water Bath 0°C = 32°F °F

Boiling Water 100°C = 212°F °F

Room Temp 68 °F

B.P. 30.12 "Hg

Date: 1/2/92 Technician: JAD /BN

KESSLER INSTRUMENTS, INC.

CALIBRATION SERVICES

THERMOMETERS HYDROMETERS

TESTING EQUIPMENT

MAILING ADDRESS.
POST OFFICE BOX 640
WESTBURY, NEW YORK 11590
516-334-4063
FAX 516-334-2689

PLANT ADDRESS
ONE-SIXTY HICKS STREET
WESTBURY, LONG ISLAND
NEW YORK 11590

CERTIFICATE OF CALIBRATION

This is to certify that the instrument listed below has been certified in our calibration laboratory using the most sensitive constant temperature equipment available. This calibration has been performed against National Institute for Standards and Technology (formerly NBS) certified master instruments in accordance with the procedures outlined by ASTM E77-89 and NBS (NIST) Monograph 150.

TESTED FOR: FISHER

THERMOMETER CAT#15041B 15041B RANGE: -1/101C DIVISIONS: .1 IMMERSION: TOTAL

INSTRUMENT SERIAL NUMBER 9123454 DATE CERTIFIED: 04-04-1991
MARKED: FISHER

POINT(S) TESTED	READING OF THIS INSTRUMENT	CORRECTION
0.00C	0.00C	0.00C
10.00C	10.00C	0.00C
20.00C	20.05C	-0.05C
30.00C	29.98C	0.02C
40.00C	40.00C	0.00C
50.00C	50.00C	0.00C
60.00C	60.00C	0.00C
70.00C	70.03C	-0.03C
80.00C	80.01C	-0.01C
90.00C	90.00C	0.00C
100.00C	99.98C	0.02C

ESTIMATED UNCERTAINTIES IN THE ABOVE CORRECTIONS DO NOT EXCEED 0.03C
FOR A DISCUSSION OF ACCURACIES ATTAINABLE WITH SUCH THERMOMETERS SEE NBS (NIST) MONOGRAPH 150, LIQUID-IN-GLASS THERMOMETRY

All temperatures in this report are based on the International Practical Temperature Scale of 1968

SERIAL AND TEST NUMBERS OF NATIONAL INSTITUTE OF STANDARDS CERTIFIED
INSTRUMENTS REFERENCED IN CERTIFICATION OF THE INSTRUMENT LISTED ABOVE:

769543,217368 P14452,176240 P14452,176240 M44165,176240 M44165,176240 791544,220391

CALIBRATION TECHNICIAN: FRANK BURGHARDT Q.A.MANAGER: J. KELLY

KESSLER INSTRUMENTS, INC.

J. Jeff Kelly
Quality Assurance Manager
JK/ak

TEST NUMBER 91 843
DATE COMPLETED:04-04-1991

KESSLER INSTRUMENTS, INC.

CALIBRATION SERVICES

THERMOMETERS HYDROMETERS

TESTING EQUIPMENT

MAILING ADDRESS.
POST OFFICE BOX 840
WESTBURY, NEW YORK 11590
516-334-4063
FAX 516-334-2689

PLANT ADDRESS
ONE-SIXTY HICKS STREET
WESTBURY, LONG ISLAND
NEW YORK 11590

CERTIFICATE OF CALIBRATION

This is to certify that the instrument listed below has been certified in our calibration laboratory using the most sensitive constant temperature equipment available. This calibration has been performed against National Institute for Standards and Technology (formerly NBS) certified master instruments in accordance with the procedures outlined by ASTM E77-89 and NBS (NIST) Monograph 150.

TESTED FOR: ENERGY ENVRMNTL

THERMOMETER CAT#2064 JENA RANGE: -10/510C DIVISIONS: 2 DEG IMMERSION: 76MM

INSTRUMENT SERIAL NUMBER 9164606 DATE CERTIFIED: 08-08-1991
MARKED: KESSLER

POINT(S) TESTED	READING OF THIS INSTRUMENT	CORRECTION
0.0C	-0.2C	0.2C
100.0C	100.0C	0.0C
410.0C	409.2C	0.8C

THE ABOVE READINGS WERE MADE UNDER 10X MAGNIFICATION AND RESOLVED TO THE NEAREST 0.2C
ESTIMATED UNCERTAINTIES IN THE ABOVE CORRECTIONS DO NOT EXCEED 1.0C
FOR A DISCUSSION OF ACCURACIES ATTAINABLE WITH SUCH THERMOMETERS SEE NBS (NIST) MONOGRAPH 150, LIQUID-IN-GLASS THERMOMETRY

All temperatures in this report are based on the International Practical Temperature Scale of 1968

THIS THERMOMETER WAS TESTED IN A CLOSED TOP, ELECTRICALLY HEATED, LIQUID BATH AT AN IMMERSION OF 76MM
THE TEMPERATURE OF THE ROOM WAS APPROXIMATELY 25 DEGREES C (77 DEG F). IF THE THERMOMETER IS USED UNDER CONDITIONS WHICH WOULD CAUSE THE AVERAGE TEMPERATURE OF THE EMERGENT LIQUID COLUMN TO DIFFER MARKEDLY FROM THAT PREVAILING IN THE TEST, APPRECIABLE DIFFERENCES IN THE INDICATIONS OF THE THERMOMETER WOULD RESULT.

SERIAL AND TEST NUMBERS OF NATIONAL INSTITUTE OF STANDARDS CERTIFIED
INSTRUMENTS REFERENCED IN CERTIFICATION OF THE INSTRUMENT LISTED ABOVE:

769543,217368 788600,219606 769543,217368

CALIBRATION TECHNICIAN: FRANK BURGHARDT Q.A.MANAGER: J. KELLY

KESSLER INSTRUMENTS, INC.

J. Kelly

J. Jeff Kelly
Quality Assurance Manager
JK/ak

TEST NUMBER 91 1947
DATE COMPLETED:08-08-1991

COMMON TYPES OF THERMOMETERS AND FACTORS AFFECTING THEIR USE

TOTAL IMMERSION thermometers are designed with scales calibrated to indicate their true temperature when the bulb and the mercury column to just below the temperature being read is exposed to the temperature being measured.

PARTIAL IMMERSION thermometers are designed with scales calibrated to indicate the true temperature when the thermometers are immersed to specified depths. The portion that should be immersed is indicated on the back of each thermometer.

DETERMINATION OF EMERGENT STEM CORRECTIONS FOR TOTAL IMMERSION THERMOMETERS

When total immersion thermometers are used in a condition other than outlined above, a stem correction should be applied to the reading to obtain the true temperature. This difference between the reading for total versus partial immersion of the mercury column is known as the stem correction and may be computed for any given temperature and immersion as follows:

1. Note the number of degrees of the column above the liquid surface (N) 2. Note thermometer reading (T) 3. Suspend alongside the main thermometer an secondary thermometer. Place this thermometer adjacent to the main thermometer so that the bulb of the second thermometer is centered halfway betwen the surface of the liquid and the temperature indicated on the main thermometer. The temperature indicated on the second thermometer will be the average temperature of the emergent mercury column (ST) 4. Find the stem correction from the following formula:

Stem correction =(0.00016 x N) x (T-ST) for Centigrade temperatures
OR =(0.00009 x N) x (T-ST) for Fahrenheit temperatures Example: a thermometer graduated 80/100C, immersed to the 80 degree mark, temperature of emergent column 60C, reading on thermometer 90C. then N=10, T=90. ST=60.
Stem correction =(0.00016 x 10) x (90 - 60) = +0.048 Rounding this to an observable correction of +0.05, the true temperature of the liquid being measured is 90 + 0.05, or 90.05C

GENERAL CONSIDERATIONS FOR MAKING AN ACCURATE READING

The error due to parallex may be eliminated by taking care that the reflection of the scale can be seen in the mercury thread. and by adjusting the line of sight so that the graduation of the scale nearest the meniscus exactly hides its own image: the line of sight will then be normal to the stem at that point. In reading thermometers, account must be taken of the fact that the lines are of appreciable width. The best practice is to consider the position of the lines as defined by their middle parts.

PERFORMING A CALIBRATION AT THE ICE POINT (0 DEGREES C or 32 DEGREES F)

Select clear pieces of ice, preferably made from relatively pure water. Discard any cloudy or unsound portions. Rinse the ice with distilled water and shave or crush into small pieces, avoiding direct contact with the hands or any chemically unclean objects. Fill a Dewar or other insulated vessel with the crushed ice and add sufficient distilled and preferably precooled water to form a slush, but not enough to float the ice. Insert the thermometer, packing the ice gently about the stem, to a depth sufficient to cover the 0C (32F) graduation. As the ice melts, drain off some of the water and add more crushed ice.

Raise the thermometer a few millimeters after at least 3 minutes have elapsed. tap the stem gently and observe the reading. Successive readings taken at least one minute apart should agree within one tenth of one graduation.

APPLYING THE CORRECTION AT ICE POINT

Record the readings and compare with previous readings. If the readings are found to be higher or lower than the reading corresponding to a previous calibration, readings at all other temperatures will be correspondingly increased or decreased.

Reproduced in part from ASTM E77-84

1744 Mullowney Lane
Billings, MT 59101

3925 Placita de la Escarpa
Tucson, AZ 85715

Date: 1/2/92

Ambient Temperature: 68 °F

Calibrator: [signature]

READOUT ZEROED & SPANNED PRIOR TO CHECK

Thermocouple No.: T/C READOUT

Barometric Pressure: 30.18 "Hg

Reference: Mercury-in-glass: FISHER #9123454

Other: OMEGA CL 300 0-2100°F CALIBRATOR

Reference point No.[a]	Source[b] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Difference,[c] %
ICE WATER 33	H_2O	33	33.3	-.06
RM TEMP H_2O 68	H_2O	68	68.2	-.04
BOILING WATER 212	H_2O	211	211.4	-.06
250	OMEGA	250	250.1	-.01
300		300	300.3	-.04
400		400	399.9	+.01
500		500	499.8	+.02
600		600	600.1	-.01
700		700	700.0	0.00
800		800	800.1	-.01
900		900	900.2	-.01
1000		1000	1000.3	-.02
1200		1200	1200.2	-.01
1400		1400	1400.1	-.01
1600		1600	1600.2	-.01
1800		1800	1800.4	-.01
2000		2000	2000.3	-.01

[a] Every 30°C (50°F) for each reference point
[b] Type of Calibration system used
[c] $\frac{(\text{Ref. temp: } ^\circ C + 273) - (\text{Test therm. temp. } ^\circ C + 273)}{\text{Ref. Temp. } ^\circ C + 273} \times 100 \leq 1.5\%$

Stack Temperature Sensor Calibration Data Sheet

TRACEABILITY DOCUMENTATION

FOR: SO2 INJECTION ROTAMETER, DRY GAS METERS, AND SLING PSYCHROMETER THERMOMETERS IN LAB. CHECKED AGAINST FISHER SN# 9123454 (NIST)

DATE: 1/8/92 LOCATION: KENT, WA TECHNICIAN: [signature]

FISHER SN# 9123454 (NIST TRACEABLE)

ACTUAL C=		ADJ C=		F
18.5	=	18.49	=	65.3
23.0	=	22.99	=	73.4
25.5	=	25.49	=	77.9
33.5	=	33.49	=	92.3

SO2 INJECTION ROTAMETER (TR)

TR F
65
73
78
92

DATE: 1/8/92 LOCATION: KENT, WA TECHNICIAN: [signature]

ACTUAL C=		ADJ C=		F
18.5	=	18.49	=	65.3
23.0	=	22.99	=	73.4
25.5	=	25.49	=	77.9
33.5	=	33.49	=	92.3

DRY GAS METER THERMOMETERS

4J IN F	OUT F	5H IN F	OUT F	KK F
65	65	65	66	65
73	73	72	74	73
78	78	78	78	78
92	92	93	92	92

DATE: 1/8/92 LOCATION: KENT, WA TECHNICIAN: [signature]

ACTUAL C=		ADJ C=		F
18.5	=	18.49	=	65.3
23.0	=	22.9	=	73.4
25.5	=	25.49	=	77.9
33.5	=	33.49	=	92.3

SLING PSYCHROMETER

WB F	DB F
65	65
73	73
78	78
92	92

C=DEGREES CENTIGRADE F=DEGREES FARENHEIT

CONVERSIONS: F=(Cx1.8)+32 C=(F-32)/1.8

ADJUSTED TEMPERATURES ARE DERIVED FROM AN ELEVEN POINT CALIBRATION OF FISHER SN# 9123454 BY KESSLER INC. SEE ENCLOSED LETTER DATED 4/4/91

KESSLER INSTRUMENTS, INC.

CALIBRATION SERVICES

THERMOMETERS KESSLER HYDROMETERS

TESTING EQUIPMENT

MAILING ADDRESS.
POST OFFICE BOX 640
WESTBURY, NEW YORK 11590
516-334-4063
FAX 516-334-2689

PLANT ADDRES
ONE-SIXTY HICKS STREE
WESTBURY, LONG ISLAN
NEW YORK 1159

CERTIFICATE OF CALIBRATION

This is to certify that the instrument listed below has been certified in our calibration laboratory using the most sensitive constant temperature equipment available. This calibration has been performed against National Institute for Standards and Technology (formerly NBS) certified master instruments in accordance with the procedures outlined by ASTM E77-89 and NBS (NIST) Monograph 150.

TESTED FOR: FISHER

THERMOMETER CAT#15041B 15041B RANGE: -1/101C DIVISIONS: .1 IMMERSION: TOTAL

INSTRUMENT SERIAL NUMBER 9123454 DATE CERTIFIED: 04-04-1991
MARKED: FISHER

POINT(S) TESTED	READING OF THIS INSTRUMENT	CORRECTION
0.00C	0.00C	0.00C
10.00C	10.00C	0.00C
20.00C	20.05C	-0.05C
30.00C	29.98C	0.02C
40.00C	40.00C	0.00C
50.00C	50.00C	0.00C
60.00C	60.00C	0.00C
70.00C	70.03C	-0.03C
80.00C	80.01C	-0.01C
90.00C	90.00C	0.00C
100.00C	99.98C	0.02C

ESTIMATED UNCERTAINTIES IN THE ABOVE CORRECTIONS DO NOT EXCEED 0.03C
FOR A DISCUSSION OF ACCURACIES ATTAINABLE WITH SUCH THERMOMETERS SEE NBS (NIST) MONOGRAPH 150, LIQUID-IN-GLASS THERMOMETRY

All temperatures in this report are based on the International Practical Temperature Scale of 1968

SERIAL AND TEST NUMBERS OF NATIONAL INSTITUTE OF STANDARDS CERTIFIED
INSTRUMENTS REFERENCED IN CERTIFICATION OF THE INSTRUMENT LISTED ABOVE:

769543,217368 P14452,176240 P14452,176240 M44165,176240 M44165,176240 791544,220391

CALIBRATION TECHNICIAN: FRANK BURGHARDT Q.A.MANAGER: J. KELLY

KESSLER INSTRUMENTS, INC.

J. Kelly

J. Jeff Kelly
Quality Assurance Manager
JK/ak

TEST NUMBER 91 843
DATE COMPLETED:04-04-1991

VANEOMETER CALIBRATION

EEMC uses a Dwyer Model #480 Vaneometer to measure test chamber air velocity. The manufacturer's specifications for accuracy are ±5.0% to 100 FPM and ±10% from 100 FPM to top of scale. EEMC insures that the instrument is level and clean prior to taking each reading. According to EPA personnel (Westlin, RTP) no further calibration of the instrument is necessary.

DRAFT GAUGE CALIBRATION

EEMC uses a Dwyer Model 115-AV 0 - 0.25" inclined water manometer (readi- bility resolution ±0.001" of water) to measure the static pressure in the stack. Once leveled and zeroed as per the manufacturer's written operating instructions, the Dwyer 0 - 0.25" manometer is a primary standard and needs no additional calibration.

The manometer is leveled and zeroed at the start of each test run, checked as necessary during the run to verify that the settings have not changed and again at the end of each test run. The results of each check are recorded on Woodstove Data Sheet #16 in each individual test run.

BAROMETER CALIBRATION

EEMC uses a Princo Model 469 NOVA Mercury Barometer to measure Barometric Pressure at the Kent, WA Lab. When installed and maintained as per the manufacturer's written operating instructions, the Princo Model 469 NOVA Mercury Barometer is a primary standard and needs no additional calibration.

MOISTURE METER CALIBRATION

The Delmhorst Model RC-1C, SN 16152 Moisture Meter is calibrated each time the meter is turned on using the two (2) calibration settings (Zero and Span). The potentiometers for each calibration point (X = Zero, Y = Span) are adjusted until the meter is correctly calibrated. Then the operation of the meter is checked in the normal operating range used during testing (11 - 25%) with a Delmhorst Model MCS-1 Moisture Content Standard at 12.0% and 22%.

EEMC also has a second Moisture Meter - Delmhorst Model G-30 SN 2477 - to use as a backup and as means of checking the readings on the Model RC-1C.

Post Test
Meter Box Audits
Woodstove Data Sheet #32

Unit: [illegible]
Date: 5/19/92
Technician: JS
WST9-Form2,Rev12/88

METER BOX CALIBRATION AUDIT

Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg. Δ H	.141	.211	.148	.166	.180	.224	.174			
Max Vac	1.0	2.0	2.0	2.0	1.5	1.5	1.5			

Avg. Test Series Δ H: .178 in H_2O. Test Series Max Vac: 2.0 in Hg

Audit Dry Gas Meter: KK Correction (Y) Factor: 1.010
Test Dry Gas Meter: 4J Correction (Y) Factor: 1.066

Audit Data

		Audit #1	Audit #2	Audit #3
BP:		29.98	29.96	29.96
Vac:		2.0	2.0	2.0
Audit Meter:	Final Vol	050.238	055.489	060.747
	Initial Vol	045.000	050.238	055.489
	Vol (V_w, ft^3)	5.238	5.251	5.259
Audit Meter:	Initial	72	78	79
Temp (°F)(T_w)	Mid	76	79	80
	Final	78	79	81
	Avg (°F/°A)	75/535	79/539	80/540
Δ H (in H_2O)	Initial	.178	.178	.178
	Mid	.178	.178	.178
	Final	.178	.178	.178
	Avg	.178	.178	.178
Dry Gas Meter:	Final Vol	899.000	904.000	909.000
	Initial Vol	894.000	899.000	904.000
	Vol (V_d, ft^3)	5.000	5.000	
Dry Gas Meter	Initial			
Temp (°F): Inlet	Mid			
	Final			
	Avg (°F/°A)			
Dry Gas Meter	Initial	82	87	90
Temp (°F): Outlet	Mid	85	89	91
	Final	87	90	92
	Avg (°F/°A)	85/545	89/549	91/551
Avg Dry Gas Meter Temp (T_m-°F/°A)		85/545	89/549	91/551
Time (minutes)		22:15	22:15	22:15

$$Y = \frac{(Vw)(MCF)(BP)(Tm)}{(Vd)(BP + \frac{\Delta H}{13.6})(Tw)}$$

Y Factor % Difference = $\frac{\text{Act} - \text{Exp}}{\text{Exp}}$ X 100

NOTE: MCF = Meter Correction (Y) Factor for Dry Gas Meter used as a Transfer Standard

Run 1

$$Y = \frac{(5.238)(1.010)(29.98)(545)}{(5.000)(29.98 + \frac{.178}{13.6})(535)} = \frac{86440.0479}{80231.5110} = 1.0774$$

$$\Delta\% = \frac{(1.0774 - 1.0682)}{1.0682} \times 100 = .8596 \%$$

Run 2

$$Y = \frac{(5.251)(1.010)(29.96)(549)}{(5.000)(29.96 + \frac{.178}{13.6})(539)} = \frac{87232.3446}{80777.4788} = 1.0799$$

$$\Delta\% = \frac{(1.0799 - 1.0682)}{1.0682} \times 100 = 1.0962 \%$$

Run 3

$$Y = \frac{(5.258)(1.010)(29.96)(551)}{(5.000)(29.96 + \frac{.178}{13.6})(540)} = \frac{87,666.8402}{80,927.3393} = 1.0833$$

$$\Delta\% = \frac{(1.0833 - 1.0682)}{1.0682} \times 100 = 1.4116 \%$$

NOTE: The Y Factor % Difference must be < ±5.0% to be acceptable

Determination of Interpolated Y Factor for
Average Certification Test Series Delta H from
Dry Gas Meter Calibration Data:

.1 (A) inch H_2O Delta H = 1.0782 (C) Calculated Calibration Y Factor (from Calibrations)

.2 (B) inch H_2O Delta H = 1.0654 (D) Calculated Calibration Y Factor (from Calibrations)

.2 (B) - .1 (A) = .1 X 100 = 10.0 (E)

1.0654 (D) - 1.0782 (C) = -.0128 ÷ 10.0 (E) = -.00128 (F)

.178 (Avg Delta H) - .1 (A) = .078 X 100 = 7.800 (G)

[-.00128 (F) x 7.800 (G)] + 1.0782 (C) = 1.0682 Interpolated Y Factor For Avg. Test Series Delta H

Volume Metering System Leak Check: 0.000 inch H_2O in one minute

DRY GAS METER CALIBRATION

Calibrated by JS
Dry Gas Meter 3 Box 4

BAROMETRIC PRESSURE, P_b = 30.48 in. Hg.

Orifice Manometer Setting, ΔH, in. H_2O		.1	.2	.3	.5	.75	1.0
Gas Volume Wet Test Meter V_w ft^3	Final	956.742	962.002	967.217	972.452	977.685	982.949
	Initial	951.400	956.742	962.002	967.217	972.452	977.685
	V_w, ft^3	5.342	5.260	5.215	5.235	5.233	5.264
Gas Volume Dry Test Meter V_d ft^3	Final	72.100	77.200	82.500	87.700	93.000	98.500
	Initial	67.100	72.200	77.500	82.700	88.000	93.500
	V_d ft^3	5.000	5.000	5.000	5.000	5.000	5.000
TEMPERATURES — WET TEST METER t_w	Initial	70	69	70	70	70	71
	Middle	69	70	69	70	77	71
	End	69	70	70	70	71	71
	Average	69/529	70/530	70/530	70/530	71/531	71/531
TEMPERATURES — DRY GAS METER t_m	Initial	71	76	77	79	81	77
	Middle	74	77	78	82	80	78
	End	76	77	79	83	79	79
	Average	74/534	77/537	78/538	81/541	80/540	78/538
θ Time, Minutes		27.75	19.25	16.333	13.25	10.67	9.500
$y = \dfrac{(V_w)(P_b)(t_m)}{V_d\left(P_b + \dfrac{\Delta H}{13.6}\right)(t_w)}$		1.0782	1.0654	1.0580	1.0674	1.0684	1.0641
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{P_b\,(t_m)}\left[\dfrac{(t_w)\theta}{V_w}\right]^2$		1.4707	1.4573	1.5980	1.7097	1.6920	1.7753
$K_o = \dfrac{V_w}{\theta}\sqrt{\dfrac{\left(P_b + \dfrac{\Delta H}{13.6}\right)(28.97)}{t_m + 460\ (\ \ H)}}$							

Averages:

y = 1.0659

ΔH = 1.6205

Ko = ____________

Ko = Factor for HP-65

$$P_b + \frac{\Delta H}{13.6} = P_m$$

28.97 - molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

Calibrated by ________
- Dry Gas Meter RK Box

BAROMETRIC PRESSURE, P_b = 30.03 in.Hg.

Orifice Manometer Setting, ΔH, in. H_2O		,1	,1	,1	,1	,1	
Gas Volume Wet Test Meter V_w ft^3	Final	170.059	175.430	180.616	185.788	190.888	
	Initial	165.000	170.059	175.430	180.616	185.789	
	V_w, ft^3	5.059	5.371	5.186	5.112	5.100	
Gas Volume Dry Test Meter V_d ft^3	Final	521.900	527.200	532.300	537.300	542.300	
	Initial	516.900	521.900	527.200	532.300	537.300	
	V_d ft^3	5.000	5300	5.100	5.000	5.000	
TEMPERATURES — WET TEST METER t_w	Initial	86	89	89	90	91	
	Middle	87	89	89	90	91	
	End	89	89	90	91	91	
	Average	87/547	89/549	89/549	90/550	91/551	
TEMPERATURES — DRY GAS METER t_m	Initial	77	83	83	85	85	
	Middle	81	83	84	85	85	
	End	83	83	85	85	85	
	Average	80/540	83/543	84/544	85/545	85/545	
θ Time, Minutes		28:10	30:00	29:00	28:15	28:20	
$y = \dfrac{(V_w)(P_b)(t_m)}{V_d\left(P_b + \dfrac{\Delta H}{13.6}\right)(t_w)}$		.9986	1.0001	1.0074	1.0109	1.0086	
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{P_b\,(t_m)}\left[\dfrac{(t_w)\theta}{V_w}\right]^2$		✓	✓	✓	✓	✓	
$K_o = \dfrac{V_w}{\theta}\sqrt{\dfrac{\left(P_b + \dfrac{\Delta H}{13.6}\right)(28.97)}{t_m + 460\ (\quad H)}}$							

Averages:

y = 1.0059

ΔH = ________

Ko = ________

Ko = Factor for HP-65

$$P_b + \frac{\Delta H}{13.6} = P_m$$

28.97 - molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

OVERALL 1.010

Calibrated by [illegible]
Dry Gas Meter RK Box

DRY GAS METER CALIBRATION

BAROMETRIC PRESSURE, P_b = 30.23 in.Hg.

Orifice Manometer Setting, ΔH, in. H_2O		.2	.2	.2	.2	.2	
Gas Volume Wet Test Meter V_w ft^3	Final	195.995	201.276	206.371	211.472	216.571	
	Initial	190.900	195.995	201.276	206.371	211.472	
	V_w, ft^3	5.095	5.281	5.095	5.101	5.099	
Gas Volume Dry Test Meter V_d ft^3	Final	547.400	552.600	557.600	562.600	567.600	
	Initial	542.400	547.400	552.600	557.600	562.600	
	V_d ft^3	5.000	5.200	5.000	5.000	5.000	
TEMPERATURES — WET TEST METER t_w	Initial	92	90	90	90	90	
	Middle	91	91	90	91	90	
	End	90	90	90	90	90	
	Average	91/551	90/550	90/550	90/550	90/550	
TEMPERATURES — DRY GAS METER t_m	Initial	85	86	86	86	86	
	Middle	86	86	86	86	86	
	End	86	86	86	86	85	
	Average	86/546	86/546	86/546	86/546	86/546	
θ Time, Minutes		20:10	21:00	20:15	20:20	20:20	
$y = \dfrac{(V_w)(P_b)(t_m)}{V_d\left(P_b + \dfrac{\Delta H}{13.6}\right)(t_w)}$		1.0093	1.0077	1.0111	1.0183	1.0119	
$\Delta H@ = \dfrac{.0317\ (\Delta H)}{P_b\ (t_m)}\left[\dfrac{(t_w)\theta}{V_w}\right]^2$							
$K_o = \dfrac{V_w}{\theta}\sqrt{\dfrac{\left(P_b + \dfrac{\Delta H}{13.6}\right)(28.97)}{t_m + 460\ (\quad H)}}$							

Averages:

y = 1.0105

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$$P_b + \frac{\Delta H}{13.6} = P_m$$

28.97 - molecular weight of air
y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01
H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O.
Tolerance 0.15.

DRY GAS METER CALIBRATION

Calibrated by ______
Dry Gas Meter RK Box ______

BAROMETRIC PRESSURE, Pb = 30.43 in.Hg.

Orifice Manometer Setting, ΔH, in. H_2O		.3	.3	.3	.3	.3
Gas Volume Wet Test Meter Vw ft^3	Final	922.052	927.139	932.050	937.349	942.462
	Initial	916.700	922.052	927.139	932.050	937.349
	Vw, ft^3	5.352	5.087	5.111	5.099	5.113
Gas Volume Dry Test Meter Vd ft^3	Final	572.900	577.900	582.900	587.900	592.900
	Initial	567.700	572.900	577.900	582.900	587.900
	Vd ft^3	5.200	5.000	5.000	5.000	5.000
TEMPERATURES — WET TEST METER tw	Initial	90	88	88	88	89
	Middle	89	88	88	88	88
	End	89	89	88	89	89
	Average	89/549	88/548	88/548	88/548	89/549
TEMPERATURES — DRY GAS METER tm	Initial	86	85	83	83	84
	Middle	86	83	84	84	84
	End	85	83	83	84	83
	Average	86/546	84/544	83/543	84/544	84/544
θ Time, Minutes		17:30	16:00	16:30	16:40	16:45
$y = \dfrac{(Vw)(Pb)(tm)}{Vd\,(Pb + \frac{\Delta H}{13.6})\,(tw)}$		1.0289	1.0092	1.0121	1.0116	1.0125
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{Pb\,(tm)} \left[\dfrac{(tw)\theta}{Vw}\right]^2$		✓	✓	✓	✓	✓
$Ko = \dfrac{Vw}{\theta} \sqrt{\dfrac{(Pb + \frac{\Delta H}{13.6})(28.97)}{tm + 460\ (\quad H)}}$						

Averages:

y = 1.0137

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$$Pb + \frac{\Delta H}{13.6} = Pm$$

28.97 - molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

DRY GAS METER CALIBRATION

Calibrated by ____
- Dry Gas Meter RK Box ____

BAROMETRIC PRESSURE, Pb = 30.08 in. Hg.							
Orifice Manometer Setting, ΔH, in. H_2O		.4	.4	.4	.4	.4	
Gas Volume Wet Test Meter V_w ft³	Final	847.693	852.797	857.898	863.011	868.114	
	Initial	842.600	847.693	852.797	857.898	863.011	
	V_w, ft³	5.093	5.104	5.101	5.113	5.103	
Gas Volume Dry Test Meter V_d ft³	Final	597.900	602.900	607.900	612.900	617.900	
	Initial	592.900	597.900	602.900	607.900	612.900	
	V_d ft³	5.000	5.000	5.000	5.000	5.000	
TEMPERATURES — WET TEST METER t_w	Initial	89	91	92	92	91	
	Middle	90	91	92	92	91	
	End	91	92	92	91	91	
	Average	90 /550	91 /551	92 /552	92 /552	91 /551	
TEMPERATURES — DRY GAS METER t_m	Initial	83	84	84	84	94	
	Middle	83	84	84	85	84	
	End	84	84	84	84	95	
	Average	83 /543	84 /544	84 /544	84 /544	84 /544	
θ Time, Minutes		14:50	14:30	14:40	14:40	14:40	
$= \dfrac{(V_w)(P_b)(t_m)}{V_d\left(P_b + \dfrac{\Delta H}{13.6}\right)(t_w)}$		1.0047	1.0069	1.0041	1.0068	1.0067	
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{P_b\,(t_m)}\left[\dfrac{(t_w)\theta}{V_w}\right]^2$		✓	✓	✓	✓	✓	
$K_o = \dfrac{V_w}{\theta}\sqrt{\dfrac{\left(P_b + \dfrac{\Delta H}{13.6}\right)(28.97)}{t_m + 460\ (\ \ H)}}$							

Averages:

y = 1.0059

ΔH = ____

Ko = ____

Ko = Factor for HP-65

$P_b + \dfrac{\Delta H}{13.6} = P_m$

28.97 - molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

DRY GAS METER CALIBRATION

Calibrated by

Dry Gas Meter KK Box

BAROMETRIC PRESSURE, Pb = 30.30 in. Hg.							
Orifice Manometer Setting, ΔH, in. H_2O			.5	.5	.5	.5	.5
Gas Volume Wet Test Meter V_w ft^3		Final	073.307	078.610	083.715	088.801	093.932
		Initial	068.000	073.307	078.610	083.715	088.801
		V_w, ft^3	5.107	5.303	5.105	5.106	5.111
Gas Volume Dry Test Meter V_d ft^3		Final	603.012	608.212	633.210	638.212	643.212
		Initial	618.000	603.012	628.212	633.210	638.212
		V_d ft^3	5.012	5.000	5.000	5.000	5.000
TEMPERATURES	WET TEST METER t_w	Initial	91	87	87	87	87
		Middle	89	87	87	87	87
		End	87	87	87	87	87
		Average	89 / 549	87 / 547	87 / 547	87 / 547	87 / 547
	DRY GAS METER t_m	Initial	84	85	84	84	84
		Middle	85	85	84	85	84
		End	85	84	84	84	84
		Average	85 / 545	85 / 545	84 / 544	84 / 544	84 / 544
θ-Time, Minutes			13:30	14:00	13:05	13:30	13:30
$= \dfrac{(V_w)(P_b)(t_m)}{V_d\left(P_b + \dfrac{\Delta H}{13.6}\right)(t_w)}$			1.0103	1.0148	1.0142	1.0144	1.0154
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{P_b\,(t_m)}\left[\dfrac{(t_w)\theta}{V_w}\right]^2$			✓	✓	✓	✓	✓
$K_o = \dfrac{V_w}{\theta}\sqrt{\dfrac{\left(P_b + \dfrac{\Delta H}{13.6}\right)(28.97)}{t_m + 460\ (\quad H)}}$							

Averages:

y = 1.0138

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$P_b + \dfrac{\Delta H}{13.6} = P_m$

28.97 - molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

DRY GAS METER CALIBRATION

Calibrated by ______
Dry Gas Meter KK Box ______

BAROMETRIC PRESSURE, Pb = 30.32 in.Hg.

Orifice Manometer Setting, ΔH, in. H_2O		.75	.75	.75	.75	.75	
Gas Volume Wet Test Meter V_w ft^3	Final	299.008	304.319	309.430	314.540	319.752	
	Initial	294.100	299.008	304.318	309.430	314.540	
	V_w, ft^3	5.108	5.110	5.118	5.110	5.212	
Gas Volume Dry Test Meter V_d ft^3	Final	648.400	653.400	658.400	663.400	668.500	
	Initial	643.4000	648.400	653.400	658.400	663.400	
	V_d ft^3	5.000	5.000	5.000	5.000	5.100	
TEMPERATURES — WET TEST METER t_w	Initial	87	87	87	86	86	
	Middle	87	87	86	86	86	
	End	87	87	86	86	85	
	Average	87/547	87/547	86/546	86/546	86/546	
TEMPERATURES — DRY GAS METER t_m	Initial	84	82	82	82	81	
	Middle	83	82	82	81	81	
	End	82	82	82	81	81	
	Average	83/543	82/542	82/542	81/541	81/541	
θ Time, Minutes		11:00	11:00	11:00	11:00	11:00	
$y = \frac{(V_w)(P_b)(t_m)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w)}$		1.0103	1.0108	1.0131	1.0108	1.0108	
$\Delta H@ = \frac{.0317(\Delta H)}{P_b(t_m)}\left[\frac{(t_w)\theta}{V_w}\right]^2$		✓	✓	✓	✓	✓	
$K_o = \frac{V_w}{\theta}\sqrt{\frac{\left(P_b + \frac{\Delta H}{13.6}\right)(28.97)}{t_m + 460\ (\ \ H)}}$							

Averages:

y = 1.0116

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$- + \frac{\Delta H}{13.6} = P_m$

28.97 – molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O.

Tolerance 0.15.

WET TEST METER CALIBRATION LOG

Wet Test Meter Serial Number AA, SS Date 12/12/91

Range of Wet Test Meter Flow Reat 0 - 0.4 ft³/min.

Volume of Test Flask Vs= 2 l (0.5284 ft³)

Satisfactory Leak Check? yes

Ambient Temperature of Equilibrate Liquid in Wet Test Meter and Reservoir 68° F

Test Number	Manometer Reading, a mm H20	Final Volume (Vf), l	Initial Volume (Vi), l	Total Volume (Vm), b l	Flask Volume (Vs), l	Percent Error, %
1	6.0 mm	0.5262	0 (Reset)	0.5262	0.5284	0.42
2	6.0 mm	0.5250	0 "	0.5250	0.5284	0.65
3	6.0 mm	0.5245	0 "	0.5245	0.5284	0.74

a - Must be less than 10 mm H20 (0.4 "H20)

Calculations:

b - Vm - Vf - Vi

c - % error = 100(Vm - Vs)/Vs = ________ (±1%)

$\overline{X}$-3 = 0.60

WET TEST METER CALIBRATION LOG

WET TEST METER CALIBRATION LOG

Wet Test Meter Serial Number AA↓SS　　Date 12/19/90

Range of Wet Test Meter Flow Rate 0-0.4 ft³/m.

Volume of Test Flask Vs = 2 l (0.5284 ft³

Satisfactory Leak Check? ______

Ambient Temperature of Equilibrate Liquid in Wet Test Meter and Reservoir ______

Test Number	Manometer Reading, a mm H2O	Final Volume (Vf), l	Initial Volume (Vi), l	Total Volume (Vm), b l	Flask Volume (Vs), l	Percent Error, c %
1	0.2	0.5259	0 (Reset)	0.5259	0.5284	0.25
2	0.2	0.5246	"	0.5246	"	0.38
3	0.2	0.5243	"	0.5243	"	0.41

a - Must be less than 10 mm H2O (0.4 "H2O)

Calculations:

b - Vm - Vf - Vi

c - % error = 100(Vm - Vs)/Vs = 0.4 (±1%)

WET TEST METER CALIBRATION LOG

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR - 4 1991

OFFICE OF
AIR AND RADIATION

Mr. Alben T. Myren Jr.
Woodstove Testing Coordinator
Energy and Environmental
Measurement Corporation
1315 S. Central Avenue, Unit C
Kent, Washington 98032

Dear Mr. Myren:

This letter is in response to your concern expressed at the lab manager's seminar on January 8, 1991 that your rotameter calibration technique is acceptable although it differs from the regulatory requirement of Method 5H, Section 6.6.

The way in which your rotameter calibration differs from theregulation is that your calibratation runs are less than five minutes whereas the regulation requires calibration runs of at least ten minutes. This is acceptable because you use a soap film volumetric flow meter as the standard as opposed to a conventional volume standard such as a dry gas meter.

If you have any further questions concerning this matter, please contact Dwight Poffenberger at (703) 308-8696.

Sincerely,

Robert J. Lebens

Robert J. Lebens, Chief
Federal Programs Section
Stationary Source Compliance Division

cc: Mamie Miller, SSCD
Peter Westlin, EMB

Printed on Recycled Paper

SO2 ROTAMETER CALIBRATION PAGE 1 OF ____

DATE: 5/7/92 BY: [signature] LAST CAL : 11/14/91 BY: [signature]

MANUFACTURER: COLE PARMER SN: EEMC #2
BUBBLE TUBE MAKE & ID: SKC 125/250 EEMC #1

BAROMETRIC PRESSURE: 30.04 " Hg TEMPERATURE: 81 F
CALIBRATION AT: EEMC KENT, WASHINGTON LAB

SPAN #	VOLUME	MIN or SEC	RTMTR	VOLUME cc/min
1	125	34.81	100	VOLUME / AVERAGE X 60 =
		34.35		
		34.84		
		34.41		
		34.62		125 / 34.478 X 60=
		35.41		
		30.91		
		33.98		
	TOTAL	275.8300		217.525
	AVERAGE	34.478		cc/min
2	125	63.61	50	VOLUME / AVERAGE X 60 =
		65.52		
		63.81		
		66.08		
		64.23		125 / 64.365 X 60=
		63.87		
		64.76		
		63.04		
	TOTAL	514.92		116.523
	AVERAGE	64.365		cc/min
3	125	157.40	25	VOLUME / AVERAGE X 60 =
		155.48		
		154.11		
		153.31		
		153.47		125 / 155.356 X 60=
		155.72		
		155.48		
		157.88		
	TOTAL	1248.850		48.276
	AVERAGE	155.356		cc/min

SETTING	CC/MIN
0	0
25	48.276
50	116.523
100	215.525

SLOPE = 2.1844800

Y-INT = -.4900000

r = .9980704

r^2 = .9961445

ROTAMETER SETTING FOR 100 cc/min : 45.99

WOODSTOVE DATA SHEET #26
CEM GAS TRAIN RESPONSE TIME

Date	1/8/92										
Technicians	BD SS										
Elapsed Time	CO_2 Conc. (V)	CO_2 Conc. (V)	CO_2 Conc. (V)	CO Conc. (V)	CO Conc. (V)	CO Conc. (V)	O_2 Conc. (V)	O_2 Conc. (V)	O_2 Conc. (V)	Conc. (V)	Conc. (V)
0 Seconds	.504	.504	.505	.496	.494	.496	.496	.496	.496		
15	.450	.448	.447	.420	.419	.401	.522	.538	.550		
30	.029	.030	.028	.025	.027	.024	.787	.785	.789		
45	.012	.011	.013	.009	.010	.009	.830	.809	.831		
60	.002	.001	.003	.002	.001	.001	.831	.832	.833		
75	.000	.000	.000	.000	.000	.000	.832	.833	.832		
90	.000	.000	.000	.000	.000	.000	.833	.833	.832		
105	.000	.000	.000	.000	.000	.000	.832	.833	.832		
120	.000	.000	.000	.000	.000	.000	.832	.833	.832		
135											
150											
165											
180											
Initial Response Time (Seconds)	~11	~11	~11	~11	~11	~11	~13	~13	~13		
95% Response Time (Seconds)	~35	~35	~35	~35	~35	~35	~40	~40	~40		
Analyzer Flow Rate	1.5 SCFH										

Comments

WOODSTOVE DATA SHEET #27
TRACER GAS TRAIN RESPONSE TIME

Date	7/03/91	→	→	1/8/92	→	→					
Technicians	BN/ JWS	→	→	JD/BN	→	→					
Elapsed Time	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)	SO_2 Conc. (V)
0 Seconds	.510	.509	.510	.493	.493	.493					
15	.301	.098	.099	.300	.099	.302					
30	.039	.037	.038	.038	.040	.037					
45	.006	.005	.007	.005	.006	.007					
60	.002	.002	.002	.002	.002	.002					
75	.002	.002	.002	.002	.002	.002					
90	.001	.001	.002	.001	.001	.002					
105	.001	.001	.001	.001	.001	.001					
120	.001	.001	.001	.001	.001	.001					
135											
150											
165											
180											
Initial Response Time (Seconds)	~11	~11	~11	~11	~11	~11					
95% Response Time (Seconds)	~40	~40	~40	~40	~40	~40					
Analyzer Flow Rate	1.5 SCFH	→	→								

Comments

EEMC

Orsat Analysis for [illegible]

Lab No. KENT Date 1/2/92

Source ——————— @ Jas 1BN

TEST NO.	GAS	1	2	3	4	5	AVERAGE
1	TOTAL/CO	0	0	0	$\bar{X}$= 0	100%	T219170
	CO_2	0	0	0	$\bar{X}$= 0	N2	LIQUID AIR
	O_2	0	0	0	$\bar{X}$= 0		8/8/91
2	TOTAL/CO	0	0	0	$\bar{X}$= 0	100%	T132257
	CO_2	0	0	0	$\bar{X}$= 0	N2	LIQUID AIR
	O_2	0	0	0	$\bar{X}$= 0		11/20/90
3	TOTAL/CO	5.0	4.9	5.0	$\bar{X}$= 4.97%	4.96% CO	29004
	CO_2	10.6	10.6	10.5	$\bar{X}$= 10.57%	10.6% CO_2	Matheson
	O_2	10.4	10.5	10.4	$\bar{X}$= 10.43%	10.4% O_2	9/4/91
4	TOTAL/CO	0	0	0	$\bar{X}$=0	21.2%	R34098
	CO_2	21.2	21.2	21.2	$\bar{X}$=21.2%	CO_2	LIQUID AIR
	O_2	0	0	0	$\bar{X}$=0		4/27/88
5	TOTAL/CO	0	0	0	$\bar{X}$=0	40.1%	A15529
	CO_2	4.0	4.0	4.0	$\bar{X}$=4.0%	CO_2	SCOTT
	O_2	0	0	0	$\bar{X}$=0		10/29/84
6	TOTAL/CO	0	0	0	$\bar{X}$=0	19.93%	X A8812
	CO_2	0	0	0	$\bar{X}$=0	O_2	SCOTT
	O2	20	20	20	$\bar{X}$=20%		10/29/84
7	TOTAL/CO	0	0	0	$\bar{X}$=0	5.03%	R35693
	CO_2	0	0	0	$\bar{X}$=0	O_2	LIQUID AIR
	O_2	5	5	5	$\bar{X}$=5%		6/29/89
8	TOTAL/CO	8	8	8	$\bar{X}$=8%	8.05%	A1682
	CO_2	0	0	0	$\bar{X}$=0	CO	SCOTT
	O_2	0	0	0	$\bar{X}$=0		10/5/84
9	TOTAL/CO	2	2	2.1	$\bar{X}$=2.03%	2.09%	A 10199
	CO_2	0	0	0	$\bar{X}$=0	CO	
	O_2	0	0	0	$\bar{X}$=0		
10	TOTAL/CO	8.5	8.5	8.4	$\bar{X}$=8.47%	8.496% CO	CC6024100
	CO_2	21.2	21.3	21.2	$\bar{X}$=21.23%	21.253% CO_2	LIQUID AIR
	O_2	21.2	21.2	21.3	$\bar{X}$=21.23%	21.244% O_2	11/19/90
11	TOTAL/CO	2.5	2.5	2.4	$\bar{X}$=2.47%	2.49% CO	T201070
	CO_2	6.2	6.3	6.3	$\bar{X}$=6.27%	6.251% CO_2	LIQUID AIR
	O_2	6.2	6.3	6.3	$\bar{X}$=6.27%	6.251% O_2	11/19/90

NOTES:

EEMC

HAUGH'S

CO2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 5/12/92

Analyzer: Make: HORIBA Model: PIR 2000 SN: 407069

Calibration by: D. Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ___

BP: 30.26 Instrument ID: PRINCO

Temp: 72 Instrument ID: TR

Analyzer last calibrated: 5/8/92 By: D. Kingman

Cylinders:

1. #T132257 Concentration: 0.00 % CO2 Cyl. Press.: 800 PSI
   Certified by: LIQUID AIR Date: 10/7/91

2. #29004 Concentration 12.6 % CO2 Cyl. Press.: 900 PSI
   Certified by: MATHESON Date: 10/31/91

3. #R34098 Concentration 21.2 % CO2 Cyl. Press.: 1200 PSI
   Certified by: LIQUID AIR Date: 4/27/88

4. #A15529 Concentration 4.01 % CO2 Cyl. Press.: 900 PSI
   Certified by: LIQUID AIR Date 10/22/84

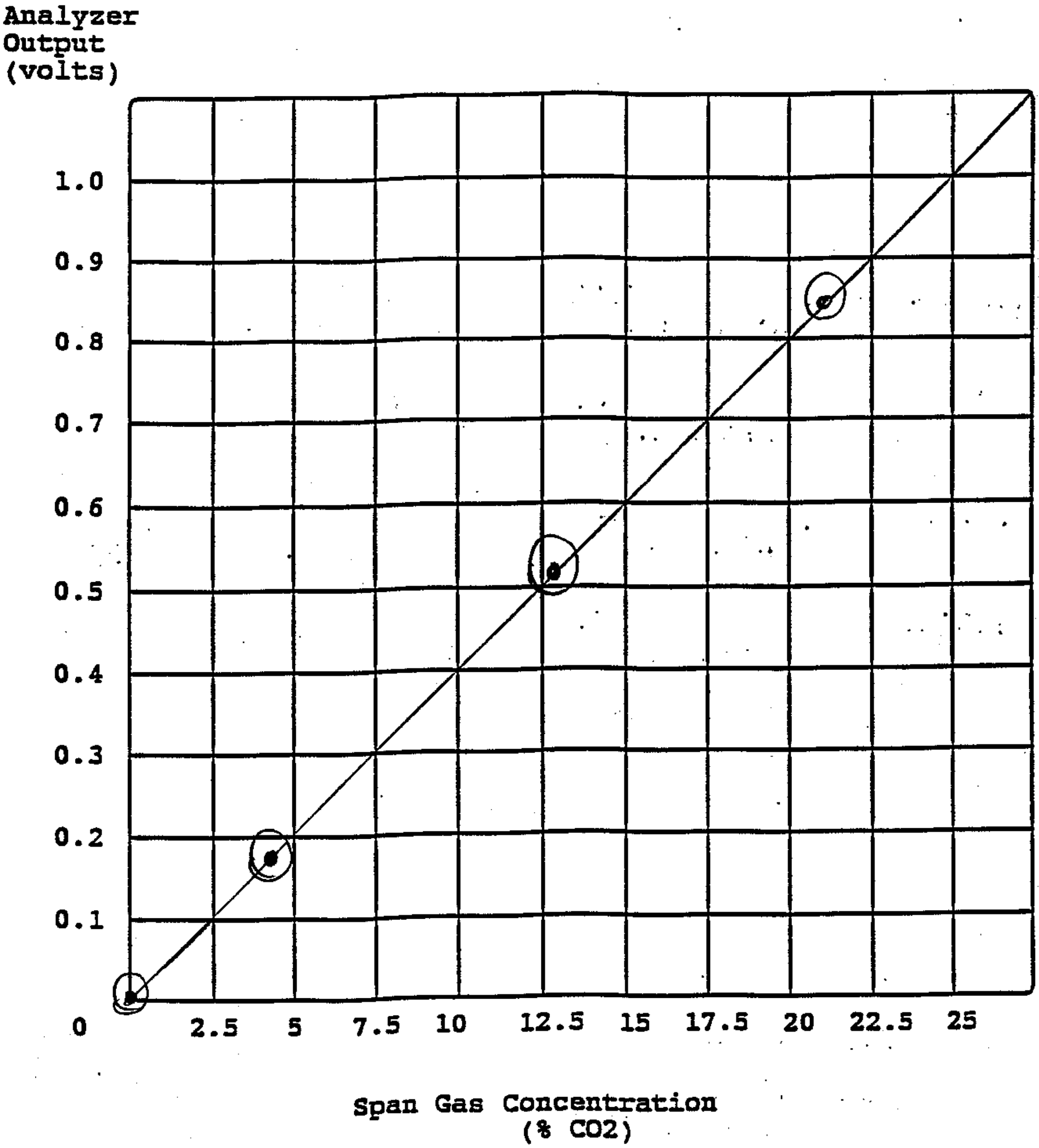
Analyzer: Calibrated Range: 0-25.0 % Output: 0-1.0
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ___

Calibration Results

Point #	Cyl. #	% CO2	Expected Meter	Expected DVM	Actual Meter	Actual DVM	Adj. Meter	Adj. DVM	% Dif.	Potentiomet Unadj.	A
1	1	0.00	00.0	.000	00.0	.000	—	—		7.78	—
2	2	12.6	50.4	.504	50.5	.505	50.4	.504		2.08	2.0
3	3	21.2	84.8	.848	86.0	.860	—	—		—	—
4	4	4.01	16.0	.160	16.0	.160	—	—		—	—
5	1	0.00	00.0	.000	00.0	.000	—	—		—	—

Comments: .5= 12.388

Y = MX + B
Slope (M) = 0.0405364
Y Intercept (B) = -0.0021700
Correlation Coefficient (r) = 0.9999615
r^2 = 0.9999231



EPA Span Value = +/- 2.0% of 25% CO2 = +/- .5%
Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/-Δ%

.860 = 21.500 - 21.2 = .300 = 1.415

.160 = 4.000 - 4.01 = -.010 = -.249

CONTROL CHART

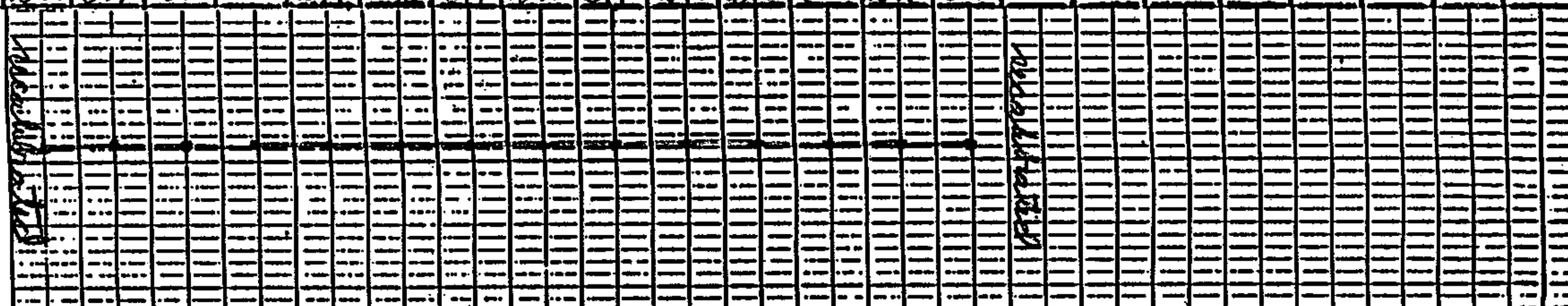
SITE EEMC - West LOCATION Kent, WA 98032 OPERATORS WA NOWAK/JASTODDARD

PARAMETER CO_2 INSTRUMENT/SN HORIBA PIR2000 / 407069 RANGE 0.0-25.0% CO_2

REFERENCE MATERIAL OR METHOD Zeroes and Spans with Certified Cylinder Gases

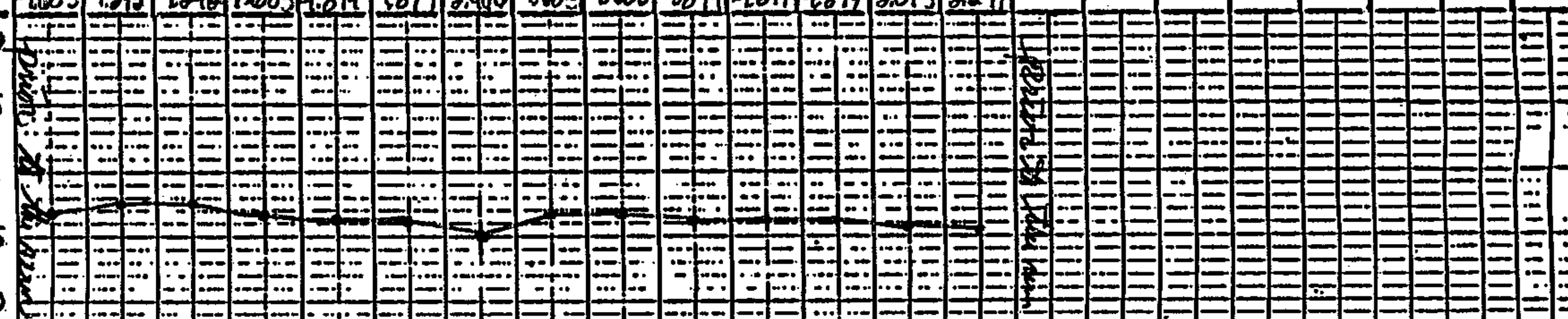
DATE	5/13	5/13	5/13	5/13	5/14	5/14	5/15	5/15	5/18	5/18	5/18	5/18	5/19	5/19								
Zero Response	.054	.054	.054	.054	.054	.054	.054	.054	.054	.054	.054	.054	.054	.054								
Zero Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Difference	.017	.017	.017	.217	.017	.017	.017	.017	.017	.017	.017	.017	.017	.017								

ZERO



Span Response	12.388	12.437	12.437	12.388	12.363	12.363	12.289	12.388	12.388	12.363	12.363	12.363	12.339	12.314								
Span Actual	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
% Difference	-1.683	-1.990	-1.990	-1.683	-1.874	-1.875	-2.466	-1.682	-1.683	-1.879	-1.879	-1.879	-2.075	-2.271								

SPAN



Zero: UWL +1.0% LWL -1.0% UCL +2.0% LCL -2.0% Span: UWL +3.5% LWL -3.5% UCL +5.0% LCL -5.0%

COMMENTS/ ACTIONS	PRE 1 HAUGHS 507X	POST 1 HAUGHS 507X	PRE 2 HAUGHS 507X	POST 2 HAUGHS 507X	PRE 3 HAUGHS 507X	POST 3 HAUGHS 507X	PRE 4 HAUGHS 507X	POST 4 HAUGHS 507X	PRE 5 HAUGHS 507X	POST 5 HAUGHS 507X	PRE 6 HAUGHS 507X	POST 6 HAUGHS 507X	PRE 7 HAUGHS 507X	POST 7 HAUGHS 507X	PRE	POST	PRE	POST	PRE	POST	PRE	POST

O2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 5/12/92

Analyzer: Make: Teledyne Model: 320 A SN: 37400

Calibration by: D. Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ___
BP: 30.26 Instrument ID: PRINCO
Temp: 72 Instrument ID: TR

Analyzer last calibrated: 5/8/92 By: D. Kingman

Cylinders:
1. #T132257 Concentration: 0.00 % O2 Cyl. Press.: 800 PSI
Certified by: LIQUID AIR Date: 10/7/91

2. #29004 Concentration 12.4 % O2 Cyl. Press.: 900 PSI
Certified by: MATHESON Date: 10/31/91

3. #XA2212 Concentration 19.93 % O2 Cyl. Press.: 400 PSI
Certified by: LIQUID AIR Date: 10/22/84

4. #R35693 Concentration 5.03 % O2 Cyl. Press.: 1700 PSI
Certified by: LIQUID AIR Date 6/29/89

Analyzer: Calibrated Range: 0-25.0 % Output: 0-1.0
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ___

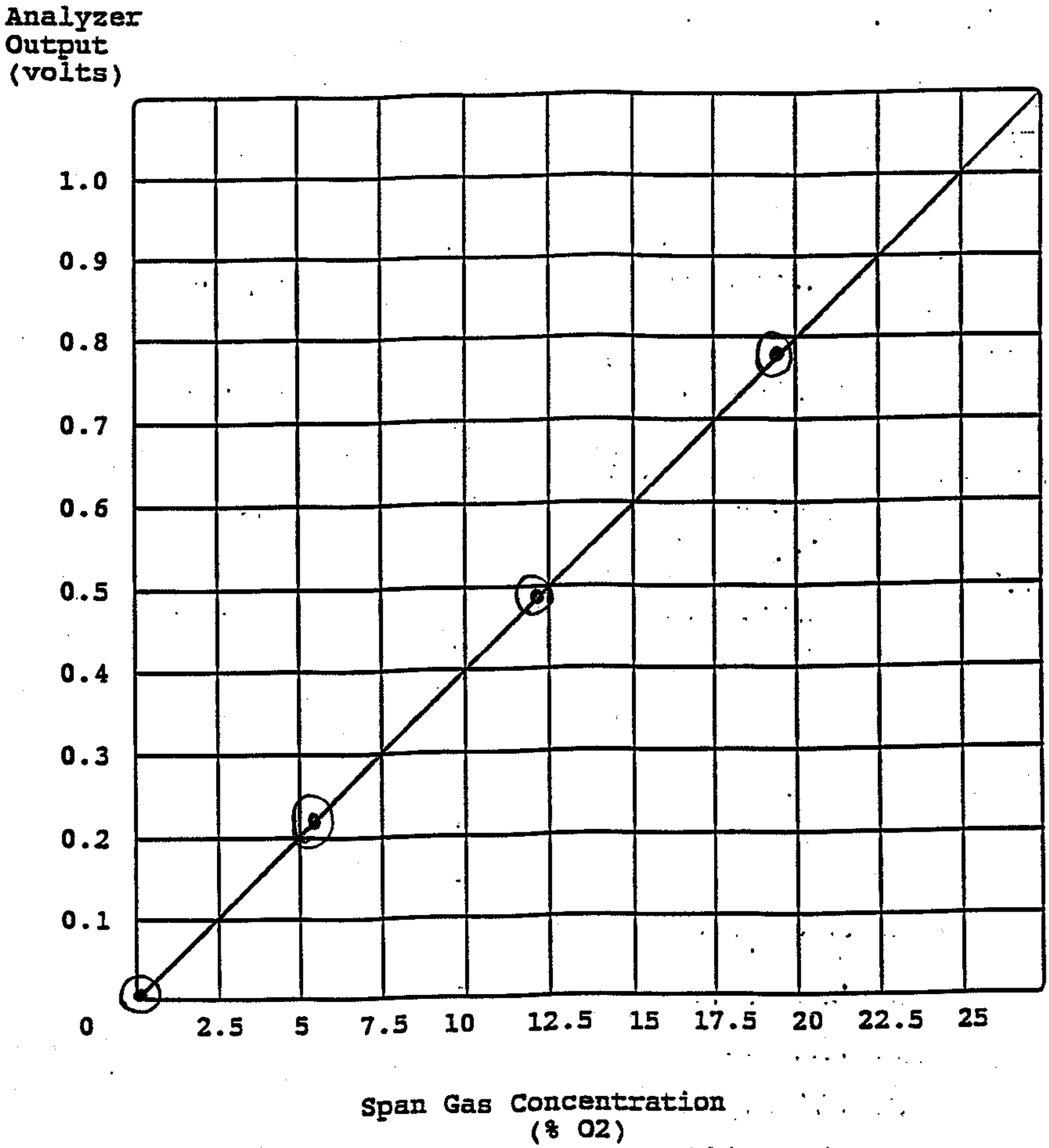
Calibration Results

Point	Cyl.	%	Expected		Actual		Adj.		%	Potentiomet[illegible]	
#	#	O2	Meter	DVM	Meter	DVM	Meter	DVM	Dif.	Unadj.	Ac[illegible]
1	1	0.00	00.0	.000	00.0	.000	—	—		—	—
2	2	12.4	12.4	.496	12.2	.491	12.4	.496		—	—
3	3	19.93	19.9	.797	19.4	.781	—	—		—	—
4	4	5.03	5.0	.201	5.0	.204	—	—		—	—
5	1	0.00	00.0	.000	00.0	.000	—	—		—	—

Comments:

.5 = 12.650

Y = MX + B
Slope (M) = 0.0391922
Y Intercept (B) = 0.0041946
Correlation Coefficient (r) = 0.9998897
r^2 = 0.9997794



EPA Span Value = +/- 2.0% of 25% O2 = +/- .5%
Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/-Δ%

.781 = 19.525 - 19.93 = -.405 = -2.032

.204 = 5.100 - 5.03 = .070 = 1.392

CONTROL CHART

ITE EEMC - WEST LOCATION KENT, WA 98032 OPERATORS WA NOWAK/JASTODDARD

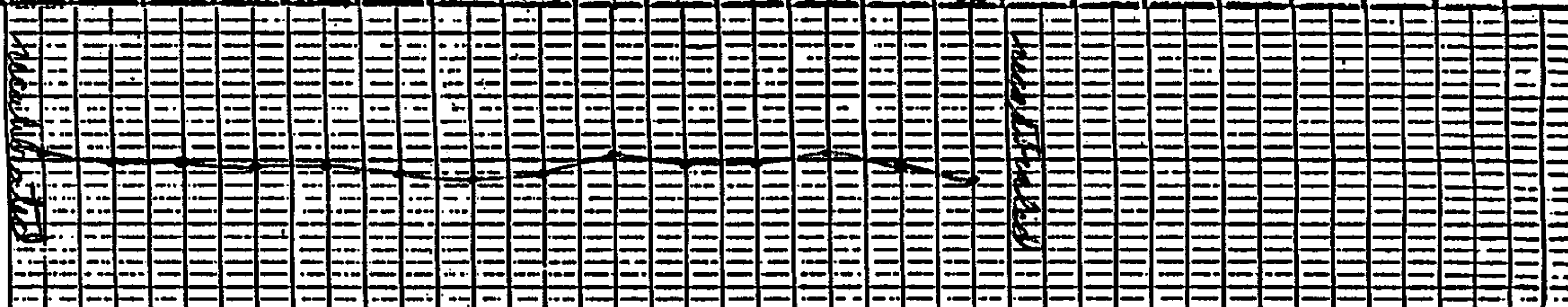
ARAMETER O_2 INSTRUMENT/SN Teledyne 320a / 37465 RANGE 0.0-25.0% O_2

EFERENCE MATERIAL OR METHOD Zeroes and Spans with Certified Cylinder Gases

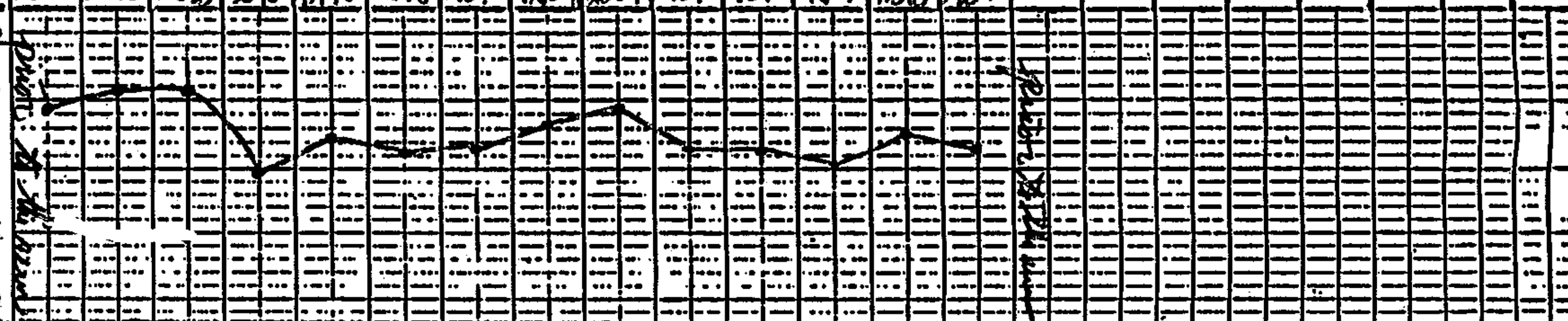
ATE	5/13	5/12	5/13	5/13	5/14	5/14	5/15	5/15	5/18	5/18	5/18	5/18	5/19	5/19
ero Response	.093	-.003	-.003	-.028	-.028	-.054	-.079	-.054	.093	-.003	-.003	.093	-.003	-.079
ero Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Difference	.090	-.018	-.018	-.114	-.114	-.216	-.318	-.216	.090	-.018	-.018	.090	-.018	-.318
Span Response	18.675	18.750	18.750	18.395	18.548	18.471	18.497	18.599	18.675	18.497	18.497	18.430	18.523	18.497
Span Actual	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4
% Difference	2.221	2.838	2.838	-.049	1.198	.575	.781	1.604	2.221	.781	.781	.164	1.398	.781
COMMENTS/ ACTIONS	PRE 1 HAUGHS 507X	POST 1 HAUGHS 507X	PRE 2 HAUGHS 507X	POST 2 HAUGHS 507X	PRE 3 HAUGHS 507X	POST 3 HAUGHS 507X	PRE 4 HAUGHS 507X	POST 4 HAUGHS 507X	PRE 5 HAUGHS 507X	POST 5 HAUGHS 507X	PRE 6 HAUGHS 507X	POST 6 HAUGHS 507X	PRE 7 HAUGHS 507X	POST 7 HAUGHS 507X

ATE								
ero Response								
ero Actual	0	0	0	0	0	0	0	0
Difference								
Span Response								
Span Actual	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4
% Difference								
COMMENTS/ ACTIONS	PRE	POST	PRE	POST	PRE	POST	PRE	POST

ZERO



SPAN



Zero: UWL +1.0% LWL -1.0% UCL +2.0% LCL -2.0%

Span: UWL +3.5% LWL -3.5% UCL +5.0% LCL -5.0%

EEMC

CO ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 5/12/92

Analyzer: Make: HORIBA Model: PIR 2000 SN: 408005

Calibration by: D. Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____
BP: 30.26 Instrument ID: PRINCO
Temp: 72 Instrument ID: TR

Analyzer last calibrated: 5/8/92 By: D. Kingman

Cylinders:
1. #T132257 Concentration: 0.00 % CO Cyl. Press.: 800 PSI
Certified by: LIQUID AIR Date: 10/7/91

2. #29004 Concentration 4.96 % CO Cyl. Press.: 900 PSI
Certified by: MATHESON Date: 10/31/91

3. #A1682 Concentration 8.05 % CO Cyl. Press.: 600 PSI
Certified by: LIQUID AIR Date: 12/5/84

4. #A10199 Concentration 2.02 % CO Cyl. Press.: 800 PSI
Certified by: LIQUID AIR Date 12/5/84

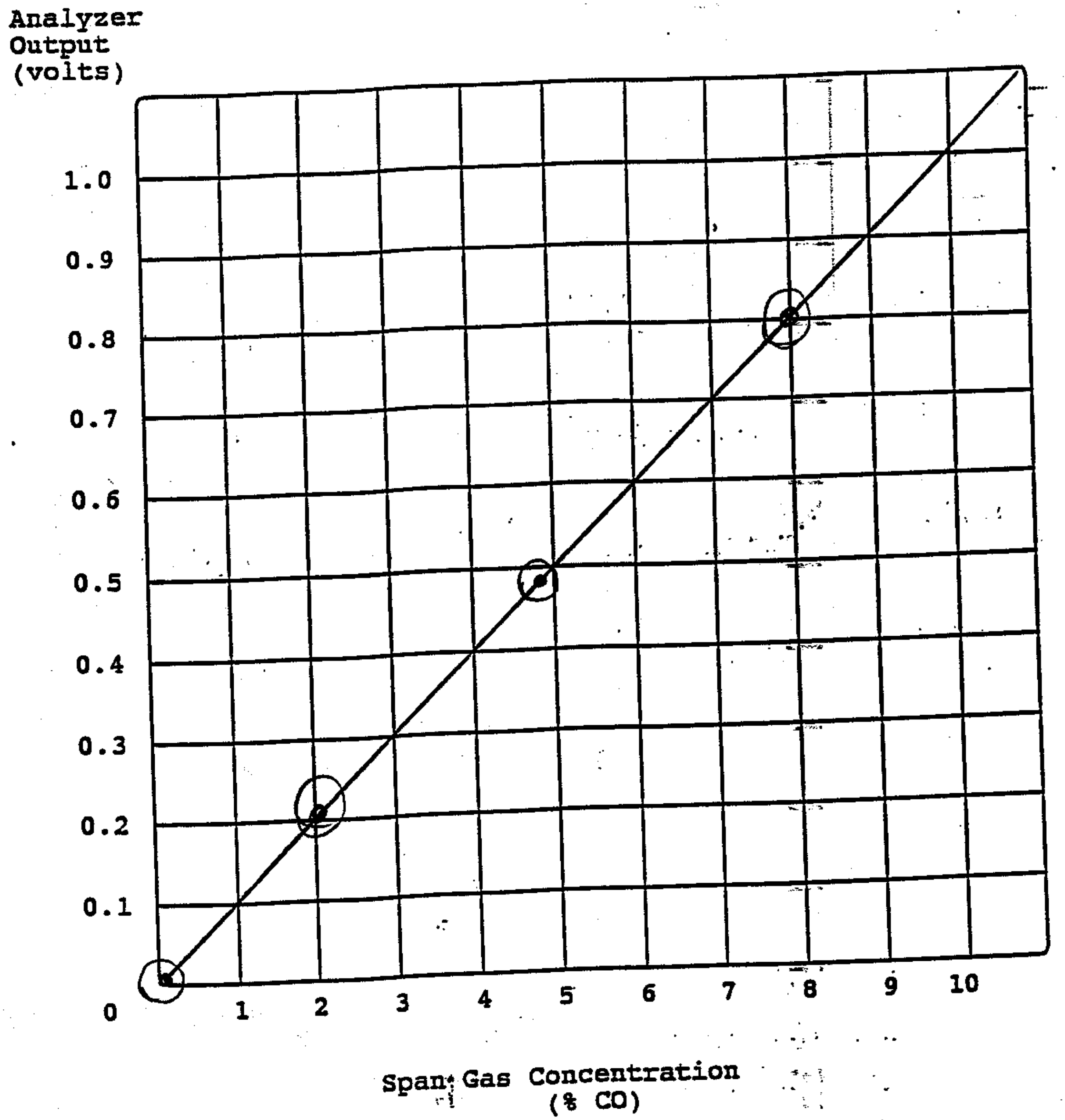
Analyzer: Calibrated Range: 0-10.0 % Output: 0-1.0
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____

Calibration Results

Point	Cyl.	%	Expected		Actual		Adj.		%	Potentiomet	
#	#	CO	Meter	DVM	Meter	DVM	Meter	DVM	Dif.	Unadj.	[illegible]
1	1	0.00	00.0	.000	00.0	.000	—	—		3.03	—
2	2	4.96	49.6	.496	49.5	.495	49.6	.496		1.32	1.3
3	3	8.05	80.5	.805	78.6	.786	—	—		—	—
4	4	2.02	20.2	.202	19.5	.195	—	—		—	—
5	1	0.00	00.0	.000	00.0	.000	—	—		—	—

Comments: .5 = 5.090

Slope (M) = [illegible]
Y Intercept (B) = 0.0005456
Correlation Coefficient (r) = 0.9998445
r^2 = 0.9996889



EPA Span Value = +/- 2.0% of 10% CO = +/- .2%
Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/-Δ%

.786 = 7.860 - 8.05 = -.190 = -2.360

.195 = 1.950 - 2.02 = -.070 = -3.465

CONTROL CHART

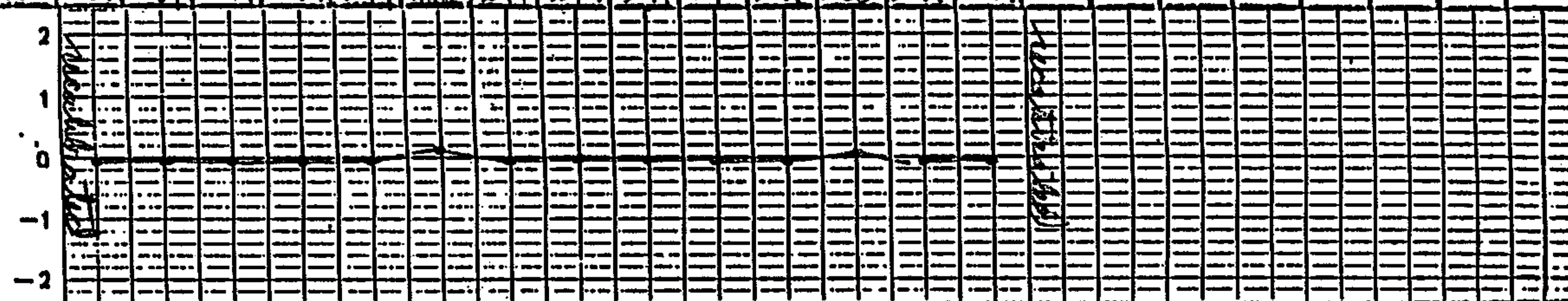
SITE EEMC - WEST LOCATION KENT, WA 98032 OPERATORS WA NOWAK/JASTODDARD

PARAMETER CO INSTRUMENT/SN HORIBA PIR 2000 /408005 RANGE 0.0-10.0% CO

REFERENCE MATERIAL OR METHOD Zeroes and Spans with Certified Cylinder Gases

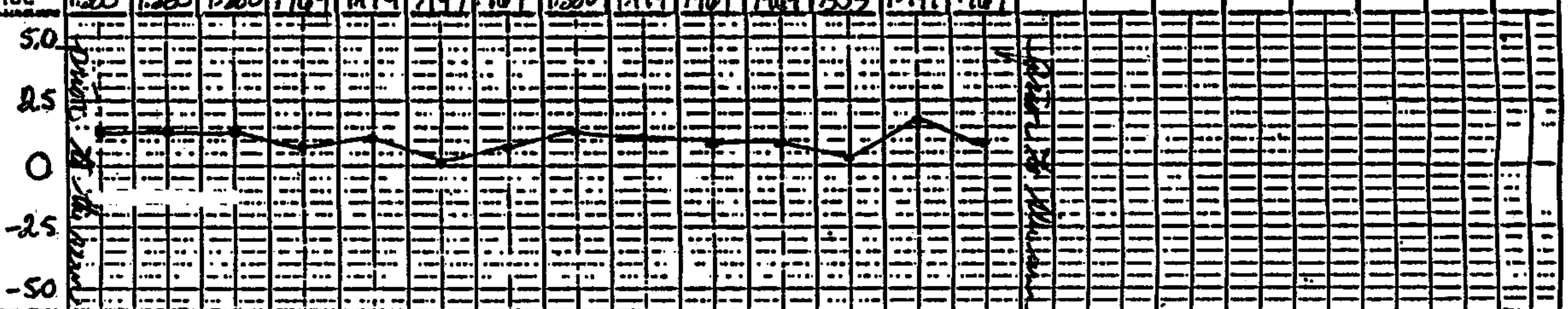
DATE	5/13	5/13	5/13	5/13	5/14	5/14	5/15	5/15	5/18	5/18	5/18	5/18	5/19	5/19								
Zero Response	-.004	-.004	-.004	-.004	-.004	.016	-.004	-.004	-.004	-.004	-.004	.006	-.004	-.004								
Zero Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Difference	-.044	-.044	-.044	-.044	-.044	.160	-.044	-.044	-.044	-.044	-.044	.058	-.044	-.044								

ZERO



Span Response	5.028	5.028	5.028	4.998	5.018	4.967	4.998	5.028	5.018	5.008	5.008	4.978	5.049	5.008								
Span Actual	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96
% Difference	1.380	1.380	1.380	.764	1.174	.147	.764	1.380	1.174	.969	.969	.353	1.791	.969								

SPAN



Zero: UWL +1.0% LWL -1.0% UCL +2.0% LCL -2.0%

Span: UWL +3.5% LWL -3.5% UCL +5.0% LCL -5.0%

COMMENTS/ ACTIONS																						
	PRE 1 HAUGHS 507X	POST 1 HAUGHS 507X	PRE 2 HAUGHS 507X	POST 2 HAUGHS 507X	PRE 3 HAUGHS 507X	POST 3 HAUGHS 507X	PRE 4 HAUGHS 507X	POST 4 HAUGHS 507X	PRE 5 HAUGHS 507X	POST 5 HAUGHS 507X	PRE 6 HAUGHS 507X	POST 6 HAUGHS 507X	PRE 7 HAUGHS 507X	POST 7 HAUGHS 507X	PRE	POST	PRE	POST	PRE	POST	PRE	POST

EEMC

SO2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 5/12/92

Analyzer: Make: HORIBA Model: PIR 2000 SN: 403019

Calibration by: D. Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ___
BP: 30.26 Instrument ID: PRINCO
Temp: 72 Instrument ID: TR

Analyzer last calibrated: 5/8/92 By: D. Kingman

Cylinders:

1. #T132257 Concentration: 0.00 PPM SO2 Cyl. Press.: 800 PSI
   Certified by: LIQUID AIR Date: 10/7/91

2. #AL 2892 Concentration 1232 PPM SO2 Cyl. Press.: 450 PSI
   Certified by: LIQUID AIR Date: 9/24/91

3. #CC 44776 Concentration 2127 PPM SO2 Cyl. Press.: 1000 PSI
   Certified by: LIQUID AIR Date: 5/13/88

4. #AAL 5858 Concentration 626 PPM SO2 Cyl. Press.: 1500 PSI
   Certified by: LIQUID AIR Date 11/2/87

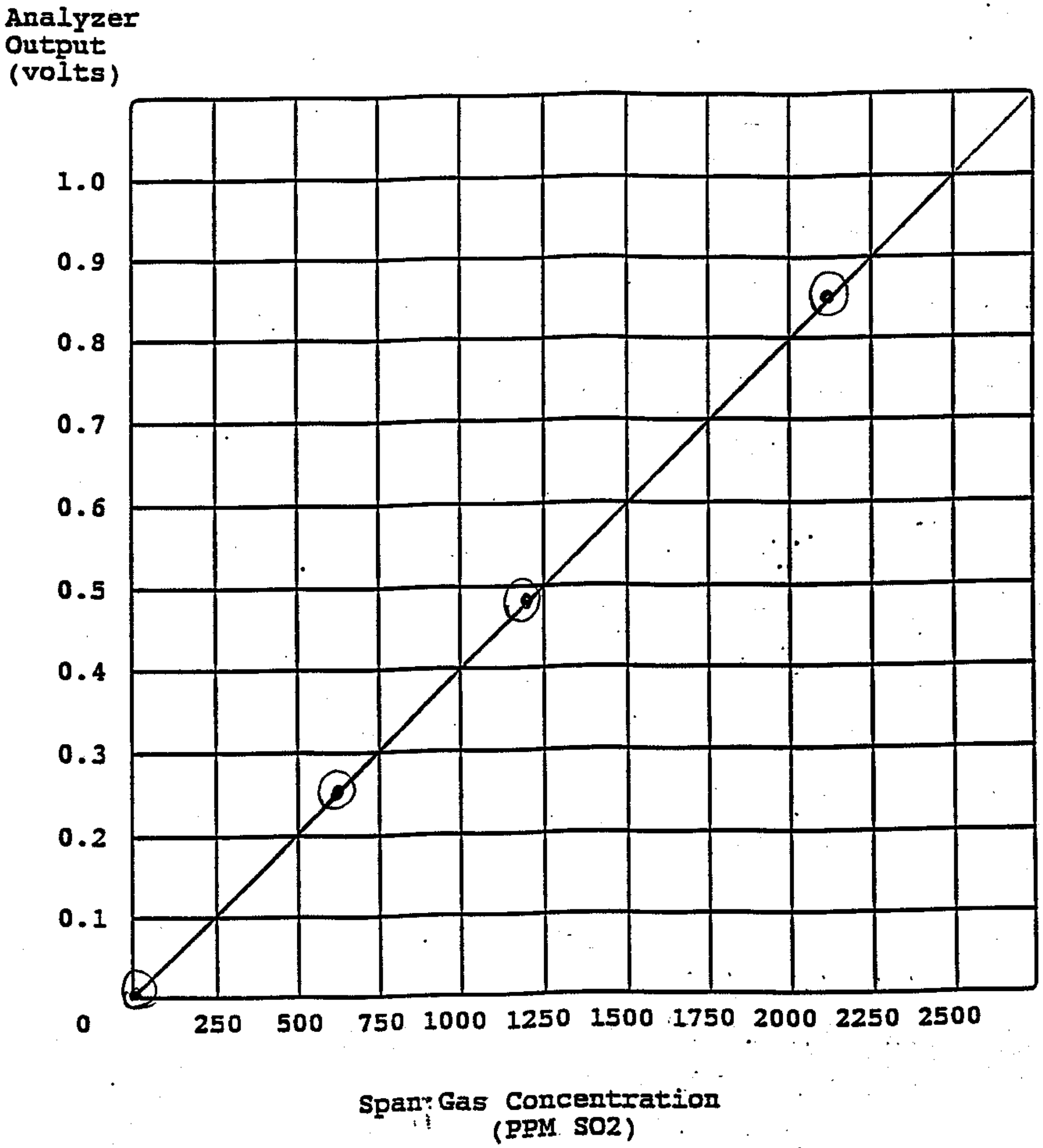
Analyzer: Calibrated Range: 0-2500 PPM Output: 0-1.0
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ___

Calibration Results

Point	Cyl.	PPM	Expected		Actual		Adj.		%	Potentiomet	
#	#	SO2	Meter	DVM	Meter	DVM	Meter	DVM	Dif.	Unadj.	A
1	1	00.0	00.0	.000	00.1	.001	00.0	.000		4.44	4.
2	2	1232	49.3	.493	49.9	.499	49.3	.493		3.53	3.7
3	3	2127	85.1	.851	85.1	.851	—	—		—	—
4	4	626	25.0	.250	24.7	.247	—	—		—	—
5	1	00.0	00.0	.000	100.0	.000	—	—		—	—

Comments: .5 = 1251.473

Y = MX + B
Slope (M) = 0.00040066
Y Intercept (B) = -0.0013695
Correlation Coefficient (r) = 0.9999893
r^2 = 0.9999787



EPA Span Value = +/- 2.0% of 2500 PPM SO2 = +/- 50 PPM
Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/-Δ%

.851 = 2126.637 - 2127 = -.363 = -.017

.247 = 617.249 - 626 = -8.751 = -1.398

CONTROL CHART

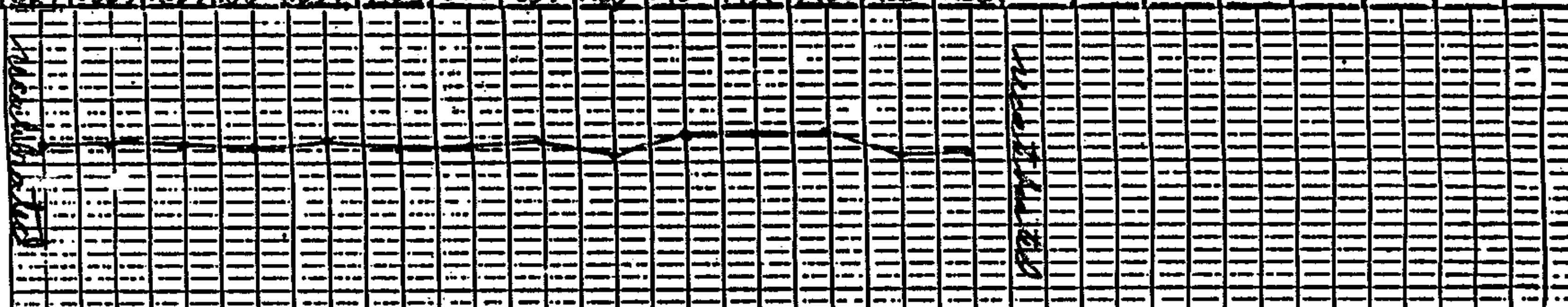
SITE EEMC - West   LOCATION Kent, WA 98032   OPERATORS WA NOWAK/JASTODDARD

PARAMETER SO_2 INSTRUMENT/SN HORIBA PIR2000 /403019   RANGE 0.0-2500 ppm SO_2

REFERENCE MATERIAL OR METHOD Zeroes and Spans with Certified Cylinder Gases

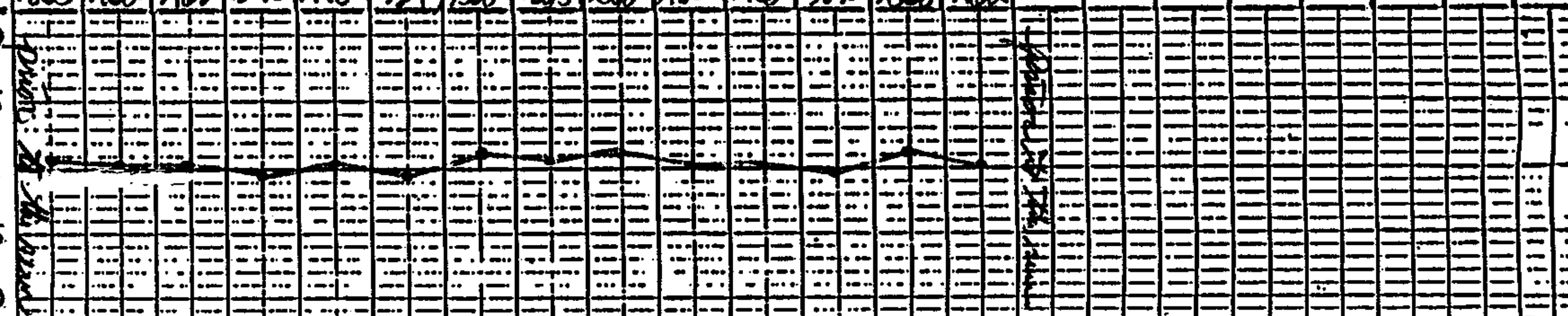
DATE	5/13	5/13	5/13	5/13	5/14	5/14	5/15	5/15	5/18	5/18	5/18	5/18	5/19	5/19								
Zero Response	8.43	8.43	8.43	5.94	8.43	5.94	5.94	8.43	3.44	10.93	10.93	10.93	3.44	3.44								
Zero Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Difference	.337	.337	.337	.237	.337	.237	.237	.337	.138	.437	.437	.437	.138	.138								

ZERO



Span Response	1036	1034	1034	1029	1034	1029	1039	1036	1039	1034	1034	1029	1029	1034								
Span Actual	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030
% Difference	.365	.162	.162	-.243	.162	-.243	.568	.365	.568	.162	.162	-.040	.568	.162								

SPAN



Zero: UWL +1.0% LWL −1.0% UCL +2.0% LCL −2.0%

Span: UWL +3.5% LWL −3.5% UCL +5.0% LCL −5.0%

COMMENTS/ ACTIONS	PRE 1 HAUGHS 507X	POST 1 HAUGHS 507X	PRE 2 HAUGHS 507X	POST 2 HAUGHS 507X	PRE 3 HAUGHS 507X	POST 3 HAUGHS 507X	PRE 4 HAUGHS 507X	POST 4 HAUGHS 507X	PRE 5 HAUGHS 507X	POST 5 HAUGHS 507X	PRE 6 HAUGHS 507X	POST 6 HAUGHS 507X	PRE 7 HAUGHS 507X	POST 7 HAUGHS 507X	PRE	POST	PRE	POST	PRE	POST	PRE	POST

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION (EEMC)

ANALYSIS OF CALIBRATION GAS MIXTURES

TEST DATE 4/29/92 SOURCE TESTED Tank LOCATION Kent WA

REFERENCE METHOD USED EPA Method

SPECIES	CALIBRATION GAS MIXTURE		GIVEN VENDOR TANK VALUE
SO_2	SAMPLE #1	1217 PPM	AL 2892
	SAMPLE #2	1220 PPM	1232 ppm
	SAMPLE #3	1219 PPM	
	AVERAGE	1219 PPM	
SO_2	SAMPLE #1	2085 PPM	CC 44776
	SAMPLE #2	2104 PPM	2127 ppm
	SAMPLE #3	2090 PPM	
	AVERAGE	2093 PPM	
SO_2	SAMPLE #1	622 PPM	AAL 5858
	SAMPLE #2	606 PPM	626 ppm
	SAMPLE #3	607 PPM	
	AVERAGE	612 PPM	
SO_2	SAMPLE #1	2148 PPM	2065
	SAMPLE #2	2190 PPM	2208 ppm
	SAMPLE #3	2179 PPM	
	AVERAGE	2172 PPM	
SO_2	SAMPLE #1	503 PPM	CC 97188
	SAMPLE #2	520 PPM	497 ppm
	SAMPLE #3	514 PPM	
	AVERAGE	512 PPM	

Data Taken By RW

Triplicate analyses of the gas mixtures shall be performed within two weel
prior to use of gas, using ref. methods 6 or 7. Analyze each mixture(5(
90%). Each test must be within 20% of the 3 test mean. This form applie
to extractive systems only.

EEMC

SO2 TANK CALCULATIONS

Date 4/29/92 Tank ID AL 2892

1232 ppm

Test # 1

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.48 cf)17.65(1.01 mcf)(30.17 + .02/13.6) / (535 A)

= 1.488 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0099 ml Ba++ = 430

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (430)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.488)

= 1217

Test # 2

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.52 cf)17.65(1.01 mcf)(30.16 + .02/13.6) / (538 A)

= 1.519 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 440

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (440)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.519)

= 1220

Test # 3

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.52 cf)17.65(1.01 mcf)(30.16 + .02/13.6) / (540 A)

= 1.513 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 438

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (439)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.513)

= 1219

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

24-Sep-91
PACIFIC RIM OXYGEN

P.O. NO.: 15626
TUKWILA, WA

CERTIFICATION OF CYLINDER # AL-2892

COMPONENT:	MEAN CONCENTRATION:
Sulfur Dioxide	1232 +/- 19 ppm
NITROGEN	BALANCE

Cylinder pressure: 2000 psi
Expiration date: 26-Mar-93

This mixture was prepared and analyzed following EPA Revised Traceability Protocol No.1, Section 3.0.4, per Procedure G1. The concentration of the Sulfur Dioxide was determined by direct comparison with NBS SRM 1662a, Sample No.:93-9-D, S/N FF-28200, 1013 +/- 10 ppm Sulfur Dioxide in Nitrogen, dated March 19, 1991. The analysis was performed on a Tracor Atlas 825R-D Hydrogen Sulfide Gas Analyzer, and a 856 Total Sulfur Hydrogenator, Serial #3725, with furnace 001419, s/n 9009115 operated at @1265 deg C. The last multipoint range calibration was done on August 14, 1991.

Moses Choi
Authorized signature

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ALPHAGAZ

DIVISION OF LIQUID AIR CORPORATION

EPA PROTOCOL NO.1 DATA SHEET COMPONENT:SULFUR DIOXIDE 304-1317

NBS SRM 1662a FF-28200 93-9-D 1013 +/- 10 ppm SO2 in N2

	TRIAD #1	TRIAD #2	TRIAD #3	TRIAD #4	TRIAD #5	TRIAD #6
DATE	09/17/91	09/17/91	09/17/91	09/24/91	09/24/91	09/24/91
UNITS	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10
FF-28200	7.450	7.460	7.470	8.000	7.950	7.900
ZERO	0.000	0.000	0.000	0.000	0.000	0.000
AL-2892	9.120	9.120	9.140	9.590	9.630	9.620

EPA PROTOCOL NO.1 WORK SHEET COMPONENT:SULFUR DIOXIDE 304-1317

NBS SRM 1662a FF-28200 93-9-D 1013 +/- 10 ppm SO2 in N2

	TRIAD #1	TRIAD #2	TRIAD #3	TRIAD #4	TRIAD #5	TRIAD #6
DATE	09/17/91	09/17/91	09/17/91	09/24/91	09/24/91	09/24/91
UNITS	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10
FF-28200	7.450	7.460	7.470	8.000	7.950	7.900
ZERO	0.000	0.000	0.000	0.000	0.000	0.000
AL-2892	9.120	9.120	9.140	9.590	9.630	9.620
ASSAYS:	1240.08	1238.41	1239.47	1214.33	1227.07	1233.55
	VALID	VALID	VALID	VALID	VALID	VALID

TRIADS 1,2,3 MEAN: 1239.3 TRIADS 4,5,6 MEAN: 1225.0

CONCENTRATION IN ppm: 1232

VARIABILITY	VDC X10	PPM x PPM
ZERO :	0.0005	0.8724
MIXd :	0.0005	0.8724
LINEARITY :	0.0100	348.94

TOLERANCE SQRT SUM : 19 ppm

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EEMC

SO2 TANK CALCULATIONS

Date 4/29/92 Tank ID CC 44776

9127 ppm

Test # 1

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.52 cf)17.65(1.01 mcf)(30.14 + .02/13.6)
(532 A)

= 1.535 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 760

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6])
Vm(std)

ppm v/v dry = (760)(32)(.0099)(13.29 X 10[-6])(10[6])
(1.535)

= 2085

Test # 2

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.52 cf)17.65(1.0 mcf)(30.14 + .02/13.6)
(534 A)

= 1.529 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 764

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6])
Vm(std)

ppm v/v dry = (764)(32)(.0099)(13.29 X 10[-6])(10[6])
(1.529)

= 2104

Test # 3

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.54 cf)17.65(1.01 mcf)(30.16 + .02/13.6)
(534 A)

= 1.551 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 770

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6])
Vm(std)

ppm v/v dry = (770)(32)(.0099)(13.29 X 10[-6])(10[6])
(1.551)

= 2090

ALPHAGAZ
SPECIALTY GASES DIVISION
LIQUID AIR CORPORATION
3070 West Cedar Street, Beaumont, Texas 77704
Telephone (409) 835-3958

ANALYSIS CERTIFICATION

CANDIDATE GAS STANDARD

SERIAL NUMBER ______ CC-44776
CONCENTRATION ______ SULFUR DIOXIDE 2127 PPM
BALANCE GAS ______ NITROGEN BALANCE
PRESSURE (PSIG) ______ 1800 PSIG
DATE OF ASSAY/CERTIFICATION ______ 5-13-88
CERTIFICATION EXPIRATION DATE ______ 5-2-89

SRM REFERENCE STANDARD

STANDARD REFERENCE MATERIAL NUMBER ______ 1696
SRM SERIAL NUMBER ______ 18203
SRM CONCENTRATION ______ 3172 PPM

ANALYZER READINGS FOR CALCULATIONS:

FIRST ANALYSIS	SECOND ANALYSIS	
DATE 5-6-88	DATE 5-13-88	
(1) 2137	(1) 2118	
(2) 2133	(2) 2122	
(3) 2127	(3) 2125	
MEAN 2132	MEAN 2122	REPORTED MEAN 2127

ANALYZER USED

MAKE ______ AIR LAB
MODEL ______ TC 100
SERIAL NUMBER ______ 003
MEASUREMENT PRINCIPLE ______ THERMAL CONDUCTIVITY
DATE OF LAST MULTIPOINT CALIBRATION ______ 5-5-88

THIS NBS-TRACEABLE CERTIFICATION WAS PERFORMED ACCORDING TO EPA PROTOCOL 1, SECTION 2.0.7, SUBSECTION 2.0.7.1 PROCEDURE G1: ASSAY AND CERTIFICATION OF A COMPRESSED GAS STANDARD WITHOUT DILUTION.

CERTIFIED BY:

LABORATORY: ALPHAGAZ- BEAUMONT, TEXAS
ANALYST: WOODROW MOCK
AUTHORIZED SIGNATURE ______ WMock

EEMC

SO2 TANK CALCULATIONS

Date 4/29/92 Tank ID AAL 5858

(626 ppm)

Test # 1

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.48 cf)17.65(1.01 mcf)(30.12 +.02/13.6)
(534 A)

= 1.488 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 220

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6])
Vm(std)

ppm v/v dry = (220)(32)(.0099)(13.29 X 10[-6])(10[6])
(1.488)

= 622

Test # 2

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.50 cf)17.65(1.01 mcf)(30.12 +.02/13.6)
(534 A)

= 1.508 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 216

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6])
Vm(std)

ppm v/v dry = (216)(32)(.0099)(13.29 X 10[-6])(10[6])
(1.508)

= 606

Test # 3

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.48 cf)17.65(1.01 mcf)(30.14 +.02/13.6)
(536 A)

= 1.484 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 214

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6])
Vm(std)

ppm v/v dry = (214)(32)(.0099)(13.29 X 10[-6])(10[6])
(1.484)

= 607

SCOTT SPECIALTY GASES — a division of Scott Environmental Technology, Inc.

Project # : [illegible]
Your P.O. # : VERBAL
Expiration : 11/01/89

SAN BERNARDINO, CA 92411 PHONE : 714-887-2571 FAX : 714-887-0549

Report:
ENERGY & ENVIRONMENTAL MEASUREMENT CORP.
[illegible] SOUTH CENTRAL
UNIT [illegible]
KENT, WA 98032
ATTN: [illegible]

******** CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES ******

Certified Per Traceability: (Protocol # 1) (Procedure # G1)

Certified Accuracy 1% NBS Traceable to : CRM [illegible]

Cylinder Number	Component	Analysis	Balance Gas	Pressure
AAL-5383	SULFUR DIOXIDE	625.51 PPM	NITROGEN	1900 psi

REFERENCE STD

REF TYPE	CYLINDER NUMBER	CONCENTRATION
CRM	AAL-19649	948.2 PPM

GAS ANALYZER

MAKE/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
DU PONT 400 2759	04/14/88	ULTRA-VIOLET

Analysis Equation: = -4.[illegible] ppm + 13.7122 *mV + 1.2E-02 *(mV)^2 +

FIRST ANALYSIS

ANALYZER READINGS Date :04/27/88

TEST GAS (mV)	REFERENCE GAS (mV)	ZERO GAS (mV)	RESULTS (ppm)
43.40	64.60	0.00	626.01
43.40	64.60	0.00	626.01
43.40	64.60	0.00	626.01

AVERAGE : 626.01
STD DEV. : 0.00

SECOND ANALYSIS

ANALYZER READINGS Date :05/[illegible]

TEST GAS (mV)	REFERENCE GAS (mV)	ZERO GAS (mV)	RESULTS (ppm)
43.40	64.60	0.00	626.01
43.30	64.60	0.00	624.51
43.40	64.60	0.00	626.01

AVERAGE : [illegible]
STD DEV. : [illegible]

*CRM - CERTIFIED REFERENCE MATERIAL (N.B.S.)

Analyst: [illegible]

Approved by : James H. Ross

EEMC

SO2 TANK CALCULATIONS

Date 4/29/92 Tank ID CC97188 (497 ppm)

Test # 1

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.50 cf)17.65(1.01 mcf)(30.18 + .02/13.6) / (536 A)

= 1.506 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 180

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (180)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.506)

= 503

Test # 2

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.50 cf)17.65(1.01 mcf)(30.18 + .02/13.6) / (536 A)

= 1.506 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 186

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (186)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.506)

= 520

Test # 3

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.54 cf)17.65(1.01 mcf)(30.18 + .02/13.6) / (538 A)

= 1.540 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 188

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (188)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.540)

= 514

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

08-Aug-91
PACIFIC RIM OXYGEN

P.O.#: 155901
TUKWILA, WA

CERTIFICATION OF CYLINDER # CC-97188

COMPONENT:	MEAN CONCENTRATION:
Sulfur Dioxide	497 +/- 19 ppm
NITROGEN	BALANCE

Cylinder pressure: 2000 psi
Expiration date: 07-Feb-93

This mixture was prepared and analyzed following EPA Revised Traceability Protocol No.1, Section 3.0.4, per Procedure G1. The concentration of the Sulfur Dioxide was determined by direct comparison with NIST SRM 1661a, Sample No.:94-36-E, S/N FF28536, 485 +/- 5 ppm Sulfur Dioxide in Nitrogen, dated May 14, 1990. The analysis was performed on a Tracor Atlas 825R-D Hydrogen Sulfide Gas Analyzer, and a 856 Total Sulfur Hydrogenator, Serial #3725, with furnace 001419, s/n 9009115 operated at @1265 deg C. The last multipoint range calibration was done on July 24, 1991.

Moses Choi
Authorized signature

2445 South Street • P.O. Box 5548 • Long Beach, CA 90805 • Phone (213) 492-5300 • Fax (213) 492-5349

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

EPA PROTOCOL NO.1 DATA SHEET COMPONENT:SULFUR DIOXIDE 0-600 ppm
NBS SRM 1661a FF28536 94-36-E 485 +/- 5 ppm SO2 in N2

	TRIAD #1	TRIAD #2	TRIAD #3	TRIAD #4	TRIAD #5	TRIAD #6
DATE	07/19/91	07/19/91	07/19/91	08/08/91	08/08/91	08/08/91
UNITS	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10
FF-28536	8.83	8.82	8.82	8.80	8.82	8.83
ZERO	0.00	0.00	0.00	0.00	0.00	0.00
CC-97188	9.03	9.05	9.07	9.02	9.04	9.03

EPA PROTOCOL NO.1 DATA SHEET COMPONENT:SULFUR DIOXIDE 0-600 ppm
NBS SRM 1661a FF28536 94-36-E 485 +/- 5 ppm SO2 in N2

	TRIAD #1	TRIAD #2	TRIAD #3	TRIAD #4	TRIAD #5	TRIAD #6
DATE	07/19/91	07/19/91	07/19/91	08/08/91	08/08/91	08/08/91
UNITS	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10
FF-28536	8.83	8.82	8.82	8.80	8.82	8.83
ZERO	0.00	0.00	0.00	0.00	0.00	0.00
CC-97188	9.03	9.05	9.07	9.02	9.04	9.03
ASSAYS:	495.99	497.65	498.75	497.13	497.10	495.99
	VALID	VALID	VALID	VALID	VALID	VALID

TRIADS 1,2,3 MEAN: 497.5 TRIADS 4,5,6 MEAN: 496.7
SULFUR DIOXIDE CONCENTRATION IN ppm: 497

VARIABILITY	VDC	PPM x PPM
ZERO :	0.0005	0.0885
SRM :	0.0300	318.6225
SRMd :	0.0010	0.3540
MIXd :	0.0010	0.3540
LINEARITY :	0.0100	35.4025

TOLERANCE SQRT SUM : 19 ppm

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SO2 TANK CALCULATIONS

Date 4/29/92 Tank ID 2065

(2208 ppm)

Test # 1

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.52 cf)17.65(1.01 mcf)(30.16 + .02/13.6)
(536 A)

= 1.525 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 778

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (778)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.525)

= 2148

Test # 2

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.50 cf)17.65(1.01 mcf)(30.16 + .02/13.6)
(538 A)

= 1.499 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 780

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (780)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.499)

= 2190

Test # 3

Gas Volume - Dry Standard Conditions

Vm (std) = VmKY[Pb+(ΔH/13.6)]/Tm

Vm(std) = (1.52 cf)17.65(1.01 mcf)(30.16 + .02/13.6)
(538 A)

= 1.519 dscf

Concentration SO2 - ppm v/v dry

Normality (N) = .0099 ml Ba++ = 786

ppm v/v dry = (ml Ba++)(32)(N)(13.29 X 10[-6])(10[6]) / Vm(std)

ppm v/v dry = (786)(32)(.0099)(13.29 X 10[-6])(10[6]) / (1.519)

= 2179

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

DATE: March 3, 1990 EXPIRATION DATE: September 3, 1

CUSTOMER: A L Compressed Gas P. O. NUMBER: 202

CERTIFICATION OF CYLINDER AL 2065, PRESSURE 1990 psig

1. These gases were analyzed and certified according to EPA protocol =
2. Thermo-Electron Model 43a Analyzer using EPA method EQSA 0486 060 w used for the analysis. The date of the analyzer's last audit was 12/5/1989.
3. National Institute of Standards and Technology's standard reference material 1664a which is 2339. ppm in sulfur dioxide in cylinder FF18327, which expires 12/27/91 was used as the reference.
4. Brooks flow controllers, model 5850 which was calibrated 3/5/90 was used to dilute the sample into the range of the analyzer.

DATA

2/27/91					
Blank	0.000	0.000	0.000		
SRM	1.086	1.087	1.088		
AL2065	1.033	1.028	1.028	Indicated SO2	2212 ppm
3/9/91					
Blank	0.000	0.000	0.000		
SRM	1.164	1.051	1.054		
AL2065	1.093	1.094	1.091	Indicated SO2	2204 ppm

Average 2208. ppm Sulfur Dioxide
In NITROGEN balance

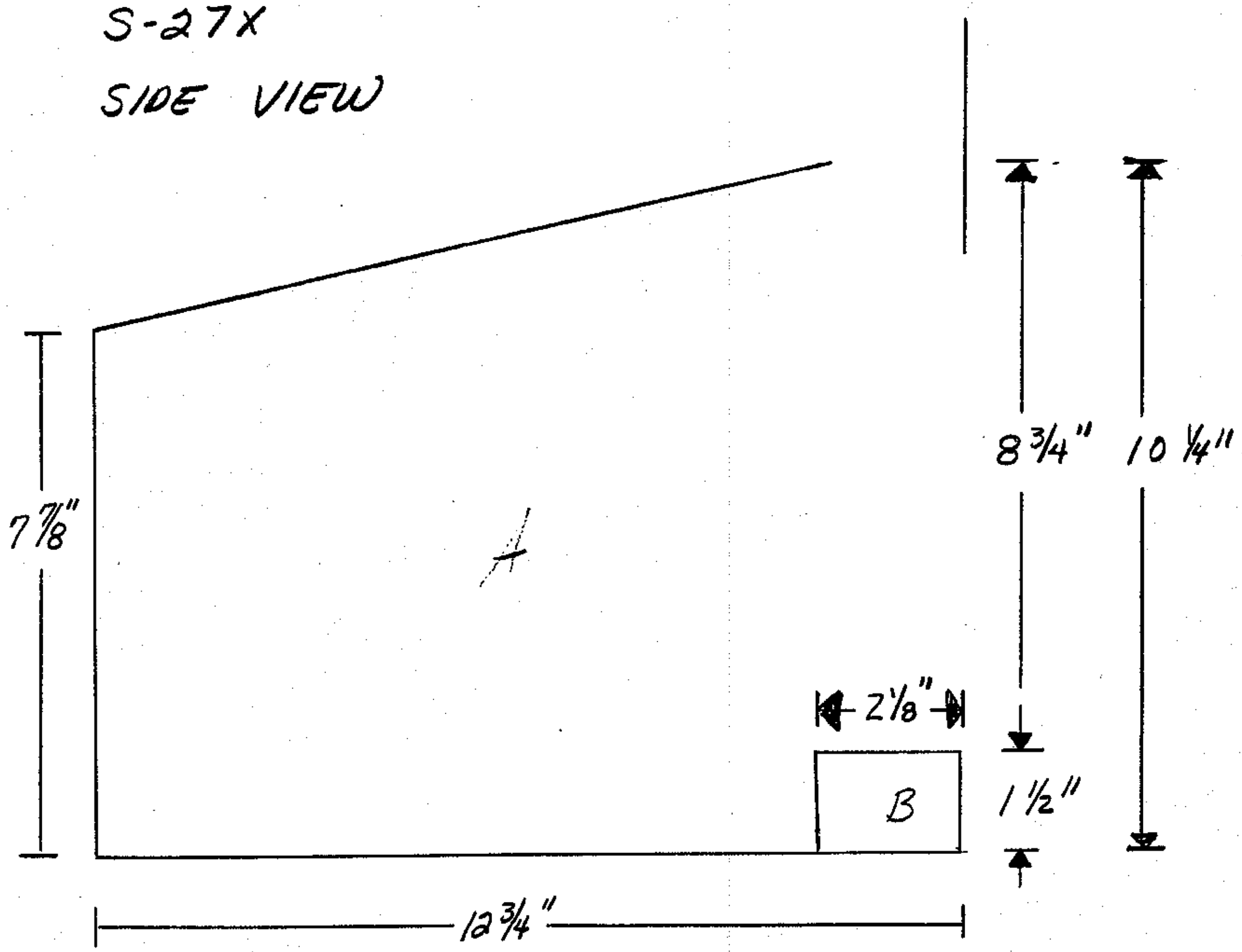
Analyst

0

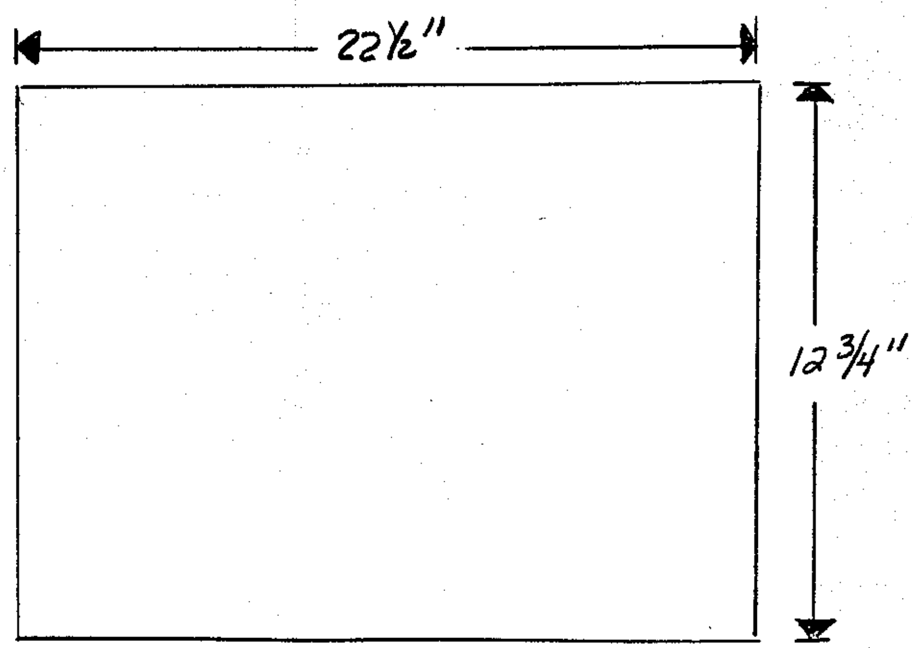
HAUGHS PRODUCTS

S-27X

SIDE VIEW



TOP VIEW



VOLUME CALCULATIONS

$$A = \frac{7.875 + 10.25}{2} \times 12.75 \times 22.5 = 2599.805$$

$$B = 2.125 \times 1.5 \times 22.5 = 71.719$$

$$A - B = 2599.805 - 71.719 = 2528.086$$

$$2528.086 \div 1728 = 1.463 \text{ cu/ft}$$

$1.463 \times 7 = 10.241$ IDEAL FUEL LOAD

$\pm\ 10.241 = 11.2 - 9.3$ FUEL LOAD RANGE

$5/6 \times 22.5 = 18.75$ FUEL LOAD LENGTH

...a Court
...pton, Ontario
...ada L6T 5C1
...ONE: 416-792-8000
...AX: 416-792-8053

Haugh's
HAUGH'S PRODUCTS

Forest Home Industrial Park
Orillia, Ontario
Canada L3V 6H1
PHONE: 705-325-4155
FAX: 705-325-8816

S270X STOVE LAB INSTRUCTIONS

Air settings for the various burn categories are as follows:

Maximum Burn:	Primary air fully open
Medium High:	Slider set 1/4 - 1/2 inch from closed position
Medium Low:	Slider set 1/8 inch from closed position or completely closed for minimum burn rate possible (below 1.00 kg/hr.)
During First 5 min:	Medium High & Medium Low Keep door cracked between 1/2 inch to 1 inch. Close door at 4½ minutes. Adjust door if wood does not seem to be igniting. Air setting fully open until 4 minutes 50 seconds then slowly adjusted to burn rate setting at 5 minutes.
Maximum Burn Rate:	Keep door cracked between 1/2 to 1 inch. Adjust door if wood does not seem to be igniting. Air setting fully open. Close door at 5 minutes.

NOTE: -All dimensions are taken from left primary opening.
-Fan is turned off for first 30 minutes of test and then turned on to high.

R.G. Geroux

RECEIVED MAY 13 1992
at EEMC

FAX TO EPA - 5/13
UPS TO EPA - 5/13 1Z27 3316 096