



TEST REPORT

SCOPE: EMISSIONS AND OUTPUT

FUEL: EPA TEST FUEL (CRIBS)

TEST STANDARD: EPA

MODEL: DECO WOOD STOVE

Notice to reader: Our Deco 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 Muldowney Lane
Billings, Montana 59101
(406) 252-4450

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

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CONFIDENTIAL

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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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CONFIDENTIAL

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Stove QC		varies
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Photos

This section contains two photographs of the fuel load for each test run and two color photographs (side and front view) of the wood heater tested and any other photographs pertinent to testing the unit.

PHOTOS varies

Appendices:

A - Example Calculations

B - Installation Description and Operating Instructions

REPORT CERTIFICATION

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

Date _____

Signature

Bill Munk

M5H INDIVIDUAL TEST RUN PAGE INDEX
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1. Initial
 2. Semi Annual
 3. Pre/Post Weighing Check

C. Temperature

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2. Thermocouple Readout
 - a. Semi annual
 - b. Daily Check
3. Dry Gas Meter
4. Tracer Gas Injection Thermometer

D. Anemometer

1. Initial
2. Semi Annual

E. Barometer

F. Draft Gauge

G. Humidity Gauge Calibration (Sling Psychrometer)

H. Dry Gas Meter

1. Initial
2. Semi Annual
3. Post Certification Test
4. Transfer Standard Calibration
5. Wet Test Meter Calibration

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K. Tracer Gas (SO₂) Train Response Check

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2. Zero/Span Control Chart
3. Pre and Post Test Zero/Span

M. CO₂ Analyzer

1. Calibration
2. Zero/Span Control Chart
3. Pre and Post Test Zero/Span

N. O₂ Analyzer (Optional)

1. Calibration
2. Zero/Span Control Chart
3. Pre and Post Test Zero/Span

O. SO₂ Analyzer

1. Calibration
2. Zero/Span Control Chart
3. Pre and Post Test Zero/Span

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Cal Data
Cal Data

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1. Particulate Sampling Train
2. SO_2 Injection System
3. Combustion Gas ($\text{CO}_2, \text{O}_2, \text{CO}$) (CEM) Train
4. Tracer Gas (SO_2) Train

Individual Test Runs
Individual Test Runs
Individual Test Runs
Individual Test Runs
Individual Test Runs

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Data Sheet #16
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Computer Printout

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Weighted Average Calc
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Data Sheet #7
(Particulate Calc Sheet)
Table 4
Computer Printout
Table 5
Computer Printout
Table 4
Computer Printout

Data Summary

- B. Dry Burn Rate
- C. $[V_m] - [V_m(\text{std})]$

Individual Test Runs
Individual Test Runs

D. Total Gas Flow Rate (Q_{SD})

Individual Test Runs

E. Proportionality Rate (PR)

Individual Test Runs

F. Particulate Emission Rate

Individual Test Runs

17. Raw Test Data

Data Sheets 1 - 16

Individual Test Runs

18. Analytical Data

- A. Filter and Beaker Tares
- B. Solvent Blanks

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C. Particulate Catches

1. Gross
2. Blanks
3. Net
4. Gr/dscf

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D. Constant Weight Weighings

Individual Test Runs
Individual Test Runs
Individual Test Runs
Individual Test Runs
Individual Test Runs

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

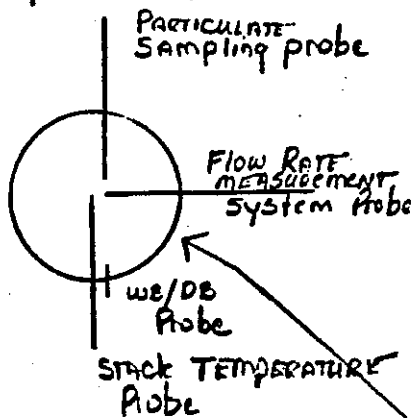
UNIT NAME

S-27X SERIES

Stack Ht. 14' 8"

15.0 ± 1 ft. (MAB, 4.1.1)

Top View
Detail



SO₂ Sampling Probe Ht 13'
13.5 ft. ± 0.5 ft (MSH, 5.1.5.2)

Stack Measurements And Sampling Port Locations

STEEL Flue Pipe Ht 8' 2"
8.5 ± 0.5 ft (MAB, 4.1.1)

SO₂ Injection Probe Ht 9'
9.5 ft ± 0.5 ft (MSH, 5.1.5.1)

WET BULB/Dry Bulb Probe Ht 8' 2"
(No Specifications given)

Particulate Sampling Probe
Ht. 8' 8.0 ± 0.5 ft (MSH, 5.1.2)

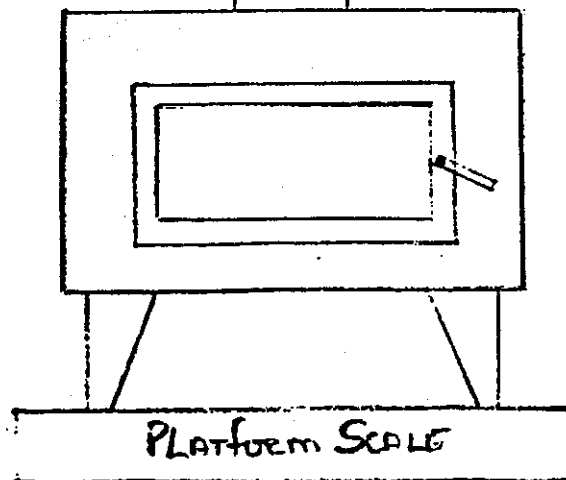
Stack Temperature Probe Ht. 8' 1"
8.5 ± 0.5 ft (DEQ, 3.3.1)

Flow Rate Measurement System Probe
Ht. 8' 3" 7.5 ± 1.0 ft (MSH, 5.1.6)

Cutaway Detail on
Barometric Oil Seal

Store Ht at the flue collar 2' 4"

Static Pressure Probe Ht 2' 11"
2.0 ft above flue connector (MAB, 6.2.3)



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:

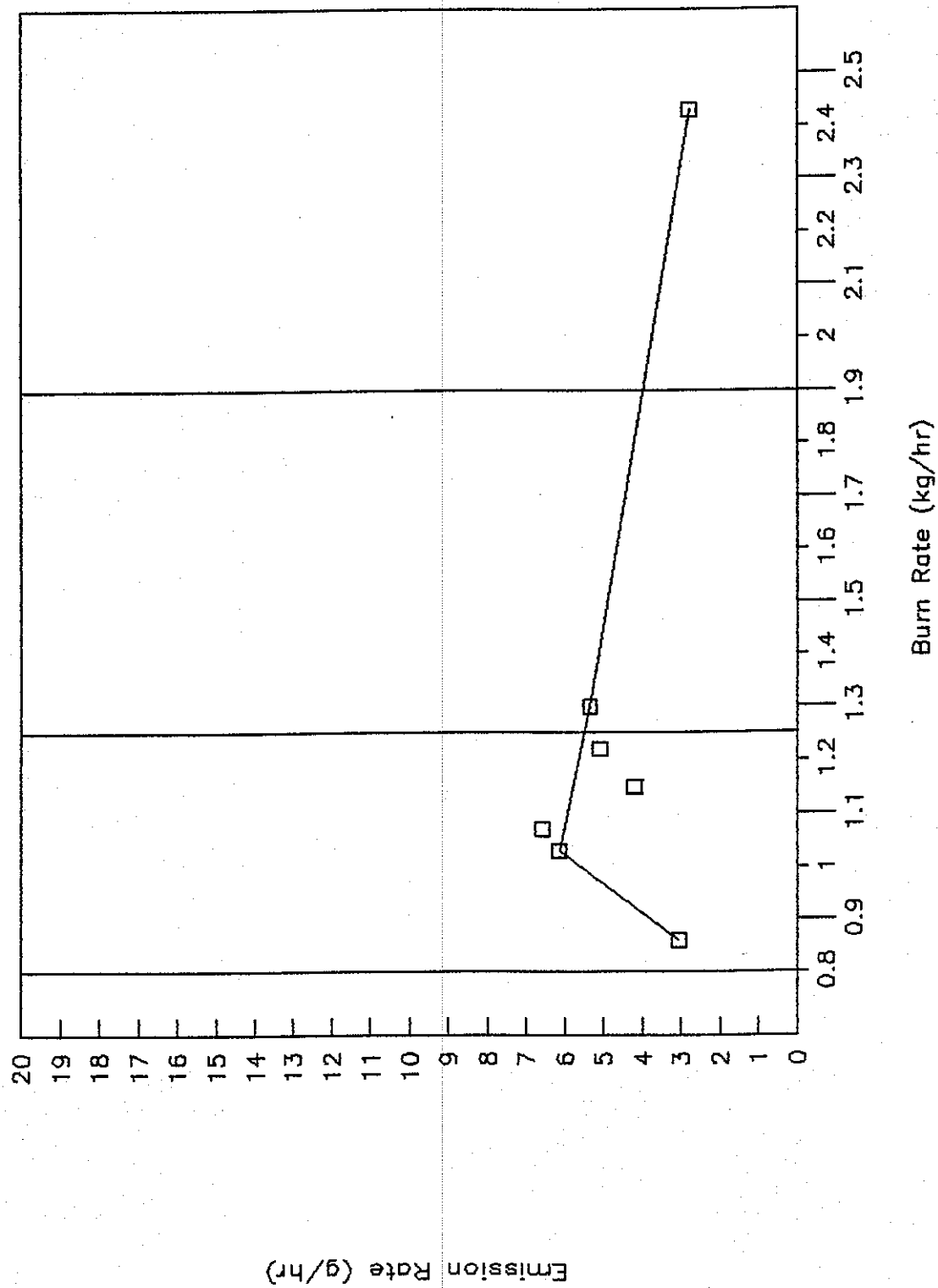
Sampling Method: 5H

=====

	Run no.	Burn Rate (kg/hr)	Emission Rate (g/hr)	Heat Output (Btu/hr)	Wtd Avg (g/hr) 4.4
	3	0.86	3.07	10370	
L	2	1.03	6.14	12420	S12034
ML	4	1.30	5.34	15676	Door
ML	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
<u>Particulate Emissions:</u>							
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
<u>Efficiency Values:</u>							
Overall Appliance Efficiency							%
Combustion Efficiency							%
Heat Transfer Efficiency							%
<u>Heat Output:</u>							
Avg. BTU/hr for test cycle							BTU/hr
<u>Fuel Burn Rates:</u>							
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

Fuel Moisture Content:	RUN #						
	3	2	4	1	5	6	7
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 -	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 ₂ O
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
<u>Average Temperatures:</u>							
Stack Gas	241	271	274	385	268	228	211 OF
Primary Combustion Chamber Gas	734	801	861	1114	820	864	810 OF
Secondary Combustion Chamber Gas	781	813	974	1157	910	898	825 OF
Catalytic Combustor Exit Gas							OF
Stove Top	272	297	349	469	382	363	323 OF
Stove Left Sidewall	316	319	360	472	369	359	332 OF
Stove Back	217	236	247	377	417	251	225 OF
Stove Right Sidewall	247	264	274	349	274	272	330 OF
Stove Bottom	332	359	371	444	362	353	341 OF
Stove Temperature Change	-95	-33	-91	-74	-78	-47	-90 OF

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 OF
Avg. & Ambient Moisture	1.20	1.10	1.20	1.15	1.35	1.30	1.25 % H ₂ O
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 ₂ O

Test Fuel Weight and Burn Time:

Density (Dry basis)	.6561	.6171	.4732	.5604	.4693	.4934	.6599 gm/cm ³
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.

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. (Vlc) -----	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 H2O

AVG PRCNT

CO

1.07

%

AVG METER

TEMP. Tm

----- 91 deg F

AVG PRCNT

CO2

5.21

%

AVG PPM

SO2

----- 595 PPM

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS

TEST No. : 3

MODEL: S-27X

DATE: 5/14/92

STD SAMPLE			STACK GAS		
VOL. Vm(std) -----	90.57 dscf		FLOW Qsd -----	404.988 dscf/Hr	
				&	
				6.75 dscf/min	
VOL. WATER			PARTICULATE		
VAPOR Vw(std) -----	6.322 scf		CONCTRT. C s -----	0.0076 g/dscf	
PRCNT			PARTC.EMISS.		
MSTR Bws -----	6.52 %		RATE E -----	3.07 g/Hr	
BURN			MOLES OF GAS		
RATE BR -----	0.86 Kg/Hr		PER Lb WOOD Nt ----	0.56 Lb-mole/Lb	
CO EMISSION			PART.EMISS.		
RATE -----	145.43 g/Hr		RATE -----	3.58 g/Kgdry	
	&			fuel	
	169.89 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. S270X
 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 "H₂O
 (0.000) (Data Sheet #12) ✓
 Barometric Pressure 30.01 "Hg
 (00.00) (Data Sheet #2) ✓
 Temperature (Average Room) Combustion Air 78 °F
 (00) (Data Sheet #14) ✓
 Flue Gas Moisture 6.5051 %
 (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 °F
 (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 10.7 lbs
 (00.0) (Data Sheet #8) ✓
 Total Particulate Catch 16860 g
 (0.0000) (Data Sheet #6) ✓
 H₂O 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: 45-1.066 Post Test Leak Rate 002 CFM ✓

Meter Box 4J Y Factor 1.066Unit: HAUGHS S27XLeak Checks: 15 " Hg @ .002 cfm
15 " Hg @ .002 cfm
" Hg @ cfm
" Hg @ cfmRun: 3 Date: 5/14/92Operator(s): BN JS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>.18</u>			Sampling Ratio: <u>.00</u> : 1			BAROMETER: <u>30.05</u>			
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC	
00	1115	509.200	6.091	.15	82	575	75	0	
05	00	530.700	8.756	.31	80	400	75	5	
10	05	532.903	5.389	.10	83	650	75	1.5	
15	30	534.264	5.594	.13	84	605	76	0	
20	35	535.626	5.378	.10	85	650	76	0	
25	40	537.057	6.069	.15	85	575	77	0	
30	45	538.608	6.345	.16	86	650	77	.5	
35	50	540.035	6.345	.16	87	550	77	1.0	
40	55	541.868	6.634	.18	88	505	78	1.0	
45	1000	543.584	7.333	.20	88	475	78	1.0	
50	5	545.481	7.333	.20	89	475	78	1.5	
55	10	547.385	7.240	.24	89	450	78	1.5	
ROTO PRESS: <u>.18</u>			TOTALS			BAROMETER: <u>30.03</u>			
60	15	549.394	7.735	.24	90	450	78	1.5	
65	20	551.413	7.308	.20	90	475	78	2.0	
70	25	553.305	7.308	.20	91	475	78	1.5	
75	30	555.044	7.735	.24	91	450	78	1.5	
80	35	557.069	7.735	.24	91	450	78	1.5	
85	40	559.095	7.701	.24	92	450	79	1.5	
90	45	561.308	7.314	.21	92	475	79	1.5	
95	50	563.054	7.301	.21	92	475	80	1.5	
100	55	565.180	7.087	.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	505	81	1.5	
115	10	570.699	6.903	.19	93	500	81	1.0	
			TOTALS			MAX VACC =			
TOTAL CU FT			TOTALS:			AV BP:			

60.08

Meter Box 45 Y Factor 1.066Unit: HAWAII S02XLeak Checks: 15 " Hg @ .002 cfm
15 " Hg @ .002 cfm
" Hg @ cfm
" Hg @ cfmRun: 3 Date: 5/14/92Operator(s): BNSS

Inject S02 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>.18</u>			Sampling Ratio: <u>20</u> : 1			BAROMETER: <u>29.99</u>			
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	S02 PPM	ROTO TEMP	PUMP VACC	
120	15	572.536	6.572	.17	93	505	82	1.0	
125	20	574.887	6.873	.16	93	500	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	579.095	5.751	.13	93	600	82	1.0	
145	40	580.558	5.751	.13	93	600	82	1.0	
150	45	582.091	5.501	.12	93	605	82	1.0	
155	50	583.563	5.501	.12	93	605	82	1.0	
160	55	585.035	5.501	.12	93	605	82	1.0	
165	1400	586.507	5.501	.12	93	605	82	1.0	
170	5	587.979	5.501	.12	93	605	82	1.0	
175	10	589.450	5.501	.12	93	605	82	1.0	
ROTO PRESS: <u>.18</u>			TOTALS: <u>68.975</u>			BAROMETER: <u>29.99</u>			
180	15	590.902	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: <u>60.651</u>			MAX VACC =			
TOTAL CU FT			TOTALS: <u>109.626</u>			AV BP: <u> </u>			

8916.556 7.54 4355 100.06

Meter Box 45 Y Factor 1.066Unit: HAUGHS S02XLeak Checks: 15 " Hg @ 1000 cfm
15 " Hg @ 1000 cfm
" Hg @ 1000 cfmRun: 3 Date: 5/14/90Operator(s): BN 55

Inject S02 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>1.12</u>			Sampling Ratio: <u>20</u> : 1			BAROMETER: <u>29.99</u>		
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	S02 PPM	ROTO TEMP	PUMP VACC
240	15	609.064	4.909	.10	90	700	80	.5
245	20	608.374	4.909	.10	90	700	80	.5
250	05	609.683	4.909	.10	90	700	80	.5
255	30	610.993	4.909	.10	90	700	80	.5
260	35	610.302	4.909	.10	90	700	80	.5
265	40	613.612	4.909	.10	90	700	80	.5
270	45	614.921	4.909	.10	90	700	80	.5
275	50	616.231	4.909	.10	90	700	80	.5
280	55	617.540	4.909	.10	90	700	80	.5
285	1600		44.361	.90	90			
290	5		340.917	8.44	5103	57.5		
295	10		5.981	.148	90			
ROTO PRESS: _____			TOTALS :			BAROMETER: _____		
300								
305								
310								
315								
320								
325								
330								
335								
340								
345								
350								
355								
TOTAL CU FT <u>88.340</u>			TOTALS:			MAX VACC = <u>20</u>		
			TOTALS:			AV BP: <u>30.01</u>		

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

Initial: Balance Level ☒ Balance Zeroed ☒Final: ☒Unit: Haughe S270XRun: 3

IMPINGER #1

Date: 5/14/92Final Weight 682.9 gramsTechnician(s): Initial: TKInitial Weight 575.2 gramsFinal: SSNet 107.7 ✓ gramsApproved By: TK

IMPINGER #2

Final Weight 584.0 gramsInitial Weight 576.1 gramsNet 7.9 ✓ grams

IMPINGER #3

Final Weight 495.6 gramsInitial Weight 494.4 gramsNet 1.2 ✓ grams

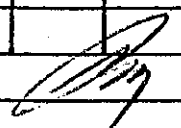
IMPINGER #4 (SILICA GEL)

Final Weight 863.0 gramsInitial Weight 845.5 gramsNet 17.5 ✓ gramsTOTAL MASS OF H₂O CAPTURED 134.300 ✓ gramsScale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 gFront Half Filter # 262F
Back Half Filter # 262BNotes: _____

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: #2.5 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	gib				
262B	0.3822		1528		.3827		1342		HAWKES RN 3			
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		.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 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	gib

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	DK				
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					
524	106.8567		1050		106.8571		1420					
525	95.1170		1052		95.1173		1422					

} HANGERS R3

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	DK

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	OK	94.2410	5/18	938	OK	94.9407	5/18	1506	OK				
507		5/15	0900	OK	89.1641	5/18	940	OK	89.1643	5/18	1508	OK				
508		5/18	0900	OK	103.1823	5/19	932	OK	103.1891	5/19	1711	OK				
509		5/18	0900	OK	95.8094	5/19	934	OK	95.8093	5/19	1713	OK				
510		5/15	0900	OK	104.9182	5/18	942	OK	104.9180	5/18	1530	OK				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
0602		5/14	1635	OK	8385	5/15	1246	BN	0.8307	5/18	944	OK	8303	5/18	1534	OK
0603		5/14	1635	OK	7.4637	5/15	1244	BN	0.4614	5/18	946	OK	4615	5/18	1536	OK

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	5/5	1200	BN	60	74	44
2	5/18	1316	OK	58	71	45
3	5/18	1500	OK	59	73	43
4	5/19	1330	OK	57	70	44
5	5/19	1700	OK	57	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	0.9997	0.1000			DK	4/24	1130	74	57	41
99.9996	10.0000	0.9998	0.1000			DK	4/24	1830	70	57	41
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	0.9998	0.0999			DK	4/28	1330	71	57	47
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	4/30	0846	77	67	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	956	71	61	39
99.9997	9.9999	1.0000	0.1000			DK	5/1	1800	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/1	930	78	62	40
100.0002	10.0002	1.0001	0.1000			DK	5/5	1010	75	60	41
100.0000	10.0001	1.0000	0.1001			DK	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	0.1000			DK	5/6	1540	75	59	44
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			DK	5/7	1445	71	59	44
99.9996	10.0001	1.0001	0.1001			DK	5/8	1105	65	54	40
99.9998	10.0001	0.9999	0.0998			DK	5/8	1650	68	56	42
99.9996	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			DK	5/12	0900	74	60	44
99.9997	10.0001	1.0000	0.0999			DK	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	0.1001			DK	5/14	1636	70	60	41
99.9998	9.9999	0.9997	0.0999			DK	5/15	1000	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/15	0900	71	58	45
100.0003	10.0000	1.0000	0.1001			DK	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	0.9999	0.0999			DK	5/19	1707	70	56	41

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
99.9999	10.0000	1.0001	0.1001			DK	2/6	1315	68	56	47
99.9999	10.0000	1.0000	0.1000			DK	2/7	0915	65	54	48
100.0001	9.9999	1.0001	0.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	0.1000			DK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	73	62	48
100.0000	10.0000	1.0000	0.1000			DK	2/10	0100	72	59	47
99.9999	10.0001	1.0000	0.1001			DK	2/11	0900	71	61	47
100.0001	10.0000	1.0001	0.1000			DK	2/12	0920	68	61	47
100.0003	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9997	10.0000	1.0000	0.1000			DK	2/12	0850	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0000	1.0001	0.1000			DK	2/13	1230	73	62	48
99.9998	10.0000	1.0001	0.1000			DK	2/13	1535	75	62	48
100.0000	9.9999	1.0000	0.1000			DK	2/14	0930	77	63	49
100.0000	10.0000	1.0000	0.1000			DK	2/14	1240	76	62	49
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	49
100.0000	10.0001	1.0000	0.0999			DK	2/14	0820	65	54	48
99.9999	10.0000	0.9999	0.1000			DK	2/17	0856	65	54	48
99.9999	10.0001	1.0000	0.1000			DK	2/17	1000	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	0915	71	58	45
100.0000	9.9999	1.0000	0.0999			DK	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	0.9999	0.0999			DK	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			DK	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			DK	3/4	1130	72	59	46
99.9999	10.0000	1.0000	0.1000			DK	3/5	0935	70	58	48
99.9999	10.0000	0.9999	0.0999			DK	3/6	0830	73	60	47
99.9998	10.0000	0.9999	0.0998			DK	3/6	1400	70	60	47
99.9998	10.0000	0.9999	0.1000			DK	3/9	1050	71	59	49
99.9999	10.0000	0.9999	0.1000			DK	3/9	1340	74	60	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0930	75	60	41
99.9996	10.0000	1.0000	0.0999			DK	3/11	1005	70	57	44

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEETDates: From 3/12Through 4/03Scale Sartorius
Model AI205
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			OK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	0.1000			OK	3/16	1309	74	60	44
100.0000	10.0001	1.0002	0.1000			OK	3/17	0900	70	57	44
100.0000	10.0001	1.0000	0.1001			OK	3/17	1607	71	59	49
99.9997	9.9999	0.9999	0.0998			OK	3/19	1715	74	59	47
100.0000	10.0000	1.0000	0.0998			OK	3/20	1500	74	60	44
100.0000	10.0000	1.0003	0.1003			OK	3/23	0945	73	59	43
99.9994	10.0000	1.0003	0.1003			OK	3/24	0945	72	58	42
100.0001	9.9999	1.0001	0.1002			OK	3/25	1035	76	61	40
100.0001	9.9996	1.0000	0.1001			OK	3/26	1043	73	59	43
99.9997	9.9999	1.0001	0.1000			OK	3/27	1140	77	60	40
99.9996	10.0000	1.0001	0.1000			OK	3/30	0930	68	56	47
99.9999	10.0004	1.0001	0.1000			OK	3/30	1000	71	57	41
100.0003	10.0000	1.0000	0.1000			OK	3/31	1076	73	59	43
99.9995	10.0000	1.0000	0.1000			OK	4/1	0915	76	60	38
99.9998	9.9997	0.9997	0.1000			OK	4/0	0900	73	59	43
99.9997	10.0001	0.9999	0.0999			OK	4/3	0900	72	59	46
99.9999	10.0001	0.9999	0.0999			OK	4/3	1630	70	58	48
100.0000	9.9999	0.9998	0.1000			TK	4/6	0936	68	57	39
99.9999	9.9998	0.9999	0.0998			BN	4/6	1600	70	57	41
99.9999	9.9999	0.9999	0.0998			TK	4/7	1300	71	58	45
100.0000	9.9998	0.9999	0.0998			OK	4/8	1515	69	58	44
100.0000	9.9998	0.9999	0.0999			TK	4/9	1035	68	55	43
100.0000	10.0001	1.0000	0.1000			OK	4/10	0935	70	56	41
100.0000	9.9999	0.9999	0.0999			OK	4/10	1900	72	58	42
100.0000	10.0003	1.0002	0.1002			OK	4/13	0945	73	58	42
100.0002	10.0003	1.0001	0.0998			OK	4/14	1030	72	57	46
99.9998	10.0001	1.0001	0.0998			OK	4/15	1015	68	56	47
99.9997	9.9999	0.9998	0.0998			OK	4/16	1006	68	56	47
100.0001	9.9999	1.0000	0.1001			OK	4/17	0915	70	57	44
99.9996	9.9999	1.0000	0.1000			OK	4/19	1545	70	58	42
100.0001	10.0000	0.9999	0.1001			OK	4/20	0900	72	59	46
99.9998	10.0000	1.0002	0.1001			OK	4/21	1940	74	60	40
100.0000	10.0000	1.0000	0.0999			OK	4/23	0900	73	59	43
99.9995	10.0003	1.0000	0.1001			OK	4/03	1007	76	60	38

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAUWLS SDR0X
Run: 3 Date: 5/14/92
Technician(s): JS

FRONT HALF

FILTER #: <u>DUF</u>	BEAKER #: <u>506</u>	FINAL WT: <u>94.2407</u> g
FINAL WT: <u>8303</u> g	ml: <u>200</u>	TARE WT: <u>94.1604</u> g
TARE WT: <u>7017</u> g	desc: ACETONE	NET WT: <u>8803</u> g
NET WT: <u>1286</u> 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 #: <u>DUB</u>	BEAKER #: <u>507</u>	FINAL WT: <u>89.1643</u> g
FINAL WT: <u>4615</u> g	ml: <u>200</u>	TARE WT: <u>88.9876</u> g
TARE WT: <u>3827</u> g	desc: ACETONE	NET WT: <u>1773</u> g
NET WT: <u>0788</u> g		

FILTER #: _____	BEAKER #: <u>508</u>	FINAL WT: <u>103.1821</u> g
FINAL WT: _____ g	ml: <u>75</u>	TARE WT: <u>103.1077</u> g
TARE WT: _____ g	desc: METHCHLOR	NET WT: <u>0744</u> g
NET WT: _____ g		

BEAKER #: <u>509</u>	FINAL WT: <u>95.8093</u> g
ml: <u>200</u>	TARE WT: <u>95.7026</u> g
desc: H2O	NET WT: <u>1067</u> g

BEAKER #: <u>510</u>	FINAL WT: <u>104.9180</u> g
ml: <u>100</u>	TARE WT: <u>104.8757</u> g
desc: H2O	NET WT: <u>0423</u> g

BEAKER #: _____	FINAL WT: <u>1490</u> 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

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

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

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: .1986 g - 1 (.0000 g) = .1986 g
Total Catch No. of filters Blank Value/
filter Net Catch

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

Total Front Half Catch .2085 g

Back Half Catch:

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

Beakers:

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

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

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

Total Back Half Catch
Total Catch
% Front Half

.4775 g
.6860 g
30.39 %

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

Unit: H AUG 15 507X

Run: 3 Date: 5/14/92

Technician(s): SS TK

HST3-Form 1 8/28/91

148 " H2O

$$1) V_m(Std) = \frac{(88.340 \checkmark V_m) (17.65) (1.066 \checkmark ncf) (300 \checkmark " Hg) (13.6)}{(581 \checkmark T_{aA})} = \frac{90.5589 \checkmark}{000.0000} \text{ decf}$$

$$2) V_m(Std) = (0.04707) (134.300 \checkmark n1 H2O) = \frac{6.3015 \checkmark}{00.0000} \text{ scf}$$

$$3) A_{SH} = \frac{(6.3015 \checkmark \text{ scf})}{(6.3015 \checkmark \text{ decf}) + 90.5589 \checkmark \text{ decf}} = \frac{0.653 \checkmark}{.0000} \times \frac{6.5051 \checkmark}{00.0000} \times H2O$$

$$4) C_s = \frac{(1.6860 \checkmark g.)}{(90.5589 \checkmark \text{ decf})} = \frac{1169 \checkmark}{0.0000} \text{ gr/decf}$$

$$5) \text{ Estimated g/hr} = \frac{(\text{ } g.)}{(\text{ } \text{ decf})} \left(\frac{\text{ } \text{ decfm}}{60} \right) = \frac{\text{ } g/hr}{00.0000}$$

598

V_m = total cubic feet pulled on meter box during test
 ncf = meter correction factor (Y factor) of the meter box used for the test
 $" Hg$ = average barometric pressure during the test
 T_{aA} = average delta H for the test
 $n1 H2O$ = average meter temperature for the test in degrees Absolute
 $g.$ = total water caught during the test
 $decfm$ = total particulate catch for the test
 $decfm$ = average stack flow during the test

(p. 2) (000.000 V_m)
 (p. 2) (0.000 ncf)
 (p. 2) (00.00 " Hg)
 (p. 2) (0.000 " $H2O$)
 (p. 2) (000 T_{aA})
 (p. 3) (000.0 $n1 H2O$)
 (p. 6) (00.0000 $g.$)
 (computer printout) (00.000 $decfm$)

Unit MM0000
 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 ft³

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 $\left(\frac{2.6}{\text{Upper Wt.}} + \frac{2.2}{\text{Lower Wt.}} / 2 \right) \cdot 25 = \underline{16}$ 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.) $\frac{10.7}{2.2025} - \left(\frac{10.7}{2.2025} \times \frac{17152}{280} \right) \times \frac{60}{280} = \underline{1.856}$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (19,140) x $\frac{63}{100} \times \underline{1.856} = \underline{10,324.7}$ Est Heat Output (HO_E) BTU's/Hr

Comments: 240 = .999
195 = 1.229

Unit: HAWKHS S27X Run: 3 Date: 5/14/92 Page 9

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:	<u>2x4</u>	<u>Manke/Tacoma</u>	<u>Std or btr</u>	<u>s. grn D fir</u>
TEST:	<u>2x4</u>	<u>Packwood</u>	<u>#2 or btr</u>	<u>s. grn D fir</u>
	<u>4x4</u>	<u>Packwood</u>	<u>#2 or btr</u>	<u>s. grn D fir</u>

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 _____ .

**FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10**

Unit: HHUOH3 521A
Run: 3
Date: 5/14/92
Technician: BN TK DK JS
WST1-Form7-Rev11/89

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		Bottom		Side		Piece Avg Corrected
			Uncor	Cor	Uncor	Cor	Uncor	Cor	
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									

% Moisture - Dry Basis:

% Moisture - Wet Basis:

Kindling	Pretest Fuel	Test Load
4.167%	19.867%	21.583%
4.000%	16.574%	17.752%

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

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

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Unit: HAWAII 3211
Run#: 3
Date: 5/14/92
Technician: BN TK DK JS
WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3 1/2
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 cm³
(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:	<u>19.5</u>	<u>21.3</u>	%
Bottom:	<u>20.5</u>	<u>22.4</u>	%
Side:	<u>20.0</u>	<u>21.8</u>	%
\bar{X} :		<u>21.833</u>	%

Avg % Moisture (Dry) 21.833 %

Avg % Moisture (Wet) 17.920 %

Scale: Levelled 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

Into Dryer Date 5/14/92 Time 1000 Temp 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 ÷ 292.077 cm³ = 1.656 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

LOW FLOW AND FLOW GAS DATA
 ROOMSTOVE DATA SHEET #12
 NST2-Form 14 Rev 1/88

Unit: HARGHS S270 Series Date: 5/14/92
 Run: 3 Technician(s): BNJS, TK
 Page: 1 of 3 DK

306.7

Minute Time	Scale M	lbs left	Burn Rate	CO ₂		O ₂		CO		Rel Bulb	Dry Bulb	% H ₂ O	Calc W/B	Stack	SO ₂ V.	PPM	Static Press.	Comm
				V.	SO ₂	V.	SO ₂	Rel Bulb	SO ₂									
0 1115	317.4	10.7	Ø	.120	3.0	.664	16.8	.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	.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	.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	.55	5.4	125	150	13.0	130	221	.25	625	-038	SO ₂
20 35	316.7	10.0	.2	.123	3.1	.676	17.1	.67	4.6	121	145	11.2	127	214	.26	650	-037	CO ₂
25 40	316.3	9.6	.4	.225	5.6	.580	14.7	.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	.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	.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	.44	14.8	126	158	13.2	138	317	.21	525	-049	
45 100	314.5	7.8	.5	.281	6.0	.535	13.5	.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	.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	.24	39.8	126	164	13.0	138	342	.18	450	-053	
60 15	313.0	6.3	.6	.406	10.1	.425	10.7	.15	17.1	127	165	13.3	139	346	.18	450	-054	Flow
65 20	312.5	5.8	.5	.405	10.0	.415	10.5	.23	43.7	126	166	13.0	139	348	.19	475	-054	SO ₂
70 25	312.1	5.4	.4	.418	10.4	.404	10.2	.26	39.9	126	166	13.0	139	353	.19	475	-055	SO ₂
75 30	311.6	4.9	.5	.429	10.6	.399	10.1	.23	46.2	124	162	12.5	138	355	.18	450	-056	CO ₂
80 35	311.0	4.3	.6	.436	10.8	.385	9.7	.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	.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	.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	.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	.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	.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	.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	.47	15.9	106	139	6.7	120	285	.20	500	-044	
120 1320														3940			-047	
125 1330														7343			-045	

1

Minute	Time	Scale	lbs	Burn	CO ₂		O ₂		H ₂ O		Dry Bulb	Wet Bulb	Calc	Stack	SO ₂		Static
					v.	ACO ₂	v.	ACO ₂	%	H ₂ O					v.	PPH		Press.
120	1315	308.7	2.0	.2	.288	7.2	.512	13.0	13.0	106	141	6.7	120	285	.21	525	-0.44
125	20	308.6	1.9	.1	.223	5.6	.562	14.2	14.2	105	138	6.4	119	266	.22	550	-0.42
130	25	308.5	1.8	.1	.193	4.8	.576	14.6	14.6	107	139	7.0	119	249	.24	600	-0.39
135	30	308.4	1.7	.1	.183	4.6	.583	14.8	14.8	108	139	7.3	118	239	.24	600	-0.36
140	35	308.3	1.6	.1	.175	4.4	.592	15.0	15.0	109	138	7.5	118	232	.24	600	-0.36
145	40	308.2	1.5	.1	.165	4.1	.602	15.3	15.3	109	137	7.5	118	225	.24	600	-0.34
150	45	308.1	1.4	.1	.157	3.9	.609	15.4	15.4	109	136	7.5	118	218	.25	625	-0.33
155	50	308.0	1.3	.1	.151	3.8	.616	15.6	15.6	109	135	7.5	117	214	.25	625	-0.32
160	55	307.9	1.2	.1	.143	3.6	.624	15.8	15.8	109	134	7.5	117	207	.25	625	-0.31
165	1400	307.9	1.2	Ø	.138	3.5	.631	16.0	16.0	108	132	7.3	116	203	.25	625	-0.30
170	65	307.8	1.1	.1	.126	3.2	.645	16.3	16.3	108	131	7.3	116	198	.25	625	-0.29
175	10	307.8	1.1	Ø	.122	3.1	.650	16.5	16.5	107	129	7.2	115	192	.25	625	-0.27
180	15	307.7	1.0	.1	.113	2.8	.658	16.7	16.7	106	127	7.1	114	187	.26	650	-0.27
185	20	307.7	1.0	Ø	.107	2.7	.666	16.9	16.9	105	125	6.8	111	183	.26	650	-0.26
190	25	307.7	1.0	Ø	.108	2.7	.663	16.8	16.8	104	124	6.6	110	180	.26	650	-0.25
195	30	307.6	.9	.1	.108	2.7	.663	16.8	16.8	104	123	6.6	110	178	.27	675	-0.24
200	35	307.6	.9	Ø	.108	2.7	.663	16.8	16.8	104	123	6.6	110	176	.27	675	-0.24
205	40	307.6	.9	Ø	.107	2.7	.663	16.8	16.8	103	122	6.5	110	173	.28	700	-0.23
210	45	307.5	.8	.1	.106	2.7	.664	16.8	16.8	103	121	6.5	110	171	.28	700	-0.23
215	50	307.5	.8	Ø	.108	2.7	.660	16.7	16.7	102	120	6.3	109	169	.28	700	-0.22
220	55	307.4	.7	.1	.141	3.5	.639	16.2	16.2	102	120	6.3	109	168	.28	700	-0.21
225	1500	307.3	.6	.1	.168	4.2	.615	15.6	15.6	103	120	6.5	110	171	.28	700	-0.22
230	65	307.3	.6	Ø	.166	4.1	.619	15.7	15.7	103	120	6.5	110	172	.28	700	-0.21
235	1510	307.2	.5	.1	.157	3.9	.624	15.8	15.8	103	121	6.5	110	174	.28	700	-0.22
240	1515	307.1	.4	.1	.148	3.7	.630	15.9	15.9	102	120	6.5	110	173	.28	700	-0.21
245	1520	307.0	.3	.1	.139	3.5	.636	16.0	16.0	101	119	6.5	109	170	.28	700	-0.20
250	1525	306.9	.2	.1	.130	3.3	.642	16.1	16.1	100	118	6.5	109	168	.28	700	-0.19

2

[illegible]

Unit: HAUGHS S270 SERIES Date: 5/14/92
Run: 3 Technician(s):
Page: 1 of 1

Technician(s): BA, JS, TK
DK

306.9-306.5T/C#-3

[illegible]

**TEMPERATURES
RECORD SHEET #14
WST2-Form 14 Rev 1/88**

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

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 11:5	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 00	320	265	184	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
60 15	3322	3551	3068	3035	4545	7725	10275	922						
65 20	400	289	203	256	333	764	1224	78	1441	248	34	242	35	36
70 25	406	307	214	272	329	804	1262	78	1441	248	34	242	35	36
75 30	413	318	222	271	327	826	1284	79	1441	248	34	243	35	36
80 35	420	332	233	274	326	858	1254	79	1441	248	34	243	35	36
85 40	426	347	244	287	325	905	1289	79	1441	248	34	244	35	36
90 45	426	358	258	295	325	952	1220	79	1441	248	34	245	35	36
95 50	415	364	263	297	325	996	1229	79	1441	248	34	246	35	36
100 55	409	368	265	306	325	1016	1254	79	1441	248	34	247	35	36
105 00	410	374	271	305	326	1029	1118	79	1441	248	34	248	35	36
110 05	402	383	268	313	329	958	1077	79	1441	248	34	248	35	36
115 10	381	390	262	307	336	935	1016	79	1442	248	35	248	35	36
120 15	370	395	255	310	332	918	955	79	1444	248	35	248	35	36
125 20	4878	4225	2958	3493	3932	10961	14182	946						
130 25	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	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalytic	Room Temp	Tube Furnaces	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	236	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
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
240 1515	2281	3366	2108	2519	3771	7830	6438	943						
245 1520	13790	15498	10663	12357	16306	36468	39499	3768						

Unit: HAUGH'S S270 SERIES
Run: 3
Page: 3 of 3

Date: 5/14/92
Technician(s):

RECORD SHEET #14

WST2-Form14 Rev1/88

Run: 3
Page: 3 of 3

Technician(s): BN, JS, TK

[illegible]

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

Site: EEMC - West, Kent, WA 98032 Date: 5/14/92 Analyte: CO₂ (15-1)
 Source: HAUGHS S270 SERIES Run #: 3
 Zero Cyl #: T132257 Conc. 00.0 % CO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.6 % CO₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 407069
 Range: 0 - 25.0% CO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO₂EPA Control Limits = $\pm 2.5\%$ of 25.0% CO₂ = $\pm 0.625\%$ CO₂Pre 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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: O₂ (15-2)
 Source: HAUGHS S270 Series Run #: 3
 Zero Cyl #: T132257 Conc. 00.0 % O₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.4 % O₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Teledyne Model: 320 Ax SN: 37465
 Range: 0 - 25.0% O₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% O₂
 EPA Control Limits = + 2.5% of 25.0% O₂ = + 0.625% O₂

Pre Run Audit: By: DK Time: 1045 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	.003	-0.28	-0.28	-1.14
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			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.002	-0.54	-0.54	-2.16
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) %
 Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$
 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 = $\pm 2.5\%$ of 10.0% CO = $\pm 0.25\%$ COPre 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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: SO₂ (15-4)
 Source: HAUGHS S270 SERIES Run #: 3
 Zero Cyl #: T132257 Conc. 00.0 ppm SO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: AL2892 Conc. 1232 ppm SO₂ Cyl Press: 450 psi
 Certified by: LIQUID AIR Date: 9/24/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 403019
 Range: 0 - 2500 ppm SO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 2500 ppm SO₂EPA Control Limits = +2.5% of 2500 ppm SO₂ = +62.5 ppm SO₂Pre Run Audit: By: DK Time: 1030 Temp: 77 °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:

Post Run Audit: By: DK Time: 1605 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	00.1	.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 % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ Span % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$

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 = 201.7 °F; 400°F = 399.0 °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 (SO₂) Injection Train Leak Check: Pre ✓ Post ✓
 Combustion Gas (CO₂, O₂, CO) Train Leak Check: Pre ✓ Post ✓
 Tracer Gas (SO₂) Analyzer Train Leak Check: Pre ✓ Post ✓
 Draft (Static) Gauge 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
235

528.872

0.170

87
87

1.44

3.20

575

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. (Vlc) -----	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 H2O	AVG PRCNT CO	----- 0.96 %
AVG METER TEMP. Tm	----- 87 deg F	AVG PRCNT CO2	----- 5.82 %
AVG PPM SO2	----- 532 PPM		

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS

TEST No. : 2

MODEL: S-27X

DATE: 5/13/92

STD SAMPLE		STACK GAS	
VOL. Vm(std) -----	88.53 dscf	FLOW Qsd -----	456.275 dscf/Hr
			&
			7.60 dscf/min
VOL. WATER		PARTICULATE	
VAPOR Vw(std) -----	6.354 scf	CONCTRT. C s -----	0.0135 g/dscf
PRCNT		PARTC. EMISS.	
MSTR Bws -----	6.70 %	RATE E -----	6.14 g/Hr
BURN		MOLES OF GAS	
RATE BR -----	1.03 Kg/Hr	PER Lb WOOD Nt -----	0.52 Lb-mole/Lb
CO EMISSION		PART. EMISS.	
RATE -----	145.94 g/Hr	RATE -----	5.98 g/Kgdry
	&		fuel
	142.24 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 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. 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) 20.367 % (wet) 18.879 %
 (00.00) (Data Sheet #10)
 Stack Static Pressure -0.41 "H₂O
 (0.000) (Data Sheet #12)
 Barometric Pressure 30.11 "Hg
 (00.00) (Data Sheet #2)
 Temperature (Average Room) Combustion Air 79 °F
 (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 °F
 (000) (Data Sheet #14)
 Particulate Emission 1.2078 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)
 H₂O 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: 45-1.066 Post Test Leak Rate 1000 CFM

Meter Box 45 Y Factor 1.066Page 1 of 2Unit: NAUGHTS 507XLeak Checks: 15 " Hg @ .002 cfm
16.0 " Hg @ .006 cfm
" Hg @ cfm
" Hg @ cfmRun: 0 Date: 5/13/90Operator(s): JS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1500

ROTO PRESS: <u>132</u>			Sampling Ratio : <u>18.5</u> : 1			BAROMETER: <u>30.14</u>			
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC	
00	1410	443.500	5.602	.15	80	605	77	0	
05	15	445.000	8.753	.37	80	400	77	.5	
10	20	447.377	5.602	.15	81	605	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	605	77	0	
30	40	453.398	5.396	.14	83	650	77	.5	
35	45	454.879	5.396	.14	84	650	77	0	
40	50	456.365	5.804	.16	85	600	78	0	
45	55	457.921	6.354	.19	85	550	78	.5	
50	1500	459.744	6.656	.21	85	505	78	1.0	
55	5	461.521	6.656	.21	86	505	78	1.5	
ROTO PRESS: <u>132</u>			TOTALS :			BAROMETER: <u>30.12</u>			
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	475.581	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:			MAX VACC =			
TOTAL CU FT			TOTALS:			AV BP: _____			

60.26

Meter Box 45 Y Factor 1.066Unit: HAUGHS 507XLeak Checks: 15 " Hg @ 002 cfm
16.0 " Hg @ 006 cfm
" Hg @ cfm
" Hg @ cfmRun: 2 Date: 5/13/90Operator(s): JS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1500

ROTO PRESS: <u>32</u>			Sampling Ratio : <u>185</u> : 1			BAROMETER: <u>30.10</u>				
MN	TIME	METER READING		STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC	
120	10	489.790		6.980	.23	89	500	78	0.0	
125	15	489.760		6.980	.23	89	500	78	0.0	
130	20	491.730		6.980	.23	89	500	78	0.0	
135	25	493.700		6.980	.23	88	500	78	0.0	
140	30	495.63		6.980	.23	88	500	78	0.0	
145	35	497.605		6.980	.23	88	500	78	0.0	
150	40	499.588		6.648	.21	88	505	78	0.0	
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: <u>32</u>			TOTALS :	(81.768)	(2.64)	(1059)	BAROMETER: <u>30.08</u>			
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 :	(311.506)	(9.92)	(4068)	MAX VACC = <u>2.0</u>			
TOTAL CU FT <u>85.372</u>			TOTALS :	(6.628)	(.211)	87	AV BP: <u>30.11</u>			

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

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

Unit: HUGHES S27X

Run: 2

Date: 5/13/92

IMPINGER #1

Final Weight 680.4 grams Technician(s): Initial: BU
Initial Weight 574.4 grams Final: SS
Net 108.0 ✓ grams Approved By: TK

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 H₂O CAPTURED 135.0 ✓ grams

Scale Check: 295.0g = 295.00 g Front Half Filter # 261 F
590.0g = 590.0 g #
885.0g = 885.0 g 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 HalfManufacturer: SES 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	g	HAWAII	2N	2	
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		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: 3/24/91 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	yes

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	g	HAUGHS	5	202	
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		.3876		1349					
270B	0.3813		1544		.3869		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 CONDITION

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

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	DK				
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					
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	DK

WST5-Form9, Pg1, Rev4/90
Unit HAWAII 507X
Run # 2
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
501		5/14	0900	DK	96.9931	5/15	1242	BD	96.9923	5/18	924	DK	96.9923	5/18	1514	g
502		5/15	0900	DK	98.8082	5/18	926	DK	98.8079	5/18	1516	g				
503		5/15	0900	DK	91.3306	5/18	928	DK	91.3307	5/18	1500	g				
504		5/14	1635	g	95.2141	5/18	930	DK	95.2144	5/18	1500	g				
505		5/14	1635	g	106.5290	5/18	932	DK	106.5291	5/18	1504	g				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
961F		5/13	1850	g	10143	5/14	1736	g	1.0135	5/15	1225	BN	1.0146	5/18	934	DK
961B		5/13	1850	g	1.0146	5/18	1539	g	1.5524	5/15	1220	BD				

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	1712	g	84	70	41
2	5/15	1200	BD	60	74	44
3	5/18	922	DK	58	71	45
4	5/18	1500	g	59	73	43
5						

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	0.9997	0.1000			DK	4/24	1130	74	57	41
99.9997	10.0000	1.0001	0.1000			DK	4/24	1830	70	57	41
99.9997	10.0000	0.9998	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	0.9998	0.0999			DK	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			DK	4/30	0846	77	61	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	0950	77	61	39
99.9997	9.9999	1.0000	0.1000			DK	5/1	1500	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/1	0930	78	62	40
100.0002	10.0002	1.0001	0.1000			DK	5/5	1010	75	60	41
100.0000	10.0001	1.0000	0.1001			DK	5/5	1505	74	61	45
99.9999	10.0000	1.0001	0.0999			DK	5/6	0930	74	60	44
99.9997	10.0000	1.0001	0.1000			DK	5/6	1540	74	59	44
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			DK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	0.1001			DK	5/8	1105	68	54	48
99.9998	10.0001	0.9998	0.0998			DK	5/8	1600	68	56	47
99.9998	9.9998	1.0000	0.1000			DK	5/11	1000	67	54	43
99.9997	10.0001	1.0000	0.0999			DK	5/12	0900	74	60	44
99.9998	10.0001	1.0000	0.0999			DK	5/12	1345	74	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	0950	74	59	40
100.0002	10.0002	1.0000	0.1000			DK	5/14	1636	70	60	41
99.9998	9.9999	1.0001	0.0999			DK	5/15	1000	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.0000	0.1001			DK	5/18	1500	73	59	45

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model AL205
SN 37010004

Dates: From 3/12
Through 4/23

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	0.1000			DK	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			DK	3/17	1607	71	59	46
99.9997	10.0001	1.0000	0.1000			DK	3/19	1115	74	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	1.0000	0.0998			DK	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9994	10.0001	1.0001	0.1000			DK	3/25	1035	76	61	42
100.0001	9.9999	1.0001	0.1002			DK	3/26	1045	73	59	43
100.0001	9.9996	1.0000	0.1001			DK	3/27	1140	77	60	44
99.9997	9.9999	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9996	10.0000	1.0001	0.1000			DK	3/30	1000	71	57	47
99.9999	10.0004	1.0001	0.1000			DK	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	0.1000			DK	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	0.0999			TK	4/6	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	56	41
99.9994	9.9998	0.9999	0.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	0.9999	0.0998			DK	4/8	1515	69	58	44
100.0000	9.9998	0.9999	0.0999			TK	4/9	1035	68	55	43
100.0000	10.0001	1.0000	0.1000			DK	4/10	0935	70	56	41
100.0000	9.9999	0.9999	0.0999			DK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	0945	72	58	42
100.0002	10.0003	1.0001	0.0998			DK	4/14	1030	70	57	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	56	47
99.9997	9.9999	0.9999	0.0998			DK	4/16	1000	70	57	47
100.0001	9.9999	1.0000	0.1001			DK	4/17	0915	70	57	44
99.9996	9.9999	1.0000	0.1000			DK	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	1.0000	0.1001			DK	4/21	1040	74	60	40
100.0000	10.0000	1.0000	0.0999			DK	4/22	0900	73	59	43
99.9995	10.0003	1.0000	0.1001			DK	4/23	1007	76	60	38

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model AL205
SN 37010004

Dates: From

2/6/92

Through

3/11/92

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			DK	2/6	1315	68	56	47
99.9994	10.0000	1.0000	.1000			DK	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			DK	2/10	0910	72	59	47
99.9997	10.0001	1.0000	.1001			DK	2/11	0900	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			DK	2/12	0900	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0000	1.0001	0.1000			TK	2/13	1230	75	62	48
99.9998	10.0000	1.0000	0.1000			DK	2/13	1535	75	62	48
100.0000	9.9999	1.0000	0.1000			DK	2/14	0930	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	0830	65	54	48
99.9997	10.0000	1.0001	.1000			DK	2/17	0835	68	56	47
99.9999	10.0000	.9999	.1000			TK	2/17	0856	65	54	48
99.9994	10.0001	1.0000	.1000			DK	2/18	1000	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	0945	71	58	45
100.0000	9.9999	1.0000	0.1000			TK	2/27	0900	71	59	44
99.9999	10.0000	1.0001	0.1000			DK	2/27	1015	74	60	44
99.9999	10.0000	.9999	.0999			TK	2/27	1035	72	59	46
99.9994	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
99.9994	10.0000	1.0000	.1000			DK	3/5	0935	70	58	48
99.9996	10.0000	.9999	.0999			TK	3/6	0830	73	60	47
99.9996	10.0000	.9999	.0999			DK	3/6	1400	76	63	45
99.9998	10.0000	.9999	.1000			TK	3/9	0830	71	59	49
99.9994	10.0000	.9999	.1000			DK	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	.0999			DK	3/11	1605	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAUGHS S07X
Run: 2 Date: 5/13/92
Technician(s): JS

FRONT HALF

FILTER #: <u>961F</u>	BEAKER #: <u>501</u>	FINAL WT: <u>96.9923</u> g
FINAL WT: <u>101.46</u> g	ml: <u>500</u>	TARE WT: <u>96.8974</u> g
TARE WT: <u>1.6997</u> g	desc: <u>ACETONE</u>	NET WT: <u>1.1049</u> g
NET WT: <u>3.155</u> g		
FILTER #: _____	BEAKER #: _____	FINAL WT: _____ g
FINAL WT: _____ g	ml: _____	TARE WT: _____ g
TARE WT: _____ g	desc: <u>ACETONE</u>	NET WT: _____ g
NET WT: _____ g		

TOTAL VOLUME OF ACETONE
USED IN WASH

500 ml

BACK HALF

FILTER #: <u>961B</u>	BEAKER #: <u>502</u>	FINAL WT: <u>98.8079</u> g
FINAL WT: <u>1.5584</u> g	ml: <u>505</u>	TARE WT: <u>98.5630</u> g
TARE WT: <u>1.3949</u> g	desc: <u>ACETONE</u>	NET WT: <u>2.449</u> g
NET WT: <u>1.1675</u> g		

FILTER #: _____	BEAKER #: <u>503</u>	FINAL WT: <u>91.3307</u> g
FINAL WT: _____ g	ml: <u>75</u>	TARE WT: <u>91.0044</u> g
TARE WT: _____ g	desc: <u>METHCHLOR</u>	NET WT: <u>1.1063</u> g
NET WT: _____ g		

BEAKER #: <u>504</u>	FINAL WT: <u>95.8144</u> g
ml: <u>500</u>	TARE WT: <u>95.0504</u> g
desc: <u>H2O</u>	NET WT: <u>1.1560</u> g

BEAKER #: <u>505</u>	FINAL WT: <u>106.5091</u> g
ml: <u>500</u>	TARE WT: <u>106.4504</u> g
desc: <u>H2O</u>	NET WT: <u>1.0787</u> g

BEAKER #: _____	FINAL WT: <u>103.47</u> 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

505 ml

TOTAL VOLUME OF DICHLOROMETHANE
USED IN EXTRACTION

75 ml

TOTAL VOLUME OF DISTILLED
WATER DRIED

300 ml

BLANKS DONE: 5/11/62

Run: A Date: 5/13/92

Technician(s): JS DK TK

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

BEAKER #: F
200 ml DISTILLED WATER
BONNEAU CERTIFIED

FINAL WT: 96.8408 9
TARE WT: 96.8404 9
NET WT: 0.0004 9

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

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

[illegible]

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

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

Blank Audit: By: Tim Kelly

Date: 5/18/92

Blank Calculations:

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

Dichloromethane: .0004 g ÷ 75 ml = .0000533 g/ml

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

Front Half Catch:

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

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

Total Front Half Catch .4200 g

Back Half Catch:

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

Beakers:

1. Acetone/Impingers:
.2449 g - 200 (.000002 g) = .2445 g
Total Catch ml of acetone Blank Value/
ml of Acetone Net Catch

2. Extract/Impingers:
.1863 g - 75 (.0000533 g) = .1859 g
Total Catch ml. of Blank Value/
Dichloromethane ml of Dichloro-
methane Net Catch

3. Water/Impingers:
.1834 g - 300 (.000004 g) = .1834 g
Total Catch ml. of water Blank Value/
ml of water Net Catch

Total Back Half Catch
Total Catch
% Front Half

.7713 g
1.1913 g
35.26 %

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

Unit: HAWAII 507X

Run: 2 Date: 5/13/90

Technician(s): TK 33

U11" H2O NST3-Form 1 8/28/91

$$1) V_m(\text{std}) = \frac{(85.372 V_m) (17.65) (1066 \text{ mcf}) (30.11 \text{ Hg}) (13.6)}{(547 \text{ Tm})} = \frac{6.3545}{00.0000} \text{ scf}$$

$$2) V_m(\text{std}) = (.04707) (135.0 \text{ m l H}_2\text{O}) = \frac{6.3545}{00.0000} \text{ scf}$$

$$3) A_{\text{SW}} = \frac{(6.3545 \text{ scf})}{(6.3545 \text{ scf} + 88.4636 \text{ dscf})} = \frac{.0670}{.0000} \text{ BWS} \times 100 = \frac{6.7018}{00.0000} \times \text{H}_2\text{O}$$

$$4) C_e = \frac{(1.1913 \text{ g.})}{(88.4636 \text{ dscf})} = \frac{.2078}{0.0000} \text{ gr/dscf}$$

$$5) \text{ Estimated g/hr} = \frac{(\text{g.})}{(\text{dscf})} \left(\frac{6.692}{00.000} \text{ dscfm} \right) (60) = \frac{6.95}{00.0000} \text{ g/hr}$$

V_m = total cubic feet pulled on meter box during test
 mcf = meter correction factor (Y factor) of the meter box used for the test
 H_g = average barometric pressure during the test
 H_2O = average delta H for the test
 Tm = average meter temperature for the test in degrees Absolute
 $\text{ml H}_2\text{O}$ = total water caught during the test
 g. = total particulate catch for the test
 dscfm = average stack flow during the test

(p. 2) (000,000 V_m)
 (p. 2) (0,000 mcf)
 (p. 2) (00,000 H_g)
 (p. 2) (000 H_2O)
 (p. 2) (000 Tm)
 (p. 3) (000,000 $\text{ml H}_2\text{O}$)
 (p. 6) (00,0000 g.)
 (computer printout) (00,000 dscfm)

MISCELLANEOUS TEST DATA
 WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft³

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: 1 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 1 lbs. Range: 1 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 (HOF) (19,140) $\times \frac{63}{100} \times 1.026 = 12371.9$ Est Heat Output (HOF) BTU's/Hr

Comments: 240 = 983
190 = 1,242

Unit: HAUGH'S S27X Run: 2 Date: 5/13/92 Page 9

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: <u>2X4</u>	<u>Manke/Tacoma</u>	<u>Std or btr</u>	<u>s. orn D fir</u>
TEST: <u>2X4</u>	<u>Packwood</u>	<u>#2 or btr</u>	<u>s. orn D fir</u>
<u>4x4</u>	<u>Packwood</u>	<u>#2 or btr</u>	<u>s. orn D fir</u>

PELLET FUEL APFI#: N/A

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 _____ .

**FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10**

Unit: HAMMERS 521A
Run: 2
Date: 5/13/92
Technician: BN TK DK JS
WST1-Form7-Rev11/89

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

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

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Unit: HMU-2
Run#: 2
Date: 5/13/92
Technician: BN TL DL JS
WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3 1/2
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:	<u>19.5</u>	<u>21.3</u>	%
Bottom:	<u>19.0</u>	<u>20.7</u>	%
Side:	<u>20.0</u>	<u>21.8</u>	%
\bar{X} :		<u>21.067</u>	%

Avg % Moisture (Dry) 21.267 %
Avg % Moisture (Wet) 17.537 %
Scale: Levelled 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

Into Dryer Date 5/13/92 Time 1200 Temp 231 °F
Out of Dryer Date 5/13/92 Time 1405 Temp 229 °F
(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 185.99 g ÷ 301.375 cm³ = 16171 ✓ g/cm³ ✓
(dry wt) (volume)

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. g
Wet Wt: g ÷ g = %
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.
Dry Wt: g ÷ g = %
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

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

UNIT: HAUGHS S27 SURVEY: 5/13/92
 Run: 2 Technician(s): BN JS JK
 Pages: 2 of 2 DK

307.1

Minute Time	1		2		3		T/C(1)/T/C(2)		T/C(3)		4		Static Press.	Comm Flow
	Scale Ht	lbs left	Burn Rate	CO ₂ v.	CO ₂ %CO ₂	O ₂ v.	CO ₂ %CO ₂	Rel Bulb	Dry Bulb	% H ₂ O	Calc H/B	Stack v.	PPH	
0 1410	317.7	10.6	Ø	.184	4.16	.604	15.3	.112	1.14	7.0	120	259	625	-0.34
05 15	317.7	10.6	Ø	.100	2.5	.700	17.8	.065	.66	5.7	115	251	400	-0.37
10 20	317.5	10.4	.2	.110	2.8	.689	17.5	.054	.55	6.1	113	214	625	-0.35
15 25	317.3	10.2	.2	.111	2.8	.691	17.5	.059	.60	6.4	112	205	650	-0.34
20 30	317.1	10.0	.2	.119	3.0	.683	17.3	.066	.67	7.3	115	201	650	-0.33
25 35	316.9	9.8	.2	.150	3.8	.656	16.6	.062	.63	8.5	120	217	625	-0.35
30 40	316.6	9.5	.3	.152	3.8	.652	16.5	.071	.72	9.1	121	214	650	-0.35
35 45	316.3	9.2	.3	.156	3.9	.647	16.4	.071	.72	9.3	122	218	650	-0.36
40 50	316.0	8.9	.3	.235	5.9	.573	14.5	.066	.67	10.0	127	259	600	-0.40
45 55	315.5	8.4	.5	.254	6.3	.559	14.2	.070	.71	11.0	131	292	550	-0.44
50 1500	315.0	7.9	.5	.322	8.0	.492	12.4	.072	.73	12.0	136	329	525	-0.48
55 05	314.5	7.4	.5	.347	8.6	.468	11.8	.067	.68	11.3	135	332	525	-0.49
60 10	313.8	6.7	.7	.392	9.7	.428	10.8	.052	.53	12.3	138	360	500	-0.52
65 15	313.3	6.2	.5	.399	9.9	.423	10.7	.039	.39	12.3	138	365	500	-0.53
70 20	312.8	5.7	.5	.405	10.0	.421	10.6	.037	.37	11.3	137	369	475	-0.54
75 25	312.2	5.1	.6	.393	9.7	.432	10.9	.037	.37	10.3	135	364	475	-0.53
80 30	311.7	4.6	.5	.412	10.2	.413	10.4	.032	.32	10.0	134	364	475	-0.53
85 35	311.3	4.2	.4	.404	10.0	.417	10.5	.030	.30	9.6	134	365	475	-0.53
90 40	310.8	3.7	.5	.406	10.1	.417	10.5	.027	.27	8.5	131	362	475	-0.53
95 45	310.4	3.3	.4	.392	9.7	.426	10.8	.025	.25	7.6	130	365	475	-0.53
100 50	310.0	2.9	.4	.399	9.9	.415	10.5	.028	.28	7.1	130	371	475	-0.53
105 55	309.7	2.6	.3	.343	8.5	.466	11.8	.035	.35	6.1	126	352	475	-0.53
110 1600	309.4	2.3	.3	.305	7.6	.500	12.7	.056	.57	5.7	121	333	500	-0.51
115 1605	309.2	2.1	.2	.282	7.0	.519	13.1	.072	.73	5.4	120	312	500	-0.47
120 1610												4282		-0.628
125 1615												7772		-1.000

Date: 5/13/92

Run:

2

Technician(s):

is TK

[illegible]

TEMPERATURES

RECORD SHEET #14

WST2-Form14 Rev1/88

Unit: HAVEN'S S27 Since Date: 5/13/92

Run: 2 Technician(s): BN, JS, TK

Page: 1 of 2

DK

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalyst	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
60 10	2749	3200	2885	2783	4321	6745	8137	941						
65 15	346	243	201	240	332	887	1227	78	1448	248	34	248	35	36
70 20	385	257	213	251	333	953	1180	79	1448	248	34	248	35	36
75 25	393	271	220	262	332	981	1231	79	1448	248	34	248	35	36
80 30	399	289	234	282	333	1050	1189	80	1448	248	34	248	35	36
85 35	408	302	242	287	335	1069	1202	80	1448	248	34	248	35	36
90 40	422	317	248	301	337	1101	1221	81	1448	248	34	248	35	36
95 45	429	334	259	317	340	1117	1201	81	1448	248	35	248	35	36
100 50	436	348	266	327	343	1115	1189	81	1447	248	35	248	35	36
105 55	452	359	273	319	347	1110	1077	81	1446	248	35	248	35	36
110 1600	440	369	275	327	351	1094	993	81	1445	248	35	248	35	36
115 1605	415	375	273	317	356	1074	957	81	1444	248	35	248	35	36
120 1610	393	378	268	316	359	1052	928	81	1444	248	35	248	35	36
125 1615	4918	3842	2972	3546	4098	12603	13595	963						
130 1620	7661	7042	5857	6329	8419	19348	21732	1904						

TEMPERATURES
RECORD SHEET #14
WST2-Form 14 Rev 1/88

Unit: HAUGHS S270 Sinc Date:
Run: 2 Technician(s): BN, JS, JK
Page: 2 of 2 OK

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16
Minute	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalyst	Room Temp	Tube Furnace	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger
120 10	363	377	264	313	365	1026	881	81	1444	248	35	248	35
125 15	352	374	260	310	367	1011	852	81	1445	248	35	248	35
130 20	340	370	257	299	371	968	938	81	1446	248	35	248	35
135 25	327	369	254	303	373	939	862	81	1447	248	35	247	35
140 30	318	369	249	298	375	923	848	80	1448	248	35	246	35
145 35	306	369	244	293	378	906	815	80	1448	248	35	245	35
150 40	297	370	242	286	380	886	784	80	1448	248	35	245	35
155 45	293	369	235	284	381	866	759	80	1447	247	35	244	35
160 50	285	367	232	282	381	848	746	80	1448	246	35	244	35
165 55	277	364	229	276	379	829	729	80	1448	246	35	244	35
170 100	271	360	225	274	378	814	719	80	1448	245	35	243	35
175 05	269	355	221	260	376	795	697	80	1448	245	35	244	35
180 10	263	349	218	256	373	772	677	79	1448	245	35	244	35
185 15	255	343	217	257	371	757	671	79	1448	245	35	244	35
190 20	249	338	214	252	368	738	657	79	1448	245	35	244	35
195 25	243	332	214	248	365	716	640	78	1448	245	35	245	35
200 30	238	326	213	241	363	696	629	78	1448	246	35	245	35
205 35	234	321	210	235	360	678	616	78	1448	246	35	245	35
210 40	230	316	209	233	356	662	609	78	1448	247	35	246	35
215 45	226	312	208	229	352	646	601	78	1448	247	35	246	35
220 50	223	308	208	223	348	631	598	78	1448	247	35	246	35
225 55	220	303	206	219	343	617	585	78	1448	247	35	246	35
230 1800	217	300	205	213	340	595	570	78	1448	247	35	246	35
235 1800	2598	3548	2322	2606	3939	7508	6853	861	AT START	288.4			
240 1800	13963	15003	11091	12413	16862	37667	38215	3729	STOP	255.0			
245 1800	2971	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: CO₂ (15-1)
 Source: HAUGH'S S270 SERIES Run #: 2
 Zero Cyl #: T132257 Conc. 00.0 % CO₂ Cyl Press: 800 psi
 Certified by: LIQUIO AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.6 % CO₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 407069
 Range: 0 - 25.0% CO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 25.0% CO₂EPA Control Limits = $\pm 2.5\%$ of 25.0% CO₂ = $\pm 0.625\%$ CO₂Pre Run Audit: By: OK Time: 1325 Temp: 81 °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:

Post Run Audit: By: OK Time: 1815 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	50.0	.500	12.388	-.212	-1.683

Comments:

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

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: O₂ (15-2)
 Source: HAUGHS S270 Series Run #: 2
 Zero Cyl #: T132257 Conc. 00.0 % O₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.4 % O₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Teledyne Model: 320 Ax SN: 37465
 Range: 0 - 25.0% O₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% O₂EPA Control Limits = + 2.5% of 25.0% O₂ = + 0.625% O₂Pre Run Audit: By: OK 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	00.03	0.003	0.012
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: OK 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	00.28	0.028	0.114
Span	12.4	.496	12.4	12.3	.490	12.395	-0.005	-0.042

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

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

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

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 = $\pm 2.5\%$ of 10.0% CO = $\pm 0.25\%$ CO

Pre Run Audit: By: OK 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: OK 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) %

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

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: SO₂ (15-4)
Source: HAUGHS S270 SERIES Run #: 2
Zero Cyl #: T132257 Conc. 00.0 ppm SO₂ Cyl Press: 800 psi
Certified by: LIQUID AIR Date: 10/7/91
Span Cyl #: AL2892 Conc. 1232 ppm SO₂ Cyl Press: 450 psi
Certified by: LIQUID AIR Date: 9/24/91
Analyzer: Make: Horiba Model: PIR-2000 SN: 403019
Range: 0 - 2500 ppm SO₂ Analyzer Output: 0 - 1.0 v.
Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 2500 ppm SO₂
EPA Control Limits = +2.5% of 2500 ppm SO₂ = +62.5 ppm SO₂

Pre Run Audit: By: OK Time: 1320 Temp: 81 °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:

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

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
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 % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$

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

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 (SO₂) Injection Train Leak Check: Pre ☒ Post ☒
Combustion Gas (CO₂, O₂, CO) Train Leak Check: Pre ☒ Post ☒
Tracer Gas (SO₂) Analyzer Train Leak Check: Pre ☒ Post ☒
Draft (Static) Gauge 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 H2O

AVG PRCNT

CO

0.76

%

AVG METER

TEMP. Tm

----- 84 deg F

AVG PRCNT

CO2

6.10

%

AVG PPM

SO2

----- 457 PPM

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS

TEST No. : 4

MODEL: S-27X

DATE: 5/15/92

STD SAMPLE		STACK GAS	
VOL. Vm(std) -----	62.40 dscf	FLOW Qsd -----	571.338 dscf/Hr & 9.52 dscf/min
VOL. WATER		PARTICULATE	
VAPOR Vw(std) -----	4.905 scf	CONCTRT. C s -----	0.0094 g/dscf
PRCNT		PARTC. EMISS.	
MSTR Bws -----	7.29 %	RATE E -----	5.34 g/Hr
BURN		MOLES OF GAS	
RATE BR -----	1.30 Kg/Hr	PER Lb WOOD Nt ----	0.52 Lb-mole/Lb
CO EMISSION		PART. EMISS.	
RATE -----	145.10 g/Hr & 111.79 g/Kgdry fuel	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. S270X
 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) 1.2980
 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 -0.48 "H₂O ✓
 (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 7.2894 % ✓
 (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 -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)
 H₂O 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: 45-1.066 Post Test Leak Rate .005 CFM ✓

Meter Box 4J Y Factor 1.066Unit: HAUGHS S27XRun: 4 Date: 5/15/92Leak Checks: 15.0 " Hg @ .005 cfm
13.0 " Hg @ .005 cfm
" Hg @ " cfm
" Hg @ " cfmOperator(s): TLC

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>18</u>			Sampling Ratio: <u>25</u> : 1			BAROMETER: <u>30.12</u>			
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	625.377	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: <u>18</u>			TOTALS: <u>97.168</u> <u>2.10</u> <u>977</u>			BAROMETER: <u>30.12</u>			
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	655.859	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: <u>106.812</u> <u>2.48</u> <u>1037</u>			MAX VACC = <u>—</u>			
TOTAL CU FT <u>—</u>			TOTALS: <u>204032</u> <u>4.58</u> <u>2003</u>			AV BP: <u>—</u>			

Meter Box 45 Y Factor 1.066Unit: Haughy S270XLeak Checks: 150 " Hg @ 0.05 cfm
150 " Hg @ 0.05 cfm
" Hg @ " cfmRun: 4 Date: 5/15/92Operator(s): TR

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>18</u>			Sampling Ratio: <u>25</u> : 1			BAROMETER: <u>30.12</u>			
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	663.517	7.021	.13	86	500	75	0.5	
135	20	665.035	7.021	.13	86	500	75	0.5	
140	25	666.521	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: <u>680.912</u> <u>1.46</u> <u>1028</u>			BAROMETER: <u>30.13</u>			
180	5	677.719	6.383	.11	85	550	75	0.5	
185									
190			<u>87.355</u>	<u>1.57</u>	<u>1113</u>				
195						<u>37</u>			
200									
205									
210									
215									
220									
225									
230									
235									
TOTALS:						MAX VACC = <u>20</u>			
TOTAL CU FT: <u>599.19</u>			TOTALS: <u>291.387</u> <u>6.150</u> <u>3121</u>			AV BP: <u>30.12</u>			

7.875 1.166 87
544

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

Balance
Initial: Level ☒ Balance
Zeroed ☒Final: ☒Unit: Houghts 5270XRun: 4Date: 5/15/92

IMPINGER #1

Final Weight 658.2 grams Technician(s): Initial: TKInitial Weight 573.5 grams Final: TKNet 84.7 ☒ grams Approved By: TK

IMPINGER #2

Final Weight 590.0 gramsInitial Weight 583.4 gramsNet 6.6 ☒ grams

IMPINGER #3

Final Weight 495.2 gramsInitial Weight 494.4 gramsNet .8 ☒ grams

IMPINGER #4 (SILICA GEL)

Final Weight 874.8 gramsInitial Weight 862.7 gramsNet 12.1 ☒ gramsTOTAL MASS OF H₂O CAPTURED 104.2 ☒ gramsScale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 gFront Half Filter # 263F

Back Half Filter # 263BNotes: _____

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

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half Back HalfManufacturer: 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	g				
262 F	0.7014		1610		.7017		1301					
263 F	0.6988		1612		.6985		1302		HAUANG 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 [Signature]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	g

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	glo				
262B	0.3822		1528		.3827		1342					
263B	0.3805		1530		.3810		1343		HAUENTS	20.4		
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		.3802		1358					
279B	0.3827		1602		.3822		1359					
280B	0.3821		1604		.3818	✓	1400	✓				

Checked by DKDate: 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	glo

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	DK				
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					
524	106.8567		1050		106.8571		1420					
525	95.1170		1052		95.1173		1422					

} HAUGHS RNY

Checked By: [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	g

WST5-Form9,Pgl,Rev4/90
Unit H106HS S27X
Run # 4
Date: 5/15/92

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into	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	g				
512		5/18	0900	DK	106.5011	5/19	940	DK	106.5009	5/19	1717	g				
513		5/18	0900	DK	99.2960	5/19	942	DK	99.2955	5/19	1719	g				
514		5/18	0900	DK	108.7011	5/19	944	DK	108.7011	5/19	1721	g				
515		5/18	0900	DK	106.2875	5/19	946	DK	106.2871	5/19	1723	g				

FINAL FILTER WEIGHTS

Filter #	Into	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
263F		5/15	1330	BD	0.7982	5/15	1605	DK	0.7976	5/18	950	BN	0.7975	5/18	1538	g
263B		5/15	1330	BD	0.4767	5/15	1610	DK	0.4736	5/18	952	BN	0.4740	5/18	1540	g

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	0948	BN	58	71	45
3	5/18	1800	g	59	73	43
4	5/19	0936	DK	57	70	44
5	5/19	1707	g	57	70	44

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			DK	4/23	1130	74	57	34
99.9996	10.0000	1.0001	0.1000			DK	4/23	1630	70	57	44
99.9997	10.0000	.9998	.0999			DK	4/23	1045	73	60	47
100.0001	10.0002	.9998	.0999			DK	4/23	1330	71	59	47
99.9999	10.0001	1.0001	0.0999			DK	4/23	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	4/23	0846	72	64	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	950	71	61	39
99.9997	9.9999	1.0000	.1000			DK	5/1	930	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/1	930	78	62	40
100.0002	10.0002	1.0001	.1000			DK	5/5	1010	75	60	41
100.0000	10.0001	1.0000	.1001			DK	5/5	1505	74	61	43
99.9999	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9997	10.0002	1.0001	.1000			DK	5/6	1540	74	59	44
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			DK	5/7	1445	71	59	44
99.9996	10.0001	1.0001	.1001			DK	5/8	1105	65	54	48
99.9998	10.0001	.9999	.1000			DK	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			DK	5/12	0910	74	60	44
99.9997	10.0001	1.0000	.0999			DK	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			DK	5/14	1636	70	56	41
99.9998	9.9999	.9997	.0999			DK	5/15	1000	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	43
100.0003	10.0000	1.0000	.1001			DK	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			DK	5/19	1707	70	56	41

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEETDates: From 3/12Through 4/03Scale Sartorius
Model AL205
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	0.1000			DK	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0000	10.0001	1.0000	0.1001			DK	3/17	1607	71	59	45
99.9997	9.9999	0.9999	0.0998			DK	3/19	1715	74	59	47
100.0000	10.0000	1.0000	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	1.0003	0.1003			DK	3/23	1045	73	58	43
99.9994	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
100.0001	9.9999	1.0001	0.1002			DK	3/25	1035	76	61	40
100.0001	9.9996	1.0000	0.1001			DK	3/26	1045	73	59	43
99.9997	9.9999	1.0001	0.1000			DK	3/27	1140	77	60	40
99.9996	10.0000	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9999	10.0004	1.0001	0.1000			DK	3/30	1000	71	57	47
100.0003	10.0000	1.0000	0.1000			DK	3/31	1016	73	59	43
99.9995	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9998	9.9997	0.9997	0.1000			DK	4/2	0900	73	59	43
99.9997	10.0001	0.9999	0.0999			DK	4/3	0900	72	59	46
99.9999	10.0001	0.9999	0.0999			DK	4/3	1630	70	58	48
100.0000	9.9999	0.9998	0.1000			TK	4/6	0936	68	57	39
99.9999	9.9998	0.9999	0.0998			BN	4/6	1600	70	57	41
99.9999	9.9999	0.9999	0.0998			TK	4/7	1300	71	58	45
100.0000	9.9998	0.9999	0.0998			DK	4/8	1545	69	55	44
100.0000	9.9998	0.9999	0.0999			TK	4/9	1635	68	55	43
100.0000	10.0001	1.0000	0.1000			DK	4/10	0935	70	56	41
100.0000	9.9999	0.9999	0.0999			DK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	0945	73	58	42
100.0002	10.0003	1.0001	0.0998			DK	4/14	1030	70	59	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	57	47
99.9997	9.9999	0.9999	0.0998			DK	4/16	1006	68	56	48
100.0001	9.9999	1.0000	0.1001			DK	4/17	0915	70	57	44
99.9996	9.9999	1.0000	0.1000			DK	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	0.1001			DK	4/21	1040	74	60	41
100.0000	10.0000	1.0000	0.0999			DK	4/23	900	73	59	43
99.9995	10.0003	1.0000	0.1001			DK	4/23	1007	76	60	38

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

Dates: From

2/6/92

Through

3/11/92

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9999	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9999	10.0000	1.0001	0.1001			DK	2/6	1315	68	56	47
99.9999	10.0000	1.0000	0.1000			DK	2/7	0915	65	54	48
99.9999	9.9999	1.0001	0.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0001	0.1000			DK	2/10	0910	68	56	47
99.9999	9.9999	0.9998	0.1000			DK	2/10	1500	73	62	48
99.9999	10.0000	1.0000	0.1000			DK	2/10	0910	72	59	47
99.9999	10.0001	1.0000	0.1000			DK	2/11	0900	71	61	47
99.9999	10.0000	1.0001	0.1000			DK	2/12	0920	68	56	47
99.9999	10.0000	0.9999	0.1000			DK	2/12	1500	71	61	47
99.9999	10.0000	1.0000	0.1000			DK	2/12	1500	71	61	47
99.9999	10.0001	1.0000	0.1000			DK	2/12	0900	70	58	48
99.9999	10.0001	1.0001	0.1000			DK	2/13	1230	75	62	48
99.9999	10.0000	1.0001	0.1000			DK	2/13	1535	75	62	48
99.9999	10.0000	1.0000	0.1000			DK	2/14	0930	77	63	46
99.9999	10.0000	1.0000	0.1000			DK	2/14	1240	76	62	45
99.9999	10.0000	1.0001	0.1000			DK	2/14	1600	76	62	45
99.9999	10.0000	0.9999	0.1000			DK	2/17	0820	65	54	47
99.9999	10.0000	1.0000	0.1000			DK	2/17	0835	65	54	47
99.9999	10.0000	1.0000	0.1000			DK	2/17	0856	67	55	46
99.9999	10.0000	1.0000	0.1000			DK	2/18	1200	71	58	45
99.9999	10.0000	1.0000	0.1000			DK	2/21	0945	71	59	44
99.9999	10.0000	1.0000	0.1000			DK	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	0.9999	0.1000			DK	2/26	1025	72	59	46
99.9999	10.0000	1.0000	0.1000			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.1000			DK	2/28	1230	78	64	46
99.9999	10.0000	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			DK	3/4	1130	72	59	46
99.9999	10.0000	0.9999	0.1000			DK	3/5	0935	70	58	46
99.9999	10.0000	0.9999	0.1000			DK	3/6	0830	73	60	47
99.9999	10.0000	0.9999	0.1000			DK	3/6	1400	76	65	45
99.9999	10.0000	0.9999	0.1000			DK	3/9	1800	71	59	49
99.9999	10.0000	0.9999	0.1000			DK	3/9	1340	78	64	46
99.9999	10.0000	1.0000	0.1000			DK	3/10	0900	75	60	41
99.9999	10.0000	1.0000	0.1000			DK	3/11	1605	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: Haugh SA20X
Run: 4 Date: 5/15/92
Technician(s): 7

FRONT HALF

FILTER #: 243F
FINAL WT: 7975 g
TARE WT: 6985 g
NET WT: 0990 g

BEAKER #: 511
ml: 100
desc: ACETONE

FINAL WT: 107.8717 g
TARE WT: 107.7745 g
NET WT: 0972 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

100 ml

BACK HALF

FILTER #: 263B
FINAL WT: 4740 g
TARE WT: 3810 g
NET WT: 0930 g

BEAKER #: 512
ml: 180
desc: ACETONE

FINAL WT: 106.5009 g
TARE WT: 106.3855 g
NET WT: 1154 g

FILTER #: _____
FINAL WT: _____ g
TARE WT: _____ g
NET WT: _____ g

BEAKER #: 513
ml: 75
desc: METHCHLOR

FINAL WT: 99.8955 g
TARE WT: 99.2417 g
NET WT: 0538 g

BEAKER #: 514
ml: 150
desc: H2O

FINAL WT: 108.7011 g
TARE WT: 108.6344 g
NET WT: 0667 g

BEAKER #: 515
ml: 150
desc: H2O

FINAL WT: 106.2871 g
TARE WT: 106.0064 g
NET WT: 0607 g

BEAKER #: _____
ml: _____
desc: _____

FINAL WT: 1274 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

180 ml

TOTAL VOLUME OF DICHLOROMETHANE
USED IN EXTRACTION

75 ml

TOTAL VOLUME OF DISTILLED
WATER DRIED

300 ml

BLANKS DONE: 5/11/92

Run: 4 Date: 5/15/92

Technician(s): JS DK TK

BEAKER #: D
200 ml ACETONE
FISHER OPTIMA LOT #: 913926

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

BEAKER #: _____
200 ml DISTILLED WATER
BOUNEAU CERTIFIED

FINAL WT: 106.2239 g
TARE WT: 106.2235 g
NET WT: 1.0004 g

FINAL WT: 96.2408 g
TARE WT: 96.8401 g
NET WT: .0004 g

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	106.8938	1326	106.2235	1036				
E	96.8424	1328	96.8424	1038				
F	96.5109	1330	96.5106	1040				

SCALE ROOM QC : TARES

[illegible]

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	OK	59	74	40
5/14	1636	SW	86	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	106.0239	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 1730		

[illegible]

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Unit: HAUGHS S27X
Run: 4
Date: 5/15/92
Technician(s): TS TR
WSTAPP1-AppDoc19-page2
Rev 6/90

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 - 1 (.0000 g) = .0990 g
Total Catch No. of filters Blank Value/
filter Net Catch
Beakers: .10972 g - 100 (.000002 g) = .10970 g
Total Catch Ml of Acetone Blank Value/
ml of Acetone Net Catch
Total Front Half Catch .1960 g

Back Half Catch:

Filters: .0930 g - 1 (.0000 g) = .0930 g
Total Catch No. of filters Blank Value/
filter Net Catch
Beakers:
1. Acetone/Impingers: .1154 g - 180 (.000002 g) = .1150 g
Total Catch ml of acetone Blank Value/
ml of Acetone Net Catch
2. Extract/Impingers: .0538 g - 75 (.00000533 g) = .0534 g
Total Catch ml. of Dichloromethane Blank Value/
ml of Dichloro-
methane Net Catch
3. Water/Impingers: .1274 g - 300 (.000004 g) = .1262 g
Total Catch ml. of water Blank Value/
ml of water 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: Houma's SD7K

Run: 4 Date: 5/15/90

Technician(s): JS TK

NST3-Form 1 8/28/91

166 " H2O

$$1) V_m(Std) = \frac{(59.99 \text{ Vm})(17.65)(1066 \text{ mcf})(30.18 \text{ " Hg})(13.6)}{(544 \text{ TmR})} = \frac{49047}{00.0000} \text{ scf}$$

$$2) V_m(Std) = (.04707)(104.8 \text{ " H2O}) = \frac{49047}{00.0000} \text{ scf}$$

$$3) A_{SW} = \frac{(49047 \text{ scf})}{(49047 \text{ scf} + 62.4451 \text{ dscf})} = \frac{.0708}{.0000} \text{ BWS} \times 100 = \frac{7.08}{00.0000} \times H2O$$

$$4) C_s = \frac{(5836 \text{ g.})}{(62.4451 \text{ dscf})} (15.43) = \frac{1442}{0.0000} \text{ gr/dscf}$$

$$5) \text{ Estimated g/hr} = \frac{(\text{g.})}{(\text{dscf})} (\text{dscfm})(60) = \frac{\text{g/hr}}{00.0000}$$

Vm = total cubic feet pulled on meter box during test
mcf = meter correction factor (Y factor) of the meter box used for the test
" Hg = average barometric pressure during the test
" H2O = average delta H for the test
TmR = average meter temperature for the test in degrees Absolute
" H2O = total water caught during the test
g. = total particulate catch for the test
dscfm = average stack flow during the test

(p. 2) (000.000 Vm)
(p. 2) (0.000 mcf)
(p. 2) (00.00 " Hg)
(p. 2) (0.000 " H2O)
(p. 2) (000 TmR)
(p. 3) (000.0 " H2O)
(p. 6) (00.0000 g.)
(computer printout) (00.000 dscfm)

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

MISCELLANEOUS TEST DATA
 WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft³

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: 0 lbs. Total: 0 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.) $\frac{10.5}{2.2025} - (10.5 \times \frac{18306}{180}) \times \frac{60}{180} = 1.8982$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HOF) (19,140) x $\frac{63}{100}$ x 1.8982 = 15653 Est Heat Output (HOF) BTU's/Hr

Comments:

125 = 1.869

185 = 1.263

Unit: HAUGHS S27X Run: 4 Date: 5/15/92 Page 9

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 12 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 H16H

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

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

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 _____ .

**FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10**

Unit: AMUGHS SET A
Run: 4
Date: 5/15/92
Technician: BN, JS, TK, DK
WSTI-Form7-Rev11/89

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: 0900
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	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: $\frac{100 \times \% \text{ Dry Rdg.}}{100 + \% \text{ Dry Rdg.}} = \% \text{ Moisture, Wet Basis}$

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

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Unit: HAUGHS 521
Run#: 4
Date: 5/15/92
Technician: BN, JS, JK, DK
WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3 1/2
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 cm³
(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:	<u>21.0</u>	<u>22.9</u>	%
Bottom:	<u>21.5</u>	<u>23.5</u>	%
Side:	<u>21.0</u>	<u>22.9</u>	%
\bar{X} :		<u>23.100</u>	%

Avg % Moisture (Dry) 23.100 %

Avg % Moisture (Wet) 18.765 %

Scale: Levelled 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

Into Dryer Date 5/15/92 Time 0815 Temp 231 °F
Out of Dryer 5/16/92 1445 209 °F
(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 157.68 g ÷ 333.188 cm³ = 473.2 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

UNIT: HAV64 SZ7X
 Run: 4
 Page: 1 of 2

Date: 5/15/82
 Technician(s): B.D. MC
 D.K. JS

307.0

Minute Time	Scale Mt	lbs left	Burn Rate	CO ₂		SO ₂		Tel		CO		Net Bulb	Dry Bulb	% H ₂ O	Calc W/B	Stack	V.	SO ₂	PPH	Static Press.	Comp Flow
				V.	SO ₂	V.	SO ₂	V.	SO ₂												
00 00.5	317.5	10.5	0	.206	5.1	.595	15.1	15.1	.077	.78	112	141	8.3	124	278	.19	475	475	-0.046	Flow	
05 10	317.4	10.4	.1	.129	3.2	.685	17.4	17.4	.066	.67	116	146	9.4	129	299	.16	400	400	-0.051	SO ₂	
10 15	316.9	9.9	.5	.117	2.9	.695	17.6	17.6	.068	.69	117	144	10.0	126	259	.19	475	475	-0.048	SO ₂	
15 20	316.5	9.5	.4	.126	3.2	.688	17.4	17.4	.074	.75	115	138	9.3	123	230	.21	525	525	-0.044	SO ₂	
20 25	316.2	9.2	.3	.129	3.2	.682	17.3	17.3	.088	.89	114	133	9.0	122	225	.21	525	525	-0.044	SO ₂	
25 30	315.8	8.8	.4	.249	6.2	.572	14.5	14.5	.063	.64	115	134	9.4	126	262	.19	475	475	-0.048	SO ₂	
30 35	315.3	8.3	.5	.329	8.2	.502	12.7	12.7	.015	.15	120	142	11.0	132	320	.16	400	400	-0.056	SO ₂	
35 40	314.7	7.7	.6	.313	7.8	.516	13.1	13.1	.019	.19	120	144	11.0	133	328	.16	400	400	-0.057	SO ₂	
40 45	314.0	7.0	.7	.417	10.3	.416	10.5	10.5	.019	.19	123	150	12.5	139	360	.17	425	425	-0.062	SO ₂	
45 50	313.4	6.4	.6	.420	10.4	.412	10.4	10.4	.012	.12	124	152	13.0	140	369	.17	425	425	-0.063	SO ₂	
50 55	312.7	5.7	.7	.419	10.4	.409	10.3	10.3	.009	.09	123	152	12.5	139	370	.17	425	425	-0.063	SO ₂	
55 1100	312.0	5.0	.7	.445	11.0	.384	9.7	9.7	.010	.10	122	152	12.0	138	373	.14	350	350	-0.063	SO ₂	
60 05	311.5	4.5	.5	.404	10.0	.421	10.6	10.6	.007	.07	120	148	11.0	135	368	.14	350	350	-0.062	SO ₂	
65 10	311.0	4.0	.5	.365	9.1	.455	11.5	11.5	.012	.12	114	142	8.9	131	349	.14	350	350	-0.061	SO ₂	
70 15	310.6	3.6	.4	.390	9.7	.432	10.9	10.9	.009	.09	113	141	8.6	130	347	.15	375	375	-0.060	SO ₂	
75 20	310.2	3.2	.4	.403	10.0	.420	10.6	10.6	.009	.09	112	138	8.3	130	352	.14	350	350	-0.059	SO ₂	
80 25	309.8	2.8	.4	.348	8.6	.473	12.0	12.0	.014	.14	108	132	7.4	128	330	.15	375	375	-0.057	SO ₂	
85 30	309.4	2.4	.4	.321	8.0	.493	12.5	12.5	.033	.33	104	129	6.4	123	311	.15	375	375	-0.054	SO ₂	
90 35	309.1	2.1	.3	.344	8.5	.474	12.0	12.0	.028	.28	103	128	6.2	122	311	.16	400	400	-0.054	SO ₂	
95 40	308.8	1.8	.3	.334	8.3	.482	12.2	12.2	.025	.25	101	125	5.8	120	306	.16	400	400	-0.053	SO ₂	
100 45	308.6	1.6	.2	.268	6.7	.540	13.7	13.7	.033	.33	97	124	5.0	117	285	.16	400	400	-0.051	SO ₂	
105 50	308.5	1.5	.1	.235	5.9	.565	14.3	14.3	.069	.70	98	128	5.1	115	269	.18	450	450	-0.048	SO ₂	
110 55	308.4	1.4	.1	.227	5.7	.573	14.5	14.5	.078	.79	101	130	5.7	116	261	.19	475	475	-0.046	SO ₂	
115 1200	308.3	1.3	.1	.223	5.6	.570	14.4	14.4	.107	1.09	102	131	5.9	116	255	.20	500	500	-0.044	SO ₂	
120 05															3744				-0.649	SO ₂	
125 10															7417				-1.294	SO ₂	

1

[illegible]

TEMPERATURES
RECORD SHEET #14
AST2-Form 14 Rev 1/88

Unit: HAD6HS S27X Date: 5/15/92
Run: 4 Technician(s): BN JK
Page: 1 of 2 OK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	SO ₂
Minute	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn Catalyst	Room Temp	Tube Furnaces	Sample Box	Impinger Out	C. Gas Box	C. Gas Impinger	Impinger
00-05	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
55-60	521	361	232	269	357	940	1406	73	1448	248	34	248	35	36
60-65	520	371	239	277	354	(8269)	(12844)	872	1448	248	34	248	35	36
65-70	486	383	244	286	351	1003	1399	74	1448	248	34	248	35	36
70-75	474	388	248	290	352	1028	1368	74	1448	248	34	248	35	36
75-80	491	394	255	295	352	1058	1449	74	1448	248	34	248	35	36
80-85	476	398	262	300	352	1138	1441	74	1448	248	34	248	35	36
85-90	430	401	263	308	354	1179	1207	75	1448	248	34	248	35	36
90-95	415	400	264	311	357	1180	1201	75	1448	248	34	248	35	36
95-100	419	398	266	314	359	1162	1228	76	1448	248	35	248	35	36
100-105	392	400	261	314	361	1125	1159	76	1447	248	35	248	35	36
105-110	358	398	253	313	364	1070	1010	75	1446	248	35	248	35	36
110-115	334	395	244	305	366	1047	970	75	1448	248	35	248	35	36
115-120	319	396	237	301	367	1005	924	75	1448	248	35	248	35	36
120-125	511	4716	3036	3614	4289	983	888	76	1448	248	35	248	35	36
125-130	9575	8907	6535	6817	9026	(12978)	(14244)	899						
130-135						21247	27088	1771						

Unit: HARRIS S27X
Run: 4
Page: 7 of 2

Date: 5/15/92
Technician(s): _____

BN	TK	TK
DK	TK	TK

[illegible]

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

Site: EEMC - West, Kent, WA 98032 Date: 5/15/92 Analyte: CO₂ (15-1)
 Source: HAUGH'S S270 SERIES Run #: 4
 Zero Cyl #: T132257 Conc. 00.0 % CO₂ Cyl Press: 800 psi
 Certified by: LIQUIO AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.6 % CO₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 407069
 Range: 0 - 25.0% CO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO₂EPA Control Limits = $\pm 2.5\%$ of 25.0% CO₂ = $\pm 0.625\%$ CO₂

Pre Run Audit: By: BN Time: 0930 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	49.6	.496	12.289	-.311	-2.466

Comments:

Post Run Audit: By: DK Time: 1320 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	50.0	.500	12.388	-.212	-1.683

Comments:

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

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

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: O₂ (15-2)
 Source: HAUGHS S270 Series Run #: 4
 Zero Cyl #: T132257 Conc. 00.0 % O₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.4 % O₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Teledyne Model: 320 Ax SN: 37465
 Range: 0 - 25.0% O₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 25.0% O₂
 EPA Control Limits = + 2.5% of 25.0% O₂ = + 0.625% O₂

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

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
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			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
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) %
 Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$
 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 = $\pm 2.5\%$ of 10.0% CO = $\pm 0.25\%$ COPre 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	1.764

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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: SO₂ (15-4)
 Source: HAUGHS S270 SERIES Run #: 4
 Zero Cyl #: T132257 Conc. 00.0 ppm SO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: AL2892 Conc. 1232 ppm SO₂ Cyl Press: 450 psi
 Certified by: LIQUID AIR Date: 9/24/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 403019
 Range: 0 - 2500 ppm SO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 2500 ppm SO₂EPA Control Limits = +2.5% of 2500 ppm SO₂ = +62.5 ppm SO₂Pre Run Audit: By: BN Time: 0925 Temp: 76 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	0.1	1.001	5.936	5.936	.237
Span	49.3	.493	1232	49.5	1.495	1238.992	6.992	.568

Comments:

Post Run Audit: By: OK Time: 1315 Temp: 77 °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	49.4	.494	1236.496	4.496	.365

Comments:

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

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

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) : -1.2 °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 (SO₂) Injection Train Leak Check: Pre ☒ Post ☒
 Combustion Gas (CO₂, O₂, CO) Train Leak Check: Pre ☒ Post ☒
 Tracer Gas (SO₂) Analyzer Train Leak Check: Pre ☒ Post ☒
 Draft (Static) Gauge 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.		Wt. WOOD		
FACTOR (Y) -----	1.066	BURNED(LB) -----	10.9	Lbs

BAROMETRIC		WET, FUEL		
PRESS.(Pb) -----	30.14 in Hg	MOISTURE % -----	18.256	%

LEAK RATE		Wt. PART.		
POST (Lp) -----	0.004 cfm	COLLECTED -----	0.0909	g

WATER		METER		
VOL. (Vlc) -----	57.7 Ml	VOLUME Vm -----	30.234	mcf

TEST		HC MOLE		
TIME (MIN) -----	100 min	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 H2O

AVG PRCNT

CO

0.45

%

AVG METER

TEMP. Tm

----- 85 deg F

AVG PRCNT

CO2

7.29

%

AVG PPM

SO2

----- 411 PPM

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS

TEST No. : 1

MODEL: S-27X

DATE: 5/13/92

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

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS

TEST No. : 1

S-27X

DATE: 5/13/92

TIME INTERVAL 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. S270X
 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) 0.407

Fuel % Moisture (dry) 00.333 ✓ % (wet) 18.25 ✓ %
 (00.00) (Data Sheet #10)

Stack Static Pressure -0.064 ✓ "H₂O ✓
 (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)

H₂O 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: 45-1.066 ✓ Post Test Leak Rate .004 ✓ CFM ✓

Meter Box HJ Y Factor 1.066Page 1 of 1Unit: HAUGH5 S27XRun: 1 Date: 5/13/92Operator(s): SS
 Leak Checks: 16.0 " Hg @ 1003 cfm
16.0 " Hg @ 804 cfm
 " Hg @ cfm
 " Hg @ cfm

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>126</u>			Sampling Ratio: <u>29</u> : 1			BAROMETER: <u>30.5</u>			
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC	
00	1030	412.600	8804	.15	80	400	74	0	
05	35	414.100	9391	.17	79	375	74	.5	
10	40	415.718	8804	.15	80	400	74	0	
15	45	417.241	9391	.17	80	375	74	0	
20	50	418.865	8804	.15	82	400	74	.5	
25	55	420.399	8804	.15	82	400	74	0	
30	1100	421.933	8787	.15	83	400	75	0	
35	5	423.473	8255	.13	84	405	76	.5	
40	10	424.927	8771	.15	85	400	76	.5	
45	15	426.478	8771	.15	86	400	76	1.0	
50	20	428.029	8771	.15	87	400	76	1.0	
55	25	429.582	8255	.13	87	405	76	1.0	
ROTO PRESS: <u>26</u>			TOTALS: <u>105.608</u>			<u>1.80</u>	<u>945</u>	BAROMETER: <u>30.12</u>	
60	30	431.063	8231	.13	87	405	77	1.0	
65	35	432.535	8231	.13	87	405	77	1.0	
70	40	434.007	8216	.13	87	405	78	1.0	
75	45	435.479	8216	.13	87	405	78	1.0	
80	50	436.951	8216	.13	87	405	78	1.0	
85	55	438.423	8216	.13	87	405	78	1.0	
90	1000	439.895	8231	.13	87	405	77	1.0	
95	5	441.368	8247	.13	86	405	76	1.0	
100	10	442.834	8247	.13	86	405	75		
105	15		74051	.17	7814				
110	20								
115	25		179.654	.297	1776	215			
			TOTALS:			<u>25</u>	MAX VACC = <u>1.0</u>		
TOTAL CU FT: <u>3023.4</u>			TOTALS:			<u>8.555</u>	<u>1.41</u>	<u>545</u>	AV BR: <u>30.14</u>

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

Initial: Balance Level ✓Balance Zeroed ✓Unit: HAUGH'S S27XFinal: ✓Run: 1

IMPINGER #1

Date: 5/13/92Final Weight 640.8 gramsTechnician(s): Initial: BNInitial Weight 593.4 gramsFinal: JS/BNNet 47.4 ✓ gramsApproved By: TK

IMPINGER #2

Final Weight 591.3 gramsInitial Weight 588.4 gramsNet 2.9 ✓ grams

IMPINGER #3

Final Weight 479.4 gramsInitial Weight 479.3 gramsNet 0.1 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 827.9 gramsInitial Weight 820.6 gramsNet 7.3 ✓ gramsTOTAL MASS OF H₂O CAPTURED 57.7 ✓ gramsScale Check: 295.0g = 295.00 g
590.0g = 590.0 g
885.0g = 885.0 gFront Half Filter # 260FBack Half Filter # 260BNotes: _____

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

Into Dessicator: Date 3/9/92 Time 0900 By OK 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	gas	0.6926	3/13	1604	OK				
242F	.6952		1641		0.6955		1606					
243F	.7047		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	OK				
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	.6993		1658		0.6980		1640					
260F	.6942		1659		0.6943		1642		HAUGHS	ENV		

Checked by 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	gas
60	74	44	3/13	1602	OK

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	83	(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	.3820		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		HAUGHTS	201		

Checked by 83

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	83
60	74	44	3/13	1520	DK

WOODS HOLE DATA SHEET INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

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

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	B
476	106.2307	4/13	958	DK	106.2312	4/14	1041	gm	✓			
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 Nounk

Date: 4/15/92

Time: 0745

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	I
58	72	42	4/13	956	DI
59	72	46	4/13	1040	9

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEETScale Sartorius
Model A1205
SN 37010004

Dates: From 4/23/92

Through _____

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	0.9997	0.1000			DK	4/24	1130	74	57	34
99.9996	10.0000	0.9998	0.1000			DK	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	0.9998	0.0999			DK	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			DK	4/30	0846	72	62	49
99.9998	9.9998	0.9999	0.1000			DK	5/1	0930	71	61	39
99.9997	9.9999	1.0000	0.1000			DK	5/1	0930	71	57	41
99.9995	10.0001	0.9999	0.0999			DK	5/4	0930	78	62	40
100.0002	10.0002	1.0001	0.1000			DK	5/5	1010	75	60	41
100.0000	10.0001	1.0000	0.1001			DK	5/6	1505	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	5/6	0930	74	60	44
99.9997	10.0000	1.0001	0.1000			DK	5/6	1540	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			DK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	0.1001			DK	5/8	1105	65	54	46
99.9998	10.0001	0.9999	0.0999			DK	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			DK	5/12	0910	74	60	44
99.9997	10.0001	1.0000	0.0999			DK	5/12	1345	74	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	0950	74	59	46
100.0002	10.0002	1.0000	0.1001			DK	5/14	1636	70	56	41
99.9998	9.9999	0.9997	0.0999			DK	5/15	1000	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.0000	0.1001			DK	5/18	1500	73	59	45

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEETDates: From 3/12Through 4/03Scale Sartorius
Model AL205
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
99.9998	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	0.1000			DK	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0000	10.0001	1.0000	0.1001			DK	3/17	1607	71	59	44
99.9997	10.0001	1.0000	0.1000			DK	3/19	1715	74	59	44
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	1.0000	0.1000			DK	3/23	0945	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9999	10.0001	1.0001	0.1002			DK	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3/26	1043	73	59	43
100.0001	9.9999	1.0000	0.1001			DK	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	0.1000			DK	3/30	1000	71	57	47
99.9999	10.0004	1.0001	0.1000			DK	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	0.1000			DK	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	0.1000			DK	4/3	1630	70	58	48
99.9999	10.0001	0.9999	0.1000			TK	4/6	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	57	41
99.9999	9.9998	0.9999	0.1000			TK	4/7	1300	71	58	45
99.9999	9.9999	0.9999	0.1000			DK	4/8	1545	69	56	44
100.0000	9.9998	0.9999	0.1000			TK	4/9	1000	68	55	43
100.0000	10.0001	1.0000	0.1000			DK	4/10	0935	70	56	41
100.0000	9.9999	0.9999	0.1000			DK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	0945	73	58	42
100.0002	10.0003	1.0001	0.1000			DK	4/14	1030	70	59	46
99.9998	10.0001	1.0001	0.1000			DK	4/15	1015	68	56	47
99.9997	9.9999	0.9999	0.1000			DK	4/16	1006	70	57	42
100.0001	9.9999	1.0000	0.1001			DK	4/17	0915	70	57	44
99.9996	9.9999	1.0000	0.1000			DK	4/19	1545	70	58	42
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0000	1.0000	0.1001			DK	4/21	1040	74	60	44
100.0000	10.0000	1.0000	0.1000			DK	4/23	0900	73	59	43
99.9995	10.0003	1.0000	0.1001			DK	4/23	1007	76	60	38

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From

2/6/92

Through

3/11/92Scale 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
99.9999	10.0000	1.0001	0.1001			DK	2/6	1315	68	56	47
99.9999	10.0000	1.0000	0.1000			DK	2/7	0915	65	51	48
100.0001	9.9999	1.0001	0.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	0.1000			DK	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	0.1000			DK	2/11	0910	72	59	47
99.9999	10.0001	1.0000	0.1001			DK	2/11	0920	71	57	47
100.0001	10.0000	1.0001	0.1000			DK	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	0.1000			DK	2/12	1500	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	48
100.0000	10.0000	1.0001	0.1000			DK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			DK	2/13	1535	75	62	48
100.0000	9.9999	1.0000	0.1000			DK	2/14	0930	77	63	46
100.0000	10.0000	1.0000	0.1000			DK	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	0.0999			DK	2/14	1600	76	62	45
99.9997	10.0000	1.0001	0.1000			DK	2/17	0820	65	54	48
99.9999	10.0000	0.9999	0.1000			DK	2/17	1035	68	56	47
99.9999	10.0001	1.0000	0.1000			DK	2/17	0856	65	54	48
100.0000	9.9999	1.0000	0.0999			DK	2/18	1000	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	0945	71	58	45
100.0000	9.9999	1.0000	0.1000			DK	2/24	0900	71	59	44
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	0.9999	0.0999			DK	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			DK	2/28	1230	78	64	46
99.9999	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			DK	3/4	1130	72	59	46
99.9999	10.0000	1.0000	0.1000			DK	3/5	0935	70	58	48
99.9999	10.0000	0.9999	0.0999			DK	3/6	0830	73	60	47
99.9999	10.0000	0.9999	0.0999			DK	3/6	1400	70	60	47
99.9999	10.0000	0.9999	0.1000			DK	3/9	0910	71	59	49
99.9999	10.0000	0.9999	0.1000			DK	3/9	1340	70	59	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0900	75	60	47
99.9996	10.0000	1.0000	0.0999			DK	3/11	1005	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAUGHS 527X
Run: 1 Date: 5/13/92
Technician(s): BN JS

FRONT HALF

FILTER #: <u>260 F</u>	BEAKER #: <u>496</u>	FINAL WT: <u>106.8090</u> ✓ g
FINAL WT: <u>17403</u> ✓ g	ml: <u>210</u>	TARE WT: <u>106.7934</u> ✓ g
TARE WT: <u>16943</u> ✓ g	desc: <u>ACETONE</u>	NET WT: <u>0146</u> ✓ g
NET WT: <u>10460</u> ✓ g		
FILTER #: _____	BEAKER #: _____	FINAL WT: _____ g
FINAL WT: _____ g	ml: _____	TARE WT: _____ g
TARE WT: _____ g	desc: <u>ACETONE</u>	NET WT: _____ g
NET WT: _____ g		

TOTAL VOLUME OF ACETONE
USED IN WASH

210 ✓ ml

BACK HALF

FILTER #: <u>260 B</u>	BEAKER #: <u>497</u>	FINAL WT: <u>104.8000</u> ✓ g
FINAL WT: <u>13996</u> ✓ g	ml: <u>165</u>	TARE WT: <u>104.8076</u> ✓ g
TARE WT: <u>13872</u> ✓ g	desc: <u>ACETONE</u>	NET WT: <u>10184</u> ✓ g
NET WT: <u>10054</u> ✓ g		
FILTER #: _____	BEAKER #: <u>498</u>	FINAL WT: <u>103.8619</u> ✓ g
FINAL WT: _____ g	ml: <u>75</u>	TARE WT: <u>103.8565</u> ✓ g
TARE WT: _____ g	desc: <u>METHCHLOR</u>	NET WT: <u>10054</u> ✓ g
NET WT: _____ g		

BEAKER #: <u>499</u>	FINAL WT: <u>107.3490</u> ✓ g
ml: <u>150</u>	TARE WT: <u>107.3439</u> ✓ g
desc: <u>H2O</u>	NET WT: <u>10051</u> ✓ g

BEAKER #: <u>500</u>	FINAL WT: <u>98.3603</u> ✓ g
ml: <u>165</u>	TARE WT: <u>98.3561</u> ✓ g
desc: <u>H2O</u>	NET WT: <u>10048</u> ✓ g

BEAKER #: _____	FINAL WT: <u>10093</u> ✓ 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

165 ✓ ml

TOTAL VOLUME OF DICHLOROMETHANE
USED IN EXTRACTION

75 ✓ ml

TOTAL VOLUME OF DISTILLED
WATER DRIED

075 ✓ ml

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

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

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: .0460 g - 1 (.0000 g) = .0460 g
Total Catch No. of filters Blank Value/
filter Net Catch
Beakers: .0146 g - 210 (.000002 g) = .0142 g
Total Catch Ml of Acetone Blank Value/
ml of Acetone Net Catch
Total Front Half Catch .0602 g

Back Half Catch:

Filters: .0054 g - 1 (.0000 g) = .0054 g
Total Catch No. of filters Blank Value/
filter Net Catch

Beakers:

1. Acetone/Impingers: .014 g - 165 (.000002 g) = .0141 g
Total Catch ml of acetone Blank Value/
ml of Acetone Net Catch
2. Extract/Impingers: .0054 g - 75 (.00000533 g) = .0050 g
Total Catch ml. of Blank Value/
Dichloromethane ml of Dichloro-
methane Net Catch
3. Water/Impingers: .0093 g - 275 (.000004 g) = .0089 g
Total Catch ml. of water Blank Value/
ml of water 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: HAWAII 507X

Run: 1 Date: 5/13/92

Technician(s): TKSS

NST3-Form 1 8/28/91

141 H2O

$$1) V_m(\text{std}) = \frac{(30934 \checkmark V_m) (17.65) (1066 \text{ mcf}) (30.14 \checkmark \text{ Hg}) (13.6 \checkmark)}{(545 \checkmark \text{ TmA})} = \frac{314698 \checkmark}{000.0000} \text{ decf}$$

$$2) V_H(\text{std}) = (.04707 \checkmark) (57.7 \checkmark \text{ H}_2\text{O}) = \frac{0.7159 \checkmark}{00.0000} \text{ scf}$$

$$3) A_{SH} = \frac{(0.7159 \checkmark \text{ scf})}{(0.7159 \checkmark \text{ scf} + 314698 \checkmark \text{ decf})} = \frac{0.7159 \checkmark}{.0000} \text{ BWS} \times 100 = \frac{79446 \checkmark}{00.0000} \times \text{H}_2\text{O}$$

$$4) C_s = \frac{(0.009 \checkmark \text{ g.})}{(314698 \checkmark \text{ decf})} (15.43 \checkmark) = \frac{0.446 \checkmark}{0.0000} \text{ gr/decf}$$

$$5) \text{ Estimated g/hr} = \frac{(\text{ } \text{ g.})}{(\text{ } \text{ decf})} (\text{ } \text{ decfm}) (60) = \frac{\text{ } \text{ g/hr}}{00.0000}$$

V_m = total cubic feet pulled on meter box during test
 mcf = meter correction factor (Y factor) of the meter box used for the test
 H_g = average barometric pressure during the test
 H_2O = average delta H for the test
 TmA = average meter temperature for the test in degrees Absolute
 H_2O = total water caught during the test
 g. = total particulate catch for the test
 decfm = average stack flow during the test

(p. 2) (000.000 V_m)
 (p. 2) (0.000 mcf)
 (p. 2) (00.00 H_g)
 (p. 2) (0.000 H_2O)
 (p. 2) (000 TmA)
 (p. 3) (000.0 H_2O)
 (p. 6) (00.0000 g.)
 (computer printout) (00.000 decfm)

Unit THU042
Run # 1
Date 5/13/92
Technician BN TL PL JS
WST6-Form1, Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft³

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: 0 lbs.

Kindling Wt. Paper: 13 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 (2.1 - 2.2) 307.2 - 306.7 lbs. Actual: 2.5 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\left(\frac{2.1}{\text{Upper Wt.}} + \frac{2.2}{\text{Lower Wt.}} / 2 \right) .25 = .6$ lbs.

Test Fuel Wt-lbs: Ideal 10.3 lbs. Range: 9.3 - 11.3 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.) $\frac{10.9 - (10.9 \times 1/256)}{2.2025} \times \frac{60}{100} = 2.427$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (19,140) x $\frac{2.427}{100} \times 63 = 29268$ Est Heat Output (HO_E) BTU's/Hr

Comments: 190 = 127

Unit: HAUGH'S 527XRun: 1Date: 5/13/92

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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/ACHARCOAL 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 secPRIMARY AIR: opened full for first 5 min. , then set to run setting of WIDE OPEN.SECONDARY AIR: N/A CAT BYPASS: N/AFAN: 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 1464.

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

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

PELLET FUEL AFFI#: 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 (	<u>10.0</u>	lbs) added at	<u>0825</u>
2nd warm up/preburn fuel charge (	<u>9.6</u>	lbs) added at	<u>0930</u>
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	

**FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10**

Unit: THUONS
Run: 5/13/92
Date: BN TK DK JS
Technician: WST1-Form7-Rev11/89

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		Bottom		Side		Piece Avg Corrected
			Uncor	Cor	Uncor	Cor	Uncor	Cor	
1	2x4x8	K	5.5	5.5	4.5	4.5	4.5	4.5	4.833
2									
3									
4	2x4x8	P	18.5	20.1	18.5	20.1	18.0	19.6	19.933
5	2x4x8	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: $\frac{100 \times \% \text{ Dry Rdg.}}{100 + \% \text{ Dry Rdg.}} = \% \text{ Moisture, Wet Basis}$

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

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Unit: 1440011-2
Run#: 5/13/92
Date: 5/13/92
Technician: BL TK DIC JS
WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3 1/2
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 cm³
(D X W X L)

MOISTURE: Room Temperature: 70 °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:	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: Levelled 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

Into Dryer Date 5/13/92 Time 0900 Temp 233 °F
Out of Dryer 5/13/92 1445 200 °F

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

Density = 169.17 g ÷ 301.860 cm³ = 560.4 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

307.0

Minute Time	Scale Wt	lbs left	Burn Rate	CO ₂		O ₂		CO		Ref Bulb	Dry Bulb	% H ₂ O	Calc H/B	Stack	SO ₂		Static Press.	Comm.
				V.	SCD ₂	V.	SCD ₂	V.	SCD ₂						V.	PPH		
00 1030	317.9	10.6	0	.204	5.1	.629	15.9	21.3	106	145	6.5	123	321	16	400	-0.62	Flow	
05 35	317.6	10.6	.3	.349	8.7	.491	11.5	13.5	108	148	6.7	126	343	15	375	-0.44	SO₂ 1	
10 40	316.2	9.2	1.4	.359	8.9	.473	12.0	29.7	123	166	12.0	141	428	16	400	-0.68	SO₂ 1	
15 45	315.3	8.3	.9	.404	10.0	.434	11.0	16.7	120	175	10.0	139	455	15	375	-0.71	SO₂ 1	
20 50	314.0	7.0	1.3	.460	11.4	.381	9.6	19.0	130	184	13.5	146	485	16	400	-0.73	SO₂ 1	
25 55	313.0	6.0	1.0	.489	12.1	.349	8.8	13.5	133	190	15.0	149	501	16	400	-0.75	SO₂ 1	
30 1100	311.7	4.7	1.3	.520	12.9	.310	7.8	14.4	135	194	16.0	151	518	16	400	-0.76	SO₂ 1	
35 05	310.7	3.7	1.0	.528	13.1	.247	7.5	16.7	134	191	15.5	150	515	17	425	-0.76	SO₂ 1	
40 10	309.7	2.7	1.0	.521	12.9	.293	7.4	16.0	131	184	14.0	148	502	16	400	-0.76	SO₂ 1	
45 15	308.8	1.8	.9	.594	7.3	.523	13.2	73.1	121	169	10.5	139	433	16	400	-0.71	SO₂ 1	
50 20	308.6	1.6	.2	.272	6.8	.551	14.0	52.0	116	161	8.9	134	404	16	400	-0.67	SO₂ 1	
55 25	308.3	1.3	.3	.254	6.3	.564	14.3	25.3	111	153	7.6	131	381	17	425	-0.65	Flow	
60 30	308.1	1.1	.2	.220	5.5	.591	15.0	10.7	107	146	6.6	127	356	17	425	-0.63	SO₂ 1	
65 35	307.9	.9	.2	.213	5.3	.597	15.1	9.0	105	143	6.3	125	345	17	425	-0.61	SO₂ 1	
70 40	307.8	.8	.1	.197	4.9	.611	15.5	6.4	103	140	5.9	122	333	17	425	-0.60	SO₂ 1	
75 45	307.6	.6	.2	.171	4.3	.634	16.1	5.0	102	137	5.8	121	321	17	425	-0.58	SO₂ 1	
80 50	307.5	.5	.1	.147	3.7	.656	16.7	4.2	101	134	5.6	120	306	17	425	-0.56	SO₂ 1	
85 55	307.4	.4	.1	.140	3.5	.664	16.8	4.1	99	132	5.1	119	296	17	425	-0.55	SO₂ 1	
90 1200	307.3	.3	.1	.133	3.3	.671	17.0	4.0	98	129	5.0	117	286	17	425	-0.54	SO₂ 1	
95 05	307.1	.1	.2	.140	3.5	.668	16.9	4.2	96	125	4.8	115	281	17	425	-0.53	SO₂ 1	
100 10	307.0	.0	.1	.140	3.5	.670	17.0	4.4	96	121	4.8	115	275	17	425	-0.52	SO₂ 1	
105 15													(2799)			(-512)	SO₂ 1	
110 20													(3085)			(-1.331)	SO₂ 1	
115 1225													(385)			(-0.64)	SO₂ 1	

Unit: HYDRA S27X
Run: 1
Page: 1 of 1

Date: 5/13/92
Technician(s): B

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[illegible]

TEMPERATURES
RECORD SHEET #14
WST2-Form 14 Rev 1/88

Unit: HAD645 S27X Date: 5/13/92
Run: 1 Technician(s): BN TK
Page: 1 of 1 DIC JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute	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
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 00	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	AT START		405.4			21
115 25	4692	4722	3772	3497	4447	11145	11573	822	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: CO₂ (15-1)
 Source: HAUGHS S270 SERIES Run #: 1
 Zero Cyl #: T132257 Conc. 00.0 % CO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.6 % CO₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 407069
 Range: 0 - 25.0% CO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO₂EPA Control Limits = $\pm 2.5\%$ of 25.0% CO₂ = $\pm 0.625\%$ CO₂Pre Run Audit: By: BK 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: OK 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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: O₂ (15-2)
Source: HAUGHS S270 SERIES Run #: 1
Zero Cyl #: T132257 Conc. 00.0 % O₂ Cyl Press: 800 psi
Certified by: LIQUID AIR Date: 10/7/91
Span Cyl #: 29004 Conc. 12.4 % O₂ Cyl Press: 900 psi
Certified by: MATHESON Date: 10/31/91
Analyzer: Make: Teledyne Model: 320 Ax SN: 37465
Range: 0 - 25.0% O₂ Analyzer Output: 0 - 1.0 v.
Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% O₂
EPA Control Limits = + 2.5% of 25.0% O₂ = + 0.625% O₂

Pre Run Audit: By: BK Time: 1010 Temp: 80 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
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			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
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) %

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

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: 5/8/92 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 = $\pm 2.5\%$ of 10.0% CO = $\pm 0.25\%$ CO

Pre Run Audit: By: BN Time: 1015 Temp: 81 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-0.004	-0.004	-0.044
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			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-0.004	-0.004	-0.044
Span	49.6	.496	4.96	49.4	.494	5.028	.068	1.380

Comments:

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

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

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: SO₂ (15-4)
 Source: HAUGHS S270 SERIES Run #: 1
 Zero Cyl #: T132257 Conc. 00.0 ppm SO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: AL2892 Conc. 1232 ppm SO₂ Cyl Press: 450 psi
 Certified by: LIQUID AIR Date: 9/24/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 403019
 Range: 0 - 2500 ppm SO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 2500 ppm SO₂EPA Control Limits = +2.5% of 2500 ppm SO₂ = +62.5 ppm SO₂Pre 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

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

Full Scale Value

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

Unit: 1
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) : -0.3 °F Adj to: 0 °F Post Test Check Zero (0°F): .6 °F % Difference 1030

Span (2000°F): 2000.7 °F Adj to: 2000.0 °F Span (2000°F): 2004.2 °F 121

(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 (SO₂) Injection Train Leak Check: Pre ☒ Post ☒
Combustion Gas (CO₂, O₂, CO) Train Leak Check: Pre ☒ Post ☒
Tracer Gas (SO₂) Analyzer Train Leak Check: Pre ☒ Post ☒
Draft (Static) Gauge 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.			Wt. WOOD		
FACTOR (Y) -----	1.066		BURNED(LB) -----	10.5	Lbs

BAROMETRIC			WET, FUEL		
PRESS. (Pb) -----	30.08 in Hg		MOISTURE % -----	17.582	%

LEAK RATE			Wt. PART.		
POST (Lp) -----	0.002 cfm		COLLECTED -----	0.6224	g

WATER			METER		
VOL. (V1c) -----	116.2 Ml		VOLUME Vm -----	71.383	mcf

TEST			HC MOLE		
TIME (MIN) -----	205 min		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 H2O

AVG PRCNT

CO

0.80

%

AVG METER

TEMP. Tm

----- 88 deg F

AVG PRCNT

CO2

6.18

%

AVG PPM

SO2

----- 573 PPM

TABLE 4 ----- CALCULATIONS

CLIENT : HAUGHS PRODUCTS

TEST No. : 5

MODEL: S-27X

DATE: 5/18/92

STD SAMPLE		STACK GAS	
VOL. Vm(std) -----	73.73 dscf	FLOW Qsd -----	498.754 dscf/Hr & 8.31 dscf/min
VOL. WATER		PARTICULATE	
VAPOR Vw(std) -----	5.470 scf	CONCTRT. C s -----	0.0084 g/dscf
PRCNT		PARTC.EMISS.	
MSTR Bws -----	6.91 %	RATE E -----	4.21 g/Hr
BURN		MOLES OF GAS	
RATE BR -----	1.15 Kg/Hr	PER Lb WOOD Nt ----	0.51 Lb-mole/Lb
CO EMISSION		PART.EMISS.	
RATE -----	133.06 g/Hr & 115.71 g/Kgdry fuel	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			

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) 01.333 % (wet) 17.582 %
 (00.00) (Data Sheet #10)

Stack Static Pressure -0.49 "H₂O
 (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 1.1302 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 1.6024 g
 (0.0000) (Data Sheet #6)

H₂O 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: 45-1.066 Post Test Leak Rate .002 CFM

FAN CONF

Meter Box 4J Y Factor 1.066Page 1 of 2Unit: HAUGHS S27XRun: 5 Date: 5/18/92Operator(s): JS

Leak Checks: 15.0 " Hg @ .001 cfm
16.0 " Hg @ .002 cfm
 " Hg @ " cfm
 " Hg @ " cfm

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1500

ROTO PRESS: <u>.20</u>			Sampling Ratio: <u>18.5</u> : 1				BAROMETER: <u>30.10</u>		
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	683.096	5.869	.17	81	600	73	.5	
20	55	684.690	5.869	.16	82	600	73	.5	
25	1100	686.899	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	697.486	7.030	.23	88	500	74	1.0	
ROTO PRESS: <u>.20</u>			TOTALS :			BAROMETER: <u>30.08</u>			
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	505	75	1.5	
80	55	707.281	6.679	.21	90	505	75	1.0	
85	1000	709.116	6.679	.21	90	505	75	1.0	
90	5	711.011	6.679	.21	90	505	75	1.0	
95	10	712.908	6.363	.19	91	550	76	1.0	
100	15	714.781	6.363	.19	91	550	76	1.0	
105	20	716.537	6.086	.17	91	575	76	1.0	
110	25	718.074	6.086	.17	91	575	76	1.0	
115	30	720.010	6.086	.17	91	575	76	1.0	
			TOTALS:			MAX VACC =			
TOTAL CU FT			TOTALS:			AV BP:			

60.18

1.5

Meter Box 45 Y Factor 1.066Unit: Hauarts 507X
 Leak Checks: 15.0 " Hg @ 200 cfm
16.0 " Hg @ 200 cfm
 " Hg @ cfm
 " Hg @ cfm
Run: 5 Date: 5/18/92Operator(s): JS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>1.00</u>			Sampling Ratio: <u>12.5</u> : 1			BAROMETER: <u>30.06</u>			
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC	
120	35	701.747	5.807	.16	91	600	77	1.0	
125	40	703.412	5.807	.16	91	600	77	1.0	
130	45	705.076	5.818	.16	90	600	77	1.0	
135	50	706.734	5.818	.16	90	600	77	1.0	
140	55	708.393	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	605	77	1.0	
170	25	738.343	5.585	.15	90	605	77	1.0	
175	30	739.935	5.585	.15	90	605	77	1.0	
ROTO PRESS: <u>1.00</u>			TOTALS :			BAROMETER: <u>30.06</u>			
180	35	741.527	5.575	.15	90	605	78	1.0	
185	40	743.119	5.575	.15	90	605	78	1.0	
190	45	744.712	5.575	.15	91	605	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		30.782	.85	544				
215	10								
220	15		258.593	.736	370				
225	20				88				
230	25		6.157	.180	548				
235	30								
			TOTALS:			MAX VACC = <u>1.5</u>			
TOTAL CU FT <u>71.383</u>			TOTALS:			AV BP: <u>30.08</u>			

MOISTURE SHEET
Woodstove Data Sheet #3Moisture DeterminationBalance
Initial: Level ☒ Balance
Zeroed ☒Unit: Hanley S270XFinal: ☒ ☒Run: 5IMPINGER #1Date: 5/18/92Final Weight 673.8 grams Technician(s): Initial: TKInitial Weight 580.0 grams Final: TK/38Net 93.8 grams Approved By: TKIMPINGER #2Final Weight 592.3 gramsInitial Weight 585.5 gramsNet 6.8 gramsIMPINGER #3Final Weight 500.2 gramsInitial Weight 498.4 gramsNet 1.8 gramsIMPINGER #4 (SILICA GEL)Final Weight 802.3 gramsInitial Weight 788.5 gramsNet 13.8 gramsTOTAL MASS OF H₂O CAPTURED 116.2 gramsScale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 gFront Half Filter # 264F

Back Half Filter # 264BNotes: _____

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

Into Dessicator: Date 3/17/92 Time 0900 By DK Front Half Back HalfManufacturer: 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	dk				
262 F	0.7014		1610		.7017		1301					
263 F	0.6988		1612		.6985		1302					
264 F	0.6893		1614		.6894		1303		HAWAII'S 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: 3/24/91 Time 0900

QA REWEIGH

Filter #	WT	Date	Time	By

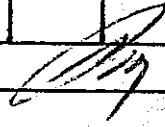
BALANCE ROOM ENVIRONMENTAL CONDITIONS

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

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	yo				
262B	0.3822		1528		.3827		1342					
263B	0.3805		1530		.3810		1343					
264B	0.3811		1532		.3818		1344		HAUNTS	RUS		
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		.3802		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	yo

Date: 5/10/91

FINAL FILTER WEIGHTS

FINAL FILTER WEIGHTS

QA REWEIGH: FINAL WEIGHTS

QA REWEIGH: FINAL WEIGHTS

SCALE ROOM ENVIRONMENTAL CONDITIONS

SCALE ROOM ENVIRONMENTAL CONDITIONS

SCALE ROOM ENVIRONMENTAL CONDITIONS

SCALE ROOM ENVIRONMENTAL CONDITIONS

SOME RISK ENVIRONMENTAL CONDITIONS									
6	500	155	80	57	20	24			
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			DK	4/23	1130	71	57	34
99.9997	10.0000	.9998	.1000			DK	4/24	1830	70	57	44
100.0001	10.0002	.9998	.0999			DK	4/27	1045	73	60	47
99.9999	10.0001	1.0001	0.0999			DK	4/28	1330	71	59	45
99.9999	10.0000	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9998	9.9998	0.9999	0.1000			DK	5/1	0846	77	64	49
99.9997	9.9999	1.0000	.1000			DK	5/1	0950	77	61	39
99.9995	10.0001	0.9999	0.0999			DK	5/1	1300	71	57	41
100.0002	10.0002	1.0001	.1000			DK	5/5	1010	78	62	40
100.0000	10.0001	1.0000	.1001			DK	5/5	1505	75	60	41
99.9999	10.0000	1.0001	0.0999			DK	5/6	0930	74	61	47
99.9997	10.0002	1.0001	.1000			DK	5/6	1540	74	60	44
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	44
99.9998	10.0001	1.0001	0.1001			DK	5/7	1445	71	59	43
99.9996	10.0001	1.0001	.1001			DK	5/8	1105	68	54	49
99.9996	10.0001	0.9998	0.0998			DK	5/8	1650	68	56	47
99.9998	9.9998	1.0000	0.1000			DK	5/11	1000	67	54	42
99.9997	10.0001	1.0000	.0999			DK	5/12	0900	74	60	44
99.9998	10.0001	1.0000	0.0999			DK	5/12	1345	74	58	45
100.0002	10.0002	1.0000	0.0999			DK	5/13	0950	74	59	46
99.9998	9.9999	.9997	.0999			DK	5/14	1636	70	56	41
100.0000	10.0002	1.0001	0.0999			DK	5/15	1000	74	60	44
100.0003	10.0000	1.0000	.1001			DK	5/18	0900	71	58	45
99.9998	9.9997	0.9996	0.0997			DK	5/18	1800	73	59	45
99.9998	10.0000	.9999	.0999			DK	5/19	0930	70	57	44
100.0001	10.0003	1.0002	0.1003			DK	5/19	1707	70	56	41
99.9996	9.9998	.9999	.1000			DK	5/20	0945	70	56	41
99.9998	10.0000	0.9998	0.0997			DK	5/21	1005	74	60	46
100.0000	10.0000	1.0001	.1001			DK	5/22	1000	73	60	47
						DK	5/22	1515	70	57	44

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEETScale Sartorius
Model AL205
SN 37010004Dates: From 3/12Through 4/03

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
99.9998	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	0.1000			DK	3/16	1309	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0000	10.0001	1.0000	0.1000			DK	3/17	1607	71	59	46
99.9998	9.9999	0.9999	0.0998			DK	3/19	1715	74	59	46
100.0000	10.0000	1.0000	0.1000			DK	3/20	1500	74	60	44
100.0000	10.0000	1.0000	0.1000			DK	3/23	1045	73	59	43
99.9998	10.0000	1.0000	0.1000			DK	3/24	0945	72	58	42
100.0001	10.0001	1.0001	0.1000			DK	3/25	1035	76	61	40
100.0001	10.0001	1.0001	0.1000			DK	3/26	1045	73	59	43
99.9997	9.9999	1.0000	0.1000			DK	3/27	1140	77	60	40
99.9997	10.0000	1.0001	0.1000			DK	3/30	0930	68	56	47
99.9997	10.0000	1.0001	0.1000			DK	3/30	1000	71	57	47
100.0003	10.0000	1.0000	0.1000			DK	3/31	1016	73	59	43
99.9998	10.0000	1.0000	0.1000			DK	4/1	0915	76	60	38
99.9997	10.0001	0.9997	0.1000			DK	4/02	0900	73	59	43
99.9997	10.0001	0.9999	0.1000			DK	4/3	0900	72	59	46
99.9999	10.0001	0.9999	0.1000			DK	4/3	1630	70	58	48
100.0000	10.0000	1.0000	0.1000			TK	4/6	0936	68	57	39
99.9999	9.9999	0.9998	0.1000			BN	4/6	1600	70	57	41
99.9999	9.9999	0.9999	0.1000			TK	4/7	1300	71	58	45
99.9999	9.9999	0.9999	0.1000			DK	4/8	1545	68	58	44
100.0000	10.0000	1.0000	0.1000			TK	4/9	1035	68	58	43
100.0000	10.0001	1.0000	0.1000			DK	4/10	0935	70	56	41
100.0000	10.0000	1.0000	0.1000			DK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1000			DK	4/13	0945	73	58	42
99.9998	10.0001	1.0001	0.1000			DK	4/14	1030	74	59	46
99.9997	9.9999	0.9998	0.1000			DK	4/15	1015	68	56	47
100.0001	10.0000	1.0000	0.1000			DK	4/16	1000	80	58	40
99.9996	9.9999	1.0000	0.1000			DK	4/17	0915	70	57	44
100.0001	10.0000	0.9999	0.1000			DK	4/19	1545	70	58	42
99.9998	10.0000	1.0000	0.1000			DK	4/20	0900	72	59	46
100.0000	10.0000	1.0000	0.1000			DK	4/21	1040	74	60	40
99.9995	10.0003	1.0000	0.1000			DK	4/23	0900	73	59	43
						DK	4/03	1007	76	60	38

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From

2/6/92

Through

3/11/92Scale Sartorius
Model AI205
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
99.9999	10.0000	1.0001	0.1001			DK	2/6	1315	68	56	47
99.9999	10.0000	1.0000	0.1000			DK	2/7	0915	65	54	48
100.0001	9.9999	1.0001	0.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	0.1000			DK	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	0.1000			DK	2/10	0910	72	59	47
99.9999	10.0001	1.0000	0.1001			DK	2/11	0920	71	61	47
100.0001	10.0000	1.0001	0.1000			DK	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	0.1000			DK	2/12	0920	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			DK	2/13	1230	75	62	48
99.9998	10.0000	1.0001	0.1000			DK	2/13	1535	77	63	48
100.0000	9.9999	1.0000	0.1000			DK	2/14	0930	77	63	48
100.0000	10.0000	1.0000	0.1000			DK	2/15	1230	76	62	47
99.9999	10.0000	1.0001	0.0999			DK	2/15	1600	76	62	47
100.0000	10.0000	1.0001	0.0999			DK	2/17	0820	65	54	48
99.9997	10.0000	0.9999	0.1000			DK	2/17	1035	68	56	47
99.9999	10.0000	0.9999	0.1000			DK	2/17	0856	65	54	48
99.9999	10.0001	1.0000	0.1000			DK	2/18	1200	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	0945	71	58	45
100.0000	9.9999	1.0000	0.1000			DK	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	0.9999	0.0999			DK	2/26	1035	72	59	46
99.9999	9.9998	1.0000	0.0999			DK	2/27	1400	77	63	46
99.9999	10.0000	1.0000	0.0999			DK	2/28	1230	78	67	46
99.9998	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			DK	3/4	1130	72	59	46
99.9999	10.0000	1.0000	0.1000			DK	3/5	0935	70	58	46
99.9999	10.0000	0.9999	0.0999			DK	3/6	0830	73	60	47
99.9998	10.0000	0.9999	0.0998			DK	3/6	1100	70	58	45
99.9998	10.0000	0.9999	0.1000			DK	3/9	0830	71	59	49
99.9999	10.0000	0.9999	0.1000			DK	3/9	1340	70	58	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0900	75	60	47
99.9996	10.0000	1.0000	0.0999			DK	3/11	1025	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: Hauauks 507V
Run: 5 Date: 5/18/40
Technician(s): JS

FRONT HALF

FILTER #: 004F BEAKER #: 516 FINAL WT: 105.7145 g
FINAL WT: 8056 g ml: 150
TARE WT: 1.6894 g desc: ACETONE
TARE WT: 1.6894 g
NET WT: 1.168 g

FILTER #: _____ BEAKER #: _____ FINAL WT: _____ g
FINAL WT: _____ g ml: _____
TARE WT: _____ g desc: ACETONE
TARE WT: _____ g
NET WT: _____ g

TOTAL VOLUME OF ACETONE
USED IN WASH

150 ml

BACK HALF

FILTER #: 004B BEAKER #: 517 FINAL WT: 94.9153 g
FINAL WT: 5170 g ml: 200
TARE WT: 1.3812 g desc: ACETONE
TARE WT: 1.3812 g
NET WT: 1.558 g

FILTER #: _____ BEAKER #: 518 FINAL WT: 103.8673 g
FINAL WT: _____ g ml: 75
TARE WT: _____ g desc: METHCHLOR
TARE WT: _____ g
NET WT: _____ g

BEAKER #: 519 FINAL WT: 100.0734 g
ml: 200 TARE WT: 100.0063 g
desc: H2O NET WT: 106.71 g

BEAKER #: 520 FINAL WT: 98.6558 g
ml: 100 TARE WT: 98.6067 g
desc: H2O NET WT: 100.91 g

BEAKER #: _____ FINAL WT: 109.62 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

BLANKS DONE: 5/11/92

Run: 5 Date: 5/18/92

Technician(s): JS DK TK

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

BEAKER #: _____
200 ml DISTILLED WATER
BONNEAU CERTIFIED

FINAL WT: 106.2239 g
TARE WT: 106.2235 g
NET WT: 1000.4 g

FINAL WT:	96.2408	g
TARE WT:	96.8404	g
NET WT:	1.0004	g

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	106.0038	1306	106.2235	1036				
E	96.8404	1308	96.8424	1038				
F	96.5109	1330	96.5106	1040				

SCALE ROOM QC : TARES

[illegible]

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	OK	59	74	40
5/14	1636	905	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 1059		
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 1330		

[illegible]

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Unit: NAUGHS 527X
Run: 5
Date: 5/18/92
Technician(s): TX TX
WSTAPPl-AppDoc19-page2
Rev 6/90

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: .1162 g - 1 (.0000 g) = .1162 g
Total Catch No. of filters Blank Value/
filter Net Catch

Beakers: .0400 g - 150 (.000002 g) = .0397 g
Total Catch Ml of Acetone Blank Value/
ml of Acetone Net Catch

Total Front Half Catch .1559 g

Back Half Catch:

Filters: .1358 g - 1 (.0000 g) = .1358 g
Total Catch No. of filters Blank Value/
filter Net Catch

Beakers:

1. Acetone/Impingers: .1993 g - 250 (.000002 g) = .1988 g
Total Catch ml of acetone Blank Value/
ml of Acetone Net Catch

2. Extract/Impingers: .0373 g - 75 (.00000533 g) = .0369 g
Total Catch ml. of Blank Value/
Dichloromethane ml of Dichloro-
methane Net Catch

3. Water/Impingers: .0962 g - 300 (.000004 g) = .0950 g
Total Catch ml. of water Blank Value/
ml of water Net Catch

Total Back Half Catch .4665 g
Total Catch .6224 g
% Front Half 25.05 %

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

Unit: HAULTS 507X

Run: 5 Date: 5/18/91

Technician(s): SS TK

HST9-Form 1 8/28/91

73.7539 decf
000.0000

180 H2O
13.6 Hg

30.08 mcf
(548 Tm)

17.65 (1066 mcf) (30.08 Hg)

1) Vm(etd) =

5.4695 scf
00.0000

2) Vm(etd) = (.04707) (116.2) (1 H2O) =

(5.4695 scf)

3) Asw =

0.000
Bws x 100 =

(5.4695 scf) (73.7539 decf)

4) Cs =

0.0000 gr/scf
(15.43) =

(16924 g.) (73.7539 decf)

5) Estimated g/hr =

(g.) (6.16 decf) (50) =

00.0000 g/hr

Vm = total cubic feet pulled on meter box during test
mcf = meter correction factor (Y factor) of the meter box used for the test
Hg = average barometric pressure during the test
H2O = average delta H for the test
Tm = average meter temperature for the test in degrees Absolute
al H2O = total water caught during the test
g. = total particulate caught for the test
decf = average stack flow during the test

(p. 2) (000.000 Vm)
(p. 2) (0.000 mcf)
(p. 2) (00.00 Hg)
(p. 2) (000.0 H2O)
(p. 2) (000 Tm)
(p. 3) (000.0 al H2O)
(p. 6) (00.0000 g.)
(computer printout) (00.000 decfm)

TEMPERATURES
RECORD SHEET #14
WS12-Form 14 Rev 1/88

Unit: HYDRA-S 27X
 Run: 5
 Page: 1 of 2

Date: 5/18/92
 Technician(s): BK TK
DK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute	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
00-05	358	383	453	296	414	866	724	76	1441	241	35	241	35	36
05-10	334	376	424	288	412	623	657	75	1441	241	35	241	35	36
10-15	313	360	386	275	412	552	567	76	1441	241	35	241	35	36
15-20	294	341	360	260	405	523	566	76	1441	241	35	243	35	36
20-25	283	325	345	248	399	516	599	76	1441	244	35	245	35	36
25-30	295	310	335	242	390	520	883	76	1441	248	35	247	35	36
30-35	347	307	337	227	380	528	862	76	1443	248	35	248	35	36
35-40	363	310	340	227	370	546	1254	76	1446	248	35	248	35	36
40-45	461	318	357	229	361	596	1400	76	1446	248	35	248	35	36
45-50	530	331	379	239	352	743	1412	76	1447	248	35	248	35	36
50-55	524	348	399	247	346	836	1482	77	1448	248	35	248	35	36
55-60	594	366	423	263	340	910	1481	77	1448	248	35	248	35	36
60-65	4736	4075	4538	3041	4581	7759	11887	913						
65-70	606	390	449	277	336	886	1476	78	1448	248	35	248	35	36
70-75	591	404	464	290	334	897	1474	79	1448	248	35	248	35	36
75-80	574	416	473	297	333	930	1414	79	1448	248	35	248	35	36
80-85	558	430	485	302	333	968	1307	80	1448	248	35	248	35	36
85-90	525	439	496	304	334	1038	1131	80	1448	248	36	248	35	36
90-95	500	444	504	308	335	1067	1145	80	1448	248	36	248	35	36
95-100	490	448	512	314	338	1070	1132	80	1448	248	36	248	35	36
100-105	468	450	511	317	342	1132	1002	80	1448	248	36	248	35	36
105-110	434	444	503	323	348	1059	942	80	1448	248	36	248	35	36
110-115	407	435	487	320	353	1009	872	80	1448	248	36	248	35	36
115-120	387	423	470	321	357	989	849	81	1448	248	36	247	35	36
120-125	371	412	455	310	362	970	833	81	1448	248	36	246	35	36
125-130	5911	5135	5809	3183	4105	12015	13577	958						
130-135	10647	9210	10347	6724	8686	19774	25464	1871						

WST2-Form14 Rev1/88

Unit: Hawks S27X

Run:

Page: 2 of 2

Date: 5/18/92
Technician(s): BN TK
DK JS

Technician(s): BA TK

OK JS

[illegible]

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

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: CO₂ (15-1)
 Source: HAUGH'S S270 SERIES Run #: 5
 Zero Cyl #: T132257 Conc. 00.0 % CO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.6 % CO₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 407069
 Range: 0 - 25.0% CO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO₂EPA Control Limits = $\pm 2.5\%$ of 25.0% CO₂ = $\pm 0.625\%$ CO₂Pre 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: OK 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:

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

Unit 11100113
Run # 5
Date 5/18/92
Technician BN TK DIL JS
WST6-Form1, Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft³

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: 13 lbs. Wood: 6.5 lbs.

Pre Burn Fuel Wt. 7.2 48.6 + 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 $\left(\frac{2.6}{\text{Upper Wt.}} + \frac{2.1}{\text{Lower Wt.}} / 2 \right) .25 = \underline{.6}$ 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.) $\frac{105 - (10.5 \times 17582)}{2.2025} \times \frac{60}{205} = \underline{1.1500}$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (19,140) x $\frac{63}{100} \times \underline{1.1500} = \underline{13867}$ Est Heat Output (HO_E) BTU's/Hr

Comments: 190 = 1240

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 CON FIRMATION

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

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

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 .

**FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10**

Unit: PAUGH'S DATA
Run: 5
Date: 5/8/92
Technician: BN, JS, TK, DK
WST1-Form7-Rev11/89

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: 0900
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	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	2x4x8 3/4	T	21.0	22.9	21.5	23.5	19.5	21.3	22.567
10	2x4x8 3/4	T	18.5	20.1	19.0	20.7	18.0	19.6	20.133
11	2x4x8 3/4	T	21.0	22.9	21.0	22.9	20.0	21.8	22.533
12	2x4x8 3/4	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									

% Moisture - Dry Basis:

% Moisture - Wet Basis:

Kindling	Pretest Fuel	Test Load
4.333%	19.933%	21.333%
4.153%	16.620%	17.582%

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

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

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Unit: 11/11/92
Run#: 5
Date: 5/18/92
Technician: BJ TK DK JS
WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3 1/2
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 cm³
(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:	<u>18.5</u>	<u>20.1</u> %
Bottom:	<u>18.5</u>	<u>20.1</u> %
Side:	<u>18.5</u>	<u>20.1</u> %
\bar{X} :		<u>20.100</u> %

Avg % Moisture (Dry) 20.100 %

Avg % Moisture (Wet) 16.736 %

Scale: Levelled In ✓ Out ✓
Zeroed: In ✓ Out ✓

Wet Weight: 186.3 g Dry Weight: 160.2 g

% Moisture Dried Basis: 13.677 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

Into Dryer Date 5/18/92 Time 1008 Temp 234 °F
Out of Dryer 5/18/92 1445 209 °F
(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 160.80 g ÷ 342.700 cm³ = 1.4693 g/cm³ ✓
(dry wt) (volume)

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. g
Wet Wt: g ÷ g = %
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.
Dry Wt: g ÷ g = %
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.
% Moisture Dried Basis: %
[1 - (Net Dry Wt - Net Wet Wt.)] X 100

DOWN TIME AND FUEL GAS DATA
HOODSTOVE DATA SHEET #12
HST2-Form 14 Rev 1/88

Unit: HAUH5 S27X
Run: 5
Page: 1 of 2

Date: 5/18/92
Technician(s): BN TK
DK JS

Minute Time	1		2		3		T/C(1)T/C(2)		T/C(3)		4		Static Press.	Comm Flow
	Scale Wt	lbs left	Burn Rate	CO ₂ V.	CO ₂ %	CO ₂ V.	CO ₂ %	Net Bulb	Dry Bulb	% H ₂ O	Calc W/B	Stack V.	PPM SO ₂	
00 035	317.1	10.5	0	.197	4.9	15.0	.115	4.2	107	136	7.1	256	625	-0.44
05 40	316.9	10.3	.2	.135	3.4	17.2	.051	6.5	113	139	8.6	287	475	-0.53
10 45	316.6	10.0	.3	.099	2.5	18.0	.054	4.5	110	128	8.0	226	600	-0.44
15 50	316.4	9.8	.2	.114	2.9	17.6	.062	4.6	107	124	7.6	214	600	-0.43
20 55	316.2	9.6	.2	.123	3.1	17.4	.063	4.8	106	123	7.3	210	600	-0.42
25 100	315.8	9.2	.4	.226	5.6	15.0	.051	10.8	109	126	7.9	254	575	-0.49
30 05	315.2	8.6	.6	.274	6.8	13.9	.052	12.9	111	128	8.4	276	550	-0.52
35 10	314.8	8.2	.4	.295	7.3	13.2	.051	14.1	112	130	8.6	289	550	-0.54
40 15	314.1	7.5	.7	.437	10.8	10.1	.008	135.4	118	137	10.2	351	500	-0.61
45 20	313.4	6.8	.7	.444	11.0	9.9	.008	137.6	119	137	10.5	367	500	-0.64
50 25	312.8	6.2	.6	.472	11.7	9.2	.011	106.3	117	135	10.0	379	500	-0.66
55 30	312.1	5.5	.7	.483	12.0	8.8	.011	108.8	113	131	9.0	385	500	-0.67
60 35	311.3	4.7	.8	.482	11.9	8.8	.011	108.6	110	127	8.1	3494		-0.39
65 40	310.8	4.2	.5	.406	10.1	14.5	.007	143.8	108	124	7.8	381	500	-0.66
70 45	310.4	3.8	.4	.422	10.5	10.1	.006	174.4	108	123	7.8	365	500	-0.64
75 50	309.9	3.3	.5	.417	10.3	10.2	.006	172.3	107	122	7.6	351	500	-0.63
80 55	309.5	2.9	.4	.395	9.8	10.4	.018	54.4	104	118	6.8	335	525	-0.62
85 100	309.2	2.6	.3	.347	9.8	10.4	.015	65.6	101	114	6.2	327	525	-0.60
90 05	308.8	2.2	.4	.378	9.4	11.1	.013	72.1	98	109	5.9	318	525	-0.58
95 10	308.6	2.0	.2	.317	7.9	12.4	.031	25.4	95	106	5.1	303	550	-0.56
100 15	308.4	1.8	.2	.273	6.8	13.4	.044	15.4	92	99	4.8	287	550	-0.54
105 20	308.3	1.7	.1	.232	5.8	14.2	.078	7.3	88	100	4.1	271	575	-0.53
110 25	308.2	1.6	.1	.224	5.6	14.4	.087	6.3	86	103	3.6	264	575	-0.50
115 130	308.1	1.5	.1	.220	5.5	14.5	.090	6.0	85	106	3.3	256	575	-0.48
												3819		-0.46
												7313		-1.319

2

[illegible]

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

Unit: 440645 S27X
Run: 5
Page: 1 of 1

Date: 5/18/92
Technician(s): 1

307.6 - 306.5

T/C#-3

4

1

[illegible]

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

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: O₂ (15-2)
 Source: HAUGHS S270 Series Run #: 5
 Zero Cyl #: T132257 Conc. 00.0 % O₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.4 % O₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Teledyne Model: 320 Ax SN: 37465
 Range: 0 - 25.0% O₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 25.0% O₂
 EPA Control Limits = + 2.5% of 25.0% O₂ = + 0.625% O₂

Pre Run Audit: By: BN Time: 1015 Temp: 71 °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	1090
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) %
 Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$
 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 = $\pm 2.5\%$ of 10.0% CO = $\pm 0.25\%$ COPre 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: OK 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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: SO₂ (15-4)
 Source: HAUGHS S270 SERIES Run #: 5
 Zero Cyl #: T132257 Conc. 00.0 ppm SO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: AL2892 Conc. 1232 ppm SO₂ Cyl Press: 450 psi
 Certified by: LIQUID AIR Date: 9/24/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 403019
 Range: 0 - 2500 ppm SO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 2500 ppm SO₂EPA Control Limits = +2.5% of 2500 ppm SO₂ = +62.5 ppm SO₂Pre Run Audit: By: BN Time: 1000 Temp: 76 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
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			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:

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

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

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 1030
Span (2000°F): 2001.4 °F Adj to: 2000.0 °F Span (2000°F): 2003.6 °F 1180

(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 (SO₂) Injection Train Leak Check: Pre ☒ Post ☒
Combustion Gas (CO₂, O₂, CO) Train Leak Check: Pre ☒ Post ☒
Tracer Gas (SO₂) Analyzer Train Leak Check: Pre ☒ Post ☒
Draft (Static) Gauge 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		STACK GAS	
VOL. Vm(std) -----	70.97 dscf	FLOW Qsd -----	526.627 dscf/Hr & 8.78 dscf/min
VOL. WATER		PARTICULATE	
VAPOR Vw(std) -----	5.027 scf	CONCTRT. C s -----	0.0097 g/dscf
PRCNT		PARTC.EMISS.	
MSTR Bws -----	6.62 %	RATE E -----	5.09 g/Hr
BURN		MOLES OF GAS	
RATE BR -----	1.22 Kg/Hr	PER Lb WOOD Nt -----	0.51 Lb-mole/Lb
CO EMISSION		PART.EMISS.	
RATE -----	138.27 g/Hr & 113.71 g/Kgdry fuel	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. S270X
 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) 00.705 ✓ % (wet) 17.167 ✓ % ✓
 (00.00) (Data Sheet #10)

Stack Static Pressure -048 ✓ "H₂O ✓
 (0.000) (Data Sheet #12)

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

Temperature (Average Room) Combustion Air 80 ✓ °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 16855 ✓ g ✓
 (0.0000) (Data Sheet #6)

H₂O 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: 45-1.066 ✓ Post Test Leak Rate 1004 ✓ CFM ✓

DOOR CONF #1

Meter Box 4J Y Factor 1.066Page 1 of 2Unit: HANNA HS 507XRun: 6 Date: 5/18/92Operator(s): JS
 Leak Checks: 15.0 " Hg @ .001 cfm
16.0 " Hg @ .004 cfm
 " Hg @ cfm
 " Hg @ cfm

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1,500

ROTO PRESS: <u>100</u>			Sampling Ratio: <u>18</u> : 1			BAROMETER: <u>30.03</u>			
MN	TIME	METER READING	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC	
00	1605	750.000	5.518	.15	87	605	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	90	500	83	1.0	
50	55	767.524	7.061	.26	90	475	83	1.0	
55	1700	769.598	7.061	.26	90	475	83	1.5	
ROTO PRESS: <u>20</u>			TOTALS: <u>(76.55)</u> <u>(2.40)</u> <u>(1080)</u>			BAROMETER: <u>32.08</u>			
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	6.908	.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	6.901	.24	94	500	81	1.5	
105	50	790.341	6.901	.24	94	500	81	1.5	
110	55	792.426	6.901	.24	94	500	81	1.5	
115	1800	794.512	6.921	.24	94	500	81	1.5	
			TOTALS: <u>(85.561)</u> <u>(3.02)</u> <u>(1184)</u>			MAX VACC =			
TOTAL CU FT			TOTALS: <u>162.113</u> <u>5.44</u> <u>2204</u>			AV BP: <u>60.05</u>			

Meter Box 45 Y Factor 1.066Unit: H AUGHS SO2Run: 6 Date: 5/18/92
 Leak Checks: 150 " Hg @ 100 cfm
160 " Hg @ 100 cfm
 " Hg @ cfm
Operator(s): SS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>20</u>			Sampling Ratio: <u>18</u> : 1			BAROMETER: <u>29.99</u>		
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	800.153	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	808.129	6.888	.23	95	500	83	1.5
155	40	810.124	6.560	.21	95	505	83	1.5
160	45	818.004	6.548	.21	95	505	84	1.5
165	50	813.984	6.548	.21	95	505	84	1.5
170	55	815.244	6.251	.19	95	550	84	1.5
175	1900	817.638	6.251	.19	95	550	84	1.0
ROTO PRESS: <u>20</u>			TOTALS: (80.452) (2.64) (1135)			BAROMETER: <u>29.99</u>		
180	5	819.451	6.251	.19	95	550	84	1.0
185	10		6.251	.19	95			
190	15							
195	20		248.216	8.07	3434	375		
200	25							
205	30		6.25	.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: 30.0		

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance	Balance
Initial: Level	<u>✓</u>	Zeroed <u>✓</u>
Final:	<u>✓</u>	<u>✓</u>

Unit: Haugh S290X

Run: 6

Date: 5/18/92

IMPINGER #1

Final Weight 665.8 grams Technician(s): Initial: TK

Initial Weight 580.8 grams Final: JS

Net 85.0 ✓ grams Approved By: TK

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 H₂O 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	8				
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		Haunke	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 DKDate: 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	8

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	gib				
262B	0.3822		1528		.3827		1342					
263B	0.3805		1530		.3810		1343					
264B	0.3811		1532		.3812		1344					
265B	0.3821		1534		.3824		1345		HAWAII	RUB		
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 DKDate: 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	gib

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	DK				
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					
524	106.8567		1050		106.8571		1420					
525	95.1170		1052		95.1173		1422					

HAUKS RNC

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	DK

Run # 6
Date: 5/

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
SD1		5/19	0900	DK	97.8084	5/20	1006	DK	(97.8087)	5/21	1013	DK				
SD2		5/19	1415	DK	104.1434	5/21	1009	DK	104.1419	5/22	1018	DK	(104.1424)	5/22	1505	DK
SD3		5/19	0900	DK	94.9862	5/20	1008	DK	(94.9859)	5/21	1015	DK				
SD4		5/19	1415	DK	106.9000	5/21	1031	DK	106.9186	5/22	1020	DK	(106.9189)	5/22	1507	DK
SD5		5/19	1415	DK	95.1621	5/21	1033	DK	95.1611	5/22	1022	DK	(95.1610)	5/22	1509	DK

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
265F		5/18	1418	g	0.8163	5/19	956	OK	(8165)	5/19	1709	g				
265B		5/18	1418	g	0.5218	5/19	958	OK	5810	5/19	1731	g	0.5195	5/20	1010	DK
					(.5198)	5/21	1019	g								

QA REWEIGH: FINAL WEIGHTS

Q4 REMEDIATION		FINAL WEIGHT	
Date	Beaker #	Final Wt	By
Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

SCALE ROOM ENVIRONMENTAL CONDITIONS									
Weighting	Date	Time	By	WB	DB	%RH			
Session	5/19	957	DK	57	70	44			
1	5/19	1707	gao	56	70	41			
2	5/20	1004	DK	56	70	41			
3	5/21	1005	gao	60	74	44			
4	5/21	1100	gao	61	72	45			

SCALE ROOM ENVIRONMENTAL CONDITIONS

SCALE ROOM ENVIRONMENTAL CONDITIONS				
6	5/10	1515	20	70
7				
8				
9				
Comments				

WST7-For.

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 4/23/92

Through

Scale Sartori
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	0.9997	0.1000			DK	4/23	1130	71	57	41
99.9996	10.0000	0.9998	0.1000			DK	4/24	1630	70	57	41
99.9997	10.0000	1.0001	0.1000			DK	4/27	1045	73	60	47
100.0001	10.0002	0.9998	0.0999			DK	4/28	1330	71	57	47
99.9999	10.0001	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9999	10.0000	1.0001	0.0999			DK	4/30	0846	77	67	49
99.9997	9.9998	0.9999	0.1000			DK	5/1	950	71	61	39
99.9995	9.9999	1.0000	0.1000			DK	5/1	1630	71	57	41
100.0002	10.0001	1.0001	0.0999			DK	5/1	930	78	62	40
100.0000	10.0000	1.0000	0.1000			DK	5/5	1010	75	60	41
99.9999	10.0000	1.0001	0.0999			DK	5/5	1505	74	61	47
99.9997	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9998	10.0001	1.0001	0.1000			DK	5/6	1540	75	59	44
99.9998	10.0001	1.0001	0.1000			DK	5/7	1000	73	59	43
99.9998	10.0001	1.0001	0.1001			DK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	0.1001			DK	5/8	1105	65	54	40
99.9996	10.0001	0.9998	0.0998			DK	5/8	1630	68	56	47
99.9998	10.0001	0.9998	0.0998			DK	5/11	1000	67	54	42
99.9998	9.9998	1.0000	0.1000			DK	5/12	0910	74	60	44
99.9997	10.0001	1.0000	0.0999			DK	5/12	1315	74	58	45
99.9998	10.0001	1.0000	0.0999			DK	5/13	950	74	59	40
100.0000	10.0002	1.0000	0.1001			DK	5/14	1636	70	56	41
99.9998	9.9999	0.9997	0.0999			DK	5/15	1000	74	60	44
100.0000	10.0002	1.0001	0.0999			DK	5/18	0900	71	58	45
100.0003	10.0000	1.0000	0.1001			DK	5/18	1500	73	57	45
99.9998	9.9997	0.9996	0.0997			DK	5/19	0920	70	57	44
99.9998	10.0000	0.9999	0.0999			DK	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	0.9999	0.0999			DK	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	0.1001			DK	5/22	1515	70	57	44

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 3/12

Through 4/23

Scale Sartorius
Model AL205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9997	10.0000	1.0000	0.0998			TK	3-12	1257	73	60	47
99.9998	9.9999	1.0000	0.0998			DK	3-13	1415	74	60	44
99.9998	10.0003	1.0001	0.1000			DK	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			DK	3-17	1607	71	59	44
99.9997	10.0001	1.0000	0.1000			DK	3-19	1715	74	59	44
99.9998	9.9999	0.9999	0.0998			DK	3-20	1500	74	60	44
100.0000	10.0000	1.0000	0.0998			DK	3-23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3-24	0945	72	58	42
99.9997	10.0001	1.0001	0.1002			DK	3-25	1035	76	61	40
100.0001	9.9999	1.0001	0.1002			DK	3-26	1045	73	59	43
100.0001	9.9999	1.0001	0.1001			DK	3-27	1140	77	60	43
99.9997	9.9999	1.0001	0.1000			DK	3-29	0930	68	56	47
99.9996	10.0000	1.0001	0.1000			DK	3-30	1000	71	57	47
99.9999	10.0004	1.0001	0.1002			DK	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	0.1000			DK	4-10	0900	73	59	43
99.9997	9.9997	0.9997	0.1000			DK	4-13	0900	72	59	46
99.9997	10.0001	0.9999	0.0999			DK	4-13	1630	70	58	48
99.9999	10.0001	0.9999	0.0999			TK	4-16	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4-16	1600	70	58	41
99.9997	9.9998	0.9999	0.0998			TK	4-17	1300	71	58	45
99.9999	9.9999	0.9999	0.0998			DK	4-18	1545	68	58	44
100.0000	9.9998	0.9999	0.0999			TK	4-19	1045	68	58	43
100.0000	10.0001	1.0000	0.1000			DK	4-10	0935	70	56	41
100.0000	9.9999	0.9999	0.0999			DK	4-10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4-13	0945	73	58	42
100.0002	10.0003	1.0001	0.0998			DK	4-14	1030	70	57	46
99.9998	10.0001	1.0001	0.0998			DK	4-15	1015	68	57	47
99.9997	9.9999	0.9998	0.0998			DK	4-16	1006	80	58	48
100.0001	9.9999	1.0000	0.1001			DK	4-17	0915	70	57	44
99.9996	9.9999	1.0000	0.1000			DK	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	1.0000	0.1001			DK	4-21	1040	74	60	44
100.0000	10.0000	1.0000	0.0999			DK	4-23	0900	73	59	43
99.9995	10.0003	1.0000	0.1001			DK	4-23	1007	76	60	38

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model AI205
SN 37010004

Dates: From

2/6/92

Through

3/11/92

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
99.9999	9.9999	1.0000	0.0999			DK	2/6	930	65	54	48
99.9999	10.0000	1.0001	0.1001			DK	2/6	1315	68	56	47
99.9999	10.0000	1.0000	0.1000			DK	2/7	0915	65	54	48
99.9999	9.9999	1.0001	0.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	0.1000			DK	2/10	0910	68	56	47
99.9999	9.9999	0.9998	0.1000			DK	2/10	1500	75	62	48
99.9999	10.0000	1.0000	0.1000			DK	2/11	0910	72	59	47
99.9999	10.0000	1.0000	0.1000			DK	2/11	0920	71	61	47
99.9999	10.0000	1.0001	0.1000			DK	2/12	0920	68	56	47
99.9999	10.0000	0.9999	0.1000			DK	2/12	1500	74	61	47
99.9999	10.0000	1.0000	0.1000			DK	2/12	0920	74	61	47
99.9999	10.0000	1.0000	0.1000			DK	2/13	0900	70	58	48
99.9999	10.0000	1.0001	0.1000			DK	2/13	1230	73	63	48
99.9999	10.0000	1.0001	0.1000			DK	2/13	1535	75	63	48
99.9999	10.0000	1.0000	0.1000			DK	2/14	0930	77	63	48
99.9999	10.0000	1.0000	0.1000			DK	2/14	1240	76	62	47
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	47
99.9999	10.0000	1.0001	0.0999			DK	2/17	0820	65	54	48
99.9999	10.0000	0.9999	0.1000			DK	2/17	1935	68	56	47
99.9999	10.0000	1.0000	0.1000			DK	2/17	0856	65	54	48
99.9999	10.0000	1.0000	0.1000			DK	2/18	1900	67	55	48
99.9999	9.9999	1.0000	0.0999			DK	2/21	0945	71	58	45
99.9999	10.0000	1.0000	0.1000			DK	2/24	0900	71	59	44
99.9999	10.0000	1.0001	0.1000			DK	2/25	1015	74	60	44
99.9999	10.0000	0.9999	0.0999			DK	2/26	1035	72	59	46
99.9999	9.9999	1.0000	0.0999			DK	2/27	1600	77	63	46
99.9999	10.0000	1.0000	0.0999			DK	2/28	1230	78	64	46
99.9999	9.9999	1.0000	0.1000			DK	3/3	1000	73	60	47
99.9999	10.0000	1.0000	0.1000			DK	3/4	1130	72	59	46
99.9999	10.0000	1.0000	0.1000			DK	3/5	0935	70	58	46
99.9999	10.0000	0.9999	0.0999			DK	3/6	0830	73	60	47
99.9999	10.0000	0.9999	0.0999			DK	3/6	1400	70	60	45
99.9999	10.0000	0.9999	0.1000			DK	3/9	1810	71	59	49
99.9999	10.0000	0.9999	0.1000			DK	3/9	1340	70	59	46
99.9999	10.0000	1.0000	0.0999			DK	3/10	0900	75	60	47
99.9999	10.0000	1.0000	0.0999			DK	3/11	1605	70	57	47

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAUGHS SDX
Run: 6 Date: 5/18/92
Technician(s): SS

FRONT HALF

FILTER #:	<u>065F</u>	BEAKER #:	<u>501</u>	FINAL WT:	<u>97.8087</u>	g
FINAL WT:	<u>8165</u>	ml:	<u>125</u>	TARE WT:	<u>97.7537</u>	g
TARE WT:	<u>6917</u>	desc:	<u>ACETONE</u>	NET WT:	<u>0550</u>	g
NET WT:	<u>1248</u>					
FILTER #:	_____	BEAKER #:	_____	FINAL WT:	_____	g
FINAL WT:	_____	ml:	_____	TARE WT:	_____	g
TARE WT:	_____	desc:	<u>ACETONE</u>	NET WT:	_____	g
NET WT:	_____					

TOTAL VOLUME OF ACETONE
USED IN WASH

125 ml

BACK HALF

FILTER #:	<u>065B</u>	BEAKER #:	<u>502</u>	FINAL WT:	<u>104.1404</u>	g
FINAL WT:	<u>5198</u>	ml:	<u>946</u>	TARE WT:	<u>103.9009</u>	g
TARE WT:	<u>3824</u>	desc:	<u>ACETONE</u>	NET WT:	<u>0195</u>	g
NET WT:	<u>1374</u>					
FILTER #:	_____	BEAKER #:	<u>503</u>	FINAL WT:	<u>94.9859</u>	g
FINAL WT:	_____	ml:	<u>75</u>	TARE WT:	<u>94.9408</u>	g
TARE WT:	_____	desc:	<u>METHCHLOR</u>	NET WT:	<u>0457</u>	g
NET WT:	_____					

BEAKER #:	<u>504</u>	FINAL WT:	<u>106.9189</u>	g
ml:	<u>500</u>	TARE WT:	<u>106.8577</u>	g
desc:	<u>H2O</u>	NET WT:	<u>0612</u>	g

BEAKER #:	<u>505</u>	FINAL WT:	<u>95.1610</u>	g
ml:	<u>105</u>	TARE WT:	<u>95.1173</u>	g
desc:	<u>H2O</u>	NET WT:	<u>0437</u>	g

BEAKER #:	_____	FINAL WT:	<u>1055</u>	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

040 ml

TOTAL VOLUME OF DICHLOROMETHANE
USED IN EXTRACTION

75 ml

TOTAL VOLUME OF DISTILLED
WATER DRIED

305 ml

BLANKS DONE: 5/11/42

Run: 6 Date: 5/18/92

Technician(s): JS DK TK

FINAL WT: 106.8239 g
TARE WT: 106.2235 g
NET WT: 1.0004 g

FINAL WT: 96.2408 g
TARE WT: 96.8404 g
NET WT: 1.0004 g

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

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
D	106.0038	1306	106.2235	1036				
E	96.8404	1308	96.8424	1038				
F	96.5109	1330	96.5106	1040				

[illegible]

DATE	TIME	BY	WB	DB	%
5/13	1046	OK	59	74	40
5/14	1636	905	86	70	41
5/15	1200	BN	60	74	44

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
D	5/12	0900	106.2243	⁵⁻¹³ 1048	106.8239	⁵⁻¹³ 1059		
E	5/12	0900	96.8431	⁵⁻¹³ 1050	96.8428	⁵⁻¹³ 1701		
F	5/12	⁵⁻¹³ 1330	96.5112	⁵⁻¹⁴ 1700	96.5114	⁵⁻¹⁵ 1730		

[illegible]

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Unit: NAUGH5 527X
Run: 6
Date: 5/18/92
Technician(s): TR TR
WSTAPP1-AppDoc19-page2
Rev 6/90

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: .1048 g - 1 (.0000 g) = .1048 g
Total Catch No. of filters Blank Value/
filter Net Catch

Beakers: .0550 g - 175 (.000002 g) = .0547 g
Total Catch Ml of Acetone Blank Value/
ml of Acetone Net Catch

Total Front Half Catch .1795 g

Back Half Catch:

Filters: .1374 g - 1 (.0000 g) = .1374 g
Total Catch No. of filters Blank Value/
filter Net Catch

Beakers:

1. Acetone/Impingers: .0195 g - 240 (.000002 g) = .0190 g
Total Catch ml of acetone Blank Value/
ml of Acetone Net Catch

2. Extract/Impingers: .0457 g - 75 (.00000533 g) = .0453 g
Total Catch ml. of Blank Value/
Dichloromethane ml of Dichloro-
methane Net Catch

3. Water/Impingers: .1055 g - 305 (.000004 g) = .1043 g
Total Catch ml. of water Blank Value/
ml of water Net Catch

Total Back Half Catch .5060 g
Total Catch .6855 g
% Front Half 26.19 %

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

Unit: HAWKS 507X

Run: 6 Date: 5/18/90

Technician(s): SSTK

dec " H2O

NST3-Form 1 8/28/91

$$1) Vm(std) = \frac{(69.451 Vm) (17.65) (1066 mcf) (3001 " Hg) (13.6)}{(553 TmR)} = \frac{50071}{00.0000} \text{ scf} = \frac{10.9512}{000.0000} \text{ decf}$$

$$2) Vm(std) = (.04707) (106.8) (1 H2O) = \frac{5.0071}{00.0000} \text{ scf}$$

$$3) AsH = \frac{(50071 \text{ scf})}{(50071 \text{ scf} + 10.9512 \text{ decf})} = \frac{1062}{.0000} \text{ Bus X 100} = \frac{6.6165}{00.0000} \times H2O$$

$$4) Cs = \frac{(6855 \text{ g.})}{(70.9512 \text{ decf})} = \frac{1491}{0.0000} \text{ gr/decf}$$

$$5) \text{ Estimated g/hr} = \frac{(\quad \text{g.})}{(\quad \text{decf})} \left(\frac{6.78}{00.0000} \text{ decfm} \right) (60) = \frac{\quad}{00.0000} \text{ g/hr}$$

V_m = total cubic feet pulled on meter box during test
 mcf = meter correction factor (Y factor) of the meter box used for the test
 $" Hg$ = average barometric pressure during the test
 $" H2O$ = average delta H for the test
 TmR = average meter temperature for the test in degrees Absolute
 $1 H2O$ = total water caught during the test
 $g.$ = total particulate catch for the test
 $decfm$ = average stack flow during the test
 (P. 2) (000.000 Vm)
 (P. 2) (0.000 mcf)
 (P. 2) (00.00 " Hg)
 (P. 2) (0.000 " H2O)
 (P. 2) (000 TmR)
 (P. 3) (000.0 1 H2O)
 (P. 6) (00.0000 g.)
 (computer printout) (00.000 decfm)

Unit WOODSTOVE
Run # 6
Date 5/18/92
Technician BN JK DK JS
WST6-Form1, Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.473 ft³

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 $\left(\frac{\text{Upper Wt. } 2.4}{\text{Lower Wt. } 2.0} \right)^{1/2} \cdot 25 = \underline{.5}$ lbs.

Test Fuel Wt-lbs: Ideal 10.3 lbs. Range: 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.) $\frac{9.7 - (9.7 \times .17167)}{2.2025} \times \frac{60}{180} = \underline{1.216}$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HOF) (19,140) x $\frac{63}{100} \times 1.216 = \underline{14663}$ Est Heat Output (HOF) BTU's/Hr

Comments: 180 = 1.216

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 1764

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

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

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 _____ .

**FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10**

Unit: 140015
Run: 6
Date: 5/18/92
Technician: BN, JS, TK, DK
WST1-Form7-Rev11/89

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: 1430
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	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									(21.900)
14									
15									
16									
17									
18									
19	FEET	T	19.5	21.3	21.5	23.5	19.5	21.3	(22.033)
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: $\frac{100 \times \% \text{ Dry Rdg.}}{100 + \% \text{ Dry Rdg.}} = \% \text{ Moisture, Wet Basis}$

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

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Unit: INCHES
Run#: 6
Date: 5/18/92
Technician: BN, TK, PK, JS
WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3 1/2
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 cm³
(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:	<u>18.5</u>	<u>20.1</u>	%
Bottom:	<u>18.5</u>	<u>20.1</u>	%
Side:	<u>18.0</u>	<u>19.6</u>	%
\bar{X} :		<u>19.933</u>	%

Avg % Moisture (Dry) 19.933 %

Avg % Moisture (Wet) 16.620 %

Scale: Levelled 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

Into Dryer Date 5/18/92 Time 1430 Temp 229 °F
Out of Dryer 5/18/92 1445 229 °F

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

Density = 150.98 g ÷ 306.000 cm³ = 493.4 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 FUEL GAS DATA
 WOODSTOVE DATA SHEET #12
 NST2-Form 14 Rev 1/88

Unit: HOVARS 527X
 Run: 6 of 2
 Page: 1

Date: 5/18/92
 Technician(s): BU JK
DK JS

314.1

Minute Time	Scale Wt	lbs left	Burn Rate	1		2		3		T/C(1)/T/C(2)		T/C(3)		4		Comm			
				V.	CO ₂	V.	CO ₂	V.	CO ₂	Bal Bulb	Rel Bulb	Dry Bulb	% H ₂ O	Calc H/B	Stack		V.	PPH	Static Press.
00 10:05	323.8	9.7	0	.197	4.9	.599	15.2	.083	.84	5.9	86	104	3.6	105	214	.25	625	-.041	Flow
05 10:10	323.8	9.7	0	.112	2.8	.692	17.5	.045	.45	6.3	86	106	3.5	106	226	.19	475	-.046	Flow
10 10:15	323.6	9.5	.2	.094	2.4	.711	18.0	.049	.50	4.7	91	109	4.4	106	195	.24	600	-.042	Flow
15 10:20	323.3	9.2	.3	.127	3.2	.681	17.3	.048	.49	6.5	95	111	5.0	106	186	.24	600	-.041	Flow
20 10:25	323.1	9.0	.2	.126	3.2	.682	17.3	.052	.53	6.0	98	112	5.7	108	181	.24	600	-.039	Flow
25 10:30	322.9	8.8	.2	.156	3.9	.652	16.5	.050	.51	7.7	101	117	6.2	110	183	.23	575	-.041	Flow
30 10:35	322.5	8.4	.4	.205	5.1	.608	15.4	.056	.57	9.0	106	123	7.3	116	202	.22	550	-.044	Flow
35 10:40	321.9	7.8	.6	.240	6.0	.575	14.6	.068	.69	8.7	109	125	7.8	118	216	.22	550	-.047	Flow
40 10:45	321.5	7.4	.4	.359	8.9	.460	11.6	.057	.58	15.4	113	133	8.9	122	242	.21	525	-.054	Flow
45 10:50	320.7	6.6	.8	.410	10.2	.421	10.6	.027	.27	37.7	115	137	9.3	129	284	.20	500	-.061	Flow
50 10:55	320.0	5.9	.7	.426	10.6	.403	10.2	.023	.23	45.9	112	134	8.6	127	295	.19	475	-.061	Flow
55 11:00	319.4	5.3	.6	.438	10.9	.391	9.9	.022	.22	49.4	107	128	7.4	124	302	.19	475	-.063	Flow
60 11:05	318.7	4.6	.7	.426	10.6	.395	10.0	.018	.18	58.7	104	125	6.5	122	303	.19	475	-.063	Flow
65 11:10	318.1	4.0	.6	.471	11.7	.344	8.7	.039	.39	29.9	102	120	6.1	122	312	.19	475	-.066	Flow
70 11:15	317.5	3.4	.6	.480	11.9	.335	8.4	.031	.31	38.4	99	115	5.7	121	312	.20	500	-.065	Flow
75 11:20	317.0	2.9	.5	.405	10.0	.410	10.4	.021	.21	47.8	98	111	5.6	120	295	.19	475	-.064	Flow
80 11:25	316.6	2.5	.4	.391	9.7	.426	10.8	.013	.13	74.6	97	109	5.5	119	280	.19	475	-.062	Flow
85 11:30	316.3	2.2	.3	.361	9.0	.453	11.5	.014	.14	64.0	95	106	5.1	115	269	.19	475	-.057	Flow
90 11:35	315.9	1.8	.4	.344	8.5	.466	11.8	.015	.15	56.9	94	103	5.0	114	258	.19	475	-.055	Flow
95 11:40	315.7	1.6	.2	.308	7.7	.495	12.5	.037	.37	20.7	94	102	5.0	113	250	.19	475	-.054	Flow
100 11:45	315.5	1.4	.2	.285	7.1	.513	13.0	.058	.59	12.0	93	99	5.0	112	242	.20	500	-.052	Flow
105 11:50	315.4	1.3	.1	.246	6.1	.546	13.8	.076	.77	8.0	92	99	4.8	110	233	.20	500	-.050	Flow
110 11:55	315.2	1.1	.2	.235	5.9	.553	14.0	.095	.96	6.1	91	101	4.6	109	224	.20	500	-.047	Flow
115 12:00	315.1	1.0	.1	.225	5.6	.560	14.2	.101	1.03	5.4	90	103	4.3	109	218	.20	500	-.045	Flow
120 12:05															3196			-.680	Flow
125 12:10															5922			-.710	Flow

CLUBB FURNACE AND FLUE GAS DATA
 WOODSTOVE DATA SHEET #12
 NST2-Form 14 Rev 1/88

Unit: HARBUS S27X
 Run: 6 of 2
 Page: 2

Date: 5/18/92
 Technician(s): BJ PK JS

314.1

Minute Time	Scale Wt	lbs left	Burn Rate	1		2		3		T/C(1)/T/C(2)		T/C(3)		Static Press.	Com Flow				
				CO ₂ V.	CO ₂ %	O ₂ V.	O ₂ %	Rel	CO ₂ V.	Rel	Bal Bulb	Hot Bulb	Dry Bulb			% H ₂ O	Calc W/B	Stack	SO ₂ V.	PPH
120	1805	314.9	.8	.224	5.6	.560	14.2	14.2	.107	1.09	5.1	89	103	4.0	106	213	.20	500	-0.45
125	1810	314.8	.7	.212	5.3	.570	14.4	14.4	.111	1.13	4.7	87	103	3.8	105	210	.20	500	-0.44
130	1815	314.8	.7	.202	5.0	.580	14.7	14.7	.114	1.16	4.3	86	104	3.6	104	207	.20	500	-0.43
135	1820	314.7	.6	.191	4.8	.586	14.8	14.8	.135	1.37	3.5	86	105	3.6	104	204	.20	500	-0.42
140	1825	314.6	.5	.183	4.6	.593	15.0	15.0	.137	1.39	3.3	85	106	3.3	103	202	.20	500	-0.40
145	1830	314.6	.5	.171	4.3	.606	15.4	15.4	.137	1.39	3.1	85	107	3.3	102	198	.20	500	-0.40
150	1835	314.5	.4	.161	4.0	.612	15.5	15.5	.142	1.44	2.8	84	107	3.1	101	196	.20	500	-0.39
155	1840	314.4	.3	.151	3.8	.622	15.8	15.8	.145	1.47	2.6	84	107	3.1	100	192	.21	525	-0.38
160	1845	314.4	.3	.134	3.4	.637	16.1	16.1	.152	1.54	2.2	83	107	3.0	100	188	.21	525	-0.36
165	1850	314.3	.2	.130	3.3	.642	16.3	16.3	.147	1.49	2.2	83	107	3.0	100	184	.21	525	-0.36
170	1855	314.2	.1	.129	3.2	.643	16.3	16.3	.146	1.48	2.2	83	107	3.0	109	181	.22	550	-0.35
175	1900	314.2	.1	.133	3.3	.640	16.2	16.2	.148	1.50	2.2	83	107	3.0	109	178	.22	550	-0.34
180	05	314.1	Ø	.122	3.1	.651	16.5	16.5	.143	1.45	2.1	82	106	2.9	109	175	.22	550	-0.33
185																175			-0.33
190																2528			-505
195																8450			-1.765
200																228			-0.48
205																			✓
210																			
215																			3.7
220																			
225																			
230																			
235																			

★

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

Unit: HL64HS S27X
Run: 6
Page: 1 of 1

Date: 5/18/92
Technician(s): BN TK
DK JS

3/4.2-3138

T/C#-3

[illegible]

TEMPERATURES

RECORD SHEET #14

WST2-Form14 Rev1/88

Unit: HAWTHES S27XDate: 5/18/92Run: 6Technician(s): BK JKPage: 1 of 2BK JK

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute	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	319	374	231	272	396	832	703	82	1448	248	34	247	35	36
05	300	364	329	263	394	547	582	81	1448	248	34	247	35	36
10	291	344	334	258	392	542	635	81	1448	248	34	248	35	36
15	276	322	325	238	388	530	658	80	1448	248	34	248	35	36
20	268	306	320	231	379	547	606	80	1448	248	34	248	35	36
25	257	291	314	228	371	558	656	81	1448	248	34	248	35	36
30	269	279	315	226	361	555	843	81	1442	248	34	248	35	36
35	294	275	199	225	348	660	750	81	1441	248	34	248	35	36
40	334	275	191	227	341	760	1263	81	1441	248	34	248	35	36
45	434	279	199	240	332	861	1331	80	1441	248	34	248	35	36
50	468	291	211	255	325	918	1389	80	1442	248	34	248	35	36
55	499	303	222	268	320	956	1398	81	1444	248	34	248	35	36
60	517	324	239	283	317	1054	1336	81	1447	248	34	248	35	36
65	532	338	250	293	317	1128	1440	81	1448	248	34	248	35	36
70	549	359	265	304	318	1179	1324	82	1448	248	34	248	35	36
75	536	374	278	313	320	1174	1247	82	1448	248	34	248	35	36
80	516	386	283	326	324	1163	1224	82	1448	248	34	248	35	36
85	493	401	287	327	329	1143	1154	82	1448	248	35	248	35	36
90	467	411	284	322	333	1139	1121	82	1448	248	35	248	35	36
95	448	417	280	317	339	1093	974	81	1448	248	35	248	35	36
100	428	423	272	316	346	1044	912	81	1448	248	35	248	35	36
105	404	428	264	311	351	1016	872	82	1448	248	35	248	35	36
110	378	428	258	306	357	986	847	83	1448	248	35	248	35	36
115	357	423	250	299	360	966	817	83	1448	248	35	248	35	36
120	5625	4712	3210	3717	4011	13085	13268	982						
125	9634	8415	6400	6648	8358	21351	24082	1951						

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27X

18/8/2

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[illegible]

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

Site: EEMC - West, Kent, WA 98032 Date: 5/18/92 Analyte: CO₂ (15-1)
 Source: HAUGH'S S270 SERIES Run #: 6
 Zero Cyl #: T132257 Conc. 00.0 % CO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.6 % CO₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 407069
 Range: 0 - 25.0% CO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO₂EPA Control Limits = $\pm 2.5\%$ of 25.0% CO₂ = $\pm 0.625\%$ CO₂Pre 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: OK 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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: O₂ (15-2)
 Source: HAUGHS S270 Series Run #: 6
 Zero Cyl #: T132257 Conc. 00.0 % O₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.4 % O₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Teledyne Model: 320 Ax SN: 37465
 Range: 0 - 25.0% O₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% O₂
 EPA Control Limits = + 2.5% of 25.0% O₂ = + 0.625% O₂

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) %
 Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$
 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 = $\pm 2.5\%$ of 10.0% CO = $\pm 0.25\%$ COPre 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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: SO₂ (15-4)
 Source: HAUGHS S270 SERIES Run #: 6
 Zero Cyl #: T132257 Conc. 00.0 ppm SO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: AL2892 Conc. 1232 ppm SO₂ Cyl Press: 450 psi
 Certified by: LIQUID AIR Date: 9/24/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 403019
 Range: 0 - 2500 ppm SO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 2500 ppm SO₂EPA Control Limits = +2.5% of 2500 ppm SO₂ = +62.5 ppm SO₂Pre 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

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

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:
 Zero (0°F) : .6 °F Adj to: .0 °F Post Test Check Zero (0°F): .6 °F % Difference .030
 Span (2000°F): 2003.5 °F Adj to: 2000.0 °F Span (2000°F): 2004.4 °F % Difference .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

Tracer Gas (SO₂) Injection Train Leak Check: Pre ✓ Post ✓
 Combustion Gas (CO₂, O₂, CO) Train Leak Check: Pre ✓ Post ✓
 Tracer Gas (SO₂) Analyzer Train Leak Check: Pre ✓ Post ✓
 Draft (Static) Gauge Zero Check: Pre ✓ Post ✓

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

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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. (Vlc) -----	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		STACK GAS	
VOL. Vm(std) -----	76.41 dscf	FLOW Qsd -----	522.083 dscf/Hr
			&
			8.70 dscf/min
VOL. WATER		PARTICULATE	
VAPOR Vw(std) -----	5.107 scf	CONCTRT. C s -----	0.0126 g/dscf
PRCNT		PARTC.EMISS.	
MSTR Bws -----	6.26 %	RATE E -----	6.58 g/Hr
BURN		MOLES OF GAS	
RATE BR -----	1.07 Kg/Hr	PER Lb WOOD Nt -----	0.57 Lb-mole/Lb
CO EMISSION		PART.EMISS.	
RATE -----	122.01 g/Hr	RATE -----	6.13 g/Kgdry
	&		fuel
	113.71 g/Kgdry		
	fuel		

TABLE 5 ----- PROPORTIONAL RATE VARIATION

HAUGHS PRODUCTS

TEST No. : 7

S-27X

DATE: 5/19/92

TIME INTERVAL 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			

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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. 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) 20.1703 % (wet) 17.207 %
 (00.00) (Data Sheet #10)

Stack Static Pressure -0.44 "H₂O
 (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 1988 .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 96.7 g
 (0.0000) (Data Sheet #6)

H₂O 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: 45-1.066 Post Test Leak Rate 1003 CFM

DOOR CONF#2

Meter Box 43 Y Factor 1.066Page 1 of 2Unit: HAUGHS S27XRun: 7 Date: 5/19/92Operator(s): JSLeak Checks: 15.0 " Hg @ .001 cfm
14.0 " Hg @ .003 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>.19</u>			Sampling Ratio : <u>.005</u> : 1			BAROMETER: <u>30.05</u>		
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	8.612	.24	78	400	73	.5
10	40	823.102	6.561	.14	79	505	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	485	71	.5
40	10	831.228	7.489	.18	82	475	71	1.0
45	15	833.514	8.304	.22	83	485	71	1.0
50	20	835.338	8.304	.22	84	485	71	1.0
55	25	837.162	8.304	.22	84	485	71	1.0
ROTO PRESS: <u>.19</u>			TOTALS :	<u>81434</u>	<u>2.10</u>	<u>970</u>	BAROMETER: <u>30.04</u>	
60	30	838.998	8.270	.22	85	485	73	1.0
65	35	840.236	8.286	.25	85	400	73	1.0
70	40	842.723	8.270	.22	85	485	73	1.5
75	45	844.626	8.270	.22	85	485	73	1.0
80	50	846.463	8.270	.22	85	485	73	1.0
85	55	848.308	7.810	.20	86	450	73	1.0
90	1200	850.050	8.270	.22	86	485	73	1.0
95	5	851.294	8.270	.22	86	485	73	1.5
100	10	853.739	7.781	.19	87	450	75	1.0
105	15	855.427	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	505	75	1.5
			TOTALS:	<u>95.450</u>	<u>2.45</u>	<u>1033</u>	MAX VACC =	
TOTAL CU FT			TOTALS:	<u>123.384</u>	<u>4.55</u>	<u>2003</u>	AV BP:	

Meter Box 45 Y Factor 1.066Unit: HAUGHS S22XLeak Checks: 150 " Hg @ 1001 cfm
210 " Hg @ 1003 cfm
" Hg @ cfm
" Hg @ cfmRun: 7 Date: 5/19/92Operator(s): JS

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: <u>.19</u>			Sampling Ratio: <u>205</u> : 1			BAROMETER: <u>30.03</u>			
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	861.219	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	866.766	6.988	.16	89	500	76	.5	
145	55	868.152	6.975	.16	89	500	77	.5	
150	1:00	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: <u>.19</u>			TOTALS: <u>83.405</u>			BAROMETER: <u>30.00</u>			
180	30	879.060	6.981	.16	89	500	76	.5	
185	35	880.247	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	1:00	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		6.981	.16	87				
235	25		336.604	.801	3946				
			TOTALS:			MAX VACC = <u>1.5</u>			
TOTAL CU FT <u>73.785</u>			TOTALS: <u>7.317</u>			AV BP: <u>30.03</u>			

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance	Balance
Initial:	Level <u>✓</u>	Zeroed <u>✓</u>
Final:	<u>✓</u>	<u>✓</u>

Unit: Hought S270

Run: 7

Date: 5/19/92

IMPINGER #1

Final Weight	<u>663.5</u>	grams	Technician(s): Initial: <u>TK</u>
Initial Weight	<u>576.4</u>	grams	Final: <u>JS</u>
Net	<u>87.1</u> ✓	grams	Approved By: <u>TK</u>

IMPINGER #2

Final Weight	<u>590.6</u>	grams
Initial Weight	<u>584.8</u>	grams
Net	<u>5.8</u> ✓	grams

IMPINGER #3

Final Weight	<u>499.9</u>	grams
Initial Weight	<u>498.5</u>	grams
Net	<u>1.4</u> ✓	grams

IMPINGER #4 (SILICA GEL)

Final Weight	<u>831.0</u>	grams
Initial Weight	<u>816.8</u>	grams
Net	<u>14.2</u> ✓	grams

TOTAL MASS OF H₂O 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 HalfManufacturer: 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	Yes				
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		HAUWHS RNT			
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: 3/24/91 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	Yes

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	g				
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 RUN #			
267P	0.3817		1538		.3822		1347					
268B	0.3772		1540		.3770		1348					
269B	0.3875		1542		.3876		1349					
270B	0.3813		1544		.3839		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 DKDate: 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	g

INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 4/22/92 Time: 0945 By: OK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
526	106.0504	4/27	1130	OK	106.0506	4/28	1417	OK				
527	104.1494		1132		104.1497		1419					
528	106.6814		1134		106.6818		1421					
529	100.9086		1136		100.9088		1423					
530	105.0427		1138		105.0431		1425					
531	95.5983	4/27	1140	OK	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	OK	96.3692		1437					
537	105.5585		1152		105.5587		1439					
538	105.4849		1154		105.4854		1441					
539	107.4790		1156		107.4794		1443					
540	107.3581		1158		107.3581		1445					
541	97.6250	4/27	1200	OK	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	OK	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: [Signature]

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	OK
59	72	46	4/28	1415	OK

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
526		5/20	0900	DK	106.1072	5/21	1035	DK	106.1064	5/22	1026	DK	106.1059	5/22	1531	DK
527		5/20	0900	DK	104.4096	5/21	1037	DK	104.4071	5/22	1028	DK	104.4069	5/22	1533	DK
528		5/21	0900	DK	106.7704	5/22	1030	DK	106.7699	5/22	1535	DK				
529		5/21	0900	DK	101.0232	5/22	1032	DK	101.0030	5/22	1537	DK				
530		5/20	0900	DK	105.0917	5/21	1039	DK	105.0904	5/22	1034	DK	105.0906	5/22	1539	DK

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
DL6F		5/19	1445	DK	0.8612	5/20	1014	DK	0.8615	5/21	1001	DK				
DL6B		5/19	1445	DK	0.6172	5/20	1016	DK	0.6174	5/21	1003	DK				

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	DK	60	74	44
3	5/22	1024	DK	60	73	47
4	5/22	1515	DK	57	70	44
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6	7	8	9	Comments

WST7-For.

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartori
Model AI205
SN 37010004

Dates: From 4/23/92

Through

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	0.9997	0.1000			DK	4/23	1130	71	57	34
99.9997	10.0000	0.9998	0.1000			DK	4/24	1630	70	57	44
100.0001	10.0002	1.0001	0.1000			DK	4/27	1045	73	60	47
99.9999	10.0001	0.9998	0.0999			DK	4/28	1330	71	59	47
99.9999	10.0000	1.0001	0.0999			DK	4/29	1010	74	61	47
99.9998	9.9998	0.9999	0.1000			DK	4/30	0846	77	62	49
99.9997	9.9999	1.0000	0.1000			DK	5/1	950	71	61	39
99.9995	10.0001	0.9999	0.0999			DK	5/1	1600	71	57	41
100.0002	10.0002	1.0001	0.1000			DK	5/1	930	78	62	40
100.0000	10.0001	1.0000	0.1001			DK	5/5	1010	75	60	41
99.9999	10.0000	1.0001	0.0999			DK	5/5	1505	74	61	47
99.9997	10.0000	1.0001	0.0999			DK	5/6	930	74	60	44
99.9998	10.0001	1.0001	0.1000			DK	5/6	1640	70	59	46
99.9998	10.0001	1.0001	0.1002			DK	5/7	1000	73	59	43
99.9997	10.0001	1.0001	0.1001			DK	5/7	1445	71	59	49
99.9996	10.0001	1.0001	0.1000			DK	5/8	1105	65	54	48
99.9996	10.0001	0.9998	0.0998			DK	5/8	1650	68	56	47
99.9998	9.9998	1.0000	0.1000			DK	5/11	1000	67	54	42
99.9997	10.0001	1.0000	0.0999			DK	5/12	0900	74	60	44
99.9998	10.0001	1.0000	0.0999			DK	5/12	1345	74	58	45
100.0002	10.0002	1.0000	0.1000			DK	5/13	950	74	59	40
99.9998	9.9999	1.0001	0.0999			DK	5/14	1636	70	56	41
100.0000	10.0002	1.0001	0.0999			DK	5/15	1000	74	60	44
100.0003	10.0000	1.0000	0.1001			DK	5/18	0900	71	58	45
99.9998	9.9997	0.9996	0.0997			DK	5/18	1500	73	59	45
99.9998	10.0000	0.9999	0.0999			DK	5/19	0930	70	57	44
100.0001	10.0003	1.0002	0.1003			DK	5/19	1707	70	56	41
99.9996	9.9998	1.0000	0.0997			DK	5/20	945	70	56	41
99.9998	10.0000	0.9998	0.0997			DK	5/21	1005	74	60	47
100.0000	10.0000	1.0001	0.1001			DK	5/22	1000	73	60	47
						DK	5/22	1515	70	57	47

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEETDates: From 3/12Through 4/03Scale Sartorius
Model AL205
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
99.9998	9.9999	1.0000	0.0998			DK	3/13	1415	74	60	44
99.9998	10.0003	1.0001	0.1000			DK	3/16	1300	74	60	44
100.0000	10.0001	1.0002	0.1000			DK	3/17	0900	70	57	44
100.0000	10.0001	1.0000	0.1001			DK	3/17	1607	71	59	44
99.9997	10.0001	1.0000	0.1000			DK	3/19	1715	74	59	44
99.9998	9.9999	0.9999	0.0998			DK	3/20	1500	74	60	44
100.0000	10.0000	1.0000	0.0998			DK	3/23	1045	73	59	43
100.0000	10.0000	1.0003	0.1003			DK	3/24	0945	72	58	42
99.9997	10.0001	1.0001	0.1002			DK	3/25	1035	76	61	40
100.0001	9.9999	1.0001	0.1001			DK	3/26	1045	73	59	43
100.0001	9.9999	1.0001	0.1001			DK	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	0.1000			DK	3/30	1000	71	57	47
99.9999	10.0004	1.0001	0.1000			DK	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	0.1000			DK	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	0.0999			TK	4/6	0936	68	57	39
100.0000	9.9999	0.9998	0.1000			BN	4/6	1600	70	57	41
99.9999	9.9998	0.9999	0.0998			TK	4/7	1300	71	58	45
99.9999	9.9999	0.9999	0.0998			DK	4/8	1515	68	58	44
100.0000	9.9998	0.9999	0.0999			TK	4/9	1035	68	58	43
100.0000	10.0001	1.0000	0.1000			DK	4/10	0935	70	58	41
100.0000	9.9999	0.9999	0.0999			DK	4/10	1400	72	58	42
100.0000	10.0003	1.0002	0.1002			DK	4/13	0945	72	58	42
100.0002	10.0003	1.0001	0.0998			DK	4/14	1030	72	58	46
99.9998	10.0001	1.0001	0.0998			DK	4/15	1015	68	57	47
99.9997	9.9999	0.9998	0.0998			DK	4/16	1006	68	57	47
100.0001	9.9999	1.0000	0.1001			DK	4/17	0915	70	57	44
99.9996	9.9999	1.0000	0.1000			DK	4/17	1525	70	58	44
100.0001	10.0000	0.9999	0.1001			DK	4/20	0900	72	59	46
99.9998	10.0000	1.0000	0.1001			DK	4/21	1040	74	60	44
100.0000	10.0000	1.0000	0.0999			DK	4/23	0900	73	59	43
99.9995	10.0003	1.0000	0.1001			DK	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 AI205

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	0.1001			DK	2/6	1315	68	56	47
99.9999	10.0000	1.0000	0.1000			DK	2/7	0915	65	51	48
100.0001	9.9999	1.0001	0.1000			DK	2/7	1415	70	58	48
99.9999	10.0000	1.0000	0.1000			DK	2/10	0910	68	56	47
100.0001	9.9999	0.9998	0.1000			DK	2/10	1500	73	62	48
100.0000	10.0000	1.0000	0.1000			DK	2/10	0910	72	59	47
99.9997	10.0001	1.0000	0.1001			DK	2/11	0920	71	61	47
100.0001	10.0000	1.0001	0.1000			DK	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	0.1000			DK	2/12	0920	74	61	47
99.9998	10.0001	1.0000	0.1000			DK	2/13	0900	70	58	47
100.0000	10.0000	1.0001	0.1000			DK	2/13	1230	75	63	48
100.0000	9.9999	1.0000	0.1000			DK	2/13	1535	15	62	48
100.0000	10.0000	1.0000	0.1000			DK	2/14	0930	77	63	48
100.0000	10.0000	1.0000	0.1000			DK	2/14	1240	76	62	47
99.9999	10.0000	1.0001	0.0999			DK	2/14	1600	76	62	47
100.0000	10.0001	1.0000	0.0999			DK	2/14	1600	76	62	47
99.9999	10.0000	1.0001	0.1000			DK	2/17	0820	65	54	48
99.9999	10.0000	0.9999	0.1000			DK	2/17	1035	68	54	47
99.9999	10.0001	1.0000	0.1000			DK	2/17	0856	65	54	48
100.0000	9.9999	1.0000	0.0999			DK	2/18	1000	67	55	46
100.0000	9.9999	1.0000	0.0999			DK	2/21	0945	71	58	45
100.0000	9.9999	1.0000	0.1000			DK	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	0.9999	0.0999			DK	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			DK	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			DK	3/4	1130	72	59	46
99.9999	10.0000	1.0000	0.1000			DK	3/5	0935	70	58	48
99.9999	10.0000	0.9999	0.0999			DK	3/6	0830	73	60	47
99.9999	10.0000	0.9999	0.0998			DK	3/6	1400	76	60	43
99.9998	10.0000	0.9999	0.1000			DK	3/9	1010	71	59	48
99.9999	10.0000	0.9999	0.1000			DK	3/9	1340	79	64	46
100.0002	9.9999	1.0000	0.0998			DK	3/10	0900	75	60	41
99.9996	10.0000	1.0000	0.0999			DK	3/11	1605	70	57	44

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: HAUGHS S27X
Run: 7 Date: 5/19/92
Technician(s): JS

FRONT HALF

FILTER #: <u>D66F</u>	BEAKER #: <u>506</u>	FINAL WT: <u>106.1059</u> g
FINAL WT: <u>1.8615</u> ✓ g	ml: <u>100</u>	TARE WT: <u>106.0506</u> ✓ g
TARE WT: <u>1.6936</u> ✓ g	desc: <u>ACETONE</u>	NET WT: <u>1.0553</u> ✓ g
NET WT: <u>1.1679</u> ✓ g		
FILTER #: _____	BEAKER #: _____	FINAL WT: _____ g
FINAL WT: _____ g	ml: _____	TARE WT: _____ g
TARE WT: _____ g	desc: <u>ACETONE</u>	NET WT: _____ g
NET WT: _____ g		

TOTAL VOLUME OF ACETONE
USED IN WASH

200 - ml

BACK HALF

FILTER #: <u>D66B</u>	BEAKER #: <u>507</u>	FINAL WT: <u>104.4069</u> ✓ g
FINAL WT: <u>1.6174</u> ✓ g	ml: <u>100</u>	TARE WT: <u>104.1497</u> ✓ g
TARE WT: <u>1.3824</u> ✓ g	desc: <u>ACETONE</u>	NET WT: <u>1.0572</u> ✓ g
NET WT: <u>1.0350</u> ✓ g		
FILTER #: _____	BEAKER #: <u>508</u>	FINAL WT: <u>106.7699</u> ✓ g
FINAL WT: _____ g	ml: <u>75</u>	TARE WT: <u>106.6818</u> ✓ g
TARE WT: _____ g	desc: <u>METHCHLOR</u>	NET WT: <u>1.0881</u> ✓ g
NET WT: _____ g		

BEAKER #: <u>509</u>	FINAL WT: <u>101.0230</u> ✓ g
ml: <u>100</u>	TARE WT: <u>100.9088</u> ✓ g
desc: <u>H2O</u>	NET WT: <u>1.1142</u> ✓ g

BEAKER #: <u>530</u>	FINAL WT: <u>105.0906</u> ✓ g
ml: <u>100</u>	TARE WT: <u>105.0431</u> ✓ g
desc: <u>H2O</u>	NET WT: <u>1.0475</u> ✓ g

BEAKER #: _____	FINAL WT: <u>1.1617</u> ✓ 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

150 - ml

TOTAL VOLUME OF DICHLOROMETHANE
USED IN EXTRACTION

75 ml

TOTAL VOLUME OF DISTILLED
WATER DRIED

300 - ml

BLANKS DONE: 5/11/92

Run: 7 Date: 5/19/92

Technician(s): JS DK TK

BEAKER #: D
200 ml ACETONE
FISHER OPTIMA LOT #: 913896

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

BEAKER #: F
200 ml DISTILLED WATER
BONNEAU CERTIFIED

FINAL WT: 106.2239 9
TARE WT: 106.2235 9
NET WT: 1.0004 9

FINAL WT: 96.2408 g
TARE WT: 96.2404 g
NET WT: 0.0004 g

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

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

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
5/13	1046	OK	59	74	40
5/14	1636	905	56	70	41
5/15	1200	BN	60	74	44

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
D	5/12	0900	106.2243	⁵⁻¹³ 1048	106.0239	⁵⁻¹³ 1059		
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 1730		

[illegible]

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Unit: HAUGHS 521X
Run: 7
Date: 5/19/92
Technician(s): JX JK
WSTAPP1-AppDoc19-page2
Rev 6/90

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 - 1 (.0000 g) = .1679 g
Total Catch No. of filters Blank Value/
filter
Beakers: .0553 g - 200 (.000002 g) = .0549 g
Total Catch Ml of Acetone Blank Value/
ml of Acetone
Total Front Half Catch .0549 g

Back Half Catch:

Filters: .0350 g - 1 (.0000 g) = .0350 g
Total Catch No. of filters Blank Value/
filter
Beakers:
1. Acetone/Impingers: .0579 g - 250 (.000002 g) = .0567 g
Total Catch ml of acetone Blank Value/
ml of Acetone
2. Extract/Impingers: .0881 g - 75 (.00000533 g) = .0877 g
Total Catch ml. of Dichloromethane Blank Value/
ml of Dichloro-
methane
3. Water/Impingers: .1617 g - 300 (.000004 g) = .1605 g
Total Catch ml. of water Blank Value/
ml of water

Total Back Half Catch .7399 g
Total Catch .9687 g
% Front Half 03.14 %

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

Unit: HAUGHS 507X

Run: 7 Date: 5/19/92

Technician(s): SS TK

NST3-Form 1 8/28/91

$$1) V_m(\text{std}) = \frac{(13.785 \text{ Vm}) (17.65) (1066 \text{ mcf}) (30.03 - \text{Hg}) (13.6)}{(546 \text{ Tm})} = \frac{174 \text{ H}_2\text{O}}{76.3867} = \frac{000.0000}{\text{scf}}$$

$$2) V_m(\text{std}) = (0.04707) (108.5 \text{ m H}_2\text{O}) = \frac{5.1071}{00.0000} \text{ scf}$$

$$3) \text{ASH} = \frac{(5.1071 \text{ scf})}{(5.1071 \text{ scf} + 76.3867 \text{ scf})} = \frac{0.007}{0.0000} \times \text{H}_2\text{O}$$

$$4) C_s = \frac{(19497 \text{ g.})}{(76.3867 \text{ scf})} (15.43) = \frac{1945}{0.0000} \text{ gr/scf}$$

$$5) \text{Estimated g/hr} = \frac{(\text{g.})}{(\text{scf})} \left(\frac{7.317}{00.000} \text{ scfm} \right) (60) = \frac{\text{g/hr}}{00.0000}$$

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

Run # 7
 Date 5/19/95
 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 ft³

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: 0 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 ($\frac{2.6}{\text{Upper Wt.}} + \frac{2.2}{\text{Lower Wt.}} / 2$) .25 = 16 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.) $\frac{10.7}{2.2025} \times \frac{60}{1000} = \frac{1.0726}{805}$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HOF) (19,140) x $\frac{63}{100} \times \frac{1.0726}{100} = \frac{12933}{100}$ Est Heat Output (HOF) BTU's/Hr

Comments: 195 = 1.238

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 416A

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

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

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 (1.5 lbs) added at 0946 .
4th warm up/preburn fuel charge (_____ lbs) added at _____ .
5th warm up/preburn fuel charge (_____ lbs) added at _____ .

**FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10**

Unit: 7
Run: 5/19/92
Date: BN, JS, TK, DK
Technician: WST1-Form7-Rev11/89

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: 0900
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	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									

% Moisture - Dry Basis:

% Moisture - Wet Basis:

Kindling	Pretest Fuel	Test Load
4.000%	20.033%	20.783%
3.846%	16.690%	17.207%

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

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

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

Unit: HHWDT3
Run#: 7
Date: 5/19/92
Technician: BN TK DK JS
WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 2 x 4 x 3 1/2
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 cm³
(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: Levelled 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

Into Dryer Date 5/19/92 Time 0830 Temp 225 °F
Out of Dryer 5:40 AM 1445 205 °F

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

Density = 201.23 g ÷ 304.943 cm³ = .6599 g/cm³ ✓
(dry wt) (volume)

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. g

Wet Wt: g ÷ g = %

Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: g ÷ g = %

Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

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

T/C(3) A

Minute Time	Scale Ht.	lbs Left	Burn Rate	CO ₂		O ₂	T/C(1)T/C(2)		CO	T/C(3)		4							
				V.	2002		Rel	V.		2002	Bal		Rel	Dry Bulb	% H ₂ O	Calc H/B	Stack	SO ₂ V.	PPH	Static Press.	Com
00 1030	317.8	10.7	0	.209	5.2	.598	15.2	15.2	.47	11.1	93	144	3.5	10.5	216	.20	500	-.042	Flow
03 35	317.6	10.5	.2	.118	3.0	.693	17.6	17.6	.46	6.4	107	154	6.4	12.4	225	.16	400	-.048	SO ₂
10 40	317.3	10.2	.3	.103	2.6	.708	18.0	18.0	.46	5.6	110	144	7.5	11.5	192	.21	525	-.043	CO ₂
15 45	317.2	10.1	.1	.102	2.6	.707	17.9	17.9	.46	5.6	109	139	7.2	11.4	182	.22	550	-.041	PPH
20 50	317.0	9.9	.2	.109	2.7	.702	17.8	17.8	.49	5.6	110	136	7.3	11.3	177	.22	550	-.040	CO
25 55	316.7	9.6	.3	.111	2.8	.699	17.7	17.7	.54	5.2	108	132	7.4	11.2	172	.22	550	-.038	
30 100	316.5	9.4	.2	.111	2.8	.696	17.7	17.7	.66	4.2	108	130	7.4	11.2	169	.23	575	-.036	
35 05	316.0	8.9	.5	.299	7.4	.515	13.0	13.0	.33	22.5	115	145	9.0	12.2	230	.17	425	-.050	
40 10	315.5	8.4	.5	.289	7.2	.525	13.3	13.3	.55	13.1	119	146	10.2	12.6	225	.19	475	-.051	
45 15	314.8	7.7	.7	.345	8.6	.480	12.1	12.1	.20	42.8	122	152	11.8	13.1	264	.17	425	-.057	
50 20	314.3	7.2	.5	.382	9.5	.430	10.9	10.9	.11	86.2	123	156	12.1	13.3	284	.17	425	-.059	
55 25	313.6	6.5	.7	.430	10.7	.394	9.9	9.9	.17	62.7	125	159	12.4	13.4	295	.17	425	-.062	Flow
															2631			-.567	SO ₂
60 30	312.8	5.7	.8	.451	11.2	.366	9.2	9.2	.25	44.7	127	163	13.0	13.6	307	.17	425	-.064	SO ₂
65 35	312.2	5.1	.6	.419	10.4	.414	10.5	10.5	.18	57.7	124	160	12.7	13.5	296	.16	400	-.064	SO ₂
70 40	311.7	4.6	.5	.393	9.7	.418	10.6	10.6	.17	57.3	121	157	11.4	13.2	283	.17	425	-.062	SO ₂
75 45	311.2	4.1	.5	.387	9.6	.431	10.9	10.9	.18	53.3	126	158	10.8	13.0	280	.17	425	-.061	CO
80 50	310.6	3.5	.6	.412	10.2	.410	10.4	10.4	.18	56.8	119	157	10.2	13.0	284	.17	425	-.061	
85 55	310.2	3.1	.4	.365	9.1	.457	11.6	11.6	.29	31.2	114	151	8.5	12.4	273	.18	450	-.058	
90 1000	309.8	2.7	.4	.345	8.6	.479	12.1	12.1	.25	34.3	109	140	7.3	12.1	265	.17	425	-.057	
95 05	309.5	2.4	.3	.348	8.6	.470	11.9	11.9	.18	48.0	105	131	6.6	11.9	258	.17	425	-.056	
100 10	309.2	2.1	.3	.318	7.9	.506	12.8	12.8	.26	30.4	101	127	5.8	11.6	251	.18	450	-.054	
105 15	309.0	1.9	.2	.280	7.0	.532	13.5	13.5	.30	23.2	97	124	4.9	11.3	242	.18	450	-.053	
110 20	308.8	1.7	.2	.245	6.1	.568	14.4	14.4	.79	7.7	92	123	3.9	10.9	231	.20	500	-.050	
115 125	308.7	1.6	.1	.210	5.2	.584	14.8	14.8	1.01	5.2	89	125	3.3	10.5	220	.21	525	-.047	
															3190			-.687	
															5491			-.1251	

LOW INTRIC AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
MS12-Form 14 Rev 1/88

Unit: Haywards S27X
Date: 5/19/92
Run: 7
Technician(s): BD JK
Page: 2 of 2

307.1

1		2		3		T/C(1)/T/C(2)		T/C(3)		4							
Minute	Scale	lbs	Burn	CO ₂	CO ₂	Ret	Dry	%	Calc	Stack	SO ₂	Static	Comm				
Time	Ht	left	Rate	V.	%CO ₂	Bulb	Bulb	H ₂ O	H/B	V.	PPH	Press.	Flow				
120	308.6	1.5	.1	.188	4.7	15.3	15.3	108	4.3	87	127	2.9	104	210	.21	525	SO₂ Flow
125	308.5	1.4	.1	.178	4.4	15.5	15.5	105	4.2	87	127	2.9	102	205	.20	500	SO₂ Flow
130	308.4	1.3	.1	.164	4.1	15.9	15.9	107	3.8	87	127	2.9	101	199	.20	500	SO₂ Flow
135	308.3	1.2	.1	.154	3.9	16.1	16.1	114	3.3	87	126	2.9	101	193	.20	500	SO₂ Flow
140	308.2	1.1	.1	.146	3.7	16.3	16.3	111	3.2	88	125	3.2	101	189	.20	500	SO₂ Flow
145	308.1	1.0	.1	.139	3.5	16.5	16.5	112	3.1	88	125	3.2	101	187	.20	500	SO₂ Flow
150	308.1	1.0	Ø	.137	3.4	16.5	16.5	106	3.2	87	123	2.9	100	182	.20	500	SO₂ Flow
155	308.0	.9	.1	.140	3.5	16.5	16.5	.095	3.7	87	122	2.9	100	178	.20	500	SO₂ Flow
160	307.9	.8	.1	.141	3.5	16.4	16.4	.00	3.5	87	122	2.9	100	176	.20	500	SO₂ Flow
165	307.8	.7	.1	.146	3.7	16.3	16.3	.100	3.6	87	120	3.2	98	173	.20	500	SO₂ Flow
170	307.8	.7	Ø	.147	3.7	16.3	16.3	.100	3.6	87	120	3.2	96	171	.20	500	SO₂ Flow
175	307.7	.6	.1	.148	3.7	16.3	16.3	.098	3.7	87	118	3.3	98	169	.20	500	SO₂ Flow
180	307.6	.5	.1	.145	3.6	16.3	16.3	.098	3.7	86	117	3.1	96	168	.20	500	SO₂ Flow
185	307.6	.5	Ø	.146	3.7	16.3	16.3	.092	3.9	86	117	3.1	96	168	.20	500	SO₂ Flow
190	307.5	.4	.1	.142	3.6	16.5	16.5	.092	3.8	86	117	3.1	96	167	.20	500	SO₂ Flow
195	307.5	.4	Ø	.136	3.4	16.7	16.7	.100	3.4	85	116	3.0	95	165	.20	500	SO₂ Flow
200	307.4	.3	.1	.123	3.1	16.9	16.9	.105	2.9	84	115	2.8	93	163	.20	500	SO₂ Flow
205	307.3	.2	.1	.126	3.2	16.8	16.8	.104	3.0	84	114	2.8	93	162	.20	500	SO₂ Flow
210	307.3	.2	Ø	.123	3.1	16.8	16.8	.112	2.7	84	114	2.8	93	161	.20	500	SO₂ Flow
215	307.2	.1	.1	.121	3.0	16.9	16.9	.105	2.8	84	114	2.8	93	160	.20	500	SO₂ Flow
220	307.2	.1	Ø	.123	3.1	16.8	16.8	.107	2.8	84	114	2.8	93	159	.20	500	SO₂ Flow
225	307.1	Ø	.1	.124	3.1	16.8	16.8	.110	2.8	84	114	2.8	93	159	.20	500	SO₂ Flow
230														1632			SO₂ Flow
235														3864			SO₂ Flow
240														9685			SO₂ Flow

TEMPERATURES
RECORD SHEET #14
WST2-Form 14 Rev 1/88

Unit: HAWKINS S27X Date: 5/19/92
Run: 7 Technician(s): BU JK
Page: 1 of 2

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute	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 30	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
30 100	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
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
90 100	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
115 125	365	392	239	401	339	1055	890	78	1445	247	35	248	35	36
120 150	5548	4421	2950	4609	3940	12839	13517	910						
125 155	9307	8178	6000	8337	8436	20569	23619	1780						

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev1/88

Unit: Harbors S27X
Run: 7
Page: 2 of 2

Date: 5/19/92
Technician(s): BK TK
BK JS

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Minute	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	SO2 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
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	222	298	191	276	318	677	589	750						
235	553	707	435	685	725	1669	14318	1671	AT START		342.6			46
240	14838	15255	10354	15194	15689	37260	37937	3451	STOP		252.8			
245	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: CO₂ (15-1)
 Source: HAUGH'S S270 SERIES Run #: 7
 Zero Cyl #: T132257 Conc. 00.0 % CO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.6 % CO₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 407069
 Range: 0 - 25.0% CO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO₂EPA Control Limits = $\pm 2.5\%$ of 25.0% CO₂ = $\pm 0.625\%$ CO₂Pre 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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: O₂ (15-2)
 Source: HAUGHS S270 Series Run #: 7
 Zero Cyl #: T132257 Conc. 00.0 % O₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: 29004 Conc. 12.4 % O₂ Cyl Press: 900 psi
 Certified by: MATHESON Date: 10/31/91
 Analyzer: Make: Teledyne Model: 320 Ax SN: 37465
 Range: 0 - 25.0% O₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: _____

EPA Span Value = 25.0% O₂EPA Control Limits = + 2.5% of 25.0% O₂ = + 0.625% O₂

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	12.513	.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) %

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

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 = $\pm 2.5\%$ of 10.0% CO = $\pm 0.25\%$ COPre 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) %

Zero % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$ 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: SO₂ (15-4)
 Source: HAUGHS S270 SERIES Run #: 7
 Zero Cyl #: T132257 Conc. 00.0 ppm SO₂ Cyl Press: 800 psi
 Certified by: LIQUID AIR Date: 10/7/91
 Span Cyl #: AL2892 Conc. 1232 ppm SO₂ Cyl Press: 450 psi
 Certified by: LIQUID AIR Date: 9/24/91
 Analyzer: Make: Horiba Model: PIR-2000 SN: 403019
 Range: 0 - 2500 ppm SO₂ Analyzer Output: 0 - 1.0 v.
 Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 2500 ppm SO₂EPA Control Limits = +2.5% of 2500 ppm SO₂ = +62.5 ppm SO₂Pre Run Audit: By: BN Time: 1000 Temp: 75 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
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			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
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

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

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: 74.0 °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 (SO₂) Injection Train Leak Check: Pre ☒ Post ☒
Combustion Gas (CO₂, O₂, CO) Train Leak Check: Pre ☒ Post ☒
Tracer Gas (SO₂) Analyzer Train Leak Check: Pre ☒ Post ☒
Draft (Static) Gauge 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

Co. EEMC

At: Kent OH

Make Weight-Tronic

S/N 016 409

Inspected By Kenneth J. Jones

Date 1-30-87

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

Initial Scale Calibration

Phillips SCALE COMPANY, INC.

Certificate of Inspection for:

Co. EMC At: Kent WA.

Make Wiegand Trex 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
<u>50</u> Lbs	<u>50</u>	<u>200</u> Lbs	<u>200</u>	<u>350</u> Lbs	<u>350</u>
<u>100</u> Lbs	<u>100</u>	<u>250</u> Lbs	<u>250</u>	<u>400</u> Lbs	<u>400</u>
<u>150</u> Lbs	<u>150</u>	<u>300</u> Lbs	<u>300</u>	<u>450</u> Lbs	<u>450</u>
		<u>500</u>	<u>500</u>	<u>520</u>	<u>520</u>

Next Inspection Due Date 7-2-92

Phillips SCALE COMPANY, INC.

Certificate of Inspection for:

Co. EEMC At: KEWT WA.

Make WeightTronix - 101-110 S/N 016409

Inspected By Kenny 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
<u>50</u> Lbs	<u>50</u>	<u>200</u> Lbs	<u>200</u>	<u>350</u> Lbs	<u>350</u>
<u>100</u> Lbs	<u>100</u>	<u>250</u> Lbs	<u>250</u>	<u>400</u> Lbs	<u>400</u>
<u>150</u> Lbs	<u>150</u>	<u>300</u> Lbs	<u>300</u>	<u>450</u> Lbs	<u>450</u>

Next Inspection Due 500 Lbs 500 Date QT-3-92

CERTIFICATE OF ACCURACY

Page of

ADMITTED BY COUNTY OF	DATE 8/20/90	CODE NO. 42923	SET B	CERTIFICATE NO.
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TO:

Phillips Scale Co.
Attn: Ken Jackson
934 Elliott Ave. W
Seattle WA 98119

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.

[illegible]

REMARKS

Principal State Metrologist (Signature)

Date: _____

STATE OF WASHINGTON

NBS Sets A & B
Test #42923

CODE NO.

CITY

STATE

212

934 Elliott Ave. W., Seattle, WA 98119

THE COMPARISONS RESULT IN APPROPRIATE ACTION TO INSURE TOLERANCE COMPLIANCE.

MASS

DESCRIPTION

CLASS

NOMINAL VALUE OR RANGE	
1	1
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99	99
100	100

(20) Cast Iron Test	
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SERVICE TRUCK # 5057-01 THRU 20

F

50 lbs.

1	Cast Iron Test
---	----------------

SERVICE TRUCK # 5057-21

F

25 lbs.

(1)	Rice Lake Wt	
	Set - 22 pcs	

SERVICE TRUCK # 5057-

7

10 mg - 5 kg

(1)	Ride Lake Wt	
	Set - 32 pcs	

SERVICE TRUCK #	5057
-----------------	------

3

.001 lb - 5 lb

REMARKS:

INSPECTED BY

~~James H. Cammel, Metrologist~~

PRINCIPAL STATE METROLOGIST

PRINCIPAL STATE METROLOGIST
James H. Gamme

PAGE OF

SEE ATTACHED DATA ☐

AGR 020-2837E

QUALITY CONTROL SERVICES

SALES AND SERVICE OF ANALYTICAL & PRECISION BALANCES AND SCALE

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	#1205	SANT	39010004	(46)

SALES AND SERVICE OF ANALYTICAL & PRECISION BALANCES AND SCALES

CUSTOMER

FEALC

DATE _____

1-20-89

ADDRESS

1315 S. CENTRAL UNIT 6

AMBIENT TEMP

178

Kent 10A

45037

Make CARL

Model A1205

S/N 37040704

Function Tested

As Found

Manufacturer's Tolerance

After Service

Cornerload

$$\frac{+}{-} \cdot 6 \text{ m } 6$$

+/- 17 m.f.

$\frac{1}{2} \cdot 2 \pi i$

Optical Range

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Optical Range with Tare

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Linearity or 50-50

$$+/- \cdot 2 \text{ m}(-)$$

4/- 2 luf

+/- 0.001

Hysteresis

+/- 0.146

+1. Ail-

4/1. Conf.

Calibration

4/ - 1116

+/- 2 ml.

+/- 1000

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.

<u>Manufacturer</u>	<u>Serial Number</u>	<u>Date of Last Calibration</u>	<u>Next Calibration</u>
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
roemner	3916	3/3/87	3/88

See attached service/maintenance procedure for complete description of service and calibration.

Technician:

Date:

For other information pertaining to this calibration, see other side.

WEIGHT CALIBRATION CERTIFICATE



Purchase Order Number 00247
 Company Q C SERVICES
 Address 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/cm ³	CORRECTION IN MG		UNCERTAINTY MILLIGRAMS	TOLERANCE	TRIM MASS
		AM vs. 8.0 g/cm ³	AM vs. 8.3909 g/cm ³			
1 mg		0.0025	0.0025	0.007	0.014	0.00
2 mg		0.0050	0.0050	0.006	0.014	0.00
2 mg w/dot		0.0040	0.0040	0.006	0.014	0.00
5 mg		0.0055	0.0054	0.006	0.014	0.00
10 mg		0.0055	0.0054	0.010	0.014	0.00
20 mg		0.0005	0.0004	0.006	0.014	0.00
20 mg w/dot		0.0045	0.0044	0.006	0.014	0.00
50 mg		0.0020	0.0016	0.006	0.014	0.00
100 mg		0.0054	0.0047	0.007	0.025	0.00
200 mg		0.0128	0.0114	0.007	0.025	0.00
200 mg w/dot		0.0053	0.0039	0.007	0.025	0.00
500 mg		-0.0049	-0.0084	0.008	0.025	-0.00
1 g		0.0195	0.0125	0.010	0.054	0.00
2 g		0.0036	-0.0104	0.011	0.054	0.00
2 g w/dot		0.0201	0.0061	0.011	0.054	0.00
5 g		0.0242	-0.0107	0.016	0.054	0.00
10 g		0.0200	-0.0499	0.023	0.074	0.00
20 g		0.0249	-0.1149	0.023	0.074	0.00
20 g w/dot		0.0288	-0.1110	0.023	0.074	0.00
50 g		0.0645	-0.2875	0.105	0.12	0.00
100 g		0.1727	-0.5262	0.115	0.25	0.00

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
 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 VS 8.0g/cm ³ VALUE 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
Volland J3000 - 2 kg
Volland 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

REPORT OF SERVICE AND CALIBRATION

CUSTOMER EEMC Make Sartorius
 ADDRESS 1315 S Central Unit C Model A120S
Kent, WA 98032 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	$\pm 0.2 \text{ mg}$	$\pm 0.2 \text{ mg}$	$\pm 0.0 \text{ mg}$
Optical Range	N/A	N/A	N/A
Optical Range with Tare	N/A	N/A	N/A
Linearity or 50-50	$\pm 0.0 \text{ mg}$	$\pm 0.2 \text{ mg}$	$\pm 0.0 \text{ mg}$
Hysteresis	$\pm 0.1 \text{ mg}$	$\pm 0.1 \text{ mg}$	$\pm 0.1 \text{ mg}$
Calibration	$\pm 0.4 \text{ mg}$	$\pm 0.1 \text{ mg}$	$\pm 0.1 \text{ mg}$

Individual Wt. Readings	As Found	Manufacturer's Tolerance	After Service
100g	-0.4mg	$\pm 0.1 \text{ mg}$	$\pm 0.1 \text{ mg}$
50g	-0.2mg	$\pm 0.1 \text{ mg}$	$\pm 0.1 \text{ mg}$
20g	-0.1mg	$\pm 0.1 \text{ mg}$	$\pm 0.0 \text{ mg}$
10g	-0.1mg	$\pm 0.1 \text{ mg}$	$\pm 0.0 \text{ mg}$
5g	$\pm 0.1 \text{ mg}$	$\pm 0.1 \text{ mg}$	$\pm 0.0 \text{ mg}$

OTHER INFORMATION AND COMMENTS PERTAINING TO THIS SERVICE AND CALIBRATION:

Ambient Temp Lab Ambient Other Comments:
 Balance Location Lab
 Contact Person Terry Stoddard

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: London Lawrence DATE: 1-9-92

QUALITY CONTROL SERVICES

LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

REPORT OF SERVICE AND CALIBRATION

CUSTOMER EEMC Make Ohaus
 ADDRESS 1315 S Central Unit C Model 64000 D
Kent, WA 98032 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	$\pm 0.2g$	$\pm 0.2g$	$\pm 0.1g$
Optical Range	N/A	N/A	N/A
Optical Range with Tare	N/A	N/A	N/A
Linearity or 50-50	$-0.1g$	$\pm 0.1g$	$\pm 0.1g$
Hysteresis	$\pm 0.1g$	$\pm 0.1g$	$\pm 0.1g$
Calibration	$+0.05g / +0.4g$	$\pm 0.01g / \pm 0.1g$	$\pm 0.01g / \pm 0.1g$

Individual Wt. Readings	As Found	Manufacturer's Tolerance	After Service
4kg	+ 0.4g	$\pm 0.1g$	$\pm 0.1g$
2kg	+ 0.2g	$\pm 0.1g$	$\pm 0.1g$
1kg	+ 0.1g	$\pm 0.1g$	$\pm 0.1g$
300g	+ 0.04g	$\pm 0.01g$	$\pm 0.01g$
200g	+ 0.03g	$\pm 0.01g$	$\pm 0.01g$
100g	+ 0.01g	$\pm 0.01g$	$\pm 0.01g$

OTHER INFORMATION AND COMMENTS PERTAINING TO THIS SERVICE AND CALIBRATION:

Ambient Temp Lab Ambient Other Comments: Lab has Vibrations
 Balance Location Upper Lab
 Contact Person Jerry Stoddard 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: London 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	Rear 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 # 9103454

Ice Water Bath 0°C = 32°F °FBoiling Water 100°C = 212°F °FRoom Temp 68 °FB.P. 30.12 "HgDate: 1/2/92 Technician: JAS / BN

KESSLER INSTRUMENTS, INC.

CALIBRATION SERVICES

THERMOMETERS



HYDROMETERS

TESTING EQUIPMENT

MAILING ADDRESS.
POST OFFICE BOX 640
WESTBURY, NEW YORK 11590
516-334-4083
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
MARKED: FISHER

DATE CERTIFIED: 04-04-1991

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

MAILING ADDRESS:
POST OFFICE BOX 640
WESTBURY, NEW YORK 11590
516-334-4063
FAX 516-334-2689

TESTING EQUIPMENT

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. 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 between 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 $= (0.00016 \times N) \times (T - ST)$ for Centigrade temperatures

OR $= (0.00009 \times N) \times (T - ST)$ 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 $= (0.00016 \times 10) \times (90 - 60) = +0.048$ 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.

Date: 1/2/92
Ambient Temperature: 68 °F
Calibrator: R. Stodola

Thermocouple No.: T/C READOUT
Barometric Pressure: 30.18 "Hg
Reference: Mercury-in-glass: FISHER #9123454

READOUT ZEROED & SPANNED
PRIOR TO CHECK

Other: OMEGA CL 300
0-8100°F CALIBRATED

Reference point No. ^a	Source ^b (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Difference, °C %
ICE WATER 33	H ₂ O	33	33.3	-.06
RM TEMP H ₂ O 68	H ₂ O	68	68.2	-.04
BOILING WATER 212	H ₂ O	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

^aEvery 300°C (500°F) for each reference point

^bType of Calibration system used

^c
$$\frac{(\text{Ref. temp: } ^\circ\text{C} + 273) - (\text{Test therm. temp. } ^\circ\text{C} + 273)}{\text{Ref. Temp. } ^\circ\text{C} + 273} \times 100 \leq 1.5\%$$

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: 1/2/92

LOCATION: KENT, WA

TECHNICIAN: Ja Stedman

FISHER SN# 9123454
(NIST TRACEABLE)

SO2 INJECTION ROTAMETER (TR)

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

TR	F
65	
73	
78	
92	

DATE: 1/2/92

LOCATION: KENT, WA

TECHNICIAN: Ja Stedman

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	OUT	5H IN	OUT	KK
F	F	F	F	F
65	65	65	66	65
73	73	72	74	73
78	78	78	78	78
92	92	93	92	92

DATE: 1/2/92

LOCATION: KENT, WA

TECHNICIAN: Ja Stedman

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

SLING PSYCHROMETER

WB	DB
F	F
65	65
73	73
78	78
92	92

C=DEGREES CENTIGRADE

F=DEGREES FARENHEIT

CONVERSIONS: $F = (C \times 1.8) + 32$ $C = (F - 32) / 1.8$

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



HYDROMETERS

MAILING ADDRESS:
POST OFFICE BOX 640
WESTBURY, NEW YORK 11590
516-334-4063
FAX 516-334-2689

TESTING EQUIPMENT

PLANT ADDRESS
ONE-SIXTY HICKS STREET
WESTBURY, LONG ISLAND
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
MARKED: FISHER

DATE CERTIFIED: 04-04-1991

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

VANEOMETER CALIBRATION

EEMC uses a Dwyer Model #480 Vaneometer to measure test chamber air velocity. The manufacturer's specifications for accuracy are $\pm 5.0\%$ to 100 FPM and $\pm 10\%$ 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 (readability 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.

METER BOX CALIBRATION AUDIT

Test Data										
Run #	1	2	3	4	5	6	7	8	9	10
Avg. ΔH	.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 ΔH : <u>.178</u> in H ₂ O. Test Series Max Vac: <u>2.0</u> 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:		<u>29.98</u>	<u>29.96</u>	<u>29.96</u>
Vac:		<u>2.0</u>	<u>2.0</u>	<u>2.0</u>
Audit Meter:	Final Vol	<u>050.238</u>	<u>055.489</u>	<u>060.747</u>
	Initial Vol	<u>045.000</u>	<u>050.238</u>	<u>055.489</u>
	Vol (V _w , ft ³)	<u>5.238</u>	<u>5.251</u>	<u>5.258</u>
Audit Meter: Temp (°F)(T _w)	Initial	<u>72</u>	<u>72</u>	<u>79</u>
	Mid	<u>76</u>	<u>79</u>	<u>80</u>
	Final	<u>78</u>	<u>79</u>	<u>81</u>
	Avg (°F/°A)	<u>75/535</u>	<u>79/539</u>	<u>80/540</u>
	ΔH (in H ₂ O)			
	Initial	<u>.178</u>	<u>.178</u>	<u>.178</u>
	Mid	<u>.178</u>	<u>.178</u>	<u>.178</u>
	Final	<u>.178</u>	<u>.178</u>	<u>.178</u>
	Avg	<u>.178</u>	<u>.178</u>	<u>.178</u>
Dry Gas Meter:	Final Vol	<u>899.000</u>	<u>904.000</u>	<u>909.000</u>
	Initial Vol	<u>894.000</u>	<u>899.000</u>	<u>904.000</u>
	Vol (V _d , ft ³)	<u>5.000</u>	<u>5.000</u>	
Dry Gas Meter Temp (°F): Inlet	Initial			
	Mid			
	Final			
	Avg (°F/°A)			
	ΔH (in H ₂ O)			
Dry Gas Meter Temp (°F): Outlet	Initial	<u>82</u>	<u>87</u>	<u>90</u>
	Mid	<u>85</u>	<u>89</u>	<u>91</u>
	Final	<u>87</u>	<u>90</u>	<u>92</u>
	Avg (°F/°A)	<u>85/545</u>	<u>89/549</u>	<u>91/551</u>
	ΔH (in H ₂ O)			
Avg Dry Gas		<u>85/545</u>	<u>89/549</u>	<u>91/551</u>
Meter Temp (T _m -°F/°A)		<u>85/545</u>	<u>89/549</u>	<u>91/551</u>
Time (minutes)		<u>22:15</u>	<u>22:15</u>	<u>22:15</u>

$$Y = \frac{(V_w)(MCF)(BP)(T_m)}{(V_d)(BP + \frac{\Delta H}{13.6})(T_w)}$$

$$Y \text{ Factor } \% \text{ Difference} = \frac{\text{Act} - \text{Exp}}{\text{Exp}} \times 100$$

NOTE: MCF = Meter Correction (Y) Factor for Dry Gas Meter used as a Transfer Standard

$$\text{Run 1 } Y = \frac{(5.238)(1.010)(89.98)(545)}{(5.000)(89.98 + \frac{.178}{13.6})(535)} = \frac{86446.0479}{80831.5110} = 1.0774$$

$$\Delta\% = \frac{(1.0774 - 1.0682)}{1.0682} \times 100 = 8596\%$$

$$\text{Run 2 } Y = \frac{(5.051)(1.010)(89.96)(549)}{(5.000)(89.96 + \frac{.178}{13.6})(539)} = \frac{87830.3446}{80777.4788} = 1.0799$$

$$\Delta\% = \frac{(1.0799 - 1.0682)}{1.0682} \times 100 = 10962\%$$

$$\text{Run 3 } Y = \frac{(5.058)(1.010)(89.96)(551)}{(5.000)(89.96 + \frac{.178}{13.6})(540)} = \frac{87646.8402}{80987.3383} = 1.0833$$

$$\Delta\% = \frac{(1.0833 - 1.0682)}{1.0682} \times 100 = 14116\%$$

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:

$$\frac{.1}{(A)} \text{ inch H}_2\text{O Delta H} = \frac{1.0782}{(C)} \text{ Calculated Calibration Y Factor (from Calibrations)}$$

$$\frac{.0}{(B)} \text{ inch H}_2\text{O Delta H} = \frac{1.0654}{(D)} \text{ Calculated Calibration Y Factor (from Calibrations)}$$

$$\frac{.0}{(B)} - \frac{.1}{(A)} = \frac{.1}{(A)} \times 100 = \frac{10.0}{(E)}$$

$$\frac{1.0654}{(D)} - \frac{1.0782}{(C)} = \frac{-0.0128}{(F)} \div \frac{10.0}{(E)} = \frac{-0.00128}{(F)}$$

$$\frac{.178}{\text{Avg Delta H}} - \frac{.1}{(A)} = \frac{.078}{(A)} \times 100 = \frac{7.800}{(G)}$$

$$\left[\frac{-0.00128}{F} \times \frac{7.800}{G} \right] + \frac{1.0782}{C} = \frac{1.0682}{\text{Interpolated Y Factor For Avg. Test Series Delta H}}$$

Volume Metering System Leak Check: 0.000 inch H₂O in one minute

BAROMETRIC PRESSURE, Pb = <u>30.48</u> in. Hg.								
Orifice Manometer Setting, ΔH , in. H ₂ O			.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	961.002	967.217	972.152	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	71	71
		End	69	70	70	70	71	71
		Average	(69/529)	(70/530)	(70/530)	(70/530)	(71/531)	(71/531)
	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)
-t Time, Minutes			8.75	19.25	16.333	13.25	10.67	9.500
$y = \frac{(V_w)(P_b)(t_m)}{V_d(P_b + \frac{\Delta H}{13.6})(t_w)}$			1.0782	1.0654	1.0580	1.0674	1.0684	1.0641
$\Delta H = \frac{.0317 (\Delta H) [(t_w) - t_m]^2}{P_b (t_m) V_w}$			1.4707	1.4573	1.5980	1.7997	1.6984	1.7753
$K_o = \frac{V_w}{-t} \sqrt{\frac{(P_b + \frac{\Delta H}{13.6})(28.97)}{t_m + 460 (H)}}$								
<p>Averages:</p> <p>y = <u>1.0659</u></p> <p>ΔH = <u>1.6905</u></p> <p>K_o = _____</p>								

K_o = 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 H₂O.

Tolerance 0.15.

BAROMETRIC PRESSURE, $P_b = 30.83$ 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	190.808	
	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	581.900	587.200	538.300	537.300	549.300	
	Initial	516.900	581.900	587.800	538.300	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
	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
Time, Minutes		28:10	30:00	29:00	28:15	28:20	
$y = \frac{(V_w) (P_b) (t_m)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w)}$		.9986	1.0001	1.0074	1.0189	1.0086
$\Delta H = \frac{.0317 (\Delta H) [(t_w) - (t_m)]^2}{P_b (t_m) V_w}$		✓	✓	✓	✓	✓	
$K_o = \frac{V_w}{V_d} \sqrt{\frac{(P_b + \frac{\Delta H}{13.6}) (29.97)}{t_m + 460 (H)}}$							
Averages: $y = 1.0059$ $\Delta H =$ $K_o =$							

K_o = Factor for HP-65

$$P_b + \frac{\Delta H}{13.6} = P_m$$

29.97 - 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 H₂O.
Tolerance 0.15.

OVERALL 1.010

BAROMETRIC PRESSURE, Pb = <u>30.93</u> in. Hg.							
Orifice Manometer Setting, ΔH , in. H ₂ O		<u>.2</u>	<u>.2</u>	<u>.2</u>	<u>.2</u>	<u>.2</u>	
Gas Volume Wet Test Meter Vw ft ³	Final	<u>195.995</u>	<u>201.976</u>	<u>206.371</u>	<u>211.472</u>	<u>216.571</u>	
	Initial	<u>190.900</u>	<u>195.995</u>	<u>201.976</u>	<u>206.371</u>	<u>211.472</u>	
	Vw, ft ³	<u>5.095</u>	<u>5.981</u>	<u>5.095</u>	<u>5.101</u>	<u>5.099</u>	
Gas Volume Dry Test Meter Vd ft ³	Final	<u>547.400</u>	<u>552.600</u>	<u>557.600</u>	<u>562.600</u>	<u>567.600</u>	
	Initial	<u>542.400</u>	<u>547.400</u>	<u>552.600</u>	<u>557.600</u>	<u>562.600</u>	
	Vd ft ³	<u>5.000</u>	<u>5.000</u>	<u>5.000</u>	<u>5.000</u>	<u>5.000</u>	
TEMPERATURES	WET TEST METER tw	Initial	<u>92</u>	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>
		Middle	<u>91</u>	<u>91</u>	<u>90</u>	<u>91</u>	<u>90</u>
		End	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>
		Average	<u>91/55.1</u>	<u>90/550</u>	<u>90/550</u>	<u>90/550</u>	<u>90/550</u>
	DRY GAS METER tm	Initial	<u>85</u>	<u>86</u>	<u>86</u>	<u>86</u>	<u>86</u>
		Middle	<u>86</u>	<u>86</u>	<u>86</u>	<u>86</u>	<u>86</u>
		End	<u>86</u>	<u>86</u>	<u>86</u>	<u>86</u>	<u>85</u>
		Average	<u>86/546</u>	<u>86/546</u>	<u>86/546</u>	<u>86/546</u>	<u>86/546</u>
Time, Minutes		<u>20:10</u>	<u>21:00</u>	<u>20:15</u>	<u>20:20</u>	<u>20:20</u>	
$y = \frac{(V_w)(P_b)(t_m)}{V_d(P_b + \frac{\Delta H}{13.6})(t_w)}$		<u>1.0093</u>	<u>1.0077</u>	<u>1.0111</u>	<u>1.0123</u>	<u>1.0119</u>	
$\Delta H \approx \frac{.0317 (\Delta H) [(t_w) \square]^2}{P_b (t_m) \left[\frac{V_w}{V_d} \right]}$		<u>✓</u>	<u>✓</u>	<u>✓</u>	<u>✓</u>	<u>✓</u>	
$K_o = \frac{V_w}{\theta} \sqrt{\frac{(P_b + \frac{\Delta H}{13.6})(29.97)}{t_m + 460 (H)}}$							
Averages: y = <u>1.0105</u> $\Delta H =$ _____ Ko = _____							

Ko = Factor for HP-65

$$P_b + \frac{\Delta H}{13.6} = P_m$$

29.97 - 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 H₂O.
Tolerance 0.15.

BAROMETRIC PRESSURE, $P_b = 30.43$ in. Hg.							
Orifice Manometer Setting, ΔH , in. H ₂ O		.3	.3	.3	.3	.3	
Gas Volume Wet Test Meter V_w ft ³	Final	820.050	827.139	830.050	837.349	840.462	
	Initial	816.700	820.050	827.139	830.050	837.349	
	V_w , ft ³	5.350	5.087	5.111	5.099	5.113	
Gas Volume Dry Test Meter V_d ft ³	Final	570.900	571.900	580.900	587.900	590.900	
	Initial	567.700	570.900	571.900	580.900	587.900	
	V_d ft ³	5.000	5.000	5.000	5.000	5.000	
TEMPERATURES	WET TEST METER t_w	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
	DRY GAS METER t_d	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
Time, Minutes		17:30	16:40	16:30	16:40	16:45	
$y = \frac{(V_w)(P_b)(t_m)}{V_d(P_b + \frac{\Delta H}{13.6})(t_w)}$		1.0009	1.0092	1.0121	1.0116	1.0125	
$\Delta H = \frac{.0317 (\Delta H)}{P_b (t_m)} \left[\frac{(t_w) D}{V_w} \right]^2$		✓	✓	✓	✓	✓	
$K_o = \frac{V_w}{t_w} \sqrt{\frac{(P_b + \frac{\Delta H}{13.6})(28.97)}{t_m + 460 (H)}}$							
Averages: $y = 1.0137$ $\Delta H =$ $K_o =$							

K_o = 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 H₂O.
Tolerance 0.15.

BAROMETRIC PRESSURE, $P_b = 30.08$ in. Hg.							
Orifice Manometer Setting, ΔH , in. H ₂ O		.4	.4	.4	.4	.4	
Gas Volume Wet Test Meter V_w ft ³	Final	947.693	950.797	957.898	963.011	968.114	
	Initial	940.600	947.693	950.797	957.898	963.011	
	V_w , ft ³	5.093	5.104	5.101	5.113	5.103	
Gas Volume Dry Test Meter V_d ft ³	Final	597.900	598.900	607.900	618.900	617.900	
	Initial	590.900	597.900	600.900	607.900	618.900	
	V_d ft ³	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	90	90	91	91
		Average	90/530	91/551	90/550	90/550	91/551
	DRY GAS METER t_m	Initial	83	84	84	84	84
		Middle	83	84	84	85	84
		End	84	84	84	84	85
		Average	83/543	84/544	84/544	84/544	84/544
-θ Time, Minutes		14:50	14:30	14:40	14:40	14:40	
$y = \frac{(V_w)(P_b)(t_m)}{V_d(P_b + \frac{\Delta H}{13.6})(t_w)}$		1.0047	1.0069	1.0041	1.0068	1.0067	
$\Delta H = \frac{.0317 (\Delta H)}{P_b (t_m)} \left[\frac{(t_w) D}{V_w} \right]^2$		✓	✓	✓	✓	✓	
$K_o = \frac{V_w}{-\theta} \sqrt{\frac{(P_b + \frac{\Delta H}{13.6})(28.97)}{t_m + 460 (H)}}$							
Averages: $y = 1.0059$ $\Delta H =$ $K_o =$							

K_o = Factor for HP-65

$$P_m + \frac{\Delta H}{13.6} = P_m$$

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 H₂O.

Tolerance 0.15.

BAROMETRIC PRESSURE, $P_b = 30.30$ in. Hg.							
Orifice Manometer Setting, ΔH , in. H ₂ O		15	15	15	15	15	
Gas Volume Wet Test Meter V_w ft ³	Final	073.307	078.610	083.715	088.801	093.932	
	Initial	068.800	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	603.010	608.912	633.810	638.212	643.212	
	Initial	618.000	603.012	608.912	633.810	638.912	
	V_d ft ³	5.012	5.000	5.000	5.000	5.000	
TEMPERATURES	NET 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
Time, Minutes		13:30	14:00	13:05	13:30	13:30	
$y = \frac{(V_w)(P_b)(t_m)}{V_d(P_b + \frac{\Delta H}{13.6})(t_w)}$		1.0103	1.0148	1.0142	1.0144	1.0154	
$\Delta H = \frac{.0317 (\Delta H)}{P_b (t_m)} \left[\frac{(t_w)O}{V_w} \right]^2$		✓	✓	✓	✓	✓	
$K_o = \frac{V_w}{t_m} \sqrt{\frac{(P_b + \frac{\Delta H}{13.6})(28.97)}{t_m + 460 (H)}}$							
Averages: $y = 1.0138$ $\Delta H =$ $K_o =$							

K_o = Factor for HP-65

$$P_m + \frac{\Delta H}{13.6} = P_b$$

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 H₂O.

Tolerance 0.15.

BAROMETRIC PRESSURE, $P_b = 30.34$ in. Hg.							
Orifice Manometer Setting, ΔH , in. H ₂ O		.75	.75	.75	.75	.75	
Gas Volume Wet Test Meter V_w ft ³	Final	899.808	304.318	309.430	314.540	319.752	
	Initial	894.100	899.008	304.318	309.430	314.540	
	V_w ft ³	5.108	5.110	5.112	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	643.400	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
	DRY GAS METER t_m	Initial	84	80	82	82	81
		Middle	83	82	82	81	81
		End	82	82	82	81	81
		Average	83/543	80/542	82/542	81/541	81/541
-G-Time, Minutes		11:00	11:00	11:00	11:00	11:00	
$y = \frac{(V_w) (P_b) (t_m)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w)}$		1.013	1.0108	1.0131	1.0108	1.0108	
$\Delta H = \frac{.0317 (\Delta H) [(t_w)O]^2}{P_b (t_m) V_w}$		✓	✓	✓	✓	✓	
$K_o = \frac{V_w}{-G} \sqrt{\frac{(P_b + \frac{\Delta H}{13.6}) (28.97)}{t_m + 460 (H)}}$							
<p>Averages:</p> <p>$y = 1.0116$</p> <p>$\Delta H =$</p> <p>$K_o =$</p>							

K_o = Factor for HP-65

$$- + \frac{\Delta H}{13.6} = P_a$$

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 H₂O.
Tolerance 0.15.

WET TEST METER CALIBRATION LOG

Wet Test Meter Serial Number AA 455 Date 12/12/91
 Range of Wet Test Meter Flow Rate 0 - 0.4 GPM/min.
 Volume of Test Flask $V_s =$ 82 (0.5284 + 43)
 Satisfactory Leak Check? yes
 Ambient Temperature of Equilibrate Liquid in Wet Test Meter and Reservoir 68°F

Test Number	Manometer Reading, a mm H ₂ O	Final Volume (V _f), l	Initial Volume (V _i), l	Total Volume (V _m), b l	Flask Volume (V _s), l	Percent Error, %
1	0.0 mm	0.5262	0 (Ref. +)	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 H₂O (0.4 "H₂O)

Calculations:

b - $V_m - V_f - V_i$

c - % error = $100(V_m - V_s)/V_s$ (+1%)

$$X_{FS} = 0.60$$

WET TEST METER CALIBRATION LOG

WET TEST METER CALIBRATION LOG

Wet Test Meter Serial Number AA4SS Date 12/19/90
 Range of Wet Test Meter Flow Rate 0-0.4 ft³/m.
 Volume of Test Flask Vs - 20 (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 (Ref)	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 - $V_m - V_f - V_i$

c - % error = $100(V_m - V_s)/V_s = 0.4$ (±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,

A handwritten signature in dark ink, appearing to read "Robert J. Lebens".

Robert J. Lebens, Chief
Federal Programs Section
Stationary Source Compliance Division

cc: Mamie Miller, SSCD
Peter Westlin, EMB

SO2 ROTAMETER CALIBRATION PAGE 1 OF 1
 DATE: 5/17/92 BY: JAS LAST CAL: 11/14/91 BY: JAS

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	<div>VOLUME</div> <div>X 60 =</div> <div>AVERAGE</div> <div>125</div> <div>X 60 =</div> <div>34.478</div> <div>217.505</div> <div>cc/min</div>
		34.35		
		34.04		
		34.41		
		34.02		
		35.41		
		30.91		
		33.98		
TOTAL		275.8300		
AVERAGE		34.478		
2	125	63.61	50	<div>VOLUME</div> <div>X 60 =</div> <div>AVERAGE</div> <div>125</div> <div>X 60 =</div> <div>64.365</div> <div>116.523</div> <div>cc/min</div>
		63.52		
		63.81		
		66.08		
		64.23		
		63.87		
		64.76		
		63.04		
TOTAL		514.92		
AVERAGE		64.365		
3	125	157.40	25	<div>VOLUME</div> <div>X 60 =</div> <div>AVERAGE</div> <div>125</div> <div>X 60 =</div> <div>155.356</div> <div>48.876</div> <div>cc/min</div>
		155.48		
		154.11		
		153.31		
		153.47		
		155.72		
		155.48		
		157.88		
TOTAL		1248.850		
AVERAGE		155.356		

SETTING	CC/MIN
0	0
25	48.876
50	116.523
100	217.505

SLOPE = 2.1847800
 Y-INT = -4900000
 $r = .9980704$
 $r^2 = .9961445$

ROTAMETER SETTING FOR 100 cc/min : 45.99

Comments



Gas Analysis for new NO NO₂
Lab No. KEAT Date 1/2/92
Source @ 800 B.N

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	$\bar{x} = 0$	N ₂	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	$\bar{x} = 0$	N ₂	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	89004
	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	$\bar{x} = 0$	0.12%	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	$\bar{x} = 0$	4.01%	A15589
	CO ₂	4.0	4.0	4.0	$\bar{x} = 4.0\%$	CO ₂	SCOTT
	O ₂	0	0	0	$\bar{x} = 0$		10/28/81
6	TOTAL/CO	0	0	0	$\bar{x} = 0$	19.93%	X A8812
	CO ₂	0	0	0	$\bar{x} = 0$	0%	SCOTT
	O ₂	80	80	80	$\bar{x} = 80\%$		10/28/81
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	$\bar{x} = 0$		10/5/81
9	TOTAL/CO	2	2	2.1	$\bar{x} = 2.03\%$	2.00%	A10199
	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	$\bar{x} = 8.47\%$	8.49% CO	CC6084100
	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: _____

HAUGH'S

EEMC

CO2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORMSite: EEMC KENT, WA Date: 5/12/92Analyzer: Make: HORIBA Model: PIR 2000 SN: 407069Calibration by: D. KingmanCal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter:
BP: 30.26 Instrument ID: PRINCO
Temp: 72 Instrument ID: TRAnalyzer last calibrated: 5/8/92 By: D. Kingman

Cylinders:

1. #T132257 Concentration: 0.00 % CO2 Cyl. Press.: 800 PSI
Certified by: LIQUID AIR Date: 10/7/912. #29004 Concentration 12.6 % CO2 Cyl. Press.: 900 PSI
Certified by: MATHESON Date: 10/31/913. #R34098 Concentration 21.2 % CO2 Cyl. Press.: 1200 PSI
Certified by: LIQUID AIR Date: 4/27/884. #A15529 Concentration 4.01 % CO2 Cyl. Press.: 900 PSI
Certified by: LIQUID AIR Date 10/22/84Analyzer: Calibrated Range: 0-25.0 % Output: 0-1.0
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter:

Calibration Results

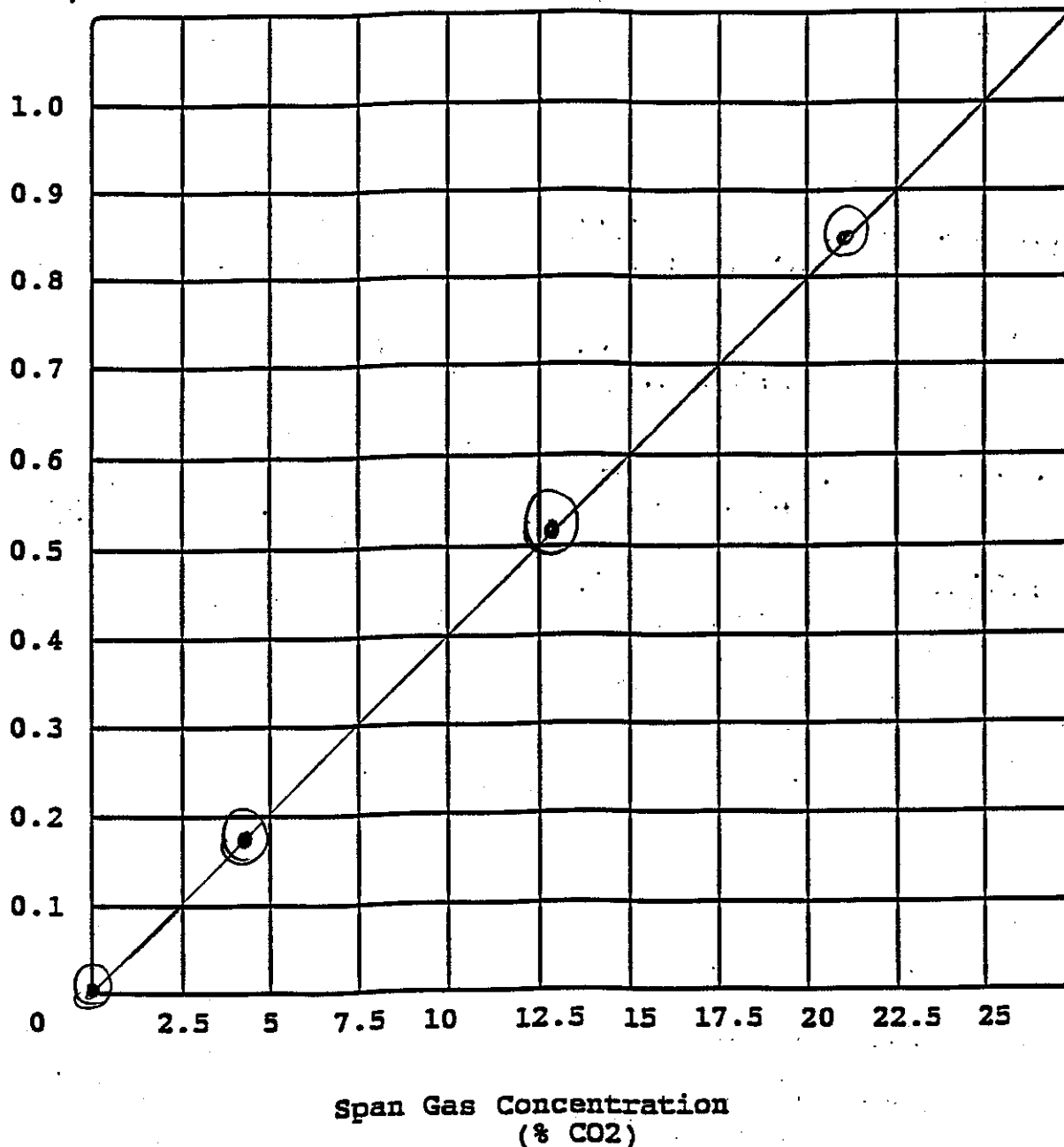
Point #	Cyl. #	% CO2	Expected		Actual		Adj.		% Dif.	Potentiomet	
			Meter	DVM	Meter	DVM	Meter	DVM		Unadj.	A
1	1	0.00	00.0	.000	00.0	.000	—	—		7.78	—
2	2	12.6	50.4	.504	50.5	.505	50.4	.504		2.08	2.0
3	3	21.2	84.8	.848	86.0	.860	—	—		—	—
4	4	4.01	16.0	.160	16.0	.160	—	—		—	—
5	1	0.00	00.0	.000	00.0	.000	—	—		—	—

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

Analyzer
 Output
 (volts)



EPA Span Value = $\pm 2.0\%$ of $25\% \text{ CO}_2 = \pm .5\%$
 Cal Volts = Cal Volt Conc - Std Conc = $\pm \Delta\%$
 $.860 = 21.500 - 21.2 = .300 = 1.415$
 $.160 = 4.000 - 4.01 = -.010 = -.249$

ITE EEMC - WEST LOCATION KENT, WA 98032 OPERATORS WA NOWAK/JASTODDARD

ITE EMC - West

LOCATION

98032

OPERATORS

WIA NOWAK/STODDARD

PARAMETER COA

INSTRUMENT/SH H024BA PIR9000

407069

RANGE -0,0

RANGE 0.0-25.0% CO₂

REFERENCE MATERIAL OR METHOD ZEROES AND SPANS WITH CERTIFIED CYLINDER GASES

ATE	Span Response	Span Actual	% Difference
5/13	10.308	10.308	0
5/13	10.437	10.437	0
5/13	10.566	10.566	0
5/14	10.695	10.695	0
5/14	10.824	10.824	0
5/14	10.953	10.953	0
5/15	11.082	11.082	0
5/15	11.211	11.211	0
5/15	11.340	11.340	0
5/16	11.469	11.469	0
5/16	11.598	11.598	0
5/16	11.727	11.727	0
5/16	11.856	11.856	0
5/16	11.985	11.985	0
5/16	12.114	12.114	0
5/16	12.243	12.243	0
5/16	12.372	12.372	0
5/16	12.501	12.501	0
5/16	12.630	12.630	0
5/16	12.759	12.759	0
5/16	12.888	12.888	0
5/16	13.017	13.017	0
5/16	13.146	13.146	0
5/16	13.275	13.275	0
5/16	13.404	13.404	0
5/16	13.533	13.533	0
5/16	13.662	13.662	0
5/16	13.791	13.791	0
5/16	13.920	13.920	0
5/16	14.049	14.049	0
5/16	14.178	14.178	0
5/16	14.307	14.307	0
5/16	14.436	14.436	0
5/16	14.565	14.565	0
5/16	14.694	14.694	0
5/16	14.823	14.823	0
5/16	14.952	14.952	0
5/16	15.081	15.081	0
5/16	15.210	15.210	0
5/16	15.339	15.339	0
5/16	15.468	15.468	0
5/16	15.597	15.597	0
5/16	15.726	15.726	0
5/16	15.855	15.855	0
5/16	15.984	15.984	0
5/16	16.113	16.113	0
5/16	16.242	16.242	0
5/16	16.371	16.371	0
5/16	16.500	16.500	0
5/16	16.629	16.629	0
5/16	16.758	16.758	0
5/16	16.887	16.887	0
5/16	17.016	17.016	0
5/16	17.145	17.145	0
5/16	17.274	17.274	0
5/16	17.403	17.403	0
5/16	17.532	17.532	0
5/16	17.661	17.661	0
5/16	17.790	17.790	0
5/16	17.919	17.919	0
5/16	18.048	18.048	0
5/16	18.177	18.177	0
5/16	18.306	18.306	0
5/16	18.435	18.435	0
5/16	18.564	18.564	0
5/16	18.693	18.693	0
5/16	18.822	18.822	0
5/16	18.951	18.951	0
5/16	19.080	19.080	0
5/16	19.209	19.209	0
5/16	19.338	19.338	0
5/16	19.467	19.467	0
5/16	19.596	19.596	0
5/16	19.725	19.725	0
5/16	19.854	19.854	0
5/16	19.983	19.983	0
5/16	20.112	20.112	0
5/16	20.241	20.241	0
5/16	20.370	20.370	0
5/16	20.499	20.499	0
5/16	20.628	20.628	0
5/16	20.757	20.757	0
5/16	20.886	20.886	0
5/16	21.015	21.015	0
5/16	21.144	21.144	0
5/16	21.273	21.273	0
5/16	21.402	21.402	0
5/16	21.531	21.531	0
5/16	21.660	21.660	0
5/16	21.789	21.789	0
5/16	21.918	21.918	0
5/16	22.047	22.047	0
5/16	22.176	22.176	0
5/16	22.305	22.305	0
5/16	22.434	22.434	0
5/16	22.563	22.563	0
5/16	22.692	22.692	0
5/16	22.821	22.821	0
5/16	22.950	22.950	0
5/16	23.079	23.079	0
5/16	23.208	23.208	0
5/16	23.337	23.337	0
5/16	23.466	23.466	0
5/16	23.595	23.595	0
5/16	23.724	23.724	0
5/16	23.853	23.853	0
5/16	23.982	23.982	0
5/16	24.111	24.111	0
5/16	24.240	24.240	0
5/16	24.369	24.369	0
5/16	24.498	24.498	0
5/16	24.627	24.627	0
5/16	24.756	24.756	0
5/16	24.885	24.885	0
5/16	25.014	25.014	0
5/16	25.143	25.143	0
5/16	25.272	25.272	0
5/16	25.401	25.401	0
5/16	25.530	25.530	0
5/16	25.659	25.659	0
5/16	25.788	25.788	0
5/16	25.917	25.917	0
5/16	26.046	26.046	0
5/16	26.175	26.175	0
5/16	26.304	26.304	0
5/16	26.433	26.433	0
5/16	26.562	26.562	0
5/16	26.691	26.691	0
5/16	26.820	26.820	0
5/16	26.949	26.949	0
5/16	27.078	27.078	0
5/16	27.207	27.207	0
5/16	27.336	27.336	0
5/16	27.465	27.465	0
5/16	27.594	27.594	0
5/16	27.723	27.723	0
5/16	27.852	27.852	0
5/16	27.981	27.981	0
5/16	28.110	28.110	0
5/16	28.239	28.239	0
5/16	28.368	28.368	0
5/16	28.497	28.497	0
5/16	28.626	28.626	0
5/16	28.755	28.755	0
5/16	28.884	28.884	0
5/16	29.013	29.013	0
5/16	29.142	29.142	0
5/16	29.271	29.271	0
5/16	29.400	29.400	0
5/16	29.529	29.529	0
5/16	29.658	29.658	0
5/16	29.787	29.787	0
5/16	29.916	29.916	0
5/16	30.045	30.045	0
5/16	30.174	30.174	0
5/16	30.303	30.303	0
5/16	30.432	30.432	0
5/16	30.561	30.561	0
5/16	30.690	30.690	0
5/16	30.819	30.819	0
5/16	30.948	30.948	0
5/16	31.077	31.077	0
5/16	31.206	31.206	0
5/16	31.335	31.335	0
5/16	31.464	31.464	0
5/16	31.593	31.593	0
5/16	31.722	31.722	0
5/16	31.851	31.851	0
5/16	31.980	31.980	0
5/16	32.109	32.109	0
5/16	32.238	32.238	0
5/16	32.367	32.367	0
5/16	32.496	32.496	0
5/16	32.625	32.625	0
5/16	32.754	32.754	0
5/16	32.883	32.883	0
5/16	33.012	33.012	0
5/16	33.141	33.141	0
5/16	33.270	33.270	0
5/16	33.399	33.399	0
5/16	33.528	33.528	0
5/16	33.657	33.657	0
5/16	33.786	33.786	0
5/16	33.915	33.915	0
5/16	34.044	34.044	0
5/16	34.173	34.173	0
5/16	34.302	34.302	0
5/16	34.431	34.431	0
5/16	34.560	34.560	0
5/16	34.689	34.689	0
5/16	34.818	34.818	0
5/16	34.947	34.947	0
5/16	35.076	35.076	0
5/16	35.205	35.205	0
5/16	35.334	35.334	0
5/16	35.463	35.463	0
5/16	35.592	35.592	0
5/16	35.721	35.721	0
5/16	35.850	35.850	0
5/16	35.979	35.979	0
5/16	36.108	36.108	0
5/16	36.237	36.237	0
5/16	36.366	36.366	0
5/16	36.495	36.495	0
5/16	36.624	36.624	0
5/16	36.753	36.753	0
5/16	36.882	36.882	0
5/16	37.011	37.011	0
5/16	37.140	37.140	0
5/16	37.269	37.269	0
5/16	37.398	37.398	0
5/16	37.527	37.527	0
5/16	37.656	37.656	0
5/16	37.785	37.785	0
5/16	37.914	37.914	0
5/16	38.043	38.043	0
5/16	38.172	38.172	0
5/16	38.301	38.301	0
5/16	38.430	38.430	0
5/16	38.559	38.559	0
5/16	38.688	38.688	0
5/16	38.817	38.817	0
5/16	38.946	38.946	0
5/16	39.075	39.075	0
5/16	39.204	39.204	0
5/16	39.333	39.333	0
5/16	39.462	39.462	0
5/16	39.591	39.591	0
5/16	39.720	39.720	0
5/16	39.849	39.849	0
5/16	39.978	39.978	0
5/16	40.107	40.107	0
5/16	40.236	40.236	0
5/16	40.365	40.365	0
5/16	40.494	40.494	0
5/16	40.623	40.623	0
5/16	40.752	40.752	0
5/16	40.881	40.881	0
5/16	41.010	41.010	0
5/16	41.139	41.139	0
5/16	41.268	41.268	0
5/16	41.397	41.397	0
5/16	41.526	41.526	0
5/16	41.655	41.655	0
5/16	41.784	41.784	0
5/16	41.913	41.913	0
5/16	42.042	42.042	0
5/16	42.171	42.171	0
5/16	42.300	42.300	0
5/16	42.429	42.429	0
5/16	42.558	42.558	0
5/16	42.687	42.687	0
5/16	42.816	42.816	0
5/16	42.945	42.945	0
5/16	43.074	43.074	0
5/16	43.203	43.203	0
5/16	43.332	43.332	0
5/16	43.461	43.461	0
5/16	43.590	43.590	0
5/16	43.719	43.719	0
5/16	43.848	43.848	0
5/16	43.977	43.977	0
5/16	44.106	44.106	0
5/16	44.235	44.235	0
5/16	44.364	44.364	0
5/16	44.493	44.493	0
5/16	44.622	44.622	0
5/16	44.751	44.751	0
5/16	44.880	44.880	0
5/16	45.009	45.009	0
5/16	45.138	45.138	0
5/16	45.267	45.267	0
5/16	45.396	45.396	0
5/16	45.525	45.525	0
5/16	45.654	45.654	0
5/16	45.783	45.783	0
5/16	45.912	45.912	0
5/16	46.041	46.041	0
5/16	46.170	46.170	0
5/16	46.299	46.299	0
5/16	46.428	46.428	0
5/16	46.557	46.557	0
5/16	46.686	46.686	0
5/16	46.815	46.815	0
5/16	46.944	46.944	0
5/16	47.073	47.073	0
5/16	47.202	47.202	0
5/16	47.331	47.331	0
5/16	47.460	47.460	0
5/16	47.589	47.589	0
5/16	47.718	47.718	0
5/16	47.847	47.847	0
5/16	47.976	47.976	0
5/16	48.105	48.105	0
5/16	48.234	48.234	0
5/16	48.363	48.363	0
5/16	48.492	48.492	0
5/16	48.621	48.621	0
5/16	48.750	48.750	0
5/16	48.879	48.879	0
5/16	49.008	49.008	0
5/16			

[illegible]

EEMC

O2 ANALYZER MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 5/12/92

Analyzer: Make: Teledyne Model: 320 A SN: 37400

Calibration by: O. Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter:
BP: 30.26 Instrument ID: PPINCO
Temp: 72 Instrument ID: TR

Analyzer last calibrated: 5/8/92 By: O. 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. #R351693 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

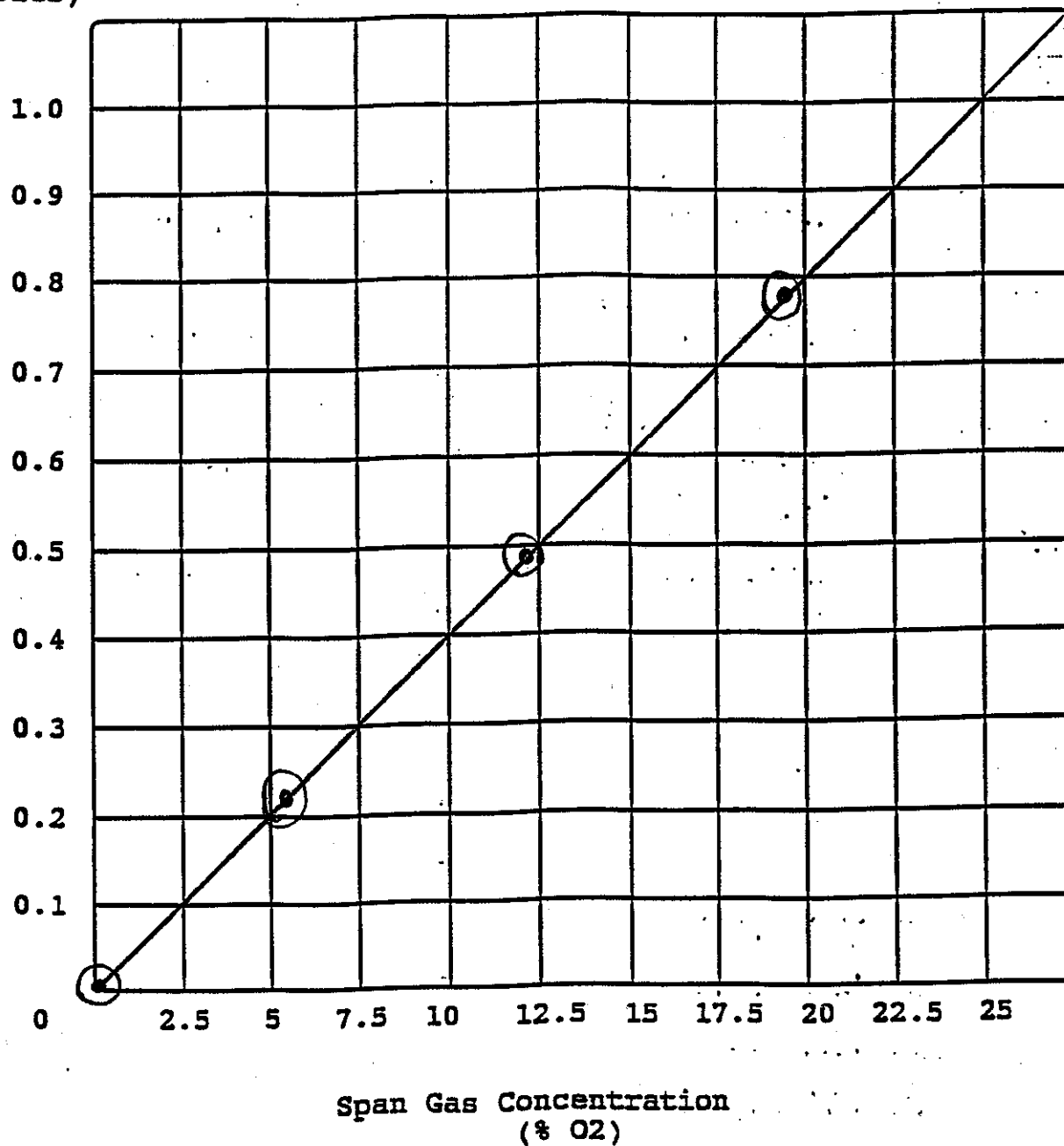
Point #	Cyl. #	% O2	Expected		Actual		Adj.		% Dif.	Potentiometer	
			Meter	DVM	Meter	DVM	Meter	DVM		Unadj.	Adj.
1	1	0.00	00.0	.000	00.0	.000	—	—		—	—
2	2	12.4	12.4	.496	12.2	.491	12.4	.496		—	—
3	3	19.93	19.9	.797	19.4	.781	—	—		—	—
4	4	5.03	5.0	.201	5.0	.204	—	—		—	—
5	1	0.00	00.0	.000	00.0	.000	—	—		—	—

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

Analyzer
 Output
 (volts)



EPA Span Value = $\pm 2.0\%$ of $25\% \text{ O}_2 = \pm .5\%$
 Cal Volts = Cal Volt Conc - Std Conc = \pm Conc Diff = $\pm \Delta\%$
 $.781 = 19.525 - 19.93 = -.405 = -2.032$
 $.204 = 5.100 - 5.03 = .070 = 1.392$

ITE EEMC - WEST LOCATION KENT, WA 98032 OPERATORS WA NOWAK/EASTODDARD

ITE EMC - West

LOCATION

KEAT. WA 98032

OPERATORS

WASSTODDARD

PARAETER

INSTRUMENT/SH

20a

165

RANGE D.O.

RANGE: 0.0-25.0% O₂

REFERENCE MATERIAL OR METHOD ZEROES AND SPANS WITH CERTIFIED CYLINDER GASES

[illegible]

Zero:	UWL	+1.0%	UCL	+2.0%
	LWL	-1.0%	LCL	-2.0%

Span: LWL $+3.5\%$
LWL -3.5%

UCL	+5.0%
LCL	-5.0%

COMMENTS/
ACTIONS

1464H5-507

PREP

HAUNTS 38 X

NAUGHS SD7X

PRG 4

HAUGHS SIX

POSTS
NAUGHTS 5978

REF

NAUHS 507X

Post 7

DE

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Post:

Die

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POST

EEMC

CO ANALYZER
MULTIPOINT CALIBRATION REPORT FORMSite: EEMC KENT, WA Date: 5/12/92Analyzer: Make: HORIBA Model: PIR 2000 SN: 408005Calibration by: D. KingmanCal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter:
BP: 30.26 Instrument ID: PRINCO
Temp: 72 Instrument ID: TRAnalyzer last calibrated: 5/8/92 By: D. Kingman

Cylinders:

1. # T132257 Concentration: 0.00 % CO Cyl. Press.: 800 PSI
Certified by: LIQUID AIR Date: 10/7/912. # 29004 Concentration 4.96 % CO Cyl. Press.: 900 PSI
Certified by: MATHESON Date: 10/31/913. # A1682 Concentration 8.05 % CO Cyl. Press.: 600 PSI
Certified by: LIQUID AIR Date: 12/5/844. # A10199 Concentration 2.02 % CO Cyl. Press.: 800 PSI
Certified by: LIQUID AIR Date 12/5/84Analyzer: Calibrated Range: 0-10.0 % Output: 0-1.0
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter:

Calibration Results

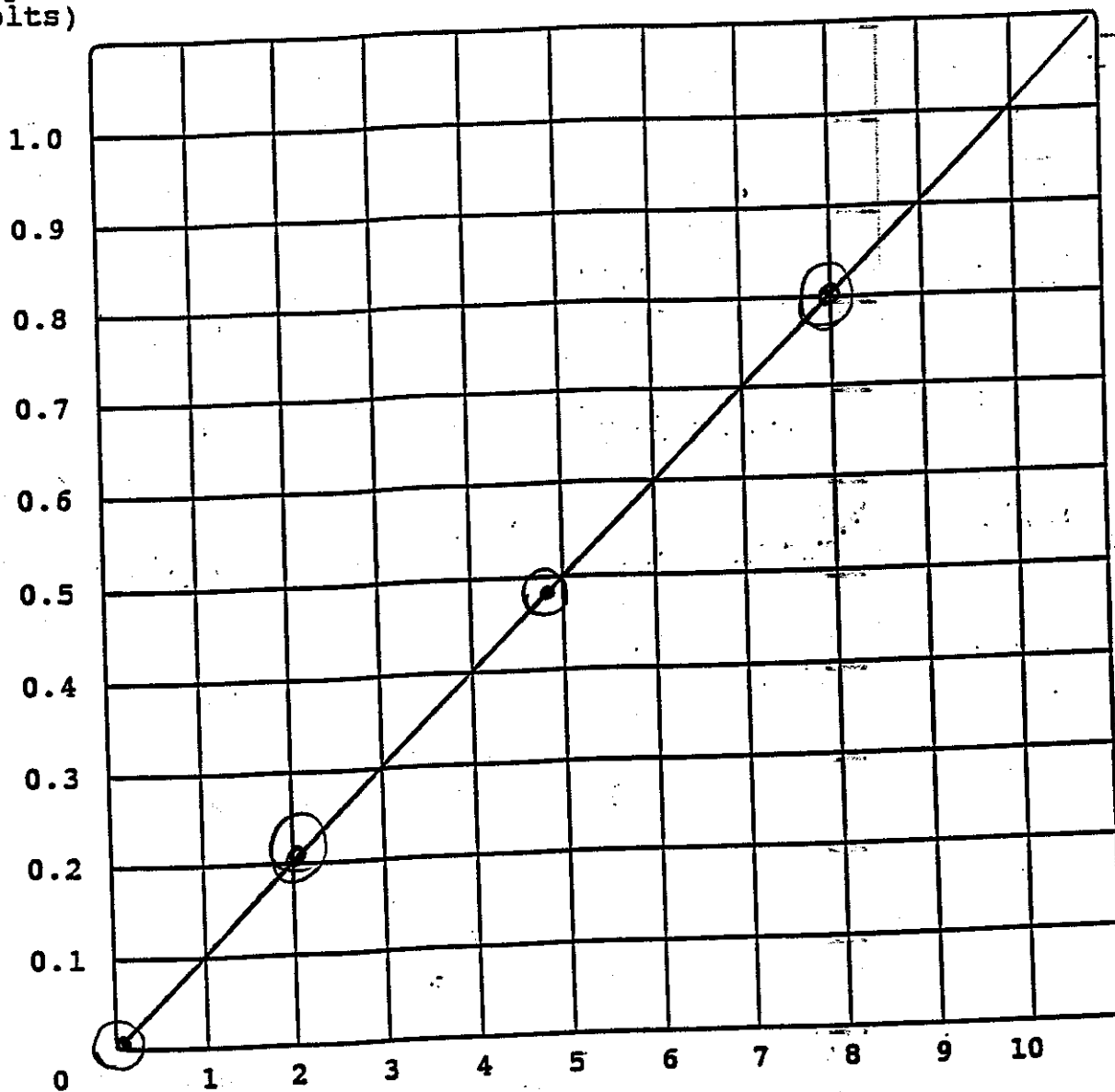
Point #	Cyl. #	% CO	Expected		Actual		Adj.		% Dif.	Potentiometer	
			Meter	DVM	Meter	DVM	Meter	DVM		Unadj.	
1	1	0.00	00.0	.000	00.0	.000	—	—		3.03	—
2	2	4.96	49.6	.496	49.5	.495	49.6	.496		1.32	1.3
3	3	8.05	80.5	.805	78.6	.786	—	—		—	—
4	4	2.02	20.2	.202	19.5	.195	—	—		—	—
5	1	0.00	00.0	.000	00.0	.000	—	—		—	—

Comments:

.5 = 5.090

Slope (M) = 0.0005436
 Y Intercept (B) = 0.0005436
 Correlation Coefficient (r) = 0.9998445
 r^2 = 0.9996889

Analyzer
 Output
 (volts)



Span Gas Concentration
 (% CO)

EPA Span Value = $\pm 2.0\%$ of $10\% \text{ CO} = \pm .2\%$
 Cal Volts = Cal Volt Conc - Std Conc = $\pm \Delta\%$
 $.786 = 7.860 - 8.05 = -.190 = -2.360$
 $.195 = 1.950 - 2.02 = -.070 = -3.465$

ITE EMC - WEST LOCATION KENT, WA 98032 OPERATORS WA NOWAK/JASTODDARD

ITE EMC - West

LOCATION

KENT, WA 98032

OPERATING

OPERATORS BY A NOWAK/JASTODDARD

PARAMETER

INSTRUMENT/SH HOEIBA PIR 0000

408005

RANGE 0.0-10.0% CO

REFERENCE MATERIAL OR METHOD ZEROES AND SPANS WITH CERTIFIED CYLINDER GASES

[illegible]

COMMENTS/ ACTIONS			
Zero:	UWL	LWL	
	+1.0%	-1.0%	
	UCL	LCL	
	+2.0%	-2.0%	
Span:	UWL	LWL	
	+3.5%	-3.5%	
	UCL	LCL	
	+5.0%	-5.0%	
	UCL	LCL	
	+5.0%	-5.0%	

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: 5/13/98
4. #AAL 5858 Concentration 626 PPM SO2 Cyl. Press.: 1500 PSI
 Certified by: LIQUID AIR Date 11/2/87

 Analyzer: Calibrated Range: 0-6500 PPM Output: 0-1.0
 Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter:

Calibration Results

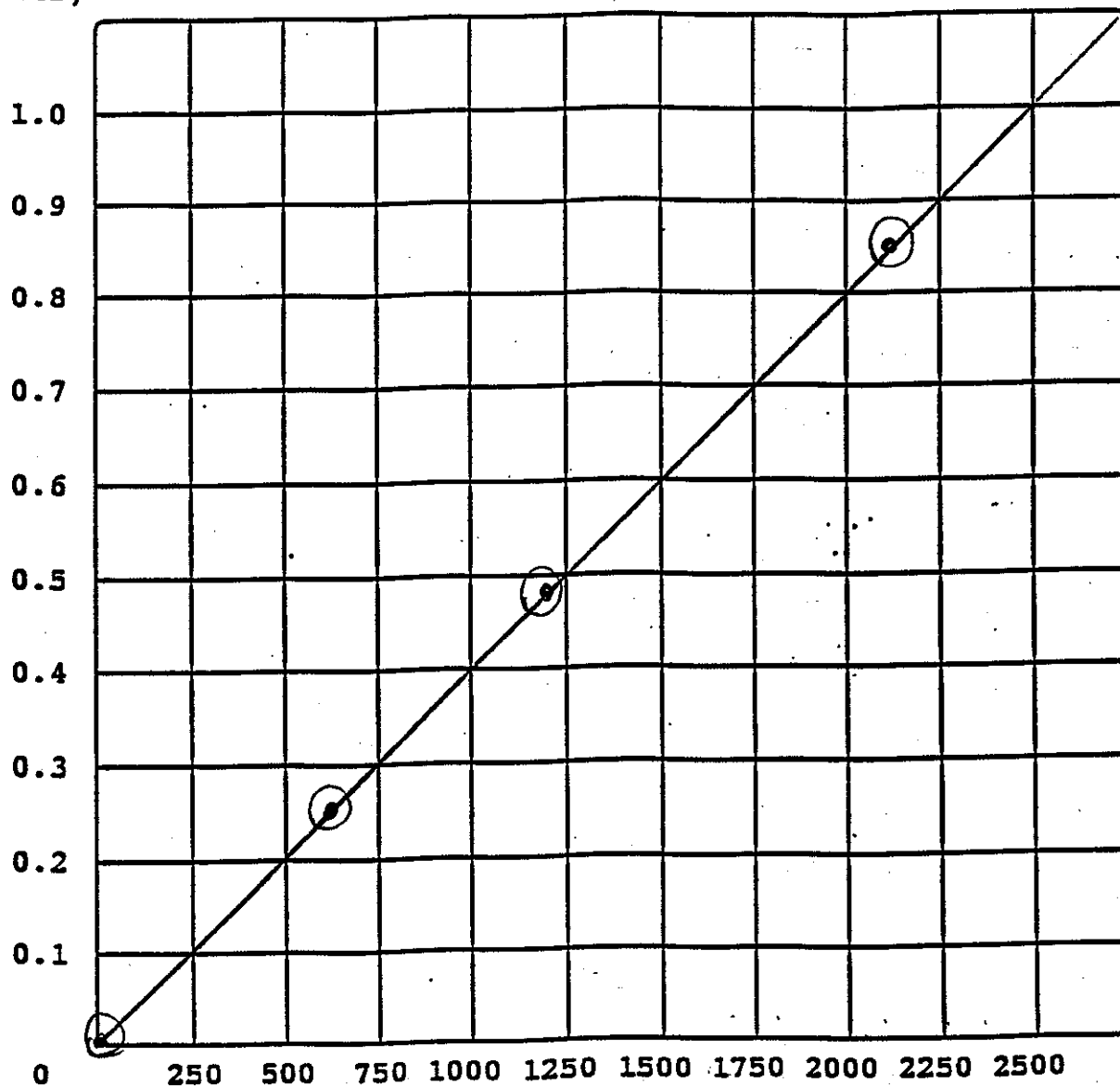
Point #	Cyl. #	PPM SO2	Expected		Actual		Adj.		% Dif.	Potentiomet	
			Meter	DVM	Meter	DVM	Meter	DVM		Unadj.	A
1	1	00.0	00.0	.000	00.1	.001	00.0	.000		4.44	4.1
2	2	1232	49.3	.493	49.9	.499	49.3	.493		3.53	3.7
3	3	2127	85.1	.851	85.1	.851	—	—		—	—
4	4	626	25.0	.250	24.7	.247	—	—		—	—
5	1	00.0	00.0	.000	00.0	.000	—	—		—	—

Comments:

.5 = 1251.473

$Y = MX + B$
 Slope (M) = 0.0004006
 Y Intercept (B) = -0.0013695
 Correlation Coefficient (r) = 0.9999893
 $r^2 =$ 0.9999787

Analyzer
 Output
 (volts)



Span Gas Concentration
 (PPM SO2)

EPA Span Value = +/- 2.0% of 2500 PPM SO2 = +/- 50 PPM
 Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/- $\Delta\%$

.851 = 2126.637 - 2127 = -0.363 = -0.017

.247 = 617.249 - 626 = -8.751 = -1.398

SITE EEMC - WEST LOCATION KENT, WA 98032 OPERATIONS WA NOWAK/JASTODDARD
 PARAMETER SOA INSTRUMENT/SH HORIBA PIR2000 / 403019 RANGE O.O - 8500 ppm SO2

RANGE 0.0-8500 ppm SO₂

REFERENCE MATERIAL OR METHOD ZEROES AND SPONS WITH CERTIFIED CYLINDER GASES

[illegible]

Zero:		+1.0%		+2.0%		+3.5%		+5.0%	
UWL	LWL	UWL	LWL	UWL	LWL	UWL	LWL	UWL	LWL
POST		PRE 3		PRE 4		PRE 5		PRE 6	
HAUGHS SDTX		POST 3		POST 4		POST 5		POST 6	
PRE 2		HAUGHS SDTX		HAUGHS SDTX		HAUGHS SDTX		HAUGHS SDTX	
PRE 1		PRE 1		PRE 2		PRE 3		PRE 4	
HAUGHS SDTX		PRE 0		PRE 1		PRE 2		PRE 3	
POST 1		POST 1		POST 2		POST 3		POST 4	
HAUGHS SDTX		POST 0		POST 1		POST 2		POST 3	
PRE 0		PRE 0		PRE 1		PRE 2		PRE 3	
HAUGHS SDTX		PRE 0		PRE 1		PRE 2		PRE 3	
POST 0		POST 0		POST 1		POST 2		POST 3	
HAUGHS SDTX		POST 0		POST 1		POST 2		POST 3	
PRE 0		PRE 0		PRE 1		PRE 2		PRE 3	
HAUGHS SDTX		PRE 0		PRE 1		PRE 2		PRE 3	
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HAUGHS SDTX		POST 0		POST 1		POST 2		POST 3	
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POST 0		POST 0		POST 1		POST 2		POST 3	
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PRE 0		PRE 0		PRE 1		PRE 2		PRE 3	
HAUGHS SDTX		PRE 0		PRE 1		PRE 2		PRE 3	
POST 0		POST 0		POST 1		POST 2		POST 3	
HAUGHS SDTX		POST 0		POST 1		POST 2		POST 3	
PRE 0		PRE 0		PRE 1		PRE 2		PRE 3	
HA									



ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

ANALYSIS OF CALIBRATION GAS MIXTURES

TEST DATE 4/29/92 SOURCE TESTED Tek LOCATION Kent WA

REFERENCE METHOD USED EPA Method

SPECIES SO₂ CALIBRATION GAS MIXTURE GIVEN VENDOR TANK VALUE

SAMPLE #1 1217 PPM

AL 2892

SAMPLE #2 1220 PPM

SAMPLE #3 1219 PPM

1232 ppm

AVERAGE 1219 PPM

SPECIES SO₂ CALIBRATION GAS MIXTURE GIVEN VENDOR TANK VALUE

SAMPLE #1 2085 PPM

CC 44776

SAMPLE #2 2104 PPM

SAMPLE #3 2090 PPM

2127 ppm

AVERAGE 2092 PPM

SPECIES SO₂ CALIBRATION GAS MIXTURE GIVEN VENDOR TANK VALUE

SAMPLE #1 622 PPM

AAL 5858

SAMPLE #2 606 PPM

SAMPLE #3 607 PPM

626 ppm

AVERAGE 612 PPM

SPECIES SO₂ CALIBRATION GAS MIXTURE GIVEN VENDOR TANK VALUE

SAMPLE #1 2148 PPM

2065

SAMPLE #2 2190 PPM

SAMPLE #3 2179 PPM

2202 ppm

AVERAGE 2172 PPM

SPECIES SO₂ CALIBRATION GAS MIXTURE GIVEN VENDOR TANK VALUE

SAMPLE #1 525 PPM

CC 97188

SAMPLE #2 520 PPM

SAMPLE #3 514 PPM

497 ppm

AVERAGE 512 PPM

Data Taken By JCW

Triplicate analyses of the gas mixtures shall be performed within two weeks prior to use of gas, using ref. methods 6 or 7. Analyze each mixture (50-90%). Each test must be within 20% of the 3 test mean. This form applies to extractive systems only.



SO2 TANK CALCULATIONS

Date 4/29/92

Tank ID AL 2892

Test # 1

1332 ppm

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.48} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.17 + .02/13.6})$$

$$= \underline{1.488} \text{ dscf} \quad (\underline{535} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{0.0099} \quad \text{ml Ba++} = \underline{430}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{430}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{1217} \quad (\underline{1.488})$$

Test # 2

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.52} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.16 + .02/13.6})$$

$$= \underline{1.519} \text{ dscf} \quad (\underline{538} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{440}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{440}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{1220} \quad (\underline{1.519})$$

Test # 3

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.52} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.76 + .02/13.6})$$

$$= \underline{1.513} \text{ dscf} \quad (\underline{540} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{438}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{438}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{1219} \quad (\underline{1.513})$$



24-Sep-91
PACIFIC RIM OXYGEN

P.O. NO.: 15626
TUKWILA, WA

CERTIFICATION OF CYLINDER # AL-2892

COMPONENT:

Sulfur Dioxide
NITROGEN

MEAN CONCENTRATION:

1232 +/- 19 ppm
BALANCE

Cylinder pressure:
Expiration date:

2000 psi
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.


Authorized signature

**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	
	INVALID	INVALID	INVALID	INVALID	INVALID	INVALID	
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

SO2 TANK CALCULATIONS

Date 4/29/92 Tank ID CC 44776

Test # 1

9127 ppm

Gas Volume - Dry Standard Conditions

$$Vm(std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.52} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.14 + .02/13.6}) \\ = \underline{1.535} \text{ dscf} \quad (\underline{532} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{760}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{760}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6]) \\ = \underline{2085} \quad (\underline{1.535})$$

Test # 2

Gas Volume - Dry Standard Conditions

$$Vm(std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.52} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.14 + .02/13.6}) \\ = \underline{1.529} \text{ dscf} \quad (\underline{534} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{764}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{764}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6]) \\ = \underline{2104} \quad (\underline{1.529})$$

Test # 3

Gas Volume - Dry Standard Conditions

$$Vm(std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.54} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.16 + .02/13.6}) \\ = \underline{1.551} \text{ dscf} \quad (\underline{534} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{770}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{770}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6]) \\ = \underline{2090} \quad (\underline{1.551})$$



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 W. Mock

SO2 TANK CALCULATIONS

Date 4/29/92

Tank ID AAL 5858

Test # 1

(626 ppm)

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.48} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.12 + .02/13.6})$$

$$= \underline{1.488} \text{ dscf} \quad (\underline{534} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{220}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{220}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{622} \quad (\underline{1.488})$$

Test # 2

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.50} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.12 + .02/13.6})$$

$$= \underline{1.508} \text{ dscf} \quad (\underline{534} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{216}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{216}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{606} \quad (\underline{1.508})$$

Test # 3

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.48} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.14 + .02/13.6})$$

$$= \underline{1.484} \text{ dscf} \quad (\underline{534} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{214}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{214}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{607} \quad (\underline{1.484})$$

ENVIRONMENTAL DA 22411

PHONE : 714-297-3371

FAX : 714-297-3549

Receives:

SECRETARY OF DEFENSE
1000 SOUTH CENTRAL
UNIT 1
MONT. LA 75302
ATTN: SEA ANAL.

***** CERTIFICATE OF ANALYSIS - EPA PROVIDED CASE *****

Certified Per Traceability: (Protocol # 1) (Procedure # 91)

Certified Accuracy 1% NBS Traceable to : CRM 1462 A

Cylinder Number	Component	Analysis	Balance Gas	Pressure
AML-5559	SULFUR DIOXIDE	525.51 PPM	NITROGEN	1900 psi

REFERENCE STD

GAS ANALYZER

REF CYLINDER
TYPE NUMBER CONCENTRATION

NAME/MODEL/SERIAL #

LAST CALIBRA-
TION DATE

ANALYTICAL PRINCIPLE

CRM AML-15547 919.2 PPM

DU FORT
400
2739

04/14/88

ULTRA-VIOLET

Analysis Equation: $y = -2.1484 \times 10^{-4} x + 10.7102 \text{ mV} + 1.72 \times 10^{-2} (\text{mV})^2$

FIRST ANALYSIS				SECOND ANALYSIS			
ANALYZER READINGS				ANALYZER READINGS			
Date: 12/27/88				Date: 12/27/88			
TEST GAS	REFERENCE GAS	ZERO GAS	RESULTS	TEST GAS	REFERENCE GAS	ZERO GAS	RESULTS
(mV)	(mV)	(mV)	(ppm)	(mV)	(mV)	(mV)	(ppm)
43.43	64.68	0.00	525.81	43.43	64.68	0.00	525.81
43.43	64.68	0.00	525.81	43.38	64.68	0.00	524.81
43.48	64.68	0.00	526.81	43.48	64.68	0.00	526.81
AVERAGE : 525.81				AVERAGE : 525.81			
STD DEV. : 0.00				STD DEV. : 0.00			

CRM - CERTIFIED REFERENCE MATERIAL (N.B.S.)

12/27/88

Approved by:

James H. Ross

SO2 TANK CALCULATIONS

Date 4/29/92 Tank ID CC97188

Test # 1

(447 ppm)

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.50} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.18 + .02/13.6})$$

$$= \underline{1.506} \text{ dscf} \quad (\underline{536} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{180}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{180}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{503} \quad (\underline{1.506})$$

Test # 2

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.50} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.18 + .02/13.6})$$

$$= \underline{1.506} \text{ dscf} \quad (\underline{536} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{186}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{186}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{520} \quad (\underline{1.506})$$

Test # 3

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.54} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.18 + .02/13.6})$$

$$= \underline{1.540} \text{ dscf} \quad (\underline{538} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{188}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{188}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{514} \quad (\underline{1.540})$$

**ALPHAGAZ**

DIVISION OF LIQUID AIR CORPORATION

08-Aug-91
PACIFIC RIM OXYGEN

P.O.#: 155901
TUKWILA, WA

CERTIFICATION OF CYLINDER # CC-97188

COMPONENT:

Sulfur Dioxide
NITROGEN

MEAN CONCENTRATION:

497 +/- 19 ppm
BALANCE

Cylinder pressure:
Expiration date:

2000 psi
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.


Authorized signature

**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

SO2 TANK CALCULATIONS

Date 4/29/92

Tank ID 2065

Test # 1

(2208 ppm)

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.52} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.16 + .02/13.6})$$

$$= \underline{1.525} \text{ dscf} \quad (\underline{536} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{778}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{778}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{2148} \quad (\underline{1.525})$$

Test # 2

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.50} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.16 + .02/13.6})$$

$$= \underline{1.499} \text{ dscf} \quad (\underline{538} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{780}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{780}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{2190} \quad (\underline{1.499})$$

Test # 3

Gas Volume - Dry Standard Conditions

$$Vm (std) = VmKY[Pb+(\Delta H/13.6)]/Tm$$

$$Vm(std) = (\underline{1.52} \text{ cf}) 17.65 (\underline{1.01} \text{ mcf}) (\underline{30.16 + .02/13.6})$$

$$= \underline{1.519} \text{ dscf} \quad (\underline{538} \text{ A})$$

Concentration SO2 - ppm v/v dry

$$\text{Normality (N)} = \underline{.0099} \quad \text{ml Ba++} = \underline{786}$$

$$\text{ppm v/v dry} = \frac{(\text{ml Ba++})(32)(N)(13.29 \times 10^{-6})(10[6])}{Vm(std)}$$

$$\text{ppm v/v dry} = (\underline{786}) (32) (\underline{.0099}) (13.29 \times 10^{-6})(10[6])$$

$$= \underline{2179} \quad (\underline{1.519})$$

**ALPHAGAZ**

DIVISION OF LIQUID AIR CORPORATION

DATE: March 3, 1990

EXPIRATION DATE: September 3, 1990

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 was 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

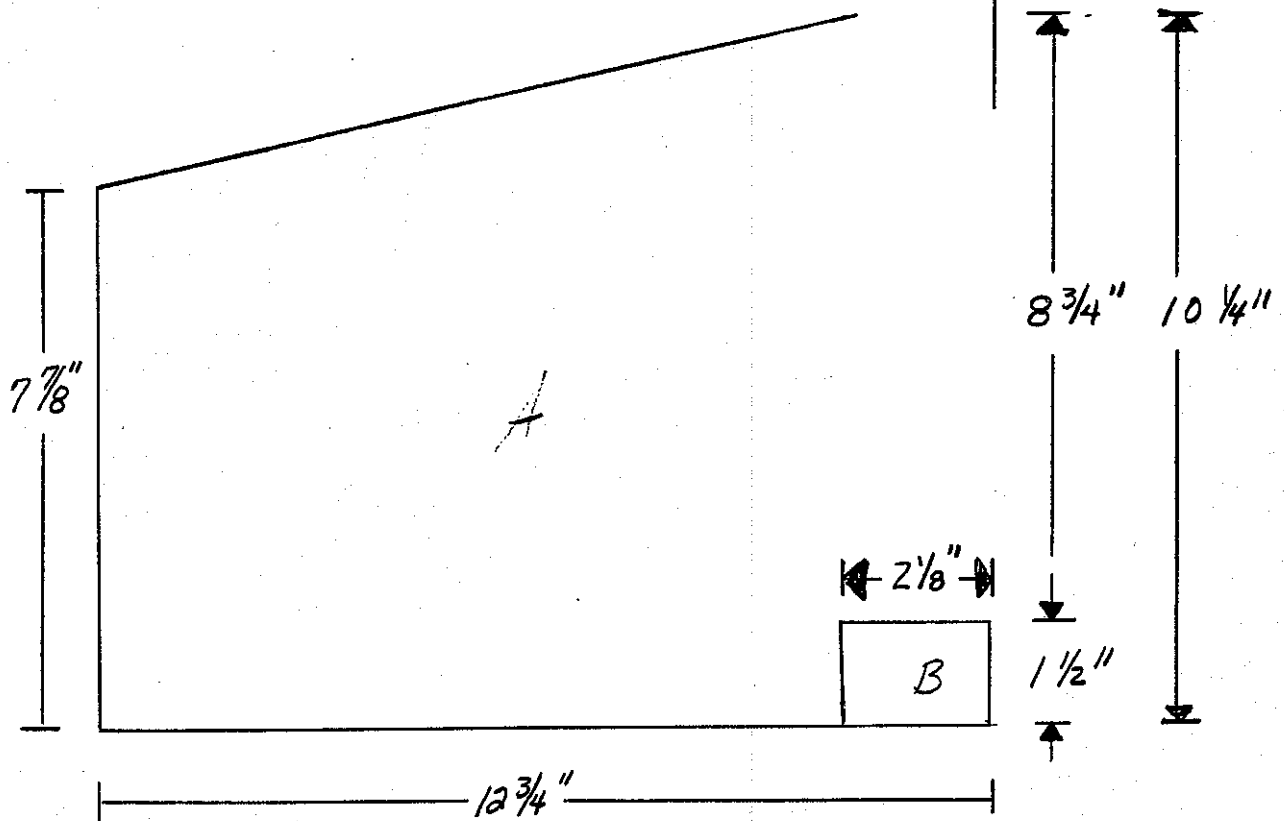

Analyst

HAUGHS PRODUCTS

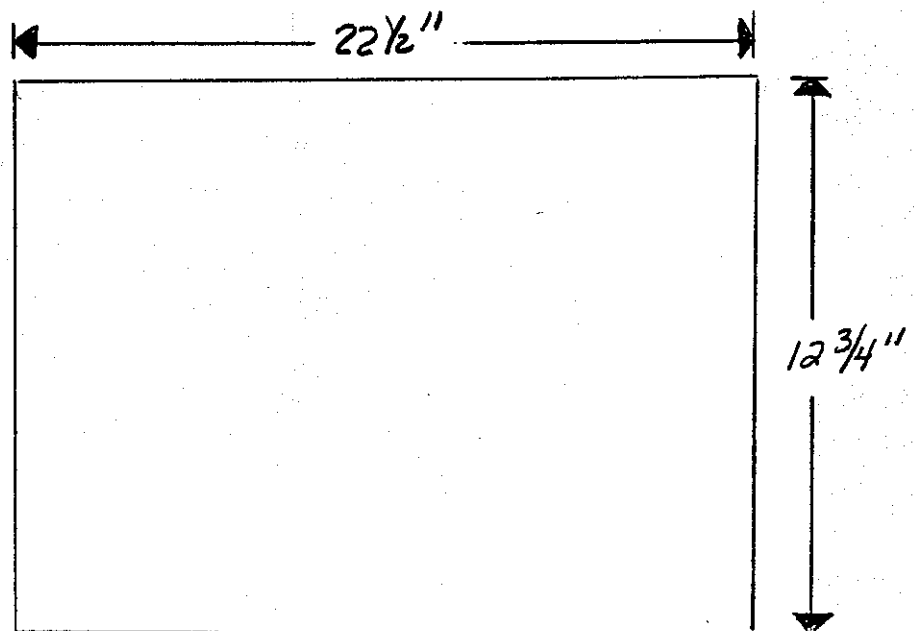
S-27X

SIDE VIEW

PAGE 1 OF



TOP VIEW



VOLUME CALCULATIONS

$$A = \frac{7.875 + 10.25}{2} \times 12.75 \times 22.5 = 2599.805$$

$$B = 2.125 \times 1.5 \times 22.5 = 71.719$$

$$A - B = 2599.805 - 71.719 = 2528.086$$

$$2528.086 \div 1728 = 1.463 \text{ cu/ft}$$

$$1.463 \times 7 = 10.241 \text{ IDEAL FUEL LOAD}$$

$$\pm 10.241 = 11.2 - 9.3 \text{ FUEL LOAD RANGE}$$

$$5/6 \times 22.5 = 18.75 \text{ FUEL LOAD LENGTH}$$

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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 4 1/2 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.

RG Feroux

RECEIVED MAY 13 1992

AT EEMC

Pia Kelly

FAX TO EPA - 5/13
UPS TO EPA - 5/13 1727 3316 096