Myren Consulting, Inc.

United States
Environmental Protection Agency
Woodheater Certification Program
Woodheater Certification Test Report

High Valley
Construction and Maintenance, Inc.
High Valley Stoves
Model 1600
Noncatalytic Woodstove

April 12, 1999

Myren Consulting, Inc.

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EPA WEIGHTED AVERAGES CALCULATIONS
EPA WEIGHTED AVERAGE PARTICULATE EMISSION RATE

The weighted average particulate emission rate ($\overline{PM}$) for the High Valley 1600 Noncatalytic woodheater manufactured by High Valley Woodstoves, Inc. is 2.73 g/hr.

EPA WEIGHTED AVERAGE OVERALL EFFICIENCY

The weighted average overall efficiency ($\overline{OE}$) for the High Valley 1600 Noncatalytic woodheater is default (63)%.

II. EPA TEST RESULTS
* Denotes runs used in weighted average calculations

Run #	Dry Burn Rate/kg/hr	Grams/Hour	Overall Efficiency
3	0.976	3.324	
2	0.989	3.380	
6	1.704	1.694	
1	3.353	3.455	
5[1]	1.246	1.749	
4[2]	1.360	1.560	

Notes: 1. Run 5 = Fan Confirmation Test.
2. Run 4 broke Delta T.

III. EPA CUMULATIVE PROBABILITY CALCULATIONS

$$P_n = \frac{[\text{Hi Prob.} - \text{Low Prob.}][\text{Act. Dry Burn Rate} - \text{Low Dry Burn Rate}]}{.05} + \text{Low Prob.} = P_n$$

$P_1 = \frac{[\ .380 - .328\ ][\ .976 - .950\ ]}{.05} + .328 = .3550$

$P_2 = \frac{[\ .380 - .328\ ][\ .989 - .950\ ]}{.05} + .328 = .3686$

$P_3 = \frac{[\ .857 - .840\ ][\ 1.704 - 1.700\ ]}{.05} + .840 = .8414$

$P_4 = \frac{[\ .989 - .939\ ][\ 3.353 - 3.350\ ]}{.05} + .939 = .9890$

$P_5 = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_6 = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_7 = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_8 = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_9 = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_{10} = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_{11} = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_{12} = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_{13} = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_{14} = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$P_{15} = \frac{[\ \ - \ \ ][\ \ - \ \ ]}{.05} + \_\_\_\_ = \_\_\_\_$

$K_1 = P_2 - P_0 =$ .3686 - .000 = .3686

$K_2 = P_3 - P_1 =$ .8414 - .3550 = .4864

$K_3 = P_4 - P_2 =$ .9890 - .3686 = .6204

$K_4 = P_5 - P_3 =$ 1.0000 - .8414 = .1586

$K_5 = P_6 - P_4 =$ _____ - _____ = _____

$K_6 = P_7 - P_5 =$ _____ - _____ = _____

$K_7 = P_8 - P_6 =$ _____ - _____ = _____

$K_8 = P_9 - P_7 =$ _____ - _____ = _____

$K_9 = P_{10} - P_8 =$ _____ - _____ = _____

$K_{10} = P_{11} - P_9 =$ _____ - _____ = _____

$K_{11} = P_{12} - P_{10} =$ _____ - _____ = _____

$K_{12} = P_{13} - P_{11} =$ _____ - _____ = _____

$K_{13} = P_{14} - P_{12} =$ _____ - _____ = _____

$K_{14} = P_{15} - P_{13} =$ _____ - _____ = _____

$K_{15} = P_{16} - P_{14} =$ _____ - _____ = _____

IV. EPA WEIGHTED AVERAGES CALCULATIONS

The following formula is the one set out in Equation 28-1, Section 8.1, Method 28 and is to be used to calculate both the weighted average particulate emission rate (PM) and the weighted average overall efficiency (OE) as shown below. The formula uses interpolated probabilities for a given heat output demand calculated from the values listed in Table 28-1(2) in Method 28.

$$\overline{PM} = \frac{K_1PM_1 + K_2PM_2 + K_3PM_3 + \ldots K_nPM_n}{K_1 + K_2 + K_3 \ldots + K_n}$$

Where $\overline{PM}$ = The EPA weighted average particulate matter (PM) emission rate in grams per hour (g/hr).
$K_1, K_2, K_3, \ldots K_n$ = The weighting factors for the individual test runs as determined in III above.
$PM_1, PM_2, PM_3, \ldots PM_n$ = The particulate emission rates for the individual test runs as listed in II above.

And

$$\overline{OE} = \frac{K_1OE_1 + K_2OE_2 + K_3OE_3 + \ldots K_nOE_n}{K_1 + K_2 + K_3 + \ldots K_n}$$

Where $\overline{OE}$ = The EPA weighted average overall efficiency in percent (%).
$K_1, K_2, K_3, \ldots K_n$ = The weighting factors for the individual runs as determined in III above.
$OE_1, OE_2, OE_3, \ldots OE_n$ = The overall efficiencies for the individual test runs as listed in II above.

IV.A. EPA WEIGHTED AVERAGE PARTICULATE EMISSIONS CALCULATIONS

$\overline{PM}$ = .3686(3.324)+.4864(3.380)+.6204(1.694)+.1586(3.455)+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )=
over .3686 + .4864 + .6204 + .1586 + + + + + + + + + +

$\overline{PM}$ = 1.2252+1.6440+1.0510+.5480+ + + + + + + + + + = over 1.6340

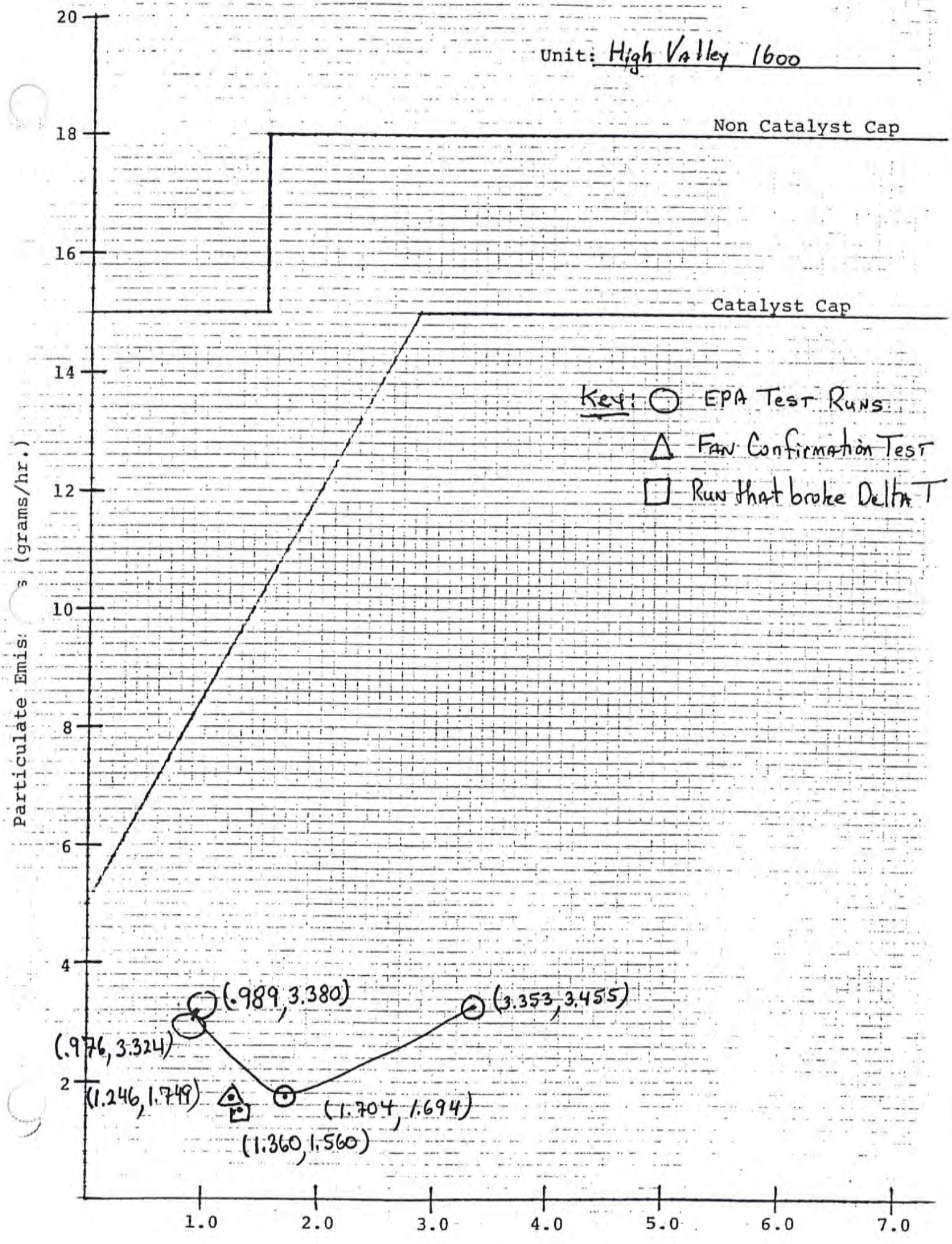
$\overline{PM}$ = 4.4682 / 1.6340 = 2.7345 = 2.73 g/hr

IV.B. EPA WEIGHTED AVERAGE OVERALL EFFICIENCY CALCULATIONS

$\overline{OE}$ = ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )+ ( )=
over + + + + + + + + + + + +

$\overline{OE}$ = + + + + + + + + + + + + =

$\overline{OE}$ = ______ = ______ = ______ %


Unit: High Valley 1600
Non Catalyst Cap
Catalyst Cap
Key: ○ EPA Test Runs
△ Fan Confirmation Test
□ Run that broke Delta T
Particulate Emis (grams/hr.)
20
18
16
14
12
10
8
6
4
2
1.0
2.0
3.0
4.0
5.0
6.0
7.0
(.989, 3.380)
(.976, 3.324)
(3.353, 3.455)
(1.246, 1.749)
(1.704, 1.694)
(1.360, 1.560)

Woodstove Data Summary

	Run #	3	2	6	1		5[1]		4[2]	
Particulate Emissions:										
Concentration: grains/dscf:										
grams/m^3:										
Emission Rate: grams/hr:		3.324	3.380	1.694	3.455		1.749		1.560	
Emission Factor: gms/kg: (dry fuel weight basis)										
Front Half Catch: % of total										%
Total Mass Captured: Frt & Bck Halves:		48.9	48.6	12.8	15.4		18.1		14.3	mg
Efficiency Valves:										
Overall Appliance Efficiency										%
Combustion Efficiency										%
Heat Transfer Efficiency										%
Heat Output:										
Avg. BTU/hr for test cycle		11,768	11,921	20,548	40,407		15,023		16,491	BTU/hr
Fuel Burn Rates:										
Avg Kg/hr for test cycle (Wet basis)										Kg/hr
Avg Kg/hr for test cycle (Dry basis)		0.976	0.989	1.704	3.353		1.246		1.360	Kg/hr

Notes: 1. Run 5 = Fan Confirmation Test
2. Run 4 broke Delta T

RUN #	3	2	6	1		5		4	
Average Temperatures:									
Stack Gas	228	225	341	527		287		303	°F
Primary Combustion Chamber Gas	500	504	831	996		699		521	°F
Secondary Combustion Chamber Gas	846	873	1028	1201		948		947	°F
Catalytic Combustor Exit Gas	N/A	N/A	N/A	N/A		N/A		N/A	°F
Stove Top	347	353	450	628		411		402	°F
Stove Left Sidewall	358	346	454	561		393		421	°F
Stove Back	349	346	416	504		416		410	°F
Stove Right Sidewall	408	413	505	630		442		478	°F
Stove Bottom	424	408	476	515		456		470	°F
Stove Temperature Change	-118.6	-83.2	-87.2	-88.0		-90.6		-125.8	°F
Test Chamber Environment:									
Avg. Barometric Pressure	28.527	28.546	28.394	28.537		28.400		28.518	in Hg
Avg. Temperature	69	71	69	76		71		69	°F
Avg. % Ambient Moisture	1.25	1.525	1.5125	1.20		1.125		1.225	% H_2O
Avg. % Relative Humidity	48.0	52.0	56.5	42.0		45.0		48.0	%RH
Avg. Air Velocity	0	0	0	0		0		0	m/sec
Avg. Dilution Tunnel Draft (If Applicable)	0	0	0	0		0		ⓒ	in/H_2O
Test Fuel Weight and Burn Time:									
Density (Dry basis)	.4665	.4359	.4911	.4205		.4574		.5363	gm/cm^3
Coal Bed Weight	4.2	4.3	3.5	3.5		3.5		3.5	lbs.
Pre Test Fuel Wt (Inc Kindling)	67.0	54.2	55.7	61.6		60.5		57.2	lbs.
Test Fuel Load Weight	17.2	17.2	17.4	17.2		17.2		17.3	lbs.
Total Test Cycle Burn Time	395	390	230	115		310		285	min.

RUN #	3	2	6	1		5		4	
Fuel Moisture Content:									
Kindling (Wet basis)	11.479	11.348	13.470	11.478		11.609		11.609	%
Pretest Fuel (Wet basis)	19.010	18.194	18.159	18.624		18.805		18.576	%
Test Fuel (Wet basis)	17.647	17.632	17.234	17.616		17.492		17.215	%
Air/Fuel Ratio:									
lbs air/lbs fuel									
Average Stack Gas Composition:									
Avg. % CO_2									%
Avg. % O_2									%
Avg. % CO									%
Avg. % Excess Air									%
Avg. % Moisture									%
Average Stack Gas Flow Rate:									
Stack flow rate - EPA CMB									dscfm
CHO balance									dscfm
Tracer Gas									dscfm
Draft (Static)	-.0442	-.0416	-.0605	-.0870		-.056		-.059	in.H_2O
Proportionality - Average	99.985	99.990	99.909	99.992		99.958		99.907	
Average Stack Gas Emission Factors:									
CO - g/Kg									
g/hr									

Unit High Valley XTEC.
Date 3/18-19/99
Technicians ATM
Page 1 of
WST5-Form3

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

Hr. #	Date	Time	T/C# Firebox Temp	Secondary Burn Temp	Post Cat	In Cat	Comments
1	3/18/99	1700	585	1183			Fire Started 1200
2	3/18/99	1800	673	1270			
3	3/18/99	1900	618	990			
4	3/19/99	1200	796	1420			Fire Started 0900
5	3/19/99	1300	685	892			
6	3/19/99	1400	568	1260			
7	3/19/99	1500	693	1246			
8	3/19/99	1600	580	812			
9	3/19/99	1700	489	707			
10	3/19/99	1800	468	659			
11	3/19/99	1900	466	596			
12	3/19/99	2000	460	513			

hivalleyepa3

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	hivalleyepa3
Stove Manufacturer:	HI VALLEY
Model Number:	XTEC
Lab Name:	MYREN
Test Date:	3\22\99
Run Number:	EPA 3
Meter Box Y Factor:	1.003
Barometric pressure (in):	28.527
Gas meter temp (ave):	81
delta H(avg):	0.900
Gas meter initial reading:	64.302
Gas meter final reading:	283.974
Front catch (acetone) mg:	7.4
first filter catch (mg):	42.8
second filter catch (mg):	-1.3
tunnel flow (ave cfm):	144.276
Emission Rate(g/hr):	2.067
Emission Rate(M5H) :	3.324
vs/VmTs:	0.0074
vs ave:	832.063
Tunnel average temp (°f):	86.902
Test time(min):	395
Fuel Load(lb. wet):	17.2
Wood moisture(%wet):	17.647
Burn rate(dry kg/hr):	0.976
Samp vol(scf):	205.417
front filter number	778
back filter number	777
acetone beaker number	2
PRELIMINARY RESULTS	
FINAL RESULTS	AUDITED
DATA SUMMARY	
MODEL :	XTEC
RUN:	EPA 3
DATE:	3\22\99
DBR:	0.976
GPH UNADJ	2.067
ADJ	3.324431254

RUN TIME (min)	PITOT DELTAP (- INCH H20)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCIT (ft/min)	PROP RATE (%)	dDGM vol std (ft3)
0	0.041	92	64.302	76	0.900	846.36		
10	0.041	110	69.975	75	0.900	860.05	105.7	5.364
20	0.040	100	75.493	76	0.900	842.01	99.2	5.208
30	0.040	102	81.048	77	0.900	843.51	102.2	5.233
40	0.040	104	86.595	79	0.900	845.01	101.8	5.206
50	0.040	105	92.143	79	0.900	845.76	101.9	5.207
60	0.040	105	97.702	79	0.900	845.76	102.0	5.218
70	0.039	104	103.325	80	0.900	834.38	102.8	5.268
80	0.039	103	108.889	80	0.900	833.64	102.9	5.213
90	0.040	100	114.410	81	0.900	842.01	101.5	5.163
100	0.040	97	119.938	81	0.900	839.75	100.0	5.169
110	0.040	93	125.490	82	0.900	836.73	99.8	5.182
120	0.040	91	131.090	82	0.900	835.22	100.7	5.227
130	0.040	89	136.678	81	0.900	833.70	100.5	5.225
140	0.040	88	142.260	82	0.900	832.94	100.2	5.210
150	0.040	87	147.858	81	0.900	832.18	100.6	5.235
160	0.040	85	153.443	81	0.900	830.66	100.1	5.223
170	0.040	85	159.032	81	0.900	830.66	100.3	5.226
180	0.040	85	164.596	80	0.900	830.66	100.1	5.213
190	0.040	85	170.116	80	0.900	830.66	99.3	5.171
200	0.040	84	175.659	80	0.900	829.90	99.5	5.193
210	0.040	83	181.245	80	0.900	829.13	100.2	5.233
220	0.040	82	186.865	81	0.900	828.37	100.5	5.255
230	0.040	82	192.411	80	0.900	828.37	99.5	5.196
240	0.040	81	197.962	82	0.900	827.61	99.0	5.181
250	0.040	81	203.531	82	0.900	827.61	99.4	5.198
260	0.040	80	209.095	83	0.900	826.84	99.0	5.184
270	0.040	79	214.633	82	0.900	826.07	98.6	5.169
280	0.040	79	220.179	83	0.900	826.07	98.6	5.167
290	0.040	79	225.739	82	0.900	826.07	99.1	5.190
300	0.040	79	231.299	83	0.900	826.07	98.9	5.180
310	0.040	78	236.703	82	0.900	825.31	96.1	5.044
320	0.040	78	242.383	83	0.900	825.31	100.9	5.292
330	0.040	78	247.991	84	0.900	825.31	99.5	5.215
340	0.040	77	253.531	83	0.900	824.54	98.3	5.161
350	0.040	76	259.065	82	0.900	823.77	98.2	5.165

360	0.040	76	264.574	83	0.900	823.77	97.7	5.133
370	0.040	76	270.096	82	0.900	823.77	98.1	5.154
380	0.040	75	275.600	83	0.900	823.00	97.4	5.128
390	0.040	75	281.121	82	0.900	823.00	98.0	5.153
395	0.040	75	283.974	82	0.900	823.00	101.3	2.663
						0.00	0.0	0.000
420						0.00	0.0	0.000
430						0.00	0.0	0.000
440						0.00	0.0	0.000
450						0.00	0.0	0.000
460						0.00	0.0	0.000
470						0.00	0.0	0.000
480						0.00	0.0	0.000
490						0.00	0.0	0.000
500						0.00	0.0	0.000
510						0.00	0.0	0.000
520						0.00	0.0	0.000
530						0.00	0.0	0.000
540						0.00	0.0	0.000
550						0.00	0.0	0.000
560						0.00	0.0	0.000
570						0.00	0.0	0.000
580						0.00	0.0	0.000
590						0.00	0.0	0.000
600						0.00	0.0	0.000
610						0.00	0.0	0.000
620						0.00	0.0	0.000
630						0.00	0.0	0.000
640						0.00	0.0	0.000
650						0.00	0.0	0.000
660						0.00	0.0	0.000
670						0.00	0.0	0.000
680						0.00	0.0	0.000
690						0.00	0.0	0.000
700						0.00	0.0	0.000
710						0.00	0.0	0.000
720						0.00	0.0	0.000
730						0.00	0.0	0.000
740						0.00	0.0	0.000
750						0.00	0.0	0.000
760						0.00	0.0	0.000
770						0.00	0.0	0.000

METHOD 5G- 1 PARTICULATE SAMPLING DATA LAB-

DATE 3/22/99 PAGE 1 OF 2 MODEL # HIGH VALLEY X-TEC RUN # EPA #3

METER BOX # 511-M METER Y 1.002 FILTER # (F) 78 (R) 77

PRE TEST LEAK RATE = .0005 CFM @ -15.5 IN. HG .9325/.938 FILTER SIZE: 110 MM

POST TEST LEAK RATE = .000 CFM @ -10.0 IN. HG .974/.974 PROBE LENGTH 24" 6/BASS

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1435	00	64.302	.041	92	76	.90	0
45	10	69.975	.041	110	75	.90	0
55	20	75.493	.040	100	76	.90	0
1505	30	81.048	.040	102	77	.90	0
15	40	86.595	.040	104	79	.90	0
25	50	92.143	.040	105	79	.90	0
35	60	97.702	.040	105	79	.90	0
45	70	103.325	.039	104	80	.90	0
55	80	108.889	.039	103	80	.90	0
1605	90	114.410	.040	100	81	.90	0
15	100	119.938	.040	97	81	.90	0
25	10	125.490	.040	93	82	.90	0
35	20	131.090	.040	91	82	.90	0
45	30	136.678	.040	89	81	.90	0
55	40	142.260	.040	88	82	.90	0
1705	50	147.858	.040	87	81	.90	0
15	60	153.443	.040	85	81	.90	0
25	70	159.032	.040	85	81	.90	0
35	80	164.596	.040	85	80	.90	0
45	90	170.116	.040	85	80	.90	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.028	96
2	1.5"	.040	96
3	4.5"	.044	96
4	5.5"	.038	96
W-1	0.5"	.037	98
2	1.5"	.045	99
3	4.5"	.040	99
4	5.5"	.033	100
	Avg.	.0371	98

Pilot Leak Check Pre ✓ Post ✓

Cp = 0.99

N
1
2
→ W 1 2 (3*Q)
3
4

*=point of Avg. delta p

$Qs = \left(\sqrt{\frac{\Delta P \times BP}{T(°R)}}\right) \times 3167.2 =$

138.133 cfm

BP = START 28.56 in Hg
60 28.54
120 28.53
180 28.53
240 28.52
300 28.52
360 28.51
395 28.505

$\bar{X} = 28.527$ ✓

METHOD 5G — PARTICULATE SAMPLING DATA — LAB-

DATE 3/22/99 PAGE 2 OF 2 MODEL # HIGH VALLEY X-TEC RUN # EPA #3

METER BOX # 57M METER Y 1.003 FILTER # (F) 778 (R) 77

PRE TEST LEAK RATE = .0005 CFM @ -15.5 IN. HG .9315/.933 FILTER SIZE: 110 MM

POST TEST LEAK RATE = .000 CFM @ -10.0 IN. HG .974/.974 PROBE LENGTH 24" GLASS

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1755	2 00	175.659	.040	84	80	.90	0
1805	10	181.245	.040	83	80	.90	0
15	20	186.865	.040	82	81	.90	0
25	30	192.411	.040	82	80	.90	0
35	40	197.962	.040	81	82	.90	0
45	50	203.531	.040	81	82	.90	0
55	60	209.095	.040	80	83	.90	0
1905	70	214.633	.040	79	82	.90	0
15	80	220.179	.040	79	83	.90	0
25	90	225.739	.040	79	82	.90	0
35	3 00	231.299	.040	79	83	.90	0
45	10	236.703	.040	78	82	.90	0
55	20	242.383	.040	78	83	.90	0
2005	30	247.991	.040	78	84	.90	0
15	40	253.531	.040	77	83	.90	0
25	50	259.065	.040	76	82	.90	0
35	60	264.574	.040	76	83	.90	0
45	70	270.096	.040	76	82	.90	0
55	80	275.600	.040	75	83	.90	0
2105	90	281.121	.040	75	82	.90	0
2110	395	283.974	.040	75	82	.90	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.028	96
2	1.5"	.040	96
3	4.5"	.044	96
4	5.5"	.038	96
W-1	0.5"	.037	98
2	1.5"	.045	99
3	4.5"	.040	99
4	5.5"	.033	100
	Avg.	.0371	98

Pilot Leak Check Pre ✓ Post ✓

Cp = 0.99

N 1 2 3* 4

→ W 1 2 3* 4

*=point of Avg. delta p

$Qs = \left(\sqrt{\frac{\Delta P \times BP}{T(°R)}}\right) \times 3167.2 =$

138.133 cfm

BP = Start 28.56 in Hg

60 28.54
120 28.52
180 28.53
240 28.52
300 28.52
360 28.51
395 28.505

$\bar{X} = 28.527$

F - 44.9 R .5 395 17.2 17.647

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

Into Dessicator: Date 1/8/99 Time 12:00 By ATM Front Half ✓ Back Half ✓

Manufacturer: Schleicher & Schuell Size: 11cm Lot No.: 78951 Grade: #25 q/ash
Order No. 06220

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
776	.7853	2/19	12:55	T.M.	.7853	2/10/99	1629	ATM				
777	.8127		12:56	T.M.	.8129		1628	ATM	←			
778	.8044		12:57	T.M.	.8040		1627	ATM	←			
779	.8036		12:58	T.M.	.8034		1626	ATM				
780	.7894		12:59	T.M.	.7898		1625	ATM				
781	.7894		1:00	T.M.	.7892		1625	ATM				
782	.7905		1:01	T.M.	.7903		1624	ATM				
783	.7967		1:02	T.M.	.7968		1623	ATM				
784	.8120		1:03	T.M.	.8118		1622	ATM				
785	.8166		1:04	T.M.	.8164		1621	ATM				
786	.7925		1:05	T.M.	.7923		1620	ATM				
787	.8064		1:06	T.M.	.8064		1619	ATM				
788	.7928		1:07	T.M.	.7926		1619	ATM				
789	.7774		1:08	T.M.	.7774		1618	ATM				
790	.7835		1:09	T.M.	.7835		1617	ATM				
791	.7981		1:10	T.M.	.7982		1616	ATM				
792	.8036		1:11	T.M.	.8035		1615	ATM				
793	.8116		1:12	T.M.	.8116		1614	ATM				
794	.8025		1:13	T.M.	.8024		1613	ATM				
795	.7766		1:14	T.M.	.7760		1613	ATM				
796	.7916		1:15	T.M.	.7915		1612	ATM				
797	.7755		1:16	T.M.	.7756		1611	ATM				
798	.8133		1:17	T.M.	.8133		1610	ATM				
799	.7949		1:18	T.M.	.7948		1610	ATM				
800	.8266	✓	1:19	T.M.	.8264	✓	1609	ATM				

Checked by [signature] Date: 2/21/99 Time 1405

QA REWEIGH

Filter #	WT	Date	Time	By	
781	.7891	2/21/99	1412	[signature]	←
789	.7772	2/21/99	1414	[signature]	←
795	.7765	2/21/99	1415	[signature]	← QA

Post Weighing Screen Scale Check

1st		2nd	3rd
0.0000	0.0010	0.0000	0.0000
1.0000	1.0001	1.0000	1.0001

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
62	76	45	2/7/99	1235	ATM
63	72	45	2/10/99	1600	ATM
65	80	44	2/21/99	1312	ATM

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 1/4/99 Time: 1600 By: A.T. Myrick

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4840	2/1/99	915	ATM	65.4838	2/3/99	1605	JM				
2	66.1516		917	ATM	65.1515	2/3	1606	JM	←			
3	67.8577		919	ATM	67.8571	2/3	1609	JM	67.8571	2/7/99	1245	ATM
4	67.5891		920	ATM	67.5886	2/3	1612	JM				
5	Broken											
6	67.4287		921	ATM	67.4282	2/3	1615	JM				
7	65.5451		922	ATM	65.5453	2/3	1617	JM				
8	60.0213		923	ATM	60.0213	2/3	1618	JM	← Blank			
9	66.9293		924	ATM	66.9294	2/3	1620	JM				
10	66.0888		926	ATM	66.0885	2/3	1621	JM				
11	65.6997		927	ATM	65.7015	2/3	1623	JM	65.7016	2/7/99	1247	ATM
12	56.0653		928	ATM	56.0652	2/3	1625	JM				
13	57.8945		929	ATM	57.8942	2/3	1627	JM				
		↓										

Checked By: A.T. Murrell Date: 2/8/99 Time: 1705

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
55	69	39	2/1/99	0910	ATM
63	76	48	2/3/99	1555	ATM
62	76	45	2/7/99	1235	ATM

WST5-Form9, Pg1, Rev4/90
Unit Hi Valley XTEC
Run # EPA-3
Date: 3/22/99

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date (1999)	Time	By	Third	Date	Time	By
2	✓	3/29	2100	ATM	66.1590	4/6/99	1037	ATM	66.1590	4/7	1730	JM	66.1590	4/18/99	1353	ATM

FINAL FILTER WEIGHTS

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	778	.8489	3/22/99	2237	ATM	.8482	3/23	1320	ATM	.8469	3/29	2047	JM	.8468	4/5	1744	ATM
R	777	.8124	3/22/99	2237	ATM	.8119	3/23	1322	ATM	.8116	3/29	2100	JM	.8116	4/5	1742	ATM

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/23	1115	ATM	69	84	46
2	3/29	2038	ATM	59	72	45
3	4/5	1230	ATM	64	80	41
4	4/6	1030	ATM	61	75	44
5	4/7	1724	JM	65	85	33

SCALE ROOM ENVIRONMENTAL CONDITIONS

6	4/8	1346	ATM	67	80	50
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Blank
3/13/99

WST5-Form9, Pg1, Rev4/90
Unit High Valley XTEC
Run # EPA-3
Date: 3/22/99

Acetone Blank - 100 ml Acetone

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
8	✓	3/18/99	0854	ATM	66.0215	3/19/99	2237	ATM	66.0215	3/20/99	1332	ATM				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/18	2140	ATM	68	84	43
2	3/20	1300	ATM	64	84	32
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 1/9/99

Through _____

Scale Mettler
Model AE100
SN K04827

Level	Recali-brated	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Date	Time	Tech	Wet Bulb	Dry Bulb	% RH
✓	Yes P.O.	99.9999	10.0001	1.0002	.1003	.0203	1/9/99	1243	ATM	58	70	48
✓	No	100.0002	10.0000	1.0000	.1000	.0200	1/14/99	1113	ATM	62	75	47
✓	YES P.O.	99.9998	10.0002	1.0000	.0999	.0201	1/23/99	1100	ATM	63	77	43
✓	YES	99.9998	10.0000	1.0000	.1000	.0201	1/24/99	1318	ATM	59	74	45
✓	YES	99.9996	10.0002	1.0000	.1000	.0200	2/1/99	0910	ATM	55	69	39
✓	YES	99.9997	10.0001	1.0001	.1002	.0201	2/2/99	0939	ATM	60	73	46
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	2/3/99	1555	ATM	63	76	48
✓	YES	99.9999	10.0000	1.0001	.1001	.0201	2/7/99	1235	ATM	62	76	45
✓	YES	99.9998	10.0000	1.0000	.1000	.0200	2/10/99	1600	ATM	63	77	45
✓	YES	99.9998	10.0000	1.0001	.1000	.0200	2/19/99	0246	ATM	64	78	46
✓	NO	99.9999	10.0000	1.0000	.1000	.0200	2/21/99	1312	ATM	65	80	44
✓	No	99.9997	10.0000	1.0001	.1000	.0200	3/5/99	1935	ATM	64	80	41
✓	YES P.O.	99.9997	10.0000	1.0000	.1001	.0200	3/6/99	1135	ATM	64	79	43
✓	YES	99.9997	10.0000	1.0001	.1000	.0200	3/13/99	1526	ATM	65	80	44
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	3/14/99	1355	ATM	63	78	43
✓	No	100.0001	10.0000	1.0000	.1000	.0200	3/15/99	1622	ATM	66	81	45
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/16/99	2025	ATM	65	82	39
✓	Yes	99.9996	10.0000	1.0001	.1001	.0200	3/17/99	1615	ATM	62	77	43
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/18/99	2140	ATM	68	84	43
✓	Yes	99.9998	10.0000	1.0000	.1000	.0200	3/20/99	1300	ATM	64	84	32
✓	Yes	99.9999	10.0000	1.0001	.1001	.0201	3/21/99	2215	ATM	61	74	47
✓	Yes	99.9997	10.0000	1.0000	.1001	.0200	3/22/99	0122	ATM	65	85	33
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/23/99	1115	ATM	69	84	46
✓	Yes	99.9998	10.0000	1.0002	.1001	.0201	3/24/99	1120	ATM	77	89	43
✓	Yes	99.9999	10.0000	1.0002	.1001	.0201	3/29/99	2038	ATM	89	72	45
✓	No	99.9999	10.0002	1.0002	.1001	.0202	3/30/99	0610	ATM	66	80	47
✓	No	99.9999	10.0000	1.0000	.1001	.0201	3/31/99	1000	ATM	64	80	41
✓	NO	99.9996	10.0000	1.0000	.1001	.0201	4/5/99	1730	ATM	64	80	41
✓	Yes	99.9998	10.0001	1.0001	.1001	.0201	4/6/99	1030	ATM	61	75	44
QC Services		Audit	4/6/97	- Wt.	Scale check after audit							
✓	NO	100.0003	10.0001	1.0001	.1001	.0201	4/6/99	1730	ATM			
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	4/7/99	1724	ATM	65	85	33
✓	No	99.9996	10.0000	1.0001	.1001	.0201	4/8/99	1346	ATM	67	80	50
✓	YES	99.9997	10.0000	1.0000	.1000	.0200	4/16/99	1230	ATM	66	82	42
✓	YES	99.9997	10.0000	1.0000	.1000	.0200	4/17/99	1625	ATM	68	84	43

Woodstove Particulate
Catch Processing Sheet
Woodstove Data Sheet #5
EPA M5G-1

Unit: Hi Valley XTEC
Run: EPA #3
Date: 3/22/99
Technicians: ATM
Revised 1/16/98-Data Sheet #5

Filters

Filter # (Front) 778 Beaker # 2 Final Wt. 66.1590 g
Final Wt. .8468 g Ml 65 Tare Wt. 66.1515 g
Tare Wt. .8040 g Desc. Acetone Net Wt. .0075 g
Net Wt. .0428 g

Filter # (Rear) 777 Beaker # _____ Final Wt. _____ g
Final Wt. .8116 g Ml _____ Tare Wt. _____ g
Tare Wt. .8129 g Desc. _____ Net Wt. _____ g
Net Wt. -.0013 g

Acetone Blank Calculation: Blank Date: 3/13/99
Blank Beaker # 8 Final Wt. 66.0215 g
Ml 100 Tare Wt. 66.0213 g
Desc. Acetone Net Wt. .0002 g
.0002 g ÷ 100 ml = .000002 g/ml

Blank Residue Value Calculation:
.000002 g/ml acetone X 65 ml acetone = .00013 g
Blank Residue Value

Total Particulate Catch Calculation
Filter: .0428 g
Filter: -.0013 g
Beakers: .0075 g (Total Catch) - .0001 g (Blank Residue Value) = .0074 g
Total Catch = .0489 g

Unit HIGH VALLEY X-TEC
Run # EPA #3
Date 3/22/99
Technician ATM, RLS.
WST6-Form1, Rev8/96

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 2,713 ft^3

Dilution Tunnel Draft (If applicable): Start 00.0 Stop 00.0

Test Chamber Air Velocity: Start: 00.0 Stop: 00.0 Avg: 00.0

Wet Bulb/ Start: WB: 56 °F DB: 68 °F 1.1 % Amb Moisture 46 %RH

Dry Bulb Stop: WB: 60 °F DB: 70 °F 1.4 % Amb Moisture 56 %RH

$\bar{X}$ = 1.250 % Ambient Moisture $\bar{X}$ = 48.0 % Relative Humidity (RH)

Empty Stove Wt: 514.0 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 606.3 lbs. Dry: 604.2 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 604.2 lbs.

Kindling Wt. Paper: 0.3 lbs. Wood: 5.0 lbs.

Pre Burn Fuel Wt. 17.0 + 17.2 + 16.6 + 16.2 Total: 67.0 lbs.

Total Kindling and Pre Burn Fuel Wt 72.3 lbs.

Coal Bed Wt-lbs: Range (608.5 - 607.7) 4.3 - 3.5 lbs. Actual: (4.2) lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\frac{4.3}{\text{Upper Wt.}} + \frac{3.5}{\text{Lower Wt.}}$ / 2 X .25 = .9 lbs. ✓

Test Fuel Wt-lbs: Ideal 19.0 lbs. Range: 17.1-20.8 lbs. Actual: 17.2 lbs.

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Flanges) 20 Pcs.

2 x 4's x 17.5	"	4 Pcs	9.3 lbs.	54.1 % ✓
4 x 4's x 17.5	"	2 Pcs	7.9 lbs.	45.9 % ✓

Est. Dry Burn Rate (Kg/Hr.) $\frac{17.2 - (17.2 \times .17647)}{2.2046} \times \frac{60}{395}$ = 0.9760 ✓ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) X $\frac{.63}{100}$ x .9760 = 11,768 ✓ Est Heat Output (HO_E) BTU's/Hr

Comments:

Stove Operating Data
Woodstove Test Data Sheet #9
Cold Start

Unit: HIGH VALLEY X-TEC
Run: EPA #3
Date: 3/22/99
Technician(s): ATH, RLS,
Data Sheet #9 - Rev 1/98-Pg.2

Fire Started: 0813 P.S.T.

Warm up and Preburn: Primary Air: Wide open from ignition until the start of preburn when the primary air control(s) was (were) adjusted to the run setting of .75" OPEN **. At the run setting until the start of the test.**

Secondary Air: No Controls. Naturally drafted.

Secondary Burn/Cat Bypass: N/A

Charcoal Bed Preparation: Broke up, raked and leveled the coal bed prior to the addition of each warm up/pre burn fuel charge. Starting 1:30 **before the start of the test, broke up, raked and leveled the coal bed. In stove for** 35 **seconds.**

Test: Door wide open during loading 1 **min** 20 **sec, then** closed.

Primary Air: Wide open during the start of the test until 4:55 **.**
Adjusted to the run setting of 0.75" **between** 4:55 **and** 5:00 **.**
At the run setting of 0.75" **at** 5:00 **into the run.**

Secondary Air: No Controls. Naturally drafted.

Secondary Burn/Cat Bypass: N/A

Fan: ON/OFF during the warm up, ON/OFF high **during the preburn, ON/OFF at the start of the test, ON/OFF for the first** 30 **minutes of the test, ON/OFF** high **at** 30 **minutes into the test, ON/OFF for the rest of the test.**

Test Run Anomalies: This run was to be about 1.15 kg/hr, but a major wood fall @ about 100 mins blocked the LPPO air flow for a long time which slowed the burn rate down dramatically. There were also 2 preburns. The 1st was aborted when it was discovered that the Primary Air setting was wrong (sup

Unit HIGH VALLEY X-TEC
Run # EPA # 3
Date 3/22/99
Technician ATM, RLS.
Page 1 of 4
WST7-Form2-A, Rev10/88

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-1

Wood Data: Kindling: A mix of the below grades

	Size	Mill	Grade	Species
Pre Burn	2x4	CANYON LBR.	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2x4	CANYON LBR.	#2 STD. & BTR.	D. FIR, S. GRN.
	4x4	STAND & 879	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (17.0 lbs) added at 0833.
2nd Warm up/Pre Burn Fuel charge (17.2 lbs) added at 0938.
3rd Warm up/Pre Burn Fuel charge (16.6 lbs) added at 1050.
4th Warm up/Pre Burn Fuel charge (16.2 lbs) added at 1238.
5th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
6th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
7th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
8th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.

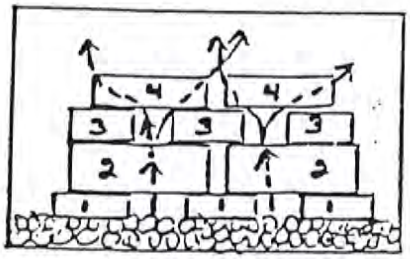
The coals were scooped out of the stove immediately prior to adding the 3 lbs pre burn/warm up fuel charge. The stove lost 2.1 lbs. 3.0 lbs of coals put back in after the scoop.

All pre burn/warm up fuel pieces were either 16 or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 16 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 16 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 3 pcs 16 inches long. The majority of the pieces in each rick were in the second layer which had an approximate 0.5-1.0" space between pieces. (The loading directions indicate the direction of the longest dimension on each piece relative to the loading door opening.) Each pre burn/warm up fuel charge normally weighs within the weight range allowed for the actual test fuel charge

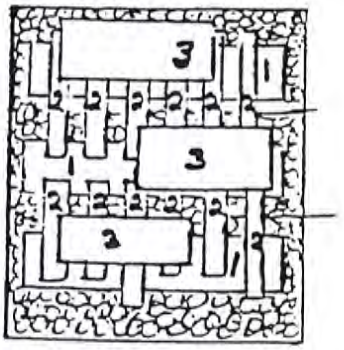
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

Warm up Information (cont.):

Each warm up/preburn fuel charge was ricked in exactly (as much as possible) the same manner and the weight of each rick was usually within the allowable weight range for the test fuel charge. The physical arrangement and alignment of each rick was designed to accomplish three (3) things: (1)The bottom layer was nestled firmly into the coal bed and was as close to being level with the bottom of the stove as possible, thus providing a stable loading platform for the rest of the rick, keeping it in a ricked state (as opposed to a col- lapsed or fallen down state) untill the rick reached the charcoal stage and sags or collapses of its own accord. (2) It enhances the flow of primary air through the ricked preburn fuel charge, for the primary air would flow through the spaces between the pieces in the first layer and then up through the spaces between the pieces in the second, third and, if present, fourth layers. (3) It maximized, as much as possible, the surface to volume ratio of each preburn fuel charge, thereby allowing the fire immediate access to as much wood surface as possible and, thereby, insuring uniform charcoalization. All three of these enhance combustion and so get the stove as hot as possible during the warm up period, therby maximizing the amount of heat (BTU's) stored in the stove. The actual preburn was not started until the stove surface temperatures had maximized and stabilized, thus indicating that the amount of heat stored in the stove had peaked. For this stove, the thermal storage was monitored using the TOP surface temperature(s) and the peak value(s) obtained were 930 °F.



Front View



Top View

The arrows indicate the direction of the air flow through the rick.

The primary air was adjusted to the run setting of 0.75" 5.5 lbs above the upper charcoal bed weight.

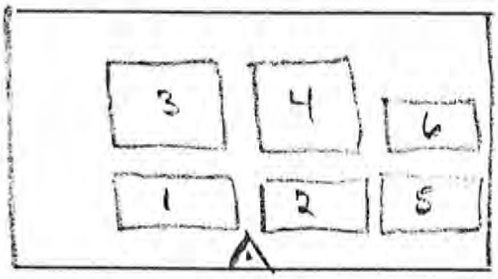
Unit HIGH VALLEY X-TEC
Run # EPA #3
Date 3/22/99
Technician ATM, R.S.
Page 3 of 4
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: ① Turned Pan off. ② Opened Primary Air Control Wide Open ③ Opened door ④ Loaded test fuel charge into stove ⑤ Closed coals away from air front of stove ⑥ Photograph ⑦ Closed door.

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



FRONT of stove view

4 X 4's: 3 & 4

2 X 4's: 1, 2, 5 & 6

Loading Sequence: 1, 2, 3, 4, 5 & 6 LAST

Driest Pcs in Load 1 & 2

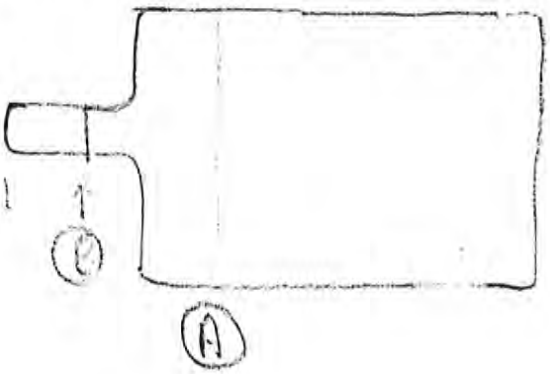
Loaded the test fuel charge on an essentially level, medium sized, avg to cold coal bed (in appearance, color and temperature for a M. low burn rate. Load 1:20, Ignition: N 1:00 VC to baffle 1:44, Secondaries igniting 2:00 Gas Balance < 3:30, 5:00 Flames decreased. Maintained VC to baffle in L. canyon with 2nds on top of VC, Placed small VC in R. canyon. Out of Balance 6:15, R. VC out 6:30, Back @ 6:42, 11:30 2nd Tube has ignited already, 3rd Tube is firing 13:08 2nds above 5 & 6. 16:20 4th tube firing 24:15 Gas Balance,

was a slower start than expected,

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-4

Additional Comments:

As noted earlier, there were two preburns prior to the start of the test. The first was aborted because the primary air control was set wrong. The primary air inlet orifice is shaped as shown. The first preburn was with the PBC set at A. It was to be set at C. As the data shows the burn rate was too fast at A, so the preburn was aborted, the fire was burnt down to 8.0 lbs of coals & the 1st/2nd charge of preburn fuel was added. From then on all was normal.



Unit: HIGH VALLEY X-TEC
Run: EPA #3
Date: 3/22/99
Technician: ATM, RLS.

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

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: 1045
Calibration Checks: X ✓ Y ✓ 12.5 12.5 22.0 22.2

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg Corrected
			Uncor	Cor	Uncor	Cor	Uncor	Cor	
1	2X4X8'	K	12.5	13.3	12.0	12.8	12.0	12.8	12.967
2									
3									
4	2X4X8'	P	22.0	23.7	22.0	23.7	21.0	22.6	23.333
5	"	P	22.0	23.7	22.0	23.7	21.5	23.1	23.500
6	"	P	22.0	23.7	22.5	24.3	22.0	23.7	23.900
7	"	P	21.5	23.1	22.0	23.7	21.5	23.1	23.300
8	"	P	22.0	23.7	21.5	23.1	21.5	23.1	23.300
9	"	P	22.0	23.7	22.0	23.7	21.5	23.1	23.500
10									140.833
11	2X4X17.5"	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
12	"	T	18.5	19.8	18.5	19.8	18.0	19.2	19.600
13	"	T	21.5	23.1	21.0	22.6	20.5	22.0	22.567
14	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700
15									
16	4X4X17.5"	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
17	"	T	22.5	24.3	22.5	24.3	22.5	24.3	24.300
18									128.567
19	FEET	T	19.0	20.3	18.5	19.8	18.5	19.8	19.967
20								OUT SPACERS	

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	12.967%	23.472 %	21.428 %
% Moisture - Wet Basis:	11.479 %	19.010 %	17.647 %

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

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

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

Unit: HIGH VALLEY X-TEC
Run #: EPA #3
Date: 3/22/99
Technician: ATM, RLS.

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 3½" x 3½" x 1½"

Depth (D): 1.558 cm 3.957

Width (W): 3.500 cm 8.890

Length (L): 3.579 ~~cm~~ in
3.531 cm in
3.535 cm in
3.550 cm in

Length $\bar{X}$ = 3.534 cm 8.976

Volume: 315.755 cm^3
(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:	21.5	23.1 %
Bottom:	21.0	22.6 %
Side:	20.5	22.0 %
$\bar{X}$:		22.567 %

Avg % Moisture (Dry) 22.567 %

Aug % Moisture (Wet) 18.412 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 176.2 g Dry Weight: 147.3 g

% Moisture Dried Basis: 16.402 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	3/22/99	1050	213 °F
Out of Dryer	3/29/99	1415	218 °F

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

Density = 147.3 g (dry wt) ÷ 315.755 cm^3 (volume) = 0.4665 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. _____ g

Wet Wt: _____ g - _____ g = _____ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: _____ g - _____ g = _____ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

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

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
End Wt.: 608.4 lbs.

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3
Page: 1 of 4
Technician(s): ATH, R.S.

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	T/C(1)T/C(2) Bal	Wet Bulb	Dry Bulb	% H_2O	T/C(3) Calc W/B	Stack	4 SO_2 v.	SO_2 PPM	Static Press.	Comments
0 / 1435	625.6	17.2	0	.177	4.42	59.7	14.96		29.4	1.48	3.0	81	115	2.4	103	229			-.045	Flow
5 / 40	624.6	16.2	1.0	.478	11.91	57.0	6.76		6.2	0.32	37.2	92	128	4.0	116	314			-.082	SO_2 1.5
10 / 45	624.1	15.7	.5	.277	6.91	53.1	13.31		15.9	0.81	8.5	119	143	10.0	132	339			-.062	~~CO_2~~ 1.5
15 / 50	623.5	15.1	.6	.310	7.73	48.3	12.10		17.4	0.89	8.7	122	140	12.0	133	297			-.062	~~O_2~~ 1.5
20 / 55	622.9	14.5	.6	.364	9.07	43.9	11.00		22.5	1.14	8.0	124	140	13.0	135	290			-.062	~~CO~~ 1.5
25 / 1500	622.2	13.8	.7	.416	10.37	38.2	9.57	GRP 2nd 24.6	20.1	1.01	(10.3)	126	140	13.0	136	297			-.065	
30 / 05	621.5	13.1	.7	.489	12.18	32.6	8.16		13.1	0.66	18.5	128	142	13.5	138	319			-.068	
35 / 10	620.7	12.3	.8	.526	13.10	29.3	7.34		11.2	0.56	23.4	129	144	14.0	140	336			-.070	
40 / 15	619.9	11.5	.8	.567	14.12	25.5	6.38		9.2	0.47	30.0	131	147	15.0	142	352			-.072	
45 / 20	619.1	10.7	.8	.575	14.32	25.5	6.38		9.4	0.48	29.8	130	148	14.5	141	362			-.072	
50 / 25	618.4	10.0	.7	.549	13.67	27.5	6.88		7.4	0.38	36.0	129	148	14.0	140	358			-.071	
55 / 30	617.7	9.3	.7	.528	13.15	29.8	7.46		8.3	0.42	31.3	129	147	14.0	140	354			-.070	
																(3847)			(.801)	Flow
60 / 35	617.0	8.6	.7	.551	13.72	28.1	7.03		7.7	0.40	34.3	129	147	14.0	140	355			-.070	SO_2 1.5
65 / 40	616.4	8.0	.6	.542	13.50	28.1	7.03		6.4	0.33	40.9	128	145	13.5	139	355			-.069	~~CO_2~~ 1.5
70 / 45	615.8	7.4	.6	.531	13.22	29.1	7.29		6.9	0.36	36.7	126	143	13.0	138	346			-.067	~~O_2~~ 1.5
75 / 50	615.3	6.9	.5	.532	13.25	29.0	7.26		6.6	0.34	39.0	124	141	12.5	137	344			-.067	~~CO~~ 1.5
80 / 55	614.7	6.3	.6	.516	12.85	30.3	7.59		7.8	0.40	32.1	123	140	12.0	136	340			-.067	
85 / 1600	614.2	5.8	.5	.499	12.43	31.5	7.89		10.1	0.52	23.9	121	137	11.5	135	333			-.065	
90 / 05	613.8	5.4	.4	.473	11.78	33.7	8.44		8.2	0.43	27.4	118	133	10.5	132	322			-.063	
95 / 10	613.4	5.0	.4	.439	10.94	37.0	9.27		7.5	0.38	28.8	115	130	9.5	130	312			-.061	
100 / 15	613.2	4.8	.2	.340	8.48	45.8	11.47	WOOD FELL OUT BAG?	19.9	1.02	(8.3)	111	124	8.4	126	294			-.058	
105 / 20	613.0	4.6	.2	.289	7.21	50.1	12.55		17.9	0.92	7.8	106	118	7.3	122	276			-.054	
110 / 25	612.8	4.4	.2	.279	6.96	50.9	12.75		16.5	0.84	8.3	100	113	6.0	118	265			-.052	
115 / 30	612.7	4.3	.1	.260	6.49	52.7	13.21		17.2	0.88	7.4	95	109	5.0	113	255			-.051	
																(3797)			(.744)	

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
END WT.: 608.4 lbs,

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3 Technician(s): ATM, RLS,
Page: 2 of 4

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	T/C(2) Dry Bulb	% H_2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO_2 v.	4 SO_2 PPM	Static Press.	Comments
120 / 16.35	612.5	4.1	.2	.269	6.71	50.9	12.75		21.1	1.07	6.3	91	107	4.4	111	247			.050	Flow
125 / 40	612.4	4.0	.1	.252	6.29	52.6	13.18		22.3	1.13	5.6	89	107	4.0	109	241			.048	SO_2 1.5
130 / 45	612.3	3.9	.1	.246	6.14	53.3	13.36		23.4	1.18	5.2	86	107	3.5	107	235			.047	~~CO_2~~ 1.5
135 / 50	612.2	3.8	.1	.243	6.07	53.5	13.41		24.0	1.21	5.0	83	105	3.1	105	229			.046	~~O_2~~ 1.5
140 / 55	612.1	3.7	.1	.248	6.19	53.1	13.31		23.4	1.18	5.2	82	104	2.9	104	226			.045	~~CO~~ 1.5
145 / 1700	612.0	3.6	.1	.236	5.89	54.5	13.66		22.7	1.15	5.1	80	104	2.6	104	222			.045	
150 / 05	612.0	3.6	0	.233	5.82	54.5	13.66		24.4	1.24	4.7	79	103	2.5	102	219			.044	
155 / 10	611.9	3.5	.1	.225	5.62	55.3	13.86		25.9	1.32	4.3	78	102	2.4	102	216			.043	
160 / 15	611.9	3.5	0	.223	5.57	55.6	13.93		27.2	1.38	4.0	78	101	2.4	102	212			.042	
165 / 20	611.8	3.4	.1	.215	5.37	56.4	14.13		27.0	1.36	3.9	77	99	2.3	101	210			.041	
170 / 25	611.7	3.3	.1	.213	5.32	56.5	14.16		27.0	1.36	3.9	77	100	2.3	101	208			.040	
175 / 30	611.6	3.2	.1	.222	5.54	55.7	13.96		26.1	1.33	4.2	77	102	2.3	99	206			.041	
																(2671)			(.532)	Flow
180 / 35	611.5	3.1	.1	.228	5.69	55.3	13.86		23.6	1.18	4.8	78	104	2.3	99	205			.040	SO_2 1.5
185 / 40	611.4	3.0	.1	.217	5.42	56.0	14.03		26.5	1.33	4.1	78	104	2.3	98	203			.040	~~CO_2~~ 1.5
190 / 45	611.3	2.9	.1	.221	5.52	55.9	14.01		25.2	1.26	4.4	78	104	2.3	98	201			.040	~~O_2~~ 1.5
195 / 50	611.2	2.8	.1	.221	5.52	56.0	14.03		26.2	1.32	4.2	78	104	2.3	98	200			.040	~~CO~~ 1.5
200 / 55	611.1	2.7	.1	.220	5.49	56.2	14.08		25.9	1.30	4.2	78	104	2.3	97	198			.039	
205 / 1800	611.0	2.6	.1	.215	5.37	56.4	14.13		27.4	1.39	3.9	79	104	2.4	96	196			.036	
210 / 05	610.9	2.5	.1	.210	5.25	56.9	14.26		28.7	1.45	3.6	78	102	2.4	97	195			.036	
215 / 10	610.8	2.4	.1	.207	5.17	57.4	14.38		27.7	1.41	3.7	78	101	2.5	98	194			.036	
220 / 15	610.7	2.3	.1	.214	5.34	56.7	14.21		28.0	1.42	3.6	77	101	2.3	98	193			.036	
225 / 20	610.6	2.2	.1	.216	5.39	56.5	14.16		28.4	1.45	3.7	77	101	2.3	97	193	wood	Sell	.035	
230 / 25	610.6	2.2	0	.205	5.12	59.1	14.81		25.0	1.28	4.0	78	100	2.5	97	192	EPA	blank	.035	
235 / 30	610.5	2.1	.1	.199	4.97	58.7	14.71		23.4	1.18	4.2	77	100	2.3	97	190			.035	
																(2360)			(.448)	
																(5031)				(.980)

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
END WT. 608.4 lbs

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3 Technician(s): A.T. Jensen, CLS.
Page: 3 of 4

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	Bal	T/C(1) Wet Bulb	T/C(2) Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 v.	SO_2 PPM	Static Press.	Comments
240 / 1835	610.4	2.0	.1	.143	4.82	59.1	14.81		24.2	1.22	4.0	77	100	2.3	96	.189			-.035	Flow
245 / 40	610.3	1.9	.1	.192	4.80	59.2	14.84		26.0	1.33	3.6	76	99	2.2	95	182			-.035	SO_2 1.5
250 / 45	610.2	1.8	.1	.189	4.72	59.4	14.89		27.4	1.39	3.4	76	99	2.3	95	186			-.034	CO_2 1.5
255 / 50	610.2	1.8	0	.184	4.60	59.7	14.96		28.2	1.41	3.3	76	98	2.2	95	185			-.034	O_2 1.5
260 / 55	610.1	1.7	.1	.186	4.65	59.7	14.96		28.1	1.41	3.3	75	98	2.1	94	184			-.034	CO 1.5
265 / 1900	610.0	1.6	.1	.189	4.72	59.1	14.81		30.0	1.51	3.1	75	98	2.1	93	183			-.034	
270 / 05	609.9	1.5	.1	.195	4.88	58.6	14.69		29.6	1.50	3.2	75	97	2.1	92	181	Burnt thru		-.034	
275 / 10	609.9	1.5	0	.216	5.39	56.8	14.23		27.7	1.40	3.9	75	97	2.1	92	181	Cont in front		-.034	
280 / 15	609.8	1.4	.1	.215	5.37	56.9	14.26		28.1	1.43	3.8	75	97	2.1	92	181	of L.P.O		-.034	
285 / 20	609.7	1.3	.1	.212	5.29	57.7	14.46		24.5	1.23	4.3	75	97	2.1	92	181			-.033	
290 / 25	609.6	1.2	.1	.213	5.32	57.4	14.38		25.6	1.28	4.2	75	97	2.1	92	181			-.033	
295 / 30	609.5	1.1	.1	.211	5.27	57.6	14.44		25.9	1.30	4.1	75	97	2.1	92	179			-.033	
																(2198)			(-.407)	Flow
300 / 35	609.4	1.0	.1	.202	5.05	58.7	14.71		26.2	1.31	3.9	75	97	2.1	92	179			-.033	SO_2 1.5
305 / 40	609.4	1.0	.0	.193	4.82	59.5	14.91		25.4	1.29	3.7	75	97	2.1	92	178			-.032	CO_2 1.5
310 / 45	609.3	.9	.1	.190	4.75	59.5	14.91		26.2	1.33	3.6	75	97	2.1	92	178			-.033	O_2 1.5
315 / 50	609.2	.8	.1	.193	4.82	59.1	14.81		26.7	1.35	3.6	74	96	2.0	92	177			-.032	CO 1.5
320 / 55	609.2	.8	0	.193	4.82	60.1	15.06		24.7	1.23	3.9	74	96	2.0	92	177			-.032	
325 / 2000	609.1	.7	.1	.177	4.42	61.6	15.44		23.7	1.20	3.7	74	96	2.0	92	176			-.032	
330 / 05	609.0	.6	.1	.166	4.15	62.0	15.54		25.9	1.32	3.1	74	96	2.0	92	176			-.032	
335 / 10	609.0	.6	0	.158	3.95	62.5	15.92		24.1	1.21	3.3	73	95	2.0	91	174			-.031	
340 / 15	608.9	.5	.1	.154	3.85	63.5	15.92		26.0	1.30	3.0	73	95	2.0	91	173			-.031	
345 / 20	608.9	.5	0	.152	3.80	63.7	15.97		25.1	1.27	3.0	73	95	2.0	90	172			-.031	
350 / 25	608.8	.4	.1	.152	3.80	63.8	15.99		24.9	1.28	3.0	73	94	2.0	90	170			-.030	
355 / 30	608.8	.4	0	.153	3.83	63.6	15.94		26.4	1.33	2.9	72	94	1.9	89	170			-.030	
																(2100)			(-.379)	
																(4298)			(-.786)	

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

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3 Technician(s): ATH, RLS.
Page: 4 of 4

End Wt.: 608.4 lbs.

Minute Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	Bal	T/C(1)T/C(2) Wet Bulb	T/C(1)T/C(2) Dry Bulb	% H_2O	Calc W/B	T/C(3) Stack	4 SO_2 v.	4 SO_2 PPM	Static Press.	Comments
360	608.7	.3	.1	.160	4.00	6.35	15.92		21.9	1.10	3.6	72	93	1.9	89	.168			-.030	Flow
365 40	608.7	.3	0	.143	3.58	6.50	16.29		24.5	1.24	2.9	72	93	1.9	89	167			-.029	SO_2 1.5
370 45	608.6	.2	.1	.110	2.76	6.80	17.04		27.1	1.37	2.0	72	93	1.9	88	166			-.029	CO_2 1.5
375 50	608.6	.2	0	.111	2.78	6.79	17.02		27.5	1.38	2.0	72	93	1.9	87	163			-.028	O_2 1.5
380 55	608.6	.2	0	.119	2.98	6.75	16.92		26.8	1.35	2.2	71	93	1.8	87	161			-.028	CO 1.5
385 100	608.5	.1	.1	.126	3.16	6.72	16.84		22.6	1.14	2.8	71	92	1.8	87	160			-.026	
390 05	608.5	.1	0	.124	3.11	6.74	16.89		22.7	1.13	2.8	71	92	1.8	86	158			-.026	
395 10	608.4	0	.1	.123	3.08	6.74	16.89		23.7	1.19	2.6	71	91	1.9	87	157			-.026	
400 15																				
405 20																				
410 25													80+			1300+			-.222+	
415 30																				
												181				18 273			3533	
420																				Flow
423																228.4			-.0441	SO_2 1.5
430																				CO_2 1.5
435																228			-.0442	O_2 1.5
440																				CO 1.5
445																				
450																				
455																				
460																				
465																				
470																				
475																				

Pre Burn Stack Wt. 5.4 lbs. up lbs.

Test Stack wt. Range 608.4 - 607.7 lbs.

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

28.67 BARO. PRESSURE 28.65 ↓ slowly

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3 Technician(s): ATH, RLS,
Page: 1 of 2

Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Hot Box On Comments
0 1120	613.8	0	644	905	538	482	584	554	714	1627	69	-.100	Primary Air Set at .75" OPEN
5 25	612.5	1.3	602	855	550	474	599	555	734	1523	69	-.097	Secondary Air Set at 1"x3"
10 30	611.5	1.0	560	791	563	472	613	555	760	1443	68	-.092	Fan: ON HIGH
15 35	610.7	.8	523	724	569	476	619	554	787	1385	70	-.087	TUNNEL ON AT: 1123
20 40	610.0	.7	501	677	575	483	624	555	809	1343	70	-.085	Buckets ICED
25 45	609.5	.5	480	641	576	487	627	553	816	1296	70	-.082	ANALYZERS SPANNED
30 50	609.0	.5	462	611	573	492	627	548	827	1227	70	-.080	Pumps turned on at: 1200
35 55	608.6	.4	433	569	563	500	623	546	828	1166	70	-.075	ΔT
40 1200	608.3	.3	413	536	556	510	615	544	817	1132	70	-.074	608.2 - .1 611.6
45 05	611.2	.5	411	507	544	518	606	544	807	1388	70	-.077	ADD FUEL Check WB/DB: 3.4 lbs,
50 10	610.4	.8	448	550	540	504	601	538	803	1306	70	-.080	546.6
55 15	609.8	.6	439	556	538	495	595	529	801	1276	70	-.080	
													Probe IN TUNNEL
60 20	609.2	.6	429	548	537	488	587	523	795	1282	71	-.079	536.6
65 25	608.8	.4	370	535	534	485	581	531	784	1257	70	-.067	533.2
70 30	608.6	.2	327	504	529	472	571	539	764	1221	71	-.062	523.0
75 35	608.5	.1	307	475	517	462	560	543	744	1113	72	-.059	511.4
80 40													
85 45													
90 50			ABORTED PAC WRONG. — 1st Preburn										
95 55													
100 1300													
105													

Pre Burn Stove Wt. 5.5 lbs.vp lbs.

Test Stove wt. Range 608.4-607.7 lbs.

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

28.62 BAR. PRESSURE 28.59

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3
Page: 1 of 2
Technician(s): ATM, PLS.

Hot Box On

Minute Time	Scale Weight	Burn Rate	Stack T/C#-3	Stove Top 4	Left Side 5	Back 6	Right Side 7	Bottom 8	Firebox 9	2nd Burn ~~Catalytic~~ 10	Room Temp 11	Static	Comments
0 1305	613.9	0	624	831	517	598	535	579	735	1412	73	-.094	Primary Air Set at .75" OPEN
5 10	613.0	.9	488	779	530	564	551	533	735	1364	74	-.082	Secondary Air Set at 1"x3"
10 15	612.3	.7	431	711	535	525	559	537	738	1345	72	-.077	Fan: ON HIGH
15 20	611.7	.6	401	661	536	502	561	534	742	1338	72	-.074	TUNNEL ON AT: 1307
20 25	611.2	.5	381	626	534	493	562	529	741	1373	72	-.072	Buckets IN
25 30	610.8	.4	360	591	529	494	560	523	737	1375	71	-.069	ANALYZERS SPANNED
30 35	610.5	.3	337	557	521	497	558	518	730	1252	71	-.065	Pumps turned on at: 1350
35 40	610.2	.3	320	574	514	502	554	574	722	1206	72	-.062	ΔT
40 45	610.0	.2	305	488	501	505	550	510	714	1179	71	-.058	570.8
45 50	609.9	.1	289	461	491	503	544	506	706	1059	70	-.058	Check WB/DB: 86/97
50 55	609.8	.1	278	437	480	497	538	503	700	1024	71	-.055	RAKE COALS FORWARD
55 1400	609.6	.2	276	427	475	486	531	501	691	991	71	-.055	
													Probe IN TUNNEL
60 05	609.6	0	267	416	463	459	519	497	672	955	71	-.052	
65 10	609.5	.1	261	406	456	446	571	494	661	957	71	-.051	462.6
70 15	608.6	.1	266	392	450	435	501	490	656	941	71	-.050	REMOVE COALS, 8lb. 453.6
75 20	608.6	0	257	375	442	421	490	490	644	857	70	-.050	443.6
80 25	608.5	.1	241	361	433	404	480	489	631	827	70	-.049	433.4
85 30	608.5	0	235	349	423	389	468	486	613	819	70	-.047	
90 35	608.4	.1	229	333	412	376	455	481	603	801	71	-.045	411.4

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3 Technician(s): ATM, RLS,
Page: 1 of 4

T/C# / Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tunnel	13 C. Gas Box	14 Impinger Out	15 5G-1 Filter	16 5G-1 Condenser	17 Condar	18
0 / 1435	333	412	376	455	481	603	801	71	92	250	33	80	51	251	
5 / 40	341	400	373	443	473	569	1105	71	134	251	35	81	40	250	
10 / 45	434	395	349	431	470	556	1235	71	110	252	35	83	40	250	
15 / 50	424	388	332	417	464	540	1220	71	102	252	35	85	40	250	
20 / 55	422	382	322	410	458	532	1213	71	100	250	36	84	40	250	
25 / 1500	437	384	317	407	451	528	1211	71	101	249	37	84	40	250	
30 / 05	492	381	315	407	443	530	1257	70	102	250	38	84	40	250	
35 / 10	538	386	305	415	437	538	1275	71	103	251	38	84	39	250	
40 / 15	581	391	301	420	432	549	1257	71	104	251	38	84	39	250	
45 / 20	618	398	302	424	427	562	1272	71	105	251	38	85	40	250	
50 / 25	611	401	308	429	423	572	1302	71	105	251	38	85	40	251	
55 / 30	599	406	317	434	419	581	1278	71	105	251	39	85	40	251	
	(5830)	(4724)	(3917)	(5092)	(6378)	(6660)	(14,420)	(851)							
60 / 35	586	411	323	440	415	589	1243	71	105	251	40	85	40	251	
65 / 40	579	416	325	447	412	594	1263	71	105	250	40	85	40	251	
70 / 45	573	418	330	455	411	601	1251	71	104	250	41	85	40	250	
75 / 50	562	424	337	466	409	611	1261	71	104	250	42	86	40	250	
80 / 55	559	429	347	474	409	620	1267	71	103	250	42	86	40	250	
85 / 1600	554	435	358	481	408	629	1259	71	101	251	42	85	40	250	
90 / 05	542	439	370	487	409	636	1264	70	100	250	42	85	40	250	
95 / 10	536	443	381	491	410	642	1269	70	98	250	43	85	40	250	
100 / 15	491	445	391	491	412	641	1122	70	97	250	42	85	40	251	
105 / 20	459	442	393	487	414	637	985	69	95	250	42	84	40	251	
110 / 25	429	436	392	479	417	629	945	69	93	250	42	82	41	250	
116 / 30	409	430	389	472	419	620	924	68	92	250	42	82	41	250	
	(6269)	(5168)	(4336)	(5670)	(4945)	(7449)	(14,053)	(842)							
	12,099	9892	8253	10,762	10,323	14,109	28,474	1693							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA43
Page: 2 of 4
Technician(s): ATM, CLS.

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17 (2nd HOT BOX)	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	~~Condar~~	
120 1635	392	421	386	464	421	611	927	68	91	251	42	82	41	250	
125 40	379	415	379	458	423	601	890	68	90	251	42	82	41	250	
130 45	367	405	373	452	427	591	867	68	89	251	42	81	41	250	
135 50	357	399	369	446	431	583	853	68	88	251	42	81	41	250	
140 55	349	393	368	441	434	575	840	67	88	250	41	80	41	250	
145 1700	341	387	367	436	436	567	832	67	87	250	41	80	41	250	
150 05	335	382	365	432	438	559	822	67	87	250	40	79	41	250	
155 10	329	376	362	428	439	552	807	67	86	250	40	79	41	250	
160 15	323	372	359	424	440	545	793	67	85	250	40	78	41	251	
165 20	317	367	356	420	440	538	782	67	85	250	40	78	41	251	
170 25	313	366	352	417	440	532	769	68	85	251	41	78	41	251	
175 30	309	362	352	414	440	527	764	69	85	251	41	78	41	251	
	4111	4645	4388	5232	5209	6781	9946	811							
180 35	306	358	353	412	440	522	764	69	85	251	41	78	41	251	
185 40	303	355	352	409	441	517	753	69	85	251	41	78	42	251	
190 45	300	351	352	407	441	512	752	70	85	251	41	78	42	251	
195 50	298	347	353	405	441	507	742	69	84	251	41	78	42	251	
200 55	295	345	356	404	440	502	735	69	84	251	41	78	42	251	
205 1800	291	341	357	400	438	494	723	70	83	251	41	78	43	251	365.4
210 05	290	339	358	399	437	490	724	70	83	251	41	78	43	250	
215 10	288	336	359	397	435	486	726	70	83	251	41	78	43	250	
220 15	286	333	359	396	433	481	726	70	82	250	41	78	43	249	
225 20	284	330	362	395	430	476	731	70	82	250	41	78	44	248	
230 25	282	327	367	395	427	472	707	70	82	249	41	77	44	248	
235 30	279	325	363	394	424	467	698	70	82	249	41	77	44	248	
	3502	4087	4299	4813	5227	5926	8381	836							
	7613	8732	8679	10045	10436	12707	18727	1647							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3 Technician(s): ATM, RLS.
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@ 240 mins ΔT = 354.0 DST = -57.4

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	~~Con~~ der	
240 1835	275	322	358	393	422	461	694	70	81	249	40	77	44	248	
245 40	273	319	355	392	423	456	687	70	81	249	40	77	44	248	
250 45	271	315	353	391	424	451	679	70	81	249	42	77	44	249	
255 50	269	313	351	390	424	445	672	70	80	248	42	76	44	248	
260 55	266	310	349	389	423	441	672	70	80	248	42	76	44	249	
265 1900	265	307	347	388	421	436	668	70	80	248	42	76	44	249	
270 05	263	304	346	388	420	432	681	70	79	249	42	76	44	249	
275 10	263	302	353	387	418	424	703	69	79	248	42	76	44	249	
280 15	263	299	366	388	416	424	694	70	79	247	42	75	45	249	
285 20	263	297	368	389	415	421	695	69	79	248	42	75	45	249	
290 25	263	295	368	389	414	419	696	69	79	247	42	75	45	249	
295 30	262	294	369	390	413	417	696	69	79	247	42	75	45	249	
	(3196)	(3677)	(4283)	(4674)	(5033)	(5232)	(8237)	(836)							
300 35	261	293	368	391	413	416	694	69	79	247	42	75	45	249	345.2
305 40	260	291	366	390	413	415	682	69	78	247	42	74	45	248	
310 45	259	290	363	389	412	414	679	69	78	247	42	74	45	249	
315 50	258	289	358	387	410	413	674	69	78	246	42	74	45	248	
320 55	256	288	356	386	409	413	659	69	78	247	42	74	45	248	
325 2000	255	288	352	384	410	414	647	69	78	246	42	74	45	248	
330 05	254	287	348	379	414	413	631	68	78	246	42	74	45	247	
335 10	251	287	345	374	417	411	629	69	77	246	42	74	45	248	
340 15	248	285	341	368	414	407	621	68	77	246	42	74	44	248	
345 20	246	283	338	362	419	404	612	68	77	246	43	73	44	247	
350 25	244	281	335	356	417	401	608	68	76	245	43	73	44	247	
355 30	241	278	334	351	415	397	609	68	76	245	43	73	44	247	
	(3033)	(3440)	(4204)	(4517)	(4968)	(4918)	(7745)	(823)							
	(6229)	(7117)	(8487)	(9191)	(10001)	(10,150)	(15982)	(1659)							

2nd/6th Box

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/22/99
Run: EPA #3 Technician(s): ATH, DLS.
Page: 4 of 4

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Con-dar	
360 2035	239	276	333	346	412	394	603	68	76	245	43	73	44	247	321.2 -9
365 40	237	275	331	342	408	390	590	68	76	245	43	72	45	246	
370 45	234	272	327	338	405	385	563	68	76	245	44	72	45	246	
375 50	231	270	318	332	400	379	551	68	75	245	44	72	45	246	
380 55	226	266	311	326	393	372	547	66	75	245	44	72	45	246	
385 2100	224	262	308	320	387	366	542	67	75	245	44	72	45	246	
390 05	221	259	306	315	381	361	535	67	75	244	45	72	45	246	
395 10	218	256	305	310	375	355	531	67	75	244	45	71	47	245	
400 15	18305	29366	25340	26799	31617	30027	44629	5411		÷80					
405 20															
410 25	27771	08677	27958	32627	33921	39968	67645	5540			Delta	T.			
415 30											Start		411.4		
	347	358	349	4084	424	500	846	6934			Stop		292.8		
420													-118.6		
425															
430															
435															
440															
445															
450															
455															
460															
465															
470															
475															

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-1

Site: Myren Consulting, Woodinville, WA Date: 3/22/99 Analyte: CO_2

Source: HIGH VALLEY X-TEC Run #: EPA # 3

Zero Cyl #: 36919 Conc. 00.0 % CO_2 Cyl Press: 220 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0 % CO_2 Cyl Press: 1490 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Horiba Model: PIR-2000 SN: 607024

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

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

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

Pre Run Audit: By: ATM, RLS Time: 1337 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0256	.0256	+0.10
Span	24.0	.240	6.0	6.0	.240	5.991	-.0093	-0.15

Comments:

Post Run Audit: By: ATM, RLS. Time: 2256 Temp: 66 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.001	.0504	+.0504	+0.20
Span	24.0	.240	6.0	24.0	.238	5.941	-.0590	-0.98

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-2

Site: Myren Consulting, Woodinville, WA Date: 3/22/99 Analyte: O_2

Source: HIGH VALLEY X-TEC Run #: EPA # 3

Zero Cyl #: 36919 Conc. 00.0 % O_2 Cyl Press: 220 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0 % O_2 Cyl Press: 1490 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Taylor Model: OA 137 SN: 137/4772

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 100 mv.

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

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

Pre Run Audit: By: ATH, RLS. Time: 1337 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	.0156	-.0156	-0.06
Span	6.0	24.0	6.0	6.0	23.9	5.981	-.0195	-0.32

Comments:

Post Run Audit: By: ATH, RLS. Time: 2256 Temp.: 66 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	.0156	-.0156	-0.06
Span	6.0	24.0	6.0	6.0	23.9	5.981	-.0195	-0.32

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-3

Site: Myren Consulting, Woodinville, WA Date: 3/22/99 Analyte: CO

Source: HIGH VALLEY X-TEC Run #: EPA # 3

Zero Cyl #: 36919 Conc. 00.0 % CO Cyl Press: 220 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 1.26 % CO Cyl Press: 1490 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Infra Red Model: 702 D SN: 113

Range: 0 - 10.0% CO Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 5.0% CO
EPA Control Limits = +2.5% of 5.0% CO = + 0.125% CO

Pre Run Audit: By: ATM, RLS. Time: 1337 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.0	.0091	-.0091	-0.18
Span	1.26	25.2	1.26	1.26	25.0	1.2467	-.01326	-1.05

Comments:

Post Run Audit: By: ATM, RLS. Time: 2256 Temp.: 66 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.0	.0091	-.0091	0.18
Span	1.26	25.2	1.26	1.27	24.8	1.2367	-.0233	-1.85

Comments:

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

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

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

Unit: HIGH VALLEY X-TEC
Run: EPA #3
Date: 3/22/99
Technicians: ATH, PLS.
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 69 °F T/C#30: ____ °F

Thermocouple Check (at ambient): T/C#1: 66 °F; T/C#2: 66 °F;

T/C #3: 90 °F; T/C #4: 94 °F; T/C #5: 116 °F;

T/C #6: 107 °F; T/C #7: 113 °F; T/C #8: 141 °F;

T/C #9: 143 °F; T/C #10: 138 °F; T/C #11: 69 °F;

T/C #12: 68 °F; T/C #13: 68 °F; T/C #14: 67 °F;

T/C #15: 68 °F; T/C #16: 67 °F; T/C #17: 68 °F;

T/C #18: ____ °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: STOVE STILL WARM FROM OVER NIGHT BURN.

Thermocouple Readout: Pretest Zero/Span Check and Calibration:

Zero (0°F): 000 °F Adj to: 000 °F Post Test Check Zero (0°F): 002 °F % Difference: +0.10

Span (2000°F): 1999 °F Adj to: 2000 °F Span (2000°F): 2000 °F % Difference: 0

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

Thermocouple Readout Pretest Linearity Check

0°F = 000 °F; 200°F = 200 °F; 400°F = 399 °F;

600°F = 599 °F; 800°F = 800 °F; 1000°F = 1000 °F;

1200°F = 1200 °F; 1400°F = 1400 °F; 1600°F = 1599 °F

1800°F = 1800 °F; 2000°F = 2000 °F

Combustion Gas (CO_2, O_2, CO) Train Leak Check: Pre ✓ Post ✓

Draft (Static) Guage Zero Check: Pre ✓ Post ✓

Scale Check Pre (Wt, #'s): 606.3 - 611.3 5.0 lbs. OK (PLS)

Post (Wt, #'s): 613.3 - 608.3 = 5.0 lbs / 5.0 lb = Ok ATH

Stack cleaned prior to the run: Yes ____ No ✓

Tunnel cleaned prior to the run: Yes ____ No ✓

hivalleyepa2

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	hivalleyepa2
Stove Manufacturer:	HI VALLEY
Model Number:	XTEC
Lab Name:	MYREN
Test Date:	3\21\99
Run Number:	EPA 2
Meter Box Y Factor:	1.003
Barometric pressure (in):	28.546
Gas meter temp (ave):	84
delta H(avg):	0.900
Gas meter initial reading:	846.701
Gas meter final reading:	1062.849
Front catch (acetone) mg:	6.1
first filter catch (mg):	41.1
second filter catch (mg):	1.5
tunnel flow (ave cfm):	144.829
Emission Rate(g/hr):	2.108
Emission Rate(M5H) :	3.380
vs/VmTs:	0.0076
vs ave:	834.045
Tunnel average temp (°f):	86.475
Test time(min):	390
Fuel Load(lb. wet):	17.2
Wood moisture(%wet):	17.632
Burn rate(dry kg/hr):	0.989
Samp vol(scf):	201.200
front filter number	776
back filter number	775
acetone beaker number	1
PRELIMINARY RESULTS	
FINAL RESULTS	AUDITED
DATA SUMMARY	
MODEL :	XTEC
RUN:	EPA 2
DATE:	3\21\99
DBR:	0.989
GPH UNADJ	2.108
ADJ	3.380154065

RUN TIME (min)	PITOT DELTAP (- INCH H20)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCIT (ft/min)	PROP RATE (%)	dDGM vol std (ft3)
0	0.040	88	846.701	70	0.900	832.66		
10	0.038	100	852.150	73	0.900	820.42	103.0	5.175
20	0.039	97	857.611	76	0.900	828.91	103.6	5.158
30	0.039	99	863.110	77	0.900	830.40	103.4	5.184
40	0.041	100	868.615	79	0.900	852.19	103.2	5.170
50	0.040	99	874.145	80	0.900	840.98	100.6	5.184
60	0.041	100	879.775	81	0.900	852.19	103.8	5.268
70	0.040	100	885.219	82	0.900	841.73	98.9	5.085
80	0.040	99	890.745	83	0.900	840.98	101.2	5.152
90	0.041	97	896.289	83	0.900	849.90	101.3	5.169
100	0.041	94	901.826	84	0.900	847.61	99.4	5.153
110	0.040	92	907.370	85	0.900	835.70	99.2	5.150
120	0.041	91	913.020	85	0.900	845.31	102.4	5.248
130	0.041	89	918.448	85	0.900	843.78	96.9	5.042
140	0.041	87	923.993	85	0.900	842.24	98.8	5.151
150	0.041	86	929.631	86	0.900	841.47	100.3	5.227
160	0.041	85	935.097	86	0.900	840.70	97.1	5.068
170	0.041	83	941.200	85	0.900	839.15	108.3	5.669
180	0.040	82	946.200	84	0.900	828.09	88.9	4.653
190	0.041	82	951.775	85	0.900	838.38	100.3	5.178
200	0.041	81	957.307	85	0.900	837.61	98.1	5.138
210	0.041	81	962.878	86	0.900	837.61	98.7	5.165
220	0.041	80	968.495	85	0.900	836.83	99.5	5.217
230	0.040	80	974.005	86	0.900	826.56	97.5	5.109
240	0.040	80	979.555	85	0.900	826.56	99.6	5.155
250	0.040	80	985.112	85	0.900	826.56	99.8	5.162
260	0.040	80	990.610	85	0.900	826.56	98.7	5.107
270	0.040	80	996.228	85	0.900	826.56	100.9	5.218
280	0.040	80	1001.791	85	0.900	826.56	99.9	5.167
290	0.040	80	1007.371	85	0.900	826.56	100.2	5.183
300	0.040	80	1013.007	86	0.900	826.56	101.0	5.226
310	0.040	81	1018.453	86	0.900	827.33	97.8	5.049
320	0.040	81	1023.996	84	0.900	827.33	99.8	5.158
330	0.040	81	1029.561	85	0.900	827.33	100.0	5.169
340	0.040	80	1035.110	86	0.900	826.56	99.3	5.145
350	0.040	81	1040.663	85	0.900	827.33	99.9	5.158

360	0.040	81	1046.197	86	0.900	827.33	99.3	5.131
370	0.040	80	1051.754	85	0.900	826.56	99.7	5.162
380	0.040	81	1057.300	86	0.900	827.33	99.6	5.142
390	0.040	81	1062.849	85	0.900	827.33	99.7	5.154
400						0.00	0.0	0.000
410						0.00	0.0	0.000
420						0.00	0.0	0.000
430						0.00	0.0	0.000
440						0.00	0.0	0.000
450						0.00	0.0	0.000
460						0.00	0.0	0.000
470						0.00	0.0	0.000
480						0.00	0.0	0.000
490						0.00	0.0	0.000
500						0.00	0.0	0.000
510						0.00	0.0	0.000
520						0.00	0.0	0.000
530						0.00	0.0	0.000
540						0.00	0.0	0.000
550						0.00	0.0	0.000
560						0.00	0.0	0.000
570						0.00	0.0	0.000
580						0.00	0.0	0.000
590						0.00	0.0	0.000
600						0.00	0.0	0.000
610						0.00	0.0	0.000
620						0.00	0.0	0.000
630						0.00	0.0	0.000
640						0.00	0.0	0.000
650						0.00	0.0	0.000
660						0.00	0.0	0.000
670						0.00	0.0	0.000
680						0.00	0.0	0.000
690						0.00	0.0	0.000
700						0.00	0.0	0.000
710						0.00	0.0	0.000
720						0.00	0.0	0.000
730						0.00	0.0	0.000
740						0.00	0.0	0.000
750						0.00	0.0	0.000
760						0.00	0.0	0.000
770						0.00	0.0	0.000

METHOD 5G-1 PARTICULATE SAMPLING DATA LAB-

DATE 3/21/99 PAGE 1 OF 2 MODEL # HIGH VALLEY X-TEC RUN # EPA # 2

METER BOX # 511M METER Y 1.003 FILTER # (F) 776 (R) 77-

PRE TEST LEAK RATE = .001 CFM @ -15.5 IN. HG. 3775/3785 FILTER SIZE: 110 MM

POST TEST LEAK RATE = .001 CFM @ -9.5 IN. HG. 869/870 PROBE LENGTH 24" 6 MSS

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1510	00	846.701	-.040	88	70	.90	0
20	10	852.150	-.038	100	73	.90	0
30	20	857.611	-.039	97	76	.90	0
40	30	863.110	-.039	99	77	.90	0
50	40	868.615	-.041	100	79	.90	0
1600	50	874.145	-.040	99	80	.90	0
10	60	879.775	-.041	100	81	.90	0
20	70	885.219	-.040	100	82	.90	0
30	80	890.745	-.040	99	83	.90	0
40	90	896.289	-.041	97	83	.90	0
50	100	901.826	-.041	94	84	.90	0
1700	10	907.370	-.040	92	85	.90	0
10	20	913.020	-.041	91	85	.90	0
20	30	918.448	-.041	89	85	.90	0
30	40	923.993	-.041	87	85	.90	0
40	50	929.631	-.041	86	86	.90	0
50	60	935.097	-.041	85	86	.90	0
1800	70	941.200	-.041	83	85	.90	0
10	80	946.200	-.040	82	84	.90	0
20	90	951.775	-.041	82	85	.90	0

F R
43.2 2.6

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	-.034	96
2	1.5"	-.043	97
3	4.5"	-.041	98
4	5.5"	-.035	98
W-1	0.5"	-.038	101
2	1.5"	-.042	102
3	4.5"	-.042	103
4	5.5"	-.033	104
	Avg.	-.0385	99.87
			559.87

Pilot Leak Check Pre ✓ Post ✓

Cp = 0.99

N
1
2
→ W 1 2 (3*4)
3
4

*=point of Avg. delta p

$Qs = \left(\sqrt{\frac{\Delta P \times BP}{T(°R)}}\right) \times 3167.2 =$

140.260 cfm

BP = START 28.52 in Hg

60 28.52
120 28.52
180 28.525
240
300 28.550
28.590
360 28.600

$\bar{X}$ = 28.546

METHOD 5G -1 PARTICULATE SAMPLING DATA High Valley LAB-

DATE 3/21/99 PAGE 2 OF 2 MODEL # XTEC RUN # EPA#2

METER BOX # 511M METER Y 1.003 FILTER # (F) 776 (R) 775

PRE TEST LEAK RATE = .001 CFM @ -15.5 IN. HG .3775/.3785 FILTER SIZE: 110 mm

POST TEST LEAK RATE = .001 CFM @ -9.5 IN. HG .869/.870 PROBE LENGTH 24" glass

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1830	200	957.307	.041	81	85	.90	0
40	10	962.878	.041	81	86	.90	0
50	20	968.495	.041	80	85	.90	0
1900	30	974.005	.040	80	86	.90	0
10	40	979.555	.040	80	85	.90	0
20	50	985.112	.040	80	85	.90	0
30	60	990.610	.040	80	85	.90	0
40	70	996.228	.040	80	85	.90	0
50	80	1001.791	.040	80	85	.90	0
2000	90	1007.371	.040	80	85	.90	0
10	300	1013.007	.040	80	86	.90	0
20	10	1018.453	.040	81	86	.90	0
30	20	1023.946	.040	81	84	.90	0
40	30	1029.561	.040	81	85	.90	0
50	40	1035.110	.040	80	86	.90	0
2100	50	1040.663	.040	81	85	.90	0
10	60	1046.197	.040	81	86	.90	0
20	70	1051.754	.040	80	85	.90	0
30	80	1057.300	.040	81	86	.90	0
40	90	1062.849	.040	81	85	.90	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.034	96
2	1.5"	.043	97
3	4.5"	.041	98
4	5.5"	.035	98
W-1	0.5"	.038	101
2	1.5"	.042	102
3	4.5"	.042	103
4	5.5"	.033	104
	Avg.	.0385	99.875
			559.87

Pilot Leak Check Pre ✓ Post ✓

Cp = 0.99

N
1
2
→ W 1 2 (3*4)
3
4

*=point of Avg. delta p

$Qs = \left(\sqrt{\frac{\Delta P \times BP}{T(°R)}}\right) \times 3167.2 =$

140.260 cfm

BP = Star 28.52 in Hg

60 28.62
120 28.52
180 28.575
240 28.550
300 28.590
360 28.600
END 28.600

$\bar{X}$ = 28.546

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

Into Dessicator: Date 1/6/99 Time 12:00 By ATM Front Half ✓ Back Half ✓

Manufacturer: Schleicher & Schuell Size: 11 cm Lot.No.: 78951 Grade: #25 q/as
Order No. 06220

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
751	.7787	1/23/99	1115	ATM	.7786	2/2/99	1051	TM				
752	.8115		1116	TM	.8115		1050	ATM				
753	.8063		1117		.8061		1049	ATM				
754	.8044		1118		.8047		1048	ATM				
755	.7882		1119		.7878		1047	ATM				
756	.7831		1120		.7827		1046	ATM				
757	.7893		1121		.7886		1045	ATM	.7886	2/2/99	1430	dm
758	.8025		1122		.8023		1044	ATM				
759	.7960		1123		.7956		1044	ATM	.7957	2/2/99	1240	T.M.
760	.7915		1124		.7914		1043	ATM				
761	.8115		1125		.8116		1042	ATM				
762	.7689		1126		.7687		1041	ATM				
763	.7894		1127		.7893		1040	ATM				
764	.7793		1128		.7792		1039	ATM				
765	.7910		1129		.7907		1038	ATM				
766	.7957		1130		.7954		1037	ATM				
767	.8028		1131		.8024		1036	ATM				
768	.8048		1132		.8044		1036	ATM				
769	.7720		1133		.7716		1035	ATM	.7715	2/2/99	1240	T.M.
770	.7894		1134		.7897		1034	ATM				
771	.7693		1135		.7691		1034	ATM				
772	.7895		1136		.7893		1033	ATM				
773	.8073		1137		.8070		1030	ATM				
774	.8181		1138		.8177		1031	ATM				
775	.8056	✓	1139	✓	.8051	✓	1030	ATM	←			

Checked by Jim Mayfield Date: 2/2/99 Time 1430

QA REWEIGH

Filter #	WT	Date	Time	By
758	.8021	2/2/99	1431	dm ✓
762	.7685	2/2/99	1432	dm ✓
767	.8029	2/2/99	1433	dm ✓

Post Weighing Operation Scale Check

	1st	2nd	3rd
0.0000	0.0000	-0.0002	0.0000
1.0000	1.0000	0.9998	1.0001

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
62	77	42	1/22/99	1100	ATM
60	73	46	2/2/99	0939	TM
62	76	45	2/7/99	1235	ATM
65	80	44	2/19/99	1312	ATM

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

Into Dessicator: Date 1/8/99 Time 12:00 By ATM Front Half ✓ Back Half ✓

Manufacturer: Schleicher & Schuell Size: 11cm Lot No.: Z8951 Grade: #25 q/bss
Order No. 06220

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
776	.7853	2/7/99	12:55	T.M.	.7853	2/10/99	1629	ATM	←			
777	.8127		12:56	T.M.	.8129		1628	ATM				
778	.8044		12:57	T.M.	.8040		1627	ATM				
779	.8036		12:58	T.M.	.8034		1626	ATM				
780	.7859		12:59	T.M.	.7858		1625	ATM				
781	.7894		1:00	T.M.	.7892		1625	ATM				
782	.7905		1:01	T.M.	.7903		1624	ATM				
783	.7967		1:02	T.M	.7968		1623	ATM				
784	.8120		1:03	T.M.	.8118		1622	ATM				
785	.8166		1:04	T.M.	.8164		1621	ATM				
786	.7925		1:05	T.M	.7923		1620	ATM				
787	.8064		1:06	T.M	.8064		1619	ATM				
788	.7928		1:07	T.M.	.7926		1619	ATM				
789	.7774		1:08	T.M	.7774		1618	ATM				
790	.7835		1:09	T.M	.7835		1617	ATM				
791	.7981		1:10	T.M.	.7982		1616	ATM				
792	.8036		1:11	T.M	.8035		1615	ATM				
793	.8116		1:12	T.M	.8116		1614	ATM				
794	.8025		1:13	T.M.	.8024		1613	ATM				
795	.7766		1:14	T.M	.7760		1613	ATM				
796	.7916		1:15	T.M	.7915		1612	ATM				
797	.7755		1:16	T.M.	.7756		1611	ATM				
798	.8133		1:17	T.M	.8133		1610	ATM				
799	.7949		1:18	T.M	.7948		1610	ATM				
800	.8266	✓	1:19	T.M	.8266	✓	1609	ATM				

Checked by Jim Taylor Date: 2/21/99 Time 1405

QA REWEIGH

Filter #	WT	Date	Time	By
781	.7891	2/21/99	1412	JT ←
789	.7772	2/21/99	1414	JT ←
795	.7765	2/21/99	1415	JT ← QA

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
62	76	45	2/7/99	1235	ATM
63	72	45	2/10/99	1630	ATM
65	80	44	2/21/99	1312	ATM

Post Weighing Session Scale Check

1st		2nd	3rd
0.0000	0.0000	0.0000	0.0000
1.0000	1.0001	1.0000	1.0001

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 1/4/99 Time: 1600 By: A.T. Myers

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4840	2/1/99	915	ATM	65.4838	2/3/99	1605	JM	←			
2	66.1516		917	ATM	65.1515	2/3	1606	JM				
3	67.8577		919	ATM	67.8571	2/3	1609	JM	67.8571	2/7/99	1245	ATM
4	67.5891		920	ATM	67.5886	2/3	1612	JM				
5	Broken											
6	67.4282		921	ATM	67.4282	2/3	1615	JM				
7	65.5451		922	ATM	65.5453	2/3	1617	JM				
8	60.0213		923	ATM	60.0213	2/3	1618	JM	← Blank			
9	66.9293		924	ATM	66.9294	2/3	1620	JM				
10	66.0888		926	ATM	66.0885	2/3	1621	JM				
11	65.6997		927	ATM	65.7015	2/3	1623	JM	65.7016	2/7/99	1247	ATM
12	56.0653		928	ATM	56.0652	2/3	1625	JM				
13	57.8945		929	ATM	57.8942	2/3	1627	JM				
		↓										

Checked By: A.T. Myers Date: 2/8/99 Time: 1705

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
55	69	39	2/1/99	0910	ATM
63	76	48	2/3/99	1555	ATM
62	76	45	2/7/99	1235	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9,Pg1,Rev4/90
Unit H.Valley XTEC
Run # EOH 2
Date 3/21 199

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
1	✓	3/24	1140	ATM	65.4905	3/29	2135	Jm	65.4900	4/6/99	1040	ATM	65.4899	4/7/99	1815	Jm

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
776	.8285	3/21/99	2221	ATM	.8275	3/30/99	2300	ATM	.8263	3/29	2105	Jm	.8264	4/5	1739	ATM
775	.8077	3/21/99	2221	ATM	.8067	3/30/99	2259	ATM	.8066	3/29	2104	Jm				

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/22	2215	ATM	65	85	33
2	3/29	2038	ATM	59	72	45
3	4/5	1730	ATM	64	80	41
4	4/6	1030	ATM	61	75	44
5	4/7	1724	Jm	65	85	33

SCALE ROOM ENVIRONMENTAL CONDITIONS

6							
7							
8							
9							

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Acetone Blank - 100 ml Acetone

Blank
3/13/99

WST5-Form9,Pg1,Rev4/90
Unit
Run #
Date:

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
B	✓	3/18/99	0854	ATM	66.0215	3/2/99	2237	ATM	66.0215	3/30/99	1332	ATM				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By
Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/18	2140	ATM	68	84	43
2	3/20	1300	ATM	64	84	32
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6							
7							
8							
9							

Comments

Dates From 1/9/99

Through _____

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Mettler
Model AE10
SN K0482

Level	Recali-brated	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Date	Time	Tech	Wet Bulb	Dry Bulb	% RH
V	Yes P.O.	99.9999	10.0001	1.0002	.1003	.0203	1/9/99	1243	ATM	58	70	48
V	No	100.0002	10.0000	1.0000	.1000	.0200	1/14/99	1113	ATM	62	75	47
V	YES P.O.	99.9998	10.0002	1.0000	.0999	.0201	1/23/99	1100	ATM	63	77	42
V	YES	99.9999	10.0000	1.0000	.1000	.0201	1/24/99	1318	ATM	59	74	45
V	YES	99.9996	10.0002	1.0000	.1000	.0200	2/1/99	0910	ATM	55	69	39
V	YES	99.9997	10.0001	1.0001	.1002	.0201	2/2/99	0959	ATM	60	73	46
V	YES	99.9999	10.0001	1.0001	.1001	.0200	2/3/99	1555	ATM	63	76	47
V	YES	99.9999	10.0000	1.0001	.1001	.0201	2/17/99	1235	ATM	62	76	45
V	YES	99.9998	10.0000	1.0000	.1000	.0200	2/10/99	1600	ATM	63	77	43
V	YES	99.9998	10.0000	1.0001	.1000	.0200	2/19/99	0246	ATM	64	78	46
V	NO	99.9999	10.0000	1.0000	.1000	.0200	2/21/99	1312	ATM	65	80	44
V	NO	99.9997	10.0000	1.0001	.1000	.0200	3/5/99	1435	ATM	64	80	41
V	YES P.O.	99.9997	10.0000	1.0000	.1001	.0200	3/6/99	1135	ATM	64	79	43
V	YES	99.9997	10.0000	1.0001	.1000	.0200	3/13/99	1526	ATM	65	80	44
V	YES	99.9999	10.0001	1.0001	.1001	.0200	3/14/99	1355	ATM	63	78	45
V	NO	100.0001	10.0000	1.0000	.1000	.0200	3/15/99	1622	ATM	66	81	45
V	YES	99.9997	10.0000	1.0001	.1000	.0200	3/16/99	0025	ATM	65	82	39
V	YES	99.9996	10.0000	1.0001	.1001	.0200	3/17/99	1615	ATM	62	77	42
V	YES	99.9997	10.0000	1.0001	.1000	.0200	3/18/99	2140	ATM	68	84	43
V	YES	99.9998	10.0000	1.0000	.1000	.0200	3/20/99	1300	ATM	64	84	32
V	YES	99.9999	10.0000	1.0001	.1001	.0201	3/21/99	2215	ATM	61	74	47
V	YES	99.9997	10.0000	1.0000	.1001	.0200	3/22/99	0127	ATM	65	85	33
V	YES	99.9997	10.0000	1.0001	.1000	.0200	3/23/99	1115	ATM	69	77	46
V	YES	99.9998	10.0000	1.0002	.1001	.0201	3/24/99	1120	ATM	72	89	43
V	YES	99.9999	10.0000	1.0002	.1001	.0201	3/29/99	2038	ATM	67	72	45
V	NO	99.9999	10.0002	1.0002	.1001	.0202	3/30/99	0610	ATM	66	80	43
V	NO	99.9999	10.0000	1.0000	.1001	.0201	3/31/99	1000	ATM	64	80	41
V	NO	99.9996	10.0000	1.0000	.1001	.0201	4/5/99	1730	ATM	64	80	41
V	YES	99.9997	10.0001	1.0001	.1001	.0201	4/6/99	1030	ATM	61	75	44
QC Services	Audit	4/6/97	- wt. / scale cleanup after audit									
V	NO	100.0003	10.0001	1.0001	.1001	.0201	4/6/99	1730	ATM			
V	YES	99.9998	10.0001	1.0001	.1001	.0200	4/8/99	1224	ATM	65	85	33

Woodstove Particulate
Catch Processing Sheet
Woodstove Data Sheet #5
EPA M5G-1

Unit: Hi Valley XTEC
Run: EPA 1 2
Date: 3/21/98
Technicians: ATM
Revised 1/16/98-Data Sheet #5

Filters

Filter # (Front) 776 Beaker # 1 Final Wt. 65.4899 g
Final Wt. .8264 g Ml 35 Tare Wt. 65.4838 g
Tare Wt. .7853 g Desc. Acetone Net Wt. .0061 g
Net Wt. .0411 g

Filter # (Rear) 775 Beaker # _____ Final Wt. _____ g
Final Wt. .8066 g Ml _____ Tare Wt. _____ g
Tare Wt. .8051 g Desc. _____ Net Wt. _____ g
Net Wt. .0015 g

Acetone Blank Calculation: Blank Date: 3/13/99

Blank Beaker # 8 Final Wt. 66.0215 g
Ml 100 Tare Wt. 66.0213 g
Desc. Acetone Net Wt. .0002 g
.0002 g ÷ 100 ml = .000002 g/ml

Blank Residue Value Calculation:

.000002 g/ml acetone X 35 ml acetone = .00007 g
Blank Residue Value

Total Particulate Catch Calculation

Filter: .0411 g
Filter: .0015 g
Beakers: .0061 g – .0001 g = .0060 g
Total Catch Blank Residue Value

Total Catch = .0486 g

Unit HIGH VALLEY X-TEC
Run # EPA #2
Date 3/21/99
Technician ATM, RLS,
WST6-Form1, Rev8/96

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 2.713 ft^3

Dilution Tunnel Draft (If applicable): Start 00.0 Stop 00.0

Test Chamber Air Velocity: Start: 00.0 Stop: 00.0 Avg: 00.0

Wet Bulb/ Start: WB: 64 °F DB: 74 °F 1.65 % Amb Moisture 58 %RH

Dry Bulb Stop: WB: 61 °F DB: 74 °F 1.40 % Amb Moisture 46 %RH

$\bar{X}$ = 1.525 % Ambient Moisture $\bar{X}$ = 52 % Relative Humidity (RH)

Empty Stove Wt: 514.0 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 606.6 lbs. Dry: 604.8 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 604.8 lbs.

Kindling Wt. Paper: 0.6 lbs. Wood: 5.9 lbs.

Pre Burn Fuel Wt. 15.1 + 16.3 + 16.3 Total: 47.7 lbs.

Total Kindling and Pre Burn Fuel Wt 54.2 lbs.

Coal Bed Wt-lbs: Range(4.3 - 3.5) 609.1-608.3 lbs. Actual: 4.3 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\frac{4.3}{\text{Upper Wt.}} + \frac{3.5}{\text{Lower Wt.}}$ / 2 X .25 = 0.9 lbs.

Test Fuel Wt-lbs: Ideal 19.0 lbs. Range: 17.1-20.8 lbs. Actual: 17.2 lbs.

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Flanges) 20 Pcs.

2 x 4's x	"	4 Pcs	9.41 lbs.	54.65 %
4 x 4's x	"	2 Pcs	7.8 lbs.	45.35 %

Est. Dry Burn Rate (Kg/Hr.) $\frac{17.2 - (17.2 \times .17632)}{2.2046} \times \frac{60}{390}$ = .9886 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output(HO_E) (Avg BTU's/Hr) (19,140) X $\frac{63}{100}$ x .9886 = 11921 Est Heat Output (HO_E) BTU's/Hr

Comments:

385 min = 1.0015

Stove Operating Data
Woodstove Test Data Sheet #9
Cold Start

Unit: HIGH VALLEY X-TEC
Run: EPA #2
Date: 3/21/89
Technician(s): ATM, RLS,
Data Sheet #9 - Rev 1/98-Pg.2

Fire Started: 1020 P.S.T.

Warm up and Preburn: Primary Air: Wide open from ignition until the start of preburn when the primary air control(s) was (were) adjusted to the run setting of 0.55". At the run setting until the start of the test.

Secondary Air: No Controls. Naturally drafted.

Secondary Burn/Cat Bypass: N/A

Charcoal Bed Preparation: Broke up, raked and leveled the coal bed prior to the addition of each warm up/pre burn fuel charge. Starting 1:30 before the start of the test, broke up, raked and leveled the coal bed. In stove for _____ seconds.

Test: Door wide open during loading 1 min 30 sec, then Closed,

Primary Air: Wide open during the start of the test until 4:55.
Adjusted to the run setting of 0.55" between 4:55 and 5:00.
At the run setting of 0.55" at 5:00 into the run.

Secondary Air: No Controls, Naturally drafted

Secondary Burn/Cat Bypass: N/A

Fan: ON/OFF during the warm up, ON/OFF high during the preburn, ON/OFF at the start of the test, ON/OFF for the first 30 minutes of the test, ON/OFF high at 30 minutes into the test, ON/OFF for the rest of the test.

Test Run Anomalies:

Unit HIGH VALLEY X-TEC
Run # EPA #2
Date 3/21/99
Technician ATM, RLS,

WST7-Form2-A, Rev10/88

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-1

Wood Data: Kindling: A mix of the below grades

	Size	Mill	Grade	Species
Pre Burn	2x4	CANYON LBR.	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2x4	CANYON LBR.	#2 STD. & BTR.	D. FIR, S. GRN.
	4x4	STAND & 879	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (15.1 lbs) added at 1040.
2nd Warm up/Pre Burn Fuel charge (16.3 lbs) added at 1148.
3rd Warm up/Pre Burn Fuel charge (16.3 lbs) added at 1250.
4th Warm up/Pre Burn Fuel charge (lbs) added at .
5th Warm up/Pre Burn Fuel charge (lbs) added at .
6th Warm up/Pre Burn Fuel charge (lbs) added at .
7th Warm up/Pre Burn Fuel charge (lbs) added at .
8th Warm up/Pre Burn Fuel charge (lbs) added at .

The coals were scooped out of the stove immediately prior to adding the 3 pre burn/warm up fuel charge. The stove lost 1.8 lbs. 3.0 lbs of coals put back in after the scoop.

All pre burn/warm up fuel pieces were either 16" or ____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 16 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 16 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 3 pcs 16 inches long. The majority of the pieces in each rick were in the second layer which had an approximate 0.5-1.0" space between pieces. (The loading directions indicate the direction of the longest dimension on each piece relative to the loading door opening.) Each pre burn/warm up fuel charge normally weighs within the weight range allowed for the actual test fuel charge

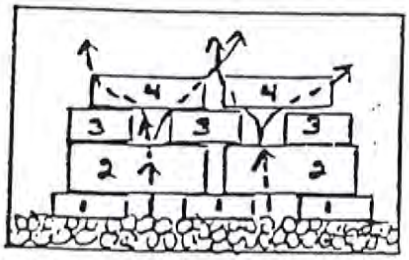
Unit HIGH VALLEY / X-TEC
Run # EPA E-2
Date 3/21/99
Technician ATH, RLS,

WST7-Form2-A, Rev 6/90

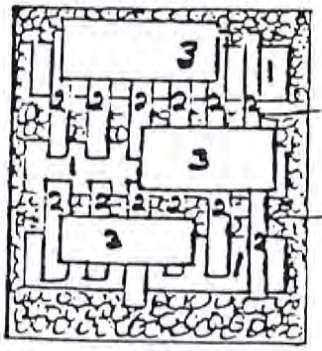
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

Warm up Information (cont.):

Each warm up/preburn fuel charge was ricked in exactly (as much as possible) the same manner and the weight of each rick was usually within the allowable weight range for the test fuel charge. The physical arrangement and alignment of each rick was designed to accomplish three (3) things: (1)The bottom layer was nestled firmly into the coal bed and was as close to being level with the bottom of the stove as possible, thus providing a stable loading platform for the rest of the rick, keeping it in a ricked state (as opposed to a col- lapsed or fallen down state) untill the rick reached the charcoal stage and sags or collapses of its own accord. (2) It enhances the flow of primary air through the ricked preburn fuel charge, for the primary air would flow through the spaces between the pieces in the first layer and then up through the spaces between the pieces in the second, third and, if present, fourth layers. (3) It maximized, as much as possible, the surface to volume ratio of each preburn fuel charge, thereby allowing the fire immediate access to as much wood surface as possible and, thereby, insuring uniform charcoalization. All three of these enhance combustion and so get the stove as hot as possible during the warm up period, therby maximizing the amount of heat (BTU's) stored in the stove. The actual preburn was not started until the stove surface temperatures had maximized and stabilized, thus indicating that the amount of heat stored in the stove had peaked. For this stove, the thermal storage was monitored using the TOP surface temperature(s) and the peak value(s) obtained were 950 °F.



Front View



Top View

The arrows indicate the direction of the air flow through the rick.

The primary air was adjusted to the run setting of 0.55" open 4.7 lbs above the upper charcoal bed weight.

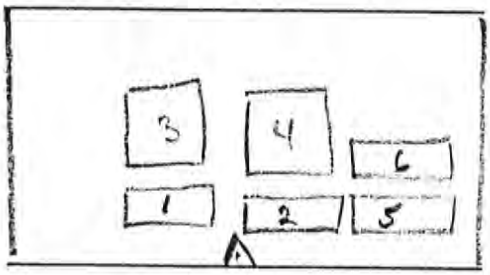
Unit HIGH VALLEY X-TE.
Run # EPA #2
Date 3/21/99
Technician ATH, RLS.
Page 3 of 3
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: ① Turned Fan OFF ② Opened Primary Air Control Wide Open ③ Opened door ④ Loaded test fuel charge into the stove ⑤ Cleared coals away from the front of LP&O ⑥ Photograph ⑦ Closed door.

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



FRONT of stove view

4 X 4's: 3, 4

2 X 4's: 1, 2, 5 & 6

Loading Sequence: 1, 2, 3, 4, 5 & 6 LAST

Driest Pcs in Load 1 & 2

Loaded the test fuel charge on an essentially level, medium sized, Average coal bed (in appearance, color and temperature for a Low (≤ 1.0 kg/hr) burn rate. Load 1:30 - hnd shovel gutting pc 6 in. Ignition N 1:00. Secondaries igniting @ 2100 2nd Tube igniting @ 3100 5100 Flames ↓ Out of Balance @ 6:15. Back in Balance @ 8:24 Out again @ 11:40 Back in 17:02 Out 17:10 dn 19:20 Flames out dn/out again @ 19:51 dn 20:53.

The whole time hnd VC to baffle w/ secondaries on top of VC.

Unit: HIGH VALLEY X-TEC
Run: EPA #2
Date: 3/21/99
Technician: ATM RLS.

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

WST1-Form7-Rev11/89

Room Temperature: 60 °F Correction Factor: +1

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes ✓. No ___
Time Test Fuel Moisture Readings taken at: 1130
Calibration Checks: X ✓ Y ✓ 12.0 12.0 22.0 22.3

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg Corrected
			Uncor	Cor	Uncor	Cor	Uncor	Cor	
1	2x4x8'	K	12.0	12.8	12.0	12.8	12.0	12.8	12.800
2									
3									
4	2x4x8'	P	20.5	22.0	22	23.7	21.5	23.1	22.933
5	"	P	20.5	22.0	22	23.7	20	21.4	22.367
6	"	P	18.5	19.8	19.5	20.9	21	22.6	21.100
7	"	P	19	20.3	20.5	22.0	19.5	20.9	21.067
8	"	P	21.5	23.3	23	24.9	20.5	22.0	23.733
9									111.200
10									
11	2x4x17⅛	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
12	"	T	19.0	20.3	19.0	20.3	20.0	21.4	20.667
13	"	T	20	21.4	20	21.4	20.5	22.0	21.600
14	" ↓	T	21	22.6	22	23.7	22.5	24.3	23.533
15									
16	4x4x17⅛	T	19	20.3	19.5	20.9	20	21.4	20.867
17	" ↓	T	21	22.6	20	21.4	22	23.7	22.567
18									128.4/6.4
19	FEET	T	19	20.3	19	20.3	19.5	20.9	20.500
20								OUT	SPACES

HUY

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	12.800 %	22.240 %	21.406 %
% Moisture - Wet Basis:	11.348%	18.194 %	17.632 %

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

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

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

Unit: HIGH VALLEY X-TEC
Run#: EPA #2
Date: 3/21/99
Technician: ATH, RLS.

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 3½" x 3½" x 1½"

Depth (D): in 1.557 cm 3.9547

Width (W): in 3.548 cm 9.0119

Length (L): 2.995 cm in
2.838 cm
2.997 cm
3.031 cm

Length $\bar{X}$ = in 2.9653 cm 7.5317

Volume: 268.425 cm^3 (D X W X L)

MOISTURE: Room Temperature: 70 °F Correction Factor: —

Uncorrected Meter Readings Corrected for temperature: Yes ✓ No ___

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	19.0	20.3 %
Bottom:	18.5	19.8 %
Side:	18.5	19.8 %
$\bar{X}$:		19.967 %

Avg % Moisture (Dry) 19.967 %

Aug % Moisture (Wet) 16.644 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 149.0 g Dry Weight: 117.0 g

% Moisture Dried Basis: 21.147 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	3/21/98	1325	220 °F
Out of Dryer	3/29/99	1415	218 °F

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

Density = 117.0 g (dry wt) ÷ 268.425 cm^3 (volume) = 0.4359 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. _____ g

Wet Wt: _____ g - _____ g = _____ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: _____ g - _____ g = _____ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

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

BU ATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
Eno Wt.: 609.1 lbs.

Unit: HIGH VALLEY X-TEC Date: 3/21/99
Run: EPA #2 Technician(s): ATH, RLS.
Page: 1 of 4

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO2 v.	1 CO2 %CO2	2 O2 v.	2 O2 %O2	Tel	3 CO v.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	T/C(2) Dry Bulb	% H2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO2 v.	4 SO2 PPM	Static Press.	Comments
0 / 1510	626.3	17.2	0	.252	6.29	52.7	13.21		23.8	1.20	5.2	76	98	2.1	101	.217			-.041	Flow
5 / 15	625.1	16.0	1.2	.478	11.91	33.1	8.29		6.5	.33	36.1	118	139	10	135	398			-.066	SO2 1.5
10 / 20	624.7	15.6	.4	.342	8.53	45.0	11.27		14.5	.74	11.5	126	140	13	136	302			-.060	CO2 1.5
15 / 25	624.2	15.1	.5	.284	7.08	51.8	12.98		14.4	.73	9.7	125	137	12.5	137	343			-.056	O2 1.5
20 / 30	623.6	14.5	.6	.390	9.72	40.7	10.20		18.5	.93	(10.5)	129	139	14.5	139	294			-.061	CO 1.5
25 / 35	622.9	13.8	.7	.469	11.68	35.0	8.77		7.1	.37	31.6	131	140	15	140	316			-.064	
30 / 40	622.3	13.2	.6	.480	11.96	34.1	8.54		4.9	.27	44.3	132	141	16	143	327			-.066	
35 / 45	621.6	12.5	.7	.527	13.12	30.5	7.64		4.3	.24	54.7	134	144	16.5	144	334			-.068	
40 / 50	620.9	11.8	.7	.492	12.25	33.0	8.26		4.1	.21	58.4	135	146	17	144	338			-.067	
45 / 55	620.3	11.2	.6	.462	11.51	35.7	8.941		7.2	.37	31.1	132	147	16	143	332			-.065	
50 / 1600	619.7	10.6	.6	.469	11.68	35.2	8.82		11.7	.61	19.2	131	147	15	141	325			-.065	
55 / 05	619.0	9.9	.7	.482	12.01	33.7	8.44		11.7	.60	20.0	131	148	15	141	325			-.065	
																(3851)		(-.744)		Flow
60 / 1610	618.3	9.2	.7	.527	13.12	30.0	7.51		8.9	.45	29.2	132	149	15	141	334			-.066	SO2 1.5
65 / 15	617.7	8.6	.6	.509	12.68	31.3	7.84		12.5	.66	19.2	131	149	15	141	335			-.065	CO2 1.5
70 / 20	617.1	8.0	.6	.537	13.37	27.9	6.98		11.1	.54	24.8	130	149	14.5	140	336			-.065	O2 1.5
75 / 25	616.5	7.4	.6	.516	12.85	30.1	7.54		11.7	.60	21.4	129	149	13	138	332			-.065	CO 1.5
80 / 30	616.0	6.9	.5	.496	12.35	31.9	7.99		10.7	.53	23.3	127	147	13	137	326			-.063	
85 / 35	615.5	6.4	.5	.453	11.28	36.2	9.07		8.1	.45	25.1	124	144	12	134	316			-.060	
90 / 40	615.1	6.0	.4	.441	10.99	37.4	9.38		8.4	.43	25.6	122	141	11.5	133	307			-.059	
95 / 45	614.7	5.6	.4	.414	10.32	39.9	9.99		9.1	.46	22.4	119	138	10	130	297			-.058	
100 / 50	614.4	5.3	.3	.390	9.72	42.0	10.52		10.8	.56	17.4	116	135	9.5	129	287			-.056	
105 / 55	614.0	4.9	.4	.373	9.30	43.2	10.82		10.2	.52	17.9	113	133	9.1	127	279			-.055	
110 / 1700	613.7	4.6	.3	.340	8.48	46.0	11.52		16.0	.84	10.1	109	129	7.8	123	270			-.052	L.
115 / 05	613.4	4.3	.3	.302	7.53	48.5	12.15		24.8	1.16	(6.5)	105	125	6.3	116	255			-.050	L.
																(3674)		(-.714)		
																(1575)		(1154)		

BU[illegible]ATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
END WT.: 609.1 lbs,

Unit: HIGH VALLEY X-TEC Date: 3/21/99
Run: EPA #2 Technician(s): ATM, RLS,
Page: 2 of 4

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	T/C(1)T/C(2) Bal	T/C(1)T/C(2) Wet Bulb	T/C(1)T/C(2) Dry Bulb	% H_2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO_2 v.	4 SO_2 PPM	Static Press.	Comments
120 1710	613.2	4.1	.2	.286	7.13	5.00	12.53		27.2	1.37	5.2	101	121	6	114	.245			-.046	Flow L
125 15	613.0	3.9	.2	.252	6.29	52.6	13.18		27.3	1.38	4.6	95	116	4.8	111	235			-.045	~~SO2 1.5~~
130 20	612.9	3.8	.1	.249	6.21	53.0	13.28		26.3	1.31	4.7	92	115	4.3	108	232	4x4's	breaking Down	-.044	~~CO2 1.5~~
135 25	612.8	3.7	.1	.246	6.14	53.2	13.33		26.5	1.30	4.7	89	113	3.8	106	226			-.044	~~O2 1.5~~
140 30	612.7	3.6	.1	.263	6.56	51.6	12.93		23.0	1.17	5.6	88	112	3.7	105	221	FRONT BOTH	PAST 4x4's	-.042	~~CO 1.5~~
145 35	612.6	3.5	.1	.259	6.46	52.1	13.06		24.1	1.23	5.3	86	111	3.4	104	217	Fell Logs	Down	-.042	
150 40	612.5	3.4	.1	.257	6.41	52.1	13.06		26.1	1.32	4.9	84	109	3	103	213	attached	NOT	-.040	
155 45	612.4	3.3	.1	.253	6.31	52.6	13.18		26.8	1.37	4.6	84	108	3	102	210			-.040	
160 50	612.3	3.2	.1	.246	6.14	53.3	13.36		25.9	1.31	14.7	83	108	2.9	100	208			-.039	
165 55	612.2	3.1	.1	.243	6.07	53.7	13.46		25.0	1.28	4.7	82	107	2.8	100	205			-.039	
170 1800	612.1	3.0	.1	.242	6.04	53.5	13.41		27.1	1.36	4.4	81	106	2.7	99	204			-.038	
175 05	612.0	2.9	.1	.237	5.92	54.0	13.53		28.1	1.42	4.2	81	106	2.7	99	201			-.038	
																2617			-1.497	Flow
180 1810	611.9	2.8	.1	.239	5.97	53.7	13.46		29.2	1.46	4.1	80	105	2.5	98	200			-.037	~~SO2 1.5~~
185 15	611.9	2.8	0	.234	5.84	54.2	13.58		33.1	1.69	3.5	80	104	2.6	98	198			-.036	~~CO2 1.5~~
190 20	611.8	2.7	.1	.234	5.84	53.7	13.46		34.5	1.73	3.4	79	103	2.5	97	196			-.036	~~O2 1.5~~
195 25	611.7	2.6	.1	.237	5.92	53.8	13.48		31.9	1.63	3.6	79	103	2.5	97	195			-.036	~~CO 1.5~~
200 30	611.6	2.5	.1	.235	5.87	54.0	13.52		32.2	1.63	3.6	79	102	2.5	97	193			-.035	
205 35	611.5	2.4	.1	.237	5.92	53.7	13.46		32.7	1.65	3.6	79	102	2.5	97	193			-.035	
210 40	611.4	2.3	.1	.234	5.84	54.1	13.56		32.7	1.63	3.6	79	102	2.5	97	192			-.035	
215 45	611.3	2.2	.1	.238	5.94	53.8	13.48		32.1	1.64	3.6	79	101	2.6	97	191			-.034	
220 50	611.3	2.2	0	.238	5.94	53.7	13.46		32.5	1.65	3.6	78	101	2.5	96	189			-.034	
225 55	611.2	2.1	.1	.236	5.89	54.1	13.56		31.4	1.62	3.6	78	102	2.5	96	189			-.034	
230 1900	611.1	2.0	.1	.236	5.99	54.0	13.53		33.0	1.66	3.5	78	102	2.5	96	188			-.034	
235 05	611.0	1.9	.1	.231	5.77	54.5	13.66		33.6	1.70	3.4	78	101	2.5	95	186			-.034	
																2310			-.420	
																4927				-.917

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

Unit: HIGH VALLEY X-TEC Date: 3/21/99
Run: EPA #2 Technician(s): A.T. Allen, ELS.
Page: 3 of 4

END WT. 609.1 lbs

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO2 v.	1 CO2 %CO2	2 O2 v.	2 O2 %O2	Tel	3 CO v.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	T/C(2) Dry Bulb	% H2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO2 v.	4 SO2 PPM	Static Press.	Comments
240 1910	611.0	1.9	0	.223	5.57	55.3	13.86		33.7	1.71	3.3	78	101	2.4	98	.186			-.034	Flow
245 15	610.9	1.8	.1	.216	5.39	56.1	14.06		31.6	1.58	3.4	78	101	2.4	97	185			-.034	SO2 1.5
250 20	610.8	1.7	.1	.216	5.39	56.1	14.06		32.2	1.61	3.3	78	100	2.5	96	183			-.033	CO2 1.5
255 25	610.8	1.7	0	.215	5.38	56.4	14.13		30.4	1.53	3.5	78	100	2.5	95	182			-.033	O2 1.5
260 30	610.7	1.6	.1	.216	5.39	56.4	14.13		31.7	1.61	3.4	78	100	2.5	94	180			-.033	CO 1.5
265 35	610.6	1.5	.1	.218	5.44	51.1	14.06		31.5	1.59	3.4	78	99	2.6	94	180			-.032	
270 40	610.6	1.5	0	.219	5.47	55.8	13.98		325	1.61	3.4	77	99	2.4	94	180			-.032	
275 45	610.5	1.4	.1	.214	5.34	56.6	14.18		30.3	1.53	3.5	78	99	2.6	95	178			-.033	
280 50	610.4	1.3	.1	.213	5.32	56.2	14.21		31.4	1.57	3.4	77	99	2.4	95	178			-.032	
285 55	610.3	1.2	.1	.204	5.10	57.6	14.44		32.5	1.64	3.1	77	99	2.4	95	176			-.031	
290 2000	610.3	1.2	0	.204	5.10	57.5	14.41		33.7	1.69	3.0	76	98	2.3	94	176			-.031	
295 05	610.2	1.1	.1	.203	5.07	57.8	14.49		30.7	1.56	3.3	77	98	2.3	94	175			-.030	
																(2159)			(-.388)	Flow
300 2010	610.1	1.0	.1	.202	5.05	57.8	14.49		32.4	1.64	3.1	77	98	2.3	93	173			-.030	SO2 1.5
305 15	610.1	1.0	0	.202	5.05	57.5	14.41		33.4	1.68	3.0	77	98	2.3	92	172			-.030	CO2 1.5
310 20	610.0	.9	.1	.192	4.80	58.6	14.69		34.2	1.71	2.8	77	97	2.4	92	172			-.029	O2 1.5
315 25	609.9	.8	.1	.190	4.75	58.7	14.71		34.9	1.77	2.7	77	97	2.4	92	171			-.029	CO 1.5
320 30	609.8	.7	.1	.214	5.34	57.6	14.44		31.6	1.68	3.2	77	97	coals fell 2.4	92	170	coals	Fell	-.029	
325 35	609.8	.7	0	.199	4.97	58.3	14.61		33.7	1.70	2.9	77	97	2.4	92	170			-.029	
330 40	609.7	.6	.1	.188	4.70	59.3	14.86		33.4	1.70	2.8	77	97	2.4	92	169	coals	Fell	-.029	
335 45	609.7	.6	0	.187	4.67	59.2	14.84		33.8	1.69	2.8	77	97	2.4	92	168			-.028	
340 50	609.6	.5	.1	.189	4.72	59.1	14.81		33.5	1.71	2.8	77	96	2.4	92	167			-.028	
345 55	609.6	.5	0	.191	4.77	59.6	14.94		29.6	1.51	3.2	77	96	2.4	91	165			-.028	
350 2100	609.5	.4	.1	.190	4.75	59.9	15.01		28.1	1.44	33	77	96	2.4	91	165			-.027	
355 05	609.5	.4	0	.182	4.55	60.4	15.14		30.3	1.53	3.0	77	96	2.4	91	164			-.027	
																(2026)			(-.343)	
																(4185)			(-.731)	

BURN RATE AND FLUE GAS DATA
WOODS[illegible] DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: High Valley X TEC Date: 3/21/99
: EPA 2 Technician(s): [illegible] m
Page: 4 of 4

				1		2			3		T/C(1)T/C(2)				T/C(3)	4			
Minute Time	Scale Wt	lbs left	Burn Rate	CO_2 v.	CO_2 %CO_2	O_2 v.	O_2 %O_2	Tel	CO v.	CO %CO	Bal	Wet Bulb	Dry Bulb	% H_2O	Calc W/B	Stack	SO_2 v.	SO_2 PPM	Static Press.	Comments
360 0:00	609.4	.3	.1	.184	4.60	60.2	15.09		30.1	1.52	3.0	77	96	2.5	92	.164			-.026	Flow
365 15	609.4	.3	0	.178	4.45	60.8	15.24		31.3	1.57	2.8	76	96	2.4	91	163			-.026	SO_2 1.5
370 20	609.3	.2	.1	.177	4.42	60.7	15.21		32.2	1.61	2.7	76	96	2.4	91	162			-.026	CO_2 1.5
375 25	609.3	.2	0	.163	4.08	62.1	1556		33.2	1.65	2.5	76	95	2.4	91	161			-.026	O_2 1.5
380 30	609.2	.1	.1	.155	3.88	62.8	15.74		34.2	1.72	2.3	76	95	2.4	91	161			-.026	CO 1.5
385 35	609.2	.1	0	.153	3.83	63.1	1582		33.1	1.67	2.3	76	95	2.4	90	160			-.025	
390 40	609.1	0	.1	.155	3.88	63.2			31.4	1.58	2.5	76	95	2.4	90	158			-.025	
																1129			-.180	
													79÷			17766			-3.286	
																224.89			-.04159	Flow
																				SO_2 1.5
																225			-.0416	CO_2 1.5
																				O_2 1.5
																				CO 1.5

Pre Burn Start wt. 4.7 lbs. vp 613.6 lbs.
Test Start wt. Range 609.1 - 608.3 lbs.

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

BARO. PRESSURE 28.50 "Hg

Unit: HIGH VALLEY X-TEC Date: 3/31/99
Run: EPA #2
Page: 1 of 1
Technician(s): ATM, PLS,

Hot Box On ✓

Minute Time	Scale Weight	Burn Rate	Stack T/C#-3	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Comments
0 1330	613.6	0	589	895	592	682	617	546	981	1455	77	-.090	Primary Air Set at 0.55"
5 25	612.5	1.1	480	798	597	618	625	555	906	1361	76	-.083	Secondary Air Set at 1"x3"
10 30	611.9	.6	434	723	587	570	623	556	874	1374	76	-.078	Fan: ON HIGH
15 35	611.3	.6	412	688	574	540	618	552	857	1383	74	-.075	TUNNEL ON AT: 1347
20 40	610.8	.5	385	645	562	518	611	542	846	1377	73	-.074	Buckets ICED ✓
25 45	610.4	.4	362	602	552	503	600	532	841	1308	72	-.070	ANALYZERS SPANNED ✓
30 50	610.2	.2	337	562	544	492	589	524	836	1186	72	-.064	Pumps turned on at: 1430
35 55	610.0	.2	314	520	531	488	572	515	828	1074	72	-.059	ΔT
40 1400	610.0	0	295	479	511	482	665	506	820	1090	71	-.055	508.6 ✓
45 05	609.9	.1	285	1153	499	475	556	500	813	1005	71	-.054	Check WB/DB: 76/98
50 10	609.9	0	274	431	491	464	547	495	802	993	72	-.050	± Raked Coals Around,
55 15	609.8	.1	266	413	478	455	537	491	788	1125	73	-.050	
	—												Probe IN TUNNEL ✓
60 1420	609.8	0	259	404	464	440	525	484	770	1053	72	-.049	463.4
65 25	609.8	0	253	393	452	427	513	476	754	987	71	-.046	452.2
70 30	609.7	.1	246	404	441	414	500	470	738	938	71	-.047	
75 35	609.7	0	242	390	432	404	490	466	721	923	70	-.048	sm blue VC 436.4
80 40	609.6	.1	236	363	424	395	479	463	644	915	70	-.046	to ball b, 424.8
85 45	609.6	0	231	355	418	387	470	460	627	878	70	-.045	418.0
90 50	609.3	.0	230	347	410	380	461	459	614	914	70	-.044	Removed 0.3lbs 411.4
95 55	609.2	.1	224	343	403	373	454	457	602	870	70	-.044	406.0
100 1500	609.2	.0	221	340	396	365	446	454	590	846	69	-.043	400.2
105 05	609.2	0	218	336	390	357	439	451	579	839	69	-.042	394.6
110 10	609.1	.1	217	333	386	352	435	449	572	832	69	-.041	391.4 ✓

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/21/99
Run: EPA #2 Technician(s): ATM, RLS.
Page: 1 of 4

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	~~Condenser~~	2nd
0 / 1500	333	388	352	435	449	572	832	69	88	251	40	79	53	244	769
5 / 15	421	380	336	417	438	556	1117	71	192	255	41	84	38	243	629
10 / 20	427	374	316	406	439	544	1221	70	100	258	41	85	38	244	630
15 / 25	417	368	303	394	438	531	1190	70	96	260	40	84	38	244	617
20 / 30	441	360	293	383	434	525	1221	70	97	254	41	84	38	244	645
25 / 35	495	359	287	380	430	524	1250	70	98	251	42	84	38	243	656
30 / 40	533	357	283	380	428	526	1228	70	99	249	41	84	37	243	685
35 / 45	575	361	273	394	426	535	1243	70	100	248	41	84	39	244	719
40 / 50	584	366	268	388	424	544	1221	70	100	247	42	84	38	244	737
45 / 55	575	374	266	391	421	553	1287	71	99	246	41	85	38	244	774
50 / 1600	558	382	266	396	419	560	1291	71	99	246	41	85	38	244	795
55 / 05	545	390	268	404	418	567	1272	70	99	245	41	85	38	244	806
	5904	4459	3511	4758	5164	6537	14373	842							
60 / 1610	550	395	272	414	416	575	1249	70	100	245	41	86	38	244	811
65 / 15	550	398	274	420	416	578	1180	71	100	245	41	86	38	241	803
70 / 20	558	396	279	431	414	584	1216	71	100	244	42	86	38	244	827
75 / 25	552	397	285	442	413	588	1218	71	100	244	43	86	38	244	832
80 / 30	541	399	292	454	413	594	1216	71	99	244	40	86	38	244	847
85 / 35	527	400	300	464	413	597	1247	71	99	244	40	87	38	243	906
90 / 40	516	405	308	469	414	601	1231	71	97	243	41	86	38	244	905
95 / 45	505	410	316	471	413	604	1229	72	96	243	41	86	38	244	914
100 / 50	486	414	323	472	413	606	1214	73	94	242	42	86	38	243	958
105 / 55	471	416	331	473	413	607	1172	72	94	241	42	86	38	243	894
110 / 1700	454	415	339	472	414	607	1135	72	92	240	42	85	38	243	860
116 / 05	429	410	349	471	416	604	1046	73	91	239	42	85	38	242	858
	6139	4855	3668	5453	4968	7145	14353	858							
	10113	9314	7129	10211	10132	13682	28726	1700							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Plt: HIGH VALLEY X-TEC Date: 3/31/99
Run: EPA #2 Technician(s): ATM, RLS,
Page: 2 of 4 2nd Hot Box

T/C# / Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tunnel	13 C. Gas Box	14 Impinger Out	15 5G-1 Filter	16 5G-1 Condenser	17 Con-~~dar~~	18
120 1710	408	404	355	468	418	600	477	72	91	238	41	85	38	242	
125 15	387	398	360	465	421	591	912	73	89	237	40	84	38	242	
130 20	381	396	361	463	422	588	902	73	89	236	40	84	39	242	
135 25	367	391	361	459	424	581	883	73	88	235	40	83	39	241	
140 30	358	386	363	456	425	574	874	73	87	235	40	83	39	242	
145 35	350	382	364	454	426	568	866	72	87	234	40	83	39	241	
150 40	341	379	366	451	427	562	852	73	86	233	40	82	39	241	
155 45	335	376	368	449	428	558	838	73	85	233	39	82	39	241	
160 50	329	372	370	445	429	552	827	73	85	234	39	82	39	241	
165 55	323	369	370	442	429	547	817	72	84	234	39	81	39	240	
170 1700	319	366	369	439	430	542	812	72	84	235	39	81	34	241	
175 05	315	362	368	435	430	536	802	72	84	235	37	80	39	241	
	4213	4581	4376	5426	5104	6799	10362	871							
180 1810	310	358	368	432	430	530	794	72	83	235	39	80	39	241	ΔT 3796
185 15	307	356	367	429	430	524	782	72	83	235	39	80	39	240	
190 20	304	351	367	426	429	519	778	71	82	235	40	79	38	240	
195 25	301	348	368	424	427	514	774	71	82	235	40	79	38	240	
200 30	298	345	368	423	426	509	771	71	81	234	40	79	39	241	
205 35	297	344	368	422	425	506	770	72	81	234	40	79	39	240	3712
210 40	296	340	367	422	423	503	768	71	81	234	40	78	39	239	
215 45	294	339	368	421	421	499	757	71	81	234	40	78	39	239	
220 50	292	336	369	420	420	495	752	71	80	234	40	78	39	239	
225 55	291	332	370	420	419	490	752	70	81	234	40	77	39	239	
230 1900	289	332	370	420	418	487	747	70	80	234	40	77	39	240	
235 05	288	330	371	419	417	484	742	70	80	233	40	77	39	240	
	3567	4111	4421	5078	5085	6059	9187	852							
	7780	8692	8797	10504	10194	12858	19549	1723							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/21/99
Run: EPA #2 Technician(s): ATM, PLS.
Page: 3 of 4

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Condar	
240 1410	286	327	372	419	416	479	730	70	80	233	40	77	39	240	
245 15	283	326	372	417	414	472	715	71	80	233	40	76	39	239	
250 20	281	322	371	415	412	468	710	70	80	233	40	76	39	240	
255 25	278	320	370	412	410	464	712	71	80	233	40	76	39	239	
260 30	276	318	370	409	408	462	710	71	80	232	40	76	39	239	
265 35	275	317	371	407	408	459	709	71	80	233	40	76	39	239	
270 40	273	316	373	404	407	457	705	70	80	232	40	76	39	238	
275 45	272	314	376	402	406	454	698	71	80	232	40	76	39	239	
280 50	270	313	375	399	404	451	696	71	80	232	40	76	39	238	
285 55	269	312	376	397	402	447	694	70	80	232	40	76	39	238	
290 2000	267	311	375	395	400	445	690	71	80	232	40	76	39	239	
295 05	266	309	375	393	398	442	687	71	80	232	40	76	39	239	
	(3296)	(3805)	(4476)	(4864)	(4885)	(5500)	(8456)	(848)							
300 2010	265	308	376	391	395	438	683	71	80	233	40	76	39	238	
305 15	264	306	377	389	393	436	681	71	81	233	40	76	39	239	
310 20	262	304	376	387	391	432	674	71	81	233	40	76	39	239	
315 25	261	303	375	386	388	428	671	71	81	232	40	76	39	238	
320 30	259	299	374	384	384	423	681	71	81	233	41	76	39	238	
325 35	258	297	376	383	380	420	676	71	80	233	41	76	40	239	
330 40	257	296	375	382	376	417	663	71	81	233	41	76	40	239	
335 45	256	295	371	379	373	415	655	71	81	233	41	76	40	239	
340 50	254	294	367	375	370	412	654	71	80	232	41	76	40	239	
345 55	251	292	365	372	368	410	651	71	80	232	41	76	40	238	
350 2100	251	290	363	368	366	407	645	71	81	232	41	76	40	239	
355 05	250	284	362	366	365	405	639	71	81	233	42	76	40	239	
	(3080)	(3568)	(4457)	(4562)	(4549)	(5043)	(7973)	(852)							
	(6384)	(7373)	(8933)	(9431)	(9434)	(10543)	(16429)	(1700)							

0

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HiValley XTEC Date: 3/21/99
Run: EPA 2 Technician(s): ATTM
Page: 4 of 4

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	~~Con-~~ dar	
360 / 210	249	282	360	362	363	401	635	71	81	233	42	76	40	239	
365 / 15	245	285	359	360	359	398	628	71	81	233	43	77	40	239	
370 / 10	245	282	358	357	357	395	625	71	80	232	43	77	40	239	
375 / 25	244	282	355	355	354	393	610	71	80	232	44	77	40	239	
380 / 30	241	280	347	351	350	391	600	71	81	233	44	76	40	239	
385 / 35	239	278	342	348	348	390	595	71	81	233	43	76	40	239	
390 / 40	237	276	338	345	345	389	589	71	81	233	45	77	40	239	
395	1700	1971	2459	2479	2476	2757	4282	4971							
400															
405															
410	2790	2735	27368	32628	32236	39840	68986	5620	79÷						
415															
	353.3	346.2	346.4	413.0	408.1	504.3	873.2	71.1			Delta T				
420															
425	353	346	346	413	408	504	873	71			Start		391.4		
430											Stop		308.2		
435													-83.2		
440															
445															
450															
455															
460															
465															
470															
475															

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-1

Site: Myren Consulting, Woodinville, WA Date: 3/31/99 Analyte: CO_2

Source: HIGH VALLEY X-TEC Run #: EPA #2

Zero Cyl #: 36919 Conc. 00.0 % CO_2 Cyl Press: 250 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0 % CO_2 Cyl Press: 1480 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Horiba Model: PIR-2000 SN: 607024

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

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

EPA Span Value = 25.0% CO_2

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

Pre Run Audit: By: ATM, RLS. Time: 1405 Temp: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.001	.0504	+.0504	+0.20
Span	24.0	.240	6.0	235	.238	5.941	-.0590	-0.98

Comments:

Post Run Audit: By: ATM, RLS. Time: 2210 Temp: 70 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0256	+.0256	+0.10
Span	24.0	.240	6.0	6.0	.242	6.040	+.0404	+0.67

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-2

Site: Myren Consulting, Woodinville, WA Date: 3/21/99 Analyte: O_2

Source: HIGH VALLEY X-TEC Run #: EPA #2

Zero Cyl #: 36919 Conc. 00.0 % O_2 Cyl Press: 250 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 350-1060 Conc. 6.0 % O_2 Cyl Press: 1480 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Taylor Model: OA 137 SN: 137/4772

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 25.0% O_2

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

Pre Run Audit: By: ATM, RLS. Time: 1405 Temp: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0	00.0	-.0155	-.0155	-0.06
Span	6.0	24.0	6.0	6.0	23.9	5.9805	-.01946	-0.32

Comments:

Post Run Audit: By: ATM, RLS. Time: 2210 Temp.: 70 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	-.0155	-.0155	-0.06
Span	6.0	24.0	6.0	6.0	24.0	6.0056	+.0056	+0.09

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-3

Site: Myren Consulting, Woodinville, WA Date: 3/21/97 Analyte: CO

Source: HIGH VALLEY X-TEC Run #: EPA # 2

Zero Cyl #: 36919 Conc. 00.0 % CO Cyl Press: 250 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 1.26 % CO Cyl Press: 1400 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Infra Red Model: 702 D SN: 113

Range: 0 - 10.0% CO Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 5.0% CO
EPA Control Limits = +2.5% of 5.0% CO = + 0.125% CO

Pre Run Audit: By: ATH, RLS. Time: 1405 Temp: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.1	.000	.0091	-.0091	-0.18
Span	1.26	2.52	1.26	1.25	24.7	1.2317	-.0283	-2.25

Comments:

Post Run Audit: By: ATH, RLS. Time: 2210 Temp.: 70 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.1	.0040	-.0040	-0.08
Span	1.26	2.52	1.26	1.26	24.9	1.2417	-0.0183	-1.45

Comments:

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

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

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

Unit: HIGH VALLEY X-TEC
Run: EPA #2
Date: 3/31/99
Technicians: ATH, RLS.
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: _____ °F T/C#30: _____ °F

Thermocouple Check (at ambient): T/C#1: 61 °F; T/C#2: 60 °F;

T/C #3: 165 °F; T/C #4: 201 °F; T/C #5: 200 °F;

T/C #6: 188 °F; T/C #7: 176 °F; T/C #8: 161 °F;

T/C #9: 165 °F; T/C #10: 189 °F; T/C #11: 60 °F;

T/C #12: 60 °F; T/C #13: 60 °F; T/C #14: 49 °F;

T/C #15: 60 °F; T/C #16: 51 °F; T/C #17: 61 °F;

T/C #18: _____ °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: Stove Still warm from previous burning.

Thermocouple Readout: Pretest Zero/Span Check and Calibration:

Zero (0°F)	: 000 °F	Adj to: — °F	Post Test Check Zero (0°F):	001 °F	% Difference +0.05
Span (2000°F)	: 2000 °F	Adj to: — °F	Span (2000°F):	2000 °F	0

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

Thermocouple Readout Pretest Linearity Check

0°F =	000 °F;	200°F =	202 °F;	400°F =	399 °F;
600°F =	600 °F;	800°F =	800 °F;	1000°F =	1002 °F;
1200°F =	1201 °F;	1400°F =	1401 °F;	1600°F =	1600 °F
1800°F =	1799 °F;	2000°F =	2000 °F		

Combustion Gas (CO_2, O_2, CO) Train Leak Check: Pre ✓ Post ✓

Draft (Static) Guage Zero Check: Pre ✓ Post ✓

Scale Check Pre (Wt, #'s): 611.6 - 606.6 = 5.0/5.0 = Ok ATM

Post (Wt, #'s): 613.6 - 608.8 = 5.0/5.0 = Ok (ATM)

Stack cleaned prior to the run: Yes ____ No ✓

Tunnel cleaned prior to the run: Yes ____ No ✓

DILUTION TUNNEL CALCULATIONS

MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	hivalleyepa6
Stove Manufacturer:	HI VALLEY
Model Number:	XTEC
Lab Name:	MYREN
Test Date:	3\30\99
Run Number:	EPA 6
Meter Box Y Factor:	1.003
Barometric pressure (in):	28.394
Gas meter temp (ave):	81
delta H(avg):	0.898
Gas meter initial reading:	617.408
Gas meter final reading:	744.112
Front catch (acetone) mg:	5.7
first filter catch (mg):	9.9
second filter catch (mg):	-2.8
tunnel flow (ave cfm):	140.471
Emission Rate(g/hr):	0.917
Emission Rate(M5H) :	1.694
vs/VmTs:	0.0126
vs ave:	849.843
Tunnel average temp (°f):	111.042
Test time(min):	230
Fuel Load(lb. wet):	17.4
Wood moisture(%wet):	17.234
Burn rate(dry kg/hr):	1.704
Samp vol(scf):	117.884
front filter number	785
back filter number	783
acetone beaker number	6
PRELIMINARY RESULTS	
FINAL RESULTS	AUDITED
DATA SUMMARY	
MODEL :	XTEC
RUN:	EPA 6
DATE:	3\30\99
DBR:	1.704
GPH UNADJ	0.917
ADJ	1.693873102

RUN TIME (min)	PITOT DELTAP (- INCH H20)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCIT (ft/min)	PROP RATE (%)	dDGM vol std (ft3)
0	0.040	110	617.408	72	0.900	851.48		
10	0.036	141	622.301	73	0.900	829.46	94.7	4.623
20	0.040	142	627.795	74	0.900	875.06	109.2	5.181
30	0.040	141	633.275	77	0.890	874.33	102.5	5.138
40	0.040	137	638.701	78	0.890	871.42	100.7	5.078
50	0.040	133	644.041	79	0.890	868.49	98.6	4.989
60	0.039	130	649.691	80	0.900	855.40	103.9	5.269
70	0.040	124	655.204	81	0.890	861.88	101.7	5.131
80	0.040	117	660.785	82	0.900	856.70	100.8	5.185
90	0.040	113	666.365	81	0.890	853.72	100.9	5.194
100	0.040	109	671.831	82	0.900	850.74	98.3	5.078
110	0.040	106	677.382	83	0.900	848.49	99.4	5.148
120	0.040	104	682.946	82	0.900	846.99	99.6	5.160
130	0.040	102	688.505	83	0.900	845.49	99.3	5.155
140	0.040	101	694.105	83	0.900	844.74	100.1	5.193
150	0.040	99	699.635	83	0.900	843.23	98.5	5.128
160	0.040	98	705.165	83	0.900	842.47	98.5	5.128
170	0.040	97	710.738	83	0.900	841.72	99.2	5.168
180	0.040	96	716.315	83	0.900	840.96	99.2	5.172
190	0.040	95	721.859	83	0.900	840.21	98.5	5.141
200	0.040	94	727.425	83	0.900	839.45	98.8	5.162
210	0.040	93	732.995	83	0.900	838.69	98.8	5.165
220	0.040	92	738.549	84	0.900	837.93	98.2	5.141
230	0.040	91	744.112	83	0.900	837.17	98.5	5.159
240						0.00	0.0	0.000
250						0.00	0.0	0.000
260						0.00	0.0	0.000
270						0.00	0.0	0.000
280						0.00	0.0	0.000
290						0.00	0.0	0.000
300						0.00	0.0	0.000
310						0.00	0.0	0.000
320						0.00	0.0	0.000
330						0.00	0.0	0.000
340						0.00	0.0	0.000
350						0.00	0.0	0.000

METHOD 5G-1 PARTICULATE SAMPLING DATA High Valley LAB-

DATE 3/30/99 PAGE 1 OF 2 MODEL # XTEC RUN # EPA 6

METER BOX # 511-M METER Y 1.003 FILTER # (F) 785 (R) 78

PRE TEST LEAK RATE = .000 CFM @ -10.0 IN. HG .143/.143 FILTER SIZE: 110 MM

POST TEST LEAK RATE = .0005 CFM @ -10.0 IN. HG .124/.1245 PROBE LENGTH 24" glass

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1425	00	617.408	-.040	110	72	.90	0
35	10	622.301	-.036	141	73	.90	0
45	20	627.795	-.040	142	74	.90	0
55	30	633.275	-.040	141	77	.89	0
1505	40	638.701	-.040	137	78	.89	0
15	50	644.041	-.040	133	79	.89	0
25	60	649.691	-.039	130	80	.90	0
35	70	655.204	-.040	124	81	.89	0
45	80	660.785	-.040	117	82	.90	0
55	90	666.365	-.040	113	81	.89	0
1605	100	671.831	-.040	109	82	.90	0
15	10	677.382	-.040	106	83	.90	0
25	20	682.946	-.040	104	82	.90	0
35	30	688.505	-.040	102	83	.90	0
45	40	694.105	-.040	101	83	.90	0
55	50	699.635	-.040	99	83	.90	0
1705	60	705.165	-.040	98	83	.90	0
15	70	710.738	-.040	97	83	.90	0
25	80	716.315	-.040	96	83	.90	0
35	90	721.859	-.040	95	83	.90	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.035	114
2	1.5"	.043	115
3	4.5"	.04	115
4	5.5"	.035	115
W-1	0.5"	.035	116
2	1.5"	.043	116
3	4.5"	.04	116
④	5.5"	.035	115
	Avg.	.03825	115.25
			575.25

Pilot Leak Check Pre ✓ Post ✓

Cp = 0.99

N
1
2
→ W 1 2 (3rd)
3
4

*=point of Avg. delta p

$Qs = \left(\sqrt{\frac{\Delta P \times BP}{T(°R)}}\right) \times 3167.2 =$

137.706 cfm

BP = Start 28.43 in Hg ↓

60 28.41
120 28.39
180 28.38
240 28.36

$\bar{X} = 28.394$

METHOD 5G-1 PARTICULATE SAMPLING DATA Hirsch Video LAB-

DATE 3/30/99 PAGE 2 OF 2 MODEL # XTEC RUN # EPA 6

METER BOX # 511-M METER Y 1.003 FILTER # (F) 785 (R) 78

PRE TEST LEAK RATE = .000 CFM @ -10.0 IN. HG, 143 / .143 FILTER SIZE: 110MM

POST TEST LEAK RATE = .0005 CFM @ -10.0 IN. HG .124/ PROBE LENGTH 24" glass

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1745	200	727.425	-.040	94	83	.90	0
55	(10)	732.995	-.040	93	83	.90	0
1805	20	738.549	-.040	92	84	.90	0
15	30	744.112	-.040	91	83	.90	0
	40						
	50						
	60						
	70						
	80						
	90						
	00						
	10						
	20						
	30						
	40						
	50						
	60						
	70						
	80						
	90						

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.035	114
2	1.5"	.043	115
3	4.5"	.040	115
4	5.5"	.035	115
W-1	0.5"	.035	116
2	1.5"	.043	116
3	4.5"	.040	116
4	5.5"	.035	115
		.03825	115.25
			575.2

Pitot leak check: Pre ✓ Post ✓

Cp = 0.99

→ W 1 3 (*) 4

*=point of Avg. delta P

$$Qs = \left(\sqrt{\frac{(\Delta P \times BP)}{T(°R)}}\right) \times 3167.2 =$$

137.706 cfm

BP = ~~Start~~ 28.43 in Hg
60 28.41
120 28.39
180 28.38
230 28.36

$\bar{X}$ = 28.394

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

Into Dessicator: Date 1/3/99 Time 12:00 By ATM Front Half ✓ Back Half ✓

Manufacturer: Schleicher & Schuell Size: 11cm Lot No.: 7895.1 Grade: #25 glass
Order No. 06220

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
776	.7853	2/7/99	12:55	T.M.	.7853	2/10/99	1629	ATM				
777	.8127		12:56	T.M.	.8129		1628	ATM				
778	.8044		12:57	T.M.	.8040		1627	ATM				
779	.8036		12:58	T.M.	.8034		1626	ATM				
780	.7889		12:59	T.M.	.7888		1625	ATM				
781	.7894		1:00	T.M.	.7892		1625	ATM				
782	.7905		1:01	T.M.	.7903		1624	ATM				
783	.7967		1:02	T.M	.7968		1623	ATM	←			
784	.8120		1:03	T.M.	.8118		1622	ATM	—TORN			
785	.8166		1:04	T.M.	.8164		1621	ATM	←			
786	.7925		1:05	T.M	.7923		1620	ATM				
787	.8064		1:06	T.M	.8064		1619	ATM				
788	.7928		1:07	T.M.	.7926		1619	ATM				
789	.7774		1:08	T.M	.7774		1618	ATM				
790	.7835		1:09	T.M.	.7835		1617	ATM				
791	.7981		1:10	T.M.	.7982		1616	ATM				
792	.8036		1:11	T.M	.8035		1615	ATM				
793	.8116		1:12	T.M	.8116		1614	ATM				
794	.8025		1:13	T.M.	.8024		1613	ATM				
795	.7766		1:14	T.M	.7760		1613	ATM				
796	.7916		1:15	T.M	.7915		1612	ATM				
797	.7755		1:16	T.M.	.7756		1611	ATM				
798	.8133		1:17	T.M.	.8133		1610	ATM				
799	.7949		1:18	T.M	.7948		1610	ATM				
800	.8266	✓	1:19	T.M	.8266	✓	1609	ATM				

Checked by Jim Taylor Date: 2/21/99 Time 1405

QA REWEIGH

Filter #	WT	Date	Time	By	
781	.7891	2/21/99	1412	Jim	←
789	.7772	2/21/99	1414	Jim	←
795	.7765	2/21/99	1415	Jim	← QA

Post Weighing Scientech Scale Check

1st		2nd	3rd
0.0000	0.0010	0.0000	0.0000
1.0000	1.0001	1.0000	1.0001

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
62	76	45	2/7/99	1235	ATM
63	72	45	2/10/99	1605	ATM
65	80	44	2/21/99	1312	ATM

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 1/4/99 Time: 1600 By: A.T.Myles

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4840	2/1/99	915	ATM	65.4838	2/3/99	1605	JM				
2	66.1516	"	917	ATM	65.1515	2/3	1606	JM				
3	67.8577	"	919	ATM	67.8571	2/3	1609	JM	67.8571	2/7/99	1245	ATM
4	67.5891	"	920	ATM	67.5886	2/3	1612	JM				
5	Broken	"										
6	67.4282	"	921	ATM	67.4282	2/3	1615	JM	←			
7	65.5451	"	922	ATM	65.5453	2/3	1617	JM				
8	60.0213	"	923	ATM	60.0213	2/3	1618	JM	← Blanks			
9	66.9293	"	924	ATM	66.9294	2/3	1620	JM				
10	66.0888	"	926	ATM	66.0885	2/3	1621	JM				
11	65.6997	"	927	ATM	65.7015	2/3	1623	JM	65.7016	2/7/99	1247	ATM
12	56.0653	"	928	ATM	56.0652	2/3	1625	JM				
13	57.8945	"	929	ATM	57.8942	2/3	1627	JM				
		↓										

Checked By: A.T.Myles Date: 2/8/99 Time: 1705

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
55	69	39	2/1/99	0910	ATM
63	76	48	2/3/99	1555	ATM
62	76	45	2/7/99	1235	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9,Pg1,Rev4/90
Unit Hi Valley XTEC
Run # EPA 6
Date: 3/30/99

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
6	✓	4/13/99	1630	TDM	67.4341	4/16/99	1240	ATM	67.4340	4/17/99	17:15	DM				

FINAL FILTER WEIGHTS

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	785	.8269	3/30/99	1850	ATM	.8264	3/31/99	1016	JM	.8263	4/15/99	18:01	DM				
R	783	.7943	3/30/99	1850	ATM	.7942	3/31/99	1015	JM	.7940	4/15/99	18:02	DM				

Note: 784 was torn - rejected

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	3/31	1060	JM	64	80	41
2	4/5	1730	ATM	64	80	41
3	4/16	1230	ATM	66	82	42
4	4/17	1625	ATM	68	84	43
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-1: CONSTANT FINAL WEIGHTS

Blank 3/13/99

WST5-Form9, Pg1, Rev4/90
Unit Hi Valley X TEC
Run # EPA-6
Date: 3/30/99

Acetone Blank - 100 ml Acetone

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
8	✓	3/18/99	0854	ATM	66.0215	3/29/99	2237	ATM	66.0215	3/30/99	1332	ATM				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/18	2140	ATM	68	84	43
2	3/20	1300	ATM	64	84	32
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

Dates From 1/9/99

Through _____

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Mettler
Model AE100
SN K04827

Level	Recali-brated	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Date	Time	Tech	Wet Bulb	Dry Bulb	% RH
✓	Yes P.O.	99.9999	10.0001	1.0002	.1003	.0203	1/9/99	1243	ATM	58	70	48
✓	No	100.0002	10.0000	1.0000	.1000	.0200	1/14/99	1113	ATM	62	75	47
✓	YES P.O.	99.9998	10.0002	1.0000	.0999	.0201	1/23/99	1100	ATM	63	77	47
✓	YES	99.9998	10.0000	1.0000	.1000	.0201	1/24/99	1318	ATM	59	74	45
✓	YES	99.9996	10.0002	1.0000	.1000	.0200	2/1/99	0910	ATM	55	69	39
✓	YES	99.9997	10.0001	1.0001	.1002	.0201	2/2/99	0939	ATM	60	73	46
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	2/3/99	1555	ATM	63	76	48
✓	YES	99.9999	10.0000	1.0001	.1001	.0201	2/17/99	1235	ATM	62	76	45
✓	YES	99.9998	10.0000	1.0000	.1000	.0200	2/10/99	1600	ATM	63	77	45
✓	YES	99.9998	10.0000	1.0001	.1000	.0200	2/19/99	0246	ATM	64	78	46
✓	NO	99.9999	10.0000	1.0000	.1000	.0200	2/21/99	1312	ATM	65	80	44
✓	No	99.9997	10.0000	1.0001	.1000	.0200	3/5/99	1935	ATM	64	80	41
✓	YES P.O.	99.9997	10.0000	1.0000	.1001	.0200	3/6/99	1135	ATM	64	79	43
✓	YES	99.9997	10.0000	1.0001	.1000	.0200	3/13/99	1526	ATM	65	80	44
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	3/14/99	1355	ATM	63	78	43
✓	No	100.0001	10.0000	1.0000	.1000	.0200	3/15/99	1622	ATM	66	81	45
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/16/99	2025	ATM	65	82	39
✓	Yes	99.9996	10.0000	1.0001	.1001	.0200	3/17/99	1615	ATM	62	77	43
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/18/99	2140	ATM	68	84	43
✓	Yes	99.9998	10.0000	1.0000	.1000	.0200	3/20/99	1300	ATM	64	84	32
✓	Yes	99.9999	10.0000	1.0001	.1001	.0201	3/21/99	2215	ATM	61	74	47
✓	Yes	99.9997	10.0000	1.0000	.1001	.0200	3/22/99	0127	ATM	65	85	33
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/23/99	1115	ATM	69	84	46
✓	Yes	99.9998	10.0000	1.0002	.1001	.0201	3/24/99	1120	ATM	72	89	43
✓	Yes	99.9999	10.0000	1.0002	.1001	.0201	3/29/99	2038	ATM	59	72	45
✓	No	99.9999	10.0002	1.0002	.1001	.0202	3/30/99	0610	ATM	66	80	47
✓	No	99.9999	10.0000	1.0000	.1001	.0201	3/31/99	1000	JMS	64	80	41
✓	NO	99.9996	10.0000	1.0000	.1001	.0201	4/5/99	1730	ATM	64	80	41
✓	Yes	99.9998	10.0001	1.0001	.1001	.0201	4/6/99	1030	ATM	61	75	44
QC Services		Audit	4/6/97	- wt.	Scale Check o/k		4/6/99					
✓	NO	100.0003	10.0001	1.0001	.1001	.0201	4/6/99	1730	ATM			
✓	YES	99.9998	10.0001	1.0001	.1001	.0200	4/7/99	1724	ATM	65	85	33
✓	No	99.9996	10.0000	1.0001	.1001	.0201	4/8/99	1346	ATM	67	80	50
✓	YES	99.9997	10.0000	1.0000	.1000	.0200	4/16/99	1230	ATM	66	87	43
✓	YES	99.9997	10.0000	1.0000	.1000	.0200	4/17/99	1625	ATM	68	84	43

Woodstove Particulate
Catch Processing Sheet
Woodstove Data Sheet #5
EPA M5G-1

Unit: High Valley XTSC
Run: EPA-6
Date: 3/30/99
Technicians: ATM
Revised 1/16/98-Data Sheet #5

Filters

Filter # (Front) 785 Beaker # 6 Final Wt. 67.4340 g
Final Wt. .8263 g Ml 50 Tare Wt. 67.4282 g
Tare Wt. .8164 g Desc. Acetone Net Wt. .0058 g
Net Wt. .0099 g

Filter # (Rear) 783 Beaker # _____ Final Wt. _____ g
Final Wt. .7940 g Ml _____ Tare Wt. _____ g
Tare Wt. .7968 g Desc. _____ Net Wt. _____ g
Net Wt. -.0028 g

Acetone Blank Calculation: Blank Date: 3/13/99

Blank Beaker # 8 Final Wt. 66.0215 g
Ml 100 Tare Wt. 66.0213 g
Desc. Acetone Net Wt. .0002 g
.0002 g ÷ 100 ml = .000002 g/ml

Blank Residue Value Calculation:

.000002 g/ml acetone X 50 ml acetone = .0001 g
Blank Residue Value

Total Particulate Catch Calculation

Filter: .0099 g
Filter: -.0028 g
Beakers: .0058 g (Total Catch) - .0001 g (Blank Residue Value) = .0057 g
Total Catch = .0128 g

Unit HIGH VALLEY X-TRC
Run # EPA #6
Date 3/30/99
Technician ATH, KLS,
WST6-Form1, Rev8/96

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 2.713 ft^3

Dilution Tunnel Draft (If applicable): Start 00.0 Stop 00.0

Test Chamber Air Velocity: Start: 00.0 Stop: 00.0 Avg: 00.0

Wet Bulb/ Start: WB: 64 °F DB: 75 °F 1.6 % Amb Moisture 54 %RH

Dry Bulb Stop: WB: 60 °F DB: 69 °F 1.45 % Amb Moisture 59 %RH

$\bar{X}$ = 1.5125 % Ambient Moisture $\bar{X}$ = 56.5 % Relative Humidity (RH)

Empty Stove Wt: lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 607.6 lbs. Dry: 605.2 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 605.2 lbs.

Kindling Wt. Paper: 0.7 lbs. Wood: 5.7 lbs.

Pre Burn Fuel Wt. 16.8 + 15.7 + 16.8 Total: 49.3 lbs. ✓

Total Kindling and Pre Burn Fuel Wt ✓ ✓ 55.7 lbs. ✓

Coal Bed Wt-lbs: Range(4.2 - 3.5) 609.5 - 608.7 lbs. Actual: lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range 4.25 (Upper Wt.) + 3.48 (Lower Wt.) /2 X .25 = 0.9 ✓ lbs.

Test Fuel Wt-lbs: Ideal 19.0 lbs. Range: 17.1-20.8 lbs. Actual: 17.4 lbs. ✓

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Flanges) 20 Pcs.

2 x 4's x	16 7/8 "	4 Pcs	8.7 lbs.	50.00 % ✓
4 x 4's x	16 7/8 "	2 Pcs	8.7 lbs.	50.00 % ✓

Est. Dry Burn Rate (Kg/Hr.) $\frac{17.4 - (17.4 \times .17234)}{2.2046} \times \frac{60}{230} = 1.704$ Est. Dry Burn Rate (Kg/Hr) ✓

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) X $\frac{63}{100}$ x 1.704 = 20,548 Est Heat Output (HO_E) BTU's/Hr ✓

Comments:

Stove Operating Data
Woodstove Test Data Sheet #9
Cold Start

Unit: HIGH VALLEY X-TEC
Run: EPA #6
Date: 3/30/99
Technician(s): ATM RLS,
Data Sheet #9 - Rev 1/98-Pg.1

Fire Started: 0950 P.S.T.

Warm up and Preburn: Primary Air: Wide open from ignition until the start of preburn when the primary air control(s) was (were) adjusted to the run setting of . 1 1/4" . At the run setting until the start of the test.

Secondary Air: No Controls. Naturally drafted.

Secondary Burn/Cat Bypass: N/A

Charcoal Bed Preparation: Broke up, raked and leveled the coal bed prior to the addition of each warm up/pre burn fuel charge. Starting 1130 before the start of the test, broke up, raked and leveled the coal bed. In stove for 35 seconds.

Test: Door wide open during loading 1 min 11 sec, then closed

Primary Air: Wide open during the start of the test until 4:55 .
Adjusted to the run setting of 1 1/4" between 4:55 and 5:00 .
At the run setting of 1 1/4" open at 5:00 into the run.

Secondary Air: No Controls. Naturally drafted

Secondary Burn/Cat Bypass:

Fan: Off during warm up. On high during preburn. Off at the start of the test. Off for the 1st 30 minutes of the test.
Test Run Anomalies: On high @ 30 mins into test. On high for the rest of the test.

↑ This run went faster than expected,

Unit HIGH VALLEY X-TEC
Run # EPA #6
Date 3/30/99
Technician ATH, RLS.
Page 1 of 3
WST7-Form2-A, Rev10/88

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-1

Wood Data: Kindling: A mix of the below grades

	Size	Mill	Grade	Species
Pre Burn	2X4	CANYON LBR.	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2X4	CANYON LBR.	#2 STD. & BTR.	D. FIR, S. GRN.
	4X4	STAND & 879	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (16.8 lbs) added at 10:12.
2nd Warm up/Pre Burn Fuel charge (15.7 lbs) added at 11:15.
3rd Warm up/Pre Burn Fuel charge (16.8 lbs) added at 12:35.
4th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
5th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
6th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
7th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
8th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.

The coals were scooped out of the stove immediately prior to adding the _____ pre burn/warm up fuel charge. The stove lost 0.4 lbs. 3.0 lbs of coals were put back in after the scoop.

All pre burn/warm up fuel pieces were either 16 or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 16 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 16 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 3 pcs 16 inches long. The majority of the pieces in each rick were in the second layer which had an approximate 0.5-1.0" space between pieces. (The loading directions indicate the direction of the longest dimension on each piece relative to the loading door opening.) Each pre burn/warm up fuel charge normally weighs within the weight range allowed for the actual test fuel charge

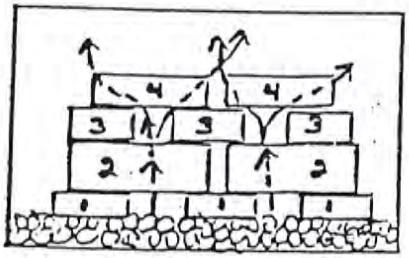
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

Run # EPA #6
Date 2/30/94
Technician ATH, RLS,

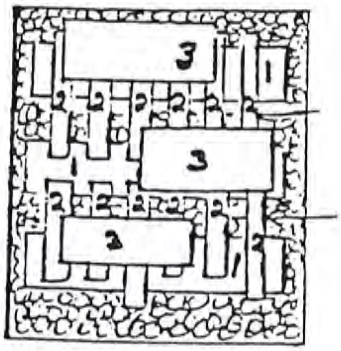
WST7-Form2-A, Rev 6/90

Warm up Information (cont.):

Each warm up/preburn fuel charge was ricked in exactly (as much as possible) the same manner and the weight of each rick was usually within the allowable weight range for the test fuel charge. The physical arrangement and alignment of each rick was designed to accomplish three (3) things: (1)The bottom layer was nestled firmly into the coal bed and was as close to being level with the bottom of the stove as possible, thus providing a stable loading platform for the rest of the rick, keeping it in a ricked state (as opposed to a col- lapsed or fallen down state) untill the rick reached the charcoal stage and sags or collapses of its own accord. (2) It enhances the flow of primary air through the ricked preburn fuel charge, for the primary air would flow through the spaces between the pieces in the first layer and then up through the spaces between the pieces in the second, third and, if present, fourth layers. (3) It maximized, as much as possible, the surface to volume ratio of each preburn fuel charge, thereby allowing the fire immediate access to as much wood surface as possible and, thereby, insuring uniform charcoalization. All three of these enhance combustion and so get the stove as hot as possible during the warm up period, therby maximizing the amount of heat (BTU's) stored in the stove. The actual preburn was not started until the stove surface temperatures had maximized and stabilized, thus indicating that the amount of heat stored in the stove had peaked. For this stove, the thermal storage was monitored using the TOP surface temperature(s) and the peak value(s) obtained were 826 °F.



Front View



Top View

The arrows indicate the direction of the air flow through the rick.

The primary air was adjusted to the run setting of 1¼" open 7.2 lbs above the upper charcoal bed weight.

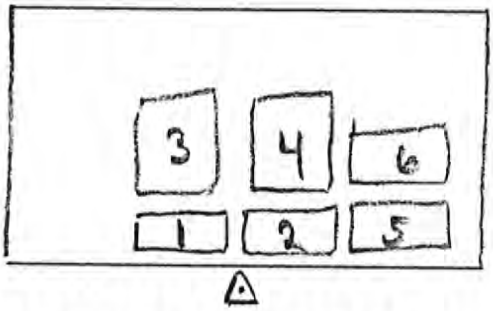
Unit HIGH VALLEY X-TRA
Run # EPA #6
Date 3/30/99
Technician ATH PLS.
Page 3 of 3
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: ① Turned fan off. ② Opened primary control wide open ③ Opened door ④ Loaded fuel ⑤ Cleared coals away from the LPAO ⑥ Photograph ⑦ Closed door.

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



FRONT of stove view

4 X 4's: 3 & 4

2 X 4's: 1, 2, 5 & 6

Loading Sequence: 1, 2, 3, 4, 5 & 6 last

Driest Pcs in Load 1 & 5

Loaded the test fuel charge on an essentially level, medium sized, hot coal bed (in appearance, color and temperature for a med high burn rate. Load 1:11 Ignition N 0155 Ons Balance by 2:30. Never lost balance. Good run. This run took off like a shot. And never slowed down. Which is unusual with a falling barometer

Unit: HIGH VALLEY X-TEC
Run: EPA #6
Date: 3/30/99
Technician: ATM, RLS,

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

WST1-Form7-Rev11/89

Room Temperature: 50 °F Correction Factor: +2

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes ✓. No ____
Time Test Fuel Moisture Readings taken at: 1135
Calibration Checks: X — Y — 12.5 12.5 22.0 22.0

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg
			Uncor	Cor	Uncor	Cor	Uncor	Cor	Corrected
1	2x4x8'	K	14.5	15.4	15.0	15.9	14.5	15.4	15.567
2									
3	2x4x8'	P	21.5	23.1	22.0	23.7	22	23.7	23.500
4	"	P	22.5	24.3	23.0	24.9	22	23.7	24.300
5	"	P	21.5	23.1	21	22.6	20	21.4	22.367
6	"	P	18	19.2	19	20.3	19.5	20.9	20.133
7	"	P	19	20.3	22	23.7	20	21.4	21.800
8	"	P	20	21.4	19	20.3	20	21.4	21.033
9									133.133
10	2x4x16½	T	20	21.4	20	21.4	19.5	20.9	21.233
11	"	T	18	19.2	18.5	19.8	18.5	19.8	19.600
12	"	T	18	19.2	18	19.2	18	19.2	19.200
13	"	T	21	22.6	22.5	24.3	21.5	23.1	23.333
14									
15	4x4x16½	T	20.0	21.4	20.0	21.4	20.0	21.4	21.400
16	"	T	18.5	19.8	19.5	20.9	18.5	19.8	20.167
17									124.933
18									
19	FEET	T	19.5	20.9	19.5	20.9	20	21.4	21.067
20									OUT SPACERS

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	15.567 %	22.189 %	20.822 %
% Moisture - Wet Basis:	13.470 %	18.159 %	17.234 %

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

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

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

Unit: HIGH VALLEY X-TEC
Run#: EDA #6
Date: 3/31/99
Technician: ATM RLS.

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 3½" x 3½" x 1½"

Depth (D): in 1.548 cm 3.9319 ✓

Width (W): in 3.512 cm 8.9205 ✓

Length (L): 3.444 cm in
3.369 cm "
3.448 cm "
3.407 cm "

Length $\bar{X}$ = in 3.4170 ✓ cm 8.6792 ✓

Volume: 304.419 ✓ cm^3
(D X W X L)

MOISTURE: Room Temperature: 55 °F Correction Factor: +1½

Uncorrected Meter Readings Corrected for temperature: Yes ✓ No ___

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	17.0	18.1 %
Bottom:	18.5	19.0 %
Side:	17.0	18.1 %
$\bar{X}$:		18.667 % ✓

Avg % Moisture (Dry) 18.667 % ✓

Aug % Moisture (Wet) 15.730 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 177.1 g Dry Weight: 149.5 g

% Moisture Dried Basis: 15.584 % ✓
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	3/31/99	1130	216 °F
Out of Dryer	4/1/99	1504	214 °F

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

Density = 149.5 g (dry wt) ÷ 304.419 cm^3 (volume) = .4911 g/cm^3 ✓

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ____ g

Wet Wt: ____ g - ____ g = ____ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ____ g - ____ g = ____ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

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

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
Eng Wt.: 608.7 lbs.

Unit: HIGH VALLEY X-TEC Date: 3/30/99
Run: EPA #6 Technician(s): ATH, PLS.
Page: 1 of 2

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO2 v.	1 CO2 %CO2	2 O2 v.	2 O2 %O2	Tel	3 CO v.	3 CO %CO	T/C(1)T/C(2) Bal	Wet Bulb	Dry Bulb	% H2O	T/C(3) Calc W/B	Stack	4 SO2 v.	4 SO2 PPM	Static Press.	Comments
0 / 1425	626.1	17.4	0	.247	6.16	53.9	13.51		18.4	.94	6.6	86	109	3.4	105	321			-.055	Flow FPM
5 / 30	624.6	15.9	1.5	.554	13.80	22.7	5.68		2.1	.12	115.0	129	156	13.5	150	515	Never lost		-.092	SO2 1.5
10 / 35	623.6	14.9	1.0	.550	13.70	25.3	6.33		5.9	.31	44.2	134	160	16.0	148	460	Balance		-.080	CO2 1.8
15 / 40	622.6	13.9	1.0	.584	14.54	23.3	5.83		5.7	.30	118.5	137	162	17.0	150	468			-.080	O2 1.5
20 / 45	621.4	12.7	1.2	.618	15.39	19.4	4.85		5.0	.27	57.0	138	165	17.0	151	481			-.082	CO 1.8
25 / 50	620.2	11.5	1.2	.635	15.81	18.0	4.50		4.1	.22	71.9	137	167	17.0	152	495			-.083	
30 / 55	619.0	10.3	1.2	.611	15.21	20.5	5.13		5.6	.30	50.7	136	168	16.5	151	493			-.082	Fan On Hi
35 / 1500	618.1	9.4	.9	.561	13.97	25.6	6.41		3.4	.20	69.8	134	172	16.0	150	481	Wood LPPO	Fall partially	-.080	
40 / 05	617.1	8.4	1.0	.531	13.22	28.1	7.03		4.7	.27	49.0	131	174	14.5	147	473	blocked off PC2		-.079	
45 / 10	616.2	7.5	.9	.494	12.30	31.6	7.91		6.6	.35	35.2	128	172	13.0	144	460	LPPO Clear		-.076	
50 / 15	615.4	6.7	.8	.492	12.25	31.9	7.99		6.0	.31	39.5	125	170	12.0	142	451			-.076	
55 / 20	614.6	5.9	.8	.501	12.48	30.4	7.61		5.5	.29	43.0	124	168	12.0	142	447			-.075	
																5545			-.940	Flow
60 / 1525	613.9	5.2	.7	.471	11.73	34.4	8.61		0.7	.04	293.3	122	165	11.0	140	441			-.075	SO2 1.5
65 / 30	613.3	4.6	.6	.435	10.84	37.7	9.44		0.5	.03	361.2	118	163	9.5	137	428			-.072	CO2 1.8
70 / 35	612.8	4.1	.5	.384	9.57	42.2	10.57		3.3	.18	53.2	114	158	8.5	134	412			-.070	O2 1.5
75 / 40	612.4	3.7	.4	.346	8.63	45.2	11.32		8.5	.44	19.6	110	155	7.0	130	398			-.068	CO 1.5
80 / 45	612.0	3.3	.4	.305	7.61	48.7	12.20		10.1	.52	14.6	104	148	5.8	126	373			-.064	
85 / 50	611.8	3.1	.2	.288	7.18	50.3	12.60		10.9	.56	12.8	101	146	5.1	123	365			-.064	
90 / 55	611.5	2.8	.3	.266	6.64	50.0	13.03		13.3	.67	9.9	97	143	4.4	121	350	OUT OF	Bal	-.062	
95 / 1600	611.3	2.6	.2	.211	5.27	57.1	14.31		18.1	.92	5.7	91	138	3.4	116	333			-.059	
100 / 05	611.2	2.5	.1	.209	5.22	57.0	14.28		19.3	.98	5.3	88	135	2.9	112	324			-.058	
105 / 10	611.1	2.4	.1	.214	5.34	56.7	14.21		18.1	.91	5.9	87	133	2.7	111	317	PC4 LPPO	Fall blocked	-.056	1→1
110 / 15	611.0	2.3	.1	.218	5.44	56.3	14.10		19.3	.98	5.6	86	132	2.6	110	310			-.056	
115 / 20	610.9	2.2	.1	.211	5.27	57.2	14.33		19.8	.99	5.3	85	131	2.4	110	305			-.055	
																4356			-.759	
																9901			-1.699	

BU[illegible]RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
END WT.: 608.7 lbs,

Unit: HIGH VALLEY/ X-TEC Date: 3/30/99
Run: EPA #6 Technician(s): ATH, RLS,
Page: 1 of 2

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO2 v.	1 CO2 %CO2	2 O2 v.	2 O2 %O2	Tel	3 CO v.	3 CO %CO	T/C(1)T/C(2) Bal	Wet Bulb	Dry Bulb	% H2O	Calc W/B	T/C(3) Stack	4 SO2 v.	SO2 PPM	Static Press.	Comments
120 / 1625	610.8	2.1	.1	.212	5.29	56.9	14.26		20.1	1.02	5.2	84	130	23	110	300			-.054	Flow
125 / 30	610.7	2.0	.1	.209	5.22	57.4	14.38		20.5	1.04	5.0	84	128	2.4	109	295			-.053	SO_2 1.5
130 / 35	610.6	1.9	.1	.207	5.17	57.8	14.49		20.0	1.01	5.1	83	126	23	109	291			-.052	CO_2 1.8
135 / 40	610.5	1.8	.1	.214	5.34	56.9	14.26		19.9	1.00	5.3	83	125	2.4	109	296	LPG TO BURNT	AIR THRU	-.051	O_2 1.8
140 / 45	610.4	1.7	.1	.218	5.44	56.6	14.18		18.7	.95	5.7	83	124	2.4	108	284			-.054	CO 1.5
145 / 50	610.3	1.6	.1	.207	5.17	57.8	14.49		19.4	.97	5.3	83	124	2.4	108	282			-.052	
150 / 55	610.2	1.5	.1	.198	4.95	58.5	14.66		19.7	1.00	4.9	83	124	2.4	108	279			-.052	
155 / 1700	610.0	1.3	.2	.197	4.92	58.5	14.66		2.02	1.03	4.8	83	122	2.4	107	275			-.052	
160 / 05	610.0	1.3	0	.195	4.87	57.2	14.84		2.01	1.02	4.8	82	122	2.4	107	273			-.051	
165 / 10	609.9	1.2	.1	.185	4.62	60.0	15.04		19.9	.97	4.8	82	121	2.3	107	270			-.050	
170 / 15	609.7	1.0	.2	.189	4.72	59.6	14.94		19.9	1.02	4.6	81	119	2.3	106	268			-.051	
175 / 20	609.6	.9	.1	.187	4.67	59.8	14.99		19.9	1.01	4.6	81	120	2.2	106	266			-.050	
																(3364)			(-.622)	Flow
180 / 1725	609.6	.9	0	.178	4.45	60.7	15.21		20.7	1.05	4.2	81	119	2.3	105	263			-.049	SO_2 1.5
185 / 30	609.4	.7	.2	.166	4.15	620	15.54		20.4	1.03	4.0	80	118	2.1	105	259			-.049	CO_2 1.8
190 / 35	609.4	.7	0	.166	4.15	62.1	15.56		20.5	1.04	4.0	80	117	2.1	105	257			-.049	O_2 1.8
195 / 40	609.3	.6	.1	.163	4.08	62.3	15.61		21.2	1.09	3.7	80	117	2.1	104	254			-.048	CO 1.5
200 / 45	609.2	.5	.1	.159	3.98	62.7	15.71		21.5	1.08	3.7	78	116	2.0	104	252			-.048	
205 / 50	609.1	.4	.1	.161	4.03	62.6	15.69		21.1	1.08	3.7	78	116	2.0	104	250			-.047	
(*) 210 / 55	609.0	.3	.1	.165	4.13	62.0	15.54		21.4	1.08	3.8	78	114	2.0	103	248			-.049	
215 / 1800	608.9	.2	.1	.158	3.95	62.9	15.76		20.6	1.04	3.8	78	115	2.0	103	246			-.046	
220 / 05	608.8	.1	.1	.156	3.90	62.9	15.76		21.7	1.10	3.5	78	114	2.0	103	244			-.046	
225 / 10	608.8	.1	0	.156	3.90	62.9	15.76		22.2	1.13	3.5	77	113	1.8	102	242			-.045	
230 / 15	608.7	0	.1	.155	3.88	62.9	15.76		22.3	1.14	3.4	77	113	1.8	102	241			-.045	
235																(2756)			(-.5214)	
														47+		(16026)			(-2.842)	
																(341)				(-.0605)

Pre Burn Start wt. 7.2 lbs. up 616.7 lbs.
Test Start wt. Range 609.5 - 608.7 lbs.

PRE BURN DATA RECORD SHEET #13
WST2-Form16

BARO. PRESSURE 28.475" Hg

Unit: HIGH VALLEY X-TEC Date: 3/30/99
Run: EPA #6 Technician(s): ATM, RLS.
Page: 1 of 1

Hot Box On ✓

Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Comments
0 1255	616.7	0	578	826	537	535	578	518	887	1489	71	-.085	Primary Air Set at 1 1/4"
5 1300	616.1	.6	527	763	516	515	586	524	981	1559	70	-.083	Secondary Air Set at 1"x3"
10 05	615.2	.9	514	737	548	502	593	527	889	1611	71	-.084	Fan: ON HIGH
15 10	614.1	1.1	513	731	552	495	600	527	912	1594	72	-.085	Tunnel on at: 1325
20 15	612.9	1.2	515	745	558	495	608	526	941	1558	72	-.084	Buckets Iced ✓
25 20	612.1	.8	493	725	564	497	617	524	958	1430	71	-.080	Analyzers Spanned ✓
30 25	611.4	.7	470	683	570	504	623	524	976	1427	72	-.076	Pumps turned on at: 1335
35 30	610.8	.6	436	631	574	515	631	524	983	1364	73	-.072	ΔT
40 35	610.4	.4	418	601	575	526	633	523	988	1315	73	-.070	
45 40	610.1	.3	397	565	571	535	630	524	973	1220	73	-.068	Check WB/DB: 88/112 ✓
50 45	609.8	.3	378	532	564	538	626	524	965	1142	73	-.065	
55 50	609.6	.2	364	501	554	536	618	526	938	1099	73	-.064	547.0
													Probe IN Tunnel
60 1355	609.5	.1	351	480	543	534	612	528	911	1045	73	-.061	Rate Conds found 539.4
65 1400	609.3	.2	336	451	528	523	602	529	888	1058	73	-.061	526.6
70 05	609.1	.2	341	451	517	501	592	527	872	1098	74	-.060	
75 10	609.0	.1	339	449	499	478	576	522	857	1097	71	-.059	504.8
80 15	608.9	.1	335	444	490	460	561	516	839	1044	69	-.059	
85 20	608.8	.1	330	434	480	446	547	512	820	990	70	-.057	
90 25	608.6	.2	321	423	470	438	537	511	808	924	70	-.055	475.8

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY/X-TEC Date: 3/30/99
Run: EPA #6 Technician(s): ATH, RLS,
Page: 1 of 2

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Mod Box ~~Con-dar~~	
0 / 1425	473	470	438	532	511	808	924	70	92	253	39	72	39	257	
5 / 30	545	456	410	510	505	745	1195	70	153	254	38	90	36	258	
10 / 35	616	454	377	496	504	753	1522	70	141	259	38	90	36	259	
15 / 40	650	458	365	494	499	781	1500	69	141	261	38	89	36	258	
20 / 45	678	466	359	498	493	817	1458	69	142	257	38	89	36	257	
25 / 50	707	477	360	505	486	860	1481	69	143	255	38	90	36	257	
30 / 55	708	486	364	511	481	907	1568	69	141	254	38	89	36	254	
35 / 1500	685	504	362	526	477	922	1504	68	139	254	38	89	36	252	
40 / 05	669	513	365	537	473	917	1368	68	137	253	38	89	36	251	
45 / 10	655	518	370	547	471	913	1367	70	134	252	38	89	36	249	
50 / 15	637	520	377	556	469	917	1366	70	133	251	38	89	36	248	
55 / 20	629	521	387	565	468	926	1403	68	131	251	39	89	36	248	
	7602	5843	4534	6282	5837	10268	16656	830							
60 / 1525	622	523	397	575	466	927	1364	70	130	250	39	89	37	247	
65 / 30	607	525	403	581	464	924	1340	69	127	249	38	89	37	247	
70 / 35	582	524	411	583	464	929	1272	70	124	248	39	88	37	246	
75 / 40	557	519	426	582	465	934	1209	70	121	247	39	87	37	246	
80 / 45	516	511	446	576	469	931	1162	69	117	245	39	86	37	245	
85 / 50	502	508	452	572	471	926	1141	69	116	244	39	85	37	245	
90 / 55	473	500	473	562	476	928	1138	69	113	243	39	84	37	246	
95 / 1600	446	493	469	549	481	914	1018	68	111	241	39	83	37	244	
100 / 05	428	486	457	538	482	916	966	68	109	240	39	83	37	244	
105 / 10	412	479	447	528	483	908	948	68	108	238	39	82	37	243	
110 / 15	399	472	442	519	482	912	941	68	106	237	39	81	37	243	
116 / 20	392	467	437	514	482	913	933	68	105	237	39	81	37	243	
	5936	6007	5260	6679	5685	11062	13432	824							
	13538	11850	9794	12961	11522	21328	30088	1656							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/30/99
Run: EPA #6 Technician(s): ATH, RLS,
Page: 2 of 2

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	~~Con~~ dar	
120 / 1625	381	460	428	504	482	904	925	67	104	235	39	80	37	243	
125 / 30	374	457	425	500	482	890	914	69	103	234	39	80	37	243	
130 / 35	367	453	426	495	482	862	891	69	102	233	39	81	37	242	ΔDT
135 / 40	362	448	428	490	482	864	878	70	101	233	39	82	37	241	-33.8
140 / 45	357	444	432	487	481	847	876	70	101	231	39	83	37	241	
145 / 50	354	440	437	484	479	796	853	70	100	230	39	83	37	240	
150 / 55	350	434	443	481	478	785	831	70	99	229	39	83	37	240	
155 / 1700	346	428	448	479	477	775	824	70	99	228	39	83	37	240	
160 / 05	342	422	451	477	476	762	810	70	98	228	39	84	37	240	
165 / 10	337	416	448	476	476	753	800	70	98	227	39	84	37	240	
170 / 15	334	411	444	473	475	750	793	70	97	227	39	84	37	239	
175 / 20	331	407	441	472	475	752	785	70	97	226	39	84	37	239	
	42355	52205	52515	58185	57455	97405	101805	8355							
180 / 1725	327	404	437	469	475	750	774	70	96	226	38	83	37	239	
185 / 30	321	400	431	464	473	751	762	70	95	226	38	83	37	239	
190 / 35	318	396	425	462	472	739	756	70	95	225	39	83	37	240	
195 / 40	314	393	418	462	472	733	744	70	94	225	39	83	37	239	
200 / 45	310	390	411	454	468	722	732	70	94	225	38	83	37	239	
205 / 50	306	386	407	450	465	728	726	70	93	224	38	82	37	239	ΔAT
210 / 55	302	384	407	445	462	731	726	70	93	223	38	82	37	239	-75.8
215 / 1800	294	382	403	441	458	717	713	70	92	223	38	82	37	239	
220 / 05	296	379	400	437	455	706	705	70	92	223	38	81	37	238	
225 / 10	293	377	398	433	451	702	698	70	92	223	38	81	37	238	
230 / 15	292	375	396	431	449	692	692	70	91	222	38	81	37	238	
235	33785	42665	45335	49485	51005	79785	80285	7705	4705						
	21151	21336	19578	23727	22367	39046	48296	3261			Delta T	Start	4758		
	450	454	416	505	476	831	1028	694				5800	398.6		
													-92.7		

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-1

Site: Myren Consulting, ~~Woodinville~~ COWLITZ, WA Date: 3/30/99 Analyte: CO_2

Source: HIGH VALLEY X-TEC Run #: EPA #6

Zero Cyl #: 36919 Conc. 00.0 % CO_2 Cyl Press: 210 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0 % CO_2 Cyl Press: 1425 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Horiba Model: PIR-2000 SN: 607024

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

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

EPA Span Value = 25.0% CO_2

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

Pre Run Audit: By: ATH, RLS. Time: 1327 Temp: 70 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.02555	.02555	0.10
Span	24.0	.240	6.0	23.5	.236	5.8913	-.10871	-1.81

Comments:

Post Run Audit: By: ATH, RLS. Time: 1900 Temp: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.02555	.02555	0.10
Span	24.0	.240	6.0	23.5	.234	5.8416	-.15842	-2.64

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-2

Site: Myren Consulting, Woodinville, WA Date: 3/30/99 Analyte: O_2

Source: HIGH VALLEY X-TEC Run #: EPA #6

Zero Cyl #: 36919 Conc. 00.0 % O_2 Cyl Press: 210 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0 % O_2 Cyl Press: 1425 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Taylor Model: OA 137 SN: 137/4772

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 25.0% O_2

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

Pre Run Audit: By: ATM, RLS. Time: 1327 Temp: 70 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	.0155	-.0155	-0.06
Span	6.0	24.0	6.0	6.0	23.8	5.9555	-.04455	-0.74

Comments:

Post Run Audit: By: ATM, RLS. Time: 1900 Temp.: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	.055	-.0155	-0.06
Span	6.0	24.0	6.0	6.0	23.7	5.9304	-.06964	-1.16

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-3

Site: Myren Consulting, Woodinville, WA Date: 3/30/99 Analyte: CO

Source: HIGH VALLEY X-TEC Run #: EPA #6

Zero Cyl #: 36919 Conc. 00.0 % CO Cyl Press: 210 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 1.26 % CO Cyl Press: 1425 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Infra Red Model: 702 D SN: 113

Range: 0 - 10.0% CO Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 5.0% CO
EPA Control Limits = +2.5% of 5.0% CO = + 0.125% CO

Pre Run Audit: By: ATH, RLS. Time: 1327 Temp: 70 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.0	.0091	-.0041	-0.18
Span	1.26	25.2	1.26	1.25	24.7	1.2317	-.0283	-2.25

Comments:

Post Run Audit: By: ATH, RLS. Time: 1900 Temp.: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.1	.0040	-.0040	-0.08
Span	1.26	25.2	1.26	1.24	24.5	1.2216	-.03837	-3.05

Comments:

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

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

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

Run: EPA #6
Date: 3/30/99
Technicians: ATH, RLS,
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: _____ °F T/C#30: _____ °F

Thermocouple Check (at ambient): T/C#1: 48 °F; T/C#2: 49 °F;
T/C #3: 49 °F; T/C #4: 49 °F; T/C #5: 48 °F;
T/C #6: 49 °F; T/C #7: 49 °F; T/C #8: 49 °F;
T/C #9: 50 °F; T/C #10: 50 °F; T/C #11: 49 °F;
T/C #12: 48 °F; T/C #13: 49 °F; T/C #14: 50 °F;
T/C #15: 49 °F; T/C #16: 49 °F; T/C #17: 49 °F;
T/C #18: — °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: lab quite cold - overnight fire went out early.

Thermocouple Readout: Pretest Zero/Span Check and Calibration:

Zero (0°F)	: 002 °F	Adj to: — °F	Post Test Check Zero (0°F):	001 °F	% Difference +0.05
Span (2000°F)	: 1998 °F	Adj to: — °F	Span (2000°F):	1999 °F	-0.05

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

Thermocouple Readout Pretest Linearity Check

0°F =	002 °F;	200°F =	201 °F;	400°F =	401 °F;
600°F =	599 °F;	800°F =	799 °F;	1000°F =	1000 °F;
1200°F =	1199 °F;	1400°F =	1399 °F;	1600°F =	1598 °F
1800°F =	1797 °F;	2000°F =	1998 °F		

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

Scale Check Pre (Wt, #'s): 614.7 - 609.7 lbs = 5.0 lbs / 5.0 lbs ok (ATM)
Post (Wt, #'s): 614.0 - 609.0 = 5.0 lbs / 5.0 lbs ok (ATM)

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

HIVALLEYEPA1

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	HIVALLEYEPA1
Stove Manufacturer:	HI VALLEY
Model Number:	XTEC
Lab Name:	MYREN
Test Date:	3\20\99
Run Number:	EPA 1
Meter Box Y Factor:	1.003
Barometric pressure (in):	28.5367
Gas meter temp (ave):	83
delta H(avg):	0.900
Gas meter initial reading:	781.047
Gas meter final reading:	844.735
Front catch (acetone) mg:	5.1
first filter catch (mg):	10.8
second filter catch (mg):	-0.5
tunnel flow (ave cfm):	138.666
Emission Rate(g/hr):	2.165
Emission Rate(M5H) :	3.455
vs/VmTs:	0.0246
vs ave:	893.250
Tunnel average temp (°f):	151.077
Test time(min):	115
Fuel Load(lb. wet):	17.2
Wood moisture(%wet):	17.616
Burn rate(dry kg/hr):	3.353
Samp vol(scf):	59.336
front filter number	774
back filter number	773
acetone beaker number	11
PRELIMINARY RESULTS	
FINAL RESULTS	AUDITED
DATA SUMMARY	
MODEL :	XTEC
RUN:	EPA 1
DATE:	3\20\99
DBR:	3.353
GPH UNADJ	2.165
ADJ	3.455143662

RUN TIME (min)	PITOT DELTAP (- INCH H20)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCIT (ft/min)	PROP RATE (%)	dDGM vol std (ft3)
0	0.044	147	781.047	79	0.900	919.27		
10	0.040	187	786.422	79	0.900	904.90	100.6	5.047
20	0.040	188	791.928	80	0.900	905.60	104.7	5.160
30	0.040	177	797.402	81	0.900	897.88	102.0	5.121
40	0.040	173	802.986	82	0.900	895.06	104.1	5.214
50	0.040	161	808.506	83	0.900	886.54	101.1	5.145
60	0.041	149	813.979	84	0.900	888.84	99.1	5.091
70	0.042	146	819.493	85	0.900	897.39	98.9	5.120
80	0.042	135	825.069	85	0.900	889.21	97.3	5.178
90	0.042	131	830.649	85	0.900	886.22	97.6	5.181
100	0.042	126	836.246	85	0.900	882.46	97.4	5.197
110	0.042	123	841.879	85	0.900	880.20	97.9	5.231
115	0.042	121	844.735	85	0.900	878.69	99.2	2.652
						0.00	0.0	0.000
140						0.00	0.0	0.000
150						0.00	0.0	0.000
160						0.00	0.0	0.000
170						0.00	0.0	0.000
180						0.00	0.0	0.000
190						0.00	0.0	0.000
200						0.00	0.0	0.000
210						0.00	0.0	0.000
220						0.00	0.0	0.000
230						0.00	0.0	0.000
240						0.00	0.0	0.000
250						0.00	0.0	0.000
260						0.00	0.0	0.000
270						0.00	0.0	0.000
280						0.00	0.0	0.000
290						0.00	0.0	0.000
300						0.00	0.0	0.000
310						0.00	0.0	0.000
320						0.00	0.0	0.000
330						0.00	0.0	0.000
340						0.00	0.0	0.000
350						0.00	0.0	0.000

METHOD 5G-1 PARTICULATE SAMPLING DATA LAB-

DATE 3/20/99 PAGE 1 OF 1 MODEL # HIGH VALLEY X-TEC RUN # EDA # 1

METER BOX # 511M METER Y 1.003 FILTER # (F) 774 (R) 77

PRE-TEST LEAK RATE = .000 CFM @ -16.0 IN. HG .642/.642 FILTER SIZE: 110 MM

POST TEST LEAK RATE = .000 CFM @ -14.0 IN. HG .084/.084 PROBE LENGTH 24" Glass

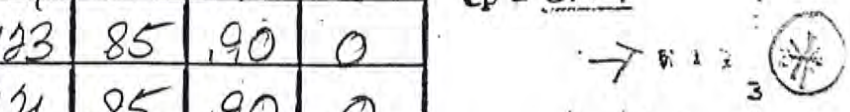
TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1440	00	781.047	.044	147	79	.90	0
50	10	786.422	.040	187	79	.90	0
1500	20	791.928	.040	188	80	.90	0
10	30	797.402	.040	177	81	.90	0
20	40	802.986	.040	173	82	.90	0
30	50	808.506	.040	161	83	.90	0
40	60	813.979	.044	149	84	.90	0
50	70	819.493	.042	146	85	.90	0
1600	80	825.019	.042	135	85	.90	0
10	90	830.649	.042	131	85	.90	0
20	100	836.246	.042	126	85	.90	0
30	10	841.879	.042	123	85	.90	0
1635	115	844.735	.042	121	85	.90	0
50	30	(63.688)					
1700	40						
	50						
	60						
	70						
	80						
	90						

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.028	175
2	1.5"	.042	178
3	4.5"	.046	179
4	5.5"	.045	178
W-1	0.5"	.042	184
2	1.5"	.047	185
3	4.5"	.042	186
4	5.5"	.040	186
Avg		.042	181

Pitot leak check: Pre ✓ Post ✓

Cp = 0.99



* = point of Avg. delta P

$$Qs = \left(\frac{\sqrt{(\Delta P \times BP)}}{T(°R)}\right) \times 3167.2 =$$

137.033 cfm

BP = START 28.57 in Hg
60 28.53
115 28.57
180
240
300

28.5367

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

Into Dessicator: Date 1/3/99 Time 12:00 By ATM Front Half ✓ Back Half ✓

Manufacturer: Schleicher & Schuell Size: 11 cm Lot No.: 7B951 Grade: # 25 g/as
Order No. 06220

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
751	.7787	1/23/99	1115	ATM	.7786	2/2/99	1051	TM				
752	.8115		1116	TM	.8115		1050	ATM				
753	.8063		1117		.8061		1049	ATM				
754	.8044		1118		.8047		1048	ATM				
755	.7882		1119		.7878		1047	ATM				
756	.7831		1120		.7827		1046	ATM				
757	.7893		1121		.7886		1045	ATM	.7886	2/2/99	1430	dm
758	.8025		1122		.8023		1044	ATM				
759	.7960		1123		.7956		1044	ATM	.7957	2/2/99	1240	TM
760	.7915		1124		.7914		1043	ATM				
761	.8115		1125		.8116		1042	ATM				
762	.7689		1126		.7687		1041	ATM				
763	.7894		1127		.7893		1040	ATM				
764	.7793		1128		.7792		1039	ATM				
765	.7910		1129		.7907		1038	ATM				
766	.7957		1130		.7954		1037	ATM				
767	.8028		1131		.8024		1036	ATM				
768	.8048		1132		.8044		1036	ATM				
769	.7722		1133		.7716		1035	ATM	.7715	2/2/99	1240	TM
770	.7898		1134		.7897		1034	ATM				
771	.7693		1135		.7691		1034	ATM				
772	.7895		1136		.7893		1033	ATM				
773	.8073		1137		.8070		1030	ATM	← ✓			
774	.8181		1138		.8177		1031	ATM	← ✓			
775	.8056	✓	1139	✓	.8051	✓	1030	ATM				

Checked by Jim Taylor Date: 2/2/99 Time 1430

QA REWEIGH

Filter #	WT	Date	Time	By
758	.8021	2/2/99	1431	dm ✓
762	.7685	2/2/99	1432	dm ✓
767	.8028	2/2/99	1433	dm ✓

Post Weighing Balance Scale Check

	1st	2nd	3rd
0.0000	0.0000	-0.0002	0.0000
1.0000	1.0000	0.9998	1.0001

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
62	77	42	1/23/99	1100	ATM
60	73	46	2/2/99	0939	TM
62	76	45	2/7/99	1235	ATM
65	80	44	2/19/99	1312	ATM

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 1/4/99 Time: 1600 By: A.T. Myrick

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4840	2/1/99	915	ATM	65.4838	2/3/99	1605	JM				
2	66.1516		917	ATM	66.1515	2/3	1606	JM				
3	67.8577		919	ATM	67.8571	2/3	1609	JM	67.8571	2/7/99	1245	ATM
4	67.5891		920	ATM	67.5886	2/3	1612	JM				
5	Broken											
6	67.4282		921	ATM	67.4282	2/3	1615	JM				
7	65.5451		922	ATM	65.5453	2/3	1617	JM				
8	60.0213		923	ATM	60.0213	2/3	1618	JM	← Blank			
9	66.9293		924	ATM	66.9294	2/3	1620	JM				
10	66.0888		926	ATM	66.0885	2/3	1621	JM			↙	
11	65.6997		927	ATM	65.7015	2/3	1623	JM	65.7016	2/7/99	1247	ATM
12	56.0653		928	ATM	56.0652	2/3	1625	JM				
13	57.8945		929	ATM	57.8942	2/3	1627	JM				
		↓										

Checked By: A.T. Murrell Date: 2/8/99 Time: 1705

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
55	69	39	2/1/99	0910	ATM
63	76	48	2/3/99	1555	ATM
62	76	45	2/7/99	1235	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9, Pg1, Rev4/90
Unit High Valley XTEC
Run # 5 EPA V1
Date: 3/20/99

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
11	✓	3/22/99	2230	ATM	65.7082	3/23/99	1139	ATM	65.7073	3/29	2145	JM	65.7068	4/6	1150	ATM

FINAL FILTER WEIGHTS

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	774	.8292	3/20/99	1710	ATM	.8287	3/21/99	2225	ATM	.8287	3/23	1312	ATM	.8285	3/29	2112	JM
R	773	.8069	3/20/99	1710	ATM	.8065	3/21/99	2227	ATM	.8066	3/23	1310	ATM	.8065	3/29	2103	JM

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/21	2215	ATM	61	74	47
2	3/23	1115	ATM	69	94	46
3	3/29	2038	ATM	59	72	45
4	4/6	1030	ATM	61	75	44
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Acetone Blank - 100 ml Acetone

Blank
3/13/99

WST5-Form9,Pg1,Rev4/90
Unit Hi Valley
Run # EPA 1
Date: 3/20/99

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
B	✓	3/18/99	0854	ATM	66.0215	3/19/99	2237	ATM	66.0215	3/20/99	1332	ATM				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/18	2140	ATM	68	84	43
2	3/20	1300	ATM	64	84	32
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

Dates From 1/9/99

Through _____

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Mettler
Model AE10
SN K0482

Level	Recalibrated	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Date	Time	Tech	Wet Bulb	Dry Bulb	% RH
V	Yes P.O.	99.9999	10.0001	1.0002	.1003	.0203	1/9/99	1243	ATM	58	70	48
V	No	100.0002	10.0000	1.0000	.1000	.0200	1/14/99	1113	ATM	62	75	47
V	YES P.O.	99.9998	10.0002	1.0000	.0999	.0201	1/23/99	1100	ATM	63	77	42
V	YES	99.9999	10.0000	1.0000	.1000	.0201	1/24/99	1318	ATM	59	74	45
V	YES	99.9996	10.0002	1.0000	.1000	.0200	2/1/99	0910	ATM	55	69	39
V	YES	99.9997	10.0001	1.0001	.1002	.0201	2/2/99	0939	ATM	60	73	46
V	YES	99.9999	10.0001	1.0001	.1001	.0200	2/3/99	1555	ATM	63	76	47
V	YES	99.9999	10.0000	1.0001	.1001	.0201	2/7/99	1235	ATM	62	76	45
V	YES	99.9998	10.0000	1.0000	.1000	.0200	2/10/99	1600	ATM	63	77	45
V	YES	99.9998	10.0000	1.0001	.1000	.0200	2/19/99	0246	ATM	64	78	46
V	NO	99.9999	10.0000	1.0000	.1000	.0200	2/21/99	1312	ATM	65	80	44
V	NO	99.9997	10.0000	1.0001	.1000	.0200	3/5/99	1935	ATM	64	80	41
V	YES P.O.	99.9997	10.0000	1.0000	.1001	.0200	3/6/99	1135	ATM	64	79	43
V	YES	99.9997	10.0000	1.0001	.1000	.0200	3/13/99	1526	ATM	65	80	44
V	YES	99.9999	10.0001	1.0001	.1001	.0200	3/14/99	1335	ATM	63	78	45
V	NO	100.0001	10.0000	1.0000	.1000	.0200	[illegible]	1623	ATM	66	81	45
V	YES	99.9997	10.0000	1.0001	.1000	.0200	3/16/99	2025	ATM	65	82	39
V	YES	99.9996	10.0000	1.0001	.1001	.0200	3/17/99	1615	ATM	62	77	42
V	YES	99.9997	10.0000	1.0001	.1000	.0200	3/18/99	2140	ATM	68	84	43
V	YES	99.9998	10.0000	1.0000	.1000	.0200	3/20/99	1300	ATM	64	84	32
V	YES	99.9999	10.0000	1.0001	.1001	.0201	3/21/99	2215	ATM	61	74	47
V	YES	99.9997	10.0000	1.0000	.1001	.0200	3/22/99	2122	ATM	65	85	33
V	YES	99.9997	10.0000	1.0001	.1000	.0200	3/23/99	1115	ATM	69	77	46
V	YES	99.9998	10.0000	1.0002	.1001	.0201	3/24/99	1120	ATM	72	89	43
V	YES	99.9999	10.0000	1.0002	.1001	.0201	3/29/99	2038	ATM	69	72	45
V	NO	99.9999	10.0002	1.0002	.1001	.0202	3/30/99	0610	ATM	66	80	47
V	NO	99.9999	10.0000	1.0000	.1001	.0201	3/31/99	1000	[illegible]	64	80	41
V	NO	99.9996	10.0000	1.0000	.1001	.0201	4/5/99	1730	ATM	64	80	41
V	YES	99.9998	10.0001	1.0001	.1001	.0201	4/6/99	1030	ATM	61	75	44
QC Services	Audit	4/6/97	− wt.	Scale check of	QC audit							
V	NO	100.0003	10.0001	1.0001	.1001	.0201	4/6/99	1730	ATM			

Woodstove Particulate
Catch Processing Sheet
Woodstove Data Sheet #5
EPA M5G-1

Unit: High Valley XTEC
Run: EPA 1
Date: 3/20/99
Technicians: ATM / RLS
Revised 1/16/98-Data Sheet #5

Filters

Filter # (Front) 774 Beaker # 11 Final Wt. 65.7068 g
Final Wt. .8285 g Ml 65 Tare Wt. 65.7016 g
Tare Wt. .8177 g Desc. acetone Net Wt. .0052 g
Net Wt. .0108 g

Filter # (Rear) 773 Beaker # _____ Final Wt. _____ g
Final Wt. .8065 g Ml _____ Tare Wt. _____ g
Tare Wt. .8070 g Desc. _____ Net Wt. _____ g
Net Wt. -.0005 g

Acetone Blank Calculation: Blank Date: 3/13/99

Blank Beaker # 8 Final Wt. 66.0215 g
Ml 100 Tare Wt. 66.0213 g
Desc. Acetone Net Wt. .0002 g

.0002 g ÷ 100 ml = .000002 g/ml

Blank Residue Value Calculation:

.000002 g/ml acetone X 65 ml acetone = .00013 g
Blank Residue Value

Total Particulate Catch Calculation

Filter: .0108 g
Filter: -.0005 g
Beakers: .0052 g (Total Catch) − .0001 g (Blank Residue Value) = .0061 g
Total Catch = .0154 g

Unit HIGH VALLEY X-TEC
Run # EPA #1
Date 3/20/99
Technician ATH, RLS,
WST6-Form1, Rev8/96

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 2.713 ft^3

Dilution Tunnel Draft (If applicable): Start 00.0 Stop 00.0

Test Chamber Air Velocity: Start: 00.0 Stop: 00.0 Avg: 00.0

Wet Bulb/ Start: WB: 68 °F DB: 73 °F 1.15% Amb Moisture 39 %RH

Dry Bulb Stop: WB: 59 °F DB: 72 °F 1.25% Amb Moisture 45 %RH

$\bar{X}$ = 1.20 % Ambient Moisture $\bar{X}$ = 42 % Relative Humidity (RH)

Empty Stove Wt: 514.0 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 606.3 lbs. Dry: 604.5 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 604.5 lbs. ✓

Kindling Wt. Paper: 0.3 lbs. Wood: 5.0 lbs.

Pre Burn Fuel Wt. 14.9 + 15.8 + 16.0 + 4.5 + 5.1 Total: 56.3 lbs.

Total Kindling and Pre Burn Fuel Wt 61.6 lbs.

Coal Bed Wt-lbs: Range (608.8 - 608.0) lbs. Actual: 608.0 lbs.

Allowable Amount of Charcoal that can be removed: (3.5)

Coal Bed Wt. Range $\frac{4.3}{\text{Upper Wt.}} + \frac{3.5}{\text{Lower Wt.}}$ 12 X .25 = .9 lbs. ✓

Test Fuel Wt-lbs: Ideal 19.0 lbs. Range: 17.1-20.8 lbs. Actual: 17.2 lbs.

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Flanges) 20 Pcs.

2 x 4's x 17.0	"	4 Pcs	9.5 lbs.	55.2 % ✓
4 x 4's x 17.0	"	2 Pcs	7.7 lbs.	44.8 % ✓

Est. Dry Burn Rate (Kg/Hr.) $\frac{17.2 - (17.2 \times 0.616)}{2.2046} \times \frac{60}{115}$ = 3.351 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) X $\frac{63}{100}$ x 3.351 = 40 407 Est Heat Output (HO_E) BTU's/Hr

Comments:

Stove Operating Data
Woodstove Test Data Sheet #9
Cold Start

Unit: HIGH VALLEY X-TEC
Run: EPA # 1
Date: 3/10/99
Technician(s): ATH, RLS.
Data Sheet #9 - Rev 1/98-Pg.2

Fire Started: 1030 P.S.T

Warm up and Preburn: Primary Air: Wide open from ignition until the start of preburn when the primary air control(s) was (were) adjusted to the run setting of WIDE OPEN. At the run setting until the start of the test.

Secondary Air: No Controls, Naturally drafted.

Secondary Burn/Cat Bypass: N/A

Charcoal Bed Preparation: Broke up, raked and leveled the coal bed prior to the addition of each warm up/pre burn fuel charge. Starting 1:30 before the start of the test, broke up, raked and leveled the coal bed. In stove for 35 seconds.

Test: Door wide open during loading 1 min 05 sec, then

Primary Air: Wide open during the ~~start of~~ the test ~~until~~ High Burn. ~~Adjusted to the run setting of ____ between ____ and ____.~~ At the run setting of Wide Open at 000 into the run.

Secondary Air: No Controls, Naturally drafted

Secondary Burn/Cat Bypass: N/A

Fan: ~~ON~~/OFF during the warm up, ON/~~OFF~~ high during the preburn, ON/~~OFF~~ at the start of the test, ON/~~OFF~~ for the first 5 minutes of the test, ON/~~OFF~~ high at 5 minutes into the test, ON/~~OFF~~ for the rest of the test.

Test Run Anomalies:

Unit HIGH VALLEY X-TEC
Run # EPA #1
Date 3/20/99
Technician ATH, RLS.
Page 1 of 3
WST7-Form2-A, Rev10/88

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-1

Wood Data: Kindling: A mix of the below grades

	Size	Mill	Grade	Species
Pre Burn	2X4	CANYON LBR.	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2X4	CANYON LBR.	#2 STD. & BTR.	D. FIR S. GRN.
	4X4	STAND & 879	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (14.9 lbs) added at 1048.
2nd Warm up/Pre Burn Fuel charge (15.8 lbs) added at 1153.
3rd Warm up/Pre Burn Fuel charge (16.0 lbs) added at 1254.
4th Warm up/Pre Burn Fuel charge (4.5 lbs) added at 1345.
5th Warm up/Pre Burn Fuel charge (5.1 lbs) added at 1407.
6th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
7th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
8th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.

The coals were scooped out of the stove immediately prior to adding the 3 (20) pre burn/warm up fuel charge. The stove lost 1.8 lbs. PUT 3.0 lbs of coals back in after the scoop.

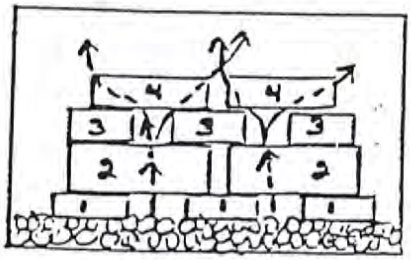
All pre burn/warm up fuel pieces were either 16" or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 16 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 16 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 3 pcs 16 inches long. The majority of the pieces in each rick were in the second layer which had an approximate 0.5-1.0" space between pieces. (The loading directions indicate the direction of the longest dimension on each piece relative to the loading door opening.) Each pre burn/warm up fuel charge normally weighs within the weight range allowed for the actual test fuel charge

Unit HIGH VALLEY X-TEC
Run # EPA # 1.
Date 3/20/99
Technician ATM, RLS.
Page 2 of 2
WST7-Form2-A, Rev 6/90

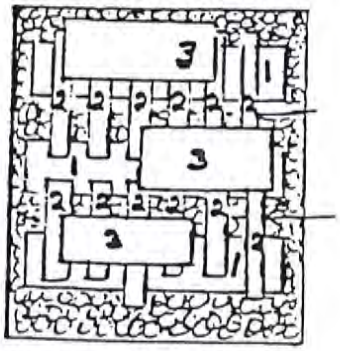
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

Warm up Information (cont.):

Each warm up/preburn fuel charge was ricked in exactly (as much as possible) the same manner and the weight of each rick was usually within the allowable weight range for the test fuel charge. The physical arrangement and alignment of each rick was designed to accomplish three (3) things: (1)The bottom layer was nestled firmly into the coal bed and was as close to being level with the bottom of the stove as possible, thus providing a stable loading platform for the rest of the rick, keeping it in a ricked state (as opposed to a col- lapsed or fallen down state) untill the rick reached the charcoal stage and sags or collapses of its own accord. (2) It enhances the flow of primary air through the ricked preburn fuel charge, for the primary air would flow through the spaces between the pieces in the first layer and then up through the spaces between the pieces in the second, third and, if present, fourth layers. (3) It maximized, as much as possible, the surface to volume ratio of each preburn fuel charge, thereby allowing the fire immediate access to as much wood surface as possible and, thereby, insuring uniform charcoalization. All three of these enhance combustion and so get the stove as hot as possible during the warm up period, therby maximizing the amount of heat (BTU's) stored in the stove. The actual preburn was not started until the stove surface temperatures had maximized and stabilized, thus indicating that the amount of heat stored in the stove had peaked. For this stove, the thermal storage was monitored using the TOP surface temperature(s) and the peak value(s) obtained were 905 °F.



Front View



Top View

The arrows indicate the direction of the air flow through the rick.

The primary air was adjusted to the run setting of Wide Open 21.3 lbs above the upper charcoal bed weight.

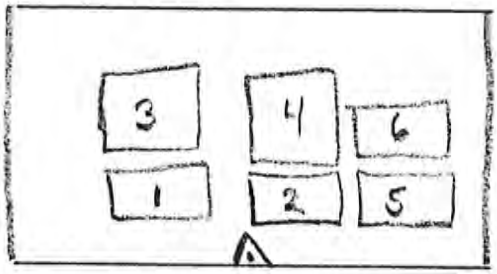
Unit HIGH VALLEY X-TE
Run # EPA #1
Date 3/20/99
Technician ATH, RLS,
Page 3 of 3
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: (1) Turned Pam off (2) Opened door (3) Loaded fuel, (4) clear coals from in front of the LPAO (5) Photograph (6) Closed door

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



Front of stove view

4 X 4's: 3, 4

2 X 4's: 1, 2, 5 & 6

Loading Sequence: 1, 2, 3, 4, 5 & 6 last

Driest Pcs in Load 1 & 2

Loaded the test fuel charge on an essentially level, medium sized, average to hot coal bed (in appearance, color and temperature for a high burn rate. (Stove was very hot a start, Lots Flames from preburn fuel had just gone out.)

Load 1105 Ignition N 0135

Gas Balance 2119 100:1 @ 4100

CO Spike to 0.34% @ N 12100,

Unit: HIGH VALLEY X-TEC
Run: EPA #1
Date: 3/20/99
Technician: ATH, R.L.S.

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

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: 1210
Calibration Checks: X ✓ Y ✓ 12.5 12.5 22.0 22.2

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg
			Uncor	Cor	Uncor	Cor	Uncor	Cor	Corrected
1	2X4X8'	K	12.5	13.3	12.0	12.8	12.0	12.8	(12.967)
2									
3									
4	2X4X8'	P	22.0	23.7	22.5	24.3	22.5	24.3	24.100
5	"	P	19.0	20.3	18.5	19.8	19.0	20.3	20.133
6	"	P	22.5	24.3	22.5	24.3	22.0	23.7	24.100
7	"	P	20.5	22.0	21.0	22.6	20.5	22.0	22.200
8	"	P	22.0	23.7	22.5	24.3	22.0	23.7	23.900
9									(114.433)
10									
11	2X4X17.0'	T	18.0	19.2	18.0	19.2	18.5	19.8	19.400
12	"	T	19.5	20.9	19.5	20.9	19.0	20.3	20.700
13	"	T	21.0	22.6	21.0	22.6	20.0	21.4	22.200
14	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700
15									
16	4X4X17.0'	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
17	"	T	21.5	23.1	21.5	23.1	21.5	23.1	23.100
18									(128.300)
19	FEET	T	19.0	20.3	18.5	19.8	18.5	19.8	(19.967)
20								OUT SPACERS	

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	12.967 %	22.887 %	21.383 %
% Moisture - Wet Basis:	11.478 %	18.624 %	17.616 %

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

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

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

Unit: HIGH VALLEY-X-TEC
Run#: EPA #1
Date: 3/20/99
Technician: ATH, RLS.

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 3½" x 3½" x 1½"

Depth (D): ≈ 1.555 cm 3.9497

Width (W): ≈ 3.515 cm 8.9281

Length (L): 3.503 cm ≈
3.492 cm
3.500 cm ≈
3.482 cm

Length $\bar{X}$ = ≈ 3.4943 cm 8.8755

Volume: 312.980 cm^3
(D X W X L)

MOISTURE: Room Temperature: 69 °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	23.7 %
Bottom:	22.0	23.7 %
Side:	22.0	23.7 %
$\bar{X}$:		23.700 %

Avg % Moisture (Dry) 23.700 %

Aug % Moisture (Wet) 19.159 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 158.8 g Dry Weight: 131.6 g

% Moisture Dried Basis: 17.128 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	3/20/99	1155	213 °F
Out of Dryer	3/29/99	1415	218 °F

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

Density = 131.6 g (dry wt) ÷ 312.980 cm^3 (volume) = 0.4205 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ___ g

Wet Wt: ___ g - ___ g = ___ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ___ g - ___ g = ___ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

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

BURN RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
Eno Wt.: 608.0 lbs.

Unit: HIGH VALLEY X-TEC Date: 3/20/99
Run: EPA #1 Technician(s): ATH, RLS,
Page: 1 of 1

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	T/C(1)T/C(2) Bal	Wet Bulb	Dry Bulb	% H_2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO_2 v.	4 SO_2 PPM	Static Press.	Comments
0 / 1440	625.2	17.2	0	.345	8.60	47.1	11.80		0.7	0.05	172.0	100	135	4.7	132	512			-.085	Flow
5 / 45	623.4	15.4	1.8	.577	14.37	21.6	5.40		6.5	0.04	359.2	124	150	12	148	584			-.098	SO_2 1.5
10 / 50	621.7	13.7	1.7	.665	16.55	15.4	3.85		1.0	0.07	236.5	133	157	16.5	156	658			-.103	~~CO_2 1.5~~
15 / 55	620.1	12.1	1.6	.651	16.21	17.0	4.25		3.3	0.18	90.0	134	162	16.5	157	668			-.103	~~O_2 1.5~~
20 / 1500	618.6	10.6	1.5	.610	15.19	21.7	5.43		2.3	0.13	116.8	133	164	15.5	154	654			-.101	~~CO 1.5~~
25 / 05	617.2	9.2	1.4	.587	14.62	24.4	6.11		0.8	0.06	248.6	131	161	15.0	153	633			-.099	
30 / 10	615.9	7.9	1.3	.547	13.62	27.6	9.42		1.5	0.09	151.3	128	159	13.0	150	611			-.096	
35 / 15	614.6	6.6	1.3	.539	13.42	28.1	7.03		2.6	0.15	89.5	125	157	12	148	603			-.096	
40 / 20	613.4	5.4	1.2	.535	13.32	28.3	7.08		0.9	0.06	222.0	123	155	11.5	148	606			-.096	
45 / 25	612.6	4.6	.8	.454	11.31	37.1	9.29		1.1	0.07	161.6	117	151	9	143	583			-.093	
50 / 30	611.9	3.9	.7	.400	9.97	42.2	10.57		1.0	0.06	166.1	111	147	7.5	140	558			-.091	
55 / 35	611.1	3.1	.8	.371	9.25	44.6	11.17		1.6	0.10	92.5	108	143	7	135	553			-.090	
																(7223)			(1.151)	Flow
60 / 40	610.6	2.6	.5	.343	8.55	47.0	11.78		2.4	0.14	61.1	103	138	5.9	136	537			-.087	SO_2 1.5
65 / 45	610.2	2.2	.4	.322	8.03	47.9	12.00		2.3	0.14	57.3	101	137	5.4	134	525			-.085	~~CO_2 1.5~~
70 / 50	609.8	1.8	.4	.321	8.00	48.0	12.03		2.2	0.13	61.6	99	136	5	133	521			-.085	~~O_2 1.5~~
75 / 55	609.5	1.5	.3	.249	6.21	56.1	14.06		5.8	0.30	20.7	91	133	3.5	130	492			-.081	~~CO 1.5~~
80 / 1600	609.3	1.3	.2	.227	5.67	58.0	14.54		6.2	0.33	17.2	87	129	2.9	126	464			-.080	
85 / 05	609.1	1.1	.2	.214	5.34	59.2	14.84		8.3	0.43	12.4	84	125	2.4	122	442			-.078	
90 / 10	608.9	.9	.2	.203	5.07	60.4	15.14	out BAL.	10.7	0.56	(9.1)	82	121	2.3	122	431			-.075	
95 / 15	608.7	.7	.2	.204	5.10	60.3	15.11		11.2	0.58	8.8	80	119	2.1	120	416			-.074	
100 / 20	608.5	.5	.2	.200	5.00	60.7	15.21		13.2	0.68	7.3	80	118	2.1	120	410			-.074	
105 / 25	608.4	.4	.1	.193	4.82	61.3	15.36		14.1	0.72	6.7	79	116	2	119	402			-.074	
110 / 30	608.2	.2	.2	.188	4.70	61.8	15.49		13.9	0.70	6.7	78	114	2	118	396			-.073	
115 / 35	608.0	0	.2	.177	4.42	63.1	15.82		14.1	0.71	6.2	77	113	1.9	116	389			-.072	
																(5425)			(.938)	
															24½	(13,648)			(2,089)	

Pre Burn Stack Wt. 28.60 BARO. PRESSURE ↓ SLOWLY
lbs.vp lbs.
Test Stack wt. Range
608.7 - 608.0 lbs.

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

Unit: HIGH VALLEY X-TEC Date: 3/20/99
Run: EPA #4
Page: 1 of 1
Technician(s): ATH, RLS,

Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Hot Box On Comments
0 1255	622.7	0	454	574	570	571	612	591	809	1037	78	-.090	Primary Air Set at WIDE OPEN
5 1300	621.0	1.7	657	741	555	507	602	591	770	1357	77	-.098	Secondary Air Set at 1"x3"
10 05	619.0	2.0	689	869	543	469	593	584	758	1458	78	-.100	Fan: ON HIGH
15 10	617.2	1.8	676	885	537	454	592	575	760	1476	79	-.100	TUNNEL ON AT: 1257
20 15	615.3	1.9	675	900	540	446	597	565	784	1547	79	-.099	Buckets IN
25 20	613.6	1.7	686	895	545	448	607	557	822	1545	78	-.100	ANALYZERS SPANNED
30 25	612.1	1.5	649	873	553	456	620	552	886	1625	78	-.097	Pumps turned on at:
35 30	611.0	1.1	613	816	565	469	632	553	943	1555	77	-.092	ΔT
40 35	610.1	.9	562	734	578	484	646	554	921	1473	79	-.088	-.1
45 40	609.4	.7	564	691	579	492	653	554	955	1448	78	-.087	Check WB/DB: 607.3 - 613.8 119 - 128
50 45	612.3	1.6	662	753	581	506	656	558	918	1461	80	-.097	ADD FUEL 4.5 lbs.
55 50	611.2	1.1	624	758	576	506	657	554	925	1420	80	-.093	
													Probe IN TUNNEL
60 55	610.1	1.1	596	733	578	512	649	551	953	1361	79	-.090	604.6
65 1400	609.2	.9	581	708	585	520	646	552	981	1352	80	-.092	-.4 602.2
70 05	608.3	.9	565	689	591	541	646	557	1029	1400	79	-.092	607.9 613.0 604.8
75 10	612.6	.8	571	661	595	555	650	563	998	1308	77	-.095	ADD FUEL 5.1 lbs.
80 15	611.2	1.4	590	730	597	548	651	562	1000	1375	78	-.095	617.6
85 20	610.3	.9	552	699	595	553	649	561	1008	1275	78	-.092	611.4
90 25	609.5	.8	534	664	592	562	645	560	1034	1262	78	-.091	604.6
95 30	608.7	.8	530	629	591	572	642	561	1048	1259	77	-.089	599.0
100 35	608.3	.4	521	606	588	570	640	563	1058	1250	78	-.087	
105 40	608.0	.3	512	589	583	564	637	561	1057	1241	78	-.085	586.8
110 45													
115 50													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/20/99
Run: EPA #1 Technician(s): ATM, RLS.
Page: 1 of 1

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Con-dar	
0 / 1440	589	583	564	637	561	1052	1211	78	147	248	44	88	58	248	
5 / 45	625	585	552	624	567	1057	1296	79	181	248	45	89	39	248	
10 / 50	770	589	476	616	560	1000	1330	78	187	251	45	89	39	248	
15 / 55	841	590	439	609	545	1040	1504	78	190	251	45	89	39	248	
20 / 1500	860	591	422	611	528	1062	1395	78	188	252	44	89	39	250	
25 / 05	840	594	418	618	573	1058	1430	79	182	252	45	89	39	250	
30 / 10	796	597	420	630	501	1050	1502	79	177	251	45	89	40	250	
35 / 15	765	597	430	643	494	1058	1464	79	176	249	45	89	40	249	
40 / 20	772	597	448	657	487	1092	1447	79	173	248	44	89	40	250	
45 / 25	746	597	470	667	483	1066	1428	78	167	248	44	89	40	251	
50 / 30	705	593	492	670	480	1058	1305	79	161	250	44	89	39	250	
55 / 35	669	587	507	670	480	1041	1291	79	157	250	44	89	39	251	
	(8978)	(7100)	(5638)	(7652)	(6199)	(12,628)	(16,603)	(943)							
60 / 40	638	568	521	670	481	1025	1206	76	149	250	44	88	38	250	
65 / 45	606	567	540	665	481	1013	1162	76	148	249	44	88	39	250	
70 / 50	591	560	568	658	487	1009	1170	75	146	250	45	88	39	250	
75 / 55	564	560	580	649	498	989	1082	75	139	250	45	87	39	250	
80 / 1600	531	552	573	637	509	964	1026	76	135	250	45	86	39	250	
85 / 05	503	537	553	626	516	933	990	75	133	250	45	86	39	250	
90 / 10	480	528	538	616	523	913	965	75	131	250	46	85	39	249	
95 / 15	463	516	534	604	529	906	949	74	128	250	46	85	39	249	
100 / 20	448	507	527	595	533	901	932	74	126	249	46	85	39	250	
105 / 25	435	497	518	587	532	890	933	72	124	249	46	84	39	249	
110 / 30	425	490	508	579	530	879	915	71	123	249	46	84	39	248	
116 / 35	413	480	499	572	530	861	887	69	121	248	46	84	39	248	
	(6097)	(6362)	(6459)	(7458)	(6149)	(11,283)	(12,417)	(888)		AVG. STOVE TEMP. CHANGE			START:	586.8	✓
	(15,075)	(13,462)	(12,097)	(15,110)	(12,348)	(23,911)	(28,820)	(1831)	24÷				STOP:	498.8	✓
	(1.28)	(2.14)	(2.04)	(1.20)	(1.52)	(2.01)	(1.41)	(2.1)					AT:	-88.0	✓

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-1

Site: Myren Consulting, Woodinville, WA Date: 3/20/99 Analyte: CO_2

Source: HIGH VALLEY X-TEC Run #: EPA ± 1

Zero Cyl #: 36919 Conc. 00.0 % CO_2 Cyl Press: 250 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0% CO_2 Cyl Press: 1486 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Horiba Model: PIR-2000 SN: 607024

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

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

EPA Span Value = 25.0% CO_2

EPA Control Limits = + 2.5% of 25.0% CO_2 = + 0.625% CO_2

Pre Run Audit: By: RLS, ATM Time: 1320 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	.0256	+.0256	+0.10
Span	24.0	.240	6.0	06.0	.240	5.991	-.0093	-0.15

Comments:

Post Run Audit: By: RLS, ATM Time: 1650 Temp: 73 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0256	+0.0256	+0.10
Span	24.0	.240	6.0	05.9	.239	5.966	-.0341	-0.57

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-2

Site: Myren Consulting, Woodinville, WA Date: 3/20/99 Analyte: O_2

Source: HIGH VALLEY X-TEC Run #: EPA #1

Zero Cyl #: 36919 Conc. 00.0 % O_2 Cyl Press: 250 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 350-1060 Conc. 6.0 % O_2 Cyl Press: 1480 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Taylor Model: OA 137 SN: 137/4772

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 100 mv.

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

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

Pre Run Audit: By: RLS, ATM Time: 1320 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	-.0155	-.0155	-0.06
Span	6.0	24.0	6.0	06.0	23.9	5.981	-.0195	-0.32

Comments:

Post Run Audit: By: RLS, ATM Time: 1650 Temp.: 73 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	-.0155	-.0155	-0.06
Span	6.0	24.0	6.0	06.0	23.9	5981	-.0195	-0.32

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-3

Site: Myren Consulting, Woodinville, WA Date: 3/20/99 Analyte: CO

Source: HIGH VALLEY X-TEC Run #: EPA # 1

Zero Cyl #: 3691 9 Conc. 00.0 % CO Cyl Press: 250 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 350-1060 Conc. 1.26 % CO Cyl Press: 1480 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Infra Red Model: 702 D SN: 113

Range: 0 - 10.0% CO Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 5.0% CO
EPA Control Limits = +2.5% of 5.0% CO = + 0.125% CO

Pre Run Audit: By: RLS, ATM Time: 1320 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.0	.0091	-.0091	-0.18
Span	1.26	25.2	1.26	1.26	24.8	1.2467	-.0140	-1.11

Comments:

Post Run Audit: By: RLS, ATM Time: 1650 Temp.: 73 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.0	.0091	-.0091	-0.18
Span	1.26	25.2	1.26	1.25	24.7	1.2417	-0.0183	-145

Comments:

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

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

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

Unit: HIGH VALLEY X-TEC
Run: EPA #1
Date: 3/20/99
Technicians: ATH, PLS.
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: _____ °F T/C#30: _____ °F

Thermocouple Check (at ambient): T/C#1: 73 °F; T/C#2: 75 °F;

T/C #3: 619 °F; T/C #4: 410 °F; T/C #5: 102 °F;

T/C #6: 103 °F; T/C #7: 106 °F; T/C #8: 87 °F;

T/C #9: 208 °F; T/C #10: 1293 °F; T/C #11: 69 °F;

T/C #12: 74 °F; T/C #13: 72 °F; T/C #14: 65 °F;

T/C #15: 68 °F; T/C #16: 69 °F; T/C #17: 71 °F;

T/C #18: _____ °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: STOVE ALREADY LIT.

Thermocouple Readout: Pretest Zero/Span Check and Calibration:

Zero (0°F): 000 °F Adj to: 000 °F Post Test Check Zero (0°F): 000 °F % Difference: +0

Span (2000°F): 1999 °F Adj to: 2000 °F Span (2000°F): 2000 °F 0

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

Thermocouple Readout Pretest Linearity Check

0°F = 000 °F; 200°F = 200 °F; 400°F = 399 °F;

600°F = 599 °F; 800°F = 800 °F; 1000°F = 1000 °F;

1200°F= 1200 °F; 1400°F = 1400 °F; 1600°F = 1600 °F

1800°F= 1800 °F; 2000°F = 2000 °F

Combustion Gas (CO_2,O_2,CO) Train Leak Check: Pre ✓ Post ✓

Draft (Static) Guage Zero Check: Pre ✓ Post ✓

Scale Check Pre (Wt, #'s): 608.6 - 613.6 5.0 lbs. OK (PLS)

Post (Wt, #'s): 608.0 - 613.0 5.0 lbs. OK (PLS)

Stack cleaned prior to the run: Yes ✓ No ____

Tunnel cleaned prior to the run: Yes ✓ No ____

hivalleyepa5

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	hivalleyepa5
Stove Manufacturer:	HI VALLEY
Model Number:	XTEC
Lab Name:	MYREN
Test Date:	3\29\99
Run Number:	EPA 5
Meter Box Y Factor:	1.003
Barometric pressure (in):	28.4
Gas meter temp (ave):	80
delta H(avg):	0.900
Gas meter initial reading:	444.104
Gas meter final reading:	616.826
Front catch (acetone) mg:	5.9
first filter catch (mg):	12.7
second filter catch (mg):	-0.5
tunnel flow (ave cfm):	140.918
Emission Rate(g/hr):	0.953
Emission Rate(M5H) :	1.749
vs/VmTs:	0.0093
vs ave:	834.763
Tunnel average temp (°f):	99.250
Test time(min):	310
Fuel Load(lb. wet):	17.2
Wood moisture(%wet):	17.492
Burn rate(dry kg/hr):	1.246
Samp vol(scf):	160.913
front filter number	782
back filter number	781
acetone beaker number	4
PRELIMINARY RESULTS	
FINAL RESULTS	AUDITED
DATA SUMMARY	
MODEL :	XTEC
RUN:	EPA 5
DATE:	3\29\99
DBR:	1.246
GPH UNADJ	0.953
ADJ	1.749288386

RUN TIME (min)	PITOT DELTAP (- INCH H20)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCIT (ft/min)	PROP RATE (%)	dDGM vol std (ft3)
0	0.040	105	444.104	71	0.900	847.65		
10	0.040	126	449.655	72	0.900	863.26	104.5	5.255
20	0.038	121	455.168	74	0.900	837.81	100.6	5.200
30	0.038	123	460.677	75	0.900	839.25	103.8	5.186
40	0.037	123	466.182	77	0.900	828.13	103.1	5.163
50	0.037	122	471.703	78	0.900	827.42	104.5	5.168
60	0.037	121	477.227	79	0.900	826.71	104.2	5.162
70	0.037	118	482.747	79	0.900	824.57	103.7	5.158
80	0.037	115	488.298	80	0.900	822.43	103.8	5.177
90	0.038	110	493.848	81	0.900	829.84	103.0	5.167
100	0.039	107	499.403	82	0.900	838.47	101.4	5.162
110	0.039	104	504.966	82	0.900	836.25	100.0	5.169
120	0.039	101	510.537	82	0.900	834.02	99.9	5.177
130	0.039	99	516.106	82	0.900	832.53	99.7	5.175
140	0.040	96	521.684	82	0.900	840.87	99.5	5.183
150	0.040	95	527.273	82	0.900	840.12	98.6	5.194
160	0.040	93	532.865	82	0.900	838.60	98.4	5.196
170	0.040	91	538.447	82	0.900	837.08	98.0	5.187
180	0.040	90	544.045	82	0.900	836.32	98.3	5.202
190	0.040	89	549.635	82	0.900	835.56	98.1	5.194
200	0.040	88	555.238	82	0.900	834.80	98.2	5.207
210	0.040	86	560.835	82	0.900	833.28	97.8	5.201
220	0.040	86	566.432	82	0.900	833.28	98.0	5.201
230	0.040	85	572.037	82	0.900	832.51	98.0	5.208
240	0.040	85	577.715	82	0.900	832.51	99.3	5.276
250	0.040	86	583.238	82	0.900	833.28	96.8	5.132
260	0.040	86	588.838	82	0.900	833.28	98.1	5.204
270	0.040	86	594.431	82	0.900	833.28	97.9	5.197
280	0.040	85	600.135	82	0.900	832.51	99.7	5.300
290	0.040	85	605.695	82	0.900	832.51	97.3	5.167
300	0.040	85	611.225	82	0.900	832.51	96.7	5.139
310	0.040	84	616.826	82	0.900	831.75	97.8	5.205
320						0.00	0.0	0.000
330						0.00	0.0	0.000
340						0.00	0.0	0.000
350						0.00	0.0	0.000

METHOD 5G — PARTICULATE SAMPLING DATA — LAB-

DATE 3/29/99 PAGE 1 OF 2 MODEL # HIGH VALLEY X-TEC RUN # EPA # 5

METER BOX # 571 M METER Y 1.003 FILTER # (F) 782 (R) 781

PRE TEST LEAK RATE = .0015 CFM @ −15.5 IN. HG .655/.6565 FILTER SIZE: 110 MM

POST TEST LEAK RATE = .001 CFM @ −10.0 IN. HG PROBE LENGTH 24" GLASS

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1570	00	444.104	.040	105	71	.90	0
20	10	449.655	.040	126	72	.90	0
30	20	455.168	.038	121	74	.90	0
40	30	460.677	.038	123	75	.90	0
50	40	466.182	.037	123	77	.90	0
1600	50	471.703	.037	122	78	.90	0
10	60	477.227	.037	121	79	.90	0
20	70	482.747	.037	118	79	.90	0
30	80	488.298	.037	115	80	.90	0
40	90	493.848	.038	110	81	.90	0
50	100	499.403	.039	107	82	.90	0
1700	10	504.966	.039	104	82	.90	0
10	20	510.537	.039	101	82	.90	0
20	30	516.106	.039	99	82	.90	0
30	40	521.684	.040	96	82	.90	0
40	50	527.273	.040	95	82	.90	0
50	60	532.865	.040	93	82	.90	0
1800	70	538.447	.040	91	82	.90	0
10	80	544.045	.040	90	82	.90	0
20	90	549.635	.040	89	82	.90	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.035	115
2	1.5"	.044	116
3	4.5"	.041	116
4	5.5"	.035	115
W-1	0.5"	.035	116
2	1.5"	.043	116
3	4.5"	.040	116
4	5.5"	.036	117
	Avg.	.03863	115.88

576

Pilot Leak Check Pre ✓ Post ✓

Cp = 0.99

N
1
2
→ W 1 2 (3*4)
3
4

*=point of Avg. delta p

$Qs = \left(\sqrt{\frac{\Delta P \times BP}{T(°R)}}\right) \times 3167.2 =$

138.279 cfm

BP = START 28.42 in Hg
60 28.41
120 28.40
180 28.39
240 28.38
300 28.40

13.4 − .3

$\bar{X} = 28.400$

METHOD 5G — PARTICULATE SAMPLING DATA — LAB-

DATE 3/29/99 PAGE 2 OF 2 MODEL # HIGH VALLEY X-TEC RUN # EPA #5

METER BOX # 571 M METER Y 1.003 FILTER # (F) 782 (R) 781

PRE TEST LEAK RATE = .0015 CFM @ -15.5 IN. HG .655/.6565 FILTER SIZE: 110 MM

POST TEST LEAK RATE = .001 CFM @ -10.0 IN. HG .835/.836 PROBE LENGTH 24" Glass

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1830	00	555.238	.040	88	82	.90	0
40	10	560.835	.040	86	82	.90	0
50	20	566.432	.040	86	82	.90	0
1900	30	572.037	.040	85	82	.90	0
10	40	577.715	.040	85	82	.90	0
20	50	583.238	.040	86	82	.90	0
30	60	588.938	.040	86	82	.90	0
40	70	594.431	.040	86	82	.90	0
50	80	600.135	.040	85	82	.90	0
2000	90	605.695	.040	85	82	.90	0
10	300	611.225	.040	85	82	.90	0
20	10	616.826	.040	84	82	.90	0
30	20						
40	30						
50	40						
2100	50						
10	60						
20	70						
30	80						
40	90						

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.035	115
2	1.5"	.044	116
3	4.5"	.041	116
4	5.5"	.035	115
W-1	0.5"	.035	116
2	1.5"	.043	116
3	4.5"	.040	116
4	5.5"	.036	117
	Avg.	.03863	115.9
			576

Pilot Leak Check ✓ Pre ____ Post ✓

Cp = 0.99

N
1
2
W 1 2 (3*4)
3
4

*=point of Avg. delta p

$Qs = \left(\frac{\sqrt{(\Delta P \times BP)}}{T(°R)}\right) \times 3167.2 =$

138.279 cfm

BP = Start 28.42 in Hg
60 28.41
120 28.40
180 28.39
240 28.38
300 28.40

$\bar{X}$ = 28.40

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

Into Dessicator: Date 1/8/99 Time 12:00 By ATM Front Half ✓ Back Half ✓

Manufacturer: Schleicher & Schuell Size: 11cm Lot No.: Z8951 Grade: #25 q/lss
Order No. 06220

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
776	.7853	2/7/99	12:55	T.M.	.7853	2/10/99	1629	ATM				
777	.8127		12:56	T.M.	.8129		1628	ATM				
778	.8044		12:57	T.M.	.8040		1627	ATM				
779	.8036		12:58	T.M.	.8034		1626	ATM				
780	.7859		12:59	T.M.	.7858		1625	ATM				
781	.7894		1:00	T.M.	.7892		1625	ATM	←			
782	.7905		1:01	T.M.	.7903		1624	ATM	←			
783	.7967		1:02	T.M.	.7968		1623	ATM				
784	.8120		1:03	T.M.	.8118		1622	ATM				
785	.8166		1:04	T.M.	.8164		1621	ATM				
786	.7925		1:05	T.M.	.7923		1620	ATM				
787	.8064		1:06	T.M.	.8064		1619	ATM				
788	.7928		1:07	T.M.	.7926		1619	ATM				
789	.7774		1:08	T.M.	.7774		1618	ATM				
790	.7835		1:09	T.M.	.7835		1617	ATM				
791	.7981		1:10	T.M.	.7982		1616	ATM				
792	.8036		1:11	T.M.	.8035		1615	ATM				
793	.8116		1:12	T.M.	.8116		1614	ATM				
794	.8025		1:13	T.M.	.8024		1613	ATM				
795	.7766		1:14	T.M.	.7765		1613	ATM				
796	.7916		1:15	T.M.	.7915		1612	ATM				
797	.7755		1:16	T.M.	.7756		1611	ATM				
798	.8133		1:17	T.M.	.8133		1610	ATM				
799	.7949		1:18	T.M.	.7948		1610	ATM				
800	.8266	✓	1:19	T.M.	.8266	✓	1609	ATM				

Checked by [signature] Date: 2/21/99 Time 1405

QA REWEIGH

Filter #	WT	Date	Time	By
781	.7891	2/21/99	1412	[signature]
789	.7772	2/21/99	1414	[signature]
795	.7765	2/21/99	1415	[signature]

QA

Post Weighing Session Scale Check

1st		2nd	3rd
0.0000	0.0010	0.0000	0.0000
1.0000	1.0001	1.0000	1.0001

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
62	76	45	2/7/99	1235	ATM
63	72	45	2/10/99	1100	ATM
65	80	44	2/21/99	1312	ATM

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 1/4/99 Time: 1600 By: A.T. Myles

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4840	2/1/99	915	ATM	65.4838	2/3/99	1605	JM				
2	66.1516		917	ATM	65.1515	2/3	1606	JM				
3	67.8577		919	ATM	67.8571	2/3	1609	JM	67.8571	2/7/99	1245	ATM
4	67.5891		920	ATM	67.5886	2/3	1612	JM	←			
5	Broken											
6	67.4282		921	ATM	67.4282	2/3	1615	JM				
7	65.5451		922	ATM	65.5453	2/3	1617	JM				
8	60.0213		923	ATM	60.0213	2/3	1618	JM	← Blank			
9	66.9293		924	ATM	66.9294	2/3	1620	JM				
10	66.0888		926	ATM	66.0885	2/3	1621	JM				
11	65.6997		927	ATM	65.7015	2/3	1623	JM	65.7016	2/7/99	1247	ATM
12	56.0653		928	ATM	56.0652	2/3	1625	JM				
13	57.8945		929	ATM	57.8942	2/3	1627	JM				
		↓										

Checked By: A.T. Myles Date: 2/8/99 Time: 1705

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
55	69	39	2/1/99	0910	ATM
63	76	48	2/3/99	1555	ATM
62	76	45	2/7/99	1235	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9, Pg1, Rev4/90
Unit Mi Valley
Run # EPA 5
Date: 3/29/99

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
4	✓	4/5/99	1745	ATM	67.5950	4/6	1043	ATM	67.5946	4/18/99	1436	ATM				

FINAL FILTER WEIGHTS

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	782	.8037	3/29/99	2015	ATM	.8034	3/30	0620	ATM	.8030	4/5/99	1735	ATM				
R	781	.7889	3/29/99	2015	ATM	.7887	3/30	0621	ATM	.7887	4/5/99	1740	ATM				

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/30	0612	ATM	46	80	47
2	4/5/99	1730	ATM	64	80	41
3	4/6/99	1030	ATM	61	75	44
4	4/18/99	1346	ATM	67	80	50
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Blank
3/13/99

WST5-Form9, Pg1, Rev4/90
Unit Hi Valley X4i
Run #
Date: 3/29/99

Acetone Blank - 100 ml Acetone

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
B	✓	3/18/99	0854	ATM	66.0215	3/19/99	2237	ATM	66.0215	3/20/99	1332	ATM				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/18	2140	ATM	68	84	43
2	3/20	1300	ATM	64	84	32
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

Dates From 1/9/99

Through _____

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Mettler
Model AE100
SN K04827

Level	Recali-brated	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Date	Time	Tech	Wet Bulb	Dry Bulb	% RH
✓	Yes P.O.	99.9999	10.0001	1.0002	.1003	.0203	1/9/99	1243	ATM	58	70	48
✓	No	100.0002	10.0000	1.0000	.1000	.0200	1/14/99	1113	ATM	62	75	47
✓	YES P.O.	99.9998	10.0002	1.0000	.0999	.0201	1/23/99	1100	ATM	63	77	47
✓	YES	99.9998	10.0000	1.0000	.1000	.0201	1/24/99	1318	ATM	59	74	45
✓	YES	99.9996	10.0002	1.0000	.1000	.0200	2/1/99	0910	ATM	55	69	39
✓	YES	99.9997	10.0001	1.0001	.1002	.0201	2/2/99	0939	ATM	60	73	46
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	2/3/99	1555	ATM	63	76	48
✓	YES	99.9999	10.0000	1.0001	.1001	.0201	2/7/99	1235	ATM	62	76	45
✓	YES	99.9998	10.0000	1.0000	.1000	.0200	2/10/99	1600	ATM	63	77	45
✓	YES	99.9998	10.0000	1.0001	.1000	.0200	2/19/99	0246	ATM	64	78	46
✓	NO	99.9999	10.0000	1.0000	.1000	.0200	2/21/99	1312	ATM	65	80	44
✓	No	99.9997	10.0000	1.0001	.1000	.0200	3/5/99	1935	ATM	64	80	41
✓	YES P.O.	99.9997	10.0000	1.0000	.1001	.0200	3/6/99	1135	ATM	64	79	43
✓	YES	99.9997	10.0000	1.0001	.1000	.0200	3/13/99	1526	ATM	65	80	44
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	3/14/99	1355	ATM	63	78	43
✓	NO	100.0001	10.0000	1.0000	.1000	.0200	3/15/99	1622	ATM	66	81	45
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/16/99	2025	ATM	65	82	39
✓	Yes	99.9996	10.0000	1.0001	.1001	.0200	3/17/99	1615	ATM	62	77	42
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/18/99	2140	ATM	68	84	43
✓	Yes	99.9998	10.0000	1.0000	.1000	.0200	3/20/99	1300	ATM	64	84	32
✓	Yes	99.9999	10.0000	1.0001	.1001	.0201	3/21/99	2215	ATM	61	74	47
✓	Yes	99.9997	10.0000	1.0000	.1001	.0200	3/22/99	0122	ATM	65	85	33
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/23/99	1115	ATM	69	84	46
✓	Yes	99.9998	10.0000	1.0002	.1001	.0201	3/24/99	1120	ATM	77	89	43
✓	Yes	99.9999	10.0000	1.0002	.1001	.0201	3/29/99	2038	ATM	69	72	45
✓	No	99.9999	10.0002	1.0002	.1001	.0202	3/30/99	0610	ATM	66	80	47
✓	No	99.9999	10.0000	1.0000	.1001	.0201	3/31/99	1300	ATM	64	80	41
✓	NO	99.9996	10.0000	1.0000	.1001	.0201	4/5/99	1730	ATM	64	80	41
✓	YES	99.9998	10.0001	1.0001	.1001	.0201	4/6/99	1030	ATM	61	75	44
QC Services		Audit	4/6/97	- Wt. / Scale check of			Audit					
✓	NO	100.0003	10.0001	1.0001	.1001	.0201	4/6/99	1730	ATM			
✓	YES	99.9998	10.0001	1.0001	.1001	.0200	4/7/99	1724	ATM	68	85	33
✓	No	99.9996	10.0000	1.0001	.1001	.0201	4/8/99	1346	ATM	67	80	50
✓	YES	99.9997	10.0000	1.0000	.1000	.0200	4/16/99	1230	ATM	66	82	42
✓	YES	99.9997	10.0000	1.0000	.1000	.0200	4/17/99	1625	ATM	68	84	43

Woodstove Particulate
Catch Processing Sheet
Woodstove Data Sheet #5
EPA M5G-1

Unit: Hi Valley
Run: EPA 5
Date: 3/29/99
Technicians: ATM
Revised 1/16/98-Data Sheet #5

Filters

Filter # (Front) 782 Beaker # 4
Final Wt. .8030 g Ml 60
Tare Wt. .7903 g Desc. Acetone
Net Wt. .0127 g

Final Wt. 67.5946 g
Tare Wt. 67.5886 g
Net Wt. .0060 g

Filter # (Rear) 781 Beaker # _____
Final Wt. .7887 g Ml _____
Tare Wt. .7892 g Desc. _____
Net Wt. -.0005 g

Final Wt. _____ g
Tare Wt. _____ g
Net Wt. _____ g

Acetone Blank Calculation:

Blank Date: 3/13/99
Blank Beaker # 8
Final Wt. 66.0215 g
Ml 100
Tare Wt. 66.0213 g
Desc. Acetone
Net Wt. .0002 g

.0002 g ÷ 100 ml = .000002 g/ml

Blank Residue Value Calculation:

.000002 g/ml acetone X 60 ml acetone = .00012 g
Blank Residue Value

Total Particulate Catch Calculation

Filter: .0127 g
Filter: -.0005 g
Beakers: .0060 g (Total Catch) − .0001 g (Blank Residue Value) = .0059 g
Total Catch = .0181 g

Unit HIGH VALLEY X-TRE
Run # EPA #5
Date 3/29/99
Technician ATH, RLS.
WST6-Forml, Rev8/96

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 2.713 ft^3

Dilution Tunnel Draft (If applicable): Start 00.0 Stop 00.0

Test Chamber Air Velocity: Start: 00.0 Stop: 00.0 Avg: 00.0

Wet Bulb/ Start: WB: 55 °F DB: 67 °F 1.0 % Amb Moisture 45 %RH

Dry Bulb Stop: WB: 59 °F DB: 72 °F 1.25 % Amb Moisture 45 %RH

$\bar{X}$ = 1.125 % Ambient Moisture $\bar{X}$ = 45 % Relative Humidity (RH)

Empty Stove Wt: 514.0 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 607.5 lbs. Dry: 605.0 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 605.0 lbs.

Kindling Wt. Paper: 0.3 lbs. Wood: 5.0 lbs.

Pre Burn Fuel Wt. 16.6 + 17.3 + 16.2 + 5.1 Total: 55.2 lbs. ✓

Total Kindling and Pre Burn Fuel Wt 60.5 lbs. ✓

Coal Bed Wt-lbs: Range (609.3 - 608.5) 4.3 - 3.5 lbs. Actual: 3.5 lbs. ✓

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\frac{4.3}{\text{Upper Wt.}} + \frac{3.5}{\text{Lower Wt.}}$ 12 X .25 = .9 lbs. ✓

Test Fuel Wt-lbs: Ideal 19.0 lbs. Range: 17.1-20.8 lbs. Actual: 17.2 lbs.

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Flanges) 20 Pcs.

2 x 4's x 17 1/8	"	4 Pcs	9.0 lbs.	52.3 % ✓
4 x 4's x 17 1/8	"	2 Pcs	8.2 lbs.	47.7 % ✓

Est. Dry Burn Rate (Kg/Hr.) $\frac{17.2 - (17.2 \times .17492)}{2.2046} \times \frac{60}{310} = 1.246$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) X $\frac{63}{100}$ x 1.246 = 15,023 Est Heat Output (HO_E) BTU's/Hr

Comments:

Stove Operating Data
Woodstove Test Data Sheet #9
Cold Start

Unit: HIGH VALLEY X-TEC
Run: EPA #5
Date: 3/29/99
Technician(s): ATH RLS.
Data Sheet #9 - Rev 1/98-Pg.1

Fire Started: 0945 P.S.T.

Warm up and Preburn: Primary Air: Wide open from ignition until the start of preburn when the primary air control(s) was (were) adjusted to the run setting of . 1 1/16 OPEN . At the run setting until the start of the test.

Secondary Air: No Conhols, Naturally drafted

Secondary Burn/Cat Bypass: N/A

Charcoal Bed Preparation: Broke up, raked and leveled the coal bed prior to the addition of each warm up/pre burn fuel charge. Starting 1:30 before the start of the test, broke up, raked and leveled the coal bed. In stove for 25 seconds.

Test: Door wide open during loading 1 min 10 sec, then closed

Primary Air: Wide open during the start of the test until 4:30. Closed PAC
Adjusted to the run setting of 1 1/16" between 4:25 and 4:30. early dur
At the run setting of 1 1/16" at 4:30 into the run. to post

Secondary Air: No Conhols, Naturlly drafted, Start

Secondary Burn/Cat Bypass: N/A

Fan: OFF, Fan Confirmation Test

Test Run Anomalies:
This FCT should have been run at either 1" or 7/8" - perhaps even 3/4".

Unit HIGH VALLEY X-TEC
Run # EPA #5
Date 3/29/99
Technician ATH, RLS,
Page 1 of 3
WST7-Form2-A, Rev10/88

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-1

Wood Data: Kindling: A mix of the below grades

	Size	Mill	Grade	Species
Pre Burn	2x4	CANYON LBR.	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2x4	CANYON LBR.	#2 STD. & BTR.	D. FIR, S. GRN.
	4x4	STAND & 879	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (16.6 lbs) added at 1025.
2nd Warm up/Pre Burn Fuel charge (17.3 lbs) added at 1115.
3rd Warm up/Pre Burn Fuel charge (16.2 lbs) added at 1223.
4th Warm up/Pre Burn Fuel charge (5.1 lbs) added at 1341.
5th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
6th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
7th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
8th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.

The coals were scooped out of the stove immediately prior to adding the 3 pre burn/warm up fuel charge. The stove lost 2.5 lbs. 3.0 lbs of coals back in after scoop.

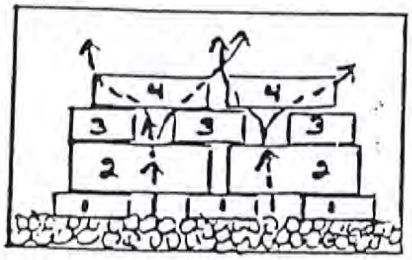
All pre burn/warm up fuel pieces were either 16 or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 16 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 16 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 3 pcs 14 inches long. The majority of the pieces in each rick were in the second layer which had an approximate 0.5-1.0" space between pieces. (The loading directions indicate the direction of the longest dimension on each piece relative to the loading door opening.) Each pre burn/warm up fuel charge normally weighs within the weight range allowed for the actual test fuel charge

Unit HIGH VALLEY X-TC
Run # EPA #5
Date 3/29/99
Technician ATM, RLS.
Page 2 of 3
WST7-Form2-A, Rev 6/90

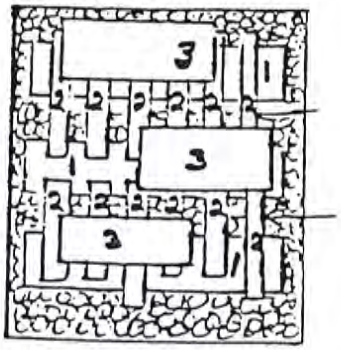
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

Warm up Information (cont.):

Each warm up/preburn fuel charge was ricked in exactly (as much as possible) the same manner and the weight of each rick was usually within the allowable weight range for the test fuel charge. The physical arrangement and alignment of each rick was designed to accomplish three (3) things: (1)The bottom layer was nestled firmly into the coal bed and was as close to being level with the bottom of the stove as possible, thus providing a stable loading platform for the rest of the rick, keeping it in a ricked state (as opposed to a col- lapsed or fallen down state) untill the rick reached the charcoal stage and sags or collapses of its own accord. (2) It enhances the flow of primary air through the ricked preburn fuel charge, for the primary air would flow through the spaces between the pieces in the first layer and then up through the spaces between the pieces in the second, third and, if present, fourth layers. (3) It maximized, as much as possible, the surface to volume ratio of each preburn fuel charge, thereby allowing the fire immediate access to as much wood surface as possible and, thereby, insuring uniform charcoalization. All three of these enhance combustion and so get the stove as hot as possible during the warm up period, therby maximizing the amount of heat (BTU's) stored in the stove. The actual preburn was not started until the stove surface temperatures had maximized and stabilized, thus indicating that the amount of heat stored in the stove had peaked. For this stove, the thermal storage was monitored using the TOP surface temperature(s) and the peak value(s) obtained were 940 °F.



Front View



Top View

The arrows indicate the direction of the air flow through the rick.

The primary air was adjusted to the run setting of 1 1/16" open 6.0 lbs above the upper charcoal bed weight.

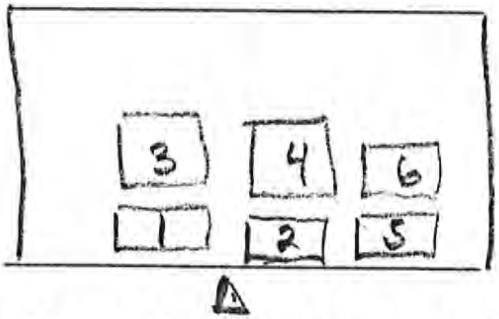
Unit HIGH VALLEY X-TEC
Run # EPA #5
Date 3/29/94
Technician ATH, RLS
Page 3 of 3
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: (1) Opened primary air control wide open. (2) Opened door. (3) Loaded test fuel charge into the stove (4) cleared coals from ash front of LPAD (5) Photograph (6) closed door

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



FRONT of stove view

4 X 4's: 3 & 4

2 X 4's: 1, 2, 5 & 6

Loading Sequence: 1, 2, 3, 4, 5 & 6 / ASTM

Driest Pcs in Load 1 & 2

Loaded the test fuel charge on an essentially level, medium to large sized, hot coal bed (in appearance, color and temperature for a Med. Low burn rate. Load 1110. Ignition 0145, Gas Balance 2105. Set PAC at 4130. Maintained gas balance, UC to baffle with secondaries on the top of the UC. 2 ARCs also on top of 3 & 4. VC on L. side of L.S stack and air right canyon as well as air Left canyon.
7:50 secondaries full width of fuel load.

Unit: HIGH VALLEY X-TEC
Run: EPA #5
Date: 3/29/99
Technician: ATM, RLS.

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

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: 1120 ✓
Calibration Checks: X ✓ Y ✓ 12.5 12.5 22.0 22.2

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg Corrected
			Uncor	Cor	Uncor	Cor	Uncor	Cor	
1	2x4x8'	K	12.5	13.3	12.5	13.3	12.0	12.8	(13.133) ✓
2									
3									
4	2x4x8'	P	22.0	23.7	22.0	23.7	21.5	23.1	23.500 ✓
5	"	P	21.5	23.1	21.5	23.1	21.5	23.1	23.100 ✓
6	"	P	21.0	22.6	21.0	22.6	21.0	22.6	22.600 ✓
7	"	P	21.5	23.1	22.0	23.7	21.5	23.1	23.300 ✓
8	"	P	21.5	23.1	22.0	23.7	21.5	23.1	23.300 ✓
9									(115.800) ✓
10									
11	2x4x17 1/8"	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200 ✓
12	"	T	18.5	19.8	18.0	19.2	18.0	19.2	19.400 ✓
13	"	T	19.0	20.3	19.0	20.3	19.5	20.9	20.500 ✓
14	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700 ✓
15									
16	4x4x17 1/8"	T	19.5	20.9	19.5	20.9	19.0	20.3	20.700 ✓
17	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700 ✓
18									(127.200) ✓
19	FEET	T	19.0	20.3	19.0	20.3	18.5	19.8	(20.133) ✓
20									(OUT SPACERS)

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	13.133 % ✓	23.160 ✓ %	21.200 % ✓
% Moisture - Wet Basis:	11.609 % ✓	18.805 ✓ %	17.492 % ✓

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

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

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

1.2

Unit: HIGH VALLEY X-TEC
Run #: EPA #5
Date: 3/29/99
Technician: ATH, RLS.

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 3½" x 3½" x 1½"

Depth (D): min. 1.560 cm 3.962 ✓

Width (W): min. 3.540 cm 8.992 ✓

Length (L): 3.530 cm min,
3.530 cm "
3.536 cm "
3.542 cm "

Length $\bar{X}$ = min 3.535 ✓ cm 8.978 ✓

Volume: 319.853 cm^3 ✓
(D X W X L)

MOISTURE: Room Temperature: 69 °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:	20.0	21.4 %
Bottom:	20.0	21.4 %
Side:	20.5	22.0 %
$\bar{X}$:		21.600 % ✓

Avg % Moisture (Dry) 21.600 % ✓

Aug % Moisture (Wet) 17.763 % ✓

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 176.3 g Dry Weight: 146.3 g

% Moisture Dried Basis: 17.016 % ✓
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	3/29/99	1140	214 °F
Out of Dryer	4/5/99	1130	215 °F

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

Density = 146.3 ✓ g (dry wt) ÷ 319.853 cm^3 (volume) = 0.4574 g/cm^3 ✓

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. _____ g

Wet Wt: _____ g - _____ g = _____ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: _____ g - _____ g = _____ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

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

BUR ATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
Eno Wt.: 608.5 lbs.

Unit: HIGH VALLEY X-TEC Date: 3/29/99
Run: EPA #5 Technician(s): ATM, RLS.
Page: 1 of 3

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	T/C(2) Dry Bulb	% H_2O	T/C(3) Calc W/B	Stack	4 SO_2 v.	4 SO_2 PPM	Static Press.	Comments
0 / 1510	625.7	17.2	0	.183	4.57	58.7	14.71		33.3	1.67	2.7	83	118	2.6	108	272			-.053	Flow
5 / 15	624.6	16.1	1.1	.407	10.14	37.3	9.34	GAS BAL.	2.3	6.13	78.0	100	130	5.4	123	347			-.086	SO_2 1.5
10 / 20	623.8	15.3	.8	.356	8.87	43.4	10.87		10.3	0.53	16.7	124	144	12.5	139	382			-.072	~~CO_2~~ 1.5
15 / 25	622.9	14.4	.9	.420	10.46	37.5	9.39		4.7	0.25	41.9	129	146	14	142	384			-.075	~~O_2~~ 1.5
20 / 30	622.1	13.6	.8	.453	11.28	35.8	8.97		7.5	0.38	29.7	131	148	15	144	396			-.076	~~CO~~ 1.5
25 / 35	621.2	12.7	.9	.475	11.83	33.8	8.46		4.1	0.22	53.8	132	149	15.5	146	407			-.077	
30 / 40	620.3	11.8	.9	.512	12.75	30.3	7.59		3.4	0.18	70.8	133	150	16	147	420			-.078	
35 / 45	619.4	10.9	.9	.503	12.53	31.9	7.99		2.1	0.12	104.4	132	150	15.5	147	426			-.077	
40 / 50	618.6	10.1	.8	.475	11.83	34.1	8.54		2.6	0.14	84.5	131	149	15.5	147	416			-.077	
45 / 55	617.7	9.2	.9	.484	12.06	33.0	8.26		3.2	0.17	70.9	130	148	14.5	144	414			-.076	
50 / 1600	617.0	8.5	.7	.475	11.83	34.0	8.51		3.2	0.17	69.6	129	148	14	143	412			-.075	
55 / 05	616.2	7.7	.8	.477	11.88	34.2	8.56		2.0	0.11	108.0	128	147	13.5	142	409			-.075	
																4685			.897	Flow
60 / 10	615.5	7.0	.7	.469	11.68	34.9	8.74		2.9	0.16	73.0	126	145	13	142	404			-.074	SO_2 1.5
65 / 15	614.9	6.4	.6	.450	11.21	36.7	9.19		2.8	0.16	70.1	124	144	12.5	140	395			-.072	~~CO_2~~ 1.5
70 / 20	614.2	5.7	.7	.425	10.59	39.0	9.77		3.0	0.16	66.2	122	141	12	139	387			-.071	~~O_2~~ 1.5
75 / 25	613.7	5.2	.5	.403	10.04	41.0	10.27		2.9	0.16	62.8	119	138	10	134	379			-.071	~~CO~~ 1.5
80 / 30	613.2	4.7	.5	.367	9.15	43.9	11.00		5.5	0.29	31.5	116	135	9.5	133	370			-.069	
85 / 35	612.8	4.3	.4	.322	8.03	47.7	11.95		6.6	0.35	22.9	111	132	8.5	131	358			-.068	
90 / 40	612.5	4.0	.3	.291	7.26	50.8	12.73		8.7	0.45	16.1	107	130	7.2	128	345			-.065	
95 / 45	612.2	3.7	.3	.285	7.11	51.1	12.80		9.7	0.50	14.2	103	128	6.3	123	333			-.065	
100 / 50	612.0	3.5	.2	.267	6.66	52.6	13.18	OUT BAL.	14.1	0.72	9.3	100	126	5.5	121	329			-.062	
105 / 55	611.8	3.3	.2	.228	5.69	55.8	13.98		18.3	0.93	6.1	96	123	4.8	118	314			-.061	
110 / 1700	611.6	3.1	.2	.217	5.42	56.2	14.08		22.6	1.15	4.7	92	121	4.0	114	306			-.060	
115 / 05	611.5	3.0	.1	.223	5.57	56.2	14.08		21.2	1.08	5.2	89	119	3.6	112	298			-.058	
																4218			.796	

BUR ATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
END WT.: 608.5 lbs,

Unit: HIGH VALLEY X-TEC Date: 3/29/99
Run: EPA #5 Technician(s): ATH, PLS,
Page: 2 of 3

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	Bal	T/C(1)T/C(2) Wet Bulb	T/C(1)T/C(2) Dry Bulb	% H_2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO_2 v.	4 SO_2 PPM	Static Press.	Comments
120 1710	611.3	2.8	.2	.222	5.54	56.1	14.06		21.9	1.11	5.0	88	118	3.5	112	292			-.057	Flow
125 15	611.2	2.7	.1	.205	5.12	57.2	14.33		24.8	1.25	4.1	86	115	3.2	111	285			-.055	SO_2 1.5
130 20	611.1	2.6	.1	.184	4.60	59.6	14.94		26.15	1.34	3.4	83	113	2.8	109	279			-.054	~~CO_2~~ 1.5
135 25	610.9	2.4	.2	.181	4.52	59.7	14.96		26.0	1.31	3.5	82	112	2.6	108	273			-.054	~~O_2~~ 1.5
140 30	610.8	2.3	.1	.169	4.23	61.0	15.29		29.1	1.48	2.9	81	110	2.5	108	269			-.053	~~CO~~ 1.5
145 35	610.7	2.2	.1	.162	4.05	61.3	15.36		28.1	1.43	2.8	80	109	2.4	107	264			-.052	
150 40	610.7	2.2	0	.155	3.88	62.3	15.61		28.0	1.42	2.7	79	108	2.3	107	259			-.052	
155 45	610.6	2.1	.1	.151	3.78	62.4	15.64		28.6	1.44	2.6	79	107	2.4	106	255			-.051	
160 50	610.5	2.0	.1	.157	3.93	61.9	15.51		28.0	1.42	2.8	78	106	2.3	106	257			-.051	
165 55	610.5	2.0	0	.155	3.87	62.2	15.59		27.6	1.40	2.8	77	106	2.1	104	249			-.050	
170 1800	610.4	1.9	.1	.153	3.83	62.5	15.66		28.1	1.42	2.7	77	105	2.1	103	246			-.050	
175 05	610.4	1.9	0	.152	3.80	62.5	15.66		28.0	1.41	2.7	77	104	2.1	103	242			-.049	
																3165			.628	Flow
180 10	610.3	1.8	.1	.157	3.78	62.8	15.74		27.4	1.38	2.7	76	103	2.1	103	240			-.049	SO_2 1.5
185 15	610.2	1.7	.1	.150	3.75	63.0	15.79		27.7	1.40	2.7	76	102	2.1	102	238			-.049	~~CO_2~~ 1.5
190 20	610.1	1.6	.1	.142	3.55	63.5	15.92		30.7	1.55	2.3	76	102	2.1	102	235			-.048	~~O_2~~ 1.5
195 25	610.1	1.6	0	.144	3.60	63.6	15.94		28.8	1.45	2.5	75	101	2	102	237			-.047	~~CO~~ 1.5
200 30	610.0	1.5	.1	.151	3.78	62.9	15.76		26.7	1.35	2.8	75	101	2	101	230			-.047	
205 35	609.9	1.4	.1	.170	4.25	61.5	15.41		22.6	1.13	3.8	76	101	2.1	101	230			-.047	
210 40	609.8	1.3	.1	.175	4.38	61.2	15.34		20.6	1.04	4.2	76	100	2.2	102	229			-.047	
215 45	609.7	1.2	.1	.176	4.40	61.0	15.29		21.1	1.07	4.1	76	100	2.2	102	229			-.047	
220 50	609.7	1.2	0	.177	4.42	61.0	15.29		21.4	1.08	4.1	75	100	2.0	101	228			-.046	
225 55	609.6	1.1	.1	.175	4.38	61.0	15.29		22.6	1.15	3.8	75	100	2.0	101	227			-.046	
230 1900	609.5	1.0	.1	.177	4.42	60.9	15.26		21.9	1.11	4.0	74	99	1.9	101	227			-.046	
235 05	609.4	.9	.1	.170	4.25	61.5	15.41		22.8	1.15	3.7	74	99	1.9	101	226			-.046	
																2771			.565	
																5936				1.193

BURN RATE AND FLUE GAS DATA
WOOD STOVE DATA SHEET #12
WSTC-Form 14 Rev 1/88
END WT. 608.5 lbs

Unit: HIGH VALLEY X-TEC Date: 3/29/99
Run: EPA #5 Technician(s): A.T. Hayden
Page: 3 of 3

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO2 v.	1 CO2 %CO2	2 O2 v.	2 O2 %O2	Tel	3 CO v.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	T/C(3) Dry Bulb	% H2O	Calc W/B	Stack	4 SO2 v.	4 SO2 PPM	Static Press.	Comments
240 / 1910	609.3	.8	.1	.160	4.00	62.9	15.76		21.9	1.10	3.6	74	99	1.9	101	.225			-.045	Flow
245 / 15	609.3	.8	0	.156	3.90	63.0	15.79		23.1	1.17	3.3	74	98	2	100	223	Wood	Settled	-.044	SO2 1.5
250 / 20	609.2	.7	.1	.149	3.73	63.6	15.94		24.4	1.22	3.1	74	98	2	100	222			-.044	CO2 1.5
255 / 25	609.1	.6	.1	.144	3.60	63.9	16.02		26.4	1.33	2.7	73	98	1.9	100	220			-.043	O2 1.5
260 / 30	609.1	.6	0	.145	3.63	63.7	15.97		27.2	1.36	2.7	74	98	2	100	218			-.043	CO 1.5
265 / 35	609.0	.5	.1	.149	3.73	63.5	15.92		26.1	1.30	2.9	74	98	2	100	217			-.043	
270 / 40	608.9	.4	.1	.153	3.83	63.4	15.89		24.4	1.23	3.1	74	98	2	100	216			-.042	
275 / 45	608.9	.4	0	.157	3.93	62.9	15.76		24.8	1.26	3.1	74	98	2	100	216	coals		-.042	
280 / 50	608.8	.3	.1	.161	4.03	62.4	15.64		24.9	1.27	3.2	74	98	2	100	214	dead		-.041	
285 / 55	608.7	.2	.1	.157	3.93	62.7	15.71		26.2	1.32	3.0	74	98	2	100	213			-.041	
290 / 2000	608.7	.2	0	.142	3.55	63.8	15.99		28.9	1.45	2.5	73	98	1.9	100	212			-.041	
295 / 05	608.7	.2	0	.122	3.06	65.8	16.49		31.1	1.58	1.9	74	97	2	100	211			-.041	
																(260?)			(.510)	Flow
300 / 10	609.6	.1	.1	.106	2.66	67.7	16.97		29.8	1.50	1.8	73	97	1.9	100	208			-.041	SO2 1.5
305 / 15	609.6	.1	0	.100	2.51	68.3	17.12		29.6	1.51	1.7	73	97	1.9	100	206			-.040	CO2 1.5
310 / 20	609.5	0	.1	.098	2.46	68.6	17.19		28.1	1.45	1.7	73	96	1.9	100	205			-.041	O2 1.5
315 / 25																(619?)			(12.2?)	CO 1.5
320 / 30																				
325 / 35																(322.6)			(.632)	
330 / 40																				
335 / 45													63±			(18065)			(3.518?)	
340 / 50																				
345 / 55																286.74			-.05584	
350 / 2100																				
355 / 05																(287?)			(-.0561)	

Pre Burn Stove Wt. 6.0 lbs. VP lbs.
Test Stove wt. Range 609.2 - 608.5 lbs.

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

28.47 BARO. PRESSURE — 28.42 ↓ SLOWLY

Unit: HIGH VALLEY X-TEC Date: 3/29/99
Run: EPA #5 Technician(s): ATH, RLS.
Page: 1 of 2

Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Hot Box On Comments
0 1250	615.2	0	644	902	540	498	572	551	874	1579	69	-.096	Primary Air Set at 1 1/16" OPEN
5 55	614.2	1.0	539	827	548	499	576	563	868	1478	69	-.087	Secondary Air Set at 1"x3"
10 1300	613.2	1.0	498	775	549	499	577	567	876	1468	70	-.083	Fan: OFF
15 05	612.3	.9	470	735	550	503	578	565	888	1396	70	-.080	TUNNEL ON AT: 1253
20 10	611.6	.7	442	694	549	509	580	562	884	1343	71	-.077	Buckets Iced
25 15	611.0	.6	421	654	545	511	582	559	877	1350	71	-.075	ANALYZERS SPANNED
30 20	610.5	.5	403	621	539	512	582	552	876	1272	71	-.072	Pumps turned on at: 1330
35 25	610.0	.5	389	592	535	511	582	545	876	1246	72	-.070	ΔT
40 30	609.7	.3	371	561	527	511	582	538	878	1196	73	-.066	
45 35	609.4	.3	356	536	520	511	579	534	880	1176	72	-.065	Check WB/DB: 119/137 536.0
50 40	609.2	.2	344	515	511	510	575	530	878	1140	73	-.064	528.2
55 45	613.9	.4	348	507	501	508	568	529	819	1254	73	-.069	ADD FUEL 5.1 lbs.
													Probe IN TUNNEL
60 50	613.3	.6	382	561	488	491	557	528	812	1240	73	-.072	525.0
65 55	612.6	.7	384	581	482	481	547	525	805	1232	73	-.071	523.2
70 1400	612.1	.5	377	580	476	475	540	524	795	1191	73	-.070	519.0
75 05	611.6	.5	376	572	472	473	535	523	793	1219	74	-.070	515.0
80 10	611.1	.5	379	572	469	472	532	523	802	1286	73	-.070	513.6
85 15	610.5	.6	391	596	467	474	531	524	810	1347	73	-.071	518.4
90 20	610.0	.5	394	609	468	478	531	525	817	1304	73	-.072	522.2
95 25	609.7	.3	378	597	469	481	532	527	824	1230	73	-.070	521.2
100 30	609.4	.3	355	551	465	481	529	527	814	1077	72	-.065	510.6
105 35	609.3	.1	336	515	459	478	522	527	804	1032	73	-.064	500.2
110 40	609.1	.2	323	487	452	473	515	526	795	1014	72	-.062	490.6
115 45	609.0	.1	311	462	445	468	507	524	780	973	72	-.060	481.2

Pre Burn Start wt. lbs. / lbs.
Test Start wt. Range 609.2 - 608.5 lbs.

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

BARO. PRESSURE 28.47

Unit: HIGH VALLEY X-TEC
Run: EPA #5
Page: 2 of 2

Date: 3/29/99
Technician(s): ATH, RLS,

Hot Box On

	Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Comments
473.4	~~0~~ 120 1450	608.9	.1	304	445	438	462	499	523	770	980	72	-.059	Primary Air Set at 1 1/16" OPEN
464.6	~~5~~ 125 55	608.8	.1	298	431	434	456	491	521	773	968	72	-.057	Secondary Air Set at 1"x3"
453.4	~~10~~ 130 1500	608.7	.1	290	415	431	450	483	518	752	910	73	-.055	Fan: OFF
442.2	~~15~~ 135 05	608.6	.1	281	401	423	444	476	515	742	895	73	-.054	TUNNEL ON AT: 1253
	~~20~~ 140 10	608.5	.1	272	386	414	437	467	510	731	880	73	-.053	Buckets Iced 442.8
	~~25~~ 145 15													ANALYZERS SPANNED
	~~30~~ 150													Pumps turned on at: 1335
	~~35~~ 155													ΔT
	~~40~~ 160													
	45													Check WB/DB: 113/137
	50													
	55													
														Probe In Tunnel
	60													
	65													
	70													
	75													
	80													
	85													
	90													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Test: HIGH VALLEY X-TEC Date: 3/29/99
Run: EPA #5 Technician(s): ATM, LLS.
Page: 1 of 3

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Condar (1107 1QX)	
0 / 1510	386	414	437	467	510	731	880	73	105	250	40	85	50	251	
5 / 15	407	414	426	462	505	673	1031	74	147	250	41	86	37	251	
10 / 20	495	409	387	450	505	642	1311	75	126	251	41	86	37	251	
15 / 25	536	403	364	443	501	653	1416	75	121	251	41	87	37	251	
20 / 30	587	402	351	441	494	661	1466	75	121	251	41	87	38	250	
25 / 35	611	405	344	443	486	679	1485	74	122	251	41	87	38	250	
30 / 40	637	411	340	446	480	720	1507	74	123	251	41	87	38	250	
35 / 45	658	419	340	452	475	728	1473	73	124	251	41	87	38	250	
40 / 50	645	426	343	459	471	738	1418	74	123	251	41	87	38	250	
45 / 55	637	434	347	468	469	758	1400	74	123	251	42	87	38	250	
50 / 1600	631	442	354	479	469	770	1452	74	122	251	42	87	38	250	
55 / 05	630	449	365	490	467	790	1391	74	121	250	42	87	38	250	
	(6860)	(5028)	(4398)	(5500)	(5832)	(8543)	(16,230)	(889)							
60 / 10	625	457	377	500	465	792	1379	74	121	250	42	87	38	250	
65 / 15	611	467	395	509	463	809	1367	74	119	250	42	87	38	250	
70 / 20	594	476	410	515	462	821	1340	73	118	250	42	87	38	250	
75 / 25	576	484	422	520	461	837	1323	74	116	250	42	87	38	250	
80 / 30	558	488	432	523	462	834	1271	74	115	250	42	86	38	251	
85 / 35	543	489	437	525	464	834	1253	74	113	250	42	86	38	251	
90 / 40	524	485	440	524	467	828	1215	73	110	250	42	86	38	251	
95 / 45	501	478	445	520	471	826	1165	73	108	250	43	86	38	251	
100 / 50	484	472	450	515	475	822	1116	73	107	250	43	86	38	251	
105 / 55	468	467	454	506	479	810	1081	73	105	250	43	86	38	251	
110 / 1700	452	462	450	496	481	806	1034	72	104	250	43	86	38	250	
116 / 05	437	453	447	487	482	801	1006	73	102	250	43	86	38	250	
	(6373)	(5678)	(5159)	(6140)	(5632)	(9820)	(14,550)	(880)							
	13,333	10,706	9557	11,640	11,464	18,363	30,780	1769							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Plant: HIGH VALLEY X-TEC Date: 3/29/99
Run: EPA #5 Technician(s): ATH, RLS.
Page: 2 of 3

T/C# / Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tunnel	13 C. Gas Box	14 Impinger Out	15 5G-1 Filter	16 5G-1 Condenser	17 ~~Con~~ dar (Hot Box)	18
120 1710	424	448	447	480	483	794	996	72	101	250	44	86	38	250	
125 15	413	442	449	475	485	788	919	72	100	250	44	86	38	250	
130 20	402	435	448	470	487	781	895	72	99	250	44	86	38	250	
135 25	392	428	443	465	485	773	879	71	98	250	44	86	38	250	
140 30	382	422	438	459	482	754	864	71	96	250	44	86	38	250	
145 35	373	415	432	453	477	747	835	71	96	250	44	86	38	250	
150 40	365	407	426	446	474	738	825	71	95	251	44	86	38	250	
155 45	359	402	421	440	471	728	809	70	94	251	44	86	39	251	
160 50	351	395	416	435	469	719	802	70	93	251	45	85	39	251	
165 55	345	390	412	431	468	706	798	70	92	251	45	85	39	251	
170 1800	341	384	409	426	467	714	783	70	91	251	45	84	38	251	
175 05	336	379	408	422	465	687	767	70	91	251	45	83	38	251	
	4483	4947	5149	5402	5713	8929	10,172	850							
180 10	331	375	408	419	463	670	759	69	90	251	45	83	39	251	
185 15	327	370	409	415	461	667	752	69	89	251	45	82	39	251	
190 20	323	366	408	412	460	659	734	69	89	250	45	82	39	250	
195 25	319	361	408	408	458	652	727	68	88	250	46	81	39	250	
200 30	315	357	408	405	454	644	730	68	88	250	46	81	39	250	
205 35	313	353	411	402	450	637	740	68	87	250	46	80	39	250	
210 40	312	349	424	402	447	629	748	68	86	251	46	80	39	250	
215 45	311	346	436	403	444	625	744	67	86	251	46	79	39	250	
220 50	311	344	443	405	441	619	742	67	86	251	44	79	39	250	
225 55	309	341	451	405	438	616	737	67	85	251	43	78	39	250	
230 1900	309	340	455	406	436	609	732	67	85	251	43	78	39	251	
235 05	308	336	458	407	433	602	722	67	85	250	43	78	39	250	
	3788	4238	5119	4884	5385	7629	8867	814							
	8271	9185	10268	10291	11098	16,558	19039	1664							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/29/99
Run: EPA #5 Technician(s): AT, PLS,
Page: 3 of 3

T/C# / Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tunnel	13 C. Gas Box	14 Impinger Out	15 5G-1 Filter	16 5G-1 Condenser	17 Hot Box ~~Con-dar~~	18
240 1410	306	334	453	408	428	603	715	67	85	251	43	72	39	251	
245 15	304	333	444	407	426	611	707	68	86	251	43	77	39	251	
250 20	302	331	438	406	424	613	693	67	85	251	43	77	39	251	
255 25	300	330	431	405	421	608	684	67	86	251	43	77	39	251	
260 30	298	329	426	403	419	608	682	68	86	251	43	77	39	251	
265 35	296	327	426	401	417	610	681	68	86	251	43	77	39	251	
270 40	294	326	425	398	415	613	676	68	86	251	43	77	39	250	
275 45	292	324	426	396	413	619	674	67	86	251	43	78	39	250	
280 50	290	324	429	392	409	620	664	67	85	251	43	78	39	251	
285 55	289	324	429	390	407	622	658	67	85	251	43	77	39	250	
290 2000	287	325	429	387	402	619	640	67	85	251	43	77	39	250	
295 05	286	325	425	384	400	614	632	67	85	251	43	77	39	250	
	35440	39332	51811	47771	49811	73607	81105	8088							
300 10	283	323	414	380	398	590	620	67	85	251	44	77	39	251	
305 15	280	321	402	376	398	574	608	67	85	251	44	77	39	250	
310 20	277	318	395	373	398	564	600	67	84	251	44	77	39	250	
315 25	8401	9621	12111	11291	11941	17285	18283	2011							
320 30															
325 35	43841	48851	63921	59061	61751	90981	99341	10091			Delta T	Start	442.8		
330 40												Stop	352.2		
335 45	259356	247851	262171	278371	287371	140091	599531	44421	631				-90.6		
340 50															
345 55	410.91	393.41	416.11	441.91	456.11	698.61	948.461	70.511							
350 2100															
355 05	4111	3931	4161	4421	4561	6971	4481	711							

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-1

Site: Myren Consulting, ~~Woodinville, WA~~ Colville, WA Date: 3/29/99 Analyte: CO_2

Source: High Valley XTEC Run #: EPA #5

Zero Cyl #: 36919 Conc. 00.0 % CO_2 Cyl Press: 220 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0 % CO_2 Cyl Press: 1480 psi

Certified by: Oxarc Date: 8/22/97

Analyzer: Make: Horiba Model: PIR-2000 SN: 607024

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

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

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

Pre Run Audit: By: ATM / RLS Time: 1315 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0256	+.0256	+0.10
Span	24.0	.240	6.0	6.0	.236	5.8913	-.1087	-1.81

Comments:

Post Run Audit: By: ATM / RLS Time: 2129 Temp: 66 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0256	+.0256	+0.10
Span	24.0	.240	6.0	23.5	.235	5.866	-.1336	-2.23

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-2

Site: Myren Consulting, ~~Woodinville, WA~~ Colville, WA Date: 3/29/99 Analyte: O_2

Source: High Valley XTEC Run #: EPA #5

Zero Cyl #: 36919 Conc. 00.0 % O_2 Cyl Press: 220 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: 250-1060 Conc: 6.0 % O_2 Cyl Press: 1480 psi

Certified by: Oxarc Date: 8/22/97

Analyzer: Make: Taylor Model: OA 137 SN: 137/4772

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 25.0% O_2

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

Pre Run Audit: By: ATM/RLS Time: 1315 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	0.0155	-.0155	-0.06
Span	6.0	24.0	6.0	6.0	23.8	5.955	-.0445	-0.74

Comments:

Post Run Audit: By: ATM/RLS Time: 2129 Temp.: 66 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	0.0155	-.0155	-0.06
Span	6.0	24.0	6.0	6.0	23.8	5.955	-.0445	-0.74

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-3

Site: Myren Consulting, ~~Woodinville~~ Colville, WA Date: 3/29/99 Analyte: CO

Source: High Valley XTEC Run #: EPA #5

Zero Cyl #: 36979 Conc. 00.0 % CO Cyl Press: 220 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: 250-1060 Conc. 1.26 % CO Cyl Press: 1480 psi

Certified by: Oxarc Date: 8/22/97

Analyzer: Make: Infra Red Model: 702 D SN: 113

Range: 0 - 10.0% CO Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 5.0% CO
EPA Control Limits = +2.5% of 5.0% CO = + 0.125% CO

Pre Run Audit: By: ATM /RLS Time: 1315 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.0	-.0091	-.0091	-0.18
Span	1.26	25.2	1.26	1.24	25.1	1.2518	-.0082	-0.65

Comments:

Post Run Audit: By: ATM /RLS Time: 2179 Temp.: 66 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.1	-.0040	-.0040	-0.08
Span	1.26	25.2	1.26	1.22	24.4	1.2166	-.0434	-3.44

Comments:

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

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

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

Unit: HIGH VALLEY X-TEC
Run: EPA 5
Date: 3/29/99
Technicians: ATH, PLS.
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: _____ °F T/C#30: _____ °F

Thermocouple Check (at ambient): T/C#1: 59 °F; T/C#2: 59 °F;

T/C #3: 58 °F;	T/C #4: 57 °F;	T/C #5: 58 °F;
T/C #6: 57 °F;	T/C #7: 57 °F;	T/C #8: 57 °F;
T/C #9: 61 °F;	T/C #10: 58 °F;	T/C #11: 60 °F;
T/C #12: 61 °F;	T/C #13: 58 °F;	T/C #14: 57 °F;
T/C #15: 61 °F;	T/C #16: 59 °F;	T/C #17: 59 °F;
T/C #18: _____ °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:

	Adj	Post Test Check	% Difference
Zero (0°F): 002 °F	to: 000 °F	Zero (0°F): 002 °F	+0.10
Span (2000°F): 1999 °F	Adj to: 2000 °F	Span (2000°F): 2000 °F	0.00

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

Thermocouple Readout Pretest Linearity Check

0°F = 000 °F;	200°F = 200 °F;	400°F = 399 °F;
600°F = 599 °F;	800°F = 800 °F;	1000°F = 1000 °F;
1200°F= 1199 °F;	1400°F = 1400 °F;	1600°F = 1599 °F
1800°F= 1800 °F;	2000°F = 2000 °F	

Combustion Gas (CO_2,O_2,CO) Train Leak Check: Pre ✓ Post ✓

Draft (Static) Guage Zero Check: Pre ✓ Post ✓

Scale Check Pre (Wt, #'s): 607.5 - 612.5 5.0 lbs, OK (PLS.)

Post (Wt, #'s): 635.6 - 630.6 5.0/5.0 lbs OK (ATH)

Stack cleaned prior to the run: Yes ____ No ✓

Tunnel cleaned prior to the run: Yes ____ No ✓

hivalleyepa4

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	hivalley epa4
Stove Manufacturer:	HI VALLEY
Model Number:	XTEC
Lab Name:	MYREN
Test Date:	3\23\99
Run Number:	EPA 4
Meter Box Y Factor:	1.003
Barometric pressure (in):	28.5183
Gas meter temp (ave):	82
delta H(avg):	0.900
Gas meter initial reading:	284.704
Gas meter final reading:	443.231
Front catch (acetone) mg:	6.6
first filter catch (mg):	10
second filter catch (mg):	-2.2
tunnel flow (ave cfm):	141.885
Emission Rate(g/hr):	0.831
Emission Rate(M5H) :	1.560
vs/VmTs:	0.0101
vs ave:	843.869
Tunnel average temp (°f):	103.833
Test time(min):	285
Fuel Load(lb. wet):	17.3
Wood moisture(%wet):	17.215
Burn rate(dry kg/hr):	1.368
Samp vol(scf):	147.931
front filter number	780
back filter number	779
acetone beaker number	3
PRELIMINARY RESULTS	
FINAL RESULTS	AUDITED
DATA SUMMARY	
MODEL :	XTEC
RUN:	EPA 4
DATE:	3\23\99
DBR:	1.368
GPH UNADJ	0.831
ADJ	1.560409169

RUN TIME (min)	PITOT DELTAP (- INCH H20)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCIT (ft/min)	PROP RATE (%)	dDGM vol std (ft3)
0	0.040	109	284.704	72	0.900	848.88		
10	0.040	132	290.182	74	0.900	865.87	104.3	5.188
20	0.040	127	295.698	75	0.900	862.20	101.9	5.214
30	0.040	130	301.198	77	0.900	864.40	102.2	5.180
40	0.039	127	306.728	78	0.900	851.36	101.8	5.198
50	0.039	124	312.241	79	0.900	849.18	102.3	5.173
60	0.039	123	317.749	80	0.900	848.45	102.1	5.159
70	0.040	119	323.258	81	0.900	856.31	101.3	5.150
80	0.040	115	328.788	82	0.900	853.35	99.9	5.160
90	0.040	111	334.319	82	0.900	850.37	99.6	5.161
100	0.040	109	339.866	82	0.900	848.88	99.9	5.176
110	0.040	106	345.413	82	0.900	846.64	99.5	5.176
120	0.040	103	350.981	83	0.900	844.39	99.6	5.196
130	0.040	101	356.533	83	0.900	842.89	99.1	5.171
140	0.040	99	362.095	83	0.900	841.39	99.1	5.180
150	0.040	98	367.667	83	0.900	840.64	99.2	5.190
160	0.040	97	373.227	83	0.900	839.88	98.9	5.179
170	0.040	96	378.801	84	0.900	839.13	98.9	5.182
180	0.040	95	384.368	84	0.900	838.37	98.7	5.175
190	0.040	94	389.973	84	0.900	837.62	99.3	5.211
200	0.040	94	395.569	84	0.900	837.62	99.2	5.202
210	0.040	93	401.176	84	0.900	836.86	99.2	5.213
220	0.040	92	406.783	84	0.900	836.10	99.1	5.213
230	0.040	91	412.372	84	0.900	835.35	98.7	5.196
240	0.040	91	417.978	84	0.900	835.35	99.1	5.212
250	0.040	90	423.578	84	0.900	834.59	98.8	5.206
260	0.040	89	429.183	84	0.900	833.83	98.8	5.211
270	0.040	88	434.801	84	0.900	833.07	99.0	5.223
280	0.040	86	440.417	84	0.900	831.55	98.7	5.221
285	0.040	86	443.231	84	0.900	831.55	99.1	2.616
300						0.00	0.0	0.000
310						0.00	0.0	0.000
320						0.00	0.0	0.000
330						0.00	0.0	0.000
340						0.00	0.0	0.000
350						0.00	0.0	0.000

METHOD 5G-1 PARTICULATE SAMPLING DATA Hi Vol LAB-

DATE 3/23/99 PAGE 1 OF 2 MODEL # XTEC RUN # EPA 4

METER BOX # 511-M METER Y 1.003 FILTER # (F) 780 (R) 77

PRE TEST LEAK RATE = .001 CFM @ -15.0 IN. HG .297/.298 FILTER SIZE: 110mm

POST TEST LEAK RATE = .000 CFM @ -15.0 IN. HG .085/.085 PROBE LENGTH 24" glass

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1235	00	284.704	.040	109	72	.90	0
45	10	290.182	.040	132	74	.90	0
55	20	295.698	.040	127	75	.90	0
1305	30	301.198	.040	130	77	.90	0
15	40	306.728	.039	127	78	.90	0
25	50	312.241	.039	124	79	.90	0
35	60	317.749	.039	123	80	.90	0
45	70	323.258	.040	119	81	.90	0
55	80	328.788	.040	115	82	.90	0
1405	90	334.319	.040	111	82	.90	0
15	100	339.866	.040	109	82	.90	0
25	10	345.413	.040	106	82	.90	0
35	20	350.981	.040	103	83	.90	0
45	30	356.533	.040	101	83	.90	0
55	40	362.095	.040	99	83	.90	0
1505	50	367.667	.040	98	83	.90	0
15	60	373.227	.040	97	83	.90	0
25	70	378.801	.040	96	84	.90	0
35	80	384.368	.040	95	84	.90	0
45	90	389.973	.040	94	84	.90	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.033	112
2	1.5"	.041	113
3	4.5"	.039	113
4	5.5"	.035	113
W-1	0.5"	.036	114
2	1.5"	.041	114
3	4.5"	.040	114
4	5.5"	.036	114
	Avg.	.0376	113

Pilot Leak Check Pre ✓ Post ✓

Cp = 0.99

N
1
2
W 1 2 (3/4)
3
4

*=point of Avg. delta p

$Qs = \left(\frac{\sqrt{(\Delta P \times BP)}}{T(°R)}\right) \times 3167.2 =$

137.063 cfm

BP = ~~Start~~ 28.54 in Hg
60 28.53
120 28.51
180 28.51
240 28.51
285 28.51
28.5183 ✓

10.6 -1.9

METHOD 5G-1 PARTICULATE SAMPLING DATA LAB-

DATE 3/23/99 PAGE 2 OF 2 MODEL # HIGH VALLEY X-TEC RUN # EPA #4

METER BOX # 511-M METER Y 1.003 FILTER # (F) 780 (R) 77

PRE TEST LEAK RATE = .001 CFM @ -15.0 IN. HG .297/.298 FILTER SIZE: 110 MM

POST TEST LEAK RATE = .000 CFM @ -15.0 IN. HG .085/.085 PROBE LENGTH 24" Glass

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1555	00	395.569	.040	94	84	.90	0
1605	10	401.176	.040	93	84	.90	0
15	20	406.783	.040	92	84	.90	0
25	30	412.372	.040	91	84	.90	0
35	40	417.978	.040	91	84	.90	0
45	50	423.578	.040	90	84	.90	0
55	60	429.183	.040	89	84	.90	0
1705	70	434.801	.040	88	84	.90	0
15	80	440.417	.040	86	84	.90	0
25	85	443.231	.040	86	84	.90	0
35	00	(158.527)					
	10						
	20						
	30						
	40						
	50						
	60						
	70						
	80						
	90						

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.033	110
2	1.5"	.041	113
3	4.5"	.039	113
4	5.5"	.035	113
W-1	0.5"	.036	114
2	1.5"	.041	114
3	4.5"	.040	114
4	5.5"	.036	114
	Avg.	.0376	113

Pilot Leak Check Pre ✓ Post ✓

Cp = 0.99

N
1
2
→ W 1 2 (3*) 4
3
4

*=point of Avg. delta p

$Qs = \left(\sqrt{\frac{\Delta P \times BP}{T(°R)}}\right) \times 3167.2 =$

137.063 cfm

BP = START 28.54 in Hg

60 28.53
120 28.51
180 28.51
240 28.51
285 28.51

$\bar{X}$ = 28.5183

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

Into Dessicator: Date 1/3/99 Time 12:00 By ATM Front Half ✓ Back Half ✓

Manufacturer: Schleicher & Schuell Size: 11cm Lot No.: 7895.1 Grade: #25 q/ash
Order No. 06220

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
776	.7853	2/7/99	12:55	T.M.	.7853	2/10/99	1629	ATM				
777	.8127		12:56	T.M.	.8129		1628	ATM				
778	.8044		12:57	T.M.	.8040		1627	ATM				
779	.8036		12:58	T.M.	.8034		1626	ATM				
780	.7859		12:59	T.M.	.7858		1625	ATM				
781	.7894		1:00	T.M.	.7892		1625	ATM				
782	.7905		1:01	T.M.	.7903		1624	ATM				
783	.7967		1:02	T.M.	.7968		1623	ATM				
784	.8120		1:03	T.M.	.8118		1622	ATM				
785	.8166		1:04	T.M.	.8164		1621	ATM				
786	.7925		1:05	T.M.	.7923		1620	ATM				
787	.8064		1:06	T.M.	.8064		1619	ATM				
788	.7928		1:07	T.M.	.7926		1619	ATM				
789	.7774		1:08	T.M.	.7774		1618	ATM				
790	.7835		1:09	T.M.	.7835		1617	ATM				
791	.7981		1:10	T.M.	.7982		1616	ATM				
792	.8036		1:11	T.M.	.8035		1615	ATM				
793	.8116		1:12	T.M.	.8116		1614	ATM				
794	.8025		1:13	T.M.	.8024		1613	ATM				
795	.7766		1:14	T.M.	.7760		1613	ATM				
796	.7916		1:15	T.M.	.7915		1612	ATM				
797	.7755		1:16	T.M.	.7756		1611	ATM				
798	.8133		1:17	T.M.	.8132		1610	ATM				
799	.7949		1:18	T.M.	.7948		1610	ATM				
800	.8266	✓	1:19	T.M.	.8266	✓	1609	ATM				

Checked by [signature] Date: 2/21/99 Time 1405

QA REWEIGH

Filter #	WT	Date	Time	By
781	.7851	2/21/99	1412	[signature]
789	.7772	2/21/99	1414	[signature]
795	.7765	2/21/99	1415	[signature]

QA

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
62	76	45	2/7/99	1235	ATM
63	72	45	2/10/99	1629	ATM
65	80	44	2/21/99	1312	ATM

Post Weighing Beam Balance Check

1st		2nd	3rd
0.0000	0.0000	0.0000	0.0000
1.0000	1.0001	1.0000	1.0001

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 1/4/99 Time: 1600 By: A.T. Mycal

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4845	2/1/99	915	ATM	65.4838	2/3/99	1605	JM				
2	66.1516		917	ATM	65.1515	2/3	1606	JM				
3	67.8577		919	ATM	67.8571	2/3	1609	JM	67.8571	2/7/99	1245	ATM
4	67.5891		920	ATM	67.5886	2/3	1612	JM				
5	Broken											
6	67.4282		921	ATM	67.4282	2/3	1615	JM				
7	65.5451		922	ATM	65.5453	2/3	1617	JM				
8	60.0213		923	ATM	66.0213	2/3	1618	JM	← Blank			
9	66.9293		924	ATM	66.9294	2/3	1620	JM				
10	66.0888		926	ATM	66.0885	2/3	1621	JM				
11	65.6997		927	ATM	65.7015	2/3	1623	JM	65.7016	2/7/99	1247	ATM
12	56.0653		928	ATM	56.0652	2/3	1625	JM				
13	57.8945		929	ATM	57.8942	2/3	1627	JM				
		↓										

Checked By: A.T. Mycal Date: 2/8/99 Time: 1705

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
55	69	39	2/1/99	0910	ATM
63	76	48	2/3/99	1555	ATM
62	76	45	2/7/99	1235	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9,Pg1,Rev4/90
Unit High Valley XTC
Run # EPA ~ 4
Date: 3/23/99

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
3	✓	3/29/99	2100	ATM	67.8637	4/6	1155	ATM	67.8637	4/8	1417	ATM				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F 780	.7994	3/23/99	1755	ATM	.7990	3/24/99	1125	ATM	.7990	3/25	2123	JM	.7988 ✓	4/5/99	1736	ATM
R 779	.8015	3/23/99	1755	ATM	.8013	3/24/99	1126	ATM	.8013	3/25	2121	JM	.8012 ✓	4/5/99	1737	ATM

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/24	1120	ATM	72	89	43
2	3/25	2038	ATM	59	72	45
3	4/5	1730	ATM	64	80	41
4	4/6	1030	ATM	61	75	44
5	4/8	1346	ATM	67	80	50

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Acetone Blank - 100 ml Acetone

Blank 3/13/99

WST5-Form9, Pg1, Rev4/90
Unit High Valley XTC
Run # EPA 4
Date: 3/23/99

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
B	✓	3/18/99	0854	ATM	66.0215	3/2/99	2237	ATM	66.0215	3/20/99	1332	ATM				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	1999 Date	Time	By	WB	DB	%RH
1	3/18	2140	ATM	68	84	43
2	3/20	1300	ATM	64	84	32
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

Dates From 1/9/99

Through _____

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Mettler
Model AE100
SN K04827

Level	Recali-brated	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Date	Time	Tech	Wet Bulb	Dry Bulb	% RH
✓	Yes P.O.	99.9999	10.0001	1.0002	.1003	.0203	1/9/99	1243	ATM	58	70	48
✓	No	100.0002	10.0000	1.0000	.1000	.0200	1/14/99	1113	ATM	62	75	47
✓	YES P.O.	99.9998	10.0002	1.0000	.0999	.0201	1/23/99	1100	ATM	63	77	42
✓	YES	99.9998	10.0000	1.0000	.1000	.0201	1/24/99	1318	ATM	59	74	45
✓	YES	99.9996	10.0002	1.0000	.1000	.0200	2/1/99	0910	ATM	55	69	39
✓	YES	99.9997	10.0001	1.0001	.1002	.0201	2/2/99	0939	ATM	60	73	46
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	2/3/99	1555	ATM	63	76	48
✓	YES	99.9999	10.0000	1.0001	.1001	.0201	2/7/99	1235	ATM	62	76	45
✓	YES	99.9998	10.0000	1.0000	.1000	.0200	2/10/99	1600	ATM	63	77	45
✓	YES	99.9998	10.0000	1.0001	.1000	.0200	2/19/99	0246	ATM	64	78	46
✓	No	99.9999	10.0000	1.0000	.1000	.0200	2/21/99	1312	ATM	65	80	44
✓	No	99.9997	10.0000	1.0001	.1000	.0200	3/5/99	1935	ATM	64	80	41
✓	YES P.O.	99.9997	10.0000	1.0000	.1001	.0200	3/6/99	1135	ATM	64	79	43
✓	YES	99.9997	10.0000	1.0001	.1000	.0200	3/13/99	1526	ATM	65	80	44
✓	YES	99.9999	10.0001	1.0001	.1001	.0200	3/14/99	1355	ATM	63	78	43
✓	No	100.0001	10.0000	1.0000	.1000	.0200	3/15/99	1622	ATM	66	81	45
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/16/99	2025	ATM	65	82	39
✓	Yes	99.9996	10.0000	1.0001	.1001	.0200	3/17/99	1615	ATM	62	77	42
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/18/99	2140	ATM	68	84	43
✓	Yes	99.9998	10.0000	1.0000	.1000	.0200	3/20/99	1300	ATM	64	84	32
✓	Yes	99.9999	10.0000	1.0001	.1001	.0201	3/21/99	2215	ATM	61	74	47
✓	Yes	99.9997	10.0000	1.0000	.1001	.0200	3/22/99	0127	ATM	65	85	33
✓	Yes	99.9997	10.0000	1.0001	.1000	.0200	3/23/99	1115	ATM	69	84	46
✓	Yes	99.9998	10.0000	1.0002	.1001	.0201	3/24/99	1120	ATM	77	89	43
✓	Yes	99.9999	10.0000	1.0002	.1001	.0201	3/29/99	2038	ATM	69	72	45
✓	No	99.9999	10.0002	1.0002	.1001	.0202	3/30/99	0610	ATM	66	80	47
✓	No	99.9999	10.0000	1.0000	.1001	.0201	3/31/99	1000	ATM	64	80	41
✓	NO	99.9996	10.0000	1.0000	.1001	.0201	4/5/99	1730	ATM	64	80	41
✓	Yes	99.9998	10.0001	1.0001	.1001	.0201	4/6/99	1030	ATM	61	75	44
QC Services	Audit	4/6/97	- wt.	Scale check a								
✓	NO	100.0003	10.0001	1.0001	.1001	.0201	4/6/99	1730	ATM			
✓	YES	99.9998	10.0001	1.0001	.1001	.0200	4/7/99	1724	ATM	68	85	33
✓	NO	99.9996	10.0000	1.0001	.1001	.0201	4/8/99	1346	ATM	67	80	50
✓	YES	99.9997	10.0000	1.0000	.1000	.0200	4/16/99	1230	ATM	66	82	42
✓	YES	99.9997	10.0000	1.0000	.1000	.0200	4/17/99	1625	ATM	68	84	43

Woodstove Particulate
Catch Processing Sheet
Woodstove Data Sheet #5
EPA M5G-1

Unit: High Volley XTEC
Run: EPA 1 4
Date: 3/23/99
Technicians: ATM
Revised 1/16/98-Data Sheet #5

Filters

Filter # (Front) 780 Beaker # 3 Final Wt. 67.8637 g
Final Wt. .7988 g Ml 50 Tare Wt. 67.8571 g
Tare Wt. .7888 g Desc. Acetone Net Wt. .0066 g
Net Wt. .0100 g

Filter # (Rear) 779 Beaker # _____ Final Wt. _____ g
Final Wt. .8012 g Ml _____ Tare Wt. _____ g
Tare Wt. .8034 g Desc. _____ Net Wt. _____ g
Net Wt. -.0022 g

Acetone Blank Calculation: Blank Date: 3/13/99
Blank Beaker # 8 Final Wt. 66.0215 g
Ml 100 Tare Wt. 66.0213 g
Desc. Acetone Net Wt. .0002 g
.0002 g ÷ 100 ml = .000002 g/ml

Blank Residue Value Calculation:

.000002 g/ml acetone X 50 ml acetone = .0001 g
Blank Residue Value

Total Particulate Catch Calculation

Filter: .0100 g
Filter: -.0022 g
Beakers: .0066 g (Total Catch) − .0001 g (Blank Residue Value) = .0065 g
Total Catch = .0143 g

Run # EPA #4
Date 3/23/99
Technician ATM, RLS,
WST6-Form1, Rev8/96

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 2.713 ft^3

Dilution Tunnel Draft (If applicable): Start 00.0 Stop 00.0

Test Chamber Air Velocity: Start: 00.0 Stop: 00.0 Avg: 00.0

Wet Bulb/ Start: WB: 55 °F DB: 67 °F 1.05% Amb Moisture 45 %RH

Dry Bulb Stop: WB: 58 °F DB: 69 °F 1.40% Amb Moisture 51 %RH

$\bar{X}$ = 1.225 % Ambient Moisture $\bar{X}$ = 48 % Relative Humidity (RH)

Empty Stove Wt: lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 606.3 lbs. Dry: 604.4 lbs.

Empty Stove Wt with Stack and Ash Ash: 0 lbs. Total: 604.4 lbs.

Kindling Wt. Paper: 0.3 lbs. Wood: 5.0 lbs.

Pre Burn Fuel Wt. 17.9+17.5+16.5 Total: 57.9 lbs.

Total Kindling and Pre Burn Fuel Wt 57.2 lbs.

Coal Bed Wt-lbs: Range (608.7-607.9) 4.3 - 3.5 lbs. Actual: 3.5 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\frac{4.3}{\text{Upper Wt.}} + \frac{3.5}{\text{Lower Wt.}}$ 12 X .25 = .9 lbs.

Test Fuel Wt-lbs: Ideal 19.0 lbs. Range: 17.1-20.8 lbs. Actual: 17.3 lbs.

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Flanges) 20 Pcs.

2 x 4's x 15 5/8	"	6 Pcs	9.2 lbs.	53.2 %
4 x 4's x 15 5/8	"	2 Pcs	8.1 lbs.	46.8 %

Est. Dry Burn Rate (Kg/Hr.) $\frac{17.3 - (17.3 \times .17715)}{2.2046} \times \frac{60}{285} = 1.368$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) X $\frac{63}{100}$ x 1.368 = 16,491.4 Est Heat Output (HO_E) BTU's/Hr

Comments:

Stove Operating Data
Woodstove Test Data Sheet #9
Cold Start

Unit: HIGH VALLEY X-TEC
Run: EPA #4
Date: 3/23/99
Technician(s): ATH, RLS,
Data Sheet #9 - Rev 1/98-Pg.2

Fire Started: 0823 P.S.T.

Warm up and Preburn: Primary Air: Wide open from ignition until the start of preburn when the primary air control(s) was (were) adjusted to the run setting of 1¼" OPEN. At the run setting until the start of the test.

Secondary Air: No Controls. Naturally drafted.

Secondary Burn/Cat Bypass: N/A

Charcoal Bed Preparation: Broke up, raked and leveled the coal bed prior to the addition of each warm up/pre burn fuel charge. Starting 1:30 before the start of the test, broke up, raked and leveled the coal bed. In stove for 35 seconds.

Test: Door wide open during loading 1 min 00 sec, then closed.

Primary Air: Wide open during the start of the test until 4:55.
Adjusted to the run setting of 1¼" between 4:55 and 5:00.
At the run setting of 1¼" at 5:00 into the run.

Secondary Air: No Controls. Naturally drafted.

Secondary Burn/Cat Bypass: N/A

Fan: ON / OFF during the warm up, ON/OFF high during the preburn, ON/OFF at the start of the test, ON/OFF for the first 30 minutes of the test, ON/OFF high at 30 minutes into the test, ON/OFF for the rest of the test.

Test Run Anomalies: Very good start time.

Unit HIGH VALLEY X-TEC
Run # EPA #4
Date 3/23/99
Technician ATM, RLS.
Page 1 of 3
WST7-Form2-A, Rev10/88

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-1

Wood Data: Kindling: A mix of the below grades

	Size	Mill	Grade	Species
Pre Burn	2X4	CANYON LBR.	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2X4	CANYON LBR.	#2 STD. & BTR.	D. FIR, S. GRN.
	4X4	STAND & 879	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (17.9 lbs) added at 0845.
2nd Warm up/Pre Burn Fuel charge (17.5 lbs) added at 0933.
3rd Warm up/Pre Burn Fuel charge (16.5 lbs) added at 1041.
4th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
5th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
6th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
7th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.
8th Warm up/Pre Burn Fuel charge (_____ lbs) added at _____.

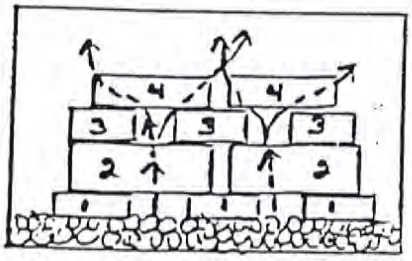
The coals were scooped out of the stove immediately prior to adding the 3 RR pre burn/warm up fuel charge. The stove lost 1.9 lbs. 3.0 lbs of coals baste in ash scoop.

All pre burn/warm up fuel pieces were either 16 or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 16 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 16 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 3 pcs 16 inches long. The majority of the pieces in each rick were in the second layer which had an approximate 0.5-1.0" space between pieces. (The loading directions indicate the direction of the longest dimension on each piece relative to the loading door opening.) Each pre burn/warm up fuel charge normally weighs within the weight range allowed for the actual test fuel charge

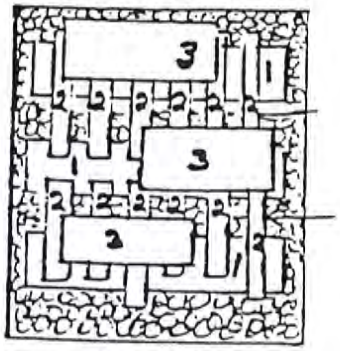
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

Warm up Information (cont.):

Each warm up/preburn fuel charge was ricked in exactly (as much as possible) the same manner and the weight of each rick was usually within the allowable weight range for the test fuel charge. The physical arrangement and alignment of each rick was designed to accomplish three (3) things: (1)The bottom layer was nestled firmly into the coal bed and was as close to being level with the bottom of the stove as possible, thus providing a stable loading platform for the rest of the rick, keeping it in a ricked state (as opposed to a col- lapsed or fallen down state) untill the rick reached the charcoal stage and sags or collapses of its own accord. (2) It enhances the flow of primary air through the ricked preburn fuel charge, for the primary air would flow through the spaces between the pieces in the first layer and then up through the spaces between the pieces in the second, third and, if present, fourth layers. (3) It maximized, as much as possible, the surface to volume ratio of each preburn fuel charge, thereby allowing the fire immediate access to as much wood surface as possible and, thereby, insuring uniform charcoalization. All three of these enhance combustion and so get the stove as hot as possible during the warm up period, therby maximizing the amount of heat (BTU's) stored in the stove. The actual preburn was not started until the stove surface temperatures had maximized and stabilized, thus indicating that the amount of heat stored in the stove had peaked. For this stove, the thermal storage was monitored using the TOP surface temperature(s) and the peak value(s) obtained were 960 °F.



Front View



Top View

The arrows indicate the direction of the air flow through the rick.

The primary air was adjusted to the run setting of 1 1/4" open 6.0 lbs above the upper charcoal bed weight.

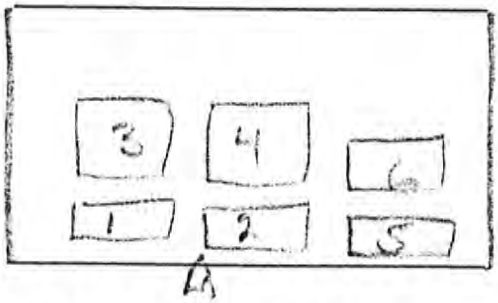
Unit HIGH VALLEY X-TEC
Run # EPA #4
Date 3/23/99
Technician ATM, RLS.
Page 3 of 7
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: ① Turned Fan Off ② Opened primary air control wide open ③ Opened door ④ Loaded fuel ⑤ cleared coals away from air front of load ⑥ Photograph ⑦ closed door

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



FRONT of stove view

4 X 4's: 3 & 4

2 X 4's: 1, 2, 5 & 6

Loading Sequence: 1, 2, 3, 4, 5 & 6 across

Driest Pcs in Load 2 & 5

Loaded the test fuel charge on an essentially level, medium to mostly small sized, hot coal bed (in appearance, color and temperature for a Mid Hi burn rate. Load 1100 Ignition 50-55 Sec. 1115 VC to baffle 1135 2nds igniting at the top of the VC 1150 3rd Tube igniting 0111 Front Tube igniting. 0130 - 0135 Give Balance 0200 Flames decreased. Maintained Two VC's, one in each canyon, 2nds on top of both VC's, 3rd tube stayed lit

Never lost gas balance.

Unit: HIGH VALLEY X-TEC
Run: EPA #4
Date: 3/23/99
Technician: ATH, RLS,

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

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: 1035
Calibration Checks: X ✓ Y ✓ 12.5 12.5 22.0 22.2

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8'	K	12.5	13.3	12.5	13.3	12.0	12.8	(13.133)
2									
3									
4	2x4x8'	P	20.5	22.0	20.0	21.4	20.0	21.4	21.600
5	"	P	21.0	22.6	21.5	23.1	21.5	23.1	22.933
6	"	P	21.0	22.6	21.5	23.1	21.5	23.1	22.933
7	"	P	21.5	23.1	21.5	23.1	21.5	23.1	23.100
8	"	P	22.0	23.7	22.0	23.7	21.5	23.1	23.500
9									(114.066)
10									
11	2x4x15 5/8"	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
12	"	T	18.5	19.8	18.5	19.8	18.5	19.8	19.800
13	"	T	20.5	22.0	20.0	21.4	19.5	20.9	21.433
14	"	T	21.0	22.6	21.5	23.1	21.0	22.6	22.767
15									
16	4x4x15 5/8"	T	18.5	19.8	18.5	19.8	19.0	20.3	19.967
17	"	T	20.0	21.4	20.0	21.4	20.5	22.0	21.600
18									(124.767)
19	FEET	T	18.5	19.8	18.5	19.8	19.0	20.3	(19.967)
20								OUT SPACERS	

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	13.133 %	22.813 %	20.795 %
% Moisture - Wet Basis:	11.609 %	18.571 %	17.215 %

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

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

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

Unit: HIGH VALLEY-X-TEC
Run#: EPA #4
Date: 3/23/99
Technician: ATM, RLS,

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 3½" x 3½" x 1½"

Depth (D): 1.549 cm 3.934

Width (W): 3.507 cm 8.908

Length (L): 3.531 cm
3.551 cm "
3.565 cm "
3.554 cm "

Length $\bar{X}$ = 3.5503 cm 9.018

Volume: 316.027 cm^3 (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	23.7 %
Bottom:	21.5	23.1 %
Side:	21.5	23.1 %
$\bar{X}$:		23.300 %

Avg % Moisture (Dry) 23.300 %

Aug % Moisture (Wet) 18.897 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 203.9 g Dry Weight: 169.5 g

% Moisture Dried Basis: 16.871 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	3/23/99	1025	219 °F
Out of Dryer	3/29/99	1415	218 °F

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

Density = 169.5 g (dry wt) ÷ 316.027 cm^3 (volume) = 0.5363 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. _____ g

Wet Wt: _____ g - _____ g = _____ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: _____ g - _____ g = _____ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

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

BU[illegible]RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
Eno Wt.: 6079 lbs.

Unit: HIGH VALLEY X-TEC Date: 3/23/99
Run: EPA #4 Technician(s): ATH, RLS.
Page: 1 of 3

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO2 v.	1 CO2 %CO2	2 O2 v.	2 O2 %O2	Tel	3 CO v.	3 CO %CO	T/C(1)T/C(2) Bal	Wet Bulb	Dry Bulb	% H2O	Calc W/B	T/C(3) Stack	4 SO2 v.	SO2 PPM	Static Press.	Comments
0 / 1235	625.2	17.3	0	.226	5.64	56.5	14.16		23.7	1.20	4.7	84	125	2.5	110	305			-.059	Flow
5 / 40	624.2	16.3	1.0	.435	10.84	36.0	9.02	GAS BAL.	7.2	0.38	28.5	103	142	5.9	127	387			-.085	SO2 1.5
10 / 45	623.4	15.5	.8	.381	9.50	42.3	10.60		15.7	0.80	11.9	124	151	12	140	407			-.076	CO2 1.5
15 / 50	622.4	14.5	1.0	.471	11.73	35.3	8.84		9.5	0.49	23.9	131	154	15	144	410			-.079	O2 1.5
20 / 55	621.5	13.6	.9	.483	12.03	34.1	8.54		6.5	0.34	35.4	132	154	15.5	146	414			-.080	CO 1.5
25 / 1300	620.4	12.5	1.1	.525	13.07	30.4	7.61		3.9	0.21	62.3	133	156	16	148	424			-.081	
30 / 05	619.4	11.5	1.0	.588	14.64	24.2	6.06		3.1	0.16	91.5	134	157	16.5	149	439			-.082	
35 / 10	618.5	10.6	.9	.573	14.27	26.0	6.51		3.6	0.20	71.3	134	160	16.5	149	444			-.081	
40 / 15	617.5	9.6	1.0	.574	14.29	25.4	6.36		3.2	0.17	84.1	133	161	15.5	147	443			-.081	
45 / 20	616.7	8.8	.8	.513	12.78	31.3	7.84		4.1	0.22	58.1	130	159	14	144	430			-.080	
50 / 25	615.8	7.9	.9	.542	13.50	27.7	6.93		4.9	0.26	51.9	130	159	14	144	428			-.078	
55 / 30	615.0	7.1	.8	.525	13.07	29.5	7.39		2.7	0.15	87.2	128	158	13	142	422			-.077	
																(453)			(.939)	Flow
60 / 35	614.2	6.3	.8	.570	12.70	31.0	7.76		3.4	0.18	70.6	126	157	12.5	141	417			-.075	SO2 1.5
65 / 40	613.6	5.7	.6	.462	11.57	35.5	8.89		4.6	0.24	48.0	123	155	11.5	140	405			-.073	CO2 1.5
70 / 45	613.1	5.2	.5	.432	10.76	37.7	9.44		3.1	0.16	67.3	120	152	10.5	137	394			-.071	O2 1.5
75 / 50	612.6	4.7	.5	.391	9.74	42.0	10.52		4.6	0.24	40.6	116	150	9	133	382			-.070	CO 1.5
80 / 55	612.2	4.3	.4	.343	8.55	46.6	11.68		6.3	0.33	25.9	111	146	7.7	130	365			-.067	
85 / 1400	611.9	4.0	.3	.318	7.93	48.6	12.18		7.2	0.38	20.9	106	142	6.5	125	357			-.066	
90 / 05	611.7	3.8	.2	.297	7.41	50.1	12.55		9.7	0.50	14.8	102	139	5.5	122	340			-.064	
95 / 10	611.5	3.6	.2	.280	6.98	51.5	12.90		12.2	0.62	11.3	99	137	5	120	331			-.063	
100 / 15	611.3	3.4	.2	.277	6.91	51.8	12.98		12.7	0.65	10.6	97	135	4.5	119	324			-.062	
105 / 20	611.1	3.2	.2	.251	6.26	54.6	13.68	OUT BAL.	15.3	0.78	(8.0)	94	133	4	116	317			-.060	
110 / 25	611.0	3.1	.1	.212	5.29	57.4	14.38		22.2	1.13	4.7	90	131	3.3	113	308			-.060	
115 / 30	610.8	2.9	.2	.223	5.57	56.2	14.08		21.8	1.11	5.0	88	128	3.1	112	301			-.059	
																(435)			(.790)	

BU[illegible]RATE AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88
ENO WT.: 607.9 lbs,

Unit: HIGH VALLEY X-TFC Date: 3/23/99
Run: EPA #4 Technician(s): ATM, RLS.
Page: 2 of 3

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO2 v.	1 CO2 %CO2	2 O2 v.	2 O2 %O2	Tel	3 CO v.	3 CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	T/C(2) Dry Bulb	% H2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO2 v.	4 SO2 PPM	Static Press.	Comments
120 / 1435	610.7	2.8	.1	.217	5.42	56.7	14.21		24.5	1.24	4.4	86	126	2.8	110	294			-.057	Flow
125 / 40	610.6	2.7	.1	.214	5.34	57.0	14.28		25.0	1.26	4.2	85	125	3.6	109	288			-.055	SO2 1.5
130 / 45	610.5	2.6	.1	.215	5.37	56.9	14.26		24.8	1.25	4.3	85	124	2.7	108	284			-.055	~~CO2~~ 1.5
135 / 50	610.4	2.5	.1	.198	4.95	58.7	14.71		25.1	1.28	3.9	84	124	2.5	108	279			-.055	~~O2~~ 1.5
140 / 55	610.3	2.4	.1	.203	5.07	58.1	14.56		22.7	1.15	4.4	83	123	2.4	107	275			-.054	~~CO~~ 1.5
145 / 1500	610.2	2.3	.1	.212	5.29	57.5	14.41		22.5	1.14	4.6	83	122	2.4	107	272			-.054	
150 / 05	610.1	2.2	.1	.212	5.29	57.6	14.44		22.9	1.16	4.6	82	121	2.3	106	269			-.054	
155 / 10	610.0	2.1	.1	.208	5.20	58.1	14.56		21.3	1.08	4.8	82	120	2.3	106	266			-.053	
160 / 15	609.9	2.0	.1	.207	5.17	58.3	14.61		21.4	1.09	4.7	82	119	2.3	105	264			-.052	
165 / 20	609.8	1.9	.1	.205	5.12	58.3	14.61		22.9	1.16	4.4	81	119	2.2	105	262			-.052	
170 / 25	609.7	1.8	.1	.211	5.27	57.6	14.44		23.7	1.20	4.4	81	119	2.2	104	259			-.051	
175 / 30	609.6	1.7	.1	.216	5.39	57.1	14.31		23.8	1.20	4.5	82	119	2.3	104	258			-.051	
																3270			.643	Flow
180 / 35	609.5	1.6	.1	.207	5.17	58.0	14.54		23.7	1.19	4.3	82	119	2.3	104	256			-.051	SO2 1.5
185 / 40	609.4	1.5	.1	.206	5.15	58.1	14.56		24.1	1.23	4.2	82	119	2.3	104	254			-.050	~~CO2~~ 1.5
190 / 45	609.3	1.4	.1	.201	5.02	58.7	14.71		24.3	1.23	4.1	81	119	2.2	104	252			-.050	~~O2~~ 1.5
195 / 50	609.2	1.3	.1	.188	4.70	59.9	15.01		25.9	1.32	3.6	81	118	2.2	104	250			-.050	~~CO~~ 1.5
200 / 55	609.1	1.2	.1	.183	4.57	60.2	15.09		27.2	1.36	3.4	81	118	2.2	103	248			-.050	
205 / 1600	609.0	1.1	.1	.178	4.45	60.7	15.21		27.4	1.38	3.2	80	117	2.1	103	246			-.050	
* 210 / 05	608.9	1.0	.1	.167	4.18	62.0	15.54		27.4	1.39	3.0	80	116	2.2	103	243			-.050	
215 / 10	608.8	.9	.1	.157	3.93	62.9	15.76		28.1	1.42	2.8	79	115	2.1	103	241			-.049	
220 / 15	608.7	.8	.1	.154	3.85	63.1	15.82		25.1	1.46	2.6	79	115	2.1	102	239			-.049	
225 / 20	608.6	.7	.1	.156	3.90	63.0	15.79		29.5	1.49	2.6	79	114	2.1	102	236			-.049	
230 / 25	608.5	.6	.1	.152	3.80	63.2	15.84		30.8	1.55	2.5	79	114	2.1	102	234			-.047	
235 / 30	608.5	.6	0	.147	3.68	64.0	16.04		27.7	1.40	2.6	79	112	2.2	102	231			-.046	
																2930			.594	

BURN RATE AND FLUE GAS DATA
WOODGROVE DATA SHEET #12
WST2-Form 14 Rev 1/88
END WT. 607.9 lbs

Unit: HIGH VALLEY X-TEC Date: 3/23/99
Run: EPA #4 Technician(s): A.T. Hyren, PLS,
Page: 3 of 3

Minute / Time	Scale Wt	lbs left	Burn Rate	1 CO_2 v.	1 CO_2 %CO_2	2 O_2 v.	2 O_2 %O_2	Tel	3 CO v.	3 CO %CO	T/C(1)T/C(2) Bal	Wet Bulb	Dry Bulb	% H_2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO_2 v.	4 SO_2 PPM	Static Press.	Comments
240 / 1635	608.4	.5	.1	.139	3.48	64.8	16.24		28.9	1.45	2.4	78	112	2.1	102	229			-.046	Flow
245 / 40	608.3	.4	.1	.134	3.36	65.3	16.37		28.1	1.42	2.4	78	112	2.1	101	226			-.045	SO_2 1.5
250 / 45	608.2	.3	.1	.132	3.31	65.8	16.49		26.7	1.35	2.4	78	112	2.1	101	223			-.044	CO_2 1.5
255 / 50	608.2	.3	0	.129	3.23	66.2	16.59		25.8	1.31	2.5	78	111	2.1	100	221			-.044	O_2 1.5
260 / 55	608.1	.2	.1	.123	3.08	67.2	16.84		23.4	1.18	2.6	78	111	2.1	100	219			-.044	CO 1.5
265 / 1700	608.1	.2	0	.121	3.03	67.5	16.92		22.3	1.13	2.7	77	110	2.0	100	216			-.044	
270 / 05	608.0	.1	.1	.108	2.71	68.9	17.27		22.8	1.16	2.3	77	109	2.0	99	213			-.043	
275 / 10	608.0	.1	0	.104	2.61	69.3	17.37		22.7	1.15	2.3	76	108	1.9	98	210			-.043	
280 / 15	608.0	.1	0	.101	2.54	69.8	17.50		21.7	1.10	2.3	76	107	1.9	98	207			-.042	
285 / 20	607.9	0	.1	.098	2.46	70.1	17.57		21.4	1.09	2.3	75	106	1.8	97	204			-.042	
290 / 25																2168			(.437)	
295 / 30																				
300															58+	(17,556)			(3,400)	Flow
305																				SO_2 1.5
*310																303			(1,059)	CO_2 1.5
315																				O_2 1.5
320																				CO 1.5
325																				
330																				
335																				
340																				
345																				
350																				
355																				

Pre Burn Stack wt. 6.0 lbs. vp lbs.

Test Stack wt. Range 608.7 - 607.9 lbs.

PRE BURN DATA RECORD SHEET #13 WST2-Form16

28.54 BARO. PRESSURE 28.54

Unit: HIGH VALLEY X-TEC Date: 3/23/99

Run: EPA # 4 Technician(s): ATM, RLS.

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Minute Time	Scale Weight	Burn Rate	T/C#-3 Stack	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	Static	Hot Box On Comments
0 1110	614.7	0	657	931	547	537	575	556	635	1532	76	-.096	Primary Air Set at 1 1/4" OPEN
5 15	613.6	1.1	576	869	562	513	583	559	646	1579	73	-.090	Secondary Air Set at 1" X 3"
10 20	612.6	1.0	543	802	568	497	590	557	650	1481	73	-.088	Fan: ON HIGH
15 25	611.8	.8	505	737	566	485	595	551	652	1452	71	-.083	TUNNEL ON AT: 1112
20 30	611.1	.7	485	700	563	481	597	546	653	1420	71	-.082	Buckets Iced
25 35	610.5	.6	464	667	560	481	598	539	657	1387	71	-.080	ANALYZERS SPANNED
30 40	610.0	.5	443	632	559	489	598	533	663	1430	71	-.077	Pumps turned on at: 1150
35 45	609.6	.4	416	597	560	501	599	528	651	1310	72	-.072	ΔT
40 50	609.4	.2	390	555	557	505	594	523	656	1262	71	-.070	RAKE COILS FORWARD
45 55	609.1	.3	394	547	546	502	590	521	653	1342	70	-.071	Check WB/DB: 92/106
50 1200	608.9	.2	383	530	535	491	583	517	646	1322	69	-.070	531.2
55 05	608.7	.2	372	514	522	481	576	511	636	1196	69	-.069	520.8
													Probe IN TUNNEL
60 10	608.5	.2	357	489	511	471	569	507	624	1123	69	-.067	509.4
65 15	608.3	.2	347	468	501	461	562	505	613	1060	69	-.065	499.4
70 20	608.2	.1	337	450	491	452	554	505	602	994	69	-.063	490.4
75 25	608.1	.1	324	431	480	441	545	505	590	952	69	-.062	480.4
80 30	608.0	.1	316	415	470	430	535	503	579	936	70	-.060	
85 35	607.9	.1	305	400	460	420	525	500	570	921	70	-.059	461.0
90 40													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/23/99
Run: EPA #4 Technician(s): ATM, PLS.
Page: 1 of 3

T/C# / Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tunnel	13 C. Gas Box	14 Impinger Out	15 5G-1 Filter	16 5G-1 Condenser	17 Con-dar	18
0 / 1235	400	460	420	525	500	570	921	70	109	250	42	84	47	257	
5 / 40	425	449	449	571	498	545	1211	71	149	250	42	86	39	251	
10 / 45	509	439	389	496	499	525	1300	72	132	251	42	87	39	251	
15 / 50	547	431	371	487	495	508	1291	70	127	251	42	87	39	251	
20 / 55	568	426	366	480	488	498	1328	70	127	251	42	88	39	250	
25 / 1300	593	425	367	479	481	492	1311	70	128	250	42	88	39	250	
30 / 05	630	427	374	483	474	493	1347	69	130	250	42	88	39	250	
35 / 10	640	440	374	497	468	507	1375	70	128	250	42	88	38	250	
40 / 15	639	452	378	510	463	519	1376	70	127	251	42	88	38	250	
45 / 20	628	463	387	522	458	532	1399	71	125	250	43	88	39	251	
50 / 25	620	472	397	533	455	544	1423	71	124	250	43	88	39	251	
55 / 30	609	482	408	544	453	558	1420	71	123	250	43	88	39	251	
	6808	5366	4650	6067	5732	6291	15,702	845							
60 / 35	598	493	422	553	452	571	1396	71	123	250	43	88	39	251	
65 / 40	586	502	435	560	452	584	1324	72	121	251	43	88	39	251	
70 / 45	569	506	450	561	454	592	1311	71	119	251	44	88	39	251	
75 / 50	550	509	468	561	456	600	1240	72	117	251	43	88	39	251	
80 / 55	524	507	486	558	458	605	1176	72	115	251	44	88	39	250	
85 / 1400	501	502	498	555	459	606	1141	72	113	250	44	88	39	250	
90 / 05	479	495	494	550	461	606	1104	71	111	250	44	87	39	250	
95 / 10	460	490	486	545	463	605	1111	70	110	250	44	87	39	250	
100 / 15	446	486	479	539	464	606	1092	71	109	250	44	86	39	250	
105 / 20	431	483	472	531	466	606	1026	70	107	250	44	86	39	250	
110 / 25	416	480	458	522	469	606	970	70	106	250	44	86	39	249	
116 / 30	402	474	449	514	471	599	950	70	104	250	44	85	39	250	
	5962	5927	5597	6549	5525	7186	13,841	852							
	13,770	11,293	10,247	13,616	11,257	13,477	29,543	1697							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/23/99
Run: EPA #4 Technician(s): ATH, PLS.
Page: 2 of 3

T/C#	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Minute / Time	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Con-dar	
120 / 1435	388	467	441	507	473	588	921	70	103	250	44	84	39	251	
125 / 40	378	458	437	501	474	576	906	69	102	250	44	84	39	251	
130 / 45	369	449	435	497	474	565	894	69	101	250	44	84	39	251	
135 / 50	361	442	433	493	474	555	875	69	100	250	44	84	39	251	
140 / 55	354	434	428	488	474	547	872	69	99	250	44	83	39	250	
145 / 1500	348	428	426	482	476	541	869	68	99	250	45	83	39	250	
150 / 05	343	424	424	478	479	537	858	69	98	250	44	83	39	250	
155 / 10	339	419	419	475	483	533	847	69	97	250	45	83	39	250	
160 / 15	335	415	415	471	488	530	833	69	97	251	45	83	39	250	
165 / 20	331	412	411	468	492	527	822	68	96	251	45	83	39	250	
170 / 25	327	408	410	465	496	523	822	68	96	251	45	83	39	250	
175 / 30	325	405	410	463	500	518	818	68	96	251	45	83	39	250	
	4198	5161	5089	5788	5783	6540	10,332	825							
180 / 35	322	402	411	461	502	513	808	68	95	251	45	83	39	251	
185 / 40	320	398	411	460	503	507	792	68	95	251	45	82	39	251	
190 / 45	318	395	412	459	503	502	790	68	94	251	45	82	39	251	
195 / 50	316	392	412	457	503	497	774	68	94	251	45	82	39	251	
200 / 55	313	388	411	455	501	492	761	67	94	250	45	81	39	250	
205 / 1600	310	384	409	453	496	487	752	67	93	250	45	81	39	250	
210 / 05	307	380	406	450	492	483	738	68	93	250	45	81	39	250	
215 / 10	302	377	403	445	488	479	725	68	92	250	45	81	39	250	
220 / 15	299	372	399	439	483	475	711	67	92	250	45	81	39	250	
225 / 20	296	369	394	434	478	470	698	67	92	249	45	80	39	249	
230 / 25	293	365	390	429	472	466	690	68	91	250	46	80	39	251	
235 / 30	290	362	387	425	467	463	680	68	91	251	46	80	39	251	
	3686	4584	4845	5367	5888	5834	8919	812							
	7884	9745	9934	11,155	11,671	12,374	19,251	1637							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: HIGH VALLEY X-TEC Date: 3/23/99
Run: EDA #4 Technician(s): AJ, RLS.
Page: 3 of 3

T/C# / Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tunnel	13 C. Gas Box	14 Impinger Out	15 5G-1 Filter	16 5G-1 Condenser	17 Con-dar	18
240 1635	286	358	382	419	459	457	667	68	91	251	46	79	39	251	
245 40	283	354	378	415	453	453	655	67	90	250	46	79	39	251	
250 45	279	350	374	410	446	449	644	67	90	250	46	79	39	251	
255 50	275	346	369	405	439	444	632	67	89	250	47	79	39	250	
260 55	271	342	365	399	433	439	620	67	89	250	47	79	39	250	
265 1700	267	338	359	393	427	434	609	67	88	250	47	78	39	249	
270 05	263	333	354	387	421	428	595	67	88	251	48	78	39	249	
275 10	259	328	348	381	415	422	585	67	87	251	48	77	39	249	
280 15	255	323	340	374	410	415	573	67	86	250	49	77	39	249	
285 20	251	319	334	367	405	409	563	67	86	250	49	77	39	249	
290 25	2689	339	3603	3950	4308	4350	6143	671							
295 30															
	33,343	34429	33,784	27,721	27,236	30,221	54,937	4005		58÷					
300											AVG. STOVE TEMP. CHANGE START: 461.0				
													STOP: 335.2		
305	402	421	410	478	470	521	947	69					ΔT: 125.8		
310															
315															
320															
325															
330															
335															
340															
345															
350															
355															

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-1

Site: Myren Consulting, Woodinville, WA Date: 3/23/99 Analyte: CO_2

Source: HIGH VALLEY X-TEC Run #: EPA #4

Zero Cyl #: 36919 Conc. 00.0 % CO_2 Cyl Press: 230 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0 % CO_2 Cyl Press: 1470 psi

Certified by: OXARC Date: 8/23/97

Analyzer: Make: Horiba Model: PIR-2000 SN: 607024

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

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

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

Pre Run Audit: By: ATH, RLS Time: 1135 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.02556	+.02556	+0.10
Span	24.0	.240	6.0	6.0	.239	5.966	-.03415	-0.57

Comments:

Post Run Audit: By: ATH, RLS, Time: 1743 Temp: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.02556	+.02556	+0.10
Span	24.0	.240	6.0	5.8	.238	5.9410	-.05900	-0.98

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-2

Site: Myren Consulting, Woodinville, WA Date: 3/23/99 Analyte: O_2

Source: HIGH VALLEY X-TEC Run #: EPA # 4

Zero Cyl #: 36919 Conc. 00.0 % O_2 Cyl Press: 230 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 6.0 % O_2 Cyl Press: 1470 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Taylor Model: OA 137 SN: 137/4772

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 100 mv.

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

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

Pre Run Audit: By: ATM, RLS Time: 1135 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	.01547	-.01547	-0.06
Span	6.0	24.0	6.0	6.0	23.9	5.981	-.01946	-0.32

Comments:

Post Run Audit: By: ATM, RLS. Time: 1743 Temp.: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	00.0	.01547	-.01547	-0.06
Span	6.0	24.0	6.0	6.0	23.9	5.981	-.01946	-0.32

Comments:

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

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

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

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15-3

Site: Myren Consulting, Woodinville, WA Date: 3/23/99 Analyte: CO

Source: HIGH VALLEY X-TEC Run #: EPA #4

Zero Cyl #: 36919 Conc. 00.0 % CO Cyl Press: 230 psi

Certified by: CASCADE AIRGAS Date: 4/24/96

Span Cyl #: 250-1060 Conc. 1.26 % CO Cyl Press: 1470 psi

Certified by: OXARC Date: 8/22/97

Analyzer: Make: Infra Red Model: 702 D SN: 113

Range: 0 - 10.0% CO Analyzer Output: 0 - 100 mv.

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

EPA Span Value = 5.0% CO
EPA Control Limits = +2.5% of 5.0% CO = + 0.125% CO

Pre Run Audit: By: ATM, RLS Time: 1135 Temp: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.0	.0091	-.0091	-0.18
Span	1.26	25.2	1.26	1.26	25.0	1.2467	-.0133	-1.05

Comments:

Post Run Audit: By: ATM, RLS. Time: 1743 Temp.: 69 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	00.0	.0091	-.0091	-0.18
Span	1.26	25.2	1.26	1.24	24.7	1.2316	-.0783	-2.25

Comments:

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

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

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

Run: EPA #4
Date: 3/23/99
Technicians: ATH, PLS.
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 66 °F T/C#30: ____ °F

Thermocouple Check (at ambient): T/C#1: 66 °F; T/C#2: 65 °F;

T/C #3: 120 °F; T/C #4: 134 °F; T/C #5: 198 °F;

T/C #6: 171 °F; T/C #7: 189 °F; T/C #8: 245 °F;

T/C #9: 259 °F; T/C #10: 150 °F; T/C #11: 66 °F;

T/C #12: 65 °F; T/C #13: 63 °F; T/C #14: 62 °F;

T/C #15: 64 °F; T/C #16: 65 °F; T/C #17: 65 °F;

T/C #18: ____ °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: STOVE STILL WARM FROM OVER NIGHT BURN.

Thermocouple Readout: Pretest Zero/Span Check and Calibration:

Zero (0°F): 000 °F	Adj to: 000 °F	Post Test Check Zero (0°F): 000 °F	% Difference 0
Span (2000°F): 1999 °F	Adj to: 2000 °F	Span (2000°F): 2000 °F	0

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

Thermocouple Readout Pretest Linearity Check

0°F = 000 °F; 200°F = 201 °F; 400°F = 399 °F;

600°F = 600 °F; 800°F = 799 °F; 1000°F = 1000 °F;

1200°F= 1200 °F; 1400°F = 1400 °F; 1600°F = 1599 °F

1800°F= 1800 °F; 2000°F = 2000 °F

Combustion Gas (CO_2,O_2,CO) Train Leak Check: Pre ✓ Post ✓

Draft (Static) Guage Zero Check: Pre ✓ Post ✓

Scale Check Pre (Wt, #'s): 606.3 – 611.3 5.0 lbs. ok (PLS)

Post (Wt, #'s): 607.9 – 612.9 5.0 lbs. ok (PLS)

Stack cleaned prior to the run: Yes ____ No ✓

Tunnel cleaned prior to the run: Yes ____ No ✓

Becherini Scale Center, Inc.
317 E. Sprague
Spokane, WA 99202

SCALE CALIBRATION RECORD

Customer: Myren Consulting | Date: 9/9/93

Work Order Number: | PO Number:

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
1. Panther	1466459	1000 x .1 lb	Ø	Ø	Ø
	Pass...Fail		100.0	100.0	100.0
Notes:			200.0	199.9	200.0
			500.0	499.8	500.0
			Ø	Ø	Ø

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
2.					
	Pass...Fail				
Notes:					

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
3.					
	Pass...Fail				
Notes:					

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
4.					
	Pass...Fail				
Notes:					

Additional Comments:

Last Checked: 3-98 | Next Check Due: 3-99

Weights Certified: | Technician: Paul Schick

Calibration checked IAW NIST handbook 44

DENSITY STANDARD USED FOR TROEMNER PRECISION WEIGHTS

Troemner Inc. adjusts all new weights and all weights received for recalibration on the basis of apparent mass versus material of density 8.0g/cm³ at 20°C. This action is in accordance with the recommendations of the American Society for Testing and Materials specification ANSI/ASTM E 617 and the International Organization of Legal Metrology (OIML) International Recommendation No. 20.

Previously, all weights had usually been adjusted on the basis of apparent mass versus "brass," a hypothetic material of defined density 8.4g/cm³ at 0°C and 8.3909g/cm³ at 20°C. This practice originated in the early 1800's and was adopted in all of the English speaking countries as well as a number of other countries. Now most mass standards and test weights are made from stainless steel (density ranges from 7.77g/cm³ to 8.0g/cm³). A number of countries have adopted the recommendations of OIML and the foremost balance manufacturers are adjusting the built-in weights in their balances on the basis of apparent mass versus 8.0g/cm³. In order to smooth the transition in this country, the Reports of Calibration of the National Bureau of Standards are reporting the corrections to calibrated mass standards on both bases.

In terms of normal weighing procedures the change is very small. For a given weight, the mass value assigned on the basis of apparent mass versus density 8.0g/cm³ material will be 7 parts per million higher than the value assigned on the basis of apparent mass versus "density 8.4g/cm³" material. In many cases the allowed weight adjustment tolerances are so large that this change is immaterial although closely adjusted weights often have a smaller tolerance than the correction change. For example at the 1 kilogram level the change is 7 mg. For comparison the ANSI/ASTM E 617 Class 6 tolerance for 1 kilogram is 100 mg while the Class 1 tolerance is 2.5 mg. A detailed discussion of mass and mass values is given in Reference 3.

Precision Weights manufactured by Troemner Inc. to ASTM Class 1, 1.1, 2, 3, 4, 5, and 6 tolerances and the equivalent OIML and NBS tolerances are of the following materials:

Designation	*Base Material*	*Density*	*Weight Range*
Stainless Steel	18-8	7.84g/cm³ at 20°C	1 g & larger
Stainless Steel	18-8	8.0g/cm³ at 20°C	50 mg to 500 mg
Aluminum	1100	2.7g/cm³ at 20°C	30 mg & smaller

References:

1. ANSI/ASTM E 617
   Available from: Troemner Inc. 6825 Greenway Ave., Phila. Pa. 19142 215-724-0800 or American Society for Testing and Materials, 1916 Race Street, Phila., Pa. 19103
2. OIML INTERNATIONAL RECOMMENDATION No. 20
   Available from: Organisation Internationale De Metrologie Legale 11 Rue Trugot - 75009 Paris, France
3. NBS MONOGRAPH 133, MASS AND MASS VALUES
   Available from: Superintendent of Documents, U.S. Government Printing Office Washington, D.C. 20402 Order by SD Catalog No. C13,44:1331 Stock Number 0303-01178

TROEMNER INC.
Manufacturers of Precision Weights... Mass Standards • Balances • Laboratory Apparatus
6825 Greenway Avenue - Philadelphia, Pa. 19142
215/724-0800

Wts. used for Scale QC Checks, P. 4-4.

QUALITY CONTROL SERVICES

LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

Date: 04/13/1999

Customer: Myren Consulting
512 Williams Lake Road
Colville, WA 99114
Attn: Ben Myren

CERTIFICATE OF CALIBRATION

THE INSTRUMENTS LISTED BELOW HAVE BEEN SERVICED AND CALIBRATED BY QUALITY CONTROL SERVICES ON THE DATE INDICATED. SERVICE CONSISTS OF ACCURACY TESTS, ADJUSTING TO MANUFACTURER OR CUSTOMER SPECIFICATIONS AND COMPLETE CALIBRATION WITH STANDARDS TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (N.I.S.T.).

Item:	Make:	Model:	Serial Number:	Location:	Contact:	Cal. Date:	Cal. Due:
Balance	Mettler	AE100	K04827	Lab	Ben Myren	04/06/1999	09/1999

STANDARDS USED FOR THIS CALIBRATION:

Item:	Make:	Model:	Serial Number:	NIST ID:	Cal. Date:	Cal. Due:
Weight Set	Rice Lake	1MG-20KG	A45	822/251337	07/07/1998	07/1999

Technician: D.Deleasa

Signature D. Deleasa

2340 S.E. 11TH AVENUE • PORTLAND, OREGON 97214
P.O. BOX 14831 • PORTLAND, OREGON 97293 • (503) 236-2712 • FAX: (503) 235-2535

QUALITY CONTROL SERVICES
LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

Date: 10/29/1998

Customer: Myren Consulting
512 Williams Lake Road
Colville, WA 99114
Attn: Ben Myren

CERTIFICATE OF CALIBRATION

THE INSTRUMENTS LISTED BELOW HAVE BEEN SERVICED AND CALIBRATED BY QUALITY CONTROL SERVICES ON THE DATE INDICATED. SERVICE CONSISTS OF ACCURACY TESTS, ADJUSTING TO MANUFACTURER OR CUSTOMER SPECIFICATIONS AND COMPLETE CALIBRATION WITH STANDARDS TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (N.I.S.T.).

Item:	Make:	Model:	Serial Number:	Location:	Contact:	Cal. Date:	Cal. Due:
Balance	Mettler	AE100	K04827	Lab	Ben Myren	10/20/1998	10/1999

STANDARDS USED FOR THIS CALIBRATION:

Item:	Make:	Model:	Serial Number:	NIST ID:	Cal. Date:	Cal. Due:
Weight Set	Rice Lake	1MG-20KG	A45	822/251337	07/07/1998	07/1999

Technician: D.Deleasa
Signature D. Deleasa

2340 S.E. 11TH AVENUE • PORTLAND, OREGON 97214
P.O. BOX 14831 • PORTLAND, OREGON 97293 • (503) 236-2712 • FAX: (503) 235-2535

WOODSTOVE DATA SHEET #33

Thermocouple Calibration Record

TC #	Location	Ice Water Bath (°F)	Boiling Water (°F)
1	Wet Bulb	32.4	209.8
2	Dry Bulb	32.3	209.8
3	Stack	32.5	209.8
4	Stove Top	32.4	209.7
5	Left Side	32.3	209.9
6	Back	32.4	209.8
7	Right Side	32.4	209.7
8	Bottom	32.5	209.7
9	Firebox	32.6	209.9
	2nd Burn		
10	Catalytic	32.6	209.8
11	Room	32.3	209.9
12	~~Tube Furnace~~ TNL TEMP	32.5	209.7
13	~~Sample~~ C GAS Flow Box	32.6	209.7
14	Impinger Out C Gas	32.6	209.8
15	~~C Gas Box~~ Filter #1	32.5	209.7
16	~~C Gas Out~~ Filter #1 cont	32.5	209.8
17	~~SO_2 Gas Out~~		
18	Extra		
19	Extra		
20	Extra		
21			
22			
23			
24			
25			
26			
27			
28			
29	Oven		
30	N/A-Calibrator		
31			
32			
33			
34			
35	Rear Top		
36	Reat L Side		
37	Rear R Side		
38	Rear Firebox		
39	Rear 2nd/cat		
40			

Thermocouples checked against

Reference Thermometer #: ERTCO CAT 1005-3FC CAT 517 SN 1697

Ice Water Bath 32.3 °F

Boiling Water 210.1 °F

Room Temp 68 °F

B.P. 28.61" Hg "Hg

Date: 2/2/98 Technician: A.T. Myren

ALTEK

CERTIFICATE OF CALIBRATION

This is to Certify that your Altek Unit has been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (formerly NBS) within the limits of the NIST Calibration Services. Actual records pertaining to these standards are on file and are available for examination.

Certified by: Altek Industries Corp.
Recommend Recalibration: Annually

In service date 4/11/96

Model K2100F Serial No. Serial # 177533

T. Knech
Calibration Technician

31 AUG 95
Factory Calibration Date

ALTEK INDUSTRIES CORP
210 Commerce Drive, Rochester, NY 14623 U.S.A.
(716) 334-3720 FAX: (716) 334-6673
800-32-ALTEK
800-322-5835
Anywhere in USA

Meter Box 511M SN 900167

Date: 2/2/99

Thermocouple No.: JENCO Model 768-KF-02

Ambient Temperature: 68 °F

Barometric Pressure: 28.61 "Hg

Calibrator: A.T. Mynn

Reference: Mercury-in-glass: EZTCO SN 1697

Other: Altec

Ambient EZTCO

Reference point No.[a]	Source[b] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Difference,[c] %
1	Altec	0	0	0
2	1	100	99	-.17
3		200	201	+.15
4		300	299	-0.13
5		400	397	-0.35
6		500	496	-0.42
7		600	597	-0.28
8		700	697	-0.25
9		800	801	+0.08
10		900	902	+0.15
11		1000	1007	+0.48
12		1100	1109	+0.58
13		1200	1212	+0.72
14		1400	1421	+1.13
15		1600	1615	+0.73
16		1800	1810	+0.44
17	↓	2000	1998	-0.08

[a] Every 30°C (50°F) for each reference point

[b] Type of Calibration system used

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

Stack Temperature Sensor Calibration Data Sheet

RANGE 0-1999°F

Date: 2/2/99 Thermocouple No.: Extech Model 4020 KF

Ambient Temperature: 68 °F Barometric Pressure: 28.61 "Hg

Calibrator: A.T. Myren Reference: Mercury-in-glass: ERTCO SN 1697

Other: Altec

Amb ERTCO

Reference point No.[a]	Source[b] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Difference,[c] %
1	Altec	0	1	+.22
2		100	99	-.18
3		200	201	+0.15
4		300	299	-0.13
5		400	400	0
6		500	499	-0.10
7		600	600	0
8		700	698	-0.17
9		800	800	0
10		900	899	-0.07
11		1000	1002	0.14
12		1100	1101	+0.06
13		1200	1201	+0.06
14		1400	1401	+0.05
15		1600	1600	0
16		1800	1799	-0.04
17	↓	1900	1900	0

[a] Every 30°C (50°F) for each reference point

[b] Type of Calibration system used

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

Stack Temperature Sensor Calibration Data Sheet

Thermometer Calibration

2/2/99 A.T.My

mfr		Ertco	Ertco	VWR	Fisher	Taylor	Taylor	Premium	Weston
Cat #		1005-3FC	517	C1016-015USA	ASTM-59F	1330NA	1330NA		
SN		1697	K85-163	—	A04544	WB	DB	A1	
Range		-1 to 101°C	0-260°C	-30 to 50°C	0-180°F	20-120°F	20-120°F	0-220°F	-40-160°F
Graduation		0.1°C	1.0°C	1.0°C	1.0°F	1.0°F	1.0°F	1°F	2°F
Type		Tube	Tube	Tube	Tube	Tube	Tube	Dial	Dial
Temp Pt	1	20.5	21.0	21.0	71	71	70.5	71	70
	2	25.0	25.5	25.0	80	80	80.5	80	90
	3	12.0	12.0	12.25	51	52	52	52	52
	4	1.0	1.0	1.0	33	33	33	34	34
	5	98.5	99	—	—	—	—	209	—

$°F = (°C \times 9/5) + 32$

$°C = (°F - 32)\ 5/9$

NOTE: Taylor 1330NA WB & DB = thermometers in sling psychrometer

EVER READY THERMOMETER CO., INC.
228 LACKAWANNA AVENUE
WEST PATTERSON, NJ 07424
(201) 812-7474

R E P O R T O F C A L I B R A T I O N

LIQUID-IN-GLASS-THERMOMETER

CALIBRATED BY EVER READY THERMOMETER CO.

MARKED: ERTCO CAT 1005-3FC S/N-1697
RANGE: -1 TO +101 DEGREES C IN 0.1 DEGREE GRADUATIONS.

THERMOMETER READING	CORRECTION (ITS-90)**
0.00 C	0.00 C
10.00	0.00
20.00	0.00
30.00	0.00
37.00	0.00
40.00	0.00
50.00	0.00
56.00	0.00
60.00	0.02
70.00	0.00
80.00	0.00
90.00	0.00
100.00	0.00

** ALL TEMPERATURES IN THIS REPORT ARE BASED ON THE INTERNATIONAL TEMPERATURE SCALE OF 1990 (ITS-90) PUBLISHED IN THE METROLGIA 27, NO. 1, 3/10/90.

THIS THERMOMETER WAS CALIBRATED AGAINST A STANDARD CALIBRATED AT THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) FORMERLY THE NATIONAL BUREAU OF STANDARDS (NBS) IN ACCORDANCE WITH ASTM METHOD E 77, AND NBS MONOGRAPH 174.

FOR A DISCUSSION OF ACCURACIES ATTAINABLE WITH SUCH THERMOMETERS SEE NBS MONOGRAPH 250-23.

IF NO SIGN IS GIVEN ON THE CORRECTION, THE TRUE TEMPERATURE IS HIGHER THAN THE INDICATED TEMPERATURE; IF THE SIGN GIVEN IS NEGATIVE, THE TRUE TEMPERATURE IS LOWER THAN THE INDICATED TEMPERATURE. TO USE THE CORRECTIONS PROPERLY, REFERENCE SHOULD BE MADE TO THE NOTES GIVEN BELOW.

CONTINUED

TEST NUMBER: 152439
DATE: 07/16/96
STANDARD SERIAL NO. 128239
NIST IDENTIFICATION NO. 88024

R E P O R T O F C A L I B R A T I O N

LIQUID-IN-GLASS-THERMOMETER

THE THERMOMETER WAS TESTED IN A LARGE, CLOSED-TOP, ELECTRICALLY HEATED, LIQUID BATH, BEING "IMMERSED" 76MM. THE TEMPERATURE OF THE ROOM WAS ABOUT 25 DEGREES C (77 DEGREES 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.

THE TABULATED CORRECTIONS APPLY PROVIDED THE ICE-POINT READING, TAKEN AFTER EXPOSURE FOR NOT LESS THAN 3 DAYS TO A TEMPERATURE OF ABOUT 20 DEGREES C (70 DEGREES F) IS 0.00 DEGREES C. IF THE ICE-POINT READING IS FOUND TO BE HIGHER (OR LOWER) THAN STATED, ALL OTHER READINGS WILL BE HIGHER (OR LOWER) TO THE SAME EXTENT. IF THE THERMOMETER IS USED AT A GIVEN TEMPERATURE SHORTLY AFTER BEING HEATED TO A HIGHER TEMPERATURE. AN ERROR OF 0.01 DEGREES OR LESS, FOR EACH 10 DEGREE DIFFERENCE BETWEEN THE TWO TEMPERATURES, MAY BE INTRODUCED. THE TABULATED CORRECTIONS APPLY IF THE THERMOMETER IS USED IN THE UPRIGHT POSITION; IF USED IN A HORIZONTAL POSITION, THE INDICATIONS MAY BE A FEW HUNDREDTHS OF A DEGREE HIGHER.

TEST NUMBER: 152439
DATE: 07/16/96
STANDARD SERIAL NO. 128239
NIST IDENTIFICATION NO. 88024

C. Tang

Charles Tang-Nian
QUALITY CONTROL MANAGER

X INSTRUMENTS
PA METHOD 5
Pre-Test Calibration
English Meter Box and English Calibration Meter Units

Filename: C:\My Documents\511cal399.wk1

Model Number: APEX 511-M
Serial Number: ~~#######~~ 20844

Date: -> March 13,99
Barometric Pressure: -> 28.64 (in. Hg)
Calibration Meter Factor Yc: -> 1.0149 (number)

dH (in H20)	Elasped Time (min)	DRY GAS METER READING Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)		GAS Temperature Inlet (deg F)	Outlet (deg F)	CALIBRATION METER READINGS Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	CALIBRATION METER Temperature Inlet (deg F)	Outlet (deg F)
0.50	15.78	747.400	753.900	6.500	Initial->	67.0	65.0	500.345	506.807	6.462	69.0	68.0
					Final--->	72.0	68.0					
0.75	10.85	754.300	759.800	5.500	Initial->	71.0	67.0	507.202	512.645	5.443	68.0	68.0
					Final--->	71.0	68.0					
1.00	8.92	760.300	765.504	5.204	Initial->	72.0	68.0	513.125	518.272	5.147	68.0	68.0
					Final--->	73.0	69.0					
1.25	7.37	765.978	771.405	5.427	Initial->	73.0	69.0	518.748	524.068	5.322	68.0	67.0
					Final--->	73.0	69.0					
1.50	6.93	772.600	777.903	5.303	Initial->	73.0	70.0	525.250	530.463	5.213	67.0	67.0
					Final--->	72.0	69.0					

	DRY GAS METER METER CALIBRATION FACTOR Y	
	Value (number)	Variation (number)
	1.006	0.002
	1.005	0.002
	1.006	0.003
	0.999	-0.005
	1.001	-0.002
Average	1.003	

	DRY GAS METER ORIFICE CALIBRATION FACTOR dH@	
	Value (in H2O)	Variation (in H2O)
	1.704	0.076
	1.693	0.065
	1.701	0.074
	1.545	-0.082
	1.494	-0.133
Average	1.627	

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

I certify that the above Dry Gas Meter was calibrated in accordance with E.P.A. Method 5 , paragraph 7.1 ;CFR 40 Part 60, using the Precision Wet Test Meter # 11AB6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature A.J. Myrum. Date 3/13/99

Post Test
Meter Box Audits
Woodstove Data Sheet #32

Unit: High Valley XTEC
Date: 4/7/99
Technician: AT Myren
WST9-Form2, Rev12/88

METER BOX CALIBRATION AUDIT

Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg. Δ H	.900	.900	.900	.900	.900	.898				
Max Vac	0	0	0	0	0	0				

Avg. Test Series Δ H: 0.89967 in H_2O. Test Series Max Vac: 0 in Hg

Audit Dry Gas Meter: 300392 Correction (Y) Factor: 1.0149
Test Dry Gas Meter: 511-M Correction (Y) Factor: 1.003

Audit Data

		Audit #1	Audit #2	Audit #3
BP:		28.48" Hg	28.47" Hg	28.47" Hg
Vac:		0	0	0
Audit Meter:	Final Vol	553.122	558.572	564.475
	Initial Vol	547.855	553.329	558.963
	Vol (Vw, ft^3)	5.267	5.243	5.512
Audit Meter:	Initial	67	66	66
Temp (°F)(Tw)	Mid	66	66	66
	Final	65	66	66
	Avg (°F/°A)	(66) 526	(66) 526	(66) 526
Δ H (in H_2O)	Initial	.90	.90	.90
	Mid	.90	.90	.90
	Final	.90	.90	.90
	Avg	.90	.90	.90
Dry Gas Meter:	Final Vol	750.600	756.004	761.955
	Initial Vol	745.400	750.700	756.400
	Vol (V_d, ft^3)	5.200	5.304	5.555
Dry Gas Meter	Initial	63	67	68
Temp (°F):Inlet	Mid	64	69	67
	Final	66	70	69
	Avg (°F/°A)	(64.3) 524.3	(68.7) 528.7	(68) 528
Dry Gas Meter	Initial	63	65	68
Temp (°F):Outlet	Mid	64	65	68
	Final	64	65	68
	Avg (°F/°A)	(63.7) 523.7	(65) 525	(68) 528
Avg Dry Gas Meter Temp (Tm-°F/°A)		(64) 524	526.85	(68) 528
Time (minutes)		9:25:30	9:29:37	10:03:06

$Y = \frac{(Vw)(MCF)(BP)(Tm)}{(Vd)(BP + \frac{\Delta H}{13.6})(Tw)}$ Y Factor % Difference = $\frac{Act - Exp}{Exp} \times 100$

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

Run 1

$Y = \frac{(5.267)(1.0149)(28.43)(524)}{(5.200)(28.43 + \frac{.90}{13.6})(526)} = \frac{79,773.352}{78,079.502} = 1.0217$

$\Delta\% = \frac{(1.0217 - 1.0056)}{1.0056} \times 100 = +1.601\%$

Run 2

$Y = \frac{(5.243)(1.0149)(28.47)(526.85)}{(5.304)(28.47 + \frac{.90}{13.6})(526)} = \frac{79,813.722}{79,613.173} = 1.0025$

$\Delta\% = \frac{(1.0025 - 1.0056)}{1.0056} \times 100 = -0.308\%$

Run 3

$Y = \frac{(5.512)(1.0149)(28.47)(528)}{(5.555)(28.47 + \frac{.90}{13.6})(526)} = \frac{84,091,839}{83,380,710} = 1.0085$

$\bar{X} = +0.53\%$

$\Delta\% = \frac{(1.0085 - 1.0056)}{1.0056} \times 100 = +0.288\%$

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:

0.75 (A) inch H_2O Delta H = 1.005 (C) Calculated Calibration Y Factor (from Calibrations)

1.00 (B) inch H_2O Delta H = 1.006 (D) Calculated Calibration Y Factor (from Calibrations)

1.00 (B) - .75 (A) = .25 X 100 = 25 (E)

1.006 (D) - 1.005 (C) = .001 : 25 (E) = 0.00004 (F)

.8997 Avg Delta H - .75 (A) = .1497 X 100 = 14.97 (G)

$\left[\frac{0.00004}{F} \times \frac{14.97}{G}\right] + \frac{1.005}{C} = \frac{1.0056}{\text{Interpolated Y Factor For Avg. Test Series Delta H}}$

at -10" Hg .549/.551

Volume Metering System Leak Check: .002 CF ~~inch H_2O in~~ one minute

REFERENCE METER CALIBRATION
TWO POINT VERIFICATION CHECK
ENGLISH REFERENCE METER UNITS
DGM Serial # 300392
Date 7/26/98

Filename: F:\DATAFILE\CALIBRAT\CAL_MENU.DSK\DGM_2VER\300392-
Revised: 1/5/98

Barometric Pressure 29.71
Meter Yw 1.00000
K (deg R/inches Hg) 17.64

		Dry Gas Meter (DGM)			Temperature		Wet Test Meter (WTM)						PREVIOUS DATA
Time (min)	Pressure (in. H20)	Meter Readings Initial	Final	Volume (cubic feet)	Initial (deg F)	Final (deg F)	Meter Readings Initial	Final	Volume (cubic feet)	Temp (deg F)	DGM Coefficient Yds	Flow Rate (CFM)	DGM Coefficient Yds
10.00	-5.000	417.848	427.852	10.004	80.0	81.0	578.155	588.070	9.915	80.0	1.004	0.962	1.009
												%CHANGE	0.4509415 %
20.00	-1.800	427.852	436.302	8.450	81.0	82.0	588.070	596.510	8.440	80.0	1.006	0.410	1.013
												%CHANGE	0.6838462 %

%CHANGE MUST BE +/- 1.5%, ELSE PERFORM 15PT CAL

I certify that the above Dry Gas Meter was calibrated in accordance with E.P.A. Method 5 , paragraph 7.1 ;CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature _____ Date 7-26-98

REFERENCE METER CALIBRATION
ENGLISH REFERENCE METER UNITS

Barometric Pressure 29.55
Meter Yw 1.00000
K (deg R/inches Hg) 17.64

DGM Serial # 300392
Date 4/17/97

Filename: F:\DATAFILE\CALIBRAT\CAL_MENU.DSK\DGM_REF.
Revised: 06/08/95

Time	Pressure	Dry Gas Meter (DGM) Meter Readings		Volume	Temperature Initial	Final	Wet Test Meter (WTM) Meter Readings		Volume	Temp	DGM Coefficient	Coefficient Variation	Flow Rate
(min)	(in. H20)	Initial	Final	(cubic feet)	(deg F)	(deg F)	Initial	Final	(cubic feet)	(deg F)	Yds	Yds-(Avg.Yds)	(CFM)
43.50	-6.800	975.414	1027.032	51.618	74.0	75.0	570.631	621.609	50.978	70.0	1.013	0.000	1.153
5.00	-6.800	27.032	33.092	6.060	75.0	76.0	621.609	627.579	5.970	70.0	1.013	0.000	1.174
5.50	-6.800	33.092	39.759	6.667	76.0	76.0	627.579	634.140	6.561	70.0	1.012	0.000	1.173
									Max Yds - Min Yds =0.000757781 Must be no greater than 0.030				
									Average Yds =1.012668100 Must be between 0.95 to 1.05				
21.00	-4.600	39.759	59.519	19.760	76.0	76.0	634.140	653.669	19.529	70.0	1.011	0.001	0.915
8.00	-4.600	59.519	67.033	7.514	76.0	76.0	653.669	661.070	7.401	70.0	1.008	-0.002	0.910
6.50	-4.600	67.033	73.137	6.104	76.0	77.0	661.070	667.091	6.021	70.0	1.010	0.000	0.911
									Max Yds - Min Yds =0.003425424 Must be no greater than 0.030				
									Average Yds =1.009592597 Must be between 0.95 to 1.05				
35.00	-3.000	73.137	99.630	26.493	77.0	76.0	667.091	693.309	26.218	70.0	1.009	-0.003	0.737
11.50	-3.000	99.630	108.357	8.727	70.0	72.0	693.309	702.130	8.821	74.0	1.013	0.000	0.749
17.50	-3.000	108.357	121.465	13.108	72.0	72.0	702.130	715.389	13.259	74.0	1.015	0.003	0.740
									Max Yds - Min Yds =0.006019406 Must be no greater than 0.030				
									Average Yds =1.012417828 Must be between 0.95 to 1.05				
11.50	-2.000	121.465	127.641	6.176	72.0	73.0	715.389	721.703	6.314	74.0	1.025	-0.002	0.536
28.00	-2.000	127.641	142.554	14.913	73.0	75.0	721.703	736.961	15.258	74.0	1.028	0.002	0.532
10.00	-2.000	142.554	147.894	5.340	75.0	76.0	736.961	742.395	5.434	74.0	1.026	-0.001	0.530
									Max Yds - Min Yds =0.003679685 Must be no greater than 0.030				
									Average Yds =1.026129451 Must be between 0.95 to 1.05				
27.50	-1.400	147.894	159.237	11.343	76.0	77.0	742.395	753.825	11.430	74.0	1.016	0.002	0.406
22.50	-1.400	159.237	167.914	8.677	77.0	79.0	753.825	762.519	8.694	74.0	1.013	-0.001	0.377
16.00	-1.400	167.914	174.098	6.184	79.0	80.0	762.519	768.690	6.171	74.0	1.012	-0.002	0.376
									Max Yds - Min Yds =0.004226433 Must be no greater than 0.030				
									Average Yds =1.013540053 Must be between 0.95 to 1.05				

Overall Average Yds =1.014869606

I certify that the above Dry Gas Meter was calibrated in accordance with E.P.A. Method 5 , paragraph 7.1 ;CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature _____ Date 4-17-97

VANEOMETER CALIBRATION

Myren Consulting uses a Dwyer Model #480 Vaneometer to measure test chamber air velocity. The manufacturer's specifications for accuracy are ±5.0% to 100 FPM and ±10% from 100 FPM to top of scale. Myren Consulting 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

Myren Consulting uses a Dwyer Model 115-AV 0 - 0.25" inclined water manometer (readibility 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

Myren Consulting uses a Weems and Plath aneriod barometer to measure barometric pressure (BP) in the Woodinville, WA lab. The barometer is calibrated daily by obtaining the barometeric pressure (station pressure) from the National Weather Service (NWS) adjusting that pressure for altitude and then calibrating the lab barometer as necessary to that pressure.

MOISTURE METER CALIBRATION

The Delmhorst Model RC-1E, SN 1509 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 12.5% and 22%.

Myren Consulting has a second moisture meter - Delmhorst Model RDX-1 SN 1359 - to use as a backup and as means of checking the readings on the Model RC-1E.

The readings obtained from the moisture meter are corrected as per the manufacturer's wriiten instructions. See the following page for the correction table used to correct the readings.

10.0 - 10.6
10.5 - 11.2
11.0 - 11.7
11.5 - 12.3
12.0 - 12.8
12.5 - 13.3
13.0 - 13.9
13.5 - 14.4
14.0 - 14.9
14.5 - 15.4
15.0 - 15.9
15.5 - 16.5
16.0 - 17.0
16.5 - 17.5
17.0 - 18.1
17.5 - 18.6
LEGAL ↑ 18.0 - 19.2
RANGE 18.5 - 19.8
19.0 - 20.3
19.5 - 20.9
20.0 - 21.4
20.5 - 22.0
21.0 - 22.6
21.5 - 23.1
22.0 - 23.7
22.5 - 24.3
↓ 23.0 - 24.9
24.0 - 26.0
24.5 - 26.6
25.0 - 27.2

26-ED ELECTRODE

OPERATING INSTRUCTIONS

The 26-E and 18-E Electrodes, fitted with insulated pins and used with any Delmhorst Moisture Detectors for Wood, are available in detecting moisture gradient in lumber or in testing dry stock that is wet on the surface.

These Electrodes, as long as they have good insulation on their shanks, measure moisture content at the tip of the pins only, that is in a layer about 3/16" thick.

Shell and core, moisture content is easily measured by driving the pins to the proper depths.

When using the Electrode, place the pins on the wood so that the current will flow parallel to the grain and drive the pins into the wood by means of the sliding hammer. Note the pins' penetration, and read the meter.

The Moisture Meter is calibrated for use with a 4-pin Electrode. When using a 2-pin Electrode, a small correction should be applied, as noted below, where line "A" shows meter readings, and line "B" the correct readings for the 2-pin Electrode.

A= 7	8	10	12	14	16	18	20	22
B= 7.3	8.4	10.6	12.8	14.9	17.0	19.2	21.4	23.7

When the insulation on the contact pins wears off, the above correction should be disregarded, and the electrode should not be used on lumber which may have a wet surface. Always use the L-319 insulating washer especially if surface moisture on the wood is expected. If washers are not available, do not allow the retainers to touch the surface of the wood.

DELMHORST INSTRUMENT CO.
INDIAN LANE EAST, TOWACO, NJ 07082. TEL: 201-334-2557. FAX: 201-334-2657. CALL US TOLL FREE AT 800-222-0638

WOODSTOVE DATA SHEET #26-A

CEM GAS TRAIN RESPONSE TIME

PRE CERTIFICATION TEST SERIES CHECK

Date	2/2/99	2/2/99	2/2/99	2/299	2/2/99	2/2/99	2/2/99	2/2/99	2/2/99		
Technicians	ATM	ATM	ATM	ATM	ATM	ATM	ATM	ATM	ATM		
Elapsed Time	CO_2 Conc.(V)	CO_2 Conc.(V)	CO_2 Conc.(V)	CO Conc.(V)	CO Conc.(V)	CO Conc.(V)	O_2 Conc.(V)	O_2 Conc.(V)	O_2 Conc.(V)	Conc.(V)	Conc.(V)
0 Seconds	.334	.331	.329	.76	.79	.83	50.1	50.4	50.9		
15	.333	.330	.329	.76	.78	.82	50.1	50.5	60.0		
30	.049	.048	.047	.06	.07	.08	81.4	81.6	81.6		
45	.023	.021	.021	.05	.05	.07	82.6	82.7	82.8		
60	.012	.012	.011	.03	.04	.05	84.3	84.4	84.5		
75	.008	.008	.009	.03	.03	.03	84.5	84.5	84.5		
90	.006	.005	.005	.02	.02	.03	84.5	84.6	84.6		
105	.004	.003	.003	.02	.01	.02	84.6	84.7	84.6		
120	.002	.002	.002	.01	.01	.01	84.7	84.7	84.7		
135	.002	.001	.002	.01	.01	.01	84.7	84.7	84.7		
150	.001	.001	.001	0	0	0	84.7	84.7	84.7		
165	.001	.001	.001	0	0	0	84.8	84.7	84.8		
180	.001	.001	.001	0	0	0	84.7	84.7	84.7		
Initial Response Time (Seconds)	~15	~15	~15	~15	~15	~15	~17	~18	~18		
95% Response Time (Seconds)	>45<60	>45<60	>45<60	>45<60	>45<60	>45<60	760<75	760<75	760<75		
Analyzer Flow Rate 1.5SCFH	———	———	———	1.5SCFH	———	———	1500 cc/min	———	———		

Comments

InterMountain Ambient
P.O. Box 5106 ☐ Missoula, MT 59806 ☐ (406) 543-6174

Pre High Valley

QA WS 1/85

CO_2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: Colville, WA Date: 3/20/99

Analyzer: Make: HORIBA Model: PIR 2000 SN: 607204

Calibration by: A.T. Myren

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: ✓ Mass Flowmeter: ___
BP: 28.59 "Hg Instrument ID: Weems
Temp: 71 °F Instrument ID: EXTECH

Analyzer last calibrated: 3/13/99 By: A.T. Myren

Cylinders:

1. # 36919 Concentration: 00.0 % CO_2 Cyl. Press.: 230 psi.
   Certified by: Cascade Airgas Date: 4/24/96
2. # 250-1146 Concentration: 12.0 % CO_2 Cyl. Press.: 550 psi.
   Certified by: Oxarc Date: 8/22/97
3. # 250-1175 Concentration: 21.0 % CO_2 Cyl. Press.: 1390 psi.
   Certified by: Oxarc Date: 8/22/97
4. # 250-1060 Concentration: 6.0 % CO_2 Cyl. Press.: 1300 psi.
   Certified by: Oxarc Date: 8/22/97

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

Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ___

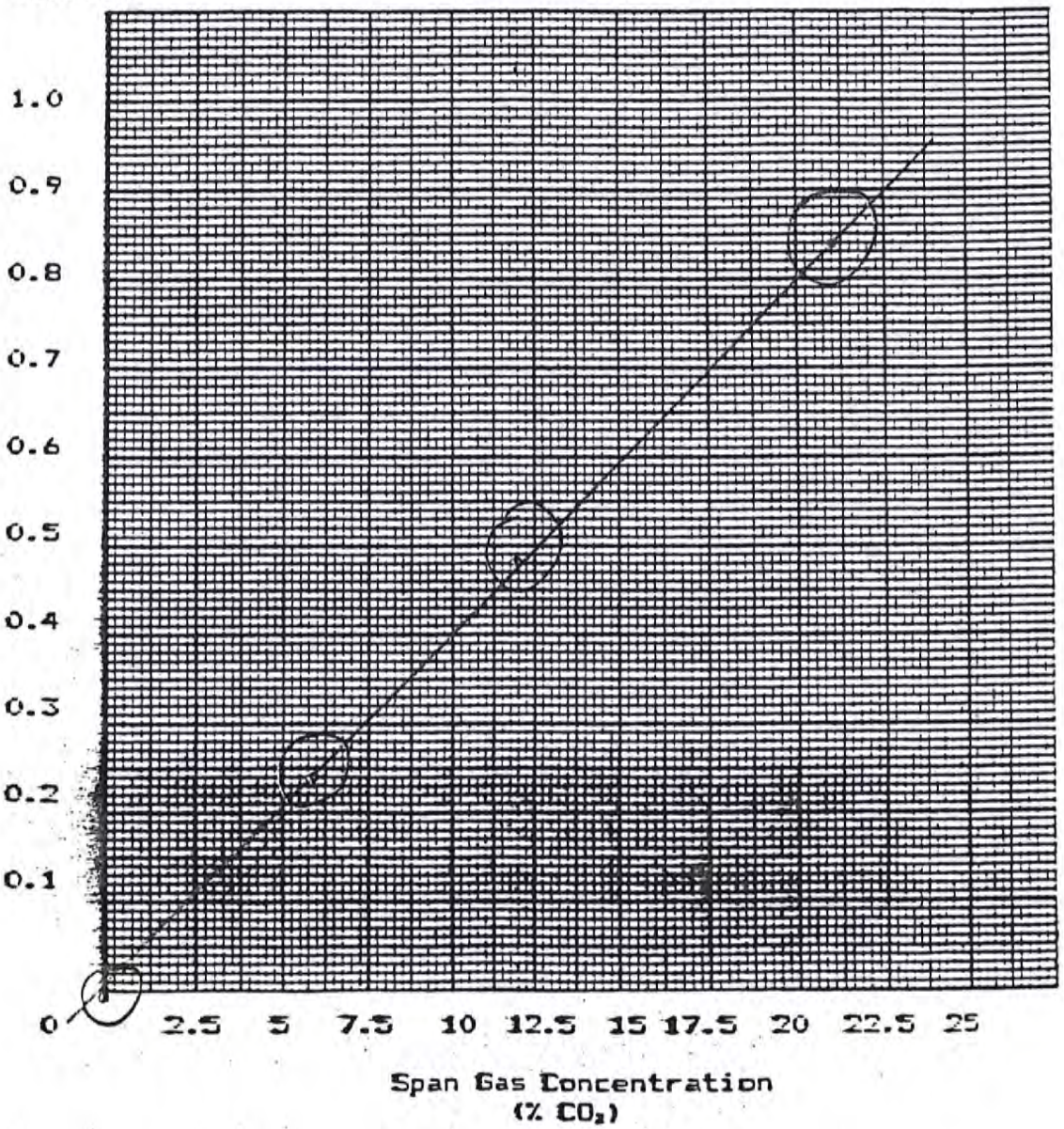
Calibration Results

Point #	Cyl. #	% CO_2	Expected Meter	Expected DVM	Actual Meter	Actual DVM	Adj. Meter	Adj. DVM	% Dif.	Potentiometer Unadj.	Potentiometer Adj.
1	1	0.0	00.0	.000	00.0	.000	—	—	—	6.46	—
2	2	12.0	48.0	.480	48.0	.481	47.5	.480	—	2.53	2.52
3	3	21.0	84.0	.840	84.0	.844	—	—	+0.11	—	—
4	4	6.0	24.0	.240	24.0	.240	—	—	-0.12	—	—
5	1	0.0	00.0	.000	00.0	.000	—	—	0	—	—

Comments: 0.50 = 12.4623256

Linear Regression Results:

Y = MX + B
Slope (M) = 24.88349
Y Intercept (B) = .0205549
Correlation Coefficient (r) = 0.9999954



Comments

InterMountain Ambient
P.O. Box 5106 ☐ Missoula, MT 59806 ☐ (406) 543-6174

Pre High Valley

QA WS 1/85

O_2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: Colville WA Date: 3/30/99

Analyzer: Make: Taylor Model: OA 137 SN: 137/4772

Calibration by: A.T. Mynen

Cal Gas Flow: 1500 cc/min Measured by: Rotameter: ✓ Mass Flowmeter: ____
BP: 23.54" Hg Instrument ID: Weems
Temp: 71°F Instrument ID: EXTECH

Analyzer last calibrated: 3/13/99 By: A.T. Mynen

Cylinders:

1. # 36919 Concentration: 00.0 % O_2 Cyl. Press.: 250 psi.
   Certified by: Cascade Airgas Date: 4/24/96
2. # 250-1146 Concentration: 12.0 % O_2 Cyl. Press.: 540 psi.
   Certified by: Oxarc Date: 8/22/97
3. # 250-1175 Concentration: 21.0 % O_2 Cyl. Press.: 1380 psi.
   Certified by: Oxarc Date: 8/22/97
4. # 250-1060 Concentration: 6.0 % O_2 Cyl. Press.: 1320 psi.
   Certified by: Oxarc Date: 8/22/97

Analyzer: Calibrated Range: 0-25.0 % Output: ✓ 0-100 mv.

Flow: 1500 cc/min Measured by: Rotameter: ✓ Mass Flowmeter: ____

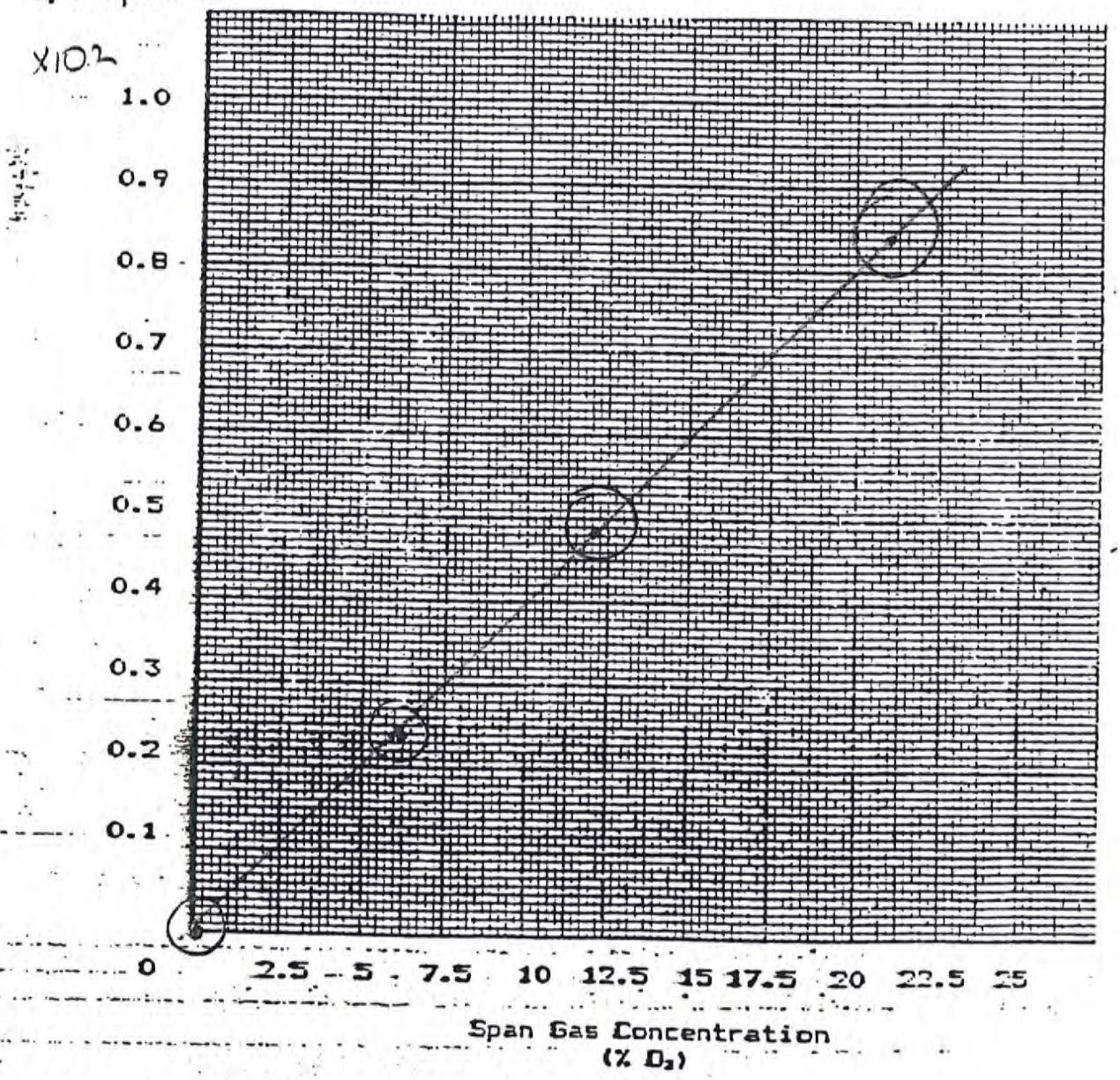
Calibration Results

Point #	Cyl. #	% O_2	Expected Meter	Expected DVM	Actual Meter	Actual DVM	Adj. Meter	Adj. DVM	% Dif.	Potentiometer Unadj.	Potentiometer Adj.
1	1	0	00.0	00.0	00.0	00.0	—	—	—	—	—
2	2	12.0	12.0	48.0	12.05	48.1	12.05	48.0	—	—	✓
3	3	21.0	21.0	84.0	21.0	83.7	—	—	-0.08	—	—
4	4	6.0	6.0	24.0	6.0	24.0	—	—	+0.09	—	—
5	1	0	00.0	00.0	00.0	00.0	—	—	0	—	—

Comments: 50.0 = 12.5284877

Linear Regression Results:

Y = MX + B
Slope (M) = 1.25088
Y Intercept (B) = -0.01542
Correlation Coefficient (r) = 0.999997



Comments

InterMountain Ambient
P.O. Box 5106 ☐ Missoula, MT 59806 ☐ [406] 543-6174

Pre High Valley

QA WS 1/85

CO ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: Colville, WA Date: 3/20/99

Analyzer: Make: Infra Red Model: 702 D SN: 113

Calibration by: A.T. Myren

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____
BP: 28.59" Hg Instrument ID: Weiss
Temp: 71°F Instrument ID: Extech

Analyzer last calibrated: 3/13/99 By: A.T. Myren

Cylinders:

1. #36919 Concentration: 00.0 % CO Cyl. Press.: 230 psi.
   Certified by: Cascade Airgas Date: 4/24/96
2. #250-1146 Concentration: 2.51 % CO Cyl. Press.: 590 psi.
   Certified by: Oxarc Date: 8/22/97
3. #250-1175 Concentration: 4.03 % CO Cyl. Press.: 1390 psi.
   Certified by: Oxarc Date: 8/22/97
4. #250-1060 Concentration: 1.26 % CO Cyl. Press.: 1320 psi.
   Certified by: Oxarc Date: 8/22/97

Analyzer: Calibrated Range: 0-5.0 % Output: 0 - 100 mv.
Flow: 1.5SCFH Measured by: Rotameter: X Mass Flowmeter: ____

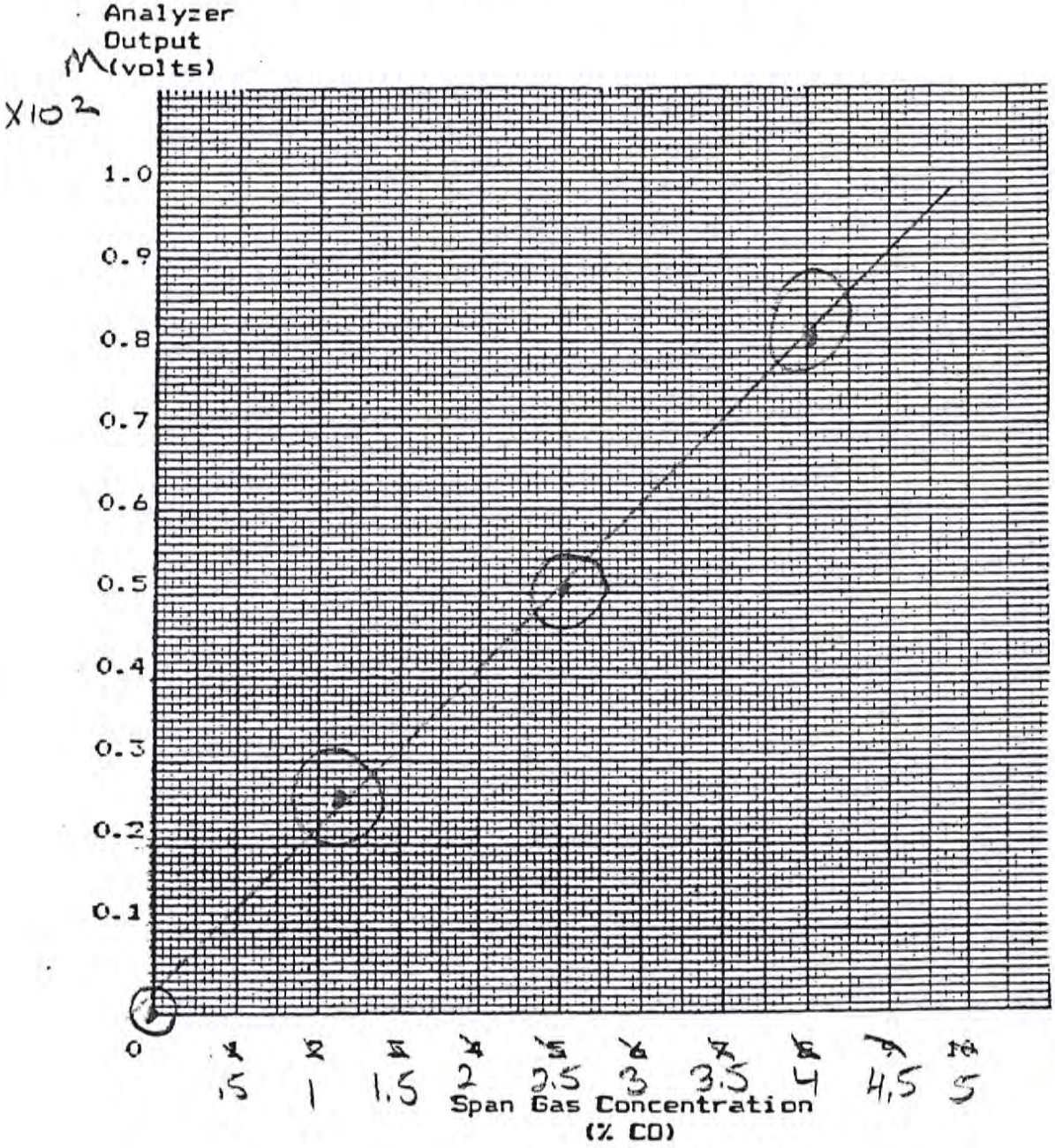
Calibration Results

Point #	Cyl. #	% CO	Expected Meter	Expected DVM	Actual Meter	Actual DVM	Adj. Meter	Adj. DVM	% Dif.	Potentiometer Unadj.	Potentiometer Adj.
1	1	0.00	0.00	00.0	0.00	00.0	—	—	0	—	—
2	2	2.51	2.51	50.2	2.50	50.0	2.51	50.2	—	—	✓
3	3	4.03	4.03	80.6	4.02	80.3	—	—	-0.12	—	—
4	4	1.26	1.26	25.2	1.29	25.4	—	—	+0.66	—	—
5	1	0.00	0.00	00.0	0.00	00.0	—	—	0	—	—

Comments: 50.0 = 2.5036150

Linear Regression Results:

Y = MX + B
Slope (M) = 0,0 502136
Y Intercept (B) = -0,0070762
Correlation Coefficient (r) = 0,9999912



Comments

MALLINCKRODT

CERTIFICATE OF ANALYSIS

A Division of Mallinckrodt Baker, Inc.
222 Red School Lane • Phillipsburg, NJ 08865
Telephone: (908) 859-2151 • Fax: (908) 859-9318

ITEM: ACETONE AR (ACS)
CODE: 2440
LOT : KTDC

TESTS	LIMITS	RESULTS
TITRATABLE ACID	0.0003 meq/g Max.	0.0002 meq/g
ALDEHYDE	0.002% Max.	0.002%
TITRATABLE BASE	0.0006 meq/g Max.	0.0004 meq/g
ISOPROPYL ALCOHOL	0.05% Max.	0.005%
METHANOL	0.05% Max.	0.005%
RESIDUE AFTER EVAPORATION	0.001% Max.	0.0002%
SOLUBILITY IN WATER	To Pass Test	Passes Test
SUBSTANCES REDUCING PERMANGANATE	To Pass Test	Passes Test
WATER	0.5% Max.	0.3%
COLOR	APHA 10 Max.	APHA 5
ASSAY	99.5% Min.	99.9%

It is hereby certified that the above is a true copy of the actual analysis of the lot indicated.

Mark Featherston

Mark Featherston
Manager, QA/QC
Mallinckrodt Baker, Inc
03/07/96 wwr

Acetone Purchased 7/10/96
1st blank done 8/8/96
2nd blank done 9/10/97
3rd blank done 9/10/97
4th Blank done 3/13/97

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FAX (509) 662-1229

YAKIMA, WA 98903
1004 EAST MEAD
(509) 248-0827
FAX (509) 452-8704

Primary Standard Certificate of Analysis
Method of Analysis Micro GC / Gravimetric
Customer: Myren Consulting **Reference # PM7234-3**
P.O.# **Cylinder # 250-1146**

Results of Investigation

Component	Requested	Concentration
Air	N/A	N/A
Argon	N/A	N/A
Carbon Dioxide	12.0%	12.0%
Carbon Monoxide	2.50%	2.51%
Helium	N/A	N/A
Hydrogen	N/A	N/A
Methane	N/A	N/A
Nitrogen	Balance	Balance
Oxygen	12.0%	12.0%

Hazard Class	**UN 1956**
DOT Shipping Name	**Compressed Gas NOS**
Shipping Volume (scf approximate)	**160 scf @ ntp**
Cylinder Pressure	**1500 psig**
CGA Valve Connection	**350**

Oxarc Primary Standard mixtures are prepared with gravimetric techniques using weights traceable to NIST. Mixture blended to +/- 1% relative to minor component and certified to +/- 1% analytical accuracy.

Authorized Signature Travis Auger **Date** 8/25/97
Travis Auger

Comments:

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FAX (509) 662-1229

YAKIMA, WA 98903
1004 EAST MEAD
(509) 248-0827
FAX (509) 452-8704

Primary Standard Certificate of Analysis
Method of Analysis Micro GC / Gravimetric
Customer: Myren Consulting **Reference # PM7234-2**
P.O.# **Cylinder # 250-1175**

Results of Investigation

Component	Requested	Concentration
Air	N/A	N/A
Argon	N/A	N/A
Carbon Dioxide	21.0%	21.0%
Carbon Monoxide	4.00%	4.03%
Helium	N/A	N/A
Hydrogen	N/A	N/A
Methane	N/A	N/A
Nitrogen	Balance	Balance
Oxygen	21.0%	21.0%

Hazard Class	**UN 1956**
DOT Shipping Name	**Compressed Gas NOS**
Shipping Volume (scf approximate)	**160 scf @ ntp**
Cylinder Pressure	**1500 psig**
CGA Valve Connection	**350**

Oxarc Primary Standard mixtures are prepared with gravimetric techniques using weights traceable to NIST. Mixture blended to +/- 1% relative to minor component and certified to +/- 1% analytical accuracy.

Authorized Signature Travis Auger **Date** 8/25/97
Travis Auger

Comments:

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FAX (509) 452-8704

Primary Standard Certificate of Analysis
Method of Analysis Micro GC / Gravimetric
Customer: Myren Consulting **Reference # PM7234-4**
P.O.# **Cylinder # 250-1060**

Results of Investigation

Component	Requested	Concentration
Air	N/A	N/A
Argon	N/A	N/A
Carbon Dioxide	6.00%	6.00%
Carbon Monoxide	1.25%	1.26%
Helium	N/A	N/A
Hydrogen	N/A	N/A
Methane	N/A	N/A
Nitrogen	Balance	Balance
Oxygen	6.00%	6.00%

Hazard Class	**UN 1956**
DOT Shipping Name	**Compressed Gas NOS**
Shipping Volume (scf approximate)	**160 scf @ ntp**
Cylinder Pressure	**1500 psig**
CGA Valve Connection	**350**

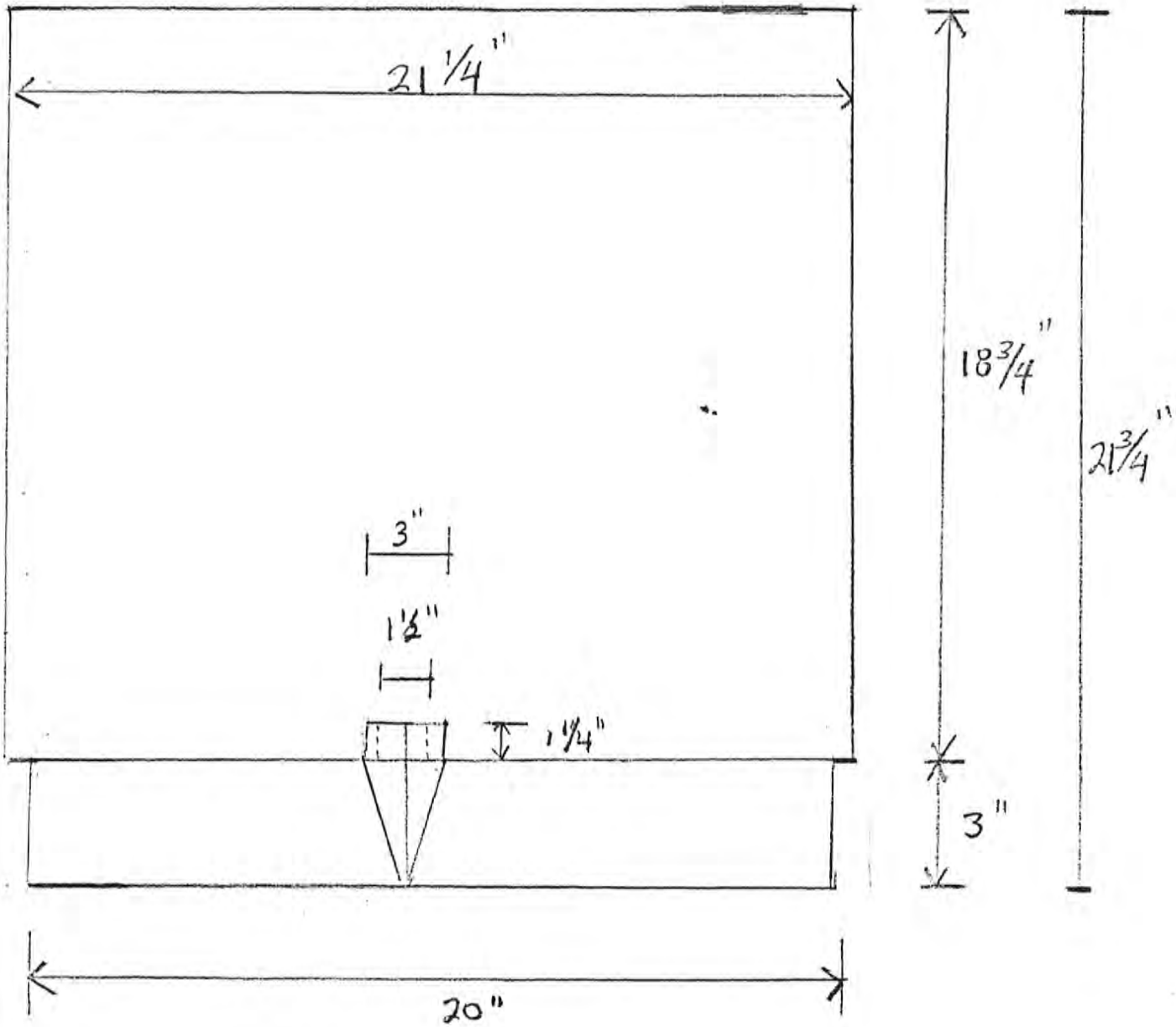
Oxarc Primary Standard mixtures are prepared with gravimetric techniques using weights traceable to NIST. Mixture blended to +/- 1% relative to minor component and certified to +/- 1% analytical accuracy.

Authorized Signature Travis Auger **Date** 8/25/97
Travis Auger

Comments:

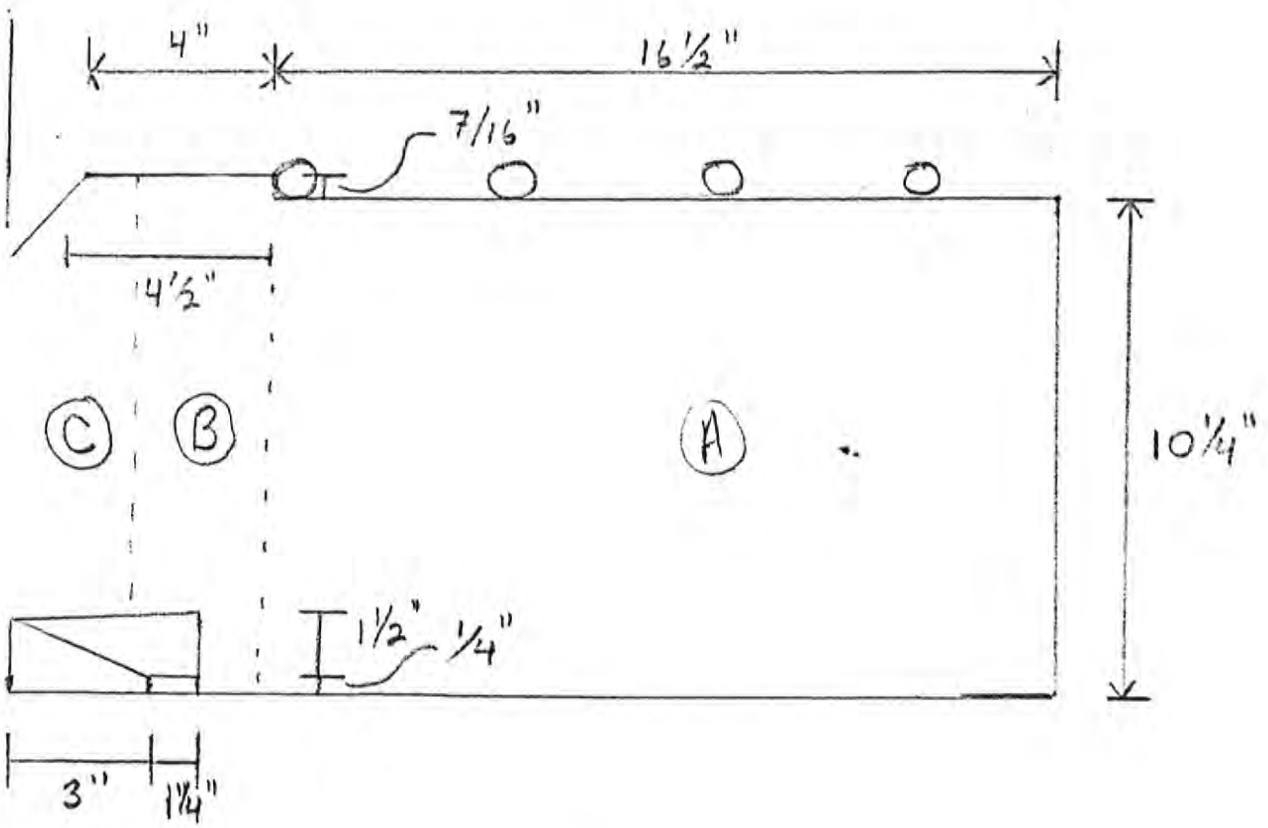
STOVE QC

The High Valley 1600 noncatalytic wood stove is a large sized (2.7 cubic foot) rectangularly shaped wood stove that is designed to normally be loaded in a north-south (front to back) manner. However, the unit will handle 20" cordwood loaded either way. The two most distinguishing features of the unit are (1.) its large size and(2.) its step top design. The secondary combustion system uses 4 stainless steel tubes to deliver the secondary air to the secondary combustion zone.



Top View

High Valley XTEC
Page 1 of 4
Not to Scale
A. T. Myran



SIDE View

High Valley XTEC
Page 2 of 4
Not to Scale
A.T. Myren

USEABLE FIREBOX VOLUME Calculations:

A: $16.5 \times 21.25 \times 10.25 = 3593.906\ in^3$

B: $(18.75 - 16.5) \times 21.25 \times (10.25 + .4375) = 510.996$

C: $3 \times 20 \times (10.25 + .4375) = 641.250$

$4746.152\ in^3$

Less:

D $\frac{.4375 \times .5}{2} \times 20 = 2.1875\ in^3$

Airwash area

E: $\frac{3 \times 1.25}{2} \times 20 = 37.500$

F: $3 \times .25 \times 20 = 15.000$

Bottom Primary Air Duct

G. $\frac{3.25 \times 1.25}{2} \times \frac{3}{2} = 3.0417$

$\frac{3 \times 1 \times 1.75}{2} = 2.625$

LPAO

$60.360\ in^3$

Firebox Volume and Fuel load Size Calculations

4746.152 in^3 - 60.360 in^3 = 4685.792 in^3

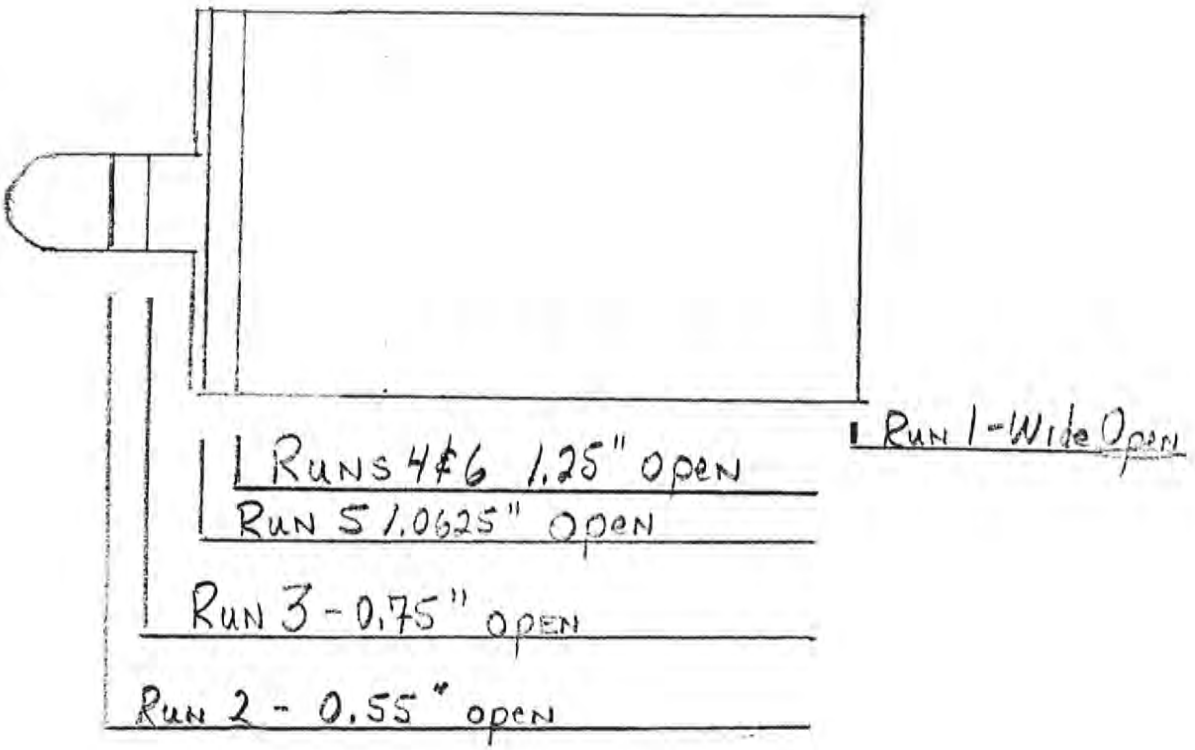
4685.792 in^3 ÷ 1728 in^3/ft^3 = 2.71169 ft^3

2.71169 ft^3 x 7.0 lbs/ft^3 = 18.982 lbs - ideal fuel load wt.

18.982 X (.1X18.982) = 17.084 - 20.880

= 17.1 - 20.8 Fuel Load weight range

High Valley 1600 Orifice Settings

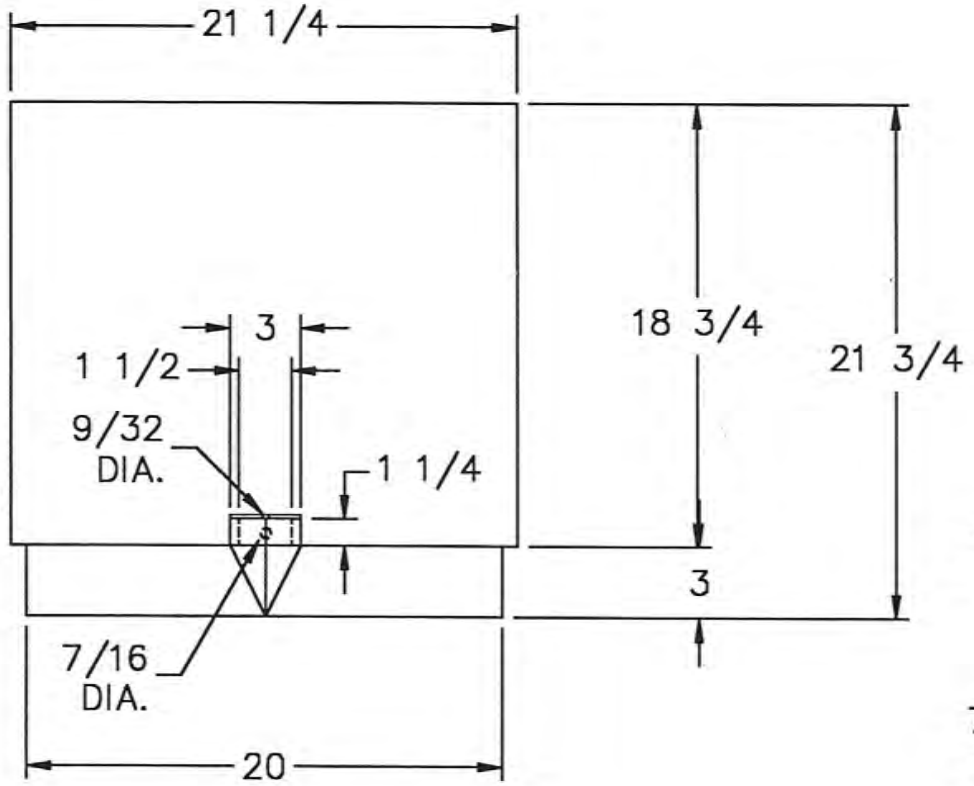


High Valley XTEC

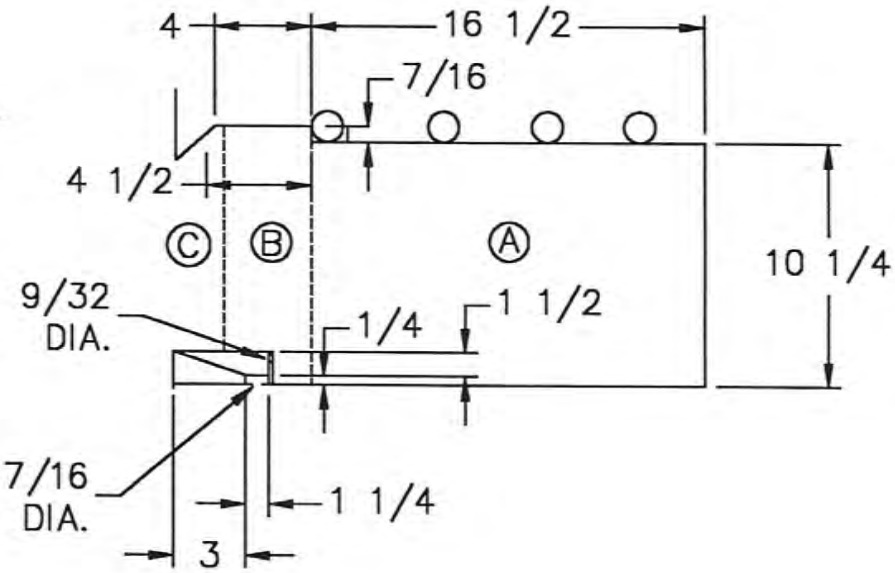
High Valley Stoves
Index for Blueprints

FIREBOX VOLUME

TOP VIEW

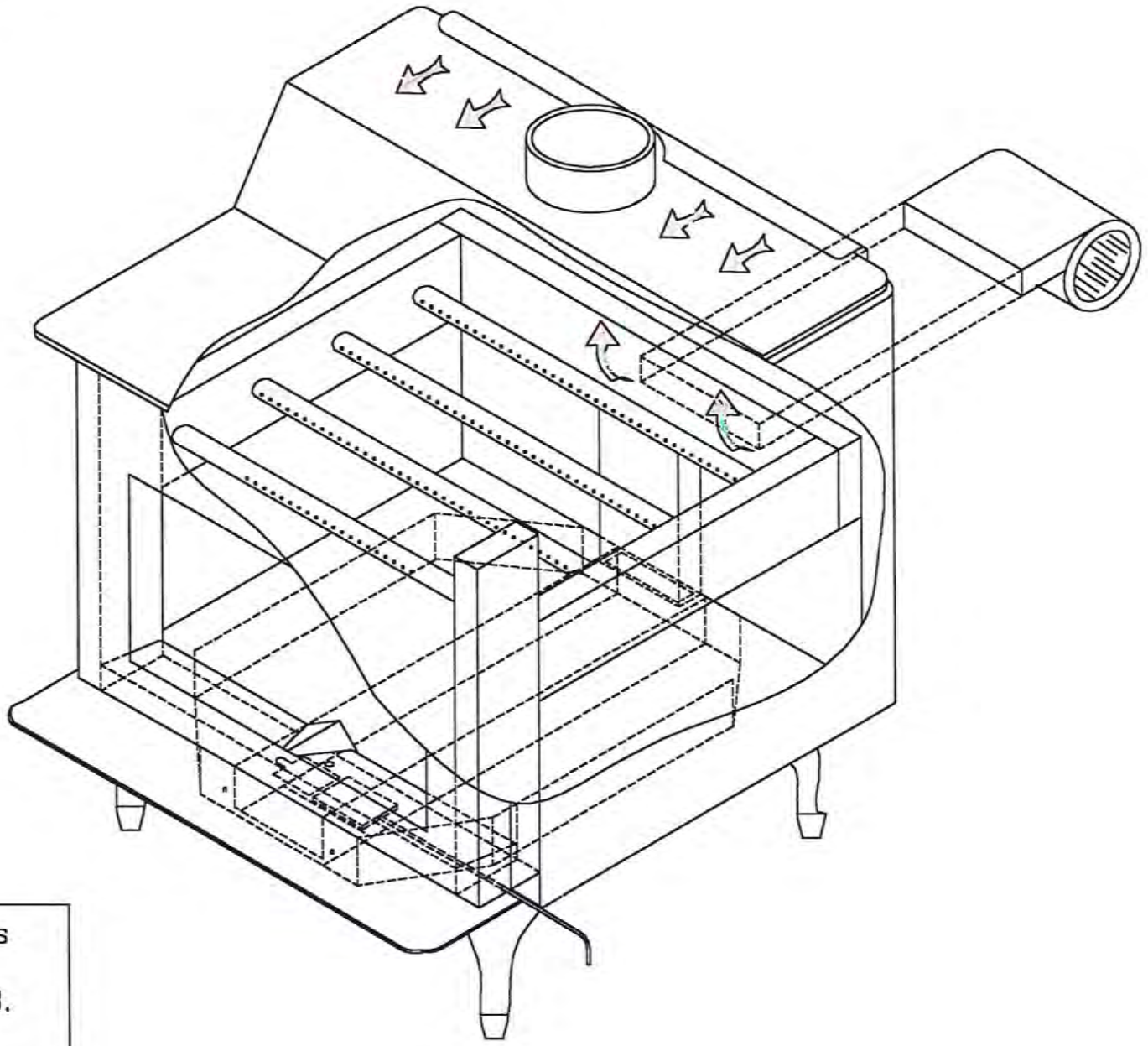


SIDE VIEW

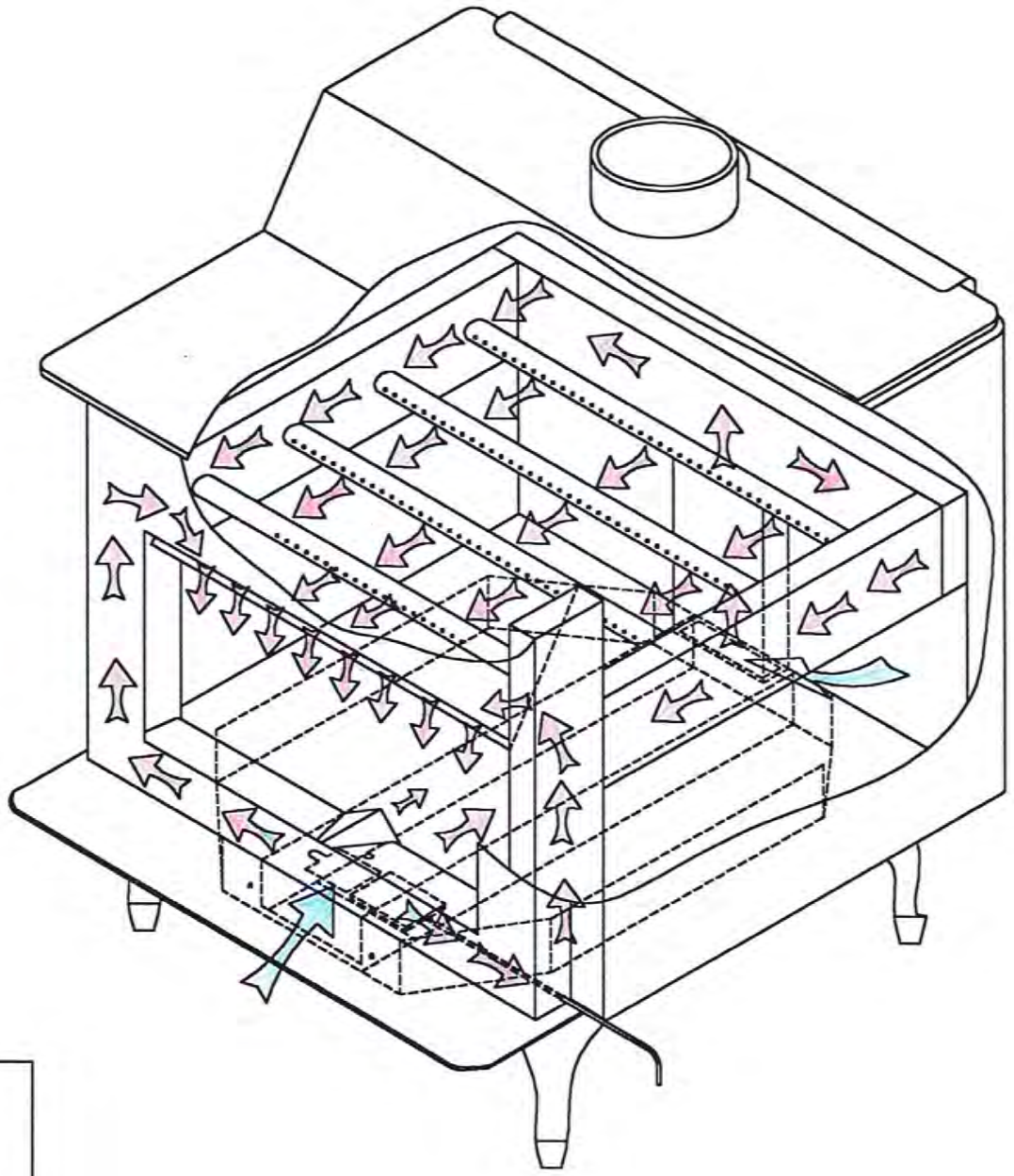


High Valley Stoves
Model 1600
Drawn by: Matt B.
Date: 4/15/99
2A of 26

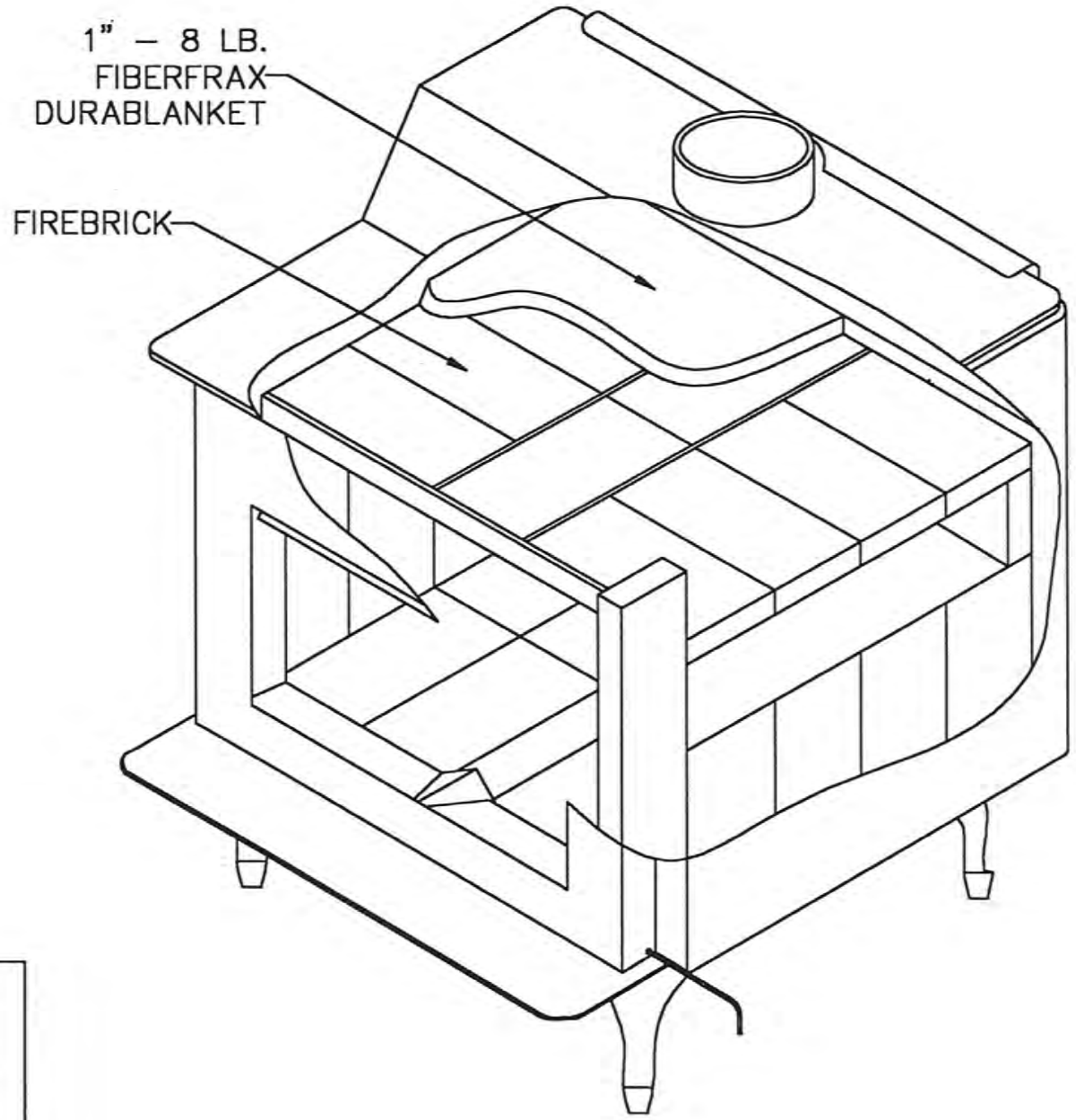
Convection Air



High Valley Stoves
Model 1600
Drawn by: Matt B.
Date: 4/15/99
2 of 26

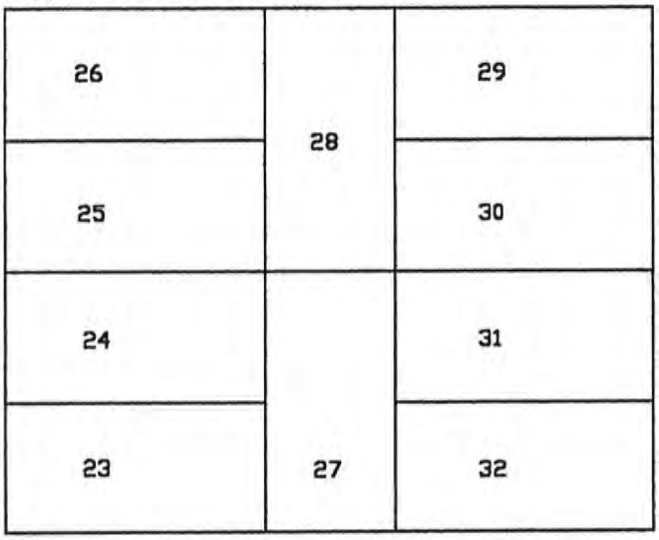


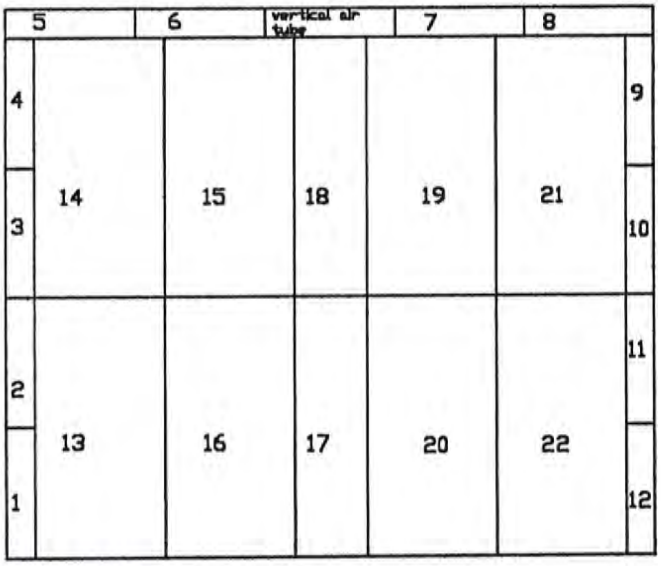
High Valley Stoves
Model 1600
Drawn by: Matt B.
Date: 4/15/99
1 of 26



High Valley Stoves
Model 1600
Drawn by: Matt B.
Date: 4/15/99
3 of 26

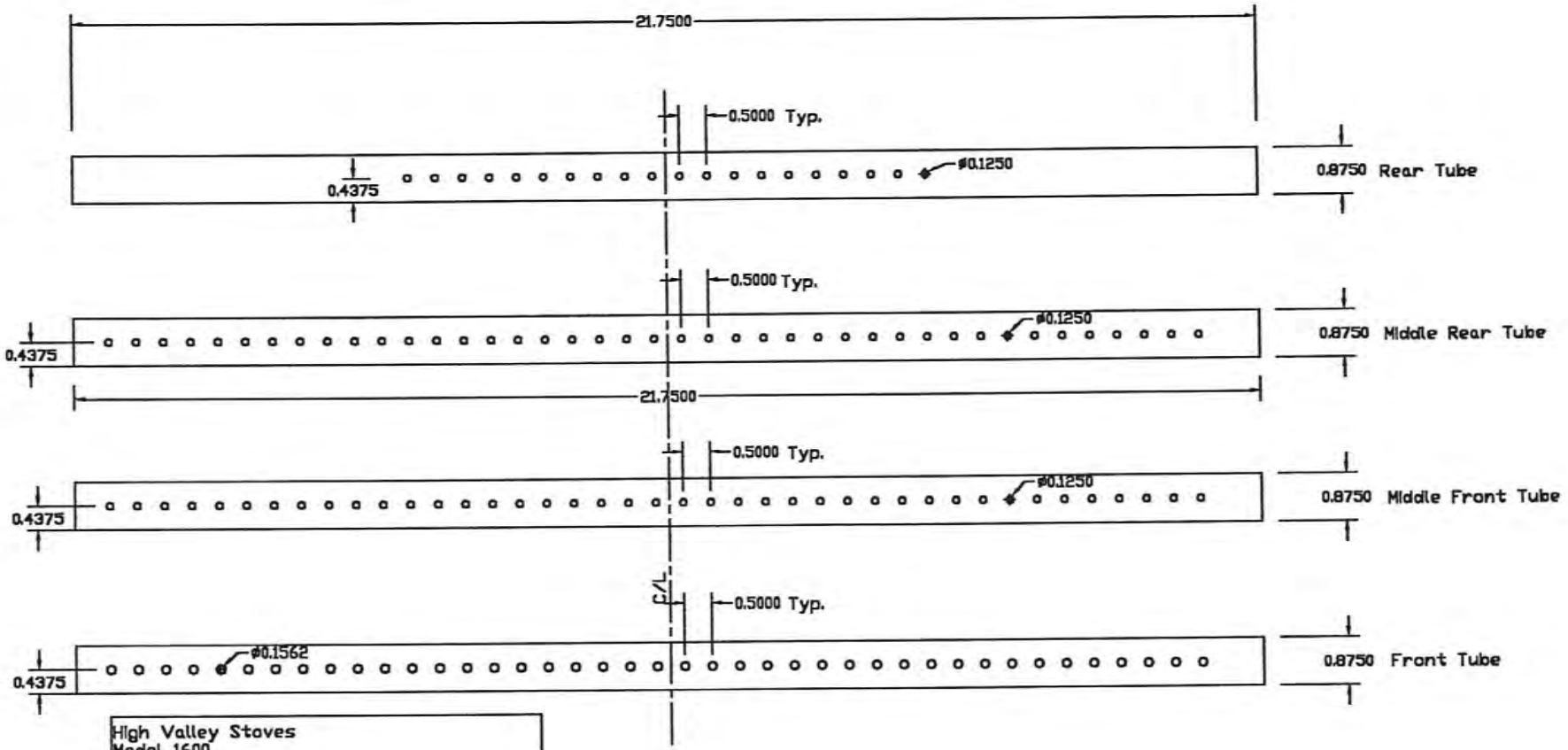
Upper shelf of Model 1600



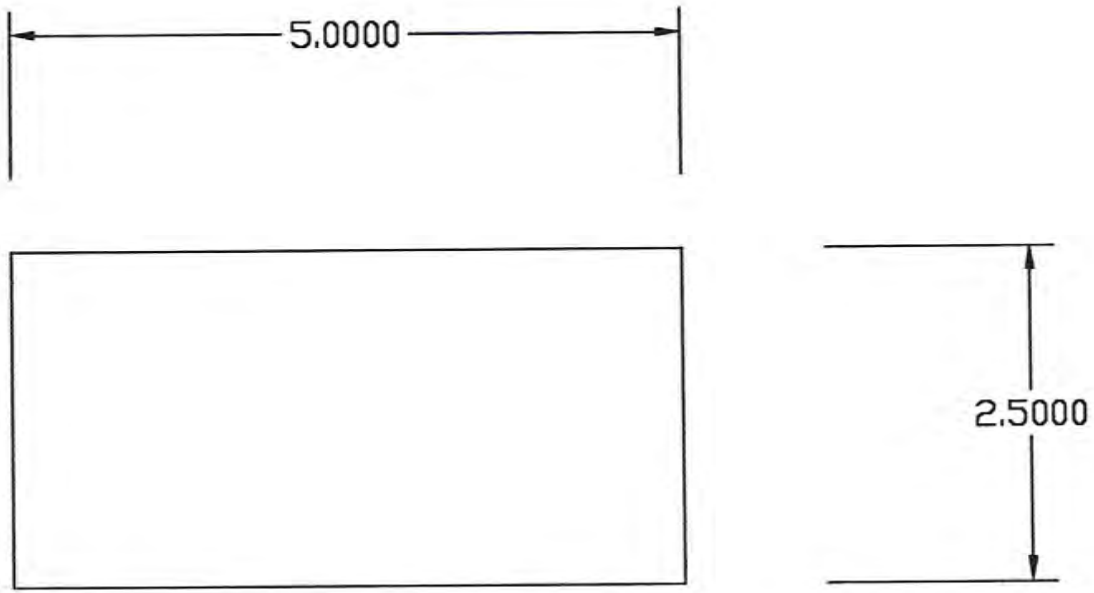


High Valley Stoves
Firebrick Layout
Model 1600
Brick 1-16 1"thick X 4 1/2" X 9"
Brick 17-18 1" thick X 2 1/4" X 9"
Brick 19-22 1" thick X 4 1/2" X 9"
Brick 23-32 1" thick X 4 1/2" X 9"

High Valley Stoves
Model 1600
Firebrick Layout
Drawn By: Matt B.
Date: 4/15/99
Drawing 4 of 26

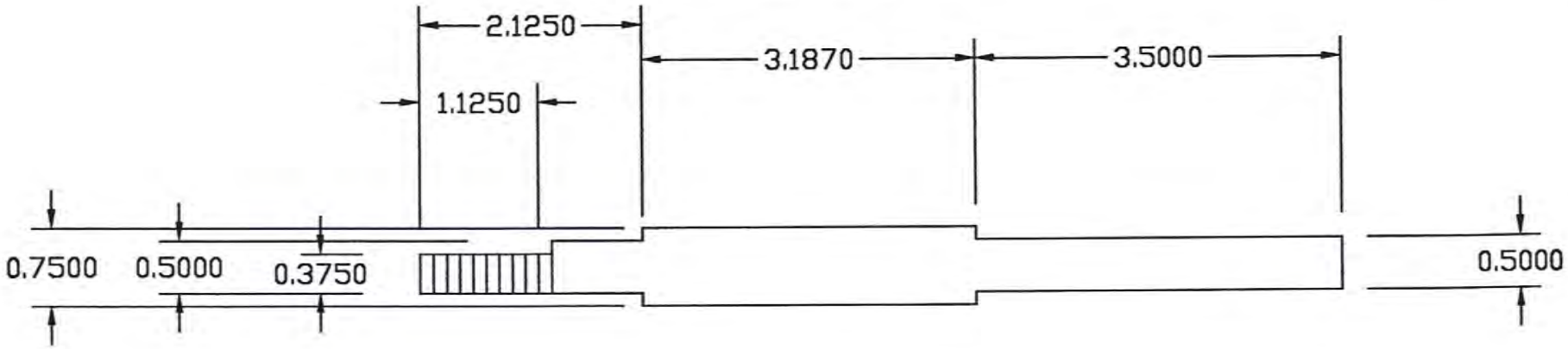


High Valley Stoves
Model 1600
Air Tubes
Material Size: SS .875 OD X .750 ID X 21.750
Drawn By: Matt B.
Date 4/7/99
Drawing 5 of 26

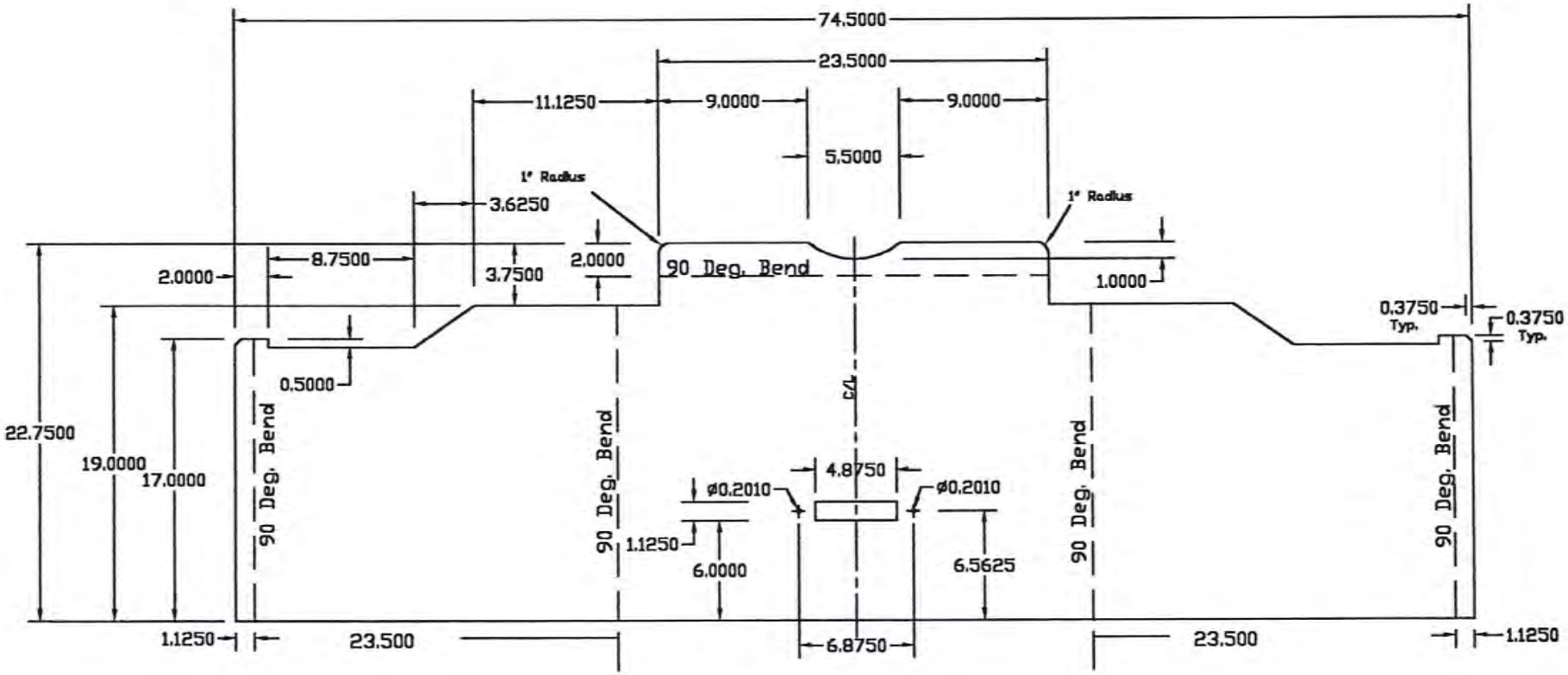


High Valley Stoves
Model 1600
Slide Draft Plate
Material Size: 3/8" X 5" X 2.5"
Drawn By: Matt B.
Date: 4/1/99
Drawing 10 of 26

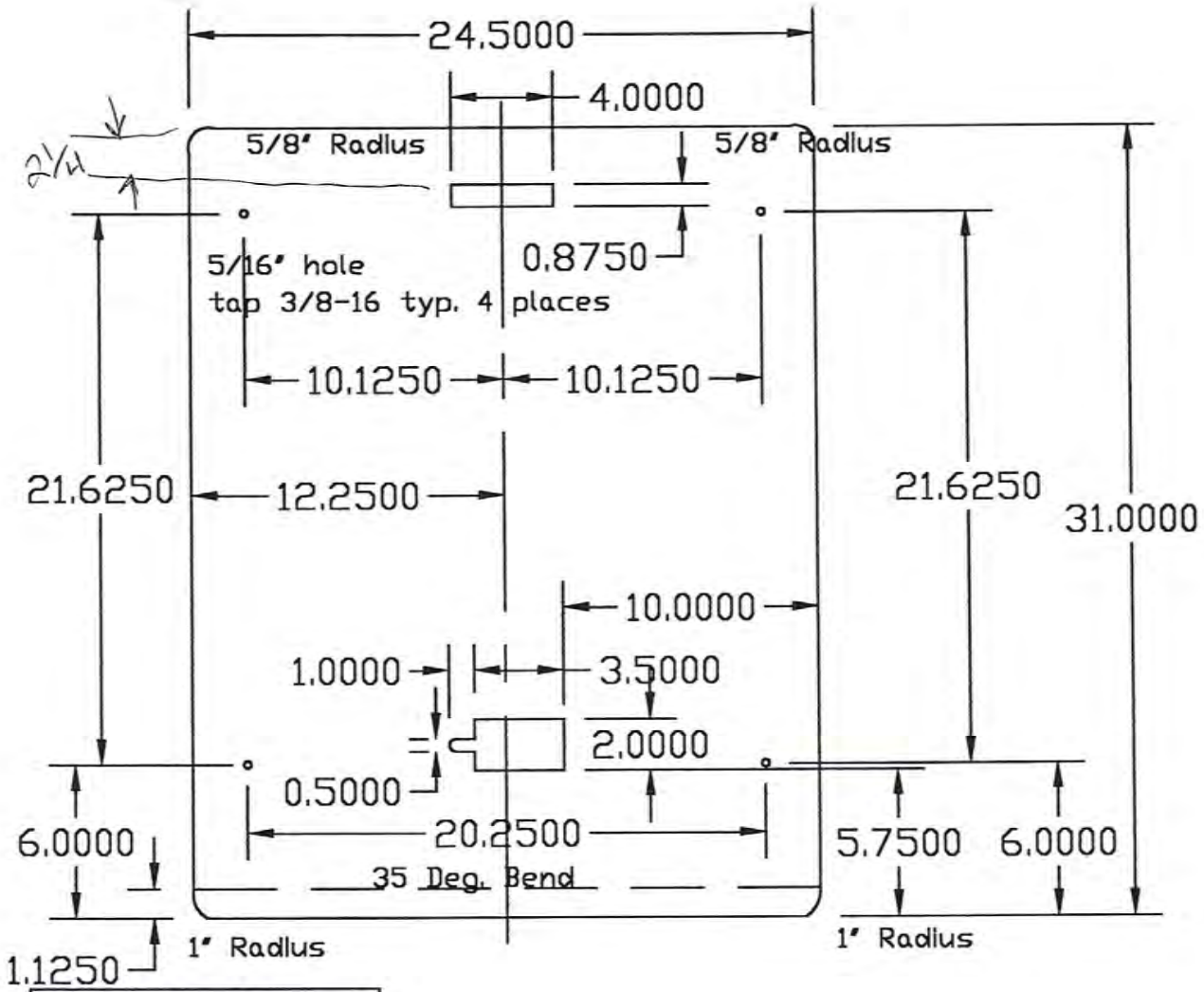
1/2" 13 Thread with a 1.25 flat that measures .375



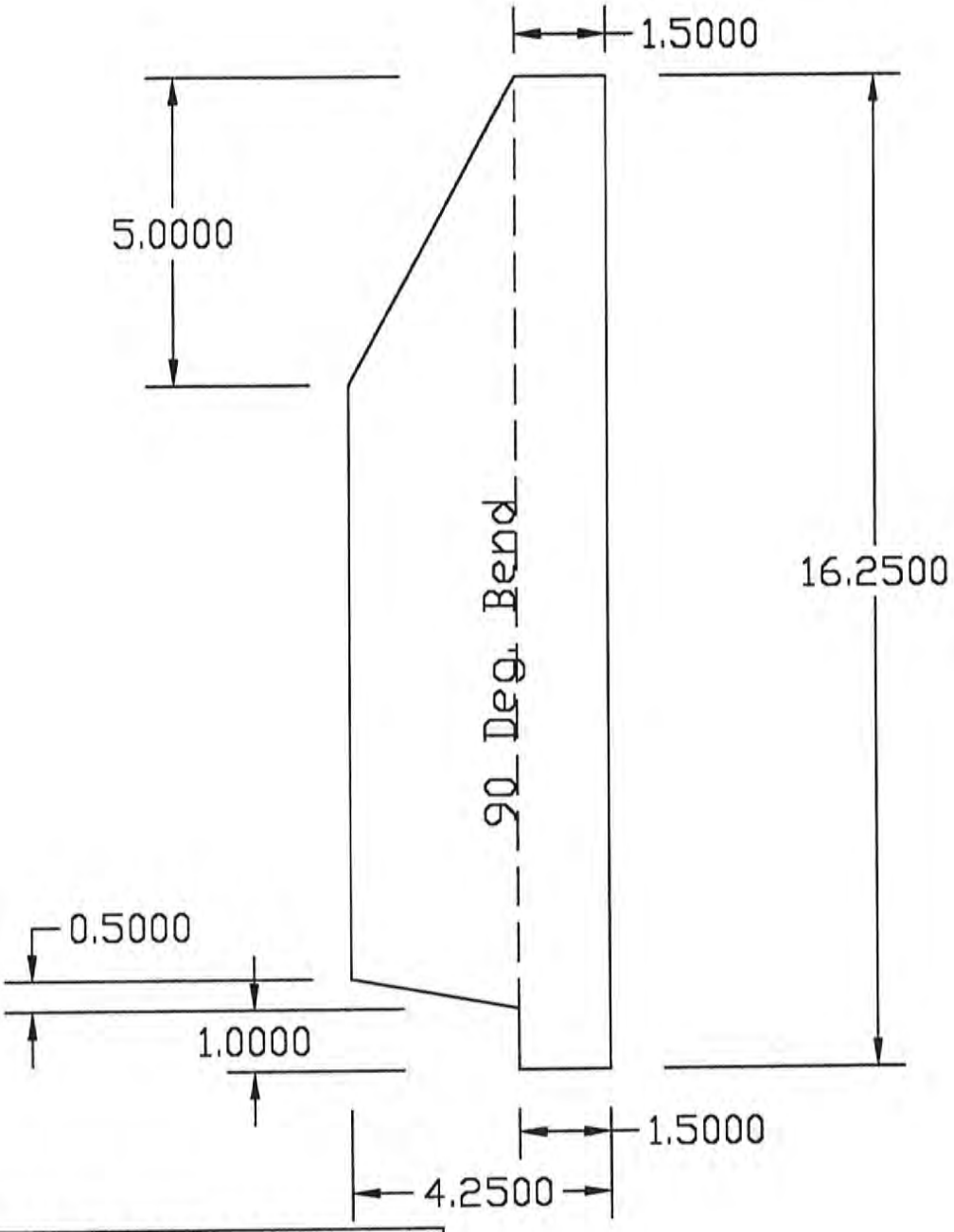
High Valley Stoves
Model 1600
Door Handle
Material Size: 3/4" CR rod X 9.75"
Drawn By: Matt B.
Date: 4/6/99
Drawing 23 of 26



High Valley Stoves
Model 1600
Skin
Material Size: 12ga X 22 3/4" X 74 1/2"
Drawn By: Matt B.
Date: 4/12/99
Drawing 21 of 26

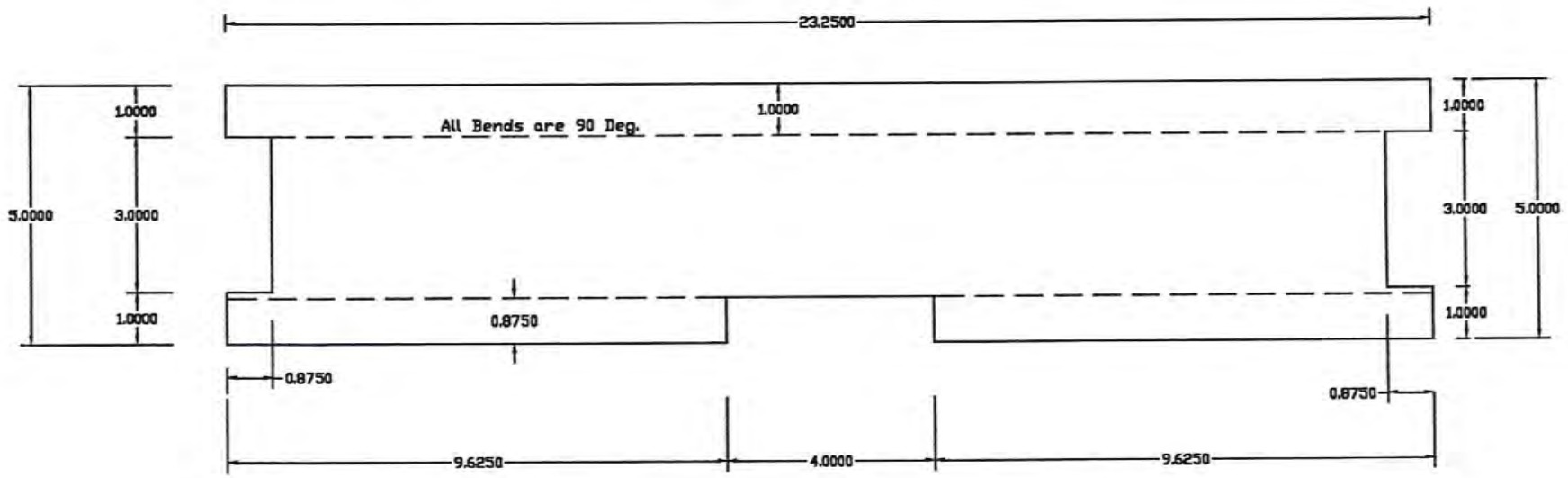


High Valley Stoves
Step Top Stove
Hearth and Bottom
Material Size:
3/16" X 31" X 24.5"
Drawn By: Matt B.
Date: 3/18/99
Drawing 19 of 26

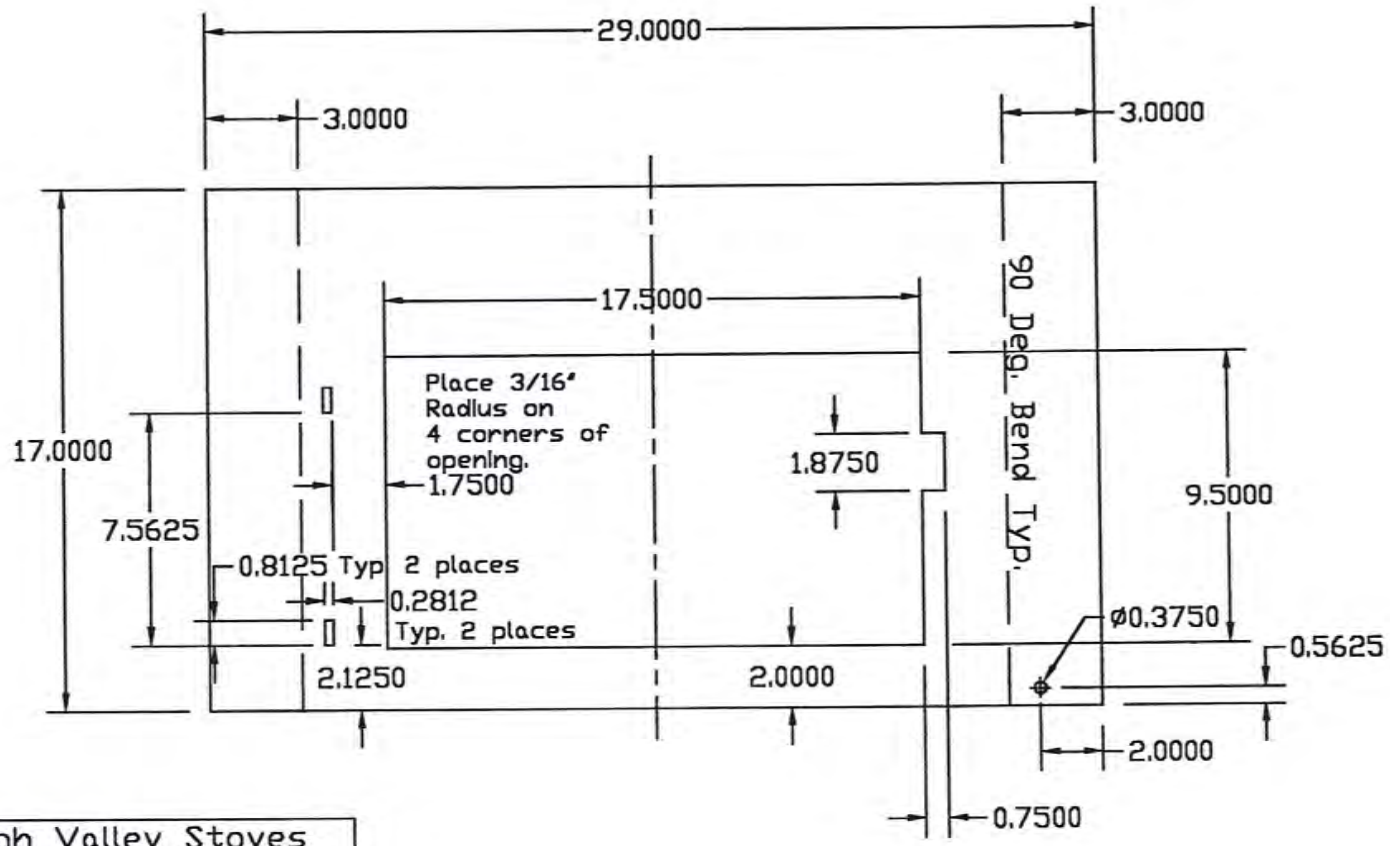


High Valley Stoves
Step Top

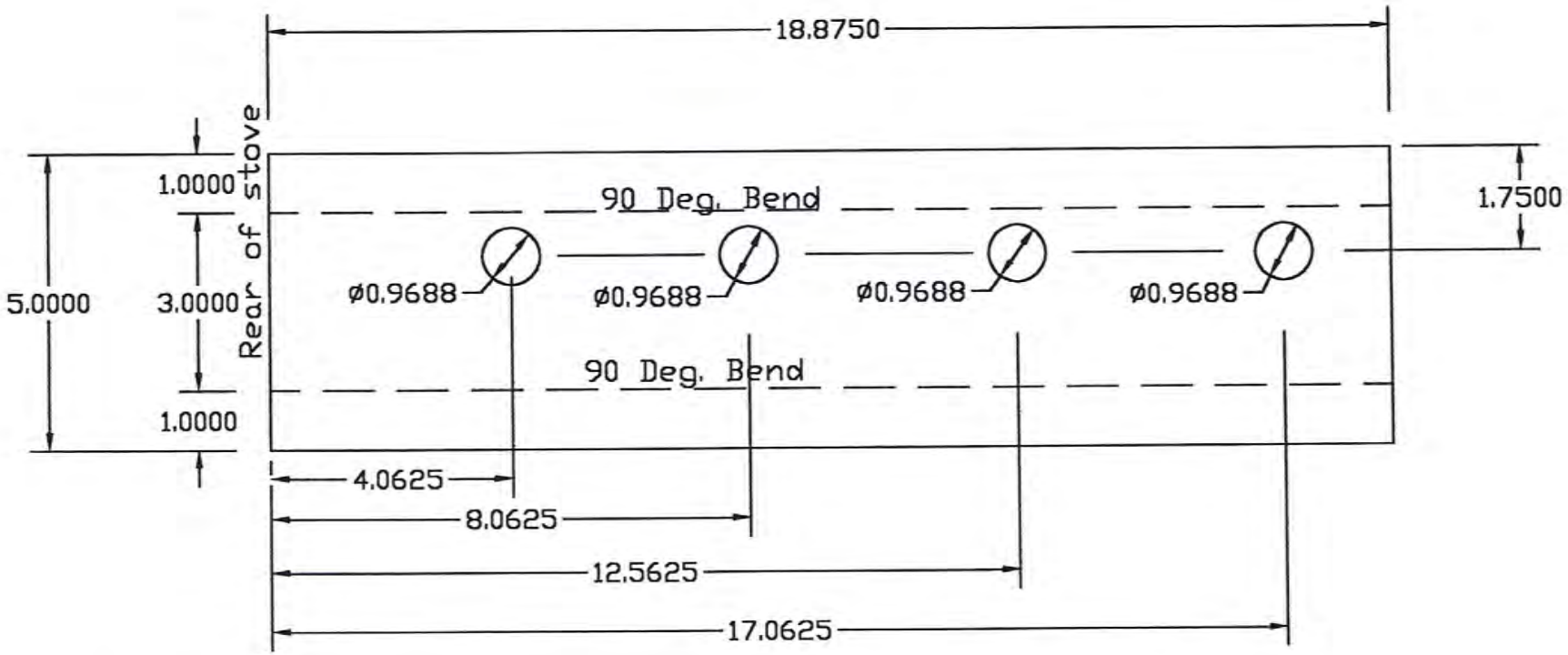
Side Air Wash Tube
material Size:
3/16" X 16.25" X 4.25"
Drawn By: Matt B.
Date 3/18/99
2 required
Drawing 18 of 26



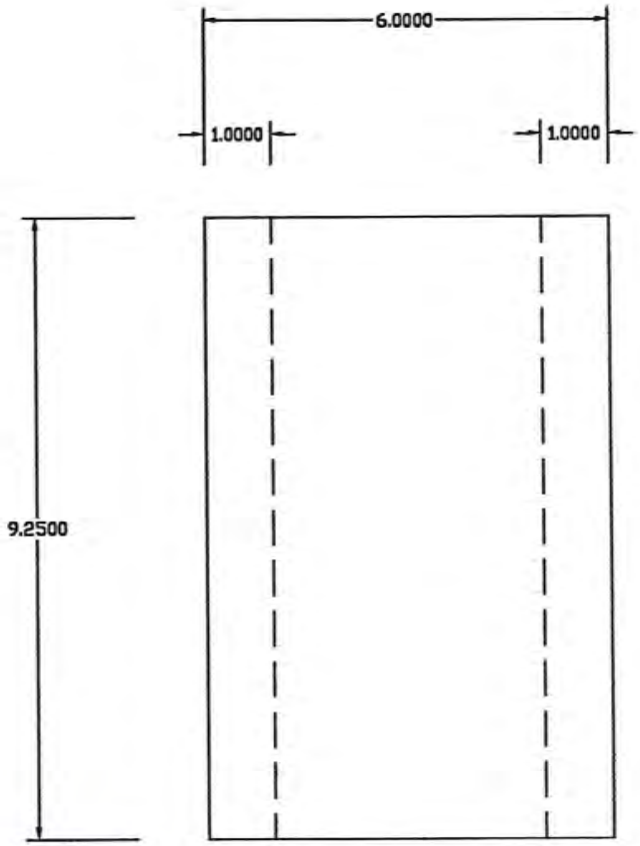
High Valley Stoves
Model 1600
Horizontal rear air tube
Material Size: 3/16" X 23 1/4" X 5"
Drawn By: Matt B.
Date: 4/1/99
Drawing 17 of 26



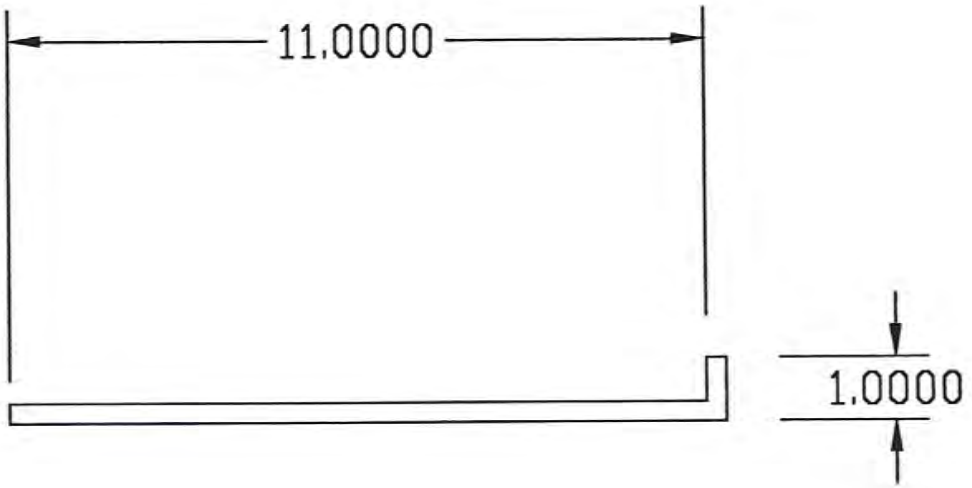
High Valley Stoves
Step Top Stove
Front
Material Size:
1/4" X 29" X 17"
Drawn By: Matt B.
Date: 4/14/99
Drawing 13 of 26



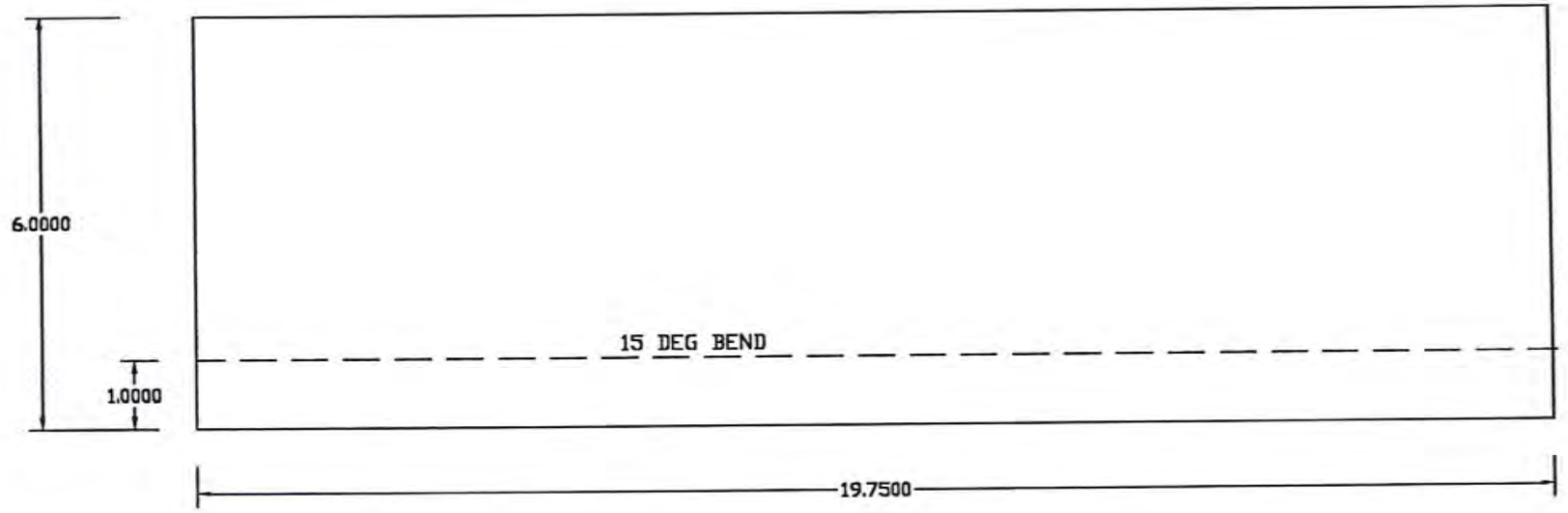
High Valle Stoves
Model 1600
Side Air Tube Holder
Material Size: 3/16" X 5" X 18.875"
Drawn By: Matt B.
Date: 3/18/99
Left and Right Required
Drawing 14 of 26



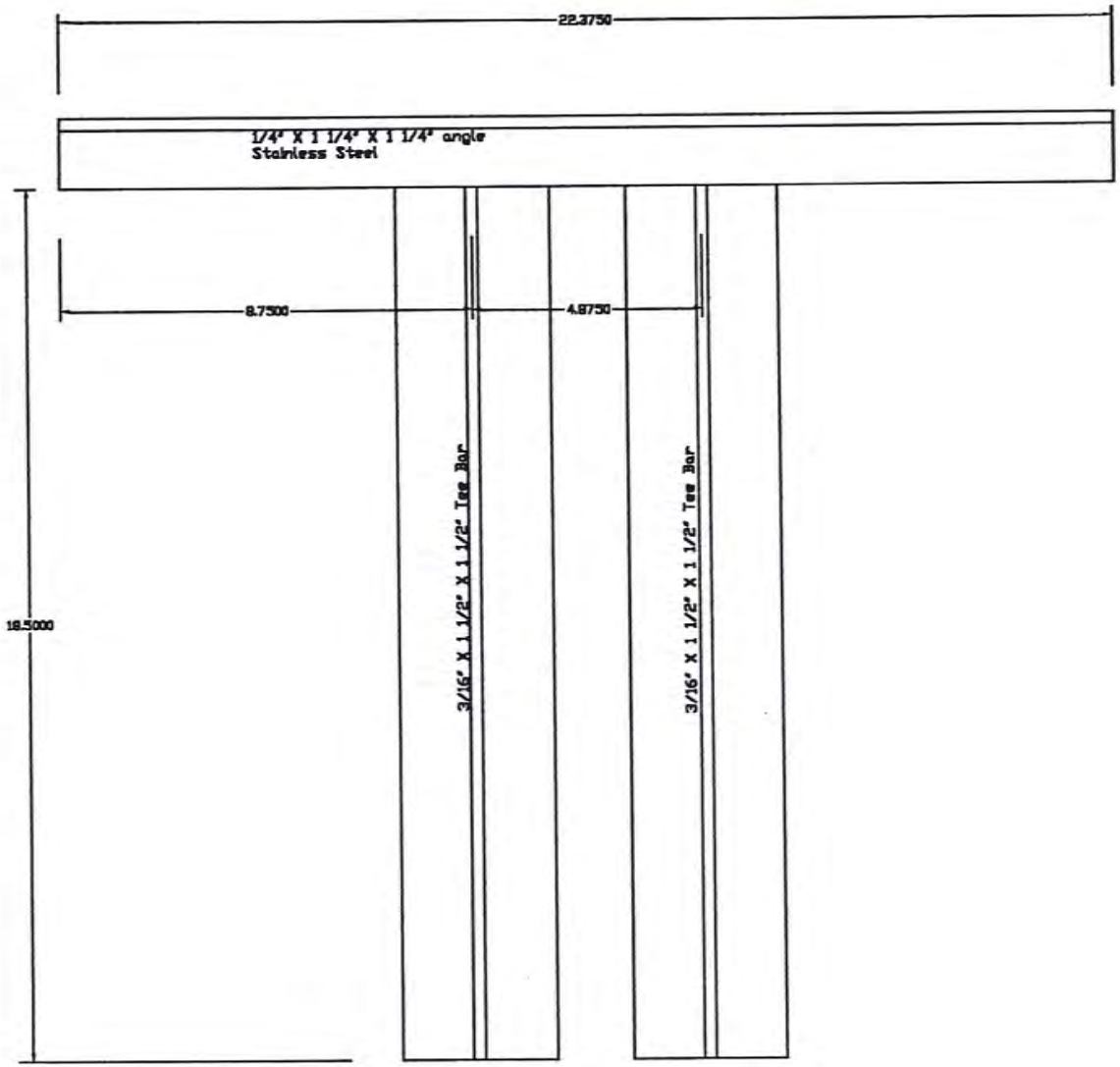
High Valley Stoves
Model 1600
Vertical Rear Air Tube
Material Size: 3/16" X 9.25 X 6"
Drawn By: Matt B.
Date: 4/1/99
Drawing 11 of 26



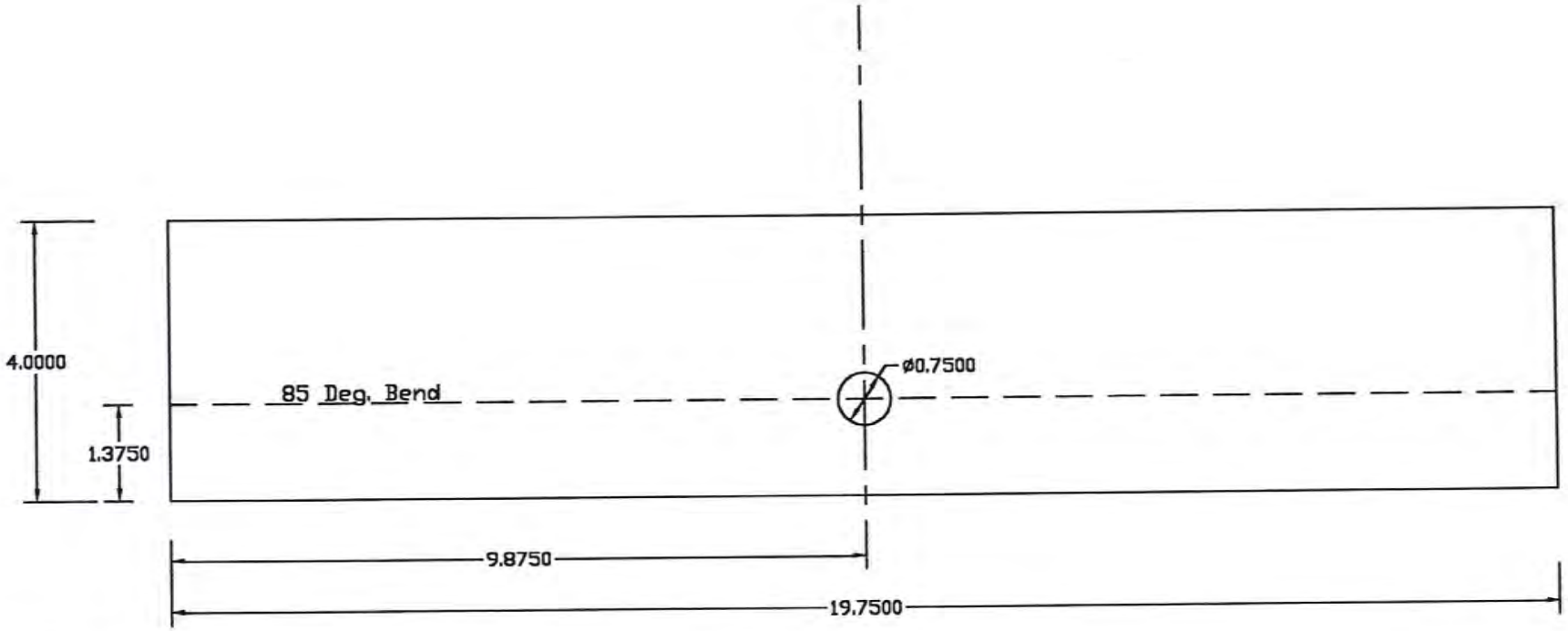
High Valley Stoves
Model 1600
Slide Draft Rod
Material Size: 5/16" X 12" Rod
Drawn By: Matt B.
Date 4/1/99
Drawing 9 of 26



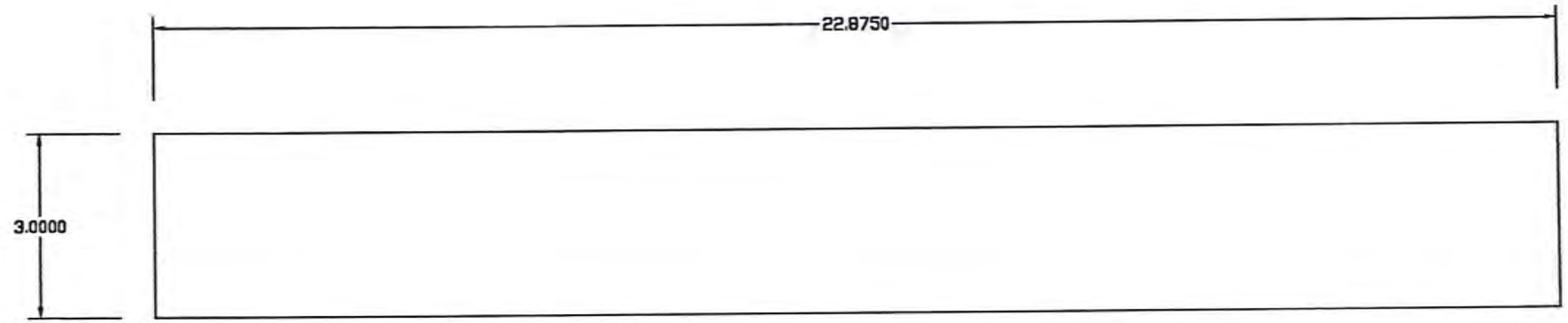
High Valley Stoves
Step Top
Top Air Wash
Material Size:
1/4" X 5.75" X 19.75"
Date: 3/18/99
Drawing 7 of 26



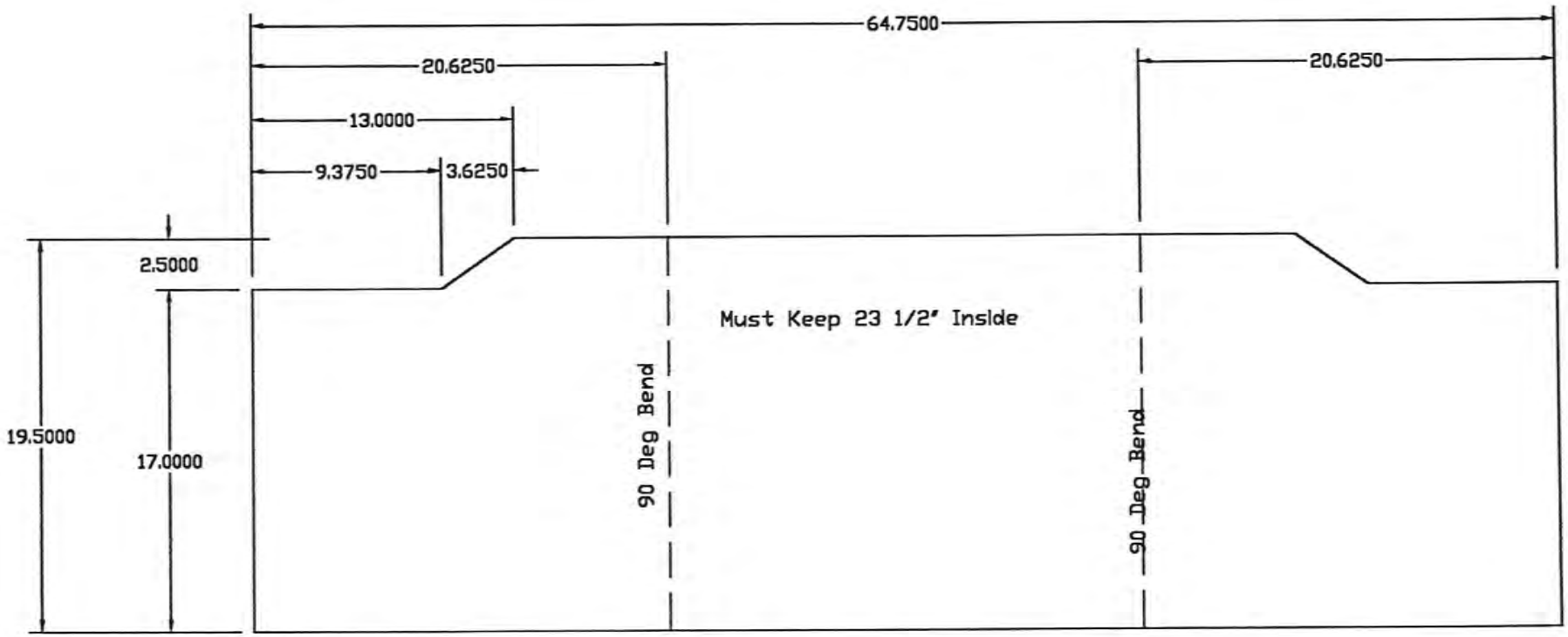
High Valley Stoves
Model 1600
Upper Firebrick Shelf
Material Size:
2 pieces 3/16" X 1 1/2" X 18.5" Tee Bar
1 piece stainless steel 1/4" X 1 1/4" X 1 1/4" X 22.375" angle
Drawn By: Matt B.
Date: 4/7/99
Drawing 6 of 26



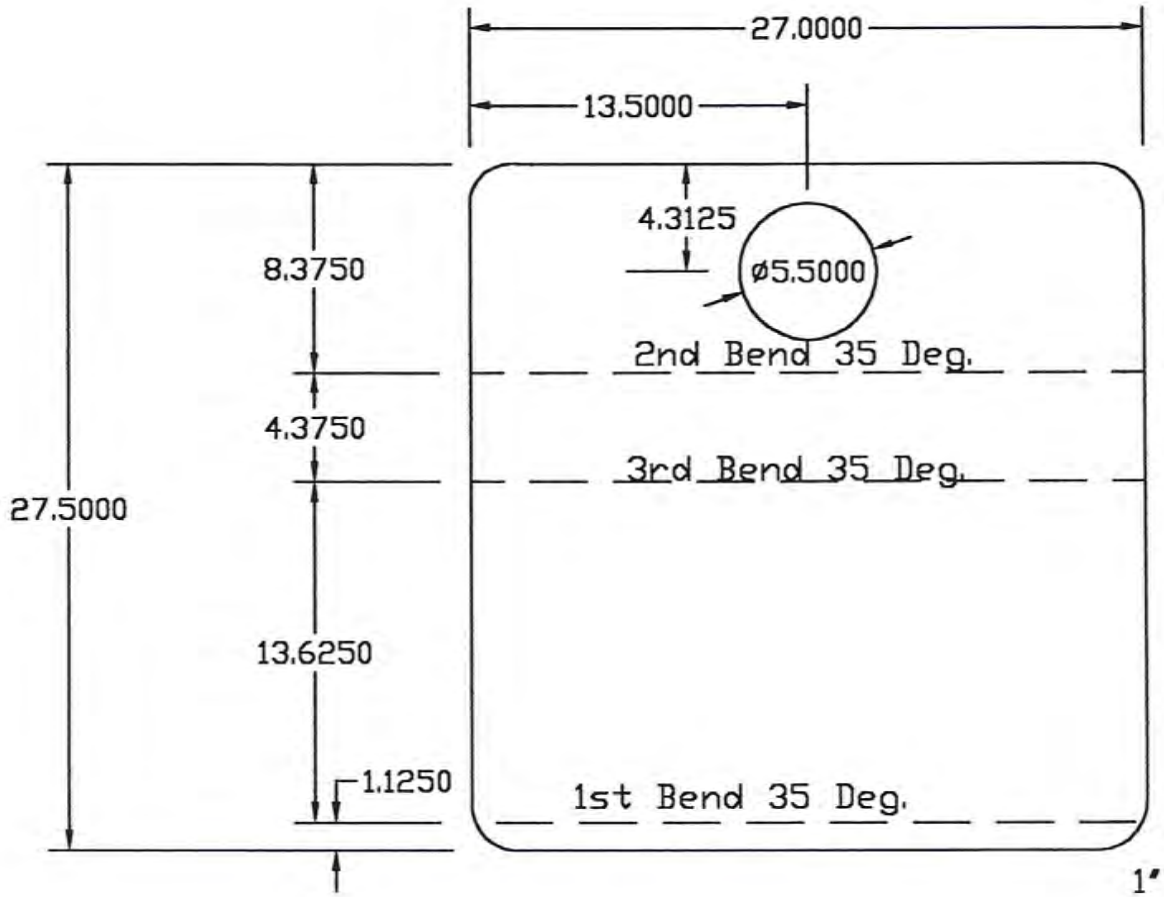
High Valley Stoves
Step Top
Bottom air wash
Material Size:
3/16 X 4.125 X 19.75
Date: 3/18/99
Drawing 8 of 26



High Valley Stoves
Step Top Stove
Top Air Wash Cap
Material Size: 3/16" X 3" X 22.875"
Date 3/18/99
Drawn By: Matt B.
Drawing 12 of 26

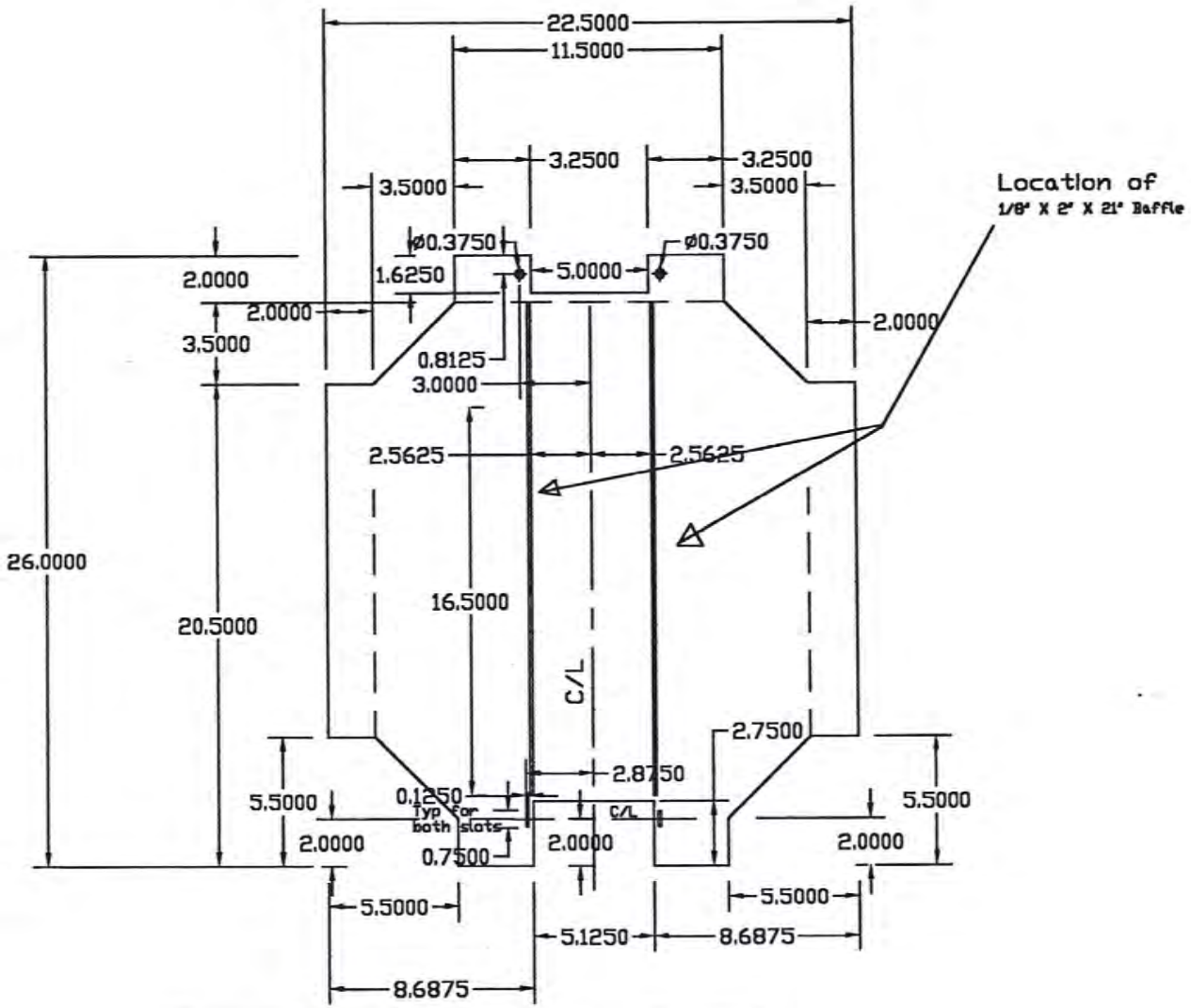


High Valley Stoves
Step Top Stove
Firebox
Material Size: 1/4" X 19.5" X 64.75"
Drawn By: Matt B.
Date: 4/15/99
Drawing 15 of 26

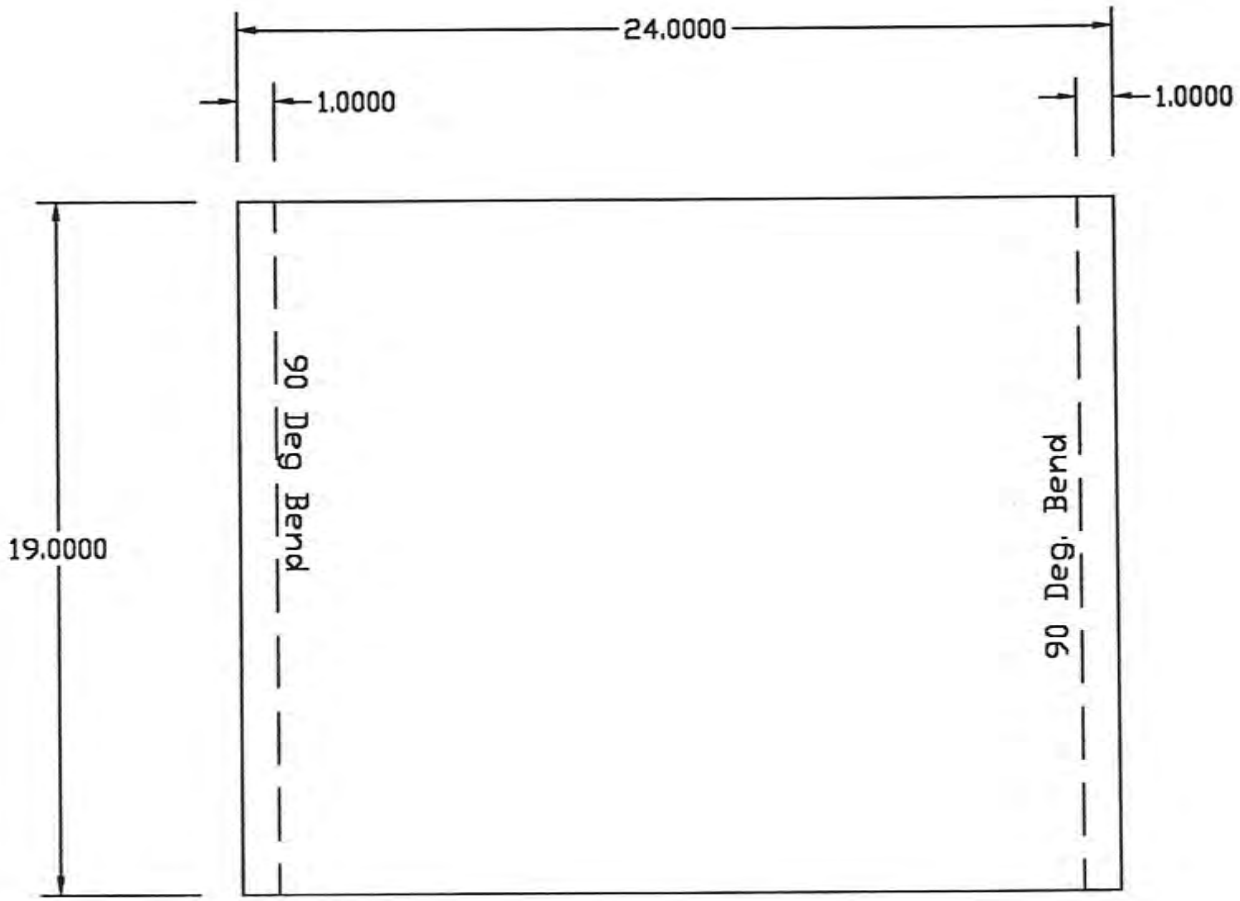


1" Radius on 4 Corners

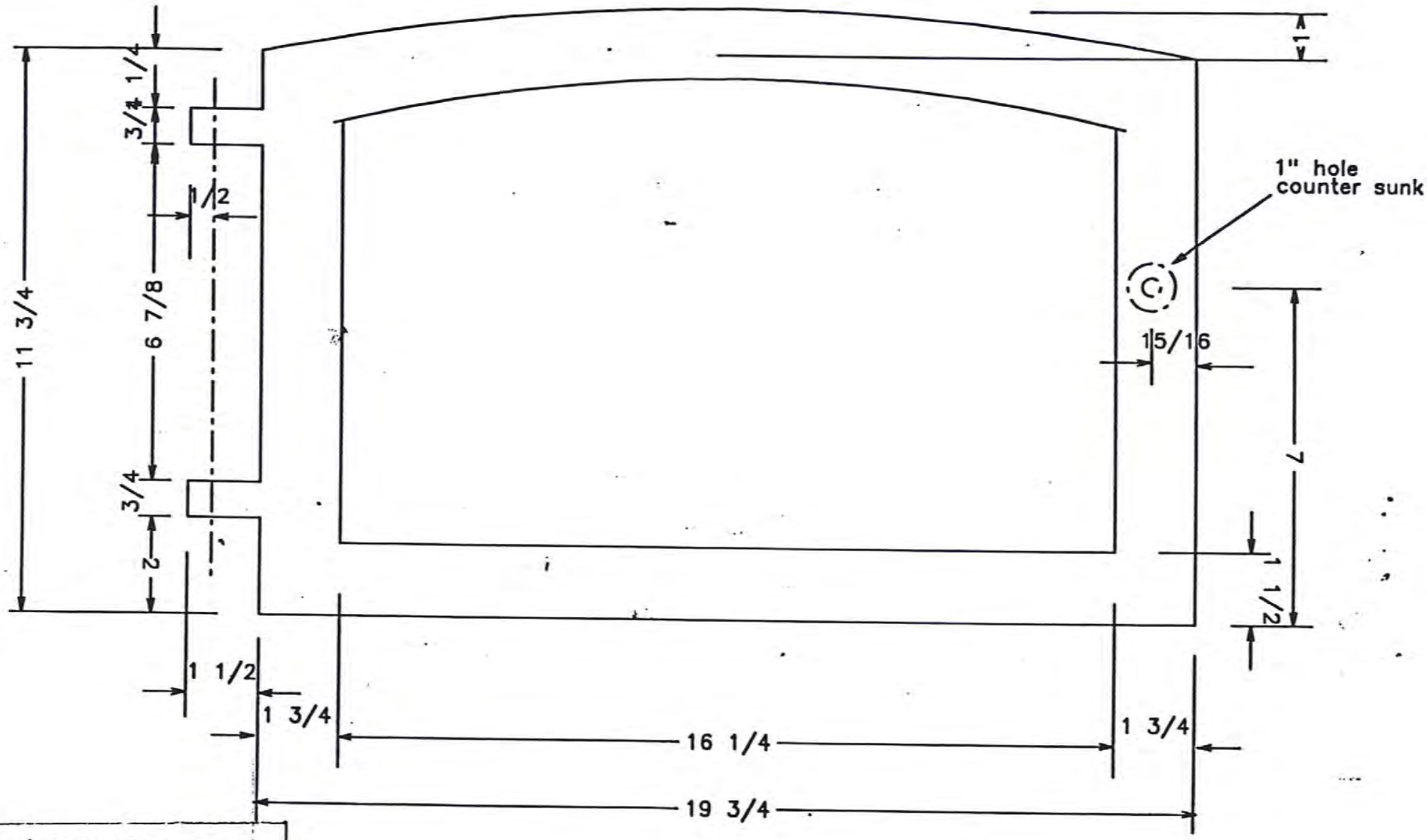
High Valley Stoves
Step Top Stove
Outer Top
Material Size: 3/8" X 27 1/2" X 27"
Drawn By: Matt B.
Date: 3/18/99
Drawing 16 of 26



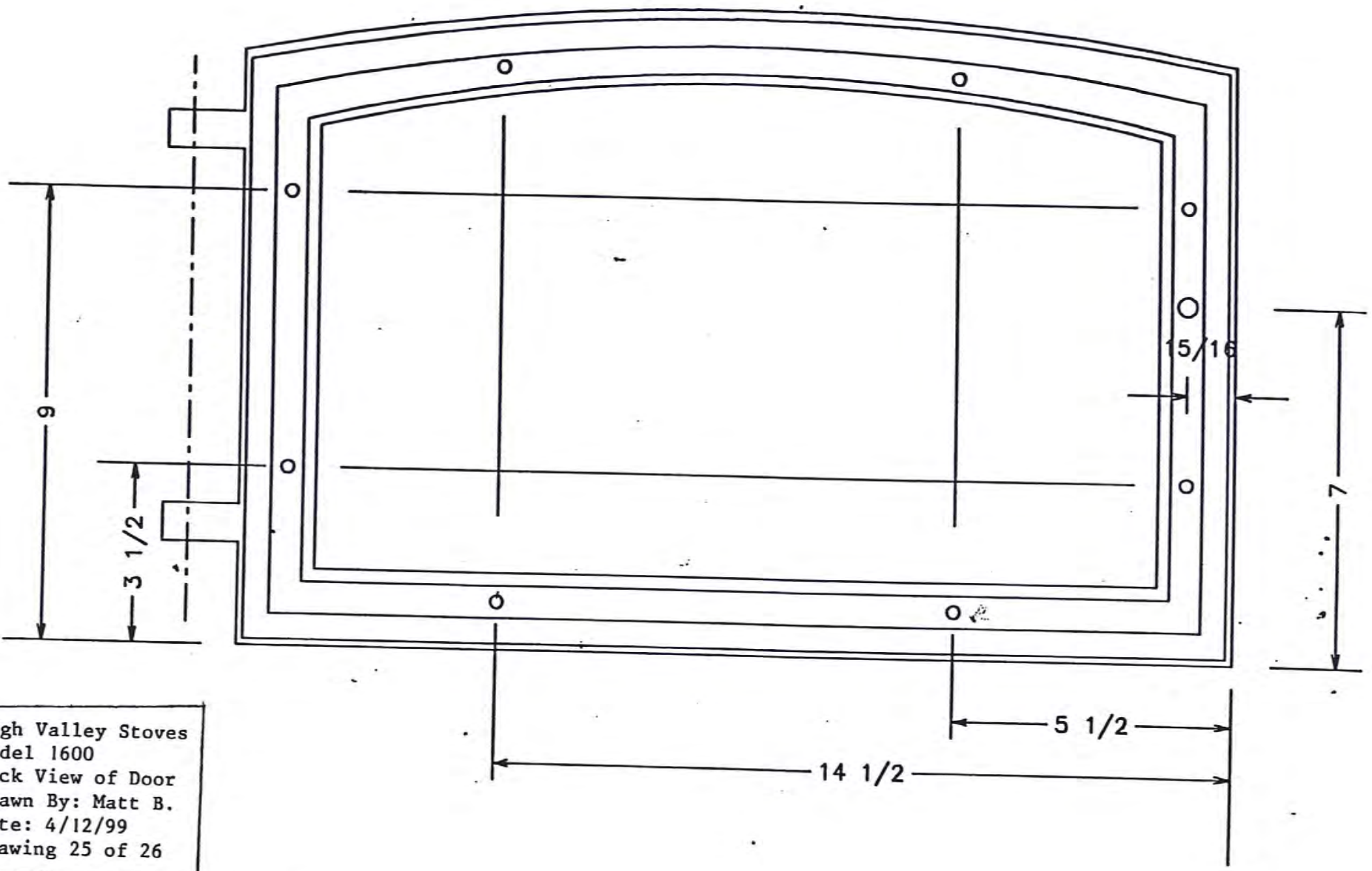
High Valley Stoves
Model 1600
Fresh Air Bottom
Material Size: 1/8" X 26" X 22 1/2"
Date: 3/18/99
Drawn By: Matt B.
Drawing 20 of 26



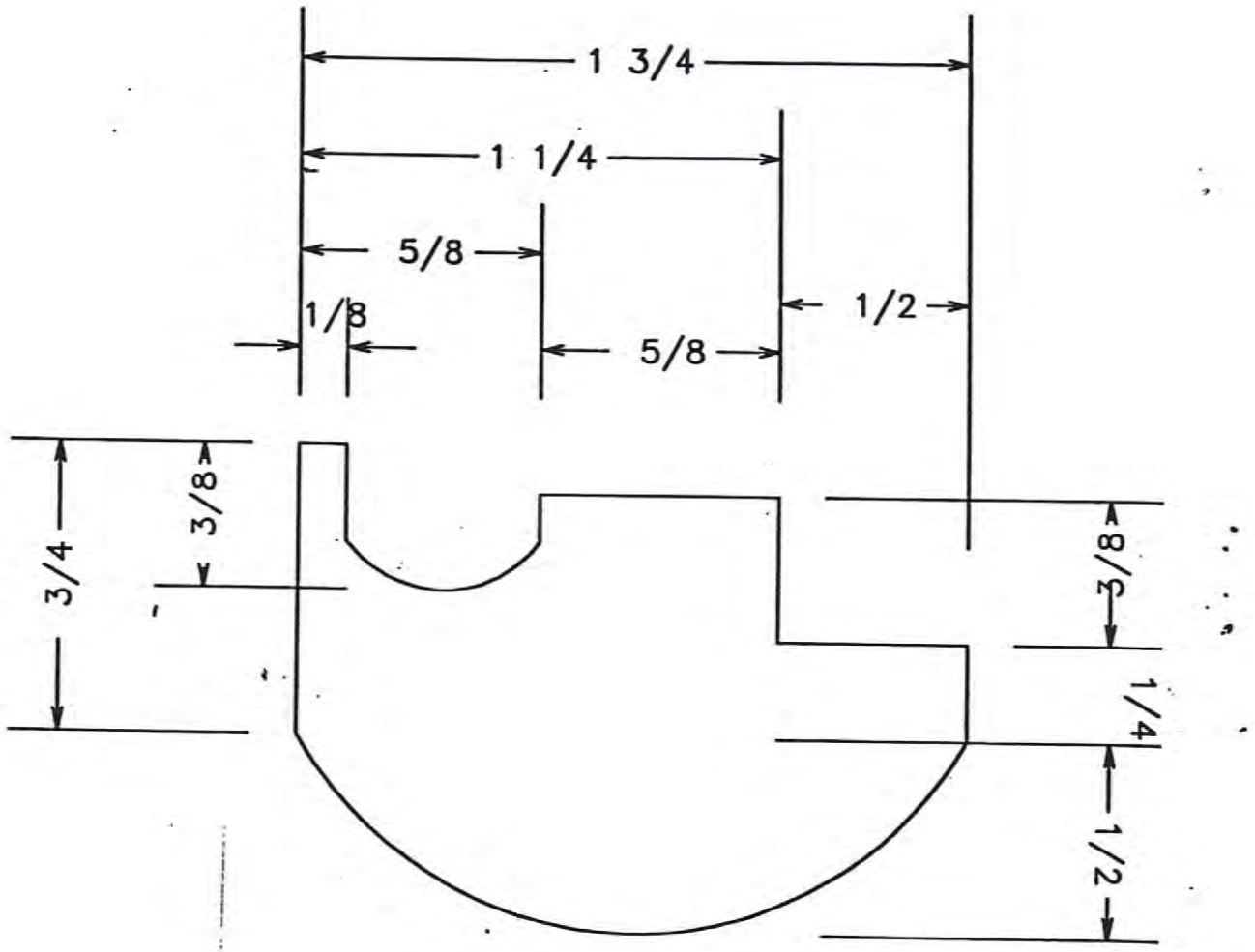
High Valley Stoves
Model 1600
Inner Heat Shield
Materail Size: 16ga X 24" X 19"
Drawn By: Matt B.
Date: 4/1/99
Drawing 22 of 26



High Valley Stoves
Model 1600
Front View of Door
Drawn By: Matt B.
Date: 4/12/99
Drawing 24 of 26



High Valley Stoves
Model 1600
Back View of Door
Drawn By: Matt B.
Date: 4/12/99
Drawing 25 of 26



High VAlley Stoves
Model 1600
Cutaway View of Door
Drawn By: Matt B.
Date: 4/12/99
Drawing 26 of 26

Table of Contents for
Material Safety Data Sheet Section

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: **FIBERFRAX® DURABLANKET® INSULATION PRODUCTS**
Chemical Name: VITREOUS ALUMINOSILICATE FIBERS
Synonym(s): Ceramic fiber; refractory fiber; MMVF; refractory ceramic fiber; RCF synthetic vitreous fiber (SVF), man-made vitreous fiber (MMVF)
Grade(s): Durablanket® HP; Durablanket® HP-S; Durablanket® S; Durablanket® Strip, Duraback®, Duraback® S, Tank Car Insulation, TCB, SMB, QSB600, QSB800.

Manufacturer/Supplier: **Unifrax Corporation**
2351 Whirlpool St.
Niagara Falls, NY 14305-2413

Product Stewardship Information Hotline
1-800-322-2293 (Monday - Friday 8:00 a.m. - 4:30 p.m. EST)

CHEMTREC Assist: **1-800-424-9300**

Effective Date: 03/16/98 Supersedes: 09/18/97 Print Date: 03/25/98

2. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	% BY WEIGHT
Aluminosilicate fiber (vitreous)	142844-00-6	100

(See Section 8 "Exposure Controls / Personal Protection" for exposure guidelines)

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

WARNING! POSSIBLE CANCER HAZARD BY INHALATION. MAY CAUSE SKIN, EYE, AND RESPIRATORY TRACT IRRITATION. MAY BE HARMFUL IF INHALED. HAZARD DEPENDS ON DURATION AND LEVEL OF EXPOSURE. WHITE ODORLESS FIBROUS BLANKET.

HAZARD RATINGS

HAZARDOUS MATERIALS INFORMATION SYSTEM (HMIS) RATINGS:
Health: 1* Flammability: 0 Reactivity: 0 Personal Protection Index: X

POTENTIAL HEALTH EFFECTS

TARGET ORGANS: Skin, eyes, and lungs.

INHALATION: If inhaled in sufficient quantity, may cause respiratory tract irritation. Symptoms may include scratchiness of the nose or throat, cough or chest discomfort.

EYE CONTACT: Slightly to moderately irritating. Fibers may be abrasive; prolonged contact may cause damage to the outer surface of the eye.

SKIN CONTACT: Slightly to moderately irritating. Exposure may result in irritation, inflammation, rash or itching.

INGESTION: If ingested in sufficient quantity, may cause gastrointestinal disturbances. Symptoms may include nausea, vomiting, or abdominal pain.

CHRONIC EFFECTS: Studies to date, involving occupationally exposed workers, have not identified any increased incidence of respiratory disease. Long-term, high-dose exposure to specially-sized, rodent respirable fiber has resulted in the development of fibrosis, lung cancer and mesothelioma in rats & hamsters. See Sections 11 & 16 of this MSDS for more information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Pre-existing medical conditions, including dermatitis, asthma or chronic lung disease may be aggravated by exposure; individuals who are atopic (with a history of allergies) may experience greater amounts of skin and respiratory irritation.

HAZARD CLASSIFICATION: Although studies, involving occupationally exposed workers, have not identified any increased incidence of respiratory disease, results from animal testing have been used as the basis for hazard classification:

The Seventh Annual Report on Carcinogens (1994), prepared by the **National Toxicology Program (NTP)**, classified respirable RCF and glasswool as substances reasonably anticipated to be carcinogens.

The **International Agency for Research on Cancer (IARC)** has classified ceramic fiber, fibrous glasswool and mineral wool (rockwool & slagwool) as possible human carcinogens (Group 2b) based on sufficient evidence of carcinogenicity in animals, but insufficient data in humans.

The **State of California**, pursuant to Proposition 65, The Safe Drinking Water and Toxic Enforcement Act of 1986, has listed "ceramic fibers (airborne fibers of respirable size)" as a material known to the State of California to cause cancer.

The **Commission of The European Communities (DG XI)** has classified RCF as substances which should be regarded as if they are carcinogenic to man.

IARC has also classified respirable crystalline silica, a possible byproduct of RCF devitrification following sustained, high-temperature (>1800°F) use, as a substance known to be carcinogenic to humans (Group 1).

4. FIRST AID MEASURES

FIRST AID PROCEDURES

INHALATION: If respiratory tract irritation occurs, relocate individual to a dust free environment. Get medical attention if irritation persists. See Section 8 for additional measures to reduce or eliminate exposure.

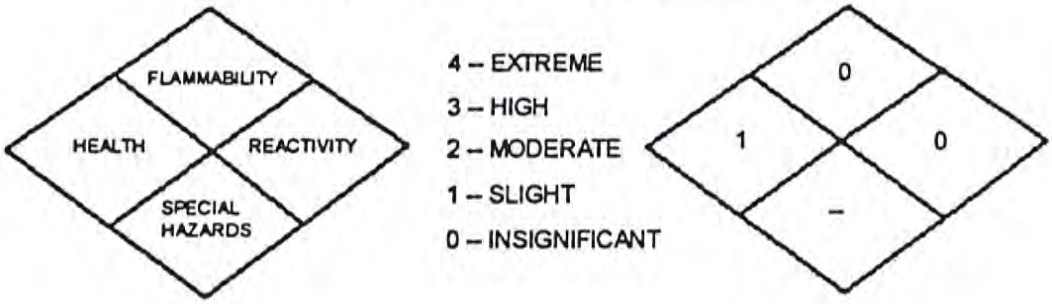
EYE CONTACT: If eyes become irritated, flush immediately with large amounts of lukewarm water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Do not rub eyes. Get medical attention if irritation persists.

SKIN CONTACT: If skin becomes irritated, remove contaminated clothing. Do not rub or scratch exposed skin. Wash area of contact thoroughly with soap and water. Using a skin cream or lotion after washing may be helpful.

INGESTION: If gastrointestinal irritation occurs, relocate individual to a dust free environment. Seek medical attention if symptoms persist.

NOTES TO PHYSICIANS: Skin and respiratory effects are the result of mechanical irritation; fiber exposure does not result in allergic manifestations.

5. FIRE FIGHTING MEASURES



NFPA Unusual Hazards: None

Flammable Properties:
Flashpoint: None.
Method: N. App

Flammable Limits:
Lower Flammable Limit: N. App.
Upper Flammable Limit: N. App.

Autoignition Temperature: None.

Hazardous Decomposition Products: None.

Extinguishing Media: Use extinguishing media suitable for type of surrounding fire.

Fire Fighting Instructions: See "Extinguishing Media" above

Unusual Fire and Explosion Hazard: None.

6. ACCIDENTAL RELEASE MEASURES

SPILL PROCEDURES
Use vacuum suction with HEPA filters to clean up spilled material. Use wet sweeping or a dust suppressant where sweeping is necessary.

7. HANDLING AND STORAGE

HANDLING AND STORAGE

Handle ceramic fiber with caution. Minimize airborne dusts by avoiding the unnecessary disturbance of materials.

Prolonged exposure to high temperatures generally increases the relative friability of aluminosilicate fibers. Removal and clean up of after service product may result in exposure to a mixture of crystalline phase silica and vitreous aluminosilicate fiber (See Section 16 for more details). Depending on the product's use, other contaminants may also be present. During removal, the exposed material should be frequently misted with water to minimize airborne dust. A surfactant may be added to the water to improve the wetting process. Use only enough water to wet the insulation. Do not allow water to accumulate on floors.

Clean Up
Dust suppressing cleaning methods such as wet sweeping or vacuuming should be used to clean the work area. If vacuuming is used the vacuum must be equipped with a HEPA filter. Compressed air or dry sweeping should not be used for cleaning. Dust suppressing compounds may be used to clean up light dust.

For additional information regarding the use and handling of refractory ceramic fiber, contact the Unifrax Corporation Product Stewardship Information Line at 1-800-322-2293 (See Section 16).

EMPTY CONTAINERS: Product packaging may contain residue. Do not reuse.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE GUIDELINES

Components	OSHA (PEL)	ACGIH (TLV)	SUPPLIER
Aluminosilicate fiber (vitreous)	None Established	None Established	0.5 fiber/cc 8-hr TWA (RCFC)*

* Pending the results of long-term health effects studies, airborne exposures should be controlled at or below the Refractory Ceramic Fiber Coalition (RCFC) Recommended Exposure Guidelines listed above.

ENGINEERING CONTROLS

Dust suppressing control technologies such as local exhaust ventilation, point of generation dust collection, down draft work stations, emission controlling tool designs, and materials handling equipment are effective means of minimizing airborne fiber emissions. For additional information, contact the Unifrax Corporation Product Stewardship Information Line at 1-800-322-2293 (See Section 16).

PERSONAL PROTECTION EQUIPMENT

Respiratory Protection:
Aluminosilicate Fiber

When engineering and/or administrative controls are insufficient, the use of appropriate respiratory protection, pursuant to the requirements of OSHA 1910.134 AND 29 CFR 1926.103, is recommended. The following information is provided as an example of appropriate respiratory protection for aluminosilicate fibers. The evaluation of workplace hazards and the identification of appropriate respiratory protection is best performed, on a case by case basis, by a qualified Industrial Hygienist.

OSHA HAS NOT ESTABLISHED A SPECIFIC PERMISSABLE EXPOSURE LIMIT (PEL) FOR RCF.

SUPPLIERS' RESPIRATORY PROTECTION RECOMMENDATIONS (WHEN HANDLING RCF PRODUCTS)	
Respirable Airborne Fiber Concentration	Respirator Recommendation
Less than 0.5 f/cc	No specific recommendation. User preference based upon conditions present
0.5 f/cc to 5.0 f/cc	Half-face, air purifying respirator equipped with a high-efficiency particulate air (HEPA) filter cartridge
5.0 f/cc to 25 f/cc	Full-facepiece, air purifying respirator equipped with a high-efficiency particulate air (HEPA) filter cartridge
More than 25 f/cc	Full-facepiece, positive pressure supplied air respirator

OTHER INFORMATION:

(1) Concentrations based upon an eight hour time weighted average (TWA) as determined by air samples collected and analyzed pursuant to NIOSH method 7400 (B) for airborne fibers.

(2) During furnace tear-out activities after service RCF removals, the manufacturer recommends, at a minimum, the use of full-facepiece air purifying respirator equipped with a high-efficiency particulate air (HEPA) filter cartridge to control fiber and potential crystalline silica exposure.

(3) In the absence of other objective data or when concentrations are unknown, the manufacturer recommends the use of half-face, air purifying respirator equipped with a high-efficiency particulate air (HEPA) filter cartridge.

(4) Situations involving a potential exposure to airborne contaminants should be evaluated by a qualified industrial hygienist for the selection of appropriate respiratory protection and air monitoring.

(5) The American Conference of Governmental Industrial Hygienists (ACGIH) has not adopted a threshold limit value (TLV) recommendation for RCF.

SKIN PROTECTION: Wear gloves, head coverings and full body clothing as necessary to prevent skin irritation. Washable or disposable clothing may be used. If possible, do not take unwashed clothing home. Work clothes should be washed separately from other clothing and the washing machine rinsed thoroughly following use. Inform the launderer of the proper procedures. Store work clothes and street clothes separately to prevent contamination.

EYE PROTECTION: Wear safety glasses or chemical goggles to prevent eye contact. Do not wear contact lenses unless chemical goggles are also worn. Do not touch eyes with contaminated body parts or materials. Have eye washing facilities readily available where eye contact can occur.

See Section 16 regarding handling considerations for after service aluminosilicate fiber.

9. PHYSICAL AND CHEMICAL PROPERTIES

Odor and Appearance:	White, odorless fibrous blanket.		
Chemical Family:	Vitreous aluminosilicate fibers		
Boiling Point:	N. App.	% Solubility in Water:	N. App.
Melting Point:	1760° C (3200° F)	Specific Gravity:	2.73
Vapor Pressure:	N. App.	pH:	N. App.
Vapor Density (Air = 1):	N. App.	% Volatile:	N. App.
Molecular Weight:	N. App.	Molecular Formula:	$Al_2O_3.1.6SiO_2$

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable under conditions of normal use.

INCOMPATIBILITY: Soluble in hydrofluoric acid, phosphoric acid, and concentrated alkali.

CONDITIONS TO AVOID: None.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

HAZARDOUS POLYMERIZATION: Not Applicable.

11. TOXICOLOGICAL INFORMATION

The existing toxicology and epidemiology data bases for RCF's are based on ongoing studies. The Unifrax Corporation supports ongoing investigations and will make all data available to interested parties upon request. Information will be updated as studies are completed and reviewed. The following is a summary of the results to date:

EPIDEMIOLOGY

An epidemiologic investigation, being conducted by the University of Cincinnati, of RCF production workers in the U.S. is ongoing The evidence obtained from employees in U. S. RCF manufacturing facilities, is as follows:

1) There is no evidence of any fibrotic lung disease (interstitial fibrosis) on x-ray.

2) There is no evidence of an elevated incidence of lung disease among RCF manufacturing employees who were exposed to RCF.

3) In the exposed population, a statistical "trend", comparing initial test results (circa 1987) to predicted norms as based on breathing tests, was observed between the duration of exposure to RCF and a decrease in some measures of pulmonary function. The observations are considered to be statistically significant, but clinically insignificant. In other words, if these observations were made on an individual employee, the results would be interpreted as being within the normal (predicted) respiratory range. A more recent longitudinal study of employees with 5 or more pulmonary function tests found that there was no further effect on lung function associated with RCF production experience.

4) Initial data (circa 1987) indicated that the decrease in pulmonary function appears to be greater in employees who smoke. RCF exposure and smoking behavior seem to demonstrate an interactive effect; in other words, RCF-exposed smokers seemed to show a greater decrease in respiratory function than would be produced by combining the average decrease observed from RCF-exposure only and smoking behavior only. More recent data and analysis have found that the smoking/production interactive effect is no longer observable. Nonetheless, to promote good health practices, employees are still actively encouraged not to smoke.

5) Pleural plaques, which are discrete areas of pleural thickening usually on the parietal pleura or diaphragm, have been observed in a small number of RCF employees. There appears to be a dose-response relationship between the occurrence of pleural plaques on chest radiographs and the following variables: a) years since RCF production hire date; b) duration of RCF production employment; and c) cumulative RCF exposure. The best evidence to date indicates that pleural plaques are a marker of exposure only. There is virtually no evidence to suggest that pleural plaques are a precursor mechanism of respiratory conditions such as interstitial fibrosis, lung cancer, or mesothelioma. Under most circumstances, pleural plaques are not associated with pulmonary impairment. The pathogenesis of pleural plaques remains incompletely understood; however, the mechanism appears to be an inflammatory response caused by inhaled fibers transported via lymphatics to the subpleural area.

TOXICOLOGY

Man-made vitreous fiber (MMVF) based products, including RCF, contain fibers of different sizes, some of which are small enough to be respirable by humans. Scientists have been conducting research since the 1950's to determine the potential risks for adverse health effects which may result from fiber inhalation.

In 1987 the International Agency for Research on Cancer (IARC) classified man-made vitreous fibers including glasswool, rockwool, slagwool, and RCF as possible human carcinogens (2B). More recently, the U.S. Department of Health and Human Services classified the respirable fibers of glasswool and RCF as "substances which may reasonably be anticipated to be carcinogens" (National Toxicology Program, 7th Annual Report on Carcinogens, 1994).

To date, a number of toxicological studies have been conducted which utilize non-physiological exposure methods such as intrapleural, intraperitoneal and intratracheal implantation or injection. Some of these studies concluded that RCF is a potential carcinogen. Some experts, however, suggest that these tests have limited relevance because they bypass many of the biological mechanisms which prevent fiber deposition or facilitate fiber clearance.

Other toxicological studies utilizing a physiological exposure method, inhalation, have produced findings of respiratory disease in rodents. The most recent RCF-inhalation studies were conducted at the Research and Consulting Company, Geneva, Switzerland. Rats and hamsters were exposed, using a nose-only inhalation system, to the "maximum tolerated dose" of 30 mg/m³ (about 200 fibers/cc) of specially-prepared RCF for 6 hours/day, 5 days/week, for up to 24 months. In another research effort, other rats were exposed, in a multi-dose study with a similar protocol, to doses of 3 mg/m³, 9 mg/m³, and 16 mg/m³, which corresponds to about 25, 75, and 115 fibers/cc.

No acute respiratory effects were seen in the rats in the 3 mg/m³ exposure group. Some cases of mild parenchymal fibrosis and one mesothelioma were observed in the 9 mg/m³ group. Some cases of pleural and parenchymal fibrosis were seen in the 16 mg/m³ and in the 30 mg/m³ exposure group. In addition to a statistically significant increase in lung tumors, two mesotheliomas were also observed in the 30 mg/m³ group. Hamsters, exposed to only the highest dose, did not develop lung tumors. However, a moderate amount of interstitial fibrosis was seen, as well as a 42% incidence rate of mesothelial tumors.

These studies have found RCF to be a rodent carcinogen, under the conditions of lifetime exposure at high doses. These studies suggest that there may be a dose/response threshold, below which irreversible respiratory impacts do not occur.

To obtain more epidemiology or toxicology information, please call the toll free telephone number for the Unifrax Corporation Product Stewardship Program found in Section 16 - Other Information.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information: No data available.

Distribution: No data available.

Chemical Fate Information: No data available.

13. DISPOSAL CONSIDERATIONS

DISPOSAL: Aluminosilicate fiber is not classified as a hazardous waste according to Federal regulations (40 CFR 261). Check local, regional, state or provincial regulations for applicable requirements for disposal. Any processing, use, alteration or chemical additions to the product, as purchased, may alter the disposal requirements. Under Federal regulations, it is the waste generator's responsibility to properly characterize a waste material, to determine if it is a "hazardous" waste.

EMPTY CONTAINERS: Product packaging may contain product residue. Do not reuse.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

BILL OF LADING DESCRIPTION (49 CFR 172.202): FIBERFRAX® DURABLANKET® INSULATION PRODUCTS (NON-REGULATED

UNITED NATIONS (UN) NUMBER: NOT APPLICABLE

NORTH AMERICA (NA) NUMBER: NOT APPLICABLE

15. REGULATORY INFORMATION

Key statutory and regulatory classifications or listings for the product, as manufactured, which may impact product storage, use, handling or disposal:

U.S. FEDERAL REGULATIONS

Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA):

Constituents regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA 40 CFR 302):

Constituent	RQ in Pounds
NONE	

Most RCF products, including this product, are composed of RCF with an average diameter greater than 1 micron, and therefore are not considered CERCLA hazardous substances. See 60 FR 30934 (June 12, 1995).

Clean Air Act (CAA):
Substances regulated as hazardous air pollutants under Section 112 of the Clean Air Act Amendments of 1990:

Chemical Name
NONE

Most RCF products, including this product, are composed of RCF with an average diameter greater than 1 micron, and therefore are not considered hazardous air pollutants. See 60 FR 30934 (June 12, 1995).

Toxic Substances Control Act (TSCA):
All substances in this product are listed, as required, on the TSCA inventory. Refractory ceramic fiber has been assigned a CAS number; however, it is a simple mixture and therefore not required to be listed on the TSCA inventory. The components of RCF are listed on the inventory.

This product contains refractory ceramic fiber and is subject to an EPA TSCA Section 5(e) Consent Order and may be subject to TSCA Section 12(b) Export Notification requirements. Monitoring of airborne workplace fiber concentrations is being conducted under the consent order. For more information on this program, contact the Unifrax Corporation Product Stewardship Information Line at 1-800-322-2293 (See Section 16).

Superfund Amendments and Reauthorization Act (SARA) Title III Information:
SARA Hazard Category:
Listed below are the hazard categories for the Superfund Amendments and Reauthorization Act (SARA) Section 311/312 (40 CFR 370):

Immediate Hazard: –	Fire Hazard: –	Reactivity Hazard: –
Delayed Hazard: X	Pressure Hazard: –	

SARA 313 Information:

Toxic chemical(s) subject to the annual reporting requirements of the Superfund Amendments and Reauthorization Act (SARA) Section 313 (40 CFR 372):

Chemical Name	CAS Number	Concentration
NONE		

EPA has proposed to place man-made mineral fibers, including RCF, on the list of substances subject to the annual TRI reporting requirements, but a final listing decision has been deferred indefinitely. See 59 FR 61439 (November 30, 1994).

SARA 302/311/312 Information:
Extremely hazardous substances subject to the notification and inventory reporting requirements of the Superfund Amendments and Reauthorization Act (SARA) Section 302 (40 CFR 355) and Section 311/312 (40 CFR 370) respectively:

Chemical Name	CAS Number	Concentration
NONE		

STATE REGULATIONS

California:
Substance(s) listed by the State of California on Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986:

Chemical Name	CAS Number
Ceramic fibers (airborne particles of respirable size)	142844-00-6

New Jersey:
Chemical(s) which are listed as a special health hazard substance as defined in New Jersey Worker and Community Right to Know Act, New Jersey Administrative Code, Title 8, Department of Health, Chapter 59, Subchapter 10:

Chemical Name	CAS Number
NONE	

Pennsylvania:
Chemical(s) which are listed as a special health hazard substance as defined in Pennsylvania Right-to-Know Law, Section 3800:

Chemical Name	CAS Number
NONE	

INTERNATIONAL REGULATIONS

Canadian Workplace Hazardous Materials Information System (WHMIS):
The following Canadian Workplace Hazardous Materials Information System (WHMIS) categories apply to this product:

Compressed Gas: –	Flammable/Combustible: –	Oxidizer: –	Acutely Toxic: –
Other Toxic Effects: X	Biohazardous: –	Corrosive: —	Dangerously Reactive: –

Canadian Environmental Protection Act (CEPA):
All substances in this product are listed, as required, on the Domestic Substances List (DSL).

Chemical(s) which are listed on the Non-Domestic Substances List:

Chemical Name	CAS Number
NONE	

16. OTHER INFORMATION

After Service RCF: Removal

As manufactured, RCF products are vitreous aluminosilicates which do not contain respirable crystalline silica. However, following sustained, high temperature (>1800°F) use, it is possible for portions of the exposed RCF to devitrify into mullite or crystalline phase silica (cristobalite or quartz). Chronic exposure to respirable crystalline silica may lead to lung disease. IARC has concluded that: "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)." [IARC Monograph 68, June 1997, p. 210-211]. The Occupational Safety and Health Administration (OSHA) has adopted a permissible exposure limit (PEL) for respirable cristobalite at 0.05 mg/m³. When needed, the use of proper exposure controls and respiratory protection is recommended to reduce potential health risks and to ensure compliance with OSHA requirements. The evaluation of workplace hazards and the identification of appropriate respiratory protection is best performed, on a cases by case basis, by a qualified Industrial Hygienist. For more detailed information regarding respirable crystalline silica, call the Product Stewardship Information Hotline (see below).

Product Stewardship Program

The Unifrax Corporation has established a program to provide customers with up-to-date information regarding the proper use and handling of refractory ceramic fiber. In addition, Unifrax Corporation has also established a program to monitor airborne fiber concentrations at customer facilities. If you would like more information about this program, please call the Unifrax Corporation Product Stewardship Information Hotline at 1-800-322-2293.

Definitions:

ACGIH:	American Conference of Governmental Industrial Hygienists
CAS:	Chemical Abstracts Service
EPA:	Environmental Protection Agency
f/cc:	Fibers per cubic centimeter
HEPA:	High Efficiency Particulate Air
HMIS:	Hazardous Materials Information System
mg/m³:	Milligrams per cubic meter of air
NFPA:	National Fire Protection Association
NIOSH:	National Institute for Occupational Safety and Health
OSHA:	Occupational Safety and Health Administration
29 CFR 1910.134 & 1926.103:	OSHA Respiratory Protection Standard
29 CFR 1910.1200 & 1926.59:	OSHA Hazard Communication Standard
PEL:	Permissable Exposure Limit
RCRA:	Resource Conservation and Recovery Act
SARA:	Superfund Amendments and Reauthorization Act
Title III:	Emergency Planning and Community Right to Know Act
Section 302:	Extremely Hazardous Substances
Section 304:	Emergency Release
Section 311:	MSDS/List of Chemicals and Hazardous Inventory
Section 312:	Emergency and Hazardous Inventory
Section 313:	Toxic Chemicals and Release Reporting
SVF:	Synthetic Vitreous Fiber
TLV:	Threshold Limit Value (ACGIH)
TSCA:	Toxic Substances Control Act

Revision Summary: Section 2: Added reference to Section 8. Section 3: Moved NFPA ratings to Section 5, added diamond, added "Hazard Classification" subsection. Section 8: Revised REG, Revised PPE table. Section 11: Replaced reference to MMVF with SVF. Section 13: added "listed or characteristic". Section 14: Added UN and NA information. Section 16: added "crystalline phase silica (crystobalite or quartz)". Added definitions.

MSDS Prepared By: UNIFRAX HSEQ DEPARTMENT

DISCLAIMER

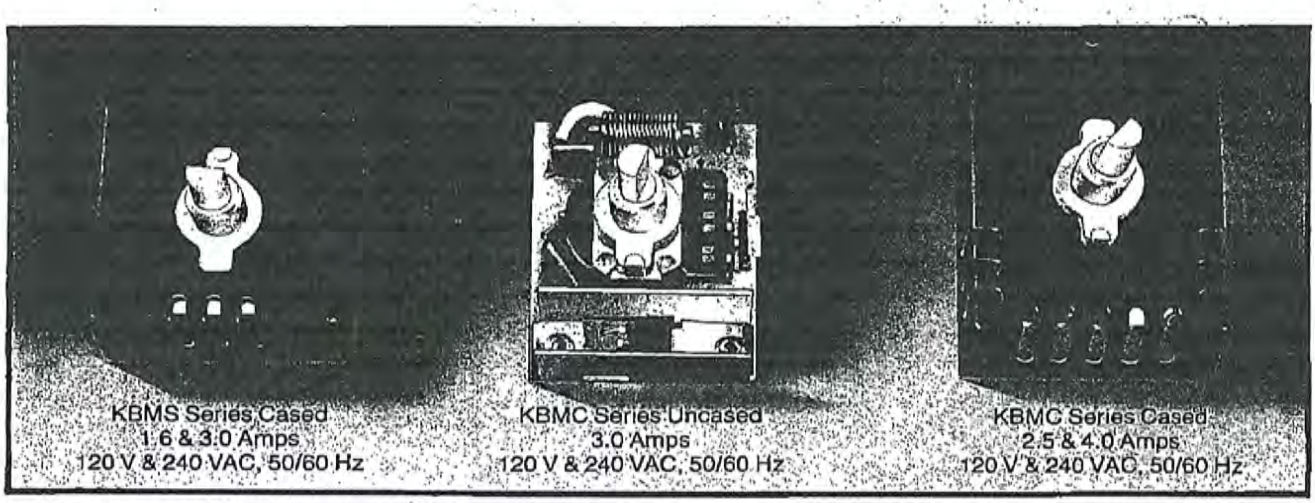
KB ELECTRONICS, INC., 73 Wortman Avenue, Brooklyn, New York 11207 (718) 257-3300
TWX (710) 584-2308
FAX (718) 257-4740

"The Right Control for Your Application"

Post-it® Fax Note 7671	Date 4/8	# of pages ▶ 4
To Matt Buchanan	From JOSEFINA	
Co./Dept.	Co. KB Electronics	
Phone #	Phone # 954-346-4900	
Fax # 828-765-6850	Fax #	

DATA SHEET D-157

KBMC and KBMS Variable Speed Solid State AC Motor Controls



KBMS Series Cased
1.6 & 3.0 Amps
120 V & 240 VAC, 50/60 Hz

KBMC Series Uncased
3.0 Amps
120 V & 240 VAC, 50/60 Hz

KBMC Series Cased
2.5 & 4.0 Amps
120 V & 240 VAC, 50/60 Hz

—NEW EXPANDED LINE—

Designed for Speed Control of Shaded Pole, AC/DC and Permanent Split Capacitor (PSC) Motors

AVAILABLE FEATURES

- Flame Retardant ABS Enclosure
- High-Gain Radio Noise Filter
- Minimum Speed Trimpot
- On/Off Rotary Line Switch
- Kit for Wall Box Mounting
- Lever-Trol™ Option

TYPICAL APPLICATIONS

•Ceiling Fans •Range Hoods •Whole-House Attic Fans •Vibrators •Humidifiers •Air Conditioners •Fireplace Blowers •Window Fans •

UL Recognized* — CSA Certified*

DESCRIPTION

The KBMC and KBMS solid state controls provide infinitely variable speed control of Shaded Pole, PSC, and AC/DC motors. The consumer is allowed selection of air volume, noise level, and energy consumption to individual preference. Solid state variable speed controls are designed to replace obsolete tapped windings, chokes, rheostats, and other methods which are currently being used to obtain speed variation. All models utilize full-wave phase control circuitry which minimizes power loss and heat dissipation. A standard self-threading Zytel mounting bushing and potentiometer shaft is used for added electrical isolation. In addition, customized metal bushings and shafts may be obtained on special order. The controls are available with an internal on/off line switch and are also available with an optional third lead which can be used to control auxiliary circuits such as relays and indicator lamps. A high-gain radio noise suppression filter and a minimum speed trimpot are also available on all models. Specifically designed for OEM applications, the KBMC and KBMS Series offer a large selection of mounting arrangements, ratings, and options. A wall mounting kit is available which includes dial plate, knob, mounting strap, hardware and instructions. Units are normally supplied with a flame retardant ABS case; however, the KBMC Series is available uncased. Controls are UL Recognized and CSA Certified.*Special lead lengths and colors are available upon request. A mounting nut is supplied as standard with all controls.

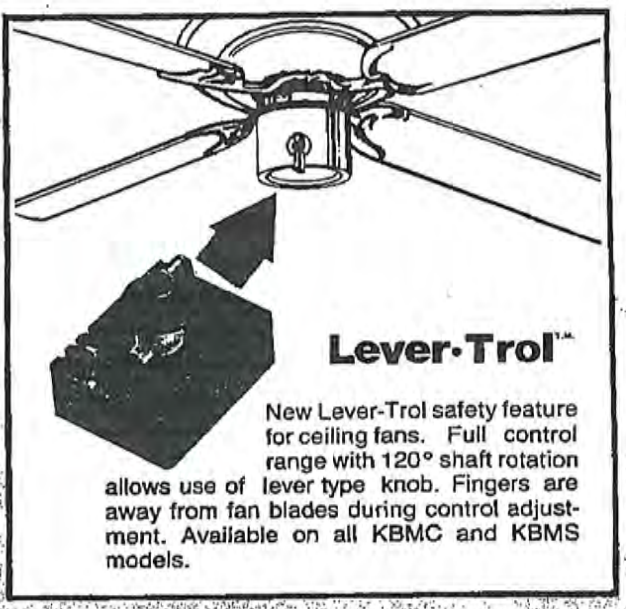
*Most models — consult factory.

TECHNICAL DATA D-157

ELECTRICAL RATINGS

MODEL	VOLTAGE (VAC 50/60 Hz)	CURRENT (RMS AMPS)
KBMC-13BV	120	2.5*
KBMC-14BV	120	4.0
KBMC-23BV	240	2.5*
KBMS-11BV	120	1.6
KBMS-13BV	120	3.0
KBMS-23BV	240	3.0

*KBMC-13B and KBMC-23B without enclosure ("B") has an increased rating of 3.0 amps.



Lever·Trol™

New Lever-Trol safety feature for ceiling fans. Full control range with 120° shaft rotation allows use of lever type knob. Fingers are away from fan blades during control adjustment. Available on all KBMC and KBMS models.

GENERAL INFORMATION

Controls as indicated are supplied as standard with the following:

- ABS enclosure
- High-gain RFI filter
- "On/Off rotary line switch
- Minimum speed trimpot

To eliminate ABS enclosure delete "B" suffix from model No. (KBMC-13)
To eliminate RFI filter add "I" suffix to model No. (KBMC-13I)
To eliminate "On/Off" switch add "NS" suffix to model No. (KBMC-13NS)
To eliminate minimum speed trimpot delete "V" from model No.

POTENTIOMETER ROTATION: on controls with built-in On/Off switch, control output is from "OFF" to "HIGH" to "LOW" with clockwise potentiometer shaft rotation. To reverse control output to "OFF" to "LOW" to "HIGH" add "R" suffix to model No. (KBMC-13R). On controls without built-in ON/OFF switch (NS suffix), control output is from "Low" to "High" with clockwise potentiometer shaft rotation. To reverse control output to "High" to "Low" add "R" suffix to model No. (KBMC-13NSR).

LEADS: standard leads are No. 18 AWG and are approximately 6" long and stripped ½". Other lead lengths are available upon request. Quick-disconnect terminals on leads also available.

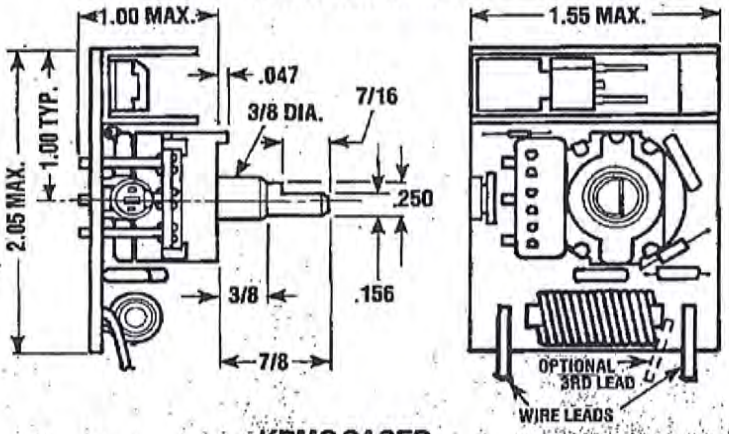
SUFFIX ADDERS WITH DESCRIPTIONS

Suffix Identification	Description	Notes
B	Adds Enclosure, Flame Retardant ABS	All KBMS models and model KBMC-14B are always supplied with ABS enclosures
V	Adds Minimum Speed Trimpot	A fixed resistor is used on all models that do not contain the minimum speed trimpot
K	Adds Kit for Wall Box Mounting	Mounting Kit contains Dial Plate, Mounting Strap, Knob, Mtg. Hardware, Instructions and Individual Packaging
~~L~~	~~Adds Lever-Trol™~~	Lever-Trol feature restricts potentiometer rotation to 120° so that a lever type knob can be utilized
NS	Deletes On/Off Line Switch	When On/Off switch is not supplied the standard control output is from "Low to High"
I	Deletes RFI Filter	Caution must be exercised when eliminating RFI filter (see application notes)
F	Adds Built-In Fuse	Built-in fuse is available on KBMC models only. Fuse rating and type must be specified.
L	Adds Auxiliary 3rd Lead	Total current of motor load and auxiliary load must not exceed 4.0 amps.
R	Reverses Control Output Vs. Pot. Rotation	(See general information on Potentiometer Rotation)

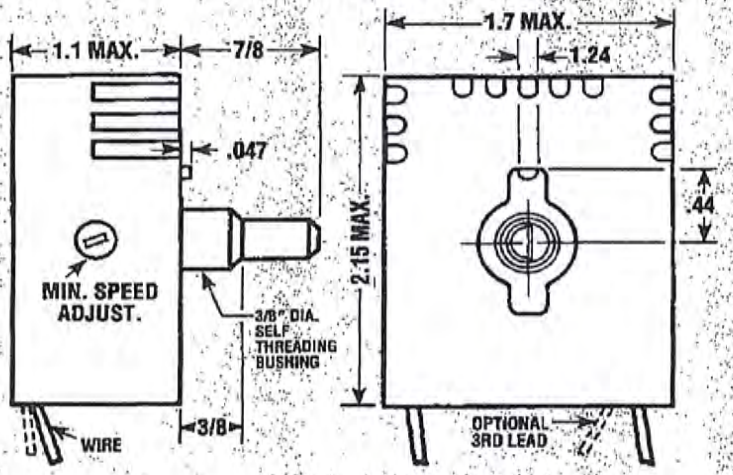
TECHNICAL DATA D-157

TYPICAL DIMENSIONS (INCHES)

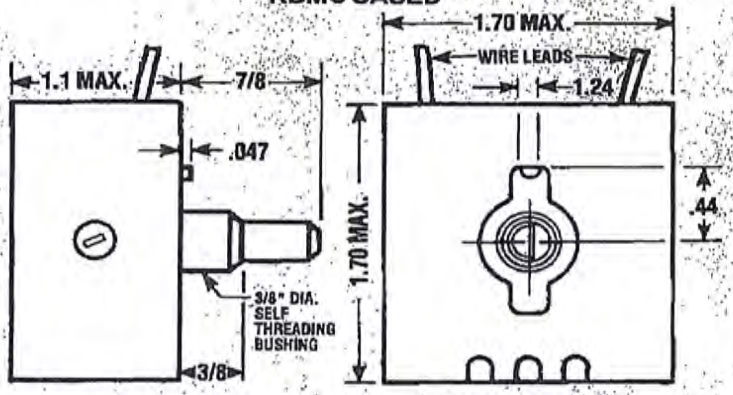
KBMC UNCASED



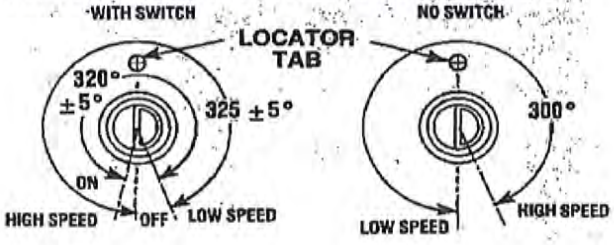
KBMC CASED



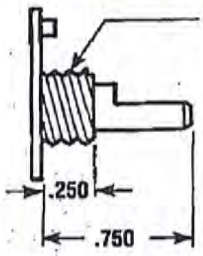
KBMS CASED



POTENTIOMETER ROTATION (Except Lever-Trol.)

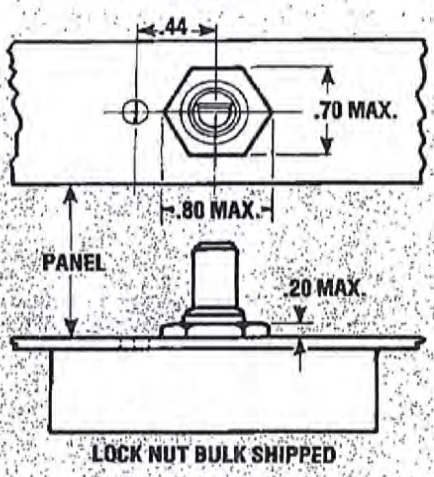


ALTERNATE MOUNTING BUSHING



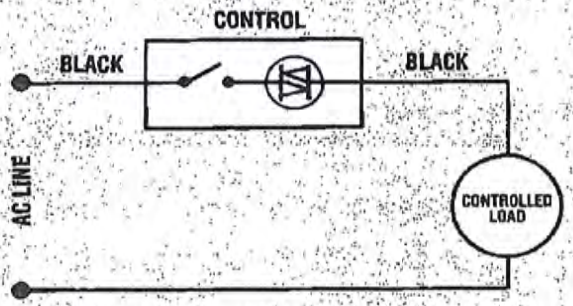
AVAILABLE ONLY ON KBMC MODELS

MOUNTING DIMENSIONS

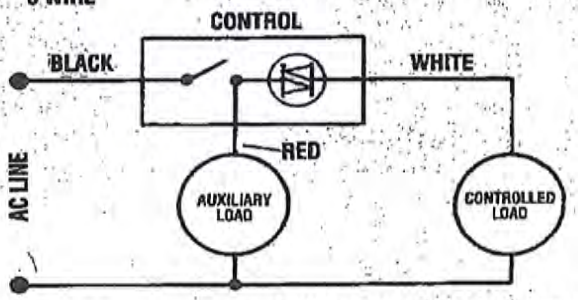


CONNECTION DIAGRAMS

2 WIRE



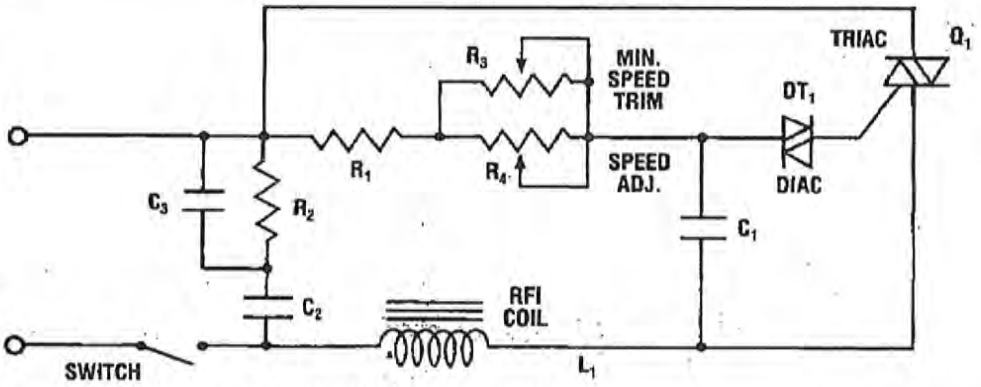
3 WIRE



NOTE: SWITCH rated 4.0 amps RMS.

TECHNICAL DATA D-157

SCHEMATIC



NOTE: In some models actual circuits used may vary from schematic as shown.

APPLICATION NOTES:

1. *Temperature Test* — The non-sinusoidal output voltage of a solid state control may increase motor heating. Therefore, it is necessary that a temperature test be performed to insure that motor is operating within manufacturer's specifications.

2. *Failure Mode* — Certain failure modes of solid state controls, such as half-waving, can cause high levels of DC. This may produce severe overheating and motor burnout. Therefore, a thermal overload protector is required which will limit the maximum motor temperature as prescribed by the manufacturer.

3. *Radio Frequency Interference* (RFI) — Solid state speed controls usually generate annoying radio noise on the AM broadcast band. KB controls incorporate, as standard, a high-gain RFI suppression filter which significantly reduces this interference.

4. *Low End Set Point* — All controls are set to 65 volts +/– 3V output as standard with an input voltage of 120 volts. An average responding AC voltmeter is used for calibration. Custom voltage settings are available as per customer requirements.

5. *Motor Suitability* — Motors must be loaded to near full capacity with appropriate fan blade in order to achieve proper speed control. Generally, motor suitability is established by determining motor speed as a function of applied voltage. Motor is determined as suitable if it changes speed linearly over a wide range of voltage.

6. *Overseas Markets* — Standard snubber network components are prone to failure when used on power sources with abnormally high transients. Therefore, controls that are used in remote areas of the world, such as Asia, Africa, and Australia, or where power generation is not properly regulated, require a special snubber. KB uses metalized paper capacitors and flameproof resistors in these applications.

Mfg. by: **KB ELECTRONICS INC.**, 73 Wortman Ave., Brooklyn, N.Y. 11207 (718) 257-3300
TWX (718) 584-2308 FAX (718) 257-4740

Printed in U.S.A.
CA REV 1/88 2.5

Fil-Tec, Inc.

MATERIAL SAFETY DATA SHEET

SECTION I

Trade Name and Synonyms: Fiberglass Rope, Tape, Sleeving
Chemical Name and Synonyms: Continuous Filament Fiberglass (Fibrous Glass, Glass Fibers)

Manufacturer's Name: Fil-Tec, Inc.
Address: P.O. Box B, Hagerstown, MD 21741-1508
Telephone #: (301) 824-6166

SECTION II - INGREDIENTS

Ingredients:	%	TLV(R) (Units)	PEL
Fibrous Glass: Composition consisting principally of oxides of silicon, aluminum, calcium, boron and magnesium fused in an amorphous vitreous state.	≥ 96.5	10 mg/M^3	None Established (5 mg/M^3 - respirable nuisance dust)
Surface Sizing:	≥ 3.5	Non Established	Non Established

SECTION III - PHYSICAL DATA

Melting Point (Softening):	800°C	Specific Gravity (Bare Glass):	2.59
Boiling Point (°F):	Not Applicable	Percent, Volatile (Volume):	0
Vapor Pressure (mm Hg.):	Not Applicable	Evaporation Rate:	Not Applicable
Vapor Density (Air=1):	Not Applicable	Solubility in Water:	Insoluble

Appearance and Odor: A texturized product consisting of yellow-white to white fibers bound together in strands and manufactured into rope, tape or sleeving.
Fiber Diameter: Normally there are no fibers with diameters smaller than 4.7 microns in any Fil-Tec, Inc. rope, tape or sleeving products.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Non-Burning
Flammable Limits: Not Applicable
Extinguishing Media: Not Applicable
Special Fire Fighting Procedures: In a sustained fire, self-contained breathing apparatus (SCBA) should be worn.
Unusual Fire and Explosion Hazards: Not Applicable

SECTION V - HEALTH HAZARD DATA

Primary Routes(s) of Entry: Inhalation
Signs and Symptoms of Overexposure: Rash, itching, conjunctivitis, coughing, sneezing.
Health Hazards: (Acute): Exposure to glass fibers sometimes causes irritation of the skin and, less frequently, irritation of the eyes, nose or throat.
(Chronic): A number of epidemiology studies, done over many years, of workers employed for up to 40 years in the manufacture of fiberglass have shown no evidence of increases in either malignant or non-malignant respiratory disease attributable to exposure to fiberglass. However, recent studies have shown slight increases in lung cancer among workers employed in the manufacture of glass wool and mineral wool insulation products.

FIBERGLASS ROPE SEALS			**FIL-TEC, INC.**
	DATE: 4/8/99		**P.O. BOX B, HAGERSTOWN, MD 21741-1191**
PART # FR1LD.625G	**DRWG: CMP**	**APP. AY**	**NO. FR1LD.625G**

DESCRIPTION: GRAPHITE COATED TYPE 1 LOW DENSITY FIBERGLASS ROPE

SPECIFICATIONS:

Diameter: .625 (± 5%)

Material: Fiberglass texturized yarn, service rating 1000°F (538°C)

Yield: 19.94 ft/lb. (± 5%)

FIBERGLASS ROPE SEALS	DATE: 4/8/99		FIL-TEC, INC. P.O. BOX B, HAGERSTOWN, MD 21741-1191
PART # FTBH125X1.00GA	BY:CMP	APP: CHR	NO. FTBH125X1.00GA

DESCRIPTION: .125" X 1" graphite coated fiberglass bolt hole tape w/pressure sensitive adhesive

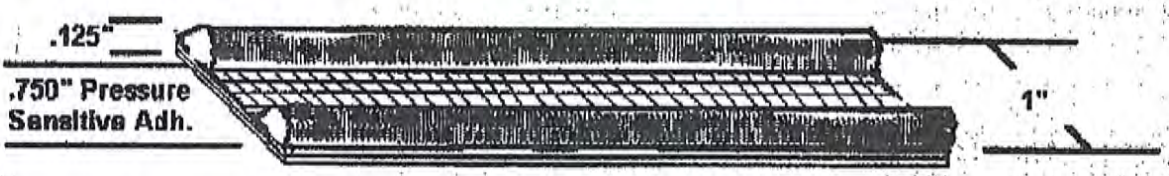
SPECIFICATIONS:

Yield: 54 ft/lb. ± 5% *without adhesive*

Width: 1" ± 5%

Thickness: .125" ± 5%

Material: Fiberglass texturized yarn, service rating 1000°F (538°C)
Acrylic based pressure sensitive adhesive



tapespc4.doc

ELECTRICAL SUBMITTALS

Manufacturer: RJW MANUFACTURING, INC
Model No.: SBL054-0J
Type of Appliance: BLOWER

MOTOR:

Manufacturer	JAKEL, INC	
Model Number	J239-115-025271	
Voltage	115V	
F.L. Amps	.93/.80 A	
L.R. Amps	1.4/1.2 A	
Phase/Cycle	SINGLE 50/60 HZ	
Horsepower	1/50 60 HZ	
R.P.M.	3000 RPM	
Approval Agency	UL	CSA
File Number	E46562	LR10432
Winding Type	WOUND BOBBIN SINGLE	COIL
Temperature Rating	130° C	
Is motor Impedance Protected?	NO-THERMALLY	
Insulation class of Leads	125°C	
Type of strain relief provided at leads?	STRAIN RELIEF POCKETS	

OVERLOAD PROTECTIVE DEVICE:

Manufacturer	TEXAS INSTRUMENTS	
Model Number	7AM209AS	
Approval Agency	UL	CSA
File Number	E15962	113726
Voltage	115V	
Current Rating	22A	
Temperature rating	110°C	
Authority for temp	±5°C	

MATERIAL SAFETY DATA SHEET

100% RTV Silicone

PR EPARED: 3/27/92

PALMETTO G & B PRODUCTS

106 N. HAMPTON ST.
KERSHAW, SC 29067
PH. 803-475-8766

I PRODUCT IDENTIFICATION

Product Identification: 100% RTV Silicone
Chemical Name: Silicone Sealant
Chemical Family: Silicone Sealant
Formula: Mixture

II PRODUCT COMPONENTS

Product Composition	Approx. %	ACGIH TLV	OSHA PEL	UNITS	CAS REG NO.
A. Hazardous					
Methyltriacetoxysilane	< 05%	10		PPM	4253-34-3 *
B. Non-Hazardous					
** Product Information	NA	NA	NA	NA	NA

III PHYSICAL DATA

**Product Information
Boiling Point NA (F) NA (C)
Physical State Paste
Vapor Pressure (20C)
Odor Acetic Acid
Vapor Density (Air=1) NEG.
Color All Colors
Solubility in Water (20C) Insoluble PH NA
Solubility in Organic Solvent Acidity/Alkalinity Unknown MEG/G
(State Solvent) Unknown
Freezing Point NA (F) NA (C) Density 1066.4 KG/M3
Melting Point NA (F) NA (C) Specific Gravity (Water=1) 1.07
% Volatile By Volume < 5 Evaporation Rate (Butyl Acetate=1) < 1

IV FIRE AND EXPLOSION DATA

Flash Point > 400 (F) > 204 (C) By TCC Ignition Temp UNK (F)UNK(C)
Flamable Limits in Air (%): Lower NA Upper NA
Extinguishing Media: All Standard Firefighting Media Dry Chemical
Special Firefighting Procedures: None Known

V REACTIVITY DATA

Stability: X Stable Unstable
Hazardous: Polyherization will not Occur
Carbon Monoxide.
Carbon Dioxide.
Silicon Dioxide.
Acetic Acid.
Incompatibility (Materials to Avoid): None Known
Conditions to Avoid: None Known.

AUG-14-91 WED 15

PRODUCT NAME:
Rhodorsil 3B- A one component Silicone Elastomeric Sealant
MANUFACTURER:
Rhône-Poulenc Inc.
Specialty Plastics Division
CN-5266

PALMETTO G & B PRODUCTS
106 N. Hampton St.
Kershaw, SC 29067

CHARACTERISTIC	TEST METHOD		Difference in test results using Hi-Temperature Red Sealant
As Supplied			
Specific Gravity at 77F		1.03	1.07
Tack-Free Time at 77F and 50% RH, min		10-20	
Flow Rate (sag or slump on ⅛ x 4" bead), in		NIL	
Extrusion Rate (⅛" orfice, 90psi), gms/min		350	335
Cure Time at 77F and 50% RH (⅛" thickness), hrs		24	
As Cured[1] - Physical			
Tensil Strength, psi (MPa)	ASTM D 412	350	375
Peel Strength,[2] ppi, glass	ASTM D 412	20	
Tear Strength, ppi	ASTM D 412	28	
Durometer Hardness, Shore A, Points	ASTM D 676	25	30
Elongation, Percent	ASTM D 412	500	400
Brittle Point, Degrees	ASTM D 746	-100F	
Weight Loss, after 100 hrs at 392F, Percent		NONE	
Water Absorption-7 days at 77F, Percent	ASTM D 570	0.40	
Volume Coefficient of Thermal Expansion, 32-212F	ASTM D 213A	9.3 x 10^{-4}	
BTU per (ft) (degrees F) (hr)		0.11	0.12
Thermal Conductivity, cal/(cm) (degrees C) (sec)		0.45 x 10^{-3}	0.5 x 10^{-3}
Shrinkage, after 3 days at 77F, Percent		NIL	
Lap Shear Adhesion,[3] strength, psi			
1/16-inch lap joint thickness		192	
1/8-inch lap joint thickness		113	
1/4-inch lap joint thickness		67	
3/8-inch lap joint thickness		44	
1/2-inch lap joint thickness		37	
As Cured[4] - Electrical			
Volume Resisivity, ohm-cm	ASTM D 257	1.5x10^{15}	3 x 10^{14}
Dielectric Strength,[5] volts/mil	ASTM D 149	550	500
Dielectric Constant at 60 Hz	ASTM D 150	2.8	
at 100 Hz	" "	2.8	
at 100 KHz	" "	2.8	
Dissipation Factor at 60 Hz	ASTM D 150	0.0015	0.0026
at 100 Hz	" "	0.0015	0.0026
at 100 KHz	" "	0.0015	0.0026
Arc Resistance, Seconds	ASTM D 489	50	
Maximum Continuous Operating Temperature, degrees		+450°F	+500°F
Maximum Intermittant Operating Temperature, degrees		+500°F	+650°F

1 Measured on 1.91-mm-thick (0.075-inch) slabs after curing 72 hours at 25 C (77 F) and 50% RH.
2 Tested on standard sheet glass.
3 Measured with 1/4-inch overlap on test piece.
4 Measured on 1.91-mm-thick (0.075-inch) cross section after vulcanizing 72 hours at 25 C (77 F) and 50% RH.
5 Measured at 65-mil thickness, 1/4-inch ASTM electrodes in oil, rapid rise.

These values are not intended for preparation of specifications. All technical information contained herein is based on tests we believe to be reliable, but the accuracy thereof is not guaranteed.

Please Note: HI-Temp Red is designed to meet low volitility requirements as specified by General Motors for use on vehicles equipped with oxygen sensors.

Draft

Material Safety Data Sheet (MSDS)

SC-000-041 REV.7
DATE 1/97

Vendor name and address: THE FOUNDRY OF THE SHOALS, INC
201 COMMERCE STREET
P. O. BOX 916
FLORENCE, AL 35631

Emergency phone number: (256) 760-2050

Conforms to requirements of OSHA standard 1910.1200 "Hazard Communication" and to various state "Employee Right to Know" Laws

GRAY IRON

SECTION I — PRODUCT IDENTIFICATION

This MSDS supplied for: GRAY IRON

ASTM ALLOY DESIGNATION

SECTION II — HAZARDOUS COMPONENTS

INGREDIENT	CAS NO.	PERCENT	TLV (mg/m³)	PEL (mg/m³)
Carbon	7440-44-0	2.5-4.0	N/E	N/E
Chromium*	7440-47-3	0.01–0.9		
Chromium (II) Compounds as Cr			0.5	0.5
Chromium (III) Compounds as Cr			0.5	0.5
Chromium Metal as Cr			0.5	1.0
Chromium VI Insoluble Compounds			0.01	N/E
Chromic Acid and Chromates as CrO_3			N/E	1.0 mg/10m³
Chromium VI Compounds Water Soluble as Cr			0.05	0.1 (CL)
Iron	1309-37-1	86.3-96.2		
Iron Oxide Fume (Fe_2O_3)			N/E	10.0
Iron Oxide Dust and Fume (Fe_2O_3)			5.0	N/E
Manganese* (as Mn)	7439-96-5	0.2-1.1		
Fume as Mn			N/E	5.0 (CL)
Elemental and Inorganic Compounds as Mn			0.2	N/E

SECTION II — HAZARDOUS COMPONENTS *(cont'd.)*

INGREDIENT	CAS NO.	PERCENT	TLV (mg/m³)	PEL (mg/m³)
Nickel*(as Ni)	7440-02-0	0.01-1.5		
Metal			1.0	1.0
Insoluble Compounds as Ni			1.0	1.0
Soluble Compounds as Ni			0.1	1.0
Silicon	7440-21-3	1.0-3.5		
Total Dust			10.0	15.0
Total Respirable Dust			N/E	5.0

N/E = none established. N/A = not applicable. N/D = no data available.
TLV = American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (8-hour time weighted average).
PEL = OSHA Permissible Exposure Limit. The PEL values given are those promulgated as final limits as part of OSHA's 1989 PEL project (8-hour time weighted average).
mg/m³ = Milligrams per cubic meter of air.
NTP = National Toxicology Program.
CL = Ceiling Limit.
STEL = Short Term Exposure Limit.

CARCINOGEN CLASSIFICATION

INGREDIENT	OSHA	NTP	IARC	TARGET ORGAN
Chromium Hexavalent	N	1	1	Lung
Nickel	N	2	2B	Lung, nasal

Y = Listed as Human Carcinogen. N = Not Listed as a Human Carcinogen.
Code for IARC (International Agency for Research on Cancer) evidence for human carcinogenicity: 1 = positive; 2A = probable; 2B = possible; 3 = not classified; 4 = probably negative.
Elements having a listed percentage greater than zero will be present in all grades. Those having a value of "0" may not be present in certain grades.

Material Safety Data Sheet (MSDS)

Label information for SC-000-041 REV. 7 DATE 1/97

The following hazard information is required for labels under OSHA Standard 1910.1200 and applicable instructions. Other label information may be added.

GRAY IRON

CAUTION

Grinding, welding, or arc gouging of this casting creates dust or fumes containing substances listed below with corresponding possible health effects after prolonged or repeated overexposure:

Carbon: Respiratory and skin irritation.

Chromium, Hexavalent: Lung cancer.

Iron: Siderosis "iron pigmentation" of the lung, which can be seen in a chest x-ray but causes little or no disability.

Manganese: Central nervous system effects are: sleepiness, weakness in legs, spastic gait, emotional disturbances.

Nickel: Dermatitis, lung and nasal cancer.

Silicon: Skin, eye and nose irritation.

Wear eye protection. Wear approved dust and fume respirator if exposures exceed safe limits.

For additional information, see Material Safety Data Sheet SC-000-041 Rev. 7 for this material.

SECTION II — HAZARDOUS COMPONENTS *(cont'd.)*

*This constituent, a toxic chemical, makes this product subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Quantity threshold amounts are 25,000 pounds for manufacturing, importing or processing and 10,000 pounds for otherwise using the listed chemical. Chemicals marked ** are reportable only if in the form of dust or fume.

SECTION III — OVERVIEW

There are no chemical hazards from these castings in solid form.

Dust or fumes generated by machining, grinding, or welding of the casting will put contaminants in the air. Since the casting is over 85% iron, most of the dust or fume will be iron or iron oxide. There is no TLV for iron dust, but available information indicates that a concentration of 10 mg/cu.m., as if it were a nuisance dust, will serve as a guideline until a TLV is established.

High production dry machining of gray iron castings usually requires local exhaust ventilation.

Flame cutting, arc gouging, or welding of the casting generates iron oxide fume. Inhalation of too much iron oxide fume over a long time can cause siderosis, sometimes called "iron pigmentation" of the lung. It can be seen on a chest x-ray but causes little or no disability. Also see the MSDS for the welding rod being used.

Welding or flame cutting may convert a fraction of the chromium to the water insoluble hexavalent (carcinogenic) form, but the chromium content of the casting is so low that over-exposure is not likely.

Nickel has been shown to cause cancer in laboratory animals. However, its potential to cause cancer in humans has not been determined. The nickel content of the casting is so low that over-exposure is not likely.

Grinding castings that have not been cleaned or that contain embedded sand will generate significant amounts of dust containing free silica, which can cause silicosis. Good local ventilation is frequently required to prevent over-exposure in this situation.

SECTION III — OVERVIEW *(cont'd.)*

If good ventilation is not available, use a NIOSH-approved dust respirator. IARC has listed crystalline silica as Class 2A, probably can cause lung cancer.

Other toxic metals in the alloy are present in small amounts that will not represent a hazard if iron dust and fume are adequately controlled.

SECTION IV — PHYSICAL DATA

PHYSICAL DESCRIPTION: Solid, silver gray in color, no odor
BOILING POINT: 2750C for iron
VAPOR PRESSURE: N/A
VAPOR DENSITY: N/A
SOLUBILITY IN WATER: N/A
SPECIFIC GRAVITY: 7.86 for iron
PERCENT VOLATILE BY VOLUME: N/A
EVAPORATION RATE: N/A

SECTION V — FIRE AND EXPLOSION DATA

Castings will not burn or explode.

SECTION VI — HEALTH HAZARD DATA

EYES: Metal particles in the eyes may cause irritation if not removed. Contact lenses should be worn with caution in a metalcasting environment. Obey work rules concerning contact lenses.

SKIN: Carbon: Skin irritation; **Nickel:** Dermatitis; **Silicon:** Skin irritation.

BREATHING: Prolonged or repeated overexposure to dust or fumes from these castings may cause the following health effects:

Carbon: Respiratory irritation.

Chromium, Hexavalent: Lung cancer.

Iron: Siderosis "iron pigmentation" of the lung, which can be seen in a chest x-ray but causes little or no disability.

SECTION VI — HEALTH HAZARD DATA *(cont'd.)*

Manganese: Central nervous system effects are: sleepiness, weakness in legs, spastic gait, emotional disturbances.

Nickel: Lung and nasal cancer.

Silicon: Skin, eye and nose irritation.

Breathing excessive amounts of silica dust for a long time can cause silicosis. Silicosis causes shortness of breath, reduced capacity to do work, and weakens the defenses against other lung diseases.

INGESTION: Hand, clothing, food and drink contact with metal dust, fume or powder can cause ingestion of particulate during hand to mouth activities such as eating, drinking, smoking, nail biting, etc.

NOISE: Grinding or machining castings is noisy. The OSHA limit for noise averaged over eight hours is 90 decibels (dBA). A hearing conservation program is required if exposure is over 85 dBA. If noise is at or above 90 dBA, you should wear ear muffs or ear plugs.

FIRST AID

IF IN EYES: Metal particles should be removed by a trained individual such as a nurse or physician.

IF ON SKIN: Use a mild hand cream if irritation develops.

IF BREATHED: (Fumes from welding): Move to fresh air.

IF INGESTED: Consult local physician.

SECTION VII — REACTIVITY DATA

HAZARDOUS POLYMERIZATION: Will not occur

STABILITY: Stable.

INCOMPATIBILITY: Metal dust can burn or explode and must be protected from ignition sources such as grinding sparks, etc. Under some conditions, metal dust is incompatible with some oxidizing conditions and may be incompatible with oxidizers, acids and water and may ignite or explode.

SECTION VIII — SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

If damaged, return castings to vendor or send to scrap reclaimer.

Collected dust from machining, welding, etc., may be classed as a "hazardous waste" depending on circumstances. Consult local authorities regarding disposal.

SECTION IX — PROTECTIVE EQUIPMENT TO BE USED

RESPIRATORY PROTECTION: Wear a NIOSH approved respirator for dusts or fume if concentrations exceed the TLV or PEL.

VENTILATION: Provide general ventilation and/or local exhaust if necessary to maintain concentrations below the TLVs.

PROTECTIVE GLOVES: Work gloves advisable for handling castings.

EYE PROTECTION: Safety glasses with side shields and/or face shields for particles (grinding). Welding goggles or helmet for welding.

OTHER PROTECTIVE EQUIPMENT: Wear a protective apron and gauntlets if arc-air gouging or cutting, or welding castings. Safety shoes may be required during certain operations.

If noise is at or above 90 dBA, you should wear ear muffs or ear plugs.

SECTION X — SPECIAL PRECAUTIONS OR OTHER COMMENTS

STORAGE: Keep dry to reduce rusting.

THE INFORMATION HEREIN IS BASED ON THE VENDOR'S MSDS WITH ADDITIONS AS NECESSARY TO COMPLY WITH CURRENT REGULATIONS. THE INFORMATION IS BELIEVED TO BE ACCURATE BUT UNDER THE CIRCUMSTANCES IS NOT WARRANTED TO BE.

N/E means none established. N/A means not applicable. N/D means no data available.

Phone: 330-823-1610
800 WG PAVER
Fax: 330-823-5502

WHITACREgreer
Quality Since 1900

PRODUCT DATA SHEET - REFRACTORIES
March 1, 1998

PRODUCT:	W-G Low Duty Firebrick
PLANT:	Alliance, Ohio
METHOD OF MANUFACTURE:	Vacuum Dry Press

TYPICAL CHEMICAL ANALYSIS

SiO_2	66.9%
Al_2O_3	25.6%
Fe_2O_3	2.5%
CaO	0.2%
MgO	0.7%
TiO_2	1.5%
Alkali	2.6%

TYPICAL PHYSICAL PROPERTIES

P. C. E.	20 – 26
Apparent Porosity	13 – 17%
Modulus of Rupture	700-1200psi

Temperature fired to during manufacture = 2100^0 F (1149^0 C)

Manufactured to meet ASTM C 27 (Low Duty) and C 1261

Recommended maximum operating temperature = 2000^0 F

NOTE: All data subject to reasonable deviation and should not be used as specification.

Firebrick/Ladle Brick
Material Safety Data Sheet

Section 6 **Potential Exposure**

When	Hazard Form
Installation:	Dust from handling and cutting brick - see note under Special Precautions
Removal:	Dust from tearing-out brick after service

Section 7 **Corrosivity and Reactivity Data**

Stability (stable or unstable):	Stable
Incompatability (Materials to avoid):	None
Decomposition Products:	N/A
Conditions to be Avoided	NE

Section 8 **Disposal Procedures**

Spill or Leak Procedures:	Use dustless vacuum or sweep up using dust suppressant
Waste Disposal Method:	Approved landfill in accordance with all Federal, State and Local regulations.

Section 9 **Personal Protective Equipment/Procedures**

Respiratory Protection: Yes Type: NIOSH or MSHA Approved dust Respirator

Ventilation:	Local:
	Mechanical (General):
	Other:
Protective Gloves:	Yes
Eye Protection:	Yes
Other Equipment:	Safety Shoes

Action to be taken during repair and maintenance of equipment that has been in contact with this product: None

Section 10 **Special Precautions**

During Storage: None

Other:

A) Brick work must be completely dry before introduction of molten metal to avoid explosion from steam.

B) See ASTM E1132-86, "Standard Practice for Health Requirements Relating to Occupational Exposure to Quartz Dust."

C) Avoid creating and breathing dust. Dust generated by dry sawing may contain crystalline silica. Wet sawing is recommended.

Section 11 **Preparation/Revision**

Date: 2/8/93 Revised 5/1/98

N/A = Not Applicable
NI = No Information or Test Data
NE = Not Established

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : CHARCOAL GRAY METALLIC H/RESIS
IDENTIFICATION NUMBER: 1-6-6215 DATE PRINTED: 10/02/97
PRODUCT USE/CLASS :

SUPPLIER:
WARLICK PAINT COMPANY
945 MONROE STREET
PO DRAWER 1508
STATESVILLE, NC 28677

EMERGENCY TELEPHONE:704-873-2244
8 AM TO 5 PM MONDAY THRU FRIDAY

MANUFACTURER:
WARLICK PAINT COMPANY
945 MONROE STREET
PO DRAWER 1508
STATESVILLE, NC 28677

EMERGENCY TELEPHONE:704-873-2244
8 AM TO 5 PM MONDAY THRU FRIDAY

PREPARER: DGG, PHONE: 704-873-2244, PREPARE DATE: 08/06/97

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % EQUAL TO
01	ALUMINUM SILICATE	1332-58-7	0.2 %
02	MINERAL SPIRITS	8052-41-3	9.5 %
03	VM&P NAPTHA	64742-89-8	42 %
04	XYLENE	1330-20-7	4.0 %
05	TOLUENE	108-88-3	6.0 %
06	ISOBUTANOL	78-83-1	14 %
07	METHYL ETHYL KETONE	78-93-3	3.1 %
08	AROMATIC HYDROCARBON	64742-95-6	1.7 %

	EXPOSURE LIMITS					
	ACGIH		OSHA		COMPANY	
ITEM	TLV-TWA	TLV-STEL	PEL-TWA	PEL-CEILING	TLV-TWA	SKIN
01	10MG/M3	NO INFO				NO
02	100 PPM	NO INFO				YES
03	300 PPM	NO INFO	300 PPM			YES
04	100 PPM	150 PPM				YES
05	50 PPM	NO INFO				YES
06	50 PPM	NO INFO				YES
07	200 PPM	300 PPM				YES
08	100 PPM	150 PPM	50 PPM			YES

(See Section 16 for abbreviation legend)

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: No Information.

EFFECTS OF OVEREXPOSURE - EYE CONTACT: EYES - CAN CAUSE SEVERE IRRITATION, REDNESS, TEARING, AND BLURRED VISION.

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: SKIN - PROLONGED OR REPEATED CONTACT CAN CAUSE MODERATE IRRITATION, DEFATTING, DERMATITIS.

EFFECTS OF OVEREXPOSURE - INHALATION: BREATHING - IN POORLY VENTILATED AREAS EXCESSIVE INHALATION OF VAPORS MAY CAUSE NASAL AND RESPIRATORY IRRITATION, DIZZINESS, WEAKNESS, FATIGUE, NAUSEA, HEADACHE, POSSIBLE UNCONCIOUSNESSAND ASPHYXIATION.

EFFECTS OF OVEREXPOSURE - INGESTION: INGESTION - MAY BE HARMFUL IF SWALLOWED.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: No Information.

PRIMARY ROUTE(S) OF ENTRY: INHALATION SKIN CONTACT INGESTION

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: EYES - FLUSH WITH LARGE AMOUNTS OF WATER.

FIRST AID - SKIN CONTACT: SKIN - THOROUGHLY WASH EXPOSED AREA WITH SOAP AND WATER.

FIRST AID - INHALATION: No Information.

FIRST AID - INGESTION: SWALLOWING - CALL PHYSICIAN. DILUTE WITH WATER. DO NOT INDUCE VOMITING.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: 24 F (TAGLIABUE CLOSED CUP)

LOWER EXPLOSIVE LIMIT: 0.7 %
UPPER EXPLOSIVE LIMIT: 11.4 %

AUTOIGNITION TEMPERATURE:

EXTINGUISHING MEDIA: WATER FOG DRY CHEMICAL FOAM CO2

UNUSUAL FIRE AND EXPLOSION HAZARDS: VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL ALONG THE GROUND OR BE MOVED BY VENTILATION AND IGNITED BY HEAT, PILOT LIGHTS, OTHER FLAMES, AND IGNITION SOURCES. CLOSED CONTAINERS MAY EXPLODE WHEN EXPOSED TO EXTREME HEAT. **** STATIC ELECTRICITY PRECAUTION - ALL CONTAINERS MUST BE GROUNDED

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

WHEN IN USE. ****

SPECIAL FIREFIGHTING PROCEDURES: No Information.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: DIKE AND CONTAIN SPILL WITH AN INERT MATERIALAND TRANSFER THE LIQUID TO CONTIANERS FOR RECOVERY OR DISPOSAL.

SECTION 7 - HANDLING AND STORAGE

HANDLING: TO PREVENT REPEATED OR PROLONGED SKIN CONTACT, WEAR IMPERMEABLE CLOTHING OR BOOTS.

STORAGE: CONTAINERS OF THIS PRODUCT MAY BE HAZARDOUS WHEN EMPTIED SINCE EMPTIED CONTAINERS RETAIN PRODUCT RESIDUES (VAPORS, LIQUID, AND/OR SOLID). ALL HAZARD PRECAUTIONS GIVEN HERE MUST BE OBSERVED.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: No Information.

RESPIRATORY PROTECTION: IN CASE OF POOR VENTILATION, USE NIOSH/MSHA JOINTLY APPROVED AIR
SUPPLIED RESPIRATOR.

SKIN PROTECTION: RESISTANT GLOVES.

EYE PROTECTION: SAFETY GOGGLES.

OTHER PROTECTIVE EQUIPMENT: No Information.

HYGIENIC PRACTICES: No Information.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: 175 - 383 F	VAPOR DENSITY	: Is heavier than air
ODOR	: SOLVENT	ODOR THRESHOLD	:
APPEARANCE	: BLACK LIQUID	EVAPORATION RATE	: Is slower than Ether
SOLUBILITY IN H2O	: NONE IN WATER		
FREEZE POINT	:	SPECIFIC GRAVITY	: 0.8616
VAPOR PRESSURE	:	pH @ 0.0 %	:
PHYSICAL STATE	:	VISCOSITY	:

COEFFICIENT OF WATER/OIL DISTRIBUTION:

(Continued on Page 4)

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: STRONG OXIDING AGENTS.

INCOMPATIBILITY: No Information.

HAZARDOUS DECOMPOSITION PRODUCTS: THERMAL DECOMPOSITION YIELDS OXIDES OF CARBON.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

No product or component toxicological information is available.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: ALL RAW MATERIALS LISTED ON TOSCA.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: DESTROY LIQUID BY INCINERATION. CONTAMINATED ABSORBENT MAY BE DEPOSITED IN A LANDFILL IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

SECTION 14 - TRANSPORTATION INFORMATION

No transportation information is available.

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

(Continued on Page 5)

SECTION 15 - REGULATORY INFORMATION

CERCLA - SARA HAZARD CATEGORY:
This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

None

SARA SECTION 313:
This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

CHEMICAL NAME	CAS NUMBER	WT/WT %
XYLENE	1330-20-7	4.0 %
TOLUENE	108-88-3	6.0 %
METHYL ETHYL KETONE	78-93-3	3.1 %

TOXIC SUBSTANCES CONTROL ACT:
This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

CHEMICAL NAME	CAS NUMBER
XYLENE	1330-20-7
TOLUENE	108-88-3
ISOBUTANOL	78-83-1
METHYL ETHYL KETONE	78-93-3
AROMATIC HYDROCARBON	64742-95-6
SILICONE ALKYD	MIXTURE
GRAPHITE	7782-42-5
NO CHEMICAL NAME FOUND	
ALUMINUM PASTE	7429-90-5
NO CHEMICAL NAME FOUND	

NEW JERSEY RIGHT-TO-KNOW:
The following materials are non-hazardous, but are among the top five components in this product:

CHEMICAL NAME	CAS NUMBER
SILICONE ALKYD	MIXTURE

PENNSYLVANIA RIGHT-TO-KNOW:
The following non-hazardous ingredients are present in the product at greater than 3%:

CHEMICAL NAME	CAS NUMBER
SILICONE ALKYD	MIXTURE
GRAPHITE	7782-42-5

(Continued on Page 6)

SECTION 15 - REGULATORY INFORMATION

CALIFORNIA PROPOSITION 65:
WARNING: The chemical(s) noted below and contained in this product, are known to the state of California to cause cancer, birth defects or other reproductive harm:

---------- CHEMICAL NAME ---------- CAS NUMBER
No Proposition 65 chemicals exist in this product.

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 2 FLAMMABILITY: 3 REACTIVITY: 0

PREVIOUS MSDS REVISION DATE: 01/08/97

VOLATILE ORGANIC COMPOUNDS (VOCS): 5.70 lbs/gal, 683 grams/ltr

LEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

The information contained on this MSDS has been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations.

<END OF MSDS>

Operating Instructions for the High Valley 1600 (XTEC) Noncatalytic Woodstove

Primary Air Control:

Pushing the control rod in reduces the size of the orifice.

Low (≤1.0 kg/hr): At the stop - 0.55" open
MLow (1.0 - 1.25 kg/hr) : Stop to 1.0625" open
MHi (1.25 - 1.90 kg/hr): .875 - 1.75" open
High (> 1.90 kg/hr): Wide open
Fan Confirmation Test: Stop to 1.0625" open

Door:

Normally close the door as soon as the fuel is loaded into the stove. If ignition is delayed, crack door open slightly. Close door as soon as ignition occurs.

Fan:

Low: On high @ 30 min.
MLow: On high @ 30 min.
MHi: On high @ 30 min.
High: On high @ 5 min.
FCT: Off

LPAO:

Clear coals away from immediately in front of the LPAO (1-3").

High Valley Stoves
Model 1600
Step Top Non-Catalytic Wood Burning Stove

Installation
Operation &
Safety Handbook

High Valley Construction & Maintenance Corporation
6573 Highway 226 South
Spruce Pine NC 28777
www.highvalleystoves.com

Safety Notice: If this wood burning stove is not properly installed a house fire may result. For your safety, follow the installation directions. Contact your local building or fire officials about restrictions and installation inspections in your area.

7. SAFETY NOTICE: If this wood stove is not properly installed, a house fire may result. For your safety, follow the installation directions. Contact local building officals about restrictions and installation inspection in your area.
8. Inspect chimney connector and chimney twice monthly and clean if necessary.
9. Keep stove away from combustibiles. Follow suggested distances.
10. Install smoke pipe segments with crimped end down. This permits creosote to drip back into the stove and be burned away.
11. The use of aluminum type "B" gas vent is unsafe and prohibited by the National Fire Prevention Association Code.
12. The area through which the chimney pipe will travel should be inspected. If the installation requries cutting a hole in the ceiling, check the attic for wires, ducting, etc., that may interfere.
13. It is vitally important that single wall pipe is *never* closer than three times the diameter of the pipe from a combustible surface. *never* use single wall pipe through a combustible surface.
14. Use only an insulated, all fuel chimney to vent the hot gases out of the house. It will reduce the amount of creostoe buildup and improve the draft needed to vent hot gases from the stove.
15. Use a 6" diameter insulated thimble or an 6" diameter insulated all-fuel chimney section when passing through a combustible wall or ceiling.
16. Do not use more than one elbow in the stove pipe
17. Any horizontal pipe should be pitched upward toward the chimney at least 1/4" inch for each horizontal foot.
18. Ensure that the ventilating pipe does not extend so far into chimney flue that it blocks air flow.
19. Particular attention should be paid to the point where the flue passes through a wall or ceiling. This penetration should always be made with insulated pipe and the proper accessories.
20. The longer the pipe and the larger the number of elbows, the greater the chance of dangerous creosote and ash buildup. Modern stoves are engineered to achieve maximum heat dispersal without lengthy vents eliminating a potentially hazardous situation.
21. Use heavy gauge stove pipe: at least 18 gauge, 6 inch diameter.
22. Each stove pipe connection should be joined and secured with sheet metal screws to avoid possible separation during use.
23. The top of the flue must be at least three feet higher than the roof at the point of exit. In pitched roofs, the top of the stovepipe must be at least two feet to the highest point of the roof and at least ten feet away.

6. Install the chimney connector. If it is passing through combustible walls, it must be insulated, such as triplewall pipe. Also, if it is impossible to maintain 10" between your smoke pipe and a combustible wall, use an insulated chimney pipe. Also consult your local building codes and regualtions.
7. After the pipe connector is in place, run the stovepipe with the crimped edge down from the chimney connector to the stove. The crimped edges must be down so cresote accumulating on the walls of the stovepipe can run back into the stove and not out the joints of the pipe.
8. Check the installation to determine the pipe is connected properly using three sheet metal screws per joint; that the proper distances have been maintained from combustible surfaces with the stove and the stovepipe; and the chimney is in good repair and is installed properly.

Instructions for Mobile Home Use
Optional outside air kit required

1. Before mounting legs onto unit remove the four leveling bolts on bottom of legs.
2. Mount four legs onto unit.
3. Position the stove onto the floor protector in its final location. Making sure all minimum clearances are meet. Mark the location of the four legs. Remove the stove and drill a 5/16" hole through the floor of the home in the four locations
4. Reposition the stove and insert a 5/16" bolt (not supplied) through the hole in the bottom of each leg and fasten to the floor.
5. The stove should be grounded to the chassis with a #8 AGW copper wire or equivalent.
6. Place the outside air kit on the rear of the unit with the elbow turned toward the bottom of the unit and fasten with 2 tec screws supplied. Connect a 4" flex pipe (not supplied) to the outside air kit, place a screen on the other end and insert through the wall of the home.
7. On the front of the stove located under the hearth notice a 5" X 1 5/8" opening. Place the 6" X 2" plate (provided with the outside kit) over this opening and attach.

Section V

HIGH VALLEY STOVES
LIMITED WARRANTY

PRODUCTS GUARANTEED

This limited warranty covers all stoves manfactured by High Valley Construction & Maintenance Corporation.

GENERAL WARRANTY PROVISIONS

High Valley Stoves, warrants the model 1600 against defects in material and workmanship for 5 years as long as it is owned by the original purchaser provided (1) stove is installed by an authorized installer: (2) stove has not been repaired by an unauthorized person in any way, so as, in our judgement as manufacture, performance or reliability is reduced: (3) stove has not been subject to unauthorized modifcation: (4) the right to repair or replace the stove is at the option and considered the judgment of the manufacturer: (5) obligation under this warranty does not include or extend to paint on surface of stove, glass door, nor decor kit an optional attachment.

SPECIFIC WARRANTY PROVISIONS & TIME PERIODS

Period 1: 30 days after purchase.

1) Stove should be used within first 30 days by having a fire started, the blower activiated, and heat generated in the owners home.

Period 2: 90 days after Purchase.

1) All electrical parts are warranted for 90 days from the date of purchase.

Period 3: Five Years from date of purchase.

1) High Valley Stoves will replace or repair, at its option, any part defective in material or workmanship with the exception of electrical components (blower, thermostat, rehostat, etc..), damper, damper handles and rod, fireclay castable lining, and all parts not permanently attached to the heating unit. Parts not permanently attached to the heating unit are defined as any part removable with common hand tools.

2) The cost of parts only are included. The customer pays any labor or transporation charges required (owner is responsible for any cost involved with stove or part removal and reinstallation.)

Procedure

Should you feel that your stove is defective, you should contact your stove dealer for assistance and for the correct procedures to resolve the problem. If for any reason you are dissatisfied with the suggested procedure, you may contact us in writing at: High Valley Stoves, 6573 Highway 226 South, Spruce Pine, NC 28777.

CONDITIONS & EXCLUSIONS

1) There is no other express warranty. All implied warranties or merchantability and fitness are limited to the duration of the express warranty.

2) High Valley Stoves is not liable for indirect, incidental, or consequential damages in connection with the use of the product including any cost or expense of providing substitute equipment or service during periods of malfunction or non-use. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

3) Warranty repairs for reimbursement must be performed by an authorized High Valley Dealer, manufacture's representative, or by customer as directed by dealer or the manufacturer.

4) Dealers will receive special instructions regarding minor repairs.

5) Warranty void if serial plate has been removed or defaced.

6) Warranty gives you specific legal rights and you may also have other rights which vary from state to state.

OWNER REGISTRATION CARD

The owner registration card must be completed in its entirety and mailed to the address on the card within ten (10) days from the purchase in order for warranty coverage to begin.

VISIT US ON THE WEB @
www.highvalleystoves.com

HIGH VALLEY STOVES
OWNER REGISTRATION CARD

NAME _____

ADDRESS _____

CITY _____ STATE ___ ___ ZIP _____

TELEPHONE ( ) _____

DEALER WHERE STOVE WAS PURCHASED _____

SELLING PRICE LESS TAX _____

DATE PURCHASED _____

DATE INSTALLED _____

MODEL ☐ 1600

SERIAL NUMBER OF WOOD STOVE
(FOUND ON REAR OF UNIT) _____

REMOVE PAGE FROM BOOK
FOLD IN HALF AND STAPLE

WOODSTOVE DATA SHEET # 30

stove storage4/99

STOVE STORAGE

The High Valley 1600 noncatalytic woodstove

tested by Myren Consulting, Inc. is being held in custody by

High Valley Stoves/ High Valley Construction and Maintenance, Inc.
and is being stored at:

High Valley Stoves/ High Valley Construction
6573 Highway 226
Spruce Pine, NC 28777

Contact person(s):
Bob or Matt Buchanan
Phone: (828) 765-4004

A. Temporary storage at Myren Consulting until certification is granted:

A single strap of steel banding is placed around the stove so that the banding crosses the door horizontally, making it impossible to open the door on the unit. If it is necessary to break the banding to check an internal dimension or component, the banding is immediately replaced after the work on the unit is completed. The unit is identified with its name written on a stove storage label that is taped to the window of the unit. (See next page for an example copy of a stove storage label.)

B. Permanent storage after certification has been granted:

The following measures have been taken to permanently seal the unit and prevent tampering. Several lengths of steel banding are placed around the stove in a manner that prevents the door from being opened. At least two of these lengths cross at 90° angles. At each 90° crossing point on the top of the stove and perhaps elsewhere, a Myren Consulting address label is placed over the crossing point. The lab manager then initials the label and it is then taped in place with 2" clear packing tape. The stove is then loaded onto a pallet and strapped to the pallet with several lengths of steel banding. A box - either cardboard, chipboard or plywood - is placed over the stove and attached to the pallet.

C. The sealed unit is identified as follows:

The name of the unit is written on a Myren Consulting address label which is affixed to the outside of the box. The top and sides of the box also have several stove storage labels affixed to it which clearly identify the unit as a test stove being stored pursuant to 40 CFR Part 60. These labels have the name of the stove clearly written on them. (A sample stove storage label follows on the next page.)

D. The unit was returned to the manufacturer via: __common carrier - USF Reddaway .

WST5-Form11

W A R N I N G

SEALED EPA TEST STOVE

DO NOT OPEN OR TAMPER WITH THE SEALS AND PACKAGING ON THIS STOVE.

TO DO SO WILL VOID THE CERTIFICATION ON THIS STOVE.

High Valley 1600

WST5-Form11

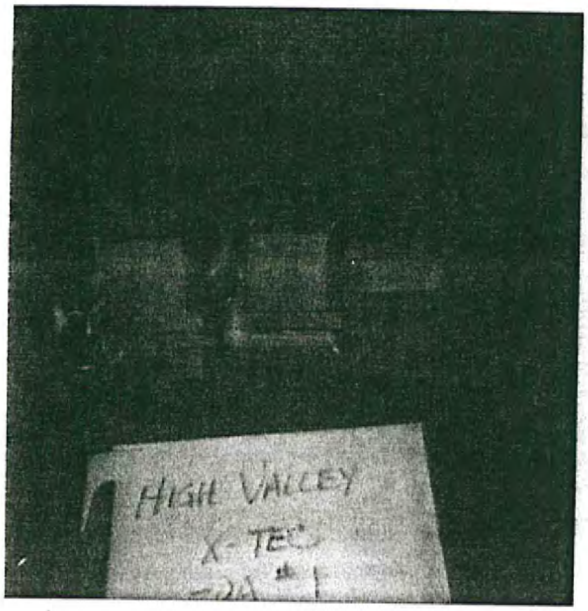
W A R N I N G

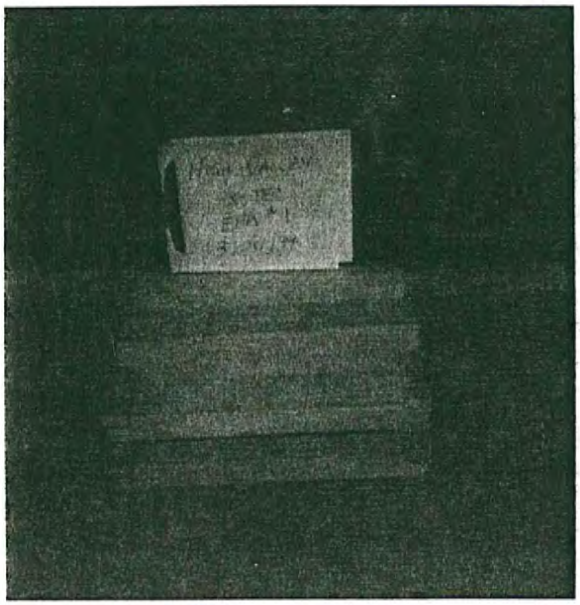
SEALED EPA TEST STOVE

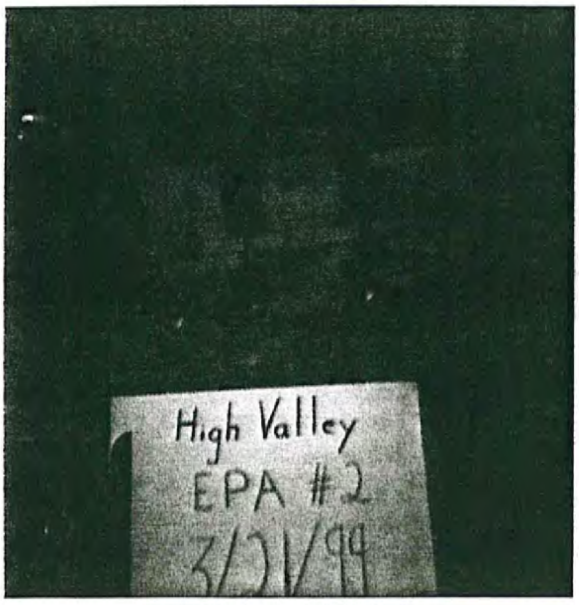
DO NOT OPEN OR TAMPER WITH THE SEALS AND PACKAGING ON THIS STOVE.

TO DO SO WILL VOID THE CERTIFICATION ON THIS STOVE.

High Valley 1600


HIGH VALLEY
X-TEC
EPA #1

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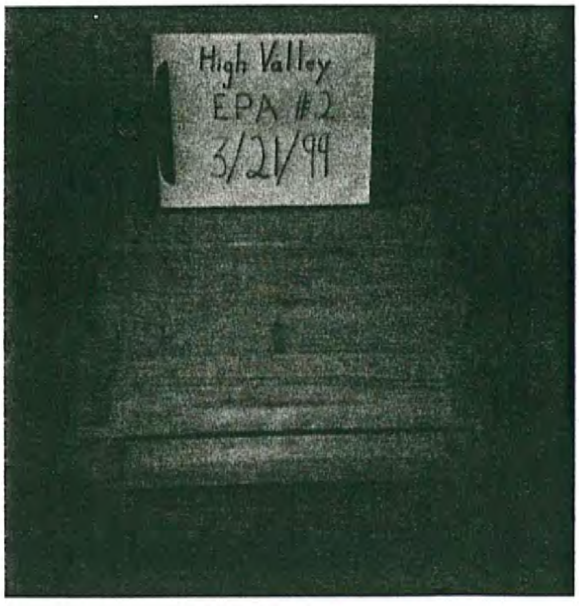
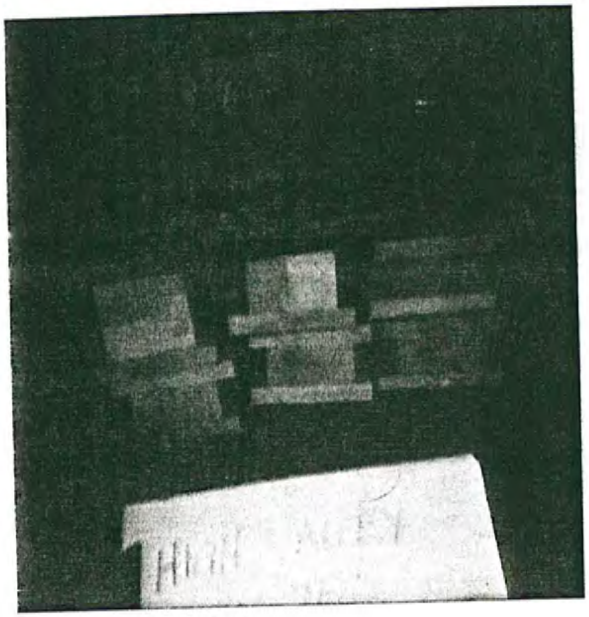
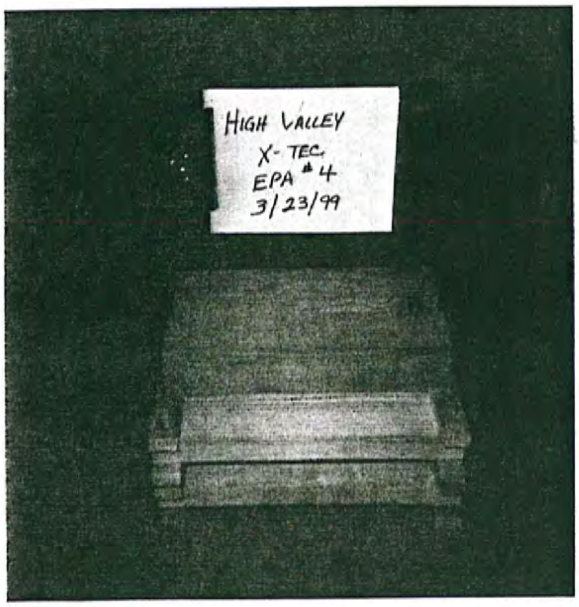
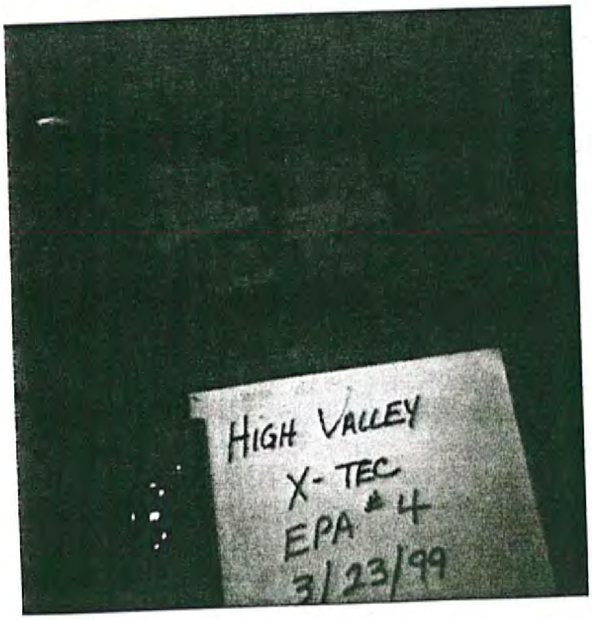
3/21/99


High Valley
EPA #2
3/21/99


HIGH VALLEY
X-TEC
EPA #3
3/23/99




HIGH VALLEY
X-TEC
EPA #4
3/23/99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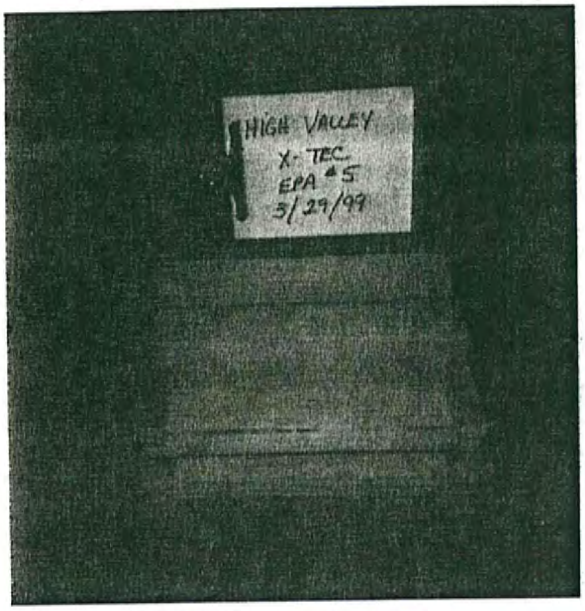
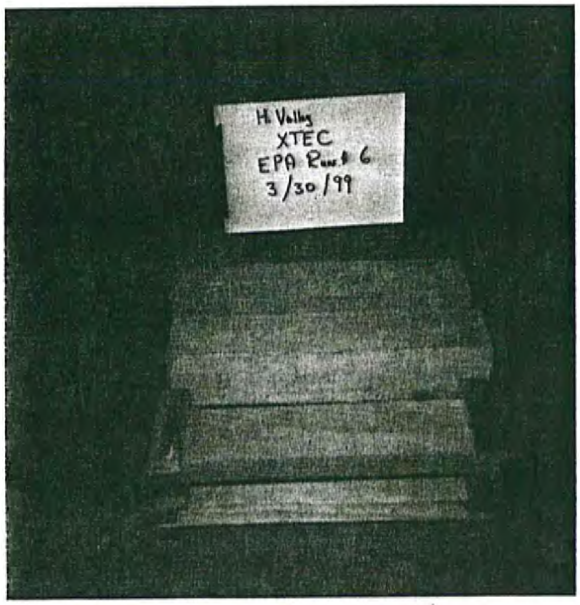
EPA #4
3/23/99


HIGH VALLEY
X-TEC
EPA #5
3/29/99


HIGH VALLEY
X-TEC
EPA #5


H. Valley
XTEC
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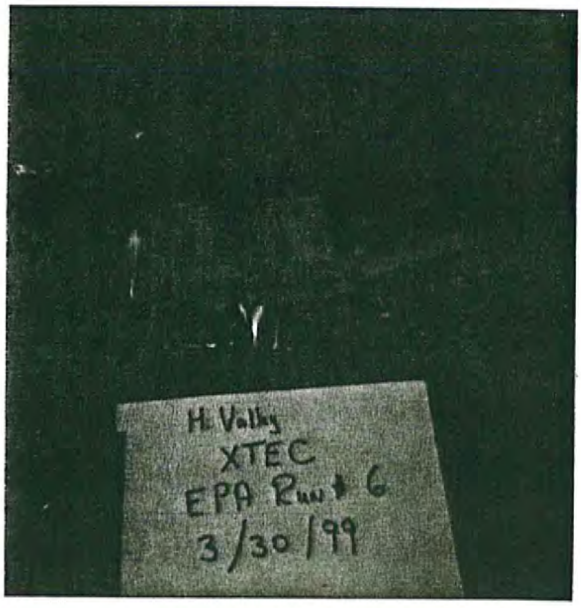
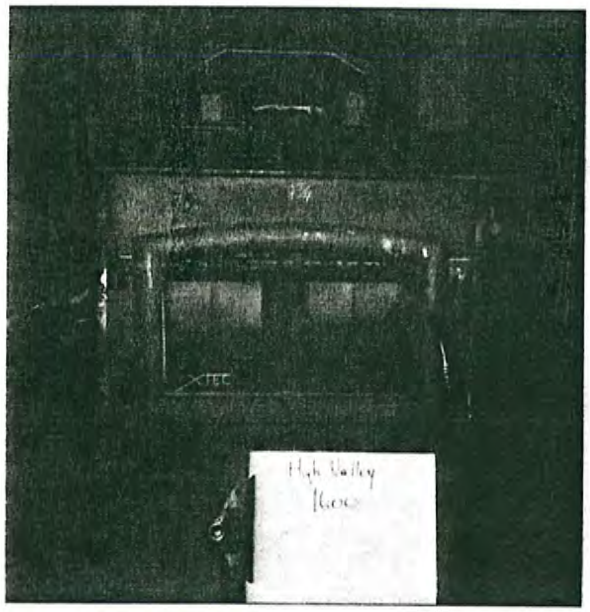
3/30/99


H. Valley
XTEC
EPA Run # 6
3/30/99


XTEC
High Valley
Farms