Myren Consulting, Inc.

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

Kuma Stove and Iron Works
Kuma Scott HT-1
Noncatalytic Woodstove

September 15,1996

Myren Consulting, Inc.

Office:

512 Williams Lake Road

Colville, WA 99114

509-684-1154

509-685-2262 Fax

Laboratory:

Suite 106

12810 NE 178 th St.

Woodinville, WA 98072

206-483-7997

206-485-1677 Fax

* * * * * * *

CONFIDENTIAL

* * * * * * *

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

* * * * * * *

CONFIDENTIAL

* * * * * * *

TABLE OF CONTENTS

FIELD OBSERVATION CHECKLIST

Unit Name: Kuma Scott HT-1 Date: 9/15/96

Manufacturer Name: Kuma Stove and Iron Works

Manufacturer Address: 450 Old Highway 95
Rathdrum, Id 83858

Manufacturer Phone: (208) 762-8002

Observers & Affiliation:

Myren Consulting's Field Team:
Supervisor: Ben Myren

Other Members: Ron Schenck

Test Location: Suite 106 12810 NE 178TH St., Woodinville, WA 98072

Phone (206) 483-7997, Fax: (206)485-1677

Test Site Elevation: 30 feet

Lab
Suite 106
12810 NE 178th St.
Woodinville, WA 98072
(206) 483-7997
(206) 485-1677 Fax

Office
512 Williams Lake Road,
Colville, WA 99114
(509) 684-1154
(509) 685-2262 Fax

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

Photos vari

Appendicies:
A - Example Calculations

B - Installation Description and Operating Instructions

REPORT CERTIFICATION

The sampling and analysis for the woodstove described in this report was carried out under my direction and supervision.

Date 9/15/96 Signature Albert V. Myers Jr.

Date _____ Signature _____

I have reviewed all of the testing data and results found in this test report and hereby certify that the test report is authentic and accurate.

Date 9/15/96 Signature Albert V. Myers Jr.

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2. Combustion Gas (CO_2,O_2,CO) (CEM) Train	Individual Test Runs	Data Sheet #16
B. Proportional Checks	Individual Test Runs	Table 1 Computer Printout
15. Sample Calculations		
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B. Dry Burn Rate	Individual Test Runs	Data Sheet #8 Computer Printout
16. Raw Test Data	Individual Test Runs	Data Sheets 1 - 16
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2. Blanks	Individual Test Runs	Data Sheets #5-3
3. Net	Individual Test Runs	Data Sheet #6
D. Constant Weight Weighings	Individual Test Runs	Data Sheet #4-3

M5G-1 INDIVIDUAL TEST RUN PAGE INDEX
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A. Computer Printouts
- Table 1 Field Data - Sampling Interval Data
- Table 1 Field Data
- Table 1 Field Data Averages
- Table 1 Calculations
- Table 1 Proportional Rate Variation

B. Raw Data Sheets

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Data Sheet #4 Scale Sheets	
#4-1 Initial Filter Weights	variable
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Data Sheet #5 Particulate Catch Processing Sheet	
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Data Sheet #9 Stove Operating Data	1
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Data Sheet #12 Burn Rate and Flue Gas Data	variable
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#15-2 O_2	1
#15-3 CO	1
Data Sheet #16 Quality Checks	1

STATEMENT OF CONFIDENTIALITY

As a condition of being allowed to visit the woodstove testing facility and/or observe a woodstove test(s) at Myren Consulting, Inc.'s testing laboratory located at Suite 106, 12810 NE 178th St., Woodinville, WA 98072, I hereby agree not to release or divulge any information about the design engineering principals used at Myren Consulting, the testing facility, the testing personnel or the testing procedures (other than the information found in the Standard Method for Measuring the Emissions and Efficiencies of Residential Woodstoves promulgated by the Oregon Department of Environmental Quality (DEQ) and/or Methods 28, 28A, 5G and 5H promulgated by the United States Environmental Protection Agency (EPA) to any other individual or firm unless specifically authorized to do so by an authorized person from Myren Consulting.

SIGNED: _____ SIGNED: _____

Name Name

Title Title

Affiliation Affiliation

Date Date

TEST SERIES INFORMATION AND DISCUSSION

Unit: Kuma Scott HT-1

Model #: Scott HT-1

Manufacturer: Kuma Stove and Iron Works

Date Received: 7/5/96 Date(s) Aged: 8/2, 14 & 15/96

Test Dates: 8/28, 29, 9/5, 6 and 9/96

Sampling Methods Used: M28, M5G-1 Number of Test Runs: 5

The Kuma Scott HT-1 Noncatalytic Woodstove manufactured by Kuma Stove and Iron Works of Rathdrum, Id was tested by Myren Consulting, Inc. using the United States Environmental Protection Agency's (EPA) Method 28, "Certification and Auditing of Wood Heaters", Method 5G-1, "Determination of Particulate Emissions from Wood Heaters from a Dilution Tunnel Location." And, if applicable, Method 28A, "Measurement of Air to Fuel Ratio and Minimum Achievable Burn Rates for Wood Fired Appliances". (See the Federal Register/ Vol. 53, No. 38/ Friday, February 26, 1988/ pp.5860-5926.) The Particulate Matter (PM) emission data, if present, was calculated as specified in the Wood Heater New Source Performance Standard (NSPS).

If computed and reported, Oregon Overall Efficiency (%OE) for each run was calculated using the computer program supplied by the State of Oregon's Department of Environmental Quality (DEQ) as part of the "Standard Method for Measuring the Emissions and Efficiency of Residential Woodstoves". The weighted average overall efficiency was calculated using the overall efficiency data for each run and the EPA Burn Rate Probabilities for calculating weighted averages.

All events pertinent to the test data and test results are recorded on the data sheets in the individual test runs, particularly on pp. 9, 9A,9A-1, 9A-2 and 12.

Any deviations made or noted from the promulgated methods other than those which were accepted and certified by the EPA and/or the DEQ during the laboratory accreditation process are listed and discussed below.

The following pages contain (1) a diagram showing the height and location of the stack components and sampling ports (2) copies of the certification test notifications and cancellations sent to EPA and (3) a discussion of test results.

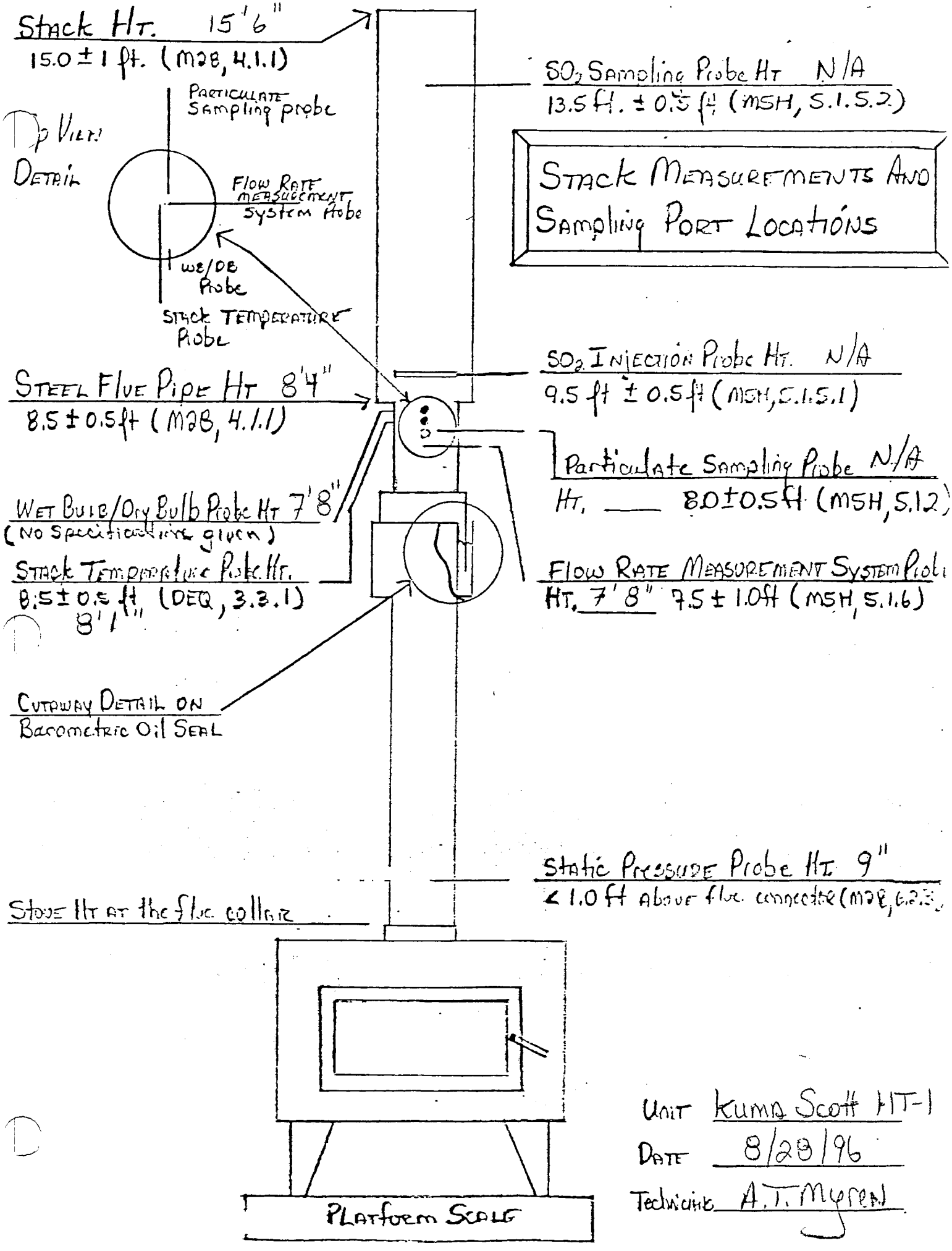
A brief note about the particulate samples is necessary to help understand the net catch values. During initial lab shakedown testing it was discovered that the portion of the filters left on the frits in the M5G-1 filter housing apparatus were full of static electricity and when removed to a plastic petri dish quickly adhered to the dish. Trying to recapture this material during weighing caused it to disintegrate making accurate weights difficult. Thus, it was decided to place this material in with the material captured with the acetone wash, where it shows up as catch. Some of the filter material was already following this flow anyway.

Thus, there may be negative filter weight catches that are used during the particulate emission rate calculation process. This accounts for the filter material that ended up in the acetone catch.

The Kuma Scott HT-1 is a true outside air unit in that all air entering the combustion chamber first must pass through the pedestal. It was a good performer in that all test runs took off as expected. The higher emissions for the medium low, medium high and fan confirmation tests were due to unfortunate wood falls which blocked the air wash air flow through the coal bed. If these falls had not occurred the weighted average for the unit will have been considerably lower.

Please note that the data sheets list the unit as the Kuma Scott HT-1 (its true name) and the Scott Kuma HT-1. This mix up with the names reversed was not caught until testing was complete. Thus, it was thought it would be easier to deal with it via an explanation in the introduction rather than change all the data sheets.

Stack Measurements And Sampling Port Locations



Unit Kuma Scott HT-1

Date 8/28/96

Technician A.T. Myren

FAXED 6/13/96

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Mr. Robert Marshall
Woodheater Certification Program
Federal Programs Section
Stationary Sources Compliance Division
U. S. EPA
Mail Drop EN 341 W
2800 Crystal Road, 8th Floor
Arlington, VA 22202

Dear Mr. Marshall:

RE: WODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

7 / 15 / 96 and ending on about 7 / 21 / 96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is 7/22-28/96.

Sincerely,

Ben

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 9/15/96

Faxed: 9/15/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

RE: WOODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled _____ or cancelled X the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

7/15/96 and ending on about 7/21/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is _____.

Sincerely,

Ben Myren

Ben Myren

epa not

FAXED 6/13/96

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Mr. Robert Marshall
Woodheater Certification Program
Federal Programs Section
Stationary Sources Compliance Division
U. S. EPA
Mail Drop EN 341 W
2800 Crystal Road, 8th Floor
Arlington, VA 22202

Dear Mr. Marshall:

RE: WODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HJ-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

7/22/96 and ending on about 7/29/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is 7/29 - 8/4/96.

Sincerely,

Ben

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 8/8/96
Faxed: 8/9/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

RE: WOODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled ____ or cancelled X the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

7/22/96 and ending on about 7/28/96

or has scheduled additional runs on the above unit starting on

____ and ending on ____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated 6/13/96

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is 7/29- 8/4/96.

Sincerely,

Ben Myren

Ben Myren

epa not

FAXED 6/13/96.

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Mr. Robert Marshall
Woodheater Certification Program
Federal Programs Section
Stationary Sources Compliance Division
U. S. EPA
Mail Drop EN 341 W
2800 Crystal Road, 8th Floor
Arlington, VA 22202

Dear Mr. Marshall:

RE: WODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

7/29/96 and ending on about 8/4/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is 8/5 - 11/96.

Sincerely,

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 8/8/96
Faxed: 8/8/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

RE: WOODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id. 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled _____ or cancelled X the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

7/29/96 and ending on about 8/4/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated 6/13/96

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test

period for this unit is 8/5 - 11/96.

Sincerely,

Ben Myren

Ben Myren

epa not

FAXED 6/13/96

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Mr. Robert Marshall
Woodheater Certification Program
Federal Programs Section
Stationary Sources Compliance Division
U. S. EPA
Mail Drop EN 341 W
2800 Crystal Road, 8th Floor
Arlington, VA 22202

Dear Mr. Marshall:

RE: WODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

8/5/96 and ending on about 8/11/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test

period for this unit is _____.

Sincerely,

Ben

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 8/8/96
Faxed: 8/9/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

RE: WOODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled _____ or cancelled X the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

8/5/96 and ending on about 8/11/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated 6/13/96

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is 8/12-18/96.

Sincerely,

Ben Myren

Ben Myren

epa not

7/6/96
FAXED 7/6/96

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Mr. Robert Marshall
Woodheater Certification Program
Federal Programs Section
Stationary Sources Compliance Division
U. S. EPA
Mail Drop EN 341 W
2800 Crystal Road, 8th Floor
Arlington, VA 22202

Dear Mr. Marshall:

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This letter is to notify EPA that

Name: Kuma Stove & Iron Works

Address 450 old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

8/12/96 and ending on about 8/18/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test

period for this unit is _____.

Sincerely,

AMM

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 9/15/96

Faxed: 9/15/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

RE: WOODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled _____ or cancelled X the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

8/12/96 and ending on about 8/18/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is _____.

Sincerely,

Ben Myren

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 8/8/96
Faxed: 8/8/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

RE: WOODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled _____ or cancelled X the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

8/15/96 and ending on about 8/21/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated 6/13/96

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test

period for this unit is 8/22-28/96.

Sincerely,

Ben Myren

Ben Myren

epa not

7/6/96

FAXED 7/6/96

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Mr. Robert Marshall
Woodheater Certification Program
Federal Programs Section
Stationary Sources Compliance Division
U. S. EPA
Mail Drop EN 341 W
2800 Crystal Road, 8th Floor
Arlington, VA 22202

Dear Mr. Marshall:

RE: WODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove & Iron Works

Address 450 Old Highway 95

Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

8/19/96 and ending on about 8/25/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is _____.

Sincerely,

BM

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 9/15/96

Faxed: 9/15/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

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This letter is to notify EPA that

Name: Kuma Stove and Iron Works

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Rathdrum, Id 83858

Contact Person: Mark Freeman

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Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

8/19/96 and ending on about 8/25/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test

period for this unit is _____.

Sincerely,

Ben Myren

Ben Myren

epa not

7/6/96
FAXED 7/6/96

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Mr. Robert Marshall
Woodheater Certification Program
Federal Programs Section
Stationary Sources Compliance Division
U. S. EPA
Mail Drop EN 341 W
2800 Crystal Road, 8th Floor
Arlington, VA 22202

Dear Mr. Marshall:

RE: WODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 old Highway 95
Rothdrum, Id 83858

Contact Person: Mark Fuelman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

8/26/96 and ending on about 9/1/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test

period for this unit is _____.

Sincerely,

HM

Ben Myren

epa not

7/6/96

FAXED 7/6/96

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Mr. Robert Marshall
Woodheater Certification Program
Federal Programs Section
Stationary Sources Compliance Division
U. S. EPA
Mail Drop EN 341 W
2800 Crystal Road, 8th Floor
Arlington, VA 22202

Dear Mr. Marshall:

RE: WODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

9/2/96 and ending on about 9/8/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test period for this unit is _____.

Sincerely,

BJM

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 8/8/96
Faxed: 8/8/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

RE: WOODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

9/9/96 and ending on about 9/15/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test

period for this unit is _____.

Sincerely,

Ben Myren

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 8/8/96
Faxed: 8/8/96

Mr. Robert Marshall
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Manufacturing, Energy and Transportation Division (2223A)
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U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

Dear Mr. Marshall:

RE: WOODHEATER CERTIFICATION TEST NOTIFICATION

This letter is to notify EPA that

Name: Kuma Stove and Iron Works

Address 450 Old Highway 95
Rathdrum, Id 83858

Contact Person: Mark Freeman

Phone: (208) 762-8002 has scheduled X or cancelled _____ the

Unit Name: Kuma Scott Model #: HT-1

for certification testing at Myren Consulting's Woodinville, WA lab starting on

9/16/96 and ending on about 9/22/96

or has scheduled additional runs on the above unit starting on

_____ and ending on _____

NOTE: If this is a cancellation notice, the cancellation is for the notification dated _____

and is only for the dates shown. All other current notifications are still in effect. The next scheduled test

period for this unit is _____.

Sincerely,

Ben Myren

Ben Myren

epa not

MYREN CONSULTING
Suite 106
12810 NE 178 th St.
Woodinville, WA 98072

Date: 9/15/96
Faxed: 9/15/96

Mr. Robert Marshall
Woodheater Certification Program
Manufacturing, Energy and Transportation Division (2223A)
Office of Compliance
U. S. EPA
1200 Pennsylvania Ave. NW
Washington, D.C. 20044

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Suite 106
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Date: 8/8/96
Faxed: 8/9/96

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Unit Kuma Scott HT-1
Date 8/2/96
Technicians ATM, RLS
Page 1 of 1
WST5-Form3

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

T/C#

Hr. #	Date	Time	Firebox Temp	Secondary Burn Temp	Post Cat	In Cat	Comments
1	8/2/96	1000	1050	1505			Fire lit 0800
2	"	1100	920	907			
3	"	1200	1050	1349			
4	✓	1300	810	874			
5	8/14/96	1125	995	1291			Fire lit 0800
6	✓	1225	885	859			
7	✓	1325	979	1106			
8	8/15/96	1110	1105	1374			Fire lit 0815
9	"	1210	829	773			
10	✓	1310	882	1322			

EPA WEIGHTED AVERAGES CALCULATIONS
EPA WEIGHTED AVERAGE PARTICULATE EMISSION RATE

The weighted average particulate emission rate ($\overline{PM}$) for the Kuma Scott HT-1 Noncatalytic Woodstove manufactured by Kuma Stove and Iron Works, Inc. of Hayden Lake, Id is 3.50 g/hr.

EPA WEIGHTED AVERAGE OVERALL EFFICIENCY

The weighted average overall efficiency ($\overline{OE}$) for the Kuma Scott HT-1 is (default) 63 %.

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

Run #	Dry Burn Rate/kg/hr	Grams/Hour	Overall Efficiency
2	.973	3.291	
1	1.104	4.752	
3	1.739	2.958	
4	2.475	1.673	
FCT 5	1.130	4.372	

III. EPA CUMULATIVE PROBABILITY CALCULATIONS

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

$P_1 = \frac{[.380 - .328][.973 - .950]}{.05} + .328 = .3519$

$P_2 = \frac{[.490 - .460][1.104 - 1.100]}{.05} + .460 = .4624$

$P_3 = \frac{[.857 - .840][1.739 - 1.700]}{.05} + .840 = .8533$

$P_4 = \frac{[.964 - .959][2.475 - 2.450]}{.05} + .959 = .9615$

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

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

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

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

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

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

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

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

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

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

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

$K_1 = P_2 - P_0 =$	.4624	- .000	=	.4624
$K_2 = P_3 - P_1 =$	.8533	- .3519	=	.5014
$K_3 = P_4 - P_2 =$	.9615	- .4624	=	.4991
$K_4 = P_5 - P_3 =$	1.0000	- .8533	=	.1467
$K_5 = P_6 - P_4 =$		-	=	
$K_6 = P_7 - P_5 =$		-	=	
$K_7 = P_8 - P_6 =$		-	=	
$K_8 = P_9 - P_7 =$		-	=	
$K_9 = P_{10} - P_8 =$		-	=	
$K_{10} = P_{11} - P_9 =$		-	=	
$K_{11} = P_{12} - P_{10} =$		-	=	
$K_{12} = P_{13} - P_{11} =$		-	=	
$K_{13} = P_{14} - P_{12} =$		-	=	
$K_{14} = P_{15} - P_{13} =$		-	=	
$K_{15} = P_{16} - P_{14} =$		-	=	

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, ...K_n = The weighting factors for the individual test runs as determined in III above.
PM_1, PM_2, PM_3, ...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, ... K_n = The weighting factors for the individual runs as determined in III above.
OE_1, OE_2, OE_3, ... OE_n = The overall efficiencies for the individual test runs as listed in II above.

IV.A. EPA WEIGHTED AVERAGE PARTICULATE EMISSIONS CALCULATIONS

$\overline{PM}$ = $\frac{.4624(3.291)+.5014(4.752)+.4991(2.958)+.1467(1.673)+(\ )+(\ )+(\ )+}{.4624 + .5014 + .4991 + .1467 + + + + .}$

$\frac{(\ )+(\ )+(\ )+(\ )+(\ )+(\ )+(\ )=}{+\ +\ +\ +\ +\ +\ +}$

$\overline{PM}$ = $\frac{1.5218+2.3827+1.4763+.2454+\ +\ +\ +\ +\ +\ +\ +\ +\ +\ =}{1.6096}$

$\overline{PM}$ = $\frac{5.6262}{1.6096}$ = 3.4954 = 3.50 g/hr

IV.B. EPA WEIGHTED AVERAGE OVERALL EFFICIENCY CALCULATIONS

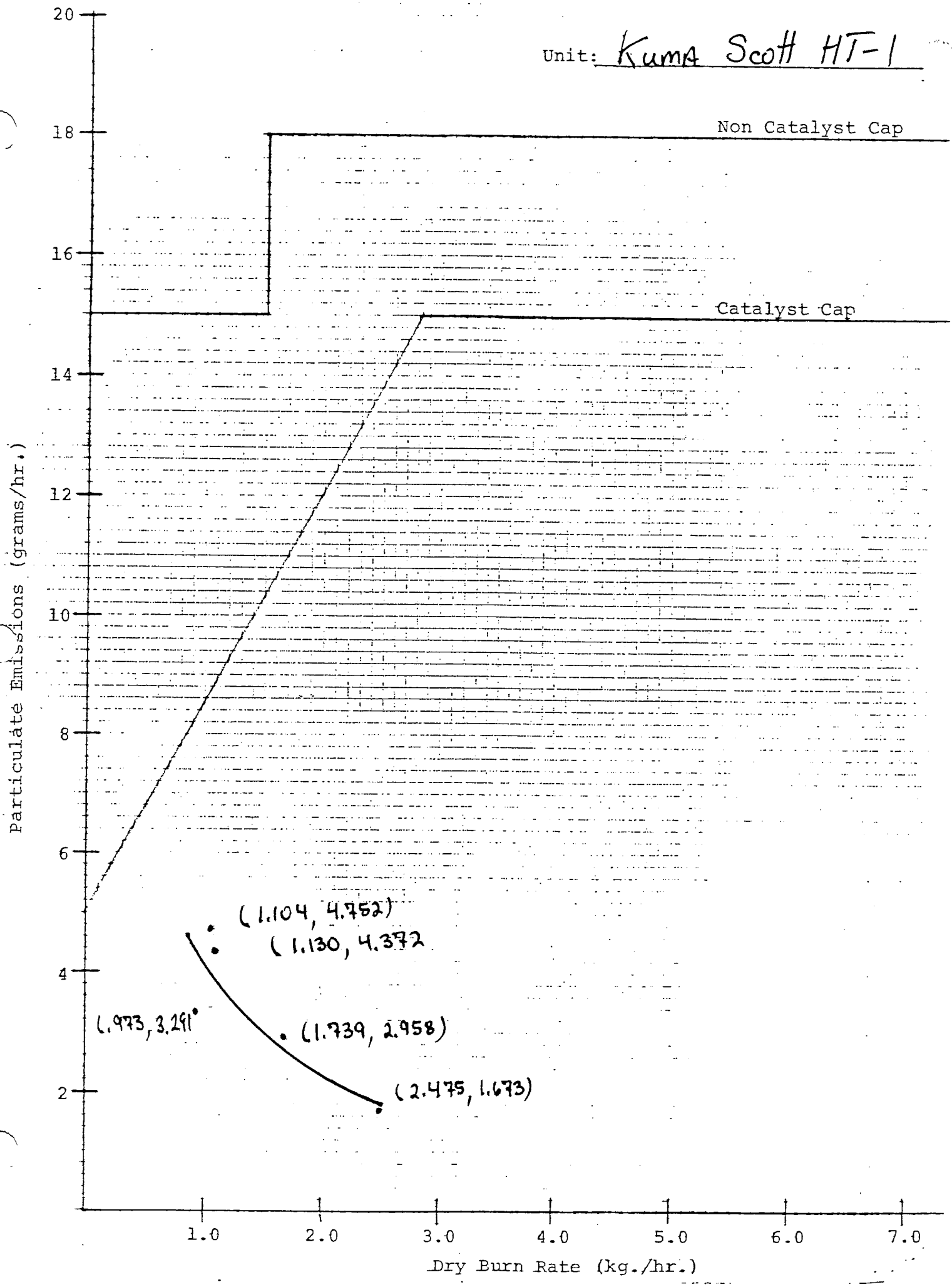
$\overline{OE}$ = $\frac{(\ )+(\ )+(\ )+(\ )+(\ )+(\ )+(\ )+}{+\ +\ +\ +\ +\ +\ +}$

$\frac{(\ )+(\ )+(\ )+(\ )+(\ )+(\ )+(\ )=}{+\ +\ +\ +\ +\ +\ +}$

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

$\overline{OE}$ = $\frac{\qquad\qquad}{\qquad\qquad}$ = $\qquad\qquad$ = $\qquad\qquad$ %

Unit: Kuma Scott HT-1



Woodstove Data Summary

	Run #	2	1	3	4		FCT 5			
Particulate Emissions:										
Concentration: grains/dscf:										
grams/m^3:										
Emission Rate: grams/hr:		3.291	4.752	2.958	1.673		4.372			
Emission Factor: gms/kg: (dry fuel weight basis)										
Front Half Catch: % of total										%
Total Mass Captured: Frt & Bck Halves:		28.6	39.0	14.1	4.9		33.5			mg
Efficiency Valves:										
Overall Appliance Efficiency										%
Combustion Efficiency										%
Heat Transfer Efficiency										%
Heat Output:										
Avg. BTU/hr for test cycle		11,727	13,310	20,973	29,845		13,621			BTU/h
Fuel Burn Rates:										
Avg Kg/hr for test cycle (Wet basis)		1.187	1.348	2.119	3.028		1.380			Kg/hr
Avg Kg/hr for test cycle (Dry basis)		0.973	1.104	1.739	2.475		1.130			Kg/hr

Unit: Kuma Scott HT-1

RUN #	2	1	3	4		FCT 5			
Fuel Moisture Content:									
Kindling (Wet basis)	7.749	7.607	7.891	7.749		7.749			%
Pretest Fuel (Wet basis)	16.551	16.440	16.248	17.241		17.241			%
Test Fuel (Wet basis)	18.038	18.139	17.915	18.234		18.133			%
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)	-.043	-.042	-.065	-.081		-.052			in.H_2O
Proportionality - Average	100.0	99.945	99.929	100.080		99.927			
Average Stack Gas Emission Factors:									
CO - g/Kg									
g/hr									

RUN #	2	1	3	4		FCT 5			
Average Temperatures:									
Stack Gas	254	261	380	479		283			°F
Primary Combustion Chamber Gas	750	830	967	1032		778			°F
Secondary Combustion Chamber Gas	876	953	1123	1168		773			°F
Catalytic Combustor Exit Gas	N/A	N/A	N/A	N/A		N/A			°F
Stove Top	392	433	539	596		431			°F
Stove Left Sidewall	406	444	511	542		415			°F
Stove Back	146	157	181	159		266			°F
Stove Right Sidewall	383	391	490	531		408			°F
Stove Bottom	373	412	466	411		370			°F
Stove Temperature Change	-87.4	-70.8	-44.2	-33.4		-63.0			°F
Test Chamber Environment:									
Avg. Barometric Pressure	29.88	29.95	29.92	29.95		29.955			in Hg
Avg. Temperature	74	82	73	70		71			°F
Avg. % Ambient Moisture	1.80	1.90	1.625	1.40		1.55			% H_2O
Avg. % Relative Humidity	63.5	51.5	54.5	53.5		56.5			%RH
Avg. Air Velocity	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)	.4673	.5195	.4703	.4867		.5091			gm/cm^3
Coal Bed Weight	2.7	2.5	2.5	2.3		2.5			lbs.
Pre Test Fuel Wt (Inc Kindling)	39.9	38.1	39.2	40.2		38.8			lbs.
Test Fuel Load Weight	10.9	10.9	10.9	10.9		10.9			lbs.
Total Test Cycle Burn Time	250	220	140	98		215			min.

CKUMAR2.XLS

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	CKUMAR2
Stove Manufacturer:	KUMA
Model Number:	SCOTT HT-1
Lab Name:	MYREN
Test Date:	8\29\96
Run Number:	2
Meter Box Y Factor:	1.012
Barometric pressure (in):	29.88
Gas meter temp (ave):	105.65
delta H(avg):	0.877
Gas meter initial reading:	786.9
Gas meter final reading:	910.872
Front catch (acetone) mg:	2.9
first filter catch (mg):	25.7
second filter catch (mg):	0
tunnel flow (ave cfm):	137.71
Emission Rate(g/hr):	2.04
Emission Rate(M5H) :	3.29
vs/VmTs:	0.01
vs ave:	763.64
Tunnel average temp (°f):	90.81
Test time(min):	250
Fuel Load(lb. wet):	10.9
Wood moisture(%wet):	18.038
Burn rate(dry kg/hr):	0.973
Samp vol(scf):	116.931
front filter number	131
back filter number	130
acetone beaker number	9
PRELIMINARY RESULTS	
FINAL RESULTS	X
DATA SUMMARY	
MODEL :	SCOTT HT-1
RUN:	2
DATE:	8\29\96
DBR:	0.973
GPH UNADJ	2.041
ADJ	3.291

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	0.036	89	786.900	75	0.900	772.80		
10	0.035	96	791.785	80	0.860	766.84	103.1	4.836
20	0.035	94	796.780	85	0.870	765.46	104.9	4.899
30	0.034	99	801.725	91	0.870	757.84	103.8	4.797
40	0.035	99	806.645	95	0.870	768.90	103.6	4.739
50	0.035	98	811.560	99	0.870	768.22	101.1	4.700
60	0.035	96	816.530	101	0.870	766.84	101.6	4.736
70	0.035	94	821.395	104	0.870	765.46	98.7	4.611
80	0.036	92	826.330	105	0.870	774.91	99.8	4.669
90	0.036	90	831.265	106	0.880	773.51	98.1	4.661
100	0.035	89	836.210	108	0.880	762.00	97.9	4.654
110	0.035	89	841.178	109	0.880	762.00	99.7	4.667
120	0.035	89	846.150	109	0.880	762.00	99.8	4.671
130	0.034	90	851.120	111	0.870	751.71	99.5	4.653
140	0.035	89	856.075	111	0.880	762.00	100.4	4.639
150	0.035	88	861.045	112	0.880	761.30	99.0	4.645
160	0.036	88	866.000	113	0.880	772.10	98.6	4.623
170	0.035	88	870.990	113	0.890	761.30	97.9	4.655
180	0.035	89	875.915	113	0.890	762.00	98.2	4.595
190	0.035	88	880.910	114	0.880	761.30	99.2	4.652
200	0.035	88	885.870	115	0.870	761.30	98.4	4.611
210	0.034	88	890.911	115	0.870	750.35	100.0	4.686
220	0.035	88	895.875	115	0.880	761.30	99.9	4.615
230	0.035	88	900.825	116	0.880	761.30	98.0	4.594
240	0.035	88	905.840	116	0.880	761.30	99.3	4.654
250	0.035	87	910.872	116	0.880	760.61	99.5	4.670
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 Kuna LAB-1

DATE 8/29/96 PAGE 1 OF 2 MODEL # Scott HT-1 RUN # 2

METER BOX # 45G-P METER Y 1.012 FILTER # (F) 131 (R) 130

PRE TEST LEAK RATE = .002 CFM @ -23.75 IN. HG FILTER SIZE: 110mm

POST TEST LEAK RATE = .000 CFM @ -11.25 IN. HG PROBE LENGTH 24" 9600

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1215	00	786.900	-.036	89	75	0.90	0
25	10	791.785	-.035	96	80	.86	0
35	20	796.780	-.035	94	85	.87	0
45	30	801.725	-.034	99	91	.87	0
55	40	806.645	-.035	99	95	.87	0
1305	50	811.560	-.035	98	99	.87	0
15	60	816.530	-.035	96	101	.87	0
25	70	821.395	-.035	94	104	.87	0
35	80	826.330	-.036	92	105	.87	0
45	90	831.265	-.036	90	106	.88	0
55	100	836.210	-.035	89	108	.88	0
1405	10	841.178	-.035	89	109	.88	0
15	20	846.150	-.035	89	109	.88	0
25	30	851.120	-.034	90	111	.87	0
35	40	856.075	-.035	89	111	.88	0
45	50	861.045	-.035	88	112	.88	0
55	60	866.000	-.036	88	113	.88	0
1505	70	870.990	-.035	88	113	.89	0
15	80	875.915	-.035	89	113	.89	0
25	90	880.910	-.035	88	114	.88	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	-.028	93
2	1.5"	-.042	92
3	4.5"	-.040	92
4	5.5"	-.030	92
W-1	0.5"	-.026	91
2	1.5"	-.039	90
3	4.5"	-.041	90
4	5.5"	-.035	89
	Avg.	-.0351	91.125
			551.125

Pitot Leak Check Pre ok Post ok

Cp = 0.99

N
1
*2
W 1 2 3 4
3
4

*=point of Avg. delta p

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

138.213 cfm

BP = Start 29.88 in Hg
60 min 29.88
120 min 29.98
180 min 29.96

$\bar{X}$ = 29.89" Hg

METHOD 5G -1 PARTICULATE SAMPLING DATA Kuma LAB-1

DATE 8/29/96 PAGE 2 OF 2 MODEL # Sco # HT-1 RUN # 2

METER BOX # 456-P METER Y 1.012 FILTER # (F) 131 (R) 130

PRE TEST LEAK RATE = .002 CFM @ -23.75 IN. HG FILTER SIZE: 110 MM

POST TEST LEAK RATE = .000 CFM @ -11.25 IN. HG PROBE LENGTH 24" glass

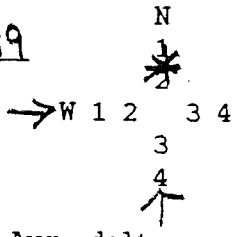
TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1535	200	885.870	-.035	88	115	.87	0
45	10	890.911	-.034	88	115	.87	0
55	20	895.875	-.035	88	115	.88	0
1605	30	900.825	-.035	88	116	.88	0
15	40	905.840	-.035	88	116	.88	0
25	50	910.872	-.035	87	116	.88	0
	60						
	70						
	80						
	90						
	00						
	10						
	20						
	30						
	40						
	50						
	60						
	70						
	80						
	90						

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	-.028	93
2	1.5"	-.042	92
3	4.5"	-.040	92
4	5.5"	-.030	92
W-1	0.5"	-.026	91
2	1.5"	-.039	90
3	4.5"	-.041	90
4	5.5"	-.035	89
	Avg.	-.0351	91.125 / 551.125

Pilot Leak Check Pre Ok Post Ok

Cp = 0.99



*=point of Avg. delta p

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

138.213 cfm

BP = 240 MIN 29.88 in Hg

250 MIN 29.93

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

Into Dessicator: Date 6/1/96 Time 1532 By ATM Front Half _____ Back Half _____

Manufacturer: S&S Size: 110 mm Lot.No.: 250941 Grade: [illegible]

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
126	.7451	6/3/96	1111	ATM	.7449	6/5/96	1853	RLS				
127	.7364	"	1110	ATM	.7360	6/5/96	1852	RLS				
128	.7419	"	1109	ATM	.7416	6/5/96	1851	RLS				
129	.7422	"	1108	ATM	.7420	6/5/96	1850	RLS				
130	.7306	"	1107	ATM	.7304	6/5/96	1849	RLS				
131	.7420	"	1106	ATM	.7413	6/5/96	1848	RLS	.7414	6/6/96	11:35	ATM
132	.7374	"	1102	ATM	.7371	6/5/96	1848	RLS				
133	.7371	"	1102	ATM	.7369	6/5/96	1847	RLS				
134	.7404	"	1101	ATM	.7403	6/5/96	1846	RLS				
135	.7390	"	1101	ATM	.7389	6/5/96	1845	RLS				
136	.7388	"	1100	ATM	.7386	6/5/96	1844	RLS				
137	.7395	"	1059	ATM	.7392	6/5/96	1843	RLS				
138	.7394	"	1058	ATM	.7392	6/5/96	1843	RLS				
139	.7435	"	1058	ATM	.7433	6/5/96	1842	RLS				
140	.7395	"	1057	ATM	.7393	6/5/96	1840	RLS				
141	.7486	"	1057	ATM	.7477	6/5/96	1839	RLS	.7476	6/6/96	1133	ATM
142	.7265	6/5/96	1838	RLS	.7264	6/6/96	11:32	ATM				
143	.7258	6/5/96	1837	RLS	.7258	6/6/96	11:31	ATM				
144	.7254	6/5/96	1836	RLS	.7254	6/6/96	11:30	ATM				
145	.7376	"	1056	ATM	.7372	6/5/96	1830	RLS	.7376	6/6/96	1139	ATM
146	.7513	"	1056	ATM	.7510	"	1832	RLS				
147	.7465	"	1055	ATM	.7462	"	1833	RLS				
148	.7450	"	1054	ATM	.7448	"	1834	RLS				
149	.7474	"	1054	ATM	.7471	"	1835	RLS				
150	.7415	"	1053	ATM	.7413	"	1835	RLS				

Checked by ATM Date: 6/6/96 Time 1141

QA REWEIGH

Filter #	WT	Date	Time	By	
136	.7386	6/6/96	11:34	ATM	OK
129	.7412	6/6/96	11:36	ATM	OK
149	.7472	6/6/96	11:39	ATM	OK

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
59	72	45	6/3/96	1005	ATM
57	73	49	6/5/96	1825	RLS
57	73	49	6/6/96	1035	ATM

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

Into Dessicator: Date: 6/27/96 Time: 1200 By: A.T. Mus...

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4824	8/8/96	1446	ATM	65.4819	8/9/96	1125	RLS				
2	66.1488	7/25/96	1217	RLS	66.1484	8/1/96	0958	ATM				
3	67.8548	8/8/96	1553	ATM	67.8542	8/9/96	1103	RLS	67.8544	8/14/96	1130	ATM
4	67.5870	8/8/96	1424	ATM	67.5865	8/9/96	1130	RLS	Kuma	#1		
5	67.2054	8/8/96	1618	ATM	67.2050	8/9/96	1058	RLS	Kuma	5		
6	67.4250	7/3/96	1403	RLS	67.4241	7/10/96	1059	ATM	67.4250	7/25/96	1155	RLS
7	65.5428	8/8/96	1533	ATM	65.5423	8/9/96	1110	RLS	Kuma	4		
8	66.0183	7/10/96	1100	ATM	66.0187	7/25/96	1055	RLS				
9	66.9280	7/10/96	1312	ATM	66.9276	8/9/96	1120	RLS	Kuma #2	✓		
10	66.0862	7/10/96	1111	ATM	66.0860	7/25/96	0933	RLS				
11	65.6989	7/10/96	1108	ATM	65.6989	7/25/96	1020	RLS				
12	Broken											

Kuma ?

Blank 8/8/96 ?

Checked By: _____ Date: _____ Time: _____

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	47	7/3/96	0953	ATM
60	72	49	7/10/96	1026	ATM
57.5	69	48	8/1/96	0948	ATM
66	79	49	8/8/96	1235	ATM
60	72	49	8/9/96	0745	ATM
64	77	49	8/14/96	1116	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9, [illegible], Rev4/90
Unit Summit Scott HT-1
Run # 2
Date: 9/29/96

9

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
9	✓	9/4/96	1016	ATM	66.9307	9/6/96	1045	ATM	66.9305	9/11/96	1942	RLS				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
(R) 130	.7307	8/29/96	1726	ATM	.7307	8/30/96	1011	ATM	.7306	9/6/96	1041	ATM	.7304	9/9/96	1817	ATM
(F) 131	.7685	8/29/96	1728	ATM	.7676	8/30/96	1009	ATM	.7672	9/6/96	1042	ATM	.7667	9/9/96	1818	ATM
					.7678	9/10/96	1746	ATM	.7670	9/12/96	1572	RLS				

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	8/30/96	1005	ATM	61	73	48
2	9/6/96	1030	ATM	60	72	49
3	9/9/96	1806	ATM	63	76	48
4	9/10/96	1726	ATM	64	77	48
5	9/11/96	1930	ATM	63	76	48

SCALE ROOM ENVIRONMENTAL CONDITIONS

6	9/12/96	1326	ATM	59	71	48
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Blank 8/8/96

WST5-Form9, Pg1, Rev4/90
Unit Kuma Scott HT-1
Run # 2
Date: 8/29/96

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
6	✓	8/16/96	11:30	ATM	67.4251	8/15/96	1717	ATM	67.4251	8/29/96	1031	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	Date	Time	By	WB	DB	%RH
1	8/15/96	1702	ATM	66	71	49
2	8/29/96	1008	ATM	64	77	49
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 6/20/96

Through 9/10/96

Scale Mettler

Model AE 100

SN K04827

TROEMNER CLASS S WTS.

	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
	100.0003	10.0000	1.0000	.1000	.0199	RLS.	6/20/96	1625	61	74	47
	100.0000	10.0000	1.0000	.1000	.0200	ATM	6/21/96	1259	61	74	47
	100.0005	10.0001	1.0001	.1000	.0200	ATM	6/25/96	1410	63	76	48
R	99.9996	10.0000	1.0001	.1001	.0201	ATM	6/26/96	1558	64	78	46
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	6/27/96	1718	65	78	49
R	99.9995	10.0000	1.0000	.1000	.0200	ATM	6/28/96	1254	58	70	48
	100.0001	10.0000	1.0001	.1000	.0200	ATM	7/1/96	1504	65	78	49
	100.0003	10.0001	1.0001	.1000	.0200	ATM	7/2/96	1316	64	77	49
	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/3/96	953	58	70	47
R	99.9998	10.0000	1.0001	.1000	.0201	ATM	7/8/96	1727	57	83	42
R	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/9/96	1456	% RH To high		
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	7/10/96	1006	60	78	49
	99.9998	10.0000	1.0000	.1001	.0200	ATM	7/11/96	0918	59	71	48
	99.9998	9.9999	1.0000	.1000	.0200	ATM	7/12/96	842	59	71	48
	100.0000	10.0001	1.0000	.1001	.0201	ATM	7/16/96	1233	62	75	47
	100.0003	10.0003	1.0002	.1002	.0202	ATM	7/17/96	1605	63	74	54
	99.9996	9.9998	.9998	.0998	.0198	ATM	7/18/96	0753	68	56	49
	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/19/96	0740	71	59	48
R	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/22/96	1445	82	68	48
R	99.9997	10.0001	1.0002	.1001	.0201	ATM	7/23/96	1513	80	66	47
	99.9996	10.0000	1.0000	.1001	.0200	ATM	7/24/96	0757	59	71	48
	99.9999	10.0000	1.0000	.1001	.0201	ATM	7/24/96	1617	71	86	47
	99.9999	10.0001	1.0001	.1001	.0201	ATM	7/25/96	0814	61	73	49
	100.0002	10.0002	1.0002	.1001	.0201	ATM	7/31/96	2035	65	79	47
	99.9995	10.0000	1.0000	.1001	.0202	ATM	8/1/96	0905	69	57.5	46
	100.0000	10.0001	1.0001	.1001	.0202	ATM	8/1/96	1950	60	72	49
	99.9998	10.0000	1.0001	.1000	.0202	ATM	8/2/96	801	59	71	47
	100.0001	10.0000	1.0000	.0999	.0199	ATM	8/8/96	1235	66	79	49
R	99.9996	10.0000	1.0001	.1000	.0201	ATM	8/9/96	0754	60	72	49
	100.0003	10.0001	1.0000	.1000	.0200	ATM	8/14/96	1116	64	77	49
R	99.9999	10.0001	1.0001	.1001	.0201	ATM	8/15/96	1902	66	79	49
	100.0002	10.0000	1.0001	.1001	.0201	ATM	8/28/96	1611	70	85	49
	99.9995	10.0000	1.0000	.1001	.0200	ATM	8/29/96	1008	64	77	49
R	99.9996	10.0000	1.0000	.1000	.0200	ATM	8/30/96	1005	61	73	48
	99.9996	10.0001	1.0000	.1000	.0200	ATM	9/5/96	0954	59	71	48
R	99.9996	10.0000	1.0000	.1002	.0200	ATM	9/6/96	1030	72	80	49
	100.0000	10.0000	1.0000	.1000	.0200	ATM	9/9/96	1806	76	63	48
	100.0005	10.0002	1.0002	.1001	.0200	ATM	9/10/96	1726	77	64	48

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 9/11/96

Through _____

Troemner Class S wts.

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
✓	No	100.0003	10.0001	1.0001	.1001	.0201	9/11/96	1730	ATM	63	76	48.0
✓	No	99.9997	10.0000	1.0000	.1000	.0199	9/12/96	1326	ATM	59	71	48.0
✓	No	99.9998	10.0000	1.0000	.1000	.0200	9/13/96	0756	ATM	70	58	49.0
✓	No	99.9996	9.9999	1.0000	.0999	.0199	9/13/96	1219	ATM	71	59	48.0

Unit: Kuma Scott HT-1
Run: 3
Date: 8/29/96
Technicians: ATM RLS
WST20, Form5

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

Filters

Filter # 131 (F) Beaker # 9 Final Wt. 66.9305 g ✓
Final Wt .7670 g ✓ Ml 35 Tare Wt. 66.9276 g ✓
Tare Wt .7414 g ✓ Desc. Acetone Net Wt. .0029 g ✓
Net Wt .0256 g

Filter # 130 (R) Beaker # _____ Final Wt. _____ g
Final Wt .7304 g ✓ Ml _____ Tare Wt. _____ g
Tare Wt .7304 g ✓ Desc. _____ Net Wt. _____ g
Net Wt .0000 g ✓

Acetone Blank Calculation: Blank done 8/8/96

Blank Beaker # 6 Final Wt 67.4251 g.
Ml 140 Tare Wt 67.4250 g.
Desc Acetone Net Wt .0001 g.
.0001 g ÷ 140 ml = .0000007 g/ml

Particulate Catch Calculation

Filter: .0257 g ✓
Filter: ✓ .0000 g ✓
Beakers: .0029 g - (.0000007)(35) = .0029 g ✓
Total Catch g/Ml of Acetone Blank Value/Ml of Acetone
Total Catch = .0286 g ✓

Unit SCOTT KUMA HT-1
Run # 2
Date 8/29/96
Technician ATH, RLS,
WST6-Form1, Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.716 ft^3

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

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

Wet Bulb/ Start: WB: 64 °F DB: 71 °F 1.8 % Amb Moisture 68 %RH

Dry Bulb Stop: WB: 67 °F DB: 77 °F 1.8 % Amb Moisture 59 %RH

$\bar{X}$ = 1.8 % Ambient Moisture $\bar{X}$ = 63.5 % Relative Humidity (RH)

Empty Stove Wt: 343.1 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 433.1 lbs. Dry: 432.8 lbs.

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

Kindling Wt. Paper: 0.3 lbs. Wood: 4.0 lbs.

Pre Burn Fuel Wt. 11.2 + 11.5 + 12.9 Total: 35.6 lbs.

Total Kindling and Pre Burn Fuel Wt 39.9 lbs.

Coal Bed Wt-lbs: Range (2.7 - 2.2) 435.5-435.0 lbs. Actual: 2.7 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\frac{435.5}{\text{Upper Wt.}} + \frac{435.0}{\text{Lower Wt.}}$ /2 x .25 = 0.6 lbs.

Test Fuel Wt-lbs: Ideal 12.0 lbs. Range: 10.9-13.2 lbs. Actual: 10.9 lbs.

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

2 x 4's x 14 5/16	"	3 Pcs	6.9 lbs.	63.3 %
4 x 4's x 14 5/16	"	1 Pcs	4.0 lbs.	36.7 %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.9 - (10.9 \times .18038)}{2.2046} \times \frac{60}{250} = .9726$ Est. Dry Burn Rate (Kg/Hr) ✓

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) x $\frac{63}{100}$ x .9726 = 11,727 Est Heat Output (HO_E) BTU's/Hr ✓

Comments:

Unit: Kuma Scott HT-1
Run: 2
Date: 8/29/96
Technician(s): ATM RLS
WST3-Form 1 Rev 9/90

STOVE OPERATING DATA
WOODSTOVE TEST DATA SHEET #9

Fire Started: 0815 PDST

Warm up and Preburn: Primary Air: Wide open from ignition until the start of the preburn when the primary air control(s) was (were) adjusted to the run setting of 3/8" open on arc. At the run setting until the start of the test.
3/8" open on arc = Stop

Secondary Air:
No Controls. Naturally drafted

Secondary Burn/[redacted] 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 _____ min 32 sec, then closed.

Primary Air: Wide open during the start of the test until 4:55.
Adjusted to the run setting of 3/8" open on arc between 4:55 and 5:00.
At the run setting of 3/8" open on arc at 5:00. into the run.

Secondary Air:
No Controls. Naturally drafted.

Secondary Burn/[redacted] Bypass: N/A

Fan: Off during warm up. On high during the preburn, off at the start of the test. Off for 1st 30 minutes of test. On high at 30 minutes. On high for rest of test.

Test Run Anomlies:

Unit SCOTT KUHA HT-1
Run # 2
Date 8/29/96
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	R.I.B. LUMBER	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2X4	R.I.B. LUMBER	#2 STD. & BTR.	D. FIR, S. GRN.
	4X4	R.I.B. LUMBER	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (11.2 lbs) added at 0832.
2nd Warm up/Pre Burn Fuel charge (11.5 lbs) added at 0938.
3rd Warm up/Pre Burn Fuel charge (12.9 lbs) added at 1028.
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 pc. pre burn/warm up fuel charge. The stove lost 0.3 lbs.

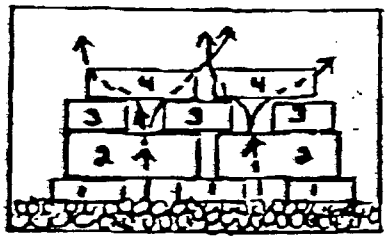
All pre burn/warm up fuel pieces were either 14 or ____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 14 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 14 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 2 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 SCOTT KUMA HT-1
Run # 5
Date 8/29/96
Technician ATH, RLS.
Page 2 of 3
WST7-Form2-A, Rev 6/90

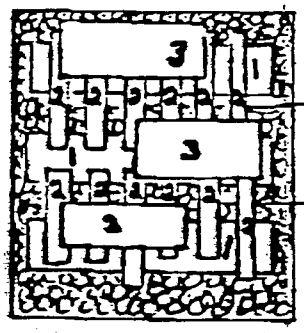
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

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 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 3/8" open on arc 3.0 lbs above the upper charcoal bed weight.

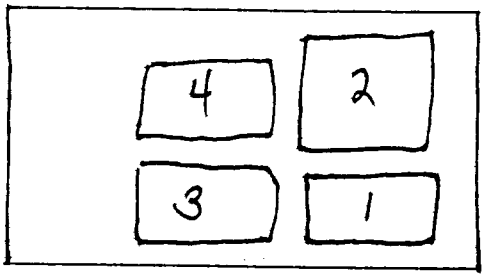
Unit SCOTT KUHA HT-1
Run # 2
Date 8/29/96
Technician ATH, RLS.
Page 3 of 3
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: (1.) Turn Fan off. (2.) Opened primary air control wide open (3.) Open door (4.) loaded test fuel charge into the stove (5.) Photo (6.) Closed the door.

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



FRONT of stove view

4 X 4's: 2

2 X 4's: 1, 3 & 4

Loading Sequence: 1, 2, 3 & 4

Driest Pcs in Load 3

Loaded the test fuel charge on an essentially level, large-medium sized, hot coal bed (in appearance, color and temperature for a low burn rate. Load 0:32, Ignition 0:30, Vertical column of flame (VC) to baffle 2:00, Secondaries igniting 2:15 at top of VC 3:00 Middle tube igniting. 3:30 Front Tube igniting 4:00 Secondaries all across the top of the fuel load under the baffle. 5:00 Primary Air → run setting. Flames decreased Maintained Hot pocket under pc 3, VC on left, in center and right (sm) w/ 2nds at top of L & Center VC's. Never lost gas balance. Max CO 0.53%. 11:35 top of pc 2 ignited. Flames steadily increasing big hole burnt out under pc 3. Btm spacer gone. 18:18 CO ↑ to 0.66%, 20:13 CO ↓ to 0:37% Front tube igniting 59:00. Rt stack broke down and slid forward into air wash. COT. Very Lt. Smoke.

Unit: SCOTT KUHA HT-1
Run: 2
Date: 8/29/96
Technician: ATH, 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: 1040
Calibration Checks: X ✓ Y ✓ 12.5 12.4 22.0 22.0

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg
			Uncor	Cor	Uncor	Cor	Uncor	Cor	Corrected
1	2x4x	K	8.0	8.4	8.0	8.4	8.0	8.4	8.400
2									
3									
4									
5	2x4x8'	P	18.0	19.2	18.0	19.2	18.5	19.8	19.400
6	"	P	18.5	19.8	18.0	19.2	18.0	19.2	19.400
7	"	P	19.5	20.9	19.0	20.3	19.5	20.9	20.700
8									59.500
9									
10									
11	2x4x14 1/2"	T	20.5	22.0	20.5	22.0	20.0	21.4	21.800
12	"	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
13	"	T	22.5	24.3	22.0	23.7	21.0	22.6	23.533
14									
15	4x4x14 1/2"	T	21.5	23.1	22.5	24.3	21.5	23.1	23.500
16									88.033
17									
18									
19	FEET	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
20									OUT SPACERS

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	8.400 %	19.833 %	22.008 %
% Moisture - Wet Basis:	7.749 %	16.551 %	18.038 %

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: SCOTT KUHA HT-1
Run#: 2
Date: 8/29/96
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. 1.545 cm 3.9243 ✓

Width (W): IN. 3.576 cm 9.0830 ✓

Length (L): 3.555 cm
3.535 cm
3.565 cm
3.563 cm

Length $\bar{X}$ = IN. 3.555 ✓ cm 9.0297 ✓

Volume: 321.860 cm³ ✓
(D X W X L)

MOISTURE: Room Temperature: 70 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ✓ ~~No~~

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	22.5	24.3 %
Bottom:	22.5	24.3 %
Side:	22.5	24.3 %
$\bar{X}$:		24.300 %

Avg % Moisture (Dry) 24.300 % ✓

Aug % Moisture (Wet) 19.549 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 191.4 g Dry Weight: 150.4 g

% Moisture Dried Basis: 21.421 % ✓
[1 - (Dry Wt - Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	8/29/96	1015	215 °F
Out of Dryer	9/9/96	1715	220 °F

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

Density = 150.4 g (dry wt) ÷ 321.860 cm³ (volume) = .4673 g/cm³ ✓

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
WOOD FIRE DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: SCOTT KUMA HT-1 Date: 8/29/91
Run: 2 Technician(s): ATH, JS
Page: 1 of 3

435.5

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.	SO_2 PPM	Static Press.	Comments
0 1215	446.4	10.9	0	.248	6.20	53.8	13.4			1.30	4.8	81	108	2.5	104	240			-.042	Flow
5 20	445.6	10.1	.8	.358	8.91	42.3	10.5			0.42	21.2	86	130	2.6	107	353			-.062	SO_2 1.5
10 25	445.1	9.6	.5	.301	7.51	50.6	12.6			0.52	14.4	114	145	8.5	130	346			-.063	~~CO_2~~ 1.5
15 30	444.7	9.2	.4	.377	9.38	44.3	11.0			0.38	24.7	119	144	10.0	133	357			-.066	~~O_2~~ 1.5
20 35	444.2	8.7	.5	.328	8.17	48.3	12.0			0.63	13.0	121	143	11.5	136	349			-.064	~~CO~~ 1.5
25 40	443.7	8.2	.5	.428	10.6	39.7	9.90			0.28	38.0	125	145	12.5	139	381			-.068	
30 45	443.1	7.6	.6	.571	12.7	31.4	7.83			0.22	57.7	126	147	13.0	142	403			-.071	
35 50	442.5	7.0	.6	.536	13.3	30.0	7.48			0.21	63.4	126	144	13.0	142	409			-.070	
40 55	441.9	6.4	.6	.544	13.5	28.1	7.01			0.29	46.6	123	140	12.0	139	398			-.069	
45 1300	441.3	5.8	.6	.568	14.1	25.4	6.34			0.38	37.1	122	139	12.0	140	405			-.069	
50 05	440.8	5.3	.5	.452	11.2	36.3	9.05			0.55	20.4	113	131	9.0	132	361			-.063	
55 10	440.5	5.0	.3	.425	10.6	38.6	9.63			0.72	14.7	108	126	7.5	127	341	✓		-.061	✓
																(4343)			(.768)	Flow
60 15	440.1	4.6	.4	.438	10.9	37.7	9.40			0.83	13.1	104	123	6.5	124	334			-.059	SO_2 1.5
65 20	439.7	4.2	.4	.431	10.7	38.1	9.50			0.97	11.0	103	122	6.5	123	324			-.058	~~CO_2~~ 1.5
70 25	439.3	3.8	.4	.397	9.88	41.1	10.2			1.20	(8.2)	101	118	6.5	123	314			-.057	~~O_2~~ 1.5
75 30	439.1	3.6	.2	.318	7.93	49.1	12.2			1.26	6.3	98	113	5.0	118	291			-.057	~~CO~~ 1.5
80 35	438.8	3.3	.3	.275	6.86	52.9	13.2			1.28	5.4	95	108	4.6	113	272			-.050	
85 40	438.6	3.1	.2	.267	6.67	53.5	13.3			1.22	5.5	93	106	4.6	112	262			-.048	
90 45	438.4	2.9	.2	.246	6.15	54.6	13.6			1.58	3.9	92	105	4.4	111	249			-.046	
95 50	438.2	2.7	.2	.236	5.90	55.6	13.9			1.57	3.9	90	103	4.3	110	242			-.044	
100 55	438.1	2.6	.1	.240	6.00	54.9	13.7			1.44	4.2	89	101	4.2	109	233			-.042	
105 1400	437.9	2.4	.2	.255	6.37	53.6	13.4			1.35	4.7	89	101	4.2	109	230			-.041	
110 05	437.7	2.2	.2	.283	7.06	51.5	12.8			1.19	5.9	88	100	4.1	109	235			-.041	
115 10	437.6	2.1	.1	.286	7.13	50.9	12.7			0.95	7.5	88	100	4.1	109	238	✓		-.041	✓
																(3324)			(.579)	

7567 ✓ 1.347

BURN ...TE AND FLUE GAS DATA
WOOD...VE DATA SHEET #12
WST2-Form 14 Rev 1/88

...it: SCOTT KUMA HT-1 Date: 8/29/96
Run: 2
Page: 2 of 3
Technician(s): ATH, KLS.

435.5

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 / 1445	437.4	1.9	.2	.262	6.54	53.8	13.4			1.02	6.4	87	98	4.0	110	243			-.041	Flow
125 / 20	437.3	1.8	.1	.266	6.64	53.4	13.3			0.92	7.2	86	97	3.8	109	247			-.041	SO2 1.5
130 / 25	437.1	1.6	.2	.279	4.96	57.5	12.8			0.89	7.8	86	97	3.8	109	250			-.041	~~CO2~~ T.S
135 / 30	437.0	1.5	.1	.282	7.04	51.2	12.8			0.92	7.6	85	95	3.7	108	248			-.041	~~O2~~ T.S
140 / 35	436.9	1.4	.1	.213	5.33	56.8	14.2			1.61	3.3	84	90	3.7	106	229			-.038	~~CO~~ T.S
145 / 40	436.8	1.3	.1	.202	5.06	57.4	14.3			1.71	3.0	83	87	3.7	105	218			-.036	
150 / 45	436.7	1.2	.1	.196	4.91	58.0	14.5			1.68	2.9	82	85	3.5	104	210			-.035	
155 / 50	436.6	1.1	.1	.203	5.08	57.5	14.3			1.69	3.0	81	87	3.4	103	206			-.034	
160 / 55	436.6	1.1	0	.194	4.86	58.2	14.5			1.88	2.6	81	88	3.4	103	200			-.033	
165 / 1500	436.5	1.0	.1	.200	5.01	57.6	14.4			1.85	2.7	81	88	3.4	102	197			-.032	
170 / 05	436.5	1.0	0	.197	4.94	57.7	14.4			1.88	2.6	81	89	3.3	100	194			-.031	
175 / 10	436.4	.9	.1	.193	4.84	58.0	14.5			1.88	2.6	81	89	3.3	101	192			-.030	✓
																(2634)	✓		(.433)	Flow
180 / 15	436.4	.9	0	.189	4.74	58.4	14.6			1.92	2.5	82	91	3.4	100	191			-.030	SO2 1.5
185 / 20	436.3	.8	.1	.193	4.84	58.1	14.5			1.90	2.5	82	91	3.4	101	188			-.029	~~CO2~~ 1.5
190 / 25	436.2	.7	.1	.189	4.74	58.1	14.5			2.06	2.3	82	92	3.4	100	186			-.029	~~O2~~ 1.5
195 / 30	436.2	.7	0	.187	4.69	58.4	14.6			2.11	2.2	82	92	3.4	100	185			-.028	~~CO~~ 1.5
200 / 35	436.1	.6	.1	.203	5.08	57.5	14.3			1.84	2.8	82	92	3.4	100	184			-.028	
205 / 40	436.0	.5	.1	.207	5.18	57.2	14.3			1.79	2.9	82	93	3.3	100	184			-.028	
210 / 45	436.0	.5	0	.213	5.33	56.6	14.1			1.78	3.0	83	93	3.4	100	184			-.027	
215 / 50	435.9	.4	.1	.210	5.26	57.0	14.2			1.70	3.1	83	93	3.4	99	183			-.027	
220 / 55	435.8	.3	.1	.213	5.33	56.6	14.1			1.72	3.1	82	95	3.1	99	182			-.027	
225 / 1600	435.8	.3	0	.219	5.48	56.2	14.0			1.68	3.3	82	97	3.1	99	182			-.027	
230 / 05	435.7	.2	.1	.199	4.98	58.5	14.6			1.54	3.2	81	98	3.1	99	180			-.026	
235 / 10	435.7	.2	0	.181	4.54	59.7				1.83	2.5	81	99	3.0	98	177	✓		-.026	
																(2206)			(.332)	✓

245

4840

.765 ✓

BURN ...E AND FLUE GAS DATA
WOODS...OVE DATA SHEET #12
WST2-Form 14 Rev 1/88

...it: SCOTT KUMA HT-1 Date: 8/29/96
Run: 2
Page: 3 of 3
Technician(s): ATH, RLS,

435.5

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
240 / 15	435.6	.1	.1	.181	4.54	59.8	14.9			1.78	2.6	81	99	3.0	98	177			-.026	Flow
245 / 20	435.6	.1	0	.179	4.49	60.2	15.0			1.74	2.6	81	99	3.0	98	176			-.026	SO_2 1.5
250 / 25	435.5	0	.1	.170	4.27	61.0	15.2			1.72	2.5	81	99	3.0	98	176			-.026	~~CO_2 1.5~~
255 / 30																529 ✓			.078	~~O_2 1.5~~
260													✓							~~CO 1.5~~
265													51÷			12,936 ✓			2.190 ✓	
270																				
275																254 ✓			-.043 ✓	
280																				
285																				
290																				
295																				
																				Flow
300																				SO_2 1.5
305																				CO_2 1.5
310																				O_2 1.5
315																				CO 1.5
320																				
325																				
330																				
335																				
340																				
345																				
350																				
355																				

Pre Burn Start Wt. 438.2 lbs. (3.0 lbs. up)
Test Start wt. Range 435.5 - 435.0 lbs.

PRE BURN DATA
RECORD SHEET #13.
WST2-Form16

BARO. PRESSURE 29.89

Test: SCOTT KUMA HT-1 Date: 8/29/96
Run: 2 Technician(s): ATM, RL
Page: 1 of 1

Minute Time	Scale Weight	Burn Rate	Stack	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Static	Comments
0 1110	438.5	0	622	856	532	308	529	457	1062	1475	78	-.08	Primary Air Set at 3/8" OPEN
5 15	438.0	.5	437	758	564	223	561	488	1018	1399	77	-.07	Secondary Air Set at N/A
10 20	437.5	.5	443	745	575	194	572	502	1045	1148	77	-.07	Fan: ON HIGH RATE COILS
15 25	437.2	.3	389	684	576	180	569	502	1032	1171	76	-.06	TUNNEL ON AT: 1110
20 30	437.0	.2	346	598	568	174	560	494	1010	1114	75	-.062	
25 35	436.8	.2	319	548	561	170	550	486	962	1034	74	-.057	
30 40	436.7	.1	300	492	550	167	538	479	941	974	74	-.054	Pumps turned on at: 1140
35 45	436.0	.1	287	447	534	163	521	473	897	891	73	-.057	REMOVE COILS .6 lb.
40 50	435.9	.1	279	438	525	159	571	470	866	861	72	-.050	420.6
45 55	435.8	.1	269	417	514	155	496	466	847	837	71	-.048	Check WB/DB: 93/101 409.6
50 1200	435.7	.1	261	403	498	151	480	462	838	819	70	-.047	398.8
55 05	435.7	0	255	392	483	147	465	460	838	810	69	-.046	389.4
60 10	435.6	.1	248	381	474	146	455	455	820	792	70	-.044	
65 15	435.5	.1	240	369	461	144	442	450	802	776	71	-.042	373.2
70													
75													
80													
85													
90													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

U: SCOTT KUMA HT-1 Date: 8/29/96
R: 2 Technician(s): ATH, RL
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	Con-dar	
0 / 1215	369	461	144	442	450	802	776	71	89	248	36	75	35		
5 / 20	363	447	186	431	417	760	1115	74	103	247	37	75	35		
10 / 25	493	434	215	418	429	707	798	70	96	247	37	76	35		
15 / 30	533	424	227	407	424	704	841	70	95	248	37	76	35		
20 / 35	535	416	233	396	412	714	879	70	94	248	37	76	36		
25 / 40	586	409	234	388	402	741	886	70	96	248	37	76	36		
30 / 45	641	404	234	383	393	801	1074	70	99	248	37	76	35		
35 / 50	680	418	176	389	389	830	1099	70	99	248	37	77	35		
40 / 55	684	426	149	395	384	867	1241	72	99	248	37	77	35		
45 / 1300	696	433	140	401	377	880	1239	72	100	248	37	77	35		
50 / 05	639	439	137	409	375	883	1253	71	98	248	37	77	35		
55 / 10	592	441	135	412	374	883	1265	72	97	247	37	77	35		
	(6811)	(5752)	(2210)	(4871)	(4826)	(9572)	(12,466)	(852)							
60 / 15	558	443	134	416	375	898	1199	71	96	247	37	77	35		c
65 / 20	536	446	134	417	379	906	1178	72	95	247	37	77	35		
70 / 25	530	447	135	421	380	892	1103	71	94	247	37	78	35		
75 / 30	480	448	136	422	382	867	982	72	93	248	38	78	35		
80 / 35	442	445	136	420	383	842	926	72	92	248	38	78	35		
85 / 40	418	440	137	416	381	822	914	71	91	248	38	77	35		
90 / 45	393	434	137	414	379	818	908	72	90	248	38	77	35		
95 / 50	377	429	137	410	377	796	897	73	90	247	37	77	36		
100 / 55	360	422	137	404	373	804	884	73	89	248	37	77	35		
105 / 1400	353	417	137	400	370	788	904	73	89	247	37	77	35		
110 / 05	351	413	138	395	367	784	917	74	89	248	37	77	35		
116 / 10	352	410	138	392	362	793	912	74	89	248	37	77	35		
	(5140)	(5194)	(1636)	(4927)	(4508)	(10,010)	(11,724)	(868)							
	11,951	19346	3846	9798	9334	19,582	24,190	1720							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Test: SCOTT KUHA HT-1 Date: 8/29/96
Run: 2 Technician(s): ATM, DS.
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 Condar	18
120 1415	358	406	139	389	360	748	881	74	89	248	37	77	35		
125 20	365	403	138	388	358	757	871	75	90	248	36	76	35		
130 25	371	399	136	388	360	767	893	75	90	248	36	76	35		
135 30	375	396	135	388	362	810	912	75	90	248	36	76	35		
140 35	360	395	134	387	365	793	838	75	89	248	36	77	35		
145 40	339	395	134	383	368	778	834	75	89	247	36	77	35		
150 45	325	396	132	377	370	764	816	76	88	247	36	77	35		
155 50	316	396	132	372	368	757	807	76	88	247	36	77	35		
160 55	307	395	132	364	367	728	759	76	88	248	36	77	36		
165 1500	295	397	131	361	368	723	743	77	87	248	36	77	35		
170 05	294	396	131	356	369	715	737	77	88	248	36	77	36		
175 10	290	398	131	355	366	702	726	77	88	248	36	77	36		
	3995	4772	1605	4508	4381	9036	9817	908							
180 15	285	398	132	353	364	688	717	77	89	247	37	77	36		
185 20	282	396	132	350	362	675	717	77	89	247	37	77	36		
190 25	278	393	132	347	360	667	708	77	88	247	37	77	36		
195 30	276	388	132	347	359	665	709	77	88	248	38	77	36		
200 35	273	384	133	346	356	661	718	77	88	248	38	77	36		
205 40	272	381	133	346	357	655	721	77	88	248	38	77	36		
210 45	272	376	133	346	356	658	731	77	88	248	38	77	36		
215 50	273	373	133	347	354	654	734	77	89	247	38	77	36		
220 55	271	371	133	348	355	652	731	77	88	247	37	77	36		
225 1600	272	368	134	348	353	654	734	77	88	247	37	77	36		
230 05	269	365	134	349	357	627	715	77	88	248	37	77	36		
235 10	266	361	134	348	350	612	696	77	88	248	36	78	36		
	3289	4554	1595	4175	4278	7868	8631	924							
	7284	9326	3200	8683	8659	16,904	18,448	1832							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

U): SCOTT KUMA HT-1 Date: 8/29/96
R. 2 Technician(s): ATH, L.
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 1615	262	357	135	346	349	605	691	77	88	248	36	78	36		
245 20	260	353	134	345	349	597	683	77	87	248	36	78	36		
250 25	257	347	133	343	349	586	669	77	87	248	36	78	36		
255 30	779	1057	402	1034	1047	1788	2043	231	✓						
260	✓	✓	✓	✓	✓	✓	✓								
265	20,014	20,772	7448	19,515	19,040	38,274	44,681	3783	✓	51÷					
270	✓	✓	✓	✓	✓	✓	✓				START	373.2	✓		
275	392	406	146	383	373	750	876	74	✓		FINISH	285.8	✓		
280											ΔT=	-87.4	✓		
285															
290															
295															
300															
305															
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: 8/29/96 Analyte: CO_2

Source: Kuma Scott HT-1 Run #: 2

Zero Cyl #: 4-36919 Conc. 00.0 % CO_2 Cyl Press: 2025 psi

Certified by: Cascade Air Gas Date: 4/24/96

Span Cyl #: W260657 Conc. 10.1 % CO_2 Cyl Press: 970 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T. Myren Time: 1100 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	,0666	,0666	0,27
Span	10.1	.404	10.1	40.0	,401	9.977	-.1230	-1,22

Comments:

Post Run Audit: By: A.T. Myren Time: 1655 Temp: 75 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	,000	.0666	,0666	0,27
Span	40.1	.404	10.1	40,1	,402	10.0017	-,0983	-0,97

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: 3/29/96 Analyte: O_2

Source: Kuuma Scott HT-1 Run #: 2

Zero Cyl #: 4-36919 Conc. 00.0 % O_2 Cyl Press: 2025 psi

Certified by: Cascade Air Gas Date: 4/24/96

Span Cyl #: W260657 Conc. 12.5 % O_2 Cyl Press: 970 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T.Myren Time: 1100 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.4	00.2	.0552	.0552	+0.22
Span	12.5	50.0	12.5	12.55	49.8	12.4175	-.0825	-0.66

Comments:

Post Run Audit: By: A.T.Myren Time: 1655 Temp.: 75 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.4	00.2	.0552	.0552	+0.22
Span	12.5	50.0	12.5	12.55	49.8	12.4175	-.0825	-.066

Comments:

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

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

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

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

Site: Myren Consulting, Woodinville, WA Date: 8/29/96 Analyte: CO

Source: Kuma Scott HT-1 Run #: 2

Zero Cyl #: 4-36919 Conc. 00.0 % CO Cyl Press: 2025 psi

Certified by: Cascade Air Gas Date: 4/24/96

Span Cyl #: W260 657 Conc. 2.47 % CO Cyl Press: 970 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T. Myren Time: 1100 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	-00.3	-.0062	-.0062	-0.12
Span	2.47	49.4	2.47	2.49	49.5	2.4004	-.0696	-2.82

Comments:

Post Run Audit: By: A.T. Myren Time: 1655 Temp.: 75 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	-00.2	-.0013	-.0013	-0.03
Span	2.47	49.4	2.47	2.46	49.0	2.3776	-.0938	-3.80

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: SCOTT KUMA HT-1
Run: 2
Date: 8/29/96
Technicians: ATH, RLS,
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: 69.0 °F; T/C#2: 69.0 °F;

T/C #3: 69.0 °F; T/C #4: 69.0 °F; T/C #5: 69.0 °F;

T/C #6: 68.8 °F; T/C #7: 68.8 °F; T/C #8: 68.8 °F;

T/C #9: 69.0 °F; T/C #10: 69.0 °F; T/C #11: 68.8 °F;

T/C #12: 68.8 °F; T/C #13: 69.0 °F; T/C #14: 69.0 °F;

T/C #15: 69.0 °F; T/C #16: 69.0 °F; T/C #17: ____ °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:

Zero (0°F): -0.6 °F Adj to: 0.0 °F Post Test Check Zero (0°F): 0.4 °F % Difference +0.02

Span (2000°F): 1999.6 °F Adj to: 2000.0 °F Span (2000°F): 2000.6 °F +0.03

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

Thermocouple Readout Pretest Linearity Check

0°F = 0.0 °F; 200°F = 202.0 °F; 400°F = 398.8 °F;

600°F = 601.4 °F; 800°F = 801.0 °F; 1000°F = 1000.8 °F;

1200°F = 1198.8 °F; 1400°F = 1399.6 °F; 1600°F = 1599.0 °F

1800°F = 1799.6 °F; 2000°F = 2000.0 °F

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

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

Scale Check Pre (Wt, #'s): 433.1 - 438.1 5.0 lbs, OK (RLS)

Post (Wt, #'s): 435.3 - 440.3 5.0 lbs, OK (RLS)

Stack cleaned prior to the run: Yes ____ No —

Tunnel cleaned prior to the run: Yes ____ No —

CKUMAR1.XLS

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	CKUMAR1
Stove Manufacturer:	KUMA
Model Number:	SCOTT HT-1
Lab Name:	MYREN
Test Date:	8\28\96
Run Number:	1
Meter Box Y Factor:	1.012
Barometric pressure (in):	29.95
Gas meter temp (ave):	110.57
delta H(avg):	0.886
Gas meter initial reading:	630.3
Gas meter final reading:	739.887
Front catch (acetone) mg:	5.9
first filter catch (mg):	33.1
second filter catch (mg):	0
tunnel flow (ave cfm):	138.10
Emission Rate(g/hr):	3.178
Emission Rate(M5H) :	4.752
vs/VmTs:	0.01
vs ave:	771.90
Tunnel average temp (°f):	96.48
Test time(min):	220
Fuel Load(lb. wet):	10.9
Wood moisture(%wet):	18.139
Burn rate(dry kg/hr):	1.104
Samp vol(scf):	102.994
front filter number	127
back filter number	126
acetone beaker number	4
PRELIMINARY RESULTS	
FINAL RESULTS	X

DATA SUMMARY

MODEL :	SCOTT HT-1
RUN:	1
DATE:	8\28\96
DBR:	1.104
GPH UNADJ	3.178
ADJ	4.752

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	0.038	96	630.000	80	0.900	798.09		
10	0.035	100	635.305	85	0.900	768.69	108.4	5.216
20	0.035	103	640.320	90	0.890	770.75	106.0	4.886
30	0.034	104	645.275	96	0.880	760.33	103.5	4.775
40	0.035	104	650.165	101	0.880	771.43	102.7	4.670
50	0.036	102	655.080	105	0.880	780.99	100.6	4.661
60	0.036	100	660.038	111	0.880	779.60	98.8	4.652
70	0.035	99	664.940	110	0.880	768.01	97.9	4.608
80	0.035	94	669.890	112	0.870	764.56	99.1	4.637
90	0.035	97	674.865	113	0.880	766.63	100.4	4.652
100	0.036	97	679.850	115	0.880	777.50	100.0	4.645
110	0.035	96	684.855	116	0.880	765.94	98.6	4.656
120	0.036	95	689.770	117	0.890	776.11	98.2	4.572
130	0.035	95	694.740	117	0.890	765.25	97.8	4.615
140	0.036	93	699.720	118	0.890	774.71	98.8	4.617
150	0.036	94	704.660	118	0.890	775.41	97.0	4.580
160	0.036	93	709.695	119	0.890	774.71	98.5	4.660
170	0.035	93	714.735	119	0.890	763.87	98.6	4.664
180	0.035	93	719.765	119	0.890	763.87	99.8	4.655
190	0.036	93	724.785	120	0.890	774.71	99.5	4.638
200	0.036	93	729.810	120	0.890	774.71	98.2	4.642
210	0.036	93	734.845	121	0.880	774.71	98.2	4.643
220	0.035	92	739.887	121	0.880	763.18	98.2	4.650
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

Kuma Scott

METHOD 5G-1 PARTICULATE SAMPLING DATA LAB-1

DATE 8/28/96 PAGE 1 OF 2 MODEL # HIT-1 RUN # 1

METER BOX # 456-P METER Y 1.012 FILTER # (F) 127 (R) 126

PRE TEST LEAK RATE = .0005 CFM @ -15.5 IN. HG FILTER SIZE: 110 mm

POST TEST LEAK RATE = .001 CFM @ -8.5 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						
1235	00	630,300	-.038	96	80	0.90	0
45	10	635,305	-.035	100	85	.90	0
55	20	640,320	-.035	103	90	.89	0
1305	30	645,275	-.034	104	96	.88	0
15	40	650,165	-.035	104	101	0.88	0
25	50	655,080	-.036	102	105	.88	0
35	60	660,038	-.036	100	111	.88	0
45	70	664,940	-.035	99	110	.88	0
55	80	669,890	-.035	94	112	.87	0
1405	90	674.865	-.035	97	113	.88	0
15	100	679.850	-.036	97	115	.88	0
25	10	684.855	-.035	96	116	.88	0
35	20	689,770	-.036	95	117	.89	0
45	30	694.740	-.035	95	117	.89	0
55	40	699.720	-.036	93	118	.89	0
1505	50	704,660	-.036	94	118	.89	0
15	60	709,695	-.036	93	119	.89	0
25	70	714,735	-.035	93	119	.89	0
35	80	719,765	-.035	93	119	.89	0
45	90	724.785	-.036	93	120	.89	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	-.032	99
2	1.5"	-.042	98
3	4.5"	-.042	98
4	5.5"	-.031	98
W-1	0.5"	-.027	97
2	1.5"	-.041	97
3	4.5"	-.043	97
4	5.5"	-.033	96
	Avg.	-.0364	97.5
			557.5

Pilot Leak Check Pre OK Post OK

Cp = 0.99

N
W 1 2 * 3 4
3
4

*=point of Avg. delta p

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

~140.008 cfm

BP = Start 29.95 in Hg
60 29.95
120 29.95
180 29.95
Stop 29.95

$\bar{X}$ = 29.95

METHOD 5G-1 PARTICULATE SAMPLING DATA Kuma LAB-1

DATE 8/28/96 PAGE 2 OF 2 MODEL # Scott HT-1 RUN # 1

METER BOX # 5G-P METER Y 1.012 FILTER # (F) 127 (R) 126

PRE TEST LEAK RATE = .0005 CFM @ -15.5 IN. HG FILTER SIZE: 110 mm

POST TEST LEAK RATE = .001 CFM @ -8.5 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						
1555	200	729.810	-.036	93	120	.99	0
1605	10	734.845	-.036	93	121	.98	0
1615	20	739.887	-.035	92	121	.88	0
	30						
	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"	-.032	99
2	1.5"	-.042	98
3	4.5"	-.042	98
4	5.5"	-.031	98
W-1	0.5"	-.027	97
2	1.5"	-.041	97
3	4.5"	-.043	97
4	5.5"	-.033	96
	Avg.	.0364	97.5
			557.5

Pilot Leak Check
Pre Ok Post Ok

Cp = 0.99

N
*2
→ W 1 2 3 4
3
4
↑

*=point of Avg. delta p

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

≈ 140.003 cfm

BP = ~~29.90~~ 29.95 in Hg

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

Into Dessicator: Date 6/1/96 Time 1532 By ATM Front Half _____ Back Half _____

Manufacturer: S&S Size: 110 mm Lot.No.: 25941 Grade: [illegible]

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
126	.7451	6/3/96	1111	ATM	.7449	6/5/96	1853	RLS				
127	.7364	"	1110	ATM	.7360	6/5/96	1852	RLS				
128	.7419	"	1109	ATM	.7416	6/5/96	1851	RLS				
129	.7422	"	1108	ATM	.7420	6/5/96	1850	RLS				
130	.7306	"	1107	ATM	.7304	6/5/96	1849	RLS				
131	.7420	"	1106	ATM	.7413	6/5/96	1848	RLS	.7414	6/6/96	11:35	ATM
132	.7374	"	1102	ATM	.7371	6/5/96	1848	RLS				
133	.7371	"	1100	ATM	.7369	6/5/96	1847	RLS				
134	.7404	"	1101	ATM	.7403	6/5/96	1846	RLS				
135	.7390	"	1101	ATM	.7389	6/5/96	1845	RLS				
136	.7388	"	1100	ATM	.7386	6/5/96	1844	RLS				
137	.7395	"	1059	ATM	.7392	6/5/96	1843	RLS				
138	.7394	"	1058	ATM	.7392	6/5/96	1843	RLS				
139	.7435	"	1058	ATM	.7433	6/5/96	1842	RLS				
140	.7395	"	1057	ATM	.7393	6/5/96	1840	RLS				
141	.7486	"	1057	ATM	.7477	6/5/96	1839	RLS	.7476	6/6/96	1133	ATM
142	.7265	6/5/96	1838	RLS	.7264	6/6/96	11:32	ATM				
143	.7258	6/5/96	1837	RLS	.7258	6/6/96	11:31	ATM				
144	.7254	6/5/96	1836	RLS	.7254	6/6/96	11:30	ATM				
145	[illegible]	"	1056	ATM	.7372	6/5/96	1830	RLS	.7376	6/6/96	1159	ATM
146	.7513	"	1056	ATM	.7510	"	1832	RLS				
147	.7465	"	1055	ATM	.7462	"	1833	RLS				
148	.7450	"	1054	ATM	.7448	"	1834	RLS				
149	.7474	"	1054	ATM	.7471	"	1835	RLS				
150	.7415	"	1058	ATM	.7413	"	1835	RLS				

Checked by ATM Date: 6/6/96 Time 11:41

QA REWEIGH

Filter #	WT	Date	Time	By
136	.7386	6/6/96	11:34	ATM
126	.7412	6/6/96	11:36	ATM
149	.7472	6/6/96	11:39	ATM

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
59	72	45	6/3/96	1005	ATM
57	73	49	6/5/96	1825	RLS
57	73	49	6/6/96	1035	ATM

WST5-Form9,Pg3,Rev6/90

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

4th Round

Into Dessicator: Date: 6/27/96 Time: 1200 By: A.T. Mi...

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4824	8/8/96	1446	ATM	65.4819	8/9/96	1125	RLS				
2	66.1488	7/25/96	1217	RLS	66.1484	8/1/96	0958	ATM				
3	67.8548	8/8/96	1553	ATM	67.8542	8/9/96	1103	RLS	67.8544	8/14/96	1130	ATM
4	67.5870	8/8/96	1424	ATM	67.5865	8/9/96	1130	RLS	Kuma	#1		
5	67.2054	8/8/96	1618	ATM	67.2050	8/9/96	1058	RLS	Kuma	5		
6	67.4250	7/3/96	1403	RLS	67.4241	7/10/96	1059	ATM	67.4250	7/25/96	1155	RLS
7	65.5428	8/8/96	1533	ATM	65.5423	8/9/96	1110	RLS	Kuma	4		
8	66.0183	7/10/96	1100	ATM	66.0187	7/25/96	1055	RLS				
9	66.9280	7/8/96	1312	ATM	66.9276	8/9/96	1120	RLS	Kuma #2			
10	66.0862	7/10/96	1111	ATM	66.0860	7/25/96	0933	RLS				
11	65.6989	7/10/96	1108	ATM	65.6989	7/25/96	1020	RLS				
12	Broken											

Kuma 2

Blank 8/8/96

Checked By: _____ Date: _____ Time: _____

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	47	7/3/96	0953	ATM
60	72	49	7/11/96	1026	ATM
57.5	69	48	8/1/96	0948	ATM
66	79	49	8/8/96	1235	ATM
60	72	49	8/9/96	0745	ATM
64	72	49	8/14/96	1116	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9, Pg-, Rev4/90
Unit Kuma Scott HT-1
Run # 1
Date: 8/29/96

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FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
4	✓	9/4/96	1016	ATM	67.5921	9/5/96	1025	ATM	(67.5924)	9/6/96	1043	RLS				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
R 126	.7449	8/28/96	1711	ATM	.7451	8/29/96	1011	ATM	.7446	8/30/96	1018	ATM	(.7449)	9/5/96	1046	RLS
F 127	.7711	8/28/96	1712	ATM	.7712	8/29/96	1012	ATM	.7695	8/30/96	1019	ATM	.7703	9/5/96	1045	RLS
					.7694	9/6/96	1037	ATM	(.7691)	9/9/96	1826	ATM				

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	8/29/96	1008	ATM	64	77	49
2	8/30/96	1005	ATM	61	73	48
3	9/5/96	0954	ATM	59	71	48
4	9/6/96	1030	ATM	60	72	49
5	9/9/96	1806	ATM	63	76	48

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Blank 8/8/96

WST5-Form9, Pg1, Rev4/90
Unit Kuma Scott HT-1
Run # 1
Date: 9/28/96

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
6	✓	8/16/96	11:30	ATM	67.4251	8/15/96	1717	ATM	67.4251	8/29/96	1031	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	Date	Time	By	WB	DB	%RH
1	8/15/96	1702	ATM	66	79	49
2	8/29/96	1008	ATM	64	77	49
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 6/20/96

Through 9/10/96

Scale Mettler
Model AE 100
SN K04827

TROEMNER CLASS S WTS.

	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
	100.0003	10.0000	1.0000	.1000	.0199	PLS.	6/20/96	1625	61	74	47
	100.0000	10.0000	1.0000	.1000	.0200	ATM	6/21/96	1259	61	74	47
	100.0005	10.0001	1.0001	.1000	.0200	ATM	6/25/96	1410	63	76	48
R	99.9996	10.0000	1.0001	.1001	.0201	ATM	6/26/96	1558	64	78	46
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	6/27/96	1718	65	78	49
R	99.9995	10.0000	1.0000	.1000	.0200	ATM	6/28/96	1254	58	70	48
	100.0001	10.0000	1.0001	.1000	.0200	ATM	7/1/96	1504	64	78	49
	100.0003	10.0001	1.0001	.1000	.0200	ATM	7/2/96	1316	64	77	49
	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/5/96	953	58	70	47
R	99.9998	10.0000	1.0001	.1000	.0201	ATM	7/8/96	1727	47	83	42
R	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/9/96	1456	% RH To high		
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	7/10/96	1006	60	72	49
	99.9998	10.0000	1.0000	.1001	.0200	ATM	7/11/96	0918	59	71	48
	99.9998	9.9999	1.0000	.1000	.0200	ATM	7/12/96	842	59	71	48
	100.0000	10.0001	1.0000	.1001	.0201	ATM	7/16/96	1233	62	75	47
	100.0003	10.0003	1.0002	.1002	.0202	ATM	7/17/96	1605	63	74	54
	99.9996	9.9998	.9998	.0998	.0198	ATM	7/18/96	0733	68	56	49
	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/19/96	0940	71	59	48
R	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/22/96	1445	82	68	48
R	99.9997	10.0001	1.0002	.1001	.0201	ATM	7/23/96	1513	80	66	47
	99.9996	10.0000	1.0000	.1001	.0200	ATM	7/24/96	0759	59	71	48
	99.9999	10.0000	1.0000	.1001	.0201	ATM	7/24/96	1617	71	86	49
	99.9999	10.0001	1.0001	.1001	.0201	ATM	7/25/96	0814	61	73	49
	100.0002	10.0002	1.0002	.1001	.0201	ATM	7/31/96	2035	65	79	47
	99.9995	10.0000	1.0000	.1001	.0202	ATM	8/1/96	0905	69	57.5	48
	100.0000	10.0001	1.0001	.1001	.0202	ATM	8/1/96	1950	60	72	49
	99.9998	10.0000	1.0001	.1000	.0202	ATM	8/2/96	801	59	71	49
	100.0001	10.0000	1.0000	.0999	.0199	ATM	8/8/96	1235	66	79	49
R	99.9996	10.0000	1.0001	.1000	.0201	ATM	8/9/96	0754	60	72	49
	100.0003	10.0001	1.0000	.1000	.0200	ATM	8/14/96	1116	64	77	49
R	99.9999	10.0001	1.0001	.1001	.0201	ATM	8/15/96	1902	66	79	49
	100.0002	10.0000	1.0001	.1001	.0201	ATM	8/28/96	1611	70	85	49
	99.9995	10.0000	1.0000	.1001	.0200	ATM	8/29/96	1008	64	77	49
R	99.9996	10.0000	1.0000	.1000	.0200	ATM	8/30/96	1005	61	73	48
	99.9996	10.0001	1.0000	.1000	.0200	ATM	9/5/96	0954	59	71	48
R	99.9996	10.0000	1.0000	.1002	.0200	ATM	9/6/96	1030	72	60	49
	100.0000	10.0000	1.0000	.1000	.0200	ATM	9/9/96	1806	76	63	48
	100.0005	10.0002	1.0000	.1001	.0200	ATM	9/10/96	1726	77	64	48

Unit: Kuma Scott HT-1
Run: 1
Date: 8/28/96
Technicians: ATM RLS
WST20, Form5

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

Filters

Filter # 126 (R) Beaker # 4 Final Wt. 67.5924 g +
Final Wt .7449 g ✓ Ml 65 Tare Wt. 67.5865 g ✓
Tare Wt .7449 g ✓ Desc. Acetone Net Wt. .0059 g +
Net Wt .0000 g ✓

Filter # 127 (F) Beaker # _____ Final Wt. _____ g
Final Wt .7691 g ✓ Ml _____ Tare Wt. _____ g
Tare Wt .7360 g ✓ Desc. _____ Net Wt. _____ g
Net Wt .0331 g ✓

Acetone Blank Calculation: Blank done 8/8/96

Blank Beaker # 6 Final Wt 67.4251 g.
Ml 140 Tare Wt 67.4250 g.
Desc Acetone Net Wt .0001 g.
.0001 g ÷ 140 ml = .0000007 g/ml

Particulate Catch Calculation

Filter: .0331 g ✓
Filter: .0000 g ✓
Beakers: .0059 g ✓ - (.0000007)(65) = .0059 g ✓
Total Catch g/Ml of Acetone Blank Value/Ml of Acetone

Total Catch = .0390 g ✓

Unit SCOTT KUMA HT-1
Run # 1
Date 8/28/96
Technician ATM, RLS.
WST6-Form1, Rev8/96

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.716 ft^3

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

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

Wet Bulb/ Start: WB: 66 °F DB: 78 °F 1.7% Amb Moisture 53 %RH

Dry Bulb Stop: WB: 71 °F DB: 85 °F 2.1 % Amb Moisture 50 %RH

$\bar{X}$ = 1.90 % Ambient Moisture $\bar{X}$ = 51.5 % Relative Humidity (RH)

Empty Stove Wt: 343.1 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 433.0 lbs. Dry: 432.6 lbs.

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

Kindling Wt. Paper: 0.3 lbs. Wood: 4.0 lbs.

Pre Burn Fuel Wt. 11.8 + 11.3 + 10.7 Total: 33.8 lbs.

Total Kindling and Pre Burn Fuel Wt 38.1 lbs.

Coal Bed Wt-lbs: Range(2.7 - 2.2) lbs. Actual: 2.5 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range 435.3 (Upper Wt.) ± 434.8 (Lower Wt.) /2 .25 = .16 lbs.

Test Fuel Wt-lbs: Ideal 12.0 lbs. Range: 10.9-13.2 lbs. Actual: 10.9 lbs.

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

2 x 4's x 14 5/16	"	3 Pcs	6.5 lbs.	59.6 %
4 x 4's x 14 5/16	"	1 Pcs	4.4 lbs.	40.4 %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.9 - (10.9 \times .18139)}{2.2046} \times \frac{60}{220} = 1.104$ Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output(HO_E) (Avg BTU's/Hr) (19,140) X $\frac{63}{100}$ x 1.104 = 13,310 Est Heat Output (HO_E) BTU's/Hr

Comments:

Unit: Kuma Scott HT-1
Run: 1
Date: 9/29/96
Technician(s): ATM RLS
WST3-Form 1 Rev 9/90

STOVE OPERATING DATA
WOODSTOVE TEST DATA SHEET #9

Fire Started: 0838 P.D.S.T.

Warm up and Preburn: Primary Air: Wide open from ignition until the start of the preburn when the primary air control(s) was (were) adjusted to the run setting of 3/8" open. At the run setting until the start of the test.
3/8" open = Stop.
Secondary Air: No Controls. Naturally drafted.

Secondary Burn/[redacted] 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 20 seconds.

Test: Door Wide Open during loading _____ min 25 sec, then Closed.

Primary Air: Wide open during the start of the test until 4:55.
Adjusted to the run setting of 3/8" open between 4:55 and 5:00.
At the run setting of 3/8" open (Stop) at 5:00 into the run.

Secondary Air:
No Controls. Naturally drafted.

Secondary Burn/[redacted] Bypass: N/A

Fan: off during warm up. On high during preburn. Off at start of test. Off for 1st 30 minutes of test. On high at 30 minutes. On high for rest of test.

Test Run Anomlies:

This was an attempt at a low burn. Ended up a med. low, probably due to temps at start.

Unit SCOTT KWHA HI-1
Run #
Date 8/28/96
Technician ATH, 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	R.I.B. LUMBER	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2X4	R.I.B. LUMBER	#2 STD. & BTR.	D. FIR, S. GRN.
	4X4	R.I.B. LUMBER	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (11.8 lbs) added at 0910.
2nd Warm up/Pre Burn Fuel charge (11.3 lbs) added at 1012.
3rd Warm up/Pre Burn Fuel charge (10.7 lbs) added at 1110.
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 RD pre burn/warm up fuel charge. The stove lost 0.4 lbs.

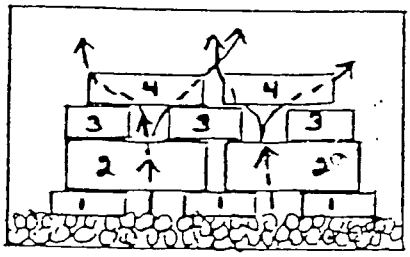
All pre burn/warm up fuel pieces were either 14" or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 14 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 14 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 2 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 SCOTT KUMA HT-1
Run # 1
Date 8/28/96
Technician ATM, RLS
Page 2 of 3
WST7-Form2-A, Rev 6/90

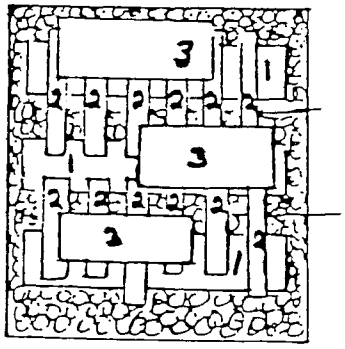
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

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 880 °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 3/8" open on arc 3.5 lbs above the upper charcoal bed weight.
3/8" open on arc = Stop

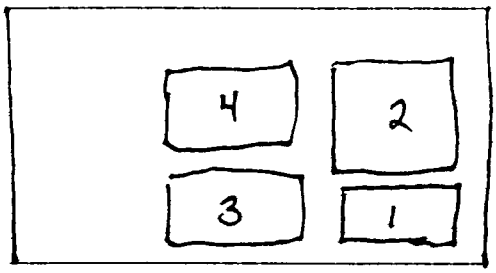
Unit SCOTT KUHA HT-1
Run # 1
Date 8/28/96
Technician ATH, RLS,
Page 3 of 3
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: ① Turned off fan, ② opened primary air control wide open, ③ opened door, ④ loaded test fuel into stove, ⑤ photo, ⑥ closed door.

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



Front of stove view

4 X 4's: 2

2 X 4's: 1, 3 & 4

Loading Sequence: 1, 2, 3 & 4

Driest Pcs in Load 3

Loaded the test fuel charge on an essentially level, medium-large sized, hot coal bed (in appearance, color and temperature for a low burn rate.

Ignition 0:30. Vertical Column with secondaries igniting at 1:30. Front tube igniting 2:38. Good start.
5:00 Flames decreased after shut down.
Vertical Column of flame (VC) on left side of left stack. Flickers in center canyon. VC w/ 2nds on top
6:28. Steady VC in middle canyon 8:00 Back in balance. once fri was back in balance, balance slowly got better.
15:00 Gas balance 20:1.

Unit: SCOTT KUHA HT-1
Run: 1
Date: 8/28/96
Technician: ATM, RLS.

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

WST1-Form7-Rev11/89

Room Temperature: 72 °F Correction Factor: 0

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes ✓. No ____
Time Test Fuel Moisture Readings taken at: 1050
Calibration Checks: X ✓ Y ✓ 12.5 12.4 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4	K	7.5	7.9	8.0	8.4	8.0	8.4	8.233
2									
3									
4									
5	2X4X8'	P	19.0	20.3	21.0	22.6	18.0	19.2	20.700
6	"	P	18.0	19.2	18.0	19.2	18.0	19.2	19.200
7	"	P	18.0	19.2	18.5	19.8	18.0	19.2	19.400
8		P	18.5	19.8	18.0	19.2	18.0	19.2	19.400
9									78.700
10									
11									
12	2X4X14'½	T	20.0	21.4	20.0	21.4	20.0	21.4	21.400
13	"	T	22.5	24.3	21.5	23.1	21.0	22.6	23.333
14	"	T	18.5	19.8	18.5	19.8	18.0	19.2	19.600
15									
16	4X4X14'½	T	22.5	24.3	22.5	24.3	22.5	24.3	24.300
17									88.633
18									
19	FEET	T	18.0	19.2	18.0	19.2	18.5	19.8	19.400
20								OUT SPACERS	

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	8.233 %	19.675 %	22.158 %
% Moisture - Wet Basis:	7.607 %	16.440 %	18.139 %

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: SCOTT KUMA HT-1
Run#:
Date: 8/28/96
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 1.575 cm 3.8481 ✓

Width (W): in 3.575 cm 8.9281 ✓

Length (L): 3.560 cm
3.568 cm
3.508 cm
3.517 cm

Length $\bar{X}$ = in 3.53825 cm 8.9872 ✓

Volume: 308.765 cm^3 ✓
(D X W X L)

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

Uncorrected Meter Readings Corrected for temperature: Yes ✓ No ___

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	19.5	20.9 %
Bottom:	20.0	21.4 %
Side:	20.0	21.4 %
$\bar{X}$:		21.133% ✓

Avg % Moisture (Dry) 21.133 % ✓

Aug % Moisture (Wet) 17.574 % ✓

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 187.1 g Dry Weight: 160.4 g

% Moisture Dried Basis: 14.270 % ✓
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	8/28/96	1012	215 °F
Out of Dryer	9/6/96	1715	220 °F

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

Density = 160.4 g (dry wt) ÷ 308.765 cm^3 (volume) = .5195 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 ( ) AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

Test: SCOTT KUMA HT-1 Date: 8/28/96
Run: 1 Technician(s): ATH, [illegible]S.
Page: 1 of 2

435.1

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 1235	446.0	10.9	0	.301	7.51	48.8	12.2			1.31	5.7	87	107	3.5	108	245			-.040	Flow
5 40	445.1	10.0	.9	.515	12.8	30.8	7.68			0.87	(14.7)	124	155	14.0	142	382			-.063	SO2 1.5
10 45	444.6	9.5	.5	.429	10.7	36.5	9.10			0.80	13.3	125	147	14.5	140	333			-.061	~~CO2~~ T.S
15 50	444.0	8.9	.6	.509	12.6	31.1	7.76			0.65	19.5	133	157	17.5	148	379			-.064	~~O2~~ T.S
20 55	443.4	8.3	.6	.566	14.1	25.7	6.41			0.72	19.5	135	160	19.0	161	401			-.066	~~CO~~ T.S
25 1300	442.7	7.6	.7	.598	14.8	22.8	5.69			0.72	20.6	137	161	20.0	153	414			-.068	
30 05	442.1	7.0	.6	.608	15.1	21.9	5.46			0.81	18.6	136	159	20.0	153	407			-.068	
35 10	441.5	6.4	.6	.596	14.8	23.7	5.91			6.52	28.5	132	153	18.5	150	398			-.067	
40 15	441.0	5.9	.5	.588	14.6	24.7	6.16			0.39	37.4	129	148	14.5	143	393			-.066	
45 20	440.4	5.3	.6	.566	14.1	25.9	6.46			0.55	25.6	126	144	13.5	141	376			-.064	
50 25	440.0	4.9	.4	.505	12.5	32.7	8.16			0.27	46.5	123	140	12.5	137	358			-.061	
55 30	439.6	4.5	.4	.446	11.1	37.9	9.45			0.53	20.9	118	134	10.0	133	334 ✓			-.056 ✓	
																(4420) ✓			(.744)	Flow
60 35	439.4	4.3	.2	.385	9.58	43.3	10.8			0.83	11.5	114	127	10.0	131	301			-.052	SO2 1.5
65 40	439.0	3.9	.4	.403	10.0	41.2	10.3			0.95	10.6	112	126	9.0	127	291			-.057	~~CO2~~ T.S
70 45	438.7	3.6	.3	.393	9.78	41.6	10.4			1.08	(9.1)	111	123	8.5	126	288			-.050	~~O2~~ T.S
75 50	438.5	3.4	.2	.374	9.31	43.9	10.9			1.25	7.4	108	120	7.5	122	276			-.047	~~CO~~ T.S
80 55	438.2	3.1	.3	.349	8.69	46.4	11.6			1.31	6.6	105	115	7.2	121	268			-.046	
85 1400	438.0	2.9	.2	.332	8.27	46.8	11.7			1.34	6.2	103	112	7.0	120	257			-.044	
90 05	437.7	2.6	.3	.350	8.72	44.7	11.1			1.26	6.9	102	111	6.4	118	258			-.043	
95 10	437.5	2.4	.2	.354	8.82	44.5	11.1			1.30	6.8	102	112	6.4	118	256			-.042	
100 15	437.3	2.2	.2	.344	8.57	46.1	11.5			1.17	7.3	102	112	6.4	117	254			-.042	
105 20	437.1	2.0	.2	.337	8.40	47.3	11.8			1.05	8.0	101	111	6.2	116	248			-.041	
110 25	436.9	1.8	.2	.319	7.95	48.5	12.1			1.13	7.0	100	109	6.1	114	238			-.039	
115 30	436.8	1.7	.1	.310	7.73	49.3	12.3			1.12	6.9	99	106	6.1	114	235 ✓			-.038 ✓	
																(3170) ✓			(.535) ✓	
																7590 ✓			1.279 ✓	

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

Unit: SCOTT KUMA HT-1 Date: 8/28/96
Run: 1
Page: 2 of 2 Technician(s): ATH, CLS.

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	436.6	1.5	.2	.314	7.83	48.5	12.1			0.92	8.5	97	106	5.4	112	237			-.037	Flow
125 / 40	436.5	1.4	.1	.324	8.07	47.7	11.9			0.89	9.1	97	106	5.4	112	232			-.036	SO2 1.5
130 / 45	436.4	1.3	.1	.288	7.18	49.8	12.4			1.40	5.1	95	103	5.2	111	223			-.035	~~CO2~~ T.S
135 / 50	436.3	1.2	.1	.266	6.64	51.7	12.9			1.57	4.2	92	99	4.6	108	215			-.034	~~O2~~ T.S
140 / 55	436.2	1.1	.1	.273	6.81	50.7	12.6			1.61	4.2	91	98	4.6	107	210			-.033	~~CO~~ T.S
145 / 1500	436.1	1.0	.1	.272	6.79	50.9	12.7			1.61	4.2	90	97	4.5	107	206			-.032	
150 / 05	436.0	.9	.1	.266	6.64	51.5	12.8			1.62	4.1	88	97	4.2	106	202			-.031	
155 / 10	435.9	.8	.1	.283	7.06	49.7	12.4			1.52	4.6	87	99	3.9	105	200			-.030	
160 / 15	435.9	.8	0	.275	6.86	50.9	12.7			1.56	4.4	86	100	3.6	103	198			-.029	
165 / 20	435.8	.7	.1	.280	6.99	50.1	12.5			1.62	4.3	85	99	3.5	103	197			-.028	
170 / 25	435.7	.6	.1	.272	6.79	51.0	12.7			1.65	4.1	85	100	3.5	103	195			-.028	
175 / 30	435.7	.6	0	.262	6.54	53.2	13.3			1.46	4.5	85	100	3.5	103	193			-.027	✓
																2503	✓		.380	Flow
180 / 35	435.6	.5	.1	.244	6.10	54.4	13.6			1.41	4.3	85	100	3.5	102	190			-.027	SO2 1.5
185 / 40	435.5	.4	.1	.243	6.07	54.1	13.5			1.54	3.9	85	100	3.5	102	190			-.027	~~CO2~~ 1.5
190 / 45	435.5	.4	0	.237	5.92	54.6	13.6			1.67	3.5	85	100	3.5	102	190			-.026	~~O2~~ 1.5
195 / 50	435.4	.3	.1	.223	5.58	56.6	14.1			1.64	3.4	85	100	3.5	102	188			-.026	~~CO~~ 1.5
200 / 55	435.3	.2	.1	.227	5.68	56.1	14.0			1.59	3.6	85	100	3.5	101	186			-.026	
205 / 1600	435.3	.2	0	.225	5.63	56.0	14.0			1.57	3.6	85	100	3.5	101	183			-.026	
210 / 05	435.2	.1	.1	.227	5.68	55.7	13.9			1.64	3.5	85	99	3.5	101	181			-.025	
215 / 10	435.2	.1	0	.227	5.68	56.0	14.0			1.61	3.5	85	99	3.5	101	181			-.025	
220 / 15	435.1	0	.1	.228	5.70	56.0	14.0			1.63	3.5	84	99	3.4	100	179			-.024	
225 / 20																1668	✓		.232	✓
230 / 25																				
235 / 30													45+			11,761	✓		1.891	✓
																260	✓		.042	✓

Pre Burn Start Wt. 438.8 lbs.

Test Start wt. Range 435.3 - 434.8 lbs.

PRE BURN DATA RECORD SHEET #13 WST2-Form16

BARO. PRESSURE 29.95

Stove: SCOTT KUMA HT-1 Date: 8/28/96

Run: 1 Technician(s): ATH, KS.

Page: 1 of 1

Minute Time	Scale Weight	Burn Rate	Stack	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Static	Comments
			T/C#-3	4	5	6	7	8	9	10	11		3/8" open max. = Stop,
0 11:30	438.8	0	787	850	555	319	518	507	1106	1309	80	-.084	Primary Air Set at 3/8" OPEN
5 :35	438.2	.6	448	787	584	230	536	521	1014	1298	81	-.074	Secondary Air Set at N/A
10 :40	437.7	.5	416	724	590	197	537	519	991	1313	80	-.071	Fan: ON HIGH
15 :45	437.3	.4	407	717	585	183	531	512	995	1350	80	-.068	TUNNEL ON AT: 11:30
20 :50	436.8	.5	409	713	581	177	527	503	1140	1157	79	-.067	RAKE COALS
25 :55	436.5	.3	371	667	574	172	516	492	1173	1166	80	-.061	
30 12:00	436.3	.2	323	578	566	169	509	480	1159	1043	80	-.054	Pumps turned on at: 1200
35 :05	436.2	.1	312	528	560	166	499	471	968	948	79	-.051	444.8
40 :10	436.1	.1	289	476	549	162	489	461	936	911	80	-.047	
45 :15	436.5	.1	280	439	534	160	483	458	956	903	80	-.046	REMOVE COALS Check WB/DB: 89'/98' 5 lb.
50 :20	436.4	.1	261	415	518	158	474	456	924	863	79	-.044	
55 :25	436.3	.1	253	399	506	155	467	454	934	852	79	-.042	396.2
60 :30	435.2	.1	248	388	492	152	457	456	938	845	79	-.041	
65 :35	435.1	.1	245	376	479	147	444	450	930	823	80	-.040	379.2
70													
75													
80													
85													
90													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: SCOTT KUMA HT-1 Date: 8/28/96
Run: 1 Technician(s): ATM, RL
Page: 1 of 2

T/C# / Minute / Time	4 Stove Top	5 Left Side	6 Back	7 Right Side	8 Bottom	9 Firebox	10 2nd Burn ~~Catalytic~~	11 Room Temp	12 Tunnel	13 C. Gas Box	14 Impinger Out	15 5G-1 Filter	16 5G-1 Condenser	17 Condar	18
0 1235	376	479	147	444	450	930	823	80	96	248	36	78	35		
5 40	455	464	205	433	441	773	825	81	106	248	36	78	35		
10 45	515	456	224	425	444	749	793	81	100	248	36	77	36		
15 50	624	445	238	411	434	775	864	81	102	248	36	77	36		
20 55	675	439	243	403	428	833	999	80	103	248	36	78	36		
25 1300	708	437	245	396	423	876	1144	81	104	248	36	78	35		
30 05	712	440	247	394	417	919	1216	81	104	248	36	78	36		
35 10	722	457	192	402	412	914	1233	81	104	248	36	78	35		
40 15	718	470	159	407	407	914	1279	81	104	248	36	78	35		
45 20	713	476	148	412	402	918	1296	81	103	248	36	78	35		
50 25	672	478	143	416	398	933	1326	81	102	248	36	78	35		
55 30	618	478	141	417	399	955	1286	81	101	247	36	78	36		
	(7508)	(5519)	(2332)	(4960)	(5055)	(16,489)	(13,084)	(970)							
60 35	545	479	140	415	398	969	1274	82	100	247	36	79	36		
65 40	507	479	139	411	398	988	1217	82	99	248	36	79	36		
70 45	505	481	139	409	398	985	1157	82	99	248	36	78	36		
75 50	493	479	139	405	401	969	1127	82	98	248	36	78	36		
80 55	471	477	139	402	402	954	1059	81	94	248	36	78	36		
85 1400	435	476	139	397	403	959	1026	82	97	247	36	78	36		
90 05	428	475	138	391	405	956	1002	82	97	247	37	78	36		
95 10	421	474	139	388	406	929	986	82	97	247	37	78	37		
100 15	413	473	139	386	406	906	979	82	97	247	37	78	36		
105 20	404	472	141	386	406	894	985	82	97	248	37	78	36		
110 25	388	468	142	386	405	869	954	83	96	248	37	78	36		
115 30	380	465	143	385	405	850	936	83	96	248	37	78	37		
	(5390)	(5698)	(1677)	(4761)	(4833)	(11,228)	(12,702)	(985)							
	12,898	11,217	4009	9721	9888	21,717	25,786	1955							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: SCOTT KUMA HT-1 Date: 8/28/96
Run: 1 Technician(s): ATM, Ra
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	Condar	
120 1435	374	460	145	385	404	830	965	83	95	248	37	78	37		
125 40	371	455	144	383	404	831	1062	83	95	248	37	78	37		
130 45	368	450	145	386	404	820	876	83	95	248	37	78	37		
135 50	351	445	146	386	405	804	846	83	95	248	37	78	37		
140 55	338	440	146	386	406	797	838	84	93	248	37	78	37		
145 1500	329	437	146	386	407	796	832	83	94	248	37	78	37		
150 05	322	432	146	385	409	786	821	83	94	248	37	78	37		
155 10	317	429	146	384	410	766	807	83	94	248	37	78	37		
160 15	312	425	147	383	412	766	801	84	93	248	37	78	37		
165 20	309	422	147	383	414	753	795	84	93	248	37	78	37		
170 25	307	419	147	381	416	756	787	84	93	248	37	78	37		
175 30	304	416	146	381	417	725	782	84	93	248	37	78	38		
	4002	5230	1751	4609	4908	9430	10,212	1001							
180 35	299	411	146	378	419	723	774	84	93	248	37	79	38		
185 40	296	407	145	375	420	718	774	84	93	248	37	79	38		
190 45	293	402	145	371	421	707	784	84	93	248	37	79	38		
195 50	289	395	144	363	420	692	802	84	93	248	38	79	38		
200 55	287	393	143	360	418	680	764	84	93	248	39	79	38		
205 1600	284	389	142	355	415	678	757	84	93	248	39	79	38		
210 05	280	386	141	352	412	673	748	84	93	248	39	79	38		
215 10	276	383	140	347	408	673	756	84	93	248	39	79	38		
220 15	274	381	140	343	404	658	720	84	92	248	39	79	38		
225 20	9578	9547	1286	3244	3737	6202	6879	756							
230 25												START	379.2		
235 30	19,478	19,994	7046	17,574	18,533	37,349	42,877	3712		45÷		FINISH	308.4		
												ΔT=	-70.8		
	433	444	157	391	412	830	953	82							

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

Site: Myren Consulting, Woodinville, WA Date: 8/28/96 Analyte: CO_2

Source: SCOTT KUMA HT-1 Run #: 1

Zero Cyl #: L-36919 Conc. 00.0 % CO_2 Cyl Press: 2025 psi

Certified by: Air Gas Date: 4/24/96

Span Cyl #: W260657 Conc. 10.1 % CO_2 Cyl Press: 975 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T.Myren Time: 1045 Temp: 72 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	.000	.000	.0666	.0666	+0.27
Span	40.4	.404	10.1	40.5	.404	10.051	-.0489	-0.48

Comments:

Post Run Audit: By: A.T.Myren Time: 1655 Temp: 83 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0666	.0666	+0.27
Span	40.4	.404	10.1	40.5	.406	10.1006	.0006	+0.01

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: 8/28/96 Analyte: O_2

Source: SCOTT KUMA HT-1 Run #: 1

Zero Cyl #: 4-36919 Conc. 00.0 % O_2 Cyl Press: 2025 psi

Certified by: Air Gas Date: 4/24/96

Span Cyl #: W260657 Conc. 12.5 % O_2 Cyl Press: 975 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T. Myren Time: 1045 Temp: 72 °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	.0054	.0054	+0.02
Span	12.5	50.0	12.5	12.5	50.0	12.467	-.0326	-0.26

Comments:

Post Run Audit: By: A.T. Myren Time: 1655 Temp.: 83 °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	.0054	.0054	+0.02
Span	12.5	50.0	12.5	12.5	50.0	12.467	-.0326	-0.26

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: 8/28/96 Analyte: CO

Source: SCOTT KUMA HT-1 Run #: 1

Zero Cyl #: 4-36919 Conc. 00.0 % CO Cyl Press: 2025 psi

Certified by: AirGas Date: 4/24/96

Span Cyl #: W 260657 Conc. 2.47 % CO Cyl Press: 975 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T. Myren Time: 1045 Temp: 72 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	-00.3	-.0062	-.0062	-0.12
Span	2.47	49.4	2.47	2.47	49.0	2.376	-.0938	-3.80

Comments:

Post Run Audit: By: A.T. Myren Time: 1655 Temp.: 83 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	-00.3	-.0062	-.0062	-0.12
Span	2.47	49.4	2.47	2.48	49.5	2.400	-.0696	-2.82

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: SCOTT KUHA HT-1
Run: 1
Date: 8/28/96
Technicians: ATM, RLS.
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 71 °F T/C#30: _____ °F

Thermocouple Check (at ambient): T/C#1: 73.4 °F; T/C#2: 73.0 °F;
T/C #3: 73.0 °F; T/C #4: 73.0 °F; T/C #5: 73.4 °F;
T/C #6: 73.6 °F; T/C #7: 73.6 °F; T/C #8: 73.8 °F;
T/C #9: 74.4 °F; T/C #10: 74.4 °F; T/C #11: 70.8 °F;
T/C #12: 71.4 °F; T/C #13: 72.2 °F; T/C #14: 72.2 °F;
T/C #15: 72.2 °F; T/C #16: 72.2 °F; T/C #17: _____ °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:

Zero (0°F)	: -0.2 °F	Adj to: 0.0 °F	Post Test Check Zero (0°F): 0.2 °F	% Difference +0.01
Span (2000°F)	: 2000.6 °F	Adj to: 2000.0 °F	Span (2000°F): 2000.6 °F	+0.03

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

Thermocouple Readout Pretest Linearity Check

0°F = 0.0 °F; 200°F = 201.6 °F; 400°F = 398.8 °F;
600°F = 601.2 °F; 800°F = 800.8 °F; 1000°F = 1000.6 °F;
1200°F = 1198.6 °F; 1400°F = 1399.2 °F; 1600°F = 1599.0 °F
1800°F = 1799.6 °F; 2000°F = 2000.0 °F

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

Scale Check Pre (Wt, #'s): 433.3 - 438.3 5.0 lbs. OK (RLS.)
Post (Wt, #'s): 434.8 - 439.8 5.0 lbs. OK (RLS.)

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

CKUMAR3.XLS

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	CKUMAR3
Stove Manufacturer:	KUMA
Model Number:	SCOTT HT-1
Lab Name:	MYREN
Test Date:	9\5\96
Run Number:	3
Meter Box Y Factor:	1.012
Barometric pressure (in):	29.92
Gas meter temp (ave):	98
delta H(avg):	0.884
Gas meter initial reading:	913.404
Gas meter final reading:	982.885
Front catch (acetone) mg:	4.0
first filter catch (mg):	11.0
second filter catch (mg):	-0.9
tunnel flow (ave cfm):	139.63
Emission Rate(g/hr):	1.795
Emission Rate(M5H) :	2.958
vs/VmTs:	0.02
vs ave:	789.53
Tunnel average temp (°f):	102.40
Test time(min):	140
Fuel Load(lb. wet):	10.9
Wood moisture(%wet):	17.915
Burn rate(dry kg/hr):	1.739
Samp vol(scf):	66.423
front filter number	133
back filter number	132
acetone beaker number	3
PRELIMINARY RESULTS	
FINAL RESULTS	X
DATA SUMMARY	
MODEL :	SCOTT HT-1
RUN:	3
DATE:	9\5\96
DBR:	1.739
GPH UNADJ	1.795
ADJ	2.958

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	0.036	100	913.404	74	0.900	779.99		
10	0.037	112	918.365	78	0.900	799.17	107.1	4.936
20	0.038	114	923.465	84	0.880	811.32	106.6	5.018
30	0.036	116	928.280	91	0.870	791.05	98.3	4.677
40	0.036	113	933.170	96	0.870	788.99	100.9	4.708
50	0.037	109	938.090	99	0.870	797.07	100.5	4.711
60	0.038	106	943.020	102	0.880	805.64	98.7	4.696
70	0.038	101	948.005	102	0.880	802.08	97.8	4.748
80	0.037	99	952.910	105	0.890	790.04	95.8	4.647
90	0.036	97	957.875	107	0.890	777.89	97.8	4.687
100	0.036	94	962.822	106	0.890	775.80	98.6	4.679
110	0.037	95	967.860	106	0.890	787.21	100.9	4.765
120	0.037	94	972.865	108	0.890	786.50	98.6	4.733
130	0.036	93	977.845	109	0.880	775.10	97.5	4.685
140	0.036	93	982.885	110	0.880	775.10	99.9	4.733
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 Kuma LAB-1

DA 9/5/96 PAGE 1 OF 1 MODEL # Scott HT-1 RUN # 3

METER BOX # 45G-P METER Y 1.012 FILTER # (F) 133 (R) 132

PRE TEST LEAK RATE = .000 CFM @ -17.0 IN. HG FILTER SIZE: 110 mm

POST TEST LEAK RATE = .000 CFM @ -16.0 IN. HG PROBE LENGTH 24" Q/aaa

TIME		METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
1240	00	913.404	.036	100	74	0.90	0
50	10	918.365	.037	112	78	.90	0
1300	20	923.465	.038	114	84	.88	0
10	30	928.280	.036	116	91	.87	0
20	40	933.170	.036	113	96	.87	0
30	50	938.090	.037	109	99	.87	0
40	60	943.020	.038	106	102	.88	0
50	70	948.005	.038	101	102	.88	0
1400	80	952.910	.037	99	105	.89	0
10	90	957.875	.036	97	107	.89	0
20	100	962.822	.036	94	106	.89	0
30	10	967.860	.037	95	106	.89	0
40	20	972.865	.037	94	108	.89	0
50	30	977.845	.036	93	109	.88	0
1500	40	982.885	.036	93	110	.88	0
	50						
	60						
	70						
	80						
	90						

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	.029	105
2	1.5"	.042	105
3	4.5"	.042	104
4	5.5"	.032	104
W-1	0.5"	.035	103
2	1.5"	.041	102
3	4.5"	.041	102
4	5.5"	.026	101
	Avg.	.0360	1825 / 563.25

Pilot Leak Check Pre ok Post ok

Cp = 0.99

N
1
2
W 1 2 3 4
3
4
*=point of Avg. delta p

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

N 138.502 cfm

BP = Start 29.92 in Hg
60 min 29.92
120 min 29.92

End 29.92

$\bar{X} = 29.92$

10.9 lbs
17.915 %
140 min

Ave 1.2
F 11.7
E 0

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

Into Dessicator: Date 6/1/96 Time 1532 By ATM Front Half _____ Back Half _____

Manufacturer: SSG Size: 110 mm Lot.No.: 2[illegible]41 Grade: [illegible]

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By	
126	.7451	6/3/96	1111	ATM	.7449	6/5/96	1853	RLS					✓
127	.7364	"	1110	ATM	.7360	6/5/96	1852	RLS					✓
128	.7419	"	1109	ATM	.7416	6/5/96	1851	RLS					✓
129	.7422	"	1108	ATM	.7420	6/5/96	1850	RLS					✓
130	.7306	"	1107	ATM	.7304	6/5/96	1849	RLS					✓
131	.7420	"	1106	ATM	.7413	6/5/96	1848	RLS	.7414	6/6/96	1135	ATM	✓
132	.7374	"	1102	ATM	.7371	6/5/96	1848	RLS	✓				✓
133	.7371	"	1100	ATM	.7369	6/5/96	1847	RLS	✓				✓
134	.7404	"	1101	ATM	.7403	6/5/96	1846	RLS					✓
135	.7390	"	1101	ATM	.7389	6/5/96	1845	RLS					✓
136	.7388	"	1100	ATM	.7386	6/5/96	1844	RLS					✓
137	.7395	"	1059	ATM	.7392	6/5/96	1843	RLS					✓
138	.7394	"	1058	ATM	.7392	6/5/96	1843	RLS					✓
139	.7435	"	1058	ATM	.7433	6/5/96	1842	RLS					✓
140	.7395	"	1057	ATM	.7393	6/5/96	1840	RLS					✓
141	.7486	"	1057	ATM	.7477	6/5/96	1839	RLS	.7476	6/6/96	1133	ATM	✓
142	.7265	6/5/96	1838	RLS	.7264	6/6/96	1132	ATM					✓
143	.7258	6/5/96	1837	RLS	.7258	6/6/96	1131	ATM					✓
144	.7254	6/5/96	1836	RLS	.7254	6/6/96	1130	ATM					✓
145	.7376	"	1056	ATM	.7372	6/5/96	1830	RLS	.7376	6/6/96	1129	ATM	✓
146	.7513	"	1056	ATM	.7510	"	1837	RLS					✓
147	.7465	"	1055	ATM	.7462	"	1833	RLS					✓
148	.7450	"	1054	ATM	.7448	"	1834	RLS					✓
149	.7474	"	1054	ATM	.7471	"	1835	RLS					✓
150	.7415	"	1053	ATM	.7413	"	1835	RLS					✓

Checked by [signature] Date: 6/6/96 Time 1141

QA REWEIGH

Filter #	WT	Date	Time	By	
136	.7386	6/6/96	1134	ATM	ok
129	.7412	6/6/96	1136	ATM	ok
149	.7472	6/6/96	1139	ATM	ok

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
59	72	45	6/3/96	1005	ATM
57	73	49	6/5/96	1825	RLS
57	73	49	6/6/96	1035	ATM

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

4th Round

Into Dessicator: Date: 6/27/96 Time: 1200 By: A.T.[illegible]

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4824	8/8/96	1446	ATM	65.4819	8/9/96	1125	RLS				
2	66.1488	7/25/96	1217	RLS	66.1484	8/1/96	0958	ATM				
3	67.8548	8/8/96	1553	ATM	67.8542	8/9/96	1103	RLS	67.8544	8/14/96	1130	ATM
4	67.5870	8/8/96	1424	ATM	67.5865	8/9/96	1130	RLS	Kuma	#1		
5	67.2054	8/8/96	1618	ATM	67.2050	8/9/96	1058	RLS	Kuma	5		
6	67.4250	7/3/96	1403	RLS	67.4241	7/10/96	1059	ATM	67.4250	7/25/96	1155	RLS
7	65.5428	8/8/96	1533	ATM	65.5423	8/9/96	1110	RLS	Kuma	4		
8	66.0183	7/10/96	1100	ATM	66.0187	7/25/96	1055	RLS				
9	66.9280	7/8/96	1312	ATM	66.9276	8/9/96	1120	RLS	Kuma	#2		
10	66.0862	7/10/96	1111	ATM	66.0860	7/25/96	0933	RLS				
11	65.6989	7/10/96	1108	ATM	65.6989	7/25/96	1020	RLS				
12	Broken											

3 Kuma

Blank 8/8/96

Checked By: _____ Date: _____ Time: _____

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	47	7/13/96	0953	ATM
60	72	49	7/11/96	1026	ATM
57.5	69	48	8/1/96	0948	ATM
66	79	49	8/13/96	1235	ATM
60	72	49	8/9/96	0945	ATM
64	77	49	8/14/96	1116	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9.1w-1 Rev4/90
Unit Kuma Scott HT-1
Run # 3
Date: 9/5/96

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
3	✓	9/9/96	1733	ATM	67.8586	9/10/96	1755	ATM	67.8585	9/11/96	1953	RLS				

FINAL FILTER WEIGHTS

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
R	132	.7367	9/5/96	1609	ATM	.7366	9/6/96	1039	ATM	.7362	9/9/96	1615	ATM				
F	133	.7486	9/5/96	1609	ATM	.7481	9/6/96	1038	ATM	.7479	9/9/96	1816	ATM				

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	9/6/96	1030	ATM	60	72	49
2	9/9/96	1806	ATM	63	76	48
3	9/10/96	1726	ATM	64	77	48
4	9/11/96	1930	ATM	63	76	48
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Blank 8/8/96

WST5-Form9, Pg1, Rev4/90
Unit: Kuma Scott HT-1
Run #: 3
Date: 9/5/96

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
6	✓	8/16/96	11:30	ATM	67.4251	8/15/96	1717	ATM	67.4251	8/29/96	1031	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	Date	Time	By	WB	DB	%RH
1	8/15/96	1702	ATM	66	79	49
2	8/29/96	1008	ATM	64	72	49
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments:

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 6/20/96

Through 9/10/96

Scale Mettler

Model AE 100

SN K04827

TROEMNER CLASS S WTS.

	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
	100.0003	10.0000	1.0000	.1000	.0199	RLS.	6/20/96	1625	61	74	47
	100.0000	10.0000	1.0000	.1000	.0200	ATM	6/21/96	1259	61	74	47
	100.0005	10.0001	1.0001	.1000	.0200	ATM	6/25/96	1410	63	76	48
R	99.9996	10.0000	1.0001	.1001	.0201	ATM	6/26/96	1558	64	78	46
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	6/27/96	1718	65	78	49
R	99.9995	10.0000	1.0000	.1000	.0200	ATM	6/28/96	1254	58	70	48
	100.0001	10.0000	1.0001	.1000	.0200	ATM	7/1/96	1504	65	78	49
	100.0003	10.0001	1.0001	.1000	.0200	ATM	7/2/96	1316	64	77	49
	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/3/96	953	58	70	47
R	99.9998	10.0000	1.0001	.1000	.0201	ATM	7/8/96	1727	57	83	42
R	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/9/96	1456	% RH To high		
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	7/10/96	1006	60	78	49
	99.9998	10.0000	1.0000	.1001	.0200	ATM	7/11/96	0918	59	71	48
	99.9998	9.9999	1.0000	.1000	.0200	ATM	7/12/96	842	59	71	48
	100.0000	10.0001	1.0000	.1001	.0201	ATM	7/16/96	1233	63	75	47
	100.0003	10.0003	1.0002	.1002	.0202	ATM	7/17/96	1605	63	74	54
	99.9996	9.9998	.9998	.0998	.0198	ATM	7/18/96	0733	68	56	49
	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/19/96	0940	71	59	48
R	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/22/96	1445	82	68	48
R	99.9998	10.0001	1.0002	.1001	.0201	ATM	7/23/96	1513	80	66	47
	99.9996	10.0000	1.0000	.1001	.0200	ATM	7/24/96	0757	59	71	48
	99.9999	10.0000	1.0000	.1001	.0201	ATM	7/24/96	1617	71	86	49
	99.9999	10.0001	1.0001	.1001	.0201	ATM	7/25/96	0814	61	73	49
	100.0002	10.0002	1.0002	.1001	.0201	ATM	7/31/96	2035	65	79	47
	99.9995	10.0000	1.0000	.1001	.0202	ATM	8/1/96	0905	69	57.5	48
	100.0000	10.0001	1.0001	.1001	.0202	ATM	8/1/96	1950	60	72	49
	99.9998	10.0000	1.0001	.1000	.0202	ATM	8/2/96	801	59	71	49
	100.0001	10.0000	1.0000	.0999	.0199	ATM	8/8/96	1335	66	79	49
R	99.9996	10.0000	1.0001	.1000	.0201	ATM	8/9/96	0754	60	72	49
	100.0003	10.0001	1.0000	.1000	.0200	ATM	8/14/96	1116	64	77	49
R	99.9999	10.0001	1.0001	.1001	.0201	ATM	8/15/96	1902	66	79	49
	100.0002	10.0000	1.0001	.1001	.0201	ATM	8/28/96	1611	70	85	49
	99.9995	10.0000	1.0000	.1001	.0200	ATM	8/29/96	1008	64	77	49
R	99.9996	10.0000	1.0000	.1000	.0200	ATM	8/30/96	1005	61	73	48
	99.9996	10.0001	1.0000	.1000	.0200	ATM	9/5/96	0954	59	71	48
R	99.9997	10.0000	1.0000	.1002	.0200	ATM	9/6/96	1030	72	60	49
	100.0000	10.0000	1.0000	.1000	.0200	ATM	9/9/96	1806	76	63	48
	100.0005	10.0002	1.0000	.1001	.0200	ATM	9/10/96	1726	77	64	48

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 9/11/96

Through _____

Troemner Class S Wts.

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
✓	No	100.0003	10.0001	1.0001	.1001	.0201	9/11/96	1730	ATM	63	76	48.0
✓	No	99.9997	10.0000	1.0000	.1000	.0199	9/12/96	1326	ATM	59	71	48.0
✓	No	99.9998	10.0000	1.0000	.1000	.0200	9/13/96	0756	ATM	70	58	49.0
✓	No	99.9996	9.9999	1.0000	.0999	.0199	9/13/96	1219	ATM	71	59	48.0

Unit: Kuma Scott HT-1
Run: 3
Date: 9/5/96
Technicians: ATM RLS
WST20, Form5

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

Filters

Filter #	132 (R)	Beaker #	3	Final Wt.	67.8585 g ✓
Final Wt	.7362 g ✓	Ml	53	Tare Wt.	67.8544 g ✓
Tare Wt	.7371 g ✓	Desc.	Acetone	Net Wt.	.0041 g ✓
Net Wt	-.0009 g ✓				

Filter #	133 (F)	Beaker #		Final Wt.	g
Final Wt	.7479 g ✓	Ml		Tare Wt.	g
Tare Wt	.7369 g ✓	Desc.		Net Wt.	g
Net Wt	.0110 g ✓				

Acetone Blank Calculation: Blank done 8/8/96

Blank Beaker #	6	Final Wt	67.4251 g.
Ml	140	Tare Wt	67.4250 g.
Desc	Acetone	Net Wt	.0001 g.

.0001 g ÷ 140 ml = .0000007 g/ml

Particulate Catch Calculation

Filter: .0110 g ✓

Filter: -.0009 g ✓

Beakers: .0041 (Total Catch) - (.000001)(53) (Ml of Acetone Blank Value/Ml of Acetone) = .0040 g ✓

Total Catch = .0141 g ✓

Unit Kuma Scott HI-1
Run # 3
Date 9.5.96
Technician ATH, RLS
WST6-Form1, Rev8/96

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.716 ft³

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

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

Wet Bulb/ Start: WB: 63 °F DB: 74 °F 1.65 % Amb Moisture 54 %RH

Dry Bulb Stop: WB: 64 °F DB: 75 °F 1.60 % Amb Moisture 55 %RH

$\bar{X}$ = 1.625 % Ambient Moisture $\bar{X}$ = 54.5 % Relative Humidity (RH)

Empty Stove Wt: 343.1 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 433.2 lbs. Dry: 432.8 lbs.

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

Kindling Wt. Paper: 0.3 lbs. Wood: 4.0 lbs.

Pre Burn Fuel Wt. 11.2 + 12.0 + 11.7 Total: 34.9 lbs.

Total Kindling and Pre Burn Fuel Wt 39.2 lbs.

Coal Bed Wt-lbs: Range (2.7 - 2.2) 435.5 - 435.0 lbs. Actual: 2.5 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\frac{435.5}{\text{Upper Wt.}} + \frac{435.0}{\text{Lower Wt.}}$ /2 .25 = 0.6 lbs.

Test Fuel Wt-lbs: Ideal 12.0 lbs. Range: 10.9-13.2 lbs. Actual: 10.9 lbs.

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

2 x 4's x 14 5/16	"	3 Pcs	6.9 lbs.	63.3 %
4 x 4's x 14 5/16	"	1 Pcs	4.0 lbs.	36.7 %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.9 - (10.9 \times .17915)}{2.2046} \times \frac{60}{140}$ = 1.739 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E) (Avg BTU's/Hr) (19,140) x $\frac{63}{100}$ x 1.739 = 20,973 Est Heat Output (HO_E) BTU's/Hr

Comments:

Unit: Kuma Scott HT-1
Run: 3
Date: 9/5/96
Technician(s): ATM RLS

STOVE OPERATING DATA
WOODSTOVE TEST DATA SHEET #9
WST3-Form 1 Rev 9/90

Fire Started: 0845 PDST

Warm up and Preburn: Primary Air: Wide open from ignition until the start of the preburn when the primary air control(s) was (were) adjusted to the run setting of 3/4" open on arc. At the run setting until the start of the test.

Secondary Air: No Controls. Naturally Drafted.

Secondary Burn/[redacted] 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 _____ min 25 sec, then Closed.

Primary Air: Wide open during the start of the test until 4:55. Adjusted to the run setting of 3/4" open on arc between 4:55 and 5:00. At the run setting of 3/4" open on arc at 5:00 into the run.

Secondary Air:
No Controls. Naturally Drafted.

Secondary Burn/[redacted] Bypass: N/A

Fan: Off during the warm up. On high during the preburn. Off at the start of the test. Off for the first 30 minutes of the test. On high at 30 minutes into the test. On high for the rest of the test.

Test Run Anomlies:

Unit Kuma Soft HT-1
Run # 3
Date 9/5/96
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	2x4x8'	R.I.B. LUMBER	STD. & BTR	D. Fir, S. Gen.
Test Fuel	2x4x8'	R.I.B. LUMBER	#2 STD. & BTR.	D. Fir, S. Gen.
	4x4x8'	R.I.B. LUMBER	#2 STD. & BTR.	D. Fir, S. Gen.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (11.2 lbs) added at 0858.
2nd Warm up/Pre Burn Fuel charge (12.0 lbs) added at 1005.
3rd Warm up/Pre Burn Fuel charge (11.7 lbs) added at 1115.
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 RD pre burn/warm up fuel charge. The stove lost 0.4 lbs.

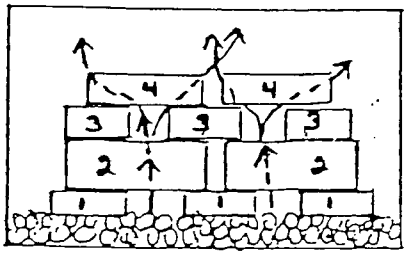
All pre burn/warm up fuel pieces were either 14" or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 14 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 14 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 2 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 Kuma Stove 4T-1
Run # 3
Date 9/5/96
Technician ATH, RLS
Page 2 of 3
WST7-Form2-A, Rev 6/90

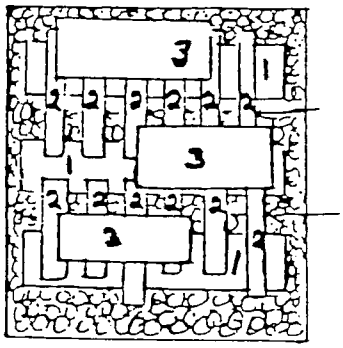
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

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 925 °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 3/4" open on arc 4.7 lbs above the upper charcoal bed weight.

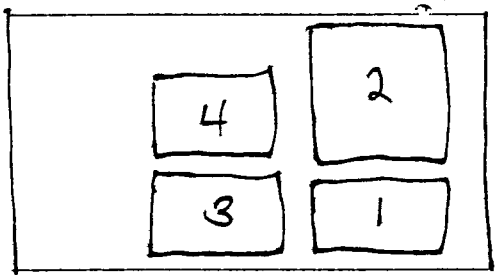
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Unit SCOTT KUHA HT-1
Run # 3
Date 9/5/96
Technician AFH, RLS
Page 3 of 3
WST5-Form2-Rev11/89

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 Photo, ⑥ closed the door.

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



Front of stove view

4 X 4's: 2

2 X 4's: 1, 3 & 4

Loading Sequence: 1, 2, 3 & 4

Driest Pcs in Load 3

Loaded the test fuel charge on an essentially level, large to medium sized, average to hot coal bed (in appearance, color and temperature for a medium high burn rate. Load 0:25. Ignition 0:30. Vertical column to baffle 1:50. Secondaries began to ignite at 2:30. Secondaries full width of stove at 3:45. Front Tube igniting @ 4:30.
5:00 after primary air control adjusted to run setting. Flames decreased slightly. Maintained Vertical column of flame (VC) to baffle L, C and R
Hot Coals under pcs 3 & 1
Seconds the Full width of stove under baffle
" off Front & Middle tubes.

Unit: Lehman Scott HT-1
Run: 3
Date: 9.5.96
Technician: ATH, RLS.

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

WST1-Form7-Rev11/89

Room Temperature: 71 °F Correction Factor: 6

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes ✓ No ____
Time Test Fuel Moisture Readings taken at: 1055
Calibration Checks: X ✓ Y ✓ 12.5 12.4 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2X4	K	8.0	8.4	8.5	8.9	8.0	8.4	(8.567)
2									
3									
4									
5	2x4x8'	P	18.0	19.2	18.5	19.8	18.0	19.2	19.400
6	"	P	18.0	19.2	18.0	19.2	18.0	19.2	19.200
7	"	P	18.5	19.8	18.5	19.8	18.0	19.2	19.600
8									(58.200)
9									
10									
11	2x4x14 5/16"	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
12	"	T	21.0	22.6	21.0	22.6	20.5	22.0	22.400
13	"	T	21.5	23.1	21.5	23.1	20.5	22.0	22.733
14									
15	4x4x14 5/16"	T	22.0	23.7	21.0	22.6	21.0	22.6	22.967
16									(87.300)
17									
18									
19	FEET	T	18.5	19.8	18.0	19.2	18.0	19.2	(19.400)
20								OUT SPACERS	

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	8.567%	19.400 %	21.825 %
% Moisture - Wet Basis:	7.891 %	16.248 %	17.915 %

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: Kuma Scott HT-1
Run#: 3
Date: 9/5/96
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. 1.523 cm 3.8684

Width (W): IN. 3.534 cm 8.9764

Length (L): 3.570 cm
3.490 cm
3.533 cm
3.505 cm

Length $\bar{X}$ = IN. 3.570 cm 8.9154

Volume: 309.581 cm^3 (D X W X L)

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

Uncorrected Meter Readings Corrected for temperature: Yes ✓ No ___

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	19.0	20.3 %
Bottom:	19.0	20.3 %
Side:	19.5	20.9 %
$\bar{X}$:		20.500 %

Avg % Moisture (Dry) 20.500 %

Aug % Moisture (Wet) 17.012 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 170.0 g Dry Weight: 145.6 g

% Moisture Dried Basis: 14.353 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	9/5/96	1045	215 °F
Out of Dryer	9/9/96	1715	220 °F

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

Density = 145.6 g (dry wt) ÷ 309.581 cm^3 (volume) = .4703 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 E AND FLUE GAS DATA
WOODSTOVE DATA SHEET #12
WST2-Form 14 Rev 1/88

)t: Kuma Soft 14T-1 Date: 9/5/96
Run: 3 Technician(s): ATM, DLS.
Page: 1 of 2

Minute Time	Scale Wt	lbs left	Burn Rate	435.3 1 CO_2 v.	CO_2 %CO_2	2 O_2 v.	O_2 %O_2	Tel	3 CO v.	CO %CO	T/C(1) Bal	T/C(2) Wet Bulb	Dry Bulb	% H_2O	T/C(3) Calc W/B	Stack	4 SO_2 v.	SO_2 PPM	Static Press.	Comments
0 1240	446.2	10.9	0	.319	7.95	48.6	12.1			0.65	12.2	86	116	3.1	105	335			-.059	Flow
5 45	445.4	10.1	.8	.156	3.92	65.6	16.4			0.63	6.2	88	129	3.1	120	378			-.077	SO_2 1.5
10 50	444.6	9.3	.8	.479	11.9	33.3	8.31			0.73	(16.3)	115	150	8.8	138	480			-.081	~~O_2~~ 1.5
15 55	443.6	8.3	1.0	.563	14.0	25.5	6.36			1.13	12.4	126	151	12.5	145	501			-.083	~~O_2~~ 1.5
20 1300	442.7	7.4	.9	.579	14.4	24.2	6.04			0.95	15.1	130	148	14.5	148	500			-.084	~~CO~~ 1.5
25 05	441.8	6.5	.9	.600	14.9	22.2	5.54			1.06	14.1	124	143	12.5	145	509			-.084	
30 10	441.0	5.7	.8	.618	15.3	20.1	5.02			1.07	14.3	119	139	10.0	142	510			-.084	
35 15	440.2	4.9	.8	.595	14.8	22.4	5.59			0.82	18.0	114	132	9.0	139	506			-.083	
40 20	439.5	4.2	.7	.601	14.9	21.5	5.36			0.51	29.3	108	126	7.5	136	494			-.082	
45 25	438.9	3.6	.6	.564	14.0	25.9	6.46			0.16	87.5	103	121	7.0	134	480			-.080	
50 30	438.4	3.1	.5	.512	12.7	31.8	7.93			0.10	127.2	98	114	5.8	131	449			-.076	
55 35	438.0	2.7	.4	.503	12.5	31.7	7.91			0.08	156.2	95	111	4.9	128	432			-.074	✓
																(5574)			(.947)	Flow
60 40	437.5	2.2	.5	.467	11.6	35.5	8.85			0.12	96.7	92	108	4.4	126	418			-.072	SO_2 1.5
65 45	437.2	1.9	.3	.442	11.0	37.7	9.40			0.20	55.0	90	105	4.2	122	400			-.070	~~O_2~~ 1.5
70 50	437.0	1.7	.2	.390	9.71	42.9	10.7			0.22	44.1	88	100	4.1	123	389			-.066	~~O_2~~ 1.5
75 55	436.7	1.4	.3	.339	8.44	47.8	11.9			0.34	24.8	86	96	3.8	121	365			-.064	~~CO~~ 1.5
80 1400	436.6	1.3	.1	.329	8.20	48.3	12.0			0.42	19.5	84	92	3.7	119	357			-.062	
85 05	436.5	1.2	.1	.287	7.16	52.3	13.0			0.48	14.9	83	91	3.7	117	342			-.060	
90 10	436.3	1.0	.2	.242	6.05	56.4	14.1			0.90	(6.7)	82	88	3.5	115	327			-.057	
95 15	436.2	.9	.1	.239	5.97	55.8	13.9			0.97	6.2	81	86	3.4	114	311			-.055	
100 20	436.1	.8	.1	.234	5.85	56.4	14.1			1.03	5.7	80	84	3.3	112	300			-.053	
105 25	436.0	.7	.1	.231	5.78	56.6	14.1			1.07	5.4	80	84	3.3	111	295			-.051	
110 30	435.9	.6	.1	.229	5.73	56.7	14.1			1.23	4.7	81	84	3.4	112	290			-.050	
115 35	435.8	.5	.1	.235	5.87	55.9	13.9			1.28	4.6	81	84	3.4	111	284			-.049	
																(4072)			(.709)	✓
																9646 ✓			1.656 ✓	

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

t: Kuma Scott HT-1 Date: 9/5/96
Run: 3
Page: 2 of 2
Technician(s): ATM, JS.

	435.3			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
120 1440	435.7	.4	.1	.232	5.80	56.4	14.1			1.27	4.6	81	85	3.4	112	281			-.048	Flow
125 45	435.6	.3	.1	.226	5.65	57.0	14.2			1.31	4.3	82	86	3.5	111	278			-.048	SO_2 1.5
130 50	435.5	.2	.1	.219	5.48	57.7	14.4			1.35	4.1	82	86	3.5	111	275			-.047	CO_2 1.5
135 55	435.4	.1	.1	.219	5.48	58.3	14.5			1.06	5.2	82	86	3.5	110	270			-.046	O_2 1.5
140 1500	435.3	0	.1	.214	5.36	58.7	14.6			1.13	4.7	82	86	3.5	110	267			-.046	CO 1.5
145 05																1371 ✓			.235 ✓	
150 10												✓								
155 15											(29÷)					11,017			1.891 ✓	
160 20																				
165 25																380			-.065 ✓	
170 30																				
175 35																				
																				Flow
180																				SO_2 1.5
185																				CO_2 1.5
190																				O_2 1.5
195																				CO 1.5
200																				
205																				
210																				
215																				
220																				
225																				
230																				
235																				

Pre Burn 5' wt. 440.2 lbs.
Test Start wt. Range 435.5 - 435.6 lbs.

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

BARO. PRESSURE 29.92

Run: 3
Page: 1 of 1

): Kuma Scott HT-1 Date: 9/5/96
Technician(s): ATH, CS

Minute Time	Scale Weight	Burn Rate	Stack	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Static	Comments
			T/C#-3	4	5	6	7	8	9	10	11		
0 1140	440.2	0	608	878	543	282	518	460	1042	1302	78	-.090	Primary Air Set at 3/4" OPEN
5 45	439.4	.8	545	815	566	212	533	474	1036	1331	77	-.084	Secondary Air Set at N/A
10 50	438.5	.9	531	791	575	184	538	476	1015	1136	76	-.086	Fan: ON HIGH RAKE COALS
15 55	437.7	.8	524	791	579	172	539	473	1069	1175	75	-.085	TUNNEL ON AT: 1140
20 1200	437.1	.6	519	781	580	168	542	472	1110	1269	75	-.081	
25 05	436.7	.4	454	712	583	167	548	468	1052	1255	75	-.075	
30 10	436.4	.3	385	605	582	167	552	466	1089	1140	75	-.070	Pumps turned on at: 1210
35 15	436.3	.1	399	568	579	167	554	462	1031	1076	74	-.066	466.0
40 20	436.2	.1	375	535	573	166	548	457	1047	1048	72	-.065	416.
45 25	435.7	.1	360	504	560	163	536	460	952	1012	72	-.064	REMOVE COALS Check WB/DB: 87/111 444.6
50 30	435.6	.1	362	491	554	162	528	448	930	978	71	-.062	436.6
55 35	435.4	.2	348	473	543	160	519	448	906	956	70	-.060	
60 40	435.3	.1	325	456	533	158	508	450	885	922	71	-.059	421.0
65													
70													
75													
80													
85													
90													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Unit: Kumm Scott HT-1 Date: 9/5/96
Run: 3 Technician(s): ATH, DS,
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 ~~Corner Side~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Con-dar	DGM
0 1240	456	533	158	508	450	885	922	71	100	248	36	76	37		
5 45	455	505	210	489	432	927	1233	72	115	248	36	76	36		
10 50	611	552	238	473	453	915	1214	72	112	247	35	75	35		
15 55	677	482	254	461	457	966	1341	71	114	248	36	76	35		
20 1300	708	480	263	455	442	991	1361	72	114	248	36	76	35		
25 05	727	482	269	454	432	1022	1352	72	116	248	37	77	35		
30 10	741	487	273	458	428	1068	1347	73	116	248	37	77	34		
35 15	747	496	209	464	428	1094	1338	74	116	247	37	77	34		
40 20	750	522	188	492	439	1195	1334	73	113	248	37	78	34		
45 25	734	535	165	502	443	1143	1346	74	111	248	37	77	35		
50 30	694	548	160	509	447	1164	1305	73	109	248	37	77	34		
55 35	658	553	158	514	456	1171	1320	73	107	248	37	76	34		
	(7958)	(6175)	(2545)	(5779)	(5301)	(12,541)	(15,413)	(870)							
60 40	622	557	158	519	464	1161	1308	73	106	248	37	76	34		
65 45	607	559	158	522	473	1133	1227	72	104	248	37	76	34		
70 50	583	556	160	526	475	1098	1192	72	101	247	36	75	35		
75 55	550	553	160	525	483	1065	1106	72	100	247	35	75	35		
80 1400	521	546	159	522	488	1016	1075	72	99	247	35	75	34		
85 05	502	537	160	519	489	947	1056	72	98	247	35	75	34		
90 10	477	529	160	515	484	911	974	74	97	247	35	76	35		
95 15	444	514	159	507	491	897	961	71	96	247	35	76	35		
100 20	411	501	159	497	491	866	942	72	94	248	35	76	35		
105 25	401	496	159	492	486	857	932	72	95	248	34	76	35		
110 30	388	490	159	485	490	827	926	73	95	248	34	76	34		
116 35	377	483	160	480	480	815	924	73	95	248	35	76	35		
	(5883)	(6321)	(1911)	(6109)	(5794)	(11,593)	(12,623)	(868)							
	13,841	12,496	4456	11,888	11,095	24,134	28,036	1738							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

U): Kuma-Scott HT-1 Date: 9/5/96
k) 3 Technician(s): ATM, &
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 ~~Co~~ c	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Con-dar	DGM
120 1440	371	477	160	476	482	817	918	75	94	248	35	76	35		
125 45	366	472	161	471	479	802	909	74	93	247	35	76	34		
130 50	360	467	160	463	479	793	893	75	93	247	35	77	35		
135 55	353	462	159	457	477	757	908	75	93	247	35	77	34		
140 1500	349	457	160	453	465	749	909	75	93	247	35	77	34		
145 05	1799	2335	800	2320	2382	3918	4537	374							
150 10	✓	✓	✓	✓	✓	✓	✓				✓				
155 15	15,640	14831	5256	14208	13,477	28,052	32,573	2112		29 ÷					
160 20	✓	✓	✓	✓	✓	✓	✓	✓					✓		
165 25	539	571	181	490	465	967	1123	73			START	421.0	✓		
170 30											FINISH	376.8	✓		
175 35											ΔT =	-44.2	✓		
180															
185															
190															
195															
200															
205															
210															
215															
220															
225															
230															
235															

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

Site: Myren Consulting, Woodinville, WA Date: 9/5/96 Analyte: CO_2

Source: Kuma Scott HT-1 Run #: 3

Zero Cyl #: 4-36919 Conc. 00.0 % CO_2 Cyl Press: 1975 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W260657 Conc. 10.1 % CO_2 Cyl Press: 950 psi

Certified by: I30C Gases. Date: 1/18/95

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: A.T. Myren Time: 1045 Temp: 74 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0666	.0666	0.27
Span	40.4	.404	10.1	40.25	.404	10.0511	-.0489	-0.48

Comments:

Post Run Audit: By: A.T. Myren Time: 1535 Temp: 80 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0666	.0666	0.27
Span	40.4	.404	10.1	40.0	.403	10.0264	-.0736	-0.73

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: 9/5/96 Analyte: O_2

Source: Kuma Sov #. 4T-1 Run #: 3

Zero Cyl #: 4-36919 Conc. 00.0 % O_2 Cyl Press: 1975 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W260657 Conc. 12.5 % O_2 Cyl Press: 950 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T. Myren Time: 1045 Temp: 74 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.5	00.1	.0303	.0303	0.12
Span	12.5	50.0	125	12.55	50.0	12.467	-.0326	-0.26

Comments:

Post Run Audit: By: A.T. Myren Time: 1535 Temp.: 80 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.5	00.1	.0303	.0303	0.12
Span	12.5	50.0	12.5	12.5	49.8	12.418	-.0825	-0.66

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: 9/5/96 Analyte: CO

Source: Kuma Scott HT-1 Run #: 3

Zero Cyl #: 4-36919 Conc. 00.0 % CO Cyl Press: 1975 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W260657 Conc. 2.47 % CO Cyl Press: 950 psi

Certified by: BOC Gases Date: 1/13/95

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: A.T. Myren Time: 1045 Temp: 74 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	-00.3	-.0062	-.0062	-0.12
Span	2.47	49.4	2.47	2.48	49.4	2.3955	-.0745	-3.01

Comments:

Post Run Audit: By: A.T. Myren Time: 1535 Temp.: 80 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	-00.2	-.0013	-.0013	-0.23
Span	2.47	49.4	2.47	2.45	48.9	2.371	-.0986	-3.99

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: Kuma Scott HT-1
Run: 3
Date: 9/5/96
Technicians: ATH, PLS.
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 71 °F T/C#30: ____ °F

Thermocouple Check (at ambient): T/C#1: 69.0 °F; T/C#2: 69.2 °F;

T/C #3: 69.2 °F; T/C #4: 69.4 °F; T/C #5: 69.4 °F;

T/C #6: 69.4 °F; T/C #7: 69.6 °F; T/C #8: 69.6 °F;

T/C #9: 69.2 °F; T/C #10: 69.6 °F; T/C #11: 69.8 °F;

T/C #12: 69.2 °F; T/C #13: 69.4 °F; T/C #14: 69.4 °F;

T/C #15: 69.2 °F; T/C #16: 66.0 °F; T/C #17: ____ °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:

Zero (0°F): -0.2 °F Adj to: 0.0 °F Post Test Check Zero (0°F): 0.4 °F % Difference +0.02

Span (2000°F): 2000.4 °F Adj to: 2000.0 °F Span (2000°F): 2000.6 °F +0.03

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

Thermocouple Readout Pretest Linearity Check

0°F = 0.0 °F; 200°F = 201.6 °F; 400°F = 398.8 °F;

600°F = 601.0 °F; 800°F = 800.8 °F; 1000°F = 1000.4 °F;

1200°F= 1198.6 °F; 1400°F = 1399.4 °F; 1600°F = 1598.6 °F

1800°F= 1799.6 °F; 2000°F = 2000.0 °F

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

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

Scale Check Pre (Wt, #'s): 433.2 - 438.2 5.0 lbs. OK (PLS.)

Post (Wt, #'s): 435.2 - 440.2 5.0 lbs. OK (PLS)

Stack cleaned prior to the run: Yes ____ No ✓

Tunnel cleaned prior to the run: Yes ____ No ✓

CKUMAR4.XLS

DILUTION TUNNEL CALCULATIONS

MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	ckumar4
Stove Manufacturer:	KUMA
Model Number:	SCOTT HT-1
Lab Name:	MYREN
Test Date:	9\6\96
Run Number:	4
Meter Box Y Factor:	1.012
Barometric pressure (in):	29.95
Gas meter temp (ave):	93.09
delta H(avg):	0.882
Gas meter initial reading:	984.2
Gas meter final reading:	1032.693
Front catch (acetone) mg:	3.1
first filter catch (mg):	3.7
second filter catch (mg):	-1.9
tunnel flow (ave cfm):	142.66
Emission Rate(g/hr):	0.904
Emission Rate(M5H) :	1.673
vs/VmTs:	0.03
vs ave:	824.18
Tunnel average temp (°f):	115.18
Test time(min):	98
Fuel Load(lb. wet):	10.9
Wood moisture(%wet):	18.234
Burn rate(dry kg/hr):	2.475
Samp vol(scf):	46.840
front filter number	135
back filter number	134
acetone beaker number	7
PRELIMINARY RESULTS	
FINAL RESULTS	X

DATA SUMMARY

MODEL :	SCOTT HT-1
RUN:	4
DATE:	9\6\96
DBR:	2.475
GPH UNADJ	0.904
ADJ	1.673

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	984.200	73	0.900	829.07		
10	0.039	125	989.225	77	0.900	829.34	106.1	5.014
20	0.038	125	994.160	82	0.870	818.64	103.2	4.879
30	0.038	124	999.055	88	0.870	817.94	102.4	4.786
40	0.039	117	1003.980	93	0.870	823.65	100.9	4.772
50	0.040	118	1008.975	97	0.870	834.87	101.1	4.805
60	0.039	116	1013.875	100	0.880	822.94	97.0	4.688
70	0.039	113	1018.815	102	0.880	820.79	98.3	4.710
80	0.039	109	1023.780	103	0.880	817.92	98.2	4.725
90	0.040	107	1028.735	104	0.890	826.89	97.8	4.707
98	0.040	103	1032.693	105	0.890	823.96	95.8	3.754
110						0.00	0.0	0.000
120						0.00	0.0	0.000
130						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 Kuma LAB-1

DATE 9/6/96 PAGE 1 OF 1 MODEL # Scott HT-1 RUN # 4

METER BOX # 45G-P METER Y 1.012 FILTER # (F) 135 (R) 134

PRE TEST LEAK RATE = .000 CFM @ -15.75 IN. HG FILTER SIZE: 110MM

POST TEST LEAK RATE = .000 CFM @ -15.00 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						
1035	00	984.200	-.040	110	73	-0.90	0
45	10	989.225	-.039	125	77	-0.90	0
55	20	994.160	-.038	125	82	0.87	0
1105	30	999.055	-.038	124	88	.87	0
15	40	1003.980	-.039	117	93	.87	0
25	50	1008.975	-.040	118	97	.87	0
35	60	1013.875	-.039	116	100	.88	0
45	70	1018.815	-.039	113	102	.88	0
55	80	1023.780	-.039	109	103	.88	0
1205	90	1028.735	-.040	107	104	.89	0
1213	98	1032.693	-.040	103	105	.89	0
	10						
	20						
	30						
	40						
	50						
	60						
	70						
	80						
	90						

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	-.024	132
2	1.5"	-.045	132
3	4.5"	-.046	133
4	5.5"	-.034	132
W-1	0.5"	-.033	130
2	1.5"	-.043	131
3	4.5"	-.039	130
4	5.5"	-.021	131
	Avg.	.03562	131.375

Pilot Leak Check Pre OK Post Ok

Cp = 0.99

N
1
W 1 2 * 3 4
3
4

*=point of Avg. delta p

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

~ 134.463 cfm

BP = Start 29.95 in Hg
60m 29.95
End 29.95

$\bar{X} = 29.95$

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

Into Dessicator: Date 6/1/96 Time 1532 By ATM Front Half _____ Back Half _____

Manufacturer: S&S Size: 110 mm Lot.No.: 29941 Grade: E2 Lot 105

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
126	.7451	6/3/96	1111	ATM	.7449	6/5/96	1853	RLS				
127	.7364	"	1110	ATM	.7360	6/5/96	1852	RLS				
128	.7419	"	1109	ATM	.7416	6/5/96	1851	RLS				
129	.7422	"	1108	ATM	.7420	6/5/96	1850	RLS				
130	.7306	"	1107	ATM	.7304	6/5/96	1849	RLS				
131	.7420	"	1106	ATM	.7413	6/5/96	1848	RLS	.7414	6/6/96	11:35	ATM
132	.7374	"	1102	ATM	.7371	6/5/96	1848	RLS				
133	.7391	"	1102	ATM	.7369	6/5/96	1847	RLS				
134	.7404	"	1101	ATM	.7403	6/5/96	1846	RLS	✓			
135	.7390	"	1101	ATM	.7389	6/5/96	1845	RLS	✓			
136	.7388	"	1100	ATM	.7386	6/5/96	1844	RLS				
137	.7395	"	1059	ATM	.7392	6/5/96	1843	RLS				
138	.7394	"	1058	ATM	.7392	6/5/96	1843	RLS				
139	.7435	"	1058	ATM	.7433	6/5/96	1842	RLS				
140	.7395	"	1057	ATM	.7393	6/5/96	1840	RLS				
141	.7486	"	1057	ATM	.7477	6/5/96	1839	RLS	.7476	6/6/96	1133	ATM
142	.7265	6/5/96	1838	RLS	.7264	6/6/96	11:32	ATM				
143	.7258	6/5/96	1837	RLS	.7258	6/6/96	11:31	ATM				
144	.7254	6/5/96	1836	RLS	.7254	6/6/96	11:30	ATM				
145	.7381	"	1056	ATM	.7372	6/5/96	1830	RLS	.7376	6/6/96	1158	ATM
146	.7513	"	1056	ATM	.7510	"	1832	RLS				
147	.7465	"	1055	ATM	.7462	"	1833	RLS				
148	.7450	"	1054	ATM	.7448	"	1834	RLS				
149	.7474	"	1054	ATM	.7471	"	1835	RLS				
150	.7415	"	1053	ATM	.7413	"	1835	RLS				

Checked by ATM Date: 6/6/96 Time 11:41

QA REWEIGH

Filter #	WT	Date	Time	By	
136	.7386	6/6/96	11:34	ATM	OK
129	.7412	6/6/96	11:36	ATM	OK
149	.7472	6/6/96	11:39	ATM	OK

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
59	72	45	6/3/96	1005	ATM
57	73	49	6/5/96	1825	RLS
57	73	49	6/6/96	1035	ATM

WST5-Form9;Pg3,Rev6/90

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

4th Round

Into Dessicator: Date: 6/27/96 Time: 1200 By: A.J.M...

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4824	8/9/96	1446	ATM	65.4819	8/9/96	1125	RLS				
2	66.1488	7/25/96	1217	RLS	66.1484	8/1/96	0958	ATM				
3	67.8548	8/8/96	1553	ATM	67.8542	8/9/96	1103	RLS	67.8544	8/14/96	11:30	ATM
4	67.5870	8/8/96	1424	ATM	67.5865	8/9/96	1130	RLS	KUMA	#1		
5	67.2054	8/8/96	1618	ATM	67.2050	8/9/96	1058	RLS	KUMA	5		
6	67.4250	7/3/96	1403	RLS	67.4241	7/10/96	1059	ATM	67.4250	7/25/96	1155	RLS
7	65.5428	8/8/96	1533	ATM	65.5423	8/9/96	1110	RLS	KUMA	4		
8	66.0183	7/10/96	1100	ATM	66.0187	7/25/96	1055	RLS				
9	66.9280	7/8/96	1312	ATM	66.9276	8/9/96	1120	RLS	KUMA #2			
10	66.0842	7/10/96	1111	ATM	66.0860	7/25/96	0933	RLS				
11	65.6989	7/10/96	1108	ATM	65.6989	7/25/96	1020	RLS				
12	Broken											

KUMA 7

BLANK 8/8/96]

Checked By: _____ Date: _____ Time: _____

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	47	7/3/96	0953	ATM
60	72	49	7/11/96	1006	ATM
57.5	69	48	8/1/96	0948	ATM
66	79	49	8/8/96	1235	ATM
60	72	49	8/9/96	0945	ATM
64	72	49	8/14/96	1116	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9, ..., Rev4/90
Unit Kuma Stove #HT-1
Run # 4
Date: 9/6/96

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
7	✓	9/10/96	1720	ATM	65.5468	9/11/96	1937	PLS	65.5460	9/12/96	1572	ATM	65.5455	9/13/96	0820	PLS

FINAL FILTER WEIGHTS

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
R	134	.7386	9/6/96	1256	ATM	.7386	9/6/96	1258	ATM	.7383	9/9/96	1819	ATM	.7384	9/10/96	1750	ATM
F	185	.7430	9/6/96	1255	ATM	.7430	9/6/96	1257	ATM	.7425	9/9/96	1814	ATM	.7426	9/11/96	1745	ATM

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	9/6/96	1030	ATM	60	72	49
2	9/9/96	1806	ATM	63	76	48
3	9/10/96	1726	ATM	64	77	48
4	9/11/96	1930	ATM	63	76	48
5	9/12/96	1326	ATM	59	71	48

SCALE ROOM ENVIRONMENTAL CONDITIONS

6	9/13/96	0956	ATM	58	70	49
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Blank 8/8/96

WST5-Form9, Pg1, Rev4/90
Unit Kama Scott MT-1
Run # 4
Date: 9/6/96

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
6	✓	8/16/96	11:30	ATM	67.4251	8/15/96	1717	ATM	67.4251	8/29/96	1031	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	Date	Time	By	WB	DB	%RH
1	8/15/96	1702	ATM	66	71	49
2	8/29/96	1008	ATM	64	72	49
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 6/20/96

Through 9/10/96

Scale Mettler
Model AE 100
SN K04827

TROEMNER CLASS S WTS.

	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
	100.0003	10.0000	1.0000	.1000	.0199	RLS	6/20/96	1625	61	74	47
	100.0000	10.0000	1.0000	.1000	.0200	ATM	6/21/96	1259	61	74	47
	100.0005	10.0001	1.0001	.1000	.0200	ATM	6/25/96	1410	63	76	48
R	99.9996	10.0000	1.0001	.1001	.0201	ATM	6/26/96	1558	64	78	46
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	6/27/96	1718	65	78	49
R	99.9998	10.0000	1.0000	.1000	.0200	ATM	6/28/96	1254	59	70	48
	100.0001	10.0000	1.0001	.1000	.0200	ATM	7/1/96	1504	65	78	49
	100.0003	10.0001	1.0001	.1000	.0200	ATM	7/2/96	1316	64	77	49
	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/5/96	953	58	70	47
R	99.9998	10.0000	1.0001	.1000	.0201	ATM	7/8/96	1727	57	83	42
R	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/9/96	1456	% RH TO high		
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	7/10/96	1006	60	72	49
	99.9998	10.0000	1.0000	.1001	.0200	ATM	7/11/96	0918	59	71	48
	99.9998	9.9999	1.0000	.1000	.0200	ATM	7/12/96	842	59	71	48
	100.0000	10.0001	1.0000	.1001	.0201	ATM	7/16/96	1233	62	75	47
	100.0003	10.0003	1.0002	.1002	.0202	ATM	7/17/96	1605	63	74	54
	99.9996	9.9998	.9998	.0998	.0198	ATM	7/18/96	0733	68	56	49
	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/19/96	0740	71	59	48
R	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/22/96	1445	82	68	48
R	99.9997	10.0001	1.0002	.1001	.0201	ATM	7/23/96	1513	80	66	47
	99.9996	10.0000	1.0000	.1001	.0200	ATM	7/24/96	0757	59	71	48
	99.9997	10.0000	1.0000	.1001	.0201	ATM	7/24/96	1617	71	86	47
	99.9999	10.0001	1.0001	.1001	.0201	ATM	7/25/96	0814	61	73	49
	100.0002	10.0002	1.0002	.1001	.0201	ATM	7/31/96	2035	65	79	47
	99.9995	10.0000	1.0000	.1001	.0202	ATM	8/1/96	0905	69	57.5	48
	100.0000	10.0001	1.0001	.1001	.0202	ATM	8/1/96	1950	60	72	49
	99.9998	10.0000	1.0001	.1000	.0202	ATM	8/2/96	801	59	71	47
	100.0001	10.0000	1.0000	.0999	.0199	ATM	8/8/96	1235	66	79	49
R	99.9996	10.0000	1.0001	.1000	.0201	ATM	8/9/96	0754	60	72	49
	100.0003	10.0001	1.0000	.1000	.0200	ATM	8/14/96	1116	64	77	49
R	99.9999	10.0001	1.0001	.1001	.0201	ATM	8/15/96	1902	66	79	49
	100.0002	10.0000	1.0001	.1001	.0201	ATM	8/28/96	1611	70	85	49
	99.9995	10.0000	1.0000	.1001	.0200	ATM	8/29/96	1008	64	77	49
R	99.9996	10.0000	1.0000	.1000	.0200	ATM	8/30/96	1005	61	73	48
	99.9996	10.0001	1.0000	.1000	.0200	ATM	9/5/96	0954	59	71	48
R	99.9996	10.0000	1.0003	.1002	.0200	ATM	9/6/96	1030	62	80	49
	100.0000	10.0000	1.0000	.1000	.0200	ATM	9/9/96	1806	76	63	48
	100.0005	10.0002	1.0000	.1001	.0200	ATM	9/10/96	1726	67	64	48

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 9/11/96

Through _____

Troemner Class S Wts.

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
✓	No	100.0003	10.0001	1.0001	.1001	.0201	9/11/96	1730	ATM	63	76	48.0
✓	No	99.9997	10.0000	1.0000	.1000	.0199	9/12/96	1326	ATM	59	71	48.0
✓	No	99.9998	10.0000	1.0000	.1000	.0200	9/13/96	0756	ATM	70	58	49.0
✓	No	99.9996	9.9999	1.0000	.0999	.0199	9/13/96	1219	ATM	71	59	48.0

Unit: Kuma Scott HT-1
Run: 4
Date: 9/6/96
Technicians: AM / RLS
WST20, Form5

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

Filters

Filter #	134 (R)	Beaker #	7	Final Wt.	65.5455 g
Final Wt	.7384 g	Ml	78	Tare Wt.	65.5423 g
Tare Wt	.7403 g	Desc.	Acetone	Net Wt.	.0032 g
Net Wt	-.0019 g				
Filter #	135 (F)	Beaker #		Final Wt.	g
Final Wt	.7426 g	Ml		Tare Wt.	g
Tare Wt	.7389 g	Desc.		Net Wt.	g
Net Wt	.0037 g				

Acetone Blank Calculation: Blank done 8/8/96

Blank Beaker #	6	Final Wt	67.4251
Ml	140	Tare Wt	67.4250
Desc	Acetone	Net Wt	.0001

.0001 g ÷ 140 ml = .000001 g/ml

Particulate Catch Calculation

Filter: .0037 g

Filter: -.0019 g

Beakers: .0032 − (.000001)(78) = .0031 g

Total Catch − (Ml of Acetone × Blank Value/Ml of Acetone) = Total Catch

Total Catch = .0049 g

Unit SCOTT KUMA HT-1
Run # 4
Date 9/6/96
Technician ATM, RLS.
WST6-Form1, Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.716 ft^3

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

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

Wet Bulb/ Start: WB: 61 °F DB: 71 °F 1.5 % Amb Moisture 5% %RH

Dry Bulb Stop: WB: 59 °F DB: 70 °F 1.3 % Amb Moisture 51 %RH

$\bar{X}$ = 1.40 % Ambient Moisture $\bar{X}$ = 53.5 % Relative Humidity (RH)

Empty Stove Wt: 343.1 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 433.0 lbs. Dry: 432.8 lbs.

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

Kindling Wt. Paper: 0.3 lbs. Wood: 4.0 lbs.

Pre Burn Fuel Wt. 11.4 + 10.8 + 13.7 Total: 35.9 lbs.

Total Kindling and Pre Burn Fuel Wt 40.2 lbs.

Coal Bed Wt-lbs: Range(2.7 - 2.2) lbs. Actual: 2.3 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\frac{435.5}{\text{Upper Wt.}} + \frac{435.0}{\text{Lower Wt.}} / 2 \times .25 =$ 0.6 lbs.

Test Fuel Wt-lbs: Ideal 12.0 lbs. Range: 10.9-13.2 lbs. Actual: 10.9 lbs.

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

2 x 4's x 14 5/16 "	3 Pcs	6.8 lbs.	62.4 %
4 x 4's x 14 5/16 "	1 Pcs	4.1 lbs.	37.6 %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.9 - (10.9 \times .18234)}{2.20\,46} \times \frac{60}{98} =$ 2.475 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output(HO_E) (Avg BTU's/Hr) (19,140) X $\frac{63}{100}$ x 2.475 = 29,845 Est Heat Output (HO_E) BTU's/Hr

Comments:

Unit: Kuma Scott HT-1
Run: 4
Date: 9/6/96
Technician(s): AMM, DLS
WST3-Form 1 Rev 9/90

STOVE OPERATING DATA
WOODSTOVE TEST DATA SHEET #9

Fire Started: 0722 PDST

Warm up and Preburn: Primary Air: Wide open from ignition until the start of the 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.
High Burn - Wide Open from ignition to start of 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 25 seconds.

Test: Door Wide Open during loading _____ min 25 sec, then Closed.

Primary Air: Wide open during the start of the test until End of test. Adjusted to the run setting of N/A between ___ and ___. At the run setting of Wide Open at 0:00 into the run.
High burn. Wide open from start to end of test.

Secondary Air:

No Controls. Naturally drafted

Secondary Burn/~~Cat~~ Bypass: N/A

Fan: Off durning warm up. On high during preburn. Off at the start of the test. Off for 1st 5 minutes of the test On high @ 5:00 into the test. On high for the rest of the test.

Test Run Anomlies:

Very Good high burn.

Unit SCOTT KUMA HT-1
Run # 4
Date 9/6/96
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	R.I.B. LUMBER	STD. & BTR.	D. Fir, S. GRN.
Test Fuel	2x4	R.I.B. LUMBER	#2 STD. & BTR.	D. Fir, S. GRN.
	4x4	R.I.B. LUMBER	#2 STD. & BTR.	D. Fir, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (11.4 lbs) added at 0743.
2nd Warm up/Pre Burn Fuel charge (10.8 lbs) added at 0822.
3rd Warm up/Pre Burn Fuel charge (13.7 lbs) added at 0913.
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 RD. pre burn/warm up fuel charge. The stove lost 0.2 lbs.

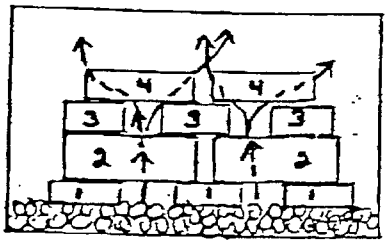
All pre burn/warm up fuel pieces were either 14 or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 14 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 14 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 2 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: SCOTT KUHA HT-1
Run # 4
Date 9/6/96
Technician ATH, RLS
Page 2 of
WST7-Form2-A, Rev 6/90

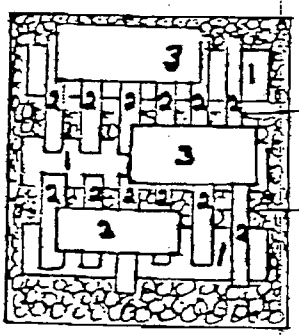
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

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 925 °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 35.9 lbs above the upper charcoal bed weight..

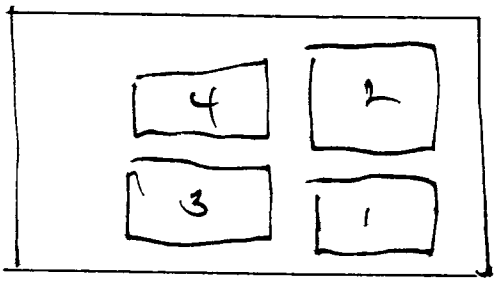
Unit SCOTT KUMA HT-1
Run # 4
Date 9/6/96
Technician ATM, RLS,
Page 3 of 3
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: ① Turned fan off. ② opened door ③ loaded test fuel charge into the stove ④ photo ⑤ closed the door.

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



Front of stove view

4 X 4's: 2

2 X 4's: 1, 3 & 4

Loading Sequence: 1, 2, 3 & 4

Driest Pcs in Load 3

Loaded the test fuel charge on an essentially level, medium-large sized, average coal bed (in appearance, color and temperature for a High burn rate.

Load 0:30
Ignition 0:25
Door Closed 0:30
Firebox engulfed in Flames 2:45
Very nice start.

Unit: SCOTT KUMA HT-1
Run: 4
Date: 9/6/96
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: 0845
Calibration Checks: X ✓ Y ✓ 12.5 12.4 22.0 22.0

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg Corrected
			Uncor	Cor	Uncor	Cor	Uncor	Cor	
1	2x4	K	8.0	8.4	8.0	8.4	8.0	8.4	(8.400)
2									
3									
4									
5	2x4x8'	P	18.0	19.2	18.0	19.2	18.0	19.2	19.200
6	"	P	18.0	19.2	18.5	19.8	18.0	19.2	19.400
7	"	P	22.0	23.7	22.5	24.3	22.0	23.7	23.900
8									(62.500)
9									
10									
11	2x4x14 5/16"	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
12	"	T	22.5	24.3	22.5	24.3	22.5	24.3	24.300
13	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700
14									
15	4x4x14 5/16"	T	19.5	20.9	20.0	21.4	22.0	23.7	22.000
16									(89.200)
17									
18									
19	FEET	T	18.0	19.2	18.0	19.2	18.0	19.2	(19.200)
20								OUT SPACERS	

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	8.400 % ✓	20.833 ✓ %	22.300 %
% Moisture - Wet Basis:	7.749 % ✓	17.241 ✓ %	18.234 %

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: SCOTT KUHA HT-1
Run#: 4
Date: 9/6/96
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 1.568 cm 3.9827

Width (W): IN 3.533 cm 8.9738

Length (L): 3.568 cm
3.548 cm
3.566 cm
3.543 cm

Length $\bar{X}$ = IN 3.556 cm 9.0322

Volume: 322.814 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:	20.5	22.0 %
Bottom:	20.0	21.4 %
Side:	19.5	20.9 %
$\bar{X}$:		21.433 %

Avg % Moisture (Dry) 21.433 %

Aug % Moisture (Wet) 17.650 %

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

Wet Weight: 186.0 g Dry Weight: 157.1 g

% Moisture Dried Basis: 15.538 %
[1 - (Dry Wt - Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	9/6/96	1100	215 °F
Out of Dryer	9/9/96	1715	220 °F

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

Density = 157.1 g (dry wt) ÷ 322.814 cm^3 (volume) = .4867 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. _____ g

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

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

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

BURN RATE AND FLUE GAS DATA
WOOD [illegible]E DATA SHEET #12
WST2-[illegible]rm 14 Rev 1/88

Unit: Rumford Stove #47-1 Date: [illegible]
Run: 4 Technician(s): [illegible]
Page: 1 of 1

END: 435.1 lbs.

				1		2			3		T/C(1)	T/C(2)			T/C(3)	4			
Minute / Time	Scale Wt	lbs left	Burn Rate	CO_2 v.	$\%CO_2$	O_2 v.	$\%O_2$	Tel	CO v.	%CO	Bal	Wet Bulb	Dry Bulb	% H_2O	Calc W/B	Stack	SO_2 v.	SO_2 PPM	Static Press.	Comments
0 / 1035	446.0	10.9	0	.324	8.07	49.0	12.2			.78	10.4	82	85	35	122	394			-.072	Flow
5 / 40	445.1	10.0	.9	.400	9.95	34.5	8.60			.37	26.9	107	118	7.5	136	476			-.087	SO_2 1.5
10 / 45	444.1	9.0	1.0	.571	14.20	26.4	6.59			.27	52.5	113	130	8.6	141	546			-.091	CO_2 1.5
15 / 50	443.1	8.0	1.0	.500	12.4	32.9	8.21			.20	62.1	122	133	12.0	147	550			-.090	O_2 1.5
20 / 55	442.1	7.0	1.0	.557	13.8	27.1	6.76			.17	81.4	127	133	13.5	148	553			-.090	CO 1.5
25 / 1100	441.2	6.1	.9	.573	14.2	26.5	6.61			.19	74.9	129	134	14.5	150	555			-.091	
30 / 05	440.4	5.3	.8	.534	13.3	29.9	7.46			.13	100.0	125	134	13.0	148	557			-.088	
35 / 10	439.8	4.7	.6	.466	11.6	36.5	9.10			.18	64.4	122	130	12.0	145	524			-.085	
40 / 15	439.2	4.1	.6	.435	10.8	39.3	9.80			.26	41.6	119	121	11.0	143	502			-.083	
45 / 20	438.6	3.5	.6	.462	11.5	37.2	9.28			.18	63.8	116	120	10.0	142	505			-.083	
50 / 25	438.0	2.9	.6	.473	11.8	35.6	8.88			.15	78.4	112	119	9.0	140	515			-.084	
55 / 30	437.5	2.4	.5	.440	10.9	39.1	9.75			.15	72.9	103	110	7.5	137	501	✓		-.082	✓
																(6178)	✓		(1.026)	Flow
60 / 1135	437.1	2.0	.4	.404	10.1	42.0	10.5			.20	503	95	103	6.3	133	485			-.087	SO_2 1.5
65 / 40	436.7	1.6	.4	.368	9.16	45.3	11.3			.25	36.6	93	104	4.7	132	475			-.080	CO_2 1.5
70 / 45	436.3	1.2	.4	.353	8.79	46.5	11.6			.28	31.4	89	102	4.2	128	459			-.078	O_2 1.5
75 / 50	436.0	.9	.3	.359	8.94	45.7	11.4			.26	34.4	89	100	4.2	128	454			-.077	CO 1.5
80 / 55	435.7	.6	.3	.318	7.93	49.7	12.4			.34	23.3	88	101	4.2	126	435			-.075	
85 / 1200	435.5	.4	.2	.282	7.03	53.1	13.2			.49	14.4	87	97	4.0	124	415			-.072	
90 / 05	435.4	.3	.1	.269	6.71	54.1	13.5			.60	11.2	85	95	3.7	123	400			-.070	
95 / 10	435.2	.1	.2	.246	6.15	56.5	14.1			.74	(8.3)	83	93	3.5	121	386			-.069	
96 / 13	435.1	.0	.1	.219	5.48	58.5	14.6			.92	6.0	82	93	3.4	120	370			-.067	
105																(3879)	✓		(.669)	✓
110												21½	✓							
115																(10,057)	✓		(1.695)	✓
																479	✓		-.081	✓

Pre Burn Start Wt. lbs.

PRE BURN DATA RECORD SHEET #13

BARO. PRESSURE 29.95

Test Start wt. Range WST2-Form16

435.5-435.0 lbs.

Stove: SCOTT KUMA HT-1 Date: 9/6/96

Run: 4 Technician(s): ATM, R.

Page: 1 of 1

Minute Time	Scale Weight	Burn Rate	Stack	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Static	Comments
T/C#-3			4	5	6	7	8	9	10	11			
0 0915	448.5	0	364	520	680	306	557	501	713	821	78	-.088	Primary Air Set at WIDE OPEN
5 20	447.4	1.1	624	742	684	220	557	489	808	935	73	-.097	Secondary Air Set at N/A
10 25	446.3	1.1	628	827	572	188	536	477	817	996	72	-.099	Fan: ON HIGH
15 30	445.1	1.2	620	844	558	168	511	461	859	1092	68	-.099	TUNNEL ON AT: 0915
20 35	444.0	1.1	619	844	549	159	491	445	1015	1224	67	-.099	
25 40	442.8	1.2	623	863	543	154	477	435	1084	1259	67	-.098	
30 45	441.6	1.2	587	860	548	150	468	430	1077	1286	68	-.095	RAKE COALS Pumps turned on at: 0945
35 50	440.1	1.5	606	806	551	149	467	442	1457	1038	69	-.096	
40 55	438.8	1.3	599	780	561	148	483	442	1404	1095	68	-.094	
45 1000	437.8	1.0	593	778	565	149	511	402	1365	1265	69	-.093	Check WB/DB: 100/133
50 05	437.0	.8	586	836	580	153	544	401	1090	1266	69	-.091	RAKE COALS 502.2
55 10	436.5	.5	568	796	590	156	554	395	1112	1282	70	-.089	498.2
60 15	436.1	.4	535	748	593	158	561	408	1381	1241	69	-.085	493.6
65 20	435.8	.3	490	672	591	158	567	417	1347	1183	69	-.081	481.0
70 25	435.5	.3	462	614	593	159	571	417	1156	1141	70	-.078	470.8
75 30	435.3	.2	432	566	586	161	573	423	1103	1048	69	-.075	
80 35	435.1	.2	394	521	578	158	561	427	1107	1008	70	-.072	449.0
85 40													
90 45													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

U SCOTT KUMA HT-1 Date: 9/6/96
R 4 Technician(s): ATH, [illegible]
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 ~~Coincidence~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Condar	
0 / 1035	521	578	158	561	427	1107	1008	70	110	247	35	77	35		
5 / 40	550	557	214	539	436	979	1103	69	122	248	36	75	34		
10 / 45	687	556	180	530	429	1046	1165	69	125	248	36	75	34		
15 / 50	707	552	163	518	428	1025	1211	69	125	248	36	75	34		
20 / 55	712	548	155	509	415	1044	1286	69	125	248	36	76	34		
25 / 1100	725	546	157	509	408	1103	1348	69	125	248	36	76	34		
30 / 05	712	542	150	515	404	1115	1340	70	124	247	36	76	34		
35 / 10	679	544	148	520	394	1109	1260	70	120	247	36	76	34		
40 / 15	640	544	149	522	389	1092	1256	70	117	247	36	77	34		
45 / 20	626	542	150	523	386	1071	1250	69	117	247	36	77	34		
50 / 25	633	542	151	524	388	1072	1250	69	118	248	37	77	34		
55 / 30	629	542	154	527	384	1066	1236	70	117	248	37	77	34		
	(7821)	(6593)	(1923)	(6297)	(4888)	(12,829)	(14,713)	(8233)							
60 / 35	606	543	155	535	399	1071	1176	70	116	248	37	76	34		
65 / 40	583	540	156	536	398	1043	1131	70	114	248	37	76	34		
70 / 45	563	538	157	537	405	1031	1113	70	113	248	37	76	34		
75 / 50	545	534	157	538	408	1026	1104	70	112	248	37	75	34		
80 / 55	529	530	158	540	413	977	1074	70	109	247	37	75	34		
85 / 1200	498	527	158	544	420	944	1038	70	108	246	37	75	34		
90 / 05	474	526	158	543	433	969	1024	70	107	247	37	74	34		
95 / 10	455	522	158	541	436	907	985	70	105	246	37	74	34		
100 / 15	433	519	157	535	434	876	957	70	103	248	37	74	34		
105 / 20	(4686)	(4779)	(1414)	(4849)	(3746)	(8844)	(9596)	(630)							
110 / 25	✓	✓	✓	✓	✓	✓	✓	✓				START	449.0	✓	
116 / 30	(12,507)	(11,372)	(3337)	(11,146)	(8634)	(21,673)	(24,309)	(1463)		(21÷)		FINISH	415.6	✓	
	✓	✓	✓	✓	✓	✓	✓	✓				(ΔT=)	-33.4	✓	
	(596)	(542)	(159)	(531)	(411)	(1032)	(1158)	(70)							

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

Site: Myren Consulting, Woodinville, WA Date: 9/6/96 Analyte: CO_2

Source: SCOTT KUMA HT-1 Run #: 4

Zero Cyl #: 4-36919 Conc. 00.0 % CO_2 Cyl Press: 1950 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W260657 Conc. 10.1 % CO_2 Cyl Press: 925 psi

Certified by: BOC Gases Date: 1/10/95

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: A.T.Myren Time: 0920 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	-.000	.0666	.0666	0.27
Span	40.4	.404	10.1	40.0	.404	10.0511	-.0489	-0.48

Comments:

Post Run Audit: By: A.T.Myren Time: 1247 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	.0666	.0666	0.27
Span	40.4	.404	10.1	40.4	.405	10.0759	-.0241	-0.24

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: 9/6/96 Analyte: O_2

Source: SCOTT KUMA HT-1 Run #: 4

Zero Cyl #: 4-36919 Conc. 00.0 % O_2 Cyl Press: 1950 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W260657 Conc. 12.5 % O_2 Cyl Press: 925 psi

Certified by: BOC Gases Date: 1/18/95

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: A. T. Myren Time: 0920 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.5	00.2	.0552	.0552	0.22
Span	12.5	50.0	12.5	12.6	50.0	12.4677	-.0323	-0.26

Comments:

Post Run Audit: By: A. T. Myren Time: 1248 Temp.: 71 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.5	00.2	.0552	.0552	0.22
Span	12.5	50.0	12.5	12.6	49.9	12.4423	-.0577	-0.46

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: 9/6/96 Analyte: CO

Source: SCOTT KUMA HT-1 Run #: 4

Zero Cyl #: 4-36919 Conc. 00.0 % CO Cyl Press: 1950 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W260657 Conc. 2.47 % CO Cyl Press: 925 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T.Myren Time: 0920 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	-00.3	-.0062	-.0062	-0.12
Span	2.47	49.4	2.47	2.48	49.4	2.396	-.0745	-3.01

Comments:

Post Run Audit: By: A.T.Myren Time: 1248 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	-00.3	-.0062	-.0062	-0.12
Span	2.47	49.4	2.47	2.48	49.4	2.396	-.0745	-3.01

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: SCOTT KUMA HT-1
Run: 4
Date: 9/6/96
Technicians: ATM, PLS.
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 67 °F T/C#30: _____ °F

Thermocouple Check (at ambient): T/C#1: 69.0 °F; T/C#2: 69.2 °F;
T/C #3: 69.4 °F; T/C #4: 69.4 °F; T/C #5: 69.2 °F;
T/C #6: 69.2 °F; T/C #7: 69.4 °F; T/C #8: 69.6 °F;
T/C #9: 69.4 °F; T/C #10: 69.6 °F; T/C #11: 67.4 °F;
T/C #12: 69.4 °F; T/C #13: 69.6 °F; T/C #14: 69.4 °F;
T/C #15: 69.2 °F; T/C #16: 66.0 °F; T/C #17: _____ °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:

Zero (0°F):	-0.4 °F	Adj to: 0.0 °F	Post Test Check Zero (0°F): 0.4 °F	% Difference +0.02
Span (2000°F):	1999.6 °F	Adj to: 2000.0 °F	Span (2000°F): 2000.0 °F	0

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

Thermocouple Readout Pretest Linearity Check

0°F = 0.0 °F; 200°F = 201.6 °F; 400°F = 398.8 °F;
600°F = 601.0 °F; 800°F = 800.8 °F; 1000°F = 1000.4 °F;
1200°F = 1198.4 °F; 1400°F = 1399.0 °F; 1600°F = 1598.6 °F
1800°F = 1799.6 °F; 2000°F = 2000.0 °F

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

Scale Check Pre (Wt, #'s): 433.0 - 438.0 5.0 lbs. OK (PLS)
Post (Wt, #'s): 435.0 - 440.0 5.0 lbs. OK (PLS)

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

CKUMAR5.XLS

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

3/31/96

File Name:	CKUMAR5
Stove Manufacturer:	KUMA
Model Number:	SCOTT HT-1
Lab Name:	MYREN
Test Date:	9\9\96
Run Number:	5
Meter Box Y Factor:	1.012
Barometric pressure (in):	29.955
Gas meter temp (ave):	102.65
delta H(avg):	0.882
Gas meter initial reading:	32.1
Gas meter final reading:	139.32
Front catch (acetone) mg:	3.8
first filter catch (mg):	28.7
second filter catch (mg):	1.0
tunnel flow (ave cfm):	144.30
Emission Rate(g/hr):	2.87
Emission Rate(M5H) :	4.37
vs/VmTs:	0.01
vs ave:	797.54
Tunnel average temp (°f):	90.35
Test time(min):	215
Fuel Load(lb. wet):	10.9
Wood moisture(%wet):	18.133
Burn rate(dry kg/hr):	1.130
Samp vol(scf):	101.927
front filter number	137
back filter number	136
acetone beaker number	5
PRELIMINARY RESULTS	
FINAL RESULTS	X

DATA SUMMARY

MODEL :	SCOTT HT-1
RUN:	5
DATE:	9\9\96
DBR:	1.130
GPH UNADJ	2.874
ADJ	4.372

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	0.038	90	32.100	72	0.900	793.71		
10	0.039	98	37.245	77	0.890	809.91	110.3	5.135
20	0.039	97	42.175	82	0.880	809.19	102.5	4.875
30	0.038	99	47.065	88	0.870	800.18	101.0	4.782
40	0.038	99	51.925	94	0.860	800.18	100.4	4.701
50	0.038	99	56.810	98	0.870	800.18	100.2	4.691
60	0.038	97	61.715	101	0.870	798.74	99.7	4.685
70	0.038	95	66.655	104	0.880	797.31	99.7	4.694
80	0.038	94	71.620	106	0.870	796.59	99.8	4.701
90	0.038	92	76.585	107	0.870	795.15	99.4	4.693
100	0.038	90	81.565	108	0.880	793.71	99.3	4.699
110	0.037	89	86.570	109	0.880	782.48	99.7	4.714
120	0.038	89	91.575	109	0.880	792.99	101.1	4.714
130	0.039	88	96.575	110	0.880	802.62	99.3	4.701
140	0.039	88	101.590	110	0.890	802.62	98.4	4.715
150	0.039	87	106.615	110	0.890	801.89	98.4	4.725
160	0.039	86	111.650	110	0.890	801.16	98.5	4.734
170	0.039	85	116.685	111	0.890	800.42	98.3	4.726
180	0.040	83	121.725	111	0.890	809.13	98.1	4.730
190	0.038	84	126.750	111	0.890	789.37	96.9	4.716
200	0.038	83	131.785	111	0.890	788.64	99.4	4.726
210	0.038	83	136.835	111	0.890	788.64	99.8	4.740
215	0.038	83	139.320	111	0.890	788.64	98.2	2.332
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 Kuma LAB-1

DATE 9/9/96 PAGE 1 OF 2 MODEL # Scott HT-1 RUN # 5

METER BOX # 45G-P METER Y 1.012 FILTER # (F) 137 (R) 136

PRE TEST LEAK RATE = .001 CFM @ -17.5 IN. HG FILTER SIZE: 110 mm

POST TEST LEAK RATE = .000 CFM @ -13.0 IN. HG PROBE LENGTH 24" glass

TIME CLOCK	TIME ELAPSED	METER READING CU.FT.	PITOT dp	TNL TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
2125	00	32.100	-.038	90	72	0.90	0
35	10	37.245	-.039	98	77	.89	0
45	20	42.175	-.039	97	82	.88	0
55	30	47.065	-.038	99	88	.87	0
2205	40	51.925	-.038	99	94	.86	0
15	50	56.810	-.038	99	98	.87	0
2225	60	61.715	-.038	97	101	.87	0
35	70	66.655	-.038	95	104	.88	0
45	80	71.620	-.038	94	106	.87	0
55	90	76.585	-.038	92	107	.87	0
2305	100	81.565	-.038	90	108	.88	0
15	10	86.570	-.037	89	109	.88	0
25	20	91.575	-.038	89	109	.88	0
35	30	96.575	-.039	88	110	.88	0
45	40	101.590	-.039	88	110	.89	0
55	50	106.615	-.039	87	110	.89	0
0005	60	111.650	-.039	86	110	.89	0
15	70	116.685	-.039	85	111	.89	0
25	80	121.725	-.040	83	111	.89	0
35	90	126.750	-.038	84	111	.89	0

VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	-.023	95
2	1.5"	-.046	95
3	4.5"	-.046	95
4	5.5"	-.032	94
W-1	0.5"	-.031	94
2	1.5"	-.043	94
3	4.5"	-.045	94
4	5.5"	-.028	92
	Avg.	-.03675	94.125

554.125

Pitot Leak Check Pre OK Post OK

Cp = 0.99

N 1 * 2 → W 1 2 3 4 3 4

*=point of Avg. delta p

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

~ 141.156 cfm

BP = start 29.95 in Hg
[illegible] 29.95
[illegible] 29.95
[illegible] 29.96

$\bar{X}$ = 29.955

17.56 .84 [illegible] 176 17.62

METHOD 5G-1 PARTICULATE SAMPLING DATA Kuma LAB-1

DATE 9/9/96 PAGE 2 OF 2 MODEL # Scott HT-1 RUN # 5

METER BOX # 45G-P METER Y 1.012 FILTER # (F) 137 (R) 136

PRE TEST LEAK RATE = .001 CFM @ -17.5 IN. HG FILTER SIZE: 110 MM

POST TEST LEAK RATE = .000 CFM @ -13.0 IN. HG PROBE LENGTH 24" glass

TIME		METER READING CU.FT.	PITOT dp	TML TEMP. (°F)	METER TEMP. (°F)	GAS METER dh	VAC IN. Hg
CLOCK	ELAPSED						
0045	200	131.785	-.038	83	111	.89	0
55	10	136.835	-.038	93	111	.89	0
0100	15	139.320	-.038	83	111	.89	0
	30						
	40						
	50						
	60						
	70						
	80						
	90						
	00						
	10						
	20						
	30						
	40						
	50						
	60						
	70						
	80						
	90						

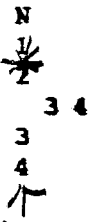
VELOCITY TRAVERSE

POINT	LOCATION	ΔP	TEMP
N-1	0.5"	-.023	95
2	1.5"	-.046	95
3	4.5"	-.046	95
4	5.5"	-.032	94
W-1	0.5"	-.031	94
2	1.5"	-.043	94
3	4.5"	-.045	94
4	5.5"	-.028	92
	Avg.	-.03675	94.125

554/125

Pilot Leak Check Pre OK Post OK

Cp = 0.99



*=point of Avg. delta p

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

Q 14,156 cfm

BP = END 29.96 in Hg

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

Into Dessicator: Date 6/1/96 Time 1532 By ATM Front Half _____ Back Half _____

Manufacturer: SKC Size: 110 mm Lot.No.: 29941 Grade: E25 Lot 105

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
126	.7451	6/3/96	1111	ATM	.7449	6/5/96	1853	RLS				
127	.7364	"	1110	ATM	.7360	6/5/96	1852	RLS				
128	.7419	"	1109	ATM	.7416	6/5/96	1851	RLS				
129	.7422	"	1108	ATM	.7420	6/5/96	1850	RLS				
130	.7306	"	1107	ATM	.7304	6/5/96	1849	RLS				
131	.7420	"	1106	ATM	.7413	6/5/96	1848	RLS	.7414	6/6/96	11:35	ATM
132	.7374	"	1102	ATM	.7371	6/5/96	1848	RLS				
133	.7391	"	1100	ATM	.7369	6/5/96	1847	RLS				
134	.7404	"	1101	ATM	.7403	6/5/96	1846	RLS				
135	.7390	"	1101	ATM	.7389	6/5/96	1845	RLS				
136	.7388	"	1100	ATM	.7386	6/5/96	1844	RLS	X			
137	.7395	"	1059	ATM	.7392	6/5/96	1843	RLS	X			
138	.7394	"	1058	ATM	.7392	6/5/96	1843	RLS				
139	.7435	"	1058	ATM	.7433	6/5/96	1842	RLS				
140	.7395	"	1057	ATM	.7393	6/5/96	1840	RLS				
141	.7486	"	1057	ATM	.7477	6/5/96	1839	RLS	.7476	6/6/96	1133	ATM
142	.7265	6/5/96	1838	RLS	.7264	6/6/96	11:32	ATM				
143	.7258	6/5/96	1837	RLS	.7258	6/6/96	11:31	ATM				
144	.7254	6/5/96	1836	RLS	.7254	6/6/96	11:30	ATM				
145	.7376	"	1056	ATM	.7372	6/5/96	1830	RLS	.7376	6/6/96	1139	ATM
146	.7513	"	1056	ATM	.7510	"	1832	RLS				
147	.7465	"	1055	ATM	.7462	"	1833	RLS				
148	.7450	"	1054	ATM	.7448	"	1834	RLS				
149	.7474	"	1054	ATM	.7471	"	1835	RLS				
150	.7415	"	1058	ATM	.7413	"	1835	RLS				

Checked by ATM Date: 6/6/96 Time 1:41

QA REWEIGH

Filter #	WT	Date	Time	By
136	.7386	6/6/96	11:34	ATM
126	.7412	6/6/96	11:36	ATM
149	.7472	6/6/96	11:39	ATM

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
59	72	45	6/3/96	1005	ATM
57	73	49	6/5/96	1825	RLS
57	73	49	6/6/96	1035	ATM

WST5-Form9,Pg3,Rev6/90

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

Into Dessicator: Date: 6/22/96 Time: 1200 By: A.J. Kumm

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
1	65.4824	8/8/96	1446	ATM	65.4819	8/9/96	1125	RLS				
2	66.1488	7/25/96	1217	RLS	66.1484	8/1/96	0958	ATM				
3	67.8548	8/8/96	1553	ATM	67.8542	8/9/96	1103	RLS	67.8544	8/14/96	1130	ATM
4	67.5870	8/8/96	1424	ATM	67.5865	8/9/96	1130	RLS	Kuma	#1		
5	67.2054	8/8/96	1618	ATM	67.2050	8/9/96	1058	RLS	Kuma	5		
6	67.4250	7/3/96	1403	RLS	67.4241	7/10/96	1059	ATM	67.4250	7/25/96	1155	RLS
7	65.5428	8/8/96	1533	ATM	65.5423	8/9/96	1110	RLS	Kuma	4		
8	66.0183	7/10/96	1100	ATM	66.0187	7/25/96	1055	RLS				
9	66.9280	7/8/96	1312	ATM	66.9276	8/9/96	1120	RLS	Kuma #2			
10	66.0862	7/10/96	1111	ATM	66.0860	7/25/96	0933	RLS				
11	65.6989	7/10/96	1108	ATM	65.6989	7/25/96	1020	RLS				
12	Broken											

Kumm ?

Blank 8/8/96 ?

Checked By: _____ Date: _____ Time: _____

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	47	7/3/96	0953	ATM
60	72	49	7/10/96	1026	ATM
57.5	69	48	8/1/96	0948	ATM
66	79	49	8/8/96	1235	ATM
60	72	49	8/9/96	0945	ATM
64	72	49	8/14/96	1116	ATM

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

WST5-Form9,1, Rev4/90
Unit Kuma Scott HT-1
Run # 5
Date: 9/9/96

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
5	✓	9/12/96	1930	ATM	67.2087	9/13/96	0858	RLS	67.2089	9/13/96	1233	RLS				

FINAL FILTER WEIGHTS

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
(R)	136	.7406	9/10/96	0200	ATM	.7400	9/10/96	1747	ATM	.7396	9/12/96	1509	RLS				
(F)	137	.7700	9/10/96	0200	ATM	.7694	9/10/96	1748	ATM	.7684	9/12/96	1570	RLS	.7679	9/13/96	0804	ATM

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	9/10/96	1726	ATM	64	77	48
2	9/11/96	1930	ATM	63	76	48
3	9/12/96	1326	ATM	59	71	48
4	9/13/96	0756	ATM	58	70	49
5	9/13/96	1219				

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

Blank 8/8/96

WST5-Form9, Pg1, Rev4/90
Unit Kuma Scott HT-1
Run # 5
Date: 9/9/96

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
6	✓	8/16/96	11:30	ATM	67.4251	8/15/96	1717	ATM	67.4251	8/29/96	1031	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	Date	Time	By	WB	DB	%RH
1	8/15/96	1702	ATM	66	71	49
2	8/29/96	1008	ATM	64	72	49
3						
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 6/20/96

Through 9/10/96

Scale Mettler

Model AE 100

SN #04827

TROEMNER CLASS S WTS.

	100g Weight	10g Weight	1.0g Weight	100mg Weight	20mg Weight	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
	100.0003	10.0000	1.0000	.1000	.0199	RLS.	6/20/96	1625	61	74	47
	100.0000	10.0000	1.0000	.1000	.0200	ATM	6/21/96	1259	61	74	47
	100.0005	10.0001	1.0001	.1000	.0200	ATM	6/25/96	1410	63	76	48
R	99.9996	10.0000	1.0001	.1001	.0201	ATM	6/26/96	1558	64	78	46
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	6/27/96	1718	65	78	49
R	99.9995	10.0000	1.0000	.1000	.0200	ATM	6/28/96	1254	58	70	48
	100.0001	10.0000	1.0001	.1000	.0200	ATM	7/1/96	1504	65	78	49
	100.0003	10.0001	1.0001	.1000	.0200	ATM	7/2/96	1316	64	77	44
	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/5/96	953	58	70	47
R	99.9998	10.0000	1.0001	.1000	.0201	ATM	7/8/96	1727	57	83	42
R	99.9997	10.0000	1.0000	.1000	.0200	ATM	7/9/96	1456	% RH TO high		
R	99.9996	10.0000	1.0000	.1000	.0201	ATM	7/10/96	1006	60	72	49
	99.9998	10.0000	1.0000	.1001	.0200	ATM	7/11/96	0918	59	71	48
	99.9998	9.9999	1.0000	.1000	.0200	ATM	7/12/96	842	59	71	48
	100.0000	10.0001	1.0000	.1001	.0201	ATM	7/16/96	1233	63	75	47
	100.0003	10.0003	1.0002	.1002	.0202	ATM	7/17/96	1605	63	74	54
	99.9996	9.9998	.9998	.0998	.0198	ATM	7/18/96	0733	68	56	49
	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/19/96	0740	71	59	48
R	99.9999	10.0000	1.0000	.1000	.0200	ATM	7/22/96	1445	82	68	48
R	99.9997	10.0001	1.0002	.1001	.0201	ATM	7/23/96	1513	80	66	47
	99.9996	10.0000	1.0000	.1001	.0200	ATM	7/24/96	0757	59	71	48
	99.9999	10.0000	1.0000	.1001	.0201	ATM	7/24/96	1617	71	86	49
	99.9999	10.0001	1.0001	.1001	.0201	ATM	7/25/96	0814	61	73	49
	100.0002	10.0002	1.0002	.1001	.0201	ATM	7/31/96	2035	65	79	47
	99.9995	10.0000	1.0000	.1001	.0202	ATM	8/1/96	0905	69	57.5	48
	100.0000	10.0001	1.0001	.1001	.0202	ATM	8/1/96	1950	60	72	49
	99.9998	10.0000	1.0001	.1000	.0202	ATM	8/2/96	801	59	71	49
	100.0001	10.0000	1.0000	.0999	.0199	ATM	8/10/96	1335	66	79	49
R	99.9996	10.0000	1.0001	.1000	.0201	ATM	8/9/96	0754	60	72	49
	100.0003	10.0001	1.0000	.1000	.0200	ATM	8/14/96	1116	64	77	49
R	99.9999	10.0001	1.0001	.1001	.0201	ATM	8/15/96	1902	66	79	49
	100.0002	10.0000	1.0001	.1001	.0201	ATM	8/28/96	1611	70	85	49
	99.9995	10.0000	1.0000	.1001	.0200	ATM	8/29/96	1008	64	77	49
R	99.9996	10.0000	1.0000	.1000	.0200	ATM	8/30/96	1005	61	73	48
	99.9996	10.0001	1.0000	.1000	.0200	ATM	9/5/96	0954	59	71	48
R	99.9996	10.0000	1.0003	.1002	.0200	ATM	9/6/96	1030	72	60	49
	100.0000	10.0000	1.0000	.1000	.0200	ATM	9/9/96	1806	76	63	48
	100.0005	10.0002	1.0002	.1001	.0200	ATM	9/10/96	1726	77	64	48

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates From 9/11/96

Through _____

Troemner Class S Wts.

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
L	No	100.0003	10.0001	1.0001	.1001	.0201	9/11/96	1730	ATM	63	76	48.0
L	No	99.9947	10.0000	1.0000	.1000	.0196	9/12/96	1326	ATM	59	71	48.0
L	No	99.9998	10.0000	1.0000	.1000	.0200	9/13/96	0756	ATM	70	58	49.0
L	No	99.9996	9.4999	1.0000	.0999	.0199	9/13/96	1219	ATM	71	59	48.0

Unit: Kuma Scott HT-1
Run: 5
Date: 9/9/96
Technicians: ATM
WST20, Form5

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

Filters

Filter # 136 (R) Beaker # 5 Final Wt. 67.2089 g
Final Wt .7396 g Ml 55 Tare Wt. 67.2050 g
Tare Wt .7386 g Desc. Acetone Net Wt. .0039 g
Net Wt .0010 g

Filter # 137 (F) Beaker # _____ Final Wt. _____ g
Final Wt .7679 g Ml _____ Tare Wt. _____ g
Tare Wt .7392 g Desc. _____ Net Wt. _____ g
Net Wt .0287 g

Acetone Blank Calculation: Blank done 8/8/96

Blank Beaker # 6 Final Wt 67.4251
Ml 140 Tare Wt 67.4250
Desc Acetone Net Wt .0001

.0001 g ÷ 140 ml = .000001 g/ml

Particulate Catch Calculation

Filter: .0010 g
Filter: .0287 g
Beakers: .0039 − (.000001) 55 = .0038 g
Total Catch g/Ml of Acetone Blank Value/Ml of Acetone

Total Catch = .0335 g

Unit SCOTT KUMA HT-1
Run # 5
Date 9/9/96
Technician ATH, RLS,
WST6-Form1, Rev11/89

MISCELLANEOUS TEST DATA
WOODSTOVE DATA SHEET #8

Useable Firebox Dimensions: See QC Section Useable Volume: 1.716 ft^3

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

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

Wet Bulb/ Start: WB: 62 °F DB: 71 °F 1.6 % Amb Moisture 60 %RH

Dry Bulb Stop: WB: 62 °F DB: 73 °F 1.5 % Amb Moisture 53 %RH

$\bar{X}$ = 1.55 % Ambient Moisture $\bar{X}$ = 56.5 % Relative Humidity (RH)

Empty Stove Wt: 343.1 lbs.

Empty Stove Wt with Stack (Inc. Oil Seal) Wet: 433.1 lbs. Dry: 432.8 lbs.

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

Kindling Wt. Paper: 0.3 lbs. Wood: 4.0 lbs.

Pre Burn Fuel Wt. 10.9 + 11.5 + 12.1 Total: 34.5 lbs.

Total Kindling and Pre Burn Fuel Wt 38.8 lbs.

Coal Bed Wt-lbs: Range(2.7 - 2.2) lbs. Actual: 2.5 lbs.

Allowable Amount of Charcoal that can be removed:

Coal Bed Wt. Range $\frac{435.5}{\text{Upper Wt.}} + \frac{435.0}{\text{Lower Wt.}} / 2 \times .25 =$ 0.6 lbs.

Test Fuel Wt-lbs: Ideal 12.0 lbs. Range: 10.9-13.2 lbs. Actual: 10.9 lbs.

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

2 x 4's x 14 5/16 "	3 Pcs	6.8 lbs.	62.4 %
4 x 4's x 14 5/16 "	1 Pcs	4.1 lbs.	37.6 %

Est. Dry Burn Rate (Kg/Hr.) $\frac{10.9 - (10.9 \times .18133)}{2.2025} \times \frac{60}{215} =$ 1.130 Est. Dry Burn Rate (Kg/Hr)

Est EPA Heat Output(HO_E) (Avg BTU's/Hr) (19,140) x $\frac{63}{100}$ x 1.130 = 13,621 Est Heat Output (HO_E) BTU's/Hr

Comments:

Unit: Kuma Scott HT-1
Run: 5
Date: 9/9/96
Technician(s): AM RLS
WST3-Form 1 Rev 9/90

STOVE OPERATING DATA
WOODSTOVE TEST DATA SHEET #9

Fire Started: 1725 PDST

Warm up and Preburn: Primary Air: Wide open from ignition until the start of the preburn when the primary air control(s) was (were) adjusted to the run setting of 3/8" open on arc. At the run setting until the start of the test.
3/8" open on arc = stop.

Secondary Air:
No Controls. Naturally drafted.

Secondary Burn/[redacted] 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 _____ min 30 sec, then closed.

Primary Air: Wide open during the start of the test until 4:55. Adjusted to the run setting of 3/8" open on arc between 4:55 and 5:00. At the run setting of 3/8" open on arc at 5:00 into the run.

Secondary Air:
No Controls. Naturally drafted

Secondary Burn/[redacted] Bypass: N/A

Fan: OFF during entire warm up, preburn and test.
FAN Confirmation Test.

Test Run Anomlies:

None.

Unit SCOTT KUMA HT-1
Run # 5
Date 9/9/96
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	R.I.B. LUMBER	STD. & BTR.	D. FIR, S. GRN.
Test Fuel	2x4	R.I.B. LUMBER	#2 STD. & BTR.	D. FIR, S. GRN.
	4x4	R.I.B. LUMBER	#2 STD. & BTR.	D. FIR, S. GRN.

All grades WCLB Rules unless otherwise noted.

Warm up Information:

1st Warm up/Pre Burn Fuel charge (10.9 lbs) added at 1547.
2nd Warm up/Pre Burn Fuel charge (11.5 lbs) added at 1837.
3rd Warm up/Pre Burn Fuel charge (12.1 lbs) added at 1932.
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 lbs. pre burn/warm up fuel charge. The stove lost 0.3 lbs.

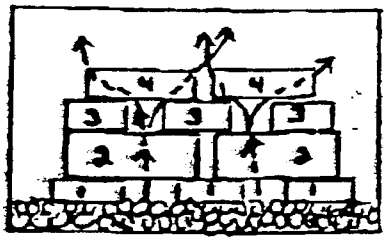
All pre burn/warm up fuel pieces were either 14 or _____ inches long. All preburn pieces/fuel charges were "ricked" in the stove. The pieces in the bottom layer in each rick contained 2 pcs that were 14 inches long and were loaded flat and perpendicular to the door. The pieces in the second layer in each rick were loaded on their side (edge) approximately parallel to the door and contained 4 pcs 14 inches long. The third layer (and fourth layer if present) was loaded flat, perpendicular to the door and contained 2 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 SCOTT KUWA HT-1
Run # 5
Date 9/9/96
Technician ATH, PLS.
Page 2 of 3
WST7-Form2-A, Rev 6/90

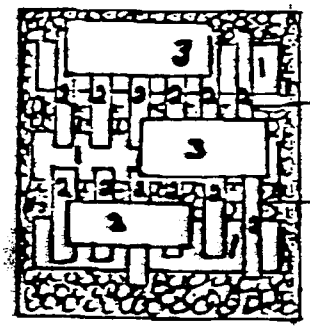
WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-2

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 915 °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 3/8 open on ash 3.0 lbs above the upper charcoal bed weight.

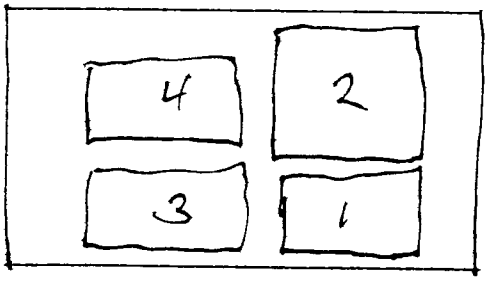
Unit SCOTT KUHA HT-1
Run # 5
Date 9/9/96
Technician ATH, RLS.
Page 3 of
WST5-Form2-Rev11/89

WOODSTOVE OPERATING DATA
WOODSTOVE DATA SHEET #9A-3

Additional Comments: Test Start Sequence: (1.) opened door (2.) opened primary air control wide open (3.) loaded test fuel charge into the stove (4.) photo (5) closed door.

Test Fuel Charge Loading Information:

Test Fuel Charge and Loading Sequence Diagram



FRONT of stove view

4 X 4's: 2

2 X 4's: 1, 3 & 4

Loading Sequence: 1, 2, 3 & 4

Driest Pcs in Load 3

Loaded the test fuel charge on an essentially level, large-medium sized, hot coal bed (in appearance, color and temperature for a medium low burn rate. Load 0:30. Ignition 0:35. Vertical column of flame (VC) to baffle 2:20. Secondaries beginning to ignite @ 3:00. Top of pc 2 igniting 3:20. Front tube igniting 3:30. Gas Balance 40:1 @ 5:00 5:00 Primary Air Control → stop Flames decreased. Maintained vertical column of flame (VC) in the center canyon with secondaries at top of VC. Also had a VC on the left side of fuel stack. Never lost gas balance. Low CO_2 6.6% Hi CO 0.64%.

Unit: SCOTT KUMA HT-1
Run: 5
Date: 9/9/96
Technician: ATH, RLS.
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 73 °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: 1955 ✓
Calibration Checks: X — Y — 12.5 12.4 22.0 22.0

Pc #	Dimen	Use	Top		Bottom		Side		Piece Avg Corrected
			Uncor	Cor	Uncor	Cor	Uncor	Cor	
1	2x4x	K	8.0	8.4	8.0	8.4	8.0	8.4	8.400
2									
3									
4	2x4x8'	P	18.0	19.2	18.0	19.2	18.0	19.2	19.200
5	"	P	18.0	19.2	18.0	19.2	18.5	19.8	19.400
6	"	P	22.0	23.7	22.0	23.7	22.5	24.3	23.900
7									62.500
8									
9									
10	2x4x14 5/16"	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
11	"	T	21.5	23.1	22.5	24.3	22.0	23.7	23.700
12	"	T	22.5	24.3	22.5	24.3	22.5	24.3	24.300
13									
14	4x4x14 5/16"	T	20.0	21.4	20.0	21.4	20.0	21.4	21.400
15									88.600
16									
17									
18									
19	FEET	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
20									OUT SPACERS

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	8.400 %	20.833 %	22.150 %
% Moisture - Wet Basis:	7.749 %	17.241 %	18.133 %

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: Kuma Scott HT-1
Run#: 5
Date: 9/9/96
Technician: ATH

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. 1.560 cm 3.9624

Width (W): IN 3.592 cm 9.1237

Length (L): 3.582 cm
3.585 cm
3.560 cm
3.587 cm

Length $\bar{X}$ = IN 3.5785 cm 9.0894

Volume: 328.597 cm^3 (D X W X L)

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

Uncorrected Meter Readings Corrected for temperature: Yes ✓ No ___

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	22.5	24.3 %
Bottom:	22.5	24.3 %
Side:	22.5	24.3 %
$\bar{X}$:		24.300 %

Avg % Moisture (Dry) 24.300 %

Aug % Moisture (Wet) 19.549 %

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

Wet Weight: 209.5 g Dry Weight: 167.3 g

% Moisture Dried Basis: 20.143 %
[1 - (Dry Wt - Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	9/9/96	2100	215 °F
Out of Dryer	9/11/96	2000	220 °F

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

Density = 167.3 g (dry wt) ÷ 328.597 cm^3 (volume) = .5091 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
WOOD)E DATA SHEET #12
WST2-Form 14 Rev 1/88

Unit: SCOTT KUMA HT-1 Date: 9/9/96
Run: 5 Technician(s): ATM, KS,
Page: 1 of 2

435.3

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	Calc W/B	T/C(3) Stack	4 SO2 v.	4 SO2 PPM	Static Press.	Comments
0 1:15	446.2	10.9	0	.255	6.37	55.0	13.7			0.97	6.6	78	99	2.5	106	256			-.046	Flow
5 30	445.3	10.0	.9	.233	5.83	54.1	13.5			0.56	10.4	81	112	2.5	113	353			-.078	SO2 1.5
10 35	444.9	9.6	.4	.263	6.57	55.7	13.9			0.62	10.6	93	126	4.1	119	336			-.062	CO2 1.5
15 40	444.4	9.1	.5	.427	10.6	37.4	9.33			0.16	66.4	100	132	5.4	124	357			-.068	O2 1.5
20 45	443.8	8.5	.6	.443	11.0	38.6	9.63			0.23	47.9	106	135	6.6	128	373			-.070	CO 1.5
25 50	443.2	7.9	.6	.467	11.7	36.5	9.10			0.18	64.5	109	135	7.6	130	384			-.071	
30 55	442.6	7.3	.6	.521	12.9	31.2	7.78			0.12	107.9	110	136	7.8	132	392			-.071	
35 2200	442.0	6.7	.6	.517	12.8	31.7	7.91			0.21	61.2	111	137	7.9	132	387			-.070	
40 05	441.5	6.2	.5	.545	13.5	28.9	7.21			0.34	39.8	111	136	8.0	132	389			-.070	
45 10	440.9	5.6	.6	.571	14.2	26.2	6.54			0.33	43.0	110	135	7.8	132	393			-.070	
50 15	440.5	5.2	.4	.505	12.5	34.4	8.58			0.20	62.7	108	130	7.6	131	380			-.068	
55 20	440.1	4.8	.4	.388	9.66	43.3	10.8			0.75	12.9	105	123	6.9	127	349	✓		-.064	
																4349			.808	Flow
60 25	439.8	4.5	.3	.414	10.3	40.6	10.1			0.62	16.6	102	120	6.1	125	345			-.064	SO2 1.5
65 30	439.5	4.2	.3	.407	10.1	41.3	10.3			0.62	16.3	99	116	5.7	122	332			-.062	CO2 1.5
70 35	439.1	3.8	.4	.378	9.41	44.0	11.0			0.75	12.5	97	113	5.4	121	323			-.059	O2 1.5
75 40	438.9	3.6	.2	.344	8.57	47.0	11.7			0.82	10.4	95	110	5.0	120	311			-.057	CO 1.5
80 45	438.6	3.3	.3	.321	8.00	49.3	12.3			0.83	9.6	93	107	4.8	118	302			-.056	
85 50	438.4	3.1	.2	.304	7.58	51.1	12.7			0.87	8.7	91	105	4.4	115	295			-.055	
90 55	438.2	2.9	.2	.278	6.94	53.3	13.3			1.02	6.8	90	103	4.3	114	279			-.051	
95 2300	438.0	2.7	.2	.264	6.59	54.7	13.6			1.08	6.1	89	101	4.2	112	270			-.050	
100 05	437.8	2.5	.2	.245	6.12	56.2	14.0			1.20	5.1	87	100	3.8	111	264			-.049	
105 10	437.7	2.4	.1	.246	6.15	56.3	14.0			1.08	5.7	87	98	3.9	110	259			-.048	
110 15	437.5	2.2	.2	.252	6.29	55.5	13.8			1.05	6.0	86	98	3.7	109	254			-.046	
115 20	437.3	2.0	.2	.251	6.27	55.7	13.9			1.09	5.8	86	98	3.7	108	250			-.046	
																3484			.643	

7833 1.451

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

Unit: SCOTT KUMA HT-1 Date: 9/9/96
Run: 5
Page: 2 of 2 Technician(s): ATH, RLS,

435.3

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	T/C(2) % H_2O	T/C(3) Calc W/B	T/C(3) Stack	4 SO_2 v.	4 SO_2 PPM	Static Press.	Comments
120 / 2325	437.1	1.8	.2	.262	6.54	54.6	13.6			1.10	5.9	85	98	3.6	108	248			-.046	Flow
125 / 30	436.9	1.6	.2	.287	7.16	52.0	13.0			0.97	7.4	85	99	3.6	109	252			-.046	SO_2 1.5
130 / 35	436.8	1.5	.1	.312	7.77	49.8	12.2			0.75	(10.4)	86	100	3.6	109	258			-.047	~~CO_2 1.5~~
135 / 40	436.6	1.3	.2	.324	8.07	48.5	12.1			0.70	11.5	86	100	3.6	110	262			-.047	~~O_2 1.5~~
140 / 45	436.4	1.1	.2	.266	6.64	53.3	13.3			1.24	(5.4)	86	97	3.7	109	250			-.046	~~CO 1.5~~
145 / 50	436.3	1.0	.1	.232	5.80	55.9	13.9			1.50	3.9	85	95	3.7	108	244			-.044	
150 / 55	436.2	.9	.1	.217	5.43	57.2	14.3			1.60	3.4	84	91	3.7	108	238			-.043	
155 / 2400	436.1	.8	.1	.208	5.21	58.0	14.5			1.61	3.2	82	91	3.4	106	234			-.042	
160 / 05	436.1	.8	0	.209	5.23	58.0	14.5			1.55	3.4	82	89	3.4	106	230			-.041	
165 / 10	436.0	.7	.1	.201	5.03	58.6	14.6			1.54	3.3	81	89	3.3	105	227			-.041	
170 / 15	435.9	.6	.1	.201	5.03	59.0	14.7			1.56	3.2	80	88	3.2	105	225			-.040	
175 / 20	435.8	.5	.1	.190	4.76	59.8	14.9			1.55	3.1	80	87	3.2	104	222	✓		-.040	✓
																(2890)	✓		(.523)	Flow
180 / 25	435.8	.5	0	.186	4.66	60.3	15.0			1.55	3.0	79	87	3.1	103	223			-.040	SO_2 1.5
185 / 30	435.7	.4	.1	.184	4.61	60.6	15.1			1.54	3.0	78	87	3.0	103	221			-.040	~~CO_2 1.5~~
190 / 35	435.6	.3	.1	.180	4.52	60.9	15.2			1.58	2.9	78	87	3.0	103	219			-.040	~~O_2 1.5~~
195 / 40	435.6	.3	0	.175	4.39	61.7	15.4			1.52	2.9	78	86	3.0	103	217			-.039	~~CO 1.5~~
200 / 45	435.5	.2	.1	.173	4.34	61.7	15.4			1.53	2.8	78	87	3.0	103	215			-.039	
205 / 50	435.4	.1	.1	.173	4.34	61.8	15.4			1.53	2.8	77	87	2.8	102	213			-.038	
210 / 55	435.4	.1	0	.170	4.27	62.1	15.5			1.52	2.8	77	87	2.8	102	211			-.037	
215 / 0100	435.3	0	.1	.168	4.22	62.4	15.6			1.51	2.8	77	87	2.8	102	209			-.037	
220 / 05																(1728)	✓		(.310)	✓
225 / 10																				
230 / 15													(44.)			(12,451)	✓		(2.284)	✓
235 / 20																				
																(283)	✓		(-.052)	✓

Pre Burn Start Wt. 438.5 lbs.
Test Start wt. Range 435.5 - 435.0 lbs.

PRE BURN DATA
RECORD SHEET #13
WST2-Form16

BARO. PRESSURE 29.95

Stove: SCOTT KUMA HT-1
5

Date: 9/9/96
Technician(s): ATH, RL

Page: 1 of 1

Minute Time	Scale Weight	Burn Rate	Stack	Stove Top	Left Side	Back	Right Side	Bottom	Firebox	2nd Burn ~~Catalytic~~	Room Temp	Static	Comments
			T/C#-3	4	5	6	7	8	9	10	11		
0 2005	438.5	0	585	847	535	319	483	443	1123	1313	74	-.089	Primary Air Set at 3/8" OPEN
5 10	437.9	.6	502	801	543	320	491	456	1076	1402	72	-.084	Secondary Air Set at N/A
10 15	437.4	.5	459	758	552	321	499	463	1099	1381	73	-.080	Fan: OFF
15 20	437.0	.4	426	706	555	321	505	467	1367	1236	72	-.073	TUNNEL ON AT: 2005
20 25	436.6	.4	404	659	554	322	508	467	1032	1314	69	-.071	RAKE COILS
25 30	436.4	.2	362	594	552	322	504	463	1022	1208	67	-.065	487.0
30 35	436.3	.1	336	541	545	322	499	459	1010	1160	67	-.062	Pumps turned on at: 2035
35 40	436.2	.1	322	506	537	320	493	455	992	1083	67	-.059	462.2
40 45	436.1	.1	309	477	527	317	486	452	978	1061	67	-.057	451.8
45 50	436.0	.1	301	467	520	314	479	451	968	1027	67	-.056	Check WB/DB: 86/109 446.2
50 55	435.9	.1	294	455	512	311	471	448	955	1001	66	-.055	439.4
55 2100	435.8	.1	288	441	506	307	466	446	941	958	66	-.054	
60 05	435.6	.2	283	430	498	304	461	443	910	925	66	-.052	427.2
05 10	435.5	.1	278	417	490	303	457	435	889	900	67	-.050	420.4
10 15	435.4	.1	271	404	483	301	453	432	864	881	68	-.048	414.6
15 20	435.4	0	266	391	476	297	446	427	849	858	70	-.047	
20 25	435.3	.1	256	380	467	292	438	421	825	831	70	-.046	399.6
25 30													

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

U: SCOTT KUHIA HT-1 Date: 9/9/96
R: 5 Technician(s): ATM, D.
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 ~~Calculate~~	Room Temp	Tunnel	C. Gas Box	Impinger Out	5G-1 Filter	5G-1 Condenser	Con-dar	
0 / 2125	380	467	292	438	421	825	831	70	90	248	36	74	35		
5 / 30	403	466	294	438	395	923	1202	67	109	247	36	77	34		
10 / 35	471	462	286	427	404	796	860	66	98	248	36	77	34		
15 / 40	536	454	279	411	399	808	888	66	95	248	36	76	34		
20 / 45	587	446	272	396	390	851	987	66	97	248	36	75	34		
25 / 50	615	440	265	386	380	894	1034	68	98	248	36	76	34		
30 / 55	638	437	260	379	376	944	1193	70	99	248	36	76	34		
35 / 2200	655	439	257	375	368	927	1260	70	99	247	36	76	35		
40 / 05	662	442	256	376	365	921	1295	71	99	248	36	76	34		
45 / 10	667	443	256	381	360	934	1327	71	100	248	36	77	35		
50 / 15	638	446	258	388	360	937	1325	71	99	248	36	77	34		
55 / 20	578	447	259	393	362	895	1321	71	98	248	36	77	34		
	(6830)	(5389)	(3234)	(4788)	(4580)	(10,655)	(13,523)	(827)	✓						
60 / 25	555	447	260	396	363	891	1343	71	97	248	36	77	34		
65 / 30	520	447	261	398	365	894	1303	71	96	248	36	77	34		
70 / 35	503	446	262	401	366	881	1307	70	95	247	36	77	34		
75 / 40	481	445	263	402	368	864	1196	70	94	247	36	77	34		
80 / 45	467	444	263	404	369	851	1139	70	94	248	37	77	35		
85 / 50	451	441	263	405	370	842	1025	70	93	248	37	77	34		
90 / 55	433	437	262	405	370	835	983	70	92	248	37	77	34		
95 / 2300	419	434	262	404	373	820	922	70	91	248	37	77	35		
100 / 05	407	430	262	401	374	806	889	70	90	248	37	77	35		
105 / 10	395	424	262	399	375	795	886	69	90	247	37	76	35		
110 / 15	383	420	261	397	374	772	900	69	89	248	37	76	35		
116 / 20	373	416	261	395	373	759	917	69	89	248	37	76	35		
	(5387)	(5231)	(3142)	(4807)	(4440)	(10,010)	(12,810)	(839)							
	1	1	1	1	1	1	1	✓							
	12,217	10,620	6376	9595	9020	20,665	26,333	1666							

TEMPERATURES
RECORD SHEET #14
WST2-Form14 Rev7/96

Test: SCOTT KUHA HT-1 Date: 9/9/96
5 Technician(s): ATH, LS.
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 2325	366	411	261	394	371	755	949	69	89	248	37	76	35		
125 30	369	408	262	396	368	758	966	69	88	248	37	76	35		
130 35	371	404	264	398	365	765	983	69	88	248	36	75	35		
135 40	385	401	266	403	362	763	993	70	88	248	36	76	35		
140 45	380	398	270	407	362	740	944	72	88	248	36	75	35		
145 50	369	397	272	411	364	727	879	72	87	248	36	75	35		
150 55	358	395	273	415	365	713	850	73	87	247	36	75	35		
155 2400	349	393	272	418	364	698	829	73	86	248	37	75	35		
160 05	342	390	271	420	364	681	818	73	86	247	37	75	35		
165 10	336	387	270	423	366	671	808	73	85	247	36	75	35		
170 15	330	384	270	427	365	674	796	73	85	247	36	75	35		
175 20	325	381	269	430	364	669	779	73	85	248	35	75	35		
	(4285)	(4749)	(3220)	(4942)	(4380)	(8614)	(10,594)	(859)							
180 25	321	378	269	432	365	656	769	73	83	248	35	75	35		
185 30	316	374	268	433	362	647	761	72	84	248	35	75	35		
190 35	311	370	267	433	363	635	752	73	84	248	35	75	35		
195 40	307	366	266	432	363	626	741	72	84	248	35	74	35		
200 45	303	361	265	430	361	613	732	72	83	248	35	74	35		
205 50	300	357	264	428	360	603	726	73	83	248	35	74	35		
210 55	297	352	263	425	359	599	718	73	83	248	35	74	35		
215 0100	295	349	2616	421	357	589	707	72	83	248	36	74	35		
220 05	(2450)	(2907)	(2123)	(3434)	(2890)	(4968)	(5906)	(580)							
225 10															
230 15	(18,952)	(18,276)	(11,719)	(17,971)	(16,290)	(34,247)	(42,833)	(3105)		(44÷)		START	399,6		
235 20												FINISH	336,6		
	(431)	(415)	(266)	(408)	(370)	(778)	(973)	(71)				(ΔT=)	(-63,0)		

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

Site: Myren Consulting, Woodinville, WA Date: 9/9/96 Analyte: CO_2

Source: SCOTT KUHA HT-1 Run #: 5

Zero Cyl #: 4-36919 Conc. 00.0 % CO_2 Cyl Press: 1975 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W 260657 Conc. % CO_2 Cyl Press: 920 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T. Myren Time: 2015 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0666	.0666	0.27
Span	40.4	.404	10.1	40.5	.405	10.0759	-.0241	-0.24

Comments:

Post Run Audit: By: A.T. Myren Time: 0040 Temp: 72 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.0666	.0666	0.27
Span	40.4	.404	10.1	40.5	.405	10.0759	-.0241	-0.24

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: 9/9/96 Analyte: O_2

Source: SCOTT KUMA HT-1 Run #: 5

Zero Cyl #: 4-36919 Conc. 00.0 % O_2 Cyl Press: 1975 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W260 657 Conc. 9 % O_2 Cyl Press: 920 psi

Certified by: BOC Gases Date: 1/15/95

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: A.T. Myren Time: 2015 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.5	00.2	.0552	.0552	0.22
Span	12.5	500	12.5	12.6	50.0	12.467	-.0326	-0.26

Comments:

Post Run Audit: By: A.T. Myren Time: 0040 Temp.: 72 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.5	00.2	.0552	.0552	0.22
Span	12.5	500	12.5	12.6	50.1	12.492	-.0077	-0.06

Comments:

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

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

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

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

Site: Myren Consulting, Woodinville, WA Date: 9/9/96 Analyte: CO

Source: SCOTT KUMA HT-1 Run #: 5

Zero Cyl #: 4-36919 Conc. 00.0 % CO Cyl Press: 1975 psi

Certified by: Cascade Airgas Date: 4/24/96

Span Cyl #: W260 657 Conc. 2.47 % CO Cyl Press: 920 psi

Certified by: BOC Gases Date: 1/18/95

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: A.T. Myren Time: 2015 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	-003	-.0062	-.0062	-0.12
Span	2.47	49.4	2.47	2.48	49.4	2396	-.0745	-3.01

Comments:

Post Run Audit: By: A.T. Myren Time: 0040 Temp.: 72 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	0.00	-003	-.0062	-.0062	-0.12
Span	2.47	49.4	2.47	2.49	49.7	2.410	-.0600	-2.43

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: SCOTT KUHA HT-1
Run: 5
Date: 9/9/96
Technicians: ATH, RLS,
WST6-Form3-Rev11/89

QUALITY CHECKS
WOODSTOVE DATA SHEET #16

Ambient = Tr: 73 °F T/C#30: _____ °F

Thermocouple Check (at ambient): T/C#1: 73.2 °F; T/C#2: 73.6 °F;
T/C #3: 73.6 °F; T/C #4: 73.6 °F; T/C #5: 76.4 °F;
T/C #6: 71.6 °F; T/C #7: 71.8 °F; T/C #8: 71.8 °F;
T/C #9: 75.8 °F; T/C #10: 72.0 °F; T/C #11: 72.4 °F;
T/C #12: 73.2 °F; T/C #13: 73.4 °F; T/C #14: 73.2 °F;
T/C #15: 72.8 °F; T/C #16: 72.2 °F; T/C #17: _____ °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): -0.2 °F	to: 0.0 °F	Zero (0°F): 0.2 °F	+0.01
Span (2000°F): 1999.8 °F	to: 2000.0 °F	Span (2000°F): 2000.4 °F	+0.02

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

Thermocouple Readout Pretest Linearity Check

0°F = 0.0 °F; 200°F = 201.8 °F; 400°F = 398.6 °F;
600°F = 601.2 °F; 800°F = 800.6 °F; 1000°F = 1000.4 °F;
1200°F = 1198.4 °F; 1400°F = 1399.4 °F; 1600°F = 1598.8 °F
1800°F = 1799.6 °F; 2000°F = 2000.0 °F

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

Scale Check Pre (Wt, #'s): 433.1 - 438.1 5.0 lbs, OK (RLS)
Post (Wt, #'s): 435.1 - 440.1 5.0 lbs. OK (RLS)

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

INSPECTION CERTIFICATE

Phillips Morris Scale Company
Scanners in Weighing Systems
934 Elliott Avenue W.
Seattle, WA 98119
Ph#(206)284-6090
Fax#(206)282-6612

CUSTOMER: Myrew Consulting
ADDRESS: 12810 NE 78th #106
Woodinville Wa
TECHNICIAN: ART Hall

AUTHORIZATION SIGNATURE: _____

DATE OF INSPECTION: 4-11-96
NEXT INSPECTION DUE: 10-11-96

CERTIFICATION TYPE
__ STANDARD
X ISO 9000
__ MIL STD-45662

EQUIPMENT TESTED

INDICATOR		BASE		OPTIONS INSTALLED	
MAKE	Digi		Digi	PRINTER	
MODEL	DI-10		Remote	SCORE BOARD	
SR#	881165			COMPUTER	
CLASS	III		III	OTHER	
CAP.	1000LB		1000LB		

PRE-TEST	POST-TEST	MANUFACTURER TOLERANCE
50 + 1	50 +/- Ø	.001 Ø
100 + 1-2	100 +/- Ø	
150 + 2	200 +/- Ø	
200 + 3	500 +/- Ø	
	1000 +/- 1	
	Ø	

CORNER TEST P X F __
SHIFT TEST P X F __
STATIC TEST 2 MIN. OK 5 MIN. __

WEIGHT KIT# TRK #10 NIST# 822/250904
STATE TEST NO, A 0353

SERIAL NUMBERS OF WEIGHTS USED (OR COPY OF CERTIFICATE)

R133/50	R137/50			
R134/50	WA105-3/500LB			
R135/50	WA106-0/500LB			
R136/50				

ANY CHANGES TO DOCUMENT OR SCALE NOT AUTHORIZED BY

QUALITY CONTROL SERVICES

LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

DATE: April 18, 1996

CUSTOMER: Myren Consulting
12810 NE 178th
Woodinville, WA 98072
Attn: Ben Myren

WEIGHT TRACEABILITY CERTIFICATE

THE BALANCES/SCALES LISTED BELOW HAVE BEEN SERVICED AND CALIBRATED BY QUALITY CONTROL SERVICES.

THIS DOCUMENT CERTIFIES THAT THE TEST WEIGHTS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (N.I.S.T.) UNDER TEST # 822/251337.

QCS Weight Set I.D. Number	Calibration Date	Next Calibration Due
A45	07-08-95	07-96
AW8543	08-16-95	08-96
AW2902	08-16-95	08-96
AW5735	08-16-95	08-96

DATE OF SERVICE	TYPE	MAKE	SERIAL NUMBER	TECHNICIAN
04-16-96	AE100	Mettler	K04827	R. Beier
04-16-96	HR200	A&D	12301167	R. Beier

AUTHORIZED REPRESENTATIVE: R. Beier

2340 S.E. 11TH AVENUE • P.O. BOX 14831 • PORTLAND, OREGON 97214 • (503) 236-2712
FAX: (503) 235-2535

WOODSTOVE DATA SHEET #33

w/ Flake Roof

Thermocouple Calibration Record

TC #	Location	Ice Water Bath (°F)	Boiling Water (°F)	TC #	Location	Ice Water Bath (°F)	Boiling Water (°F)
1	Wet Bulb	32.3	210.9	21			
2	Dry Bulb	32.4	210.4	22			
3	Stack	32.5	210.4	23			
4	Stove Top	32.3	210.5	24			
5	Left Side	30.4	210.8	25			
6	Back	30.4	210.7	26			
7	Right Side	32.6	210.5	27			
8	Bottom	32.7	210.1	28			
9	Firebox	32.9	210.0	29	Oven		
	2nd Burn			30	N/A-Calibrator		
10	Catalytic	33.0	209.9	31			
11	Room	33.3	210.0	32			
12	~~Tube Furnace~~ TNL Temp	33.1	210.1	33			
13	~~Sample~~ Box Flot (C Gas)	33.0	209.8	34			
14	Impinger Out C Gas	33.8	209.8	35	Rear Top		
15	~~B Gas Box~~ Filter #1	32.9	210.1	36	Reat L Side		
16	C Gas Out Cond. #1	30.9	210.6	37	Rear R Side		
17	~~SO2 Gas Out~~ Filter #2	32.7	210.7	38	Rear Firebox		
18	~~Extra~~ Cond. #2	32.6	210.9	39	Rear 2nd/cat		
19	Extra			40			
20	Extra						

Thermocouples checked against

Reference Thermometer #: NBS

Ice Water Bath 32.1 °F

Boiling Water 211 °F

Room Temp 71 °F

B.P. 30.02 "Hg

Date: 4/17/96 Technician: A.T. Mc

Date: 4/18/96 Thermocouple No.: 40

Ambient Temperature: 71 °F Barometric Pressure: 30.02 "Hg

Calibrator: A.T. Myers Reference: Mercury-in-glass:

Other: Altec

Fluke 2 Readout SN 6120410 Readout Calibrated

Reference point No.[a]	Source[b] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Difference,[c] %
0	Altec		0.0	0
200			202.1	+0.32
400			399.9	-0.01
600			601.6	+0.15
800			800.2	+0.02
1000			1000.8	+0.05
1200			1199.1	-0.05
1400			1400.4	+0.02
1600			1599.0	-0.05
1800			1799.7	-0.01
2000			2000	0.0

[a] Every 30°C (50°F) for each reference point

[b] Type of Calibration system used

[c] $\frac{\text{(Ref. temp: °C + 273) − (Test therm. temp. °C + 273}}{\text{Ref. Temp. °C + 273}} \times 100 \leq 1.5\%$

[redacted] Temperature Sensor Calibration Data Sheet

Date: 4/19/96 Thermocouple No.:

Ambient Temperature: 65-72 °F Barometric Pressure: 30.02 "Hg

Calibrator: A.T.Nuttle Reference: Mercury-in-glass: ✓

Other: ✓ Altec.

Mtr. Box 456-P

Reference point No.[a]	Source[b] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Difference,[c] %
1	Altec	0	0.0	
2	Glass	65	65	
3	Glass	70	70	
4	Glass	72	71	
5	Altec	100	99	

[a] Every 30°C (50°F) for each reference point

[b] Type of Calibration system used

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

[redacted] Temperature Sensor Calibration Data Sheet

Thermometer ID

ERTCO	ERTCO	VWR	Fisher
CAT 1005 3FC	CAT 517	C1016-015 U.A	ASTM 17F
SN 16917	KBS-163		H04544
-1 to +101°C	0-260°C	-30° - +50°C	0-180°F
in 0.1°	1°	1°	1°

Thermometer ID

Mfr.	ERTCO	ERTCO	VWR	Fisher
CAT #	1005-3FC	517	C1016-015 U.A	ASTM-17F
S/N	16917	KBS-163	—	A0115444
Range	-1 to +101°C	0-260°C	-30 to +50°C	0-180°F
Graduations	0.1°C	1°C	1°C	1°F
TEMP PT				
1	21.5°C	23°C	21.5	70°F
2	19.4°C	21°C	19.5	67
3	13.2°C	15°C	15.5	56
4	0.6	4°C	1.1	33.5
5	40	41.5	40	105
6.	99	99		

Mfr.	Taylor	Taylor	Perfection Instruments	Weston
CAT #	1330NA	1330NA		model
S/N	WB	DB	A1	
Range	20-100°F	20-100°F	0-220°F	-40-160°F
Graduations	1°F	1°F	1°F	2°F
Temp #				
1	70°F	69.5	61.5	69.5
2	66	66	58	66
3	[illegible]	55.5	41	56
4	33	32	23	33
5	104	104	95 199	105

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

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

MYREN CONSULTING
EPA METHOD 5
METER BOX PRE TEST 5 POINT CALIBRATION
English Meter Box and English Calibration Meter Units

Filename: C:\WINDOWS\DESKTOP\DAD'SW-1\DGMCAL1.WK1

Model Number: 45G-P
Serial Number: 1

Date: -> April 18,1996
Barometric Pressure: -> 29.81 (in. Hg)
Calibration Meter Factor Yc: -> 0.9903 (number)

		DRY GAS METER READING				GAS Temperature		CALIBRATION METER READINGS			CALIBRATION METER Temperature	
dH (in H20)	Elasped Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)		Inlet (deg F)	Outlet (deg F)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Inlet (deg F)	Outlet (deg F)
0.25	31.47	446.100	451.712	5.612	Initial->	70.0	70.0	418.254	423.927	5.673	73.0	73.0
					Final--->	79.0	79.0					
0.50	19.87	452.202	457.401	5.199	Initial->	80.0	80.0	424.428	429.639	5.211	73.0	73.0
					Final--->	83.0	83.0					
0.75	13.00	458.001	464.000	5.999	Initial->	82.0	82.0	430.231	436.251	6.020	73.0	73.0
					Final--->	84.0	84.0					
1.00	17.84	464.701	474.501	9.800	Initial->	84.0	84.0	436.968	446.836	9.868	73.0	73.0
					Final--->	85.0	85.0					
1.25	8.55	474.901	480.004	5.103	Initial->	85.5	85.5	447.238	452.401	5.164	73.0	73.0
					Final--->	86.0	86.0					

	DRY GAS METER METER CALIBRATION FACTOR Y		DRY GAS METER ORIFICE CALIBRATION FACTOR dH@	
	Value (number)	Variation (number)	Value (in H20)	Variation (in H20)
	1.003	-0.009	4.434	1.566
	1.007	-0.005	4.136	1.268
	1.011	-0.001	1.984	-0.883
	1.016	0.004	1.849	-1.018
	1.023	0.011	1.935	-0.933
Average	1.012		Average 2.867	

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 # 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 Albert F. Myren Jr. Date 4/18/96

Post Test
Meter Box Audits
Woodstove Data Sheet #32

Unit: Kuma Scott 1171-1
Date: 9/10/96
Technician: A.T. Myers
WST9-Form2, Rev 12/88

METER BOX CALIBRATION AUDIT

Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg. Δ H	.886	.877	.884	.882	.852					
Max Vac	0	0	0	0	0					

Avg. Test Series Δ H: .8802 in H_2O. Test Series Max Vac: 0 in Hg

Audit Dry Gas Meter: MC-1 300332 Correction (Y) Factor: 0.9903
Test Dry Gas Meter: 456-P Correction (Y) Factor: 1.012

Audit Data

		Audit #1	Audit #2	Audit #3
BP:		29.86	29.86	29.88
Vac:		0	0	0
Audit Meter:	Final Vol	624.719	630.221	635.798
	Initial Vol	619.745	625.015	630.635
	Vol (Vw, ft^3)	4.974 ✓	5.206 ✓	5.163 ✓
Audit Meter:	Initial	78	77	76
Temp (°F)(Tw)	Mid	78	77	76
	Final	✓ 77 ✓	✓ 76 ✓	76
	Avg (°F/°A)	(77.67) 537.67	(76.67) 536.67	(76) ✓ 536 ✓
Δ H (in H_2O)	Initial	.88	.88	.88
	Mid	.88	.88	.88
	Final	.88	.88	.88
	Avg	.88 ✓	.88 ✓	.88 ✓
Dry Gas Meter:	Final Vol	151.520	156.993	162.392
	Initial Vol	146.700	151.800	157.300
	Vol (V_d, ft^3)	4.820 ✓	5.193 ✓	5.092 ✓
Dry Gas Meter	Initial	83	86	89
Temp (°F):Inlet	Mid	86	89.5	93
	Final	✓ 88 ✓	✓ 91.5	✓ 95 ✓
	Avg (°F/°A)	(85.67) 545.67	(89) 549	(92.3) 552.3
Dry Gas Meter	Initial	83	86	89
Temp (°F):Outlet	Mid	86	89.5	93
	Final	✓ 88 ✓	✓ 91.5 ✓	✓ 95 ✓
	Avg (°F/°A)	(85.67) 545.67	(89) 549	(92.3) 552.3
Avg Dry Gas Meter Temp (Tm-°F/°A)		✓ ✓ (85.67) 545.67	✓ ✓ (89) 549	✓ ✓ (92.3) 552.3
Time (minutes)		10:00	10:00	10:00

$Y = \frac{(Vw)(MCF)(BP)(Tm)}{(Vd)(BP + \frac{\Delta H}{13.6})(Tw)}$ 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

$Y = \frac{(4.974)(.9903)(29.85)(545.67)}{(4.850)(29.86 + \frac{.88}{13.6})(537.67)} = \frac{80,30,516}{77,603.783} = 1.0349$

$\Delta\% = \frac{(1.0349 - 1.0136)}{1.0136} \times 100 = +2.10\ \%$

Run 2

$Y = \frac{(5.206)(.9903)(29.88)(549)}{(5.193)(29.86 + \frac{.88}{13.6})(536.67)} = \frac{84,571.470}{83,453.719} = 1.0133$

$\Delta\% = \frac{(1.0133 - 1.0136)}{1.0136} \times 100 = -0.03\ \%$

Run 3

$Y = \frac{(5.162)(.9903)(29.86)(552.33)}{(5.092)(29.86 + \frac{.88}{13.6})(536)} = \frac{84,381.673}{81,728.445} = 1.0325$

$\Delta\% = \frac{(1.0325 - 1.0136)}{1.0136} \times 100 = 1.86\ \%$

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: $\bar{Y} = 1.312\%$

.75 (A) inch H_2O Delta H = 1.011 (C) Calculated Calibration Y Factor (from Calibrations)

1.000 (B) inch H_2O Delta H = 1.016 (D) Calculated Calibration Y Factor (from Calibrations)

1.00 (B) − .75 (A) = .25 × 100 = 25 (E)

1.016 (D) − 1.011 (C) = .005 ÷ 25 (E) = .0002 (F)

.8800 Avg Delta H − .75 (A) = .1300 × 100 = 13.22 (G)

$\left[\frac{.0002}{F} \times \frac{13.22}{G}\right] + \frac{1.011}{C} = \frac{1.0136}{\text{Interpolated Y Factor For Avg. Test Series Delta H}}$

1,000 CFM @ -17.5" Hg Pre 1 min.

Volume Metering System Leak Check: _____ inch H_2O in one minute

REFERENCE METER CALIBRATION
ENGLISH REFERENCE METER UNITS

DGM Serial # 300392
Date 4/1/96

Filename: F:\DATAFILE\CALIBRAT\CAL_MENU.DSK\DGM_REF.
Revised: 06/08/95

Barometric Pressure 29.45
Meter Yw 1.00000
K (deg R/inches Hg) 17.64

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)
9.00	-6.40	26.28	37.60	11.33	70.0	71.0	322.220	333.158	10.938	67.0	0.988	0.000	1.198
8.50	-6.40	37.60	48.29	10.69	71.0	72.0	333.158	343.460	10.302	67.0	0.988	0.000	1.195
11.50	-6.40	48.29	62.72	14.43	72.0	73.0	343.460	357.351	13.891	67.0	0.989	0.000	1.191
									Max Yds - Min Yds =0.000614711 Must be no greater than 0.030				
									Average Yds =0.988195552 Must be between 0.95 to 1.05				
8.50	-4.10	62.72	71.03	8.32	73.0	74.0	357.351	365.395	8.044	67.0	0.989	0.000	0.933
6.00	-4.10	71.03	76.92	5.89	74.0	74.0	365.395	371.091	5.696	67.0	0.990	0.000	0.936
5.50	-4.10	76.92	82.28	5.36	74.0	75.0	371.091	376.275	5.184	68.0	0.989	0.000	0.927
									Max Yds - Min Yds =0.000811587 Must be no greater than 0.030				
									Average Yds =0.989551764 Must be between 0.95 to 1.05				
23.00	-3.00	82.28	100.69	18.41	74.0	76.0	376.275	394.109	17.834	68.0	0.989	-0.001	0.763
10.50	-3.00	100.69	109.10	8.41	76.0	77.0	394.109	402.250	8.141	68.0	0.991	0.001	0.763
20.50	-3.00	109.10	125.59	16.49	77.0	78.0	402.250	418.165	15.915	68.0	0.990	0.000	0.764
									Max Yds - Min Yds =0.002111523 Must be no greater than 0.030				
									Average Yds =0.990046834 Must be between 0.95 to 1.05				
9.00	-1.80	125.59	130.71	5.12	78.0	78.0	418.165	423.125	4.960	68.0	0.992	0.001	0.542
9.50	-1.80	130.71	136.10	5.39	78.0	79.0	423.125	428.350	5.225	69.0	0.991	0.000	0.540
10.00	-1.80	136.10	141.81	5.71	79.0	79.0	428.350	433.874	5.524	69.0	0.991	-0.001	0.542
									Max Yds - Min Yds =0.001237161 Must be no greater than 0.030				
									Average Yds =0.991169657 Must be between 0.95 to 1.05				
13.50	-1.20	141.81	147.41	5.60	79.0	80.0	433.874	439.307	5.433	69.0	0.992	0.000	0.395
14.50	-1.20	147.41	153.44	6.03	80.0	80.0	439.307	445.155	5.848	69.0	0.993	0.001	0.396
13.50	-1.20	153.44	159.06	5.62	80.0	80.0	445.155	450.600	5.445	69.0	0.992	-0.001	0.396
									Max Yds - Min Yds =0.001332081 Must be no greater than 0.030				
									Average Yds =0.992331519 Must be between 0.95 to 1.05				

Overall Average Yds =0.990259065

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 4-1-96

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
23.5 - 25.4

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

Calibration Data for Taylor Sling Psychrometer

Reference	WB	DB
Fisher	Taylor	Taylor
ASTM-59F	1330NA	1330NA
A04544	WB	DB
0-180°F	20-120°F	20-120°F
in 1° graduations	1°F	1°F
70°F	70°F	69.5°F
67°F	66	66
56°F	55.5	55.5
33.5°F	33	33
105°F	104	103

Date: 4/17/96

Technician: A.T. Myers

WOODSTOVE DATA SHEET #26
CEM GAS TRAIN RESPONSE TIME

Date	4/20/96										
Technicians	A.TIM R.L.S										
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	.309	.291	.287	0.10	0.12	0.11	54.0	55.2	56.2		
15	.308	.283	.264	0.10	0.11	.010	54.0	58.5	59.3		
30	.041	.030	.026	.01	.01	0.01	82.5	82.7	81.9		
45	.020	.015	.015	.01	.01	.01	84.2	84.3	84.4		
60	.012	.011	.009	.01	.01	.01	84.4	84.5	84.5		
75	.009	.007	.007	.01	.01	.01	84.6	84.6	84.5		
90	.006	.005	.005	.01	.01	.01	84.6	84.6	84.6		
105	.004	.004	.004	.01	0	0	84.2	84.7	84.6		
120	.003	.003	.003	.00	0	0	84.7	84.7	84.7		
135	.003	.002	.002	0	0	0	84.7	84.7	84.7		
150	.002	.002	.002	0	0	0	84.7	84.7	84.7		
165	.002	.002	.001	0	0	0	84.7	84.7	84.7		
180	.002	.001	.001	0	0	0	84.7	84.8	84.7		
Initial Response Time (Seconds) N 15		14	14	15	14	14	15	14	14		
95% Response Time (Seconds)											
Analyzer Flow Rate 1.5SCFH		1.5SCFH									

Comments: The gas analyzers share a common gas conditioning train [illegible] train with a heated "[illegible]" [illegible] a "[illegible]" [illegible]. The overall [illegible] for each analyzer were [illegible]. [illegible] made to [illegible] manual [illegible].

Pre Tuma

InterMountain Ambient
P.O. Box 5106 ☐ Missoula, MT 59806 ☐ (406) 543-6174

QA WS 1/85

CO_2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: Woodinville, WA Date: 8/27/96

Analyzer: Make: HORIBA Model: PIR 2000 SN: 607024

Calibration by: A. Tiffany

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: ✓ Mass Flowmeter: ____
BP: 29.88" Hg Instrument ID: Weems
Temp: 72 °F Instrument ID: Fluke

Analyzer last calibrated: 7/15/96 By: A.T. Murphy

Cylinders:

1. # L-36919 Concentration: 00.0 % CO_2 Cyl. Press.: 2025 psi.
   Certified by: Airgas Date: 4/24/96
2. # W260657 Concentration: 10.1 % CO_2 Cyl. Press.: 975 psi.
   Certified by: BOC Gases Date: 1/19/95
3. # W19567 Concentration: 17.0 % CO_2 Cyl. Press.: 1825 psi.
   Certified by: BOC Gases Date: 1/25/95
4. # W392263 Concentration: 5.08 % CO_2 Cyl. Press.: 1830 psi.
   Certified by: BOC Gases Date: 1/25/95

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

Flow: 1.5 SCFH Measured by: Rotameter: ✓ Mass Flowmeter: ____

Calibration Results

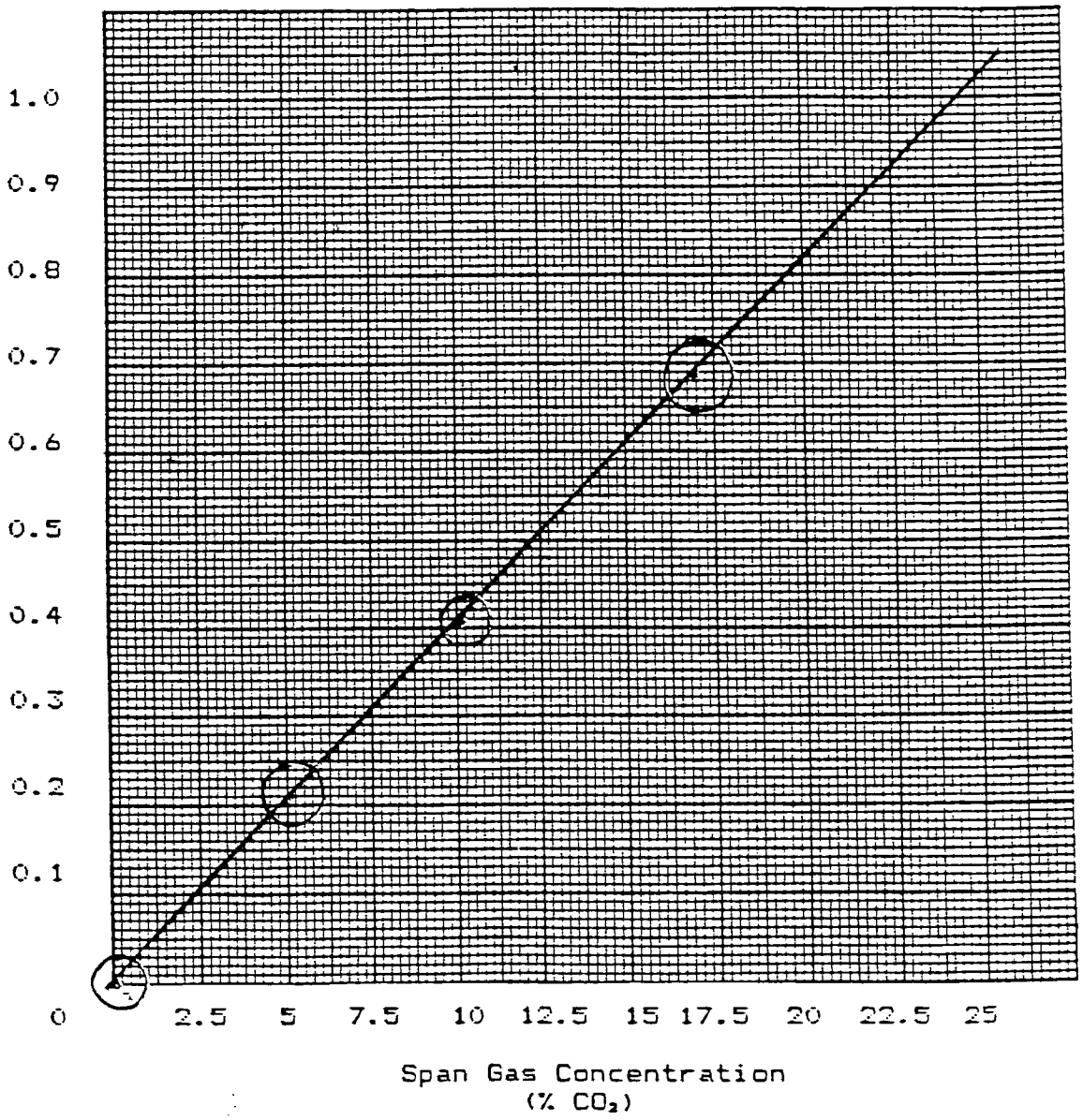
Point #	Cyl. #	% CO_2	Expected		Actual		Adj.		% Dif.	Potentiometer	
			Meter	DVM	Meter	DVM	Meter	DVM		Unadj.	Adj.
1	1	0	00.0	.000	-0.5	-.004	00.0	.000	—	5.04	5.35
2	2	10.1	40.4	.404	41.0	.411	40.4	.404	—	3.37	2.88
3	3	17.0	68.0	.680	68.7	.686	—	—	+0.12	—	—
4	4	5.08	20.3	.203	20.7	.204	—	—	+0.56	—	—
5	1	00.0	00.0	.000	00.0	.000	—	—	0	—	—

Comments: 0.500 = 12.42 ?? Span Value = 25%
2% Span = 0.500%

.186 = 17.020% - 17.0 = .0206 .204 = 5.1083 - 5.08 = .0283

Linear Regression Results:

Y = MX + B
Slope (M) = .040325
Y Intercept (B) = -.000916
Correlation Coefficient (r) = 0.999984



Comments

P.O. Box 5108 ☐ Missoula, MT 59806 ☐ 1-843-6174

CONTROL CHART

SITE Myren Consulting Lab LOCATION Woodinville, WA 98072 OPERATOR ATM, RLS

PARAMETER CO_2 INSTRUMENT/SN HORIBA PIR 2000 SN687204 RANGE 0-25.0%

REFERENCE MATERIAL OR METHOD Zero and Span with Certified (± 2.0%) Reference Materials

DATE 1996	8/28	8/28	8/29	8/29	9/5	9/5	9/6	9/6	9/9	9/9												
Zero Response	.067	.067	.067	.067	.067	.067	.067	.067	.067	.067												
Zero Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Difference	.27	.27	.27	.27	.27	.27	.27	.27	.27	.27												

ZERO: 2, 1, 0, −1, −2

Span Response	10.05	10.10	10.07	10.07	10.05	10.03	10.05	10.08	10.08	10.08												
Span Actual	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1												
% Difference	-.48	.01	-.32	-.32	-.48	-.73	-.48	-.24	-.24	-.24												

SPAN: 10, 5, 0, −5, −10

Zero: UWL +2.0% UCL +5.0% LWL −2.0% LCL −5.0%

Span: UWL +2.0% UCL +5.0% LWL −2.0% LCL −5.0%

COMMENTS/ ACTIONS	Kuma Scott HT-1 Pre 1	Kuma Scott HT-1 Post 1	Kuma Scott HT-1 Pre 2	Kuma Scott HT-1 Post 2	Kuma Scott HT-1 Pre 3	Kuma Scott HT-1 Post 3	Kuma Scott HT-1 Pre 4	Kuma Scott HT-1 Post 4	Kuma Scott HT-1 Pre 5	Kuma Scott HT-1 Post 5	Kuma Scott HT-1

Pre Kuma

InterMountain Ambient
P.O. Box 5106 ☐ Missoula, MT 59806 ☐ (406) 543-6174

QA WS 1/85

O_2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: Woodinville, WA Date: 8/27/96

Analyzer: Make: TAYLOR Model: OA-137 SN: 137 / 4772

Calibration by: A.T. Meyers

Cal Gas Flow: 1500 cc/MIN Measured by: Rotameter: ✓ Mass Flowmeter: ____
BP: 29.88 "Hg Instrument ID: Weems
Temp: 72°F Instrument ID: Fluke

Analyzer last calibrated: 7/15/96 By: A.T. Meyers

Cylinders:

1. # 4-36919 Concentration: 00.0 % O_2 Cyl. Press.: 2025 psi.
   Certified by: Airgas Date: 4/21/96
2. # W260657 Concentration: 12.5 % O_2 Cyl. Press.: 975 psi.
   Certified by: BOC Gases Date: 1/18/95
3. # W19567 Concentration: 21.1 % O_2 Cyl. Press.: 1825 psi.
   Certified by: BOC Gases Date: 1/25/95
4. # W392263 Concentration: 6.25 % O_2 Cyl. Press.: 1830 psi.
   Certified by: BOC Gases Date: 1/25/95

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

Flow: 1500 cc/min Measured by: Rotameter: ✓ Mass Flowmeter: ____

Calibration Results

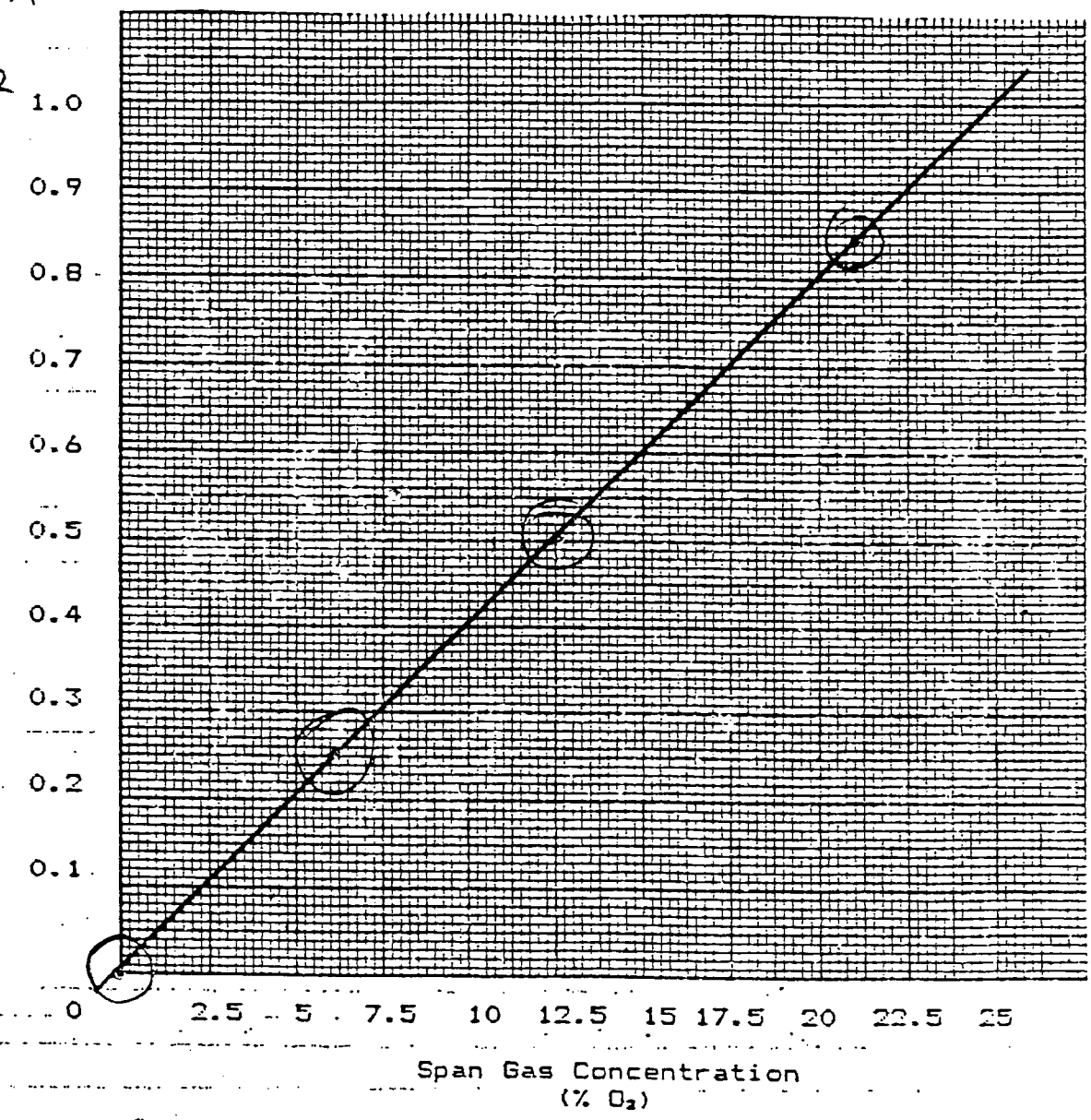
Point #	Cyl. #	% O_2	Expected Meter	Expected DVM	Actual Meter	Actual DVM	Adj. Meter	Adj. DVM	% Dif.	Potentiometer Unadj.	Potentiometer Adj.
1	1	0	00.0	00.0	00.0	00.0	—	—		—	✓
2	2	12.5	12.5	50.0	51	50.7	12.5	50.0		—	✓
3	3	21.1	21.1	84.4	85.0	84.7	—	—		—	—
4	4	6.25	6.25	25.0	6.3	25.1	—	—		—	—
5	1	0	00.0	00.0	0.5	00.2	—	—		—	—

Comments: 50.0 mV = 12.4674 Span Value = 25.0%
2% of Span Value = 0.500 %

84.7 = 21.116 − 21.1 = .01599 • 25.1 = 6.261 − 6.25 = 0.0113

Linear Regression Results:

Y = MX + B
Slope (M) = 4.0121963
Y Intercept (B) = -0.02151
Correlation Coefficient (r) = 0.9999997



Comments

P.O. Box 6100 ☐ Missoula, MT 59806 ☐ (406) 543-6174

CONTROL CHART

SITE Myron Consulting Lab LOCATION Woodinville, WA OPERATOR ATM, RLS

PARAMETER O_2 INSTRUMENT/SN Taylor OA 137 SN 137/4772 RANGE 0-25.0%

REFERENCE MATERIAL OR METHOD Zero and Span with Certified (±2.0%) Reference Materials

DATE 1996	8/28	8/28	8/29	8/29	9/5	9/5	9/6	9/6	9/9	9/9												
Zero Response	.005	.005	.055	.055	.030	.020	.06	.06	.055	.055												
Zero Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Difference	.02	.02	.22	.22	.12	.12	.22	.22	.22	.22												

ZERO: 2, 1, 0, −1, −2

Span Response	12.47	12.47	12.42	12.42	12.48	12.42	12.47	12.44	12.47	12.49												
Span Actual	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5												
% Difference	-.26	-.26	-.66	-.66	-.26	-.66	-.26	-.46	-.26	-.06												

SPAN: 10, 5, 0, −5, −10

Zero: UWL ±2.0% LWL −2.0% UCL ±5.0% LCL −5.0%

Span: UWL ±2.0% LWL −2.0% UCL ±5.0% LCL −5.0%

COMMENTS/ ACTIONS

- Kuma Sc# HT-1 Pre 1
- Kuma Sc# HT-1 Post 1
- Kuma Sc# HT-1 Pre 2
- Kuma Sc# HT-1 Post 2
- Kuma Sc# HT-1 Pre 3
- Kuma Sc# HT-1 Post 3
- Kuma Sc# HT-1 Pre 4
- Kuma Sc# HT-1 Post 4
- Kuma Sc# HT-1 Pre 5
- Kuma Sc# HT-1 Post 5

InterMountain Ambient
P.O. Box 5106 ☐ Missoula, MT 59806 ☐ [406] 543-6174

Pre kung

QA.WS 1/85

CO ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: Woodinville, WA Date: 8/27/96

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

Calibration by: A.T. Myers

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____
BP: 29.68 "Hg Instrument ID: Weems
Temp: 72°F Instrument ID: Fluke

Analyzer last calibrated: 7/15/96 By: A.T. Myers

Cylinders:

1. # 4-36919 Concentration: 00.0 % CO Cyl. Press.: 2025 psi.
   Certified by: Airgas Date: 4/24/96
2. # W260657 Concentration: 2.47 % CO Cyl. Press.: 975 psi.
   Certified by: BOC Gases Date: 1/18/95
3. # W19567 Concentration: 4.11 % CO Cyl. Press.: 1825 psi.
   Certified by: BOC Gases Date: 1/25/95
4. # W392263 Concentration: 1.19 % CO Cyl. Press.: 1880 psi.
   Certified by: BOC Gases Date: 1/25/95

Analyzer: Calibrated Range: 0-5.0 % Output: 0-100 Mv.

Flow: 1.5 SCFH 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	00.0	0.00	00.0	0.00	00.3	—	—	—	—	—	
2	2	2.47	2.47	49.4	2.42	48.4	2.47	49.0	—	—	✓	
3	3	4.11	4.11	80.2	4.31	85.8	—	—	1.08	—	—	4.1
4	4	1.19	1.19	23.8	1.28	25.3	—	—	3.44	—	—	1.2
5	1	0	0.00	00.0	0.00	-00.3	—	—	-0.12	—	—	-.0

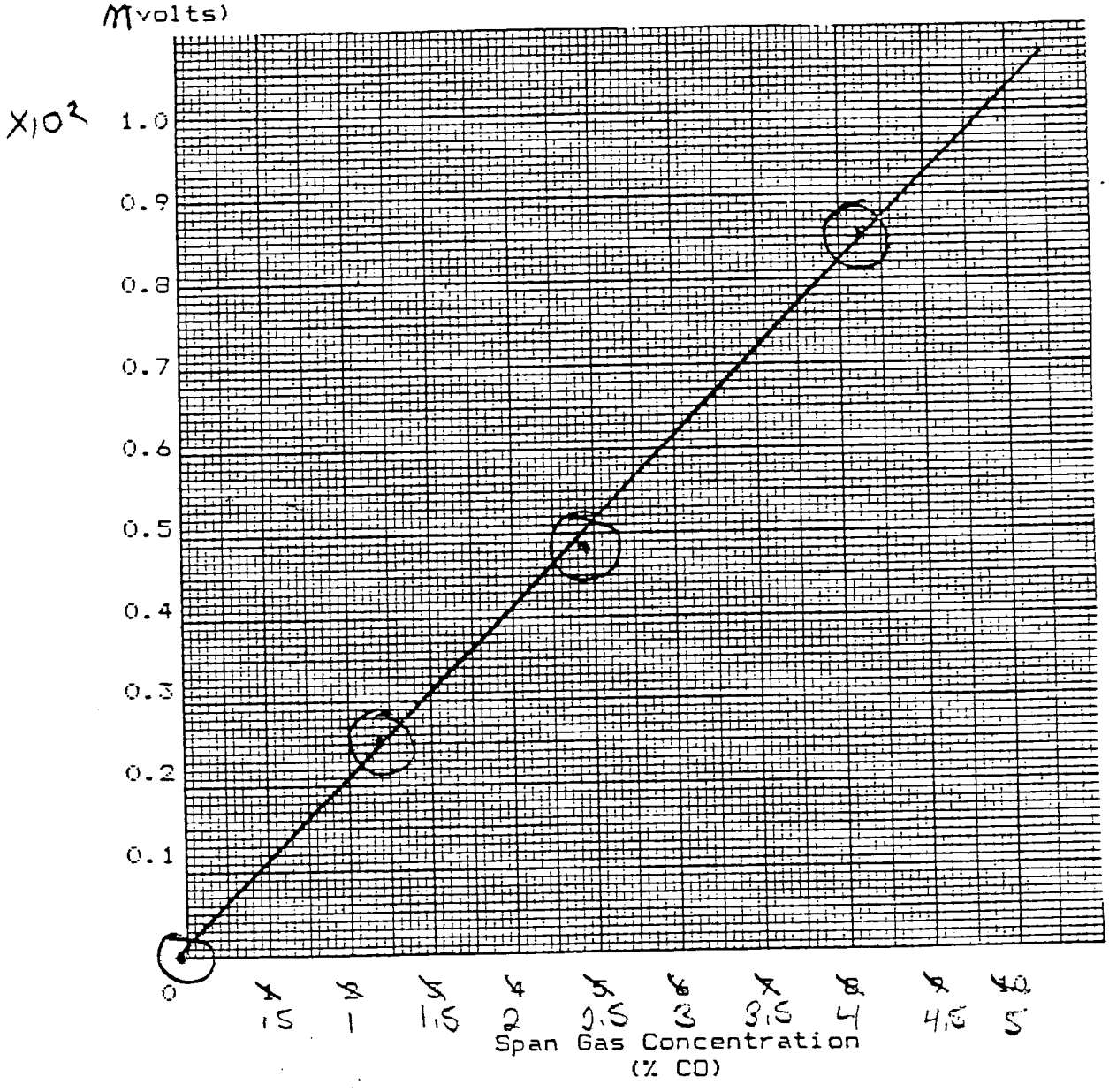
Comments: 50 > 2.4245 287

EPA Span Value: 5.0%
2% of " " = 0.100%

4.1545 - 4.11 = .0445, 1.0309 - 1.19 = .0409 %

Linear Regression Results:

Y = MX + B
Slope (M) = 20.69379
Y Intercept (B) = -.17268
Correlation Coefficient (r) = 0.99932



Comments

CONTROL CHART

P.O. Box 6100 ☐ Missoula, MT 59806 ☐ 543-6174

SITE Myron Consulting Lab LOCATION Woodinville, WA OPERATOR ATM, RLS

PARAMETER CO INSTRUMENT/SN Infra Red 702D SN 113 RANGE 0-5.00%

REFERENCE MATERIAL OR METHOD Zero and Span with Certified (±2.0%) Reference Materials

DATE 1996	8/28	8/28	8/29	8/29	9/5	9/5	9/6	9/6	9/9	9/9												
Zero Response	.006	-.006	-.006	.0013	.006	-.006	-.006	-.006	.006	-.006												
Zero Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Difference	-.12	-.12	-.12	-.03	-.12	-.12	-.12	-.12	-.12	-.12												

ZERO: 2, 1, 0, −1, −2

Span Response	2.38	2.40	2.40	2.38	2.40	2.37	2.40	2.40	2.40	2.41												
Span Actual	2.47	2.47	2.47	2.47	2.47	2.47	2.47	2.47	2.47	2.47												
% Difference	-3.80	-2.82	-2.82	-3.80	-3.01	-3.99	-3.01	-3.01	-3.01	-2.43												

SPAN: 10, 5, 0, −5, −10

Zero: UWL ±2.0% LWL −2.0% UCL ±5.00% LCL −5.00%

Span: UWL ±2.0% LWL −2.0% UCL ±5.0% LCL −5.0%

COMMENTS/ ACTIONS	Kuma Sc# HT-1 Pre1	Kuma Sc# HT-1 Post-1	Kuma Sc# HT-1 Pre 2	Kuma Sc# HT-1 Post-2	Kuma Sc# HT-1 Pre 3	Kuma Sc# HT-1 Post 3	Kuma Sc# HT-1 Pre 4	Kuma Sc# HT-1 Post 4	Kuma Sc# HT-1 Pre 5	Kuma Sc# HT-1 Post 5												

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

Stove QC

The Kuma Scott H-1 Noncatalytic Woodstove is a small to medium sized rectangularly shaped stove designed to be loaded either north-south or east-west with 16" wood. The firebox depth on the test unit was slightly longer (1/16") so the fuel load was placed in the unit in a North-South fashion.

The unit has a cast door, a fire brick baffle covered with a 1/2" ceramic blanket and 3 secondary air tubes.

The unit has several distinguishing features.

1. It is a step top stove.

2. It is a true outside air stove in that all of the air entering the unit has to go through the pedestal.

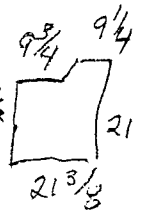
3. The unit is a very good consistent performer. Test starts were not a problem. The unit often did not loose gas balance after the primary air control was adjusted to the run setting at 5:00 into the test, which is unusual.

KUMA4.doc

QUALITY CONTROL INSPECTION

MODEL Kuma Scott HT-1 DATE 9/12/96 ATM

VERIFY	MEASUREMENTS		VERIFY	MEASUREMENTS	
___	HEIGHT [OVERALL]	32½"	___	DOOR OPENING	14¼ X 9½
___	WIDTH [OVERALL]	24"	___	DRAFT-OPENING	See drawings
___	DEPTH [OVERALL]	25¼"	___	DRAFT-SECONDARY	"
___	HEIGHT FIREBOX	See	___	DRAFT-3rd STAGE	N/A
___	WIDTH FIREBOX	drawings	___	BAFFLE PLATE	N/A brick
___	DEPTH FIREBOX		___	BASE (Pedestal)	22¼ x 22¼
___	FLUE COLLAR	6" X 2"		HEAT SHIELDS	Pedestal Riser 8⅞ x 12⅛
___	ASH FENDER	19¾ X 3¾"	___	BACK	
___	GLASS		___	SIDES	12½
___	Air Wash Gap	3/16"	___	BOTTOM	N/A
___	3/16" ← Front of Stove		___		
___	← Air Wash Plate Shim		___		



MATERIAL

___	TOP	1/4"
___	BACK	3/16"
___	SIDES	3/16"
___	BOTTOM	3/16"
___	DOOR	CAST
___	BAFFLE	Brick w/ Kwool (Clay)
___	HANDLE(S)	door ½"
___	BASE	
___	SHIELDS	

BLOWER

TYPE & MODEL: Fasco – No Visible ID
CORD:
STRAIN RELIEF: YES
WIRING: 3 wire 16ga (?) grnd'd
V.S.C.: Yes
FUSES: N/A

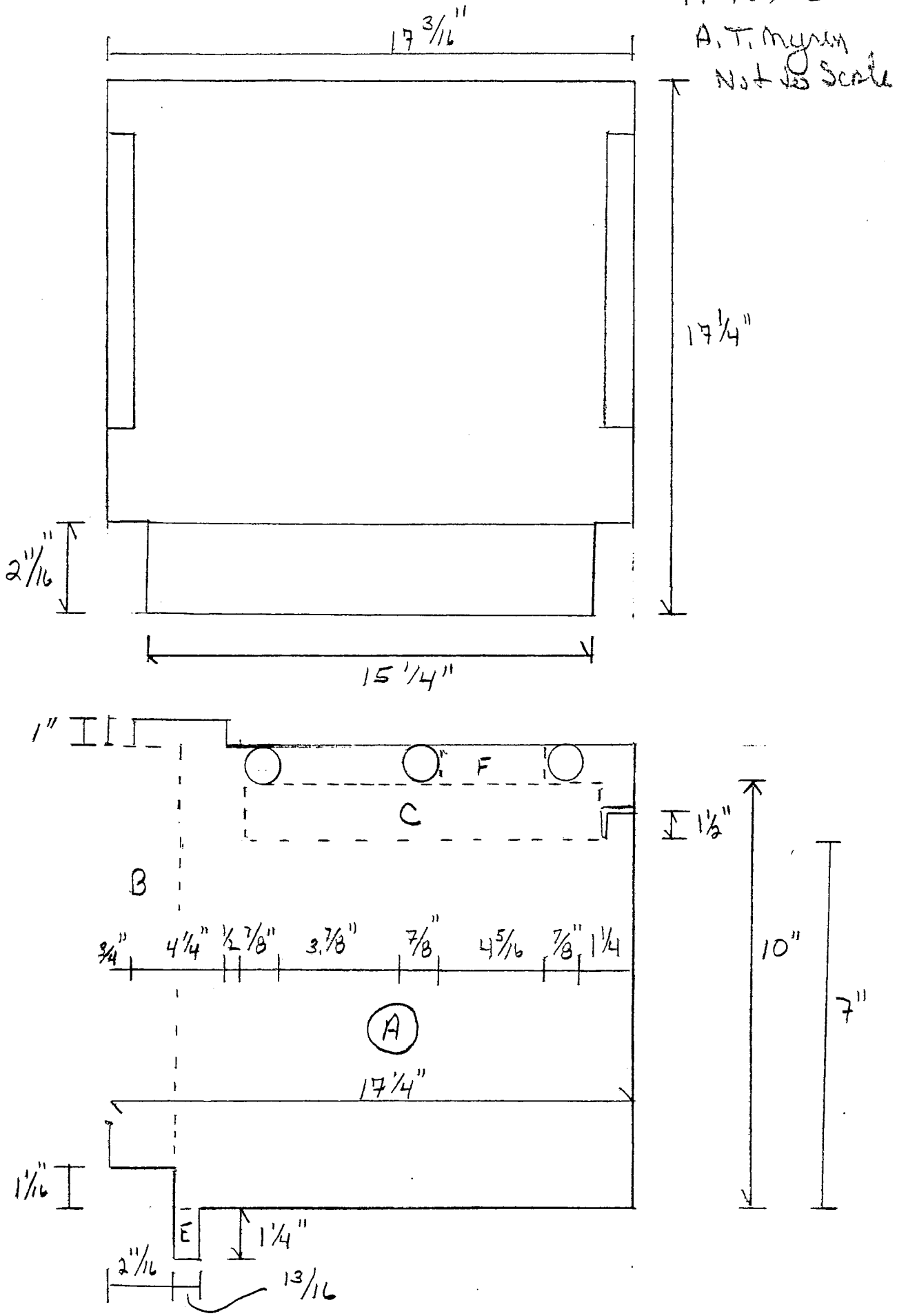
DRAFT CONTROL: Paddle Type See drawings

LABELING: CHECK OF RECORDS
ANY IMPROPER USAGE FOUND
SERIAL NO'S ON HAND

ADDITIONAL OBSERVATIONS: 5-tep Top Stove, 31⅛ @ Flue Collar
Hole in top below Flue Collar = 5½"

Kuma Scott HT-1 Useable Firebox Dimensions

A. T. Myers
Not to Scale



USEABLE FIREBOX VOLUME CALCULATIONS:

A: 17.1875 X (17.25 - 2 11/16) X 7 = 1752.051 ✓

B: 15.25 X 2 11/16 X 10 = 409.844 ✓

C: 16 X (17.25 - 2 11/16) X 3 = 699.000 ✓

D: 15.25 X 4.25 X 1 = 64.813 ✓

E: 17.1875 X 1.25 X 13/16 = 17.456 ✓

F: 1 X 4.3125 X 16 = 69.000 ✓

3012.164 in^3

Less

G: 15.25 X 1.0625 X 2 11/16 = 43.5459

3012.164 in^3 − 43.5459 in^3 = 2965.615

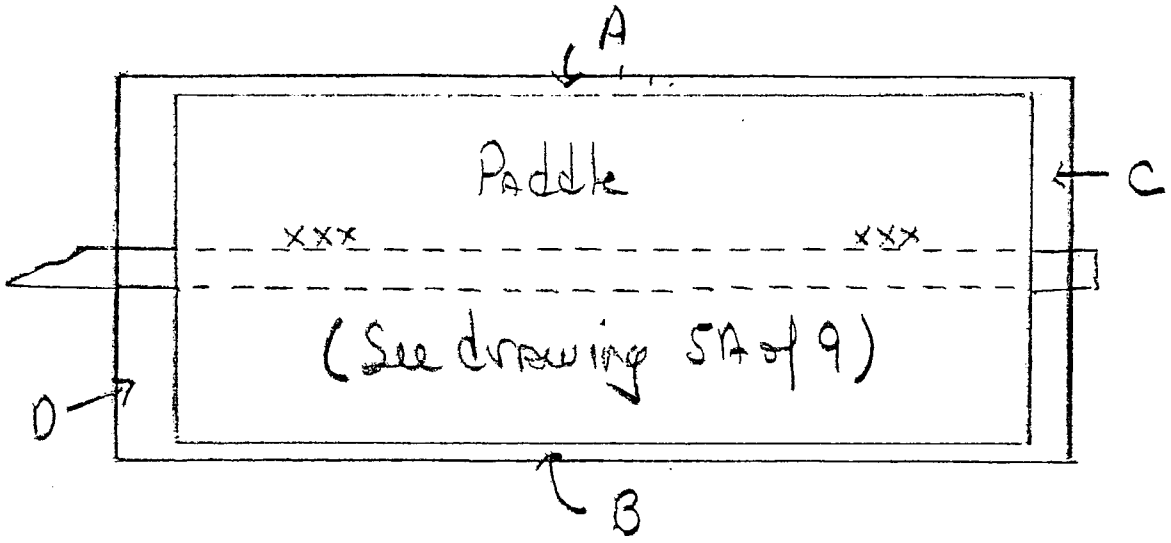
2965.615 in^3 ÷ 1728 in^3/ft^3 = 1.7162 ft^3

1.7162 ft^3 X 7 lbs/ft^3 = 12.0135 lbs. Ideal Fuel Load Wt.

12.0135 lbs ± 10% = 13.215 − 10.812 lbs

= 13.2 - 10.9 lbs, Fuel Load Wt. Range.

Primary air Control Gap Dimensions

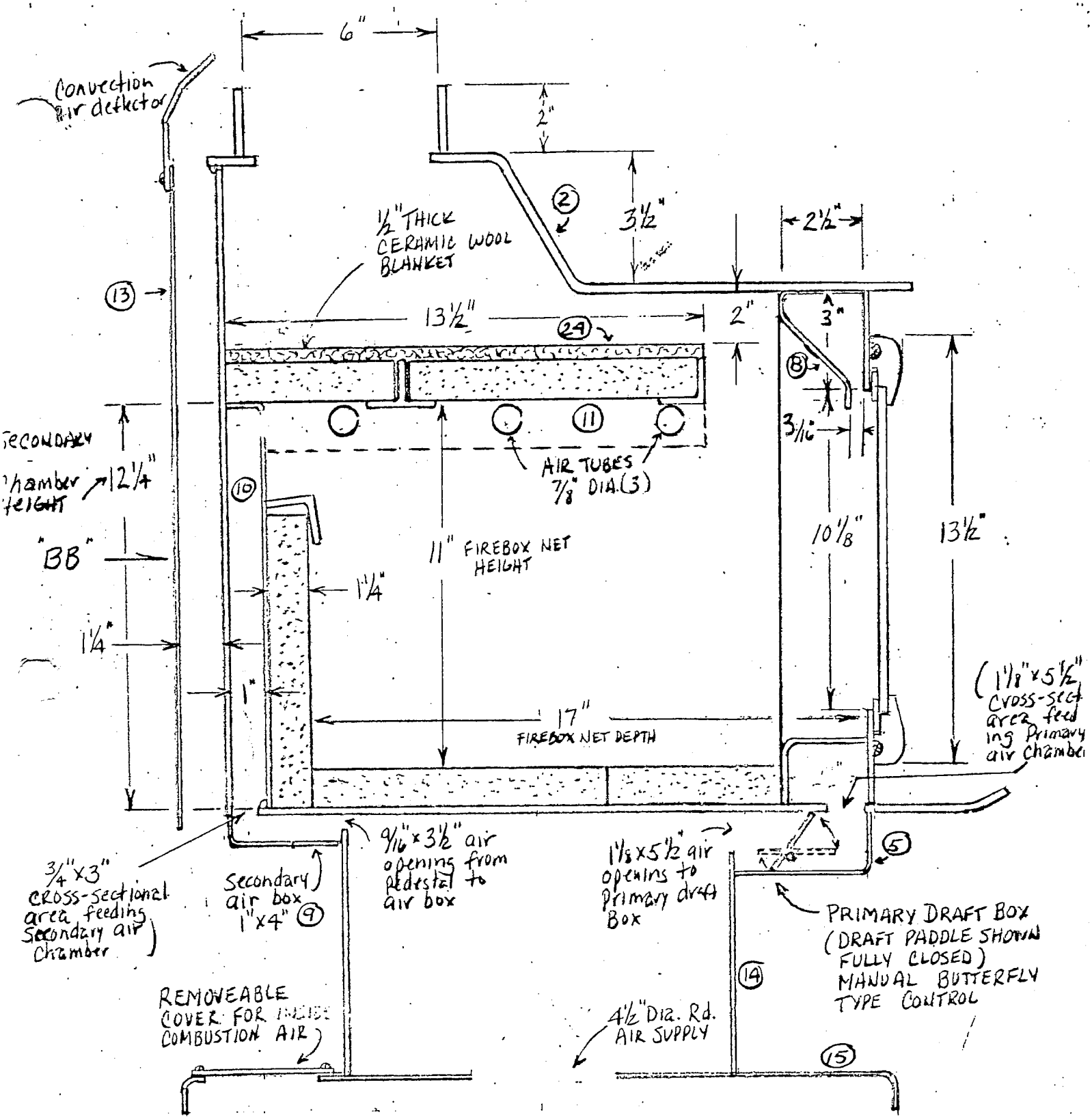


The gaps for the primary air control at the "stop" position (3/8" on the arc from to fully closed) are as follows:

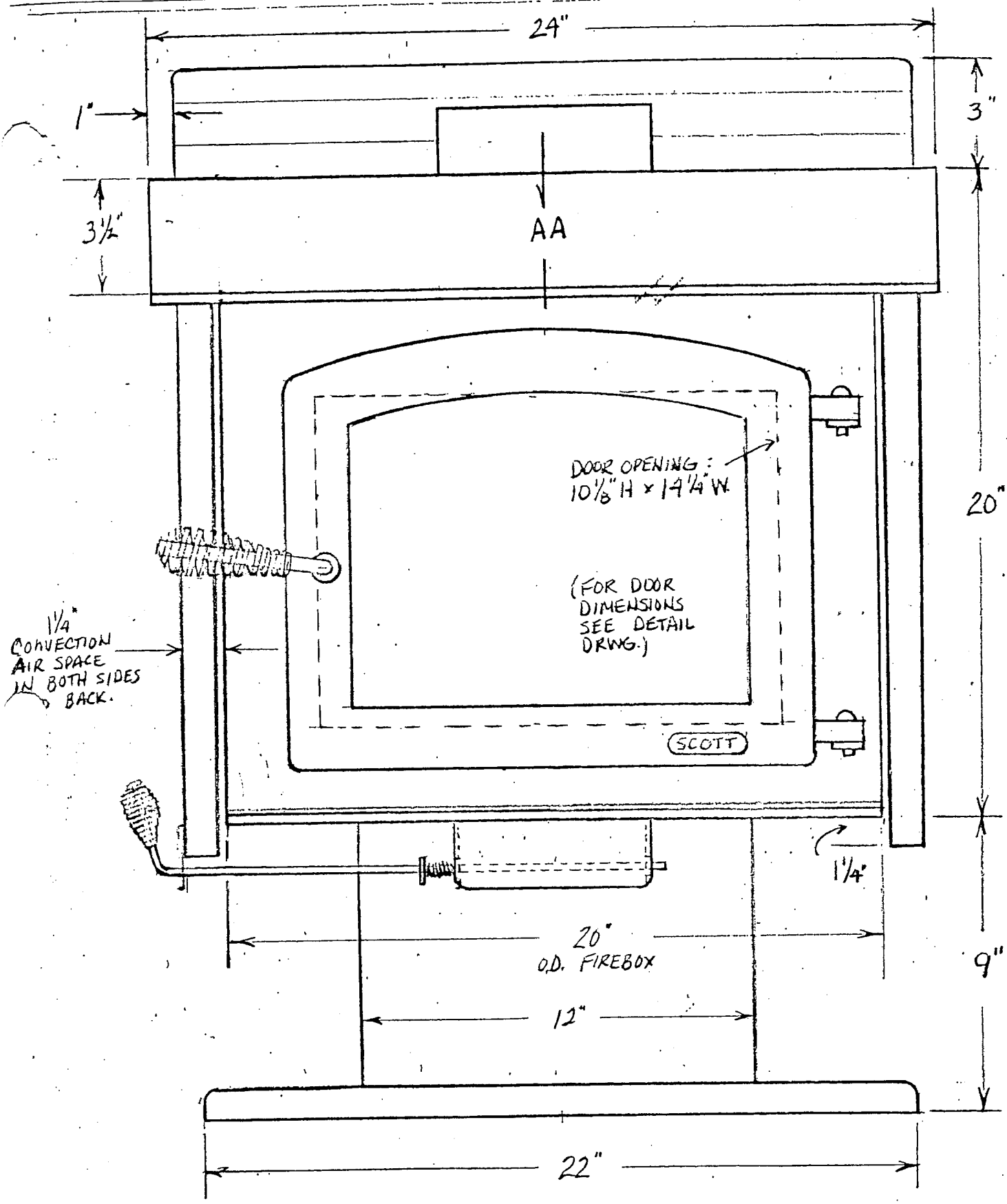
A	.0411	59	drill bit size used to measure the gap
B	.055	55	
C	.0785	47	
D	.1222	30	32

$\bar{X}$ of .1235 @ top and .1160 @ bottom

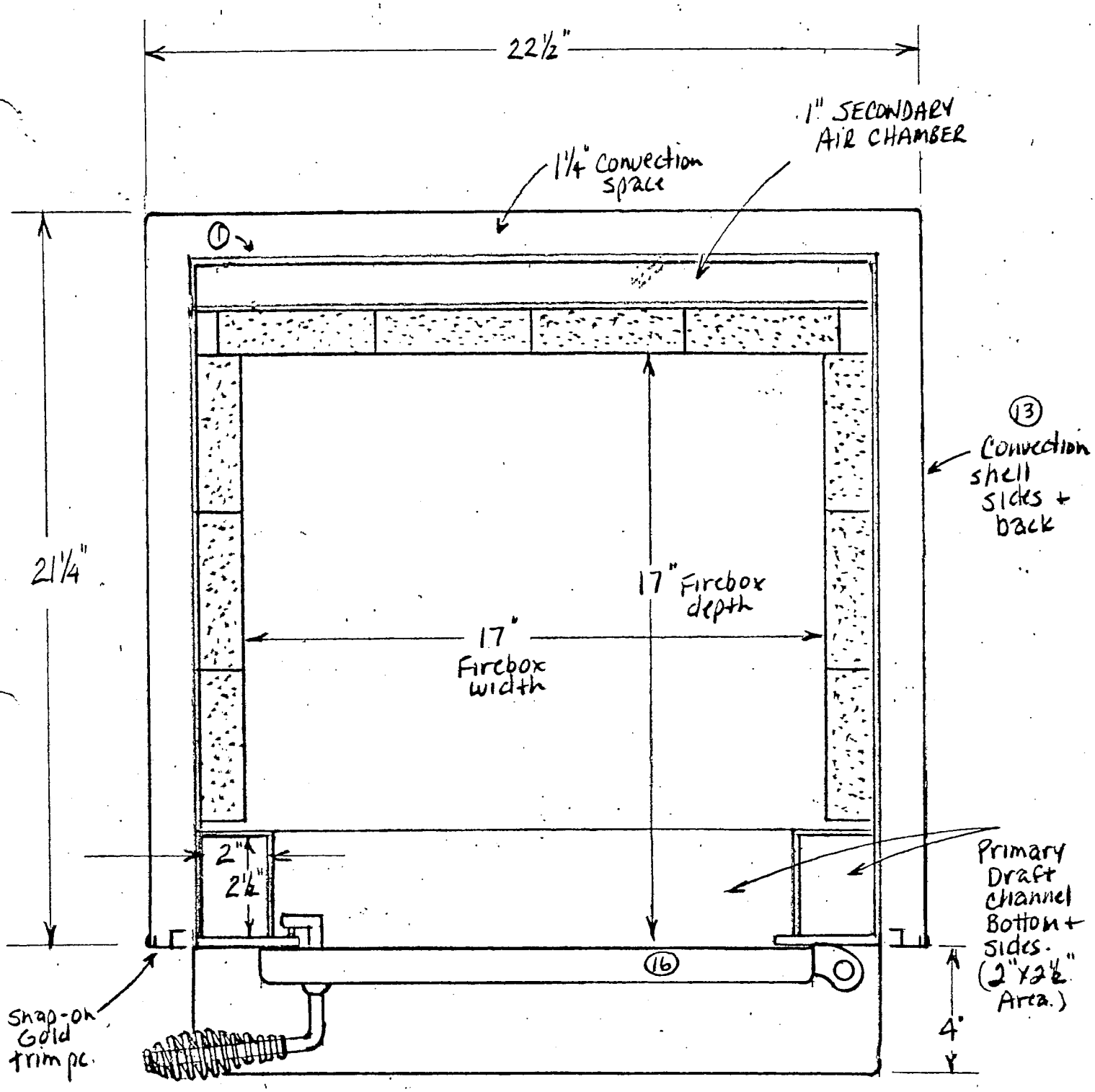
The manufacture intends to install a small shim inside the primary air control box to produce the desired gaps and thereby eliminate the step on the heat shield that was used on the prototype.



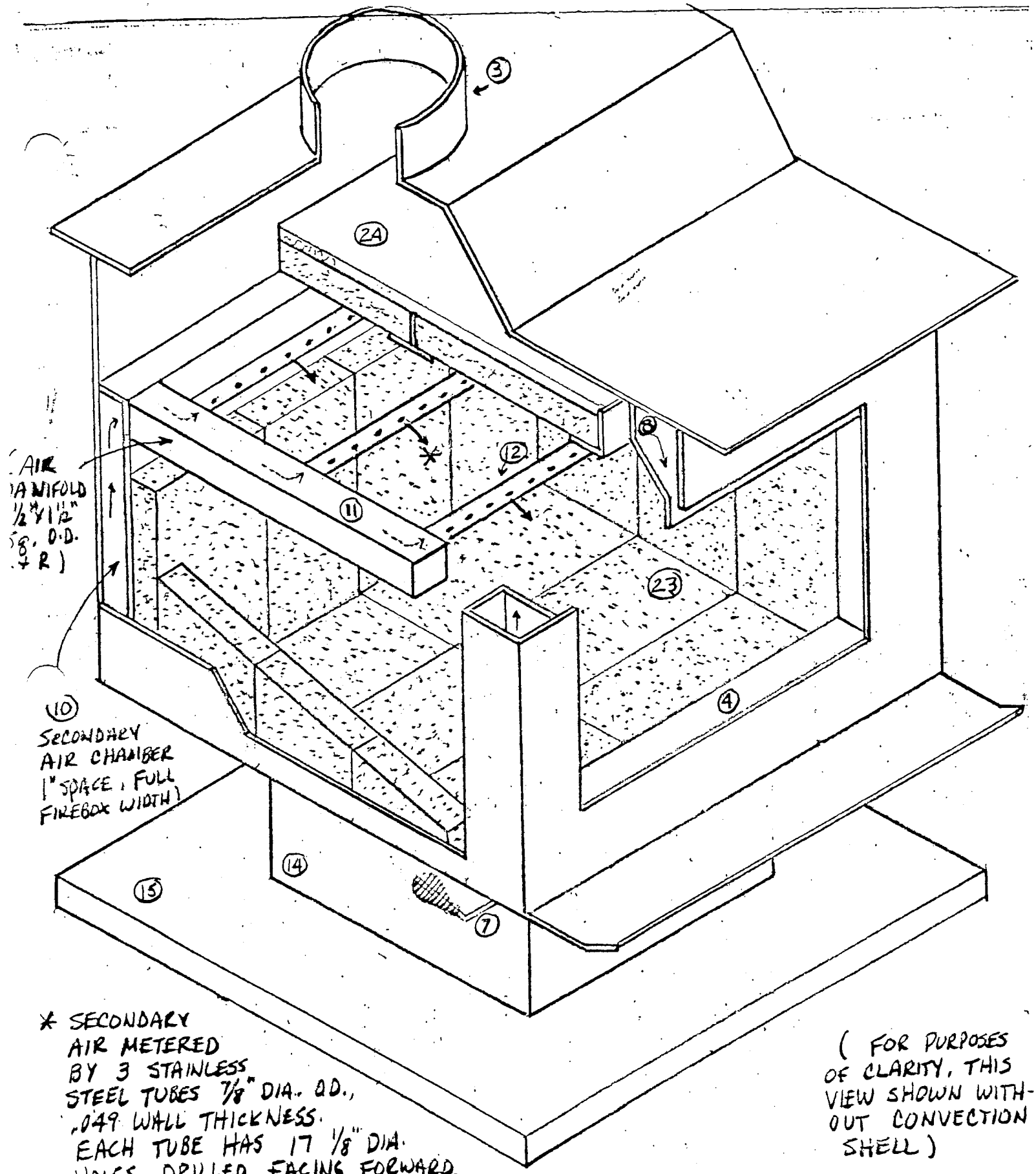
TITLE: KUMA SCOTT HT	DRAW. NO. 1 OF 9	DR. BY M.F.
VIEW: SIDE CROSS-SECTION A-A	DATE: 6-20-96	SCALE: ¼" = 1"



TITLE: KUMA SCOTT HT	DRAW. NO. 2 OF 9	DR. BY M.F.
VIEW: FRONT	DATE: 6-20-96	



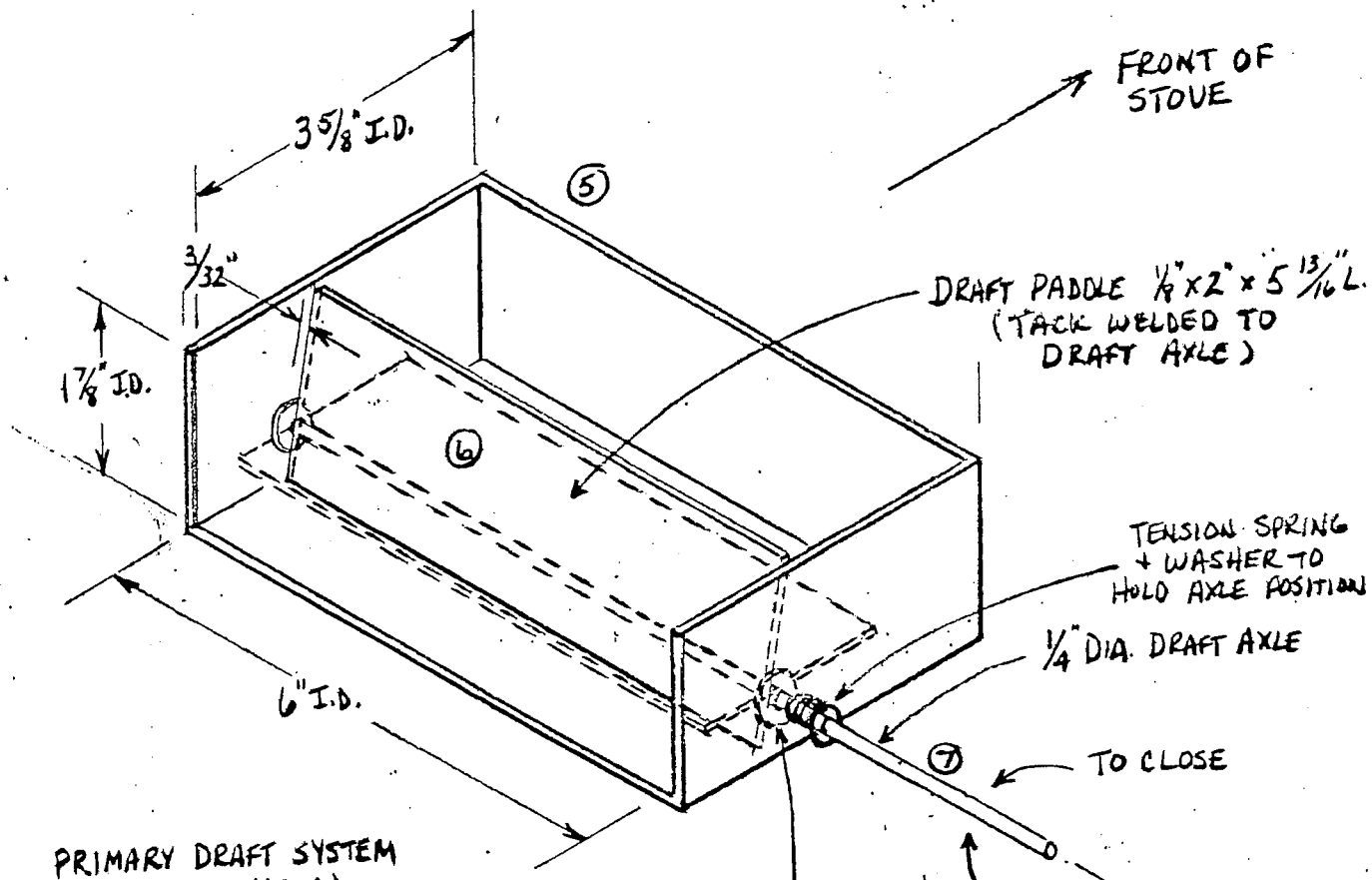
TITLE: KUMA SCOTT HT	DRAW. NO. 3 OF 9	DR. BY MF.
VIEW: TOP CROSS-SECTION B-B	DATE: 6-24-96	SCALE ¼"=1"



* SECONDARY AIR METERED BY 3 STAINLESS STEEL TUBES 7/8" DIA. O.D., .049 WALL THICKNESS. EACH TUBE HAS 17 1/8" DIA. HOLES DRILLED, FACING FORWARD. TOTAL SECONDARY AIR TO FIREBOX: (51, 1/8" Holes .636 sq in TOTAL AREA.)

(FOR PURPOSES OF CLARITY, THIS VIEW SHOWN WITHOUT CONVECTION SHELL)

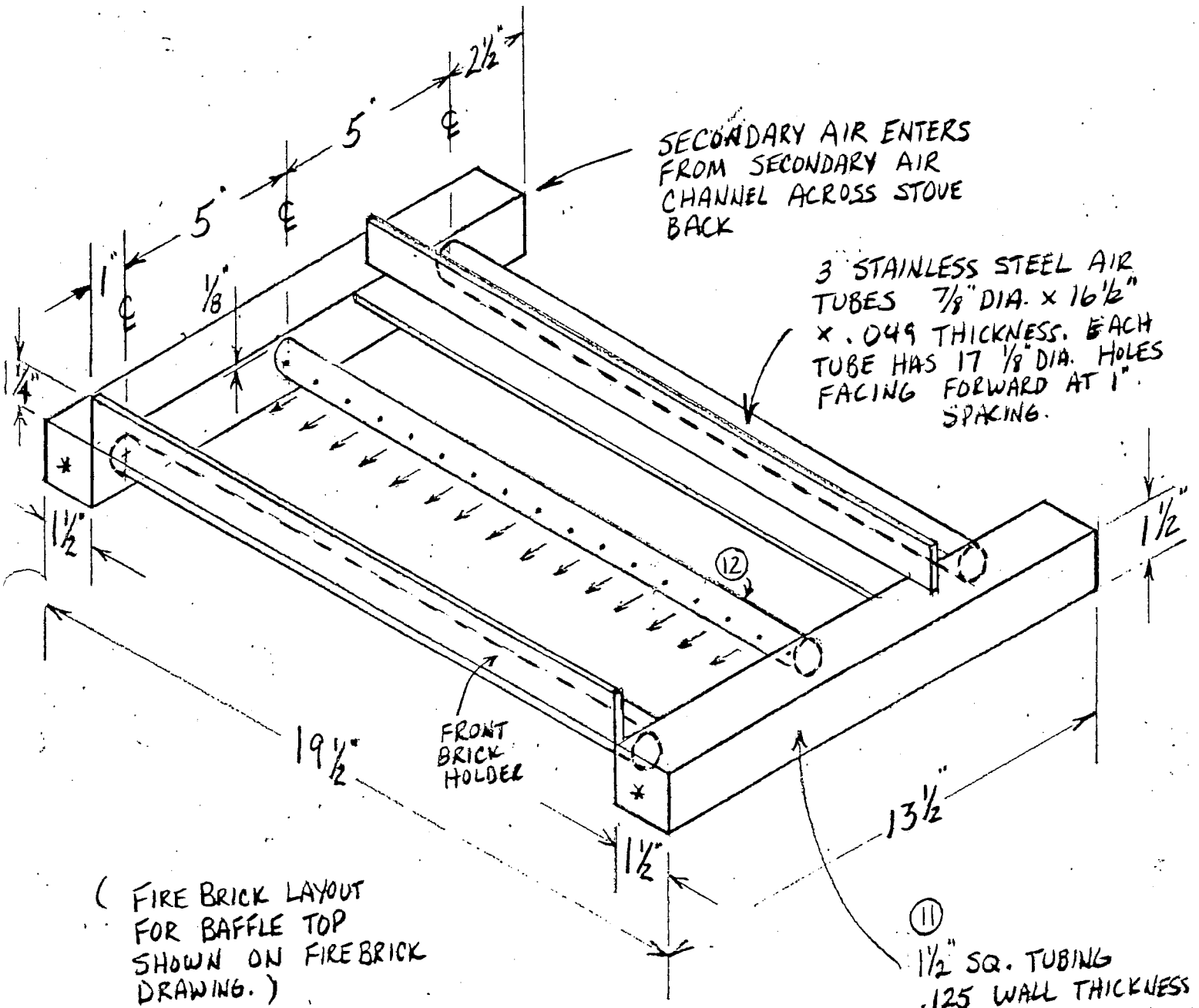
TITLE: KUMA SCOTT HT	DRAW. NO. 4 OF 9	DR. BY MF.
VIEW: FIREBOX CUTAWAY PRIMARY/SECONDARY AIR	DATE: 6-26-96	SCALE 1 CM = 1"



PRIMARY DRAFT SYSTEM OPENINGS (AREA)

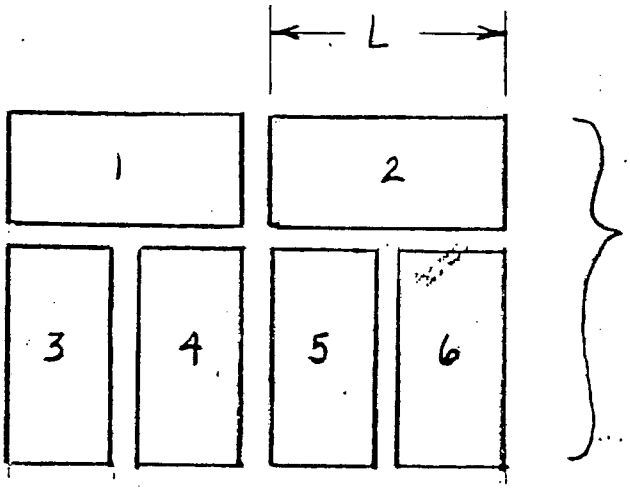
1. FROM PEDESTAL TO DRAFT BOX (1 1/8" x 5 1/2") = 6.188 sq. in.
2. DRAFT BOX AREA - (CLOSED POSITION) (3/16" x 2") = .374 sq. in.
3. DRAFT BOX AREA - (OPEN POSITION) (1 1/2" x 6") = 9 sq. in.
4. FROM DRAFT BOX TO AIR CHANNEL: (1 1/2" x 5 1/2") 6.188 sq. in.
5. DRAFT CHANNEL AREA (2" x 2 1/2" = 5 sq. in.)
6. TOP AIRWASH AREA: (7/16" x 15") = 6.56 sq. in.

TITLE: KUMA SCOTT HT	DRAW. NO. 5A OF 9	DR. BY M.F.
VIEW: PRIMARY DRAFT BOX DET.	DATE: 6/28/96	SCALE: 1/2" = 1"



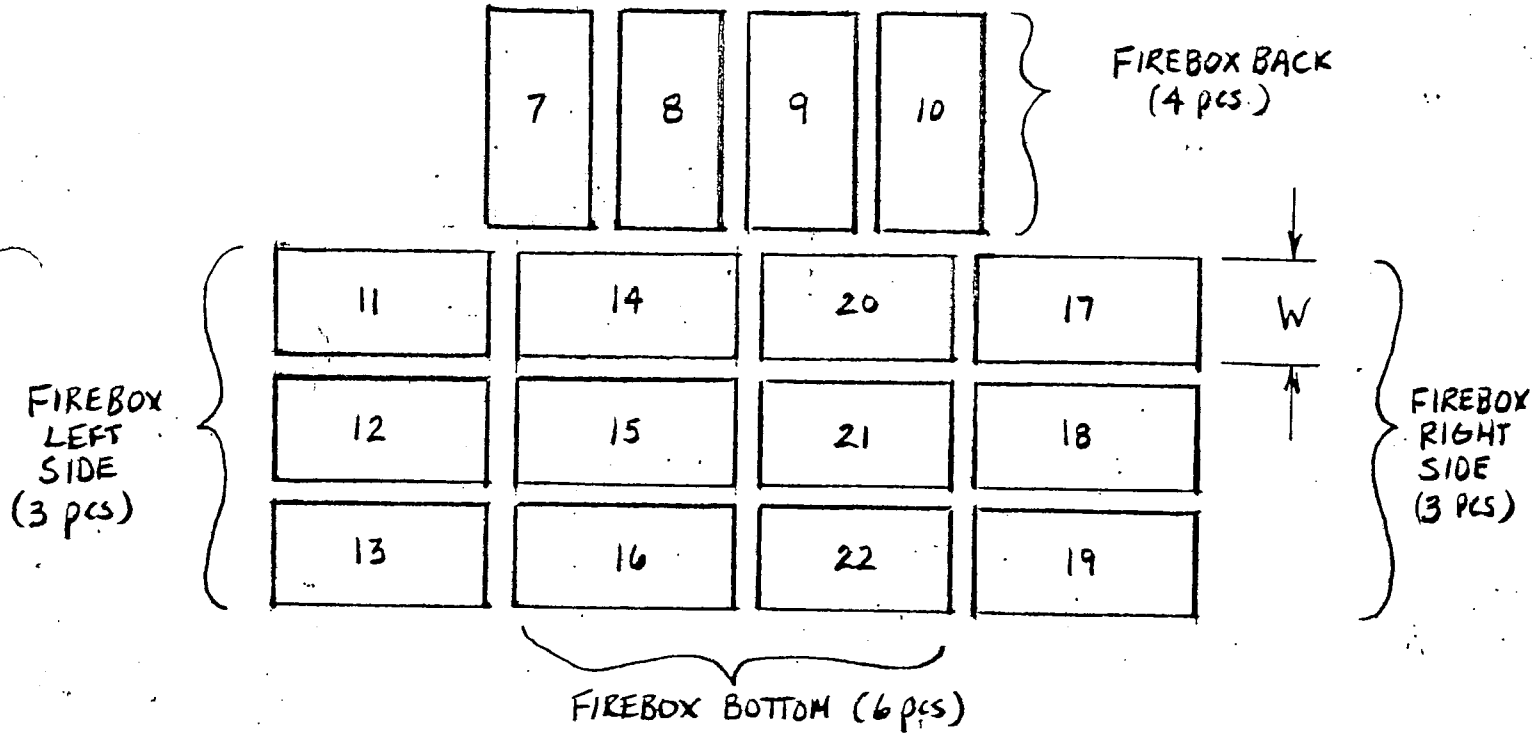
(FIRE BRICK LAYOUT FOR BAFFLE TOP SHOWN ON FIREBRICK DRAWING.)

TITLE: KUMA SCOTT HT	DRAW. NO. 5B of 9	DR. BY M.F.
VIEW: BAFFLE DETAIL	DATE: 7-5-96	SCALE: 1/4" = 1"



TOP VIEW OF BAFFLE FIRE BRICK LAYOUT (6 pcs.)

(23)



FIREBOX BACK (4 pcs.)

FIREBOX LEFT SIDE (3 pcs)

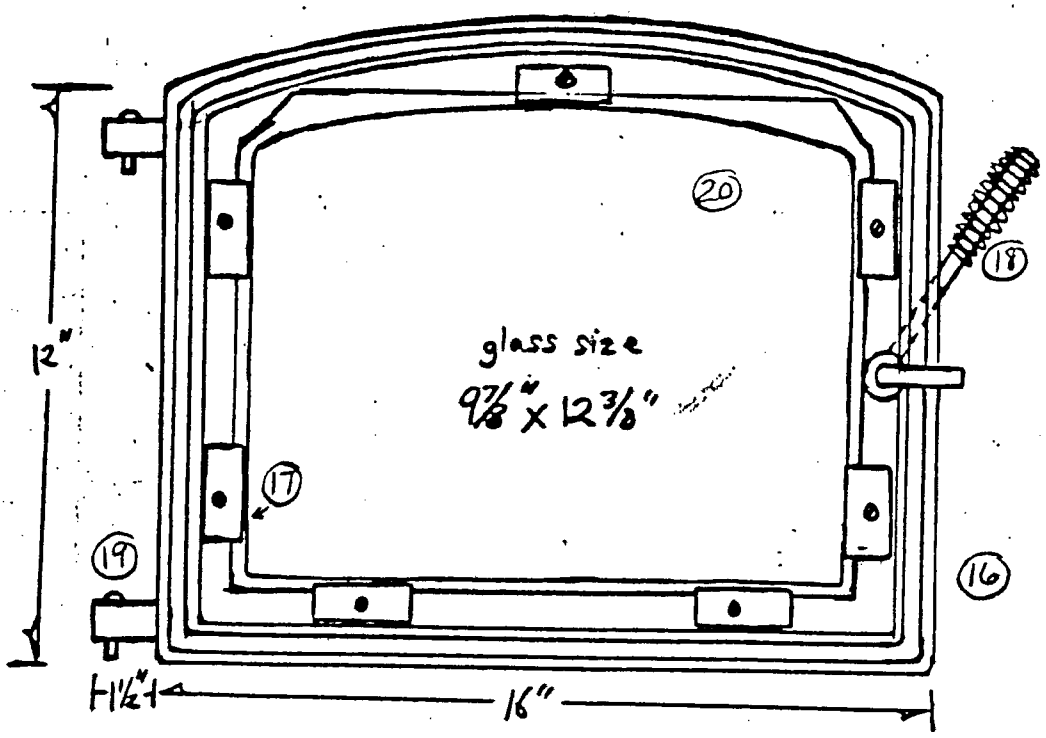
FIREBOX RIGHT SIDE (3 pcs)

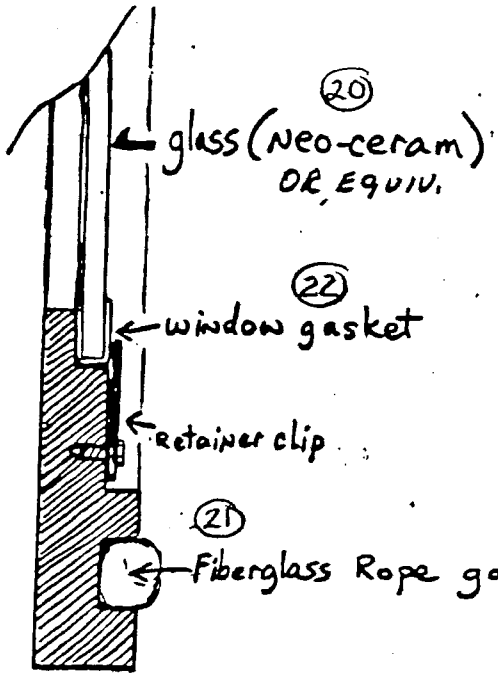
FIREBOX BOTTOM (6 pcs)

BRICK/LOCATION	L	W	THICKNESS
No. 1-19	9"	4½"	1¼"
No. 20-22	8"	4½"	1¼"

ALL REFRACTORY IS LOW-DUTY FIREBRICK MFG. BY MUTUAL MATERIALS. CO. INC., 81% FIRECLAY 19% SILICATED ALUMINA

TITLE: KUMA SCOTT HT	DRAW. NO. 6 of 9	DR. BY MF
VIEW: REFRACTORY DETAIL	DATE: 7-5-96	



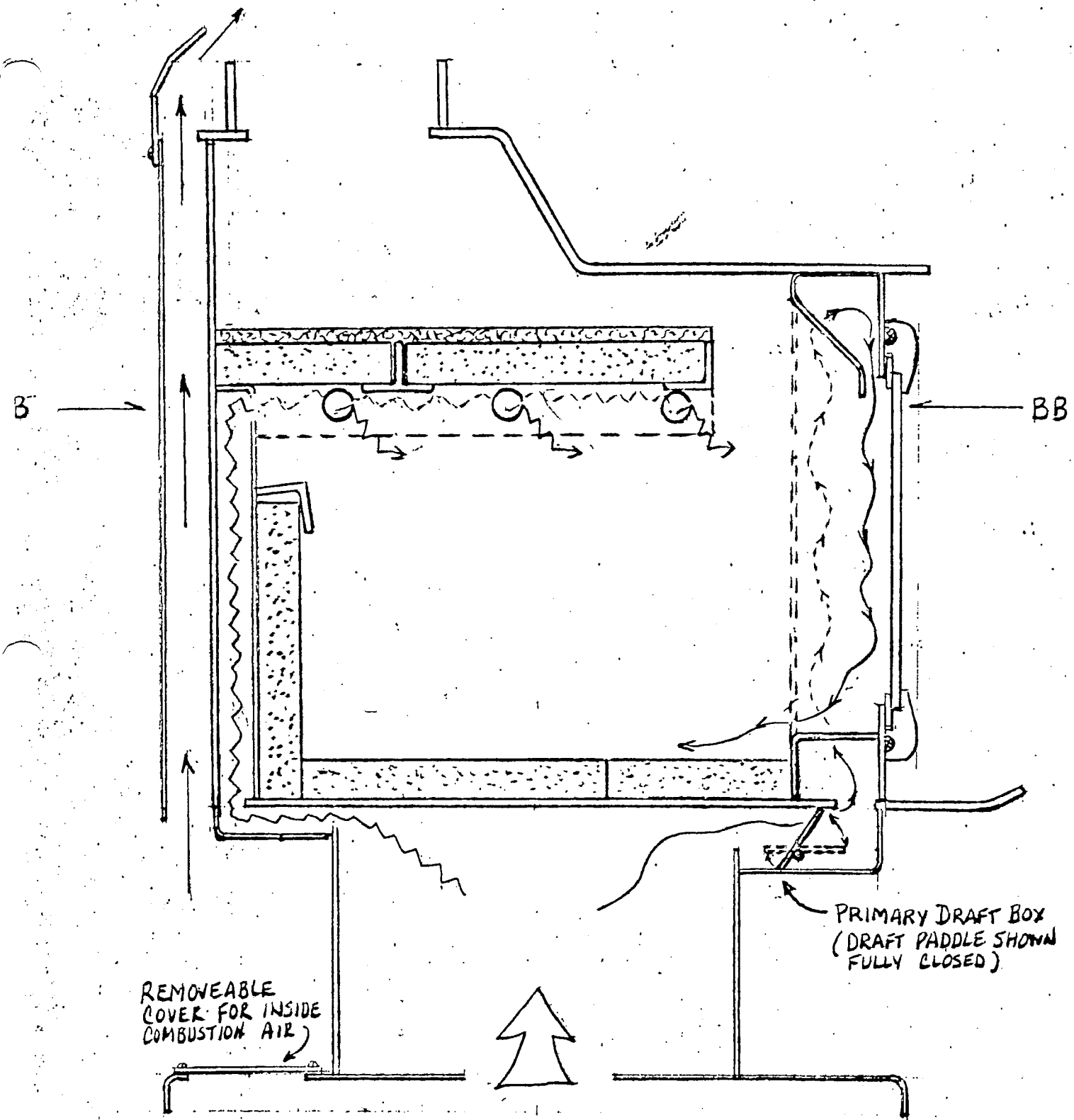


cutaway side view
(NOT to scale).

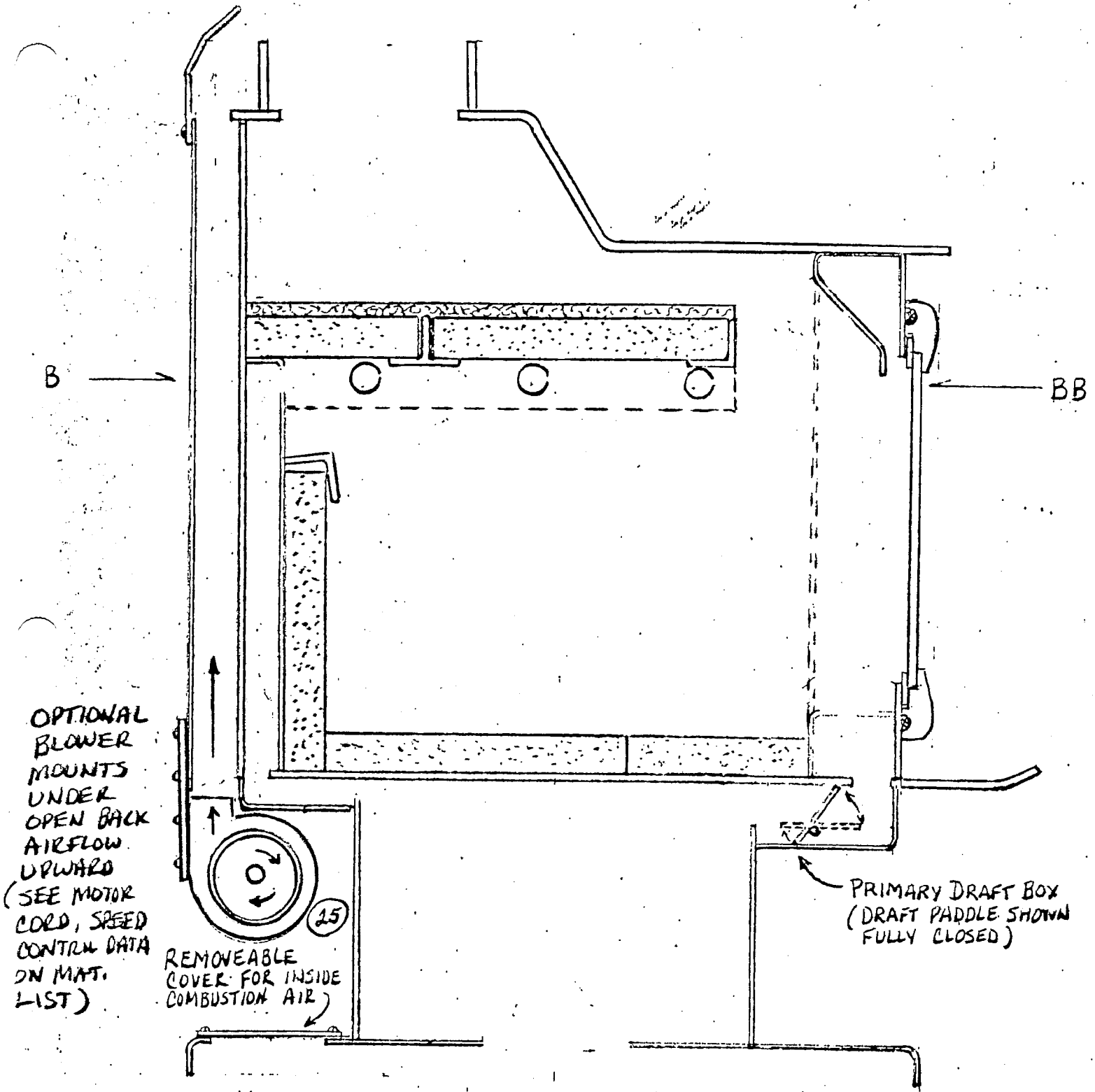
Note: The stove used for certification testing had a one piece glass retainer that went all the way around the glass except at the door handle.

ATMyrna
The screw locations were the same.

TITLE: KUMA SCOTT HT	DRAW. NO. 7 of 9	DR BY S.C.
VIEW: DOOR BACK / CUTAWAY	DATE: 7-5-96	SCALE 1/4" = 1"



TITLE: KUMA SCOTT HT	DRAW. NO. 8 OF 9	DR. BY M.F.
VIEW: SIDE CROSS-SECTION A-A COMBUSTION AIR PATTERNS	DATE: 6-20-96	SCALE: 1/4" = 1"



TITLE: KUMA SCOTT HT BLOWER LOCATION	DRAW. NO. 9 OF 9	DR. BY M.F.
VIEW: SIDE CROSS-SECTION A-A	DATE: 6-20-96	SCALE: 1/4" = 1"

PART #	DESCRIPTION	DIMENSION	# OF PARTS	MATERIALS OF CONSTRUCTION MFG, MODEL ETC.
1	FIREBOX ASSLY	19⅝ x 19⅝ x 19⅝	1	A-36 PLATE STEEL 3/16"
2	FIREBOX TOP	24" x 21⅜	1	A-36 PLATE STEEL 1/4"
3	FLUE COLLAR	2" x 6" I.D.	1	MILD STEEL 3/16"
4	PRIMARY DRAFT CHANNEL	2" x 2½"	3	MILD STEEL 10 ga.
5.	" " BOX	2" x 6" x 3⅝"	1	" " 12 ga.
6.	" " PADDLE	2" x 5 13/16"	1	" " 1/8"
7.	" " CONTROL	1/4" x 19"	1	1/4" C.R. ROUND
8.	" " AIRWASH	2½" x 3⅝" x 19½"	1	MILD STEEL 10 ga.
9.	SECONDARY DRAFT BOX	3⅝" x 3⅝" x 1"	1	" " 12 ga.
10.	" " CHANNEL	12¼" x 19½" x 1"	1	" " 10 ga.
11	" " MANIFOLDS	1½" x 1½" x 13½"	2	" " 1/8"
12.	" " TUBES	⅞" x 16½"	3	STAINLESS STEEL .049
13.	CONVECTION SHROUD	21¼" x 22½" x 21"	1	MILD STEEL 14 ga.
14.	PEDESTAL	12" x 12" x 8"	1	" " 12 ga.
15.	PEDESTAL BASE	22" x 22" x 1"	1	" " 10 ga.
16.	DOOR	13" x 16" x 1¼"	1	CAST IRON 14 lbs.
17.	DOOR CLIPS (GLASS)	1" x 3"	7	MILD STEEL 1/8"
18.	" HANDLE	½" x 7"	1	½" H.R. ROUND
19.	" PINS	⅜" x 1½"	2	STEEL RD. HD. RIVET
20.	GLASS	10" x 12⅜"	1	5MM NEO-CERAM
21.	DOOR GASKET	⅝" DIA. x 60"	1	WOVEN FIBERGLASS
22.	GLASS GASKET	¾" x ⅛" x 45"	1	WOVEN FIBERGLASS WINDOW CHAN.
23.	FIREBRICK	4½" x 9"	22	(SEE REFRACTORY DRAW. # 6
24.	BAFFLE BLANKET	14½" x 19⅝"	1	½" CERAMIC FIBER BLANKET
		MFG.- HI-TEMP		PRODUCTS 1400°-2300° CONT.
25.	BLOWER MOTOR	14" x 4" x 4½"	1	MFG. BY FASCO INDUSTRIES
		SHADED-POLE, 1.10 A, 115V.,		3200 R.P.M., 125 CFM MOD. A-125
26.	BLOWER POWER CORD	5/16" x 8'	1	DAYTON SJT TYPE 18/3 w/GRD.
27.	IN-LINE SPEED CONTROL	2½x3½x1½	1	WELLS TECH. MODEL ILS-3-ST, 3A.

TITLE: KUMA SCOTT HT	DRAW. NO.	DR. BY MF.
VIEW: PARTS/MATERIAL LIST	DATE: 7-5-96	

7/3/96

Kuma Scott HT
Operating Instructions

1. Primary Air Control Settings

   Category 2 ($\leq$ 1.0 Kg/hr) Stop - 1/8"

   Category 2 (> 1.0 $\leq$ 1.25 Kg/hr) Stop - 3/8"

   Category 3 (> 1.25 $\leq$ 1.9 Kg/hr) 1/4 - 1"

   Category 4 Maximum Wide Open

   Note: Measurements are from the stop and the movement is an arc. Measure at the top of the pointer.

   Option (This can also vary with each burn category): Leave the primary air control wide open for the full five minutes. Adjust to the run setting early if the burn rate appears to be too fast. Crack the door open to enhance or assist ignition if necessary.

2. Blower

   Category 2 and 3 - turn blower on High at 30 minutes

   Category 4 - turn blower on high at 5 minutes.

7-3-96

Statements of Affirmation
KUMA SCOTT HT

In direct relation to this application for certification of the Kuma model Scott HT, Kuma Stove and Iron Works affirms that:

1. Kuma Stove and Iron Works will conduct a Quality Assurance program (QA) on this model line.

2. Kuma Stove and Iron Works will notify the lab (Myron Consulting) that this model line has been certified within 30 days.

3. Kuma Stove and Iron Works will manufacture units pursuant to the certificate that will be similar in all material respects to the unit submitted for testing.

4. Kuma Stove and Iron Works will meet permanent and temporary labeling requirements.

5. Kuma Stove and Iron Works will execute record keeping and reporting according to requirements as set forth in Section 60.537.

6. Kuma Stove and Iron Works estimates annual production of this model line for the first two years: less than 2,500 per year.

7. Kuma Stove and Iron Works has entered into a contract agreement with Myron Consulting for Audit testing under the R.C.A. program.

KUMA STOVE AND IRON WORKS

MODEL: Scott HT Stove

INSTALLATION & OPERATING INSTRUCTIONS

— SAVE THESE INSTRUCTIONS —

THIS MANUAL DESCRIBES THE INSTALLATION AND OPERATION OF THE KUMA MODEL SCOTT HT WOOD HEATER. UNER SPECIFIC TEST CONDITIONS, THIS HEATER HAS BEEN SIIOWN TO MEED U.S. ENVIRONMENTAL PROTECTION AGENCIES EMISSION LIMITS FOR RESIDENTIAL WOOD HEATERS.

PLEASE READ THE FOLLOWING SAFETY PRECAUTIONS
AND THE ENTIRE INSTALLATION & OPERATING INSTRUCTIONS:

SAFETY PRECAUTIONS

1. If this stove is not properly installed, a house fire can occur. For your protection, follow the installation instructions provided. We recommend contacting local building or fire officials regarding restrictions and installation inspection requirements in your area.

2. **DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.**

3. Do not use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in this heater. Keep all such liquids well away from the heater while it is in use.

4. Do not burn garbage.

5. Do not overfire. The stove is in an overfire condition if any part of the stove glows. If this should happen, immediately close air damper.

6. **WARNING: DO NOT INSTALL IN SLEEPING ROOM.**

7. Caution: The structural integrity of a mobile home floor, wall, & ceiling/roof must be maintained.

8. Do not use single wall pipe for exterior chimney or mobile home applications.

9. When installing into an existing metal or masonry chimney, examine chimney system carefully. If you have any question, seek professional advice. **DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.**

10. Note all minimum clearances to combustibles. Installation must comply with minimum clearances as listed in this manual.

11. **INSTALL AND USE IN ACCORDANCE WITH THE MANUFACTURERS INSTALLATION AND OPERATING INSTRUCTIONS ONLY.**

12. Safety Notice: If this heater is not properly installed, a house fire may result. For your safety, follow the installation directions.

13. Do not operate stove with firing door in an open position.

CODES & APPROVALS—The Kuma model Scott IIT Stove is tested to UL, ULC, ICBO, HUD, and CSA standards, and listed with the Warnock Hersey International Test Lab (WHI).

MOBILE HOME INSTALLATION INSTRUCTIONS

Model: Kuma Scott HT

CAUTION: THE STRUCTURAL INTEGRITY OF A MOBILE HOME FLOOR, WALL, & CEILING/ROOF MUST BE MAINTAINED.

CAUTION: DO NOT INSTALL IN A SLEEPING ROOM.

BEFORE YOU START insure that there are no major obstructions. (i.e. floor joists, ceiling joists, electrical wires, heat ducts, plumbing, etc.)

Clearance—backwall 2 inches, corners 3 1/2 inches, sidewall 23 inches (using Class A Listed chimney and double wall connector). See figures 5 and 6. Consult your local building official and build your hearth pad to local building requirements.

Typical hearth pad (see Example: typical hearth pad on Page 3) - 18" to front of unit, 6" to sides.

Material required for installation—6-inch outside air duct with screen, roof mate to seal roof flashing, assorted nails and screws, 8-gauge ground wire, 3/8 lag bolts to fasten stove to the floor (length will depend upon hearth thickness).

Tools required—saber saw, screw drivers, measuring tape, pencil, plumb line, electric drill and assorted bits, tin shears, knife, pliers, hammer.

1. After locating possible obstructions (joist, pipes, etc.) and taking into account the necessary combustible clearances (fig. 2), position the stove in the intended installation position. Use a plumb line to locate the position of the ceiling hole for the chimney. Size the chimney hole to the recommended manufacturers clearances for your chimney, mark the hole.
2. Mark a pencil outline around the base of the stove. Move the stove out of the way.
3. Mark with a pencil the holes to be drilled to fasten the stove to the floor, then mark with a pencil a 6-inch hole for the fresh air intake. This hole may be positioned anywhere under the stove.
4. If ceiling and floor are clear of all obstructions, cut out the holes.
5. In case of attic space use a plumb line to locate the hole in the roof. Cut out the opening, keeping in mind the chimney manufacturers recommended clearances.
6. Install the outside air duct to the floor using screws or nails. Ensure that your air duct has a screen or mesh to keep out predators. Air duct must be 6 inches.
7. Install a hearth pad 18" in front of unit -6" back, 6" to sides according to local building codes or manufacturers specs (see applicable figure —corner of straight wall).
8. Position the stove on the hearth and lag bolt the stove to the floor. Ensure that your lag bolts fasten securely to the floor of the mobile home.
9. Ground your stove to the mobile home frame with a min. 8-gauge wire. See figure 2 wiring diagram.
10. Install the first section of listed chimney pipe to the stove by carefully pushing it down on the flue collar, making sure it seats. Place the trim collar black side down over the first section of chimney pipe at this time. Ref. fig. 2 for parts list.
11. Check all chimney pipe for damage. Do not use any damaged pipe. Installation procedures may vary from manufacturer to manufacturer of listed chimney. Install the rest of the chimney up through the hole in the ceiling and roof.
12. After the chimney is perpendicular, fasten the trim collar to the ceiling.
13. In cases where there is an attic space, install a protective joist shield tube or box. Consult local building officials or chimney manufacturer.
14. Install the roof flashing, sealing water tight. Install the storm collar and seal water tight. Install chimney cap. Note: refer to chimney manufacturers specs. Chimney height see fig. 7. Minimum for mobile home 9 1/2' above stove.
15. Call for final inspection.
16. INSTALL & USE IN ACCORDANCE WITH THE MANUFACTURES INSTALLATION AND OPERATING INSTRUCTIONS ONLY.
17. YOUR STOVE IS NOW READY FOR USE. REFER TO OPERATING INSTRUCTIONS.

RESIDENTIAL INSTALLATION INSTRUCTIONS

Model: Scott HT

CAUTION —Always read instructions manual carefully before beginning the installation.

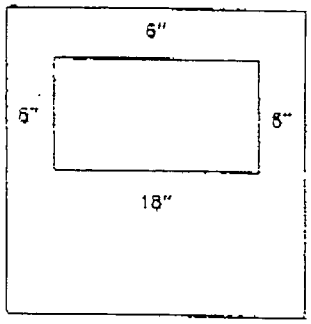
Check all listed factory built chimneys for concealed damage.

Exercise caution to insure that all necessary parts are installed correctly.

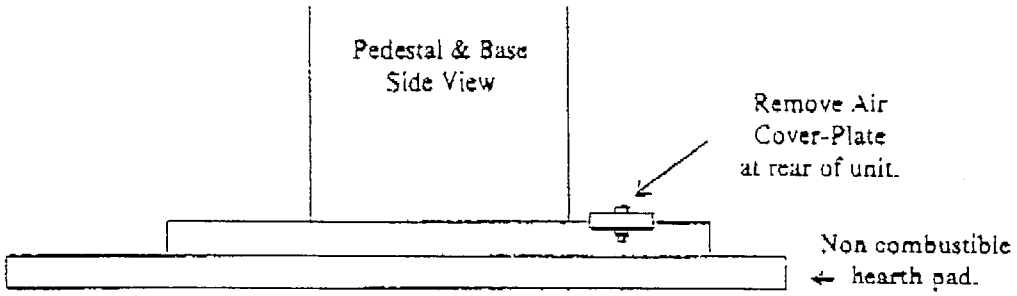
BEFORE YOU START insure that there are no major obstructions. (i.e. floor joists, ceiling joists, electrical wires, heat ducts, plumbing, etc.)

Clearance — backwall 2 inches, corners 3 1/2 inches, sidewall 21 inches. See figures 3 through 6. Consult your local building official and build your hearth pad to local building requirements.

Example: Typical hearth pad.



NOTE: For residential installation, in which outside air intake is not desired, remove cover-plate at rear of pedestal base by removing cover-plate before installing stove as shown below. In this application, hole through floor is not required.



INSTALLATION

1. After locating possible obstructions (joists, pipes, etc.) and taking into account the necessary combustible clearances (fig. 2), position the stove in the intended installation position. Use a plumb line to locate the position of the ceiling hole for the chimney. Size the chimney hole to the recommended manufacturers clearances for your chimney, mark the hole.
2. Mark a pencil outline around the base of the stove. Move the stove out of the way.
3. Mark with a pencil the holes to be drilled to fasten the stove to the floor, then mark with a pencil a 6-inch hole for the fresh air intake. This hole may be positioned anywhere under the stove, if fresh air is desired.
4. If ceiling and floor are clear of all obstructions, cut out the holes.
5. In case of attic space use a plumb line to locate the hole in the roof. Cut out the opening, keeping in mind the chimney manufacturers recommended clearances.
6. Install the outside air duct to the floor using screws or nails. Ensure that your air duct has a screen or mesh to keep out predators. Air duct must be 6 inches.
7. Install a hearth pad according to local building codes or manufacturers specs (see applicable figure).
8. Position the stove on the hearth and lag bolt the stove to the floor if desired.
9. Install the first section of listed chimney pipe to the stove by carefully pushing it down on the flue collar, making sure it seats. Place the trim collar black side down over the first section of chimney pipe at this time.
10. Check all chimney pipe for damage. Do not use any damaged pipe. Installation procedures may vary from manufacturer to manufacturer of listed chimney. Install the rest of the chimney up through the hole in the ceiling and roof.
11. After the chimney is perpendicular, fasten the trim collar to the ceiling.
12. In cases where there is an attic space, install a protective joist shield tube or box. Consult local building officials or chimney manufacturer.
13. Install the roof flashing, sealing water tight. Install the storm collar and seal water tight. Install chimney cap. Note: refer to chimney manufacturers specs. Chimney height see fig. 7.
14. Call for final inspection.
15. Read completely the Operating and Burning instructions.
16. Your stove is ready to burn.

WOOD BURNING OPERATING INSTRUCTIONS

Model: Scott HT

RECOMMENDATIONS ON BUILDING AND MAINTAINING A FIRE:

1. Open air control by rotating draft handle forward.
2. Start with tinder and small kindling. When starting a fire, stack wood in a "criss-cross" arrangement so as to allow the fuel plenty of air. Place smaller chunks of wood, on up to larger ones until desired fire size and heat level is achieved. Once the desired heat level in house is reached, rotating the air control handle back decreases the air to the firebox, and thus reduces heat produced. Use the following table as a general guideline for desired burn rates:

low burn	draft handle rotated back completely
med-low	draft handle full back to 1/4" forward
medium	draft handle 1/4" to 1/2" forward
med-high	draft handle 1/2" to 3/4" forward
high burn	draft handle rotated full forward

CAUTION: When building the first couple of fires be careful to build the fire small and increase heat slowly over 4-5 hour period. The paint on the stove "cures" with heat and needs to be done slowly. As the paint "cures" it gives off a smell of paint and even sometimes a visible "smoky" haze into the room. Make sure the area is well ventilated during the curing operation. The smell will disappear after a few hours of operation.

OPTIONAL BLOWER OPERATING INSTRUCTIONS: Install blower unit in back of stove as per instructions, and plug into nearest 115V grounded circuit. Turn the variable speed knob to 'click' onto high speed. As the knob is turned clock-wise, the blower speed decreases to your desired speed. The blower speed should match the desired burn rate on your stove: i.e., low burn rate-low blower speed; high blower rate-high blower speed and so forth.

DO NOT OPERATE THIS STOVE WITH THE DOOR OPEN. It may be necessary however to crack door during the first 5 or 10 minutes during the start-up stage. Contact your dealer if you have any questions or problems building or maintaining a fire.

CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START OR FRESHEN UP A FIRE. DO NOT BURN GARBAGE OF FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA, OR ENGINE OIL.

1. The unit is designed to burn wood only. Build the fire directly on the hearth. Do not use grates. Your stove will burn better with about one inch of ash in the bottom, but never let the ash build up to the level of the combustion air inlet. Your stove is a very efficient "airtight" heater and if you use high quality wood, there will be very little ash residue.
2. Use only the best grade of dry wood available. It takes a full year to properly dry your split wood, so plan ahead. Burning wet or green wood greatly increases the chance of creosote build-up and produces less heat much less efficiently. Store your fuel in a dry location and be sure to maintain clearances from wood supply to your stove.
3. Small hot fires produce less creosote than long low smoldering fires. When you start your stove, open the draft fully and once or twice each day repeat this high burn cycle to reduce any creosote build-up. Just after starting the fire some smoke may occur until the chimney warms up to produce some draft. During normal operation adjust the draft to the position required. If properly set, it will assure longest burn times and the most even heat cycle.
4. Make routine inspections of your flue systems at least once every two months to ensure clean, safe operation.
5. Ensure an adequate supply of outside combustion air is available. Failure to provide adequate combustion air is dangerous. Fifteen (15) square inches is recommended.

WOOD BURNING OPERATING INSTRUCTIONS
continued

CREOSOTE FORMATION AND NEED FOR REMOVAL

6. When wood is burned slowly, it produces tar and other organic vapors which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes and extremely hot fire. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

DISPOSAL OF ASHES

7. Ashes should be placed in a metal container with a tight-fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
8. Maintain door seals, etc., to ensure airtight fit. Operate only with the fire door closed. Open door only to fuel fire.
9. Resist the temptation to refuel too soon. Let the fire burn down to just glowing coals before you open the door. This will be the most efficient operation and there will be less smoking. Do not overfire.
10. Contact your local or provincial fire authority for information on how to handle a chimney fire.
11. For further information on using your heater safely, obtain a copy of the National Fire Protection Association publication: "Using Coal and Wood Stoves Safely." NFPA No. HS-8-1974. The address of NFPA is: 470 Atlantic Ave., Boston, Ma. 02210.

GLASS DOOR

1. Never clean hot glass.
2. Clean with an approved cleaner. Never use an abrasive.
3. Excessive mechanical stress will crack or break the glass. Should breakage occur see your dealer or carefully remove retainer clip screws to release glass. Dispose of broken glass in a safe place. Replace glass only with 5mm neoceram available from your dealer. Always replace the gasket with a glass replacement. Check glass after heater has been fired to ensure a tight seal. Tighten clip just enough to provide the air tight seal. Uneven pressure from over tightened screws will break the ceramic (glass). See Figure 1.
4. Never build the fire up against the glass and ensure the glass wash secondary air draft slot is open.
5. When closing door, do not allow logs to protrude against glass.

A WORD ABOUT DRAFT

The principle of draft is that warm air rises. Your chimney provides draft which sucks the smoke up the chimney. The stove does not "push" out the smoke. Your Scott HT Stove has been designed and approved for use under normal conditions. Unacceptable smoking usually indicates poor draft in your chimney system. CHECK THAT YOU HAVE PROVIDED FOR ADEQUATE OUTSIDE AIR FOR COMBUSTION.

PROBABLE CAUSE FOR SMOKING ARE:

1. Insufficient chimney height above nearby obstructions.
2. Clogged or obstructed chimney system.
3. Downdrafts caused by nearby trees, hills, building, etc.

Figure 1

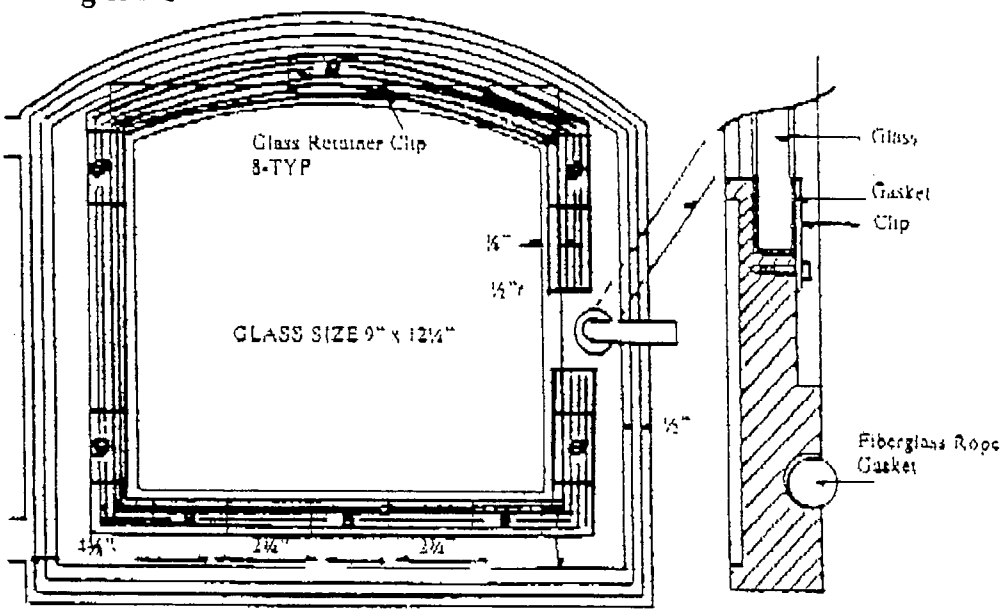
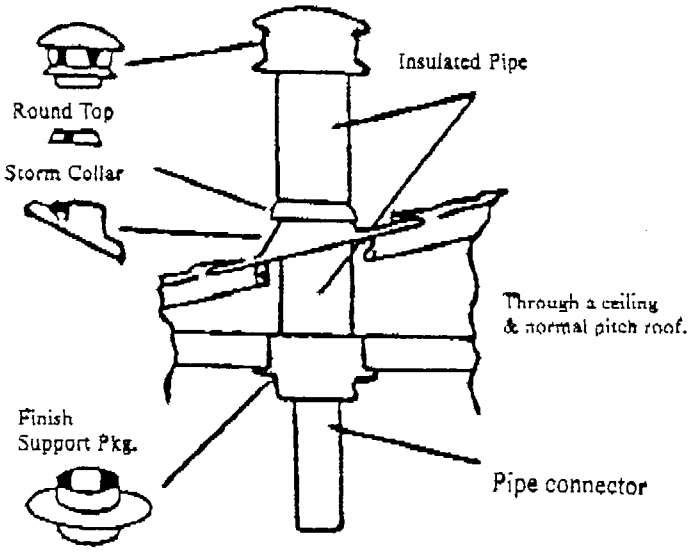
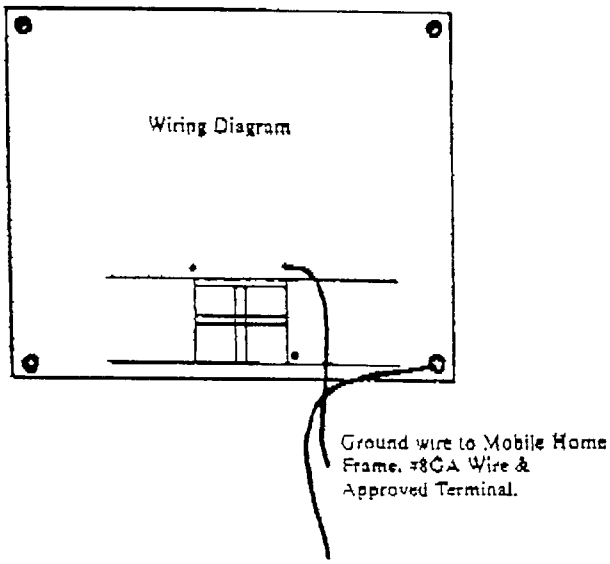


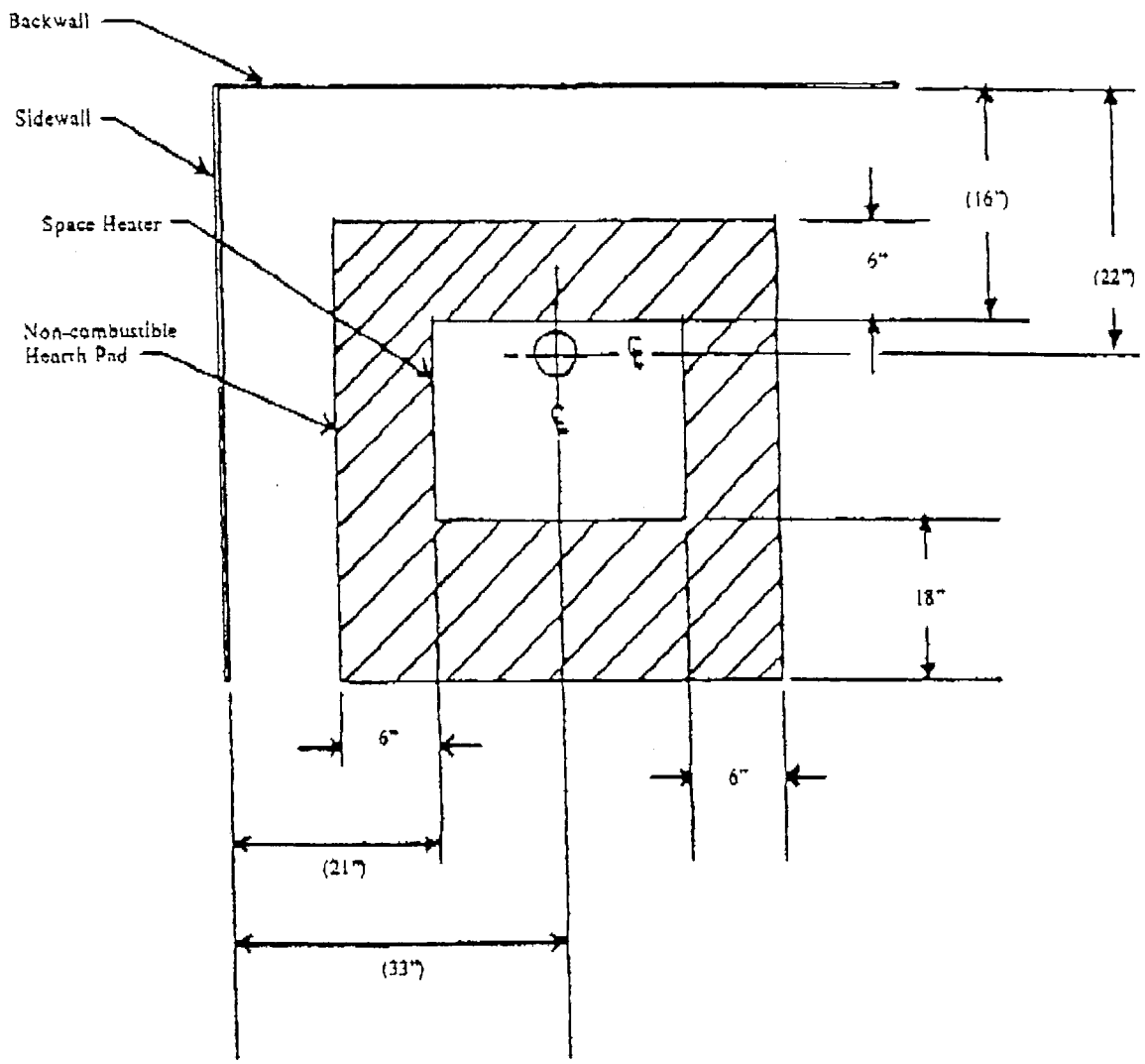
Figure 2





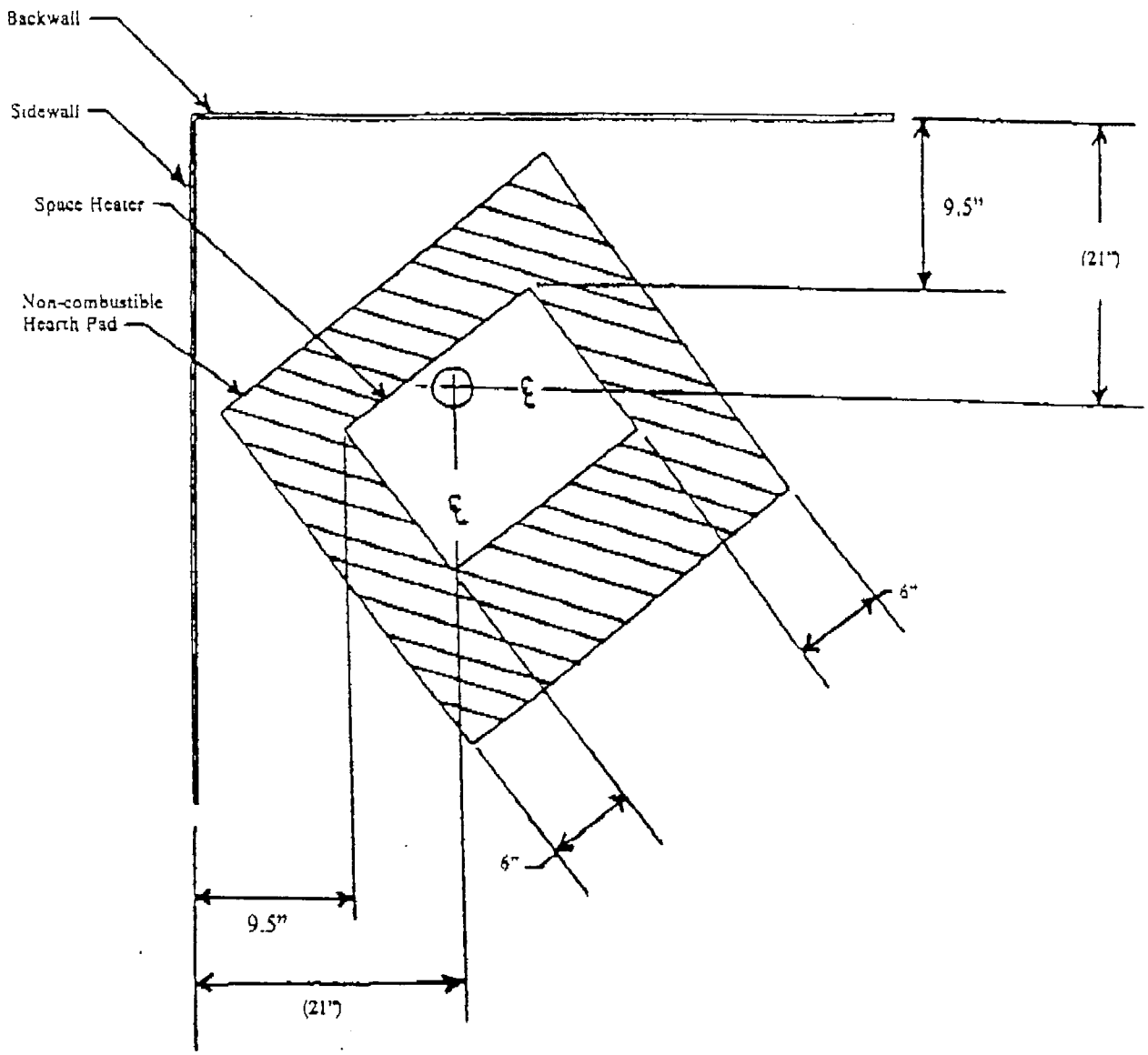
Use only 6" diameter Listed chimney system parts that have been tested and found to be compliant with all applicable U.L. standards. Clearances to combustibles must be maintained as per manufacturers instructions on chimney pipe, and stove pipe connectors. Use only double-wall connector in mobile home applications.

Figure 3



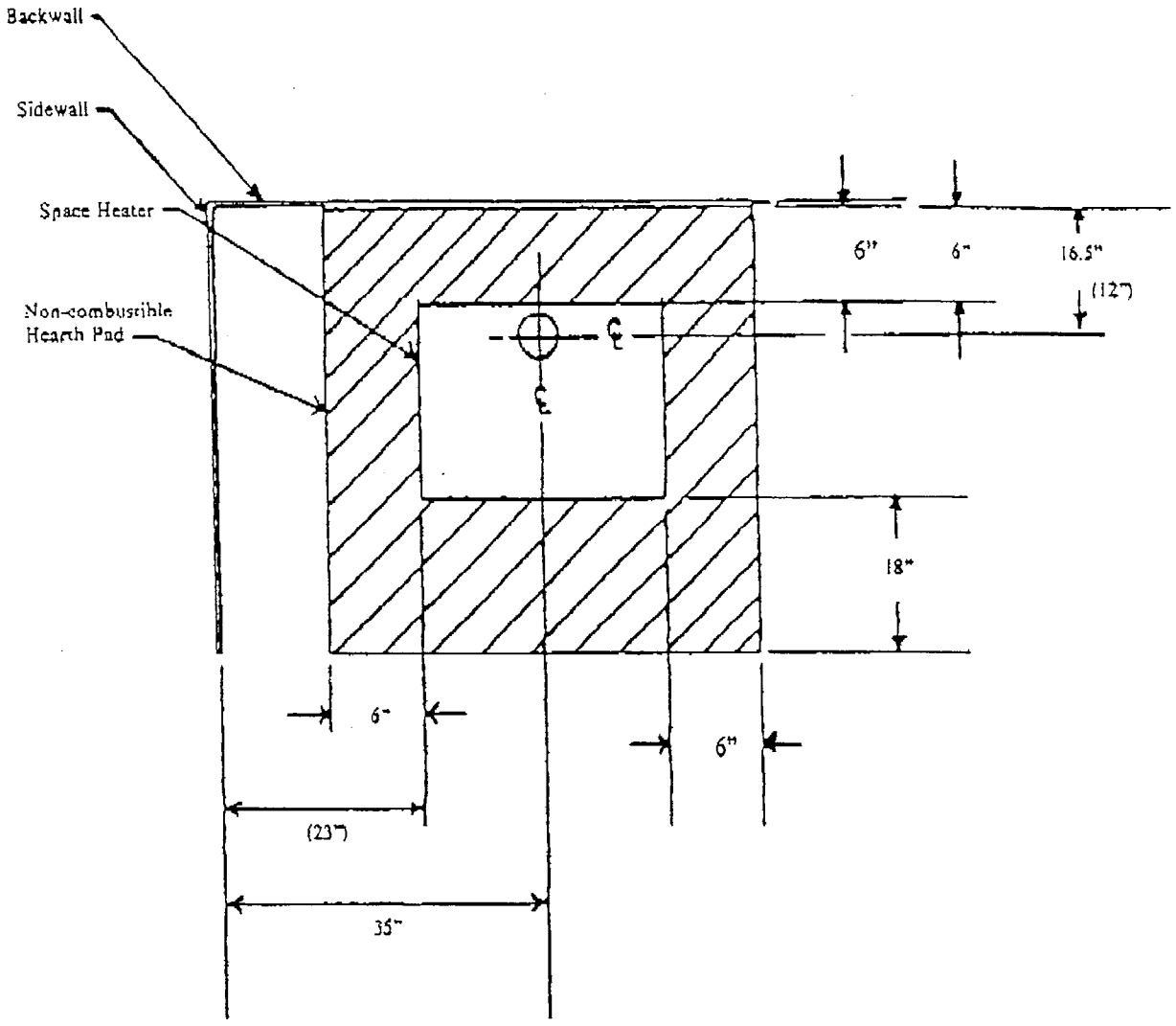
MINIMUM CLEARANCES TO COMBUSTIBLES — STRAIGHT WALL
CLASS C SINGLE WALL CHIMNEY CONNECTOR

Figure 4



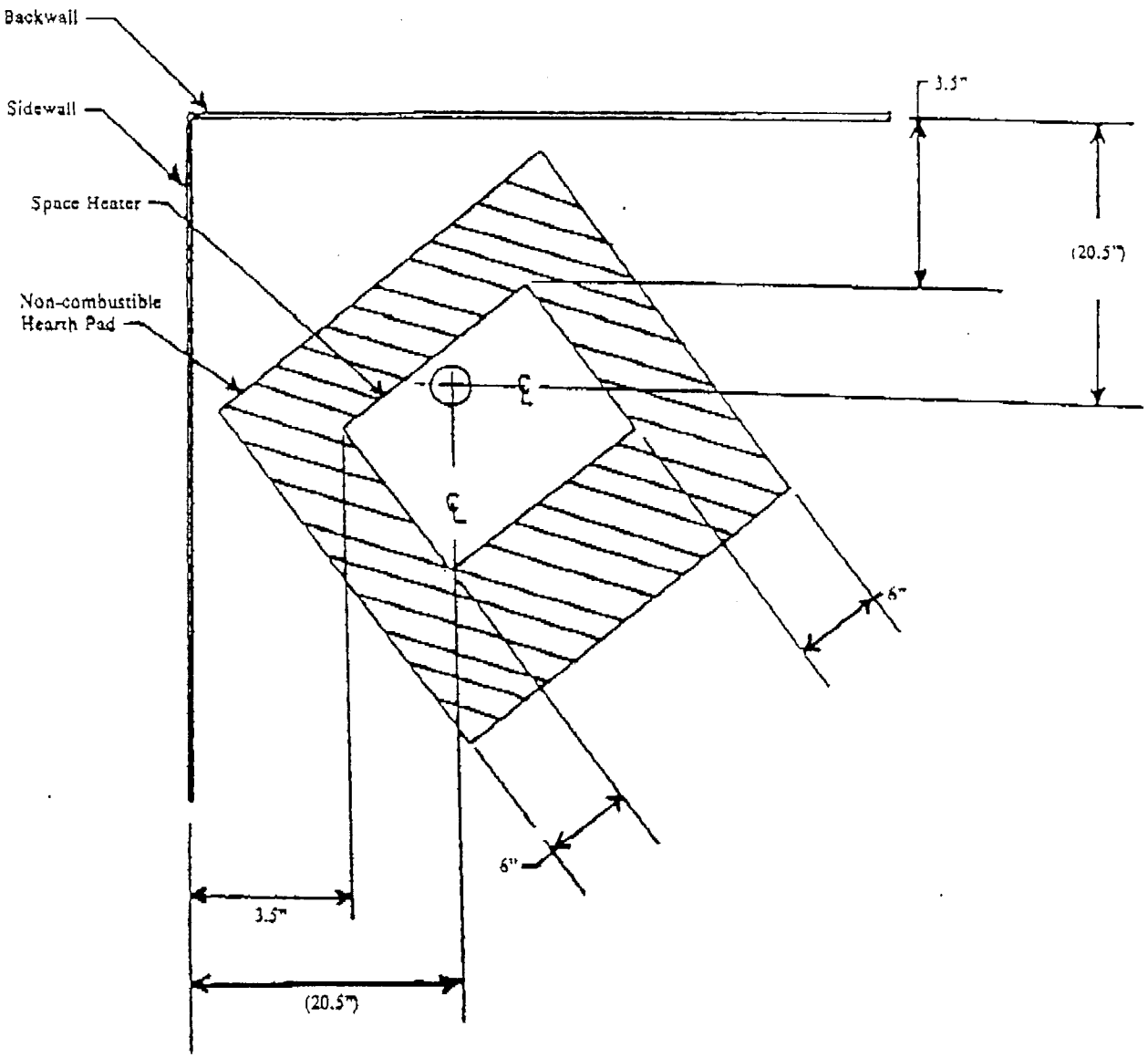
MINIMUM CLEARANCES TO COMBUSTIBLES — CORNER
CLASS C SINGLE WALL CHIMNEY CONNECTOR

Figure 5



MINIMUM CLEARANCES TO COMBUSTIBLE — STRAIGHT WALL
CLASS A LISTED CHIMNEYS USING APPROVED DOUBLE-WALL CONNECTOR

Figure 6

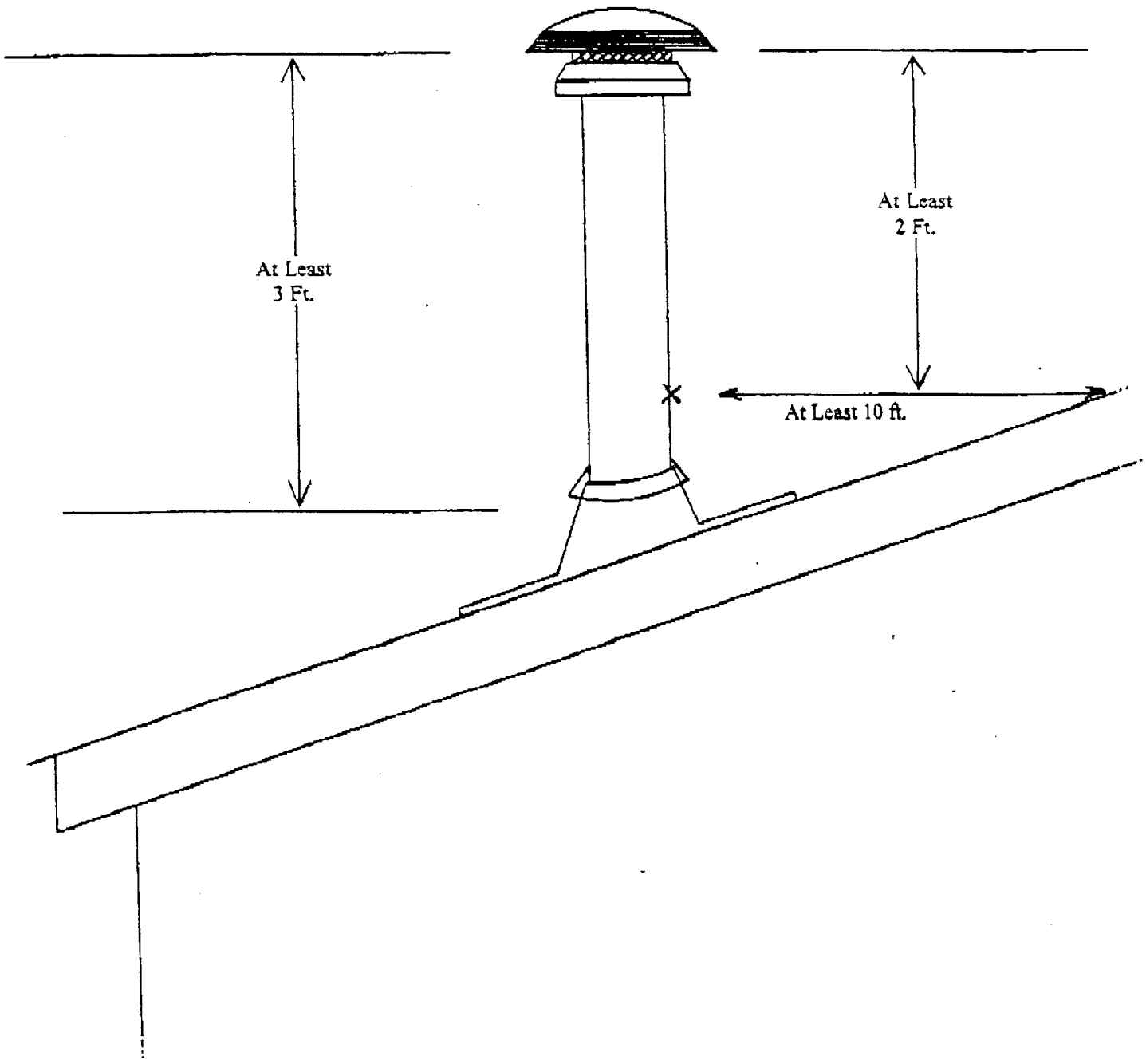


MINIMUM CLEARANCES TO COMBUSTIBLES - CORNER
CLASS A LISTED CHIMNEYS USING APPROVED DOUBLE-WALL CONNECTOR

HEIGHT REQUIREMENTS

A chimney must be the required height above the roof or other obstruction for safety and for proper draft operation. The requirement is that the chimney must be at least 3 feet higher than the highest point where it passes through the roof and at least 2 feet higher than the highest part of the roof or structure that is within 10 feet of the chimney, measured horizontally (FIGURE 7).

Figure 7



WOODSTOVE DATA SHEET #30
STOVE STORAGE

The Kuma Scott HT-1 Noncatalytic Woodstove tested by Myren Consulting is being held in custody by Kuma Stove and Iron Works and is being stored at:

Kuma Stove and Iron Works
450 Old Highway 95
Rathdrum, Id 83858

Contact Person
Mark Freeman

Phone
(208) 762-8002

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 some internal dimension or component, the banding is immediately replaced after the work on the unit has been completed.

The unit is identified by having the unit's certification tracking name written on a tag, label or piece of tape which is attached to the unit.

B. Permanent storage after certification has been granted.

The following measures have been taken to seal the unit against tampering: several lengths of steel banding have been placed around the stove in a manner which prevents the door from being opened. At least two (2) of these lengths cross at 90° angles. At each 90° crossing point on the top of the stove, a Myren Consulting address label has been placed over the crossing point and the label is then taped to the stove with 2" clear packing tape. The stove is then loaded onto a pallet and strapped to the pallet with several lengths of metal banding. A shipping carton (box) is then placed over the stove and attached to the pallet with staples and/or nails. The name of the unit is written on a Myren Consulting address label which is affixed to the outside of the box.

C. The stored unit is identified as follows:

The Myren Consulting address label(s) on top of the stove has (have) the name of the stove written on them. The box has warning labels affixed to the sides and top of the box which clearly identify the stove 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 warning label follows on the next page.)

D. The unit was returned to the manufacturer via manufacturer's and lab's pickup trucks

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.

WST5-Form11

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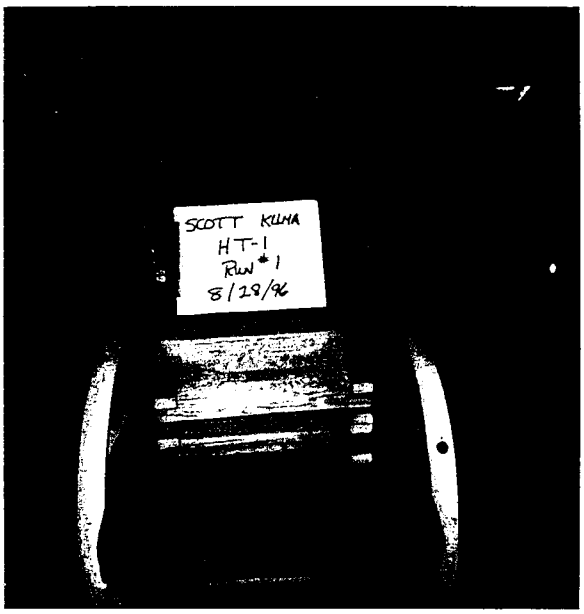
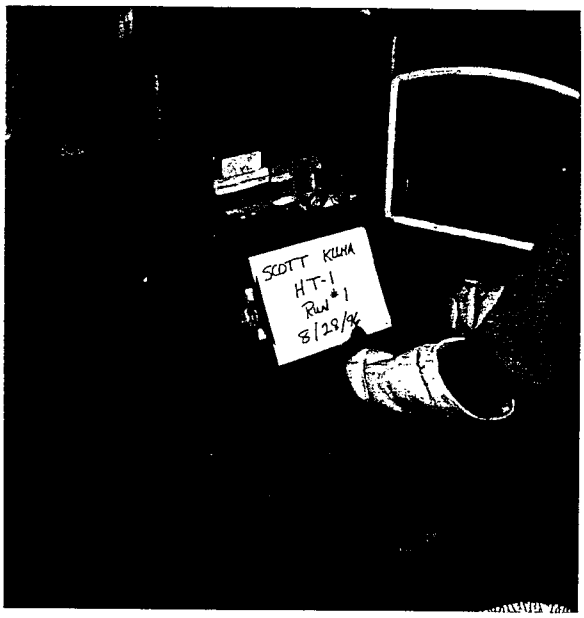

SCOTT KUHA
HT-1
RUN # 1
8/29/96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HT-1
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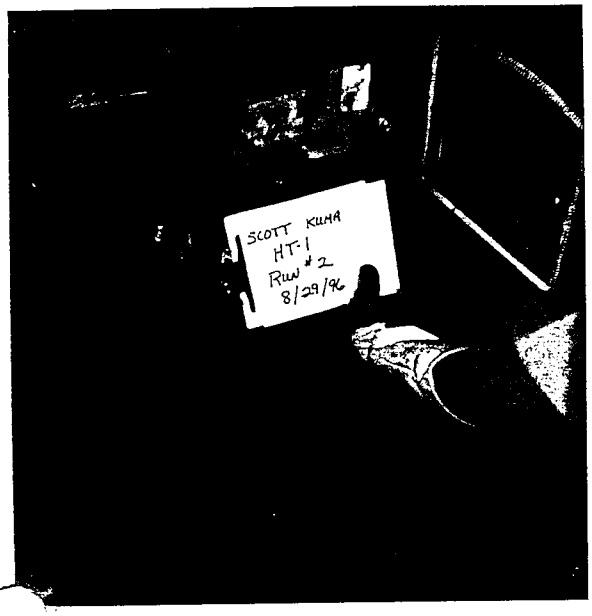
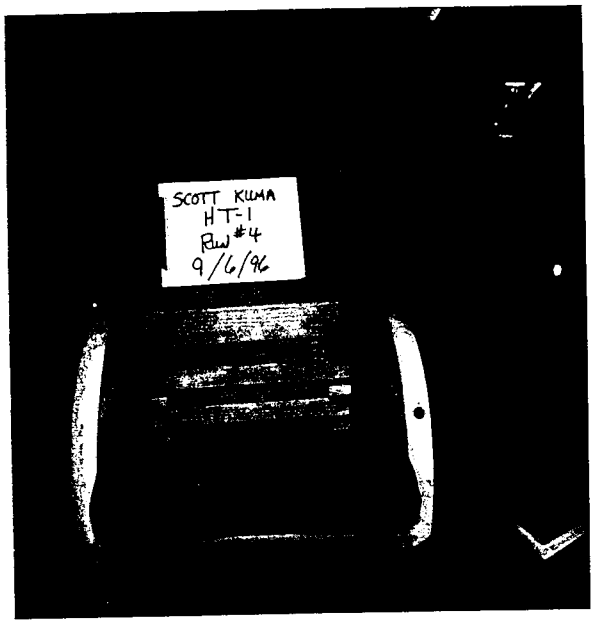
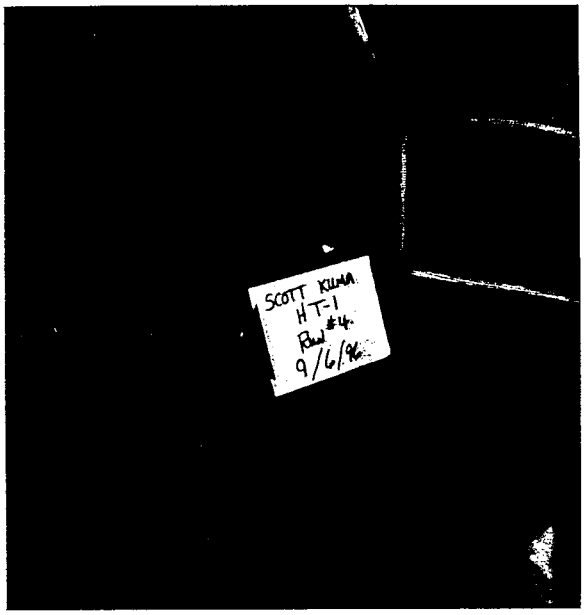

SCOTT KUHA
HT-1
RUN # 2
8/29/96


SCOTT KUHA
HT-1
RUN # 2
8/29/96


SCOTT KUMA
HT-1
Run #4
9/6/96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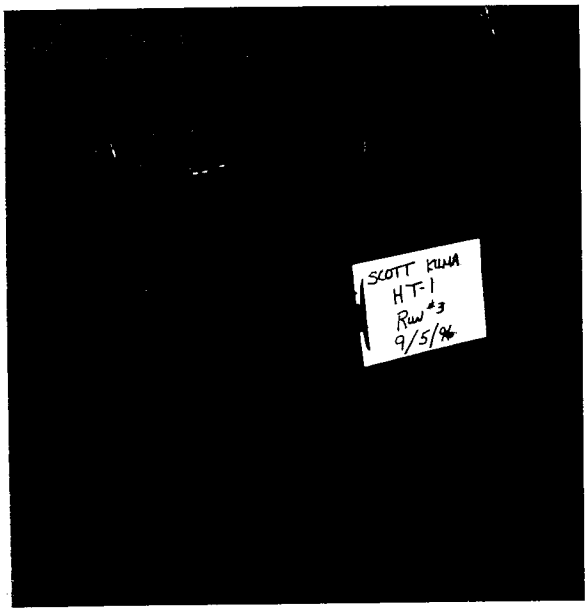
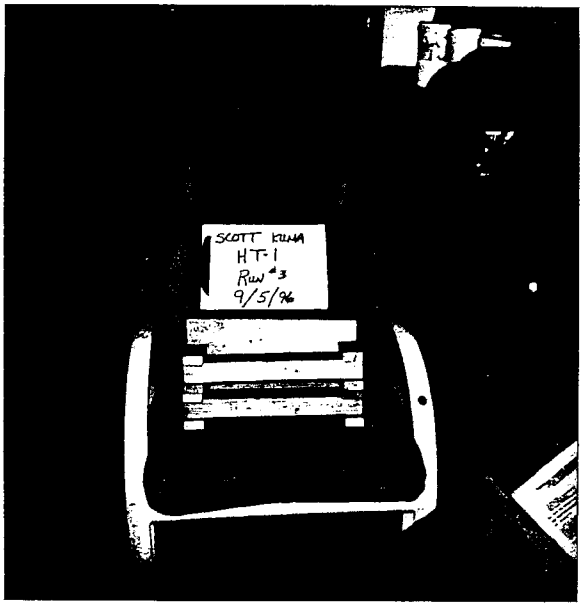
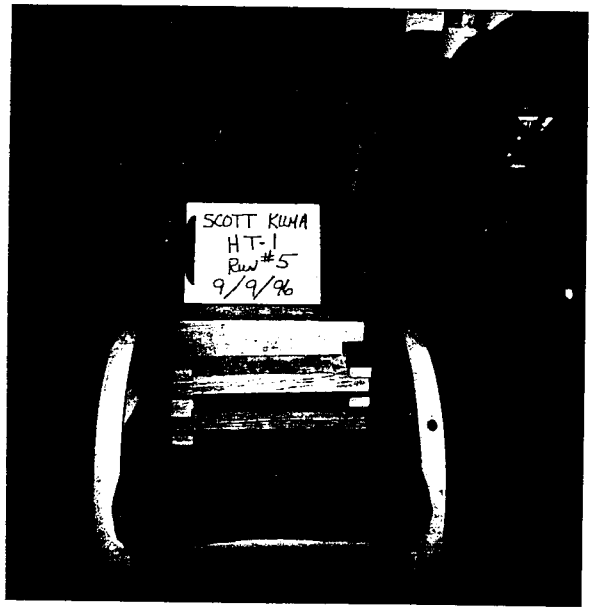
HT-1
Run #4
9/6/96


SCOTT KUMA
HT-1
Run #3
9/5/96


SCOTT KUMA
HT-1
Run #3
9/5/96


SCOTT KUHA
HT-1
Run #5
9/9/96


SCOTT KUHA
HT-1
Run #5
9/9/96