



**ENERGY AND ENVIRONMENTAL
MEASUREMENT
CORPORATION**

(406) 252-4450 ■ 1744 Mallowney Lane ■ Billings, MT 59101

United States
Environmental Protection Agency
Woodheater Certification Test Report

Country Stoves, Inc.
Country C-60A
Noncatalytic Freestanding Woodstove

S 310

REPORT BY:

A.T. MYREN

G.E. WADINGTON

CONFIDENTIAL

RELEASED ONLY BY
AUTHORIZED PERSONNEL

PROJECT NO. W-181

DATE 2/19/91

EEMC/KENT
1315 S. Central Avenue, Unit C
Kent Washington 98032
(206) 859-8318

EEMC/TUCSON
3925 Placita de la Escarpa
Tucson, Arizona 85715
(602) ~~298-2557~~
290-8965

* * * * *

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

	<u>Section(s)</u>	<u>Page(s)</u>
Introduction		
Title Page	Introduction	i
Confidentiality Statement		ii
Table of Contents		iii
Field Observation Checklist		v
Report Certification		vi
Test Report (Data) Page Number Index		vii
Individual Test Run Page Number Index		x
Statement of Confidentiality		xi
Test Series Information and Discussion		xii
Summary and Discussion of Results		
Weighted Average Calc Sheets	Data Summary	1-3
Cap Graph		4
Data Summary		5-7
Stove/Cat Aging Data	Aging	vari
Individual Test Runs (Raw Data)		
See Introduction, Individual Test Run	<0.8 kg/Hr	vari
Page Index for a complete, sequential list	0.8-1.25 kg/Hr	vari
of the data and data sequence in the	1.26-1.90 kg/Hr	vari
individual test runs	>1.90 kg/Hr	vari
Calibration Data	Cal Data	vari
See Test Report (Data) Page Number Index,		
Item 14, for a complete, sequential listing		
of the data in this section.		
Stove QC		
Wood Heater Description/Stove QC	Stove QC	1-2
Useable Firebox Volume Dimensions and Calculations		3
Primary Air Inlet Dimensions and Settings		5
Secondary Air Inlet Dimensions and Settings		5
Blueprints		
Promotional (Sales) Brochure	Blueprints	vari
Laboratory verified blueprints		vari
Manual		
Manufacturer's Written Test Instructions	Manual	1-2
Manufacturer's Operators Manual		vari
Storage		
Storage Location	Storage	1
Sealing Information		1

Photos

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

Photos

vari

Appendicies:

A - Example Calculations

B - Installation Description and Operating Instructions

Field Observation Checklist

Unit Name: Country C-60A Noncatalytic Freestanding Woodstove

Manufacturer Name: Country Stoves, Inc.

Manufacturer Address: P.O. Box 987

1411 R Street NW

Auburn, WA 98071

Manufacturer Phone: 206) 931-1271 Fax: 206) 931-1271

Observers & Affiliation: Dick Olsen

EEMC's Field Team

Supervisor: Ben Myren

Other Members: Bill Nowak

Ron Schenck

Chip Wadington

Test Location: Unit C, 1315 S. Central Ave., Kent, WA 98032

Phone: (206) 859-8318

Test Site Elevation: 42 Feet

EEMC
1744 Mullowney Lane
Billings, MT 59101
(406) 252-4450

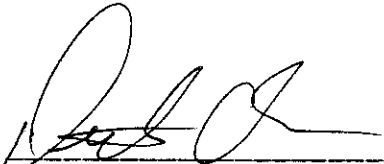
IMA
P.O. Box 5106
Missoula, MT 59806
(406) 543-6174

EEMC
3925 Placita de la Escarpa
Tucson, AZ 85715
(602) 290-8965

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

STATEMENT OF CONFIDENTIALITY

As a condition of being allowed to visit the woodstove testing facility and/or observe a woodstove test(s) at Energy and Environmental Measurement Corporation (EEMC), Unit C, 1315 S. Central Ave., Kent, WA 98032, I hereby agree not to release or divulge any information about the design engineering principals used at EEMC, testing facility, testing personnel or 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 EEMC or InterMountain Ambient (IMA).

SIGNED: 
Name

SIGNED: _____
Name

Prod MGR
Title

Title

Country Stoves
Affiliation

Affiliation

1-23-91
Date

Date

REPORT CERTIFICATION

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

Date 2/11/91

Signature Alben T. Myren 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 3/26/91

Signature Ed Wadington

PAGE NUMBER INDEX

	Section	Location
1. Summary Table of Burn Rate and Emission Rate Results	Data Summary	Weight Avg Calc Sheet, pp.1-4
2. Summary Table of Other Data	Data Summary	Data Summary Sheets, pp 5-7
3. Wood Heater Description	Stove QC	Wood Heater Description, p.1 (vari)
4. Manufacturer's Testing Wood Heater Instructions	Operators Manual	P.1 of Section
5. Test Chamber Installation Description	Installation Description	P. 1
6. Wood Heater/Catalyst Aging Documentation	Stove/Cat Aging	
7. Wood Heater Dimensions and Useable Firebox Volume	Stove QC	
8. Pretest Burn Procedures	Individual Test Runs	Data Sheets #9,9A,9A-1,9A-2,13
9. Pretest Facility Measurements	Individual Test Runs	Data Sheets #8,16
10. Test Fuel Measurements		
A. Load Wt.	Individual Test Runs	Data Sheet #8
B. Load Moisture	Individual Test Runs	Data Sheet #10
C. Wood Density	Individual Test Runs	Data Sheet #11
11. Test Fuel Crib Description		
A. Photographs	Photographs	
B. Wood Type and Line Drawing	Individual Test Run	Data Sheet #9A,9A-1, or 9A-2
12. Test Run Heater Operation and Air Supply Settings	Individual Test Run	Data Sheets #9,9A,9A-1,9A-2,13
13. Detailed Description of Sampling Systems and Locations		
A. Method 5H	Installation Description	P.2
B. Proportional Gas Flow Rate System	Installation Description	P.3
C. Stack Gas Flow Rate Measurement System	Installation Description	P.4
14. Calibrations		
A. Platform Scale		P. 1
1. Initial		P. 2
2. Semi Annual	Individual Test Run	Data Sheet #16
3. Pre and Post Test		

B. Analytical Balance			
1. Initial	Cal Data		P. 3
2. Semi Annual	Cal Data		P. 4
3. Pre/Post Weighing Check	Individual Test Run		Data Sheet #4
C. Temperature			
1. Thermocouples	Cal Data		P.5
2. Thermocouple Readout			
a. Semi annual	Cal Data		P. 6
b. Daily Check	Individual Test Run		Data Sheet #16
3. Dry Gas Meter	Cal Data		P. 7
4. Tracer Gas Injection Thermometer	Cal Data		P. 8
D. Anemometer			
1. Initial	Cal Data		P. 9
2. Semi Annual	Cal Data		P. 10
E. Barometer	Cal Data		P. 11
F. Draft Gauge	Cal Data		P. 12
G. Humidity Gauge Calibration (Sling Psychrometer)	Cal Data		P. 13
H. Dry Gas Meter			
1. Initial	Cal Data		P. 14
2. Semi Annual	Cal Data		P. 15
3. Post Certification Test	Cal Data		P. 16
4. Transfer Standard Calibration	Cal Data		P. 17
5. Wet Test Meter Calibration	Cal Data		P. 18
I. Tracer Gas Rotameter	Cal Data		P. 19
J. Combustion Gas (CO ₂ , O ₂ , CO) Train Response Check	Cal Data		P. 20
K. Tracer Gas (SO ₂) Train Response Check	Cal Data		P. 21
L. CO Analyzer			
1. Calibration	Cal Data		P. 22
2. Zero/Span Control Chart	Cal Data		P. 23
3. Pre and Post Test Zero/Span	Individual Test Run		Data Sheet #15-3
M. CO ₂ Analyzer			
1. Calibration	Cal Data		P. 24
2. Zero/Span Control Chart	Cal Data		P. 25
3. Pre and Post Test Zero/Span	Individual Test Run		Data Sheet #15-1
N. O ₂ Analyzer (Optional)			
1. Calibration	Cal Data		P. 26
2. Zero/Span Control Chart	Cal Data		P. 27
3. Pre and Post Test Zero/Span	Individual Test Run		Data Sheet #15-2
O. SO ₂ Analyzer			
1. Calibration	Cal Data		P. 28
2. Zero/Span Control Chart	Cal Data		P. 29
3. Pre and Post Test Zero/Span	Individual Test Run		Data Sheet #15-4
P. Calibration Gas Certificates of Analysis			
1. The Pre and Post Test Zero/Span Audits	Individual Test Runs		Data Sheets #15-1,15-2,15-3,15-4

2. Method 3 Verification of Analysis (CO ₂ , O ₂ , CO, N ₂)	Cal Data	P. 30-31
3. Method 6 Verification of Analysis (SO ₂ , N ₂)	Cal Data	P. vari
15. Quality Checks		
A. Leak Checks		
1. Particulate Sampling Train	Individual Test Runs	P. 1 of Data Sheet #2
2. SO ₂ Injection System	Individual Test Runs	Data Sheet #16
3. Combustion Gas (CO ₂ , O ₂ , CO) (CEM) Train	Individual Test Runs	Data Sheet #16
4. Tracer Gas (SO ₂) Train	Individual Test Runs	Data Sheet #16
B. Proportional Checks	Individual Test Runs	Table 5
		Computer Printout
16. Sample Calculations		
A. Weighted Average Emission Rate	Data Summary	Weighted Average Calc Sheets, pp.1-3
B. Dry Burn Rate	Individual Test Runs	Data Sheet #8
C. $[V_m] - [V_m(\text{std})]$	Individual Test Runs	Data Sheet #7 (Particulate Calc Sheet)
D. Total Gas Flow Rate (QSD)	Individual Test Runs	Table 4
E. Proportionality Rate (PR)	Individual Test Runs	Computer Printout
F. Particulate Emission Rate	Individual Test Runs	Table 5 Computer Printout
		Table 4 Computer Printout
17. Raw Test Data	Individual Test Runs	Data Sheets 1 - 16
18. Analytical Data		
A. Filter and Beaker Tares	Individual Test Runs	Data Sheets #4-1, 4-2
B. Solvent Blanks	Individual Test Runs	Data Sheet #4-3, 5-3
C. Particulate Catches		
1. Gross	Individual Test Runs	Data Sheets #5-1, 5-2
2. Blanks	Individual Test Runs	Data Sheets #5-3
3. Net	Individual Test Runs	Data Sheet #6
4. Gr/dscf	Individual Test Runs	Data Sheet #7
D. Constant Weight Weighings	Individual Test Runs	Data Sheet #4-3

MSH INDIVIDUAL TEST RUN PAGE INDEX
The Data Sheets in the Individual Test Runs
Are Organized in the Following Sequence

A. Computer Printouts

- Table 1 Field Data - Sampling Interval Data
- Table 2 Field Data
- Table 3 Field Data Averages
- Table 4 Calculations
- Table 5 Proportional Rate Variation

B. Raw Data Sheets

	No. of Pages
Data Sheet #1 Computer Input Data	1
Data Sheet #2 Meterbox Data Sheets	variable
Data Sheet #3 Moisture Catch Sheet	1
Data Sheet #4 Scale Sheets	
#4-1 Initial Filter Weights	variable
#4-2 Initial Beaker Weights	variable
#4-3 Constant Weights	variable
#4-4 Scale QA Checks	variable
Data Sheet #5 Particulate Catch Processing Sheet	
#5-1 Front Half Catch	1
#5-2 Back Half Catch	1
#5-3 Blank Catch	1
Data Sheet #6 Net Particulate Catch Calc Sheet	1
Data Sheet #7 Particulate Calc Sheet	1
Data Sheet #8 Miscellaneous Test Data	1
Data Sheet #9 Stove Operating Data	1
Data Sheet #9A Stove Operating Data	variable
Data Sheet #10 Fuel Moisture	1
Data Sheet #11 Wood Density	1
Data Sheet #12 Burn Rate and Flue Gas Data	variable
Data Sheet #13 Pre Burn Data	variable
Data Sheet #14 Temperature Data	variable
Data Sheet #15 Pre and Post Test Zero/Span Audits	
#15-1 CO ₂	1
#15-2 O ₂	1
#15-3 CO	1
#15-4 SO ₂	1
Data Sheet #16 Quality Checks	1

Test Series Information and Discussion

Unit: Country T-Top C-60A Noncatalytic Freestanding Woodstove

Model#: T-Top C-60A

Manufacturer: Country Stoves

Date Received: 1/21/91 Date(s) Aged: 1/21/91

Sampling Methods Used: M28, M5H Number of Test Runs: 5

The Country C-60A Noncatalytic Woodstove manufactured by Country Stoves, Inc. of Auburn, WA was tested by Energy and Environmental Measurement Corporation (EEMC) and InterMountain Ambient (IMA) using the United States Environmental Protection Agency's (EPA) Methods 28, "Certification and Auditing of Wood Heaters" and 5H, "Determination of Particulate Emissions from Wood Heaters from a Stack 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) emissions data, if present, were calculated as specified in the Wood Heater New Source Performance Standard (NSPS).

If computed and reported, the Oregon Overall Efficiency (%OE) for each run was calculated using the computer program supplied by the State of Oregon's Department of Environmental Quality's (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 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 and (2) copies of the certification tests notifications and cancellations sent to EPA and (3) a copy of a letter from EPA.

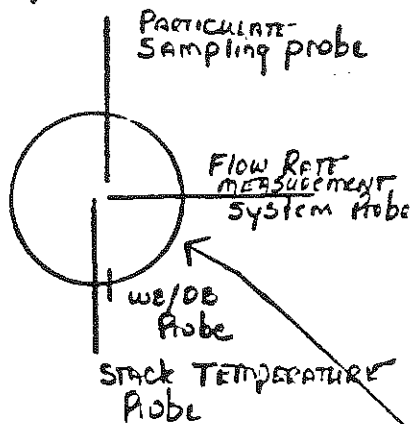
The following table summarizes the certification test notifications and cancellations sent to EPA for the C-60A

<u>Test Period</u>	<u>Notification Date</u>	<u>Cancellation Date</u>	<u>Testing Activity</u>
1/2-6/91	11/30/90	1/3/91	CNS
1/7-13/91	11/30/90	1/9/91	CNS
1/14-20/91	11/30/90	1/16/91	CNS
1/21-27/91	11/29/90	-----	Tested, 3 Runs
1/28-2/3/91	11/29/90	-----	Tested, 2 Runs
2/4-10/91	11/29/90	1/31/91	CTP
2/11-17/91	11/29/90	2/8/91	CTP
2/18-24/91	11/29/90	2/8/91	CTP
2/25-3/3/91	11/29/90	2/11/91	CTP
3/4-10/91	1/3/91	2/11/91	CTP

Also please note that an earlier unit scheduled by Country, the C-60, was in reality the C-65A, the fireplace insert version. Country had hoped to obtain a reciprocal certification for the freestanding unit based upon the test results for the fireplace insert model, the C-65A. However, upon learning that EPA would not allow a reciprocal certification of a freestanding unit based upon the test results for a fireplace insert, Country scheduled the freestanding unit, the C-60A, for certification testing. This is the test report for that unit.

Stack Ht. 14.933
15.0 ± 1 ft. (MAB, 4.1.1)

Top View
Detail



SO₂ Sampling Probe Ht 13.50'
13.5 ft. ± 0.5 ft (MSH, 5.1.5.2)

STACK MEASUREMENTS AND
SAMPLING PORT LOCATIONS

STEEL Flue Pipe Ht 8.91'
8.5 ± 0.5 ft (MAB, 4.1.1)

SO₂ INJECTION Probe Ht 9.23'
9.5 ft ± 0.5 ft (MSH, 5.1.5.1)

Particulate Sampling Probe
Ht. 8.19' 8.0 ± 0.5 ft (MSH, 5.1.2)

WET BULB/Dry Bulb Probe Ht 8.55'
(No specifications given)

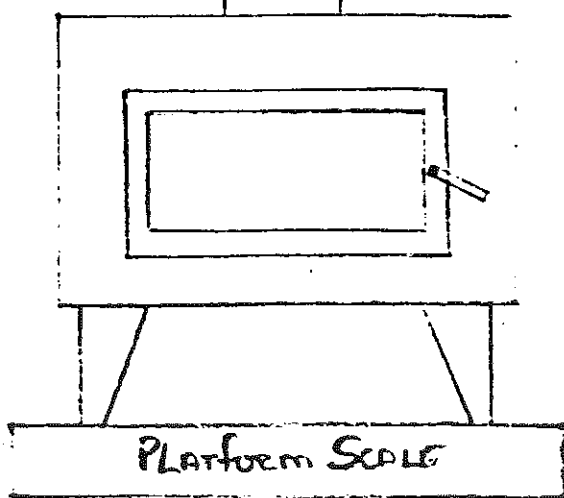
Stack Temperature Probe Ht. 8.56'
8.5 ± 0.5 ft (DEQ, 3.2.1)

FLOW RATE MEASUREMENT SYSTEM Prol
Ht. 8.19' 7.5 ± 1.0 ft (MSH, 5.1.6)

CUTAWAY DETAIL ON
Barometric Oil SEAL

Static Pressure Probe Ht 10 1/4"
< 1.0 ft above flue connector (MAB, 6.2.3)

Stack Ht at the flue collar 36 1/8"



Unit Country C-60A

Date 1/25/91

Technicians A.T.M./C.W.

EPA Weighted Averages Calculations

EPA Weighted Average Particulate Emission

The weighted average particulate emission rate (\overline{PM}) for the
Country C-60 A Freestanding Noncatalytic Woodstove manufactured
by Country Stoves, Inc. of Auburn, WA is 3.2 g/hr.

EPA Weighted Average Overall Efficiency

The weighted average overall efficiency (\overline{OE}) for the _____
Country C-60 A _____ is (default) 63 %.

II. EPA Test Results

*Denotes runs used in weighted average calculations

<u>Run#</u>	<u>Dry Burn Rate/kg/hr</u>	<u>Train #1 Grams/Hour</u>	<u>Train #2 Grams/Hour</u>
<u>*1</u>	<u>0.947</u>	<u>3.905</u>	<u>-----</u>
<u>*2</u>	<u>1.231</u>	<u>3.593</u>	<u>-----</u>
<u>*4</u>	<u>1.531</u>	<u>2.466</u>	<u>-----</u>
<u>*3</u>	<u>2.901</u>	<u>1.950</u>	<u>-----</u>
<u>5</u>	<u>1.168</u>	<u>1.575</u>	<u>-----</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Run 5= Fan Confirmation Test

III. EPA Cumulative Probability Calculations

	Act. Dry	Low Dry		Low Prob. =	P_n
P_w	$\frac{[0.328 - 0.300]}{.05}$	$\frac{[0.947 - 0.900]}{.05}$	+	$\frac{0.300}{.05}$	$= 0.3263$
P_1	$\frac{[0.572 - 0.550]}{.05}$	$\frac{[1.231 - 1.200]}{.05}$	+	$\frac{0.550}{.05}$	$= 0.5636$
P_2	$\frac{[0.779 - 0.750]}{.05}$	$\frac{[1.531 - 1.500]}{.05}$	+	$\frac{0.750}{.05}$	$= 0.7680$
P_3	$\frac{[0.984 - 0.982]}{.05}$	$\frac{[2.901 - 2.900]}{.05}$	+	$\frac{0.982}{.05}$	$= 0.9820$
P_4	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_5	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_6	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_7	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_8	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_9	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_{10}	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_{11}	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_{12}	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_{13}	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$
P_{14}	$\frac{[- -]}{.05}$	$\frac{[- -]}{.05}$	+	$\frac{ - }{.05}$	$= -$

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

And

$$\overline{OE} = \frac{K_1 OE_1 + K_2 OE_2 + K_3 OE_3 + \dots + K_n OE_n}{K_1 + K_2 + K_3 + \dots + K_n}$$

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

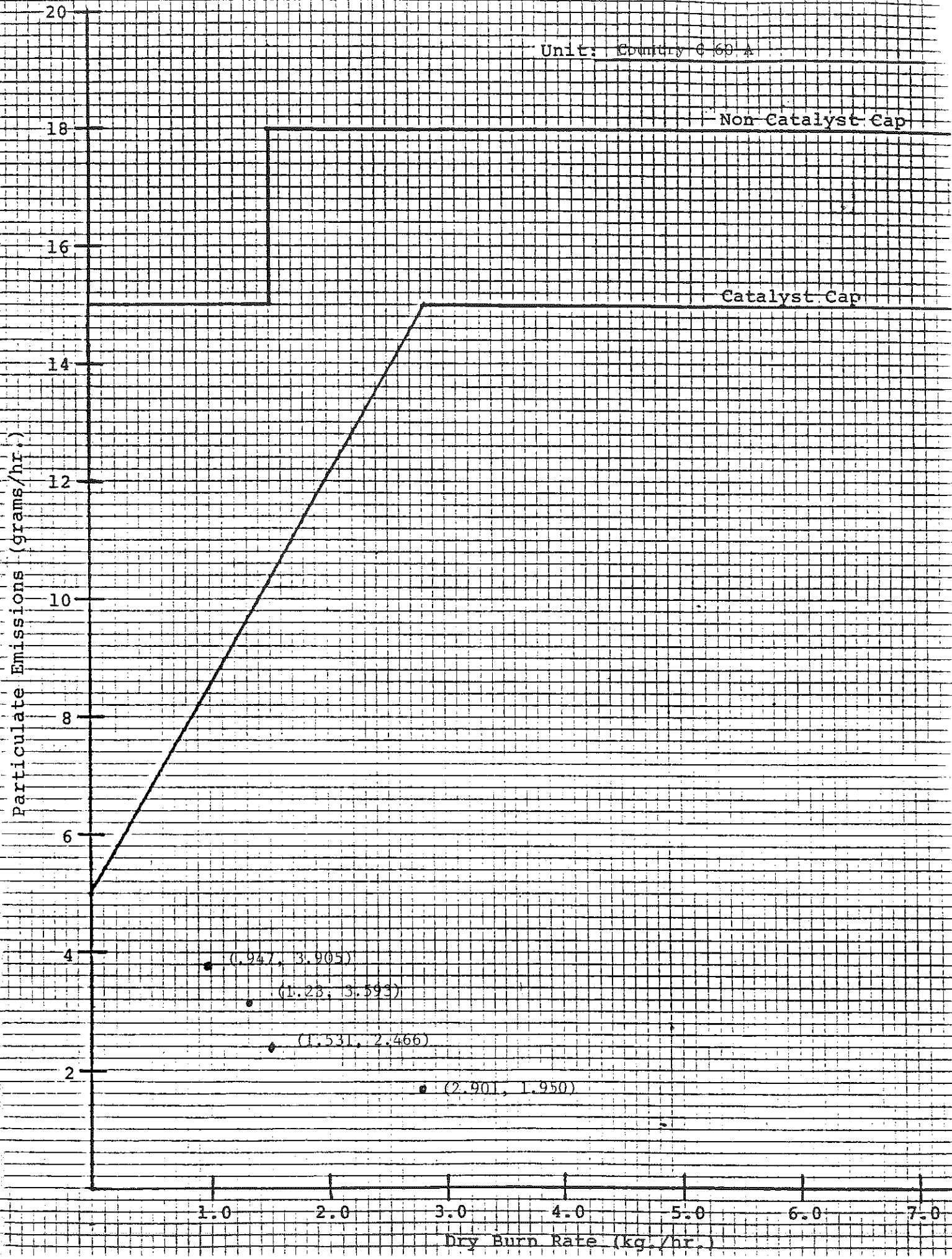
IV.A. EPA WEIGHTED AVERAGE PARTICULATE EMISSIONS CALCULATIONS

$$\overline{PM} = \frac{.5636 (3.905) + .4417 (3.593) + .4184 (2.466) + .2320 (1.950)}{.5636 + .4417 + .4184 + .2320} = \frac{3.2}{1.6557} \text{ g/hr}$$

IV.B. EPA WEIGHTED AVERAGE OVERALL EFFICIENCY CALCULATIONS

$$\overline{OE} = \frac{() + () + () + () + () + () + () + () + () + ()}{+ + + + + + + + + +} = \frac{1}{1} = 100\%$$

Unit: Country C 60 A



Non-Catalyst Cap

Catalyst Cap

Particulate Emissions (grams/hr.)

Dry Burn Rate (kg./hr.)

Woodstove Data Summary

	Run #	1	2	4	3	5	
<u>Particulate Emissions:</u>							
Concentration: grains/dscf:		.1315	.0997	.0553	.0270	.0438	
grams/m ³ :							
Emission Rate: grams/hr:		3.905	5.593	2.466	1.950	1.575	
Emission Factor: gms/kg: (dry fuel weight basis)							
Front Half Catch: % of total		32.13	37.33	45.19	47.66	31.23	%
Total Mass Captured:		1082.4	570.8	333.9	85.6	337.8	mg
Frt & Bck Halves:							
<u>Efficiency Values:</u>							
Overall Appliance Efficiency							%
Combustion Efficiency							%
Heat Transfer Efficiency							%
<u>Heat Output:</u>							
Avg. BTU/hr for test cycle							BTU/hr
<u>Fuel Burn Rates:</u>							
Avg Kg/hr for test cycle (wet basis)							Kg/hr
Avg Kg/hr for test cycle (Dry basis)		0.947	1.231	1.531	2.901	1.168	Kg/hr

Run 5= Fan Confirmation Test

	RUN #				
	1	2	4	3	5
<u>Fuel Moisture Content:</u>					
Kindling (Wet basis)	10.233	9.666	10.661	7.536	11.583
Pretest Fuel (Wet basis)	18.139	18.644	18.633	18.996	18.362
Test Fuel (Wet basis)	18.447	17.768	18.897	18.292	18.642
<u>Air/Fuel Ratio:</u>					
lbs air/lbs fuel					
<u>Average Stack Gas Composition:</u>					
Avg. % CO ₂	5.12	5.70	5.97	7.68	5.52
Avg. % O ₂					
Avg. % CO	1.01	.93	.71	.36	.73
Avg. % Excess Air					
Avg. % Moisture	5.32	3.80	5.53	7.23	5.11
<u>Average Stack Gas Flow Rate:</u>					
Stack flow rate - EPA CMB	7.63	9.28	11.476	18.59	9.245
CHO balance					
Tracer Gas	8.268	7.785	6.792	13.216	7.779
Draft (Static)	-.030	-.042	-.047	-.065	-.044
Proportionality - Average	100	100	100	100	100
<u>Average Stack Gas Emission Factors:</u>					
CO - g/Kg					
g/hr					

	RUN #				
	1	2	4	3	5
<u>Average Temperatures:</u>					
Stack Gas	229	288	307	517	292
Primary Combustion Chamber Gas	678	802	829	1047	765
Secondary Combustion Chamber Gas	722	800	834	1068	791
Catalytic Combustor Exit Gas					
Stove Top	284	327	326	495	329
Stove Left Sidewall	362	398	402	533	410
Stove Back	262	289	228	309	356
Stove Right Sidewall	353	392	398	518	400
Stove Bottom	327	344	312	328	301
Stove Temperature Change	-124	-96	-101	-86	-81

<u>Test Chamber Environment:</u>					
Avg. Barometric Pressure	30.30	30.38	30.25	30.29	30.21
Avg. Temperature	73	75	75	77	70
Avg. % Ambient Moisture	1.35	1.45	0.90	1.35	1.30
Avg. % Relative Humidity	51.0	53.0	35.0	61.0	48.0
Avg. Air Velocity					
Avg. Dilution Tunnel Draft (If Applicable)					

<u>Test Fuel Weight and Burn Time:</u>					
Density (Dry basis)	.367	.406	.472	.409	.459
Coal Bed Weight	4.4	4.2	4.6	5.0	4.3
Pre Test Fuel Wt (Inc Kindling)	42.7	42.4	46.4	44.1	44.5
Test Fuel Load Weight	19.4	19.5	19.4	20.2	19.5
Total Test Cycle Burn Time	455	355	280	155	370