



01/26/2021

Alaska Department of Environmental Conservation (ADEC)

RE: Alaska Regulation 18 AAC 50.077(c)  
Report Revision Hearth & Home Technologies 57ST-ACC-C

To Whom it May Concern:

This cover letter provides an overview of results generated from ADEC's review of OMNI certification report 0061WS092E generated for Hearth & Home Technologies. Stove model 57ST-ACC-C was tested in May 2017 to test standard ASTM 2780, and ASTM 2515. In 2020, ADEC reviewed a Non-CBI version of the report and released a list of findings from their report review. The following is a list of responses to the ADEC audit in the order they appeared in the Summary of Review.

#### **Test Report Elements**

- a.) ADEC requires first hour emissions be less than 6 grams per hour, highest first hour emissions result for this series is 18.32 grams per hour. By ADEC regulations this disapproves the appliance. This regulation does not exist in certification to ASTM standards.
- b.) *Weighted average CO not reported* - Straight average, and a weighted average CO emissions value have been added to Table 3 of the report.
- c.) *Manufacturer's Instructions not reported* - Manufacturer's operating instructions were added to page 25 of the certification report.
- d.) *Firebox dimensions and calculations* - Prior to 2019 OMNI considered firebox dimensions as confidential business information and were not included in the non-CBI report. A firebox volume calculation has been added to the revised non-CBI report in appendix A.
- e.) *Pre-burn completed by not reported* - Conditioning data is provided on page 31 of the test report.

#### **Test Run Data**

- a.) *Train precision % not reported* - Actual train precision % was not reported, quality checks do show Dual Train Comparison results are Acceptable on Wood Heater results page for each test run. Precision percentage and gram per



### **OMNI-Test Laboratories, Inc.**

---

Product Testing & Certification

[www.omni-test.com](http://www.omni-test.com)

Mailing: Post Office Box 301367 • 97294  
Street: 13327 NE Airport Way • 97230  
Portland, Oregon • USA

Phone: (503) 643-3788  
Fax: (503) 643-3799  
Email: [contact@omni-test.com](mailto:contact@omni-test.com)



kilogram comparison have been added to revised report for each test on the results page. Passing criteria is precision within 7.5% or gram per kilogram within 0.5.

- b.) *Negative weights handled appropriately* - On clean burning wood fired devices it is typical to capture near zero measurable catch. A built-in variance in the test standard for filters is 0.2 mg, meaning they are considered at a constant weight when weighed twice and show no more than  $\pm 0.2$  mg. Negative values of 0.2 mg should be allowed as part of the built-in variance. In some tests negative filter weights more than 0.2 mg are found, the corresponding weight can be seen on the O-ring or probe assembly final weights indicating transfer of material. There is no indication of total loss. Transfer of filter material to a secondary container using a solvent would only add additional error by 0.2 mg. for any weighing container, and error in calculating residue weight of the solvent used. No changes were made to the report on this issue.

### **Appliance Fueling**

- a.) *Log length (in)* - Used two different log lengths for testing – shorter for low burn tests <5/6. Fuel length as specified by ASTM 2780 is to approximate 5 / 6 the firebox depth. With no specified variance to the word *approximant*, it is difficult to apply a pass or fail. At the discretion of the testing laboratory, 18” was found to approximant 5/6 of the 24” firebox depth.

### **Reporting**

- a.) *Test report complete* - Requested information is explained above.  
b.) *30-day notice submitted* - This information is not included in any certification reports.  
c.) *Testing on proposed dates* - This information is not included in any certification report.  
d.) *Tested in consecutive days* – Testing schedule was communicated and approved by EPA during testing. This information is not included in the certification report.  
e.) *60-day report to EPA* - This information is not included in any certification report.

Findings of this evaluation by ADEC did not produce any deficiencies that caused the Certified emissions and efficiency values for the Hearth & Home Technologies model 57ST-ACC-C to change. All requested changes are to simply clarify information already included in the certification report.

If you have any questions, please do not hesitate to contact **OMNI**.

Sincerely,

A handwritten signature in black ink, appearing to read "Bruce Davis".

Bruce Davis  
Testing Manager

## **Non-Confidential Business Information**

# **Certification Test Report**

## **Hearth and Home Technologies Wood-Fired Freestanding Room Heater**

**Model: 57ST-ACC-C**

**Prepared for:** Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114

**Prepared by:** OMNI-Test Laboratories, Inc.  
13327 NE Airport Way  
Portland, OR 97230  
(503) 643-3788

**Test Period:** May 15, 2017 – June 8, 2017

**Original Report Date:** July 7, 2017

**First Revised Report Date:** July 18, 2017

**Report Number:** 0061WS092E

*All data and information contained in this report are confidential and proprietary to Hearth and Home Technologies. Its significance is subject to the adequacy and representative character of the samples and to the comprehensiveness of the tests, examinations, or surveys made. The contents of this report cannot be copied or quoted, except in full, without specific, written authorization from Hearth and Home Technologies and OMNI-Test Laboratories, Inc. No use of the OMNI-Test Laboratories, Inc. name, logo, or registered mark (O-TL) is permitted, except as expressly authorized by OMNI-Test Laboratories, Inc. in writing.*

## TABLE OF CONTENTS

PREFACE.....	(3 pages)
1. SAMPLING PROCEDURES AND TEST RESULTS.....	4
Introduction.....	5
Individual Run Summaries.....	6
Individual Run Summaries.....	7
<u>Summary Tables</u>	
Table 1 - Particulate Emissions Results.....	8
Table 2 - Particulate Emissions Results (First Hour).....	8
Table 3 – B415.1 Efficiency and CO Emissions .....	9
Table 4 - Test Facility Conditions .....	9
Table 5 - Fuel Measurements and Crib Descriptions - Pretest .....	10
Table 6 - Fuel Measurements and Crib Descriptions - Test .....	10
Table 7 - Dilution Tunnel Gas Measurements and Sampling Data .....	11
Table 8 – Average Temperature Data.....	11
Table 9 - Pretest Configurations .....	12
Table 10 - Test Configurations .....	13
2. PHOTOGRAPHS/APPLIANCE DESCRIPTION/DRAWINGS.....	15
Appliance Description .....	16
Fuel Photographs .....	18
3. TEST DATA BY RUN.....	24
Run 1.....	29
Run 2.....	43
Run 3.....	55
Run 4.....	66
Run 5.....	77
Run 6 .....	89
Run 7 .....	101
Run 8 .....	113
4. QUALITY ASSURANCE/QUALITY CONTROL .....	125
Sample Analysis.....	128
Calibrations – EPA Method 28R, ASTM E2515, ASTM E2780 .....	144
Example Calculations .....	165
5. LABELING, & OWNER’S MANUAL.....	181
Appendix A: Firebox Volume	

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **AUTHORIZED SIGNATORIES**

This report has been reviewed and approved by the following authorized signatories:

**Technician:**

A handwritten signature in black ink, appearing to read "Bruce Davis", written over a horizontal line.

Bruce Davis, Testing Manager  
OMNI-Test Laboratories, Inc.

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

# **Section 1**

## **Sampling Procedures and Test Results**

## **INTRODUCTION**

Hearth and Home Technologies retained *OMNI* to perform U.S. Environmental Protection Agency (EPA) certification testing on the 57ST-ACC-C wood stove. The 57ST-ACC-C wood stove is a freestanding-type room heater. The firebox is constructed of mild steel. Usable firebox volume was measured to be 2.95 cubic feet and the stove is vented through a 6” collar located on the top of the appliance near the rear of the firebox.

The testing was performed at Hearth & Home Technologies. The altitude of the laboratory is 1635 feet above sea level. The unit was received in good condition and logged in on May 15, 2017, then assigned and labeled with *OMNI* ID #2187. *OMNI* representative Bruce Davis conducted the certification testing and completed all testing by June 8, 2017.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this section. The results in this report are limited to the item submitted.

## **SAMPLING PROCEDURE**

The 57ST-ACC-C wood stove was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standards of Performance for New Residential Wood Heaters using EPA Method 28R, ASTM E2515 and ASTM E2780. Particulate emissions were measured using sampling trains consisting of two filters (front and back).

The model 57ST-ACC-C was tested for thermal efficiency and carbon monoxide (CO) emissions in accordance with CSA B415.1-10.

## **SUMMARY OF RESULTS**

The weighted average emissions of the four test runs included in the results indicate a particulate emission rate of 1.8 grams per hour. Tests number 5, 6, and 7 were fan confirmation tests to confirm operation of the appliance without the optional fan in operation. Two additional tests were conducted to eliminate an outlier and use two thirds of the tests for certification. An additional test was conducted in category 3 with intent to improve weighted average results by re-dispersing the weighting. The 57ST-ACC-C results are within the emission limit of 2.0 g/hr. for affected facilities manufactured on or after May 15, 2020.

Proportionality results for all eight test runs were acceptable. Quality check results for each test run are presented in Section 2 of this report.

## INDIVIDUAL RUN SUMMARIES

- Run 1 -** Attempted category 2 burn rate at primary air setting of 0.68” open. Observed burn rate of 0.95 kg/hr. (category 2). No sampling anomalies occurred, so this test run is valid for inclusion in the weighted average.
- Run 2 -** Attempted category 3 burn rate at primary air setting of 0.75” open. Observed burn rate of 0.96 kg/hr. (category 2). No sampling anomalies occurred, so this test run is valid for inclusion in the weighted average.
- Run 3 -** Attempted category 3 burn rate at primary air setting of 1.50” open. Observed burn rate of 1.42 kg/hr. (category 3). No sampling anomalies occurred, so this test run is valid for inclusion in the weighted average.
- Run 4 -** Attempted category 4 burn rate at primary air setting of fully open, boost air was locked open. Observed burn rate of 3.13 kg/hr. (category 4). No sampling anomalies occurred, so this test run is valid for inclusion in the weighted average.
- Run 5 -** Attempted category 2 burn rate at primary air setting of 0.68” open. Observed burn rate of 1.04 kg/hr. (category 2). No sampling anomalies occurred, the appliance was operated without the fan in operation as a fan confirmation test so this test run is not used in the weighted average. Emission results were found to be greater than  $\pm 1$  g/hr. of category 2 results generated with the blower operating. Two additional tests were conducted to use only two thirds of the data for certification.
- Run 6 -** Attempted category 2 burn rate at primary air setting of 0.70” open. Observed burn rate of 1.11 kg/hr. (category 2). No sampling anomalies occurred, the appliance was operated without the fan in operation as a fan confirmation test so this test run is not used in the weighted average.
- Run 7 -** Attempted category 2 burn rate at primary air setting of 0.715” open. Observed burn rate of 1.09 kg/hr. (category 2). No sampling anomalies occurred, the appliance was operated without the fan in operation as a fan confirmation test so this test run is not used in the weighted average.
- Run 8 -** Attempted category 3 burn rate at primary air setting of fully open. Observed burn rate of 1.88 kg/hr. (category 3). No sampling anomalies occurred, so this test run is valid for inclusion in the weighted average.



## CATEGORY 1 BURN RATE RATIONALE

EPA Method 28 section 8.1.1.3.2 states the following:

*Evidence that a wood heater cannot be operated at a burn rate less than 0.80 kg/hr shall include documentation of two or more attempts to operate the wood heater in burn rate Category 1 and fuel combustion has stopped, or results of two or more test runs demonstrating that the burn rates were greater than 0.80 kg/hr. when the air supply controls were adjusted to the lowest possible position or settings... NOTE: After July 1, 1990, if a wood heater cannot be operated at a burn rate less than 0.80 kg/hr., at least one test run with an average burn rate of 1.00 kg/hr. or less shall be conducted.*

The U.S. Environmental Protection Agency Applicability Determination Index, under Control Number WDS-109, states the following regarding this requirement of Method 28:

*The purpose of this requirement is to ensure that a good-faith effort has been made to achieve a Category 1 burn rate. However, if the air supply control is tamper-proof, EPA will accept one test as adequate documentation that the stove cannot achieve a Category 1 burn rate. Note that this applies only to stoves which do not reach the low burn rate because of limits on the air supply; manufacturers of stoves which cannot sustain a burn rate at lower air settings will still be required to submit documentation of two or more attempts. In all cases, a test series consisting of at least four runs is required.*

As the Run Notes in Section 5 and Table 1.1a in Section 1 of this report show, run 1 was operated at a burn-rate of less than 1.0 kg/hr. with a combustion air inlet opening of 0.68". The primary air control was designed and manufactured with a stop that provides a fixed opening of 0.68" when the control is set to the minimum position. See attached drawings of the primary air controls in the QC report. The air controls for this heater are tamper-proof. When tested in accordance with EPA Method 28 the heater cannot be induced to operate at a burn rate less than 0.80 kg/hr therefore Run 1 fulfills the requirements of the standard.

**Table 1 – Particulate Emissions**

<b>Run</b>	<b>Burn Rate (kg/hr. dry)</b>	<b>ASTM E2515 Emissions (g/hr.)</b>
1	0.95	3.29
2	0.96	1.19
3	1.42	0.73
4	3.13	5.49
*5	1.04	18.99
*6	1.11	1.07
*7	1.09	0.95
8	1.88	1.38

Weighted particulate emission average of 5 test runs: 1.8 grams per hour.

\*Fan confirmation run excluded from weighted average results

**Table 2 – Particulate Emissions (First Hour)**

<b>Run</b>	<b>ASTM E2515 Emissions – First Hour (g/hr.)</b>
1	18.32
2	4.18
3	2.46
4	10.32
5	12.39
6	5.40
7	4.40
8	4.30

**Table 3 – B415.1 Efficiency and CO Emissions**

Run	Heat Output (BTU/hr)	HHV Efficiency (%)	LHV Efficiency (%)	CO Emissions (g/MJ Output)	CO Emissions (g/kg Dry Fuel)	CO Emissions (g/min)
1	12,772	72.2	78.0	9.18	131.23	2.06
2	13,173	73.8	79.7	7.90	115.54	1.83
3	20,439	78.0	84.3	4.90	75.77	1.76
4	38,284	66.3	71.7	7.11	93.45	4.78
5*	12,683	66.4	71.7	15.87	208.54	3.54
6*	14,917	72.9	78.8	7.77	112.21	2.04
7*	14,881	73.9	79.8	7.10	103.89	1.86
8	24,995	71.9	77.7	4.22	60.04	1.85
<p>Weighted average HHV efficiency of 5 test runs: 74.0%.</p> <p>Weighted average CO Emissions of 5 test runs: 2.05 g/min.</p> <p>Straight average CO Emissions of 5 test runs: 2.46 g/min.</p>						

\*Fan confirmation tests excluded from weighted average results.

**Table 4 – Test Facility Conditions**

Run	Room Temperature (°F)		Barometric Pressure (Hg)		Air Velocity (ft/min)	
	Before	After	Before	After	Before	After
1	79	81	28.34	28.38	<50	<50
2	76	78	28.07	28.16	<50	<50
3	81	81	28.37	28.39	<50	<50
4	83	83	28.50	28.55	<50	<50
5	76	78	28.56	28.49	<50	<50
6	79	84	28.57	28.41	<50	<50
7	78	87	28.35	28.15	<50	<50
8	82	79	28.11	28.16	<50	<50

**Table 5 – Fuel Measurement and Crib Description Summary – PRETEST**

<b>Run</b>	<b>Pretest Fuel Weight (Starting weight in lbs)</b>	<b>Pretest Moisture (Dry basis - %)</b>	<b>Coal Bed Weight (lbs)</b>
1	7.3	21.27	4.4
2	6.7	19.57	4.6
3	8.0	23.0	4.4
4	20.7	21.24	4.4
5	7.0	21.37	4.3
6	7.1	23.17	4.6
7	6.5	24.23	4.4
8	18.2	22.7	4.4

**Table 6 – Fuel Measurement and Crib Description Summary – TEST**

<b>Run</b>	<b>Test Fuel Wet Basis (lbs)</b>	<b>Firebox Volume (ft<sup>3</sup>)</b>	<b>Fuel Loading Density Wet Basis (lbs/ft<sup>3</sup>)</b>	<b>Test Fuel Dry Basis (lbs)</b>	<b>Piece Length (in)</b>	<b>2x4s Used</b>	<b>4x4s Used</b>
1	19.1	2.95	6.47	16.1	18	4	2
2	19.3	2.95	6.54	16.3	18	4	2
3	19.3	2.95	6.54	16.1	19	4	2
4	18.9	2.95	6.41	15.5	19	4	2
5	18.7	2.95	6.34	15.6	19	4	2
6	18.9	2.95	6.41	15.8	19	4	2
7	19.0	2.95	6.55	16.0	18	4	2
8	18.7	2.95	6.34	15.6	18	4	2

**Table 7 – Dilution Tunnel Gas Measurements and Sampling Data Summary**

Run	Length of Test (min)	Average Dilution Tunnel Gas Measurements		
		Velocity (ft/sec)	Flow Rate (dscf/min)	Temperature (°F)
1	460	16.98	178.9	87
2	460	16.71	174.8	87
3	310	16.83	174.5	97
4	135	16.57	166.2	119
5	410	16.48	174.8	87
6	390	15.65	163.1	96
7	400	16.09	165.8	97
8	225	16.25	166.3	100

**Table 8 - Average Temperature Data**

Run	Beginning Surface Temperature Average <sup>a</sup>	Ending Surface Temperature Average <sup>a</sup>	Surface Delta T <sup>b</sup>
1	363	265	98
2	370	267	103
3	385	292	93
4	489	458	31
5	399	330	69
6	451	345	106
7	436	342	94
8	440	360	80

a. All temperatures are in degrees F.  
 b. Represents the difference between beginning and ending average surface temperatures.

**Table 9 – Pretest Configuration**

<b>Run</b>	<b>Combustion Air</b>	<b>Fuel Added</b>	<b>Fuel Removed</b>	<b>Time (min)</b>
1	Fully Closed	2.9	0	60
2	0.75"	2.5	0	60
3	1.50"	2.2	0	65
4	Fully Open	18.3	0	72
5	Fully Closed	2.6	0	75
6	0.70"	2.4	0	60
7	0.715"	2.2	0	66
8	Fully Open	15.9	0	88

**Table 10 – Test Configurations**

<b>Run</b>	<b>Five-Minute Startup Procedures</b>	<b>Combustion Air</b>
1	<u>Fuel Loading:</u> Fuel loaded by 44 seconds. <u>Door:</u> Closed by 50 seconds. <u>Primary Air:</u> Fully open until 5:00 then immediately set to test setting. <u>Secondary:</u> Air opening is fixed without adjustment. <u>Fan:</u> Off for the first 30 minutes then turned to high for remainder of test. <u>Boost Air:</u> Boost air locked open at 0 minutes, then timed air activated at 5 minutes.	Air set at mechanical stop, measured at 0.68"
2	<u>Fuel Loading:</u> Fuel loaded by 80 seconds. <u>Door:</u> Closed by 90 seconds. <u>Primary Air:</u> Fully open until 5:00 then immediately set to test setting. <u>Secondary:</u> Air opening is fixed without adjustment. <u>Fan:</u> Off for the first 30 minutes then turned to high for remainder of test. <u>Boost Air:</u> Boost air locked open at 0 minutes, then timed air activated at 5 minutes.	0.75"
3	<u>Fuel Loading:</u> Fuel loaded by 47 seconds. <u>Door:</u> Closed by 95 seconds. <u>Primary Air:</u> Fully open until 5:00 then immediately set to test setting. <u>Secondary:</u> Air opening is fixed without adjustment. <u>Fan:</u> Off for the first 30 minutes then turned to high for remainder of test. <u>Boost Air:</u> Boost air locked open at 0 minutes, then timed air activated at 5 minutes.	1.50"
4	<u>Fuel Loading:</u> Fuel loaded by 47 seconds. <u>Door:</u> Closed by 60 seconds. <u>Primary Air:</u> Fully open entire test. <u>Secondary:</u> Air opening is fixed without adjustment. <u>Fan:</u> On high for the entire test. <u>Boost Air:</u> Boost air locked open for entire test.	Air set to mechanical stop fully open.
5	<u>Fuel Loading:</u> Fuel loaded by 50 seconds. <u>Door:</u> Closed by 80 seconds. <u>Primary Air:</u> Fully open until 5:00 then immediately set to test setting. <u>Secondary:</u> Air opening is fixed without adjustment. <u>Fan:</u> Off for the entire test. <u>Boost Air:</u> Boost air locked open at 0 minutes, then timed air activated at 5 minutes.	Air set at mechanical stop, measured at 0.68"
6	<u>Fuel Loading:</u> Fuel loaded by 40 seconds. <u>Door:</u> Closed by 50 seconds. <u>Primary Air:</u> Fully open until 5:00 then immediately set to test setting. <u>Secondary:</u> Air opening is fixed without adjustment. <u>Fan:</u> Off for the entire test. <u>Boost Air:</u> Boost air locked open at 0 minutes, then timed air activated at 5 minutes.	0.70"

7	<p><u>Fuel Loading:</u> Fuel loaded by 50 seconds.  <u>Door:</u> Closed by 57 seconds.  <u>Primary Air:</u> Fully open until 5:00 then immediately set to test setting.  <u>Secondary:</u> Air opening is fixed without adjustment.  <u>Fan:</u> Off for the entire test.  <u>Boost Air:</u> Boost air locked open at 0 minutes, then timed air activated at 5 minutes.</p>	0.715"
8	<p><u>Fuel Loading:</u> Fuel loaded by 35 seconds.  <u>Door:</u> Closed by 40 seconds.  <u>Primary Air:</u> Fully open entire test.  <u>Secondary:</u> Air opening is fixed without adjustment.  <u>Fan:</u> On high for the entire test.  <u>Boost Air:</u> Boost air locked open at 0 minutes, then timed air activated at 5 minutes.</p>	Air set to mechanical stop fully open.



*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Section 2**

### **Photographs/Appliance Description/Drawings**

## WOOD HEATER DESCRIPTION

**Appliance Manufacturer:** Hearth and Home Technologies

**Wood Stove Model:** 57ST-ACC-C

**Type:** Freestanding

## WOOD HEATER INFORMATION

**Materials of Construction:** The unit is constructed primarily of mild Steel. The firebox is lined with fire brick that measures 4.5 x 9 x 1.25” thick. The feed door has a 17.61” x 11.49” glass panel and ¾” gasket.

**Air Introduction System:** Primary combustion air enters the appliance through an opening located on the right side of the firebox near the top and front of the appliance. A control arm extends out the face of the unit, pushing the control downwards closes off the air opening. Air used for secondary has no user controls, combustion enters a manifold near the rear of the appliance and is channeled to four air tube mounted in the top of the firebox directly under the baffle. A third air source is located on the right side of the appliance near the bottom of the firebox. The control for this air source extends out the front of the appliance near the bottom right. Pushing the control in and releasing locks the control open providing combustion air to openings in the rear of the firebox and to an opening located in the front of the firebox near the floor. If this control is pushed in and then pulled out it activates a timer that slowly closes these openings over a time of approximately 22 minutes.

**Combustion Control Mechanisms:** All control mechanisms are manually controlled; the timer mechanism is manually set and once closed will not open again until manually reset.

**Combustor:** N/A.

**Internal Baffles:** A noncombustible baffle board is located above the secondary air tubes mounted in the top of the firebox. A ceramic wool blanket is used on top of the baffle for additional insulation.

**Other Features:** An optional fan is located in the center of the rear shield.

**Flue Outlet:** The 6” diameter flue outlet is in the top of the unit near the rear of the firebox.

**Similar Models:** None

Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114

**Hearth and Home Technologies**  
**31M-ACC-C**  
**Test Dates: February 13, 2017 – February 16, 2017**



Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114

## Hearth and Home Technologies 31M-ACC-C

**Run 1 – Fuel**



**Run 1 – Newly Loaded Stove**



**Run 2 – Fuel**



**Run 2 – Newly Loaded Stove**



Hearth and Home Technologies  
31M-ACC-C

**Run 3 – Fuel**



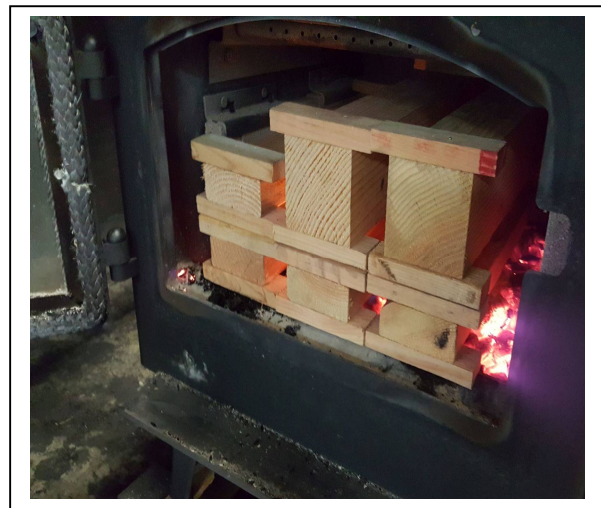
**Run 3 – Newly Loaded Stove**



**Run 4 – Fuel**



**Run 4 – Newly Loaded Stove**

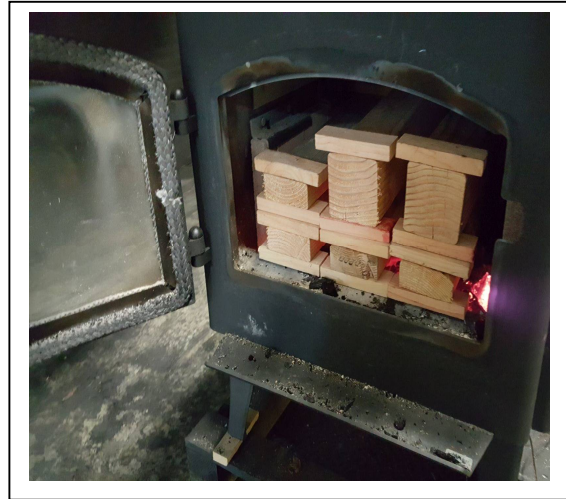


Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114

**Run 5 – Fuel**



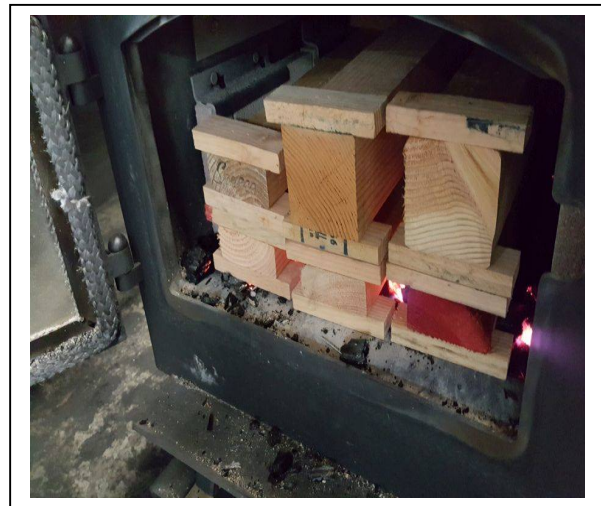
**Run 5 – Newly Loaded Stove**



**Run 6 – Fuel**



**Run 6 – Newly Loaded Stove**



Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114

**Run 7 – Fuel**



**Run 7 – Newly Loaded Stove**



**Run 8 – Fuel**



**Run 8 – Newly Loaded Stove**



*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **WOOD HEATER OPERATING INSTRUCTIONS**

**Specific Written Instructions:** See Section 5 of this report. All markings and instruction materials were reviewed for content prior to printing.



*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

**Engineering Drawings/Blueprints (K List)**  
**Redacted as confidential business information**

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Section 3**

### **Test Data by Run**



## **Test Instruction Recommendations: 57ST-ACC-C**

Created on/by: 03/30/17; C. Winslow Howe – HHT Design Engineer

Purpose: To create repeatability in test protocol for coal bed establishment and loading of the stove.

### Coal Bed establishment (Low, Medium Low, Medium High)

Wood Load: 2 loads of 2x4's. Each load will consist of 4 pieces at 18" and 6 pieces at 14". The second wood load should be loaded when the first load has burnt down to around 2.7 pounds.

Air Settings: Unit air control should be fully open with the ACC locked open.

Fan Settings: Fan should be off during the burn off the first load and turned on after the second load.

### Coal Bed establishment (Medium High(Blocker), High)

Wood Load: 1 Load of 2x4's. Load will consist of 4 Pieces at 18" and 7 Pieces at 17"

Air Settings: Unit air control should be fully open with ACC locked open.

Fan Settings: Fan should be off during the burn.

### Pre-burn (Low)

Shut down: Pre-burn should be started .2 lb below the top end of the coal bed range.

Wood load: 3 pieces of 2x4 at 8", 19-25% moisture

Settings: Primary set to .68" opening and ACC is closed

Fan Settings: Fan is on during pre-burn

### Pre-burn (Medium-Low)

Shut down: Pre-burn should be started at the top end of the coal bed range.

Wood load: 3 pieces 2x4 at 8", 19-25% moisture

Settings: Primary set to .75" opening and ACC is closed

Fan Settings: Fan is on during pre-burn



Pre-burn (Medium-High)

Shut down: Pre-burn should be started 1.6 lb above the top end of the coal bed range.

Wood load: 3 pieces of 2x4 8", 19-25% moisture

Settings: Primary set to 1.5" opening and ACC is closed

Fan Settings: Fan is on during pre-burn

Pre-burn (Medium-High (Blocker))

Shut down: Pre-burn should be started 2.7 lb.

Wood load: 11 pieces of 2x4, 4 pieces at 18" 7 pieces at 14", 19-25% moisture

Settings: Primary set full open stop, and ACC is closed

Fan Settings: Fan is on during pre-burn

Pre-burn (High)

Shut down: Pre-burn should be started around 2.7 lb

Wood load: 11 pieces of 2x4, 4 pieces at 18" 7 pieces at 14", 19-25% moisture

Settings: Primary set full open stop, and ACC is locked open

Fan Settings: Fan is on during pre-burn

Test Burn (Low)

Wood Load: 18-19" in length, 2 4x4's and 4 2x4's. Right side 4x4 at <20%, center 4x4 at <22% moisture. 2x4's at <22% moisture with the center piece at <20% moisture. Please see figure 1 for recommended arrangement of load.

Settings: Primary set to .68" and ACC is activated at Time= 5 minutes.

Loading: Left side of load should be about .25" off the brick and front of load should rest on the front channel by about .5"-1".

Fan Settings: Fan is off for the first 30 minutes of the test.

Additional Notes: For the first 5 Minutes of the test the Primary and ACC should be fully open, then moved to their test settings (Primary at .68" and ACC activated) at 5 minutes.



Test Burn (Medium-Low)

Wood Load: Please refer to the wood load described for Test Burn (Low)

Settings: Primary set to .75” and ACC is activated at Time= 5 minutes.

Loading: Please refer to the loading procedure described in Test Burn (low)

Fan Settings: Fan is off for the first 30 minutes of the test.

Additional Notes: For the first 5 Minutes of the test the Primary and ACC should be fully open, then moved to their test settings (Primary at .75” and ACC activated) at 5 minutes.

Test Burn (Medium-High)

Wood Load: 18-19” in length, 2 4x4’s and 4 2x4’s. left side 2x4’s around 23% moisture, 2x4’s under the 4x4’s should be <20% moisture. Right side 4x4 <20% moisture. Please see figure 1 for recommended arrangement of load.

Settings: Primary set to 1.5” and ACC is activated at Time= 5 minutes.

Loading: Please refer to Loading for Test Burn(Low)

Fan Settings: Fan is off for the first 30 minutes of the test.

Additional Notes: For the first 5 Minutes of the test the Primary and ACC should be fully open, then moved to their test settings (Primary at 1.5” and ACC activated) at 5 minutes.

Test Burn (Medium-High (blocker))

Wood Load: please refer to Wood load for Test Burn (Medium-High)

Settings: Primary set to full open stop and ACC is activated at Time= 5 minutes.

Loading: Please refer to Loading for Test Burn(Low)

Fan Settings: Fan is on at start of the test

Additional Notes: For the first 5 Minutes of the test the Primary and ACC should be fully open, then moved to their test settings (Primary at full open stop and ACC activated) at 5 minutes.

Test Burn (High)

Wood Load: 18-19” in length, 2 4x4’s and 4 2x4’s. 2x4’s 23-24% moisture, center 2x4 should be <20% moisture. 4x4’s around 23% moisture. Please see figure 1 for recommended arrangement of load.

Settings: Primary set to full open stop and ACC is locked open

Loading: Please refer to Loading for Test Burn(Low)

Fan Settings: Fan is on at start of the test

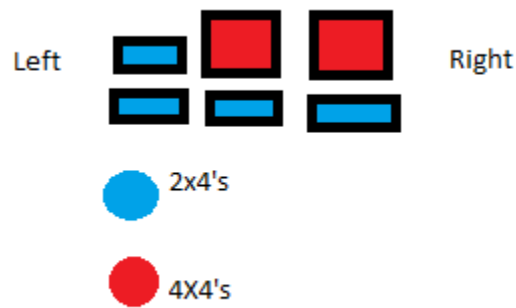


Figure 1: Facing Front of Wood Load

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

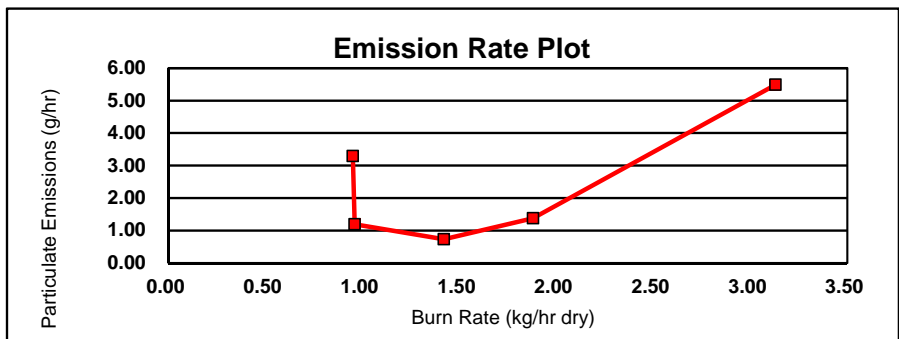
# **Run 1**

# EPA Weighted Average Emissions EPA Method 28

Client: Hearth & Home  
 Stove Model: 57ST-ACC-C  
 Test Dates: 5/15/17 - 6/8/17  
 Project Number: 0061WS092E  
 Tracking Number: 2187

Status: Final  
 Stove Type: Non-Catalytic Stove

<b>Emissions (g/hr):</b>	<b>1.8</b>
<b>Weighted Averages HHV Efficiency (%):</b>	<b>74.0</b>
<b>LHV Efficiency (%):</b>	<b>80.0</b>



<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Run #</td> <td style="width: 30%;">1</td> <td style="width: 20%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td>Burn Rate (dry kg/hr)</td> <td>0.95</td> <td></td> <td></td> </tr> <tr> <td>Category</td> <td>2</td> <td></td> <td></td> </tr> <tr> <td>LHV Efficiency (%)</td> <td>78</td> <td></td> <td></td> </tr> <tr> <td>HHV Efficiency (%)</td> <td>72.2</td> <td></td> <td></td> </tr> <tr> <td>Emissions (g/hr)</td> <td>3.29</td> <td></td> <td></td> </tr> <tr> <td>Weighting Factor</td> <td>0.338</td> <td>20.40%</td> <td></td> </tr> </table>	Run #	1			Burn Rate (dry kg/hr)	0.95			Category	2			LHV Efficiency (%)	78			HHV Efficiency (%)	72.2			Emissions (g/hr)	3.29			Weighting Factor	0.338	20.40%		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Run #</td> <td style="width: 30%;">4</td> <td style="width: 20%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td>Burn Rate (dry kg/hr)</td> <td>3.13</td> <td></td> <td></td> </tr> <tr> <td>Category</td> <td>4</td> <td></td> <td></td> </tr> <tr> <td>LHV Efficiency (%)</td> <td>71.7</td> <td></td> <td></td> </tr> <tr> <td>HHV Efficiency (%)</td> <td>66.3</td> <td></td> <td></td> </tr> <tr> <td>Emissions (g/hr)</td> <td>5.49</td> <td></td> <td></td> </tr> <tr> <td>Weighting Factor</td> <td>0.110</td> <td>6.64%</td> <td></td> </tr> </table>	Run #	4			Burn Rate (dry kg/hr)	3.13			Category	4			LHV Efficiency (%)	71.7			HHV Efficiency (%)	66.3			Emissions (g/hr)	5.49			Weighting Factor	0.110	6.64%	
Run #	1																																																								
Burn Rate (dry kg/hr)	0.95																																																								
Category	2																																																								
LHV Efficiency (%)	78																																																								
HHV Efficiency (%)	72.2																																																								
Emissions (g/hr)	3.29																																																								
Weighting Factor	0.338	20.40%																																																							
Run #	4																																																								
Burn Rate (dry kg/hr)	3.13																																																								
Category	4																																																								
LHV Efficiency (%)	71.7																																																								
HHV Efficiency (%)	66.3																																																								
Emissions (g/hr)	5.49																																																								
Weighting Factor	0.110	6.64%																																																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Run #</td> <td style="width: 30%;">2</td> <td style="width: 20%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td>Burn Rate (dry kg/hr)</td> <td>0.96</td> <td></td> <td></td> </tr> <tr> <td>Category</td> <td>2</td> <td></td> <td></td> </tr> <tr> <td>LHV Efficiency (%)</td> <td>79.7</td> <td></td> <td></td> </tr> <tr> <td>HHV Efficiency (%)</td> <td>73.8</td> <td></td> <td></td> </tr> <tr> <td>Emissions (g/hr)</td> <td>1.19</td> <td></td> <td></td> </tr> <tr> <td>Weighting Factor</td> <td>0.378</td> <td>22.78%</td> <td></td> </tr> </table>	Run #	2			Burn Rate (dry kg/hr)	0.96			Category	2			LHV Efficiency (%)	79.7			HHV Efficiency (%)	73.8			Emissions (g/hr)	1.19			Weighting Factor	0.378	22.78%																														
Run #	2																																																								
Burn Rate (dry kg/hr)	0.96																																																								
Category	2																																																								
LHV Efficiency (%)	79.7																																																								
HHV Efficiency (%)	73.8																																																								
Emissions (g/hr)	1.19																																																								
Weighting Factor	0.378	22.78%																																																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Run #</td> <td style="width: 30%;">3</td> <td style="width: 20%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td>Burn Rate (dry kg/hr)</td> <td>1.42</td> <td></td> <td></td> </tr> <tr> <td>Category</td> <td>3</td> <td></td> <td></td> </tr> <tr> <td>LHV Efficiency (%)</td> <td>84.3</td> <td></td> <td></td> </tr> <tr> <td>HHV Efficiency (%)</td> <td>78</td> <td></td> <td></td> </tr> <tr> <td>Emissions (g/hr)</td> <td>0.73</td> <td></td> <td></td> </tr> <tr> <td>Weighting Factor</td> <td>0.551</td> <td>33.24%</td> <td></td> </tr> </table>	Run #	3			Burn Rate (dry kg/hr)	1.42			Category	3			LHV Efficiency (%)	84.3			HHV Efficiency (%)	78			Emissions (g/hr)	0.73			Weighting Factor	0.551	33.24%																														
Run #	3																																																								
Burn Rate (dry kg/hr)	1.42																																																								
Category	3																																																								
LHV Efficiency (%)	84.3																																																								
HHV Efficiency (%)	78																																																								
Emissions (g/hr)	0.73																																																								
Weighting Factor	0.551	33.24%																																																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Run #</td> <td style="width: 30%;">8</td> <td style="width: 20%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td>Burn Rate (dry kg/hr)</td> <td>1.88</td> <td></td> <td></td> </tr> <tr> <td>Category</td> <td>3</td> <td></td> <td></td> </tr> <tr> <td>LHV Efficiency (%)</td> <td>77.7</td> <td></td> <td></td> </tr> <tr> <td>HHV Efficiency (%)</td> <td>71.9</td> <td></td> <td></td> </tr> <tr> <td>Emissions (g/hr)</td> <td>1.38</td> <td></td> <td></td> </tr> <tr> <td>Weighting Factor</td> <td>0.281</td> <td>16.93%</td> <td></td> </tr> </table>	Run #	8			Burn Rate (dry kg/hr)	1.88			Category	3			LHV Efficiency (%)	77.7			HHV Efficiency (%)	71.9			Emissions (g/hr)	1.38			Weighting Factor	0.281	16.93%																														
Run #	8																																																								
Burn Rate (dry kg/hr)	1.88																																																								
Category	3																																																								
LHV Efficiency (%)	77.7																																																								
HHV Efficiency (%)	71.9																																																								
Emissions (g/hr)	1.38																																																								
Weighting Factor	0.281	16.93%																																																							




## Wood Heater Conditioning Data - ASTM E2780/ ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 15-May-17  
 Technician: B. Davis  
 Operation Category: II - III

Elapsed Time (hr)	Flue Gas Temp (° F)	Catalyst Exit Temp (° F)
0	331.0	N/A
1	259.0	
2	153.0	
3	133.0	
4	552.0	
5	361.0	
6	356.0	
7	296.0	
8	166.0	
9	147.0	
10	140.0	
11	133.0	
12	131.0	
13	578.0	
14	360.0	
15	472.0	
16	292.0	
17	199.0	
18	185.0	
19	184.0	
20	416.0	
21	280.0	
22	176.0	
23	154.0	
24	150.0	
25	460.0	

Elapsed Time (hr)	Flue Gas Temp (° F)	Catalyst Exit Temp (° F)
26	425.0	
27	375.0	
28	267.0	
29	349.0	
30	204.0	
31	370.0	
32	293.0	
33	212.0	
34	205.0	
35	387.0	
36	377.0	
37	219.0	
38	186.0	
39	374.0	
40	327.0	
41	213.0	
42	271.0	
43	375.0	
44	269.0	
45	268.0	
46	177.0	
47	164.0	
48	339.0	
49	271.0	
50	397.0	

Technician Signature: 

### Wood Heater Test Results - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Project No.: 0061WS092E  
 Tracking No.: 2187  
 Run: 1  
 Test Date: 05/15/17

Burn Rate	<b>0.95 kg/hr dry</b>
Average Tunnel Temperature	87 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	16.98 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	10733.5 dscf/hour
Average Delta p	0.068 inches H2O
Total Time of Test	460 minutes

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - V <sub>m</sub>	79.405 cubic feet	64.360 cubic feet	58.696 cubic feet	8.331 cubic feet
Average Gas Meter Temperature	80 degrees Fahrenheit	86 degrees Fahrenheit	87 degrees Fahrenheit	86 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - V <sub>mstd</sub>	73.388 dscf	59.297 dscf	53.496 dscf	7.676 dscf
Total Particulates - m <sub>n</sub>	0 mg	18.7 mg	15.9 mg	13.1 mg
Particulate Concentration (dry-standard) - C <sub>p</sub> /C <sub>s</sub>	0.000000 grams/dscf	0.00032 grams/dscf	0.00030 grams/dscf	0.00171 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.00 grams	25.95 grams	24.46 grams	18.32 grams
Particulate Emission Rate	0.00 grams/hour	3.38 grams/hour	3.19 grams/hour	18.32 grams/hour
Emissions Factor		3.55 g/kg	3.34 g/kg	6.30 g/kg
Difference from Average Total Particulate Emissions		0.75 grams	0.75 grams	

**Dual Train Comparison Results Are Acceptable**

	FINAL AVERAGE RESULTS
<b>Complete Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	25.20 grams
Particulate Emission Rate	<b>3.29 grams/hour</b>
Emissions Factor	3.44 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	18.32 grams
Particulate Emission Rate	18.32 grams/hour
Emissions Factor	6.30 grams/kg

QUALITY CHECKS	
Filter Temps < 90 °F	OK
Filter Face Velocity (47 mm)	OK
Dryer Exit Temp < 80F	OK
Leakage Rate	OK
Ambient Temp (55-90°F)	OK
Negative Probe Weight Eval.	OK
Pro-Rate Variation	OK
Total PM Precision (%)	4.44
Train A - Train B G/KG ≤ 0.5	0.20
Stove Surface ΔT	OK

Technician Signature: 

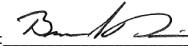


### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: 1

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 05/15/17  
 Beginning Clock Time: 11:51  
 Total Sampling Time: 460 min  
 Recording Interval: 10 min  
 Background Sample Volume: 79.405 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

PM Control Modules: 371, 372  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.612 °H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.98 ft/sec.  
 Initial Tunnel Flow: 177.3 scfm  
 Average Tunnel Flow: 178.9 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 11 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 14 in. Hg  
 Average Test Piece Fuel Moisture: 20.08 Dry Basis %

Technician Signature: 

Barometric Pressure: Begin Middle End Average  
28.34 28.36 28.38 28.36 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center		
Initial dP	0.060	0.066	0.060	0.060	0.052	0.056	0.064	0.054	0.068	"H2O	
Temp:	88	88	88	88	88	88	88	88	88	°F	
V <sub>strav</sub>	16.99				ft/sec				V <sub>scent</sub>	18.10	ft/sec
F <sub>p</sub>	0.938										

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)										Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
0	0.000	0.000			1.140	74.000	-0.020	0.30	74	-3.9	88	0.068			19.1		172	512	200	448	481	363	N/A	145	83	72	83	72	79	-0.022	2.01	0.66
10	1.377	1.093	0.14	0.11	1.560	75.000	-0.490	1.11	76	-1.3	90	0.068	101	88	18.2	-0.9	291	493	265	397	438	377	N/A	324	84	72	85	72	78	-0.063	8.71	0.87
20	2.749	2.150	0.14	0.11	1.550	78.000	-0.490	1.11	79	-1	101	0.068	101	85	16.1	-2.1	662	472	300	400	439	455	N/A	518	87	73	87	72	77	-0.081	15.41	0.94
30	4.123	3.249	0.14	0.11	1.540	80.000	-0.470	1.11	81	-1	96	0.068	100	88	14.5	-1.6	621	455	326	410	446	452	N/A	335	87	73	87	73	77	-0.067	6.16	1.13
40	5.509	4.404	0.14	0.12	1.620	81.000	-0.530	1.11	82	-1.1	93	0.068	100	92	13.6	-0.9	354	440	200	402	428	365	N/A	302	87	74	87	73	78	-0.059	6.73	0.83
50	6.917	5.550	0.14	0.11	1.610	83.000	-0.530	1.11	83	-1.1	91	0.068	101	91	12.6	-1	301	426	176	389	410	340	N/A	290	87	75	87	74	77	-0.062	6.96	0.47
60	8.331	6.731	0.14	0.12	1.610	84.000	-0.530	1.11	84	-1.1	94	0.068	102	94	11.4	-1.2	381	413	175	399	396	353	N/A	371	87	76	87	74	77	-0.069	10.32	0.64
70	9.750	7.988	0.14	0.13	1.620	85.000	-0.520	1.11	85	-1.1	94	0.068	102	99	10.2	-1.2	399	401	179	429	401	362	N/A	353	87	76	87	75	77	-0.066	11.66	0.43
80	11.166	9.258	0.14	0.13	1.610	86.000	-0.520	1.12	86	-1.2	96	0.068	102	100	8.9	-1.3	413	392	188	461	426	376	N/A	350	88	77	88	75	79	-0.066	11.51	0.74
90	12.584	10.488	0.14	0.12	1.610	86.000	-0.520	1.12	86	-1.2	97	0.068	102	97	7.6	-1.3	443	384	197	490	444	392	N/A	360	88	77	89	76	81	-0.068	11.87	0.62
100	13.997	11.703	0.14	0.12	1.600	87.000	-0.520	1.11	87	-1.2	97	0.068	102	96	6.5	-1.1	422	377	204	504	465	394	N/A	328	89	78	89	77	82	-0.062	9.11	0.7
110	15.417	12.948	0.14	0.12	1.610	88.000	-0.510	1.11	88	-1.2	95	0.068	102	98	5.7	-0.8	379	368	203	509	478	387	N/A	291	89	78	90	77	81	-0.058	8.39	0.6
120	16.836	14.211	0.14	0.13	1.610	88.000	-0.510	1.11	88	-1.2	91	0.068	101	99	5.2	-0.5	280	364	201	508	486	368	N/A	228	88	78	89	77	80	-0.051	5.1	0.81
130	18.256	15.453	0.14	0.12	1.610	88.000	-0.510	1.12	89	-1.2	91	0.068	101	97	4.7	-0.5	238	363	203	502	487	359	N/A	203	88	78	88	77	81	-0.046	4.78	0.88
140	19.676	16.703	0.14	0.13	1.610	89.000	-0.510	1.11	89	-1.2	90	0.068	101	98	4.4	-0.3	214	364	202	487	481	350	N/A	183	87	78	88	78	82	-0.042	3.88	0.89
150	21.098	17.964	0.14	0.13	1.610	89.000	-0.500	1.12	90	-1.2	90	0.068	101	98	4.1	-0.3	197	366	200	471	468	340	N/A	171	87	78	87	78	82	-0.039	4.15	0.86
160	22.518	19.223	0.14	0.13	1.610	90.000	-0.500	1.11	90	-1.2	89	0.068	101	98	3.9	-0.2	188	367	197	457	453	332	N/A	163	87	78	87	78	82	-0.038	5.72	1.16
170	23.942	20.494	0.14	0.13	1.620	90.000	-0.510	1.12	90	-1.2	88	0.068	101	99	3.7	-0.2	178	369	195	447	443	326	N/A	158	86	78	86	78	81	-0.036	5.25	1.37
180	25.350	21.789	0.14	0.13	1.620	89.000	-0.500	1.12	90	-1.2	85	0.068	100	101	3.6	-0.1	168	370	190	439	436	321	N/A	152	85	77	85	77	80	-0.036	5.21	1.46
190	26.754	23.092	0.14	0.13	1.630	89.000	-0.500	1.13	90	-1.2	84	0.068	99	101	3.5	-0.1	164	370	189	435	429	317	N/A	150	84	77	84	77	79	-0.036	5.62	1.66
200	28.163	24.400	0.14	0.13	1.630	88.000	-0.510	1.12	90	-1.2	84	0.068	100	102	3.3	-0.2	163	370	187	429	421	314	N/A	146	83	76	83	76	78	-0.034	5.34	1.63
210	29.559	25.699	0.14	0.13	1.630	88.000	-0.500	1.13	89	-1.7	84	0.068	99	101	3.1	-0.2	160	369	185	423	414	310	N/A	142	83	76	82	76	78	-0.033	4.94	1.5
220	30.961	27.011	0.14	0.13	1.630	88.000	-0.500	1.13	89	-1.1	84	0.068	99	102	3.0	-0.1	158	368	182	417	407	306	N/A	143	83	76	82	76	78	-0.034	4.99	1.79
230	32.359	28.344	0.14	0.13	1.620	88.000	-0.500	1.12	89	-1.2	84	0.068	99	104	2.9	-0.1	156	367	180	412	400	303	N/A	140	83	75	82	75	78	-0.033	4.91	1.87
240	33.756	29.683	0.14	0.13	1.630	88.000	-0.500	1.12	89	-1.2	84	0.068	99	104	2.7	-0.2	154	365	178	408	393	300	N/A	138	82	75	82	75	78	-0.032	4.67	1.93
250	35.156	31.002	0.14	0.13	1.630	88.000	-0.500	1.13	89	-1.2	83	0.068	99	102	2.6	-0.1	150	363	174	402	386	295	N/A	134	82	75	82	75	77	-0.031	4.78	1.72
260	36.556	32.303	0.14	0.13	1.620	87.000	-0.510	1.13	89	-1	83	0.068	99	101	2.5	-0.1	147	362	174	395	379	291	N/A	130	82	75	81	75	77	-0.031	4.73	1.73
270	37.954	33.584	0.14	0.13	1.620	87.000	-0.510	1.13	88	-1	84	0.068	99	100	2.3	-0.2	147	361	174	389	373	289	N/A	130	82	74	82	74	79	-0.031	4.71	1.62
280	39.348	34.868	0.14	0.13	1.630	86.000	-0.510	1.13	87	-1.5	84	0.068	99	100	2.2	-0.1	147	359	174	383	369	286	N/A	129	83	74	82	74	79	-0.031	4.71	1.55
290	40.737	36.146	0.14	0.13	1.630	85.000	-0.510	1.12	87	-1.4	84	0.068	99	100	2.1	-0.1	145	356	172	377	366	283	N/A	128	83	73	82	73	79	-0.030	4.82	1.46
300	42.126	37.450	0.14	0.13	1.630	85.000	-0.510	1.13	86	-1.4	83	0.068	99	102	2.0	-0.1	145	354	172	371	366	282	N/A	127	82	73	82	73	79	-0.030	4.52	1.23
310	43.512	38.764	0.14	0.13	1.620	85.000	-0.500	1.12	86	-1.4	83	0.068	99	103	1.9	-0.1	145	352	173	367	366	281	N/A	127	82	73	82	73	80	-0.030	5	1.22
320	44.897	40.095	0.14	0.13	1.63	85	-0.51	1.12	86	-1.4	84	0.068	99	104	1.7	-0.2	145	351	175	365	367	281	N/A	127	82	73	82	73	80	-0.030	5.54	1.32
330	46.281	41.353	0.14	0.13	1.62	85	-0.51	1.12	87	-1.4	84	0.068	99	98	1.6	-0.1	146	349	178	365	370	282	N/A	128	83	74	82	73	80	-0.030	5.17	1.24
340	47.668	42.616	0.14	0.13	1.61	86	-0.51	1.11	87	-1	84	0.068	99	99	1.5	-0.1	147	348	179	364	371	282	N/A	128	83	74	82	74	80	-0.031	5.38	1.47
350	49.054	43.922	0.14	0.13	1.62	86	-0.51	1.12	87	-1.3	84	0.068	99	102	1.3	-0.2	147	347	180	362	372	282	N/A	130	83	74	83	74	81	-0.030	5.25	1.57
360	50.446	45.230	0.14	0.13	1.62	86	-0.51	1.12	87	-2.3	84	0.068	99	102	1.2	-0.1	146	344	178	359	368	279	N/A	131	83	74	82	74	80	-0.031	4.83	1.65

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **1**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 05/15/17  
 Beginning Clock Time: 11:51 Background Sample Volume: 79.405 cubic feet


Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

Barometric Pressure: Begin Middle End Average  
28.34 28.36 28.38 28.36 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

PM Control Modules: 371, 372  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.612 "H2O  
 Tunnel Area: 0.19635 ft<sup>2</sup>  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 16.98 ft/sec.  
 Initial Tunnel Flow: 177.3 scfm  
 Average Tunnel Flow: 178.9 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 11 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 14 in. Hg  
 Average Test Piece Fuel Moisture: 20.08 Dry Basis %

Technician Signature: 

Velocity Traverse Data											
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center		
Initial dP	0.060	0.066	0.060	0.060	0.052	0.056	0.064	0.054	0.068	"H2O	
Temp:	88	88	88	88	88	88	88	88	88	°F	
	V <sub>strav</sub> <u>16.99</u> ft/sec				V <sub>scent</sub> <u>18.10</u> ft/sec				F <sub>p</sub> <u>0.938</u>		

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)												Stack Gas Data					
	Gas Meter 1 (ft <sup>3</sup> )	Gas Meter 2 (ft <sup>3</sup> )	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
370	51.845	46.573	0.14	0.13	1.63	87	-0.51	1.11	88	-1	84	0.068	99	105	1.1	-0.1	146	344	178	357	364	278	N/A	128	83	74	83	74	80	-0.030	4.58	1.76
380	53.240	47.923	0.14	0.14	1.62	87	-0.52	1.12	88	-1	85	0.068	99	105	0.9	-0.2	145	344	179	355	360	277	N/A	128	83	74	83	74	81	-0.031	4.78	1.88
390	54.628	49.263	0.14	0.13	1.61	86	-0.52	1.12	87	-1.2	85	0.068	99	105	0.8	-0.1	144	344	180	354	356	276	N/A	126	84	74	83	74	81	-0.030	4.33	1.71
400	56.018	50.604	0.14	0.13	1.62	86	-0.51	1.11	87	-1.2	85	0.068	99	105	0.7	-0.1	143	342	179	351	353	274	N/A	124	84	74	83	74	81	-0.030	4.62	1.82
410	57.419	51.941	0.14	0.13	1.62	86	-0.52	1.13	87	-1.2	85	0.068	100	104	0.6	-0.1	142	341	179	347	350	272	N/A	123	84	74	84	74	81	-0.030	4.42	1.74
420	58.817	53.286	0.14	0.13	1.61	86	-0.51	1.12	87	-1.2	85	0.068	100	105	0.4	-0.2	141	339	178	344	348	270	N/A	123	84	74	84	74	82	-0.030	4.57	1.8
430	60.206	54.635	0.14	0.13	1.62	86	-0.52	1.12	87	-1.2	85	0.068	99	105	0.3	-0.1	140	338	179	341	345	269	N/A	123	84	74	84	74	82	-0.029	4.67	1.8
440	61.595	55.987	0.14	0.14	1.62	86	-0.52	1.13	87	-1.2	85	0.068	99	106	0.2	-0.1	140	337	180	339	342	268	N/A	123	84	74	84	74	82	-0.030	4.29	1.62
450	62.978	57.341	0.14	0.14	1.62	86	-0.52	1.12	87	-1.2	85	0.068	99	106	0.1	-0.1	140	336	180	336	340	266	N/A	122	84	74	84	74	82	-0.029	4.73	1.79
460	64.360	58.696	0.14	0.14	1.62	86	-0.52	1.12	87	-1.2	84	0.068	98	106	0.0	-0.1	139	335	179	333	339	265	N/A	123	84	74	83	74	81	-0.029	4.47	1.66
Avg/Tot	64.360	58.696	0.14	0.13	1.60	86		1.10	87		87	0.068	100	100								97.6				75	84	75	80	-0.040		

### Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home      Equipment Numbers: \_\_\_\_\_  
 Model: 57ST-ACC-C \_\_\_\_\_  
 Tracking No.: 2187 \_\_\_\_\_  
 Project No.: 0061WS092E \_\_\_\_\_  
 Run #: 1 \_\_\_\_\_  
 Date: 5/15/17 \_\_\_\_\_

**TRAIN 1 (First Hour emissions)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D169	135.5	122.4	13.1
C. Rear filter catch	Filter				0.0
D. Probe catch*	Probe				0.0
E. Filter seals catch*	Seals				0.0

**Sub-Total**      Total Particulate, mg:      13.1

**TRAIN 1 (Post First Hour Change-out)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D171	124.6	120.0	4.6
C. Rear filter catch	Filter	D170	123.6	123.0	0.6
D. Probe catch*	Probe	OES 4	114146.9	114146.5	0.4
E. Filter seals catch*	Seals	R469	3619.9	3619.9	0.0

**Sub-Total**      Total Particulate, mg:      5.6

**Train 1 Aggregate**      Total Particulate, mg:      18.7

**TRAIN 2**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	D172	137.3	122.2	15.1
B. Rear filter catch	Filter	D173	123.7	123.3	0.4
C. Probe catch*	Probe	6	115352.7	115352.5	0.2
D. Filter seals catch*	Seals	R470	3323.5	3323.3	0.2

**Total Particulate, mg:      15.9**

**AMBIENT**

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	D174	120.2	120.2	0.0

**Total Particulate, mg:      0.0**

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight.

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Technician Signature: 

### Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: **Hearth & Home**  
 Model: **57ST-ACC-C**  
 Tracking No.: **2187**  
 Project No.: **0061WS092E**  
 Test Date: **5/15/2017**  
 Run No.: **1**

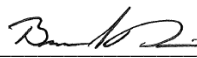
Firebox Volume (ft <sup>3</sup> ):	2.95
Fuel Piece Length (in):	18
2x4 Crib Weight (lb):	10
4x4 Crib Weight (lb):	9.1

<b>Total Fuel Weight (Dry Basis, lb):</b>	16.1	
Fuel Density (lb/ft <sup>3</sup> , Dry Basis):	29.19	OK
Loading Density (lb/ft <sup>3</sup> , Wet Basis):	6.47	OK
2x4 Percentage:	52%	OK

Coal Bed Range (20-25%): **3.82 - 4.775**


Test Fuel Piece	Weight (lb)	Size	Readings (Dry Basis %)			Dry Weight (lb)
1	2.3	2"x 4"	22.8	20.3	23.0	1.88
2	2.1	2"x 4"	21.4	19.3	20.9	1.74
3	1.8	2"x 4"	19.1	19.7	19.2	1.51
4	2.1	2"x 4"	19.3	19.3	19.0	1.76
5	3.6	4"x 4"	20.5	19.1	20.8	3.00
6	4.7	4"x 4"	19.6	19.4	18.7	3.94

Spacer Readings (Dry Basis %)			
8.9	9.1		
8.0	8.0		
9.0	8.2		
8.3	9.1		
8.7	9.1		
9.3	8.1		
8.8	8.1		
8.4	8.2		
8.8	8.8		
8.3	9.1		
9.5	7.8		
9.0			
8.8			

Technician Signature: 

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Hearth & Home  
**Model:** 57ST-ACC-C  
**Date:** 05/15/17  
**Run:** 1  
**Control #:** 0061WS092E  
**Test Duration:** 460  
**Output Category:** 2

**Technicians:**   
 \_\_\_\_\_  
 \_\_\_\_\_

### Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	72.2%	78.0%
Combustion Efficiency	90.7%	90.7%
Heat Transfer Efficiency	80%	86.1%

Output Rate (kJ/h)	13,464	12,772	(Btu/h)
Burn Rate (kg/h)	0.94	2.07	(lb/h)
Input (kJ/h)	18,648	17,690	(Btu/h)

Test Load Weight (dry kg)	7.22	15.91	dry lb
MC wet (%)	16.72		
MC dry (%)	20.08		
Particulate (g)	25.2		
CO (g)	947		
Test Duration (h)	7.67		

Emissions	Particulate	CO
g/MJ Output	0.24	9.18
g/kg Dry Fuel	3.49	131.23
g/h	3.29	123.53
lb/MM Btu Output	0.57	21.32

Air/Fuel Ratio (A/F)	16.82
----------------------	-------

VERSION: 2.2 12/14/2009



VERSION: 2.2

12/14/2009

Manufacturer: Hearth & Home

Model: 57ST-ACC-C

Date: 5/15/2017

Run: 1

Control #: 0061WS092E

Test Duration: 460

Output Category: 2

Appliance Type: Non-Cat (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)

Weight Units lb (kg or lb)

Wood Moisture (% wet): 16.72  
 Load Weight (lb wet): 19.10  
 Burn Rate (dry kg/h): 0.94  
 Total Particulate Emissions: 25.2 g

Fuel Data

D. Fir  
 HHV 19,810 kj/kg  
 %C 48.73  
 %H 6.87  
 %O 43.9  
 %ASH 0.5

Elapsed Time (min)	Fuel Weight Remaining (lb)	Averages			#DIV/0!	188.85	79.66
		1.31	5.92	Temp. (°F)			
		Flue Gas Composition (%)			Flue Gas	Room Temp	
		CO	CO <sub>2</sub>	O <sub>2</sub>			
0	19.10	0.66	2.01		145.0	79.0	
10	18.20	0.87	8.71		324.0	78.0	
20	16.10	0.94	15.41		518.0	77.0	
30	14.50	1.13	6.16		335.0	77.0	
40	13.60	0.83	6.73		302.0	78.0	
50	12.60	0.47	6.96		290.0	77.0	
60	11.40	0.64	10.32		371.0	77.0	
70	10.20	0.43	11.66		353.0	77.0	
80	8.90	0.74	11.51		350.0	79.0	
90	7.60	0.62	11.87		360.0	81.0	
100	6.50	0.70	9.11		328.0	82.0	
110	5.70	0.60	8.39		291.0	81.0	
120	5.20	0.81	5.10		228.0	80.0	
130	4.70	0.88	4.78		203.0	81.0	
140	4.40	0.89	3.88		183.0	82.0	
150	4.10	0.86	4.15		171.0	82.0	
160	3.90	1.16	5.72		163.0	82.0	
170	3.70	1.37	5.25		158.0	81.0	
180	3.60	1.46	5.21		152.0	80.0	
190	3.50	1.66	5.62		150.0	79.0	
200	3.30	1.63	5.34		146.0	78.0	
210	3.10	1.50	4.94		142.0	78.0	
220	3.00	1.79	4.99		143.0	78.0	
230	2.90	1.87	4.91		140.0	78.0	
240	2.70	1.93	4.67		138.0	78.0	
250	2.60	1.72	4.78		134.0	77.0	
260	2.50	1.73	4.73		130.0	77.0	
270	2.30	1.62	4.71		130.0	79.0	
280	2.20	1.55	4.71		129.0	79.0	
290	2.10	1.46	4.82		128.0	79.0	
300	2.00	1.23	4.52		127.0	79.0	
310	1.90	1.22	5.00		127.0	80.0	
320	1.70	1.32	5.54		127.0	80.0	
330	1.60	1.24	5.17		128.0	80.0	
340	1.50	1.47	5.38		128.0	80.0	
350	1.30	1.57	5.25		130.0	81.0	
360	1.20	1.65	4.83		131.0	80.0	
370	1.10	1.76	4.58		128.0	80.0	
380	0.90	1.88	4.78		128.0	81.0	
390	0.80	1.71	4.33		126.0	81.0	
400	0.70	1.82	4.62		124.0	81.0	
410	0.60	1.74	4.42		123.0	81.0	
420	0.40	1.80	4.57		123.0	82.0	
430	0.30	1.80	4.67		123.0	82.0	
440	0.20	1.62	4.29		123.0	82.0	
450	0.10	1.79	4.73		122.0	82.0	
460	0.00	1.66	4.47		123.0	81.0	

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 1

Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/15/17

Test Crew: B. Davis

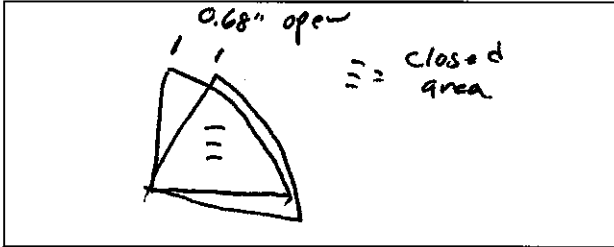
OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Run Notes**

**Air Control Settings**

Primary:

Secondary: fixed



Tertiary/Pilot: Boost Air not used

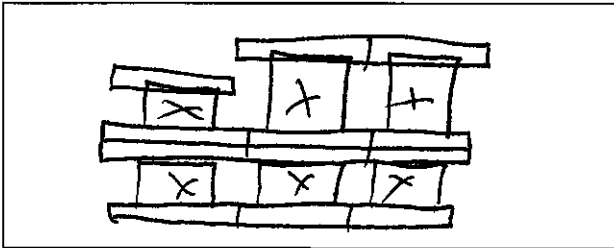
Fan: on high

**Preburn Notes**

Time	Notes
50	Leveled coal bed

**Test Notes**

Sketch test fuel configuration:



Start up procedures & Timeline:

Bypass: N/A

Fuel loaded by: 44 seconds

Door closed at: 50 seconds

Primary air: fully open until 5:00 min.

Then set to test setting

Fan off for first 30 min, then set to High.

Notes: Boost Air locked open until 5:00 min.

Then timed Air was activated.

Time	Notes
60	front filters changed in train A.

Technician Signature: B. Davis

Date: 6/1/17

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 1  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/15/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Fuel Data**

Fuel: Douglas fir, untreated and air dried, standard grade or better dimensional lumber

**Pre-Burn Fuel**

Calibration: Cal Value (1) = 12% Actual Reading 12.0  
 Cal Value (2) = 22% Actual Reading 22.0

Piece:	Length:	Reading:	Piece:	Length:	Reading:
1	<u>8</u> in	<u>21.7</u>	7	_____ in	_____
2	<u>8</u> in	<u>22.8</u>	8	_____ in	_____
3	<u>8</u> in	<u>19.3</u>	9	_____ in	_____
4	_____ in	_____	10	_____ in	_____
5	_____ in	_____	11	_____ in	_____
6	_____ in	_____	12	_____ in	_____

Total Pre-Burn Fuel Weight: 2.9 Pre-Burn Fuel Average Moisture: 21.27  
 Time (clock): 10:30 Room Temperature (F): 65 Initials: BD

**Test Fuel**

Firebox Volume (ft³): 2.9 Test Fuel Piece Length (in): 18  
 Load Weight Range (lb): 20.3 Total Wet Fuel Load Weight (lb): 19.1  
18.3 - 22.3

Fuel Type & Amount: 2 x 4: 4 4 x 4: 2  
 Weight (with spacers): 10.0 Weight (with spacers): 9.1

Piece:	Weight (lbs):	Moisture Readings (%DB):				Fuel Type:
1	<u>2.3</u>	<u>22.8</u>	<u>20.3</u>	<u>23.0</u>	<u>2x4</u>	
2	<u>2.1</u>	<u>21.4</u>	<u>19.3</u>	<u>20.9</u>	<u>2x4</u>	
3	<u>1.8</u>	<u>19.1</u>	<u>19.7</u>	<u>19.2</u>	<u>2x4</u>	
4	<u>2.1</u>	<u>19.3</u>	<u>19.3</u>	<u>19.0</u>	<u>2x4</u>	
5	<u>3.6</u>	<u>23.7</u>	<u>21.1</u>	<u>20.6</u>	<u>4x4</u>	
6	<u>4.7</u>	<u>19.6</u>	<u>19.4</u>	<u>18.7</u>	<u>4x4</u>	
7	_____	_____	_____	_____	_____	

**Spacer Moisture Readings (%DB)**

<u>8.9</u>	<u>8.7</u>	<u>8.8</u>	<u>8.8</u>	<u>9.1</u>	<u>8.2</u>	_____	_____
<u>8.0</u>	<u>9.3</u>	<u>8.3</u>	<u>9.1</u>	<u>9.1</u>	<u>8.8</u>	_____	_____
<u>9.0</u>	<u>8.8</u>	<u>9.5</u>	<u>8.0</u>	<u>8.1</u>	<u>9.1</u>	_____	_____
<u>8.3</u>	<u>8.4</u>	<u>9.0</u>	<u>8.2</u>	<u>8.1</u>	<u>7.8</u>	_____	_____

Time (clock): 10:10 Room Temperature (F): 65 Initials: BD

Technician Signature: [Signature]

Date: 6/1/17

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 1  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/15/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Supplemental Data**

Start Time: 11:51 Booth #: 7  
 Stop Time: 19:31

**Stack Gas Leak Check:**

Initial: good Final: good

**Sample Train Leak Check:**

A: 0.0 @ 11 "Hg  
 B: 0.0 @ 14 "Hg

**Calibrations:** Span Gas CO<sub>2</sub>: 15.96 CO: 5.08

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	<u>0</u>	<u>0</u>	<u>1935</u>	<u>1935</u>
CO <sub>2</sub>	<u>0.00</u>	<u>15.97</u>	<u>0.02</u>	<u>15.83</u>
CO	<u>0.000</u>	<u>5.08</u>	<u>0.000</u>	<u>4.959</u>

Air Velocity (ft/min): Initial: 250 Final: 250  
 Scale Audit (lbs): Initial: 10.0 Final: 10.0  
 Pitot Tube Leak Test: Initial: good Final: good  
 Stack Diameter (in): 6"  
 Induced Draft: 0.0  
 % Smoke Capture: 100%  
 Flue Pipe Cleaned Prior to First Test in Series:  
 Date: 5/15/17 Initials: BD

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>28.34</u>	<u>28.36</u>	<u>28.38</u>
RH (%)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Ambient (°F)	<u>79</u>	<u>78</u>	<u>81</u>

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
1	<u>0.60</u>	<u>88</u>
2	<u>0.66</u>	<u>88</u>
3	<u>0.60</u>	<u>88</u>
Y	<u>0.60</u>	<u>88</u>
1	<u>0.60<sup>052</sup></u>	<u>88</u>
2	<u>0.56</u>	<u>88</u>
3	<u>0.64</u>	<u>88</u>
Y	<u>0.57</u>	<u>88</u>
Center: <u>0.57<sup>052</sup></u>		
<u>0.64<sup>052</sup></u>		
<u>0.68</u>		

**Background Filter Volume:** 79.405

Tunnel Static Pressure (in H <sub>2</sub> O):	
Beginning of Test	End of Test
<u>-0.61</u>	<u>-0.612</u>

Technician Signature: 

Date: 6/1/17

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Run 2**

## Wood Heater Test Results - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Project No.: 0061WS092E  
 Tracking No.: 2187  
 Run: 2  
 Test Date: 05/16/17

Burn Rate	<b>0.96 kg/hr dry</b>
Average Tunnel Temperature	87 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	16.71 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	10486.0 dscf/hour
Average Delta p	0.061 inches H2O
Total Time of Test	460 minutes

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - V <sub>m</sub>	81.404 cubic feet	62.410 cubic feet	62.456 cubic feet	8.204 cubic feet
Average Gas Meter Temperature	80 degrees Fahrenheit	84 degrees Fahrenheit	85 degrees Fahrenheit	84 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - V <sub>mstd</sub>	74.588 dscf	57.224 dscf	56.611 dscf	7.522 dscf
Total Particulates - m <sub>p</sub>	0.5 mg	7.5 mg	6.2 mg	3 mg
Particulate Concentration (dry-standard) - C <sub>p</sub> /C <sub>s</sub>	0.000007 grams/dscf	0.00013 grams/dscf	0.00011 grams/dscf	0.00040 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.54 grams	10.00 grams	8.27 grams	4.18 grams
Particulate Emission Rate	0.07 grams/hour	1.30 grams/hour	1.08 grams/hour	4.18 grams/hour
Emissions Factor		1.36 g/kg	1.12 g/kg	1.42 g/kg
Difference from Average Total Particulate Emissions		0.87 grams	0.87 grams	
<b>Dual Train Comparison Results Are Acceptable</b>				

	FINAL AVERAGE RESULTS
<b>Complete Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	9.13 grams
Particulate Emission Rate	<b>1.19 grams/hour</b>
Emissions Factor	1.24 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	4.18 grams
Particulate Emission Rate	4.18 grams/hour
Emissions Factor	1.42 grams/kg

QUALITY CHECKS	
Filter Temps < 90 °F	OK
Filter Face Velocity (47 mm)	OK
Dryer Exit Temp < 80F	OK
Leakage Rate	OK
Ambient Temp (55-90F)	OK
Negative Probe Weight Eval.	OK
Pro-Rate Variation	OK
Total PM Precision (%)	14.23
Train A - Train B G/KG ≤ 0.5	0.23
Stove Surface ΔT	OK

Technician Signature: \_\_\_\_\_




### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **2**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 16-May-17  
 Beginning Clock Time: 11:03  
 Total Sampling Time: 460 min  
 Recording Interval: 10 min  
 Background Sample Volume: 81.404 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.590 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.71 ft/sec.  
 Initial Tunnel Flow: 173.7 scfm  
 Average Tunnel Flow: 174.8 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 10 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 10 in. Hg  
 Average Test Piece Fuel Moisture: 20.23 Dry Basis %

Technician Signature: 

Barometric Pressure: Begin Middle End Average  
28.07 28.14 28.16 28.12 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

Velocity Traverse Data										
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.050	0.052	0.062	0.058	0.056	0.060	0.062	0.058	0.061	
Temp:	90	90	90	90	90	90	90	90	90	
$V_{strav}$	16.77				17.26				$F_p$	0.972

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)												Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H₂O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
0	0.000	0.000			1.56	76	-0.43	1.11	76	-1.2	90	0.061			19.3		188	501	244	441	475	370	N/A	205	84	72	84	72	75	-0.050	1.09	0.29
10	1.312	1.328	0.13	0.13	1.52	77	-0.42	1.09	77	-1	90	0.061	98	100	18.3	-1	289	488	265	408	441	378	N/A	354	84	73	84	72	75	-0.073	10.46	0.67
20	2.648	2.682	0.13	0.14	1.57	78	-0.49	1.17	79	-1.5	99	0.061	101	102	16.2	-2.1	645	469	301	414	450	456	N/A	480	86	73	86	73	75	-0.081	13.05	0.62
30	4.005	4.070	0.14	0.14	1.57	80	-0.47	1.17	81	-1.1	93	0.061	101	104	14.9	-1.3	621	453	317	410	444	449	N/A	366	86	74	86	73	75	-0.071	9.31	0.42
40	5.382	5.458	0.14	0.14	1.57	81	-0.47	1.15	82	-1.2	95	0.061	103	104	13.7	-1.2	449	437	201	409	432	386	N/A	373	87	74	86	73	77	-0.071	11.64	0.09
50	6.794	6.847	0.14	0.14	1.57	83	-0.47	1.17	84	-1.2	94	0.061	105	103	12.6	-1.1	396	422	184	411	422	367	N/A	357	87	75	87	74	78	-0.070	11.17	0.14
60	8.204	8.236	0.14	0.14	1.57	84	-0.47	1.17	85	-1.2	95	0.061	105	103	11.5	-1.1	405	408	182	430	414	368	N/A	376	88	76	87	75	79	-0.073	12.79	0.62
70	9.620	9.630	0.14	0.14	1.57	85	-0.47	1.17	86	-1.2	96	0.061	105	103	10.2	-1.3	412	395	189	472	438	381	N/A	372	88	76	88	75	79	-0.071	13.77	0.94
80	11.031	11.022	0.14	0.14	1.56	85	-0.48	1.16	86	-1.2	96	0.061	105	103	8.8	-1.4	420	385	197	504	461	393	N/A	367	88	77	88	75	80	-0.071	13.63	0.82
90	12.444	12.413	0.14	0.14	1.56	86	-0.48	1.16	87	-1.2	96	0.061	105	103	7.6	-1.2	411	377	202	525	473	398	N/A	362	88	77	88	76	80	-0.070	13.61	0.99
100	13.855	13.793	0.14	0.14	1.54	86	-0.46	1.09	87	-1.1	96	0.061	104	102	6.4	-1.2	419	370	207	540	489	405	N/A	347	88	77	88	76	80	-0.067	13.13	0.8
110	15.258	15.138	0.14	0.13	1.53	87	-0.45	1.09	88	-1.1	94	0.061	103	99	5.5	-0.9	371	365	211	547	506	400	N/A	296	88	78	88	77	80	-0.060	10.17	0.92
120	16.661	16.485	0.14	0.13	1.53	87	-0.45	1.09	88	-1.1	92	0.061	103	99	5.0	-0.5	317	362	211	528	511	386	N/A	261	88	78	87	77	80	-0.056	9.01	0.76
130	18.034	17.832	0.14	0.13	1.54	87	-0.45	1.09	88	-1.1	90	0.061	101	99	4.5	-0.5	260	360	207	505	506	368	N/A	216	87	78	87	77	79	-0.049	7.08	1.59
140	19.406	19.181	0.14	0.13	1.53	87	-0.44	1.09	88	-1.1	87	0.061	101	99	4.2	-0.3	213	358	202	483	486	348	N/A	185	86	77	85	77	79	-0.044	5.97	1.53
150	20.768	20.531	0.14	0.14	1.54	87	-0.44	1.10	88	-1.1	86	0.061	100	99	4.0	-0.2	189	357	199	460	467	334	N/A	167	84	77	84	76	79	-0.040	5.81	1.45
160	22.130	21.881	0.14	0.14	1.55	87	-0.44	1.10	88	-1.1	85	0.061	100	99	3.9	-0.1	177	357	198	441	452	325	N/A	159	84	77	84	76	79	-0.038	5.87	1.61
170	23.488	23.233	0.14	0.14	1.55	87	-0.45	1.09	88	-1.1	86	0.061	99	99	3.7	-0.2	172	359	195	427	440	319	N/A	154	84	76	84	75	81	-0.037	5.86	1.77
180	24.838	24.585	0.14	0.14	1.55	86	-0.45	1.10	88	-1.2	86	0.061	99	99	3.6	-0.1	166	358	193	416	428	312	N/A	150	84	75	84	75	82	-0.036	5.42	2.03
190	26.190	25.936	0.14	0.14	1.55	86	-0.45	1.10	87	-1.3	86	0.061	99	99	3.5	-0.1	162	357	190	407	417	307	N/A	146	84	74	84	74	82	-0.036	5.48	2.17
200	27.540	27.289	0.14	0.14	1.55	85	-0.45	1.10	87	-1.3	85	0.061	99	99	3.3	-0.2	159	355	187	400	407	302	N/A	142	84	74	84	73	82	-0.035	5.42	2.2
210	28.890	28.641	0.14	0.14	1.55	85	-0.46	1.10	86	-1.3	85	0.061	99	99	3.2	-0.1	157	353	185	392	399	297	N/A	140	84	73	84	73	82	-0.033	5.36	2.22
220	30.237	29.992	0.13	0.14	1.55	84	-0.45	1.10	86	-1.3	85	0.061	99	99	3.1	-0.1	155	350	183	386	391	293	N/A	143	84	73	84	73	82	-0.035	5.2	2.35
230	31.581	31.343	0.13	0.14	1.55	84	-0.46	1.10	86	-1.3	85	0.061	99	99	3.0	-0.1	155	347	180	380	385	289	N/A	143	84	73	84	73	82	-0.034	5.29	2.31
240	32.926	32.695	0.13	0.14	1.54	84	-0.45	1.10	86	-1.4	85	0.061	99	99	2.9	-0.1	153	345	177	373	381	286	N/A	142	84	73	84	72	82	-0.034	5.38	2.26
250	34.268	34.047	0.13	0.14	1.55	84	-0.45	1.10	86	-1.4	85	0.061	99	99	2.8	-0.1	152	343	176	367	378	283	N/A	141	84	73	83	72	82	-0.034	5.08	2.12
260	35.604	35.399	0.13	0.14	1.55	84	-0.46	1.10	85	-1.3	85	0.061	98	99	2.6	-0.2	149	342	174	363	375	281	N/A	140	84	72	83	72	82	-0.034	5.2	2.27
270	36.940	36.751	0.13	0.14	1.55	84	-0.46	1.10	85	-1.4	85	0.061	98	99	2.5	-0.1	149	341	174	361	371	279	N/A	141	84	72	83	72	82	-0.034	5.47	2.32
280	38.279	38.103	0.13	0.14	1.55	84	-0.46	1.10	85	-1.4	85	0.061	98	99	2.4	-0.1	149	340	175	360	369	279	N/A	140	84	72	83	72	82	-0.034	5.39	2.3
290	39.622	39.455	0.13	0.14	1.55	83	-0.46	1.10	85	-1.2	84	0.061	99	99	2.2	-0.2	149	339	176	358	368	278	N/A	139	83	72	83	72	82	-0.033	5.53	2.39
300	40.959	40.807	0.13	0.14	1.55	83	-0.46	1.10	85	-1	84	0.061	98	99	2.1	-0.1	149	338	176	357	367	277	N/A	141	83	72	83	72	81	-0.034	5.41	2.3
310	42.292	42.159	0.13	0.14	1.55	83	-0.46	1.10	85	-1	84	0.061	98	99	2.0	-0.1	149	337	176	355	365	276	N/A	142	83	72	83	72	81	-0.033	5.69	1.93
320	43.623	43.511	0.13	0.14	1.54	83	-0.46	1.09	85	-1	84	0.061	98	99	1.8	-0.2	149	335	175	356	364	276	N/A	145	83	72	83	72	81	-0.034	5.6	2.07
330	44.957	44.863	0.13	0.14	1.56	83	-0.46	1.10	85	-1.2	84	0.061	98	99	1.7	-0.1	149	335	176	357	365	276	N/A	146	83	72	82	72	81	-0.034	5.62	1.96
340	46.290	46.216	0.13	0.14	1.55	84	-0.46	1.11	85	-1	84	0.061	98	99	1.5	-0.2	150	335	177	358	366	277	N/A	147	82	72	82	72	80	-0.034	5.68	1.93
350	47.626	47.567	0.13	0.14	1.58	84	-0.48	1.10	85	-1.1	84	0.061	98	99	1.4	-0.1	149	335	177	357	367	277	N/A	147	82	72	82	72	80	-0.035	5.6	1.97
360	48.974	48.920	0.13	0.14	1.59	84	-0.48	1.10	85	-1.4	83	0.061	99	99	1.3	-0.1	149	334	177	357	367	277	N/A	145	82	72	82	72	80	-0.034	5.55	1.94



### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **2**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 16-May-17  
 Beginning Clock Time: 11:03 Background Sample Volume: 81.404 cubic feet

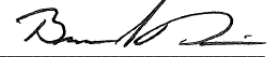
Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

Barometric Pressure: Begin Middle End Average  
28.07 28.14 28.16 28.12 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

PM Control Modules: \_\_\_\_\_  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.590 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 16.71 ft/sec.  
 Initial Tunnel Flow: 173.7 scfm  
 Average Tunnel Flow: 174.8 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 10 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 10 in. Hg  
 Average Test Piece Fuel Moisture: 20.23 Dry Basis %

Technician Signature: 

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.050	0.052	0.062	0.058	0.056	0.060	0.062	0.058	0.061
Temp:	90	90	90	90	90	90	90	90	90
	V <sub>strav</sub> <u>16.77</u> ft/sec				V <sub>scnt</sub> <u>17.26</u> ft/sec				F <sub>p</sub> <u>0.972</u>

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)													Stack Gas Data				
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
370	50.322	50.273	0.13	0.14	1.59	84	-0.48	1.10	85	-1.1	83	0.061	99	99	1.1	-0.2	146	334	177	355	366	276	N/A	143	82	72	82	71	80	-0.034	5.46	1.93
380	51.666	51.627	0.13	0.14	1.59	83	-0.48	1.11	85	-1.3	83	0.061	99	99	1.0	-0.1	146	335	177	353	366	275	N/A	141	81	72	81	71	79	-0.034	5.38	1.98
390	53.009	52.981	0.13	0.14	1.59	83	-0.48	1.11	85	-1.3	83	0.061	99	99	0.9	-0.1	146	335	177	351	366	275	N/A	142	81	71	81	71	79	-0.034	5.43	1.91
400	54.353	54.335	0.13	0.14	1.60	83	-0.48	1.10	85	-1.3	83	0.061	99	99	0.8	-0.1	146	336	177	351	365	275	N/A	143	81	71	81	71	80	-0.034	5.45	2.05
410	55.694	55.689	0.13	0.14	1.59	83	-0.48	1.10	84	-1.3	83	0.061	99	100	0.6	-0.2	146	336	178	351	365	275	N/A	143	81	71	81	71	80	-0.035	5.27	2.08
420	57.036	57.044	0.13	0.14	1.60	83	-0.48	1.11	84	-1.5	82	0.061	99	100	0.5	-0.1	145	336	176	350	365	274	N/A	143	81	71	81	71	80	-0.034	5.21	2.11
430	58.374	58.397	0.13	0.14	1.59	83	-0.48	1.11	84	-1.6	82	0.061	98	99	0.4	-0.1	144	336	174	349	364	273	N/A	142	81	71	81	70	79	-0.034	4.87	2.05
440	59.722	59.751	0.13	0.14	1.58	83	-0.48	1.11	84	-1	82	0.061	99	99	0.2	-0.2	143	335	172	346	361	271	N/A	140	81	71	80	71	79	-0.033	4.76	2.02
450	61.067	61.103	0.13	0.14	1.58	83	-0.47	1.10	84	-1	81	0.061	99	99	0.1	-0.1	141	333	172	342	358	269	N/A	137	80	71	80	71	78	-0.033	4.74	2.02
460	62.410	62.456	0.13	0.14	1.58	84	-0.48	1.09	85	-1.2	81	0.061	98	99	0.0	-0.1	140	332	172	336	356	267	N/A	136	80	72	80	72	78	-0.033	4.7	2.02
Avg/Tot	62.410	62.456	0.14	0.14	1.56	84		1.11	85		87	0.061	100	100								102.6				74	84	73	80	-0.044		

### Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home      Equipment Numbers: \_\_\_\_\_  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Run #: 2  
 Date: 5/16/17

**TRAIN 1 (First Hour emissions)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D175	125.5	122.5	3.0
C. Rear filter catch	Filter				0.0
D. Probe catch*	Probe				0.0
E. Filter seals catch*	Seals				0.0

**Sub-Total**    Total Particulate, mg:    **3.0**

**TRAIN 1 (Post First Hour Change-out)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D176	127.5	123.9	3.6
C. Rear filter catch	Filter	D177	120.9	120.7	0.2
D. Probe catch*	Probe	7	114984.0	114983.3	0.7
E. Filter seals catch*	Seals	R471	4147.3	4147.5	0.0

**Sub-Total**    Total Particulate, mg:    **4.5**

**Train 1 Aggregate**    Total Particulate, mg:    **7.5**

**TRAIN 2**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	D178	127.5	121.9	5.6
B. Rear filter catch	Filter	D179	124.4	124.1	0.3
C. Probe catch*	Probe	8	115595.2	115595.0	0.2
D. Filter seals catch*	Seals	R472	3594.5	3594.4	0.1

Total Particulate, mg:    **6.2**

**AMBIENT**

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	D73	121.7	121.2	0.5

Total Particulate, mg:    **0.5**

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight.

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Technician Signature: 

### Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: **Hearth & Home**  
 Model: **57ST-ACC-C**  
 Tracking No.: **2187**  
 Project No.: **0061WS092E**  
 Test Date: **5/16/2017**  
 Run No.: **2**

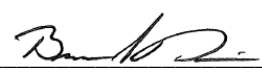
Firebox Volume (ft <sup>3</sup> ):	2.95
Fuel Piece Length (in):	18
2x4 Crib Weight (lb):	9.3
4x4 Crib Weight (lb):	10

<b>Total Fuel Weight (Dry Basis, lb):</b>	16.3	
Fuel Density (lb/ft <sup>3</sup> , Dry Basis):	29.63	OK
Loading Density (lb/ft <sup>3</sup> , Wet Basis):	6.54	OK
2x4 Percentage:	48%	OK

Coal Bed Range (20-25%): **3.86 - 4.825**

Test Fuel Piece	Weight (lb)	Size	Readings (Dry Basis %)			Dry Weight (lb)
1	2.2	2"x 4"	19.9	19.4	20.8	1.83
2	2.2	2"x 4"	19.0	19.3	19.8	1.84
3	2.2	2"x 4"	20.1	21.0	19.9	1.83
4	1.7	2"x 4"	20.2	18.6	21.3	1.42
5	4.1	4"x 4"	22.8	21.9	22.5	3.35
6	4.5	4"x 4"	19.8	19.1	18.7	3.78

Spacer Readings (Dry Basis %)			
8.0	8.1		
8.1	7.9		
7.6	8.8		
8.9	8.5		
8.4	8.7		
8.3	8.4		
9.4	8.7		
8.9	8.0		
8.8	8.9		
8.0	8.8		
8.9	8.2		
8.1			
8.1			

Technician Signature: 

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Hearth & Home  
**Model:** 57ST-ACC-C  
**Date:** 05/16/17  
**Run:** 2  
**Control #:** 0061WS092E  
**Test Duration:** 460  
**Output Category:** 2

**Technicians:** *B...*  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	73.8%	79.7%
Combustion Efficiency	91.7%	91.7%
Heat Transfer Efficiency	80%	87.0%

Output Rate (kJ/h)	13,886	13,173	(Btu/h)
Burn Rate (kg/h)	0.95	2.09	(lb/h)
Input (kJ/h)	18,821	17,854	(Btu/h)

Test Load Weight (dry kg)	7.28	16.05	dry lb
MC wet (%)	16.82		
MC dry (%)	20.22		
Particulate (g)	9.13		
CO (g)	842		
Test Duration (h)	7.67		

Emissions	Particulate	CO
g/MJ Output	0.09	7.90
g/kg Dry Fuel	1.25	115.54
g/h	1.19	109.77
lb/MM Btu Output	0.20	18.37

Air/Fuel Ratio (A/F)	14.09
----------------------	-------

VERSION:                      2.2                      12/14/2009

VERSION: 2.2

12/14/2009

Manufacturer: Hearth & Home

Appliance Type: Non-Cat (Cat, Non-Cat, Pellet)

Model: 57ST-ACC-C

Date: 5/16/2017

Run: 2

Control #: 0061WS092E

Test Duration: 460

Output Category: 2

Temp. Units F (F or C)

Weight Units lb (kg or lb)

Fuel Data

Wood Moisture (% wet): 16.82  
 Load Weight (lb wet): 19.30  
 Burn Rate (dry kg/h): 0.95  
 Total Particulate Emissions: 9.13 g

D. Fir  
 HHV 19,810 kj/kg  
 %C 48.73  
 %H 6.87  
 %O 43.9  
 %ASH 0.5

Averages 1.64 6.98 #DIV/0! 202.70 79.81  
 Temp. (°F)

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%)			Flue Gas Temp (°F)	Room Temp (°F)
		CO	CO <sub>2</sub>	O <sub>2</sub>		
0	19.30	0.29	1.09		205.0	76.0
10	18.30	0.67	10.46		354.0	75.0
20	16.20	0.62	13.05		480.0	75.0
30	14.90	0.42	9.31		366.0	75.0
40	13.70	0.09	11.64		373.0	77.0
50	12.60	0.14	11.17		357.0	78.0
60	11.50	0.62	12.79		376.0	79.0
70	10.20	0.94	13.77		372.0	79.0
80	8.80	0.82	13.63		367.0	80.0
90	7.60	0.99	13.61		362.0	80.0
100	6.40	0.80	13.13		347.0	80.0
110	5.50	0.92	10.17		296.0	80.0
120	5.00	0.76	9.01		261.0	80.0
130	4.50	1.59	7.08		216.0	79.0
140	4.20	1.53	5.97		185.0	79.0
150	4.00	1.45	5.81		167.0	79.0
160	3.90	1.61	5.87		159.0	79.0
170	3.70	1.77	5.86		154.0	81.0
180	3.60	2.03	5.42		150.0	82.0
190	3.50	2.17	5.48		146.0	82.0
200	3.30	2.20	5.42		142.0	82.0
210	3.20	2.22	5.36		140.0	82.0
220	3.10	2.35	5.20		143.0	82.0
230	3.00	2.31	5.29		143.0	82.0
240	2.90	2.26	5.38		142.0	82.0
250	2.80	2.12	5.08		141.0	82.0
260	2.60	2.27	5.20		140.0	82.0
270	2.50	2.32	5.47		141.0	82.0
280	2.40	2.30	5.39		140.0	82.0
290	2.20	2.39	5.53		139.0	82.0
300	2.10	2.30	5.41		141.0	81.0
310	2.00	1.93	5.69		142.0	81.0
320	1.80	2.07	5.60		145.0	81.0
330	1.70	1.96	5.62		146.0	81.0
340	1.50	1.93	5.68		147.0	80.0
350	1.40	1.97	5.60		147.0	80.0
360	1.30	1.94	5.55		145.0	80.0
370	1.10	1.93	5.46		143.0	80.0
380	1.00	1.98	5.38		141.0	79.0
390	0.90	1.91	5.43		142.0	79.0
400	0.80	2.05	5.45		143.0	80.0
410	0.60	2.08	5.27		143.0	80.0
420	0.50	2.11	5.21		143.0	80.0
430	0.40	2.05	4.87		142.0	79.0
440	0.20	2.02	4.76		140.0	79.0
450	0.10	2.02	4.74		137.0	78.0
460	0.00	2.02	4.70		136.0	78.0

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 2

Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/16/17

Test Crew: B. Davis

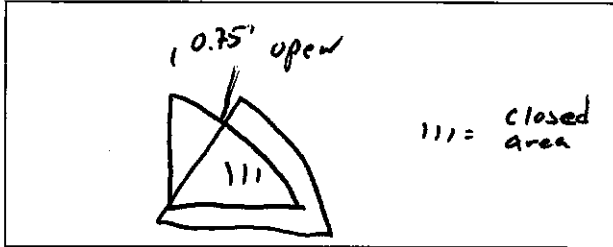
OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Run Notes

##### Air Control Settings

Primary:

Secondary: Fixed



Tertiary/Pilot: boost Air Not used

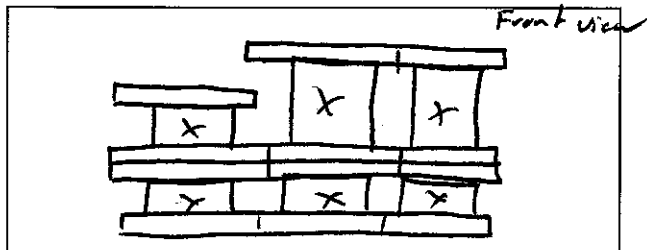
Fan: on high

##### Preburn Notes

Time	Notes
50	Leveled coal bed

##### Test Notes

Sketch test fuel configuration:



Start up procedures & Timeline:

Bypass: N/A

Fuel loaded by: 80 seconds

Door closed at: 90 seconds

Primary air: fully open until slow flow set to test setting

Notes: boost Air locked open @ 500 m.m. Then timed Air Activated @ 5:00 m.m. Fan off for 1st 30 min. then set to high for remainder of test

Time	Notes
60	changed front filter at trav. A.

Technician Signature: B. Davis

Date: 6/1/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 2  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/16/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Fuel Data

Fuel: Douglas fir, untreated and air dried, standard grade or better dimensional lumber

Pre-Burn Fuel					
<b>Calibration:</b>		Cal Value (1) = 12%	Actual Reading	<u>12</u>	
		Cal Value (2) = 22%	Actual Reading	<u>22</u>	
Piece:	Length:	Reading:	Piece:	Length:	Reading:
1	<u>8</u> in	<u>19.5</u>	7	_____ in	_____
2	<u>8</u> in	<u>20.6</u>	8	_____ in	_____
3	<u>8</u> in	<u>18.6</u>	9	_____ in	_____
4	_____ in	_____	10	_____ in	_____
5	_____ in	_____	11	_____ in	_____
6	_____ in	_____	12	_____ in	_____
Total Pre-Burn Fuel Weight:		<u>2.5</u>	Pre-Burn Fuel Average Moisture: <u>19.57</u>		
Time (clock): <u>0930</u>		Room Temperature (F): <u>70</u>		Initials: <u>BC</u>	

Test Fuel					
Firebox Volume (ft³):		<u>2.9</u>	Test Fuel Piece Length (in): <u>18</u>		
Load Weight Range (lb):		<u>20.3</u>	Total Wet Fuel Load Weight (lb): <u>19.3</u>		
		<u>18.3 - 22.3</u>			
Fuel Type & Amount: 2 x 4:		<u>4</u>	4 x 4:		<u>2</u>
Weight (with spacers):		<u>10.0</u>	Weight (with spacers):		<u>9.3</u>
Piece:	Weight (lbs):	Moisture Readings (%DB):			Fuel Type:
1	<u>2.2</u>	<u>19.9</u>	<u>19.4</u>	<u>20.8</u>	<u>2x4</u>
2	<u>2.2</u>	<u>19.0</u>	<u>19.3</u>	<u>19.8</u>	<u>2x4</u>
3	<u>2.2</u>	<u>20.1</u>	<u>21.0</u>	<u>19.9</u>	<u>2x4</u>
4	<u>1.7</u>	<u>20.2</u>	<u>18.6</u>	<u>21.3</u>	<u>2x4</u>
5	<u>4.1</u>	<u>22.8</u>	<u>21.9</u>	<u>22.5</u>	<u>4x4</u>
6	<u>4.8</u>	<u>19.8</u>	<u>19.1</u>	<u>18.7</u>	<u>4x4</u>
7	_____	_____	_____	_____	_____
Spacer Moisture Readings (%DB)					
<u>8.0</u>	<u>8.4</u>	<u>8.8</u>	<u>8.1</u>	<u>8.5</u>	<u>8.0</u>
<u>8.1</u>	<u>8.3</u>	<u>8.0</u>	<u>8.1</u>	<u>8.7</u>	<u>8.9</u>
<u>7.6</u>	<u>7.4</u>	<u>8.9</u>	<u>7.9</u>	<u>8.4</u>	<u>8.8</u>
<u>8.9</u>	<u>8.9</u>	<u>8.1</u>	<u>8.8</u>	<u>8.7</u>	<u>8.2</u>
Time (clock): <u>0930</u>		Room Temperature (F): <u>70</u>		Initials: <u>BC</u>	
245					

Technician Signature: B. Davis

Date: 6/1/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 2  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/16/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Supplemental Data

Start Time: 11:03 Booth #: 7

Stop Time: 1843

#### Stack Gas Leak Check:

Initial: good Final: good

#### Sample Train Leak Check:

A: 0.0 @ 10 "Hg  
 B: 0.0 @ 10 "Hg

Calibrations: Span Gas CO<sub>2</sub>: 15.96 CO: 5.08

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	$\phi$	$\phi$	<u>18:46</u>	<u>18:46</u>
CO <sub>2</sub>	<u>0.00</u>	<u>15.96</u>	<u>0.08</u>	<u>15.92</u>
CO	<u>0.000</u>	<u>5.082</u>	<u>0.020</u>	<u>5.064</u>

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: good Final: good

Stack Diameter (in): 6"

Induced Draft: 0.0

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 5/15/17 Initials: DL

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>28.07</u>	<u>28.14</u>	<u>28.16</u>
RH (%)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Ambient (°F)	<u>76</u>	<u>82</u>	<u>78</u>

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
1	<u>.050</u>	<u>90</u>
2	<u>.052</u>	<u>90</u>
3	<u>.062</u>	<u>90</u>
Y	<u>.058</u>	<u>90</u>
1	<u>.056</u>	<u>90</u>
2	<u>.060</u>	<u>89</u>
3	<u>.062</u>	<u>89</u>
Y	<u>.058</u>	<u>89</u>
Center:		
	<u>.060</u>	<u>90</u>
	<u>.062</u>	

Background Filter Volume: 81.404

Tunnel Static Pressure (in H <sub>2</sub> O):	
Beginning of Test	End of Test
<u>-0.59</u>	<u>-0.59</u>
<u>295</u>	

Technician Signature: B. Davis

Date: 6/1/17



*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Run 3**

### Wood Heater Test Results - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Project No.: 0061WS092E  
 Tracking No.: 2187  
 Run: 3  
 Test Date: 05/17/17

Burn Rate	<b>1.42 kg/hr dry</b>
Average Tunnel Temperature	97 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	16.83 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	10470.2 dscf/hour
Average Delta p	0.064 inches H2O
Total Time of Test	310 minutes

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - V <sub>m</sub>	54.613 cubic feet	41.789 cubic feet	42.617 cubic feet	7.893 cubic feet
Average Gas Meter Temperature	82 degrees Fahrenheit	89 degrees Fahrenheit	90 degrees Fahrenheit	89 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - V <sub>mstd</sub>	50.272 dscf	38.337 dscf	38.655 dscf	7.241 dscf
Total Particulates - m <sub>n</sub>	0.3 mg	3 mg	2.8 mg	1.7 mg
Particulate Concentration (dry-standard) - C <sub>p</sub> /C <sub>s</sub>	0.000006 grams/dscf	0.00008 grams/dscf	0.00007 grams/dscf	0.00023 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.32 grams	3.91 grams	3.60 grams	2.46 grams
Particulate Emission Rate	0.06 grams/hour	0.76 grams/hour	0.70 grams/hour	2.46 grams/hour
Emissions Factor		0.53 g/kg	0.49 g/kg	0.53 g/kg
Difference from Average Total Particulate Emissions		0.16 grams	0.16 grams	

**Dual Train Comparison Results Are Acceptable**

	FINAL AVERAGE RESULTS
<b>Complete Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	3.75 grams
Particulate Emission Rate	<b>0.73 grams/hour</b>
Emissions Factor	0.51 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	2.46 grams
Particulate Emission Rate	2.46 grams/hour
Emissions Factor	0.53 grams/kg

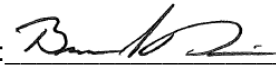
QUALITY CHECKS	
Filter Temps < 90 °F	OK
Filter Face Velocity (47 mm)	OK
Dryer Exit Temp < 80F	OK
Leakage Rate	OK
Ambient Temp (55-90°F)	OK
Negative Probe Weight Eval.	OK
Pro-Rate Variation	OK
Total PM Precision (%)	6.29
Train A - Train B G/KG ≤ 0.5	0.04
Stove Surface ΔT	OK

Technician Signature: 

# Wood Heater Preburn Data - ASTM E2780

**Run: 3**  
 Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 05/17/17  
 Beginning Clock Time: 09:32:00 AM

Coal Bed		
Range	<b>3.9</b>	<b>4.8</b>
(lb):	(min)	(max)

Technician Signature: 

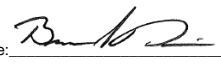
Temperatures (°F)										
Elapsed Time (min)	Scale (lb)	Stack Draft (in H <sub>2</sub> O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Avg. Firebox Surface	Stack	Ambient
0	8	-0.074	657	515	378	724	605	575.8	692	82
10	6.3	-0.065	544	541	348	715	589	547.4	485	83
20	5.6	-0.056	389	548	318	673	604	506.4	403	83
30	5.1	-0.048	325	547	293	628	579	474.4	342	82
40	4.8	-0.04	250	543	269	587	568	443.4	278	82
50	4.6	-0.037	217	539	252	555	538	420.2	253	82
60	4.5	-0.034	197	537	233	526	512	401	146	81
65	4.4	-0.033	189	535	224	508	520	395.2	142	81

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **3**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 05/17/17  
 Beginning Clock Time: 10:38  
 Total Sampling Time: 310 min  
 Recording Interval: 10 min  
 Background Sample Volume: 54.613 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

PM Control Modules: 371, 372  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.592 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.83 ft/sec.  
 Initial Tunnel Flow: 173.7 scfm  
 Average Tunnel Flow: 174.5 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 11 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 5 in. Hg  
 Average Test Piece Fuel Moisture: 21.58 Dry Basis %

Technician Signature: 

Barometric Pressure: Begin Middle End Average  
28.37 28.38 28.39 28.38 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.052	0.056	0.062	0.058	0.052	0.060	0.062	0.056	0.064
Temp:	95	95	95	95	95	95	95	95	95
$V_{strav}$	16.81				17.67			$F_p$ 0.951	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)												Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H₂O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
0	0.000	0.000			1.18	77	-0.42	0.97	78	-1.3	95	0.064			19.3		203	534	240	501	447	385	N/A	142	86	74	86	74	81	-0.039	3.18	0.93
10	1.283	1.324	0.13	0.13	1.53	78	-0.51	1.08	79	-1.2	109	0.064	98	99	17.5	-1.8	537	523	300	462	499	464	N/A	366	89	75	87	75	80	-0.091	15.22	0.67
20	2.577	2.659	0.13	0.13	1.59	80	-0.59	1.14	81	-1.4	122	0.064	100	101	14.5	-3	772	507	362	505	527	535	N/A	408	88	76	87	75	80	-0.096	16.8	0.5
30	3.895	4.019	0.13	0.14	1.59	82	-0.58	1.13	83	-1.4	118	0.064	101	102	12.1	-2.4	815	493	408	550	566	566	N/A	353	85	77	82	76	82	-0.090	15.45	0.29
40	5.219	5.380	0.13	0.14	1.58	84	-0.57	1.13	85	-1.4	117	0.064	101	102	10.0	-2.1	554	481	271	579	584	494	N/A	332	87	78	84	77	83	-0.087	15.17	0.72
50	6.555	6.744	0.13	0.14	1.59	86	-0.55	1.14	86	-1.6	114	0.064	101	101	8.2	-1.8	491	473	255	600	600	484	N/A	304	88	80	85	78	83	-0.084	13.73	0.41
60	7.893	8.111	0.13	0.14	1.59	87	-0.54	1.13	88	-1.6	110	0.064	101	101	6.8	-1.4	440	467	250	612	612	476	N/A	276	87	80	85	79	84	-0.079	12.29	0.22
70	9.240	9.481	0.13	0.14	1.60	88	-0.52	1.13	89	-1.3	107	0.064	101	101	5.6	-1.2	414	461	249	617	618	472	N/A	264	83	79	84	77	84	-0.077	11.6	0.14
80	10.591	10.853	0.14	0.14	1.59	88	-0.52	1.13	89	-1.4	105	0.064	101	101	4.8	-0.8	365	458	248	612	613	459	N/A	233	83	78	84	75	84	-0.069	9.21	0.43
90	11.944	12.228	0.14	0.14	1.59	89	-0.51	1.14	90	-1.4	102	0.064	101	100	4.2	-0.6	321	455	245	598	606	445	N/A	215	83	78	83	75	83	-0.066	9.17	0.33
100	13.297	13.604	0.14	0.14	1.61	89	-0.51	1.15	90	-1.4	99	0.064	100	100	3.7	-0.5	306	453	244	580	600	437	N/A	202	82	78	83	75	84	-0.063	8.31	0.41
110	14.652	14.982	0.14	0.14	1.60	90	-0.51	1.15	91	-1.4	97	0.064	100	100	3.4	-0.3	268	452	237	555	579	418	N/A	181	82	77	82	75	83	-0.058	6.58	0.95
120	16.007	16.360	0.14	0.14	1.60	90	-0.5	1.15	91	-1.4	95	0.064	100	100	3.3	-0.1	239	449	231	532	528	396	N/A	168	81	77	81	75	83	-0.055	5.99	1.19
130	17.365	17.740	0.14	0.14	1.60	90	-0.51	1.14	91	-1.5	94	0.064	100	100	3.0	-0.3	220	444	227	515	505	382	N/A	160	80	77	81	75	83	-0.053	5.95	1.16
140	18.722	19.119	0.14	0.14	1.61	90	-0.5	1.15	92	-1.3	93	0.064	100	100	2.7	-0.3	212	438	225	501	498	375	N/A	158	80	77	80	75	82	-0.052	5.89	1.21
150	20.082	20.499	0.14	0.14	1.60	90	-0.5	1.14	92	-1.3	92	0.064	100	100	2.6	-0.1	206	433	222	489	485	367	N/A	153	80	77	80	75	83	-0.051	5.62	1.3
160	21.438	21.879	0.14	0.14	1.61	90	-0.5	1.14	92	-1.3	92	0.064	100	100	2.4	-0.2	200	427	219	479	476	360	N/A	153	79	76	79	75	83	-0.050	5.83	1.2
170	22.792	23.259	0.14	0.14	1.60	90	-0.51	1.15	92	-1.3	92	0.064	100	100	2.2	-0.2	197	423	216	472	471	356	N/A	151	79	76	79	74	83	-0.050	6	1.08
180	24.152	24.639	0.14	0.14	1.61	91	-0.5	1.14	92	-1.3	92	0.064	100	100	2.0	-0.2	196	420	214	467	467	353	N/A	151	79	76	79	74	82	-0.049	5.75	1.15
190	25.511	26.020	0.14	0.14	1.60	91	-0.5	1.14	92	-1.3	91	0.064	100	100	1.8	-0.2	192	418	211	461	462	349	N/A	147	79	76	79	75	82	-0.050	5.44	1.17
200	26.871	27.401	0.14	0.14	1.61	91	-0.5	1.15	92	-1.4	91	0.064	100	100	1.6	-0.2	188	415	207	452	454	343	N/A	145	79	76	79	75	82	-0.049	5.11	1.41
210	28.228	28.782	0.14	0.14	1.61	92	-0.49	1.14	93	-1.6	91	0.064	99	99	1.3	-0.3	184	413	203	446	445	338	N/A	143	79	76	79	75	82	-0.048	4.96	1.49
220	29.581	30.163	0.14	0.14	1.61	92	-0.5	1.15	93	-1.6	91	0.064	99	99	1.2	-0.1	181	409	200	440	438	334	N/A	142	78	76	78	75	82	-0.048	4.76	1.61
230	30.942	31.545	0.14	0.14	1.60	92	-0.49	1.14	93	-1.3	90	0.064	100	99	1.1	-0.1	176	406	199	434	431	329	N/A	138	78	76	78	75	82	-0.048	4.51	1.72
240	32.298	32.927	0.14	0.14	1.61	92	-0.49	1.15	93	-1.4	89	0.064	99	99	0.9	-0.2	173	401	198	424	425	324	N/A	137	78	76	78	74	82	-0.048	4.38	1.69
250	33.655	34.310	0.14	0.14	1.61	91	-0.49	1.15	93	-1.4	89	0.064	99	99	0.8	-0.1	171	396	195	414	419	319	N/A	137	78	76	78	74	82	-0.047	3.83	1.86
260	35.016	35.693	0.14	0.14	1.61	91	-0.5	1.15	92	-1.4	89	0.064	100	99	0.6	-0.2	168	390	192	404	409	313	N/A	134	78	76	78	74	82	-0.046	3.76	1.83
270	36.370	37.077	0.14	0.14	1.61	91	-0.5	1.15	92	-1.6	87	0.064	99	99	0.5	-0.1	163	384	188	394	398	305	N/A	131	77	76	77	74	81	-0.046	3.57	1.83
280	37.726	38.462	0.14	0.14	1.60	90	-0.5	1.15	92	-1.4	87	0.064	99	99	0.4	-0.1	161	378	186	384	382	298	N/A	129	77	76	77	74	81	-0.046	3.64	1.89
290	39.079	39.847	0.14	0.14	1.62	90	-0.49	1.14	92	-1.4	87	0.064	99	99	0.2	-0.2	159	373	185	378	387	296	N/A	132	77	76	77	74	81	-0.046	3.65	1.87
300	40.434	41.232	0.14	0.14	1.62	90	-0.5	1.16	91	-1.4	87	0.064	99	100	0.1	-0.1	157	369	183	372	390	294	N/A	130	77	76	77	74	81	-0.045	3.73	1.75
310	41.789	42.617	0.14	0.14	1.62	90	-0.5	1.15	91	-1.6	87	0.064	99	100	0.0	-0.1	156	365	184	368	387	292	N/A	130	77	76	76	74	81	-0.044	3.3	1.8
Avg/Tot	41.789	42.617	0.13	0.14	1.59	89		1.14	90		97	0.064	100	100								93.0			77	81	75	82	-0.058			

### Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home      Equipment Numbers: \_\_\_\_\_  
 Model: 57ST-ACC-C \_\_\_\_\_  
 Tracking No.: 2187 \_\_\_\_\_  
 Project No.: 0061WS092E \_\_\_\_\_  
 Run #: 3 \_\_\_\_\_  
 Date: 5/17/17 \_\_\_\_\_

**TRAIN 1 (First Hour emissions)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D180	121.8	120.1	1.7
C. Rear filter catch	Filter				0.0
D. Probe catch*	Probe				0.0
E. Filter seals catch*	Seals				0.0

**Sub-Total**    Total Particulate, mg:    **1.7**

**TRAIN 1 (Post First Hour Change-out)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D181	122.1	121.7	0.4
C. Rear filter catch	Filter	D182	123.8	123.8	0.0
D. Probe catch*	Probe	11	114189.6	114189.0	0.6
E. Filter seals catch*	Seals	R473	3532.4	3532.1	0.3

**Sub-Total**    Total Particulate, mg:    **1.3**

**Train 1 Aggregate**    Total Particulate, mg:    **3.0**

**TRAIN 2**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	D183	126.3	124.1	2.2
B. Rear filter catch	Filter	D184	120.0	120.2	-0.2
C. Probe catch*	Probe	13	114323.0	114322.9	0.1
D. Filter seals catch*	Seals	R474	3376.5	3375.8	0.7

Total Particulate, mg:    **2.8**

**AMBIENT**

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	D74	124.0	123.7	0.3

Total Particulate, mg:    **0.3**

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight.

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Technician Signature: 

### Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: **Hearth & Home**  
 Model: **57ST-ACC-C**  
 Tracking No.: **2187**  
 Project No.: **0061WS092E**  
 Test Date: **5/17/2017**  
 Run No.: **3**

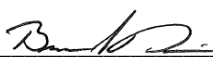
Firebox Volume (ft <sup>3</sup> ):	2.95
Fuel Piece Length (in):	19
2x4 Crib Weight (lb):	9.5
4x4 Crib Weight (lb):	9.8

<b>Total Fuel Weight (Dry Basis, lb):</b>	16.1	
Fuel Density (lb/ft <sup>3</sup> , Dry Basis):	27.79	OK
Loading Density (lb/ft <sup>3</sup> , Wet Basis):	6.54	OK
2x4 Percentage:	49%	OK

Coal Bed Range (20-25%): **3.86 - 4.825**

Test Fuel Piece	Weight (lb)	Size	Readings (Dry Basis %)			Dry Weight (lb)
1	1.7	2"x 4"	24.7	24.8	24.8	1.36
2	2.2	2"x 4"	20.5	24.6	18.4	1.82
3	1.8	2"x 4"	19.5	19.2	23.8	1.49
4	2.2	2"x 4"	19.7	18.7	18.7	1.85
5	4.3	4"x 4"	22.6	20.4	22.1	3.53
6	4.7	4"x 4"	21.6	22.0	22.3	3.85

Spacer Readings (Dry Basis %)			
8.0	8.8		
8.9	8.9		
7.6	7.6		
8.4	7.7		
7.9	8.0		
8.5	8.0		
8.4	7.8		
8.5	8.1		
7.9	8.4		
8.3	8.4		
8.5	8.0		
8.4			
7.7			

Technician Signature: 

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Hearth & Home  
**Model:** 57ST-ACC-C  
**Date:** 05/17/17  
**Run:** 3  
**Control #:** 0061WS092E  
**Test Duration:** 310  
**Output Category:** 3

**Technicians:** *B. B. D.*  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	78.0%	84.3%
Combustion Efficiency	94.6%	94.6%
Heat Transfer Efficiency	82%	89.2%

Output Rate (kJ/h)	21,546	20,439	(Btu/h)
Burn Rate (kg/h)	1.39	3.07	(lb/h)
Input (kJ/h)	27,616	26,196	(Btu/h)

Test Load Weight (dry kg)	7.20	15.87	dry lb
MC wet (%)	17.75		
MC dry (%)	21.58		
Particulate (g)	3.75		
CO (g)	546		
Test Duration (h)	5.17		

Emissions	Particulate	CO
g/MJ Output	0.03	4.90
g/kg Dry Fuel	0.52	75.77
g/h	0.73	105.62
lb/MM Btu Output	0.08	11.39

Air/Fuel Ratio (A/F)	14.48
----------------------	-------

VERSION:                      2.2                      12/14/2009

VERSION: 2.2 12/14/2009

Manufacturer: Hearth & Home

Model: 57ST-ACC-C

Date: 5/17/2017

Run: 3

Control #: 0061WS092E

Test Duration: 310

Output Category: 3

Appliance Type: Non-Cat (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)

Weight Units lb (kg or lb)

Wood Moisture (% wet): 17.75  
 Load Weight (lb wet): 19.30  
 Burn Rate (dry kg/h): 1.39  
 Total Particulate Emissions: 3.75 g

Fuel Data

D. Fir

HHV 19,810 kj/kg  
 %C 48.73  
 %H 6.87  
 %O 43.9  
 %ASH 0.5

Averages 1.13 7.28 #DIV/0! 192.03 82.22

Temp. (°F)

Elapsed Time (min) Fuel Weight Remaining (lb) Flue Gas Composition (%) CO CO<sub>2</sub> O<sub>2</sub> Flue Gas Room Temp

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO <sub>2</sub>	O <sub>2</sub>	Flue Gas	Room Temp
0	19.30	0.93	3.18		142.0	81.0
10	17.50	0.67	15.22		366.0	80.0
20	14.50	0.50	16.80		408.0	80.0
30	12.10	0.29	15.45		353.0	82.0
40	10.00	0.72	15.17		332.0	83.0
50	8.20	0.41	13.73		304.0	83.0
60	6.80	0.22	12.29		276.0	84.0
70	5.60	0.14	11.60		264.0	84.0
80	4.80	0.43	9.21		233.0	84.0
90	4.20	0.33	9.17		215.0	83.0
100	3.70	0.41	8.31		202.0	84.0
110	3.40	0.95	6.58		181.0	83.0
120	3.30	1.19	5.99		168.0	83.0
130	3.00	1.16	5.95		160.0	83.0
140	2.70	1.21	5.89		158.0	82.0
150	2.60	1.30	5.62		153.0	83.0
160	2.40	1.20	5.83		153.0	83.0
170	2.20	1.08	6.00		151.0	83.0
180	2.00	1.15	5.75		151.0	82.0
190	1.80	1.17	5.44		147.0	82.0
200	1.60	1.41	5.11		145.0	82.0
210	1.30	1.49	4.96		143.0	82.0
220	1.20	1.61	4.76		142.0	82.0
230	1.10	1.72	4.51		138.0	82.0
240	0.90	1.69	4.38		137.0	82.0
250	0.80	1.86	3.83		137.0	82.0
260	0.60	1.83	3.76		134.0	82.0
270	0.50	1.83	3.57		131.0	81.0
280	0.40	1.89	3.64		129.0	81.0
290	0.20	1.87	3.65		132.0	81.0
300	0.10	1.75	3.73		130.0	81.0
310	0.00	1.80	3.80		130.0	81.0



Client: Hearth & Home Project Number: 0061WS092E Run Number: 3

Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/17/17

Test Crew: B. Davis

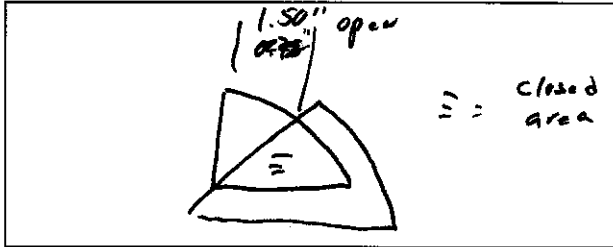
OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Run Notes**

**Air Control Settings**

Primary:

Secondary: fixed



Tertiary/Pilot: no Boost Air not used

Fan: on high entire pre heat

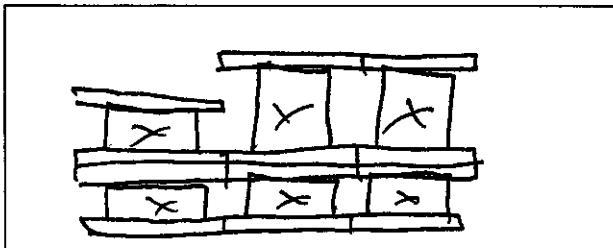
**Preburn Notes**

Time	Notes
50	Levelled coal bed

**Test Notes**

Sketch test fuel configuration:

Start up procedures & Timeline:



Bypass: N/A  
 Fuel loaded by: 47 seconds  
 Door closed at: 95 seconds  
 Primary air: Fully open until 5:00 then set to test setting  
 Notes: boost Air locked open @ 0 min. then set to fixed Air @ 5:00  
FAN off for first 30 min then set to high for remainder of test

Time	Notes
60	changed front filter in train A.

Technician Signature: [Signature]

Date: 6/1/17

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 3  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/17/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Fuel Data**

Fuel: Douglas fir, untreated and air dried, standard grade or better dimensional lumber

**Pre-Burn Fuel**

**Calibration:** Cal Value (1) = 12% Actual Reading 12  
 Cal Value (2) = 22% Actual Reading 22

Piece:	Length:	Reading:	Piece:	Length:	Reading:
1	<u>8</u> in	<u>220</u>	7	_____ in	_____
2	<u>8</u> in	<u>249</u>	8	_____ in	_____
3	<u>8</u> in	<u>221</u>	9	_____ in	_____
4	_____ in	_____	10	_____ in	_____
5	_____ in	_____	11	_____ in	_____
6	_____ in	_____	12	_____ in	_____

Total Pre-Burn Fuel Weight: 2.2 Pre-Burn Fuel Average Moisture: 230  
 Time (clock): 0900 Room Temperature (F): 70 Initials: MD

**Test Fuel**

Firebox Volume (ft³): 2.9 Test Fuel Piece Length (in): 19"  
 Load Weight Range (lb): 20.3 Total Wet Fuel Load Weight (lb): 19.3  
11.3 22.3

Fuel Type & Amount: 2 x 4: 4 4 x 4: 2  
 Weight (with spacers): 9.5 Weight (with spacers): 9.8

Piece:	Weight (lbs):	Moisture Readings (%DB):				Fuel Type:
1	<u>1.7</u>	<u>24.7</u>	<u>24.8</u>	<u>24.8</u>	<u>2x4</u>	
2	<u>2.2</u>	<u>20.5</u>	<u>24.6</u>	<u>18.4</u>	<u>2x4</u>	
3	<u>1.8</u>	<u>19.5</u>	<u>19.2</u>	<u>23.8</u>	<u>2x4</u>	
4	<u>2.2</u>	<u>19.7</u>	<u>18.7</u>	<u>18.7</u>	<u>2x4</u>	
5	<u>4.3</u>	<u>22.6</u>	<u>20.4</u>	<u>22.1</u>	<u>4x4</u>	
6	<u>4.7</u>	<u>21.6</u>	<u>22.0</u>	<u>22.3</u>	<u>4x4</u>	
7	_____	_____	_____	_____	_____	

**Spacer Moisture Readings (%DB)**

<u>8.0</u>	<u>7.9</u>	<u>7.9</u>	<u>7.7</u>	<u>7.7</u>	<u>8.1</u>	_____	_____
<u>8.9</u>	<u>8.5</u>	<u>8.3</u>	<u>8.8</u>	<u>8.0</u>	<u>8.4</u>	_____	_____
<u>7.6</u>	<u>8.4</u>	<u>8.5</u>	<u>8.9</u>	<u>8.0</u>	<u>8.4</u>	_____	_____
<u>8.4</u>	<u>8.5</u>	<u>8.4</u>	<u>7.6</u>	<u>7.8</u>	<u>8.0</u>	_____	_____

Time (clock): 0900 Room Temperature (F): 70 Initials: MD

Technician Signature: [Signature] Date: 6/1/17

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 3

Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/13/17

Test Crew: B. Davis

OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Supplemental Data**

Start Time: 10:38

Booth #: 7

Stop Time: 15:48

**Stack Gas Leak Check:**

Initial: good Final: good

**Sample Train Leak Check:**

A: 0.0 @ 11 "Hg

B: 0.0 @ 5 "Hg

Calibrations: Span Gas CO<sub>2</sub>: 15.96 CO: 5.08

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	<u>∅</u>	<u>∅</u>	<u>15:55</u>	<u>15:55</u>
CO <sub>2</sub>	<u>0.00</u>	<u>16.00</u>	<u>0.05</u>	<u>15.97</u>
CO	<u>0.000</u>	<u>5.08</u>	<u>0.013</u>	<u>5.07</u>

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: good Final: good

Stack Diameter (in): 6"

Induced Draft: 0.0

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 5/15/17 Initials: bn

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>28.44</u> <sup>37</sup>	<u>28.38</u>	<u>28.39</u>
RH (%)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Ambient (°F)	<u>81</u>	<u>83</u>	<u>81</u>

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
1	<u>.052</u>	<u>95</u>
2	<u>.056</u>	<u>95</u>
3	<u>.062</u>	<u>95</u>
4	<u>.058</u>	<u>95</u>
1	<u>.052</u>	<u>95</u>
2	<u>.060</u>	<u>95</u>
3	<u>.062</u>	<u>95</u>
4	<u>.056</u>	<u>95</u>
Center:		
	<u>.064</u>	<u>95</u>

Background Filter Volume: 54.613

Tunnel Static Pressure (in H <sub>2</sub> O):	
Beginning of Test	End of Test
<u>-.592</u>	<u>-.592</u>
<u>-.296</u>	

Technician Signature: [Signature]

Date: 5/11/17

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Run 4**

### Wood Heater Test Results - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Project No.: 0061WS092E  
 Tracking No.: 2187  
 Run: 4  
 Test Date: 5/18/17

Burn Rate	<b>3.13 kg/hr dry</b>
Average Tunnel Temperature	119 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	16.57 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9974.9 dscf/hour
Average Delta p	0.060 inches H2O
Total Time of Test	135 minutes

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - V <sub>m</sub>	24.196 cubic feet	17.460 cubic feet	17.902 cubic feet	7.713 cubic feet
Average Gas Meter Temperature	85 degrees Fahrenheit	85 degrees Fahrenheit	85 degrees Fahrenheit	85 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - V <sub>mstd</sub>	22.277 dscf	16.199 dscf	16.473 dscf	7.156 dscf
Total Particulates - m <sub>T</sub>	0.5 mg	10.1 mg	8.6 mg	7.4 mg
Particulate Concentration (dry-standard) - C <sub>p</sub> /C <sub>s</sub>	0.000022 grams/dscf	0.00062 grams/dscf	0.00052 grams/dscf	0.00103 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.50 grams	13.49 grams	11.21 grams	10.32 grams
Particulate Emission Rate	0.22 grams/hour	6.00 grams/hour	4.98 grams/hour	10.32 grams/hour
Emissions Factor		1.92 g/kg	1.59 g/kg	1.80 g/kg
Difference from Average Total Particulate Emissions		1.14 grams	1.14 grams	

**Dual Train Comparison Results Are Acceptable**

	FINAL AVERAGE RESULTS
<b>Complete Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	12.35 grams
Particulate Emission Rate	<b>5.49 grams/hour</b>
Emissions Factor	1.75 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	10.32 grams
Particulate Emission Rate	10.32 grams/hour
Emissions Factor	1.80 grams/kg


QUALITY CHECKS	
Filter Temps < 90 °F	OK
Filter Face Velocity (47 mm)	OK
Dryer Exit Temp < 80F	OK
Leakage Rate	OK
Ambient Temp (55-90°F)	OK
Negative Probe Weight Eval.	OK
Pro-Rate Variation	OK
Total PM Precision (%)	13.82
Train A - Train B G/KG ≤ 0.5	0.32
Stove Surface ΔT	OK

Technician Signature: 

# Wood Heater Preburn Data - ASTM E2780

**Run: 4**  
 Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 5/18/17  
 Beginning Clock Time: 09:47:00 AM

Coal Bed		
Range	<b>3.8</b>	<b>4.7</b>
(lb):	(min)	(max)

Technician Signature: 

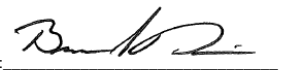
Temperatures (°F)										
Elapsed Time (min)	Scale (lb)	Stack Draft (in H <sub>2</sub> O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Avg. Firebox Surface	Stack	Ambient
0	20.7	-0.067	435	426	491	575	591	503.6	415	78
10	17.3	-0.089	535	456	312	581	556	488	752	80
20	13.6	-0.09	604	476	313	619	561	514.6	782	81
30	9.9	-0.09	652	497	331	668	597	549	792	82
40	7	-0.086	629	520	340	708	645	568.4	726	83
50	5.5	-0.076	525	539	340	738	684	565.2	593	84
60	4.8	-0.067	387	555	332	728	695	539.4	483	84
70	4.4	-0.06	300	574	318	683	608	496.6	392	83
72	4.4	-0.058	288	577	315	671	601	490.4	383	83

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **4**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 5/18/17  
 Beginning Clock Time: 11:00  
 Total Sampling Time: 135 min  
 Recording Interval: 5 min  
 Background Sample Volume: 24.196 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

PM Control Modules: 371, 372  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.574 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.57 ft/sec.  
 Initial Tunnel Flow: 165.2 scfm  
 Average Tunnel Flow: 166.2 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 8 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 7 in. Hg  
 Average Test Piece Fuel Moisture: 24.12 Dry Basis %

Technician Signature: 

Barometric Pressure: Begin Middle End Average  
28.50 28.53 28.55 28.53 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.054	0.058	0.058	0.056	0.050	0.050	0.056	0.050	0.060	"H2O
Temp:	127	126	124	123	122	120	117	115	125	°F
	V <sub>strav</sub> 16.67 ft/sec				V <sub>scent</sub> 17.52 ft/sec				F <sub>p</sub> 0.952	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)												Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
0	0	0			1.22	78	-0.19	0.6	78	-0.9	122	0.060			18.9		284	577	314	668	600	489	N/A	385	85	65	85	64	83	(0)	5	0
5	0.636	0.659	0.13	0.13	1.56	78	-0.55	1.1	79	-1.5	121	0.060	100	101	17.7	-1.2	431	578	294	634	579	503	N/A	722	87	71	87	70	84	-0.102	16.83	1.14
10	1.271	1.316	0.13	0.13	1.57	79	-0.58	1.07	80	-1.2	133	0.060	101	101	16.0	-1.7	564	575	300	623	618	536	N/A	778	88	72	87	71	84	-0.105	17.63	1.94
15	1.906	1.97	0.13	0.13	1.63	81	-0.64	1.07	81	-1.3	140	0.060	101	101	14.0	-2	621	570	311	624	613	548	N/A	798	88	73	88	71	85	-0.106	17.65	2.62
20	2.551	2.62	0.13	0.13	1.57	82	-0.61	1.08	83	-1.5	144	0.060	102	100	11.9	-2.1	648	563	321	640	620	558	N/A	790	89	74	90	72	85	-0.105	17.44	3.05
25	3.193	3.28	0.13	0.13	1.56	83	-0.62	1.08	84	-1.5	145	0.060	102	102	10.0	-1.9	664	557	325	664	632	568	N/A	779	88	74	90	73	85	-0.104	17.36	2.8
30	3.834	3.939	0.13	0.13	1.54	85	-0.7	1.07	85	-1.3	143	0.060	101	101	8.2	-1.8	673	551	331	698	652	581	N/A	756	89	75	89	73	86	-0.104	17.26	2.2
35	4.473	4.596	0.13	0.13	1.54	86	-0.72	1.08	86	-1.4	140	0.060	100	101	6.7	-1.5	659	545	344	737	679	593	N/A	737	86	76	88	74	86	-0.103	16.81	0.76
40	5.112	5.253	0.13	0.13	1.54	87	-0.73	1.08	87	-1.5	136	0.060	100	100	5.6	-1.1	611	541	358	777	710	599	N/A	679	87	77	87	74	87	-0.1	15.07	0.35
45	5.765	5.913	0.13	0.13	1.59	87	-0.76	1.08	87	-1.3	130	0.060	102	100	4.9	-0.7	548	538	371	805	738	600	N/A	614	86	78	86	74	88	-0.095	12.64	0.18
50	6.418	6.572	0.13	0.13	1.59	87	-0.75	1.08	87	-1.3	125	0.060	101	99	4.1	-0.8	499	538	385	808	758	598	N/A	569	85	78	86	74	87	-0.091	11.33	0.12
55	7.065	7.234	0.13	0.13	1.57	87	-0.7	1.09	86	-1.3	121	0.060	100	100	3.6	-0.5	456	539	391	800	767	591	N/A	536	85	78	85	75	87	-0.089	10.44	0.06
60	7.713	7.898	0.13	0.13	1.57	87	-0.68	1.09	86	-1.3	118	0.060	100	100	3.2	-0.4	427	541	390	789	769	583	N/A	517	84	78	85	75	87	-0.089	9.97	0.04
65	8.38	8.563	0.13	0.13	1.65	87	-0.52	1.1	86	-1.3	117	0.060	103	100	2.7	-0.5	402	545	388	776	767	576	N/A	500	85	78	84	74	86	-0.086	9.17	0.04
70	9.047	9.229	0.13	0.13	1.55	87	-0.44	1.1	86	-1.3	115	0.060	102	100	2.3	-0.4	373	549	374	755	763	563	N/A	488	85	78	83	74	86	-0.085	8.73	0.09
75	9.697	9.897	0.13	0.13	1.56	87	-0.43	1.1	86	-1.3	113	0.060	100	100	2.0	-0.3	358	551	359	735	748	550	N/A	476	85	77	83	74	86	-0.083	8.34	0.1
80	10.345	10.564	0.13	0.13	1.54	86	-0.43	1.1	85	-1.3	111	0.060	99	100	1.8	-0.2	341	554	348	715	734	538	N/A	454	84	77	82	74	85	-0.081	7.74	0.29
85	10.995	11.231	0.13	0.13	1.54	86	-0.43	1.1	85	-1.3	109	0.060	100	100	1.4	-0.4	318	556	338	696	715	525	N/A	430	84	77	83	74	85	-0.079	7.03	0.34
90	11.645	11.898	0.13	0.13	1.56	86	-0.43	1.1	85	-1.3	108	0.060	99	100	1.2	-0.2	301	558	329	679	701	514	N/A	413	85	76	83	74	85	-0.077	6.78	0.42
95	12.291	12.566	0.13	0.13	1.56	86	-0.43	1.1	85	-1.3	106	0.060	99	100	1.1	-0.1	287	558	321	664	686	503	N/A	404	85	76	84	74	85	-0.077	6.63	0.51
100	12.939	13.234	0.13	0.13	1.56	86	-0.43	1.11	85	-1.3	105	0.060	99	99	1.0	-0.1	276	557	315	650	671	494	N/A	393	84	75	84	74	84	-0.076	6.47	0.58
105	13.586	13.901	0.13	0.13	1.56	86	-0.44	1.1	84	-1.3	104	0.060	99	99	0.9	-0.1	267	556	309	638	661	486	N/A	387	84	75	84	73	84	-0.074	6.28	0.62
110	14.234	14.569	0.13	0.13	1.56	86	-0.43	1.1	84	-1.3	103	0.060	99	99	0.8	-0.1	260	554	304	627	650	479	N/A	381	83	74	83	73	83	-0.074	6.29	0.61
115	14.88	15.235	0.13	0.13	1.55	86	-0.43	1.1	84	-1.3	103	0.060	98	99	0.6	-0.2	256	551	302	619	639	473	N/A	379	83	74	83	73	83	-0.074	6.02	0.64
120	15.522	15.902	0.13	0.13	1.55	86	-0.43	1.1	85	-1.3	102	0.060	98	99	0.4	-0.2	252	548	297	611	631	468	N/A	372	83	74	83	73	83	-0.072	6.05	0.66
125	16.169	16.569	0.13	0.13	1.55	87	-0.43	1.1	85	-1.3	102	0.060	98	99	0.3	-0.1	248	545	295	604	623	463	N/A	368	83	74	83	72	83	-0.072	5.92	0.65
130	16.814	17.235	0.13	0.13	1.55	87	-0.43	1.08	86	-1.3	102	0.060	98	99	0.1	-0.2	245	542	292	597	631	461	N/A	367	83	73	82	73	83	-0.072	5.9	0.61
135	17.46	17.902	0.13	0.13	1.55	87	-0.43	1.09	87	-1.3	102	0.060	98	99	0.0	-0.1	242	539	290	591	626	458	N/A	361	83	74	82	73	83	-0.071	5.7	0.66
Avg/Tot	17.460	17.902	0.13	0.13	1.55	85		1.07	85		119	0.060	100	100								31.0				75	85	73	85	-0.086		

### Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home      Equipment Numbers: \_\_\_\_\_  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Run #: 4  
 Date: 5/18/17

**TRAIN 1 (First Hour emissions)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D186	131.1	123.7	7.4
C. Rear filter catch	Filter				0.0
D. Probe catch*	Probe				0.0
E. Filter seals catch*	Seals				0.0

**Sub-Total**    Total Particulate, mg:    7.4

**TRAIN 1 (Post First Hour Change-out)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D187	121.6	120.8	0.8
C. Rear filter catch	Filter	D188	121.7	121.8	-0.1
D. Probe catch*	Probe	15	114345.8	114344.0	1.8
E. Filter seals catch*	Seals	R475	3290.3	3290.1	0.2

**Sub-Total**    Total Particulate, mg:    2.7

**Train 1 Aggregate**    Total Particulate, mg:    10.1

**TRAIN 2**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	D189	130.6	123.8	6.8
B. Rear filter catch	Filter	D190	120.7	120.4	0.3
C. Probe catch*	Probe	18	114404.6	114403.2	1.4
D. Filter seals catch*	Seals	R476	4315.3	4315.2	0.1

Total Particulate, mg:    8.6

**AMBIENT**

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	D75	121.3	120.8	0.5

Total Particulate, mg:    0.5

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight.

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Technician Signature: 



### Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: **Hearth & Home**  
 Model: **57ST-ACC-C**  
 Tracking No.: **2187**  
 Project No.: **0061WS092E**  
 Test Date: **5/18/17**  
 Run No.: **4**


Firebox Volume (ft <sup>3</sup> ):	2.95
Fuel Piece Length (in):	19
2x4 Crib Weight (lb):	9.1
4x4 Crib Weight (lb):	9.8

<b>Total Fuel Weight (Dry Basis, lb):</b>	15.5	
Fuel Density (lb/ft <sup>3</sup> , Dry Basis):	26.39	OK
Loading Density (lb/ft <sup>3</sup> , Wet Basis):	6.41	OK
2x4 Percentage:	48%	OK

Coal Bed Range (20-25%): **3.78 - 4.725**

Test Fuel Piece	Weight (lb)	Size	Readings (Dry Basis %)			Dry Weight (lb)
1	1.8	2"x 4"	24.5	24.7	21.9	1.46
2	2.1	2"x 4"	24.5	23.5	22.0	1.70
3	1.8	2"x 4"	24.8	24.1	24.7	1.45
4	1.8	2"x 4"	24.3	24.3	24.5	1.45
5	4.4	4"x 4"	22.8	23.8	25.5	3.55
6	4.5	4"x 4"	24.9	25.0	24.4	3.61

Spacer Readings (Dry Basis %)			
7.9	8.0		
7.3	7.8		
6.7	8.4		
8.4	7.4		
7.6	8.5		
8.4	8.4		
8.1	8.1		
8.2	7.9		
7.8	8.4		
7.8	7.8		
7.8	7.1		
8.0			
7.9			

Technician Signature: 

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Hearth & Home  
**Model:** 57ST-ACC-C  
**Date:** 05/18/17  
**Run:** 4  
**Control #:** 0061WS092E  
**Test Duration:** 135  
**Output Category:** 4

**Technicians:** *B. [Signature]*  
 \_\_\_\_\_  
 \_\_\_\_\_

### Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	66.3%	71.7%
Combustion Efficiency	93.2%	93.2%
Heat Transfer Efficiency	71%	77.0%

Output Rate (kJ/h)	40,358	38,284	(Btu/h)
Burn Rate (kg/h)	3.07	6.77	(lb/h)
Input (kJ/h)	60,831	57,705	(Btu/h)

Test Load Weight (dry kg)	6.91	15.23	dry lb
MC wet (%)	19.43		
MC dry (%)	24.12		
Particulate (g)	12.35		
CO (g)	646		
Test Duration (h)	2.25		

Emissions	Particulate	CO
g/MJ Output	0.14	7.11
g/kg Dry Fuel	1.79	93.45
g/h	5.49	286.96
lb/MM Btu Output	0.32	16.52

Air/Fuel Ratio (A/F)	10.99
----------------------	-------

VERSION: 2.2 12/14/2009

VERSION: 2.2

12/14/2009

Manufacturer: **Hearth & Home**

Model: **57ST-ACC-C**

Date: **5/18/2017**

Run: **4**

Control #: **0061WS092E**

Test Duration: **135**

Output Category: **4**

Appliance Type: **Non-Cat** (Cat, Non-Cat, Pellet)

Temp. Units **F** (F or C)

Weight Units **lb** (kg or lb)

Wood Moisture (% wet): **19.43**  
 Load Weight (lb wet): **18.90**  
 Burn Rate (dry kg/h): **3.07**  
 Total Particulate Emissions: **12.35 g**

**Fuel Data**

**D. Fir**

HHV **19,810** kj/kg

%C **48.73**

%H **6.87**

%O **43.9**

%ASH **0.5**

Averages **0.80 10.29 #DIV/0! 529.75 84.93**  
 Temp. (°F)

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%)			Flue Gas	Room Temp
		CO	CO <sub>2</sub>	O <sub>2</sub>		
0	18.90	0.38	4.67		385.0	83.0
5	17.70	1.14	16.83		722.0	84.0
10	16.00	1.94	17.63		778.0	84.0
15	14.00	2.62	17.65		798.0	85.0
20	11.90	3.05	17.44		790.0	85.0
25	10.00	2.80	17.36		779.0	85.0
30	8.20	2.20	17.26		756.0	86.0
35	6.70	0.76	16.81		737.0	86.0
40	5.60	0.35	15.07		679.0	87.0
45	4.90	0.18	12.64		614.0	88.0
50	4.10	0.12	11.33		569.0	87.0
55	3.60	0.06	10.44		536.0	87.0
60	3.20	0.04	9.97		517.0	87.0
65	2.70	0.04	9.17		500.0	86.0
70	2.30	0.09	8.73		488.0	86.0
75	2.00	0.10	8.34		476.0	86.0
80	1.80	0.29	7.74		454.0	85.0
85	1.40	0.34	7.03		430.0	85.0
90	1.20	0.42	6.78		413.0	85.0
95	1.10	0.51	6.63		404.0	85.0
100	1.00	0.58	6.47		393.0	84.0
105	0.90	0.62	6.28		387.0	84.0
110	0.80	0.61	6.29		381.0	83.0
115	0.60	0.64	6.02		379.0	83.0
120	0.40	0.66	6.05		372.0	83.0
125	0.30	0.65	5.92		368.0	83.0
130	0.10	0.61	5.90		367.0	83.0
135	0.00	0.66	5.70		361.0	83.0

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home

Project Number: 0061WS092E

Run Number: 4

Model: 57ST-ACC-C

Tracking Number: 2187

Date: 5/10/17

Test Crew: B. Davis

OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

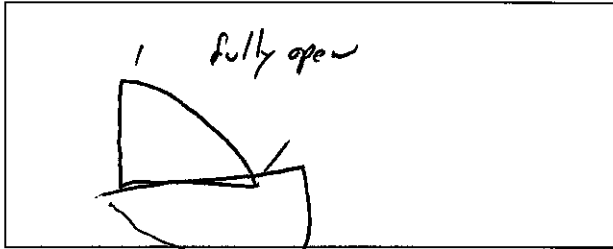
#### Wood Heater Run Notes

##### Air Control Settings

Primary:

Secondary:

fixed



Tertiary/Pilot:

boost air locked open

Fan:

on high entire test

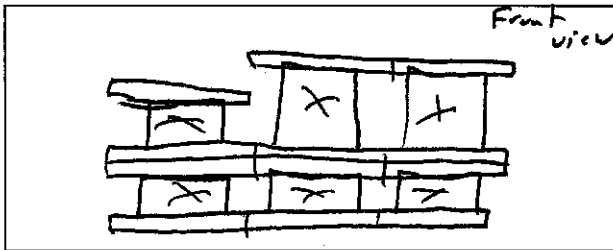
##### Preburn Notes

Time	Notes
<u>60</u>	<u>Levelled coal bed</u>

##### Test Notes

Sketch test fuel configuration:

Start up procedures & Timeline:



Bypass:

N/A

Fuel loaded by:

47 seconds

Door closed at:

60 seconds

Primary air:

fully open for entire test

Fan on high entire test

boost air locked open entire test

Notes:

Time	Notes
<u>60</u>	<u>changed front filter in to air A</u>

Technician Signature: [Signature]

Date: 6/1/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 4  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/14/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Fuel Data

Fuel: Douglas fir, untreated and air dried, standard grade or better dimensional lumber

**Pre-Burn Fuel**

**Calibration:** Cal Value (1) = 12% Actual Reading 12  
 Cal Value (2) = 22% Actual Reading 22

Piece:	Length:	Reading:	Piece:	Length:	Reading:
1	<u>18</u> <u>20.0</u> in	<u>20.0</u>	7	<u>14</u> in	<u>23.1</u>
2	<u>18</u> <u>19.4</u> in	<u>19.4</u>	8	<u>14</u> in	<u>20.0</u>
3	<u>14</u> in	<u>21.4</u>	9	<u>14</u> in	<u>19.4</u>
4	<u>14</u> in	<u>24.5</u>	10	<u>18</u> in	<u>21.3</u>
5	<u>14</u> in	<u>22.0</u>	11	<u>18</u> in	<u>20.8</u>
6	<u>14</u> in	<u>22.0</u>	12	_____ in	_____

Total Pre-Burn Fuel Weight: 18.3 Pre-Burn Fuel Average Moisture: 21.24  
 Time (clock): 0910 Room Temperature (F): 70 Initials: BD

**Test Fuel**

Firebox Volume (ft³): 2.9 Test Fuel Piece Length (in): 19  
 Load Weight Range (lb): 20.3 Total Wet Fuel Load Weight (lb): 16.9  
18.3 - 22.3

Fuel Type & Amount: 2 x 4: 4 4 x 4: 2  
 Weight (with spacers): 7.1 Weight (with spacers): 9.8

Piece:	Weight (lbs):	Moisture Readings (%DB):				Fuel Type:
1	<u>1.8</u>	<u>24.5</u>	<u>24.7</u>	<u>21.9</u>	<u>2x4</u>	
2	<u>2.1</u>	<u>24.5</u>	<u>23.5</u>	<u>22.0</u>	<u>2x4</u>	
3	<u>1.8</u>	<u>24.8</u>	<u>24.1</u>	<u>24.7</u>	<u>2x4</u>	
4	<u>1.8</u>	<u>24.3</u>	<u>24.3</u>	<u>24.5</u>	<u>2x4</u>	
5	<u>4.4</u>	<u>22.8</u>	<u>23.8</u>	<u>25.5</u>	<u>4x4</u>	
6	<u>4.5</u>	<u>24.9</u>	<u>25.0</u>	<u>24.4</u>	<u>4x4</u>	
7	_____	_____	_____	_____	_____	

**Spacer Moisture Readings (%DB)**

<u>7.9</u>	<u>7.6</u>	<u>7.8</u>	<u>7.9</u>	<u>7.4</u>	<u>7.9</u>	_____	_____
<u>7.3</u>	<u>8.4</u>	<u>7.8</u>	<u>8.0</u>	<u>8.5</u>	<u>8.4</u>	_____	_____
<u>6.7</u>	<u>8.1</u>	<u>7.8</u>	<u>7.8</u>	<u>8.4</u>	<u>7.8</u>	_____	_____
<u>8.4</u>	<u>8.2</u>	<u>8.0</u>	<u>8.4</u>	<u>8.1</u>	<u>7.1</u>	_____	_____

Time (clock): 0920 Room Temperature (F): 70 Initials: BD

Technician Signature: BD Date: 6/1/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 4  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/12/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Supplemental Data

Start Time: 11:00 Booth #: 7

Stop Time: 13:15

**Stack Gas Leak Check:**

Initial: good Final: good

**Sample Train Leak Check:**

A: 0.0 @ 8 "Hg  
 B: 0.0 @ 7 "Hg

**Calibrations:** Span Gas CO<sub>2</sub>: 15.96 CO: 5.08

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	$\emptyset$	$\emptyset$	<u>13:20</u>	<u>13:20</u>
CO <sub>2</sub>	<u>0.00</u>	<u>15.97</u>	<u>0.13</u>	<u>16.10</u>
CO	<u>0.000</u>	<u>5.04</u>	<u>0.008</u>	<u>5.085</u>

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: good Final: good

Stack Diameter (in): 6"

Induced Draft: 0.0

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 5/12/17 Initials: BD

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>28.50</u>	<u>28.53</u>	<u>28.55</u>
RH (%)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Ambient (°F)	<u>83</u>	<u>86</u>	<u>83</u>

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
1	<u>.054</u>	<u>127</u>
2	<u>.058</u>	<u>126</u>
3	<u>.058</u>	<u>124</u>
4	<u>.056</u>	<u>123</u>
1	<u>.050</u>	<u>122</u>
2	<u>.050</u>	<u>120</u>
3	<u>.056</u>	<u>117</u>
4	<u>.050</u>	<u>115</u>
Center:		
	<u>.060</u>	<u>125</u>

**Background Filter Volume:** 24.196

Tunnel Static Pressure (in H <sub>2</sub> O):	
Beginning of Test	End of Test
<u>-0.574</u>	<u>-0.574</u>
<u>-287</u>	

Technician Signature: BD

Date: 6/1/17

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Run 5**

## Wood Heater Test Results - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Project No.: 0061WS092E  
 Tracking No.: 2187  
 Run: 5  
 Test Date: 05/19/17

Burn Rate	<b>1.04 kg/hr dry</b>
Average Tunnel Temperature	87 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	16.48 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	10487.0 dscf/hour
Average Delta p	0.060 inches H2O
Total Time of Test	410 minutes

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - V <sub>m</sub>	73.151 cubic feet	51.470 cubic feet	54.792 cubic feet	7.504 cubic feet
Average Gas Meter Temperature	77 degrees Fahrenheit	87 degrees Fahrenheit	87 degrees Fahrenheit	87 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - V <sub>mstd</sub>	68.300 dscf	47.609 dscf	50.193 dscf	6.941 dscf
Total Particulates - m <sub>T</sub>	1.3 mg	91.3 mg	87.4 mg	8.2 mg
Particulate Concentration (dry-standard) - C <sub>p</sub> /C <sub>s</sub>	0.000019 grams/dscf	0.00192 grams/dscf	0.00174 grams/dscf	0.00118 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	1.36 grams	136.06 grams	123.42 grams	12.39 grams
Particulate Emission Rate	0.20 grams/hour	19.91 grams/hour	18.06 grams/hour	12.39 grams/hour
Emissions Factor		19.20 g/kg	17.41 g/kg	4.54 g/kg
Difference from Average Total Particulate Emissions		6.32 grams	6.32 grams	
<b>Dual Train Comparison Results Are Acceptable</b>				

	FINAL AVERAGE RESULTS
<b>Complete Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	129.74 grams
Particulate Emission Rate	<b>18.99 grams/hour</b>
Emissions Factor	18.30 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	12.39 grams
Particulate Emission Rate	12.39 grams/hour
Emissions Factor	4.54 grams/kg

QUALITY CHECKS	
Filter Temps < 90 °F	OK
Filter Face Velocity (47 mm)	OK
Dryer Exit Temp < 80F	OK
Leakage Rate	OK
Ambient Temp (55-90F)	OK
Negative Probe Weight Eval.	OK
Pro-Rate Variation	OK
Total PM Precision (%)	7.31
Train A - Train B G/KG ≤ 0.5	1.78
Stove Surface ΔT	OK


Technician Signature: \_\_\_\_\_



# Wood Heater Preburn Data - ASTM E2780

**Run: 5**  
 Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 05/19/17  
 Beginning Clock Time: 09:39:00 AM

Coal Bed		
Range	<b>3.7</b>	<b>4.7</b>
(lb):	(min)	(max)

Technician Signature: 


Elapsed Time (min)	Scale (lb)	Stack Draft (in H <sub>2</sub> O)	Temperatures (°F)							Stack	Ambient
			FB Top	FB Bottom	FB Back	FB Left	FB Right	Avg. Firebox Surface			
0	7	-0.067	604	558	448	752	574	587.2	481	82	
10	6.1	-0.055	653	581	506	708	568	603.2	331	80	
20	5.5	-0.049	570	581	485	638	530	560.8	296	80	
30	5	-0.046	529	568	459	591	501	529.6	282	79	
40	4.7	-0.039	481	551	436	559	479	501.2	246	78	
50	4.6	-0.034	419	535	414	525	453	469.2	218	78	
60	4.4	-0.032	379	523	390	488	430	442	206	78	
70	4.3	-0.029	345	508	365	453	402	414.6	193	77	
75	4.3	-0.028	330	499	354	436	387	401.2	188	77	

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **5**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 05/19/17  
 Beginning Clock Time: 10:55  
 Total Sampling Time: 410 min  
 Recording Interval: 10 min  
 Background Sample Volume: 73.151 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

PM Control Modules: 371, 372  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.598 °H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.48 ft/sec.  
 Initial Tunnel Flow: 173.6 scfm  
 Average Tunnel Flow: 174.8 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 12 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 10 in. Hg  
 Average Test Piece Fuel Moisture: 21.41 Dry Basis %

Technician Signature: 

Barometric Pressure: Begin Middle End Average  
28.56 28.53 28.49 28.53 °Hg

OMNI Equipment Numbers: \_\_\_\_\_

Velocity Traverse Data										
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.050	0.054	0.060	0.058	0.050	0.060	0.062	0.058	0.060	
Temp:	91	91	91	91	91	91	91	91	91	
$V_{strav}$	16.53				16.99				$F_p$	0.973

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)												Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 (H <sub>2</sub> O)	Meter 1 Temp (°F)	Meter 1 Vacuum (°Hg)	Orifice dH 2 (H <sub>2</sub> O)	Meter 2 Temp (°F)	Meter 2 Vacuum (°Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft (H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
0	0.000	0.000			1.27	74	-0.19	0.90	75	-0.8	91	0.060			18.7		328	497	352	434	385	399	N/A	188	80	64	82	69	76	-0.042	3.49	1.13
10	1.223	1.317	0.12	0.13	1.54	76	-0.43	1.10	76	-1.2	96	0.060	100	101	17.3	-1.4	547	477	332	407	443	441	N/A	502	83	69	84	70	76	-0.084	14.29	1.28
20	2.458	2.651	0.12	0.13	1.59	78	-0.48	1.12	79	-1.2	101	0.060	101	103	15.1	-2.2	694	461	347	431	453	477	N/A	502	85	70	86	71	77	-0.084	13.75	0.22
30	3.705	3.999	0.12	0.13	1.58	80	-0.46	1.12	81	-1.2	94	0.060	101	103	14.0	-1.1	585	449	344	437	446	452	N/A	326	86	71	86	72	78	-0.067	5.81	1.1
40	4.973	5.350	0.13	0.14	1.58	82	-0.45	1.13	83	-1.2	91	0.060	102	102	13.3	-0.7	490	439	326	417	422	419	N/A	295	85	72	85	72	78	-0.066	7.3	0.92
50	6.239	6.695	0.13	0.13	1.58	83	-0.45	1.09	84	-1.2	91	0.060	102	102	12.3	-1	577	426	319	409	402	427	N/A	353	84	73	84	73	78	-0.070	10.82	0.45
60	7.504	8.031	0.13	0.13	1.58	84	-0.45	1.10	85	-1.2	91	0.060	102	101	11.4	-0.9	575	414	318	423	402	426	N/A	337	83	73	83	74	77	-0.067	9.92	1.04
70	8.769	9.369	0.13	0.13	1.56	85	-0.44	1.10	86	-1.2	89	0.060	101	100	10.6	-0.8	451	405	310	421	401	398	N/A	257	83	74	83	74	77	-0.058	5.79	2.94
80	10.034	10.708	0.13	0.13	1.56	85	-0.44	1.10	86	-1.2	88	0.060	101	100	9.8	-0.8	395	398	299	413	396	380	N/A	236	83	74	83	75	77	-0.055	5.86	2.88
90	11.296	12.046	0.13	0.13	1.55	86	-0.46	1.10	86	-1.2	87	0.060	101	100	9.0	-0.8	366	392	291	409	392	370	N/A	227	82	74	82	75	77	-0.053	5.82	2.9
100	12.549	13.383	0.13	0.13	1.54	86	-0.48	1.09	86	-1.2	87	0.060	100	100	8.1	-0.9	354	388	288	411	390	366	N/A	227	82	74	82	75	77	-0.053	6.1	3.07
110	13.812	14.717	0.13	0.13	1.56	86	-0.53	1.09	86	-1.2	87	0.060	101	100	7.3	-0.8	345	385	291	417	390	366	N/A	224	82	74	82	75	77	-0.052	6	3.15
120	15.069	16.049	0.13	0.13	1.55	87	-0.53	1.09	86	-1.2	88	0.060	100	100	6.4	-0.9	415	382	299	433	397	385	N/A	278	82	75	82	75	77	-0.059	10.43	1.05
130	16.325	17.382	0.13	0.13	1.55	87	-0.54	1.09	87	-1.2	89	0.060	100	100	5.6	-0.8	482	380	323	470	428	417	N/A	283	83	75	82	76	77	-0.059	9.7	0.9
140	17.583	18.714	0.13	0.13	1.56	87	-0.53	1.09	87	-1.2	89	0.060	100	100	5.1	-0.5	476	381	340	496	448	428	N/A	268	83	75	82	76	78	-0.056	8	0.77
150	18.846	20.046	0.13	0.13	1.55	88	-0.53	1.09	88	-1.2	89	0.060	101	100	4.6	-0.5	431	381	346	500	447	421	N/A	241	83	75	83	76	78	-0.054	6.22	1.27
160	20.107	21.379	0.13	0.13	1.55	88	-0.53	1.09	88	-1.2	88	0.060	100	100	4.1	-0.5	390	382	345	500	439	411	N/A	224	83	75	82	77	78	-0.051	5.69	1.24
170	21.368	22.713	0.13	0.13	1.56	88	-0.54	1.08	88	-1.2	87	0.060	100	100	3.9	-0.2	366	383	341	492	433	403	N/A	211	82	75	82	77	78	-0.049	4.96	1.4
180	22.629	24.047	0.13	0.13	1.55	88	-0.53	1.09	88	-1.2	86	0.060	100	100	3.6	-0.3	349	383	337	479	426	395	N/A	202	82	75	82	77	78	-0.048	4.62	1.46
190	23.890	25.381	0.13	0.13	1.55	88	-0.53	1.09	89	-1.2	86	0.060	100	99	3.4	-0.2	333	381	334	466	421	387	N/A	196	82	75	81	77	78	-0.047	4.31	1.39
200	25.155	26.715	0.13	0.13	1.55	89	-0.53	1.09	89	-1.2	85	0.060	100	99	3.3	-0.1	322	379	331	455	416	381	N/A	190	81	75	81	77	78	-0.046	4.32	1.35
210	26.415	28.051	0.13	0.13	1.55	89	-0.53	1.09	89	-1.2	85	0.060	100	99	3.1	-0.2	315	375	329	446	412	375	N/A	187	81	75	81	77	78	-0.045	4.27	1.42
220	27.676	29.386	0.13	0.13	1.56	89	-0.52	1.09	89	-1.2	85	0.060	100	99	2.9	-0.2	308	372	327	439	409	371	N/A	184	81	75	81	77	78	-0.044	3.99	1.46
230	28.934	30.722	0.13	0.13	1.55	89	-0.52	1.09	89	-1.2	84	0.060	100	99	2.8	-0.1	300	368	324	427	404	365	N/A	182	81	75	81	77	78	-0.044	3.99	1.47
240	30.190	32.058	0.13	0.13	1.55	89	-0.52	1.09	89	-1.2	84	0.060	99	99	2.6	-0.2	295	365	322	417	401	360	N/A	179	81	75	80	77	78	-0.043	4.08	1.46
250	31.442	33.395	0.13	0.13	1.54	89	-0.52	1.08	89	-1.2	84	0.060	99	99	2.5	-0.1	291	363	321	411	400	357	N/A	178	80	75	80	77	77	-0.043	4.13	1.49
260	32.698	34.732	0.13	0.13	1.56	89	-0.53	1.09	89	-1.2	85	0.060	99	99	2.3	-0.2	289	361	322	407	401	356	N/A	179	80	75	80	77	77	-0.043	4.23	1.5
270	33.951	36.070	0.13	0.13	1.56	89	-0.52	1.09	89	-1.2	85	0.060	99	100	2.1	-0.2	289	359	326	404	404	356	N/A	180	80	75	80	77	77	-0.043	4.32	1.53
280	35.205	37.407	0.13	0.13	1.56	89	-0.52	1.09	89	-1.2	84	0.060	99	99	2.0	-0.1	289	356	330	401	407	357	N/A	179	80	75	80	77	77	-0.044	4.4	1.59
290	36.456	38.744	0.13	0.13	1.56	88	-0.53	1.09	89	-1.2	85	0.060	99	99	1.8	-0.2	290	355	334	398	413	358	N/A	182	80	75	80	77	77	-0.044	4.48	1.77
300	37.710	40.081	0.13	0.13	1.56	89	-0.52	1.09	89	-1.2	85	0.060	99	99	1.6	-0.2	290	354	337	396	417	359	N/A	185	80	75	80	77	77	-0.045	4.03	2.45
310	38.960	41.420	0.13	0.13	1.55	88	-0.52	1.09	89	-1.2	85	0.060	99	100	1.4	-0.2	289	354	336	391	417	357	N/A	185	80	75	80	77	77	-0.048	3.96	2.35
320	40.214	42.757	0.13	0.13	1.55	89	-0.52	1.09	89	-1.2	85	0.060	99	99	1.3	-0.1	288	354	335	387	418	356	N/A	184	80	76	80	77	77	-0.047	3.84	2.3
330	41.464	44.095	0.13	0.13	1.56	89	-0.51	1.09	89	-1.2	85	0.060	99	100	1.1	-0.2	287	355	333	383	418	355	N/A	179	80	76	80	77	77	-0.047	3.58	2.11
340	42.719	45.433	0.13	0.13	1.55	89	-0.51	1.09	88	-1.2	85	0.060	99	100	1.0	-0.1	283	356	329	377	414	352	N/A	175	80	76	80	77	77	-0.047	3.51	2
350	43.964	46.771	0.12	0.13	1.55	89	-0.51	1.09	89	-1.2	84	0.060	98	99	0.8	-0.2	280	356	324	371	410	348	N/A	174	80	76	80	77	77	-0.046	3.51	2.02
360	45.216	48.108	0.13	0.13	1.55	89	-0.51	1.08	89	-1.2	85	0.060	99	99	0.7	-0.1	277	356	321	366	406	345	N/A	173	80	76	80	77	77	-0.046	3.54	2.03

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **5**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 05/19/17  
 Beginning Clock Time: 10:55 Background Sample Volume: 73.151 cubic feet


Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

Barometric Pressure: Begin Middle End Average  
28.56 28.53 28.49 28.53 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

PM Control Modules: 371, 372  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.598 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 16.48 ft/sec.  
 Initial Tunnel Flow: 173.6 scfm  
 Average Tunnel Flow: 174.8 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 12 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 10 in. Hg  
 Average Test Piece Fuel Moisture: 21.41 Dry Basis %

Technician Signature: 

Velocity Traverse Data											
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center		
Initial dP	0.050	0.054	0.060	0.058	0.050	0.060	0.062	0.058	0.060	"H2O	
Temp:	91	91	91	91	91	91	91	91	91	°F	
	V <sub>strav</sub> <u>16.53</u> ft/sec				V <sub>scent</sub> <u>16.99</u> ft/sec				F <sub>p</sub> <u>0.973</u>		

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)												Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
370	46.468	49.445	0.13	0.13	1.56	89	-0.52	1.09	89	-1.2	85	0.060	99	99	0.5	-0.2	274	355	317	361	403	342	N/A	171	81	76	81	77	77	-0.045	3.44	1.96
380	47.724	50.782	0.13	0.13	1.55	89	-0.51	1.08	89	-1.2	86	0.060	100	100	0.4	-0.1	272	354	315	357	400	340	N/A	169	81	76	81	77	77	-0.045	3.4	1.96
390	48.971	52.118	0.12	0.13	1.55	89	-0.51	1.09	90	-1.2	86	0.060	99	99	0.3	-0.1	270	353	314	353	397	337	N/A	168	81	76	81	77	77	-0.045	3.35	1.93
400	50.221	53.455	0.13	0.13	1.55	89	-0.51	1.09	90	-1.2	86	0.060	99	99	0.1	-0.2	266	350	310	349	392	333	N/A	167	82	76	82	77	78	-0.046	3.28	1.91
410	51.470	54.792	0.12	0.13	1.54	90	-0.51	1.09	90	-1.2	85	0.060	99	99	0.0	-0.1	263	348	307	345	388	330	N/A	167	81	77	81	77	78	-0.045	3.24	1.87
Avg/Tot	51.470	54.792	0.13	0.13	1.55	87		1.09	87		87	0.060	100	100								69.0				74	82	76	77	-0.052		

### Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home      Equipment Numbers: \_\_\_\_\_  
 Model: 57ST-ACC-C \_\_\_\_\_  
 Tracking No.: 2187 \_\_\_\_\_  
 Project No.: 0061WS092E \_\_\_\_\_  
 Run #: 5 \_\_\_\_\_  
 Date: 5/19/17 \_\_\_\_\_

**TRAIN 1 (First Hour emissions)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D191	130.4	122.2	8.2
C. Rear filter catch	Filter				0.0
D. Probe catch*	Probe				0.0
E. Filter seals catch*	Seals				0.0

**Sub-Total**    Total Particulate, mg:    8.2

**TRAIN 1 (Post First Hour Change-out)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D192	202.8	124.2	78.6
C. Rear filter catch	Filter	D193	122.5	120.4	2.1
D. Probe catch*	Probe	20	114256.6	114255.0	1.6
E. Filter seals catch*	Seals	R477	3504.4	3503.6	0.8

**Sub-Total**    Total Particulate, mg:    83.1

**Train 1 Aggregate**    Total Particulate, mg:    91.3

**TRAIN 2**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	D194	205.2	122.4	82.8
B. Rear filter catch	Filter	D195	125.2	123.3	1.9
C. Probe catch*	Probe	24	114130.1	114128.6	1.5
D. Filter seals catch*	Seals	R478	3342.1	3340.9	1.2

**Total Particulate, mg:    87.4**

**AMBIENT**

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	D76	123.5	122.2	1.3

**Total Particulate, mg:    1.3**

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight.

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Technician Signature: 

### Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: **Hearth & Home**  
 Model: **57ST-ACC-C**  
 Tracking No.: **2187**  
 Project No.: **0061WS092E**  
 Test Date: **5/19/2017**  
 Run No.: **5**

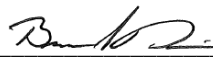
Firebox Volume (ft <sup>3</sup> ):	2.95
Fuel Piece Length (in):	19
2x4 Crib Weight (lb):	8.8
4x4 Crib Weight (lb):	9.9

<b>Total Fuel Weight (Dry Basis, lb):</b>	15.6	
Fuel Density (lb/ft <sup>3</sup> , Dry Basis):	26.66	OK
Loading Density (lb/ft <sup>3</sup> , Wet Basis):	6.34	OK
2x4 Percentage:	47%	OK

Coal Bed Range (20-25%): **3.74 - 4.675**

Test Fuel Piece	Weight (lb)	Size	Readings (Dry Basis %)			Dry Weight (lb)
1	1.8	2"x 4"	19.3	20.0	20.4	1.50
2	1.8	2"x 4"	21.5	23.1	21.3	1.48
3	1.7	2"x 4"	21.4	20.5	19.1	1.41
4	1.8	2"x 4"	23.8	22.4	23.1	1.46
5	4.4	4"x 4"	22.5	23.1	18.6	3.62
6	4.7	4"x 4"	21.2	22.0	22.1	3.86

Spacer Readings (Dry Basis %)			
12.8	8.0		
7.0	10.7		
9.5	9.0		
11.7	7.9		
8.7	7.6		
14.5	9.5		
13.6	8.8		
8.4	8.4		
8.1	7.0		
8.0	8.2		
8.0	7.6		
7.8			
9.0			

Technician Signature: 

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Hearth & Home  
**Model:** 57ST-ACC-C  
**Date:** 05/19/17  
**Run:** 5  
**Control #:** 0061WS092E  
**Test Duration:** 410  
**Output Category:** 2

**Technicians:** *B. W. [Signature]*  
 \_\_\_\_\_  
 \_\_\_\_\_

### Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	66.4%	71.7%
Combustion Efficiency	84.9%	84.9%
Heat Transfer Efficiency	78%	84.5%

Output Rate (kJ/h)	13,370	12,683	(Btu/h)
Burn Rate (kg/h)	1.02	2.24	(lb/h)
Input (kJ/h)	20,150	19,114	(Btu/h)

Test Load Weight (dry kg)	6.95	15.32	dry lb
MC wet (%)	17.64		
MC dry (%)	21.42		
Particulate (g)	129.74		
CO (g)	1,449		
Test Duration (h)	6.83		

Emissions	Particulate	CO
g/MJ Output	1.42	15.87
g/kg Dry Fuel	18.67	208.54
g/h	18.99	212.12
lb/MM Btu Output	3.30	36.87

Air/Fuel Ratio (A/F)	16.77
----------------------	-------

VERSION:                      2.2                      12/14/2009

VERSION: 2.2 12/14/2009

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Date: 5/19/2017  
 Run: 5  
 Control #: 0061WS092E

Appliance Type: Non-Cat (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)  
 Weight Units lb (kg or lb)

Test Duration: 410  
 Output Category: 2

Wood Moisture (% wet): 17.64  
 Load Weight (lb wet): 18.60  
 Burn Rate (dry kg/h): 1.02  
 Total Particulate Emissions: 129.74 g

Fuel Data  
 D. Fir  
 HHV 19,810 kJ/kg  
 %C 48.73  
 %H 6.87  
 %O 43.9  
 %ASH 0.5

Averages 1.68 5.57 #DIV/0! 226.05 77.33  
 Temp. (°F)

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%)			Flue Gas Temp (°F)	Room Temp (°F)
		CO	CO <sub>2</sub>	O <sub>2</sub>		
0	18.60	1.13	3.49		188.0	76.0
10	17.20	1.28	14.29		502.0	76.0
20	15.00	0.22	13.75		502.0	77.0
30	13.90	1.10	5.81		326.0	78.0
40	13.20	0.92	7.30		295.0	78.0
50	12.20	0.45	10.82		353.0	78.0
60	11.30	1.04	9.92		337.0	77.0
70	10.50	2.94	5.79		257.0	77.0
80	9.70	2.88	5.86		236.0	77.0
90	8.90	2.90	5.82		227.0	77.0
100	8.00	3.07	6.10		227.0	77.0
110	7.20	3.15	6.00		224.0	77.0
120	6.30	1.05	10.43		278.0	77.0
130	5.50	0.90	9.70		283.0	77.0
140	5.00	0.77	8.00		268.0	78.0
150	4.50	1.27	6.22		241.0	78.0
160	4.00	1.24	5.69		224.0	78.0
170	3.80	1.40	4.96		211.0	78.0
180	3.50	1.46	4.62		202.0	78.0
190	3.30	1.39	4.31		196.0	78.0
200	3.20	1.35	4.32		190.0	78.0
210	3.00	1.42	4.27		187.0	78.0
220	2.80	1.46	3.99		184.0	78.0
230	2.70	1.47	3.99		182.0	78.0
240	2.50	1.46	4.08		179.0	78.0
250	2.40	1.49	4.13		178.0	77.0
260	2.20	1.50	4.23		179.0	77.0
270	2.00	1.53	4.32		180.0	77.0
280	1.90	1.59	4.40		179.0	77.0
290	1.70	1.77	4.48		182.0	77.0
300	1.50	2.45	4.03		185.0	77.0
310	1.30	2.35	3.96		185.0	77.0
320	1.20	2.30	3.84		184.0	77.0
330	1.00	2.11	3.58		179.0	77.0
340	0.90	2.00	3.51		175.0	77.0
350	0.70	2.02	3.51		174.0	77.0
360	0.60	2.03	3.54		173.0	77.0
370	0.40	1.96	3.44		171.0	77.0
380	0.30	1.96	3.40		169.0	77.0
390	0.20	1.93	3.35		168.0	77.0
400	0.00	1.91	3.28		167.0	78.0
410	0.00	1.87	3.24		167.0	78.0

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 5

Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/19/17

Test Crew: B. Davis

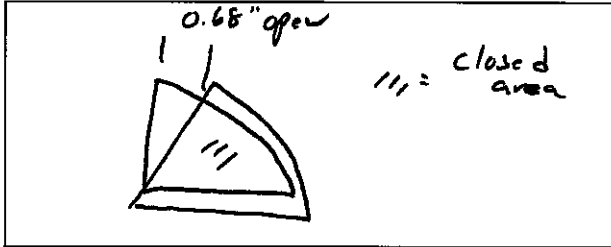
OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Run Notes

##### Air Control Settings

Primary:

Secondary: fixed



Tertiary/Pilot: blast air not used

Fan: Not used

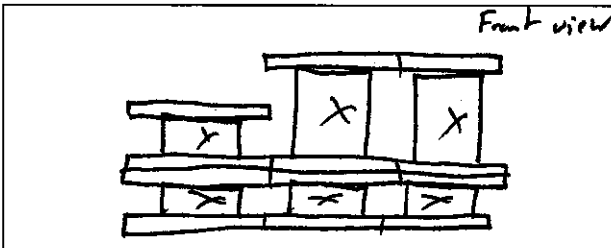
##### Preburn Notes

Time	Notes
50	Levelled coal bed

##### Test Notes

Sketch test fuel configuration:

Start up procedures & Timeline:



Bypass: N/A

Fuel loaded by: 50 seconds

Door closed at: 90 seconds

Primary air: fully open for first 5:00 then set to test setting

Notes: Blast air locked open @ 0 min. Then set to timed air @ 5:00 Fan not used.

Time	Notes
60	changed filter in train A.

Technician Signature: B. Davis

Date: 6/1/17



**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 5

Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/19/17

Test Crew: B. Davis

OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Fuel Data**

Fuel: Douglas fir, untreated and air dried, standard grade or better dimensional lumber

**Pre-Burn Fuel**

**Calibration:** Cal Value (1) = 12% Actual Reading 12  
 Cal Value (2) = 22% Actual Reading 22

Piece:	Length:	Reading:	Piece:	Length:	Reading:
1	<u>8</u> in	<u>21.0</u>	7	_____ in	_____
2	<u>8</u> in	<u>22.5</u>	8	_____ in	_____
3	<u>8</u> in	<u>20.6</u>	9	_____ in	_____
4	_____ in	_____	10	_____ in	_____
5	_____ in	_____	11	_____ in	_____
6	_____ in	_____	12	_____ in	_____

Total Pre-Burn Fuel Weight: 2.6 Pre-Burn Fuel Average Moisture: 21.37

Time (clock): 0925 Room Temperature (F): 70 Initials: BD

**Test Fuel**

Firebox Volume (ft<sup>3</sup>): 2.9 Test Fuel Piece Length (in): 19  
 Load Weight Range (lb): 18.3 - 22.3 Total Wet Fuel Load Weight (lb): 11.7

Fuel Type & Amount: 2 x 4: 4 4 x 4: 2  
 Weight (with spacers): 4 Weight (with spacers): 2 9.9

Piece:	Weight (lbs):	Moisture Readings (%DB):		Fuel Type:
1	<u>1.8</u>	<u>19.3</u>	<u>20.0</u>	<u>2x4</u>
2	<u>1.8</u>	<u>21.5</u>	<u>23.1</u>	<u>2x4</u>
3	<u>1.7</u>	<u>21.4</u>	<u>20.5</u>	<u>2x4</u>
4	<u>1.8</u>	<u>23.8</u>	<u>22.4</u>	<u>2x4</u>
5	<u>4.4</u>	<u>22.5</u>	<u>23.1</u>	<u>4x4</u>
6	<u>4.7</u>	<u>21.2</u>	<u>22.0</u>	<u>4x4</u>
7	_____	_____	_____	_____

**Spacer Moisture Readings (%DB)**

<u>12.8</u>	<u>8.7</u>	<u>8.1</u>	<u>9.0</u>	<u>7.9</u>	<u>8.4</u>	_____	_____
<u>7.0</u>	<u>14.5</u>	<u>8.0</u>	<u>8.0</u>	<u>7.6</u>	<u>7.0</u>	_____	_____
<u>9.5</u>	<u>13.6</u>	<u>8.0</u>	<u>10.7</u>	<u>9.5</u>	<u>8.2</u>	_____	_____
<u>11.7</u>	<u>8.4</u>	<u>7.8</u>	<u>9.0</u>	<u>8.8</u>	<u>7.6</u>	_____	_____

Time (clock): 0910 Room Temperature (F): 70 Initials: BD

Technician Signature: [Signature]

Date: 6/1/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 5  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/19/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Supplemental Data

Start Time: 10:55 Booth #: 7

Stop Time: 17:45

**Stack Gas Leak Check:**

Initial: good Final: good

**Sample Train Leak Check:**

A: 0.0 @ 12 "Hg  
 B: 0.0 @ 10 "Hg

Calibrations: Span Gas CO<sub>2</sub>: 15.96 CO: 5.08

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	<u>∅</u>	<u>∅</u>	<u>1756</u>	<u>1756</u>
CO <sub>2</sub>	<u>0.00</u>	<u>15.96</u>	<u>0.03</u>	<u>15.89</u>
CO	<u>0.004</u>	<u>5.08</u>	<u>0.014</u>	<u>5.07</u>

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: good Final: good

Stack Diameter (in): 6"

Induced Draft: 0.0

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 5/15/17 Initials: BD

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>28.56</u>	<u>28.53</u>	<u>28.49</u>
RH (%)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Ambient (°F)	<u>76</u>	<u>78</u>	<u>78</u>

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
1	<u>.050</u>	<u>91</u>
2	<u>.054</u>	<u>91</u>
3	<u>.060</u>	<u>91</u>
4	<u>.058</u>	<u>91</u>
1	<u>.050</u>	<u>91</u>
2	<u>.060</u>	<u>91</u>
3	<u>.062</u>	<u>91</u>
4	<u>.058</u>	<u>91</u>
Center:		
	<u>.060</u>	<u>91</u>

Background Filter Volume: 73.151

Tunnel Static Pressure (in H <sub>2</sub> O):	
Beginning of Test	End of Test
<u>- .598</u>	<u>- .598</u>

- .299

Technician Signature: BD

Date: 6/1/17

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Run 6**

## Wood Heater Test Results - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Project No.: 0061WS092E  
 Tracking No.: 2187  
 Run: 6  
 Test Date: 06/06/17

Burn Rate	<b>1.11 kg/hr dry</b>
Average Tunnel Temperature	96 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	15.65 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9788.7 dscf/hour
Average Delta p	0.054 inches H2O
Total Time of Test	390 minutes

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - V <sub>m</sub>	69.149 cubic feet	49.190 cubic feet	51.539 cubic feet	7.478 cubic feet
Average Gas Meter Temperature	83 degrees Fahrenheit	88 degrees Fahrenheit	87 degrees Fahrenheit	88 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - V <sub>mstd</sub>	63.901 dscf	45.330 dscf	47.156 dscf	6.891 dscf
Total Particulates - m <sub>p</sub>	0.3 mg	6.2 mg	4.3 mg	3.8 mg
Particulate Concentration (dry-standard) - C <sub>p</sub> /C <sub>s</sub>	0.000005 grams/dscf	0.00014 grams/dscf	0.00009 grams/dscf	0.00055 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.30 grams	8.40 grams	5.50 grams	5.40 grams
Particulate Emission Rate	0.05 grams/hour	1.29 grams/hour	0.85 grams/hour	5.40 grams/hour
Emissions Factor		1.17 g/kg	0.77 g/kg	1.64 g/kg
Difference from Average Total Particulate Emissions		1.45 grams	1.45 grams	

**Dual Train Comparison Results Are Acceptable**

FINAL AVERAGE RESULTS	
<b>Complete Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	6.95 grams
Particulate Emission Rate	<b>1.07 grams/hour</b>
Emissions Factor	0.97 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	5.40 grams
Particulate Emission Rate	5.40 grams/hour
Emissions Factor	1.64 grams/kg


QUALITY CHECKS	
Filter Temps < 90 °F	OK
Filter Face Velocity (47 mm)	OK
Dryer Exit Temp < 80F	OK
Leakage Rate	OK
Ambient Temp (55-90°F)	OK
Negative Probe Weight Eval.	OK
Pro-Rate Variation	OK
Total PM Precision (%)	31.29
Train A - Train B G/KG ≤ 0.5	0.40
Stove Surface ΔT	OK

Technician Signature:

# Wood Heater Preburn Data - ASTM E2780

<b>Run:</b>	<b>6</b>
Manufacturer:	Hearth & Home
Model:	57ST-ACC-C
Tracking No.:	2187
Project No.:	0061WS092E
Test Date:	6/6/2017
Beginning Clock Time:	9:55

Coal Bed		
Range	<b>3.8</b>	<b>4.7</b>
(lb):	(min)	(max)

Technician Signature: 

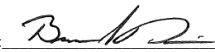
Temperatures (°F)										
Elapsed Time (min)	Scale (lb)	Stack Draft (in H <sub>2</sub> O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Avg. Firebox Surface	Stack	Ambient
0	7.1	-0.067	762	561	568	739	748	675.6	510	83
10	6.2	-0.055	672	573	545	697	716	640.6	342	82
20	5.7	-0.049	581	571	504	638	664	591.6	301	81
30	5.2	-0.046	537	562	473	599	625	559.2	288	81
40	4.9	-0.041	494	548	445	563	588	527.6	261	81
50	4.8	-0.037	429	534	418	527	555	492.6	226	80
60	4.6	-0.035	378	522	391	488	523	460.4	207	80

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **6**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 06-Jun-17  
 Beginning Clock Time: 10:58  
 Total Sampling Time: 390 min  
 Recording Interval: 10 min  
 Background Sample Volume: 69.149 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.574 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 15.65 ft/sec.  
 Initial Tunnel Flow: 162.5 scfm  
 Average Tunnel Flow: 163.1 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 10 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 9 in. Hg  
 Average Test Piece Fuel Moisture: 21.14 Dry Basis %

Technician Signature: 

Barometric Pressure: Begin Middle End Average  
28.57 28.54 28.41 28.51 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.042	0.052	0.056	0.048	0.048	0.050	0.054	0.050	0.054
Temp:	96	96	96	96	96	96	96	96	96
V <sub>strav</sub>	15.63 ft/sec				V <sub>scent</sub> 16.18 ft/sec				F <sub>p</sub> 0.966

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)										Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H2O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H2O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H2O)	CO2 (%)	CO (%)
0	0.000	0.000			1.09	76	-0.01	0.30	76	-0.8	96	0.054			18.9		367	518	383	477	512	451	N/A	203	82	73	83	74	79	-0.041	2.88	0.98
10	1.240	1.319	0.12	0.13	1.58	78	-0.46	1.09	78	-1.2	102	0.054	101	102	17.3	-1.6	584	501	361	437	477	472	N/A	511	87	75	87	74	80	-0.083	13.85	1.22
20	2.474	2.635	0.12	0.13	1.56	80	-0.45	1.08	80	-1.2	105	0.054	100	102	15.2	-2.1	740	484	373	446	481	505	N/A	477	89	76	89	75	80	-0.079	13.91	0.52
30	3.721	3.951	0.12	0.13	1.56	83	-0.43	1.08	83	-1.2	99	0.054	100	101	13.9	-1.3	655	471	367	443	469	481	N/A	374	89	77	89	75	81	-0.071	9.99	0.54
40	4.970	5.270	0.12	0.13	1.56	85	-0.43	1.08	85	-1.2	98	0.054	100	100	12.7	-1.2	613	458	354	435	454	463	N/A	348	89	78	89	76	82	-0.066	9.36	0.47
50	6.218	6.591	0.12	0.13	1.57	86	-0.44	1.08	87	-1.2	99	0.054	100	100	11.5	-1.2	669	443	352	445	447	471	N/A	401	89	79	89	77	82	-0.072	14.32	0.54
60	7.478	7.914	0.13	0.13	1.56	88	-0.44	1.07	88	-1.2	101	0.054	100	100	10.1	-1.4	724	430	367	483	472	495	N/A	411	88	79	88	78	83	-0.073	14.11	1.12
70	8.741	9.239	0.13	0.13	1.58	89	-0.42	1.08	89	-1.2	101	0.054	100	100	8.7	-1.4	726	420	380	517	493	507	N/A	403	86	80	85	78	83	-0.072	14.25	0.64
80	10.009	10.566	0.13	0.13	1.57	90	-0.42	1.08	90	-1.2	102	0.054	101	100	7.5	-1.2	702	413	391	547	508	512	N/A	379	86	75	84	74	84	-0.070	12.97	0.82
90	11.275	11.894	0.13	0.13	1.57	91	-0.43	1.08	91	-1.3	102	0.054	100	100	6.4	-1.1	703	408	400	556	529	519	N/A	376	86	76	84	75	84	-0.068	12.53	0.78
100	12.544	13.226	0.13	0.13	1.58	91	-0.42	1.09	92	-1.2	102	0.054	101	100	5.5	-0.9	658	405	406	554	540	513	N/A	334	86	77	85	76	85	-0.064	10.39	0.42
110	13.820	14.561	0.13	0.13	1.58	91	-0.42	1.09	90	-1.1	99	0.054	101	101	5.0	-0.5	564	403	401	542	543	491	N/A	293	86	77	84	76	84	-0.058	8.81	0.84
120	15.103	15.897	0.13	0.13	1.59	90	-0.43	1.10	89	-1.2	98	0.054	102	101	4.6	-0.4	506	403	394	522	539	473	N/A	271	85	77	84	75	84	-0.054	8.03	1.15
130	16.376	17.228	0.13	0.13	1.57	89	-0.41	1.07	88	-1.1	97	0.054	101	101	4.2	-0.4	457	404	384	504	530	456	N/A	244	85	76	83	75	83	-0.050	7.04	1.38
140	17.644	18.548	0.13	0.13	1.55	89	-0.4	1.07	87	-1.3	96	0.054	100	100	3.9	-0.3	420	406	373	484	520	441	N/A	228	84	76	83	74	83	-0.053	6.81	1.32
150	18.905	19.867	0.13	0.13	1.56	89	-0.4	1.07	87	-1.5	95	0.054	100	100	3.7	-0.2	386	407	363	469	505	426	N/A	212	87	75	87	74	83	-0.050	5.87	1.47
160	20.165	21.188	0.13	0.13	1.55	89	-0.4	1.06	87	-1.3	94	0.054	100	100	3.5	-0.2	364	407	353	453	490	413	N/A	206	89	75	89	74	82	-0.049	6.07	1.16
170	21.424	22.507	0.13	0.13	1.56	88	-0.4	1.07	87	-1.3	94	0.054	100	100	3.4	-0.1	350	407	347	443	481	406	N/A	199	89	74	90	73	82	-0.047	6.21	1.29
180	22.682	23.826	0.13	0.13	1.55	88	-0.4	1.07	87	-1.4	94	0.054	100	100	3.2	-0.2	339	406	342	433	475	399	N/A	195	86	74	87	73	82	-0.046	6.05	1.39
190	23.938	25.145	0.13	0.13	1.56	89	-0.4	1.07	87	-1.4	93	0.054	99	100	3.1	-0.1	332	405	337	426	467	393	N/A	194	84	74	83	73	82	-0.046	6	1.49
200	25.195	26.464	0.13	0.13	1.55	89	-0.4	1.07	87	-1.4	94	0.054	99	100	2.9	-0.2	326	403	333	421	458	388	N/A	192	84	74	82	73	82	-0.045	6.03	1.43
210	26.450	27.784	0.13	0.13	1.56	89	-0.4	1.07	87	-1.4	94	0.054	99	100	2.7	-0.2	321	400	328	416	451	383	N/A	189	84	74	82	73	82	-0.045	5.87	1.67
220	27.706	29.103	0.13	0.13	1.55	89	-0.4	1.06	87	-1.4	94	0.054	99	100	2.6	-0.1	316	397	324	411	443	378	N/A	187	84	74	83	73	82	-0.044	5.53	1.82
230	28.960	30.423	0.13	0.13	1.55	89	-0.39	1.06	87	-1.4	94	0.054	99	100	2.5	-0.1	312	394	321	407	436	374	N/A	187	85	74	83	73	82	-0.044	5.67	1.77
240	30.212	31.742	0.13	0.13	1.55	89	-0.4	1.07	87	-1.4	94	0.054	99	100	2.3	-0.2	307	390	319	405	431	370	N/A	184	85	74	83	73	82	-0.043	5.68	1.82
250	31.468	33.062	0.13	0.13	1.54	89	-0.4	1.07	87	-1.4	94	0.054	99	100	2.2	-0.1	304	386	318	402	426	367	N/A	183	85	74	83	73	82	-0.044	5.59	1.84
260	32.718	34.381	0.13	0.13	1.55	89	-0.4	1.06	88	-1.4	94	0.054	99	99	1.9	-0.3	301	382	319	403	421	365	N/A	183	85	74	83	73	82	-0.043	5.71	1.97
270	33.972	35.701	0.13	0.13	1.32	90	-0.3	1.06	88	-1.4	94	0.054	99	100	1.7	-0.2	300	378	320	403	416	363	N/A	185	85	74	83	73	82	-0.044	5.58	2.2
280	35.237	37.021	0.13	0.13	1.57	90	-0.42	1.07	88	-1.4	94	0.054	100	100	1.6	-0.1	299	375	322	403	413	362	N/A	185	85	74	83	74	82	-0.043	5.58	1.97
290	36.504	38.342	0.13	0.13	1.57	90	-0.42	1.07	88	-1.4	94	0.054	100	100	1.4	-0.2	297	373	322	404	410	361	N/A	184	85	74	83	74	83	-0.044	5.26	2.16
300	37.773	39.661	0.13	0.13	1.57	90	-0.42	1.07	88	-1.4	95	0.054	100	100	1.2	-0.2	292	370	321	398	406	357	N/A	180	85	75	83	74	83	-0.043	5.01	1.72
310	39.046	40.982	0.13	0.13	1.57	90	-0.42	1.06	88	-1.4	95	0.054	101	100	1.1	-0.1	289	367	320	391	401	354	N/A	178	85	75	83	74	83	-0.043	4.9	1.74
320	40.318	42.302	0.13	0.13	1.57	90	-0.42	1.06	88	-1.4	94	0.054	100	100	0.9	-0.2	287	364	323	385	396	351	N/A	175	85	75	83	74	83	-0.042	5.15	1.8
330	41.587	43.622	0.13	0.13	1.57	90	-0.42	1.06	88	-1.4	95	0.054	100	100	0.7	-0.2	282	360	326	381	394	349	N/A	175	85	75	83	74	83	-0.042	5.02	2.08
340	42.859	44.943	0.13	0.13	1.57	90	-0.42	1.06	89	-1.4	95	0.054	100	100	0.6	-0.1	281	356	328	379	393	347	N/A	175	86	75	83	74	83	-0.042	5.44	1.83
350	44.127	46.262	0.13	0.13	1.57	90	-0.41	1.06	89	-1.4	95	0.054	100	99	0.5	-0.1	280	353	333	378	395	348	N/A	174	86	75	84	74	83	-0.042	5.51	1.82
360	45.394	47.582	0.13	0.13	1.57	91	-0.42	1.06	89	-1.4	95	0.054	100	99	0.4	-0.1	280	350	337	377	396	348	N/A	176	86	75	84	74	83	-0.042	5	2.3
370	46.662	48.901	0.13	0.13	1.57	91	-0.42	1.06	89	-1.4	96	0.054	100	99	0.2	-0.2	279	348	340	376	395	348	N/A	175	86	75	84	74	83	-0.042	4.96	2.32

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **6**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 06-Jun-17  
 Beginning Clock Time: 10:58

Total Sampling Time: 390 min  
 Recording Interval: 10 min  
 Background Sample Volume: 69.149 cubic feet


Meter Box Y Factor: 1.001 (1)    0.993 (2)    0.997 (Amb)

Barometric Pressure: Begin    Middle    End    Average  
28.57    28.54    28.41    28.51 "Hg

OMNI Equipment Numbers: \_\_\_\_\_

PM Control Modules: \_\_\_\_\_  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.574 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 15.65 ft/sec.  
 Initial Tunnel Flow: 162.5 scfm  
 Average Tunnel Flow: 163.1 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 10 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 9 in. Hg  
 Average Test Piece Fuel Moisture: 21.14 Dry Basis %

Technician Signature: 

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.042	0.052	0.056	0.048	0.048	0.050	0.054	0.050	0.054
Temp:	96	96	96	96	96	96	96	96	96
	V <sub>strav</sub> 15.63 ft/sec				V <sub>scent</sub> 16.18 ft/sec				F <sub>p</sub> 0.966

Elapsed Time (min)	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)											Stack Gas Data				
	Gas Meter 1 (ft <sup>3</sup> )	Gas Meter 2 (ft <sup>3</sup> )	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
380	47.924	50.220	0.13	0.13	1.56	91	-0.42	1.06	89	-1.4	96	0.054	100	99	0.1	-0.1	278	346	343	375	394	347	N/A	175	86	75	84	74	84	-0.041	4.93	2.31
390	49.190	51.539	0.13	0.13	1.56	91	-0.42	1.06	90	-1.4	96	0.054	100	99	0.0	-0.1	278	343	341	373	391	345	N/A	174	87	75	85	75	84	-0.041	4.48	2.05
Avg/Tot	49.190	51.539	0.13	0.13	1.55	88		1.05	87		96	0.054	100	100								106.2				75	85	74	83	-0.052		

### Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home      Equipment Numbers: \_\_\_\_\_  
 Model: 57ST-ACC-C \_\_\_\_\_  
 Tracking No.: 2187 \_\_\_\_\_  
 Project No.: 0061WS092E \_\_\_\_\_  
 Run #: 6 \_\_\_\_\_  
 Date: 6/6/17 \_\_\_\_\_

**TRAIN 1 (First Hour emissions)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D141	124.6	120.8	3.8
C. Rear filter catch	Filter				0.0
D. Probe catch*	Probe				0.0
E. Filter seals catch*	Seals				0.0

**Sub-Total**    Total Particulate, mg:    **3.8**

**TRAIN 1 (Post First Hour Change-out)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D148	122.7	120.6	2.1
C. Rear filter catch	Filter	D147	122.6	122.6	0.0
D. Probe catch*	Probe	2	115016.3	115016.3	0.0
E. Filter seals catch*	Seals	R481	3538.2	3537.9	0.3

**Sub-Total**    Total Particulate, mg:    **2.4**

**Train 1 Aggregate**    Total Particulate, mg:    **6.2**

**TRAIN 2**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	D149	126.6	123.2	3.4
B. Rear filter catch	Filter	D150	123.0	122.7	0.3
C. Probe catch*	Probe	4	114860.2	114860.3	0.0
D. Filter seals catch*	Seals	R482	3575.2	3574.6	0.6

Total Particulate, mg:    **4.3**

**AMBIENT**

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	D77	124.0	123.7	0.3

Total Particulate, mg:    **0.3**

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight.

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Technician Signature: 



### Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: **Hearth & Home**  
 Model: **57ST-ACC-C**  
 Tracking No.: **2187**  
 Project No.: **0061WS092E**  
 Test Date: **6/6/2017**  
 Run No.: **6**


Firebox Volume (ft <sup>3</sup> ):	2.95
Fuel Piece Length (in):	19
2x4 Crib Weight (lb):	9.3
4x4 Crib Weight (lb):	9.6

<b>Total Fuel Weight (Dry Basis, lb):</b>	15.8	
Fuel Density (lb/ft <sup>3</sup> , Dry Basis):	27.57	OK
Loading Density (lb/ft <sup>3</sup> , Wet Basis):	6.41	OK
2x4 Percentage:	49%	OK

Coal Bed Range (20-25%): **3.78 - 4.725**

Test Fuel Piece	Weight (lb)	Size	Readings (Dry Basis %)			Dry Weight (lb)
1	1.7	2"x 4"	22.8	21.5	19.1	1.40
2	1.7	2"x 4"	23.8	21.4	20.5	1.39
3	2.3	2"x 4"	22.4	20.1	21.9	1.89
4	2.2	2"x 4"	22.5	20.8	18.7	1.82
5	4.7	4"x 4"	21.9	20.1	22.1	3.87
6	4.1	4"x 4"	21.5	20.1	19.3	3.41

Spacer Readings (Dry Basis %)			
8.4	6.3		
6.9	7.8		
8.0	6.6		
7.0	6.5		
6.5	7.8		
7.4	7.6		
8.2	7.6		
7.1	6.8		
7.9	7.2		
7.8	8.0		
8.4	7.4		
7.2			
7.6			

Technician Signature: 

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Hearth & Home  
**Model:** 57ST-ACC-C  
**Date:** 06/06/17  
**Run:** 6  
**Control #:** 0061WS092E  
**Test Duration:** 390  
**Output Category:** 2

**Technicians:** *B. W. [Signature]*  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	72.9%	78.8%
Combustion Efficiency	91.9%	91.9%
Heat Transfer Efficiency	79%	85.7%

Output Rate (kJ/h)	15,725	14,917	(Btu/h)
Burn Rate (kg/h)	1.09	2.40	(lb/h)
Input (kJ/h)	21,574	20,466	(Btu/h)

Test Load Weight (dry kg)	7.08	15.60	dry lb
MC wet (%)	17.45		
MC dry (%)	21.14		
Particulate (g)	6.95		
CO (g)	794		
Test Duration (h)	6.50		

Emissions	Particulate	CO
g/MJ Output	0.07	7.77
g/kg Dry Fuel	0.98	112.21
g/h	1.07	122.20
lb/MM Btu Output	0.16	18.06

Air/Fuel Ratio (A/F)	13.72
----------------------	-------

VERSION:                      2.2                      12/14/2009

VERSION: 2.2

12/14/2009

Manufacturer: Hearth & Home

Model: 57ST-ACC-C

Date: 6/6/2017

Run: 6

Control #: 0061WS092E

Test Duration: 390

Output Category: 2

Appliance Type: Non-Cat (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)

Weight Units lb (kg or lb)

Fuel Data

D. Fir

HHV 19,810 kj/kg

%C 48.73

%H 6.87

%O 43.9

%ASH 0.5

Wood Moisture (% wet): 17.45  
 Load Weight (lb wet): 18.90  
 Burn Rate (dry kg/h): 1.09  
 Total Particulate Emissions: 6.95 g

Averages 1.45 7.41 #DIV/0! 246.88 82.53  
 Temp. (°F)

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO <sub>2</sub>	O <sub>2</sub>	Flue Gas Temp. (°F)	Room Temp
0	18.90	0.98	2.88		203.0	79.0
10	17.30	1.22	13.85		511.0	80.0
20	15.20	0.52	13.91		477.0	80.0
30	13.90	0.54	9.99		374.0	81.0
40	12.70	0.47	9.36		348.0	82.0
50	11.50	0.54	14.32		401.0	82.0
60	10.10	1.12	14.11		411.0	83.0
70	8.70	0.64	14.25		403.0	83.0
80	7.50	0.82	12.97		379.0	84.0
90	6.40	0.78	12.53		376.0	84.0
100	5.50	0.42	10.39		334.0	85.0
110	5.00	0.84	8.81		293.0	84.0
120	4.60	1.15	8.03		271.0	84.0
130	4.20	1.38	7.04		244.0	83.0
140	3.90	1.32	6.81		228.0	83.0
150	3.70	1.47	5.87		212.0	83.0
160	3.50	1.16	6.07		206.0	82.0
170	3.40	1.29	6.21		199.0	82.0
180	3.20	1.39	6.05		195.0	82.0
190	3.10	1.49	6.00		194.0	82.0
200	2.90	1.43	6.03		192.0	82.0
210	2.70	1.67	5.87		189.0	82.0
220	2.60	1.82	5.53		187.0	82.0
230	2.50	1.77	5.67		187.0	82.0
240	2.30	1.82	5.68		184.0	82.0
250	2.20	1.84	5.59		183.0	82.0
260	1.90	1.97	5.71		183.0	82.0
270	1.70	2.20	5.58		185.0	82.0
280	1.60	1.97	5.58		185.0	82.0
290	1.40	2.16	5.26		184.0	83.0
300	1.20	1.72	5.01		180.0	83.0
310	1.10	1.74	4.90		178.0	83.0
320	0.90	1.80	5.15		175.0	83.0
330	0.70	2.08	5.02		175.0	83.0
340	0.60	1.83	5.44		175.0	83.0
350	0.50	1.82	5.51		174.0	83.0
360	0.40	2.30	5.00		176.0	83.0
370	0.20	2.32	4.96		175.0	83.0
380	0.10	2.31	4.93		175.0	84.0
390	0.00	2.05	4.48		174.0	84.0

Client: Hearth & Home Project Number: 0061WS092E Run Number: 6

Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-6-6

Test Crew: B. Davis

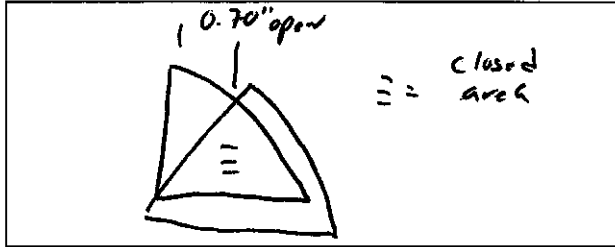
OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Run Notes**

**Air Control Settings**

Primary:

Secondary: fixed



Tertiary/Pilot: Burst Air not used

Fan: Not used

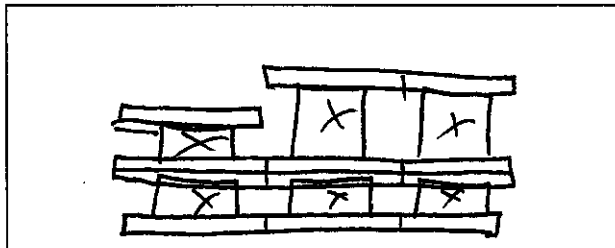
**Preburn Notes**

Time	Notes
50	Levelled coal bed

**Test Notes**

Sketch test fuel configuration:

Start up procedures & Timeline:



Bypass: N/A  
 Fuel loaded by: 40 seconds  
 Door closed at: 50 seconds  
 Primary air: Rtly open until slow flame sub to test setting  
Burst Air locked open @ 0 m.u.  
 Notes: At 5 min Burst Air moved to timed air.  
Fan not used.

Time	Notes
60	Changed Front filter in frame A.

Technician Signature: B. Davis

Date: 6/14/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 6  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 6/6/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Fuel Data

Fuel: Douglas fir, untreated and air dried, standard grade or better dimensional lumber

Pre-Burn Fuel						
<b>Calibration:</b>	Cal Value (1) = 12%	Actual Reading	<u>12</u>			
	Cal Value (2) = 22%	Actual Reading	<u>22</u>			
<b>Piece:</b>	<b>Length:</b>	<b>Reading:</b>	<b>Piece:</b>	<b>Length:</b>	<b>Reading:</b>	
1	<u>8</u> in	<u>24.2</u> <del><u>25.6</u></del>	7	_____ in	_____	
2	<u>8</u> in	<u>20.6</u>	8	_____ in	_____	
3	<u>8</u> in	<u>24.7</u>	9	_____ in	_____	
4	_____ in	_____	10	_____ in	_____	
5	_____ in	_____	11	_____ in	_____	
6	_____ in	_____	12	_____ in	_____	
Total Pre-Burn Fuel Weight: <u>2.4</u>			Pre-Burn Fuel Average Moisture: <u>23.7</u>			
Time (clock): <u>0920</u>		Room Temperature (F): <u>70</u>		Initials: <u>BC</u>		

Test Fuel						
Firebox Volume (ft³): <u>2.95</u>			Test Fuel Piece Length (in): <u>19</u>			
Load Weight Range (lb): <u>18.6 - 22.7</u>			Total Wet Fuel Load Weight (lb): <u>16.9</u>			
Fuel Type & Amount: 2 x 4: <u>5</u>			4 x 4: <u>2</u>			
Weight (with spacers): <u>9.3</u>			Weight (with spacers): <u>7.6</u>			
<b>Piece:</b>	<b>Weight (lbs):</b>	<b>Moisture Readings (%DB):</b>			<b>Fuel Type:</b>	
1	<u>1.7</u>	<u>21.5</u>	<u>22.8</u>	<u>19.1</u>	<u>2x4</u>	
2	<u>1.7</u>	<u>21.4</u>	<u>23.8</u>	<u>20.5</u>	<u>2x4</u>	
3	<u>2.3</u>	<u>20.1</u>	<u>22.4</u>	<u>21.9</u>	<u>2x4</u>	
4	<u>2.2</u>	<u>20.8</u>	<u>22.5</u>	<u>18.7</u>	<u>2x4</u>	
5	<u>4.7</u>	<u>20.1</u>	<u>21.9</u>	<u>22.1</u>	<u>4x4</u>	
6	<u>4.1</u>	<u>20.1</u>	<u>21.5</u>	<u>19.3</u>	<u>4x4</u>	
7	_____	_____	_____	_____	_____	
<b>Spacer Moisture Readings (%DB)</b>						
<u>8.4</u>	<u>6.5</u>	<u>7.9</u>	<u>7.6</u>	<u>6.5</u>	<u>6.8</u>	_____
<u>6.9</u>	<u>7.4</u>	<u>7.8</u>	<u>6.3</u>	<u>7.8</u>	<u>7.2</u>	_____
<u>8.0</u>	<u>8.2</u>	<u>8.4</u>	<u>7.8</u>	<u>7.6</u>	<u>8.0</u>	_____
<u>7.0</u>	<u>7.1</u>	<u>7.2</u>	<u>6.6</u>	<u>7.6</u>	<u>7.4</u>	_____
Time (clock): <u>0920</u>			Room Temperature (F): <u>70</u>		Initials: <u>BC</u>	

Technician Signature: B. Davis Date: 6/6/17

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 6  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-6-17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Supplemental Data**

Start Time: 10:58 Booth #: 7

Stop Time: 17:28

**Stack Gas Leak Check:**

Initial: good Final: good

**Sample Train Leak Check:**

A: 0.0 @ 10 "Hg  
 B: 0.0 @ 9 "Hg

Calibrations: Span Gas CO<sub>2</sub>: 15.96 CO: 5.08

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	<u>10:37</u> <u>Ø</u>	<u>10:37</u> <u>Ø</u>	<u>17:34</u>	<u>17:34</u>
CO <sub>2</sub>	<u>0.00</u>	<u>15.98</u>	<u>0.00</u>	<u>15.87</u>
CO	<u>0.000</u>	<u>5.082</u>	<u>0.012</u>	<u>5.056</u>

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: good Final: good

Stack Diameter (in): 6"

Induced Draft: 0.0

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 5/15/17 Initials: BL

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>28.57</u>	<u>28.57</u>	<u>28.41</u>
RH (%)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Ambient (°F)	<u>79</u>	<u>84</u>	<u>84</u>

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
1	<u>.042</u>	<u>96</u>
2	<u>.052</u>	<u>96</u>
3	<u>.056</u>	<u>96</u>
4	<u>.048</u>	<u>96</u>
1	<u>.048</u>	<u>96</u>
2	<u>.050</u>	<u>96</u>
3	<u>.054</u>	<u>96</u>
4	<u>.050</u>	<u>96</u>
Center:		
	<u>.054</u>	<u>96</u>

Background Filter Volume: 69.149

Tunnel Static Pressure (in H <sub>2</sub> O):	
Beginning of Test	End of Test
<u>-0.574</u>	<u>-0.574</u>
<u>-.287</u>	

Technician Signature: [Signature]

Date: 6/14/17

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Run 7**

## Wood Heater Test Results - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Project No.: 0061WS092E  
 Tracking No.: 2187  
 Run: 7  
 Test Date: 06/07/17

Burn Rate	<b>1.09 kg/hr dry</b>
Average Tunnel Temperature	97 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	16.09 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9950.8 dscf/hour
Average Delta p	0.058 inches H2O
Total Time of Test	400 minutes

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - Vm	70.958 cubic feet	50.285 cubic feet	51.568 cubic feet	7.435 cubic feet
Average Gas Meter Temperature	84 degrees Fahrenheit	89 degrees Fahrenheit	88 degrees Fahrenheit	89 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	64.787 dscf	45.906 dscf	46.698 dscf	6.788 dscf
Total Particulates - m <sub>p</sub>	0.6 mg	3.9 mg	5.8 mg	3 mg
Particulate Concentration (dry-standard) - C <sub>p</sub> /C <sub>s</sub>	0.000009 grams/dscf	0.00008 grams/dscf	0.00012 grams/dscf	0.00044 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.61 grams	5.02 grams	7.63 grams	4.40 grams
Particulate Emission Rate	0.09 grams/hour	0.75 grams/hour	1.14 grams/hour	4.40 grams/hour
Emissions Factor		0.69 g/kg	1.05 g/kg	1.30 g/kg
Difference from Average Total Particulate Emissions		1.30 grams	1.30 grams	

**Dual Train Comparison Results Are Acceptable**

FINAL AVERAGE RESULTS	
<b>Complete Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	6.32 grams
Particulate Emission Rate	<b>0.95 grams/hour</b>
Emissions Factor	0.87 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	4.40 grams
Particulate Emission Rate	4.40 grams/hour
Emissions Factor	1.30 grams/kg

QUALITY CHECKS	
Filter Temps < 90 °F	OK
Filter Face Velocity (47 mm)	OK
Dryer Exit Temp < 80F	OK
Leakage Rate	OK
Ambient Temp (55-90°F)	OK
Negative Probe Weight Eval.	OK
Pro-Rate Variation	OK
Total PM Precision (%)	30.88
Train A - Train B G/KG ≤ 0.5	0.36
Stove Surface ΔT	OK


Technician Signature: \_\_\_\_\_



## Wood Heater Preburn Data - ASTM E2780

<b>Run:</b>	<b>7</b>
Manufacturer:	Hearth & Home
Model:	57ST-ACC-C
Tracking No.:	2187
Project No.:	0061WS092E
Test Date:	6/7/2017
Beginning Clock Time:	9:18

Coal Bed		
Range	<b>3.8</b>	<b>4.8</b>
(lb):	(min)	(max)

Technician Signature: 


Elapsed Time (min)	Scale (lb)	Stack Draft (in H <sub>2</sub> O)	Temperatures (°F)							Stack	Ambient
			FB Top	FB Bottom	FB Back	FB Left	FB Right	Avg. Firebox Surface			
0	6.5	-0.073	896	529	617	755	723	704	540	81	
10	5.8	-0.058	696	550	581	709	716	650.4	350	81	
20	5.2	-0.049	581	558	531	648	671	597.8	302	79	
30	4.8	-0.047	566	553	492	601	634	569.2	302	80	
40	4.4	-0.041	505	541	462	562	601	534.2	254	79	
50	4.5	-0.038	424	528	427	520	563	492.4	220	79	
60	4.5	-0.034	377	513	394	478	521	456.6	204	79	
66	4.4	-0.032	354	502	376	455	498	437	196	78	

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: 7

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 07-Jun-17  
 Beginning Clock Time: 10:25  
 Total Sampling Time: 400 min  
 Recording Interval: 10 min  
 Background Sample Volume: 70.958 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)  
 Barometric Pressure: Begin Middle End Average  
28.35 28.24 28.15 28.25 "Hg  
 OMNI Equipment Numbers: \_\_\_\_\_

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.574 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.09 ft/sec.  
 Initial Tunnel Flow: 166.4 scfm  
 Average Tunnel Flow: 165.8 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 8 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 6 in. Hg  
 Average Test Piece Fuel Moisture: 20.61 Dry Basis %

Technician Signature: 

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.048	0.052	0.054	0.050	0.050	0.054	0.058	0.050	0.058
Temp:	87	87	87	87	87	87	87	87	87
	V <sub>strav</sub> 15.91 ft/sec				V <sub>scent</sub> 16.70 ft/sec			F <sub>p</sub> 0.952	


Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)										Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H₂O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
0	0.000	0.000			1.20	73	-0.13	0.38	73	-1.5	87	0.058			19.0		354	501	375	454	496	436	N/A	196	73	65	74	65	78	-0.034	2.91	1.41
10	1.212	1.291	0.12	0.13	1.59	75	-0.48	1.04	75	-2.4	97	0.058	99	103	17.7	-1.3	461	484	342	418	459	433	N/A	453	79	71	79	69	79	-0.086	14.86	1.75
20	2.447	2.568	0.12	0.13	1.60	78	-0.51	1.01	78	-3.1	105	0.058	101	102	15.3	-2.4	719	466	357	433	469	489	N/A	514	82	73	82	70	80	-0.089	14.88	0.59
30	3.685	3.847	0.12	0.13	1.60	81	-0.48	1.02	81	-1.9	101	0.058	100	101	13.6	-1.7	713	454	365	447	476	491	N/A	391	83	74	83	71	81	-0.076	11.2	0.14
40	4.934	5.129	0.12	0.13	1.60	83	-0.48	1.02	83	-2.8	99	0.058	101	100	12.5	-1.1	657	443	360	453	465	476	N/A	369	83	75	83	71	81	-0.074	11.48	0.21
50	6.184	6.414	0.13	0.13	1.60	85	-0.48	1.03	85	-2.5	100	0.058	100	100	11.3	-1.2	701	430	364	470	457	484	N/A	400	84	75	83	72	81	-0.077	14.09	0.45
60	7.435	7.700	0.13	0.13	1.60	86	-0.48	1.02	86	-2.5	100	0.058	100	100	10.0	-1.3	751	418	377	499	468	503	N/A	405	84	76	84	73	83	-0.078	14.5	1
70	8.692	8.987	0.13	0.13	1.60	87	-0.47	1.01	87	-2.5	101	0.058	101	100	8.6	-1.4	741	408	389	521	489	510	N/A	396	84	77	84	73	83	-0.077	13.99	0.59
80	9.956	10.272	0.13	0.13	1.61	88	-0.42	1.02	88	-3.2	101	0.058	101	100	7.4	-1.2	734	399	398	532	504	513	N/A	385	83	77	85	74	85	-0.075	13.36	0.7
90	11.227	11.559	0.13	0.13	1.59	89	-0.4	1.01	88	-2.6	100	0.058	101	100	6.3	-1.1	709	391	407	536	515	512	N/A	362	83	77	85	75	86	-0.072	12.02	0.85
100	12.495	12.846	0.13	0.13	1.59	90	-0.41	1.02	89	-3.3	101	0.058	101	100	5.5	-0.8	662	383	411	535	534	505	N/A	335	83	78	86	75	85	-0.068	11.21	0.73
110	13.767	14.137	0.13	0.13	1.59	90	-0.41	1.01	90	-1.2	99	0.058	101	100	5.0	-0.5	583	380	409	529	548	490	N/A	301	83	77	86	75	84	-0.063	9.28	1
120	15.040	15.428	0.13	0.13	1.59	90	-0.41	1.02	89	-1	98	0.058	101	100	4.6	-0.4	524	379	404	520	551	476	N/A	278	83	77	86	75	84	-0.060	8.8	1.19
130	16.311	16.720	0.13	0.13	1.60	90	-0.41	1.02	89	-1.1	98	0.058	101	100	4.1	-0.5	502	380	399	510	552	469	N/A	261	83	77	85	75	84	-0.056	8.31	1.06
140	17.580	18.012	0.13	0.13	1.60	89	-0.41	1.02	88	-1.1	97	0.058	101	100	3.8	-0.3	441	383	390	494	533	448	N/A	232	83	76	85	75	84	-0.053	6.23	1.46
150	18.850	19.303	0.13	0.13	1.57	89	-0.4	1.02	88	-1.1	96	0.058	101	100	3.6	-0.2	402	386	379	482	513	432	N/A	220	83	76	85	75	83	-0.050	6.46	1.41
160	20.113	20.595	0.13	0.13	1.57	89	-0.4	1.02	88	-1.1	96	0.058	100	100	3.5	-0.1	378	388	370	473	498	421	N/A	212	83	76	85	75	84	-0.048	6.61	1.44
170	21.377	21.886	0.13	0.13	1.57	89	-0.4	1.02	88	-1.1	96	0.058	100	100	3.3	-0.2	361	390	363	465	487	413	N/A	207	83	76	85	75	84	-0.047	6.45	1.38
180	22.640	23.177	0.13	0.13	1.57	89	-0.39	1.01	88	-1.1	96	0.058	100	100	3.1	-0.2	348	391	356	459	477	406	N/A	201	83	76	85	75	84	-0.046	6.37	1.49
190	23.904	24.468	0.13	0.13	1.57	89	-0.4	1.02	88	-1.1	96	0.058	100	100	3.0	-0.1	340	390	352	455	468	401	N/A	199	83	77	85	75	84	-0.045	6.54	1.53
200	25.168	25.759	0.13	0.13	1.56	89	-0.39	1.02	88	-1.1	96	0.058	100	100	2.8	-0.2	335	389	349	452	460	397	N/A	196	83	77	85	75	84	-0.045	6.4	1.6
210	26.426	27.050	0.13	0.13	1.55	89	-0.4	1.01	88	-1.1	96	0.058	100	100	2.6	-0.2	331	388	346	448	453	393	N/A	195	83	77	86	75	84	-0.045	5.93	1.81
220	27.685	28.341	0.13	0.13	1.56	89	-0.4	1.02	88	-1.1	96	0.058	100	100	2.4	-0.2	324	386	343	443	446	388	N/A	191	83	77	86	75	84	-0.044	5.85	1.86
230	28.944	29.632	0.13	0.13	1.55	89	-0.39	1.02	88	-1.1	96	0.058	100	100	2.3	-0.1	319	383	340	437	440	384	N/A	189	84	77	86	75	84	-0.043	5.86	1.8
240	30.197	30.922	0.13	0.13	1.56	89	-0.4	1.02	89	-1.1	96	0.058	99	100	2.2	-0.1	313	381	338	431	435	380	N/A	186	84	77	86	75	84	-0.043	5.68	1.87
250	31.451	32.212	0.13	0.13	1.56	90	-0.4	1.02	89	-1.1	96	0.058	99	100	2.0	-0.2	308	378	339	423	431	376	N/A	184	84	78	86	76	85	-0.042	5.72	1.91
260	32.710	33.502	0.13	0.13	1.56	90	-0.39	1.02	89	-1.1	96	0.058	100	100	1.9	-0.1	303	376	339	415	429	372	N/A	182	84	78	86	76	85	-0.042	5.6	2.13
270	33.963	34.792	0.13	0.13	1.55	90	-0.39	1.02	89	-1.1	96	0.058	99	100	1.7	-0.2	301	375	336	409	427	370	N/A	181	84	78	86	76	85	-0.042	5.66	1.96
280	35.219	36.082	0.13	0.13	1.54	91	-0.39	1.01	90	-1.1	97	0.058	99	100	1.6	-0.1	300	374	334	404	426	368	N/A	183	84	78	86	76	85	-0.042	5.81	1.81
290	36.480	37.373	0.13	0.13	1.55	91	-0.4	1.02	90	-1.1	97	0.058	100	100	1.5	-0.1	299	373	332	401	426	366	N/A	182	85	78	87	76	85	-0.042	5.77	1.82
300	37.736	38.663	0.13	0.13	1.55	91	-0.4	1.01	90	-1.1	97	0.058	99	100	1.3	-0.2	298	372	332	397	425	365	N/A	182	85	79	87	77	85	-0.041	5.65	1.89
310	38.990	39.953	0.13	0.13	1.55	91	-0.39	1.01	91	-1.1	97	0.058	99	99	1.2	-0.1	296	371	330	393	423	363	N/A	181	85	79	87	77	86	-0.042	5.07	2.05
320	40.244	41.244	0.13	0.13	1.54	92	-0.39	1.01	91	-1.1	97	0.058	99	100	1.0	-0.2	293	370	322	387	423	359	N/A	179	85	79	87	77	86	-0.040	5.45	1.51
330	41.497	42.534	0.13	0.13	1.54	92	-0.39	1.00	91	-1.1	97	0.058	99	99	0.9	-0.1	291	369	317	382	425	357	N/A	179	85	78	87	77	86	-0.041	5.42	1.57
340	42.755	43.824	0.13	0.13	1.55	92	-0.39	1.00	91	-1.1	97	0.058	99	99	0.7	-0.2	290	368	313	376	425	354	N/A	179	85	78	87	78	86	-0.041	5.64	1.32
350	44.011	45.114	0.13	0.13	1.55	92	-0.4	1.01	91	-1.1	97	0.058	99	99	0.6	-0.1	288	368	312	372	427	353	N/A	178	85	79	87	78	86	-0.041	5.48	1.35
360	45.274	46.405	0.13	0.13	1.55	92	-0.4	1.01	91	-1.1	97	0.058	100	100	0.5	-0.1	286	368	310	368	428	352	N/A	178	85	79	87	78	86	-0.041	5.25	1.47
370	46.532	47.696	0.13	0.13	1.55	92	-0.39	1.00	91	-1.1	97	0.058	99	100	0.4	-0.1	284	368	308	364	427	350	N/A	177	85	79	87	78	86	-0.041	5.06	1.6

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **7**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 07-Jun-17  
 Beginning Clock Time: 10:25  
 Total Sampling Time: 400 min  
 Recording Interval: 10 min  
 Background Sample Volume: 70.958 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)  
 Barometric Pressure: Begin Middle End Average  
28.35 28.24 28.15 28.25 "Hg  
 OMNI Equipment Numbers: \_\_\_\_\_

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.574 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.09 ft/sec.  
 Initial Tunnel Flow: 166.4 scfm  
 Average Tunnel Flow: 165.8 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 8 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 6 in. Hg  
 Average Test Piece Fuel Moisture: 20.61 Dry Basis %

Technician Signature: 

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.048	0.052	0.054	0.050	0.050	0.054	0.058	0.050	0.058
Temp:	87	87	87	87	87	87	87	87	87
	V <sub>strav</sub> 15.91 ft/sec			V <sub>scent</sub> 16.70 ft/sec			F <sub>p</sub> 0.952		

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)												Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
380	47.783	48.986	0.13	0.13	1.53	93	-0.39	1.01	92	-1.1	97	0.058	99	99	0.2	-0.2	283	369	308	360	424	349	N/A	176	85	79	87	78	86	-0.041	4.86	1.67
390	49.032	50.277	0.12	0.13	1.53	94	-0.39	1.01	92	-1.1	97	0.058	98	99	0.1	-0.1	280	369	307	356	417	346	N/A	174	86	79	88	79	86	-0.040	4.43	1.74
400	50.285	51.568	0.13	0.13	1.55	94	-0.39	1.01	92	-1.1	97	0.058	99	99	0.0	-0.1	277	367	306	352	407	342	N/A	174	86	79	88	79	87	-0.039	4.42	1.85
Avg/Tot	50.285	51.568	0.13	0.13	1.56	89		1.00	88		97	0.058	100	100								94.2			77	85	75	84	-0.052			

### Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home      Equipment Numbers: \_\_\_\_\_  
 Model: 57ST-ACC-C \_\_\_\_\_  
 Tracking No.: 2187 \_\_\_\_\_  
 Project No.: 0061WS092E \_\_\_\_\_  
 Run #: 7 \_\_\_\_\_  
 Date: 6/7/17 \_\_\_\_\_

**TRAIN 1 (First Hour emissions)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D151	122.8	119.8	3.0
C. Rear filter catch	Filter				0.0
D. Probe catch*	Probe				0.0
E. Filter seals catch*	Seals				0.0

**Sub-Total**    Total Particulate, mg:    3.0

**TRAIN 1 (Post First Hour Change-out)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D153	123.0	122.3	0.7
C. Rear filter catch	Filter	D152	123.5	124.0	-0.5
D. Probe catch*	Probe	14	114550.8	114550.6	0.2
E. Filter seals catch*	Seals	R483	3507.2	3506.7	0.5

**Sub-Total**    Total Particulate, mg:    0.9

**Train 1 Aggregate**    Total Particulate, mg:    3.9

**TRAIN 2**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	D154	128.7	123.7	5.0
B. Rear filter catch	Filter	D155	120.0	119.5	0.5
C. Probe catch*	Probe	16	114267.5	114267.4	0.1
D. Filter seals catch*	Seals	R484	3331.3	3331.1	0.2

**Total Particulate, mg:    5.8**

**AMBIENT**

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	D78	121.4	120.8	0.6

**Total Particulate, mg:    0.6**

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight.

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Technician Signature: 

### Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: **Hearth & Home**  
 Model: **57ST-ACC-C**  
 Tracking No.: **2187**  
 Project No.: **0061WS092E**  
 Test Date: **6/7/2017**  
 Run No.: **7**

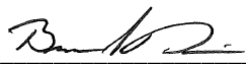
Firebox Volume (ft <sup>3</sup> ):	2.9
Fuel Piece Length (in):	19
2x4 Crib Weight (lb):	10.2
4x4 Crib Weight (lb):	8.8

<b>Total Fuel Weight (Dry Basis, lb):</b>	16.0	
Fuel Density (lb/ft <sup>3</sup> , Dry Basis):	27.51	OK
Loading Density (lb/ft <sup>3</sup> , Wet Basis):	6.55	OK
2x4 Percentage:	54%	OK

Coal Bed Range (20-25%): **3.8 - 4.75**

Test Fuel Piece	Weight (lb)	Size	Readings (Dry Basis %)			Dry Weight (lb)
1	2	2"x 4"	19.8	22.0	21.7	1.65
2	2.2	2"x 4"	21.9	19.5	20.0	1.83
3	2.1	2"x 4"	20.8	20.9	19.5	1.74
4	2.3	2"x 4"	20.2	20.3	20.9	1.91
5	4.4	4"x 4"	22.6	18.1	21.6	3.64
6	3.6	4"x 4"	19.8	22.2	19.1	2.99

Spacer Readings (Dry Basis %)			
7.0	6.3		
6.5	7.7		
7.1	6.6		
7.4	6.3		
7.0	6.7		
7.7	6.5		
6.5	6.6		
6.7	7.6		
6.3	7.1		
7.4	6.7		
6.3	6.9		
6.5			
6.3			

Technician Signature: 

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Hearth & Home  
**Model:** 57ST-ACC-C  
**Date:** 06/07/17  
**Run:** 7  
**Control #:** 0061WS092E  
**Test Duration:** 400  
**Output Category:** 2

**Technicians:** *B. K. [Signature]*  
 \_\_\_\_\_  
 \_\_\_\_\_

### Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	73.9%	79.8%
<b>Combustion Efficiency</b>	92.5%	92.5%
<b>Heat Transfer Efficiency</b>	80%	86.3%

<b>Output Rate (kJ/h)</b>	15,687	14,881	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.07	2.36	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	21,239	20,147	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	7.15	15.75	<b>dry lb</b>
<b>MC wet (%)</b>	17.09		
<b>MC dry (%)</b>	20.61		
<b>Particulate (g )</b>	6.32		
<b>CO (g)</b>	743		
<b>Test Duration (h)</b>	6.67		

	Particulate	CO
<b>Emissions g/MJ Output</b>	0.06	7.10
<b>g/kg Dry Fuel</b>	0.88	103.89
<b>g/h</b>	0.95	111.39
<b>lb/MM Btu Output</b>	0.14	16.50

<b>Air/Fuel Ratio (A/F)</b>	13.42
-----------------------------	-------

VERSION:                      2.2                      12/14/2009

VERSION: 2.2

12/14/2009

Manufacturer: Hearth & Home

Appliance Type: Non-Cat (Cat, Non-Cat, Pellet)

Model: 57ST-ACC-C

Date: 6/7/2017

Run: 7

Temp. Units F (F or C)

Weight Units lb (kg or lb)

Control #: 0061WS092E

Test Duration: 400

Output Category: 2

Fuel Data

D. Fir

Wood Moisture (% wet): 17.09

HHV 19,810 kJ/kg

Load Weight (lb wet): 19.00

%C 48.73

Burn Rate (dry kg/h): 1.07

%H 6.87

Total Particulate Emissions: 6.32 g

%O 43.9

%ASH 0.5

Averages 1.39 7.67 #DIV/0! 247.39 84.10

Temp. (°F)

Elapsed Time (min) Fuel Weight Remaining (lb) Flue Gas Composition (%) CO CO<sub>2</sub> O<sub>2</sub> Flue Gas Temp Room Temp

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO <sub>2</sub>	O <sub>2</sub>	Flue Gas Temp	Room Temp
0	19.00	1.41	2.91		196.0	78.0
10	17.70	1.75	14.86		453.0	79.0
20	15.30	0.59	14.88		514.0	80.0
30	13.60	0.14	11.20		391.0	81.0
40	12.50	0.21	11.48		369.0	81.0
50	11.30	0.45	14.09		400.0	81.0
60	10.00	1.00	14.50		405.0	83.0
70	8.60	0.59	13.99		396.0	83.0
80	7.40	0.70	13.36		385.0	85.0
90	6.30	0.85	12.02		362.0	86.0
100	5.50	0.73	11.21		335.0	85.0
110	5.00	1.00	9.28		301.0	84.0
120	4.60	1.19	8.80		278.0	84.0
130	4.10	1.06	8.31		261.0	84.0
140	3.80	1.46	6.23		232.0	84.0
150	3.60	1.41	6.46		220.0	83.0
160	3.50	1.44	6.61		212.0	84.0
170	3.30	1.38	6.45		207.0	84.0
180	3.10	1.49	6.37		201.0	84.0
190	3.00	1.53	6.54		199.0	84.0
200	2.80	1.60	6.40		196.0	84.0
210	2.60	1.81	5.93		195.0	84.0
220	2.40	1.86	5.85		191.0	84.0
230	2.30	1.80	5.86		189.0	84.0
240	2.20	1.87	5.68		186.0	84.0
250	2.00	1.91	5.72		184.0	85.0
260	1.90	2.13	5.60		182.0	85.0
270	1.70	1.96	5.66		181.0	85.0
280	1.60	1.81	5.81		183.0	85.0
290	1.50	1.82	5.77		182.0	85.0
300	1.30	1.89	5.65		182.0	85.0
310	1.20	2.05	5.07		181.0	86.0
320	1.00	1.51	5.45		179.0	86.0
330	0.90	1.57	5.42		179.0	86.0
340	0.70	1.32	5.64		179.0	86.0
350	0.60	1.35	5.48		178.0	86.0
360	0.50	1.47	5.25		178.0	86.0
370	0.40	1.60	5.06		177.0	86.0
380	0.20	1.67	4.86		176.0	86.0
390	0.10	1.74	4.43		174.0	86.0
400	0.00	1.85	4.42		174.0	87.0

**ASTM E2780 Wood Heater Run Sheets**

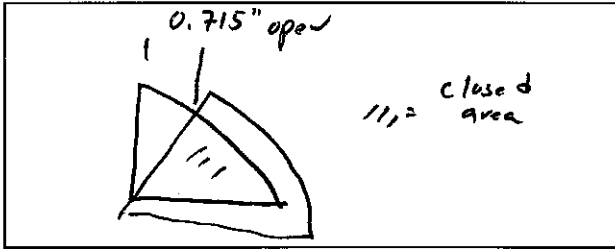
Client: Hearth & Home Project Number: 0061WS092E Run Number: 7  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-7-17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Run Notes**

**Air Control Settings**

Primary:

Secondary: Fixed



Tertiary/Pilot: Bypass Air Not used

Fan: Not used

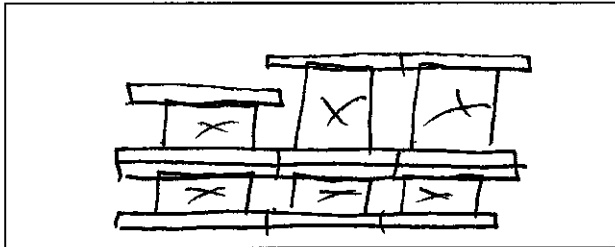
**Preburn Notes**

Time	Notes
42	Levelled coal bed

**Test Notes**

Sketch test fuel configuration:

Start up procedures & Timeline:



Bypass: N/A  
 Fuel loaded by: 50 seconds  
 Door closed at: 57 seconds  
 Primary air: fully open until 5:00 then set to test setting  
Bypass Air Locked open @ 5:00 min.  
 Notes: then set to time & air @ 5:00  
FAN Not used

Time	Notes
60	changed front filter to front A.

Technician Signature: B. Davis

Date: 6/14/17



### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 7  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-7-17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Fuel Data

Fuel: Douglas fir, untreated and air dried, standard grade or better dimensional lumber

Pre-Burn Fuel					
<b>Calibration:</b>		Cal Value (1) = 12%	Actual Reading	<u>12</u>	
		Cal Value (2) = 22%	Actual Reading	<u>22</u>	
<b>Piece:</b>	<b>Length:</b>	<b>Reading:</b>	<b>Piece:</b>	<b>Length:</b>	<b>Reading:</b>
1	<u>8</u> in	<u>24.5</u>	7	_____ in	_____
2	<u>8</u> in	<u>24.4</u>	8	_____ in	_____
3	<u>8</u> in	<u>23.8</u>	9	_____ in	_____
4	_____ in	_____	10	_____ in	_____
5	_____ in	_____	11	_____ in	_____
6	_____ in	_____	12	_____ in	_____
Total Pre-Burn Fuel Weight:		<u>2.2</u> <u>0850</u>	Pre-Burn Fuel Average Moisture:		<u>24.23</u> <u>68</u>
Time (clock):		<u>0850</u>	Room Temperature (F):		<u>68</u> Initials: <u>BD</u>

Test Fuel					
Firebox Volume (ft³):		<u>2.95</u>		Test Fuel Piece Length (in): <u>18</u>	
Load Weight Range (lb):		<u>20.65</u>		Total Wet Fuel Load Weight (lb): <u>19.0</u>	
Fuel Type & Amount:		2 x 4: <u>4</u>		4 x 4: <u>2</u>	
Weight (with spacers):		<u>10.2</u>		Weight (with spacers): <u>8.8</u>	
<b>Piece:</b>	<b>Weight (lbs):</b>	<b>Moisture Readings (%DB):</b>			<b>Fuel Type:</b>
1	<u>2.0</u>	<u>19.8</u>	<u>22.0</u>	<u>21.7</u>	<u>2x4</u>
2	<u>2.2</u>	<u>21.9</u>	<u>19.5</u>	<u>20.0</u>	<u>2x4</u>
3	<u>2.1</u>	<u>20.8</u>	<u>20.9</u>	<u>19.5</u>	<u>2x4</u>
4	<u>2.3</u>	<u>20.2</u>	<u>20.3</u>	<u>20.9</u>	<u>2x4</u>
5	<u>264.4</u>	<u>22.6</u>	<u>18.1</u>	<u>21.6</u>	<u>4x4</u>
6	<u>3.6</u>	<u>19.8</u>	<u>22.2</u>	<u>19.1</u>	<u>4x4</u>
7	_____	_____	_____	_____	_____
<b>Spacer Moisture Readings (%DB)</b>					
<u>7.0</u>	<u>7.0</u>	<u>6.3</u>	<u>6.3</u>	<u>6.3</u>	<u>7.6</u>
<u>6.5</u>	<u>7.7</u>	<u>7.4</u>	<u>6.3</u>	<u>6.7</u>	<u>7.1</u>
<u>7.1</u>	<u>6.5</u>	<u>6.3</u>	<u>7.7</u>	<u>6.5</u>	<u>6.7</u>
<u>7.4</u>	<u>6.7</u>	<u>6.5</u>	<u>6.6</u>	<u>6.6</u>	<u>6.9</u>
Time (clock):		<u>0850</u>		Room Temperature (F): <u>68</u> Initials: <u>BD</u>	

Technician Signature: BD

Date: 6/14/17

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 7  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-7-17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Supplemental Data**

Start Time: 10:25 Booth #: 7

Stop Time: 17:05

**Stack Gas Leak Check:**

Initial: good Final: good

**Sample Train Leak Check:**

A: 0.0 @ 8.0"Hg  
 B: 0.0 @ 60"Hg

**Calibrations:** Span Gas CO<sub>2</sub>: 15.96 CO: 5.08

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	<u>0957</u>	<u>1000</u>	<u>1711</u>	<u>1711</u>
CO <sub>2</sub>	<u>0.00</u>	<u>15.96</u>	<u>-0.03</u>	<u>15.78</u>
CO	<u>0.005</u>	<u>5.084</u>	<u>-0.001</u>	<u>5.011</u>

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: good Final: good

Stack Diameter (in): 6"

Induced Draft: 0.0

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 5/15/17 Initials: BL

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
1	<u>.048</u>	<u>87</u>
2	<u>.052</u>	<u>87</u>
3	<u>.054</u>	<u>87</u>
4	<u>.050</u>	<u>87</u>
1	<u>.050</u>	<u>87</u>
2	<u>.054</u>	<u>87</u>
3	<u>.058</u>	<u>87</u>
4	<u>.050</u>	<u>87</u>
Center:		
	<u>.058</u>	<u>87</u>

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>28.35</u>	<u>28.24</u>	<u>28.15</u>
RH (%)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Ambient (°F)	<u>78</u>	<u>84</u>	<u>87</u>

**Background Filter Volume:** 70.958

Tunnel Static Pressure (in H <sub>2</sub> O):	
Beginning of Test	End of Test
<u>-0.574</u>	<u>-0.574</u>

-.287

Technician Signature: B. Davis

Date: 6/14/17

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Run 8**

## Wood Heater Test Results - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Project No.: 0061WS092E  
 Tracking No.: 2187  
 Run: 8  
 Test Date: 06/08/17

Burn Rate	<b>1.88 kg/hr dry</b>
Average Tunnel Temperature	100 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	16.25 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9977.6 dscf/hour
Average Delta p	0.056 inches H2O
Total Time of Test	225 minutes

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - V <sub>m</sub>	40.132 cubic feet	28.306 cubic feet	29.018 cubic feet	7.367 cubic feet
Average Gas Meter Temperature	82 degrees Fahrenheit	86 degrees Fahrenheit	85 degrees Fahrenheit	86 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - V <sub>mstd</sub>	36.614 dscf	25.862 dscf	26.289 dscf	6.731 dscf
Total Particulates - m <sub>p</sub>	0.5 mg	4.3 mg	3.6 mg	2.9 mg
Particulate Concentration (dry-standard) - C <sub>p</sub> /C <sub>s</sub>	0.000014 grams/dscf	0.00017 grams/dscf	0.00014 grams/dscf	0.00043 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.51 grams	5.71 grams	4.61 grams	4.30 grams
Particulate Emission Rate	0.14 grams/hour	1.52 grams/hour	1.23 grams/hour	4.30 grams/hour
Emissions Factor		0.81 g/kg	0.65 g/kg	0.83 g/kg
Difference from Average Total Particulate Emissions		0.55 grams	0.55 grams	

**Dual Train Comparison Results Are Acceptable**

FINAL AVERAGE RESULTS	
<b>Complete Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	5.16 grams
Particulate Emission Rate	<b>1.38 grams/hour</b>
Emissions Factor	0.73 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	4.30 grams
Particulate Emission Rate	4.30 grams/hour
Emissions Factor	0.83 grams/kg


QUALITY CHECKS	
Filter Temps < 90 °F	OK
Filter Face Velocity (47 mm)	OK
Dryer Exit Temp < 80F	OK
Leakage Rate	OK
Ambient Temp (55-90°F)	OK
Negative Probe Weight Eval.	OK
Pro-Rate Variation	OK
Total PM Precision (%)	15.94
Train A - Train B G/KG ≤ 0.5	0.16
Stove Surface ΔT	OK

Technician Signature: \_\_\_\_\_

# Wood Heater Preburn Data - ASTM E2780

<b>Run:</b>	<b>8</b>
Manufacturer:	Hearth & Home
Model:	57ST-ACC-C
Tracking No.:	2187
Project No.:	0061WS092E
Test Date:	6/8/2017
Beginning Clock Time:	8:53

Coal Bed		
Range	3.7	4.7
(lb):	(min)	(max)

Technician Signature: 

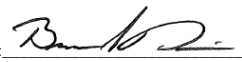
Elapsed Time (min)	Scale (lb)	Stack Draft (in H <sub>2</sub> O)	Temperatures (°F)							Stack	Ambient
			FB Top	FB Bottom	FB Back	FB Left	FB Right	Avg. Firebox Surface			
0	18.2	-0.056	453	418	536	608	636	530.2	361	76	
10	16.3	-0.071	582	463	476	553	571	529	511	76	
20	13.3	-0.074	540	478	339	550	569	495.2	541	78	
30	11.5	-0.071	415	479	283	550	558	457	480	79	
40	9.4	-0.075	501	472	285	585	561	480.8	539	80	
50	7.4	-0.075	566	466	290	615	590	505.4	550	82	
60	5.6	-0.069	491	463	311	648	605	503.6	490	82	
70	5.1	-0.061	388	467	325	639	632	490.2	404	83	
80	4.5	-0.05	302	487	310	621	640	472	329	82	
88	4.4	-0.044	246	506	281	575	606	442.8	281	82	

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **8**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 08-Jun-17  
 Beginning Clock Time: 10:22  
 Total Sampling Time: 225 min  
 Recording Interval: 5 min  
 Background Sample Volume: 40.132 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)  
 Barometric Pressure: Begin Middle End Average  
28.11 28.14 28.16 28.14 "Hg  
 OMNI Equipment Numbers: \_\_\_\_\_

PM Control Modules: 371, 372  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.524 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.25 ft/sec.  
 Initial Tunnel Flow: 165.8 scfm  
 Average Tunnel Flow: 166.3 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 7 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 9 in. Hg  
 Average Test Piece Fuel Moisture: 22.23 Dry Basis %

Technician Signature: 

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.048	0.050	0.056	0.052	0.050	0.056	0.058	0.054	0.056
Temp:	100	100	99	99	99	99	99	99	99
V <sub>strav</sub>	16.25 ft/sec				V <sub>scent</sub> 16.66 ft/sec				F <sub>p</sub> 0.976


Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)										Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H₂O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
0	0.000	0.000			0.98	74	0.13	0.89	75	-0.8	99	0.056			18.7		243	507	278	570	602	440	N/A	280	83	63	83	64	82	-0.049	2.66	0.73
5	0.594	0.642	0.12	0.13	1.68	75	-0.6	1.03	75	-1.1	110	0.056	97	102	17.9	-0.8	345	511	256	542	570	445	N/A	576	87	71	86	70	82	-0.092	13.93	0.3
10	1.207	1.280	0.12	0.13	1.60	76	-0.58	1.01	76	-1.1	120	0.056	101	103	16.3	-1.6	516	514	253	545	558	477	N/A	676	88	71	86	71	82	-0.098	16.34	1.25
15	1.821	1.912	0.12	0.13	1.62	77	-0.63	0.99	78	-1.1	127	0.056	102	102	14.4	-1.9	607	513	258	568	566	502	N/A	705	90	72	88	71	82	-0.099	17.11	1.1
20	2.431	2.541	0.12	0.13	1.60	79	-0.63	0.98	80	-1.1	130	0.056	101	101	12.7	-1.7	642	510	265	598	579	519	N/A	697	88	73	89	72	82	-0.098	17.16	0.91
25	3.036	3.173	0.12	0.13	1.62	80	-0.64	0.99	81	-1.2	128	0.056	100	101	11.2	-1.5	647	507	270	618	592	527	N/A	647	88	74	87	73	82	-0.095	16.61	0.62
30	3.648	3.806	0.12	0.13	1.61	82	-0.63	0.99	83	-1.2	123	0.056	100	101	9.9	-1.3	630	505	271	632	602	528	N/A	614	87	75	87	73	83	-0.094	16.31	0.5
35	4.262	4.438	0.12	0.13	1.59	83	-0.63	0.98	84	-1.2	121	0.056	100	100	8.8	-1.1	616	505	271	642	611	529	N/A	596	87	76	87	74	83	-0.094	15.99	0.42
40	4.878	5.071	0.12	0.13	1.60	84	-0.63	0.98	85	-1.2	119	0.056	100	100	7.8	-1	596	504	273	656	622	530	N/A	575	86	76	87	74	83	-0.091	15.26	0.41
45	5.497	5.704	0.12	0.13	1.61	85	-0.62	0.99	86	-1.2	117	0.056	100	100	6.8	-1	553	504	275	672	634	528	N/A	543	86	77	86	75	83	-0.088	14.35	0.5
50	6.118	6.339	0.12	0.13	1.61	86	-0.61	0.99	87	-1.2	114	0.056	100	99	6.0	-0.8	518	504	276	688	645	526	N/A	509	85	78	86	75	83	-0.085	13.22	0.38
55	6.742	6.974	0.12	0.13	1.61	87	-0.59	0.99	88	-1.2	112	0.056	100	99	5.3	-0.7	479	504	278	695	655	522	N/A	469	84	79	85	76	84	-0.082	11.78	0.27
60	7.367	7.612	0.13	0.13	1.62	87	-0.58	0.99	88	-1.2	109	0.056	100	99	4.7	-0.6	446	505	279	693	664	517	N/A	445	83	79	85	76	84	-0.080	10.84	0.18
65	7.999	8.251	0.13	0.13	1.63	88	-0.55	1.00	89	-1.2	107	0.056	101	99	4.1	-0.6	414	506	282	685	670	511	N/A	424	83	79	84	76	84	-0.077	10.16	0.08
70	8.634	8.893	0.13	0.13	1.63	88	-0.53	1.00	89	-1.2	106	0.056	101	99	3.9	-0.2	390	507	285	676	670	506	N/A	405	83	80	84	77	84	-0.075	9.74	0.08
75	9.273	9.536	0.13	0.13	1.63	89	-0.51	1.01	90	-1.2	104	0.056	101	99	3.5	-0.4	368	508	285	668	663	498	N/A	398	83	80	84	77	84	-0.074	9.27	0.16
80	9.911	10.181	0.13	0.13	1.65	90	-0.51	1.01	90	-1.1	103	0.056	101	100	3.2	-0.3	349	510	283	660	654	491	N/A	385	83	80	84	77	85	-0.072	8.7	0.14
85	10.554	10.828	0.13	0.13	1.65	90	-0.5	1.01	91	-1.1	102	0.056	102	100	3.0	-0.2	317	511	278	648	642	479	N/A	349	83	80	83	77	85	-0.069	7.42	0.25
90	11.199	11.475	0.13	0.13	1.65	90	-0.51	1.02	90	-1.1	100	0.056	102	100	2.9	-0.1	291	512	271	634	626	467	N/A	330	83	80	83	78	85	-0.066	6.9	0.39
95	11.844	12.124	0.13	0.13	1.66	90	-0.51	1.01	90	-1.1	98	0.056	102	100	2.7	-0.2	273	514	266	620	610	457	N/A	316	83	79	83	77	85	-0.065	6.78	0.47
100	12.487	12.773	0.13	0.13	1.61	90	-0.47	1.02	89	-1.1	97	0.056	101	100	2.6	-0.1	261	515	261	608	595	448	N/A	305	82	79	82	77	84	-0.063	6.78	0.55
105	13.122	13.421	0.13	0.13	1.62	90	-0.47	1.01	89	-1.1	96	0.056	100	100	2.4	-0.2	247	516	255	596	581	439	N/A	292	82	79	82	77	84	-0.063	5.82	0.74
110	13.760	14.070	0.13	0.13	1.62	90	-0.47	1.03	89	-1.1	95	0.056	100	100	2.3	-0.1	236	516	249	584	567	430	N/A	284	81	78	81	77	84	-0.060	5.74	0.8
115	14.396	14.719	0.13	0.13	1.62	89	-0.47	1.02	88	-1.1	94	0.056	100	100	2.2	-0.1	228	515	242	570	553	422	N/A	275	81	78	81	77	84	-0.060	5.33	0.86
120	15.034	15.369	0.13	0.13	1.62	89	-0.48	1.03	88	-1.1	93	0.056	100	100	2.2	0	220	514	237	555	540	413	N/A	267	81	77	81	77	84	-0.059	5.14	0.92
125	15.670	16.018	0.13	0.13	1.62	89	-0.48	1.03	88	-1.2	92	0.056	100	99	2.0	-0.2	215	511	232	542	528	406	N/A	262	81	77	80	76	83	-0.057	5.16	0.91
130	16.304	16.668	0.13	0.13	1.63	89	-0.48	1.02	87	-1.1	91	0.056	99	100	1.9	-0.1	210	509	228	531	518	399	N/A	259	81	77	80	76	83	-0.058	5.25	0.92
135	16.941	17.318	0.13	0.13	1.63	88	-0.48	1.03	87	-1.1	91	0.056	100	100	1.9	0	206	506	224	522	508	393	N/A	256	80	76	80	76	83	-0.057	5.06	0.83
140	17.573	17.967	0.13	0.13	1.63	88	-0.48	1.02	87	-1.1	91	0.056	99	100	1.8	-0.1	203	502	221	513	500	388	N/A	252	80	76	80	75	83	-0.057	4.97	0.91
145	18.208	18.617	0.13	0.13	1.63	88	-0.48	1.03	86	-1.1	90	0.056	100	100	1.7	-0.1	199	499	217	505	493	383	N/A	249	80	76	79	75	83	-0.056	4.91	0.95
150	18.843	19.267	0.13	0.13	1.62	88	-0.48	1.02	86	-1.1	90	0.056	100	100	1.6	-0.1	196	496	215	498	485	378	N/A	246	80	76	79	75	83	-0.056	4.87	0.98
155	19.476	19.917	0.13	0.13	1.63	87	-0.49	1.03	86	-1.1	89	0.056	100	100	1.5	-0.1	194	492	212	492	479	374	N/A	243	82	75	81	74	82	-0.056	5	0.99
160	20.108	20.567	0.13	0.13	1.63	87	-0.48	1.03	86	-1.1	89	0.056	99	100	1.4	-0.1	193	488	213	486	473	371	N/A	242	83	75	82	74	82	-0.055	5.06	1.01
165	20.740	21.217	0.13	0.13	1.63	87	-0.49	1.03	85	-1.1	88	0.056	99	100	1.3	-0.1	191	485	212	483	468	368	N/A	239	83	75	83	74	81	-0.053	4.66	0.92
170	21.373	21.866	0.13	0.13	1.63	87	-0.49	1.03	85	-1.1	88	0.056	99	100	1.2	-0.1	189	482	210	479	463	365	N/A	238	83	75	83	74	81	-0.055	4.81	0.95
175	22.004	22.516	0.13	0.13	1.63	87	-0.49	1.03	85	-1.1	88	0.056	99	100	1.0	-0.2	186	478	209	477	458	362	N/A	238	83	74	83	74	81	-0.055	4.88	0.94
180	22.636	23.166	0.13	0.13	1.63	87	-0.48	1.03	85	-1.1	88	0.056	99	100	0.9	-0.1	185	475	208	475	455	360	N/A	238	83	74	83	74	81	-0.054	4.97	0.93
185	23.266	23.816	0.13	0.13	1.63	87	-0.48	1.02	85	-1.1	88	0.056	99	100	0.8	-0.1	185	471	209	473	452	358	N/A	237	83	74	83	73	81	-0.054	5.08	0.91

### Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **8**

Manufacturer: Hearth & Home  
 Model: 57ST-ACC-C  
 Tracking No.: 2187  
 Project No.: 0061WS092E  
 Test Date: 08-Jun-17  
 Beginning Clock Time: 10:22  
 Total Sampling Time: 225 min  
 Recording Interval: 5 min  
 Background Sample Volume: 40.132 cubic feet  
 Meter Box Y Factor: 1.001 (1) 0.993 (2) 0.997 (Amb)  
 Barometric Pressure: Begin Middle End Average  
28.11 28.14 28.16 28.14 "Hg  
 OMNI Equipment Numbers: \_\_\_\_\_

PM Control Modules: 371, 372  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.524 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 16.25 ft/sec.  
 Initial Tunnel Flow: 165.8 scfm  
 Average Tunnel Flow: 166.3 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ 7 in. Hg  
 Post-Test Leak Check (2): 0.000 cfm @ 9 in. Hg  
 Average Test Piece Fuel Moisture: 22.23 Dry Basis %

Technician Signature: 

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.048	0.050	0.056	0.052	0.050	0.056	0.058	0.054	0.056
Temp:	100	100	99	99	99	99	99	99	99
	V <sub>strav</sub> 16.25 ft/sec				V <sub>scent</sub> 16.66 ft/sec				F <sub>p</sub> 0.976

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)												Stack Gas Data					
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H2O)	Meter 1 Temp (°F)	Meter 1 Vacuum ("Hg)	Orifice dH 2 ("H2O)	Meter 2 Temp (°F)	Meter 2 Vacuum ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Avg. Stove Surface Temp	Catalyst Exit Temp	Stack	Filter 1	Dryer Exit 1	Filter 2	Dryer Exit 2	Ambient	Draft ("H2O)	CO2 (%)	CO (%)
190	23.897	24.466	0.13	0.13	1.63	87	-0.49	1.03	85	-1.1	87	0.056	99	100	0.7	-0.1	183	468	212	472	450	357	N/A	235	83	74	83	73	80	-0.054	5.09	0.93
195	24.528	25.116	0.13	0.13	1.63	87	-0.48	1.03	85	-1.1	87	0.056	99	100	0.6	-0.1	183	465	215	472	449	357	N/A	235	83	74	83	73	80	-0.055	5.23	0.95
200	25.156	25.766	0.13	0.13	1.63	87	-0.49	1.03	85	-1.1	87	0.056	99	100	0.5	-0.1	184	463	218	472	449	357	N/A	236	83	74	83	73	80	-0.054	5.34	0.94
205	25.787	26.416	0.13	0.13	1.63	87	-0.48	1.03	85	-1.1	87	0.056	99	100	0.4	-0.1	183	460	224	473	450	358	N/A	238	83	74	83	73	80	-0.055	5.55	0.85
210	26.418	27.066	0.13	0.13	1.63	86	-0.49	1.03	84	-1.1	87	0.056	99	100	0.3	-0.1	184	457	229	474	452	359	N/A	241	82	74	82	73	79	-0.057	5.56	0.86
215	27.051	27.717	0.13	0.13	1.63	86	-0.48	1.03	84	-1.1	86	0.056	99	100	0.2	-0.1	185	454	233	475	453	360	N/A	241	82	74	82	73	79	-0.056	5.38	0.83
220	27.679	28.368	0.13	0.13	1.63	86	-0.49	1.03	84	-1.1	86	0.056	99	100	0.1	-0.1	183	451	235	477	454	360	N/A	238	82	74	82	73	79	-0.055	5.24	0.86
225	28.306	29.018	0.13	0.13	1.63	86	-0.49	1.02	83	-1.1	86	0.056	98	100	0.0	-0.1	182	449	236	477	455	360	N/A	239	82	73	82	72	79	-0.056	5.3	0.87
Avg/Tot	28.306	29.018	0.13	0.13	1.61	86		1.01	85		100	0.056	100	100								80.2				76	83	74	82	-0.068		

### Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Hearth & Home      Equipment Numbers: \_\_\_\_\_  
 Model: 57ST-ACC-C \_\_\_\_\_  
 Tracking No.: 2187 \_\_\_\_\_  
 Project No.: 0061WS092E \_\_\_\_\_  
 Run #: 8 \_\_\_\_\_  
 Date: 6/8/17 \_\_\_\_\_

**TRAIN 1 (First Hour emissions)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D156	122.8	119.9	2.9
C. Rear filter catch	Filter				0.0
D. Probe catch*	Probe				0.0
E. Filter seals catch*	Seals				0.0

**Sub-Total**    Total Particulate, mg:    2.9

**TRAIN 1 (Post First Hour Change-out)**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
B. Front filter catch	Filter	D157	123.9	123.4	0.5
C. Rear filter catch	Filter	D158	121.3	121.5	-0.2
D. Probe catch*	Probe	17	114562.8	114562.5	0.3
E. Filter seals catch*	Seals	R485	3425.3	3424.5	0.8

**Sub-Total**    Total Particulate, mg:    1.4

**Train 1 Aggregate**    Total Particulate, mg:    4.3

**TRAIN 2**

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	D159	122.9	120.4	2.5
B. Rear filter catch	Filter	D160	122.9	123.7	-0.8
C. Probe catch*	Probe	21	114393.3	114393.1	0.2
D. Filter seals catch*	Seals	R486	3310.5	3308.8	1.7

**Total Particulate, mg:    3.6**

**AMBIENT**

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	D79	122.3	121.8	0.5

**Total Particulate, mg:    0.5**

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight.

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Technician Signature: 



### Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: **Hearth & Home**  
 Model: **57ST-ACC-C**  
 Tracking No.: **2187**  
 Project No.: **0061WS092E**  
 Test Date: **6/8/2017**  
 Run No.: **8**

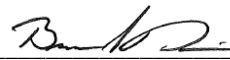
Firebox Volume (ft <sup>3</sup> ):	2.95
Fuel Piece Length (in):	18
2x4 Crib Weight (lb):	9
4x4 Crib Weight (lb):	9.7

Total Fuel Weight (Dry Basis, lb):	15.6	
Fuel Density (lb/ft <sup>3</sup> , Dry Basis):	28.29	OK
Loading Density (lb/ft <sup>3</sup> , Wet Basis):	6.34	OK
2x4 Percentage:	48%	OK

Coal Bed Range (20-25%): **3.74 - 4.675**

Test Fuel Piece	Weight (lb)	Size	Readings (Dry Basis %)			Dry Weight (lb)
1	1.9	2"x 4"	22.7	22.4	21.7	1.55
2	1.8	2"x 4"	22.6	20.8	21.7	1.48
3	1.7	2"x 4"	22.6	23.1	22.0	1.39
4	2	2"x 4"	22.4	21.1	22.4	1.64
5	4.3	4"x 4"	21.9	21.6	22.0	3.53
6	4.7	4"x 4"	24.2	22.2	22.8	3.82

Spacer Readings (Dry Basis %)			
6.9	7.4		
6.2	7.4		
7.0	7.7		
7.9	6.9		
7.6	7.2		
7.4	6.7		
7.4	7.0		
6.6	8.1		
6.7	8.1		
6.3	6.8		
6.9	7.0		
7.9			
7.6			

Technician Signature: 

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Hearth & Home  
**Model:** 57ST-ACC-C  
**Date:** 06/18/17  
**Run:** 8  
**Control #:** 0061WS092E  
**Test Duration:** 225  
**Output Category:** 3

**Technicians:** *B. K. [Signature]*  
 \_\_\_\_\_  
 \_\_\_\_\_

### Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	71.9%	77.7%
Combustion Efficiency	95.7%	95.7%
Heat Transfer Efficiency	75%	81.1%

Output Rate (kJ/h)	26,349	24,995	(Btu/h)
Burn Rate (kg/h)	1.85	4.08	(lb/h)
Input (kJ/h)	36,668	34,784	(Btu/h)

Test Load Weight (dry kg)	6.94	15.30	dry lb
MC wet (%)	18.19		
MC dry (%)	22.23		
Particulate (g)	5.16		
CO (g)	417		
Test Duration (h)	3.75		

Emissions	Particulate	CO
g/MJ Output	0.05	4.22
g/kg Dry Fuel	0.74	60.04
g/h	1.38	111.12
lb/MM Btu Output	0.12	9.80

Air/Fuel Ratio (A/F)	13.73
----------------------	-------

VERSION:                      2.2                      12/14/2009

VERSION: 2.2

12/14/2009

Manufacturer: Hearth & Home

Model: 57ST-ACC-C

Date: 6/18/2017

Run: 8

Control #: 0061WS092E

Test Duration: 225

Output Category: 3

Appliance Type: Non-Cat (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)

Weight Units lb (kg or lb)

Fuel Data

D. Fir

HHV 19,810 kj/kg

%C 48.73

%H 6.87

%O 43.9

%ASH 0.5

Wood Moisture (% wet): 18.19  
 Load Weight (lb wet): 18.70  
 Burn Rate (dry kg/h): 1.85  
 Total Particulate Emissions: 5.16 g

Averages 0.70 8.19 #DIV/0! 357.91 82.39  
 Temp. (°F)

Elapsed Time (min) Fuel Weight Remaining (lb) Flue Gas Composition (%) CO CO<sub>2</sub> O<sub>2</sub> Flue Gas Room Temp

Elapsed Time (min)	Fuel Weight Remaining (lb)	CO	CO <sub>2</sub>	O <sub>2</sub>	Flue Gas	Room Temp
0	18.70	0.73	2.66		280.0	82.0
5	17.90	0.30	13.93		576.0	82.0
10	16.30	1.25	16.34		676.0	82.0
15	14.40	1.10	17.11		705.0	82.0
20	12.70	0.91	17.16		697.0	82.0
25	11.20	0.62	16.61		647.0	82.0
30	9.90	0.50	16.31		614.0	83.0
35	8.80	0.42	15.99		596.0	83.0
40	7.80	0.41	15.26		575.0	83.0
45	6.80	0.50	14.35		543.0	83.0
50	6.00	0.38	13.22		509.0	83.0
55	5.30	0.27	11.78		469.0	84.0
60	4.70	0.18	10.84		445.0	84.0
65	4.10	0.08	10.16		424.0	84.0
70	3.90	0.08	9.74		405.0	84.0
75	3.50	0.16	9.27		398.0	84.0
80	3.20	0.14	8.70		385.0	85.0
85	3.00	0.25	7.42		349.0	85.0
90	2.90	0.39	6.90		330.0	85.0
95	2.70	0.47	6.78		316.0	85.0
100	2.60	0.55	6.78		305.0	84.0
105	2.40	0.74	5.82		292.0	84.0
110	2.30	0.80	5.74		284.0	84.0
115	2.20	0.86	5.33		275.0	84.0
120	2.20	0.92	5.14		267.0	84.0
125	2.00	0.91	5.16		262.0	83.0
130	1.90	0.92	5.25		259.0	83.0
135	1.90	0.83	5.06		256.0	83.0
140	1.80	0.91	4.97		252.0	83.0
145	1.70	0.95	4.91		249.0	83.0
150	1.60	0.98	4.87		246.0	83.0
155	1.50	0.99	5.00		243.0	82.0
160	1.40	1.01	5.06		242.0	82.0
165	1.30	0.92	4.66		239.0	81.0
170	1.20	0.95	4.81		238.0	81.0
175	1.00	0.94	4.88		238.0	81.0
180	0.90	0.93	4.97		238.0	81.0
185	0.80	0.91	5.08		237.0	81.0
190	0.70	0.93	5.09		235.0	80.0
195	0.60	0.95	5.23		235.0	80.0
200	0.50	0.94	5.34		236.0	80.0
205	0.40	0.85	5.55		238.0	80.0
210	0.30	0.86	5.56		241.0	79.0
215	0.20	0.83	5.38		241.0	79.0
220	0.10	0.86	5.24		238.0	79.0
225	0.00	0.87	5.30		239.0	79.0

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 8  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-8-17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Run Notes

##### Air Control Settings

Primary:

Secondary: fixed



Tertiary/Pilot: Boost Air not used

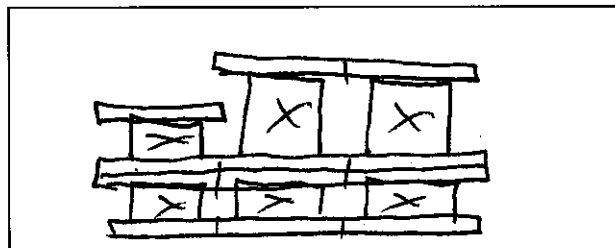
Fan: on high entire preburn

##### Preburn Notes

Time	Notes
28 77	Adjusted Preburn fuel. Levelled coal bed

##### Test Notes

Sketch test fuel configuration:



Start up procedures & Timeline:

Bypass: N/A  
 Fuel loaded by: 35 seconds  
 Door closed at: 40 seconds  
 Primary air: fully open entire test  
Boost Air locked open until 5 min.  
Then set to timed Air @ 5:00 min  
 Notes: Fan on high entire test.

Time	Notes
60	Changed front filter in train A.

Technician Signature: BAD

Date: 6/14/17

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 8

Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-8-17

Test Crew: B. Davis

OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**Wood Heater Fuel Data**

Fuel: Douglas fir, untreated and air dried, standard grade or better dimensional lumber

**Pre-Burn Fuel**

Calibration: Cal Value (1) = 12% Actual Reading 12  
 Cal Value (2) = 22% Actual Reading 22

Piece:	Length:	Reading:	Piece:	Length:	Reading:
1	32 <del>24.05</del> in	<u>21.0</u>	7	_____ in	_____
2	32 <del>24.05</del> in	<u>23.8</u>	8	_____ in	_____
3	32 <del>24.05</del> in	<u>23.3</u>	9	_____ in	_____
4	32 in	<u>21.9</u>	10	_____ in	_____
5	32 in	<u>22.3</u>	11	_____ in	_____
6	32 in	<u>21.9</u>	12	_____ in	_____

Total Pre-Burn Fuel Weight: 15.9 Pre-Burn Fuel Average Moisture: 22.7

Time (clock): 0825 Room Temperature (F): 67 Initials: BD

**Test Fuel**

Firebox Volume (ft³): 2.95 Test Fuel Piece Length (in): 18.0  
 Load Weight Range (lb): 20.65 Total Wet Fuel Load Weight (lb): 18.7

Fuel Type & Amount: 2 x 4: 4 4 x 4: 2  
 Weight (with spacers): 9.0 Weight (with spacers): 9.7

Piece:	Weight (lbs):	Moisture Readings (%DB):		Fuel Type:
1	<u>1.9</u>	<u>22.7</u>	<u>22.4</u>	<u>2x4</u>
2	<u>1.8</u>	<u>22.6</u>	<u>20.8</u>	<u>2x4</u>
3	<u>1.7</u>	<u>22.6</u>	<u>23.1</u>	<u>2x4</u>
4	<u>2.0</u>	<u>22.4</u>	<u>21.1</u>	<u>2x4</u>
5	<u>4.3</u>	<u>21.9</u>	<u>21.6</u>	<u>4x4</u>
6	<u>4.7</u>	<u>24.2</u>	<u>22.2</u>	_____
7	_____	_____	_____	_____

**Spacer Moisture Readings (%DB)**

<u>6.9</u>	<u>7.6</u>	<u>6.7</u>	<u>7.6</u>	<u>6.9</u>	<u>8.1</u>	_____	_____
<u>6.2</u>	<u>7.4</u>	<u>6.3</u>	<u>7.4</u>	<u>7.2</u>	<u>8.1</u>	_____	_____
<u>7.0</u>	<u>7.4</u>	<u>6.9</u>	<u>7.4</u>	<u>6.7</u>	<u>6.8</u>	_____	_____
<u>7.9</u>	<u>6.6</u>	<u>7.9</u>	<u>7.7</u>	<u>7.0</u>	<u>7.0</u>	_____	_____

Time (clock): 0825 Room Temperature (F): 67 Initials: BD

Technician Signature: [Signature]

Date: 6/14/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 8  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 6/8/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### Wood Heater Supplemental Data

Start Time: 10:22 Booth #: 7

Stop Time: 1407

**Stack Gas Leak Check:**

Initial: good Final: good

**Sample Train Leak Check:**

A: 0.0 @ 7 "Hg  
 B: 0.0 @ 9 "Hg

**Calibrations:** Span Gas CO<sub>2</sub>: 15.96 CO: 5.08

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	<u>0935</u>	<u>0935</u>	<u>1414</u>	<u>1444</u>
CO <sub>2</sub>	<u>0.00</u>	<u>15.97</u>	<u>0.06</u>	<u>16.01</u>
CO	<u>0.000</u>	<u>5.082</u>	<u>-0.003</u>	<u>5.075</u>

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: good Final: good

Stack Diameter (in): 6"

Induced Draft: 0.0

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 5/15/17 Initials: BD

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
1	<u>.048</u>	<u>100</u>
2	<u>.050</u>	<u>100</u>
3	<u>.056</u>	<u>99</u>
Y	<u>.052</u>	<u>99</u>
1	<u>.050</u>	<u>99</u>
2	<u>.056</u>	<u>99</u>
3	<u>.058</u>	<u>99</u>
Y	<u>.054</u>	<u>99</u>
Center:		
	<u>.056</u>	<u>99</u>

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>28.11</u>	<u>28.14</u>	<u>28.16</u>
RH (%)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Ambient (°F)	<u>82</u>	<u>84</u>	<u>79</u>

Tunnel Static Pressure (in H <sub>2</sub> O):	
Beginning of Test	End of Test
<u>-.524</u>	<u>-.524</u>
<u>-.262</u>	

Background Filter Volume: 40.132

Technician Signature: BD

Date: 6/16/17

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Section 4**

### **Quality Assurance/Quality Control**

## QUALITY ASSURANCE/QUALITY CONTROL

OMNI follows the guidelines of ISO/IEC 17025, “General Requirements for the Competence of Testing and Calibration Laboratories,” and the quality assurance/quality control (QA/QC) procedures found in OMNI’s Quality Assurance Manual.

OMNI’s scope of accreditation includes, but is not limited to, the following:

- ANSI (American National Standards Institute) for certification of product to safety standards.
- To perform product safety testing by the International Accreditation Service, Inc. (formerly ICBO ES) under accreditation as a testing laboratory designated TL-130.
- To perform product safety testing as a “Certification Organization” by the Standards Council of Canada (SCC).
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of OMNI’s accreditation. Accreditation certificates are available upon request.

The manufacturing facilities and quality control system for the production of the 57ST-ACC-C at Hearth and Home Technologies were evaluated to determine if sufficient to maintain conformance with OMNI’s requirements for product certification. OMNI has concluded that the manufacturing facilities, processes, and quality control system are adequate to produce the appliance congruous with the standards and model codes to which it was evaluated.

This report shall not be reproduced, except in full, without the written approval of OMNI-Test Laboratories, Inc.



## **Manufacturer's Quality Assurance Plan**

The following quality assurance plan has been developed to ensure all that all units within the model line are similar in all material respects that would affect emissions to the sample tested under this report, in accordance with § 60.533 (m).

**Redacted as confidential business information**

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

# **Sample Analysis**

Analysis Worksheets  
Tared Filter, Probe, and O-Ring Data

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 1  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/15/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### ASTM E2515 Lab Sheet

Assembled By:

B. Davis

Date/Time in Dessicator:

5/22/17 0845

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date/Time: <u>5/22/17 0845</u>	Date/Time: <u>5/22/17 0845</u>	Date/Time: <u>5/22/17 0850</u>	Date/Time: <u>5/22/17 0830</u>	Date/Time: <u>5/22/17 0845</u>
R/H %: <u>20.5</u>	R/H %: <u>9.4</u>	R/H %: <u>11.3</u>	R/H %: <u>7.7</u>	R/H %: <u>10.2</u>
Temp: <u>77</u>	Temp: <u>74</u>	Temp: <u>73</u>	Temp: <u>74</u>	Temp: <u>73</u>
200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>
2 g Audit: <u>1.9997</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>
100 g Audit: <u>99.9998</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>
Initials: <u>Bd</u>	Initials: <u>Bd</u>	Initials: <u>Bd</u>	Initials: <u>BA</u>	Initials: <u>Bd</u>

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	D169	122.4	0 135.9	135.6	135.7	135.5	✓
	Rear Filter							
	Probe							
	O-Ring Set	R469						
A (Remainder)	Front Filter	D171	120.0	124.8	124.6	124.6	124.6	✓
	Rear Filter	D170	123.0	123.9	123.7	123.6	123.6	✓
	Probe	DES 4	114146.5	114148.1	114146.8	114146.8	114146.9	✓
	O-Ring Set	R469	3619.9	3620.5	3620.5	3620.1	3619.9	✓
B	Front Filter	D172	122.2	137.7	137.4	137.3	137.3	✓
	Rear Filter	D173	123.3	124.1	123.9	123.7	123.7	✓
	Probe	6	115352.5	115354.4	115352.7	115352.7	115352.7	✓
	O-Ring Set	R470	3323.3	3324.0	3324.1	3323.8	3323.4	3323.5 ✓
BG	Filter	D174	120.2	120.2	120.2	120.2	120.2	✓

Technician Signature: B. Davis

Date: 6-1-17

**ASTM E2780 Wood Heater Run Sheets**

Client: Hearth & Home Project Number: 0061WS092E Run Number: 2  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/16/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

**ASTM E2515 Lab Sheet**

Assembled By:

B Davis

Date/Time in Dessicator:

5/22/17 0845

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date/Time: <u>5/22/17 0830</u>	Date/Time: <u>5/22/17 0815</u>	Date/Time: <u>5/25/17 0850</u>	Date/Time: <u>5/24/17 0830</u>	Date/Time: <u>5/23/17 0815</u>
R/H %: <u>20.5</u>	R/H %: <u>7.4</u>	R/H %: <u>11.3</u>	R/H %: <u>7.7</u>	R/H %: <u>10.2</u>
Temp: <u>77</u>	Temp: <u>74</u>	Temp: <u>73</u>	Temp: <u>74</u>	Temp: <u>73</u>
200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>
2 g Audit: <u>1.9997</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>
100 g Audit: <u>99.9998</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>
Initials: <u>BC</u>	Initials: <u>BA</u>	Initials: <u>BC</u>	Initials: <u>BA</u>	Initials: <u>BC</u>

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	D175	122.5	125.9	125.5	125.6	125.5	
	Rear Filter							
	Probe							
	O-Ring Set							
A (Remainder)	Front Filter	D176	123.9	127.6	127.4	127.5	127.5	
	Rear Filter	D177	120.7	121.1	121.0	120.9	120.9	
	Probe	7	114983.3	114985.4	114983.7	114984.0	114984.0	
	O-Ring Set	R471	4147.5	4148.0	4147.9	4147.7	4147.3	4147.3
B	Front Filter	D178	121.9	127.9	127.7	127.6	127.5	
	Rear Filter	D179	124.1	124.6	124.5	124.4	124.4	
	Probe	8	115595.0	115596.9	115595.2	115595.2	115595.2	
	O-Ring Set	R472	3594.4	3595.1	3595.0	3594.7	3594.4	3594.5
BG	Filter	D73	121.2	121.8	121.7	121.8	121.7	

Technician Signature: B Davis

Date: 6-1-17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 3  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 5/12/17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### ASTM E2515 Lab Sheet

Assembled By:

B. Davis

Date/Time in Dessicator:

5/22/17 0845

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date/Time: <u>5/23/17 0830</u>	Date/Time: <u>5/24/17 0815</u>	Date/Time: <u>5/25/17 0850</u>	Date/Time: <u>5/30/17 0830</u>	Date/Time: <u>5/31/17 0845</u>
R/H %: <u>20.5</u>	R/H %: <u>9.4</u>	R/H %: <u>11.3</u>	R/H %: <u>7.7</u>	R/H %: <u>10.2</u>
Temp: <u>77</u>	Temp: <u>74</u>	Temp: <u>73</u>	Temp: <u>74</u>	Temp: <u>73</u>
200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>
2 g Audit: <u>1.9997</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>
100 g Audit: <u>99.9998</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>
Initials: <u>BL</u>	Initials: <u>BL</u>	Initials: <u>BL</u>	Initials: <u>BL</u>	Initials: <u>BL</u>

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	D180	120.1	122.0	121.8	121.8	121.8	
	Rear Filter							
	Probe							
	O-Ring Set							
A (Remainder)	Front Filter	D181	121.7	122.2	122.2	122.1	122.1	
	Rear Filter	D182	123.8	123.9	123.7	123.8	123.8	
	Probe	11	114189.0	114191.0	114189.4	114189.5	114189.6	
	O-Ring Set	R473	3532.1	3533.0	3532.8	3532.6	3532.4	
B	Front Filter	D183	124.1	126.2	126.2	126.3	126.3	
	Rear Filter	D184	120.2	120.1	120.0	120.0	120.0	
	Probe	13	114322.9	114324.7	114323.0	114323.0	114323.0	
	O-Ring Set	R474	3375.8	3377.2	3377.1	3376.9	3376.4	3376.5
BG	Filter	D74	123.7	124.0	123.9	124.0	124.0	

Technician Signature: B. Davis

Date: 6/1/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home

Project Number: 0061WS092E

Run Number: 4

Model: 57ST-ACC-C

Tracking Number: 2187

Date: 5/15/17

Test Crew: B. Davis

OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### ASTM E2515 Lab Sheet

Assembled By:

B Davis

Date/Time in Dessicator:

5/22/17 0845

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date/Time: <u>5/22/17 0830</u>	Date/Time: <u>5/22/17 0815</u>	Date/Time: <u>5/22/17 0850</u>	Date/Time: <u>5/22/17 0830</u>	Date/Time: <u>5/22/17 0845</u>
R/H %: <u>20.5</u>	R/H %: <u>9.4</u>	R/H %: <u>11.3</u>	R/H %: <u>7.7</u>	R/H %: <u>10.2</u>
Temp: <u>77</u>	Temp: <u>74</u>	Temp: <u>73</u>	Temp: <u>74</u>	Temp: <u>73</u>
200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>
2 g Audit: <u>1.9997</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>
100 g Audit: <u>99.9998</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>
Initials: <u>BD</u>	Initials: <u>BD</u>	Initials: <u>BD</u>	Initials: <u>BD</u>	Initials: <u>BD</u>

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	D186	123.7	131.2	131.1	131.1	131.1	✓
	Rear Filter							
	Probe							
	O-Ring Set							
A (Remainder)	Front Filter	D187	120.8	121.6	121.6	121.6	121.6	✓
	Rear Filter	D188	121.8	121.8	121.6	121.7	121.7	✓
	Probe	15	114344.0	114347.1	114345.7	114345.8	114345.8	✓
	O-Ring Set	R475	3290.1	3291.0	3290.9	3290.6	3290.3	3290.3
B	Front Filter	D189	123.8	130.8	130.5	130.6	130.6	✓
	Rear Filter	D190	120.4	121.0	120.9	120.9	120.7	✓
	Probe	18	114403.2	114406.2	114404.6	114404.6	114404.6	✓
	O-Ring Set	R476	4315.2	4316.0	4315.9	4315.5	4315.2	4315.3
BG	Filter	D75	120.8	121.3	121.3	121.3	121.3	✓

Technician Signature: B Davis

Date: 6/1/17

**ASTM E2515 Lab Sheet**

Assembled By:

B. Davis

Date/Time in Dessicator:

5/22/17 0845

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date/Time: <u>5/23/17 0830</u>	Date/Time: <u>5/23/17 0815</u>	Date/Time: <u>5/23/17 0850</u>	Date/Time: <u>5/23/17 0830</u>	Date/Time: <u>5/23/17 0845</u>
R/H %: <u>20.5</u>	R/H %: <u>9.4</u>	R/H %: <u>11.3</u>	R/H %: <u>7.7</u>	R/H %: <u>10.2</u>
Temp: <u>77</u>	Temp: <u>74</u>	Temp: <u>73</u>	Temp: <u>74</u>	Temp: <u>73</u>
200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>
2 g Audit: <u>1.9997</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>	2 g Audit: <u>1.9998</u>
100 g Audit: <u>99.9998</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>
Initials: <u>BD</u>	Initials: <u>BD</u>	Initials: <u>BD</u>	Initials: <u>BD</u>	Initials: <u>BD</u>

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	D191	122.2	131.1	130.7	130.8	130.5	130.4
	Rear Filter							
	Probe							
	O-Ring Set							
A (Remainder)	Front Filter	D192	124.2	203.9	203.1	203.7	203.0	202.8
	Rear Filter	D193	120.4	122.7	122.5	122.5	122.5	
	Probe	20	114255.0	114258.0	114256.6	114256.6	114256.6	
	O-Ring Set	R477	3503.6	3504.9	3504.7	3504.5	3504.4	
B	Front Filter	D194	122.4	208.0	206.0	206.2	205.4	205.2
	Rear Filter	D195	123.3	125.4	125.1	125.1	125.2	
	Probe	24	114128.6	114131.7	114129.9	114130.0	114130.1	
	O-Ring Set	R478	3340.9	3342.8	3342.4	3342.4	3342.1	3342.1
BG	Filter	D76	122.2	123.6	123.4	123.5	123.5	

Technician Signature: B. Davis

Date: 6/1/17

### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 7  
 Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-7-17  
 Test Crew: B. Davis  
 OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### ASTM E2515 Lab Sheet

Assembled By:

B. Davis

Date/Time in Dessicator:

6/9/17 1330

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date/Time: <u>6-12-17 0810</u>	Date/Time: <u>6-13-17 0815</u>	Date/Time: <u>6-14-17 0815</u>		
R/H %: <u>17.3</u>	R/H %: <u>8.0</u>	R/H %: <u>8.8</u>		
Temp: <u>73.5</u>	Temp: <u>71.6</u>	Temp: <u>71.0</u>		
200 mg Audit: <u>0.2001</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>		
2 g Audit: <u>1.9999</u>	2 g Audit: <u>1.9999</u>	2 g Audit: <u>1.9999</u>		
100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>		
Initials: <u>BL</u>	Initials: <u>BL</u>	Initials: <u>BL</u>		

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	<u>D151</u>	<u>119.8</u>	<u>122.9</u>	<u>122.8</u>			
	Rear Filter							
	Probe							
	O-Ring Set							
A (Remainder)	Front Filter	<u>D153</u>	<u>122.3</u>	<u>123.0</u>	<u>123.0</u>			
	Rear Filter	<u>D152</u>	<u>124.0</u>	<u>123.4</u>	<u>123.5</u>			
	Probe	<u>14</u>	<u>114550.6</u>	<u>114551.3</u>	<u>114550.8</u>	<u>114550.8</u>		
	O-Ring Set	<u>R483</u>	<u>3506.7</u>	<u>3507.2</u>	<u>3507.2</u>			
B	Front Filter	<u>D154</u>	<u>123.7</u>	<u>128.7</u>	<u>128.7</u>			
	Rear Filter	<u>D155</u>	<u>119.5</u>	<u>119.9</u>	<u>120.0</u>			
	Probe	<u>16</u>	<u>114267.4</u>	<u>114267.9</u>	<u>114267.4</u>	<u>114267.5</u>		
	O-Ring Set	<u>R484</u>	<u>3331.1</u>	<u>3331.4</u>	<u>3331.3</u>			
BG	Filter	<u>D78</u>	<u>120.8</u>	<u>121.4</u>	<u>121.4</u>			

Technician Signature: B. Davis

Date: 6/14/17



### ASTM E2780 Wood Heater Run Sheets

Client: Hearth & Home Project Number: 0061WS092E Run Number: 8

Model: 57ST-ACC-C Tracking Number: 2187 Date: 6-8-17

Test Crew: B. Davis

OMNI Equipment ID numbers: 1, 244, 131, 132, 5142132, 209, 296-T54, 371, 372, 340, 592, 410, 419, 432, 265, 413, 283A

#### ASTM E2515 Lab Sheet

Assembled By:

B Davis

Date/Time in Dessicator:

6/9/17 1330

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date/Time: <u>6-12-17 0810</u>	Date/Time: <u>6-13-17 0815</u>	Date/Time: <u>6-14-17 0815</u>	Date/Time:	Date/Time:
R/H %: <u>17.3</u>	R/H %: <u>8.0</u>	R/H %: <u>8.8</u>	R/H %:	R/H %:
Temp: <u>73.5</u>	Temp: <u>71.6</u>	Temp: <u>71.0</u>	Temp:	Temp:
200 mg Audit: <u>0.2001</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit: <u>0.2000</u>	200 mg Audit:	200 mg Audit:
2 g Audit: <u>1.9999</u>	2 g Audit: <u>1.9999</u>	2 g Audit: <u>1.9999</u>	2 g Audit:	2 g Audit:
100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit: <u>99.9990</u>	100 g Audit:	100 g Audit:
Initials: <u>BD</u>	Initials: <u>BD</u>	Initials: <u>BD</u>	Initials:	Initials:

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	<u>D156</u>	<u>119.9</u>	<u>122.9</u>	<u>122.8</u>			
	Rear Filter							
	Probe							
	O-Ring Set							
A (Remainder)	Front Filter	<u>D157</u>	<u>123.4</u>	<u>124.0</u>	<u>123.9</u>			
	Rear Filter	<u>D158</u>	<u>121.5</u>	<u>121.3</u>	<u>121.3</u>			
	Probe	<u>17</u>	<u>114562.5</u>	<u>114563.4</u>	<u>114562.8</u>	<u>114562.8</u>		
	O-Ring Set	<u>R485</u>	<u>3424.5</u>	<u>3425.4</u>	<u>3425.3</u>			
B	Front Filter	<u>D159</u>	<u>120.4</u>	<u>122.9</u>	<u>122.9</u>			
	Rear Filter	<u>D160</u>	<u>123.7</u>	<u>123.0</u>	<u>122.9</u>			
	Probe	<u>21</u>	<u>114393.1</u>	<u>114393.7</u>	<u>114393.4</u>	<u>114393.3</u>		
	O-Ring Set	<u>R486</u>	<u>3308.8</u>	<u>3310.7</u>	<u>3310.5</u>			
BG	Filter	<u>D79</u>	<u>121.8</u>	<u>122.3</u>	<u>122.3</u>			

Technician Signature: BD

Date: 6/16/17

**Tare Sheet: (check one)** Probes 47mm Filters 100mm Filters        O-Ring Pair        ✓  
 Prepared By: B. DAVIS Balance ID #: OMNI-00247 Thermohygrometer ID #: 0111-0572 Audit: Weight ID #/Mass: OMN-00283A / 5g

Placed in Dessicator: Date: <u>4/13/17</u> Time: <u>0800</u>	47mm Filters				100mm Filters				Date Used	Project Number	Run No.
	Date: <u>4/14/17</u> Time: <u>0840</u> RH %: <u>8.6</u> T (°F): <u>70</u> Audit: <u>4.9999</u>	Date: <u>4/17/17</u> Time: <u>0820</u> RH %: <u>7.5</u> T (°F): <u>70</u> Audit: <u>4.9999</u>	Date: <u>4/21/17</u> Time: <u>0910</u> RH %: <u>7.3</u> T (°F): <u>70</u> Audit: <u>5.0000</u>	Date: <u>4/24/17</u> Time: <u>0125</u> RH %: <u>8.1</u> T (°F): <u>70</u> Audit: <u>5.0000</u>							
R 467	3.3756	3.3755	-	-							
R 468	3.3192	3.3191	-	-							
R 469	3.6200	3.6199	-	-				5-15-17 ↓	006145092E ↓	R-1 ↓	
R 470	3.3237	3.3233	-	-							
R 471	4.1476	4.1475	-	-				5-16-17 ↓	006145092E ↓	R-2 ↓	
R 472	3.5946	3.5944	-	-							
R 473	3.5323	3.5321	-	-				5-17-17 ↓	006145092E ↓	R-3 ↓	
R 474	3.3764	3.3760	-	-							
R 475	3.2907	3.2903	-	-				5-18-17 ↓	006145092E ↓	R-4 ↓	
R 476	4.3153	4.3152	-	-							
R 477	<del>3.3415</del> 3.5037	3.5036	-	-				5-19-17 ↓	006145092E ↓	R-5 ↓	
R 478	3.3415	3.3411	-	-							
R 479	3.3275	3.3272	-	-							
R 480	3.3572	3.3569	-	-							

Initials: AD Initials: AD Initials: AD Initials: AK  
 Final Technician Signature:  Evaluator signature:   
 Date: 6-1-17

Tare Sheet: (check one) Probes 47mm Filters 100mm Filters O-Ring Pair  
 Prepared By: DD Balance ID #: 00001-00200 Thermohygrometer ID #: 00001-00592 Audit Weight ID #/Mass: 00001-00203A/12g

Placed in Dessicator: Date: <u>5/22/17</u> Time: <u>10:10</u>	Date: <u>5/24/17</u>		Date: <u>5/25/17</u>		Date: <u>5/26/17</u>		Date: <u>5/29/17</u>		Date Used	Project Number	Run No.
	Time: <u>10:30</u>	RH %: <u>10.5</u>	T (°F): <u>70</u>	Audit: <u>1.9998</u>	Time: <u>08:50</u>	RH %: <u>18.7</u>	T (°F): <u>70</u>	Audit: <u>1.9998</u>			
R481	3538.8	3538.5	3537.9	3537.9	3537.9	3537.9	3537.9	3537.9	6-6-17	006/05092E	6
R482	3575.4	3575.2	3574.5	3574.5	3574.6	3574.6	3574.6	3574.6	6-6-17	006/05092E	6
R483	3507.3	3507.0	3506.6	3506.6	3506.7	3506.7	3506.7	3506.7	6-7-17		7
R484	3332.2	3331.8	3330.9	3330.9	3331.1	3331.1	3331.1	3331.1	6-7-17		7
R485	3425.9	3425.5	3424.3	3424.3	3424.5	3424.5	3424.5	3424.5	6-8-17		8
R486	3309.6	3309.4	3308.7	3308.7	3308.8	3308.8	3308.8	3308.8	6-8-17		8
R487	3355.6	3355.3	3354.4	3354.4	3354.6	3354.6	3354.6	3354.6			
R488	3373.4	3373.0	3372.1	3372.1	3372.3	3372.3	3372.3	3372.3			
R489	3333.5	3333.1	3331.9	3331.9	3332.4	3332.4	3332.4	3332.4	Not used		
R490	4104.7	4104.4	4102.9	4102.9	4103.0	4103.0	4103.0	4103.0			
R491	3323.8	3323.6	3322.5	3322.5	3322.9	3322.9	3322.9	3322.9	Not used		
R492	4158.8	4158.6	4157.6	4157.6	4157.8	4157.8	4157.8	4157.8			
R493	4175.6	4175.3	4174.5	4174.5	4174.7	4174.7	4174.7	4174.7			
R494	3329.0	3328.7	3327.6	3327.6	3328.0	3328.0	3328.0	3328.0	Not used		
R495	3308.4	3308.0	3307.5	3307.5	3307.5	3307.5	3307.5	3307.5			
R496	3337.6	3337.4	3336.8	3336.8	3337.0	3337.0	3337.0	3337.0			
R497	3307.4	3307.2	3306.5	3306.5	3306.7	3306.7	3306.7	3306.7			
R498	3318.0	3317.7	3317.1	3317.1	3317.4	3317.4	3317.4	3317.4	Not used		
R499	4139.2	4138.8	4138.4	4138.4	4138.2	4138.2	4138.2	4138.2			
R500	4091.6	4091.3	4090.7	4090.7	4090.9	4090.9	4090.9	4090.9			

Initials: DL Initials: AM Initials: AM Initials: AM  
 Final Technician Signature: [Signature] Date: 6/16/17  
 Evaluator signature: [Signature]  
 Control No. P-SFDP-0002.xls, Effective date: 2/1/2017

Tare Sheet: Probes  47mm Filters  100mm Filters  O-Ring Pair

Date/Time Placed in Dessicator: 4/12/17 0800

Thermohygrometer ID #: Omni-00572

Prepared By: B Davis

Analytical Balance ID #: Omni-00247

Audit Weight ID #/Mass: Omni-0023A / 100g

ID #	Date: 4/14/17		Date: 4/19/17		Date: 4/24/17		Date Used	Project Number	Run No.
	Time: 0830	Time: 0820	Time: 0910	Time: 0825	Time: 0825	Time: 0825			
	RH %: 7.6	RH %: 7.5	RH %: 7.3	RH %: 5.1	RH %: 5.1	RH %: 5.1			
	T (°F): 70	T (°F): 70	T (°F): 70	T (°F): 70	T (°F): 70	T (°F): 70			
	Audit: 77.9990	Audit: 99.9990	Audit: 99.9990	Audit: 99.9990	Audit: 99.9990	Audit: 99.9990			
2	115.0168	115.0170							
OES 3	114.7700	114.7705	114.7704				006LWS092E	Rn-1	
OES 4	114.1465	114.1465							
6	115.3527	115.3525							
7	114.9832	114.9833							
8	115.5947	115.5950							
11	114.1881	114.1890	114.1890						
13	114.3224	114.3231	114.3229						
15	114.3433	114.3442	114.3440						
18	114.4030	114.4036	114.4030						
20	114.2548	114.2551	114.2550						
24	114.1283	114.1288	114.1284						
32	114.7429	114.7434	114.7433						
34	114.1519	114.1525	114.1524						

Initials: BD    Initials: BD    Initials: BD    Initials: BD    Initials: BD    Initials: BD

Final Technician Signature: BD    Date: 6/1/17    Evaluator signature: [Signature]

Control No. P-SFDP-0001.xls, Effective date: 9/9/2015

Tare Sheet: Probes ✓ 47mm Filters 100mm Filters O-Ring Pair

Date/time Placed in Dessicator: 5/23/17

Prepared By: B Davis

Thermohyrometer ID #: Omnis - 00592

Analytical Balance ID #: Omnis - 00247


Audit Weight ID #/Mass: Omnis - 00283A 15g

ID #	Date: <u>5/24/17</u>					Date: <u>5/25/17</u>					Date Used	Project Number	Run No.		
	Time: <u>10:10</u>	RH %: <u>11.4</u>	T (°F): <u>70</u>	Audit: <u>99.9989</u>	Weight: <u>115016.3</u>	Time: <u>08:30</u>	RH %: <u>12.5</u>	T (°F): <u>70</u>	Audit: <u>99.9990</u>	Weight: <u>115016.3</u>					
2	<u>114860.4</u>	<u>114550.4</u>	<u>114267.4</u>	<u>114562.3</u>	<u>114392.6</u>	<u>114345.7</u>	<u>114275.6</u>	<u>114279.9</u>	<u>114331.0</u>	<u>114371.2</u>	<u>114529.0</u>	<u>114466.7</u>	<u>6-6-17</u>	<u>006145092E</u>	<u>6</u>
4															
14													<u>6-7-17</u>		<u>7</u>
16															<u>7</u>
17													<u>6-7-17</u>		<u>8</u>
21															<u>8</u>
22															<u>1</u>
27															
29															
30															
31															
35															
37															
55															
58															
64															
65															
67															
68															
69															

Final Technician Signature: [Signature] Date: 6/6/17  
 Control No. P-SFDP-0001.xls, Effective date: 9/9/2015  
 Evaluator signature: [Signature]

Tare Sheet: (check one) Probes 47mm Filters 100mm Filters O-Ring Pair  
 Prepared By: B Davis Balance ID #: 00001-00244 Thermohyrometer ID #: 00001-00592 Audit Weight ID #/Mass: 00001-02834 / 200 mg

Placed in Dessicator: Date: <u>4-11-17</u> Time: <u>0840</u>	Date: <u>4/12/17</u> Time: <u>0945</u> RH %: <u>90</u> T (°F): <u>70</u> Audit: <u>0.2000</u>		Date: <u>4/13/17</u> Time: <u>0830</u> RH %: <u>90</u> T (°F): <u>70</u> Audit: <u>0.2000</u>		Date: _____ Time: _____ RH %: _____ T (°F): _____ Audit: _____		Date Used	Project Number	Run No.
	ID #	Date	Time	RH %	T (°F)	Audit			
D163	0.1223	0.1223	0.1203	0.1222	0.1224	0.1206	5-15-17	006145092 E	R-1
D164	0.1236	0.1235	0.1203	0.1222	0.1224	0.1230			
D165	0.1203	0.1203	0.1203	0.1222	0.1224	0.1206			
D166	0.1223	0.1223	0.1203	0.1222	0.1224	0.1230			
D167	0.1225	0.1225	0.1203	0.1222	0.1224	0.1230			
D168	0.1205	0.1205	0.1203	0.1222	0.1224	0.1230			
D169	0.1225	0.1225	0.1203	0.1222	0.1224	0.1230			
D170	0.1231	0.1231	0.1203	0.1222	0.1224	0.1230			
D171	0.1202	0.1202	0.1203	0.1222	0.1224	0.1230			
D172	0.1222	0.1222	0.1203	0.1222	0.1224	0.1230			
D173	0.1233	0.1233	0.1203	0.1222	0.1224	0.1230			
D174	0.1201	0.1201	0.1203	0.1222	0.1224	0.1230			
D175	0.1224	0.1224	0.1203	0.1222	0.1224	0.1230	5-16-17	006145092 E	R-2
D176	0.1239	0.1239	0.1203	0.1222	0.1224	0.1230			
D177	0.1208	0.1208	0.1203	0.1222	0.1224	0.1230			
D178	0.1218	0.1218	0.1203	0.1222	0.1224	0.1230			
D179	0.1241	0.1241	0.1203	0.1222	0.1224	0.1230			
D180	0.1201	0.1201	0.1203	0.1222	0.1224	0.1230	5-17-17	006145092 E	R-3
D181	0.1217	0.1217	0.1203	0.1222	0.1224	0.1230			
D182	0.1237	0.1237	0.1203	0.1222	0.1224	0.1230			

Initials: AS Initials: MA Initials: \_\_\_\_\_  
 Date: 6-1-17 Date: \_\_\_\_\_  
 Evaluator signature: 

Final Technician Signature: AS  
 Control No. P-SFDP-0002.xls, Effective date: 2/1/2017

Tare Sheet: (check one) Probes 47mm Filters 100mm Filters O-Ring Pair  
 Prepared By: B Davis Balance ID #: 0mmv.0024y Thermohygrometer ID #: 0mmv.00592 Audit Weight ID #/Mass: 0mmv.02F34 /

Placed in Dessicator:	Date:	Time:	RH %:	T (°F):	Audit:	Date:	Time:	RH %:	T (°F):	Audit:	Date Used	Project Number	Run No.
	4/12/17	0945	71	70	0.2000	4/13/17	0830	70	70	0.2000	5-17-17	006/LS092 E	R-3
D183	0.1242	0.1208	0.1237	0.1208	0.1238	0.1208	0.1218	0.1238	0.1204	0.1222	Not used	006/LS092 E	R-4
D184	0.1202	0.1219	0.1237	0.1208	0.1238	0.1208	0.1218	0.1238	0.1204	0.1222	5-19-17	006/LS092 E	R-5
D185	0.1222	0.1208	0.1237	0.1208	0.1238	0.1208	0.1218	0.1238	0.1204	0.1222			
D186	0.1237	0.1219	0.1237	0.1208	0.1238	0.1208	0.1218	0.1238	0.1204	0.1222			
D187	0.1208	0.1219	0.1237	0.1208	0.1238	0.1208	0.1218	0.1238	0.1204	0.1222			
D188	0.1219	0.1237	0.1237	0.1208	0.1238	0.1208	0.1218	0.1238	0.1204	0.1222			
D189	0.1237	0.1237	0.1237	0.1208	0.1238	0.1208	0.1218	0.1238	0.1204	0.1222			
D190	0.1204	0.1222	0.1237	0.1208	0.1238	0.1208	0.1218	0.1238	0.1204	0.1222			
D191	0.1222	0.1242	0.1205	0.1233	0.1195	0.1242	0.1205	0.1233	0.1195	0.1224			
D192	0.1242	0.1223	0.1233	0.1195	0.1224	0.1242	0.1205	0.1233	0.1195	0.1224			
D193	0.1205	0.1233	0.1195	0.1224	0.1233	0.1205	0.1233	0.1195	0.1224	0.1233			
D194	0.1223	0.1195	0.1224	0.1233	0.1195	0.1223	0.1195	0.1224	0.1233	0.1199			
D195	0.1233	0.1195	0.1224	0.1233	0.1195	0.1233	0.1195	0.1224	0.1233	0.1223			
D196	0.1195	0.1224	0.1233	0.1195	0.1224	0.1195	0.1224	0.1233	0.1195	0.1223			
D197	0.1224	0.1233	0.1195	0.1224	0.1233	0.1224	0.1233	0.1195	0.1224	0.1223			
D198	0.1233	0.1195	0.1224	0.1233	0.1195	0.1233	0.1195	0.1224	0.1233	0.1223			
D199	0.1199	0.1236	0.1236	0.1205	0.1205	0.1199	0.1236	0.1236	0.1205	0.1205			
D200	0.1233	0.1236	0.1236	0.1205	0.1205	0.1233	0.1236	0.1236	0.1205	0.1205			
D201	0.1236	0.1236	0.1236	0.1205	0.1205	0.1236	0.1236	0.1236	0.1205	0.1205			
D202	0.1206	0.1206	0.1206	0.1205	0.1205	0.1206	0.1206	0.1206	0.1205	0.1205			

Initials: BC Initials: BC Initials: BC  
 Date: 6-1-17 Evaluator signature: [Signature]  
 Final Technician Signature: [Signature] Date: 6-1-17  
 Control No. P-SFDP-0002.xls, Effective date: 2/1/2017

Tare Sheet: Probes 47mm Filters ✓ 100mm Filters O-Ring Pair

Date/time Placed in Dessicator: 4/6/2017

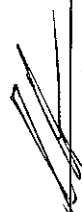
Thermohyrometer ID #: 592


Prepared By: S. Buthman

Analytical Balance ID #: 244

Audit Weight ID #/Mass: 283A / 200 mg

ID #	Date: 4/7/2017				Date: 4/10/2017				Date Used	Project Number	Run No.		
	Time: 14:00	RH %: 18.47	T (°F): 68.7	Audit: 200.0 mg	Time: 8:30	RH %: 5.17	T (°F): 69.7	Audit: 200.0 mg				Date:	Time:
D141	122.6			122.7				122.7	Not used				
D142	120.5			120.6				120.6	5/14/17	0061FS049E	1		
D143	123.6			123.5				123.5					
D144	122.4			122.4				122.4					
D145	120.6			120.5				120.5					
D146	123.4			123.3				123.3					
D147	122.5			122.6				122.6	6-6-17	0061WS092E	6		
D148	120.5			120.6				120.6					
D149	127.2			123.2				123.2					
D150	122.8			122.7				122.7					
D151	119.9			119.8				119.8	6-7-17		7		
D152	124.1			124.0				124.0					
D153	122.4			122.3				122.3					
D154	123.8			123.7				123.7					
D155	119.6			119.5				119.5					
D156	119.8			119.9				119.9	6-7-17		8		
D157	123.6			123.4				123.4					
D158	121.7			121.5				121.5					
D159	120.4			120.4				120.4					
D160	123.8			123.7				123.7					
D161	121.4			121.4				121.4					
D162	124.9			124.2				124.2					
	Initials: SB			Initials: SB				Initials:					

Final Technician Signature:  Date: 4/10/2017

Evaluator signature: 



Tare Sheet: Probes 47mm Filters  100mm Filters O-Ring Pair

Date/time Placed in Dessicator: 1/31/17 0710

Prepared By: B. Davis

Analytical Balance ID #: OMU1-0023

Thermohyrometer ID #: OMU1-00592

Audit Weight ID #/Mass: 131/283A 1 500g/200g

ID #	Date: <u>2/1/17</u>		Date: <u>2/2/17</u>		Date:		Date Used	Project Number	Run No.
	Time: <u>0715</u>	Time: <u>0730</u>	Time: <u>0730</u>	Time: <u>0737</u>	Time:	Time:			
	RH %: <u>7.1</u>	RH %: <u>10.2</u>	RH %: <u>10.2</u>	RH %: <u>10.2</u>	RH %:	RH %:			
	T (°F): <u>64.3</u>	T (°F): <u>65</u>	T (°F): <u>65</u>	T (°F): <u>65</u>	T (°F):	T (°F):			
	Audit: <u>0.5001/0.2000</u>	Audit: <u>0.5001/0.2000</u>	Audit: <u>0.5001/0.2000</u>	Audit: <u>0.5001/0.2000</u>	Audit:	Audit:			
D61	0.1220	0.1220	0.1220	0.1220					
D62	0.1238	0.1237	0.1237	0.1237					
D63	0.1208	0.1208	0.1208	0.1208					
D64	0.1223	0.1222	0.1222	0.1222					
D65	0.1224	0.1224	0.1224	0.1224					
D66	0.1210	0.1207	0.1207	0.1207					
D67	0.1218	0.1217	0.1217	0.1217					
D68	0.1227	0.1228	0.1228	0.1228					
D69	0.1204	0.1203	0.1203	0.1203					
D70	0.1223	0.1223	0.1223	0.1223					
D71	0.1226	0.1225	0.1225	0.1225					
D72	0.1201	0.1200	0.1200	0.1200					
D73	0.1213	0.1212	0.1212	0.1212			5-16-17	006145092 E	R-2
D74	0.1238	0.1237	0.1237	0.1237			5-17-17	006145092 E	R-3
D75	0.1209	0.1208	0.1208	0.1208			5-18-17	006145092 E	R-4
D76	0.1222	0.1222	0.1222	0.1222			5-17-17	006145092 E	R-5
D77	0.1237	0.1237	0.1237	0.1237			6-6-17	006145092 E	R-6
D78	0.1209	0.1208	0.1208	0.1208			6-7-17	006145092 E	R-7
D79	0.1220	0.1218	0.1218	0.1218			6-8-17	006145092 E	R-8
D80	0.1233	0.1231	0.1231	0.1231					
D81	0.1206	0.1204	0.1204	0.1204					
	Initials: <u>DL</u>	Initials: <u>BS</u>	Initials: <u>BS</u>	Initials: <u>BS</u>	Initials:	Initials:			

Final Technician Signature: BS

Date: 2/3/17

Control No. P-SFDP-0001.xls, Effective date: 9/9/2015

Evaluator signature: [Signature]

# Calibrations

## Methods EPA 28R, ASTM E2515, ASTM E2780

ID #	Lab Name/Purpose	Log Name	Attachment Type
1	Calibrator Dry Gas Meter	Rockwell Int'l Standard Test Meter	Calibration Certificate
244	Scale-Analytical Balance	Sartorius Analytical Balance	Calibration Certificate
132	10 lb Weight	Weight Standard, 10 lb.	Calibration Certificate
5142132	Platform Scale	Panther Platform Scale	Calibration Certificate
209	Barometer	Barometer – Princo	Manual Cover
296-T54	Tape Measure	Stanley Tape Measure	Calibration Log
371	Sample Box / Dry Gas Meter	Apex Automated Emissions Sampling Box	Calibration Log
372	Sample Box / Dry Gas Meter	Apex Automated Emissions Sampling Box	Calibration Log
340	Wood Moisture Meter	Moisture Meter - Delmhorst	See Test Run Notes
592	Thermohygrometer	Omega Digital Thermohygrometer	Calibration Log
410	Microtector	Dwyer Microtector	Manual, Photograph
419	Combustion Gas Analyzer	Infrared Gas Analyzer	Manual, See Test Run Notes
432	Moisture Meter Calibrator	Delmhorst Moisture Content Calibrator	Calibration Log
265	Vaneometer	Dwyer Vaneometer	Manual
413	Ambient filter Dry Gas Meter	Dry Gas Meter	Calibration Log
283A	Weight set	Troemner 21 pc Mass Set	Calibration Log

## CERTIFICATE OF CALIBRATION

<b>CUSTOMER:</b>	OMNI TEST LABS INC. PORTLAND OR	<b>CALIBRATION DATE:</b>	10/27/16
<b>PO NUMBER:</b>	160109	<b>CALIBRATION DUE:</b>	10/27/17
<b>INST. MANUFACTURER:</b>	ROCKWELL	<b>PROCEDURE:</b>	NAVAIR 17-20MG-02
<b>INST. DESCRIPTION:</b>	P.D. METER	<b>CALIBRATION FLUID:</b>	AIR @ 14.7 PSIA 70 F
<b>MODEL NUMBER:</b>	S-275	<b>STANDARD(S) USED:</b>	A4, A24 DUE 05-2017
<b>SERIAL NUMBER:</b>	684390L	<b>NIST TRACE # 'S':</b>	1331545884, 1390386562, 1424683640
<b>RATED UNCERTAINTY:</b>	+/- .5 % RD.	<b>AMBIENT CONDITIONS:</b>	762 mm HGA 55 % RH 72 F
<b>UNCERTAINTY GIVEN:</b>	TOTAL measurement uncertainty: +/- .190 % RD. K=2		
<b>NOTES:</b>	AS RECEIVED/ AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F **OMNI-00001**		

TEST POINT NUMBER	UUT INDICATED SCFH	DM.STD. ACTUAL SCFH	CORRECTION FACTOR	K FACTOR
1	0.6115	0.55	0.89943	66.709
2	9.1412	8.75	0.95721	62.682
3	53.5324	54.27	1.01378	59.185
4	100.1887	101.02	1.00830	59.506
5	136.8205	137.38	1.00409	59.756
6	178.5292	176.92	0.99099	60.546
7	215.1102	212.24	0.98666	60.811
8	250.5044	249.92	0.99767	60.140
AVERAGE (Y) =			0.98226405	

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

**Dick Munns Company • 10572 Calle Lee #130 • Los Alamitos, CA 90720**  
Phone (714) 827-1215 • Fax (714) 827-0823

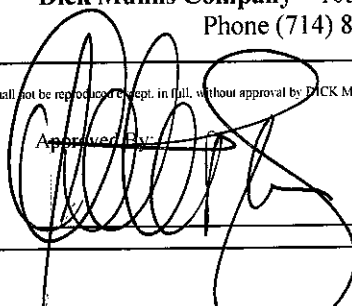
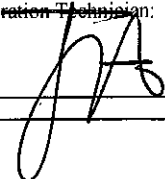
This Calibration Certificate shall not be reproduced, in full, without approval by DICK MUNN'S COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Date:

Approved By:

Calibration Technician:

10/27/2016

# Certificate of Calibration

Certificate Number: **642192**



**JJ Calibrations, Inc.**  
 7007 SE Lake Rd  
 Portland, OR 97267-2105  
 Phone 503.786.3005  
 FAX 503.786.2994

**Omni-Test Laboratories**  
 13327 NE Airport Way  
 Portland, OR 97230

OnSite

PO: **170117**

Order Date: **02/06/2017**

Authorized By: **N/A**



Property #: **Omni-00244**

User: **N/A**

Department: **N/A**

Make: **Sartorius**

Model: **BP 1215**

Serial #: **90709883**

Description: **Balance, Analytical, 120g**

Procedure: **500887**

Accuracy: **±.0005g**

Calibrated on: **02/06/2017**

\*Recommended Due: **08/06/2017**

Environment: **23 °C 32 % RH**

\* As Received: **Within Tolerance**

\* As Returned: **Within Tolerance**

Action Taken: **Calibrated**

Technician: **123**

Remarks: \* Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit. Uncertainties include the effects of the unit.

## Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
723A	Rice Lake	1mg-200g (Class 0)	Mass Set	02/03/2018	637125

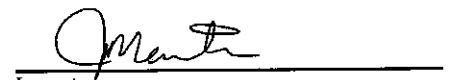
## Measurement Data

Parameter	Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
<b>Before/After</b>	<b>Force</b>							Accredited = ✓
		g	0.00100	0.0005	0.0015	0.0000	0.0010 g	4E-02 ✓
		g	0.01000	0.0095	0.0105	0.0001	0.0101 g	4E-02 ✓
		g	0.10000	0.0995	0.1005	0.0000	0.1000 g	4E-02 ✓
		g	0.50000	0.4995	0.5005	0.0000	0.5000 g	4E-02 ✓
		g	2.00000	1.9995	2.0005	0.0000	2.0000 g	4E-02 ✓
		g	23.00000	22.9995	23.0005	0.0002	23.0002 g	4E-02 ✓
		g	48.00000	47.9995	48.0005	0.0004	48.0004 g	4E-02 ✓
		g	72.00000	71.9995	72.0005	0.0003	72.0003 g	4E-02 ✓
		g	95.00000	94.9995	95.0005	0.0005	95.0005 g	4E-02 ✓
		g	120.00000	119.9995	120.0005	0.0005	120.0005 g	4E-02 ✓

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCCL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc. JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

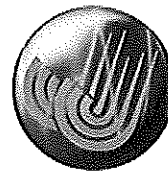
  
 Reviewer

3 Issued 02/10/2017 Rev #15

  
 Inspector

# Certificate of Calibration

Certificate Number: 543402



**JJ Calibrations, Inc.**  
7007 SE Lake Rd  
Portland, OR 97267-2105  
Phone 503.786.3005  
FAX 503.786.2994

Omni-Test Laboratories  
13327 NE Airport Way  
Portland, OR 97230

PO: OTL-13-031  
Order Date: 09/27/2013  
Authorized By: N/A



Property #: OMNI-00283A  
User: N/A  
Department: N/A  
Make: Troemner Inc  
Model: 1mg-100g (Class F)  
Serial #: 47883  
Description: Mass Set, 21 Pc.  
Procedure: DCN 500901  
Accuracy: Class F

Calibrated on: 10/09/2013  
\*Recommended Due: 10/09/2018  
Environment: 20 °C 41 % RH  
As Received: Other - See Remarks  
As Returned: Within Tolerance  
Action Taken: Calibrated  
Technician: 34


Remarks: \* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired  
Changed set from a Class 4 to a Class F per Jeremy Clark.  
Received missing 1g weight.  
Refer to attachment for measurement results.

## Standards Used

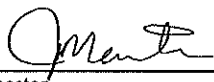
Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
432A	Sartorius	C-44	Microbalance 5.1g	03/11/2014	517747
479A	Sartorius	MC210S	Scale, 210g	02/22/2014	517755
503A	Rice Lake	1mg-200g (Class O)	Mass Set	12/07/2013	517746
723A	Rice Lake	1mg-200g (Class O)	Mass Set	09/05/2014	540048

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.

JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

  
\_\_\_\_\_  
Reviewer

3 Issued 10/11/2013 Rev # 14

  
\_\_\_\_\_  
Inspector



## SCALE WEIGHT CALIBRATION DATA SHEET

Weight to be calibrated: 10 lb

ID Number: 132

Standard Calibration Weight: 10 lb

ID Number: 255

Scale Used: MTW-150K

ID Number: 353

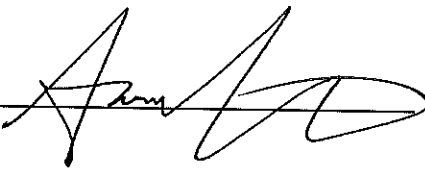
Date: 2/19/13

By: A. Kravitz

Standard Weight (A) (Lb.)	Weight Verified (B) (Lb.)	Difference (A - B)	% Error
10.0	10.0	0.0	0

\*Acceptable tolerance is 1%.

*This calibration is traceable to NIST using calibrated standard weights.*

Technician signature:  Date: 2/19/13

# SCALE CALIBRATION RECORD

Customer: Heorth & Home Date: 11/4/2015

Work Order Number: 47099 PO Number:

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
1. <u>MT</u>	<u>5142132</u>	<u>1000 x .1</u>	$\emptyset$	$\emptyset$	$\emptyset$
<u>Panther</u>	<u>Pass..Fail</u>	<u>Lb</u>	<u>25</u>	<u>25.1</u>	<u>25.0</u>
Notes: <u>Recalibrated Scale</u> <u>Scale checks good</u>  <u>ETC-7</u>			<u>100</u>	<u>100.1</u>	<u>100.0</u>
			<u>200</u>	<u>200.3</u>	<u>200.0</u>
			<u>400</u>	<u>400.5</u>	<u>400.0</u>
			$\emptyset$	$\emptyset$	$\emptyset$
			$\emptyset$	$\emptyset$	$\emptyset$

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
2. <u>MT</u>	<u>5237590</u>	<u>1000 x .1</u>	$\emptyset$	$\emptyset$	$\emptyset$
<u>Panther</u>	<u>Pass..Fail</u>	<u>Lb</u>	<u>25</u>	<u>25.0</u>	<u>25.0</u>
Notes: <u>Recalibrated Scale</u> <u>Scale checks good</u>  <u>ETC-5</u>			<u>100</u>	<u>100.0</u>	<u>100.0</u>
			<u>200</u>	<u>199.9</u>	<u>200.0</u>
			<u>400</u>	<u>400.1</u>	<u>400.0</u>
			$\emptyset$	$\emptyset$	$\emptyset$
			$\emptyset$	$\emptyset$	$\emptyset$

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
3. <u>MT</u>	<u>5208324</u>	<u>1000 x .1</u>	$\emptyset$	$\emptyset$	$\emptyset$
<u>Panther</u>	<u>Pass..Fail</u>	<u>Lb</u>	<u>25</u>	<u>25.0</u>	<u>25.0</u>
Notes: <u>Recalibrated Scale</u> <u>Scale checks good.</u> <u>Display going bad</u> <u>(Display shows numerous trimarkers Lit)</u>  <u>ETC-8</u>			<u>100</u>	<u>100.1</u>	<u>100.0</u>
			<u>200</u>	<u>200.1</u>	<u>200.0</u>
			<u>400</u>	<u>400.2</u>	<u>400.0</u>
			$\emptyset$	$\emptyset$	$\emptyset$
			$\emptyset$	$\emptyset$	$\emptyset$

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
4. <u>MT</u>	<u>5237589</u>	<u>1000 x .1</u>	$\emptyset$	$\emptyset$	$\emptyset$
<u>Panther</u>	<u>Pass...Fail</u>	<u>Lb</u>	<u>25</u>	<u>25.2</u>	<u>25.0</u>
Notes: <u>Levelled Scale</u> <u>Recalibrated Scale</u> <u>Scale checks good</u>  <u>ETC6-1</u>			<u>100</u>	<u>100.6</u>	<u>100.0</u>
			<u>200</u>	<u>201.2</u>	<u>200.0</u>
			<u>400</u>	<u>402.5</u>	<u>400.0</u>
			$\emptyset$	$\emptyset$	$\emptyset$
			$\emptyset$	$\emptyset$	$\emptyset$

Additional Comments:

Last Checked: 3/5/14 Next Check Due: 5/2016

Weights Certified: 10/2014 Technician: Dudley



OMNI 00209

# Instruction Booklet

for use with

# PRINCO

Fortin type mercurial

## Barometers

*Manufactured by*

**PRINCO INSTRUMENTS, INC.**

1020 Industrial Blvd.

Southampton, Pa. 18966-4095

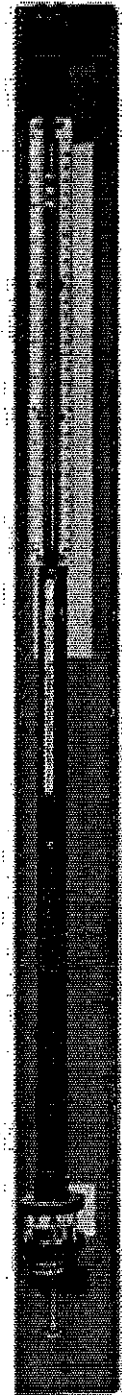
U.S.A.

Phone: 215 355-1500

Fax: 215 355-7766



453  
National  
Weather  
Service  
Type



463  
NOVA™  
Economy  
Model

## Tape Measure Calibration Log

Place the calibrated 12" ruler under the tape measure and verify that each 1/2" (i.e. 1.5", 2", 2.5") between 0 and 36" is within 1/8".

CALIBRATED USING OMNI I - 00231

Tape Measure Number	Description	Cal Dates						Technician Initials	
		7/25/12	7/2/13	7/8/14	7/20/15	7/20/15	7/20/15	7/20/15	
00296 - T32	Stanley FatMax 16'	9/7/12	9/13/13	9/23/14	10/22/15	10/22/15	DC	DC	
00296 - T51	Ace 26' Tape Measure	9/7/12	9/13/13	9/22/14	10/22/15	10/22/15	DC	DC	
-T52	Stanley PowerLock 26'	9/7/12	9/13/13	9/22/14	10/22/15	10/22/15	DC	DC	
-T53	Stanley PowerLock 16'	9/7/12	9/13/13	9/22/14	10/22/15	10/22/15	DC	DC	
-T11	Stanley intermate Tape Measure (cm)	11/30/12	2/28/14	2/25/15			DC	DC	
-T21	MTH Tape Measure (cm)	11/30/12	11/21/13				DC	DC	
-T30	Workforce Tape Measure	11/30/12					DC	DC	
-T31	Stanley Powerlock Tape Measure	11/30/12	11/21/13	11/18/14	11/25/15	11/25/15	DC	DC	
-T47	Workforce Tape Measure	11/30/12	11/21/13	11/26/14	11/25/15	11/25/15	DC	DC	
-T36	Stanley FatMax 16' Tape Measure	11/30/12	11/21/13	11/18/14	11/25/15	11/25/15	DC	DC	
-T42 -T40	Stanley FatMax 16' Tape Measure	11/30/12	11/21/13	11/18/14	11/25/15	11/25/15	DC	DC	
-T54	DeWalt 16' Tape Measure	12/20/12	12/17/13	12/29/14	12/11/15	12/11/15	DC	DC	
-T55	DeWalt 16' Tape Measure	12/20/12	12/18/13	12/29/14	12/11/15	12/11/15	DC	DC	
-T56	DeWalt 25' Tape Measure	12/20/12	12/17/13	12/16/14	12/11/15	12/11/15	DC	DC	
-T57	DeWalt 25' Tape Measure	12/20/12	12/17/13	12/16/14	12/11/15	12/11/15	DC	DC	
-T58	DeWalt 25' Tape Measure	12/20/12	12/17/13	12/16/14	12/11/15	12/11/15	DC	DC	
-T59	DeWalt 25' Tape Measure	12/20/12	12/17/13	12/16/14	12/11/15	12/11/15	DC	DC	
-T42	Stanley PowerLock 26' Tape Measure	11/21/13	11/18/14	11/25/15	Removed for Service	Removed for Service	DC	DC	
-T32	Stanley FatMax 16'	7/26/16					BD		
-T51	Ace 26' Tape Measure	10/20/16					DC		
-T52	Stanley PowerLock 26'	10/3/16					DC		
-T40	Stanley FatMax 16' Tape Measure	11/5/16					DC		
-T31	Stanley PowerLock Tape Measure	11/29/16					DC		
-T47	Workforce Tape Measure	11/29/16					DC		
-T54	DeWalt 16' Tape Measure	12/12/16					DC		

# Thermal Metering System Calibration Y Factor

Manufacturer: APEX  
 Model: XC-60-EP  
 Serial Number: 702003  
 OMNI Tracking No.: OMNI-00371  
 Calibrated Orifice:  Yes

<b>Average Gas Meter y Factor</b>
<b>1.001</b>

<b>Orifice Meter dH@</b>
<b>N/A</b>

Calibration Date: 01/18/17  
 Calibrated by: B. Davis  
 Calibration Frequency: Six months  
 Next Calibration Due: 7/18/2017  
 Instrument Range: 1.000 cfm  
 Standard Temp.: 68 oF  
 Standard Press.: 29.92 "Hg  
 Barometric Press., Pb: 29.51 "Hg  
 Signature/Date: [Signature] 1/20/17

### Previous Calibration Comparison

Date	9/15/2015	Acceptable Deviation (5%)	Deviation
y Factor	1.011	0.05055	0.010
Acceptance	Acceptable		

### Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.002
Acceptable dH@ Deviation	N/A
Maximum dH@ Deviation	N/A
Acceptance	Acceptable

### Reference Standard \*

Standard Calibrator	Model	Standard Test Meter
	S/N	OMNI-00001
	Calib. Date	27-Oct-16
	Calib. Value	0.9823 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H2O), Pr	0.00	0.00	0.00
DGM Pressure ("H2O), Pd	3.29	1.50	0.80
Initial Reference Meter	279.203	290.3	295.8
Final Reference Meter	284.455	295.703	303.914
Initial DGM	0	0	0
Final DGM	5.191	5.37	8.09
Temp. Ref. Meter (°F), Tr	68.0	68.0	69.0
Temperature DGM (°F), Td	75.0	78.0	79.0
Time (min)	26.0	39.0	82.0
Net Volume Ref. Meter, Vr	5.252	5.403	8.114
Net Volume DGM, Vd	5.191	5.37	8.09
Gas Meter y Factor =	0.999	1.003	1.002
Gas Meter y Factor Deviation (from avg.)	0.002	0.002	0.001
Orifice dH@	N/A	N/A	N/A
Orifice dH@ Deviation (from avg.)	N/A	N/A	N/A

where:

1. Deviation = |Average value for all runs - current run value|
- \*\* 2.  $y = [Vr \times (y \text{ factor (ref)}) \times (Pb + (Pr / 13.6))] \times (Td + 460) / [Vd \times (Pb + (Pd / 13.6))] \times (Tr + 460)$
- \*\* 3.  $dH@ = 0.0317 \times Pd / (Pb (Td + 460)) \times [(Tr + 460) \times \text{time}] / Vr^2$

\* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272, or NIST traceable laboratory

\*\* Equations come from EPA Method 5

The uncertainty of measurement is ±0.14 ft<sup>3</sup>/min. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Temperature Calibration EPA Method 28R, ASTM 2515							
BOOTH:		TEMPERATURE MONITOR TYPE:				EQUIPMENT NUMBER:	
N/A		National Instruments Logger				00371, 00372	
REFERENCE METER EQUIPMENT NUMBER: 00373				Calibration Due Date: 8/02/17			
CALIBRATION PERFORMED BY:			DATE:		AMBIENT TEMPERATURE:		BAROMETRIC PRESSURE:
B. Davis			1/19/17		68		29.51
Input Temperature (F)	Ambient	Meter A					FB Interior
			Meter B	Filter A	Filter B	Tunnel	
0	-1	-1	-1	-1	-1	-1	-1
100	99	99	99	99	99	99	99
300	299	299	299	299	299	298	299
500	499	499	499	499	499	499	499
700	699	699	699	699	698	699	699
1000	998	998	998	998	998	998	998

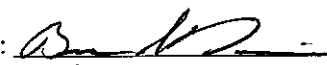
Input (F)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Imp A	Imp B	Cat	Stack
0	0	0	0	0	-1	-1	-1	-1	1
100	100	99	99	99	99	99	99	99	101
300	299	299	299	299	299	299	298	299	301
500	499	499	499	499	499	499	498	499	501
700	699	699	699	699	699	699	698	699	701
1000	999	999	999	999	999	998	998	998	1000

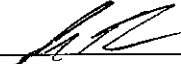
1500

1498

2000

1997

Technician signature:  Date: 1-19-17

Reviewed By:  Date: 1/20/2017

## DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET

Instrument to be calibrated: Pressure Transducer

Maximum Range: 0-1" WC

ID Number: OMNI-003713

Calibration Instrument: Digital Manometer

ID Number: OMNI-00633

Date: 1/19/17

By: B. Davis

**This form is to be used only in conjunction with Standard Procedure C-SPC.**

Range of Calibration Point ("WC)	Digital Manometer Input ("WC)	Pressure Gauge Response ("WC)	Difference (Input - Response)	% Error of Full Span*
0-20% Max. Range 0 - 0.2	0.032	0.032	0	0
20-40% Max. Range 0.2 - 0.4	0.254	0.255	0.001	0.1
40-60% Max. Range 0.4 - 0.6	0.503	0.504	0.001	0.1
60-80% Max. Range 0.6 - 0.8	0.702	0.702	0	0
80-100% Max. Range 0.8 - 1.0	0.904	0.905	0.001	0.1

\*Acceptable tolerance is 4%.

The uncertainty of measurement is  $\pm 0.4$ " WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature:  Date: 1/19/17

Reviewed by:  Date: 1/20/2017

# Thermal Metering System Calibration Y Factor

Manufacturer: APEX  
 Model: XC-60-EP  
 Serial Number: 702004  
 OMNI Tracking No.: OMNI-00372  
 Calibrated Orifice:  Yes

<b>Average Gas Meter y Factor</b>
<b>0.993</b>

<b>Orifice Meter dH@</b>
<b>N/A</b>

Calibration Date: 01/18/17  
 Calibrated by: B. Davis  
 Calibration Frequency: Six months  
 Next Calibration Due: 7/18/2017  
 Instrument Range: 1.000 cfm  
 Standard Temp.: 68 oF  
 Standard Press.: 29.92 "Hg  
 Barometric Press., Pb: 29.51 "Hg  
 Signature/Date: *B. Davis* 1/20/17

*B. Davis* 1/20/2017

### Previous Calibration Comparison

Date	9/15/2015	Acceptable Deviation (5%)	Deviation
y Factor	1.003	0.05015	0.010
Acceptance	Acceptable		

### Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.001
Acceptable dH@ Deviation	N/A
Maximum dH@ Deviation	N/A
Acceptance	Acceptable

### Reference Standard \*

Standard Calibrator	Model	Standard Test Meter
	S/N	OMNI-00001
	Calib. Date	27-Oct-16
	Calib. Value	0.9823 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H2O), Pr	0.00	0.00	0.00
DGM Pressure ("H2O), Pd	2.34	1.50	0.80
Initial Reference Meter	304.4	312.9	320.9
Final Reference Meter	312.123	318	326.047
Initial DGM	0	0	0
Final DGM	7.723	5.088	5.184
Temp. Ref. Meter (°F), Tr	69.0	69.0	70.0
Temperature DGM (°F), Td	78.0	76.0	80.0
Time (min)	42.0	35.0	49.0
Net Volume Ref. Meter, Vr	7.723	5.100	5.147
Net Volume DGM, Vd	7.723	5.088	5.184
Gas Meter y Factor =	0.993	0.994	0.992
Gas Meter y Factor Deviation (from avg.)	0.000	0.001	0.001
Orifice dH@	N/A	N/A	N/A
Orifice dH@ Deviation (from avg.)	N/A	N/A	N/A

where:

1. Deviation = |Average value for all runs - current run value|
- \*\* 2.  $y = [Vr \times (y \text{ factor (ref)}) \times (Pb + (Pr / 13.6))] \times (Td + 460) / [Vd \times (Pb + (Pd / 13.6))] \times (Tr + 460)$
- \*\* 3.  $dH@ = 0.0317 \times Pd / (Pb (Td + 460)) \times [(Tr + 460) \times \text{time}] / Vr]^2$

\* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272, or NIST traceable laboratory

\*\* Equations come from EPA Method 5

The uncertainty of measurement is ±0.14 ft<sup>3</sup>/min. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Temperature Calibration EPA Method 28R, ASTM 2515							
BOOTH:		TEMPERATURE MONITOR TYPE:				EQUIPMENT NUMBER:	
N/A		National Instruments Logger				00371, 00372	
REFERENCE METER EQUIPMENT NUMBER: 00373				Calibration Due Date: 8/02/17			
CALIBRATION PERFORMED BY:			DATE:		AMBIENT TEMPERATURE:		BAROMETRIC PRESSURE:
B. Davis			1/19/17		68		29.51
Input Temperature (F)	Ambient	Meter A					FB Interior
			Meter B	Filter A	Filter B	Tunnel	
0	-1	-1	-1	-1	-1	-1	-1
100	99	99	99	99	99	99	99
300	299	299	299	299	299	298	299
500	499	499	499	499	499	499	499
700	699	699	699	699	698	699	699
1000	998	998	998	998	998	998	998

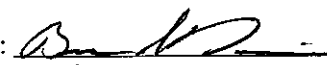
Input (F)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Imp A	Imp B	Cat	Stack
0	0	0	0	0	-1	-1	-1	-1	1
100	100	99	99	99	99	99	99	99	101
300	299	299	299	299	299	299	298	299	301
500	499	499	499	499	499	499	498	499	501
700	699	699	699	699	699	699	698	699	701
1000	999	999	999	999	999	998	998	998	1000


1500

1498

2000

1997

Technician signature:  Date: 1-19-17

Reviewed By:  Date: 1/20/2017

## DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET

Instrument to be calibrated: Pressure Transducer

Maximum Range: 0-1"

ID Number: 00372 B

Calibration Instrument: Digital Manometer

ID Number: OMNI-00633

Date: 1/19/17

By: B. Davis

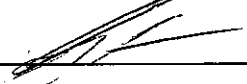
**This form is to be used only in conjunction with Standard Procedure C-SPC.**

Range of Calibration Point ("WC)	Digital Manometer Input ("WC)	Pressure Gauge Response ("WC)	Difference (Input - Response)	% Error of Full Span*
0-20% Max. Range 0.0-0.2	0.052	0.052	0	0
20-40% Max. Range 0.2-0.4	0.276	0.279	0.003	0.3
40-60% Max. Range 0.4-0.6	0.575	0.575	0	0
60-80% Max. Range 0.6-0.8	0.795 <del>0.788</del>	0.797	0.002	0.2
80-100% Max. Range 0.8-1.0	0.981	0.953	0.002	0.2

\*Acceptable tolerance is 4%.

The uncertainty of measurement is  $\pm 0.4$ " WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature:  Date: 1/19/17

Reviewed by:  Date: 1/20/17



## VWR Temperature Hygrometer Calibration Procedure and Data Sheet

Frequency: Every Two Years

Step 1: Locate NIST traceable standard.

Step 2: Place unit to be calibrated, tracking No. OMNI-00592, inside OMNI desiccate box on the same shelf with the NIST traceable standard.

Step 3: After a period of not less than four hours record the temperature and humidity of both units in the spaces provide below.

Step 4: If the unit to be calibrated matches the NIST standard within  $\pm 4\%$ , it is acceptable. If not, the unit needs to be sent to a repair company or replaced.

### Verification Data:

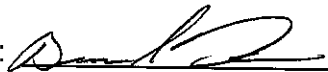
Date: 1/5/17 Technician: B DAVIS

Time in desiccate: 0900 Recording time: 0845 1/6/17

NIST Standard Temperature: 62.5 °F NIST Standard Humidity: 9.5

Test Unit Temperature Reading: 66.9 °F Test Unit Humidity Reading: 6.1

Test unit OMNI- 00592 is X or was not      within acceptable limits.

Technician Signature: 

Comments: Humidity Results of 00592 are within  $\pm 4\%$  of Reference *me hq*  
*382-*

---

---

---

---

---

---

---

---

# Certificate of Calibration

Certificate Number: **629694**



**JJ Calibrations, Inc.**

7007 SE Lake Rd  
Portland, OR 97267-2105  
Phone 503.786.3005  
FAX 503.786.2994

**Omni-Test Laboratories**  
13327 NE Airport Way  
Portland, OR 97230

PO: **160099**

Order Date: **08/18/2016**

Authorized By: **N/A**



Calibrated on: **08/29/2016**

\*Recommended Due: **08/29/2017**

Environment: **19 °C 50 % RH**

\* As Received: **Other - See Remarks**

\* As Returned: **Limited**

Action Taken: **Calibrated**

Technician: **34**

Property #: **OMNI-00410**

User: **N/A**

Department: **N/A**

Make: **Dwyer**

Model: **1430**

Serial #: **OMNI-00410**

Description: **Microtector**

Procedure: **500908**

Accuracy: **±0.00025" WC**

Remarks: \* Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit. Uncertainties include the effects of the unit.

Calibrated micrometer head only per Bruce Davis.

Limited Calibration - Calibrated micrometer head only.

## Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
541A	Select	E8FED2	8 Piece Gage Block Set	11/24/2016	607288

## Measurement Data

Parameter	Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After Length							Accredited = ✓	
		Inch	0.1300	0.129	0.131	0.000	0.130 Inch	1.1E-03 ✓
		Inch	0.3850	0.384	0.386	0.000	0.385 Inch	1.1E-03 ✓
		Inch	0.6150	0.614	0.616	0.000	0.615 Inch	1.1E-03 ✓
		Inch	0.8700	0.869	0.871	0.001	0.871 Inch	1.1E-03 ✓
		Inch	1.0000	0.999	1.001	0.001	1.001 Inch	1.1E-03 ✓

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCCL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.  
JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

Reviewer

3 Issued 08/31/2016

Rev # 15

Inspector

# ZRE

# NDIR/O<sub>2</sub>



# USER'S

# MANUAL



1312 West Grove Avenue  
Orange, CA 92865-4134  
Phone: 714-974-5560 Fax: 714-921-2531<sub>161</sub>  
[www.gasanalyzers.com](http://www.gasanalyzers.com)

## WOOD MOISTURE CONTENT CALIBRATION WORKSHEET

Moisture Content Standard OMNI ID #: 00432

Reference Moisture Content Standard: OMNI # 00430

Date	Temp.	Barometric Pressure	Fixed Moisture %	Fixed Moisture %	Observed Moisture %		Initials
5/20/2016	69°F	29.90 in Hg	22%	12%	22.0%	12.0%	AK
11/14/16	68°F	30.10 in Hg	22%	12%	22.0%	12.0%	BD
5/10/17	70°F	30.14 in Hg	22%	12%	22.0%	12.0%	AK
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Technician signature: BD Date: 5/24/16

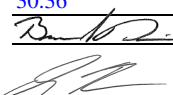


# Thermal Metering System Calibration Y Factor

Manufacturer: APEX  
 Model: DGM-SK25DA-TL  
 Serial Number: 8004298  
 OMNI Tracking No.: OMNI-00413  
 Calibrated Orifice:  Yes

<b>Average Gas Meter y Factor</b>
<b>0.997</b>

<b>Orifice Meter dH@</b>
<b>N/A</b>

Calibration Date: 03/28/17  
 Calibrated by: B. Davis  
 Calibration Frequency: Six month  
 Next Calibration Due: 9/28/2017  
 Instrument Range: 1.000 cfm  
 Standard Temp.: 68 oF  
 Standard Press.: 29.92 "Hg  
 Barometric Press., Pb: 30.36 "Hg  
 Signature/Date: 

3/29/2017

### Previous Calibration Comparison

Date	<u>9/22/2016</u>	Acceptable Deviation (5%)	Deviation
y Factor	<u>1.014</u>	0.0507	0.017
Acceptance	<b>Acceptable</b>		

### Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.018
Acceptable dH@ Deviation	N/A
Maximum dH@ Deviation	N/A
Acceptance	<b>Acceptable</b>

### Reference Standard \*

Standard	Model	Standard Test Meter
Calibrator	S/N	<u>OMNI-00001</u>
	Calib. Date	<u>27-Oct-16</u>
	Calib. Value	<u>0.9823</u> y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H2O), Pr	-0.50	-1.70	-3.50
DGM Pressure ("H2O), Pd	0.00	0.00	0.00
Initial Reference Meter	577.5	586.1	596.912
Final Reference Meter	585.88	596.709	614.247
Initial DGM	0	0	0
Final DGM	8.393	10.389	16.658
Temp. Ref. Meter (°F), Tr	67.0	67.0	67.0
Temperature DGM (°F), Td	67.0	67.0	67.0
Time (min)	34.0	15.0	15.0
Net Volume Ref. Meter, Vr	8.380	10.609	17.335
Net Volume DGM, Vd	8.393	10.389	16.658
<b>Gas Meter y Factor =</b>	<b>0.980</b>	<b>0.999</b>	<b>1.014</b>
<b>Gas Meter y Factor Deviation (from avg.)</b>	0.018	0.002	0.016
<b>Orifice dH@</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
<b>Orifice dH@ Deviation (from avg.)</b>	N/A	N/A	N/A

where:

1. Deviation = |Average value for all runs - current run value|
- \*\* 2.  $y = [Vr \times (y \text{ factor (ref)}) \times (Pb + (Pr / 13.6)) \times (Td + 460)] / [Vd \times (Pb + (Pd / 13.6)) \times (Tr + 460)]$
- \*\* 3.  $dH@ = 0.0317 \times Pd / (Pb (Td + 460)) \times [(Tr + 460) \times \text{time}] / Vr^2$

\* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272, or NIST traceable laboratory

\*\* Equations come from EPA Method 5

The uncertainty of measurement is  $\pm 0.14 \text{ ft}^3/\text{min}$ . This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

## **Example Calculations**

## Equations and Sample Calculations – ASTM E2780 & E2515

Manufacturer: Hearth & Home  
Model: 57ST-ACC-C  
Run: 1  
Category: \_\_\_\_\_

Equations used to calculate the parameters listed below are described in this appendix. Sample calculation are provided for each equation. The raw data and printout results from a sample run are also provided for comparison to the sample calculations.

$M_{Sdb}$  – Weight of test fuel spacers, dry basis, kg

$M_{Cdb}$  – Weight of test fuel crib, excluding nails and spacers, dry basis, kg

$D_{Cdb}$  - Density of fuel crib, excluding spacers and nails, dry basis, lbs/ft<sup>3</sup>

$M_{FTAdb}$  - Total weight of fuel crib excluding nails, dry basis, kg

BR – Dry burn rate, kg/hr

$V_s$  – Average gas velocity in the dilution tunnel, ft/sec

$Q_{sd}$  – Average gas flow rate in dilution tunnel, dscf/hr

$V_{m(std)}$  – Volume of gas sampled, corrected to dry standard conditions, dscf

$m_n$  – Total particulate matter collected, mg

$C_s$  - Concentration of particulate matter in tunnel gas, dry basis, corrected to standard conditions, g/dscf

$E_T$  – Total particulate emissions, g

PR - Proportional rate variation

$PM_R$  – Particulate emissions for test run, g/hr

$PM_F$  – Particulate emission factor for test run, g/dry kg of fuel burned



**M<sub>Sdb</sub> – Weight of test fuel spacers, dry basis, kg**

ASTM E2780 equation (1)

$$M_{Sdb} = (M_{Swb})(100/(100 + FM_S))$$

Where,

FM<sub>S</sub> = average fuel moisture of test fuel spacers, % dry basis

M<sub>Swb</sub> = weight of test fuel spacers, wet basis, kg

Sample Calculation:

$$FM_S = 8.6 \%$$

$$M_{Swb} = 2.5 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{Sdb} = [(2.5 \times 0.4536) (100/(100 + 8.6))]$$

$$M_{Sdb} = 1 \text{ kg}$$

**$M_{Cdb}$** – Weight of test fuel crib, excluding nails and spacers, dry basis, kg  
ASTM E2780 equation (2)

$$M_{Cdb} = \Sigma[(M_{CPnwb})(100/(100 + FM_{CPn}))]$$

Where,

$M_{CPnwb}$  = weight of each test fuel piece n in fuel crib, excluding nails and spacers, wet basis, kg

$FM_{CPn}$  = Average fuel moisture of test fuel n in fuel crib, % dry basis

Sample Calculation (test fuel piece 1):

$$M_{CPnwb} = 2.3$$

$$FM_{CPn} = 22.0$$

$$= 2.3 (100/(100+ 22.0 )$$

$$= 1.9 \text{ lbs}$$

Total crib weight, excluding spacer 13.84 lbs

$$M_{Cdb} = \mathbf{6.28 \text{ kg}}$$

**$D_{Cdb}$  - Density of fuel crib, excluding spacers and nails, dry basis, lbs/ft<sup>3</sup>**

ASTM E2780 equation (3)

$$D_{Cdb} = M_{Cdb}/V_C$$

Where,

$$V_C = \text{Volume of fuel crib, ft}^3$$

Sample calculation:

$$V_C = 819 \text{ in}^3$$

$$1728 = \text{conversion from in}^3 \text{ to ft}^3$$

$$D_{Cdb} = ##### / 819 * 1728$$

$$= \mathbf{29.2} \text{ lbs/ft}^3$$

**$M_{FTAdb}$  - Total weight of fuel crib excluding nails, dry basis, kg**  
ASTM E2780 equation (4)

$$M_{FTAdb} = M_{Sdb} + M_{Cdb}$$

Sample calculation:

$$\begin{aligned} M_{FTAdb} &= 1.04 + 6.28 \\ &= 7.32 \text{ kg} \end{aligned}$$

**BR – dry burn rate, kg/hr**

ASTM E2780 equation (5)

$$BR = \frac{60 M_{FTAdb}}{\theta}$$

Where,

$\theta$  = Total length of test run, min

Sample Calculation:

$$M_{Bdb} = 7.32 \quad \text{kg}$$

$$\theta = 460 \quad \text{min}$$

$$BR = \frac{60 \times 7.32}{460}$$

$$BR = \mathbf{0.95} \quad \text{kg/hr}$$

**V<sub>s</sub> – Average gas velocity in the dilution tunnel, ft/sec**  
 ASTM E2515 equations (9)

$$V_s = F_p \times k_p \times C_p \times (\sqrt{\Delta P})_{avg} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

Where:

- F<sub>p</sub> = Adjustment factor for center of tunnel pitot tube placement,  $F_p = \frac{V_{strav}}{V_{scent}}$ , ASTM E2515 Equation (1)
- V<sub>scent</sub> = Dilution tunnel velocity calculated after the multi-point pitot traverse at the center, ft/sec
- V<sub>strav</sub> = Dilution tunnel velocity calculated after the multi-point pitot traverse, ft/sec
- k<sub>p</sub> = Pitot tube constant, 85.49
- C<sub>p</sub> = Pitot tube coefficient: 0.99, unitless
- ΔP\* = Velocity pressure in the dilution tunnel, in H<sub>2</sub>O
- T<sub>s</sub> = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- P<sub>s</sub> = Absolute average gas static pressure in dilution tunnel, = P<sub>bar</sub> + P<sub>g</sub>, in Hg
- P<sub>bar</sub> = Barometric pressure at test site, in. Hg
- P<sub>g</sub> = Static pressure of tunnel, in. H<sub>2</sub>O; (in Hg = in H<sub>2</sub>O/13.6)
- M<sub>s</sub> = \*\*The dilution tunnel wet molecular weight; M<sub>s</sub> = 28.78 assuming a dry weight of 29 lb/lb-mole

Sample calculation:

$$F_p = \frac{16.99}{18.10} = 0.938$$

$$V_s = 0.938 \times 85.49 \times 0.99 \times 0.261 \times \left( \left( \frac{87.5 + 460}{28.36 + \frac{-0.61}{13.6}} \right) \times 28.78 \right)^{1/2}$$

$$V_s = \mathbf{16.98 \text{ ft/s}}$$

\*The ASTM test standard mistakenly has the square root of the average delta p instead of the average of the square root of delta p. The current EPA Method 2 is also incorrect. This was verified by Mike Toney at EPA.

\*\*The ASTM test standard mistakenly identifies M<sub>s</sub> as the dry molecular weight. It should be the wet molecular weight as indicated in EPA Method 2.

**Q<sub>sd</sub> – Average gas flow rate in dilution tunnel, dscf/hr**

ASTM E2515 equation (3)

$$Q_{sd} = 3600 \times (1 - B_{ws}) \times v_s \times A \times \frac{T_{std}}{T_{s(avg)}} \times \frac{P_s}{P_{std}}$$

Where:

- 3600 = Conversion from seconds to hours (ASTM method uses 60 to convert in minutes)
- B<sub>ws</sub> = Water vapor in gas stream, proportion by volume; assume 2%
- A = Cross sectional area of dilution tunnel, ft<sup>2</sup>
- T<sub>std</sub> = Standard absolute temperature, 528 °R
- P<sub>s</sub> = Absolute average gas static pressure in dilution tunnel, = P<sub>bar</sub> + P<sub>g</sub>, in Hg
- T<sub>s(avg)</sub> = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- P<sub>std</sub> = Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 16.98 \times 0.196 \times \frac{528}{87.5 + 460} \times \frac{28.4 + \frac{-0.61}{13.6}}{29.92}$$

Q<sub>sd</sub> = ##### dscf/hr

$V_{m(std)}$  – Volume of Gas Sampled Corrected to Dry Standard Conditions, dscf  
 ASTM E2515 equation (6)

$$V_{m(std)} = K_1 V_m Y \frac{P_{bar} + \left( \frac{\Delta H}{13.6} \right)}{T_m}$$

Where:

- $K_1$  = 17.64 °R/in. Hg
- $V_m$  = Volume of gas sample measured at the dry gas meter, dcf
- $Y$  = Dry gas meter calibration factor, dimensionless
- $P_{bar}$  = Barometric pressure at the testing site, in. Hg
- $\Delta H$  = Average pressure differential across the orifice meter, in. H<sub>2</sub>O
- $T_m$  = Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 64.360 \times 1.001 \times \frac{\left( 28.36 + \frac{1.60}{13.6} \right)}{\left( 85.8 + 460 \right)}$$

$$V_{m(std)} = \mathbf{59.297} \text{ dscf}$$

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 58.696 \times 0.993 \times \frac{\left( 28.36 + \frac{1.10}{13.6} \right)}{\left( 86.6 + 460 \right)}$$

$$V_{m(std)} = \mathbf{53.496} \text{ dscf}$$

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 79.41 \times 0.997 \times \frac{\left( \underline{28.36} + \frac{0.00}{13.6} \right)}{\left( 79.7 + 460 \right)}$$

$$V_{m(std)} = \mathbf{73.388} \text{ dscf}$$



**$m_n$  – Total Particulate Matter Collected, mg**

ASTM E2515 Equation (12)

$$m_n = m_p + m_f + m_g$$

Where:

$m_p$  = mass of particulate matter from probe, mg

$m_f$  = mass of particulate matter from filters, mg

$m_g$  = mass of particulate matter from filter seals, mg

Sample Calculation:

Using equation for Train 1 (first hour):

$$m_n = 0.0 + 13.1 + 0.0$$

$$m_n = 13.1 \text{ mg}$$

Using equation for Train 1 (post-first hour):

$$m_n = 0.4 + 5.2 + 0.0$$

$$m_n = 5.6 \text{ mg}$$

Train 1 aggregate:

$$m_n = 13.1 + 5.6$$

$$m_n = \mathbf{18.7 \text{ mg}}$$

Using equation for Train 2:

$$m_n = 0.2 + 15.5 + 0.2$$

$$m_n = \mathbf{15.9 \text{ mg}}$$

**C<sub>s</sub> - Concentration of particulate matter in tunnel gas, dry basis, corrected to standard conditions, g/ds**  
ASTM E2515 equation (13)

$$C_s = K_2 \times \frac{m_n}{V_{m(std)}}$$

Where:

K<sub>2</sub> = Constant, 0.001 g/mg

m<sub>n</sub> = Total mass of particulate matter collected in the sampling train, mg

V<sub>m(std)</sub> = Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train 1:

$$C_s = 0.001 \times \frac{18.7}{59.30}$$

$$C_s = \mathbf{0.00032} \text{ g/dscf}$$

For Train 2

$$C_s = 0.001 \times \frac{15.9}{53.50}$$

$$C_s = \mathbf{0.00030} \text{ g/dscf}$$

For Ambient Train

$$C_r = 0.001 \times \frac{0.0}{73.39}$$

$$C_r = \mathbf{0.000000} \text{ g/dscf}$$

**E<sub>T</sub> – Total Particulate Emissions, g**

ASTM E2515 equation (15)

$$E_T = (C_s - C_r) \times Q_{std} \times \theta$$

Where:

- C<sub>s</sub> = Concentration of particulate matter in tunnel gas, g/dscf
- C<sub>r</sub> = Concentration particulate matter room air, g/dscf
- Q<sub>std</sub> = Average dilution tunnel gas flow rate, dscf/hr
- θ = Total time of test run, minutes

Sample calculation:

For Train 1

$$E_T = ( \underline{0.000315} - 0.000000 ) \times \text{#####} \times \underline{460} /60$$

$$E_T = \underline{25.95} \text{ g}$$

For Train 2

$$E_T = ( \underline{0.000297} - 0.000000 ) \times \text{#####} \times \underline{460} /60$$

$$E_T = \underline{24.46} \text{ g}$$

Average

$$E = \underline{25.20} \text{ g}$$

Total emission values shall not differ by more than 7.5% from the total average emissions

$$7.5\% \text{ of the average} = \underline{1.89}$$

$$\text{Train 1 difference} = \underline{0.75}$$

$$\text{Train 2 difference} = \underline{0.75}$$

**PR - Proportional Rate Variation**

ASTM E2515 equation (16)

$$PR = \left[ \frac{\theta \times V_{mi} \times V_s \times T_m \times T_{si}}{\theta_i \times V_m \times V_{si} \times T_{mi} \times T_s} \right] \times 100$$

Where:

- $\theta$  = Total sampling time, min
- $\theta_i$  = Length of recording interval, min
- $V_{mi}$  = Volume of gas sample measured by the dry gas meter during the "ith" time interval, dcf
- $V_m$  = Volume of gas sample as measured by dry gas meter, dcf
- $V_{si}$  = Average gas velocity in the dilution tunnel during the "ith" time interval, ft/sec
- $V_s$  = Average gas velocity in the dilution tunnel, ft/sec
- $T_{mi}$  = Absolute average dry gas meter temperature during the "ith" time interval, °R
- $T_m$  = Absolute average dry gas meter temperature, °R
- $T_{si}$  = Absolute average gas temperature in the dilution tunnel during the "ith" time interval, °R
- $T_s$  = Absolute average gas temperature in the dilution tunnel, °R

Sample calculation (for the first 1 minute interval of Train 1):

$$PR = \left( \frac{460 \times 1.377 \times 16.98 \times (90.0 + 460) \times (85.8 + 460)}{10 \times 64.36 \times 17.02 \times (87.5 + 460) \times (75.0 + 460)} \right) \times 100$$

$$PR = \underline{101} \%$$

**PM<sub>R</sub> – Particulate emissions for test run, g/hr**

ASTM E2780 equation (6)

$$PM_R = 60 (E_T/\theta)$$

Where,

E<sub>T</sub> = Total particulate emissions, grams

θ = Total length of full integrated test run, min

Sample Calculation:

$$E_T (\text{Dual train average}) = 25.20 \text{ g}$$

$$\theta = 460 \text{ min}$$

$$PM_R = 60 \times (25.20 / 460)$$

$$PM_R = \mathbf{3.29} \text{ g/hr}$$

**PM<sub>F</sub> – Particulate emission factor for test run, g/dry kg of fuel burned**  
ASTM E2780 equation (7)

$$PM_F = E_T / M_{FTAdb}$$

Sample Calculation:

$$E_T \text{ (Dual train average)} = 25.20 \text{ g}$$

$$M_{Bdb} = 7.32 \text{ kg}$$

$$PM_F = 25.20 / 7.32$$

$$PM_F = \mathbf{3.44} \text{ g/kg}$$

*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

# **Section 5**

## **Labeling, & Owner's Manual**

# Owner's Manual

## Operation & Care

**INSTALLER:** Leave this manual with party responsible for use and operation.

**OWNER:** Retain this manual for future reference.

Contact your dealer with questions on installation, operation, or service.

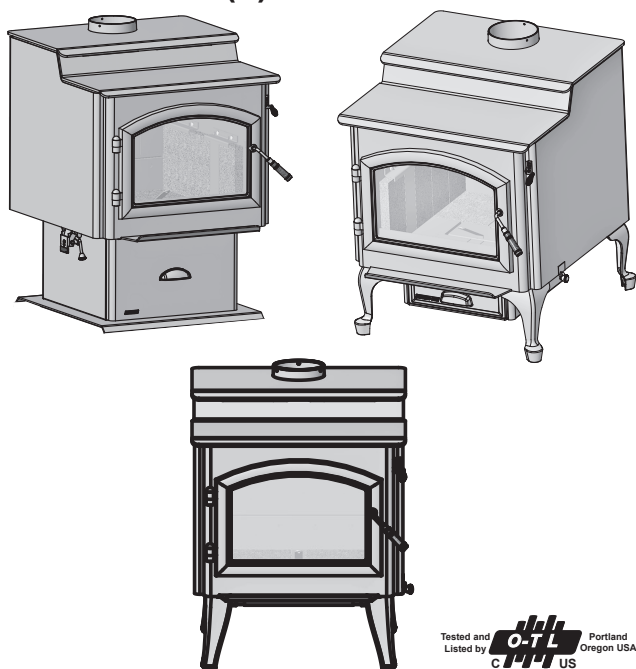
**NOTICE: DO NOT DISCARD THIS MANUAL**

# QUADRA-FIRE®

## 5700 STEP TOP WOOD APPLIANCE SERIES

### Automatic Combustion Control (ACC)

Model(s): 57ST-ACC-C



Tested and  
Listed by  Portland  
Oregon USA  
C US  
OMNI-Test Laboratories, Inc.

### WARNING



If the information in these instructions is not followed exactly, a fire could result causing property damage, personal injury, or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not over fire - If appliance or chimney connector glows, you are over firing. Over firing will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may cause a house fire.

### WARNING



#### HOT SURFACES!

Glass and other surfaces are hot during operation AND cool down.

**Hot glass will cause burns.**

- Do not touch glass until it is cooled
- NEVER allow children to touch glass
- Keep children away
- CAREFULLY SUPERVISE children in same room as appliance.
- Alert children and adults to hazards of high temperatures
- **High temperatures may ignite clothing or other flammable materials.**
- Keep clothing, furniture, draperies and other flammable materials away.

### WARNING



#### Fire Risk.

For use with solid wood fuel only.  
Other fuels may over fire and generate poisonous gases (i.e. carbon monoxide).

Installation and service of this appliance should be performed by qualified personnel. Hearth & Home Technologies recommends HHT Factory Trained or NFI certified professionals.

**hearthED**  
FACTORY TRAINING  
Fuel Your Fire

**NFI** NATIONAL  
FIREPLACE  
INSTITUTE®  
A CERTIFICATION AGENCY

### NOTE


To obtain a French translation of this manual, please contact your dealer or visit [www.quadrafire.com](http://www.quadrafire.com)

Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez [www.quadrafire.com](http://www.quadrafire.com)




**NOTE: Clearances may only be reduced by means approved by the regulatory authority having jurisdiction**

**A. Sample of Serial Number / Safety Label**  
**LOCATION: Back of appliance**




**CAUTION:** HOT WHILE IN OPERATION DO NOT TOUCH, KEEP CHILDREN AND CLOTHING AWAY. CONTACT MAY CAUSE SKIN BURNS. KEEP FURNISHINGS AND OTHER COMBUSTIBLE MATERIAL FAR AWAY FROM THE APPLIANCE. SEE NAMEPLATE AND INSTRUCTIONS  
**ATTENTION:** CHAUD LORS DE L'OPERATION. NE PAS TOUCHER. GARDEZ LES ENFANTS ET LES VETEMENTS LOIN DE L'ESPACE DESIGNÉ DE L'INSTALLATION. LE CONTACT PEUT CAUSER DES BRULURES À LA PEAU. GARDEZ LES MEUBLES ET LES MATERIAUX COMBUSTIBLES LOIN DE L'ESPACE DESIGNÉ DE L'APPAREIL. VOIR L'ETIQUETTE ET LES INSTRUCTIONS.



**QUADRA-FIRE**  
 TESTED TO/ TESTÉ À:  
 UL 1482-11 (R2015), ULC S627-00

Serial No. / N° de série  
**HF**



**VENT SPECIFICATIONS:**

**SINGLE WALL PIPE:** Six inch (6 inches) (152mm) diameter, minimum 24 MSG black or blue steel connector pipe, with a listed factory-built UL103HT\* Class "A" chimney, a masonry chimney, or a masonry chimney, and the referenced clearances.

**DOUBLE WALL PIPE:** Six inch (6 inches) (152mm) diameter, listed double wall air insulated connector pipe with listed factory-built UL103HT\* Class "A" chimney, a masonry chimney, or a masonry chimney, and the referenced clearances.

**MOBILE HOME:** Use double wall pipe by Dura-Vent DVL, Selkirk Metalbestos DS or Security DL double wall connector pipe. Must be equipped with a spark arrester. Apply double wall clearances below when installing unit.

**MIN CLEARANCES TO COMBUSTIBLE MATERIALS:** Inches & (Millimeters)

**NOTE:** All "A", "C" and "F" Dimensions are to inside corner of flue collar.

**SPÉCIFICATIONS DE LA VENTILATION:**

**MUR SIMPLE:** De six (6 inches) (152mm) de diamètre le connecteur de conduit de minimum 24MSG, avec une cheminée bâtie en usine UL103HT\* de Classe "A", adéquate pour usage avec les combustions solides, ou une cheminée maçonnée, ou une cheminée maçonnée, avec espaces libres référés.

**MUR DOUBLE:** De six (6 inches) (152mm) de diamètre, le connecteur de conduit d'air isolé pour mur double avec une cheminée bâtie en usine UL103HT\* de Classe "A", ou une cheminée maçonnée, avec espaces libres référés.

**MAISON MOBILE:** Utiliser un conduit de mur double par Dura-Vent DVL, Selkirk Metalbestos DS ou Security DL. Doit être équipé d'un pare-étincelles. Toutes les espaces libres pour mur double mentionnés ci-dessus.

**ESPACES LIBRES MIN DES MATERIAUX COMBUSTIBLES:** En Pouces & (millimètres)

**NOTE:** Toutes les dimensions "A", "C", et "F" sont à partir du diamètre intérieur de l'entrée du conduit.

**5700 Step Top ACC-C**

	A	B	C	D	E	F	G	H	
<b>SINGLE WALL PIPE</b>	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	N/A	CONDUIT DU MUR SIMPLE
<b>DOUBLE WALL PIPE</b>	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	N/A	CONDUIT DU MUR DOUBLE
<b>DOUBLE WALL PIPE</b>	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	45 (1143) 18 (457)*	CONDUIT DU MUR DOUBLE
<b>DOUBLE WALL PIPE</b>	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	13 (330)	CONDUIT DU MUR DOUBLE
<b>DOUBLE WALL PIPE</b>	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	13 (330)	CONDUIT DU MUR DOUBLE
<b>DOUBLE WALL PIPE</b>	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	13 (330)	CONDUIT DU MUR DOUBLE
<b>DOUBLE WALL PIPE</b>	10.5 (268)	8.5 (216)	25.5 (648)	15 (381)	N/A	N/A	45 (1143)	*	CONDUIT DU MUR DOUBLE

**INSTALLATION: FULL VERTICAL / ENTièrement VERTICALE**

**INSTALLATION: 90° ELBOW OFF TOP OF STOVE THROUGH BACKWALL**

**INSTALLATION: 90° DU COUBURE AU DESSUS DE HAUT DU POÊLE A TRAVERS LE MUR ARRIERE**

**INSTALLATION: ALCOVE - Six inches (6 inches) (152mm) diameter listed DOUBLE WALL air insulated connector pipe with UL103 HT\* listed factory-built Class "A" chimney, or a masonry chimney. (Mobile Home must be equipped with a spark arrester) Maximum depth of Alcove shall be no more than 48 inches (1219mm) and the referenced alcove clearances.**

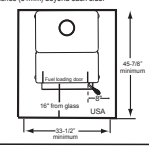
**INSTALLATION: ALCOVE - Six pouces (6 pouces) (152mm) de diamètre listé air isolé tuyau de raccordement à double paroi avec UL103 HT\* cotée Classe usine construite "A" cheminée ou une cheminée de maçonnerie. (Mobile Home doit être équipé d'un pare-étincelles) Profondeur maximale de Alcove ne doit pas être plus de 48 pouces (1219mm) et les dégagements en alcove référencés.**

**INSTALLATION: ALCOVE - Six pouces (6 pouces) (152mm) de diamètre listé air isolé tuyau de raccordement à double paroi avec UL103 HT\* cotée Classe usine construite "A" cheminée ou une cheminée de maçonnerie. (Mobile Home doit être équipé d'un pare-étincelles) Profondeur maximale de Alcove ne doit pas être plus de 48 pouces (1219mm) et les dégagements en alcove référencés.**

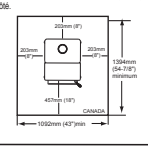
**90 OFF TOP UP & OUT CEILING CLEARANCE/ ESPACE LIBRE DU DESSUS DE L'APPAREIL AU PLAFOND AVEC 90 DE COUBURE**

**STOVE TO CEILING CLEARANCE/ ESPACE LIBRE DU POÊLE AU PLAFOND**

**FLOOR PROTECTION:** Floor protector must be (R value = 2.04) non-combustible material or equivalent, extending beneath heater and to front/side/rear as indicated on the diagram below. Exception: Non-combustible floor protectors must extend beneath the flue pipe when installed with horizontal venting and extend 2 inches (51mm) beyond each side.



**PROTECTION DU PLANCHER:** Protécteur de genécher doit être (valeur de R = 2.04) matériau non combustible ou équivalent, étendant sous chauffage et à l'avant/côtés/arrière comme indiqué sur le schéma ci-dessous. Exception: protections de sol non combustibles doivent s'étendre au-dessous du conduit de fumée lorsqu'il est installé avec ventilation horizontale et s'étendre 2 pouces (51mm) au-delà de chaque côté.



**BACKWALL/SIDE WALL / MUR DE CÔTÉ**

**CORNER INSTALLATION/ INSTALLATION DU COIN**

**ALCOVE SIDE VIEW/ VUE DE CÔTÉ DE L'ALCOVE**

**ALCOVE TOP VIEW/ VUE DU HAUT DE L'ALCOVE**

**90 OFF TOP UP & OUT CEILING CLEARANCE/ ESPACE LIBRE DU DESSUS DE L'APPAREIL AU PLAFOND AVEC 90 DE COUBURE**

**STOVE TO CEILING CLEARANCE/ ESPACE LIBRE DU POÊLE AU PLAFOND**

Manufactured by: **HEARTH & HOME technologies**

Made in U.S.A. or US and imported parts.

2017 2018 2019 Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

**DO NOT REMOVE THIS LABEL / NE PAS ENLEVER L'ÉTIQUETTE**

U.S. ENVIRONMENTAL PROTECTION AGENCY  
 Certified to comply with 2020 particulate emission standards using crib wood at 1.8 GHR EPA Method 289, ASTM 2915-11 and CSA B415.1-10. This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information.

7038-228\_R1

Serial No.

Model Name

Test Lab & Report No.

Mfg. Date

SAMPLE

**Safety Alert Key:**

- **DANGER!** Indicates a hazardous situation which, if not avoided will result in death or serious injury.
- **WARNING!** Indicates a hazardous situation which, if not avoided could result in death or serious injury.
- **CAUTION!** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE:** Indicates practices which may cause damage to the appliance or to property.

**TABLE OF CONTENTS**

A. Sample of Serial Number / Safety Label .....	2	<b>3 Maintenance and Service .....</b>	<b>16</b>
B. Warranty Policy.....	4	A. Quick Reference Maintenance Guide.....	16
C. Quick Start Guide .....	6	B. Cleaning and Operating the Ash Removal System.....	17
<b>1 Listing and Code Approvals .....</b>	<b>7</b>	C. General Maintenance .....	18
A. Appliance Certification .....	7	<b>4 Troubleshooting Guide.....</b>	<b>19</b>
B. BTU & Efficiency Specifications.....	7	<b>5 Service Part Replacement.....</b>	<b>20</b>
C. Mobile Home Approved .....	7	A. Glass Replacement .....	20
D. Glass Specifications .....	7	B. Firebrick Replacement .....	20
<b>2 Operating Instructions .....</b>	<b>8</b>	C. Snap Disc Replacement .....	20
A. Over-Firing Your Appliance .....	8	D. Door Handle Assembly.....	21
B. Wood Selection & Storage.....	8	E. Baffle Removal .....	21
C. Burning Process .....	8	G. Tube Channel Assembly Replacement .....	22
D. Air Controls.....	9	<b>6 Reference Materials .....</b>	<b>23</b>
F. Burn Rates and Operating Efficiency .....	10	A. Exploded View .....	23
G. Building A Fire .....	11	B. Service Parts & Accessories.....	24
H. Correct Baffle & Blanket Placement .....	12		
I. Blower Operating Instructions .....	13		
J. Opacity (Smoke) .....	13		
K. Clear Space.....	14		
L. Negative Pressure.....	14		
M. Frequently Asked Questions .....	15		

## B. Warranty Policy

### Hearth & Home Technologies LIMITED LIFETIME WARRANTY

Hearth & Home Technologies, on behalf of its hearth brands (“HHT”), extends the following warranty for HHT gas, wood, pellet, coal and electric hearth appliances that are purchased from an HHT authorized dealer.

#### **WARRANTY COVERAGE:**

HHT warrants to the original owner of the HHT appliance at the site of installation, and to any transferee taking ownership of the appliance at the site of installation within two years following the date of original purchase, that the HHT appliance will be free from defects in materials and workmanship at the time of manufacture. After installation, if covered components manufactured by HHT are found to be defective in materials or workmanship during the applicable warranty period, HHT will, at its option, repair or replace the covered components. HHT, at its own discretion, may fully discharge all of its obligations under such warranties by replacing the product itself or refunding the verified purchase price of the product itself. The maximum amount recoverable under this warranty is limited to the purchase price of the product. This warranty is subject to conditions, exclusions and limitations as described below.

#### **WARRANTY PERIOD:**

Warranty coverage begins on the date of original purchase. In the case of new home construction, warranty coverage begins on the date of first occupancy of the dwelling or six months after the sale of the product by an independent, authorized HHT dealer/ distributor, whichever occurs earlier. The warranty shall commence no later than 24 months following the date of product shipment from HHT, regardless of the installation or occupancy date. The warranty period for parts and labor for covered components is produced in the following table.

The term “Limited Lifetime” in the table below is defined as: 20 years from the beginning date of warranty coverage for gas appliances, and 10 years from the beginning date of warranty coverage for wood, pellet, and coal appliances. These time periods reflect the minimum expected useful lives of the designated components under normal operating conditions.

Warranty Period		HHT Manufactured Appliances and Venting							Components Covered
Parts	Labor	Gas	Wood	Pellet	EPA Wood	Coal	Electric	Venting	
1 Year		X	X	X	X	X	X	X	All parts and material except as covered by Conditions, Exclusions, and Limitations listed
2 years				X	X	X			Igniters, electronic components, and glass
		X	X	X	X	X			Factory-installed blowers
			X						Molded refractory panels
		X							Ignition Modules
3 years				X					Firepots and burnpots
5 years	1 year			X	X				Castings and baffles
7 years	3 years		X	X	X				Manifold tubes, HHT chimney and termination
10 years	1 year	X							Burners, logs and refractory
Limited Lifetime	3 years	X	X	X	X	X			Firebox and heat exchanger
90 Days		X	X	X	X	X	X	X	All replacement parts beyond warranty period

See conditions, exclusions, and limitations on next page.

**WARRANTY CONDITIONS:**

- This warranty only covers HHT appliances that are purchased through an HHT authorized dealer or distributor. A list of HHT authorized dealers is available on the HHT branded websites.
- This warranty is only valid while the HHT appliance remains at the site of original installation.
- This warranty is only valid in the country in which the HHT authorized dealer or distributor that sold the appliance resides.
- Contact your installing dealer for warranty service. If the installing dealer is unable to provide necessary parts, contact the nearest HHT authorized dealer or supplier. Additional service fees may apply if you are seeking warranty service from a dealer other than the dealer from whom you originally purchased the product.
- Check with your dealer in advance for any costs to you when arranging a warranty call. Travel and shipping charges for parts are not covered by this warranty.

**WARRANTY EXCLUSIONS:**

This warranty does not cover the following:

- Changes in surface finishes as a result of normal use. As a heating appliance, some changes in color of interior and exterior surface finishes may occur. This is not a flaw and is not covered under warranty.
- Damage to printed, plated, or enameled surfaces caused by fingerprints, accidents, misuse, scratches, melted items, or other external sources and residues left on the plated surfaces from the use of abrasive cleaners or polishes.
- Repair or replacement of parts that are subject to normal wear and tear during the warranty period. These parts include: paint, wood, pellet and coal gaskets, firebricks, grates, flame guides, batteries and the discoloration of glass.
- Expansion, contraction, or movement of certain parts causing noise. These conditions are normal and complaints related to this noise are not covered by this warranty.
- Damages resulting from: (1) failure to install, operate, or maintain the appliance in accordance with the installation instructions, operating instructions, and listing agent identification label furnished with the appliance; (2) failure to install the appliance in accordance with local building codes; (3) shipping or improper handling; (4) improper operation, abuse, misuse, continued operation with damaged, corroded or failed components, accident, or improperly/incorrectly performed repairs; (5) environmental conditions, inadequate ventilation, negative pressure, or drafting caused by tightly sealed constructions, insufficient make-up air supply, or handling devices such as exhaust fans or forced air furnaces or other such causes; (6) use of fuels other than those specified in the operating instructions; (7) installation or use of components not supplied with the appliance or any other components not expressly authorized and approved by HHT; (8) modification of the appliance not expressly authorized and approved by HHT in writing; and/or (9) interruptions or fluctuations of electrical power supply to the appliance.
- Non-HHT venting components, hearth components or other accessories used in conjunction with the appliance.
- Any part of a pre-existing fireplace system in which an insert or a decorative gas appliance is installed.
- HHT's obligation under this warranty does not extend to the appliance's capability to heat the desired space. Information is provided to assist the consumer and the dealer in selecting the proper appliance for the application. Consideration must be given to appliance location and configuration, environmental conditions, insulation and air tightness of the structure.

**This warranty is void if:**

- The appliance has been over-fired or operated in atmospheres contaminated by chlorine, fluorine, or other damaging chemicals. Over-firing can be identified by, but not limited to, warped plates or tubes, rust colored cast iron, bubbling, cracking and discoloration of steel or enamel finishes.
- The appliance is subjected to prolonged periods of dampness or condensation.
- There is any damage to the appliance or other components due to water or weather damage which is the result of, but not limited to, improper chimney or venting installation.

**LIMITATIONS OF LIABILITY:**

- The owner's exclusive remedy and HHT's sole obligation under this warranty, under any other warranty, express or implied, or in contract, tort or otherwise, shall be limited to replacement, repair, or refund, as specified above. In no event will HHT be liable for any incidental or consequential damages caused by defects in the appliance. Some states do not allow exclusions or limitation of incidental or consequential damages, so these limitations may not apply to you. This warranty gives you specific rights; you may also have other rights, which vary from state to state. EXCEPT TO THE EXTENT PROVIDED BY LAW, HHT MAKES NO EXPRESS WARRANTIES OTHER THAN THE WARRANTY SPECIFIED HEREIN. THE DURATION OF ANY IMPLIED WARRANTY IS LIMITED TO DURATION OF THE EXPRESSED WARRANTY SPECIFIED ABOVE.

C. Quick Start Guide

*Note: These are generic drawings and may not represent your specific model.*

**ITEMS NEEDED FOR FIRST FIRE:** 10 Pieces of Newspaper, 10-20 Pieces of Dry Kindling and a Few Pieces of Dry Split Wood.

**OPEN AIR CONTROLS**

HIGH  
BURN RATE CONTROL (Upper Right Corner)

HIGH

AUTOMATIC COMBUSTION CONTROL (ACC) (Middle right hand side)

**1**

**LOAD WOOD**

**2**

**ADD NEWSPAPER**

**3**

**ADD KINDLING**

**LIGHT THE PAPER**

**4**

**WARNING! Risk of Fire**

Close and securely latch the door after the fire has started, and after refueling, to prevent:

- Spillage of smoke, flame and carbon monoxide
- Spillage of sparks, coals, and logs
- Over firing

DO NOT leave the appliance unattended with the door open. Starting a fire may not require an open door for draft. The air control should supply adequate draft.

**5**

**ADD MORE WOOD**

**6**

**REDUCE AIR CONTROLS**

Set to desired heat output.

LOW  
BURN RATE CONTROL (Upper Right Corner)

LOW

AUTOMATIC COMBUSTION CONTROL (ACC) (Middle right hand side)

**7**

**The appliance is ready for normal operation.**

# 1 Listing and Code Approvals

## A. Appliance Certification

<b>Model:</b>	5700 Step Top ACC Wood Appliance
<b>Laboratory:</b>	OMNI Test Laboratories, Inc.
<b>Report No &amp; Date:</b>	0061WS092S
<b>Type:</b>	Listed Room Appliance, Solid Fuel Type
<b>Standard:</b>	UL 1482-11 (R2015) and ULC S627-00 and (UM) 84-HUD, Mobile Home Approved.

NOTE: This installation must conform with local codes. In the absence of local codes you must comply with (UM) 84-HUD and NPFA211 in the U.S.A. and CAN/CSA-B365 Installation Codes in Canada.

## B. BTU & Efficiency Specifications

Emissions Certification #:	0061WS092E
EPA Certification #:	
EPA Certified Emissions:	1.8 g/hr
*LHV Tested Efficiency:	80.0%
**HHV Tested Efficiency:	74.0%
***EPA BTU Output:	12,772 - 38,284 btu/hr
****Peak BTU/Hour Output:	
Vent Size:	6 inches
Firebox Size:	2.90 cubic feet
Recommended Wood Length:	22 inches
Fuel Orientation:	Front-to-Back
Fuel	Seasoned Cord Wood
*Weighted average LHV efficiency using Douglas Fir dimensional lumber and data collected during EPA emission test.	
**Weighted average HHV efficiency using Douglas Fir dimensional lumber and data collected during EPA emission test.	
***A range of BTU outputs based on HHV and the burn rates from the low and high EPA tests, using Douglas Fir dimensional lumber.	
****A peak BTU out of the appliance calculated using the maximum first hour burn rate from the High EPA Test and the BTU content of cord wood (8600) times the efficiency.	

The Quadra-Fire 5700 Wood Appliance meets the U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using crib wood at 1.8 G/HR EPA Method 28 and 5G. This wood appliance needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

## C. Mobile Home Approved

- This appliance is approved for mobile home installations; when not installed in a sleeping room and when an outside combustion air inlet is provided.
- The structural integrity of the mobile home floor, ceiling, and walls must be maintained.
- The appliance must be properly grounded to the frame of the mobile home with #8 copper ground wire, and chimney must be listed to UL103 HT or a listed UL-1777 full length six inch (152mm) diameter liner must be used.
- Outside Air Kit, part OAK-ACC must be installed in a mobile home installation.

## D. Glass Specifications

This appliance is equipped with 5mm ceramic glass. Replace glass only with 5mm ceramic glass. Please contact your dealer for replacement glass.



### WARNING



#### Fire Risk.

Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by, the following actions:

- Installation and use of any damaged appliance.
- Modification of the appliance.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.
- Operating appliance without fully assembling all components.
- Operating appliance without legs attached (if supplied with appliance).
- Do NOT Over fire - If appliance or chimney connector glows, you are over firing.

Any such action that may cause a fire hazard.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage.



For assistance or additional information, consult a qualified installer, service agency or your dealer.

NOTE: Hearth & Home Technologies, manufacturer of this appliance, reserves the right to alter its products, their specifications and/or price without notice.

# User Guide

## 2 Operating Instructions

### A. Over-Firing Your Appliance

 <b>WARNING</b>	
	<p><b>Fire Risk</b></p> <p>Do not over-fire. Over-firing may ignite creosote or will damage the appliance and chimney.</p> <p>To prevent over-firing your appliance, DO NOT:</p> <ul style="list-style-type: none"> <li>• Use flammable liquids</li> <li>• Overload with wood</li> <li>• Burn trash or large amounts of scrap lumber</li> <li>• Permit too much air to the fire</li> </ul>

#### 1. Symptoms of Over-Firing

Symptoms of over-firing may include one or more of the following:

- Chimney connector or appliance glowing
- Roaring, rumbling noises
- Loud cracking or banging sounds
- Metal warping
- Chimney fire

#### 2. What To Do if Your Appliance is Over-Firing

- Immediately close the door and air controls to reduce air supply to the fire.
- If you suspect a chimney fire, call the fire department and evacuate your house.
- Contact your local chimney professional and have your appliance and appliance pipe inspected for any damage.
- Do not use your appliance until the chimney professional informs you it is safe to do so.

Hearth & Home Technologies WILL NOT warranty appliances that exhibit evidence of over-firing. Evidence of over-firing includes, but is not limited to:

- Warped air tube
- Deteriorated refractory brick retainers
- Deteriorated baffle and other interior components

### B. Wood Selection & Storage

Burn only dry seasoned wood. Store wood under cover, out of the rain and snow. Dry and well-seasoned wood will not only minimize the chance of creosote formation, but will give you the most efficient fire. Even dry wood contains at least 15% moisture by weight, and should be burned hot enough to keep the chimney hot for as long as it takes to dry the wood out - about one hour. It is a waste of energy to burn unseasoned wood of any kind.

Dead wood lying on the forest floor should be considered wet, and requires full seasoning time. Standing dead wood can be considered to be about 2/3 seasoned. To tell if wood is dry enough to burn, check the ends of the logs. If there are cracks radiating in all directions from the center, it is dry. If your wood sizzles in the fire, even though the surface is dry, it may not be fully cured.

Splitting wood before it is stored reduces drying time. Wood should be stacked so that both ends of each piece are exposed to air, since more drying occurs through the cut ends than the sides. This is true even with wood that has been split. Store wood under cover, such as in a shed, or covered with a tarp, plastic, tar paper, sheets of scrap plywood, etc., as uncovered wood can absorb water from rain or snow, delaying the seasoning process.

### C. Burning Process

In recent years there has been an increasing concern about air quality. Much of the blame for poor air quality has been placed on the burning of wood for home heating. In order to improve the situation, we at Quadra-Fire have developed cleaner-burning wood appliances that surpass the requirements for emissions established by our governing agencies. These wood appliances, like any other appliances, must be properly operated in order to insure that they perform the way they are designed to perform. Improper operation can turn most any wood appliance into a smoldering environmental hazard.

#### 1. Kindling or First Stage

It helps to know a little about the actual process of burning in order to understand what goes on inside a appliance. The first stage of burning is called the kindling stage. In this stage, the wood is heated to a temperature high enough to evaporate the moisture which is present in all wood. The wood will reach the boiling point of water (212°F) and will not get any hotter until the water is evaporated. This process takes heat from the coals and tends to cool the appliance.

Fire requires three things to burn - fuel, air and heat. So, if heat is robbed from the appliance during the drying stage, the new load of wood has reduced the chances for a good clean burn. For this reason, it is always best to burn dry, seasoned firewood. When the wood isn't dry, you must open the air controls and burn at a high burn setting for a longer time to start it burning. The heat generated from the fire should be warming your home and establishing the flue draft, not evaporating the moisture out of wet, unseasoned wood, resulting in wasted heat.

#### 2. Second Stage

The next stage of burning, the secondary stage, is the period when the wood gives off flammable gases which burn above the fuel with bright flames. During this stage of burning it is

very important that the flames be maintained and not allowed to go out. This will ensure the cleanest possible fire. If the flames tend to go out, it is set too low for your burning conditions. The air control located at the upper right hand corner is used to adjust for burn rates. This is called the Burn Rate Air Control. **Figure 9.1**

### 3. Final Stage

The final stage of burning is the charcoal stage. This occurs when the flammable gases have been mostly burned and only charcoal remains. This is a naturally clean portion of the burn. The coals burn with hot blue flames.

It is very important to reload your appliance while enough lively hot coals remain in order to provide the amount of heat needed to dry and rekindle the next load of wood. It is best to open the Burn Rate Air and Start-Up Air Controls **before reloading**. This livens up the coal bed and reduces excessive emissions (opacity/smoke). Open door slowly so that ash or smoke does not exit appliance through opening. You should also break up any large chunks and distribute the coals so that the new wood is laid on hot coals.

Air quality is important to all of us, and if we choose to use wood to heat our homes we should do so responsibly. To do this we need to learn to burn our appliances in the cleanest way possible. Doing this will allow us to continue using our wood appliances for many years to come.

## D. Air Controls

Users will need to find their preferred setting between high and low based on desired heat output, installation configuration, and fuel type.

### 1. Burn Rate Air Control

This air supply enters at the upper front of the firebox, near the top of the glass door. This preheated air supplies the necessary fresh oxygen to mix with the unburned gases, helping to create second, third and fourth combustions. This air is regulated by the Burn Rate Air Control. When the control is moved all the way up it is on the High setting and when moved all the way down it is on the Low setting. **Figure 10.1**

### 2. Automatic Combustion Control System (ACC)

To engage the Automatic Combustion Control (ACC) timer system push the lever towards the back of the appliance to the "HI" position, then pull towards the front of the appliance until the knob stops. The timer will slowly close in about 25 minutes. Use this feature when reloading fuel or if you want more air supplied to the fire. **Figure 9.3**

## E. Using Burn Rate Air Control & ACC System

### 1. Start up and Reloading Fuel

Open both Burn Rate Air Control and ACC systems fully. To do this with the Burn Rate Air Control push spring handle up to high. For the ACC timer system push knob towards back of appliance until the knob is located under the high position. **Figure 9.1**

## 2. Maximize Heat with The ACC System

To maximize heat output with the ACC timer System or also known as high burn push the ACC Air Control lever towards the back of the appliance and leave. This combined with having the main burn rate control lever pushed up to the high position will deliver the most amount of air needed to achieve the highest amount of heat output. **Figure 9.1**

### 3. Manual Timer Over-Ride

If you need to shut the ACC system off before it goes through the cycle of shutting itself off; 25 minutes, reach towards the back of the appliance on the right side and pull the lever towards the front of the appliance. **Figure 9.2**

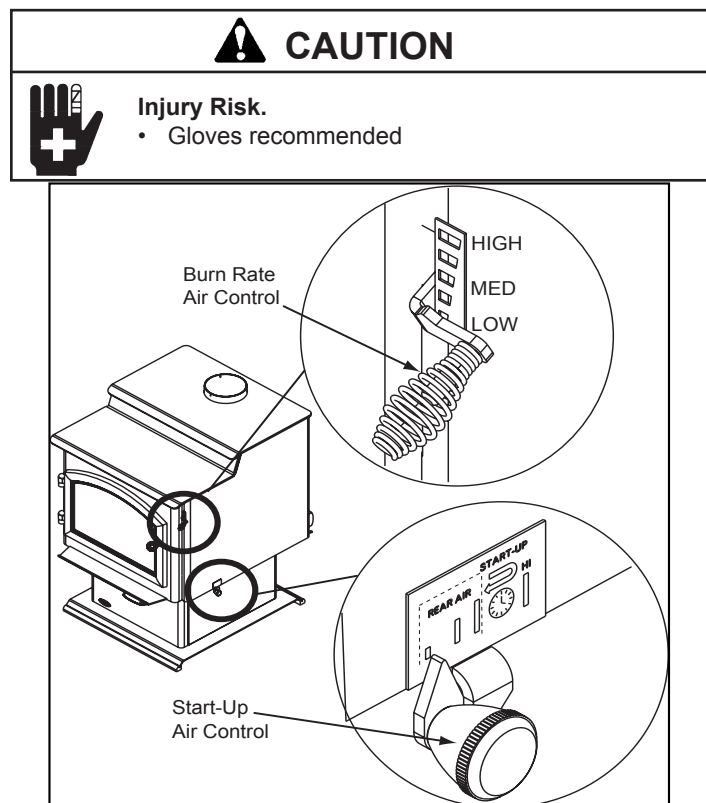


Figure 9.1

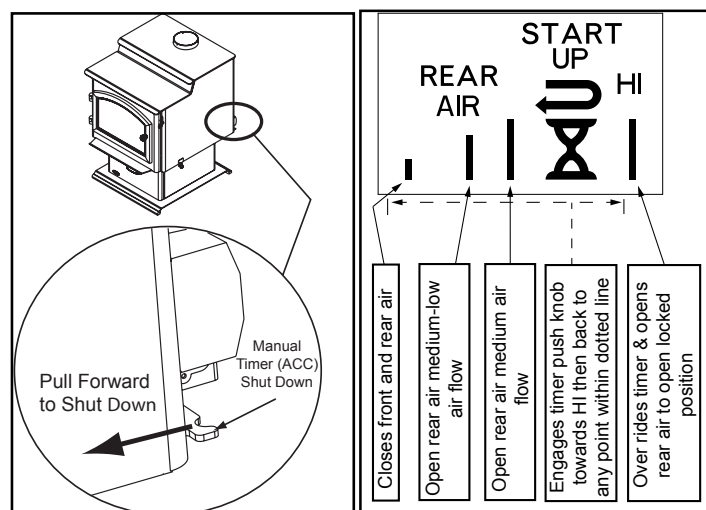


Figure 9.2

Figure 9.3



## F. Burn Rates and Operating Efficiency

### For maximum operating efficiency

This wood appliance has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood appliance in a manner inconsistent with operating instructions in this manual.

- Burn dry, well-seasoned wood.

### Burn Rates

#### 1. Low burn setting:

- Burn Rate Air Control spring handle up to high position for 5 minutes.
- Then activate the ACC timer system by pushing the knob all the back toward the appliance to “HI” then pull forwards towards the front of the appliance until the knob stops (**Figure 9.1 on page 9**).
- At that point close the Burn Rate Air Control by moving the spring handle to the low setting.

#### 2. Medium low burn setting:

- Burn Rate Air Control spring handle up to high position for 5 minutes.
- Then activate the ACC timer system by pushing the knob all the back toward the appliance to “HI” then pull forwards towards the front of the appliance until the knob stops (**Figure 8.1 on page 8**).
- At that point move the Burn Rate Air Control spring handle approx. 1/8”-1/2” up from the low position.

#### 3. Medium high burn setting:

- Burn Rate Air Control spring handle up to high position.
- Then activate the ACC timer system by pushing the knob all the back toward the appliance to “HI” then pull forwards towards the front of the appliance until the knob stops (**Figure 8.1 on page 8**).
- At that point move the Burn Rate Air Control spring handle approx. 1/2” up from low position to maximum high position.

#### 4. High burn setting:

- Burn Rate Air Control spring handle up to high position
- Also activate ACC timer system knob pushed back to the “HI” position.

**Note:** If using the optional blower for settings 1-3, the blower shall be off for the first 30 minutes and then be operated in the high position at 30 minutes. For high burn setting, blower may continue to be on full after the loading of the fuel.

**NOTE:** The above information is provided as a guideline only. Altitude and other circumstances may require control adjustments to achieve the desired burn rates.

**NOTE:** Operate appliance on High Burn 45 minutes a day to help keep flue/chimney clean.

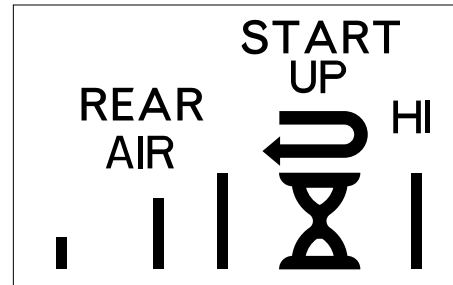
## **WARNING**



### Risk of Fire.

When set on High Burn Rate and over-riding the Automatic Combustion Control system an over fire situation can occur and may result in a chimney fire.

Over firing will void the appliance warranty.



**Figure 10.1**

After activating the timer (ACC), if the control is placed within the rear air section on the label it will allow rear air to enter the firebox. This will not interfere with the timer gradually closing the front air channel in 25 minutes. If control is set on “HI” it over-rides the timer (ACC).

## G. Building A Fire

Before lighting your first fire in the appliance:

**NOTE:** The special high temperature paint that your appliance is finished with will cure as your appliance heats. You will notice an odor and perhaps see some vapor rise from the appliance surface; this is normal. We recommend that you open a window until the odor dissipates and paint is cured.

1. Confirm the baffle is correctly positioned. It should be even with the front tube and resting on all tubes. (**Figure 11.1**).

2. Remove all labels from glass and inside of appliance.

There are many ways to build a fire. The basic principle is to light easily-ignitable tinder or paper, which ignites the fast burning kindling, which in turn ignites the slow-burning firewood. Here is one method that works well:

1. Open the Burn Rate Air and ACC Controls fully (Refer to page 6 Start-Up Guide).
2. Place several wads of crushed paper on the firebox floor. Heating the flue with slightly crumpled newspaper before adding kindling keeps smoke to a minimum.
3. Lay small dry sticks of kindling on top of the paper.
4. Make sure that no matches or other combustibles are in the immediate area of the appliance. Be sure the room is adequately ventilated and the flue unobstructed.
5. Light the paper in the appliance. NEVER light or rekindle fire with kerosene, gasoline, or charcoal lighter fluid; the results can be fatal.
6. Once the kindling is burning quickly, add several full-length logs 3 inches (76mm) or 4 inches (102mm) in diameter. Be careful not to smother the fire. Stack the pieces of wood carefully; near enough to keep each other hot, but far enough away from each other to allow adequate air flow between them.
7. Set the Burn Rate Air Control and activate the ACC timer system.
8. When ready to reload, it is best to fully open both the Burn Rate Air and Start-up Air Controls **before reloading**. This livens up the coal bed and reduces excessive emissions (opacity/smoke). Open door slowly so that ash or smoke does not exit appliance through opening. Large logs burn slowly, holding a fire longer. Small logs burn fast and hot, giving quick heat.
9. As long as there are hot coals, repeating steps 6 through 8 will maintain a continuous fire.

### NOTE:

- Build fire on brick firebox floor.
- Do NOT use grates, andirons or other methods to support fuel. It will adversely affect emissions.

### WARNING



#### Fire Risk

Do NOT store wood:

- Closer than required clearances to combustibles to appliance
  - Within space required for loading or ash removal.

Do NOT operate appliance:

- With appliance door open.
- With ash removal system door open.

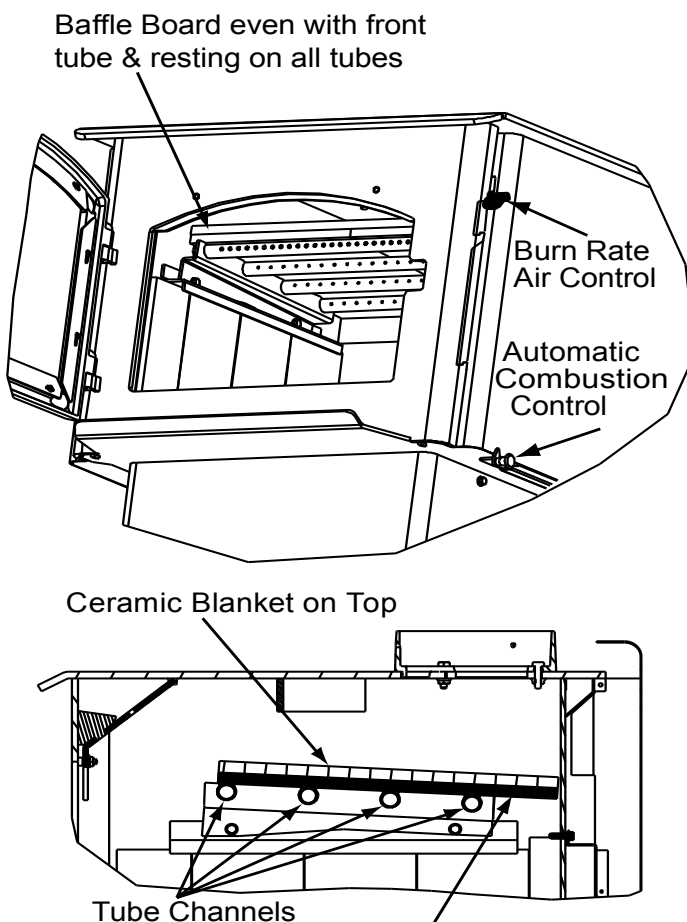


Figure 11.1

### WARNING



#### Fire Risk.

- Do NOT burn wet or green wood.
  - Store wood in dry location.
  - Stack wood so both ends are exposed to air.
- Wet, unseasoned wood can cause accumulation of creosote.

H. Correct Baffle & Blanket Placement

**⚠ WARNING**

**Fire Risk**  
 Firebox damage due to improper baffle placement is not covered by warranty. Operate the wood burning appliance with the baffle in the correct position only.

Not doing so could result in:

- Reduced efficiency
- Overheating the chimney
- Overheating the rear of the firebox
- Poor performance

Ensure correct baffle placement and replace baffle components if damaged or missing.

**CAUTION**

The baffle boards are FRAGILE. Use extreme caution when loading firewood to prevent:

- Cracking, breaking or damaging the baffle boards

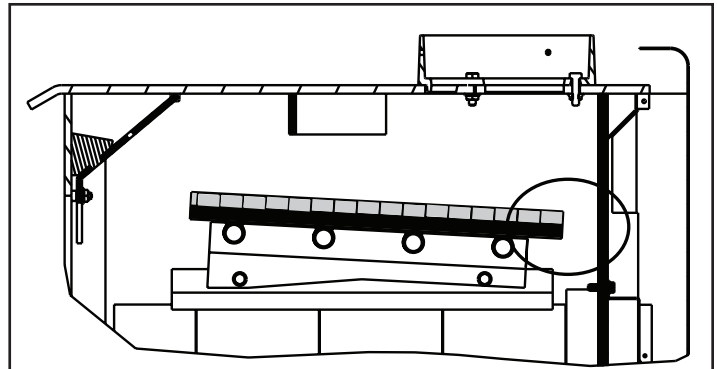
DO NOT operate the appliance without baffle boards

**CORRECT POSITION**

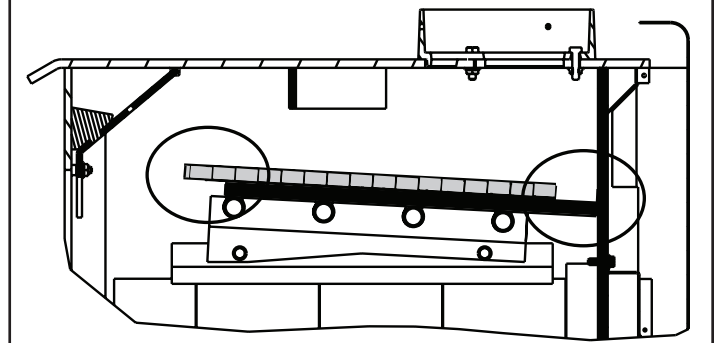
Ceramic Blanket and Baffle Board **MUST** be in contact with the back of the firebox and even in the front.

Figure 12.1

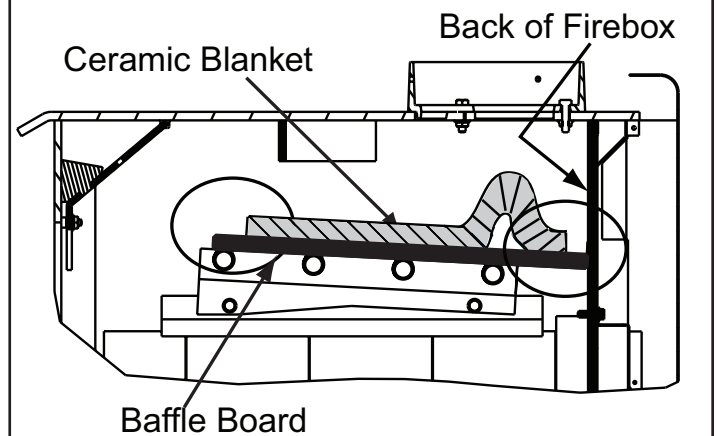
**INCORRECT POSITIONS**



Ceramic Blanket and Baffle Board are **NOT** in contact with the back of the firebox.



Ceramic Blanket is **NOT** in contact with the back of the firebox and **NOT** even with the Baffle Board in the front.



Ceramic Blanket is bunched up at the back of the firebox and **NOT** even with the Baffle Board in the front.

Figure 12.2

## I. Blower Operating Instructions

**NOTE:** If your Quadra-Fire wood appliance is equipped with an optional blower, you should follow these guidelines:

### 1. Initial (cold) start-up and all Burn Settings

The blower can be plugged in and turned on right away. The blower is turned on and off by a snap disc. When your appliance has reached a certain temperature the blower will turn on and when your appliance has cooled down to a certain temperature it will turn off. Switch on blower control must be set to auto for this feature to work (Figure 13.2).

2. The blower is equipped with a speed control. Adjust the fan speed by turning the speed control clockwise to "Low" or counterclockwise to "High". **Figure 13.2.**

### 3. Snap Disc Location

If you find the blower coming on and off at undesirable temperatures, relocate the snap disc to another location in the designated zone on the back of the appliance. **Figure 13.1** There is a manual over-ride switch to deactivate the snap disc, if necessary.

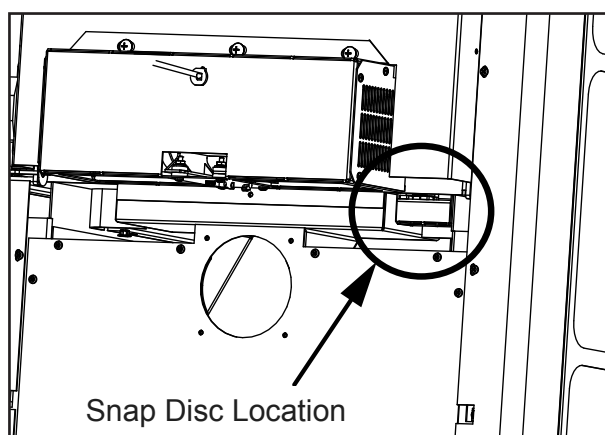


Figure 13.1

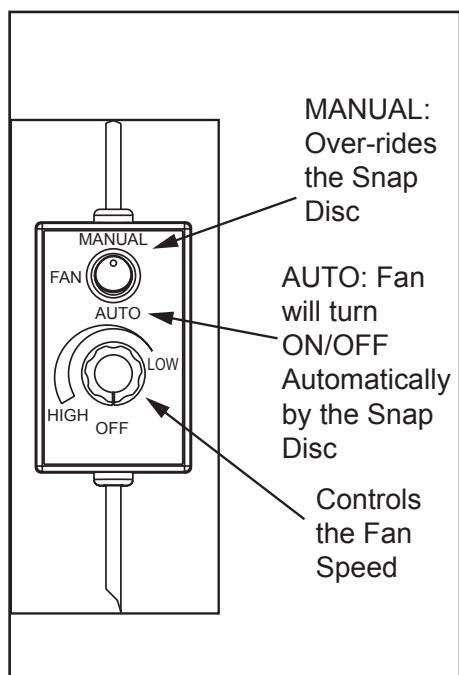


Figure 13.2

## J. Opacity (Smoke)

This is the measure of how clean your appliance is burning. Opacity is measured in percent; 100% opacity is when an object is totally obscured by the smoke column from a chimney, and 0% opacity means that no smoke column can be seen. As you become familiar with your appliance, you should periodically check the opacity. This will allow you to know how to burn as nearly smoke-free as possible (goal of 0% opacity).

### WARNING



#### Fire Risk.

- DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.
  - Do NOT burn treated wood or wood with salt (drift-wood).
  - May generate carbon monoxide if burn material other than wood.
- May result in illness or possible death.

### WARNING



#### Fire Risk.

- Keep combustible materials, gasoline and other flammable vapors and liquids clear of appliance.
- Combustible materials may ignite.
  - Do NOT store flammable materials in the appliance's vicinity.
  - DO NOT USE GASOLINE, LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID OR SIMILAR LIQUIDS TO START OR "FRESHEN UP" A FIRE IN THIS APPLIANCE.
  - Keep all such liquids well away from the appliance while it is in use.

### CAUTION

When burning your first fire, you will experience smoke and odor from the appliance resulting from the curing of paint and burning off of any oils remaining from manufacturing.

#### OPEN WINDOWS DURING INITIAL BURN TO DISSIPATE SMOKE AND ODORS!

- Odors may be irritating to sensitive individuals.
- Smoke detectors may activate.

## K. Clear Space

- Do NOT place combustible objects within 4 ft (1.2 m) of the front of appliance. See **Figure 14.1**.
- Mantel - avoid placing candles and other heat-sensitive objects on mantel or hearth. Heat may damage these objects.

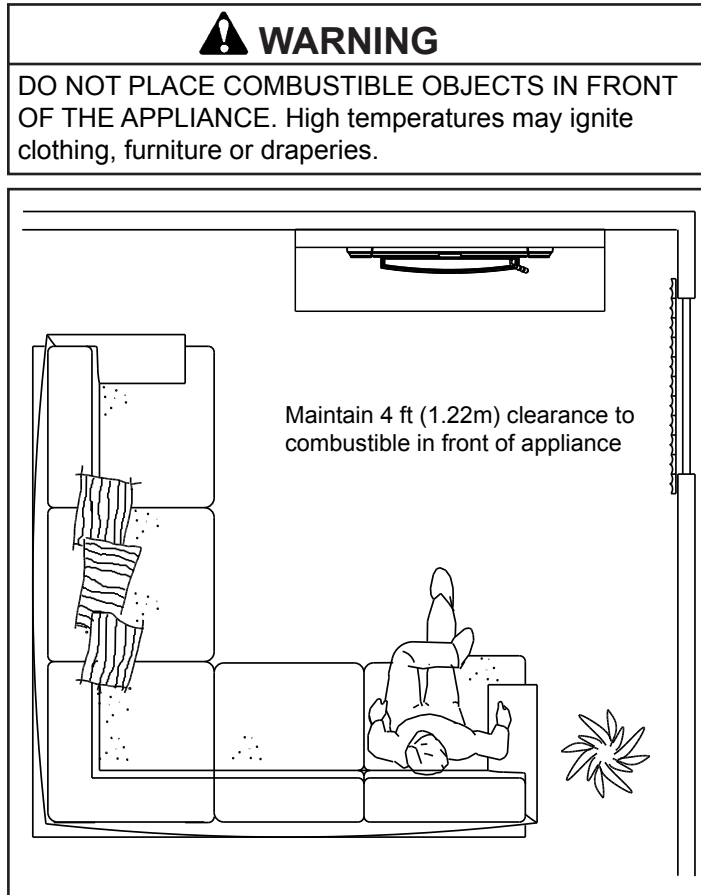



Figure 14.1

## L. Negative Pressure

 <b>WARNING</b>
<p><b>Asphyxiation Risk.</b></p> <ul style="list-style-type: none"> <li>• Negative pressure can cause spillage of combustion fumes, soot and carbon monoxide.</li> <li>• Appliance needs to draft properly for safety.</li> </ul>

Negative pressure results from the imbalance of air available for the appliance to operate properly. It can be strongest in lower levels of the house.

Causes include:

- Exhaust fans (kitchen, bath, etc.)
- Range hoods
- Combustion air requirements for furnaces, water appliances and other combustion appliances
- Clothes dryers
- Location of return-air vents to furnace or air conditioning
- Imbalances of the HVAC air handling system
- Upper level air leaks such as:
  - Recessed lighting
  - Attic hatch
  - Duct leaks

To minimize the effects of negative air pressure:

- Install the outside air kit with the intake facing prevailing winds during the heating season
- Ensure adequate outdoor air for all combustion appliances and exhaust equipment
- Ensure furnace and air conditioning return vents are not located in the immediate vicinity of the appliance
- Avoid installing the appliance near doors, walkways or small isolated spaces
- Recessed lighting should be a “sealed can” design
- Attic hatches weather stripped or sealed
- Attic mounted duct work and air handler joints and seams taped or sealed

## M. Frequently Asked Questions

ISSUES	SOLUTIONS
Odor from appliance	When first operated, this appliance may release an odor for the first several hours. This is caused by the curing of the paint and the burning off of any oils remaining from manufacturing.
Metallic noise	Noise is caused by metal expanding and contracting as it heats up and cools down, similar to the sound produced by a furnace or heating duct. This noise does not affect the operation or longevity of the appliance.
Whirring sound	If the optional blower has been installed, the blower produces a whirring sound which increases in volume as the speed is increased.

**CONTACT YOUR DEALER** for additional information regarding operation and troubleshooting.  
Visit [www.quadrafire.com](http://www.quadrafire.com) to find a dealer.

### **WARNING**



#### **Fire Risk.**

- DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.
  - Do NOT burn treated wood or wood with salt (driftwood).
  - May generate carbon monoxide if burn material other than wood.
- May result in illness or possible death.

### **WARNING**



#### **Fire Risk.**

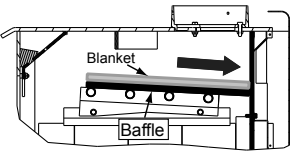
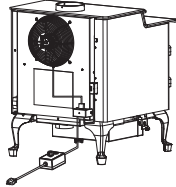
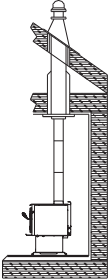
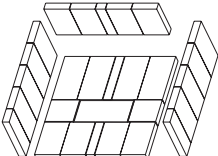
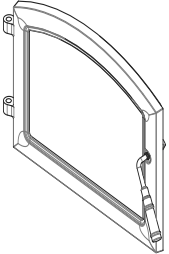
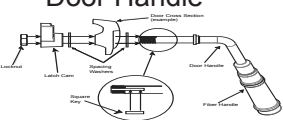
- Keep combustible materials, gasoline and other flammable vapors and liquids clear of appliance.
- Do NOT store flammable materials in the appliance's vicinity.
  - DO NOT USE GASOLINE, LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID OR SIMILAR LIQUIDS TO START OR "FRESHEN UP" A FIRE IN THIS APPLIANCE.
  - Keep all such liquids well away from the appliance while it is in use.
  - Combustible materials may ignite.

# 3 Maintenance and Service

## A. Quick Reference Maintenance Guide



**CAUTION!** Allow the appliance to completely cool down before performing any cleaning or maintenance.

Start the first inspection after the first 2 months of use, or if performance changes, and adjust your schedule accordingly. Maintenance is required for safe operation and must be performed to maintain your warranty.

	Frequency	Task
<p>Baffle &amp; Blanket</p> 	<p>MONTHLY, After Every Cord of Wood, OR After Each Cleaning</p>	<p>Baffle and blanket placement is critical to heat output, efficiency and overall life of the appliance. Make sure the baffle is pushed all of the way to the back of the firebox and the blanket is laying flat. Inspect baffle for cracks.</p>
<p>Optional Blower</p> 	<p>YEARLY</p>	<p>Vacuum the blower impellers.</p>
<p>Chimney System</p> 	<p>EVERY 2 MONTHS or After Every 2 Cords of Wood</p>	<p>The chimney and chimney cap must be inspected for soot and creosote every two months during the burn season or more frequency if chimney exceeds or is under 14-16 ft (4.3m-4.8m) measured from bottom of appliance.</p> <p>This will prevent pipe blockage, poor draft, and chimney fires.</p> <p>Always burn dry wood to help prevent cap blockage and creosote build-up.</p>
<p>Firebrick &amp; Ash Removal</p> 	<p>WEEKLY or After Every 25 Loads of Wood</p>	<p>Ashes must be cool before you can dispose of the ashes in a non-combustible container.</p> <p>Firebrick is designed to protect your firebox. After ashes are removed, inspect the firebrick and replace firebricks that are crumbling, cracked or broken.</p>
<p>Door &amp; Glass Assemblies</p> 	<p>WEEKLY or After Every 25 Loads of Wood</p>	<p>Keep door and glass gasket in good shape to maintain good burn times on a low burn setting. To test: place a dollar bill between the appliance and door and then shut the door. If you can pull the dollar out, remove one washer from door handle behind latch cam and try again. If you can still pull it out, replace the door gasket.</p> <p>Check the glass frame for loose screws to prevent air leakage. Check glass for cracks.</p>
<p>Door Handle</p> 	<p>YEARLY</p>	<p>Check the door latch for proper adjustment. This is very important especially after the door rope has formed to the appliance face.</p> <p>Check door handle for smooth cam operation.</p>

*These are generic drawings and may not represent your model.*

## B. Cleaning and Operating the Ash Removal System

	<b>WARNING</b>
	<p><b>Fire Risk</b></p> <p>Make sure Ash Removal System door is sealed tight against the gasket.</p> <p>Air leakage may cause:</p> <ul style="list-style-type: none"> <li>• Over-fire condition</li> <li>• Flame and/or smoke spillage</li> <li>• Wood to burn too fast</li> </ul> <p>Do NOT use Ash Removal System while stove is burning.</p>

1. The appliance and ashes must be completely cool before using the Ash Removal System (ARS).

Locate the ash removal door handle under the left side of the stove in the center. Grasp the handle with your fingers and place your thumb on the latch release. Press the latch release inward. Keep the latch release pressed in and lower the handle gently. Take your thumb off the release once the handle is clear of the latch and guide the handle back until it stops.

2. Remove cast iron cap from inside the firebox using tools supplied. Clean ash through the ash removal system channel into the drawer below (**Figure 17.2**).

Make sure all ash is removed from the top of ARS door. Lift up the grate and inspect the top of the door to ensure all ash has been removed.

You can rapidly move the ARS latch handle up and down to help remove any ash from the door. Use a small brush to clean off the top of the door if any ash remains.

**Be sure to replace the cap before operating the stove.** It is recommended to leave 1/4 to 1/2 inch (6-13mm) of ash on the firebox floor to allow air to flow freely underneath wood.

3. Close the door handle, you will hear a “click” when it closes. The ash drawer will not pull out if the door handle is left in the open position. Wear gloves to remove the drawer. Dispose of the ashes properly as described in your owner’s manual.

	<b>CAUTION</b>
	<p><b>Injury Risk.</b></p> <ul style="list-style-type: none"> <li>• Gloves recommended</li> <li>• May have sharp edges</li> </ul>

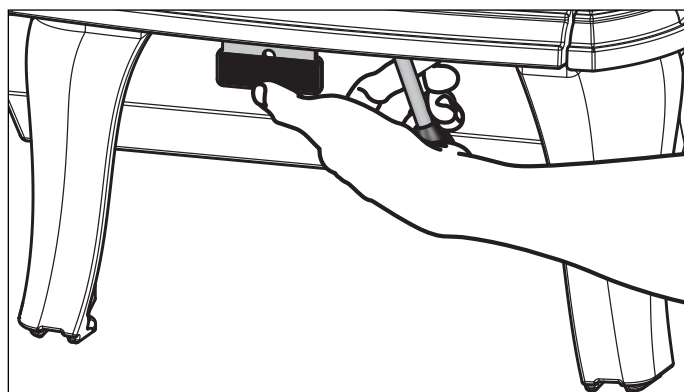


Figure 17.1

### Access Cover Handle

Insert Access Cover Handle handle into slot of ARS Cover to remove ARS Cover for cleaning ash out of firebox.

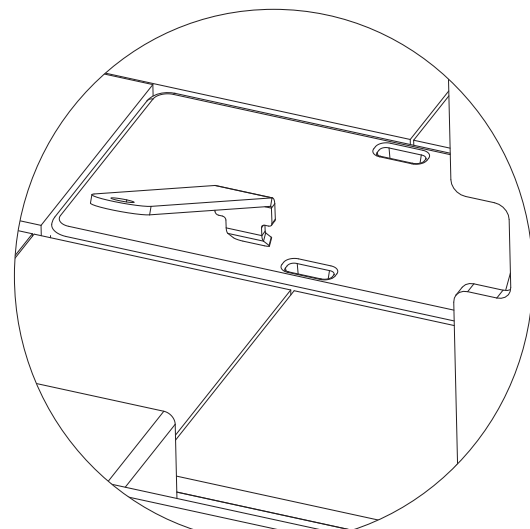


Figure 17.2



## C. General Maintenance

### 1. Creosote (Chimney) Cleaning

- **Frequency:** Every 2 months during heating season or as recommended by a certified chimney sweep; more frequently if chimney exceeds or is under 14-16 ft. (measured from bottom of appliance)
- **By:** Certified Chimney Sweep

Remove all ash from the firebox and extinguish all hot embers before disposal. Allow the appliance to cool completely. Disconnect flue pipe or remove baffle and ceramic blanket from appliance before cleaning chimney. Otherwise residue can pile up on top of the baffle and ceramic blanket and the appliance will not work properly. (See Baffle Removal on **page 19**). Close the door tightly. The creosote or soot should be removed with a brush specifically designed for the type of chimney in use. Clean out fallen ashes from the firebox.





It is also recommended that before each heating season the entire system be professionally inspected, cleaned and repaired if necessary.

**Inspection:** Inspect the system at the appliance connection and at the chimney top. Cooler surfaces tend to build creosote deposits quicker, so it is important to check the chimney from the top as well as from the bottom.

**Formation and Need For Removal:** 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 newly-started or a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote creates an extremely hot fire which may damage the chimney or even destroy the house.

The chimney connector and chimney should be inspected once every 2 months during the heating season to determine if a creosote or soot buildup has occurred. If creosote or soot has accumulated, it should be removed to reduce the risk of a chimney fire.

 <b>WARNING</b>	
	<b>Fire Risk.</b> Prevent creosote buildup.
	<ul style="list-style-type: none"> <li>• Inspect chimney connector and chimney once every two months during heating season.</li> <li>• Remove creosote to reduce risk of chimney fire.</li> <li>• Ignited creosote is extremely HOT.</li> </ul>
 <b>WARNING</b>	
	<b>Fire Risk.</b>
	<ul style="list-style-type: none"> <li>• Do not use chimney cleaners or flame colorants in your appliance. Will corrode chimney pipe.</li> </ul>

### 4. Cleaning Plated Surfaces

- **Frequency:** Prior to first burn and then as desired
- **By:** Homeowner

Clean all the fingerprints and oils from plated surfaces **BEFORE** firing the appliance for the first time. If not cleaned properly before lighting your first fire, the oils can cause permanent markings on the plating.



After the plating is cured, the oils will not affect the finish and little maintenance is required. Wipe clean as needed.

<b>CAUTION</b>	
<ul style="list-style-type: none"> <li>• Do not use polishes with abrasives. It will scratch plated surfaces.</li> </ul>	

### 3. Disposal of Ashes

- **Frequency:** When ash is within 1-3/4 in. (44mm) of firebox lip
- **By:** Homeowner

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.

 <b>WARNING</b>	
	<b>Fire Risk.</b>
	<b>Disposal of Ashes</b>
<ul style="list-style-type: none"> <li>• Ashes should be placed in metal container with tight fitting lid.</li> <li>• Do not place metal container on combustible surface.</li> <li>• Ashes should be retained in closed container until all cinders have thoroughly cooled.</li> </ul>	

### 4. Glass Cleaning

- **Frequency:** As desired
- **By:** Homeowner

Clean glass with a non-abrasive glass cleaner. Abrasive cleaners may scratch and cause glass to crack. If the deposits on the glass are not very heavy, normal glass cleaners work well. Heavier deposits may be removed by using a damp cloth dipped in wood ashes or by using a commercially available oven cleaner.

After using an oven cleaner, it is advisable to remove any residue with a glass cleaner or soap and water. Oven cleaner left on during the next firing can permanently stain the glass and damage the finish on metal surfaces.

A portion of the combustion air entering the firebox is deflected down over the inside of the door glass. This air flow “washes” the glass, helping to keep smoke from adhering to its surface.

When operated at a low burn rate, less air will be flowing over the glass and the smokey, relatively cool condition of a low fire will cause the glass to become coated.

Operating the appliance with the Burn Rate Air Control and Start-Up Air Control all the way open for 30-45 minutes should remove the built up coating.

<b>CAUTION</b>	
<ul style="list-style-type: none"> <li>• Do not use polishes with abrasives. It will scratch surfaces.</li> </ul>	

# 4 Troubleshooting Guide

With proper installation, operation, and maintenance your wood appliance will provide years of trouble-free service. If you do experience a problem, this troubleshooting guide will assist you or a qualified service person in the diagnosis of a problem and the corrective action to be taken.

Start Fire Problems	Possible Cause	Solution
Can not get fire started Excessive smoke or spillage Burns too slowly Not enough heat output	Not enough kindling/paper or no kindling/paper	Use dry kindling, more paper. Arrange kindling & wood for air movement.
	Not enough air for fire to ignite	Check for restricted termination cap
		Check for blockage of outside air kit (if installed).
		Check for flue blockage.
		Pre-warm flue before starting fire (refer to Building a Fire Section).
		Check for adequate vent height (refer to Chimney Height Section).
	Open window below the appliance towards the wind.	
	Wood condition is too wet, too large	Use dry, seasoned wood (refer to Seasoned Wood Section).
	Bed of coals not established before adding wood	Start with paper & kindling to establish bed of coals (refer to Building a Fire Section).
Flue blockage such as birds' nests or leaves in termination cap	Have chimney inspected for creosote and cleaned by a certified chimney sweep.	
Down draft or negative pressure Competition with exhaust devices	Do not use exhaust fans during start-up (refer to Negative Pressure Section).	
	Open window below the appliance towards the wind.	
Fire burns too fast	Extremely dry or soft wood	Mix in hardwood.
		Mix in less seasoned wood after fire is established (refer to Wood Fuel Section).
	Over drafting	Check for correct vent height; too much vertical height creates over drafting.
		Check location of vent termination (refer to Chimney Termination Requirement Section).

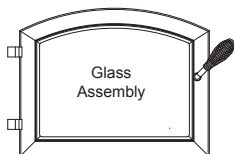
# 5 Service Part Replacement

## A. Glass Replacement

1. Ensure that the fire is out and the appliance is cool to the touch.
2. Protect a table or counter top with padding or towels. Protect your hands and wear gloves to prevent injury.
3. Remove the door with the broken glass by lifting the door up and off of the hinges.
4. Lay door face down on a table or counter making sure the handle hangs over the edge so the door lays flat, on a soft surface.
5. Remove the screws from each glass retainer and remove the glass. (If screws are difficult to remove, soak with penetrating oil first).
6. Center the glass with edges evenly overlapping the opening in the door, (i.e. same space top and bottom, left and right sides).
7. Replace the glass retainers. Be careful not to cross thread the screws.
8. Tighten each retainer just a few turns until each is secured. Check again for centering of glass in door frame. Continue to tighten each retainer alternately, a few turns at a time, until the glass is secure. **DO NOT OVER TIGHTEN.**
9. Replace the door on the appliance.

Quadra-Fire appliances are equipped with ceramic super heat-resistant glass, which can only be broken by impact or misuse. Do not slam appliance door or impact the glass. When closing door, make sure that logs do not protrude against the glass. Inspect glass regularly. If you find a crack or break, immediately put the fire out and return the door to your dealer for replacement of glass before further use.

### CAUTION



Handle glass assembly with care.

#### When cleaning glass:

- Avoid striking, scratching or slamming glass.

- Do NOT clean glass when hot.
- Do NOT use abrasive cleaners.
- Use a hard water deposit glass cleaner on white film.
- Use commercial oven cleaner on heavier deposits.
- Remove all residue of oven cleaner or will permanently stain glass on next firing. **Refer to maintenance instructions.**



### WARNING



#### Injury Risk.

- Use only glass specified in manual.
- DO NOT REPLACE with any other material.

## B. Firebrick Replacement

Replace the firebrick if they become crumbly and/or if there is a 1/4 inch (6.35mm) gap between the bricks.

Inspect the firebrick after each ash removal.

The firebox is lined with high quality firebrick, which has exceptional insulating properties. There is no need to use a grate; simply build a fire on the firebox floor. Do not operate appliance without firebrick.

1. After the coals have completely cooled, remove all old brick and ash from appliance and vacuum firebox.
2. Remove new brick set from box and lay out to diagram shown.
3. Lay bottom bricks in appliance.
4. Install rear bricks on the top of the bottom bricks. Slide top of bricks under clip on back of firebox wall and push bottom of brick back.
5. Install side bricks. Slide top of brick under clips on side of firebox and push the bottom of the brick until it is flush with the side of the appliance.

## C. Snap Disc Replacement

(Included with optional blower)

1. Unplug the appliance.
2. Locate the snap disc bracket assembly at the bottom left rear corner of the appliance.
3. A magnet holds the bracket to the appliance. Pull the bracket down away from the appliance to expose the snap disc.
4. Pull the snap disc and spade connectors up and out of bracket as shown in **Figure 20.1**
5. Using a Phillips head screw driver, remove the 2 screws from the snap disc and then remove the snap disc from the spade connectors. Replace with new snap disc and re-connect to spade connectors.
6. Push the snap disc and spade connectors back inside bracket. Reassemble in reverse order.

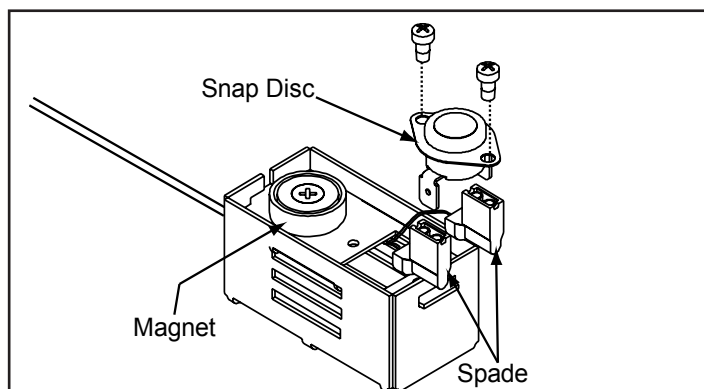


Figure 20.1

## D. Door Handle Assembly

1. Slide door handle through door.
2. Install additional washer(s) as shown in **Figure 21.1**
3. Install key in groove.
4. Align groove in latch cam with key; slide latch cam over shaft
5. Install locknut but do not over tighten, the handle needs to rotate smoothly.
6. Install fiber handle. **Figure 21.1**

**CAUTION!** Do not over tighten lock nut. The door handle needs to move smoothly.

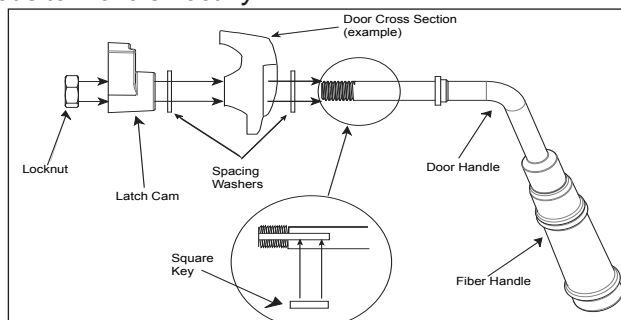


Figure 21.1

## E. Baffle Removal

1. Remove all ash from the firebox, and extinguish all hot embers before disposal into a metal container.
2. The baffle board has 2 pieces. With the ceramic blanket still in place, slide one baffle piece over the top of other one and pull out top piece through the door opening and then remove bottom baffle piece. **Figure 21.2.**
3. Remove the ceramic blanket.
4. Re-install the ceramic blanket and smooth out the blanket.
4. Slide the baffle pieces one piece at a time underneath the blanket. Be sure the baffle boards are even with the front manifold tube and is resting on all tubes. **Figures 21.2 and 21.3.**



Figure 21.2

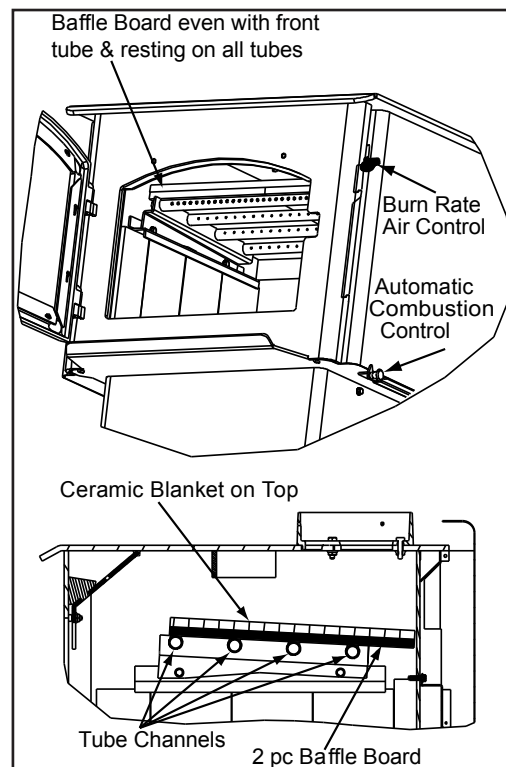




Figure 21.3

## G. Tube Channel Assembly Replacement

### Removing Tube Channel Assembly

1. Remove the right side shield by removing 3 Phillips screws from back of appliance; then pull back of side out and push back on side.
2. Remove 4 Phillips screws from channel access cover and remove cover.
3. Locate 3 channel nuts inside of chamber and remove using a 7/16 socket wrench.
4. Inside of firebox, remove the right side bricks (5 pieces) and right hand rear brick.
5. Remove the 2 brick retainers by sliding back and then up.
6. Remove the baffle protection channel by rolling forward and out of the firebox.
7. Remove three bolts from inside fire box.
8. Slide the tube channel assembly to the left. Drop the right side down, then slide the assembly back to right.
9. The ceramic blanket and both baffle boards can be removed at the same time you remove the tube channel assembly.
10. When the tube channel assembly is free of the left side support, rotate clockwise and pull assembly, blanket and baffles out through the front opening.
11. Re-install in reverse order.

	<b>CAUTION</b>
	Ensure manifold tube gasket is placed between firebox and manifold tube assembly during re-installation process.

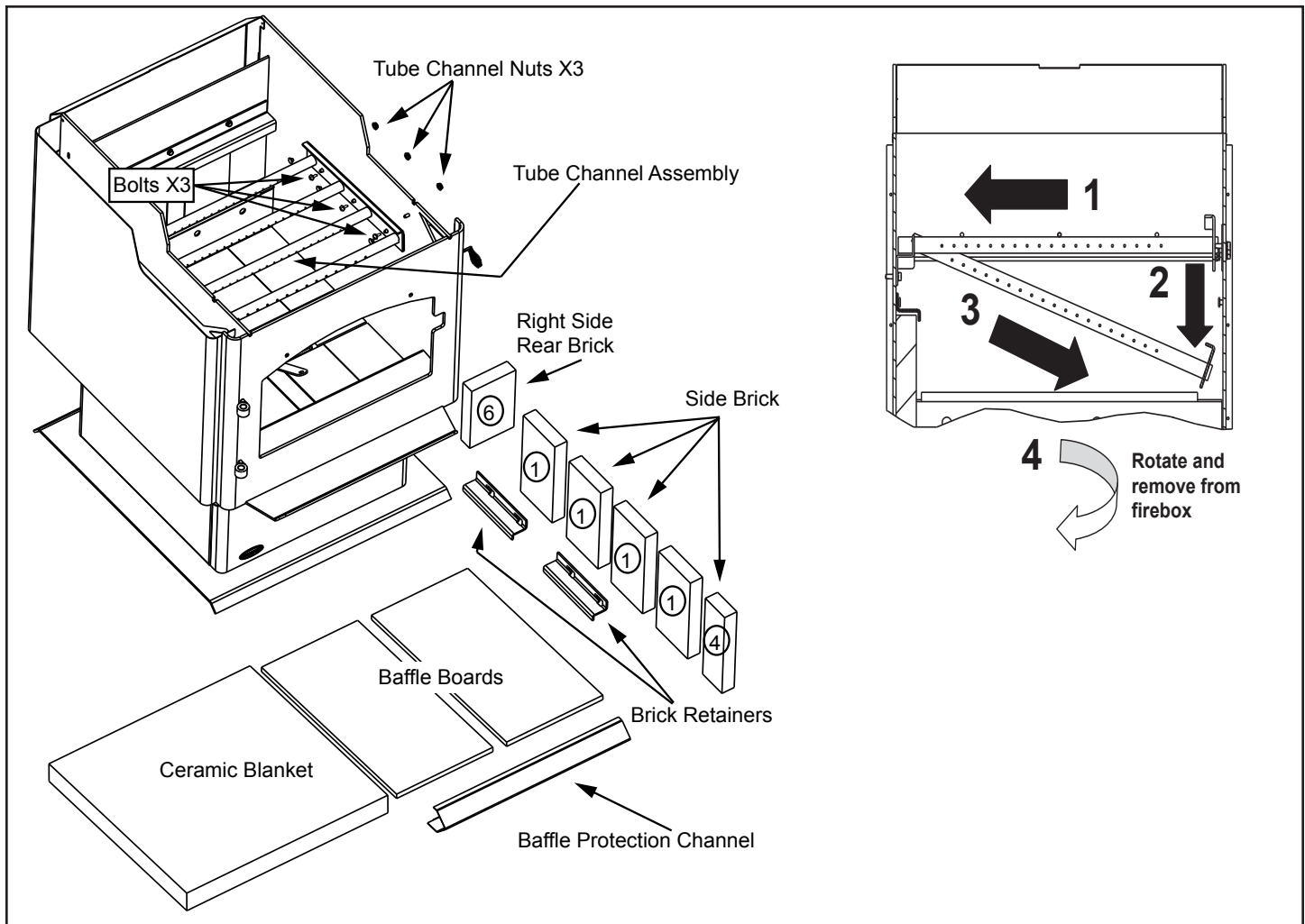


Figure 22.1

# 6 Reference Materials

## A. Exploded View

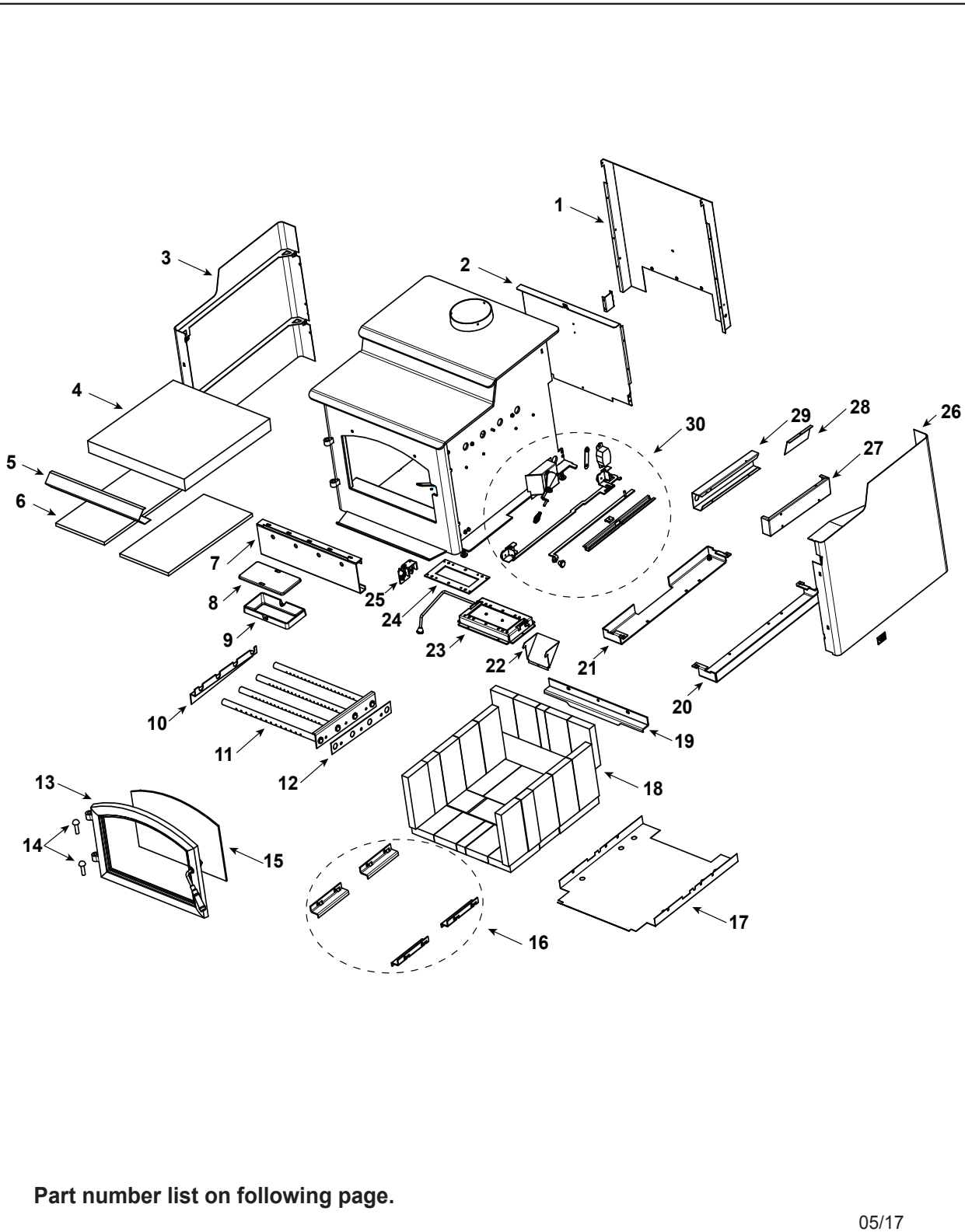
**QUADRA-FIRE**

Service Parts

Step Top Wood Stove  
Advanced Combustion Control

**57ST-ACC-B**

Beginning Manufacturing Date: Sept 2016  
Ending Manufacturing Date: Active



Part number list on following page.

05/17

## B. Service Parts &amp; Accessories

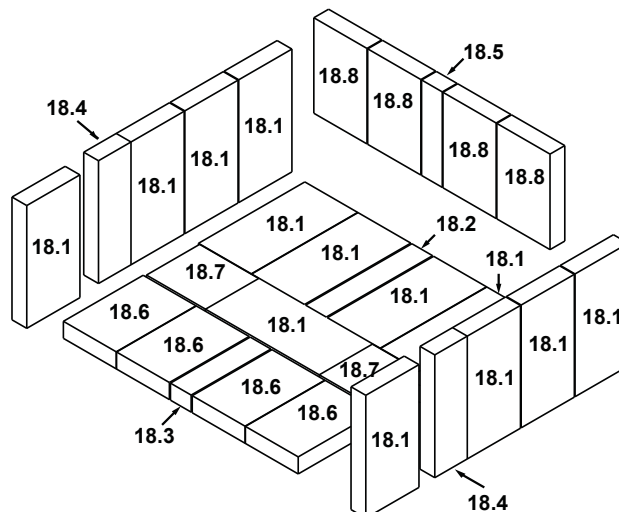
**QUADRA-FIRE**® Service Parts**57ST-ACC-B**Beginning Manufacturing Date: Sept 2016  
Ending Manufacturing Date: Active

IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.


**Stocked  
at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
1	Air Channel, Convection		SRV7038-127	
2	Air Supply Back		SRV7038-119	
3	Panel Assembly Side, Left		SRV7038-006	
4	Blanket, Ceramic Fiber		SRV7038-117	Y
5	Baffle Protection Channel (illustration on page 5)		SRV7038-179	
6	Baffle Board	Qty: 2	SRV7038-118	Y
7	Rear Channel Assembly		SRV7038-001	
8	Access Cover - ARS		SRV7038-196	
9	Channel - Ash Removal System (ARS)		7033-172	
10	Tube Channel Rack		SRV7038-174	
11	Tube Channel Assembly		SRV7038-008	Y
12	Secondary Tube Gasket		SRV7038-187	
13	Door Assembly	Black	DR-57BK-FH	
		Nickel Trim	DR-57NL-FH	
14	Hinge Pins, 1/2"	Qty: 2 Gold	832-0250	
		Qty: 2 Nickel	SRV430-5320	
15	Glass Assembly		SRV7000-014	Y
	Glass Frame Set		GLA-FRM-5700	
	Gasket, Glass Tape, 3/4" - Field Cut to Size	5 Ft	832-0460	Y
	Rope, Door, 3/4" x 84" - Field Cut to Size	7 Ft	832-1680	Y
	Logo, Quadra-Fire	Pkg of 10	7000-694/10	
	Component Pack (Includes Nickel Spring Handles (1) 1/2" & (2) 1/4", (2) Nickel Hinge Pins, Quadra-Fire Logo)	Black & Gold Doors	436-5350	
		Nickel Doors	436-5360	
	Door Handle Assemblies	Spring Handle	832-0540	
		Fiber Handle	SRV7033-071	
	Nut, Locking (For Door Handle)	Pkg of 24	226-0100/24	Y
	Handle Assembly		472-5130	
	Cam Latch		SRV430-1141	
	Key, Cam Latch		SRV430-1151	
	Screw, Flat Head Phillips 8-32 x 1/2	Pkg of 10	832-0860	Y
	Washer, Sae, 3/8	Qty: 3 ea.	832-0990	Y
	Door Handle, Formed		SRV430-1131	
16	Brick Retainer, Side	Qty: 4	SRV7038-145	
17	Heat Shield		SRV7038-211	
18	Brick Assembly		See following page	
	Label, Start-Up Air Control		SRV7038-211	

Additional service part numbers appear on following page.

**#18 Brick Set**


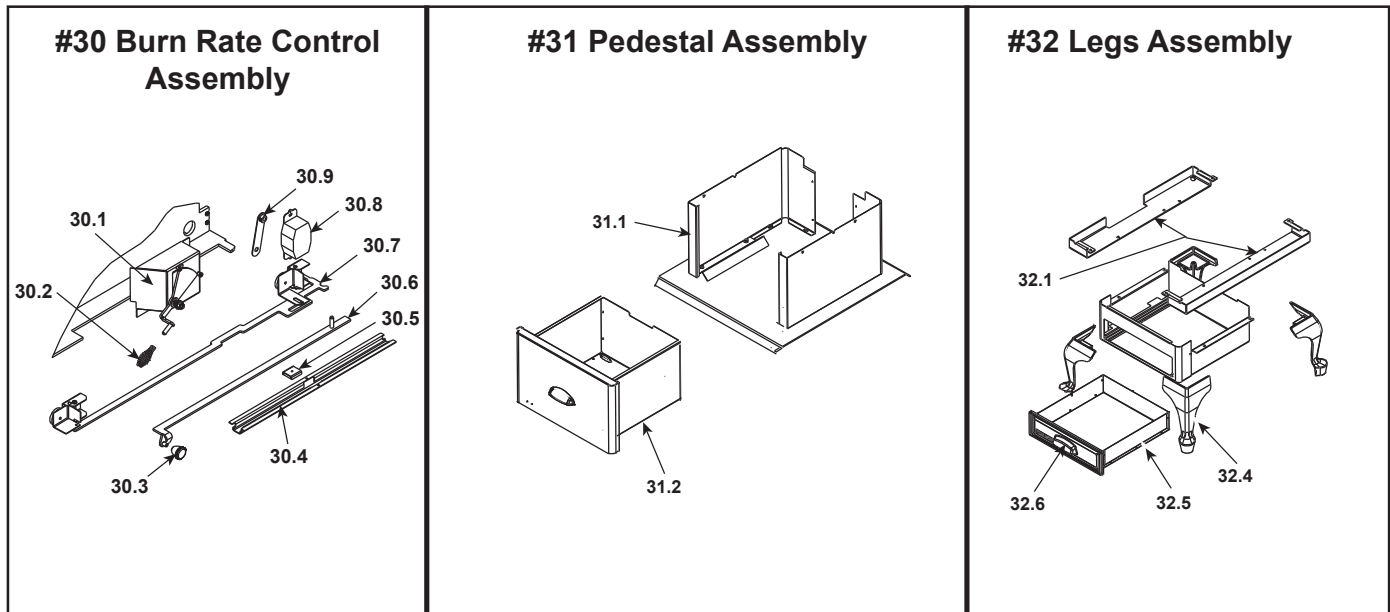
IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.


**Stocked  
at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
18	Brick Assembly - Complete Set	Pkg of 27	SRV7038-007	
18.1	Brick, 9 x 4.5 x 1.25"	Qty. 13 Req.		
18.2	Brick, 9 x 1.75 x 1.25"	Qty. 1 Req.		
18.3	Brick, 6.75 x 1.75 x 1.25"	Qty. 1 Req.		
18.4	Brick, 9 x 2.75 x 1.25"	Qty. 2 Req.		
18.5	Brick, 7 x 1.75 x 1.25"	Qty. 1 Req.		
18.6	Brick, 6.75 x 4.5 x 1.25"	Qty. 4 Req.		
18.7	Brick, 5 x 4.5 x 1.25"	Qty. 2 Req.		
18.8	Brick, 7 x 4.5 x 1.25"	Qty. 4 Req.		
	Brick, Uncut	Qty: 1	832-0550	
		Qty: 6	832-3040	
19	Brick Retainer, Rear		SRV7038-148	
20	Leg Mount, Right Assembly		7038-028	
21	Leg Mount, Left Assembly		7038-029	
22	Oak Cover Plate Kit		SRV7038-024	
23	ARS Door Assembly		SRV7060-048	Y
24	Gasket - ARS		SRV7033-296	Y
25	ARS Latch, Handle Assembly		SRV7062-034	Y
	ARS Cast Components		SRV7037-038	
26	Panel Assembly Side, Right		SRV7038-005	
27	Manifold Cover Plate		SRV7038-185	
28	Secondary Air Diverter		SRV7038-186	
29	Manifold Tube Cover		SRV7038-177	

Additional service part numbers appear on following page.





IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.



**Stocked at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
30.1	Burn Rate Control Assembly		SRV7038-025	
30.2	Spring Handle, 1/4"	Qty: 2 Gold	832-0630	Y
		Qty: 1 Nickel	250-8340	Y
30.3	Knob		SRV7000-343	
30.4	Air Control Rod Guide		7033-210	
30.5	Latch, Magnet		229-0631	
30.6	Control Arm Assembly Rear		SRV7038-004	
30.7	Timer Door Control Arm Assembly		SRV7038-019	
	Door Gasket		7033-282	Y
30.8	Timer (Only) Replacement Assembly		SRV480-1940	Y
30.9	Timer Arm Assembly		7033-034	Y
31.1	Pedestal Kit		PED-KIT-57	
31.2	Ash Pan, Pedestal Model w/Door		SRV7038-010	
	Component Pack, Pedestal, Step-Top (Includes Gasket For Ash Removal & Fasteners)		7038-048	
	Leg Kit & Ash Removal System (ARS)	Black	LEG-KIT-BK	
		Nickel	LEG-KIT-NL	
32.1	Leg Adapter Set (Bracket), Left & Right	Qty: 2	SRV7038-028	
32.2	Ash Pan Door Handle		7033-274	
	Ash Pan Leg Assembly		7033-008	
32.3	Ash Pan Leg - ARS		7033-050	
	Component Pack, Leg Step Top (Includes Gasket For Ash Removal & Fasteners)		7037-036	
32.4	Legs, Queen Anne	Qty: 4	831-1240	
		Qty: 4	LEGS-QANL	

Additional service part numbers appear on following page.

IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.



Stocked  
at Depot

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
	Component Pack (Includes Touch-Up Paint, Owners Manual, Warranty Card & Access Cover Handle)		SRV7038-017	
	Handle, Access Cover		SRV7038-197	
	Paint Touch-Up		812-0910	
	Upgrade, Door, Nickel		UK-DRNL	
	Gasket, Manifold	Pkg of 4	7038-168/4	Y
<b>Side view</b> 				
	Baffle Protection Channel		SRV7038-179	
<b>ACCESSORIES</b>				
	Blower Assembly		BK-ACC	
	Blower Control Box W/Switch		SRV7000-194	Y
	Component Pack		7033-051	
	Magnet Round		SRV7000-140	Y
	Snap Disc Bracket Assembly		7033-036	
	Snap Disc, # 1, Convection Blower		SRV230-0470	Y
	Speed Control Only (Rheostat)		842-0370	Y
	Wire Harness (Blower)		7033-262	
	Blower, Convection	Blower Only	812-4900	Y
	Outside Air Kit, Floor & Rear		OAK-ACC	
	Outside Air Collar Assembly		7033-039	
	Outside Air Shield		33271	Y
<b>FASTENERS</b>				
	Avk Rivnut Repair Kit - 1/4-20 & 3/8-16 Rivnut Tools		RIVNUT-REPAIR	Y
	Bolt, Hex Head, 1/4-20x1	Pkg of 10	25221A/10	Y
	Button Head, 1/4-20x0.5	Pkg of 20	32328/20	Y
	Nut, Keps Lock, 10-32	Pkg of 40	226-0050/40	Y
	Nut, Keps Lock, 8-32	Pkg of 40	226-0060/40	Y
	Nut, Ser Flange Small 1/4-20	Pkg of 24	226-0130/24	Y
	Screw, Flat Head Philips, 8-32x1/2	Pkg of 10	832-0860	Y
	Screw, Pan Head Philips 8-32 X 3/8	Pkg of 40	225-0500/40	Y
	Screw, Sheet Metal #8 X 1/2 S-Grip	Pkg of 40	12460/40	Y
	Washer, 1/4 Sae	Pkg of 24	28758/24	Y
	Washer, 3/8 Sae	Pkg of 3	832-0990	Y



**CONTACT INFORMATION**

Hearth & Home Technologies  
352 Mountain House Road  
Halifax, PA 17032  
Division of HNI INDUSTRIES

**Please contact your Quadra-Fire dealer with any questions or concerns.  
For the number of your nearest Quadra-Fire dealer  
log onto [www.quadrafire.com](http://www.quadrafire.com)**

**CAUTION**



**DO NOT DISCARD THIS MANUAL**

Important operating and maintenance instructions included.

• Read, understand and follow these instructions for safe installation and operation.

• Leave this manual with party responsible for use and operation.



**We recommend that you record the following pertinent information for your heating appliance.**

Date purchased/installed: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Location on appliance: \_\_\_\_\_

Dealership purchased from: \_\_\_\_\_ Dealer phone: 1(\_\_\_\_) \_\_\_\_ - \_\_\_\_\_

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

This product may be covered by one or more of the following patents: (United States) 5341794, 5263471, 6688302, 7216645, 7047962 or other U.S. and foreign patents pending.



# Installation Manual

## Installation & Appliance Set-Up

**INSTALLER:** Leave this manual with party responsible for use and operation.

**OWNER:** Retain this manual for future reference.

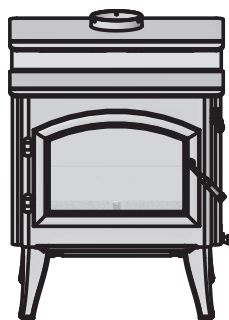
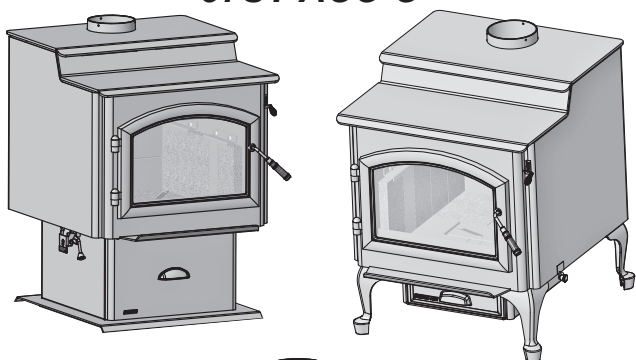
**NOTICE: DO NOT DISCARD THIS MANUAL**

# QUADRA-FIRE®

## 5700 STEP TOP WOOD APPLIANCE SERIES

### Automatic Combustion Control (ACC)

**Model(s):  
57ST-ACC-C**



Tested and  
Listed by  
**OTL**  
US  
OMNI-Test Laboratories, Inc. Portland  
Oregon USA

### WARNING



If the information in these instructions is not followed exactly, a fire could result causing property damage, personal injury, or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not over fire - If appliance or chimney connector glows, you are over firing. Over firing will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may cause a house fire.

### WARNING



#### **HOT SURFACES!**

Glass and other surfaces are hot during operation AND cool down.

#### **Hot glass will cause burns.**

- Do not touch glass until it is cooled
- NEVER allow children to touch glass
- Keep children away
- CAREFULLY SUPERVISE children in same room as appliance.
- Alert children and adults to hazards of high temperatures
- **High temperatures may ignite clothing or other flammable materials.**
- Keep clothing, furniture, draperies and other flammable materials away.

### WARNING



#### **Fire Risk.**

For use with solid wood fuel only.  
Other fuels may over fire and generate poisonous gases (i.e. carbon monoxide).

Installation and service of this appliance should be performed by qualified personnel. Hearth & Home Technologies recommends HHT Factory Trained or NFI certified professionals.

hearthED  
FACTORY TRAINING  
Fuel Your Fire

NFI  
NATIONAL  
FIREPLACE  
INSTITUTE®  
A CERTIFICATION AGENCY

### NOTE

To obtain a French translation of this manual, please contact your dealer or visit [www.quadrafire.com](http://www.quadrafire.com)

Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez [www.quadrafire.com](http://www.quadrafire.com)

**Safety Alert Key:**

- **DANGER!** Indicates a hazardous situation which, if not avoided will result in death or serious injury.
- **WARNING!** Indicates a hazardous situation which, if not avoided may result in death or serious injury.
- **CAUTION!** Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
- **NOTICE:** Indicates practices which may cause damage to the appliance or to property.

## TABLE OF CONTENTS

<p><b>1 Important Safety Information.....3</b></p> <p>A. Appliance Certification .....3</p> <p>B. BTU &amp; Efficiency Specifications.....3</p> <p>C. Mobile Home Approved .....3</p> <p>D. Glass Specifications .....3</p> <p>E. Non-Combustible Materials .....3</p> <p>F. Combustible Materials.....3</p> <p><b>2 Getting Started .....4</b></p> <p>A. Design and Installation Considerations .....4</p> <p>C. Negative Pressure .....5</p> <p>E. Inspect Appliance and Components .....5</p> <p>D. Tools And Supplies Needed.....5</p> <p>F. Install Checklist .....6</p> <p><b>3 Dimensions and Clearances .....7</b></p> <p>A. Appliance Dimensions .....7</p> <p>A. Appliance Dimensions (continued) .....8</p> <p>A. Appliance Dimensions (continued) .....9</p> <p>A. Appliance Dimensions (continued) .....10</p> <p>B. Hearth Protection Requirements .....11</p> <p>C. Clearances to Combustibles.....12</p> <p><b>4 Chimney Systems .....13</b></p> <p>A. Locating Your Appliance &amp; Chimney .....13</p> <p>B. Chimney Termination Requirements.....14</p> <p>C. 2-10-3 Rule .....14</p> <p>E. Venting Components .....15</p> <p>F. Chimney Systems .....15</p> <p>G. Installing Chimney Components.....17</p>	<p><b>5 Appliance Set-Up .....18</b></p> <p>A. Pedestal Assembly and Ash Removal System (ARS) Installation .....18</p> <p>C. <b>Leg Kit and Ash Removal System (ARS) Installation.....20</b></p> <p>D. <b>Traditional Leg Installation .....22</b></p> <p>F. Outside Air Kit Installation .....23</p> <p>G. BKST-350 Blower Kit (Optional).....24</p> <p>H. Adjusting The Blower Speed Control .....24</p> <p><b>6 Mobile Home Installation.....25</b></p> <p><b>7 Accessory List .....26</b></p> <p>A. Service and Maintenance Log .....26</p> <p>B. Accessory List.....27</p>
--	---

Quadra-Fire is a registered trademark of Hearth & Home Technologies.

# 1 Important Safety Information

## A. Appliance Certification

<b>Model:</b>	5700 Step Top ACC Wood Appliance
<b>Laboratory:</b>	OMNI Test Laboratories, Inc.
<b>Report No:</b>	0061WS092S
<b>Type:</b>	Listed Room Appliance, Solid Fuel Type
<b>Standard:</b>	UL1482-11 (R2015) and ULC S627-00 and (UM) 84-HUD, Mobile Home Approved.

The Quadra-Fire 5700 Wood Appliance meets the U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using crib wood at 1.8 G/HR EPA Method 28 and 5G. This wood appliance needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

## B. BTU & Efficiency Specifications

Emissions Certification #:	0061WS092E
EPA Certification #:	
EPA Certified Emissions:	1.8 g/hr
*LHV Tested Efficiency:	80.0%
**HHV Tested Efficiency:	74.0%
***EPA BTU Output:	12,772 - 38,284 btu/hr
****Peak BTU/Hour Output:	
Vent Size:	6 inches
Firebox Size:	2.90 cubic feet
Recommended Wood Length:	22 inches
Fuel Orientation:	Front-to-Back
Fuel	Seasoned Cord Wood
*Weighted average LHV efficiency using Douglas Fir dimensional lumber and data collected during EPA emission test.	
**Weighted average HHV efficiency using Douglas Fir dimensional lumber and data collected during EPA emission test.	
***A range of BTU outputs based on HHV and the burn rates from the low and high EPA tests, using Douglas Fir dimensional lumber.	
****A peak BTU out of the appliance calculated using the maximum first hour burn rate from the High EPA Test and the BTU content of cord wood (8600) times the efficiency.	

## C. Mobile Home Approved

- This appliance is approved for mobile home installations; when not installed in a sleeping room and when an outside combustion air inlet is provided.
- The structural integrity of the mobile home floor, ceiling, and walls must be maintained.
- The appliance must be properly grounded to the frame of the mobile home with #8 copper ground wire.
- Outside Air Kit, part OAK-ACC must be installed in a mobile home installation.

NOTE: Hearth & Home Technologies, manufacturer of this appliance, reserves the right to alter its products, their specifications and/or price without notice.

NOTE: This installation must conform with local codes. In the absence of local codes you must comply with (UM) 84-HUD and NFPA211 in the U.S.A. and CAN/CSA-B365 Installation Codes in Canada.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. For assistance or additional information, consult a qualified installer, service agency or your dealer.

Hearth & Home Technologies WILL NOT warranty appliances that exhibit evidence of over-firing. Evidence of over-firing includes, but is not limited to:

- Warped air tube
- Deteriorated refractory brick retainers
- Deteriorated baffle and other interior components

## D. Glass Specifications

This appliance is equipped with 5mm ceramic glass. Replace glass only with 5mm ceramic glass. Please contact your dealer for replacement glass.

## E. Non-Combustible Materials

Material which will not ignite and burn, composed of any combination of the following:

- Steel
- Brick
- Concrete
- Glass
- Plaster
- Iron
- Tile
- Slate

Materials reported as passing **ASTM E 136, Standard Test Method for Behavior of Metals, in a Vertical Tube Furnace of 750° C.**

## F. Combustible Materials

Material made of/or surfaced with any of the following materials:

- Wood
- Plant Fibers
- Plywood/OSB
- Compressed Paper
- Plastic
- Sheet Rock (drywall)

Any material that can ignite and burn: flame proofed or not, plastered or non-plastered.

# Install Guide

## 2 Getting Started

### A. Design and Installation Considerations

Consideration must be given to:

- Safety
- Convenience
- Traffic flow
- Chimney and chimney connector required

It is a good idea to plan your installation on paper, using exact measurements for clearances and floor protection, before actually beginning the installation. If you are not using an existing chimney, place the appliance where there will be a clear passage for a factory-built listed chimney through the ceiling and roof.

We recommend that a qualified building inspector and your insurance company representative review your plans before and after installation.

If this appliance is in an area where children may be near it is recommended that you purchase a decorative barrier to go in front of the appliance. Remember to always keep children away while it is operating and do not let anyone operate this appliance unless they are familiar with these operating instructions.

### CAUTION

Check building codes prior to installation.

- Installation **MUST** comply with local, regional, state and national codes and regulations.
- Consult insurance carrier, local building, fire officials or authorities having jurisdiction about restrictions, installation inspection, and permits.



### WARNING

#### Asphyxiation Risk.



- DO NOT CONNECT THIS APPLIANCE TO A CHIMNEY FLUE SERVICING ANOTHER APPLIANCE.
- DO NOT CONNECT TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.

May allow flue gases to enter the house.

### B. Fire Safety



To provide reasonable fire safety, the following should be given serious consideration:

1. Install at least one smoke detector on each floor of your home to ensure your safety. They should be located away from the heating appliance and close to the sleeping areas. Follow the smoke detector manufacturer's placement and installation instructions, and be sure to maintain regularly.
2. A conveniently located Class A fire extinguisher to contend with small fires resulting from burning embers.
3. A CO detector should be installed in the room with the appliance.
4. A practiced evacuation plan, consisting of at least two escape routes.
5. A plan to deal with a chimney fire as follows:  
In the event of a chimney fire:
  - a. Evacuate the house immediately
  - b. Notify fire department.

**NOTICE:** HEARTH & HOME TECHNOLOGIES ASSUMES NO RESPONSIBILITY FOR THE IMPROPER PERFORMANCE OF THE APPLIANCE SYSTEM CAUSED BY:

- Inadequate draft due to environmental conditions
- Down drafts
- Tight sealing construction of the structure
- Mechanical exhausting devices
- Over drafting caused by excessive chimney heights
- Ideal performance is with height of chimney between 14-16 feet (4.26-4.88m) measured from the base of the appliance.

## C. Negative Pressure

 <b>WARNING</b>	
	<p><b>Asphyxiation Risk.</b></p> <ul style="list-style-type: none"> <li>• Negative pressure can cause spillage of combustion fumes, soot and carbon monoxide.</li> <li>• Appliance needs to draft properly for safety.</li> </ul>

Negative pressure results from the imbalance of air available for the appliance to operate properly. It can be strongest in lower levels of the house.

Causes include:

- Exhaust fans (kitchen, bath, etc.)
- Range hoods
- Combustion air requirements for furnaces, water appliances and other combustion appliances
- Clothes dryers
- Location of return-air vents to furnace or air conditioning
- Imbalances of the HVAC air handling system
- Upper level air leaks such as:
  - Recessed lighting
  - Attic hatch
  - Duct leaks

To minimize the effects of negative air pressure:

- Install optional outside air kit with the intake facing prevailing winds during the heating season
- Ensure adequate outdoor air for all combustion appliances and exhaust equipment
- Ensure furnace and air conditioning return vents are not located in the immediate vicinity of the appliance
- Avoid installing the appliance near doors, walkways or small isolated spaces
- Recessed lighting should be a “sealed can” design
- Attic hatches weather stripped or sealed
- Attic mounted duct work and air handler joints and seams taped or sealed
- Basement installations should be avoided

## **WARNING**



### Fire Risk.

Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by, the following actions:

- Installation and use of any damaged appliance.
- Modification of the appliance.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.
- Operating appliance without fully assembling all components.
- Operating appliance without legs or pedestal attached.
- Do NOT Over fire - If appliance or chimney connector glows, you are over firing.

**Any such action that may cause a fire hazard.**

## D. Tools And Supplies Needed

Before beginning the installation be sure the following tools and building supplies are available:

Reciprocating saw	Framing material
Pliers	High temp caulking material
Hammer	Gloves
Phillips screwdriver	Framing square
Flat blade screwdriver	Electric drill and bits
Plumb line	Safety glasses
Level	Tape measure
Misc. screws and nails	
1/2-3/4 in. length, #6 or #8 self-drilling screws	

## E. Inspect Appliance and Components

- Remove appliance and components from packaging and inspect for damage.
- Report to your dealer any parts damaged in shipment.
- **Read all the instructions before starting the installation. Follow these instructions carefully during the installation to ensure maximum safety and benefit.**

## **WARNING**



### Fire Risk.

Inspect appliance and components for damage. Damaged parts may impair safe operation.

- Do NOT install damaged components.
- Do NOT install incomplete components.
- Do NOT install substitute components.

Report damaged parts to dealer.



## F. Install Checklist

**ATTENTION INSTALLER:**  
**Follow this Standard Work Checklist**

This standard work checklist is to be used by the installer in conjunction with, not instead of, the instructions contained in this installation manual.

Customer: \_\_\_\_\_  
 Date Installed: \_\_\_\_\_  
 Lot/Address: \_\_\_\_\_  
 Location of Appliance: \_\_\_\_\_  
 Installer: \_\_\_\_\_  
 Dealer/ Distributor Phone #: \_\_\_\_\_  
 Serial #: \_\_\_\_\_  
 Model : \_\_\_\_\_

**WARNING! Risk of Fire or Explosion!** Failure to install appliance according to these instructions can lead to a fire or explosion.

**Appliance Install**

Verified clearances to combustibles.  
 Appliance is leveled and connector is secured to appliance.  
 Hearth extension size/height decided.  
 Outside air kit installed.  
 Floor protection requirements have been met.  
 If appliance is connected to a masonry chimney, it should be cleaned and inspected by a professional. If installed to a factory built metal chimney, the chimney must be installed according to the manufacturer's instructions and clearances.

**YES**

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

**IF NO, WHY?**

_____
_____
_____
_____
_____

**Chimney**

Chimney configuration complies with diagrams.  
 Chimney installed, locked and secured in place with proper clearance.  
 Chimney meets recommended height requirements (14-16 feet).  
 Roof flashing installed and sealed.  
 Terminations installed and sealed.

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

_____
_____
_____
_____

**Clearances**

Combustible materials not installed in non-combustible areas.  
 Verified all clearances meet installation manual requirements.  
 Mantels and wall projections comply with installation manual requirements.  
 Protective hearth strips and hearth extension installed per manual requirements.

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

_____
_____
_____

**Appliance Setup**

All packaging and protective materials removed.  
 Firebrick, baffle and ceramic blanket installed correctly.  
 All labels have been removed from the door.  
 All packaging materials are removed from inside/under the appliance.  
 Manual bag and all of its contents are removed from inside/under the appliance and given to the party responsible for use and operation.

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

_____
_____
_____
_____

**Hearth & Home Technologies recommends the following:**

- Photographing the installation and copying this checklist for your file.
- That this checklist remain visible at all times on the appliance until the installation is complete.

**Comments:** Further description of the issues, who is responsible (Installer/Builder/Other Trades, etc.) and corrective action needed:

Comments communicated to party responsible \_\_\_\_\_ by \_\_\_\_\_ on \_\_\_\_\_  
 (Builder/Gen. Contractor) (Installer) (Date)

# 3 Dimensions and Clearances

## A. Appliance Dimensions

NOTE: Flue Collar size is 6 inch (152mm) diameter (ID)

### 5700 Step Top Pedestal Model

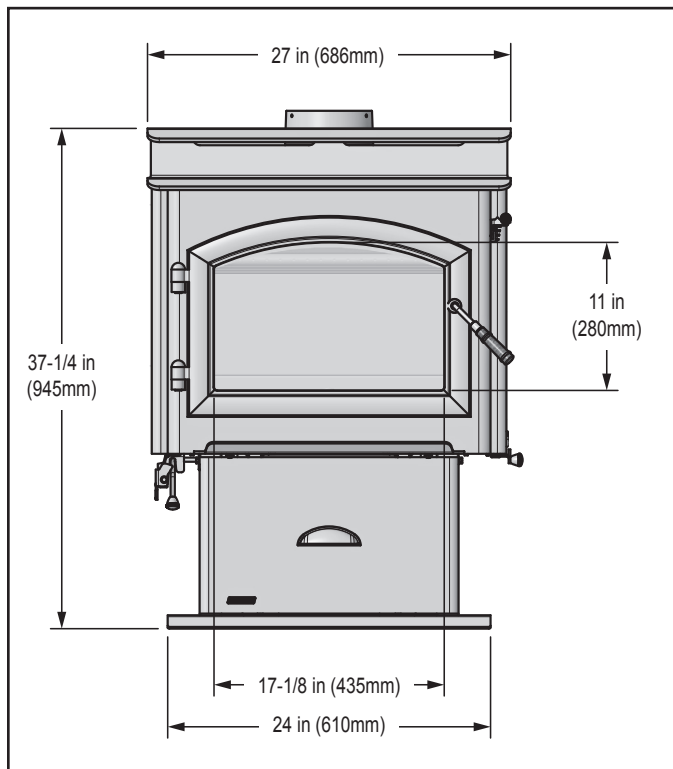


Figure 7.1 Front View

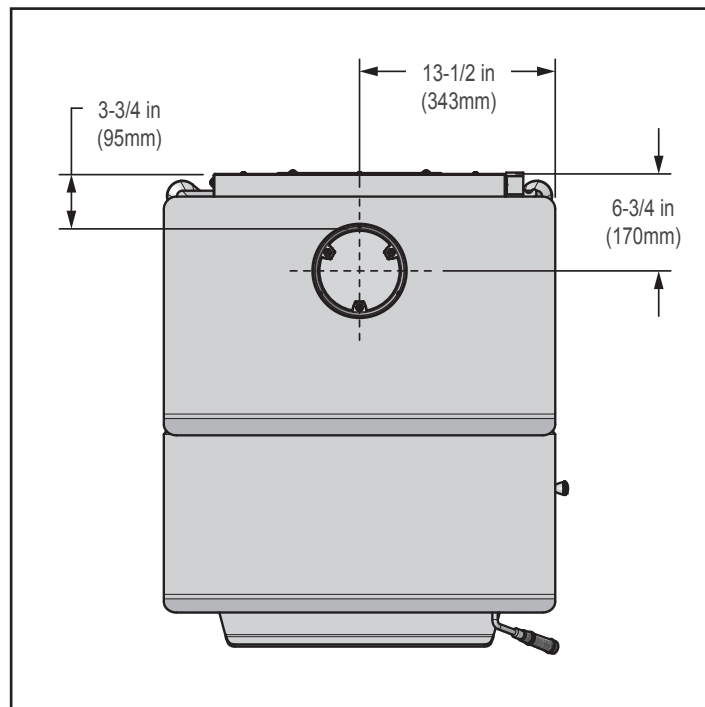


Figure 7.2 Top View

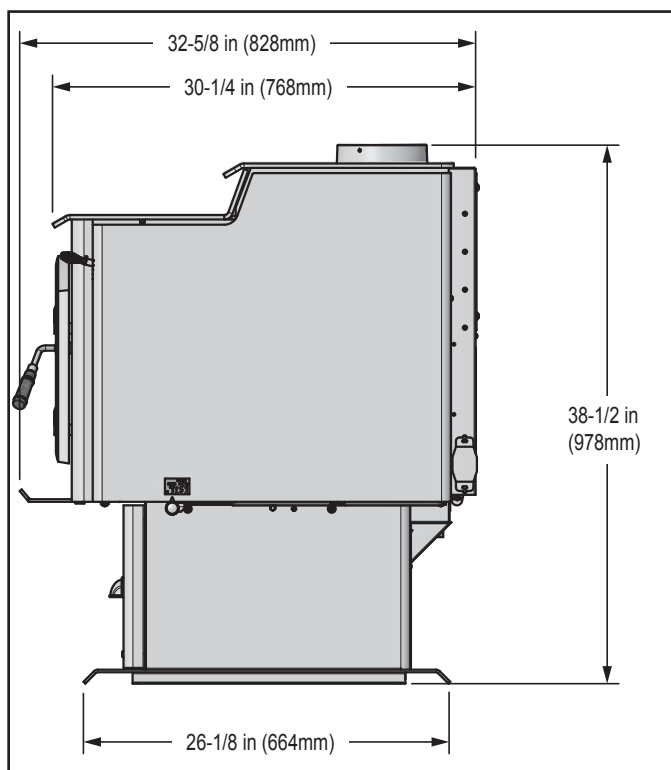


Figure 7.3 Side View

A. Appliance Dimensions (continued)

NOTE: Flue Collar size is 6 inch (152mm) diameter (ID)

**5700 Step Top Queen Anne Leg Model**

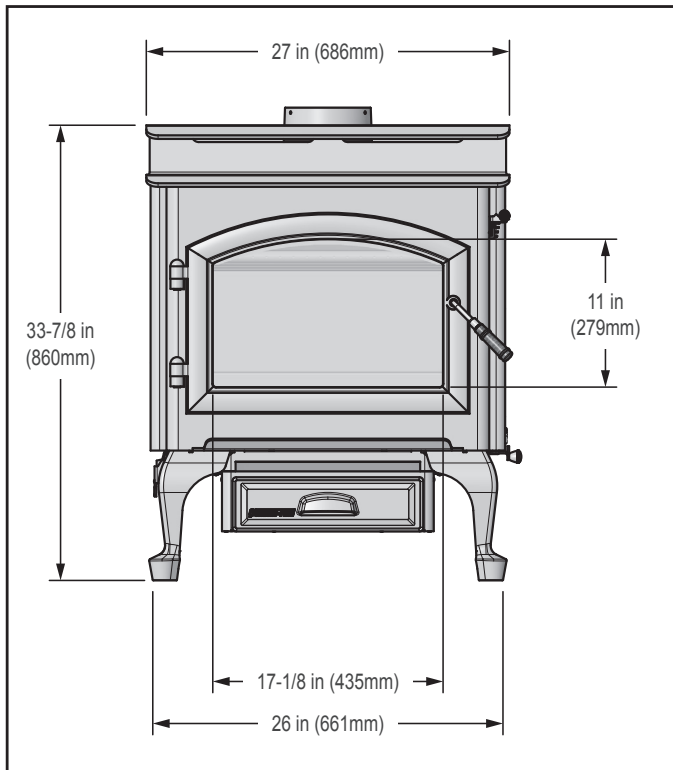


Figure 8.1 - Front View

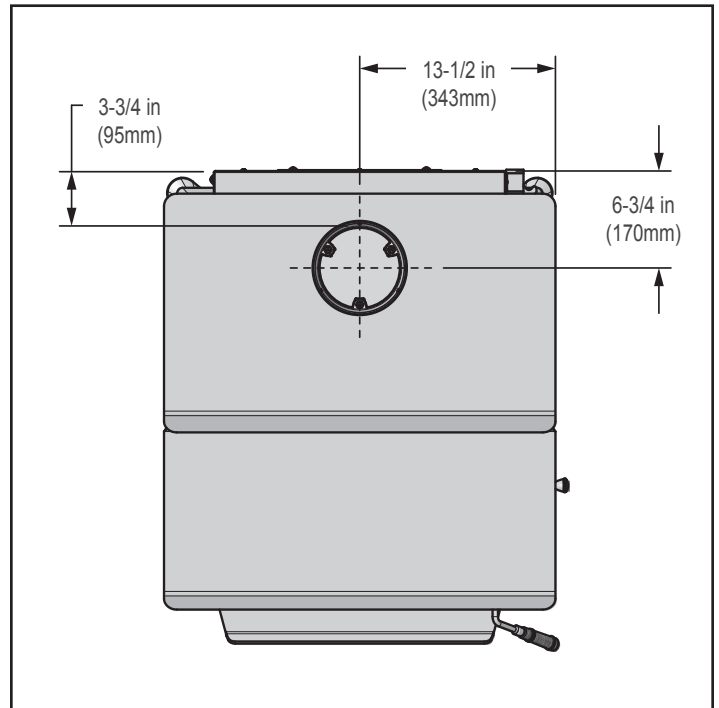


Figure 8.2 Top View

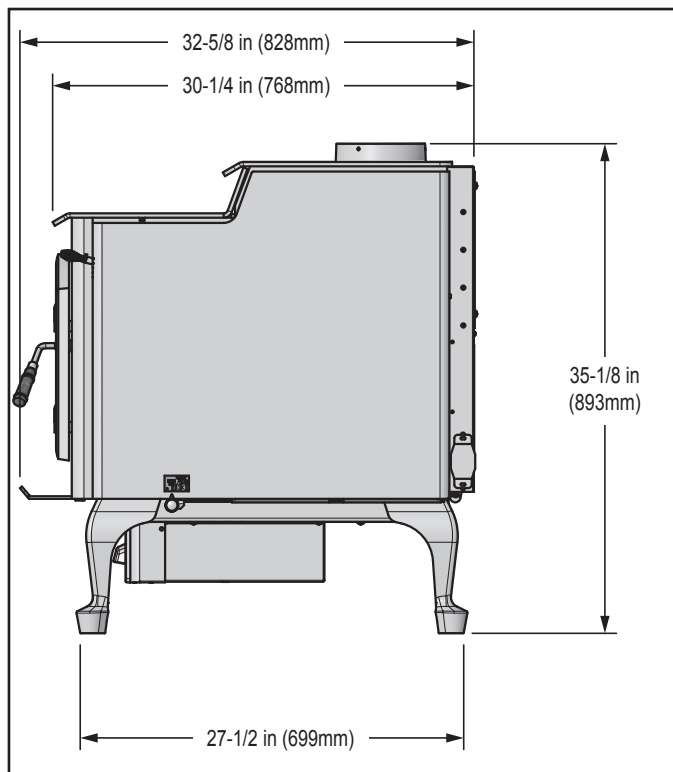


Figure 8.3 - Side View

A. Appliance Dimensions (continued)

NOTE: Flue Collar size is 6 inch (152mm) diameter (ID)

**5700 Step Top Traditional Leg Model**

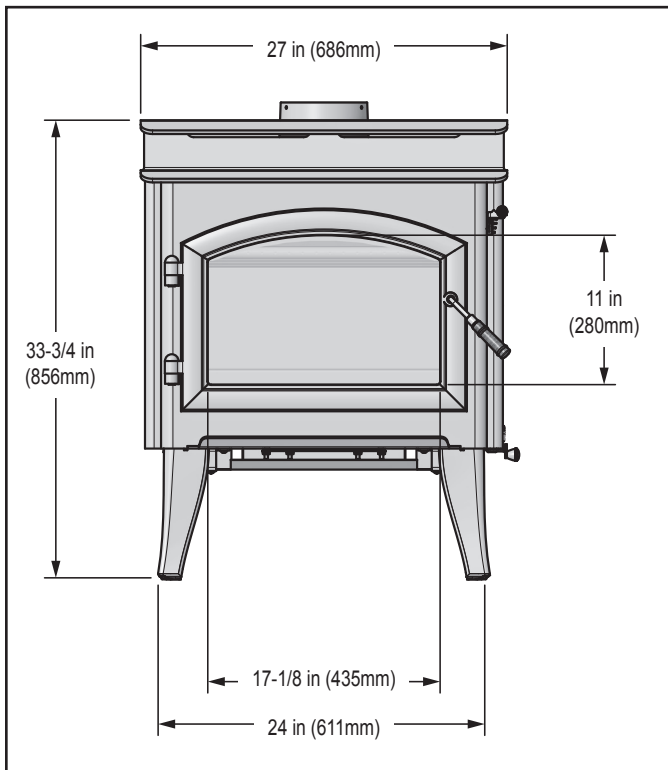


Figure 9.1 - Front View

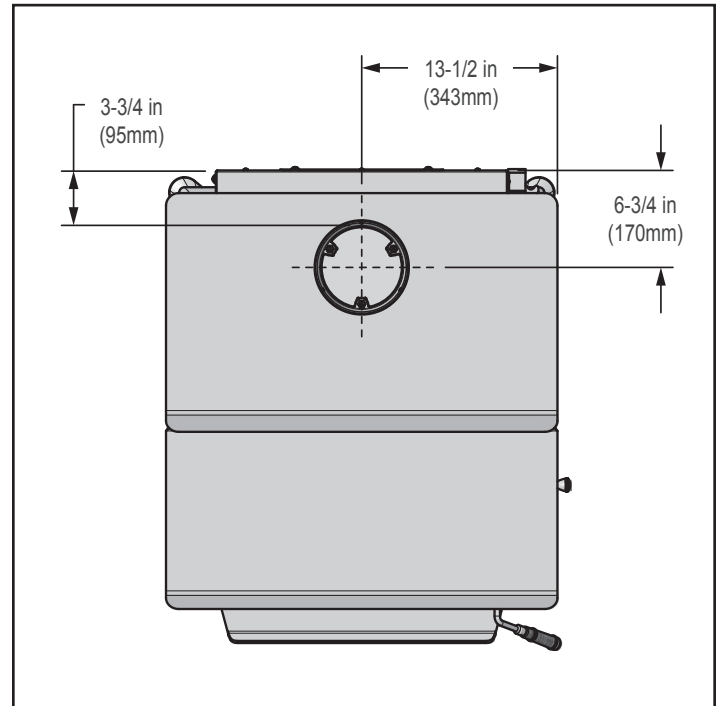


Figure 9.2 Top View

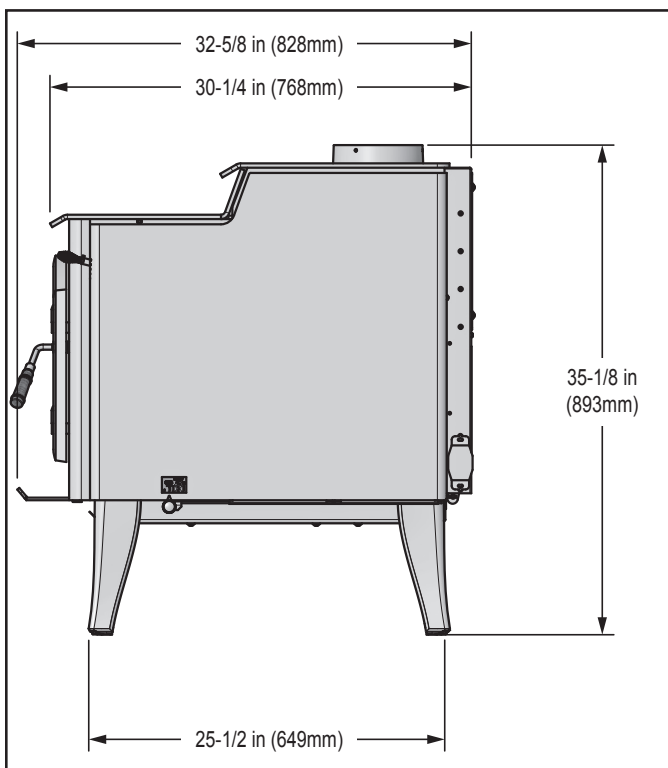
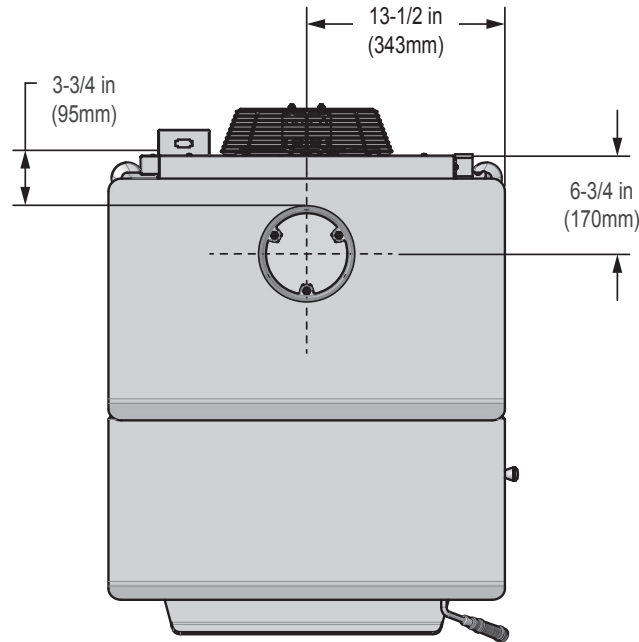
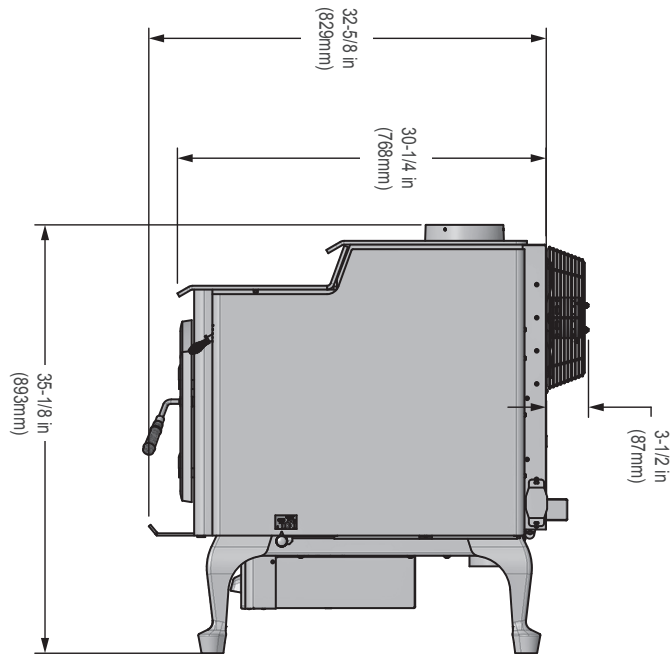


Figure 9.3 - Side View

**A. Appliance Dimensions (continued)**

NOTE: Flue Collar size is 6 inch (152mm) diameter (ID)

**5700 Step Top Blower Option***(Model shown is only an example and the BKST-350 blower kit can be used on all three models)***Note:** Clearance to combustibles do not change for adding the BKST-350 blower option to the 5700 Step Top appliance.**Figure 10.1 - Front View****Figure 10.2 - Side View**

## B. Hearth Protection Requirements

**FLOOR PROTECTION:** Floor protector must be non-combustible material, extending beneath appliance and to the front, sides and rear as indicated. The floor must be non-combustible or otherwise adequately protected from radiant heat given off by the appliance and from sparks and falling embers. A layer of thin brick or ceramic tile over a combustible floor is not sufficient.

It is necessary to install a Type II floor protector with a minimum R value=2.04, 16 inches (406mm) in front of glass and 8 inches (203mm) to both sides of the fuel loading door. Open the door and measure 8 inches (203mm) from the side edge of the opening in the face of the appliance.

**In Canada,** similar floor protection must be provided 18 inches (457mm) in front and 8 inches (203mm) from the sides and rear of the appliance. **Figure 9.2 \*See exception.**

**\*EXCEPTION:** Non-combustible floor protector must extend beneath the flue pipe when installed with horizontal venting and extend 2 inches (51mm) beyond each side. **See Figure 11.2**

 <b>WARNING</b>	
	<b>Fire Risk.</b>
	Hearth pads must be installed exactly as specified. High temperatures or hot embers may ignite concealed combustibles.

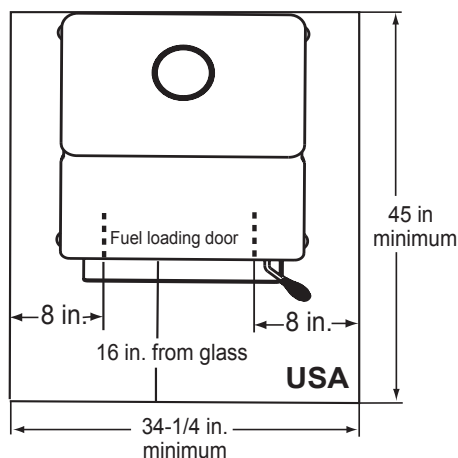


Figure 11.1

### Corner hearth pad dimensions with double wall pipe

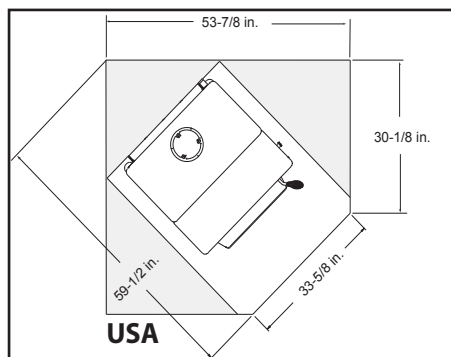


Figure 11.3

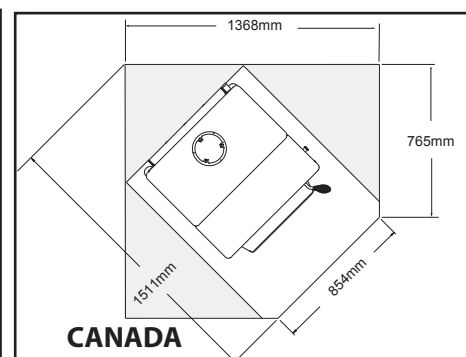


Figure 11.5

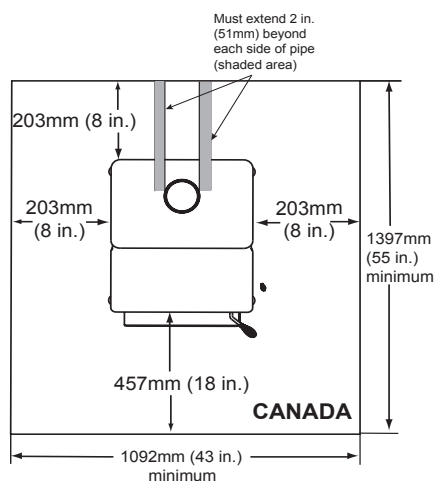


Figure 11.2

### Corner hearth pad dimensions with single wall pipe

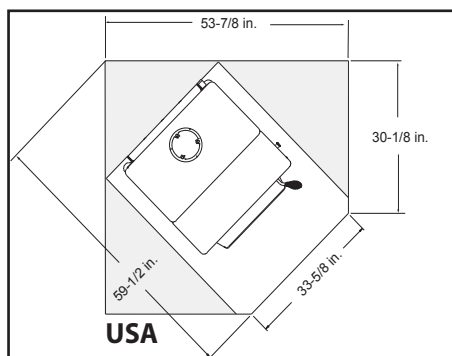


Figure 11.4

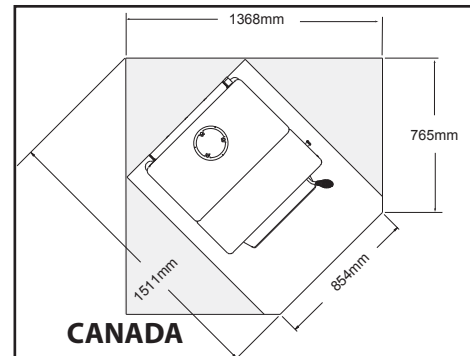


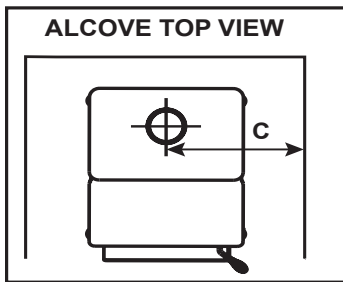
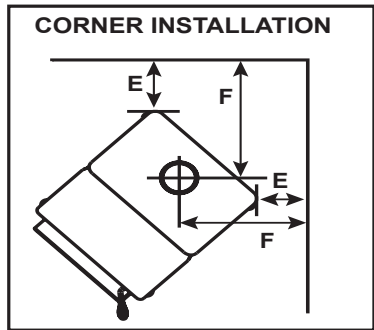
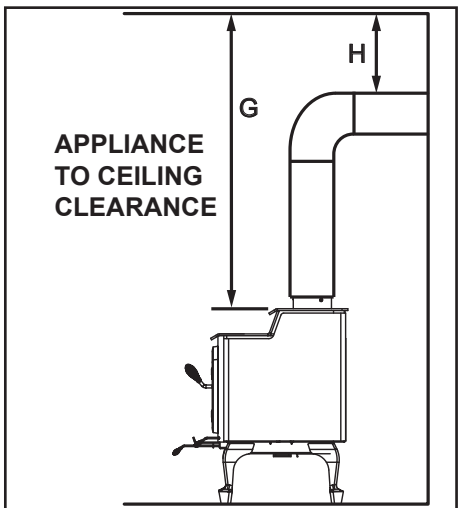
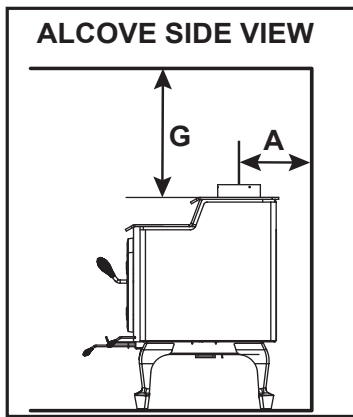
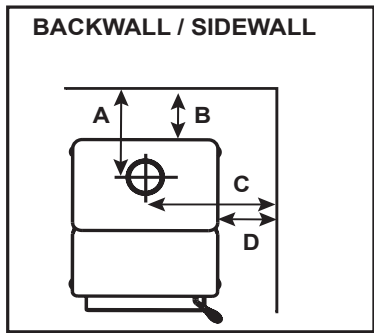
Figure 11.6

**C. Clearances to Combustibles**

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS in inches (Millimeters) Note: A, C, and F Dimensions are to the center of the flue collar <b>5700 WOOD APPLIANCE</b>								
INSTALLATION: FULL VERTICAL								
	A	B	C	D	E	F	G	H*
<b>SINGLE WALL PIPE</b>	15-1/2 (394)	10-1/2 (267)	28-1/2 (724)	15 (381)	2 (51)	15 (381)	45 (1143)	N/A
<b>DOUBLE WALL PIPE</b>	12-1/2 (318)	7-1/2 (191)	28-1/2 (724)	15 (381)	2 (51)	15 (381)	45 (1143)	N/A
INSTALLATION: HORIZONTAL WITH MINIMUM 2 FOOT VERTICAL OFF STOVE TOP								
<b>SINGLE WALL PIPE</b>	12-1/2 (318)	7-1/2 (191)	28-1/2 (724)	15 (381)	2 (51)	15 (381)	45 (1143)	18 (457)
<b>DOUBLE WALL PIPE</b>	12-1/2 (318)	7-1/2 (191)	28-1/2 (724)	15 (381)	2 (51)	15 (381)	45 (1143)	13 (330)
INSTALLATION: 90 DEGREE ELBOW OFF TOP OF STOVE THROUGH BACKWALL								
<b>SINGLE WALL PIPE</b>	12-1/2 (318)	7-1/2 (191)	28-1/2 (724)	15 (381)	2 (51)	15 (381)	45 (1143)	18 (457)
<b>DOUBLE WALL PIPE</b>	12-1/2 (318)	7-1/2 (191)	28-1/2 (724)	15 (381)	2 (51)	15 (381)	45 (1143)	13 (330)
INSTALLATION: ALCOVE								
<b>DOUBLE WALL PIPE</b>	13-1/2 (343)	8-1/2 (216)	28-1/2 (724)	15 (381)	N/A	N/A	45 (1153)	13 (330)

**For alcove only:** Six inch diameter listed Double wall air insulated connector pipe with UL103 HT listed factory built Class A chimney or masonry chimney. Maximum depth of Alcove shall be no more than 48 inches (1219mm) and the referenced alcove clearances. Canada must comply with **CAN/ULC-S269 M87** for the 650° factory built chimney.

**\* FOLLOW PIPE MANUFACTURES CLEARANCES AS REQUIRED**



**NOTE:** Clearances may only be reduced by means approved by the regulatory authority having jurisdiction

**WARNING**

**Fire Risk.**

- Comply with all minimum clearances to combustibles as specified.
- Failure to comply may cause house fire.

**NOTE: Service Space**

In order to replace the tube channel assembly a clearance of 19 inches (483mm) is required on the right side of appliance in order to remove the tubes with the appliance in place.

If space is not available, the appliance will have to be disconnected from the chimney to proceed with the tube replacement.

# 4 Chimney Systems

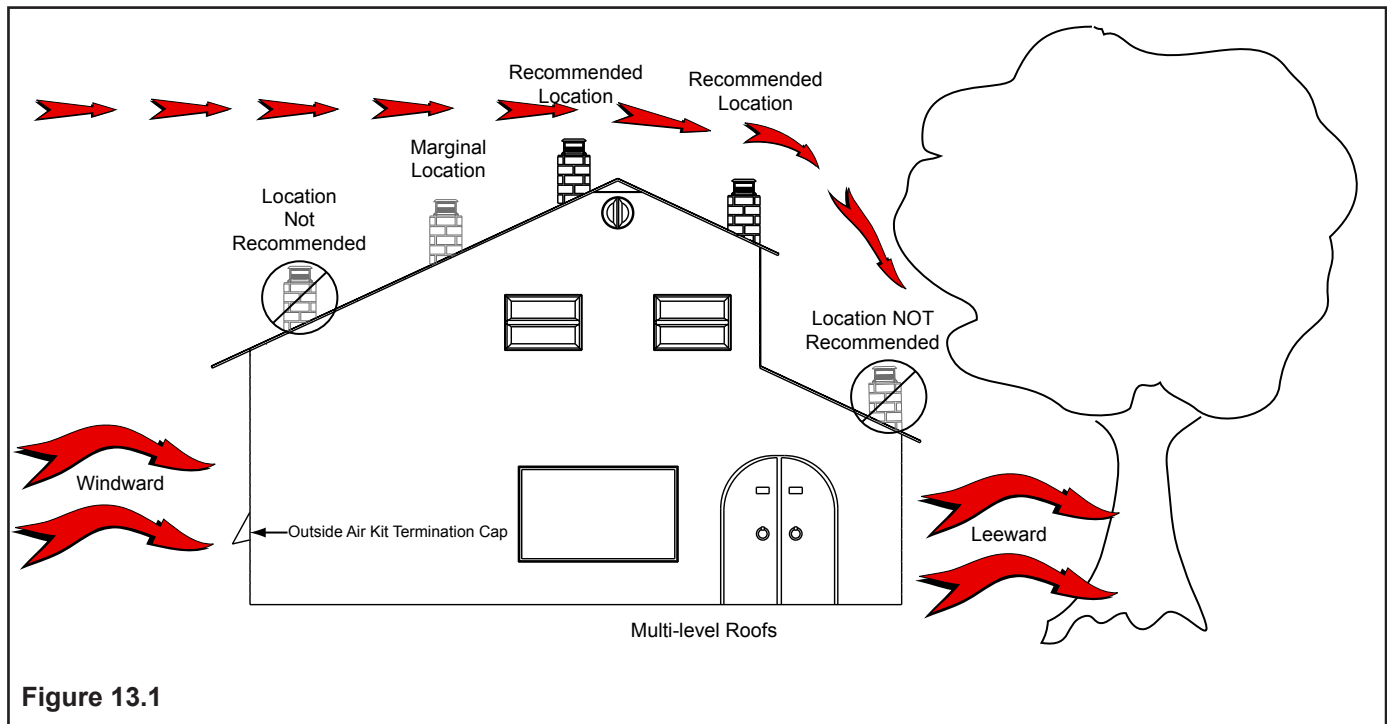
## A. Locating Your Appliance & Chimney

Location of the appliance and chimney will affect performance. As shown in **Figure 13.1** the chimney should:

- Install through the warm space enclosed by the building envelope. This helps to produce more draft, especially during lighting and die down of the fire.
- Penetrate the highest part of the roof. This minimizes the affects of wind turbulence and down drafts.

- Consider the appliance location in order to avoid floor and ceiling attic joists and rafters.
- Locate termination cap away from trees, adjacent structures, uneven roof lines and other obstructions.

Your local dealer is the expert in your geographic area and can usually make suggestions or discover solutions that will easily correct your flue problem.





**B. Chimney Termination Requirements**

Follow manufacturer’s instructions for clearance, securing flashing and terminating the chimney. **Fig. 14.1 & 14.2**

- Must have an approved and Listed cap
- Must not be located where it will become plugged by snow or other material
- Must terminate at least 3 feet (91cm) above the roof **and** at least 2 feet (61cm) above any portion of the roof within 10 feet (305cm).
- Must be located away from trees or other structures

**NOTICE:**

- Chimney performance may vary.
- Trees, buildings, roof lines and wind conditions affect performance.
- Chimney height may need adjustment if smoking or overdraft occurs.

**NOTICE:** Locating the appliance in a basement or in a location of considerable air movement can cause intermittent smoke spillage from appliance. Do not locate appliance near

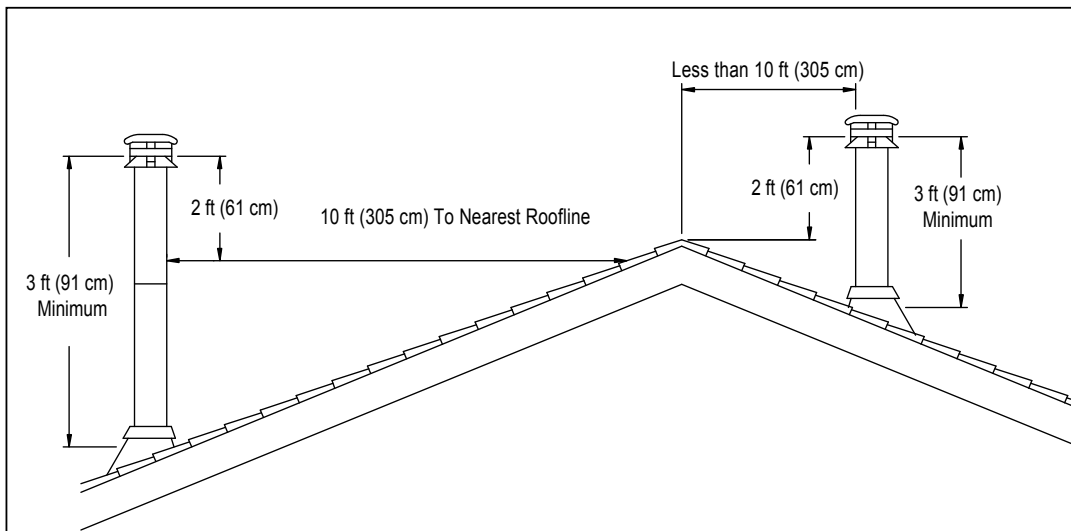
- Frequently open doors
- Central heat outlets or returns

**C. 2-10-3 Rule**

**These are safety requirements and are not meant to assure proper flue draft.**

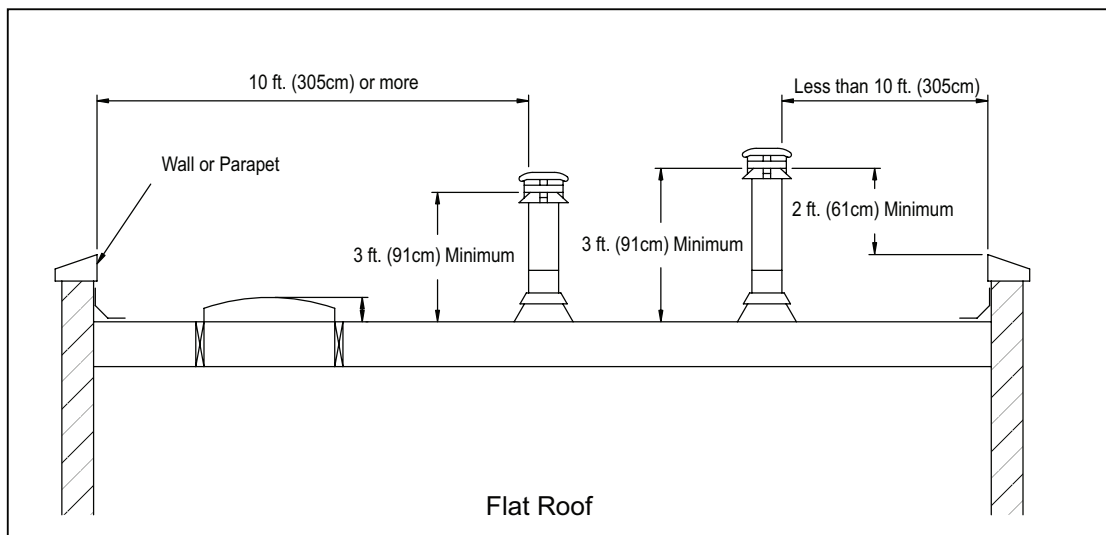
This appliance is made with a 6 inch (152mm) diameter chimney connector as the flue collar on the appliance.

- Changing the diameter of the chimney can affect draft and cause poor performance.
- It is not recommended to use offsets and elbows at altitudes above 4000 feet above sea level and or when there are other factors that affect flue draft.



Pitched Roof

**Figure 14.1**



Flat Roof

**Figure 14.2**

## D. Chimney Height / Rise and Run

This product was designed for and tested on a 6 inch (152mm) chimney, 14 to 16 feet (420-480cm) high, (includes appliance height) measured from the base of the appliance. The further your stack height or diameter varies from this configuration, the greater the likelihood it may affect performance.

Chimney height may need to be increased by 2 - 3% per each 1000 feet above sea level. It is not recommended to use offsets or elbows at altitudes above 4000 feet above sea level or when there are other factors that affect flue draft.

### WARNING



#### Fire Risk.

Inspection of Chimney:

- Chimney must be in good condition.
- Meets minimum standard of NFPA 211
- Factory-built chimney must be 6 inch (152mm) UL103 HT.

### WARNING



#### Asphyxiation Risk.

- DO NOT CONNECT THIS Appliance TO A CHIMNEY FLUE SERVICING ANOTHER APPLIANCE.
- DO NOT CONNECT TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.

May allow flue gases to enter the house.

### WARNING

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to the owner's information manual provided with this appliance. For assistance or additional information consult a qualified installer, service agency or your dealer.

## E. Venting Components

### Chimney Connector:

It is also known as flue pipe or appliance pipe. The chimney connector joins the appliance to the chimney. It must be a 6 inch (152mm) minimum diameter 24 gauge mild steel black or 26 gauge blued steel, or an approved air-insulated double wall venting pipe.

### Thimble:

A manufactured or site-constructed device installed in combustible walls through which the chimney connector passes to the chimney. It is intended to keep the walls from igniting. Site constructed thimbles must meet NFPA 211 Standards. Prefabricated must be suitable for use with selected chimney and meet UL103 Type HT Standards. Follow instructions provided by the manufacturer for manufactured thimbles for masonry chimney and prefabricated chimneys.

### Chimney:

The chimney can be new or existing, masonry or prefabricated and must meet the following minimum requirements and as specified in Section 4F.

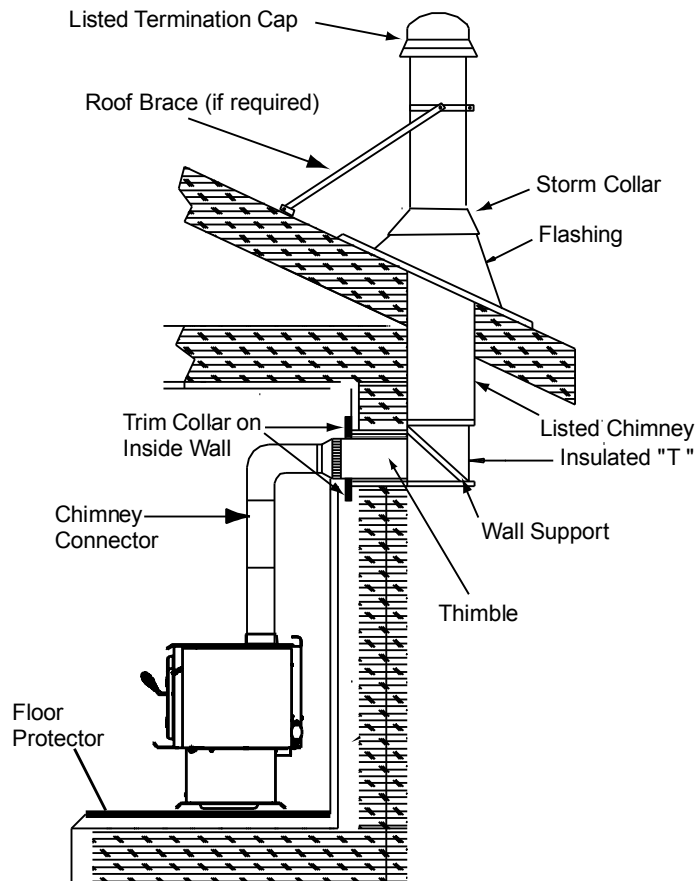


Figure 15.1 Prefabricated Exterior Chimney

## F. Chimney Systems

### Prefabricated Metal Chimney

- Must be minimum 6 inch (152mm) diameter (ID) high temperature chimney listed to UL 103 HT (2100°F) or ULC S629M.
- Must use components required by the manufacturer for installation.
- Must maintain clearances required by the manufacturer for installation.
- Refer to manufacturers instructions for installation.

**NOTE:** In Canada when using a factory-built chimney it must be safety listed, **Type UL103 HT (2100°F) CLASS "A"** or conforming to **CAN/ULC-S629M, STANDARD FOR 650°C FACTORY-BUILT CHIMNEYS.**

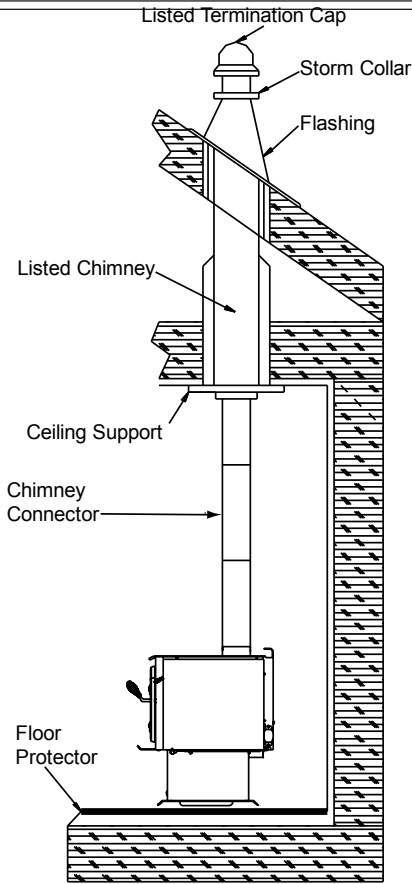


Figure 16.1 - Prefabricated Interior Chimney

**Thimble**

Site constructed for masonry chimney installation:

**Components**

- A minimum length of 12 inches [305mm] (longer for thicker walls) of solid insulated factory-built chimney length constructed to UL 103 Type HT 6 inch (152mm) inside diameter. Chimney needs to extend a minimum of 2 inches (51mm) from the interior wall and a minimum of 1 inch (25mm) from the exterior wall.
- Wall spacer, trim collar and wall band to fit solid pack chimney selected.
- Minimum 8 inch (203mm) diameter clay liner (if not already present in chimney) and refractory mortar.
- When jurisdiction requires install approved chimney liner in masonry chimney.

**Air Clearances**

- Masonry chimney clearance must meet NFPA 211 minimum requirement of 2 inches (51mm) to sheet metal supports and combustibles.
- Minimum of 1 inch (25mm) clearance around the chim-

ney connector.

- Top of wall opening is a minimum of 13-1/2 inches (343mm) from ceiling or 4-1/2 inches (114mm) below minimum clearance specified by chimney connector manufacturer. NFPA 211 minimum vertical clearance of 18 inches (457mm) from chimney connector and ceiling or minimum recommended by chimney connector manufacturer. **Figure 16.2**

**Instructions:**

1. Open inside wall at proper height for the chimney connector to entry the masonry chimney. **Figure 16.2**
2. Entry hole to masonry chimney must be lined with an 8 inch (203mm) minimum diameter clay liner, or equivalent, secured with refractory mortar.
3. Construct a 17 inch x 17 inch (432mm x 432mm) outside dimension frame from 2 x 2 framing lumber to fit into wall opening. Inside opening of frame should be no less than 14 inch x 14 inch (356mm x 356mm). **Figure 16.2**
4. Attach the wall spacer to the chimney side of the frame.
5. Nail the frame into the wall opening. The spacer should be on the chimney side.
6. Insert the section of the solid insulated chimney into the outer wall of the masonry chimney.
7. Tightly secure the length of the solid insulated chimney with the wall band to the masonry chimney.
8. Insert a section of chimney connector into the chimney. Make sure it does not protrude past the edge of the clay chimney liner inside the chimney.
9. Seal the end of the chimney connector to the clay liner with refractory mortar.
10. Install trim collar around the sold pack chimney section.

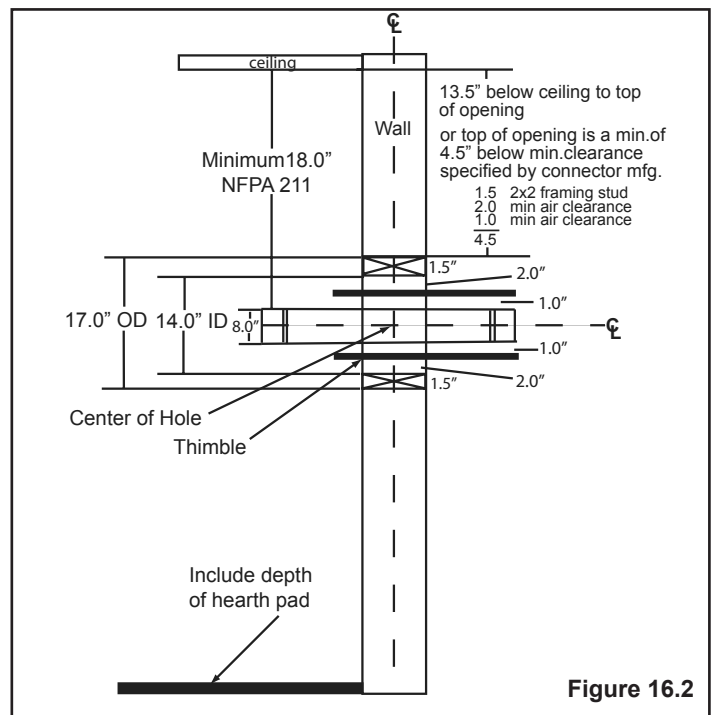


Figure 16.2

## Solid Pack Chimney with Metal Supports as a Thimble

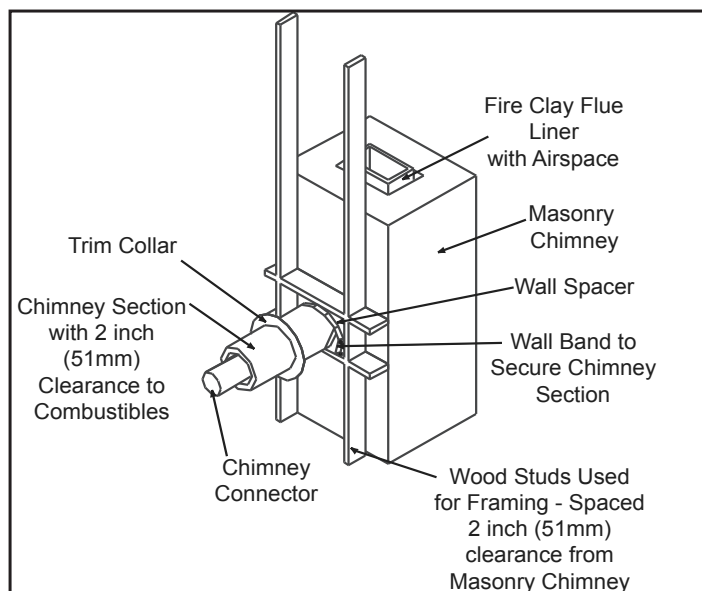


Figure 16.1

### WARNING



#### Fire Risk.

Do NOT pack insulation or other combustibles between spacers.

- ALWAYS maintain specified clearances around venting and spacers.
- Install spacers as specified.

Failure to keep insulation or other material away from vent pipe may cause fire.

## Solid Pack Chimney with Metal Supports as a Thimble (Cont'd)

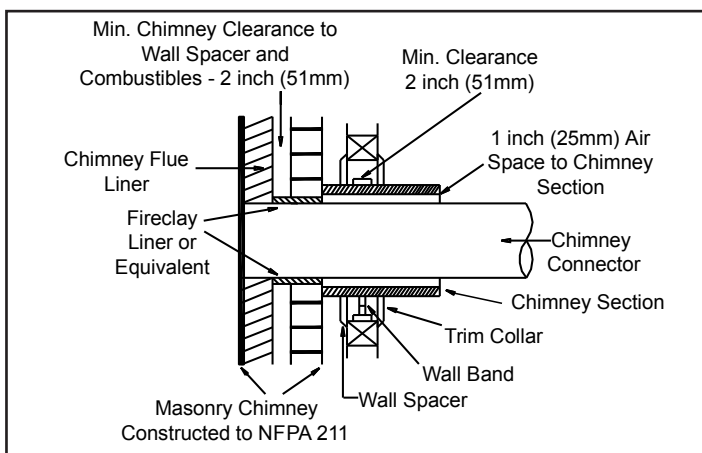


Figure 17.2

## G. Installing Chimney Components

### Chimney Connector

#### Single wall connector or appliance pipe.

This must be at least 24 gauge mild steel or 26 gauge blue steel. The sections must be attached to the appliance and to each other with the crimped (male) end pointing toward the appliance. All joints, including the connection at the flue collar, should be secured with 3 sheet metal screws. Make sure to follow the minimum clearances to combustibles. Where passage through the wall, or partition of combustible construction is desired in Canada, the installation shall conform to CAN/CSA-B365.

#### Factory-built listed chimney connector (vented).

A listed connector (vented) must be used when installing this appliance in a mobile home. The listed connectors must conform to each other to ensure a proper fit and seal.

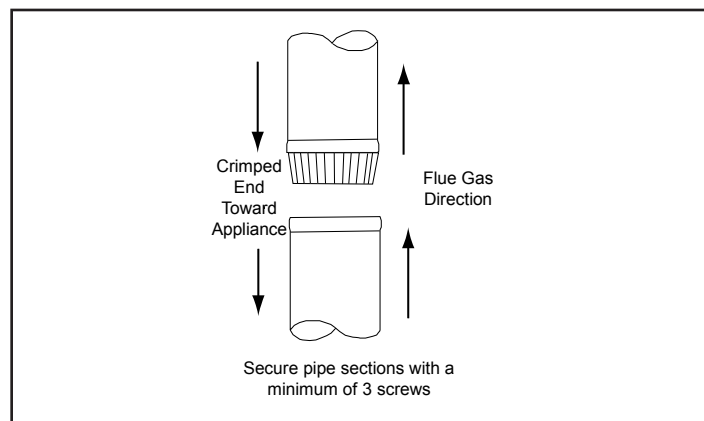


Figure 17.3 Chimney Connector (Appliance Pipe)



### WARNING



#### Fire Risk.

Follow Chimney Connector Manufacturer's Instructions for Proper Installation.

ONLY use connector:

- Within the room, between appliance and ceiling or wall.

Connector shall NOT pass through:

- Attic or roof space
- Closet or similar concealed space
- Floor or ceiling

Maintain minimum clearances to combustibles

## H. Proper Draft

To be sure that your Quadra-Fire insert burns properly, the chimney draft (static pressure) should be approximately -0.10 inches water column (W.C.) during a high burn and -0.04 inches W.C. during a low burn, measured 6 inches (152mm) above the top of the insert after one hour of operation at each burn setting.

# 5 Appliance Set-Up

## A. Pedestal Assembly and Ash Removal System (ARS) Installation

**NOTE: The Ash Removal System, must be installed first before installing the pedestal.**

**Included in Kit:** ARS door assembly, ARS latch assembly, Pedestal, Ash Pedestal Drawer, ARS Channel, ARS Cover, and fastener package.

**Tools Required:** 7/16 socket wrench, 3/8 open end wrench, Phillips screw driver, and hammer.

### Begin installing the ARS System.

1. Remove leg mount brackets packaged inside of firebox and discard.
2. Remove the 3 bricks in the front most part of the firebox (**Figure 18.1**).
3. Lay appliance on its back on a protective pad or pallet (**Figure 18.2**).
4. Remove heat shield by loosening the four bolts using 3/8 open end wrench (**Figure 18.2**).
5. Remove 8 nuts that hold the cover plate on using a 7/16 socket wrench; discard cover plate (**Figure 18.2**).

### Warning!

#### CHECK GASKET!

- Verify that the gasket is present and that the glossy side is away from firebox bottom.
- It is important that the gasket is put in correctly for sealing capabilities.

6. Remove knock out from bottom of firebox by using a hammer (**Figure 18.2**).
7. Install ash door assembly by sliding the rod at an angle into the slot on the left side (**Figure 18.3**).
8. Slide the ash door over the 8 screws protruding from the bottom of the appliance. Secure with nuts and washers using 7/16 socket wrench (**Figure 18.3**).
9. Install ARS latch by sliding latch assembly over 2 threaded studs protruding from the bottom on the left hand side of the appliance. Secure by using two nuts use 7/16 socket wrench (**Figure 19.1 on page 19**).
10. Add knob to handle rod (**Figure 19.2 on page 19**).
11. Using two bolts and two flange nuts to secure ARS channel using 3/8 open end wrench and 7/16 socket wrench (**Figure 19.3 on page 19**).



### WARNING



Do **NOT** operate before fully assembling components.

Burning your appliance without a pedestal or leg kit attached:

- Will void your warranty.
- May result in property damage or personal injury.

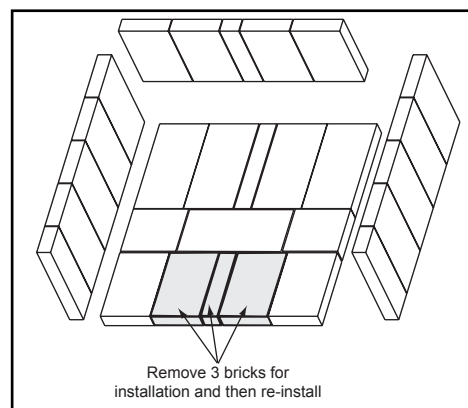


Figure 18.1

Remove 3 bricks for installation and then re-install

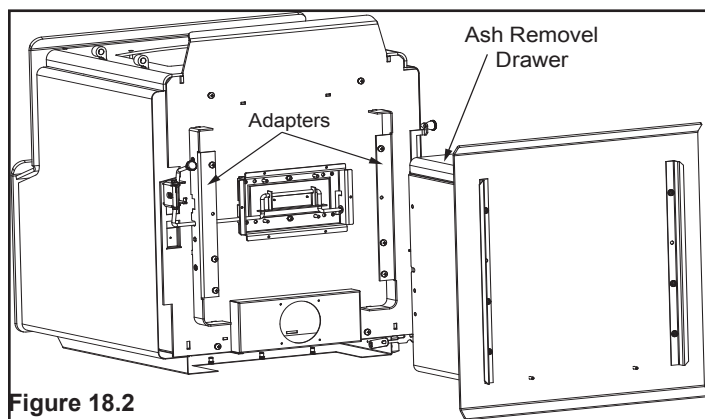


Figure 18.2

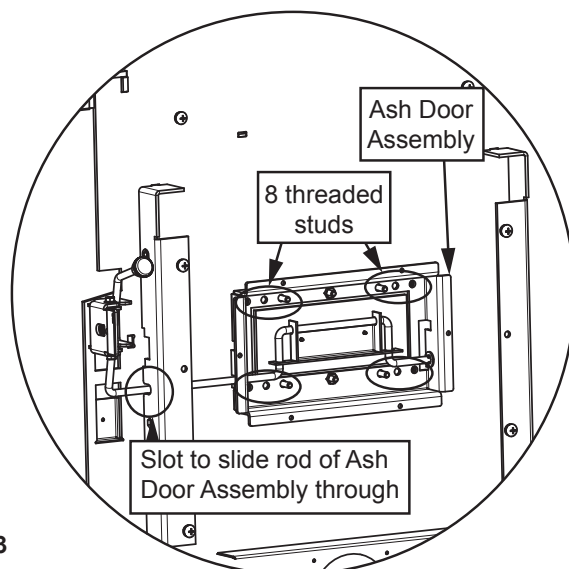


Figure 18.3

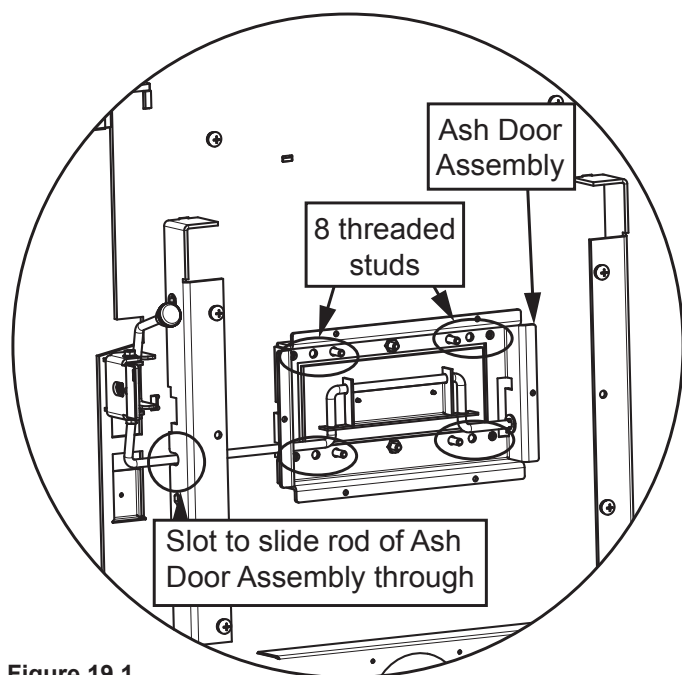


Figure 19.1

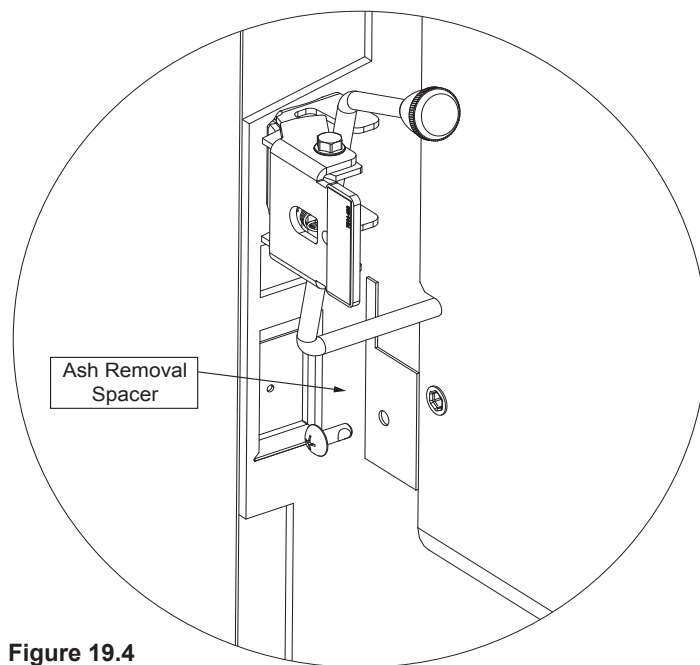


Figure 19.4

## Ped Kit and Ash Removal System (Cont'd)

### Installing Ped Kit

1. Follow [Beginning installing the ARS system](#) instructions provided on page 17.
2. Slide pedestal over adapter on bottom of appliance and secure with four screws using Phillips head screwdriver (Figure 19.1 on page 19).
3. Install ARS Spacer on left hand side with one bolt using Phillips head screwdriver (**Figure 19.4**).
4. Carefully stand appliance up and place in desired location.

### Finishing the ARS Installation

1. Replace front 3 bricks that were removed in step 1 (**Figure 20.2**).
2. Install the ash drawer to pedestal base.
3. Install ARS access cover inside of ARS Channel that is located inside the firebox (**Figure 20.2**).

### Caution!

#### CHECK BAFFLE BOARDS & CERAMIC BLANKET!

- Verify that the baffle boards and ceramic blanket are in their proper locations.
- It is important that the baffle boards and ceramic blanket are correctly installed for proper burn safety.

**NOTE:** If installing a floor installation of an outside air kit on a Step Top model with a pedestal assembly you must attach the enclosed cover plate with 4 screw to the back of the appliance. Other wise you may discard this piece (**Figure 20.3**).

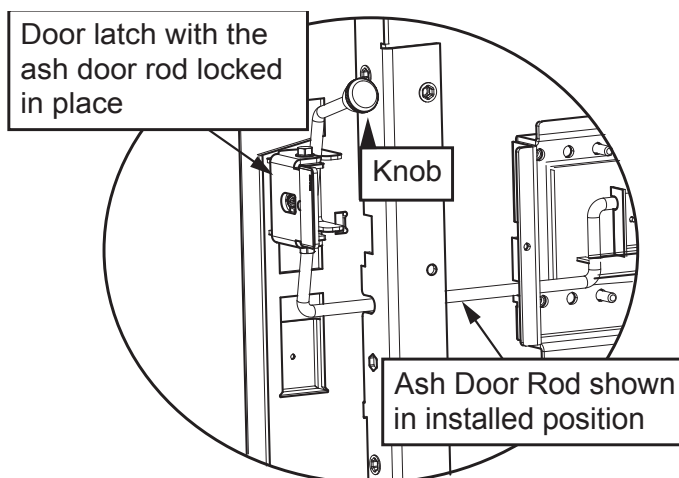


Figure 19.2

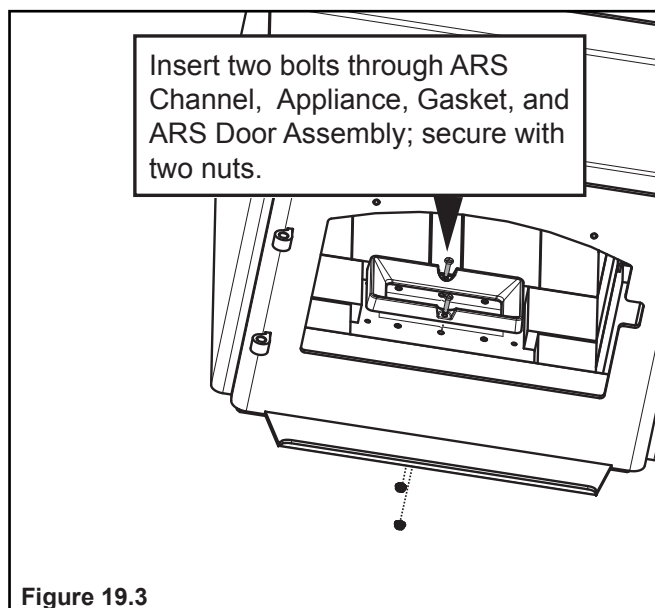


Figure 19.3

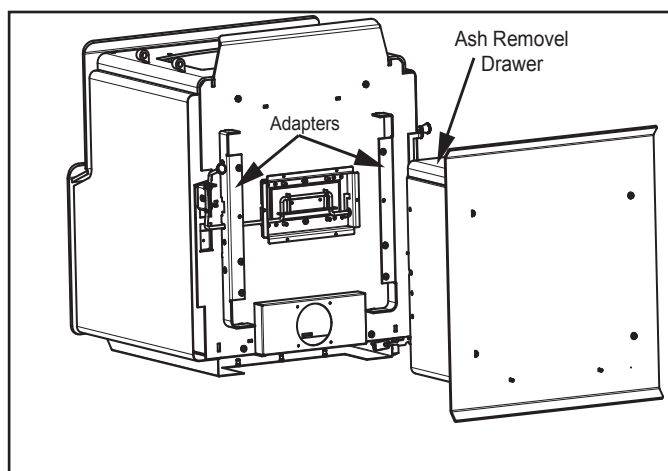


Figure 20.1

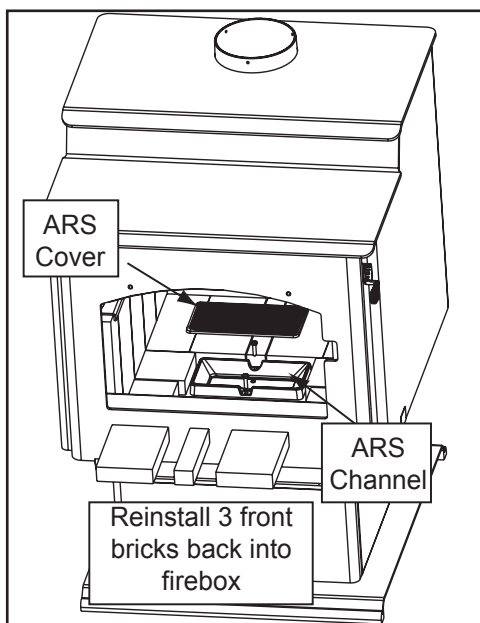


Figure 20.2

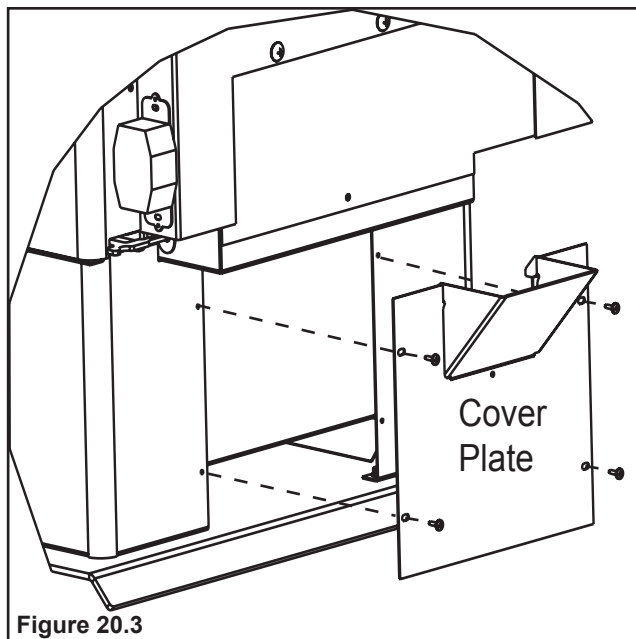


Figure 20.3

## B. Access Cover Handle

Insert Access Cover Handle handle into slot of ARS Cover to remove ARS Cover for cleaning ash out of firebox (Figure 20.4).

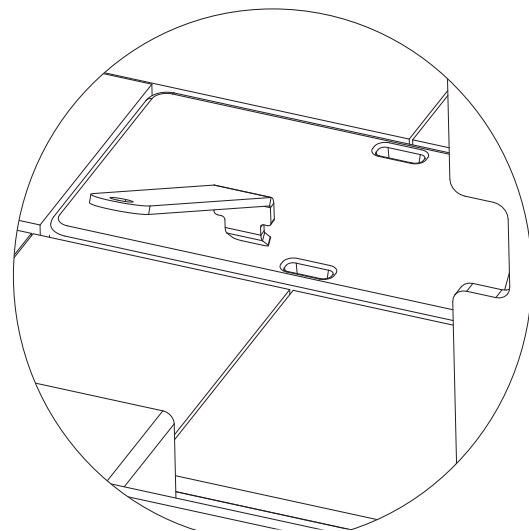


Figure 20.4

## C. Leg Kit and Ash Removal System (ARS) Installation

**NOTE:** The Ash Removal System, must be installed first before installing the legs.

**Included in Kit:** ARS door assembly, ARS latch assembly, Ash Removal Box, Ash Removal Drawer, ARS Channel, ARS Cover, and fastener package.

**Tools Required:** 7/16 socket wrench, 9/16 socket wrench, 3/8 open end wrench, Phillips screw driver, and hammer.

### Begin installing the ARS System.

1. Remove leg mount brackets packaged inside of firebox and set aside.
2. Remove the 3 bricks in the front most part of the firebox (Figure 18.1 on page 18).
3. Lay appliance on its back on a protective pad or pallet (Figure 18.2 on page 18).
4. Remove heat shield by loosening the four bolts using 3/8 open end wrench (Figure 18.2 on page 18).
5. Remove 8 nuts that hold the cover plate on using a 7/16 socket wrench; discard cover plate (Figure 18.2 on page 18).

### **Warning!**

#### **CHECK GASKET!**

- Verify that the gasket is present and that the glossy side is away from firebox bottom.
- It is important that the gasket is put in correctly for sealing capabilities.

6. Remove knock out from bottom of firebox by using a hammer (**Figure 18.2 on page 18**).
7. Install ash door assembly by sliding the rod at an angle into the slot on the left side (**Figure 18.3 on page 18**).
8. Slide the ash door over the 8 screws protruding from the bottom of the appliance. Secure with nuts and washers using 7/16 socket wrench (**Figure 18.3 on page 18**).
9. Install ARS latch by sliding latch assembly over 2 threaded studs protruding from the bottom on the left hand side of the appliance. Secure by using two nuts use 7/16 socket wrench (**Figure 19.1 on page 19**).
10. Add knob to handle rod (**Figure 19.2 on page 19**).
11. Use 2 bolts and 2 flange nuts to secure ARS channel using 3/8 open end wrench and 7/16 socket wrench (**Figure 19.3 on page 19**).

### **Installing Queen Anne Leg ARS Kit**

1. Follow Beginning installing the ARS system instructions provided on page 19.
2. Install ARS Spacer on left hand side with one bolt using Phillips head screwdriver (**Figure 19.4 on page 19**).
3. Install leg brackets and ash drawer using four screws and Phillips head screwdriver .
  - Start bottom two bolts through ash drawer, leg mount and into the bottom of the appliance (**Figure 21.1**).
  - Align top holes and repeat; secure all four bolts.
4. Install legs onto mounting brackets making sure the legs are up against the bracket and secure with bolts and washers using a 3/8 open end wrench (**Figure 21.2**).
5. Install leveling bolts into 2 legs; these leveling legs should be in opposite corners (**Figure 21.2**).
6. Carefully stand appliance up and place in desired location.
7. Use leveling bolts on legs to stabilize and level appliance (**Figure 21.3**).

### **Finishing the ARS Installation**

1. Replace front 3 bricks that were removed (**Figure 21.4**).
2. Install the ash drawer to ASH Removal.
3. Install ARS access cover inside of ARS Channel that is located inside the firebox (**Figure 21.4**).

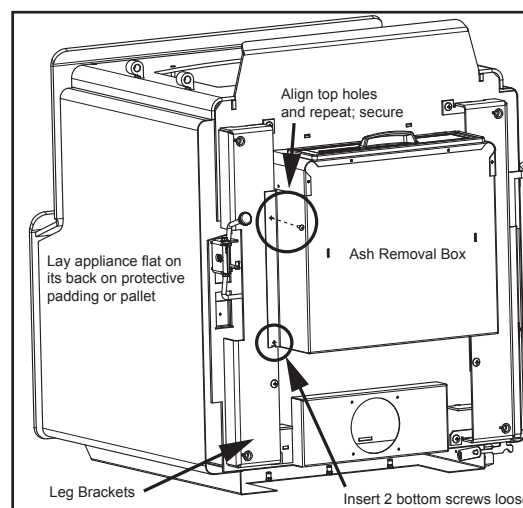


Figure 21.1

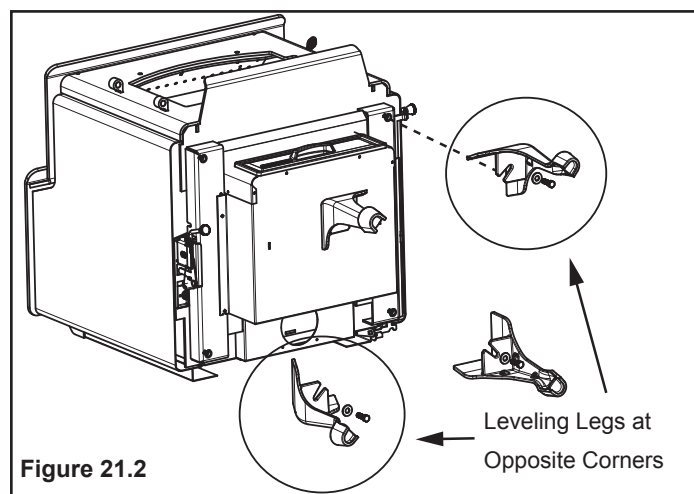


Figure 21.2

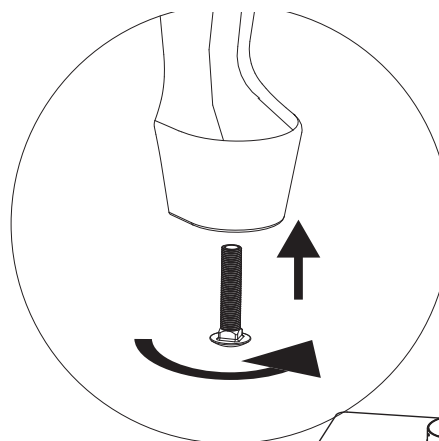


Figure 21.3

<b>Caution!</b>
<b>CHECK BAFFLE BOARDS &amp; CERAMIC BLANKET!</b>
<ul style="list-style-type: none"> <li>• Verify that the baffle boards and ceramic blanket are in their proper locations.</li> <li>• It is important that the baffle boards and ceramic blanket are in correctly installed for proper burn safety.</li> </ul>

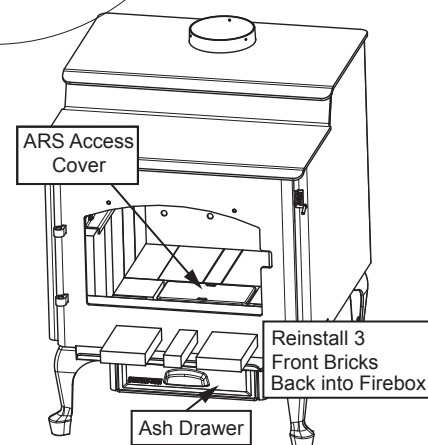


Figure 21.4



## D. Traditional Leg Installation

**Included with Appliance:** Leg brackets; inside firebox.

**Tools Required:** 9/16 socket wrench and Phillips screw driver.

### Installing your traditional legs to your appliance.

1. Remove leg brackets from inside of firebox of appliance.
2. Lay body of appliance on its back on a protective pad or pallet.
3. Remove four screws from bottom of appliance (**Figure 22.1**).
4. Install leg brackets to bottom of appliance using the four just removed screws in step 3.

**NOTE:** There is a right and a left of the leg brackets (**Figure 22.1**).

5. Install six screws to the bottom of the leg brackets (**Figure 22.1**).
6. Attach legs onto leg brackets and secure with bolts and washers.
7. Carefully stand appliance up and place in desired location.

### CAUTION

Do **NOT** tilt the appliance on the cast iron legs.

- Tilting could lead to property damage.
- Lift the appliance upright and place it into position on the floor protector.

8. Thread Allen bolts through nuts until flush (**Figure 22.2**)
9. Slide Allen bolt/nut assemblies into slots of two of the legs with the nuts on the bottom (**Figure 22.3**).

**Note:** Legs with leveling bolts need to be on opposite sides of the appliance - one in the front and one in the back (**Figure 22.1**)

10. Use Allen wrench to adjust legs up and down to desired level (**Figure 22.4**).

### Caution!

#### CHECK BAFFLE BOARDS & CERAMIC BLANKET!

- Verify that the baffle boards and ceramic blanket are in their proper locations.
- It is important that the baffle boards and ceramic blanket are in correctly installed for proper burn safety.

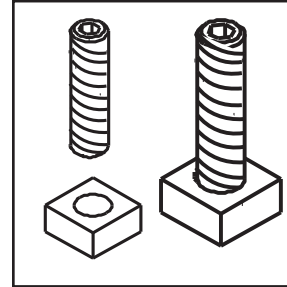


Figure 22.2

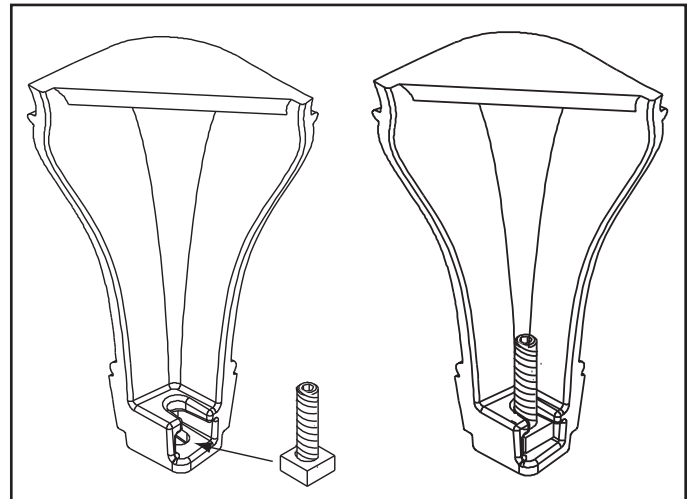


Figure 22.3

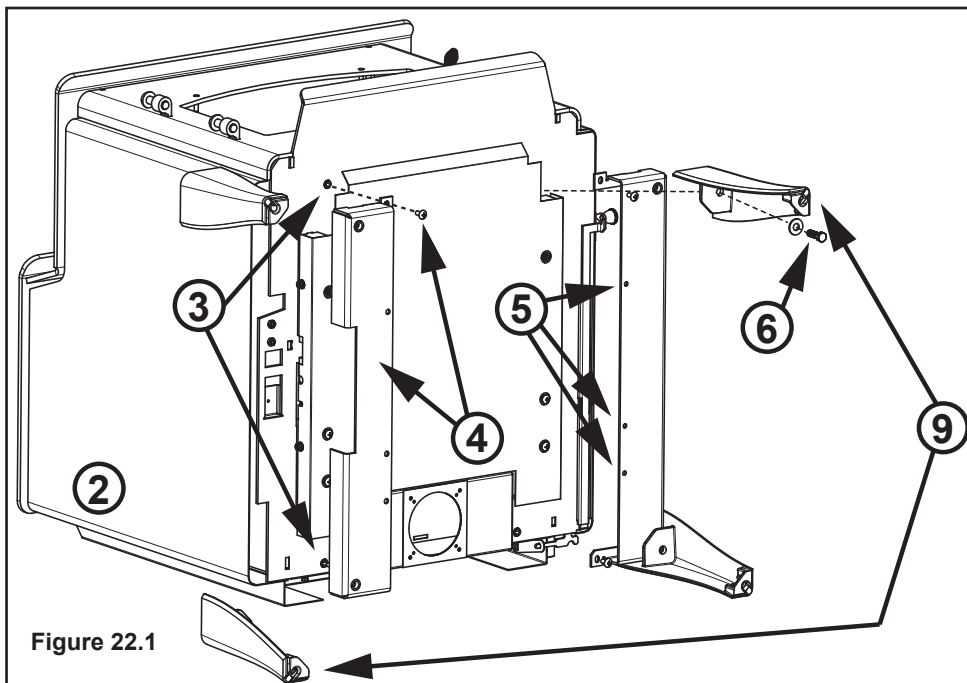


Figure 22.1

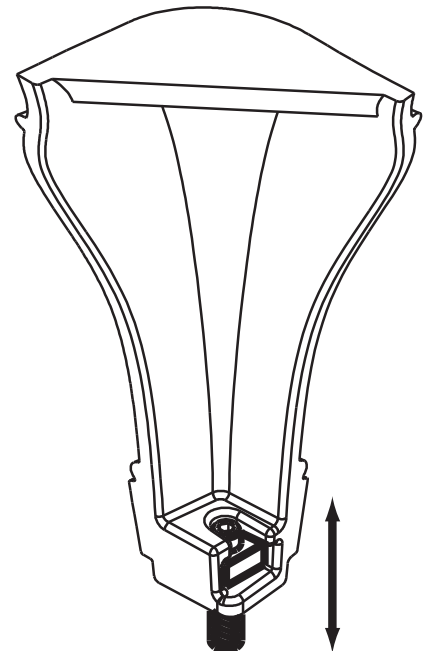


Figure 22.4

## E. Door Handle Assembly

### INSTALL NEW DOOR HANDLE

1. Install washer on door handle shaft and slide door handle through door.
2. Install second washer(s) as shown and install key in groove.
3. Align groove in latch cam with key; slide latch cam over shaft.
4. Install locknut.

**CAUTION! DO NOT OVER TIGHTEN LOCKNUT. DOOR HANDLE NEEDS TO MOVE SMOOTHLY.**

5. Install fiber hand using a clockwise motion until the fiber handle is snug against the door handle shaft.

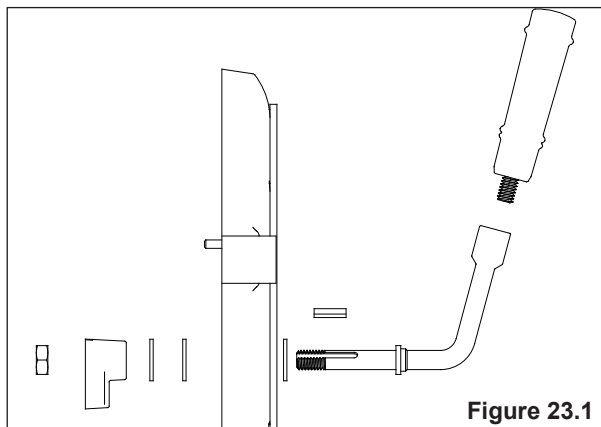


Figure 23.1

## F. Outside Air Kit Installation

A source of air (oxygen) is necessary in order for combustion to take place. Whatever combustion air is consumed by the fire must be replaced. Air is replaced via air leakage around windows and under doors. In homes that have tightly sealed doors and windows, an outside air source is needed. An optional Outside Air Kit is available.

**Optional OAK-ACC includes:** Termination cap, (2) wire ties, flex adapter, and fasteners

### Items Needed for Installation (not supplied)

- 4 inch flex aluminum pipe, or if using alternate material, then it shall be made from durable, non-combustible, heat resistant material up to 350°F. Cut the pipe to the required length for your installation.
- Phillips head screw driver
- Silicone sealant
- Drills and saws necessary for cutting holes through the wall or flooring in your home.

### Installation Instructions

1. Remove all materials from packing box.
2. **Floor & Rear Installation:** Cut a 4 inch (102mm) hole in outside wall or floor to accommodate outside air piping. Use 4 inch (102mm) aluminum metal flex or rigid piping to directly connect outside air to appliance intake. Use the supplied termination cap with a rodent screen. Seal between the wall (or floor) and the pipe with silicone to prevent moisture penetration.

## WARNING



### Asphyxiation Risk.

Length of outside air supply duct shall NOT exceed the length of the vertical height of the exhaust flue.

- Fire will not burn properly
- Smoke spillage occurs when door is opened due to air starvation

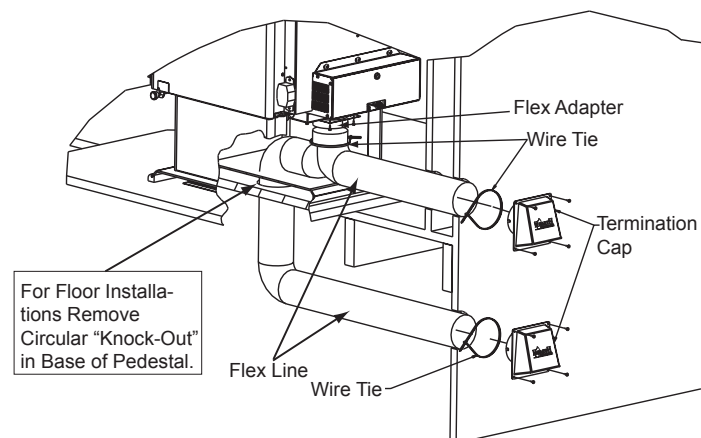


Figure 24.2

## WARNING



### Fire Risk. Asphyxiation Risk.

Do not draw outside combustion air from:

- Wall, floor or ceiling cavity
- Enclosed space such as an attic or garage
- Close proximity to exhaust vents or chimneys

Fumes or odor may result



## WARNING



### Asphyxiation Risk.

Outside air inlet must be located to prevent blockage from:

- Leaves
- Snow or ice
- Other debris

Block may cause combustion air starvation

Smoke spillage may set off alarms or irritate sensitive individuals.

## G. BKST-350 Blower Kit (Optional)

**Tools Required:** #2 Phillips head screwdriver

1. Using #2 Phillips head screwdriver remove 4x screws from back plate of appliance; discard plate.
2. Locate 4x screws supplied with the blower kit.
3. Align mounting flange x4 of blower with screw holes on back of appliance.

**Note:** Blower wire should be positioned towards the bottom as shown in **Figure 24.1**

4. Using #2 Phillips head screwdriver and 4x screws secure blower to appliance (**Figure 24.1**).
5. Locate 1x screw supplied with blower kit.
6. Install junction box to the bottom right back of the appliance shown in **Figure 24.1** by inserting tab into slot and aligning flange; secure with 1x screw by using #2 Phillips head screwdriver.
7. Place the bracket containing the snap disc and magnet lower right side of the appliance as shown is **Figure 24.1**.
8. Install blower cord with rectangle plug into junction box.
9. Plug in power cord to electrical outlet.



See **Owner's Manual** for detailed operating instructions for the blower and snap disc.

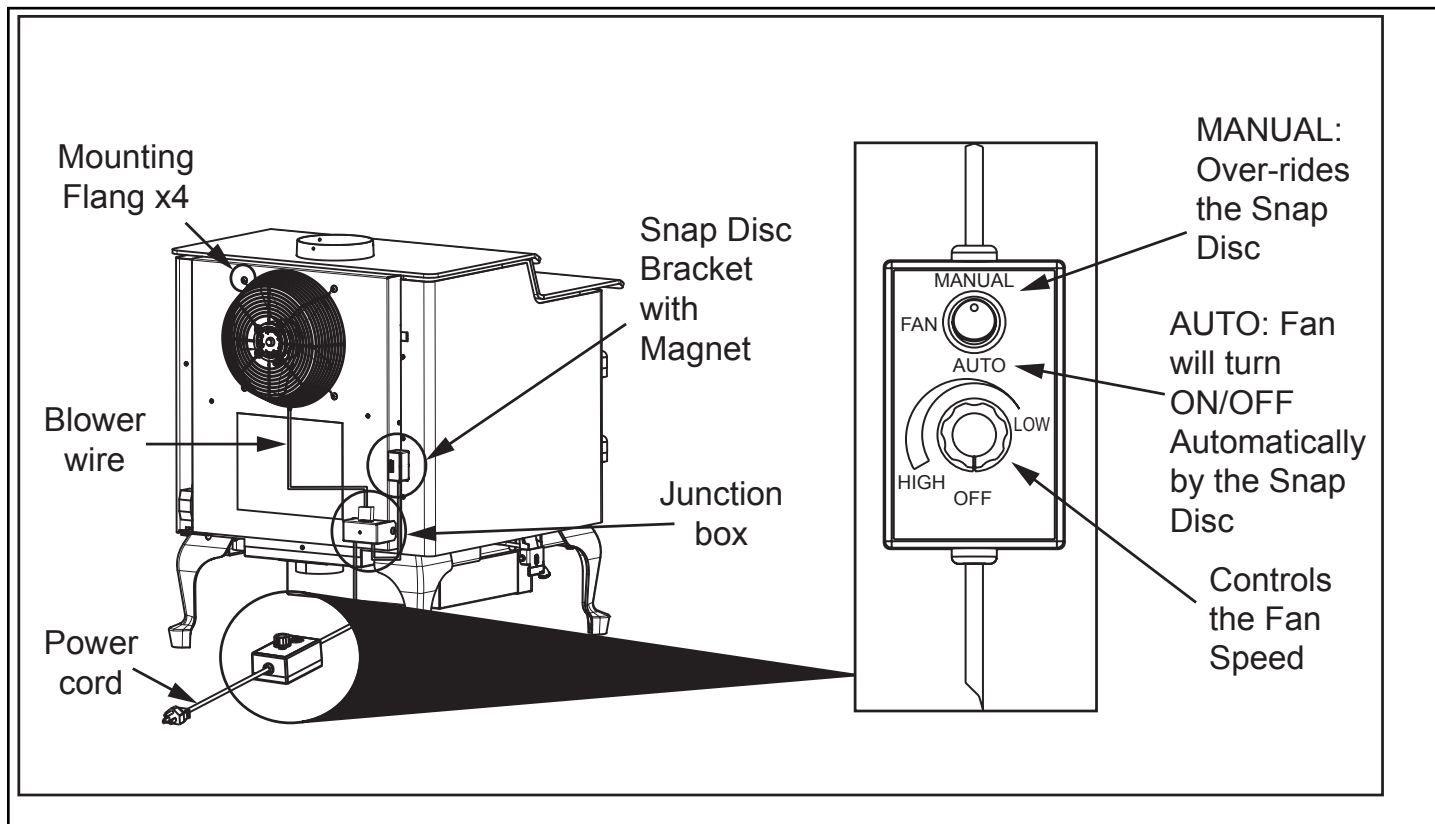
## H. Adjusting The Blower Speed Control

The blower speed control for this appliance is adjusted at the factory, and normally does not require further adjustment.

1. With the appliance plugged in, turn the speed control knob to slow (full clockwise).
2. With a small screwdriver, adjust the blower speed by turning the adjustment mechanism through the hole on the side of the speed control.
3. Adjust the speed so the blower runs slowly, but does not stop. Turn clockwise to slow the blower and counterclockwise to increase the speed.

**NOTE:** When the speed control is turned clockwise, it will click on to high speed. Continue to turn the speed control clockwise to decrease the speed. At full clockwise, the blower should blow gently, but should not stop.

 <b>CAUTION</b>	
	<b>Shock Risk.</b>
	<ul style="list-style-type: none"> <li>• Do NOT remove grounding prong from plug.</li> <li>• Route cord away from appliance.</li> <li>• Do NOT route cord under or in front of appliance.</li> <li>• Plug directly into properly grounded 3 prong receptacle.</li> </ul>



**Figure 24.1**

# 6 Mobile Home Installation

**You must use a Quadra-Fire Outside Air Kit Part OAK-ACC; which is available from you dealer, for installation in a mobile home.**

1. An outside air inlet must be provided for combustion.
2. Appliance must be secured to the mobile home structure by bolting the legs or pedestal to the floor.
3. Appliance must be grounded with #8 solid copper grounding wire or equivalent and terminated at each end with N.E.C. approved grounding device.
4. Appliance must be installed with an approved UL103 HT ventilated chimney connector, UL103 HT chimney, and terminal cap with spark arrestor. Never use a single wall connector (appliance pipe) in a mobile home installation. Use only double-wall connector pipe, Dura-Vent DVL, Selkirk Metalbestos DS or Security DL double-wall connector or any listed double-wall connector pipe.
5. In Canada, this appliance must be connected to a 6 inch (152mm) factory-built chimney conforming to CAN/ULC-629M, STANDARD FOR FACTORY BUILT CHIMNEYS.
6. Follow the chimney and chimney connector manufacturer's instructions when installing the flue system for use in a mobile home.
7. Maintain clearance to combustibles.
8. Floor protection requirements must be followed precisely.
9. Use silicone to create an effective vapor barrier at the location where the chimney or other component penetrates to the exterior of the structure.

**NOTE:** Offsets from the vertical, not exceeding 45°, are allowed per Section 905(a) of the Uniform Mechanical Code (UMC). Offsets greater than 45° are considered horizontal and are also allowed, providing the horizontal run does not exceed 75% of the vertical height of the vent. Construction, clearance and termination must be in compliance with the UMC Table 9C. This installation must also comply with NFPA 211.

**NOTE:** Top sections of chimney must be removable to allow maximum clearance of 13.5 feet (411cm) from ground level for transportation purposes.

10. Burn seasoned cord wood only. Other types of fuels may generate poisonous gases (e.g., carbon monoxide).
11. If appliance burns poorly while an exhaust blower is on in home, (i.e., range hood), increase combustion air.
12. Installation shall be in accordance with the Manufacturers Home & Safety Standard (HUD) CFR 3280, Part 24.

## CAUTION

THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL AND CEILING/ROOF MUST BE MAINTAINED

Do NOT cut through:

- Floor joist, wall, studs or ceiling trusses.
- Any supporting material that would affect the structural integrity.

## WARNING



**Asphyxiation Risk.**

**NEVER INSTALL IN A SLEEPING ROOM.**

Consumes oxygen in the room.



## B. Accessory List

**QUADRA-FIRE**® Service Parts

**57ST-ACC-B**

Beginning Manufacturing Date: Sept 2016

Ending Manufacturing Date: Active

IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.


**Stocked  
at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
<b>ACCESSORIES</b>				
	Blower Assembly		BK-ACC	
	Blower Control Box W/Switch		SRV7000-194	Y
	Component Pack		7033-051	
	Magnet Round		SRV7000-140	Y
	Snap Disc Bracket Assembly		7033-036	
	Snap Disc, # 1, Convection Blower		SRV230-0470	Y
	Speed Control Only (Rheostat)		842-0370	Y
	Wire Harness (Blower)		7033-262	
	Blower, Convection	Blower Only	812-4900	Y
	Outside Air Kit, Floor & Rear		OAK-ACC	
	Outside Air Collar Assembly		7033-039	
	Outside Air Shield		33271	Y
<b>FASTENERS</b>				
	Avk Rivnut Repair Kit - 1/4-20 & 3/8-16 Rivnut Tools		RIVNUT-REPAIR	Y
	Bolt, Hex Head, 1/4-20x1	Pkg of 10	25221A/10	Y
	Button Head, 1/4-20x0.5	Pkg of 20	32328/20	Y
	Nut, Keps Lock, 10-32	Pkg of 40	226-0050/40	Y
	Nut, Keps Lock, 8-32	Pkg of 40	226-0060/40	Y
	Nut, Ser Flange Small 1/4-20	Pkg of 24	226-0130/24	Y
	Screw, Flat Head Philips, 8-32x1/2	Pkg of 10	832-0860	Y
	Screw, Pan Head Philips 8-32 X 3/8	Pkg of 40	225-0500/40	Y
	Screw, Sheet Metal #8 X 1/2 S-Grip	Pkg of 40	12460/40	Y
	Washer, 1/4 Sae	Pkg of 24	28758/24	Y
	Washer, 3/8 Sae	Pkg of 3	832-0990	Y



**CONTACT INFORMATION**

Hearth & Home Technologies  
352 Mountain House Road  
Halifax, PA 17032  
Division of HNI INDUSTRIES

**Please contact your Quadra-Fire dealer with any questions or concerns.  
For the number of your nearest Quadra-Fire dealer  
log onto [www.quadrafire.com](http://www.quadrafire.com)**

**CAUTION**



**DO NOT DISCARD THIS MANUAL**

Important operating and maintenance instructions included.

• Read, understand and follow these instructions for safe installation and operation.

• Leave this manual with party responsible for use and operation.



**We recommend that you record the following pertinent information for your heating appliance.**

Date purchased/installed: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Location on appliance: \_\_\_\_\_

Dealership purchased from: \_\_\_\_\_ Dealer phone: 1( ) -

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

This product may be covered by one or more of the following patents: (United States) 5341794, 5263471, 6688302, 7216645, 7047962 or other U.S. and foreign patents pending.



ITEM	PART NUMBER	PART NAME	QTY
1	7038-228	SERIAL RATING PLATE	

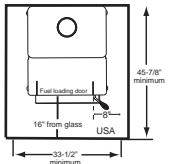


**CAUTION: HOT WHILE IN OPERATION DO NOT TOUCH, KEEP CHILDREN AND CLOTHING AWAY. CONTACT MAY CAUSE SKIN BURNS. KEEP FURNISHINGS AND OTHER COMBUSTIBLE MATERIAL FAR AWAY FROM THE APPLIANCE. SEE NAMEPLATE AND INSTRUCTIONS**  
**ATTENTION: CHAUD LORS DE L'OPÉRATION. NE PAS TOUCHER, GARDEZ LES ENFANTS ET LES VÊTEMENTS LOIN DE L'ESPACE DÉSIGNÉ DE L'INSTALLATION. LE CONTACT PEUT CAUSER DES BRÛLURES À LA PEAU. GARDEZ LES MEUBLES ET LES MATÉRIAUX COMBUSTIBLES LOIN DE L'ESPACE DÉSIGNÉ DE L'APPAREIL. VOIR L'ÉTIQUETTE ET LES INSTRUCTIONS.**

LISTED ROOM HEATER, SOLID FUEL TYPE.  
 ALSO FOR USE IN MOBILE HOMES. (UM)  
 84-HUD. "For Use with Solid Wood Fuel Only"

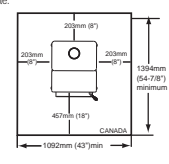
**PREVENT HOUSE FIRES**  
 Install and use only in accordance with manufacturer's installation and operating instructions. Contact local building or fire officials about restrictions and installation inspections in your area. Do not obstruct the space beneath heater.  
 For use only with leg and pedestal options intended for this model, refer to owner's manual for appropriate part numbers and installation instructions.  
**SUITABLE FOR MOBILE HOME INSTALLATION**  
**WARNING - For Mobile Homes:** Do not install in a sleeping room. An outside combustion air inlet must be provided and unrestricted while unit is in use. The structural integrity of the mobile home floor, ceiling and walls must be maintained. The stove needs to be properly grounded to the frame of the mobile home. Components required for mobile home installation: Outside Air Kit, Part Number OAK-ACC.  
 Refer to manufacturer's instructions and local codes for precautions required for passing chimney through a combustible wall or ceiling and maximum offsets. Inspect and clean chimney frequently. Under Certain Conditions of Use, Creosote Buildup May Occur Rapidly.  
 Do not connect this unit to a chimney serving another appliance.  
 Optional Components: Optional Blower, Part BK-ACC.  
 Electrical Rating: 115 VAC, 1.2 Amps, 60 Hz.  
 Route power cord away from unit. Do not route cord under or in front of appliance.  
**DANGER:** Risk of electrical shock. Disconnect power supply before servicing.  
 Replace glass only with 5mm ceramic available from your dealer.  
 Do not use grate or elevate fire. Build wood fire directly on hearth.  
 Do not overfire - if heater or chimney connector glows, you are overfiring.  
**OPERATE ONLY WITH DOORS CLOSED**  
 Open only to add fuel to the fire.  
 Do NOT operate before fully assembling components.  
**WARNING:** Only used approved wood fuel listed in owners manual. Burning any other fuel will void warranty.

**FLOOR PROTECTION:**  
 Floor protector must be (R value = 2.04) non-combustible material or equivalent, extending beneath heater and to front/sides/rear as indicated on the diagram below.  
 Exception: Non-combustible floor protectors must extend beneath the flue pipe when installed with horizontal venting and extend 2 inches (51mm) beyond each side.



APPAREIL DE CHAUFFAGE DE PIÈCE, DE TYPE DE COMBUSTIBLE SOLIDE, POUR USAGE DANS LES MAISONS MOBILES, (UM) 84 HUD. "Pour Usage Avec Bois Solide Seulement"  
**PRÉVENTION DES FEUX DE MAISON**  
 Installez et utilisez en accord avec les instructions d'installation et d'opération du fabricant. Contactez le bureau de la construction ou le bureau des incendies au sujet des restrictions et des inspections d'installation dans votre chambre à coucher. Un tuyau extérieur de combustion d'air doit être installé et ne doit pas être obstrué lorsque l'appareil est en usage. La structure intégrale du plancher, du plafond et des murs de la maison mobile doit être maintenue intacte. L'appareil de chauffage doit être fixé à la charpente de la maison mobile. Les composants requis pour l'installation des maisons mobiles: Assemblage d'air extérieur, Numéro de Pièce OAK-ACC.  
 Référez vous aux instructions du fabricant et des codes locaux pour les précautions requises pour passer une cheminée à travers un mur ou un plafond combustibles, et les compensations maximums.  
 Inspectez et nettoyez la cheminée fréquemment. Sous certaines conditions, il se peut que la créosote s'accumule rapidement.  
 Ne pas connecter cet appareil à une cheminée servant un autre appareil.  
 Composants Optionnels: Ventilateur Optionnel, Pièce BKST-350.  
 Puissance Électrique: 115 VAC, 1.2 Amps, 60 Hz.  
 Éloignez le fil électrique de l'appareil. Ne pas faire passer le fil électrique au dessus ou en dessous de l'appareil.  
**DANGER:** Il y a risque de décharge électrique. Déconnectez le fil électrique de la prise de contact avant le service.  
 Remplacez la vitre seulement avec une vitre céramique de 5 mm disponible chez votre fournisseur.  
 N'éveillez pas le feu. Bâissez le feu de bois directement sur râte.  
 Ne pas surchauffer. Si l'appareil de chauffage ou le tuyau de cheminée rougissent, vous surchauffez.  
 Opérez l'appareil seulement lorsque la porte de chargement est fermée. Ouvrez la porte seulement lorsque vous devez ajouter des combustibles dans le feu.  
 Ne mettez PAS le poêle en marche tant que tous les composants n'ont pas été entièrement assemblés.  
**ATTENTION:** Seulement utilisé carburant approuvé indiquée dans le manuel des propriétaires. La combustion d'autres combustibles annulera la garantie.

**PROTECTION DU PLANCHER:**  
 Protecteur de plancher doit être (valeur de R = 2.04) matériau non combustible ou équivalent, étendant sous chauffage et à l'avant/côtés/arrière comme indiqué sur le schéma ci-dessous.  
 Exception: protections de sol non combustibles doivent étendre au-dessous du conduit de fumée lorsqu'il est installé avec ventilation horizontale et d'étendre 2 pouces (51mm) au-delà de chaque côté.



Tested and Listed by **CULC** Portland Oregon USA  
 Omni-Test Laboratories, Inc.  
 Report / Rapport #0061WS092E

**QUADRA-FIRE**  
 TESTED TO/ TESTÉ À:  
 UL 1482-11 (R2015), ULC S627-00

Serial No. / N° de série

**HF**

BARCODE LABEL

**5700 Step Top ACC-C**

**VENT SPECIFICATIONS:**

**SINGLE WALL:** Six inch (6 inches) (152mm) diameter, minimum 24 MSG black or blued steel connector pipe, with a listed factory-built UL103HT\* Class "A" chimney, suitable for use with solid fuels, or a masonry chimney, and the referenced clearances.  
**DOUBLE WALL:** Six inch (6 inches) (152mm) diameter, listed double wall air insulated connector pipe with listed factory-built UL103HT\* Class "A" chimney, or a masonry chimney and the referenced clearances  
**MOBILE HOME:** Use double wall pipe by Dura-Vent DVL, Selkirk Metalbestos DS or Security DL double wall connector pipe. Must be equipped with a spark arrester. Apply double wall clearances below when installing unit.  
**MIN CLEARANCES TO COMBUSTIBLE MATERIALS:** Inches & (Millimeters)  
**NOTE:** All "A", "C" and "F" Dimensions are to inside diameter of flue collar.

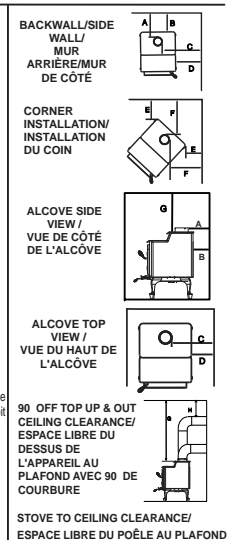
INSTALLATION: FULL VERTICAL	INSTALLATION: ENTièrement VERTICALE									
	A	B	C	D	E	F	G	H		
SINGLE WALL PIPE	12.5 (318)	10.5 (267)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	N/A	CONDUIT DU MUR SIMPLE	
DOUBLE WALL PIPE	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	N/A	CONDUIT DU MUR DOUBLE	
INSTALLATION: HORIZONTAL WITH MINIMUM 2 FT VERTICAL OFF STOVE TOP										
INSTALLATION: HORIZONTAL AVEC 609mm VERTICAL MINIMUM DU HAUT DU POÊLE										
SINGLE WALL PIPE	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	*	*	45 (1143)	18 (457)*	CONDUIT DU MUR SIMPLE	
DOUBLE WALL PIPE	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	*	*	45 (1143)	13 (330)	CONDUIT DU MUR DOUBLE	
INSTALLATION: 90° ELBOW OFF TOP OF STOVE THROUGH BACKWALL										
INSTALLATION: 90° DU COURBURE AU DESSUS DE HAUT DU POÊLE A TRAVERS LE MUR ARRIERE										
SINGLE WALL PIPE	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	18 (457)*	CONDUIT DU MUR SIMPLE	
DOUBLE WALL PIPE	9.5 (241)	7.5 (191)	25.5 (648)	15 (381)	2 (51)	12 (305)	45 (1143)	13 (330)	CONDUIT DU MUR DOUBLE	

**INSTALLATION: ALCÔVE - Six inch (6 inches) (152mm) diameter listed DOUBLE WALL air insulated connector pipe with UL103 HT\*\* listed factory-built Class "A" chimney, or a masonry chimney. (Mobile Home must be equipped with a spark arrester.) Maximum depth of Alcove shall be no more than 48 inches (1219mm) and the referenced alcove clearances.**  
**INSTALLATION: ALCÔVE - Six pouces (6 pouces) (152mm) de diamètre listé air isolé tuyau de raccordement à double paroi avec UL103 HT\*\* cotée Classe usine construite "A" cheminée ou une cheminée de maçonnerie. (Mobile Home doit être équipé d'un pare-étincelles.) Profondeur maximale de Alcove ne doit pas être plus de 48 pouces (1219mm) et les dégagements en alcove référencés.**

(\*\*In Canada must comply with Standard CAN/ULC-S629-M87 for the 650°C Factory-built chimney.)  
 (\*\*Au Canada doit conformer à CAN/ULC-S629-M87 la norme pour 650°C cheminée bâtit en usine.)

DOUBLE WALL PIPE	10.5 (268)	8.5 (216)	25.5 (648)	15 (381)	N/A	N/A	45 (1143)	*	CONDUIT DU MUR DOUBLE
------------------	------------	-----------	------------	----------	-----	-----	-----------	---	-----------------------

\* SEE PIPE MANUFACTURERS CLEARANCES - NOT TESTED



Manufactured by: **HEARTH & HOME technologies**  
 Fabriqué par: **HEARTH & HOME technologies**  
 352 Mountain House Road, Halifax, PA 17032  
 www.quadrafire.com

Made in U.S.A. of US and imported parts. **2017 2018 2019 Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.**  
 Fabriqué aux États-Unis-d'Amérique par des pièces d'origine américaine et pièces importées.  
**DO NOT REMOVE THIS LABEL / NE PAS ENLEVER L'ÉTIQUETTE**

**U.S. ENVIRONMENTAL PROTECTION AGENCY**  
 Certified to comply with 2020 particulate emission standards using crib wood at 1.8 G/HR EPA Method 28R, ASTM 2515-11 and CSA B415.1-10.  
 This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information.  
 It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual

7038-228\_R1

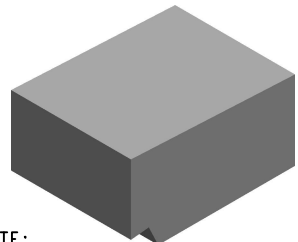
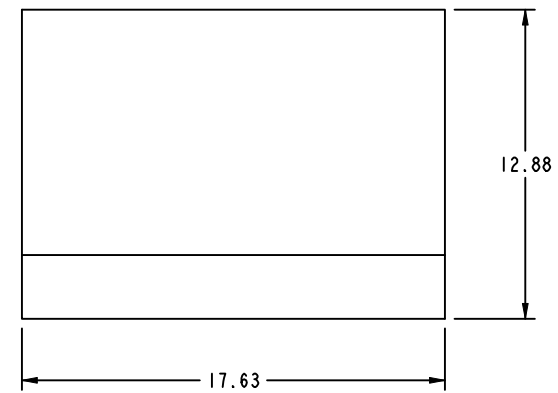
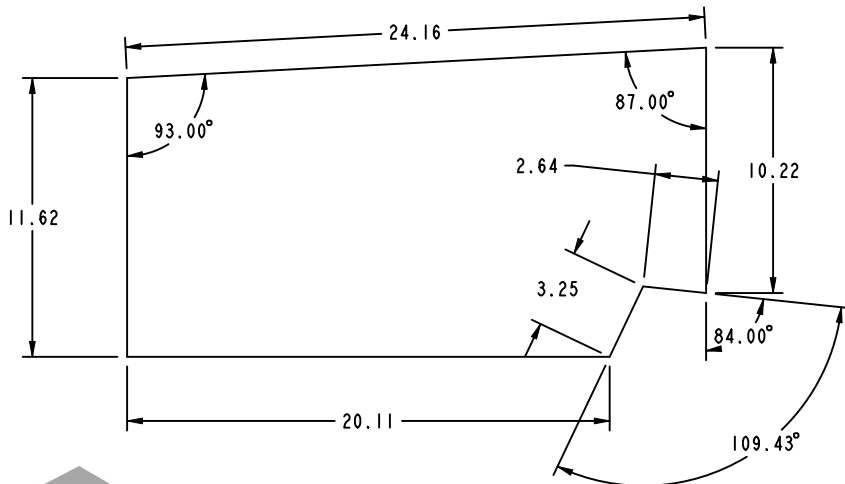
- NOTE:**
1. MATERIAL: NON-ANODIZED ALUMINUM 0.020 THICK
  2. BACKGROUND: SILVER
  3. COPY: BLACK & RED
  4. ADHESIVE: 3M #468 PERMANENT ACRYLIC
  5. TEMPERATURE RATING: -50 F TO 350 F

REV	REVISIONS	ECO #	DATE	BY	UNLESS OTHERWISE SPECIFIED DIMS ARE INCHES[MM] & ; TOLERANCES ARE: (2) PLACE DEC: ± 0.03 (3) PLACE DEC: ± 0.005 ANGLE: ± 2° FRACTION: ± 1/16	PART NAME:	LABEL				
1	NEW SAFETY LABEL		06/20/17	TPS	←← OUTSIDE MATERIAL. ←← NORMAL DIM & INSIDE MATERIAL. ←← OUTSIDE APEX ←← INSIDE APEX ←← DIMS ENCLOSED BY AN OVAL ARE CRITICAL DIMENSIONS	DRAWN BY: XXX	SCALE: NTS	MATERIAL: SEE NOTE			
					CONFIDENTIAL PROPERTY OF HEARTH & HOME TECHNOLOGIES INC.	THIS PRINT IS CHECKED AND CONTROLLED BY THE ENGINEERING DEPARTMENTS OF HEARTH & HOME TECHNOLOGIES INC.					
						SHEET: 1 OF 1		PART NUMBER: 7038-228	REV: 1		



*Model: 57ST-ACC-C  
Hearth and Home Technologies  
1445 North Highway  
Colville, WA 99114*

# **Appendix A Firebox Volume**



FIRE BOX VOLUME = 5042.65 cu. ft.

NOTE:  
 1. THIS DRAWING SHALL BE USED WITH SUPPLIED GEOMETRY FOR COMPLETE PRODUCT DEFINITION. UNLESS OTHERWISE SPECIFIED TOLERANCES FOR SUPPLIED GEOMETRY ARE:  
 ±0.005 FOR HOLES LESS THAN Ø2.000.  
 ±0.03 FOR HOLES GREATER THAN Ø2.00.  
 ±0.005 FOR INTERIOR GEOMETRY WITHIN 24.000 PROXIMITY.  
 ±0.03 FOR ALL OTHERS.

UNLESS OTHERWISE SPECIFIED DIMS ARE INCHES[mm] & TOLERANCES ARE: (2) PLACE DEC :±0.03 (3) PLACE DEC: ±0.005 ANGLE: ±2° FRACTION: ±1/16  
 ←←← OUTSIDE MATERIAL. ←←← NORMAL DIM & INSIDE MATERIAL. ←←← OUTSIDE APEX. ←←← INSIDE APEX - DIMS ENCLOSED BY AN OVAL ARE CRITICAL DIMENSIONS

01	PROTOTYPE	P16028	06/21/17	HEH
REV	REVISIONS	ECO #	DATE	BY

  
**HEARTH & HOME**  
 technologies  
 CONFIDENTIAL PROPERTY OF HEARTH & HOME TECHNOLOGIES INC.

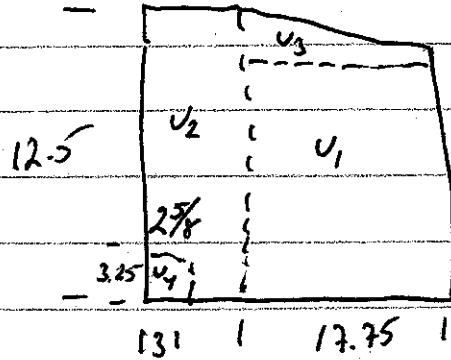
PART NAME: 57ST-ACC-C Volume	
DRAWN BY:	SCALE: 0.125
MATERIAL:	
THIS PRINT IS CHECKED AND CONTROLLED BY THE ENGINEERING DEPARTMENTS OF HEARTH & HOME TECHNOLOGIES INC.	
SHEET: 1 of 1	PART NUMBER: 7038-241
REV: 01	

Health & Home 5700

5/1/17

B Dams

H	W	D
11.875	17.625	2.4



$$U_1, 11.875 \times 17.625 \times 17.75 = 2.1499$$

$$U_2, 12.5 \times 17.625 \times 6.25 = 0.7968$$

$$U_3, \frac{0.625 \times 17.625 \times 17.75}{2} = 0.05657$$

3.00

$$U_4, 3.25 \times 17.625 \times 3$$

$$0.09945$$

$$2.90 \quad \#3$$

Project # 0061W5092E Date 7-7-17

Client Health & Home Tracking # 218

Model 57ST-Acc-C Initials AK