

**Non-Confidential Business Information
(Non-CBI)**

Certification Test Report

**Valley Comfort Systems Inc.
Wood-Fired Freestanding Room Heater
Model Series: Blaze King 20.2 Series
Models: SC 20.2, CK 20.2, AF20.2**

Prepared for: Valley Comfort Systems Inc.
1290 Commercial Way
Penticton, BC V2A 3H5
CANADA

Prepared by: OMNI-Test Laboratories, Inc.
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Test Period: August 22, 2017 – August 27, 2017

Original Report Date: November 2017

Report Revision Date: **July 15, 2021**

Report Number: 0142WS013E

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- Document Edition # 004 (07/15/21) -

*Model: Blaze King 20.2 Series
Valley Comfort Systems Inc.
1290 Commercial Way
Penticton, BC V2A 3H5 Canada*

AUTHORIZED SIGNATORIES

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

Evaluator:

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

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

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Section 1

Introduction

Sampling Procedure

Test Results

Individual Run Summaries – Certification Testing

Individual Run Summaries – Catalyst Equivalency Testing

Summary Tables

INTRODUCTION

Valley Comfort Systems Inc. retained *OMNI* to perform U.S. Environmental Protection Agency (EPA) certification testing on the Blaze King 20.2 Series wood stove. The Blaze King 20.2 Series wood stove is a catalytic-type room heater. The firebox is constructed of mild steel. Usable firebox volume was measured to be 1.82 cubic feet and the stove is vented through 6" collar located on the top of the appliance.

The testing was performed at Blaze King Industries located at 146 A St., in Walla Walla Washington. The altitude of the laboratory is 1,191 feet above sea level. The unit was received in good condition and logged in on 8/22/17. The tested unit was labeled with *OMNI* ID # 2253. *OMNI* representative Aaron Kravitz conducted tests 1 – 6, and Bruce Davis conducted test 7 of the certification testing and completed all testing by September 7, 2017. Two additional tests (tests 6 and 7) were performed to verify equivalency of the Applied Ceramics catalyst to the Clariant catalyst used during certification test numbers 1-5.

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 Blaze King 20.2 Series 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 20.2 Series was tested for thermal efficiency and carbon monoxide (CO) emissions in accordance with CSA B415.1-10 using Douglas Fir dimensional lumber.

An ambient filter (Background) was not operated during this series, there were no operations in the area that would have generated additional particulate into the ambient air. Running an ambient filter can only reduce emissions by backing out any particulate not generated by fuel in the appliance, it can never increase emissions. Tests conducted without an ambient filter are worse case.

Efficiency results were calculated using spread sheet Version 2.2 created 12/14/2009 and distributed by CSA. Example calculations for CSA B415.1 were not provided by CSA, spreadsheet is protected from modifications by means of a password.

SUMMARY OF RESULTS

The weighted average emissions of the four test runs included in the results indicate a particulate emission rate of 0.7 grams per hour. Testing on the 20.2 series consisted of four certification tests used for a weighted average (1, 2, 3, and 4), one fan confirmation test (5), and two catalyst confirmation tests (6-7). The 20.2 Series results are within the emission limit of 2.0 g/h. for affected appliances manufactured on or after May 15, 2020.

The catalyst equivalency tests met the requirements described in the letter data Dec 15, 2016 from the EPA office of compliance. Both the category 1 test and the category 4 test resulted in emissions rates below that of the original tests plus 0.5 g/hr.

The proportionality results for all 7 test runs were acceptable. Quality check results for each test run are presented in Section 3 of this report.

INDIVIDUAL RUN SUMMARIES – Certification Testing

Run 1 - Attempted category 2 burn rate at primary air setting of 9 degrees from horizontal setting on thermostat. Observed burn rate of 1.04 kg/hr. (category 2). Negative filter weights were identified during this test, negative values were either within tare tolerance of 0.2 mg or negative value can be seen as positive transfer weight on O-rings, or probe assembly. No sampling anomalies occurred, so this test run is valid and appropriate for inclusion in the weighted average.

Run 2 - Attempted category 3 burn rate at primary air setting of 36 degrees from horizontal setting on thermostat. Observed burn rate of 1.54 kg/hr. (category 3). Negative filter weights were identified during this test, negative values were either within tare tolerance of 0.2 mg or negative value can be seen as positive transfer weight on O-rings, or probe assembly. No sampling anomalies occurred, so this test run is valid and appropriate for inclusion in the weighted average.

Run 3 - Attempted category 4 burn rate at primary air setting of fully open (90 degrees from horizontal). Observed burn rate of 2.26 kg/hr. (category 4). Negative filter weights were identified during this test, negative values were either within tare tolerance of 0.2 mg or negative value can be seen as positive transfer weight on O-rings, or probe assembly. No sampling anomalies occurred, so this test run is valid and appropriate for inclusion in the weighted average.

Run 4 - Attempted category 1 burn rate at primary air setting of 0 degrees from horizontal (level) on thermostat; Observed burn rate of 0.60 kg/hr. (category 1). Negative filter weights were identified during this test, negative values were either within tare tolerance of 0.2 mg or negative value can be seen as positive transfer weight on O-rings, or probe assembly. No sampling anomalies occurred, so this test run is valid and appropriate for inclusion in the weighted average.

Run 5 - Fan confirmation test. Attempted category 2 burn rate at primary air setting of 36 degrees from horizontal setting on thermostat. This setting is equivalent to the setting used for category 3, but a slower burn was anticipated due to the disuse of the fan. Observed burn rate of 1.18 kg/hr. (category 2). Negative filter weights were identified during this test, negative values were either within tare tolerance of 0.2 mg or negative value can be seen as positive transfer weight on O-rings, or probe assembly. No sampling anomalies occurred, so this test run is valid and appropriate for inclusion in the weighted average.

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INDIVIDUAL RUN SUMMARIES – Catalyst equivalency testing

- Run 6 -** After retrofitting the unit with an Applied Ceramics catalyst, attempted category 4 burn rate at primary air setting of fully open (90 degrees from horizontal). Observed burn rate of 2.26 kg/hr. (category 4). Negative filter weights were identified during this test, negative values were either within tare tolerance of 0.2 mg or negative value can be seen as positive transfer weight on O-rings, or probe assembly. No sampling anomalies occurred, so this test run is valid and appropriate for catalyst equivalency determination.
- Run 7 -** Continued testing with alternate catalyst. Attempted category 1 burn rate at primary air setting of 0 degrees from horizontal (level) on thermostat; Observed burn rate of 0.59 kg/hr. (category 1). Negative filter weights were identified during this test, negative values were either within tare tolerance of 0.2 mg or negative value can be seen as positive transfer weight on O-rings, or probe assembly. No sampling anomalies occurred, so this test run is valid and appropriate for catalyst equivalency determination.

CATALYST EQUIVALENCY PROCEDURE LETTER



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF
COMPLIANCE

DEC 15 2016

Chris Neufeld
Vice President
Blaze King Industries, Inc.
146 A Street
Walla Walla, Washington 99362

RE: Blaze King Industries, Inc. (Blaze King) Request for Catalyst Suitable Replacement Procedures

Dear Mr. Neufeld:

This letter is in response to the February 3, 2016, Blaze King letter requesting the United States Environmental Protection Agency (EPA) implement a program to allow catalyst equipped wood heater manufacturers and suppliers to seek suitable replacement status during the life cycle of the product. As discussed below, replacement catalysts may be used if equivalency is properly demonstrated.

To have a catalyst deemed suitable for replacement, equivalency testing must be conducted by an EPA-approved test laboratory. Consistent with the 2015 Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces (Subpart AAA) (2015 Standards), the manufacturer must notify the EPA of the date that certification testing (catalyst equivalency testing) is scheduled to begin as stated in Section 60.534(g). This notice must be received by the EPA at least 30 days before the start of testing. EPA will consider the following steps to be adequate to demonstrate replacement catalyst equivalency:

- 1) The manufacturer uses the same test method as the original certification test was conducted. If the original certification test method is no longer valid, the manufacturer requests an alternative test method prior to testing.
- 2) The replacement catalyst is aged 50 hours prior to catalytic equivalency testing. The catalyst is tested in the same model or model line unit in which the original catalyst was tested.
- 3) Both a Category 1 run and Category 4 run are conducted by an EPA-approved test laboratory.

- 4) The new Category 1 run is compared to the original Category 1 run, and the new Category 4 run is compared to the original Category 4 run. The new runs are not more than 0.5 grams/hour greater than the original certification test results for each run. They are compared separately, with no averaging. In equation form:

Replacement catalyst category 1 \leq (original catalyst category 1 + 0.5g/hr)

AND

Replacement catalyst category 4 \leq (original catalyst category 4 + 0.5g/hr)

As noted in Section 60.533(k)(4)¹, the EPA Administrator must approve the change in the catalyst in advance, with proper documentation of the equivalency testing. This documentation consists of the original certification test report category 1 and 4 data and the new category 1 and 4 test data results. All demonstration test data must be sent to WoodHeaterReports@epa.gov within 60 days after the date of completing the test. EPA considers the catalyst equivalency testing to be a form of certification testing governed by the provisions in Section 60.534.

The EPA finds the request outside the scope of an applicability determination. The term "applicability determination" is limited to the Agency's formal decisions, issued in response to a non-hypothetical and site-specific request about the applicability of a specific rule to a specific facility. Therefore, the EPA considers this response to be a regulatory interpretation to a source request for clarification.²

This response has been prepared in consultation with the Office of Air Quality, Planning, and Standards, and the Office of General Counsel. If you have any questions, please contact Rafael Sanchez of my staff at 202-564-7028 or email at sanchez.rafael@epa.gov.

Sincerely,



Edward J. Messina, Director
Monitoring, Assistance, and Media Programs Division
Office of Compliance

¹ A change in the make, model or composition of a catalyst is presumed to affect particulate matter and carbon monoxide emissions and efficiency, unless the change has been requested by the heater manufacturer and has been approved in advance by the Administrator, based on test data that demonstrate that the replacement catalyst is equivalent to or better than the original catalyst in terms of particulate matter emission reduction.

² This regulatory interpretation updates EPA Applicability Determination WDS-138 (July 6, 1990).

SUMMARY TABLES

Table 1 – Particulate Emissions

| Run | Burn Rate (kg/hr dry) | ASTM E2515 Emissions (g/hr) |
|---|-----------------------|-----------------------------|
| 1 | 1.04 | 0.58 |
| 2 | 1.54 | 0.96 |
| 3 | 2.26 | 1.53 |
| 4 | 0.60 | 0.22 |
| 5 | 1.18 | 0.55 |
| Catalyst Equivalency Tests | | |
| 6 | 2.26 | 1.91 |
| 7 | 0.59 | 0.18 |
| Weighted particulate emission average of four test runs: 0.73 g/h | | |

Note: Run 5 is a fan confirmation and not included in the weighted average. Tests 6 and 7 are catalyst equivalence tests and not included in the weighted average.

Table 2 – Particulate Emissions (First Hour)

| Run | Emissions – 1 st Hour (g/hr) |
|-----------------------------------|---|
| 1 | 1.12 |
| 2 | 1.55 |
| 3 | 2.41 |
| 4 | 0.40 |
| 5 | 1.41 |
| Catalyst Equivalency Tests | |
| 6 | 2.00 |
| 7 | 0.29 |

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 | 15,450 | 78.99% | 85.37% | 1.69 | 26.37 | 0.46 |
| 2 | 22,295 | 77.09% | 83.32% | 2.74 | 41.86 | 1.07 |
| 3 | 29,785 | 70.35% | 76.04% | 2.67 | 37.25 | 1.40 |
| 4 | 8,900 | 79.12% | 85.51% | 2.50 | 39.14 | 0.39 |
| 5 | 16,254 | 73.57% | 79.51% | 1.96 | 28.55 | 0.56 |
| Catalyst Equivalency Tests | | | | | | |
| 6 | 28,562 | 67.92% | 73.41% | 2.85 | 38.30 | 1.43 |
| 7 | 8,847 | 80.63% | 87.15% | 2.25 | 35.86 | 0.35 |
| Weighted average HHV efficiency of four test runs: 77.4% . | | | | | | |
| Average CO Emissions: 0.83 g/min. Weighted Average CO Emissions: 0.74 g/min. | | | | | | |

Note: See note from Table 1.

Table 4 – Test Facility Conditions

| Run | Room Temp (°F) | | Barometric Pressure (Hg) | | Air Velocity (ft/min) | |
|-----------------------------------|----------------|-------|--------------------------|--------|-----------------------|-------|
| | Before | After | Before | After | Before | After |
| 1 | 83 | 79 | 28.69 | 28.64 | <50 | <50 |
| 2 | 79 | 79 | 28.72 | 28.70 | <50 | <50 |
| 3 | 85 | 82 | 28.68 | 28.60 | <50 | <50 |
| 4 | 77 | 75 | 28.58 | 28.59 | <50 | <50 |
| 5 | 69 | 75 | 28.76 | 28.74 | <50 | <50 |
| Catalyst Equivalency Tests | | | | | | |
| 6 | 77 | 78 | 28.68 | 28.64 | <50 | <50 |
| 7 | 73 | 79 | 28.74* | 28.57* | <50 | <50 |

*hand notes show sea-level corrected data. All calculations performed with uncorrected values.

Table 5 – Fuel Measurement and Crib Description Summary – PRETEST

| Run | Pretest Fuel Weight (lbs) | Pretest Moisture (Dry basis - %) | Coal Bed Weight (lbs) |
|-----------------------------------|----------------------------------|---|------------------------------|
| 1 | 14.3 | 21.65 | 2.8 |
| 2 | 14.3 | 20.21 | 2.5 |
| 3 | 14.9 | 22.41 | 3.2 |
| 4 | 14.7 | 21.41 | 3.0 |
| 5 | 14.9 | 22.41 | 3.0 |
| Catalyst Equivalency Tests | | | |
| 6 | 14.9 | 22.41 | 2.9 |
| 7 | 14.3 | 20.72 | 2.8 |

Table 6 – Fuel Measurement and Crib Description Summary – TEST

| Run | Test Fuel Wet Basis (lbs) | Firebox Volume (ft³) | Loading Density Wet Basis (lbs/ft³) | Test Fuel Dry Basis (lbs) | Length (in) | 2x4s Used | 4x4s Used |
|-----------------------------------|----------------------------------|--|---|----------------------------------|--------------------|------------------|------------------|
| 1 | 12.7 | 1.82 | 7.06 | 10.6 | 13 | 3 | 2 |
| 2 | 12.1 | 1.82 | 6.65 | 9.9 | 13 | 3 | 2 |
| 3 | 13.0 | 1.82 | 7.14 | 10.7 | 13 | 3 | 2 |
| 4 | 12.2 | 1.82 | 6.70 | 10.0 | 13 | 3 | 2 |
| 5 | 11.9 | 1.82 | 6.54 | 9.8 | 13 | 3 | 2 |
| Catalyst Equivalency Tests | | | | | | | |
| 6 | 12.0 | 1.82 | 6.59 | 9.9 | 13 | 3 | 2 |
| 7 | 11.6 | 1.82 | 6.37 | 9.7 | 13 | 3 | 2 |

Table 7 – Dilution Tunnel Gas Measurements and Sampling Data Summary

| Average Dilution Tunnel Gas Measurements | | | | |
|---|-----------------------------|--------------------------|-----------------------------|-------------------------|
| Run | Length of Test (min) | Velocity (ft/sec) | Flow Rate (dscf/min) | Temperature (°F) |
| 1 | 276 | 14.87 | 156.61 | 94.5 |
| 2 | 175 | 13.45 | 140.72 | 98.8 |
| 3 | 129 | 13.66 | 138.56 | 114.9 |
| 4 | 454 | 13.16 | 140.73 | 84.4 |
| 5 | 227 | 13.33 | 141.55 | 91.4 |
| Catalyst Equivalency Tests | | | | |
| 6 | 120 | 13.70 | 137.73 | 120.6 |
| 7 | 450 | 13.08 | 139.41 | 87.3 |

Table 8 - Average Temperature Data

| Run | Beginning Surface Temperature Average^a | Ending Surface Temperature Average^a | Surface Delta T^b |
|---|--|---|------------------------------------|
| 1 | 407 | 393 | 14 |
| 2 | 500 | 439 | 61 |
| 3 | 508 | 462 | 46 |
| 4 | 325 | 286 | 39 |
| 5 | 423 | 452 | 29 |
| Catalyst Equivalency Tests | | | |
| 6 | 477 | 470 | 7 |
| 7 | 298 | 277 | 21 |
| a. All temperatures are in degrees F. | | | |
| b. Represents the difference between beginning and ending average surface temperatures. | | | |

Table 9 – Pretest Configuration

| Run | Combustion Air | Fuel Added | Fuel Removed | Time (min) |
|-----------------------------------|----------------------------------|-------------------|---------------------|-------------------|
| 1 | 9 degrees from horizontal | N/A | N/A | 60 |
| 2 | 36 degrees from horizontal | N/A | N/A | 107 |
| 3 | 90 degrees from horizontal (max) | N/A | N/A | 77 |
| 4 | 0 degrees from horizontal | N/A | N/A | 75 |
| 5 | 36 degrees from horizontal | N/A | N/A | 119 |
| Catalyst Equivalency Tests | | | | |
| 6 | 90 degrees from horizontal (max) | N/A | -0.4 lb @ 63 min | 78 |
| 7 | 0 degrees from horizontal | N/A | N/A | 60 |

Table 10 – Test Configurations

| Run | Five-Minute Startup Procedures | Combustion Air |
|-----------------------------------|--|----------------------------------|
| 1 | <u>Fuel Loading:</u> Fuel loaded by 45 seconds. <u>Bypass:</u> Closed entire test. <u>Door:</u> Open for 50 seconds then closed for remainder of test. <u>Primary Air:</u> Fully open until 4:45 minutes then quickly set to test setting. <u>Fan:</u> Turned off for the first 30 minutes then turned to medium low for the remainder of the test. | 9 degrees from horizontal |
| 2 | <u>Fuel Loading:</u> Fuel loaded by 30 seconds. <u>Bypass:</u> Closed entire test. <u>Door:</u> Open for 35 seconds then closed for remainder of test. <u>Primary Air:</u> Fully open until 4:50 minutes then quickly set to test setting. <u>Fan:</u> Turned off for the first 30 minutes then turned to medium high for the remainder of the test. | 36 degrees from horizontal |
| 3 | <u>Fuel Loading:</u> Fuel loaded by 30 seconds. <u>Bypass:</u> Closed entire test. <u>Door:</u> Open for 35 seconds then closed for remainder of test. <u>Primary Air:</u> Fully open for the entire test. <u>Fan:</u> Turned off for the first 30 minutes then turned to high for the remainder of the test. | 90 degrees from horizontal (max) |
| 4 | <u>Fuel Loading:</u> Fuel loaded by 30 seconds. <u>Bypass:</u> Closed entire test. <u>Door:</u> Open for 35 seconds then closed for remainder of test. <u>Primary Air:</u> Fully open until 4:25 minutes then quickly set to test setting. <u>Fan:</u> Turned off for the first 30 minutes then turned to low for the remainder of the test. | 0 degrees from horizontal |
| 5 | <u>Fuel Loading:</u> Fuel loaded by 30 seconds. <u>Bypass:</u> Closed entire test. <u>Door:</u> Open for 40 seconds then closed for remainder of test. <u>Primary Air:</u> Fully open until 4:55 minutes then quickly set to test setting. <u>Fan:</u> Turned off for the first the entire test. | 36 degrees from horizontal |
| Catalyst Equivalency Tests | | |
| 6 | <u>Fuel Loading:</u> Fuel loaded by 40 seconds. <u>Bypass:</u> Closed entire test. <u>Door:</u> Open for 45 seconds then closed for remainder of test. <u>Primary Air:</u> Fully open for the entire test. <u>Fan:</u> Turned off for the first 30 minutes then turned to high for the remainder of the test. | 90 degrees from horizontal (max) |
| 7 | <u>Fuel Loading:</u> Fuel loaded by 25 seconds. <u>Bypass:</u> Closed entire test. <u>Door:</u> Open for 27 seconds then closed for remainder of test. <u>Primary Air:</u> Fully open until 5 minutes then quickly set to test setting. <u>Fan:</u> Turned off for the first 30 minutes then turned to low for the remainder of the test. | 0 degrees from horizontal |

Section 2

**Appliance Photographs
Fuel Photographs
Appliance Description**

APPLIANCE PHOTOGRAPHS



Appliance Front/Right



Appliance Front/Left



Appliance Rear/Left



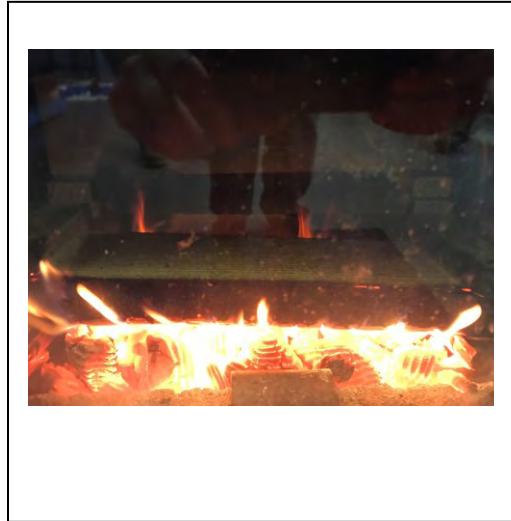
Appliance Right

FUEL PHOTOGRAPHS
Test Dates: August 29, 2017 – September 7, 2017

Run 1 – Fuel



Run 1 – Newly Loaded Stove



Run 2 – Fuel



Run 2 – Newly Loaded Stove



Run 3 – Fuel



Run 3 – Newly Loaded Stove



Run 4 – Fuel



Run 4 – Newly Loaded Stove



Run 5 – Fuel



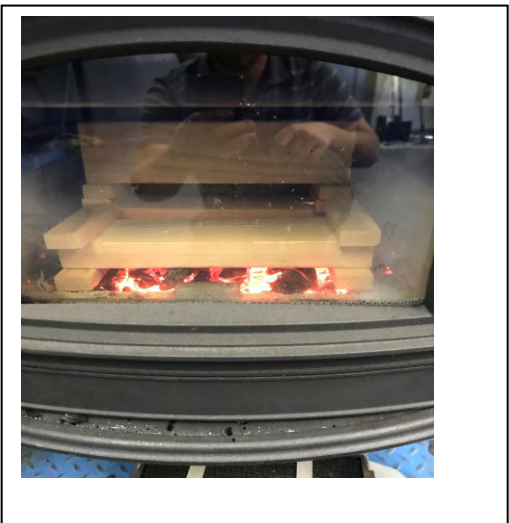
Run 5 – Newly Loaded Stove



Run 6 – Fuel



Run 6 – Newly Loaded Stove



Run 7 – Fuel



Run 7 – Newly Loaded Stove



APPLIANCE PHOTOGRAPHS – SEALED

Sealed Unit – Front



Sealed Catalyst



APPLIANCE DESCRIPTION

Appliance Manufacturer: Valley Comfort Systems Inc.

Wood Stove Model: Sirocco 20.2

Additional Models: The Blaze King 20.2 series comes in three models: the Ashford (AF) 20.2, the Sirocco (SC) 20.2, and Chinook (CK) 20.2. The air intake, thermostat, internal air tubes, internal firebox dimensions, combustor position, bypass mechanisms, and flue exhaust are the exact same for each unit. Where the units differ from each other is with respect to external, aesthetic features.

The CK20.2 is a European styled stove which is supported by slender legs in each corner with large 16 gauge shields that span from stove top to floor on either side of the unit. The SC20.2 is a modern style stove with the option of either a pedestal mount or cast iron legs. The AF20.2 comes dressed in a full cast iron shell (front with affixed door, sides, top, trim pieces and legs) in multiple color options. It has a standard ash drawer and an optional fan kit that attaches to the permanent, rear heat shield.

Type: Catalytic, thermostatic, freestanding woodstove with an optional room air blower.

Materials of Construction: The unit is constructed primarily of mild steel with a cast iron shell. The firebox is lined with pumice firebrick that measures 9" by 4.5". The feed door has a 10-7/8-inch by 17-7/8-inch glass panel and 7/8-inch rope gasket.

Air Introduction System: Air enters the firebox through an opening located at the rear/bottom of the appliance.

Combustion Control Mechanisms: The combustion air inlet is controlled by a dial knob at the top/rear of the appliance on the right side.

Combustor: Clariant or Applied Ceramics – 10.65" x 4" x 2" – verified by catalyst equivalency testing.

Internal Baffles: A steel baffle is mounted in the upper portion of the firebox. The flame path is forced to the front of the firebox where it travels up through the opening into the catalyst.

Other Features: Optional fan accessory.

Flue Outlet: The 6-inch diameter flue outlet is located at the top of the unit.

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

Section 3

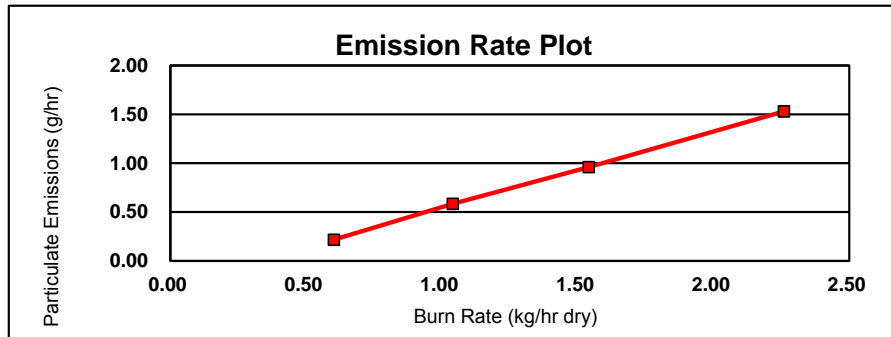
Test Data by Run

EPA Weighted Average Emissions EPA Method 28R

Client: Valley Comfort
 Stove Model: Sirocco 20.2
 Test Dates: 8/22/17 - 8/25/17
 Project Number: 0142WS013E
 Tracking Number: 2253

Status: Final
 Stove Type: Catalytic Stove

| | |
|--|--------------|
| Emissions (g/hr): | 0.731 |
| Weighted Averages HHV Efficiency (%): | 77.4 |
| LHV Efficiency (%): | 83.6 |



| | | |
|-----------------------|-------------|--------|
| Run # | 4 | |
| Burn Rate (dry kg/hr) | 0.60 | |
| Category | 1 | |
| LHV Efficiency (%) | 85.5 | |
| HHV Efficiency (%) | 79.1 | |
| Emissions (g/hr) | 0.217408841 | |
| Weighting Factor | 0.402 | 21.83% |

| | | |
|-----------------------|-------------|--------|
| Run # | 1 | |
| Burn Rate (dry kg/hr) | 1.04 | |
| Category | 2 | |
| LHV Efficiency (%) | 85.37462576 | |
| HHV Efficiency (%) | 78.99066045 | |
| Emissions (g/hr) | 0.584627778 | |
| Weighting Factor | 0.673 | 36.59% |

| | | |
|-----------------------|-------------|--------|
| Run # | 2 | |
| Burn Rate (dry kg/hr) | 1.54 | |
| Category | 3 | |
| LHV Efficiency (%) | 83.31777324 | |
| HHV Efficiency (%) | 77.08761094 | |
| Emissions (g/hr) | 0.96 | |
| Weighting Factor | 0.538 | 29.26% |

| | | |
|-----------------------|-------------|--------|
| Run # | 3 | |
| Burn Rate (dry kg/hr) | 2.26 | |
| Category | 4 | |
| LHV Efficiency (%) | 76.03505809 | |
| HHV Efficiency (%) | 70.34946744 | |
| Emissions (g/hr) | 1.529845688 | |
| Weighting Factor | 0.227 | 12.33% |

Conditioning Data - ASTM E2780/ ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/18/17 - 8/24/17
 Technician: Charlie Bishop
 Operation Category: II - III

Applied Ceramics V3 Catalyst Aging, operated for 50 hours at medium using fuel with 18 - 28% moisture.

| Elapsed Time (hr) | Fuel Weight (lbs) | Flue Gas Temp (° F) | Catalyst Exit Temp (° F) |
|-------------------|-------------------|---------------------|--------------------------|
| 0 | 17.9 | 316.3 | 669.5 |
| 1 | 9.2 | 512.9 | 1153.4 |
| 2 | 2.1 | 347.5 | 956.3 |
| 3 | 4.8 | 402.6 | 1151.4 |
| 4 | 0.4 | 342.9 | 921.6 |
| 5 | 3.6 | 371.0 | 1055.5 |
| 6 | 8.7 | 405.5 | 1108.9 |
| 7 | 2.2 | 364.3 | 977.1 |
| 8 | 0.0 | 330.1 | 864.7 |
| 9 | 19.8 | 388.2 | 1114.4 |
| 10 | 11.9 | 386.3 | 1122.7 |
| 11 | 3.6 | 382.3 | 1142.3 |
| 12 | 0.2 | 318.8 | 852.9 |
| 13 | 19.7 | 259.3 | 1076.3 |
| 14 | 14.1 | 273.3 | 1128.7 |
| 15 | 10.0 | 246.5 | 1037.4 |
| 16 | 6.9 | 248.1 | 1047.6 |
| 17 | 4.3 | 222.4 | 922.0 |
| 18 | 3.1 | 226.4 | 842.8 |
| 19 | 1.9 | 229.7 | 822.1 |
| 20 | 0.8 | 232.2 | 756.4 |
| 21 | 0.0 | 232.1 | 649.2 |
| 22 | 19.4 | 414.8 | 1241.5 |
| 23 | 7.9 | 397.0 | 1239.0 |
| 24 | 1.5 | 343.2 | 988.0 |
| 25 | 17.2 | 390.8 | 1007.9 |

| Elapsed Time (hr) | Fuel Weight (lbs) | Flue Gas Temp (° F) | Catalyst Exit Temp (° F) |
|-------------------|-------------------|---------------------|--------------------------|
| 26 | 13.2 | 187.4 | 716.2 |
| 27 | 9.4 | 238.3 | 943.3 |
| 28 | 5.5 | 207.7 | 1052.6 |
| 29 | 2.7 | 183.2 | 931.8 |
| 30 | 1.1 | 192.4 | 827.8 |
| 31 | 0.0 | 184.4 | 768.4 |
| 32 | 18.8 | 125.4 | 628.5 |
| 33 | 10.9 | 281.2 | 899.1 |
| 34 | 7.2 | 239.9 | 968.7 |
| 35 | 4.5 | 204.9 | 974.2 |
| 36 | 2.8 | 224.0 | 832.3 |
| 37 | 1.4 | 229.2 | 814.3 |
| 38 | 0.5 | 220.8 | 747.6 |
| 39 | 12.7 | 505.0 | 1242.0 |
| 40 | 2.9 | 268.5 | 992.3 |
| 41 | 12.4 | 193.4 | 452.5 |
| 42 | 9.1 | 307.4 | 1032.6 |
| 43 | 5.7 | 235.0 | 803.8 |
| 44 | 4.2 | 231.7 | 732.0 |
| 45 | 2.0 | 269.3 | 1048.1 |
| 46 | 0.9 | 209.1 | 676.3 |
| 47 | 0.0 | 214.5 | 675.8 |
| 48 | 19.2 | 245.7 | 423.4 |
| 49 | 14.9 | 154.8 | 821.3 |
| 50 | 12.5 | 177.9 | 920.2 |

Highlighted "Time" cells reflect fuel loading times.

Technician Signature: _____

Conditioning Data - ASTM E2780/ ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/18/17 - 8/24/17
 Technician: Charlie Bishop
 Operation Category: II - III

Clariant Catalyst Aging, operated for 50 hours at medium using fuel with 18 - 28% moisture.

| Elapsed Time (hr) | Fuel Weight (lbs) | Flue Gas Temp (° F) | Catalyst Exit Temp (° F) |
|-------------------|-------------------|---------------------|--------------------------|
| 0 | 11.7 | 141.0 | 560.0 |
| 1 | 0.9 | 374.0 | 872.0 |
| 2 | 11.8 | 265.0 | 479.0 |
| 3 | 3.4 | 380.0 | 1021.0 |
| 4 | 12.7 | 405.0 | 1028.0 |
| 5 | 5.0 | 395.0 | 983.0 |
| 6 | 1.1 | 345.0 | 773.0 |
| 7 | 11.3 | 423.0 | 958.0 |
| 8 | 2.6 | 349.0 | 763.0 |
| 9 | 12.7 | 289.0 | 892.0 |
| 10 | 5.6 | 491.0 | 576.0 |
| 11 | 0.6 | 333.0 | 703.0 |
| 12 | 13.3 | 406.0 | 952.0 |
| 13 | 3.3 | 344.0 | 845.0 |
| 14 | 13.0 | 190.0 | 269.0 |
| 15 | 10.5 | 221.0 | 504.0 |
| 16 | 8.0 | 193.0 | 545.0 |
| 17 | 6.0 | 168.0 | 534.0 |
| 18 | 4.3 | 171.0 | 503.0 |
| 19 | 3.0 | 188.0 | 483.0 |
| 20 | 2.1 | 188.0 | 507.0 |
| 21 | 1.3 | 192.0 | 486.0 |
| 22 | 0.5 | 212.0 | 474.0 |
| 23 | 12.7 | 290.0 | 385.0 |
| 24 | 9.1 | 275.0 | 798.0 |
| 25 | 5.7 | 239.0 | 782.0 |

| Elapsed Time (hr) | Fuel Weight (lbs) | Flue Gas Temp (° F) | Catalyst Exit Temp (° F) |
|-------------------|-------------------|---------------------|--------------------------|
| 26 | 3.2 | 227.0 | 762.0 |
| 27 | 1.8 | 234.0 | 587.0 |
| 28 | 0.7 | 244.0 | 526.0 |
| 29 | 15.8 | 362.0 | 496.0 |
| 30 | 4.6 | 257.0 | 508.0 |
| 31 | 11.4 | 223.0 | 536.0 |
| 32 | 8.6 | 402.0 | 763.0 |
| 33 | 1.2 | 365.0 | 795.0 |
| 34 | 16.2 | 289.0 | 767.0 |
| 35 | 4.0 | 316.0 | 789.0 |
| 36 | 3.2 | 278.0 | 745.0 |
| 37 | 10.5 | 167.0 | 741.0 |
| 38 | 7.1 | 276.0 | 638.0 |
| 39 | 4.1 | 256.0 | 613.0 |
| 40 | 2.3 | 213.0 | 598.0 |
| 41 | 1.2 | 198.0 | 643.0 |
| 42 | 0.3 | 186.0 | 510.0 |
| 43 | 11.7 | 151.0 | 579.0 |
| 44 | 2.4 | 289.0 | 648.0 |
| 45 | 16.5 | 246.0 | 708.0 |
| 46 | 5.7 | 367.0 | 662.0 |
| 47 | 3.1 | 310.0 | 677.0 |
| 48 | 2.7 | 297.0 | 692.0 |
| 49 | 13.2 | 256.0 | 626.0 |
| 50 | 8.0 | 343.0 | 601.0 |


Highlighted "Time" cells reflect fuel loading times.

Technician Signature: _____

RUN 1

Wood Heater Preburn Data - ASTM E2780

Run: 1

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/22/17
 Beginning Clock Time: 12:34

Preburn Fuel Data

Fuel Piece Lengths (in.): 13
 Total Preburn Weight (lb): 14.3


| | | | |
|---------------------------|--------------|-------------|-------------|
| | <u>22.0</u> | <u>24.6</u> | <u>24.4</u> |
| Moisture Readings (% DB): | <u>19.9</u> | <u>19.3</u> | <u>19.8</u> |
| | <u>21.1</u> | <u>23.1</u> | |
| | <u>21.7</u> | <u>20.6</u> | |
| Avg PB Moisture (% DB): | <u>21.65</u> | | |

Coal Bed Range (lb): **2.5** (min) **3.2** (max)

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | Stack | Ambient |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-----|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | | | |
| 0 | 3.0 | -0.02 | 671 | 565 | 334 | 475 | 464 | 502 | 145 | 85 | |
| 1 | 3.0 | -0.019 | 662 | 562 | 332 | 469 | 459 | 497 | 143 | 84 | |
| 2 | 3.4 | -0.018 | 653 | 559 | 330 | 464 | 453 | 492 | 142 | 84 | |
| 3 | 3.5 | -0.018 | 644 | 556 | 328 | 457 | 448 | 487 | 140 | 84 | |
| 4 | 3.4 | -0.017 | 635 | 553 | 326 | 452 | 442 | 482 | 139 | 85 | |
| 5 | 3.4 | -0.017 | 627 | 550 | 324 | 446 | 437 | 477 | 137 | 85 | |
| 6 | 3.4 | -0.016 | 619 | 547 | 321 | 439 | 432 | 472 | 135 | 85 | |
| 7 | 3.4 | -0.015 | 610 | 544 | 318 | 435 | 426 | 467 | 134 | 85 | |
| 8 | 3.4 | -0.015 | 603 | 541 | 316 | 429 | 421 | 462 | 133 | 85 | |
| 9 | 3.4 | -0.015 | 595 | 538 | 313 | 424 | 416 | 457 | 132 | 85 | |
| 10 | 3.4 | -0.015 | 588 | 535 | 310 | 418 | 411 | 452 | 131 | 84 | |
| 11 | 3.4 | -0.014 | 581 | 532 | 308 | 413 | 406 | 448 | 133 | 84 | |
| 12 | 3.4 | -0.014 | 574 | 530 | 304 | 409 | 402 | 444 | 133 | 85 | |
| 13 | 3.4 | -0.015 | 568 | 527 | 301 | 404 | 398 | 440 | 136 | 85 | |
| 14 | 3.4 | -0.015 | 562 | 525 | 299 | 400 | 394 | 436 | 138 | 85 | |
| 15 | 3.4 | -0.015 | 557 | 523 | 295 | 397 | 390 | 432 | 143 | 85 | |
| 16 | 3.4 | -0.015 | 553 | 520 | 292 | 392 | 387 | 429 | 144 | 85 | |
| 17 | 3.4 | -0.016 | 550 | 519 | 290 | 389 | 384 | 426 | 145 | 85 | |
| 18 | 3.4 | -0.016 | 546 | 517 | 287 | 386 | 382 | 424 | 148 | 85 | |
| 19 | 3.4 | -0.016 | 543 | 516 | 284 | 384 | 379 | 421 | 153 | 84 | |
| 20 | 3.4 | -0.016 | 540 | 515 | 282 | 381 | 378 | 419 | 156 | 85 | |
| 21 | 3.3 | -0.016 | 537 | 514 | 280 | 379 | 376 | 417 | 156 | 84 | |
| 22 | 3.3 | -0.017 | 535 | 513 | 277 | 377 | 374 | 415 | 159 | 85 | |
| 23 | 3.3 | -0.017 | 533 | 513 | 276 | 376 | 373 | 414 | 159 | 85 | |
| 24 | 3.3 | -0.017 | 531 | 513 | 275 | 375 | 372 | 413 | 163 | 84 | |
| 25 | 3.3 | -0.017 | 529 | 513 | 273 | 374 | 372 | 412 | 168 | 84 | |
| 26 | 3.3 | -0.018 | 527 | 514 | 271 | 374 | 371 | 411 | 164 | 84 | |
| 27 | 3.3 | -0.019 | 526 | 515 | 270 | 373 | 371 | 411 | 168 | 84 | |
| 28 | 3.2 | -0.02 | 524 | 515 | 270 | 374 | 370 | 411 | 169 | 85 | |
| 29 | 3.2 | -0.019 | 522 | 515 | 269 | 373 | 369 | 410 | 170 | 84 | |
| 30 | 3.2 | -0.02 | 520 | 514 | 268 | 373 | 368 | 409 | 171 | 84 | |
| 31 | 3.2 | -0.02 | 518 | 513 | 268 | 373 | 366 | 408 | 172 | 85 | |
| 32 | 3.2 | -0.02 | 516 | 512 | 267 | 372 | 365 | 406 | 170 | 85 | |
| 33 | 3.1 | -0.02 | 514 | 510 | 265 | 373 | 364 | 405 | 176 | 84 | |
| 34 | 3.1 | -0.02 | 512 | 509 | 264 | 372 | 363 | 404 | 175 | 84 | |
| 35 | 3.1 | -0.021 | 511 | 508 | 264 | 372 | 361 | 403 | 176 | 84 | |
| 36 | 3.1 | -0.021 | 509 | 507 | 263 | 371 | 360 | 402 | 178 | 84 | |

Wood Heater Preburn Data - ASTM E2780

Run: 1

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/22/17
 Beginning Clock Time: 12:34

Preburn Fuel Data

Fuel Piece Lengths (in.): 13
 Total Preburn Weight (lb): 14.3

| | | | |
|---------------------------|--------------|-------------|-------------|
| | <u>22.0</u> | <u>24.6</u> | <u>24.4</u> |
| Moisture Readings (% DB): | <u>19.9</u> | <u>19.3</u> | <u>19.8</u> |
| | <u>21.1</u> | <u>23.1</u> | |
| | <u>21.7</u> | <u>20.6</u> | |
| Avg PB Moisture (% DB): | <u>21.65</u> | | |

Coal Bed **2.5** **3.2**
 Range (lb): (min) (max)

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | Stack | Ambient |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-----|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | | | |
| 37 | 3.1 | -0.022 | 507 | 506 | 263 | 371 | 359 | 401 | 179 | 84 | |
| 38 | 3.1 | -0.023 | 506 | 505 | 261 | 372 | 357 | 400 | 181 | 84 | |
| 39 | 3.1 | -0.023 | 505 | 504 | 260 | 370 | 358 | 399 | 184 | 85 | |
| 40 | 3.1 | -0.023 | 504 | 504 | 259 | 371 | 357 | 399 | 183 | 84 | |
| 41 | 3.0 | -0.023 | 504 | 505 | 258 | 370 | 357 | 399 | 184 | 84 | |
| 42 | 3.0 | -0.023 | 504 | 506 | 258 | 370 | 357 | 399 | 184 | 84 | |
| 43 | 3.0 | -0.023 | 504 | 508 | 257 | 370 | 357 | 399 | 187 | 84 | |
| 44 | 3.0 | -0.023 | 504 | 509 | 257 | 371 | 357 | 400 | 184 | 84 | |
| 45 | 3.0 | -0.023 | 504 | 511 | 256 | 371 | 357 | 400 | 186 | 84 | |
| 46 | 3.0 | -0.023 | 504 | 513 | 255 | 371 | 358 | 400 | 184 | 84 | |
| 47 | 2.9 | -0.023 | 504 | 515 | 255 | 371 | 358 | 401 | 186 | 84 | |
| 48 | 2.9 | -0.023 | 504 | 517 | 255 | 370 | 358 | 401 | 182 | 84 | |
| 49 | 2.9 | -0.023 | 504 | 519 | 255 | 370 | 358 | 401 | 188 | 84 | |
| 50 | 2.9 | -0.023 | 505 | 521 | 254 | 370 | 358 | 402 | 184 | 84 | |
| 51 | 2.9 | -0.023 | 504 | 522 | 254 | 370 | 358 | 402 | 183 | 84 | |
| 52 | 2.9 | -0.024 | 504 | 524 | 254 | 370 | 358 | 402 | 184 | 84 | |
| 53 | 2.9 | -0.024 | 505 | 525 | 253 | 370 | 358 | 402 | 185 | 84 | |
| 54 | 2.8 | -0.026 | 505 | 525 | 253 | 369 | 358 | 402 | 186 | 84 | |
| 55 | 2.8 | -0.024 | 505 | 526 | 253 | 370 | 358 | 402 | 188 | 85 | |
| 56 | 2.8 | -0.024 | 506 | 526 | 253 | 369 | 358 | 402 | 190 | 84 | |
| 57 | 2.8 | -0.024 | 507 | 527 | 254 | 369 | 357 | 403 | 189 | 85 | |
| 58 | 2.8 | -0.024 | 507 | 527 | 254 | 369 | 357 | 403 | 191 | 85 | |
| 59 | 2.8 | -0.024 | 507 | 527 | 254 | 369 | 358 | 403 | 186 | 84 | |
| 60 | 2.8 | -0.024 | 508 | 527 | 253 | 368 | 357 | 403 | 189 | 84 | |

Wood Heater Test Fuel Data - ASTM E2780

| | |
|---------------|----------------|
| Manufacturer: | Valley Comfort |
| Model: | 20.2 Series |
| Tracking No.: | 2253 |
| Project No.: | 0142WS013E |
| Test Date: | 8/22/2017 |
| Run No.: | 1 |

| | | | |
|-----------|-------|----------|------|
| PB Time | 12:00 | 12% Cal: | 12.0 |
| PB Temp | 78 | 22% Cal: | 22.0 |
| Test Time | 12:00 | | |
| Test Temp | 80 | | |

| | |
|------------------------------------|-----|
| Firebox Volume (ft ³): | 1.8 |
| Fuel Piece Length (in): | 13 |
| 2x4 Crib Weight (lb): | 5.7 |
| 4x4 Crib Weight (lb): | 7 |


| | |
|--|----------|
| Total Fuel Weight (Dry Basis, lb): | 10.6 |
| Fuel Density (lb/ft ³ , Dry Basis): | 30.10 OK |
| Loading Density (lb/ft ³ , Wet) | 7.06 OK |
| 2x4 Percentage: | 45% OK |

Coal Bed Range (20-25%): **2.54 - 3.175**

| Test Fuel Piece | Weight (lb) | Size | Readings (Dry Basis %) | | | Dry Weight (lb) |
|-----------------|-------------|--------|------------------------|------|------|-----------------|
| 1 | 1.6 | 2"x 4" | 18.6 | 19.0 | 19.1 | 1.35 |
| 2 | 1.4 | 2"x 4" | 19.9 | 20.6 | 20.5 | 1.16 |
| 3 | 1.4 | 2"x 4" | 19.3 | 18.6 | 21.0 | 1.17 |
| 4 | 3.3 | 4"x 4" | 23.2 | 23.8 | 23.2 | 2.67 |
| 5 | 3.3 | 4"x 4" | 19.0 | 19.8 | 19.7 | 2.76 |

Spacer Readings (Dry Basis %)

| | |
|------|------|
| 16.7 | 8.2 |
| 17.5 | 17.8 |
| 21.9 | 16.2 |
| 18.1 | 16.4 |
| 22.3 | 19.7 |
| 13.3 | 22.3 |
| 22.2 | 22.5 |

Technician Signature: 

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: 1

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 22-Aug-17
 Beginning Clock Time: 14:29

Total Sampling Time: 276 min
 Recording Interval: 1 min

Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.003 (1) 0.997 (2) N/A (Amb)

Barometric Pressure: Begin Middle End Average
28.69 28.68 28.64 28.67 "Hg

OMNI Equipment Numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

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: -0.170 "H2O

Tunnel Area: 0.19635 ft²
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 14.87 ft/sec.
 Initial Tunnel Flow: 155.5 scfm
 Average Tunnel Flow: 156.6 scfm

Post-Test Leak Check (1): 0.000 cfm @ -15 in. Hg
 Post-Test Leak Check (2): 0.000 cfm @ -17 in. Hg

Average Test Piece Fuel Moisture: 20.35 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 | 0.040 | 0.050 | 0.054 | 0.036 | 0.040 | 0.054 | 0.050 | 0.038 | 0.054 |
| Temp: | 90 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |

V_{strav} 14.82 ft/sec V_{scnt} 16.07 ft/sec F_p 0.922

| Elapsed Time (min) | Particulate Sampling Data | | | | | | | | | | | | | | Fuel Weight (lb) | | Temperature Data (°F) | | | | | | | | | | | | | | Stack Gas Data | | |
|--------------------|--------------------------------|--------------------------------|---------------------|---------------------|----------------------------------|-------------------|----------------------|----------------------------------|-------------------|----------------------|----------------------|---------------------------|-------------|-------------|------------------|---------------|-----------------------|----------------|--------------|--------------|---------------|--------------------|---------------|-------|----------|--------------|----------|--------------|---------|---------------------------|---------------------|--------|--|
| | Gas Meter 1 (ft ³) | Gas Meter 2 (ft ³) | Sample Rate 1 (cfm) | Sample Rate 2 (cfm) | Orifice dH 1 ("H ₂ O) | Meter 1 Temp (°F) | Meter 1 Vacuum ("Hg) | Orifice dH 2 ("H ₂ 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 | Catalyst Exit | Stack | Filter 1 | Dryer Exit 1 | Filter 2 | Dryer Exit 2 | Ambient | Draft ("H ₂ O) | CO ₂ (%) | CO (%) | |
| 256 | 38.360 | 37.390 | 0.15 | 0.15 | 1.81 | 78 | -1.03 | 1.32 | 77 | -0.8 | 93 | 0.054 | 101 | 100 | 0.5 | 0 | 496 | 519 | 267 | 366 | 349 | 399 | 748 | 248 | 85 | 71 | 85 | 72 | 86 | -0.021 | 6.69 | -0.01 | |
| 257 | 38.511 | 37.537 | 0.15 | 0.15 | 1.81 | 78 | -1.04 | 1.29 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.4 | -0.1 | 495 | 521 | 267 | 365 | 348 | 399 | 746 | 246 | 85 | 71 | 85 | 72 | 85 | -0.021 | 6.14 | -0.01 | |
| 258 | 38.662 | 37.684 | 0.15 | 0.15 | 1.82 | 78 | -1.04 | 1.33 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.4 | 0 | 494 | 522 | 268 | 365 | 348 | 399 | 745 | 245 | 85 | 71 | 85 | 72 | 86 | -0.021 | 6.05 | -0.01 | |
| 259 | 38.813 | 37.832 | 0.15 | 0.15 | 1.81 | 78 | -1.03 | 1.36 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.4 | 0 | 495 | 522 | 267 | 364 | 348 | 399 | 745 | 239 | 85 | 71 | 85 | 72 | 86 | -0.021 | 5.91 | -0.01 | |
| 260 | 38.963 | 37.978 | 0.15 | 0.15 | 1.78 | 78 | -1.04 | 1.35 | 78 | -0.8 | 94 | 0.054 | 100 | 100 | 0.4 | 0 | 493 | 523 | 268 | 363 | 347 | 399 | 743 | 246 | 85 | 71 | 85 | 72 | 86 | -0.021 | 5.94 | -0.01 | |
| 261 | 39.115 | 38.126 | 0.15 | 0.15 | 1.77 | 78 | -1.03 | 1.34 | 78 | -0.8 | 94 | 0.054 | 101 | 101 | 0.4 | 0 | 493 | 524 | 267 | 362 | 346 | 398 | 741 | 246 | 85 | 71 | 85 | 72 | 85 | -0.020 | 5.86 | -0.01 | |
| 262 | 39.266 | 38.272 | 0.15 | 0.15 | 1.81 | 78 | -1.04 | 1.34 | 78 | -0.8 | 94 | 0.054 | 101 | 100 | 0.3 | -0.1 | 492 | 525 | 266 | 362 | 345 | 398 | 740 | 248 | 85 | 71 | 85 | 72 | 85 | -0.021 | 5.95 | -0.01 | |
| 263 | 39.418 | 38.418 | 0.15 | 0.15 | 1.81 | 78 | -1.03 | 1.32 | 78 | -0.8 | 94 | 0.054 | 101 | 100 | 0.3 | 0 | 491 | 527 | 266 | 360 | 344 | 398 | 739 | 251 | 85 | 71 | 85 | 72 | 86 | -0.021 | 5.99 | -0.01 | |
| 264 | 39.568 | 38.565 | 0.15 | 0.15 | 1.82 | 78 | -1.04 | 1.29 | 78 | -0.8 | 94 | 0.054 | 100 | 100 | 0.3 | 0 | 491 | 528 | 265 | 359 | 343 | 397 | 738 | 246 | 85 | 71 | 85 | 72 | 86 | -0.020 | 6.01 | -0.01 | |
| 265 | 39.719 | 38.713 | 0.15 | 0.15 | 1.81 | 78 | -1.04 | 1.34 | 78 | -0.8 | 94 | 0.054 | 101 | 101 | 0.3 | 0 | 490 | 529 | 265 | 358 | 342 | 397 | 737 | 250 | 85 | 71 | 85 | 72 | 85 | -0.021 | 5.88 | -0.01 | |
| 266 | 39.870 | 38.860 | 0.15 | 0.15 | 1.77 | 78 | -1.04 | 1.37 | 78 | -0.8 | 93 | 0.054 | 101 | 100 | 0.3 | 0 | 489 | 530 | 265 | 357 | 341 | 396 | 735 | 247 | 85 | 71 | 85 | 72 | 85 | -0.021 | 5.86 | -0.01 | |
| 267 | 40.022 | 39.007 | 0.15 | 0.15 | 1.80 | 78 | -1.04 | 1.35 | 78 | -0.8 | 93 | 0.054 | 101 | 100 | 0.2 | -0.1 | 488 | 530 | 264 | 356 | 340 | 396 | 733 | 247 | 85 | 71 | 85 | 72 | 86 | -0.021 | 5.91 | -0.01 | |
| 268 | 40.173 | 39.154 | 0.15 | 0.15 | 1.81 | 78 | -1.04 | 1.35 | 78 | -0.8 | 93 | 0.054 | 101 | 100 | 0.2 | 0 | 487 | 531 | 263 | 355 | 340 | 395 | 731 | 248 | 85 | 71 | 85 | 72 | 86 | -0.021 | 6.02 | -0.01 | |
| 269 | 40.324 | 39.300 | 0.15 | 0.15 | 1.81 | 78 | -1.03 | 1.32 | 78 | -0.8 | 93 | 0.054 | 101 | 100 | 0.2 | 0 | 486 | 532 | 264 | 355 | 339 | 395 | 730 | 246 | 85 | 71 | 85 | 72 | 85 | -0.021 | 6.1 | -0.01 | |
| 270 | 40.475 | 39.447 | 0.15 | 0.15 | 1.81 | 78 | -1.03 | 1.30 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.2 | 0 | 485 | 532 | 263 | 354 | 338 | 394 | 729 | 243 | 85 | 71 | 85 | 72 | 86 | -0.021 | 5.95 | -0.01 | |
| 271 | 40.626 | 39.595 | 0.15 | 0.15 | 1.78 | 78 | -1.03 | 1.33 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.2 | 0 | 484 | 533 | 263 | 353 | 338 | 394 | 727 | 242 | 85 | 71 | 85 | 72 | 86 | -0.021 | 5.91 | -0.01 | |
| 272 | 40.777 | 39.743 | 0.15 | 0.15 | 1.77 | 78 | -1.03 | 1.36 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.1 | -0.1 | 483 | 533 | 263 | 353 | 337 | 394 | 725 | 250 | 85 | 71 | 85 | 72 | 85 | -0.021 | 6.13 | -0.01 | |
| 273 | 40.929 | 39.890 | 0.15 | 0.15 | 1.81 | 78 | -1.03 | 1.35 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.1 | 0 | 482 | 534 | 262 | 352 | 337 | 393 | 724 | 246 | 85 | 71 | 85 | 72 | 85 | -0.021 | 6.13 | -0.01 | |
| 274 | 41.081 | 40.037 | 0.15 | 0.15 | 1.80 | 78 | -1.04 | 1.35 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.1 | 0 | 481 | 535 | 262 | 352 | 336 | 393 | 723 | 248 | 85 | 71 | 85 | 72 | 86 | -0.021 | 6.14 | -0.01 | |
| 275 | 41.231 | 40.184 | 0.15 | 0.15 | 1.82 | 78 | -1.04 | 1.32 | 77 | -0.8 | 93 | 0.054 | 100 | 101 | 0.1 | 0 | 480 | 535 | 262 | 351 | 336 | 393 | 721 | 245 | 85 | 71 | 85 | 72 | 86 | -0.021 | 6.12 | -0.01 | |
| 276 | 41.382 | 40.331 | 0.15 | 0.15 | 1.81 | 78 | -1.04 | 1.31 | 77 | -0.8 | 93 | 0.054 | 101 | 101 | 0.0 | -0.1 | 479 | 536 | 262 | 351 | 336 | 393 | 720 | 243 | 85 | 71 | 85 | 72 | 86 | -0.021 | 6.18 | -0.01 | |
| Avg/Tot | 41.382 | 40.331 | 0.15 | 0.15 | 1.77 | 78 | | 1.33 | 78 | | 94 | 0.054 | 100 | 100 | | | | | | | | 13.8 | | | 73 | 85 | 73 | 85 | -0.029 | | | | |

Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort Equipment Numbers: 283A, 637, 592
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Run #: 1
 Date: 8/22/17

TRAIN 1 (First Hour emissions)

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| B. Front filter catch | Filter | D225 | 120.5 | 119.5 | 1.0 |
| 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: 1.0

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 | D226 | 122.6 | 121.5 | 1.1 |
| C. Rear filter catch | Filter | D227 | 120.5 | 120.2 | 0.3 |
| D. Probe catch* | Probe | 3 | 116010.6 | 116010.6 | 0.0 |
| E. Filter seals catch* | Seals | R501 | 3285.3 | 3285.3 | 0.0 |

Sub-Total Total Particulate, mg: 1.4

Train 1 Aggregate Total Particulate, mg: 2.4

TRAIN 2

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch | Filter | D228 | 123.7 | 121.9 | 1.8 |
| B. Rear filter catch | Filter | D229 | 119.7 | 119.8 | -0.1 |
| C. Probe catch* | Probe | 22 | 114344.6 | 114344.5 | 0.1 |
| D. Filter seals catch* | Seals | R502 | 3423.9 | 3423.3 | 0.6 |

Total Particulate, mg: 2.4


AMBIENT

| Sample Component | Reagent | Filter # or Probe # | Weights | | |
|------------------------|---------|---------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch* | Filter | | | | 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 Results - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Project No.: 0142WS013E
 Tracking No.: 2253
 Run: 1
 Test Date: 08/22/17

| | |
|--|-----------------------|
| Burn Rate | 1.04 kg/hr dry |
| Average Tunnel Temperature | 94 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 14.87 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 9396.3 dscf/hour |
| Average Delta p | 0.054 inches H2O |
| Total Time of Test | 276 minutes |

| | AMBIENT | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 | FIRST HOUR FILTER (TRAIN 1) |
|---|-----------------------|-----------------------|-----------------------|-----------------------------|
| Total Sample Volume - Vm | 0.000 cubic feet | 41.382 cubic feet | 40.331 cubic feet | 8.859 cubic feet |
| Average Gas Meter Temperature | 85 degrees Fahrenheit | 78 degrees Fahrenheit | 78 degrees Fahrenheit | 77 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 0.000 dscf | 39.207 dscf | 37.960 dscf | 8.400 dscf |
| Total Particulates - m _n | 0 mg | 2.4 mg | 2.4 mg | 1 mg |
| Particulate Concentration (dry-standard) - C _r /C _s | 0.000000 grams/dscf | ##### grams/dscf | 0.00006 grams/dscf | 0.00012 grams/dscf |
| Total Particulate Emissions - E _T | 0.00 grams | 2.65 grams | 2.73 grams | 1.12 grams |
| Particulate Emission Rate | 0.00 grams/hour | 0.58 grams/hour | 0.59 grams/hour | 1.12 grams/hour |
| Emissions Factor | | 0.55 g/kg | 0.57 g/kg | 0.80 g/kg |
| Difference from Average Total Particulate Emissions | | 0.04 grams | 0.04 grams | |

Dual Train Comparison Results Are Acceptable

| FINAL AVERAGE RESULTS | |
|--|------------------------|
| Complete Test Run | |
| Total Particulate Emissions - E _T | 2.69 grams |
| Particulate Emission Rate | 0.58 grams/hour |
| Emissions Factor | 0.56 grams/kg |
| First Hour Emissions | |
| Total Particulate Emissions - E _T | 1.12 grams |
| Particulate Emission Rate | 1.12 grams/hour |
| Emissions Factor | 0.80 grams/kg |
| 7.5% of Average Total Particulate Emissions | 0.20 grams |

| 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 |
| Train A - Train B G/KG ≤ 0.5 | 0.02 |
| Total PM Precision (%) | 1.62 |
| Stove Surface ΔT | OK |

Wood Heater Efficiency Results - CSA B415.1

Manufacturer: Valley Comfort
Model: 20.2 Series
Date: 08/22/17
Run: 1
Control #: 0142WS013E
Test Duration: 276
Output Category: II

Technician Signature: 

Test Results in Accordance with CSA B415.1-09

| | HHV Basis | LHV Basis |
|--------------------------|-----------|-----------|
| Overall Efficiency | 78.99% | 85.4% |
| Combustion Efficiency | 98.5% | 98.5% |
| Heat Transfer Efficiency | 80% | 86.6% |

| | | | |
|--------------------|--------|--------|---------|
| Output Rate (kJ/h) | 16,287 | 15,450 | (Btu/h) |
| Burn Rate (kg/h) | 1.04 | 2.29 | (lb/h) |
| Input (kJ/h) | 20,619 | 19,559 | (Btu/h) |

| | | | |
|---------------------------|-------------|-------|--------|
| Test Load Weight (dry kg) | 4.79 | 10.55 | dry lb |
| MC wet (%) | 16.91131668 | | |
| MC dry (%) | 20.35 | | |
| Particulate (g) | 0.58 | | |
| CO (g) | 126 | | |
| Test Duration (h) | 4.60 | | |

| Emissions | Particulate | CO |
|------------------|-------------|-------|
| g/MJ Output | 0.01 | 1.69 |
| g/kg Dry Fuel | 0.12 | 26.37 |
| g/h | 0.13 | 27.45 |
| lb/MM Btu Output | 0.02 | 3.92 |

| | |
|----------------------|-------|
| Air/Fuel Ratio (A/F) | 14.32 |
|----------------------|-------|

VERSION:

2.2

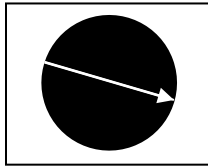
12/14/2009

Wood Heater Run Notes

Air Control Settings

Primary:

Medium Low:
9° From Horizontal



Secondary: Auto

Tertiary/Pilot: Fixed

Fan: On Med Low

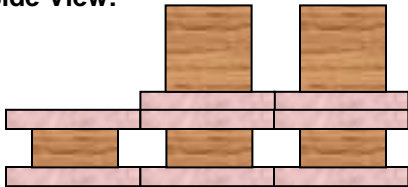
Preburn Notes

| Time | Notes |
|------|-----------------------------|
| 0:00 | Reduced air to test setting |

Test Notes

Sketch test fuel configuration:

Side View:



Start up procedures & Timeline:

Bypass: Closed

Fuel loaded by: 0:45

Door closed at: 0:50

Primary air: Set @ 4:45

Notes: None

| Time | Notes |
|-------------------|---|
| 30:00 | Set fan to test setting |
| 60:00 | Replaced Filter A |
| 188:00- 193:00 | Optical encoder sticking, assume constant sample rate |

Ah

Wood Heater Supplemental Data

Start Time: 14:29

Booth #: N/A (site testing)

Stop Time: 19:05

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0 @ -15" Hg

B: 0 @ -18" Hg

Calibrations: Span Gas CO₂: 17.00 CO: 4.267

| | Pre Test | | Post Test | |
|-----------------|----------|-------|-----------|-------|
| | Zero | Span | Zero | Span |
| Time | 13:20 | 13:25 | 19:11 | 19:14 |
| CO ₂ | 0.00 | 17.01 | 0.14 | 16.93 |
| CO | 0.000 | 4.268 | 0.008 | 4.239 |

Air Velocity (ft/min): Initial: <50 Final: <50

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

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (in): 6

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 8/21/17 Initials: Adh

| | Initial | Middle | Ending |
|------------------------|---------|--------|--------|
| P _b (in/Hg) | 28.69 | 28.68 | 28.64 |
| RH (%) | 36.6 | 34.7 | 33.3 |
| Ambient (°F) | 76 | 80 | 79 |

| Tunnel Traverse | | |
|---------------------|--------------------------|-------|
| Microtector Reading | dP (in H ₂ O) | T(°F) |
| 0.020 | 0.040 | 90 |
| 0.025 | 0.050 | 91 |
| 0.027 | 0.054 | 91 |
| 0.018 | 0.036 | 91 |
| 0.020 | 0.040 | 91 |
| 0.027 | 0.054 | 91 |
| 0.025 | 0.050 | 91 |
| 0.018 | 0.038 | 91 |
| Center: | | |
| .027 | 0.054 | 91 |

Background Filter Volume: N/A

| Tunnel Static Pressure (in H ₂ O): | |
|---|-------------|
| Beginning of Test | End of Test |
| -0.17 | -0.17 |

Adh

RUN 2

Wood Heater Preburn Data - ASTM E2780

Run: 2

Technician Signature:

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/23/17
 Beginning Clock Time: 8:38


| Preburn Fuel Data | | |
|--------------------------------|--------------|------|
| Fuel Piece Lengths (in.): | <u>13</u> | |
| Total Preburn Weight (lb): | <u>14.3</u> | |
| Fuel Moisture Readings (% DB): | 19.4 | 18.6 |
| | 21.4 | 22.3 |
| | 19.7 | 23.8 |
| | 19.3 | 19.9 |
| | 19 | 18.7 |
| Avg Preburn Moisture (% DB): | <u>20.21</u> | |

| | | |
|----------------------|--------------|--------------|
| Coal Bed Range (lb): | 2.4 (min) | 3.0 (max) |
|----------------------|--------------|--------------|

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | Stack | Ambient |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-----|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | | | |
| 0 | 14.3 | -0.048 | 630 | 512 | 261 | 381 | 408 | 438.3 | 358 | 76 | |
| 1 | 14.1 | -0.049 | 636 | 509 | 255 | 375 | 403 | 435.7 | 365 | 76 | |
| 2 | 14 | -0.049 | 642 | 506 | 250 | 369 | 398 | 433.3 | 364 | 76 | |
| 3 | 13.8 | -0.049 | 645 | 503 | 245 | 365 | 394 | 430.5 | 367 | 76 | |
| 4 | 13.6 | -0.049 | 650 | 500 | 241 | 362 | 390 | 428.7 | 372 | 76 | |
| 5 | 13.5 | -0.05 | 656 | 496 | 237 | 358 | 388 | 427 | 371 | 76 | |
| 6 | 13.3 | -0.05 | 664 | 493 | 234 | 355 | 385 | 426.2 | 381 | 76 | |
| 7 | 13.1 | -0.05 | 670 | 490 | 230 | 352 | 383 | 425.2 | 382 | 76 | |
| 8 | 12.9 | -0.051 | 680 | 487 | 228 | 350 | 382 | 425.3 | 390 | 77 | |
| 9 | 12.8 | -0.051 | 689 | 483 | 225 | 348 | 380 | 425 | 398 | 76 | |
| 10 | 12.6 | -0.051 | 699 | 480 | 223 | 348 | 380 | 425.7 | 402 | 77 | |
| 11 | 12.4 | -0.052 | 708 | 477 | 221 | 348 | 379 | 426.5 | 407 | 76 | |
| 12 | 12.2 | -0.052 | 714 | 474 | 219 | 346 | 380 | 426.5 | 410 | 77 | |
| 13 | 11.9 | -0.053 | 724 | 471 | 218 | 347 | 380 | 427.9 | 417 | 76 | |
| 14 | 11.7 | -0.052 | 731 | 468 | 217 | 348 | 382 | 429.2 | 415 | 77 | |
| 15 | 11.6 | -0.053 | 738 | 466 | 216 | 349 | 384 | 430.4 | 414 | 77 | |
| 16 | 11.3 | -0.053 | 745 | 463 | 215 | 350 | 386 | 431.9 | 420 | 76 | |
| 17 | 11.1 | -0.053 | 752 | 461 | 215 | 352 | 389 | 433.7 | 420 | 77 | |
| 18 | 10.9 | -0.053 | 761 | 459 | 214 | 353 | 393 | 435.9 | 420 | 77 | |
| 19 | 10.7 | -0.053 | 769 | 457 | 214 | 356 | 397 | 438.7 | 424 | 77 | |
| 20 | 10.4 | -0.053 | 776 | 455 | 214 | 358 | 401 | 440.8 | 422 | 77 | |
| 21 | 10.2 | -0.053 | 783 | 453 | 214 | 362 | 406 | 443.7 | 421 | 76 | |
| 22 | 10 | -0.053 | 788 | 452 | 214 | 367 | 410 | 446.2 | 425 | 77 | |
| 23 | 9.8 | -0.052 | 785 | 451 | 214 | 372 | 415 | 447.4 | 429 | 77 | |
| 24 | 9.7 | -0.052 | 778 | 450 | 215 | 375 | 420 | 447.6 | 426 | 77 | |
| 25 | 9.6 | -0.051 | 771 | 448 | 216 | 379 | 423 | 447.5 | 412 | 77 | |
| 26 | 9.4 | -0.051 | 765 | 447 | 216 | 383 | 426 | 447.4 | 409 | 77 | |
| 27 | 9.3 | -0.05 | 757 | 446 | 217 | 384 | 427 | 446.4 | 390 | 77 | |
| 28 | 9.2 | -0.05 | 749 | 445 | 217 | 385 | 426 | 444.3 | 388 | 77 | |
| 29 | 9.1 | -0.05 | 740 | 444 | 218 | 386 | 424 | 442.6 | 383 | 77 | |
| 30 | 9 | -0.05 | 733 | 443 | 218 | 386 | 423 | 440.7 | 379 | 78 | |
| 31 | 8.9 | -0.049 | 727 | 442 | 218 | 385 | 422 | 438.8 | 383 | 78 | |
| 32 | 8.8 | -0.049 | 721 | 441 | 219 | 383 | 420 | 436.7 | 377 | 78 | |
| 33 | 8.7 | -0.049 | 715 | 440 | 218 | 383 | 419 | 435.2 | 369 | 78 | |
| 34 | 8.6 | -0.049 | 712 | 439 | 218 | 383 | 418 | 434 | 375 | 78 | |
| 35 | 8.5 | -0.049 | 708 | 439 | 218 | 385 | 416 | 433.1 | 368 | 78 | |
| 36 | 8.4 | -0.049 | 707 | 438 | 218 | 384 | 415 | 432.4 | 359 | 78 | |
| 37 | 8.2 | -0.05 | 708 | 438 | 217 | 384 | 417 | 432.8 | 375 | 78 | |
| 38 | 8 | -0.051 | 717 | 438 | 217 | 388 | 422 | 436.4 | 384 | 78 | |

Wood Heater Preburn Data - ASTM E2780

Run: 2

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/23/17
 Beginning Clock Time: 8:38


| Preburn Fuel Data | | |
|--------------------------------|--------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | |
| Total Preburn Weight (lb): | <u>14.3</u> | |
| | <u>19.4</u> | <u>18.6</u> |
| Fuel Moisture Readings (% DB): | <u>21.4</u> | <u>22.3</u> |
| | <u>19.7</u> | <u>23.8</u> |
| | <u>19.3</u> | <u>19.9</u> |
| | <u>19</u> | <u>18.7</u> |
| Avg Preburn Moisture (% DB): | <u>20.21</u> | |

| | | |
|----------------------|---------------------|---------------------|
| Coal Bed Range (lb): | <u>2.4</u> (min) | <u>3.0</u> (max) |
|----------------------|---------------------|---------------------|

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | Stack | Ambient |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-----|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | | | |
| 39 | 7.8 | -0.051 | 729 | 438 | 217 | 393 | 429 | 441.4 | 389 | 78 | |
| 40 | 7.6 | -0.052 | 743 | 439 | 218 | 401 | 435 | 447.2 | 398 | 78 | |
| 41 | 7.4 | -0.052 | 755 | 441 | 218 | 409 | 441 | 452.7 | 400 | 78 | |
| 42 | 7.2 | -0.052 | 767 | 443 | 219 | 414 | 447 | 458.1 | 402 | 78 | |
| 43 | 7 | -0.053 | 777 | 445 | 219 | 420 | 454 | 463.3 | 413 | 79 | |
| 44 | 6.8 | -0.052 | 785 | 448 | 220 | 428 | 462 | 468.6 | 406 | 78 | |
| 45 | 6.7 | -0.052 | 785 | 450 | 224 | 435 | 469 | 472.5 | 404 | 78 | |
| 46 | 6.5 | -0.049 | 778 | 451 | 230 | 451 | 479 | 477.8 | 371 | 78 | |
| 47 | 6.4 | -0.049 | 776 | 452 | 235 | 459 | 487 | 481.6 | 365 | 79 | |
| 48 | 6.3 | -0.048 | 773 | 453 | 240 | 465 | 492 | 484.4 | 352 | 78 | |
| 49 | 6.2 | -0.048 | 770 | 454 | 243 | 471 | 494 | 486.4 | 349 | 79 | |
| 50 | 6 | -0.048 | 768 | 456 | 247 | 478 | 495 | 488.5 | 350 | 79 | |
| 51 | 5.9 | -0.047 | 768 | 457 | 250 | 485 | 497 | 491.2 | 350 | 78 | |
| 52 | 5.8 | -0.048 | 769 | 458 | 252 | 490 | 499 | 493.5 | 352 | 79 | |
| 53 | 5.6 | -0.047 | 772 | 459 | 256 | 495 | 501 | 496.7 | 345 | 78 | |
| 54 | 5.5 | -0.047 | 775 | 460 | 258 | 499 | 503 | 499 | 343 | 78 | |
| 55 | 5.4 | -0.046 | 777 | 462 | 261 | 503 | 504 | 501.3 | 335 | 79 | |
| 56 | 5.2 | -0.047 | 779 | 463 | 264 | 507 | 504 | 503.5 | 335 | 78 | |
| 57 | 5.1 | -0.048 | 780 | 464 | 267 | 514 | 504 | 505.9 | 334 | 79 | |
| 58 | 5 | -0.048 | 780 | 466 | 270 | 519 | 504 | 507.7 | 328 | 79 | |
| 59 | 4.9 | -0.049 | 780 | 467 | 273 | 522 | 504 | 509.2 | 325 | 79 | |
| 60 | 4.8 | -0.047 | 778 | 468 | 276 | 526 | 503 | 510.6 | 326 | 79 | |
| 61 | 4.7 | -0.047 | 777 | 470 | 278 | 529 | 503 | 511.5 | 318 | 79 | |
| 62 | 4.6 | -0.046 | 774 | 471 | 281 | 532 | 502 | 512.3 | 312 | 79 | |
| 63 | 4.5 | -0.046 | 771 | 473 | 284 | 536 | 501 | 513 | 309 | 79 | |
| 64 | 4.4 | -0.047 | 768 | 474 | 286 | 536 | 501 | 513.1 | 305 | 79 | |
| 65 | 4.3 | -0.047 | 767 | 476 | 288 | 537 | 501 | 513.7 | 308 | 79 | |
| 66 | 4.2 | -0.046 | 767 | 478 | 290 | 538 | 503 | 515.1 | 312 | 78 | |
| 67 | 4.1 | -0.046 | 767 | 480 | 291 | 540 | 505 | 516.7 | 311 | 79 | |
| 68 | 4 | -0.046 | 767 | 483 | 293 | 541 | 508 | 518.6 | 308 | 79 | |
| 69 | 3.9 | -0.046 | 768 | 486 | 294 | 541 | 509 | 519.5 | 307 | 79 | |
| 70 | 3.9 | -0.045 | 767 | 489 | 296 | 541 | 511 | 520.6 | 297 | 79 | |
| 71 | 3.8 | -0.045 | 765 | 492 | 297 | 541 | 512 | 521.7 | 297 | 79 | |
| 72 | 3.7 | -0.044 | 762 | 496 | 298 | 541 | 513 | 522 | 297 | 79 | |
| 73 | 3.6 | -0.044 | 760 | 499 | 299 | 543 | 513 | 523 | 294 | 79 | |
| 74 | 3.6 | -0.045 | 757 | 503 | 300 | 543 | 514 | 523.4 | 293 | 79 | |
| 75 | 3.5 | -0.044 | 754 | 507 | 301 | 541 | 513 | 523.2 | 292 | 79 | |
| 76 | 3.5 | -0.044 | 749 | 511 | 301 | 539 | 514 | 522.6 | 283 | 79 | |
| 77 | 3.4 | -0.043 | 743 | 516 | 303 | 535 | 513 | 522 | 282 | 79 | |

Wood Heater Preburn Data - ASTM E2780

Run: 2

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/23/17
 Beginning Clock Time: 8:38

| Preburn Fuel Data | | |
|--------------------------------|--------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | |
| Total Preburn Weight (lb): | <u>14.3</u> | |
| | <u>19.4</u> | <u>18.6</u> |
| Fuel Moisture Readings (% DB): | <u>21.4</u> | <u>22.3</u> |
| | <u>19.7</u> | <u>23.8</u> |
| | <u>19.3</u> | <u>19.9</u> |
| | <u>19</u> | <u>18.7</u> |
| Avg Preburn Moisture (% DB): | <u>20.21</u> | |

| | | |
|----------------------|---------------------|---------------------|
| Coal Bed Range (lb): | <u>2.4</u> (min) | <u>3.0</u> (max) |
|----------------------|---------------------|---------------------|

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | Stack | Ambient |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-----|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | | | |
| 78 | 3.4 | -0.043 | 738 | 520 | 303 | 533 | 513 | 521.4 | 282 | 79 | |
| 79 | 3.3 | -0.043 | 732 | 525 | 305 | 531 | 512 | 521 | 280 | 80 | |
| 80 | 3.3 | -0.042 | 727 | 529 | 307 | 529 | 511 | 520.7 | 274 | 80 | |
| 81 | 3.3 | -0.042 | 721 | 534 | 308 | 526 | 510 | 519.8 | 269 | 79 | |
| 82 | 3.2 | -0.042 | 716 | 538 | 310 | 523 | 509 | 519.2 | 272 | 80 | |
| 83 | 3.2 | -0.041 | 709 | 542 | 312 | 522 | 507 | 518.5 | 270 | 80 | |
| 84 | 3.2 | -0.041 | 703 | 547 | 314 | 520 | 505 | 517.6 | 268 | 79 | |
| 85 | 3.1 | -0.041 | 695 | 551 | 315 | 518 | 503 | 516.5 | 260 | 79 | |
| 86 | 3.1 | -0.041 | 689 | 555 | 317 | 516 | 500 | 515.3 | 261 | 80 | |
| 87 | 3.1 | -0.04 | 681 | 559 | 319 | 516 | 497 | 514.4 | 260 | 79 | |
| 88 | 3 | -0.04 | 675 | 562 | 319 | 514 | 494 | 513 | 255 | 80 | |
| 89 | 3 | -0.04 | 668 | 565 | 321 | 511 | 492 | 511.6 | 264 | 80 | |
| 90 | 3 | -0.04 | 663 | 568 | 323 | 510 | 490 | 510.6 | 253 | 80 | |
| 91 | 2.9 | -0.04 | 657 | 571 | 324 | 509 | 487 | 509.6 | 261 | 79 | |
| 92 | 2.9 | -0.04 | 652 | 574 | 325 | 506 | 486 | 508.4 | 261 | 80 | |
| 93 | 2.9 | -0.04 | 647 | 577 | 325 | 504 | 484 | 507.3 | 256 | 80 | |
| 94 | 2.9 | -0.04 | 642 | 579 | 326 | 503 | 481 | 506.4 | 257 | 80 | |
| 95 | 2.8 | -0.039 | 637 | 582 | 327 | 500 | 480 | 505.3 | 256 | 79 | |
| 96 | 2.8 | -0.04 | 634 | 585 | 328 | 499 | 478 | 504.7 | 253 | 79 | |
| 97 | 2.8 | -0.039 | 629 | 588 | 328 | 498 | 476 | 503.6 | 254 | 80 | |
| 98 | 2.7 | -0.039 | 625 | 590 | 328 | 495 | 474 | 502.3 | 258 | 80 | |
| 99 | 2.7 | -0.039 | 622 | 593 | 328 | 491 | 472 | 501.1 | 253 | 79 | |
| 100 | 2.7 | -0.039 | 619 | 595 | 328 | 489 | 471 | 500.2 | 253 | 79 | |
| 101 | 2.6 | -0.039 | 616 | 597 | 328 | 487 | 469 | 499.3 | 256 | 79 | |
| 102 | 2.6 | -0.039 | 612 | 599 | 327 | 486 | 467 | 498.4 | 265 | 79 | |
| 103 | 2.6 | -0.04 | 609 | 602 | 327 | 485 | 465 | 497.6 | 266 | 79 | |
| 104 | 2.6 | -0.039 | 606 | 604 | 327 | 483 | 465 | 496.9 | 260 | 79 | |
| 105 | 2.5 | -0.04 | 604 | 605 | 327 | 481 | 463 | 496 | 259 | 79 | |
| 106 | 2.5 | -0.039 | 601 | 607 | 327 | 479 | 462 | 495.2 | 264 | 79 | |
| 107 | 2.5 | -0.04 | 600 | 608 | 327 | 479 | 461 | 494.8 | 261 | 80 | |

Wood Heater Test Fuel Data - ASTM E2780

| | | |
|------------------------------|-----------------|---------------|
| Manufacturer: Valley Comfort | PB Time: 6:30 | 12% Cal: 12.0 |
| Model: 20.2 Series | PB Temp: 70 | 22% Cal: 22.0 |
| Tracking No.: 2253 | | |
| Project No.: 0142WS013E | Test Time: 9:30 | |
| Test Date: 8/23/2017 | Test Temp: 80 | |
| Run No.: 2 | | |

| | |
|------------------------------------|------|
| Firebox Volume (ft ³): | 1.82 |
| Fuel Piece Length (in): | 13 |
| 2x4 Crib Weight (lb): | 5.2 |
| 4x4 Crib Weight (lb): | 6.9 |

| | | |
|---|-------|----|
| Total Fuel Weight (Dry Basis, lb): | 9.9 | |
| Fuel Density (lb/ft ³ , Dry Basis): | 29.91 | OK |
| Loading Density (lb/ft ³ , Wet Basis): | 6.65 | OK |
| 2x4 Percentage: | 43% | OK |

Coal Bed Range (20-25%): 2.42 - 3.025

| Test Fuel Piece | Weight (lb) | Size | Readings (Dry Basis %) | | | Dry Weight (lb) |
|-----------------|-------------|--------|------------------------|------|------|-----------------|
| 1 | 1.3 | 2"x 4" | 24.5 | 23.8 | 23.1 | 1.05 |
| 2 | 1.4 | 2"x 4" | 22.7 | 21.5 | 21.9 | 1.15 |
| 3 | 1.5 | 2"x 4" | 19.5 | 19.2 | 19.3 | 1.26 |
| 4 | 3.4 | 4"x 4" | 22.7 | 23.8 | 24.3 | 2.75 |
| 5 | 3.5 | 4"x 4" | 23.3 | 23.2 | 21.7 | 2.85 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| Spacer Readings (Dry Basis %) | | | |
|-------------------------------|------|--|--|
| 18.6 | 19.3 | | |
| 17.0 | 20.2 | | |
| 17.1 | 17.1 | | |
| 16.0 | | | |
| 17.3 | | | |
| 20.1 | | | |
| 16.9 | | | |
| 20.6 | | | |
| 16.6 | | | |
| 16.5 | | | |
| 16.5 | | | |
| | | | |
| | | | |

Technician Signature:

Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort **Equipment Numbers:** 283A, 637, 592
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Run #: 2
Date: 8/23/17

TRAIN 1 (First Hour emissions)

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|----------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| B. Front filter catch | Filter | D231 | 123.0 | 121.5 | 1.5 |
| 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:** 1.5

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 | D232 | 122.9 | 122.0 | 0.9 |
| C. Rear filter catch | Filter | D233 | 120.3 | 120.5 | -0.2 |
| D. Probe catch* | Probe | 27 | 114274.9 | 114274.9 | 0.0 |
| E. Filter seals catch* | Seals | R503 | 3298.8 | 3298.5 | 0.3 |

Sub-Total **Total Particulate, mg:** 1.0

Train 1 Aggregate **Total Particulate, mg:** 2.5

TRAIN 2

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|----------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch | Filter | D234 | 123.9 | 121.9 | 2.0 |
| B. Rear filter catch | Filter | D235 | 121.1 | 121.2 | -0.1 |
| C. Probe catch* | Probe | 29 | 114278.9 | 114278.7 | 0.2 |
| D. Filter seals catch* | Seals | R504 | 3384.9 | 3384.0 | 0.9 |

Total Particulate, mg: 3.0


AMBIENT

| Sample Component | Reagent | Filter # or Probe # | Weights | | |
|------------------------|---------|------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch* | Filter | | | | 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 Results - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Project No.: 0142WS013E
 Tracking No.: 2253
 Run: 2
 Test Date: 08/23/17

| | |
|--|-----------------------|
| Burn Rate | 1.54 kg/hr dry |
| Average Tunnel Temperature | 99 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.45 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8443.3 dscf/hour |
| Average Delta p | 0.048 inches H2O |
| Total Time of Test | 175 minutes |


| | AMBIENT | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 | FIRST HOUR FILTER (TRAIN 1) |
|---|-----------------------|-----------------------|-----------------------|-----------------------------|
| Total Sample Volume - Vm | 0.000 cubic feet | 25.248 cubic feet | 25.494 cubic feet | 8.567 cubic feet |
| Average Gas Meter Temperature | 80 degrees Fahrenheit | 75 degrees Fahrenheit | 73 degrees Fahrenheit | 74 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 0.000 dscf | 24.056 dscf | 24.217 dscf | 8.182 dscf |
| Total Particulates - m _n | 0 mg | 2.5 mg | 3 mg | 1.5 mg |
| Particulate Concentration (dry-standard) - C _p /C _s | 0.000000 grams/dscf | 0.00010 grams/dscf | 0.00012 grams/dscf | 0.00018 grams/dscf |
| Total Particulate Emissions - E _T | 0.00 grams | 2.56 grams | 3.05 grams | 1.55 grams |
| Particulate Emission Rate | 0.00 grams/hour | 0.88 grams/hour | 1.05 grams/hour | 1.55 grams/hour |
| Emissions Factor | | 0.57 g/kg | 0.68 g/kg | 0.60 g/kg |
| Difference from Average Total Particulate Emissions | | 0.25 grams | 0.25 grams | |
| Dual Train Comparison Results Are Acceptable | | | | |

| FINAL AVERAGE RESULTS | |
|--|------------------------|
| Complete Test Run | |
| Total Particulate Emissions - E _T | 2.81 grams |
| Particulate Emission Rate | 0.96 grams/hour |
| Emissions Factor | 0.62 grams/kg |
| First Hour Emissions | |
| Total Particulate Emissions - E _T | 1.55 grams |
| Particulate Emission Rate | 1.55 grams/hour |
| Emissions Factor | 0.60 grams/kg |
| 7.5% of Average Total Particulate Emissions | 0.21 grams |

| 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 |
| Train A - Train B G/KG ≤ 0.5 | 0.11 |
| Total PM Precision (%) | 8.76 |
| Stove Surface ΔT | OK |

Wood Heater Efficiency Results - CSA B415.1

Manufacturer: Valley Comfort
Model: 20.2 Series
Date: 08/23/17
Run: 2
Control #: 0142WS013E
Test Duration: 175
Output Category: III

Technician Signature: 

Test Results in Accordance with CSA B415.1-09

| | HHV Basis | LHV Basis |
|--------------------------|-----------|-----------|
| Overall Efficiency | 77.1% | 83.3% |
| Combustion Efficiency | 97.3% | 97.3% |
| Heat Transfer Efficiency | 79% | 85.6% |

| | | | |
|--------------------|--------|--------|---------|
| Output Rate (kJ/h) | 23,503 | 22,295 | (Btu/h) |
| Burn Rate (kg/h) | 1.54 | 3.39 | (lb/h) |
| Input (kJ/h) | 30,489 | 28,922 | (Btu/h) |

| | | | |
|---------------------------|-------------|------|--------|
| Test Load Weight (dry kg) | 4.49 | 9.89 | dry lb |
| MC wet (%) | 18.23385119 | | |
| MC dry (%) | 22.30 | | |
| Particulate (g) | 0.96 | | |
| CO (g) | 188 | | |
| Test Duration (h) | 2.92 | | |

| Emissions | Particulate | CO |
|------------------|-------------|-------|
| g/MJ Output | 0.01 | 2.74 |
| g/kg Dry Fuel | 0.21 | 41.86 |
| g/h | 0.33 | 64.43 |
| lb/MM Btu Output | 0.03 | 6.37 |

| | |
|----------------------|-------|
| Air/Fuel Ratio (A/F) | 13.03 |
|----------------------|-------|

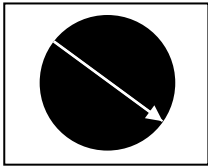
VERSION: 2.2 12/14/2009

Wood Heater Run Notes

Air Control Settings

Primary:

Medium High:
36 degrees
from
horizontal



Secondary: Auto

Tertiary/Pilot: Fixed

Fan: On Med High

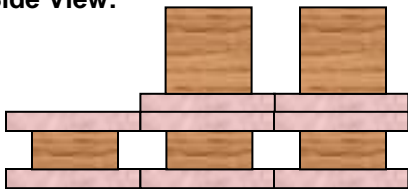
Preburn Notes

| Time | Notes |
|------|-------|
| | |

Test Notes

Sketch test fuel configuration:

Side View:



Start up procedures & Timeline:

Bypass: Closed

Fuel loaded by: 0:30

Door closed at: 0:35

Primary air: Set @ 4:50

Notes: None

| Time | Notes |
|-------------|---|
| 22:00-26:00 | Optical encoder sticking, assume constant sample rate |
| 29:30 | Set fan to test setting |

Wood Heater Supplemental Data

Start Time: 10:24

Booth #: N/A (site testing)

Stop Time: 13:19

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0 @ -18 "Hg

B: 0 @ -18 "Hg

Calibrations: Span Gas CO₂: 17.00 CO: 4.267

| | Pre Test | | Post Test | |
|-----------------|----------|-------|-----------|-------|
| | Zero | Span | Zero | Span |
| Time | 7:50 | 7:55 | 17:46 | 17:48 |
| CO ₂ | 0.00 | 17.00 | -0.03 | 17.01 |
| CO | 0.000 | 4.267 | -0.003 | 4.273 |

Air Velocity (ft/min): Initial: <50 Final: <50

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

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (in): 6

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 8/21/17 Initials: AK

| | Initial | Middle | Ending |
|------------------------|---------|--------|--------|
| P _b (in/Hg) | 28.72 | 28.71 | 28.70 |
| RH (%) | 36.6 | 34.7 | 33.3 |
| Ambient (°F) | 76 | 80 | 79 |

| Tunnel Traverse | | |
|---------------------|--------------------------|-------|
| Microtector Reading | dP (in H ₂ O) | T(°F) |
| 0.014 | 0.028 | 99 |
| 0.022 | 0.044 | 99 |
| 0.021 | 0.042 | 99 |
| 0.013 | 0.026 | 99 |
| 0.016 | 0.032 | 99 |
| 0.023 | 0.046 | 99 |
| 0.022 | 0.044 | 99 |
| 0.015 | 0.030 | 99 |
| Center: | | |
| .024 | 0.048 | 99 |

Background Filter Volume: N/A

| Tunnel Static Pressure (in H ₂ O): | |
|---|-------------|
| Beginning of Test | End of Test |
| -0.17 | -0.17 |



RUN 3

Wood Heater Preburn Data - ASTM E2780

Run: 3

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/23/17
 Beginning Clock Time: 14:03

| Preburn Fuel Data | | |
|--------------------------------|--------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | |
| Total Preburn Weight (lb): | <u>14.9</u> | |
| | <u>19</u> | <u>23.6</u> |
| Fuel Moisture Readings (% DB): | <u>19.9</u> | <u>23.8</u> |
| | <u>23.8</u> | <u>23.8</u> |
| | <u>23.8</u> | <u>24.9</u> |
| | <u>19.4</u> | <u>22.1</u> |
| Avg Preburn Moisture (% DB): | <u>22.41</u> | |

| | | |
|----------------------|---------------------|---------------------|
| Coal Bed Range (lb): | <u>2.6</u> (min) | <u>3.3</u> (max) |
|----------------------|---------------------|---------------------|

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | Stack | Ambient |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-----|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | | | |
| 0 | 14.5 | -0.052 | 584 | 583 | 286 | 385 | 395 | 446.6 | 412 | 82 | |
| 1 | 14.1 | -0.052 | 596 | 581 | 285 | 383 | 398 | 448.5 | 424 | 82 | |
| 2 | 13.7 | -0.053 | 606 | 579 | 284 | 383 | 399 | 450.4 | 425 | 84 | |
| 3 | 13.2 | -0.054 | 616 | 577 | 285 | 385 | 403 | 453.2 | 431 | 83 | |
| 4 | 12.8 | -0.054 | 624 | 575 | 284 | 387 | 408 | 455.5 | 436 | 83 | |
| 5 | 12.3 | -0.054 | 632 | 573 | 285 | 390 | 412 | 458.3 | 437 | 82 | |
| 6 | 11.9 | -0.054 | 640 | 571 | 285 | 393 | 418 | 461.5 | 435 | 83 | |
| 7 | 11.4 | -0.054 | 647 | 569 | 286 | 397 | 423 | 464.4 | 433 | 83 | |
| 8 | 11 | -0.055 | 654 | 567 | 287 | 402 | 428 | 467.8 | 427 | 83 | |
| 9 | 10.6 | -0.054 | 662 | 566 | 288 | 406 | 433 | 470.7 | 424 | 82 | |
| 10 | 10.2 | -0.054 | 668 | 564 | 289 | 411 | 437 | 473.8 | 428 | 82 | |
| 11 | 9.8 | -0.054 | 677 | 564 | 290 | 415 | 441 | 477.4 | 421 | 83 | |
| 12 | 9.5 | -0.055 | 701 | 563 | 291 | 420 | 441 | 483 | 424 | 84 | |
| 13 | 9.3 | -0.055 | 718 | 561 | 290 | 425 | 441 | 487 | 425 | 84 | |
| 14 | 9.1 | -0.055 | 720 | 560 | 288 | 430 | 440 | 487.7 | 417 | 83 | |
| 15 | 8.9 | -0.054 | 720 | 559 | 286 | 433 | 440 | 487.6 | 405 | 83 | |
| 16 | 8.8 | -0.054 | 720 | 557 | 285 | 435 | 440 | 487.3 | 400 | 83 | |
| 17 | 8.7 | -0.051 | 721 | 556 | 282 | 437 | 439 | 487.1 | 399 | 83 | |
| 18 | 8.5 | -0.053 | 722 | 554 | 280 | 438 | 440 | 486.7 | 399 | 83 | |
| 19 | 8.3 | -0.052 | 722 | 553 | 277 | 441 | 439 | 486.6 | 391 | 83 | |
| 20 | 8.2 | -0.052 | 727 | 551 | 275 | 444 | 439 | 487.1 | 395 | 83 | |
| 21 | 8 | -0.051 | 730 | 550 | 273 | 447 | 440 | 487.9 | 391 | 83 | |
| 22 | 7.9 | -0.050 | 734 | 548 | 271 | 450 | 440 | 488.6 | 387 | 83 | |
| 23 | 7.7 | -0.049 | 738 | 546 | 269 | 453 | 441 | 489.4 | 393 | 83 | |
| 24 | 7.6 | -0.050 | 745 | 544 | 268 | 456 | 443 | 491.2 | 390 | 83 | |
| 25 | 7.4 | -0.049 | 749 | 542 | 267 | 460 | 443 | 492.2 | 389 | 83 | |
| 26 | 7.3 | -0.049 | 753 | 540 | 265 | 463 | 445 | 493.2 | 395 | 83 | |
| 27 | 7.2 | -0.049 | 758 | 538 | 265 | 467 | 446 | 494.9 | 394 | 83 | |
| 28 | 7 | -0.050 | 761 | 536 | 264 | 470 | 448 | 495.9 | 394 | 84 | |
| 29 | 6.9 | -0.050 | 766 | 535 | 263 | 471 | 449 | 496.9 | 392 | 84 | |
| 30 | 6.8 | -0.049 | 768 | 533 | 262 | 473 | 451 | 497.4 | 388 | 83 | |
| 31 | 6.6 | -0.049 | 771 | 531 | 262 | 475 | 452 | 498.1 | 386 | 84 | |
| 32 | 6.5 | -0.049 | 772 | 529 | 261 | 475 | 454 | 498.1 | 389 | 83 | |
| 33 | 6.4 | -0.049 | 770 | 528 | 260 | 479 | 453 | 497.8 | 382 | 84 | |
| 34 | 6.3 | -0.049 | 771 | 526 | 259 | 485 | 452 | 498.6 | 385 | 83 | |
| 35 | 6.1 | -0.049 | 777 | 524 | 259 | 490 | 450 | 500 | 391 | 84 | |
| 36 | 6 | -0.049 | 784 | 523 | 259 | 498 | 450 | 502.7 | 394 | 83 | |
| 37 | 5.9 | -0.049 | 791 | 522 | 260 | 505 | 450 | 505.4 | 393 | 84 | |
| 38 | 5.7 | -0.050 | 796 | 520 | 260 | 511 | 450 | 507.5 | 397 | 84 | |

Wood Heater Preburn Data - ASTM E2780

Run: 3

Technician Signature:

Manufacturer: Valley Comfort
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Test Date: 8/23/17
Beginning Clock Time: 14:03

| Preburn Fuel Data | | |
|--------------------------------|--------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | |
| Total Preburn Weight (lb): | <u>14.9</u> | |
| | <u>19</u> | <u>23.6</u> |
| Fuel Moisture Readings (% DB): | <u>19.9</u> | <u>23.8</u> |
| | <u>23.8</u> | <u>23.8</u> |
| | <u>23.8</u> | <u>24.9</u> |
| | <u>19.4</u> | <u>22.1</u> |
| Avg Preburn Moisture (% DB): | <u>22.41</u> | |

| | | |
|-------------|-------|-------|
| Coal Bed | 2.6 | 3.3 |
| Range (lb): | (min) | (max) |

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | Stack | Ambient |
| 39 | 5.6 | -0.050 | 799 | 519 | 260 | 510 | 451 | 507.9 | 390 | 84 |
| 40 | 5.5 | -0.050 | 798 | 518 | 261 | 506 | 454 | 507.5 | 398 | 84 |
| 41 | 5.4 | -0.050 | 798 | 517 | 262 | 503 | 458 | 507.7 | 390 | 85 |
| 42 | 5.3 | -0.049 | 795 | 517 | 262 | 501 | 462 | 507.2 | 391 | 84 |
| 43 | 5.2 | -0.049 | 793 | 517 | 262 | 499 | 467 | 507.4 | 389 | 84 |
| 44 | 5.1 | -0.048 | 787 | 516 | 261 | 497 | 471 | 506.7 | 387 | 84 |
| 45 | 4.9 | -0.049 | 791 | 516 | 262 | 498 | 473 | 507.9 | 386 | 84 |
| 46 | 4.8 | -0.050 | 793 | 516 | 264 | 502 | 476 | 510.1 | 386 | 84 |
| 47 | 4.7 | -0.049 | 791 | 517 | 266 | 505 | 480 | 511.8 | 384 | 84 |
| 48 | 4.6 | -0.048 | 788 | 518 | 269 | 512 | 486 | 514.6 | 379 | 84 |
| 49 | 4.5 | -0.048 | 787 | 519 | 273 | 515 | 492 | 517.2 | 382 | 85 |
| 50 | 4.4 | -0.048 | 785 | 521 | 279 | 524 | 499 | 521.6 | 374 | 84 |
| 51 | 4.3 | -0.048 | 784 | 523 | 283 | 528 | 505 | 524.7 | 374 | 85 |
| 52 | 4.3 | -0.047 | 780 | 526 | 289 | 532 | 512 | 527.6 | 376 | 84 |
| 53 | 4.2 | -0.047 | 777 | 529 | 295 | 538 | 519 | 531.5 | 373 | 85 |
| 54 | 4.1 | -0.046 | 775 | 532 | 301 | 543 | 527 | 535.7 | 373 | 85 |
| 55 | 4 | -0.046 | 769 | 536 | 307 | 547 | 537 | 539 | 369 | 85 |
| 56 | 4 | -0.046 | 766 | 539 | 312 | 549 | 545 | 542.2 | 363 | 86 |
| 57 | 3.9 | -0.045 | 761 | 543 | 317 | 554 | 552 | 545.5 | 358 | 85 |
| 58 | 3.9 | -0.045 | 757 | 547 | 323 | 557 | 560 | 548.8 | 355 | 85 |
| 59 | 3.8 | -0.045 | 749 | 551 | 326 | 556 | 564 | 549.3 | 355 | 84 |
| 60 | 3.8 | -0.044 | 737 | 555 | 330 | 553 | 563 | 547.5 | 347 | 85 |
| 61 | 3.8 | -0.044 | 729 | 558 | 333 | 551 | 561 | 546.6 | 344 | 85 |
| 62 | 3.7 | -0.044 | 718 | 562 | 334 | 548 | 558 | 544.1 | 339 | 85 |
| 63 | 3.7 | -0.043 | 711 | 565 | 336 | 547 | 555 | 542.5 | 339 | 84 |
| 64 | 3.6 | -0.043 | 702 | 568 | 336 | 544 | 549 | 539.9 | 332 | 85 |
| 65 | 3.6 | -0.043 | 695 | 570 | 336 | 539 | 544 | 536.8 | 334 | 85 |
| 66 | 3.6 | -0.043 | 687 | 573 | 335 | 533 | 541 | 533.7 | 331 | 85 |
| 67 | 3.6 | -0.042 | 682 | 575 | 334 | 531 | 535 | 531.3 | 327 | 85 |
| 68 | 3.5 | -0.042 | 676 | 577 | 332 | 523 | 531 | 527.9 | 328 | 85 |
| 69 | 3.5 | -0.042 | 670 | 580 | 332 | 518 | 526 | 525.1 | 326 | 85 |
| 70 | 3.5 | -0.042 | 664 | 582 | 329 | 513 | 521 | 521.7 | 328 | 85 |
| 71 | 3.4 | -0.042 | 659 | 583 | 328 | 508 | 517 | 518.9 | 325 | 85 |
| 72 | 3.4 | -0.042 | 653 | 585 | 327 | 503 | 512 | 515.8 | 326 | 86 |
| 73 | 3.4 | -0.042 | 647 | 586 | 325 | 499 | 508 | 513.2 | 323 | 84 |
| 74 | 3.3 | -0.043 | 642 | 588 | 322 | 495 | 505 | 510.3 | 325 | 84 |
| 75 | 3.3 | -0.042 | 639 | 589 | 320 | 491 | 502 | 508.2 | 326 | 86 |
| 76 | 3.3 | -0.042 | 635 | 591 | 319 | 488 | 498 | 506 | 329 | 85 |
| 77 | 3.2 | -0.042 | 630 | 592 | 317 | 485 | 496 | 504.1 | 325 | 85 |

Wood Heater Test Fuel Data - ASTM E2780

| | | |
|------------------------------|------------------|---------------|
| Manufacturer: Valley Comfort | PB Time: 14:30 | 12% Cal: 12.0 |
| Model: 20.2 Series | PB Temp: 82 | 22% Cal: 22.0 |
| Tracking No.: 2253 | | |
| Project No.: 0142WS013E | Test Time: 14:30 | |
| Test Date: 8/23/2017 | Test Temp: 82 | |
| Run No.: 3 | | |

| | |
|------------------------------------|------|
| Firebox Volume (ft ³): | 1.82 |
| Fuel Piece Length (in): | 13 |
| 2x4 Crib Weight (lb): | 5.1 |
| 4x4 Crib Weight (lb): | 7.9 |

| | | |
|---|-------|----|
| Total Fuel Weight (Dry Basis, lb): | 10.7 | |
| Fuel Density (lb/ft ³ , Dry Basis): | 30.58 | OK |
| Loading Density (lb/ft ³ , Wet Basis): | 7.14 | OK |
| 2x4 Percentage: | 39% | OK |

Coal Bed Range (20-25%): 2.6 - 3.25

| Test Fuel Piece | Weight (lb) | Size | Readings (Dry Basis %) | | | Dry Weight (lb) |
|-----------------|-------------|--------|------------------------|------|------|-----------------|
| 1 | 1.2 | 2"x 4" | 19.3 | 22.8 | 22.0 | 0.99 |
| 2 | 1.2 | 2"x 4" | 21.0 | 21.6 | 19.9 | 0.99 |
| 3 | 1.4 | 2"x 4" | 19.0 | 23.4 | 23.0 | 1.15 |
| 4 | 3.9 | 4"x 4" | 21.6 | 21.9 | 22.8 | 3.19 |
| 5 | 3.6 | 4"x 4" | 23.3 | 23.2 | 21.7 | 2.93 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| Spacer Readings (Dry Basis %) | | | |
|-------------------------------|--|--|--|
| 15.4 | | | |
| 18.3 | | | |
| 13.3 | | | |
| 16.0 | | | |
| 18.7 | | | |
| 17.9 | | | |
| 21.2 | | | |
| 17.7 | | | |
| 20.0 | | | |
| 14.9 | | | |
| | | | |
| | | | |
| | | | |

Technician Signature: _____

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: 3

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 23-Aug-17

Total Sampling Time: 129 min
 Recording Interval: 1 min

Beginning Clock Time: 15:20 Background Sample Volume: _____ cubic feet


Meter Box Y Factor: 1.003 (1) 0.997 (2) _____ (Amb)

Barometric Pressure: Begin Middle End Average
28.68 28.62 28.60 28.63 *Hg

OMNI Equipment Numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

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: -0.170 *H2O
 Tunnel Area: 0.19635 ft2
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.66 ft/sec
 Initial Tunnel Flow: 138.2 scfm
 Average Tunnel Flow: 138.6 scfm
 Post-Test Leak Check (1): 0.000 cfm @ -18 in. Hg
 Post-Test Leak Check (2): 0.000 cfm @ -18 in. Hg
 Average Test Piece Fuel Moisture: 21.77 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 | 0.028 | 0.044 | 0.042 | 0.026 | 0.032 | 0.046 | 0.044 | 0.030 | 0.048 |
| Temp: | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |

V_{strav} 13.46 ft/sec V_{scent} 15.26 ft/sec F_p 0.882

| Elapsed Time (min) | Particulate Sampling Data | | | | | | | | | | | | | | Fuel Weight (lb) | | Temperature Data (*F) | | | | | | | | | | | | | Stack Gas Data | | |
|--------------------|--------------------------------|--------------------------------|---------------------|---------------------|----------------------------------|-------------------|----------------------|----------------------------------|-------------------|----------------------|----------------------|---------------------------|-------------|-------------|------------------|---------------|-----------------------|----------------|--------------|--------------|---------------|--------------------|---------------|-------|----------|--------------|----------|--------------|---------|---------------------------|---------------------|--------|
| | Gas Meter 1 (ft ³) | Gas Meter 2 (ft ³) | Sample Rate 1 (cfm) | Sample Rate 2 (cfm) | Orifice dH 1 (*H ₂ O) | Meter 1 Temp (*F) | Meter 1 Vacuum (*Hg) | Orifice dH 2 (*H ₂ 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 | Catalyst Exit | Stack | Filter 1 | Dryer Exit 1 | Filter 2 | Dryer Exit 2 | Ambient | Draft (*H ₂ O) | CO ₂ (%) | CO (%) |
| 120 | 17.801 | 17.546 | 0.15 | 0.15 | 1.80 | 81 | -1.36 | 1.30 | 75 | -1 | 110 | 0.048 | 100 | 100 | 0.3 | 0 | 582 | 578 | 317 | 452 | 464 | 479 | 806 | 421 | 80 | 73 | 80 | 75 | 85 | -0.059 | 5.77 | 0 |
| 121 | 17.953 | 17.693 | 0.15 | 0.15 | 1.84 | 81 | -1.37 | 1.30 | 75 | -1 | 110 | 0.048 | 102 | 100 | 0.3 | 0 | 581 | 579 | 315 | 450 | 460 | 477 | 801 | 420 | 80 | 73 | 80 | 75 | 86 | -0.059 | 5.5 | 0 |
| 122 | 18.105 | 17.839 | 0.15 | 0.15 | 1.84 | 81 | -1.37 | 1.30 | 75 | -1 | 110 | 0.048 | 102 | 99 | 0.2 | -0.1 | 578 | 580 | 313 | 447 | 457 | 475 | 800 | 419 | 80 | 73 | 80 | 75 | 84 | -0.059 | 5.47 | 0 |
| 123 | 18.255 | 17.987 | 0.15 | 0.15 | 1.85 | 80 | -1.36 | 1.30 | 75 | -1 | 109 | 0.048 | 100 | 101 | 0.2 | 0 | 576 | 580 | 311 | 444 | 454 | 473 | 798 | 418 | 80 | 73 | 80 | 75 | 85 | -0.059 | 5.48 | 0 |
| 124 | 18.406 | 18.133 | 0.15 | 0.15 | 1.84 | 81 | -1.36 | 1.31 | 75 | -1 | 110 | 0.048 | 101 | 99 | 0.2 | 0 | 572 | 581 | 309 | 442 | 452 | 471 | 796 | 417 | 80 | 73 | 80 | 75 | 85 | -0.058 | 5.53 | 0 |
| 125 | 18.557 | 18.279 | 0.15 | 0.15 | 1.83 | 81 | -1.36 | 1.31 | 75 | -1 | 110 | 0.048 | 101 | 99 | 0.2 | 0 | 570 | 582 | 308 | 439 | 448 | 469 | 795 | 416 | 80 | 73 | 80 | 75 | 85 | -0.059 | 5.44 | 0 |
| 126 | 18.708 | 18.426 | 0.15 | 0.15 | 1.80 | 80 | -1.36 | 1.30 | 74 | -1 | 109 | 0.048 | 101 | 100 | 0.1 | -0.1 | 568 | 581 | 306 | 437 | 446 | 468 | 801 | 416 | 80 | 73 | 79 | 75 | 84 | -0.058 | 5.5 | 0 |
| 127 | 18.860 | 18.573 | 0.15 | 0.15 | 1.85 | 80 | -1.36 | 1.30 | 74 | -1 | 110 | 0.048 | 102 | 100 | 0.1 | 0 | 567 | 581 | 304 | 433 | 443 | 466 | 801 | 415 | 80 | 73 | 79 | 75 | 85 | -0.059 | 5.48 | 0 |
| 128 | 19.011 | 18.720 | 0.15 | 0.15 | 1.84 | 80 | -1.37 | 1.30 | 75 | -1 | 110 | 0.048 | 101 | 100 | 0.1 | 0 | 565 | 580 | 302 | 430 | 440 | 463 | 798 | 415 | 80 | 73 | 79 | 75 | 84 | -0.059 | 5.33 | 0 |
| 129 | 19.161 | 18.867 | 0.15 | 0.15 | 1.85 | 80 | -1.36 | 1.30 | 75 | -1 | 110 | 0.048 | 100 | 100 | 0.0 | -0.1 | 563 | 578 | 302 | 427 | 438 | 462 | 798 | 414 | 80 | 73 | 79 | 76 | 84 | -0.059 | 5.22 | 0 |
| Avg/Tot | 19.161 | 18.867 | 0.15 | 0.15 | 1.78 | 80 | | 1.30 | 75 | | 115 | 0.048 | 100 | 100 | | | | | | | | 46.2 | | | 70 | 79 | 73 | 85 | -0.063 | | | |

Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort **Equipment Numbers:** 283A, 637, 592
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Run #: 3
Date: 8/23/17

TRAIN 1 (First Hour emissions)

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|----------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| B. Front filter catch | Filter | D236 | 121.5 | 119.1 | 2.4 |
| 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:** **2.4**

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 | D237 | 123.4 | 122.9 | 0.5 |
| C. Rear filter catch | Filter | D238 | 119.1 | 121.4 | -2.3 |
| D. Probe catch* | Probe | 30 | 114330.5 | 114330.5 | 0.0 |
| E. Filter seals catch* | Seals | R505 | 3340.1 | 3337.9 | 2.2 |

Sub-Total **Total Particulate, mg:** **0.4**

Train 1 Aggregate **Total Particulate, mg:** **2.8**

TRAIN 2

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|----------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch | Filter | D239 | 122.7 | 120.1 | 2.6 |
| B. Rear filter catch | Filter | D240 | 121.6 | 122.0 | -0.4 |
| C. Probe catch* | Probe | 31 | 114369.7 | 114369.6 | 0.1 |
| D. Filter seals catch* | Seals | R506 | 4160.3 | 4158.8 | 1.5 |

Total Particulate, mg: **3.8**

AMBIENT

| Sample Component | Reagent | Filter # or Probe # | Weights | | |
|------------------------|---------|------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch* | Filter | | | | 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 Results - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Project No.: 0142WS013E
 Tracking No.: 2253
 Run: 3
 Test Date: 08/23/17

| | |
|--|------------------------|
| Burn Rate | 2.26 kg/hr dry |
| Average Tunnel Temperature | 115 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.66 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8313.4 dscf/hour |
| Average Delta p | 0.048 inches H2O |
| Total Time of Test | 129 minutes |

| | AMBIENT | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 | FIRST HOUR FILTER (TRAIN 1) |
|---|-----------------------|-----------------------|-----------------------|-----------------------------|
| Total Sample Volume - Vm | 0.000 cubic feet | 19.161 cubic feet | 18.867 cubic feet | 8.752 cubic feet |
| Average Gas Meter Temperature | 85 degrees Fahrenheit | 80 degrees Fahrenheit | 75 degrees Fahrenheit | 79 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 0.000 dscf | 18.072 dscf | 17.831 dscf | 8.270 dscf |
| Total Particulates - m _n | 0 mg | 2.8 mg | 3.8 mg | 2.4 mg |
| Particulate Concentration (dry-standard) - C _p /C _s | 0.000000 grams/dscf | 0.00015 grams/dscf | 0.00021 grams/dscf | 0.00029 grams/dscf |
| Total Particulate Emissions - E _T | 0.00 grams | 2.77 grams | 3.81 grams | 2.41 grams |
| Particulate Emission Rate | 0.00 grams/hour | 1.29 grams/hour | 1.77 grams/hour | 2.41 grams/hour |
| Emissions Factor | | 0.57 g/kg | 0.78 g/kg | 0.70 g/kg |
| Difference from Average Total Particulate Emissions | | 0.52 grams | 0.52 grams | |


Dual Train Comparison Results Are Acceptable

| FINAL AVERAGE RESULTS | |
|--|------------------------|
| Complete Test Run | |
| Total Particulate Emissions - E _T | 3.29 grams |
| Particulate Emission Rate | 1.53 grams/hour |
| Emissions Factor | 0.68 grams/kg |
| First Hour Emissions | |
| Total Particulate Emissions - E _T | 2.41 grams |
| Particulate Emission Rate | 2.41 grams/hour |
| Emissions Factor | 0.70 grams/kg |
| 7.5% of Average Total Particulate Emissions | 0.25 grams |

| 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 |
| Train A - Train B G/KG ≤ 0.5 | 0.21 |
| Total PM Precision (%) | 15.81 |
| Stove Surface ΔT | OK |

Wood Heater Efficiency Results - CSA B415.1

Manufacturer: Valley Comfort
Model: 20.2 Series
Date: 08/23/17
Run: 3
Control #: 0142WS013E
Test Duration: 129
Output Category: IV

Technician Signature: 

Test Results in Accordance with CSA B415.1-09

| | HHV Basis | LHV Basis |
|--------------------------|-----------|-----------|
| Overall Efficiency | 70.3% | 76.0% |
| Combustion Efficiency | 97.6% | 97.6% |
| Heat Transfer Efficiency | 72% | 77.9% |

| | | | |
|--------------------|--------|--------|---------|
| Output Rate (kJ/h) | 31,399 | 29,785 | (Btu/h) |
| Burn Rate (kg/h) | 2.25 | 4.97 | (lb/h) |
| Input (kJ/h) | 44,632 | 42,339 | (Btu/h) |

| | | | |
|---------------------------|-------------|-------|--------|
| Test Load Weight (dry kg) | 4.84 | 10.68 | dry lb |
| MC wet (%) | 17.87571859 | | |
| MC dry (%) | 21.77 | | |
| Particulate (g) | 1.53 | | |
| CO (g) | 180 | | |
| Test Duration (h) | 2.15 | | |

| Emissions | Particulate | CO |
|------------------|-------------|-------|
| g/MJ Output | 0.02 | 2.67 |
| g/kg Dry Fuel | 0.32 | 37.25 |
| g/h | 0.71 | 83.92 |
| lb/MM Btu Output | 0.05 | 6.21 |

| | |
|----------------------|-------|
| Air/Fuel Ratio (A/F) | 12.52 |
|----------------------|-------|

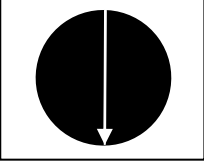
VERSION: 2.2 12/14/2009

Wood Heater Run Notes

Air Control Settings

Primary:

Secondary: Auto

| | |
|--|---|
| Maximum: 180 degrees from vertical |  |
|--|---|

Tertiary/Pilot: Fixed

Fan: On Max

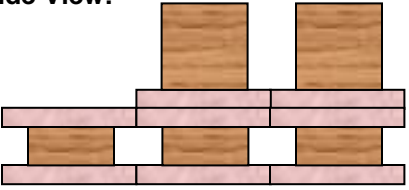
Preburn Notes

| Time | Notes |
|------|-------|
| | |

Test Notes

Sketch test fuel configuration:

Start up procedures & Timeline:

| | |
|-------------------|---|
| Side View: |  |
|-------------------|---|

Bypass: Closed

Fuel loaded by: 0:30

Door closed at: 0:35

Primary air: Set @ 0:00

Notes: None

| Time | Notes |
|-------|-------------------------|
| 30:00 | Set fan to test setting |
| 60:00 | Replaced Filter A |



Wood Heater Supplemental Data

Start Time: 15:20

Booth #: N/A (site testing)

Stop Time: 17:29

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0 @ -18 "Hg

B: 0 @ -18 "Hg

Calibrations: Span Gas CO₂: 17.00 CO: 4.267

| | Pre Test | | Post Test | |
|-----------------|----------|-------|-----------|-------|
| | Zero | Span | Zero | Span |
| Time | 7:50 | 7:55 | 17:46 | 17:48 |
| CO ₂ | 0.00 | 17.00 | -0.03 | 17.01 |
| CO | 0.000 | 4.267 | -0.003 | 4.273 |

Air Velocity (ft/min): Initial: <50 Final: <50

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

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (in): 6

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 8/21/17 Initials: *AK*

| | Initial | Middle | Ending |
|------------------------|---------|--------|--------|
| P _b (in/Hg) | 28.68 | 28.62 | 28.60 |
| RH (%) | 31.5 | 30.9 | 31.4 |
| Ambient (°F) | 81 | 84 | 82 |

| Tunnel Traverse | | |
|---------------------|--------------------------|-------|
| Microtector Reading | dP (in H ₂ O) | T(°F) |
| 0.014 | 0.028 | 99 |
| 0.022 | 0.044 | 99 |
| 0.021 | 0.042 | 99 |
| 0.013 | 0.026 | 99 |
| 0.016 | 0.032 | 99 |
| 0.023 | 0.046 | 99 |
| 0.022 | 0.044 | 99 |
| 0.015 | 0.030 | 99 |
| Center: | | |
| .0.024 | 0.048 | 99 |

Background Filter Volume: N/A

| Tunnel Static Pressure (in H ₂ O): | |
|---|-------------|
| Beginning of Test | End of Test |
| -0.17 | -0.17 |

[Handwritten Signature]

RUN 4

Low Burn Rate Justification

Completed by Ashnil Reddy

Product Development, Blaze King Ind.

December 14, 2016

Revised January 13, 2021

The two main components of a Blaze King thermostat are the damper blade and the bimetallic coil; they work in unison to produce a consistent heat output. The damper blade is controlled by a thermostat knob that is positioned accordingly based on desired heat output. The bimetallic coil regulates the flow of intake air by adjusting the damper blade angle based on its reaction with heat radiating off the appliance. As the fire loses intensity (appliance radiates less heat) the bimetallic coil contracts causing both the damper blade angle and the flow of intake air to increase which stokes the fire so the appliance can maintain the desired heat output. As the fire gains intensity (appliance radiates more heat) the bimetallic coil expands causing both the damper blade angle and the flow of intake air to decrease for the opposite effect.

When performing an emission certification test run in the Low Burn rate category ($<0.8\text{kg/hr}$), Blaze King's target fuel consumption rate is 0.1lb of test fuel per 10 minute interval. To achieve this, the thermostat knob is positioned such that the damper blade is almost fully closed. If the blade is closed beyond this point, inadequate intake air would cause the burn to stall. This low burn rate is consistently achievable in a test lab environment given that external conditions are held constant. However, when burning in a real world environment, external conditions cannot be held constant which could yield a faster low burn rate given the same thermostat knob setting as used in the test lab environment.

A great example of a real world inconsistency that would affect the low burn rate is chimney draft. If the unit were installed with a chimney height of 20ft or greater, the increased draft associated with that chimney height could increase the velocity of intake air into the unit and result in a faster low burn rate given the same thermostat knob setting as used in the test lab. In this scenario, the operator would be able to turn the thermostat knob lower to account for the increased draft and maintain the same low burn rate that was achieved in the test lab environment. If the consumer were to turn the thermostat knob too low, the fire would stall due to inadequate intake air as previously mentioned. This proves that when the damper blade is closed within the thermostat, regardless of the thermostat knob position, the low burn rate achieved during emissions testing is no greater than the rate that an operator can achieve in real world use.

Wood Heater Preburn Data - ASTM E2780

Run: 4

Technician Signature:

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/24/17
 Beginning Clock Time: 8:25


| Preburn Fuel Data | | | |
|--------------------------------|--------------|-------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | | |
| Total Preburn Weight (lb): | <u>14.7</u> | | |
| | <u>20</u> | <u>22.5</u> | <u>24.2</u> |
| Fuel Moisture Readings (% DB): | <u>24.2</u> | <u>19</u> | <u>20.8</u> |
| | <u>22.4</u> | <u>20</u> | |
| | <u>22.4</u> | <u>18.6</u> | |
| Avg Preburn Moisture (% DB): | <u>21.41</u> | | |

| | | |
|----------------------|---------------------|---------------------|
| Coal Bed Range (lb): | <u>2.4</u> (min) | <u>3.1</u> (max) |
|----------------------|---------------------|---------------------|

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | Stack | Ambient |
| 0 | 3.3 | -0.052 | 733 | 605 | 329 | 515 | 553 | 547 | 341 | 77 |
| 1 | 3.2 | -0.051 | 727 | 606 | 327 | 514 | 551 | 545 | 332 | 77 |
| 2 | 3.1 | -0.051 | 720 | 607 | 324 | 513 | 550 | 542.8 | 334 | 76 |
| 3 | 3.1 | -0.051 | 713 | 607 | 323 | 511 | 549 | 540.6 | 337 | 76 |
| 4 | 3 | -0.051 | 707 | 607 | 321 | 510 | 545 | 538 | 333 | 76 |
| 5 | 3 | -0.042 | 700 | 607 | 326 | 517 | 542 | 538.4 | 268 | 76 |
| 6 | 2.9 | -0.041 | 693 | 607 | 333 | 520 | 540 | 538.6 | 228 | 77 |
| 7 | 2.9 | -0.038 | 686 | 607 | 339 | 519 | 535 | 537.2 | 208 | 77 |
| 8 | 2.9 | -0.037 | 681 | 607 | 343 | 515 | 529 | 535 | 194 | 77 |
| 9 | 2.9 | -0.035 | 675 | 606 | 347 | 511 | 522 | 532.2 | 182 | 77 |
| 10 | 2.9 | -0.034 | 670 | 604 | 349 | 505 | 514 | 528.4 | 173 | 77 |
| 11 | 2.9 | -0.033 | 664 | 603 | 351 | 500 | 507 | 525 | 166 | 77 |
| 12 | 2.9 | -0.032 | 658 | 601 | 351 | 493 | 500 | 520.6 | 160 | 76 |
| 13 | 2.9 | -0.031 | 651 | 599 | 351 | 488 | 492 | 516.2 | 155 | 77 |
| 14 | 2.9 | -0.03 | 646 | 597 | 350 | 482 | 486 | 512.2 | 149 | 77 |
| 15 | 2.9 | -0.029 | 640 | 595 | 350 | 476 | 479 | 508 | 145 | 77 |
| 16 | 2.9 | -0.028 | 634 | 592 | 349 | 470 | 472 | 503.4 | 142 | 77 |
| 17 | 2.9 | -0.026 | 628 | 589 | 347 | 463 | 466 | 498.6 | 140 | 76 |
| 18 | 2.8 | -0.024 | 622 | 587 | 345 | 457 | 460 | 494.2 | 136 | 77 |
| 19 | 2.8 | -0.023 | 616 | 584 | 344 | 452 | 453 | 489.8 | 134 | 76 |
| 20 | 2.8 | -0.025 | 609 | 581 | 341 | 447 | 448 | 485.2 | 132 | 77 |
| 21 | 2.8 | -0.019 | 602 | 577 | 339 | 440 | 442 | 480 | 129 | 76 |
| 22 | 2.8 | -0.019 | 596 | 574 | 337 | 435 | 436 | 475.6 | 128 | 77 |
| 23 | 2.8 | -0.018 | 589 | 571 | 333 | 429 | 430 | 470.4 | 126 | 77 |
| 24 | 2.8 | -0.017 | 583 | 568 | 331 | 424 | 425 | 466.2 | 124 | 77 |
| 25 | 2.8 | -0.017 | 576 | 565 | 329 | 419 | 420 | 461.8 | 122 | 77 |
| 26 | 2.8 | -0.016 | 569 | 561 | 326 | 414 | 414 | 456.8 | 122 | 76 |
| 27 | 2.8 | -0.016 | 563 | 558 | 324 | 410 | 409 | 452.8 | 121 | 77 |
| 28 | 2.8 | -0.016 | 556 | 555 | 322 | 405 | 405 | 448.6 | 118 | 77 |
| 29 | 2.8 | -0.015 | 550 | 552 | 319 | 401 | 400 | 444.4 | 117 | 77 |
| 30 | 2.8 | -0.015 | 544 | 549 | 316 | 397 | 396 | 440.4 | 116 | 77 |
| 31 | 2.8 | -0.014 | 537 | 546 | 314 | 392 | 391 | 436 | 115 | 77 |
| 32 | 2.8 | -0.013 | 531 | 542 | 311 | 388 | 386 | 431.6 | 114 | 77 |
| 33 | 2.8 | -0.014 | 525 | 539 | 309 | 383 | 382 | 427.6 | 115 | 77 |
| 34 | 2.8 | -0.013 | 519 | 536 | 306 | 379 | 377 | 423.4 | 113 | 77 |
| 35 | 2.8 | -0.013 | 512 | 532 | 304 | 375 | 373 | 419.2 | 112 | 77 |
| 36 | 2.8 | -0.012 | 507 | 529 | 301 | 372 | 369 | 415.6 | 111 | 77 |
| 37 | 2.8 | -0.012 | 501 | 526 | 299 | 367 | 365 | 411.6 | 111 | 77 |
| 38 | 2.8 | -0.012 | 495 | 523 | 296 | 363 | 360 | 407.4 | 110 | 77 |

Wood Heater Preburn Data - ASTM E2780

Run: 4

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/24/17
 Beginning Clock Time: 8:25

| Preburn Fuel Data | | | |
|--------------------------------|--------------|-------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | | |
| Total Preburn Weight (lb): | <u>14.7</u> | | |
| | <u>20</u> | <u>22.5</u> | <u>24.2</u> |
| Fuel Moisture Readings (% DB): | <u>24.2</u> | <u>19</u> | <u>20.8</u> |
| | <u>22.4</u> | <u>20</u> | |
| | <u>22.4</u> | <u>18.6</u> | |
| Avg Preburn Moisture (% DB): | <u>21.41</u> | | |

| | | |
|----------------------|---------------------|---------------------|
| Coal Bed Range (lb): | <u>2.4</u> (min) | <u>3.1</u> (max) |
|----------------------|---------------------|---------------------|

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | Stack | Ambient |
| 39 | 2.8 | -0.013 | 489 | 519 | 294 | 359 | 356 | 403.4 | 110 | 77 |
| 40 | 2.9 | -0.013 | 484 | 516 | 291 | 356 | 352 | 399.8 | 110 | 77 |
| 41 | 2.9 | -0.012 | 478 | 513 | 288 | 352 | 348 | 395.8 | 108 | 77 |
| 42 | 2.9 | -0.012 | 472 | 510 | 286 | 348 | 344 | 392 | 107 | 77 |
| 43 | 2.9 | -0.012 | 467 | 507 | 284 | 345 | 341 | 388.8 | 107 | 76 |
| 44 | 2.9 | -0.011 | 461 | 504 | 281 | 341 | 337 | 384.8 | 106 | 77 |
| 45 | 2.9 | -0.011 | 456 | 500 | 279 | 337 | 333 | 381 | 106 | 77 |
| 46 | 2.9 | -0.01 | 451 | 497 | 276 | 333 | 329 | 377.2 | 105 | 77 |
| 47 | 2.9 | -0.01 | 446 | 494 | 274 | 331 | 326 | 374.2 | 105 | 77 |
| 48 | 2.9 | -0.01 | 441 | 491 | 272 | 326 | 322 | 370.4 | 104 | 77 |
| 49 | 2.9 | -0.01 | 436 | 488 | 270 | 323 | 319 | 367.2 | 104 | 77 |
| 50 | 2.9 | -0.01 | 431 | 485 | 267 | 320 | 316 | 363.8 | 104 | 77 |
| 51 | 2.9 | -0.009 | 426 | 482 | 265 | 317 | 312 | 360.4 | 104 | 77 |
| 52 | 2.9 | -0.009 | 422 | 479 | 262 | 314 | 309 | 357.2 | 103 | 77 |
| 53 | 2.9 | -0.009 | 418 | 476 | 260 | 311 | 306 | 354.2 | 48 | 77 |
| 54 | 3 | -0.01 | 414 | 473 | 258 | 308 | 303 | 351.2 | 3218 | 77 |
| 55 | 2.9 | -0.009 | 410 | 471 | 256 | 305 | 301 | 348.6 | 3218 | 77 |
| 56 | 2.9 | -0.009 | 406 | 468 | 253 | 302 | 298 | 345.4 | 3218 | 77 |
| 57 | 2.9 | -0.009 | 403 | 465 | 252 | 300 | 295 | 343 | 3218 | 77 |
| 58 | 2.9 | -0.009 | 401 | 463 | 250 | 297 | 292 | 340.6 | 84 | 77 |
| 59 | 3 | -0.009 | 398 | 461 | 248 | 294 | 290 | 338.2 | 79 | 77 |
| 60 | 3 | -0.009 | 396 | 458 | 246 | 292 | 288 | 336 | 88 | 77 |
| 61 | 3 | -0.01 | 394 | 456 | 244 | 290 | 285 | 333.8 | 109 | 77 |
| 62 | 3 | -0.009 | 393 | 454 | 244 | 288 | 283 | 332.4 | 120 | 77 |
| 63 | 3 | -0.009 | 393 | 452 | 242 | 286 | 281 | 330.8 | 127 | 77 |
| 64 | 3 | -0.009 | 392 | 451 | 241 | 284 | 279 | 329.4 | 131 | 77 |
| 65 | 3 | -0.009 | 391 | 449 | 240 | 282 | 278 | 328 | 135 | 76 |
| 66 | 3 | -0.009 | 390 | 447 | 240 | 281 | 276 | 326.8 | 138 | 77 |
| 67 | 3 | -0.009 | 389 | 446 | 239 | 280 | 274 | 325.6 | 139 | 77 |
| 68 | 3 | -0.01 | 388 | 445 | 240 | 279 | 273 | 325 | 140 | 77 |
| 69 | 3 | -0.01 | 387 | 444 | 240 | 278 | 272 | 324.2 | 141 | 77 |
| 70 | 3 | -0.01 | 385 | 443 | 240 | 278 | 271 | 323.4 | 142 | 76 |
| 71 | 3 | -0.01 | 384 | 442 | 241 | 277 | 271 | 323 | 144 | 77 |
| 72 | 3 | -0.01 | 383 | 441 | 242 | 277 | 270 | 322.6 | 145 | 77 |
| 73 | 3 | -0.01 | 381 | 441 | 242 | 277 | 269 | 322 | 146 | 77 |
| 74 | 3 | -0.01 | 380 | 440 | 244 | 276 | 268 | 321.6 | 147 | 77 |
| 75 | 3 | -0.01 | 379 | 440 | 244 | 276 | 268 | 321.4 | 147 | 77 |

Wood Heater Test Fuel Data - ASTM E2780

| | | |
|------------------------------|-----------------|---------------|
| Manufacturer: Valley Comfort | PB Time: 7:00 | 12% Cal: 12.0 |
| Model: 20.2 Series | PB Temp: 75 | 22% Cal: 22.0 |
| Tracking No.: 2253 | | |
| Project No.: 0142WS013E | Test Time: 7:00 | |
| Test Date: 8/24/2017 | Test Temp: 75 | |
| Run No.: 4 | | |

| | |
|------------------------------------|------|
| Firebox Volume (ft ³): | 1.82 |
| Fuel Piece Length (in): | 13 |
| 2x4 Crib Weight (lb): | 5.6 |
| 4x4 Crib Weight (lb): | 6.6 |

| | | |
|---|-------|----|
| Total Fuel Weight (Dry Basis, lb): | 10.0 | |
| Fuel Density (lb/ft ³ , Dry Basis): | 28.46 | OK |
| Loading Density (lb/ft ³ , Wet Basis): | 6.70 | OK |
| 2x4 Percentage: | 46% | OK |

Coal Bed Range (20-25%): 2.44 - 3.05

| Test Fuel Piece | Weight (lb) | Size | Readings (Dry Basis %) | | | Dry Weight (lb) |
|-----------------|-------------|--------|------------------------|------|------|-----------------|
| 1 | 1.5 | 2"x 4" | 19.9 | 24.8 | 24.9 | 1.22 |
| 2 | 1.4 | 2"x 4" | 22.3 | 22.4 | 24.6 | 1.14 |
| 3 | 1.4 | 2"x 4" | 22.7 | 22.5 | 21.5 | 1.15 |
| 4 | 2.9 | 4"x 4" | 22.7 | 22.0 | 21.9 | 2.37 |
| 5 | 3.3 | 4"x 4" | 19.7 | 20.8 | 20.4 | 2.74 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| Spacer Readings (Dry Basis %) | | | |
|-------------------------------|------|--|--|
| 15.9 | 17.2 | | |
| 18.6 | 16.4 | | |
| 22.9 | 19.9 | | |
| 23.1 | 20.2 | | |
| 18.5 | 15.7 | | |
| 19.7 | 18.9 | | |
| 21.2 | | | |
| 16.0 | | | |
| 21.0 | | | |
| 19.7 | | | |
| | | | |
| | | | |
| | | | |

Technician Signature: _____

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: 4

Manufacturer: Valley Comfort
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Test Date: 24-Aug-17
Beginning Clock Time: 09:40

Total Sampling Time: 454 min
Recording Interval: 1 min
Background Sample Volume: cubic feet

Meter Box Y Factor: 1.003 (1) 0.997 (2) (Amb)

Barometric Pressure: Begin Middle End Average
28.58 28.62 28.59 28.60 Hg

OMNI Equipment Numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

PM Control Modules: 29.00 lb/lb-mole
Dilution Tunnel MW (dry): 28.78 lb/lb-mole
Dilution Tunnel MW (wet): 2.00 percent
Dilution Tunnel H2O: -0.170 H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99
Avg. Tunnel Velocity: 13.16 ft/sec
Initial Tunnel Flow: 139.4 scfm
Average Tunnel Flow: 140.7 scfm
Post-Test Leak Check (1): 0.000 cfm @ -15 in. Hg
Post-Test Leak Check (2): 0.000 cfm @ -17 in. Hg
Average Test Piece Fuel Moisture: 22.21 Dry Basis %

Technician Signature: [Handwritten Signature]

Table with columns: Velocity Traverse Data (Pt.1-Pt.8, Center), Initial dP, Temp, Vstrav, Vscnt, Fp

Main data table with columns: Elapsed Time (min), Gas Meter 1/2, Sample Rate 1/2, Orifice dH 1/2, Meter 1 Temp/Vacuum, Orifice dH 2, Meter 2 Temp/Vacuum, Dilution Tunnel, Pro. Rate 1/2, Scale Reading, Weight Change, Firebox Top/Bottom/Back/Left/Right, Avg. Stove Surface, Catalyst Exit, Stack, Filter 1, Dryer Exit 1, Filter 2, Dryer Exit 2, Ambient, Draft (H2O), CO2 (%), CO (%)

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: 4

Manufacturer: Valley Comfort
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Test Date: 24-Aug-17

Total Sampling Time: 454 min
Recording Interval: 1 min

Beginning Clock Time: 09:40 Background Sample Volume: cubic feet

Meter Box Y Factor: 1.003 (1) 0.997 (2) (Amb)

Barometric Pressure: Begin Middle End Average
28.58 28.62 28.59 28.60 Hg

OMNI Equipment Numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

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: -0.170 H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99
Avg. Tunnel Velocity: 13.16 ft/sec
Initial Tunnel Flow: 139.4 scfm
Average Tunnel Flow: 140.7 scfm
Post-Test Leak Check (1): 0.000 cfm @ -15 in. Hg
Post-Test Leak Check (2): 0.000 cfm @ -17 in. Hg
Average Test Piece Fuel Moisture: 22.21 Dry Basis %

Technician Signature: [Signature]

Velocity Traverse Data table with columns: Pt.1, Pt.2, Pt.3, Pt.4, Pt.5, Pt.6, Pt.7, Pt.8, Center. Rows: Initial dP, Temp, Vstrav, Vscant, Fp.


Main data table with columns: Elapsed Time, Gas Meter 1, Gas Meter 2, Sample Rate 1, Sample Rate 2, Orifice dH 1, Meter 1 Temp, Meter 1 Vacuum, Orifice dH 2, Meter 2 Temp, Meter 2 Vacuum, Dilution Tunnel Temp, 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, Catalyst Exit, Stack, Filter 1, Dryer Exit 1, Filter 2, Dryer Exit 2, Ambient, Draft (H2O), CO2 (%), CO (%).

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **4**

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 24-Aug-17
 Beginning Clock Time: 09:40
 Total Sampling Time: 454 min
 Recording Interval: 1 min
 Background Sample Volume: _____ cubic feet
 Meter Box Y Factor: 1.003 (1) 0.997 (2) _____ (Amb)
 Barometric Pressure: Begin Middle End Average
28.58 28.62 28.59 28.60 *Hg
 OMNI Equipment Numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

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: -0.170 *H2O
 Tunnel Area: 0.19635 ft2
 Pitot Tube Cp: 0.99
 Avg. Tunnel Velocity: 13.16 ft/sec.
 Initial Tunnel Flow: 139.4 scfm
 Average Tunnel Flow: 140.7 scfm
 Post-Test Leak Check (1): 0.000 cfm @ -15 in. Hg
 Post-Test Leak Check (2): 0.000 cfm @ -17 in. Hg
 Average Test Piece Fuel Moisture: 22.21 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 | 0.030 | 0.046 | 0.044 | 0.026 | 0.024 | 0.044 | 0.046 | 0.028 | 0.046 |
| Temp: | 78 | 78 | 78 | 78 | 78 | 78 | 78 | 78 | 78 |
| | V _{strav} 13.08 ft/sec | | | V _{scant} 14.68 ft/sec | | | F _p 0.891 | | |

| Elapsed Time (min) | Particulate Sampling Data | | | | | | | | | | | | Fuel Weight (lb) | | Temperature Data (*F) | | | | | | | | | | | | Stack Gas Data | | | | | |
|--------------------|--------------------------------|--------------------------------|---------------------|---------------------|----------------------------------|-------------------|----------------------|----------------------------------|-------------------|----------------------|----------------------|---------------------------|------------------|-------------|-----------------------|---------------|-------------|----------------|--------------|--------------|---------------|--------------------|---------------|-------|----------|--------------|----------------|--------------|---------|---------------------------|---------------------|--------|
| | Gas Meter 1 (ft ³) | Gas Meter 2 (ft ³) | Sample Rate 1 (cfm) | Sample Rate 2 (cfm) | Orifice dH 1 (*H ₂ O) | Meter 1 Temp (*F) | Meter 1 Vacuum (*Hg) | Orifice dH 2 (*H ₂ 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 | Catalyst Exit | Stack | Filter 1 | Dryer Exit 1 | Filter 2 | Dryer Exit 2 | Ambient | Draft (*H ₂ O) | CO ₂ (%) | CO (%) |
| 444 | 65.546 | 66.691 | 0.15 | 0.15 | 1.77 | 80 | -1.25 | 1.38 | 75 | -0.8 | 85 | 0.046 | 100 | 99 | 0.2 | 0 | 393 | 307 | 228 | 249 | 253 | 286 | 639 | 214 | 70 | 71 | 72 | 71 | 78 | -0.028 | 5.46 | -0.02 |
| 445 | 65.694 | 66.842 | 0.15 | 0.15 | 1.77 | 80 | -1.24 | 1.37 | 74 | -0.8 | 85 | 0.046 | 100 | 100 | 0.2 | 0 | 392 | 307 | 227 | 249 | 252 | 285 | 639 | 215 | 70 | 71 | 72 | 71 | 78 | -0.028 | 5.4 | -0.02 |
| 446 | 65.842 | 66.992 | 0.15 | 0.15 | 1.76 | 80 | -1.24 | 1.37 | 74 | -0.8 | 85 | 0.046 | 100 | 100 | 0.2 | 0 | 392 | 307 | 227 | 249 | 252 | 285 | 639 | 215 | 70 | 71 | 72 | 71 | 77 | -0.028 | 5.49 | -0.02 |
| 447 | 65.990 | 67.144 | 0.15 | 0.15 | 1.78 | 80 | -1.24 | 1.38 | 74 | -0.8 | 85 | 0.046 | 100 | 101 | 0.2 | 0 | 392 | 307 | 227 | 249 | 252 | 285 | 639 | 215 | 70 | 71 | 72 | 71 | 77 | -0.028 | 5.4 | -0.02 |
| 448 | 66.138 | 67.294 | 0.15 | 0.15 | 1.78 | 80 | -1.24 | 1.38 | 75 | -0.8 | 85 | 0.046 | 100 | 99 | 0.2 | 0 | 392 | 306 | 226 | 249 | 252 | 285 | 640 | 217 | 70 | 71 | 72 | 71 | 77 | -0.028 | 5.58 | -0.02 |
| 449 | 66.285 | 67.444 | 0.15 | 0.15 | 1.78 | 80 | -1.24 | 1.36 | 75 | -0.8 | 85 | 0.046 | 99 | 99 | 0.2 | 0 | 392 | 306 | 226 | 249 | 252 | 285 | 644 | 217 | 70 | 71 | 72 | 71 | 77 | -0.028 | 6.07 | -0.01 |
| 450 | 66.433 | 67.596 | 0.15 | 0.15 | 1.78 | 80 | -1.25 | 1.37 | 75 | -0.8 | 85 | 0.046 | 100 | 101 | 0.1 | -0.1 | 392 | 306 | 226 | 249 | 252 | 285 | 648 | 218 | 70 | 71 | 72 | 71 | 78 | -0.028 | 6.31 | -0.02 |
| 451 | 66.582 | 67.745 | 0.15 | 0.15 | 1.78 | 80 | -1.25 | 1.38 | 75 | -0.8 | 85 | 0.046 | 100 | 99 | 0.1 | 0 | 392 | 306 | 226 | 250 | 252 | 285 | 641 | 218 | 70 | 71 | 72 | 71 | 77 | -0.028 | 6.14 | -0.02 |
| 452 | 66.730 | 67.896 | 0.15 | 0.15 | 1.77 | 80 | -1.25 | 1.36 | 75 | -0.8 | 85 | 0.046 | 100 | 100 | 0.1 | 0 | 391 | 307 | 226 | 251 | 252 | 285 | 633 | 218 | 70 | 71 | 72 | 71 | 78 | -0.028 | 6.12 | -0.02 |
| 453 | 66.878 | 68.047 | 0.15 | 0.15 | 1.77 | 80 | -1.25 | 1.37 | 75 | -0.8 | 85 | 0.046 | 100 | 100 | 0.1 | 0 | 391 | 307 | 227 | 251 | 252 | 286 | 627 | 217 | 70 | 71 | 72 | 71 | 78 | -0.028 | 5.84 | -0.02 |
| 454 | 67.025 | 68.197 | 0.15 | 0.15 | 1.76 | 80 | -1.25 | 1.38 | 75 | -0.8 | 85 | 0.046 | 99 | 99 | 0.0 | -0.1 | 390 | 308 | 228 | 252 | 253 | 286 | 623 | 218 | 70 | 71 | 72 | 72 | 78 | -0.028 | 5.83 | -0.02 |
| Avg/Tot | 67.025 | 68.197 | 0.15 | 0.15 | 1.76 | 77 | | 1.37 | 72 | | 84 | 0.046 | 100 | 100 | | | | | | | | 38.4 | | | | 71 | 74 | 72 | 78 | -0.029 | | |

Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort **Equipment Numbers:** 283A, 637, 592
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Run #: 4
Date: 8/24/17

TRAIN 1 (First Hour emissions)

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| B. Front filter catch | Filter | D241 | 120.7 | 120.3 | 0.4 |
| 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:** **0.4**

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 | D242 | 122.8 | 122.2 | 0.6 |
| C. Rear filter catch | Filter | D243 | 121.9 | 122.1 | -0.2 |
| D. Probe catch* | Probe | 32 | 114742.4 | 114742.4 | 0.0 |
| E. Filter seals catch* | Seals | R507 | 3374.1 | 3373.4 | 0.7 |

Sub-Total **Total Particulate, mg:** **1.1**

Train 1 Aggregate **Total Particulate, mg:** **1.5**

TRAIN 2

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch | Filter | D244 | 122.1 | 120.5 | 1.6 |
| B. Rear filter catch | Filter | D245 | 122.4 | 122.7 | -0.3 |
| C. Probe catch* | Probe | 35 | 114327.0 | 114327.0 | 0.0 |
| D. Filter seals catch* | Seals | R508 | 3309.0 | 3308.5 | 0.5 |

Total Particulate, mg: **1.8**

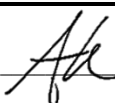
AMBIENT

| Sample Component | Reagent | Filter # or Probe # | Weights | | |
|------------------------|---------|---------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch* | Filter | | | | 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 Results - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Project No.: 0142WS013E
 Tracking No.: 2253
 Run: 4
 Test Date: 08/24/17

| | |
|--|-----------------------|
| Burn Rate | 0.60 kg/hr dry |
| Average Tunnel Temperature | 84 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.16 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8443.7 dscf/hour |
| Average Delta p | 0.046 inches H2O |
| Total Time of Test | 454 minutes |


| | AMBIENT | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 | FIRST HOUR FILTER (TRAIN 1) |
|---|-----------------------|-----------------------|-----------------------|-----------------------------|
| Total Sample Volume - Vm | 0.000 cubic feet | 67.025 cubic feet | 68.197 cubic feet | 8.816 cubic feet |
| Average Gas Meter Temperature | 78 degrees Fahrenheit | 77 degrees Fahrenheit | 72 degrees Fahrenheit | 72 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 0.000 dscf | 63.410 dscf | 64.654 dscf | 8.417 dscf |
| Total Particulates - m _n | 0 mg | 1.5 mg | 1.8 mg | 0.4 mg |
| Particulate Concentration (dry-standard) - C _p /C _s | 0.000000 grams/dscf | 0.00002 grams/dscf | 0.00003 grams/dscf | 0.00005 grams/dscf |
| Total Particulate Emissions - E _T | 0.00 grams | 1.51 grams | 1.78 grams | 0.40 grams |
| Particulate Emission Rate | 0.00 grams/hour | 0.20 grams/hour | 0.24 grams/hour | 0.40 grams/hour |
| Emissions Factor | | 0.33 g/kg | 0.39 g/kg | 0.45 g/kg |
| Difference from Average Total Particulate Emissions | | 0.13 grams | 0.13 grams | |
| Dual Train Comparison Results Are Acceptable | | | | |

| FINAL AVERAGE RESULTS | |
|--|------------------------|
| Complete Test Run | |
| Total Particulate Emissions - E _T | 1.65 grams |
| Particulate Emission Rate | 0.22 grams/hour |
| Emissions Factor | 0.36 grams/kg |
| First Hour Emissions | |
| Total Particulate Emissions - E _T | 0.40 grams |
| Particulate Emission Rate | 0.40 grams/hour |
| Emissions Factor | 0.45 grams/kg |
| 7.5% of Average Total Particulate Emissions | 0.12 grams |

| 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 |
| Train A - Train B G/KG ≤ 0.5 | 0.06 |
| Total PM Precision (%) | 8.13 |
| Stove Surface ΔT | OK |

Wood Heater Efficiency Results - CSA B415.1

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Date: 08/24/17
 Run: 4
 Control #: 0142WS013E
 Test Duration: 454
 Output Category: I

Technician Signature: 

Test Results in Accordance with CSA B415.1-09

| | HHV Basis | LHV Basis |
|--------------------------|-----------|-----------|
| Overall Efficiency | 79.1% | 85.5% |
| Combustion Efficiency | 97.6% | 97.6% |
| Heat Transfer Efficiency | 81% | 87.6% |

| | | | |
|--------------------|--------|--------|---------|
| Output Rate (kJ/h) | 9,382 | 8,900 | (Btu/h) |
| Burn Rate (kg/h) | 0.60 | 1.32 | (lb/h) |
| Input (kJ/h) | 11,859 | 11,249 | (Btu/h) |

| | | | |
|---------------------------|-------------|------|--------|
| Test Load Weight (dry kg) | 4.53 | 9.98 | dry lb |
| MC wet (%) | 18.17140363 | | |
| MC dry (%) | 22.21 | | |
| Particulate (g) | 0.22 | | |
| CO (g) | 177 | | |
| Test Duration (h) | 7.57 | | |

| Emissions | Particulate | CO |
|------------------|-------------|-------|
| g/MJ Output | 0.00 | 2.50 |
| g/kg Dry Fuel | 0.05 | 39.14 |
| g/h | 0.03 | 23.43 |
| lb/MM Btu Output | 0.01 | 5.80 |

| | |
|----------------------|-------|
| Air/Fuel Ratio (A/F) | 14.55 |
|----------------------|-------|

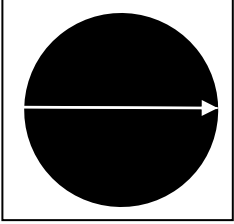
VERSION: 2.2 12/14/2009

Wood Heater Run Notes

Air Control Settings

Primary:

Secondary: Auto

| | |
|--------------------|---|
| Set to Low: |  |
| 90° From Vertical: | |

Tertiary/Pilot: Fixed

Fan: On Min

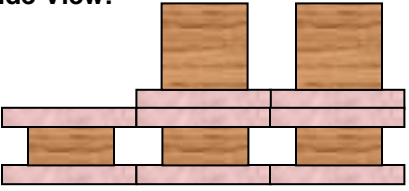
Preburn Notes

| Time | Notes |
|------|-------|
| | |

Test Notes

Sketch test fuel configuration:

Start up procedures & Timeline:

| | |
|-------------------|---|
| Side View: |  |
|-------------------|---|

Bypass: Closed

Fuel loaded by: 0:30

Door closed at: 0:35

Primary air: Set @ 4:25

Notes: None

| Time | Notes |
|-------|-------------------------|
| 30:00 | Set fan to test setting |
| 60:00 | Replaced Filter A |



Wood Heater Supplemental Data

Start Time: 9:40

Booth #: N/A (site testing)

Stop Time: 17:14

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0 @ -15 "Hg

B: 0 @ -17 "Hg

Calibrations: Span Gas CO₂: 17.00 CO: 4.267

| | Pre Test | | Post Test | |
|-----------------|----------|-------|-----------|-------|
| | Zero | Span | Zero | Span |
| Time | 7:50 | 7:55 | 17:17 | 17:22 |
| CO ₂ | 0.00 | 17.00 | 0.09 | 16.87 |
| CO | 0.000 | 4.267 | -0.018 | 4.101 |

Air Velocity (ft/min): Initial: <50 Final: <50

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

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (in): 6

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 8/21/17 Initials: AK

| | Initial | Middle | Ending |
|------------------------|---------|--------|--------|
| P _b (in/Hg) | 28.58 | 28.62 | 28.59 |
| RH (%) | 42.3 | 35.8 | 25.0 |
| Ambient (°F) | 73.9 | 78.4 | 74.9 |

| Tunnel Traverse | | |
|---------------------|--------------------------|-------|
| Microtector Reading | dP (in H ₂ O) | T(°F) |
| 1 | 0.030 | 78 |
| 2 | 0.046 | 78 |
| 3 | 0.044 | 78 |
| 4 | 0.026 | 78 |
| 5 | 0.024 | 78 |
| 6 | 0.044 | 78 |
| 7 | 0.046 | 78 |
| 8 | 0.028 | 78 |
| Center: | | |
| - | 0.046 | 78 |

Background Filter Volume: N/A

| Tunnel Static Pressure (in H ₂ O): | |
|---|-------------|
| Beginning of Test | End of Test |
| -0.17 | -0.17 |



RUN 5

Wood Heater Preburn Data - ASTM E2780

Run: 5

Technician Signature: _____

Manufacturer: Valley Comfort
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Test Date: 8/25/17
Beginning Clock Time: 9:32

| Preburn Fuel Data | | |
|--------------------------------|--------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | |
| Total Preburn Weight (lb): | <u>14.9</u> | |
| | <u>19</u> | <u>23.6</u> |
| Fuel Moisture Readings (% DB): | <u>19.9</u> | <u>23.8</u> |
| | <u>23.8</u> | <u>23.8</u> |
| | <u>23.8</u> | <u>24.9</u> |
| | <u>19.4</u> | <u>22.1</u> |
| Avg Preburn Moisture (% DB): | <u>22.41</u> | |

| | | |
|-------------|-------|-------|
| Coal Bed | 2.4 | 3.0 |
| Range (lb): | (min) | (max) |

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | Stack | Ambient |
| 0 | 15.3 | -0.062 | 748 | 403 | 292 | 494 | 528 | 493 | 456 | 70 |
| 1 | 15.1 | -0.06 | 751 | 406 | 294 | 486 | 518 | 491 | 460 | 70 |
| 2 | 14.8 | -0.062 | 758 | 409 | 295 | 481 | 510 | 490.6 | 460 | 70 |
| 3 | 14.5 | -0.061 | 766 | 412 | 295 | 477 | 505 | 491 | 465 | 70 |
| 4 | 14.2 | -0.062 | 774 | 414 | 295 | 474 | 500 | 491.4 | 470 | 69 |
| 5 | 13.9 | -0.063 | 781 | 416 | 295 | 474 | 498 | 492.8 | 473 | 69 |
| 6 | 13.6 | -0.063 | 788 | 418 | 295 | 474 | 496 | 494.2 | 477 | 69 |
| 7 | 13.3 | -0.063 | 795 | 420 | 295 | 476 | 495 | 496.2 | 481 | 68 |
| 8 | 12.9 | -0.063 | 801 | 421 | 296 | 478 | 496 | 498.4 | 483 | 68 |
| 9 | 12.6 | -0.064 | 807 | 423 | 297 | 480 | 497 | 500.8 | 483 | 68 |
| 10 | 12.3 | -0.063 | 812 | 424 | 298 | 483 | 498 | 503 | 485 | 68 |
| 11 | 12 | -0.062 | 817 | 426 | 299 | 487 | 501 | 506 | 485 | 68 |
| 12 | 11.7 | -0.063 | 822 | 427 | 300 | 490 | 504 | 508.6 | 484 | 67 |
| 13 | 11.4 | -0.062 | 825 | 428 | 301 | 493 | 507 | 510.8 | 483 | 67 |
| 14 | 11.1 | -0.062 | 829 | 429 | 302 | 496 | 511 | 513.4 | 481 | 68 |
| 15 | 10.7 | -0.062 | 831 | 430 | 303 | 500 | 515 | 515.8 | 483 | 68 |
| 16 | 10.4 | -0.062 | 834 | 431 | 305 | 503 | 519 | 518.4 | 483 | 68 |
| 17 | 10.1 | -0.062 | 836 | 433 | 307 | 507 | 523 | 521.2 | 483 | 68 |
| 18 | 9.8 | -0.063 | 838 | 435 | 309 | 511 | 527 | 524 | 484 | 67 |
| 19 | 9.5 | -0.061 | 840 | 437 | 311 | 515 | 531 | 526.8 | 481 | 68 |
| 20 | 9.3 | -0.06 | 841 | 439 | 313 | 519 | 536 | 529.6 | 478 | 68 |
| 21 | 8.9 | -0.06 | 842 | 442 | 315 | 523 | 540 | 532.4 | 475 | 68 |
| 22 | 8.6 | -0.062 | 843 | 444 | 318 | 527 | 544 | 535.2 | 471 | 68 |
| 23 | 8.4 | -0.061 | 844 | 446 | 320 | 530 | 548 | 537.6 | 466 | 68 |
| 24 | 8.1 | -0.06 | 845 | 449 | 322 | 534 | 553 | 540.6 | 465 | 68 |
| 25 | 7.8 | -0.059 | 845 | 451 | 324 | 538 | 557 | 543 | 463 | 68 |
| 26 | 7.6 | -0.059 | 846 | 454 | 327 | 541 | 562 | 546 | 458 | 69 |
| 27 | 7.3 | -0.058 | 846 | 456 | 329 | 543 | 566 | 548 | 454 | 69 |
| 28 | 7.1 | -0.058 | 848 | 459 | 331 | 547 | 571 | 551.2 | 451 | 69 |
| 29 | 6.8 | -0.058 | 849 | 462 | 333 | 550 | 576 | 554 | 449 | 69 |
| 30 | 6.6 | -0.058 | 849 | 464 | 335 | 554 | 581 | 556.6 | 446 | 69 |
| 31 | 6.4 | -0.057 | 850 | 467 | 337 | 557 | 586 | 559.4 | 441 | 69 |
| 32 | 6.2 | -0.057 | 852 | 470 | 339 | 563 | 590 | 562.8 | 440 | 69 |
| 33 | 6 | -0.057 | 856 | 472 | 340 | 570 | 594 | 566.4 | 438 | 69 |
| 34 | 5.8 | -0.057 | 859 | 474 | 343 | 574 | 598 | 569.6 | 434 | 70 |
| 35 | 5.7 | -0.056 | 863 | 476 | 344 | 577 | 601 | 572.2 | 433 | 70 |
| 36 | 5.5 | -0.056 | 869 | 478 | 346 | 581 | 604 | 575.6 | 435 | 70 |
| 37 | 5.4 | -0.056 | 875 | 479 | 349 | 585 | 605 | 578.6 | 436 | 70 |
| 38 | 5.3 | -0.055 | 878 | 481 | 350 | 587 | 607 | 580.6 | 433 | 70 |
| 39 | 5.1 | -0.055 | 881 | 482 | 352 | 591 | 608 | 582.8 | 430 | 70 |

Wood Heater Preburn Data - ASTM E2780

Run: 5

Technician Signature:

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/25/17
 Beginning Clock Time: 9:32

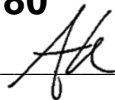
| Preburn Fuel Data | | | |
|--------------------------------|--------------|------|--|
| Fuel Piece Lengths (in.): | <u>13</u> | | |
| Total Preburn Weight (lb): | <u>14.9</u> | | |
| | 19 | 23.6 | |
| Fuel Moisture Readings (% DB): | 19.9 | 23.8 | |
| | 23.8 | 23.8 | |
| | 23.8 | 24.9 | |
| | 19.4 | 22.1 | |
| Avg Preburn Moisture (% DB): | <u>22.41</u> | | |

| | | |
|-------------|-------|-------|
| Coal Bed | 2.4 | 3.0 |
| Range (lb): | (min) | (max) |

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | Stack | Ambient |
| 40 | 5 | -0.055 | 882 | 484 | 353 | 593 | 610 | 584.4 | 426 | 70 |
| 41 | 4.9 | -0.055 | 883 | 485 | 355 | 597 | 611 | 586.2 | 424 | 70 |
| 42 | 4.8 | -0.055 | 883 | 486 | 356 | 598 | 612 | 587 | 421 | 70 |
| 43 | 4.7 | -0.055 | 884 | 488 | 357 | 600 | 614 | 588.6 | 420 | 70 |
| 44 | 4.6 | -0.054 | 884 | 489 | 359 | 603 | 615 | 590 | 418 | 70 |
| 45 | 4.5 | -0.054 | 885 | 490 | 360 | 606 | 615 | 591.2 | 416 | 70 |
| 46 | 4.3 | -0.054 | 886 | 491 | 361 | 608 | 615 | 592.2 | 414 | 70 |
| 47 | 4.3 | -0.054 | 886 | 492 | 363 | 611 | 616 | 593.6 | 413 | 70 |
| 48 | 4.2 | -0.054 | 887 | 493 | 365 | 614 | 617 | 595.2 | 412 | 70 |
| 49 | 4.1 | -0.053 | 887 | 494 | 366 | 616 | 616 | 595.8 | 409 | 71 |
| 50 | 4 | -0.053 | 886 | 496 | 367 | 618 | 616 | 596.6 | 408 | 70 |
| 51 | 3.9 | -0.053 | 886 | 497 | 369 | 619 | 615 | 597.2 | 408 | 70 |
| 52 | 3.8 | -0.053 | 885 | 498 | 370 | 620 | 615 | 597.6 | 408 | 71 |
| 53 | 3.7 | -0.053 | 885 | 500 | 372 | 620 | 616 | 598.6 | 407 | 71 |
| 54 | 3.6 | -0.052 | 883 | 501 | 373 | 620 | 617 | 598.8 | 403 | 71 |
| 55 | 3.5 | -0.048 | 881 | 503 | 374 | 621 | 618 | 599.4 | 400 | 71 |
| 56 | 3.6 | -0.045 | 876 | 504 | 378 | 615 | 615 | 597.6 | 333 | 71 |
| 57 | 3.5 | -0.043 | 868 | 505 | 381 | 608 | 607 | 593.8 | 287 | 71 |
| 58 | 3.5 | -0.041 | 860 | 506 | 383 | 599 | 600 | 589.6 | 257 | 71 |
| 59 | 3.5 | -0.039 | 852 | 506 | 385 | 590 | 592 | 585 | 235 | 71 |
| 60 | 3.4 | -0.038 | 844 | 506 | 387 | 583 | 584 | 580.8 | 220 | 71 |
| 61 | 3.4 | -0.037 | 835 | 505 | 389 | 574 | 576 | 575.8 | 208 | 71 |
| 62 | 3.4 | -0.036 | 826 | 505 | 390 | 566 | 568 | 571 | 199 | 71 |
| 63 | 3.4 | -0.035 | 816 | 504 | 391 | 557 | 561 | 565.8 | 191 | 70 |
| 64 | 3.4 | -0.034 | 807 | 503 | 391 | 549 | 554 | 560.8 | 186 | 70 |
| 65 | 3.4 | -0.033 | 798 | 501 | 391 | 542 | 547 | 555.8 | 180 | 70 |
| 66 | 3.4 | -0.032 | 790 | 500 | 391 | 536 | 540 | 551.4 | 174 | 70 |
| 67 | 3.4 | -0.032 | 781 | 499 | 390 | 528 | 534 | 546.4 | 98 | 70 |
| 68 | 3.4 | -0.03 | 772 | 497 | 390 | 522 | 527 | 541.6 | 135 | 70 |
| 69 | 3.3 | -0.03 | 764 | 496 | 388 | 515 | 521 | 536.8 | 159 | 70 |
| 70 | 3.3 | -0.029 | 755 | 494 | 388 | 508 | 515 | 532 | 157 | 70 |
| 71 | 3.3 | -0.028 | 746 | 492 | 386 | 502 | 509 | 527 | 155 | 70 |
| 72 | 3.3 | -0.028 | 737 | 490 | 385 | 495 | 503 | 522 | 153 | 70 |
| 73 | 3.3 | -0.027 | 729 | 488 | 383 | 489 | 497 | 517.2 | 151 | 70 |
| 74 | 3.4 | -0.027 | 720 | 485 | 382 | 483 | 491 | 512.2 | 150 | 70 |
| 75 | 3.4 | -0.026 | 711 | 483 | 380 | 477 | 486 | 507.4 | 147 | 70 |
| 76 | 3.4 | -0.026 | 702 | 481 | 378 | 472 | 481 | 502.8 | 146 | 70 |
| 77 | 3.4 | -0.026 | 694 | 479 | 377 | 467 | 475 | 498.4 | 144 | 70 |
| 78 | 3.4 | -0.025 | 685 | 477 | 375 | 461 | 471 | 493.8 | 142 | 70 |
| 79 | 3.4 | -0.025 | 677 | 475 | 373 | 456 | 466 | 489.4 | 141 | 70 |

Wood Heater Preburn Data - ASTM E2780

Run: 5

Technician Signature: 

Manufacturer: Valley Comfort
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Test Date: 8/25/17
Beginning Clock Time: 9:32

| Preburn Fuel Data | | |
|--------------------------------|--------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | |
| Total Preburn Weight (lb): | <u>14.9</u> | |
| | <u>19</u> | <u>23.6</u> |
| Fuel Moisture Readings (% DB): | <u>19.9</u> | <u>23.8</u> |
| | <u>23.8</u> | <u>23.8</u> |
| | <u>23.8</u> | <u>24.9</u> |
| | <u>19.4</u> | <u>22.1</u> |
| Avg Preburn Moisture (% DB): | <u>22.41</u> | |

| | | |
|-------------|-------|-------|
| Coal Bed | 2.4 | 3.0 |
| Range (lb): | (min) | (max) |

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | Stack | Ambient |
| 80 | 3.4 | -0.024 | 668 | 473 | 371 | 451 | 461 | 484.8 | 141 | 70 |
| 81 | 3.4 | -0.024 | 661 | 471 | 370 | 446 | 456 | 480.8 | 138 | 70 |
| 82 | 3.4 | -0.024 | 653 | 469 | 368 | 441 | 452 | 476.6 | 137 | 70 |
| 83 | 3.4 | -0.023 | 645 | 468 | 366 | 436 | 447 | 472.4 | 135 | 70 |
| 84 | 3.3 | -0.023 | 638 | 466 | 364 | 433 | 443 | 468.8 | 134 | 70 |
| 85 | 3.4 | -0.023 | 631 | 464 | 362 | 427 | 439 | 464.6 | 133 | 70 |
| 86 | 3.3 | -0.023 | 624 | 462 | 360 | 423 | 435 | 460.8 | 131 | 70 |
| 87 | 3.4 | -0.022 | 618 | 460 | 358 | 419 | 430 | 457 | 130 | 70 |
| 88 | 3.4 | -0.022 | 611 | 459 | 356 | 415 | 426 | 453.4 | 129 | 70 |
| 89 | 3.4 | -0.022 | 605 | 457 | 354 | 411 | 422 | 449.8 | 128 | 70 |
| 90 | 3.4 | -0.021 | 599 | 455 | 352 | 407 | 419 | 446.4 | 128 | 70 |
| 91 | 3.4 | -0.022 | 593 | 453 | 350 | 403 | 415 | 442.8 | 128 | 70 |
| 92 | 3.4 | -0.021 | 587 | 451 | 348 | 398 | 411 | 439 | 125 | 70 |
| 93 | 3.4 | -0.021 | 582 | 449 | 346 | 396 | 407 | 436 | 124 | 69 |
| 94 | 3.4 | -0.021 | 576 | 448 | 344 | 392 | 404 | 432.8 | 124 | 70 |
| 95 | 3.4 | -0.021 | 571 | 446 | 342 | 389 | 400 | 429.6 | 124 | 69 |
| 96 | 3.4 | -0.021 | 566 | 444 | 340 | 386 | 397 | 426.6 | 125 | 69 |
| 97 | 3.4 | -0.021 | 562 | 442 | 338 | 382 | 394 | 423.6 | 129 | 69 |
| 98 | 3.4 | -0.022 | 558 | 440 | 336 | 378 | 392 | 420.8 | 133 | 69 |
| 99 | 3.4 | -0.022 | 556 | 439 | 334 | 377 | 389 | 419 | 138 | 69 |
| 100 | 3.3 | -0.024 | 552 | 437 | 331 | 374 | 388 | 416.4 | 146 | 69 |
| 101 | 3.3 | -0.024 | 549 | 436 | 329 | 373 | 387 | 414.8 | 154 | 69 |
| 102 | 3.3 | -0.025 | 547 | 435 | 327 | 371 | 386 | 413.2 | 161 | 69 |
| 103 | 3.3 | -0.025 | 545 | 434 | 325 | 371 | 385 | 412 | 168 | 69 |
| 104 | 3.3 | -0.026 | 543 | 434 | 323 | 370 | 386 | 411.2 | 175 | 69 |
| 105 | 3.3 | -0.027 | 542 | 434 | 321 | 370 | 387 | 410.8 | 180 | 69 |
| 106 | 3.2 | -0.029 | 541 | 433 | 319 | 370 | 388 | 410.2 | 187 | 69 |
| 107 | 3.3 | -0.029 | 540 | 434 | 318 | 370 | 389 | 410.2 | 194 | 69 |
| 108 | 3.2 | -0.03 | 540 | 434 | 317 | 371 | 391 | 410.6 | 200 | 69 |
| 109 | 3.2 | -0.03 | 540 | 435 | 316 | 373 | 393 | 411.4 | 204 | 69 |
| 110 | 3.2 | -0.035 | 540 | 436 | 315 | 375 | 395 | 412.2 | 208 | 69 |
| 111 | 3.2 | -0.035 | 541 | 437 | 314 | 377 | 397 | 413.2 | 212 | 69 |
| 112 | 3.1 | -0.033 | 541 | 438 | 314 | 379 | 400 | 414.4 | 215 | 69 |
| 113 | 3.1 | -0.032 | 542 | 440 | 314 | 381 | 403 | 416 | 220 | 69 |
| 114 | 3.1 | -0.033 | 543 | 442 | 314 | 384 | 406 | 417.8 | 222 | 69 |
| 115 | 3 | -0.034 | 543 | 444 | 314 | 384 | 408 | 418.6 | 225 | 69 |
| 116 | 3 | -0.034 | 543 | 445 | 314 | 386 | 410 | 419.6 | 228 | 69 |
| 117 | 3 | -0.034 | 542 | 447 | 314 | 387 | 412 | 420.4 | 230 | 69 |
| 118 | 3 | -0.035 | 543 | 448 | 315 | 387 | 414 | 421.4 | 230 | 69 |
| 119 | 3 | -0.035 | 543 | 449 | 315 | 389 | 416 | 422.4 | 230 | 69 |

Wood Heater Test Fuel Data - ASTM E2780

Manufacturer: Valley Comfort
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Test Date: 8/25/2017
Run No.: 5

PB Time: 7:15 **12% Cal:** 12.0
PB Temp: 68 **22% Cal:** 22.0

Test Time: 7:15
Test Temp: 68

| | |
|------------------------------------|------|
| Firebox Volume (ft ³): | 1.82 |
| Fuel Piece Length (in): | 13 |
| 2x4 Crib Weight (lb): | 5.1 |
| 4x4 Crib Weight (lb): | 6.8 |

| | | |
|---|-------|----|
| Total Fuel Weight (Dry Basis, lb): | 9.8 | |
| Fuel Density (lb/ft ³ , Dry Basis): | 27.72 | OK |
| Loading Density (lb/ft ³ , Wet Basis): | 6.54 | OK |
| 2x4 Percentage: | 43% | OK |

Coal Bed Range (20-25%): 2.38 - 2.975

| Test Fuel Piece | Weight (lb) | Size | Readings (Dry Basis %) | | | Dry Weight (lb) |
|-----------------|-------------|--------|------------------------|------|------|-----------------|
| 1 | 1.2 | 2"x 4" | 21.4 | 19.2 | 19.5 | 1.00 |
| 2 | 1.3 | 2"x 4" | 22.4 | 23.3 | 23.8 | 1.06 |
| 3 | 1.3 | 2"x 4" | 20.0 | 20.5 | 20.5 | 1.08 |
| 4 | 3.3 | 4"x 4" | 22.5 | 22.2 | 25.0 | 2.68 |
| 5 | 3.1 | 4"x 4" | 19.0 | 22.1 | 19.4 | 2.58 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| Spacer Readings (Dry Basis %) | | | |
|-------------------------------|------|--|--|
| 19.7 | 20.1 | | |
| 21.0 | 21.7 | | |
| 16.8 | 20.5 | | |
| 17.7 | 14.6 | | |
| 22.9 | 19.9 | | |
| 19.1 | | | |
| 16.8 | | | |
| 18.5 | | | |
| 22.5 | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Technician Signature:

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: 5

Manufacturer: Valley Comfort
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Test Date: 25-Aug-17

Total Sampling Time: 227 min
Recording Interval: 1 min

Beginning Clock Time: 09:32
Background Sample Volume: cubic feet
Meter Box Y Factor: 1.003 (1) 0.997 (2) (Amb)

Barometric Pressure: Begin Middle End Average
28.76 28.75 28.74 28.75 Hg

OMNI Equipment Numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

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: -0.170 H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.33 ft/sec
Initial Tunnel Flow: 140.2 scfm
Average Tunnel Flow: 141.5 scfm
Post-Test Leak Check (1): 0.000 cfm @ -16 in. Hg
Post-Test Leak Check (2): 0.000 cfm @ -17 in. Hg
Average Test Piece Fuel Moisture: 21.39 Dry Basis %

Technician Signature: [Signature]

Table with 10 columns: Pt.1 to Pt.8 and Center. Rows: Initial dP, Temp, Vstrav, Vscnt, Fp.


Main table with columns: Elapsed Time (min), Gas Meter 1, Gas Meter 2, Sample Rate 1, Sample Rate 2, Orifice dH 1, Meter 1 Temp, Meter 1 Vacuum, Orifice dH 2, Meter 2 Temp, Meter 2 Vacuum, Dilution Tunnel, 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, Catalyst Exit, Stack, Filter 1, Dryer Exit 1, Filter 2, Dryer Exit 2, Ambient, Draft (H2O), CO2 (%), CO (%).

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **5**

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 25-Aug-17
 Beginning Clock Time: 09:32
 Total Sampling Time: 227 min
 Recording Interval: 1 min
 Background Sample Volume: _____ cubic feet
 Meter Box Y Factor: 1.003 (1) 0.997 (2) _____ (Amb)
 Barometric Pressure: Begin Middle End Average
28.76 28.75 28.74 28.75 "Hg
 OMNI Equipment Numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

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: -0.170 "H2O
 Tunnel Area: 0.19635 ft²
 Pitot Tube Cp: 0.99
 Avg. Tunnel Velocity: 13.33 ft/sec.
 Initial Tunnel Flow: 140.2 scfm
 Average Tunnel Flow: 141.5 scfm
 Post-Test Leak Check (1): 0.000 cfm @ -16 in. Hg
 Post-Test Leak Check (2): 0.000 cfm @ -17 in. Hg
 Average Test Piece Fuel Moisture: 21.39 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 | 0.028 | 0.048 | 0.040 | 0.028 | 0.030 | 0.046 | 0.044 | 0.026 | 0.050 |
| Temp: | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| | V _{strav} 13.19 ft/sec | | | V _{scnt} 15.29 ft/sec | | | F _p 0.863 | | |

| Elapsed Time (min) | Particulate Sampling Data | | | | | | | | | | | | | | Fuel Weight (lb) | | Temperature Data (°F) | | | | | | | | | | | | Stack Gas Data | | | |
|--------------------|--------------------------------|--------------------------------|---------------------|---------------------|----------------------------------|-------------------|----------------------|----------------------------------|-------------------|----------------------|----------------------|---------------------------|-------------|-------------|------------------|---------------|-----------------------|----------------|--------------|--------------|---------------|--------------------|---------------|-------|----------|--------------|----------|--------------|----------------|---------------------------|---------------------|--------|
| | Gas Meter 1 (ft ³) | Gas Meter 2 (ft ³) | Sample Rate 1 (cfm) | Sample Rate 2 (cfm) | Orifice dH 1 ("H ₂ O) | Meter 1 Temp (°F) | Meter 1 Vacuum ("Hg) | Orifice dH 2 ("H ₂ 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 | Catalyst Exit | Stack | Filter 1 | Dryer Exit 1 | Filter 2 | Dryer Exit 2 | Ambient | Draft ("H ₂ O) | CO ₂ (%) | CO (%) |
| 222 | 32.605 | 33.321 | 0.15 | 0.15 | 1.74 | 76 | -1.28 | 1.38 | 77 | -0.8 | 95 | 0.050 | 101 | 100 | 0.2 | 0 | 588 | 424 | 382 | 433 | 436 | 453 | 800 | 326 | 80 | 73 | 81 | 73 | 76 | -0.058 | 6.02 | -0.03 |
| 223 | 32.752 | 33.471 | 0.15 | 0.15 | 1.73 | 76 | -1.29 | 1.36 | 77 | -0.8 | 95 | 0.050 | 100 | 100 | 0.1 | -0.1 | 588 | 423 | 382 | 434 | 436 | 453 | 800 | 327 | 80 | 73 | 81 | 73 | 76 | -0.058 | 6.15 | -0.03 |
| 224 | 32.900 | 33.621 | 0.15 | 0.15 | 1.74 | 76 | -1.28 | 1.37 | 78 | -0.8 | 95 | 0.050 | 101 | 100 | 0.1 | 0 | 589 | 423 | 383 | 433 | 435 | 453 | 799 | 328 | 80 | 73 | 81 | 73 | 76 | -0.057 | 6.01 | -0.03 |
| 225 | 33.047 | 33.772 | 0.15 | 0.15 | 1.73 | 76 | -1.28 | 1.38 | 78 | -0.8 | 94 | 0.050 | 100 | 100 | 0.1 | 0 | 588 | 422 | 383 | 433 | 435 | 452 | 799 | 327 | 80 | 73 | 81 | 73 | 76 | -0.057 | 5.99 | -0.03 |
| 226 | 33.195 | 33.921 | 0.15 | 0.15 | 1.73 | 76 | -1.28 | 1.37 | 78 | -0.8 | 95 | 0.050 | 101 | 99 | 0.1 | 0 | 589 | 422 | 383 | 433 | 435 | 452 | 799 | 325 | 80 | 73 | 81 | 73 | 76 | -0.058 | 5.99 | -0.03 |
| 227 | 33.342 | 34.071 | 0.15 | 0.15 | 1.74 | 76 | -1.28 | 1.37 | 78 | -0.8 | 95 | 0.050 | 100 | 100 | 0.0 | -0.1 | 589 | 421 | 383 | 432 | 435 | 452 | 799 | 325 | 80 | 73 | 81 | 73 | 76 | -0.057 | 5.97 | -0.03 |
| Avg/Tot | 33.342 | 34.071 | 0.15 | 0.15 | 1.76 | 73 | | 1.38 | 74 | | 91 | 0.050 | 100 | 100 | | | | | | | | 29.0 | | | | 71 | 77 | 70 | 72 | -0.058 | | |

Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort **Equipment Numbers:** 283A, 637, 592
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Run #: 5
Date: 8/25/17

TRAIN 1 (First Hour emissions)

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| B. Front filter catch | Filter | D246 | 123.5 | 122.1 | 1.4 |
| 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:** **1.4**

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 | D247 | 123.7 | 123.1 | 0.6 |
| C. Rear filter catch | Filter | D248 | 121.1 | 121.2 | -0.1 |
| D. Probe catch* | Probe | 36 | 114885.8 | 114885.7 | 0.1 |
| E. Filter seals catch* | Seals | R509 | 3307.8 | 3307.6 | 0.2 |

Sub-Total **Total Particulate, mg:** **0.8**

Train 1 Aggregate **Total Particulate, mg:** **2.2**

TRAIN 2

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch | Filter | D249 | 121.5 | 119.8 | 1.7 |
| B. Rear filter catch | Filter | D250 | 120.4 | 122.0 | -1.6 |
| C. Probe catch* | Probe | 37 | 114466.0 | 114466.0 | 0.0 |
| D. Filter seals catch* | Seals | R510 | 4093.6 | 4091.7 | 1.9 |

Total Particulate, mg: **2.0**

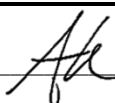
AMBIENT

| Sample Component | Reagent | Filter # or Probe # | Weights | | |
|------------------------|---------|---------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch* | Filter | | | | 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 Results - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Project No.: 0142WS013E
 Tracking No.: 2253
 Run: 5
 Test Date: 08/25/17

| | |
|--|-----------------------|
| Burn Rate | 1.18 kg/hr dry |
| Average Tunnel Temperature | 91 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.33 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8493.0 dscf/hour |
| Average Delta p | 0.050 inches H2O |
| Total Time of Test | 227 minutes |


| | AMBIENT | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 | FIRST HOUR FILTER (TRAIN 1) |
|---|-----------------------|-----------------------|-----------------------|-----------------------------|
| Total Sample Volume - Vm | 0.000 cubic feet | 33.342 cubic feet | 34.071 cubic feet | 8.755 cubic feet |
| Average Gas Meter Temperature | 72 degrees Fahrenheit | 73 degrees Fahrenheit | 74 degrees Fahrenheit | 71 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 0.000 dscf | 31.954 dscf | 32.373 dscf | 8.417 dscf |
| Total Particulates - m _n | 0 mg | 2.2 mg | 2 mg | 1.4 mg |
| Particulate Concentration (dry-standard) - C _r /C _s | 0.000000 grams/dscf | 0.00007 grams/dscf | 0.00006 grams/dscf | 0.00017 grams/dscf |
| Total Particulate Emissions - E _T | 0.00 grams | 2.21 grams | 1.99 grams | 1.41 grams |
| Particulate Emission Rate | 0.00 grams/hour | 0.58 grams/hour | 0.52 grams/hour | 1.41 grams/hour |
| Emissions Factor | | 0.50 g/kg | 0.45 g/kg | 0.61 g/kg |
| Difference from Average Total Particulate Emissions | | 0.11 grams | 0.11 grams | |
| Dual Train Comparison Results Are Acceptable | | | | |

| FINAL AVERAGE RESULTS | |
|--|------------------------|
| Complete Test Run | |
| Total Particulate Emissions - E _T | 2.10 grams |
| Particulate Emission Rate | 0.55 grams/hour |
| Emissions Factor | 0.47 grams/kg |
| First Hour Emissions | |
| Total Particulate Emissions - E _T | 1.41 grams |
| Particulate Emission Rate | 1.41 grams/hour |
| Emissions Factor | 0.61 grams/kg |
| 7.5% of Average Total Particulate Emissions | 0.16 grams |

| 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 |
| Train A - Train B G/KG ≤ 0.5 | 0.05 |
| Total PM Precision (%) | 5.41 |
| Stove Surface ΔT | OK |

Wood Heater Efficiency Results - CSA B415.1

Manufacturer: Valley Comfort
Model: 20.2 Series
Date: 08/25/17
Run: 5
Control #: 0142WS013E
Test Duration: 227
Output Category: II

Technician Signature: 

Test Results in Accordance with CSA B415.1-09

| | HHV Basis | LHV Basis |
|--------------------------|-----------|-----------|
| Overall Efficiency | 73.6% | 79.5% |
| Combustion Efficiency | 98.4% | 98.4% |
| Heat Transfer Efficiency | 75% | 80.8% |

| | | | |
|--------------------|--------|--------|---------|
| Output Rate (kJ/h) | 17,134 | 16,254 | (Btu/h) |
| Burn Rate (kg/h) | 1.18 | 2.59 | (lb/h) |
| Input (kJ/h) | 23,290 | 22,093 | (Btu/h) |

| | | | |
|---------------------------|-------------|------|--------|
| Test Load Weight (dry kg) | 4.45 | 9.80 | dry lb |
| MC wet (%) | 17.61862917 | | |
| MC dry (%) | 21.39 | | |
| Particulate (g) | 0.55 | | |
| CO (g) | 127 | | |
| Test Duration (h) | 3.78 | | |

| Emissions | Particulate | CO |
|------------------|-------------|-------|
| g/MJ Output | 0.01 | 1.96 |
| g/kg Dry Fuel | 0.12 | 28.55 |
| g/h | 0.15 | 33.56 |
| lb/MM Btu Output | 0.02 | 4.55 |

| | |
|----------------------|-------|
| Air/Fuel Ratio (A/F) | 14.44 |
|----------------------|-------|

VERSION: 2.2 12/14/2009

Wood Heater Run Notes

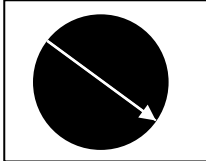
Air Control Settings

Primary:

Secondary: Auto

Set to medium high for fan confirmation:

36 degrees
from
horizontal



Tertiary/Pilot: Fixed

Fan: Off

Preburn Notes

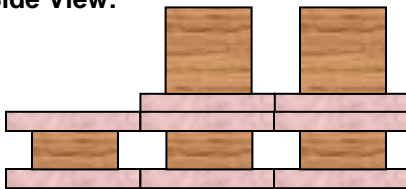
| Time | Notes |
|------|-------|
| | |

Test Notes

Sketch test fuel configuration:

Start up procedures & Timeline:

Side View:



Bypass: Closed

Fuel loaded by: 0:30

Door closed at: 0:40

Primary air: Set @ 4:55

Notes: None

| Time | Notes |
|-------|-------------------|
| 60:00 | Replaced Filter A |

Wood Heater Supplemental Data

Start Time: 9:32

Booth #: N/A (site testing)

Stop Time: 13:19

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0 @ -16 "Hg

B: 0 @ -17 "Hg

Calibrations: Span Gas CO₂: 17.00 CO: 4.267

| | Pre Test | | Post Test | |
|-----------------|----------|-------|-----------|-------|
| | Zero | Span | Zero | Span |
| Time | 7:50 | 7:17 | 17:17 | 17:22 |
| CO ₂ | 0.00 | 17.00 | 0.09 | 16.87 |
| CO | 0.000 | 4.267 | -0.018 | 4.101 |

Air Velocity (ft/min): Initial: <50 Final: <50

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

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (in): 6

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 8/21/17 Initials: *AK*

| Tunnel Traverse | | |
|---------------------|--------------------------|-------|
| Microtector Reading | dP (in H ₂ O) | T(°F) |
| 1 | 0.028 | 80 |
| 2 | 0.048 | 80 |
| 3 | 0.04 | 80 |
| 4 | 0.028 | 80 |
| 5 | 0.03 | 80 |
| 6 | 0.046 | 80 |
| 7 | 0.044 | 80 |
| 8 | 0.026 | 80 |
| Center: | | |
| - | 0.050 | 80 |

| | Initial | Middle | Ending |
|------------------------|---------|--------|--------|
| P _b (in/Hg) | 28.76 | 28.75 | 28.74 |
| RH (%) | 30.5 | 32.3 | 30.1 |
| Ambient (°F) | 71 | 73 | 75 |

| Tunnel Static Pressure (in H ₂ O): | |
|---|-------------|
| Beginning of Test | End of Test |
| -0.17 | -0.17 |


Background Filter Volume: N/A



RUN 6

Wood Heater Preburn Data - ASTM E2780

Run: **6**

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/25/17
 Beginning Clock Time: 13:50


| Preburn Fuel Data | | | |
|--------------------------------|--------------|-------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | | |
| Total Preburn Weight (lb): | <u>14.9</u> | | |
| | <u>19</u> | <u>23.8</u> | <u>23.8</u> |
| Fuel Moisture Readings (% DB): | <u>19.9</u> | <u>23.8</u> | <u>23.6</u> |
| | <u>23.8</u> | <u>24.9</u> | |
| | <u>19.4</u> | <u>22.1</u> | |
| Avg Preburn Moisture (% DB): | <u>22.41</u> | | |

| | | |
|-------------|-------|-------|
| Coal Bed | 0.0 | 0.0 |
| Range (lb): | (min) | (max) |

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | Stack | Ambient |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|--------|--------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | | | |
| 0 | 16.9 | 278 | 358 | 359 | 225 | 245 | 291 | 295.6 | -0.041 | -0.041 | |
| 1 | 16.8 | 297 | 362 | 359 | 223 | 242 | 285 | 294.2 | -0.043 | -0.043 | |
| 2 | 16.6 | 324 | 373 | 359 | 221 | 238 | 280 | 294.2 | -0.047 | -0.047 | |
| 3 | 16.4 | 368 | 400 | 359 | 219 | 237 | 279 | 298.8 | -0.049 | -0.049 | |
| 4 | 16.1 | 397 | 431 | 359 | 217 | 236 | 279 | 304.4 | -0.051 | -0.051 | |
| 5 | 15.8 | 437 | 463 | 359 | 215 | 236 | 280 | 310.6 | -0.054 | -0.054 | |
| 6 | 15.4 | 449 | 492 | 359 | 215 | 238 | 282 | 317.2 | -0.055 | -0.055 | |
| 7 | 15.1 | 474 | 519 | 358 | 215 | 241 | 285 | 323.6 | -0.055 | -0.055 | |
| 8 | 14.7 | 484 | 541 | 358 | 215 | 245 | 290 | 329.8 | -0.055 | -0.055 | |
| 9 | 14.4 | 483 | 560 | 358 | 216 | 249 | 295 | 335.6 | -0.056 | -0.056 | |
| 10 | 14 | 485 | 577 | 358 | 216 | 254 | 301 | 341.2 | -0.057 | -0.057 | |
| 11 | 13.6 | 487 | 593 | 358 | 218 | 260 | 308 | 347.4 | -0.058 | -0.058 | |
| 12 | 13.2 | 494 | 606 | 358 | 219 | 266 | 316 | 353 | -0.057 | -0.057 | |
| 13 | 12.9 | 497 | 617 | 358 | 220 | 273 | 324 | 358.4 | -0.058 | -0.058 | |
| 14 | 12.5 | 499 | 630 | 358 | 222 | 280 | 332 | 364.4 | -0.057 | -0.057 | |
| 15 | 12.1 | 497 | 641 | 359 | 223 | 287 | 341 | 370.2 | -0.058 | -0.058 | |
| 16 | 11.8 | 495 | 652 | 359 | 225 | 294 | 350 | 376 | -0.058 | -0.058 | |
| 17 | 11.4 | 492 | 661 | 359 | 226 | 301 | 360 | 381.4 | -0.058 | -0.058 | |
| 18 | 11 | 489 | 671 | 360 | 228 | 310 | 370 | 387.8 | -0.057 | -0.057 | |
| 19 | 10.7 | 487 | 677 | 360 | 229 | 317 | 382 | 393 | -0.057 | -0.057 | |
| 20 | 10.3 | 479 | 682 | 361 | 230 | 326 | 394 | 398.6 | -0.057 | -0.057 | |
| 21 | 10 | 471 | 686 | 362 | 232 | 333 | 408 | 404.2 | -0.056 | -0.056 | |
| 22 | 9.6 | 461 | 688 | 363 | 233 | 340 | 420 | 408.8 | -0.056 | -0.056 | |
| 23 | 9.3 | 458 | 692 | 364 | 234 | 348 | 432 | 414 | -0.056 | -0.056 | |
| 24 | 9 | 454 | 695 | 365 | 235 | 356 | 444 | 419 | -0.056 | -0.056 | |
| 25 | 8.7 | 450 | 700 | 366 | 236 | 363 | 456 | 424.2 | -0.056 | -0.056 | |
| 26 | 8.4 | 446 | 703 | 367 | 237 | 370 | 467 | 428.8 | -0.055 | -0.055 | |
| 27 | 8.1 | 446 | 707 | 369 | 238 | 381 | 478 | 434.6 | -0.055 | -0.055 | |
| 28 | 7.9 | 448 | 711 | 370 | 238 | 388 | 487 | 438.8 | -0.055 | -0.055 | |
| 29 | 7.6 | 443 | 716 | 372 | 240 | 397 | 495 | 444 | -0.055 | -0.055 | |
| 30 | 7.4 | 441 | 721 | 373 | 241 | 406 | 504 | 449 | -0.054 | -0.054 | |
| 31 | 7.2 | 439 | 726 | 375 | 243 | 417 | 511 | 454.4 | -0.054 | -0.054 | |
| 32 | 6.9 | 435 | 732 | 377 | 244 | 424 | 519 | 459.2 | -0.054 | -0.054 | |
| 33 | 6.7 | 434 | 739 | 379 | 245 | 433 | 526 | 464.4 | -0.054 | -0.054 | |
| 34 | 6.5 | 433 | 746 | 381 | 247 | 441 | 532 | 469.4 | -0.054 | -0.054 | |
| 35 | 6.3 | 434 | 754 | 383 | 248 | 448 | 537 | 474 | -0.053 | -0.053 | |
| 36 | 6.1 | 435 | 762 | 385 | 249 | 455 | 542 | 478.6 | -0.054 | -0.054 | |
| 37 | 6 | 438 | 770 | 387 | 251 | 462 | 548 | 483.6 | -0.054 | -0.054 | |
| 38 | 5.8 | 435 | 776 | 389 | 253 | 468 | 552 | 487.6 | -0.053 | -0.053 | |
| 39 | 5.6 | 438 | 781 | 392 | 255 | 474 | 558 | 492 | -0.053 | -0.053 | |

Wood Heater Preburn Data - ASTM E2780

Run: **6**

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/25/17
 Beginning Clock Time: 13:50

| Preburn Fuel Data | | | |
|--------------------------------|--------------|-------------|-------------|
| Fuel Piece Lengths (in.): | <u>13</u> | | |
| Total Preburn Weight (lb): | <u>14.9</u> | | |
| | <u>19</u> | <u>23.8</u> | <u>23.8</u> |
| Fuel Moisture Readings (% DB): | <u>19.9</u> | <u>23.8</u> | <u>23.6</u> |
| | <u>23.8</u> | <u>24.9</u> | |
| | <u>19.4</u> | <u>22.1</u> | |
| Avg Preburn Moisture (% DB): | <u>22.41</u> | | |

| | | |
|-------------|-------|-------|
| Coal Bed | 0.0 | 0.0 |
| Range (lb): | (min) | (max) |

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|---------|--------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | Stack | Ambient |
| 40 | 5.5 | 440 | 785 | 394 | 257 | 478 | 568 | 496.4 | -0.054 | -0.054 |
| 41 | 5.3 | 436 | 787 | 396 | 260 | 485 | 577 | 501 | -0.053 | -0.053 |
| 42 | 5.2 | 435 | 789 | 399 | 263 | 491 | 585 | 505.4 | -0.052 | -0.052 |
| 43 | 5 | 440 | 791 | 401 | 265 | 494 | 591 | 508.4 | -0.054 | -0.054 |
| 44 | 4.9 | 444 | 795 | 404 | 270 | 499 | 593 | 512.2 | -0.053 | -0.053 |
| 45 | 4.8 | 439 | 797 | 406 | 274 | 501 | 592 | 514 | -0.053 | -0.053 |
| 46 | 4.8 | 430 | 794 | 408 | 277 | 504 | 591 | 514.8 | -0.052 | -0.052 |
| 47 | 4.7 | 424 | 789 | 410 | 280 | 504 | 588 | 514.2 | -0.052 | -0.052 |
| 48 | 4.6 | 418 | 781 | 412 | 283 | 505 | 585 | 513.2 | -0.051 | -0.051 |
| 49 | 4.1 | 413 | 774 | 414 | 285 | 506 | 582 | 512.2 | -0.051 | -0.051 |
| 50 | 4 | 407 | 768 | 416 | 287 | 509 | 580 | 512 | -0.051 | -0.051 |
| 51 | 4.4 | 403 | 761 | 418 | 288 | 513 | 578 | 511.6 | -0.051 | -0.051 |
| 52 | 4.3 | 402 | 755 | 420 | 290 | 517 | 576 | 511.6 | -0.05 | -0.05 |
| 53 | 4.3 | 400 | 749 | 422 | 292 | 522 | 573 | 511.6 | -0.051 | -0.051 |
| 54 | 4.2 | 397 | 744 | 424 | 294 | 523 | 570 | 511 | -0.05 | -0.05 |
| 55 | 4.1 | 396 | 738 | 426 | 296 | 525 | 567 | 510.4 | -0.049 | -0.049 |
| 56 | 4.1 | 394 | 733 | 428 | 298 | 523 | 565 | 509.4 | -0.049 | -0.049 |
| 57 | 4 | 391 | 727 | 430 | 299 | 522 | 560 | 507.6 | -0.049 | -0.049 |
| 58 | 4 | 388 | 720 | 431 | 301 | 520 | 557 | 505.8 | -0.049 | -0.049 |
| 59 | 4 | 383 | 713 | 433 | 302 | 518 | 553 | 503.8 | -0.049 | -0.049 |
| 60 | 3.9 | 380 | 706 | 435 | 303 | 518 | 550 | 502.4 | -0.048 | -0.048 |
| 61 | 3.9 | 377 | 699 | 437 | 303 | 517 | 546 | 500.4 | -0.05 | -0.05 |
| 62 | 3.8 | 375 | 691 | 438 | 304 | 514 | 543 | 498 | -0.049 | -0.049 |
| 63 | 3.8 | 374 | 685 | 440 | 305 | 513 | 541 | 496.8 | -0.048 | -0.048 |
| 64 | 3.3 | 382 | 678 | 442 | 310 | 513 | 540 | 496.6 | -0.048 | -0.048 |
| 65 | 3.3 | 372 | 672 | 445 | 309 | 508 | 534 | 493.6 | -0.048 | -0.048 |
| 66 | 3.3 | 368 | 667 | 449 | 309 | 503 | 529 | 491.4 | -0.048 | -0.048 |
| 67 | 3.2 | 365 | 660 | 453 | 309 | 499 | 523 | 488.8 | -0.049 | -0.049 |
| 68 | 3.2 | 362 | 655 | 457 | 309 | 496 | 518 | 487 | -0.048 | -0.048 |
| 69 | 3.1 | 360 | 649 | 462 | 309 | 492 | 513 | 485 | -0.048 | -0.048 |
| 70 | 3.1 | 358 | 644 | 466 | 308 | 489 | 508 | 483 | -0.048 | -0.048 |
| 71 | 3.1 | 357 | 640 | 471 | 307 | 485 | 505 | 481.6 | -0.048 | -0.048 |
| 72 | 3.1 | 354 | 635 | 475 | 307 | 482 | 501 | 480 | -0.048 | -0.048 |
| 73 | 3 | 355 | 630 | 480 | 306 | 478 | 499 | 478.6 | -0.048 | -0.048 |
| 74 | 3 | 353 | 625 | 484 | 305 | 476 | 496 | 477.2 | -0.048 | -0.048 |
| 75 | 3 | 351 | 621 | 488 | 304 | 472 | 493 | 475.6 | -0.048 | -0.048 |
| 76 | 2.9 | 351 | 616 | 492 | 302 | 470 | 489 | 473.8 | -0.047 | -0.047 |
| 77 | 2.9 | 351 | 613 | 495 | 301 | 467 | 486 | 472.4 | -0.047 | -0.047 |
| 78 | 2.9 | 350 | 609 | 498 | 300 | 465 | 484 | 471.2 | -0.048 | -0.048 |

Wood Heater Test Fuel Data - ASTM E2780

| | | |
|------------------------------|------------------|---------------|
| Manufacturer: Valley Comfort | PB Time: 13:09 | 12% Cal: 12.0 |
| Model: 20.2 | PB Temp: 78 | 22% Cal: 22.0 |
| Tracking No.: 2253 | | |
| Project No.: 0142WS013E | Test Time: 13:11 | |
| Test Date: 8/25/2017 | Test Temp: 80 | |
| Run No.: 6 | | |

| | |
|------------------------------------|------|
| Firebox Volume (ft ³): | 1.82 |
| Fuel Piece Length (in): | 13 |
| 2x4 Crib Weight (lb): | 5.2 |
| 4x4 Crib Weight (lb): | 6.8 |

| | | |
|---|-------|----|
| Total Fuel Weight (Dry Basis, lb): | 9.9 | |
| Fuel Density (lb/ft ³ , Dry Basis): | 27.82 | OK |
| Loading Density (lb/ft ³ , Wet Basis): | 6.59 | OK |
| 2x4 Percentage: | 43% | OK |

Coal Bed Range (20-25%): 2.4 - 3

| Test Fuel Piece | Weight (lb) | Size | Readings (Dry Basis %) | | | Dry Weight (lb) |
|-----------------|-------------|--------|------------------------|------|------|-----------------|
| 1 | 1.4 | 2"x 4" | 24.6 | 23.8 | 23.0 | 1.13 |
| 2 | 1.1 | 2"x 4" | 20.6 | 20.9 | 19.2 | 0.91 |
| 3 | 1.3 | 2"x 4" | 20.0 | 20.5 | 20.5 | 1.08 |
| 4 | 3.2 | 4"x 4" | 24.8 | 20.8 | 19.2 | 2.63 |
| 5 | 3.2 | 4"x 4" | 20.6 | 19.9 | 19.7 | 2.67 |
| | | | | | | |
| | | | | | | |
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| | | | | | | |
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| | | | | | | |
| | | | | | | |
| | | | | | | |

| Spacer Readings (Dry Basis %) | | | |
|-------------------------------|------|--|--|
| 18.4 | 15.2 | | |
| 15.7 | 19.7 | | |
| 19.2 | 17.8 | | |
| 20.8 | 20.2 | | |
| 15.4 | 16.7 | | |
| 13.9 | 19.2 | | |
| 20.2 | 20.5 | | |
| 21.5 | 18.7 | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Technician Signature: _____

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: 6
 Manufacturer: Valley Comfort
 Model: 20.2 Series
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 25-Aug-17
 Beginning Clock Time: 15:09
 Total Sampling Time: 120 min
 Recording Interval: 1 min
 Background Sample Volume: _____ cubic feet
 Meter Box Y Factor: 1.003 (1) 0.997 (2) _____ (Amb)
 Barometric Pressure: Begin Middle End Average
28.68 28.67 28.64 28.66 *Hg
 OMNI Equipment Numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

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: -0.170 *H2O
 Tunnel Area: 0.19635 ft²
 Pitot Tube Cp: 0.99
 Avg. Tunnel Velocity: 13.70 ft/sec.
 Initial Tunnel Flow: 140.0 scfm
 Average Tunnel Flow: 137.7 scfm
 Post-Test Leak Check (1): 0.000 cfm @ -16 in. Hg
 Post-Test Leak Check (2): 0.000 cfm @ -17 in. Hg
 Average Test Piece Fuel Moisture: 21.65 Dry Basis %

Technician Signature: *AK*

| Velocity Traverse Data | | | | | | | | | |
|------------------------|-------|-------|-------|--------|-------|-------|-------------------|-------|--------|
| | Pt.1 | Pt.2 | Pt.3 | Pt.4 | Pt.5 | Pt.6 | Pt.7 | Pt.8 | Center |
| Initial dP | 0.028 | 0.048 | 0.040 | 0.028 | 0.030 | 0.046 | 0.044 | 0.026 | 0.050 |
| Temp: | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| V _{strav} | 13.21 | | | ft/sec | | | V _{scnt} | 15.31 | |
| | | | | | | | F _p | 0.863 | |

| Elapsed Time (min) | Particulate Sampling Data | | | | | | | | | | | | | | Fuel Weight (lb) | | Temperature Data (*F) | | | | | | | | | | | | | | Stack Gas Data | | |
|--------------------|--------------------------------|--------------------------------|---------------------|---------------------|----------------------------------|-------------------|----------------------|----------------------------------|-------------------|----------------------|----------------------|---------------------------|-------------|-------------|------------------|---------------|-----------------------|----------------|--------------|--------------|---------------|--------------------|---------------|-------|----------|--------------|----------|--------------|---------|---------------------------|---------------------|--------|--|
| | Gas Meter 1 (ft ³) | Gas Meter 2 (ft ³) | Sample Rate 1 (cfm) | Sample Rate 2 (cfm) | Orifice dH 1 (*H ₂ O) | Meter 1 Temp (*F) | Meter 1 Vacuum (*Hg) | Orifice dH 2 (*H ₂ 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 | Catalyst Exit | Stack | Filter 1 | Dryer Exit 1 | Filter 2 | Dryer Exit 2 | Ambient | Draft (*H ₂ O) | CO ₂ (%) | CO (%) | |
| 114 | 16.640 | 16.949 | 0.15 | 0.15 | 1.72 | 79 | -1.29 | 1.34 | 80 | -0.9 | 116 | 0.050 | 101 | 99 | 0.3 | 0 | 591 | 539 | 337 | 461 | 473 | 480 | 828 | 427 | 77 | 72 | 77 | 72 | 79 | -0.061 | 5.14 | 0 | |
| 115 | 16.787 | 17.097 | 0.15 | 0.15 | 1.74 | 79 | -1.29 | 1.33 | 80 | -0.9 | 116 | 0.050 | 100 | 99 | 0.2 | -0.1 | 590 | 540 | 335 | 458 | 471 | 479 | 827 | 427 | 77 | 72 | 77 | 72 | 79 | -0.061 | 5.11 | 0 | |
| 116 | 16.935 | 17.246 | 0.15 | 0.15 | 1.72 | 79 | -1.29 | 1.34 | 80 | -0.9 | 115 | 0.050 | 101 | 99 | 0.2 | 0 | 587 | 542 | 332 | 456 | 467 | 477 | 826 | 426 | 77 | 72 | 77 | 72 | 78 | -0.061 | 5.1 | 0 | |
| 117 | 17.082 | 17.394 | 0.15 | 0.15 | 1.74 | 79 | -1.28 | 1.35 | 80 | -0.9 | 115 | 0.050 | 100 | 99 | 0.2 | 0 | 586 | 543 | 331 | 453 | 465 | 476 | 825 | 426 | 77 | 72 | 77 | 72 | 78 | -0.061 | 4.99 | 0 | |
| 118 | 17.229 | 17.543 | 0.15 | 0.15 | 1.76 | 79 | -1.28 | 1.35 | 80 | -0.9 | 115 | 0.050 | 100 | 99 | 0.1 | -0.1 | 584 | 544 | 328 | 449 | 462 | 473 | 824 | 425 | 77 | 72 | 77 | 72 | 79 | -0.062 | 4.98 | 0 | |
| 119 | 17.376 | 17.691 | 0.15 | 0.15 | 1.73 | 79 | -1.29 | 1.34 | 80 | -0.9 | 115 | 0.050 | 100 | 99 | 0.1 | 0 | 581 | 545 | 326 | 447 | 459 | 472 | 824 | 425 | 77 | 72 | 77 | 72 | 79 | -0.061 | 5.09 | 0 | |
| 120 | 17.524 | 17.840 | 0.15 | 0.15 | 1.75 | 79 | -1.28 | 1.34 | 80 | -0.9 | 115 | 0.050 | 101 | 99 | 0.0 | -0.1 | 580 | 547 | 324 | 444 | 455 | 470 | 825 | 425 | 77 | 72 | 77 | 72 | 79 | -0.061 | 4.96 | 0 | |
| Avg/Tot | 17.524 | 17.840 | 0.15 | 0.15 | 1.72 | 78 | | 1.34 | 78 | | 121 | 0.050 | 100 | 100 | | | | | | | | 7.0 | | | | 69 | 76 | 69 | 78 | -0.071 | | | |

Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort **Equipment Numbers:** 283A, 637, 592
Model: 20.2 Series
Tracking No.: 2253
Project No.: 0142WS013E
Run #: 6
Date: 8/25/17

TRAIN 1 (First Hour emissions)

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| B. Front filter catch | Filter | D251 | 123.7 | 121.7 | 2.0 |
| 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:** **2.0**

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 | D252 | 121.1 | 120.1 | 1.0 |
| C. Rear filter catch | Filter | D253 | 120.3 | 121.9 | -1.6 |
| D. Probe catch* | Probe | 38 | 114151.4 | 114151.3 | 0.1 |
| E. Filter seals catch* | Seals | R511 | 4141.6 | 4139.2 | 2.4 |

Sub-Total **Total Particulate, mg:** **1.9**

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 | D254 | 124.1 | 121.4 | 2.7 |
| B. Rear filter catch | Filter | D255 | 121.6 | 122.4 | -0.8 |
| C. Probe catch* | Probe | 58 | 117066.7 | 117066.6 | 0.1 |
| D. Filter seals catch* | Seals | R512 | 4177.5 | 4175.7 | 1.8 |

Total Particulate, mg: **3.8**

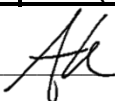
AMBIENT

| Sample Component | Reagent | Filter # or Probe # | Weights | | |
|------------------------|---------|---------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch* | Filter | | | | 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 Results - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Project No.: 0142WS013E
 Tracking No.: 2253
 Run: 6
 Test Date: 08/25/17

| | |
|--|------------------------|
| Burn Rate | 2.26 kg/hr dry |
| Average Tunnel Temperature | 121 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.70 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8264.1 dscf/hour |
| Average Delta p | 0.050 inches H2O |
| Total Time of Test | 120 minutes |

| | AMBIENT | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 | FIRST HOUR FILTER (TRAIN 1) |
|---|-----------------------|-----------------------|-----------------------|-----------------------------|
| Total Sample Volume - Vm | 0.000 cubic feet | 17.524 cubic feet | 17.840 cubic feet | 8.695 cubic feet |
| Average Gas Meter Temperature | 78 degrees Fahrenheit | 78 degrees Fahrenheit | 78 degrees Fahrenheit | 77 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 0.000 dscf | 16.602 dscf | 16.786 dscf | 8.252 dscf |
| Total Particulates - m _n | 0 mg | 3.9 mg | 3.8 mg | 2 mg |
| Particulate Concentration (dry-standard) - C _p /C _s | 0.000000 grams/dscf | 0.00023 grams/dscf | 0.00023 grams/dscf | 0.00024 grams/dscf |
| Total Particulate Emissions - E _T | 0.00 grams | 3.88 grams | 3.74 grams | 2.00 grams |
| Particulate Emission Rate | 0.00 grams/hour | 1.94 grams/hour | 1.87 grams/hour | 2.00 grams/hour |
| Emissions Factor | | 0.86 g/kg | 0.83 g/kg | 0.60 g/kg |
| Difference from Average Total Particulate Emissions | | 0.07 grams | 0.07 grams | |


Dual Train Comparison Results Are Acceptable

| FINAL AVERAGE RESULTS | |
|--|------------------------|
| Complete Test Run | |
| Total Particulate Emissions - E _T | 3.81 grams |
| Particulate Emission Rate | 1.91 grams/hour |
| Emissions Factor | 0.85 grams/kg |
| First Hour Emissions | |
| Total Particulate Emissions - E _T | 2.00 grams |
| Particulate Emission Rate | 2.00 grams/hour |
| Emissions Factor | 0.60 grams/kg |
| 7.5% of Average Total Particulate Emissions | 0.29 grams |

| 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 |
| Train A - Train B G/KG ≤ 0.5 | 0.03 |
| Total PM Precision (%) | 1.85 |
| Stove Surface ΔT | OK |

Wood Heater Efficiency Results - CSA B415.1

Manufacturer: Valley Comfort
 Model: 20.2 Series
 Date: 08/25/17
 Run: 6
 Control #: 0142WS013E
 Test Duration: 120
 Output Category: IV

Technician Signature: 

Test Results in Accordance with CSA B415.1-09

| | HHV Basis | LHV Basis |
|--------------------------|-----------|-----------|
| Overall Efficiency | 67.9% | 73.4% |
| Combustion Efficiency | 97.6% | 97.6% |
| Heat Transfer Efficiency | 70% | 75.2% |

| | | | |
|--------------------|--------|--------|---------|
| Output Rate (kJ/h) | 30,110 | 28,562 | (Btu/h) |
| Burn Rate (kg/h) | 2.24 | 4.93 | (lb/h) |
| Input (kJ/h) | 44,331 | 42,053 | (Btu/h) |

| | | | |
|---------------------------|-------------|------|--------|
| Test Load Weight (dry kg) | 4.48 | 9.86 | dry lb |
| MC wet (%) | 17.79695849 | | |
| MC dry (%) | 21.65 | | |
| Particulate (g) | 1.91 | | |
| CO (g) | 171 | | |
| Test Duration (h) | 2.00 | | |

| Emissions | Particulate | CO |
|------------------|-------------|-------|
| g/MJ Output | 0.03 | 2.85 |
| g/kg Dry Fuel | 0.43 | 38.30 |
| g/h | 0.95 | 85.70 |
| lb/MM Btu Output | 0.07 | 6.61 |

| | |
|----------------------|-------|
| Air/Fuel Ratio (A/F) | 14.02 |
|----------------------|-------|

VERSION: 2.2 12/14/2009

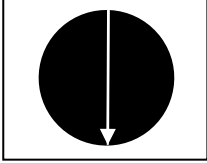
Wood Heater Run Notes

Air Control Settings

Primary:

Secondary: Auto

Maximum:
180° From
Vertical



Tertiary/Pilot: Fixed

Fan: On Max

Preburn Notes

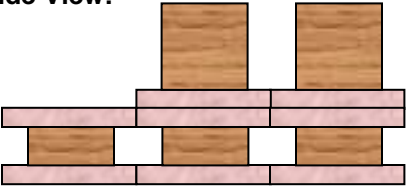
| Time | Notes |
|-------|----------------|
| 63:00 | Removed 0.4 lb |

Test Notes

Sketch test fuel configuration:

Start up procedures & Timeline:

Side View:



Bypass: Closed

Fuel loaded by: 0:40

Door closed at: 0:45

Primary air: Set @ 4:50

Notes: Catalyst equivalency test #1

| Time | Notes |
|-------|-------------------------|
| 30:00 | Set fan to test setting |
| 60:00 | Replaced Filter A |



Wood Heater Supplemental Data

Start Time: 15:09

Booth #: N/A (site testing)

Stop Time: 17:09

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0 @ -16 "Hg

B: 0 @ -17 "Hg

Calibrations: Span Gas CO₂: 17.00 CO: 4.267

| | Pre Test | | Post Test | |
|-----------------|----------|-------|-----------|-------|
| | Zero | Span | Zero | Span |
| Time | 7:50 | 7:17 | 17:17 | 17:22 |
| CO ₂ | 0.00 | 17.00 | 0.09 | 16.87 |
| CO | 0.000 | 4.267 | -0.018 | 4.101 |

Air Velocity (ft/min): Initial: <50 Final: <50

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

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (in): 6

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 8/21/17 Initials: _____

| | Initial | Middle | Ending |
|------------------------|---------|--------|--------|
| P _b (in/Hg) | 28.68 | 28.67 | 28.64 |
| RH (%) | 23.5 | 21.7 | 31.4 |
| Ambient (°F) | 78 | 81 | 82 |

| Tunnel Traverse | | |
|---------------------|--------------------------|-------|
| Microtector Reading | dP (in H ₂ O) | T(°F) |
| 1 | 0.028 | 80 |
| 2 | 0.048 | 80 |
| 3 | 0.04 | 80 |
| 4 | 0.028 | 80 |
| 5 | 0.03 | 80 |
| 6 | 0.046 | 80 |
| 7 | 0.044 | 80 |
| 8 | 0.026 | 80 |
| Center: | | |
| - | 0.050 | 80 |

Background Filter Volume: N/A


| Tunnel Static Pressure (in H ₂ O): | |
|---|-------------|
| Beginning of Test | End of Test |
| -0.17 | -0.17 |



RUN 7

Wood Heater Preburn Data - ASTM E2780

Run: 7

Technician Signature: 

Manufacturer: Valley Comfort
 Model: 20.2
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 8/27/17
 Beginning Clock Time: 8:55

Preburn Fuel Data

Fuel Piece Lengths (in.): 13
 Total Preburn Weight (lb): 14.3

| | | | |
|-------------------------------|---------------------|-------------|-------------|
| | <u>21.9</u> | <u>19.2</u> | <u>19</u> |
| Fuel Moisture Readings (% DB) | <u>22.3</u> | <u>20.0</u> | <u>21.9</u> |
| | <u>22.5</u> | <u>20.0</u> | |
| | <u>20.3</u> | <u>20.1</u> | |
| Avg Preburn Moisture (% DB): | <u>20.72</u> | | |

Coal Bed **2.3** **2.9**
 Range (lb): (min) (max)

| Elapsed Time (min) | Scale (lb) | Stack Draft (in H ₂ O) | Temperatures (°F) | | | | | | | Stack | Ambient |
|--------------------|------------|-----------------------------------|-------------------|-----------|---------|---------|----------|------------|-----|-------|---------|
| | | | FB Top | FB Bottom | FB Back | FB Left | FB Right | Avg. FB | | | |
| 0 | 2.8 | -0.036 | 693 | 508 | 301 | 549 | 541 | 518 | 390 | 75 | |
| 10 | 2.7 | -0.025 | 627 | 519 | 332 | 483 | 474 | 487 | 193 | 73 | |
| 20 | 2.8 | -0.019 | 563 | 503 | 311 | 420 | 413 | 442 | 162 | 72 | |
| 30 | 2.8 | -0.015 | 502 | 478 | 283 | 370 | 365 | 400 | 147 | 71 | |
| 40 | 2.9 | -0.012 | 449 | 455 | 258 | 330 | 326 | 364 | 135 | 71 | |
| 50 | 2.6 | -0.011 | 407 | 432 | 238 | 300 | 297 | 335 | 132 | 72 | |
| 60 | 2.8 | -0.013 | 385 | 415 | 223 | 280 | 190 | 299 | 152 | 72 | |

Wood Heater Test Fuel Data - ASTM E2780

| | | |
|------------------------------|-----------------|---------------|
| Manufacturer: Valley Comfort | PB Time: 8:30 | 12% Cal: 12.0 |
| Model: 20.2 | PB Temp: 72 | 22% Cal: 22.0 |
| Tracking No.: 2253 | | |
| Project No.: 0142WS013E | Test Time: 9:30 | |
| Test Date: 8/27/2017 | Test Temp: 74 | |
| Run No.: 7 | | |

| | |
|------------------------------------|------|
| Firebox Volume (ft ³): | 1.82 |
| Fuel Piece Length (in): | 13 |
| 2x4 Crib Weight (lb): | 4.98 |
| 4x4 Crib Weight (lb): | 6.62 |

| | | |
|---|-------|----|
| Total Fuel Weight (Dry Basis, lb): | 9.7 | |
| Fuel Density (lb/ft ³ , Dry Basis): | 27.29 | OK |
| Loading Density (lb/ft ³ , Wet Basis): | 6.37 | OK |
| 2x4 Percentage: | 43% | OK |

Coal Bed Range (20-25%): **2.32 - 2.9**

| Test Fuel Piece | Weight (lb) | Size | Readings (Dry Basis %) | | | Dry Weight (lb) |
|-----------------|-------------|--------|------------------------|------|------|-----------------|
| 1 | 1.22 | 2"x 4" | 20.4 | 19.3 | 19.3 | 1.02 |
| 2 | 1.26 | 2"x 4" | 20.5 | 19.5 | 19.2 | 1.05 |
| 3 | 1.26 | 2"x 4" | 19.2 | 19.1 | 18.8 | 1.06 |
| 4 | 3.14 | 4"x 4" | 21.9 | 21.9 | 22.3 | 2.57 |
| 5 | 3.08 | 4"x 4" | 22.6 | 19.0 | 19.5 | 2.56 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| Spacer Readings (Dry Basis %) | | | |
|-------------------------------|------|--|--|
| 12.3 | 17.9 | | |
| 13.4 | 16.0 | | |
| 13.0 | 17.3 | | |
| 12.7 | | | |
| 18.1 | | | |
| 12.3 | | | |
| 18.1 | | | |
| 17.2 | | | |
| 17.0 | | | |
| 10.2 | | | |
| 17.6 | | | |
| 15.7 | | | |
| 16.0 | | | |


Technician Signature:

Wood Heater Test Data - ASTM E2780 / ASTM E2515

Run: **7**

Manufacturer: Valley Comfort
 Model: 20.2
 Tracking No.: 2253
 Project No.: 0142WS013E
 Test Date: 27-Aug-17
 Beginning Clock Time: 09:58
 Total Sampling Time: 450 min
 Recording Interval: 10 min
 Background Sample Volume: _____ cubic feet
 Meter Box Y Factor: 1.003 (1) 0.997 (2) _____ (Amb)
 Barometric Pressure: Begin Middle End Average
28.74 28.63 28.57 28.65 "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: -0.170 "H2O
 Tunnel Area: 0.19635 ft²
 Pitot Tube Cp: 0.99
 Avg. Tunnel Velocity: 13.08 ft/sec.
 Initial Tunnel Flow: 137.7 scfm
 Average Tunnel Flow: 139.4 scfm
 Post-Test Leak Check (1): 0.000 cfm @ 5 in. Hg
 Post-Test Leak Check (2): 0.000 cfm @ 8 in. Hg
 Average Test Piece Fuel Moisture: 20.17 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 | 0.030 | 0.046 | 0.032 | 0.024 | 0.030 | 0.044 | 0.044 | 0.030 | 0.048 |
| Temp: | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 |
| | V _{strav} 12.96 ft/sec | | | V _{scnt} 14.97 ft/sec | | | F _p 0.865 | | |

| Elapsed Time (min) | Particulate Sampling Data | | | | | | | | | | | | | Fuel Weight (lb) | | Temperature Data (°F) | | | | | | | | | | | | Stack Gas Data | | | | |
|--------------------|--------------------------------|--------------------------------|---------------------|---------------------|----------------------------------|-------------------|----------------------|----------------------------------|-------------------|----------------------|----------------------|---------------------------|-------------|------------------|---------------|-----------------------|-------------|----------------|--------------|--------------|---------------|--------------------|---------------|-------|----------|--------------|----------|----------------|---------|---------------------------|---------------------|--------|
| | Gas Meter 1 (ft ³) | Gas Meter 2 (ft ³) | Sample Rate 1 (cfm) | Sample Rate 2 (cfm) | Orifice dH 1 ("H ₂ O) | Meter 1 Temp (°F) | Meter 1 Vacuum ("Hg) | Orifice dH 2 ("H ₂ 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 | Catalyst Exit | Stack | Filter 1 | Dryer Exit 1 | Filter 2 | Dryer Exit 2 | Ambient | Draft ("H ₂ O) | CO ₂ (%) | CO (%) |
| 370 | 56.099 | 55.767 | 0.15 | 0.15 | 1.80 | 80 | -1.5 | 1.38 | 81 | -0.7 | 91 | 0.048 | 98 | 100 | 1.0 | -0.1 | 396 | 332 | 186 | 270 | 257 | 288 | 635 | 213 | 82 | 78 | 82 | 77 | 80 | -0.020 | 4.5 | -0.01 |
| 380 | 57.590 | 57.275 | 0.15 | 0.15 | 1.79 | 80 | -1.39 | 1.38 | 81 | -0.7 | 92 | 0.048 | 99 | 100 | 0.9 | -0.1 | 389 | 339 | 186 | 273 | 255 | 288 | 606 | 209 | 82 | 78 | 82 | 78 | 80 | -0.020 | 4.52 | -0.02 |
| 390 | 59.064 | 58.782 | 0.15 | 0.15 | 1.79 | 81 | -1.47 | 1.38 | 81 | -0.7 | 92 | 0.048 | 97 | 100 | 0.8 | -0.1 | 382 | 346 | 188 | 274 | 252 | 288 | 601 | 206 | 82 | 78 | 82 | 78 | 80 | -0.019 | 4.13 | -0.02 |
| 400 | 60.546 | 60.288 | 0.15 | 0.15 | 1.84 | 81 | -1.56 | 1.37 | 82 | -0.7 | 92 | 0.048 | 98 | 100 | 0.7 | -0.1 | 377 | 346 | 189 | 268 | 247 | 285 | 601 | 205 | 83 | 78 | 83 | 78 | 80 | -0.021 | 3.64 | -0.02 |
| 410 | 62.046 | 61.795 | 0.15 | 0.15 | 1.82 | 81 | -1.51 | 1.37 | 82 | -0.7 | 92 | 0.048 | 99 | 100 | 0.6 | -0.1 | 370 | 341 | 189 | 256 | 242 | 280 | 591 | 205 | 82 | 79 | 83 | 78 | 80 | -0.021 | 3.48 | -0.02 |
| 420 | 63.543 | 63.302 | 0.15 | 0.15 | 1.83 | 81 | -1.51 | 1.38 | 82 | -0.7 | 93 | 0.048 | 99 | 100 | 0.5 | -0.1 | 368 | 335 | 193 | 248 | 237 | 276 | 607 | 208 | 83 | 79 | 83 | 79 | 81 | -0.020 | 4.22 | -0.02 |
| 430 | 65.040 | 64.808 | 0.15 | 0.15 | 1.80 | 81 | -1.52 | 1.38 | 82 | -0.7 | 93 | 0.048 | 99 | 100 | 0.3 | -0.2 | 371 | 326 | 201 | 244 | 233 | 275 | 614 | 210 | 83 | 79 | 83 | 79 | 81 | -0.021 | 4.05 | -0.02 |
| 440 | 66.538 | 66.315 | 0.15 | 0.15 | 1.79 | 81 | -1.51 | 1.37 | 82 | -0.7 | 92 | 0.048 | 99 | 100 | 0.2 | -0.1 | 369 | 314 | 206 | 243 | 233 | 273 | 592 | 207 | 83 | 79 | 83 | 79 | 80 | -0.021 | 4.77 | -0.02 |
| 450 | 68.038 | 67.824 | 0.15 | 0.15 | 1.82 | 80 | -1.51 | 1.37 | 81 | -0.7 | 91 | 0.048 | 99 | 100 | 0.0 | -0.2 | 360 | 322 | 210 | 248 | 244 | 277 | 573 | 201 | 82 | 78 | 82 | 78 | 79 | -0.020 | 4.65 | -0.02 |
| Avg/Tot | 68.038 | 67.824 | 0.15 | 0.15 | 1.82 | 77 | | 1.38 | 78 | | 87 | 0.048 | 100 | 100 | | | | | | | | 20.8 | | | | 76 | 79 | 76 | 77 | -0.028 | | |

Wood Heater Lab Data - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort Equipment Numbers: 283A, 637, 592
 Model: 20.2
 Tracking No.: 2253
 Project No.: 0142WS013E
 Run #: 7
 Date: 8/27/17

TRAIN 1 (First Hour emissions)

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| B. Front filter catch | Filter | D267 | 121.9 | 121.6 | 0.3 |
| 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: 0.3

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 | D269, 270 | 243.4 | 242.7 | 0.7 |
| C. Rear filter catch | Filter | D268 | 121.8 | 121.9 | -0.1 |
| D. Probe catch* | Probe | 64 | 118208.6 | 118208.3 | 0.3 |
| E. Filter seals catch* | Seals | R515 | 3318.2 | 3318.7 | 0.0 |

Sub-Total Total Particulate, mg: 0.9

Train 1 Aggregate Total Particulate, mg: 1.2

TRAIN 2

| Sample Component | Reagent | Filter, Probe or Dish # | Weights | | |
|------------------------|---------|-------------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch | Filter | D271 | 120.9 | 119.7 | 1.2 |
| B. Rear filter catch | Filter | D272 | 121.8 | 122.0 | -0.2 |
| C. Probe catch* | Probe | 65 | 117084.9 | 117084.4 | 0.5 |
| D. Filter seals catch* | Seals | R516 | 3296.6 | 3296.8 | 0.0 |

Total Particulate, mg: 1.5

AMBIENT

| Sample Component | Reagent | Filter # or Probe # | Weights | | |
|------------------------|---------|---------------------|-----------|----------|-----------------|
| | | | Final, mg | Tare, mg | Particulate, mg |
| A. Front filter catch* | Filter | | | | 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 Results - ASTM E2780 / ASTM E2515

Manufacturer: Valley Comfort
 Model: 20.2
 Project No.: 0142WS013E
 Tracking No.: 2253
 Run: 7
 Test Date: 08/27/17

| | |
|--|-----------------------|
| Burn Rate | 0.59 kg/hr dry |
| Average Tunnel Temperature | 87 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.08 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8364.6 dscf/hour |
| Average Delta p | 0.048 inches H2O |
| Total Time of Test | 450 minutes |

| | AMBIENT | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 | FIRST HOUR FILTER (TRAIN 1) |
|---|-----------------------|-----------------------|-----------------------|-----------------------------|
| Total Sample Volume - Vm | 0.000 cubic feet | 68.038 cubic feet | 67.824 cubic feet | 9.022 cubic feet |
| Average Gas Meter Temperature | 77 degrees Fahrenheit | 77 degrees Fahrenheit | 78 degrees Fahrenheit | 77 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 0.000 dscf | 64.509 dscf | 63.757 dscf | 8.554 dscf |
| Total Particulates - m _n | 0 mg | 1.2 mg | 1.5 mg | 0.3 mg |
| Particulate Concentration (dry-standard) - C _p /C _s | 0.000000 grams/dscf | 0.00002 grams/dscf | 0.00002 grams/dscf | 0.00004 grams/dscf |
| Total Particulate Emissions - E _T | 0.00 grams | 1.17 grams | 1.48 grams | 0.29 grams |
| Particulate Emission Rate | 0.00 grams/hour | 0.16 grams/hour | 0.20 grams/hour | 0.29 grams/hour |
| Emissions Factor | | 0.27 g/kg | 0.34 g/kg | 0.32 g/kg |
| Difference from Average Total Particulate Emissions | | 0.15 grams | 0.15 grams | |
| Dual Train Comparison Results Are Acceptable | | | | |

| FINAL AVERAGE RESULTS | |
|--|------------------------|
| Complete Test Run | |
| Total Particulate Emissions - E _T | 1.32 grams |
| Particulate Emission Rate | 0.18 grams/hour |
| Emissions Factor | 0.30 grams/kg |
| First Hour Emissions | |
| Total Particulate Emissions - E _T | 0.29 grams |
| Particulate Emission Rate | 0.29 grams/hour |
| Emissions Factor | 0.32 grams/kg |
| 7.5% of Average Total Particulate Emissions | 0.10 grams |

| 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 |
| Train A - Train B G/KG ≤ 0.5 | 0.07 |
| Total PM Precision (%) | 11.69 |
| Stove Surface ΔT | OK |

Wood Heater Efficiency Results - CSA B415.1



Manufacturer: Valley Comfort
Model: 20.2
Date: 08/27/17
Run: 7
Control #: 0142WS013E
Test Duration: 450
Output Category: I

Technician Signature: _____

Test Results in Accordance with CSA B415.1-09

| | HHV Basis | LHV Basis |
|--------------------------|-----------|-----------|
| Overall Efficiency | 80.6% | 87.1% |
| Combustion Efficiency | 97.9% | 97.9% |
| Heat Transfer Efficiency | 82% | 89.0% |

| | | | |
|--------------------|--------|--------|---------|
| Output Rate (kJ/h) | 9,328 | 8,849 | (Btu/h) |
| Burn Rate (kg/h) | 0.58 | 1.29 | (lb/h) |
| Input (kJ/h) | 11,569 | 10,974 | (Btu/h) |

| | | | |
|---------------------------|-------------|------|--------|
| Test Load Weight (dry kg) | 4.38 | 9.65 | dry lb |
| MC wet (%) | 16.78224688 | | |
| MC dry (%) | 20.17 | | |
| Particulate (g) | 0.18 | | |
| CO (g) | 157 | | |
| Test Duration (h) | 7.50 | | |

| Emissions | Particulate | CO |
|------------------|-------------|-------|
| g/MJ Output | 0.00 | 2.24 |
| g/kg Dry Fuel | 0.04 | 35.86 |
| g/h | 0.02 | 20.94 |
| lb/MM Btu Output | 0.01 | 5.22 |

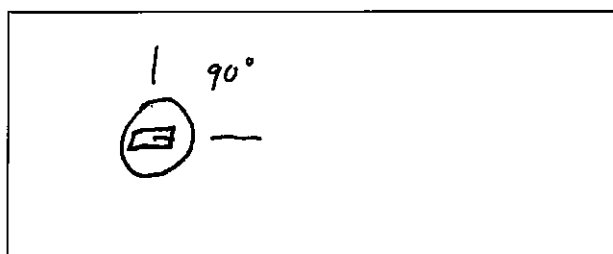
| | |
|----------------------|-------|
| Air/Fuel Ratio (A/F) | 15.80 |
|----------------------|-------|

VERSION: 2.2 12/14/2009

Wood Heater Run Notes

Air Control Settings

Primary: _____ Secondary: fixed
 Tertiary/Pilot: NA
 Fan: Low

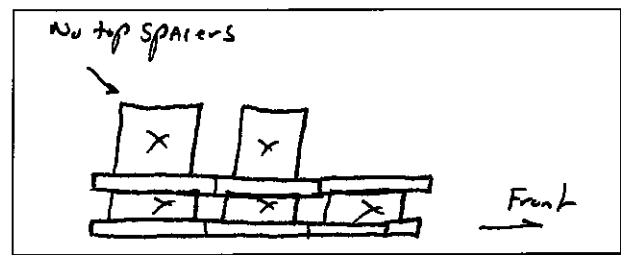


Preburn Notes

| Time | Notes |
|------|------------|
| 60 | Raked coal |

Test Notes

Sketch test fuel configuration:



Start up procedures & Timeline:

Bypass: closed entire test
 Fuel loaded by: 25 seconds
 Door closed at: 27 seconds
 Primary air: fully open until slow then set to test setting
 Notes: FAN off for first 30 min: Then turned to low

| Time | Notes |
|------|----------------------------------|
| 60 | changed Front filter at train A. |

Technician Signature: *B. Davis* Date: 9/6/17

ASTM E2780 Wood Heater Run Sheets

Client: Valley Comfort Systems, Inc. Project Number: 142WS044E Run Number: 7

Model: 30.2 Series Tracking Number: 2253 Date: 8/29/17

Test Crew: B. Davis

OMNI Equipment ID numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

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>13.0</u> in | <u>19.0</u> | 7 | <u>13.0</u> in | <u>19.2</u> |
| 2 | <u>13.0</u> in | <u>21.9</u> | 8 | <u>13.0</u> in | <u>20.0</u> |
| 3 | <u>13.0</u> in | <u>22.3</u> | 9 | <u>13.0</u> in | <u>20.0</u> |
| 4 | <u>13.0</u> in | <u>22.5</u> | 10 | <u>13.0</u> in | <u>20.1</u> |
| 5 | <u>13.0</u> in | <u>20.3</u> | 11 | _____ in | _____ |
| 6 | <u>13.0</u> in | <u>21.9</u> | 12 | _____ in | _____ |

Total Pre-Burn Fuel Weight: 14.3 Pre-Burn Fuel Average Moisture: 20.72

Time (clock): 0730 Room Temperature (F): 70 Initials: BD

Test Fuel

Firebox Volume (ft³): 1.82 Test Fuel Piece Length (in): 130
 Load Weight Range (lb): _____ Total Wet Fuel Load Weight (lb): 11.60

Fuel Type & Amount: 2 x 4: 3 4 x 4: 2
 Weight (with spacers): 4.98 Weight (with spacers): 6.62

| Piece: | Weight (lbs): | Moisture Readings (%DB): | | Fuel Type: |
|--------|---------------|--------------------------|-------------|------------|
| 1 | <u>1.22</u> | <u>20.4</u> | <u>19.3</u> | <u>2x4</u> |
| 2 | <u>1.26</u> | <u>20.5</u> | <u>19.5</u> | <u>2x4</u> |
| 3 | <u>1.26</u> | <u>19.2</u> | <u>19.1</u> | <u>2x4</u> |
| 4 | <u>3.14</u> | <u>21.9</u> | <u>21.9</u> | <u>4x4</u> |
| 5 | <u>3.08</u> | <u>22.6</u> | <u>19.0</u> | <u>4x4</u> |
| 6 | _____ | _____ | _____ | _____ |
| 7 | _____ | _____ | _____ | _____ |

Spacer Moisture Readings (%DB)

| | | | | | |
|-------------|-------------|-------------|-------------|-------|-------|
| <u>12.3</u> | <u>18.1</u> | <u>17.0</u> | <u>16.0</u> | _____ | _____ |
| <u>13.4</u> | <u>12.3</u> | <u>10.2</u> | <u>17.9</u> | _____ | _____ |
| <u>13.0</u> | <u>18.1</u> | <u>17.6</u> | <u>16.0</u> | _____ | _____ |
| <u>12.7</u> | <u>17.2</u> | <u>15.7</u> | <u>17.3</u> | _____ | _____ |

Time (clock): 0740 Room Temperature (F): 70 Initials: BD

Technician Signature: BD Date: 8/22/17

OMNI-Test Laboratories, Inc. **ASTM E2780 Wood Heater Run Sheets**
 Client: Valley Comfort Systems, Inc. Project Number: 142WS014E Run Number: 7
 Model: 30.1 Series Tracking Number: 2253 Date: 8/28/17
 Test Crew: B. Davis
 OMNI Equipment ID numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

Wood Heater Supplemental Data

Start Time: 0958 Booth #: N/A (site testing)

Stop Time: 1728

Stack Gas Leak Check:

Initial: good Final: good

Sample Train Leak Check:

A: 0.0 @ 5" Hg
 B: 0.0 @ 8" Hg

Calibrations: Span Gas CO₂: 17.00 CO: 4.27

| | Pre Test | | Post Test | |
|-----------------|--------------|--------------|---------------|--------------|
| | Zero | Span | Zero | Span |
| Time | <u>0939</u> | <u>0940</u> | <u>1729</u> | <u>1729</u> |
| CO ₂ | <u>0.01</u> | <u>17.00</u> | <u>-0.29</u> | <u>16.87</u> |
| CO | <u>0.000</u> | <u>4.27</u> | <u>-0.017</u> | <u>4.171</u> |

Air Velocity (ft/min): Initial: 250 Final: 200

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: 8/24/17 Initials: DA

| | Initial | Middle | Ending |
|------------------------|--------------|--------------|--------------|
| P _b (in/Hg) | <u>29.94</u> | <u>29.83</u> | <u>29.77</u> |
| RH (%) | <u>26.7</u> | <u>35.6</u> | <u>34.5</u> |
| Ambient (°F) | <u>72</u> | <u>75</u> | <u>76</u> |

| Tunnel Traverse | | |
|---------------------|--------------------------|-----------|
| Microtector Reading | dP (in H ₂ O) | T(°F) |
| 1 | <u>.030</u> | <u>79</u> |
| 2 | <u>.046</u> | <u>79</u> |
| 3 | <u>.032</u> | <u>79</u> |
| 4 | <u>.024</u> | <u>79</u> |
| 5 | <u>.030</u> | <u>79</u> |
| 6 | <u>.044</u> | <u>79</u> |
| 7 | <u>.044</u> | <u>79</u> |
| 8 | <u>.030</u> | <u>79</u> |
| Center: | | |
| | <u>.048</u> | <u>79</u> |

Background Filter Volume: N/A

| Tunnel Static Pressure (in H ₂ O): | |
|---|-------------|
| Beginning of Test | End of Test |
| <u>-0.17</u> | <u>0.17</u> |

Technician Signature: B. Davis

Date: 8/27/17

Section 4

**Quality Assurance/Quality Control
Sample Analysis
Calibrations
Example Calculations**

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 Blaze King 20.2 Series at Valley Comfort Systems Inc. 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.

SAMPLE ANALYSIS

Analysis Worksheets

Tared Filter, Probe, and O-Ring Data

ASTM E2780 Wood Heater Run Sheets

Client: Valley Comfort Systems, Inc. Project Number: 142WS013E Run Number: 1

Model: 20.2 Series Tracking Number: 2253 Date: 8/22/17

Test Crew: A. Kravitz

OMNI Equipment ID numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

ASTM E2515 Lab Sheet

Assembled By:

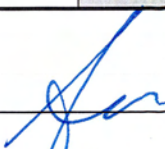
A. Kravitz

Date/Time in Dessicator:

8/26/17

| Weighing #1 | Weighing #2 | Weighing #3 | Weighing #4 | Weighing #5 |
|-----------------------------|-----------------------------|----------------------------|---------------------------|---------------------------|
| Date/Time: <u>8/31/17</u> | Date/Time: <u>9/1/17</u> | Date/Time: <u>9/4/17</u> | Date/Time: <u>9/11/17</u> | Date/Time: <u>9/12/17</u> |
| R/H %: <u>19.8</u> | R/H %: <u>19.8</u> | R/H %: <u>22.8</u> | R/H %: <u>13.2</u> | R/H %: <u>11.4</u> |
| Temp: <u>76.1</u> | Temp: <u>75.2</u> | Temp: <u>71.0</u> | Temp: <u>74.1</u> | Temp: <u>77.3</u> |
| 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>500.0</u> | 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>N/A</u> | 200 mg Audit: <u>N/A</u> |
| 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.9</u> | 2 g Audit: <u>1999.8</u> |
| 100 g Audit: <u>99997.8</u> | 100 g Audit: <u>99997.9</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> |
| Initials: <u>A</u> | Initials: <u>AK</u> | Initials: <u>A</u> | Initials: <u>A</u> | Initials: <u>A</u> |

| Train | Element | ID # | Tare (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) |
|-------------------|--------------|------|--|-----------------|-----------------|---------------|---------------|---------------|
| A (First Hour) | Front Filter | D225 | 119.5 | <u>120.6</u> | <u>120.5</u> | - | | |
| | Rear Filter | N/A | | | | | | |
| | Probe | N/A | | | | | | |
| | O-Ring Set | N/A | | | | | | |
| A (Remainder) | Front Filter | D226 | 121.5 | <u>122.6</u> | <u>122.6</u> | - | | |
| | Rear Filter | D227 | 120.2 | <u>120.6</u> | <u>120.5</u> | - | | |
| | Probe | 3 | 116010.6 | <u>116010.5</u> | <u>116010.6</u> | - | | |
| | O-Ring Set | R501 | 3285.3 | <u>3287.3</u> | <u>3286.9</u> | <u>3286.9</u> | <u>3285.4</u> | <u>3285.3</u> |
| B | Front Filter | D228 | 121.9 | <u>123.7</u> | <u>123.7</u> | - | | |
| | Rear Filter | D229 | 119.8 | <u>119.7</u> | <u>119.7</u> | - | | |
| | Probe | 22 | 114344.5 | <u>114344.6</u> | <u>114344.6</u> | - | | |
| | O-Ring Set | R502 | 3423.5 3364.0 | <u>3426.2</u> | <u>3426.0</u> | - | <u>3423.9</u> | <u>3423.1</u> |
| BG | Filter | N/A | | | | | | |

Technician Signature: 

Date: 9/4/17 9/12/17

ASTM E2780 Wood Heater Run Sheets

Client: Valley Comfort Systems, Inc. Project Number: 142WS013E Run Number: 2
 Model: 20.2 Series Tracking Number: 2253 Date: 8/23/17
 Test Crew: A. Kravitz
 OMNI Equipment ID numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

ASTM E2515 Lab Sheet

Assembled By:


A. Kravitz

Date/Time in Dessicator:

8/26/17

| Weighing #1 | Weighing #2 | Weighing #3 | Weighing #4 | Weighing #5 |
|-----------------------------|-----------------------------|----------------------------|---------------------------|---------------------------|
| Date/Time: <u>8/31/17</u> | Date/Time: <u>9/1/17</u> | Date/Time: <u>9/4/17</u> | Date/Time: <u>9/11/17</u> | Date/Time: <u>9/12/17</u> |
| R/H %: <u>19.8</u> | R/H %: <u>19.8</u> | R/H %: <u>22.8</u> | R/H %: <u>13.2</u> | R/H %: <u>11.4</u> |
| Temp: <u>76.1</u> | Temp: <u>75.2</u> | Temp: <u>77.0</u> | Temp: <u>74.1</u> | Temp: <u>77.3</u> |
| 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>500.0</u> | 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>N/A</u> | 200 mg Audit: <u>N/A</u> |
| 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.9</u> | 2 g Audit: <u>1999.8</u> |
| 100 g Audit: <u>99997.8</u> | 100 g Audit: <u>99997.9</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> |
| Initials: <u>A</u> | Initials: <u>AK</u> | Initials: <u>A</u> | Initials: <u>A</u> | Initials: <u>A</u> |

| Train | Element | ID # | Tare (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) |
|--------------------------|--------------|------|-----------|-----------------|-----------------|--------------|---------------|---------------|
| A (First Hour) | Front Filter | D231 | 121.5 | <u>123.2</u> | <u>123.0</u> | - | | |
| | Rear Filter | N/A | | | | | | |
| | Probe | N/A | | | | | | |
| | O-Ring Set | N/A | | | | | | |
| A (Remainder) | Front Filter | D232 | 122.0 | <u>122.8</u> | <u>122.9</u> | - | | |
| | Rear Filter | D233 | 120.5 | <u>120.5</u> | <u>120.3</u> | - | | |
| | Probe | 27 | 114274.9 | <u>114274.9</u> | <u>114274.9</u> | - | | |
| | O-Ring Set | R503 | 3298.5 | <u>3300.4</u> | <u>3300.3</u> | - | <u>3298.7</u> | <u>3298.8</u> |
| B | Front Filter | D234 | 121.9 | <u>124.2</u> | <u>123.9</u> | <u>123.9</u> | | |
| | Rear Filter | D235 | 121.2 | <u>121.1</u> | <u>121.1</u> | - | | |
| | Probe | 29 | 114278.9 | <u>114278.9</u> | <u>114278.9</u> | - | | |
| | O-Ring Set | R504 | 3384.0 | <u>3387.3</u> | <u>3387.2</u> | - | <u>3384.9</u> | <u>3384.9</u> |
| BG | Filter | N/A | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Technician Signature: 

Date: 8/26/17 9/12/17

ASTM E2780 Wood Heater Run Sheets

Client: Valley Comfort Systems, Inc. Project Number: 142WS013E Run Number: 3

Model: 20.2 Series Tracking Number: 2253 Date: 8/23/17

Test Crew: A. Kravitz

OMNI Equipment ID numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

ASTM E2515 Lab Sheet

Assembled By:

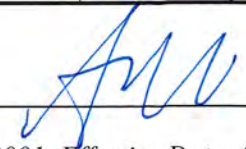
A. Kravitz

Date/Time in Dessicator:

8/28/17

| Weighing #1 | Weighing #2 | Weighing #3 | Weighing #4 | Weighing #5 |
|-----------------------------|-----------------------------|----------------------------|---------------------------|---------------------------|
| Date/Time: <u>8/31/17</u> | Date/Time: <u>9/1/17</u> | Date/Time: <u>9/4/17</u> | Date/Time: <u>9/11/17</u> | Date/Time: <u>9/12/17</u> |
| R/H %: <u>19.8</u> | R/H %: <u>19.8</u> | R/H %: <u>22.8</u> | R/H %: <u>13.2</u> | R/H %: <u>11.4</u> |
| Temp: <u>76.1</u> | Temp: <u>75.2</u> | Temp: <u>71.0</u> | Temp: <u>74.1</u> | Temp: <u>77.3</u> |
| 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>500.0</u> | 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>N/A</u> | 200 mg Audit: <u>N/A</u> |
| 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.9</u> | 2 g Audit: <u>1999.8</u> |
| 100 g Audit: <u>99997.8</u> | 100 g Audit: <u>99997.9</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> |
| Initials: <u>A</u> | Initials: <u>AK</u> | Initials: <u>A</u> | Initials: <u>A</u> | Initials: <u>A</u> |

| Train | Element | ID # | Tare (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) |
|--------------------------|--------------|------|-----------|-----------------|-----------------|--------------|---------------|---------------|
| A (First Hour) | Front Filter | D236 | 119.1 | <u>121.8</u> | <u>121.5</u> | <u>121.5</u> | | |
| | Rear Filter | N/A | | | | | | |
| | Probe | N/A | | | | | | |
| | O-Ring Set | N/A | | | | | | |
| A (Remainder) | Front Filter | D237 | 122.9 | <u>123.7</u> | <u>123.4</u> | <u>123.4</u> | | |
| | Rear Filter | D238 | 121.4 | <u>119.3</u> | <u>119.1</u> | - | | |
| | Probe | 30 | 114330.5 | <u>114330.4</u> | <u>114330.5</u> | - | | |
| | O-Ring Set | R505 | 3337.9 | <u>3340.7</u> | <u>3340.4</u> | - | <u>3340.1</u> | <u>3340.1</u> |
| B | Front Filter | D239 | 120.1 | <u>122.8</u> | <u>122.7</u> | - | | |
| | Rear Filter | D240 | 122.0 | <u>121.6</u> | <u>121.6</u> | - | | |
| | Probe | 31 | 114369.6 | <u>114369.7</u> | <u>114369.7</u> | - | | |
| | O-Ring Set | R506 | 4158.8 | <u>4161.0</u> | <u>4160.9</u> | - | <u>4160.2</u> | <u>4160.3</u> |
| BG | Filter | N/A | | | | | | |

Technician Signature: 

Date: 9/12/17

ASTM E2780 Wood Heater Run Sheets

Client: Valley Comfort Systems, Inc. Project Number: 142WS013E Run Number: 4
 Model: 20.2 Series Tracking Number: 2253 Date: 8/24/17
 Test Crew: A. Kravitz
 OMNI Equipment ID numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

ASTM E2515 Lab Sheet

Assembled By:

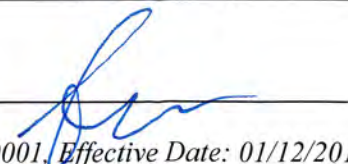
A. Kravitz

Date/Time in Dessicator:

8/24/17

| Weighing #1 | Weighing #2 | Weighing #3 | Weighing #4 | Weighing #5 |
|-----------------------------|-----------------------------|----------------------------|---------------------------|---------------------------|
| Date/Time: <u>8/31/17</u> | Date/Time: <u>9/1/17</u> | Date/Time: <u>9/4/17</u> | Date/Time: <u>9/11/17</u> | Date/Time: <u>9/12/17</u> |
| R/H %: <u>19.8</u> | R/H %: <u>19.8</u> | R/H %: <u>22.8</u> | R/H %: <u>13.2</u> | R/H %: <u>11.4</u> |
| Temp: <u>76.1</u> | Temp: <u>75.2</u> | Temp: <u>71.0</u> | Temp: <u>74.1</u> | Temp: <u>77.3</u> |
| 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>500.0</u> | 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>N/A</u> | 200 mg Audit: <u>N/A</u> |
| 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.9</u> | 2 g Audit: <u>1999.8</u> |
| 100 g Audit: <u>99997.8</u> | 100 g Audit: <u>99997.9</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> |
| Initials: <u>A</u> | Initials: <u>AK</u> | Initials: <u>A</u> | Initials: <u>A</u> | Initials: <u>A</u> |

| Train | Element | ID # | Tare (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) |
|--------------------------|--------------|------|-----------|-----------------|-----------------|--------------|---------------|---------------|
| A (First Hour) | Front Filter | D241 | 120.3 | <u>121.0</u> | <u>120.7</u> | <u>120.7</u> | | |
| | Rear Filter | N/A | | | | | | |
| | Probe | N/A | | | | | | |
| | O-Ring Set | N/A | | | | | | |
| A (Remainder) | Front Filter | D242 | 122.2 | <u>123.0</u> | <u>122.8</u> | - | | |
| | Rear Filter | D243 | 122.1 | <u>121.8</u> | <u>121.9</u> | - | | |
| | Probe | 32 | 114742.4 | <u>114742.2</u> | <u>114742.4</u> | - | | |
| | O-Ring Set | R507 | 3373.4 | <u>3375.1</u> | <u>3375.0</u> | - | <u>3374.0</u> | <u>3374.1</u> |
| B | Front Filter | D244 | 120.5 | <u>122.0</u> | <u>122.1</u> | - | | |
| | Rear Filter | D245 | 122.7 | <u>122.6</u> | <u>122.4</u> | - | | |
| | Probe | 35 | 114327.0 | <u>114329.1</u> | <u>114327.0</u> | - | | |
| | O-Ring Set | R508 | 3308.5 | <u>3310.1</u> | <u>3310.0</u> | - | <u>3308.9</u> | <u>3308.0</u> |
| BG | Filter | N/A | | | | | | |

Technician Signature: 

Date: 9/4/17 9/12/17

ASTM E2780 Wood Heater Run Sheets

Client: Valley Comfort Systems, Inc. Project Number: 142WS013E Run Number: 5
 Model: 20.2 Series Tracking Number: 2253 Date: 8/25/17
 Test Crew: A. Kravitz
 OMNI Equipment ID numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

ASTM E2515 Lab Sheet

Assembled By:

A. Kravitz

Date/Time in Dessicator:

8/26/17

| Weighing #1 | Weighing #2 | Weighing #3 | Weighing #4 | Weighing #5 |
|-----------------------------|-----------------------------|----------------------------|---------------------------|---------------------------|
| Date/Time: <u>8/31/17</u> | Date/Time: <u>9/1/17</u> | Date/Time: <u>9/4/17</u> | Date/Time: <u>9/11/17</u> | Date/Time: <u>9/12/17</u> |
| R/H %: <u>19.8</u> | R/H %: <u>19.8</u> | R/H %: <u>22.8</u> | R/H %: <u>13.2</u> | R/H %: <u>11.4</u> |
| Temp: <u>76.1</u> | Temp: <u>75.2</u> | Temp: <u>71.0</u> | Temp: <u>74.1</u> | Temp: <u>77.3</u> |
| 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>500.0</u> | 200 mg Audit: <u>500.1</u> | 200 mg Audit: <u>N/A</u> | 200 mg Audit: <u>N/A</u> |
| 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.8</u> | 2 g Audit: <u>1999.9</u> | 2 g Audit: <u>1999.8</u> |
| 100 g Audit: <u>99997.8</u> | 100 g Audit: <u>99997.9</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> | 100 g Audit: <u>N/A</u> |
| Initials: <u>A</u> | Initials: <u>AK</u> | Initials: <u>A</u> | Initials: <u>A</u> | Initials: <u>A</u> |

| Train | Element | ID # | Tare (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) |
|--------------------------|--------------|------|-----------|-----------------|-----------------|--------------|---------------|---------------|
| A (First Hour) | Front Filter | D246 | 122.1 | <u>123.5</u> | <u>123.5</u> | - | | |
| | Rear Filter | N/A | | | | | | |
| | Probe | N/A | | | | | | |
| | O-Ring Set | N/A | | | | | | |
| A (Remainder) | Front Filter | D247 | 123.1 | <u>123.9</u> | <u>123.7</u> | - | | |
| | Rear Filter | D248 | 121.2 | <u>121.1</u> | <u>121.1</u> | - | | |
| | Probe | 36 | 114885.7 | <u>114885.8</u> | <u>114885.8</u> | - | | |
| | O-Ring Set | R509 | 3307.6 | <u>3308.9</u> | <u>3308.8</u> | - | <u>3307.7</u> | <u>3307.8</u> |
| B | Front Filter | D249 | 119.8 | <u>121.6</u> | <u>121.5</u> | - | | |
| | Rear Filter | D250 | 122.0 | <u>120.7</u> | <u>120.4</u> | <u>120.4</u> | | |
| | Probe | 37 | 114466.0 | <u>114465.9</u> | <u>114466.0</u> | - | | |
| | O-Ring Set | R510 | 4091.7 | <u>4094.4</u> | <u>4094.4</u> | - | <u>4093.6</u> | <u>4093.6</u> |
| BG | Filter | N/A | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Technician Signature: 

Date: 9/4/17 9/12/17

Client: Valley Comfort Systems, Inc. Project Number: 142WS013E Run Number: 6

Model: 20.2 Series Tracking Number: 2253 Date: 8/25/17

Test Crew: A. Kravitz

OMNI Equipment ID numbers: 464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592

ASTM E2515 Lab Sheet

Assembled By:

A. Kravitz

Date/Time in Dessicator:

8/26/17

| Weighing #1 | Weighing #2 | Weighing #3 | Weighing #4 | Weighing #5 |
|----------------------|----------------------|---------------------|--------------------|--------------------|
| Date/Time: 8/24/17 | Date/Time: 9/11/17 | Date/Time: 8/4/17 | Date/Time: 8/11/17 | Date/Time: 8/12/17 |
| RH %: 19.8 | RH %: 14.8 | RH %: 22.8 | RH %: 13.2 | RH %: 11.4 |
| Temp: 76.1 | Temp: 75.2 | Temp: 72.0 | Temp: 74.1 | Temp: 77.3 |
| 200 mg Audit: 500.1 | 200 mg Audit: 500.0 | 200 mg Audit: 500.1 | 200 mg Audit: N/A | 200 mg Audit: N/A |
| 2 g Audit: 1999.8 | 2 g Audit: 1999.8 | 2 g Audit: 1999.8 | 2 g Audit: 1999.9 | 2 g Audit: 1999.8 |
| 100 g Audit: 99997.8 | 100 g Audit: 99997.9 | 100 g Audit: N/A | 100 g Audit: N/A | 100 g Audit: N/A |
| Initials: A | Initials: A | Initials: A | Initials: A | Initials: A |

| Train | Element | ID # | Tare (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) |
|-------------------|--------------|------|-----------|----------------|----------------|-------------|-------------|-------------|
| A (First Hour) | Front Filter | D251 | 121.7 | 123.8 124.4 | 123.7 124.4 | | | |
| | Rear Filter | N/A | | | | | | |
| | Probe | N/A | | | | | | |
| | O-Ring Set | N/A | | | | | | |
| A (Remainder) | Front Filter | D252 | 120.1 | 121.1 | 121.1 | | | |
| | Rear Filter | D253 | 121.9 | 120.3 | 120.3 | | | |
| | Probe | 38 | 114151.3 | 114151.3 | 114151.4 | | | |
| | O-Ring Set | R511 | 4139.2 | 4144.4 | 4144.5 | 4141.7 | 4141.6 | |
| B | Front Filter | D254 | 121.4 | 124.1 123.8 | 124.1 123.7 | | | |
| | Rear Filter | D255 | 122.4 | 121.7 | 121.6 | | | |
| | Probe | 58 | 117066.6 | 117066.6 | 117066.7 | | | |
| | O-Ring Set | R512 | 4175.7 | 4175.3 | 4178.2 | 4177.6 | 4177.5 | |
| BG | Filter | N/A | | | | | | |

Technician Signature: A. Kravitz

146 of 359

Date: 8/24/17 9/12/17

ASTM E2780 Wood Heater Run Sheets

Client: **Valley Comfort Systems, Inc.** Project Number: **142WS01AE** Run Number: **7**

Model: **30.2 Series** Tracking Number: **2253** Date: **9/28/17**

Test Crew: **B. Davis**

OMNI Equipment ID numbers: **464,410,132,576,318,432,419,371,372,432,296-T55,567,413,592**

ASTM E2515 Lab Sheet

Assembled By:

B Davis

Date/Time in Dessicator:

9/1/17 0530

| Weighing #1 | Weighing #2 | Weighing #3 | Weighing #4 | Weighing #5 |
|----------------------|----------------------|----------------------|---------------|---------------|
| Date/Time: 9/5/17 | Date/Time: 9/6/17 | Date/Time: 9/7/17 | Date/Time: | Date/Time: |
| R/H %: 20.2 | R/H %: 16.7 | R/H %: 17.3 | R/H %: | R/H %: |
| Temp: 78 | Temp: 77 | Temp: 77 | Temp: | Temp: |
| 200 mg Audit: 0.2000 | 200 mg Audit: 0.2000 | 200 mg Audit: 0.2000 | 200 mg Audit: | 200 mg Audit: |
| 2 g Audit: 1.9998 | 2 g Audit: 1.9998 | 2 g Audit: 1.9999 | 2 g Audit: | 2 g Audit: |
| 100 g Audit: 99.9977 | 100 g Audit: 99.9976 | 100 g Audit: 99.9977 | 100 g Audit: | 100 g Audit: |
| Initials: BK | Initials: BL | Initials: BK | Initials: | Initials: |

| Train | Element | ID # | Tare (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) | Weight (mg) |
|-------------------|--------------|--------------|----------------|-------------|-------------|--------------|-------------|-------------|
| A (First Hour) | Front Filter | D267 | 121.6 | 121.9 | 121.9 | | | |
| | Rear Filter | | | | | | | |
| | Probe | | | | | | | |
| | O-Ring Set | | | | | | | |
| A (Remainder) | Front Filter | D270 D269 | 122.4 121.9 | 243.4 | 243.4 | | | |
| | Rear Filter | D268 | 121.9 | 121.9 | 121.8 | | | |
| | Probe | 64 | 118208.3 | 118208.6 | 118208.6 | | | |
| | O-Ring Set | D255 | 3318.7 | 3318.4 | 3318.2 | BK 3317.9 | | |
| B | Front Filter | D271 | 119.7 | 121.0 | 120.9 | | | |
| | Rear Filter | D272 | 122.0 | 121.7 | 121.8 | | | |
| | Probe | 65 | 117084.4 | 117085.1 | 117084.9 | | | |
| | O-Ring Set | D256 | 3296.8 | 3296.7 | 3296.4 | 3296.6 | | |
| BG | Filter | | | | | | | |

Technician Signature: B Davis

Date: 9/6/17

Tare Sheet: (check one)

Probes _____

47mm Filters _____

100mm Filters _____

O-Ring Pair

Prepared By: J. Button

Balance ID #: 637

Thermohyrometer ID #: 592

Audit Weight ID #/Mass: 9834 / 2000 mg

| Placed in Dessicator: Date: <u>8/9/2017</u> Time: <u>4:30 PM</u> | Date: <u>8/15/17</u> Time: <u>10:27</u> RH %: <u>18.6</u> T (°F): <u>72.1</u> Audit: <u>1.9999</u> | Date: <u>8/14/17</u> Time: <u>10:08</u> RH %: <u>14.1</u> T (°F): <u>73.0</u> Audit: <u>1.9999</u> | Date: <u>8/17/17</u> Time: <u>0836</u> RH %: <u>12.2</u> T (°F): <u>71.5</u> Audit: <u>1.9999</u> | Date: _____ Time: _____ RH %: _____ T (°F): _____ Audit: _____ | Date Used | Project Number | Run No. |
|---|--|--|---|--|-----------|----------------|---------|
| | ID # | | | | | | |
| R501 | 3285.4 | 3285.3 | - | | 8/22/17 | D142WS03E | 1 |
| R502 | 3423.4 | 3423.3 | - | | ↓ | | 2 |
| R503 | 3298.6 | 3298.5 | - | | 8/23/17 | | 3 |
| R504 | 3384.1 | 3384.0 | - | | ↓ | | 4 |
| R505 | 3337.9 | 3337.9 | - | | ↓ | | 5 |
| R506 | 4158.9 | 4158.8 | - | | ↓ | | 6 |
| R507 | 3373.5 | 3373.4 | - | | 8/24/17 | | 7 |
| R508 | 3308.6 | 3308.5 | - | | ↓ | | ↓ |
| R509 | 3307.5 | 3307.6 | - | | 8/25/17 | | ↓ |
| R510 | 4091.7 | 4091.7 | - | | ↓ | | ↓ |
| R511 | 4139.4 | 4139.2 | - | | ↓ | | ↓ |
| R512 | 4175.8 | 4175.7 | - | | ↓ | | ↓ |
| R513 | 4104.4 | 4104.6 | - | | | | |
| R514 | 3355.5 | 3355.9 | 3355.8 | - | | | |
| R515 | 3318.7 | 3318.7 | - | | 8/28/17 | | ↓ |
| R516 | 3296.7 | 3296.8 | - | | ↓ | ↓ | ↓ |
| R517 | 3313.3 | 3313.4 | - | | | | |
| R518 | 3366.2 | 3366.4 | - | | | | |
| R519 | 3320.9 | 3321.5 | 3321.3 | - | | | |
| R520 | 4081.4 | 4081.5 | - | | | | |

Initials: DB

Initials: DB

Initials: BC

Initials: _____

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

Date: _____

Evaluator signature: [Signature]

Tare Sheet: (check one)

Probes

47mm Filters _____

100mm Filters _____

O-Ring Pair _____

Prepared By: S. Burtan

Balance ID #: 637

Thermohyrometer ID #: 592

Audit Weight ID #/Mass: 2834 / 100g

| Placed in Dessicator: Date: <u>8/9/17</u> Time: <u>4:20</u> | Date: <u>8/15/17</u> Time: <u>1047</u> RH %: <u>19.6</u> T (°F): <u>72.1</u> Audit: <u>99.9980</u> | | Date: <u>8/16/17</u> Time: <u>10:08</u> RH %: <u>14.1</u> T (°F): <u>73.0</u> Audit: <u>99.9979</u> | | Date: <u>8/17/17</u> Time: <u>0836</u> RH %: <u>12.2</u> T (°F): <u>71.5</u> Audit: <u>99.9980</u> | | Date: <u>8/18/17</u> Time: <u>0815</u> RH %: <u>11.4</u> T (°F): <u>71.4</u> Audit: <u>99.9979</u> | | Date Used | Project Number | Run No. |
|--|--|----------|---|----------|--|--|--|--|-----------|----------------|---------|
| | ID # | | | | | | | | | | |
| 3 | 116010.6 | 116010.6 | - | | | | | | 8/22/17 | 014245013E | 1 |
| 22 | 114345.1 | 114344.7 | 114344.5 | - | | | | | ↓ | ↓ | ↓ |
| 27 | 114274.7 | 114274.9 | - | | | | | | 8/23/17 | | 2 |
| 29 | 114279.2 | 114278.9 | 114278.7 | - | | | | | ↓ | | ↓ |
| 30 | 114330.4 | 114330.5 | - | | | | | | ↓ | | 3 |
| 31 | 114370.4 | 114370.0 | 114369.7 | 114369.6 | - | | | | ↓ | | ↓ |
| 32 | 114742.3 | 114742.4 | - | | | | | | 8/24/17 | | 4 |
| 35 | 114326.9 | 114327.0 | - | | | | | | ↓ | | ↓ |
| 36 | 114885.9 | 114885.7 | - | | | | | | 8/25/17 | | 5 |
| 37 | 114465.9 | 114466.0 | - | | | | | | ↓ | | ↓ |
| 38 | 114151.4 | 114151.3 | - | | | | | | ↓ | | 6 |
| 58 | 117067.2 | 117066.9 | 117066.5 | 117066.6 | - | | | | ↓ | | ↓ |
| 64 | 118208.4 | 118208.3 | - | | | | | | 8/28/17 | | 7 |
| 65 | 117085.3 | 117084.9 | 117084.5 | 117084.4 | - | | | | ↓ | ↓ | ↓ |
| 66 | 118460.3 | 118460.1 | - | | | | | | | | |
| 67 | 117760.5 | 117760.3 | - | | | | | | | | |
| 68 | 116806.0 | 116806.2 | - | | | | | | | | |
| 69 | 117372.7 | 117372.8 | - | | | | | | | | |

Initials: BR Initials: an Initials: AK Initials: _____

Final Technician Signature:

Date: _____

Evaluator signature:

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

Date/time Placed in Dessicator: 6/22/17 8:45

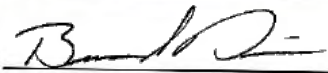
Thermohygrometer ID #: 592

Prepared By: S. Buttan

Analytical Balance ID #: SB 8/10
244 637

Audit Weight ID #/Mass: 00283A - 1 200mg

| ID # | Date: 8/15/17 Time: 0934 RH %: 10.5 T (°F): 71.6 Audit: .2000 | Date: 8/16/17 Time: 0930 RH %: 10.5 T (°F): 72.8 Audit: 0.2001 | Date: Time: RH %: T (°F): Audit: | Date: Time: RH %: T (°F): Audit: | Date Used | Project Number | Run No. |
|------|---|--|--|--|-----------|----------------|---------|
| D225 | 119.5 | 119.5 | | | 8/22/17 | 0142W5013E | 1 |
| D226 | 121.5 | 121.5 | | | ↓ | ↓ | ↓ |
| D227 | 120.3 | 120.2 | | | ↓ | ↓ | ↓ |
| D228 | 122.0 | 121.9 | | | ↓ | ↓ | ↓ |
| D229 | 119.9 | 119.8 | | | ↓ | ↓ | ↓ |
| D230 | 121.7 | 121.5 | | | ↓ | ↓ | ↓ |
| D231 | 121.4 | 121.5 | | | 8/23/17 | 0142V5013E | 2 |
| D232 | 122.1 | 122.0 | | | ↓ | ↓ | ↓ |
| D233 | 120.3 | 120.5 | | | ↓ | ↓ | ↓ |
| D234 | 121.8 | 121.9 | | | ↓ | ↓ | ↓ |
| D235 | 121.3 | 121.2 | | | ↓ | ↓ | ↓ |
| D236 | 118.9 | 119.1 | | | ↓ | ↓ | ↓ |
| D237 | 122.9 | 122.9 | | | ↓ | ↓ | ↓ |
| D238 | 121.3 | 121.4 | | | ↓ | ↓ | ↓ |
| D239 | 120.0 | 120.1 | | | ↓ | ↓ | ↓ |
| D240 | 122.1 | 122.0 | | | ↓ | ↓ | ↓ |
| D241 | 120.2 | 120.3 | | | 8/24/17 | | 4 |
| D242 | 122.4 | 122.2 | | | ↓ | ↓ | ↓ |
| D243 | 122.0 | 122.1 | | | ↓ | ↓ | ↓ |
| D244 | 120.3 | 120.5 | | | ↓ | ↓ | ↓ |
| D245 | 122.6 | 122.7 | | | ↓ | ↓ | ↓ |
| D246 | 122.0 | 122.1 | | | 7/25/17 | | 5 |
| | Initials: <u>SB</u> | Initials: <u>SB</u> | Initials: | Initials: | | | |

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

Date: _____
150 of 359

Evaluator signature: 

Tare Sheet: (check one)

Probes _____

47mm Filters

100mm Filters _____

O-Ring Pair _____

Prepared By: S. Buttm

Balance ID #: 637

Thermohygrometer ID #: 592

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

| Placed in Dessicator: Date: <u>8/10/2017</u> Time: <u>10:30</u> | Date: <u>8/15/17</u> Time: <u>0934</u> RH %: <u>10.5</u> T (°F): <u>71.6</u> Audit: <u>12021</u> | Date: <u>8/16/17</u> Time: <u>0934</u> RH %: <u>10.5</u> T (°F): <u>72.8</u> Audit: <u>0.2001</u> | Date: _____ Time: _____ RH %: _____ T (°F): _____ Audit: _____ | Date: _____ Time: _____ RH %: _____ T (°F): _____ Audit: _____ | Date Used | Project Number | Run No. |
|---|--|---|--|--|----------------|-------------------|----------|
| | ID # | Audit: <u>12021</u> | Audit: <u>0.2001</u> | Audit: _____ | | | |
| <u>D247</u> | <u>123.1</u> | <u>123.1</u> | | | <u>8/25/17</u> | <u>0142W3013E</u> | <u>5</u> |
| <u>D248</u> | <u>121.1</u> | <u>121.2</u> | | | | | |
| <u>D249</u> | <u>120.0</u> | <u>119.8</u> | | | | | |
| <u>D250</u> | <u>121.9</u> | <u>122.0</u> | | | | | |
| <u>D251</u> | <u>121.5</u> | <u>121.7</u> | | | | | <u>6</u> |
| <u>D252</u> | <u>119.9</u> | <u>120.1</u> | | | | | |
| <u>D253</u> | <u>121.9</u> | <u>121.9</u> | | | | | |
| <u>D254</u> | <u>B² 120.7 121.2</u> | <u>121.4</u> | | | | | |
| <u>D255</u> | <u>122.4</u> | <u>122.4</u> | | | | | |
| <u>D256</u> | <u>119.2</u> | <u>119.4</u> | | | | | |
| <u>D257</u> | <u>121.2</u> | <u>121.0</u> | | | | | |
| <u>D258</u> | <u>119.9</u> | <u>119.8</u> | | | | | |
| <u>D259</u> | <u>122.3</u> | <u>122.3</u> | | | | | |
| <u>D260</u> | <u>121.0</u> | <u>121.0</u> | | | | | |
| <u>D261</u> | <u>119.9</u> | <u>119.7</u> | | | | | |
| <u>D262</u> | <u>122.5</u> | <u>122.5</u> | | | | | |
| <u>D263</u> | <u>121.6</u> | <u>121.5</u> | | | | | |
| <u>D264</u> | <u>120.5</u> | <u>120.7</u> | | | | | |
| <u>D265</u> | <u>123.4</u> | <u>123.4</u> | | | | | |
| <u>D266</u> | <u>121.4</u> | <u>121.4</u> | | | | | |
| Initials: <u>BR</u> | Initials: <u>BR</u> | Initials: _____ | Initials: _____ | Initials: _____ | | | |

Final Technician Signature: B. [Signature]

Date: _____

Evaluator signature: [Signature]

Tare Sheet: (check one)

Probes _____

47mm Filters

100mm Filters _____

O-Ring Pair _____

Prepared By: S. Buffon

Balance ID #: 637

Thermohygrometer ID #: 592

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

| Placed in Dessicator: Date: <u>8/10/2017</u> Time: <u>10:20</u> | Date: <u>8/15/17</u> Time: <u>0934</u> RH %: <u>10.5</u> T (°F): <u>71.6</u> Audit: <u>0.2001</u> | Date: <u>8/16/17</u> Time: <u>0934</u> RH %: <u>10.5</u> T (°F): <u>72.2</u> Audit: <u>0.2001</u> | Date: <u>8/17/17</u> Time: <u>0836</u> RH %: <u>12.2</u> T (°F): <u>71.5</u> Audit: <u>0.2001</u> | Date: _____ Time: _____ RH %: _____ T (°F): _____ Audit: _____ | Date Used | Project Number | Run No. |
|--|---|---|---|--|-----------|----------------|---------|
| | ID # | | | | | | |
| D267 | 121.7 | 121.6 | | | 8/28/17 | 0142WS013E | 7 |
| D268 | 121.8 | 121.9 | | | ↓ | ↓ | ↓ |
| D269 | 120.3 | 120.3 | | | | | |
| D270 | 122.3 | 122.4 | | | | | |
| D271 | 119.5 | 119.7 | | | | | |
| D272 | 122.1 | 122.0 | | | | | |
| D273 | 121.7 | 121.9 | | | 8-29-17 | 0142WS014E | 1 |
| D274 | 119.3 | 119.3 | | | ↓ | ↓ | ↓ |
| D275 | 122.3 | 122.4 | | | | | |
| D276 | 121.6 | 121.6 | | | | | |
| D277 | 119.4 | 119.6 | | | | | |
| D278 | 121.3 | 121.3 | | | | | |
| D279 | 122.7 | 122.5 | | | 8-30-17 | | 2 |
| D280 | 121.3 | 120.8 | 120.8 | | ↓ | ↓ | ↓ |
| D281 | 122.6 | 122.7 | | | | | |
| D282 | 121.9 | 122.0 | | | | | |
| D283 | 119.7 | 119.7 | | | | | |
| D284 | 122.8 | 122.9 | | | | | |
| D285 | 120.4 | 120.2 | | | 8-31-17 | | 3 |
| D286 | 121.4 | 121.3 | | | | | |
| Initials: <u>SB</u> | Initials: <u>SB</u> | Initials: <u>SB</u> | Initials: _____ | Initials: _____ | | | |

Final Technician Signature: [Signature]

Date: 8/17/17

Evaluator signature: [Signature]

CALIBRATIONS

Equipment used for Methods EPA 28R, ASTM E2515, ASTM E2780

| ID # | Lab Name/Purpose | Log Name | Attachment Type |
|-------------|----------------------------|---------------------------------------|--------------------------|
| 132 | 10 lb Weight | Stanley Tape Measure | Calibration Log |
| 296-T55 | Tape Measure | Weight Standard, 10 lb. | Calibration Log |
| 318 | Digital thermometer | Fluke 52II | 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 |
| 410 | Microtector | Dwyer Microtector | Calibration Certificate |
| 413 | Dry Gas Meter | Dry Gas Meter with Digital Readout | Calibration Log |
| 419 | Combustion Gas Analyzer | Infrared Gas Analyzer | N/A - See Test Run Notes |
| 432 | Moisture Meter Calibrator | Delmhorst Moisture Content Calibrator | Calibration Log |
| 464 | Data Logging System | NI Fieldpoint Rail & Software | N/A – see 371 & 372 |
| 559 | Vaneometer | Dwyer Vaneometer | Equipment Record |
| 567 | Stopwatch | Robic Stopwatch SC-606W | Calibration Log |
| 576 | Caliper, 6" | 6" Dial Caliper | Calibration Certificate |
| 592 | Thermohygrometer | Omega Digital Thermohygrometer | Calibration Log |

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

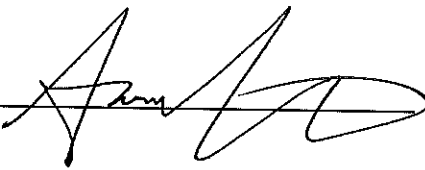
Date: 2/19/13

By: A. Kravitz

| Standard Weight (A) (Lb.) | Weight Verified (B) (Lb.) | Difference (A - B) | % Error |
|------------------------------|------------------------------|-----------------------|---------|
| 10.0 | 10.0 | 0.0 | Ø |

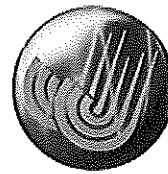
*Acceptable tolerance is 1%.

This calibration is traceable to NIST using calibrated standard weights.

Technician signature:  Date: 2/19/13

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

| <u>Std ID</u> | <u>Manufacturer</u> | <u>Model</u> | <u>Nomenclature</u> | <u>Due Date</u> | <u>Trace ID</u> |
|---------------|---------------------|--------------------|---------------------|-----------------|-----------------|
| 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 |

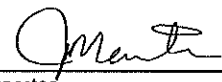
JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (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

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 OMNE-00281

| Tape Measure Number | Description | Cal Dates | | | Technician Initials | | | |
|---------------------|--------------------------|-----------|--|--|---------------------|--|--|--|
| OMNE-00296-T55 | Dewalt 16' Tape Measure | 12/12/16 | | | BR | | | |
| OMNE-00296-T56 | Dewalt 25' Tape Measure | 12/12/16 | | | BL | | | |
| OMNE-00296-T59 | Dewalt 25' Tape Measures | 12/12/16 | | | BL | | | |
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Thermocouple Readout Calibration Log

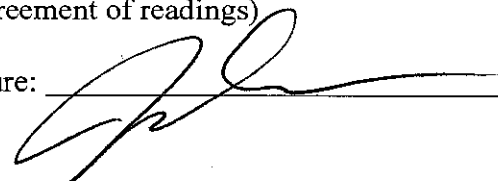
Date: 2/13/14

OMNI Meter Identification Number: OMNI-00318

Technician: Jeremy Clark

| | | Meter Response | | | | | | Acceptable? | | Initials |
|---------------|----------------------|----------------|--------|-------|-------|--------|--------|-------------|----|----------|
| | | 0 | 200 | 400 | 600 | 800 | 1000 | Yes | No | |
| Date | Calibration Meter ID | | ± 3EF* | ± 6EF | ± 9EF | ± 12EF | ± 15EF | | | |
| Γ1 2/13/14 | OMNI-00373 | 0.2 | 200.0 | 400.1 | 600.1 | 800.1 | 1001 | ✓ | | JC |
| Γ2 2/13/14 | " " | 0.3 | 200.0 | 400.1 | 600.1 | 800.1 | 1000 | ✓ | | JC |
| Γ1 2/3/15 | OMNI-00373 | -0.1 | 199.9 | 399.9 | 599.9 | 800.0 | 1000 | ✓ | | JC |
| Γ2 2/3/15 | OMNI-00373 | -0.1 | 199.9 | 400.0 | 600.0 | 800.1 | 1001 | ✓ | | JC |
| Γ1 2/29/16 | OMNI-00373 | 0.3 | 200.1 | 400.2 | 600.2 | 800.1 | 1000 | ✓ | | BR |
| TL 2/29/16 | OMNI-00373 | 0.1 | 200.1 | 400.1 | 600.3 | 800.4 | 1001 | ✓ | | BR |
| T1 3/9/17 | OMNI-00373 | -2.4 | 197.6 | 397.5 | 597.5 | 797.5 | 997.3 | ✓ | | BR |
| TL 3/9/17 | OMNI-00373 | -1.1 | 197.5 | 398.4 | 598.3 | 797.1 | 998.3 | ✓ | | BR |
| | | | | | | | | | | |
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*Note: Acceptance Criteria are based on EPA Method 2 Section 4.3 (1.5% agreement of readings)

Technician signature:  Date: 2/13/14

Thermal Metering System Calibration Y Factor

Manufacturer: Apex
 Model: XC-60-EP
 Serial Number: 0702003
 OMNI Tracking No.: OMNI-00371
 Calibrated Orifice: Yes

| |
|-----------------------------------|
| Average Gas Meter y Factor |
| 1.003 |

| |
|--------------------------|
| Orifice Meter dH@ |
| N/A |

Calibration Date: 07/20/17
 Calibrated by: B. Davis
 Calibration Frequency: 6 months
 Next Calibration Due: 1/20/2018
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 °F
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 30.2 "Hg
 Signature/Date: *[Signature]* 7/21/2017

[Handwritten] 8/1/2017

Previous Calibration Comparison

| | | | |
|------------|------------|---------------------------|-----------|
| Date | 1/18/2017 | Acceptable Deviation (5%) | Deviation |
| y Factor | 1.001 | 0.05005 | 0.002 |
| Acceptance | Acceptable | | |

Current Calibration

| | |
|--------------------------|------------|
| Acceptable y Deviation | 0.020 |
| Maximum y Deviation | 0.005 |
| Acceptable dH@ Deviation | N/A |
| Maximum dH@ Deviation | N/A |
| Acceptance | Acceptable |

Reference Standard *

| | | |
|------------|--------------|-----------------------|
| Standard | Model | Standard Test Meter |
| Calibrator | 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 | 1.70 | 1.00 |
| Initial Reference Meter | 824.4 | 829.7 | 838 |
| Final Reference Meter | 829.6 | 837.9 | 843.6 |
| Initial DGM | 0 | 0 | 0 |
| Final DGM | 5.069 | 8.146 | 5.572 |
| Temp. Ref. Meter (°F), Tr | 69.0 | 70.7 | 73.4 |
| Temperature DGM (°F), Td | 73.0 | 79.0 | 82.0 |
| Time (min) | 26.0 | 58.5 | 52.5 |
| Net Volume Ref. Meter, Vr | 5.200 | 8.200 | 5.600 |
| Net Volume DGM, Vd | 5.069 | 8.146 | 5.572 |
| Gas Meter y Factor = | 1.007 | 1.000 | 1.001 |
| Gas Meter y Factor Deviation (from avg.) | 0.005 | 0.003 | 0.002 |
| 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 $\pm 0.14 \text{ ft}^3/\text{min}$. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

| Temperature Calibration EPA Method 28R, ASTM 2515 | | | | | | | | |
|--|---------|-----------------------------|---------|-------------------------------|----------|----------------------|--------|-------------|
| BOOTH: | | TEMPERATURE MONITOR TYPE: | | | | EQUIPMENT NUMBER: | | |
| E1 | | 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 | | 7/24/17 | | 68 | | 30.02 | | |
| Input Temperature (F) | Ambient | Meter A | | | | | Tunnel | FB Interior |
| | | | Meter B | Filter A | Filter B | | | |
| 0 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | |
| 100 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 300 | 299 | 300 | 299 | 299 | 300 | 300 | 300 | |
| 500 | 499 | 499 | 499 | 499 | 500 | 500 | 500 | |
| 700 | 699 | 699 | 699 | 699 | 699 | 700 | 700 | |
| 1000 | 999 | 999 | 999 | 999 | 999 | 1000 | 1000 | |

| Input (F) | FB Top | FB Bottom | FB Back | FB Left | FB Right | Imp A | Imp B | Cat | Stack |
|-----------|--------|-----------|---------|---------|----------|-------|-------|-----|-------|
| 0 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ |
| 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 100 |
| 300 | 300 | 300 | 300 | 300 | 300 | 299 | 300 | 299 | 300 |
| 500 | 500 | 500 | 500 | 500 | 500 | 499 | 500 | 499 | 500 |
| 700 | 700 | 700 | 700 | 700 | 700 | 699 | 700 | 699 | 700 |
| 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 999 | 999 | 999 | 1000 |


1500

2000

1499

1998

Technician signature:  Date: 7/24/17

Reviewed By:  Date: 8/1/2017

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET

Instrument to be calibrated: Pressure Transducer

Maximum Range: 0-2" WC ID Number: OMNI-00371

Calibration Instrument: Digital Manometer ID Number: OMNI-00633



Date: 7/24/17 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 - 0.4 | -0.035 | -0.028 | 0.007 | 0.35 |
| 20-40% Max. Range 0.4 - 0.8 | -0.583 | -0.577 | 0.006 | 0.30 |
| 40-60% Max. Range 0.8 - 1.2 | -1.003 | -0.998 | 0.005 | 0.25 |
| 60-80% Max. Range 1.2 - 1.6 | -1.358 | -1.352 | 0.006 | 0.30 |
| 80-100% Max. Range 1.6 - 2.0 | -1.876 | -1.871 | 0.005 | 0.25 |

*Acceptable tolerance is 4%.

The uncertainty of measurement is ± 0.4 " WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature:  Date: 08/03/17
 Reviewed by:  Date: 8/4/2017

Thermal Metering System Calibration Y Factor

Manufacturer: Apex
 Model: XC-60-EP
 Serial Number: 0702004
 OMNI Tracking No.: OMNI-00372
 Calibrated Orifice: Yes

Previous Calibration Comparison

| | | | |
|------------|------------|---------------------------|-----------|
| Date | 1/18/2017 | Acceptable Deviation (5%) | Deviation |
| y Factor | 0.993 | 0.04965 | 0.004 |
| Acceptance | Acceptable | | |

Current Calibration

| | |
|--------------------------|------------|
| Acceptable y Deviation | 0.020 |
| Maximum y Deviation | 0.005 |
| Acceptable dH@ Deviation | N/A |
| Maximum dH@ Deviation | N/A |
| Acceptance | Acceptable |

| |
|--|
| Average Gas Meter y Factor 0.997 |
|--|

| |
|--------------------------|
| Orifice Meter dH@ N/A |
|--------------------------|

Calibration Date: 07/21/17
 Calibrated by: B. Davis
 Calibration Frequency: 6 months
 Next Calibration Due: 1/21/2018
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 oF
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 30.2 "Hg
 Signature/Date: *B. Davis* 7/21/2017

| Reference Standard * | | |
|----------------------|--------------|-----------------------|
| Standard | Model | Standard Test Meter |
| Calibrator | S/N | OMNI-00001 |
| | Calib. Date | 27-Oct-16 |
| | Calib. Value | 0.9823 y factor (ref) |

8/1/2017

| Calibration Parameters | Run 1 | Run 2 | Run 3 |
|--|-------|-------|---------|
| Reference Meter Pressure ("H2O), Pr | 0.00 | 0.00 | 0.00 |
| DGM Pressure ("H2O), Pd | 2.00 | 1.30 | 0.80 |
| Initial Reference Meter | 856.9 | 864 | 870.7 |
| Final Reference Meter | 863.9 | 870.6 | 877.902 |
| Initial DGM | 0 | 0 | 0 |
| Final DGM | 6.93 | 6.564 | 7.233 |
| Temp. Ref. Meter (°F), Tr | 78.2 | 79.1 | 79.0 |
| Temperature DGM (°F), Td | 85.0 | 87.0 | 88.0 |
| Time (min) | 38.5 | 46.0 | 60.0 |
| Net Volume Ref. Meter, Vr | 7.000 | 6.600 | 7.202 |
| Net Volume DGM, Vd | 6.93 | 6.564 | 7.233 |
| Gas Meter y Factor = | 1.000 | 0.999 | 0.992 |
| Gas Meter y Factor Deviation (from avg.) | 0.003 | 0.002 | 0.005 |
| 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 ft³/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: | | | |
| E1 | 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 | | 7/24/17 | | 68 | | 30.02 | | |
| Input Temperature (F) | Ambient | Meter A | | | | | Tunnel | FB Interior |
| | | | Meter B | Filter A | Filter B | | | |
| 0 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | |
| 100 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 300 | 299 | 300 | 299 | 299 | 300 | 300 | 300 | |
| 500 | 499 | 499 | 499 | 499 | 500 | 500 | 500 | |
| 700 | 699 | 699 | 699 | 699 | 699 | 700 | 700 | |
| 1000 | 999 | 999 | 999 | 999 | 999 | 1000 | 1000 | |


| Input (F) | FB Top | FB Bottom | FB Back | FB Left | FB Right | Imp A | Imp B | Cat | Stack |
|-----------|--------|-----------|---------|---------|----------|-------|-------|-----|-------|
| 0 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ |
| 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 100 |
| 300 | 300 | 300 | 300 | 300 | 300 | 299 | 300 | 299 | 300 |
| 500 | 500 | 500 | 500 | 500 | 500 | 499 | 500 | 499 | 500 |
| 700 | 700 | 700 | 700 | 700 | 700 | 699 | 700 | 699 | 700 |
| 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 999 | 999 | 999 | 1000 |


1500

2000

1499

1998

Technician signature:  Date: 7/24/17

Reviewed By:  Date: 8/1/2017

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET

Instrument to be calibrated: Pressure Transducer

Maximum Range: 0-2" WC ID Number: OMNI-00372

Calibration Instrument: Digital Manometer ID Number: OMNI-00633

Date: 7/24/17 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 - 0.4 | 0.340 | 0.340 | 0 | 0 |
| 20-40% Max. Range 0.4 - 0.8 | 0.569 | 0.569 | 0 | 0 |
| 40-60% Max. Range 0.8 - 1.2 | 0.982 | 0.985 | 0.003 | 0.15 |
| 60-80% Max. Range 1.2 - 1.6 | 1.168 | 1.168 | 0 | 0 |
| 80-100% Max. Range 1.6 - 2.0 | 1.930 | 1.934 | 0.003 | 0.15 |

*Acceptable tolerance is 4%.

The uncertainty of measurement is ± 0.4 " WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature:  Date: 08/03/17

Reviewed by:  Date: 8/14/2017

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/NC SL 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

Thermal Metering System Calibration Y Factor

Manufacturer: APEX Instruments
 Model: DGM-SK25DA-TL
 Serial Number: 8004298
 OMNI Tracking No.: OMNI-00413
 Calibrated Orifice: Yes

| |
|-----------------------------------|
| Average Gas Meter y Factor |
| 1.003 |

| |
|--------------------------|
| Orifice Meter dH@ |
| N/A |

Calibration Date: 09/26/17
 Calibrated by: B. Davis
 Calibration Frequency: Six month
 Next Calibration Due: 3/26/2018
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 oF
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 30.2 "Hg
 Signature/Date: *B. Davis* 9/26/17
[Signature] 9/27/17

Previous Calibration Comparison

| | | | |
|------------|------------|---------------------------|-----------|
| Date | 3/28/2017 | Acceptable Deviation (5%) | Deviation |
| y Factor | 0.997 | 0.04985 | 0.006 |
| Acceptance | Acceptable | | |

Current Calibration

| | |
|--------------------------|------------|
| Acceptable y Deviation | 0.020 |
| Maximum y Deviation | 0.016 |
| Acceptable dH@ Deviation | N/A |
| Maximum dH@ Deviation | N/A |
| Acceptance | Acceptable |

Reference Standard *

| | | |
|---------------------|--------------|-----------------------|
| Standard Calibrator | Model S/N | Standard Test Meter |
| | | 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 | -0.40 | -0.24 | -0.10 |
| DGM Pressure ("H2O), Pd | 0.00 | 0.00 | 0.00 |
| Initial Reference Meter | 118.005 | 104.503 | 111.9 |
| Final Reference Meter | 123.505 | 111.702 | 117.2 |
| Initial DGM | 0 | 0 | 0 |
| Final DGM | 5.313 | 7.032 | 5.273 |
| Temp. Ref. Meter (°F), Tr | 76.0 | 75.0 | 76.0 |
| Temperature DGM (°F), Td | 76.0 | 75.0 | 76.0 |
| Time (min) | 7.0 | 13.5 | 22.0 |
| Net Volume Ref. Meter, Vr | 5.500 | 7.199 | 5.300 |
| Net Volume DGM, Vd | 5.313 | 7.032 | 5.273 |
| Gas Meter y Factor = | 1.016 | 1.005 | 0.987 |
| Gas Meter y Factor Deviation (from avg.) | 0.013 | 0.002 | 0.016 |
| 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 ft³/min. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

WOOD MOISTURE CONTENT CALIBRATION WORKSHEET

Moisture Content Standard OMNI ID #: 00432

Reference Moisture Content Standard: OMNI # 00430

| Date | Temp. | Barometric Pressure | Fixed Moisture % | | Observed Moisture % | | Initials |
|-----------|-------|---------------------|------------------|------------------|---------------------|---------------------|----------|
| | | | Fixed Moisture % | Fixed Moisture % | Observed Moisture % | Observed Moisture % | |
| 5/20/2016 | 69°F | 29.90 in Hg | 22% | 12% | 22.0% | 12.0% | AL |
| 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% | AL |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
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| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |
| | | | 22% | 12% | | | |

Notes: _____

Technician signature: BD Date: 5/24/16

| | | | | | | | |
|-----------------------------|------------------------------------|-----|-------------------------------------|---|----|--------------------------|------------------------|
| OMNI Track # | OMNI-00559 | | | | | | |
| Equipment Name/Description | Vaneometer, Air Vel. Meter - Dwyer | | | | | | |
| Equipment S/N: | T36Z | | | | | | |
| Comments | New vane installed | | | | | | |
| Status | Active | | | | | | |
| Part # | 480 | | | | | | |
| Reference Standard: | <input type="checkbox"/> | YES | <input checked="" type="checkbox"/> | X | NO | <input type="checkbox"/> | (Check 'X' for answer) |
| Location of Equipment: | Cab 1 | | | | | | |
| Calibration Vendor | OMNI in house | | | | | | |
| Type of Calibration | 6 month | | | | | | |
| Calibration Period (Months) | 6 | | | | | | |
| Date of Last Calibration | 5/10/2017 | | | | | | |
| Date of Next Calibration | 11/10/2017 | | | | | | |

Do the following:

- 1) Complete Calibration documentation
- 2) Complete top half of this form
- 3) Attach appropriate calibration forms and save in following location
 \\omni-serv\Test Equipment\Equipment\OMNI-XXXXX - Equipment Name
- 4) Repopulate database with updated information
- 5) Print, laminate and adhere calibration tag to equipment

| |
|--|
| <p align="center">Six Month OMNI-00559 Vaneometer</p> <p>Last Cal Date: 5/10/2017 Due Date of Cal: 11/10/17</p> |
|--|

| |
|--|
| <p align="center">Six Month OMNI-00559 Vaneometer</p> <p>Last Cal Date: 5/10/2017 Due Date of Cal: 11/10/2017</p> |
|--|

NIST Stopwatch Calibration, Time Proficiency Testing Procedure and Data Sheet

Date: 8/17/17 User/Technician: N. Sodergren Pass Fail

NIST traceable stopwatch OMNI tracking number: 00565 Last Cal: 06/27/2017

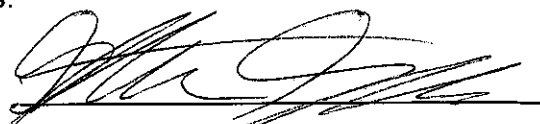
Stopwatch to be tested for time proficiency OMNI tracking number: 00567

1. Start the NIST traceable stopwatch: at a predetermined time (i.e. 1.00 minutes), the technician shall start the watch being tested. When 15.00 seconds have passed (i.e. the NIST traceable stopwatch reads 1 minute, 15 seconds), the technician shall stop the watch being tested. Record the target time interval (i.e. 15.00 seconds). Repeat this step twice and record the data.
2. Repeat step #1 for each of the following target time intervals: 30.00 seconds, 10.00 minutes, and 30 minutes.
3. If the delta between the target time and measured time is less than 5% of the target time interval or 2.00 seconds (whichever is less), then the technician has demonstrated proficiency with the specific instrument utilized in the proficiency test. The proficiency is valid for a period of 12 months.
4. Archive the proficiency test data and information, including the effective date and expiration date of the proficiency, in the equipment record for the instrument involved.

| | | | |
|-----------------------------------|---|-----------------------------------|-----------------------------------|
| Target time: <u>15.00 seconds</u> | #1 Measured time: <u>15.03</u> | #2 Measured time: <u>14.96</u> | #3 Measured time: <u>15.00</u> |
| Target time: <u>30.00 seconds</u> | #1 Measured time: <u>30.19</u> | #2 Measured time: <u>30.18</u> | #3 Measured time: <u>29.84</u> |
| Target time: <u>45.00 seconds</u> | #1 Measured time: <u>44.98</u> | #2 Measured time: <u>44.79</u> | #3 Measured time: <u>44.89</u> |
| Target time: <u>60.00 seconds</u> | #1 Measured time: <u>59.97</u> | #2 Measured time: <u>59.94</u> | #3 Measured time: <u>59.97</u> |
| Target time: <u>10.00 minutes</u> | #1 Measured time: <u>9'59"78</u> | #2 Measured time: <u>9'59"90</u> | #3 Measured time: <u>10'00"15</u> |
| Target time: <u>30.00 minutes</u> | #1 Measured time: <u>29'59"40 30'00"23</u> | #2 Measured time: <u>30'00"06</u> | #3 Measured time: <u>29'59"97</u> |

The uncertainty of measurement is ± 1 sec. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

This calibration procedure is confirmed by the manufacturer as a proper method for evaluating the accuracy of timers.

Technician Signature:  Date: 8/17/17

Reviewed by:  Date: 8/17/17

Certificate of Calibration

Certificate Number: **636406**



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: **160115**
Order Date: **11/22/2016**
Authorized By: **N/A**



Property #: **OMNI-00576**
User: **N/A**
Department: **N/A**
Make: **General**
Model: **0-6"**
Serial #: **OMNI-00576**
Description: **Caliper, 0-6"**
Procedure: **DCN 500777**
Accuracy: **±0.001"**

Calibrated on: **12/05/2016**
*Recommended Due: **12/05/2017**
Environment: **20 °C 43 % RH**
* As Received: **Out of Tolerance**
* As Returned: **Limited**
Action Taken: **Calibrated**
Technician: **53**

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.

Received unit with OD jaws out of tolerance over 3.0". Limited Calibration per Bruce Davis: Do not use OD jaws past 3.0".

Standards Used

| Std ID | Manufacturer | Model | Nomenclature | Due Date | Trace ID |
|--------|--------------|------------|---------------------------|------------|----------|
| 368A | Rutland | 2225-7081 | 81 Piece Gage Block Set | 05/24/2017 | 620803 |
| 449A | Mitutoyo | 293-766-30 | Micrometer, Digital, 0-1" | 07/25/2017 | 627018 |

Measurement Data

| Parameter | Measurement Description | Range Unit | Reference | Min | Max | *Error | UUT | Uncertainty |
|------------------------------|-------------------------|------------|-----------|-------|-------|--------|------------|----------------|
| Before/After | | | | | | | | Accredited = ✓ |
| Length - Outside | | | | | | | | |
| | | Inch | 0.2500 | 0.249 | 0.251 | 0.000 | 0.250 Inch | 1.1E-03 ✓ |
| | | Inch | 0.5000 | 0.499 | 0.501 | 0.000 | 0.500 Inch | 1.1E-03 ✓ |
| | | Inch | 0.7500 | 0.749 | 0.751 | 0.001 | 0.751 Inch | 1.1E-03 ✓ |
| | | Inch | 1.0000 | 0.999 | 1.001 | 0.001 | 1.001 Inch | 1.1E-03 ✓ |
| | | Inch | 3.0000 | 2.999 | 3.001 | 0.001 | 3.001 Inch | 1.1E-03 ✓ |
| | | Inch | 6.0000 | 5.999 | 6.001 | 0.003 | 6.003 Inch | 1.2E-03 ✓ |
| Step | | Inch | 1.0000 | 0.999 | 1.001 | 0.000 | 1.000 Inch | 1.1E-03 ✓ |
| Depth Rod | | Inch | 1.0000 | 0.999 | 1.001 | 0.001 | 1.001 Inch | 1.1E-03 ✓ |
| Length inside ID jaws | | | | | | | | |
| I.D. Jaws | | Inch | 0.5000 | 0.499 | 0.501 | 0.000 | 0.500 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 12/05/2016 Rev # 15

Inspector

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 desiccator 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:

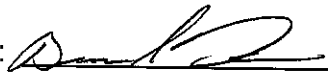
Date: 1/5/17 Technician: B DAVIS

Time in desiccator: 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 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: **655889**



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: 170142

Order Date: 08/07/2017

Authorized By: N/A



0723.01
Calibration

Property #: **OMNI-00637**

User: **N/A**

Department: **N/A**

Make: **Mettler Toledo**

Model: **MS104TS/00**

Serial #: **B729400181**

Description: **Scale, Analytical, 120g**

Procedure: **DCN 500887**

Accuracy: **±0.0005g**

Calibrated on: **08/07/2017**

*Recommended Due: **02/07/2018**

Environment: **22 °C 45 % RH**

* As Received: **Within Tolerance**

* As Returned: **Within Tolerance**

Action Taken: **Calibrated**

Technician: **34**

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 |
|--------|--------------|--------|--------------|------------|----------|
| 256A | Rice Lake | W0133K | Mass Set | 10/28/2017 | 616126 |

Measurement Data

| Parameter | Measurement Description | Range Unit | Reference | Min | Max | *Error | UUT | Uncertainty |
|--------------|-------------------------|------------|-----------|----------|----------|--------|------------|----------------|
| Before/After | Force | | | | | | | Accredited = ✓ |
| | | g | 10.00000 | 9.9995 | 10.0005 | 0.0001 | 10.0001 g | 5.7E-04 ✓ |
| | | g | 30.00000 | 29.9995 | 30.0005 | 0.0001 | 30.0001 g | 5.7E-04 ✓ |
| | | g | 60.00000 | 59.9995 | 60.0005 | 0.0003 | 60.0003 g | 5.7E-04 ✓ |
| | | g | 90.00000 | 89.9995 | 90.0005 | 0.0002 | 90.0002 g | 5.7E-04 ✓ |
| | | g | 120.00000 | 119.9995 | 120.0005 | 0.0003 | 120.0003 g | 5.7E-04 ✓ |

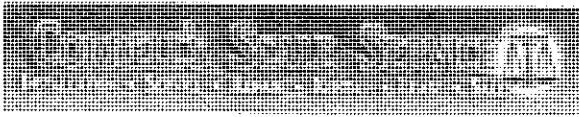
JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (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 08/14/2017

Rev # 15

Inspector



Certificate of Calibration

4300 RD. K.N.E.
Moses Lake,
Washington 98837
Ph: (509) 765-7754
Fax: (509) 765-4941
rpugh@nctv.com

An R.B. Pugh Company LLC
Celebrating Over 40 Years of Sales and Service in the Columbia Basin

Customer: BLAZE KING
Address: 146 A. STREET
City, State Zip: WALLA WALLA, WASHINGTON 99362

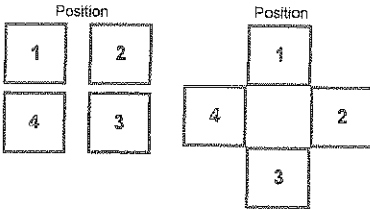
Certificate ID: BK-2171506
ISO Number:
Date: 6/15/2017

| | | | | |
|--------------------------------|--------------------|-----------------------|----------------------------|-------------------------------------|
| Indicator Mfg. Weigh-Tronix | Base Mfg. N/A | Cal Date 6/15/2017 | Scale ID BK-2 | Scale Location LAB |
| Indicator Model W1125 | Base Model N/A | Due Date 6/15/2018 | Scale Class III | Scale Range 0 - 1000 lb x 0.1 lb |
| Indicator Serial 073824 | Base Serial N/A | Procedure - | Scale Status In Service | |
| Test Interval 1 Year | | | | |

EQUIPMENT CONDITIONS

[Working] Non-Working [Clean] Dirty Out of Level Out of Service

SHIFT TEST Shift Test Result: [Pass] Fail Adjust Not Applicable Shift Weight: 100.0 lb



All tolerances calculated in conformance with Handbook 44 Table 6.

LOAD TEST

| Preliminary Load Test | | |
|-----------------------|----------|---------|
| Test Wt. | Reading | Error |
| 50.0 lb | 50.0 lb | 0.0 lb |
| 100.0 lb | 100.0 lb | 0.0 lb |
| 200.0 lb | 200.0 lb | 0.0 lb |
| 300.0 lb | 299.9 lb | -0.1 lb |
| 400.0 lb | 399.9 lb | -0.1 lb |
| 500.0 lb | 499.9 lb | -0.1 lb |

| Final Load Test | | |
|-----------------|----------|--------|
| Test Wt. | Reading | Error |
| 50.0 lb | 50.0 lb | 0.0 lb |
| 100.0 lb | 100.0 lb | 0.0 lb |
| 200.0 lb | 200.0 lb | 0.0 lb |
| 300.0 lb | 300.0 lb | 0.0 lb |
| 400.0 lb | 400.0 lb | 0.0 lb |
| 500.0 lb | 500.0 lb | 0.0 lb |

In acceptance tolerance? [Yes] No N/A

In acceptance tolerance? [Yes] No N/A

TEST INFORMATION

Test Weight Classification: F
 Traceability Certificate Number(s): I-5743 Cal Date: 10/5/2016 Recal Date: 10/5/2018
 Standards Used: 50 LB 50 lb #1, 2, 3, 4, 5, 6, 7, 8, 9, 10
 Expanded Uncertainty: Available on Request or Reported on this Document
 Test Location: [Onsite] Offsite
 Overall Result: [Pass] Fail Adjust
 Was the scale within customers required accuracy? [Y] N N/A
 Environmental Conditions: [Acceptable] Unacceptable
 Comments / Notes: TESTED AND ADJUSTED SCALE LEFT AS SHOWN
 Technician: Mike Pugh A0110
 Certifying Technician: Technician Signature not found.

Scales were calibrated with certified test weights. Adjustments made to restore and/or maintain the accuracy of the scale conform to the tolerances established by the National Institute of Standards and Technology as specified in Handbook 44 Section 2.2, or Manufacturers Specifications. Best measurement of uncertainty calculated using a coverage factor of K=2. This provides confidence level of 95%. This certificate shall not be reproduced, except in full, with the written approval of the laboratory. Measurement uncertainty available on request.



Certificate of Calibration

4300 RD. K.N.E.
Moses Lake,
Washington 98837
Ph: (509) 765-7754
Fax: (509) 765-4941
rpugh@nctv.com

An R.B. Pugh Company LLC
Celebrating Over 40 Years of Sales and Service in the Columbia Basin

Customer: BLAZE KING
Address: 146 A.STREET
City, State Zip: WALLA WALLA, WASHINGTON 99362

Certificate ID: BK-1171506
ISO Number:
Date: 6/15/2017

| | | | | |
|--------------------------------|--------------------|-----------------------|--------------------------------|-------------------------------------|
| Indicator Mfg. Weigh-Tronix | Base Mfg. N/A | Cal Date 6/15/2017 | Scale ID BK-1 | Scale Location LAB |
| Indicator Model WI125 | Base Model N/A | Due Date 6/15/2018 | Scale Class III | Scale Range 0 - 1000 lb x 0.1 lb |
| Indicator Serial 123 | Base Serial N/A | Procedure - | Scale Status Out Of Service | |
| Test Interval 1 Year | | | | |

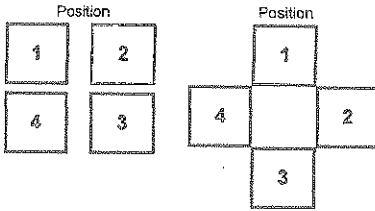
EQUIPMENT CONDITIONS

[Working] Non-Working [Clean] Dirty Out of Level Out of Service

SHIFT TEST

Shift Test Result: [Pass] Fail Adjust Not Applicable

Shift Weight: 100.0 lb



Shipping Scale

All tolerances calculated in conformance with Handbook 44 Table 6.

LOAD TEST

| Preliminary Load Test | | |
|-----------------------|----------|--------|
| Test Wt. | Reading | Error |
| 50.0 lb | 50.0 lb | 0.0 lb |
| 100.0 lb | 100.0 lb | 0.0 lb |
| 200.0 lb | 200.0 lb | 0.0 lb |
| 300.0 lb | 300.0 lb | 0.0 lb |
| 400.0 lb | 400.1 lb | 0.1 lb |
| 500.0 lb | 500.0 lb | 0.0 lb |

| Final Load Test | | |
|-----------------|----------|--------|
| Test Wt. | Reading | Error |
| 50.0 lb | 50.0 lb | 0.0 lb |
| 100.0 lb | 100.0 lb | 0.0 lb |
| 200.0 lb | 200.0 lb | 0.0 lb |
| 300.0 lb | 300.0 lb | 0.0 lb |
| 400.0 lb | 400.0 lb | 0.0 lb |
| 500.0 lb | 500.0 lb | 0.0 lb |

In acceptance tolerance? [Yes] No N/A

In acceptance tolerance? [Yes] No N/A

TEST INFORMATION

Test Weight Classification:
Traceability Certificate Number(s):
Standards Used:
Expanded Uncertainty:
Test Location:
Overall Result:
Was the scale within customers required accuracy?
Environmental Conditions:
Comments / Notes:
Technician:
Certifying Technician:

F
I-5743 Cal Date: 10/5/2016 Recal Date: 10/5/2018
50 LB 50 lb #1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Available on Request or Reported on this Document
[Onsite] Offsite
[Pass] Fail Adjust
[Y] N N/A
[Acceptable] Unacceptable
TESTED AND ADJUSTED SCALE LEFT AS SHOWN
Mike Pugh A0110
Technician Signature not found.

Scales were calibrated with certified test weights. Adjustments made to restore and/or maintain the accuracy of the scale conform to the tolerances established by the National Institute of Standards and Technology as specified in Handbook 44 Section 2.2, or Manufacturers Specifications. Best measurement of uncertainty calculated using a coverage factor of K=2. This provides confidence level of 95%. This certificate shall not be reproduced, except in full, with the written approval of the laboratory. Measurement uncertainty available on request.



Praxair
 5700 South Alameda Street
 Los Angeles, CA 90058
 Tel: (323) 585-2154 Fax: (714) 542-6689
 PGVPID: F22017

DocNumber: 000104669

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PXPKG TUALATIN OR H
 10450 SW TUALATIN SHERWOOD
 TUALATIN OR 97062

Praxair Order Number: 70187070
 Customer P. O. Number:
 Customer Reference Number:

Fill Date: 1/27/2017
 Part Number: NI CD10CO33E-AS
 Lot Number: 109702715
 Cylinder Style & Outlet: AS CGA 590
 Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

| | | |
|------------------|-----------------|-------------------------|
| Expiration Date: | 2/22/2025 | NIST Traceable |
| Cylinder Number: | CC76915 | Analytical Uncertainty: |
| 10.04 % | CARBON DIOXIDE | ± 0.4 % |
| 2.52 % | CARBON MONOXIDE | ± 0.7 % |
| 10.52 % | OXYGEN | ± 0.2 % |
| Balance | NITROGEN | |

Certification Information: Certification Date: 2/22/2017 Term: 96 Months Expiration Date: 2/22/2025

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

CO2 responses have been corrected for O2 effect. O2 responses have been corrected for CO2 interference.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: CARBON DIOXIDE

Requested Concentration: 10 %
 Certified Concentration: 10.04 %
 Instrument Used: Horiba VIA-510 S/N 20C194WK
 Analytical Method: NDIR
 Last Multipoint Calibration: 2/10/2017

Reference Standard Type: GMIS
 Ref. Std. Cylinder #: CC283552
 Ref. Std. Conc: 13.99%
 Ref. Std. Traceable to SRM #: 1675b
 SRM Sample #: 6-F-51
 SRM Cylinder #: CAL014538

First Analysis Data: Date: 2/22/2017

| | | | |
|----------|------------------|----------|--------------|
| Z: 0 | R: 13.97 | C: 10.02 | Conc: 10.039 |
| R: 13.96 | Z: 0 | C: 10.02 | Conc: 10.039 |
| Z: 0 | C: 10.02 | R: 13.96 | Conc: 10.039 |
| UOM: % | Mean Test Assay: | 10.039 % | |

Second Analysis Data: Date:

| | | | |
|--------|------------------|------|---------|
| Z: 0 | R: 0 | C: 0 | Conc: 0 |
| R: 0 | Z: 0 | C: 0 | Conc: 0 |
| Z: 0 | C: 0 | R: 0 | Conc: 0 |
| UOM: % | Mean Test Assay: | 0 % | |

2. Component: CARBON MONOXIDE

Requested Concentration: 2.5 %
 Certified Concentration: 2.52 %
 Instrument Used: Horiba VIA-510 S/N UB9UCSYX
 Analytical Method: NDIR
 Last Multipoint Calibration: 2/10/2017

Reference Standard Type: GMIS
 Ref. Std. Cylinder #: CC103175
 Ref. Std. Conc: 2.017%
 Ref. Std. Traceable to SRM #: 2640a
 SRM Sample #: 53-C-38
 SRM Cylinder #: CAL013925

First Analysis Data: Date: 2/22/2017

| | | | |
|----------|------------------|----------|-------------|
| Z: 0 | R: 2.013 | C: 2.508 | Conc: 2.513 |
| R: 2.013 | Z: 0 | C: 2.519 | Conc: 2.524 |
| Z: 0 | C: 2.508 | R: 2.013 | Conc: 2.513 |
| UOM: % | Mean Test Assay: | 2.517 % | |

Second Analysis Data: Date:

| | | | |
|--------|------------------|------|---------|
| Z: 0 | R: 0 | C: 0 | Conc: 0 |
| R: 0 | Z: 0 | C: 0 | Conc: 0 |
| Z: 0 | C: 0 | R: 0 | Conc: 0 |
| UOM: % | Mean Test Assay: | 0 % | |

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

DocNumber: 000104669

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS**3. Component: OXYGEN**

Requested Concentration: 10.5 %
 Certified Concentration: 10.52 %
 Instrument Used: OXYMAT 5E
 Analytical Method: PARAMAGNETIC
 Last Multipoint Calibration: 2/5/2017

Reference Standard Type: GMS
 Ref. Std. Cylinder #: CC111177
 Ref. Std. Conc: 10.01%
 Ref. Std. Traceable to SRM #: 2658a
 SRM Sample #: 72-D-28
 SRM Cylinder #: CAL016862

First Analysis Data: Date: 2/22/2017
 Z: 0 R: 10.02 C: 10.53 Conc: 10.519
 R: 10.02 Z: 0 C: 10.53 Conc: 10.519
 Z: 0 C: 10.53 R: 10.02 Conc: 10.519
 UOM: % Mean Test Assay: 10.519%

Second Analysis Data: Date:
 Z: 0 R: 0 C: 0 Conc: 0
 R: 0 Z: 0 C: 0 Conc: 0
 Z: 0 C: 0 R: 0 Conc: 0
 UOM: % Mean Test Assay: 0%

Analyzed by:

Ying Yu

Certified by:

Nassim Haddad



Praxair
 5700 South Alameda Street
 Los Angeles, CA 90058
 Tel: (323) 585-2154 Fax: (714) 542-6689
 PGVPID: F22017

DocNumber: 000104682

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

XPXKG TUALATIN OR H
 10450 SW TUALATIN SHERWOOD
 TUALATIN OR 97062

Praxair Order Number: 70187071
 Customer P. O. Number:
 Customer Reference Number:

Fill Date: 1/24/2017
 Part Number: NI CD17C08E-AS
 Lot Number: 109702414
 Cylinder Style & Outlet: AS CGA 590
 Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

| | | |
|------------------|-----------------|-------------------------|
| Expiration Date: | 2/22/2025 | NIST Traceable |
| Cylinder Number: | CC153453 | Analytical Uncertainty: |
| 17.00 % | CARBON DIOXIDE | ± 0.3 % |
| 4.27 % | CARBON MONOXIDE | ± 0.6 % |
| 17.01 % | OXYGEN | ± 0.1 % |
| Balance | NITROGEN | |

Certification Information: Certification Date: 2/22/2017 Term: 96 Months Expiration Date: 2/22/2025

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

CO2 responses have been corrected for O2 effect. O2 responses have been corrected for CO2 interference.

Analytical Data: (R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: CARBON DIOXIDE

Requested Concentration: 17 %
 Certified Concentration: 17.00 %
 Instrument Used: Horiba VIA-510 S/N 20C194WK
 Analytical Method: NDIR
 Last Multipoint Calibration: 2/10/2017

Reference Standard Type: GMIS
 Ref. Std. Cylinder #: SA10234
 Ref. Std. Conc: 20.02%
 Ref. Std. Traceable to SRM #: RGM#CC28
 SRM Sample #: N/A
 SRM Cylinder #: RGM#CC28033

| | | | |
|-----------------------------|-------------------------|------------------------|--------------|
| First Analysis Data: | | Date: 2/22/2017 | |
| Z: 0 | R: 20.01 | C: 16.99 | Conc: 16.998 |
| R: 20.01 | Z: 0 | C: 17 | Conc: 17.008 |
| Z: 0 | C: 16.99 | R: 20.01 | Conc: 16.998 |
| UOM: % | Mean Test Assay: | | 17.002 % |

| | | | |
|------------------------------|-------------------------|--------------|---------|
| Second Analysis Data: | | Date: | |
| Z: 0 | R: 0 | C: 0 | Conc: 0 |
| R: 0 | Z: 0 | C: 0 | Conc: 0 |
| Z: 0 | C: 0 | R: 0 | Conc: 0 |
| UOM: % | Mean Test Assay: | | 0 % |

2. Component: CARBON MONOXIDE

Requested Concentration: 4.25 %
 Certified Concentration: 4.27 %
 Instrument Used: Horiba VIA-510 S/N UB9UCSYX
 Analytical Method: NDIR
 Last Multipoint Calibration: 2/10/2017

Reference Standard Type: GMIS
 Ref. Std. Cylinder #: CC257812
 Ref. Std. Conc: 3.96%
 Ref. Std. Traceable to SRM #: 2641a
 SRM Sample #: 59-C-02
 SRM Cylinder #: FF13690

| | | | |
|-----------------------------|-------------------------|------------------------|-------------|
| First Analysis Data: | | Date: 2/22/2017 | |
| Z: 0 | R: 4 | C: 4.31 | Conc: 4.263 |
| R: 4 | Z: 0 | C: 4.32 | Conc: 4.273 |
| Z: 0 | C: 4.31 | R: 4.01 | Conc: 4.263 |
| UOM: % | Mean Test Assay: | | 4.267 % |

| | | | |
|------------------------------|-------------------------|--------------|---------|
| Second Analysis Data: | | Date: | |
| Z: 0 | R: 0 | C: 0 | Conc: 0 |
| R: 0 | Z: 0 | C: 0 | Conc: 0 |
| Z: 0 | C: 0 | R: 0 | Conc: 0 |
| UOM: % | Mean Test Assay: | | 0 % |

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

3. Component: OXYGEN

Requested Concentration: 17 %
Certified Concentration: 17.01 %
Instrument Used: OXYMAT 5E
Analytical Method: PARAMAGNETIC
Last Multipoint Calibration: 2/5/2017

Reference Standard Type: GMIS
Ref. Std. Cylinder #: CC112100
Ref. Std. Conc.: 19.74 %
Ref. Std. Traceable to SRM #: 2659a
SRM Sample #: 71-E-19
SRM Cylinder #: FF22331

First Analysis Data: Date: 2/22/2017

Z: 0 R: 19.74 C: 17.01 Conc: 17.016
R: 19.72 Z: 0 C: 16.99 Conc: 16.996
Z: 0 C: 17.01 R: 19.74 Conc: 17.016
UOM: % Mean Test Assay: 17.009 %

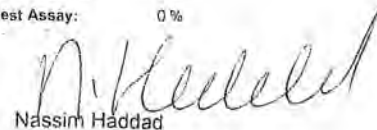
Second Analysis Data: Date:

Z: 0 R: 0 C: 0 Conc: 0
R: 0 Z: 0 C: 0 Conc: 0
Z: 0 C: 0 R: 0 Conc: 0
UOM: % Mean Test Assay: 0 %

Analyzed by:

Ying Yu 

Certified by:


Nassim Haddad

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EXAMPLE CALCULATIONS

Equations and Sample Calculations – ASTM E2780 & E2515

Manufacturer: Valley Comfort
Model: 20.2 Series
Run: 2
Category:

Equations used to calculate the parameters listed below are described in this appendix. Sample calculations 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/ft³

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_{Sdb} – Weight of test fuel spacers, dry basis, kg

ASTM E2780 equation (1)

$$M_{Sdb} = (M_{Swb}) (100 / (100 + FM_S))$$

Where,

FM_S = average fuel moisture of test fuel spacers, % dry basis

M_{Swb} = weight of test fuel spacers, wet basis, kg

Sample Calculation:

$$FM_S = 17.8 \%$$

$$M_{Swb} = 1.0 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{Sdb} = [(1.0 \times 0.4536) (100 / (100 + 17.8))]$$

$$M_{Sdb} = \mathbf{0.38 \text{ kg}}$$

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):

$$M_{CPnwb} = 1.3$$

$$FM_{CPn} = 23.8$$

$$= 1.3 (100/(100+ 23.8)$$

$$= 1.1 \text{ lbs}$$

Total crib weight, excluding spacer: 9.06 lbs

$$M_{Cdb} = \mathbf{4.11 \text{ kg}}$$

D_{Cdb} - Density of fuel crib, excluding spacers and nails, dry basis, lbs/ft³
ASTM E2780 equation (3)

$$D_{Cdb} = M_{Cdb}/V_C$$

Where,

$$V_C = \text{Volume of fuel crib, ft}^3$$

Sample calculation:

$$V_C = 523 \text{ in}^3$$

$$1728 = \text{conversion from in}^3 \text{ to ft}^3$$

$$D_{Cdb} = 9.06 / 523 * 1728$$

$$= \mathbf{29.9} \text{ lbs/ft}^3$$

M_{FTAdb} - Total weight of fuel crib excluding nails, dry basis, kg
ASTM E2780 equation (4)

$$M_{FTAdb} = M_{Sdb} + M_{Cdb}$$

Sample calculation:

$$M_{FTAdb} = 0.38 + 4.11$$

$$= \mathbf{4.49 \text{ kg}}$$

BR – dry burn rate, kg/hr

ASTM E2780 equation (5)

$$BR = \frac{60 M_{FTAdb}}{\theta}$$

Where,

θ = Total length of test run, min

Sample Calculation:

$$M_{Bdb} = 4.49 \quad \text{kg}$$

$$\theta = 175 \quad \text{min}$$

$$BR = \frac{60 \times 4.49}{175}$$

$$BR = \mathbf{1.54} \quad \text{kg/hr}$$

V_s – 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_p = Adjustment factor for center of tunnel pitot tube placement, $F_p = \frac{V_{strav}}{V_{scent}}$, ASTM E2515 Equation (1)
- V_{scent} = Dilution tunnel velocity calculated after the multi-point pitot traverse at the center, ft/sec
- V_{strav} = Dilution tunnel velocity calculated after the multi-point pitot traverse, ft/sec
- k_p = Pitot tube constant, 85.49
- C_p = Pitot tube coefficient: 0.99, unitless
- ΔP* = Velocity pressure in the dilution tunnel, in H₂O
- T_s = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- P_s = Absolute average gas static pressure in dilution tunnel, = P_{bar} + P_g, in Hg
- P_{bar} = Barometric pressure at test site, in. Hg
- P_g = Static pressure of tunnel, in. H₂O; (in Hg = in H₂O/13.6)
- M_s = **The dilution tunnel wet molecular weight; M_s = 28.78 assuming a dry weight of 29 lb/lb-mole

Sample calculation:

$$F_p = \frac{13.45}{15.25} = 0.882$$

$$V_s = 0.882 \times 85.49 \times 0.99 \times 0.219 \times \left(\frac{98.8 + 460}{\left(\frac{28.71}{28.71} + \frac{-0.17}{13.6} \right) \times 28.78} \right)^{1/2}$$

$$V_s = 13.45 \text{ ft/s}$$

*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_s as the dry molecular weight. It should be the wet molecular weight as indicated in EPA Method 2.

Q_{sd} – 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_{ws} = Water vapor in gas stream, proportion by volume; assume 2%
- A = Cross sectional area of dilution tunnel, ft²
- T_{std} = Standard absolute temperature, 528 °R
- P_s = Absolute average gas static pressure in dilution tunnel, = P_{bar} + P_g, in Hg
- T_{s(avg)} = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- P_{std} = Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 13.45 \times 0.196 \times \frac{528}{98.8 + 460} \times \frac{28.7 + \frac{-0.17}{13.6}}{29.92}$$

$$Q_{sd} = \mathbf{8443.3} \text{ dscf/hr}$$

$V_{m(std)}$ – 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
- ΔH = Average pressure differential across the orifice meter, in. H₂O
- T_m = Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 25.248 \times 1.003 \times \frac{\left(28.71 + \frac{1.70}{13.6} \right)}{\left(75.5 + 460 \right)}$$

$$V_{m(std)} = \mathbf{24.056} \text{ dscf}$$

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 25.494 \times 0.997 \times \frac{\left(28.71 + \frac{1.35}{13.6} \right)}{\left(73.4 + 460 \right)}$$

$$V_{m(std)} = \mathbf{24.217} \text{ dscf}$$

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 0.00 \times 0 \times \frac{\left(28.71 + \frac{0.00}{13.6} \right)}{\left(80.1 + 460 \right)}$$

$$V_{m(std)} = \mathbf{0} \text{ dscf}$$

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):

$$m_n = 0.0 + 1.5 + 0.0$$

$$m_n = 1.5 \text{ mg}$$

Using equation for Train 1 (post-first hour):

$$m_n = 0.0 + 0.7 + 0.3$$

$$m_n = 1.0 \text{ mg}$$

Train 1 aggregate:

$$m_n = 1.5 + 1.0$$

$$m_n = 2.5 \text{ mg}$$

Using equation for Train 2:

$$m_n = 0.2 + 1.9 + 0.9$$

$$m_n = 3 \text{ mg}$$

C_s - Concentration of particulate matter in tunnel gas, dry basis, corrected to standard conditions, g/dsc
ASTM E2515 equation (13)

$$C_s = K_2 \times \frac{m_n}{V_{m(\text{std})}}$$

Where:

K₂ = Constant, 0.001 g/mg

m_n = Total mass of particulate matter collected in the sampling train, mg

V_{m(std)} = Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train 1:

$$C_s = 0.001 \times \frac{2.5}{24.06}$$

$$C_s = \mathbf{0.00010} \text{ g/dscf}$$

For Train 2

$$C_s = 0.001 \times \frac{3.0}{24.22}$$

$$C_s = \mathbf{0.00012} \text{ g/dscf}$$

For Ambient Train

$$C_r = 0.001 \times \frac{0.0}{0}$$

$$C_r = \mathbf{0} \text{ g/dscf}$$

E_T – Total Particulate Emissions, g

ASTM E2515 equation (15)

$$E_T = (C_s - C_r) \times Q_{std} \times \theta$$

Where:

- C_s = Concentration of particulate matter in tunnel gas, g/dscf
- C_r = Concentration particulate matter room air, g/dscf
- Q_{std} = Average dilution tunnel gas flow rate, dscf/hr
- θ = Total time of test run, minutes

Sample calculation:

For Train 1

$$E_T = (\underline{0.000104} - 0) \times \underline{8443.3} \times \underline{175} /60$$
$$E_T = \underline{2.56} \text{ g}$$

For Train 2

$$E_T = (\underline{0.000124} - 0) \times \underline{8443.3} \times \underline{175} /60$$
$$E_T = \underline{3.05} \text{ g}$$

Average

$$E = \underline{2.81} \text{ g}$$

Total emission values shall not differ by more than 7.5% from the total average emissions

$$7.5\% \text{ of the average} = \underline{0.21}$$

$$\text{Train 1 difference} = \underline{0.25}$$

$$\text{Train 2 difference} = \underline{0.25}$$

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:

- θ = Total sampling time, min
- θ_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):

$$PR = \left(\frac{175 \times 0.118 \times 13.45 \times (117.0 + 460) \times (75.5 + 460)}{1 \times 25.25 \times 13.67 \times (98.8 + 460) \times (75.0 + 460)} \right) \times 100$$

$$PR = \underline{83} \%$$

PM_R – Particulate emissions for test run, g/hr

ASTM E2780 equation (6)

$$PM_R = 60 (E_T/\theta)$$

Where,

E_T = Total particulate emissions, grams

θ = Total length of full integrated test run, min

Sample Calculation:

$$E_T (\text{Dual train average}) = 2.81 \text{ g}$$

$$\theta = 175 \text{ min}$$

$$PM_R = 60 \times (2.81 / 175)$$

$$PM_R = \mathbf{0.96} \text{ g/hr}$$

PM_F – Particulate emission factor for test run, g/dry kg of fuel burned
ASTM E2780 equation (7)

$$PM_F = E_T / M_{FTAdb}$$

Sample Calculation:

$$E_T \text{ (Dual train average)} = 2.81 \text{ g}$$

$$M_{Bdb} = 4.49 \text{ kg}$$

$$PM_F = 2.81 / 4.49$$

$$PM_F = \mathbf{0.62} \text{ g/kg}$$

*Model: Blaze King 20.2 Series
Valley Comfort Systems Inc.
1290 Commercial Way
Penticton, BC V2A 3H5 Canada*

Appendix A

Labeling & Owner's Manual

SIROCCO SC20.2

SN - 23.

BLAZE KING CATALYST STOVE - POËLE À BOIS CATALYTIQUE
 ROOM HEATER, SOLID FUEL TYPE, ALSO FOR USE IN MOBILE HOMES. / APPAREIL APPROUVÉ DE TYPE CARBURANT SOLIDE, AUSSI ADAPTÉ POUR INSTALLER DANS UNE MAISON MOBILE.
 SUITABLE FOR MOBILE-HOME INSTALLATION. / CONCU POUR MAISONS MOBILES.
 MODEL / MODÈLE: SC20.2
 Tested to / Testé: UL 1482-11(R2015) / ULC S627-00
 CERTIFIED IN BOTH UNITED STATES AND CANADA / CERTIFIÉ POUR LES ÉTATS-UNIS ET LE CANADA

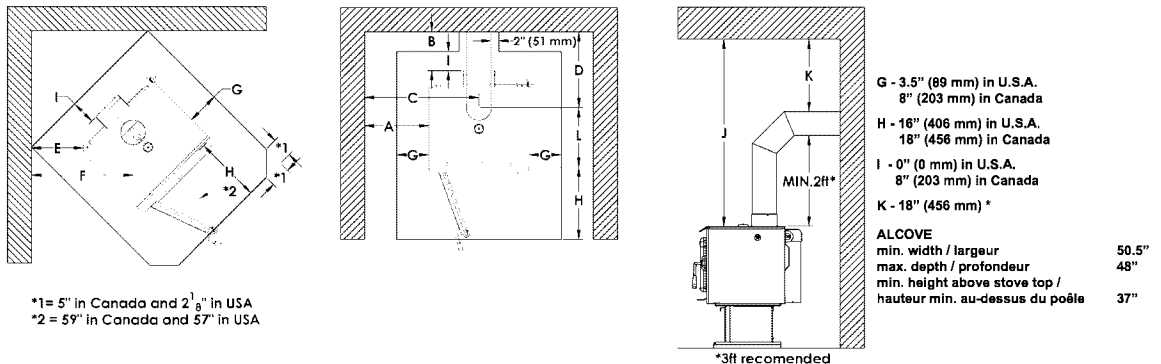
PREVENT HOUSE FIRES- Install and use only in accordance with Blaze King's installation and operation instructions. Contact local building or fire officials about restrictions and installation inspection in your area. The flue size is 6".
CHIMNEYS: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE. Except for installation detailed below, use 6" listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA or a masonry residential type chimney.
 Mobile Home, residential close clearance, and residential alcove installations require a 6" listed double wall close clearance chimney connector, with matching listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA. Mobile Home installations are only allowed with a roof exit.
 Do not install in a sleeping room. Passing through a wall or ceiling requires special methods: see instructions and local building codes.

POUR PRÉVENIR UN INCENDIE - Installer et employer seulement selon le manuel d'installation de Blaze King. Contacter les autorités locales en bâtiments ou en matière de prévention d'incendies au sujet des normes d'inspection et d'installation dans votre secteur. La dimension des conduits de cheminée est de 6".
CHEMINÉE: NE PAS CONNECTER CETTE UNITÉ À UNE CONDUITE DE CHEMINÉE SERVANT UN AUTRE APPAREIL. Excepté pour les situations détaillées ci-dessous, employer une cheminée de 6" homologuée par le fabricant à des fins d'utilisation pour combustibles solides conformément à la norme ULC629 au Canada ou UL-103HT aux États-Unis ou employer une cheminée en maçonnerie de type résidentiel.
 L'installation dans une maison mobile, en espace restreint ou dans des endroits à faible dégagement, requiert l'utilisation de connecteurs muraux à doubles parois et ayant une épaisseur 8" pour la cheminée. Ceux-ci doivent être homologués par le fabricant à des fins d'utilisation pour combustibles solides conformément à la norme ULC629 au Canada ou UL-103HT aux États-Unis. L'installation dans une maison mobile est permise seulement avec une sortie passant par le toit.
 Ne pas installer dans une chambre à coucher. Passer à travers un mur ou un plafond requiert une méthode spécifique décrite dans les instructions et dans le code local du bâtiment.

MINIMUM CLEARANCES TO COMBUSTIBLES (See owners manual for complete description of all requirements)
DÉGAGEMENTS MINIMUM AUX COMBUSTIBLES (voir les directives d'installation pour la description complète de toutes les conditions)

| Residential Installations / Installations Résidentielles | A | B | C | D | E | F | J |
|---|------------------|----------------|------------------|-------------------|--------------|-----------------|---------------|
| Roof exit, parallel and corner. Sortie de toit, parallèle et coin. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875" 404 mm | 6" 153 mm | 18.5" 470 mm | 37" 940 mm |
| Wall exit, parallel and corner. Sortie de mur, parallèle et coin. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875" 404 mm | 6" 153 mm | 18.5" 470 mm | 37" 940 mm |
| Alcove roof exit. Fan kit or rear shield required. Sortie de toit en alcôve. Kit de ventilateur et protection arrière requise. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875" 404 mm | | | 37" 940 mm |
| Mobile Home Installations / Installation pour Maison Mobile | | | | | | | |
| Roof exit, parallel and corner. Fan kit or rear shield required. Outside air kit required. Sortie de toit, parallèle et en coin. Kit de ventilateur et protection arrière requise. Kit d'air extérieur requis. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875" 404 mm | 6" 153 mm | 18.5" 470 mm | 37" 940 mm |

*Check with local codes and pipe manufacturers for pipe clearances. In Canada 18" clearances from single wall pipe is required.
 * Vérifier avec le code du bâtiment local et avec le fabricant de tuyaux pour les dégagements. Au Canada un dégagement de 18 po est exigé pour un tuyau à simple paroi.



Floor protection may be any non-combustible material or Listed Floor Protector, and must extend at least 18" (456 mm) in Canada or 16" (406 mm) in U.S.A., in front of the loading door opening: In USA, minimum size is 32" x 40 1/8" (813 mm x 1020 mm), in Canada, minimum size is 41" x 50 1/8" (1042 mm x 1274 mm).
 US ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using crib wood. (EPA test methods 28R/5G with an emission-rate of .73 g/hr). 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 operating instructions in the owner's manual, or if the catalytic element is deactivated or removed.
***ONLY OPERATE WITH DOORS CLOSED.** Open door to feed fire ONLY. ***DO NOT OBSTRUCT COMBUSTION AIR OPENINGS.** Do not obstruct the space beneath the heater. For use with solid wood fuel only - do not burn other fuels, this may make the catalyst in the combustor inactive. The performance of the catalytic device or its durability has not been evaluated as part of the certification. Combustor part number: Z0336-A or Z0334. Provide adequate outside air for combustion. *Replace with only ceramic glass, 5 mm. Thickness. Unit must be installed with Blaze King Leg Kit Z2613BK or Blaze King Pedestal Kit Z3803BK, attach as shown in the installation instructions.

La protection de plancher peut être de n'importe quel matériel non combustible ou Protecteur de plancher homologué, et doit se prolonger au moins de 18" (456 mm) au Canada ou 16" (406 mm) aux États-Unis devant la porte de chargement; Aux États-Unis, la taille minimum est de 32" x 40 1/8" (813 mm x 1020 mm), au Canada la taille minimum est 41" x 50 1/8" (1042 mm x 1274 mm).
 L'AGENCE DE PROTECTION ENVIRONNEMENTALE DES U.S. - Certifié conformément aux normes d'émission de particules 2020, en utilisant du bois machiné (méthodes d'essai EPA 28R / 5G, ASTM E2515 et ASTM E2790, avec un taux d'émission de 0,73 g / hre). Cet appareil de chauffage au bois nécessite des inspections périodiques et des réparations pour un fonctionnement adéquat. Consulter le manuel du propriétaire pour plus d'informations. Il est contre les règlements fédéraux de faire fonctionner cet appareil de chauffage à l'encontre des instructions d'utilisation fournies dans le manuel du propriétaire, ou si l'élément catalytique est enlevé ou désactivé.
***Utiliser le uniquement avec les portes fermées.** Ouvrir la porte pour alimenter le feu SEULEMENT. *Ne pas obstruer l'entrée d'air de combustion. Fournir l'apport d'air extérieur adéquat pour alimenter la combustion. Ne pas obstruer l'espace sous l'appareil. Utiliser uniquement avec des combustibles solides - ne pas brûler aucun autre combustible, ce qui peut rendre le catalyseur de la chambre à combustion inactif. La performance du catalyseur ou sa longévité n'a pas été évaluée dans le cadre de la certification. Numéro du catalyseur: Z0336-A ou Z0334. *Employer seulement le verre en céramique d'une épaisseur de 5mm si le remplacement est nécessaire. L'appareil doit être installé avec le Blaze King kit de jambe Z2613BK ou Blaze King piédestal Kit Z2803BK, attache comme indiqué dans les instructions d'installation.

MANUFACTURED IN
 USA: **Blaze King Industries**
 146A Street
 Walla Walla, WA.
 99362
 CANADA: **Valley Comfort Systems**
 1290 Commercial Way
 Penticton, B.C.
 V2A 3H5

MANUFACTURE DATE
 JAN FEB MAR APR MAY JUN
 JUL AUG SEP OCT NOV DEC
 2018 2019 2020 2021 2022 2023

Blaze King

SIROCCO SC20.2

SOLID FUEL WOOD CATALYTIC STOVE



U.S. Environmental Protection Agency certified to comply with 2020 particulate emission standards using crib wood.



Installer: Please complete the details on the back cover and leave this manual with the homeowner.

Homeowner: Please SAVE THESE INSTRUCTIONS for future reference.

The authority having jurisdiction (such a municipal building department, fire department, etc.) should be consulted before installation to determine the need to obtain a permit.

OPERATION & INSTALLATION MANUAL

Manufactured By

Valley Comfort Systems Inc., 1290 Commercial Way, Penticton, BC, V2A 3H5, Canada
Phone: 250-493-7444 ♦ Fax: 250-493-5833 ♦ www.blazeking.com ♦ info@blazeking.com

Pour la version française de nos manuels S.V.P. vous référez à notre site web: www.blazeking.com

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⚠ WARNING

- **THIS APPLIANCE IS HOT WHEN OPERATED AND CAN CAUSE SEVERE BURNS IF CONTACTED. ANY CHANGES OR ALTERATIONS TO THIS APPLIANCE OR ITS CONTROLS CAN BE DANGEROUS AND IS PROHIBITED BY FEDERAL AND STATE LAWS.**
- Do not operate appliance before reading and understanding operating instructions. Failure to operate appliance according to operating instructions could cause fire or injury.
- Before installing this appliance, contact the local building or fire authority and follow their guidelines
- This appliance must be installed by a qualified installer.
- Risk of burns. The appliance should be turned off and cooled before servicing
- Do not operate without fully assembling all components.
- Do not let the appliance become hot enough for any part to glow red.
- Do not install damaged, incomplete or substitute components.
- Risk of cuts and abrasions. Wear protective gloves and safety glasses during installation. Sheet metal edges may be sharp.
- Children and adults should be alerted to the hazards of high surface temperature and should stay away to avoid burns or clothing ignition.
- Young children should be carefully supervised when they are in the same room as the appliance. Toddlers, young children and others may be susceptible to accidental contact burns. A physical barrier is recommended if there are at risk individuals in the house. To restrict access to an appliance or appliance, install an adjustable safety gate to keep toddlers, young children and other at risk individuals out of the room and away from hot surfaces.
- Clothing or other flammable material should not be placed on or near the appliance. Objects placed in front of the appliance must be kept a minimum of 48" away from the front face of the appliance.
- Due to high temperatures, the appliance should be located out of traffic and away from furniture and draperie
- Ensure you have incorporated adequate safety measure to protect infants / toddlers from touching hot surfaces.
- Even after the appliance is out, all surfaces, including the glass and/or any attachment will remain hot for an extended period of time.
- Check with your local hearth specialty dealer for safety hearth guards to protect children from hot surfaces. These guards must be fastened to a wall and/or to the floor.
- Any safety guard removed for servicing must be replaced prior to operating the appliance.
- Under no circumstances should this appliance be modified
- This appliance must not be connected to a chimney flue pipe serving a separate solid fuel burning appliance.
- Do not operate the appliance with the glass door removed, cracked or broken. Replacement of the glass should be done by a licensed or qualified service person
- Do not strike or slam shut the appliance glass door.
- Operate only with the doors tightly closed.
- Appliance will over-fire if door is not shut and latched
- Only certified doors / optional fronts / and surrounds for inserts with the unit are to be installed on the appliance.
- Keep the packaging material out of reach of children and dispose of the material in a safe manner. As with all plastic bags, these are not toys and should be kept away from children and infants.
- If the appliance is not properly installed, a house fire may result. Do not expose the appliance to the elements (rain, etc.) and keep the appliance dry at all times.
- The chimney must be sound and free of cracks and obstructions. Clean your chimney regularly as required.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use.
- Your appliance requires periodic maintenance and cleaning. Failure to maintain your appliance may lead to smoke spillage in your home.
- Higher efficiencies and lower emissions will generally result with burning air dried seasoned woods, as compared to wet, green or freshly cut wood. Burning wet unseasoned wood can cause excessive creosote accumulation. When ignited it can cause a chimney fire that may result in a serious house fire
- The appliance is designed to burn seasoned wood only. Do not burn treated wood, coal, charcoal, colored paper, cardboard, solvents or garbage.
- Burn wood directly on the firebricks. Do not use a grate or elevate the fire
- Do not store wood within appliance installation clearances or within the space required for re-fueling and ash removal.
- Ashes must be disposed in a metal container with a tight lid and placed on a non-combustible surface well away from the home or structure until completely cool.

**CALIFORNIA PROPOSITION 65**

WARNING: This product can expose you to chemicals including benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information:

www.P65Warnings.ca.gov

| | |
|----------------------------------|--|
| Model | Sirocco 20.2 (catalytic) |
| Height (w/ Pedestal) | 33 3/8" (848 mm) |
| Height (w/ Legs) | 31 7/8" (810 mm) |
| Width | 25" (635 mm) (without removable bypass handle) |
| Depth | 27 1/4" (692 mm) (without optional fan kit) |
| | 28 1/8" (715 mm) (with optional fan kit) |
| Flue collar | 6" I.D. |
| Fire door opening | 15 5/8" x 8" (397 mm x 204 mm) |
| Firebox depth | 16" (407 mm) brick to brick, 18 1/2" (470 mm) brick to glass |
| Firebox width | 17 1/2" (445 mm) |
| Firebox height | 10 3/4" (273 mm) |
| Fire box capacity | 1.8 cu. ft. |
| Recommended Fuel length | 16" max. (407 mm) |
| Wood capacity (approximate): | White oak - 45 lbs. (20.41 kg) |
| | Fir - 30 lbs. (13.61 kg) |
| Construction | 10 gauge & 1/4" firebox, brick line 16 gauge outer shields |
| Shipping Weight (Firebox only) | 320 lbs. (145.2 kg) |
| Shipping Weight (Pedestal only) | 50 lbs. (22.7 kg) |
| Shipping Weight (Legs only) | 20 lbs. (9.1 kg) |
| Chimney recommendation (Minimum) | 15' from stove top to chimney cap: Insulated liner recommended |

This unit was tested and listed UL 1482-11(R2015) and ULC-S627-00 by OMNI-Test Laboratories. This manual describes the installation and operation of the Ashford AF20.2 catalytic equipped wood heater. This heater is certified to comply with the 2020 U.S. Environmental Protection Agency's particulate emission standards using crib wood.

| EMISSIONS | CO Average(%) | g/hr |
|---|---------------|-----------------|
| Low Burn | 0.20 | 0.22 |
| Med-low Burn | 0.14 | 0.58 |
| Med-high Burn | 0.25 | 0.93 |
| High Burn | 0.23 | 1.53 |
| EPA emission rate weighted average | | .73 g/hr |

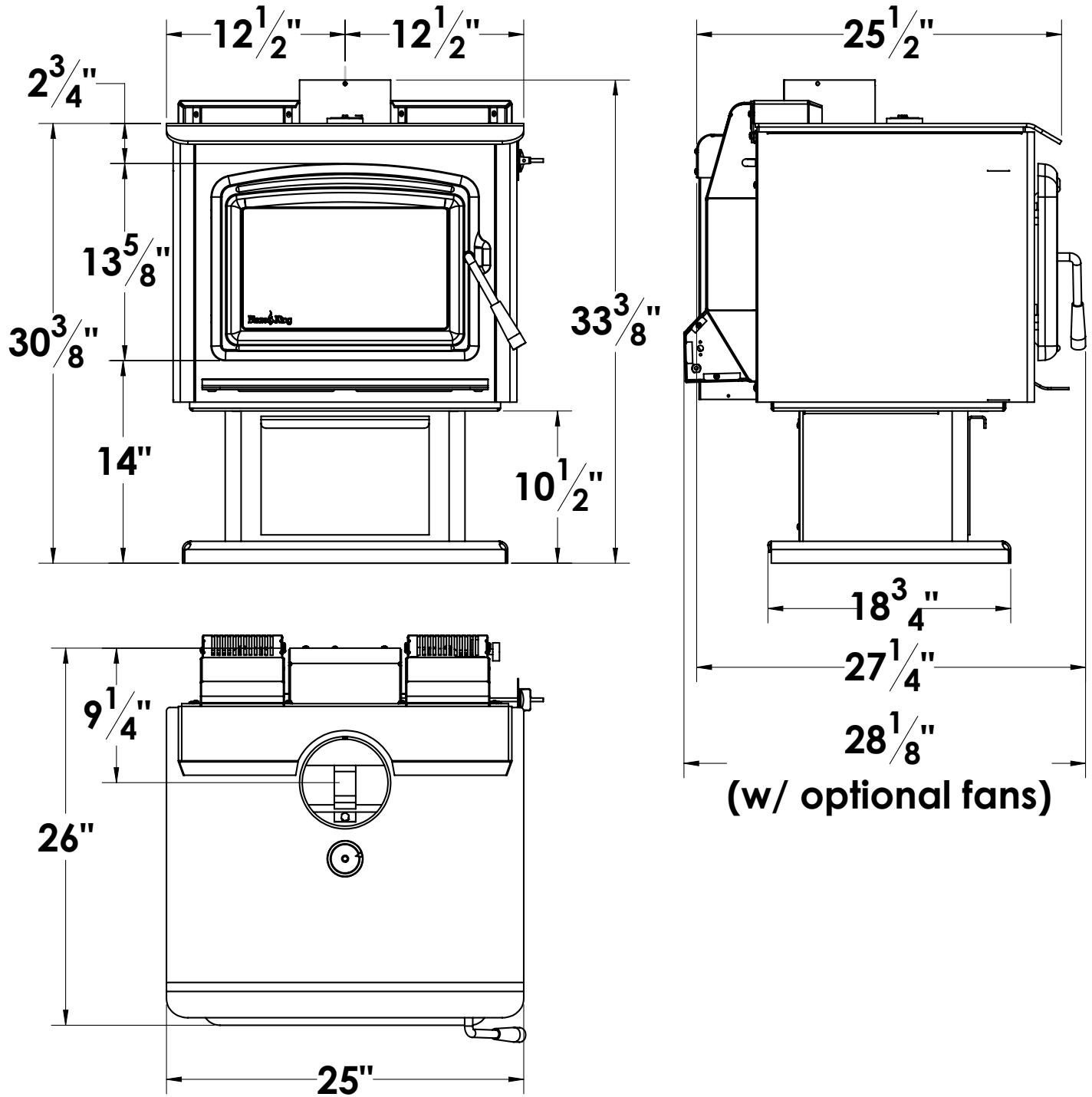
Under specific test conditions this heater has been shown to deliver heat at rates ranging from 8900 to 29785 Btu/hr. This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.

This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual, or if the catalytic element is deactivated or removed.

The combustor supplied with this heater is either a 115-0336-A-M or 115-0556 metal combustor. Consult the catalytic combustor warranty also supplied with this wood heater. Warranty claims should be addressed to:

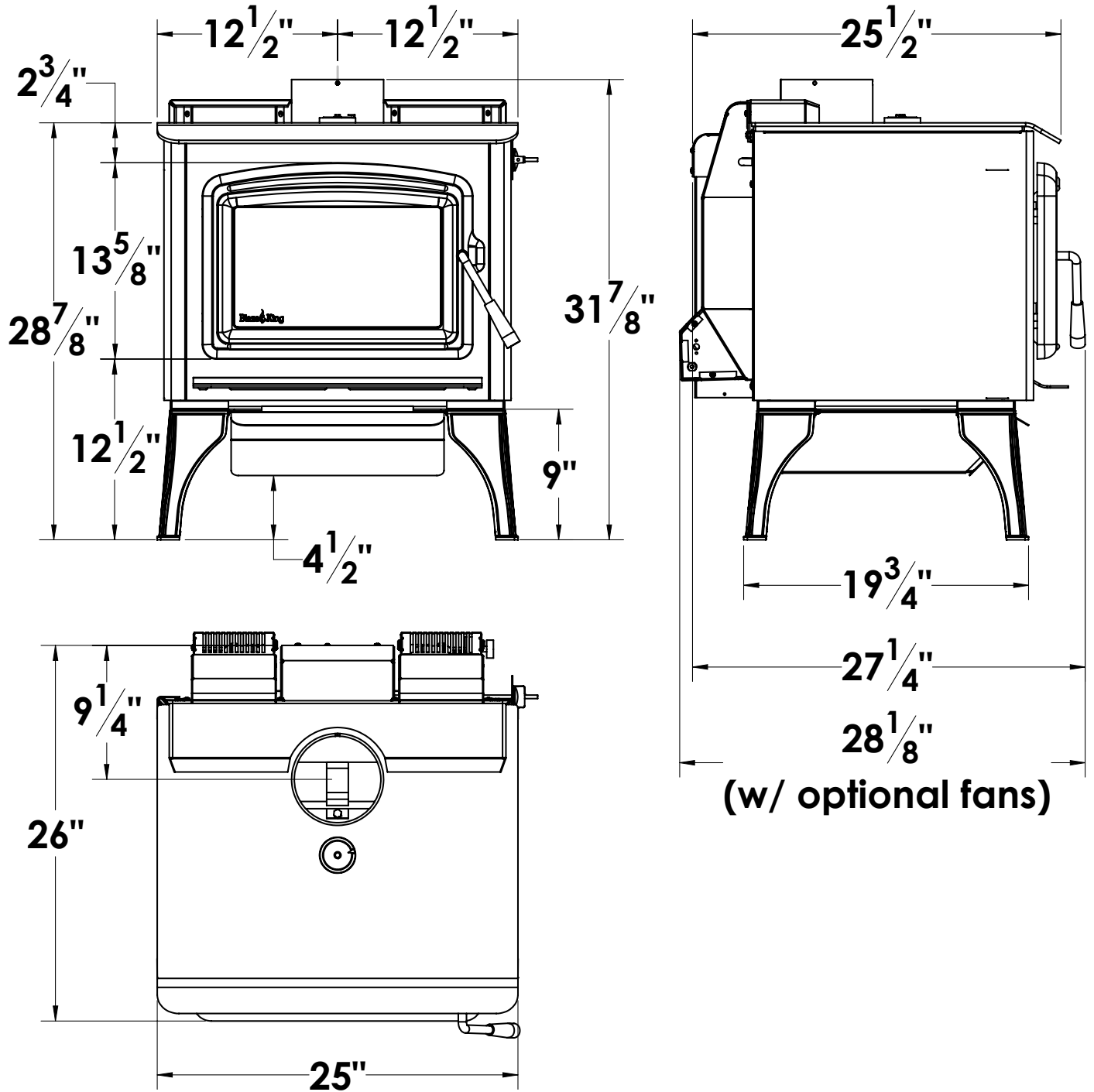
| in Canada | in USA |
|--|---|
| Blaze King Industries / Valley Comfort Systems Warranty Department, 1290 Commercial Way Penticton, BC Canada V2A 3H5, Ph: 250-493-7444 | Blaze King Industries Warranty Department, 146A Street Walla, Walla, Washington 99362, Ph: 509-522-2730 |

APPLIANCE DIMENSIONS—Sirocco SC20.2 (w/ Pedestal)



APPLIANCE DIMENSIONS

APPLIANCE DIMENSIONS—Sirocco SC20.2 (w/ Legs)





SIROCCO SC20.2

SN - 23.

BLAZE KING CATALYST STOVE - POËLE À BOIS CATALYTIQUE

ROOM HEATER, SOLID FUEL TYPE, ALSO FOR USE IN MOBILE HOMES. / APPAREIL APPROUVÉ DE TYPE CARBURANT SOLIDE, AUSSI ADAPTÉ POUR INSTALLER DANS UNE MAISON MOBILE.
SUITABLE FOR MOBILE-HOME INSTALLATION. / CONÇU POUR MAISONS MOBILES.
MODEL / MODÈLE: SC20.2
Tested / Testé: UL 1482-11(R2015) / ULC S627-00
CERTIFIED IN BOTH UNITED STATES AND CANADA / CERTIFIÉ POUR LES ÉTATS-UNIS ET LE CANADA

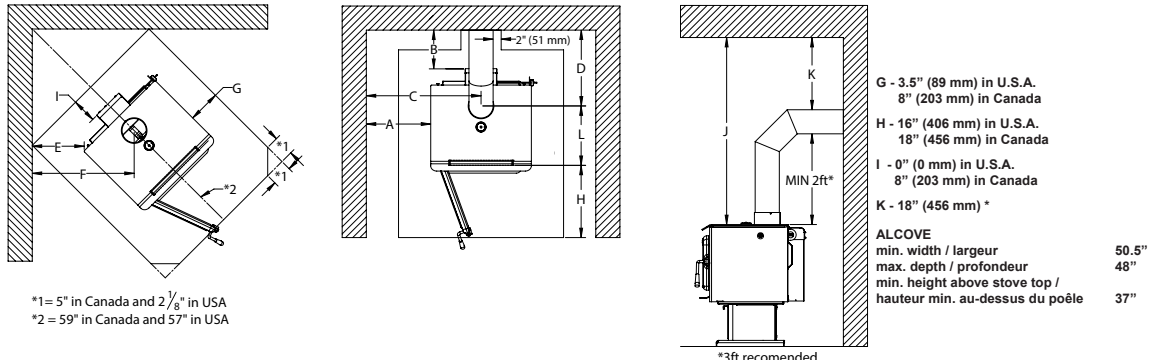
PREVENT HOUSE FIRES- Install and use only in accordance with Blaze King's installation and operation instructions. Contact local building or fire officials about restrictions and installation inspection in your area. The flue size is 6".
CHIMNEYS: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE. Except for installation detailed below, use 6" listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA or a masonry residential type chimney.
Mobile Home, residential close clearance, and residential alcove installations require a 6" listed double wall close clearance chimney connector, with matching listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA. Mobile Home installations are only allowed with a roof exit.
Do not install in a sleeping room. Passing through a wall or ceiling requires special methods: see instructions and local building codes.

POUR PRÉVENIR UN INCENDIE - Installer et employer seulement selon le manuel d'installation de Blaze King. Contacter les autorités locales en bâtiments ou en matière de prévention d'incendies au sujet des normes d'inspection et d'installation dans votre secteur. La dimension des conduits de cheminée est de 6".
CHEMINÉE: NE PAS CONNECTER CETTE UNITÉ À UNE CONDUITE DE CHEMINÉE SERVANT UN AUTRE APPAREIL. Excepté pour les situations détaillées ci-dessous, employer une cheminée de 6" homologuée par le fabricant à des fins d'utilisation pour combustibles solides conformément à la norme ULC629 au Canada ou UL-103HT aux États-Unis ou employer une cheminée en maçonnerie de type résidentiel.
L'installation dans une maison mobile, en espace restreint ou dans des endroits à faible dégagement, requiert l'utilisation de connecteurs muraux à doubles parois et ayant une épaisseur 6" pour la cheminée. Ceux-ci doivent être homologués par le fabricant à des fins d'utilisation pour combustibles solides conformément à la norme ULC629 au Canada ou UL-103HT aux États-Unis. L'installation dans une maison mobile est permise seulement avec une sortie passant par le toit.
Ne pas installer dans une chambre à coucher. Passer à travers un mur ou un plafond requiert une méthode spécifique décrite dans les instructions et dans le code local du bâtiment.

MINIMUM CLEARANCES TO COMBUSTIBLES (See owners manual for complete description of all requirements)
DÉGAGEMENTS MINIMUM AUX COMBUSTIBLES (voir les directives d'installation pour la description complète de toutes les conditions)

| Residential Installations / Installations Résidentielles | A | B | C | D | E | F | J |
|---|------------------|----------------|------------------|-------------------|--------------|-----------------|---------------|
| Roof exit, parallel and corner. Sortie de toit, parallèle et coin. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875" 404 mm | 6" 153 mm | 18.5" 470 mm | 37" 940 mm |
| Wall exit, parallel and corner. Sortie de mur, parallèle et coin. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875" 404 mm | 6" 153 mm | 18.5" 470 mm | 37" 940 mm |
| Alcove roof exit. Fan kit or rear shield required. Sortie de toit en alcôve. Kit de ventilateur et protection arrière requise. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875" 404 mm | | | 37" 940 mm |
| Mobile Home Installations / Installation pour Maison Mobile | | | | | | | |
| Roof exit, parallel and corner. Fan kit or rear shield required. Outside air kit required. Sortie de toit, parallèle et en coin. Kit de ventilateur et protection arrière requise. Kit d'air extérieur requis. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875" 404 mm | 6" 153 mm | 18.5" 470 mm | 37" 940 mm |

*Check with local codes and pipe manufacturers for pipe clearances. In Canada 18" clearances from single wall pipe is required.
*Vérifier avec le code du bâtiment local et avec le manufacturier de tuyaux pour les dégagements. Au Canada un dégagement de 18 po est exigé pour un tuyau à simple paroi.



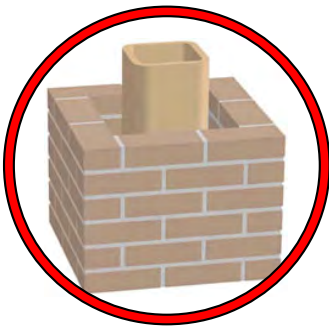
Floor protection may be any non-combustible material or Listed Floor Protector, and must extend at least 18" (456 mm) in Canada or 16" (406 mm) in U.S.A., in front of the loading door opening: In USA, minimum size is 32" x 40 1/8" (813 mm x 1020 mm), in Canada, minimum size is 41" x 50 1/8" (1042 mm x 1274 mm).
US ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using crib wood. (EPA test methods 28R/5G with an emission-rate of .73 g/hr). 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 operating instructions in the owner's manual, or if the catalytic element is deactivated or removed.
*ONLY OPERATE WITH DOORS CLOSED. Open door to feed fire ONLY. *DO NOT OBSTRUCT COMBUSTION AIR OPENINGS. Do not obstruct the space beneath the heater. For use with solid wood fuel only - do not burn other fuels, this may make the catalyst in the combustor inactive. The performance of the catalytic device or its durability has not been evaluated as part of the certification. Combustor part number: 115-0336-A-M or 115-0556. Provide adequate outside air for combustion. *Replace with only ceramic glass, 5 mm. Thickness. Unit must be installed with Blaze King Leg Kit Z2613BK or Blaze King Pedestal Kit Z3803BK /Z3903BK; attach as shown in the installation instructions.

La protection de plancher peut être de n'importe quel matériel non combustible ou Protecteur de plancher homologué, et doit se prolonger au moins de 18" (456 mm) au Canada ou 16" (406 mm) aux États-Unis devant la porte de chargement; Aux États-Unis, la taille minimum est de 32" x 40 1/8" (813 mm x 1020 mm), au Canada la taille minimum est 41" x 50 1/8" (1042 mm x 1274 mm).
L'AGENCE DE PROTECTION ENVIRONNEMENTALE DES U.S. - Certifié conformément aux normes d'émission de particules 2020, en utilisant du bois machiné (méthodes d'essai EPA 28R / 5G, ASTM E2515 et ASTM E2780, avec un taux d'émission de 0.73 g /hre). Cet appareil de chauffage au bois nécessite des inspections périodiques et des réparations pour un fonctionnement adéquat. Consulter le manuel du propriétaire pour plus d'informations. Il est contre les règlements fédéraux de faire fonctionner cet appareil de chauffage à l'encontre des instructions d'utilisation fournies dans le manuel du propriétaire, ou si l'élément catalytique est enlevé ou désactivé.
*Utiliser le uniquement avec les portes fermées. Ouvrir la porte pour alimenter le feu SEULEMENT. *Ne pas obstruer l'entrée d'air de combustion. Fournir l'apport d'air extérieur adéquat pour alimenter la combustion. Ne pas obstruer l'espace sous l'appareil. Utiliser uniquement avec des combustibles solides - ne pas brûler aucun autre combustible, ce qui peut rendre le catalyseur de la chambre à combustion inactif. La performance du catalyseur ou sa longévité n'a pas été évaluée dans le cadre de la certification. Numéro du catalyseur: 115-0336-A-M ou 115-0556. *Employer seulement le verre en céramique d'une épaisseur de 5mm si le remplacement est nécessaire. L'appareil doit être installé avec le Blaze King kit de jambe Z2613BK ou Blaze King piédestal Kit Z3803BK /Z3903BK; attache comme indiqué dans les instructions d'installation.

| | |
|--|---|
| <p>MANUFACTURED IN</p> <p><input type="checkbox"/> USA: Blaze King Industries 146A Street Walla Walla, WA. 99362</p> <p><input type="checkbox"/> CANADA: Valley Comfort Systems 1290 Commercial Way Penticton, B.C. V2A 3H5</p> | <p>MANUFACTURE DATE</p> <p>JAN <input type="checkbox"/> FEB <input type="checkbox"/> MAR <input type="checkbox"/> APR <input type="checkbox"/> MAY <input type="checkbox"/> JUN <input type="checkbox"/> JUL <input type="checkbox"/> AUG <input type="checkbox"/> SEP <input type="checkbox"/> OCT <input type="checkbox"/> NOV <input type="checkbox"/> DEC <input type="checkbox"/> 2021 <input type="checkbox"/> 2022 <input type="checkbox"/> 2023 <input type="checkbox"/> 2024 <input type="checkbox"/> 2025 <input type="checkbox"/> 2026 <input type="checkbox"/></p> |
| 170-0236 [01 21] | |

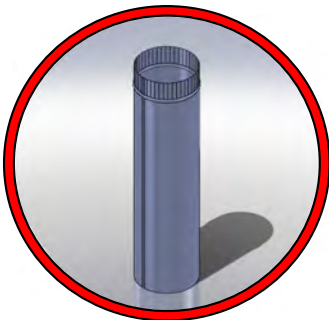
IF THIS BLAZE KING APPLIANCE IS NOT PROPERLY INSTALLED OR OPERATED, A HOUSE FIRE MAY RESULT. TO REDUCE THE RISK OF FIRE, FOLLOW THE INSTALLATION INSTRUCTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW APPLIANCE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.



This appliance must be connected to a listed high temperature (**ULC629 IN CANADA OR UL-103HT IN THE USA**) residential type factory built solid fuel chimney or an approved masonry chimney with a flue line .

Chimney and chimney connector must be in good condition and kept clean.
NEVER vent the stove to other rooms of the building. Must be vented to the outside **ONLY**.
NEVER use a chimney or chimney connector smaller than the stove exhaust, unless approved by your local inspector.
NEVER vent the stove into a "Class B" gas vent chimney.
DO NOT CONNECT IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.



Inspect the chimney connector and chimney regularly during each burning season and clean when necessary.

DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

NEVER intentionally start a chimney fire to clean the flu



When installed in a mobile home, this appliance must be bolted to the floor and provided with outside air.

WARNING: DO NOT INSTALL IN A SLEEPING ROOM
CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.

Check with local building official



If the Optional Fan Kit is installed, connect this unit to a properly grounded, 110-volt electrical outlet. Do not route the power cord in front of or under the appliance.



Do not make any changes or modifications to an existing masonry fireplace or chimney to install this appliance. Do not make any changes to the appliance to increase combustion air.

SAFETY PRECAUTIONS



Never try to repair or replace any part of this appliance unless instructions are given in this manual. All other work must be done by a trained technician.



Do not place clothing or other flammable items on or near this appliance.



Allow the appliance to cool down before carrying out any maintenance or cleaning.



DO NOT OVER FIRE THIS HEATER. Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater and to the catalytic combustor. Over firing the appliance may cause a house fire. Never burn the appliance so hot that the appliance or chimney connector begins to glow.



Maintain the door and glass seal and keep them in good condition. A leaking door seal will shorten burn times and may harm the combustor.

Avoid placing wood against the glass when loading. Do not slam the door or strike the glass.



Do not use a grate or other device to elevate the fire off of the firebox floor. Burn the fire directly on the bricks.



Do not throw this manual away. This manual has important operating and maintenance instructions that you will need at a later time. Always follow the instructions in this manual.



Ashes should be placed in a steel container with a tightly fitting lid and moved outdoors immediately. 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. Other waste shall not be placed in this container.



It is required in some jurisdictions to install smoke and carbon monoxide detectors where heaters are installed. Install at least one smoke detector on each floor of your home to ensure your safety. It should be located away from the wood appliance and close to the sleeping areas. Locating a smoke detector too close to a wood appliance can cause the smoke detector alarm to sound if a puff of smoke is emitted while the wood appliance door is open during reloading. Follow the smoke detector manufacturers placement, installation, and maintenance instructions.

This appliance is designed and approved for burning cord wood only. DO NOT burn trash, garbage; artificial or paper logs; gift wrappings; coal; lighter fluids; chemical cleaners chemical starters; treated or painted wood; salt water driftwood or foil-backed paper such as gum wrappers or cigarette packages; lawn clippings or yard waste; materials containing rubber (including tires), plastic, asbestos; waste petroleum products, paints or paint thinners, or asphalt products; construction or demolition debris; railroad ties or pressure-treated wood; manure or animal remains; unseasoned wood or paper products, cardboard, plywood, or particleboard. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected wood heat . Burning these materials may result in the release of toxic fumes or render the heater ineffective and cause smoke. Burn natural wood only. It will void all warranties and safety listings and may damage the combustor.



Never burn the appliance with the loading door open. Leaving the door cracked open may damage the combustor.



Never block free airflow through vents on this appliance.



Do not use chemicals or fluids to start the fire. Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater . Keep all such liquids well away from the heater while it is in use. Some fuels could generate carbon monoxide and are very dangerous.

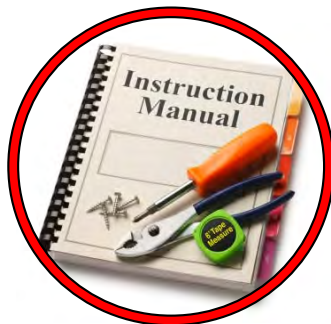
HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.

Do not touch the appliance when it is hot and educate all children of the danger of a high temperature appliance. Young children should be supervised when they are in the same room as the appliance.



Keep furniture, curtains, wood, paper and other combustibles a minimum of 48in (1219mm) away from the front of the appliance. ALSO, DO NOT STORE COMBUSTIBLES UNDER THE APPLIANCE (WOOD, PAPER etc.).

This appliance must be properly installed to prevent the possibility of a house fire. The instructions must be strictly adhered to. Do not use makeshift methods or compromise in the installation.



Contact local building official to obtain a permit and information on any installation restriction or inspection requirements in your area. Notify your insurance company as well.

⚠ WARNING

- BEFORE INSTALLING THIS APPLIANCE, CONTACT THE LOCAL BUILDING OR FIRE OR OTHER AUTHORITY HAVING JURISDICTION AND FOLLOW THEIR GUIDELINES.
- THIS APPLIANCE MUST BE INSTALLED BY A QUALIFIED INSTALLER. FOLLOW THE INSTALLATION DIRECTIONS. DO NOT OPERATE WITHOUT FULLY ASSEMBLING ALL COMPONENTS.
- IF THIS APPLIANCE IS NOT PROPERLY INSTALLED, A HOUSE FIRE MAY RESULT.
- THIS APPLIANCE IS HOT WHEN OPERATED AND CAN CAUSE SEVERE BURNS IF CONTACTED. CHILDREN AND PETS MUST BE KEPT FROM TOUCHING THE APPLIANCE WHEN IT IS HOT.
- COMBUSTIBLE MATERIAL SUCH AS FIRE WOOD, WET CLOTHING, ETC. PLACED TOO CLOSE CAN CATCH FIRE. OBJECTS PLACED IN FRONT OF THE APPLIANCE MUST BE KEPT A MINIMUM OF 48”(1219 MM) FROM THE FRONT OF THE APPLIANCE.

Blaze King grants no warranty, implied or stated, for the installation or maintenance of the appliance and assumes no responsibility of any consequential damage(s).

**PARTS INCLUDED**

1. Poker
2. Manual Kit (w/ warranty cards, thermometer, bypass handle)

OPTIONAL EQUIPMENT

- | | |
|--------------------------------|---|
| 1. Fan Kit (S.Z2514) | 2. Rear Shield (S.Z4015) |
| 3. Leg Model Ash Pan (S.Z3820) | 4. Outside Air Kit (S.Z1726 / S.Z1726B) |

FLOOR PROTECTION

If the stove sits on a combustible floor, a non-combustible shield must be used underneath the stove and extending 16” out from the front and 8” on either side of the fuel-loading door in the USA. In Canada a non-combustible shield must be used underneath the stove and extending 8” on either side and rear and 18” out in front of the loading door.

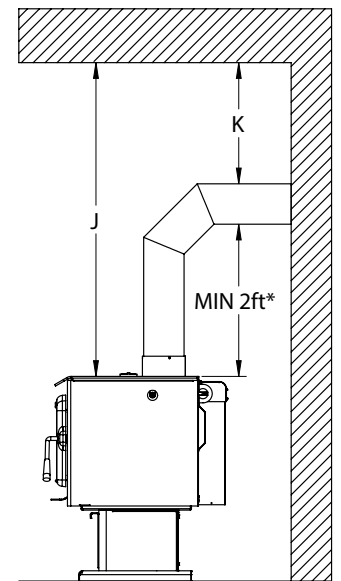
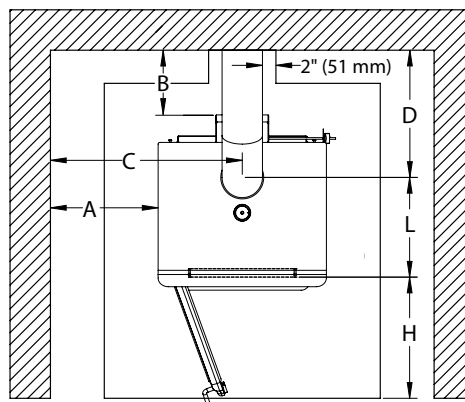
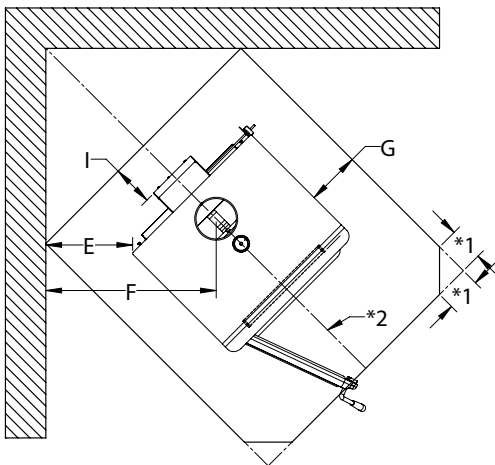
A non-combustible shield is also required underneath the chimney connector and extending at least 2” (50.8mm) on either side of the chimney connector.

See the next page for minimum sizes depending on model. This floor protection is required to prevent sparks from falling onto the combustible floor. See CSA B365-M87. **This product does not require thermal hearth pad protection.**

MINIMUM CLEARANCES

| Residential Installations | A | B | C | D | E | F | J |
|--|------------------|----------------|------------------|--------------------|--------------|------------------|----------------|
| Roof exit, parallel and corner. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875"* 404 mm | 6" 153 mm | 18.5"* 470 mm | 37" 940 mm |
| Wall exit, parallel and corner. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875"* 404 mm | 6" 153 mm | 18.5"* 470 mm | 37"* 940 mm |
| Alcove, roof exit. Fan kit or rear shield required. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875"* 404 mm | | | 37" 940 mm |
| Mobile Home Installation | | | | | | | |
| Roof exit, parallel and corner. Fan kit or rear shield required. Outside air kit required. | 12.75" 324 mm | 6.5" 166 mm | 25.25" 642 mm | 15.875"* 404 mm | 6" 153 mm | 18.5"* 470 mm | 37" 940 mm |

* Check with local codes and pipe manufacturer for pipe clearances. In Canada, 18" clearances from single wall pipe is required. Clearances may only be reduced by means approved by the regulatory authority



*3ft recommended

*1 = 5" in Canada and 2 1/8" in USA
 *2 = 59" in Canada and 57" in USA

| | | | |
|--|---|---|--|
| G = 3 1/2" (89mm) in USA 8" (203mm) in Canada | H = 16" (406mm) in USA 18" (456mm) in Canada | I = 0" (0mm) in USA 8" (203mm) in Canada | K = 18" (456mm) for single wall pipe in Canada |
|--|---|---|--|

Ember protection shield (not required to have an insulation value) or a listed UL 1618 Type 1 floor protector must have a minimum size of

In USA: 32" x 40 1/8" (813 mm x 1020 mm)
 In Canada: 41" x 50 1/8" (1042 mm x 1274 mm)

Alcove minimum width 50 1/2", maximum depth 48", minimum above stove top 37"

This stove must be installed in compliance with all local codes and regulations.

COMBUSTION AIR

Ensure adequate combustion air allowing for all other exhausting type appliances in the dwelling (range hoods, dryers, etc.). In air tight homes and modern constructions, careful considerations must be taken into account when using a wood burning appliance. Heat recovery ventilators (HRV) systems along with constant running fan motors in air handlers must be taken into account when balancing the system. Failure to do so may result in air starvation, smoke spillage and carbon monoxide threats. Consult a HVAC specialist for proper installation. Ensure adequate combustion air allowing for all other exhausting type appliances in the dwelling (range hoods, dryers, etc.). In airtight houses it is recommended to install a fresh air inlet into the room where the appliance is located, to prevent air starvation.

DRAFTING PERFORMANCE

Draft is the force which moves air into the appliance up through the chimney. The amount of draft created by your chimney depends upon length, offsets, insulating properties, obstructions (such as architectural design, trees), local geography and other factors.

External forces, such as outdoor temperature, wind, barometric pressure, topography, or factors inside the home (negative pressure from exhaust fans, chimneys, air infiltration, etc) may adversely affect draft.

Too much draft may cause excessive temperatures in the appliance and may damage the heater. An uncontrollable burn or excessive temperature indicates excessive draft.

Inadequate draft may cause back puffing (spillage) into the room and plugging of the chimney, chimney cap or spark arrestor screen. Inadequate draft may cause smoke to leak into the room through appliance or chimney connector joints. Poor draft can also lead to poor heat production and the inability for the combustor to remain active in lower burn rate settings.

High efficiency appliances, such as your Blaze King stove, may require some fine tuning of your chimney system in order to maximize performance.

Blaze King cannot be responsible for external forces leading to less than optimal performance.

ROLE OF THE CHIMNEY

Without a proper installed chimney, this appliance will not burn correctly.

The role of the chimney is to pull the proper amount of air into the firebox for the purpose of complete combustion. Incomplete combustion will lead to more smoke and pollution of the outside air. A proper operating chimney will allow the user to enjoy peak performance at all burn operating levels from low to high. Blaze King therefore recommends vertical installations with a minimum length of 15' from stove top to chimney cap. In all freestanding stove installations, use double wall stove pipe from the stove top to the ceiling support box. The use of double wall stove pipe does allow for reduced clearances, however most importantly, it helps to keep the chimney warm and improve draft.

For wall exits, the same suggestion applies. With the addition of the recommendation to use two 45 degree elbows rather than a single 90 degree elbow. The use of two 45 degree elbows will allow for both a smoother transition to the exterior chimney and will also shorten the horizontal run to the outside chimney. A minimum 36" rise is recommended prior to any elbows being used. When possible, outside chimney systems should be isolated from direct exposure to winter weather by building a chase around the chimney, observing all clearances as specified by the venting manufacture. Doing so will help to keep the chimney warmer and improve draft. (see ***RECOMMENDED FLUE HEIGHTS***)

VENTING SYSTEMS

The venting system consists of a chimney connector and a chimney. These get extremely hot during use. Temperatures inside the chimney may exceed 2000 degrees in the event of a creosote fire. To protect against the possibility of a house fire, the chimney connector and chimney must be properly installed and maintained. A listed thimble must be used when a connection is made through a combustible wall to a chimney. A chimney support package must be used when a connection is made through the ceiling to a listed prefabricated chimney. These accessories are absolutely necessary to provide safe clearances to combustible wall and ceiling material.

This stove may be connected to a lined masonry chimney or a listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA. Do not connect it to a chimney serving another appliance. To do so will affect the safe operation of both appliances, and will void the stove warranty. You must comply with the local authority having jurisdiction and/or in Canada, CSA installation standard B365-M87.

The chimney connector must be 6" diameter, 24 MSG Black/Blue steel. Do not use aluminum or galvanized steel. They cannot properly withstand the extreme temperatures of a wood fire. The chimney connector between the stove and the chimney should be as short and direct as possible.

The chimney connector must be attached to either an approved masonry chimney or one of the listed factory built chimneys suitable for use with solid wood fuel. All joints must be tight and fastened with sheet metal screws.

⚠ WARNING

THE CHIMNEY CONNECTOR IS TO BE USED ONLY WITHIN THE ROOM, BETWEEN THE STOVE AND CEILING / WALL. NEVER USE A CHIMNEY CONNECTOR TO PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. AN EFFECTIVE VAPOR BARRIER MUST BE MAINTAINED AT THE LOCATION WHERE THE CHIMNEY OR COMPONENT PENETRATES TO THE EXTERIOR OF THE STRUCTURE. ALWAYS MAINTAIN THE MINIMUM CLEARANCES TO COMBUSTIBLES AS REQUIRED BY THE APPLICABLE BUILDING CODES.

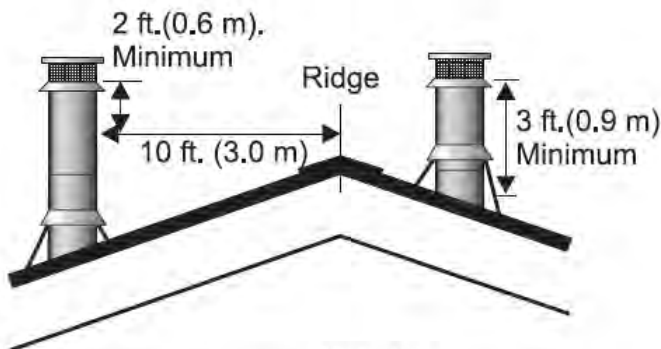
INSTALLATION INSTRUCTIONS

CONNECTION TO A METAL PREFABRICATED CHIMNEY

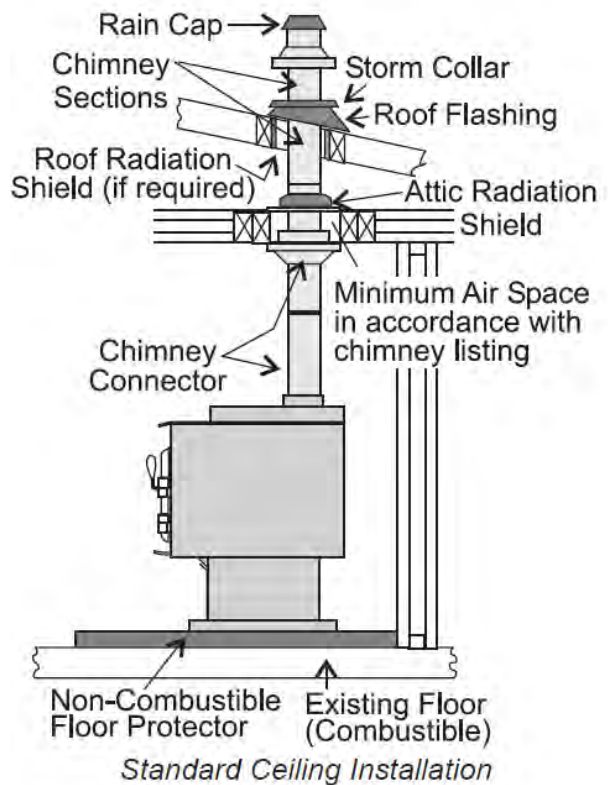
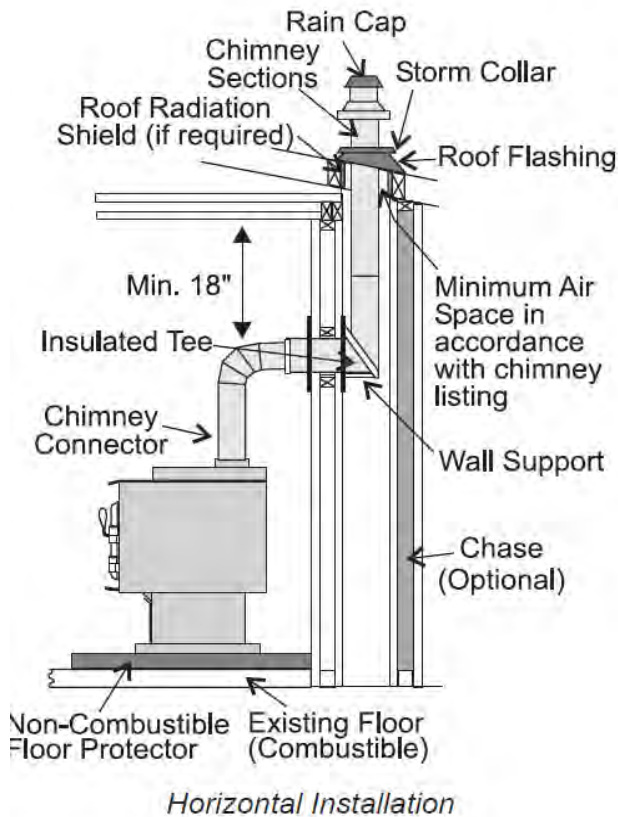
Refer to “**RECOMMENDED FLUE HEIGHTS**” chart for minimum flue height recommendations and ULC629 in Canada or UL-103HT in the USA for installation codes. When a metal prefabricated chimney is used, the manufacturer’s installation instructions must be followed precisely. You must also purchase (from the same manufacturer) and install the ceiling support package or wall pass through and “T” section package, fire stops (when needed), insulation shield, roof flashing, chimney cap, etc. Maintain the proper clearance to the structure as recommended by the manufacturer. This clearance is usually a minimum of 2 inches, although it may vary by manufacturer or for certain components.

There are basically two methods of metal chimney installation. One method is to install the chimney inside the residence through the ceiling(s) and the roof. The other method is to install an exterior chimney that runs up the outside of the residence (**not recommended**). If it is necessary to run the chimney outside, build an outside chase around the chimney.

The chimney must be the required height above the roof or other obstruction for safety and for proper draft operation.



The requirement is that the chimney must be at least 3 feet higher than the highest point where it passes through the roof and at least 2 feet higher than the highest part of the roof or structure that is within 10 feet of the chimney, measured horizontally (**Fig. 1**). The height requirement is necessary in the interest of safety and does not necessarily assure proper flue draft. Use a minimum total system height of 15 feet, measured from the stove flue collar to the top of the chimney, not including the chimney cap.



CONNECTION TO A MASONRY CHIMNEY

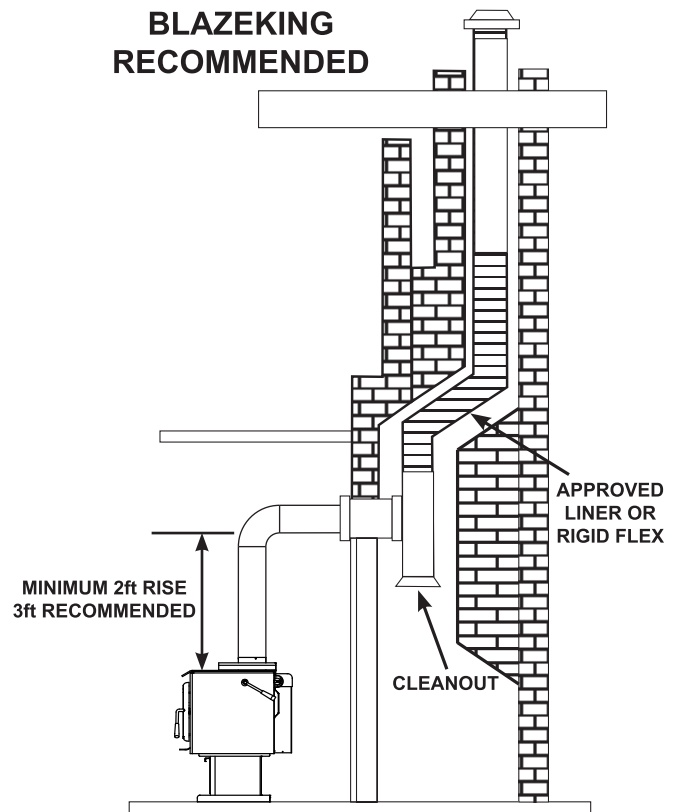
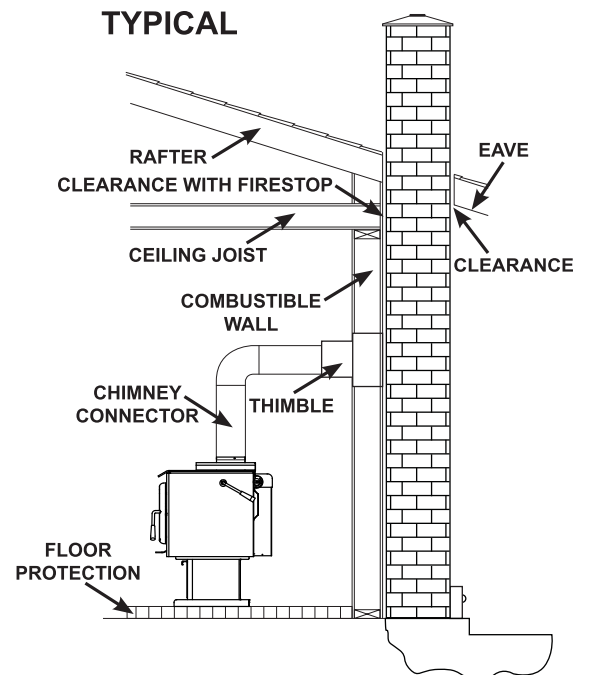
Masonry chimney***

Ensure that a masonry chimney meets the minimum standards (NFPA) by having it inspected by a professional. Make sure there are no cracks, loose mortar or other signs of deterioration and blockage. Have the chimney cleaned before the stove is installed and operated. When connecting the stove through a combustible wall to a masonry chimney, special methods are needed.

In Canada, the wall cut away is to provide 18" clearance for the connector. The resulting space must remain empty. A flush mounted sheet metal cover may be used on one side only. If covers are to be used on both sides, each cover must be mounted on noncombustible spacers at least 1" clear of the wall.

*****Blaze King recommends the use of a Stainless steel liner, preferably insulated, inside a masonry chimney. This is to maintain proper draft and overall better operation of the unit.**

Your local dealer or local jurisdiction can provide details of approved methods of passing a chimney connector through a combustible wall in your area. In USA, the National Fire Protection Association has minimum standards to comply with. In Canada, this type of installation must conform to CAN/CSA-B365, Installation Code for Solid Fuel Burning Appliances and Equipment.



RECOMMENDED FLUE HEIGHTS

1. At sea level the minimum height is a 15 ft (4.6 m) straight run.
2. Add the following vertical height to the flue to compensate for
 - 45° elbow = 1.0 ft (.30 m)
 - 90° elbow = 2.0 ft (.61 m)
 - "T" section = 3.0 ft (.91 m)
3. Each foot of horizontal run = 2 ft (.61 m) of vertical rise.

Example: One 90° elbow = 2ft (.61 m)
 2ft Horizontal run = 4ft (1.2 m)
 One base "T" = 3ft (.91 m)
 Total height addition = 9ft (2.7 m) at sea level

| MINIMUM RECOMMENDED FLUE HEIGHT | | | | |
|---|------------------|---------------|---------------|---------------|
| ELEVATION ABOVE SEA LEVEL | NUMBER OF ELBOWS | | | |
| | 0 | 2 X 15° | 2 X 30° | 2 X 45° |
| 0 - 1000 ft 0 - 305 m | 15 4.6 m | 16 4.9 m | 18 5.5 m | 19 5.8 m |
| 1000 - 2000 ft 305 - 610 m | 15.5 4.7 m | 16.5 5.0 m | 18.5 5.6 m | 19.5 5.9 m |
| 2000 - 3000 ft 610 - 914 m | 16 4.9 m | 17 5.2 m | 19 5.8 m | 20 6.1 m |
| 3000 - 4000 ft 914 - 1219 m | 16.5 5.0 m | 17.5 5.3 m | 19.5 5.9 m | 20.5 6.2 m |
| 4000 - 5000 ft 1219 - 1524 m | 17 5.2 m | 18 5.5 m | 20 6.1 m | 21 6.4 m |
| 5000 - 6000 ft 1524 - 1829 m | 17.5 5.3 m | 18.5 5.6 m | 20.5 6.2 m | 21.5 6.6 m |
| 6000-7000 ft 1829 - 2134 m | 18 5.5 m | 19 5.8 m | 21 6.4 m | 22 6.7 m |
| 7000 - 8000 ft 2134 - 2438 m | 18.5 5.6 m | 19.5 5.9 m | 21.5 6.6 m | 22.5 6.9 m |
| NOTE: No more than one offset (two elbows allowed). Two 45° elbows equal one 90° elbow | | | | |

Please note: These are only guidelines. Please refer to the section in the manual pertaining to draft. Every installation is unique and can be influenced by topographical and geographical phenomena. The use of a manometer and an understanding of pressure planes and the stack effect are imperative in planning and executing a successful installation.

MOBILE HOME (AND RESIDENTIAL ALCOVE INSTALLATIONS)

Requires outside air kit, and either rear shield OR fan kit. (See next page for kits and part numbers). The outside air kit is easiest to mount before the stove is installed. See instructions packed with each kit.

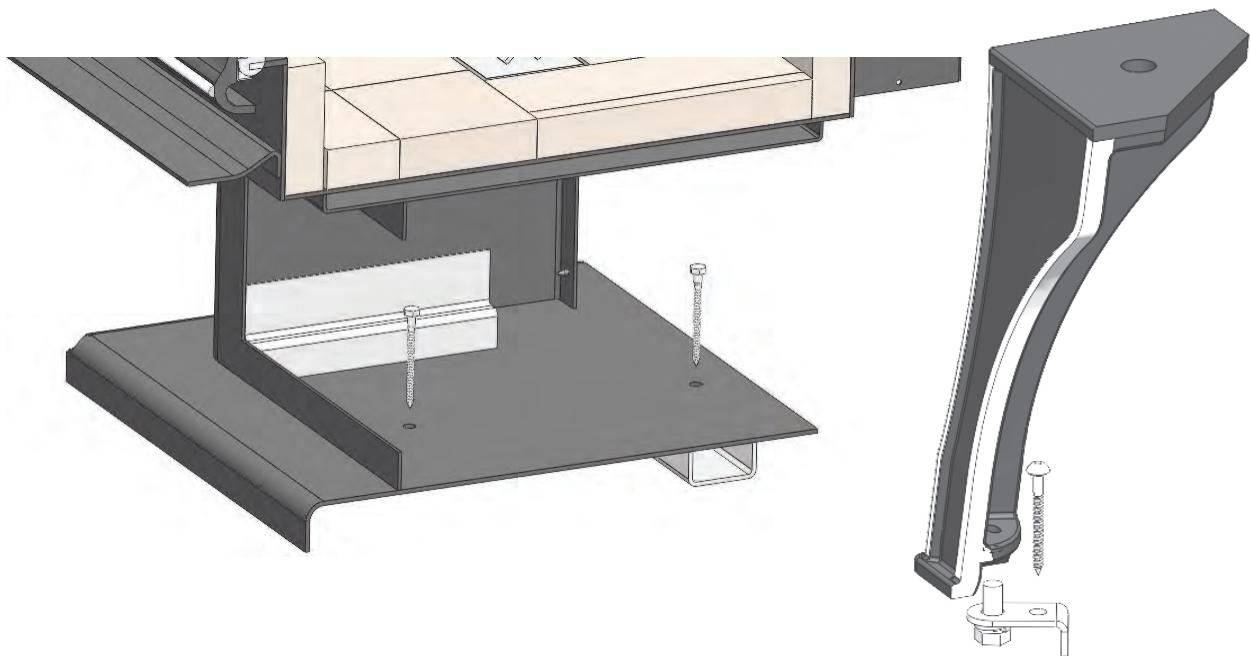
NOTE: UNDER NO CIRCUMSTANCES SHOULD THE FRESH AIR TUBE EVER BE INSTALLED HIGHER THAN THE BOTTOM OF THE APPLIANCE FIREBOX FLOOR.

When a metal prefabricated chimney is used, the manufacturer's installation instructions must be followed precisely. You must also purchase (from the same manufacturer) and install the ceiling support package, fire stops (when needed), insulation shield, roof flashing, chimney cap, etc. Maintain the proper clearance to the structure as recommended by the manufacturer.

The Chimney connector must be a listed double wall close clearance type. Insulated chimney components must be a listed factory built chimney suitable for use with solid fuels and conforming to ULC629 in Canada and UL-103HT in the USA. Single wall stove pipe is not allowed in mobile homes or alcove installations. For mobile home, the chimney needs to be removable to allow for transportation of the mobile home.

⚠ WARNING

DO NOT INSTALL IN SLEEPING ROOM. THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL AND CEILING / ROOF MUST BE MAINTAINED.



In mobile home installations, the stove must be securely fastened to the floor using the tie-downs provided in the Outside Air kit. (For the pedestal model, remove the ash drawer to access the screw down holes. For the Leg model, use the Leg Anchor Kit (P/N ZR8039) to secure stove to floor.)
ALSO, a #8 ground wire must be attached to the stove and an appropriate ground.

OPTIONAL ACCESSORIES

Outside air kit, rear shield or fan kit are optional accessories, but are required for the following installations:

MOBILE HOME INSTALLATION — Requires outside air kit and fan kit or rear shield

RESIDENTIAL ALCOVE — Requires fan kit or rear shield

REAR SHIELD KIT (S.Z4015)

EITHER this rear shield OR the fan kit (P/N S.Z2514) is REQUIRED FOR:

MOBILE HOME, any installation

RESIDENTIAL ALCOVE

FAN KIT (P/N S.Z2514)

EITHER this fan kit or the rear shield (S.Z4015) is REQUIRED FOR:

MOBILE HOME, any installation

RESIDENTIAL ALCOVE

NOTE: Fan kit should be installed before the stove is placed into position

ELECTRICAL CONNECTION

Your Blaze King fan kit is equipped with a three-prong (grounded) plug to decrease shock hazard.

THIS PLUG SHOULD BE INSERTED DIRECTLY INTO A PROPERLY-GROUNDED, THREE-HOLE RECEPTACLE. DO NOT CUT OR REMOVE THE GROUNDING PRONG FROM THIS PLUG. Do not route the power cord in front or under the stove.

OUTSIDE AIR KIT (P/N S.Z1726 / S.Z1726B)

REQUIRED FOR: MOBILE HOME (any installation)

The outside air inlet hose is a flexible tube to bring outside air for combustion into the stove from outside the residence, through the wall or up through the floor. The flexible tube will allow some adjustment over or around floor joists or plumbing. **DO NOT CHANGE THE STRUCTURAL INTEGRITY OF THE FLOOR.** This air hose must be kept open at all times to provide outside air for combustion.

INSTALLATION:

See instructions included with the outside air kit. Tools needed: 1/4" or 3/8" drill motor, saber saw, saber saw wood & metal blades, 5/16" nut driver or wrench, 7/16" wrench, small tube of hi-heat silicone.

PEDESTAL (S.Z3803 / S.Z3903)

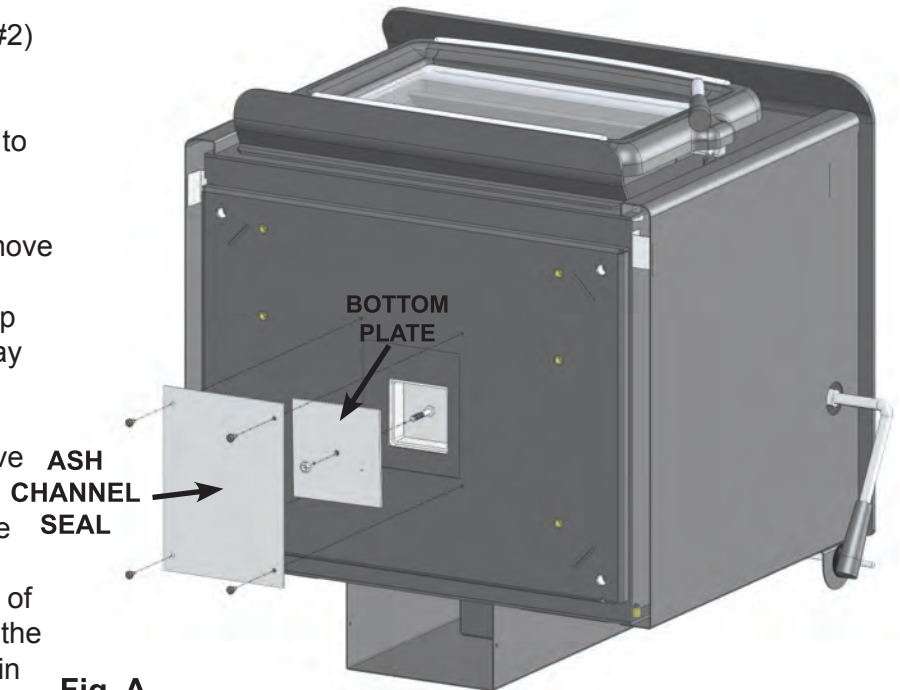
NOTE: EITHER PEDESTAL OR LEG KIT(see next page) MUST BE INSTALLED BEFORE STOVE CAN BE DUCTED AND READY FOR USE.

TOOLS NEEDED FOR INSTALLATION:

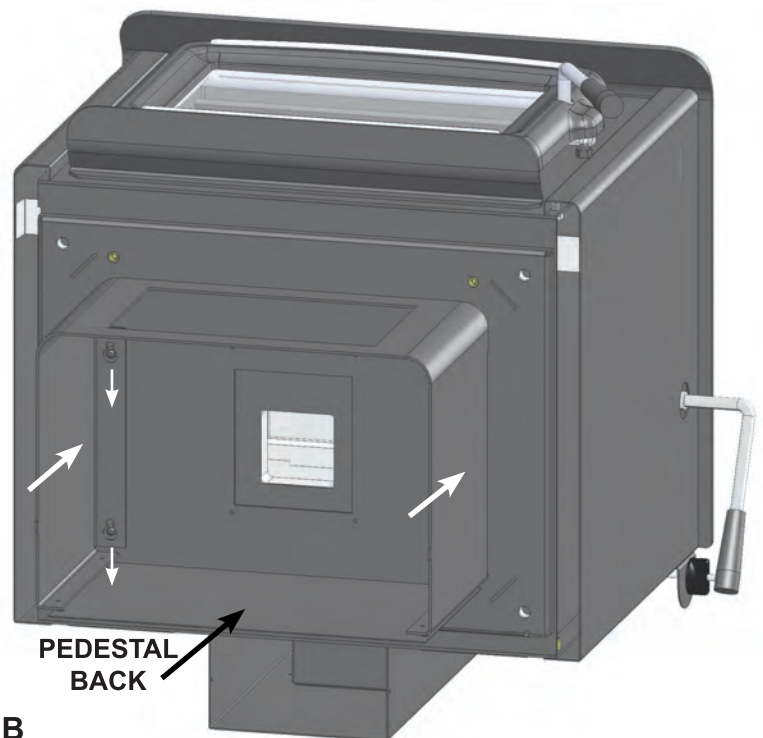
5/32" allen key and a square (Robertson #2) screwdriver.

INSTALLATION

1. Lean stove backwards to gain access to stove bottom.
2. Remove "ASH CHANNEL SEAL" by unscrewing the four #10 screws. Remove the 1/4" nut and bottom plate **Fig. A**.
3. Thread all four 1/4"-20 button head cap screws into the stove base until halfway (included w/ pedestal kit).
4. Remove the ash drawer from the assembled pedestal. (Can also remove pedestal back panel if needed)
5. Utilizing the key holes on the top of the pedestal body, slide the pedestal into place by pushing it against the bottom of the stove and then pushing it towards the back of the stove (use the half turned in screws as guide pins) **Fig. B**.
6. Once the pedestal is in position, finish tightening the four screws into the stove bottom and lift stove into its upright position.
7. Insert the ash drawer into the pedestal front. (Reattach pedestal back panel if removed during install)
8. Insert ash plug from pedestal kit into stove firebox

**Fig. A**

PUSH PEDESTAL AGAINST FIREBOX BOTTOM, THEN TOWARDS FIREBOX BACK TO CORRECTLY POSITION IN KEY HOLES

**Fig. B**

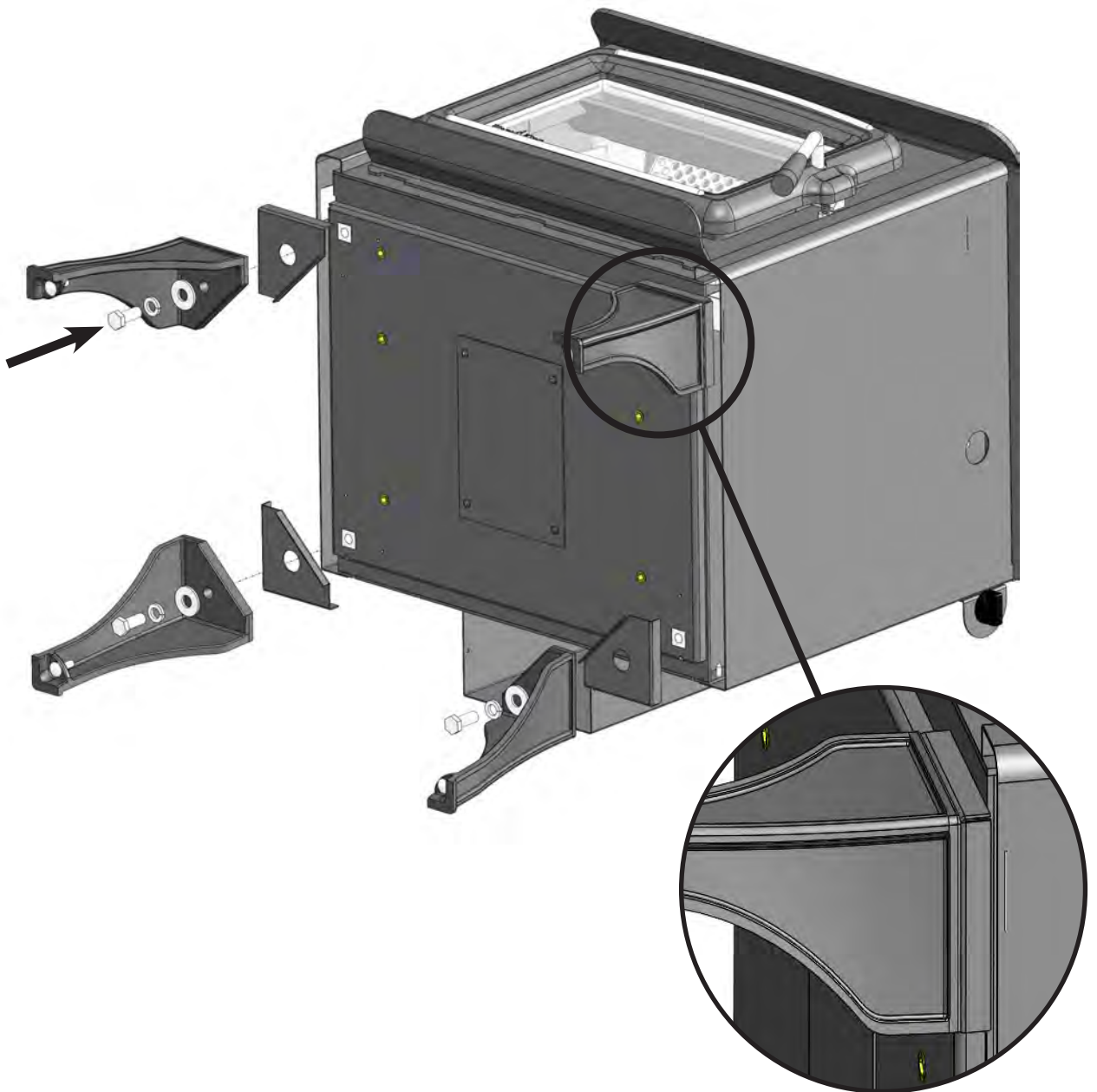
LEG KIT (S.Z2613.BK)

NOTE: EITHER LEG KIT OR PEDESTAL (SEE PREVIOUS PAGE) MUST BE INSTALLED BEFORE STOVE CAN BE DUCTED AND READY FOR USE.

TOOLS NEEDED FOR INSTALLATION: 3/4" wrench or socket wrench

INSTALLATION

1. Lean stove backwards to gain access to stove bottom.
2. Position each leg and leg plate(flanges up, away from leg) parallel to stove base and fasten to stove using the supplied washer, lock washer, and 1/2" bolt.
3. Lift stove back to its upright position.
4. Adjust carriage bolts in order to level stove.



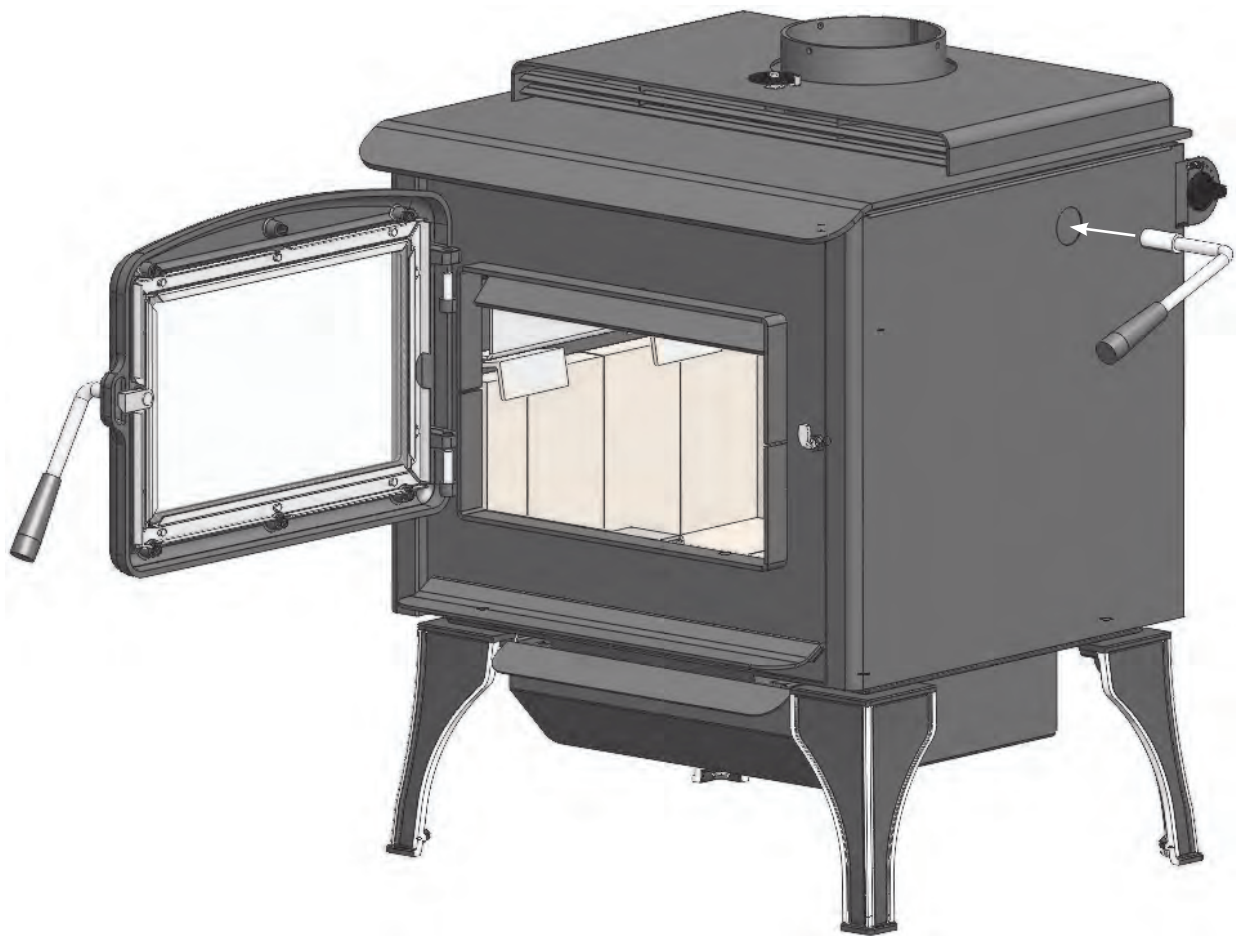
DOOR INSTALLATION AND CHANGE-OUT (S.Z2680.BK or S.Z2680.SA)

To install the door upon stove installation or to change it out, follow these steps:

WARNING: DOOR IS HEAVY, PLEASE HOLD FIRMLY.

INSTALLATION

1. Align bottom door hinge hole with bottom firebox hinge pin
2. Lower door onto bottom hinge pin, then align top door hinge hole with top firebox hinge pin
3. Lower door onto pins until door hinge surface contacts firebox hinge surface
4. Fit Bypass Handle (packaged with door assembly) onto protruding bypass extension on right side of stove.



YOUR FIRST FIRE!

The following pages contain information on the operation of the major components on your Blaze King appliance. Please take the time to read through this section as it will give you a better understanding of how your appliance works. This understanding will help you to operate your appliance at its optimum level thus extended its life while allowing you to get the highest efficiencies from your heat .

INTRODUCTION

All Blaze King free standing wood appliances are designed as radiant room space heaters. They have been designed and tested to be installed in insulated habitable rooms areas of your dwelling. The appliance has not been designed to be installed in a concrete uninsulated basement or in a shop/garage environment. Such applications may cause the thermostat to be unresponsive due the constant call for heat resulting in appliance being in a constant or over fire situation. Consequential damage from this type of operation will deem the warranty null and void.

All Blaze King wood appliances are designed to burn cord wood only. Dimensional timber off cuts, very low moisture content small diameter wood and pressed wood logs, when used in excess, may result in excessive internal firebox temperatures that can cause causing irreversible damage to the firebo s internal structure. Excessive temperatures can be caused by many small pieces of very low moisture content wood being used as a primary fuel source. This may be evident by warping or warped internal plates and retainers, possible cracking of the outer firebox and possibly premature failure of the catalytic combusto . All wood appliances should be cleaned out and inspected at the end of every burning season to identify if any internal components have been affected during the burning season. If problems are observed steps must be taken to identify and correct the problem before the subsequent burning season. Failure to do so will result in the warranty of the product being null and void.

EFFICIENCY

Efficiency was determined using the method outlined in B415.1-10 test method. It is represented by the High Heating Value (HHV) as the fuel used during testing contains between 19% - 25% water moisture included in the total calculated fuel weight. (Other test methods such as LHV or Low Heating Value, does not take the water moisture into account).

Annual Fuel Utilization Efficiency (AFUE) attempts to represent the actual, season long, average efficiency an appliance. HHV is the actual, calculated average efficiency obtained under test conditions. Using correctl seasoned wood is important when trying to gain efficien . The more seasoned (dry) the wood, the higher the efficiency (less energy wasted on eliminating moisture during combustion). Operating your Blaze King at low settings will result in higher efficiencies as the fuel will undergo a more complete combustion. For maximu efficien , the appliance should be installed in a location that provides adequate intake/combustion air as well as a location that will allow for the straightest run of optimal chimney length to establish necessary draft .

FAN OPERATION

Fans are an optional item for most Blaze King appliances. If fans are installed on your appliance, they should be turned off until the stove reaches normal operating temperatures. Approximately 30 minutes after a fire has been established within the appliance, the fan speed should match the thermostat control setting. (i.e. if your thermostat is set to a medium heat output then your fan should also be set at medium, low—low, high—high etc.). We recommend the use of fans on all of our wood appliances. The fan system recirculates room air over the hot surfaces of your appliance and helps spread this super heated air around your home.

SELECTING WOOD**⚠ WARNING**

- **THIS APPLIANCE IS DESIGNED TO BURN NATURAL WOOD ONLY. DO NOT BURN TREATED WOOD, COAL, CHARCOAL, COLORED PAPER, CARDBOARD, SOLVENTS OR GARBAGE.**
- **HIGHER EFFICIENCIES AND LOWER EMISSIONS WILL GENERALLY RESULT WHEN BURNING AIR DRIED SEASONED WOODS, AS COMPARED TO WET, GREEN OR FRESHLY CUT WOODS.**
- **BURNING WET UNSEASONED WOOD CAN CAUSE EXCESSIVE CREOSOTE ACCUMULATION. WHEN IGNITED IT CAN CAUSE A CHIMNEY FIRE THAT MAY RESULT IN A SERIOUS HOUSE FIRE.**

It takes a great deal of energy to evaporate the moisture contained in green or wet wood and that energy will not be heating your house. Green or wet wood will also greatly increase creosote issues. To ensure that your wood fuel has a moisture content of 20% or lower, only use seasoned wood that has been split, stacked, and protected from rain or snow for at least 24 months. Firewood should be split and stacked in a manner that allows for air flow to all areas

Never burn salt-water driftwood as it is very corrosive and will deteriorate the structure of the appliance. The burning of salt-water driftwood will void the warranty.

Both hardwood and softwood burn equally well in this appliance, but the more dense hardwood will weigh more per cord and burn a little slower and longer.

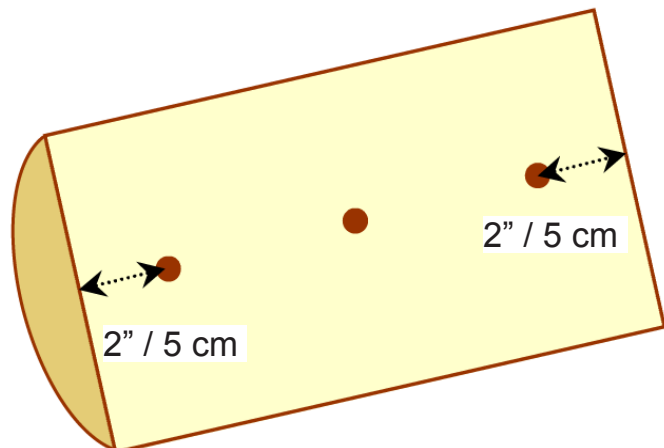
The only accurate way to determine wood moisture is to purchase a moisture meter.

⚠ WARNING

- **NEVER START A FIRE UNLESS ALL BRICKS ARE CORRECTLY PLACED INSIDE THE FIREBOX. CHECK THE INSTALLATION INSTRUCTIONS CAREFULLY.**
- **ALWAYS OPEN THE BYPASS DOOR BEFORE OPENING THE LOADING DOOR.**
- **ONCE THE LOADING DOOR IS CLOSED, CLOSE THE BYPASS DOOR DIRECTLY AFTER THE CATALYTIC THERMOMETER NEEDLE IS IN THE ACTIVE ZONE.**

HOW TO USE MOISTURE METERS

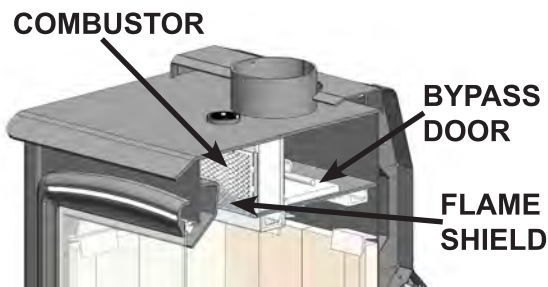
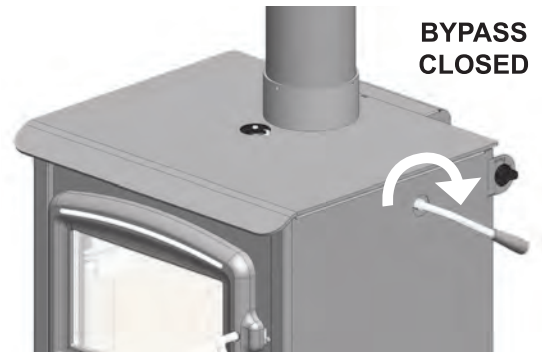
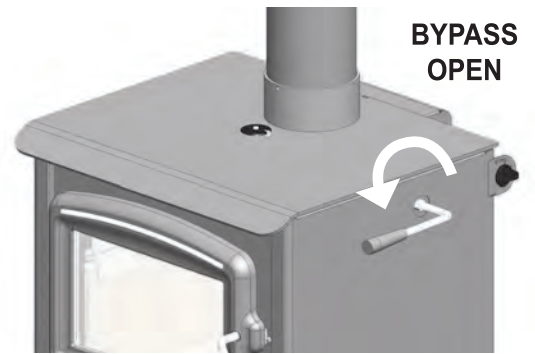
1. Take a random selection of around 3-4 logs per cubic yard or cubic meter.
2. Split each log down the middle.
3. In the center of log push pins of meter along grain - three measurements are taken on the freshly split surface: 2" or 5 cm in from each end of the log and in the middle of the split surface with sufficient contact (see figure)
4. Do this to all the logs and take an average of the readings (this will be only an approximate indication but a good guide).



OPERATING INSTRUCTIONS

BYPASS DOOR

Your catalytic wood burning appliance is fitted with a bypass door which allows exhaust from the fire to temporarily bypass the catalytic combustor. The bypass door is located inside the dome of the firebox at the top of the appliance. It is a hinged, steel plate door and is controlled by the bypass handle located on the right side of the appliance. When the handle is pointing forward, the bypass door is open. To close the bypass door you must rotate the handle clockwise until it points to the rear of the appliance. To ensure the bypass door is fully closed, push down on the bypass handle until you hear a positive click. **NEVER OPEN THE LOADING DOOR WITHOUT OPENING THE BYPASS DOOR**



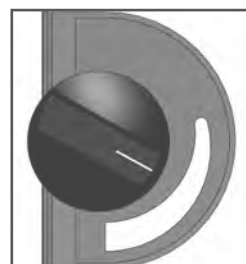
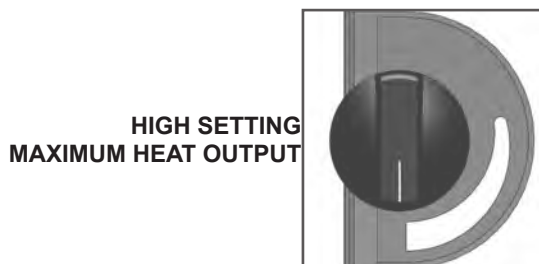
CATALYTIC THERMOMETER

The catalytic thermometer is located on the top of the appliance. Its sole purpose is to indicate whether the combustor is ACTIVE or INACTIVE. It is important to ensure that the appliance is operated in the stove in the ACTIVE zone. When the thermometer reads INACTIVE it means that the combustor temperature is below 500F and is not producing a clean burn. For the most accurate reading, turn the fan off for approximately 5 minutes before reading the thermometer. For calibration instructions refer to “CATALYTIC THERMOMETER” in the “MAINTENANCE” section.



THERMOSTAT

The thermostat is located at the rear of the appliance and is controlled by the thermostat knob which is located at the upper right rear corner of the appliance. When the knob is positioned at the **HIGH** setting, the appliance will operate at its highest burn rate and deliver its maximum heat output. As the knob is rotated counter clockwise the burn rate will decrease along with heat output. Burn rate is greatly influenced by location, installation, and external environment, so you may find it necessary to reposition the knob until you find the ideal setting to suit your situation. Please note that all adjustments to the thermostat should be done gradually as too rapid a change may cause the thermostat to operate improperly. The thermostat is set at the factory. **DO NOT TAMPER WITH THE THERMOSTAT**, this will result in a malfunctioning thermostat.



LIGHTING THE FIRE

NOTE: As you heat up the appliance for the first time, the paint will go through a curing process and will give off an odor. To minimize the inconvenience, burn the stove at a low temperature setting for several hours. It is advisable to open a door or window until the odor dissipates. You may also notice a change in color as the paint cures, this is normal and will appear uniform after subsequent firings

1. **DO NOT USE A GRATE. BUILD THE FIRE DIRECTLY ON THE BRICK IN THE BOTTOM OF THE STOVE.**
2. Position the thermostat to the **HIGH** setting and turn the fan (if fitted) **OFF**.
3. Open both the loading door and the bypass door (rotate the bypass handle forward).
4. Place 10 balls of non-glossy paper towards the front of the bottom of the firebox then stack 20 pieces of kindling on top of the paper in a crisscross fashion (leaving air gaps in between sticks).
5. Light the fire and allow it to get a good start while leaving the loading door cracked open (approximately 3 to 5 minutes). **DO NOT LEAVE THE STOVE UNATTENDED.**
6. Once the kindling is fully on fire, place two or three medium size logs onto the fire. Keeping the loading door unlatched, allow the logs to catch fire (approximately 5 minutes). **DO NOT LEAVE THE STOVE UNATTENDED.**
7. Once the logs are burning, latch the loading door shut **BUT** keep the bypass door open. Leaving the loading door open after the wood load has caught fire may cause premature failure of the catalytic combustor.
8. When nearly all of the wood in the firebox is fully burning, finish loading the appliance. Lay the wood as far back in the stove as possible. Latch the loading door shut and observe the catalytic thermometer. Once the needle is in the **ACTIVE ZONE**, close the bypass door (rotate the bypass handle backwards).
9. Let the fire burn with the thermostat at the **HIGH** setting for 20-30 minutes or until the fire is well established. This ensures that the stove, catalyst, and wood load are all stabilized at optimum operating temperatures. The temperature in the stove and the gases entering the combustor must be raised to at least 500F (indicated by the thermometer needle in the **ACTIVE ZONE**) for catalytic activity to be initiated.
10. After 20-30 minutes or once the fire is well established, gradually turn the thermostat down to the desired heat output setting. Please note that if the thermostat is turned down too low too quickly, the fire may go out or the combustor may stop working, indicated by the thermometer needle falling into the **INACTIVE ZONE**. If this happens, simply turn the thermostat back to a higher heat output setting to let the fire reestablish itself
11. If installed, turn the fan on after the initial warm up period of 20-30 minutes.

Probably the least understood requirement in maintaining a good fire is that of establishing a good base of coals or embers. A good bed of hot coals or embers will maintain a more even temperature as well as getting the new load of wood started easily. Put as much wood into the appliance as needed, practice will teach the amount of wood necessary to keep the fire going until the next reloading time. Don't be afraid to fill it completely if necessary. With the Blaze King thermostat, the wood will only burn at the rate set on the thermostat. Once the fire is established, the appliance should be left to complete the full burn cycle. This is evident by a) only coal bed (ember bed) remaining or b) the catalytic thermometer hovers just inside the active zone. Following this procedure will maximize the efficiency of the appliance as well as limit exhaust emission and smoke spillage.

RELOADING PROCEDURE

WHEN PREPARING TO RELOAD, IF THE NEEDLE ON THE CATALYTIC THERMOMETER IS STILL IN THE ACTIVE ZONE, FOLLOW THE PROCEDURE BELOW; IF THE NEEDLE HAS DROPPED INTO THE INACTIVE ZONE, REFER BACK TO THE “LIGHTING THE FIRE” PROCEDURE ON THE PREVIOUS PAGE.

It is important to note that the catalytic thermometer is simply displaying the temperature of the catalytic combustor. It may be used as an aide when it comes to indentifying a reload point, but other factors such as lack of fuel in the firebox or dropping room temperatures should be used as well.

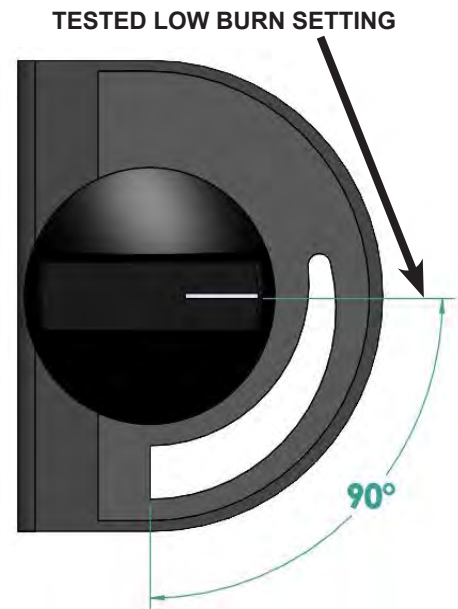


1. Have your next load of wood ready before beginning. Turn the thermostat to **HIGH**. Wait 2 minutes for the air flow to stabilize
2. To help minimize smoke spillage into the room, you may wish to open the bypass door and again wait 2 minutes for the air flow to stabilize.
3. Crack open the loading door to allow ambient room air to be introduced into the firebox, this may take a minute to stabilize.
4. Slowly open the loading door and proceed to reload the firebox. If you experience excessive smoke spillage, slightly close the loading door to re-establish a draft through the chimney.
5. Once loaded, latch the loading door shut and (if opened) close the bypass door immediately. Let the fire burn on the **HIGH** thermostat setting for 20 to 30 minutes OR until the fire is very well established. At that point, turn the thermostat down to the desired setting. Keep in mind you may not see a large amount of flame activity in the lower thermostat setting. The thermometer needle will remain in the active zone indicating that the burn cycle is continuing.
6. Should you burn the stove on a very low setting for extended periods of time, you will begin to see creosote deposits forming on the glass door. To remove these deposits, simply run the stove on **HIGH** for approximately 30 minutes. The **HIGH** setting will burn off most of the deposit

Note: Our loading instructions are outlined in general terms due to the vast array of variables that arise with each installation. Such variables include type of wood fuel, chimney hieght and configuration, installation altitude, seasonal weather conditions, and the desired heat output required. Over time you will learn which settings are necessary to achieve optimal performance with your sepecific installation.

OPTIMAL LOW BURN THERMOSTAT SETTING

Your Blaze King appliance was tested and certified in accordance to the New Source Performance Standards for Residential Wood Heaters. During this test series, the low burn rate of the unit was determined by setting the thermostat knob to a position that yielded the lowest burn rate achievable. Considering that certification testing was conducting in a controlled laboratory environment with the appliance connected to a 15ft tall chimney, you may find that your optimal low burn thermostat setting is either above of below the certification test setting based on your location, installation, and the external environment you are operating in. If you find that you are setting your thermostat beyond the test setting, please note that if the thermostat is turned down too low the fire may go out or the combustor may stop working which is indicated by the thermometer needle falling into the **INACTIVE ZONE**. If this happens, simply turn the thermostat back to a higher heat output setting and let the fire reestablish itself

**WOOD BURNING IN THE SHOULDER SEASON**

There are a few things to consider if you choose to light a fire during the spring or fall seasons when the outside temperature is milder, perhaps 55°F to 70°F (13°C to 21°C).

You may notice smoke spillage out of the loading door when it is opened during start up or reloading. This is caused by a lack of natural draft within the chimney system. The temperature difference between the chimney system and the outside air causes flue gasses to be drawn up and out of the chimney. Smaller temperature differences produce less draft in your chimney system than larger temperature differences. This air movement, referred to as Stack Effect, is also influenced by air density and moisture differences. To eliminate the smoke spillage you may have to stoke the fire for longer than usual. Once the fire warms the chimney the draft will improve and spillage will be reduced. When operating the appliance on a lower thermostat setting, the resultant lower flue temperatures can cause your chimney system to cool down. This also decreases natural draft and spillage may occur.

General Rules for burning in the shoulder season:

- Run your appliance on **HIGH** for 30 minutes after start up and reloading before gradually turning the thermostat down to the desired heat output setting.
- The thermostat setting needs to be high enough to keep the catalytic thermometer in the active zone. If the thermometer will not stay in the active zone, turn the thermostat to a higher setting and then wait 15 minutes to confirm that the thermometer remains in the active zone. Repeat as required
- If your appliance is producing too much heat, try to reduce the volume of wood fuel loads rather than turning your thermostat down. It is good burning practice to build smaller, hotter fires on milder days in the spring and fall.

ICE - FORMATION AND PREVENTION

Most of what you see coming from the chimney of a properly operating catalytic appliance is water vapor. In extremely cold weather, and with some exterior chimneys, this vapor may freeze in the chimney to the point of actually blocking the chimney and extinguishing the fire. In such weather, burn the appliance for 5 to 10 minutes with the thermostat set to **HIGH** to melt any possible ice build.

⚠ WARNING**DO NOT USE THE APPLIANCE WITHOUT A COMBUSTOR**

It is important to periodically monitor the operation of the catalytic combustor to ensure that it is functioning properly. A non-functioning combustor will result in a loss of heating efficiency, and an increase in creosote and emissions. Following is a list of items that should be checked on a periodic basis:

- Combustors should be visually inspected at least three times during the heating season to determine if physical degradation has occurred. Actual removal of the combustor is not recommended unless more detailed inspection is warranted because of decreased performance. Refer to “CATALYTIC COMBUSTOR TROUBLESHOOTING” on next page.
- This catalytic heater is equipped with a temperature probe to monitor catalyst operation. Properly functioning combustors typically maintain temperatures in excess of 500°F (indicated by the thermometer needle in the active zone), and often reach temperatures in excess of 1000°F. If catalyst temperatures fall below 500°F (indicated by the thermometer needle in the inactive zone), refer to next step and to “CATALYTIC COMBUSTOR, TESTING” below.
- You can get an indication of whether the catalyst is working by comparing the amount of smoke leaving the chimney when the smoke is going through the combustor and catalyst light-off has been achieved, to the amount of smoke leaving the chimney when smoke is not routed through the combustor (bypass mode):
 - Light the appliance as per the lighting instructions (see “LIGHTING THE FIRE”). With smoke routed through the catalyst, go outside and observe the emissions leaving the chimney.
 - Open the bypass mechanism, wait approximately 15 minutes, and again observe the emissions leaving the chimney. Significantly more smoke will be seen when the exhaust is not routed through the combustor (bypass mode). Some smoke may be visible shortly after you start the fire and shortly after reloading the fire. Allow 20 to 30 minutes for the fire to stabilize before making observations

CATALYTIC COMBUSTOR, TESTING

Light the fire per the lighting instructions. After 1 hour of burning a well established fire, position the thermostat knob to a medium - low burn rate setting. Allow 5 minutes for the catalytic thermometer to reach equilibrium and observe the location of the indicator needle. A properly functioning combustor will have an active temperature greater than 500F and the thermometer will read in the ACTIVE zone. A “tired” or “dead” combustor will yield thermometer reading in the INACTIVE zone. Repeat this procedure for at least 3 burn cycles. If, after several burn cycles, the thermometer will not indicate an ACTIVE reading your combustor may require cleaning or replacement. If, after cleaning and reburning, your combustor is still not producing an ACTIVE reading you should contact your Blaze King dealer for a replacement combustor. Note - It is also possible that the catalytic thermometer itself may be functioning incorrectly. Before condemning the combustor, read CATALYTIC THERMOMETER in OPERATING INSTRUCTIONS.

CATALYTIC COMBUSTOR, CLEANING

Under certain conditions, ash particles may become attached to the face of the combustor. These may be seen while the combustor is in the glowing stage, or when the fire is out. Any deposit on the visible face of the combustor should be removed. Wait until the fire is out and the appliance is cold before performing any cleaning. Brushing the combustor with a soft bristle paint brush will remove some deposits. Passing a vacuum cleaner wand or brush near the face of the combustor will remove most deposits. (Hot ash in a vacuum cleaner bag will burn, may melt the vacuum or cause a house fire. Exercise caution and never clean the appliance when the appliance or ashes are hot.) Never scrape the combustor with any hard tool or brush. Never run pipe cleaner through the individual cells of the combustor. This is not needed, and may do more harm than good. Limit cleaning to the face of the combustor. **NOTE: Never remove a combustor without approved combustor gasket in hand as original gasket will fall apart when removed from appliance.** Remember to re-install the Flame Shield (the perforated plate) in same position it was found. TIP: A hot fire will usually prove to be the best method of cleaning the combustor of deposits

CATALYTIC COMBUSTOR, TROUBLESHOOTING

PROBLEM - CREOSOTE PLUGGING

Possible Cause: Burning materials that produce a lot of char and fly-ash

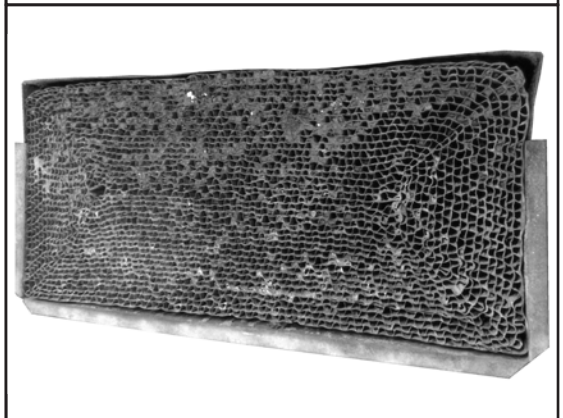
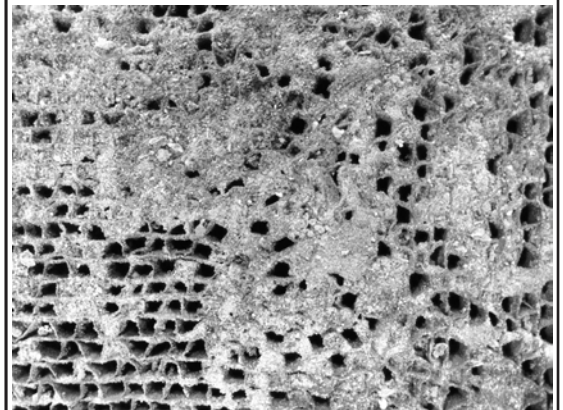
Solution: Do not burn materials such as garbage, gift wrap, or cardboard.

Possible Cause: Burning wet, pitchy woods or burning large loads of small diameter wood with the combustor in the operating position without the thermostat needle in the active zone.

Solution: Burn dry, seasoned wood, don't engage the bypass until the temperatures are high enough to initiate light-off (indicated by the thermostat needle in the active zone).

Possible Cause: Combustor not functioning. If proper burning procedures have been followed to no avail, the combustor is not functioning.

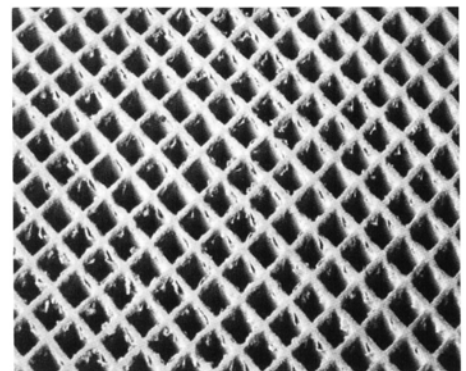
Solution: Replace the combustor with a genuine Blaze King combustor (failure to do so will void your warranty).



PROBLEM - CATALYST PEELING

Possible Cause: Extreme temperatures (above 1800°F, or 1000°C.) at combustor surface can cause the catalysts to peel. Over firing and flame impingement on the combustor are primary causes. Minor peeling photo shows minor peeling that is normal and does not affect function. Severe peeling photo shows that are closed or plugged.

Solution: Avoid extreme temperatures and flame impingement. If peeling is severe, remove and replace combustor.

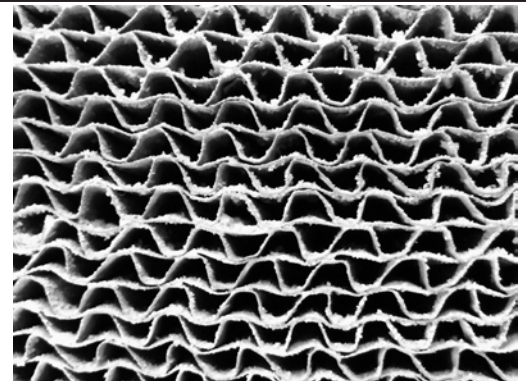


Minor Peeling

PROBLEM - CATALYST DEACTIVATION

Possible Cause: Burning large quantities of trash, pressure-treated lumber, or painted woods.

Solution: Burn quality woods available in your area. If you decide the catalyst has been deactivated, replace combustor with a genuine Blaze King combustor (failure to do so will void your warranty).



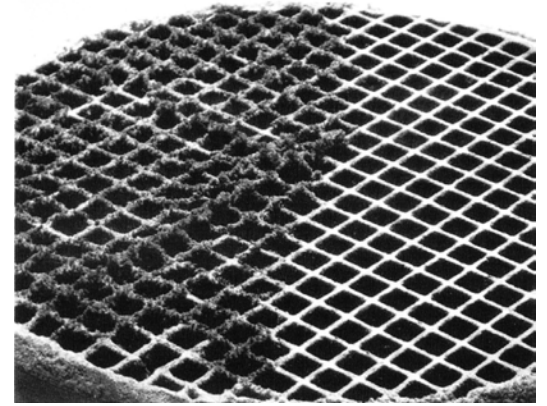
Severe Peeling

PROBLEM - CATALYST MASKING

(The catalyst is coated with a layer of fly-as or soot which prevents catalytic activity)

Possible Cause: Accumulation of fly-as

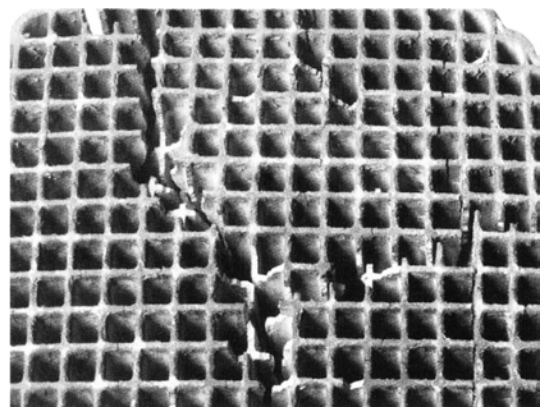
Solution: Brush cooled combustor with a soft-bristled brush or vacuum lightly at least once per burning season.



PROBLEM - THERMAL CRACKING

Possible Cause: Normal operation, as long as the combustor remains intact.

Solution: If cracking causes large pieces to fall out, replace the combustor.



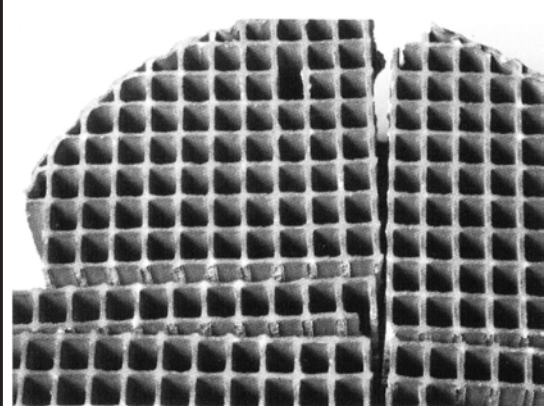
PROBLEM - MECHANICAL CRACKING

Possible Cause: Mishandling, abuse, or operating without a properly gasket sealed combustor.

Solution: Handle with care

Possible Cause: Distortion of holding collar.

Solution: Combustor should be held firmly in its can. It should slide easily into and out of the holding collar of the stove. If severe cracking has resulted in loss of large chunks of combustor, replace combustor. Also replace any warped stove parts.



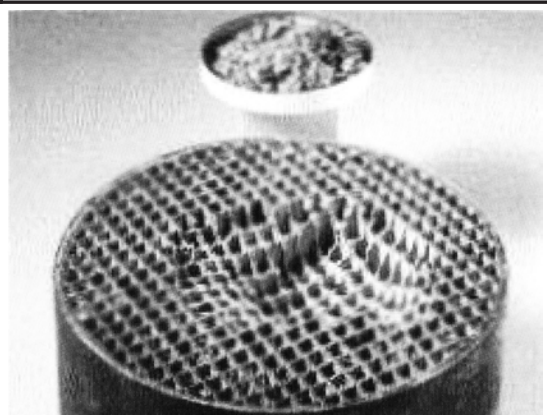
PROBLEM - CRUMBLING

Possible Cause: Air leaks

Solution: Inspect door gasket, see "MAINTENANCE cont." on page 38.

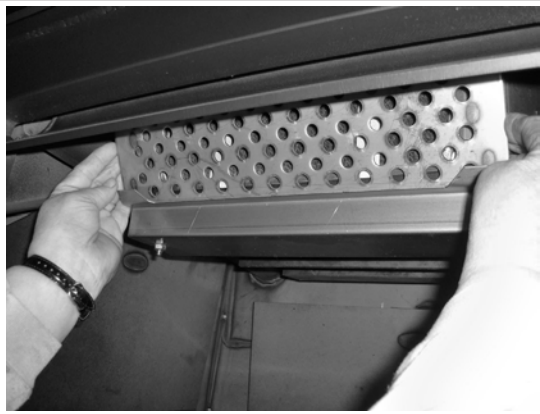
Possible Cause: High draft

Solution: Maintain draft to manufactured specifications



CATALYTIC COMBUSTOR, REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

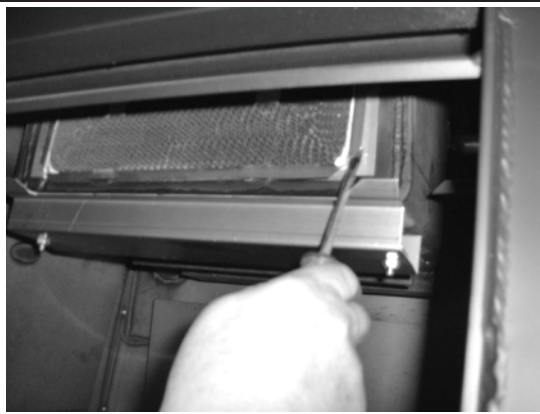
The catalytic thermometer on top of the stove should read in the active zone after the stove has been in operation for several hours. If the thermometer's indicator needle does not stay in the active zone, even with a hot fire, over a 7-10 day period of regular use, the combustor may need replacement or cleaning, see "CATALYST MONITORING". If the combustor needs replacing then discontinue use of the appliance until the combustor is replaced. If the combustor must be examined or replaced contact your Blaze King dealer.



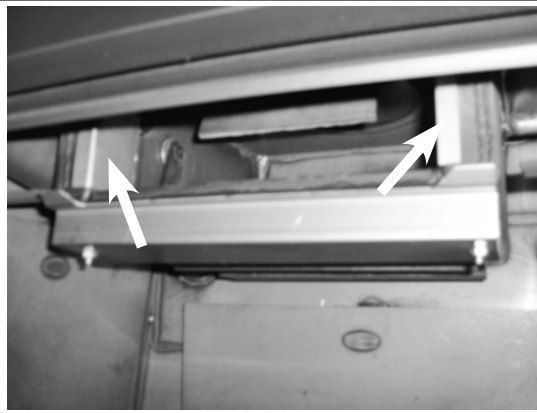
1. The removal of a Blaze King Catalytic combustor requires a small flat blade screwdriver or pocket knife. The stove fire must be out for at least 12 hours prior to the removal process. A combustor can reach 1400°F and hold high temperatures for several hours even after the fire is out. After waiting 12 hours, first remove the flame shield by simply lifting the shield off the tabs at either side. Pay particular attention to orientation as there is a top and bottom edge to the flame shield



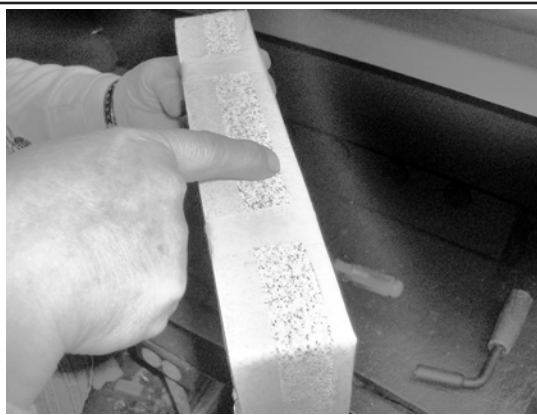
2. Once you remove the flame shield, you'll find the combustor. The honeycomb combustor can be made of different materials such as cordierite, mulite or even stainless steel. They are all the same with regard to removal and caution should be taken so as to not drop or damage the combustor. If your combustor has never been cleaned according the manufacturers directions, you may wish to clean the combustor before replacing it with a new combustor, see "CATALYTIC COMBUSTOR CLEANING".



3. The combustor has a metal tab across the bottom and on each side of the combustor. Using a flat blade screwdriver or pocket knife blade, slide the blade behind the metal tab and the heavy steel dome of the stove. The dome is the housing that surrounds the combustor. Apply slight pressure until the combustor begins to move forward, about 1/4". Repeat the process on the opposite end tab. By working back and forth the combustor will work free of the dome housing. It is normal for the gasket surrounding the metal band to fall apart during this process. New combustors are shipped with a new gasket.



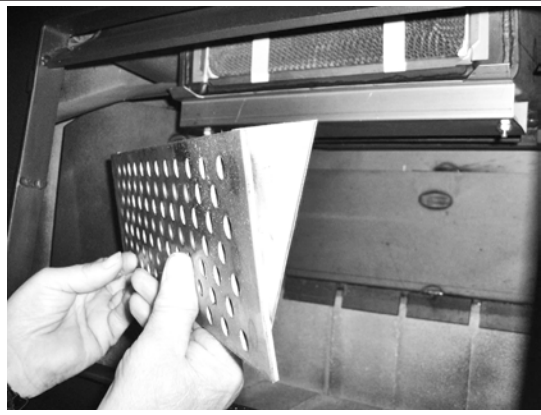
4. Now that the combustor has been removed you'll be able to see one stainless bypass retainer on each side. These can remain in place and do not need to be removed. These clips are not fixed in position and can fall into the firebox. Make sure they are in position before replacing the combustor. Using the same screwdriver or pocket knife, scrape any old gasket from the surface areas of the dome. The dome is the housing that surrounds the combustor. If you clean your existing combustor, you'll need to order replacement combustor gasket. It is always a good idea to have a spare combustor gasket on hand prior to performing any maintenance. If you purchase a new combustor a new gasket will already be applied to the combustor.



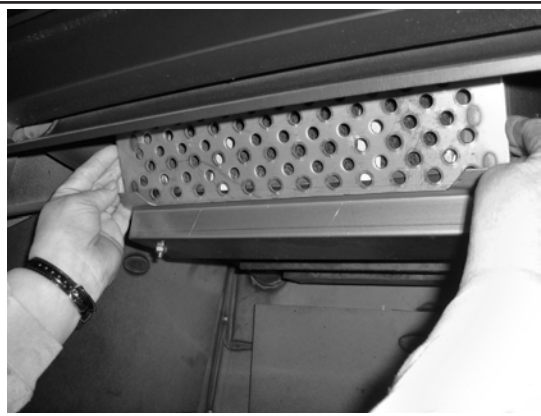
5. This new combustor already has the gasket installed. Note the 1" wide masking tape. This tape will help to keep the leading edge of the gasket from snagging during installation. If you've cleaned your combustor, wrap the combustor gasket as you see here and use the 1" masking tape around the perimeter front and rear. During the first fire the masking tape will burn off and the combustor gasket will swell providing a tight seal. It is this tight seal that improves efficiency and performance. You should never burn your stove without a combustor gasket installed.



6. Since the combustor is only 2" deep, there is ample room to lift the new combustor into place. **REMEMBER TO HAVE THE TAB ACROSS THE BOTTOM EDGE OF THE COMBUSTOR AS IT IS INSTALLED.** Slowly push the combustor in at the top apply even pressure to the left and right corners. This will allow for a better view of the bottom edge for the final fitting. **DO NOT FORCE THE COMBUSTOR INTO THE DOME. TAKE YOUR TIME AND WORK IT INTO PLACE SLOWLY.**



7. Once the combustor is installed completely so that all three tabs are touching the face of the dome, replace the flame shield. Note the brackets welded to the back flame shield are shaped like a triangle. The point of the triangle should face down when installed correctly. Never operate your stove without the flame shield in place. The flame shield will protect the face of the combustor against damages from wood when loading and other possible damages that can occur during the cleaning process.



8. The flame shield will rest on the two tabs located on the dome guard and lean slightly forward. Now that your combustor has been installed you can relight your stove. You will continue to receive excellent efficiency and clean burning for years to come. A few reminders, never burn anything other than dry, seasoned cordwood. Burning anything else may contaminate or ruin your new combustor. Also remember to keep your front loading door gasket seal properly adjusted, see "LOADING DOOR TENSION ADJUSTMENT". Doing so will improve burn times and extend combustor life span.

The combustor supplied with this heater is either a 115-0336-A-M or 115-0556 metal combustor. Consult the catalytic combustor warranty also supplied with this wood heater. Warranty claims should be addressed to:

| in Canada | in USA |
|--|---|
| Blaze King Industries / Valley Comfort Systems Warranty Department, 1290 Commercial Way Penticton, BC Canada V2A 3H5, Ph: 250-493-7444 | Blaze King Industries Warranty Department, 146A Street Walla, Walla, Washington 99362, Ph: 509-522-2730 |

RUN-AWAY OR CHIMNEY FIRE**⚠ WARNING**

A CHIMNEY FIRE CAN PERMANENTLY DAMAGE YOUR CHIMNEY SYSTEM. THIS DAMAGE CAN ONLY BE REPAIRED BY REPLACING THE DAMAGED COMPONENT PARTS. CHIMNEY FIRE DAMAGE IS NOT COVERED BY THE LIMITED WARRANTY.

CAUSES:

1. Using incorrect fuel, or small fuel pieces which would normally be used as kindling.
2. Leaving the door ajar too long and creating extreme temperatures as the air rushes in the open door.
3. Improperly installed or worn gaskets.
4. Creosote build up in the chimney.

SOLUTIONS:

1. Do not burn treated or processed wood, coal, charcoal, colored paper or cardboard.
2. Be careful not to over fire the appliance by leaving the door open too long after the initial start-up
3. Replace worn, dried out (inflexible) gaskets
4. Have your chimney cleaned regularly.

WHAT TO DO IF A RUN-AWAY OR CHIMNEY FIRE STARTS:

1. Close the draft fully (lowest position) by shutting off thermostat, and make sure firebox is closed tight .
2. Call the local fire department
3. Examine the chimney, attic and roof of the house, to see if any part has become hot enough to catch fire. If necessary spray with a fire extinguisher or water from a garden hos
4. Do not operate the appliance again until you are certain the chimney has not been damaged.

CREOSOTE FORMATION AND REMOVAL

When wood is burned slowly, it produces tar and other organic vapors which combine with expelled moisture to form creosote. These vapors condense in the relatively cooler chimney flue of a slow burning fire and when ignited, make an extremely hot fire. Check your chimney for creosote and soot regularly, until a safe frequency for cleaning is established. The chimney connector and chimney should be inspected regularly during the heating season to determine if a creosote build up has occurred. Be aware that the hotter the fire, the less creosote is deposited.

If accumulation is excessive, clean the chimney. You may want to call a professional chimney sweep to clean it. Both the chimney and the appliance have to be cleaned at least once a year or as often as necessary. Have a clearly understood plan to handle a chimney fire

CHIMNEY MAINTENANCE

The most efficient method to sweep the chimney is using a hard brush. Brush downwards so soot and creosote residues will come off the inner surface and fall to the bottom of the chimney where they can be removed easily.

The chimney must be checked regularly and if creosote has accumulated, it must be removed without delay. Cleaning on a regular basis should be sufficient during the coldest months. **ENSURE THE BYPASS DOOR IS OPEN PRIOR TO CLEANING THE CHIMNEY SO THE SOOT AND CREOSOTE FALLS INTO THE FIREBOX.**

Chimney / Flue Inspection:

1. The chimney should be inspected regularly during the heating season.
2. If possible, the chimney should be dismantled and cleaned.
3. The chimney should be inspected for possible damage.
4. If it is in good condition, put the chimney back in place; otherwise, it must be replaced.

FIRE EXTINGUISHERS AND SMOKE DETECTORS

All homes with a solid fuel burning appliance should have at least one fire extinguisher in a central location, known to all, and at least one smoke detector in the room containing the appliance. If it sounds an alarm, correct the cause but do not de-activate or relocate the smoke detector.

ASH REMOVAL

This appliance is required to be cleaned frequently because soot, creosote and ash may accumulate. Wait until the appliance is fully cooled off before the removal of ashes. **ALWAYS REMOVE THE ASH BUCKET IMMEDIATELY AFTER FILLING.** Ashes should be removed any time they come within one inch of the door opening. It is not necessary or advisable to completely remove all of the ashes when cleaning this appliance. Wood burns best in a bed of ashes 1/2" thick. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground (outside), 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. Other waste shall not be placed in this container.

⚠️ WARNING

NEVER STORE HOT ASHES IN A GARAGE OR BASEMENT. HOT ASHES WILL GENERATE CARBON MONOXIDE AND / OR FLAMMABLE GASES. THESE GASES MAY CAUSE SUFFOCATION AND POSSIBLE DEATH.

LOADING DOOR GASKET INSPECTION

Inspect the door gasket for physical deterioration, missing sections or obvious leakage. The appliance front should make a groove in the gasket material - one side of the groove (toward the inside) will often be dark or black, and the other side (toward the outside) should be light or white. Dark smudges on the outside of the groove may indicate an air leak. If the groove is very shallow or missing, or if there is a heavy ash or creosote deposit along the bottom edge of the gasket, it may need to be replaced. Frayed or broken gasket material, or a gasket that is hard and unyielding, will also indicate need for replacement. Any time a piece of gasket is missing or is broken anywhere, the entire gasket must be replaced.

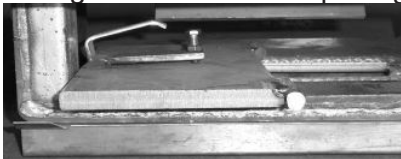
To check the gasket further, wait until the appliance is cooled and insert a piece of paper (a dollar bill will work) into the door opening and close and latch the door. Obvious resistance should be felt when pulling the paper out. Repeat this check several times around the perimeter of the door.

LOADING DOOR GASKET REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

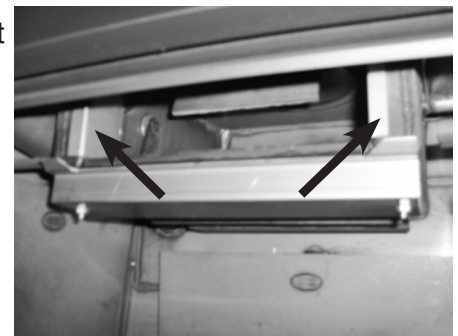
1. If the door gasket is to be replaced, be sure you have Blaze King 7/8" fiber glass gasket ready to re install, as well as high temperature adhesive. See your Blaze King dealer.
2. Be sure the fire is out and the stove has cooled down. The door should be removed by lifting up and out, off of the hinge pins. Then lay the door flat
3. With a pair of pliers, pull the old door gasket out of the channel and dispose of it.
4. Thoroughly clean out the channel so the new silicone adhesive will adhere and the gasket will fit smoothly.
5. Dry fit the new gasket first to ensure proper fit. Do not stretch or cut the gasket. Distribute the gasket evenly around the frame.
6. Run a small bead of a high temperature silicone adhesive along the center of the channel. **DO NOT USE HOUSEHOLD SILICONE CAULKING.** High temperature silicone may be obtained from wood stove dealer.
7. Start the new gasket in the lower right corner. Do not stretch or cut the gasket. Distribute the gasket evenly around the frame.
8. Allow the adhesive to dry before closing the loading door. The loading door tension may need to be adjusted, see "LOADING DOOR TENSION ADJUSTMENT".
9. Check the fit of the door gasket. Insert a narrow strip of paper into the door opening and close and latch the door. Obvious resistance should be felt when pulling the paper out. Repeat this check several times around the perimeter of the door. If no resistance is felt, adjust door latch catch, see "LOADING DOOR TENSION ADJUSTMENT".
10. A tight sealing door extends the burn times & protects the combustor.

BYPASS DOOR GASKET REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

1. Will require THERMOSEAL® 1000SF high-temperature resistant cement and Blaze King 5/8" dense fiber glass gasket. See your Blaze King dealer. You will also require masking tape and combustor gasket as disassembly of the combustor will result in a damaged combustor gasket.
2. Be sure the fire is out and the stove has cooled down.
3. You will need to remove the liner from the collar of the stove, and have the ability to see straight down into the stove box through the collar.
4. Please follow steps on "CATALYTIC COMBUSTOR, REPLACEMENT" on how to remove your combustor.
5. After removing the combustor you will notice stainless bypass retainers on the left and right sides of the combustor opening. These tabs prevent the bypass door from popping out of its hinge holding pins during operation. Remove the stainless bypass retainers by pulling inwards. This will allow the bypass door to pop out of its hinge holding pins.
6. To remove the bypass door, move the bypass rod out of the way using the bypass handle on the side of the stove. Looking down through the collar, lift one end of the bypass door for clearance to turn inside the top assembly. Once the bypass plate is in this position, remove the plate through the combustor opening.

**BYPASS DOOR REMOVAL THROUGH COMBUSTOR OPENING**

7. Remove the old gasket and apply the THERMOSEAL® 1000SF high-temperature resistant cement along the door opening edge.
8. Place the gasket along the cement, and tap it in to seat it securely in the channel.
9. Replace bypass retainers.
10. Reverse method of removing bypass door to put it back in place.
11. Prior to reconnecting the liner, you will need to adjust the bypass ramp bolt. You must first loosen the retaining nut located under the head of the adjustment bolt. Then using a 7/16" box wrench, tighten the bolt until the bypass handle, when closed, has a slight cam-over feel. Do not over tighten.
12. Secure bolt adjustment by tightening the 7/16" nut against the ramp as seen in the photo to the left. Now work the bypass handle several times to make certain the bypass operation is smooth and working properly. When you are satisfied with the operation of the bypass, please lower the venting. Important: Apply high temp anti-seize lubricant to the under side of the bypass ramp where the rod contacts.
13. Please follow steps 5-8 on pages 30 & 31 to return the combustor into place. Please note that if the gasket of the combustor is damaged, it will have to be replaced.

VIEW OF BYPASS DOOR AND CRANK THROUGH COLLAR**BYPASS RETAINERS****COMBUSTOR OPENING****BYPASS DOOR OPENING****APPLY LUBE TO THE UNDER SIDE OF THE BYPASS RAMP**

DOOR GLASS GASKET INSPECTION

When the appliance is cold, hold the glass by placing the palm of each hand on either side of the glass. Press firmly and try to move the glass. If the glass moves the door glass retainers may need to be tightened or the door glass gasket may need to be replaced.

1. Inspect the door glass gasket. If the gasket is frayed or missing sections replace the gasket.
2. Inspect the glass retainers and ensure the screws holding the retainers in place are tight. Hand tighten plus 1/4 turn. Do not over tighten.

DOOR GLASS GASKET REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

1. You will require Blaze King glass gasket and Blaze King door gasket. Please see your Blaze King dealer.
2. Remove the old glass gasket.
3. Starting at the corner opposite of the “Blaze King” logo, carefully wrap the gasket around the edges, pressing firmly onto the sides of the glass with the gasket centered on the edge. Finish the wrapping with a 1/2” overlap. Ensure the thickness of the gasket remains consistent and uniform.
4. Install glass with the “Blaze King” logo to the lower left corner of the door. Install the glass retainers with original fasteners. Ensure the glass is parallel to the frame and tighten the fasteners evenly.
5. Follow steps on “**LOADING DOOR GASKET REPLACEMENT**”.

**DOOR GLASS, CLEANING**

The best way to keep the glass clean is to leave the appliance on high burn for a period of time after each reloading. The moisture which is driven from a new load of wood contributes much of the creosote on the inside of the glass. Removing that moisture at the beginning of the burn cycle helps to keep the glass clean. Leaving the thermostat on a higher setting for 30 minutes to an hour before turning to low for an overnight burn will also help. Heavier deposits may require hand cleaning. Manual glass cleaning should be done when the appliance and glass are cool. **DO NOT CLEAN THE GLASS WHILE IT IS HOT. WARNING: Do not use abrasive cleaners to clean the glass.** Use a soft cloth. After using any cleaner, thoroughly rinse the glass with water to remove any deposits left by the cleaner. Failure to remove all traces of glass cleaner will result in the glass cleaner residue baking on. This residue may be very difficult to remove.

OPTIONAL FAN ASSEMBLY

Routine maintenance of the OPTIONAL Fan Assembly on the back of the stove is not required. However, should it become necessary to replace an individual fan or rheostat, contact your local dealer.

THERMOSTAT

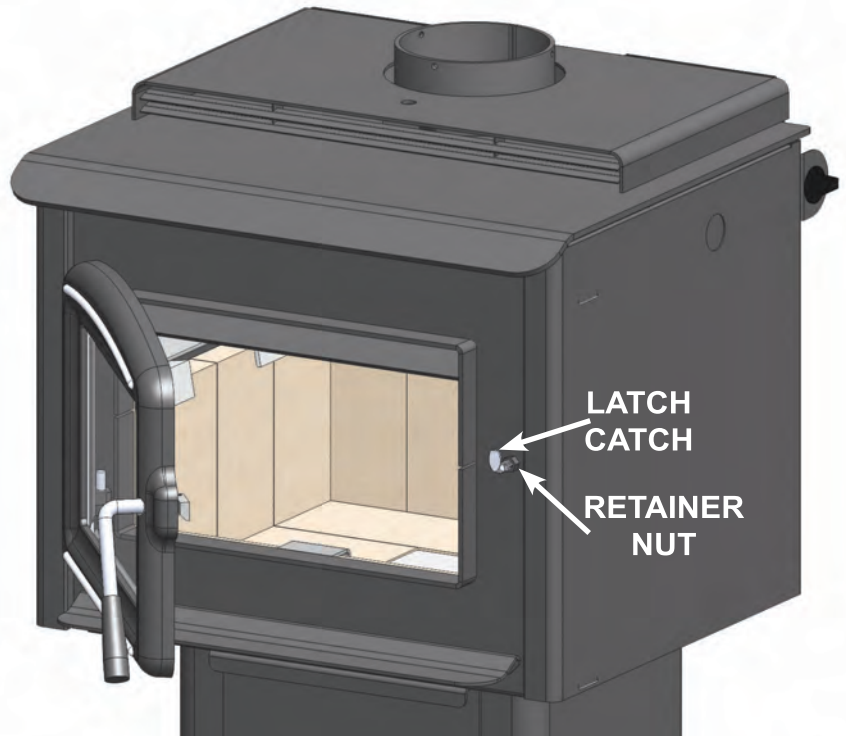
This wood heater thermostat has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual. If the thermostat malfunctions contact your dealer for replacement by a qualified installer.

LOADING DOOR TENSION ADJUSTMENT

To tighten the seal, use a 9/16" wrench to loosen retainer nut on the outside and tighten nut on inside firebox to move latch catch in (see figure beside). Secure retainer nut and (repeat) paper test (see "LOADING DOOR GASKET INSPECTION").

Use penetrating oil if necessary to make turning easier.

DO NOT FORCE !!

**⚠️ WARNING**

DO NOT OPERATE THIS WOOD STOVE IF THE DOOR GASKET IS MISSING OR DAMAGED DANGEROUS OVER FIRING CAN OCCUR WHICH CAN DAMAGE THE APPLIANCE OR IGNITE CREOSOTE IN THE CHIMNEY, POSSIBLY CAUSING A HOUSE FIRE. IF ANY PART OF THE WOODSTOVE OR FLUE SYSTEM IS GLOWING THE STOVE IS BEING OVER FIRED.

CATALYTIC THERMOMETER

The combustor thermometer tells you what was happening 4-8 minutes ago, and remember, it is only an indication of the temperatures of the gasses after they pass through the combustor. The thermometer probe, the part that fits into the stove, must be cleaned at least once a year. Lift it from the stove (be careful, it may be hot) and wipe or scrape it clean. At room temperature, away from the stove, the indicator should point near the bottom of the "Inactive" zone. If, after several years use, you find that the needle no longer points to the bottom of the "Inactive" zone when the thermometer has been at room temperature for 10 minutes or longer, it may need adjustment. Holding the probe with a pair of pliers, loosen the bolt on the top of the dial. Turn the dial to align the pointer with the bottom of the "Inactive" zone, then retighten the bolt.

NOTE: IF YOUR BLAZE KING IS EQUIPPED WITH FANS, TURN OFF FANS AND WAIT 10 MINUTES PRIOR TO READING CATALYTIC THERMOMETER INDICATOR. AIR MOVEMENT ACROSS THE TOP OF THE STOVE MAY PROVIDE FALSE READING.

Your Blaze King is designed to allow a wide selection of heat output levels. If you begin to lose control of the amount of heat the stove is emitting, determine the cause early so that major problems may be avoided.

The six major needs of a well-controlled fire are

1. Knowledgeable operator.
2. Adequate air supply.
3. Firewood of good quality and proper size.
4. Catalytic combustor in good condition.
5. Clean chimney, properly sized and installed.
6. Door gasket tight and firm

Considering all of the above, number one is the most important for safe and efficient operation of any woodstove. Please study the operation instructions carefully. Consult your BLAZE KING dealer or call the Customer Service Department at Blaze King in the U.S.A. at 509-522-2730 or in Canada at 250-493-7444 if you have any questions not answered in this manual.

All of the six above mentioned needs are interrelated. A deficiency in any one will affect all of the others. If you encounter a problem, determine the source of the problem and then follow-up by checking the other needs as possible contributing factors.

| PROBLEM: Chimney Fire | |
|--|---|
| CAUSE Act immediately regardless of cause | SOLUTION Turn the thermostat to lowest setting, check loading door to be sure it is tightly closed. Call Fire Department. |
| After the fire is out, have your chimney and flue connector inspected by a certified chimney sweep. A damaged masonry chimney should be repaired or rebuilt. A prefabricated chimney (factory built) that is damaged should be replaced. Any damage to the flue connector should be corrected before the system is used again. | |
| Possible causes of a chimney fire, and remedies for those causes, can be found further in this section: "Excessive Creosote Formation", and "Spots of Creosote Accumulation in Chimney or Flue Connector". | |

| PROBLEM: Not enough heat. | |
|---|--|
| CAUSE Green or wet wood. Not enough fuel in stove. | SOLUTION Use seasoned wood. Don't be afraid to FULLY load the stove. A FULL load of wood won't burn any hotter than the thermostat is set. |
| Obstruction in chimney or cap screen. Combustor plugged or coated. | Remove obstruction. See "COMBUSTOR, TESTING" See "COMBUSTOR, CLEANING" |
| Combustor not functioning. | See "COMBUSTOR, TESTING". If needed, replace combustor, See "COMBUSTOR, REPLACING". |
| Thermostat set too low. | Raise thermostat setting. |
| Thermostat not operating properly. | Consult your Blaze King dealer. |
| Poor draft caused by an oversize flu | Measure draft with Manometer. See "CHIMNEY DRAFTS" Consult your Blaze King dealer or a chimney sweep. |
| Strong, gusting winds causing downdraft in chimney | Install wind-resistant chimney cap. Directional caps may not stay freely rotating. If you have a directional cap, check it frequently. |
| Tightly sealed house, inadequate air supply. | Slightly open a window, near the stove or install an outside air kit. |
| Reloading too much wood on top of too few coals. | Allow a larger bed of coals to build up. |

| PROBLEM: Too much heat. | |
|--|--|
| CAUSE | SOLUTION |
| By-Pass door left open. | Close the by-pass door. |
| Thermostat set too high. | Lower thermostat setting. |
| Loading door gasket leaking, admitting excess air into firebox | Replace door gasket and/or adjust door. See "GASKET INSPECTION" |
| Excessive draft in the chimney. | Measure draft with a Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. Install a cap. |
| Thermostat not operating properly. | Consult your Blaze King dealer. |
| Wood is too small. | Use larger pieces. |
| PROBLEM: One or both fans will not run, or there is no adjustment for fan speed. | |
| CAUSE | SOLUTION |
| Fans mounted improperly. | Check that fan blade's not touch edges of hole. |
| Fan speed control. | Consult your Blaze King dealer for replacement. |
| PROBLEM: Fans minimum speed too fast or maximum speed too slow. | |
| CAUSE | SOLUTION |
| Fan speed control out of adjustment. | Consult your Blaze King Dealer. |
| PROBLEM: Excessive creosote formation in chimney and chimney Connector. | |
| CAUSE | SOLUTION |
| By-pass door left open. | Close by-pass door. |
| By-pass door not sealing tightly. | Inspect by-pass door and seal for warping. Ash or creosote buildup may occur on door or seat. With stove cold scrape and vacuum area around by-pass. Be sure all mating steel surfaces are clean and smooth. |
| Improper operation. | Check thermostat setting and operating procedures. See "THERMOSTAT & OPTIMAL THERMOSTAT SETTING" |
| Wood too green or wet. | Use seasoned wood. Use a moisture meter to confirm |
| Catalytic combustor not operating properly. | Inspect the combustor. See "CATALYTIC COMBUSTOR, TESTING" |
| Poor draft caused by an oversize or short flue, etc | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
| Chimney too cold or poorly insulated. | Upgrade chimney system. Consult your Blaze King dealer or a chimney sweep. |
| PROBLEM: Catalytic combustor thermometer (on top of stove) does not go into "Active" zone, or does not stay there for long. (Fans must be in "off" position for 10 minutes prior to checking) | |
| CAUSE | SOLUTION |
| Improper operation. | Check thermostat setting and operating procedures. See "THERMOSTAT & OPTIMAL THERMOSTAT SETTING" |
| Obstruction in chimney or cap. | Clean chimney, remove obstructions. |
| Faulty combustor thermometer. | Replace thermometer and Recheck combustor operating Temperature. |
| Wood too green or wet. | Use seasoned wood. |

| | |
|---|---|
| Combustor plugged or coated. | Clean combustor. See "CATALYTIC COMBUSTOR TESTING" |
| Combustor not functioning. | Check and test combustor. If needed replace combustor. See "CATALYTIC COMBUSTOR, REPLACING" |
| Thermostat not operating properly. | Consult your blaze King Dealer. |
| By-pass door leaking or not closing completely. | Inspect and clean area around by-pass doors. Adjust or replace gasket if necessary. Consult your Blaze King Dealer. |

PROBLEM: Spots of creosote accumulation in chimney or chimney connector.

| CAUSE | SOLUTION |
|--|---|
| Air leaks in chimney or chimney connector. | Inspect chimney and / or chimney connector. Repair or replace as necessary. Check to be sure that the chimney connector is installed correctly. |

CAUTION: a leaking chimney connector is a fire hazard and demands immediate attention.

| | |
|---|--|
| Poor draft caused by an oversize flue, single wall pipe, to many elbows, etc. | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
|---|--|

PROBLEM: Door glass quickly becomes coated with creosote.

| CAUSE | SOLUTION |
|---|--|
| Low thermostat setting or lowering the thermostat setting too far, too quickly. | Turn the thermostat to the warmest setting during the first 20-30 minutes or until the fire is well established after each reloading |
| Poor draft caused by an oversize or short flue, etc | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
| Obstruction in chimney or cap screen. | Remove obstruction. Clean chimney and/or cap screen. |
| Strong, gusting winds causing downdraft in chimney. | Install wind-resistant chimney cap. |
| Tightly sealed house, inadequate air supply. | Open a window, slightly, near the stove. |
| Burning poorly seasoned wet wood, or wood with high pitch content. | Use seasoned wood with low pitch content, such as some types of pine. |

PROBLEM: The combustor temperature cannot be controlled. Turning the thermostat down often makes the combustor temperature go up.

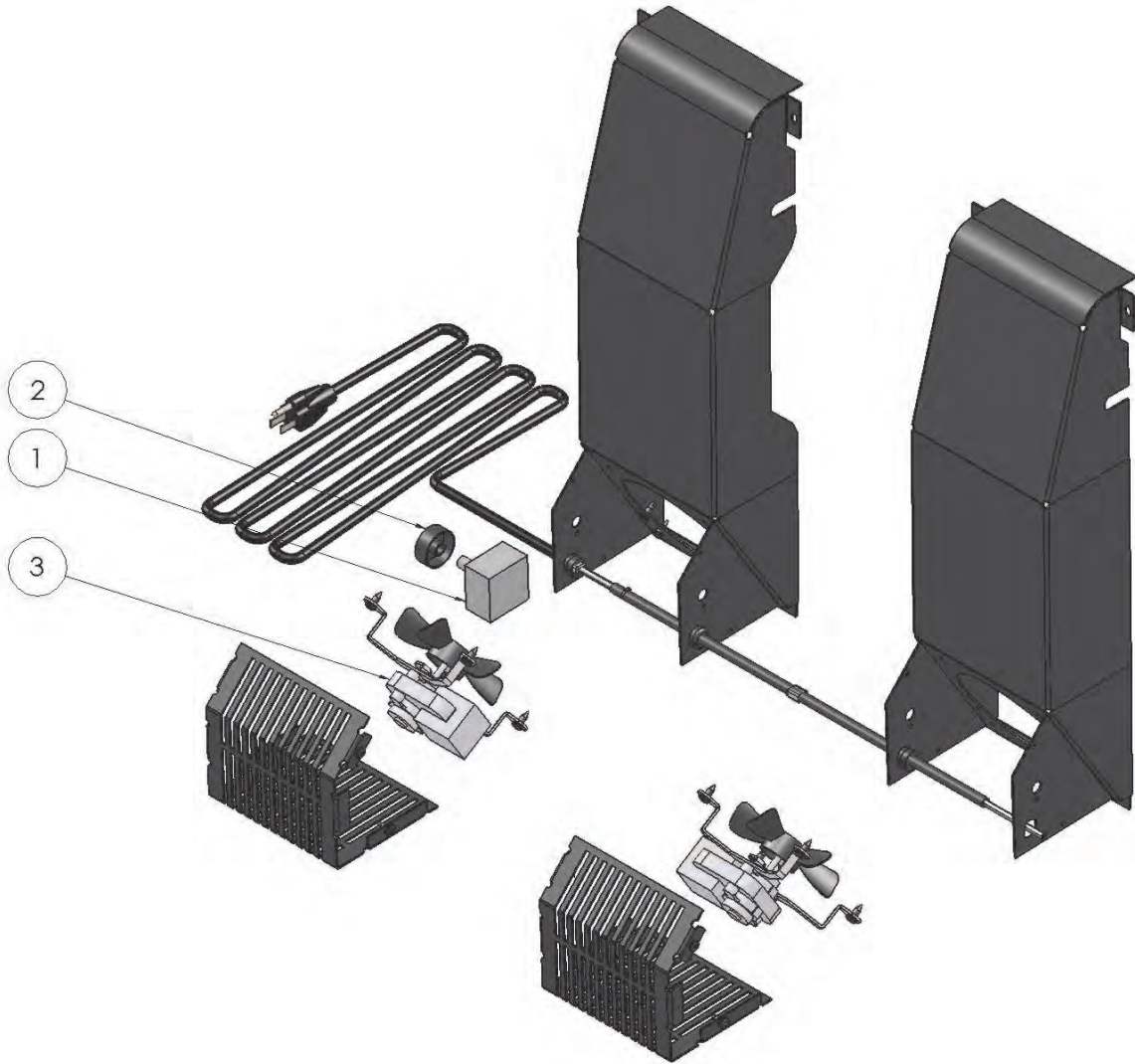
| CAUSE |
|---|
| Turning the thermostat down, particularly in the first half of the burn cycle, causes the fire to emit more smoke, which is fuel for the combustor. The combustor temperature therefore climbs for up to several hours. This is normal, and is of no concern. As long as only the combustor temperature is elevated, there is nothing to worry about. |

PROBLEM: Smoke spills from door opening when loading fuel

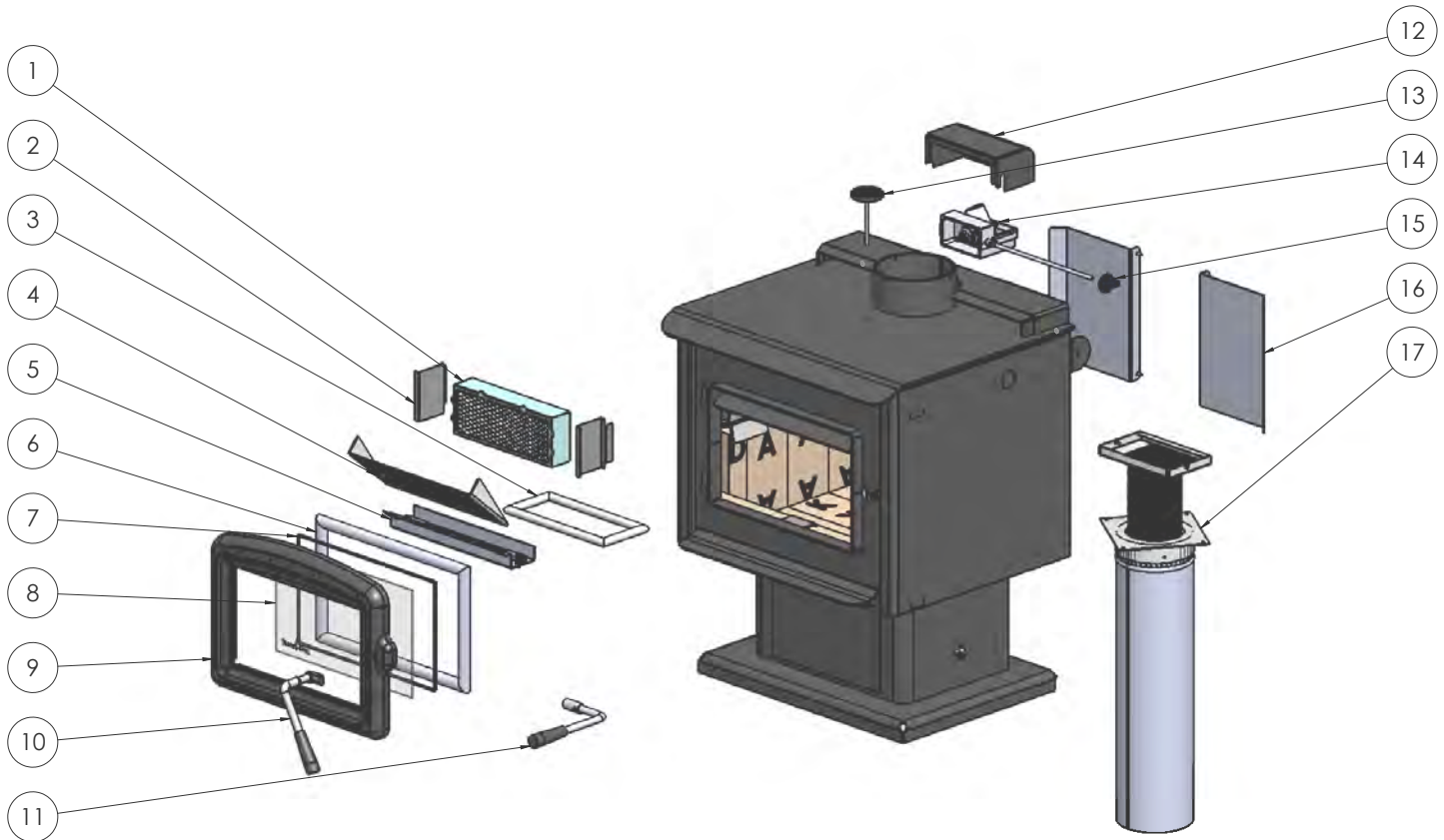
| CAUSE | SOLUTION |
|---------------------------------------|---|
| Spark arrestor screen on cap plugged. | Clean spark arrestor screen to bare metal wire. |
| Chimney too cold. | Make certain double wall stove pipe is used in installation. |
| Not enough vertical rise. | Make certain a minimum vertical rise of 36" is observed prior to elbows. Use two 45 elbows instead of 90 elbow. |
| Chimney not drafting. | Turn thermostat to highest setting, open bypass, leave loading door closed and wait 5-10 minutes to increase chimney or flue temperature. |

REPLACEMENT PARTS

Z2514 Fan Kit

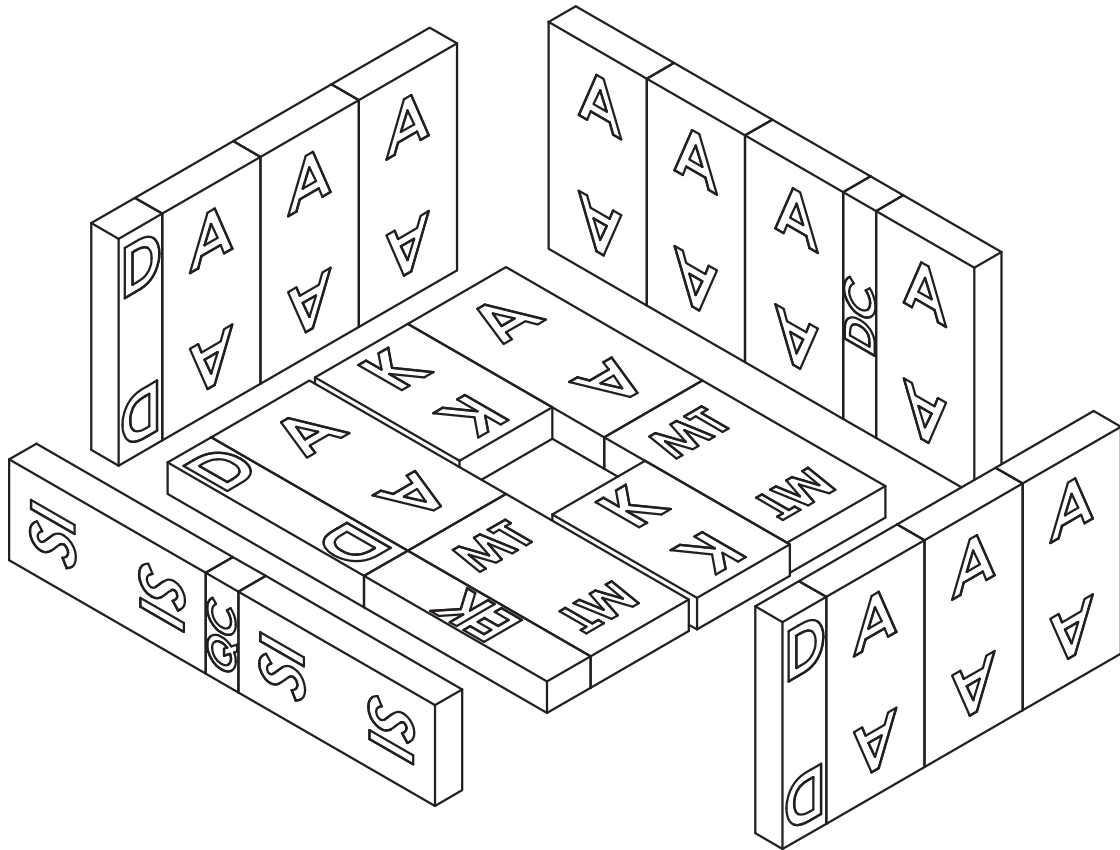


| No. exploded view | Part # | Description | QTY |
|-------------------|---------|----------------------------|-----|
| 1 | H/Z0136 | Rheostat with off switc | 1 |
| 2 | H/0137 | Rheostat knob silver inlay | 1 |
| 3 | H/Z7005 | Replacement axial fan | 1 |



| No. exploded view | Part # | Description | QTY |
|-------------------|--------------------|---|-----|
| 1 | S.CAT203032 | COMBUSTOR | 1 |
| 2 | S.Z4498 | BYPASS RETAINER KIT | 1 |
| 3 | 155-0255-B | BYPASS GASKET 5/8" DENSE ROUND - 3 ft | 1 |
| 4 | S.Z2430 | FLAME SHIELD | 1 |
| 5 | S.Z4551 | DOME GUARD REPLACEMENT KIT | 1 |
| 6 | 155-0186-S | DOOR GASKET 7/8" ROUND - 5 ft | 1 |
| 7 | 155-0254-AS | Glass Gasket 1/8 x 3/4 301B W/PSA - 4 ft | 1 |
| 8 | 130-0241 | 5 MM THICK CERAMIC GLASS 15" X 9" W/ GASKET | 1 |
| 9 | S.Z2680.BK | CAST DOOR SC20.2 | 1 |
| 10 | S.Z2644.S.B | DOOR HANDLE SATIN W BLCK SC | 1 |
| 11 | S.Z2452.BK | BYPASS HANDLE BLK ASM SC | 1 |
| 12 | 3241 | MAIN TUBE LID | 1 |
| 13 | 120-0342-E | CAT THERMOMETER W/PAN 4" PROBE | 1 |
| 14 | S.Z3009 | THERMOSTAT CK30, SC30, AF30 | 1 |
| 15 | 220-0102 | KNOB BLK 1.50 X 75H (THERM) | 1 |
| 16 | S.Z4015 | REAR HEAT SHIELD KIT | 1 |
| 17 | S.Z1726 / S.Z1726B | OUTSIDE AIR KIT 4" / 3" | 1 |

Brick Layout



| ITEM NO. | PART NUMBER | QTY. |
|----------|---------------|------|
| 1 | A Size Brick | 12 |
| 2 | D Size Brick | 3 |
| 3 | DC Size Brick | 1 |
| 4 | EK Size Brick | 1 |
| 5 | K Size Brick | 2 |
| 6 | MT Size Brick | 2 |
| 7 | QC Size Brick | 1 |
| 8 | SI Size Brick | 2 |

BLAZE KING WOOD LIMITED WARRANTY

Blaze King and Valley Comfort's respective brands extend the following warranty for wood fired appliances purchased from an authorized Blaze King / Valley Comfort dealer and installed in the United States of America or Canada. Warranty starts with date of purchase by the original owner (End User) except as noted for replacement parts.

| Warranty Period | | Components Covered | |
|---|---------|--------------------|---|
| Parts | Labor | Wood | |
| | | | |
| 1 Year | | X | All parts, materials and surface finishes (flaking and peeling) Subject to Conditions, Exclusion, and Limitations listed. |
| | | | |
| 2 Years | | X | Fan assemblies and motors, thermal sensors, catalytic thermometer, bi-metallic thermostat assembly, door handle metal components. |
| | | | |
| 5 Years | 2 Years | X | Firebox & Heat Exchanger, Bypass Door Steel Components |
| | | | |
| 6 Years | | X | Catalyst Combustor (see Conditions, Exclusions, and Limitations) |
| | | | |
| 1 Year | | X | Other Replacement Parts |
| | | | |
| See Conditions, Exclusions, and Limitations | | | |

Blaze King Wood Limited 5 Year Warranty

Blaze King is the manufacturer of the Blaze King line of heating products. At Blaze King, our commitment to the highest level of quality and customer service is the most important thing we do. Each Blaze King stove is built on a tradition of using only the finest materials and is backed by our limited warranty to the original purchase. With Blaze King, you're not just buying a stove; you're buying a company with years of unequalled performance and quality.

Limited Six (6) Year Warranty:

The CATALYTIC COMBUSTOR is under warranty by Blaze King for six (6) years from the date of original retail purchase. The purchaser shall pay the following share of the then current retail price for the combustor: The first three (3) years no charge, 4th year 60%; 5th year 70%, 6th year 80%. The Combustor must be returned to your dealer along with a completed COMBUSTOR FAILURE REPORT and original proof of purchase document.

Limited (5) Year Warranty:

Under this warranty, Blaze King covers the stove body and accessories against defects in materials and workmanship, for part repair or replacement for the first five (5) years *** to the original purchase. This Warranty covers: All Steel firebox components against defects in material and workmanship. Please see the exclusions and limitation section below as certain restrictions and exclusions apply this warranty.

Limited Two (2) Year Warranty:

Under this warranty, Blaze King covers, fan assemblies, modular thermostat and door handle steel components against defects in materials and workmanship, for part repair or replacement and limited labor for the first two (2) years to the original purchaser. Please see the exclusions and limitation section below as certain restrictions and exclusions apply to this warranty.

Limited One (1) Year Warranty:

Under this warranty, Blaze King covers all parts and materials against defects in materials and workmanship including exterior paint finishes, for part repair or replacement and limited labor for the first year to the original purchase. Please see the exclusions and limitation section below as certain restrictions and exclusions apply to this warranty.

How the Warranty Works

1. All warranties by the manufacturer are set herein and no claim shall be made against the manufacturer on any oral warranty or representation. All claims under this Limited Warranty must be made in writing by your dealer.
2. Any stove or part thereof that is repaired or replaced during the Limited Warranty period will be warranted under the terms of the Limited Warranty for a period not exceeding the remaining term of the original Limited Warranty or six (6) months, whichever is longer.
3. For any part or parts of this stove, which in our judgment show evidence of defects, Blaze King reserves the option to repair or to replace the defective part(s) through an accredited distributor or agent, provided the defective part is returned to the distributor or agent, transportation prepaid, if requested.
4. If you discover a problem that you think may be covered by the Limited Warranty, you MUST REPORT it to your Blaze King dealer WITHIN 30 DAYS from the date the problem was first detected, giving them proof of purchase and the date of purchase. The dealer will investigate the problem and work with Blaze King to determine whether the problem:
 - a) Is covered by the Limited Warranty or
 - b) Can be fixed in your home or does the product need to be returned to Blaze King for repair.
5. If Blaze King determines that the stove needs to be returned to Blaze King for repair, the customer has the responsibility and the expense of removing it from their home and shipping it to Blaze King. If the problem is covered by the Warranty, Blaze King will repair or replace the item at their discretion and the customer will be responsible for return shipping and re-installation in their home.
6. If the problem is not covered by the Limited Warranty, the customer will be responsible for all repair costs, as well as all storage, shipping and the cost of removing and re-installing the stove.

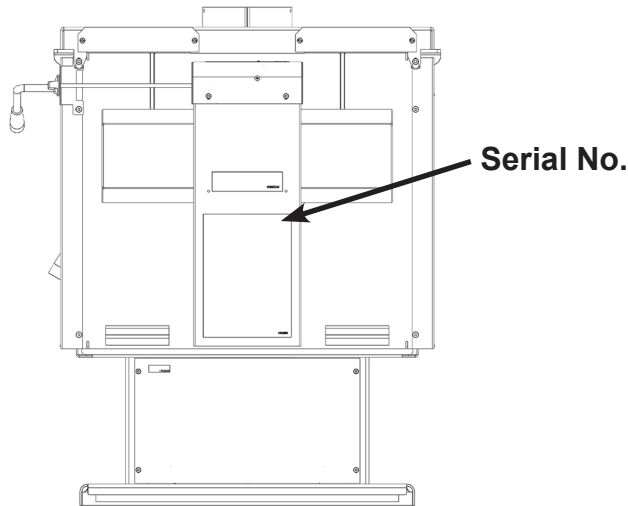
If you are not satisfied with the service provided by the Blaze King dealer, write to Blaze King at the address listed on the last page of the Owner's Manual. Include a copy of the original purchase invoice and a description of the problem.

Exclusions and Limitations:

1. This Warranty does not cover tarnish, discoloration or wear on the plated surfaces. Painted finishes will change color after initial firing and will continue to change through the lifetime of the stove. This is normal occurrence for all high temperature coatings.
2. This Warranty does not cover gasket material or firebrick.
3. Blaze King strongly recommends installation by a certified installer. Failure to comply may adversely affect coverage under the terms of this warranty. This Limited Warranty covers defects in materials and workmanship only if the product has been installed in accordance with local building and fire codes; in their absence refer to the owner's manual. If the product is damaged or broken as a result of any alteration, wilful abuse, mishandling, accident, neglect, or misuse of the product, the Limited Warranty does not apply.
4. The stove must be operated and maintained at all times in accordance with the instructions in the Owner's Manual. If the unit shows signs of neglect or misuse, it is not covered under the terms of this Warranty policy. Performance problems due to operator error will not be covered by the Limited Warranty policy. Some minor expansion, contraction, or movement of certain parts and resulting noise, is normal and not a defect and, therefore, is not covered under this Limited Warranty.
5. Misuse includes over-firing. Over-firing can be identified later by warped plates and paint pigment being burnt off. Over-firing this appliance can cause serious damage and will nullify the Limited Warranty.
6. The Limited Warranty will cover glass thermal breakage only and will not cover misuse of the stove glass, including but not limited to:
 - a) Glass that is struck, has surface contaminants or has had harsh or abrasive cleaners used on it.
 - b) If the door is slammed or is closed while wood in the firebox is protruding out the stove opening thus striking the glass.
7. This warranty does not cover products made or provided by other manufacturers and used in conjunction with the operation of this stove without prior authorization from Blaze King. The use of such products may nullify the Limited Warranty on this stove. If unsure as to the extent of this Limited Warranty, contact your authorized Blaze King dealer before installation.
8. Blaze King will not be responsible for inadequate performance caused by environmental conditions.
9. The Limited Warranty does not cover installation and operational related problems such as use of downdrafts or spillage caused by environmental conditions. Environmental conditions include but are not limited to nearby trees, buildings, roof tops, wind, hills, mountains, inadequate venting or ventilation, excessive offsets, negative air pressures or other influences caused by mechanical systems such as furnaces, fans, clothes dryers etc.
10. The Limited Warranty does not cover damage caused by burning salt-saturated wood, corrosive driftwood, chemically treated wood or any fuel not recommended in the Owner's Manual (use cord wood only).
11. The Limited Warranty is void if:
 - a) The stove has been operated in atmospheres contaminated by chlorine, fluorine or other damaging chemicals.
 - b) The stove is subject to submersion in water or prolonged periods of dampness or condensation.
 - c) Any damage to the unit, combustion chamber or other components due to water, or weather damage which is the result of, but not limited to, improper chimney/venting installation.
 - d) Salt air in coastal areas or high humidity can be corrosive to the finish; these environmental conditions can cause rusting. Damage caused by salt air or high humidity is not covered by the Limited Warranty.
12. Exclusions to the Limited Warranty include: injury, loss of use, damage, failure to function due to accident, negligence, misuse, improper installation, alteration or adjustment of the manufacturer's settings of components, lack of proper and regular maintenance, alteration, or act of God.
13. The Limited Warranty does not cover damage caused to the stove while in transit. If this occurs, do not operate the stove and contact your courier and/or dealer.
14. The Limited Warranty does not extend to or include paint, door or glass gaskets or firebricks damage caused by normal wear and tear, such as paint discoloration or chipping, worn or torn gaskets, chipped or cracked firebrick, etc.
15. The Limited Warranty does not include damage to the unit caused by abuse, improper installation, or modification of the unit.
16. Damage to plated surfaces caused by fingerprints, scratches, melted items, or other external scores and residues left on the plated surfaces from the use of abrasive cleaners or polishes is not covered in this warranty.

17. Blaze King is free of liability for any damages caused by the stove, as well as inconvenience expenses and materials. The Limited Warranty does not cover incidental or consequential damages.
18. The Limited Warranty does not cover any loss or damage incurred by the use or removal of any component or apparatus to or from the Blaze King stove without the express written permission of Blaze King and bearing a Blaze King label of approval.
19. Any statement or representation of Blaze King Products and their performance contained in Blaze King advertising, packaging literature, or printed material is not part of the Limited Warranty.
20. The Limited Warranty is automatically voided if the stove's serial number has been removed or altered in any way. If the stove is used for commercial purposes, it is excluded from the Limited Warranty.
21. No dealer, distributor, or similar person has the authority to represent or warrant Blaze King Products beyond the terms contained within the Limited Warranty. Blaze King assumes no liability for such warranties or representations.
22. Blaze King will not cover the cost of the removal or re-installation of the stove, hearth, facing, mantels, venting or other components.
23. Labor to replace or repair items under this Limited Warranty will be covered per our warranty service fee reimbursement and labor rates are set per component schedule. Labor rates vary from location to location and as such total labor costs may not be covered. Please consult with your dealer or service technician for any additional charges such as travel time or additional labor charges that may apply.
24. For parts of the Blaze King woodstove or fireplace insert warranted beyond the first year, the five year limited warranty will have the same obligations as described in this document, provided, however that the purchaser shall pay the following percentage of the then current retail cost of the repair or the replacement, according to the year after purchase in the which the defect is brought to the attention of Blaze King.*** During the 2nd year----purchaser pays 20%. 3rd year ----purchaser pays 40%. 4th year ----purchaser pays 60%. 5th year---- purchaser pays 80%.
25. If a defect or problem is determined by Blaze King to be non warrantable, Blaze King is not liable for travel costs for service work. In the event of in-home repair work, the customer will pay any in-home travel fees or service charges required by the Authorized Dealer.
26. At no time will Blaze King be liable for any consequential damages which exceed the purchase price of the unit. Blaze King has no obligation to enhance or modify any stove once manufactured (example: as a stove model evolves, field modifications or upgrades will not be performed)
27. This Limited Warranty is applicable only to the original purchaser and it is nontransferable.
28. This warranty only covers Blaze King Products that are purchased through an authorized Blaze King dealer.
29. If for any reason any section of the Limited Warranty is declared invalid, the balance of the warranty remains in effect and all other clauses shall remain in effect
30. The Limited Warranty is the only warranty supplied by Blaze King, the manufacturer of the stove. All other warranties, whether express or implied, are hereby expressly disclaimed and the purchaser's recourse is expressly limited to the Limited Warranty.
31. Blaze King and its employees or representatives will not assume any liability for damages, either directly or indirectly, caused by improper usage, operation, installation, servicing or maintenance of this stove.
32. Blaze King reserves the right to make changes without notice. Please complete and mail the warranty registration card and have the installer fill in the installation data sheet in the back of the manual for warranty and future reference
33. Blaze King is responsible for stocking parts for a maximum of seven (7) years after discontinuing the manufacture or incorporation of the item into its products. An exception to this would be if an OEM supplier is not able to supply a part.

INSTALLER NOTES



Installer: Please complete the following information

Dealer Name & Address: _____

Installer (print): _____

Installer (sign): _____

Phone #: _____

Date Installed: _____

Serial No.: _____

Blaze King

ASHFORD AF20.2

SOLID FUEL WOOD CATALYTIC STOVE



U.S. Environmental Protection Agency certified to comply with 2020 particulate emission standards using crib wood.



Installer: Please complete the details on the back cover and leave this manual with the homeowner.

Homeowner: Please SAVE THESE INSTRUCTIONS for future reference.

The authority having jurisdiction (such a municipal building department, fire department, etc.) should be consulted before installation to determine the need to obtain a permit.

OPERATION & INSTALLATION MANUAL

Manufactured By

Valley Comfort Systems Inc., 1290 Commercial Way, Penticton, BC, V2A 3H5, Canada
Phone: 250-493-7444 w Fax: 250-493-5833 w www.blazeking.com w info@blazeking.com

Pour la version française de nos manuels S.V.P. vous référez à notre site web: www.blazeking.com

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⚠ WARNING

- **THIS APPLIANCE IS HOT WHEN OPERATED AND CAN CAUSE SEVERE BURNS IF CONTACTED. ANY CHANGES OR ALTERATIONS TO THIS APPLIANCE OR ITS CONTROLS CAN BE DANGEROUS AND IS PROHIBITED BY FEDERAL AND STATE LAWS.**
- Do not operate appliance before reading and understanding operating instructions. Failure to operate appliance according to operating instructions could cause fire or injury.
- Before installing this appliance, contact the local building or fire authority and follow their guidelines
- This appliance must be installed by a qualified installer.
- Risk of burns. The appliance should be turned off and cooled before servicing
- Do not operate without fully assembling all components.
- Do not let the appliance become hot enough for any part to glow red.
- Do not install damaged, incomplete or substitute components.
- Risk of cuts and abrasions. Wear protective gloves and safety glasses during installation. Sheet metal edges may be sharp.
- Children and adults should be alerted to the hazards of high surface temperature and should stay away to avoid burns or clothing ignition.
- Young children should be carefully supervised when they are in the same room as the appliance. Toddlers, young children and others may be susceptible to accidental contact burns. A physical barrier is recommended if there are at risk individuals in the house. To restrict access to an appliance or appliance, install an adjustable safety gate to keep toddlers, young children and other at risk individuals out of the room and away from hot surfaces.
- Clothing or other flammable material should not be placed on or near the appliance. Objects placed in front of the appliance must be kept a minimum of 48" away from the front face of the appliance.
- Due to high temperatures, the appliance should be located out of traffic and away from furniture and draperie
- Ensure you have incorporated adequate safety measure to protect infants / toddlers from touching hot surfaces.
- Even after the appliance is out, all surfaces, including the glass and/or any attachment will remain hot for an extended period of time.
- Check with your local hearth specialty dealer for safety hearth guards to protect children from hot surfaces. These guards must be fastened to a wall and/or to the floor.
- Any safety guard removed for servicing must be replaced prior to operating the appliance.
- Under no circumstances should this appliance be modified
- This appliance must not be connected to a chimney flue pipe serving a separate solid fuel burning appliance.
- Do not operate the appliance with the glass door removed, cracked or broken. Replacement of the glass should be done by a licensed or qualified service person
- Do not strike or slam shut the appliance glass door.
- Operate only with the doors tightly closed.
- Appliance will over-fire if door is not shut and latched
- Only certified doors / optional fronts / and surrounds for inserts with the unit are to be installed on the appliance.
- Keep the packaging material out of reach of children and dispose of the material in a safe manner. As with all plastic bags, these are not toys and should be kept away from children and infants.
- If the appliance is not properly installed, a house fire may result. Do not expose the appliance to the elements (rain, etc.) and keep the appliance dry at all times.
- The chimney must be sound and free of cracks and obstructions. Clean your chimney regularly as required.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use.
- Your appliance requires periodic maintenance and cleaning. Failure to maintain your appliance may lead to smoke spillage in your home.
- Higher efficiencies and lower emissions will generally result with burning air dried seasoned woods, as compared to wet, green or freshly cut wood. Burning wet unseasoned wood can cause excessive creosote accumulation. When ignited it can cause a chimney fire that may result in a serious house fire
- The appliance is designed to burn seasoned wood only. Do not burn treated wood, coal, charcoal, colored paper, cardboard, solvents or garbage.
- Burn wood directly on the firebricks. Do not use a grate or elevate the fire
- Do not store wood within appliance installation clearances or within the space required for re-fueling and ash removal.
- Ashes must be disposed in a metal container with a tight lid and placed on a non-combustible surface well away from the home or structure until completely cool.

**CALIFORNIA PROPOSITION 65**

WARNING: This product can expose you to chemicals including benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information:

www.P65Warnings.ca.gov

| | |
|----------------------------------|--|
| Model | Ashford 20.2 (catalytic) |
| Height | 30 3/8" (772 mm) |
| Width | 26 3/4" (680 mm) (without removable bypass handle) |
| Depth | 27 1/8" (689 mm) (without optional fan kit) |
| | 28 1/4" (718 mm) (with optional fan kit) |
| Flue collar | 6" I.D. |
| Fire door opening | 15 5/8" x 8" (397 mm x 204 mm) |
| Firebox depth | 16" (407 mm) brick to brick, 18 1/2" (470 mm) brick to glass |
| Firebox width | 17 1/2" (445 mm) |
| Firebox height | 10 3/4" (273 mm) |
| Firebox capacity | 1.8 cu. ft. |
| Recommended Fuel length | 16" max. (407 mm) |
| Wood capacity (approximate): | White oak - 45 lbs. (20.41 kg) |
| | Fir - 30 lbs. (13.61 kg) |
| Construction | 10 gauge & 1/4" firebox, brick line Cast iron outer shell |
| Shipping Weight (Firebox only) | 450 lbs. (205 kg) |
| Chimney recommendation (Minimum) | 15' from stove top to chimney cap: Insulated liner recommended |

This unit was tested and listed UL 1482-11(R2015) and ULC-S627-00 by OMNI-Test Laboratories.

This manual describes the installation and operation of the Ashford AF20.2 catalytic equipped wood heater.

This heater is certified to comply with the 2020 U.S.

Environmental Protection Agency's particulate emission standards using crib wood.

| EMISSIONS | CO Average(%) | g/hr |
|---|---------------|-----------------|
| Low Burn | 0.20 | 0.22 |
| Med-low Burn | 0.14 | 0.58 |
| Med-high Burn | 0.25 | 0.93 |
| High Burn | 0.23 | 1.53 |
| EPA emission rate weighted average | | .73 g/hr |

Under specific test conditions this heater has been shown to deliver heat at rates ranging from 8900 to 29785 Btu/hr.

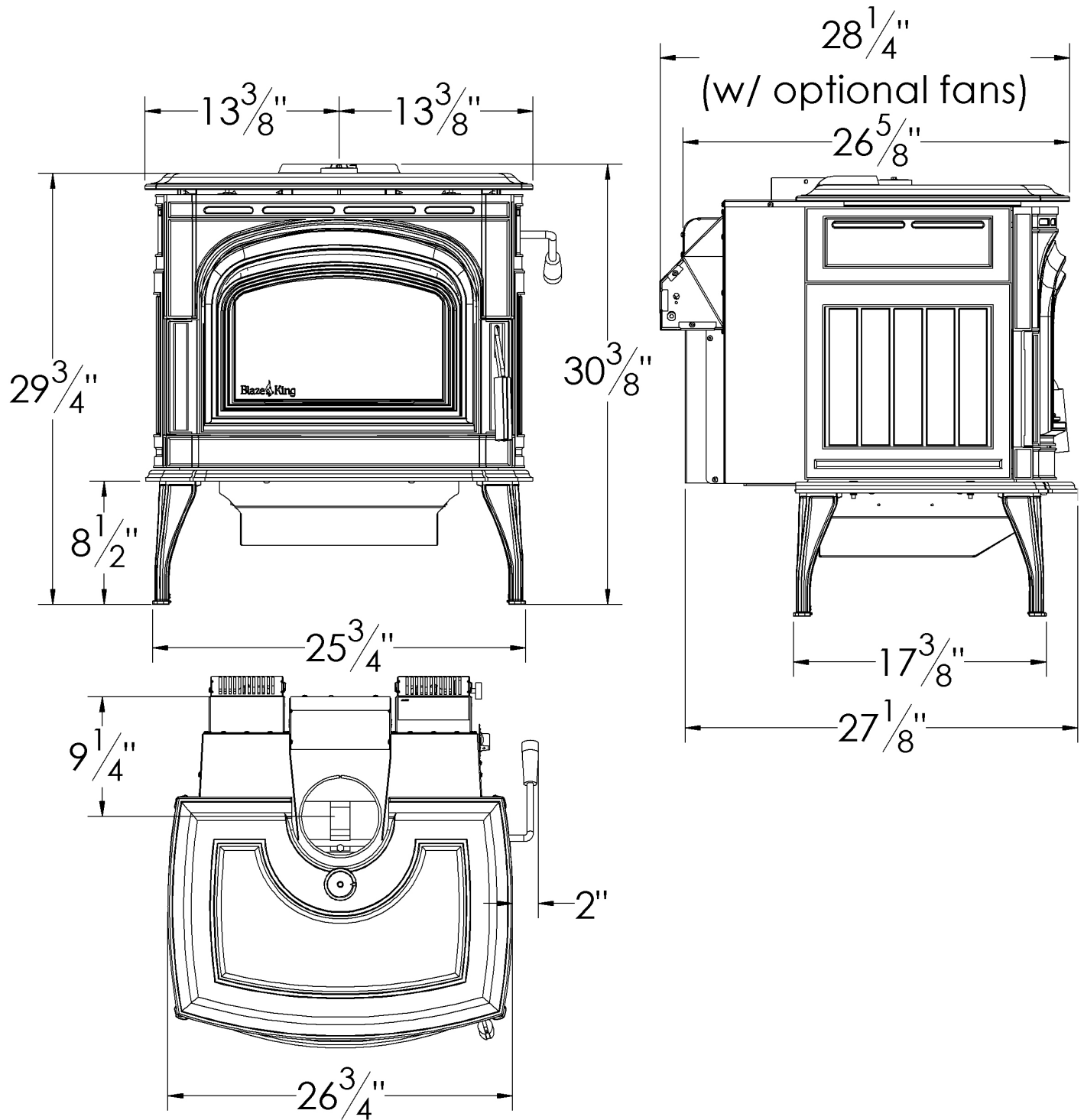
This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.

This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual, or if the catalytic element is deactivated or removed.

The combustor supplied with this heater is either a 115-0336A-M or 115-0556 metal combustor. Consult the catalytic combustor warranty also supplied with this wood heater. Warranty claims should be addressed to:

| in Canada | in USA |
|--|---|
| Blaze King Industries / Valley Comfort Systems Warranty Department, 1290 Commercial Way Penticton, BC Canada V2A 3H5, Ph: 250-493-7444 | Blaze King Industries Warranty Department, 146A Street Walla, Walla, Washington 99362, Ph: 509-522-2730 |

APPLIANCE DIMENSIONS





ASHFORD AF20.2

SN - 25.

BLAZE KING CATALYST STOVE - POÈLE À BOIS CATALYTIQUE

ROOM HEATER, SOLID FUEL TYPE, ALSO FOR USE IN MOBILE HOMES. / APPAREIL APPROUVÉ DE TYPE CARBURANT SOLIDE, AUSSI ADAPTÉ POUR INSTALLER DANS UNE MAISON MOBILE. SUIABLE FOR MOBILE-HOME INSTALLATION. / CONCU POUR MAISONS MOBILES. MODEL / MODÈLE: AF20.2 Tested to / Testé: UL 1482-11(R2015) / ULC S627-00 CERTIFIED IN BOTH UNITED STATES AND CANADA / CERTIFIÉ POUR LES ÉTATS-UNIS ET LE CANADA

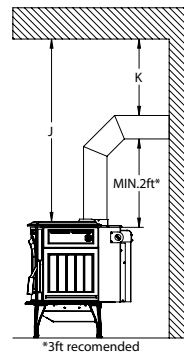
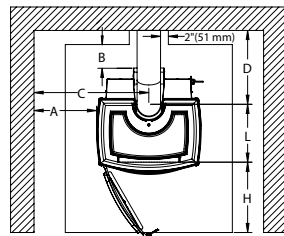
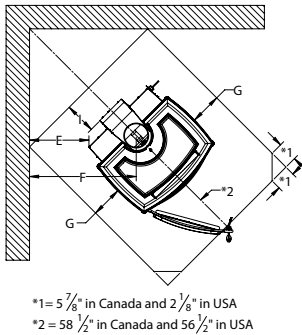
PREVENT HOUSE FIRES - Install and use only in accordance with Blaze King's installation and operation instructions. Contact local building or fire officials about restrictions and installation inspection in your area. The flue size is 6".
CHIMNEYS: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE. Except for installation detailed below, use 6" listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA or a masonry residential type chimney.
 Mobile Home, residential close clearance, and residential alcove installations require a 6" listed double wall close clearance chimney connector, with matching listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA. Mobile Home installations are only allowed with a roof exit.
 Do not install in a sleeping room. Passing through a wall or ceiling requires special methods: see instructions and local building codes.

POUR PRÉVENIR UN INCENDIE - Installer et employer seulement selon le manuel d'installation de Blaze King. Contacter les autorités locales en bâtiments ou en matière de prévention d'incendies au sujet des normes d'inspection et d'installation dans votre secteur. La dimension des conduits de cheminée est de 6".
CHEMINÉE: NE PAS CONNECTER CETTE UNITÉ À UNE CONDUITE DE CHEMINÉE SERVANT UN AUTRE APPAREIL. Excepté pour les situations détaillées ci-dessous, employer une cheminée de 6" homologuée par le fabricant à des fins d'utilisation pour combustibles solides conformément à la norme ULC629 au Canada ou UL-103HT aux États-Unis ou employer une cheminée en maçonnerie de type résidentiel. L'installation dans une maison mobile, en espace restreint ou dans des endroits à faible dégagement, requiert l'utilisation de connecteurs muraux à doubles parois et ayant une épaisseur 6" pour la cheminée.
 Ceux-ci doivent être homologués par le fabricant à des fins d'utilisation pour combustibles solides conformément à la norme ULC629 au Canada ou UL-103HT aux États-Unis. L'installation dans une maison mobile est permise seulement avec une sortie passant par le toit.
 Ne pas installer dans une chambre à coucher. Passer à travers un mur ou un plafond requiert une méthode spécifique décrite dans les instructions et dans le code local du bâtiment.

MINIMUM CLEARANCES TO COMBUSTIBLES (See owners manual for complete description of all requirements)
DÉGAGEMENTS MINIMUM AUX COMBUSTIBLES (voir les directives d'installation pour la description complète de toutes les conditions)

| Residential Installations / Installations Résidentielles | A | B | C | D | E | F | J |
|--|------------------|----------------|-------------------|-------------------|--------------|-------------------|---------------|
| Roof exit, parallel and corner. Sortie de toit, parallèle et coin. | 12.75" 324 mm | 6.5" 166 mm | 26.125" 664 mm | 15.875" 404 mm | 6" 153 mm | 18.125" 461 mm | 37" 940 mm |
| Wall exit, parallel and corner. Sortie de mur, parallèle et coin. | 12.75" 324 mm | 6.5" 166 mm | 26.125" 664 mm | 15.875" 404 mm | 6" 153 mm | 18.125" 461 mm | 37" 940 mm |
| Alcove roof exit. Fan kit required. Sortie de toit en alcôve. Kit de ventilateur requis. | 12.75" 324 mm | 6.5" 166 mm | 26.125" 664 mm | 15.875" 404 mm | | | 37" 940 mm |
| Mobile Home Installations / Installation pour Maison Mobile | | | | | | | |
| Roof exit, parallel and corner. Fan kit and outside air kit required. Sortie de toit, parallèle et en coin. Kit de ventilateur et kit d'air extérieur requis. | 12.75" 324 mm | 6.5" 166 mm | 26.125" 664 mm | 15.875" 404 mm | 6" 153 mm | 18.125" 461 mm | 37" 940 mm |

*Check with local codes and pipe manufacturers for pipe clearances. In Canada 18" clearances from single wall pipe is required.
 *Vérifier avec le code du bâtiment local et avec le fabricant de tuyaux pour les dégagements. Au Canada un dégagement de 18 po est exigé pour un tuyau à simple paroi.



- G - 2 5/8" (67 mm) in U.S.A.
8" (203 mm) in Canada
 - H - 16" (406 mm) in U.S.A.
18" (456 mm) in Canada
 - I - 0" (0 mm) in U.S.A.
8" (203 mm) in Canada
 - K - 18" (456 mm) *
- ALCOVE
 min. width / min. largeur 52"
 max. depth / min. profondeur 48"
 min. height above stove top / hauteur min. au-dessus du poêle 37"

Floor protection may be any non-combustible material or Listed Floor Protector, and must extend at least 18" (456 mm) in Canada or 16" (406 mm) in U.S.A., in front of the loading door opening: In USA, minimum size is 32" x 40 1/8" (813 mm x 1019 mm)
 In Canada, minimum size is 42 3/4" x 50 1/8" (1086 mm x 1273 mm)

US ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using crib wood. (EPA test methods 28R/5G with an emission-rate of .73 g/hr). 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 operating instructions in the owner's manual, or if the catalytic element is deactivated or removed.

*ONLY OPERATE WITH DOORS CLOSED. Open door to feed fire ONLY. *DO NOT OBSTRUCT COMBUSTION AIR OPENINGS. Do not obstruct the space beneath the heater. For Use with solid wood fuel only - do not burn other fuels, this may make the catalyst in the combustor inactive. The performance of the catalytic device or its durability has not been evaluated as part of the certification. Combustor part number: 115-0336A-M or 115-0556. Provide adequate outside air for combustion. *Replace with only ceramic glass, 5 mm. Thickness. WARNING: This wood heater must be installed with the legs secured and attached to the stove as shown in the installation instructions.

La protection de plancher peut être de n'importe quel matériel non combustible ou Protecteur de plancher approuvé, et doit se prolonger au moins de 18" (456 mm) au Canada ou 16" (406 mm) aux États-Unis devant la porte de chargement: Aux États-Unis, la taille minimum est de 32" x 40 1/8" (813 mm x 1019 mm)
 Au Canada la taille minimum est 42 3/4" x 50 1/8" (1086 mm x 1273 mm)

L'AGENCE DE PROTECTION ENVIRONNEMENTALE DES U.S. - Certifié conformément aux normes d'émission de particules 2020, en utilisant du bois machiné (méthodes d'essai EPA 28R / 5G, ASTM E2715 et ASTM E2780, avec un taux d'émission de 0.73 g / hre). Cet appareil de chauffage au bois nécessite des inspections périodiques et des réparations pour un fonctionnement adéquat. Consulter le manuel du propriétaire pour plus d'informations. Il est contre les règlements fédéraux de faire fonctionner cet appareil de chauffage à l'encontre des instructions d'utilisation fournies dans le manuel du propriétaire, ou si l'élément catalytique est enlevé ou désactivé.
 *Utiliser le uniquement avec des portes fermées. Ouvrir la porte pour alimenter le feu SEULEMENT. *Ne pas obstruer l'entrée d'air de combustion. Fournir l'apport d'air extérieur adéquat pour alimenter la combustion. Ne pas obstruer l'espace sous l'appareil. Utiliser uniquement avec des combustibles solides - ne pas brûler aucun autre combustible, ce qui peut rendre le catalyseur de la chambre à combustion inactif. La performance du catalyseur ou sa longévité n'a pas été évaluée dans le cadre de la certification. Numéro du catalyseur: 115-0336A-M ou 115-0556. *Employer seulement le verre en céramique d'une épaisseur de 5mm si le remplacement est nécessaire. Attention: Ce poêle à bois doit être installé avec les pieds de support attachés et fixés au poêle tel que montré dans les instructions d'installation.

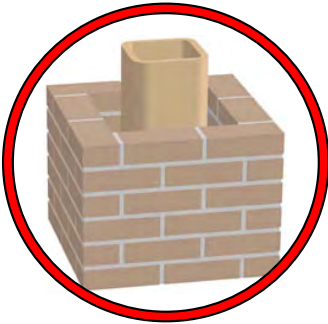
MANUFACTURED IN
 USA: Blaze King Industries
 146A Street
 Walla Walla, WA.
 99362
 CANADA: Valley Comfort Systems
 1290 Commercial Way
 Penticton, B.C.
 V2A 3H5

MANUFACTURE DATE
 JAN FEB MAR APR MAY JUN
 JUL AUG SEP OCT NOV DEC
 2019 2020 2021 2022 2023 2024

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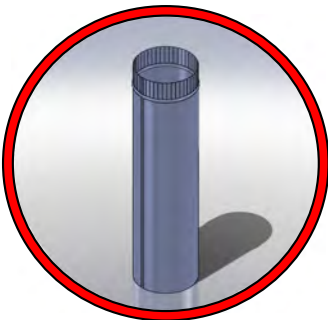
IF THIS BLAZE KING APPLIANCE IS NOT PROPERLY INSTALLED OR OPERATED, A HOUSE FIRE MAY RESULT. TO REDUCE THE RISK OF FIRE, FOLLOW THE INSTALLATION INSTRUCTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW APPLIANCE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.



This appliance must be connected to a listed high temperature (**ULC629 IN CANADA OR UL-103HT IN THE USA**) residential type factory built solid fuel chimney or an approved masonry chimney with a flue line .

Chimney and chimney connector must be in good condition and kept clean.
NEVER vent the stove to other rooms of the building. Must be vented to the outside **ONLY**.
NEVER use a chimney or chimney connector smaller than the stove exhaust, unless approved by your local inspector.
NEVER vent the stove into a "Class B" gas vent chimney.
DO NOT CONNECT IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.



Inspect the chimney connector and chimney regularly during each burning season and clean when necessary.

DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

NEVER intentionally start a chimney fire to clean the flu



When installed in a mobile home, this appliance must be bolted to the floor and provided with outside air.

WARNING: DO NOT INSTALL IN A SLEEPING ROOM
CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.

Check with local building official



If the Optional Fan Kit is installed, connect this unit to a properly grounded, 110-volt electrical outlet. Do not route the power cord in front of or under the appliance.



Do not make any changes or modifications to an existing masonry fireplace or chimney to install this appliance. Do not make any changes to the appliance to increase combustion air.



Never try to repair or replace any part of this appliance unless instructions are given in this manual. All other work must be done by a trained technician.



Do not place clothing or other flammable items on or near this appliance.



Allow the appliance to cool down before carrying out any maintenance or cleaning.



DO NOT OVER FIRE THIS HEATER. Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater and to the catalytic combustor. Over firing the appliance may cause a house fire. Never burn the appliance so hot that the appliance or chimney connector begins to glow.



Maintain the door and glass seal and keep them in good condition. A leaking door seal will shorten burn times and may harm the combustor.

Avoid placing wood against the glass when loading. Do not slam the door or strike the glass.



Do not use a grate or other device to elevate the fire off of the firebox floor. Burn the fire directly on the bricks.



Do not throw this manual away. This manual has important operating and maintenance instructions that you will need at a later time. Always follow the instructions in this manual.



Ashes should be placed in a steel container with a tightly fitting lid and moved outdoors immediately. 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. Other waste shall not be placed in this container.



It is required in some jurisdictions to install smoke and carbon monoxide detectors where heaters are installed. Install at least one smoke detector on each floor of your home to ensure your safety. It should be located away from the wood appliance and close to the sleeping areas. Locating a smoke detector too close to a wood appliance can cause the smoke detector alarm to sound if a puff of smoke is emitted while the wood appliance door is open during reloading. Follow the smoke detector manufacturers placement, installation, and maintenance instructions.

SAFETY PRECAUTIONS

This appliance is designed and approved for burning cord wood only. DO NOT burn trash, garbage; artificial or paper logs; gift wrappings; coal; lighter fluids; chemical cleaners chemical starters; treated or painted wood; salt water driftwood or foil-backed paper such as gum wrappers or cigarette packages; lawn clippings or yard waste; materials containing rubber (including tires), plastic, asbestos; waste petroleum products, paints or paint thinners, or asphalt products; construction or demolition debris; railroad ties or pressure-treated wood; manure or animal remains; unseasoned wood or paper products, cardboard, plywood, or particleboard. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected wood heat. Burning these materials may result in the release of toxic fumes or render the heater ineffective and cause smoke. Burn natural wood only. It will void all warranties and safety listings and may damage the combustor.



Never burn the appliance with the loading door open. Leaving the door cracked open may damage the combustor.



Never block free airflow through vents on this appliance.



Do not use chemicals or fluids to start the fire. Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. Some fuels could generate carbon monoxide and are very dangerous.

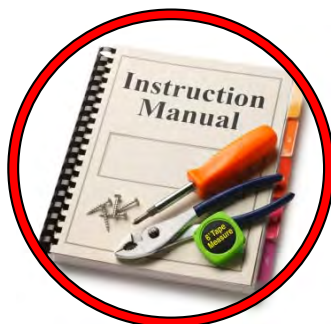
HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.

Do not touch the appliance when it is hot and educate all children of the danger of a high temperature appliance. Young children should be supervised when they are in the same room as the appliance.



Keep furniture, curtains, wood, paper and other combustibles a minimum of 48in (1219mm) away from the front of the appliance. ALSO, DO NOT STORE COMBUSTIBLES UNDER THE APPLIANCE (WOOD, PAPER etc.).

This appliance must be properly installed to prevent the possibility of a house fire. The instructions must be strictly adhered to. Do not use makeshift methods or compromise in the installation.



Contact local building official to obtain a permit and information on any installation restriction or inspection requirements in your area. Notify your insurance company as well.

⚠ WARNING

- BEFORE INSTALLING THIS APPLIANCE, CONTACT THE LOCAL BUILDING OR FIRE OR OTHER AUTHORITY HAVING JURISDICTION AND FOLLOW THEIR GUIDELINES.
- THIS APPLIANCE MUST BE INSTALLED BY A QUALIFIED INSTALLER. FOLLOW THE INSTALLATION DIRECTIONS. DO NOT OPERATE WITHOUT FULLY ASSEMBLING ALL COMPONENTS.
- IF THIS APPLIANCE IS NOT PROPERLY INSTALLED, A HOUSE FIRE MAY RESULT.
- THIS APPLIANCE IS HOT WHEN OPERATED AND CAN CAUSE SEVERE BURNS IF CONTACTED. CHILDREN AND PETS MUST BE KEPT FROM TOUCHING THE APPLIANCE WHEN IT IS HOT.
- COMBUSTIBLE MATERIAL SUCH AS FIRE WOOD, WET CLOTHING, ETC. PLACED TOO CLOSE CAN CATCH FIRE. OBJECTS PLACED IN FRONT OF THE APPLIANCE MUST BE KEPT A MINIMUM OF 48”(1219 MM) FROM THE FRONT OF THE APPLIANCE.

Blaze King grants no warranty, implied or stated, for the installation or maintenance of the appliance and assumes no responsibility of any consequential damage(s).

**PARTS INCLUDED WITH THE ASHFORD**

| | |
|----|--|
| 1. | Poker |
| 2. | Manual kit (w/ warranty cards, thermometer, bypass handle) |

OPTIONAL EQUIPMENT

| | | | |
|----|------------------------------|----|-------------------------------|
| 1. | Fan Kit (S.Z2814) | 2. | Side Shelf (S.Z2853) |
| 3. | 4" Outside Air Kit (S.Z1726) | 4. | 3" Outside Air Kit (S.Z1726B) |

FLOOR PROTECTION

If the stove sits on a combustible floor, a non-combustible shield must be used underneath the stove and extending 16" out from the front and 8" on either side of the fuel-loading door in the USA. In Canada a non-combustible shield must be used underneath the stove and extending 8" on either side and rear and 18" out in front of the loading door.

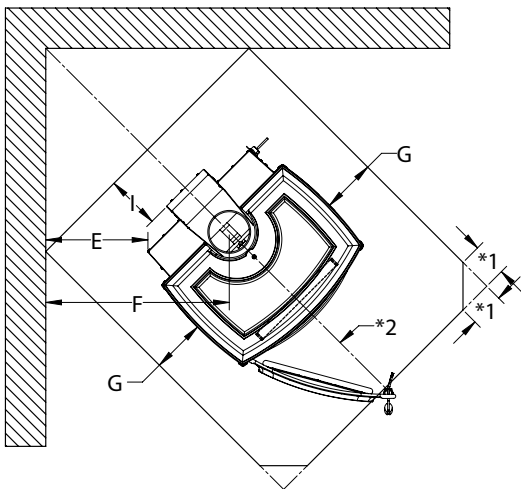
A non-combustible shield is also required underneath the chimney connector and extending at least 2" (50.8mm) on either side of the chimney connector.

See the next page for minimum sizes depending on model. This floor protection is required to prevent sparks from falling onto the combustible floor. See CSA B365-M87. **This product does not require thermal hearth pad protection.**

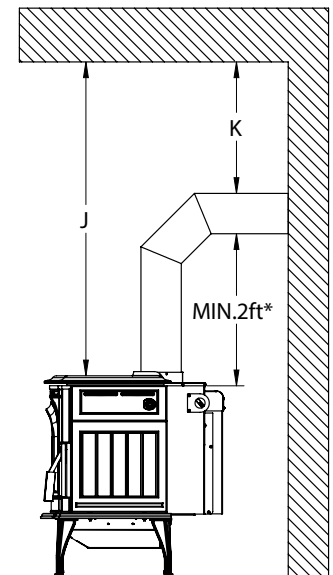
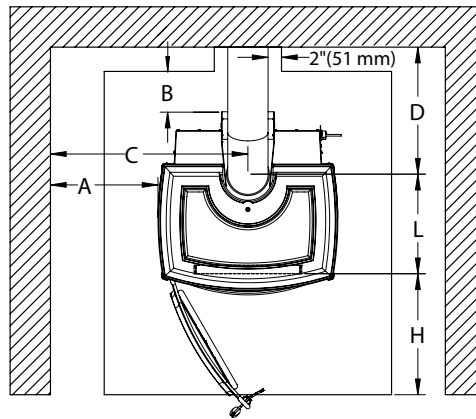
MINIMUM CLEARANCES for AF20.2

| Residential Installations | A | B | C | D | E | F | J |
|---|------------------|----------------|-------------------|--------------------|--------------|--------------------|----------------|
| Roof exit, parallel and corner. | 12.75" 324 mm | 6.5" 166 mm | 26.125" 664 mm | 15.875** 404 mm | 6" 153 mm | 18.125** 461 mm | 37" 940 mm |
| Wall exit, parallel and corner. | 12.75" 324 mm | 6.5" 166 mm | 26.125" 664 mm | 15.875** 404 mm | 6" 153 mm | 18.125** 461 mm | 37** 940 mm |
| Alcove, roof exit. Fan kit required. | 12.75" 324 mm | 6.5" 166 mm | 26.125" 664 mm | 15.875** 404 mm | | | 37" 940 mm |
| Mobile Home Installation | | | | | | | |
| Roof exit, parallel and corner. Fan kit and outside air kit required. | 12.75" 324 mm | 6.5" 166 mm | 26.125" 664 mm | 15.875** 404 mm | 6" 153 mm | 18.125** 461 mm | 37" 940 mm |

*** Check with local codes and pipe manufacturer for pipe clearances. In Canada, 18" clearances from single wall pipe is required. Clearances may only be reduced by means approved by the regulatory authority**



*1 = 5 7/8" in Canada and 2 1/8" in USA
 *2 = 58 1/2" in Canada and 56 1/2" in USA



| | | | |
|--|---|---|--|
| G = 2 5/8" (67mm) in USA 8" (203mm) in Canada | H = 16" (406mm) in USA 18" (456mm) in Canada | I = 0" (0mm) in USA 8" (203mm) in Canada | K = 18" (456mm) for single wall pipe in Canada |
|--|---|---|--|

Ember protection shield (not required to have an insulation value)
 is to be listed under UL 1618-2009 (type 1) and must have a minimum size of:

In USA: 32" x 40 1/8" (813 x 1019 mm)
 In Canada: 42 3/4" x 50 1/8" (1086 x 1273 mm)

Min. Alcove minimum width 52", maximum depth 48", minimum height above stove top 37"

This stove must be installed in compliance with all local codes and regulations.

COMBUSTION AIR

Ensure adequate combustion air allowing for all other exhausting type appliances in the dwelling (range hoods, dryers, etc.). In air tight homes and modern constructions, careful considerations must be taken into account when using a wood burning appliance. Heat recovery ventilators (HRV) systems along with constant running fan motors in air handlers must be taken into account when balancing the system. Failure to do so may result in air starvation, smoke spillage and carbon monoxide threats. Consult a HVAC specialist for proper installation. Ensure adequate combustion air allowing for all other exhausting type appliances in the dwelling (range hoods, dryers, etc.). In airtight houses it is recommended to install a fresh air inlet into the room where the appliance is located, to prevent air starvation.

DRAFTING PERFORMANCE

Draft is the force which moves air into the appliance up through the chimney. The amount of draft created by your chimney depends upon length, offsets, insulating properties, obstructions (such as architectural design, trees), local geography and other factors.

External forces, such as outdoor temperature, wind, barometric pressure, topography, or factors inside the home (negative pressure from exhaust fans, chimneys, air infiltration, etc) may adversely affect draft. Too much draft may cause excessive temperatures in the appliance and may damage the heater. An uncontrollable burn or excessive temperature indicates excessive draft.

Inadequate draft may cause back puffing (spillage) into the room and plugging of the chimney, chimney cap or spark arrestor screen. Inadequate draft may cause smoke to leak into the room through appliance or chimney connector joints. Poor draft can also lead to poor heat production and the inability for the combustor to remain active in lower burn rate settings.

High efficiency appliances, such as your Blaze King stove, may require some fine tuning of your chimney system in order to maximize performance.

Blaze King cannot be responsible for external forces leading to less than optimal performance.

ROLE OF THE CHIMNEY

Without a proper installed chimney, this appliance will not burn correctly.

The role of the chimney is to pull the proper amount of air into the firebox for the purpose of complete combustion. Incomplete combustion will lead to more smoke and pollution of the outside air. A proper operating chimney will allow the user to enjoy peak performance at all burn operating levels from low to high. Blaze King therefore recommends vertical installations with a minimum length of 15' from stove top to chimney cap. In all freestanding stove installations, use double wall stove pipe from the stove top to the ceiling support box. The use of double wall stove pipe does allow for reduced clearances, however most importantly, it helps to keep the chimney warm and improve draft.

For wall exits, the same suggestion applies. With the addition of the recommendation to use two 45 degree elbows rather than a single 90 degree elbow. The use of two 45 degree elbows will allow for both a smoother transition to the exterior chimney and will also shorten the horizontal run to the outside chimney. A minimum 36" rise is recommended prior to any elbows being used. When possible, outside chimney systems should be isolated from direct exposure to winter weather by building a chase around the chimney, observing all clearances as specified by the venting manufacture. Doing so will help to keep the chimney warmer and improve draft. (see **RECOMMENDED FLUE HEIGHTS**)

VENTING SYSTEMS

The venting system consists of a chimney connector and a chimney. These get extremely hot during use. Temperatures inside the chimney may exceed 2000 degrees in the event of a creosote fire. To protect against the possibility of a house fire, the chimney connector and chimney must be properly installed and maintained. A listed thimble must be used when a connection is made through a combustible wall to a chimney. A chimney support package must be used when a connection is made through the ceiling to a listed prefabricated chimney. These accessories are absolutely necessary to provide safe clearances to combustible wall and ceiling material.

This stove may be connected to a lined masonry chimney or a listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA. Do not connect it to a chimney serving another appliance. To do so will affect the safe operation of both appliances, and will void the stove warranty. You must comply with the local authority having jurisdiction and/or in Canada, CSA installation standard B365-M87.

The chimney connector must be 6" diameter, 24 MSG Black/Blue steel. Do not use aluminum or galvanized steel. They cannot properly withstand the extreme temperatures of a wood fire. The chimney connector between the stove and the chimney should be as short and direct as possible.

The chimney connector must be attached to either an approved masonry chimney or one of the listed factory built chimneys suitable for use with solid wood fuel. All joints must be tight and fastened with sheet metal screws.

 WARNING

THE CHIMNEY CONNECTOR IS TO BE USED ONLY WITHIN THE ROOM, BETWEEN THE STOVE AND CEILING / WALL. NEVER USE A CHIMNEY CONNECTOR TO PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. AN EFFECTIVE VAPOR BARRIER MUST BE MAINTAINED AT THE LOCATION WHERE THE CHIMNEY OR COMPONENT PENETRATES TO THE EXTERIOR OF THE STRUCTURE. ALWAYS MAINTAIN THE MINIMUM CLEARANCES TO COMBUSTIBLES AS REQUIRED BY THE APPLICABLE BUILDING CODES.

INSTALLATION INSTRUCTIONS

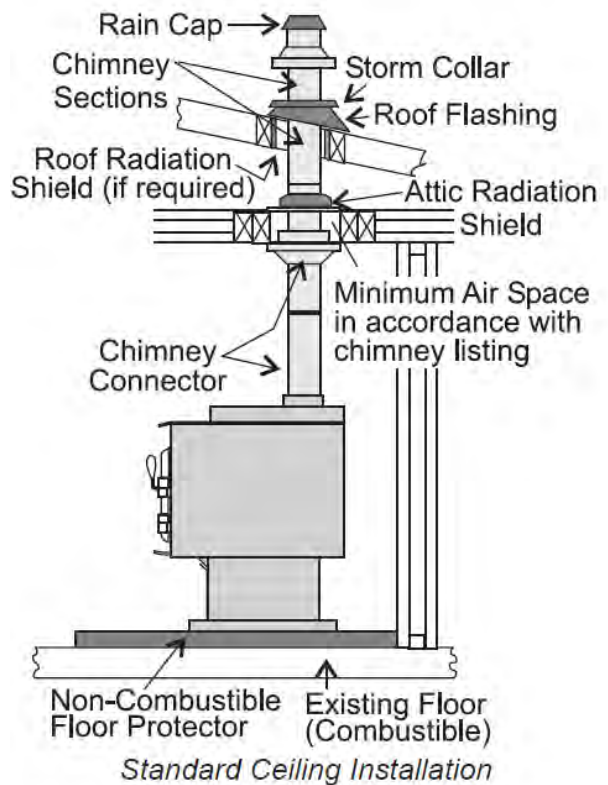
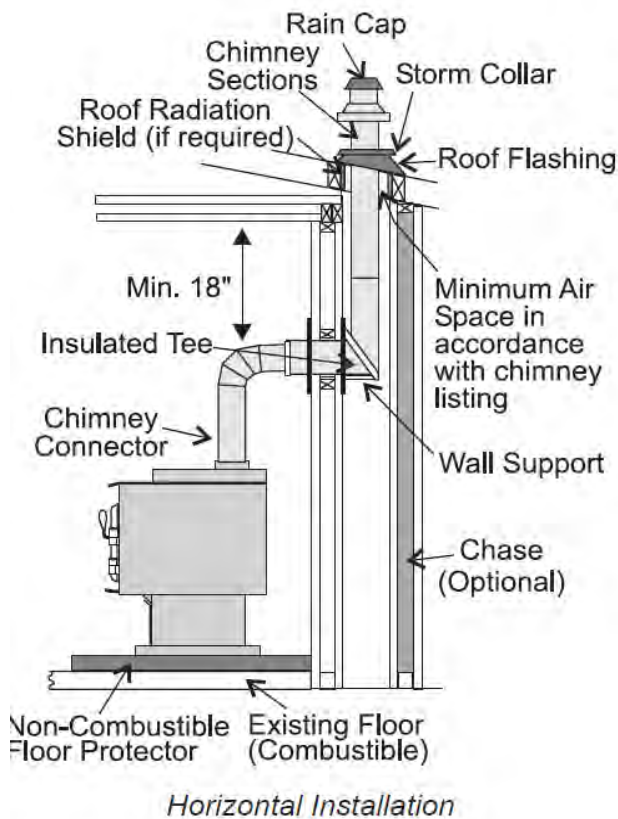
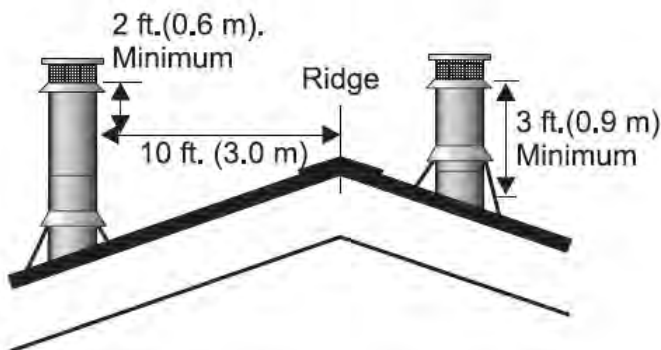
CONNECTION TO A METAL PREFABRICATED CHIMNEY

Refer to “**RECOMMENDED FLUE HEIGHTS**” chart for minimum flue height recommendations and ULC629 in Canada or UL-103HT in the USA for installation codes. When a metal prefabricated chimney is used, the manufacturer’s installation instructions must be followed precisely. You must also purchase (from the same manufacturer) and install the ceiling support package or wall pass through and “T” section package, fire stops (when needed), insulation shield, roof flashing, chimney cap, etc. Maintain the proper clearance to the structure as recommended by the manufacturer. This clearance is usually a minimum of 2 inches, although it may vary by manufacturer or for certain components.

There are basically two methods of metal chimney installation. One method is to install the chimney inside the residence through the ceiling(s) and the roof. The other method is to install an exterior chimney that runs up the outside of the residence (**not recommended**). If it is necessary to run the chimney outside, build an outside chase around the chimney.

The chimney must be the required height above the roof or other obstruction for safety and for proper draft

operation. The requirement is that the chimney must be at least 3 feet higher than the highest point where it passes through the roof and at least 2 feet higher than the highest part of the roof or structure that is within 10 feet of the chimney, measured horizontally (**Fig. 1**). The height requirement is necessary in the interest of safety and does not necessarily assure proper flue draft. Use a minimum total system height of 15 feet, measured from the stove flue collar to the top of the chimney, not including the chimney cap.



CONNECTION TO A MASONRY CHIMNEY

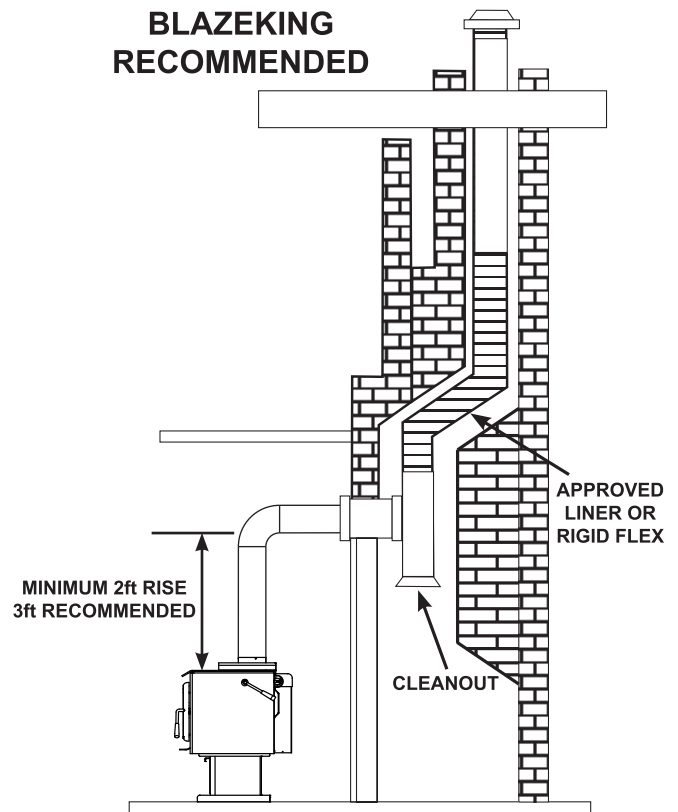
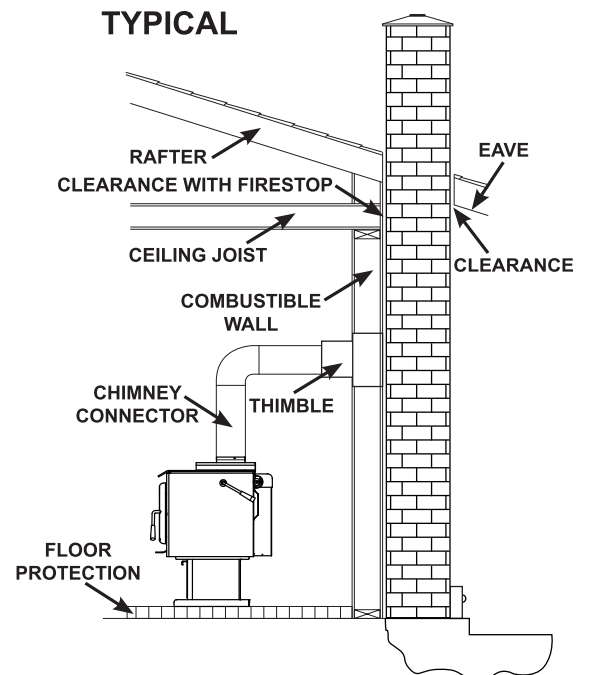
Masonry chimney***

Ensure that a masonry chimney meets the minimum standards (NFPA) by having it inspected by a professional. Make sure there are no cracks, loose mortar or other signs of deterioration and blockage. Have the chimney cleaned before the stove is installed and operated. When connecting the stove through a combustible wall to a masonry chimney, special methods are needed.

In Canada, the wall cut away is to provide 18" clearance for the connector. The resulting space must remain empty. A flush mounted sheet metal cover may be used on one side only. If covers are to be used on both sides, each cover must be mounted on noncombustible spacers at least 1" clear of the wall.

*****Blaze King recommends the use of a Stainless steel liner, preferably insulated, inside a masonry chimney. This is to maintain proper draft and overall better operation of the unit.**

Your local dealer or local jurisdiction can provide details of approved methods of passing a chimney connector through a combustible wall in your area. In USA, the National Fire Protection Association has minimum standards to comply with. In Canada, this type of installation must conform to CAN/CSA-B365, Installation Code for Solid Fuel Burning Appliances and Equipment.



RECOMMENDED FLUE HEIGHTS

- At sea level the minimum height is a 15 ft (4.6 m) straight run.
- Add the following vertical height to the flue to compensate for
 - 45° elbow = 1.0 ft (.30 m)
 - 90° elbow = 2.0 ft (.61 m)
 - "T" section = 3.0 ft (.91 m)
- Each foot of horizontal run = 2 ft (.61 m) of vertical rise.

Example: One 90° elbow = 2ft (.61 m)
 2ft Horizontal run = 4ft (1.2 m)
 One base "T" = 3ft (.91 m)
 Total height addition = 9ft (2.7 m) at sea level

| MINIMUM RECOMMENDED FLUE HEIGHT | | | | |
|---|------------------|---------------|---------------|---------------|
| ELEVATION ABOVE SEA LEVEL | NUMBER OF ELBOWS | | | |
| | 0 | 2 X 15° | 2 X 30° | 2 X 45° |
| 0 - 1000 ft 0 - 305 m | 15 4.6 m | 16 4.9 m | 18 5.5 m | 19 5.8 m |
| 1000 - 2000 ft 305 - 610 m | 15.5 4.7 m | 16.5 5.0 m | 18.5 5.6 m | 19.5 5.9 m |
| 2000 - 3000 ft 610 - 914 m | 16 4.9 m | 17 5.2 m | 19 5.8 m | 20 6.1 m |
| 3000 - 4000 ft 914 - 1219 m | 16.5 5.0 m | 17.5 5.3 m | 19.5 5.9 m | 20.5 6.2 m |
| 4000 - 5000 ft 1219 - 1524 m | 17 5.2 m | 18 5.5 m | 20 6.1 m | 21 6.4 m |
| 5000 - 6000 ft 1524 - 1829 m | 17.5 5.3 m | 18.5 5.6 m | 20.5 6.2 m | 21.5 6.6 m |
| 6000-7000 ft 1829 - 2134 m | 18 5.5 m | 19 5.8 m | 21 6.4 m | 22 6.7 m |
| 7000 - 8000 ft 2134 - 2438 m | 18.5 5.6 m | 19.5 5.9 m | 21.5 6.6 m | 22.5 6.9 m |
| NOTE: No more than one offset (two elbows allowed). Two 45° elbows equal one 90° elbow | | | | |

Please note: These are only guidelines. Please refer to the section in the manual pertaining to draft. Every installation is unique and can be influenced by topographical and geographical phenomena. The use of a manometer and an understanding of pressure planes and the stack effect are imperative in planning and executing a successful installation.

MOBILE HOME (AND RESIDENTIAL ALCOVE INSTALLATIONS)

Requires outside air kit and fan kit. (See next page for kits and part numbers). The outside air kit is easiest to mount before the stove is installed. See instructions packed with each kit.

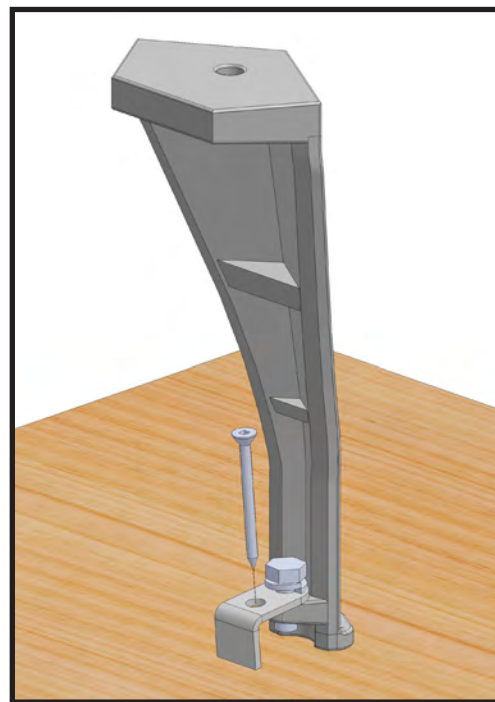
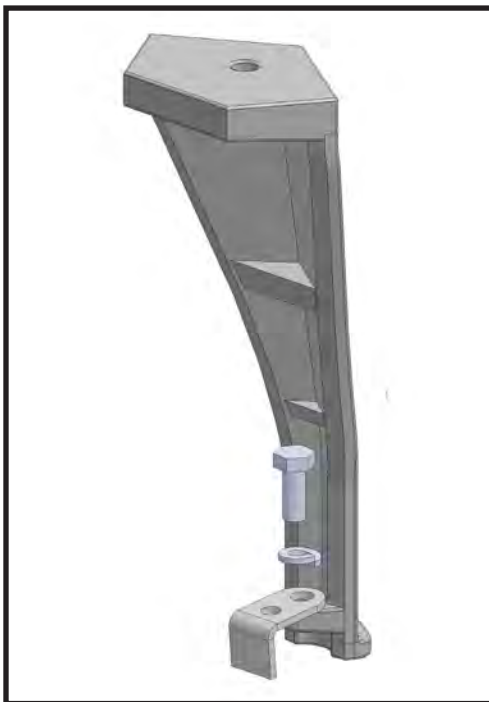
NOTE: UNDER NO CIRCUMSTANCES SHOULD THE FRESH AIR TUBE EVER BE INSTALLED HIGHER THAN THE BOTTOM OF THE APPLIANCE FIREBOX FLOOR.

When a metal prefabricated chimney is used, the manufacturer's installation instructions must be followed precisely. You must also purchase (from the same manufacturer) and install the ceiling support package, fire stops (when needed), insulation shield, roof flashing, chimney cap, etc. Maintain the proper clearance to the structure as recommended by the manufacturer.

The Chimney connector must be a listed double wall close clearance type. Insulated chimney components must be a listed factory built chimney suitable for use with solid fuels and conforming to ULC629 in Canada and UL-103HT in the USA. Single wall stove pipe is not allowed in mobile homes or alcove installations. For mobile home, the chimney needs to be removable to allow for transportation of the mobile home.

⚠ WARNING

DO NOT INSTALL IN SLEEPING ROOM. THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL AND CEILING / ROOF MUST BE MAINTAINED.



In mobile home installations, the stove must be securely fastened to the floor using the tie-downs provided in the outside air kit. Use the leg anchor kit (Z2872) to secure stove to floor . ALSO, a #8 ground wire must be attached to the stove and an appropriate ground.

OPTIONAL ACCESSORIES

Outside air kit or fan kit are optional accessories, but are required for the following installations:

MOBILE HOME INSTALLATION — Requires outside air kit and fan kit

RESIDENTIAL ALCOVE — Requires fan kit

FAN KIT (Z2814)

The fan kit is REQUIRED FOR:

MOBILE HOME, any installation

RESIDENTIAL ALCOVE

NOTE: Fan kit should be installed before the stove is placed into position.

INSTALLATION: See instructions included with fan kit. Tools needed: Square (Robertson no. 2) screw driver and a 5/32" allen wrench.

ELECTRICAL CONNECTION

Your Blaze King fan kit is equipped with a three-prong (grounded) plug to decrease shock hazard.

THIS PLUG SHOULD BE INSERTED DIRECTLY INTO A PROPERLY-GROUNDED, THREE-HOLE RECEPTACLE. DO NOT CUT OR REMOVE THE GROUNDING PRONG FROM THIS PLUG. Do not route the power cord in front or under the stove.

OUTSIDE AIR KIT (S.Z1726 or S.Z1726B)

REQUIRED FOR: MOBILE HOME (any installation)

The outside air inlet is a flexible tube to bring outside air for combustion into the stove from outside the residence, through the wall or up through the floor. The flexible tube will allow some adjustment over or around floor joists or plumbing. **DO NOT CHANGE THE STRUCTURAL INTEGRITY OF THE FLOOR.**

THE FRESH AIR TUBE AND OUTSIDE INLET SHOULD NEVER BE ABOVE THE BOTTOM LEVEL OF THE FIREBOX. This air tube must be kept open at all times to provide outside air for combustion.

INSTALLATION:

See instructions included with the outside air kit. Tools needed: 1/4" or 3/8" drill motor, saber saw, saber saw wood & metal blades, 5/16" nut driver or wrench, 7/16" wrench, small tube of hi-heat silicone.

DOOR INSTALLATION AND CHANGE-OUT (Z2910BK)

To install the door assembly or to change it out, follow these steps:

WARNING: CAST PARTS ARE HEAVY, PLEASE HOLD FIRMLY.

REMOVAL

1. Remove catalytic thermometer and cast top from stove. **(Fig A)**
2. Remove left and right cast sides from stove by lifting up and out from hangers. **(Fig B)** If necessary use a 7/16" wrench to loosen the top two bolts that secure the cast sides to the firebox
3. Remove the Cast iron front and door: This operation requires two people as the cast iron front is large and heavy. Loosen four 1/4-20 hex bolts and 1/4" spacer washers. **(Fig C)** Use a 1/2" wrench. Have an assistant support the front then remove the bolts and washers

INSTALLATION

Perform the above tasks in reverse order.



Fig A



Fig B

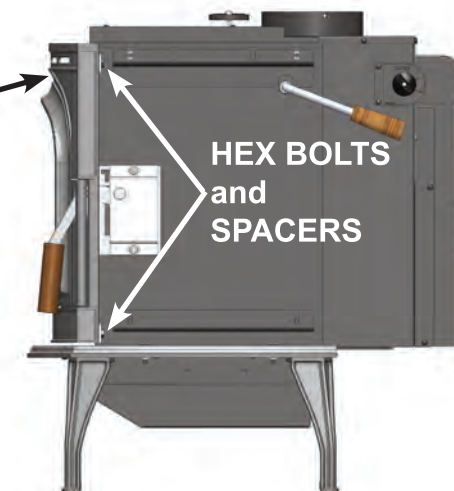
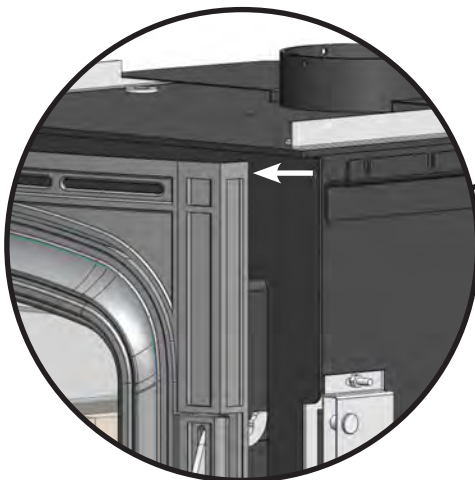


Fig C

YOUR FIRST FIRE!

The following pages contain information on the operation of the major components on your Blaze King appliance. Please take the time to read through this section as it will give you a better understanding of how your appliance works. This understanding will help you to operate your appliance at its optimum level thus extended its life while allowing you to get the highest efficiencies from your heat .

INTRODUCTION

All Blaze King free standing wood appliances are designed as radiant room space heaters. They have been designed and tested to be installed in insulated habitable rooms areas of your dwelling. The appliance has not been designed to be installed in a concrete uninsulated basement or in a shop/garage environment. Such applications may cause the thermostat to be unresponsive due the constant call for heat resulting in appliance being in a constant or over fire situation. Consequential damage from this type of operation will deem the warranty null and void.

All Blaze King wood appliances are designed to burn cord wood only. Dimensional timber off cuts, very low moisture content small diameter wood and pressed wood logs, when used in excess, may result in excessive internal firebox temperatures that can cause causing irreversible damage to the firebo s internal structure. Excessive temperatures can be caused by many small pieces of very low moisture content wood being used as a primary fuel source. This may be evident by warping or warped internal plates and retainers, possible cracking of the outer firebox and possibly premature failure of the catalytic combusto . All wood appliances should be cleaned out and inspected at the end of every burning season to identify if any internal components have been affected during the burning season. If problems are observed steps must be taken to identify and correct the problem before the subsequent burning season. Failure to do so will result in the warranty of the product being null and void.

EFFICIENCY

Efficiency was determined using the method outlined in B415.1-10 test method. It is represented by the High Heating Value (HHV) as the fuel used during testing contains between 19% - 25% water moisture included in the total calculated fuel weight. (Other test methods such as LHV or Low Heating Value, does not take the water moisture into account).

Annual Fuel Utilization Efficiency (AFUE) attempts to represent the actual, season long, average efficiency an appliance. HHV is the actual, calculated average efficiency obtained under test conditions. Using correctl seasoned wood is important when trying to gain efficien . The more seasoned (dry) the wood, the higher the efficiency (less energy wasted on eliminating moisture during combustion). Operating your Blaze King at lowe settings will result in higher efficiencies as the fuel will undergo a more complete combustion. For maximu efficien , the appliance should be installed in a location that provides adequate intake/combustion air as well as a location that will allow for the straightest run of optimal chimney length to establish necessary draft .

FAN OPERATION

Fans are an optional item for most Blaze King appliances. If fans are installed on your appliance, they should be turned off until the stove reaches normal operating temperatures. Approximately 30 minutes after a fire has been established within the appliance, the fan speed should match the thermostat control setting. (i.e. if your themrostat is set to a medium heat output then your fan should also be set at medium, low—low, high—high etc.). We recommend the use of fans on all of our wood appliances. The fan system recirculates room air over the hot surfaces of your appliance and helps spread this super heated air around your home.

SELECTING WOOD**⚠ WARNING**

- **THIS APPLIANCE IS DESIGNED TO BURN NATURAL WOOD ONLY. DO NOT BURN TREATED WOOD, COAL, CHARCOAL, COLORED PAPER, CARDBOARD, SOLVENTS OR GARBAGE.**
- **HIGHER EFFICIENCIES AND LOWER EMISSIONS WILL GENERALLY RESULT WHEN BURNING AIR DRIED SEASONED WOODS, AS COMPARED TO WET, GREEN OR FRESHLY CUT WOODS.**
- **BURNING WET UNSEASONED WOOD CAN CAUSE EXCESSIVE CREOSOTE ACCUMULATION. WHEN IGNITED IT CAN CAUSE A CHIMNEY FIRE THAT MAY RESULT IN A SERIOUS HOUSE FIRE.**

It takes a great deal of energy to evaporate the moisture contained in green or wet wood and that energy will not be heating your house. Green or wet wood will also greatly increase creosote issues. To ensure that your wood fuel has a moisture content of 20% or lower, only use seasoned wood that has been split, stacked, and protected from rain or snow for at least 24 months. Firewood should be split and stacked in a manner that allows for air flow to all areas

Never burn salt-water driftwood as it is very corrosive and will deteriorate the structure of the appliance. The burning of salt-water driftwood will void the warranty.

Both hardwood and softwood burn equally well in this appliance, but the more dense hardwood will weigh more per cord and burn a little slower and longer.

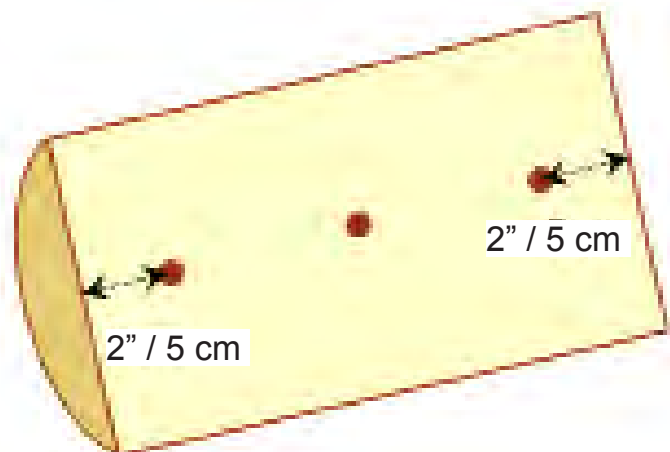
The only accurate way to determine wood moisture is to purchase a moisture meter.

⚠ WARNING

- **NEVER START A FIRE UNLESS ALL BRICKS ARE CORRECTLY PLACED INSIDE THE FIREBOX. CHECK THE INSTALLATION INSTRUCTIONS CAREFULLY.**
- **ALWAYS OPEN THE BYPASS DOOR BEFORE OPENING THE LOADING DOOR.**
- **ONCE THE LOADING DOOR IS CLOSED, CLOSE THE BYPASS DOOR DIRECTLY AFTER THE CATALYTIC THERMOMETER NEEDLE IS IN THE ACTIVE ZONE.**

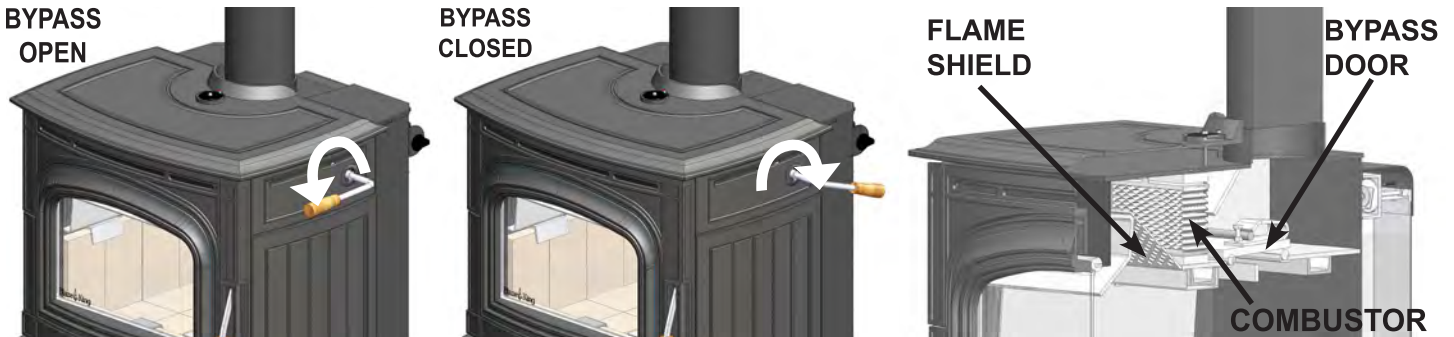
HOW TO USE MOISTURE METERS

1. Take a random selection of around 3-4 logs per cubic yard or cubic meter.
2. Split each log down the middle.
3. In the center of log push pins of meter along grain - three measurements are taken on the freshly split surface: 2" or 5 cm in from each end of the log and in the middle of the split surface with sufficient contact (see figure)
4. Do this to all the logs and take an average of the readings (this will be only an approximate indication but a good guide).



BYPASS DOOR

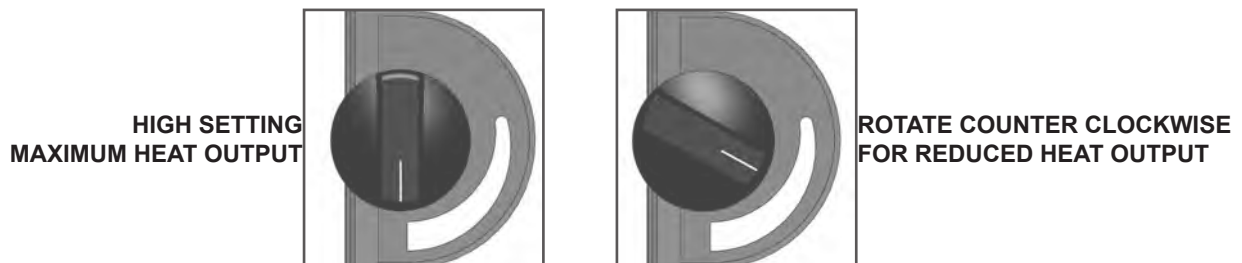
Your catalytic wood burning appliance is fitted with a bypass door which allows exhaust from the fire to temporarily bypass the catalytic combustor. The bypass door is located inside the dome of the firebox at the top of the appliance. It is a hinged, steel plate door and is controlled by the bypass handle located on the right side of the appliance. When the handle is pointing forward, the bypass door is open. To close the bypass door you must rotate the handle clockwise until it points to the rear of the appliance. To ensure the bypass door is fully closed, push down on the bypass handle until you hear a positive click. **NEVER OPEN THE LOADING DOOR WITHOUT OPENING THE BYPASS DOOR**

**CATALYTIC THERMOMETER**

The catalytic thermometer is located on the top of the appliance. Its sole purpose is to indicate whether the combustor is ACTIVE or INACTIVE. It is important to ensure that the appliance is operated in the stove in the ACTIVE zone. When the thermometer reads INACTIVE it means that the combustor temperature is below 500F and is not producing a clean burn. For the most accurate reading, turn the fan off for approximately 5 minutes before reading the thermometer. For calibration instructions refer to "CATALYTIC THERMOMETER" in the "MAINTENANCE" section.

**THERMOSTAT**

The thermostat is located at the rear of the appliance and is controlled by the thermostat knob which is located at the upper right rear corner of the appliance. When the knob is positioned at the **HIGH** setting, the appliance will operate at its highest burn rate and deliver its maximum heat output. As the knob is rotated counter clockwise the burn rate will decrease along with heat output. Burn rate is greatly influenced by location, installation, and external environment, so you may find it necessary to reposition the knob until you find the ideal setting to suit your situation. Please note that all adjustments to the thermostat should be done gradually as too rapid a change may cause the thermostat to operate improperly. The thermostat is set at the factory. **DO NOT TAMPER WITH THE THERMOSTAT**, this will result in a malfunctioning thermostat.



LIGHTING THE FIRE

NOTE: As you heat up the appliance for the first time, the paint will go through a curing process and will give off an odor. To minimize the inconvenience, burn the stove at a low temperature setting for several hours. It is advisable to open a door or window until the odor dissipates. You may also notice a change in color as the paint cures, this is normal and will appear uniform after subsequent firings

1. **DO NOT USE A GRATE. BUILD THE FIRE DIRECTLY ON THE BRICK IN THE BOTTOM OF THE STOVE.**
2. Position the thermostat to the **HIGH** setting and turn the fan (if fitted) **OFF**.
3. Open both the loading door and the bypass door (rotate the bypass handle forward).
4. Place 10 balls of non-glossy paper towards the front of the bottom of the firebox then stack 20 pieces of kindling on top of the paper in a crisscross fashion (leaving air gaps in between sticks).
5. Light the fire and allow it to get a good start while leaving the loading door cracked open (approximately 3 to 5 minutes). **DO NOT LEAVE THE STOVE UNATTENDED.**
6. Once the kindling is fully on fire, place two or three medium size logs onto the fire. Keeping the loading door unlatched, allow the logs to catch fire (approximately 5 minutes). **DO NOT LEAVE THE STOVE UNATTENDED.**
7. Once the logs are burning, latch the loading door shut **BUT** keep the bypass door open. Leaving the loading door open after the wood load has caught fire may cause premature failure of the catalytic combustor.
8. When nearly all of the wood in the firebox is fully burning, finish loading the appliance. Lay the wood as far back in the stove as possible. Latch the loading door shut and observe the catalytic thermometer. Once the needle is in the **ACTIVE ZONE**, close the bypass door (rotate the bypass handle backwards).
9. Let the fire burn with the thermostat at the **HIGH** setting for 20-30 minutes or until the fire is well established. This ensures that the stove, catalyst, and wood load are all stabilized at optimum operating temperatures. The temperature in the stove and the gases entering the combustor must be raised to at least 500F (indicated by the thermometer needle in the **ACTIVE ZONE**) for catalytic activity to be initiated.
10. After 20-30 minutes or once the fire is well established, gradually turn the thermostat down to the desired heat output setting. Please note that if the thermostat is turned down too low too quickly, the fire may go out or the combustor may stop working, indicated by the thermometer needle falling into the **INACTIVE ZONE**. If this happens, simply turn the thermostat back to a higher heat output setting to let the fire reestablish itself
11. If installed, turn the fan on after the initial warm up period of 20-30 minutes.

Probably the least understood requirement in maintaining a good fire is that of establishing a good base of coals or embers. A good bed of hot coals or embers will maintain a more even temperature as well as getting the new load of wood started easily. Put as much wood into the appliance as needed, practice will teach the amount of wood necessary to keep the fire going until the next reloading time. Don't be afraid to fill it completely if necessary. With the Blaze King thermostat, the wood will only burn at the rate set on the thermostat. Once the fire is established, the appliance should be left to complete the full burn cycle. This is evident by a) only coal bed (ember bed) remaining or b) the catalytic thermometer hovers just inside the active zone. Following this procedure will maximize the efficiency of the appliance as well as limit exhaust emission and smoke spillage.

RELOADING PROCEDURE

WHEN PREPARING TO RELOAD, IF THE NEEDLE ON THE CATALYTIC THERMOMETER IS STILL IN THE ACTIVE ZONE, FOLLOW THE PROCEDURE BELOW; IF THE NEEDLE HAS DROPPED INTO THE INACTIVE ZONE, REFER BACK TO THE “LIGHTING THE FIRE” PROCEDURE ON THE PREVIOUS PAGE.

It is important to note that the catalytic thermometer is simply displaying the temperature of the catalytic combustor. It may be used as an aide when it comes to indentifying a reload point, but other factors such as lack of fuel in the firebox or dropping room temperatures should be used as well.

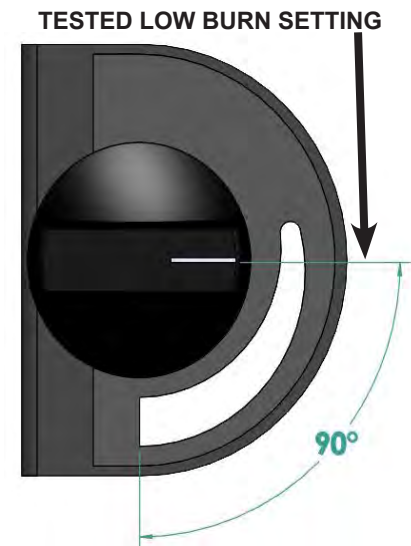


1. Have your next load of wood ready before beginning. Turn the thermostat to **HIGH**. Wait 2 minutes for the air flow to stabilize
2. To help minimize smoke spillage into the room, you may wish to open the bypass door and again wait 2 minutes for the air flow to stabilize
3. Crack open the loading door to allow ambient room air to be introduced into the firebox, this may take a minute to stabilize.
4. Slowly open the loading door and proceed to reload the firebox. If you experience excessive smoke spillage, slightly close the loading door to re-establish a draft through the chimney.
5. Once loaded, latch the loading door shut and (if opened) close the bypass door immediately. Let the fire burn on the **HIGH** thermostat setting for 20 to 30 minutes OR until the fire is very well established. At that point, turn the thermostat down to the desired setting. Keep in mind you may not see a large amount of flame activity in the lower thermostat setting. The thermometer needle will remain in the active zone indicating that the burn cycle is continuing.
6. Should you burn the stove on a very low setting for extended periods of time, you will begin to see creosote deposits forming on the glass door. To remove these deposits, simply run the stove on **HIGH** for approximately 30 minutes. The **HIGH** setting will burn off most of the deposit

Note: Our loading instructions are outlined in general terms due to the vast array of variables that arise with each installation. Such variables include type of wood fuel, chimney hieght and configuration, installation altitude, seasonal weather conditions, and the desired heat output required. Over time you will learn which settings are necessary to achieve optimal performance with your sepecific installation.

OPTIMAL LOW BURN THERMOSTAT SETTING

Your Blaze King appliance was tested and certified in accordance to the New Source Performance Standards for Residential Wood Heaters. During this test series, the low burn rate of the unit was determined by setting the thermostat knob to a position that yielded the lowest burn rate achievable. Considering that certification testing was conducting in a controlled laboratory environment with the appliance connected to a 15ft tall chimney, you may find that your optimal low burn thermostat setting is either above or below the certification test setting based on your location, installation, and the external environment you are operating in. If you find that you are setting your thermostat beyond the test setting, please note that if the thermostat is turned down too low the fire may go out or the combustor may stop working which is indicated by the thermometer needle falling into the **INACTIVE ZONE**. If this happens, simply turn the thermostat back to a higher heat output setting and let the fire reestablish itself.



WOOD BURNING IN THE SHOULDER SEASON

There are a few things to consider if you choose to light a fire during the spring or fall seasons when the outside temperature is milder, perhaps 55°F to 70°F (13°C to 21°C).

You may notice smoke spillage out of the loading door when it is opened during start up or reloading. This is caused by a lack of natural draft within the chimney system. The temperature difference between the chimney system and the outside air causes flue gasses to be drawn up and out of the chimney. Smaller temperature differences produce less draft in your chimney system than larger temperature differences. This air movement, referred to as Stack Effect, is also influenced by air density and moisture differences. To eliminate the smoke spillage you may have to stoke the fire for longer than usual. Once the fire warms the chimney the draft will improve and spillage will be reduced. When operating the appliance on a lower thermostat setting, the resultant lower flue temperatures can cause your chimney system to cool down. This also decreases natural draft and spillage may occur.

General Rules for burning in the shoulder season:

- Run your appliance on **HIGH** for 30 minutes after start up and reloading before gradually turning the thermostat down to the desired heat output setting.
- The thermostat setting needs to be high enough to keep the catalytic thermometer in the active zone. If the thermometer will not stay in the active zone, turn the thermostat to a higher setting and then wait 15 minutes to confirm that the thermometer remains in the active zone. Repeat as required.
- If your appliance is producing too much heat, try to reduce the volume of wood fuel loads rather than turning your thermostat down. It is good burning practice to build smaller, hotter fires on milder days in the spring and fall.

ICE - FORMATION AND PREVENTION

Most of what you see coming from the chimney of a properly operating catalytic appliance is water vapor. In extremely cold weather, and with some exterior chimneys, this vapor may freeze in the chimney to the point of actually blocking the chimney and extinguishing the fire. In such weather, burn the appliance for 5 to 10 minutes with the thermostat set to **HIGH** to melt any possible ice build.

⚠ WARNING**DO NOT USE THE APPLIANCE WITHOUT A COMBUSTOR**

It is important to periodically monitor the operation of the catalytic combustor to ensure that it is functioning properly. A non-functioning combustor will result in a loss of heating efficiency, and an increase in creosote and emissions. Following is a list of items that should be checked on a periodic basis:

- Combustors should be visually inspected at least three times during the heating season to determine if physical degradation has occurred. Actual removal of the combustor is not recommended unless more detailed inspection is warranted because of decreased performance. Refer to “CATALYTIC COMBUSTOR TROUBLESHOOTING” on next page.
- This catalytic heater is equipped with a temperature probe to monitor catalyst operation. Properly functioning combustors typically maintain temperatures in excess of 500°F (indicated by the thermometer needle in the active zone), and often reach temperatures in excess of 1000°F. If catalyst temperatures fall below 500°F (indicated by the thermometer needle in the inactive zone), refer to next step and to “CATALYTIC COMBUSTOR, TESTING” below.
- You can get an indication of whether the catalyst is working by comparing the amount of smoke leaving the chimney when the smoke is going through the combustor and catalyst light-off has been achieved, to the amount of smoke leaving the chimney when smoke is not routed through the combustor (bypass mode):
 - Light the appliance as per the lighting instructions (see “LIGHTING THE FIRE”). With smoke routed through the catalyst, go outside and observe the emissions leaving the chimney.
 - Open the bypass mechanism, wait approximately 15 minutes, and again observe the emissions leaving the chimney. Significantly more smoke will be seen when the exhaust is not routed through the combustor (bypass mode). Some smoke may be visible shortly after you start the fire and shortly after reloading the fire. Allow 20 to 30 minutes for the fire to stabilize before making observations

CATALYTIC COMBUSTOR, TESTING

Light the fire per the lighting instructions. After 1 hour of burning a well established fire, position the thermostat knob to a medium - low burn rate setting. Allow 5 minutes for the catalytic thermometer to reach equilibrium and observe the location of the indicator needle. A properly functioning combustor will have an active temperature greater than 500F and the thermometer will read in the ACTIVE zone. A “tired” or “dead” combustor will yield thermometer reading in the INACTIVE zone. Repeat this procedure for at least 3 burn cycles. If, after several burn cycles, the thermometer will not indicate an ACTIVE reading your combustor may require cleaning or replacement. If, after cleaning and reburning, your combustor is still not producing an ACTIVE reading you should contact your Blaze King dealer for a replacement combustor. Note - It is also possible that the catalytic thermometer itself may be functioning incorrectly. Before condemning the combustor, read CATALYTIC THERMOMETER in OPERATING INSTRUCTIONS.

CATALYTIC COMBUSTOR, CLEANING

Under certain conditions, ash particles may become attached to the face of the combustor. These may be seen while the combustor is in the glowing stage, or when the fire is out. Any deposit on the visible face of the combustor should be removed. Wait until the fire is out and the appliance is cold before performing any cleaning. Brushing the combustor with a soft bristle paint brush will remove some deposits. Passing a vacuum cleaner wand or brush near the face of the combustor will remove most deposits. (Hot ash in a vacuum cleaner bag will burn, may melt the vacuum or cause a house fire. Exercise caution and never clean the appliance when the appliance or ashes are hot.) Never scrape the combustor with any hard tool or brush. Never run pipe cleaner through the individual cells of the combustor. This is not needed, and may do more harm than good. Limit cleaning to the face of the combustor. **NOTE: Never remove a combustor without approved combustor gasket in hand as original gasket will fall apart when removed from appliance.** Remember to re-install the Flame Shield (the perforated plate) in same position it was found.

TIP: A hot fire will usually prove to be the best method of cleaning the combustor of deposits

CATALYTIC COMBUSTOR, TROUBLESHOOTING

PROBLEM - CREOSOTE PLUGGING

Possible Cause: Burning materials that produce a lot of char and fly-ash

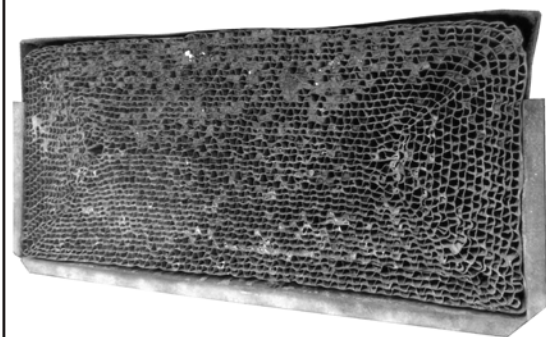
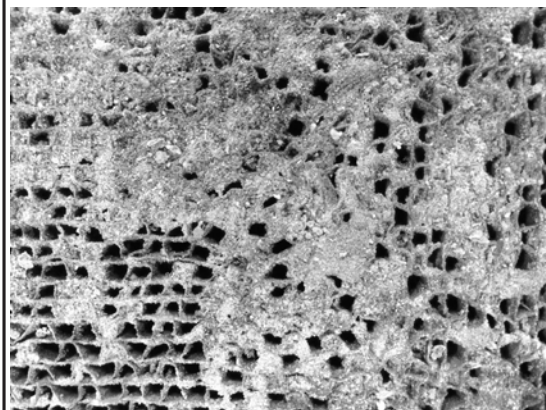
Solution: Do not burn materials such as garbage, gift wrap, or cardboard.

Possible Cause: Burning wet, pitchy woods or burning large loads of small diameter wood with the combustor in the operating position without the thermostat needle in the active zone.

Solution: Burn dry, seasoned wood, don't engage the bypass until the temperatures are high enough to initiate light-off (indicated by the thermostat needle in the active zone).

Possible Cause: Combustor not functioning. If proper burning procedures have been followed to no avail, the combustor is not functioning.

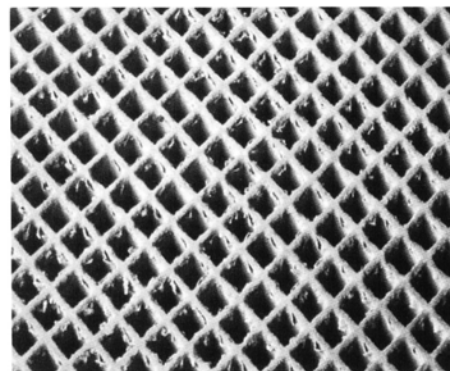
Solution: Replace the combustor with a genuine Blaze King combustor (failure to do so will void your warranty).



PROBLEM - CATALYST PEELING

Possible Cause: Extreme temperatures (above 1800°F, or 1000°C.) at combustor surface can cause the catalysts to peel. Over firing and flame impingement on the combustor are primary causes. Minor peeling photo shows minor peeling that is normal and does not affect function. Severe peeling photo shows that are closed or plugged.

Solution: Avoid extreme temperatures and flame impingement. If peeling is severe, remove and replace combustor.

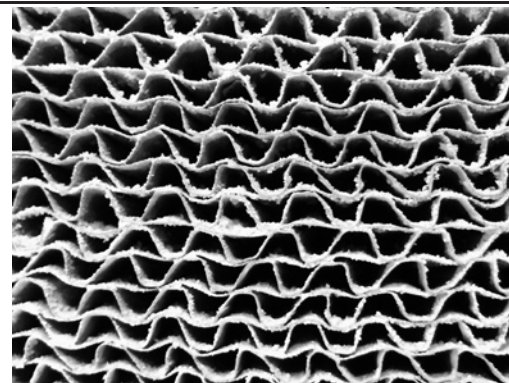


Minor Peeling

PROBLEM - CATALYST DEACTIVATION

Possible Cause: Burning large quantities of trash, pressure-treated lumber, or painted woods.

Solution: Burn quality woods available in your area. If you decide the catalyst has been deactivated, replace combustor with a genuine Blaze King combustor (failure to do so will void your warranty).



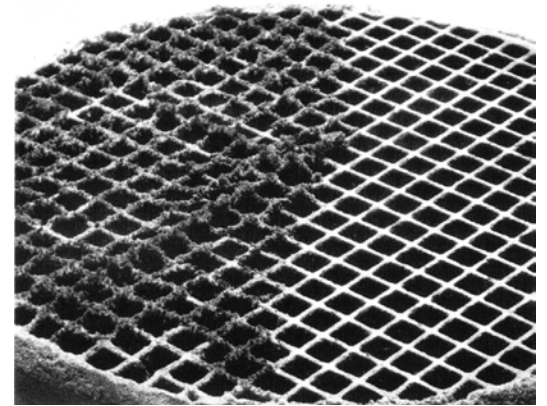
Severe Peeling

PROBLEM - CATALYST MASKING

(The catalyst is coated with a layer of fly-as or soot which prevents catalytic activity)

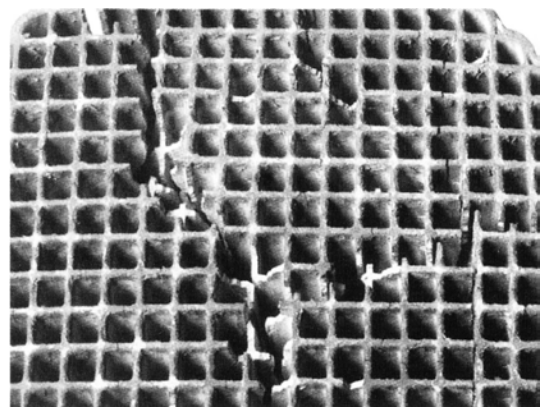
Possible Cause: Accumulation of fly-as

Solution: Brush cooled combustor with a soft-bristled brush or vacuum lightly at least once per burning season.

**PROBLEM - THERMAL CRACKING**

Possible Cause: Normal operation, as long as the combustor remains intact.

Solution: If cracking causes large pieces to fall out, replace the combustor.

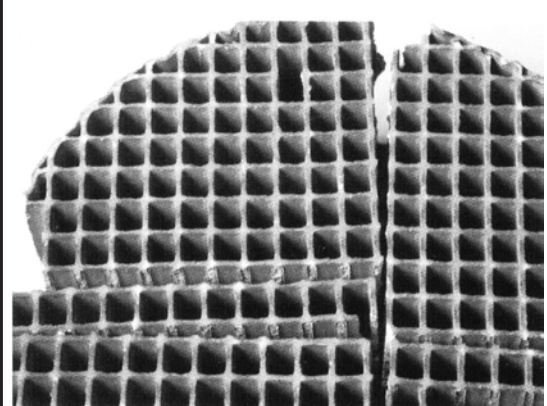
**PROBLEM - MECHANICAL CRACKING**

Possible Cause: Mishandling, abuse, or operating without a properly gasket sealed combustor.

Solution: Handle with care

Possible Cause: Distortion of holding collar.

Solution: Combustor should be held firmly in its can. It should slide easily into and out of the holding collar of the stove. If severe cracking has resulted in loss of large chunks of combustor, replace combustor. Also replace any warped stove parts.

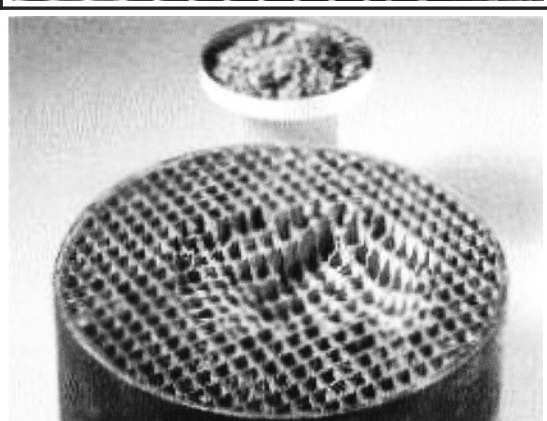
**PROBLEM - CRUMBLING**

Possible Cause: Air leaks

Solution: Inspect door gasket, see "MAINTENANCE" on page 35.

Possible Cause: High draft

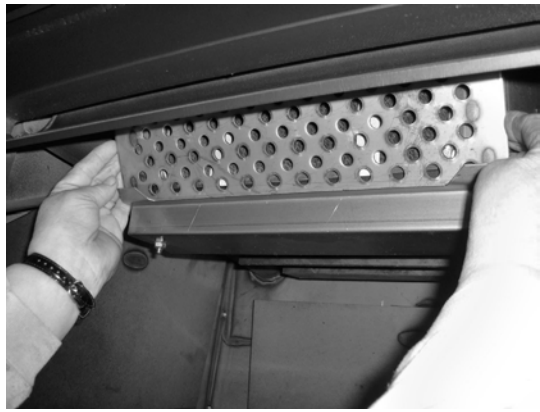
Solution: Maintain draft to manufactured specifications



CATALYTIC COMBUSTOR, REPLACEMENT

BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK

The catalytic thermometer on top of the stove should read in the active zone after the stove has been in operation for several hours. If the thermometer's indicator needle does not stay in the active zone, even with a hot fire, over a 7-10 day period of regular use, the combustor may need replacement or cleaning, see "CATALYST MONITORING". If the combustor needs replacing then discontinue use of the appliance until the combustor is replaced. If the combustor must be examined or replaced contact your Blaze King dealer.



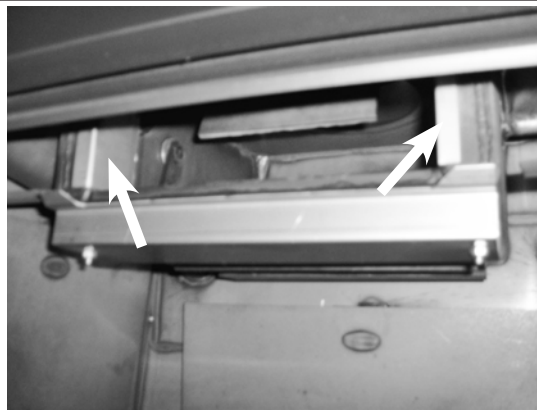
1. The removal of a Blaze King Catalytic combustor requires a small flat blade screwdriver or pocket knife. The stove fire must be out for at least 12 hours prior to the removal process. A combustor can reach 1400°F and hold high temperatures for several hours even after the fire is out. After waiting 12 hours, first remove the flame shield by simply lifting the shield off the tabs at either side. Pay particular attention to orientation as there is a top and bottom edge to the flame shield



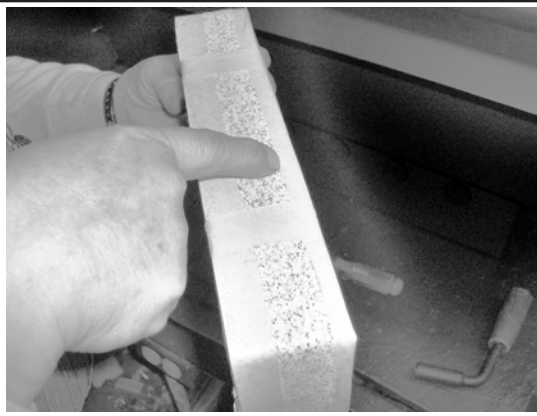
2. Once you remove the flame shield, you'll find the combustor. The honeycomb combustor can be made of different materials such as cordierite, mulite or even stainless steel. They are all the same with regard to removal and caution should be taken so as to not drop or damage the combustor. If your combustor has never been cleaned according the manufacturers directions, you may wish to clean the combustor before replacing it with a new combustor, see "CATALYTIC COMBUSTOR CLEANING".



3. The combustor has a metal tab across the bottom and on each side of the combustor. Using a flat blade screwdriver or pocket knife blade, slide the blade behind the metal tab and the heavy steel dome of the stove. The dome is the housing that surrounds the combustor. Apply slight pressure until the combustor begins to move forward, about 1/4". Repeat the process on the opposite end tab. By working back and forth the combustor will work free of the dome housing. It is normal for the gasket surrounding the metal band to fall apart during this process. New combustors are shipped with a new gasket.



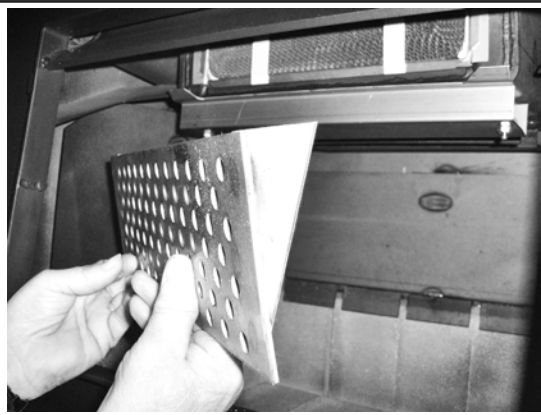
4. Now that the combustor has been removed you'll be able to see one stainless bypass retainer on each side. These can remain in place and do not need to be removed. These clips are not fixed in position and can fall into the firebox. Make sure they are in position before replacing the combustor. Using the same screwdriver or pocket knife, scrape any old gasket from the surface areas of the dome. The dome is the housing that surrounds the combustor. If you clean your existing combustor, you'll need to order replacement combustor gasket. It is always a good idea to have a spare combustor gasket on hand prior to performing any maintenance. If you purchase a new combustor a new gasket will already be applied to the combustor.



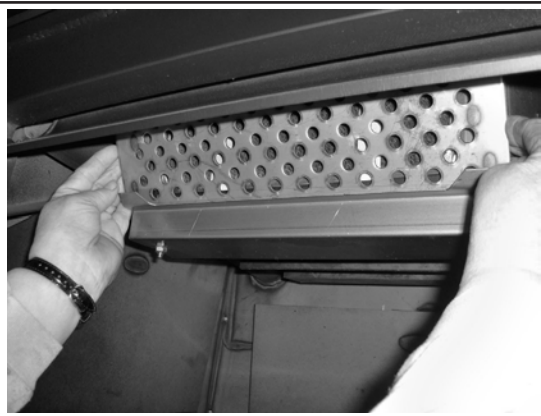
5. This new combustor already has the gasket installed. Note the 1" wide masking tape. This tape will help to keep the leading edge of the gasket from snagging during installation. If you've cleaned your combustor, wrap the combustor gasket as you see here and use the 1" masking tape around the perimeter front and rear. During the first fire the masking tape will burn off and the combustor gasket will swell providing a tight seal. It is this tight seal that improves efficiency and performance. You should never burn your stove without a combustor gasket installed.



6. Since the combustor is only 2" deep, there is ample room to lift the new combustor into place. **REMEMBER TO HAVE THE TAB ACROSS THE BOTTOM EDGE OF THE COMBUSTOR AS IT IS INSTALLED.** Slowly push the combustor in at the top apply even pressure to the left and right corners. This will allow for a better view of the bottom edge for the final fitting. **DO NOT FORCE THE COMBUSTOR INTO THE DOME. TAKE YOUR TIME AND WORK IT INTO PLACE SLOWLY.**



7. Once the combustor is installed completely so that all three tabs are touching the face of the dome, replace the flame shield. Note the brackets welded to the back flame shield are shaped like a triangle. The point of the triangle should face down when installed correctly. Never operate your stove without the flame shield in place. The flame shield will protect the face of the combustor against damages from wood when loading and other possible damages that can occur during the cleaning process.



8. The flame shield will rest on the two tabs located on the dome guard and lean slightly forward. Now that your combustor has been installed you can relight your stove. You will continue to receive excellent efficiency and clean burning for years to come. A few reminders, never burn anything other than dry, seasoned cordwood. Burning anything else may contaminate or ruin your new combustor. Also remember to keep your front loading door gasket seal properly adjusted, see "LOADING DOOR TENSION ADJUSTMENT". Doing so will improve burn times and extend combustor life span.

The combustor supplied with this heater is either a 115-0336A-M or 115-0556 metal combustor. Consult the catalytic combustor warranty also supplied with this wood heater. Warranty claims should be addressed to:

| in Canada | in USA |
|--|---|
| Blaze King Industries / Valley Comfort Systems Warranty Department, 1290 Commercial Way Penticton, BC Canada V2A 3H5, Ph: 250-493-7444 | Blaze King Industries Warranty Department, 146A Street Walla, Walla, Washington 99362, Ph: 509-522-2730 |

RUN-AWAY OR CHIMNEY FIRE**⚠ WARNING**

A CHIMNEY FIRE CAN PERMANENTLY DAMAGE YOUR CHIMNEY SYSTEM. THIS DAMAGE CAN ONLY BE REPAIRED BY REPLACING THE DAMAGED COMPONENT PARTS. CHIMNEY FIRE DAMAGE IS NOT COVERED BY THE LIMITED WARRANTY.

CAUSES:

1. Using incorrect fuel, or small fuel pieces which would normally be used as kindling.
2. Leaving the door ajar too long and creating extreme temperatures as the air rushes in the open door.
3. Improperly installed or worn gaskets.
4. Creosote build up in the chimney.

SOLUTIONS:

1. Do not burn treated or processed wood, coal, charcoal, colored paper or cardboard.
2. Be careful not to over fire the appliance by leaving the door open too long after the initial start-up
3. Replace worn, dried out (inflexible) gaskets
4. Have your chimney cleaned regularly.

WHAT TO DO IF A RUN-AWAY OR CHIMNEY FIRE STARTS:

1. Close the draft fully (lowest position) by shutting off thermostat, and make sure firebox is closed tight .
2. Call the local fire department
3. Examine the chimney, attic and roof of the house, to see if any part has become hot enough to catch fire. If necessary spray with a fire extinguisher or water from a garden hos
4. Do not operate the appliance again until you are certain the chimney has not been damaged.

CREOSOTE FORMATION AND REMOVAL

When wood is burned slowly, it produces tar and other organic vapors which combine with expelled moisture to form creosote. These vapors condense in the relatively cooler chimney flue of a slow burning fire and when ignited, make an extremely hot fire. Check your chimney for creosote and soot regularly, until a safe frequency for cleaning is established. The chimney connector and chimney should be inspected regularly during the heating season to determine if a creosote build up has occurred. Be aware that the hotter the fire, the less creosote is deposited.

If accumulation is excessive, clean the chimney. You may want to call a professional chimney sweep to clean it. Both the chimney and the appliance have to be cleaned at least once a year or as often as necessary. Have a clearly understood plan to handle a chimney fire

CHIMNEY MAINTENANCE

The most efficient method to sweep the chimney is using a hard brush. Brush downwards so soot and creosote residues will come off the inner surface and fall to the bottom of the chimney where they can be removed easily.

The chimney must be checked regularly and if creosote has accumulated, it must be removed without delay. Cleaning on a regular basis should be sufficient during the coldest months. **ENSURE THE BYPASS DOOR IS OPEN PRIOR TO CLEANING THE CHIMNEY SO THE SOOT AND CREOSOTE FALLS INTO THE FIREBOX.**

Chimney / Flue Inspection:

1. The chimney should be inspected regularly during the heating season.
2. If possible, the chimney should be dismantled and cleaned.
3. The chimney should be inspected for possible damage.
4. If it is in good condition, put the chimney back in place; otherwise, it must be replaced.

FIRE EXTINGUISHERS AND SMOKE DETECTORS

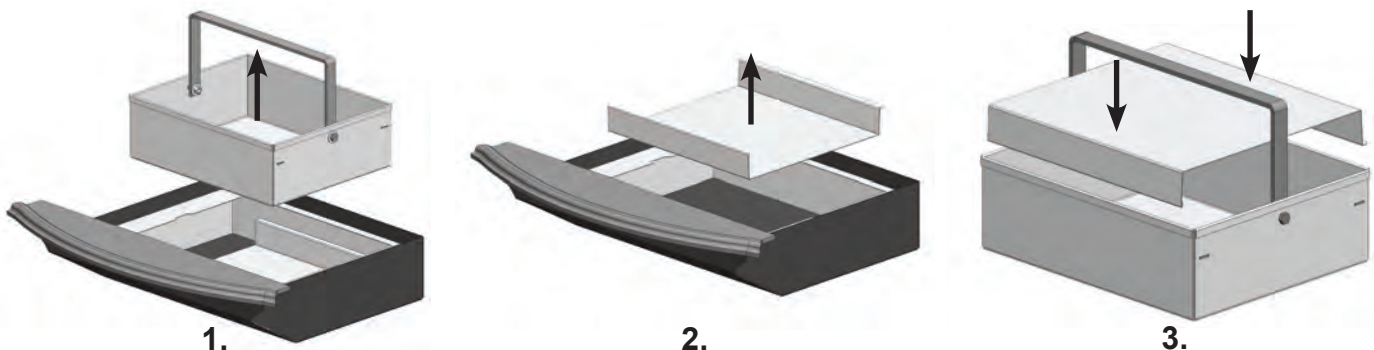
All homes with a solid fuel burning appliance should have at least one fire extinguisher in a central location, known to all, and at least one smoke detector in the room containing the appliance. If it sounds an alarm, correct the cause but do not de-activate or relocate the smoke detector.

ASH REMOVAL

This appliance is required to be cleaned frequently because soot, creosote and ash may accumulate. Wait until the appliance is fully cooled off before the removal of ashes. **ALWAYS REMOVE THE ASH BUCKET IMMEDIATELY AFTER FILLING.** Ashes should be removed any time they come within one inch of the door opening. It is not necessary or advisable to completely remove all of the ashes when cleaning this appliance. Wood burns best in a bed of ashes 1/2" thick. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground (outside), 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. Other waste shall not be placed in this container.

⚠ WARNING

NEVER STORE HOT ASHES IN A GARAGE OR BASEMENT. HOT ASHES WILL GENERATE CARBON MONOXIDE AND / OR FLAMMABLE GASES. THESE GASES MAY CAUSE SUFFOCATION AND POSSIBLE DEATH.



LOADING DOOR GASKET INSPECTION

Inspect the door gasket for physical deterioration, missing sections or obvious leakage. The appliance front should make a groove in the gasket material - one side of the groove (toward the inside) will often be dark or black, and the other side (toward the outside) should be light or white. Dark smudges on the outside of the groove may indicate an air leak. If the groove is very shallow or missing, or if there is a heavy ash or creosote deposit along the bottom edge of the gasket, it may need to be replaced. Frayed or broken gasket material, or a gasket that is hard and unyielding, will also indicate need for replacement. Any time a piece of gasket is missing or is broken anywhere, the entire gasket must be replaced.

To check the gasket further, wait until the appliance is cooled and insert a piece of paper (a dollar bill will work) into the door opening and close and latch the door. Obvious resistance should be felt when pulling the paper out. Repeat this check several times around the perimeter of the door.

LOADING DOOR GASKET REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

1. If the door gasket is to be replaced, be sure you have Blaze King 7/8" fiber glass gasket ready to re install, as well as high temperature adhesive. See your Blaze King dealer.
2. Be sure the fire is out and the stove has cooled down. The door does not have to be removed from the stove.
3. With a pair of pliers, pull the old door gasket out of the channel and dispose of it.
4. Thoroughly clean out the channel so the new silicone adhesive will adhere and the gasket will fit smoothly.
5. Dry fit the new gasket first to ensure proper fit. Do not stretch or cut the gasket. Distribute the gasket evenly around the frame.
6. Run a small bead of a high temperature silicone adhesive along the center of the channel. **DO NOT USE HOUSEHOLD SILICONE CAULKING.** High temperature silicone may be obtained from wood stove dealer.
7. Start the new gasket in the lower right corner. Do not stretch or cut the gasket. Distribute the gasket evenly around the frame.
8. Allow the adhesive to dry before closing the loading door. The loading door tension may need to be adjusted, see "LOADING DOOR TENSION ADJUSTMENT".
9. Check the fit of the door gasket. Insert a narrow strip of paper into the door opening and close and latch the door. Obvious resistance should be felt when pulling the paper out. Repeat this check several times around the perimeter of the door. If no resistance is felt, adjust door latch catch, see "LOADING DOOR TENSION ADJUSTMENT".
10. A tight sealing door extends the burn times & protects the combustor.

BYPASS DOOR GASKET INSPECTION

If you do not hear a positive click when closing your bypass door first try adjusting the tension, see number 9 below. If the seal is not tight after making the adjustment, the gasket may need to be replaced.

BYPASS DOOR GASKET REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

1. You will require THERMOSEAL® 1000SF high-temperature resistant cement and Blaze King 5/8" dense fiber glass gasket. See your Blaze King dealer. You will also require masking tape and combustor gasket as disassembly of the combustor will result in a damaged combustor gasket.
2. Be sure the fire is out and the stove has cooled down.
3. You will need to remove the liner from the collar of the stove, and have the ability to see straight down into the stove box through the collar.
4. Please follow steps on "CATALYTIC COMBUSTOR, REPLACEMENT" on how to remove your combustor.
5. To remove the bypass door, move the bypass rod out of the way using the bypass handle on the side of the stove. Looking down through the collar, lift one end of the bypass door for clearance to turn inside the top assembly. Once the bypass plate is in this position, remove the plate through the combustor opening.



**BYPASS DOOR REMOVAL
THROUGH COMBUSTOR OPENING**

6. Remove the old gasket and apply the THERMOSEAL® 1000SF high-temperature resistant cement along the door opening edge.
7. Place the gasket along the cement, and tap it in to seat it securely in the channel.
8. Reverse method of removing bypass door to put it back in place.
9. Prior to reconnecting the liner, you will need to adjust the bypass ramp bolt. You must first loosen the retaining nut located under the head of the adjustment bolt. Then using a 7/16" box wrench, tighten the bolt until the bypass handle, when closed, has a slight cam-over feel. Do not over tighten.
10. Secure bolt adjustment by tightening the 7/16" nut against the ramp as seen in the photo to the left. Now work the bypass handle several times to make certain the bypass operation is smooth and working properly. When you are satisfied with the operation of the bypass, please lower the venting.
Important: Apply high temp anti-seize lubricant to the under side of the bypass ramp where the rod contacts.
11. Please follow steps 5-8 in "CATALYST MONITORING" to return the combustor into place. Please note that if the gasket of the combustor is damaged, it will have to be replaced.

**VIEW OF BYPASS DOOR
AND CRANK
THROUGH COLLAR**



COMBUSTOR OPENING



BYPASS DOOR OPENING



**APPLY LUBE TO THE UNDER
SIDE OF THE BYPASS RAMP**

DOOR GLASS GASKET INSPECTION

When the appliance is cold, hold the glass by placing the palm of each hand on either side of the glass. Press firmly and try to move the glass. If the glass moves the door glass retainers may need to be tightened or the door glass gasket may need to be replaced.

1. Inspect the door glass gasket. If the gasket is frayed or missing sections replace the gasket.
2. Inspect the glass retainers and ensure the screws holding the retainers in place are tight. Hand tighten plus 1/4 turn. Do not over tighten.

DOOR GLASS GASKET REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

1. You will require Blaze King glass gasket and Blaze King door gasket. Please see your Blaze King dealer.
2. Remove the old glass gasket.
3. Starting at the corner opposite of the “Blaze King” logo, carefully wrap the gasket around the edges, pressing firmly onto the sides of the glass with the gasket centered on the edge. Finish the wrapping with a 1/2” overlap. Ensure the thickness of the gasket remains consistent and uniform.
4. Install glass with the “Blaze King” logo to the lower left corner of the door. Install the glass retainers with original fasteners. Ensure the glass is parallel to the frame and tighten the fasteners evenly.
5. Follow steps on “**LOADING DOOR GASKET REPLACEMENT**”.

**DOOR GLASS, CLEANING**

The best way to keep the glass clean is to leave the appliance on high burn for a period of time after each reloading. The moisture which is driven from a new load of wood contributes much of the creosote on the inside of the glass. Removing that moisture at the beginning of the burn cycle helps to keep the glass clean. Leaving the thermostat on a higher setting for 30 minutes to an hour before turning to low for an overnight burn will also help. Heavier deposits may require hand cleaning. Manual glass cleaning should be done when the appliance and glass are cool. **DO NOT CLEAN THE GLASS WHILE IT IS HOT. WARNING: Do not use abrasive cleaners to clean the glass.** Use a soft cloth. After using any cleaner, thoroughly rinse the glass with water to remove any deposits left by the cleaner. Failure to remove all traces of glass cleaner will result in the glass cleaner residue baking on. This residue may be very difficult to remove.

LOADING DOOR TENSION ADJUSTMENT

1. Remove catalytic thermometer and cast top from stove (**Fig A**).
2. Remove left and right cast sides from stove by lifting up and out from hangers (**Fig B**). If necessary use a 7/16" wrench to loosen the top two bolts that secure the cast sides to the firebox
3. To tighten the door tension use a 7/16" wrench to loosen the two nuts on the latch cover. Slide the latch cover towards the back of the stove and tighten nuts (**Fig C**). Repeat paper test (see "LOADING DOOR GASKET INSPECTION").



Fig A



Fig B

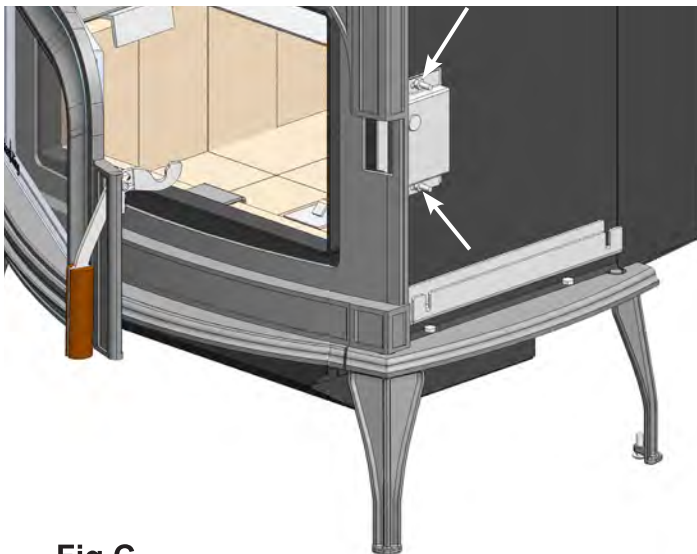


Fig C

⚠ WARNING

DO NOT OPERATE THIS WOOD STOVE IF THE DOOR GASKET IS MISSING OR DAMAGED DANGEROUS OVER FIRING CAN OCCUR WHICH CAN DAMAGE THE APPLIANCE OR IGNITE CREOSOTE IN THE CHIMNEY, POSSIBLY CAUSING A HOUSE FIRE. IF ANY PART OF THE WOODSTOVE OR FLUE SYSTEM IS GLOWING THE STOVE IS BEING OVER FIRED.

OPTIONAL FAN ASSEMBLY

Routine maintenance of the OPTIONAL Fan Assembly on the back of the stove is not required. However, should it become necessary to replace an individual fan or rheostat, contact your local dealer.

CARE OF SURFACES

DO NOT paint or clean the stove while it is **HOT**.

Cast Iron Finish:

If the finish on the stove ever becomes blemished, you can repaint with high temperature paint available from your dealer. First, mask the areas, such as enamelled parts, glass, or handles, around the spot to be painted. Clean the spot with a wire brush, then spray area. **NOTE:** two light coats of paint are better than a single heavy one.

Porcelain Enamel finish:

Use a dry/slightly damp rag or soft brush to remove spills or stains. For difficult jobs that require a cleaning agent use only a kitchen appliance cleaner or polish recommended for use on enamel surfaces. If porcelain enamel becomes chipped or scratched during use, apply "enamel epoxy" to the damaged area and allow to dry. Once the epoxy has dried, sand the area to blend with surrounding area and apply appropriate color touch-up paint. Allow to dry completely before operating stove.

CATALYTIC THERMOMETER

The combustor thermometer tells you what was happening 4-8 minutes ago, and remember, it is only an indication of the temperatures of the gasses after they pass through the combustor. The thermometer probe, the part that fits into the stove, must be cleaned at least once a year. Lift it from the stove (be careful, it may be hot) and wipe or scrape it clean. At room temperature, away from the stove, the indicator should point near the bottom of the "Inactive" zone. If, after several years use, you find that the needle no longer points to the bottom of the "Inactive" zone when the thermometer has been at room temperature for 10 minutes or longer, it may need adjustment. Holding the probe with a pair of pliers, loosen the bolt on the top of the dial. Turn the dial to align the pointer with the bottom of the "Inactive" zone, then retighten the bolt.

NOTE: IF YOUR BLAZE KING IS EQUIPPED WITH FANS, TURN OFF FANS AND WAIT 10 MINUTES PRIOR TO READING CATALYTIC THERMOMETER INDICATOR. AIR MOVEMENT ACROSS THE TOP OF THE STOVE MAY PROVIDE FALSE READING.

THERMOSTAT

This wood heater thermostat 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 heater in a manner inconsistent with operating instructions in this manual. If the thermostat malfunctions contact your dealer for replacement by a qualified installer.

Your Blaze King is designed to allow a wide selection of heat output levels. If you begin to lose control of the amount of heat the stove is emitting, determine the cause early so that major problems may be avoided.

The six major needs of a well-controlled fire are

1. Knowledgeable operator.
2. Adequate air supply.
3. Firewood of good quality and proper size.
4. Catalytic combustor in good condition.
5. Clean chimney, properly sized and installed.
6. Door gasket tight and firm

Considering all of the above, number one is the most important for safe and efficient operation of any woodstove. Please study the operation instructions carefully. Consult your BLAZE KING dealer or call the Customer Service Department at Blaze King in the U.S.A. at 509-522-2730 or in Canada at 250-493-7444 if you have any questions not answered in this manual.

All of the six above mentioned needs are interrelated. A deficiency in any one will affect all of the others. If you encounter a problem, determine the source of the problem and then follow-up by checking the other needs as possible contributing factors.

| PROBLEM: Chimney Fire | |
|--|---|
| CAUSE Act immediately regardless of cause | SOLUTION Turn the thermostat to lowest setting, check loading door to be sure it is tightly closed. Call Fire Department. |
| After the fire is out, have your chimney and flue connector inspected by a certified chimney sweep. A damaged masonry chimney should be repaired or rebuilt. A prefabricated chimney (factory built) that is damaged should be replaced. Any damage to the flue connector should be corrected before the system is used again. | |
| Possible causes of a chimney fire, and remedies for those causes, can be found further in this section: "Excessive Creosote Formation", and "Spots of Creosote Accumulation in Chimney or Flue Connector". | |

| PROBLEM: Not enough heat. | |
|---|--|
| CAUSE Green or wet wood. Not enough fuel in stove. | SOLUTION Use seasoned wood. Don't be afraid to FULLY load the stove. A FULL load of wood won't burn any hotter than the thermostat is set. |
| Obstruction in chimney or cap screen. Combustor plugged or coated. | Remove obstruction. See "COMBUSTOR, TESTING" See "COMBUSTOR, CLEANING" |
| Combustor not functioning. | See "COMBUSTOR, TESTING". If needed, replace combustor, See "COMBUSTOR, REPLACING". |
| Thermostat set too low. | Raise thermostat setting. |
| Thermostat not operating properly. | Consult your Blaze King dealer. |
| Poor draft caused by an oversize flu | Measure draft with Manometer. See "CHIMNEY DRAFTS" Consult your Blaze King dealer or a chimney sweep. |
| Strong, gusting winds causing downdraft in chimney | Install wind-resistant chimney cap. Directional caps may not stay freely rotating. If you have a directional cap, check it frequently. |
| Tightly sealed house, inadequate air supply. | Slightly open a window, near the stove or install an outside air kit. |
| Reloading too much wood on top of too few coals. | Allow a larger bed of coals to build up. |

| PROBLEM: Too much heat. | |
|--|--|
| CAUSE | SOLUTION |
| By-Pass door left open. | Close the by-pass door. |
| Thermostat set too high. | Lower thermostat setting. |
| Loading door gasket leaking, admitting excess air into firebox | Replace door gasket and/or adjust door. See "GASKET INSPECTION" |
| Excessive draft in the chimney. | Measure draft with a Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. Install a cap. |
| Thermostat not operating properly. | Consult your Blaze King dealer. |
| Wood is too small. | Use larger pieces. |
| PROBLEM: One or both fans will not run, or there is no adjustment for fan speed. | |
| CAUSE | SOLUTION |
| Fans mounted improperly. | Check that fan blade's not touch edges of hole. |
| Fan speed control. | Consult your Blaze King dealer for replacement. |
| PROBLEM: Fans minimum speed too fast or maximum speed too slow. | |
| CAUSE | SOLUTION |
| Fan speed control out of adjustment. | Consult your Blaze King Dealer. |
| PROBLEM: Excessive creosote formation in chimney and chimney Connector. | |
| CAUSE | SOLUTION |
| By-pass door left open. | Close by-pass door. |
| By-pass door not sealing tightly. | Inspect by-pass door and seal for warping. Ash or creosote buildup may occur on door or seat. With stove cold scrape and vacuum area around by-pass. Be sure all mating steel surfaces are clean and smooth. |
| Improper operation. | Check thermostat setting and operating procedures. See "THERMOSTAT & OPTIMAL THERMOSTAT SETTING" |
| Wood too green or wet. | Use seasoned wood. Use a moisture meter to confirm |
| Catalytic combustor not operating properly. | Inspect the combustor. See "CATALYTIC COMBUSTOR, TESTING" |
| Poor draft caused by an oversize or short flue, etc | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
| Chimney too cold or poorly insulated. | Upgrade chimney system. Consult your Blaze King dealer or a chimney sweep. |
| PROBLEM: Catalytic combustor thermometer (on top of stove) does not go into "Active" zone, or does not stay there for long. (Fans must be in "off" position for 10 minutes prior to checking) | |
| CAUSE | SOLUTION |
| Improper operation. | Check thermostat setting and operating procedures. See "THERMOSTAT & OPTIMAL THERMOSTAT SETTING" |
| Obstruction in chimney or cap. | Clean chimney, remove obstructions. |
| Faulty combustor thermometer. | Replace thermometer and Recheck combustor operating Temperature. |
| Wood too green or wet. | Use seasoned wood. |

| | |
|---|---|
| Combustor plugged or coated. | Clean combustor. See "CATALYTIC COMBUSTOR TESTING" |
| Combustor not functioning. | Check and test combustor. If needed replace combustor. See "CATALYTIC COMBUSTOR, REPLACING" |
| Thermostat not operating properly. | Consult your blaze King Dealer. |
| By-pass door leaking or not closing completely. | Inspect and clean area around by-pass doors. Adjust or replace gasket if necessary. Consult your Blaze King Dealer. |

PROBLEM: Spots of creosote accumulation in chimney or chimney connector.

| CAUSE | SOLUTION |
|--|---|
| Air leaks in chimney or chimney connector. | Inspect chimney and / or chimney connector. Repair or replace as necessary. Check to be sure that the chimney connector is installed correctly. |

CAUTION: a leaking chimney connector is a fire hazard and demands immediate attention.

| | |
|---|--|
| Poor draft caused by an oversize flue, single wall pipe, to many elbows, etc. | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
|---|--|

PROBLEM: Door glass quickly becomes coated with creosote.

| CAUSE | SOLUTION |
|---|--|
| Low thermostat setting or lowering the thermostat setting too far, too quickly. | Turn the thermostat to the warmest setting during the first 20-30 minutes or until the fire is well established after each reloading |
| Poor draft caused by an oversize or short flue, etc | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
| Obstruction in chimney or cap screen. | Remove obstruction. Clean chimney and/or cap screen. |
| Strong, gusting winds causing downdraft in chimney. | Install wind-resistant chimney cap. |
| Tightly sealed house, inadequate air supply. | Open a window, slightly, near the stove. |
| Burning poorly seasoned wet wood, or wood with high pitch content. | Use seasoned wood with low pitch content, such as some types of pine. |

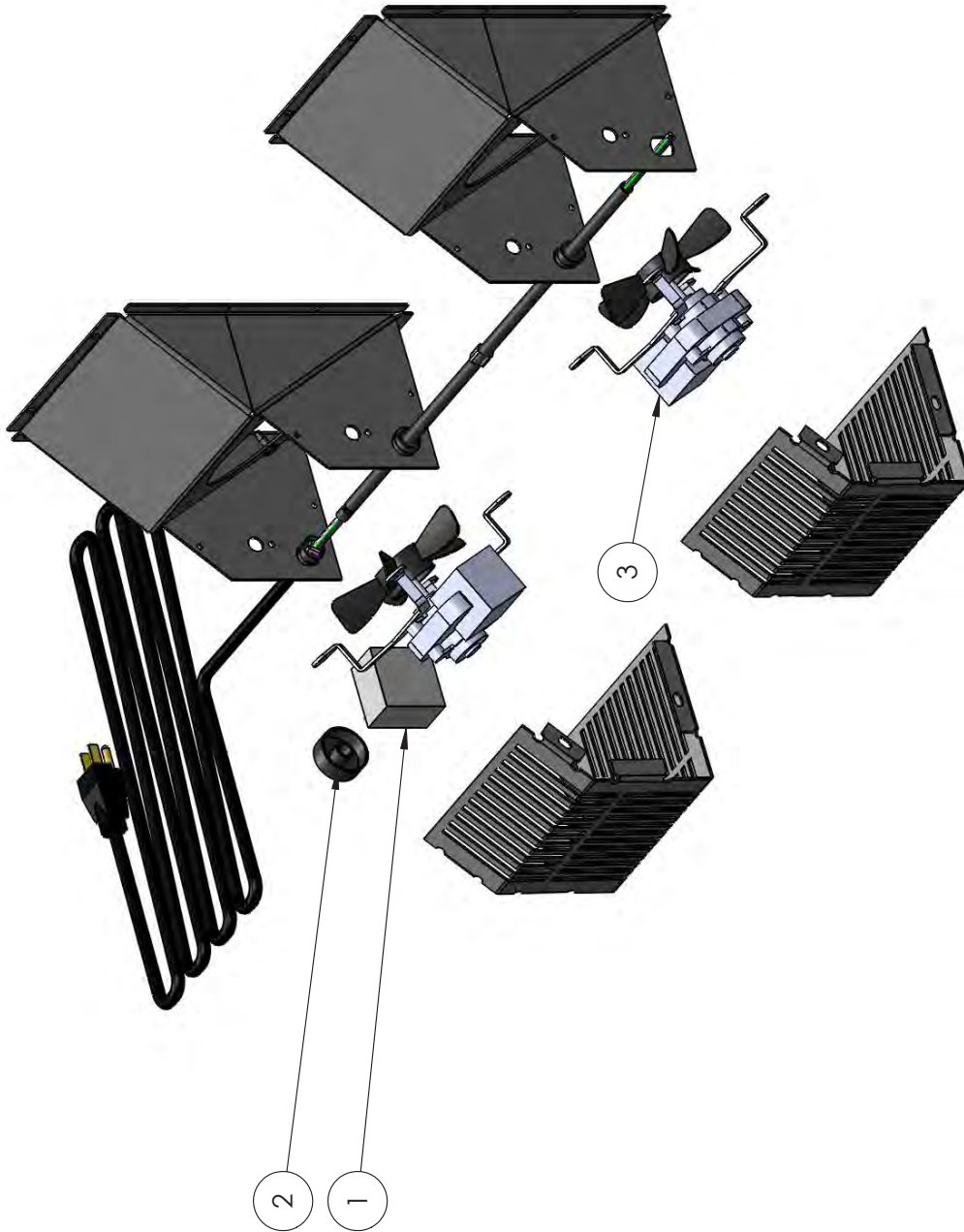
PROBLEM: The combustor temperature cannot be controlled. Turning the thermostat down often makes the combustor temperature go up.

| CAUSE |
|---|
| Turning the thermostat down, particularly in the first half of the burn cycle, causes the fire to emit more smoke, which is fuel for the combustor. The combustor temperature therefore climbs for up to several hours. This is normal, and is of no concern. As long as only the combustor temperature is elevated, there is nothing to worry about. |

PROBLEM: Smoke spills from door opening when loading fuel

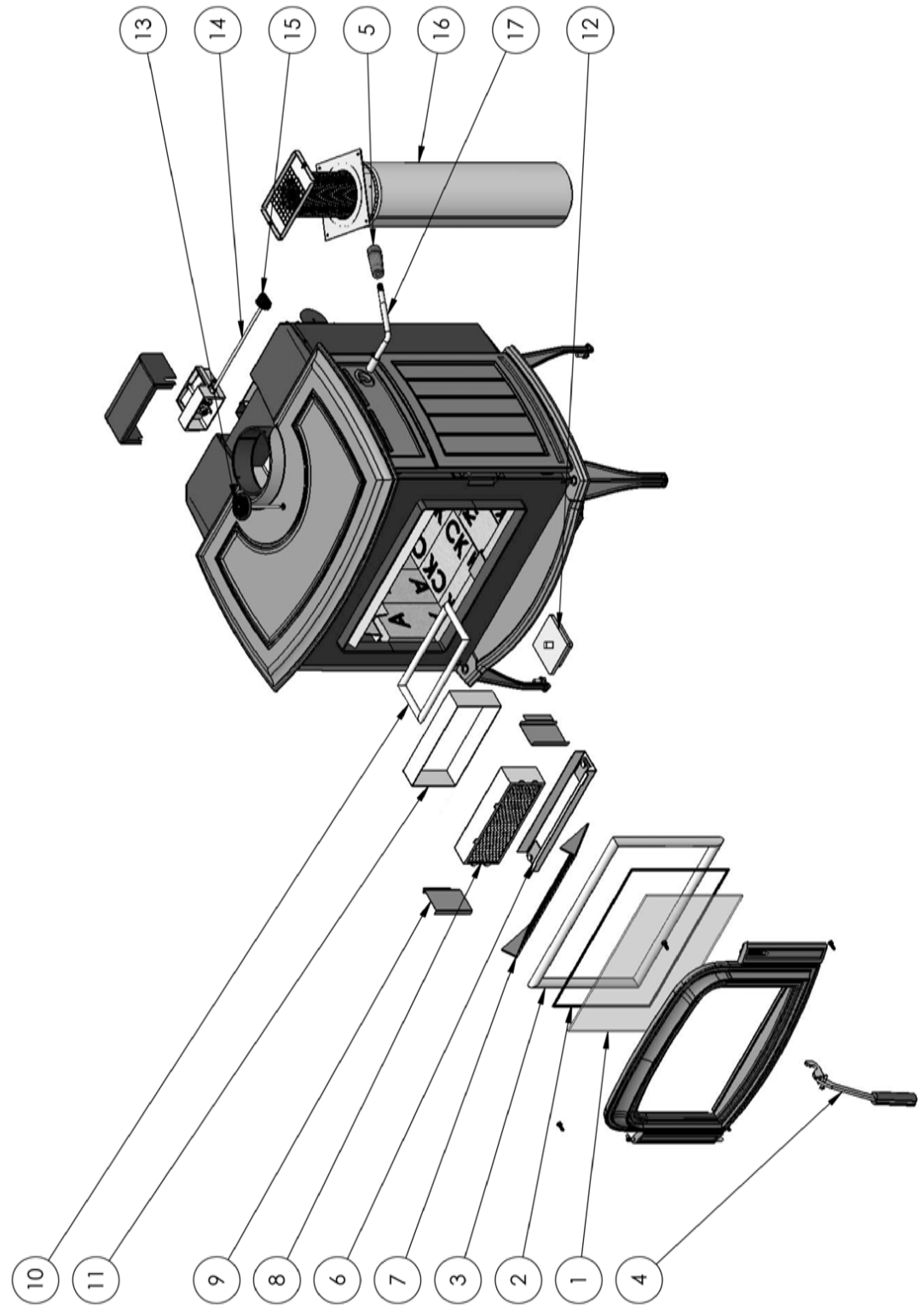
| CAUSE | SOLUTION |
|---------------------------------------|---|
| Spark arrestor screen on cap plugged. | Clean spark arrestor screen to bare metal wire. |
| Chimney too cold. | Make certain double wall stove pipe is used in installation. |
| Not enough vertical rise. | Make certain a minimum vertical rise of 36" is observed prior to elbows. Use two 45 elbows instead of 90 elbow. |
| Chimney not drafting. | Turn thermostat to highest setting, open bypass, leave loading door closed and wait 5-10 minutes to increase chimney or flue temperature. |

Z2814 Fan Kit Replacement Parts



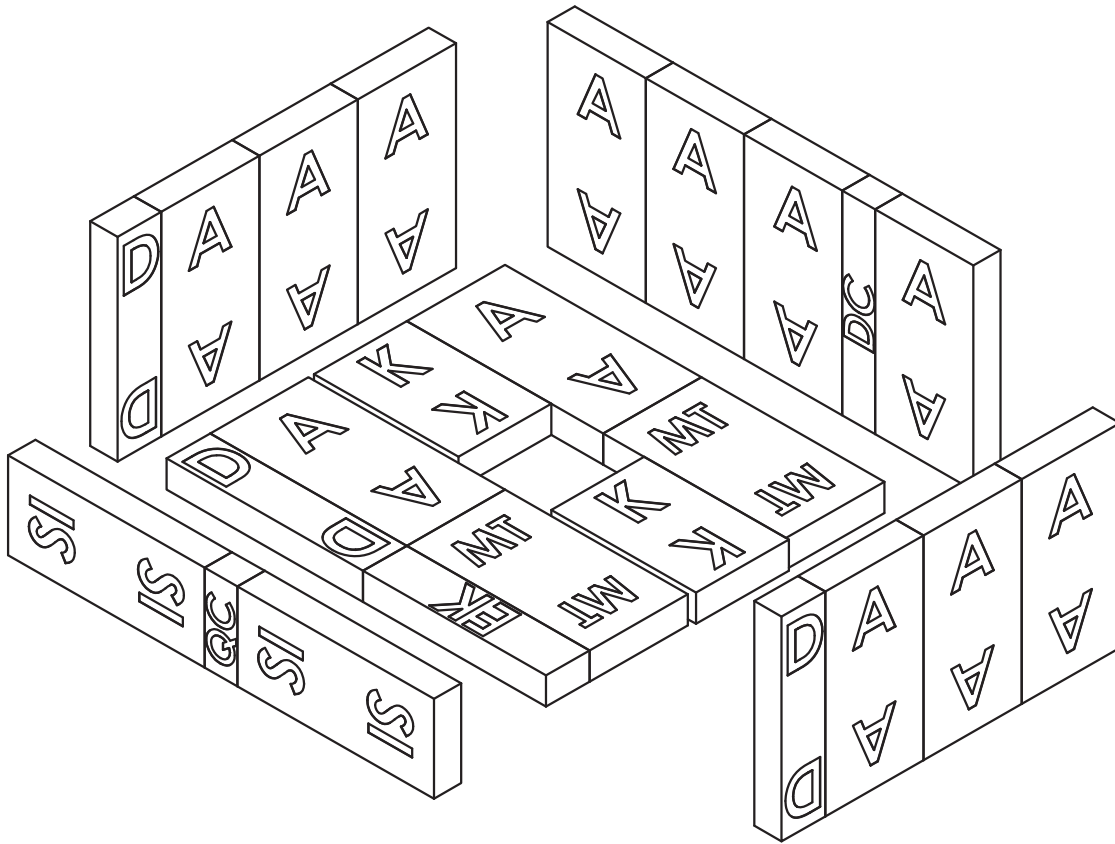
| No. exploded view | Part # | Description | QTY |
|-------------------|---------|----------------------------|-----|
| 1 | H/Z0136 | Rheostat with off switc | 1 |
| 2 | H/0137 | Rheostat knob silver inlay | 1 |
| 3 | H/Z7005 | Replacement axial fan | 1 |

REPLACEMENT PARTS



| No. exploded view | Part # | Description | QTY |
|-------------------|--------------------|--|-----|
| 1 | 130-0256 | GLASS CERAMIC 5MM | 1 |
| 2 | 155-0254-AS | GLASS GASKET 1/8 X 3/4 301B W/PSA - 4 FT | 1 |
| 3 | 155-0186 | DOOR GASKET 7/8" ROUND - 4 FT | 1 |
| 4 | S.Z2944 | DOOR HANDLE W/ WOODEN GRIP | 1 |
| 5 | Z2821 | WOODEN BYPASS HANDLE GRIP | 1 |
| 6 | S.Z4551 | DOME GUARD KIT COMPLETE | 1 |
| 7 | Z2430 | FLAME SHIELD | 1 |
| 8 | S.CAT203032 | COMBUSTOR ASM | 1 |
| 9 | Z4498 | BYPASS RETAINERS KIT COMPLETE | 1 |
| 10 | 155-0255B | BYPASS GASKET 5/8" DENSE ROUND - 3 FT | 1 |
| 11 | 155-0341-C | COMBUSTOR GASKET SLIT 2" X 1/16" - 3 FT | 1 |
| 12 | Z3808 | ASH CHANNEL LID ASM 4 INCH | 1 |
| 13 | 120-0342-E | CAT THERMOMETER W/PAN 4" PROBE | 1 |
| 14 | S.Z3009 | THERMOSTAT | 1 |
| 15 | 220-0102 | THERMOSTAT KNOB BLACK | 1 |
| 16 | S.Z1726 / S.Z1726B | (MOBILE HOME) OUTSIDE AIR KIT | 1 |
| 17 | S.Z2452-SW | BYPASS HANDLE (INCL. WOOD END) (PLATED/WALNUT) | 1 |

Brick Layout



| ITEM NO. | PART NUMBER | QTY. |
|----------|---------------|------|
| 1 | A Size Brick | 12 |
| 2 | D Size Brick | 3 |
| 3 | DC Size Brick | 1 |
| 4 | EK Size Brick | 1 |
| 5 | K Size Brick | 2 |
| 6 | MT Size Brick | 2 |
| 7 | QC Size Brick | 1 |
| 8 | SI Size Brick | 2 |

BLAZE KING WOOD LIMITED WARRANTY

Blaze King and Valley Comfort’s respective brands extend the following warranty for wood fired appliances purchased from an authorized Blaze King / Valley Comfort dealer and installed in the United States of America or Canada. Warranty starts with date of purchase by the original owner (End User) except as noted for replacement parts.

| Warranty Period | | Components Covered | |
|---|---------|--------------------|---|
| Parts | Labor | Wood | |
| 1 Year | | X | All parts, materials and surface finishes (flaking and peeling) Subject to Conditions, Exclusion, and Limitations listed. |
| 2 Years | | X | Fan assemblies and motors, thermal sensors, catalytic thermometer, bi-metallic thermostat assembly, door handle metal components. |
| 5 Years | 2 Years | X | Firebox & Heat Exchanger, Bypass Door Steel Components |
| 6 Years | | X | Catalyst Combustor (see Conditions, Exclusions, and Limitations) |
| 1 Year | | X | Other Replacement Parts |
| See Conditions, Exclusions, and Limitations | | | |

Blaze King Wood Limited 5 Year Warranty

Blaze King is the manufacturer of the Blaze King line of heating products. At Blaze King, our commitment to the highest level of quality and customer service is the most important thing we do. Each Blaze King stove is built on a tradition of using only the finest materials and is backed by our limited warranty to the original purchase. With Blaze King, you're not just buying a stove; you're buying a company with years of unequalled performance and quality.

Limited Six (6) Year Warranty:

The CATALYTIC COMBUSTOR is under warranty by Blaze King for six (6) years from the date of original retail purchase. The purchaser shall pay the following share of the then current retail price for the combustor: The first three (3) years no charge, 4th year 60%; 5th year 70%, 6th year 80%. The Combustor must be returned to your dealer along with a completed COMBUSTOR FAILURE REPORT and original proof of purchase document.

Limited (5) Year Warranty:

Under this warranty, Blaze King covers the stove body and accessories against defects in materials and workmanship, for part repair or replacement for the first five (5) years *** to the original purchase. This Warranty covers: All Steel firebox components against defects in material and workmanship. Please see the exclusions and limitation section below as certain restrictions and exclusions apply this warranty.

Limited Two (2) Year Warranty:

Under this warranty, Blaze King covers, fan assemblies, modular thermostat and door handle steel components against defects in materials and workmanship, for part repair or replacement and limited labor for the first two (2) years to the original purchaser. Please see the exclusions and limitation section below as certain restrictions and exclusions apply to this warranty.

Limited One (1) Year Warranty:

Under this warranty, Blaze King covers all parts and materials against defects in materials and workmanship including exterior paint finishes, for part repair or replacement and limited labor for the first year to the original purchase. Please see the exclusions and limitation section below as certain restrictions and exclusions apply to this warranty.

How the Warranty Works

1. All warranties by the manufacturer are set herein and no claim shall be made against the manufacturer on any oral warranty or representation. All claims under this Limited Warranty must be made in writing by your dealer.
2. Any stove or part thereof that is repaired or replaced during the Limited Warranty period will be warranted under the terms of the Limited Warranty for a period not exceeding the remaining term of the original Limited Warranty or six (6) months, whichever is longer.
3. For any part or parts of this stove, which in our judgment show evidence of defects, Blaze King reserves the option to repair or to replace the defective part(s) through an accredited distributor or agent, provided the defective part is returned to the distributor or agent, transportation prepaid, if requested.
4. If you discover a problem that you think may be covered by the Limited Warranty, you MUST REPORT it to your Blaze King dealer WITHIN 30 DAYS from the date the problem was first detected, giving them proof of purchase and the date of purchase. The dealer will investigate the problem and work with Blaze King to determine whether the problem:
 - a) Is covered by the Limited Warranty or
 - b) Can be fixed in your home or does the product need to be returned to Blaze King for repair.
5. If Blaze King determines that the stove needs to be returned to Blaze King for repair, the customer has the responsibility and the expense of removing it from their home and shipping it to Blaze King. If the problem is covered by the Warranty, Blaze King will repair or replace the item at their discretion and the customer will be responsible for return shipping and re-installation in their home.
6. If the problem is not covered by the Limited Warranty, the customer will be responsible for all repair costs, as well as all storage, shipping and the cost of removing and re-installing the stove.

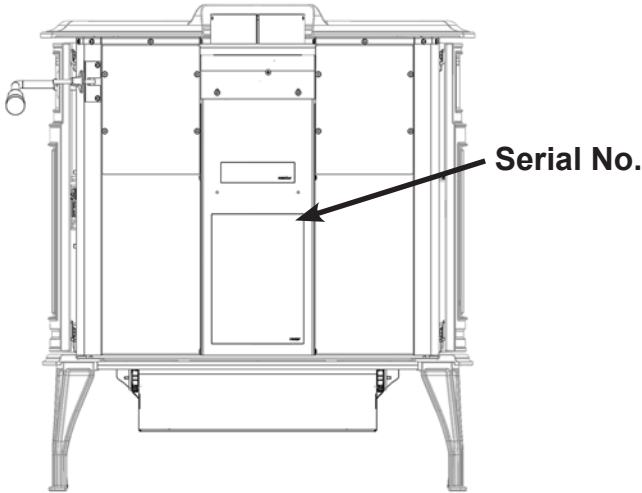
If you are not satisfied with the service provided by the Blaze King dealer, write to Blaze King at the address listed on the last page of the Owner's Manual. Include a copy of the original purchase invoice and a description of the problem.

Exclusions and Limitations:

1. This Warranty does not cover tarnish, discoloration or wear on the plated surfaces. Painted finishes will change color after initial firing and will continue to change through the lifetime of the stove. This is normal occurrence for all high temperature coatings.
2. This Warranty does not cover gasket material or firebrick.
3. Blaze King strongly recommends installation by a certified installer. Failure to comply may adversely affect coverage under the terms of this warranty. This Limited Warranty covers defects in materials and workmanship only if the product has been installed in accordance with local building and fire codes; in their absence refer to the owner's manual. If the product is damaged or broken as a result of any alteration, willful abuse, mishandling, accident, neglect, or misuse of the product, the Limited Warranty does not apply.
4. The stove must be operated and maintained at all times in accordance with the instructions in the Owner's Manual. If the unit shows signs of neglect or misuse, it is not covered under the terms of this Warranty policy. Performance problems due to operator error will not be covered by the Limited Warranty policy. Some minor expansion, contraction, or movement of certain parts and resulting noise, is normal and not a defect and, therefore, is not covered under this Limited Warranty.
5. Misuse includes over-firing. Over-firing can be identified later by warped plates and paint pigment being burnt off. Over-firing this appliance can cause serious damage and will nullify the Limited Warranty.
6. The Limited Warranty will cover glass thermal breakage only and will not cover misuse of the stove glass, including but not limited to:
 - a) Glass that is struck, has surface contaminants or has had harsh or abrasive cleaners used on it.
 - b) If the door is slammed or is closed while wood in the firebox is protruding out the stove opening thus striking the glass.
7. This warranty does not cover products made or provided by other manufacturers and used in conjunction with the operation of this stove without prior authorization from Blaze King. The use of such products may nullify the Limited Warranty on this stove. If unsure as to the extent of this Limited Warranty, contact your authorized Blaze King dealer before installation.
8. Blaze King will not be responsible for inadequate performance caused by environmental conditions.
9. The Limited Warranty does not cover installation and operational related problems such as use of downdrafts or spillage caused by environmental conditions. Environmental conditions include but are not limited to nearby trees, buildings, roof tops, wind, hills, mountains, inadequate venting or ventilation, excessive offsets, negative air pressures or other influences caused by mechanical systems such as furnaces, fans, clothes dryers etc.
10. The Limited Warranty does not cover damage caused by burning salt-saturated wood, corrosive driftwood, chemically treated wood or any fuel not recommended in the Owner's Manual (use cord wood only).
11. The Limited Warranty is void if:
 - a) The stove has been operated in atmospheres contaminated by chlorine, fluorine or other damaging chemicals.
 - b) The stove is subject to submersion in water or prolonged periods of dampness or condensation.
 - c) Any damage to the unit, combustion chamber or other components due to water, or weather damage which is the result of, but not limited to, improper chimney/venting installation.
 - d) Salt air in coastal areas or high humidity can be corrosive to the finish; these environmental conditions can cause rusting. Damage caused by salt air or high humidity is not covered by the Limited Warranty.
12. Exclusions to the Limited Warranty include: injury, loss of use, damage, failure to function due to accident, negligence, misuse, improper installation, alteration or adjustment of the manufacturer's settings of components, lack of proper and regular maintenance, alteration, or act of God.
13. The Limited Warranty does not cover damage caused to the stove while in transit. If this occurs, do not operate the stove and contact your courier and/or dealer.
14. The Limited Warranty does not extend to or include paint, door or glass gaskets or firebricks damage caused by normal wear and tear, such as paint discoloration or chipping, worn or torn gaskets, chipped or cracked firebrick, etc.
15. The Limited Warranty does not include damage to the unit caused by abuse, improper installation, or modification of the unit.
16. Damage to plated surfaces caused by fingerprints, scratches, melted items, or other external scores and residues left on the plated surfaces from the use of abrasive cleaners or polishes is not covered in this warranty.
17. Blaze King is free of liability for any damages caused by the stove, as well as inconvenience expenses and materials. The Limited Warranty does not cover incidental or consequential damages.

18. The Limited Warranty does not cover any loss or damage incurred by the use or removal of any component or apparatus to or from the Blaze King stove without the express written permission of Blaze King and bearing a Blaze King label of approval.
19. Any statement or representation of Blaze King Products and their performance contained in Blaze King advertising, packaging literature, or printed material is not part of the Limited Warranty.
20. The Limited Warranty is automatically voided if the stove's serial number has been removed or altered in any way. If the stove is used for commercial purposes, it is excluded from the Limited Warranty.
21. No dealer, distributor, or similar person has the authority to represent or warrant Blaze King Products beyond the terms contained within the Limited Warranty. Blaze King assumes no liability for such warranties or representations.
22. Blaze King will not cover the cost of the removal or re-installation of the stove, hearth, facing, mantels, venting or other components.
23. Labor to replace or repair items under this Limited Warranty will be covered per our warranty service fee reimbursement and labor rates are set per component schedule. Labor rates vary from location to location and as such total labor costs may not be covered. Please consult with your dealer or service technician for any additional charges such as travel time or additional labor charges that may apply.
24. For parts of the Blaze King woodstove or fireplace insert warranted beyond the first year, the five year limited warranty will have the same obligations as described in this document, provided, however that the purchaser shall pay the following percentage of the then current retail cost of the repair or the replacement, according to the year after purchase in the which the defect is brought to the attention of Blaze King.*** During the 2nd year----purchaser pays 20%. 3rd year ----purchaser pays 40%. 4th year -----purchaser pays 60%. 5th year---- purchaser pays 80%.
25. If a defect or problem is determined by Blaze King to be non warrantable, Blaze King is not liable for travel costs for service work. In the event of in-home repair work, the customer will pay any in-home travel fees or service charges required by the Authorized Dealer.
26. At no time will Blaze King be liable for any consequential damages which exceed the purchase price of the unit. Blaze King has no obligation to enhance or modify any stove once manufactured (example: as a stove model evolves, field modifications or upgrades will not be performed)
27. This Limited Warranty is applicable only to the original purchaser and it is nontransferable.
28. This warranty only covers Blaze King Products that are purchased through an authorized Blaze King dealer.
29. If for any reason any section of the Limited Warranty is declared invalid, the balance of the warranty remains in effect and all other clauses shall remain in effect
30. The Limited Warranty is the only warranty supplied by Blaze King, the manufacturer of the stove. All other warranties, whether express or implied, are hereby expressly disclaimed and the purchaser's recourse is expressly limited to the Limited Warranty.
31. Blaze King and its employees or representatives will not assume any liability for damages, either directly or indirectly, caused by improper usage, operation, installation, servicing or maintenance of this stove.
32. Blaze King reserves the right to make changes without notice. Please complete and mail the warranty registration card and have the installer fill in the installation data sheet in the back of the manual for warranty and future reference
33. Blaze King is responsible for stocking parts for a maximum of seven (7) years after discontinuing the manufacture or incorporation of the item into its products. An exception to this would be if an OEM supplier is not able to supply a part.

INSTALLER NOTES



Installer: Please complete the following information

Dealer Name & Address: _____

Installer (print): _____

Installer (sign): _____

Phone #: _____

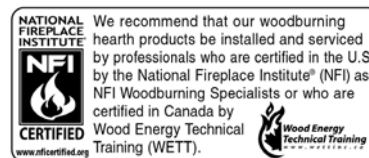
Date Installed: _____

Serial No.: _____

Blaze King

CHINOOK CK20.2

SOLID FUEL WOOD CATALYTIC STOVE



U.S. Environmental Protection Agency certified to comply with 2020 particulate emission standards using crib wood



Installer: Please complete the details on the back cover and leave this manual with the homeowner.
Homeowner: Please SAVE THESE INSTRUCTIONS for future reference.

The authority having jurisdiction (such a municipal building department, fire department, etc.) should be consulted before installation to determine the need to obtain a permit.

OPERATION & INSTALLATION MANUAL

Manufactured By

Valley Comfort Systems Inc., 1290 Commercial Way, Penticton, BC, V2A 3H5, Canada
Phone: 250-493-7444 w Fax: 250-493-5833 w www.blazeking.com w info@blazeking.com

Pour la version française de nos manuels S.V.P. vous référez à notre site web: www.blazeking.com

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⚠ WARNING

- **THIS APPLIANCE IS HOT WHEN OPERATED AND CAN CAUSE SEVERE BURNS IF CONTACTED. ANY CHANGES OR ALTERATIONS TO THIS APPLIANCE OR ITS CONTROLS CAN BE DANGEROUS AND IS PROHIBITED BY FEDERAL AND STATE LAWS.**
- Do not operate appliance before reading and understanding operating instructions. Failure to operate appliance according to operating instructions could cause fire or injury.
- Before installing this appliance, contact the local building or fire authority and follow their guidelines
- This appliance must be installed by a qualified installer.
- Risk of burns. The appliance should be turned off and cooled before servicing
- Do not operate without fully assembling all components.
- Do not let the appliance become hot enough for any part to glow red.
- Do not install damaged, incomplete or substitute components.
- Risk of cuts and abrasions. Wear protective gloves and safety glasses during installation. Sheet metal edges may be sharp.
- Children and adults should be alerted to the hazards of high surface temperature and should stay away to avoid burns or clothing ignition.
- Young children should be carefully supervised when they are in the same room as the appliance. Toddlers, young children and others may be susceptible to accidental contact burns. A physical barrier is recommended if there are at risk individuals in the house. To restrict access to an appliance or appliance, install an adjustable safety gate to keep toddlers, young children and other at risk individuals out of the room and away from hot surfaces.
- Clothing or other flammable material should not be placed on or near the appliance. Objects placed in front of the appliance must be kept a minimum of 48" away from the front face of the appliance.
- Due to high temperatures, the appliance should be located out of traffic and away from furniture and draperie
- Ensure you have incorporated adequate safety measure to protect infants / toddlers from touching hot surfaces.
- Even after the appliance is out, all surfaces, including the glass and/or any attachment will remain hot for an extended period of time.
- Check with your local hearth specialty dealer for safety hearth guards to protect children from hot surfaces. These guards must be fastened to a wall and/or to the floor.
- Any safety guard removed for servicing must be replaced prior to operating the appliance.
- Under no circumstances should this appliance be modified
- This appliance must not be connected to a chimney flue pipe serving a separate solid fuel burning appliance.
- Do not operate the appliance with the glass door removed, cracked or broken. Replacement of the glass should be done by a licensed or qualified service person
- Do not strike or slam shut the appliance glass door.
- Operate only with the doors tightly closed.
- Appliance will over-fire if door is not shut and latched
- Only certified doors / optional fronts / and surrounds for inserts with the unit are to be installed on the appliance.
- Keep the packaging material out of reach of children and dispose of the material in a safe manner. As with all plastic bags, these are not toys and should be kept away from children and infants.
- If the appliance is not properly installed, a house fire may result. Do not expose the appliance to the elements (rain, etc.) and keep the appliance dry at all times.
- The chimney must be sound and free of cracks and obstructions. Clean your chimney regularly as required.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use.
- Your appliance requires periodic maintenance and cleaning. Failure to maintain your appliance may lead to smoke spillage in your home.
- Higher efficiencies and lower emissions will generally result with burning air dried seasoned woods, as compared to wet, green or freshly cut wood. Burning wet unseasoned wood can cause excessive creosote accumulation. When ignited it can cause a chimney fire that may result in a serious house fire
- The appliance is designed to burn seasoned wood only. Do not burn treated wood, coal, charcoal, colored paper, cardboard, solvents or garbage.
- Burn wood directly on the firebricks. Do not use a grate or elevate the fire
- Do not store wood within appliance installation clearances or within the space required for re-fueling and ash removal.
- Ashes must be disposed in a metal container with a tight lid and placed on a non-combustible surface well away from the home or structure until completely cool.

**CALIFORNIA PROPOSITION 65**

WARNING: This product can expose you to chemicals including benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information:

www.P65Warnings.ca.gov

| | |
|------------------------------|--|
| Model | Chinook CK20.2 (catalytic) |
| Height | 32 1/2" (826 mm) |
| Width | 25 3/8" (645 mm) (without removable bypass handle) |
| Depth | 25 7/8" (658 mm) (without optional fan kit) |
| | 26 1/2" (673 mm) (with optional fan kit) |
| Flue collar | 6" I.D. |
| Fire door opening | 15 5/8" x 8" (397 mm x 203 mm) |
| Firebox depth | 16" (407 mm) brick to brick, 18 1/2" (470 mm) brick to glass |
| Firebox width | 17 1/2" (445 mm) |
| Firebox height | 10 3/4" (273 mm) |
| Fire box capacity | 1.8 cu. ft. |
| Recommended Fuel length | 16" (407 mm) max. |
| Wood capacity (approximate): | White oak - 45 lbs. (20.41 kg) |
| | Fir - 30 lbs. (13.61 kg) |
| Construction | 10 gauge & 1/4" firebox, brick line 18 gauge outer shields |
| Shipping Weight | 320 lbs. (145.2 kg) |
| Chimney recommendation | 15' from stove top to chimney cap: Insulated liner recommended |

This unit was tested and listed UL 1482-11(R2015) and ULC-S627-00 by OMNI-Test Laboratories.

This manual describes the installation and operation of the Chinook CK20.2 catalytic equipped wood heater.

This heater is certified to comply with the 2020 U.S. Environmental Protection Agency's particulate emission standards using crib wood.

| EMISSIONS | CO Average(%) | g/hr |
|---|---------------|-----------------|
| Low Burn | 0.20 | 0.22 |
| Med-low Burn | 0.14 | 0.58 |
| Med-high Burn | 0.25 | 0.93 |
| High Burn | 0.23 | 1.53 |
| EPA emission rate weighted average | | .73 g/hr |

Under specific test conditions this heater has been shown to deliver heat at rates ranging from 8900 to 29785 Btu/hr.

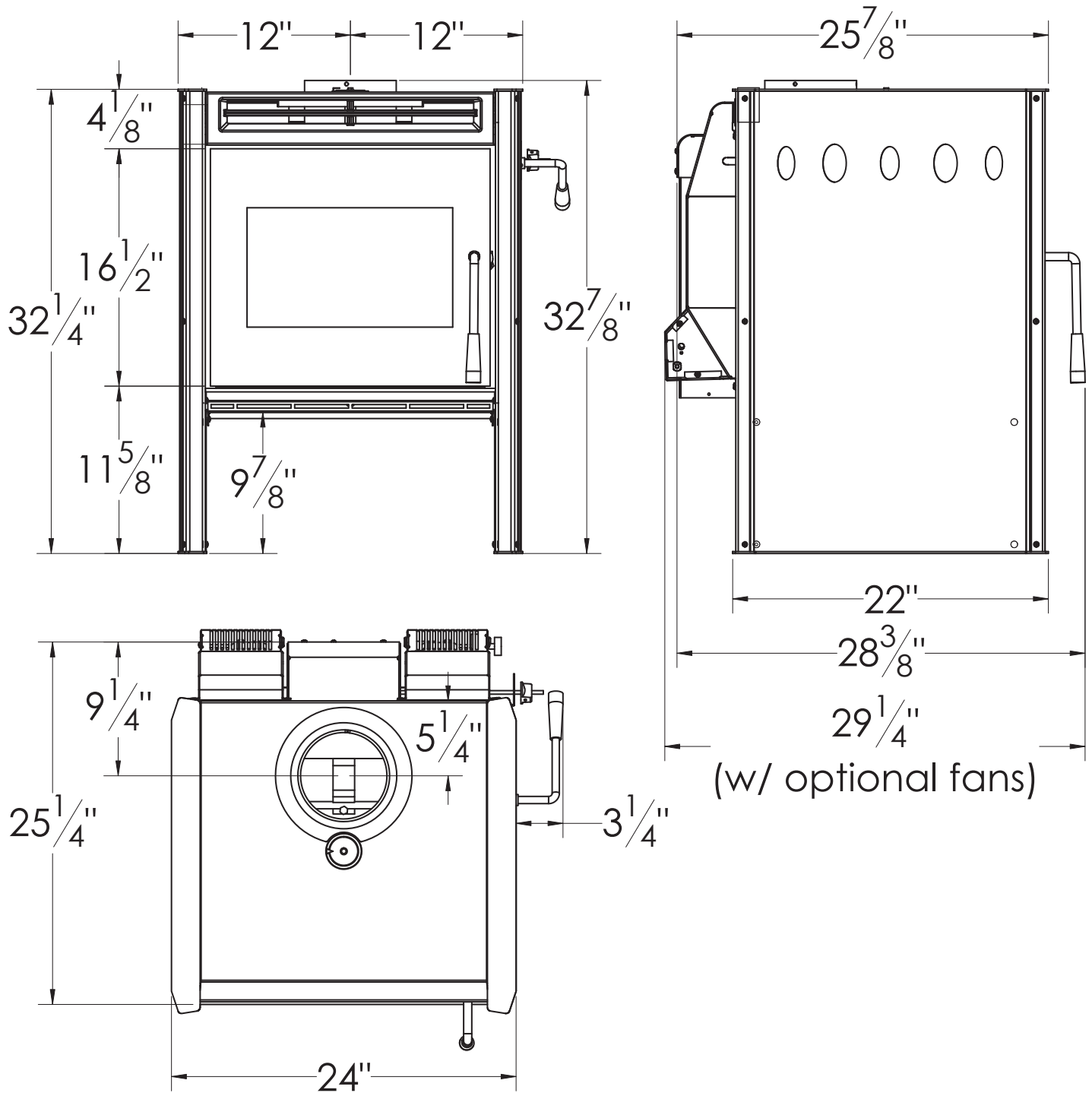
This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.

This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual, or if the catalytic element is deactivated or removed.

The combustor supplied with this heater is a 115-0336-A-M or 115-0556 metal combustor. Consult the catalytic combustor warranty also supplied with this wood heater. Warranty claims should be addressed to:

| in Canada | in USA |
|--|---|
| Blaze King Industries / Valley Comfort Systems Warranty Department, 1290 Commercial Way Penticton, BC Canada V2A 3H5, Ph: 250-493-7444 | Blaze King Industries Warranty Department, 146A Street Walla, Walla, Washington 99362, Ph: 509-522-2730 |

APPLIANCE DIMENSIONS





CHINOOK CK20.2

SN - 21.

BLAZE KING CATALYST STOVE - POËLE À BOIS CATALYTIQUE

ROOM HEATER, SOLID FUEL TYPE, ALSO FOR USE IN MOBILE HOMES. / APPAREIL APPROUVÉ DE TYPE CARBURANT SOLIDE, AUSSI ADAPTÉ POUR INSTALLER DANS UNE MAISON MOBILE. SUIABLE FOR MOBILE-HOME INSTALLATION / CONCU POUR MAISONS MOBILES.

MODEL / MODÈLE: CK20.2
 Tested to / Testé: UL 1482-11(R2015) / ULC S627-00
 CERTIFIED IN BOTH UNITED STATES AND CANADA / CERTIFIÉ POUR LES ÉTATS-UNIS ET LE CANADA

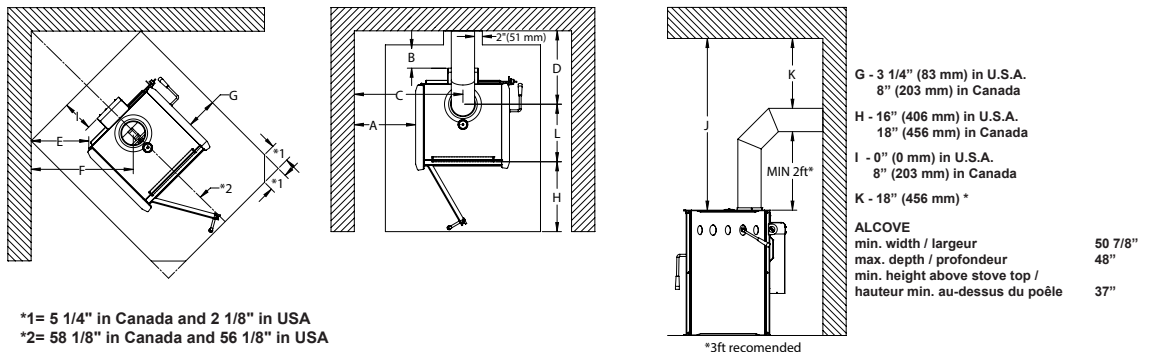
PREVENT HOUSE FIRES- Install and use only in accordance with Blaze King's installation and operation instructions. Contact local building or fire officials about restrictions and installation inspection in your area. The flue size is 6".
CHIMNEYS: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE. Except for installation detailed below, use 6" listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA or a masonry residential type chimney.
 Mobile home, residential close clearance, and residential alcove installations require a 6" listed double wall close clearance chimney connector, with matching listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA. Mobile Home installations are only allowed with a roof exit. Do not install in a sleeping room. Passing through a wall or ceiling requires special methods: see instructions and local building codes.

POUR PRÉVENIR UN INCENDIE - Installer et employer seulement selon le manuel d'installation de Blaze King. Contacter les autorités locales en bâtiments ou en matière de prévention d'incendies au sujet des normes d'inspection et d'installation dans votre secteur. La dimension des conduits de cheminée est de 6".
CHEMINÉE: NE PAS CONNECTER CETTE UNITÉ À UNE CONDUITE DE CHEMINÉE SERVANT UN AUTRE APPAREIL. Excepté pour les situations détaillées ci-dessous, employer une cheminée de 6" homologuée par le fabricant à des fins d'utilisation pour combustibles solides conformément à la norme ULC629 au Canada ou UL-103HT aux États-Unis ou employer une cheminée en maçonnerie de type résidentiel.
 L'installation dans une maison mobile, en espace restreint ou dans des endroits à faible dégagement, requiert l'utilisation de connecteurs muraux à doubles parois et ayant une épaisseur 6" pour la cheminée. Ceux-ci doivent être homologués par le fabricant à des fins d'utilisation pour combustibles solides conformément à la norme ULC629 au Canada ou UL-103HT aux États-Unis. L'installation dans une maison mobile est permise seulement avec une sortie passant par le toit. Ne pas installer dans une chambre à coucher. Passer à travers un mur ou un plafond requiert une méthode spécifique décrite dans les instructions et dans le code local du bâtiment.

MINIMUM CLEARANCES TO COMBUSTIBLES (See owners manual for complete description of all requirements)
DÉGAGEMENTS MINIMUM AUX COMBUSTIBLES (voir les directives d'installation pour la description complète de toutes les conditions)

| Residential Installations / Installations Résidentielles | A | B | C | D | E | F | J |
|---|------------------|----------------|-----------------|-------------------|--------------|-------------------|---------------|
| Roof exit, parallel and corner. Sortie de toit, parallèle et coin. | 12.75" 324 mm | 6.5" 166 mm | 25.5" 648 mm | 15.875" 404 mm | 6" 153 mm | 17.875" 454 mm | 37" 940 mm |
| Wall exit, parallel and corner. Sortie de mur, parallèle et coin. | 12.75" 324 mm | 6.5" 166 mm | 25.5" 648 mm | 15.875" 404 mm | 6" 153 mm | 17.875" 454 mm | 37" 940 mm |
| Alcove roof exit. Fan kit or rear shield required. Sortie de toit en alcôve. Kit de ventilateur et protection arrière requise. | 12.75" 324 mm | 6.5" 166 mm | 25.5" 648 mm | 15.875" 404 mm | | | 37" 940 mm |
| Mobile Home Installations / Installation pour Maison Mobile | | | | | | | |
| Roof exit, parallel and corner. Fan kit or rear shield required. Outside air kit required. Sortie de toit, parallèle et en coin. Kit de ventilateur et protection arrière requise. Kit d'air extérieur requis. | 12.75" 324 mm | 6.5" 166 mm | 25.5" 648 mm | 15.875" 404 mm | 6" 153 mm | 17.875" 454 mm | 37" 940 mm |

*Check with local codes and pipe manufacturers for pipe clearances. In Canada 18" clearances from single wall pipe is required.
 *Vérifier avec le code du bâtiment local et avec le manufacturier de tuyaux pour les dégagements. Au Canada un dégagement de 18 po est exigé pour un tuyau à simple paroi.



Floor protection may be any non-combustible material or Listed Floor Protector, and must extend at least 18" (456 mm) in Canada or 16" (406 mm) in U.S.A., in front of the loading door opening: In USA minimum size is 32"x 40 1/8" (1020 mm x 813 mm)
 In Canada, minimum size is 41 3/8" x 50 1/8" (1051 mm x 1274 mm)

US ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using crib wood. (EPA test methods 28R/5G with an emission-rate of .73 g/hr). 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 operating instructions in the owner's manual, or if the catalytic element is deactivated or removed.
 *ONLY OPERATE WITH DOORS CLOSED. Open door to feed fire ONLY. *DO NOT OBSTRUCT COMBUSTION AIR OPENINGS. Do not obstruct the space beneath the heater. For Use With Solid Wood Fuel Only - Do not burn other fuels, this may make the catalyst in the combustor inactive. The performance of the catalytic device or its durability has not been evaluated as part of the certification. Combustor part number: 115-0336-A-M or 115-0556. Provide adequate outside air for combustion. *Replace with only ceramic glass, 5 mm. Thickness.

La protection de plancher peut être de n'importe quel matériel non combustible ou Protecteur de plancher approuvé, et doit se prolonger au moins de 18" (456 mm) au Canada ou 16" (406 mm) aux États-Unis devant la porte de chargement: Aux États-Unis, la taille minimum est de 32" x 40 1/8" (813 mm x 1020 mm)
 Au Canada la taille minimum est de 41 3/8" x 50 1/8" (1051 mm x 1274 mm)

L'AGENCE DE PROTECTION ENVIRONNEMENTALE DES U.S. - Certifié conformément aux normes d'émission de particules 2020, en utilisant du bois machiné (méthodes d'essai EPA 28R / 5G, ASTM E2615 et ASTM E2780, avec un taux d'émission de 0.73 g / hre). Cet appareil de chauffage au bois nécessite des inspections périodiques et des réparations pour un fonctionnement adéquat. Consulter le manuel du propriétaire pour plus d'informations. Il est contre les règlements fédéraux de faire fonctionner cet appareil de chauffage à l'encontre des instructions d'utilisation fournies dans le manuel du propriétaire, ou si l'élément catalytique est enlevé ou désactivé.
 *Utiliser le uniquement avec les portes fermées. Ouvrir la porte pour alimenter le feu SEULEMENT. *Ne pas obstruer l'entrée d'air de combustion. Fournir l'apport d'air extérieur adéquat pour alimenter la combustion. Ne pas obstruer l'espace sous l'appareil. Utiliser uniquement avec des combustibles solides - ne pas brûler aucun autre combustible, ce qui peut rendre le catalyseur de la chambre à combustion inactif. La performance du catalyseur ou sa longévité n'a pas été évaluée dans le cadre de la certification. Numéro du catalyseur: 115-0336-A-M ou 115-0556. *Employer seulement le verre en céramique d'une épaisseur de 5mm si le remplacement est nécessaire.

MANUFACTURED IN

USA: Blaze King Industries
 146A Street
 Walla Walla, WA.
 99362

CANADA: Valley Comfort Systems
 1290 Commercial Way
 Penticton, B.C.
 V2A 3H5

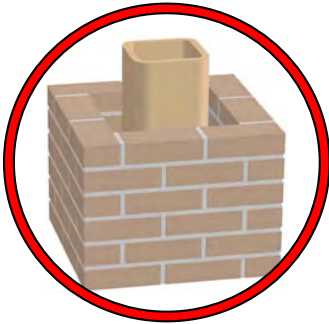
MANUFACTURE DATE

JAN FEB MAR APR MAY JUN
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 2019 2020 2021 2022 2023 2024

170-0234 [05 20]

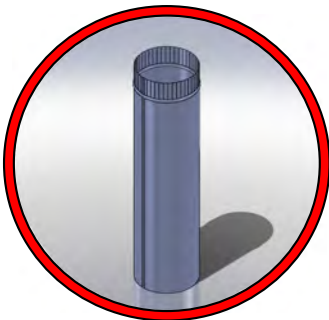
IF THIS BLAZE KING APPLIANCE IS NOT PROPERLY INSTALLED OR OPERATED, A HOUSE FIRE MAY RESULT. TO REDUCE THE RISK OF FIRE, FOLLOW THE INSTALLATION INSTRUCTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW APPLIANCE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.



This appliance must be connected to a listed high temperature (**ULC629 IN CANADA OR UL-103HT IN THE USA**) residential type factory built solid fuel chimney or an approved masonry chimney with a flue line .

Chimney and chimney connector must be in good condition and kept clean.
NEVER vent the stove to other rooms of the building. Must be vented to the outside **ONLY**.
NEVER use a chimney or chimney connector smaller than the stove exhaust, unless approved by your local inspector.
NEVER vent the stove into a "Class B" gas vent chimney.
DO NOT CONNECT IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.



Inspect the chimney connector and chimney regularly during each burning season and clean when necessary.
DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

NEVER intentionally start a chimney fire to clean the flu



When installed in a mobile home, this appliance must be bolted to the floor and provided with outside air.

WARNING: DO NOT INSTALL IN A SLEEPING ROOM
CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.

Check with local building official



If the Optional Fan Kit is installed, connect this unit to a properly grounded, 110-volt electrical outlet. Do not route the power cord in front of or under the appliance.



Do not make any changes or modifications to an existing masonry fireplace or chimney to install this appliance. Do not make any changes to the appliance to increase combustion air.



Never try to repair or replace any part of this appliance unless instructions are given in this manual. All other work must be done by a trained technician.



Do not place clothing or other flammable items on or near this appliance.



Allow the appliance to cool down before carrying out any maintenance or cleaning.



DO NOT OVER FIRE THIS HEATER. Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater and to the catalytic combustor. Over firing the appliance may cause a house fire. Never burn the appliance so hot that the appliance or chimney connector begins to glow.



Maintain the door and glass seal and keep them in good condition. A leaking door seal will shorten burn times and may harm the combustor.

Avoid placing wood against the glass when loading. Do not slam the door or strike the glass.



Do not use a grate or other device to elevate the fire off of the firebox floor. Burn the fire directly on the bricks.



Do not throw this manual away. This manual has important operating and maintenance instructions that you will need at a later time. Always follow the instructions in this manual.



Ashes should be placed in a steel container with a tightly fitting lid and moved outdoors immediately. 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. Other waste shall not be placed in this container.



It is required in some jurisdictions to install smoke and carbon monoxide detectors where heaters are installed. Install at least one smoke detector on each floor of your home to ensure your safety. It should be located away from the wood appliance and close to the sleeping areas. Locating a smoke detector too close to a wood appliance can cause the smoke detector alarm to sound if a puff of smoke is emitted while the wood appliance door is open during reloading. Follow the smoke detector manufacturers placement, installation, and maintenance instructions.



This appliance is designed and approved for burning cord wood only. DO NOT burn trash, garbage; artificial or paper logs; gift wrappings; coal; lighter fluids; chemical cleaners chemical starters; treated or painted wood; salt water driftwood or foil-backed paper such as gum wrappers or cigarette packages; lawn clippings or yard waste; materials containing rubber (including tires), plastic, asbestos; waste petroleum products, paints or paint thinners, or asphalt products; construction or demolition debris; railroad ties or pressure-treated wood; manure or animal remains; unseasoned wood or paper products, cardboard, plywood, or particleboard. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected wood heat. Burning these materials may result in the release of toxic fumes or render the heater ineffective and cause smoke. Burn natural wood only. It will void all warranties and safety listings and may damage the combustor.



Never burn the appliance with the loading door open. Leaving the door cracked open may damage the combustor.

Never block free airflow through vents on this appliance.



Do not use chemicals or fluids to start the fire. Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. Some fuels could generate carbon monoxide and are very dangerous.

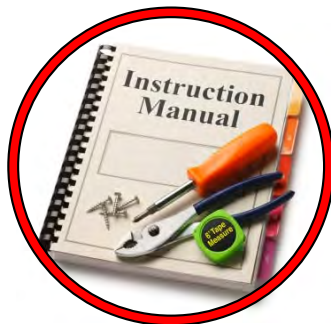


**HOT WHILE IN OPERATION.
KEEP CHILDREN,
CLOTHING AND FURNITURE
AWAY.
CONTACT MAY CAUSE SKIN
BURNS.**

Do not touch the appliance when it is hot and educate all children of the danger of a high temperature appliance. Young children should be supervised when they are in the same room as the appliance.



Keep furniture, curtains, wood, paper and other combustibles a minimum of 48in (1219mm) away from the front of the appliance. ALSO, DO NOT STORE COMBUSTIBLES UNDER THE APPLIANCE (WOOD, PAPER etc.).



This appliance must be properly installed to prevent the possibility of a house fire. The instructions must be strictly adhered to. Do not use makeshift methods or compromise in the installation.



Contact local building official to obtain a permit and information on any installation restriction or inspection requirements in your area. Notify your insurance company as well.

⚠ WARNING

- BEFORE INSTALLING THIS APPLIANCE, CONTACT THE LOCAL BUILDING OR FIRE OR OTHER AUTHORITY HAVING JURISDICTION AND FOLLOW THEIR GUIDELINES.
- THIS APPLIANCE MUST BE INSTALLED BY A QUALIFIED INSTALLER. FOLLOW THE INSTALLATION DIRECTIONS. DO NOT OPERATE WITHOUT FULLY ASSEMBLING ALL COMPONENTS.
- IF THIS APPLIANCE IS NOT PROPERLY INSTALLED, A HOUSE FIRE MAY RESULT.
- THIS APPLIANCE IS HOT WHEN OPERATED AND CAN CAUSE SEVERE BURNS IF CONTACTED. CHILDREN AND PETS MUST BE KEPT FROM TOUCHING THE APPLIANCE WHEN IT IS HOT.
- COMBUSTIBLE MATERIAL SUCH AS FIRE WOOD, WET CLOTHING, ETC. PLACED TOO CLOSE CAN CATCH FIRE. OBJECTS PLACED IN FRONT OF THE APPLIANCE MUST BE KEPT A MINIMUM OF 48”(1219 MM) FROM THE FRONT OF THE APPLIANCE.

Blaze King grants no warranty, implied or stated, for the installation or maintenance of the appliance and assumes no responsibility of any consequential damage(s).



We recommend that our products be installed and serviced by professionals who are certified in the U.S. by the National Fireplace Institute® (NFI) as NFI Specialists or who are certified in Canada by Wood Energy Technical Training (WETT).

**PARTS INCLUDED WITH THE CHINOOK**

1. Poker
2. Manual Kit (w/ warranty cards, thermometer, bypass handle, flue ring)

OPTIONAL EQUIPMENT

- | | |
|---------------------------------|----------------------------------|
| 1. Fan Kit (S.Z2514) | 2. Rear Shield (S.Z4015) |
| 3. 4" Outside Air Kit (S.Z1726) | 4. 3" Outside Air Kit (S.Z1726B) |

FLOOR PROTECTION

If the stove sits on a combustible floor, a non-combustible shield must be used underneath the stove and extending 16" out from the front and 8" on either side of the fuel-loading door in the USA. In Canada a non-combustible shield must be used underneath the stove and extending 8" on either side and rear and 18" out in front of the loading door.

A non-combustible shield is also required underneath the chimney connector and extending at least 2" (50.8mm) on either side of the chimney connector.

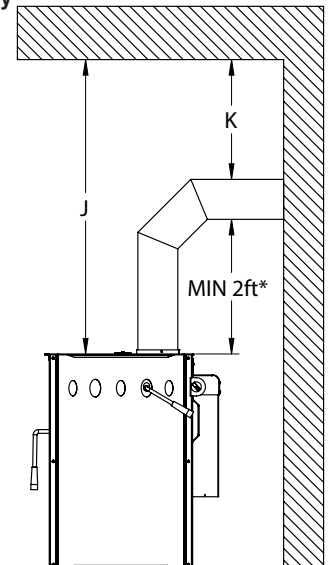
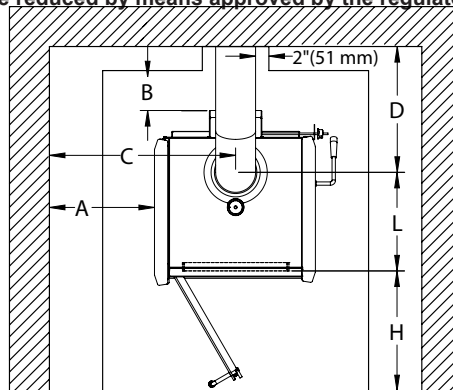
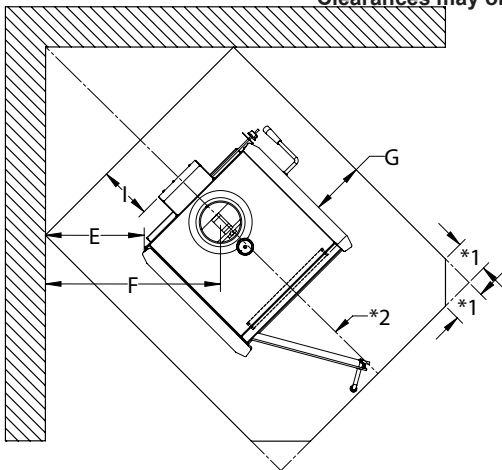
See the next page for minimum sizes depending on model. This floor protection is required to prevent sparks from falling onto the combustible floor. See CSA B365-M87. **This product does not require thermal hearth pad protection.**

MINIMUM CLEARANCES for CK20.2

| Residential Installations | A | B | C | D | E | F | J |
|--|------------------|----------------|-----------------|--------------------|--------------|--------------------|----------------|
| Roof exit, parallel and corner. | 12.75" 324 mm | 6.5" 166 mm | 25.5" 648 mm | 15.875"* 404 mm | 6" 153 mm | 17.875"* 454 mm | 37" 940 mm |
| Wall exit, parallel and corner. | 12.75" 324 mm | 6.5" 166 mm | 25.5" 648 mm | 15.875"* 404 mm | 6" 153 mm | 17.875"* 454 mm | 37"* 940 mm |
| Alcove roof exit. Fan kit or rear shield required. | 12.75" 324 mm | 6.5" 166 mm | 25.5" 648 mm | 15.875"* 404 mm | | | 37" 940 mm |
| Mobile Home Installation | | | | | | | |
| Roof exit, parallel and corner. Fan kit or rear shield required. Outside air kit required. | 12.75" 324 mm | 6.5" 166 mm | 25.5" 648 mm | 15.875"* 404 mm | 6" 153 mm | 17.875"* 454 mm | 37" 940 mm |

* Check with local codes and pipe manufacturer for pipe clearances. In Canada, 18" clearances from single wall pipe is required.

Clearances may only be reduced by means approved by the regulatory authority



*3ft recommended

*1= 5 1/4" in Canada and 2 1/8" in USA
 *2= 58 1/8" in Canada and 56 1/8" in USA

| | | | |
|--|---|---|--|
| G = 3 1/4" (83mm) in USA 8" (203mm) in Canada | H = 16" (406mm) in USA 18" (456mm) in Canada | I = 0" (0mm) in USA 8" (203mm) in Canada | K = 18" (456mm) for single wall pipe in Canada |
|--|---|---|--|

Ember protection shield (not required to have an insulation value) or a listed UL 1618 Type 1 floor protector must have a minimum size of

In USA: 32 x 40 1/8" (813 mm x 1019 mm)
 In Canada: 41 3/8" x 50 1/8" (1051 mm x 1273 mm)

Alcove minimum width 50 7/8", maximum depth 48", minimum above stove top 37".

This stove must be installed in compliance with all local codes and regulations.

COMBUSTION AIR

Ensure adequate combustion air allowing for all other exhausting type appliances in the dwelling (range hoods, dryers, etc.). In air tight homes and modern constructions, careful considerations must be taken into account when using a wood burning appliance. Heat recovery ventilators (HRV) systems along with constant running fan motors in air handlers must be taken into account when balancing the system. Failure to do so may result in air starvation, smoke spillage and carbon monoxide threats. Consult a HVAC specialist for proper installation. Ensure adequate combustion air allowing for all other exhausting type appliances in the dwelling (range hoods, dryers, etc.). In airtight houses it is recommended to install a fresh air inlet into the room where the appliance is located, to prevent air starvation.

DRAFTING PERFORMANCE

Draft is the force which moves air into the appliance up through the chimney. The amount of draft created by your chimney depends upon length, offsets, insulating properties, obstructions (such as architectural design, trees), local geography and other factors.

External forces, such as outdoor temperature, wind, barometric pressure, topography, or factors inside the home (negative pressure from exhaust fans, chimneys, air infiltration, etc) may adversely affect draft.

Too much draft may cause excessive temperatures in the appliance and may damage the heater. An uncontrollable burn or excessive temperature indicates excessive draft.

Inadequate draft may cause back puffing (spillage) into the room and plugging of the chimney, chimney cap or spark arrestor screen. Inadequate draft may cause smoke to leak into the room through appliance or chimney connector joints. Poor draft can also lead to poor heat production and the inability for the combustor to remain active in lower burn rate settings.

High efficiency appliances, such as your Blaze King stove, may require some fine tuning of your chimney system in order to maximize performance.

Blaze King cannot be responsible for external forces leading to less than optimal performance.

ROLE OF THE CHIMNEY

Without a proper installed chimney, this appliance will not burn correctly.

The role of the chimney is to pull the proper amount of air into the firebox for the purpose of complete combustion. Incomplete combustion will lead to more smoke and pollution of the outside air. A proper operating chimney will allow the user to enjoy peak performance at all burn operating levels from low to high. Blaze King therefore recommends vertical installations with a minimum length of 15' from stove top to chimney cap. In all freestanding stove installations, use double wall stove pipe from the stove top to the ceiling support box. The use of double wall stove pipe does allow for reduced clearances, however most importantly, it helps to keep the chimney warm and improve draft.

For wall exits, the same suggestion applies. With the addition of the recommendation to use two 45 degree elbows rather than a single 90 degree elbow. The use of two 45 degree elbows will allow for both a smoother transition to the exterior chimney and will also shorten the horizontal run to the outside chimney. A minimum 36" rise is recommended prior to any elbows being used. When possible, outside chimney systems should be isolated from direct exposure to winter weather by building a chase around the chimney, observing all clearances as specified by the venting manufacture. Doing so will help to keep the chimney warmer and improve draft. (see **RECOMMENDED FLUE HEIGHTS**)

VENTING SYSTEMS

The venting system consists of a chimney connector and a chimney. These get extremely hot during use. Temperatures inside the chimney may exceed 2000 degrees in the event of a creosote fire. To protect against the possibility of a house fire, the chimney connector and chimney must be properly installed and maintained. A listed thimble must be used when a connection is made through a combustible wall to a chimney. A chimney support package must be used when a connection is made through the ceiling to a listed prefabricated chimney. These accessories are absolutely necessary to provide safe clearances to combustible wall and ceiling material.

This stove may be connected to a lined masonry chimney or a listed factory built chimney suitable for use with solid fuels and conforming to, ULC629 in Canada or UL-103HT in the USA. Do not connect it to a chimney serving another appliance. To do so will affect the safe operation of both appliances, and will void the stove warranty. You must comply with the local authority having jurisdiction and/or in Canada, CSA installation standard B365-M87.

The chimney connector must be 6" diameter, 24 MSG Black/Blue steel. Do not use aluminum or galvanized steel. They cannot properly withstand the extreme temperatures of a wood fire. The chimney connector between the stove and the chimney should be as short and direct as possible.

The chimney connector must be attached to either an approved masonry chimney or one of the listed factory built chimneys suitable for use with solid wood fuel. All joints must be tight and fastened with sheet metal screws.

⚠ WARNING

THE CHIMNEY CONNECTOR IS TO BE USED ONLY WITHIN THE ROOM, BETWEEN THE STOVE AND CEILING / WALL. NEVER USE A CHIMNEY CONNECTOR TO PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. AN EFFECTIVE VAPOR BARRIER MUST BE MAINTAINED AT THE LOCATION WHERE THE CHIMNEY OR COMPONENT PENETRATES TO THE EXTERIOR OF THE STRUCTURE. ALWAYS MAINTAIN THE MINIMUM CLEARANCES TO COMBUSTIBLES AS REQUIRED BY THE APPLICABLE BUILDING CODES.

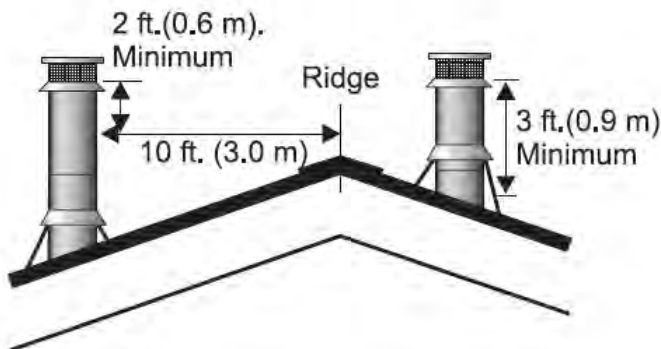
INSTALLATION INSTRUCTIONS

CONNECTION TO A METAL PREFABRICATED CHIMNEY

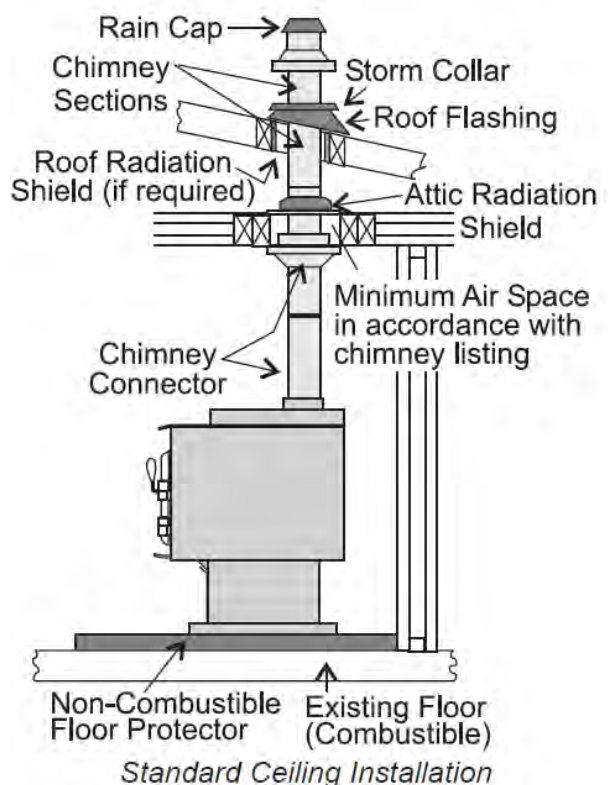
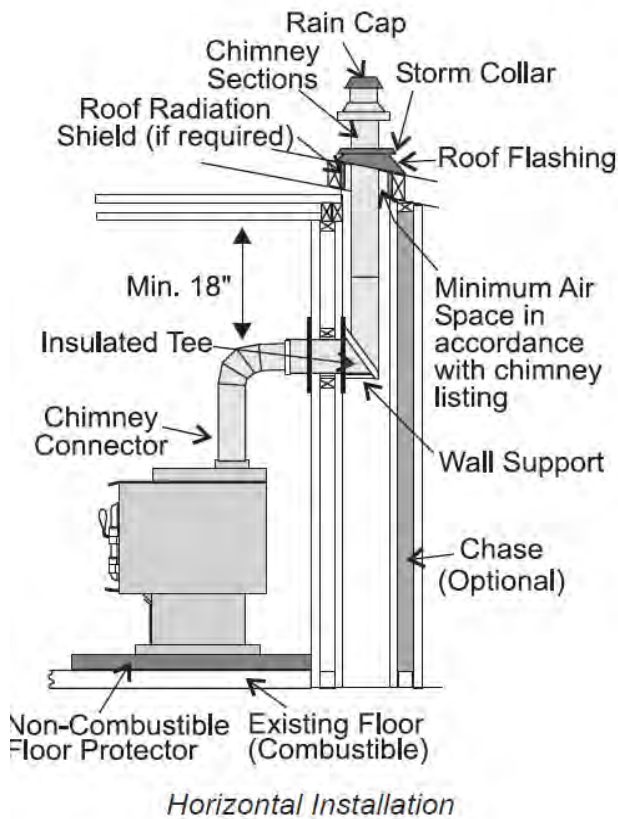
Refer to “**RECOMMENDED FLUE HEIGHTS**” chart for minimum flue height recommendations and ULC629 in Canada or UL-103HT in the USA for installation codes. When a metal prefabricated chimney is used, the manufacturer’s installation instructions must be followed precisely. You must also purchase (from the same manufacturer) and install the ceiling support package or wall pass through and “T” section package, fire stops (when needed), insulation shield, roof flashing, chimney cap, etc. Maintain the proper clearance to the structure as recommended by the manufacturer. This clearance is usually a minimum of 2 inches, although it may vary by manufacturer or for certain components.

There are basically two methods of metal chimney installation. One method is to install the chimney inside the residence through the ceiling(s) and the roof. The other method is to install an exterior chimney that runs up the outside of the residence (**not recommended**). If it is necessary to run the chimney outside, build an outside chase around the chimney.

The chimney must be the required height above the roof or other obstruction for safety and for proper draft



operation. The requirement is that the chimney must be at least 3 feet higher than the highest point where it passes through the roof and at least 2 feet higher than the highest part of the roof or structure that is within 10 feet of the chimney, measured horizontally (**Fig. 1**). The height requirement is necessary in the interest of safety and does not necessarily assure proper flue draft. Use a minimum total system height of 15 feet, measured from the stove flue collar to the top of the chimney, not including the chimney cap.



CONNECTION TO A MASONRY CHIMNEY

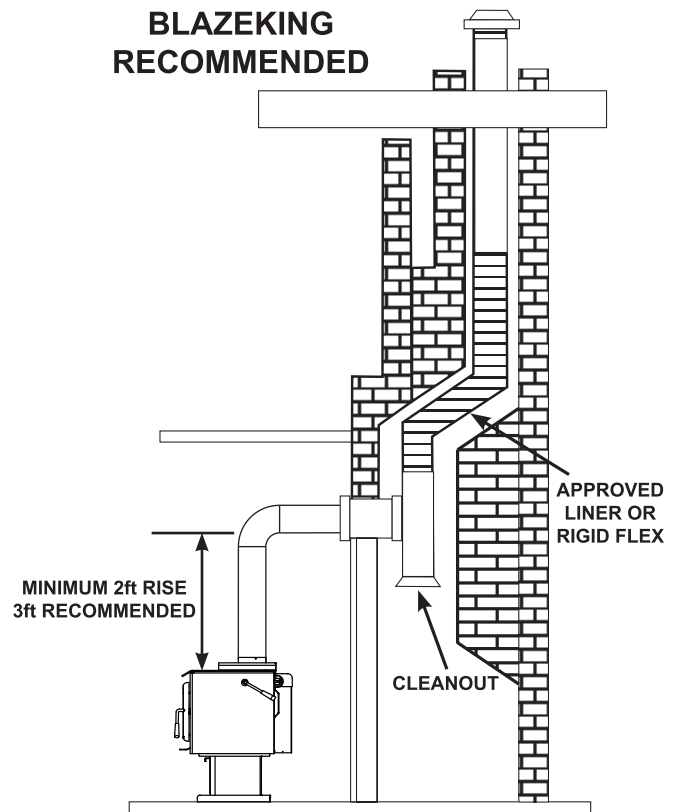
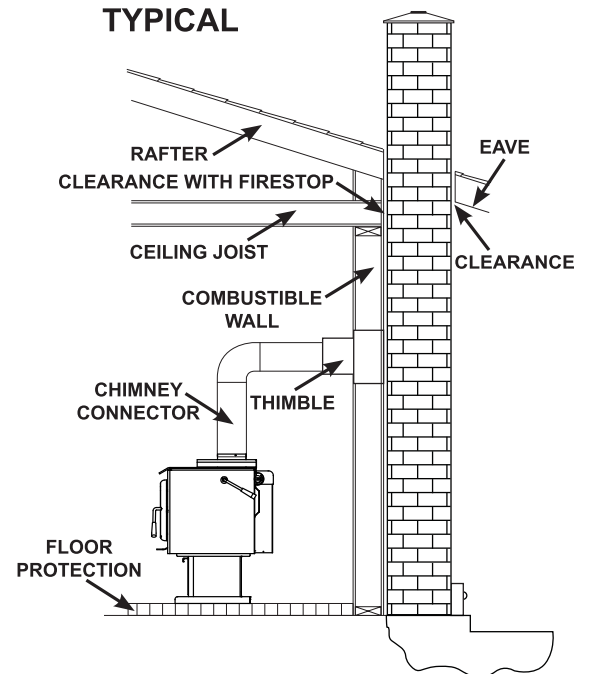
Masonry chimney***

Ensure that a masonry chimney meets the minimum standards (NFPA) by having it inspected by a professional. Make sure there are no cracks, loose mortar or other signs of deterioration and blockage. Have the chimney cleaned before the stove is installed and operated. When connecting the stove through a combustible wall to a masonry chimney, special methods are needed.

In Canada, the wall cut away is to provide 18" clearance for the connector. The resulting space must remain empty. A flush mounted sheet metal cover may be used on one side only. If covers are to be used on both sides, each cover must be mounted on noncombustible spacers at least 1" clear of the wall.

*****Blaze King recommends the use of a Stainless steel liner, preferably insulated, inside a masonry chimney. This is to maintain proper draft and overall better operation of the unit.**

Your local dealer or local jurisdiction can provide details of approved methods of passing a chimney connector through a combustible wall in your area. In USA, the National Fire Protection Association has minimum standards to comply with. In Canada, this type of installation must conform to CAN/CSA-B365, Installation Code for Solid Fuel Burning Appliances and Equipment.



RECOMMENDED FLUE HEIGHTS

1. At sea level the minimum height is a 15 ft (4.6 m) straight run.
2. Add the following vertical height to the flue to compensate for
 - 45° elbow = 1.0 ft (.30 m)
 - 90° elbow = 2.0 ft (.61 m)
 - “T” section= 3.0 ft (.91 m)
3. Each foot of horizontal run = 2 ft (.61 m) of vertical rise.

Example: One 90° elbow = 2ft (.61 m)
 2ft Horizontal run = 4ft (1.2 m)
 One base “T” = 3ft (.91 m)
 Total height addition = 9ft (2.7 m) at sea level

| MINIMUM RECOMMENDED FLUE HEIGHT | | | | |
|--|-------------------------|----------------|----------------|----------------|
| ELEVATION ABOVE SEA LEVEL | NUMBER OF ELBOWS | | | |
| | 0 | 2 X 15° | 2 X 30° | 2 X 45° |
| 0 - 1000 ft 0 - 305 m | 15 4.6 m | 16 4.9 m | 18 5.5 m | 19 5.8 m |
| 1000 - 2000 ft 305 - 610 m | 15.5 4.7 m | 16.5 5.0 m | 18.5 5.6 m | 19.5 5.9 m |
| 2000 - 3000 ft 610 - 914 m | 16 4.9 m | 17 5.2 m | 19 5.8 m | 20 6.1 m |
| 3000 - 4000 ft 914 - 1219 m | 16.5 5.0 m | 17.5 5.3 m | 19.5 5.9 m | 20.5 6.2 m |
| 4000 - 5000 ft 1219 - 1524 m | 17 5.2 m | 18 5.5 m | 20 6.1 m | 21 6.4 m |
| 5000 - 6000 ft 1524 - 1829 m | 17.5 5.3 m | 18.5 5.6 m | 20.5 6.2 m | 21.5 6.6 m |
| 6000-7000 ft 1829 - 2134 m | 18 5.5 m | 19 5.8 m | 21 6.4 m | 22 6.7 m |
| 7000 - 8000 ft 2134 - 2438 m | 18.5 5.6 m | 19.5 5.9 m | 21.5 6.6 m | 22.5 6.9 m |
| NOTE: No more than one offset (two elbows allowed). Two 45°elbows equal one 90° elbow | | | | |

Please note: These are only guidelines. Please refer to the section in the manual pertaining to draft. Every installation is unique and can be influenced by topographical and geographical phenomena
 The use of a manometer and an understanding of pressure planes and the stack effect are imperative in planning and executing a successful installation.

MOBILE HOME (AND RESIDENTIAL ALCOVE INSTALLATIONS)

Requires outside air kit, and either rear shield OR fan kit. (See next page for kits and part numbers). The outside air kit is easiest to mount before the stove is installed. See instructions packed with each kit.

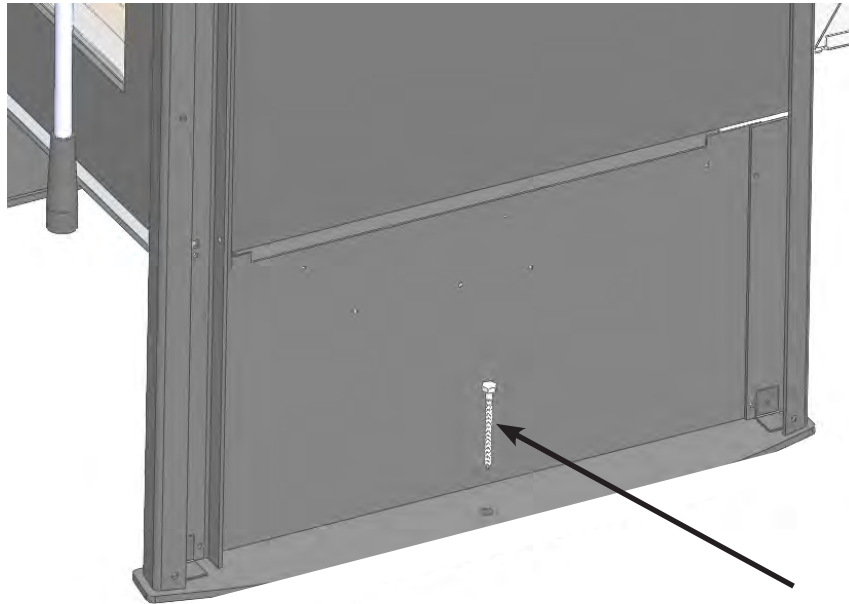
NOTE: UNDER NO CIRCUMSTANCES SHOULD THE FRESH AIR TUBE EVER BE INSTALLED HIGHER THAN THE BOTTOM OF THE APPLIANCE FIREBOX FLOOR.

When a metal prefabricated chimney is used, the manufacturer's installation instructions must be followed precisely. You must also purchase (from the same manufacturer) and install the ceiling support package, fire stops (when needed), insulation shield, roof flashing, chimney cap, etc. Maintain the proper clearance to the structure as recommended by the manufacturer.

The Chimney connector must be a listed double wall close clearance type. Insulated chimney components must be a listed factory built chimney suitable for use with solid fuels and conforming to ULC629 in Canada and UL-103HT in the USA. Single wall stove pipe is not allowed in mobile homes or alcove installations. For mobile home, the chimney needs to be removable to allow for transportation of the mobile home.

⚠ WARNING

DO NOT INSTALL IN SLEEPING ROOM. THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL AND CEILING / ROOF MUST BE MAINTAINED.



In mobile home installations, the stove must be securely fastened to the floor using the tie-downs provided in the Outside Air kit. To access the screw down hole, remove side shields (see "SIDESHIELD REMOVAL AND CHANGE-OUT").

ALSO, a #8 ground wire must be attached to the stove and an appropriate ground.

OPTIONAL ACCESSORIES

Outside air kit, rear shield or fan kit are optional accessories, but are required for the following installations:

MOBILE HOME INSTALLATION — Requires outside air kit and fan kit or rear shield

RESIDENTIAL ALCOVE — Requires fan kit or rear shield

REAR SHIELD KIT (S.Z4015)

EITHER this rear shield OR the fan kit (P/N Z2514) is REQUIRED FOR:

MOBILE HOME, any installation

RESIDENTIAL ALCOVE

FAN KIT (P/N S.Z2514)

EITHER this fan kit or the rear shield (Z4015) is REQUIRED FOR:

MOBILE HOME, any installation

RESIDENTIAL ALCOVE

NOTE: Fan kit should be installed before the stove is placed into position

ELECTRICAL CONNECTION

Your Blaze King fan kit is equipped with a three-prong (grounded) plug to decrease shock hazard.

THIS PLUG SHOULD BE INSERTED DIRECTLY INTO A PROPERLY-GROUNDED, THREE-HOLE RECEPTACLE. DO NOT CUT OR REMOVE THE GROUNDING PRONG FROM THIS PLUG. Do not route the power cord in front or under the stove.

OUTSIDE AIR KIT (P/N S.Z1726 / S.Z1726B)

REQUIRED FOR: MOBILE HOME (any installation)

The outside air inlet hose is a flexible tube to bring outside air for combustion into the stove from outside the residence, through the wall or up through the floor. The flexible tube will allow some adjustment over or around floor joists or plumbing. **DO NOT CHANGE THE STRUCTURAL INTEGRITY OF THE FLOOR.** This air hose must be kept open at all times to provide outside air for combustion.

INSTALLATION:

See instructions included with the outside air kit. Tools needed: 1/4" or 3/8" drill motor, saber saw, saber saw wood & metal blades, 5/16" nut driver or wrench, 7/16" wrench, small tube of hi-heat silicone.

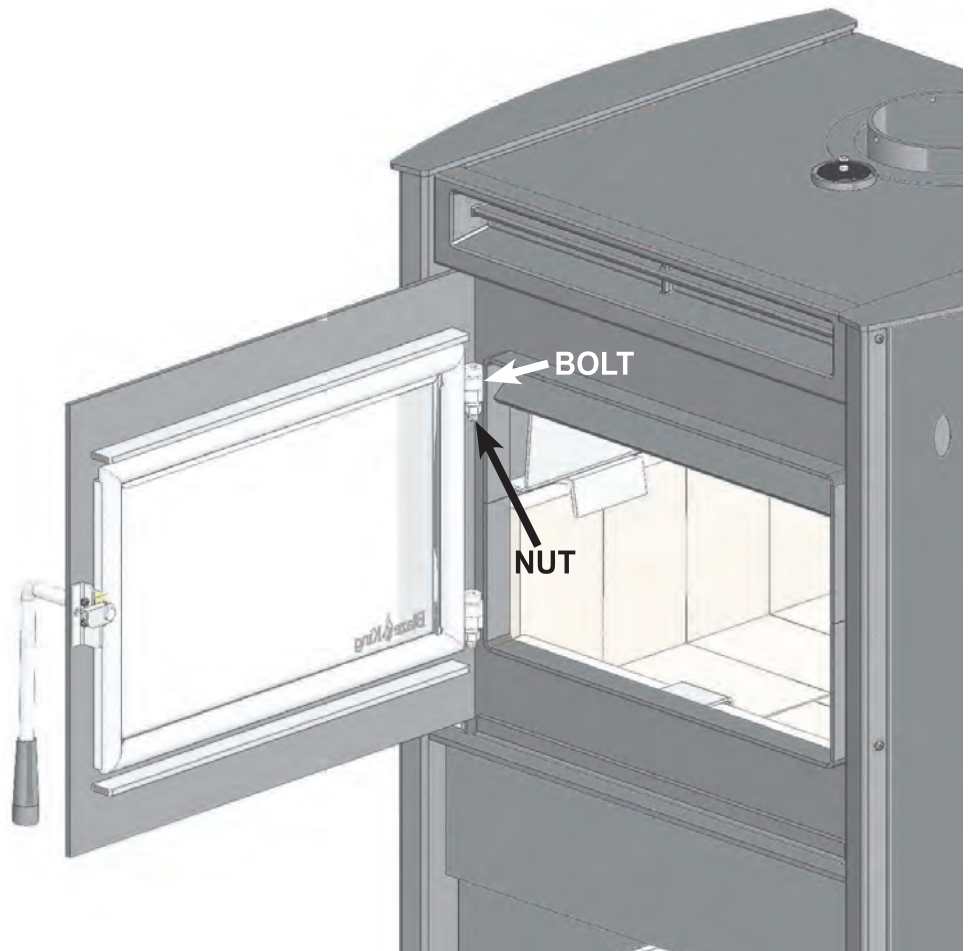
DOOR REMOVAL AND CHANGE-OUT

If the door needs to be removed or changed out, follow the steps below:

⚠ WARNING

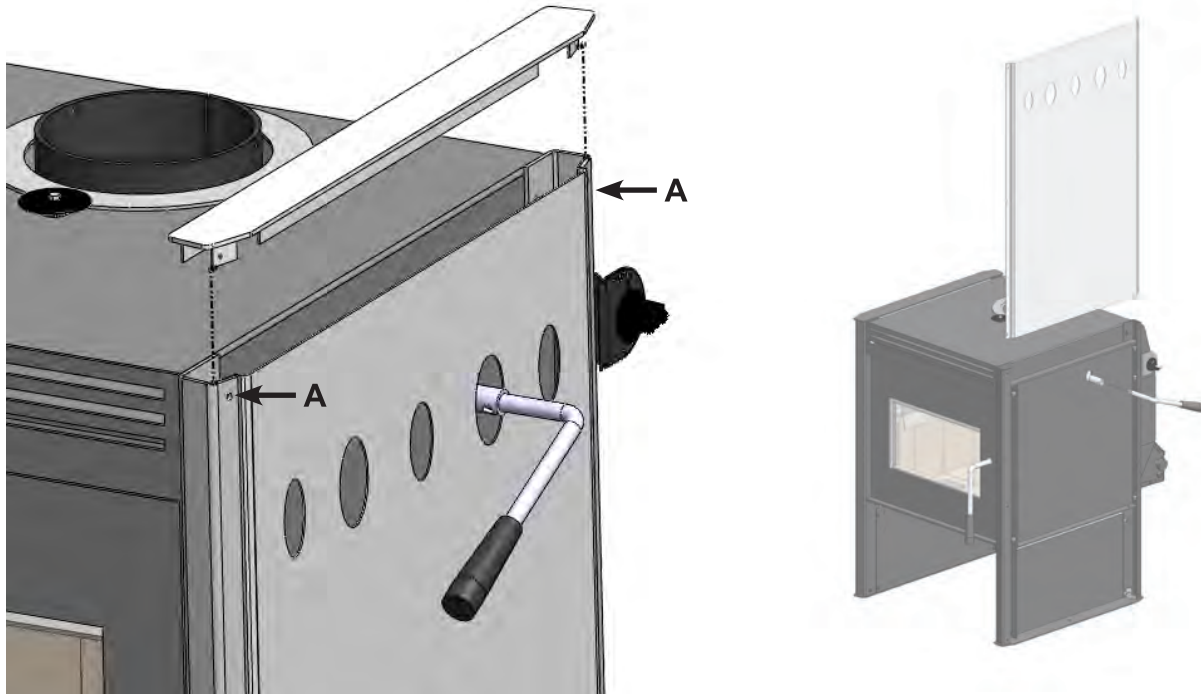
DOOR IS HEAVY AND FALLS OUT WHEN PIN BOLTS ARE PULLED OUT PLEASE HOLD DOOR FIRMLY.

1. Insert a 1/4" Allen key into the bolt head.
2. Secure the nut with a 9/16" wrench.
3. Turn the bolt counter-clockwise to remove the nut.
4. Repeat STEP 1-3 on other hinge.
5. Holding the door securely, pull out the bolts.
6. Pull the door away from the stove.



SIDE SHIELD REMOVAL AND CHANGE-OUT

The side shields can be removed for replacement and access to mobile home tie down holes. To do so, undo the two top screws (A) from the side shield and pull off cover plate. Now undo the other 4 screws holding the side shield and slide out side shield (on right side, remove bypass handle before doing so).



Installing the side shields will be in reverse order.

⚠ WARNING

**DO NOT OPERATE THIS UNIT WITHOUT EITHER OF THE APPROVED SIDESHIELDS IN PLACE.
DOING SO MAY CAUSE A HOUSE FIRE.**

YOUR FIRST FIRE!

The following pages contain information on the operation of the major components on your Blaze King appliance. Please take the time to read through this section as it will give you a better understanding of how your appliance works. This understanding will help you to operate your appliance at its optimum level thus extended its life while allowing you to get the highest efficiencies from your heat .

INTRODUCTION

All Blaze King free standing wood appliances are designed as radiant room space heaters. They have been designed and tested to be installed in insulated habitable rooms areas of your dwelling. The appliance has not been designed to be installed in a concrete uninsulated basement or in a shop/garage environment. Such applications may cause the thermostat to be unresponsive due the constant call for heat resulting in appliance being in a constant or over fire situation. Consequential damage from this type of operation will deem the warranty null and void.

All Blaze King wood appliances are designed to burn cord wood only. Dimensional timber off cuts, very low moisture content small diameter wood and pressed wood logs, when used in excess, may result in excessive internal firebox temperatures that can cause causing irreversible damage to the firebo s internal structure. Excessive temperatures can be caused by many small pieces of very low moisture content wood being used as a primary fuel source. This may be evident by warping or warped internal plates and retainers, possible cracking of the outer firebox and possibly premature failure of the catalytic combusto . All wood appliances should be cleaned out and inspected at the end of every burning season to identify if any internal components have been affected during the burning season. If problems are observed steps must be taken to identify and correct the problem before the subsequent burning season. Failure to do so will result in the warranty of the product being null and void.

EFFICIENCY

Efficiency was determined using the method outlined in B415.1-10 test method. It is represented by the High Heating Value (HHV) as the fuel used during testing contains between 19% - 25% water moisture included in the total calculated fuel weight. (Other test methods such as LHV or Low Heating Value, does not take the water moisture into account).

Annual Fuel Utilization Efficiency (AFUE) attempts to represent the actual, season long, average efficiency an appliance. HHV is the actual, calculated average efficiency obtained under test conditions. Using correct seasoned wood is important when trying to gain efficien . The more seasoned (dry) the wood, the higher the efficiency (less energy wasted on eliminating moisture during combustion). Operating your Blaze King at low settings will result in higher efficiencies as the fuel will undergo a more complete combustion. For maximum efficien , the appliance should be installed in a location that provides adequate intake/combustion air as well as a location that will allow for the straightest run of optimal chimney length to establish necessary draft .

FAN OPERATION

Fans are an optional item for most Blaze King appliances. If fans are installed on your appliance, they should be turned off until the stove reaches normal operating temperatures. Approximately 30 minutes after a fire has been established within the appliance, the fan speed should match the thermostat control setting. (i.e. if your thermostat is set to a medium heat output then your fan should also be set at medium, low—low, high—high etc.). We recommend the use of fans on all of our wood appliances. The fan system recirculates room air over the hot surfaces of your appliance and helps spread this super heated air around your home.

SELECTING WOOD**⚠ WARNING**

- THIS APPLIANCE IS DESIGNED TO BURN NATURAL WOOD ONLY. DO NOT BURN TREATED WOOD, COAL, CHARCOAL, COLORED PAPER, CARDBOARD, SOLVENTS OR GARBAGE.
- HIGHER EFFICIENCIES AND LOWER EMISSIONS WILL GENERALLY RESULT WHEN BURNING AIR DRIED SEASONED WOODS, AS COMPARED TO WET, GREEN OR FRESHLY CUT WOODS.
- BURNING WET UNSEASONED WOOD CAN CAUSE EXCESSIVE CREOSOTE ACCUMULATION. WHEN IGNITED IT CAN CAUSE A CHIMNEY FIRE THAT MAY RESULT IN A SERIOUS HOUSE FIRE.

It takes a great deal of energy to evaporate the moisture contained in green or wet wood and that energy will not be heating your house. Green or wet wood will also greatly increase creosote issues. To ensure that your wood fuel has a moisture content of 20% or lower, only use seasoned wood that has been split, stacked, and protected from rain or snow for at least 24 months. Firewood should be split and stacked in a manner that allows for air flow to all areas

Never burn salt-water driftwood as it is very corrosive and will deteriorate the structure of the appliance. The burning of salt-water driftwood will void the warranty.

Both hardwood and softwood burn equally well in this appliance, but the more dense hardwood will weigh more per cord and burn a little slower and longer.

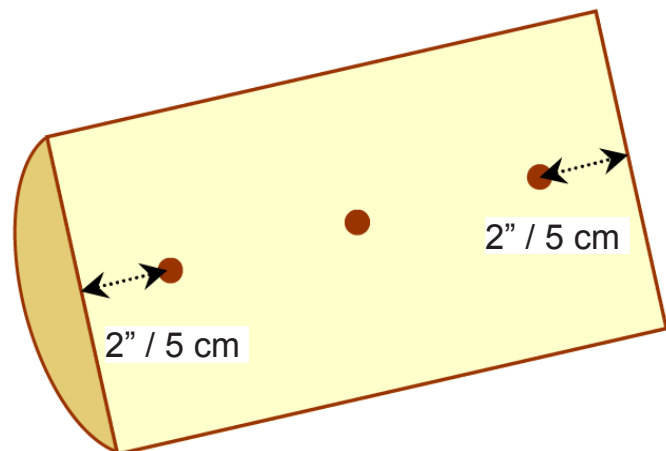
The only accurate way to determine wood moisture is to purchase a moisture meter.

⚠ WARNING

- NEVER START A FIRE UNLESS ALL BRICKS ARE CORRECTLY PLACED INSIDE THE FIREBOX. CHECK THE INSTALLATION INSTRUCTIONS CAREFULLY.
- ALWAYS OPEN THE BYPASS DOOR BEFORE OPENING THE LOADING DOOR.
- ONCE THE LOADING DOOR IS CLOSED, CLOSE THE BYPASS DOOR DIRECTLY AFTER THE CATALYTIC THERMOMETER NEEDLE IS IN THE ACTIVE ZONE.

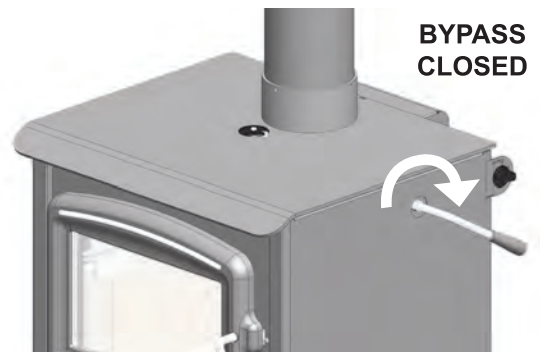
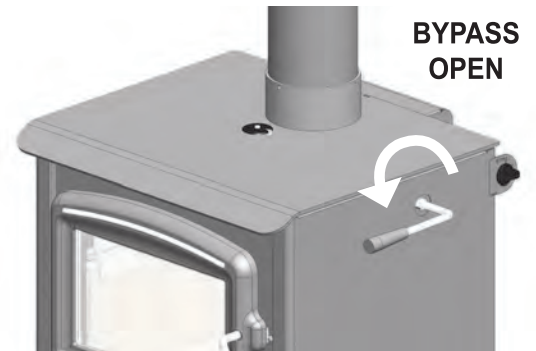
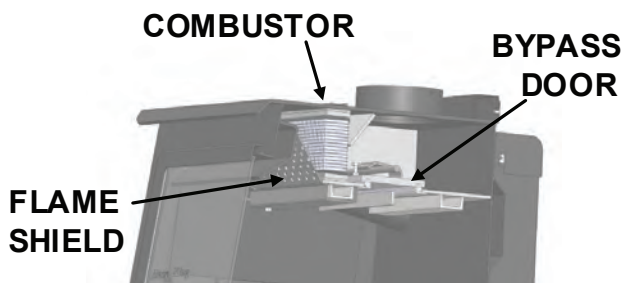
HOW TO USE MOISTURE METERS

1. Take a random selection of around 3-4 logs per cubic yard or cubic meter.
2. Split each log down the middle.
3. In the center of log push pins of meter along grain - three measurements are taken on the freshly split surface: 2" or 5 cm in from each end of the log and in the middle of the split surface with sufficient contact (see figure)
4. Do this to all the logs and take an average of the readings (this will be only an approximate indication but a good guide).



BYPASS DOOR

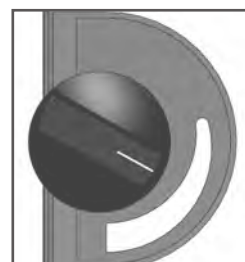
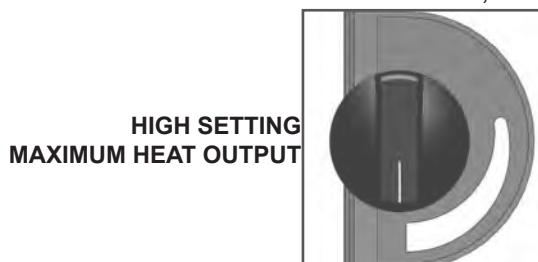
Your catalytic wood burning appliance is fitted with a bypass door which allows exhaust from the fire to temporarily bypass the catalytic combustor. The bypass door is located inside the dome of the firebox at the top of the appliance. It is a hinged, steel plate door and is controlled by the bypass handle located on the right side of the appliance. When the handle is pointing forward, the bypass door is open. To close the bypass door you must rotate the handle clockwise until it points to the rear of the appliance. To ensure the bypass door is fully closed, push down on the bypass handle until you hear a positive click. **NEVER OPEN THE LOADING DOOR WITHOUT OPENING THE BYPASS DOOR**

***CATALYTIC THERMOMETER***

The catalytic thermometer is located on the top of the appliance. Its sole purpose is to indicate whether the combustor is **ACTIVE** or **INACTIVE**. It is important to ensure that the appliance is operated in the stove in the **ACTIVE** zone. When the thermometer reads **INACTIVE** it means that the combustor temperature is below 500F and is not producing a clean burn. For the most accurate reading, turn the fan off for approximately 5 minutes before reading the thermometer. For calibration instructions refer to "CATALYTIC THERMOMETER" in the "MAINTENANCE" section.

***THERMOSTAT***

The thermostat is located at the rear of the appliance and is controlled by the thermostat knob which is located at the upper right rear corner of the appliance. When the knob is positioned at the **HIGH** setting, the appliance will operate at its highest burn rate and deliver its maximum heat output. As the knob is rotated counter clockwise the burn rate will decrease along with heat output. Burn rate is greatly influenced by location, installation, and external environment, so you may find it necessary to reposition the knob until you find the ideal setting to suit your situation. Please note that all adjustments to the thermostat should be done gradually as too rapid a change may cause the thermostat to operate improperly. The thermostat is set at the factory. **DO NOT TAMPER WITH THE THERMOSTAT**, this will result in a malfunctioning thermostat.



LIGHTING THE FIRE

NOTE: As you heat up the appliance for the first time, the paint will go through a curing process and will give off an odor. To minimize the inconvenience, burn the stove at a low temperature setting for several hours. It is advisable to open a door or window until the odor dissipates. You may also notice a change in color as the paint cures, this is normal and will appear uniform after subsequent firings

1. **DO NOT USE A GRATE. BUILD THE FIRE DIRECTLY ON THE BRICK IN THE BOTTOM OF THE STOVE.**
2. Position the thermostat to the **HIGH** setting and turn the fan (if fitted) **OFF**.
3. Open both the loading door and the bypass door (rotate the bypass handle forward).
4. Place 10 balls of non-glossy paper towards the front of the bottom of the firebox then stack 20 pieces of kindling on top of the paper in a crisscross fashion (leaving air gaps in between sticks).
5. Light the fire and allow it to get a good start while leaving the loading door cracked open (approximately 3 to 5 minutes). **DO NOT LEAVE THE STOVE UNATTENDED.**
6. Once the kindling is fully on fire, place two or three medium size logs onto the fire. Keeping the loading door unlatched, allow the logs to catch fire (approximately 5 minutes). **DO NOT LEAVE THE STOVE UNATTENDED.**
7. Once the logs are burning, latch the loading door shut **BUT** keep the bypass door open. Leaving the loading door open after the wood load has caught fire may cause premature failure of the catalytic combustor.
8. When nearly all of the wood in the firebox is fully burning, finish loading the appliance. Lay the wood a far back in the stove as possible. Latch the loading door shut and observe the catalytic thermometer. Once the needle is in the **ACTIVE ZONE**, close the bypass door (rotate the bypass handle backwards).
9. Let the fire burn with the thermostat at the **HIGH** setting for 20-30 minutes or until the fire is well established. This ensures that the stove, catalyst, and wood load are all stabilized at optimum operating temperatures. The temperature in the stove and the gases entering the combustor must be raised to at least 500F (indicated by the thermometer needle in the **ACTIVE ZONE**) for catalytic activity to be initiated.
10. After 20-30 minutes or once the fire is well established, gradually turn the thermostat down to the desired heat output setting. Please note that if the thermostat is turned down too low too quickly, the fire may go out or the combustor may stop working, indicated by the thermometer needle falling into the **INACTIVE ZONE**. If this happens, simply turn the thermostat back to a higher heat output setting to let the fire reestablish itself
11. If installed, turn the fan on after the initial warm up period of 20-30 minutes.

Probably the least understood requirement in maintaining a good fire is that of establishing a good base of coals or embers. A good bed of hot coals or embers will maintain a more even temperature as well as getting the new load of wood started easily. Put as much wood into the appliance as needed, practice will teach the amount of wood necessary to keep the fire going until the next reloading time. Don't be afraid to fill it completely if necessary. With the Blaze King thermostat, the wood will only burn at the rate set on the thermostat. Once the fire is established, the appliance should be left to complete the full burn cycle. This is evident by a) only coal bed (ember bed) remaining or b) the catalytic thermometer hovers just inside the active zone. Following this procedure will maximize the efficiency of the appliance as well as limit exhaust emission and smoke spillage.

RELOADING PROCEDURE

WHEN PREPARING TO RELOAD, IF THE NEEDLE ON THE CATALYTIC THERMOMETER IS STILL IN THE ACTIVE ZONE, FOLLOW THE PROCEDURE BELOW; IF THE NEEDLE HAS DROPPED INTO THE INACTIVE ZONE, REFER BACK TO THE “LIGHTING THE FIRE” PROCEDURE ON THE PREVIOUS PAGE.

It is important to note that the catalytic thermometer is simply displaying the temperature of the catalytic combustor. It may be used as an aide when it comes to indentifying a reload point, but other factors such as lack of fuel in the firebox or dropping room temperatures should be used as well.

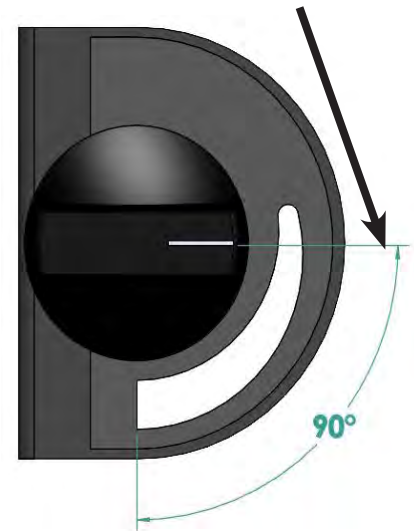


1. Have your next load of wood ready before beginning. Turn the thermostat to **HIGH**. Wait 2 minutes for the air flow to stabilize
2. To help minimize smoke spillage into the room, you may wish to open the bypass door and again wait 2 minutes for the air flow to stabilize
3. Crack open the loading door to allow ambient room air to be introduced into the firebox, this may take a minute to stabilize.
4. Slowly open the loading door and proceed to reload the firebox. If you experience excessive smoke spillage, slightly close the loading door to re-establish a draft through the chimney.
5. Once loaded, latch the loading door shut and (if opened) close the bypass door immediately. Let the fire burn on the **HIGH** thermostat setting for 20 to 30 minutes OR until the fire is very well established. At that point, turn the thermostat down to the desired setting. Keep in mind you may not see a large amount of flame activity in the lower thermostat setting. The thermometer needle will remain in the active zone indicating that the burn cycle is continuing.
6. Should you burn the stove on a very low setting for extended periods of time, you will begin to see creosote deposits forming on the glass door. To remove these deposits, simply run the stove on **HIGH** for approximately 30 minutes. The **HIGH** setting will burn off most of the deposit

Note: Our loading instructions are outlined in general terms due to the vast array of variables that arise with each installation. Such variables include type of wood fuel, chimney hieght and configuration, installation altitude, seasonal weather conditions, and the desired heat output required. Over time you will learn which settings are necessary to achieve optimal performance with your sepecific installation.

OPTIMAL LOW BURN THERMOSTAT SETTING

Your Blaze King appliance was tested and certified in accordance to the New Source Performance Standards for Residential Wood Heaters. During this test series, the low burn rate of the unit was determined by setting the thermostat knob to a position that yielded the lowest burn rate achievable. Considering that certification testing was conducted in a controlled laboratory environment with the appliance connected to a 15ft tall chimney, you may find that your optimal low burn thermostat setting is either above or below the certification test setting based on your location, installation, and the external environment you are operating in. If you find that you are setting your thermostat beyond the test setting, please note that if the thermostat is turned down too low the fire may go out or the combustor may stop working which is indicated by the thermometer needle falling into the **INACTIVE ZONE**. If this happens, simply turn the thermostat back to a higher heat output setting and let the fire reestablish itself

TESTED LOW BURN SETTING**WOOD BURNING IN THE SHOULDER SEASON**

There are a few things to consider if you choose to light a fire during the spring or fall seasons when the outside temperature is milder, perhaps 55°F to 70°F (13°C to 21°C).

You may notice smoke spillage out of the loading door when it is opened during start up or reloading. This is caused by a lack of natural draft within the chimney system. The temperature difference between the chimney system and the outside air causes flue gasses to be drawn up and out of the chimney. Smaller temperature differences produce less draft in your chimney system than larger temperature differences. This air movement, referred to as Stack Effect, is also influenced by air density and moisture differences. To eliminate the smoke spillage you may have to stoke the fire for longer than usual. Once the fire warms the chimney the draft will improve and spillage will be reduced. When operating the appliance on a lower thermostat setting, the resultant lower flue temperatures can cause your chimney system to cool down. This also decreases natural draft and spillage may occur.

General Rules for burning in the shoulder season:

- Run your appliance on **HIGH** for 30 minutes after start up and reloading before gradually turning the thermostat down to the desired heat output setting.
- The thermostat setting needs to be high enough to keep the catalytic thermometer in the active zone. If the thermometer will not stay in the active zone, turn the thermostat to a higher setting and then wait 15 minutes to confirm that the thermometer remains in the active zone. Repeat as required.
- If your appliance is producing too much heat, try to reduce the volume of wood fuel loads rather than turning your thermostat down. It is good burning practice to build smaller, hotter fires on milder days in the spring and fall.

ICE - FORMATION AND PREVENTION

Most of what you see coming from the chimney of a properly operating catalytic appliance is water vapor. In extremely cold weather, and with some exterior chimneys, this vapor may freeze in the chimney to the point of actually blocking the chimney and extinguishing the fire. In such weather, burn the appliance for 5 to 10 minutes with the thermostat set to **HIGH** to melt any possible ice build.

⚠ WARNING**DO NOT USE THE APPLIANCE WITHOUT A COMBUSTOR**

It is important to periodically monitor the operation of the catalytic combustor to ensure that it is functioning properly. A non-functioning combustor will result in a loss of heating efficiency, and an increase in creosote and emissions. Following is a list of items that should be checked on a periodic basis:

- Combustors should be visually inspected at least three times during the heating season to determine if physical degradation has occurred. Actual removal of the combustor is not recommended unless more detailed inspection is warranted because of decreased performance. Refer to “CATALYTIC COMBUSTOR TROUBLESHOOTING” on next page.
- This catalytic heater is equipped with a temperature probe to monitor catalyst operation. Properly functioning combustors typically maintain temperatures in excess of 500°F (indicated by the thermometer needle in the active zone), and often reach temperatures in excess of 1000°F. If catalyst temperatures fall below 500°F (indicated by the thermometer needle in the inactive zone), refer to next step and to “CATALYTIC COMBUSTOR, TESTING” below.
- You can get an indication of whether the catalyst is working by comparing the amount of smoke leaving the chimney when the smoke is going through the combustor and catalyst light-off has been achieved, to the amount of smoke leaving the chimney when smoke is not routed through the combustor (bypass mode):
 - Light the appliance as per the lighting instructions (see “LIGHTING THE FIRE”). With smoke routed through the catalyst, go outside and observe the emissions leaving the chimney.
 - Open the bypass mechanism, wait approximately 15 minutes, and again observe the emissions leaving the chimney. Significantly more smoke will be seen when the exhaust is not routed through the combustor (bypass mode). Some smoke may be visible shortly after you start the fire and shortly after reloading the fire. Allow 20 to 30 minutes for the fire to stabilize before making observations

CATALYTIC COMBUSTOR, TESTING

Light the fire per the lighting instructions. After 1 hour of burning a well established fire, position the thermostat knob to a medium - low burn rate setting. Allow 5 minutes for the catalytic thermometer to reach equilibrium and observe the location of the indicator needle. A properly functioning combustor will have an active temperature greater than 500F and the thermometer will read in the ACTIVE zone. A “tired” or “dead” combustor will yield thermometer reading in the INACTIVE zone. Repeat this procedure for at least 3 burn cycles. If, after several burn cycles, the thermometer will not indicate an ACTIVE reading your combustor may require cleaning or replacement. If, after cleaning and reburning, your combustor is still not producing an ACTIVE reading you should contact your Blaze King dealer for a replacement combustor. Note - It is also possible that the catalytic thermometer itself may be functioning incorrectly. Before condemning the combustor, read CATALYTIC THERMOMETER in OPERATING INSTRUCTIONS.

CATALYTIC COMBUSTOR, CLEANING

Under certain conditions, ash particles may become attached to the face of the combustor. These may be seen while the combustor is in the glowing stage, or when the fire is out. Any deposit on the visible face of the combustor should be removed. Wait until the fire is out and the appliance is cold before performing any cleaning. Brushing the combustor with a soft bristle paint brush will remove some deposits. Passing a vacuum cleaner wand or brush near the face of the combustor will remove most deposits. (Hot ash in a vacuum cleaner bag will burn, may melt the vacuum or cause a house fire. Exercise caution and never clean the appliance when the appliance or ashes are hot.) Never scrape the combustor with any hard tool or brush. Never run pipe cleaner through the individual cells of the combustor. This is not needed, and may do more harm than good. Limit cleaning to the face of the combustor. **NOTE: Never remove a combustor without approved combustor gasket in hand as original gasket will fall apart when removed from appliance.** Remember to re-install the Flame Shield (the perforated plate) in same position it was found. TIP: A hot fire will usually prove to be the best method of cleaning the combustor of deposits

CATALYTIC COMBUSTOR, TROUBLESHOOTING

PROBLEM - CREOSOTE PLUGGING

Possible Cause: Burning materials that produce a lot of char and fly-ash

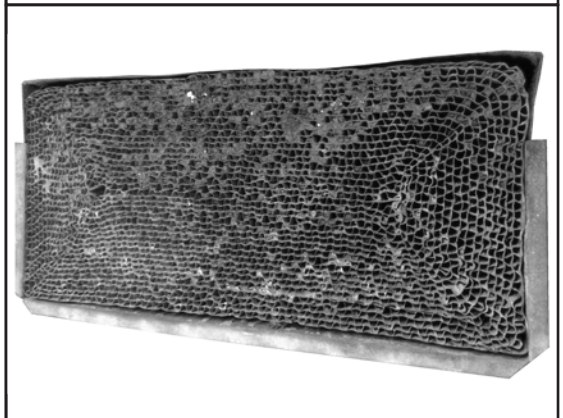
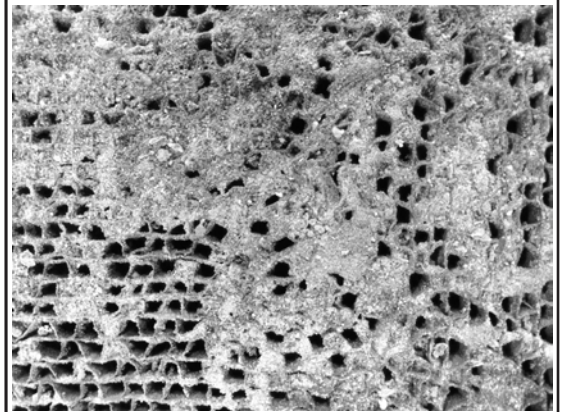
Solution: Do not burn materials such as garbage, gift wrap, or cardboard.

Possible Cause: Burning wet, pitchy woods or burning large loads of small diameter wood with the combustor in the operating position without the thermostat needle in the active zone.

Solution: Burn dry, seasoned wood, don't engage the bypass until the temperatures are high enough to initiate light-off (indicated by the thermostat needle in the active zone).

Possible Cause: Combustor not functioning. If proper burning procedures have been followed to no avail, the combustor is not functioning.

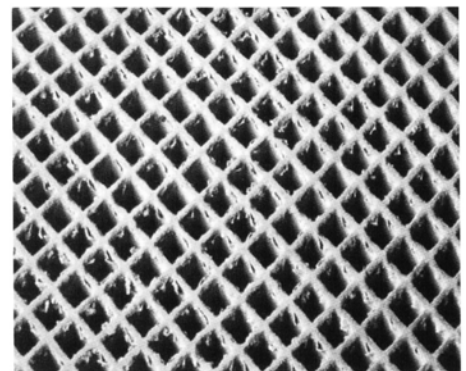
Solution: Replace the combustor with a genuine Blaze King combustor (failure to do so will void your warranty).



PROBLEM - CATALYST PEELING

Possible Cause: Extreme temperatures (above 1800°F, or 1000°C.) at combustor surface can cause the catalysts to peel. Over firing and flame impingement on the combustor are primary causes. Minor peeling photo shows minor peeling that is normal and does not affect function. Severe peeling photo shows that are closed or plugged.

Solution: Avoid extreme temperatures and flame impingement. If peeling is severe, remove and replace combustor.

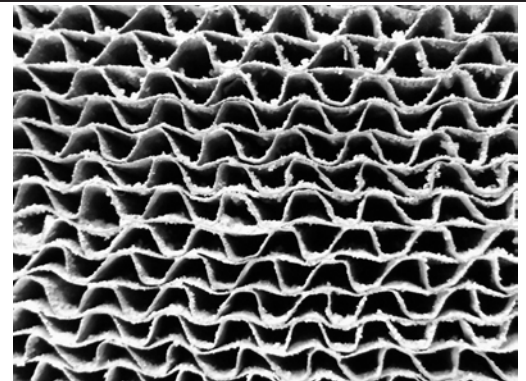


Minor Peeling

PROBLEM - CATALYST DEACTIVATION

Possible Cause: Burning large quantities of trash, pressure-treated lumber, or painted woods.

Solution: Burn quality woods available in your area. If you decide the catalyst has been deactivated, replace combustor with a genuine Blaze King combustor (failure to do so will void your warranty).



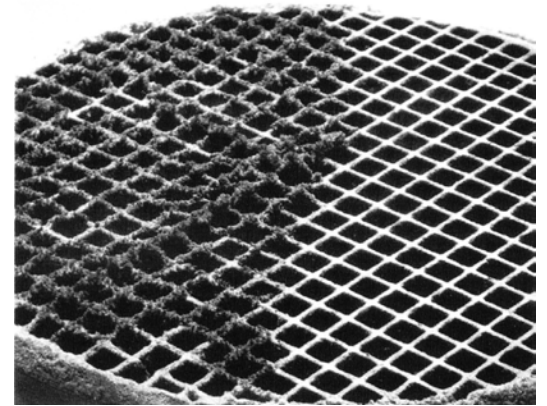
Severe Peeling

PROBLEM - CATALYST MASKING

(The catalyst is coated with a layer of fly-as or soot which prevents catalytic activity)

Possible Cause: Accumulation of fly-as

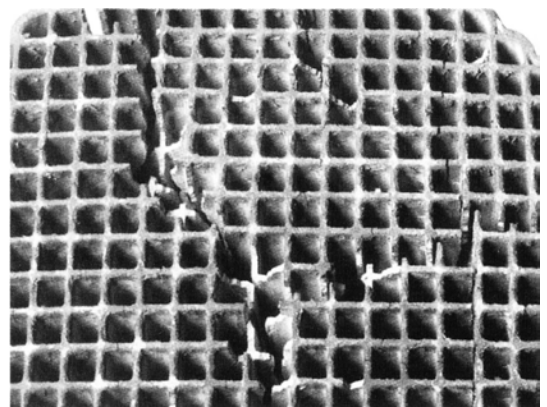
Solution: Brush cooled combustor with a soft-bristled brush or vacuum lightly at least once per burning season.



PROBLEM - THERMAL CRACKING

Possible Cause: Normal operation, as long as the combustor remains intact.

Solution: If cracking causes large pieces to fall out, replace the combustor.



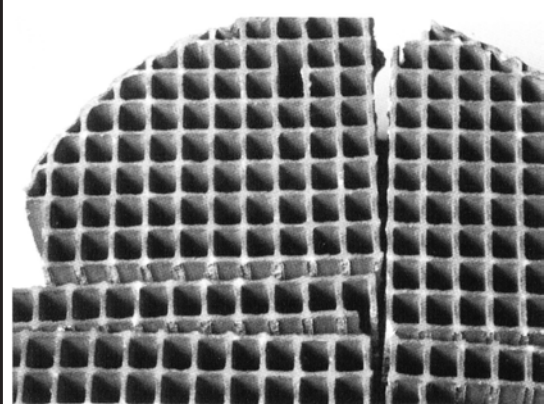
PROBLEM - MECHANICAL CRACKING

Possible Cause: Mishandling, abuse, or operating without a properly gasket sealed combustor.

Solution: Handle with care

Possible Cause: Distortion of holding collar.

Solution: Combustor should be held firmly in its can. It should slide easily into and out of the holding collar of the stove. If severe cracking has resulted in loss of large chunks of combustor, replace combustor. Also replace any warped stove parts.



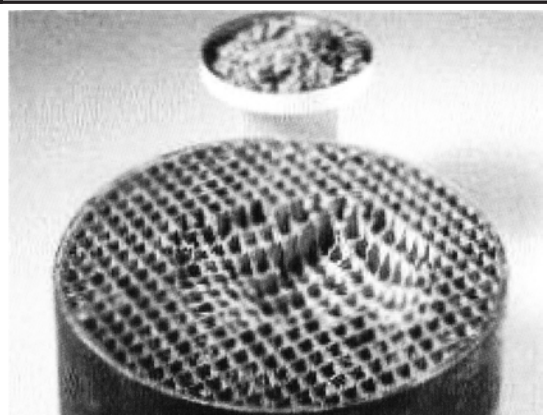
PROBLEM - CRUMBLING

Possible Cause: Air leaks

Solution: Inspect door gasket, see "MAINTENANCE cont." on page 36.

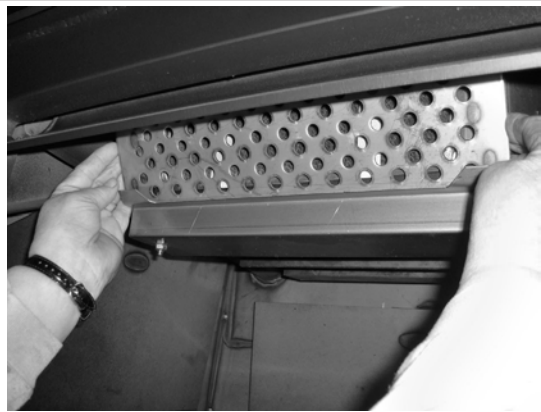
Possible Cause: High draft

Solution: Maintain draft to manufactured specifications



CATALYTIC COMBUSTOR, REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

The catalytic thermometer on top of the stove should read in the active zone after the stove has been in operation for several hours. If the thermometer's indicator needle does not stay in the active zone, even with a hot fire, over a 7-10 day period of regular use, the combustor may need replacement or cleaning, see "CATALYST MONITORING". If the combustor needs replacing then discontinue use of the appliance until the combustor is replaced. If the combustor must be examined or replaced contact your Blaze King dealer.



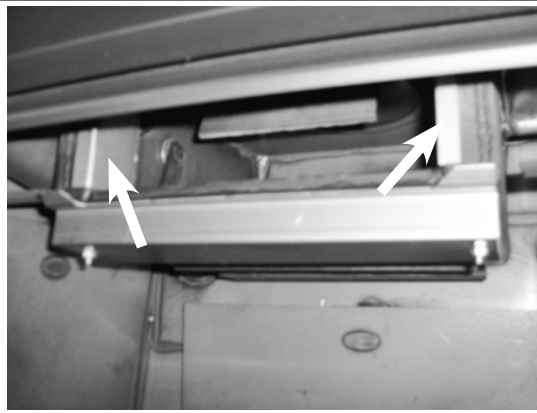
1. The removal of a Blaze King Catalytic combustor requires a small flat blade screwdriver or pocket knife. The stove fire must be out for at least 12 hours prior to the removal process. A combustor can reach 1400°F and hold high temperatures for several hours even after the fire is out. After waiting 12 hours, first remove the flame shield by simply lifting the shield off the tabs at either side. Pay particular attention to orientation as there is a top and bottom edge to the flame shield



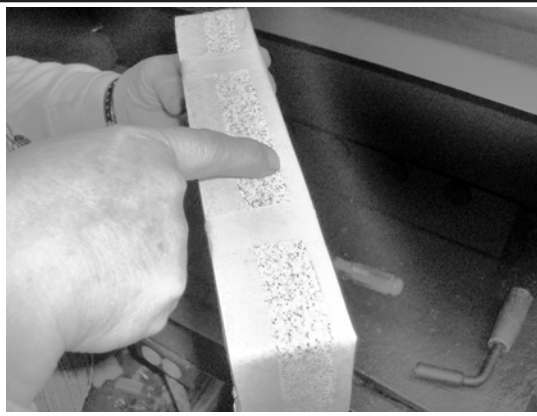
2. Once you remove the flame shield, you'll find the combustor. The honeycomb combustor can be made of different materials such as cordierite, mulite or even stainless steel. They are all the same with regard to removal and caution should be taken so as to not drop or damage the combustor. If your combustor has never been cleaned according the manufacturers directions, you may wish to clean the combustor before replacing it with a new combustor, see "CATALYTIC COMBUSTOR CLEANING".



3. The combustor has a metal tab across the bottom and on each side of the combustor. Using a flat blade screwdriver or pocket knife blade, slide the blade behind the metal tab and the heavy steel dome of the stove. The dome is the housing that surrounds the combustor. Apply slight pressure until the combustor begins to move forward, about 1/4". Repeat the process on the opposite end tab. By working back and forth the combustor will work free of the dome housing. It is normal for the gasket surrounding the metal band to fall apart during this process. New combustors are shipped with a new gasket.



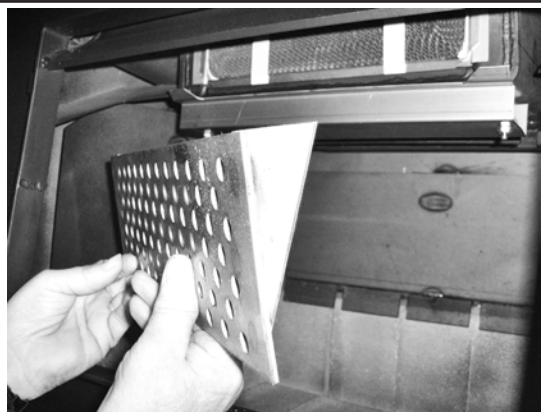
4. Now that the combustor has been removed you'll be able to see one stainless bypass retainer on each side. These can remain in place and do not need to be removed. These clips are not fixed in position and can fall into the firebox. Make sure they are in position before replacing the combustor. Using the same screwdriver or pocket knife, scrape any old gasket from the surface areas of the dome. The dome is the housing that surrounds the combustor. If you clean your existing combustor, you'll need to order replacement combustor gasket. It is always a good idea to have a spare combustor gasket on hand prior to performing any maintenance. If you purchase a new combustor a new gasket will already be applied to the combustor.



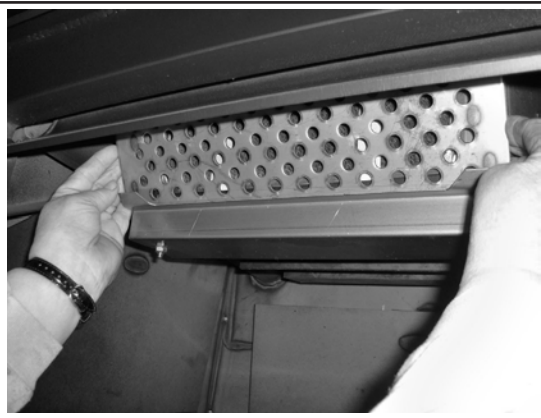
5. This new combustor already has the gasket installed. Note the 1" wide masking tape. This tape will help to keep the leading edge of the gasket from snagging during installation. If you've cleaned your combustor, wrap the combustor gasket as you see here and use the 1" masking tape around the perimeter front and rear. During the first fire the masking tape will burn off and the combustor gasket will swell providing a tight seal. It is this tight seal that improves efficiency and performance. You should never burn your stove without a combustor gasket installed.



6. Since the combustor is only 2" deep, there is ample room to lift the new combustor into place. **REMEMBER TO HAVE THE TAB ACROSS THE BOTTOM EDGE OF THE COMBUSTOR AS IT IS INSTALLED.** Slowly push the combustor in at the top apply even pressure to the left and right corners. This will allow for a better view of the bottom edge for the final fitting. **DO NOT FORCE THE COMBUSTOR INTO THE DOME. TAKE YOUR TIME AND WORK IT INTO PLACE SLOWLY.**



7. Once the combustor is installed completely so that all three tabs are touching the face of the dome, replace the flame shield. Note the brackets welded to the back flame shield are shaped like a triangle. The point of the triangle should face down when installed correctly. Never operate your stove without the flame shield in place. The flame shield will protect the face of the combustor against damages from wood when loading and other possible damages that can occur during the cleaning process.



8. The flame shield will rest on the two tabs located on the dome guard and lean slightly forward. Now that your combustor has been installed you can relight your stove. You will continue to receive excellent efficiency and clean burning for years to come. A few reminders, never burn anything other than dry, seasoned cordwood. Burning anything else may contaminate or ruin your new combustor. Also remember to keep your front loading door gasket seal properly adjusted, see "LOADING DOOR TENSION ADJUSTMENT". Doing so will improve burn times and extend combustor life span.

The combustor supplied with this heater is either a 115-0336-A-M or 115-0556 metal combustor. Consult the catalytic combustor warranty also supplied with this wood heater. Warranty claims should be addressed to:

| in Canada | in USA |
|--|---|
| Blaze King Industries / Valley Comfort Systems Warranty Department, 1290 Commercial Way Penticton, BC Canada V2A 3H5, Ph: 250-493-7444 | Blaze King Industries Warranty Department, 146A Street Walla, Walla, Washington 99362, Ph: 509-522-2730 |

RUN-AWAY OR CHIMNEY FIRE**⚠ WARNING**

A CHIMNEY FIRE CAN PERMANENTLY DAMAGE YOUR CHIMNEY SYSTEM. THIS DAMAGE CAN ONLY BE REPAIRED BY REPLACING THE DAMAGED COMPONENT PARTS. CHIMNEY FIRE DAMAGE IS NOT COVERED BY THE LIMITED WARRANTY.

CAUSES:

1. Using incorrect fuel, or small fuel pieces which would normally be used as kindling.
2. Leaving the door ajar too long and creating extreme temperatures as the air rushes in the open door.
3. Improperly installed or worn gaskets.
4. Creosote build up in the chimney.

SOLUTIONS:

1. Do not burn treated or processed wood, coal, charcoal, colored paper or cardboard.
2. Be careful not to over fire the appliance by leaving the door open too long after the initial start-up
3. Replace worn, dried out (inflexible) gaskets
4. Have your chimney cleaned regularly.

WHAT TO DO IF A RUN-AWAY OR CHIMNEY FIRE STARTS:

1. Close the draft fully (lowest position) by shutting off thermostat, and make sure firebox is closed tight .
2. Call the local fire department
3. Examine the chimney, attic and roof of the house, to see if any part has become hot enough to catch fire. If necessary spray with a fire extinguisher or water from a garden hos
4. Do not operate the appliance again until you are certain the chimney has not been damaged.

CREOSOTE FORMATION AND REMOVAL

When wood is burned slowly, it produces tar and other organic vapors which combine with expelled moisture to form creosote. These vapors condense in the relatively cooler chimney flue of a slow burning fire and when ignited, make an extremely hot fire. Check your chimney for creosote and soot regularly, until a safe frequency for cleaning is established. The chimney connector and chimney should be inspected regularly during the heating season to determine if a creosote build up has occurred. Be aware that the hotter the fire, the less creosote is deposited.

If accumulation is excessive, clean the chimney. You may want to call a professional chimney sweep to clean it. Both the chimney and the appliance have to be cleaned at least once a year or as often as necessary. Have a clearly understood plan to handle a chimney fire

CHIMNEY MAINTENANCE

The most efficient method to sweep the chimney is using a hard brush. Brush downwards so soot and creosote residues will come off the inner surface and fall to the bottom of the chimney where they can be removed easily.

The chimney must be checked regularly and if creosote has accumulated, it must be removed without delay. Cleaning on a regular basis should be sufficient during the coldest months. **ENSURE THE BYPASS DOOR IS OPEN PRIOR TO CLEANING THE CHIMNEY SO THE SOOT AND CREOSOTE FALLS INTO THE FIREBOX.**

Chimney / Flue Inspection:

1. The chimney should be inspected regularly during the heating season.
2. If possible, the chimney should be dismantled and cleaned.
3. The chimney should be inspected for possible damage.
4. If it is in good condition, put the chimney back in place; otherwise, it must be replaced.

FIRE EXTINGUISHERS AND SMOKE DETECTORS

All homes with a solid fuel burning appliance should have at least one fire extinguisher in a central location, known to all, and at least one smoke detector in the room containing the appliance. If it sounds an alarm, correct the cause but do not de-activate or relocate the smoke detector.

ASH REMOVAL

This appliance is required to be cleaned frequently because soot, creosote and ash may accumulate. Wait until the appliance is fully cooled off before the removal of ashes. **ALWAYS REMOVE THE ASH BUCKET IMMEDIATELY AFTER FILLING.** Ashes should be removed any time they come within one inch of the door opening. It is not necessary or advisable to completely remove all of the ashes when cleaning this appliance. Wood burns best in a bed of ashes 1/2" thick. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground (outside), 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. Other waste shall not be placed in this container.

WARNING

NEVER STORE HOT ASHES IN A GARAGE OR BASEMENT. HOT ASHES WILL GENERATE CARBON MONOXIDE AND / OR FLAMMABLE GASES. THESE GASES MAY CAUSE SUFFOCATION AND POSSIBLE DEATH.

LOADING DOOR GASKET INSPECTION

Inspect the door gasket for physical deterioration, missing sections or obvious leakage. The appliance front should make a groove in the gasket material - one side of the groove (toward the inside) will often be dark or black, and the other side (toward the outside) should be light or white. Dark smudges on the outside of the groove may indicate an air leak. If the groove is very shallow or missing, or if there is a heavy ash or creosote deposit along the bottom edge of the gasket, it may need to be replaced. Frayed or broken gasket material, or a gasket that is hard and unyielding, will also indicate need for replacement. Any time a piece of gasket is missing or is broken anywhere, the entire gasket must be replaced.

To check the gasket further, wait until the appliance is cooled and insert a piece of paper (a dollar bill will work) into the door opening and close and latch the door. Obvious resistance should be felt when pulling the paper out. Repeat this check several times around the perimeter of the door.

LOADING DOOR GASKET REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

1. If the door gasket is to be replaced, be sure you have Blaze King 7/8" fiber glass gasket ready to re install, as well as high temperature adhesive. See your Blaze King dealer.
2. Be sure the fire is out and the stove has cooled down. The door should be removed by lifting up and out, off of the hinge pins. Then lay the door flat
3. With a pair of pliers, pull the old door gasket out of the channel and dispose of it.
4. Thoroughly clean out the channel so the new silicone adhesive will adhere and the gasket will fit smoothly.
5. Dry fit the new gasket first to ensure proper fit. Do not stretch or cut the gasket. Distribute the gasket evenly around the frame.
6. Run a small bead of a high temperature silicone adhesive along the center of the channel. **DO NOT USE HOUSEHOLD SILICONE CAULKING.** High temperature silicone may be obtained from wood stove dealer.
7. Start the new gasket in the lower right corner. Do not stretch or cut the gasket. Distribute the gasket evenly around the frame.
8. Allow the adhesive to dry before closing the loading door. The loading door tension may need to be adjusted, see "LOADING DOOR TENSION ADJUSTMENT".
9. Check the fit of the door gasket. Insert a narrow strip of paper into the door opening and close and latch the door. Obvious resistance should be felt when pulling the paper out. Repeat this check several times around the perimeter of the door. If no resistance is felt, adjust door latch catch, see "LOADING DOOR TENSION ADJUSTMENT".
10. A tight sealing door extends the burn times & protects the combustor.

BYPASS DOOR GASKET INSPECTION

If you do not hear a positive click when closing your bypass door first try adjusting the tension, see number 9 below. If the seal is not tight after making the adjustment, the gasket may need to be replaced.

BYPASS DOOR GASKET REPLACEMENT

BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK

1. You will require THERMOSEAL® 1000SF high-temperature resistant cement and Blaze King 5/8" dense fiber glass gasket. See your Blaze King dealer. You will also require masking tape and combustor gasket as disassembly of the combustor will result in a damaged combustor gasket.
2. Be sure the fire is out and the stove has cooled down.
3. You will need to remove the liner from the collar of the stove, and have the ability to see straight down into the stove box through the collar.
4. Please follow steps on "CATALYTIC COMBUSTOR, REPLACEMENT" on how to remove your combustor.
5. To remove the bypass door, move the bypass rod out of the way using the bypass handle on the side of the stove. Looking down through the collar, lift one end of the bypass door for clearance to turn inside the top assembly. Once the bypass plate is in this position, remove the plate through the combustor opening.



BYPASS DOOR REMOVAL THROUGH COMBUSTOR OPENING

VIEW OF BYPASS DOOR AND CRANK THROUGH COLLAR



COMBUSTOR OPENING



BYPASS DOOR OPENING

6. Remove the old gasket and apply the THERMOSEAL® 1000SF high-temperature resistant cement along the door opening edge.
7. Place the gasket along the cement, and tap it in to seat it securely in the channel.
8. Reverse method of removing bypass door to put it back in place.
9. Prior to reconnecting the liner, you will need to adjust the bypass ramp bolt. You must first loosen the retaining nut located under the head of the adjustment bolt. Then using a 7/16" box wrench, tighten the bolt until the bypass handle, when closed, has a slight cam-over feel. Do not over tighten.
10. Secure bolt adjustment by tightening the 7/16" nut against the ramp as seen in the photo to the left. Now work the bypass handle several times to make certain the bypass operation is smooth and working properly. When you are satisfied with the operation of the bypass, please lower the venting.
Important: Apply high temp anti-seize lubricant to the under side of the bypass ramp where the rod contacts.
11. Please follow steps 5-8 in "CATALYST MONITORING" to return the combustor into place. Please note that if the gasket of the combustor is damaged, it will have to be replaced.



APPLY LUBE TO THE UNDER SIDE OF THE BYPASS RAMP

DOOR GLASS GASKET INSPECTION

When the appliance is cold, hold the glass by placing the palm of each hand on either side of the glass. Press firmly and try to move the glass. If the glass moves the door glass retainers may need to be tightened or the door glass gasket may need to be replaced.

1. Inspect the door glass gasket. If the gasket is frayed or missing sections replace the gasket.
2. Inspect the glass retainers and ensure the screws holding the retainers in place are tight. Hand tighten plus 1/4 turn. Do not over tighten.

DOOR GLASS GASKET REPLACEMENT**BLAZE KING RECOMMENDS YOUR DEALER PERFORM THIS TASK**

1. You will require Blaze King glass gasket and Blaze King door gasket. Please see your Blaze King dealer.
2. Remove the old glass gasket.
3. Starting at the corner opposite of the “Blaze King” logo, carefully wrap the gasket around the edges, pressing firmly onto the sides of the glass with the gasket centered on the edge. Finish the wrapping with a 1/2” overlap. Ensure the thickness of the gasket remains consistent and uniform.
4. Install glass with the “Blaze King” logo to the lower left corner of the door. Install the glass retainers with original fasteners. Ensure the glass is parallel to the frame and tighten the fasteners evenly.
5. Follow steps on “**LOADING DOOR GASKET REPLACEMENT**”.

**DOOR GLASS, CLEANING**

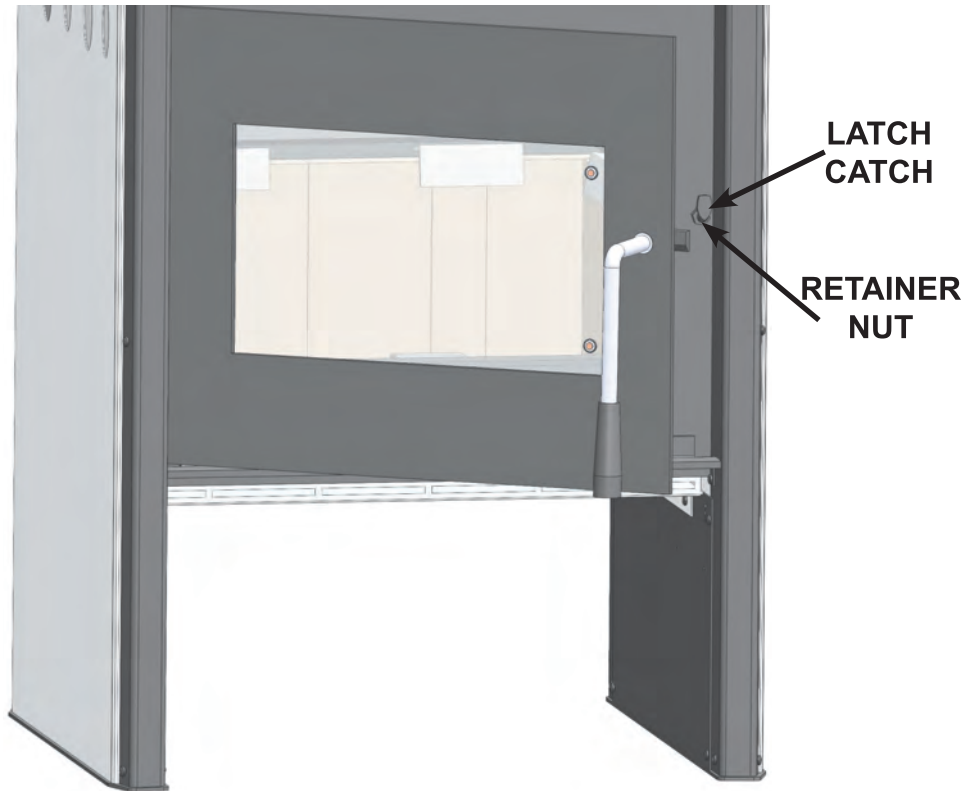
The best way to keep the glass clean is to leave the appliance on high burn for a period of time after each reloading. The moisture which is driven from a new load of wood contributes much of the creosote on the inside of the glass. Removing that moisture at the beginning of the burn cycle helps to keep the glass clean. Leaving the thermostat on a higher setting for 30 minutes to an hour before turning to low for an overnight burn will also help. Heavier deposits may require hand cleaning. Manual glass cleaning should be done when the appliance and glass are cool. **DO NOT CLEAN THE GLASS WHILE IT IS HOT. WARNING: Do not use abrasive cleaners to clean the glass.** Use a soft cloth. After using any cleaner, thoroughly rinse the glass with water to remove any deposits left by the cleaner. Failure to remove all traces of glass cleaner will result in the glass cleaner residue baking on. This residue may be very difficult to remove.

LOADING DOOR TENSION ADJUSTMENT

To tighten the seal, use a 9/16" wrench to loosen retainer nut on the outside and tighten nut on inside firebox to move latch catch in (see figure beside). Secure retainer nut and (repeat) paper test (see "LOADING DOOR GASKET INSPECTION").

Use penetrating oil if necessary to make turning easier.

DO NOT FORCE !!

**⚠ WARNING**

DO NOT OPERATE THIS WOOD STOVE IF THE DOOR GASKET IS MISSING OR DAMAGED DANGEROUS OVER FIRING CAN OCCUR WHICH CAN DAMAGE THE APPLIANCE OR IGNITE CREOSOTE IN THE CHIMNEY, POSSIBLY CAUSING A HOUSE FIRE. IF ANY PART OF THE WOODSTOVE OR FLUE SYSTEM IS GLOWING THE STOVE IS BEING OVER FIRED.

OPTIONAL FAN ASSEMBLY

Routine maintenance of the OPTIONAL Fan Assembly on the back of the stove is not required. However, should it become necessary to replace an individual fan or rheostat, contact your local dealer.

CATALYTIC THERMOMETER

The combustor thermometer tells you what was happening 4-8 minutes ago, and remember, it is only an indication of the temperatures of the gasses after they pass through the combustor. The thermometer probe, the part that fits into the stove, must be cleaned at least once a year. Lift it from the stove (be careful, it may be hot) and wipe or scrape it clean. At room temperature, away from the stove, the indicator should point near the bottom of the "Inactive" zone. If, after several years use, you find that the needle no longer points to the bottom of the "Inactive" zone when the thermometer has been at room temperature for 10 minutes or longer, it may need adjustment. Holding the probe with a pair of pliers, loosen the bolt on the top of the dial. Turn the dial to align the pointer with the bottom of the "Inactive" zone, then retighten the bolt.

NOTE: IF YOUR BLAZE KING IS EQUIPPED WITH FANS, TURN OFF FANS AND WAIT 10 MINUTES PRIOR TO READING CATALYTIC THERMOMETER INDICATOR. AIR MOVEMENT ACROSS THE TOP OF THE STOVE MAY PROVIDE FALSE READING.

THERMOSTAT

This wood heater thermostat 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 heater in a manner inconsistent with operating instructions in this manual. If the thermostat malfunctions contact your dealer for replacement by a qualified installer.

Your Blaze King is designed to allow a wide selection of heat output levels. If you begin to lose control of the amount of heat the stove is emitting, determine the cause early so that major problems may be avoided.

The six major needs of a well-controlled fire are

1. Knowledgeable operator.
2. Adequate air supply.
3. Firewood of good quality and proper size.
4. Catalytic combustor in good condition.
5. Clean chimney, properly sized and installed.
6. Door gasket tight and firm

Considering all of the above, number one is the most important for safe and efficient operation of any woodstove. Please study the operation instructions carefully. Consult your BLAZE KING dealer or call the Customer Service Department at Blaze King in the U.S.A. at 509-522-2730 or in Canada at 250-493-7444 if you have any questions not answered in this manual.

All of the six above mentioned needs are interrelated. A deficiency in any one will affect all of the others. If you encounter a problem, determine the source of the problem and then follow-up by checking the other needs as possible contributing factors.

| PROBLEM: Chimney Fire | |
|--|---|
| CAUSE Act immediately regardless of cause | SOLUTION Turn the thermostat to lowest setting, check loading door to be sure it is tightly closed. Call Fire Department. |
| After the fire is out, have your chimney and flue connector inspected by a certified chimney sweep. A damaged masonry chimney should be repaired or rebuilt. A prefabricated chimney (factory built) that is damaged should be replaced. Any damage to the flue connector should be corrected before the system is used again. | |
| Possible causes of a chimney fire, and remedies for those causes, can be found further in this section: "Excessive Creosote Formation", and "Spots of Creosote Accumulation in Chimney or Flue Connector". | |

| PROBLEM: Not enough heat. | |
|---|--|
| CAUSE Green or wet wood. Not enough fuel in stove. | SOLUTION Use seasoned wood. Don't be afraid to FULLY load the stove. A FULL load of wood won't burn any hotter than the thermostat is set. |
| Obstruction in chimney or cap screen. Combustor plugged or coated. | Remove obstruction. See "COMBUSTOR, TESTING" See "COMBUSTOR, CLEANING" |
| Combustor not functioning. | See "COMBUSTOR, TESTING". If needed, replace combustor, See "COMBUSTOR, REPLACING". |
| Thermostat set too low. | Raise thermostat setting. |
| Thermostat not operating properly. | Consult your Blaze King dealer. |
| Poor draft caused by an oversize flu | Measure draft with Manometer. See "CHIMNEY DRAFTS" Consult your Blaze King dealer or a chimney sweep. |
| Strong, gusting winds causing downdraft in chimney | Install wind-resistant chimney cap. Directional caps may not stay freely rotating. If you have a directional cap, check it frequently. |
| Tightly sealed house, inadequate air supply. | Slightly open a window, near the stove or install an outside air kit. |
| Reloading too much wood on top of too few coals. | Allow a larger bed of coals to build up. |

| PROBLEM: Too much heat. | |
|--|---|
| CAUSE | SOLUTION |
| By-Pass door left open. | Close the by-pass door. |
| Thermostat set too high. | Lower thermostat setting. |
| Loading door gasket leaking, admitting excess air into firebox | Replace door gasket and/or adjust door. See "GASKET INSPECTION" |
| Excessive draft in the chimney. | Measure draft with a Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. Install a cap. |
| Thermostat not operating properly. | Consult your Blaze King dealer. |
| Wood is too small. | Use larger pieces. |

| PROBLEM: One or both fans will not run, or there is no adjustment for fan speed. | |
|---|---|
| CAUSE | SOLUTION |
| Fans mounted improperly. | Check that fan blade's not touch edges of hole. |
| Fan speed control. | Consult your Blaze King dealer for replacement. |

| PROBLEM: Fans minimum speed too fast or maximum speed too slow. | |
|--|---------------------------------|
| CAUSE | SOLUTION |
| Fan speed control out of adjustment. | Consult your Blaze King Dealer. |

| PROBLEM: Excessive creosote formation in chimney and chimney Connector. | |
|--|--|
| CAUSE | SOLUTION |
| By-pass door left open. | Close by-pass door. |
| By-pass door not sealing tightly. | Inspect by-pass door and seal for warping. Ash or creosote buildup may occur on door or seat. With stove cold scrape and vacuum area around by-pass. Be sure all mating steel surfaces are clean and smooth. |
| Improper operation. | Check thermostat setting and operating procedures. See "THERMOSTAT & OPTIMAL THERMOSTAT SETTING" |
| Wood too green or wet. | Use seasoned wood. Use a moisture meter to confirm |
| Catalytic combustor not operating properly. | Inspect the combustor. See "CATALYTIC COMBUSTOR, TESTING" |
| Poor draft caused by an oversize or short flue, etc | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
| Chimney too cold or poorly insulated. | Upgrade chimney system. Consult your Blaze King dealer or a chimney sweep. |

| PROBLEM: Catalytic combustor thermometer (on top of stove) does not go into "Active" zone, or does not stay there for long. (Fans must be in "off" position for 10 minutes prior to checking) | |
|--|--|
| CAUSE | SOLUTION |
| Improper operation. | Check thermostat setting and operating procedures. See "THERMOSTAT & OPTIMAL THERMOSTAT SETTING" |
| Obstruction in chimney or cap. | Clean chimney, remove obstructions. |
| Faulty combustor thermometer. | Replace thermometer and Recheck combustor operating Temperature. |
| Wood too green or wet. | Use seasoned wood. |

| | |
|---|---|
| Combustor plugged or coated. | Clean combustor. See "CATALYTIC COMBUSTOR TESTING" |
| Combustor not functioning. | Check and test combustor. If needed replace combustor. See "CATALYTIC COMBUSTOR, REPLACING" |
| Thermostat not operating properly. | Consult your blaze King Dealer. |
| By-pass door leaking or not closing completely. | Inspect and clean area around by-pass doors. Adjust or replace gasket if necessary. Consult your Blaze King Dealer. |

PROBLEM: Spots of creosote accumulation in chimney or chimney connector.

| CAUSE | SOLUTION |
|--|---|
| Air leaks in chimney or chimney connector. | Inspect chimney and / or chimney connector. Repair or replace as necessary. Check to be sure that the chimney connector is installed correctly. |

CAUTION: a leaking chimney connector is a fire hazard and demands immediate attention.

| | |
|---|--|
| Poor draft caused by an oversize flue, single wall pipe, to many elbows, etc. | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
|---|--|

PROBLEM: Door glass quickly becomes coated with creosote.

| CAUSE | SOLUTION |
|---|--|
| Low thermostat setting or lowering the thermostat setting too far, too quickly. | Turn the thermostat to the warmest setting during the first 20-30 minutes or until the fire is well established after each reloading |
| Poor draft caused by an oversize or short flue, etc | Measure draft with Manometer. See "DRAFTS". Consult your Blaze King dealer or a chimney sweep. |
| Obstruction in chimney or cap screen. | Remove obstruction. Clean chimney and/or cap screen. |
| Strong, gusting winds causing downdraft in chimney. | Install wind-resistant chimney cap. |
| Tightly sealed house, inadequate air supply. | Open a window, slightly, near the stove. |
| Burning poorly seasoned wet wood, or wood with high pitch content. | Use seasoned wood with low pitch content, such as some types of pine. |

PROBLEM: The combustor temperature cannot be controlled. Turning the thermostat down often makes the combustor temperature go up.

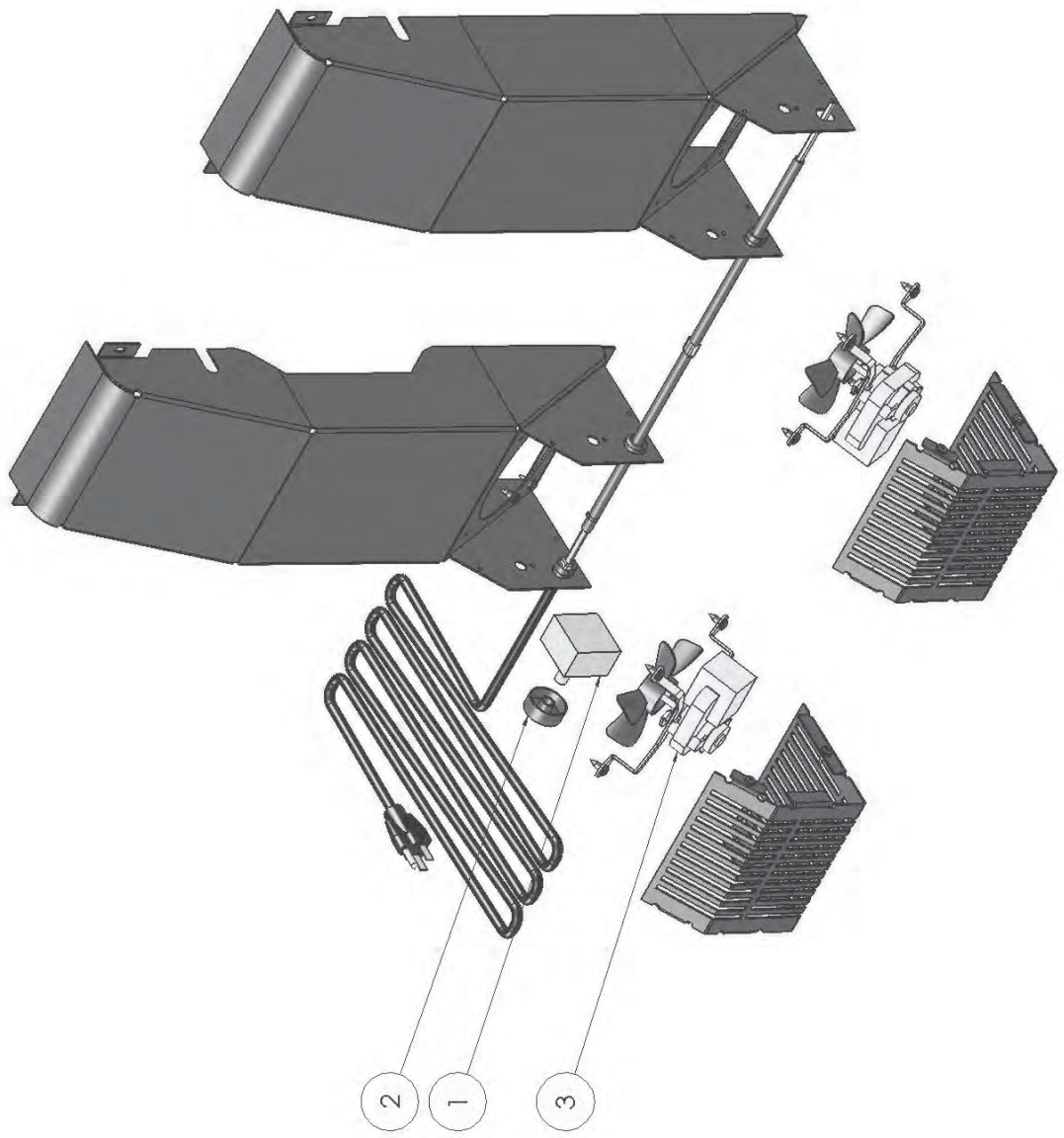
| CAUSE |
|---|
| Turning the thermostat down, particularly in the first half of the burn cycle, causes the fire to emit more smoke, which is fuel for the combustor. The combustor temperature therefore climbs for up to several hours. This is normal, and is of no concern. As long as only the combustor temperature is elevated, there is nothing to worry about. |

PROBLEM: Smoke spills from door opening when loading fuel

| CAUSE | SOLUTION |
|---------------------------------------|---|
| Spark arrestor screen on cap plugged. | Clean spark arrestor screen to bare metal wire. |
| Chimney too cold. | Make certain double wall stove pipe is used in installation. |
| Not enough vertical rise. | Make certain a minimum vertical rise of 36" is observed prior to elbows. Use two 45 elbows instead of 90 elbow. |
| Chimney not drafting. | Turn thermostat to highest setting, open bypass, leave loading door closed and wait 5-10 minutes to increase chimney or flue temperature. |

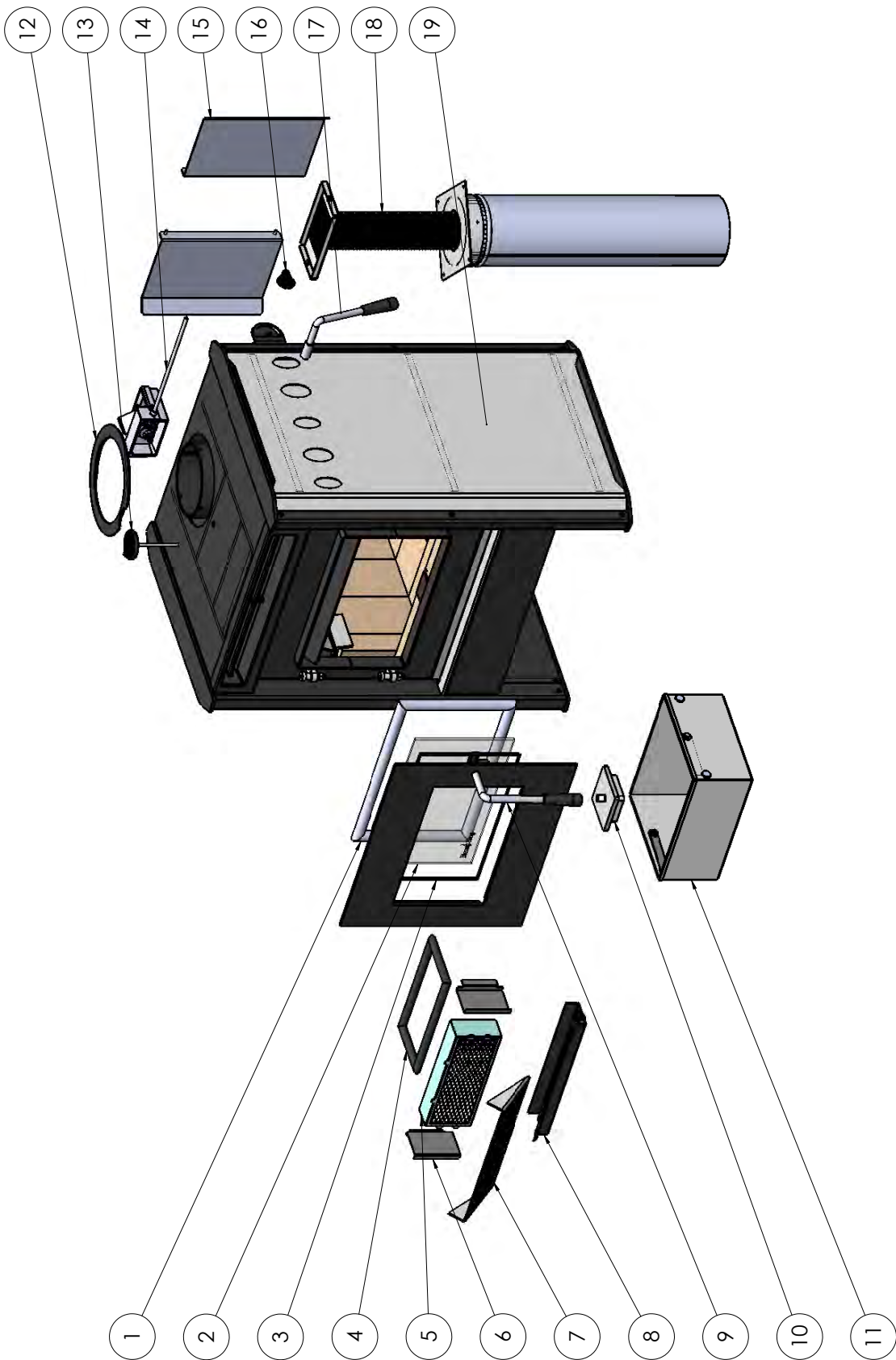
REPLACEMENT PARTS

Z2514 Fan Kit



| No. exploded view | Part # | Description | QTY |
|-------------------|--------|----------------------------|-----|
| 1 | Z0136 | Rheostat with off switch | 1 |
| 2 | 0137 | Rheostat knob silver inlay | 1 |
| 3 | Z7005 | Replacement axial fan | 1 |

REPLACEMENT PARTS



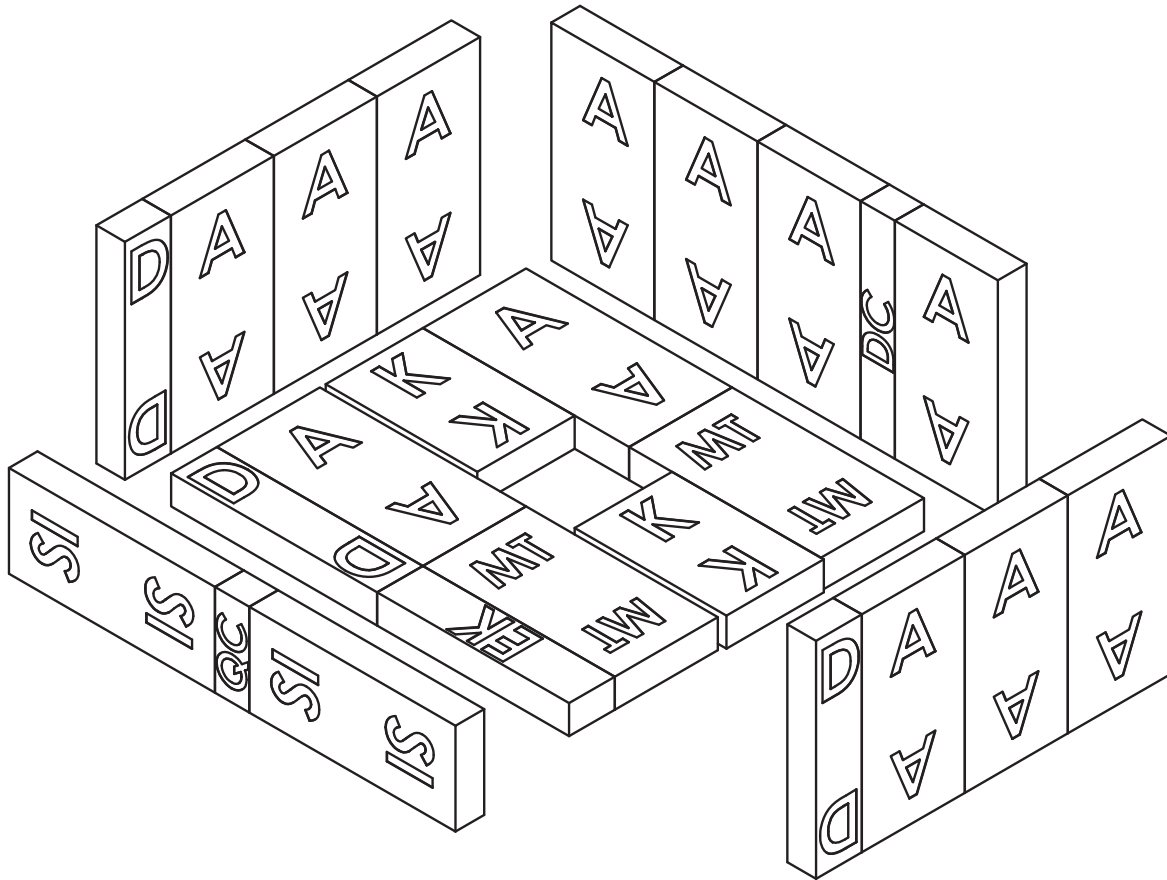
REPLACEMENT PARTS

| No. exploded view | Part # | Description | QTY |
|-------------------------|--------------------|-------------------------------------|-----|
| 1 | 155-0186-S | DOOR GASKET 7/8" ROUND | 1 |
| 2 | 130-0241 | 5 MM THICK CERAMIC GLASS 15" X 9" | 1 |
| 3 | 155-0254-AS | GLASS GASKET 1/8 X 3/4 301B W/PSA | 1 |
| 4 | 155-0255-B | BYPASS GASKET 5/8" DENSE ROUND | 1 |
| 5 | S.CAT203032 | COMBUSTOR | 1 |
| 6 | S.Z4498 | BYPASS RETAINER KIT | 1 |
| 7 | S.Z2430 | FLAME SHIELD COMPLETE | 1 |
| 8 | S.Z4551 | DOME GUARD REPLACEMENT KIT | 1 |
| 9 | S.Z2544-S | DOOR HANDLE ASM CK20 SATIN COMPLETE | 1 |
| 10 | S.Z3808 | ASH CHANNEL LID ASM 4INCH | 1 |
| 11 | S.Z2433 | ASH PAN ASSEMBLY | 1 |
| 12 | Z3849 | FLUE COLLAR RING 7.25" ID | 1 |
| 13 | 120-0342-E | CAT THERMOMETER W/PAN 4" PROBE | 1 |
| 14 | S.Z3009 | THERMOSTAT | 2 |
| 15 | S.Z4015 | OPTIONAL REAR SHEILD KIT | 1 |
| 16 | 220-0102 | THERMOSTAT KNOB BLACK | 1 |
| 17 | S.Z2452-S-B | BYPASS HANDLE SATIN WITH BLK | 1 |
| 18 | S.Z1726 / S.Z1726B | (MOBILE HOME) OUTSIDE AIR KIT | 1 |
| 19 | S.Z2570 | CK20 SIDE SHIELD ASSEMBLY | 1 |

**Parts can be ordered through your local dealer or distributor by giving
PART # and DESCRIPTION.**

REPLACEMENT PARTS

Brick Layout



| ITEM NO. | PART NUMBER | QTY. |
|----------|---------------|------|
| 1 | A Size Brick | 12 |
| 2 | D Size Brick | 3 |
| 3 | DC Size Brick | 1 |
| 4 | EK Size Brick | 1 |
| 5 | K Size Brick | 2 |
| 6 | MT Size Brick | 2 |
| 7 | QC Size Brick | 1 |
| 8 | SI Size Brick | 2 |

BLAZE KING WOOD LIMITED WARRANTY

Blaze King and Valley Comfort's respective brands extend the following warranty for wood fired appliances purchased from an authorized Blaze King / Valley Comfort dealer and installed in the United States of America or Canada. Warranty starts with date of purchase by the original owner (End User) except as noted for replacement parts.

| Warranty Period | | Components Covered | |
|---|---------|--------------------|---|
| Parts | Labor | Wood | |
| 1 Year | | X | All parts, materials and surface finishes (flaking and peeling) Subject to Conditions, Exclusion, and Limitations listed. |
| 2 Years | | X | Fan assemblies and motors, thermal sensors, catalytic thermometer, bi-metallic thermostat assembly, door handle metal components. |
| 5 Years | 2 Years | X | Firebox & Heat Exchanger, Bypass Door Steel Components |
| 6 Years | | X | Catalyst Combustor (see Conditions, Exclusions, and Limitations) |
| 1 Year | | X | Other Replacement Parts |
| See Conditions, Exclusions, and Limitations | | | |

Blaze King Wood Limited 5 Year Warranty

Blaze King is the manufacturer of the Blaze King line of heating products. At Blaze King, our commitment to the highest level of quality and customer service is the most important thing we do. Each Blaze King stove is built on a tradition of using only the finest materials and is backed by our limited warranty to the original purchase. With Blaze King, you're not just buying a stove; you're buying a company with years of unequalled performance and quality.

Limited Six (6) Year Warranty:

The CATALYTIC COMBUSTOR is under warranty by Blaze King for six (6) years from the date of original retail purchase. The purchaser shall pay the following share of the then current retail price for the combustor: The first three (3) years no charge, 4th year 60%; 5th year 70%, 6th year 80%. The Combustor must be returned to your dealer along with a completed COMBUSTOR FAILURE REPORT and original proof of purchase document.

Limited (5) Year Warranty:

Under this warranty, Blaze King covers the stove body and accessories against defects in materials and workmanship, for part repair or replacement for the first five (5) years *** to the original purchase. This Warranty covers: All Steel firebox components against defects in material and workmanship. Please see the exclusions and limitation section below as certain restrictions and exclusions apply this warranty.

Limited Two (2) Year Warranty:

Under this warranty, Blaze King covers, fan assemblies, modular thermostat and door handle steel components against defects in materials and workmanship, for part repair or replacement and limited labor for the first two (2) years to the original purchaser. Please see the exclusions and limitation section below as certain restrictions and exclusions apply to this warranty.

Limited One (1) Year Warranty:

Under this warranty, Blaze King covers all parts and materials against defects in materials and workmanship including exterior paint finishes, for part repair or replacement and limited labor for the first year to the original purchase. Please see the exclusions and limitation section below as certain restrictions and exclusions apply to this warranty.

How the Warranty Works

1. All warranties by the manufacturer are set herein and no claim shall be made against the manufacturer on any oral warranty or representation. All claims under this Limited Warranty must be made in writing by your dealer.
2. Any stove or part thereof that is repaired or replaced during the Limited Warranty period will be warranted under the terms of the Limited Warranty for a period not exceeding the remaining term of the original Limited Warranty or six (6) months, whichever is longer.
3. For any part or parts of this stove, which in our judgment show evidence of defects, Blaze King reserves the option to repair or to replace the defective part(s) through an accredited distributor or agent, provided the defective part is returned to the distributor or agent, transportation prepaid, if requested.
4. If you discover a problem that you think may be covered by the Limited Warranty, you MUST REPORT it to your Blaze King dealer WITHIN 30 DAYS from the date the problem was first detected, giving them proof of purchase and the date of purchase. The dealer will investigate the problem and work with Blaze King to determine whether the problem:
 - a) Is covered by the Limited Warranty or
 - b) Can be fixed in your home or does the product need to be returned to Blaze King for repair.
5. If Blaze King determines that the stove needs to be returned to Blaze King for repair, the customer has the responsibility and the expense of removing it from their home and shipping it to Blaze King. If the problem is covered by the Warranty, Blaze King will repair or replace the item at their discretion and the customer will be responsible for return shipping and re-installation in their home.
6. If the problem is not covered by the Limited Warranty, the customer will be responsible for all repair costs, as well as all storage, shipping and the cost of removing and re-installing the stove.

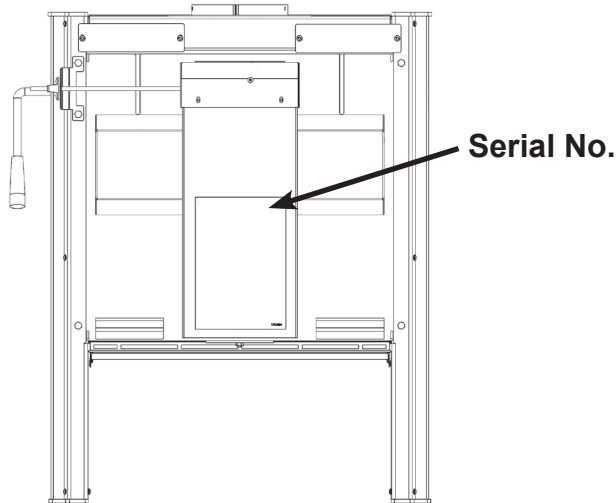
If you are not satisfied with the service provided by the Blaze King dealer, write to Blaze King at the address listed on the last page of the Owner's Manual. Include a copy of the original purchase invoice and a description of the problem.

Exclusions and Limitations:

1. This Warranty does not cover tarnish, discoloration or wear on the plated surfaces. Painted finishes will change color after initial firing and will continue to change through the lifetime of the stove. This is normal occurrence for all high temperature coatings.
2. This Warranty does not cover gasket material or firebrick.
3. Blaze King strongly recommends installation by a certified installer. Failure to comply may adversely affect coverage under the terms of this warranty. This Limited Warranty covers defects in materials and workmanship only if the product has been installed in accordance with local building and fire codes; in their absence refer to the owner's manual. If the product is damaged or broken as a result of any alteration, wilful abuse, mishandling, accident, neglect, or misuse of the product, the Limited Warranty does not apply.
4. The stove must be operated and maintained at all times in accordance with the instructions in the Owner's Manual. If the unit shows signs of neglect or misuse, it is not covered under the terms of this Warranty policy. Performance problems due to operator error will not be covered by the Limited Warranty policy. Some minor expansion, contraction, or movement of certain parts and resulting noise, is normal and not a defect and, therefore, is not covered under this Limited Warranty.
5. Misuse includes over-firing. Over-firing can be identified later by warped plates and paint pigment being burnt off. Over-firing this appliance can cause serious damage and will nullify the Limited Warranty.
6. The Limited Warranty will cover glass thermal breakage only and will not cover misuse of the stove glass, including but not limited to:
 - a) Glass that is struck, has surface contaminants or has had harsh or abrasive cleaners used on it.
 - b) If the door is slammed or is closed while wood in the firebox is protruding out the stove opening thus striking the glass.
7. This warranty does not cover products made or provided by other manufacturers and used in conjunction with the operation of this stove without prior authorization from Blaze King. The use of such products may nullify the Limited Warranty on this stove. If unsure as to the extent of this Limited Warranty, contact your authorized Blaze King dealer before installation.
8. Blaze King will not be responsible for inadequate performance caused by environmental conditions.
9. The Limited Warranty does not cover installation and operational related problems such as use of downdrafts or spillage caused by environmental conditions. Environmental conditions include but are not limited to nearby trees, buildings, roof tops, wind, hills, mountains, inadequate venting or ventilation, excessive offsets, negative air pressures or other influences caused by mechanical systems such as furnaces, fans, clothes dryers etc.
10. The Limited Warranty does not cover damage caused by burning salt-saturated wood, corrosive driftwood, chemically treated wood or any fuel not recommended in the Owner's Manual (use cord wood only).
11. The Limited Warranty is void if:
 - a) The stove has been operated in atmospheres contaminated by chlorine, fluorine or other damaging chemicals.
 - b) The stove is subject to submersion in water or prolonged periods of dampness or condensation.
 - c) Any damage to the unit, combustion chamber or other components due to water, or weather damage which is the result of, but not limited to, improper chimney/venting installation.
 - d) Salt air in coastal areas or high humidity can be corrosive to the finish; these environmental conditions can cause rusting. Damage caused by salt air or high humidity is not covered by the Limited Warranty.
12. Exclusions to the Limited Warranty include: injury, loss of use, damage, failure to function due to accident, negligence, misuse, improper installation, alteration or adjustment of the manufacturer's settings of components, lack of proper and regular maintenance, alteration, or act of God.
13. The Limited Warranty does not cover damage caused to the stove while in transit. If this occurs, do not operate the stove and contact your courier and/or dealer.
14. The Limited Warranty does not extend to or include paint, door or glass gaskets or firebricks damage caused by normal wear and tear, such as paint discoloration or chipping, worn or torn gaskets, chipped or cracked firebrick, etc.
15. The Limited Warranty does not include damage to the unit caused by abuse, improper installation, or modification of the unit.
16. Damage to plated surfaces caused by fingerprints, scratches, melted items, or other external scores and residues left on the plated surfaces from the use of abrasive cleaners or polishes is not covered in this warranty.

17. Blaze King is free of liability for any damages caused by the stove, as well as inconvenience expenses and materials. The Limited Warranty does not cover incidental or consequential damages.
18. The Limited Warranty does not cover any loss or damage incurred by the use or removal of any component or apparatus to or from the Blaze King stove without the express written permission of Blaze King and bearing a Blaze King label of approval.
19. Any statement or representation of Blaze King Products and their performance contained in Blaze King advertising, packaging literature, or printed material is not part of the Limited Warranty.
20. The Limited Warranty is automatically voided if the stove's serial number has been removed or altered in any way. If the stove is used for commercial purposes, it is excluded from the Limited Warranty.
21. No dealer, distributor, or similar person has the authority to represent or warrant Blaze King Products beyond the terms contained within the Limited Warranty. Blaze King assumes no liability for such warranties or representations.
22. Blaze King will not cover the cost of the removal or re-installation of the stove, hearth, facing, mantels, venting or other components.
23. Labor to replace or repair items under this Limited Warranty will be covered per our warranty service fee reimbursement and labor rates are set per component schedule. Labor rates vary from location to location and as such total labor costs may not be covered. Please consult with your dealer or service technician for any additional charges such as travel time or additional labor charges that may apply.
24. For parts of the Blaze King woodstove or fireplace insert warranted beyond the first year, the five year limited warranty will have the same obligations as described in this document, provided, however that the purchaser shall pay the following percentage of the then current retail cost of the repair or the replacement, according to the year after purchase in the which the defect is brought to the attention of Blaze King.*** During the 2nd year----purchaser pays 20%. 3rd year ----purchaser pays 40%. 4th year ----purchaser pays 60%. 5th year---- purchaser pays 80%.
25. If a defect or problem is determined by Blaze King to be non warrantable, Blaze King is not liable for travel costs for service work. In the event of in-home repair work, the customer will pay any in-home travel fees or service charges required by the Authorized Dealer.
26. At no time will Blaze King be liable for any consequential damages which exceed the purchase price of the unit. Blaze King has no obligation to enhance or modify any stove once manufactured (example: as a stove model evolves, field modifications or upgrades will not be performed)
27. This Limited Warranty is applicable only to the original purchaser and it is nontransferable.
28. This warranty only covers Blaze King Products that are purchased through an authorized Blaze King dealer.
29. If for any reason any section of the Limited Warranty is declared invalid, the balance of the warranty remains in effect and all other clauses shall remain in effect
30. The Limited Warranty is the only warranty supplied by Blaze King, the manufacturer of the stove. All other warranties, whether express or implied, are hereby expressly disclaimed and the purchaser's recourse is expressly limited to the Limited Warranty.
31. Blaze King and its employees or representatives will not assume any liability for damages, either directly or indirectly, caused by improper usage, operation, installation, servicing or maintenance of this stove.
32. Blaze King reserves the right to make changes without notice. Please complete and mail the warranty registration card and have the installer fill in the installation data sheet in the back of the manual for warranty and future reference
33. Blaze King is responsible for stocking parts for a maximum of seven (7) years after discontinuing the manufacture or incorporation of the item into its products. An exception to this would be if an OEM supplier is not able to supply a part.

INSTALLER NOTES



Installer: Please complete the following information

Dealer Name & Address: _____

Installer (print): _____

Installer (sign): _____

Phone #: _____

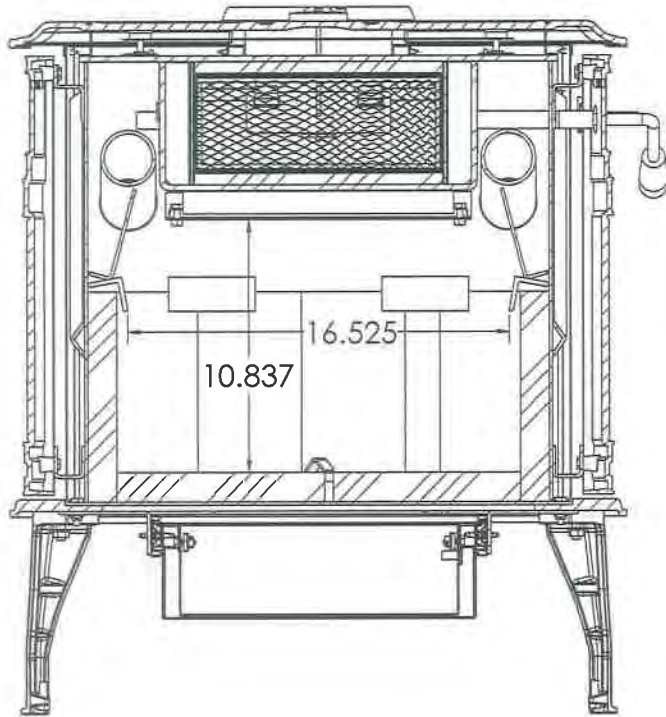
Date Installed: _____

Serial No.: _____

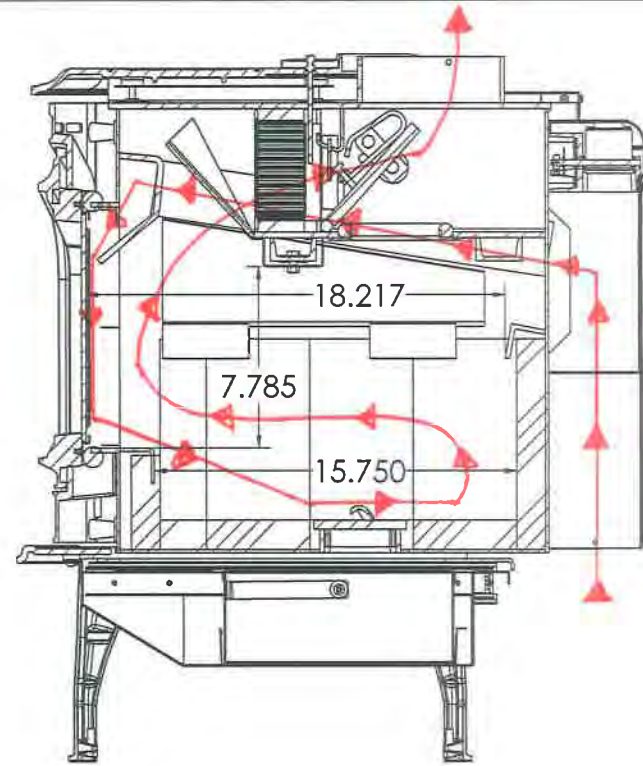
*Model: Blaze King 20.2 Series
Valley Comfort Systems Inc.
1290 Commercial Way
Penticton, BC V2A 3H5 Canada*

Appendix B

Firebox Volume



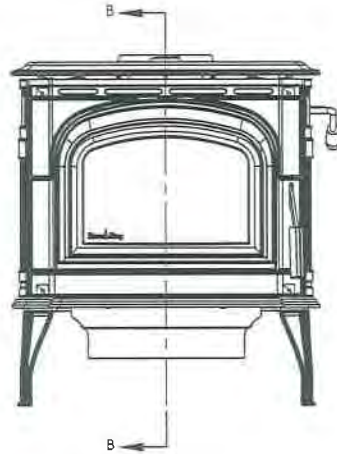
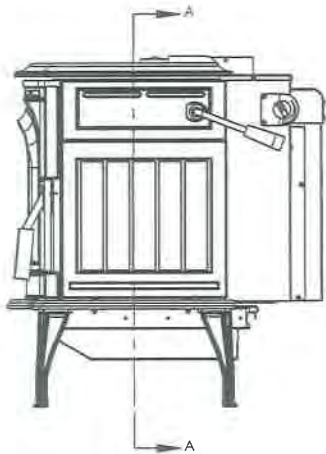
SECTION A-A
SCALE 1 : 4



SECTION B-B
SCALE 1 : 4

FIREBOX VOLUME CALC:

$$\begin{aligned}
 & (16.525" \times 10.837" \times 15.75") + (17.5" \times 7.785" \times (18.217" - 15.75")) \\
 & = 2820.53244375 \text{ in}^3 + 336.0979125 \text{ in}^3 \\
 & = 3156.63035625 \text{ in}^3 \times 1 \text{ ft}^3 / 1728 \text{ in}^3 \\
 & = \mathbf{1.82 \text{ ft}^3}
 \end{aligned}$$



Valley Comfort Systems Inc

1290 Commercial way Penticton, BC V2A 3H5

Part Name **Part Number**

20.2 FB VOLUME CALC & AIRFLOW

| Date | Rev Date | Model | |
|-----------|----------|---------------|-----------|
| Aug 22 17 | ?? | AF/CK/SC 20.2 | |
| Drawn By | QTY Per | Material | Thickness |
| AR | 1 | | |

All Dimensions in Inches
Tolerance

| General | Hole Size | Hole Pos | Angles |
|----------|-----------|----------|---------|
| +/- 0.03 | +/- 0.005 | +/- 0.03 | +/- 0.5 |

WEIGHT:

PUNCH BLANK SIZE:

LASER BLANK SIZE:

Appendix C

Low Burn Justification

(Data shown is not for use in the weighted average)

Manufacturer supplied evidence that control setting used during testing was lowest possible setting. A setting of 90° on the thermostat Z3009 caused the fire to go out. A setting of 80° used during certification testing generated a burn rate of 0.66 kg.hr.

Wood Heater Test Data - EPA Method 5G

Run:
 Manufacturer: Blaze King
 Model: SC25
 Tracking No.: _____
 Project No.: Low Burn - Invalid Run Stalled
 Test Date: 31-Mar-21
 Beginning Clock Time: 00:00
 Recording Interval: 10 min.
 Total Sampling Time: 720 min.
 Burn Rate: N/A kg/hr

| Velocity Traverse Data | | | | | | | | |
|------------------------|------|------|------|------|------|------|------|------|
| | Pt.1 | Pt.2 | Pt.3 | Pt.4 | Pt.5 | Pt.6 | Pt.7 | Pt.8 |
| Initial dP | | | | | | | | |
| Initial Temp. | | | | | | | | |

Equipment Numbers: THERMOSTAT KNOB WAS CLOSED 90° FROM FULLY OPEN
NOTE: THERM KNOB WAS CLOSED 80° FROM FULLY OPEN FOR OFFICIAL EPA LOW BURN
TEST TERMINATED AT 720 MINS BECAUSE < .1 LB/MIN WEIGHT CHANGE FOR 30 MINUTES

PM Control Module: BK-06
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.680 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 0.988
 Barometric Pressure: Begin Middle End Average

Signature/Date: _____
 Tunnel Velocity: #DIV/0! ft/sec.
 Initial Tunnel Flow: #DIV/0! scfm
 Average Tunnel Flow: #DIV/0! scfm
 Tunnel Area: 0.196 ft2
 Post-Test Leak Check: .008@6 cfm@"Hg
 Fuel Moisture (dry basis): 22.3 %
 Total Particulate: _____ mg
 Filter Holder No.: _____
 0.00 "Hg

| Elapsed Time | Particulate Sampling Data | | | | | | | | Fuel Weight, lb | | Wood Heater Temperature Data, oF | | | | | | | | | | Stack | |
|--------------|---------------------------|------------------|------------|----------|--------------------|-----------------------|--------------------|-----------------|-----------------|---------------|----------------------------------|----------------|--------------|--------------|---------------|------------------|-----------------|-------|--------|---------------|---------|---------------|
| | Gas Meter Cubic Feet | Sample Rate, cfm | Orifice dH | Meter oF | Meter Vac. In. Hg. | Dilution Tunnel Temp. | Dilution Tunnel dP | Pro. Rate (10%) | Scale Reading | Weight Change | Firebox Top | Firebox Bottom | Firebox Back | Firebox Left | Firebox Right | Firebox Interior | Average Surface | Stack | Filter | Impinger exit | Ambient | Draft In. H2O |
| 0 | 1.000 | | | | | | | 18.5 | | N/A | N/A | N/A | N/A | N/A | | N/A | 173.88 | | | 64.79 | | 452.53 |
| 10 | 1.000 | 0.00 | | | | | | 18.5 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 110.63 | | | 64.74 | | 357.5 |
| 20 | 1.000 | 0.00 | | | | | | 18.4 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 110.57 | | | 65.07 | | 330.1 |
| 30 | 1.000 | 0.00 | | | | | | 18.2 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 112.53 | | | 65.58 | | 322.59 |
| 40 | 1.000 | 0.00 | | | | | | 18.0 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 111.91 | | | 65.69 | | 336.26 |
| 50 | 1.000 | 0.00 | | | | | | 17.8 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 109.39 | | | 65.91 | | 343.44 |
| 60 | 1 | 0.00 | | | | | | 17.7 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 105.81 | | | 66.19 | | 322.7 |
| 70 | 1.000 | 0.00 | | | | | | 17.6 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 101.38 | | | 66.47 | | 302.31 |
| 80 | 1.000 | 0.00 | | | | | | 17.5 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 97.46 | | | 66.31 | | 284.88 |
| 90 | 1.000 | 0.00 | | | | | | 17.5 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 94.54 | | | 66.59 | | 272.56 |
| 100 | 1.000 | 0.00 | | | | | | 17.4 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 92.19 | | | 66.36 | | 261.8 |
| 110 | 1.000 | 0.00 | | | | | | 17.3 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 91.24 | | | 66.53 | | 251.49 |
| 120 | 1 | 0.00 | | | | | | 17.2 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 90.57 | | | 66.7 | | 239.22 |
| 130 | 1.000 | 0.00 | | | | | | 17.1 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 90.23 | | | 66.59 | | 230.31 |
| 140 | 1.000 | 0.00 | | | | | | 16.9 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 98.92 | | | 66.92 | | 258.44 |
| 150 | 1.000 | 0.00 | | | | | | 16.6 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 104.29 | | | 67.03 | | 295.81 |
| 160 | 1.000 | 0.00 | | | | | | 16.3 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 108.44 | | | 66.64 | | 312.45 |
| 170 | 1.000 | 0.00 | | | | | | 16.0 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 110.85 | | | 66.53 | | 313.96 |
| 180 | 1 | 0.00 | | | | | | 15.7 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 110.12 | | | 66.64 | | 313.35 |
| 190 | 1.000 | 0.00 | | | | | | 15.4 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 108.44 | | | 66.59 | | 307.86 |
| 200 | 1.000 | 0.00 | | | | | | 15.2 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 107.21 | | | 66.7 | | 306.34 |
| 210 | 1.000 | 0.00 | | | | | | 15.0 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 106.76 | | | 66.7 | | 303.15 |
| 220 | 1.000 | 0.00 | | | | | | 14.7 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 105.69 | | | 66.92 | | 303.09 |
| 230 | 1.000 | 0.00 | | | | | | 14.5 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 104.29 | | | 67.03 | | 300.91 |
| 240 | 1 | 0.00 | | | | | | 14.3 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 103.45 | | | 67.26 | | 295.47 |
| 250 | 1.000 | 0.00 | | | | | | 14.1 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 103.01 | | | 67.37 | | 290.6 |
| 260 | 1.000 | 0.00 | | | | | | 13.9 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 101.83 | | | 67.37 | | 283.2 |
| 270 | 1.000 | 0.00 | | | | | | 13.8 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 101.27 | | | 67.54 | | 271.6 |
| 280 | 1.000 | 0.00 | | | | | | 13.6 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 101.88 | | | 67.59 | | 261.07 |

Wood Heater Test Data - EPA Method 5G

Run:
 Manufacturer: Blaze King
 Model: SC25
 Tracking No.: _____
 Project No.: Low Burn - Invalid Run Stalled
 Test Date: 31-Mar-21
 Beginning Clock Time: 00:00
 Recording Interval: 10 min.
 Total Sampling Time: 720 min.
 Burn Rate: N/A kg/hr

| Velocity Traverse Data | | | | | | | | |
|------------------------|------|------|------|------|------|------|------|------|
| | Pt.1 | Pt.2 | Pt.3 | Pt.4 | Pt.5 | Pt.6 | Pt.7 | Pt.8 |
| Initial dP | | | | | | | | |
| Initial Temp. | | | | | | | | |

Equipment Numbers: THERMOSTAT KNOB WAS CLOSED 90° FROM FULLY OPEN
NOTE: THERM KNOB WAS CLOSED 80° FROM FULLY OPEN FOR OFFICIAL EPA LOW BURN
TEST TERMINATED AT 720 MINS BECAUSE < .1 LB/MIN WEIGHT CHANGE FOR 30 MINUTES

PM Control Module: BK-06
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.680 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 0.988
 Barometric Pressure: Begin Middle End Average

Signature/Date: _____
 Tunnel Velocity: #DIV/0! ft/sec.
 Initial Tunnel Flow: #DIV/0! scfm
 Average Tunnel Flow: #DIV/0! scfm
 Tunnel Area: 0.196 ft2
 Post-Test Leak Check: .008@6 cfm@"Hg
 Fuel Moisture (dry basis): 22.3 %
 Total Particulate: _____ mg
 Filter Holder No.: _____
 0.00 "Hg

| Elapsed Time | Particulate Sampling Data | | | | | | | | Fuel Weight, lb | | Wood Heater Temperature Data, oF | | | | | | | | | | Stack | |
|--------------|---------------------------|------------------|------------|----------|--------------------|-----------------------|--------------------|-----------------|-----------------|---------------|----------------------------------|----------------|--------------|--------------|---------------|------------------|-----------------|-------|--------|---------------|---------|---------------|
| | Gas Meter Cubic Feet | Sample Rate, cfm | Orifice dH | Meter oF | Meter Vac. In. Hg. | Dilution Tunnel Temp. | Dilution Tunnel dP | Pro. Rate (10%) | Scale Reading | Weight Change | Firebox Top | Firebox Bottom | Firebox Back | Firebox Left | Firebox Right | Firebox Interior | Average Surface | Stack | Filter | Impinger exit | Ambient | Draft In. H2O |
| 290 | 1.000 | 0.00 | | | | | | 13.4 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 104.01 | | | 67.65 | | 260.51 |
| 300 | 1 | 0.00 | | | | | | 13.1 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 105.98 | | | 67.76 | | 264.54 |
| 310 | 1.000 | 0.00 | | | | | | 12.9 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 106.65 | | | 67.76 | | 267.18 |
| 320 | 1.000 | 0.00 | | | | | | 12.6 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 107.54 | | | 67.76 | | 268.8 |
| 330 | 1.000 | 0.00 | | | | | | 12.4 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 107.54 | | | 67.76 | | 269.08 |
| 340 | 1.000 | 0.00 | | | | | | 12.1 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 108.16 | | | 67.65 | | 273.06 |
| 350 | 1.000 | 0.00 | | | | | | 11.9 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 108.44 | | | 67.82 | | 275.02 |
| 360 | 1 | 0.00 | | | | | | 11.6 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 107.88 | | | 67.87 | | 276.37 |
| 370 | 1.000 | 0.00 | | | | | | 11.4 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 106.76 | | | 67.76 | | 277.49 |
| 380 | 1.000 | 0.00 | | | | | | 11.3 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 106.14 | | | 67.65 | | 275.58 |
| 390 | 1.000 | 0.00 | | | | | | 11.0 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 107.21 | | | 67.59 | | 275.58 |
| 400 | 1.000 | 0.00 | | | | | | 10.8 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 108.78 | | | 67.48 | | 277.99 |
| 410 | 1.000 | 0.00 | | | | | | 10.6 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 107.04 | | | 67.59 | | 274.74 |
| 420 | 1 | 0.00 | | | | | | 10.4 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 105.47 | | | 67.48 | | 268.8 |
| 430 | 1.000 | 0.00 | | | | | | 10.3 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 104.35 | | | 67.37 | | 262.53 |
| 440 | 1.000 | 0.00 | | | | | | 10.1 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 102.78 | | | 67.26 | | 255.07 |
| 450 | 1.000 | 0.00 | | | | | | 10.1 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 101.04 | | | 67.15 | | 245.83 |
| 460 | 1.000 | 0.00 | | | | | | 9.9 | -0.1 | N/A | N/A | N/A | N/A | N/A | | N/A | 100.99 | | | 67.15 | | 239.05 |
| 470 | 1.000 | 0.00 | | | | | | 9.7 | -0.3 | N/A | N/A | N/A | N/A | N/A | | N/A | 104.85 | | | 66.92 | | 235.29 |
| 480 | 1 | 0.00 | | | | | | 9.4 | -0.2 | N/A | N/A | N/A | N/A | N/A | | N/A | 111.35 | | | 66.7 | | 232.61 |
| 490 | 1.000 | 0.00 | | | | | | 9.0 | -0.4 | N/A | N/A | N/A | N/A | N/A | | N/A | 117.52 | | | 66.7 | | 249.36 |
| 500 | 1.000 | 0.00 | | | | | | 8.5 | -0.5 | N/A | N/A | N/A | N/A | N/A | | N/A | 122.56 | | | 66.47 | | 271.83 |
| 510 | 1.000 | 0.00 | | | | | | 8.0 | -0.5 | N/A | N/A | N/A | N/A | N/A | | N/A | 125.36 | | | 66.31 | | 291.61 |
| 520 | 1.000 | 0.00 | | | | | | 7.5 | -0.5 | N/A | N/A | N/A | N/A | N/A | | N/A | 126.2 | | | 66.02 | | 303.15 |
| 530 | 1.000 | 0.00 | | | | | | 7.0 | -0.6 | N/A | N/A | N/A | N/A | N/A | | N/A | 125.75 | | | 65.86 | | 319.01 |
| 540 | 1 | 0.00 | | | | | | 6.5 | -0.5 | N/A | N/A | N/A | N/A | N/A | | N/A | 124.24 | | | 65.69 | | 325.39 |
| 550 | 1.000 | 0.00 | | | | | | 6.1 | -0.4 | N/A | N/A | N/A | N/A | N/A | | N/A | 123.68 | | | 65.52 | | 335.87 |
| 560 | 1.000 | 0.00 | | | | | | 5.6 | -0.4 | N/A | N/A | N/A | N/A | N/A | | N/A | 123.18 | | | 65.3 | | 349.43 |
| 570 | 1.000 | 0.00 | | | | | | 5.2 | -0.4 | N/A | N/A | N/A | N/A | N/A | | N/A | 121.44 | | | 64.96 | | 361.25 |

Wood Heater Test Data - EPA Method 5G

Run:
 Manufacturer: Blaze King
 Model: SC25
 Tracking No.: _____
 Project No.: Low Burn - Invalid Run Stalled
 Test Date: 31-Mar-21
 Beginning Clock Time: 00:00
 Recording Interval: 10 min.
 Total Sampling Time: 720 min.
 Burn Rate: N/A kg/hr

| Velocity Traverse Data | | | | | | | | |
|------------------------|------|------|------|------|------|------|------|------|
| | Pt.1 | Pt.2 | Pt.3 | Pt.4 | Pt.5 | Pt.6 | Pt.7 | Pt.8 |
| Initial dP | | | | | | | | |
| Initial Temp. | | | | | | | | |

Equipment Numbers: THERMOSTAT KNOB WAS CLOSED 90° FROM FULLY OPEN
NOTE: THERM KNOB WAS CLOSED 80° FROM FULLY OPEN FOR OFFICIAL EPA LOW BURN
TEST TERMINATED AT 720 MINS BECAUSE < .1 LB/MIN WEIGHT CHANGE FOR 30 MINUTES

PM Control Module: BK-06
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.680 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 0.988
 Barometric Pressure: Begin Middle End Average

Signature/Date: _____
 Tunnel Velocity: #DIV/0! ft/sec.
 Initial Tunnel Flow: #DIV/0! scfm
 Average Tunnel Flow: #DIV/0! scfm
 Tunnel Area: 0.196 ft2
 Post-Test Leak Check: .008@6 cfm@"Hg
 Fuel Moisture (dry basis): 22.3 %
 Total Particulate: _____ mg
 Filter Holder No.: _____
 0.00 "Hg

| Elapsed Time | Particulate Sampling Data | | | | | | | | Fuel Weight, lb | | Wood Heater Temperature Data, oF | | | | | | | | | | Stack | |
|--------------|---------------------------|------------------|------------|----------|--------------------|-----------------------|--------------------|-----------------|-----------------|---------------|----------------------------------|----------------|--------------|--------------|---------------|------------------|-----------------|-------|--------|---------------|---------|---------------|
| | Gas Meter Cubic Feet | Sample Rate, cfm | Orifice dH | Meter oF | Meter Vac. In. Hg. | Dilution Tunnel Temp. | Dilution Tunnel dP | Pro. Rate (10%) | Scale Reading | Weight Change | Firebox Top | Firebox Bottom | Firebox Back | Firebox Left | Firebox Right | Firebox Interior | Average Surface | Stack | Filter | Impinger exit | Ambient | Draft In. H2O |
| 580 | 1.000 | 0.00 | | | | | | 5.0 | -0.3 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 115.56 | | | 65.02 | | 360.64 |
| 590 | 1.000 | 0.00 | | | | | | 4.8 | -0.2 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 107.49 | | | 64.79 | | 350.78 |
| 600 | 1 | 0.00 | | | | | | 4.6 | -0.2 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 99.81 | | | 64.68 | | 333.74 |
| 610 | 1.000 | 0.00 | | | | | | 4.5 | -0.1 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 94.15 | | | 64.68 | | 319.51 |
| 620 | 1.000 | 0.00 | | | | | | 4.4 | -0.1 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 89.84 | | | 64.68 | | 306.85 |
| 630 | 1.000 | 0.00 | | | | | | 4.4 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 86.81 | | | 64.62 | | 293.74 |
| 640 | 1.000 | 0.00 | | | | | | 4.3 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 85.58 | | | 64.57 | | 282.25 |
| 650 | 1.000 | 0.00 | | | | | | 4.3 | -0.1 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 84.74 | | | 64.34 | | 272.16 |
| 660 | 1 | 0.00 | | | | | | 4.3 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 84.18 | | | 64.12 | | 261.41 |
| 670 | 1.000 | 0.00 | | | | | | 4.2 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 84.24 | | | 64.12 | | 251.21 |
| 680 | 1.000 | 0.00 | | | | | | 4.2 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 83.45 | | | 64.01 | | 243.25 |
| 690 | 1.000 | 0.00 | | | | | | 4.2 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 83.28 | | | 63.84 | | 234.17 |
| 700 | 1.000 | 0.00 | | | | | | 4.2 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 83.23 | | | 63.73 | | 225.15 |
| 710 | 1.000 | 0.00 | | | | | | 4.1 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 83.67 | | | 63.62 | | 213.39 |
| 720 | 1 | 0.00 | | | | | | 4.2 | 0.0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 83.79 | | | 63.5 | | 200.67 |
| Avg/Total | 0.00 | 0.00 | | | | | | | -0.2 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 104.81 | | | 66.24 | | 287.07 |

*Model: Blaze King 20.2 Series
Valley Comfort Systems Inc.
1290 Commercial Way
Penticton, BC V2A 3H5 Canada*

Appendix D

Revision History

| Date | Project No. | Tech. & Evaluator | Report Sect. | Summary of Changes |
|---------------|---------------------------|------------------------------|--------------|---|
| November 2017 | 0142WS013E | Aaron Kravitz Bruce Davis | All | Original Report Generated |
| 10/28/2020 | 0142WS013E Edition 001 | Bruce Davis | 1 | CO weighted average emissions added to table 3. |
| | | | Appendix B | Firebox Volume calculation added to revised report. |
| | | | 3 | Train precision added to pages 42, 57, 70, 93, 110, 123, and 133 of revised report. |
| | | | 1 | Added fuel species to Introduction page. |
| 05/04/21 | 0142WS013E Edition 002 | Bruce Davis | 1 | Paragraph added to introduction page regarding ambient sampling filters. |
| | | | 3 | Added revised Conditioning data showing fuel weight and medium operation on page 26 and 27. |
| | | | 3 | Added low burn justification to run 4 data on page 75. |
| 5/11/21 | 0142WS013E Edition 003 | Bruce Davis | Appendix C | Added client supplied data showing low burn rate air control setting justification. |
| 7/15/21 | 0142WS013E Edition 004 | Bruce Davis | Appendix C | Added thermostat part number Z3009 to low burn justification. |
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