Hussong Manufacturing Co., Inc., dba Kozy Heat Fireplaces

Project # 18-449
Model: Z42
Type: Wood-Fired Room Heater
July 22, 2019
Revised: February 22, 2021

ASTM E3053 Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters Using Cordwood Test Fuel (EPA ALT-125)

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Summary of Revisions

Date: July 22, 2019 – Original Issue

Date: February 22, 2021 – Revisions as follows, per request from EPA:

-The “Notes” Section on page 4 of the test report was edited to indicate that pre-conditioning was performed by PFS staff at a medium burn setting.

-The firebox volume drawing was added to the main body of the test report, page 11. References to volume found elsewhere in the report appendicies have also been updated.

-The user manual was updated to provide guidance on draft and proper use of air controls, see Appendix B.

Contents

Affidavit

PFS-TECO was contracted by Hussong Manufacturing Co., Inc. (Kozy Heat Fireplaces) to provide testing services for the Model Z42 Wood-Fired Room Heater per ASTM E3053, *Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters Using Cordwood Test Fuel*, which was approved for use under EPA ALT-125. All testing and associated procedures were conducted at PFS-TECO's Portland Laboratory beginning on 6/11/2019 and ending on 6/13/2019. PFS-TECO's Portland Laboratory is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015. Testing procedures followed ASTM E3053 with the exception of caveats described in EPA ALT-125. Particulate sampling was performed per ASTM E2515, *Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel,* with the exception of caveats described in EPA ALT-125. A copy of EPA ALT-125 is included in Appendix A for reference, as required by the approval letter.

PFS-TECO is accredited by the U.S. Environmental Protection Agency for the certification and auditing of wood heaters pursuant to subpart AAA of 40 CFR Part 60, New Source Performance Standards for Residential Wood Heaters and subpart QQQQ of 40 CFR Part 60, Standards of Performance for New Hydronic Heaters and Forced Air Furnaces, Methods 28R, 28WHH, 28 WHH-PTS, and all methods listed in Sections 60.534 and 60.5476. PFS-TECO holds EPA Accreditation Certificate Numbers 4 and 4M (mobile). PFS-TECO is accredited by IAS to ISO 17020:2012 "Criteria for Bodies Performing Inspections", and ISO 17025:2005 "Requirements for Testing Laboratories." PFS-TECO is also accredited by Standards Council of Canada to ISO 17065:2012 "Requirements for Bodies Operating Product Certification Systems."

The following people were associated with the testing, analysis and report writing associated with this project.

Sebastian Button, Laboratory Supervisor

Introduction

Kozy Heat Fireplaces of Lakefield, MN, contracted with PFS-TECO to perform EPA certification testing on Z42 Wood-Fired Room Heater. All testing was performed at PFS-TECO's Portland Laboratory. Testing was performed by Mr. Sebastian Button.

Notes

- Prior to start of testing, 50 hours of conditioning was performed at a medium burn setting by PFS staff, in accordance with ASTM E3053.
- Prior to start of testing, the dilution tunnel was cleaned with a steel brush.
- Front filters were changed on sample train A at one hour for all 3 test runs.
- A total of 3 test runs were performed in accordance with ASTM E3053, no anomalies occurred, no additional tests performed, see Run Narrative section for further detail on each run.

Wood Heater Identification and Testing

- Appliance Tested: ***Z42***
- Serial Number: ***15294 – PFS Tracking Number 0019***
- Manufacturer*:* ***Kozy Heat Fireplaces***
- Catalyst: ***No***
- Heat exchange blower: ***Optional***
- Type: ***Wood Stove***
- Style: ***Zero-Clearance***
- Date Received: ***Monday, January 07, 2019***
- Testing Period – Start: ***Tuesday, June 11, 2019*** Finish: ***Thursday, June 13, 2019***
- Test Location: ***PFS-TECO Portland Laboratory, 11785 SE HWY 212 - Suite 305, Clackamas, OR 97015***
- Elevation: ***≈131 Feet above sea level***
- Test Technician(s): ***Sebastian Button***
- Observers: ***None***

Test Procedures and Equipment

All Sampling and analytical procedures were performed by Sebastian Button. All procedures used are directly from ASTM E3053 and ASTM E2515. See the list below for equipment used. See Appendix C submitted with this report for calibration data.

Equipment List:

Equipment ID#	Equipment Description
041	Rice Lake 3'x3' floor scale w/digital weight indicator
050	Digiweigh DWP12i Platform Scale
053	APEX XC-60 Digital Emissions Sampling Box A
054	APEX XC-60 Digital Emissions Sampling Box B
055	APEX Ambient sampling box
057	California Analytical ZRE CO2/CO/O2 IR ANALYZER
064	Digital Barometer
109A/B	Troemner 100mg/200mg Audit Weights
107	Sartorius Analytical Balance
051	10 lb audit weight
090	Dewalt Tape Measure
092	Digital Calipers
095	Anemometer
111	Microtector
115	Delmhorst Wood Moisture Meter
CC700832	Gas Analyzer Calibration Span Gas
CC170624	Gas Analyzer Calibration Mid Gas

Results

The weighted average emissions rate for the 3 run test series was measured to be **1.22 g/hr** with a Higher Heating Value efficiency of **66.0%.** The average CO emission rate for the 3 tests was **1.4 g/min.** The FPI F5200 Wood-Fired Room Heater meets the 2020 cordwood PM emission standard of ≤ 2.5 g/hr per CFR 40 part 60, §60.532 (c).

Detailed individual run data can be found in Appendix A submitted with this report.

Summary Table

	High Fire Test	Low Fire Test	Medium Fire Test
Date	6/11/2019	6/13/2019	6/11/2019
Run Number	1	3	2
PM Emission Rate (g/hr)	2.90	0.74	0.87
Burn Rate (kg/hr)	3.14	1.01	1.31
Heat Output (BTU/hr)	36,231	12,850	16,688
HHV Efficiency (%)	59.8%	67.3%	67.7%
LHV Efficiency (%)	64.0%	72.0%	72.4%
CO Emissions (g/MJ output)	3.28	4.40	4.00
CO Emissions (g/kg dry fuel)	39.11	59.10	54.07
CO Emissions (g/min)	2.09	0.99	1.17
First Hour Emission Rate (g/hr)	2.75	0.77	2.70
Weighting Factor (%)	20%	40%	40%
Weighted particulate emission average of 3 test runs: 1.22 grams per hour.			
Weighted average HHV efficiency of 3 test runs: 66.0%.			
Average CO emission rate for 3 test runs: 1.4 grams per minute			

Test Run Narrative

Run 1

Run 1 was performed on 6/11/2019 as a high fire test run per ASTM E3053. Emissions sampling began from a cold start ignition of kindling and start-up fuel. The test fuel load was loaded 23 minutes into the test. Testing was completed when 90% of the test fuel load was consumed. Total test time was 145 minutes, main test fuel load burn time was 122 min. The particulate emissions rate from kindling ignition to test completion was 2.90 g/hr. The burn rate of the test fuel load was 3.14 kg/hr. The main test load portion of the run had an overall HHV efficiency of 59.8%. The train A front filter was changed at 1 hr. All test results were appropriate and valid. There were no anomalies and all test criteria were met.

Run 2

Run 2 was performed on 6/11/2019 as an attempted medium fire test run per ASTM E3053. The overall test duration was 398 minutes. The burn rate for the test run was 1.31 kg/hr, meeting medium fire category requirements, less than the mid-point of the high and low burn rates (2.08 kg/hr). The particulate emissions rate for the test run was 0.87 g/hr. The run had an overall HHV efficiency of 67.7%. The train A front filter was changed at 1 hr. There were no anomalies and all criteria were met.

Run 3

Run 3 was performed on 6/13/2019 as a low fire test run per ASTM E3053. The overall test duration was 539 minutes. The burn rate for the test run was 1.01 kg/hr. The particulate emissions rate for the test run was 0.74 g/hr. The run had an overall HHV efficiency of 67.3%. The train A front filter was changed at 1 hr. All test results were appropriate and valid. There were no anomalies and all test criteria were met.

Test Conditions Summary

Testing conditions for all runs fell within allowable specifications of ASTM E3053 and ASTM E2515. A summary of facility conditions, fuel burned, and run times is listed below.

Runs	Ambient (°F)		Relative Humidity (%)		Average Barometric Pressure (In. Hg.)	Preburn Fuel Weight (lbs)	Test Fuel Weight (lbs)	Test Fuel Moisture (%DB)	Test Run Time (Min)
	Pre	Post	Pre	Post					
1	76	86	42.3	25	29.96	7.5[1]	20.1	23.4%	145[2]
2	86	83	25	36.4	29.87	20.1	23.31	21.9%	398
3	78	81	32.6	13.4	29.79	19.97	23.98	19.7%	539

[1]This is the weight of the kindling and startup fuel

[2]Total test time was 145 min, high fire test load burn duration was 122 min.

Appliance Operation and Test Settings

The appliance was operated according to procedures as described in the Operations Manual, found in Appendix B submitted with this report. Detailed run information can be found in Appendix A submitted with this report.

Settings & Run Notes

	Pre-Burn Air Setting	Test Run Air and Fan Settings
Run 1	N/A – Cold Start Ignition	Air control set to high fire test setting; blower set to high.
Run 2	Air control set to High Fire Setting in accordance with ASTM E3053	Air control set to fully closed; blower set to high.
Run 3	Air control set to High Fire Setting in accordance with ASTM E3053	Air control set to fully closed; blower set to high.

Appliance Description

Model(s): Z42

Appliance Type: Wood-Fired Room Heater

Firebox Volume: 1.96 ft^3

Air Introduction System: Primary Air enters the firebox from the left side of the appliance and is channeled over the top and down through the air wash, as well as through a pilot air opening in the front of the firebox. Primary air is controlled via a damper arm located below the door which moves up (open) and down (closed). Secondary air is pulled through a fixed opening on the side of the appliance and channeled through a four secondary air tubes. Dimensions on all these features can be found in Appendix D.

Baffle:

Refractory Insulation: The firebox is lined with 1" thick firebrick.

Flue Outlet: 6-inch exhaust outlet located on the top of the appliance.

Catalytic Combustor: N/A

Fan: The Z42 is optionally offered with a convection fan that attaches to the bottom rear of the appliance.

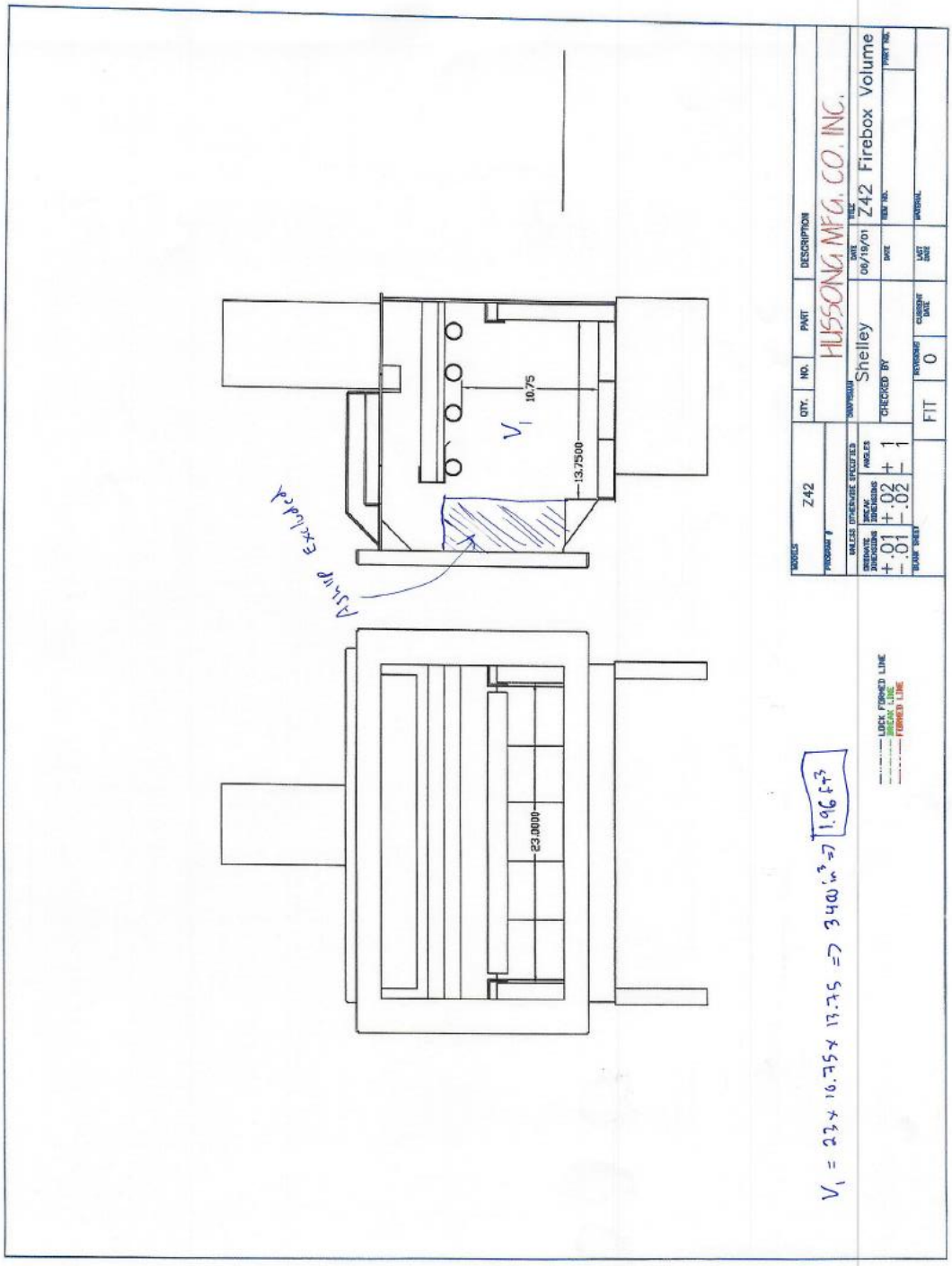
Appliance Dimensions

Z42 Unit Dimensions

Height	Width	Depth	Firebox Volume
38"	31.75"	26"	1.96 ft^3

Appliance design drawings can be found in Appendix D submitted with the CBI copy of this report.

Firebox Dimensions



Appliance Front

Appliance Left

Appliance Right

Appliance Rear

Test Fuel Properties

Test fuel used was Maple cordwood, split and air-dried to the specified moisture content range. Typical fuel loads are pictured below:

Typical Kindling Load

Typical Startup Load

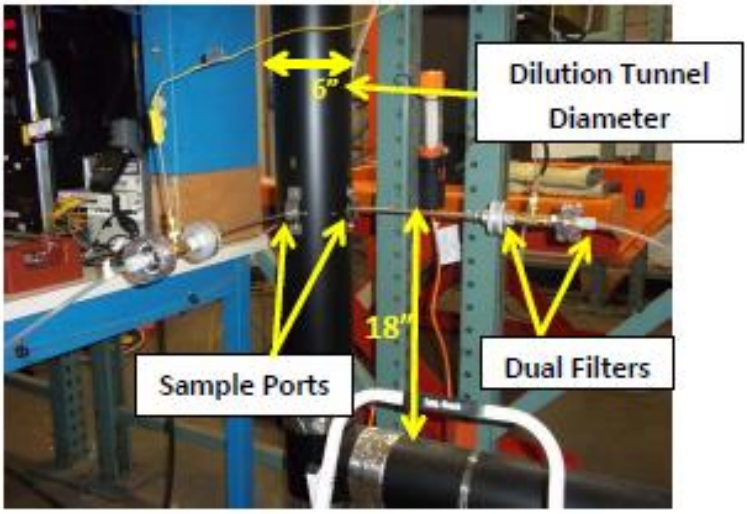
Typical High Fire Load

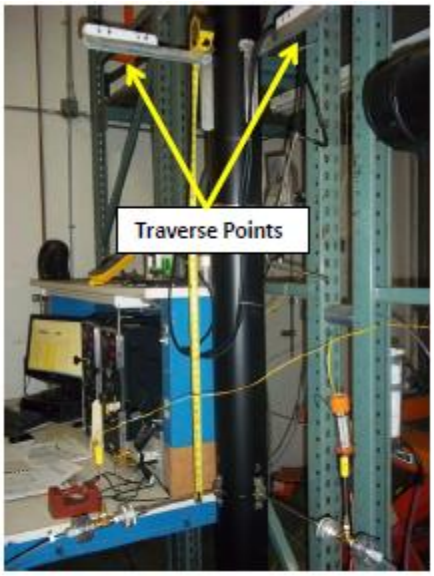
Typical Low Fire Load

Sampling Locations and Descriptions

Sample ports are located 16.5 feet downstream from any disturbances and 1 foot upstream from any disturbances. Flow rate traverse data was collected 12 feet downstream from any disturbances and 5.5 feet upstream from any disturbances. (See below).

Sample Points





Sampling Methods

ASTM E2515 was used in collecting particulate samples. The dilution tunnel is 6 inches in diameter. All sampling conditions per ASTM E2515 were followed. No alternate procedures were used with the exception of caveats described in ALT-125: Pall TX40 Emfab filters were used, filter temperatures were maintained between 80 and 90°F for all tests, filters were weighed in pairs where applicable, and no sampling intervals fell outside of proportional rates of +/- 10%.

Analytical Methods Description

All sample recovery and analysis procedures followed ASTM E2515 procedures. At the end of each test run, filters, O-Rings and probes were removed from their housings, dessicated for a minimum of 24 hours, and then weighed at 6 hour intervals to a constant weight per ASTM E2515-11 Section 10.

Calibration, Quality Control and Assurances

Calibration procedures and results were conducted per EPA Method 28R, ASTM E2515-11 and ASTM E3053. Test method quality control procedures (leak checks, volume meter checks, stratification checks, proportionality results) followed the procedures outlined.

Appliance Sealing and Storage

Upon completion of testing, the appliance was secured with metal strapping and the seal below was applied, the appliance was then returned to the manufacturer's location at: 204 Industrial Park Drive, Lakefiled, MN 56150, for archival.

Sealing Label

ATTENTION:

THIS SEAL IS NOT TO BE BROKEN WITHOUT PRIOR AUTHORIZATION FROM THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

THIS APPLIANCE HAS BEEN SEALED INACCORDANCE WITH REQUIREMNTS OF 40CFR PART 60 SUBPART AAA §60.535 (a)(2)(vii)

REPORT #_____ DATE SEALED_____

MANUFACTURER_____ MODEL #_____

Sealed Unit

List of Appendices

The following appendices have been submitted electronically in conjunction with this report:

Appendix A – Test Run Data, Technician Notes, Sample Analysis, and Alternate Test Method Approval

Appendix B – Labels and Manuals

Appendix C –Equipment Calibration Records

Appendix D – Design Drawings (CBI Report Only)

Appendix E – Manufacturer QAP (CBI Report Only)

WOOD HEATER TESTING SUMMARY

SECTION 1 – Model Identification	
Model Name(s)/Number(s)	Z42
Manufacturer	Kozy Heat Fireplaces
Address 1	204 Industrial Park Drive
Address 2	Lakefield, MN 56150
Appliance Category(s) (Free-standing, Insert, etc.)	Zero-Clearance Wood Heater
Usable Firebox Volume - ft^3	1.96
Catalytic/Non-Cat	Non-Cat
Convection Air Fan (No, Standard, Optional)	Optional
SECTION 1B – Laboratory Information	
Testing Laboratory	PFS-TECO
Address 1	11785 SE Hwy 212 Ste 305
Address 2	Clackamas, OR 97015
ISO/Accreditation Info	ISO 17025
Dates Tested	6/11/19-6/13/19
Test Methods/Standards	ASTM E3053 (ALT-125), ASTM E2515
Dilution Tunnel Inside Diameter - in.	6.00
Filter Diameter - mm	47
Filter Material	Pall Type TX40

SECTION 2 – Test Conditions Summary

Test Run #	1	2	3	
Date Tested	6/11/2019	6/11/2019	6/13/2019	
Test Run Category (L, M, H)	High Fire	Medium Fire	Low Fire	
Average Barometric Pressure - in Hg	29.96	29.87	29.79	
Max. Observed Ambient Temp - °F	86	90	83	
Min. Observed Ambient Temp - °F	76	83	78	
Max. Observed Filter Temp - °F	90	89	88	
Test Fuel Load				
Cordwood Fuel Species	Maple, Hard	Maple, Hard	Maple, Hard	
Specific Gravity (from Table 1)	0.6	0.6	0.6	
Higher Heating Value - Btu/lb (from Annex A1)	8587	8587	8587	
Nom. Test Fuel Load Piece Length - in.	17	17	17	
Number of Test Fuel Pieces	4	5	5	
Test Fuel Weight				
Kindling - As Fired lb	3.00	N/A	N/A	
Kindling Wt. - As % of Test Fuel Load	15%	N/A	N/A	
Kindling Moisture - % DB	10%	N/A	N/A	
Kindling - kg DB	1.24	N/A	N/A	
SU Fuel - As Fired lb	4.50	N/A	N/A	
SU Fuel Wt. - As % of Test Fuel Load	22%	N/A	N/A	
SU Fuel Moisture - % DB	21%	N/A	N/A	
SU Fuel - kg DB	1.69	N/A	N/A	
Test Fuel Load - As Fired lb	20.1	23.31	23.98	
Ave. Test Fuel Load MC % DB	23.4%	21.9%	19.7%	
Test Fuel Load - kg DB	7.39	8.67	9.08	
Test Fuel Loading Density - lb/ft3	10.47	12.14	12.49	
Residual SU Fuel Wt. - As Fired lb	2.20	N/A	N/A	
Residual SU Fuel Wt. - As % of Test Fuel Load	11%	N/A	N/A	
Test Run Duration - minutes	145	398	539	
Test Run Duration - h	2.42	6.63	8.98	
Run Duration of High Fire Load Only - minutes	89	N/A	N/A	
Run Duration of High Fire Load Only - h	1.48	N/A	N/A	
Test Fuel Load Wt. at End of Test - As Fired lb	2.2	0	0	
Total Fuel Burned - kg DB	8.32	8.67	9.08	
% Test Fuel Load Wt. at End of Test	10.9%	0.0%	0.0%	

SECTION 3 – Test Run Results Summary

Test Run #	1	2	3	
Date Tested	6/11/19	6/11/19	6/13/19	
Test Run Category	High Fire	Medium Fire	Low Fire	
Burn Rate - kg/h DB	3.14	1.31	1.01	
Heat Output - Btu/h	36,231	16,688	12,850	
Average Dilution Tunnel Flow Rate - dscfm	154.64	158.01	160.02	
Average Sample Flow Rates - dscfm				
Train 1	0.149	0.152	0.150	
Train 2	0.147	0.149	0.148	
Total PM Emissions - g				
Train 1	6.65	5.92	6.70	
Train 2	7.35	5.67	6.55	
Average	7.001	5.796	6.626	
PM Emission Train Precision - %	5.0%	2.2%	1.1%	
PM Emission Train Precision - g/kg	0.04	0.01	0.01	
PM Emission Rate - g/h	2.90	0.87	0.74	
Total CO Emissions - g	254	467	535	
CO Emissions Rate - g/h	125	70	60	
Overall Efficiency - CSA B415.1-10				
% HHV Basis	60%	68%	67%	
% LHV Basis	64%	72%	72%	

SECTION 4 - Weighted Average Summary

Test Run Category	High Fire	Medium Fire	Low Fire
Burn Rate - kg/h DB	3.14	1.31	1.01
PM Emission Rate - g/h	2.90	0.87	0.74
CO Emissions Rate - g/h	125.1	70.4	59.6
Overall Efficiency - CSA B415.1-10			
% HHV Basis	60%	68%	67%
% LHV Basis	64%	72%	72%
Heat Output - Btu/h	36200	16700	12800
Category Weighting	20%	40%	40%

ASTM E 3053 Weighted Averages			
PM Emission Rate - g/h	1.22		
CO Emissions Rate - g/h (Arithmetic Average)	85.0		
CO Emissions Rate - g/min (Arithmetic Average)	1.4		
Overall Efficiency - CSA B415.1-10			
% HHV Basis	66%		
% LHV Basis	71%		
Heat Output Range - Btu/h	12800	to	36200

Conditioning Data

Client:	Kozy Heat Fireplaces	Job #:	18-449
Model:	Z42	Tracking #:	0019
Date(s):	1/16/19 - 5/7/19	Technician:	SJB

		Average:	436.4	73.4	N/A
Elapsed Time (hrs)	**Scale Reading (lbs)**	**Weight Change (lbs)**	**Flue (°F)**	**Ambient (°F)**	**Catalyst Exit (°F)**
0	13.1	-	389	70	N/A
1	5.4	-7.7	591	71	N/A
2	22.6	17.2	504	73	N/A
3	10.9	-11.7	636	74	N/A
4	3.7	-7.2	532	74	N/A
5	2.0	-1.7	403	72	N/A
6	0.7	-1.3	367	72	N/A
7	7.4	6.7	600	66	N/A
8	15.0	7.6	676	70	N/A
9	4.6	-10.4	614	73	N/A
10	26.0	21.4	526	72	N/A
11	11.2	-14.8	821	75	N/A
12	4.5	-6.7	637	75	N/A
13	2.8	-1.7	501	75	N/A
14	1.2	-1.6	450	73	N/A
15	0.0	-1.2	392	73	N/A
16	14.5	14.5	351	70	N/A
17	8.6	-5.9	494	72	N/A
18	3.5	-5.1	430	73	N/A
19	1.2	-2.3	343	72	N/A
20	24.7	23.5	434	71	N/A
21	15.1	-9.6	585	71	N/A
22	7.3	-7.8	494	72	N/A
23	5.0	-2.3	330	72	N/A
24	3.8	-1.2	288	70	N/A
25	2.7	-1.1	263	70	N/A
26	1.7	-1.0	251	69	N/A
27	1.0	-0.7	237	69	N/A
28	0.1	-0.9	223	68	N/A
29	20.0	19.9	469	80	N/A
30	8.8	-11.2	597	79	N/A
31	4.1	-4.7	407	78	N/A
32	3.0	-1.1	307	80	N/A
33	1.9	-1.1	283	81	N/A
34	1.0	-0.9	262	80	N/A
35	0.2	-0.8	236	80	N/A
36	22.0	21.8	514	74	N/A
37	12.2	-9.8	522	73	N/A
38	5.1	-7.1	523	74	N/A
39	3.5	-1.6	382	73	N/A
40	2.4	-1.1	352	73	N/A
41	1.2	-1.2	341	72	N/A
42	0.2	-1.0	324	72	N/A
43	23.1	22.9	552	73	N/A
44	14.9	-8.2	566	74	N/A
45	8.0	-6.9	523	76	N/A
46	4.7	-3.3	426	76	N/A
47	3.6	-1.1	348	75	N/A
48	2.5	-1.1	333	75	N/A
49	1.5	-1.0	317	74	N/A
50	0.6	-0.9	309	74	N/A

Signature/Date: 

WOOD STOVE TEST DATA PACKET
ASTM E3053/E2515

Run 1 Data Summary

Client:	Kozy Heat Fireplaces
Model:	Z42
Job #:	18-449
Tracking #:	0019
Test Date:	6/11/2019

Techician Signature

2/22/2021
Date

TEST RESULTS - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

Burn Rate (kg/hr):	3.14

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft^3)	15.223	21.632	21.357	8.858
Average Gas Velocity in Dilution Tunnel (ft/sec)	15.23			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	9278.5			
Average Gas Meter Temperature (°F)	82.2	83.3	95.1	79.0
Total Sample Volume (dscf)	14.821	21.239	20.440	8.766
Average Tunnel Temperature (°F)	140.8			
Total Time of Test (min)	145			
Total Particulate Catch (mg)	0.0	6.3	6.7	2.6
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0002966	0.0003278	0.0002966
Total PM Emissions (g)	0.00	6.65	7.35	2.75
Particulate Emission Rate (g/hr)	0.00	2.75	3.04	2.75
Emissions Factor (g/kg)	-	0.80	0.88	-
Difference from Average Total Particulate Emissions (g)	-	0.35	0.35	-
Difference from Average Emissions Factor (g/kg)	-	0.04	0.04	-

Final Average Results	
Total Particulate Emissions (g)	7.00
Particulate Emission Rate (g/hr)	2.90
Emissions Factor (g/kg)	0.84
HHV Efficiency (%)	59.8%
LHV Efficiency (%)	64.0%
CO Emissions (g/min)	2.09

Quality Checks	Requirement	Observed	Result
Dual Train Precision	Each train within 7.5% of average emissions (in grams), or emission factors within 0.5 g/kg	See Above	OK
Filter Temps	>80 °F, <90 °F	Min: 81 / Max: 90	OK
Face Velocity	< 30 ft/min	9.5	OK
Leakage Rate	Less than 4% of average sample rate	0 cfm	OK
Ambient Temp	55-90 °F	Min: 76 / Max: 86	OK
Negative Probe Weight Evaluation	<5% of Total Catch	Probe Catch Not Negative	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	OK

B415.1 Efficiency Results

Manufacturer: ozy Heat Fireplaces
Model: Z42
Date: 06/11/19
Run: 1
Control #: 18-449
Test Duration: 122
Output Category: High

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	59.8%	64.0%
Combustion Efficiency	97.7%	97.7%
Heat Transfer Efficiency	61.2%	65.5%

Output Rate (kJ/h)	38,194	36,231	**(Btu/h)**
Burn Rate (kg/h)	3.20	7.05	**(lb/h)**
Input (kJ/h)	63,861	60,579	**(Btu/h)**

Test Load Weight (dry kg)	6.51	14.34	**dry lb**
MC wet (%)	18.99		
MC dry (%)	23.45		
Particulate (g)	7.00		
CO (g)	254		
Test Duration (h)	2.03		

Emissions	Particulate	CO
g/MJ Output	0.09	3.28
g/kg Dry Fuel	1.08	39.11
g/h	3.44	125.12
g/min	0.06	2.09
lb/MM Btu Output	0.21	7.61

Air/Fuel Ratio (A/F)	15.57

VERSION: **2.2** **12/14/2009**

HIGH FIRE FUEL LOAD DATA - ASTM E3053

Client: Kozy Heat Fireplaces
Job #: 18-449
Model: Z42
Tracking #: 0019
Run #: 1
Technician: SJB
Date: 6/11/2019

Nominal Loading Density (lbs/ft^3, wet basis):	10		
Usable Firebox Volume (ft^3):	1.96		
Target Load Weight (lbs):	19.60		
Total Load Weight Range (lbs):	18.60	to	20.60
Core Load Weight Range (lbs):	8.80	to	12.70
Remainder Load Weight Range (lbs):	6.90	to	10.80
Core Load Piece Range (lbs):	2.90	to	4.90
Remainder Load Piece Range (lbs):	2.00	to	10.80
Max Allowable Kindling Weight (lbs):	4.02		
Max Allowable Start-up Fuel Weight (lbs):	6.03		

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	4.52	In Range	25.3	24.9	24.7	25.0	In Range	3.62	1.64
2	17.00	4.41	In Range	24.9	23.2	22.9	23.7	In Range	3.57	1.62
3	17.00	3.24	In Range	24.1	20.7	22.4	22.4	In Range	2.65	1.20
Core Load Wt. (lbs)		12.17	In Range							

REMAINDER LOAD DATA (1 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	7.93	In Range	25.4	23.7	19.6	22.9	In Range	6.45	2.93
2			NA				NA	NA	NA	NA
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		7.93	In Range							

Total Load Weight (lbs):	20.10	In Range	
Core Load % of Total Weight:	61%	In Range	45-65%
Remainder % of Total Weight:	39%	In Range	35-55%
Total Load % of Target Weight:	103%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	10.3		
Total Load Average Moisture Content (%DB):	23.4	In Range	19-25%
Total Load Average Moisture Content (%WB):	19.0		
Total Test Load Weight (dry basis):	16.28 lbs	7.39 kg	

KINDLING AND START-UP FUEL

		Kindling Moisture Readings (%DB)					Dry Weight	
Kindling Weight (lbs)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
3.00	In Range	10	10	10	10.0	In Range	2.73	1.24

		Start-up Moisture Readings (%DB)					Dry Weight	
Start-up Fuel Wt. (lb)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
4.50	In Range	19.7	22.4	20.6	20.9	In Range	3.72	1.69

TEST FUEL LOADING RANGE

Allowable Residual Start-up Fuel Range (lb):	2.0	to	4.0	
Actual Residual Start-up Fuel Weight (lb):		2.2		In Range

TEST END POINT

High Fire Test Run End Point Range:	1.8	to	2.2	lb
Actual Fuel Load Ending Weight (lb):		2.2		In Range

Total Weight All Fuel Added: 27.60 lbs, wet basis
22.73 lbs, dry basis
10.31 kg, dry basis

Total Weight All Fuel Burned (dry basis): 18.33 lbs
8.32 kg

DILUTION TUNNEL & MISC. DATA - ASTM E3053 / E2515

Client:	Kozy Heat Fireplaces	Job #:	18-449
Model:	Z42	Tracking #:	0019
Run #:	1	Technician:	SJB
Test Start Time:	11:40	Date:	6/11/2019
Test Type:	High Fire		

Recording Interval (min):	1
Total Sampling Time (min):	145
High Fire Test Load Time (min):	23

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	29.98	29.93	29.96
Relative Humidity (%)	42.3	25.0	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	

Meter Box γ Factor:	1.004	(A)	
Meter Box γ Factor:	1.000	(B)	
Meter Box γ Factor:	0.999	(Ambient)	
Ambient Sample Volume:	15.223	ft^3	

Induced Draft Check (in. H_2O):	0
Smoke Capture Check (%):	100%
Date Flue Pipe Last Cleaned:	6/10/2019

Sample Train Post-Test Leak Checks

(A)	0.000	cfm @	-13	in. Hg
(B)	0.000	cfm @	-12	in. Hg
(Ambient)	0.002	cfm @	-14	in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H_2O)	Temp (°F)
1	0.040	78
2	0.050	78
3	0.052	78
4	0.032	78
5	0.038	78
6	0.044	78
7	0.050	78
8	0.038	78
Center	0.054	78

Static Pressure: -0.170 in. H_2O

Dilution Tunnel H_2O:	2.00	percent
Tunnel Diameter:	6	inches
Pitot Tube Cp:	0.99	[unitless]
Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Tunnel Area:	0.1963	ft^2
V_{strav}:	14.01	ft/sec
V_{scent}:	15.53	ft/sec
F_p:	0.902	[ratio]
Initial Tunnel Flow:	156.8	scf/min

TEST FUEL PROPERTIES

ASTM 3053-17 - Table A1.1 Fuel Properties by Fuel Species

Select Fuel Type	Species	%C	%H	%O	%Ash	MJ/kg	BTU/lb
	Ash, White	49.70	6.90	43.00	0.30	20.75	8927
	Beech	48.70	5.80	44.70	0.60	18.80	8088
	Birch, Sweet	49.80	6.50	43.40	0.30	20.12	8656
	Birch, Yellow	49.80	6.50	43.40	0.30	20.12	8656
	Doug Fir (Coast, Interior West/North)	48.73	6.87	43.90	0.50	19.81	8522
	Doug Fir (Interioir South)	48.73	6.87	43.90	0.50	19.81	8522
	Elm, Rock	50.40	6.60	42.30	0.70	20.49	8815
	Elm, Soft	50.40	6.60	42.30	0.70	20.49	8815
	Gum, Red	50.88	6.06	41.57	1.28	19.72	8478
	Larch, Western	50.54	6.36	42.40	0.70	17.58	7558
X	Maple, Hard	50.64	6.02	41.74	1.35	19.96	8587
	Maple, Sugar	50.64	6.02	41.74	1.35	19.96	8587
	Oak, Red	49.50	6.62	43.70	0.20	20.20	8690
	Oak, White	50.40	6.59	42.70	0.20	20.50	8819
	Pine, Southern	52.60	7.00	40.10	1.31	22.30	9587
	Pine, Southern Long Leaf	52.60	7.02	40.10	1.30	22.30	9594
	Other						

WOODSTOVE PREBURN DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

High Fire Test Begins from Cold Start, No Preburn is Performed

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.057	0.00	76	-0.11		7.5		79	76	83	76
1	0.139	0.139	0.053	2.30	77	-0.23	93	7.2	-0.3	81	111	83	77
2	0.290	0.151	0.052	2.30	76	-1.03	102	7.3	0.1	84	174	83	77
3	0.434	0.144	0.054	2.28	76	-0.48	96	7.1	-0.2	88	256	83	77
4	0.584	0.150	0.058	2.27	77	-1.8	97	7.0	-0.1	94	344	83	77
5	0.728	0.144	0.048	2.27	76	-0.12	103	6.6	-0.4	101	425	83	77
6	0.878	0.150	0.050	2.26	76	-1.21	106	6.3	-0.3	107	468	84	77
7	1.022	0.144	0.056	2.26	76	-1.93	96	6.0	-0.3	110	492	84	77
8	1.172	0.150	0.064	2.25	76	0	94	5.7	-0.3	116	536	84	77
9	1.315	0.143	0.063	2.26	76	0	91	5.4	-0.3	121	570	84	77
10	1.465	0.150	0.061	2.25	76	-2.08	97	5.0	-0.4	125	598	85	77
11	1.608	0.143	0.055	2.24	77	-2.16	98	4.7	-0.3	131	621	85	78
12	1.757	0.149	0.060	2.24	77	0	98	4.4	-0.3	132	614	85	78
13	1.901	0.144	0.049	2.24	77	-1.08	105	4.0	-0.4	133	616	85	78
14	2.050	0.149	0.052	2.23	77	-2.21	105	3.8	-0.2	135	625	85	78
15	2.196	0.146	0.058	2.22	77	-1.19	98	3.6	-0.2	136	635	85	78
16	2.345	0.149	0.060	2.23	77	-1.85	98	3.4	-0.2	138	640	85	78
17	2.489	0.144	0.064	2.21	77	-0.48	92	3.1	-0.3	141	658	84	78
18	2.637	0.148	0.066	2.21	77	-1.89	93	2.8	-0.3	141	659	84	79
19	2.780	0.143	0.060	2.20	78	0	94	2.5	-0.3	140	646	84	79
20	2.929	0.149	0.064	2.22	77	0	95	2.5	0	138	632	84	78
21	3.073	0.144	0.055	2.22	78	0	99	2.4	-0.1	138	630	84	78
22	3.235	0.162	0.066	2.22	77	0	102	2.2	-0.2	139	634	84	78
23	3.378	0.143	0.061	2.21	77	-1.89	96	22.1	19.9	168	471	83	79
24	3.527	0.149	0.053	2.20	78	0	107	22.0	-0.1	169	425	84	79
25	3.671	0.144	0.056	2.21	78	-0.77	100	21.8	-0.2	160	419	83	79
26	3.820	0.149	0.059	2.21	80	-1.58	99	21.7	-0.1	144	455	83	79
27	3.963	0.143	0.057	2.28	78	-2.09	96	21.6	-0.1	134	445	85	79
28	4.115	0.152	0.061	2.27	79	0	98	21.5	-0.1	128	434	85	79
29	4.261	0.146	0.054	2.27	79	0	100	21.4	-0.1	126	423	84	79
30	4.412	0.151	0.061	2.26	80	-0.9	97	21.3	-0.1	123	411	84	79
31	4.557	0.145	0.057	2.26	79	-0.43	96	21.3	0	121	401	84	79
32	4.709	0.152	0.066	2.26	78	-2.27	94	21.1	-0.2	120	394	84	79

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	4.855	0.146	0.053	2.25	80	-0.12	100	21.1	0	119	407	85	79
34	5.007	0.152	0.062	2.27	79	-1.99	97	20.8	-0.3	121	440	85	80
35	5.153	0.146	0.061	2.26	79	-2.13	94	20.7	-0.1	126	509	85	79
36	5.301	0.148	0.055	2.25	79	-1.31	101	20.5	-0.2	131	544	87	80
37	5.447	0.146	0.059	2.26	79	-1.18	96	20.3	-0.2	133	555	88	80
38	5.597	0.150	0.055	2.23	79	-1.57	103	20.1	-0.2	133	558	89	80
39	5.742	0.145	0.053	2.23	80	-0.67	101	19.9	-0.2	135	566	90	80
40	5.892	0.150	0.058	2.22	80	-2.39	100	19.5	-0.4	137	574	90	80
41	6.036	0.144	0.053	2.22	80	-2.79	100	19.5	0	137	584	89	80
42	6.188	0.152	0.062	2.33	82	-1.3	98	19.3	-0.2	137	588	89	80
43	6.335	0.147	0.059	2.32	81	-2.88	97	19.1	-0.2	138	604	89	80
44	6.486	0.151	0.054	2.29	80	-0.86	105	18.9	-0.2	141	618	89	80
45	6.634	0.148	0.056	2.29	82	-2.26	101	18.7	-0.2	142	627	89	80
46	6.783	0.149	0.058	2.25	80	-1.27	100	18.4	-0.3	142	633	89	81
47	6.932	0.149	0.057	2.27	83	-0.5	100	18.2	-0.2	143	639	89	81
48	7.080	0.148	0.056	2.23	81	-1.51	101	17.9	-0.3	144	646	89	81
49	7.228	0.148	0.055	2.21	82	-3.11	102	17.7	-0.2	145	649	89	81
50	7.374	0.146	0.058	2.20	81	-0.31	98	17.5	-0.2	146	652	90	81
51	7.521	0.147	0.050	2.15	82	-0.39	106	17.3	-0.2	147	655	89	81
52	7.672	0.151	0.055	2.36	82	-3.25	104	17.0	-0.3	147	656	90	81
53	7.825	0.153	0.059	2.33	82	-2.35	102	16.8	-0.2	148	660	90	81
54	7.972	0.147	0.049	2.29	81	-3.11	107	16.6	-0.2	148	664	90	81
55	8.124	0.152	0.056	2.24	82	-2.72	104	16.4	-0.2	149	667	89	82
56	8.269	0.145	0.059	2.22	82	-1.57	97	16.2	-0.2	150	670	89	82
57	8.422	0.153	0.059	2.24	82	-3.1	102	16.0	-0.2	151	672	89	82
58	8.566	0.144	0.053	2.11	82	-3	101	15.7	-0.3	151	677	89	82
59	8.713	0.147	0.058	2.31	83	-3.5	99	15.6	-0.1	151	678	88	82
60	8.858	0.145	0.059	2.13	82	-3.07	97	15.4	-0.2	152	680	88	82
61	9.035	0.177	0.059	3.30	83	0	118	15.2	-0.2	151	684	88	82
62	9.195	0.160	0.064	2.36	82	-1.42	102	15.0	-0.2	152	687	88	82
63	9.343	0.148	0.061	2.32	83	-2.27	97	14.8	-0.2	154	688	87	83
64	9.497	0.154	0.064	2.33	84	-0.01	98	14.5	-0.3	152	686	86	82
65	9.646	0.149	0.062	2.32	83	-1.67	97	14.4	-0.1	151	687	82	82

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	9.800	0.154	0.056	2.31	83	-2.66	105	14.2	-0.2	151	689	81	83
67	9.948	0.148	0.055	2.28	83	-1.06	102	14.0	-0.2	151	693	82	83
68	10.100	0.152	0.058	2.31	83	-0.11	102	13.7	-0.3	152	698	82	83
69	10.247	0.147	0.055	2.26	84	-0.09	101	13.6	-0.1	152	703	82	83
70	10.398	0.151	0.059	2.25	83	-0.53	101	13.3	-0.3	153	710	82	83
71	10.546	0.148	0.058	2.25	84	-0.67	99	13.1	-0.2	153	709	83	83
72	10.696	0.150	0.053	2.25	84	-0.1	105	12.9	-0.2	153	708	83	83
73	10.846	0.150	0.055	2.24	84	-0.1	103	12.7	-0.2	153	708	83	83
74	10.995	0.149	0.051	2.24	84	-2.86	107	12.5	-0.2	153	707	84	83
75	11.144	0.149	0.063	2.23	84	-1.33	96	12.4	-0.1	152	702	84	83
76	11.292	0.148	0.054	2.22	84	-1.86	103	12.1	-0.3	153	698	84	83
77	11.443	0.151	0.058	2.24	84	-1.45	101	12.0	-0.1	152	695	84	83
78	11.589	0.146	0.056	2.23	84	-0.53	100	11.8	-0.2	151	688	84	83
79	11.739	0.150	0.059	2.23	84	-0.99	100	11.8	0	150	684	84	83
80	11.886	0.147	0.064	2.23	84	-2.81	94	11.5	-0.3	151	680	84	84
81	12.037	0.151	0.057	2.21	85	-2.67	102	11.5	0	149	675	84	83
82	12.182	0.145	0.053	2.21	85	-2.48	101	11.2	-0.3	149	670	84	83
83	12.334	0.152	0.065	2.20	85	-2.18	96	11.2	0	148	666	84	82
84	12.481	0.147	0.056	2.22	85	-0.23	100	11.1	-0.1	147	663	84	84
85	12.633	0.152	0.062	2.21	85	-0.63	98	10.9	-0.2	148	663	83	83
86	12.779	0.146	0.054	2.23	86	-1.64	101	10.8	-0.1	149	662	84	84
87	12.930	0.151	0.055	2.20	86	-2.71	103	10.6	-0.2	147	661	84	84
88	13.077	0.147	0.054	2.22	87	-1.51	101	10.5	-0.1	147	664	83	83
89	13.227	0.150	0.055	2.22	86	-1	103	10.3	-0.2	148	663	83	83
90	13.373	0.146	0.053	2.21	86	-0.1	102	10.2	-0.1	148	665	84	83
91	13.523	0.150	0.060	2.18	86	-2.68	98	9.9	-0.3	148	662	84	84
92	13.671	0.148	0.054	2.20	86	-2.99	102	9.8	-0.1	148	661	83	84
93	13.820	0.149	0.053	2.22	86	-2.13	104	9.8	0	148	661	83	84
94	13.968	0.148	0.055	2.18	86	-0.19	101	9.6	-0.2	148	660	83	85
95	14.117	0.149	0.056	2.19	86	-0.77	101	9.5	-0.1	146	657	83	84
96	14.266	0.149	0.054	2.19	86	-0.19	103	9.3	-0.2	147	657	83	85
97	14.415	0.149	0.055	2.20	86	-2.84	102	9.3	0	146	656	83	84
98	14.564	0.149	0.055	2.18	86	-2.64	102	9.1	-0.2	145	656	83	83

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	14.711	0.147	0.057	2.19	86	-1.59	99	8.9	-0.2	147	655	83	84
100	14.862	0.151	0.059	2.17	86	-0.15	100	8.9	0	147	655	83	84
101	15.008	0.146	0.057	2.20	86	-0.29	98	8.7	-0.2	147	656	83	85
102	15.158	0.150	0.056	2.21	87	-2.02	101	8.5	-0.2	147	657	83	84
103	15.304	0.146	0.057	2.22	87	-0.09	98	8.4	-0.1	148	656	83	85
104	15.454	0.150	0.059	2.17	87	-1.3	99	8.4	0	147	657	83	85
105	15.600	0.146	0.058	2.18	87	-1.64	97	8.2	-0.2	148	659	83	85
106	15.750	0.150	0.055	2.19	87	-0.17	102	8.1	-0.1	148	659	83	85
107	15.895	0.145	0.058	2.19	87	-0.14	96	7.9	-0.2	147	658	83	84
108	16.046	0.151	0.057	2.17	87	-0.72	101	7.8	-0.1	147	657	83	85
109	16.192	0.146	0.054	2.17	87	-2.48	100	7.5	-0.3	147	656	83	85
110	16.343	0.151	0.060	2.18	87	-2.96	99	7.6	0.1	147	653	83	85
111	16.488	0.145	0.058	2.16	87	-2.18	96	7.5	-0.1	146	651	83	85
112	16.639	0.151	0.057	2.17	87	-0.29	101	7.3	-0.2	146	652	83	84
113	16.784	0.145	0.055	2.22	87	-1.62	99	7.2	-0.1	145	650	83	85
114	16.939	0.155	0.067	2.30	87	-1.07	96	7.1	-0.1	145	651	83	84
115	17.087	0.148	0.062	2.31	87	-2.87	95	7.0	-0.1	145	650	83	85
116	17.240	0.153	0.057	2.27	88	-2.83	102	6.9	-0.1	146	650	83	85
117	17.391	0.151	0.056	2.29	88	-1.59	102	6.8	-0.1	146	651	83	85
118	17.543	0.152	0.060	2.28	88	-0.34	99	6.7	-0.1	145	651	83	85
119	17.695	0.152	0.059	2.27	88	-3	100	6.5	-0.2	145	646	83	85
120	17.844	0.149	0.066	2.29	87	-0.38	93	6.5	0	144	642	83	84
121	17.997	0.153	0.054	2.27	87	-2.99	105	6.3	-0.2	144	637	83	85
122	18.146	0.149	0.055	2.26	88	-2.87	101	6.3	0	143	633	83	84
123	18.301	0.155	0.051	2.27	88	-0.48	109	6.3	0	142	631	83	85
124	18.450	0.149	0.053	2.25	88	-1.54	103	6.2	-0.1	144	629	83	85
125	18.603	0.153	0.062	2.29	88	-0.6	98	6.1	-0.1	144	628	83	85
126	18.753	0.150	0.052	2.27	88	-0.24	105	6.0	-0.1	143	624	83	86
127	18.904	0.151	0.055	2.25	87	-2.43	103	5.9	-0.1	143	621	83	85
128	19.057	0.153	0.061	2.28	88	-0.49	98	5.8	-0.1	142	619	83	86
129	19.207	0.150	0.057	2.27	89	-0.23	100	5.6	-0.2	142	618	83	86
130	19.360	0.153	0.065	2.29	88	-1.32	95	5.7	0.1	142	616	83	86
131	19.509	0.149	0.051	2.27	89	-1.23	105	5.6	-0.1	143	615	83	85

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
132	19.662	0.153	0.058	2.28	88	-1.1	101	5.5	-0.1	142	615	83	85
133	19.811	0.149	0.053	2.27	88	-3.01	103	5.3	-0.2	142	614	83	86
134	19.966	0.155	0.052	2.27	88	-0.44	108	5.3	0	142	614	83	86
135	20.115	0.149	0.054	2.28	89	-0.26	102	5.1	-0.2	142	614	84	86
136	20.268	0.153	0.054	2.28	89	-2.18	104	5.2	0.1	142	615	84	86
137	20.418	0.150	0.055	2.26	90	-0.43	101	4.9	-0.3	142	615	83	86
138	20.570	0.152	0.059	2.25	89	-1.35	99	5.0	0.1	142	614	83	86
139	20.723	0.153	0.050	2.25	89	-0.2	109	4.9	-0.1	142	613	83	86
140	20.872	0.149	0.058	2.28	88	-0.33	98	4.7	-0.2	141	612	84	86
141	21.026	0.154	0.056	2.28	89	-2.82	103	4.8	0.1	140	612	83	85
142	21.174	0.148	0.058	2.27	90	-0.34	97	4.6	-0.2	141	612	84	86
143	21.329	0.155	0.052	2.26	90	-0.56	108	4.6	0	141	610	84	86
144	21.478	0.149	0.064	2.27	90	-1.38	93	4.5	-0.1	141	611	84	86
145	21.632	0.154	0.063	2.28	90	-2.9	97	4.4	-0.1	142	609	84	86
Avg/Tot	21.632	0.149	0.057	2.24	83	-1.35	100			141	607	85	82.2

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
0	0.000		0.00	77	-1		84	0.000	0.08	0.00
1	0.140	0.140	2.29	77	-1.68	97	85	-0.010	0.69	0.00
2	0.289	0.149	2.28	77	-2.37	104	85	-0.040	2.74	0.16
3	0.433	0.144	2.29	77	-0.01	99	85	-0.050	6.63	0.24
4	0.582	0.149	2.26	77	-2.56	100	86	-0.060	9.39	0.50
5	0.726	0.144	2.25	77	-0.01	107	86	-0.070	11.11	1.36
6	0.874	0.148	2.26	78	-0.93	108	86	-0.070	11.48	1.33
7	1.018	0.144	2.26	78	-0.64	99	86	-0.060	12.19	0.88
8	1.166	0.148	2.22	78	-2.7	96	85	-0.080	13.34	1.36
9	1.309	0.143	2.24	78	-1.62	94	85	-0.080	12.58	1.29
10	1.457	0.148	2.24	78	-0.05	99	85	-0.060	14.09	0.90
11	1.600	0.143	2.24	79	-0.4	101	85	-0.080	14.57	0.98
12	1.748	0.148	2.23	79	-0.38	100	84	-0.070	13.28	0.69
13	1.891	0.143	2.22	79	-2.67	107	84	-0.070	12.57	0.55
14	2.039	0.148	2.22	80	-0.87	108	84	-0.070	12.40	0.53
15	2.181	0.142	2.21	80	-1.22	98	83	-0.080	12.89	0.43
16	2.328	0.147	2.20	80	-1.25	100	83	-0.070	12.61	0.33
17	2.471	0.143	2.21	81	0	94	83	-0.060	13.03	0.32
18	2.619	0.148	2.21	81	-1.11	96	83	-0.090	12.60	0.38
19	2.762	0.143	2.20	81	-1.32	97	83	-0.080	11.52	0.15
20	2.910	0.148	2.21	82	-0.36	97	84	-0.090	10.18	0.17
21	3.053	0.143	2.20	82	-2.52	101	84	-0.070	9.03	0.18
22	3.200	0.147	2.21	82	-2.64	95	85	-0.060	10.09	0.32
23	3.343	0.143	2.21	83	0	98	85	-0.060	6.54	0.21
24	3.491	0.148	2.21	83	-2.62	109	86	-0.060	1.22	0.21
25	3.635	0.144	2.19	83	-1.04	103	85	-0.060	1.96	0.39
26	3.782	0.147	2.20	84	-0.1	100	86	-0.060	3.83	0.52
27	3.923	0.141	2.29	84	-2.78	97	88	-0.070	3.34	0.63
28	4.074	0.151	2.26	85	-1.65	100	87	-0.060	3.15	0.59
29	4.221	0.147	2.28	85	-0.69	103	87	-0.060	3.02	0.59
30	4.370	0.149	2.29	85	-1.26	98	86	-0.050	2.78	0.60
31	4.516	0.146	2.29	86	-1.81	99	85	-0.050	2.53	0.64

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
32	4.666	0.150	2.28	86	-0.91	95	85	-0.060	2.61	0.65
33	4.813	0.147	2.28	87	-1.37	103	85	-0.050	2.65	0.68
34	4.963	0.150	2.27	87	-2.65	98	85	-0.060	4.95	0.31
35	5.109	0.146	2.28	87	-2.3	96	84	-0.080	7.60	0.28
36	5.259	0.150	2.43	88	-0.6	104	86	-0.090	9.39	0.59
37	5.408	0.149	2.34	88	-2.6	100	87	-0.080	9.01	0.36
38	5.561	0.153	2.32	88	-2.14	107	88	-0.060	8.87	0.33
39	5.707	0.146	2.31	89	-3.04	104	89	-0.070	8.51	0.26
40	5.859	0.152	2.30	89	-0.82	103	89	-0.070	8.82	0.36
41	6.005	0.146	2.28	90	-1.56	104	89	-0.070	8.90	0.29
42	6.155	0.150	2.26	90	-3.17	98	89	-0.070	8.60	0.23
43	6.301	0.146	2.25	90	-1.02	98	89	-0.070	9.22	0.24
44	6.450	0.149	2.22	90	-2.99	105	90	-0.070	9.56	0.21
45	6.596	0.146	2.22	91	-1.36	101	90	-0.070	9.85	0.33
46	6.745	0.149	2.21	91	-2.16	101	89	-0.080	9.82	0.28
47	6.889	0.144	2.18	91	-3.37	99	90	-0.080	9.68	0.23
48	7.037	0.148	2.17	92	-3.37	102	90	-0.060	9.77	0.22
49	7.180	0.143	2.17	92	-3.38	100	90	-0.080	9.54	0.22
50	7.328	0.148	2.27	92	-3.51	101	90	-0.070	9.80	0.29
51	7.474	0.146	2.25	93	-1.21	107	90	-0.090	9.76	0.31
52	7.623	0.149	2.21	93	-1.51	104	90	-0.080	9.64	0.33
53	7.767	0.144	2.19	93	-3.6	97	90	-0.080	9.44	0.26
54	7.915	0.148	2.16	93	-2.05	110	90	-0.090	9.60	0.25
55	8.058	0.143	2.35	94	-3.03	99	90	-0.070	9.56	0.26
56	8.211	0.153	2.34	94	-1.56	103	90	-0.080	9.72	0.23
57	8.359	0.148	2.25	94	-2.11	100	90	-0.080	9.64	0.26
58	8.507	0.148	2.13	95	-3.34	105	90	-0.090	9.74	0.22
59	8.649	0.142	2.23	95	-4.87	96	89	-0.080	9.71	0.23
60	8.796	0.147	2.07	95	-4.58	99	89	-0.080	9.56	0.24
61	8.933	0.137	1.84	95	-5.29	92	88	-0.090	9.65	0.21
62	9.092	0.159	3.22	96	-0.72	103	83	-0.080	9.77	0.21
63	9.256	0.164	2.22	96	-1.1	109	81	-0.090	9.72	0.22

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
64	9.402	0.146	2.19	96	-2.68	94	82	-0.060	10.08	0.23
65	9.550	0.148	2.19	96	-1.83	97	82	-0.070	10.09	0.23
66	9.695	0.145	2.17	97	-1.93	100	85	-0.080	10.02	0.24
67	9.843	0.148	2.27	97	-2.96	103	86	-0.080	10.11	0.25
68	9.990	0.147	2.23	97	-2.34	100	87	-0.090	10.44	0.21
69	10.140	0.150	2.24	97	-1.57	104	86	-0.080	10.61	0.21
70	10.286	0.146	2.22	97	-2.77	98	85	-0.080	10.78	0.19
71	10.437	0.151	2.22	98	-0.97	102	85	-0.100	10.64	0.22
72	10.582	0.145	2.23	98	-2.47	103	84	-0.080	9.98	0.23
73	10.732	0.150	2.21	98	-2.67	104	84	-0.090	9.91	0.14
74	10.878	0.146	2.21	99	-3.21	105	86	-0.100	9.67	0.13
75	11.028	0.150	2.20	98	-3.26	97	87	-0.080	9.57	0.11
76	11.174	0.146	2.20	98	-1.12	102	86	-0.080	9.23	0.15
77	11.324	0.150	2.21	98	-2.88	101	85	-0.080	9.08	0.16
78	11.469	0.145	2.19	99	-0.91	100	86	-0.080	8.86	0.17
79	11.620	0.151	2.18	99	-0.83	101	86	-0.080	8.40	0.17
80	11.765	0.145	2.19	100	-0.83	93	85	-0.070	8.27	0.16
81	11.915	0.150	2.19	99	-3.13	102	85	-0.080	8.13	0.16
82	12.060	0.145	2.19	100	-1.5	102	85	-0.070	7.80	0.16
83	12.210	0.150	2.18	100	-1.32	95	86	-0.080	7.48	0.21
84	12.355	0.145	2.18	100	-1.28	99	87	-0.060	7.66	0.19
85	12.506	0.151	2.19	100	-0.85	98	87	-0.080	7.62	0.27
86	12.651	0.145	2.19	100	-2.61	101	85	-0.080	7.88	0.21
87	12.801	0.150	2.19	100	-3.23	103	86	-0.080	7.82	0.22
88	12.946	0.145	2.19	100	-3.03	101	86	-0.070	8.04	0.19
89	13.095	0.149	2.20	100	-2.32	103	86	-0.070	8.05	0.24
90	13.241	0.146	2.19	101	-3.14	102	85	-0.090	8.21	0.21
91	13.390	0.149	2.19	101	-1.09	98	85	-0.080	8.12	0.24
92	13.535	0.145	2.17	101	-0.79	101	85	-0.080	7.94	0.21
93	13.685	0.150	2.19	101	-1.51	105	86	-0.090	8.00	0.22
94	13.831	0.146	2.18	101	-3.25	101	87	-0.060	7.97	0.19
95	13.980	0.149	2.18	102	-2.05	101	87	-0.080	7.88	0.19

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
96	14.125	0.145	2.17	102	-2.86	101	86	-0.080	7.66	0.18
97	14.274	0.149	2.18	102	-0.95	102	86	-0.060	7.78	0.14
98	14.420	0.146	2.17	102	-1.51	100	86	-0.070	7.51	0.19
99	14.569	0.149	2.17	102	-0.96	101	86	-0.070	7.58	0.16
100	14.715	0.146	2.17	102	-3.21	97	85	-0.090	7.53	0.19
101	14.863	0.148	2.15	102	-3.39	100	85	-0.070	7.72	0.18
102	15.010	0.147	2.15	102	-2.84	100	85	-0.080	7.59	0.21
103	15.158	0.148	2.16	103	-1.12	100	85	-0.080	7.73	0.20
104	15.305	0.147	2.16	103	-1.92	97	85	-0.080	7.88	0.19
105	15.452	0.147	2.16	103	-1.06	98	85	-0.080	7.72	0.15
106	15.599	0.147	2.17	103	-3.33	101	87	-0.080	7.78	0.17
107	15.746	0.147	2.15	103	-3.12	98	87	-0.080	7.69	0.18
108	15.893	0.147	2.15	103	-1.07	99	86	-0.090	7.70	0.16
109	16.040	0.147	2.16	103	-1.68	102	86	-0.070	7.29	0.18
110	16.187	0.147	2.16	103	-3.33	96	86	-0.090	7.39	0.16
111	16.335	0.148	2.15	104	-1.38	99	86	-0.080	7.46	0.17
112	16.481	0.146	2.14	104	-3.33	98	86	-0.080	7.38	0.13
113	16.628	0.147	2.12	104	-1.85	100	85	-0.080	7.29	0.14
114	16.776	0.148	2.19	104	-2.92	92	85	-0.090	7.40	0.14
115	16.924	0.148	2.18	104	-2.25	95	85	-0.080	7.54	0.09
116	17.072	0.148	2.17	104	-3.4	99	85	-0.080	7.58	0.10
117	17.220	0.148	2.15	104	-1.78	100	85	-0.070	7.44	0.08
118	17.368	0.148	2.17	104	-2.39	97	85	-0.080	7.27	0.12
119	17.515	0.147	2.17	104	-1.16	97	87	-0.080	7.08	0.05
120	17.664	0.149	2.16	104	-3.24	93	87	-0.080	6.82	0.06
121	17.810	0.146	2.17	104	-1.99	101	87	-0.070	6.51	0.07
122	17.958	0.148	2.17	105	-2.52	101	86	-0.090	6.24	0.11
123	18.105	0.147	2.18	105	-0.93	104	86	-0.070	6.28	0.11
124	18.254	0.149	2.17	105	-0.94	103	86	-0.070	6.17	0.11
125	18.400	0.146	2.18	105	-3.02	94	86	-0.070	6.17	0.11
126	18.550	0.150	2.16	105	-2.74	105	85	-0.090	6.09	0.11
127	18.695	0.145	2.17	105	-1.42	99	85	-0.070	6.18	0.08

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
128	18.845	0.150	2.16	105	-2.05	97	85	-0.080	6.22	0.08
129	18.991	0.146	2.17	105	-2.89	98	85	-0.070	6.07	0.11
130	19.141	0.150	2.16	105	-1.52	94	85	-0.080	6.03	0.10
131	19.287	0.146	2.17	105	-3.35	103	85	-0.060	5.96	0.09
132	19.437	0.150	2.17	105	-1.13	99	84	-0.070	6.03	0.10
133	19.583	0.146	2.16	105	-1.35	101	84	-0.060	6.04	0.13
134	19.733	0.150	2.17	106	-3.35	105	86	-0.070	6.24	0.10
135	19.879	0.146	2.16	106	-3.21	100	86	-0.070	6.24	0.12
136	20.029	0.150	2.17	106	-1.72	103	87	-0.080	6.34	0.13
137	20.174	0.145	2.17	106	-1.56	98	86	-0.070	6.39	0.13
138	20.325	0.151	2.14	106	-3.12	99	86	-0.080	6.37	0.13
139	20.471	0.146	2.17	106	-1.01	104	86	-0.070	6.52	0.10
140	20.620	0.149	2.15	106	-1.83	98	86	-0.070	6.39	0.13
141	20.766	0.146	2.16	106	-1.06	98	86	-0.080	6.41	0.12
142	20.915	0.149	2.17	106	-3.35	98	85	-0.070	6.38	0.11
143	21.061	0.146	2.16	106	-3.41	102	85	-0.080	6.33	0.14
144	21.210	0.149	2.15	107	-0.98	94	85	-0.070	6.50	0.12
145	21.357	0.147	2.18	106	-3.26	93	85	-0.070	6.49	0.13
Avg/Tot	21.357	0.147	2.19	95	-2.01	100	86	-0.074	8.07	0.27

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	73	73	72	73	72	72.6	N/A
1	73	73	72	76	72	73.2	N/A
2	73	76	72	85	72	75.6	N/A
3	74	81	73	101	72	80.2	N/A
4	76	89	73	125	72	87.0	N/A
5	80	100	75	152	72	95.8	N/A
6	86	115	77	180	73	106.2	N/A
7	93	133	80	206	73	117.0	N/A
8	102	149	86	237	74	129.6	N/A
9	113	164	93	264	76	142.0	N/A
10	124	179	102	299	78	156.4	N/A
11	135	195	113	335	80	171.6	N/A
12	145	209	125	361	84	184.8	N/A
13	154	222	138	381	88	196.6	N/A
14	166	234	151	396	93	208.0	N/A
15	178	246	163	410	98	219.0	N/A
16	192	258	175	422	104	230.2	N/A
17	206	270	187	435	111	241.8	N/A
18	219	282	198	445	119	252.6	N/A
19	232	294	213	449	127	263.0	N/A
20	246	306	230	450	136	273.6	N/A
21	258	317	247	448	145	283.0	N/A
22	271	329	266	451	153	294.0	N/A
23	282	341	288	436	160	301.4	N/A
24	293	351	308	420	168	308.0	N/A
25	301	358	323	413	176	314.2	N/A
26	309	360	335	412	182	319.6	N/A
27	314	361	344	407	189	323.0	N/A
28	319	360	350	402	196	325.4	N/A
29	322	357	355	397	201	326.4	N/A
30	324	354	358	391	207	326.8	N/A
31	326	351	359	385	211	326.4	N/A
32	327	347	359	379	215	325.4	N/A
33	327	343	359	376	219	324.8	N/A
34	328	339	358	376	222	324.6	N/A
35	328	336	357	388	225	326.8	N/A
36	327	336	355	401	228	329.4	N/A
37	327	337	353	412	231	332.0	N/A
38	328	341	352	421	233	335.0	N/A
39	329	346	351	429	234	337.8	N/A
40	331	352	351	437	237	341.6	N/A
41	333	358	353	445	239	345.6	N/A
42	336	365	355	450	240	349.2	N/A
43	339	371	359	459	242	354.0	N/A
44	342	376	364	469	245	359.2	N/A
45	346	382	369	479	248	364.8	N/A
46	350	386	374	489	249	369.6	N/A
47	356	390	380	498	252	375.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	361	394	386	507	255	380.6	N/A
49	366	397	392	515	258	385.6	N/A
50	372	400	398	523	260	390.6	N/A
51	378	404	404	530	263	395.8	N/A
52	385	408	409	536	265	400.6	N/A
53	391	412	415	540	268	405.2	N/A
54	397	416	420	546	271	410.0	N/A
55	404	419	426	551	275	415.0	N/A
56	410	422	431	555	278	419.2	N/A
57	417	427	436	559	281	424.0	N/A
58	423	430	441	564	284	428.4	N/A
59	429	434	446	568	287	432.8	N/A
60	435	438	450	571	290	436.8	N/A
61	441	442	455	576	295	441.8	N/A
62	447	447	459	579	298	446.0	N/A
63	453	451	464	583	302	450.6	N/A
64	458	454	468	585	305	454.0	N/A
65	464	457	472	589	309	458.2	N/A
66	469	462	477	592	312	462.4	N/A
67	476	466	481	596	317	467.2	N/A
68	480	469	485	599	320	470.6	N/A
69	484	474	489	605	325	475.4	N/A
70	489	478	493	608	329	479.4	N/A
71	495	481	497	610	333	483.2	N/A
72	499	486	501	612	337	487.0	N/A
73	504	490	504	616	341	491.0	N/A
74	509	494	509	617	345	494.8	N/A
75	512	499	513	619	348	498.2	N/A
76	517	504	516	619	350	501.2	N/A
77	521	509	519	619	352	504.0	N/A
78	525	515	522	619	354	507.0	N/A
79	528	520	526	618	354	509.2	N/A
80	532	524	528	618	355	511.4	N/A
81	534	527	531	616	355	512.6	N/A
82	536	530	532	614	355	513.4	N/A
83	539	531	534	611	357	514.4	N/A
84	541	533	536	607	357	514.8	N/A
85	542	535	538	604	359	515.6	N/A
86	543	537	539	602	360	516.2	N/A
87	544	537	541	600	362	516.8	N/A
88	545	539	543	599	363	517.8	N/A
89	546	540	544	598	365	518.6	N/A
90	545	544	545	598	367	519.8	N/A
91	546	546	547	597	369	521.0	N/A
92	546	550	549	597	371	522.6	N/A
93	547	553	550	597	373	524.0	N/A
94	548	556	551	596	375	525.2	N/A
95	548	559	553	596	377	526.6	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	548	562	554	595	379	527.6	N/A
97	548	565	556	595	380	528.8	N/A
98	548	567	557	595	382	529.8	N/A
99	548	570	559	595	385	531.4	N/A
100	548	573	560	594	387	532.4	N/A
101	548	576	560	593	390	533.4	N/A
102	548	579	561	593	392	534.6	N/A
103	547	581	563	593	395	535.8	N/A
104	546	583	563	593	397	536.4	N/A
105	546	586	565	593	400	538.0	N/A
106	545	588	566	594	403	539.2	N/A
107	544	590	567	593	406	540.0	N/A
108	544	592	568	592	409	541.0	N/A
109	543	594	568	591	413	541.8	N/A
110	542	595	569	590	416	542.4	N/A
111	541	597	571	588	419	543.2	N/A
112	541	598	572	587	422	544.0	N/A
113	541	599	572	585	426	544.6	N/A
114	540	601	574	584	430	545.8	N/A
115	540	602	575	583	433	546.6	N/A
116	539	602	576	582	436	547.0	N/A
117	539	605	577	581	440	548.4	N/A
118	538	607	578	580	443	549.2	N/A
119	537	606	579	579	447	549.6	N/A
120	536	607	580	576	453	550.4	N/A
121	536	607	582	574	458	551.4	N/A
122	535	605	583	571	462	551.2	N/A
123	535	605	583	569	465	551.4	N/A
124	534	604	584	567	469	551.6	N/A
125	533	602	585	565	471	551.2	N/A
126	532	601	586	563	472	550.8	N/A
127	531	599	586	562	474	550.4	N/A
128	529	597	586	560	476	549.6	N/A
129	528	595	587	558	477	549.0	N/A
130	527	594	586	557	480	548.8	N/A
131	526	590	587	556	482	548.2	N/A
132	525	588	586	554	485	547.6	N/A
133	524	586	587	552	488	547.4	N/A
134	522	584	587	551	491	547.0	N/A
135	520	583	585	551	494	546.6	N/A
136	520	582	585	549	497	546.6	N/A
137	519	580	585	549	500	546.6	N/A
138	518	578	585	548	503	546.4	N/A
139	517	577	584	548	507	546.6	N/A
140	515	575	583	547	510	546.0	N/A
141	515	574	583	546	513	546.2	N/A
142	514	573	582	546	517	546.4	N/A
143	512	572	582	545	519	546.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	512	573	581	544	522	546.4	N/A
145	511	572	582	543	525	546.6	N/A
Average	420	451	439	508	313	426	N/A

LAB SAMPLE DATA - ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 1

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
Train A Filters - First Hour	T223	89.3	89.3	91.9	2.6
Train A Filters - Remainder	T224	89.4	177.9	180.3	2.4
	T225	88.5			
Train A Probe	1A	115630.2	115630.2	115631.0	0.8
Train A O-Rings	1A	3562.8	3562.8	3563.3	0.5
Train B Filters	T226	88.3	266.2	271.4	5.2
	T227	88.3			
	T229	89.6			
Train B Probe	1B	115903.8	115903.8	115904.7	0.9
Train B O-Rings	1B	3551.3	3551.3	3551.9	0.6
Background Filter	T228	88.8	88.8	88.8	0.0

Placed in Dessicator on:	6/11/19 - 14:10

Train A Filters - First Hour	91.8	6/12 10:29	91.9	6/14 8:27				
Train A Filters - Remainder	180.3	6/12 10:29	180.3	6/14 8:27				
Train A Probe	115631.1	6/12 10:29	115631.0	6/14 8:27				
Train A O-Rings	3563.2	6/12 10:29	3563.3	6/14 8:28				
Train B Filters	271.5	6/12 10:29	271.4	6/14 8:28				
Train B Probe	115904.7	6/12 10:29	115904.7	6/14 8:28				
Train B O-Rings	3552.0	6/12 10:29	3551.9	6/14 8:28				
Background Filter	88.8	6/12 10:29	88.8	6/14 8:29				

1st hour Sub-Total, mg:	2.6
Remainder Sub-Total, mg:	3.7
Train 1 Aggregate, mg:	**6.3**
Train 2 Aggregate, mg:	**6.7**
Ambient Aggregate, mg:	0.0

ASTM E3053 Wood Heater Run Sheets

Client: Kozy Heat Fireplaces Job Number: 18-449 Tracking #: 0019
Model: Z42 Run Number: 1 Test Date: 6/11/2019

Wood Heater Run Notes

Pre-Test Notes
Pre-Test Start Time: N/A
Air Control Setting: N/A

Time	Notes
N/A	N/A – High fire test begins from cold start

Test Notes
Test Burn Start Time: 11:40
Air Control Setting: Full Open

Time	Notes
0 min	Loaded all 7.5 lbs of kindling and start-up fuel into stove, lit kindling with propane torch for 60 seconds then closed the door. Air set to high setting, fan on high.
23 min	@2.2 lbs leveled coal bed and loaded high fire test fuel.
60 min	Changed 1-hour filter
145 min	@ 4.4lbs, ended test (2.2 residual + 2.2 lbs of test fuel)

Test Burn End Time: 14:05

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO_2 (%): 17.00 CO (%): 4.310
Mid Gas CO_2 (%): 10.00 CO (%): 2.51

Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	11:04	11:07	11:06	6/12 – 8:05	6/12 – 8:07	6/12 – 8:09
CO_2	0.00	10.07	17.00	0.08	10.11	17.16
CO	0.000	2.483	4.310	-0.004	2.476	4.257

Flue Gas Probe Leak Check: Initial: No Leakage Final: No Leakage

Technician Signature:  Date: 6/12/2019

ASTM E3053 Wood Heater Run Sheets

Client: Kozy Heat Fireplaces Job Number: 18-449 Tracking #: 0019
Model: Z42 Run Number: 1 Test Date: 6/11/2019

Test Photos

Kindling Fuel Load

Start-up Fuel Load

High Fire Fuel Load

Residual Start-up Fuel Coal Bed

Technician Signature: Date: 6/12/2019

ASTM E3053 Wood Heater Run Sheets

Client: Kozy Heat Fireplaces Job Number: 18-449 Tracking #: 0019
Model: Z42 Run Number: 1 Test Date: 6/11/2019

High Fire Fuel Loaded

Residual High Fire Load Coal Bed

N/A

Low Fire Fuel Load

N/A

Low Fire Fuel Loaded

Technician Signature: _____ Date: 6/12/2019

WOOD STOVE TEST DATA PACKET
ASTM E3053/E2515

Run 2 Data Summary

Client:	Kozy Heat Fireplaces
Model:	Z42
Job #:	18-449
Tracking #:	0019
Test Date:	6/11/2019

2/22/2021

Techician Signature Date

TEST RESULTS - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

Burn Rate (kg/hr):	1.31

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft^3)	42.843	60.326	59.389	8.995
Average Gas Velocity in Dilution Tunnel (ft/sec)	14.93			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	9480.6			
Average Gas Meter Temperature (°F)	85.7	93.5	111.0	90.4
Total Sample Volume (dscf)	41.327	57.972	55.092	8.691
Average Tunnel Temperature (°F)	114.8			
Total Time of Test (min)	398			
Total Particulate Catch (mg)	0.1	5.6	5.1	2.5
Particulate Concentration, dry-standard (g/dscf)	0.0000024	0.0000966	0.0000926	0.0002876
Total PM Emissions (g)	0.15	5.92	5.67	2.70
Particulate Emission Rate (g/hr)	0.02	0.89	0.85	2.70
Emissions Factor (g/kg)	-	0.68	0.65	-
Difference from Average Total Particulate Emissions (g)	-	0.13	0.13	-
Difference from Average Emissions Factor (g/kg)	-	0.01	0.01	-

Final Average Results	
Total Particulate Emissions (g)	5.80
Particulate Emission Rate (g/hr)	0.87
Emissions Factor (g/kg)	0.67
HHV Efficiency (%)	67.7%
LHV Efficiency (%)	72.4%
CO Emissions (g/min)	1.17

Quality Checks	Requirement	Observed	Result
Dual Train Precision	Each train within 7.5% of average emissions (in grams), or emission factors within 0.5 g/kg	See Above	OK
Filter Temps	>80 °F, <90 °F	Min: 83 / Max: 89	OK
Face Velocity	< 30 ft/min	8.6	OK
Leakage Rate	Less than 4% of average sample rate	0.001 cfm	OK
Ambient Temp	55-90 °F	Min: 83 / Max: 90	OK
Negative Probe Weight Evaluation	<5% of Total Catch	Probe Catch Not Negative	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	OK

B415.1 Efficiency Results

Manufacturer: ozy Heat Fireplaces
Model: Z42
Date: 06/11/19
Run: 2
Control #: 18-449
Test Duration: 398
Output Category: Medium

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	67.7%	72.4%
Combustion Efficiency	96.4%	96.4%
Heat Transfer Efficiency	70.2%	75.1%

Output Rate (kJ/h)	17,592	16,688	**(Btu/h)**
Burn Rate (kg/h)	1.30	2.87	**(lb/h)**
Input (kJ/h)	25,984	24,649	**(Btu/h)**

Test Load Weight (dry kg)	8.64	19.03	**dry lb**
MC wet (%)	17.96		
MC dry (%)	21.90		
Particulate (g)	5.80		
CO (g)	467		
Test Duration (h)	6.63		

Emissions	Particulate	CO
g/MJ Output	0.05	4.00
g/kg Dry Fuel	0.67	54.07
g/h	0.87	70.39
g/min	0.01	1.17
lb/MM Btu Output	0.12	9.30

Air/Fuel Ratio (A/F)	14.87

VERSION: **2.2** **12/14/2009**

HIGH FIRE FUEL LOAD DATA - ASTM E3053

Client: Kozy Heat Fireplaces
Job #: 18-449
Model: Z42
Tracking #: 0019
Run #: 2
Technician: SJB
Date: 6/11/2019

Nominal Loading Density (lbs/ft^3, wet basis):	10		
Usable Firebox Volume (ft^3):	1.96		
Target Load Weight (lbs):	19.60		
Total Load Weight Range (lbs):	18.60	to	20.60
Core Load Weight Range (lbs):	8.80	to	12.70
Remainder Load Weight Range (lbs):	6.90	to	10.80
Core Load Piece Range (lbs):	2.90	to	4.90
Remainder Load Piece Range (lbs):	2.00	to	10.80
Max Allowable Kindling Weight (lbs):	4.02		
Max Allowable Start-up Fuel Weight (lbs):	6.03		

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	4.52	In Range	25.3	24.9	24.7	25.0	In Range	3.62	1.64
2	17.00	4.41	In Range	24.9	23.2	22.9	23.7	In Range	3.57	1.62
3	17.00	3.24	In Range	24.1	20.7	22.4	22.4	In Range	2.65	1.20
Core Load Wt. (lbs)		12.17	In Range							

REMAINDER LOAD DATA (1 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	7.93	In Range	25.4	23.7	19.6	22.9	In Range	6.45	2.93
2			NA				NA	NA	NA	NA
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		7.93	In Range							

Total Load Weight (lbs):	20.10	In Range	
Core Load % of Total Weight:	61%	In Range	45-65%
Remainder % of Total Weight:	39%	In Range	35-55%
Total Load % of Target Weight:	103%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	10.3		
Total Load Average Moisture Content (%DB):	23.4	In Range	19-25%
Total Load Average Moisture Content (%WB):	19.0		
Total Test Load Weight (dry basis):	16.28 lbs	7.39 kg	

KINDLING AND START-UP FUEL

		Kindling Moisture Readings (%DB)					Dry Weight	
Kindling Weight (lbs)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
3.00	In Range	10	10	10	10.0	In Range	2.73	1.24

		Start-up Moisture Readings (%DB)					Dry Weight	
Start-up Fuel Wt. (lb)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
4.50	In Range	19.7	22.4	20.6	20.9	In Range	3.72	1.69

TEST FUEL LOADING RANGE

Allowable Residual Start-up Fuel Range (lb):	2.0	to	4.0	
Actual Residual Start-up Fuel Weight (lb):	2.2			In Range

LOW & MEDIUM FIRE FUEL LOAD DATA - ASTM E3053

Client: Kozy Heat Fireplaces
Job #: 18-449
Model: Z42
Tracking #: 0019
Run #: 2
Technician: SJB
Date: 6/11/2019

Nominal Loading Density (lbs/ft^3, wet basis):	12		
Usable Firebox Volume (ft^3):	1.96		
Target Load Weight (lbs):	23.52		
Total Load Weight Range (lbs):	22.34	to	24.70
Core Load Weight Range (lbs):	10.58	to	15.29
Remainder Load Weight Range (lbs):	8.23	to	12.94
Core Load Piece Range (lbs):	3.53	to	5.88
Remainder Load Piece Range (lbs):	2.35	to	7.06

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	3.88	In Range	23.5	18.9	24.9	22.4	In Range	3.17	1.44
2	17.00	4.90	In Range	23.5	22.7	18.4	21.5	In Range	4.03	1.83
3	17.00	4.33	In Range	22.4	26.3	19.7	22.8	In Range	3.53	1.60
Core Load Wt. (lbs)		13.11	In Range							

REMAINDER LOAD DATA (2 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	6.86	In Range	23.8	21.6	19.7	21.7	In Range	5.64	2.56
2	17.00	3.34	In Range	23.5	20.1	19.6	21.1	In Range	2.76	1.25
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		10.20	In Range							

Remainder Load Small/Large Piece Weight Ratio:	49%	In Range	≤ 67%
Total Load Weight (lbs):	23.31	In Range	
Core Load % of Total Weight:	56%	In Range	45-65%
Remainder % of Total Weight:	44%	In Range	35-55%
Total Load % of Target Weight:	99%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	11.9		
Total Load Average Moisture Content (%DB):	21.9	In Range	19-25%
Total Load Average Moisture Content (%WB):	18.0		
Total Test Load Weight (dry basis):	19.12 lbs	8.67 kg	

TEST FUEL LOADING RANGE

Allowable Charcoal Bed Weight Range (lb):	2.4	to	4.6	
Actual Charcoal Bed Wt. (lb):	3.6	In Range		

TEST END POINT

Actual Fuel Load Ending Weight (lb): 0.0 Valid Test (≥90%)

Total Fuel Burned During Test Run:	23.3	lbs, wet basis
	19.1	lbs, dry basis
	8.67	kg, dry basis

DILUTION TUNNEL & MISC. DATA - ASTM E3053 / E2515

Client:	Kozy Heat Fireplaces	Job #:	18-449
Model:	Z42	Tracking #:	0019
Run #:	2	Technician:	SJB
Test Start Time:	14:18	Date:	6/11/2019
Test Type:	Medium Fire		

Recording Interval (min):	1
Total Sampling Time (min):	398

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	29.93	29.81	29.87
Relative Humidity (%)	25.0	36.4	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	

Meter Box γ Factor:	1.004	(A)	
Meter Box γ Factor:	1.000	(B)	
Meter Box γ Factor:	0.999	(Ambient)	
Ambient Sample Volume:	42.843	ft^3	

Induced Draft Check (in. H_2O):	0
Smoke Capture Check (%):	100%
Date Flue Pipe Last Cleaned:	6/10/2019

Sample Train Post-Test Leak Checks

(A)	0.001	cfm @	-14	in. Hg
(B)	0.000	cfm @	-13	in. Hg
(Ambient)	0.001	cfm @	-13	in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H_2O)	Temp (°F)
1	0.040	78
2	0.050	78
3	0.052	78
4	0.032	78
5	0.038	78
6	0.044	78
7	0.050	78
8	0.038	78
Center	0.054	78

Static Pressure: -0.170 in. H_2O

Dilution Tunnel H_2O:	2.00	percent
Tunnel Diameter:	6	inches
Pitot Tube Cp:	0.99	[unitless]
Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Tunnel Area:	0.1963	ft^2
V_{strav}:	14.02	ft/sec
V_{scent}:	15.55	ft/sec
F_p:	0.902	[ratio]
Initial Tunnel Flow:	156.5	scf/min

TEST FUEL PROPERTIES

ASTM 3053-17 - Table A1.1 Fuel Properties by Fuel Species

Select Fuel Type	Species	%C	%H	%O	%Ash	MJ/kg	BTU/lb
	Ash, White	49.70	6.90	43.00	0.30	20.75	8927
	Beech	48.70	5.80	44.70	0.60	18.80	8088
	Birch, Sweet	49.80	6.50	43.40	0.30	20.12	8656
	Birch, Yellow	49.80	6.50	43.40	0.30	20.12	8656
	Doug Fir (Coast, Interior West/North)	48.73	6.87	43.90	0.50	19.81	8522
	Doug Fir (Interioir South)	48.73	6.87	43.90	0.50	19.81	8522
	Elm, Rock	50.40	6.60	42.30	0.70	20.49	8815
	Elm, Soft	50.40	6.60	42.30	0.70	20.49	8815
	Gum, Red	50.88	6.06	41.57	1.28	19.72	8478
	Larch, Western	50.54	6.36	42.40	0.70	17.58	7558
X	Maple, Hard	50.64	6.02	41.74	1.35	19.96	8587
	Maple, Sugar	50.64	6.02	41.74	1.35	19.96	8587
	Oak, Red	49.50	6.62	43.70	0.20	20.20	8690
	Oak, White	50.40	6.59	42.70	0.20	20.50	8819
	Pine, Southern	52.60	7.00	40.10	1.31	22.30	9587
	Pine, Southern Long Leaf	52.60	7.02	40.10	1.30	22.30	9594
	Other						

WOODSTOVE PREBURN DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

Medium Fire performed as a continuation of High Fire Test, see Run 1 test data for details

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.054	0.02	89	-0.17		23.2		147	565	84	86
1	0.143	0.143	0.056	2.32	89	-2.14	99	23.3	0.1	152	492	83	86
2	0.301	0.158	0.053	2.34	90	0	114	23.1	-0.2	165	504	84	86
3	0.453	0.152	0.055	2.35	90	0	106	22.8	-0.3	155	551	84	86
4	0.608	0.155	0.061	2.21	89	-0.03	103	22.5	-0.3	153	614	83	86
5	0.755	0.147	0.053	2.21	89	-0.79	105	22.3	-0.2	155	659	83	86
6	0.906	0.151	0.061	2.22	90	-1.87	101	21.9	-0.4	158	697	83	86
7	1.053	0.147	0.052	2.20	90	-1.29	106	21.7	-0.2	159	713	83	85
8	1.203	0.150	0.058	2.20	89	-0.72	103	21.3	-0.4	161	727	83	86
9	1.352	0.149	0.054	2.19	89	-2.56	106	21.1	-0.2	162	736	83	86
10	1.499	0.147	0.055	2.18	90	-2.52	104	20.7	-0.4	162	743	84	86
11	1.648	0.149	0.054	2.15	89	-0.05	106	20.5	-0.2	163	751	83	87
12	1.794	0.146	0.060	2.12	89	-1.62	99	20.2	-0.3	164	757	84	86
13	1.943	0.149	0.059	2.24	89	0	102	20.0	-0.2	165	762	83	86
14	2.092	0.149	0.051	2.24	89	-1.65	109	19.7	-0.3	158	735	83	86
15	2.244	0.152	0.059	2.23	90	-2.44	102	19.5	-0.2	148	701	83	86
16	2.391	0.147	0.060	2.25	89	-0.28	98	19.4	-0.1	143	674	84	86
17	2.544	0.153	0.053	2.23	89	-2.27	108	19.2	-0.2	138	658	83	86
18	2.691	0.147	0.056	2.24	89	-2.38	101	19.1	-0.1	136	647	83	86
19	2.845	0.154	0.057	2.23	90	-2.33	104	18.9	-0.2	134	639	83	86
20	2.993	0.148	0.059	2.21	90	-1.19	98	18.8	-0.1	133	634	83	86
21	3.146	0.153	0.060	2.22	90	-0.87	101	18.7	-0.1	133	631	83	87
22	3.293	0.147	0.055	2.23	90	-0.08	101	18.5	-0.2	133	629	83	86
23	3.444	0.151	0.056	2.20	90	-0.25	103	18.4	-0.1	132	626	84	87
24	3.593	0.149	0.059	2.22	90	-1.35	99	18.2	-0.2	131	625	84	87
25	3.744	0.151	0.059	2.21	90	-1.37	100	18.1	-0.1	131	623	84	86
26	3.895	0.151	0.055	2.21	90	-0.11	104	17.9	-0.2	130	623	83	86
27	4.044	0.149	0.057	2.22	90	-0.97	100	17.8	-0.1	130	621	83	87
28	4.196	0.152	0.060	2.20	90	-2.5	100	17.5	-0.3	130	620	83	87
29	4.344	0.148	0.057	2.22	90	-2.8	100	17.5	0	130	618	84	87
30	4.495	0.151	0.059	2.21	90	-1.1	100	17.2	-0.3	130	616	85	87
31	4.643	0.148	0.050	2.23	91	-0.19	106	17.2	0	129	614	84	87
32	4.795	0.152	0.062	2.21	90	-0.21	98	17.0	-0.2	128	613	84	86

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	4.943	0.148	0.057	2.22	91	-0.24	99	16.7	-0.3	129	613	84	87
34	5.096	0.153	0.058	2.21	92	-1.15	102	16.7	0	127	612	84	86
35	5.244	0.148	0.056	2.20	91	-0.03	100	16.6	-0.1	127	612	84	87
36	5.396	0.152	0.056	2.21	91	-1.78	103	16.5	-0.1	127	612	84	87
37	5.543	0.147	0.054	2.20	92	-0.37	101	16.3	-0.2	126	611	84	87
38	5.695	0.152	0.058	2.17	91	-1.74	101	16.2	-0.1	127	611	84	87
39	5.843	0.148	0.053	2.21	91	-1.21	103	16.0	-0.2	127	609	84	86
40	5.994	0.151	0.061	2.21	91	-0.21	98	15.9	-0.1	126	610	84	86
41	6.145	0.151	0.059	2.23	91	-1.6	100	15.8	-0.1	127	610	84	87
42	6.294	0.149	0.063	2.21	92	-1.49	95	15.6	-0.2	127	610	84	88
43	6.446	0.152	0.055	2.21	91	-0.04	104	15.5	-0.1	127	610	84	87
44	6.593	0.147	0.055	2.23	92	-0.41	100	15.3	-0.2	126	609	84	87
45	6.746	0.153	0.064	2.21	92	-2.31	97	15.1	-0.2	126	612	84	87
46	6.892	0.146	0.057	2.20	91	-1.66	98	15.1	0	126	613	84	88
47	7.046	0.154	0.060	2.22	91	-2.86	101	14.9	-0.2	125	611	84	87
48	7.194	0.148	0.059	2.21	91	-2.67	98	14.8	-0.1	126	610	84	87
49	7.346	0.152	0.060	2.20	91	-0.41	99	14.6	-0.2	126	610	84	87
50	7.494	0.148	0.060	2.23	92	-2.71	97	14.5	-0.1	126	609	84	88
51	7.645	0.151	0.057	2.21	92	-2.38	101	14.4	-0.1	126	609	84	87
52	7.793	0.148	0.059	2.22	91	-2.73	98	14.2	-0.2	126	609	84	87
53	7.944	0.151	0.062	2.22	91	-0.76	97	14.0	-0.2	126	611	84	87
54	8.094	0.150	0.057	2.21	91	-1.12	100	14.0	0	125	612	84	87
55	8.244	0.150	0.058	2.20	91	-0.13	100	13.8	-0.2	126	613	84	87
56	8.395	0.151	0.063	2.19	92	-1.61	96	13.7	-0.1	126	616	84	88
57	8.544	0.149	0.062	2.22	91	-0.31	96	13.5	-0.2	125	619	85	87
58	8.696	0.152	0.062	2.22	92	-2.42	98	13.4	-0.1	126	622	84	88
59	8.843	0.147	0.055	2.22	92	-0.37	100	13.3	-0.1	126	624	84	88
60	8.995	0.152	0.055	2.21	92	-2.09	104	13.2	-0.1	127	628	84	88
61	9.149	0.154	0.060	2.57	92	0	100	13.2	0	126	629	85	87
62	9.309	0.160	0.054	2.35	92	-2.61	110	13.0	-0.2	126	633	88	87
63	9.463	0.154	0.053	2.32	92	-0.01	107	12.8	-0.2	126	638	88	87
64	9.617	0.154	0.059	2.35	92	-2.31	101	12.8	0	126	639	88	88
65	9.772	0.155	0.056	2.32	92	-2.67	105	12.6	-0.2	127	644	88	88

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	9.924	0.152	0.060	2.33	92	-0.31	99	12.5	-0.1	128	651	88	88
67	10.082	0.158	0.058	2.34	92	-2.65	105	12.3	-0.2	127	658	88	87
68	10.233	0.151	0.056	2.31	92	0	102	12.1	-0.2	127	657	88	87
69	10.388	0.155	0.062	2.34	92	0	100	12.0	-0.1	128	660	88	88
70	10.543	0.155	0.059	2.34	92	-2.46	102	11.8	-0.2	128	660	88	88
71	10.695	0.152	0.052	2.31	93	0	106	11.7	-0.1	128	658	88	88
72	10.851	0.156	0.060	2.34	92	-1.56	102	11.5	-0.2	128	656	88	87
73	11.002	0.151	0.058	2.36	93	-0.06	100	11.7	0.2	128	653	88	88
74	11.159	0.157	0.058	2.30	92	-1	104	11.5	-0.2	127	647	88	87
75	11.310	0.151	0.058	2.31	92	-0.09	100	11.4	-0.1	127	644	88	88
76	11.464	0.154	0.059	2.32	92	-0.19	101	11.2	-0.2	128	641	88	88
77	11.620	0.156	0.055	2.32	93	-2.68	106	11.0	-0.2	127	639	88	88
78	11.772	0.152	0.057	2.32	93	-2.62	102	10.9	-0.1	127	637	88	87
79	11.927	0.155	0.062	2.33	93	-0.38	99	10.8	-0.1	127	637	88	87
80	12.079	0.152	0.057	2.31	93	-0.32	102	10.7	-0.1	127	636	89	88
81	12.236	0.157	0.057	2.32	93	-2.46	105	10.5	-0.2	126	637	88	88
82	12.387	0.151	0.057	2.32	93	0	101	10.5	0	127	638	89	89
83	12.541	0.154	0.054	2.31	93	-1.04	106	10.3	-0.2	128	640	88	88
84	12.696	0.155	0.059	2.30	93	-2.6	102	10.2	-0.1	126	643	89	88
85	12.847	0.151	0.059	2.33	93	-2.69	99	10.0	-0.2	126	642	88	88
86	13.002	0.155	0.056	2.31	93	-2.62	104	9.9	-0.1	126	642	88	87
87	13.154	0.152	0.055	2.29	93	-0.19	103	9.8	-0.1	127	640	88	88
88	13.310	0.156	0.065	2.30	93	-1.38	98	9.7	-0.1	127	641	88	88
89	13.459	0.149	0.054	2.28	93	-1.39	102	9.4	-0.3	126	640	88	88
90	13.614	0.155	0.055	2.28	93	-2.46	105	9.4	0	126	637	88	88
91	13.768	0.154	0.051	2.29	93	-0.6	109	9.3	-0.1	127	632	88	88
92	13.920	0.152	0.058	2.28	94	-2.24	100	9.2	-0.1	125	624	88	88
93	14.074	0.154	0.060	2.31	94	-0.56	100	9.1	-0.1	126	621	88	88
94	14.224	0.150	0.056	2.27	93	-0.68	101	9.0	-0.1	126	617	88	88
95	14.381	0.157	0.054	2.29	93	-2.2	108	8.9	-0.1	126	615	88	89
96	14.531	0.150	0.056	2.30	93	-2.62	101	8.8	-0.1	125	612	89	90
97	14.685	0.154	0.056	2.29	94	0	103	8.6	-0.2	124	611	89	88
98	14.837	0.152	0.051	2.29	94	-2.18	107	8.6	0	125	609	88	88

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	14.990	0.153	0.052	2.29	94	-0.38	107	8.6	0	124	609	88	89
100	15.144	0.154	0.054	2.30	94	-1.75	105	8.3	-0.3	125	608	89	89
101	15.294	0.150	0.062	2.29	94	-2.68	96	8.3	0	125	610	89	88
102	15.449	0.155	0.057	2.27	93	-2.6	103	8.2	-0.1	124	609	89	88
103	15.600	0.151	0.057	2.27	94	-0.09	101	8.1	-0.1	125	608	88	88
104	15.755	0.155	0.058	2.27	95	-0.67	102	8.0	-0.1	124	607	88	88
105	15.905	0.150	0.061	2.28	94	-2.53	97	7.9	-0.1	124	604	89	88
106	16.058	0.153	0.064	2.24	94	-0.5	96	7.8	-0.1	125	604	88	89
107	16.212	0.154	0.056	2.24	94	-2.59	104	7.7	-0.1	125	603	88	88
108	16.363	0.151	0.056	2.26	94	0	101	7.5	-0.2	124	602	88	89
109	16.517	0.154	0.061	2.27	94	-0.68	99	7.5	0	123	597	88	88
110	16.667	0.150	0.058	2.25	94	-0.08	99	7.4	-0.1	123	596	88	88
111	16.823	0.156	0.060	2.25	95	-0.21	101	7.3	-0.1	123	595	88	89
112	16.973	0.150	0.053	2.27	94	-1.18	103	7.2	-0.1	123	592	88	88
113	17.126	0.153	0.060	2.24	94	-2	99	7.2	0	123	590	88	88
114	17.277	0.151	0.054	2.25	94	-2.64	103	7.0	-0.2	122	588	88	88
115	17.431	0.154	0.058	2.26	94	-0.67	101	7.0	0	122	580	89	89
116	17.585	0.154	0.059	2.25	94	-2.33	100	6.9	-0.1	121	572	89	89
117	17.734	0.149	0.059	2.28	94	-1.61	97	6.8	-0.1	121	567	89	89
118	17.889	0.155	0.061	2.28	94	-1.15	99	6.8	0	121	562	89	88
119	18.039	0.150	0.061	2.25	94	0	96	6.6	-0.2	119	557	89	89
120	18.195	0.156	0.053	2.28	94	-0.03	107	6.7	0.1	119	553	89	89
121	18.344	0.149	0.058	2.25	95	-2.61	98	6.6	-0.1	119	551	88	88
122	18.498	0.154	0.056	2.25	94	-2.66	103	6.6	0	120	548	89	89
123	18.651	0.153	0.059	2.23	93	-0.67	100	6.5	-0.1	120	543	88	88
124	18.803	0.152	0.057	2.26	95	-2.1	101	6.4	-0.1	119	540	89	89
125	18.957	0.154	0.056	2.25	94	-2.68	103	6.4	0	120	537	88	89
126	19.106	0.149	0.060	2.27	95	-1.11	96	6.3	-0.1	119	535	89	90
127	19.262	0.156	0.056	2.25	94	-2.68	104	6.2	-0.1	119	532	88	89
128	19.412	0.150	0.059	2.24	95	-0.04	97	6.2	0	118	529	89	90
129	19.567	0.155	0.058	2.26	94	-2.48	102	6.0	-0.2	118	527	88	89
130	19.717	0.150	0.057	2.27	95	-0.18	99	6.1	0.1	117	525	88	89
131	19.870	0.153	0.058	2.24	94	-2.48	100	5.9	-0.2	118	522	88	89

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
132	20.024	0.154	0.056	2.27	95	-2.19	103	6.0	0.1	118	520	89	90
133	20.175	0.151	0.063	2.25	96	-0.11	95	5.9	-0.1	118	518	88	88
134	20.329	0.154	0.056	2.25	94	0	103	5.8	-0.1	117	515	89	89
135	20.478	0.149	0.056	2.22	96	-2.38	99	5.8	0	118	514	88	89
136	20.634	0.156	0.054	2.23	96	-2.64	106	5.6	-0.2	117	512	88	88
137	20.784	0.150	0.060	2.24	96	-2.2	96	5.7	0.1	117	511	88	88
138	20.937	0.153	0.063	2.21	96	-0.06	96	5.5	-0.2	118	509	88	88
139	21.088	0.151	0.062	2.27	94	-0.11	96	5.6	0.1	117	506	88	88
140	21.241	0.153	0.061	2.23	95	0	98	5.5	-0.1	117	504	89	88
141	21.395	0.154	0.062	2.24	94	0	98	5.4	-0.1	118	502	89	88
142	21.545	0.150	0.051	2.25	95	-1.26	105	5.5	0.1	117	501	89	87
143	21.699	0.154	0.057	2.23	96	-0.07	102	5.4	-0.1	117	500	88	87
144	21.849	0.150	0.051	2.24	95	0	105	5.4	0	116	498	88	87
145	22.004	0.155	0.056	2.25	94	-0.44	103	5.3	-0.1	117	496	89	88
146	22.154	0.150	0.055	2.25	96	-2.7	101	5.2	-0.1	116	495	88	87
147	22.307	0.153	0.055	2.24	95	-2.59	103	5.2	0	117	494	88	87
148	22.457	0.150	0.058	2.23	96	-2.43	98	5.1	-0.1	116	493	88	86
149	22.611	0.154	0.062	2.25	95	-0.16	97	5.1	0	116	491	88	87
150	22.764	0.153	0.060	2.23	95	-2.73	98	5.0	-0.1	116	489	89	87
151	22.913	0.149	0.060	2.23	95	-0.03	96	5.0	0	117	488	89	87
152	23.067	0.154	0.057	2.21	96	-0.08	101	4.9	-0.1	116	487	88	87
153	23.217	0.150	0.048	2.24	96	-2.74	108	4.8	-0.1	115	487	88	87
154	23.372	0.155	0.054	2.23	95	-2.56	105	4.9	0.1	116	485	88	86
155	23.522	0.150	0.061	2.23	95	-2.02	96	4.8	-0.1	116	484	89	86
156	23.675	0.153	0.061	2.25	95	-0.04	98	4.7	-0.1	115	483	88	87
157	23.825	0.150	0.055	2.24	95	-1.67	101	4.7	0	116	483	88	87
158	23.978	0.153	0.059	2.24	95	-1.31	99	4.7	0	115	482	88	86
159	24.132	0.154	0.061	2.23	96	-0.04	98	4.6	-0.1	115	482	88	86
160	24.281	0.149	0.057	2.25	95	-2.23	98	4.6	0	115	483	88	86
161	24.435	0.154	0.053	2.24	95	-0.8	105	4.4	-0.2	116	483	88	86
162	24.584	0.149	0.053	2.22	95	-1.22	102	4.4	0	116	483	88	86
163	24.739	0.155	0.056	2.25	95	-1.29	103	4.4	0	115	479	88	86
164	24.889	0.150	0.056	2.24	95	-1.47	100	4.4	0	115	475	88	86

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
165	25.042	0.153	0.055	2.26	95	-2.68	103	4.3	-0.1	114	471	87	86
166	25.192	0.150	0.053	2.24	94	-1.27	103	4.3	0	115	467	89	86
167	25.346	0.154	0.059	2.25	95	-2.54	100	4.3	0	115	466	88	86
168	25.499	0.153	0.058	2.25	94	-0.55	100	4.4	0.1	114	461	88	86
169	25.649	0.150	0.055	2.26	95	-1.59	101	4.3	-0.1	114	458	88	87
170	25.803	0.154	0.059	2.25	95	-0.09	100	4.3	0	114	457	87	86
171	25.952	0.149	0.051	2.24	96	-2.73	103	4.2	-0.1	113	455	87	86
172	26.108	0.156	0.059	2.25	94	-0.52	101	4.2	0	113	452	88	86
173	26.258	0.150	0.059	2.24	95	-1.26	97	4.3	0.1	113	449	88	86
174	26.410	0.152	0.065	2.23	95	0	94	4.1	-0.2	114	447	87	85
175	26.561	0.151	0.058	2.24	95	-0.58	99	4.1	0	113	443	87	85
176	26.714	0.153	0.056	2.23	95	-0.65	102	4.1	0	113	441	87	86
177	26.868	0.154	0.053	2.25	95	-1.43	105	4.1	0	112	438	88	86
178	27.017	0.149	0.057	2.28	95	-1.99	98	4.1	0	112	435	87	85
179	27.171	0.154	0.058	2.25	96	0	100	4.1	0	113	434	87	85
180	27.321	0.150	0.054	2.25	95	-2.16	101	4.1	0	112	431	87	85
181	27.476	0.155	0.059	2.26	95	-2.71	100	4.0	-0.1	111	429	88	86
182	27.626	0.150	0.057	2.25	95	-2.04	99	4.0	0	111	427	87	86
183	27.779	0.153	0.057	2.23	95	-1.79	101	4.0	0	111	425	87	85
184	27.929	0.150	0.061	2.24	95	-0.23	95	3.9	-0.1	112	424	87	85
185	28.082	0.153	0.055	2.22	96	-2.34	102	4.0	0.1	111	421	87	86
186	28.236	0.154	0.058	2.22	95	-0.6	100	3.9	-0.1	112	420	87	85
187	28.385	0.149	0.055	2.24	95	-0.17	100	3.9	0	111	418	87	86
188	28.540	0.155	0.062	2.24	95	-0.4	98	3.9	0	111	416	87	85
189	28.689	0.149	0.056	2.25	94	-0.03	99	3.8	-0.1	110	415	87	85
190	28.844	0.155	0.058	2.23	94	-2.23	101	3.8	0	110	412	87	85
191	28.994	0.150	0.056	2.25	95	-2.43	99	3.8	0	110	411	87	85
192	29.147	0.153	0.063	2.22	95	-0.93	96	3.8	0	110	410	87	85
193	29.298	0.151	0.053	2.23	93	-2.62	103	3.8	0	110	408	86	85
194	29.451	0.153	0.058	2.23	95	-2.55	100	3.7	-0.1	110	407	87	85
195	29.604	0.153	0.062	2.24	95	-2.81	96	3.7	0	110	406	86	85
196	29.754	0.150	0.054	2.24	94	-2.68	101	3.6	-0.1	110	405	88	85
197	29.908	0.154	0.056	2.24	95	-0.85	102	3.7	0.1	109	404	86	85

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
198	30.058	0.150	0.053	2.23	94	-2.68	102	3.6	-0.1	110	402	87	85
199	30.213	0.155	0.055	2.23	96	-0.15	103	3.6	0	110	402	86	85
200	30.363	0.150	0.058	2.21	95	-0.75	98	3.6	0	109	400	86	86
201	30.516	0.153	0.060	2.22	95	-1.43	98	3.6	0	109	398	87	85
202	30.666	0.150	0.052	2.24	96	-2.7	103	3.6	0	109	396	87	85
203	30.819	0.153	0.059	2.25	95	-2.67	99	3.6	0	109	395	86	85
204	30.973	0.154	0.053	2.23	95	0	105	3.6	0	109	393	87	85
205	31.122	0.149	0.057	2.25	95	-0.35	98	3.5	-0.1	108	391	86	85
206	31.276	0.154	0.058	2.25	95	-0.41	100	3.5	0	108	391	87	85
207	31.426	0.150	0.056	2.26	95	0	99	3.6	0.1	109	390	86	85
208	31.581	0.155	0.061	2.24	95	-0.8	98	3.5	-0.1	108	388	86	85
209	31.731	0.150	0.057	2.26	95	0	98	3.5	0	109	387	86	85
210	31.884	0.153	0.056	2.25	94	-2.62	101	3.6	0.1	108	385	86	85
211	32.034	0.150	0.055	2.24	95	-1.09	100	3.4	-0.2	108	385	86	84
212	32.188	0.154	0.050	2.22	95	-2.49	108	3.4	0	108	383	87	86
213	32.341	0.153	0.053	2.23	94	-0.13	104	3.4	0	108	382	86	85
214	32.490	0.149	0.062	2.26	95	0	94	3.4	0	108	381	87	86
215	32.644	0.154	0.054	2.23	93	-2.49	104	3.3	-0.1	108	380	86	85
216	32.794	0.150	0.054	2.25	95	-2.69	101	3.3	0	107	379	86	85
217	32.949	0.155	0.060	2.23	94	-0.96	99	3.3	0	108	378	86	85
218	33.099	0.150	0.054	2.23	95	-2.52	101	3.3	0	108	377	86	85
219	33.252	0.153	0.057	2.23	96	-2.04	100	3.3	0	107	376	86	85
220	33.402	0.150	0.060	2.24	94	-2.69	96	3.3	0	107	374	86	85
221	33.555	0.153	0.060	2.24	94	-2.15	98	3.3	0	108	374	86	85
222	33.709	0.154	0.055	2.25	94	-2.69	103	3.2	-0.1	107	373	86	85
223	33.858	0.149	0.060	2.25	94	-0.04	95	3.2	0	108	373	85	85
224	34.012	0.154	0.056	2.26	95	-1.98	102	3.2	0	108	372	86	85
225	34.161	0.149	0.056	2.25	94	-2.23	99	3.2	0	107	371	86	85
226	34.317	0.156	0.057	2.25	95	-0.76	102	3.1	-0.1	107	370	87	84
227	34.467	0.150	0.054	2.27	96	-0.05	101	3.1	0	106	369	86	85
228	34.619	0.152	0.056	2.23	95	-0.08	100	3.1	0	107	368	86	85
229	34.769	0.150	0.057	2.24	95	-2.68	98	3.1	0	107	367	86	85
230	34.923	0.154	0.061	2.25	95	-0.97	97	3.1	0	107	367	86	85

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
231	35.076	0.153	0.057	2.23	95	-0.68	100	3.1	0	106	366	87	85
232	35.226	0.150	0.062	2.24	94	-2.79	94	3.1	0	107	365	86	85
233	35.379	0.153	0.060	2.25	95	-1.32	98	3.0	-0.1	107	364	86	85
234	35.528	0.149	0.060	2.25	95	-2.47	95	3.0	0	106	364	85	84
235	35.684	0.156	0.054	2.24	94	-0.38	105	3.0	0	106	363	86	85
236	35.834	0.150	0.061	2.25	95	-0.01	95	3.0	0	106	362	85	84
237	35.987	0.153	0.053	2.24	94	0	104	3.0	0	106	361	85	85
238	36.137	0.150	0.059	2.24	95	-0.2	96	2.9	-0.1	106	361	85	85
239	36.290	0.153	0.056	2.23	95	-0.09	101	2.9	0	106	361	86	85
240	36.444	0.154	0.055	2.22	94	-2.73	103	2.9	0	106	360	85	84
241	36.594	0.150	0.055	2.24	95	-0.52	100	2.8	-0.1	106	359	85	84
242	36.748	0.154	0.060	2.25	94	-0.31	98	2.9	0.1	107	358	86	85
243	36.896	0.148	0.055	2.21	94	-0.88	99	2.8	-0.1	106	358	85	85
244	37.052	0.156	0.059	2.23	95	-0.94	100	2.8	0	106	358	85	85
245	37.202	0.150	0.053	2.21	94	-2.02	102	2.8	0	106	358	85	85
246	37.355	0.153	0.060	2.22	95	-0.72	98	2.8	0	106	358	85	84
247	37.505	0.150	0.058	2.22	94	-2.7	97	2.8	0	105	357	85	85
248	37.658	0.153	0.061	2.21	94	-0.18	97	2.8	0	105	357	86	85
249	37.811	0.153	0.060	2.22	94	-0.33	98	2.8	0	106	356	85	85
250	37.961	0.150	0.054	2.22	94	-2.03	101	2.7	-0.1	106	357	85	84
251	38.114	0.153	0.056	2.22	94	-0.44	101	2.7	0	106	357	85	84
252	38.263	0.149	0.048	2.21	94	-1.52	106	2.7	0	105	356	85	84
253	38.419	0.156	0.062	2.21	94	-1.56	98	2.7	0	105	356	85	85
254	38.568	0.149	0.059	2.23	94	-2.57	96	2.6	-0.1	105	356	85	84
255	38.722	0.154	0.061	2.25	95	-0.54	97	2.6	0	105	356	85	84
256	38.872	0.150	0.050	2.23	95	-2.37	105	2.6	0	105	355	85	84
257	39.024	0.152	0.057	2.21	95	-2.76	99	2.6	0	106	355	86	85
258	39.177	0.153	0.053	2.21	95	-1.35	104	2.6	0	105	356	85	84
259	39.328	0.151	0.064	2.22	95	-2.83	93	2.5	-0.1	106	355	85	85
260	39.480	0.152	0.054	2.22	94	-2.41	102	2.5	0	105	355	85	84
261	39.630	0.150	0.058	2.21	96	-0.44	97	2.5	0	105	355	85	84
262	39.785	0.155	0.053	2.21	94	-2.77	105	2.5	0	106	355	85	85
263	39.934	0.149	0.061	2.18	95	-0.72	94	2.5	0	105	355	85	84

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
264	40.088	0.154	0.057	2.22	96	-0.45	100	2.4	-0.1	105	355	85	84
265	40.237	0.149	0.062	2.23	94	-0.23	94	2.4	0	105	356	85	84
266	40.389	0.152	0.058	2.24	94	-0.76	99	2.5	0.1	105	356	85	84
267	40.542	0.153	0.061	2.23	94	-2.03	97	2.4	-0.1	105	357	85	85
268	40.693	0.151	0.059	2.21	94	-1.67	97	2.4	0	105	357	85	84
269	40.846	0.153	0.063	2.20	94	-0.24	95	2.3	-0.1	104	358	85	84
270	40.995	0.149	0.053	2.22	94	-2.54	101	2.3	0	105	358	85	84
271	41.149	0.154	0.058	2.22	94	-0.46	100	2.2	-0.1	105	358	85	85
272	41.298	0.149	0.058	2.21	94	-1.93	97	2.3	0.1	105	358	85	84
273	41.453	0.155	0.058	2.22	94	0	101	2.3	0	105	358	85	84
274	41.602	0.149	0.052	2.23	94	-0.72	102	2.2	-0.1	105	357	85	85
275	41.755	0.153	0.059	2.22	94	-2.51	98	2.2	0	105	358	85	85
276	41.905	0.150	0.055	2.21	94	-2.74	100	2.1	-0.1	105	358	85	85
277	42.057	0.152	0.053	2.20	94	-2.51	103	2.2	0.1	105	358	85	85
278	42.210	0.153	0.053	2.21	94	-2.72	104	2.0	-0.2	105	358	85	84
279	42.360	0.150	0.059	2.25	94	-1.24	97	2.2	0.2	105	358	85	85
280	42.513	0.153	0.052	2.24	94	-1.01	105	2.1	-0.1	105	358	85	84
281	42.661	0.148	0.053	2.23	94	-2.53	100	2.1	0	105	358	85	85
282	42.816	0.155	0.053	2.22	94	-0.97	105	2.1	0	105	358	85	85
283	42.965	0.149	0.059	2.24	94	-0.25	96	2.1	0	105	358	85	84
284	43.119	0.154	0.060	2.22	94	-1.47	98	2.1	0	105	358	85	84
285	43.268	0.149	0.052	2.25	94	-0.1	102	2.0	-0.1	105	358	85	84
286	43.420	0.152	0.063	2.21	94	-0.81	95	2.0	0	105	358	85	84
287	43.572	0.152	0.050	2.22	94	-2.29	106	2.0	0	105	357	85	84
288	43.723	0.151	0.059	2.20	94	-2.64	97	2.0	0	105	357	85	85
289	43.876	0.153	0.059	2.23	94	0	98	1.9	-0.1	105	358	85	84
290	44.024	0.148	0.056	2.20	94	-0.03	98	1.9	0	104	357	85	84
291	44.178	0.154	0.056	2.21	94	-2.59	102	1.9	0	105	357	85	85
292	44.327	0.149	0.056	2.22	94	-2.75	98	1.9	0	105	357	85	85
293	44.481	0.154	0.054	2.20	94	-1.5	104	1.9	0	105	357	85	85
294	44.631	0.150	0.058	2.23	94	-0.01	97	1.8	-0.1	105	357	85	85
295	44.783	0.152	0.058	2.22	93	-1.88	99	1.9	0.1	105	357	85	84
296	44.933	0.150	0.060	2.24	94	-0.87	96	1.8	-0.1	105	357	85	85

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
297	45.085	0.152	0.060	2.22	94	-2.49	97	1.8	0	105	356	85	84
298	45.237	0.152	0.059	2.20	94	-0.71	98	1.8	0	105	356	85	84
299	45.387	0.150	0.059	2.21	94	0	97	1.7	-0.1	105	356	85	84
300	45.539	0.152	0.060	2.23	94	0	97	1.6	-0.1	105	356	85	84
301	45.688	0.149	0.051	2.20	94	-0.74	103	1.7	0.1	105	357	85	84
302	45.842	0.154	0.057	2.22	94	-2.5	101	1.7	0	105	356	85	84
303	45.991	0.149	0.059	2.19	94	0	96	1.7	0	105	357	85	84
304	46.145	0.154	0.060	2.20	94	-2.72	98	1.7	0	104	357	85	84
305	46.294	0.149	0.056	2.21	94	0	98	1.5	-0.2	105	356	85	84
306	46.447	0.153	0.060	2.23	94	0	98	1.7	0.2	105	356	85	84
307	46.597	0.150	0.055	2.21	94	-2.58	100	1.6	-0.1	104	356	84	84
308	46.749	0.152	0.053	2.21	94	-2.63	103	1.6	0	105	356	84	84
309	46.902	0.153	0.053	2.21	94	-2.64	104	1.6	0	105	356	84	84
310	47.051	0.149	0.061	2.23	94	-0.69	94	1.4	-0.2	105	357	84	84
311	47.205	0.154	0.059	2.23	94	-0.23	99	1.5	0.1	104	358	84	84
312	47.353	0.148	0.059	2.21	94	0	95	1.5	0	104	358	85	85
313	47.508	0.155	0.057	2.23	93	-1.66	102	1.5	0	104	358	84	84
314	47.658	0.150	0.057	2.21	94	-2.61	98	1.4	-0.1	105	357	84	84
315	47.810	0.152	0.056	2.23	94	-0.41	100	1.4	0	104	357	84	85
316	47.960	0.150	0.051	2.26	94	-2.47	104	1.3	-0.1	105	357	84	84
317	48.112	0.152	0.058	2.23	94	-2.72	99	1.4	0.1	105	356	84	84
318	48.264	0.152	0.055	2.23	94	-0.32	101	1.4	0	104	356	85	84
319	48.415	0.151	0.061	2.22	94	-2.3	96	1.4	0	105	356	85	84
320	48.568	0.153	0.051	2.24	94	0	106	1.4	0	104	356	84	84
321	48.716	0.148	0.051	2.26	94	-0.2	102	1.3	-0.1	104	356	84	84
322	48.870	0.154	0.051	2.23	94	-2.62	107	1.3	0	105	355	84	84
323	49.019	0.149	0.051	2.24	93	-0.65	103	1.3	0	104	355	85	85
324	49.173	0.154	0.058	2.23	94	-2.45	100	1.3	0	104	355	84	85
325	49.322	0.149	0.056	2.23	94	-2.72	98	1.3	0	105	356	84	84
326	49.475	0.153	0.053	2.22	94	-0.36	104	1.2	-0.1	104	355	85	85
327	49.624	0.149	0.057	2.25	94	-0.06	97	1.2	0	104	356	84	84
328	49.777	0.153	0.054	2.23	93	-0.64	103	1.2	0	104	357	84	84
329	49.929	0.152	0.051	2.22	94	-2.64	105	1.2	0	105	355	84	84

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
330	50.079	0.150	0.061	2.23	93	-1.65	95	1.2	0	105	356	84	84
331	50.231	0.152	0.059	2.23	93	-2.32	98	1.2	0	104	356	84	84
332	50.380	0.149	0.049	2.23	94	-2.68	105	1.0	-0.2	104	355	84	84
333	50.535	0.155	0.063	2.22	93	0	97	1.1	0.1	104	355	84	84
334	50.683	0.148	0.061	2.22	93	-0.13	94	1.1	0	105	355	83	84
335	50.837	0.154	0.058	2.21	92	-2.62	100	1.1	0	104	354	85	84
336	50.985	0.148	0.056	2.24	95	-0.37	97	1.2	0.1	104	354	84	84
337	51.138	0.153	0.057	2.22	95	-0.39	100	1.2	0	104	355	84	84
338	51.288	0.150	0.054	2.22	94	-2.63	101	1.0	-0.2	104	354	84	84
339	51.440	0.152	0.060	2.20	93	-2.06	97	1.0	0	104	354	84	84
340	51.592	0.152	0.059	2.21	94	-0.08	98	1.0	0	104	354	84	84
341	51.741	0.149	0.061	2.23	94	-1.2	94	0.9	-0.1	104	354	84	84
342	51.893	0.152	0.056	2.21	94	-2.35	100	1.0	0.1	104	354	84	84
343	52.041	0.148	0.058	2.21	94	-0.2	96	0.9	-0.1	104	354	84	84
344	52.196	0.155	0.061	2.24	94	-2.62	98	0.9	0	104	354	84	84
345	52.345	0.149	0.062	2.21	94	-2.58	93	0.9	0	104	354	84	84
346	52.498	0.153	0.062	2.22	93	-1.86	96	0.9	0	104	353	84	84
347	52.646	0.148	0.063	2.22	94	-1.12	92	0.9	0	104	353	84	84
348	52.799	0.153	0.054	2.21	93	-2.8	103	0.8	-0.1	104	353	84	84
349	52.948	0.149	0.054	2.21	94	-0.84	100	0.8	0	104	353	84	84
350	53.100	0.152	0.061	2.21	94	-0.85	96	0.7	-0.1	104	352	83	84
351	53.252	0.152	0.052	2.20	94	-2.62	104	0.8	0.1	104	353	84	84
352	53.402	0.150	0.054	2.21	94	-0.04	101	0.8	0	104	353	84	84
353	53.553	0.151	0.056	2.22	94	-2.34	100	0.8	0	104	352	83	83
354	53.702	0.149	0.055	2.20	93	-2.42	99	0.7	-0.1	104	352	84	84
355	53.855	0.153	0.053	2.20	94	-2.91	104	0.7	0	104	352	84	84
356	54.004	0.149	0.059	2.21	93	-2.73	96	0.7	0	104	352	84	84
357	54.157	0.153	0.053	2.21	93	-1.81	104	0.7	0	104	351	84	84
358	54.306	0.149	0.054	2.23	93	-2.52	100	0.7	0	104	351	84	84
359	54.457	0.151	0.055	2.21	93	-1.33	101	0.7	0	103	351	84	84
360	54.607	0.150	0.059	2.22	93	-1.23	97	0.6	-0.1	104	351	84	83
361	54.759	0.152	0.062	2.20	93	-1.29	96	0.6	0	104	350	84	84
362	54.911	0.152	0.055	2.22	93	-1.2	101	0.5	-0.1	104	350	84	84

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
363	55.060	0.149	0.061	2.23	93	-1.92	94	0.6	0.1	104	349	84	84
364	55.213	0.153	0.062	2.22	93	-2.18	96	0.6	0	104	350	83	83
365	55.360	0.147	0.062	2.20	93	-0.19	92	0.5	-0.1	104	348	84	84
366	55.513	0.153	0.060	2.20	94	-2.79	97	0.5	0	103	349	84	84
367	55.662	0.149	0.060	2.22	93	-2.29	95	0.5	0	104	348	84	84
368	55.816	0.154	0.054	2.22	94	-2.29	103	0.5	0	104	349	84	84
369	55.964	0.148	0.054	2.23	93	-0.15	100	0.5	0	104	349	83	84
370	56.116	0.152	0.057	2.17	93	-1.1	100	0.5	0	103	348	84	84
371	56.264	0.148	0.057	2.20	93	-2.64	97	0.5	0	104	348	84	84
372	56.416	0.152	0.060	2.21	93	-0.04	97	0.4	-0.1	103	347	84	84
373	56.566	0.150	0.056	2.20	93	-2.35	99	0.4	0	103	347	84	84
374	56.717	0.151	0.058	2.21	93	-2.48	98	0.4	0	103	347	84	84
375	56.869	0.152	0.056	2.18	93	-1.39	100	0.4	0	103	347	84	84
376	57.018	0.149	0.053	2.21	93	-1.9	101	0.3	-0.1	104	346	83	84
377	57.169	0.151	0.058	2.20	93	-0.1	98	0.4	0.1	104	345	83	84
378	57.317	0.148	0.058	2.19	94	0	96	0.4	0	103	346	83	84
379	57.470	0.153	0.062	2.20	93	-0.72	96	0.3	-0.1	103	346	83	84
380	57.619	0.149	0.062	2.18	94	-1.12	93	0.3	0	103	344	83	84
381	57.772	0.153	0.059	2.19	93	-0.22	98	0.3	0	103	344	84	83
382	57.921	0.149	0.057	2.19	94	-2.64	97	0.3	0	104	343	84	84
383	58.072	0.151	0.059	2.21	94	-0.1	97	0.3	0	103	342	83	84
384	58.221	0.149	0.056	2.22	93	-0.56	98	0.3	0	103	342	84	84
385	58.371	0.150	0.054	2.18	93	-2.55	101	0.2	-0.1	103	342	83	84
386	58.522	0.151	0.059	2.18	94	-2.39	97	0.2	0	103	341	83	84
387	58.672	0.150	0.059	2.19	94	-2.43	96	0.2	0	103	341	83	84
388	58.824	0.152	0.058	2.21	93	0	99	0.3	0.1	103	340	84	84
389	58.973	0.149	0.062	2.18	94	-2.23	93	0.2	-0.1	103	341	84	83
390	59.124	0.151	0.058	2.21	93	-2.54	98	0.1	-0.1	103	340	83	84
391	59.272	0.148	0.060	2.20	94	-2.63	94	0.1	0	103	339	83	83
392	59.425	0.153	0.058	2.21	94	-0.1	99	0.1	0	103	338	83	84
393	59.573	0.148	0.058	2.20	93	-2.43	96	0.1	0	103	338	83	84
394	59.727	0.154	0.063	2.19	93	-0.25	96	0.1	0	103	337	83	83
395	59.875	0.148	0.061	2.21	93	-1.14	94	0.1	0	103	337	83	83

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
396	60.027	0.152	0.060	2.20	93	-2.75	97	0.1	0	103	337	83	83
397	60.175	0.148	0.058	2.21	93	-1.04	96	0.1	0	102	336	83	83
398	60.326	0.151	0.060	2.20	93	-1.77	96	0.0	-0.1	103	336	83	83
Avg/Tot	60.326	0.152	0.057	2.23	94	-1.36	100			115	462	86	85.7

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
0	0.000		0.00	105	-1		86	0.000	5.31	0.18
1	0.142	0.142	2.12	105	-0.6	100	87	-0.070	1.87	0.23
2	0.292	0.150	2.34	105	-1.51	110	87	-0.070	2.82	0.72
3	0.446	0.154	2.32	105	-1.91	110	86	-0.070	6.33	0.66
4	0.598	0.152	2.32	105	-2.71	103	86	-0.080	9.54	0.50
5	0.750	0.152	2.25	105	-0.54	111	86	-0.080	11.47	0.53
6	0.897	0.147	2.24	105	-2.95	100	85	-0.080	12.96	0.56
7	1.050	0.153	2.24	105	-1.02	113	85	-0.090	13.26	0.48
8	1.196	0.146	2.24	105	-3.15	102	85	-0.090	12.72	0.48
9	1.347	0.151	2.22	104	-2.76	110	86	-0.080	12.84	0.45
10	1.495	0.148	2.22	104	-0.87	107	88	-0.070	12.69	0.43
11	1.645	0.150	2.21	105	-0.74	109	87	-0.080	12.30	0.57
12	1.792	0.147	2.20	105	-2.17	101	86	-0.090	12.31	0.62
13	1.942	0.150	2.21	104	-0.77	104	87	-0.090	12.29	0.55
14	2.090	0.148	2.20	104	-2.05	110	87	-0.080	12.34	0.49
15	2.239	0.149	2.20	105	-2.83	102	86	-0.090	13.88	0.19
16	2.387	0.148	2.18	105	-2.29	100	86	-0.070	10.66	0.57
17	2.536	0.149	2.19	105	-2.3	107	86	-0.070	9.83	0.49
18	2.685	0.149	2.19	105	-0.64	104	85	-0.080	9.55	0.48
19	2.832	0.147	2.19	105	-2.99	101	85	-0.080	9.68	0.47
20	2.982	0.150	2.19	105	-3.08	102	86	-0.090	9.78	0.49
21	3.128	0.146	2.19	105	-3	98	87	-0.080	9.86	0.52
22	3.279	0.151	2.19	105	-0.73	106	87	-0.090	10.13	0.49
23	3.425	0.146	2.18	105	-2.72	101	87	-0.090	10.38	0.45
24	3.575	0.150	2.19	105	-1.14	101	87	-0.060	10.47	0.46
25	3.721	0.146	2.16	106	-3.07	99	87	-0.070	10.63	0.43
26	3.873	0.152	2.18	106	-2.83	106	86	-0.080	10.74	0.44
27	4.019	0.146	2.19	106	-1.17	100	85	-0.080	10.62	0.43
28	4.170	0.151	2.18	106	-2.49	101	86	-0.080	10.73	0.40
29	4.316	0.146	2.18	106	-0.59	100	85	-0.080	10.85	0.36
30	4.467	0.151	2.17	106	-0.64	102	85	-0.080	10.76	0.31
31	4.613	0.146	2.17	106	-0.68	107	85	-0.080	10.80	0.31

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
32	4.764	0.151	2.18	106	-1.26	99	85	-0.070	10.87	0.31
33	4.910	0.146	2.17	107	-2.39	100	86	-0.060	10.92	0.28
34	5.059	0.149	2.20	107	-0.78	101	87	-0.080	11.01	0.26
35	5.206	0.147	2.17	106	-0.9	102	87	-0.070	11.15	0.24
36	5.356	0.150	2.19	106	-2.12	104	87	-0.070	11.16	0.22
37	5.503	0.147	2.17	107	-2.81	103	87	-0.070	10.99	0.29
38	5.652	0.149	2.17	106	-0.46	101	86	-0.070	11.17	0.21
39	5.799	0.147	2.18	107	-3.03	104	86	-0.080	10.99	0.25
40	5.949	0.150	2.18	107	-0.66	99	86	-0.070	11.08	0.22
41	6.097	0.148	2.17	107	-1	99	86	-0.060	10.92	0.26
42	6.246	0.149	2.20	107	-1.34	97	85	-0.080	11.02	0.23
43	6.395	0.149	2.18	108	-2.14	103	85	-0.080	11.25	0.13
44	6.543	0.148	2.17	107	-0.99	103	85	-0.080	11.48	0.14
45	6.692	0.149	2.16	107	-1.46	96	85	-0.070	11.43	0.17
46	6.840	0.148	2.18	108	-1.05	101	86	-0.070	11.28	0.16
47	6.989	0.149	2.19	108	-3.17	99	87	-0.070	11.09	0.15
48	7.135	0.146	2.18	108	-0.53	98	87	-0.070	11.12	0.19
49	7.285	0.150	2.17	108	-2.23	100	87	-0.080	11.03	0.18
50	7.432	0.147	2.17	108	-1.86	98	87	-0.080	11.00	0.19
51	7.582	0.150	2.16	108	-2.21	102	87	-0.080	11.22	0.18
52	7.728	0.146	2.17	108	-2.16	98	86	-0.070	11.34	0.17
53	7.879	0.151	2.16	108	-1.31	99	85	-0.060	11.35	0.17
54	8.026	0.147	2.18	108	-2.58	100	85	-0.070	11.56	0.20
55	8.176	0.150	2.17	108	-0.96	101	85	-0.090	12.08	0.14
56	8.323	0.147	2.18	109	-0.59	95	85	-0.080	12.03	0.15
57	8.474	0.151	2.16	108	-2.29	99	85	-0.080	12.29	0.12
58	8.620	0.146	2.17	109	-2.95	95	86	-0.070	12.14	0.16
59	8.771	0.151	2.18	109	-3.07	105	87	-0.100	11.86	0.28
60	8.917	0.146	2.19	109	-0.64	101	87	-0.070	12.00	0.30
61	9.067	0.150	2.18	109	-1	99	87	-0.080	12.29	0.25
62	9.213	0.146	2.17	109	-0.71	102	87	-0.090	12.66	0.24
63	9.364	0.151	2.17	109	-2.86	107	87	-0.080	12.58	0.24

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
64	9.510	0.146	2.15	109	-3.06	98	86	-0.080	12.81	0.22
65	9.660	0.150	2.16	109	-3.11	103	86	-0.080	13.01	0.25
66	9.807	0.147	2.15	109	-0.51	98	85	-0.080	13.10	0.32
67	9.957	0.150	2.17	109	-0.85	101	86	-0.080	13.57	0.35
68	10.105	0.148	2.16	109	-2.96	102	85	-0.090	13.62	0.28
69	10.254	0.149	2.15	110	-0.88	97	85	-0.070	13.68	0.24
70	10.402	0.148	2.15	109	-2.45	99	86	-0.090	13.06	0.30
71	10.552	0.150	2.22	110	-1.39	107	86	-0.090	12.88	0.31
72	10.703	0.151	2.24	110	-3.03	100	86	-0.070	12.44	0.26
73	10.852	0.149	2.24	110	-2.65	100	87	-0.090	12.33	0.11
74	11.004	0.152	2.23	110	-2.32	102	86	-0.080	11.83	0.17
75	11.154	0.150	2.25	110	-3.13	101	86	-0.080	11.82	0.14
76	11.307	0.153	2.24	110	-0.77	102	86	-0.080	11.87	0.15
77	11.456	0.149	2.22	110	-2.73	103	86	-0.080	11.98	0.23
78	11.608	0.152	2.24	110	-3.1	103	85	-0.060	12.03	0.27
79	11.757	0.149	2.24	110	-2.29	97	85	-0.080	12.36	0.27
80	11.908	0.151	2.23	110	-1.98	103	85	-0.090	12.19	0.33
81	12.059	0.151	2.23	111	-2.72	102	85	-0.060	12.41	0.26
82	12.211	0.152	2.24	110	-0.69	103	85	-0.060	12.56	0.28
83	12.362	0.151	2.24	110	-1.6	106	86	-0.080	12.86	0.29
84	12.511	0.149	2.23	110	-2.62	99	87	-0.070	13.07	0.25
85	12.663	0.152	2.23	110	-2.21	101	87	-0.080	12.95	0.26
86	12.812	0.149	2.21	111	-2.94	102	87	-0.070	12.72	0.25
87	12.965	0.153	2.22	110	-0.7	106	87	-0.070	12.51	0.27
88	13.113	0.148	2.21	110	-2.39	94	86	-0.080	12.60	0.28
89	13.267	0.154	2.21	110	-0.98	107	87	-0.090	12.65	0.26
90	13.414	0.147	2.22	111	-2.6	101	86	-0.060	12.44	0.20
91	13.566	0.152	2.23	111	-0.69	109	86	-0.070	11.96	0.23
92	13.714	0.148	2.21	111	-2.63	99	86	-0.070	11.32	0.35
93	13.866	0.152	2.23	111	-2.14	100	85	-0.070	11.13	0.30
94	14.016	0.150	2.21	110	-3.07	103	85	-0.090	11.17	0.31
95	14.166	0.150	2.21	111	-0.74	104	85	-0.060	11.07	0.32

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
96	14.318	0.152	2.21	111	-0.7	104	85	-0.070	11.26	0.33
97	14.466	0.148	2.21	111	-2.99	101	86	-0.060	11.26	0.33
98	14.618	0.152	2.22	111	-0.99	109	86	-0.070	11.41	0.28
99	14.766	0.148	2.22	111	-1.3	105	87	-0.090	11.44	0.29
100	14.919	0.153	2.21	112	-1.11	106	87	-0.080	11.74	0.31
101	15.067	0.148	2.21	111	-1.25	96	87	-0.090	11.81	0.37
102	15.219	0.152	2.21	111	-0.72	103	87	-0.080	12.01	0.31
103	15.367	0.148	2.21	111	-2.52	100	87	-0.070	11.88	0.38
104	15.519	0.152	2.21	111	-0.95	102	86	-0.070	11.50	0.34
105	15.667	0.148	2.21	111	-2.76	97	85	-0.080	11.19	0.30
106	15.818	0.151	2.18	111	-1.15	97	86	-0.070	11.19	0.21
107	15.967	0.149	2.20	112	-1.73	102	85	-0.080	11.06	0.22
108	16.118	0.151	2.20	112	-3.13	103	85	-0.080	10.76	0.24
109	16.268	0.150	2.21	111	-0.73	98	85	-0.080	10.95	0.20
110	16.418	0.150	2.21	112	-0.82	100	85	-0.070	10.68	0.26
111	16.568	0.150	2.20	111	-2.67	99	86	-0.080	10.72	0.21
112	16.717	0.149	2.18	111	-3.03	104	87	-0.060	10.47	0.28
113	16.868	0.151	2.20	111	-0.76	100	87	-0.060	10.57	0.26
114	17.016	0.148	2.20	112	-0.72	103	87	-0.080	10.56	0.23
115	17.168	0.152	2.19	111	-1.22	102	87	-0.060	9.76	0.21
116	17.316	0.148	2.20	111	-3.11	98	87	-0.070	8.72	0.26
117	17.468	0.152	2.20	111	-2.04	101	87	-0.070	8.59	0.27
118	17.616	0.148	2.19	112	-2.84	96	87	-0.040	8.55	0.24
119	17.767	0.151	2.20	111	-2.03	98	86	-0.080	8.56	0.24
120	17.915	0.148	2.21	111	-3.01	103	85	-0.080	8.30	0.26
121	18.066	0.151	2.19	112	-0.85	101	86	-0.090	8.45	0.23
122	18.216	0.150	2.20	112	-0.86	102	86	-0.070	8.32	0.25
123	18.367	0.151	2.19	112	-1.68	100	85	-0.060	8.19	0.29
124	18.516	0.149	2.20	112	-1.81	100	86	-0.070	8.15	0.29
125	18.666	0.150	2.21	112	-1.77	102	87	-0.060	8.17	0.25
126	18.816	0.150	2.19	112	-2.74	98	87	-0.080	8.00	0.28
127	18.964	0.148	2.19	112	-0.77	100	87	-0.050	8.02	0.23

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
128	19.116	0.152	2.21	112	-1.87	100	87	-0.070	8.01	0.25
129	19.264	0.148	2.20	112	-1.49	99	86	-0.080	8.05	0.21
130	19.417	0.153	2.19	112	-1.45	103	86	-0.070	8.12	0.23
131	19.564	0.147	2.19	112	-0.89	98	86	-0.070	8.08	0.24
132	19.716	0.152	2.19	112	-0.84	103	85	-0.060	8.07	0.24
133	19.864	0.148	2.19	112	-0.96	95	84	-0.060	8.01	0.28
134	20.015	0.151	2.20	112	-0.73	102	84	-0.060	7.94	0.26
135	20.163	0.148	2.20	112	-0.88	100	85	-0.070	7.84	0.26
136	20.314	0.151	2.19	113	-0.72	104	85	-0.070	7.74	0.28
137	20.462	0.148	2.19	112	-1.99	97	86	-0.070	7.86	0.30
138	20.614	0.152	2.18	113	-2.6	97	86	-0.080	7.81	0.27
139	20.763	0.149	2.21	112	-3.31	96	87	-0.070	7.83	0.30
140	20.913	0.150	2.18	112	-0.77	97	86	-0.050	7.88	0.25
141	21.064	0.151	2.18	112	-1.19	97	86	-0.070	7.81	0.31
142	21.211	0.147	2.19	112	-2.4	104	86	-0.070	7.82	0.29
143	21.363	0.152	2.19	113	-0.79	102	86	-0.090	7.83	0.31
144	21.510	0.147	2.19	112	-3.18	104	86	-0.070	7.84	0.30
145	21.662	0.152	2.18	113	-3.09	103	85	-0.080	7.73	0.28
146	21.810	0.148	2.19	112	-3.1	101	85	-0.060	7.85	0.29
147	21.962	0.152	2.18	113	-1.3	104	86	-0.070	7.90	0.25
148	22.109	0.147	2.19	113	-2.39	98	87	-0.060	7.75	0.31
149	22.261	0.152	2.17	113	-0.77	98	87	-0.060	7.97	0.27
150	22.408	0.147	2.19	112	-0.75	96	88	-0.060	7.89	0.28
151	22.560	0.152	2.19	113	-0.93	99	87	-0.070	7.95	0.25
152	22.707	0.147	2.18	113	-1.2	98	87	-0.080	7.84	0.28
153	22.858	0.151	2.17	113	-1.51	110	87	-0.070	7.93	0.29
154	23.007	0.149	2.17	113	-3.08	103	85	-0.070	8.00	0.26
155	23.157	0.150	2.17	113	-0.74	97	85	-0.060	7.94	0.31
156	23.307	0.150	2.19	113	-1.27	97	85	-0.070	8.08	0.26
157	23.456	0.149	2.19	112	-3.02	102	85	-0.070	8.12	0.31
158	23.606	0.150	2.18	113	-3.19	99	86	-0.070	8.12	0.38
159	23.754	0.148	2.15	112	-1.12	96	87	-0.070	8.35	0.36

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
160	23.905	0.151	2.18	113	-1.62	101	87	-0.060	8.34	0.39
161	24.052	0.147	2.18	113	-3.16	102	87	-0.070	8.53	0.35
162	24.204	0.152	2.17	113	-1.41	106	87	-0.060	8.47	0.35
163	24.351	0.147	2.16	113	-0.81	99	86	-0.070	7.92	0.40
164	24.503	0.152	2.18	113	-1.23	103	86	-0.090	7.04	0.47
165	24.650	0.147	2.16	113	-2.89	100	86	-0.070	6.47	0.50
166	24.802	0.152	2.18	112	-3.24	106	85	-0.060	6.43	0.48
167	24.949	0.147	2.18	113	-0.73	97	85	-0.080	6.27	0.53
168	25.100	0.151	2.17	113	-1.02	100	86	-0.080	6.40	0.53
169	25.247	0.147	2.19	113	-0.77	100	86	-0.070	6.17	0.53
170	25.398	0.151	2.18	113	-1.79	99	87	-0.070	6.28	0.51
171	25.547	0.149	2.18	113	-2.19	105	86	-0.060	6.32	0.54
172	25.698	0.151	2.18	113	-2.89	99	86	-0.080	6.10	0.61
173	25.847	0.149	2.16	112	-3.11	98	86	-0.060	6.31	0.61
174	25.997	0.150	2.17	113	-0.94	94	86	-0.070	6.15	0.67
175	26.147	0.150	2.19	113	-1.59	99	86	-0.080	5.87	0.85
176	26.294	0.147	2.20	113	-0.81	99	85	-0.060	6.02	0.82
177	26.446	0.152	2.18	113	-3.2	105	85	-0.060	5.84	0.85
178	26.593	0.147	2.19	113	-0.94	98	86	-0.070	5.96	0.84
179	26.745	0.152	2.19	113	-0.78	101	87	-0.060	5.94	0.84
180	26.892	0.147	2.18	113	-0.82	101	87	-0.050	6.02	0.78
181	27.044	0.152	2.15	113	-0.81	100	87	-0.060	5.97	0.77
182	27.191	0.147	2.18	113	-0.82	98	87	-0.050	6.00	0.75
183	27.343	0.152	2.19	113	-3.15	101	87	-0.060	6.06	0.76
184	27.490	0.147	2.19	113	-0.8	95	86	-0.060	5.88	0.80
185	27.641	0.151	2.16	113	-3.18	103	85	-0.060	6.04	0.79
186	27.789	0.148	2.18	112	-2.32	98	86	-0.060	5.99	0.79
187	27.939	0.150	2.18	113	-0.84	102	85	-0.060	6.03	0.79
188	28.089	0.150	2.18	113	-0.72	96	85	-0.070	5.88	0.81
189	28.239	0.150	2.18	113	-0.74	101	86	-0.050	5.92	0.80
190	28.389	0.150	2.18	113	-2.45	99	87	-0.040	6.04	0.76
191	28.538	0.149	2.17	113	-2.68	100	87	-0.070	5.96	0.78

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
192	28.688	0.150	2.18	113	-0.92	95	87	-0.050	6.10	0.80
193	28.836	0.148	2.19	113	-2.72	102	86	-0.060	5.97	0.80
194	28.987	0.151	2.18	113	-3.07	100	87	-0.060	6.05	0.79
195	29.134	0.147	2.18	113	-1.75	94	85	-0.060	6.04	0.76
196	29.286	0.152	2.18	113	-2.45	104	86	-0.060	6.10	0.78
197	29.434	0.148	2.18	113	-0.77	99	85	-0.050	6.01	0.76
198	29.586	0.152	2.17	113	-1.72	105	85	-0.060	6.15	0.77
199	29.733	0.147	2.18	113	-0.7	100	85	-0.060	6.04	0.76
200	29.885	0.152	2.18	112	-1.11	100	87	-0.060	6.10	0.71
201	30.031	0.146	2.18	113	-1.67	95	87	-0.060	5.84	0.80
202	30.183	0.152	2.17	112	-3.02	106	87	-0.050	5.83	0.75
203	30.330	0.147	2.18	112	-3.26	96	87	-0.060	5.74	0.77
204	30.481	0.151	2.17	113	-2.58	104	87	-0.060	5.83	0.73
205	30.630	0.149	2.18	113	-1.3	99	86	-0.050	5.83	0.73
206	30.781	0.151	2.18	113	-0.71	100	85	-0.050	5.86	0.74
207	30.930	0.149	2.17	113	-1.14	100	85	-0.050	5.92	0.73
208	31.079	0.149	2.15	113	-2.63	96	84	-0.060	5.58	0.79
209	31.229	0.150	2.18	113	-1.98	100	85	-0.070	5.78	0.74
210	31.377	0.148	2.19	113	-3.06	99	86	-0.050	5.66	0.73
211	31.528	0.151	2.19	112	-1.8	102	87	-0.060	5.61	0.73
212	31.675	0.147	2.18	112	-2.94	105	87	-0.060	5.79	0.65
213	31.827	0.152	2.17	113	-0.76	105	87	-0.050	5.80	0.72
214	31.975	0.148	2.18	112	-0.83	95	86	-0.060	5.69	0.72
215	32.127	0.152	2.18	112	-2.98	104	86	-0.070	5.81	0.68
216	32.274	0.147	2.18	112	-1.44	101	86	-0.050	5.69	0.68
217	32.426	0.152	2.18	112	-0.89	99	86	-0.060	5.81	0.64
218	32.573	0.147	2.19	113	-3.16	100	85	-0.060	5.77	0.68
219	32.724	0.151	2.17	113	-2.45	100	85	-0.050	5.93	0.66
220	32.872	0.148	2.18	112	-3.03	96	87	-0.060	5.97	0.65
221	33.022	0.150	2.18	113	-2.06	97	87	-0.050	5.72	0.70
222	33.172	0.150	2.19	112	-1.92	102	86	-0.060	5.72	0.67
223	33.322	0.150	2.19	113	-0.99	97	87	-0.050	5.75	0.64

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
224	33.471	0.149	2.19	113	-2.91	100	86	-0.050	5.78	0.66
225	33.621	0.150	2.17	113	-3.29	101	86	-0.060	5.83	0.65
226	33.771	0.150	2.18	112	-3.07	100	85	-0.050	5.76	0.63
227	33.919	0.148	2.20	113	-1.99	101	85	-0.060	5.76	0.65
228	34.070	0.151	2.18	112	-3.14	101	85	-0.040	5.68	0.65
229	34.217	0.147	2.16	113	-1.25	98	86	-0.050	5.69	0.67
230	34.369	0.152	2.17	113	-3.12	98	86	-0.050	5.86	0.63
231	34.516	0.147	2.18	113	-1.11	98	87	-0.050	5.87	0.62
232	34.669	0.153	2.16	112	-2.66	98	88	-0.050	5.83	0.63
233	34.816	0.147	2.18	112	-0.76	95	87	-0.050	5.82	0.67
234	34.968	0.152	2.18	113	-2.83	98	87	-0.050	5.92	0.63
235	35.114	0.146	2.19	112	-0.82	100	86	-0.060	5.93	0.61
236	35.266	0.152	2.18	113	-0.91	98	85	-0.050	5.86	0.65
237	35.413	0.147	2.18	112	-0.84	101	86	-0.050	5.81	0.64
238	35.564	0.151	2.18	113	-0.73	99	84	-0.050	5.89	0.64
239	35.713	0.149	2.19	113	-3.17	100	85	-0.050	5.74	0.68
240	35.863	0.150	2.17	113	-2.4	101	87	-0.030	5.65	0.66
241	36.012	0.149	2.19	112	-1.28	101	87	-0.050	5.76	0.65
242	36.162	0.150	2.17	113	-2.79	97	87	-0.060	5.68	0.65
243	36.312	0.150	2.17	112	-2.85	102	86	-0.050	5.83	0.61
244	36.460	0.148	2.20	112	-2.55	97	87	-0.030	5.78	0.64
245	36.611	0.151	2.19	112	-3.05	104	85	-0.050	6.01	0.65
246	36.758	0.147	2.18	112	-2.44	95	85	-0.070	5.81	0.67
247	36.910	0.152	2.18	112	-0.75	100	85	-0.060	5.92	0.65
248	37.057	0.147	2.18	112	-3.21	94	84	-0.050	5.82	0.67
249	37.210	0.153	2.18	113	-3.08	99	85	-0.060	5.84	0.61
250	37.357	0.147	2.17	113	-1.07	100	86	-0.030	5.87	0.63
251	37.509	0.152	2.19	112	-1.15	102	87	-0.050	6.09	0.64
252	37.655	0.146	2.17	113	-2.49	106	86	-0.040	6.07	0.62
253	37.806	0.151	2.16	113	-1.88	96	86	-0.040	5.94	0.64
254	37.954	0.148	2.18	112	-2.74	97	86	-0.050	5.86	0.67
255	38.105	0.151	2.17	113	-2.44	97	86	-0.060	6.00	0.65

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
256	38.253	0.148	2.17	113	-3.16	105	85	-0.050	5.98	0.65
257	38.404	0.151	2.17	112	-3.09	100	85	-0.050	6.03	0.65
258	38.553	0.149	2.18	113	-2.36	102	84	-0.050	6.02	0.64
259	38.703	0.150	2.17	112	-2.94	94	85	-0.040	6.25	0.60
260	38.853	0.150	2.18	112	-2.31	102	86	-0.050	6.07	0.62
261	39.001	0.148	2.19	112	-3.1	97	87	-0.040	6.16	0.61
262	39.151	0.150	2.17	112	-0.79	103	87	-0.040	6.08	0.62
263	39.299	0.148	2.18	113	-2.19	95	87	-0.050	6.13	0.58
264	39.450	0.151	2.19	112	-2.55	100	86	-0.050	6.12	0.63
265	39.598	0.148	2.18	112	-2.81	94	86	-0.050	6.44	0.52
266	39.749	0.151	2.17	112	-1.81	99	86	-0.050	6.60	0.52
267	39.896	0.147	2.17	112	-0.81	94	85	-0.050	6.47	0.52
268	40.048	0.152	2.16	112	-2.25	99	85	-0.050	6.44	0.55
269	40.195	0.147	2.17	113	-2.17	93	87	-0.050	6.60	0.49
270	40.346	0.151	2.20	113	-0.91	104	86	-0.060	6.54	0.52
271	40.493	0.147	2.17	112	-1.55	97	86	-0.050	6.54	0.49
272	40.644	0.151	2.18	112	-3.06	99	87	-0.060	6.53	0.52
273	40.792	0.148	2.18	112	-0.82	97	86	-0.070	6.43	0.54
274	40.943	0.151	2.19	112	-0.8	105	86	-0.050	6.39	0.50
275	41.092	0.149	2.17	112	-2.2	97	85	-0.050	6.50	0.48
276	41.241	0.149	2.15	112	-0.73	101	85	-0.060	6.46	0.48
277	41.391	0.150	2.17	112	-2.89	103	85	-0.050	6.45	0.49
278	41.540	0.149	2.16	112	-2.92	103	86	-0.060	6.45	0.49
279	41.690	0.150	2.18	112	-1.58	98	87	-0.050	6.54	0.46
280	41.837	0.147	2.16	112	-0.95	102	87	-0.060	6.52	0.49
281	41.988	0.151	2.18	112	-2.15	104	87	-0.050	6.47	0.49
282	42.135	0.147	2.17	112	-1.89	101	86	-0.040	6.53	0.51
283	42.287	0.152	2.18	112	-3.09	99	86	-0.030	6.62	0.51
284	42.434	0.147	2.16	112	-2.05	95	86	-0.050	6.43	0.60
285	42.586	0.152	2.17	112	-0.97	106	85	-0.050	6.34	0.54
286	42.733	0.147	2.17	112	-3.16	93	85	-0.050	6.36	0.53
287	42.885	0.152	2.17	112	-0.85	108	86	-0.060	6.15	0.53

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
288	43.031	0.146	2.18	112	-0.82	95	87	-0.050	6.22	0.52
289	43.182	0.151	2.14	112	-2.71	99	87	-0.050	6.19	0.54
290	43.330	0.148	2.17	112	-3.1	99	87	-0.060	6.15	0.53
291	43.480	0.150	2.18	112	-1.11	101	87	-0.060	6.15	0.53
292	43.628	0.148	2.17	112	-3.05	99	86	-0.050	6.26	0.50
293	43.779	0.151	2.17	112	-1.93	103	86	-0.050	6.26	0.51
294	43.928	0.149	2.17	112	-0.93	98	85	-0.050	6.36	0.50
295	44.078	0.150	2.17	112	-1.29	99	85	-0.040	6.25	0.50
296	44.228	0.150	2.19	112	-0.67	97	85	-0.050	6.33	0.47
297	44.376	0.148	2.18	112	-0.81	96	86	-0.040	6.36	0.48
298	44.525	0.149	2.18	112	-1.73	97	87	-0.040	6.37	0.47
299	44.673	0.148	2.17	112	-3.21	97	87	-0.050	6.22	0.49
300	44.824	0.151	2.18	112	-3.22	98	87	-0.040	6.39	0.48
301	44.971	0.147	2.17	112	-0.98	103	86	-0.050	6.26	0.50
302	45.123	0.152	2.17	112	-1.4	101	86	-0.050	6.26	0.48
303	45.270	0.147	2.17	112	-1.17	96	85	-0.060	6.24	0.47
304	45.422	0.152	2.17	112	-1.45	98	85	-0.060	6.20	0.54
305	45.569	0.147	2.15	112	-2.79	99	85	-0.060	6.21	0.52
306	45.720	0.151	2.18	112	-2.8	98	86	-0.040	6.38	0.48
307	45.866	0.146	2.19	112	-0.76	99	87	-0.060	6.18	0.50
308	46.018	0.152	2.16	112	-1.12	105	87	-0.050	6.19	0.51
309	46.165	0.147	2.16	112	-1.45	101	87	-0.040	6.22	0.50
310	46.315	0.150	2.17	112	-1.87	96	86	-0.060	6.35	0.51
311	46.463	0.148	2.15	113	-1.17	96	86	-0.060	6.26	0.50
312	46.614	0.151	2.16	112	-0.8	99	85	-0.050	6.34	0.48
313	46.763	0.149	2.16	112	-3.23	99	85	-0.050	6.21	0.49
314	46.912	0.149	2.16	112	-1.34	99	85	-0.060	6.18	0.48
315	47.062	0.150	2.17	112	-1.38	100	86	-0.050	5.93	0.50
316	47.210	0.148	2.17	112	-1.44	104	86	-0.050	5.96	0.48
317	47.359	0.149	2.18	112	-0.9	98	87	-0.050	6.03	0.48
318	47.507	0.148	2.16	112	-3.29	100	86	-0.050	5.94	0.52
319	47.658	0.151	2.16	112	-2.93	97	87	-0.050	5.92	0.52

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
320	47.805	0.147	2.17	113	-1.36	103	86	-0.050	5.86	0.51
321	47.956	0.151	2.16	113	-0.81	106	85	-0.060	5.86	0.54
322	48.103	0.147	2.15	112	-2.92	103	85	-0.050	5.83	0.57
323	48.255	0.152	2.17	112	-0.89	107	85	-0.060	6.03	0.53
324	48.401	0.146	2.15	112	-1.9	96	86	-0.050	5.91	0.52
325	48.553	0.152	2.15	112	-0.82	102	87	-0.050	6.04	0.51
326	48.699	0.146	2.15	112	-3.37	101	86	-0.050	6.04	0.51
327	48.850	0.151	2.17	112	-1.58	100	86	-0.030	6.07	0.48
328	48.997	0.147	2.15	112	-1	100	86	-0.060	5.94	0.51
329	49.148	0.151	2.17	112	-2.79	106	86	-0.050	6.10	0.45
330	49.295	0.147	2.16	112	-0.98	94	86	-0.060	6.08	0.43
331	49.445	0.150	2.15	111	-1.66	98	84	-0.040	6.07	0.43
332	49.594	0.149	2.17	112	-0.8	107	84	-0.050	5.94	0.49
333	49.743	0.149	2.15	112	-1.73	94	86	-0.060	5.88	0.58
334	49.892	0.149	2.17	112	-0.79	96	87	-0.060	5.84	0.62
335	50.041	0.149	2.16	112	-3.15	98	87	-0.060	5.81	0.67
336	50.191	0.150	2.17	112	-3.27	100	86	-0.040	5.86	0.63
337	50.338	0.147	2.16	112	-2.98	98	86	-0.060	5.85	0.62
338	50.487	0.149	2.17	112	-1.65	102	86	-0.060	5.77	0.62
339	50.635	0.148	2.16	112	-1.28	96	85	-0.050	5.90	0.58
340	50.785	0.150	2.16	112	-0.73	98	85	-0.050	5.82	0.62
341	50.932	0.147	2.16	112	-1.51	94	85	-0.060	5.94	0.57
342	51.083	0.151	2.16	112	-3.22	101	86	-0.050	5.95	0.59
343	51.230	0.147	2.17	112	-3.31	97	87	-0.050	5.93	0.56
344	51.381	0.151	2.16	112	-1.43	97	86	-0.050	5.87	0.55
345	51.527	0.146	2.17	112	-3.32	93	87	-0.040	5.82	0.56
346	51.678	0.151	2.15	112	-1.21	96	87	-0.060	5.72	0.62
347	51.825	0.147	2.14	112	-1.02	93	86	-0.050	5.75	0.59
348	51.976	0.151	2.14	112	-0.89	103	85	-0.060	5.66	0.59
349	52.122	0.146	2.15	112	-0.91	100	85	-0.030	5.64	0.62
350	52.272	0.150	2.16	111	-1.39	96	84	-0.050	5.78	0.59
351	52.419	0.147	2.15	112	-1.66	102	85	-0.050	5.77	0.59

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
352	52.569	0.150	2.15	111	-2.14	102	87	-0.050	5.84	0.59
353	52.716	0.147	2.15	112	-0.89	98	87	-0.060	5.69	0.58
354	52.866	0.150	2.16	112	-1.81	101	87	-0.050	5.66	0.59
355	53.014	0.148	2.16	112	-1.54	102	86	-0.040	5.62	0.61
356	53.163	0.149	2.14	111	-2.88	97	86	-0.050	5.64	0.57
357	53.312	0.149	2.15	112	-2.98	103	86	-0.050	5.78	0.58
358	53.460	0.148	2.16	112	-1.12	101	85	-0.050	5.72	0.53
359	53.609	0.149	2.15	112	-2.17	101	85	-0.060	5.62	0.57
360	53.758	0.149	2.16	112	-3.12	97	86	-0.050	5.61	0.53
361	53.907	0.149	2.14	112	-0.85	95	87	-0.050	5.57	0.53
362	54.053	0.146	2.16	112	-1.6	99	87	-0.050	5.61	0.54
363	54.203	0.150	2.14	112	-1.14	96	87	-0.050	5.53	0.54
364	54.350	0.147	2.15	112	-0.84	94	86	-0.050	5.67	0.54
365	54.500	0.150	2.14	112	-3.17	95	86	-0.040	5.57	0.53
366	54.646	0.146	2.14	112	-1.3	94	85	-0.050	5.49	0.54
367	54.796	0.150	2.15	111	-3.37	97	85	-0.050	5.51	0.58
368	54.943	0.147	2.14	111	-2.33	100	85	-0.050	5.53	0.57
369	55.094	0.151	2.15	111	-0.95	103	86	-0.040	5.51	0.54
370	55.240	0.146	2.13	112	-2.65	97	86	-0.050	5.56	0.51
371	55.391	0.151	2.14	111	-1.9	100	87	-0.050	5.46	0.52
372	55.537	0.146	2.14	111	-2.09	95	87	-0.070	5.59	0.51
373	55.687	0.150	2.14	111	-0.88	101	86	-0.050	5.49	0.53
374	55.834	0.147	2.16	112	-3.25	97	86	-0.040	5.48	0.54
375	55.984	0.150	2.15	112	-2.61	100	85	-0.050	5.47	0.52
376	56.130	0.146	2.14	111	-1.07	101	85	-0.040	5.40	0.54
377	56.279	0.149	2.14	111	-2.48	98	85	-0.050	5.46	0.50
378	56.426	0.147	2.14	112	-2.71	97	85	-0.050	5.49	0.54
379	56.576	0.150	2.14	112	-2.32	95	87	-0.050	5.55	0.52
380	56.722	0.146	2.14	111	-2.35	93	87	-0.050	5.05	0.59
381	56.872	0.150	2.15	111	-2.48	98	87	-0.050	5.09	0.58
382	57.018	0.146	2.13	111	-1.03	97	85	-0.060	5.10	0.53
383	57.168	0.150	2.15	111	-3.21	98	86	-0.060	5.02	0.52

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
384	57.316	0.148	2.13	111	-1.04	99	86	-0.050	5.10	0.50
385	57.465	0.149	2.14	112	-1.78	102	85	-0.050	5.10	0.49
386	57.613	0.148	2.14	111	-0.87	97	85	-0.060	5.06	0.50
387	57.761	0.148	2.14	111	-0.87	97	86	-0.050	5.14	0.54
388	57.909	0.148	2.14	111	-3.02	97	86	-0.060	4.85	0.53
389	58.057	0.148	2.12	111	-3.09	94	87	-0.060	5.12	0.49
390	58.206	0.149	2.14	111	-2.23	98	87	-0.050	5.00	0.50
391	58.353	0.147	2.13	111	-1.53	95	86	-0.050	4.88	0.51
392	58.501	0.148	2.15	111	-3.2	97	85	-0.050	5.03	0.46
393	58.648	0.147	2.14	111	-3.17	97	84	-0.050	5.04	0.44
394	58.797	0.149	2.13	111	-1.26	94	85	-0.050	5.03	0.44
395	58.944	0.147	2.14	111	-0.87	94	85	-0.050	4.95	0.45
396	59.093	0.149	2.14	112	-1.19	96	86	-0.040	5.06	0.47
397	59.239	0.146	2.13	111	-2.89	96	87	-0.050	4.99	0.46
398	59.389	0.150	2.14	111	-1.15	97	87	-0.030	5.02	0.44
Avg/Tot	59.389	0.149	2.17	111	-1.86	100	86	-0.062	7.75	0.47

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	502	560	577	523	569	546.2	N/A
1	502	558	579	509	574	544.4	N/A
2	501	557	580	501	578	543.4	N/A
3	501	552	581	504	582	544.0	N/A
4	499	548	580	523	583	546.6	N/A
5	497	546	579	546	584	550.4	N/A
6	496	546	576	573	583	554.8	N/A
7	495	545	573	596	583	558.4	N/A
8	496	546	569	615	581	561.4	N/A
9	496	548	566	631	579	564.0	N/A
10	498	551	563	642	576	566.0	N/A
11	500	556	561	651	572	568.0	N/A
12	502	560	559	659	569	569.8	N/A
13	505	564	559	665	565	571.6	N/A
14	509	567	558	674	561	573.8	N/A
15	513	570	559	673	559	574.8	N/A
16	517	573	557	667	556	574.0	N/A
17	520	573	557	661	552	572.6	N/A
18	522	573	557	655	548	571.0	N/A
19	524	574	557	650	545	570.0	N/A
20	524	573	557	647	541	568.4	N/A
21	524	572	556	644	537	566.6	N/A
22	523	571	555	642	532	564.6	N/A
23	522	571	554	641	529	563.4	N/A
24	521	571	554	640	525	562.2	N/A
25	519	570	552	639	521	560.2	N/A
26	516	569	552	639	518	558.8	N/A
27	515	568	550	639	515	557.4	N/A
28	514	568	549	640	512	556.6	N/A
29	512	568	547	640	508	555.0	N/A
30	510	568	545	641	505	553.8	N/A
31	508	568	544	640	501	552.2	N/A
32	506	568	542	641	497	550.8	N/A
33	505	567	541	641	494	549.6	N/A
34	503	565	540	641	490	547.8	N/A
35	501	565	537	641	487	546.2	N/A
36	500	563	536	641	485	545.0	N/A
37	499	562	534	641	482	543.6	N/A
38	498	560	533	640	478	541.8	N/A
39	497	558	531	641	475	540.4	N/A
40	496	556	530	641	473	539.2	N/A
41	496	555	529	641	470	538.2	N/A
42	495	552	528	641	467	536.6	N/A
43	495	551	526	642	464	535.6	N/A
44	494	548	526	643	462	534.6	N/A
45	494	545	525	644	459	533.4	N/A
46	495	543	524	645	456	532.6	N/A
47	494	540	523	646	453	531.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	494	536	522	646	451	529.8	N/A
49	494	533	521	647	448	528.6	N/A
50	495	529	521	648	447	528.0	N/A
51	494	525	520	650	444	526.6	N/A
52	494	522	519	652	441	525.6	N/A
53	495	520	518	655	439	525.4	N/A
54	494	517	516	658	437	524.4	N/A
55	495	514	516	661	435	524.2	N/A
56	495	512	515	665	433	524.0	N/A
57	496	510	513	670	431	524.0	N/A
58	497	508	512	676	429	524.4	N/A
59	498	505	511	685	427	525.2	N/A
60	499	503	510	693	425	526.0	N/A
61	500	501	510	699	423	526.6	N/A
62	501	499	509	706	421	527.2	N/A
63	501	497	508	712	419	527.4	N/A
64	502	496	507	719	418	528.4	N/A
65	502	493	507	726	415	528.6	N/A
66	503	491	505	735	414	529.6	N/A
67	503	489	505	741	412	530.0	N/A
68	504	488	504	747	411	530.8	N/A
69	505	487	503	752	410	531.4	N/A
70	506	486	502	755	408	531.4	N/A
71	506	485	502	757	406	531.2	N/A
72	507	484	501	757	405	530.8	N/A
73	508	483	501	750	404	529.2	N/A
74	508	482	501	742	402	527.0	N/A
75	509	482	500	735	401	525.4	N/A
76	510	482	500	729	399	524.0	N/A
77	510	481	500	722	398	522.2	N/A
78	512	481	499	717	397	521.2	N/A
79	512	482	499	712	396	520.2	N/A
80	512	483	498	709	393	519.0	N/A
81	514	484	498	706	392	518.8	N/A
82	514	486	497	705	392	518.8	N/A
83	515	486	498	705	390	518.8	N/A
84	516	488	497	705	390	519.2	N/A
85	517	488	497	705	388	519.0	N/A
86	519	489	498	704	388	519.6	N/A
87	519	490	498	704	387	519.6	N/A
88	520	493	498	703	386	520.0	N/A
89	520	493	499	702	385	519.8	N/A
90	522	494	499	701	384	520.0	N/A
91	522	496	500	700	383	520.2	N/A
92	524	498	500	695	382	519.8	N/A
93	524	500	501	691	381	519.4	N/A
94	525	503	502	688	380	519.6	N/A
95	525	505	502	685	379	519.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	525	508	503	681	379	519.2	N/A
97	525	510	503	680	378	519.2	N/A
98	526	511	503	678	377	519.0	N/A
99	526	512	504	675	378	519.0	N/A
100	527	515	505	674	376	519.4	N/A
101	527	516	505	673	376	519.4	N/A
102	527	518	506	673	375	519.8	N/A
103	528	519	507	672	374	520.0	N/A
104	529	521	507	671	375	520.6	N/A
105	530	522	508	669	373	520.4	N/A
106	530	523	508	667	373	520.2	N/A
107	531	525	510	665	374	521.0	N/A
108	531	526	510	663	373	520.6	N/A
109	531	527	511	660	373	520.4	N/A
110	531	528	512	659	372	520.4	N/A
111	531	529	512	656	373	520.2	N/A
112	532	530	514	654	372	520.4	N/A
113	532	531	514	652	372	520.2	N/A
114	532	532	515	649	372	520.0	N/A
115	531	533	516	647	371	519.6	N/A
116	531	535	517	642	371	519.2	N/A
117	531	534	518	638	371	518.4	N/A
118	531	534	519	634	371	517.8	N/A
119	529	534	519	630	372	516.8	N/A
120	529	533	519	627	371	515.8	N/A
121	528	532	520	623	371	514.8	N/A
122	528	532	520	620	370	514.0	N/A
123	526	531	520	617	370	512.8	N/A
124	525	531	520	614	370	512.0	N/A
125	525	530	520	612	370	511.4	N/A
126	525	530	520	609	371	511.0	N/A
127	523	529	520	607	371	510.0	N/A
128	522	530	520	604	371	509.4	N/A
129	521	529	520	602	371	508.6	N/A
130	520	528	520	599	372	507.8	N/A
131	520	528	520	597	371	507.2	N/A
132	519	528	520	593	371	506.2	N/A
133	518	528	520	592	372	506.0	N/A
134	516	528	520	589	372	505.0	N/A
135	516	527	520	586	372	504.2	N/A
136	516	526	521	585	373	504.2	N/A
137	515	527	520	582	373	503.4	N/A
138	515	526	520	580	373	502.8	N/A
139	513	525	520	578	374	502.0	N/A
140	513	526	520	577	375	502.2	N/A
141	513	525	520	575	374	501.4	N/A
142	512	524	520	573	374	500.6	N/A
143	511	523	521	571	375	500.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	511	523	520	568	376	499.6	N/A
145	510	523	520	567	376	499.2	N/A
146	509	522	520	566	377	498.8	N/A
147	509	521	521	564	377	498.4	N/A
148	509	520	521	562	377	497.8	N/A
149	507	521	520	561	379	497.6	N/A
150	507	520	521	560	379	497.4	N/A
151	506	520	521	558	380	497.0	N/A
152	506	519	521	557	381	496.8	N/A
153	505	518	521	556	382	496.4	N/A
154	505	517	521	554	381	495.6	N/A
155	504	518	521	552	383	495.6	N/A
156	503	517	523	551	383	495.4	N/A
157	503	517	522	550	385	495.4	N/A
158	503	516	523	549	386	495.4	N/A
159	503	516	524	548	386	495.4	N/A
160	503	517	524	547	386	495.4	N/A
161	502	516	524	546	387	495.0	N/A
162	502	516	525	545	388	495.2	N/A
163	501	516	525	543	389	494.8	N/A
164	502	515	525	541	390	494.6	N/A
165	501	514	526	537	391	493.8	N/A
166	501	513	526	534	391	493.0	N/A
167	500	511	527	531	392	492.2	N/A
168	499	509	527	528	393	491.2	N/A
169	499	507	527	525	394	490.4	N/A
170	499	504	527	522	394	489.2	N/A
171	498	503	527	519	395	488.4	N/A
172	497	500	528	517	396	487.6	N/A
173	497	498	528	514	396	486.6	N/A
174	495	496	528	511	397	485.4	N/A
175	495	494	528	509	398	484.8	N/A
176	495	492	528	507	399	484.2	N/A
177	494	490	528	504	399	483.0	N/A
178	494	488	528	502	400	482.4	N/A
179	493	485	527	500	401	481.2	N/A
180	493	484	527	497	402	480.6	N/A
181	492	482	527	495	403	479.8	N/A
182	490	480	526	493	403	478.4	N/A
183	490	478	526	491	403	477.6	N/A
184	489	476	525	489	405	476.8	N/A
185	487	474	525	487	406	475.8	N/A
186	487	473	523	484	406	474.6	N/A
187	486	472	523	483	406	474.0	N/A
188	485	470	522	481	408	473.2	N/A
189	484	468	521	479	408	472.0	N/A
190	482	466	521	477	408	470.8	N/A
191	482	465	520	474	409	470.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
192	481	464	520	473	409	469.4	N/A
193	479	462	520	471	410	468.4	N/A
194	479	462	519	469	411	468.0	N/A
195	478	460	518	468	412	467.2	N/A
196	476	459	518	466	412	466.2	N/A
197	476	458	517	464	413	465.6	N/A
198	475	457	516	462	413	464.6	N/A
199	474	456	515	461	415	464.2	N/A
200	473	454	516	459	415	463.4	N/A
201	472	454	515	458	415	462.8	N/A
202	470	452	513	456	417	461.6	N/A
203	469	452	514	454	417	461.2	N/A
204	469	451	513	453	417	460.6	N/A
205	468	449	512	451	419	459.8	N/A
206	467	449	512	449	419	459.2	N/A
207	467	447	511	448	420	458.6	N/A
208	465	446	510	446	420	457.4	N/A
209	464	446	511	445	421	457.4	N/A
210	463	445	510	444	422	456.8	N/A
211	462	444	509	442	421	455.6	N/A
212	461	443	509	441	423	455.4	N/A
213	461	442	508	439	422	454.4	N/A
214	459	442	507	438	423	453.8	N/A
215	457	441	507	437	423	453.0	N/A
216	458	439	507	436	424	452.8	N/A
217	456	438	506	434	424	451.6	N/A
218	456	438	505	433	424	451.2	N/A
219	454	437	504	431	425	450.2	N/A
220	453	435	504	431	425	449.6	N/A
221	453	435	504	429	425	449.2	N/A
222	451	434	502	428	426	448.2	N/A
223	451	433	502	427	427	448.0	N/A
224	450	432	501	426	426	447.0	N/A
225	449	431	501	424	427	446.4	N/A
226	448	431	501	423	427	446.0	N/A
227	449	430	500	422	428	445.8	N/A
228	446	428	499	421	429	444.6	N/A
229	446	428	499	419	428	444.0	N/A
230	446	427	498	419	429	443.8	N/A
231	444	426	498	417	429	442.8	N/A
232	443	426	498	416	430	442.6	N/A
233	443	425	497	416	430	442.2	N/A
234	442	424	496	414	430	441.2	N/A
235	441	423	496	413	430	440.6	N/A
236	441	423	496	413	431	440.8	N/A
237	439	422	496	411	431	439.8	N/A
238	439	421	495	411	431	439.4	N/A
239	438	421	495	410	432	439.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
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	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
240	437	420	495	409	432	438.6	N/A
241	436	419	495	408	432	438.0	N/A
242	435	419	494	408	432	437.6	N/A
243	435	419	494	406	433	437.4	N/A
244	434	417	493	406	433	436.6	N/A
245	433	417	493	406	433	436.4	N/A
246	432	416	492	405	433	435.6	N/A
247	432	416	492	405	433	435.6	N/A
248	431	415	492	404	433	435.0	N/A
249	431	415	492	403	433	434.8	N/A
250	430	414	491	403	434	434.4	N/A
251	429	413	490	403	434	433.8	N/A
252	429	413	491	402	434	433.8	N/A
253	429	413	490	401	434	433.4	N/A
254	428	411	490	401	434	432.8	N/A
255	427	411	490	400	434	432.4	N/A
256	428	410	489	400	434	432.2	N/A
257	425	410	489	400	434	431.6	N/A
258	427	409	489	400	434	431.8	N/A
259	426	409	488	399	434	431.2	N/A
260	426	409	488	399	435	431.4	N/A
261	425	408	488	398	435	430.8	N/A
262	424	408	489	398	435	430.8	N/A
263	424	407	488	397	436	430.4	N/A
264	423	407	488	398	436	430.4	N/A
265	422	406	489	398	435	430.0	N/A
266	423	406	488	397	436	430.0	N/A
267	423	407	488	398	436	430.4	N/A
268	423	405	488	397	436	429.8	N/A
269	422	406	489	396	437	430.0	N/A
270	422	405	489	397	437	430.0	N/A
271	422	406	489	397	437	430.2	N/A
272	422	405	490	397	438	430.4	N/A
273	422	405	491	397	439	430.8	N/A
274	421	404	491	397	439	430.4	N/A
275	421	404	491	397	440	430.6	N/A
276	421	404	492	397	440	430.8	N/A
277	421	404	492	397	441	431.0	N/A
278	420	404	492	397	441	430.8	N/A
279	420	404	493	397	442	431.2	N/A
280	420	403	493	397	442	431.0	N/A
281	420	404	493	397	443	431.4	N/A
282	420	403	494	397	444	431.6	N/A
283	419	403	494	397	444	431.4	N/A
284	419	403	495	397	445	431.8	N/A
285	419	403	495	397	446	432.0	N/A
286	418	403	495	397	446	431.8	N/A
287	418	403	496	397	447	432.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
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	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
288	418	402	496	396	447	431.8	N/A
289	418	402	496	397	448	432.2	N/A
290	417	402	496	396	448	431.8	N/A
291	417	402	496	396	448	431.8	N/A
292	416	402	496	396	448	431.6	N/A
293	416	402	497	396	449	432.0	N/A
294	415	401	496	396	449	431.4	N/A
295	415	401	496	396	449	431.4	N/A
296	414	401	497	396	449	431.4	N/A
297	414	401	496	396	450	431.4	N/A
298	413	400	496	396	450	431.0	N/A
299	413	400	496	396	450	431.0	N/A
300	412	400	496	396	450	430.8	N/A
301	412	400	496	395	451	430.8	N/A
302	412	400	496	395	451	430.8	N/A
303	411	400	496	395	451	430.6	N/A
304	411	399	496	395	452	430.6	N/A
305	410	399	496	395	452	430.4	N/A
306	409	399	496	395	453	430.4	N/A
307	409	399	496	395	453	430.4	N/A
308	408	399	496	395	453	430.2	N/A
309	408	399	496	394	454	430.2	N/A
310	408	399	496	394	454	430.2	N/A
311	407	399	495	394	454	429.8	N/A
312	407	398	495	394	455	429.8	N/A
313	407	399	496	394	455	430.2	N/A
314	406	398	495	395	455	429.8	N/A
315	406	399	496	394	455	430.0	N/A
316	406	398	496	394	456	430.0	N/A
317	405	397	495	395	455	429.4	N/A
318	405	398	495	394	456	429.6	N/A
319	403	398	496	394	456	429.4	N/A
320	404	398	495	393	457	429.4	N/A
321	403	398	495	393	457	429.2	N/A
322	403	398	494	393	457	429.0	N/A
323	401	398	495	393	457	428.8	N/A
324	401	398	494	393	458	428.8	N/A
325	401	397	493	392	457	428.0	N/A
326	400	398	493	392	458	428.2	N/A
327	400	397	493	392	458	428.0	N/A
328	400	397	492	392	458	427.8	N/A
329	398	397	492	391	458	427.2	N/A
330	398	396	492	392	458	427.2	N/A
331	397	397	491	391	459	427.0	N/A
332	396	396	490	390	460	426.4	N/A
333	396	397	490	391	459	426.6	N/A
334	395	396	490	391	459	426.2	N/A
335	395	397	490	390	458	426.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
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	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
336	394	397	489	390	460	426.0	N/A
337	394	397	489	389	459	425.6	N/A
338	393	397	489	389	459	425.4	N/A
339	393	397	488	389	459	425.2	N/A
340	392	398	488	389	459	425.2	N/A
341	391	398	487	388	459	424.6	N/A
342	390	397	487	388	460	424.4	N/A
343	390	398	486	388	460	424.4	N/A
344	389	398	486	388	460	424.2	N/A
345	389	398	486	387	460	424.0	N/A
346	389	398	486	387	460	424.0	N/A
347	388	398	486	387	460	423.8	N/A
348	388	398	486	387	460	423.8	N/A
349	387	398	485	386	460	423.2	N/A
350	387	399	485	386	460	423.4	N/A
351	386	398	484	386	460	422.8	N/A
352	386	398	484	385	460	422.6	N/A
353	385	398	484	385	460	422.4	N/A
354	385	398	483	385	460	422.2	N/A
355	385	398	484	384	460	422.2	N/A
356	383	398	483	384	460	421.6	N/A
357	383	397	482	383	459	420.8	N/A
358	383	397	482	384	460	421.2	N/A
359	382	397	482	383	459	420.6	N/A
360	382	397	481	383	459	420.4	N/A
361	381	396	481	383	459	420.0	N/A
362	381	396	481	383	459	420.0	N/A
363	380	396	481	382	459	419.6	N/A
364	379	395	480	382	459	419.0	N/A
365	379	395	480	381	459	418.8	N/A
366	379	395	479	381	458	418.4	N/A
367	378	395	479	381	458	418.2	N/A
368	377	395	478	380	458	417.6	N/A
369	377	394	478	380	458	417.4	N/A
370	376	394	477	379	458	416.8	N/A
371	375	394	477	379	458	416.6	N/A
372	375	394	476	379	458	416.4	N/A
373	374	393	476	379	458	416.0	N/A
374	374	393	476	379	458	416.0	N/A
375	373	393	475	378	458	415.4	N/A
376	372	393	474	378	458	415.0	N/A
377	372	392	474	377	457	414.4	N/A
378	372	392	473	377	457	414.2	N/A
379	372	391	473	377	457	414.0	N/A
380	370	391	472	376	457	413.2	N/A
381	370	391	472	376	457	413.2	N/A
382	370	391	471	376	458	413.2	N/A
383	369	390	471	375	457	412.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
384	368	390	470	375	457	412.0	N/A
385	368	389	470	374	457	411.6	N/A
386	367	388	468	374	457	410.8	N/A
387	367	388	468	373	457	410.6	N/A
388	366	388	467	372	456	409.8	N/A
389	365	387	466	372	455	409.0	N/A
390	364	387	466	372	455	408.8	N/A
391	364	386	464	371	455	408.0	N/A
392	363	386	464	371	454	407.6	N/A
393	363	386	463	370	454	407.2	N/A
394	362	385	462	369	453	406.2	N/A
395	361	384	461	369	453	405.6	N/A
396	361	384	460	369	452	405.2	N/A
397	360	383	460	368	452	404.6	N/A
398	359	382	459	367	452	403.8	N/A
Average	460	463	507	507	435	474	N/A

LAB SAMPLE DATA - ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 2

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/11/2019

	Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
Train A Filters - First Hour	T230	88.5	88.5	91.0	2.5
Train A Filters - Remainder	T231	88.3	176.7	175.7	-1.0
	T232	88.4			
Train A Probe	2A	116240.5	116240.5	116241.3	0.8
Train A O-Rings	2A	3548.5	3548.5	3551.8	3.3
Train B Filters	T233	88.6	176.1	177.6	1.5
	T234	87.5			
Train B Probe	2B	116330.6	116330.6	116331.3	0.7
Train B O-Rings	2B	3567.1	3567.1	3570.0	2.9
Background Filter	T235	87.4	87.4	87.5	0.1

**Negative value corrected to zero*

Placed in Dessicator on:	6/12/19 - 8:00

Train A Filters - First Hour	91.4	6/13 9:03	91.0	6/14 8:43	91.0	6/17 7:28		
Train A Filters - Remainder	176.2	6/13 9:03	175.8	6/14 8:43	175.7	6/17 7:28		
Train A Probe	116241.4	6/13 9:03	116241.3	6/14 8:44				
Train A O-Rings	3551.8	6/13 9:04	3551.8	6/14 8:44				
Train B Filters	178.2	6/13 9:06	177.7	6/14 8:44	177.6	6/17 7:29		
Train B Probe	116331.4	6/13 9:03	116331.3	6/14 8:47				
Train B O-Rings	3570.1	6/13 9:04	3570.0	6/14 8:44				
Background Filter	87.4	6/14 9:04	87.5	6/14 8:44				

1st hour Sub-Total, mg:	2.5
Remainder Sub-Total, mg:	3.1
Train 1 Aggregate, mg:	**5.6**
Train 2 Aggregate, mg:	**5.1**
Ambient Aggregate, mg:	0.1

ASTM E3053 Wood Heater Run Sheets

Client: Kozy Heat Fireplaces Job Number: 18-449 Tracking #: 0019
Model: Z42 Run Number: 2 Test Date: 6/11/2019

Wood Heater Run Notes

Pre-Test Notes
Pre-Test Start Time: 11:40
Air Control Setting: Full Open

Time	Notes
N/A	Test performed as a continuation of High Fire Test, see Run 1 test notes for details

Test Notes
Test Burn Start Time: 14:18
Air Control Setting: Full Closed

Time	Notes
0 min	@3.6 lbs coal bed, leveled and zeroed scale. Then started sampling/loaded test fuel, loading done in 30 seconds, door closed at 2 minutes. Air set to high setting, fan on high.
14 min	Set air to test setting
60 min	Changed 1-hour filter
398 min	End of Test

Test Burn End Time: 20:56

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO_2 (%): 17.00 CO (%): 4.310
Mid Gas CO_2 (%): 10.00 CO (%): 2.51

Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	11:04	11:07	11:06	6/12 – 8:05	6/12 – 8:07	6/12 – 8:09
CO_2	0.00	10.07	17.00	0.08	10.11	17.16
CO	0.000	2.483	4.310	-0.004	2.476	4.257

Flue Gas Probe Leak Check: Initial: No Leakage Final: No Leakage

Technician Signature:  Date: 6/13/2019

ASTM E3053 Wood Heater Run Sheets

Client: Kozy Heat Fireplaces | Job Number: 18-449 | Tracking #: 0019
Model: Z42 | Run Number: 2 | Test Date: 6/11/2019

Test Photos

Kindling Fuel Load

Start-up Fuel Load

High Fire Fuel Load

Residual Start-up Fuel Coal Bed

Technician Signature: _____ Date: 6/13/2019

ASTM E3053 Wood Heater Run Sheets

Client: Kozy Heat Fireplaces Job Number: 18-449 Tracking #: 0019
Model: Z42 Run Number: 2 Test Date: 6/11/2019

High Fire Fuel Loaded

Residual High Fire Load Coal Bed

Medium Fire Fuel Load

Medium Fire Fuel Loaded

Technician Signature: Date: 6/13/2019

WOOD STOVE TEST DATA PACKET
ASTM E3053/E2515

Run 3 Data Summary

Client:	Kozy Heat Fireplaces
Model:	Z42
Job #:	18-449
Tracking #:	0019
Test Date:	6/13/2019

Techician Signature

2/22/2021
Date

TEST RESULTS - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

Burn Rate (kg/hr):	1.01

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft^3)	59.334	81.026	79.971	8.858
Average Gas Velocity in Dilution Tunnel (ft/sec)	15.04			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	9601.0			
Average Gas Meter Temperature (°F)	81.5	87.3	103.3	79.2
Total Sample Volume (dscf)	57.525	78.541	75.008	8.715
Average Tunnel Temperature (°F)	110.1			
Total Time of Test (min)	539			
Total Particulate Catch (mg)	0.0	6.1	5.7	0.7
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0000777	0.0000760	0.0000803
Total PM Emissions (g)	0.00	6.70	6.55	0.77
Particulate Emission Rate (g/hr)	0.00	0.75	0.73	0.77
Emissions Factor (g/kg)	-	0.74	0.72	-
Difference from Average Total Particulate Emissions (g)	-	0.07	0.07	-
Difference from Average Emissions Factor (g/kg)	-	0.01	0.01	-

Final Average Results	
Total Particulate Emissions (g)	6.63
Particulate Emission Rate (g/hr)	0.74
Emissions Factor (g/kg)	0.73
HHV Efficiency (%)	67.3%
LHV Efficiency (%)	72.0%
CO Emissions (g/min)	0.99

Quality Checks	Requirement	Observed	Result
Dual Train Precision	Each train within 7.5% of average emissions (in grams), or emission factors within 0.5 g/kg	See Above	OK
Filter Temps	>80 °F, <90 °F	Min: 81 / Max: 88	OK
Face Velocity	< 30 ft/min	8.4	OK
Leakage Rate	Less than 4% of average sample rate	0.001 cfm	OK
Ambient Temp	55-90 °F	Min: 78 / Max: 83	OK
Negative Probe Weight Evaluation	<5% of Total Catch	Probe Catch Not Negative	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	CHECK 10 MIN. INTERVAL PRO-RATES

B415.1 Efficiency Results

Manufacturer: ozy Heat Fireplaces
Model: Z42
Date: 06/13/19
Run: 3
Control #: 18-449
Test Duration: 539
Output Category: Low

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	67.3%	72.0%
Combustion Efficiency	96.1%	96.1%
Heat Transfer Efficiency	70.0%	74.9%

Output Rate (kJ/h)	13,546	12,850	**(Btu/h)**
Burn Rate (kg/h)	1.01	2.22	**(lb/h)**
Input (kJ/h)	20,120	19,086	**(Btu/h)**

Test Load Weight (dry kg)	9.06	19.96	**dry lb**
MC wet (%)	16.49		
MC dry (%)	19.75		
Particulate (g)	6.63		
CO (g)	535		
Test Duration (h)	8.98		

Emissions	**Particulate**	**CO**
g/MJ Output	0.05	4.40
g/kg Dry Fuel	0.73	59.10
g/h	0.74	59.57
g/min	0.01	0.99
lb/MM Btu Output	0.13	10.22

Air/Fuel Ratio (A/F)	17.44

VERSION: **2.2** **12/14/2009**

HIGH FIRE FUEL LOAD DATA - ASTM E3053

Client: Kozy Heat Fireplaces
Job #: 18-449
Model: Z42
Tracking #: 0019
Run #: 3
Technician: SJB
Date: 6/13/2019

Nominal Loading Density (lbs/ft^3, wet basis):	10		
Usable Firebox Volume (ft^3):	1.96		
Target Load Weight (lbs):	19.60		
Total Load Weight Range (lbs):	18.60	to	20.60
Core Load Weight Range (lbs):	8.80	to	12.70
Remainder Load Weight Range (lbs):	6.90	to	10.80
Core Load Piece Range (lbs):	2.90	to	4.90
Remainder Load Piece Range (lbs):	2.00	to	10.80
Max Allowable Kindling Weight (lbs):	3.99		
Max Allowable Start-up Fuel Weight (lbs):	5.99		

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	4.36	In Range	18.7	24.8	24.1	22.5	In Range	3.56	1.61
2	17.00	4.05	In Range	23.5	25.9	20.2	23.2	In Range	3.29	1.49
3	17.00	3.62	In Range	23.5	22.7	26.7	24.3	In Range	2.91	1.32
Core Load Wt. (lbs)		12.03	In Range							

REMAINDER LOAD DATA (1 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	5.44	In Range	25.4	26.7	22.9	25.0	In Range	4.35	1.97
2	17.00	2.50	In Range	24.7	23.8	22.9	23.8	In Range	2.02	0.92
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		7.94	In Range							

Total Load Weight (lbs):	19.97	In Range	
Core Load % of Total Weight:	60%	In Range	45-65%
Remainder % of Total Weight:	40%	In Range	35-55%
Total Load % of Target Weight:	102%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	10.2		
Total Load Average Moisture Content (%DB):	23.8	In Range	19-25%
Total Load Average Moisture Content (%WB):	19.2		
Total Test Load Weight (dry basis):	16.13 lbs	7.32 kg	

KINDLING AND START-UP FUEL

		Kindling Moisture Readings (%DB)					Dry Weight	
Kindling Weight (lbs)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
3.07	In Range	10	10	10	10.0	In Range	2.79	1.27

		Start-up Moisture Readings (%DB)					Dry Weight	
Start-up Fuel Wt. (lb)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
5.93	In Range	19.8	22.4	23.1	21.8	In Range	4.87	2.21

TEST FUEL LOADING RANGE

Allowable Residual Start-up Fuel Range (lb):	2.0	to	4.0	
Actual Residual Start-up Fuel Weight (lb):	2.9			In Range

LOW & MEDIUM FIRE FUEL LOAD DATA - ASTM E3053

Client: Kozy Heat Fireplaces
Job #: 18-449
Model: Z42
Tracking #: 0019
Run #: 3
Technician: SJB
Date: 6/13/2019

Nominal Loading Density (lbs/ft^3, wet basis):	12		
Usable Firebox Volume (ft^3):	1.96		
Target Load Weight (lbs):	23.52		
Total Load Weight Range (lbs):	22.34	to	24.70
Core Load Weight Range (lbs):	10.58	to	15.29
Remainder Load Weight Range (lbs):	8.23	to	12.94
Core Load Piece Range (lbs):	3.53	to	5.88
Remainder Load Piece Range (lbs):	2.35	to	7.06

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	4.45	In Range	21.8	17.9	19.6	19.8	In Range	3.72	1.69
2	17.00	5.01	In Range	21.9	17.9	19.6	19.8	In Range	4.18	1.90
3	17.00	4.77	In Range	20.0	18.6	19.4	19.3	In Range	4.00	1.81
Core Load Wt. (lbs)		14.23	In Range							

REMAINDER LOAD DATA (2 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	17.00	6.89	In Range	21.2	18.7	19.3	19.7	In Range	5.75	2.61
2	17.00	2.86	In Range	22.1	18.7	20.3	20.4	In Range	2.38	1.08
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		9.75	In Range							

Remainder Load Small/Large Piece Weight Ratio:	42%	In Range	≤ 67%
Total Load Weight (lbs):	23.98	In Range	
Core Load % of Total Weight:	59%	In Range	45-65%
Remainder % of Total Weight:	41%	In Range	35-55%
Total Load % of Target Weight:	102%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	12.2		
Total Load Average Moisture Content (%DB):	19.7	In Range	19-25%
Total Load Average Moisture Content (%WB):	16.5		
Total Test Load Weight (dry basis):	20.03 lbs	9.08 kg	

TEST FUEL LOADING RANGE

Allowable Charcoal Bed Weight Range (lb):	2.4	to	4.7	
Actual Charcoal Bed Wt. (lb):		3.0		In Range

TEST END POINT

Actual Fuel Load Ending Weight (lb): 0.0 Valid Test (≥90%)

Total Fuel Burned During Test Run:
24.0 lbs, wet basis
20.0 lbs, dry basis
9.08 kg, dry basis

DILUTION TUNNEL & MISC. DATA - ASTM E3053 / E2515

Client:	Kozy Heat Fireplaces	Job #:	18-449
Model:	Z42	Tracking #:	0019
Run #:	3	Technician:	SJB
Test Start Time:	10:47	Date:	6/13/2019
Test Type:	Low Fire		

Recording Interval (min):	1
Total Sampling Time (min):	539

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	29.8	29.78	29.79
Relative Humidity (%)	32.6	13.4	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	

Meter Box γ Factor:	1.004	(A)	
Meter Box γ Factor:	1.000	(B)	
Meter Box γ Factor:	0.999	(Ambient)	
Ambient Sample Volume:	59.334	ft^3	

Induced Draft Check (in. H_2O):	0
Smoke Capture Check (%):	100%
Date Flue Pipe Last Cleaned:	6/10/2019

Sample Train Post-Test Leak Checks

(A)	0.001	cfm @	-12	in. Hg
(B)	0.000	cfm @	-14	in. Hg
(Ambient)	0.002	cfm @	-14	in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H_2O)	Temp (°F)
1	0.034	154
2	0.054	154
3	0.052	154
4	0.038	154
5	0.038	154
6	0.054	154
7	0.050	154
8	0.036	154
Center	0.054	154

Static Pressure: -0.190 in. H_2O

Dilution Tunnel H_2O:	2.00	percent
Tunnel Diameter:	6	inches
Pitot Tube Cp:	0.99	[unitless]
Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Tunnel Area:	0.1963	ft^2
V_{strav}:	15.22	ft/sec
V_{scent}:	16.64	ft/sec
F_p:	0.915	[ratio]
Initial Tunnel Flow:	148.7	scf/min

TEST FUEL PROPERTIES

ASTM 3053-17 - Table A1.1 Fuel Properties by Fuel Species

Select Fuel Type	Species	%C	%H	%O	%Ash	MJ/kg	BTU/lb
	Ash, White	49.70	6.90	43.00	0.30	20.75	8927
	Beech	48.70	5.80	44.70	0.60	18.80	8088
	Birch, Sweet	49.80	6.50	43.40	0.30	20.12	8656
	Birch, Yellow	49.80	6.50	43.40	0.30	20.12	8656
	Doug Fir (Coast, Interior West/North)	48.73	6.87	43.90	0.50	19.81	8522
	Doug Fir (Interioir South)	48.73	6.87	43.90	0.50	19.81	8522
	Elm, Rock	50.40	6.60	42.30	0.70	20.49	8815
	Elm, Soft	50.40	6.60	42.30	0.70	20.49	8815
	Gum, Red	50.88	6.06	41.57	1.28	19.72	8478
	Larch, Western	50.54	6.36	42.40	0.70	17.58	7558
X	Maple, Hard	50.64	6.02	41.74	1.35	19.96	8587
	Maple, Sugar	50.64	6.02	41.74	1.35	19.96	8587
	Oak, Red	49.50	6.62	43.70	0.20	20.20	8690
	Oak, White	50.40	6.59	42.70	0.20	20.50	8819
	Pine, Southern	52.60	7.00	40.10	1.31	22.30	9587
	Pine, Southern Long Leaf	52.60	7.02	40.10	1.30	22.30	9594
	Other						

WOODSTOVE PREBURN DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

Recording Interval (min): 1
Run Time (min): 184

			Temperatures (°F)							
Elapsed Time (min)	**Scale Reading (lbs)**	**Flue Draft (in H_2O)**	**FB Left**	**FB Right**	**FB Back**	**FB Top**	**FB Bottom**	**Stove Surface Average**	**Flue**	**Ambient**
0	9.0	0.009	76	75	75	75	75	75.2	77	74
1	8.9	-0.016	75	75	75	77	75	75.4	98	73
2	8.8	-0.024	75	78	75	83	75	77.2	124	73
3	8.8	-0.021	76	81	75	91	75	79.6	153	73
4	8.6	-0.040	78	85	76	108	75	84.4	249	73
5	8.4	-0.062	80	92	76	132	75	91.0	339	73
6	8.2	-0.070	83	100	77	159	75	98.8	410	73
7	7.8	-0.063	88	112	79	184	76	107.8	437	73
8	7.5	-0.062	93	125	82	208	76	116.8	476	73
9	7.3	-0.068	101	140	86	240	76	128.6	517	73
10	6.9	-0.071	110	156	92	281	77	143.2	576	73
11	6.6	-0.076	121	171	100	320	78	158.0	606	73
12	6.2	-0.085	133	186	109	360	79	173.4	642	73
13	5.8	-0.081	145	203	106	364	81	179.8	658	73
14	5.5	-0.080	156	212	131	418	83	200.0	646	73
15	5.3	-0.084	166	224	144	437	85	211.2	635	73
16	4.9	-0.085	178	236	157	449	88	221.6	630	73
17	4.8	-0.075	191	248	171	461	92	232.6	635	73
18	4.6	-0.091	205	260	182	465	96	241.6	631	73
19	4.4	-0.077	217	272	191	463	100	248.6	620	73
20	4.1	-0.077	230	284	203	460	105	256.4	609	73
21	4.0	-0.074	241	296	217	457	110	264.2	607	73
22	3.9	-0.080	252	308	232	457	115	272.8	606	73
23	3.7	-0.090	263	319	246	457	120	281.0	605	73
24	3.5	-0.089	272	331	262	458	125	289.6	601	73
25	3.4	-0.075	282	341	278	458	130	297.8	597	74
26	3.1	-0.077	290	351	292	459	134	305.2	595	73
27	3.0	-0.077	299	360	305	460	139	312.6	596	73
28	2.9	-0.072	307	368	320	465	142	320.4	597	73
29	22.7	-0.075	316	376	333	457	145	325.4	551	73
30	22.5	-0.079	323	384	346	463	148	332.8	583	73
31	22.2	-0.080	331	390	358	475	152	341.2	598	73
32	22.1	-0.070	339	393	369	480	155	347.2	583	73
33	22.0	-0.066	345	394	378	483	159	351.8	574	73
34	21.8	-0.068	352	394	385	484	162	355.4	561	73
35	21.7	-0.075	357	393	390	483	165	357.6	551	73
36	21.6	-0.070	362	391	394	482	168	359.4	546	73
37	21.5	-0.078	367	389	397	481	171	361.0	547	73
38	21.3	-0.070	370	387	399	480	174	362.0	544	73
39	21.2	-0.073	374	384	400	481	176	363.0	543	73
40	21.0	-0.085	378	381	400	482	179	364.0	543	73
41	20.9	-0.072	381	379	400	484	181	365.0	552	73
42	20.6	-0.068	384	376	399	489	183	366.2	575	73
43	20.4	-0.079	387	376	399	494	185	368.2	589	73

WOODSTOVE PREBURN DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

Recording Interval (min): 1
Run Time (min): 184

			Temperatures (°F)							
Elapsed Time (min)	**Scale Reading (lbs)**	**Flue Draft (in H_2O)**	**FB Left**	**FB Right**	**FB Back**	**FB Top**	**FB Bottom**	**Stove Surface Average**	**Flue**	**Ambient**
44	20.3	-0.067	390	377	398	502	186	370.6	608	73
45	20.0	-0.075	393	380	398	510	188	373.8	620	73
46	19.9	-0.086	396	383	398	516	190	376.6	624	73
47	19.6	-0.088	400	386	398	523	192	379.8	628	73
48	19.4	-0.082	403	390	400	528	193	382.8	632	73
49	19.1	-0.079	407	394	402	533	195	386.2	639	73
50	19.0	-0.085	410	397	404	539	197	389.4	647	73
51	18.8	-0.090	414	400	407	546	199	393.2	653	73
52	18.6	-0.077	417	404	410	554	201	397.2	660	73
53	18.3	-0.082	421	407	414	561	202	401.0	668	73
54	18.1	-0.079	425	410	418	569	205	405.4	675	74
55	17.9	-0.075	429	414	423	578	207	410.2	683	74
56	17.5	-0.075	433	417	427	587	209	414.6	689	73
57	17.4	-0.072	437	421	432	595	211	419.2	693	73
58	17.2	-0.082	441	425	437	602	213	423.6	698	73
59	17.0	-0.092	445	430	442	608	215	428.0	701	74
60	16.8	-0.085	449	435	447	613	218	432.4	704	74
61	16.4	-0.094	454	439	453	619	220	437.0	708	73
62	16.3	-0.087	458	444	459	624	222	441.4	710	73
63	16.1	-0.087	462	449	465	629	225	446.0	712	74
64	15.9	-0.075	466	453	470	634	227	450.0	713	74
65	15.6	-0.079	470	458	476	638	230	454.4	714	74
66	15.5	-0.089	474	463	481	642	232	458.4	715	74
67	15.3	-0.079	478	467	486	646	235	462.4	716	74
68	15.1	-0.080	481	472	491	648	238	466.0	718	74
69	14.8	-0.084	485	476	495	651	240	469.4	717	74
70	14.6	-0.087	488	480	500	653	243	472.8	719	74
71	14.3	-0.079	492	484	503	655	246	476.0	721	74
72	14.2	-0.095	495	488	507	657	248	479.0	723	74
73	14.0	-0.086	498	492	511	658	251	482.0	723	74
74	13.7	-0.089	501	496	515	660	254	485.2	723	74
75	13.7	-0.084	503	500	519	662	257	488.2	723	74
76	13.4	-0.084	506	504	522	663	260	491.0	723	74
77	13.3	-0.097	509	509	526	664	263	494.2	723	74
78	13.0	-0.080	511	513	529	665	267	497.0	722	74
79	12.9	-0.087	514	516	532	667	270	499.8	723	74
80	12.7	-0.091	516	521	536	668	273	502.8	722	74
81	12.4	-0.085	518	524	539	669	276	505.2	724	74
82	12.3	-0.088	520	528	542	670	280	508.0	725	74
83	12.1	-0.088	522	531	545	671	283	510.4	726	74
84	12.0	-0.075	524	535	548	673	287	513.4	726	74
85	11.7	-0.089	526	537	551	674	290	515.6	726	74
86	11.5	-0.079	528	540	554	674	293	517.8	725	74
87	11.4	-0.087	530	542	557	675	297	520.2	726	74

WOODSTOVE PREBURN DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

Recording Interval (min): 1
Run Time (min): 184

			Temperatures (°F)							
Elapsed Time (min)	**Scale Reading (lbs)**	**Flue Draft (in H_2O)**	**FB Left**	**FB Right**	**FB Back**	**FB Top**	**FB Bottom**	**Stove Surface Average**	**Flue**	**Ambient**
88	11.2	-0.084	532	545	559	676	300	522.4	726	74
89	11.0	-0.081	534	547	562	676	304	524.6	725	74
90	10.9	-0.102	536	550	564	676	307	526.6	725	74
91	10.6	-0.093	537	553	567	675	311	528.6	724	74
92	10.6	-0.078	539	555	569	675	315	530.6	726	74
93	10.3	-0.091	540	558	571	675	318	532.4	726	74
94	10.1	-0.070	541	560	573	675	322	534.2	726	74
95	10.0	-0.089	542	562	575	675	326	536.0	727	74
96	9.8	-0.090	544	565	577	676	329	538.2	729	74
97	9.7	-0.085	545	567	578	677	333	540.0	730	74
98	9.4	-0.080	546	569	580	677	337	541.8	731	74
99	9.4	-0.075	547	572	583	678	341	544.2	732	74
100	9.2	-0.089	548	575	584	678	345	546.0	732	74
101	8.9	-0.085	549	578	587	679	348	548.2	732	74
102	8.8	-0.093	550	581	589	679	352	550.2	733	73
103	8.6	-0.087	551	583	591	679	357	552.2	733	73
104	8.6	-0.091	553	586	594	679	361	554.6	734	72
105	8.4	-0.088	553	587	596	677	364	555.4	735	72
106	8.2	-0.088	555	589	598	676	368	557.2	734	71
107	8.1	-0.082	556	591	600	675	372	558.8	735	71
108	7.9	-0.083	558	593	602	673	376	560.4	727	71
109	7.8	-0.089	558	594	605	670	381	561.6	723	70
110	7.7	-0.087	560	595	607	668	385	563.0	721	70
111	7.5	-0.068	561	595	609	667	389	564.2	719	69
112	7.4	-0.080	562	596	611	665	393	565.4	716	69
113	7.3	-0.067	564	597	613	665	397	567.2	716	69
114	7.0	-0.069	565	597	614	665	401	568.4	713	68
115	7.0	-0.083	566	597	616	663	405	569.4	714	68
116	6.9	-0.090	567	597	617	658	409	569.6	713	68
117	6.8	-0.091	568	597	619	655	413	570.4	709	67
118	6.7	-0.093	570	597	620	652	417	571.2	705	67
119	6.6	-0.087	572	597	622	650	421	572.4	702	67
120	6.5	-0.078	573	596	623	648	425	573.0	699	67
121	6.4	-0.088	575	595	625	646	429	574.0	696	66
122	6.3	-0.079	577	595	626	644	433	575.0	691	66
123	6.2	-0.077	578	594	628	641	437	575.6	686	66
124	6.1	-0.087	579	594	629	639	440	576.2	683	66
125	6.0	-0.079	580	593	630	636	444	576.6	680	65
126	5.9	-0.077	581	592	631	634	447	577.0	677	65
127	5.8	-0.093	581	591	632	631	450	577.0	675	65
128	5.7	-0.089	581	590	633	628	454	577.2	673	65
129	5.7	-0.088	581	589	634	626	458	577.6	670	65
130	5.5	-0.080	581	588	635	623	461	577.6	668	65
131	5.5	-0.084	580	588	636	620	465	577.8	665	65

WOODSTOVE PREBURN DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

Recording Interval (min): 1
Run Time (min): 184

			Temperatures (°F)							
Elapsed Time (min)	**Scale Reading (lbs)**	**Flue Draft (in H_2O)**	**FB Left**	**FB Right**	**FB Back**	**FB Top**	**FB Bottom**	**Stove Surface Average**	**Flue**	**Ambient**
132	5.3	-0.085	579	586	636	618	469	577.6	663	64
133	5.4	-0.078	579	585	637	616	472	577.8	660	64
134	5.3	-0.074	578	584	639	614	476	578.2	658	64
135	5.2	-0.086	577	583	639	612	479	578.0	656	64
136	5.0	-0.075	576	581	640	611	483	578.2	652	64
137	5.1	-0.077	575	580	641	609	486	578.2	650	64
138	5.0	-0.068	574	579	641	606	490	578.0	646	64
139	4.9	-0.085	573	578	642	604	494	578.2	642	64
140	4.8	-0.073	571	576	642	602	498	577.8	638	64
141	4.8	-0.069	570	575	642	599	501	577.4	634	64
142	4.7	-0.082	568	573	642	596	505	576.8	630	64
143	4.7	-0.080	567	571	643	593	508	576.4	627	64
144	4.5	-0.084	565	569	643	590	512	575.8	624	64
145	4.6	-0.081	563	568	643	587	515	575.2	620	64
146	4.5	-0.077	561	566	643	584	518	574.4	617	64
147	4.4	-0.070	559	564	643	581	521	573.6	614	64
148	4.4	-0.074	557	561	643	579	524	572.8	611	64
149	4.3	-0.077	554	559	642	576	527	571.6	609	64
150	4.3	-0.076	552	557	642	574	530	571.0	605	64
151	4.3	-0.089	549	556	642	571	533	570.2	602	64
152	4.1	-0.071	547	553	641	569	535	569.0	600	64
153	4.1	-0.080	544	551	641	567	538	568.2	597	64
154	4.0	-0.079	542	549	640	564	540	567.0	595	64
155	4.1	-0.073	540	547	640	562	543	566.4	592	64
156	4.1	-0.079	537	544	640	559	546	565.2	590	64
157	3.9	-0.080	534	542	639	557	548	564.0	589	64
158	3.9	-0.076	532	540	638	555	551	563.2	583	64
159	3.9	-0.065	530	538	637	551	553	561.8	575	64
160	3.8	-0.074	527	536	636	548	555	560.4	571	64
161	3.8	-0.071	525	533	635	544	557	558.8	568	64
162	3.8	-0.075	523	531	634	541	559	557.6	565	64
163	3.7	-0.079	520	529	632	539	561	556.2	565	64
164	3.7	-0.069	518	527	631	537	563	555.2	563	64
165	3.5	-0.078	515	525	629	535	565	553.8	562	64
166	3.6	-0.068	513	524	627	533	567	552.8	559	64
167	3.6	-0.073	511	522	626	530	569	551.6	557	64
168	3.6	-0.073	509	521	624	528	571	550.6	555	64
169	3.5	-0.074	507	520	622	526	573	549.6	553	64
170	3.5	-0.064	505	519	620	524	575	548.6	551	64
171	3.5	-0.066	503	518	619	522	576	547.6	549	64
172	3.4	-0.072	501	517	617	520	578	546.6	548	64
173	3.4	-0.067	500	516	615	518	579	545.6	546	64
174	3.4	-0.067	498	515	613	516	581	544.6	544	64
175	3.4	-0.076	496	514	612	514	583	543.8	543	64

WOODSTOVE PREBURN DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

Recording Interval (min): 1
Run Time (min): 184

			Temperatures (°F)							
Elapsed Time (min)	**Scale Reading (lbs)**	**Flue Draft (in H_2O)**	**FB Left**	**FB Right**	**FB Back**	**FB Top**	**FB Bottom**	**Stove Surface Average**	**Flue**	**Ambient**
176	3.3	-0.062	495	513	611	513	584	543.2	541	64
177	3.2	-0.075	493	512	609	510	585	541.8	539	64
178	3.2	-0.074	492	512	608	508	587	541.4	537	64
179	3.2	-0.073	491	511	606	506	588	540.4	532	64
180	3.1	-0.072	490	510	604	504	589	539.4	530	64
181	3.1	-0.053	489	509	603	502	589	538.4	528	64
182	3.1	-0.068	488	508	601	500	590	537.4	526	64
183	3.1	-0.070	487	507	600	498	590	536.4	523	64
184	3.0	-0.066	486	505	598	496	589	534.8	522	64

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.054	0.00	76	-0.08		23.9		143	481	83	78
1	0.101	0.101	0.058	2.32	77	0	70	23.9	0	155	430	82	78
2	0.252	0.151	0.055	2.27	77	0	107	23.7	-0.2	148	480	82	78
3	0.397	0.145	0.059	2.26	78	-2.68	99	23.5	-0.2	143	554	81	78
4	0.546	0.149	0.054	2.23	78	-0.89	107	23.3	-0.2	146	626	82	78
5	0.691	0.145	0.054	2.23	77	-1.86	104	23.1	-0.2	150	667	82	78
6	0.839	0.148	0.058	2.22	77	-2.13	103	22.9	-0.2	154	698	83	78
7	0.982	0.143	0.055	2.22	77	-1.18	103	22.6	-0.3	158	729	84	78
8	1.128	0.146	0.052	2.19	77	0	108	22.4	-0.2	159	746	84	78
9	1.273	0.145	0.057	2.30	77	0	102	22.2	-0.2	153	720	84	78
10	1.424	0.151	0.060	2.30	77	-0.44	102	22.0	-0.2	144	685	84	78
11	1.571	0.147	0.049	2.29	77	-1.76	110	22.0	0	137	654	84	78
12	1.722	0.151	0.057	2.29	77	-2.26	104	21.9	-0.1	133	639	83	78
13	1.867	0.145	0.059	2.30	77	-2.72	98	21.7	-0.2	130	630	83	78
14	2.018	0.151	0.051	2.30	77	-2.46	110	21.6	-0.1	129	626	82	78
15	2.164	0.146	0.054	2.30	77	-2.66	103	21.4	-0.2	128	624	82	78
16	2.315	0.151	0.053	2.29	78	-2.56	107	21.3	-0.1	127	621	82	78
17	2.460	0.145	0.059	2.25	78	-0.01	98	21.1	-0.2	126	617	83	78
18	2.612	0.152	0.062	2.27	78	-2.76	100	21.0	-0.1	126	615	83	78
19	2.757	0.145	0.057	2.29	78	-1.07	99	20.9	-0.1	125	614	84	78
20	2.909	0.152	0.059	2.26	78	-2.51	102	20.7	-0.2	125	613	84	78
21	3.055	0.146	0.061	2.27	78	-2.48	97	20.6	-0.1	125	610	84	78
22	3.206	0.151	0.060	2.27	78	-2.71	101	20.4	-0.2	124	610	84	78
23	3.352	0.146	0.058	2.29	79	0	99	20.3	-0.1	124	610	83	78
24	3.503	0.151	0.062	2.26	78	-1.55	99	20.1	-0.2	124	609	83	78
25	3.649	0.146	0.060	2.27	79	-2.6	97	19.9	-0.2	124	609	82	78
26	3.799	0.150	0.053	2.28	79	-2.59	106	19.8	-0.1	125	610	82	78
27	3.945	0.146	0.059	2.28	79	-2	98	19.7	-0.1	124	609	82	78
28	4.095	0.150	0.053	2.25	79	-2.48	106	19.5	-0.2	124	610	82	78
29	4.242	0.147	0.063	2.27	80	0	95	19.4	-0.1	123	608	83	78
30	4.392	0.150	0.056	2.26	79	-0.22	103	19.2	-0.2	124	607	84	78
31	4.539	0.147	0.060	2.26	79	0	98	19.1	-0.1	123	608	84	79
32	4.688	0.149	0.056	2.25	79	-0.7	102	19.0	-0.1	123	608	84	78

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	4.838	0.150	0.054	2.25	79	-2.61	105	18.8	-0.2	124	608	84	78
34	4.986	0.148	0.052	2.26	80	-2.01	105	18.7	-0.1	124	608	84	78
35	5.136	0.150	0.057	2.26	80	-2.47	102	18.6	-0.1	123	608	83	78
36	5.284	0.148	0.052	2.26	81	-1.82	105	18.4	-0.2	123	607	83	78
37	5.435	0.151	0.057	2.26	80	-0.2	103	18.3	-0.1	123	607	82	79
38	5.581	0.146	0.060	2.28	80	-2.56	97	18.1	-0.2	123	606	82	78
39	5.731	0.150	0.058	2.26	80	-0.07	101	18.0	-0.1	124	607	82	79
40	5.877	0.146	0.055	2.26	79	-0.86	101	17.8	-0.2	124	607	83	78
41	6.029	0.152	0.059	2.25	80	-1.93	102	17.7	-0.1	123	610	83	79
42	6.174	0.145	0.053	2.25	80	-2.65	102	17.6	-0.1	123	612	84	78
43	6.326	0.152	0.058	2.25	80	-0.19	102	17.4	-0.2	123	611	84	79
44	6.472	0.146	0.048	2.24	81	-0.53	108	17.3	-0.1	124	611	84	78
45	6.624	0.152	0.054	2.25	81	-2.34	106	17.1	-0.2	124	611	84	79
46	6.771	0.147	0.060	2.25	82	-2.73	97	17.0	-0.1	124	609	84	79
47	6.922	0.151	0.060	2.26	81	0	100	16.9	-0.1	124	607	83	78
48	7.069	0.147	0.061	2.23	80	-2.61	97	16.7	-0.2	124	604	82	79
49	7.220	0.151	0.054	2.25	81	-0.87	105	16.5	-0.2	122	601	82	79
50	7.366	0.146	0.054	2.25	81	-0.2	102	16.5	0	123	600	82	79
51	7.516	0.150	0.057	2.23	81	-2.52	102	16.4	-0.1	122	598	83	78
52	7.664	0.148	0.055	2.25	82	-2.59	102	16.1	-0.3	122	597	83	79
53	7.814	0.150	0.056	2.25	82	-1.07	102	16.1	0	122	597	83	79
54	7.962	0.148	0.057	2.24	81	-2.62	100	16.0	-0.1	123	598	84	79
55	8.112	0.150	0.066	2.23	81	-1.2	95	15.9	-0.1	123	597	84	78
56	8.262	0.150	0.056	2.24	81	0	103	15.6	-0.3	123	599	84	79
57	8.410	0.148	0.057	2.22	83	0	100	15.6	0	123	600	83	79
58	8.560	0.150	0.060	2.23	82	0	99	15.5	-0.1	123	602	83	79
59	8.708	0.148	0.056	2.24	82	-0.47	101	15.4	-0.1	123	604	82	79
60	8.858	0.150	0.059	2.25	81	-1.59	100	15.2	-0.2	123	606	82	79
61	9.013	0.155	0.056	2.58	82	-0.6	106	15.1	-0.1	123	609	82	79
62	9.169	0.156	0.052	2.35	82	-1.41	111	14.9	-0.2	123	611	83	79
63	9.319	0.150	0.060	2.34	82	-0.4	99	14.8	-0.1	124	612	83	79
64	9.472	0.153	0.054	2.36	82	-0.01	107	14.7	-0.1	125	615	83	79
65	9.624	0.152	0.055	2.33	82	-2.46	105	14.5	-0.2	124	619	84	79

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	9.777	0.153	0.054	2.35	82	-2.33	107	14.4	-0.1	125	619	85	79
67	9.932	0.155	0.056	2.36	83	-1.64	106	14.2	-0.2	124	622	84	79
68	10.080	0.148	0.056	2.34	84	-2.01	101	14.1	-0.1	124	624	84	79
69	10.235	0.155	0.055	2.34	83	-0.59	107	13.9	-0.2	125	626	83	80
70	10.386	0.151	0.052	2.35	82	0	107	13.8	-0.1	126	627	82	79
71	10.542	0.156	0.058	2.34	82	-0.62	105	13.6	-0.2	126	629	82	79
72	10.691	0.149	0.058	2.32	83	0	100	13.5	-0.1	126	631	82	79
73	10.844	0.153	0.051	2.35	82	-0.6	110	13.4	-0.1	126	633	83	79
74	10.997	0.153	0.066	2.33	83	-2.28	96	13.2	-0.2	125	632	83	79
75	11.149	0.152	0.059	2.34	83	-0.25	101	13.1	-0.1	126	635	83	79
76	11.303	0.154	0.054	2.34	83	-2.57	107	12.9	-0.2	126	638	84	80
77	11.452	0.149	0.057	2.34	83	-0.07	101	12.9	0	126	638	84	80
78	11.608	0.156	0.056	2.34	84	-2.39	107	12.8	-0.1	126	639	84	80
79	11.758	0.150	0.055	2.33	83	-2.57	103	12.5	-0.3	125	642	84	80
80	11.912	0.154	0.057	2.34	84	0	104	12.3	-0.2	126	645	83	80
81	12.063	0.151	0.051	2.34	83	-0.11	108	12.1	-0.2	127	649	83	80
82	12.216	0.153	0.062	2.32	84	-0.94	99	12.0	-0.1	127	650	82	80
83	12.370	0.154	0.054	2.34	83	0	107	12.0	0	127	650	82	80
84	12.520	0.150	0.062	2.30	84	-0.11	97	12.0	0	127	651	83	80
85	12.674	0.154	0.053	2.33	83	-2.62	108	11.8	-0.2	127	651	83	80
86	12.823	0.149	0.056	2.33	84	0	102	11.6	-0.2	126	651	84	80
87	12.979	0.156	0.056	2.32	84	-1.96	107	11.5	-0.1	128	650	84	80
88	13.129	0.150	0.057	2.32	84	0	102	11.4	-0.1	127	649	85	80
89	13.282	0.153	0.062	2.32	83	-1.2	100	11.3	-0.1	127	645	84	80
90	13.432	0.150	0.054	2.32	84	-1.93	104	11.0	-0.3	127	643	84	80
91	13.585	0.153	0.054	2.32	84	-1.27	106	11.0	0	127	643	83	80
92	13.739	0.154	0.055	2.31	84	-0.72	106	10.9	-0.1	127	641	83	80
93	13.889	0.150	0.058	2.31	84	0	101	10.7	-0.2	127	642	82	80
94	14.043	0.154	0.051	2.34	84	0	110	10.7	0	126	642	82	80
95	14.192	0.149	0.058	2.31	85	0	100	10.6	-0.1	126	640	82	80
96	14.348	0.156	0.055	2.30	83	-0.95	108	10.5	-0.1	126	640	83	80
97	14.498	0.150	0.061	2.31	83	-0.66	98	10.4	-0.1	127	641	83	80
98	14.650	0.152	0.057	2.34	84	-2.62	103	10.2	-0.2	126	642	83	80

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	14.801	0.151	0.056	2.30	84	-1.19	103	10.1	-0.1	127	642	84	80
100	14.954	0.153	0.050	2.32	84	0	111	10.0	-0.1	126	642	83	80
101	15.107	0.153	0.058	2.31	84	-2.75	103	9.8	-0.2	125	637	83	80
102	15.257	0.150	0.055	2.32	85	-1.5	103	9.8	0	126	638	83	80
103	15.411	0.154	0.063	2.32	84	-2.67	99	9.8	0	125	638	82	80
104	15.559	0.148	0.059	2.30	84	-2.22	98	9.5	-0.3	125	641	82	80
105	15.715	0.156	0.053	2.31	84	-1.96	110	9.4	-0.1	126	640	83	81
106	15.864	0.149	0.054	2.31	84	-0.97	104	9.2	-0.2	126	639	83	81
107	16.017	0.153	0.051	2.29	84	-2.75	109	9.1	-0.1	125	636	84	80
108	16.167	0.150	0.056	2.29	85	-0.13	102	9.0	-0.1	125	634	84	80
109	16.319	0.152	0.057	2.29	84	-1.02	103	8.9	-0.1	125	631	84	80
110	16.472	0.153	0.056	2.29	84	-0.85	104	8.9	0	125	625	84	80
111	16.623	0.151	0.058	2.28	85	-2.56	101	8.8	-0.1	124	621	83	80
112	16.775	0.152	0.060	2.30	84	-1.37	100	8.5	-0.3	124	619	83	81
113	16.924	0.149	0.056	2.30	84	-2.36	102	8.6	0.1	124	617	82	81
114	17.078	0.154	0.065	2.27	85	-0.37	97	8.4	-0.2	124	616	82	81
115	17.228	0.150	0.055	2.28	85	0	103	8.4	0	124	615	82	81
116	17.382	0.154	0.055	2.27	85	-0.78	106	8.3	-0.1	123	614	83	81
117	17.531	0.149	0.056	2.29	85	-2.01	101	8.2	-0.1	123	612	83	81
118	17.683	0.152	0.058	2.29	85	-2.63	102	8.1	-0.1	123	609	84	81
119	17.834	0.151	0.062	2.31	85	-2.55	98	8.0	-0.1	123	605	84	81
120	17.986	0.152	0.055	2.29	85	-2.45	104	7.9	-0.1	123	603	84	81
121	18.139	0.153	0.057	2.28	85	-2.1	103	7.8	-0.1	123	600	83	81
122	18.288	0.149	0.053	2.29	85	-0.06	104	7.8	0	122	599	83	81
123	18.441	0.153	0.058	2.29	85	0	102	7.6	-0.2	122	597	82	81
124	18.590	0.149	0.058	2.27	85	-1.83	99	7.6	0	121	594	82	81
125	18.745	0.155	0.061	2.29	86	-2.5	101	7.5	-0.1	121	591	82	81
126	18.894	0.149	0.055	2.28	85	-2.42	102	7.3	-0.2	121	588	83	80
127	19.047	0.153	0.059	2.27	86	-1.38	101	7.3	0	121	584	83	81
128	19.196	0.149	0.055	2.27	86	-1.16	102	7.3	0	120	579	84	80
129	19.348	0.152	0.056	2.28	85	-2.42	103	7.2	-0.1	120	572	84	81
130	19.500	0.152	0.054	2.26	85	0	105	7.2	0	120	566	83	81
131	19.651	0.151	0.050	2.26	86	-0.44	108	7.0	-0.2	118	561	84	80

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
132	19.804	0.153	0.054	2.28	85	-0.65	106	7.1	0.1	119	556	83	80
133	19.952	0.148	0.060	2.28	85	-2.44	97	7.0	-0.1	118	551	83	81
134	20.105	0.153	0.057	2.28	87	-0.62	102	7.1	0.1	117	547	82	81
135	20.255	0.150	0.057	2.27	86	-0.09	100	6.9	-0.2	118	544	82	81
136	20.409	0.154	0.057	2.26	86	-1.21	103	6.9	0	117	540	82	81
137	20.558	0.149	0.058	2.26	85	0	99	6.8	-0.1	117	536	82	81
138	20.710	0.152	0.061	2.26	86	-2.04	98	6.8	0	117	534	83	80
139	20.860	0.150	0.054	2.28	85	-2.1	103	6.7	-0.1	117	531	83	81
140	21.012	0.152	0.055	2.26	86	-2.42	104	6.7	0	117	527	84	81
141	21.164	0.152	0.065	2.26	86	-2.69	95	6.6	-0.1	117	526	83	81
142	21.315	0.151	0.054	2.28	85	-0.31	104	6.6	0	117	523	83	81
143	21.467	0.152	0.056	2.28	85	-1.45	103	6.4	-0.2	116	520	82	81
144	21.616	0.149	0.057	2.27	85	-1.91	100	6.5	0.1	116	518	82	81
145	21.769	0.153	0.054	2.26	86	-0.37	105	6.4	-0.1	116	517	82	81
146	21.918	0.149	0.054	2.27	87	-2.39	102	6.4	0	116	516	82	81
147	22.072	0.154	0.058	2.26	86	-0.04	102	6.3	-0.1	116	515	82	81
148	22.221	0.149	0.061	2.25	86	-2.41	96	6.3	0	115	514	82	81
149	22.372	0.151	0.059	2.25	86	-1.64	99	6.2	-0.1	115	510	83	81
150	22.522	0.150	0.060	2.28	86	-0.07	98	6.2	0	115	508	83	81
151	22.674	0.152	0.062	2.27	86	-2.66	97	6.1	-0.1	115	505	83	81
152	22.826	0.152	0.061	2.25	86	-1.12	98	6.0	-0.1	115	503	83	81
153	22.976	0.150	0.052	2.23	86	-1.53	105	6.1	0.1	115	501	82	81
154	23.128	0.152	0.057	2.27	86	-0.21	102	6.0	-0.1	115	499	82	81
155	23.276	0.148	0.053	2.26	86	0	102	6.0	0	114	497	82	81
156	23.429	0.153	0.066	2.26	86	-0.54	95	5.8	-0.2	114	496	81	81
157	23.578	0.149	0.060	2.26	87	-2.79	97	5.9	0.1	114	494	82	81
158	23.732	0.154	0.054	2.24	86	0	106	5.9	0	114	493	83	81
159	23.881	0.149	0.058	2.27	86	-2.27	99	5.8	-0.1	114	492	83	82
160	24.032	0.151	0.053	2.26	85	-1.53	105	5.8	0	113	491	84	81
161	24.182	0.150	0.057	2.27	86	-2.73	100	5.7	-0.1	114	490	83	81
162	24.333	0.151	0.058	2.25	86	-2.48	100	5.7	0	113	488	83	81
163	24.485	0.152	0.057	2.25	86	-1.66	101	5.7	0	113	488	83	81
164	24.635	0.150	0.054	2.24	86	-0.08	103	5.6	-0.1	113	487	83	82

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
165	24.788	0.153	0.054	2.27	87	-0.68	105	5.6	0	113	485	82	81
166	24.936	0.148	0.055	2.26	86	0	100	5.6	0	113	481	82	81
167	25.089	0.153	0.054	2.25	87	0	105	5.6	0	113	478	82	81
168	25.238	0.149	0.059	2.27	86	0	98	5.5	-0.1	113	475	82	81
169	25.392	0.154	0.054	2.26	87	-2.3	105	5.5	0	112	472	83	81
170	25.540	0.148	0.059	2.23	86	-1.77	97	5.5	0	112	470	83	82
171	25.693	0.153	0.057	2.29	86	0	102	5.4	-0.1	112	469	83	81
172	25.842	0.149	0.056	2.29	87	-2.32	100	5.4	0	111	466	83	81
173	25.993	0.151	0.060	2.25	87	0	98	5.4	0	112	464	83	81
174	26.145	0.152	0.065	2.23	87	-2.5	95	5.4	0	112	462	83	81
175	26.295	0.150	0.059	2.25	87	-2.66	98	5.3	-0.1	111	459	83	81
176	26.448	0.153	0.060	2.24	87	-2.65	99	5.3	0	111	457	82	81
177	26.596	0.148	0.055	2.25	87	-2.5	100	5.3	0	111	456	82	81
178	26.749	0.153	0.053	2.24	86	-2.2	106	5.3	0	111	454	82	82
179	26.897	0.148	0.064	2.25	87	-0.71	93	5.2	-0.1	111	451	82	81
180	27.052	0.155	0.060	2.23	87	-0.88	100	5.2	0	111	449	82	81
181	27.200	0.148	0.066	2.24	87	-0.43	91	5.2	0	111	447	83	82
182	27.353	0.153	0.051	2.25	88	-2.64	107	5.2	0	110	445	83	82
183	27.501	0.148	0.056	2.24	88	-0.9	99	5.0	-0.2	110	442	83	81
184	27.653	0.152	0.059	2.24	87	-2.46	99	5.1	0.1	110	439	83	81
185	27.804	0.151	0.057	2.25	87	-2.66	100	5.1	0	110	434	84	81
186	27.955	0.151	0.060	2.24	87	-2.66	98	5.1	0	110	431	82	81
187	28.108	0.153	0.061	2.23	88	-2.47	98	5.0	-0.1	109	429	82	82
188	28.256	0.148	0.060	2.27	87	-1.24	96	5.1	0.1	110	426	82	81
189	28.409	0.153	0.061	2.25	87	-2.18	98	5.0	-0.1	110	424	82	82
190	28.556	0.147	0.057	2.25	87	-0.36	98	5.0	0	109	422	82	81
191	28.711	0.155	0.055	2.23	88	-1.16	104	5.0	0	109	420	82	81
192	28.859	0.148	0.056	2.23	87	-2.64	99	4.9	-0.1	109	418	83	81
193	29.013	0.154	0.055	2.22	87	0	104	4.9	0	109	416	83	81
194	29.161	0.148	0.057	2.24	87	-1.53	98	4.9	0	108	414	83	82
195	29.313	0.152	0.064	2.25	87	-1.53	95	4.9	0	109	412	83	82
196	29.462	0.149	0.054	2.24	87	-0.17	101	4.9	0	108	411	83	82
197	29.614	0.152	0.059	2.23	87	-0.68	99	4.9	0	108	410	82	82

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
198	29.766	0.152	0.056	2.25	87	-2.65	102	4.8	-0.1	109	409	82	81
199	29.916	0.150	0.057	2.22	87	-2.67	99	4.8	0	108	407	82	81
200	30.068	0.152	0.061	2.24	87	-2.46	97	4.8	0	108	406	82	81
201	30.216	0.148	0.055	2.25	87	-1.15	100	4.8	0	108	405	82	82
202	30.370	0.154	0.056	2.25	87	-2.4	103	4.7	-0.1	108	404	83	82
203	30.519	0.149	0.055	2.23	87	-1.17	101	4.7	0	108	402	83	82
204	30.672	0.153	0.061	2.23	87	-1.72	98	4.7	0	108	402	83	82
205	30.821	0.149	0.054	2.25	87	-2.24	101	4.6	-0.1	108	400	83	82
206	30.972	0.151	0.058	2.23	87	-0.65	99	4.6	0	108	399	83	82
207	31.122	0.150	0.059	2.26	87	-0.34	98	4.6	0	107	399	82	82
208	31.274	0.152	0.060	2.25	87	-0.02	98	4.6	0	107	397	82	82
209	31.426	0.152	0.056	2.23	88	-2.26	101	4.6	0	107	397	82	82
210	31.576	0.150	0.055	2.23	87	-2.72	101	4.6	0	107	396	82	82
211	31.728	0.152	0.060	2.25	87	-1.18	98	4.5	-0.1	107	395	82	82
212	31.876	0.148	0.052	2.25	87	-2.65	103	4.5	0	107	394	83	82
213	32.029	0.153	0.052	2.25	87	-2.62	106	4.5	0	107	393	83	81
214	32.178	0.149	0.062	2.23	87	-0.06	95	4.5	0	107	391	83	82
215	32.331	0.153	0.054	2.23	88	-2.61	104	4.5	0	107	391	83	82
216	32.480	0.149	0.054	2.21	88	-1.36	101	4.5	0	107	390	83	82
217	32.632	0.152	0.057	2.26	87	-0.13	101	4.4	-0.1	107	389	83	82
218	32.781	0.149	0.062	2.24	88	0	94	4.3	-0.1	107	389	82	82
219	32.932	0.151	0.053	2.25	87	-1.78	104	4.5	0.2	107	387	82	82
220	33.083	0.151	0.056	2.24	87	-2.77	101	4.4	-0.1	107	387	82	81
221	33.234	0.151	0.056	2.23	88	-2.65	101	4.3	-0.1	107	387	82	82
222	33.386	0.152	0.053	2.22	88	-2.73	104	4.3	0	107	386	82	82
223	33.534	0.148	0.057	2.24	88	-0.08	98	4.2	-0.1	107	385	83	82
224	33.687	0.153	0.051	2.26	88	-0.01	107	4.2	0	107	384	83	82
225	33.834	0.147	0.058	2.23	88	-0.95	96	4.2	0	107	384	83	82
226	33.989	0.155	0.057	2.24	88	-0.7	102	4.2	0	107	383	83	82
227	34.137	0.148	0.054	2.24	88	0	101	4.0	-0.2	107	383	83	82
228	34.290	0.153	0.057	2.23	88	0	101	4.1	0.1	107	383	82	82
229	34.438	0.148	0.060	2.24	88	-2.69	95	4.1	0	107	382	82	82
230	34.590	0.152	0.054	2.25	88	-0.36	103	4.1	0	107	381	82	82

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
231	34.739	0.149	0.053	2.22	88	-2.3	102	4.1	0	107	380	82	82
232	34.891	0.152	0.053	2.24	88	0	104	4.0	-0.1	107	380	82	82
233	35.043	0.152	0.066	2.24	88	0	93	3.9	-0.1	107	380	83	82
234	35.193	0.150	0.058	2.23	88	-0.01	98	4.0	0.1	106	379	83	82
235	35.344	0.151	0.057	2.25	88	-2.5	100	4.0	0	107	378	83	82
236	35.493	0.149	0.056	2.24	88	-0.47	99	3.9	-0.1	106	379	83	82
237	35.645	0.152	0.055	2.23	88	-0.11	102	3.8	-0.1	107	379	83	82
238	35.794	0.149	0.060	2.23	88	0	96	3.8	0	107	379	83	82
239	35.948	0.154	0.058	2.23	89	-2.41	101	3.8	0	106	379	83	82
240	36.097	0.149	0.056	2.25	88	0	99	3.8	0	107	379	82	82
241	36.248	0.151	0.059	2.22	88	-2.7	98	3.8	0	107	378	82	82
242	36.397	0.149	0.054	2.23	88	-2.7	101	3.7	-0.1	107	378	82	82
243	36.548	0.151	0.059	2.22	88	-0.14	98	3.7	0	106	378	82	82
244	36.700	0.152	0.059	2.23	89	-2.61	99	3.7	0	107	377	83	82
245	36.850	0.150	0.052	2.25	88	-2.45	104	3.7	0	107	378	83	82
246	37.003	0.153	0.053	2.24	88	-2.68	105	3.6	-0.1	106	377	84	82
247	37.150	0.147	0.059	2.23	89	-2.58	95	3.6	0	106	377	83	82
248	37.303	0.153	0.066	2.24	88	-1.13	94	3.6	0	106	376	83	82
249	37.450	0.147	0.061	2.22	88	-0.21	94	3.6	0	107	375	83	82
250	37.605	0.155	0.060	2.21	88	-2.58	100	3.7	0.1	106	375	82	82
251	37.753	0.148	0.052	2.24	88	-2.26	102	3.5	-0.2	106	375	82	82
252	37.906	0.153	0.065	2.22	88	-2.67	95	3.5	0	106	375	82	82
253	38.054	0.148	0.051	2.24	88	-0.14	103	3.5	0	107	374	82	82
254	38.205	0.151	0.054	2.24	88	-0.04	103	3.5	0	107	374	83	82
255	38.354	0.149	0.059	2.22	88	0	97	3.5	0	106	374	83	82
256	38.506	0.152	0.057	2.22	88	-0.09	100	3.5	0	106	374	84	82
257	38.658	0.152	0.057	2.23	89	0	100	3.4	-0.1	106	373	83	82
258	38.807	0.149	0.053	2.24	88	-2.65	102	3.3	-0.1	106	373	83	82
259	38.959	0.152	0.054	2.23	88	-0.66	103	3.4	0.1	106	373	83	82
260	39.108	0.149	0.057	2.20	88	-2.54	98	3.4	0	106	373	83	81
261	39.261	0.153	0.056	2.22	88	-2.48	102	3.3	-0.1	107	373	82	82
262	39.409	0.148	0.057	2.22	88	-0.15	98	3.3	0	106	374	82	82
263	39.563	0.154	0.059	2.25	88	-0.07	100	3.3	0	107	374	82	82

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
264	39.710	0.147	0.059	2.22	88	-1.79	96	3.3	0	107	373	82	82
265	39.864	0.154	0.055	2.23	88	-0.04	104	3.2	-0.1	107	372	82	82
266	40.011	0.147	0.059	2.23	89	-1.82	95	3.3	0.1	106	373	83	82
267	40.163	0.152	0.052	2.22	88	-1.01	105	3.2	-0.1	106	373	83	82
268	40.313	0.150	0.054	2.22	89	0	102	3.2	0	106	372	83	82
269	40.464	0.151	0.055	2.22	88	-1.91	102	3.1	-0.1	106	373	83	82
270	40.616	0.152	0.054	2.23	89	-1.57	103	3.2	0.1	106	372	83	82
271	40.765	0.149	0.056	2.22	88	-2.52	99	3.1	-0.1	107	372	83	82
272	40.917	0.152	0.058	2.23	88	-1.67	100	3.0	-0.1	107	373	82	82
273	41.064	0.147	0.054	2.24	89	-0.82	100	3.1	0.1	106	372	82	82
274	41.217	0.153	0.058	2.23	89	-0.22	100	3.1	0	106	371	82	82
275	41.366	0.149	0.060	2.22	89	-0.19	96	3.1	0	106	371	82	82
276	41.519	0.153	0.057	2.23	88	-0.11	101	3.1	0	106	371	83	82
277	41.668	0.149	0.053	2.20	88	0	102	3.0	-0.1	107	370	83	82
278	41.820	0.152	0.057	2.23	89	-1.82	100	3.0	0	106	371	83	82
279	41.968	0.148	0.054	2.23	89	-2.59	100	3.0	0	106	370	83	82
280	42.119	0.151	0.054	2.22	89	-1.84	102	3.0	0	107	370	83	82
281	42.271	0.152	0.054	2.24	89	-1.69	103	3.0	0	106	369	83	82
282	42.421	0.150	0.061	2.23	89	-2.77	96	3.1	0.1	106	369	82	82
283	42.573	0.152	0.052	2.23	89	-0.84	105	3.0	-0.1	107	370	82	82
284	42.721	0.148	0.058	2.24	89	-2.55	97	2.9	-0.1	107	369	82	82
285	42.873	0.152	0.058	2.21	89	-0.23	99	2.9	0	107	369	82	82
286	43.021	0.148	0.056	2.22	89	-0.18	99	2.9	0	107	369	83	82
287	43.175	0.154	0.055	2.23	89	-0.08	103	2.8	-0.1	107	368	83	82
288	43.323	0.148	0.059	2.20	89	-2.72	96	2.9	0.1	107	369	83	82
289	43.476	0.153	0.057	2.20	89	-0.91	101	2.8	-0.1	107	368	83	82
290	43.624	0.148	0.052	2.21	89	-1.83	102	2.8	0	106	368	83	82
291	43.775	0.151	0.054	2.22	89	-0.26	102	2.8	0	107	368	83	82
292	43.924	0.149	0.055	2.21	89	-0.36	100	2.8	0	106	367	83	82
293	44.075	0.151	0.060	2.22	89	-1.07	97	2.7	-0.1	107	367	82	83
294	44.226	0.151	0.063	2.21	89	0	95	2.7	0	107	367	82	82
295	44.376	0.150	0.061	2.19	89	-1.36	96	2.7	0	106	367	82	82
296	44.529	0.153	0.059	2.20	89	-0.37	99	2.7	0	107	366	83	82

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
297	44.676	0.147	0.056	2.23	89	-0.17	98	2.7	0	107	367	83	82
298	44.829	0.153	0.057	2.20	89	-0.4	101	2.7	0	107	366	84	83
299	44.976	0.147	0.056	2.24	89	-0.41	98	2.6	-0.1	106	365	83	82
300	45.130	0.154	0.053	2.23	89	-2.25	105	2.6	0	107	365	83	82
301	45.278	0.148	0.049	2.22	89	-1.86	105	2.6	0	107	364	83	82
302	45.430	0.152	0.062	2.19	89	-1.93	96	2.6	0	107	364	82	82
303	45.579	0.149	0.063	2.23	89	-2.32	94	2.6	0	107	364	82	82
304	45.730	0.151	0.055	2.24	89	-2.41	101	2.6	0	107	363	81	82
305	45.879	0.149	0.064	2.22	89	-1.96	93	2.5	-0.1	107	362	82	82
306	46.030	0.151	0.054	2.22	89	-0.67	102	2.5	0	107	361	83	82
307	46.181	0.151	0.053	2.22	89	-1.48	103	2.5	0	106	362	83	82
308	46.331	0.150	0.060	2.22	89	-0.11	96	2.5	0	106	361	84	82
309	46.483	0.152	0.056	2.20	89	-0.55	101	2.5	0	106	360	84	82
310	46.631	0.148	0.053	2.24	89	-2.75	101	2.5	0	107	360	83	82
311	46.783	0.152	0.053	2.21	89	-0.28	104	2.4	-0.1	106	360	84	82
312	46.930	0.147	0.057	2.21	89	-2.5	97	2.4	0	106	359	83	82
313	47.083	0.153	0.057	2.22	89	-0.86	101	2.4	0	106	358	83	83
314	47.232	0.149	0.061	2.21	89	0	95	2.4	0	106	358	82	83
315	47.385	0.153	0.062	2.20	89	-0.47	97	2.4	0	106	359	82	83
316	47.533	0.148	0.054	2.21	89	-2.69	100	2.4	0	106	358	82	83
317	47.684	0.151	0.059	2.23	89	-2.41	98	2.3	-0.1	106	358	83	83
318	47.833	0.149	0.057	2.23	89	-2.61	98	2.3	0	106	357	83	82
319	47.984	0.151	0.059	2.19	89	-0.07	98	2.3	0	106	357	83	82
320	48.135	0.151	0.054	2.21	89	-1.76	102	2.3	0	107	357	83	83
321	48.285	0.150	0.057	2.21	89	-1.61	99	2.3	0	106	357	83	83
322	48.437	0.152	0.062	2.22	89	-2.77	96	2.3	0	106	356	83	83
323	48.585	0.148	0.056	2.21	89	-1.9	98	2.2	-0.1	106	356	83	83
324	48.736	0.151	0.056	2.20	89	-2.71	101	2.2	0	107	356	82	83
325	48.884	0.148	0.057	2.21	89	-0.22	98	2.2	0	107	356	82	83
326	49.037	0.153	0.061	2.19	89	-2.67	98	2.2	0	107	355	82	83
327	49.185	0.148	0.057	2.22	90	0	97	2.0	-0.2	106	355	83	83
328	49.338	0.153	0.053	2.20	89	-2.73	105	2.1	0.1	106	355	83	83
329	49.486	0.148	0.055	2.19	89	-1.18	99	2.2	0.1	106	355	83	82

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
330	49.638	0.152	0.059	2.21	90	-0.02	98	2.1	-0.1	106	354	83	83
331	49.786	0.148	0.055	2.22	90	-0.99	99	2.0	-0.1	107	354	83	83
332	49.937	0.151	0.055	2.21	89	-2.61	101	2.1	0.1	106	353	84	83
333	50.087	0.150	0.053	2.22	89	-0.49	103	2.1	0	106	353	83	83
334	50.237	0.150	0.057	2.19	89	-0.11	99	2.0	-0.1	106	353	83	82
335	50.389	0.152	0.063	2.20	90	-1.75	95	2.0	0	106	352	82	83
336	50.538	0.149	0.054	2.21	89	-2.74	101	2.0	0	106	352	82	83
337	50.689	0.151	0.056	2.22	90	-2.75	100	2.0	0	106	352	82	83
338	50.837	0.148	0.060	2.23	90	-2.75	95	2.0	0	106	351	83	83
339	50.989	0.152	0.060	2.22	90	-2.02	97	2.0	0	106	351	83	83
340	51.136	0.147	0.051	2.21	90	-2.63	102	1.9	-0.1	106	349	83	83
341	51.290	0.154	0.057	2.20	90	-0.57	101	1.9	0	106	348	83	83
342	51.438	0.148	0.055	2.20	90	-0.56	99	1.9	0	106	348	84	83
343	51.591	0.153	0.050	2.21	90	-1.15	107	1.9	0	106	347	83	83
344	51.738	0.147	0.061	2.21	90	-0.03	93	1.9	0	106	347	83	83
345	51.889	0.151	0.049	2.21	90	-2.43	107	1.9	0	105	346	83	83
346	52.038	0.149	0.062	2.22	89	-0.79	94	1.9	0	105	346	82	83
347	52.190	0.152	0.054	2.21	90	0	103	1.8	-0.1	105	345	82	83
348	52.341	0.151	0.057	2.21	90	-0.36	99	1.9	0.1	105	344	82	83
349	52.490	0.149	0.060	2.21	90	-0.84	95	1.8	-0.1	105	344	83	83
350	52.642	0.152	0.057	2.19	90	-0.35	100	1.7	-0.1	105	343	83	83
351	52.789	0.147	0.054	2.21	90	-0.06	99	1.8	0.1	105	343	84	83
352	52.942	0.153	0.058	2.21	90	0	100	1.8	0	105	342	84	83
353	53.088	0.146	0.054	2.22	90	-0.08	99	1.8	0	105	341	83	83
354	53.243	0.155	0.053	2.22	90	-0.22	106	1.7	-0.1	105	341	83	83
355	53.390	0.147	0.059	2.22	90	-0.16	95	1.6	-0.1	105	340	83	83
356	53.543	0.153	0.058	2.20	90	-2.66	100	1.7	0.1	105	340	83	83
357	53.691	0.148	0.053	2.21	91	-0.36	101	1.7	0	104	338	82	83
358	53.842	0.151	0.058	2.20	90	-2.66	98	1.7	0	105	337	82	83
359	53.991	0.149	0.055	2.22	90	-1.42	100	1.7	0	105	337	82	83
360	54.142	0.151	0.061	2.19	90	-2.43	96	1.7	0	104	335	82	83
361	54.293	0.151	0.057	2.19	90	-0.14	99	1.6	-0.1	104	335	83	83
362	54.443	0.150	0.058	2.22	90	-2.74	98	1.6	0	104	334	84	83

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
363	54.595	0.152	0.049	2.21	90	-1.75	108	1.6	0	104	334	83	83
364	54.742	0.147	0.049	2.23	90	-0.92	104	1.6	0	104	334	84	83
365	54.894	0.152	0.059	2.19	90	0	98	1.6	0	104	333	83	83
366	55.041	0.147	0.056	2.23	90	-2.13	97	1.6	0	104	332	84	83
367	55.194	0.153	0.062	2.20	91	-2.55	96	1.7	0.1	104	332	83	83
368	55.342	0.148	0.054	2.20	90	-2.7	100	1.6	-0.1	104	331	83	83
369	55.496	0.154	0.057	2.19	91	-2.85	101	1.5	-0.1	104	331	83	83
370	55.644	0.148	0.055	2.20	90	-0.09	99	1.5	0	104	330	82	83
371	55.795	0.151	0.061	2.22	90	-2.74	96	1.5	0	104	329	82	83
372	55.943	0.148	0.055	2.21	90	-0.07	99	1.5	0	104	328	82	83
373	56.094	0.151	0.058	2.20	90	-1.58	98	1.5	0	104	328	83	83
374	56.244	0.150	0.055	2.20	90	0	100	1.5	0	104	328	83	83
375	56.395	0.151	0.052	2.20	90	-2.73	104	1.5	0	104	326	83	83
376	56.546	0.151	0.060	2.21	90	-0.14	97	1.5	0	104	326	83	83
377	56.695	0.149	0.057	2.21	91	-1.87	98	1.4	-0.1	104	326	84	83
378	56.846	0.151	0.055	2.21	90	-0.59	101	1.4	0	104	326	83	83
379	56.993	0.147	0.055	2.21	91	-1.12	98	1.4	0	104	325	83	83
380	57.146	0.153	0.055	2.20	91	-0.11	102	1.5	0.1	104	324	83	83
381	57.293	0.147	0.057	2.23	91	0	96	1.4	-0.1	104	324	82	83
382	57.447	0.154	0.062	2.20	91	-0.86	97	1.4	0	104	324	82	83
383	57.595	0.148	0.056	2.20	90	-0.9	98	1.4	0	104	323	82	83
384	57.748	0.153	0.059	2.21	91	-2.68	99	1.3	-0.1	104	323	82	83
385	57.894	0.146	0.056	2.23	90	-0.4	97	1.4	0.1	103	322	83	83
386	58.046	0.152	0.056	2.21	90	-0.54	101	1.3	-0.1	103	321	83	83
387	58.195	0.149	0.053	2.22	91	-0.35	101	1.3	0	103	321	83	83
388	58.346	0.151	0.066	2.21	90	-0.39	92	1.4	0.1	103	321	83	83
389	58.497	0.151	0.059	2.19	90	-2.66	97	1.3	-0.1	103	320	83	83
390	58.646	0.149	0.054	2.21	90	0	101	1.3	0	104	320	83	83
391	58.799	0.153	0.068	2.20	90	-2.74	92	1.1	-0.2	103	320	83	83
392	58.946	0.147	0.050	2.22	90	-0.24	103	1.3	0.2	103	319	82	83
393	59.098	0.152	0.060	2.19	90	-2.36	97	1.3	0	103	319	82	83
394	59.245	0.147	0.056	2.21	90	-2.86	97	1.2	-0.1	103	318	82	83
395	59.399	0.154	0.052	2.20	90	-2.65	106	1.2	0	103	317	82	83

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
396	59.547	0.148	0.055	2.20	91	-2.09	99	1.2	0	103	317	83	83
397	59.700	0.153	0.061	2.19	90	-0.61	97	1.1	-0.1	103	317	83	83
398	59.847	0.147	0.063	2.19	90	-0.01	92	1.2	0.1	103	316	83	83
399	59.999	0.152	0.056	2.20	90	-0.52	101	1.2	0	103	316	83	83
400	60.147	0.148	0.054	2.19	91	-1.39	100	1.2	0	103	315	83	83
401	60.298	0.151	0.054	2.20	90	-2.35	102	1.1	-0.1	103	314	83	83
402	60.449	0.151	0.058	2.21	90	-0.6	98	1.1	0	103	314	83	83
403	60.599	0.150	0.053	2.20	91	-1.58	102	1.1	0	103	313	83	83
404	60.751	0.152	0.052	2.20	91	-2.75	104	1.1	0	103	313	82	83
405	60.898	0.147	0.050	2.21	91	-0.29	103	1.1	0	103	312	82	83
406	61.050	0.152	0.052	2.18	91	0	104	1.2	0.1	103	312	82	83
407	61.198	0.148	0.055	2.20	91	-2.49	99	1.1	-0.1	103	311	82	83
408	61.351	0.153	0.055	2.18	91	-2.37	102	1.1	0	103	310	83	83
409	61.499	0.148	0.053	2.20	91	-1.91	101	1.1	0	103	310	83	83
410	61.652	0.153	0.052	2.20	91	-0.22	105	1.0	-0.1	103	310	83	83
411	61.800	0.148	0.050	2.21	91	-1.33	104	1.0	0	103	309	83	83
412	61.952	0.152	0.058	2.21	91	-0.03	99	0.9	-0.1	103	308	83	83
413	62.100	0.148	0.059	2.20	91	-1.27	95	1.0	0.1	103	308	83	83
414	62.251	0.151	0.059	2.20	91	-2.35	97	1.0	0	103	307	83	83
415	62.401	0.150	0.054	2.19	91	-2.64	101	1.0	0	103	306	83	83
416	62.551	0.150	0.058	2.20	91	0	97	1.0	0	103	306	82	83
417	62.703	0.152	0.056	2.19	90	-2.26	101	1.0	0	103	305	82	83
418	62.852	0.149	0.062	2.21	91	-0.52	94	1.0	0	103	304	82	83
419	63.003	0.151	0.057	2.20	91	-1.97	99	1.0	0	103	305	82	83
420	63.151	0.148	0.058	2.23	91	-1.99	96	1.0	0	103	303	83	83
421	63.303	0.152	0.058	2.21	91	-2.54	99	0.9	-0.1	102	303	83	83
422	63.451	0.148	0.058	2.21	91	-0.01	96	0.9	0	102	302	83	83
423	63.605	0.154	0.057	2.21	91	-0.97	101	0.9	0	102	302	83	83
424	63.752	0.147	0.058	2.20	90	-0.11	96	0.9	0	103	301	83	83
425	63.905	0.153	0.056	2.20	91	-0.06	101	0.9	0	102	301	83	83
426	64.052	0.147	0.059	2.18	91	-0.91	95	0.9	0	102	300	82	83
427	64.204	0.152	0.062	2.22	91	-0.65	95	0.9	0	102	299	82	83
428	64.352	0.148	0.062	2.21	91	-1.36	93	0.9	0	103	298	82	83

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
429	64.504	0.152	0.066	2.21	90	0	93	0.9	0	102	298	82	83
430	64.654	0.150	0.058	2.20	91	-2.41	97	0.9	0	102	298	83	83
431	64.804	0.150	0.052	2.20	91	-2.73	103	0.8	-0.1	102	297	84	83
432	64.956	0.152	0.057	2.22	91	0	99	0.8	0	102	296	84	83
433	65.102	0.146	0.061	2.22	91	-2.38	92	0.8	0	102	296	84	83
434	65.255	0.153	0.060	2.22	91	-1.02	98	0.8	0	102	295	83	83
435	65.402	0.147	0.049	2.21	91	-1.82	104	0.8	0	102	294	83	83
436	65.556	0.154	0.057	2.20	91	-2.78	101	0.8	0	102	294	83	83
437	65.703	0.147	0.056	2.21	91	-0.39	97	0.8	0	102	293	83	83
438	65.856	0.153	0.056	2.20	91	-2.7	101	0.8	0	102	292	83	83
439	66.004	0.148	0.056	2.20	91	-0.14	98	0.8	0	101	291	82	83
440	66.155	0.151	0.054	2.23	91	-2.2	101	0.7	-0.1	101	291	82	83
441	66.304	0.149	0.052	2.21	91	-0.81	102	0.8	0.1	101	291	83	83
442	66.454	0.150	0.060	2.20	91	-0.25	96	0.7	-0.1	101	290	83	83
443	66.605	0.151	0.060	2.20	90	-2.5	96	0.8	0.1	101	289	84	83
444	66.755	0.150	0.050	2.20	91	-2.42	105	0.7	-0.1	101	289	84	83
445	66.907	0.152	0.055	2.19	91	-2.73	101	0.7	0	101	288	84	83
446	67.055	0.148	0.054	2.20	91	-0.2	99	0.7	0	101	287	83	83
447	67.207	0.152	0.059	2.21	91	0	98	0.7	0	101	287	83	83
448	67.354	0.147	0.059	2.20	91	-1.64	94	0.7	0	101	286	83	83
449	67.507	0.153	0.056	2.21	91	-1.84	101	0.7	0	101	286	83	83
450	67.655	0.148	0.055	2.21	91	-2.63	98	0.7	0	100	286	82	83
451	67.809	0.154	0.060	2.21	90	-0.85	98	0.7	0	101	284	82	83
452	67.957	0.148	0.062	2.19	91	-0.13	93	0.7	0	101	284	83	83
453	68.109	0.152	0.055	2.19	91	-2.59	101	0.6	-0.1	101	284	83	83
454	68.256	0.147	0.057	2.18	91	-2.81	96	0.7	0.1	100	283	84	83
455	68.407	0.151	0.058	2.20	91	-2.54	98	0.6	-0.1	100	283	84	83
456	68.557	0.150	0.051	2.20	90	-1.53	104	0.6	0	100	282	83	83
457	68.708	0.151	0.058	2.18	91	-2.7	98	0.6	0	101	281	83	83
458	68.859	0.151	0.058	2.21	91	-0.35	98	0.6	0	100	281	83	83
459	69.008	0.149	0.051	2.22	92	-0.08	103	0.6	0	100	280	83	83
460	69.160	0.152	0.056	2.22	90	0	100	0.6	0	100	279	83	83
461	69.307	0.147	0.056	2.24	91	-0.05	97	0.6	0	101	279	82	83

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
462	69.460	0.153	0.052	2.20	90	-0.01	105	0.6	0	100	278	82	83
463	69.607	0.147	0.059	2.21	91	-2.53	94	0.6	0	100	278	82	82
464	69.761	0.154	0.050	2.19	91	-2.11	107	0.7	0.1	100	277	83	83
465	69.909	0.148	0.053	2.21	91	-2.02	100	0.6	-0.1	100	277	83	83
466	70.062	0.153	0.057	2.20	90	-2.84	100	0.6	0	99	276	83	82
467	70.209	0.147	0.050	2.22	91	-1.9	103	0.5	-0.1	100	276	83	83
468	70.361	0.152	0.056	2.20	91	-2.66	100	0.5	0	100	275	83	83
469	70.509	0.148	0.054	2.22	90	-0.05	100	0.5	0	100	274	83	83
470	70.661	0.152	0.060	2.19	91	-2.33	97	0.5	0	99	273	82	83
471	70.812	0.151	0.056	2.20	91	-2.73	99	0.5	0	99	273	82	83
472	70.961	0.149	0.060	2.19	91	-0.31	95	0.5	0	99	272	82	83
473	71.113	0.152	0.062	2.20	91	-2.62	95	0.5	0	99	271	82	82
474	71.260	0.147	0.054	2.19	90	0	99	0.5	0	99	271	83	82
475	71.413	0.153	0.057	2.19	90	-1.59	100	0.5	0	99	270	84	83
476	71.561	0.148	0.061	2.20	90	-2.53	94	0.5	0	99	270	83	83
477	71.714	0.153	0.058	2.20	91	-0.29	99	0.5	0	99	269	84	83
478	71.862	0.148	0.059	2.20	91	-1.02	95	0.5	0	99	269	83	83
479	72.015	0.153	0.058	2.19	90	-2.39	99	0.5	0	99	268	83	83
480	72.162	0.147	0.055	2.21	91	-0.53	98	0.4	-0.1	99	267	83	83
481	72.314	0.152	0.059	2.19	91	-1.5	97	0.5	0.1	98	267	82	82
482	72.463	0.149	0.060	2.20	91	-2.75	95	0.4	-0.1	99	266	82	82
483	72.614	0.151	0.061	2.20	90	-0.16	95	0.4	0	98	266	82	82
484	72.765	0.151	0.061	2.21	91	-0.15	95	0.4	0	98	265	82	82
485	72.914	0.149	0.059	2.20	90	0	96	0.5	0.1	99	265	82	82
486	73.067	0.153	0.055	2.21	90	-2.73	102	0.4	-0.1	98	263	84	83
487	73.213	0.146	0.057	2.21	91	-0.23	95	0.4	0	98	263	84	82
488	73.366	0.153	0.054	2.23	91	-0.26	103	0.4	0	98	262	84	82
489	73.513	0.147	0.062	2.20	91	-0.07	92	0.4	0	98	262	84	82
490	73.667	0.154	0.056	2.20	90	-1.81	102	0.4	0	98	261	84	82
491	73.815	0.148	0.056	2.18	90	-0.28	98	0.4	0	98	261	83	82
492	73.967	0.152	0.060	2.21	91	-2.24	97	0.4	0	98	260	83	82
493	74.115	0.148	0.065	2.20	90	-0.08	91	0.4	0	98	260	83	82
494	74.267	0.152	0.056	2.22	90	-0.59	100	0.4	0	98	259	83	82

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
495	74.415	0.148	0.056	2.21	90	-0.73	98	0.3	-0.1	98	259	82	82
496	74.566	0.151	0.053	2.20	90	-1.66	102	0.3	0	98	258	82	82
497	74.717	0.151	0.057	2.21	91	-0.3	98	0.3	0	97	258	82	82
498	74.867	0.150	0.055	2.20	90	-0.87	100	0.3	0	97	257	83	82
499	75.018	0.151	0.057	2.22	91	-0.04	98	0.3	0	97	257	84	82
500	75.166	0.148	0.058	2.20	90	-2.59	96	0.3	0	97	256	84	82
501	75.318	0.152	0.055	2.21	90	-0.1	101	0.3	0	97	256	84	82
502	75.466	0.148	0.051	2.19	90	-1.24	102	0.3	0	97	255	84	82
503	75.618	0.152	0.058	2.21	90	-0.98	98	0.3	0	97	254	83	82
504	75.766	0.148	0.055	2.20	90	-1.24	98	0.3	0	97	254	84	82
505	75.919	0.153	0.059	2.20	90	-1.88	98	0.3	0	97	253	83	82
506	76.067	0.148	0.062	2.19	90	-0.05	93	0.3	0	96	252	83	82
507	76.219	0.152	0.056	2.23	90	-2.81	100	0.3	0	97	253	82	82
508	76.367	0.148	0.058	2.20	90	-0.26	96	0.3	0	97	252	82	81
509	76.518	0.151	0.058	2.22	90	-2.8	98	0.4	0.1	96	252	83	81
510	76.668	0.150	0.060	2.20	91	-0.02	95	0.3	-0.1	96	250	83	81
511	76.819	0.151	0.057	2.21	90	-1.26	98	0.3	0	96	250	84	81
512	76.970	0.151	0.054	2.19	90	-1.17	101	0.2	-0.1	96	249	84	82
513	77.119	0.149	0.058	2.19	90	-2.76	96	0.3	0.1	96	249	83	82
514	77.271	0.152	0.058	2.21	90	-0.13	98	0.2	-0.1	96	249	83	82
515	77.418	0.147	0.061	2.19	90	-0.39	93	0.2	0	96	248	83	82
516	77.571	0.153	0.053	2.20	91	-0.81	103	0.2	0	96	248	83	82
517	77.718	0.147	0.059	2.19	90	-2.42	94	0.2	0	96	248	82	82
518	77.872	0.154	0.052	2.21	91	-0.24	105	0.2	0	96	247	82	82
519	78.020	0.148	0.051	2.20	90	-0.25	102	0.2	0	96	247	82	81
520	78.173	0.153	0.057	2.21	90	-0.24	100	0.2	0	96	245	83	81
521	78.320	0.147	0.060	2.20	91	-1.72	93	0.2	0	96	245	83	82
522	78.472	0.152	0.059	2.21	90	-1.34	97	0.2	0	96	245	84	81
523	78.621	0.149	0.056	2.21	90	-0.9	98	0.2	0	95	244	84	82
524	78.772	0.151	0.053	2.22	90	-1.53	102	0.2	0	96	244	84	82
525	78.923	0.151	0.052	2.20	90	0	103	0.2	0	95	243	83	81
526	79.072	0.149	0.054	2.21	90	-0.1	100	0.2	0	96	243	83	81
527	79.225	0.153	0.057	2.20	90	-0.56	100	0.2	0	95	242	83	81

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
528	79.371	0.146	0.059	2.21	90	-2.56	94	0.1	-0.1	95	241	82	81
529	79.524	0.153	0.057	2.21	90	-2.68	100	0.1	0	95	241	82	81
530	79.671	0.147	0.058	2.22	90	-2.13	95	0.1	0	95	240	82	81
531	79.826	0.155	0.064	2.20	90	0	95	0.1	0	96	240	83	82
532	79.973	0.147	0.060	2.20	90	-2.21	93	0.1	0	95	240	83	81
533	80.127	0.154	0.056	2.21	90	-2.73	101	0.1	0	95	239	84	82
534	80.274	0.147	0.055	2.21	90	0	98	0.1	0	95	239	84	81
535	80.426	0.152	0.054	2.22	90	-0.15	102	0.1	0	94	238	83	81
536	80.575	0.149	0.057	2.21	90	-0.17	97	0.1	0	94	239	83	81
537	80.726	0.151	0.062	2.20	90	-1.67	94	0.1	0	94	237	83	81
538	80.877	0.151	0.060	2.19	89	-0.91	96	0.1	0	94	236	83	81
539	81.026	0.149	0.055	2.21	91	-2.48	99	0.0	-0.1	95	237	82	81
Avg/Tot	81.026	0.150	0.057	2.23	87	-1.30	100			110	416	83	81.5

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
0	0.000		0.00	80	-1		84	0.000	2.42	0.27
1	0.097	0.097	2.13	79	-0.58	70	86	-0.070	1.48	0.18
2	0.237	0.140	2.11	79	-2.58	103	86	-0.070	2.85	0.32
3	0.384	0.147	2.19	79	-1.55	104	85	-0.080	6.77	0.54
4	0.526	0.142	2.20	80	-1.21	105	85	-0.080	10.87	0.34
5	0.673	0.147	2.19	80	-0.61	110	84	-0.070	11.95	0.35
6	0.815	0.142	2.15	80	-1.55	102	84	-0.080	12.52	0.44
7	0.959	0.144	2.17	80	-1.05	107	84	-0.080	12.91	0.51
8	1.101	0.142	2.15	80	-2.37	109	86	-0.080	13.83	0.61
9	1.242	0.141	2.16	80	-2.54	103	87	-0.080	14.12	0.64
10	1.387	0.145	2.16	80	-2.28	102	86	-0.080	13.41	0.60
11	1.529	0.142	2.17	80	-0.55	110	86	-0.070	14.14	0.49
12	1.676	0.147	2.16	81	-0.6	105	85	-0.080	10.81	0.38
13	1.817	0.141	2.13	81	-2.17	99	84	-0.070	10.68	0.41
14	1.963	0.146	2.16	81	-0.48	110	84	-0.070	10.85	0.37
15	2.104	0.141	2.15	82	-2.97	103	85	-0.080	10.96	0.37
16	2.249	0.145	2.14	82	-1.08	107	86	-0.080	11.07	0.32
17	2.391	0.142	2.27	82	-3.04	99	87	-0.070	11.06	0.29
18	2.541	0.150	2.28	83	-1.75	102	86	-0.070	11.04	0.29
19	2.686	0.145	2.26	83	-1.14	102	85	-0.070	11.05	0.34
20	2.836	0.150	2.27	83	-1.64	104	85	-0.090	10.95	0.29
21	2.982	0.146	2.27	84	-2.34	100	84	-0.080	10.88	0.34
22	3.131	0.149	2.28	84	-3.12	102	84	-0.080	10.95	0.32
23	3.276	0.145	2.27	84	-2.38	101	85	-0.090	10.98	0.33
24	3.427	0.151	2.26	84	-0.63	102	86	-0.080	11.01	0.33
25	3.572	0.145	2.27	85	-3.14	99	87	-0.080	11.05	0.29
26	3.722	0.150	2.27	85	-1.27	110	86	-0.070	11.05	0.29
27	3.867	0.145	2.26	85	-2.38	100	85	-0.080	10.97	0.24
28	4.017	0.150	2.26	86	-1.87	109	85	-0.070	10.91	0.23
29	4.162	0.145	2.25	86	-2.65	97	84	-0.070	10.84	0.22
30	4.313	0.151	2.26	86	-2.77	107	84	-0.080	10.71	0.23
31	4.458	0.145	2.26	87	-0.74	99	85	-0.080	10.58	0.28

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
32	4.608	0.150	2.26	87	-0.76	106	86	-0.070	10.67	0.25
33	4.753	0.145	2.27	87	-0.74	104	87	-0.080	10.82	0.28
34	4.903	0.150	2.26	88	-2.1	110	86	-0.070	10.65	0.29
35	5.049	0.146	2.26	88	-1.85	102	86	-0.070	10.61	0.29
36	5.199	0.150	2.24	89	-0.68	110	85	-0.080	10.78	0.26
37	5.345	0.146	2.26	89	-3.16	102	84	-0.080	10.68	0.27
38	5.494	0.149	2.25	89	-1.57	101	84	-0.080	10.64	0.28
39	5.641	0.147	2.25	89	-0.75	102	85	-0.080	10.75	0.28
40	5.790	0.149	2.24	90	-0.9	106	86	-0.070	10.68	0.28
41	5.937	0.147	2.25	90	-2.84	101	87	-0.080	10.69	0.30
42	6.087	0.150	2.25	90	-2.05	108	86	-0.080	10.78	0.29
43	6.235	0.148	2.25	91	-3.22	102	85	-0.080	10.80	0.32
44	6.383	0.148	2.25	91	-0.97	112	84	-0.070	10.96	0.29
45	6.532	0.149	2.24	91	-2.12	107	84	-0.070	10.77	0.31
46	6.679	0.147	2.26	92	-1.01	99	84	-0.080	10.54	0.35
47	6.829	0.150	2.24	92	-1.6	102	85	-0.070	10.37	0.37
48	6.976	0.147	2.24	92	-2.23	99	86	-0.080	10.15	0.36
49	7.125	0.149	2.25	92	-1.51	106	87	-0.080	9.88	0.44
50	7.272	0.147	2.25	92	-0.92	105	86	-0.060	9.84	0.46
51	7.422	0.150	2.24	92	-0.99	104	86	-0.070	9.61	0.48
52	7.569	0.147	2.26	93	-1.52	104	85	-0.070	9.77	0.45
53	7.719	0.150	2.25	93	-0.66	105	84	-0.080	9.69	0.42
54	7.865	0.146	2.25	93	-1.52	101	84	-0.080	9.83	0.35
55	8.016	0.151	2.24	93	-0.79	97	86	-0.080	10.03	0.37
56	8.162	0.146	2.25	94	-2.64	102	87	-0.080	10.03	0.34
57	8.314	0.152	2.23	94	-0.75	105	87	-0.080	10.15	0.31
58	8.460	0.146	2.22	94	-3.19	98	86	-0.080	10.32	0.31
59	8.610	0.150	2.24	94	-0.83	105	86	-0.060	10.66	0.26
60	8.756	0.146	2.24	95	-2.32	99	85	-0.070	10.91	0.22
61	8.908	0.152	2.24	95	-0.65	106	84	-0.070	10.98	0.22
62	9.053	0.145	2.24	95	-0.83	105	85	-0.070	11.34	0.17
63	9.204	0.151	2.25	95	-1.24	102	86	-0.090	11.42	0.20

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
64	9.350	0.146	2.23	95	-0.81	104	88	-0.080	11.51	0.19
65	9.501	0.151	2.25	96	-1.14	106	87	-0.080	11.73	0.17
66	9.647	0.146	2.25	95	-3.02	104	86	-0.080	11.74	0.17
67	9.797	0.150	2.23	96	-0.64	104	85	-0.080	11.89	0.17
68	9.945	0.148	2.24	96	-3.09	103	85	-0.080	11.89	0.14
69	10.095	0.150	2.23	96	-0.78	105	84	-0.090	11.87	0.19
70	10.244	0.149	2.24	97	-2.13	108	85	-0.080	12.08	0.16
71	10.392	0.148	2.23	96	-0.81	101	86	-0.080	12.01	0.17
72	10.542	0.150	2.24	97	-3.22	103	87	-0.070	11.97	0.17
73	10.690	0.148	2.25	97	-0.59	108	87	-0.070	12.09	0.15
74	10.839	0.149	2.23	97	-1.38	95	86	-0.090	12.10	0.14
75	10.986	0.147	2.24	97	-2.47	100	86	-0.080	12.12	0.20
76	11.136	0.150	2.22	97	-2.38	106	84	-0.080	12.07	0.20
77	11.283	0.147	2.24	97	-0.7	101	84	-0.070	12.08	0.25
78	11.433	0.150	2.22	97	-1.2	104	84	-0.080	12.24	0.20
79	11.579	0.146	2.23	97	-3.21	102	86	-0.070	12.33	0.20
80	11.730	0.151	2.23	98	-3.15	104	86	-0.080	12.32	0.31
81	11.877	0.147	2.23	98	-1.04	107	86	-0.090	12.44	0.21
82	12.028	0.151	2.22	98	-2.95	100	85	-0.080	12.49	0.28
83	12.174	0.146	2.23	98	-1.63	103	85	-0.070	12.42	0.33
84	12.325	0.151	2.22	98	-0.95	100	84	-0.080	12.45	0.34
85	12.471	0.146	2.21	98	-0.9	104	84	-0.080	12.47	0.34
86	12.622	0.151	2.23	99	-0.85	105	85	-0.090	12.37	0.34
87	12.768	0.146	2.23	99	-0.95	101	87	-0.080	12.17	0.37
88	12.918	0.150	2.21	99	-1.34	103	87	-0.070	12.09	0.38
89	13.064	0.146	2.22	99	-0.89	96	87	-0.070	11.58	0.34
90	13.214	0.150	2.22	99	-2.15	106	86	-0.060	11.56	0.27
91	13.361	0.147	2.21	99	-2.31	104	86	-0.080	11.45	0.26
92	13.510	0.149	2.22	99	-0.69	104	84	-0.070	11.36	0.28
93	13.657	0.147	2.21	99	-1.15	100	84	-0.070	11.47	0.30
94	13.807	0.150	2.20	99	-3.1	109	84	-0.070	11.27	0.35
95	13.955	0.148	2.19	99	-2.54	101	86	-0.090	11.40	0.29

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
96	14.104	0.149	2.20	100	-2.6	104	87	-0.070	11.41	0.30
97	14.252	0.148	2.20	100	-3.29	98	87	-0.080	11.44	0.30
98	14.400	0.148	2.20	100	-2.27	101	86	-0.080	11.54	0.27
99	14.549	0.149	2.20	99	-0.71	103	85	-0.080	11.54	0.27
100	14.697	0.148	2.18	100	-2.83	108	85	-0.080	11.50	0.23
101	14.846	0.149	2.20	100	-0.92	101	84	-0.080	11.67	0.22
102	14.992	0.146	2.20	100	-1.54	102	84	-0.080	12.21	0.24
103	15.141	0.149	2.21	100	-1.27	97	86	-0.080	12.47	0.25
104	15.288	0.147	2.20	100	-2.82	99	86	-0.090	12.51	0.28
105	15.437	0.149	2.18	100	-3.19	106	87	-0.080	12.74	0.26
106	15.583	0.146	2.18	100	-2.75	103	86	-0.080	12.76	0.29
107	15.732	0.149	2.18	100	-3.24	108	86	-0.080	12.30	0.29
108	15.878	0.146	2.17	101	-1.3	101	85	-0.090	12.01	0.31
109	16.027	0.149	2.18	101	-2.01	102	85	-0.080	11.81	0.25
110	16.172	0.145	2.17	101	-1.92	100	85	-0.080	11.67	0.16
111	16.321	0.149	2.17	101	-3.09	101	86	-0.070	11.16	0.18
112	16.466	0.145	2.17	101	-2.52	97	86	-0.050	11.05	0.20
113	16.616	0.150	2.15	101	-3.19	103	87	-0.070	11.17	0.17
114	16.761	0.145	2.17	101	-1.26	93	86	-0.070	11.13	0.14
115	16.910	0.149	2.16	101	-0.95	104	86	-0.070	11.25	0.16
116	17.055	0.145	2.15	101	-2.56	101	85	-0.080	11.29	0.08
117	17.204	0.149	2.15	101	-3.2	103	85	-0.080	11.25	0.08
118	17.349	0.145	2.15	101	-3.21	98	85	-0.080	10.98	0.12
119	17.499	0.150	2.16	101	-2.02	98	86	-0.080	10.78	0.12
120	17.643	0.144	2.15	101	-2.46	100	87	-0.070	10.53	0.13
121	17.793	0.150	2.15	101	-3.35	102	87	-0.070	10.38	0.13
122	17.937	0.144	2.15	101	-1.13	102	86	-0.070	10.30	0.14
123	18.087	0.150	2.23	101	-1.4	101	86	-0.060	10.28	0.12
124	18.234	0.147	2.23	102	-0.98	99	85	-0.070	9.99	0.15
125	18.386	0.152	2.23	101	-2.26	100	84	-0.070	10.01	0.14
126	18.533	0.147	2.23	102	-3.29	102	85	-0.080	9.64	0.19
127	18.684	0.151	2.21	101	-1.79	101	86	-0.070	9.55	0.18

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
128	18.830	0.146	2.20	102	-2.62	101	87	-0.070	9.19	0.18
129	18.980	0.150	2.20	102	-1.09	103	87	-0.080	8.98	0.23
130	19.127	0.147	2.21	102	-1.07	103	86	-0.070	8.46	0.29
131	19.277	0.150	2.20	102	-3.34	109	86	-0.070	7.95	0.34
132	19.424	0.147	2.19	102	-0.93	103	85	-0.080	7.94	0.34
133	19.574	0.150	2.19	102	-1.7	99	84	-0.070	7.88	0.36
134	19.722	0.148	2.20	102	-1.14	100	84	-0.070	7.79	0.35
135	19.871	0.149	2.18	102	-3.05	101	85	-0.080	7.73	0.36
136	20.019	0.148	2.19	102	-1.03	100	86	-0.070	7.76	0.33
137	20.168	0.149	2.18	102	-1.64	100	87	-0.070	7.66	0.34
138	20.316	0.148	2.19	103	-1.21	97	86	-0.070	7.77	0.33
139	20.464	0.148	2.17	102	-2.86	103	85	-0.070	7.94	0.32
140	20.613	0.149	2.18	102	-1.07	103	85	-0.070	7.83	0.33
141	20.759	0.146	2.18	102	-2.62	93	84	-0.080	7.81	0.30
142	20.908	0.149	2.17	102	-3.56	104	84	-0.080	7.72	0.33
143	21.054	0.146	2.17	103	-3.1	100	85	-0.080	7.83	0.33
144	21.203	0.149	2.18	102	-2.71	101	86	-0.060	7.78	0.36
145	21.349	0.146	2.15	103	-0.98	101	86	-0.060	7.76	0.36
146	21.498	0.149	2.14	103	-3.26	104	86	-0.070	7.95	0.32
147	21.643	0.145	2.16	103	-3.46	97	86	-0.070	8.13	0.33
148	21.792	0.149	2.14	103	-3.35	97	85	-0.070	8.49	0.32
149	21.937	0.145	2.13	103	-1.03	96	84	-0.070	8.68	0.35
150	22.085	0.148	2.13	103	-3.19	97	84	-0.060	8.13	0.28
151	22.230	0.145	2.13	103	-3.38	94	85	-0.070	7.73	0.33
152	22.378	0.148	2.13	103	-1.79	97	86	-0.050	7.48	0.41
153	22.523	0.145	2.11	103	-1.55	103	87	-0.060	7.37	0.44
154	22.670	0.147	2.12	103	-1.16	99	86	-0.050	7.31	0.47
155	22.815	0.145	2.10	103	-1.16	102	86	-0.070	7.25	0.47
156	22.963	0.148	2.32	103	-2.61	93	85	-0.060	7.33	0.44
157	23.113	0.150	2.34	103	-1.89	99	85	-0.070	7.19	0.46
158	23.269	0.156	2.30	103	-1.78	108	85	-0.060	7.40	0.43
159	23.419	0.150	2.31	103	-3.55	100	85	-0.070	7.24	0.43

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
160	23.573	0.154	2.32	103	-2.39	108	86	-0.060	7.30	0.44
161	23.723	0.150	2.30	103	-2.43	101	87	-0.050	7.32	0.42
162	23.877	0.154	2.31	103	-2.81	103	87	-0.060	7.44	0.43
163	24.029	0.152	2.31	103	-2.1	103	86	-0.070	7.55	0.38
164	24.180	0.151	2.29	103	-3.18	105	86	-0.070	7.60	0.41
165	24.333	0.153	2.30	103	-2.49	106	85	-0.070	7.69	0.41
166	24.482	0.149	2.29	103	-2.08	102	84	-0.060	7.36	0.43
167	24.637	0.155	2.28	104	-1.4	107	84	-0.060	6.84	0.49
168	24.787	0.150	2.30	104	-3.54	99	86	-0.060	6.65	0.52
169	24.940	0.153	2.29	104	-1.37	106	87	-0.050	6.72	0.52
170	25.090	0.150	2.29	104	-1.97	99	87	-0.050	6.66	0.54
171	25.242	0.152	2.28	103	-3.61	102	86	-0.060	6.60	0.55
172	25.394	0.152	2.29	104	-3.23	103	86	-0.060	6.66	0.53
173	25.546	0.152	2.27	104	-1.44	100	85	-0.060	6.49	0.57
174	25.698	0.152	2.29	104	-1.56	96	84	-0.060	6.64	0.55
175	25.847	0.149	2.29	104	-3.51	98	85	-0.050	6.65	0.54
176	26.001	0.154	2.27	104	-2.21	101	86	-0.060	6.60	0.57
177	26.150	0.149	2.28	104	-1.43	102	87	-0.070	6.56	0.60
178	26.304	0.154	2.26	104	-3.4	107	87	-0.070	6.48	0.62
179	26.453	0.149	2.28	104	-3.11	95	87	-0.060	6.36	0.63
180	26.606	0.153	2.28	104	-2.02	100	86	-0.050	6.29	0.65
181	26.755	0.149	2.27	104	-2.22	93	85	-0.070	6.27	0.66
182	26.908	0.153	2.27	104	-1.4	109	85	-0.060	6.25	0.70
183	27.060	0.152	2.27	105	-1.38	103	85	-0.050	6.18	0.72
184	27.210	0.150	2.28	104	-3.2	99	85	-0.060	6.04	0.86
185	27.362	0.152	2.26	104	-2.71	102	86	-0.040	5.90	0.94
186	27.511	0.149	2.27	104	-1.36	98	87	-0.050	5.66	1.04
187	27.665	0.154	2.26	104	-3.68	100	87	-0.050	5.71	1.06
188	27.814	0.149	2.26	104	-1.92	98	86	-0.060	5.72	1.02
189	27.967	0.153	2.26	104	-3.09	99	86	-0.060	5.75	1.04
190	28.115	0.148	2.26	105	-2.99	99	85	-0.060	5.70	1.03
191	28.268	0.153	2.27	104	-2.85	104	85	-0.050	5.74	1.03

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
192	28.417	0.149	2.25	105	-1.26	101	85	-0.050	5.66	1.03
193	28.569	0.152	2.24	105	-1.48	104	86	-0.060	5.88	0.99
194	28.720	0.151	2.25	105	-1.39	101	87	-0.050	5.87	0.98
195	28.871	0.151	2.26	105	-1.42	95	87	-0.060	5.86	1.01
196	29.021	0.150	2.26	104	-2.58	103	86	-0.060	5.97	1.01
197	29.171	0.150	2.27	104	-2.63	99	85	-0.050	6.16	0.98
198	29.322	0.151	2.24	105	-3.2	102	85	-0.050	6.12	0.99
199	29.471	0.149	2.24	105	-2.9	100	85	-0.060	6.19	0.97
200	29.624	0.153	2.24	105	-1.36	99	85	-0.060	6.24	1.01
201	29.772	0.148	2.23	105	-3.76	101	86	-0.060	6.06	1.01
202	29.925	0.153	2.24	105	-3.56	103	87	-0.050	6.21	1.02
203	30.072	0.147	2.24	105	-1.46	100	87	-0.060	6.30	1.00
204	30.225	0.153	2.24	105	-1.46	99	86	-0.050	6.25	1.01
205	30.373	0.148	2.24	105	-2.53	102	86	-0.050	6.25	1.00
206	30.525	0.152	2.24	105	-3.58	101	85	-0.060	6.34	0.98
207	30.675	0.150	2.23	105	-3.52	99	84	-0.050	6.34	0.99
208	30.825	0.150	2.24	105	-1.57	98	84	-0.060	6.40	0.96
209	30.976	0.151	2.23	105	-3.78	102	85	-0.060	6.26	0.96
210	31.124	0.148	2.22	105	-1.67	101	87	-0.060	6.36	0.95
211	31.276	0.152	2.24	105	-2.14	99	87	-0.070	6.19	0.99
212	31.424	0.148	2.21	105	-2.05	104	86	-0.060	6.33	0.97
213	31.576	0.152	2.23	105	-1.43	106	86	-0.060	6.29	0.97
214	31.724	0.148	2.23	105	-1.54	95	85	-0.030	6.36	0.95
215	31.876	0.152	2.21	105	-2.05	104	85	-0.040	6.34	0.94
216	32.024	0.148	2.23	105	-3.69	102	84	-0.060	6.32	0.95
217	32.175	0.151	2.24	105	-3.38	101	85	-0.050	6.43	0.94
218	32.323	0.148	2.22	105	-2.3	95	87	-0.060	6.51	0.92
219	32.474	0.151	2.22	105	-1.72	105	87	-0.080	6.39	0.93
220	32.623	0.149	2.21	105	-1.5	100	86	-0.050	6.53	0.92
221	32.774	0.151	2.21	105	-3.67	102	86	-0.050	6.42	0.93
222	32.923	0.149	2.22	105	-1.73	103	85	-0.030	6.45	0.88
223	33.073	0.150	2.21	105	-1.78	100	85	-0.030	6.58	0.93

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
224	33.223	0.150	2.22	105	-3	106	85	-0.060	6.39	0.95
225	33.371	0.148	2.22	105	-2.77	98	85	-0.050	6.55	0.92
226	33.522	0.151	2.21	105	-3.69	101	87	-0.060	6.52	0.94
227	33.669	0.147	2.21	105	-1.89	101	87	-0.050	6.41	0.93
228	33.821	0.152	2.21	105	-3.77	102	87	-0.050	6.53	0.91
229	33.969	0.148	2.21	105	-3.71	96	86	-0.050	6.58	0.89
230	34.121	0.152	2.19	105	-2.95	104	86	-0.050	6.40	0.93
231	34.268	0.147	2.20	105	-3.79	102	85	-0.050	6.42	0.90
232	34.420	0.152	2.22	106	-1.99	105	85	-0.050	6.63	0.81
233	34.567	0.147	2.22	106	-3.65	91	85	-0.050	6.53	0.79
234	34.718	0.151	2.20	106	-1.57	100	86	-0.050	6.58	0.79
235	34.865	0.147	2.21	106	-3.47	98	87	-0.050	6.55	0.80
236	35.016	0.151	2.21	105	-3.16	102	87	-0.050	6.58	0.77
237	35.165	0.149	2.20	106	-2.84	101	86	-0.050	6.56	0.79
238	35.315	0.150	2.20	106	-1.47	98	86	-0.050	6.46	0.81
239	35.464	0.149	2.20	106	-1.34	98	85	-0.060	6.51	0.72
240	35.613	0.149	2.20	106	-3.34	100	85	-0.060	6.53	0.70
241	35.764	0.151	2.22	106	-3.7	99	85	-0.040	6.60	0.69
242	35.911	0.147	2.20	106	-1.59	101	86	-0.050	6.54	0.71
243	36.061	0.150	2.19	106	-3.8	98	86	-0.060	6.53	0.71
244	36.209	0.148	2.21	106	-3.82	97	87	-0.050	6.56	0.70
245	36.359	0.150	2.20	106	-3.15	105	86	-0.050	6.56	0.70
246	36.506	0.147	2.19	106	-3.66	102	85	-0.050	6.48	0.69
247	36.658	0.152	2.20	106	-3.57	100	85	-0.040	6.54	0.68
248	36.805	0.147	2.19	105	-3.83	91	85	-0.050	6.58	0.68
249	36.956	0.151	2.20	106	-2.92	97	85	-0.030	6.44	0.72
250	37.103	0.147	2.19	106	-3.83	96	85	-0.040	6.54	0.68
251	37.254	0.151	2.21	106	-1.48	105	87	-0.040	6.55	0.69
252	37.400	0.146	2.20	106	-3.76	91	87	-0.060	6.46	0.70
253	37.551	0.151	2.19	106	-3.76	107	86	-0.050	6.58	0.69
254	37.698	0.147	2.19	106	-3.66	101	86	-0.060	6.60	0.70
255	37.848	0.150	2.19	106	-2.34	98	85	-0.060	6.55	0.70

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
256	37.996	0.148	2.19	106	-3.3	99	85	-0.060	6.48	0.67
257	38.146	0.150	2.19	106	-1.49	100	85	-0.050	6.50	0.69
258	38.295	0.149	2.19	106	-2.92	103	86	-0.060	6.43	0.72
259	38.444	0.149	2.19	106	-3.83	102	87	-0.040	6.61	0.65
260	38.593	0.149	2.19	106	-2.93	99	87	-0.060	6.43	0.67
261	38.742	0.149	2.17	106	-1.44	100	86	-0.050	6.62	0.67
262	38.891	0.149	2.19	106	-1.65	99	86	-0.050	6.65	0.66
263	39.039	0.148	2.19	106	-3.41	97	85	-0.040	6.42	0.66
264	39.188	0.149	2.19	106	-1.75	98	84	-0.050	6.58	0.66
265	39.335	0.147	2.18	106	-2.39	100	85	-0.050	6.56	0.66
266	39.486	0.151	2.19	106	-1.6	99	85	-0.050	6.52	0.66
267	39.632	0.146	2.18	106	-2.19	102	87	-0.050	6.53	0.64
268	39.783	0.151	2.18	106	-2.54	103	87	-0.040	6.50	0.64
269	39.930	0.147	2.18	106	-2.81	100	86	-0.050	6.61	0.62
270	40.081	0.151	2.18	106	-3.23	103	86	-0.050	6.51	0.64
271	40.227	0.146	2.18	106	-1.97	98	85	-0.050	6.36	0.66
272	40.378	0.151	2.18	106	-1.68	100	85	-0.050	6.23	0.68
273	40.525	0.147	2.17	106	-1.61	101	84	-0.050	6.37	0.64
274	40.676	0.151	2.19	106	-1.54	100	85	-0.050	6.24	0.67
275	40.822	0.146	2.18	106	-3.87	95	86	-0.070	6.15	0.64
276	40.972	0.150	2.18	106	-2.79	100	87	-0.050	6.29	0.64
277	41.118	0.146	2.17	106	-1.78	101	87	-0.050	6.38	0.59
278	41.269	0.151	2.17	106	-3.57	101	86	-0.060	6.27	0.62
279	41.415	0.146	2.18	106	-1.8	100	86	-0.060	6.24	0.64
280	41.565	0.150	2.18	106	-2.23	103	85	-0.050	6.22	0.65
281	41.713	0.148	2.16	106	-3.84	101	85	-0.050	6.25	0.64
282	41.863	0.150	2.19	106	-3.77	97	84	-0.050	6.16	0.67
283	42.011	0.148	2.17	106	-2.42	103	85	-0.050	6.25	0.64
284	42.160	0.149	2.18	106	-3.86	99	86	-0.050	6.31	0.64
285	42.309	0.149	2.18	106	-2.65	99	87	-0.060	6.25	0.65
286	42.457	0.148	2.16	106	-2.44	100	87	-0.050	6.30	0.62
287	42.606	0.149	2.17	106	-1.66	101	86	-0.050	6.25	0.63

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
288	42.753	0.147	2.17	106	-3.79	96	86	-0.060	6.14	0.64
289	42.903	0.150	2.17	106	-1.77	100	85	-0.050	6.20	0.64
290	43.049	0.146	2.14	107	-3.87	102	85	-0.060	6.20	0.61
291	43.200	0.151	2.17	107	-1.79	103	85	-0.040	6.24	0.64
292	43.346	0.146	2.18	107	-1.94	99	86	-0.060	6.16	0.63
293	43.496	0.150	2.17	106	-2.74	98	86	-0.040	6.22	0.62
294	43.642	0.146	2.18	106	-1.56	93	87	-0.050	6.11	0.63
295	43.794	0.152	2.19	106	-3.19	98	87	-0.050	6.16	0.58
296	43.939	0.145	2.17	107	-1.58	95	86	-0.050	6.13	0.65
297	44.091	0.152	2.18	107	-1.55	102	86	-0.060	5.91	0.55
298	44.236	0.145	2.16	107	-1.68	97	85	-0.060	5.87	0.55
299	44.387	0.151	2.19	107	-1.96	101	85	-0.050	5.89	0.53
300	44.534	0.147	2.18	107	-1.6	102	85	-0.050	5.90	0.56
301	44.684	0.150	2.16	106	-2.74	108	86	-0.040	5.77	0.58
302	44.830	0.146	2.17	107	-2.25	93	87	-0.040	5.87	0.55
303	44.980	0.150	2.17	107	-3.26	95	87	-0.040	5.85	0.56
304	45.126	0.146	2.16	107	-3.87	99	87	-0.060	5.73	0.61
305	45.276	0.150	2.18	107	-2.06	94	86	-0.050	5.74	0.60
306	45.423	0.147	2.16	107	-1.81	101	86	-0.040	5.71	0.61
307	45.572	0.149	2.17	106	-3.87	103	85	-0.050	5.65	0.61
308	45.720	0.148	2.15	107	-3.93	96	84	-0.040	5.56	0.64
309	45.870	0.150	2.16	107	-3.6	101	85	-0.050	5.66	0.62
310	46.017	0.147	2.17	107	-3.66	102	86	-0.050	5.60	0.65
311	46.166	0.149	2.18	107	-3.89	103	87	-0.050	5.64	0.64
312	46.314	0.148	2.17	107	-1.62	99	87	-0.050	5.70	0.64
313	46.463	0.149	2.18	107	-3.82	99	86	-0.040	5.56	0.66
314	46.612	0.149	2.14	107	-1.68	96	86	-0.040	5.70	0.61
315	46.759	0.147	2.17	107	-1.79	94	85	-0.040	5.73	0.62
316	46.908	0.149	2.18	107	-3.81	102	84	-0.050	5.76	0.67
317	47.055	0.147	2.18	107	-3.7	96	84	-0.040	5.68	0.60
318	47.204	0.149	2.16	107	-2.08	99	85	-0.060	5.71	0.64
319	47.351	0.147	2.18	107	-3.82	96	86	-0.060	5.61	0.65

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
320	47.501	0.150	2.16	107	-2.04	103	87	-0.050	5.75	0.62
321	47.647	0.146	2.17	107	-2.64	97	87	-0.060	5.69	0.63
322	47.798	0.151	2.17	107	-1.96	96	86	-0.050	5.66	0.65
323	47.944	0.146	2.16	107	-3.08	98	86	-0.050	5.65	0.69
324	48.095	0.151	2.17	107	-2.26	101	85	-0.050	5.76	0.74
325	48.241	0.146	2.16	107	-3.86	97	85	-0.050	5.69	0.74
326	48.392	0.151	2.17	107	-2.47	97	84	-0.050	5.77	0.68
327	48.538	0.146	2.16	107	-3.6	97	85	-0.050	5.66	0.76
328	48.688	0.150	2.16	107	-2.45	104	86	-0.050	5.74	0.74
329	48.835	0.147	2.15	107	-1.52	100	87	-0.050	5.67	0.77
330	48.985	0.150	2.16	107	-1.79	98	86	-0.060	5.72	0.72
331	49.130	0.145	2.17	107	-1.52	98	86	-0.040	5.73	0.71
332	49.280	0.150	2.16	107	-2.64	102	86	-0.070	5.64	0.73
333	49.426	0.146	2.15	107	-3.88	101	85	-0.060	5.55	0.73
334	49.577	0.151	2.17	107	-2.05	101	84	-0.050	5.67	0.72
335	49.723	0.146	2.15	107	-1.67	92	85	-0.050	5.62	0.69
336	49.872	0.149	2.16	107	-2.38	102	84	-0.050	5.60	0.71
337	50.019	0.147	2.16	107	-2.28	99	85	-0.050	5.53	0.74
338	50.169	0.150	2.16	107	-2.27	97	86	-0.050	5.65	0.69
339	50.317	0.148	2.17	107	-3.86	96	86	-0.050	5.68	0.70
340	50.466	0.149	2.16	107	-3.88	105	86	-0.060	5.60	0.70
341	50.614	0.148	2.17	107	-2.19	99	86	-0.060	5.41	0.73
342	50.762	0.148	2.16	107	-3.16	100	85	-0.050	5.46	0.69
343	50.910	0.148	2.17	107	-1.64	105	85	-0.050	5.34	0.70
344	51.058	0.148	2.13	107	-3.29	95	84	-0.050	5.33	0.69
345	51.208	0.150	2.17	107	-1.66	108	84	-0.040	5.39	0.67
346	51.354	0.146	2.17	107	-2.83	93	85	-0.050	5.32	0.68
347	51.503	0.149	2.15	107	-3.78	102	86	-0.060	5.38	0.66
348	51.650	0.147	2.17	107	-3.63	98	87	-0.040	5.43	0.66
349	51.800	0.150	2.17	107	-1.99	97	86	-0.050	5.27	0.66
350	51.947	0.147	2.16	107	-1.68	98	86	-0.040	5.08	0.63
351	52.096	0.149	2.17	107	-2.68	102	85	-0.040	5.09	0.61

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
352	52.242	0.146	2.16	107	-3.52	96	85	-0.050	4.92	0.64
353	52.393	0.151	2.15	107	-2.07	103	84	-0.060	5.00	0.62
354	52.540	0.147	2.16	107	-2.03	101	84	-0.050	5.12	0.62
355	52.690	0.150	2.15	108	-2.15	98	84	-0.050	4.98	0.64
356	52.836	0.146	2.16	108	-3.48	96	85	-0.040	5.02	0.64
357	52.987	0.151	2.16	108	-1.92	104	86	-0.050	4.83	0.63
358	53.132	0.145	2.16	108	-1.98	95	86	-0.050	4.89	0.60
359	53.283	0.151	2.15	108	-1.89	102	86	-0.040	4.87	0.58
360	53.429	0.146	2.17	108	-1.58	94	86	-0.050	4.84	0.59
361	53.579	0.150	2.17	108	-3.69	99	85	-0.060	4.76	0.60
362	53.725	0.146	2.16	108	-1.57	96	85	-0.050	4.64	0.61
363	53.875	0.150	2.17	108	-2.95	107	84	-0.050	4.78	0.57
364	54.021	0.146	2.16	108	-2.68	104	84	-0.050	4.62	0.62
365	54.172	0.151	2.17	108	-3.14	98	85	-0.060	4.72	0.60
366	54.318	0.146	2.17	107	-1.55	98	86	-0.060	4.65	0.61
367	54.467	0.149	2.17	107	-2.48	95	86	-0.060	4.69	0.60
368	54.614	0.147	2.16	108	-1.56	100	86	-0.050	4.67	0.55
369	54.765	0.151	2.16	108	-1.61	100	86	-0.050	4.57	0.58
370	54.912	0.147	2.16	107	-3.84	99	85	-0.050	4.63	0.55
371	55.061	0.149	2.17	108	-2.39	96	84	-0.050	4.67	0.55
372	55.209	0.148	2.16	108	-3.35	100	84	-0.040	4.68	0.53
373	55.357	0.148	2.16	107	-3.71	97	84	-0.050	4.58	0.57
374	55.506	0.149	2.15	108	-1.69	101	85	-0.040	4.54	0.56
375	55.654	0.148	2.17	108	-3.85	103	86	-0.050	4.54	0.55
376	55.803	0.149	2.18	108	-1.63	96	86	-0.050	4.61	0.55
377	55.949	0.146	2.16	108	-3.74	97	86	-0.050	4.61	0.54
378	56.099	0.150	2.16	108	-2.51	101	85	-0.050	4.68	0.53
379	56.246	0.147	2.16	108	-3.87	99	85	-0.040	4.48	0.56
380	56.396	0.150	2.17	108	-2.64	101	84	-0.040	4.68	0.51
381	56.542	0.146	2.16	108	-3.88	97	84	-0.050	4.55	0.53
382	56.692	0.150	2.15	108	-1.88	95	84	-0.040	4.64	0.51
383	56.838	0.146	2.14	108	-3.88	98	85	-0.040	4.54	0.52

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
384	56.990	0.152	2.16	108	-1.92	99	86	-0.050	4.56	0.52
385	57.135	0.145	2.16	108	-1.85	97	87	-0.040	4.55	0.51
386	57.286	0.151	2.15	108	-1.61	101	86	-0.040	4.41	0.53
387	57.432	0.146	2.16	108	-3.19	100	85	-0.050	4.62	0.51
388	57.583	0.151	2.16	108	-2.65	93	85	-0.050	4.54	0.51
389	57.729	0.146	2.14	108	-3.71	95	85	-0.050	4.47	0.55
390	57.879	0.150	2.16	108	-1.72	102	84	-0.050	4.50	0.52
391	58.025	0.146	2.16	108	-2.24	89	84	-0.050	4.44	0.57
392	58.175	0.150	2.16	108	-3.07	106	84	-0.040	4.33	0.55
393	58.321	0.146	2.16	108	-1.8	94	86	-0.060	4.29	0.58
394	58.471	0.150	2.16	108	-1.69	100	86	-0.040	4.39	0.54
395	58.618	0.147	2.16	108	-1.88	102	86	-0.040	4.35	0.51
396	58.767	0.149	2.16	108	-1.71	101	86	-0.050	4.40	0.52
397	58.914	0.147	2.15	108	-1.58	94	85	-0.040	4.42	0.52
398	59.064	0.150	2.14	108	-1.53	95	85	-0.060	4.29	0.50
399	59.212	0.148	2.15	108	-2.42	99	84	-0.050	4.19	0.51
400	59.360	0.148	2.14	108	-2.54	101	84	-0.050	4.27	0.52
401	59.509	0.149	2.17	108	-3.76	101	84	-0.050	4.15	0.53
402	59.657	0.148	2.15	108	-2.45	97	85	-0.040	4.14	0.52
403	59.805	0.148	2.15	108	-3.11	102	86	-0.050	4.15	0.49
404	59.953	0.148	2.14	108	-3.89	103	86	-0.050	4.08	0.52
405	60.102	0.149	2.17	108	-2.52	105	86	-0.040	4.07	0.52
406	60.249	0.147	2.16	108	-2.1	102	85	-0.050	4.04	0.51
407	60.398	0.149	2.16	108	-3.81	101	85	-0.050	4.01	0.48
408	60.545	0.147	2.17	108	-2.17	99	84	-0.040	4.05	0.48
409	60.695	0.150	2.16	108	-1.54	103	84	-0.050	4.09	0.49
410	60.841	0.146	2.16	108	-2.54	101	85	-0.050	3.94	0.49
411	60.991	0.150	2.17	108	-1.72	106	86	-0.050	3.94	0.47
412	61.137	0.146	2.14	108	-3.7	96	86	-0.050	3.96	0.48
413	61.288	0.151	2.14	108	-3.01	98	86	-0.040	3.84	0.50
414	61.434	0.146	2.16	108	-1.6	95	86	-0.050	3.79	0.50
415	61.585	0.151	2.16	108	-2.53	103	85	-0.050	3.86	0.51

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
416	61.730	0.145	2.16	108	-2.97	95	85	-0.050	3.85	0.48
417	61.881	0.151	2.16	108	-3.47	101	84	-0.040	3.90	0.46
418	62.027	0.146	2.14	108	-3.68	93	84	-0.030	3.80	0.48
419	62.177	0.150	2.15	108	-1.63	99	85	-0.050	3.78	0.46
420	62.324	0.147	2.16	108	-2.96	97	86	-0.050	3.63	0.49
421	62.474	0.150	2.16	108	-2.46	98	87	-0.040	3.80	0.49
422	62.619	0.145	2.17	108	-1.58	95	86	-0.030	3.66	0.48
423	62.769	0.150	2.17	108	-1.63	99	85	-0.050	3.71	0.47
424	62.915	0.146	2.15	108	-2.43	96	85	-0.040	3.73	0.47
425	63.066	0.151	2.16	108	-3.91	101	85	-0.050	3.75	0.45
426	63.212	0.146	2.16	108	-2.11	95	84	-0.030	3.76	0.46
427	63.361	0.149	2.16	109	-3.72	94	84	-0.050	3.60	0.49
428	63.508	0.147	2.16	108	-1.57	93	85	-0.030	3.66	0.46
429	63.658	0.150	2.15	108	-3.48	92	86	-0.060	3.61	0.49
430	63.806	0.148	2.17	109	-1.93	97	87	-0.040	3.69	0.46
431	63.954	0.148	2.15	108	-2.21	103	87	-0.050	3.61	0.46
432	64.103	0.149	2.17	108	-2.26	99	86	-0.040	3.66	0.48
433	64.251	0.148	2.15	108	-2.68	95	85	-0.050	3.56	0.46
434	64.399	0.148	2.15	108	-3.09	96	85	-0.050	3.57	0.45
435	64.547	0.148	2.15	108	-3.97	106	84	-0.050	3.42	0.45
436	64.696	0.149	2.16	109	-3.53	98	84	-0.030	3.44	0.46
437	64.843	0.147	2.17	108	-3.84	98	85	-0.040	3.54	0.46
438	64.992	0.149	2.18	109	-1.85	99	86	-0.040	3.42	0.48
439	65.139	0.147	2.16	108	-2.52	98	87	-0.040	3.45	0.48
440	65.289	0.150	2.16	109	-3.98	102	86	-0.040	3.48	0.46
441	65.435	0.146	2.15	109	-2.2	101	86	-0.030	3.50	0.45
442	65.585	0.150	2.15	108	-2.29	97	85	-0.050	3.34	0.42
443	65.731	0.146	2.16	108	-3.53	94	85	-0.060	3.34	0.47
444	65.881	0.150	2.16	108	-1.54	106	84	-0.050	3.39	0.46
445	66.028	0.147	2.16	108	-1.92	99	84	-0.040	3.42	0.49
446	66.178	0.150	2.16	108	-1.89	102	84	-0.040	3.39	0.45
447	66.324	0.146	2.15	108	-2.3	95	86	-0.020	3.37	0.45

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
448	66.475	0.151	2.16	108	-1.69	98	86	-0.040	3.42	0.44
449	66.621	0.146	2.17	108	-3.85	97	86	-0.040	3.27	0.45
450	66.771	0.150	2.16	108	-3.93	101	86	-0.040	3.38	0.43
451	66.918	0.147	2.15	109	-2.49	95	85	-0.040	3.28	0.43
452	67.068	0.150	2.16	108	-2.1	95	84	-0.030	3.32	0.41
453	67.214	0.146	2.16	108	-3.49	98	84	-0.050	3.23	0.41
454	67.363	0.149	2.15	109	-2.58	98	84	-0.030	3.20	0.45
455	67.509	0.146	2.16	108	-2.36	96	84	-0.050	3.25	0.42
456	67.660	0.151	2.17	108	-1.79	105	85	-0.040	3.32	0.42
457	67.806	0.146	2.16	108	-1.56	96	86	-0.050	3.15	0.46
458	67.955	0.149	2.17	108	-3.68	98	86	-0.040	3.19	0.44
459	68.102	0.147	2.16	108	-3.43	103	86	-0.040	3.18	0.46
460	68.252	0.150	2.15	108	-1.55	100	85	-0.040	3.15	0.43
461	68.400	0.148	2.16	108	-1.58	99	85	-0.030	3.16	0.42
462	68.548	0.148	2.15	109	-1.66	102	84	-0.040	3.10	0.42
463	68.697	0.149	2.17	108	-1.75	97	84	-0.050	3.13	0.41
464	68.845	0.148	2.15	109	-1.65	104	84	-0.030	3.14	0.41
465	68.994	0.149	2.14	108	-2.21	102	86	-0.040	2.98	0.43
466	69.141	0.147	2.15	108	-2.34	97	86	-0.030	3.04	0.41
467	69.291	0.150	2.16	108	-3.97	106	86	-0.040	2.99	0.43
468	69.438	0.147	2.16	108	-3.57	98	85	-0.040	3.01	0.39
469	69.587	0.149	2.16	108	-1.72	101	85	-0.040	2.94	0.41
470	69.733	0.146	2.15	108	-2.7	94	85	-0.040	3.03	0.38
471	69.884	0.151	2.16	108	-3.36	101	84	-0.050	2.91	0.42
472	70.030	0.146	2.16	108	-2.99	94	84	-0.040	2.89	0.43
473	70.180	0.150	2.16	108	-2.45	95	84	-0.050	2.88	0.42
474	70.326	0.146	2.15	108	-3.86	99	85	-0.040	2.82	0.44
475	70.477	0.151	2.15	108	-2.11	100	86	-0.040	2.94	0.40
476	70.623	0.146	2.15	108	-1.88	93	86	-0.040	2.88	0.43
477	70.774	0.151	2.15	108	-3.31	99	85	-0.030	2.85	0.41
478	70.920	0.146	2.16	108	-3.33	95	85	-0.040	2.86	0.42
479	71.071	0.151	2.16	108	-2.12	99	84	-0.040	2.94	0.37

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
480	71.216	0.145	2.17	108	-3.47	97	84	-0.020	2.96	0.39
481	71.368	0.152	2.17	108	-3.37	99	84	-0.040	2.81	0.38
482	71.513	0.145	2.16	108	-1.74	93	85	-0.040	2.79	0.41
483	71.663	0.150	2.17	108	-2.92	96	85	-0.030	2.81	0.40
484	71.809	0.146	2.17	108	-3.59	93	85	-0.040	2.77	0.40
485	71.960	0.151	2.15	108	-2.36	98	86	-0.030	2.75	0.40
486	72.106	0.146	2.16	108	-3.67	98	85	-0.040	2.86	0.38
487	72.256	0.150	2.17	108	-2.16	99	84	-0.030	2.83	0.40
488	72.402	0.146	2.17	108	-3.91	99	84	-0.050	2.75	0.42
489	72.552	0.150	2.15	108	-3.91	95	84	-0.040	2.78	0.40
490	72.700	0.148	2.17	108	-3.89	99	85	-0.040	2.76	0.38
491	72.849	0.149	2.16	109	-1.8	99	86	-0.030	2.86	0.39
492	72.997	0.148	2.17	108	-3.86	95	86	-0.040	2.87	0.38
493	73.146	0.149	2.16	108	-2.27	92	86	-0.020	2.82	0.39
494	73.294	0.148	2.16	108	-3.4	99	86	-0.040	2.72	0.39
495	73.442	0.148	2.14	108	-3.93	99	84	-0.040	2.75	0.38
496	73.592	0.150	2.18	108	-3.62	103	84	-0.040	2.81	0.38
497	73.739	0.147	2.18	108	-3.88	97	84	-0.030	2.74	0.38
498	73.888	0.149	2.16	108	-2.38	100	85	-0.030	2.58	0.40
499	74.034	0.146	2.15	108	-3.07	96	86	-0.040	2.75	0.38
500	74.184	0.150	2.16	108	-3.68	98	86	-0.030	2.84	0.37
501	74.331	0.147	2.17	108	-1.97	99	86	-0.040	2.72	0.38
502	74.481	0.150	2.17	108	-2.9	105	85	-0.030	2.61	0.39
503	74.627	0.146	2.16	108	-3.88	95	85	-0.040	2.68	0.38
504	74.778	0.151	2.16	108	-2.16	101	84	-0.040	2.83	0.37
505	74.924	0.146	2.17	108	-2.64	95	85	-0.030	2.71	0.38
506	75.075	0.151	2.16	108	-2.27	95	85	-0.050	2.71	0.36
507	75.221	0.146	2.16	108	-2.95	97	86	-0.040	2.66	0.37
508	75.372	0.151	2.14	109	-2.77	98	86	-0.050	2.66	0.40
509	75.518	0.146	2.15	108	-1.53	95	86	-0.040	2.62	0.40
510	75.669	0.151	2.17	108	-3.89	97	86	-0.050	2.82	0.38
511	75.815	0.146	2.16	107	-3.7	96	85	-0.040	2.62	0.38

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
512	75.964	0.149	2.16	107	-1.62	101	84	-0.040	2.68	0.38
513	76.110	0.146	2.16	108	-2.72	95	84	-0.060	2.62	0.38
514	76.261	0.151	2.17	108	-1.66	99	84	-0.040	2.50	0.39
515	76.408	0.147	2.16	108	-1.62	94	86	-0.030	2.59	0.35
516	76.557	0.149	2.17	108	-1.61	102	86	-0.040	2.55	0.36
517	76.704	0.147	2.16	108	-1.64	95	85	-0.040	2.56	0.37
518	76.854	0.150	2.16	108	-3.28	103	86	-0.040	2.57	0.37
519	77.002	0.148	2.16	108	-3.93	103	85	-0.030	2.50	0.37
520	77.151	0.149	2.15	108	-2.08	98	84	-0.040	2.57	0.37
521	77.299	0.148	2.15	108	-3.77	95	84	-0.040	2.43	0.37
522	77.447	0.148	2.15	108	-1.91	96	84	-0.030	2.67	0.35
523	77.596	0.149	2.16	108	-1.69	99	85	-0.040	2.56	0.34
524	77.744	0.148	2.17	108	-1.6	101	86	-0.040	2.53	0.35
525	77.893	0.149	2.16	108	-3.68	103	86	-0.040	2.56	0.32
526	78.040	0.147	2.17	108	-3.61	99	87	-0.020	2.57	0.34
527	78.189	0.149	2.17	108	-1.73	98	86	-0.030	2.53	0.32
528	78.336	0.147	2.16	108	-2.49	95	84	-0.050	2.41	0.36
529	78.486	0.150	2.16	108	-3.42	99	85	-0.010	2.53	0.34
530	78.632	0.146	2.17	108	-3.77	95	84	-0.040	2.49	0.37
531	78.782	0.150	2.16	108	-3.16	93	86	-0.020	2.59	0.35
532	78.929	0.147	2.16	108	-2.12	94	86	-0.040	2.47	0.32
533	79.080	0.151	2.17	107	-2.29	100	86	-0.030	2.48	0.36
534	79.226	0.146	2.16	107	-1.48	98	85	-0.040	2.39	0.37
535	79.377	0.151	2.16	107	-2.23	102	85	-0.040	2.52	0.33
536	79.523	0.146	2.16	107	-3.89	96	84	-0.030	2.52	0.33
537	79.674	0.151	2.17	107	-1.83	95	84	-0.050	2.47	0.35
538	79.820	0.146	2.16	107	-3.81	94	84	-0.030	2.43	0.35
539	79.971	0.151	2.16	107	-2.5	101	85	-0.040	2.39	0.34
Avg/Tot	79.971	0.148	2.19	103	-2.40	100	85	-0.055	6.50	0.50

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	485	504	596	488	591	532.8	N/A
1	485	502	598	476	592	530.6	N/A
2	484	501	600	474	594	530.6	N/A
3	483	498	600	484	595	532.0	N/A
4	482	498	598	514	596	537.6	N/A
5	481	499	595	540	595	542.0	N/A
6	481	502	592	567	593	547.0	N/A
7	481	506	588	591	591	551.4	N/A
8	482	510	586	617	588	556.6	N/A
9	484	514	584	629	585	559.2	N/A
10	487	519	583	634	582	561.0	N/A
11	491	522	582	634	578	561.4	N/A
12	494	524	581	631	574	560.8	N/A
13	496	526	581	628	569	560.0	N/A
14	498	529	580	627	565	559.8	N/A
15	499	530	580	627	561	559.4	N/A
16	499	532	578	627	556	558.4	N/A
17	499	533	577	628	552	557.8	N/A
18	498	534	575	628	547	556.4	N/A
19	498	534	573	628	543	555.2	N/A
20	497	535	570	628	539	553.8	N/A
21	496	535	568	629	534	552.4	N/A
22	494	535	566	629	530	550.8	N/A
23	493	536	564	630	526	549.8	N/A
24	491	535	562	631	523	548.4	N/A
25	490	536	560	632	519	547.4	N/A
26	488	536	558	633	515	546.0	N/A
27	487	535	556	633	511	544.4	N/A
28	486	535	554	633	507	543.0	N/A
29	485	535	552	633	504	541.8	N/A
30	484	533	550	633	500	540.0	N/A
31	483	532	548	632	498	538.6	N/A
32	482	531	546	632	495	537.2	N/A
33	481	530	545	632	491	535.8	N/A
34	481	529	543	632	488	534.6	N/A
35	480	528	542	632	485	533.4	N/A
36	480	527	541	631	483	532.4	N/A
37	479	525	539	631	480	530.8	N/A
38	479	524	538	631	477	529.8	N/A
39	479	523	537	631	474	528.8	N/A
40	480	522	536	630	471	527.8	N/A
41	479	520	534	629	468	526.0	N/A
42	480	517	533	629	466	525.0	N/A
43	480	515	533	630	463	524.2	N/A
44	479	512	532	630	460	522.6	N/A
45	479	509	531	630	458	521.4	N/A
46	479	507	530	629	456	520.2	N/A
47	480	504	530	628	453	519.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	480	503	529	626	451	517.8	N/A
49	479	501	529	623	449	516.2	N/A
50	480	499	529	621	446	515.0	N/A
51	478	497	528	619	444	513.2	N/A
52	478	495	528	617	442	512.0	N/A
53	478	494	528	616	440	511.2	N/A
54	477	492	528	617	438	510.4	N/A
55	476	491	527	616	436	509.2	N/A
56	476	489	527	618	434	508.8	N/A
57	475	488	527	618	433	508.2	N/A
58	475	487	527	620	430	507.8	N/A
59	474	488	527	623	428	508.0	N/A
60	474	488	527	625	427	508.2	N/A
61	473	489	526	629	425	508.4	N/A
62	474	490	527	632	423	509.2	N/A
63	473	492	526	635	422	509.6	N/A
64	473	493	526	639	420	510.2	N/A
65	473	496	526	642	419	511.2	N/A
66	473	497	525	646	417	511.6	N/A
67	474	500	525	649	416	512.8	N/A
68	473	501	525	652	415	513.2	N/A
69	473	503	524	655	413	513.6	N/A
70	474	505	524	658	412	514.6	N/A
71	475	507	524	660	410	515.2	N/A
72	475	508	523	662	409	515.4	N/A
73	476	510	523	665	408	516.4	N/A
74	476	511	523	666	407	516.6	N/A
75	477	513	523	667	405	517.0	N/A
76	478	514	522	667	404	517.0	N/A
77	478	516	522	667	403	517.2	N/A
78	479	517	522	667	402	517.4	N/A
79	480	518	522	667	401	517.6	N/A
80	481	520	522	667	401	518.2	N/A
81	482	520	522	667	399	518.0	N/A
82	483	521	523	667	399	518.6	N/A
83	484	522	523	668	398	519.0	N/A
84	486	523	523	667	397	519.2	N/A
85	487	524	524	667	396	519.6	N/A
86	489	524	524	666	395	519.6	N/A
87	490	525	525	665	394	519.8	N/A
88	491	526	526	663	393	519.8	N/A
89	493	527	527	662	392	520.2	N/A
90	494	528	528	660	392	520.4	N/A
91	495	529	529	658	391	520.4	N/A
92	496	529	530	658	390	520.6	N/A
93	498	530	531	657	390	521.2	N/A
94	498	530	532	656	389	521.0	N/A
95	499	530	533	656	388	521.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	501	531	534	656	388	522.0	N/A
97	501	532	535	656	387	522.2	N/A
98	502	532	536	657	387	522.8	N/A
99	503	533	537	657	386	523.2	N/A
100	504	533	538	657	386	523.6	N/A
101	505	534	539	659	386	524.6	N/A
102	506	534	540	660	385	525.0	N/A
103	507	535	541	661	385	525.8	N/A
104	507	535	542	664	384	526.4	N/A
105	509	536	542	666	384	527.4	N/A
106	510	536	544	668	383	528.2	N/A
107	511	537	544	669	383	528.8	N/A
108	512	537	545	667	382	528.6	N/A
109	513	537	546	666	382	528.8	N/A
110	514	538	547	666	382	529.4	N/A
111	514	538	547	665	381	529.0	N/A
112	516	538	548	665	381	529.6	N/A
113	517	538	549	665	380	529.8	N/A
114	517	539	549	665	380	530.0	N/A
115	519	540	549	663	379	530.0	N/A
116	519	540	550	661	379	529.8	N/A
117	521	541	550	661	379	530.4	N/A
118	521	541	550	660	378	530.0	N/A
119	522	541	551	658	378	530.0	N/A
120	522	543	551	657	378	530.2	N/A
121	522	544	551	656	377	530.0	N/A
122	522	545	552	656	377	530.4	N/A
123	522	545	552	655	377	530.2	N/A
124	522	546	553	653	377	530.2	N/A
125	522	546	552	652	376	529.6	N/A
126	521	547	552	649	375	528.8	N/A
127	521	548	553	647	375	528.8	N/A
128	520	548	553	644	375	528.0	N/A
129	519	547	553	639	375	526.6	N/A
130	518	545	553	635	374	525.0	N/A
131	517	543	553	630	374	523.4	N/A
132	516	542	553	625	374	522.0	N/A
133	515	540	553	620	374	520.4	N/A
134	513	538	552	616	373	518.4	N/A
135	512	537	552	611	372	516.8	N/A
136	511	535	552	608	373	515.8	N/A
137	509	532	551	604	372	513.6	N/A
138	507	532	551	600	372	512.4	N/A
139	506	530	551	597	372	511.2	N/A
140	505	528	550	594	372	509.8	N/A
141	504	527	550	591	372	508.8	N/A
142	503	525	550	588	372	507.6	N/A
143	501	524	550	586	372	506.6	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	500	522	549	583	372	505.2	N/A
145	499	522	549	581	372	504.6	N/A
146	499	521	548	580	372	504.0	N/A
147	497	520	548	578	372	503.0	N/A
148	497	519	548	577	372	502.6	N/A
149	496	518	547	575	372	501.6	N/A
150	496	517	547	572	372	500.8	N/A
151	495	516	546	569	372	499.6	N/A
152	495	515	546	566	372	498.8	N/A
153	494	514	546	564	372	498.0	N/A
154	492	513	546	562	372	497.0	N/A
155	491	513	545	559	372	496.0	N/A
156	490	512	545	557	373	495.4	N/A
157	488	511	545	555	372	494.2	N/A
158	487	511	544	553	373	493.6	N/A
159	485	510	544	551	373	492.6	N/A
160	484	509	544	550	373	492.0	N/A
161	483	509	544	548	374	491.6	N/A
162	482	508	544	546	374	490.8	N/A
163	480	508	543	545	375	490.2	N/A
164	479	509	543	543	376	490.0	N/A
165	478	508	543	541	376	489.2	N/A
166	477	508	542	539	377	488.6	N/A
167	476	507	542	537	378	488.0	N/A
168	475	507	542	535	378	487.4	N/A
169	474	506	542	532	379	486.6	N/A
170	473	506	541	530	379	485.8	N/A
171	472	505	540	527	380	484.8	N/A
172	471	504	541	525	380	484.2	N/A
173	471	504	540	523	382	484.0	N/A
174	469	503	539	521	382	482.8	N/A
175	468	502	538	518	383	481.8	N/A
176	468	501	537	516	384	481.2	N/A
177	467	500	536	514	385	480.4	N/A
178	466	499	535	512	386	479.6	N/A
179	466	498	534	509	386	478.6	N/A
180	465	497	533	507	388	478.0	N/A
181	464	496	532	505	388	477.0	N/A
182	463	494	532	503	390	476.4	N/A
183	463	493	531	501	391	475.8	N/A
184	462	491	530	498	391	474.4	N/A
185	461	491	529	495	392	473.6	N/A
186	460	489	528	492	394	472.6	N/A
187	460	487	527	489	395	471.6	N/A
188	459	485	526	486	395	470.2	N/A
189	458	483	525	483	396	469.0	N/A
190	457	482	524	480	397	468.0	N/A
191	456	479	523	478	398	466.8	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
192	455	478	522	476	399	466.0	N/A
193	454	477	521	473	401	465.2	N/A
194	453	475	520	471	402	464.2	N/A
195	452	474	519	469	402	463.2	N/A
196	451	472	518	467	404	462.4	N/A
197	450	470	518	465	405	461.6	N/A
198	450	468	517	463	405	460.6	N/A
199	449	467	516	461	406	459.8	N/A
200	448	465	515	459	407	458.8	N/A
201	448	464	514	458	408	458.4	N/A
202	448	462	514	457	409	458.0	N/A
203	447	461	513	455	410	457.2	N/A
204	447	460	513	454	411	457.0	N/A
205	447	458	512	453	412	456.4	N/A
206	446	457	511	451	413	455.6	N/A
207	445	456	511	450	414	455.2	N/A
208	445	455	510	448	415	454.6	N/A
209	445	454	510	447	416	454.4	N/A
210	445	452	510	446	417	454.0	N/A
211	444	451	510	444	418	453.4	N/A
212	444	450	509	443	419	453.0	N/A
213	443	449	509	442	420	452.6	N/A
214	443	448	509	440	421	452.2	N/A
215	443	447	508	439	421	451.6	N/A
216	442	446	509	438	422	451.4	N/A
217	442	445	508	437	423	451.0	N/A
218	441	444	508	436	424	450.6	N/A
219	440	444	508	435	425	450.4	N/A
220	441	442	508	434	426	450.2	N/A
221	440	442	508	432	426	449.6	N/A
222	439	441	508	432	427	449.4	N/A
223	439	441	508	431	428	449.4	N/A
224	439	440	508	430	429	449.2	N/A
225	438	439	509	428	430	448.8	N/A
226	438	438	509	428	431	448.8	N/A
227	437	437	509	427	432	448.4	N/A
228	436	436	509	426	432	447.8	N/A
229	436	435	509	426	433	447.8	N/A
230	436	435	509	425	434	447.8	N/A
231	436	434	509	424	434	447.4	N/A
232	435	434	509	424	435	447.4	N/A
233	435	433	509	423	436	447.2	N/A
234	434	432	510	422	436	446.8	N/A
235	434	431	509	422	437	446.6	N/A
236	434	431	510	421	437	446.6	N/A
237	433	430	510	420	438	446.2	N/A
238	433	429	510	420	438	446.0	N/A
239	432	429	510	420	439	446.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
240	432	428	510	419	439	445.6	N/A
241	433	427	510	419	440	445.8	N/A
242	431	427	510	419	440	445.4	N/A
243	432	426	510	418	440	445.2	N/A
244	432	425	510	418	440	445.0	N/A
245	431	424	510	417	440	444.4	N/A
246	430	424	510	417	440	444.2	N/A
247	430	423	510	416	441	444.0	N/A
248	429	423	510	416	441	443.8	N/A
249	430	422	509	415	441	443.4	N/A
250	430	421	509	415	441	443.2	N/A
251	429	421	510	415	441	443.2	N/A
252	429	420	509	414	441	442.6	N/A
253	427	420	509	414	442	442.4	N/A
254	427	419	509	414	442	442.2	N/A
255	427	419	509	413	442	442.0	N/A
256	427	418	509	413	442	441.8	N/A
257	426	417	508	412	443	441.2	N/A
258	425	417	508	412	443	441.0	N/A
259	425	416	508	412	443	440.8	N/A
260	425	416	508	412	443	440.8	N/A
261	424	415	508	412	444	440.6	N/A
262	424	415	508	411	444	440.4	N/A
263	423	414	508	411	444	440.0	N/A
264	423	414	507	411	445	440.0	N/A
265	422	413	508	410	445	439.6	N/A
266	421	413	507	410	446	439.4	N/A
267	421	412	507	410	446	439.2	N/A
268	421	412	507	409	446	439.0	N/A
269	420	411	507	409	446	438.6	N/A
270	420	411	507	409	446	438.6	N/A
271	419	410	507	408	447	438.2	N/A
272	419	410	507	408	447	438.2	N/A
273	418	409	506	407	447	437.4	N/A
274	418	409	506	407	447	437.4	N/A
275	418	408	506	407	447	437.2	N/A
276	417	408	505	406	448	436.8	N/A
277	417	407	505	406	448	436.6	N/A
278	416	407	505	405	447	436.0	N/A
279	415	406	505	405	447	435.6	N/A
280	415	405	505	405	447	435.4	N/A
281	414	405	504	404	447	434.8	N/A
282	413	405	504	404	447	434.6	N/A
283	413	404	504	404	447	434.4	N/A
284	413	403	503	404	447	434.0	N/A
285	412	403	503	404	447	433.8	N/A
286	411	402	503	403	447	433.2	N/A
287	411	402	502	403	447	433.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
288	410	401	502	403	447	432.6	N/A
289	409	401	501	403	447	432.2	N/A
290	409	400	501	403	447	432.0	N/A
291	409	399	500	402	447	431.4	N/A
292	408	399	500	402	447	431.2	N/A
293	408	399	499	401	446	430.6	N/A
294	407	398	499	401	446	430.2	N/A
295	407	397	499	401	447	430.2	N/A
296	406	397	499	400	447	429.8	N/A
297	405	396	498	399	447	429.0	N/A
298	405	396	498	399	447	429.0	N/A
299	404	395	498	399	447	428.6	N/A
300	403	395	497	398	447	428.0	N/A
301	403	394	497	398	447	427.8	N/A
302	402	393	497	397	447	427.2	N/A
303	401	392	497	397	446	426.6	N/A
304	400	392	497	396	446	426.2	N/A
305	399	392	496	396	446	425.8	N/A
306	398	391	496	395	445	425.0	N/A
307	397	391	496	394	445	424.6	N/A
308	397	390	495	394	444	424.0	N/A
309	396	390	495	393	444	423.6	N/A
310	395	389	494	393	443	422.8	N/A
311	395	389	494	392	443	422.6	N/A
312	394	389	494	392	442	422.2	N/A
313	393	388	493	391	442	421.4	N/A
314	392	387	493	391	441	420.8	N/A
315	391	387	493	391	441	420.6	N/A
316	390	386	492	390	440	419.6	N/A
317	390	385	491	389	440	419.0	N/A
318	389	384	491	389	439	418.4	N/A
319	388	384	491	389	439	418.2	N/A
320	388	384	490	388	438	417.6	N/A
321	387	384	490	388	438	417.4	N/A
322	386	383	489	387	437	416.4	N/A
323	385	382	488	387	437	415.8	N/A
324	385	382	488	386	436	415.4	N/A
325	384	382	488	386	436	415.2	N/A
326	383	381	487	386	436	414.6	N/A
327	382	381	487	385	436	414.2	N/A
328	381	381	486	385	435	413.6	N/A
329	381	380	486	385	434	413.2	N/A
330	380	380	485	384	434	412.6	N/A
331	380	379	484	384	433	412.0	N/A
332	380	379	484	383	433	411.8	N/A
333	379	379	484	383	433	411.6	N/A
334	378	378	483	382	433	410.8	N/A
335	378	378	483	382	433	410.8	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
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	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
336	378	378	482	381	432	410.2	N/A
337	377	377	482	380	432	409.6	N/A
338	376	377	481	380	432	409.2	N/A
339	375	377	481	380	432	409.0	N/A
340	375	376	480	379	431	408.2	N/A
341	375	376	480	379	431	408.2	N/A
342	374	376	479	378	430	407.4	N/A
343	374	375	479	377	429	406.8	N/A
344	373	375	479	377	428	406.4	N/A
345	373	375	478	376	428	406.0	N/A
346	373	374	478	375	428	405.6	N/A
347	372	374	478	375	427	405.2	N/A
348	371	374	478	374	426	404.6	N/A
349	371	373	477	374	425	404.0	N/A
350	371	373	477	373	425	403.8	N/A
351	370	373	476	372	424	403.0	N/A
352	370	372	476	372	423	402.6	N/A
353	369	372	476	371	422	402.0	N/A
354	368	371	476	370	421	401.2	N/A
355	367	371	475	370	420	400.6	N/A
356	367	371	475	369	420	400.4	N/A
357	366	370	474	368	419	399.4	N/A
358	365	370	474	368	418	399.0	N/A
359	364	369	473	367	417	398.0	N/A
360	363	369	473	366	416	397.4	N/A
361	363	368	472	366	415	396.8	N/A
362	362	368	471	365	415	396.2	N/A
363	362	367	470	364	414	395.4	N/A
364	361	367	469	363	413	394.6	N/A
365	360	367	468	363	413	394.2	N/A
366	359	366	466	362	412	393.0	N/A
367	358	365	466	361	411	392.2	N/A
368	358	365	464	361	410	391.6	N/A
369	357	365	463	360	409	390.8	N/A
370	356	364	462	359	409	390.0	N/A
371	355	363	460	359	408	389.0	N/A
372	354	363	459	358	407	388.2	N/A
373	354	363	458	357	407	387.8	N/A
374	353	361	456	357	406	386.6	N/A
375	352	361	455	356	405	385.8	N/A
376	351	360	453	355	404	384.6	N/A
377	351	360	452	354	403	384.0	N/A
378	349	359	450	354	402	382.8	N/A
379	349	358	450	353	402	382.4	N/A
380	348	358	448	352	401	381.4	N/A
381	347	357	447	352	400	380.6	N/A
382	347	357	446	351	399	380.0	N/A
383	346	356	445	351	399	379.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
384	345	355	443	350	398	378.2	N/A
385	344	355	443	350	397	377.8	N/A
386	345	354	441	349	397	377.2	N/A
387	343	354	440	348	396	376.2	N/A
388	342	354	439	348	395	375.6	N/A
389	342	353	438	347	394	374.8	N/A
390	341	353	437	347	394	374.4	N/A
391	340	352	436	346	393	373.4	N/A
392	340	352	435	346	392	373.0	N/A
393	339	351	434	345	391	372.0	N/A
394	339	351	433	345	390	371.6	N/A
395	337	351	432	344	390	370.8	N/A
396	337	351	431	343	389	370.2	N/A
397	336	350	430	343	389	369.6	N/A
398	336	350	429	342	388	369.0	N/A
399	335	350	428	342	387	368.4	N/A
400	334	350	427	341	386	367.6	N/A
401	334	349	426	340	385	366.8	N/A
402	333	349	425	340	385	366.4	N/A
403	332	348	424	339	384	365.4	N/A
404	331	348	423	339	383	364.8	N/A
405	330	348	422	338	383	364.2	N/A
406	330	347	421	337	382	363.4	N/A
407	329	347	420	337	381	362.8	N/A
408	328	346	419	336	380	361.8	N/A
409	327	346	417	335	380	361.0	N/A
410	327	344	416	335	379	360.2	N/A
411	325	344	415	334	378	359.2	N/A
412	325	344	414	333	377	358.6	N/A
413	324	343	413	333	376	357.8	N/A
414	323	342	412	332	375	356.8	N/A
415	323	342	411	332	374	356.4	N/A
416	322	341	410	331	374	355.6	N/A
417	321	341	409	330	373	354.8	N/A
418	320	340	408	330	372	354.0	N/A
419	320	339	407	329	371	353.2	N/A
420	319	338	406	328	370	352.2	N/A
421	318	337	405	328	369	351.4	N/A
422	317	337	404	327	369	350.8	N/A
423	316	336	403	327	368	350.0	N/A
424	316	335	401	326	366	348.8	N/A
425	315	334	401	325	365	348.0	N/A
426	315	333	400	324	365	347.4	N/A
427	314	333	399	323	363	346.4	N/A
428	312	332	398	323	362	345.4	N/A
429	311	331	396	323	362	344.6	N/A
430	311	330	396	322	361	344.0	N/A
431	309	330	395	321	360	343.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
432	309	329	394	320	359	342.2	N/A
433	308	328	393	320	358	341.4	N/A
434	307	328	392	319	357	340.6	N/A
435	307	327	391	318	356	339.8	N/A
436	306	326	390	318	355	339.0	N/A
437	306	325	389	317	354	338.2	N/A
438	305	324	388	317	353	337.4	N/A
439	304	323	387	316	352	336.4	N/A
440	304	323	386	315	351	335.8	N/A
441	303	322	385	314	350	334.8	N/A
442	302	321	385	313	349	334.0	N/A
443	301	321	383	313	349	333.4	N/A
444	300	319	383	312	347	332.2	N/A
445	299	319	382	311	347	331.6	N/A
446	299	318	381	311	346	331.0	N/A
447	298	316	380	310	345	329.8	N/A
448	297	316	379	310	344	329.2	N/A
449	296	315	378	309	343	328.2	N/A
450	296	314	377	308	342	327.4	N/A
451	295	313	376	308	341	326.6	N/A
452	294	312	375	307	340	325.6	N/A
453	293	312	375	306	339	325.0	N/A
454	292	311	374	306	339	324.4	N/A
455	292	310	373	305	338	323.6	N/A
456	291	309	372	304	337	322.6	N/A
457	290	308	371	304	336	321.8	N/A
458	289	307	370	303	335	320.8	N/A
459	289	307	369	302	334	320.2	N/A
460	288	306	369	302	333	319.6	N/A
461	287	305	367	302	332	318.6	N/A
462	287	304	366	301	331	317.8	N/A
463	286	303	366	300	330	317.0	N/A
464	286	302	365	299	329	316.2	N/A
465	285	302	364	299	329	315.8	N/A
466	284	301	363	298	328	314.8	N/A
467	283	300	362	297	327	313.8	N/A
468	283	299	362	297	326	313.4	N/A
469	281	298	361	296	325	312.2	N/A
470	281	297	360	295	325	311.6	N/A
471	280	296	359	294	324	310.6	N/A
472	279	296	358	294	323	310.0	N/A
473	279	295	356	293	322	309.0	N/A
474	277	294	356	292	322	308.2	N/A
475	277	293	355	292	321	307.6	N/A
476	276	292	354	291	320	306.6	N/A
477	276	291	353	290	319	305.8	N/A
478	275	291	353	290	319	305.6	N/A
479	274	290	351	289	318	304.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
480	274	289	351	288	317	303.8	N/A
481	273	288	350	287	317	303.0	N/A
482	272	287	349	287	315	302.0	N/A
483	271	287	348	286	315	301.4	N/A
484	270	286	347	286	314	300.6	N/A
485	269	285	346	285	313	299.6	N/A
486	269	285	345	284	313	299.2	N/A
487	268	284	345	284	313	298.8	N/A
488	267	283	344	283	312	297.8	N/A
489	267	282	343	283	311	297.2	N/A
490	266	281	342	282	311	296.4	N/A
491	266	281	341	281	310	295.8	N/A
492	264	280	340	280	309	294.6	N/A
493	264	279	339	280	309	294.2	N/A
494	263	279	338	279	308	293.4	N/A
495	263	278	338	279	307	293.0	N/A
496	262	277	337	278	307	292.2	N/A
497	261	276	336	277	307	291.4	N/A
498	261	276	335	277	306	291.0	N/A
499	260	275	334	276	305	290.0	N/A
500	259	274	334	275	304	289.2	N/A
501	259	274	333	275	304	289.0	N/A
502	258	273	332	274	303	288.0	N/A
503	257	272	331	274	303	287.4	N/A
504	257	272	331	273	303	287.2	N/A
505	256	272	330	272	301	286.2	N/A
506	255	271	329	272	301	285.6	N/A
507	255	270	329	271	300	285.0	N/A
508	254	269	327	271	299	284.0	N/A
509	254	269	327	270	298	283.6	N/A
510	252	268	326	269	298	282.6	N/A
511	251	267	325	269	298	282.0	N/A
512	251	268	325	268	297	281.8	N/A
513	251	266	324	267	297	281.0	N/A
514	250	265	323	267	296	280.2	N/A
515	250	265	322	266	296	279.8	N/A
516	249	264	321	266	295	279.0	N/A
517	248	264	321	265	295	278.6	N/A
518	248	263	320	264	294	277.8	N/A
519	247	262	319	264	293	277.0	N/A
520	246	262	318	264	293	276.6	N/A
521	245	261	318	263	292	275.8	N/A
522	245	260	317	262	292	275.2	N/A
523	244	260	317	262	292	275.0	N/A
524	244	259	316	261	291	274.2	N/A
525	242	258	315	261	290	273.2	N/A
526	242	257	315	260	290	272.8	N/A
527	242	256	314	259	289	272.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
528	241	256	313	259	289	271.6	N/A
529	240	255	312	258	288	270.6	N/A
530	240	255	312	258	287	270.4	N/A
531	239	254	311	257	287	269.6	N/A
532	239	253	310	256	287	269.0	N/A
533	238	253	310	256	286	268.6	N/A
534	237	252	308	255	286	267.6	N/A
535	237	251	308	255	286	267.4	N/A
536	236	250	307	254	285	266.4	N/A
537	236	250	307	254	284	266.2	N/A
538	235	249	306	254	284	265.6	N/A
539	234	248	306	253	283	264.8	N/A
Average	401	416	476	447	401	428	N/A

LAB SAMPLE DATA - ASTM E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run #: 3

Job #: 18-449
Tracking #: 0019
Technician: SJB
Date: 6/13/2019

	Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
Train A Filters - First Hour	T236	89.1	89.1	89.8	0.7
Train A Filters - Remainder	T237	87.2	174.8	176.0	1.2
	T238	87.6			
Train A Probe	3A	116078.1	116078.1	116079.1	1.0
Train A O-Rings	3A	3575.7	3575.7	3578.9	3.2
Train B Filters	T239	88.3	177.1	178.3	1.2
	T240	88.8			
Train B Probe	3B	116340.9	116340.9	116342.2	1.3
Train B O-Rings	3B	3564.2	3564.2	3567.4	3.2
Background Filter	T241	87.6	87.6	87.6	0.0

Placed in Dessicator on:	6/14 - 7:15

Train A Filters - First Hour	89.9	6/17 7:30	89.8	6/17 14:07				
Train A Filters - Remainder	176.1	6/17 7:31	176.0	6/17 14:08				
Train A Probe	116079.1	6/17 7:30	116079.1	6/17 14:08				
Train A O-Rings	3578.9	6/17 7:30	3578.9	6/17 14:08				
Train B Filters	178.3	6/17 7:31	178.3	6/17 14:08				
Train B Probe	116342.3	6/17 7:30	116342.2	6/17 14:08				
Train B O-Rings	3567.3	6/17 7:30	3567.4	6/17 14:08				
Background Filter	87.6	6/18 7:30	87.6	6/17 14:08				

1st hour Sub-Total, mg:	0.7
Remainder Sub-Total, mg:	5.4
Train 1 Aggregate, mg:	**6.1**
Train 2 Aggregate, mg:	**5.7**
Ambient Aggregate, mg:	0.0

ASTM E3053 Wood Heater Run Sheets

Client: Kozy Heat Fireplaces Job Number: 18-449 Tracking #: 0019
Model: Z42 Run Number: 3 Test Date: 6/13/2019

Wood Heater Run Notes

Pre-Test Notes
Pre-Test Start Time: 7:42
Air Control Setting: Full Open

Time	Notes
0 min	Loaded all 9.0 lbs of kindling and start-up fuel into stove, lit kindling with propane torch for 60 seconds then closed the door. Air set to high setting, fan on high.
28 min	@2.9 lbs leveled coal bed and loaded high fire test fuel.
184 min	@3.0 lbs leveled coal bed and zeroed scale in preparation of loading test fuel.

Test Notes
Test Burn Start Time: 10:47
Air Control Setting: Full Closed

Time	Notes
0 min	Loaded test fuel, within 30 seconds, door closed at 1 minute. Air set to high setting, fan on high.
10 min	Set air to test setting
60 min	Changed 1-hour filter
539 min	End of Test

Test Burn End Time: 19:46

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO_2 (%): 17.00 CO (%): 4.310
Mid Gas CO_2 (%): 10.00 CO (%): 2.51

Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	9:15	9:19	9:17	19:59	19:53	19:55
CO_2	0.00	10.07	17.00	0.21	9.77	16.67
CO	0.000	2.484	4.310	-0.013	2.488	4.260

Flue Gas Probe Leak Check: Initial: No Leakage Final: No Leakage

Technician Signature: Date: 6/14/2019

ASTM E3053 Wood Heater Run Sheets

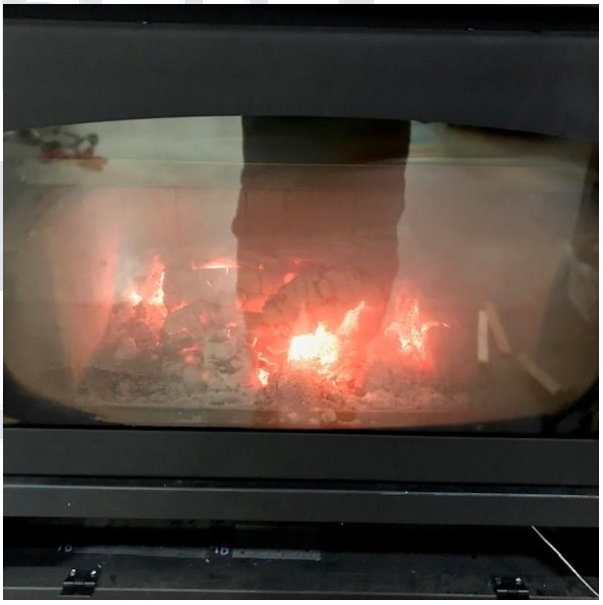
Client: Kozy Heat Fireplaces Job Number: 18-449 Tracking #: 0019
Model: Z42 Run Number: 3 Test Date: 6/13/2019

Test Photos

Kindling Fuel Load

Start-up Fuel Load

High Fire Fuel Load



Residual Start-up Fuel Coal Bed

Technician Signature: Date: 6/14/2019

ASTM E3053 Wood Heater Run Sheets

Client: Kozy Heat Fireplaces Job Number: 18-449 Tracking #: 0019
Model: Z42 Run Number: 3 Test Date: 6/13/2019

High Fire Fuel Loaded

Residual High Fire Load Coal Bed

Low Fire Fuel Load

Low Fire Fuel Loaded

Technician Signature: Date: 6/14/2019

Sample Pre-Test Tare Sheet: ☐ Probes ☒ TX40 Filters ☐ O-Rings

Date/Time In Desiccator: 4/19 - 16:00 Balance ID#: 107 Audit Weight ID# / Weight(mg): 109A-100mg

Sample ID	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Tech. Initials	Project/Run #
T221	4/23 16:00	88.7	4/25 - 7:00	88.7	-	-	-	-	SB	19-464 #3
T222		88.9		88.7	-	-	-	-	SB	1
T223		89.3		89.3	-	-	-		SB	18-449 #1
T224		89.4		89.4	-	-	-	-	SB	
T225		88.6		88.5	-	-	-	-	SB	
T226		88.4		88.3	-	-	-	-	SB	
T227		88.4		88.3	-	-	-	-	SB	
T228		88.9		88.8	-	-	-	-	SB	
T229		89.7		89.6	-	-	-	-	SB	
T230		88.4		88.5	-	-	-	-	SB	18-449 #2
T231		88.4		88.3	-	-	-	-	SB	
T232		88.3		88.4	-	-	-	-	SB	
T233		88.6		88.6	-	-	-	-	SB	
T234		87.5		87.5	-	-	-	-	SB	
T235		87.3		87.4	-	-	-	-	SB	
T236	6/10 - 7:00	89.1	6/11 - 7:45	89.1	-	-	-	-	SB	18-449 #3
T237		87.0		87.2	-	-	-	-	SB	
T238		87.5		87.6	-	-	-	-	SB	
T239		88.3		88.3	-	-	-	-	SB	
T240		88.8		88.8	-	-	-	-	SB	
T241		87.6		87.6	-	-	-	-	SB	
T242		85.9		86.0	-	-	-	-	SB	19-480 #1
T243		86.3		86.4	-	-	-	-	SB	
T244		86.6		86.4	-	-	-	-	SB	
T245		85.6		85.5	-	-	-	-	SB	
T246		86.0		86.0	-	-	-	-	SB	
T247		85.8		85.6	-	-	-	-	SB	19-480 #2
T248		90.7		90.9	-	-	-	-	SB	
T249		86.9		87.0	-	-	-	-	SB	
T250		87.2		87.0	-	-	-	-	SB	

ASTM E2515 - Filters

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
T251	87.3	87.3	–	~	SB	19-480	#2
T252	87.0	86.8	-	-	SB	19-480	#3
T253	86.9	87.1	-	-	SB	19-480	#3
T254	87.5	87.5	-	-	SB	19-480	#3
T255	88.0	87.8	-	-	SB	19-480	#3
T256	87.8	87.8	-	-	SB	19-480	#3
T257	87.0	86.9	-	-	SB		
T258	87.5	87.5	-	-	SB		
T259	87.5	87.7	-	-	SB		
T260	87.8	87.9	-	-	SB		
T261	86.9	86.8	-	-	SB		
T262	88.4	88.5	-	-	SB		
T263	88.2	88.2	-	-	SB		
T264	87.9	87.9	-	-	SB		
T265	89.1	89.1	-	-	SB		
T266	89.7	89.6	-	-	SB		
T267	88.4	88.5	-	-	SB		
T268	88.2	88.2	-	-	SB		

Weight 1 Date/Time:
6/14 - 14:00
Weight 2 Date/Time:
6/17 - 8:00
Weight 3 Date/Time:
Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
T269	87.7	87.8	-	-	SB		
T270	88.2	88.2	-	-	SB		
T271	87.7	87.7	-	-	SB		
T272	87.3	87.2	-	-	SB		
T273	87.8	87.8	-	-	SB		
T274	87.1	87.1	-	-	SB		
T275	86.6	86.5	-	-	SB		
T276	86.2	86.2	-	-	SB		
T277	86.8	86.8	-	-	SB		
T278	87.3	87.2	-	-	SB		
T279	87.2	87.1	-	-	SB		
T280	88.0	87.9	-	-	SB		
T281	87.9	88.0	-	-	SB		
T282	86.9	86.9	-	-	SB		
T283	86.9	86.8	-	-	SB		
T284	87.2	87.0	-	-	SB		
T285	87.2	87.2	-	-	SB		
T286	87.6	87.5	-	-	SB		

Weight 1 Date/Time:
6/14 - 14:00
Weight 2 Date/Time:
6/17 - 8:00
Weight 3 Date/Time:
Weight 4 Date/Time:

ASTM E2515 - Probes

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
1A	115630.0	115630.2	–	–	SB	18-449	#1
1B	115903.7	115903.8	–	–	SB		
2A	116240.5	116240.5	–	–	SB	18-449	#2
2B	116330.5	116330.6	–	–	SB		
3A	116078.1	116078.1	–	–	SB	18-449	#3
3B	116340.8	116340.9	–	–	SB		
4A	116183.6	116183.8	–	–	SB	19-480	#1
4B	116365.8	116366.0	–	–	SB		
5A	116769.1	116769.7	116769.1	116769.3	SB	19-480	#2
5B	116876.8	116877.2	116876.8	116876.9	SB		

Weight 1 Date/Time:
6/10 - 7:00

Weight 2 Date/Time:
6/11 - 7:45

Weight 3 Date/Time:
6/13 - 8:30

Weight 4 Date/Time:
6/14 - 7:30

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
6A	116544.8	116545.5	116545.3	–	SB	19-480	#3
6B	116117.9	116118.4	116118.4	–	SB		
7A	116740.8	116741.1	116741.2	–	SB		
7B	117289.4	117289.1	117289.0	–	SB		
8A	116823.4	116824.4	116824.3	–	SB		
8B	116825.8	116826.3	116826.2	–	SB		
9A							
9B							
10A							
10B							

Weight 1 Date/Time:
6/13 - 8:30

Weight 2 Date/Time:
6/14 - 7:30

Weight 3 Date/Time:
6/17 - 7:00

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
11A							
11B							
12A							
12B							
13A							
13B							
14A							
14B							
15A							
15B							

Weight 1 Date/Time:

Weight 2 Date/Time:

Weight 3 Date/Time:

Weight 4 Date/Time:

ASTM E2515 - O-Rings

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
1A	3562.7	3562.8	-	-	SB	18-449	#1
1B	3551.3	3551.3	-	-	SB		
2A	3548.4	3548.5	-	-	SB	18-449	#2
2B	3566.9	3567.1	-	-	SB		
3A	3575.6	3575.7	-	-	SB	18.449	#3
3B	3564.0	3564.2	-	-	SB		
4A	3588.4	3588.5	-	-	SB	19.480	#1
4B	3576.1	3576.3	-	-	SB		
5A	3530.2	3530.2	-	-	SB	19.480	#2
5B	3526.8	3526.9	-	-	SB		

Weight 1 Date/Time:
6/10 - 7:00

Weight 2 Date/Time:
6/11 - 7:45

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
6A	3611.1	3611.2	-	-	SB	19-480	#3
6B	3387.9	3387.8	-	-	SB		
7A	3570.0	3570.1	-	-	SB		
7B	3518.8	3519.0	-	-	SB		
8A	3548.8	3549.0	-	-	SB		
8B	3582.2	3582.3	-	-	SB		
9A							
9B							
10A							
10B							

Weight 1 Date/Time:
6/10 - 7:00

Weight 2 Date/Time:
6/13 - 8:30

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
11A							
11B							
12A							
12B							
13A							
13B							
14A							
14B							
15A							
15B							

Weight 1 Date/Time:

Weight 2 Date/Time:

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample Calculations – ASTM E3053 & E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run: 2

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_{Fldb} – Weight of test fuel load, dry basis, lb (kg)

M_{SUdb} – Weight of start-up fuel, dry basis, lb (kg)

M_{Kdb} - Weight of kindling, dry basis, lb (kg)

M_{FREHdb} - Total weight of all remaining fuel at end of high fire test run, lb (kg)

M_{TFBHdb} - Total weight of all fuel burned during high fire test run, lb (kg), dry basis

BR_H – Dry burn rate for high fire test run, from time when test fuel load is added to end of test run, lb/h (kg/h)

M_{TFBdb} - Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis

BR - Dry burn rate for low and medium fire test runs, lb/h (kg/h)

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 STP, g/dscf

E_T – Total particulate emissions, g

PR - Proportional rate variation

PM_{RH} - Particulate emission rate for high fire test run, g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned

PM_R – Particulate emission rate for low or medium fire test run, g/hr

PM_F – Particulate emission factor for low or medium fire test run, g/dry kg of fuel burned

M_{Fldb} – Weight of test fuel load, dry basis, lb (kg)
ASTM E3053 equation (1)

$$M_{Fldb} = \Sigma((M_{FLnwb})(100/(100 + MC_{FLn})))$$

Where,

M_{FLnwb} = Weight of each test fuel piece, n, in test fuel load per 8.4.1, wet basis, lb (kg)
MC_{FLn} = Average fuel moisture of test fuel piece, n, in test fuel load, % dry basis
n = individual test fuel pieces that comprise the test fuel load, as applicable.

Sample Calculation:

n	M_{FLnwb}	MC_{FLn}	$(M_{FLnwb})(100/(100 + MC_{FLn}))$		
1	3.88	22.4	3.88 (100) / (100+ 22.4)) =	3.17	
2	4.90	21.5	4.9 (100) / (100+ 21.5)) =	4.03	
3	4.33	22.8	4.33 (100) / (100+ 22.8)) =	3.53	
4	6.86	21.7	6.86 (100) / (100+ 21.7)) =	5.64	
5	3.34	21.1	3.34 (100) / (100+ 21.1)) =	2.76	
6	0.00	NA	N/A	-	
7	0.00		N/A	-	
			SUM	19.12	lbs

M_{Fldb} = **19.12** lbs
M_{Fldb} = **8.67** kg

M_{SUdb} – Weight of start-up fuel, dry basis, lb (kg)
ASTM E3053 equation (2)

$$M_{SUdb} = (M_{SUwb})(100/(100 + MC_{SU}))$$

Where,

M_{SUwb} = Total weight of start-up fuel pieces, wet basis, lb (kg)

MC_{SU} = Average fuel moisture of the piece(s) from which start-up fuel was split, % dry basis

Sample Calculation:

M_{SUwb} = N/A - Applicable to High Fire Tests Only

MC_{SU} = N/A - Applicable to High Fire Tests Only

M_{SUdb} = N/A (100/(100+ N/A)

M_{SUdb} = **N/A** lbs

= **N/A** kg

M_{Kdb} - Weight of kindling, dry basis, lb (kg)
ASTM E3053 equation (3)

$$M_{Kdb} = (M_{Kwb})(100/(100 + MC_K))$$

Where,

M_{Kwb} = Weight of kindling per 8.5.6, wet basis, lb (kg);

MC_K = Average moisture of kindling (may be assumed 10%), % dry basis.

Sample calculation:

M_{Kwb} = N/A - Applicable to High Fire Tests Only

MC_K = N/A - Applicable to High Fire Tests Only

M_{Kdb} = N/A (100/(100+ N/A)

M_{Kdb} = **N/A** lbs

= **N/A** kgs

M_{FREHdb} - Total weight of all remaining fuel at end of high fire test run, lb (kg)
ASTM E3053 equation (4)

$$M_{FREHdb} = M_{RSUBdb} + M_{FLEHdb}$$

Where,

M_{RSUBdb} = Weight of residual start-up fuel bed when high fire test load added, lb (kg)

M_{FLEHdb} = Weight of unburned portion of test fuel load at the end of the high fire test run, lb (kg)

Sample calculation:

M_{RSUBdb} = N/A - Applicable to High Fire Tests Only

M_{FLEHdb} = N/A - Applicable to High Fire Tests Only

M_{FREHdb} = N/A + N/A

M_{FREHdb} = **N/A** lbs

= **N/A** kg

M_{TFBHdb} - Total weight of all fuel burned during high fire test run, lb (kg), dry basis

ASTM E3053 equation (5)

$$M_{TFBHdb} = M_{Kdb} + M_{SUdb} + M_{FLdb} - M_{FREHdb}$$

Sample Calculation:

M_{Kdb} = N/A

M_{SUdb} = N/A

M_{FLdb} = N/A

M_{FREHdb} = N/A

M_{TFBHdb} = N/A + N/A + N/A - N/A

= **N/A** lbs

= **N/A** kg

BR_H – Dry burn rate for high fire test run, from time when test fuel load is added to end of test run, lb/h (kg/h)

ASTM E3053 equation (6)

$$BR_H = 60\ (M_{FLdb} - M_{FLEHdb})/\theta_{H1}$$

Where,

θ_{H1} = Total duration of high fire test run, from time when test fuel load is added to end of test run, min.

Sample calculation:

M_{FLdb} = N/A - Applicable to High Fire Tests Only

M_{FLEHdb} = N/A - Applicable to High Fire Tests Only

θ_{H1} = N/A - Applicable to High Fire Tests Only

$$BR_H = \frac{60\ (\ N/A\ -\ N/A\ )}{N/A}$$

BR_H = **N/A** lb/hr

= **N/A** kg/hr

M_{TFBdb} - Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis
ASTM E3053 equation (7)

$$M_{TFBdb} = M_{FLdb} - M_{FREdb}$$

Where,

M_{FLdb} = Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis

M_{FREdb} = Weight of remaining fuel at end of low or medium fire test run, lb (kg)

Sample Calculation:

M_{FLdb} = 19.12

M_{FREdb} = 0.00

M_{TFBdb} = 19.12 - 0.00

= **19.12** lbs

= **8.67** kg

BR - Dry burn rate for low and medium fire test runs, lb/h (kg/h)
ASTM E3053 equation (8)

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

Where,

θ = Total test run duration for low or medium fire test run, min.

Sample Calculation:

M_{TFBdb} = 19.12

θ = 398

$$BR = \frac{60 \times 19.12}{398}$$

BR = **2.88** lb/hr

= **1.31** kg/hr

V_s – Average gas velocity in the dilution tunnel, ft/sec
ASTM E2515 equation (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 pitot tube center point reading = $\frac{V_{strav}}{V_{scent}}$, 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 H_2O

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. H_20; (in Hg = in H_20/13.6)

M_s = **The dilution tunnel wet molecular weight; M_s = 28.78 assuming a dry weight of 29 lb/lb-mole

Sample calculation:

$$Fp = \frac{14.02}{15.55} = 0.902$$

$$V_s = 0.902 \times 85.49 \times 0.99 \times 0.239 \times \left(\frac{114.8 + 460}{\left(29.87 + \frac{-0.17}{13.6}\right) \times 28.78} \right)^{1/2}$$

V_s = **14.93** 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 Ms 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, ft^2
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:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 14.93 \times 0.1963 \times \frac{528}{114.8 + 460} \times \frac{29.87 + \frac{-0.17}{13.6}}{29.92}$$

Q_{sd} = **9480.6** dscf/hr

$V_{m(std)}$ – Volume of Gas Sampled Corrected to Dry Standard Conditions, dscf
ASTM E2515 equation (6)

$$V_{m(std)} = K_1 V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

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. H_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 60.326 \times 1.004 \times \frac{\left(29.87 + \frac{2.23}{13.6}\right)}{(93.5 + 460)}$$

$V_{m(std)}$ = **57.972** dscf

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 59.389 \times 1 \times \frac{\left(29.87 + \frac{2.17}{13.6}\right)}{(\#\#\#\#\# + 460)}$$

$V_{m(std)}$ = **55.092** dscf

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 42.84 \times 0.999 \times \frac{\left(\underline{29.87} + \frac{0.00}{13.6}\right)}{(85.7 + 460)}$$

$V_{m(std)}$ = **41.327** 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 A (first hour):

m_n = 0.0 + 2.5 + 0.0

m_n = 2.5 mg

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

m_n = 0.8 + -0.9 + 3.3

m_n = 3.2 mg

Train A aggregate:

m_n = 2.5 + 3.2

m_n = **5.7** mg

Using equation for Train B:

m_n = 0.7 + 1.6 + 2.9

m_n = **5.2** mg

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

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

Where:

K_2	=	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:

$$C_s = 0.001 \times \frac{5.7}{57.97}$$

C_s = **0.00010** g/dscf

For Train 2

$$C_s = 0.001 \times \frac{5.2}{55.09}$$

C_s = **0.00009** g/dscf

For Ambient Train

$$C_r = 0.001 \times \frac{0.1}{41.33}$$

C_r = **0.000002** 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 = (0.000098 - 0.000002) x 9480.6 x 398 /60

E_T = **6.03** g

For Train 2

E_T = (0.000094 - 0.000002) x 9480.6 x 398 /60

E_T = **5.78** g

Average

E = **5.91** g

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

7.5% of the average =	0.44
Train 1 difference =	0.12
Train 2 difference =	0.12

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, ^oR
T_m	=	Absolute average dry gas meter temperature, ^oR
T_{si}	=	Absolute average gas temperature in the dilution tunnel during the "ith" time interval, ^oR
T_s	=	Absolute average gas temperature in the dilution tunnel, ^oR

Sample calculation (for the first 1 minute interval of Train 1):

$$PR = \left(\frac{398 \times 0.143 \times 14.93 \times (152.0 + 460) \times (93.5 + 460)}{1 \times 60.326 \times 15.24 \times (114.8 + 460) \times (89.0 + 460)} \right) \times 100$$

PR = **99** %

PM_{RH} - Particulate emission rate for high fire test run, g/hr;
ASTM E3053 equation (9)

$$PM_{RH} = 60(E_{TH}/\theta_{H2})$$

Where,

E_{TH} = Total particulate emissions for high fire test run including kindling and start-up, g

θ_{H2} = Total duration of high fire test run, from ignition of kindling to end of test run, min.

Sample Calculation:

E_{TH} = N/A - Applicable to High Fire Tests Only

θ_{H2} = N/A - Applicable to High Fire Tests Only

PM_{RH} = 60(N/A / N/A)

PM_{RH} = **N/A** g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned.

ASTM E3053 equation (10)

$$PM_{FH} = E_{TH}/M_{TFBHdb}$$

Sample Calculation:

E_{TH} = N/A - Applicable to High Fire Tests Only

M_{TFBHdb} = N/A - Applicable to High Fire Tests Only

PM_{FH} = N/A / N/A

= **N/A** g/kg

PM_R - Particulate emission rate for low or medium fire test runs, g/hr
ASTM E3053 equation (12)

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

Where,

E_T = Total particulate emissions for low or medium fire test runs from Test Method E2515, g

Sample Calculation:

E_T = 5.91
θ = 398

PM_R = 60(5.91 / 398)

PM_{RH} = **0.89** g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned.
ASTM E3053 equation (13)

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

Sample Calculation:

E_T = 5.91
M_{TFBdb} = 8.67

PM_{FH} = 5.91 / 8.67
= **0.68** g/kg

Sample Calculations – ASTM E3053 & E2515

Client: Kozy Heat Fireplaces
Model: Z42
Run: 1

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_{Fldb} – Weight of test fuel load, dry basis, lb (kg)

M_{SUdb} – Weight of start-up fuel, dry basis, lb (kg)

M_{Kdb} - Weight of kindling, dry basis, lb (kg)

M_{FREHdb} - Total weight of all remaining fuel at end of high fire test run, lb (kg)

M_{TFBHdb} - Total weight of all fuel burned during high fire test run, lb (kg), dry basis

BR_H – Dry burn rate for high fire test run, from time when test fuel load is added to end of test run, lb/h (kg/h)

M_{TFBdb} - Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis

BR - Dry burn rate for low and medium fire test runs, lb/h (kg/h)

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 STP, g/dscf

E_T – Total particulate emissions, g

PR - Proportional rate variation

PM_{RH} - Particulate emission rate for high fire test run, g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned

PM_R – Particulate emission rate for low or medium fire test run, g/hr

PM_F – Particulate emission factor for low or medium fire test run, g/dry kg of fuel burned

M_{Fldb} – Weight of test fuel load, dry basis, lb (kg)
ASTM E3053 equation (1)

$$M_{Fldb} = \Sigma((M_{FLnwb})(100/(100 + MC_{FLn})))$$

Where,

M_{FLnwb} = Weight of each test fuel piece, n, in test fuel load per 8.4.1, wet basis, lb (kg)
MC_{FLn} = Average fuel moisture of test fuel piece, n, in test fuel load, % dry basis
n = individual test fuel pieces that comprise the test fuel load, as applicable.

Sample Calculation:

n	M_{FLnwb}	MC_{FLn}	$(M_{FLnwb})(100/(100 + MC_{FLn}))$		
1	4.52	25.0	4.52 (100) / (100+ 25)) =	3.62	
2	4.41	23.7	4.41 (100) / (100+ 23.7)) =	3.57	
3	3.24	22.4	3.24 (100) / (100+ 22.4)) =	2.65	
4	7.93	22.9	7.93 (100) / (100+ 22.9)) =	6.45	
5	0.00	NA	N/A	-	
6	0.00	NA	N/A	-	
7	N/A	N/A	N/A	-	
			SUM	16.28	lbs

M_{Fldb} = **16.28** lbs
M_{Fldb} = **7.39** kg

M_{SUdb} – Weight of start-up fuel, dry basis, lb (kg)
ASTM E3053 equation (2)

$$M_{SUdb} = (M_{SUwb})(100/(100 + MC_{SU}))$$

Where,

M_{SUwb} = Total weight of start-up fuel pieces, wet basis, lb (kg)

MC_{SU} = Average fuel moisture of the piece(s) from which start-up fuel was split, % dry basis

Sample Calculation:

M_{SUwb} = 4.5

MC_{SU} = 20.9

M_{SUdb} = 4.5 (100/(100+ 20.9)

M_{SUdb} = **3.72** lbs

= **1.69** kg

M_{Kdb} - Weight of kindling, dry basis, lb (kg)
ASTM E3053 equation (3)

$$M_{Kdb} = (M_{Kwb})(100/(100 + MC_K))$$

Where,

M_{Kwb} = Weight of kindling per 8.5.6, wet basis, lb (kg);

MC_K = Average moisture of kindling (may be assumed 10%), % dry basis.

Sample calculation:

M_{Kwb} = 3

MC_K = 10.0

M_{Kdb} = 3.00 (100/(100+ 10.0)

M_{Kdb} = **2.73** lbs

= **1.24** kgs

M_{FREHdb} - Total weight of all remaining fuel at end of high fire test run, lb (kg)
ASTM E3053 equation (4)

$$M_{FREHdb} = M_{RSUBdb} + M_{FLEHdb}$$

Where,

M_{RSUBdb} = Weight of residual start-up fuel bed when high fire test load added, lb (kg)

M_{FLEHdb} = Weight of unburned portion of test fuel load at the end of the high fire test run, lb (kg)

Sample calculation:

M_{RSUBdb} = 2.2

M_{FLEHdb} = 2.2

M_{FREHdb} = 2.20 + 2.2

M_{FREHdb} = **4.40** lbs

= **2.00** kg

M_{TFBHdb} - Total weight of all fuel burned during high fire test run, lb (kg), dry basis

ASTM E3053 equation (5)

$$M_{TFBHdb} = M_{Kdb} + M_{SUdb} + M_{FLdb} - M_{FREHdb}$$

Sample Calculation:

M_{Kdb} = 2.73

M_{SUdb} = 3.72

M_{FLdb} = 16.28

M_{FREHdb} = 4.40

M_{TFBHdb} = 2.73 + 3.72 + 16.28 - 4.40

= **18.33** lbs

= **8.32** kg

BR_H – Dry burn rate for high fire test run, from time when test fuel load is added to end of test run, lb/h (kg/h)

ASTM E3053 equation (6)

$$BR_H = 60\ (M_{FLdb} - M_{FLEHdb})/\theta_{H1}$$

Where,

θ_{H1} = Total duration of high fire test run, from time when test fuel load is added to end of test run, min.

Sample calculation:

M_{FLdb} = 16.28

M_{FLEHdb} = 2.20

θ_{H1} = 122

$$BR_H = \frac{60\ (\ 16.28\ -\ 2.20\ )}{122}$$

BR_H = **6.93** lb/hr

= **3.14** kg/hr

M_{TFBdb} - Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis
ASTM E3053 equation (7)

$$M_{TFBdb} = M_{FLdb} - M_{FREdb}$$

Where,

M_{FLdb} = Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis

M_{FREdb} = Weight of remaining fuel at end of low or medium fire test run, lb (kg)

Sample Calculation:

M_{FLdb} = N/A - Applicable to Low/Medium Fire Tests Only

M_{FREdb} = N/A - Applicable to Low/Medium Fire Tests Only

M_{TFBdb} = N/A - N/A

= **N/A** lbs

= **N/A** kg

BR - Dry burn rate for low and medium fire test runs, lb/h (kg/h)
ASTM E3053 equation (8)

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

Where,

θ = Total test run duration for low or medium fire test run, min.

Sample Calculation:

M_{TFBdb} = N/A - Applicable to Low/Medium Fire Tests Only

θ = N/A - Applicable to Low/Medium Fire Tests Only

$$BR = \frac{60 \times \text{N/A}}{\text{N/A}}$$

BR = **N/A** lb/hr

= **N/A** kg/hr

V_s – Average gas velocity in the dilution tunnel, ft/sec
ASTM E2515 equation (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 pitot tube center point reading = $\frac{V_{strav}}{V_{scent}}$, 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 H_2O

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. H_20; (in Hg = in H_20/13.6)

M_s = **The dilution tunnel wet molecular weight; M_s = 28.78 assuming a dry weight of 29 lb/lb-mole

Sample calculation:

$$Fp = \frac{14.01}{15.53} = 0.902$$

$$V_s = 0.902 \times 85.49 \times 0.99 \times 0.239 \times \left(\frac{140.8 + 460}{\left(29.96 + \frac{-0.17}{13.6}\right) \times 28.78} \right)^{1/2}$$

V_s = **15.23** 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 Ms 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, ft^2
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:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 15.23 \times 0.1963 \times \frac{528}{140.8 + 460} \times \frac{29.96 + \frac{-0.17}{13.6}}{29.92}$$

Q_{sd} = **9278.5** dscf/hr

$V_{m(std)}$ – Volume of Gas Sampled Corrected to Dry Standard Conditions, dscf
ASTM E2515 equation (6)

$$V_{m(std)} = K_1 V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

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. H_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 21.632 \times 1.004 \times \frac{\left(29.96 + \frac{2.24}{13.6}\right)}{(83.3 + 460)}$$

$V_{m(std)}$ = **21.239** dscf

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 21.357 \times 1 \times \frac{\left(29.96 + \frac{2.19}{13.6}\right)}{(95.1 + 460)}$$

$V_{m(std)}$ = **20.440** dscf

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 15.22 \times 0.999 \times \frac{\left(\underline{29.96} + \frac{0.00}{13.6}\right)}{(82.2 + 460)}$$

$V_{m(std)}$ = **14.821** 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 A (first hour):

m_n = 0.0 + 2.6 + 0.0

m_n = 2.6 mg

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

m_n = 0.8 + 2.4 + 0.5

m_n = 3.7 mg

Train A aggregate:

m_n = 2.6 + 3.7

m_n = **6.3** mg

Using equation for Train B:

m_n = 0.9 + 5.2 + 0.6

m_n = **6.7** mg

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

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

Where:

K_2	=	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:

$$C_s = 0.001 \times \frac{6.3}{21.24}$$

C_s = **0.00030** g/dscf

For Train 2

$$C_s = 0.001 \times \frac{6.7}{20.44}$$

C_s = **0.00033** g/dscf

For Ambient Train

$$C_r = 0.001 \times \frac{0.0}{14.82}$$

C_r = **0.000000** 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 = (0.000297 - 0.000000) x 9278.5 x 145 /60

E_T = **6.65** g

For Train 2

E_T = (0.000328 - 0.000000) x 9278.5 x 145 /60

E_T = **7.35** g

Average

E = **7.00** g

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

7.5% of the average =	0.53
Train 1 difference =	0.35
Train 2 difference =	0.35

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, ^oR
T_m	=	Absolute average dry gas meter temperature, ^oR
T_{si}	=	Absolute average gas temperature in the dilution tunnel during the "ith" time interval, ^oR
T_s	=	Absolute average gas temperature in the dilution tunnel, ^oR

Sample calculation (for the first 1 minute interval of Train 1):

$$PR = \left(\frac{145 \times 0.139 \times 15.23 \times (81.0 + 460) \times (83.3 + 460)}{1 \times 21.632 \times 13.92 \times (140.8 + 460) \times (76.0 + 460)} \right) \times 100$$

PR = **93** %

PM_{RH} - Particulate emission rate for high fire test run, g/hr;
ASTM E3053 equation (9)

$$PM_{RH} = 60(E_{TH}/\theta_{H2})$$

Where,

E_{TH} = Total particulate emissions for high fire test run including kindling and start-up, g

θ_{H2} = Total duration of high fire test run, from ignition of kindling to end of test run, min.

Sample Calculation:

E_{TH} = 7.00

θ_{H2} = 145

PM_{RH} = 60(7.00 / 145)

PM_{RH} = **2.90** g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned.

ASTM E3053 equation (10)

$$PM_{FH} = E_{TH}/M_{TFBHdb}$$

Sample Calculation:

E_{TH} = 7.00

M_{TFBHdb} = 8.32

PM_{FH} = 7.00 / 8.32

= **0.84** g/kg

PM_R - Particulate emission rate for low or medium fire test runs, g/hr
ASTM E3053 equation (12)

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

Where,

E_T = Total particulate emissions for low or medium fire test runs from Test Method E2515, g

Sample Calculation:

E_T = N/A - Applicable to Low/Medium Fire Tests Only
θ = N/A - Applicable to Low/Medium Fire Tests Only

PM_R = 60(N/A / N/A)

PM_{RH} = **N/A** g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned.
ASTM E3053 equation (13)

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

Sample Calculation:

E_T = N/A - Applicable to Low/Medium Fire Tests Only
M_{TFBdb} = N/A - Applicable to Low/Medium Fire Tests Only

PM_{FH} = N/A / N/A
= **N/A** g/kg

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

FEB 2 8 2018

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Mr. Justin White
Hearthstone QHPP, Inc.
#17 Stafford Ave.
Morrisville, VT 05661

Dear Mr. White,

I am writing in response to your letter dated January 12, 2018, regarding wood heaters manufactured by Hearthstone QHPP, Inc. (Hearthstone). This response, dated February 28, 2018, supercedes our previous response (dated February 26, 2018) to correct an inaccuracy regarding required changes to ASTM E3053-17.

You are requesting to use an alternative test method, using cord wood, as referenced in section 60.532(c) of 40 CFR part 60, Subpart AAA, Standards of Performance for New Residential Wood Heaters (Subpart AAA) to meet the 2020 cord wood alternative compliance option. The 2020 cord wood alternative compliance option states that each affected wood heater manufactured or sold at retail for use in the United States on or after May 15, 2020, must not discharge into the atmosphere any gases that contain particulate matter in excess of 2.5 g/hr. Compliance must be determined by a cord wood test method approved by the Administrator along with the procedures in 40 CFR 60.534. You have requested approval to use the procedures and specifications found in ASTM Method E3053-17, a cord wood test method titled, "Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters using Cordwood Test Fuel," in conjunction with ASTM E2515-11 and Canadian Standards Administration (CSA) Method CSA-B415.1-10, which are specified in 40 CFR 60.534.

We understand that Hearthstone is also requesting that the alternative method proposed above be approved to apply broadly to all wood heaters manufactured by Hearthstone meeting the requirements of Subpart AAA, from the approval date of this request until such time that Subpart AAA is revised or replaced to require a different cord wood certification method, providing all requirements of section 60.533 of Subpart AAA are met.

With the caveats set forth below, we approve your alternative test method request for certifying wood heaters using ASTM E3053-17 in conjunction with section 60.534 of Subpart AAA to meet the 2020 cord wood compliance option until such time that Subpart AAA is revised or replaced to require a different cord wood certification method. We also approve application of this alternative method to all wood heaters manufactured by Hearthstone meeting the requirements of Subpart AAA.

As required in Subpart AAA, section 60.354(d), you or your approved test laboratory must also measure the first hour of particulate matter emissions for each test run using a separate filter in one of the two parallel sampling trains. These results must be reported separately and also included in the total particulate matter emissions per run. Also, as required by Subpart AAA, section 60.534(e), you must have your approved laboratory measure the efficiency, heat output, and carbon monoxide emissions of the tested wood heater using CSA-B415.1-10. For measurement of particulate matter emission concentrations, ASTM 2515-11 must be used.

The following change to ASTM E3053-17 must be followed:

1. Coal bed conditions prior to loading test fuel. The coal bed shall be a level plane without valleys or ridges for all test runs in the high, low, and medium burn rate categories.

The following changes to ASTM E2515-11 must be followed:

1. The filter temperature must be maintained between 80 and 90 degrees F during testing.

2. Filters must be weighed in pairs to reduce weighing error propagation; see ASTM 2515-11, Section 10.2.1 Analytical Procedure.

3. Sample filters must be Pall TX-40 or equivalent Teflon-coated glass fiber, and of 47 mm, 90 mm, 100 mm, or 110 mm in diameter.

4. Only one point is allowed outside the +/- 10 percent proportionality range per test run.

A copy of this letter must be included in each certification test report where this alternative test method is utilized.

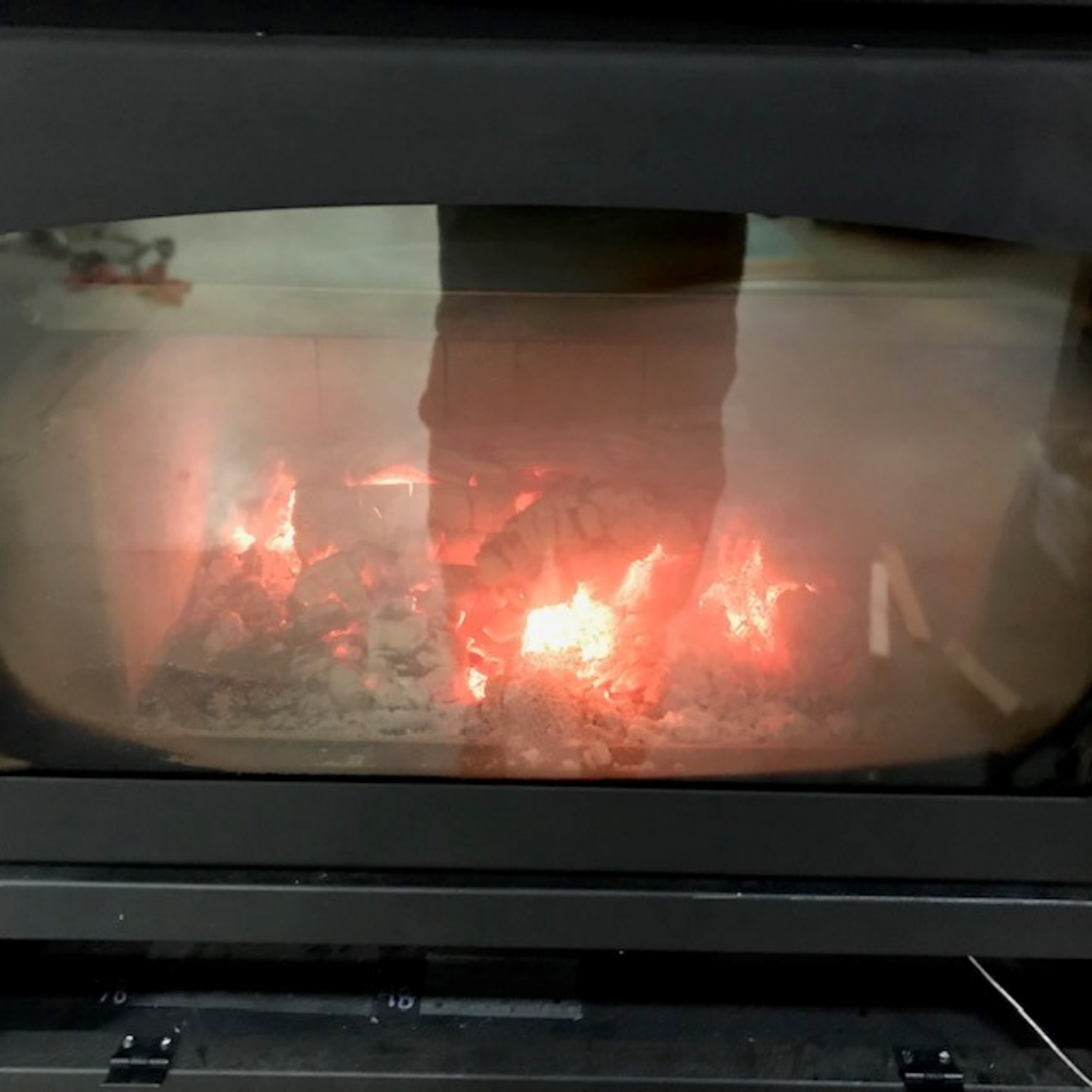
It is reasonable that this alternative test method approval be broadly applicable to all wood heaters subject to the requirements of 40 CFR part 60, Subpart AAA. For this reason, we will post this letter as ALT-125 on our website at *http://www3.epa.gov/ttn/emc/approalt.html* for use by other interested parties. As noted earlier in this letter, this alternative method approval is valid until such time that Subpart AAA is revised or replaced to require a different cord wood certification method, and at such time, this alternative will be reconsidered and possibly withdrawn.

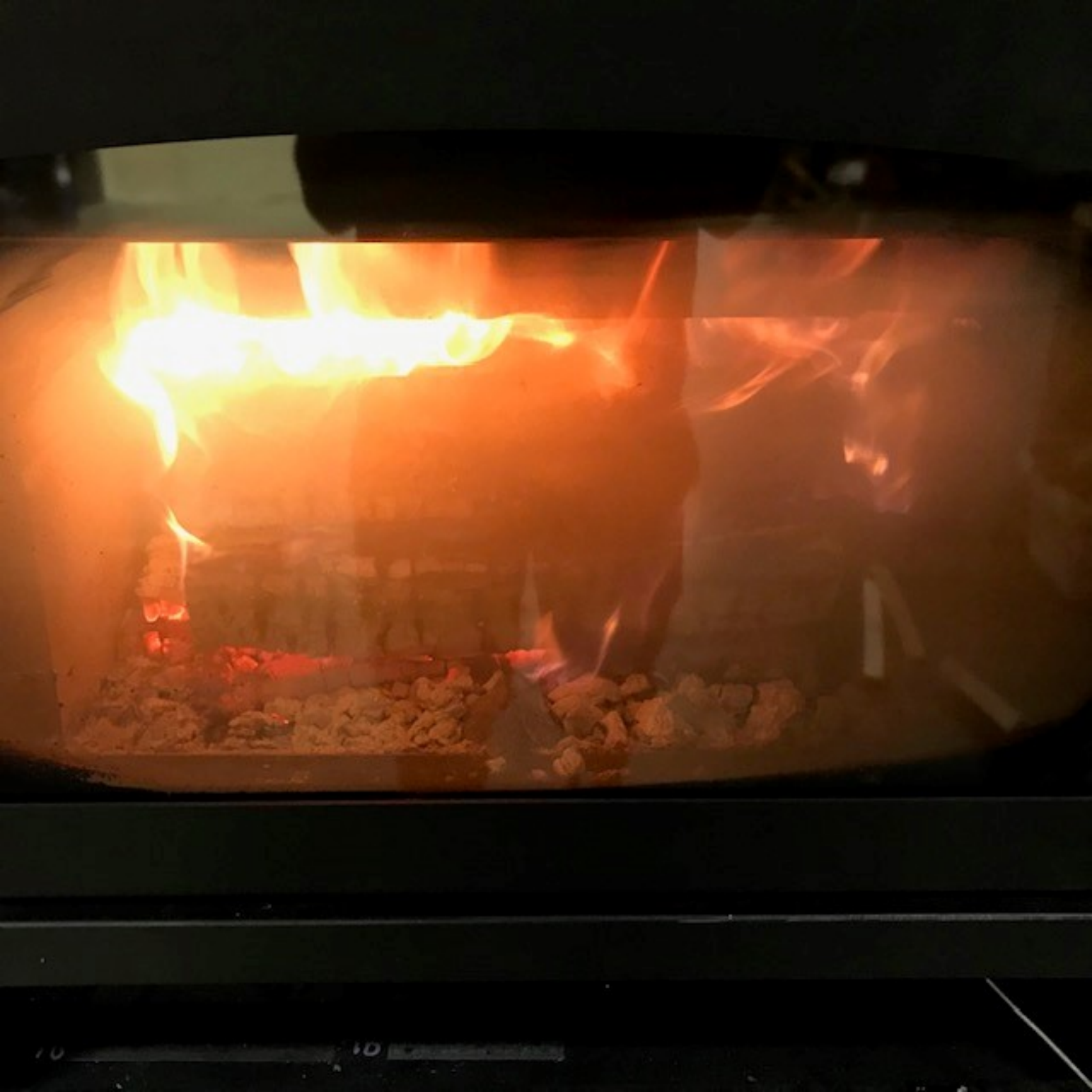
If you have additional questions regarding this approval, please contact Michael Toney of my staff at 919-541-5247 or toney.mike@epa.gov.

Sincerely,

Steffan M. Johnson, Group Leader
Measurement Technology Group

cc: Amanda Aldridge, EPA/OAQPS/OID
Adam Baumgart-Getz, EPA/OAQPS/OID
Rafael Sanchez, EPA/OECA
Michael Toney, EPA/OAQPS/AQAD



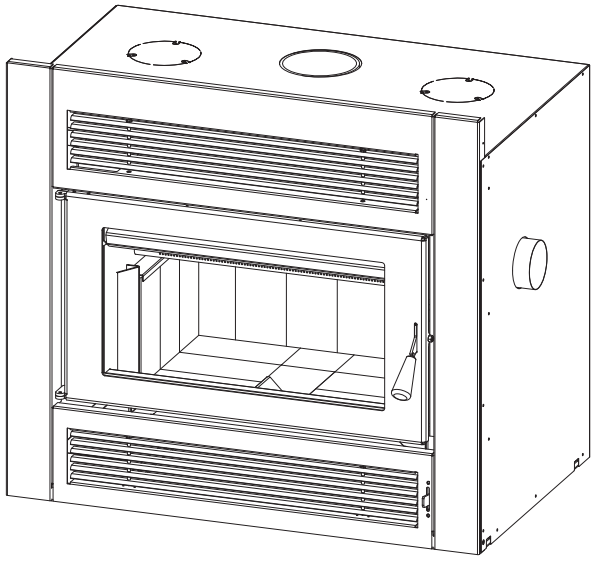


KOZY HEAT
FIREPLACES
HUSSONG MANUFACTURING CO., INC.

INSTALLATION AND OPERATION MANUAL

Z-42 & Z-42-CD

Models #Z-42 & #Z-42-CD
Zero Clearance Factory Built Fireplace



English and French installation manuals are available through your local dealer. Visit our website *www.kozyheat.com*.

Les manuels d'installation en français et en anglais sont disponibles chez votre détaillant local. Visitez *www.kozyheat.com*.

PFS C US

NATIONAL FIREPLACE INSTITUTE NFI CERTIFIED www.nficertified.org

We suggest that our gas hearth products be installed and serviced by professionals who are certified in the U.S. by the National Fireplace Institute® (NFI) as NFI Gas Specialists.

⚠WARNING:
Read instructions carefully before installation. Failure to install this fireplace correctly can cause serious structural and fire hazards and may void your warranty.

- **Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this fireplace or any other appliance.**
- **Do not overfire.**
- **For use with solid wood fuel only.**
- **Comply with all minimum clearances to combustibles as specified. Failure to comply may cause house fire.**

⚠ WARNING

HOT SURFACES!
Glass and other surfaces are hot during operation AND cool down.

Hot glass will cause burns.

- **DO NOT touch glass until its cooled**
- **NEVER allow children to touch glass**
- **Keep children away**

- **CAREFULLY SUPERVISE children in the same room as the fireplace**
- **Alert children and adults to hazards of high temperatures**
- **Keep clothing, furniture, draperies and other flammable materials away**

INSTALLER: Leave this manual with the appliance.
CONSUMER: Retain this manual for future reference.

Read this manual before installation or operating this appliance.
Please retain this owner's manual for future reference.

CONGRATULATIONS!

We welcome you as a new owner of a Kozy Heat fireplace. Kozy Heat products are designed with superior components and materials, and assembled by trained craftsmen who take pride in their work. To ensure you receive a quality product, the complete fireplace is thoroughly inspected before packaging. Our commitment to quality and customer satisfaction has remained the same for over 40 years. We offer a complete line of gas and wood fireplaces, along with stylish accessories to complement any decor. Adding a fireplace is one of the best ways to increase the value of your home, and we are proud to offer a network of dealers throughout the country to help make your experience everything you imagine. We pride ourselves in being dedicated not only to functionality and reliability, but also customer safety. We offer our continual support and guidance to help you achieve the maximum benefit and enjoyment from your Kozy Heat fireplace.

Jim Hussong
President

Dudley Hussong
Board Chairman

Homeowner Reference Information

We recommend you record the following information:

Model Name: _____ Date purchased/installed: _____

Serial Number: _____ Location of fireplace: _____

Dealership Purchased from: _____ Dealer phone: _____

Notes: _____

_____

_____

_____

_____

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Appliance Certification

Laboratory: PFS in Cottage Grove, Wisconsin, USA

Standards:

UL 127-2015 (R2016) and CAN/ULC S610:2018 Safety Standards for U.S. and Canadian installations.

U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

1.2 California Proposition 65 Warning

WARNING: This product and the fuels used to operate this product (wood), and the products of combustion of such fuels, can expose you to chemicals including carbon black, which is known to the State of California to cause cancer, and carbon monoxide, which is known to the State of California to cause birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov

1.3 Safety Information

WARNING: THIS FIREPLACE HAS NOT BEEN TESTED WITH AN UNVENTED GAS LOG SET. TO REDUCE THE RISK OF FIRE OR INJURY, DO NOT INSTALL AN UNVENTED GAS LOG SET INTO THIS FIREPLACE.

For further information on using your fireplace safely, obtain a copy of the National Fire Protection Association publication "Using Coal & Wood Stoves Safely" NFPA No. HS-10.

This fireplace installation must conform with local building codes, or in the absence of local codes, with the NFPA 211 Standard for Chimneys, Fireplaces, and Vents.

Installation and repair should only be performed by a qualified installer.

This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.

CAUTION: This appliance requires the need for an adequate supply of air for combustion. Ensure there is enough ventilation air for safe operation of all fuel burning appliances in the home at the same time. Starving appliances for air can cause severe back drafting, negative pressure, and nuisance outages.

Do not use any makeshift components or any components not specified for use with this appliance. If you modify it or any of its components, you will void the warranty and you may possibly cause a fire hazard.

CAUTION: Check building codes prior to installation.

- Installation MUST comply with local, regional, state, and national codes and regulations.
- Consult insurance carrier, local building, fire officials or authorities having jurisdiction about restrictions, installation inspection, and permits.

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.

1.4 Installation Overview

NOTE: The qualified installer should follow the procedure best suited for the installation.

1. If masonry (optional) is to be used, prepare the foundation for the masonry load. A lintel is required to support the added weight above the fireplace.
2. Frame an opening for the fireplace, allowing for vent installation and type of installation (corner, flat wall application).
3. Install optional hearth.
4. Install optional heat duct venting.
5. Install any electrical wiring.
6. Install fireplace into framing.
7. Attach combustion air pipe.
8. Install chimney.
9. Install desired facing material.
10. Install mantel.
11. Install optional fan.
12. Install firebrick.
13. Install door components and grills.
14. Install any optional decorative accessories.

2.0 SPECIFICATIONS

2.1 Btu & Efficiency Specifications

EPA Certification #	214-19
EPA Certified Emissions	1.22 grams per hour
LHV Tested Efficiency	70.6%
HHV Tested Efficiency	66.0%
Burn time (length of high fire test / low fire test)	2 - 9 hours
EPA Btu Output	12,850-36,231 Btu/ hr
***Peak Btu/hour Output**	49,133 Btu/hr
****Optimum Efficiency**	73.32
Fuel	Cord wood
*A peak BTU out of the appliance is calculated using the maximum first hour burn rate from the High EPA Test and the BTU content of cordwood times the efficiency.	
**Optimum efficiency is calculated using the medium fire test burn data, BTU content of the cordwood, and the best case moisture content of the cordwood.	
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.	

2.2 Electrical Specifications

Code approved line voltage wiring 14 gauge or better must be used when wiring the optional #600-1 fan kit assembly. Refer to local codes for specific requirements.

This appliance must be electrical grounded and connected with local codes, or in the absence of local codes, with the *National Electrical Code, ANSI/NFPA 70 Current Edition*, or the *Canadian Electrical Code CSA C22.1*.

2.3 Fireplace Dimensions

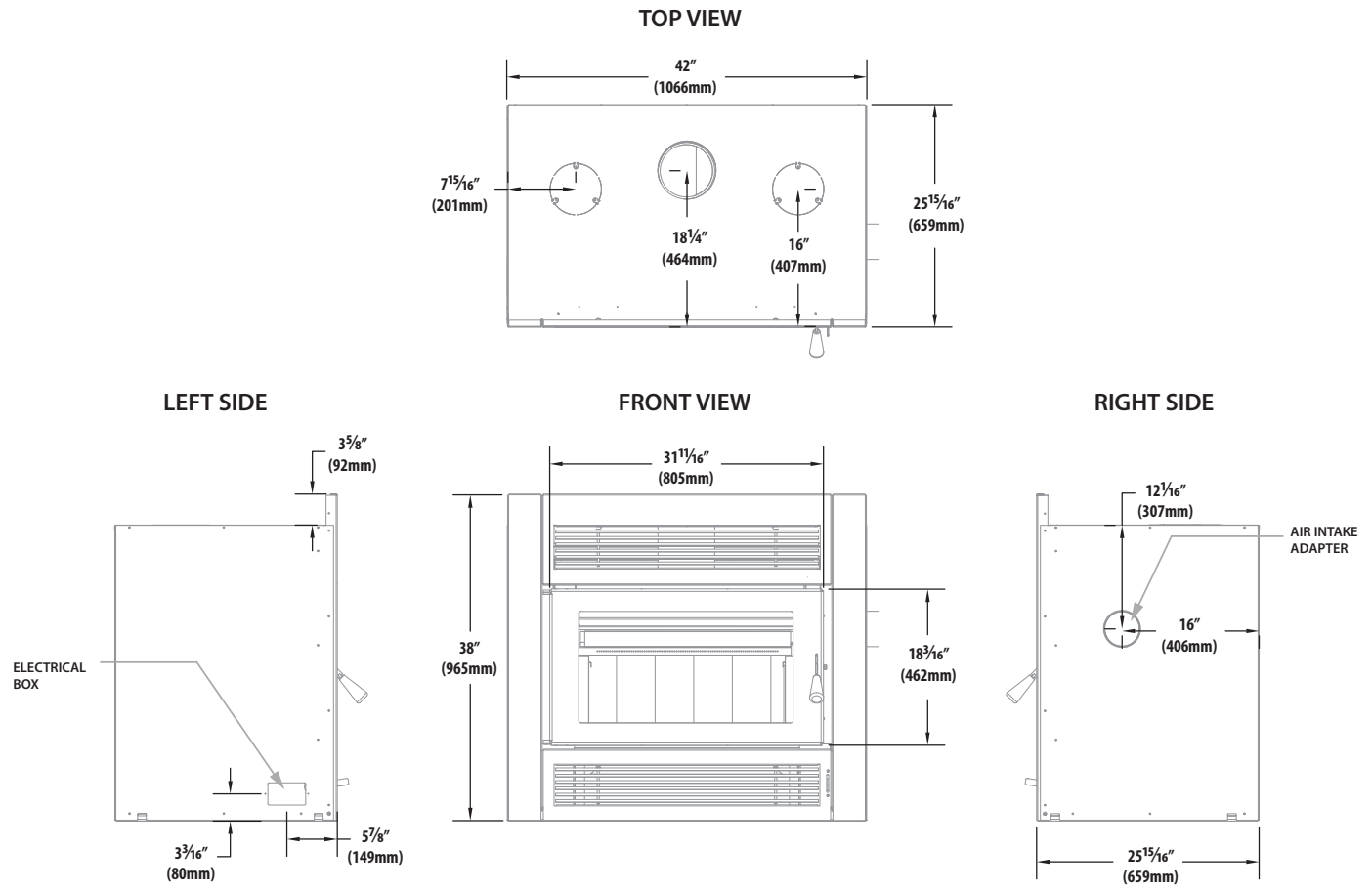


Figure 2.1, Fireplace Dimensions

3.0 INSTALLATION PLANNING

3.1 Fireplace Placement Clearance Requirements

WARNING: Follow all instructions and clearances as outlined throughout this manual.

See Figure 3.1, Placement Clearance Requirements on page 11 for illustration.

- Location of doors and windows on all floors of the home in relation to the fireplace and chimney must be considered and be in compliance with applicable codes, if any.
- This fireplace must be installed on a level surface capable of supporting the fireplace and venting.
- The fireplace must be placed directly on wood or non-combustible surface (not linoleum or carpet) extending the entire depth and width of the fireplace.
- Metal sealing strips must be used under the fireplace and hearth extension. See section 3.5 Hearth Extension on page 14 for more information.
- Due to high surface temperatures, the fireplace should be located out of traffic and away from furniture and draperies.
- The minimum hearth extension floor area is 16" (406mm) in front of the fireplace opening and 8" (203mm) beyond each side of the fireplace opening. The minimum hearth extension must be insulated with non-combustible floor protection with a minimum insulation R-value of 0.8.
  Manufactured hearth materials have a published **R value (resistance to heat)** or k **value (conductivity of heat)**. Use the following formula to convert a k value to a R value.
  R=1/k x inches of thickness. See section 3.6 Alternate Floor Protection Material on page 15 for full equation.
- Please be aware of the large amount of heat this fireplace will produce when determining a location.

3.2 Zone Heating

The Z42 wood fireplace is an appliance that provides zone heating. Zone heating effectively heats the area the appliance is installed in, as well as the spaces connected to that area. Zone heating is a great method to complement a primary heating source, such as a conventional oil, gas, or electric heating system.

To increase the effectiveness of zone heating, consider where the family spends the most of the time. This is normally the family room. By locating your fireplace in this area, you will maximize the effectiveness of the appliance's heat production. Other factors affecting your heating capabilities will be your house size, type and amount of insulation in your home, the use of optional heat transfer kits, and your climate zone.

Optional heat transfer kits are a great method to move heat to other sections of the house. The Z42 wood fireplace is approved for use with part #HTK-INT. This kit contains flexible pipe that is connected to a wall mounted fan to transfer heat from the fireplace. See additional information in the heat transfer kit manual. Ceiling fans are an additional mechanism to promote good air movement to fully utilize the heat produced from your fireplace.

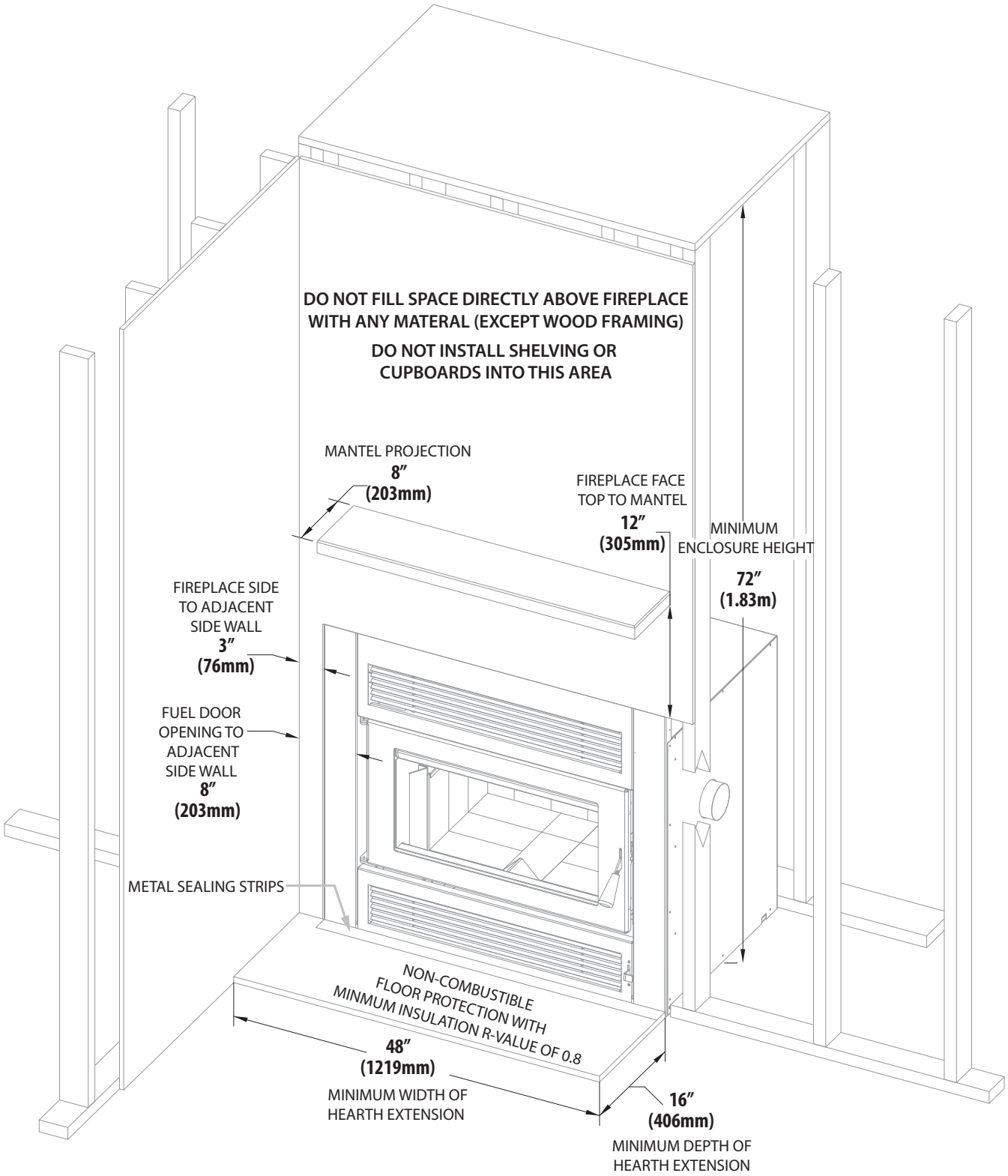


Figure 3.1, Placement Clearance Requirements

Nominal 2″ x 4″ framing used

3.3 Clearances to Combustibles

NOTE: Even though minimum clearances from back wall and side walls is 0" (0mm), a 1/4" (6mm) expansion space is recommended to allow for heat expansion.

Table 3.1, Minimum Clearances to Combustibles		
WITHIN ENCLOSURE AREA		
Fireplace to back wall	0"	0mm
Fireplace to sidewalls	0"	0mm
Top stand-off to header	0"	0mm
Minimum height of fireplace enclosure from the fireplace base	72"	1.83m
EXPOSED AREA		
Wallboard to faceplate top edge and sides	0"	0mm
Fuel door opening to sidewall	8"	203mm
Fireplace face top to 8" (203mm) mantel	12"	305mm
Front of fireplace	36"	914mm

NOTE: All dimensions include 1/4" (6mm) side & back expansion space and 1/2" (13mm) sheathing. Sheathing is flush with with the fireplace front. Dimensions must be adjusted if your sheathing is more than 1/2" (13mm) thick.

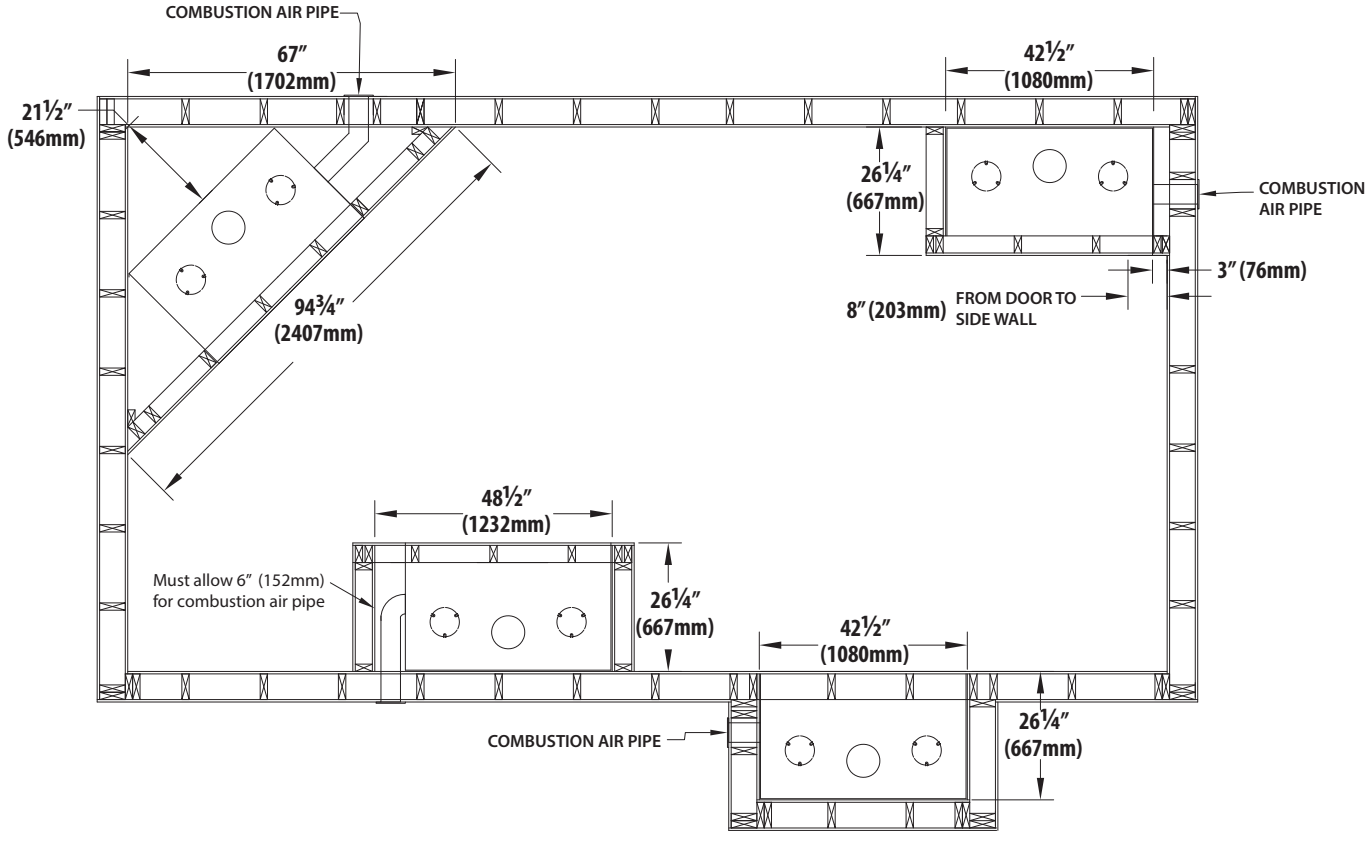


Figure 3.2, Typical Installation Options

3.4 Wall Enclosure Rough Opening

IMPORTANT: If this fireplace is installed on an exterior wall, it must be insulated the same as any other exterior wall to prevent cold air from entering the home.

IMPORTANT: Allow a minimum of 6" (152mm) in framing width dimensions for the combustion air duct pipe, which will be installed after fireplace has been inserted into framing. See Figure 3.2 on page 12.

CAUTION: Consider the height of the hearth extension when framing the opening. The height of a hearth extension material may require the fireplace to be raised on a platform so the hearth extension material does not block the air inlet and outlet grills. If the air inlet or outlet grills are blocked, this may cause the fireplace to overheat.

- Frame the opening to fit fireplace. All required clearances must be maintained.
- Minimum wall enclosure dimensions: 42-1/2" (1080mm) wide x 38-1/4" (792mm) high x 26-1/4" (667mm) deep.
- If masonry (optional) is to be used, prepare the foundation necessary to support the full masonry load. A lintel is required to support the added weight of the masonry construction above the fireplace.

3.4.1 TV Mounting Considerations

Mounting a television above a fireplace is a common practice. Mantel depth, ceiling heights, and wall and mantel construction material all affect television surface temperatures. Most television manufacturers specify in their instructions that a television should not be installed on, near, or above a heat source.

Television location rests solely on the homeowner. It is the home owner's responsibility that the preferred TV mounting and mantel design will not exceed the listed maximum operation temperature of their electronic goods.

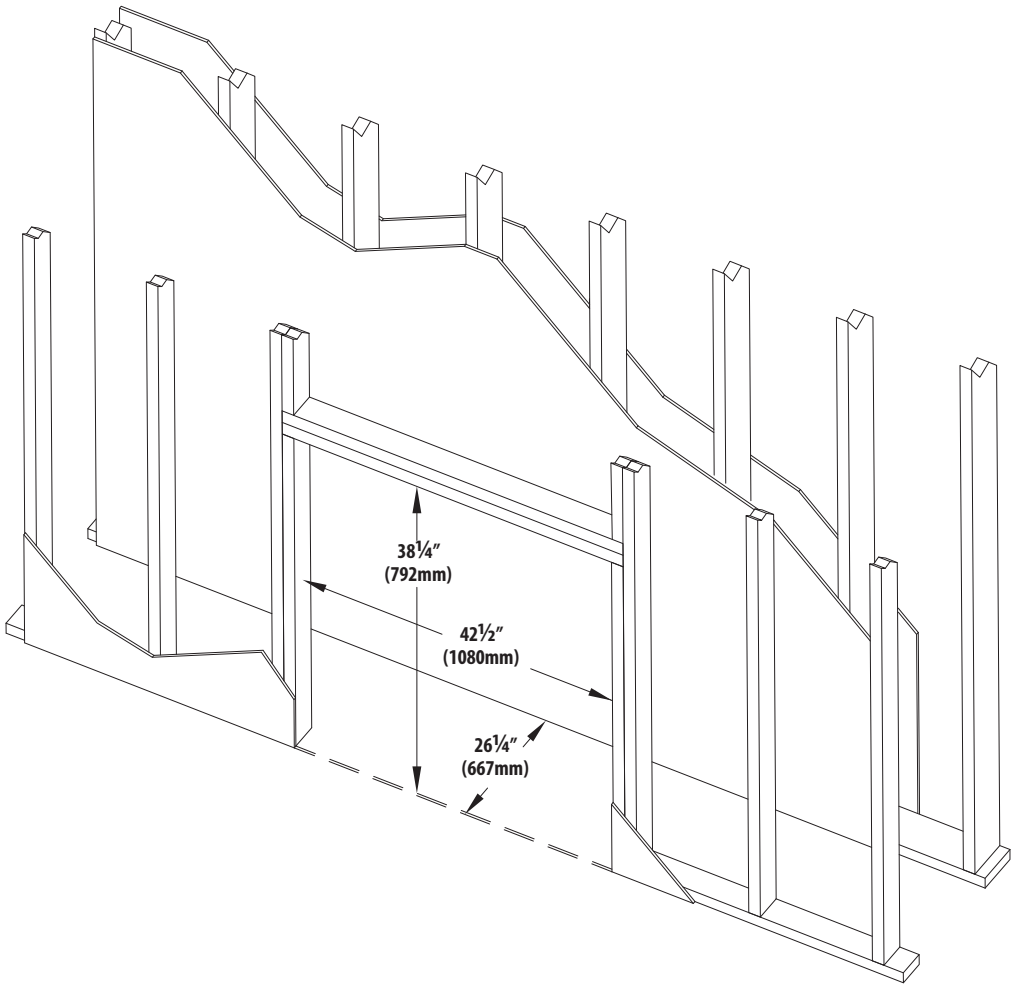


Figure 3.3, Framing Dimensions

Nominal 2" x 4" framing used

3.5 Hearth Extension

WARNING: Hearth extensions MUST be installed exactly as specified.

CAUTION: The lower grill must be allowed to open completely. Do not position fireplace in such a manner that would obstruct this grill.

IMPORTANT: Metal sealing strip (included) MUST be installed to provide protection against sparks or embers that might come in contact with combustible flooring or support.

- Install the sealing strip so it is centered under the fireplace and the hearth extension, for the full width of the fireplace. Ensure that the gap between the hearth and an on-site constructed hearth extension is sealed, with sand-cement grout and/or covered with a metal sealing strip.
- RAISED AND NON-RAISED HEARTHS: Combustible flooring 16" (406mm) in front of the fireplace opening and 8" (203mm) beyond each side of the fireplace opening (minimum dimensions of hearth extension) must be insulated with non-combustible floor protection with a minimum insulation R-value of 0.8.
- Manufactured hearth materials have a published **R value (resistance to heat)** or k **value (conductivity of heat)**. Use the following formula to convert a k value to a R value. **R=1/k x inches of thickness**. See section 3.6 Alternate Floor Protection Material on page 15 for complete formula.
- If installing optional #600-1 fan kit, run electrical wiring prior to enclosing the sides of the fireplace. See Section section 4.0 Optional Fan Installation on page 19.

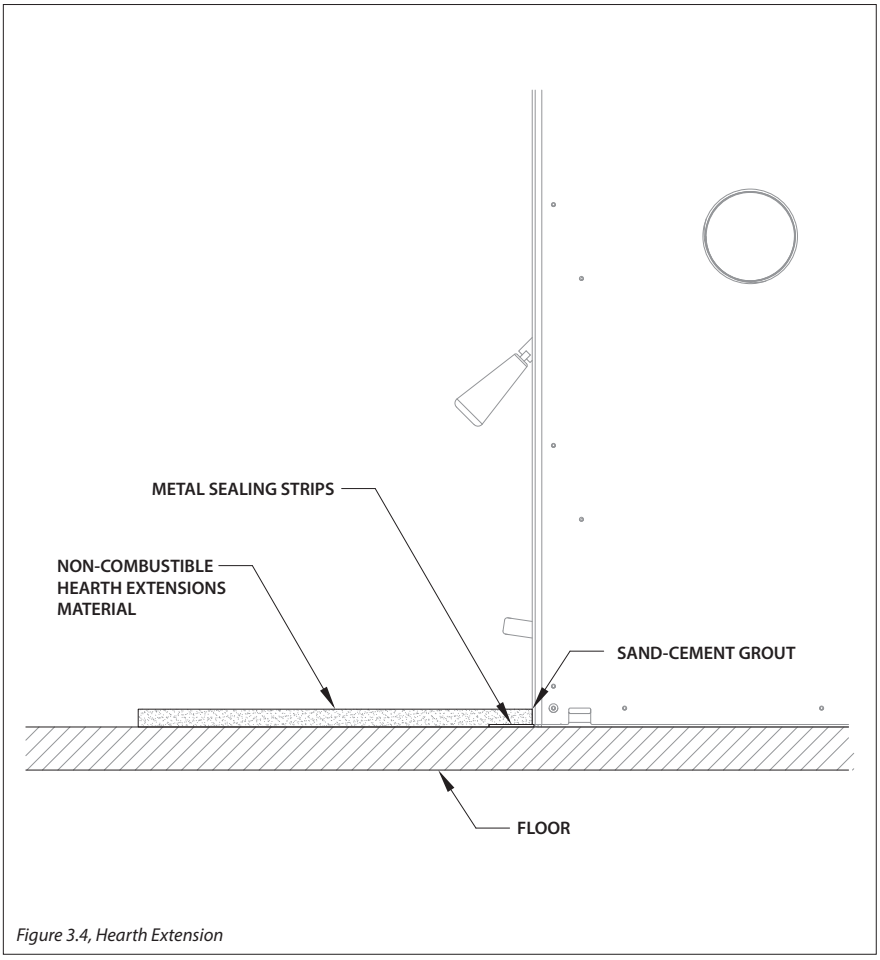


Figure 3.4, Hearth Extension

3.6 Alternate Floor Protection Material

How to determine if alternate floor protection materials are acceptable:

- All floor protection materials must be non-combustible (i.e., metals, brick, stone, mineral fiber boards, etc.).
- Any organic materials (i.e., plastics, wood, paper products, etc.) are combustible and must not be used.
- The floor protection specified may include some form of thermal designation such as R-value (thermal resistance),
- K-factor (thermal conductivity), or C-factor (thermal conductance).

Procedure:

A. Convert specification to R-value:
   I. R-value given: **no conversion needed**
   II. k-factor is given with a required **thickness (T)** in inches: **R=1/k x T**
   III. C-factor is given: **R=1/C**

B. Determine the R-value of proposed alternate floor protector
   I. Use formula is step 1 to convert values not expressed as 'R'. For multiple layers, add R-values of each layer to determine overall R-value.

C. If overall R-value of the system is greater than the R-value of specified floor protector, the alternate is acceptable.

EXAMPLE:
The specified floor protector should by 3/4 inch thick material with a k-factor of 0.84.
The proposed alternate is 4" brick with a C-factor of 1.25 over 1/8" mineral board with a k-factor of .29.

Step (a): Use formula above to convert specification to R-value.

$R = 1/k \times T = 1/.84 \times .75 = 0.893.$

Step (b): Calculate R of proposed system.

To determine the R value of 4" brick with C =1.25;

$R_{brick} = 1/C = 1/1.25 = 0.80$

To determine the R value of the 1/8" mineral board with k = 0.29;

$R_{mineral\ board} = 1/k \times T$ (thickness of board) $= 1/.29 \times .125 = .431$

To determine the Combined R value of brick and mineral board =

$R_{brick} + R_{mineral\ board} = .8 + .431 = 1.231$

Step (c): Compare proposed system of R of 1.231 to specified R of .893.

Since proposed system R is greater than required, the system is acceptable.

Definitions:

		IMPERIAL UNITS		METRIC UNITS
Thermal conductance	**C=**	$\frac{Btu}{(hr)(ft^2)(^oF)}$	=	$\frac{W}{(m^2)(^oK)}$
Thermal conductivity	**k=**	$\frac{(Btu)(in)}{(hr)(ft^2)(^oF)}$	= $\frac{W}{(m)(^oK)}$	= $\frac{Btu}{(hr)(ft)(^oF)}$
Thermal resistance	**R=**	$\frac{(ft^2)(hr)(^oF)}{Btu}$	=	$\frac{(m^2)(^oK)}{W}$

3.7 Combustion Air Duct Pipe

WARNING: Do not use plastic flexible pipe, such as dryer vent pipe, for combustion air duct pipe venting.

WARNING: Do not terminate combustion air duct pipe into attic or garage. Termination must be to the outside of the home.

IMPORTANT: Combustion air duct pipes must be secured with screws to prevent separation and cold air transfer.

NOTE: If the combustion air duct pipe runs for any distance outside the enclosure, but inside the house, wrap with insulation to eliminate condensation or frost build-up. See Figure 3.6

NOTE: If the air intake duct pipe will terminate at the same height or above the air combustion collar on the fireplace, an air trap is recommended. See venting configurations in section Figure 3.7, Combustion Air Duct Venting Configurations on page 17.

This fireplace requires a supply of outside air for combustion. The Z-42 is manufactured with a collar protruding approximately 1/4" (6mm) out from the right side of the fireplace. An outside air duct pipe adapter (4" [102mm] in diameter and 3" [76mm] in length) is included with this fireplace to properly connect the outside air duct pipe to the fireplace.

The combustion air duct pipe termination must be located in an area so it cannot be blocked (i.e., snow drifts). 4' (1219mm) above grade is recommended.

Do not connect outside air adapter until after the fireplace has been inserted into framing.

Installation instructions continue on the next page.

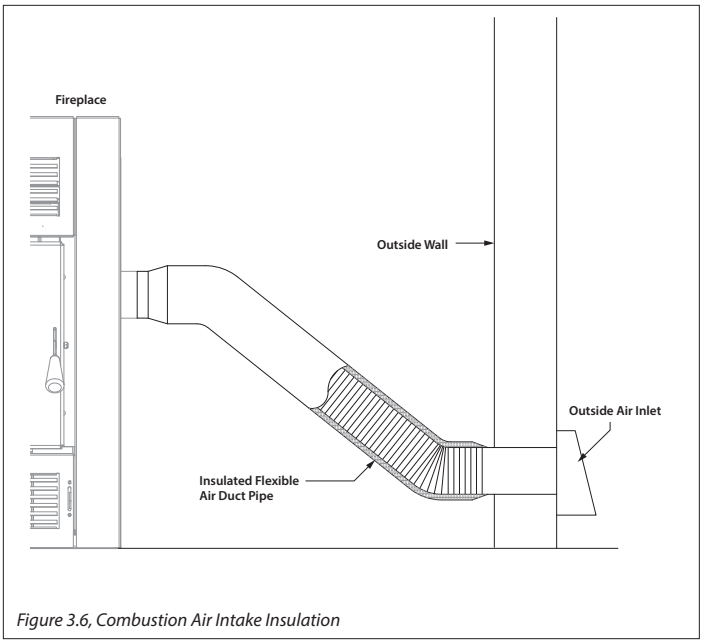


Figure 3.6, Combustion Air Intake Insulation

INSERT AIR INTAKE ADAPTER INTO 4" COLLAR ON THE RIGHT SIDE OF THE FIREPLACE AFTER FIREPLACE HAS BEEN INSERTED INTO FRAMING

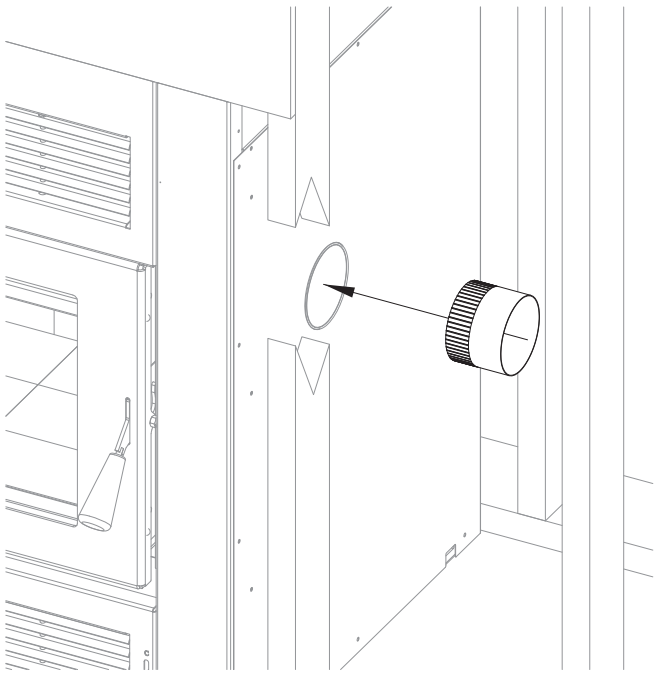


Figure 3.5, Combustion Air Intake Adapter

3.7.1 Combustion Air Intake - Air Trap

- An optional air trap can be used in venting configurations 1 through 3 in Figure 3.7 below.
- An air trap is REQUIRED on venting configuration 4 when the combustion air intake is above the air intake collar on the fireplace.

3.7.2 Combustion Air Duct Installation

IMPORTANT: Maximum air duct vent pipe length is 25' (7.6m).

1. Insert combustion air intake adapter into the 4" (102mm) collar on the right side of the fireplace. Secure with screws.
2. Connect a 4" (102mm) galvanized or heavier pipe to the adapter, and run to the nearest outside wall. Secure with screws. See venting configurations below.
3. Aluminum flex duct pipe is approved for outside combustion air, and may also be used. Do not crush or tear aluminum flex duct pipe. Do not use plastic pipe.
4. Use 4" flexible duct pipe for vent runs under 10' (3m). For vent runs longer than 10' (3m), use 5" aluminum flex duct pipe. Place the 4" to 5" adapter as close to the fireplace as possible.
5. If ducting beside the chimney chase, terminate intake air at least 3' (914mm) below the termination level of chimney. The air pipe may also be ducted below floor level of the fireplace, providing it is ducted to the outside.
6. Mount a standard metal vent cover designed for a 4" (102mm) pipe on outside exterior wall, with the louvers pointing downward. Use a 5" metal vent cover if you increased the air duct vent size in Step 4.

VENTING CONFIGURATIONS

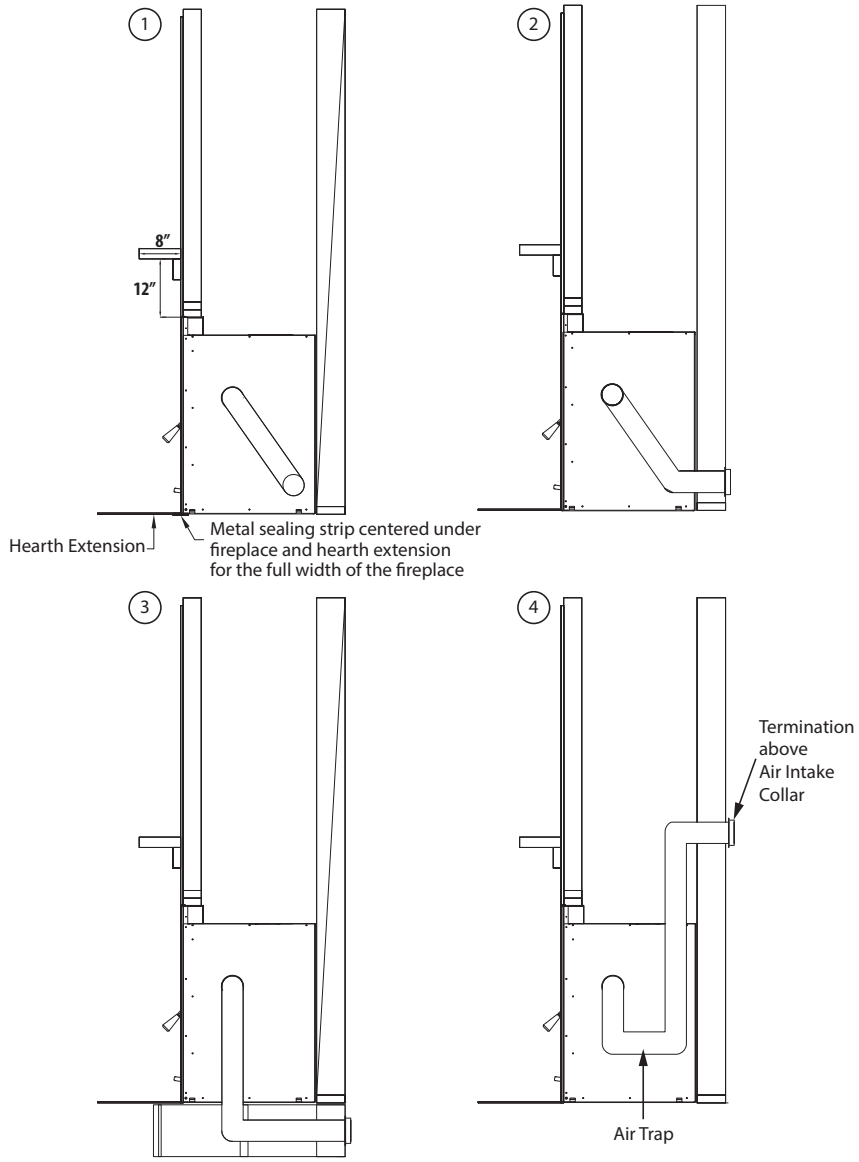


Figure 3.7, Combustion Air Duct Venting Configurations

3.8 Mantel and Facing Requirements

NOTE: Non-combustible material such as brick, tile, marble, or stone may be placed over the top and side face sections. This material MUST NOT come in direct contact with fireplace, or cracking of face material will occur.

CAUTION: If using 'thin' brick, non-combustible facing material, such as rock board or metal, must be used. Do not attach directly to fireplace face.

- Facing material should overlap side framing member approximately 1/4" to 3/8" (6mm to 10mm).
- Frame in fireplace. Maintain necessary clearances to combustibles.
- Framing materials should not come in actual contact with the fireplace.
- If installing a mantel (combustible material may be used), follow Figure 3.8 below.

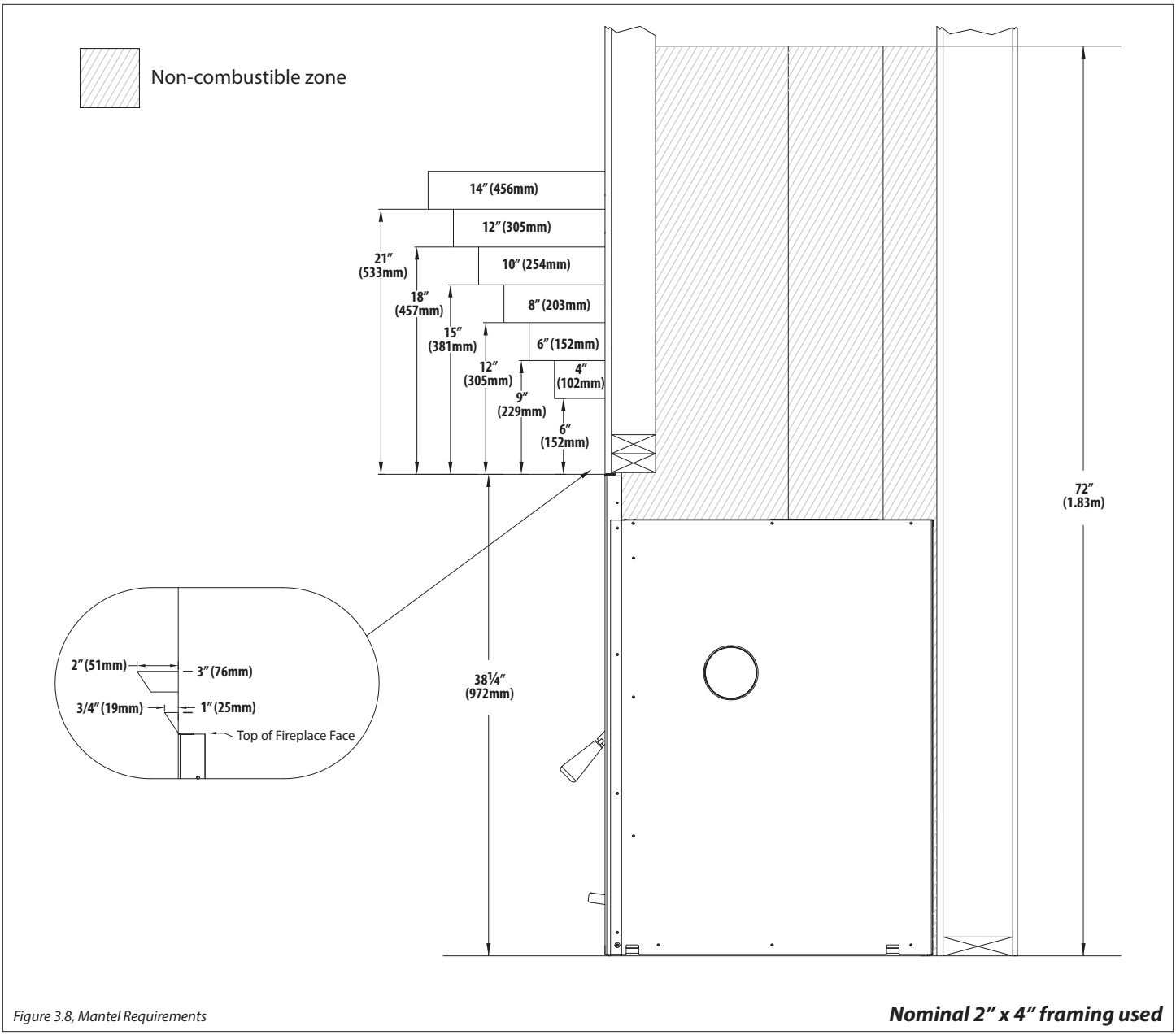


Figure 3.8, Mantel Requirements

Nominal 2" x 4" framing used

4.0 OPTIONAL FAN INSTALLATION

4.1 #600-1 Optional Fan Kit

ATTENTION: Installation of this fan kit should be done only by a qualified installer.

WARNING: Verify household breaker is shut off prior to working on any electrical lines. Disconnect all electric power from fireplace before performing any of these tasks.

WARNING - Electrical Grounding Instructions: This appliance is equipped with a three-prong (grounding) plug for your protection against shock hazard and should be plugged directly into a properly grounded three-prong receptacle. Do not cut or remove the grounding prong from this plug.

Code approved line voltage wiring 14 gauge or better must be used when wiring the optional #600-1 fan kit assembly. Refer to local codes for specific requirements.

This optional fan kit includes:

(2) 110 CFM fan with temperature control switch and 4' (1.22m) fan cord
(4) 1/4" nuts

4.1.1 Fan Shield Installation

(2) fan shields are included in the fireplace components packet. These shields divert more air circulating through the fans upward, increasing the volume of air exiting through the upper grill.

1. Slide one corner of a fan shield onto the front chute on each fan, making sure the 'V' portion of the shield is inside the chute.
2. Slide fan shield down onto the chute.

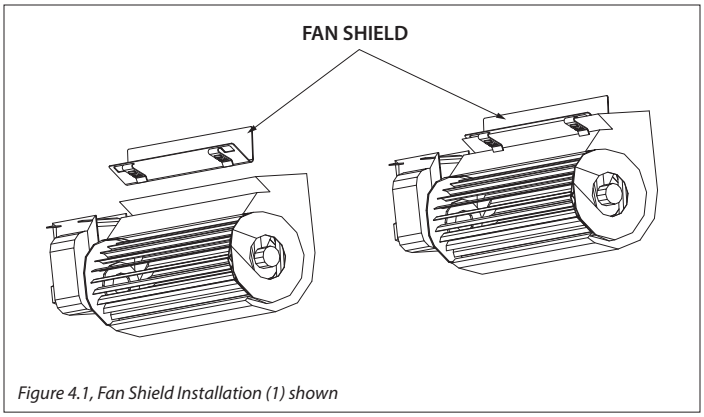


Figure 4.1, Fan Shield Installation (1) shown

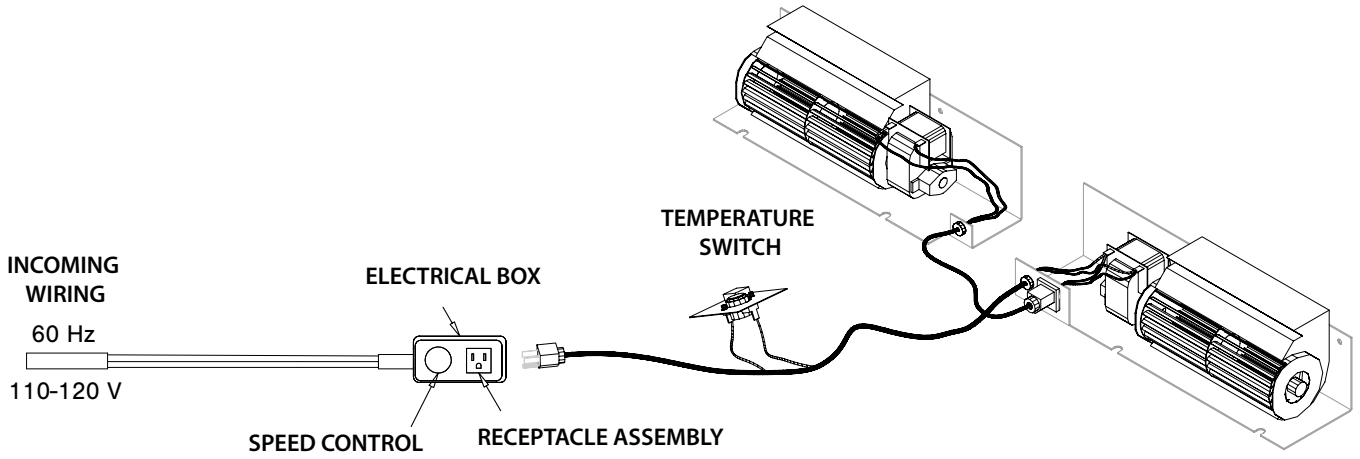
4.1.2 Fan Kit Installation

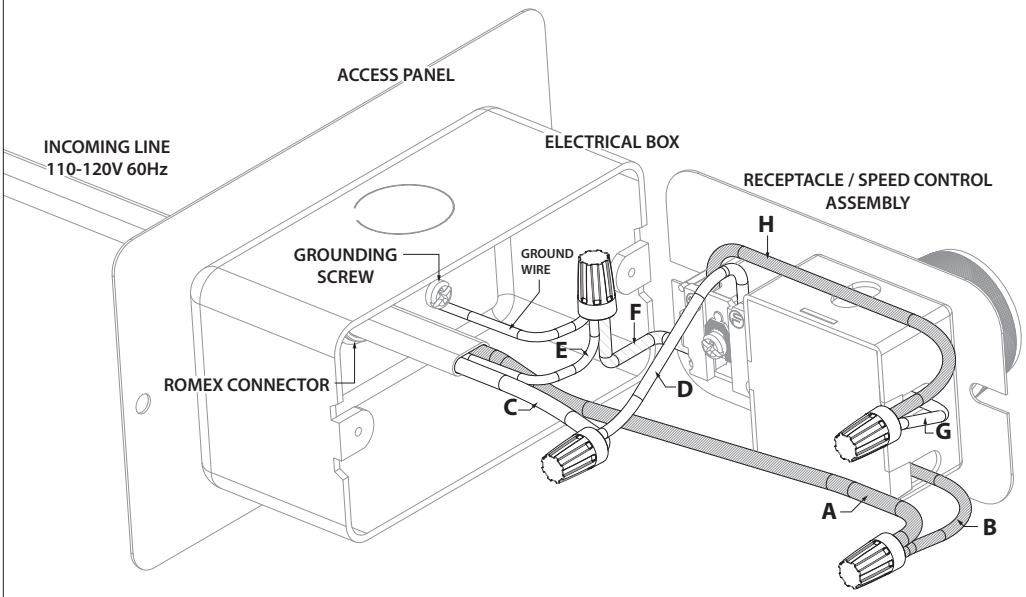
Fan wiring is on the next page.

1. The lower grill must be removed from the fireplace prior to installation of this fan. Refer to Section 6.2 Grill Set Installation and Removal on page 27.
2. Insert fans through lower grill opening and push to back. Align mounting slots in fan brackets onto mounting studs. Secure with nuts.
3. Connect fan wiring by attaching connectors on right fan onto terminals on left fan.
4. From inside lower right grill opening, loosen screws securing removable access panel (with electrical box & romex connector installed). Remove access panel.
5. Insert 110V - 120V wiring (with ground) through romex connector and wire to the speed control / receptacle assembly, matching black (hot), white (neutral), and green (ground) wires to corresponding wires on speed control / receptacle assembly.
6. Secure speed control / receptacle assembly to the electrical box with (2) screws provided.
7. Re-install electrical access panel. Tighten screws.
8. Attach temperature control switch to bottom of firebox.
9. Plug cord into electrical box receptacle.
10. Turn speed control counter-clockwise until it 'clicks'. This is the OFF position.
11. Turn speed control ON by turning knob clockwise past the 'click' - this is the highest setting.
12. Re-install lower grill. Refer to Section 6.2 Grill Set Installation and Removal on page 27.

4.1.2.1 Temperature Control Switch Position

Before adjusting temperature control switch, unplug 3-prong plug on fan cord from receptacle. Adjust position of temperature control switch to a warmer location under firebox to turn fan ON sooner or move it to a cooler location under firebox to turn fan ON later. Fan will turn on when sensor in temperature control switch reaches 110° F and will turn OFF when sensor reaches 90° F. After adjustment, plug 3-prong plug on fan cord into receptacle.





LEGEND	
A	Black (hot) from incoming line
B	Black from speed control
C	White (neutral) from incoming line
D	White (neutral) from receptacle
E	Ground (bare) from incoming line
F	Ground (green) from receptacle
G	White from speed control
H	Black from receptacle

Connect A to B, C to D, E to F, and G to H

Figure 4.2, Fan Wiring and Connections

5.0 INSTALLATION

5.1 Chimney Requirements

IMPORTANT: Do not connect this fireplace to a chimney flue serving another appliance.

- Minimum Chimney Height: 12' (3.66m)
- Maximum Chimney Height: 50' (15.24m)
- Elbows: A maximum of (4) 30° elbows may be used (2 sets offsets)
- Maximum Offset: 4' (1219mm)
  If (2) 30° elbows are used, chimney height must be a minimum of 14' (4.27 m).
  If (4) 30° elbows are used, chimney height must be a minimum of 25' (7.62m)

5.2 Approved Chimney Systems

CAUTION: DO NOT fill required clearances between chimney and combustible with insulation.

This fireplace must be connected to a listed UL 103 HT insulated 6" diameter chimney and/or CAN/ULC S629 of any vent manufacturer. The following vent manufacturers listed are, but not limited to, approved UL103-HT vent pipe.

- **Selkirk:** UltimateONE, SuperVent (JSC), Ultra-Temp HT, Galva-Temp HT, Sure-Temp
- **Simpson Dura-Vent:** Dura-Plus, Dura-Tech,
- **AmeriVent:** AmeriVent TLC, HS
- **ICC:** Excel

Follow chimney manufacturer's instructions for proper chimney installation, clearances to combustibles, and support bracket requirements.

The entire chimney system must be installed to meet all local requirements, as well as chimney manufacturer requirements.

Follow the chimney manufacturer's instructions for the installation and maintenance of a flashing/storm collar assembly (this prevents water from entering the house at the roof line).

5.3 Anchor Plate Installation

IMPORTANT: The appropriate anchor plate must be purchased with the chosen chimney system. Sealant and screws for attaching the anchor plate to the fireplace are included with this unit.

IMPORTANT: The anchor plate must fit into flue collar on fireplace to prevent creosote leakage.

1. Place a bead of sealant under the chimney anchor plate.
2. Push plate collar into fireplace flue. Secure with (4) screws.

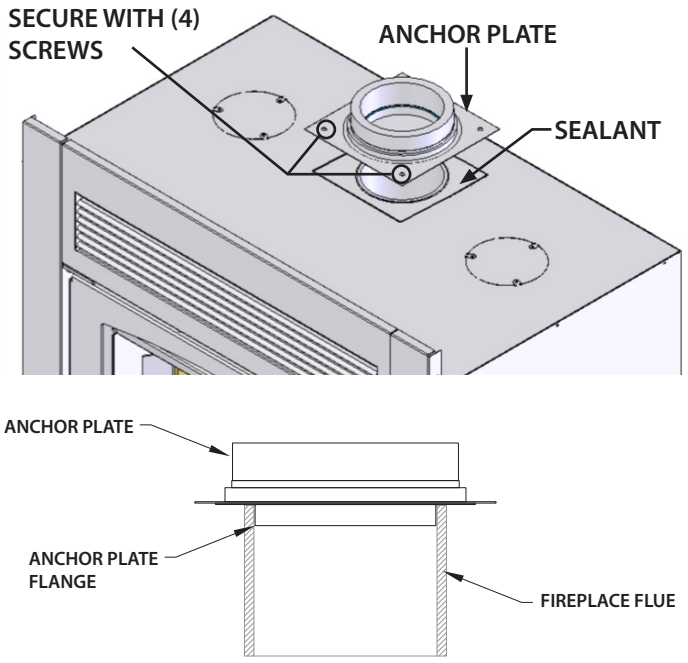


Figure 5.1, Anchor Plate Installation

5.4 Chimney Location and Considerations

NOTE: Chimney must extend a minimum of 3' (914mm) above highest point where it passes through roof and at least 2' (610mm) higher than any portion of a building within 10' (3.05m).

For chimney heights and locations for slanted and flat roofs, see Figure 5.2 below.

For draft and chimney considerations, refer to Section 6.4.1 Importance of Draft and Chimney Location on page 22.

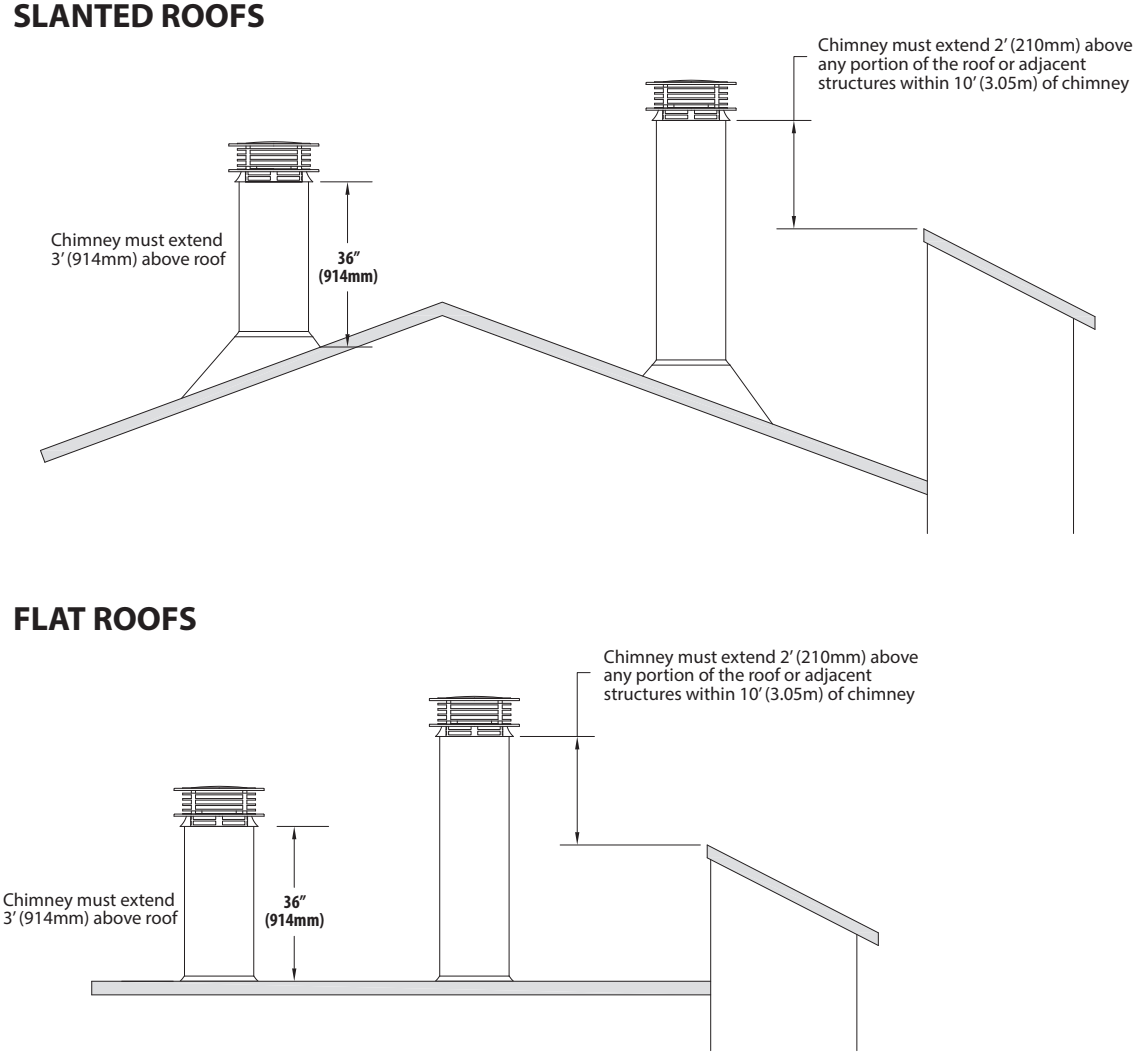


Figure 5.2, Chimney Locations for Roof Types

5.4.1 Importance of Draft and Chimney Location

What is draft? Draft is the ability of the vent system to draw air through the air intake pipe, through the appliance, and up the exhaust vent pipe. A functioning exhaust system will pull the exhaust and smoke up the vent pipe and out the termination cap. Inadequate draft may result in excess smoke coming into the house.

A typical household will have appliances such as exhaust fans, forced air furnaces, and clothing dryers that can create negative pressure inside the house. When a household has negative pressure and the fireplace door is opened, the negative pressure will pull the combustion by-products (gas and smoke) into the house. An easy way to alleviate negative pressure is to open up a window in the room containing the fireplace.

The most common factors that cause a poor draft are air supply, environmental conditions, cold chimney temperatures, poor chimney installation and maintenance, and atmospheric pressure.

There can be environmental conditions that cause poor drafting, such as trees, or other structures, around the house. Having a house in a low-lying location (such as a valley), and with windy conditions, can also cause poor drafting. Refer to Figure 5.3 below.

Excessively cold chimneys can cause poor draft. Starting a quick, hot initial fire is important. See Section 8.0 Fireplace Operation on page 31 for additional information. Poor insulation in an exterior chase can also cause excessively cold chimneys.

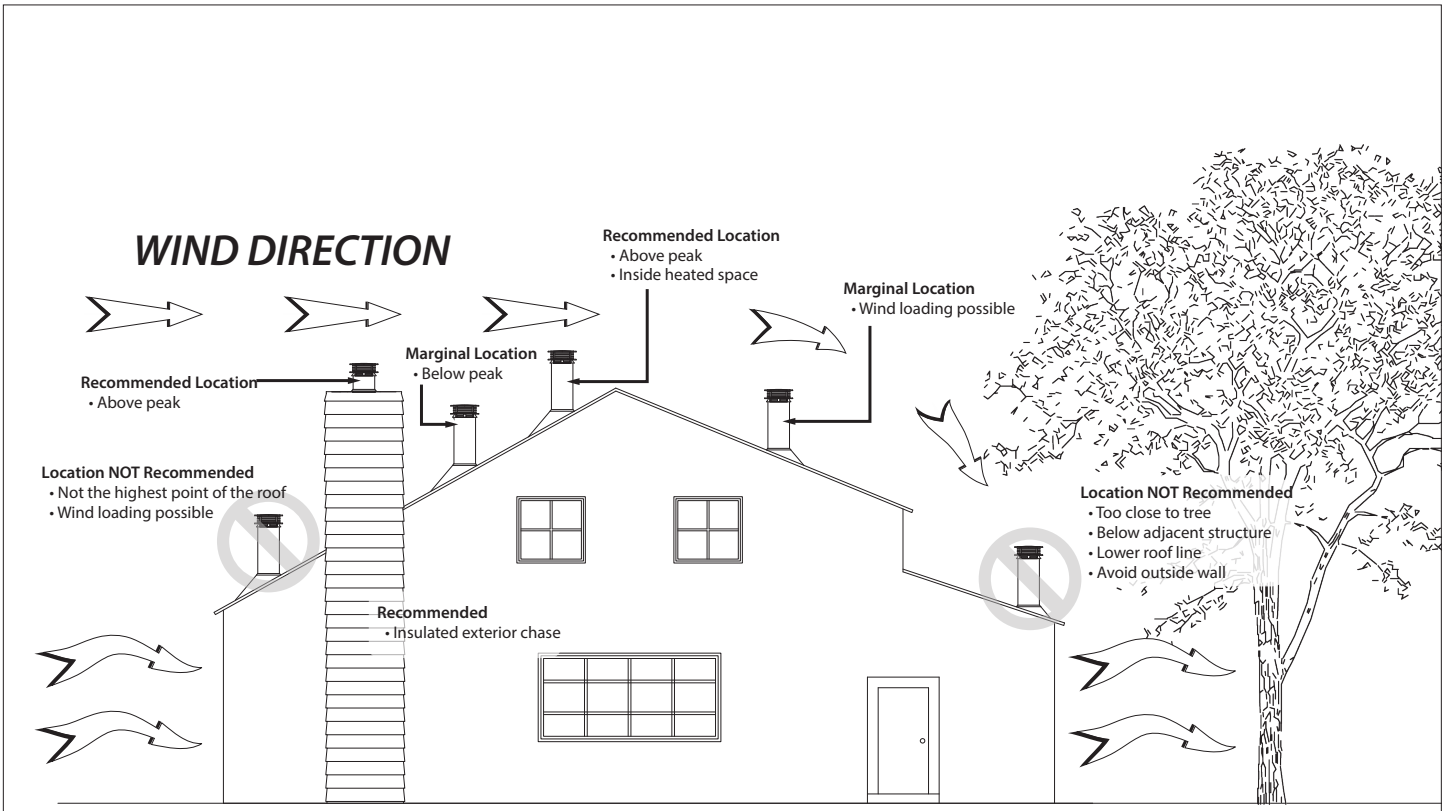


Figure 5.3, Wind Conditions and Chimney Location

5.5 Chimney Installation

WARNING: Refer to chimney manufacturer's instructions for proper framing size, clearance to combustibles, and support bracket requirements.

WARNING: The clearance between the chimney and combustible should never be less than 2" (51mm). DO NOT fill this required air space with insulation or other materials.

1. After anchor plate installation, connect first chimney section per manufacturer's installation instructions.
2. Cut and frame required holes in floor, ceiling, and roof where chimney will pass through. See Figure 5.5 on page 25.
3. A firestop must be installed where chimney passes through each floor level. Refer to chimney manufacturer's instructions for part numbers and installation procedures.
4. An attic insulation shield is required by chimney manufacturers for protection where the chimney passes into attic space. This will prevent debris and insulation from coming into contact with the chimney. Refer to chimney manufacturer requirements.
5. Install chimney sections, firestops, attic insulation shields, etc., following chimney manufacturer's instructions and requirements, as well as chimney minimum / maximum height requirements as outlined in this installation manual. See Figure 5.6 on page 25 for combustible chase enclosure for chimney sections installed above the roof.
6. Apply the orange label included in components packet with repeated "WARNING: HOT. Fire Risk. Insulation and combustible must not touch pipe. Consult manual for clearance requirements. Ensure proper protection." to all chimney pipe sections. It is not required on sections that will be visible after the installation is complete. The label must wrap around the chimney circumference.
7. Install flashing, storm collar and chimney cap following chimney manufacturer's instructions.
8. Refer to chimney manufacturer's requirements concerning supports, bracing, anchors, etc.

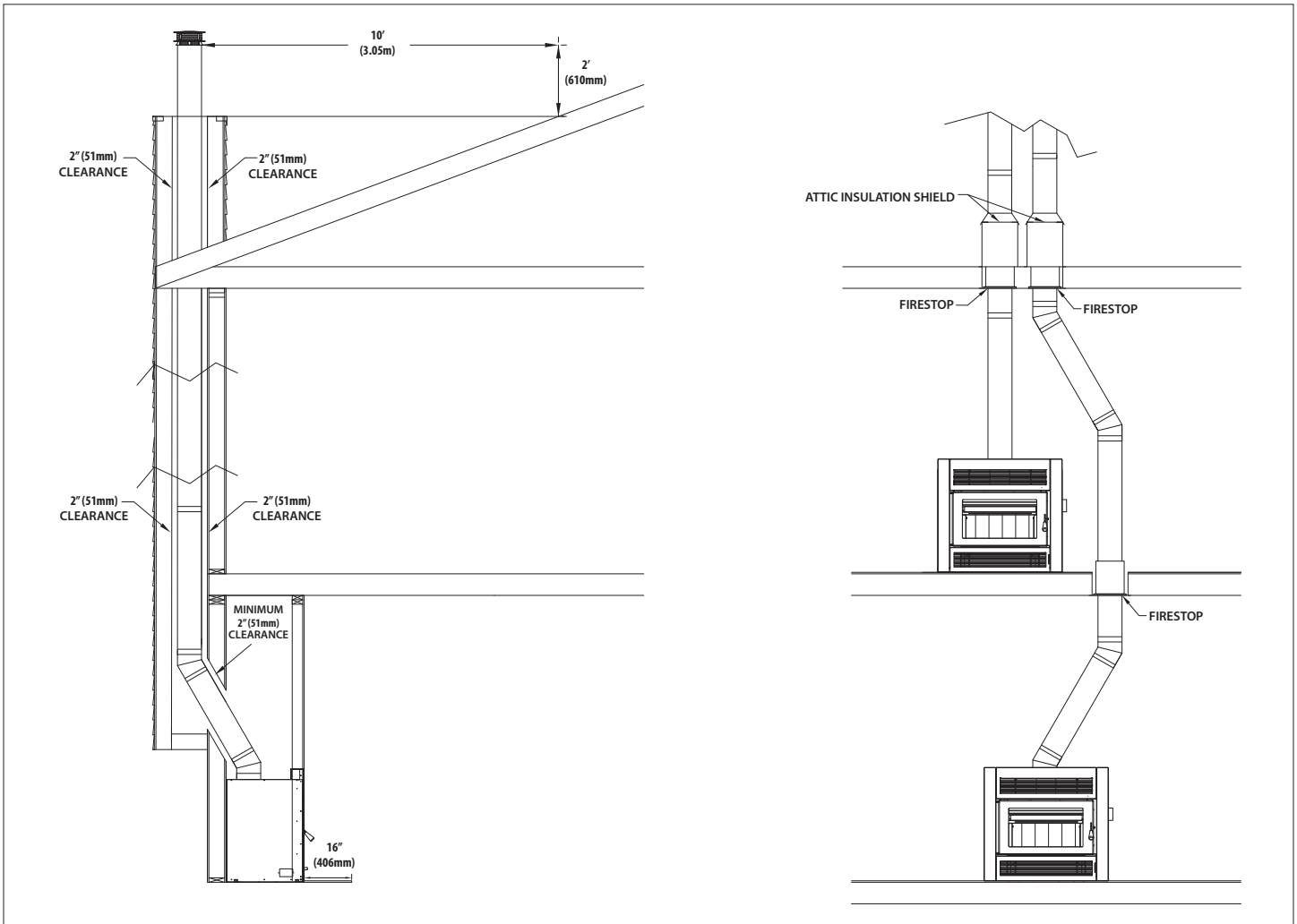


Figure 5.4, Chimney Installation Overview

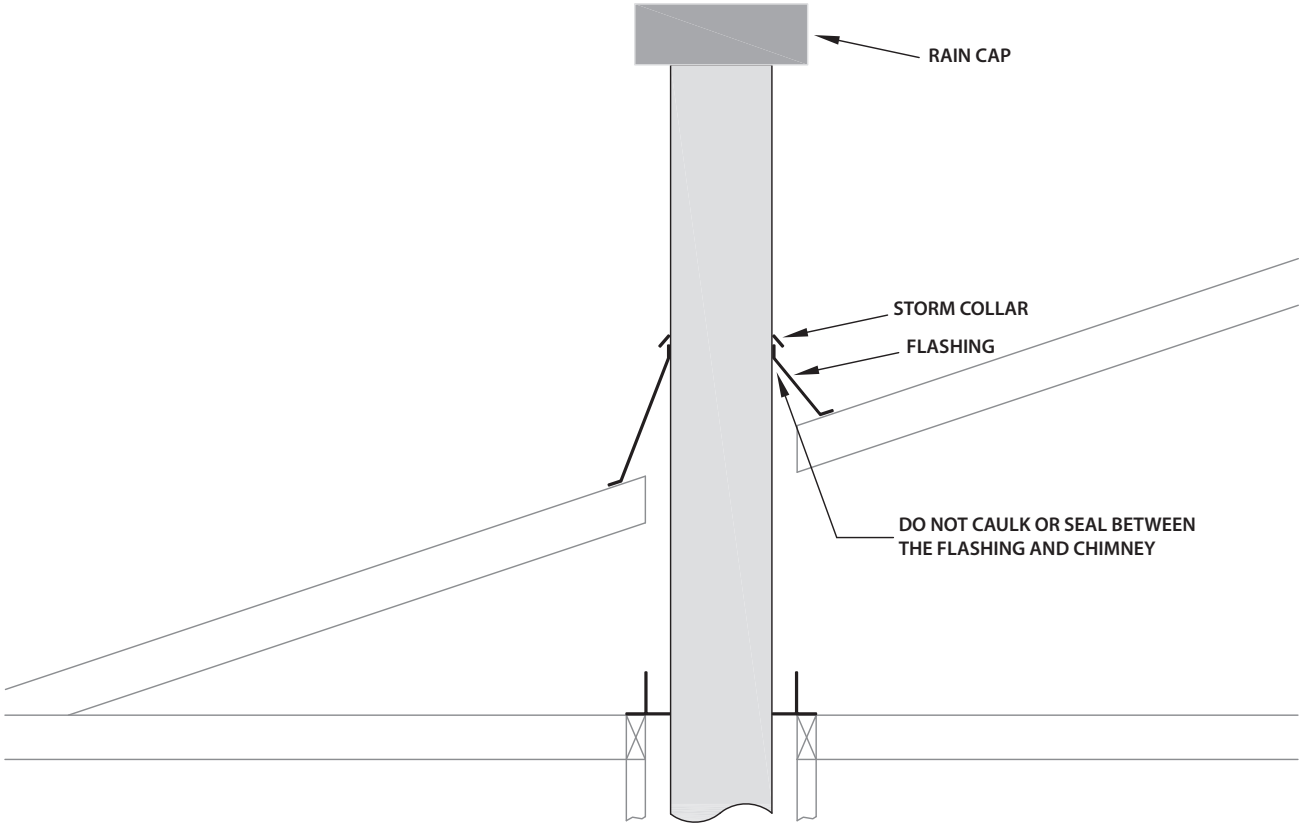


Figure 5.5, Flashing-Storm Collar Installation

COMBUSTIBLE CHASE ENCLOSURE FOR CHIMNEYS SECTIONS INSTALLED ABOVE THE ROOF

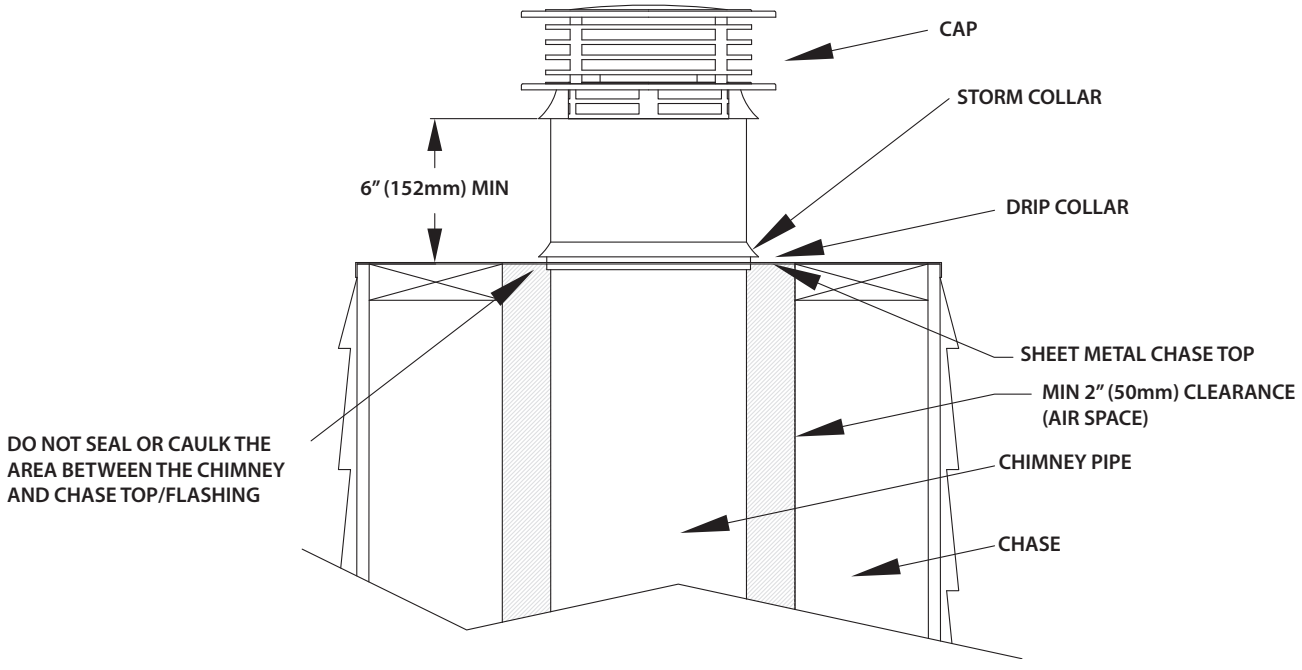


Figure 5.6, Chase Installation

6.0 FIREPLACE SETUP

6.1 Firebrick Installation

The firebrick refractory panel is located on top of the pipes. DO NOT DISCARD.

Measure the firebrick to follow along with these instructions.

The following firebrick are included with this fireplace:

(7) 4-1/2" x 9" (114mm x 229mm)
(6) 4-1/2" x 10-3/4" (114mm x 273mm)
(1) 4-1/2" x 4-1/2" (114mm x 114mm)
(10) 4-1/2" x 13-1/2" (114mm x 343mm)
(2) 2-1/2" x 13-1/2" (64mm x 343mm)
(1) Firebrick Retainer

1. Position (5) 4-1/2" x 13-1/2" (114mm x 343mm) fire bricks and (1) 2-1/2" x 13-1/2" (64mm x 343mm) firebrick along back wall of firebox.

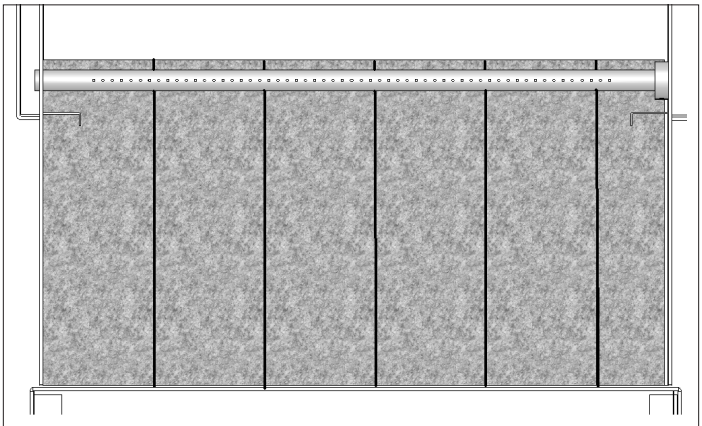


Figure 6.1, Step 1

2. Starting at back, position (3) 4-1/2" x 10-3/4" (114mm x 273mm) firebricks under firebrick brackets along each side of firebox.

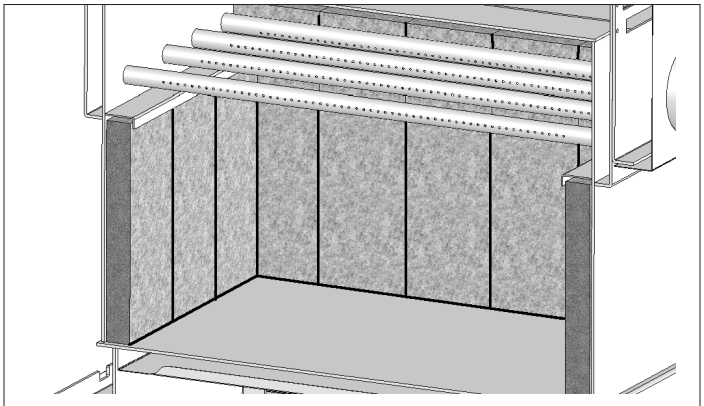


Figure 6.2, Step 2

3. Place (7) 4-1/2" x 9" (114mm x 229mm) firebricks and (1) 4-1/2" x 4-1/2" (114mm x 114mm) firebrick on firebox bottom (at the center back).
4. Lay (5) 4-1/2" x 13-1/2" (114mm x 343mm) fire bricks and (1) 2-1/2" x 13-1/2" (64mm x 343mm) firebrick over the firebrick refractory panel that rests on (4) stainless steel pipes at top of firebox.
5. With the 45˚ flange down, slide firebrick retainer between the top of the first pipe & firebrick. Push retainer back until it is against the front of firebrick and under the refractory panel.
6. Set retainer down on top of pipe. The 45˚ flange on the firebrick retainer should now be behind the first pipe.

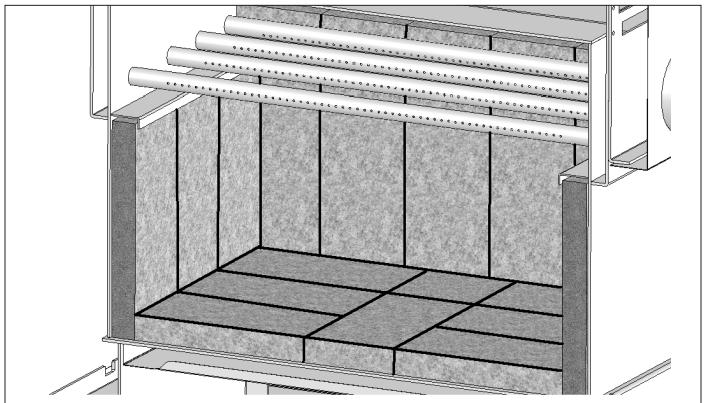


Figure 6.3, Step 3

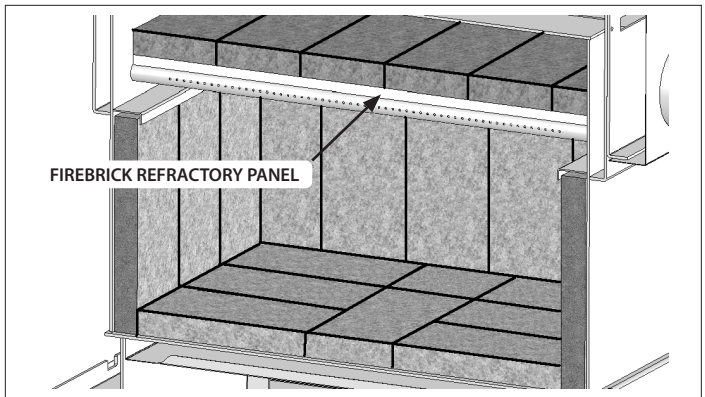


Figure 6.4, Step 4

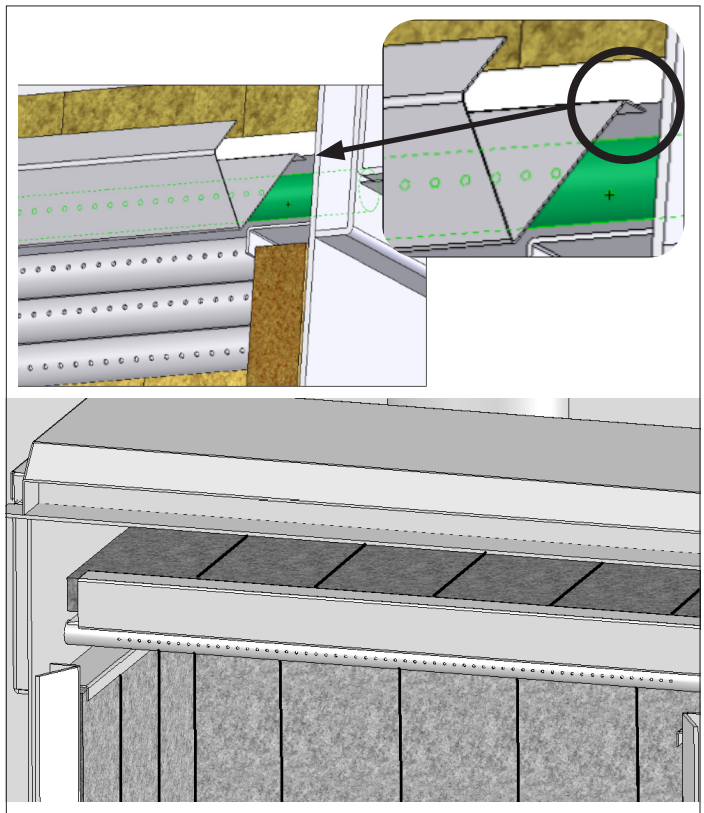


Figure 6.5, Steps 5 & 6

6.2 Grill Set Installation and Removal

Sold separately.

6.2.1 Installation

1. Align the rods in the upper grill with the holes at the top of the upper grill opening. Push the upper grill up until bottom clears the face frame. Set down into holes at bottom of the upper grill opening.
2. Remove the nuts from lower grill assembly and save. Align the bolts with the lower grill hinge and insert bolt through the lower grill hinges. Secure with nuts previously removed

6.2.2 Removal

1. Lift upper grill up and out of opening.
2. Remove nuts securing the lower grill to the lower grill hinges. Remove the grill, and reattach nuts to the grill bolts.

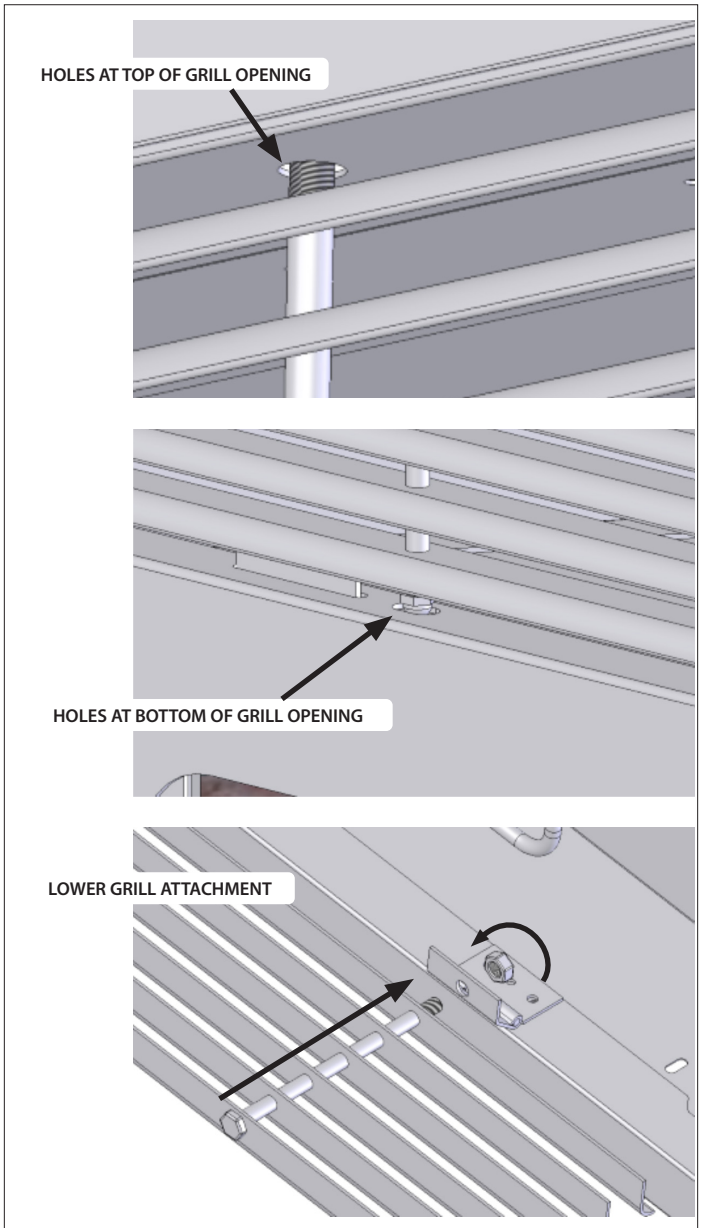


Figure 6.6, Grill Set Installation and Removal

6.3 Door Handle Installation

6.3.1 Single Door Model/Cast Door Model

There is a threaded handle in the components packet. Install on threaded rod(s) as shown in Figure 6.7 by turning the handle clockwise until it is hand-tight.

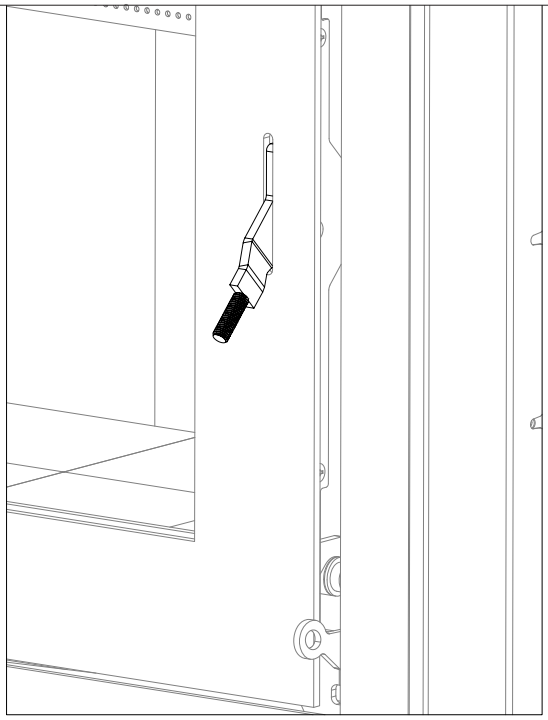


Figure 6.7, Threaded Rod

6.4 Door Seal Alignment and Adjustment

NOTICE TO INSTALLER AND HOMEOWNER: Achieving proper seal and door alignment is a trial and error adjustment. You may need to make additional minor adjustments after the first few initial burn periods. Deposits which collect on glass corner(s) while fireplace is in operation indicates an improper seal, indicating door should be adjusted as instructed below.

Every effort has been made at the factory to ensure a proper door seal prior to shipment. Misalignment, however, may still occur during shipment, installation, or mishandling.

The following procedures will help you determine if the door is sealing properly, and how to achieve a proper seal.

6.4.1 Single Door Model

6.4.1.1 Check the Seal

1. Close and latch door.
2. Check seal by pushing against corners of glass.
   - No movement indicates proper seal.
   - Any movement between the glass and firebox face at any corner indicates an inadequate seal. This will create creosote build-up on glass and cause the fire to burn faster.

6.4.1.2 Hinge Adjustment

IMPORTANT: Do not loosen nuts securing door hinges at the top and bottom of the door.

NOTE: Door may need to be 'pulled out' if binding occurs at either the top or the bottom right corners.

1. Close and latch door.
2. Place wooden shim (included) between the bottom of door and the face on the latch side. This is necessary to 'hold' door in horizontal alignment.
3. Determine if the upper, lower, or both hinges need adjustment.

- UPPER FACE HINGE: Remove upper grill. Locate two nuts securing upper face hinge.
- LOWER FACE HINGE: Open lower grill, locate two nuts securing lower face hinge (similar to upper grill hinge).

4. Using a 7/16 wrench or nut driver, LOOSEN, BUT DO NOT REMOVE, the two nuts. Push door in slightly, (either top or bottom, depending on adjustment needed) to achieve a tighter door seal. Re-tighten nuts.
5. Remove shim. Repeat steps #1 & #2 in Section 6.4.1.1 above.
6. Repeat steps #1 - #5 of this section until proper door seal is achieved.

6.4.1.3 Latch Adjustment

NOTE: A washer has been installed on each mounting bracket at the factory. You may only need to place a washer at the top or the bottom mounting bolt, depending on where the seal needs adjustment.

1. Open door. Locate the 'latch dog' secured to firebox face.
2. Determine whether the upper, lower or both corners of the door seal need adjustment.
3. Remove and save acorn nuts securing latch dog. Remove and save latch dog.
4. Place a washer (included in parts packet) onto top and/or bottom mounting bolt on latch dog. Re-install onto firebox face.
5. Re-install acorn nuts.
6. Re-check door seal as instructed in Section 6.4.1.1 above.

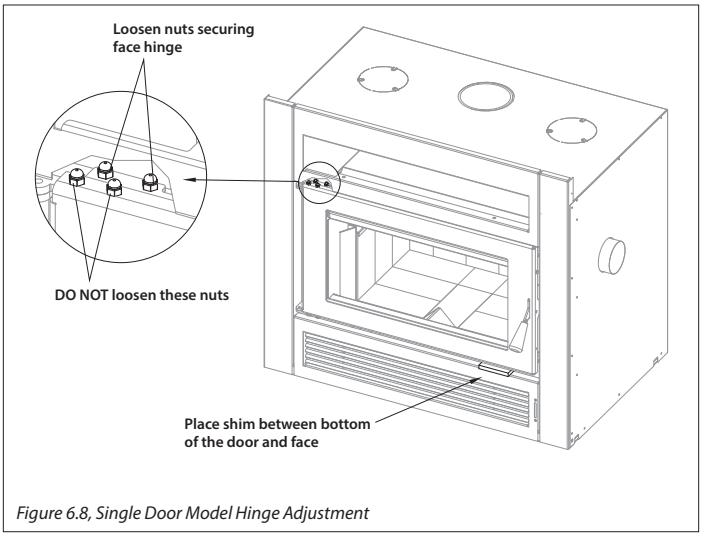


Figure 6.8, Single Door Model Hinge Adjustment

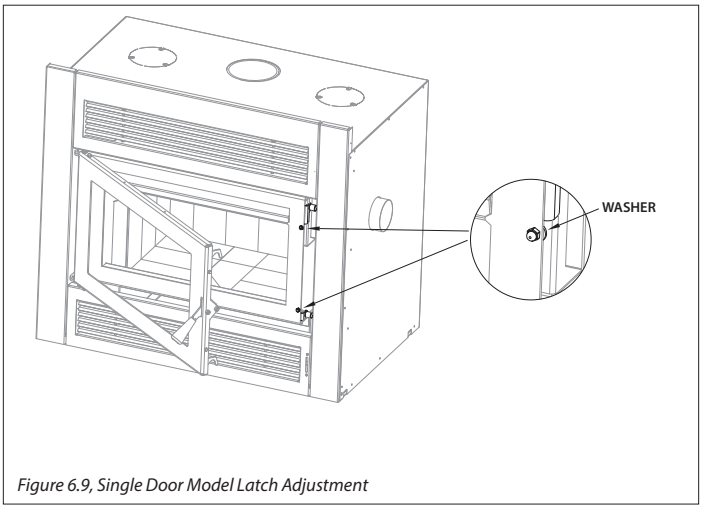


Figure 6.9, Single Door Model Latch Adjustment

6.4.2 Cast Door Model

6.4.2.1 Checking the Seal

1. Open doors.
2. Insert a piece of paper between the door and face frame. Close and latch doors.
3. Gently pull paper. If removed with little or no force, the door seal needs adjustment. Follow directions below for seal adjustment.
4. Perform the paper test on all outside edges of doors.

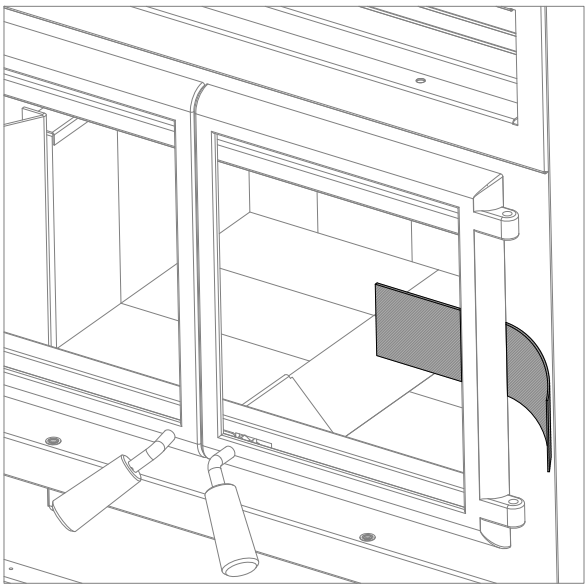


Figure 6.10, Cast Door Model Seal Check

6.4.2.2 Correcting Door Seal

There are three items subject to wear on this appliance that will lead to a poor seal on the cast doors: (1) door gasket, (2) roller catch plate, and (3) roller/clevis pin. Inspect these three items and replace as needed to establish a proper door seal. Refer to Sections 9.4, 9.5, and 9.6.

7.0 FIREWOOD SELECTION AND CONSIDERATIONS

7.1 Materials that should not be burned

DO NOT BURN

(1) Garbage;

(2) Lawn clippings or yard waste;

(3) Materials containing rubber, including tires;

(4) Materials containing plastic;

(5) Waste petroleum products, paints or paint thinners, or asphalt products;

(6) Materials containing asbestos;

(7) Construction or demolition debris;

(8) Railroad ties or pressure-treated wood;

(9) Manure or animal remains;

(10) Salt water driftwood or other previously salt water saturated materials;

(11) Unseasoned wood; or

(12) 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 heater. Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

7.2 Preparing and Purchasing Firewood

WARNING: FOR USE WITH SOLID FUEL ONLY.

Only use solid wood or processed solid fuel firelogs. If processed solid fuel firelogs are used, do not poke or stir logs while they are burning. Use only firelogs that have been evaluated for the application in fireplace, and refer to firelog warnings and caution markings on packaging prior to use.

Some fuels, such as charcoal, may generate carbon monoxide, a dangerous, odorless gas. Exposure to carbon monoxide may cause serious illness or death.

7.2.1 What is good firewood?

Good firewood has been cut to the correct length for the fireplace, split into a range of sizes for different types of burns, and stacked in the open until its moisture content is between 15 to 20 percent. Purchasing a wood moisture meter is recommended.

You may hear the term "seasoned firewood," which refers to wood that has been left out to dry. Higher efficiencies and lower emissions generally result when burning seasoned firewood that is in between the specified moisture content (15% to 20%).

Firewood that is not dry enough can lead to undesirable effects. Burning green or unseasoned wood produces more creosote, resulting in more maintenance for the homeowner to have the chimney cleaned. Unseasoned wood makes starting a fire difficult and will make the glass door dirtier.

7.2.2 Types of wood

When looking at the different types of wood, you will find out that species of trees are referenced as either hardwood or softwood. The species of the firewood is less important than its moisture content. Hardwoods are denser than softwoods. Hardwood will burn a little longer and slower than softwood.

When homeowners have access to both hardwood and softwood, they can burn specific wood depending on the climate and type of fire they desire. During milder weather, typically in fall and spring, softwood can be burned for a quicker fire with less heat. Hardwoods can be best used for colder winter weather.

7.2.3 Log length and size

Logs should be cut at least 1" (25mm) shorter than the firebox. This will ensure the logs can be easily loaded into the firebox. Splitting firewood is important for effective drying of the firewood, but also for fireplace operation. When firewood is split, it will dry much faster than large, unsplit pieces. Wood should be split into various sizes, as you will want smaller split pieces for kindling compared to loading the fireplace for an extended burn.

7.2.4 Drying firewood

Some things to consider when drying wood:

(1) Firewood takes a long time to dry,

(2) Firewood bought from a dealer or a reputable seller may still not be dry enough to burn, check the moisture level when you get home,

(3) Drying happens faster in dry weather climates – if you are located in maritime climates it will take longer to dry your wood,

(4) Small pieces will dry faster than larger pieces,

(5) Split pieces will dry faster than unsplit pieces,

(6) Softwoods generally dry faster than hardwoods,

(7) Firewood dries faster when it is stacked in the open, compared to being stacked inside a wood shed where there is no airflow.

Figure 7.1, Split, stacked wood

8.0 FIREPLACE OPERATION

8.1 Fireplace Safety Information

Young children should be carefully supervised when they are in the same room as the appliance. Toddlers, young children, and other individuals at-risk are susceptible to accidental contact burns. A physical barrier is recommended if there are at-risk individuals in the home. To restrict access to a fireplace or stove, install an adjustable safety gate to keep toddlers, young children, and other at-risk individuals out of the room and away from hot surfaces.

WARNING: DO NOT INSTALL A FIREPLACE INSERT OR ANY OTHER PRODUCT NOT SPECIFIED FOR USE WITH THIS FIREPLACE.

WARNING: THIS FIREPLACE HAS NOT BEEN TESTED WITH ANY GAS COMPONENT OR ACCESSORY. DO NOT INSTALL A GAS COMPONENT, INCLUDING A GAS LOG SET, INTO THIS FIREPLACE.

8.2 Initial Fireplace Operation

There are a few items to note for the initial operation of your fireplace.

- Do not store clothing, furniture or combustibles within 36" (914mm) of the fireplace.
- Except when loading and during start-up burn, the fireplace must be operated with the door fully closed.
- As the paint cures, you may notice some light smoke or vapor coming off the fireplace. These vapors are not poisonous but do have an odor. If possible, open doors/windows to promote air flow through the house to get rid of these vapors and odor. Depending on your location of a smoke detector, this can cause a false alarm. As you burn a hotter fire, more of the painted surfaces will continue to cure. The paint curing process may not happen all at once.

8.3 Building a Fire

There are a number of ways to arrange your firewood and build a fire. As you become more familiar with your wood fireplace, you will develop your method to building a fire with the goal of creating a hot, quick fire. The quicker you can produce a hot fire, the less smoke and creosote will be produced. In the next three subsections, we will outline three popular methods to start fires. We recommend the log cabin method.

If you are building a fire after an existing burn, it is advised to keep some of the existing coal bed to help build a fire quicker. See Section 8.4 Maintaining a Wood Fire on the following page.

8.3.1 Method 1 - Log Cabin (recommended)

You will be building a fire with a log cabin style of stacking wood.

1. Place (2) full sized split pieces of seasoned wood in the firebox, running front to back, where one piece will occupy each side of the firebox.
2. Place (2) to (4) medium sized split logs running side to side on top of the larger pieces of split wood.
3. Place smaller kindling wood in the center of the firebox. Fully open the air damper and ignite the kindling. You will close the door as to leave approximately a 1" to 2" gap between the door and the firebox.

Once the fire is burning well, where the kindling has burned through and the stacked layer of medium split pieces of firewood are burning well, you are able to close your door completely.

Figure 8.1, Log Cabin Method

8.3.2 Method 2 - Traditional

You will be building a fire with a traditional style of burning kindling first, then adding large pieces of wood.

1. Place several thin pieces of kindling wood in the center of the firebox. These kindling pieces should be less than a 1" (25mm) diameter thick. You can also use chunks of bark.
2. Place some larger pieces of kindling on top previous thin kindling wood. Verify the air damper is fully open and then ignite the kindling. You will close the door as to leave approximately a 1" to 2" gap between the door and the firebox.

Once the fire is burning well and your kindling is mostly burned, you can continue to add larger pieces. When you have established a good fire and coal bed, you can close the door completely.

Figure 8.2, Traditional Method

8.3.3 Method 3 - Top Down

You will be building a top down fire where the small kindling is placed on top of larger pieces.

1. Start by placing (2) to (3) full sized split pieces of seasoned wood in the firebox. Then place (4) to (5) medium split pieces of wood on top of the larger wood base.
2. Place finely split kindling wood on top. Fully open the air damper and ignite the kindling. You will close the door as to leave approximately a 1" to 2" gap between the door and the firebox.

Once the fire is burning well, where the kindling has burned through and the layer of medium split pieces of firewood are burning well, you are able to close your door completely.

Figure 8.3, Top Down Method

8.3.4 Use of fire starters

Many wood fireplace owners like to use commercial fire starters instead of kindling. Fire starters are also commonly used after the fireplace has not been used for a period of time, which results in a cold start. They will help facilitate a quick, hot initial fire which will help create a good draft in the chimney system. Some of these fire starters are made up of a gel, compressed sawdust and wax, and others are specialized chemical products. If you decide to use one of these fire starters, follow manufacturer's instructions that relate to a wood burning fireplace. **DO NOT** use flammable liquids such as gasoline, fuel oil, kerosene, motor oil, aerosols, or other unapproved items.

8.4 Maintaining a Wood Fire

Your wood fireplace will operate as a space heater. You will see variations in the amount of heat produced during operation. Heat production will variate throughout the burning of the wood (fuel), allowing the homeowner to gain experience in understanding the heat output within the house.

The amount of wood (fuel) loaded into the fireplace can be matched to the amount of heat output needed. A full load of wood, generally (3) pieces of firewood, will provide several hours of high heat output. The use of the air intake damper will help the homeowner regulate their fire based on their needs. See Section 8.5.1 Air intake damper for more information on regulating the fire.

8.4.1 Utilizing a Coal Bed

When the wood is consumed and you are down to a bed of coals, you can rake the coals toward the front and center of the firebox before loading more firewood. It will concentrate the remaining hot coals where the combustion air enters the firebox and it will help ignite the next load of firewood quicker. Open the air damper to help the next load of fuel reignite faster before closing the damper back down to achieve a longer burn.

When you remove ashes from your fireplace, it is recommended to leave behind a small bed of coals. They will help in building your next fire. See Section Figure 8.4, Air Intake Adjustment on page 33 for more information on ash disposal.

8.5 How to Operate the Z-42 Fireplace

WARNING: This fireplace should be operate only with the door(s) closed and latched. Operating fireplace with the door(s) open causes flames to be drawn out into the living space, creating a smoke and fire risk.

1. Open intake damper by putting it in 'O' (up) position.
2. Build a base of kindling wood and small logs placed on the firebox floor, with a couple of larger logs on top. The base should be in the front center of the firebox. See Section 8.3.4 Use of fire starters on page 32.
   For cold startups, we suggest using an fire starter
3. Do not elevate fire. Do not use a grate, andirons, or other methods of supporting the fuel.
4. Light fire with matches.
   NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM FIREPLACE WHILE IT IS IN USE.
5. As the fire builds push the door closer to the firebox to promote a good fire start-up. Leave approximately a 1" gap between the door and the firebox. Keep the damper in the 'O' (up) open position.
6. As the kindling burns continue to add slightly larger wood. If possible lay (2) logs front to back on the sides of the firebox with larger kindling or small logs diagonally over the base.
7. When the fire is burning well on kindling add larger wood. It is recommended 2-3 pieces of larger wood. Keep the door pushed closed 1" away from the firebox after the initial loading of this wood to promote a strong fire. Once the fire has started to engulf the added wood you can start to close the door completely.
8. Slowly load the firebox with average sized wood over a period of 30-45 minutes. DO NOT OVER-FIRE, this could damage the fireplace and void warranty.

Do not leave the fireplace unattended while a fire is being started. Once the fire is fully started, and the door is completely sealed, you are able to leave the fire unattended.

9. Adjust intake damper to desired heat output position. See Figure 8.4. To keep glass cleaner, never completely close the intake damper.

8.5.1 Air intake damper

The Z42 has an air intake damper, which regulates how much outside air is brought into the fireplace for combustion. When performing a cold start or rekindling a fire from a coal bed make sure the damper is in the fully open position. By leaving the damper fully open, you will produce the most heat. This will also burn the fuel quicker. As you become experienced with your fireplace and matching its use to your lifestyle, you will figure out when it is applicable to close the air intake to achieve a longer fire.

When you are loading the fireplace to produce heat for the remaining of the night, you will want to have the air intake fully open for a brief period to ensure flames engulf the new firewood. Make sure you have a large bed of coals for overnight burns like this. Do not leave the air intake fully open for too long before you begin to close the air intake damper until you have it at your desired position. A fully closed air intake will achieve the slowest burn and allow more heat transfer from the fireplace. As the flames in the fireplace slow down you are increasing the efficiency of the fireplace. Depending on the wood and other factors, some soot may build up on the glass when the air intake is fully closed.

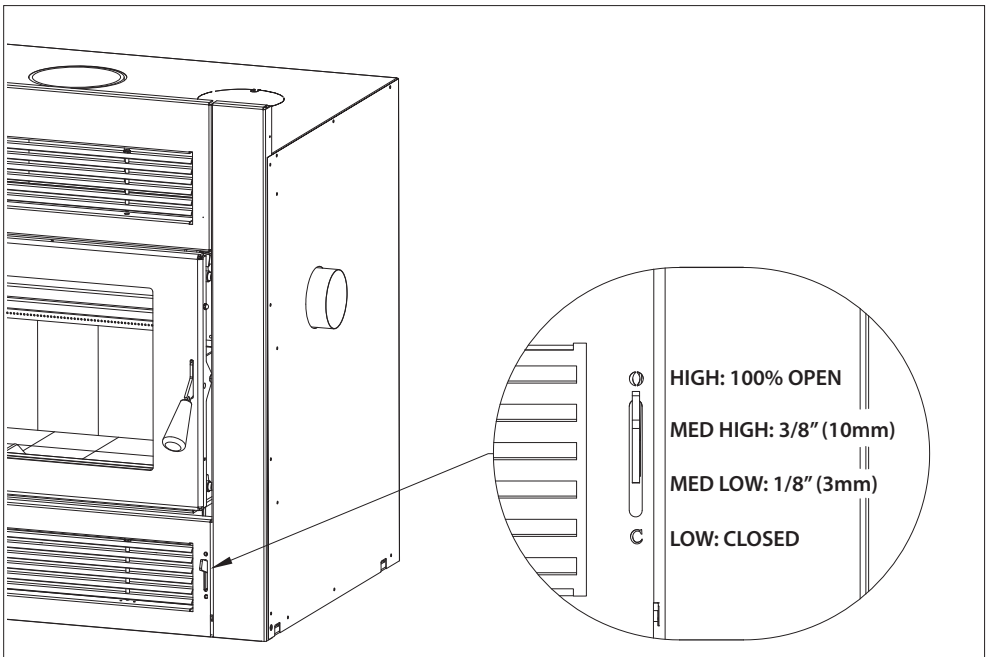


Figure 8.4, Air Intake Adjustment

9.0 MAINTENANCE REQUIREMENTS

9.1 Ash Disposal

Ash should be periodically removed from a cold fireplace. NEVER remove ash from a hot fireplace. Depending on the amount and type of wood burned, and the length of your burn cycles, the time in between ash removals will vary. When you remove ashes from your fireplace, it is recommended to leave behind a small bed of coals. They will help in building your next fire.

The best time to remove ash is after an overnight burn when the fireplace is relatively cool but draft is still established. Ashes normally contain some live embers that can stay hot for a long time. Use a metal container with a tight-fitting lid. The closed container of ashes should be removed from the interior of the house and to a non-combustible floor, well away from all combustible materials, pending final disposal.

If the ashes are disposed of by burial in the soil or otherwise locally dispersed, they must be retained in the closed container until all cinders have thoroughly cooled.

9.2 Creosote - Formation and Need for Removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire.

The chimney should be inspected monthly during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (1/8" [3mm] or more) it should be removed to reduce the risk of a chimney fire.

Inspection can be accomplished from the top of chimney cap or from inside the stove by removing upper firebrick.

We recommend a professional chimney cleaner inspect and clean the chimney at least once annually.

9.3 Glass Information

Do not operate this appliance with the glass frame assembly removed, cracked, or broken. The glass assembly shall only be replaced as supplied by Hussong Mfg. Co., Inc. Replacement of the glass assembly must only be performed by a licensed or qualified service person. DO NOT SUBSTITUTE MATERIALS.

- Do not strike or slam doors. This may cause glass damage.
- In the event of glass breakage, let fireplace cool completely.
- DO NOT USE THIS FIREPLACE WITH BROKEN OR CRACKED GLASS.
- Replace only with Kozy Heat #150-380 for Model #Z-42 / #150-250 for Model Z-42-CD. Do not substitute materials.
- Clean glass on a regular basis. Should glass become discolored with creosote, follow this procedure for easy removal.

  Burn fireplace with the outside air damper completely open for 30-45 minutes. This will normally clean the glass and also minimize ashes in the firebox.

  Oven cleaner or a cleaner specifically designed for fireplace may also be used. DO NOT use abrasive cleaners. Clean only when glass is cool.

9.3.1 Broken Glass Removal

9.3.1.1 Single Door Model

1. Open door to a 45˚ angle from face.
2. Remove bottom hinge pin.
3. Lift door up off hinges far enough to release upper hinge pin.
4. Remove door and lay face side down on a flat protected surface.
5. Remove and save screws and glass clips. Carefully remove broken glass.
6. Place new glass with gasket inside door frame (gasket with second layer should be facing you).
7. Secure glass with glass clips and screws previously removed. (Glass clips are placed between first and second layers of gasket).
8. Re-install door and hinge pins.

9.3.1.2 Cast Door Model

1. Remove door /doors from fireplace by lifting 'up' off hinges. Lay face down on a flat protected surface.
2. Remove and save screws and glass clips. Carefully remove broken glass. Inspect glass gasket on inside frame of door / doors. Replace if necessary.
3. Place new glass with gasket inside door frame, secure with glass clips and screws previously removed.
4. Re-install door and hinge pins, making sure pins are properly seated before closing door / doors.

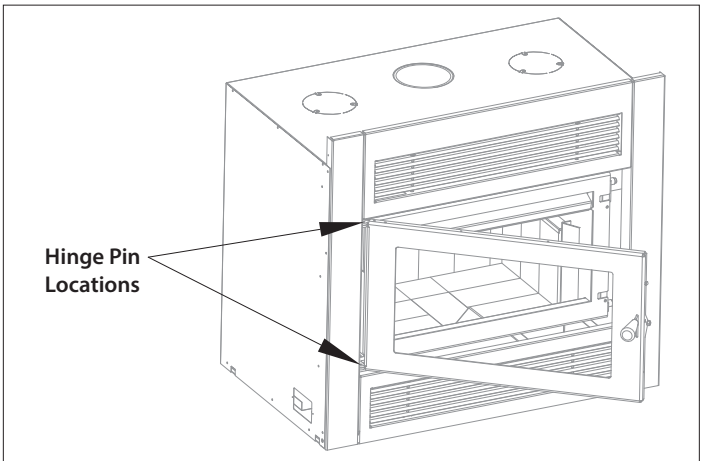


Figure 9.1, Single Door Model Hinge Pin Locations

9.4 Cast Door Model Roller Catch Plate Replacement

If the roller catch plate needs to be replaced;

1. Open the doors.
2. Locate the roller catch plate. Remove screw.
3. Insert the new roller catch plate as shown. Secure with previously removed screw.

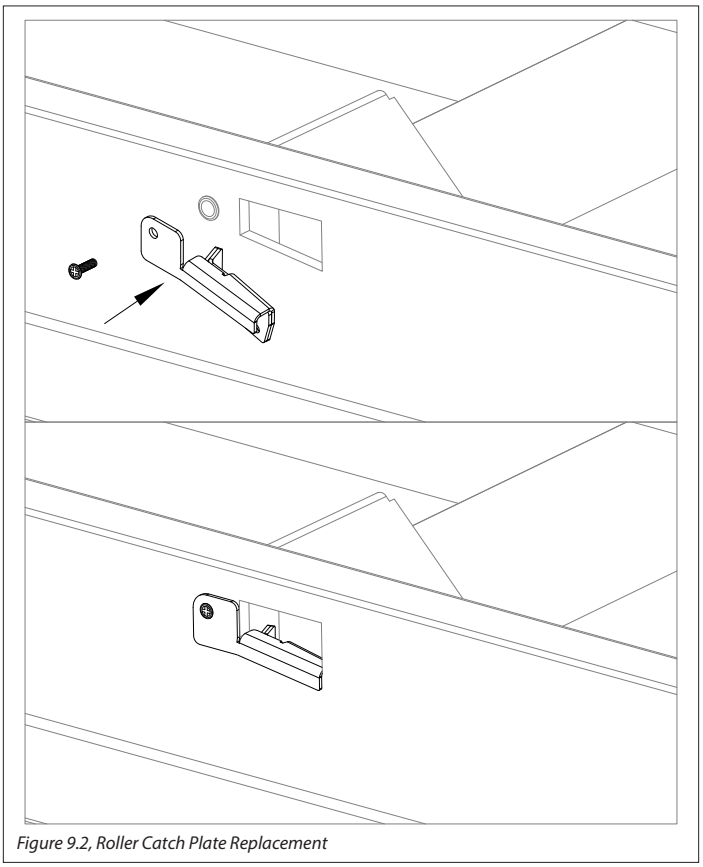


Figure 9.2, Roller Catch Plate Replacement

9.5 Cast Door Model Roller and Clevis Pin Replacement

If the roller/clevis pin needs to be replaced;

1. Open the doors.
2. Remove cotter pin from clevis pin.
3. Remove clevis pin and roller.
4. Replace clevis pin and/or roller with new parts.
5. Insert the clevis pin through the roller and door handle, as shown below. Slide the cotter pin into the hole in the clevis pin. Bend the cotter pin prongs around the clevis pin and trim excess.

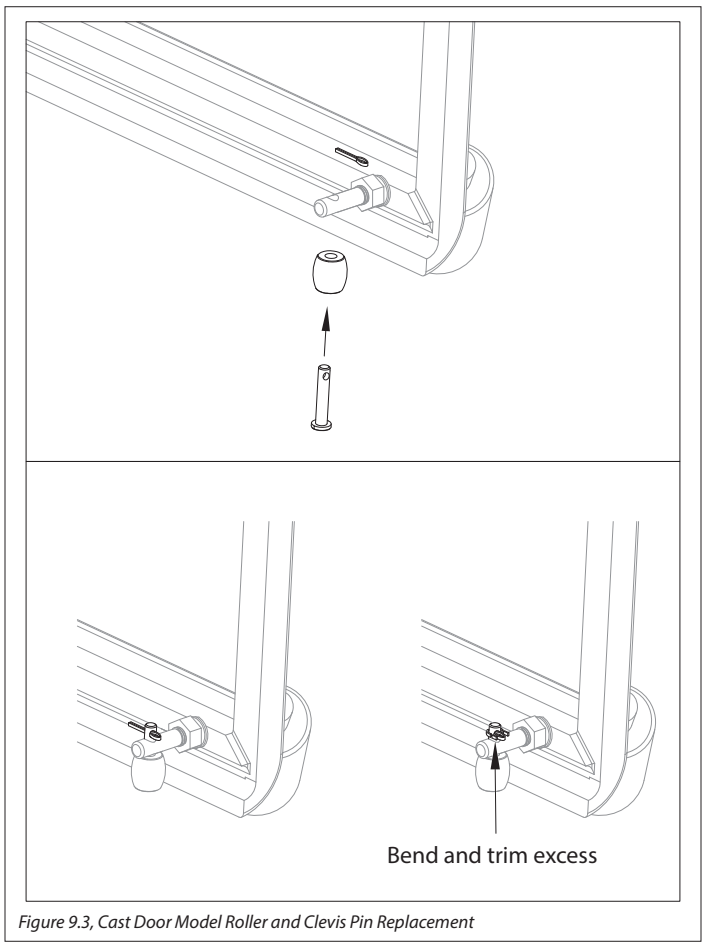


Figure 9.3, Cast Door Model Roller and Clevis Pin Replacement

9.6 Door Gasket Replacement

9.6.1 Single Door Model

1. Open door to a 45˚ angle from face.
2. Remove bottom hinge pin.
3. Lift door up off hinges far enough to release upper hinge pin.
4. Remove door and lay face side down on a flat protected surface.
5. Remove and save screws and glass clips. Carefully remove glass.
6. Remove old gasket.
7. Prop glass in an upright position. Remove new gasket paper backing. Starting several inches in from any corner, center the width of gasket around edge of glass so that a portion of the material is adhered to both sides of the glass, wrapping around all four sides. Cut off excess gasketing where ends meet. Do not overlap gasketing.
8. Cut excessive gasketing material from corner.
9. Reinstall glass in door. Secure with glass clips and screws previously removed.
10. Re-install door and hinge pins.

9.6.2 Cast Door Model

There are two different types of gasket used in the cast door model. There is the glass gasket kit (part #808) and door gasket kit (part #804). Follow instructions below to replace gasket kits.

9.6.2.1 #808 Glass Gasket Kit

1. Remove door(s) from fireplace by lifting 'up' off hinges. Lay face down on a flat protected surface.
2. Remove and save screws and glass clips.
3. Remove glass.
4. Place glass with the new glass gasket inside door frame, secure with glass clips and screws previously removed. Repeat for other door, if necessary.
5. Reinstall door(s).

9.6.2.2 #804 Door Gasket

1. Remove the left door. Lay face side up on a protected, flat surface.
2. Carefully remove old 1/4" banger rope and sealant from the left door using a small chisel or flat head screwdriver.
3. Distribute a small bead of sealant along groove. While sealant is still wet, gently lay 1/4" banger rope into groove, being careful not to stretch the rope.
4. Remove the right door. Place the left door and the right door face side down on a protected, flat surface.
5. Remove old 1/2" door gasket and sealant using a small chisel or flat head screw driver.
6. Distribute a small bead of sealant along groove in both doors. While sealant is still wet, lay door gasket into groove.
7. Reinstall doors. Close and latch for (2) minutes. Open doors and leave open for at least (2) hours to allow sealant to cure.

10.0 TROUBLESHOOTING

Issue	Cause
Smoke enters back through door when opened	Negative pressure in the home. Chimney not high enough. Cool wind cooling poorly insulated chimney. Adjacent structures, trees, etc., too close to chimney. Remove or raise chimney. Screen on chimney top too fine, or plugged. Restriction within chimney (creosote, mortar, leaves, bird nest, etc.). Ice buildup on chimney top.
Smoke enters back when first starting fire	
Smoke enters the room when the fire dies down	
Smoke exits out of doors or intake pipe when the wind is from a certain direction	
Fireplace won't generate enough heat	Wood not seasoned or is wet from snow or rain. Not enough wood being burned. Obstructed grill openings.
There is an odor coming from the fireplace	New paint. This odor will disappear after several burn periods. Open doors & windows to ventilate during initial burn period.
Fireplace will not light	Damp, wet, unseasoned wood. See Section 7.0 Firewood selection and considerations on page 30. Poor draft. See Section 5.4 Chimney Location and Considerations on page 22.

11.0 REPLACEMENT PARTS

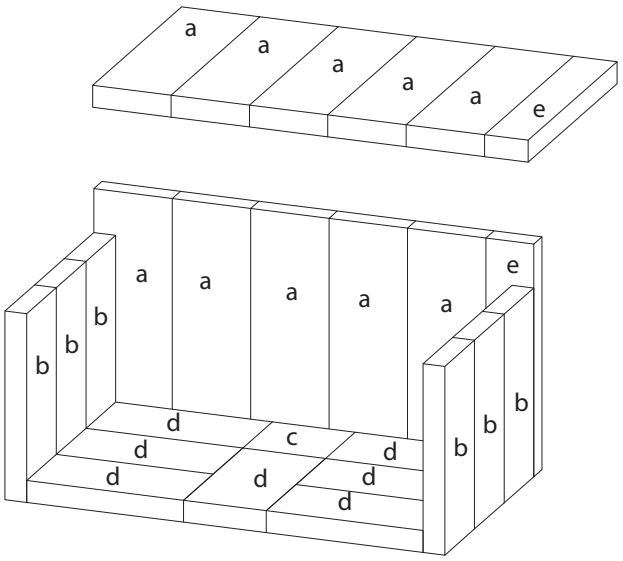
Replacement parts are available through your local dealer. Contact your local dealer for availability and pricing.

WARNING: This product and the fuels used to operate this product (wood), and the products of combustion of such fuels, can expose you to chemicals including carbon black, which is known to the State of California to cause cancer, and carbon monoxide, which is known to the State of California to cause birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov

OPTIONAL ACCESSORIES	
HTK-INT	Heat Transfer Kit - Interior
617	44" Lintel Iron
945	4" Air Vent Non-Closure

OPTIONAL FAN KIT	
600-1	Fan Kit (2) 110 CFM
404-4	Limit Switch Assembly
600-085	Speed Control (only)

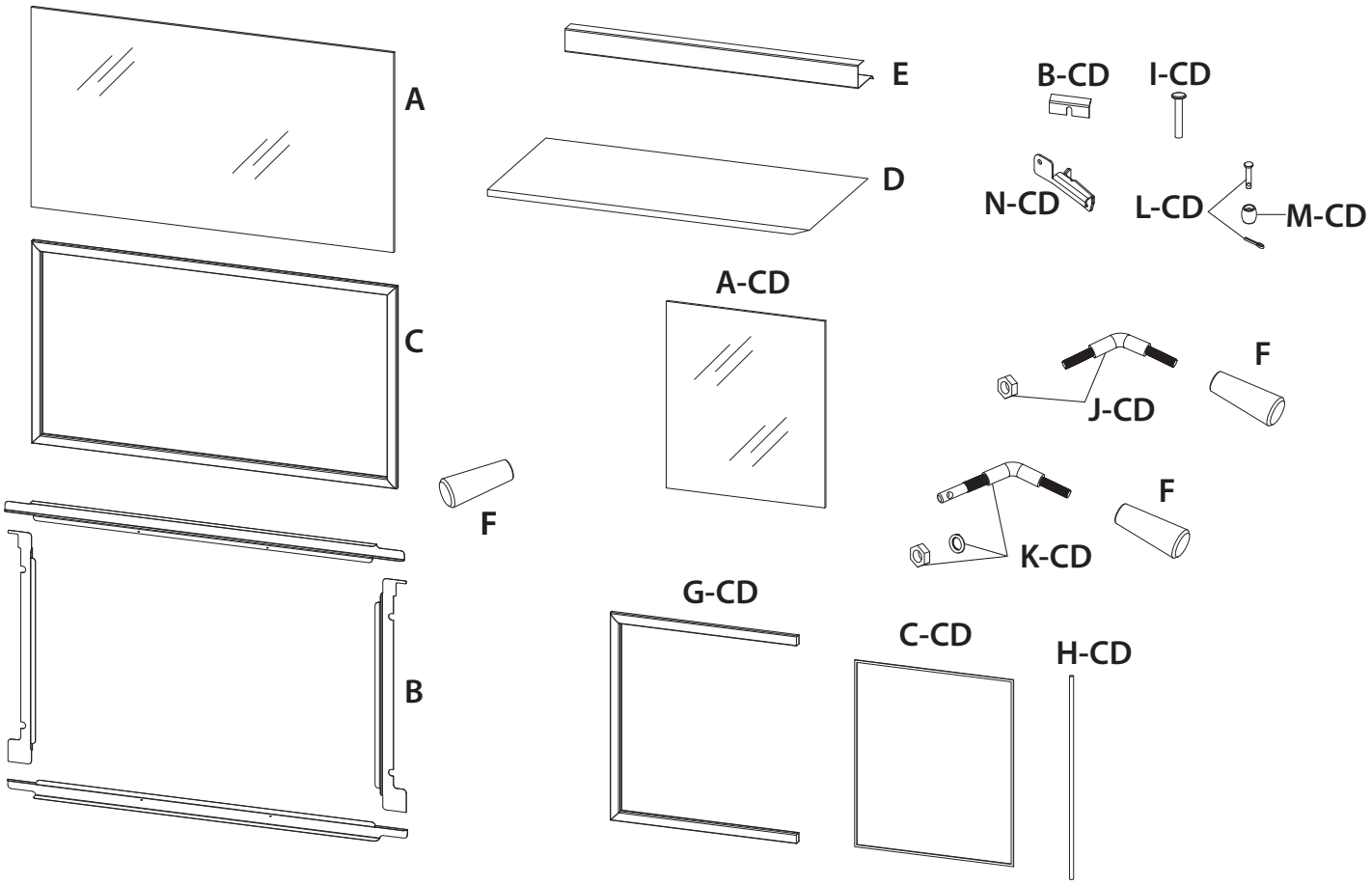
FIREBRICK		
	Z42-500	Z-42 Firebrick Kit
a	Z42-501	13-1/2" x 4-1/2" Firebrick
b	Z42-503	10-3/4" x 4-1/2" Firebrick
c	Z42-504	4-1/2" x 4-1/2" Firebrick
d	Z42-502	9" x 4-1/2" Firebrick
e	Z42-505	13-1/2" x 2-1/2" Firebrick



Hussong Manufacturing Co., Inc.
P.O. Box 577
204 Industrial Park Drive
Lakefield, MN 56150-0577 USA
Z-42 and Z-42-CD

Z-42 REPLACEMENT PARTS		
A	150-380	Replacement Glass
B	200-181	Glass Clips (4)
C	810	Glass Gasket
D	Z42-900	Refractory Brick Panel
E	111-121	Stainless Steel Firebrick Retainer
F	500-308	Black Wooden Handle

Z-42-CD REPLACEMENT PARTS		
A-CD	150-250	Replacement Glass
B-CD	200-160	Glass Clips (8)
C-CD	808	Glass Gasket Kit (1 per door)
D	Z42-900	Refractory Brick Panel
E	111-121	Stainless Steel Firebrick Retainer
F	500-308	Black Wooden Handle
G-CD	804	Door Gasket Kit (1 per door)
H-CD	500-404	Banger Rope
I-CD	300-349	Door Pins (4)
J-CD	200-308R	Fixed Operator Handle Assembly
K-CD	200-309R	Operator Handle Assembly
L-CD	Z42-315R	Clevis Pin with cotter pin
M-CD	Z42-319R	Door Roller
N-CD	Z42-318R	Roller Catch Plate



Hussong Manufacturing Co., Inc.
P.O. Box 577
204 Industrial Park Drive
Lakefield, MN 56150-0577 USA
Z-42 and Z-42-CD

LIMITED 20 YEAR WARRANTY

Warranty Coverage

Hussong Manufacturing Company, Inc. (Hussong Mfg.) warrants this Kozy Heat wood burning appliance from the date of purchase to the original purchaser, that it is free of defects in materials and workmanship at the time of manufacture. Registering your fireplace warranty does not require any documents to be sent in to Hussong Mfg. Please retain your proof of purchase reflecting the date of purchase along with the serial number and model of your fireplace for any future warranty claims.

If a defect is noted within the warranty period, the customer should contact their authorized dealer for service within 30 days.

30 Days: Parts & Labor*

- Paint
- Gasket material

Year 1: Parts & Labor*

- Glass (breakage from thermal shock)
- Handles
- Firebrick and top refractory panel
- Fan kit and speed control

****Hussong Mfg. will issue labor reimbursement to an authorized dealer only. Hussong Mfg. will not be liable for charges occurred as a result of any service performed by a non-authorized service provider, without pre-authorization.***

Years 2 through 20: Parts Only

- Firebox assembly
- Outer fireplace shell
- Door assembly
- Air tubes (against warpage)
- Air tube support brackets
- Ash lip / hearth extension
- Firebrick retainer

EXCLUSIONS AND LIMITATIONS

1. This appliance must be installed by a licensed, authorized service technician or contractor. It must be installed, operated and maintained at all times in accordance with the instructions in the owner's manual or the warranty is void.
2. This warranty is nontransferable and is made to the original purchaser only.
3. This warranty excludes standard wear and tear of the appliance which is considered normal usage over time. Damage resulting from operational-related problems such as over-firing, down drafts, smoke spillage, corrosive woods are not considered warranty problems and will not be covered.
4. Discoloration and some minor expansion, contraction or movement of certain parts, resulting in noise, is normal and not a defect.
5. Warranty is automatically voided if the appliance's serial number and/or testing label is removed or if the appliance is altered or tampered with in any way.
6. Warranty is void if the appliance is subject to submersion in water or prolonged periods of dampness or condensation. Any damage to any part of the appliance due to water or weather damage which is the result of, but not limited to, improper chimney/venting installation will also render this warranty void.
7. This warranty does not cover installation and operational related problems such as environmental conditions, nearby trees, buildings, hilltops, mountains, inadequate venting or ventilation, excessive offsets, negative air pressures caused by any mechanical systems.
8. Chimney components and other Non-Hussong Mfg. accessories used in conjunction with the installation of this appliance are not covered under this warranty.
9. Damage to plated surfaces or accessories, if applicable, caused by scratches, fingerprints, melted items or other external sources left on the surfaces from the use of cleaners is not covered under this warranty.
10. It is expressly agreed and understood that this warranty is Hussong Mfg.'s sole obligation and purchaser's exclusive remedy for defective fireplace equipment. Hussong Mfg. is free of liability for any damages caused by this appliance, as well as inconvenience expenses and materials. Incidental or consequential damages are not covered by this warranty. In some states, the exclusion of incidental or consequential damage may not apply. Hussong Mfg. shall not be held to implied warranties and this warranty shall replace all previous warranties.
11. This limited 20 year warranty is the only warranty supplied by Hussong Mfg. Any warranties extended to the purchaser by the dealer/distributor, whether expressed or implied, are hereby disclaimed and the purchaser's recourse is expressly limited to the warranties set forth herein.
12. Any part repaired or replaced during the limited warranty period will be warranted under the terms of the limited warranty for a period not to exceed the remaining term of the original limited warranty.
13. Any replacement part repaired after the warranty period will include a 90 day parts coverage
14. Hussong Mfg. may require the defective part to be returned using a pre-authorized RGA number or a photo of the defective component. Failure to provide either can result in a denied claim.
15. This warranty does not cover the appliances ability to heat a desired space, as there are many factors that can impact the heating performance in each home. Consideration should be implied to the fuel source, appliance's location, room size, home design, environmental conditions, insulation, and tightness of the home.
16. Hussong Mfg. reserves the right to make changes at any time, without notice, in design, material, specifications, and prices. Hussong Mfg. reserves the right to discontinue models and products.

USE SOLID WOOD, PROCESSED SOLID FUEL FIRE LOGS FUEL ONLY
DO NOT OVERFIRE UNIT
THIS FIREPLACE MUST BE CONNECTED TO AN INSULATED 6" DIAMETER HT-TYPE UL 103, AND/OR CAN/ULC S629 CHIMNEY.
OUTSIDE COMBUSTION AIR IS REQUIRED FOR PROPER INSTALLATION. DO NOT OBSTRUCT COMBUSTION AIR OPENING.
THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. CONSULT THE OWNER'S MANUAL FOR FURTHER INFORMATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH THE OPERATING INSTRUCTIONS IN THE OWNERS MANUAL.
UTILISEZ SEULEMENT DU BOIS SOLIDE ET/OU DES BOCHES A FEU EN BOIS/ COMBUSTIBLE DENSIFIE. NE PAS SUR LE-FEU
CE FOYER DOIT ETRE RACCORDE A UNE CHEMINEE HOMOLOGUEE DE ISOLANTE 6 PO DIAM. TYPE HT UL 103 ET/OU CAN/ULC S629.
DE L'AIR DE COMBUSTION EXTERIEUR EST EXIGE POUR UNE INSTALLATION ADEQUATE. N'OBSTRUEZ PAS L'OUVERTURE D'AIR DE COMBUSTION.
DO NOT USE A FIREPLACE INSERT OR OTHER PRODUCTS NOT SPECIFIED FOR USE WITH THIS PRODUCT.
DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.
OPTIONAL BLOWER: #600-1 MFGR: EBM 115 VOLTS, 60 HZ, 1.3 AMPS
OPTIONAL HEAT DUCT KIT #970: MFGR: HUSSONG 120V, 60 HZ, .25 AMPS
N'UTILISEZ AUCUN FOYER ENCASTRABLE OU AUTRE PRODUIT NON SPECIFIE POUR UTILISATION AVEC CE PRODUIT.
NE RACCORDEZ PAS CET APPAREIL A UN CONDUIT DE CHEMIN EE DESSERVANT UN AUTRE APPAREIL.
VENTILATEUR OPTIONNEL: N° 600-1 MFGR: EBM 115V , 60 HZ, 1,3 AMPS
NO 970 KIT OPTIONNEL DE CONDUIT DE CHAUFFAGE: FABRICANT: HUSSONG 120V, 60 HZ, 0,25 AMPS

MINIMUM CLEARANCES: WITHIN ENCLOSURE AREA	
UNIT TO BACK WALL	0"
UNIT TO SIDEWALLS	0"
DUCT BOOTS TO FRAMING	0"
TOP STAND-OFFS TO HEADER	0"

EXPOSED AREA	
WALLBOARD TO FACEPLATE TOP EDGE/SIDES	0"
FUEL DOOR TO SIDEWALL	8"
OUTLET AIR GRILL TO MANTEL	15"
REMOTE OUTLET AIR GRILLS TO CEILING	2"

DÉGAGEMENTS MIN. DU FOYER AUX MATÉRIAUX COMBUSTIBLES : DANS LA ZONE DU BLOC-FOYER	
DU FOYER AU MUR ARRIÈRE	0 po
DU FOYER AUX MURS LATÉRAUX	0 po
DES RACCORDS DE CONDUIT AU CADRE	0 po
DES ÉTRIERS DE DÉGAGEMENT SUPÉRIEURS AU LINTEAU	0 po

DANS LA ZONE EXPOSÉE :	
DU PANNEAU MURAL AUX BORDS LATÉRAUX ET SUPÉRIEUR DE LA PLAQUE DE FAÇADE	0 po
DE LA (DES) PORTE(S) DU FOYER AU MUR LATÉRAL	8 po
DE LA GRILLE D'AIR DE SORTIE AU MANTEAU	15 po
DES GRILLES D'AIR DE SORTIE ÉLOIGNÉES (CONDUITS D'AIR CHAUD) AU PLAFOND	2 po

WARNING: THIS FIREPLACE HAS NOT BEEN TESTED WITH AN UNVENTED GAS LOG SET. TO REDUCE RISK OF FIRE OR INJURY, DO NOT INSTALL AN UNVENTED GAS LOG SET INTO FIREPLACE.
OPTIONAL HEAT DUCTS, PART #970: INSTALL AND ENCLOSE FOLLOWING INSTRUCTIONS INCLUDED WITH THE HEAT DUCT KIT.
OPEN DAMPER BEFORE OPENING DOORS TO ADD FUEL. OPERATE ONLY WITH DOORS FULLY CLOSED. REPLACE ONLY WITH PRYOCERAM GLASS OBTAINED FROM THE DEALER OR CERTIFIED FOR USE WITH THE FIREPLACE. SEE MANUFACTURER'S INSTALLATION AND OPERATING INSTRUCTIONS FOR THIS MODEL.
DO NOT REMOVE OR COVER THIS LABEL
AVERTISSEMENT : CE FOYER N'A PAS ETE TESTE AVEC UN ENSEMBLE DE BUCHES A GAZ SANS CONDUIT D'EV ACUATION. POUR REDUIRE LES RISQUES D'INCENDIE OU DE BLESSURES, N'INSTALLEZ PAS DE BUCHES A GAZ SANS CONDUIT D'EVACUATION A L'INTERIEUR DE CE FOYER.
KIT OPTIONNEL DE CONDUITS D'AIR CHAUD, PIECE N° 970 : INSTALLEZ ET ISOLEZ EN SUIVANT LES INSTRUCTIONS FOURNIES AVEC LE KIT DE CONDUITS D'AIR CHAUD.
OUVREZ LE REGISTRE AV ANT D'OUVRIR LA (LES) PORTE(S) POUR AJOUTER DU BOIS (COMBUSTIBLE). UTILISEZ SEULEMENT AVEC LES PORTES COMPLETEMENT FERMEES. REMPLACEZ LA VITRE SEULEMENT PAR UNE VITRE PYROCERAM FOURNIE PAR LE DETAILLANT OU CERTIFIEE POUR UTILISATION A VEC CE FOYER. VOIR LES INSTRUCTIONS D'INSTALLATION ET D'UTILISATION DU FABRICANT POUR CE MODELE DE FOYER.
CETTE ETIQUETTE NE DOIT PAS ETRE RETIREE, ET ELLE DOIT RESTER VISIBLE.

U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
Tested to ASTM E3053 - 1.2 g/hr.

MODEL (MODELE): Z42 -

LISTED FACTORY BUILT FIREPLACE (FOYER PRÉFABRIQUÉ HOMOLOGUÉ)
Tested to (teste selon) UL 127-2015(R2016) FACTORY BUILT FIREPLACES, ET CAN/ULC S610-M87 (R2016)

HUSSONG MFG. COMPANY, INC.
204 INDUSTRIAL PARK DRIVE
LAKEFIELD, MN 56150

PFS C US

REPORT NO: 18-449

SERIAL:

YEAR/ANNÉE **WEEK/SEMAINE**

Established 1974

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A2LA ACCREDITED
CERTIFICATE #1550.01

PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI01A05026181218

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Rice Lake	IQ+355E-2A x 100(	A05026	#041	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	0.1	QC033	12/18/18	6/13/18	12/2019

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 250 Tol: 1	Test Wt: HB44 Tol: HB44	Test Wt: 100 Tol: 1	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 16.9°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	999.3	1000.2	0.12
700	699.7	700.1	0.12
500	499.7	500.1	0.08
300	299.8	300.1	0.08
100	99.9	100.0	0.05
50	50.0	50.0	0.05

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	11/24/17	11/2019	20172265

Permanent Information Concerning this Equipment:
12 month calibration cycle. 2000lb platform.

Comments/Information Concerning this Calibration
12/18 - RH = 67%. Adjusted span.

Report prepared/reviewed by: ServiceTechDC **Date:** 12/28/18 **Technician:** R.Kauble **Signature:**

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy.

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A2LA ACCREDITED
CERTIFICATE #1550.01

PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI0182484A0912013i181218

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Digiweigh	DWP12i 400x.01	82484A0912013i	#050	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	0.01	QC033	12/18/18	6/13/18	12/2019

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 50 Tol: 0.05	Test Wt: HB44 Tol: HB44	Test Wt: 50 Tol: 0.01	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 16.4°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
400	399.99	399.99	0.058
300	300.00	300.00	0.058
200	200.03	200.03	0.058
100	100.01	100.01	0.012
50	50.00	50.00	0.012
20	20.00	20.00	0.012

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	11/24/17	11/2019	20172265

Permanent Information Concerning this Equipment:
12 month calibration cycle.

Comments/Information Concerning this Calibration
12/18 - RH = 64%. Adjusted span.

Report prepared/reviewed by: ServiceTechJC **Date:** 12/28/18 **Technician:** R.Kauble
Signature:

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy.

Dry Gas Meter Calibration

Meter Manufacturer:	Apex
Model:	XC-60-ED
Lab ID #:	53
Serial #:	1902130
Calibration Date:	12/17/2018
Calibration Expiration:	6/17/2019
Barometric Pressure:	29.87 in. Hg

PFS·TECO

Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/5/2019
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	12/13/2018
γ Factor:	1.002
Allowable Deviation (±5%):	0.0501
Actual Deviation:	0.00
Result:	PASS

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	166.180	147.027	169.354
Standard DGM Temperature (°F)	71.7	72.5	73.0
Standard DGM Pressure (in H_2O)	0.00	0.00	0.0
DGM Initial Volume (ft^3)	0.000	0.000	0.000
DGM Final Volume (ft^3)	5.950	5.296	6.132
DGM Temperature (°F)	83.0	91.0	93.0
DGM Pressure (in H_2O)	2.60	2.00	1.5
Time (min)	37.0	37.0	49.0
Net Volume for Standard DGM (ft^3)	5.869	5.192	5.981
Net Volume for DGM (ft^3)	5.950	5.296	6.132
Dry Gas Meter γ Factor	0.999	1.007	1.006
γ Factor Deviation From Average	0.999	1.007	1.006

Average Gas Meter γ Factor: 1.004

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. $\gamma = [V_{std} \times (\gamma_{Std}) \times (P_{bar}+P_{std}/13.6) \times (T_{DGM} + 460)] / [V_{DGM} \times (T_{std} + 460) \times (P_{bar} + P_{DGM}/ 13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is ±0.5%.

Technician: 12/17/2018

Dry Gas Meter Calibration

Meter Manufacturer:	Apex
Model:	XC-60-ED
Lab ID #:	54
Serial #:	1902133
Calibration Date:	12/17/2018
Calibration Expiration:	6/17/2019
Barometric Pressure:	29.87 in. Hg

Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/5/2019
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	12/13/2018
γ Factor:	0.997
Allowable Deviation (±5%):	0.04985
Actual Deviation:	0.00
Result:	PASS

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	153.596	138.287	193.022
Standard DGM Temperature (°F)	73.0	73.0	74.0
Standard DGM Pressure (in H_2O)	0.00	0.00	0.0
DGM Initial Volume (ft^3)	0.000	0.000	0.000
DGM Final Volume (ft^3)	5.594	5.047	7.058
DGM Temperature (°F)	94.5	95.0	96.0
DGM Pressure (in H_2O)	2.60	2.00	1.5
Time (min)	35.0	36.0	57.0
Net Volume for Standard DGM (ft^3)	5.424	4.884	6.816
Net Volume for DGM (ft^3)	5.594	5.047	7.058
Dry Gas Meter γ Factor	1.000	1.001	1.000
γ Factor Deviation From Average	1.000	1.001	1.000

Average Gas Meter γ Factor: 1.000

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. $\gamma = [V_{std} \times (\gamma_{Std}) \times (P_{bar}+P_{std}/13.6) \times (T_{DGM} + 460)] / [V_{DGM} \times (T_{std} + 460) \times (P_{bar} + P_{DGM}/ 13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is ±0.5%.

Technician: 12/17/2018

Dry Gas Meter Calibration

Meter Manufacturer:	Apex
Model:	Apex-AK-600
Lab ID #:	055
Serial #:	810016
Calibration Date:	6/15/2018
Calibration Expiration:	6/15/2019
Barometric Pressure:	29.83 in. Hg

Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	047
Serial #:	1101001
Calibration Expiration Date:	3/5/2019
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	1/18/2017
γ Factor:	0.997
Allowable Deviation (±5%):	0.04985
Actual Deviation:	0.00
Result:	PASS

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	145.479	148.058	143.802
Standard DGM Temperature (°F)	71.0	71.0	71.0
Standard DGM Pressure (in H_2O)	0.00	0.00	0.0
DGM Initial Volume (ft^3)	0.000	0.000	0.000
DGM Final Volume (ft^3)	5.146	5.254	5.114
DGM Temperature (°F)	75.0	76.5	77.5
DGM Pressure (in H_2O)	1.80	1.80	1.8
Time (min)			
Net Volume for Standard DGM (ft^3)	5.138	5.229	5.078
Net Volume for DGM (ft^3)	5.146	5.254	5.114

Dry Gas Meter γ Factor	0.999	0.999	0.999
γ Factor Deviation From Average	0.999	0.999	0.999

Average Gas Meter γ Factor: 0.999

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. $\gamma = [V_{std} \times (\gamma_{Std}) \times (P_{bar}+P_{std}/13.6) \times (T_{DGM} + 460)] / [V_{DGM} \times (T_{std} + 460) \times (P_{bar} + P_{DGM}/ 13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is ±0.5%.

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Calibration Services

Certificate Number: 1550.01

Laboratory code: 115953

Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 03/21/17
Submitted By: John Steiner
Traceable Number: 20170468

Test Item: 200mg and 100mg Individual Weights
Serial No.: Listed in Table

Manufacturer: Troemner

Material	Assumed Density	Range	Tolerance Class
Stainless Steel	7.95 g/cm^3	200mg & 100mg	ASTM Class 1

Method and Traceability
The procedure used for this calibration is NIST IR 6969 SOP 4 Double Substitution Weighing Design. Standards used for comparison are traceable to the National Institute of Standards and Technology (reports on file) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and traceability within the level of uncertainty reported. The Traceable Number listed above is Traceable to National Standards through an unbroken chain of comparison each having stated uncertainties.

Standards Used:
100g to 1mg Working Standards Were Calibrated: 03/03/17 Due: 03/31/18 Standards ID: 723318
Mass Comparators Used: MET-05 **Tested by:** D. Thompson

Conventional Mass: "The conventional value of the result of weighing a body in air is equal to the mass of a standard, of conventionally chosen density, at a conventionally chosen temperature, which balances this body at this reference temperature in air of conventionally chosen density. International Recommendation 33 (OIML IR 33 1973, 1979). "Conventional Value of the Result of Weighing in Air" **(Previously known as "Apparent Mass vs. 8.0g/cm^3).**

Uncertainty Statement: The uncertainty conforms to the ISO Guide to the Expressions of Uncertainty in Measurement. Uncertainty as reported is based on a coverage factor k=2 for an approximate 95 percent level of uncertainty. Uncertainty components include the standard deviation of the process, the uncertainty of the standard used, an uncertainty component associated with the potential drift of the standard used, and the estimated uncertainty related to measuring and determining the air buoyancy effect.

Conventional Mass Values are listed on page 2 of this report.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 03/21/17

Signature David S. Thompson

Established 1974

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Calibration Services

Certificate Number: 1550.01

Laboratory code: 115953

Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 03/21/17
Submitted By: John Steiner
Traceable Number: 20170468

Test Item: 200mg and 100mg Individual Weights
Serial No.: Listed in Table

Manufacturer: Troemner

Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.967	753.44	49.44

Conventional Mass Value

Nominal Value	As Found grams	As Found Correction* (mg)	Uncertainty (mg)	Tolerance (mg)
200mg SN 1000101395	0.2000061	0.0061	0.0026	0.01
100mg SN 1000126267	0.1000046	0.0046	0.0028	0.01

*Correction is the difference between the conventional mass value of a weight and its nominal value.

Comments: These weights were new from the manufacturer and were within ASTM Class 1 tolerances As Found. No adjustments or changes were made so As Found values should be considered to be As Left values.

Accredited by the American Association for Laboratory Accreditation (A2LA) under Calibration Laboratory Code 115953 and Certificate Number 1550.01. This laboratory meets the requirements of ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories.* This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 03/21/17

Signature David S. Thompson

Established 1974

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ACCREDITED
Calibration Services
Certificate Number: 1550.01
Laboratory code: 115953

Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 01/15/16
Purchase Order: 1001
Traceable Number: 20152489

Test Item: 20lb and 10lb Individual Grip Handle Weights
Serial No.: Listed in Table

Manufacturer: Unknown

Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.448	760.64	44.58

Conventional Mass Value

Nominal Value	As Found pounds	As Found Correction* (mg)	Uncertainty (mg)	Tolerance (mg)
20lb #098	19.9995450	-206.4	6.4	910
10lb #097	10.0006510	295.3	5.1	450
10lb #051	10.0003421	155.2	5.1	450

*Correction is the difference between the conventional mass value of a weight and its nominal value.

Comments: These weights were received in good condition and were within NIST Handbook 105-1 Class F tolerances As Found. No adjustments or changes were made so As Found values should be considered to be As Left values.

Accredited by the American Association for Laboratory Accreditation (A2LA) under Calibration Laboratory Code 115953 and Certificate Number 1550.01. This laboratory meets the requirements of ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 01/15/16

Signature David S. Thompson

Established 1974

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A2LA ACCREDITED
CERTIFICATE #1550.01

PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI0134307497181218

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	ENTRIS224-1S	34307497	#107	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
g	0.0001	QC012	12/18/18	6/13/18	12/2019

FUNCTIONAL CHECKS

ECCENTRICITY
Test Wt: 100 Tol: 0.0003
As-Found: Pass: ☑ Fail: ☐
As-Left: Pass: ☑ Fail: ☐

LINEARITY
Test Wt: 50 x 4 Tol: 0.0002
As-Found: Pass: ☑ Fail: ☐
As-Left: Pass: ☑ Fail: ☐

STANDARD DEVIATION
Test Wt: 100 Tol: 0.0001

1. 100.0001	5. 100.0002	9. 100.0001
2. 100.0001	6. 100.0001	10. 100.0001
3. 100.0001	7. 100.0001	**Result**
4. 100.0001	8. 100.0002	0.00004

ENVIRONMENTAL CONDITIONS
☐ Good ☑ Fair ☐ Poor
Temperature: 21.3°C

A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
200	200.0002	200.0001	0.00014
100	100.0001	100.0001	0.00014
50	50.0003	50.0001	0.00014
20	20.0001	20.0001	0.00014
1	1.0001	1.0000	0.00014
0.1	0.1000	0.1000	0.00014

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	R.L./Troemner	10kg to 1mg	G782	1/3/18	1/2019	20172421

Permanent Information Concerning this Equipment:
12 month calibration cycle.

Comments/Info Concerning this Calibration:
12/18 - RH = 56%. Adjusted span.

Report prepared/reviewed by: ServiceTech JC **Date:** 12/28/18 **Technician:** R.Kauble

Signature:

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation and readability of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy. Calibrations comply with ISO/IEC 17025 and ANSI/Z540-1-1994 quality standards.

DICK MUNNS COMPANY
LIQUID & GAS FLOW CALIBRATION

ISO 17025 ACCREDITED
CL-122

CERTIFICATE OF CALIBRATION

CUSTOMER:	**PFS-TECO :** CLACKAMAS, OR	**CALIBRATION DATE:**	03/14/2019
PO NUMBER:	N/A	**CALIBRATION DUE:**	03/14/2020
INST. MANUFACTURER:	DWYER	**PROCEDURE:**	T.O.33K6-4-1769-1
INST. DESCRIPTION:	VELOMETER	**CALIBRATION FLUID:**	AIR @ 14.7 PSIA 70°F
MODEL NUMBER:	471	**RECEIVED CONDITION:**	WITHIN MFG. SPECS.
SERIAL NUMBER:	CP288559 (ID# 095)	**LEFT CONDITION:**	WITHIN MFG. SPECS.
RATED UNCERTAINTY:	SEE NOTES BELOW.	**AMBIENT CONDITIONS:**	762 mm HGA 43% RH 69°F
UNCERTAINTY GIVEN:	± .20% RD ; k=2	**CERTIFICATE FILE #:**	490265.2019

NOTES: ± 3% FS (0-500 / 0-1500) *** ± 4% F.S. (0-5000) ***± 5% F.S. (0-15000) *** ± 2 °F

NOTES CONT. : Q.MANUAL IM 1.5 REV 2017.1 DATED 7-18-2017

UUT INDICATED FT/MIN	DM.STD. ACTUAL FT/MIN	UUT INDICATED DEG. F	DM STD. ACTUAL DEG. F
64	65	0 TO 200°F	0 TO 200°F
110	112	43.4	43.5
206	210	69.0	68.9
498	509	99.4	99.2
503	505		
1049	1058		
1497	1514		
509	513		
3419	3460		
4992	5068		
5136	5235		
13928	14232		

STANDARDS USED:		
A220: 12" WIND TUNNEL 0 - 8000 FPM | CMC ± .203% RD | TRACE# 1520423238	DUE	05/23/2019
A24: HART SCIENTIFIC TEMP. STANDARD | ±.024 F | TRACE# 1520423238	DUE	03/07/2020

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 11133 Winners Circle • Los Alamitos, CA 90720
Phone (714) 827-1215 • Fax (714) 827-0823

Date: 3/14/2019

Approved By:

Calibration Technician:

Model 1430 Microtector® Electronic Point Gage

Installation and Operating Instructions

Model 1430 Microtector® Portable Electronic Point Gage combines modern, solid-state integrated circuit electronics with a time-proven point gage manometer to provide fast, accurate pressure measurements.

SPECIFICATIONS AND FEATURES

- Accurate and repeatable to ± .00025 inches water column
- Pressure range: 0 - 2″ w.c., positive, negative, or differential pressures
- Non-toxic and inexpensive gage fluid consists of distilled water mixed with a small amount of fluorescein green color concentrate
- Convenient, portable, lightweight and self-contained, the unit requires no external power connections and is operated by a 1.5 volt penlight cell
- A.C. detector current eliminates point plating, fouling and erosion
- Micrometers are manufactured in accordance with ASME B89.1.13-2001, and are traceable to a standard at the National Institute of Standards and Technology
- Three-point mounting, dual leveling adjustment, and circular level vial assure rapid setup
- Durablock® precision-machined acrylic plastic gage body
- Sensitive 0 - 50 microamp D.C. meter acts as a detector and also indicates battery and probe condition
- Heavy 2″ thick steel base plate provides steady mounting
- Top-quality glass epoxy circuit board and solid-state, integrated circuit electronics
- Electronic enclosure of tough, molded styrene acrylonitrile provides maximum protection to components yet allows easy access to battery compartment
- Rugged sheet steel cover and carrying case protects the entire unit when not in use
- Accessories included are (2) 3-foot lengths Tygon® tubing, (2) 1/8″ pipe thread adapters and 3/4 oz. bottle of fluorescein green color concentrate with wetting agent

Maximum pressure: 100 psig with optional pipe thread connections.

Tygon® is a registered trademark of Saint-Gobain Corporation

DWYER INSTRUMENTS, INC.
P.O. BOX 373
MICHIGAN CITY, INDIANA 46361,U.S.A
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

PRAXAIR

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

DocNumber: 000113537

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PXPKG TUALATIN OR H
10450 SW TUALATIN SHERWOOD
TUALATIN OR 97062

Praxair Order Number: 70337802
Customer P. O. Number:
Customer Reference Number:

Fill Date: 8/7/2017
Part Number: NI CD17CO8E-AS
Lot Number: 70086721903
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 1290 psig 99 cu. ft.

Certified Concentration:

Expiration Date: 8/11/2025
Cylinder Number: CC700832

			NIST Traceable Analytical Uncertainty:
4.33	%	CARBON MONOXIDE	± 0.5 %
16.93	%	CARBON DIOXIDE	± 0.3 %
16.99	%	OXYGEN	± 0.3 %
Balance		NITROGEN	± 0.2 %

Certifcation Information: *Certification Date:* 8/11/2017 *Term:* 96 Months *Expiration Date:* 8/11/2025
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 IR boardening effect. O2 responses have been corrected for CO2 interference.

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

1. Component: CARBON MONOXIDE

Requested Concentration: 4.25 %
Certified Concentration: 4.33 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method: NDIR
Last Multipoint Calibration: 7/23/2017

First Analysis Data: Date: 8/11/2017

Z:	0	R:	5	C:	4.33	Conc: 4.333
R:	4.99	Z:	0	C:	4.33	Conc: 4.333
Z:	0	C:	4.32	R:	5	Conc: 4.323

UOM: % Mean Test Assay: 4.33 %

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC242633
Ref. Std. Conc: 5.00%
Ref. Std. Traceable to SRM # : 2642a
SRM Sample # : 51-D-23
SRM Cylinder # : FF23106

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 DIOXIDE

Requested Concentration: 17 %
Certified Concentration: 16.93 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method: NDIR
Last Multipoint Calibration: 7/20/2017

First Analysis Data: Date: 8/11/2017

Z:	0	R:	20.08	C:	16.99	Conc: 16.936
R:	20.08	Z:	0	C:	16.99	Conc: 16.936
Z:	0	C:	16.98	R:	20.09	Conc: 16.926

UOM: % Mean Test Assay: 16.933 %

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

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 %

PRAXAIR
Making our planet more productive

DocNumber: 223791

Praxair Distribution, Inc.
5700 S. Alameda Street
Los Angeles CA 90058
Tel: 323-585-2154
Fax: 714-542-6689
PGVP ID: F22018

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

PXPKG TUALATIN OR H
10450 SW TUALATIN SHERWOOD ROAD
TUALATIN OR 97062

Certificate Modification Date: 09/05/2018
Praxair Order Number: 70716136
Part Number: NI CD10CO33E-AS

Fill Date: 08/31/2018
Lot Number: 70086824308
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure and Volume: 2000 psig 140 ft3

Certified Concentration

ProSpec EZ Cert

Expiration Date:	09/05/2026	NIST Traceable
Cylinder Number:	CC170624	Expanded Uncertainty
10.00 %	Carbon dioxide	± 0.3 %
2.51 %	Carbon monoxide	± 0.7 %
10.50 %	Oxygen	± 0.6 %
Balance	Nitrogen	

Certification Information:

Certification Date: 09/05/2018 *Term:* 96 Months *Expiration Date:* 09/05/2026

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.

CO responses have been corrected for CO2 interference. CO2 responses have been corrected for Oxygen IR Broadening 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: 10.00 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method: NDIR
Last Multipoint Calibration: 08/20/2018

First Analysis Data: **Date** 09/05/2018

Z:	0	R:	14.02	C:	10	Conc:	10
R:	14.02	Z:	0	C:	10	Conc:	10
Z:	0	C:	10	R:	14.02	Conc:	10

UOM: % **Mean Test Assay:** 10 %

Reference Standard: Type / Cylinder #: GMIS / CC141375
Concentration / Uncertainty: 14.02 % ±0.3%
Expiration Date: 06/11/2026
Traceable to: SRM # / Sample # / Cylinder #: SRM 1675b / 6-F-51 / CAL014538
SRM Concentration / Uncertainty: 13.963% / ±0.034%
SRM Expiration Date: 05/16/2022

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:** %

2. ***Component:*** **Carbon monoxide**

Requested Concentration: 2.5 %
Certified Concentration: 2.51 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method: NDIR
Last Multipoint Calibration: 08/20/2018

First Analysis Data: **Date** 09/05/2018

Z:	0	R:	2.48	C:	2.51	Conc:	2.51
R:	2.48	Z:	0	C:	2.51	Conc:	2.51
Z:	0	C:	2.51	R:	2.48	Conc:	2.51

UOM: % **Mean Test Assay:** 2.51 %

Reference Standard: Type / Cylinder #: GMIS / CC102045
Concentration / Uncertainty: 2.48 % ±0.448%
Expiration Date: 04/03/2025
Traceable to: SRM # / Sample # / Cylinder #: SRM 2641a / 52-D-30 / CAL017193
SRM Concentration / Uncertainty: 4.009% / ±0.017%
SRM Expiration Date: 07/15/2019

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:** %

3. ***Component:*** **Oxygen**

Requested Concentration: 10.5 %
Certified Concentration: 10.50 %
Instrument Used: OXYMAT 5E
Analytical Method: Paramagnetic
Last Multipoint Calibration: 09/04/2018

First Analysis Data: **Date** 09/05/2018

Z:	0	R:	9.88	C:	10.49	Conc:	10.49
R:	9.88	Z:	0	C:	10.5	Conc:	10.5
Z:	0	C:	10.5	R:	9.88	Conc:	10.5

UOM: % **Mean Test Assay:** 10.5 %

Reference Standard: Type / Cylinder #: NTRM / DT0010402
Concentration / Uncertainty: 9.88 % ±0.4%
Expiration Date: 11/18/2022
Traceable to: SRM # / Sample # / Cylinder #: NTRM #170701 / N/A / NTRM #DT0010402
SRM Concentration / Uncertainty: 9.875% / ±0.040%
SRM Expiration Date: 11/18/2022

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:** %

Analyzed By: Danielle Burns

Certified By: Jose Vasquez

Verification of Standardization

of

Tape Measure

by

Advanced Calibration Technologies
28111 S.E. Wally Road
Boring, OR 97009
1-800-259-5058

ACCREDITED
Calibration
Cert# 1342.01

Customer:	PFS Teco, Inc	Street:	11785 Southeast Highway 212 Suite 305
City:	Clackamas State: OR	Zip:	97015 Location: In House
Machine Manufacturer:	Dewalt	Model:	16' Tape Measure
Capacity:	0.000 - 192.000 inches 0.125 Divisions	Serial #:	090
Calibration Cycle:	12 Months	Lab ID#:	#090
Previous Calibration Date:	January 2019	Calibration Procedure:	Ad-Tek SR
Equipment Used:	Gauge Blocks S/N: ADGB002	Action Recommended:	
If Other, Explain:			

Verification Data

Purpose:

This method provides instructions for checking the critical dimensions of the equipment.

Tolerance:

Equipment shall meet the dimensional tolerances specified in the applicable test method.

Procedure:

Verified using manufacturer's procedures.

Actual Dimensions (inches)	Unit Under Test As Found (inches)	Unit Under Test As Left (inches)	Difference (inches)
0.0000	0.000	0.000	0.000
0.1250	0.050	0.050	-0.075
0.2500	0.250	0.250	0.000
0.5000	0.500	0.500	0.000
0.7500	0.750	0.750	0.000
1.0000	1.000	1.000	0.000
3.0000	3.000	3.000	0.000
5.0000	5.000	5.000	0.000
7.0000	7.000	7.000	0.000
9.0000	9.000	9.000	0.000
12.0000	12.000	12.000	0.000

The overall condition of the device as found:	Within Specification
The overall condition of the device as left:	Within Specification
The measurement of uncertainty (MU) was calculated to be:	0.00060

File No: PFS-101666-0119D0120-AH-SR-090

Temperature: 72.1°F Humidity: 41.1%

The equipment used in the verification of this instrument has been calibrated and is NIST traceable.
The uncertainty of calibration was estimated at the 95% confidence level, coverage factor (k=2).

Remarks:

This certificate of verification is issued as a statement of fact that on the date of verification the above instrument had an accuracy as indicated and was calibrated to meet the requirements of the manufacturer's specifications. This certificate should not be construed or regarded as a guarantee or warranty of any kind that the instrument will retain the same percentage of accuracy as determined on the date when the verification was performed and reported. Ad-Tek, Inc. hereby expressly disclaims any and all liability for damage or loss by all parties arising or resulting from deterioration, obsolescence, malfunction, subsequent calibration performed by another agency or substandard performance of said instrument.

Service Technician: Alisa Houser Date of Service: January 16, 2019

Technical Manager: Nicole Ostrowski Date Next Due: January 2020

We sincerely appreciate your business and thank you for selecting Advanced Calibration Technologies, Inc. for servicing your equipment.
To reschedule, please call (800) 259-5058. Thank You.

Verification of Standardization

of

Calipers

by

Advanced Calibration Technologies
28111 S.E. Wally Road
Boring, OR 97009
1-800-259-5058

ACCREDITED
Calibration
Cert# 1342.01

Customer:	PFS Teco, Inc	Street:	11785 Southeast Highway 212 Suite 305
City:	Clackamas State: OR	Zip:	97015 Location: In House
Machine Manufacturer:	General	Model:	6" Digital Caliper
Capacity:	0.0000 - 6.0000 inches 0.0005 Divisions	Serial #:	092
Calibration Cycle:	12 Months	Lab ID#:	092
Previous Calibration Date:	January 2018	Calibration Procedure:	Ad-Tek DC
Equipment Used:	Gauge Blocks S/N: ADGB002	Action Recommended:	
If Other, Explain:			

Verification Data

Purpose:

This method provides instructions for checking the critical dimensions of the inside diameter of the equipment.

Tolerance:

Equipment shall meet the dimensional tolerances specified by the manufacturer for the inside diameter.

Procedure:

Verified using the procedure to meet manufacturer's tolerance for inside diameter.

Actual Dimensions (inches)	Unit Under Test As Found (inches)	Unit Under Test As Left (inches)	Difference (inches)
0.0000	0.0000	0.0000	0.0000
0.0500	0.0500	0.0500	0.0000
0.1000	0.1000	0.1000	0.0000
0.1010	0.1010	0.1010	0.0000
0.1050	0.1050	0.1050	0.0000
0.1100	0.1100	0.1100	0.0000
0.1500	0.1500	0.1500	0.0000
0.5000	0.5000	0.5000	0.0000
1.0000	1.0000	1.0000	0.0000
3.0000	2.9995	2.9995	-0.0005
5.0000	4.9990	4.9990	-0.0010

The overall condition of the device as found:	Within Specification
The overall condition of the device as left:	Within Specification
The measurement of uncertainty (MU) was calculated to be:	0.00062

This certificate does not reflect meausrements for inside jaws, step height, or depth.

File No: PFS-101666-0119D0120-AH-DC-092

Temperature: 68.2°F Humidity: 41.6%

The equipment used in the verification of this instrument has been calibrated and is NIST traceable.
The uncertainty of calibration was estimated at the 95% confidence level, coverage factor (k=2).

Remarks:

This certificate of verification is issued as a statement of fact that on the date of verification the above instrument had an accuracy as indicated and was calibrated to meet the requirements of the manufacturer's specifications. This certificate should not be construed or regarded as a guarantee or warranty of any kind that the instrument will retain the same percentage of accuracy as determined on the date when the verification was performed and reported. Ad-Tek, Inc. hereby expressly disclaims any and all liability for damage or loss by all parties arising or resulting from deterioration, obsolescence, malfunction, subsequent calibration performed by another agency or substandard performance of said instrument.

Service Technician: Alisa Houser Date of Service: January 15, 2019

Technical Manager: Nicole Ostrowski Date Next Due: January 2020

We sincerely appreciate your business and thank you for selecting Advanced Calibration Technologies, Inc. for servicing your equipment.
To reschedule, please call (800) 259-5058. Thank You.

J-2000

owner's manual

DELMHORST®
INSTRUMENT CO.

WHEN ACCURACY IS THE POINT.™

ACCREDITED
A2LA Certificate No. 1750.01
Calibration

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4198-9765787

Traceable® Certificate of Calibration for Hand Held Barometer

Customer :PFS TECO Suite 305 ,11785 SE Highway 212 ,Clackamas ,OR-97015 ,U.S.A.

Instrument Identification:

Model: 4198, S/N: 80531676 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	09 Oct 2018	1000415948
Digital Thermometer	111879345	09 Apr 2019	4000-9377595

Certificate Information:

Technician: 57 Procedure: CAL-32 Cal Date: 29 Aug 2018 Cal Due Date: 29 Aug 2019

Test Conditions: 62.73%RH 23.92°C 1018mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C	24.10	24.1	Y	23.51	23.9	Y	22.01	25.01	0.05	>4:1
mb/hPa	551.55	552	Y	551.62	546	Y	544	560	0.62	>4:1
mb/hPa	751.22	744	Y	748.87	746	Y	741	757	0.62	>4:1
mb/hPa	1015.90	1011	Y	1018.22	1017	Y	1010	1026	0.62	>4:1

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement : (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ± U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min=As Left Nominal(Rounded) – Tolerance; Max= As Left Nominal(Rounded) + Tolerance;

Nicol Rodriguez

Nicol Rodriguez, Quality Manager

Aaron Judice

Aaron Judice. Technical Manager

Note :

Maintaining Accuracy:

In our opinion once calibrated your Hand Held Barometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Hand Held Barometer change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.control3.com

Control Company is an ISO/IEC 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).