United States Stove Company

Project # 18-438
Model: SP2047
Type: Pellet-Fired Room Heater
February 4, 2019

ASTM E2779 Standard Test Method for Determining Particulate Matter Emissions from Pellet Heaters

227 Industrial Park Road
South Pittsburg, TN 37380

Prepared by: Sebastian Button,
Laboratory Supervisor

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Contents

Affidavit

PFS-TECO was contracted by United States Stove Company to provide testing services for the SP2047 Pellet-Fired Room Heater per ASTM E2779, *Determining PM Emissions from Pellet Heaters*. All testing and associated procedures were conducted at PFS-TECO's Portland Laboratory on 12/6/2018. PFS-TECO's Portland Laboratory is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015. Testing procedures were followed in accordance with an EPA Alternate test method (SP2047 ATM), which is largely based on ASTM E2779. Particulate sampling was performed per ASTM E2515, *Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel.* A copy of the SP2047 ATM is included in Appendix A of this report.

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, By A2LA to ISO 17025:2005 "Requirements for Testing Laboratories", and 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

United States Stove Company of South Pittsburg, TN, contracted with PFS-TECO to perform EPA certification testing on SP2047 Pellet-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 per ASTM E2779
- 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 after the test began.
- A single, integrated test run, in accordance with ASTM E2779 was performed:
    - 1 Hour at Maximum Burn Setting
    - 2 Hours at Medium Burn Setting (Defined as <50% of Maximum Burn Rate)
    - 3 Hours at Minimum Burn Setting
- As mentioned above, an EPA approved alternate test method (SP2047 ATM) was used during the testing of the appliance. This ATM is functionally the same as ASTM E2779, except sampling measurements are stopped during the burn rate transition portions of the test until burn rate has stabilized at the new rate. See ATM in Appendix A for further detail.

Pellet Heater Identification and Testing

- Appliance Tested: ***SP2047***
- Serial Number: ***N/A – Prototype Unit; PFS Tracking Number 0013***
- Manufacturer*:* ***United States Stove Company***
- Catalyst: ***No***
- Heat exchange blower: ***None***
- Type: ***Pellet Stove***
- Style: ***Free Standing***
- Date Received: ***Friday, October 19, 2018***
- Wood Heater Aging: ***September 17-21, 2018***
- Testing Period – Start: ***Thursday, December 06, 2018*** Finish: ***Thursday, December 06, 2018***
- 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: ***N/A***

Test Procedures and Equipment

All Sampling and analytical procedures were performed by Sebastian Button. All procedures used are directly from ASTM E2779 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
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
092	Digital Caliper
095	Anemometer
111	Microtector
CC700832	Gas Analyzer Calibration Span Gas

Results

The integrated test run emission rate for test run 1 was measured to be **0.41 g/hr** with a Higher Heating Values efficiency of **74.6%** and a CO emission rate of **0.36 g/min.** The calculated first hour particulate emission rate was **0.22 g/hr.** The United States Stove Company Model SP2047 Pellet-Fired Room Heater meets the 2020 PM emission standard of ≤ 2.0 g/hr per CFR 40 part 60, §60.532 (b).

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

Summary Table

Run Number	Date	Segments		Run Time (min)	Heat Output (BTU/hr)	1st Hr Emissions (g/hr)	Integrated Total (g/hr)	CO Emissions (g/min)	Overall CO Emissions (g/min)	Heating Efficiency (%HHV)	Overall Heating Efficiency (%HHV)
		Setting	BR								
1	12/6/2018	H	2.51	60	33684	0.22	0.41	0.12	0.36	72.3%	74.6%
		M	1.21	120	16871			0.25		75.0%	
		L	1.15	180	16030			0.49		75.2%	
		OA	1.40	360	19339			0.36		74.6%	

Test Run Narrative

Run 1

Run 1 was performed on 12/6/2018 as an attempted integrated test run per ASTM E2779. The overall test duration was 450 minutes, including the non-sampling transitory periods, the total sampling time was 360 minutes, in accordance with ASTM E2779. The particulate emissions rate for the integrated test run was 0.41 g/hr. The run had an overall HHV efficiency of 74.6%. The train A front filter was changed at 1 hr. All test results were appropriate and valid and the burn rate requirement for the integrated test run were achieved. There were no anomalies and all criteria were met.

Test Conditions Summary

Testing conditions for all runs fell within allowable specifications of ASTM E2779 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	65	69	19.1	12.1	30.00	6.9	19.7*	6.7	360*

*These values represent the sampling period values only, not the additional 90 minutes of transitory burn, in accordance with EPA SP2047 ATM

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	Test Run
Run 1	Air inlet damper set to full open	High Segment: Air inlet damper set to full open. Medium Segment: Air inlet damper set to 1/32” open from full closed. Low Segment: Air inlet damper set to full closed.

Appliance Description

Model(s): SP2047

Additional Models Discussion: None

Appliance Type: Pellet-Fired Room Heater

Air Introduction System: Primary Air enters from the rear of the appliance and is channeled up the side of the appliance and down through the air wash of the lower burn chamber. Air then rises up through the holes in the burn grate, as well as the secondary baffle weldment for combustion, and the gasses rise through a series of baffles to the flue outlet on the top of the appliance. Primary air is controlled via a damper arm located on the side of the stove, which moves up (open) to down (closed). This is a naturally drafting appliance, there is no exhaust blower, pulling the air through the firebox, see air flow diagram in Appendix D.

Baffles: The flue gases are routed around a series of 3 ¼" steel baffle plates at the top of the upper chamber before exiting out the flue.

Refractory Insulation: The upper burn chamber is lined with 1.0" thick vermiculate panels.

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

Catalytic Combustor: N/A

Fan: N/A

Gasketing: The glass for both the upper and lower burn chamber is sealed against the door frame with flat 3/16" thick fiberglass gasket, the door seals against the appliance with ½" rope gasket.

Appliance Dimensions

SP2047 Dimensions

Height	Width	Depth	Firebox Volume
42.4"	18.9"	24.4"	N/A – Pellet Stove

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

Appliance Front

Appliance Left

Appliance Right

Appliance Rear

Test Fuel Properties

Test fuel used was purHeat Wood Pellet Fuel, a PFI Certified Premium Pellet Brand. A sample of pellets was sent to Twin Ports Testing for analysis, see report below.

Pellet Fuel Analysis

Twin Ports Testing, Inc.
1301 North 3rd Street
Superior, WI 54880
p: 715-392-7114
p: 800-373-2562
f: 715-392-7163
www.twinportstesting.com

Analytical Test Report

Report No: USR:W218-1164-01
Issue No: 1

Client: PFS-TECO
11785 SE Hwy 212
Clackamas, OR 97015
Attention: Sebastian Button

PO No:

Signed: Katy Jahr
Katy Jahr
Chemistry Lab Supervisor
Date of Issue: 12/17/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample Log No:	W218-1164-01	Sample Date:	
Sample Designation:	purHeat 12/6/2018	Sample Time:	
Sample Recognized As:	Wood Pellets	Arrival Date:	12/10/2018

Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		7.19
Ash	ASTM D1102	wt. %	0.53	0.49
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.007	0.006
SO_2	Calculated	lb/mmbtu		0.016
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.27	16.78
Net Cal. Value at Const. Pressure	ISO 1928	J/g	18270	16782
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	19578	18171
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8418	7813
Carbon	ASTM D5373	wt. %	49.40	45.85
Hydrogen*	ASTM D5373	wt. %	6.01	5.57
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen*	ASTM D3176	wt. %	> 43.86	> 40.71
Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft^3		
Fines (Less than 1/8")	TPT CH-P-06	wt.%		
Durability Index	Kansas State	PDI		
Sample Above 1.50"	TPT CH-P-06	wt.%		
Maximum Length (Single Pellet)	TPT CH-P-06	inch		
Diameter, Range	TPT CH-P-05	inch		to
Diameter, Average	TPT CH-P-05	inch		
Stated Bag Weight	TPT CH-P-01	lbs		
Actual Bag Weight	TPT CH-P-01	lbs		

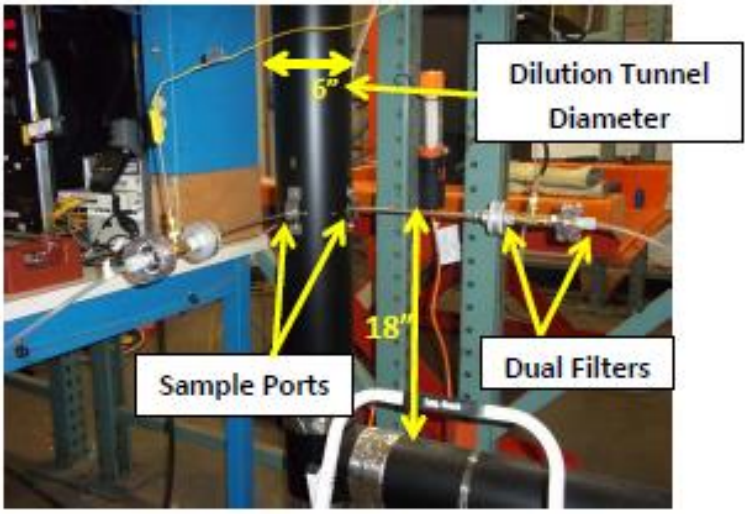
*Note: As received values do not include hydrogen and oxygen in the total moisture.

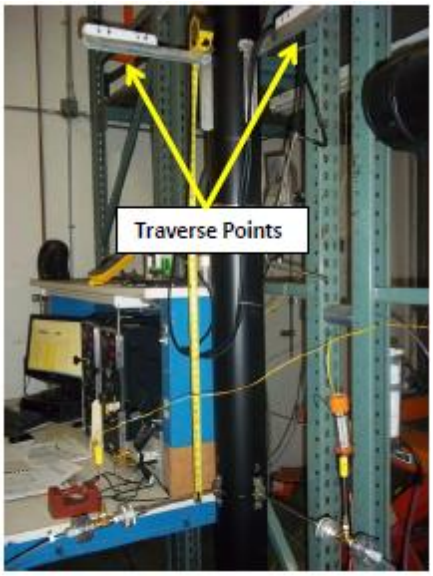
Comments

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 listed in EPA SP2047 ATM.

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 E2780-10. 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: 227 Industrial Park Road, South Pittsburg, TN 37380 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, and Sample Analysis

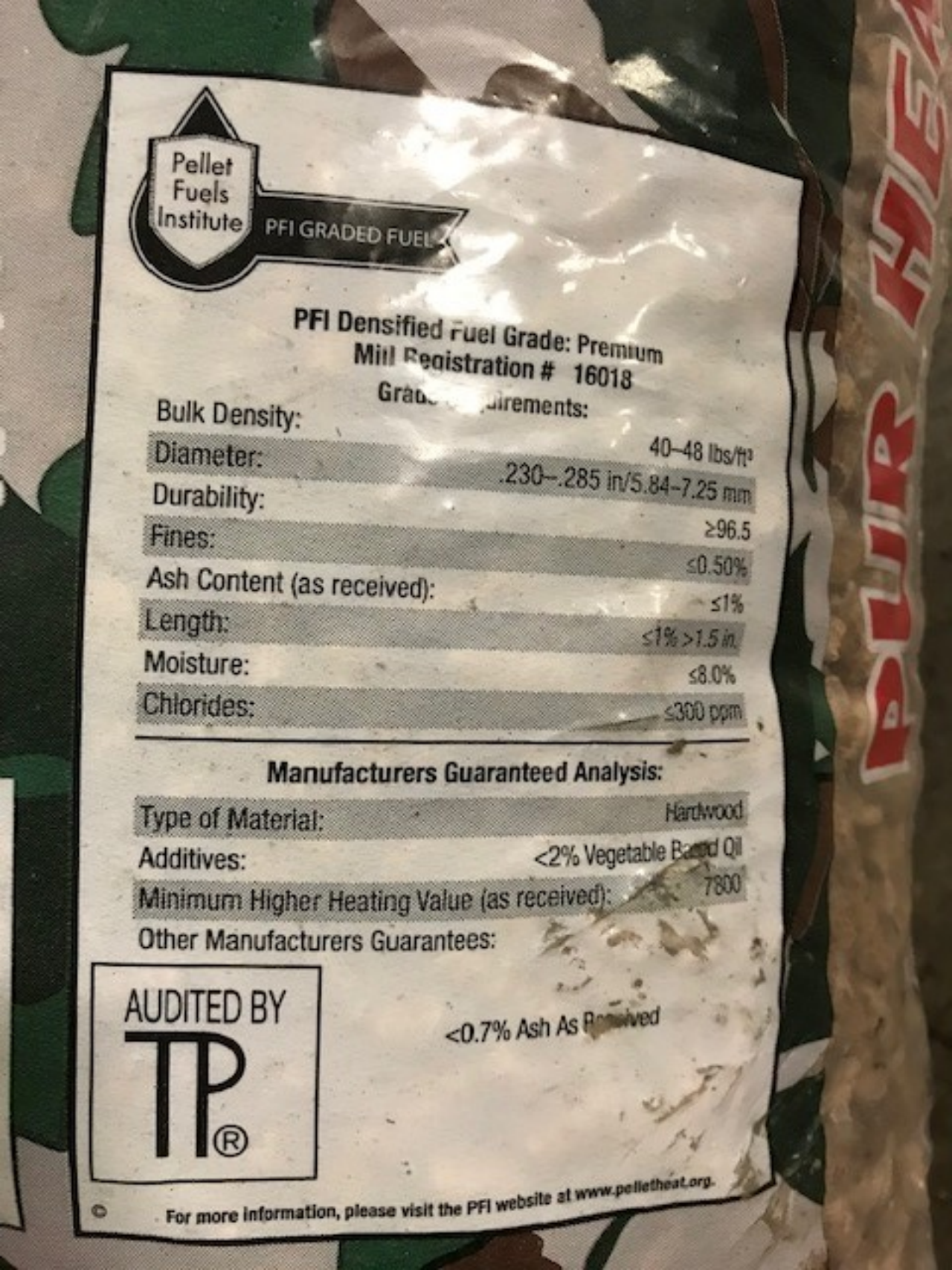
Appendix B – Labels and Manuals

Appendix C –Equipment Calibration Records

Appendix D – Design Drawings (CBI Report Only)

Appendix E – Manufacturer QAP (CBI Report Only)


purHEAT
HARDWOOD
• Premium Pellet Fuel
• Made from 100% Sawdust NO Bark
• Low Ash Content & Energy Efficient
• An Economical, Natural Fuel Source
CAUTION
This fuel is to be used in Pellet Burning Appliances ONLY.
PurHeat is not responsible for damages due to misuse.
Not for Human or Animal Consumption.
40 lb.
USA


Pellet Fuels Institute
PFI GRADED FUEL
PFI Densified Fuel Grade: Premium
Mill Registration # 16018
Grade Requirements:
Bulk Density: 40–48 lbs/ft³
Diameter: .230–.285 in/5.84–7.25 mm
Durability: ≥96.5
Fines: ≤0.50%
Ash Content (as received): ≤1%
Length: ≤1% >1.5 in.
Moisture: ≤8.0%
Chlorides: ≤300 ppm
Manufacturers Guaranteed Analysis:
Type of Material: Hardwood
Additives: <2% Vegetable Based Oil
Minimum Higher Heating Value (as received): 7800
Other Manufacturers Guarantees:
<0.7% Ash As Received
AUDITED BY TP®
© For more information, please visit the PFI website at www.pelletheat.org.

ET (min)	Meter A	V	Sample Ra	Tunnel dP	Orifice A d	Filter A Va	Pro-Rate (%	Scale Weig	Weight Ch	Tunnel Ter
0	0		0	0.05	0.01	-0.16	0	70.1	0	115
1	0.115		0	0.05	2.41	-1.34	0	70	0	116
2	0.264		0	0.05	2.37	-2.4	0	69.9	0	116
3	0.415		0	0.05	2.38	-0.07	0	69.6	0	116
4	0.562		0	0.05	2.36	-2.48	0	69.6	0	116
5	0.712		0	0.05	2.34	-2.58	0	69.5	0	117
6	0.858		0	0.05	2.34	-2.55	0	69.4	0	117
7	1.008		0	0.05	2.32	-0.76	0	69.3	0	116
8	1.154		0	0.05	2.36	-0.05	0	69.2	0	116
9	1.304		0	0.05	2.34	0	0	69.1	0	117
10	1.448		0	0.05	2.32	-2.52	0	69	0	117
11	1.598		0	0.05	2.33	-1.02	0	68.9	0	117
12	1.743		0	0.05	2.33	-2.18	0	68.8	0	116
13	1.892		0	0.05	2.31	-2.45	0	68.6	0	117
14	2.037		0	0.05	2.3	-2.59	0	68.6	0	116
15	2.186		0	0.05	2.3	-0.13	0	68.5	0	117
16	2.33		0	0.05	2.29	-0.53	0	68.4	0	117
17	2.48		0	0.05	2.3	0	0	68.3	0	117
18	2.624		0	0.05	2.28	-0.34	0	68.2	0	117
19	2.774		0	0.05	2.28	0	0	68.1	0	117
20	2.918		0	0.05	2.28	-2.41	0	68	0	117
21	3.068		0	0.05	2.28	0	0	67.9	0	117
22	3.212		0	0.05	2.29	0	0	67.7	0	117
23	3.362		0	0.05	2.29	-1.51	0	67.6	0	117
24	3.506		0	0.05	2.28	-0.25	0	67.6	0	118
25	3.656		0	0.05	2.27	-1.48	0	67.5	0	117
26	3.8		0	0.05	2.27	-0.25	0	67.4	0	117
27	3.95		0	0.05	2.26	-0.02	0	67.2	0	116
28	4.093		0	0.05	2.26	-0.24	0	67.1	0	116
29	4.244		0	0.05	2.26	-2.54	0	67	0	115
30	4.387		0	0.05	2.28	0	0	66.9	0	114
31	4.538		0	0.05	2.27	-2.52	0	66.9	0	114
32	4.682		0	0.05	2.26	-0.48	0	66.7	0	114
33	4.832		0	0.05	2.26	0	0	66.6	0	114
34	4.976		0	0.05	2.27	-1.8	0	66.6	0	115
35	5.127		0	0.05	2.26	0	0	66.5	0	115
36	5.272		0	0.05	2.25	-0.42	0	66.4	0	116
37	5.422		0	0.05	2.25	-2.54	0	66.3	0	116
38	5.567		0	0.05	2.27	0	0	66.2	0	116
39	5.717		0	0.05	2.24	-2.7	0	66.1	0	116
40	5.861		0	0.05	2.26	0	0	66	0	115
41	6.012		0	0.05	2.24	-0.17	0	65.9	0	116
42	6.157		0	0.05	2.26	-2.16	0	65.8	0	116
43	6.307		0	0.05	2.27	-2.22	0	65.7	0	115
44	6.452		0	0.05	2.27	0	0	65.5	0	115
45	6.602		0	0.05	2.25	-0.02	0	65.4	0	115

46	6.747	0	0.05	2.24	-1.49	0	65.4	0	115
47	6.897	0	0.05	2.25	-0.86	0	65.3	0	115
48	7.042	0	0.05	2.23	-2.53	0	65.2	0	116
49	7.192	0	0.05	2.25	0	0	65.1	0	116
50	7.338	0	0.05	2.25	-0.37	0	64.9	0	116
51	7.487	0	0.05	2.25	-0.98	0	65	0	115
52	7.633	0	0.05	2.26	-2.01	0	64.9	0	115
53	7.782	0	0.05	2.26	-2.11	0	64.8	0	115
54	7.928	0	0.05	2.24	-2.27	0	64.7	0	115
55	8.077	0	0.05	2.24	-0.93	0	64.6	0	115
56	8.224	0	0.05	2.25	0	0	64.4	0	114
57	8.373	0	0.05	2.24	-1.79	0	64.4	0	114
58	8.519	0	0.05	2.25	0	0	64.3	0	114
59	8.667	0	0.05	2.25	-2.4	0	64.3	0	113
60	8.816	0	0.05	2.23	-1	0	64.2	0	114
61	8.826	0	0.05	0	0	0	64.1	0	111
62	8.826	0	0.05	0.01	-0.1	0	64	0	110
63	8.826	0	0.05	0	-0.11	0	63.9	0	109
64	8.826	0	0.05	0.01	-0.1	0	63.8	0	108
65	8.826	0	0.05	0.01	-0.04	0	63.8	0	108
66	8.826	0	0.05	0.01	-0.1	0	63.7	0	107
67	8.826	0	0.05	0.01	-0.07	0	63.7	0	107
68	8.826	0	0.05	0.01	-0.14	0	63.4	0	107
69	8.826	0	0.05	0	-0.07	0	63.4	0	107
70	8.826	0	0.05	0.01	-0.03	0	63.4	0	106
71	8.826	0	0.05	0.01	-0.14	0	63.3	0	106
72	8.826	0	0.05	0	-0.1	0	63.2	0	105
73	8.826	0	0.05	0	-0.17	0	63.1	0	105
74	8.826	0	0.05	0.02	-0.06	0	63.1	0	105
75	8.826	0	0.05	0.03	-0.05	0	63	0	104
76	8.826	0	0.05	0	-0.12	0	62.9	0	104
77	8.826	0	0.05	0.02	-0.04	0	62.9	0	104
78	8.826	0	0.05	0.01	-0.06	0	62.8	0	103
79	8.826	0	0.05	0.02	-0.03	0	62.6	0	103
80	8.826	0	0.05	0.01	-0.12	0	62.6	0	103
81	8.826	0	0.05	0.01	-0.11	0	62.6	0	103
82	8.826	0	0.05	0	-0.01	0	62.6	0	102
83	8.826	0	0.05	0	-0.06	0	62.5	0	103
84	8.826	0	0.05	0.03	-0.07	0	62.4	0	103
85	8.826	0	0.05	0.01	-0.09	0	62.2	0	102
86	8.826	0	0.05	0.01	-0.03	0	62.3	0	103
87	8.826	0	0.05	0.02	-0.08	0	62.2	0	102
88	8.826	0	0.05	0	-0.02	0	62.2	0	102
89	8.826	0	0.05	0.01	-0.11	0	62.1	0	102
90	8.826	0	0.05	0.02	-0.1	0	62	0	102
91	8.826	0	0.05	0.01	-0.11	0	62	0	101
92	8.826	0	0.05	0	-0.06	0	62	0	101

93	8.826	0	0.05	0.01	-0.05	0	61.9	0	100
94	8.826	0	0.05	0.02	-0.04	0	61.9	0	100
95	8.826	0	0.05	0.01	-0.1	0	61.8	0	100
96	8.826	0	0.05	0	-0.14	0	61.7	0	100
97	8.826	0	0.05	0.01	-0.1	0	61.7	0	100
98	8.826	0	0.05	0.02	-0.17	0	61.6	0	100
99	8.826	0	0.05	0.01	-0.04	0	61.6	0	99
100	8.826	0	0.05	0.01	-0.03	0	61.5	0	99
101	8.826	0	0.05	0.02	-0.08	0	61.4	0	99
102	8.826	0	0.05	0.01	-0.05	0	61.3	0	99
103	8.826	0	0.05	0.01	-0.08	0	61.3	0	98
104	8.826	0	0.05	0.01	-0.03	0	61.3	0	98
105	8.826	0	0.05	0	-0.01	0	61.2	0	99
106	8.826	0	0.05	0.01	-0.04	0	61.2	0	98
107	8.826	0	0.05	0.01	-0.02	0	61.1	0	98
108	8.826	0	0.05	0.01	-0.03	0	61.1	0	98
109	8.826	0	0.05	0.01	-0.1	0	61	0	97
110	8.826	0	0.05	0	-0.04	0	61	0	97
111	8.826	0	0.05	0.01	0	0	60.9	0	96
112	8.826	0	0.05	0	-0.04	0	60.9	0	95
113	8.826	0	0.05	0.01	-0.05	0	60.8	0	95
114	8.826	0	0.05	0.02	0	0	60.8	0	95
115	8.826	0	0.05	0.02	-0.06	0	60.7	0	94
116	8.826	0	0.05	0	-0.04	0	60.7	0	95
117	8.826	0	0.05	0	-0.11	0	60.6	0	95
118	8.826	0	0.05	0	-0.11	0	60.6	0	95
119	8.826	0	0.05	0.01	-0.21	0	60.5	0	96
120	8.826	0	0.05	0.01	-0.02	0	60.5	0	96
121	8.953	0	0.05	2.4	0	0	60.4	0	96
122	9.101	0	0.05	2.39	-2.49	0	60.3	0	97
123	9.253	0	0.05	2.38	0	0	60.2	0	97
124	9.404	0	0.05	2.37	-0.18	0	60.1	0	97
125	9.555	0	0.05	2.37	-0.08	0	60.1	0	97
126	9.707	0	0.05	2.38	0	0	60	0	97
127	9.855	0	0.05	2.35	0	0	60	0	97
128	10.007	0	0.05	2.35	0	0	59.9	0	97
129	10.154	0	0.05	2.34	-1.15	0	59.9	0	97
130	10.306	0	0.05	2.34	0	0	59.8	0	97
131	10.452	0	0.05	2.32	-0.02	0	59.7	0	97
132	10.606	0	0.05	2.31	-0.16	0	59.7	0	97
133	10.752	0	0.05	2.31	-0.34	0	59.6	0	97
134	10.904	0	0.05	2.33	0	0	59.6	0	97
135	11.052	0	0.05	2.3	0	0	59.5	0	97
136	11.202	0	0.05	2.32	-0.23	0	59.5	0	97
137	11.349	0	0.05	2.29	-0.47	0	59.4	0	98
138	11.5	0	0.05	2.3	-2.42	0	59.3	0	97
139	11.648	0	0.05	2.32	-0.05	0	59.3	0	97

140	11.797	0	0.05	2.3	-1.67	0	59.2	0	98
141	11.948	0	0.05	2.29	0	0	59.2	0	97
142	12.096	0	0.05	2.3	-2.36	0	59.1	0	97
143	12.247	0	0.05	2.3	0	0	59.1	0	97
144	12.394	0	0.05	2.28	-2.3	0	59	0	97
145	12.546	0	0.05	2.29	0	0	59	0	97
146	12.692	0	0.05	2.3	-2.52	0	58.9	0	97
147	12.843	0	0.05	2.26	-0.44	0	58.9	0	98
148	12.989	0	0.05	2.3	-1.72	0	58.8	0	97
149	13.141	0	0.05	2.29	-2.38	0	58.8	0	97
150	13.287	0	0.05	2.29	-0.04	0	58.7	0	97
151	13.44	0	0.05	2.28	-2.5	0	58.7	0	98
152	13.586	0	0.05	2.28	0	0	58.6	0	98
153	13.738	0	0.05	2.29	-2.35	0	58.6	0	98
154	13.885	0	0.05	2.27	-1.39	0	58.5	0	98
155	14.036	0	0.05	2.29	-0.03	0	58.5	0	97
156	14.183	0	0.05	2.3	-0.22	0	58.5	0	97
157	14.333	0	0.05	2.29	-0.03	0	58.4	0	97
158	14.482	0	0.05	2.28	0	0	58.4	0	97
159	14.631	0	0.05	2.28	-0.22	0	58.3	0	97
160	14.781	0	0.05	2.28	-0.34	0	58.3	0	98
161	14.93	0	0.05	2.28	0	0	58.2	0	98
162	15.081	0	0.05	2.27	-2.28	0	58.2	0	95
163	15.229	0	0.05	2.25	-0.17	0	58.2	0	96
164	15.381	0	0.05	2.28	-0.57	0	58.1	0	97
165	15.527	0	0.05	2.29	-2.5	0	58.1	0	96
166	15.678	0	0.05	2.27	-0.09	0	58.1	0	96
167	15.825	0	0.05	2.28	-0.03	0	58	0	96
168	15.977	0	0.05	2.26	-1.29	0	58	0	96
169	16.124	0	0.05	2.28	-0.2	0	58	0	98
170	16.276	0	0.05	2.26	0	0	57.9	0	99
171	16.423	0	0.05	2.27	-2.47	0	57.9	0	99
172	16.575	0	0.05	2.25	-0.19	0	57.8	0	100
173	16.722	0	0.05	2.26	-0.98	0	57.8	0	100
174	16.872	0	0.05	2.27	-0.72	0	57.8	0	100
175	17.02	0	0.05	2.25	0	0	57.7	0	101
176	17.17	0	0.05	2.27	-0.89	0	57.7	0	101
177	17.318	0	0.05	2.26	-1.21	0	57.7	0	100
178	17.468	0	0.05	2.25	-2.13	0	57.7	0	100
179	17.618	0	0.05	2.25	-1.54	0	57.6	0	100
180	17.767	0	0.05	2.25	-1.03	0	57.6	0	100
181	17.918	0	0.05	2.26	-1.4	0	57.5	0	100
182	18.065	0	0.05	2.26	-0.6	0	57.5	0	100
183	18.216	0	0.05	2.26	-0.45	0	57.4	0	99
184	18.362	0	0.05	2.24	-0.28	0	57.3	0	100
185	18.514	0	0.05	2.27	-0.35	0	57.3	0	98
186	18.66	0	0.05	2.26	0	0	57.2	0	99

187	18.813	0	0.05	2.25	-0.89	0	57.2	0	100
188	18.96	0	0.05	2.25	-2.55	0	57.1	0	100
189	19.112	0	0.05	2.25	-0.98	0	57	0	100
190	19.259	0	0.05	2.25	-1.5	0	56.9	0	100
191	19.411	0	0.05	2.26	-1.21	0	56.9	0	99
192	19.557	0	0.05	2.25	-1.37	0	56.8	0	99
193	19.708	0	0.05	2.24	-0.21	0	56.7	0	100
194	19.856	0	0.05	2.25	0	0	56.7	0	100
195	20.005	0	0.05	2.24	-0.74	0	56.6	0	100
196	20.155	0	0.05	2.24	-2.5	0	56.5	0	100
197	20.304	0	0.05	2.24	-2.35	0	56.5	0	99
198	20.455	0	0.05	2.24	-0.78	0	56.4	0	98
199	20.603	0	0.05	2.25	0	0	56.3	0	99
200	20.755	0	0.05	2.25	0	0	56.3	0	100
201	20.901	0	0.05	2.24	-2.25	0	56.2	0	100
202	21.052	0	0.05	2.25	-1.89	0	56.1	0	100
203	21.199	0	0.05	2.25	-2.29	0	56.1	0	100
204	21.35	0	0.05	2.25	-2.52	0	56	0	100
205	21.497	0	0.05	2.24	-2.33	0	56	0	100
206	21.65	0	0.05	2.25	0	0	56	0	100
207	21.797	0	0.05	2.24	-0.98	0	55.9	0	100
208	21.948	0	0.05	2.24	-0.52	0	55.9	0	99
209	22.096	0	0.05	2.25	-2.24	0	55.9	0	98
210	22.247	0	0.05	2.24	-0.56	0	55.8	0	99
211	22.393	0	0.05	2.23	-0.89	0	55.8	0	100
212	22.544	0	0.05	2.24	-1.24	0	55.8	0	99
213	22.693	0	0.05	2.24	-2.46	0	55.7	0	100
214	22.842	0	0.05	2.25	-0.52	0	55.7	0	100
215	22.993	0	0.05	2.24	-0.28	0	55.7	0	100
216	23.141	0	0.05	2.24	-0.57	0	55.6	0	100
217	23.292	0	0.05	2.24	-1.34	0	55.6	0	100
218	23.44	0	0.05	2.26	-0.99	0	55.5	0	100
219	23.591	0	0.05	2.24	-2.52	0	55.5	0	100
220	23.737	0	0.05	2.24	-1.63	0	55.5	0	100
221	23.889	0	0.05	2.24	-0.48	0	55.4	0	100
222	24.035	0	0.05	2.24	-0.74	0	55.4	0	100
223	24.187	0	0.05	2.22	-0.47	0	55.3	0	101
224	24.334	0	0.05	2.22	-2.45	0	55.3	0	100
225	24.486	0	0.05	2.25	0	0	55.2	0	99
226	24.633	0	0.05	2.23	-0.05	0	55.2	0	100
227	24.785	0	0.05	2.22	0	0	55.2	0	99
228	24.932	0	0.05	2.23	0	0	55.1	0	100
229	25.082	0	0.05	2.23	-2.25	0	55.1	0	100
230	25.23	0	0.05	2.23	-2.04	0	55.1	0	101
231	25.38	0	0.05	2.23	-0.23	0	55	0	100
232	25.528	0	0.05	2.23	-2.45	0	55	0	100
233	25.678	0	0.05	2.22	-2.45	0	55	0	100

234	25.829	0	0.05	2.21	-2.19	0	54.9	0	101
235	25.976	0	0.05	2.22	-2.11	0	54.9	0	101
236	26.127	0	0.05	2.21	-0.01	0	54.8	0	100
237	26.275	0	0.05	2.23	-0.24	0	54.8	0	100
238	26.425	0	0.05	2.22	-1.73	0	54.7	0	100
239	26.571	0	0.05	2.2	-2.22	0	54.7	0	98
240	26.724	0	0.05	2.21	-0.5	0	54.7	0	99
241	26.733	0	0.05	0.01	-0.08	0	54.7	0	98
242	26.733	0	0.05	0.01	-0.1	0	54.6	0	99
243	26.733	0	0.05	0.02	-0.13	0	54.5	0	99
244	26.733	0	0.05	0.01	-0.07	0	54.5	0	100
245	26.733	0	0.05	0	-0.18	0	54.3	0	100
246	26.733	0	0.05	0	-0.14	0	54.3	0	100
247	26.733	0	0.05	0.01	-0.1	0	54.3	0	100
248	26.733	0	0.05	0.03	-0.09	0	54.3	0	99
249	26.733	0	0.05	0.02	-0.1	0	54.1	0	99
250	26.733	0	0.05	0.02	-0.11	0	54.1	0	99
251	26.733	0	0.05	0.01	-0.13	0	54.1	0	99
252	26.733	0	0.05	0	-0.22	0	54.1	0	99
253	26.733	0	0.05	0.01	-0.07	0	54.1	0	98
254	26.733	0	0.05	0.04	-0.06	0	54	0	98
255	26.733	0	0.05	0.01	-0.18	0	54	0	98
256	26.733	0	0.05	0.02	-0.13	0	53.9	0	98
257	26.733	0	0.05	0.01	-0.04	0	53.9	0	98
258	26.733	0	0.05	0.03	-0.1	0	53.8	0	97
259	26.733	0	0.05	0.02	-0.03	0	53.6	0	96
260	26.733	0	0.05	0.02	-0.14	0	53.7	0	97
261	26.733	0	0.05	0.03	-0.1	0	53.7	0	97
262	26.733	0	0.05	0.02	-0.04	0	53.6	0	97
263	26.733	0	0.05	0.02	-0.1	0	53.6	0	97
264	26.733	0	0.05	0.02	-0.12	0	53.5	0	98
265	26.733	0	0.05	0.02	-0.19	0	53.5	0	98
266	26.733	0	0.05	0.02	-0.09	0	53.3	0	97
267	26.733	0	0.05	0	-0.16	0	53.4	0	97
268	26.733	0	0.05	0	-0.08	0	53.3	0	97
269	26.733	0	0.05	0.02	-0.12	0	53.3	0	97
270	26.733	0	0.05	0.02	0	0	53.1	0	97
271	26.868	0	0.05	2.3	-1.33	0	53.1	0	96
272	27.021	0	0.05	2.31	-1.88	0	53	0	97
273	27.169	0	0.05	2.29	-2.62	0	52.9	0	97
274	27.322	0	0.05	2.29	-1.15	0	52.9	0	97
275	27.47	0	0.05	2.29	-1.87	0	52.8	0	97
276	27.622	0	0.05	2.26	0	0	52.8	0	97
277	27.769	0	0.05	2.27	-2.55	0	52.8	0	97
278	27.919	0	0.05	2.27	-1.76	0	52.8	0	97
279	28.067	0	0.05	2.28	-2.58	0	52.7	0	97
280	28.217	0	0.05	2.26	-1.08	0	52.7	0	97

281	28.365	0	0.05	2.24	-1.04	0	52.6	0	97
282	28.514	0	0.05	2.23	-0.14	0	52.5	0	97
283	28.664	0	0.05	2.22	-2.26	0	52.5	0	97
284	28.812	0	0.05	2.23	-1.09	0	52.5	0	97
285	28.962	0	0.05	2.22	-2.51	0	52.4	0	97
286	29.109	0	0.05	2.23	0	0	52.4	0	98
287	29.26	0	0.05	2.24	-2.69	0	52.3	0	97
288	29.405	0	0.05	2.22	-0.45	0	52.3	0	97
289	29.556	0	0.05	2.23	-2.52	0	52.2	0	97
290	29.701	0	0.05	2.22	-2.41	0	52.2	0	97
291	29.852	0	0.05	2.21	-2.48	0	52.1	0	96
292	29.997	0	0.05	2.22	-2.43	0	52	0	96
293	30.148	0	0.05	2.21	-0.59	0	52	0	96
294	30.293	0	0.05	2.22	-1.34	0	52	0	97
295	30.444	0	0.05	2.21	-0.52	0	51.9	0	97
296	30.59	0	0.05	2.21	0	0	52	0	97
297	30.741	0	0.05	2.22	-2.56	0	51.8	0	97
298	30.887	0	0.05	2.2	-0.74	0	51.8	0	97
299	31.038	0	0.05	2.21	-1.79	0	51.7	0	97
300	31.183	0	0.05	2.21	-1.38	0	51.8	0	97
301	31.334	0	0.05	2.2	-0.72	0	51.5	0	97
302	31.48	0	0.05	2.19	-2.29	0	51.6	0	97
303	31.63	0	0.05	2.21	-2.51	0	51.6	0	97
304	31.776	0	0.05	2.21	-1.46	0	51.5	0	97
305	31.925	0	0.05	2.21	0	0	51.5	0	97
306	32.071	0	0.05	2.22	-2.58	0	51.4	0	97
307	32.221	0	0.05	2.17	-0.49	0	51.4	0	97
308	32.368	0	0.05	2.19	-1.34	0	51.3	0	96
309	32.517	0	0.05	2.21	0	0	51.3	0	97
310	32.664	0	0.05	2.19	-2.16	0	51.2	0	97
311	32.812	0	0.05	2.18	-2.68	0	51.2	0	96
312	32.96	0	0.05	2.17	-2.49	0	51.1	0	96
313	33.108	0	0.05	2.2	-1.32	0	51.1	0	96
314	33.257	0	0.05	2.17	-1.63	0	51	0	96
315	33.404	0	0.05	2.18	0	0	51	0	97
316	33.553	0	0.05	2.18	-0.05	0	50.9	0	97
317	33.699	0	0.05	2.19	-2.65	0	50.9	0	97
318	33.849	0	0.05	2.18	-0.39	0	50.8	0	97
319	33.995	0	0.05	2.18	0	0	50.8	0	97
320	34.145	0	0.05	2.17	-0.64	0	50.7	0	97
321	34.291	0	0.05	2.19	-1.96	0	50.7	0	97
322	34.441	0	0.05	2.19	-0.94	0	50.6	0	97
323	34.586	0	0.05	2.17	0	0	50.5	0	97
324	34.736	0	0.05	2.19	-2.61	0	50.4	0	97
325	34.881	0	0.05	2.18	-1.92	0	50.5	0	97
326	35.031	0	0.05	2.18	-2.12	0	50.4	0	97
327	35.176	0	0.05	2.19	0	0	50.4	0	97

328	35.327	0	0.05	2.18	-0.67	0	50.4	0	97
329	35.471	0	0.05	2.17	-2.62	0	50.3	0	97
330	35.622	0	0.05	2.18	0	0	50.2	0	97
331	35.766	0	0.05	2.17	0	0	50.2	0	97
332	35.917	0	0.05	2.17	-0.52	0	50.2	0	96
333	36.062	0	0.05	2.16	-0.5	0	50.1	0	96
334	36.213	0	0.05	2.18	0	0	50.1	0	96
335	36.358	0	0.05	2.16	-2.5	0	50	0	96
336	36.508	0	0.05	2.18	0	0	50	0	96
337	36.653	0	0.05	2.15	-0.23	0	49.9	0	96
338	36.804	0	0.05	2.17	0	0	50	0	96
339	36.949	0	0.05	2.17	-0.52	0	49.8	0	96
340	37.099	0	0.05	2.17	-2.68	0	49.8	0	96
341	37.244	0	0.05	2.18	-2.25	0	49.9	0	96
342	37.394	0	0.05	2.16	-1.21	0	49.7	0	96
343	37.539	0	0.05	2.14	-0.49	0	49.6	0	96
344	37.689	0	0.05	2.17	-0.41	0	49.6	0	95
345	37.834	0	0.05	2.16	-2.65	0	49.6	0	96
346	37.983	0	0.05	2.18	-0.97	0	49.5	0	96
347	38.129	0	0.05	2.17	-1.36	0	49.5	0	96
348	38.278	0	0.05	2.18	-2.6	0	49.4	0	96
349	38.423	0	0.05	2.18	-0.06	0	49.4	0	95
350	38.572	0	0.05	2.17	-0.03	0	49.3	0	94
351	38.717	0	0.05	2.17	-2.49	0	49.3	0	95
352	38.866	0	0.05	2.15	-0.12	0	49.2	0	95
353	39.013	0	0.05	2.17	-1.47	0	49.1	0	96
354	39.161	0	0.05	2.17	-2.51	0	49.2	0	96
355	39.308	0	0.05	2.16	-2.49	0	49.1	0	96
356	39.455	0	0.05	2.18	-2.59	0	49	0	96
357	39.602	0	0.05	2.15	-0.33	0	49	0	96
358	39.75	0	0.05	2.15	-2.63	0	48.9	0	96
359	39.896	0	0.05	2.17	-2.67	0	48.9	0	96
360	40.044	0	0.05	2.17	-2.52	0	48.9	0	96
361	40.191	0	0.05	2.16	-0.18	0	48.7	0	96
362	40.339	0	0.05	2.15	-2.4	0	48.8	0	96
363	40.486	0	0.05	2.16	-0.65	0	48.7	0	96
364	40.633	0	0.05	2.14	-0.12	0	48.7	0	96
365	40.781	0	0.05	2.16	-0.93	0	48.6	0	96
366	40.928	0	0.05	2.16	-1.4	0	48.6	0	96
367	41.076	0	0.05	2.15	-2.73	0	48.6	0	96
368	41.222	0	0.05	2.15	-0.54	0	48.5	0	96
369	41.37	0	0.05	2.13	-2.65	0	48.5	0	96
370	41.517	0	0.05	2.15	-0.06	0	48.4	0	96
371	41.665	0	0.05	2.16	-2.58	0	48.4	0	96
372	41.811	0	0.05	2.16	-2.64	0	48.3	0	97
373	41.959	0	0.05	2.14	-0.41	0	48.3	0	96
374	42.105	0	0.05	2.15	-1.42	0	48.2	0	96

375	42.254	0	0.05	2.15	-2.65	0	48.2	0	96
376	42.399	0	0.05	2.14	-1.6	0	48.1	0	95
377	42.548	0	0.05	2.14	-0.86	0	48.1	0	95
378	42.694	0	0.05	2.14	-0.17	0	48	0	96
379	42.843	0	0.05	2.14	-0.14	0	48	0	96
380	42.988	0	0.05	2.15	-0.02	0	48	0	96
381	43.137	0	0.05	2.13	-2.28	0	47.9	0	96
382	43.282	0	0.05	2.15	-1.8	0	47.9	0	96
383	43.431	0	0.05	2.17	-0.19	0	48	0	95
384	43.576	0	0.05	2.16	-0.05	0	47.8	0	96
385	43.725	0	0.05	2.13	-2.39	0	47.8	0	96
386	43.87	0	0.05	2.15	-0.06	0	47.7	0	95
387	44.019	0	0.05	2.16	-1.36	0	47.7	0	96
388	44.163	0	0.05	2.15	-0.13	0	47.6	0	96
389	44.313	0	0.05	2.13	-2.47	0	47.6	0	95
390	44.457	0	0.05	2.14	-1.62	0	47.4	0	95
391	44.606	0	0.05	2.15	0	0	47.5	0	95
392	44.75	0	0.05	2.16	-2.65	0	47.5	0	95
393	44.9	0	0.05	2.15	-0.32	0	47.4	0	95
394	45.044	0	0.05	2.15	-0.22	0	47.4	0	95
395	45.193	0	0.05	2.15	-0.99	0	47.4	0	94
396	45.337	0	0.05	2.14	-2.63	0	47.3	0	94
397	45.486	0	0.05	2.15	-2.65	0	47.2	0	94
398	45.63	0	0.05	2.14	0	0	47.3	0	95
399	45.78	0	0.05	2.13	-1.53	0	47.1	0	95
400	45.924	0	0.05	2.14	-1.57	0	47.1	0	96
401	46.073	0	0.05	2.16	-2.69	0	47.1	0	95
402	46.217	0	0.05	2.16	-2.29	0	47	0	95
403	46.366	0	0.05	2.13	-2.67	0	46.9	0	95
404	46.51	0	0.05	2.13	-0.09	0	46.9	0	95
405	46.659	0	0.05	2.15	-0.14	0	46.9	0	95
406	46.803	0	0.05	2.14	-2.51	0	46.8	0	95
407	46.952	0	0.05	2.15	-2.7	0	46.8	0	95
408	47.096	0	0.05	2.14	-0.52	0	46.8	0	95
409	47.245	0	0.05	2.15	-0.1	0	46.7	0	95
410	47.39	0	0.05	2.15	-1.44	0	46.7	0	95
411	47.539	0	0.05	2.14	-1.27	0	46.6	0	95
412	47.683	0	0.05	2.13	-2.59	0	46.6	0	95
413	47.832	0	0.05	2.14	-0.09	0	46.6	0	95
414	47.976	0	0.05	2.13	-2.51	0	46.5	0	94
415	48.125	0	0.05	2.11	-1.97	0	46.5	0	94
416	48.269	0	0.05	2.13	-0.53	0	46.4	0	93
417	48.418	0	0.05	2.12	-2.51	0	46.4	0	94
418	48.562	0	0.05	2.13	-2.72	0	46.2	0	94
419	48.711	0	0.05	2.14	-2.52	0	46.2	0	95
420	48.855	0	0.05	2.12	-0.72	0	46.3	0	94
421	49.004	0	0.05	2.13	-2.19	0	46.2	0	94

422	49.148	0	0.05	2.13	-0.52	0	46.2	0	93
423	49.297	0	0.05	2.13	-0.29	0	46.2	0	93
424	49.441	0	0.05	2.12	-0.25	0	46.1	0	93
425	49.59	0	0.05	2.14	-1.73	0	46.1	0	93
426	49.733	0	0.05	2.12	-0.3	0	46	0	93
427	49.882	0	0.05	2.1	-1.67	0	45.9	0	93
428	50.026	0	0.05	2.13	-0.07	0	45.9	0	94
429	50.175	0	0.05	2.12	-2.17	0	45.9	0	94
430	50.319	0	0.05	2.13	-0.69	0	45.9	0	94
431	50.467	0	0.05	2.13	-1.32	0	45.7	0	94
432	50.612	0	0.05	2.12	-1.62	0	45.8	0	94
433	50.76	0	0.05	2.1	-0.08	0	45.7	0	94
434	50.904	0	0.05	2.1	-0.54	0	45.7	0	94
435	51.052	0	0.05	2.12	-0.06	0	45.7	0	94
436	51.196	0	0.05	2.11	-0.16	0	45.6	0	94
437	51.344	0	0.05	2.11	-0.62	0	45.6	0	94
438	51.488	0	0.05	2.12	-0.84	0	45.5	0	94
439	51.636	0	0.05	2.11	-0.14	0	45.5	0	93
440	51.78	0	0.05	2.12	-2.52	0	45.4	0	93
441	51.927	0	0.05	2.12	-2.76	0	45.4	0	93
442	52.072	0	0.05	2.11	-2.71	0	45.4	0	93
443	52.219	0	0.05	2.11	-2.44	0	45.3	0	94
444	52.364	0	0.05	2.12	-0.08	0	45.3	0	94
445	52.51	0	0.05	2.11	-1.75	0	45.2	0	95
446	52.655	0	0.05	2.12	-1.91	0	45.2	0	94
447	52.802	0	0.05	2.11	-1.79	0	45.2	0	94
448	52.946	0	0.05	2.1	-1.01	0	45.1	0	94
449	53.092	0	0.05	2.1	-2.68	0	45.1	0	94
450	53.238	0	0.05	2.11	-0.58	0	45	0	94

Flue Temp	Filter A Ter	FB Rear (F)	Catalyst Te	Meter A Te	Ambient T	O2 (%)	CO2 (%)	CO (%)	Meter B V
635	84	4147	4146.54	67	65	9.62	11.55	0.05	0
633	82	4147	4146.59	67	66	9.28	11.95	0.02	0.13
638	82	4147	4146.64	67	66	8.73	12.33	0.05	0.277
646	84	4147	4146.7	67	66	8.49	12.24	0.06	0.425
642	86	4147	4146.74	67	66	8.12	12.74	0.12	0.571
645	86	4147	4146.77	67	66	8.68	12.45	0.08	0.719
643	83	4147	4146.79	67	66	7.89	12.96	0.01	0.865
639	83	4147	4146.83	67	66	8.19	12.49	0.02	1.013
643	84	4147	4146.87	67	66	9.09	11.81	0	1.159
647	85	4147	4146.9	67	67	8.83	12.13	0.04	1.307
644	85	4147	4146.95	67	67	8.23	12.72	0.06	1.452
639	83	4147	4146.99	68	66	8.38	12.68	0.05	1.6
642	83	4147	4147.02	68	66	8.96	12.07	0.02	1.746
645	84	4147	4147.1	68	67	7.88	13.08	0.04	1.893
637	86	4147	4147.14	69	66	8.42	12.59	0.05	2.039
640	85	4147	4147.22	68	67	9.3	11.96	0	2.187
637	83	4147	4147.29	68	67	8.69	12.08	0.02	2.332
638	82	4147	4147.38	68	67	8.83	11.89	0.05	2.48
633	83	4147	4147.43	68	67	8.73	12.08	0.05	2.626
628	85	4147	4147.49	68	67	9.19	11.78	0.03	2.773
634	86	4148	4147.56	70	67	9.99	11.13	0.01	2.919
639	84	4148	4147.62	69	67	8.39	12.45	0.07	3.066
636	83	4148	4147.72	68	67	8.28	12.74	0.05	3.212
636	84	4148	4147.77	69	67	8.87	12.1	0.05	3.36
636	85	4148	4147.84	68	67	8.76	12.27	0.02	3.505
631	85	4148	4147.86	69	67	8.7	12.28	0.03	3.653
625	83	4148	4147.91	69	67	9.54	11.43	0.02	3.799
626	83	4148	4147.93	70	65	9.64	11.45	0.02	3.947
629	84	4148	4147.94	69	64	8.86	12.22	0.04	4.093
630	86	4148	4147.84	69	63	9.05	11.86	0.02	4.241
629	84	4148	4147.75	69	62	8.94	11.91	0.06	4.387
625	83	4148	4147.63	69	63	9.48	11.53	0.04	4.535
622	83	4148	4147.54	69	64	9.82	11.23	0.01	4.681
621	84	4147	4147.43	69	65	9.91	11.45	0.01	4.83
622	86	4147	4147.4	70	65	10.15	11.08	0	4.976
624	85	4147	4147.43	69	66	9.3	11.71	0.02	5.124
620	83	4147	4147.42	69	66	9.39	11.75	0.03	5.269
617	83	4147	4147.45	69	66	9.34	11.75	0.03	5.418
618	85	4147	4147.45	70	66	9.98	11.18	0.03	5.563
610	86	4148	4147.51	70	66	9.53	11.67	0.02	5.712
609	85	4148	4147.53	69	67	10.1	11.03	0.02	5.858
613	83	4148	4147.57	69	67	10.04	11.17	0.02	6.007
612	83	4148	4147.64	69	67	9.77	11.36	0.02	6.152
610	85	4148	4147.67	70	67	9.66	11.34	0.03	6.302
605	86	4148	4147.7	69	66	10.32	10.92	0	6.447
605	85	4148	4147.78	70	67	10.58	10.52	0.03	6.597

605	83	4148	4147.85	70	67	10.27	10.86	0	6.742
601	84	4148	4147.84	71	67	10.18	11.01	0.03	6.891
601	86	4148	4147.9	70	67	10.18	10.84	0.01	7.036
600	86	4148	4147.99	70	67	10.45	10.8	0.04	7.186
597	84	4148	4148.04	70	67	10.18	10.93	0.02	7.331
592	83	4148	4148.13	70	67	10.27	10.75	0	7.482
591	84	4148	4148.19	70	67	10.91	10.25	0.04	7.627
593	86	4148	4148.24	70	67	10.41	10.68	0.01	7.778
592	86	4148	4148.29	70	67	10.17	10.89	0.05	7.923
586	84	4148	4148.34	70	68	10.92	10.3	0.01	8.073
585	83	4148	4148.4	71	67	11.23	10	0	8.218
583	84	4148	4148.48	71	67	11	10.14	0.02	8.369
582	86	4149	4148.56	71	67	10.83	10.28	0	8.514
580	86	4149	4148.63	71	67	10.44	10.59	0	8.664
583	84	4149	4148.7	71	67	10.43	10.54	0	8.81
554	81	4149	4148.74	71	67	10.73	10.48	0.02	8.817
548	82	4149	4148.8	71	68	10.09	10.91	0.28	8.817
545	84	4149	4148.84	71	67	9.87	11.15	0.27	8.817
534	86	4149	4148.93	71	67	10.17	10.86	0.21	8.817
533	85	4149	4148.98	71	68	10.67	10.29	0.2	8.817
532	83	4149	4149.05	71	68	10.61	10.43	0.17	8.817
525	82	4149	4149.11	71	68	10.64	10.5	0.22	8.817
526	83	4149	4149.21	71	68	10.91	9.96	0.22	8.817
519	85	4149	4149.25	71	67	10.62	10.25	0.19	8.817
514	86	4149	4149.28	71	67	11.08	10.09	0.14	8.817
512	84	4149	4149.37	71	67	11.24	9.66	0.18	8.817
510	83	4149	4149.47	71	68	11.25	9.86	0.15	8.817
505	83	4150	4149.52	71	67	11.06	9.86	0.14	8.817
502	84	4150	4149.57	71	68	11.4	9.59	0.21	8.817
499	86	4150	4149.62	71	67	11.19	9.76	0.13	8.817
495	84	4150	4149.7	71	68	11.58	9.41	0.08	8.817
493	82	4150	4149.76	71	68	11.49	9.4	0.11	8.817
488	82	4150	4149.83	71	67	11.95	9.2	0.12	8.817
487	84	4150	4149.88	71	68	12.05	9.09	0.1	8.817
483	86	4150	4149.95	71	67	11.89	9.1	0.15	8.817
479	86	4150	4150	71	67	11.89	9.12	0.07	8.817
478	83	4150	4150.07	71	67	11.92	9.1	0.09	8.817
475	82	4150	4150.11	71	67	12.04	9.01	0.1	8.817
474	83	4150	4150.17	71	67	12.21	8.79	0.11	8.817
475	84	4150	4150.27	72	67	11.71	9.21	0.09	8.817
471	86	4150	4150.32	71	67	11.6	9.36	0.08	8.817
471	84	4150	4150.37	71	67	11.8	9.13	0.11	8.817
471	82	4150	4150.46	71	67	11.53	9.32	0.1	8.817
467	83	4150	4150.5	71	67	12.01	9.02	0.11	8.817
462	84	4151	4150.58	71	67	12.17	8.83	0.11	8.817
458	86	4151	4150.6	71	67	12.22	8.64	0.07	8.817
455	85	4151	4150.67	72	67	12.57	8.42	0.06	8.817

453	83	4151	4150.72	72	67	12.61	8.4	0.1	8.817
452	82	4151	4150.8	72	67	12.51	8.46	0.09	8.817
448	83	4151	4150.81	72	67	12.71	8.14	0.1	8.817
445	85	4151	4150.91	72	67	12.69	8.19	0.11	8.817
445	86	4151	4150.98	72	67	12.83	8.21	0.13	8.817
443	84	4151	4151.02	71	67	12.67	8.19	0.13	8.817
443	82	4151	4151.04	72	67	12.48	8.35	0.12	8.817
445	83	4151	4151.11	72	67	12.61	8.37	0.12	8.817
443	84	4151	4151.19	72	67	12.48	8.39	0.12	8.817
441	86	4151	4151.22	71	67	12.73	8.27	0.14	8.817
440	85	4151	4151.25	71	67	12.67	8.27	0.08	8.817
441	83	4151	4151.34	72	67	12.47	8.47	0.09	8.817
438	82	4151	4151.37	71	67	12.25	8.63	0.07	8.817
439	83	4151	4151.43	71	67	12.46	8.51	0.09	8.817
438	85	4151	4151.46	72	66	12.21	8.68	0.13	8.817
438	87	4151	4151.49	72	65	12.4	8.45	0.13	8.817
439	84	4151	4151.46	71	65	12.51	8.36	0.13	8.817
432	83	4151	4151.41	72	64	12.32	8.58	0.1	8.817
432	83	4151	4151.33	71	64	12.82	8.22	0.07	8.817
432	85	4151	4151.26	72	64	12.92	8.14	0.1	8.817
428	87	4151	4151.16	71	63	12.86	8.03	0.09	8.817
428	86	4151	4151.05	71	63	12.92	8.05	0.08	8.817
428	83	4151	4150.94	71	64	12.8	8.11	0.13	8.817
426	83	4151	4150.82	71	64	12.96	8.09	0.14	8.817
424	84	4151	4150.69	71	64	13.04	8.22	0.07	8.817
425	85	4151	4150.65	71	65	12.94	7.93	0.12	8.817
427	87	4151	4150.58	71	66	13.39	7.7	0.12	8.817
425	84	4151	4150.58	71	66	13.02	8.1	0.08	8.817
430	83	4151	4150.59	72	66	12.91	8.15	0.09	8.955
429	83	4151	4150.57	71	65	12.73	8.36	0.11	9.101
429	84	4151	4150.6	71	66	12.76	8.31	0.07	9.253
428	86	4151	4150.65	71	66	12.79	8.13	0.07	9.399
429	87	4151	4150.66	70	66	12.76	8.11	0.1	9.549
429	84	4151	4150.67	71	66	12.76	8.17	0.09	9.695
428	83	4151	4150.75	72	66	12.56	8.27	0.12	9.845
428	83	4151	4150.74	71	66	12.62	8.18	0.09	9.992
426	84	4151	4150.77	72	66	12.62	8.28	0.07	10.141
426	86	4151	4150.82	71	66	12.48	8.29	0.08	10.288
426	85	4151	4150.85	71	67	12.66	8.2	0.05	10.437
424	83	4151	4150.89	72	66	12.75	8.16	0.08	10.584
427	82	4151	4150.91	70	66	12.73	8.13	0.08	10.733
427	83	4151	4150.94	71	67	12.94	8.22	0.09	10.881
430	85	4151	4150.99	71	66	12.89	8.25	0.11	11.029
428	86	4151	4151.01	71	66	12.58	8.35	0.07	11.177
429	84	4151	4151.07	71	67	12.62	8.32	0.09	11.324
432	83	4151	4151.1	71	67	12.57	8.33	0.08	11.472
432	83	4151	4151.15	71	67	12.25	8.62	0.08	11.619

431	84	4151	4151.19	71	67	12.49	8.47	0.09	11.768
428	86	4151	4151.21	71	67	12.46	8.42	0.07	11.914
429	85	4151	4151.26	71	67	12.83	8.12	0.1	12.063
424	83	4151	4151.31	71	66	12.64	8.12	0.09	12.21
428	82	4151	4151.38	71	67	12.88	7.94	0.12	12.359
427	83	4151	4151.42	73	67	12.9	8.03	0.11	12.504
423	85	4151	4151.46	72	66	12.81	8.04	0.08	12.653
425	87	4152	4151.52	72	67	12.92	7.97	0.09	12.799
426	85	4152	4151.55	72	67	12.78	8.08	0.09	12.948
428	83	4152	4151.61	72	67	12.48	8.34	0.09	13.093
426	82	4152	4151.64	72	67	12.64	8.28	0.08	13.243
428	84	4152	4151.67	72	67	12.87	8.09	0.12	13.388
427	85	4152	4151.73	72	67	12.62	8.27	0.07	13.538
428	86	4152	4151.77	72	67	12.77	8.13	0.08	13.683
427	83	4152	4151.83	72	67	12.53	8.25	0.08	13.833
428	82	4152	4151.87	72	67	12.58	8.25	0.07	13.978
425	83	4152	4151.89	72	67	12.72	8.1	0.11	14.128
424	85	4152	4151.95	72	67	12.69	8.18	0.08	14.274
425	86	4152	4152	73	67	13.01	8	0.11	14.425
423	84	4152	4152.03	72	67	12.85	8.04	0.11	14.57
423	82	4152	4152.08	73	67	12.96	7.89	0.11	14.72
426	82	4152	4152.11	73	67	12.62	8.18	0.15	14.865
424	84	4152	4152.15	73	67	12.71	8.31	0.1	15.015
425	86	4152	4152.19	73	68	12.8	8.15	0.1	15.161
428	85	4152	4152.29	72	68	12.56	8.43	0.09	15.311
426	83	4152	4152.25	73	66	12.48	8.53	0.13	15.456
429	83	4152	4152.26	74	66	12.27	8.58	0.11	15.607
428	84	4152	4152.24	73	67	12.15	8.77	0.08	15.752
429	86	4152	4152.23	72	67	12.47	8.61	0.08	15.902
430	87	4152	4152.22	74	68	12.29	8.56	0.11	16.048
432	85	4152	4152.24	74	67	12.07	8.8	0.15	16.197
432	83	4152	4152.29	73	68	11.89	8.85	0.17	16.342
435	84	4152	4152.32	74	68	12.07	8.81	0.16	16.492
438	85	4152	4152.4	73	68	12.01	8.91	0.11	16.638
434	88	4152	4152.48	73	67	12.31	8.54	0.14	16.788
436	86	4152	4152.49	73	67	12.32	8.56	0.09	16.934
437	84	4153	4152.52	74	67	12.15	8.75	0.09	17.083
436	83	4153	4152.57	73	67	11.92	8.9	0.13	17.229
437	84	4153	4152.59	74	67	12.18	8.79	0.11	17.378
433	86	4153	4152.61	73	67	12.3	8.59	0.1	17.526
432	87	4153	4152.7	74	67	12.97	8.08	0.11	17.674
433	85	4153	4152.66	74	68	12.5	8.41	0.13	17.822
432	83	4153	4152.75	75	68	12.27	8.65	0.12	17.97
431	83	4153	4152.79	74	68	12.46	8.49	0.07	18.118
431	84	4153	4152.82	75	67	12.55	8.39	0.11	18.266
429	86	4153	4152.84	74	68	12.45	8.45	0.05	18.415
429	85	4153	4152.87	74	68	12.57	8.2	0.08	18.562

426	83	4153	4152.96	74	68	12.72	8.16	0.09	18.711
422	83	4153	4153.02	74	68	12.77	8.15	0.09	18.857
424	85	4153	4153.07	75	68	12.98	7.94	0.12	19.006
428	87	4153	4153.12	74	68	13.02	7.88	0.07	19.153
427	86	4153	4153.21	75	68	13.2	7.88	0.07	19.302
427	83	4153	4153.24	75	68	13.07	7.8	0.09	19.449
430	83	4153	4153.28	75	68	12.98	8.03	0.08	19.599
432	84	4153	4153.32	75	68	12.56	8.3	0.06	19.744
432	86	4153	4153.36	74	68	12.79	8.04	0.07	19.894
428	87	4153	4153.39	74	68	12.87	7.97	0.07	20.04
426	84	4153	4153.45	74	68	12.82	8.07	0.04	20.191
426	83	4153	4153.44	74	69	12.73	8.07	0.04	20.337
423	83	4153	4153.5	75	68	12.94	7.86	0.05	20.488
422	85	4154	4153.53	75	68	12.91	7.84	0.09	20.633
424	87	4154	4153.59	74	68	12.89	7.84	0.07	20.784
424	85	4154	4153.67	74	68	12.98	7.88	0.15	20.929
424	83	4154	4153.7	75	68	12.91	7.85	0.08	21.08
422	82	4154	4153.73	75	68	13.25	7.7	0.08	21.226
422	84	4154	4153.82	75	68	12.97	7.8	0.07	21.376
422	86	4154	4153.84	74	68	13	7.65	0.09	21.522
422	86	4154	4153.89	75	68	12.8	7.98	0.04	21.672
422	84	4154	4153.93	75	68	12.68	8.08	0.06	21.818
422	83	4154	4153.98	75	68	12.88	7.87	0.07	21.968
420	83	4154	4154.01	75	69	12.99	7.91	0.07	22.115
422	85	4154	4154.09	75	69	13.39	7.46	0.11	22.264
421	87	4154	4154.14	75	69	12.69	8.17	0.06	22.411
422	86	4154	4154.21	75	69	12.99	7.82	0.11	22.561
420	84	4154	4154.27	75	69	12.8	8.02	0.09	22.709
422	83	4154	4154.31	75	68	13.02	7.86	0.11	22.857
423	84	4154	4154.37	75	68	12.78	7.97	0.08	23.006
423	85	4154	4154.43	75	69	12.88	7.94	0.05	23.154
422	87	4154	4154.48	75	69	12.89	7.88	0.1	23.303
423	85	4154	4154.49	75	69	12.88	7.95	0.05	23.451
423	83	4155	4154.56	75	69	12.47	8.29	0.08	23.6
424	83	4155	4154.57	75	68	12.82	8.09	0.09	23.746
424	84	4155	4154.63	76	69	12.61	8.23	0.08	23.896
426	87	4155	4154.67	76	69	12.53	8.29	0.06	24.042
425	86	4155	4154.71	75	69	12.64	8.17	0.05	24.193
427	84	4155	4154.72	75	69	12.66	8.1	0.09	24.339
425	83	4155	4154.74	75	69	12.36	8.34	0.07	24.489
426	84	4155	4154.81	75	69	12.64	8.17	0.04	24.635
428	86	4155	4154.84	75	69	12.55	8.4	0.05	24.787
428	86	4155	4154.88	75	68	12.42	8.21	0.07	24.932
429	84	4155	4154.95	75	69	12.89	7.97	0.08	25.083
429	83	4155	4154.98	76	69	12.53	8.36	0.06	25.229
427	83	4155	4155.06	76	69	12.47	8.26	0.11	25.38
428	85	4155	4155.1	76	69	12.95	7.92	0.08	25.527

426	87	4155	4155.12	76	68	12.85	7.98	0.08	25.677
426	85	4155	4155.18	76	69	12.51	8.2	0.11	25.823
425	83	4155	4155.22	76	69	12.74	7.93	0.08	25.973
425	83	4155	4155.26	76	69	12.75	7.99	0.03	26.119
421	84	4155	4155.28	76	69	13.05	7.81	0.03	26.269
421	86	4155	4155.33	76	69	13.39	7.63	0.07	26.416
419	87	4155	4155.35	76	69	13.13	7.7	0.04	26.565
410	85	4155	4155.39	76	69	13.22	7.73	0.04	26.575
409	83	4155	4155.41	76	69	13.3	7.45	0.14	26.575
409	83	4155	4155.46	76	69	12.86	7.93	0.11	26.575
410	85	4156	4155.55	76	69	12.9	7.96	0.14	26.575
411	87	4156	4155.54	76	69	12.8	7.96	0.14	26.575
411	85	4156	4155.61	76	69	12.77	7.94	0.16	26.575
409	83	4156	4155.66	76	69	13.18	7.52	0.21	26.575
406	83	4156	4155.68	76	69	13.25	7.67	0.16	26.575
403	84	4156	4155.73	76	69	13.26	7.5	0.18	26.575
398	86	4156	4155.77	76	69	13.45	7.4	0.19	26.575
398	86	4156	4155.78	76	69	13.78	6.98	0.18	26.575
396	84	4156	4155.78	76	69	13.35	7.3	0.15	26.575
397	83	4156	4155.82	76	69	13.48	7.38	0.13	26.575
394	83	4156	4155.85	76	69	13.4	7.27	0.18	26.575
392	85	4156	4155.89	76	69	13.39	7.32	0.15	26.575
392	86	4156	4155.9	76	69	13.41	7.24	0.13	26.575
388	84	4156	4155.92	76	69	13.17	7.55	0.14	26.575
390	83	4156	4155.96	76	69	13.5	7.22	0.13	26.575
391	83	4156	4156	76	69	13.57	7.33	0.13	26.575
391	85	4156	4156.02	76	69	13.18	7.67	0.14	26.575
392	87	4156	4156.07	76	69	12.99	7.7	0.17	26.575
392	86	4156	4156.12	76	70	13.29	7.54	0.11	26.575
391	84	4156	4156.17	76	69	13.32	7.38	0.12	26.575
391	83	4156	4156.22	76	69	13.24	7.5	0.15	26.575
392	84	4156	4156.26	76	69	13.14	7.53	0.16	26.575
391	85	4156	4156.29	76	70	13.41	7.37	0.13	26.575
390	87	4156	4156.35	76	69	13.28	7.45	0.12	26.575
389	85	4156	4156.36	76	70	13.46	7.39	0.13	26.575
389	83	4156	4156.4	76	69	13.85	7.07	0.16	26.575
388	83	4156	4156.45	76	69	13.41	7.4	0.14	26.575
385	85	4156	4156.46	77	69	13.47	7.21	0.16	26.697
386	87	4157	4156.5	76	69	13.39	7.33	0.14	26.85
387	85	4156	4156.49	76	69	13.16	7.48	0.16	26.996
390	84	4157	4156.54	77	69	13.28	7.42	0.2	27.147
387	83	4157	4156.54	76	69	12.88	7.67	0.16	27.294
385	84	4157	4156.58	76	69	13.07	7.58	0.17	27.444
385	86	4157	4156.65	77	70	13.42	7.27	0.17	27.592
387	86	4157	4156.64	76	69	13.2	7.49	0.16	27.741
386	84	4157	4156.69	76	69	13.24	7.36	0.19	27.89
385	82	4157	4156.7	77	69	13.08	7.61	0.14	28.039

387	83	4157	4156.76	76	69	13.35	7.47	0.09	28.187
389	84	4157	4156.79	75	69	13.21	7.53	0.13	28.335
390	87	4157	4156.79	76	69	12.98	7.7	0.12	28.483
388	85	4157	4156.85	75	69	12.97	7.78	0.18	28.631
389	83	4157	4156.86	77	69	13.33	7.43	0.24	28.78
390	82	4157	4156.88	76	69	12.96	7.72	0.23	28.926
390	83	4157	4156.91	76	69	13.31	7.44	0.22	29.075
389	86	4157	4156.94	76	69	13.03	7.74	0.1	29.221
391	86	4157	4156.93	76	69	12.8	7.86	0.15	29.37
391	84	4157	4157	76	69	13	7.56	0.17	29.517
389	83	4157	4157.01	76	69	13.15	7.57	0.16	29.666
389	83	4157	4157.02	76	69	13.51	7.26	0.23	29.812
387	84	4157	4157.03	76	69	13.28	7.52	0.19	29.961
389	87	4157	4157.1	76	69	13.25	7.53	0.22	30.107
388	87	4157	4157.1	76	69	13.26	7.5	0.16	30.256
389	84	4157	4157.14	76	69	13.46	7.37	0.13	30.402
387	83	4157	4157.15	76	69	13.27	7.52	0.16	30.552
385	83	4157	4157.21	76	69	13.35	7.23	0.18	30.698
385	84	4157	4157.21	76	69	13.66	7.13	0.16	30.848
383	87	4157	4157.26	76	69	13.63	7.14	0.11	30.993
382	85	4157	4157.28	76	69	13.67	7.03	0.19	31.143
382	83	4157	4157.29	76	69	13.64	7.03	0.26	31.288
384	83	4157	4157.33	76	69	13.45	7.24	0.23	31.438
383	84	4157	4157.35	76	69	13.14	7.51	0.2	31.583
384	86	4157	4157.34	76	69	13.16	7.45	0.15	31.733
387	86	4157	4157.4	76	70	13.31	7.44	0.17	31.878
386	84	4157	4157.41	76	69	12.84	7.92	0.19	32.029
385	82	4157	4157.45	76	69	13.24	7.52	0.18	32.174
384	83	4157	4157.49	76	69	13.39	7.43	0.24	32.324
384	85	4157	4157.47	76	69	13.32	7.48	0.21	32.469
388	87	4158	4157.5	76	69	12.88	7.87	0.19	32.618
385	85	4158	4157.52	76	69	12.87	7.9	0.19	32.763
389	83	4158	4157.52	76	69	12.96	7.79	0.16	32.913
388	83	4158	4157.58	77	70	12.8	8.01	0.17	33.058
389	84	4158	4157.59	76	69	13.01	7.82	0.18	33.208
387	87	4158	4157.62	76	70	12.95	7.85	0.14	33.353
387	87	4158	4157.67	77	69	13.31	7.37	0.19	33.503
388	84	4158	4157.71	77	70	13.26	7.5	0.15	33.649
389	83	4158	4157.7	77	70	13.15	7.55	0.18	33.797
387	83	4158	4157.75	76	69	13.18	7.57	0.12	33.943
385	85	4158	4157.78	77	69	13.13	7.52	0.16	34.092
387	87	4158	4157.82	77	69	13.5	7.19	0.15	34.238
386	85	4158	4157.85	77	69	13.51	7.31	0.16	34.387
383	83	4158	4157.89	77	70	13.51	7.25	0.17	34.534
381	83	4158	4157.89	77	69	13.97	6.89	0.12	34.683
382	84	4158	4157.9	77	69	13.59	7.22	0.16	34.83
383	86	4158	4157.94	77	69	13.28	7.34	0.1	34.978

382	86	4158	4157.96	77	69	13.42	7.37	0.11	35.126
380	83	4158	4157.98	77	69	13.33	7.37	0.11	35.273
379	83	4158	4157.98	77	69	13.46	7.16	0.12	35.421
378	84	4158	4158	77	69	13.66	6.97	0.13	35.568
376	86	4158	4158.03	77	69	13.59	7.1	0.15	35.716
374	86	4158	4158.04	77	69	13.92	6.82	0.15	35.863
375	84	4158	4158.03	77	69	14.16	6.62	0.19	36.012
374	83	4158	4158.05	77	69	13.92	6.91	0.17	36.159
374	83	4158	4158.08	77	69	13.71	7.05	0.18	36.307
376	85	4158	4158.11	77	69	13.74	6.96	0.14	36.454
374	87	4158	4158.12	77	70	13.72	7.1	0.16	36.602
372	85	4158	4158.15	77	69	13.78	6.9	0.21	36.748
373	83	4158	4158.13	77	69	13.83	6.88	0.17	36.897
372	83	4158	4158.17	77	69	13.53	7.08	0.17	37.043
372	84	4158	4158.17	77	69	13.67	7.03	0.14	37.192
372	87	4158	4158.17	77	69	13.59	7.07	0.2	37.338
373	85	4158	4158.2	77	69	13.3	7.34	0.16	37.488
375	83	4158	4158.17	77	69	13.57	7.14	0.2	37.633
375	82	4158	4158.21	77	69	13.32	7.38	0.2	37.782
379	84	4158	4158.23	77	69	13.21	7.49	0.19	37.928
378	86	4158	4158.24	77	69	13.07	7.59	0.22	38.078
377	87	4158	4158.23	77	69	13.35	7.35	0.23	38.223
376	84	4158	4158.22	77	69	13.39	7.16	0.2	38.374
377	83	4158	4158.23	77	70	13.49	7.28	0.17	38.519
379	83	4158	4158.25	77	69	13.35	7.39	0.17	38.668
380	85	4158	4158.29	77	69	13.24	7.61	0.17	38.813
378	87	4158	4158.32	77	69	13.27	7.44	0.23	38.964
380	86	4158	4158.35	77	69	13.41	7.36	0.21	39.109
379	84	4158	4158.36	77	69	13.32	7.5	0.2	39.258
381	83	4158	4158.38	77	70	13.32	7.44	0.16	39.403
382	84	4158	4158.41	77	69	13.24	7.57	0.16	39.554
384	85	4158	4158.4	77	69	13.01	7.57	0.16	39.699
383	87	4158	4158.42	77	69	12.71	7.87	0.15	39.849
384	85	4158	4158.44	77	69	13.24	7.44	0.19	39.994
385	83	4158	4158.47	77	69	13.34	7.36	0.18	40.144
384	83	4158	4158.45	77	69	13.2	7.34	0.21	40.289
382	84	4159	4158.51	78	70	13.44	7.44	0.16	40.439
384	87	4158	4158.48	77	69	13.67	7.03	0.19	40.584
383	86	4159	4158.51	77	70	13.29	7.38	0.18	40.733
380	84	4159	4158.51	77	69	13.34	7.33	0.19	40.878
381	82	4159	4158.52	78	70	13.79	7.12	0.19	41.027
380	83	4159	4158.52	78	69	13.63	7.07	0.2	41.173
380	85	4159	4158.54	78	69	13.29	7.44	0.15	41.323
382	87	4159	4158.55	77	70	13.51	7.18	0.17	41.468
383	85	4159	4158.53	77	69	13.32	7.39	0.18	41.617
381	83	4159	4158.56	77	69	13.36	7.32	0.16	41.763
382	83	4159	4158.55	77	69	13.41	7.36	0.16	41.912

380	84	4159	4158.57	78	69	13.21	7.49	0.17	42.058
378	87	4159	4158.57	78	70	13.48	7.2	0.17	42.206
377	86	4159	4158.54	78	70	13.44	7.21	0.13	42.353
375	84	4159	4158.57	77	70	13.65	7.06	0.13	42.501
374	83	4159	4158.62	78	69	13.89	6.82	0.15	42.649
371	84	4159	4158.65	78	69	13.82	6.9	0.11	42.797
371	86	4159	4158.64	78	69	13.84	6.87	0.1	42.944
368	86	4159	4158.64	79	70	13.86	6.81	0.1	43.091
370	84	4159	4158.66	79	69	14.05	6.7	0.14	43.239
372	83	4159	4158.64	79	70	13.58	7.14	0.16	43.386
372	84	4159	4158.68	79	70	13.49	7.24	0.14	43.534
368	85	4159	4158.64	79	69	13.7	7.11	0.16	43.681
367	87	4159	4158.67	79	69	14.12	6.58	0.23	43.829
370	85	4159	4158.67	78	70	13.68	7.02	0.19	43.976
369	83	4159	4158.66	78	69	13.51	7.13	0.17	44.123
368	83	4159	4158.66	78	70	13.74	6.97	0.14	44.27
367	84	4159	4158.69	78	70	13.84	6.96	0.16	44.419
368	86	4159	4158.66	79	69	13.69	7.05	0.14	44.565
367	85	4159	4158.66	79	69	13.89	6.9	0.16	44.714
365	84	4159	4158.7	78	69	13.67	6.94	0.15	44.859
365	83	4159	4158.67	78	69	13.82	6.87	0.15	45.008
366	84	4159	4158.68	79	70	13.88	6.89	0.13	45.153
365	85	4159	4158.7	79	70	13.64	6.87	0.13	45.302
366	87	4159	4158.71	79	70	13.8	6.87	0.14	45.448
366	85	4159	4158.74	79	69	13.8	6.9	0.13	45.597
366	83	4159	4158.72	78	69	13.86	6.91	0.15	45.742
368	83	4159	4158.74	79	69	13.51	7.23	0.12	45.891
366	84	4159	4158.75	78	70	13.49	7.2	0.16	46.037
365	86	4159	4158.78	78	69	13.73	6.95	0.14	46.186
365	86	4159	4158.78	79	69	13.76	7.01	0.11	46.331
362	84	4159	4158.76	78	70	13.8	6.86	0.12	46.48
364	82	4159	4158.77	79	69	14.06	6.74	0.12	46.625
364	83	4159	4158.77	80	69	13.51	7.01	0.17	46.775
362	85	4159	4158.74	78	69	13.95	6.76	0.25	46.919
361	87	4159	4158.77	78	69	13.99	6.69	0.18	47.069
363	85	4159	4158.78	78	69	13.92	6.76	0.15	47.214
363	83	4159	4158.75	78	70	13.84	6.81	0.25	47.363
361	83	4159	4158.79	77	69	13.84	6.94	0.2	47.508
362	84	4159	4158.75	79	69	14.06	6.73	0.25	47.658
363	86	4159	4158.75	78	69	13.79	6.84	0.21	47.803
364	86	4159	4158.76	79	69	13.75	6.86	0.23	47.953
362	84	4159	4158.74	78	69	13.81	6.92	0.11	48.098
359	83	4159	4158.78	78	69	13.94	6.78	0.09	48.247
358	84	4159	4158.78	78	69	14.09	6.74	0.14	48.392
358	86	4159	4158.81	78	70	14.02	6.67	0.19	48.542
357	87	4159	4158.81	78	69	14.08	6.66	0.18	48.686
357	85	4159	4158.85	78	70	14.14	6.59	0.16	48.836

356	83	4159	4158.89	78	69	14.1	6.67	0.18	48.981
355	83	4159	4158.92	78	70	14	6.69	0.15	49.13
352	84	4159	4158.96	78	70	14.11	6.61	0.12	49.275
353	87	4159	4159	78	69	14.08	6.58	0.13	49.424
356	86	4159	4159.02	78	69	14.07	6.63	0.14	49.569
355	84	4159	4159.04	78	69	13.85	6.94	0.16	49.718
357	83	4159	4159.04	78	69	13.82	6.81	0.14	49.863
355	83	4159	4159.03	78	69	13.9	6.88	0.13	50.012
354	85	4159	4159.03	78	69	14.02	6.79	0.16	50.157
354	87	4159	4159.06	78	69	14.09	6.58	0.14	50.307
354	85	4159	4159.01	78	69	13.84	6.73	0.14	50.451
355	83	4159	4159.03	78	69	13.97	6.64	0.13	50.601
354	83	4159	4159.03	78	69	13.95	6.79	0.16	50.745
355	84	4159	4159.02	78	69	14.01	6.7	0.18	50.895
355	87	4159	4159.04	78	69	13.79	6.83	0.16	51.039
354	86	4159	4159	78	69	13.89	6.74	0.13	51.189
357	84	4159	4159	78	69	13.94	6.73	0.12	51.333
358	83	4159	4159.01	78	69	13.99	6.78	0.11	51.483
356	83	4159	4159.01	78	69	13.88	6.88	0.12	51.627
356	85	4159	4158.96	78	70	13.82	6.9	0.17	51.777
356	87	4159	4158.98	78	70	13.93	6.86	0.14	51.921
356	86	4159	4158.97	78	70	13.94	6.87	0.16	52.07
357	84	4159	4159.01	78	69	13.82	6.83	0.14	52.215
357	83	4159	4159.06	78	69	14	6.61	0.19	52.364
356	84	4159	4159.07	78	70	13.91	6.74	0.15	52.508
358	87	4159	4159.09	78	69	14.07	6.66	0.17	52.657
356	86	4159	4159.11	78	69	13.76	6.8	0.14	52.802
357	84	4159	4159.12	78	70	14.01	6.71	0.14	52.951
358	83	4159	4159.13	78	69	13.66	6.98	0.13	53.095

Sample Ra	Pro-Rate (%	Flue Draft	Orifice B dI	Filter B Va	FB Left (F)	FB Right (F	Filter B Ter	FB Left (F)	FB Bottom
0	0	0	0	-1	4147	4147	85	4147	4147
0	0	-0.08	2.42	-2.72	4147	4147	85	4147	4147
0	0	-0.08	2.42	-0.55	4147	4147	85	4147	4147
0	0	-0.09	2.41	-2.61	4147	4147	84	4147	4147
0	0	-0.09	2.4	-0.83	4147	4147	84	4147	4147
0	0	-0.08	2.39	-1.21	4147	4147	84	4147	4147
0	0	-0.08	2.38	-1.59	4147	4147	85	4147	4147
0	0	-0.08	2.38	-0.99	4147	4147	85	4147	4147
0	0	-0.08	2.38	-2.53	4147	4147	86	4147	4147
0	0	-0.1	2.37	-2.49	4147	4147	85	4147	4147
0	0	-0.09	2.38	-2.65	4147	4147	84	4147	4147
0	0	-0.07	2.37	-0.79	4147	4147	84	4147	4147
0	0	-0.1	2.37	-1.7	4147	4147	85	4147	4147
0	0	-0.08	2.36	-0.61	4147	4147	85	4147	4147
0	0	-0.09	2.35	-1.24	4147	4147	86	4147	4147
0	0	-0.08	2.36	-2.74	4147	4147	85	4147	4147
0	0	-0.09	2.36	-2.53	4147	4147	85	4147	4147
0	0	-0.09	2.35	-1.06	4147	4147	84	4147	4147
0	0	-0.11	2.35	-2.72	4147	4147	85	4147	4147
0	0	-0.08	2.34	-1.03	4147	4147	85	4147	4147
0	0	-0.08	2.34	-0.62	4148	4148	86	4148	4148
0	0	-0.07	2.34	-1.23	4148	4148	86	4148	4148
0	0	-0.08	2.33	-2.27	4148	4148	85	4148	4148
0	0	-0.1	2.34	-1.32	4148	4148	85	4148	4148
0	0	-0.08	2.34	-0.58	4148	4148	85	4148	4148
0	0	-0.07	2.34	-2.59	4148	4148	85	4148	4148
0	0	-0.08	2.33	-1.69	4148	4148	86	4148	4148
0	0	-0.08	2.32	-2	4148	4148	86	4148	4148
0	0	-0.08	2.33	-1.77	4148	4148	86	4148	4148
0	0	-0.09	2.32	-1.52	4148	4148	84	4148	4148
0	0	-0.1	2.32	-1.01	4148	4148	84	4148	4148
0	0	-0.09	2.32	-2.5	4148	4148	85	4148	4148
0	0	-0.08	2.33	-0.64	4148	4148	85	4148	4148
0	0	-0.08	2.34	-2.14	4147	4147	86	4147	4147
0	0	-0.08	2.33	-1.96	4147	4147	86	4147	4147
0	0	-0.09	2.32	-0.69	4147	4147	85	4147	4147
0	0	-0.09	2.32	-2.53	4147	4147	85	4147	4147
0	0	-0.08	2.33	-2.56	4147	4147	85	4147	4147
0	0	-0.08	2.32	-2.51	4147	4147	85	4147	4147
0	0	-0.08	2.32	-2.13	4148	4148	85	4148	4148
0	0	-0.09	2.32	-1.16	4148	4148	86	4148	4148
0	0	-0.08	2.31	-2.8	4148	4148	86	4148	4148
0	0	-0.09	2.3	-0.93	4148	4148	85	4148	4148
0	0	-0.08	2.3	-1.19	4148	4148	84	4148	4148
0	0	-0.09	2.31	-2.78	4148	4148	85	4148	4148
0	0	-0.08	2.31	-1.76	4148	4148	85	4148	4148

0	0	-0.08	2.3	-2.55	4148	4148	86	4148	4148
0	0	-0.08	2.31	-0.74	4148	4148	86	4148	4148
0	0	-0.07	2.31	-2.72	4148	4148	85	4148	4148
0	0	-0.08	2.31	-1.43	4148	4148	85	4148	4148
0	0	-0.08	2.29	-2.48	4148	4148	85	4148	4148
0	0	-0.07	2.3	-2.7	4148	4148	85	4148	4148
0	0	-0.07	2.3	-1.27	4148	4148	86	4148	4148
0	0	-0.08	2.32	-0.72	4148	4148	86	4148	4148
0	0	-0.08	2.3	-2.6	4148	4148	86	4148	4148
0	0	-0.08	2.29	-2.43	4148	4148	85	4148	4148
0	0	-0.07	2.31	-0.93	4148	4148	85	4148	4148
0	0	-0.08	2.29	-1.27	4148	4148	85	4148	4148
0	0	-0.07	2.3	-1.53	4149	4149	85	4149	4149
0	0	-0.08	2.3	-2.37	4149	4149	86	4149	4149
0	0	-0.08	2.28	-2.56	4149	4149	86	4149	4149
0	0	-0.08	0.01	-0.72	4149	4149	85	4149	4149
0	0	-0.08	0.01	-0.64	4149	4149	85	4149	4149
0	0	-0.07	0.01	-0.68	4149	4149	85	4149	4149
0	0	-0.08	0.02	-0.59	4149	4149	85	4149	4149
0	0	-0.07	0.01	-0.66	4149	4149	86	4149	4149
0	0	-0.08	0.01	-0.64	4149	4149	86	4149	4149
0	0	-0.07	0.02	-0.67	4149	4149	86	4149	4149
0	0	-0.08	0.01	-0.6	4149	4149	85	4149	4149
0	0	-0.08	0.01	-0.61	4149	4149	85	4149	4149
0	0	-0.08	0.02	-0.66	4149	4149	85	4149	4149
0	0	-0.07	0.02	-0.61	4149	4149	85	4149	4149
0	0	-0.08	0.01	-0.65	4149	4149	86	4149	4149
0	0	-0.08	0.01	-0.62	4150	4150	86	4150	4150
0	0	-0.08	0.01	-0.59	4150	4150	85	4150	4150
0	0	-0.07	0.01	-0.6	4150	4150	85	4150	4150
0	0	-0.07	0.01	-0.72	4150	4150	85	4150	4150
0	0	-0.07	0.01	-0.56	4150	4150	85	4150	4150
0	0	-0.07	0.01	-0.7	4150	4150	86	4150	4150
0	0	-0.07	0.01	-0.68	4150	4150	86	4150	4150
0	0	-0.07	0.01	-0.6	4150	4150	86	4150	4150
0	0	-0.07	0.01	-0.61	4150	4150	85	4150	4150
0	0	-0.07	0.01	-0.62	4150	4150	85	4150	4150
0	0	-0.08	0.01	-0.63	4150	4150	85	4150	4150
0	0	-0.07	0.02	-0.61	4150	4150	85	4150	4150
0	0	-0.07	0.01	-0.65	4150	4150	86	4150	4150
0	0	-0.08	0.01	-0.64	4150	4150	86	4150	4150
0	0	-0.07	0.01	-0.59	4150	4150	85	4150	4150
0	0	-0.08	0.02	-0.62	4150	4150	84	4150	4150
0	0	-0.07	0.01	-0.68	4150	4150	85	4150	4150
0	0	-0.07	0.02	-0.56	4151	4151	85	4151	4151
0	0	-0.08	0.01	-0.59	4151	4151	85	4151	4151
0	0	-0.07	0.01	-0.69	4151	4151	86	4151	4151

0	0	-0.06	0.01	-0.66	4151	4151	85	4151	4151
0	0	-0.06	0.01	-0.6	4151	4151	85	4151	4151
0	0	-0.07	0.01	-0.61	4151	4151	84	4151	4151
0	0	-0.07	0.01	-0.6	4151	4151	85	4151	4151
0	0	-0.07	0.01	-0.72	4151	4151	85	4151	4151
0	0	-0.07	0.01	-0.73	4151	4151	86	4151	4151
0	0	-0.06	0.01	-0.59	4151	4151	86	4151	4151
0	0	-0.06	0.01	-0.7	4151	4151	85	4151	4151
0	0	-0.06	0.01	-0.59	4151	4151	84	4151	4151
0	0	-0.08	0.02	-0.59	4151	4151	85	4151	4151
0	0	-0.07	0.02	-0.57	4151	4151	85	4151	4151
0	0	-0.06	0.02	-0.61	4151	4151	85	4151	4151
0	0	-0.06	0.01	-0.59	4151	4151	86	4151	4151
0	0	-0.06	0.01	-0.66	4151	4151	86	4151	4151
0	0	-0.06	0.01	-0.59	4151	4151	85	4151	4151
0	0	-0.05	0.01	-0.62	4151	4151	84	4151	4151
0	0	-0.07	0.01	-0.61	4151	4151	84	4151	4151
0	0	-0.06	0.01	-0.59	4151	4151	85	4151	4151
0	0	-0.07	0.01	-0.69	4151	4151	85	4151	4151
0	0	-0.06	0.01	-0.6	4151	4151	86	4151	4151
0	0	-0.07	0.01	-0.63	4151	4151	86	4151	4151
0	0	-0.07	0.01	-0.65	4151	4151	85	4151	4151
0	0	-0.06	0.01	-0.59	4151	4151	84	4151	4151
0	0	-0.07	0.02	-0.55	4151	4151	84	4151	4151
0	0	-0.05	0.01	-0.64	4151	4151	84	4151	4151
0	0	-0.08	0.01	-0.57	4151	4151	85	4151	4151
0	0	-0.07	0.01	-0.59	4151	4151	85	4151	4151
0	0	-0.06	0.01	-0.6	4151	4151	85	4151	4151
0	0	-0.06	2.38	-2.09	4151	4151	85	4151	4151
0	0	-0.07	2.37	-1.58	4151	4151	84	4151	4151
0	0	-0.07	2.37	-0.66	4151	4151	84	4151	4151
0	0	-0.07	2.37	-1.29	4151	4151	84	4151	4151
0	0	-0.06	2.35	-2.59	4151	4151	85	4151	4151
0	0	-0.06	2.35	-2.64	4151	4151	85	4151	4151
0	0	-0.07	2.35	-1.74	4151	4151	86	4151	4151
0	0	-0.06	2.35	-1.27	4151	4151	85	4151	4151
0	0	-0.08	2.34	-2.51	4151	4151	84	4151	4151
0	0	-0.07	2.34	-1.1	4151	4151	84	4151	4151
0	0	-0.06	2.33	-0.69	4151	4151	85	4151	4151
0	0	-0.06	2.32	-2.7	4151	4151	85	4151	4151
0	0	-0.07	2.33	-1.56	4151	4151	86	4151	4151
0	0	-0.06	2.32	-2.81	4151	4151	86	4151	4151
0	0	-0.07	2.32	-2.37	4151	4151	85	4151	4151
0	0	-0.06	2.33	-0.6	4151	4151	84	4151	4151
0	0	-0.07	2.32	-2.78	4151	4151	85	4151	4151
0	0	-0.07	2.31	-0.65	4151	4151	85	4151	4151
0	0	-0.06	2.32	-2.81	4151	4151	85	4151	4151

0	0	-0.06	2.31	-2.75	4151	4151	86	4151	4151
0	0	-0.06	2.29	-2.35	4151	4151	86	4151	4151
0	0	-0.06	2.31	-0.73	4151	4151	85	4151	4151
0	0	-0.06	2.31	-0.58	4151	4151	84	4151	4151
0	0	-0.07	2.3	-0.8	4151	4151	84	4151	4151
0	0	-0.07	2.31	-0.69	4151	4151	85	4151	4151
0	0	-0.07	2.31	-0.67	4151	4151	85	4151	4151
0	0	-0.07	2.3	-0.68	4152	4152	86	4152	4152
0	0	-0.06	2.3	-2.52	4152	4152	85	4152	4152
0	0	-0.07	2.29	-2.75	4152	4152	85	4152	4152
0	0	-0.06	2.29	-0.65	4152	4152	84	4152	4152
0	0	-0.06	2.29	-2.77	4152	4152	85	4152	4152
0	0	-0.07	2.3	-1.01	4152	4152	85	4152	4152
0	0	-0.06	2.29	-1.1	4152	4152	85	4152	4152
0	0	-0.06	2.29	-0.67	4152	4152	86	4152	4152
0	0	-0.06	2.29	-0.7	4152	4152	85	4152	4152
0	0	-0.06	2.28	-2.08	4152	4152	85	4152	4152
0	0	-0.06	2.28	-0.87	4152	4152	84	4152	4152
0	0	-0.06	2.28	-2.65	4152	4152	85	4152	4152
0	0	-0.06	2.28	-1.33	4152	4152	85	4152	4152
0	0	-0.06	2.28	-1.77	4152	4152	85	4152	4152
0	0	-0.06	2.29	-1.39	4152	4152	86	4152	4152
0	0	-0.06	2.28	-1.68	4152	4152	85	4152	4152
0	0	-0.06	2.29	-2.41	4152	4152	84	4152	4152
0	0	-0.06	2.28	-0.74	4152	4152	84	4152	4152
0	0	-0.05	2.28	-2.76	4152	4152	85	4152	4152
0	0	-0.08	2.27	-2.19	4152	4152	85	4152	4152
0	0	-0.06	2.28	-2.22	4152	4152	86	4152	4152
0	0	-0.06	2.28	-2.55	4152	4152	86	4152	4152
0	0	-0.07	2.28	-2.36	4152	4152	86	4152	4152
0	0	-0.07	2.28	-0.82	4152	4152	85	4152	4152
0	0	-0.06	2.27	-2.79	4152	4152	84	4152	4152
0	0	-0.06	2.25	-1.52	4152	4152	84	4152	4152
0	0	-0.07	2.27	-2.48	4152	4152	85	4152	4152
0	0	-0.06	2.27	-1.19	4152	4152	85	4152	4152
0	0	-0.08	2.27	-0.69	4152	4152	85	4152	4152
0	0	-0.06	2.27	-2.77	4153	4153	85	4153	4153
0	0	-0.07	2.26	-2.72	4153	4153	84	4153	4153
0	0	-0.08	2.26	-1.43	4153	4153	84	4153	4153
0	0	-0.07	2.26	-2.84	4153	4153	85	4153	4153
0	0	-0.06	2.26	-1.65	4153	4153	85	4153	4153
0	0	-0.06	2.26	-0.69	4153	4153	85	4153	4153
0	0	-0.07	2.27	-1.38	4153	4153	85	4153	4153
0	0	-0.06	2.26	-1.3	4153	4153	84	4153	4153
0	0	-0.06	2.26	-1.1	4153	4153	84	4153	4153
0	0	-0.06	2.27	-1.59	4153	4153	84	4153	4153
0	0	-0.07	2.26	-0.98	4153	4153	85	4153	4153

0	0	-0.07	2.26	-0.75	4153	4153	85	4153	4153
0	0	-0.06	2.26	-0.65	4153	4153	86	4153	4153
0	0	-0.06	2.25	-1.86	4153	4153	85	4153	4153
0	0	-0.07	2.27	-2.49	4153	4153	84	4153	4153
0	0	-0.07	2.25	-2.88	4153	4153	84	4153	4153
0	0	-0.06	2.27	-1.59	4153	4153	85	4153	4153
0	0	-0.07	2.26	-2.64	4153	4153	85	4153	4153
0	0	-0.07	2.25	-0.74	4153	4153	85	4153	4153
0	0	-0.07	2.24	-1.68	4153	4153	86	4153	4153
0	0	-0.07	2.26	-2.43	4153	4153	85	4153	4153
0	0	-0.06	2.26	-0.79	4153	4153	84	4153	4153
0	0	-0.06	2.25	-0.82	4153	4153	84	4153	4153
0	0	-0.06	2.25	-2.61	4153	4153	85	4153	4153
0	0	-0.06	2.26	-1.05	4154	4154	85	4154	4154
0	0	-0.06	2.25	-0.71	4154	4154	86	4154	4154
0	0	-0.06	2.25	-2.48	4154	4154	86	4154	4154
0	0	-0.06	2.24	-0.71	4154	4154	85	4154	4154
0	0	-0.07	2.26	-1.46	4154	4154	84	4154	4154
0	0	-0.05	2.25	-2.31	4154	4154	84	4154	4154
0	0	-0.07	2.25	-2.74	4154	4154	85	4154	4154
0	0	-0.07	2.25	-2.86	4154	4154	85	4154	4154
0	0	-0.07	2.25	-2.13	4154	4154	86	4154	4154
0	0	-0.06	2.25	-1.65	4154	4154	86	4154	4154
0	0	-0.06	2.25	-1.47	4154	4154	85	4154	4154
0	0	-0.06	2.25	-2.66	4154	4154	84	4154	4154
0	0	-0.06	2.23	-2.86	4154	4154	84	4154	4154
0	0	-0.07	2.24	-2.81	4154	4154	85	4154	4154
0	0	-0.07	2.25	-2.9	4154	4154	85	4154	4154
0	0	-0.06	2.24	-1.52	4154	4154	86	4154	4154
0	0	-0.06	2.25	-1.63	4154	4154	86	4154	4154
0	0	-0.06	2.25	-0.82	4154	4154	85	4154	4154
0	0	-0.07	2.24	-0.94	4154	4154	84	4154	4154
0	0	-0.06	2.26	-2.79	4154	4154	84	4154	4154
0	0	-0.06	2.25	-2.85	4155	4155	85	4155	4155
0	0	-0.06	2.25	-2.37	4155	4155	85	4155	4155
0	0	-0.06	2.25	-2.25	4155	4155	86	4155	4155
0	0	-0.07	2.24	-2.73	4155	4155	86	4155	4155
0	0	-0.06	2.25	-1.17	4155	4155	85	4155	4155
0	0	-0.06	2.24	-0.91	4155	4155	84	4155	4155
0	0	-0.06	2.25	-0.72	4155	4155	84	4155	4155
0	0	-0.06	2.23	-2.89	4155	4155	85	4155	4155
0	0	-0.06	2.25	-2.35	4155	4155	85	4155	4155
0	0	-0.07	2.23	-2.55	4155	4155	86	4155	4155
0	0	-0.06	2.25	-0.84	4155	4155	86	4155	4155
0	0	-0.06	2.25	-2	4155	4155	85	4155	4155
0	0	-0.08	2.25	-1.77	4155	4155	84	4155	4155
0	0	-0.07	2.24	-2.88	4155	4155	85	4155	4155

0	0	-0.05	2.24	-1.08	4155	4155	85	4155	4155
0	0	-0.05	2.24	-1.6	4155	4155	86	4155	4155
0	0	-0.08	2.25	-1.99	4155	4155	86	4155	4155
0	0	-0.07	2.23	-0.82	4155	4155	86	4155	4155
0	0	-0.06	2.25	-0.87	4155	4155	85	4155	4155
0	0	-0.07	2.24	-1.49	4155	4155	84	4155	4155
0	0	-0.07	2.24	-2.83	4155	4155	85	4155	4155
0	0	-0.06	0.01	-0.65	4155	4155	85	4155	4155
0	0	-0.06	0.01	-0.65	4155	4155	86	4155	4155
0	0	-0.06	0.01	-0.68	4155	4155	86	4155	4155
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0	0	-0.05	0.01	-0.68	4156	4156	85	4156	4156
0	0	-0.06	0.01	-0.68	4156	4156	85	4156	4156
0	0	-0.06	0.01	-0.6	4156	4156	85	4156	4156
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0	0	-0.06	0.01	-0.6	4156	4156	86	4156	4156
0	0	-0.06	0.01	-0.63	4156	4156	85	4156	4156
0	0	-0.06	0.02	-0.64	4156	4156	84	4156	4156
0	0	-0.06	0.01	-0.62	4156	4156	85	4156	4156
0	0	-0.06	0.01	-0.68	4156	4156	85	4156	4156
0	0	-0.07	0.01	-0.62	4156	4156	86	4156	4156
0	0	-0.06	0.01	-0.57	4156	4156	86	4156	4156
0	0	-0.06	0.01	-0.67	4156	4156	85	4156	4156
0	0	-0.06	0.01	-0.66	4156	4156	85	4156	4156
0	0	-0.05	0.01	-0.64	4156	4156	85	4156	4156
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0	0	-0.06	0.01	-0.63	4156	4156	86	4156	4156
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0	0	-0.06	2.32	-2.71	4156	4156	84	4156	4156
0	0	-0.06	2.31	-2.29	4157	4157	85	4157	4157
0	0	-0.07	2.32	-0.66	4156	4156	85	4156	4156
0	0	-0.07	2.29	-2.26	4157	4157	85	4157	4157
0	0	-0.07	2.3	-2.13	4157	4157	85	4157	4157
0	0	-0.06	2.29	-1.39	4157	4157	86	4157	4157
0	0	-0.06	2.27	-2.77	4157	4157	85	4157	4157
0	0	-0.06	2.28	-2.77	4157	4157	84	4157	4157
0	0	-0.06	2.27	-2.29	4157	4157	85	4157	4157
0	0	-0.06	2.27	-2.49	4157	4157	85	4157	4157

0	0	-0.06	2.26	-0.95	4157	4157	85	4157	4157
0	0	-0.05	2.27	-1.73	4157	4157	86	4157	4157
0	0	-0.06	2.26	-2.87	4157	4157	86	4157	4157
0	0	-0.05	2.27	-0.74	4157	4157	85	4157	4157
0	0	-0.07	2.26	-0.78	4157	4157	84	4157	4157
0	0	-0.06	2.26	-1.25	4157	4157	84	4157	4157
0	0	-0.07	2.24	-2.37	4157	4157	85	4157	4157
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0	0	-0.06	2.25	-1.98	4157	4157	86	4157	4157
0	0	-0.06	2.24	-2.12	4157	4157	86	4157	4157
0	0	-0.06	2.24	-2.27	4157	4157	85	4157	4157
0	0	-0.06	2.24	-2.93	4157	4157	85	4157	4157
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0	0	-0.05	2.25	-0.96	4157	4157	85	4157	4157
0	0	-0.06	2.23	-0.78	4157	4157	85	4157	4157
0	0	-0.06	2.23	-0.82	4157	4157	86	4157	4157
0	0	-0.06	2.23	-2.83	4157	4157	86	4157	4157
0	0	-0.07	2.25	-1.84	4157	4157	85	4157	4157
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0	0	-0.06	2.22	-1.68	4157	4157	85	4157	4157
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0	0	-0.05	2.24	-1.07	4157	4157	86	4157	4157
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0	0	-0.06	2.21	-2.88	4157	4157	85	4157	4157
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0	0	-0.04	2.23	-2.85	4158	4158	84	4158	4158
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0	0	-0.07	2.2	-2.25	4158	4158	86	4158	4158
0	0	-0.05	2.22	-2.68	4158	4158	86	4158	4158
0	0	-0.06	2.23	-1.78	4158	4158	86	4158	4158
0	0	-0.05	2.22	-0.91	4158	4158	85	4158	4158
0	0	-0.06	2.22	-2.12	4158	4158	84	4158	4158
0	0	-0.07	2.22	-2.75	4158	4158	85	4158	4158
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0	0	-0.04	2.21	-2.86	4158	4158	86	4158	4158
0	0	-0.05	2.21	-2.76	4158	4158	86	4158	4158
0	0	-0.04	2.22	-0.84	4158	4158	85	4158	4158
0	0	-0.06	2.21	-1.64	4158	4158	85	4158	4158
0	0	-0.05	2.21	-0.79	4158	4158	85	4158	4158

0	0	-0.04	2.21	-2.89	4158	4158	85	4158	4158
0	0	-0.05	2.22	-0.85	4158	4158	86	4158	4158
0	0	-0.06	2.22	-1.65	4158	4158	86	4158	4158
0	0	-0.07	2.23	-0.93	4158	4158	85	4158	4158
0	0	-0.06	2.21	-2.89	4158	4158	85	4158	4158
0	0	-0.07	2.2	-2.93	4158	4158	85	4158	4158
0	0	-0.05	2.21	-0.81	4158	4158	85	4158	4158
0	0	-0.06	2.23	-1.51	4158	4158	86	4158	4158
0	0	-0.06	2.2	-2.92	4158	4158	86	4158	4158
0	0	-0.06	2.21	-0.81	4158	4158	85	4158	4158
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0	0	-0.05	2.21	-1.36	4158	4158	85	4158	4158
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0	0	-0.06	2.19	-1.15	4158	4158	85	4158	4158
0	0	-0.05	2.2	-0.83	4158	4158	85	4158	4158
0	0	-0.05	2.2	-2.47	4158	4158	86	4158	4158
0	0	-0.06	2.19	-1.3	4158	4158	86	4158	4158
0	0	-0.06	2.21	-1.57	4158	4158	86	4158	4158
0	0	-0.05	2.2	-0.91	4158	4158	85	4158	4158
0	0	-0.05	2.2	-1.8	4158	4158	85	4158	4158
0	0	-0.06	2.2	-2.05	4158	4158	85	4158	4158
0	0	-0.06	2.22	-1.31	4158	4158	85	4158	4158
0	0	-0.05	2.21	-0.98	4158	4158	86	4158	4158
0	0	-0.06	2.21	-1.81	4158	4158	86	4158	4158
0	0	-0.07	2.21	-2.78	4158	4158	86	4158	4158
0	0	-0.06	2.2	-2	4158	4158	85	4158	4158
0	0	-0.07	2.2	-2.62	4158	4158	84	4158	4158
0	0	-0.06	2.19	-2.48	4158	4158	85	4158	4158
0	0	-0.06	2.22	-0.74	4158	4158	85	4158	4158
0	0	-0.07	2.21	-1.28	4158	4158	86	4158	4158
0	0	-0.06	2.2	-2.87	4158	4158	86	4158	4158
0	0	-0.06	2.2	-2.94	4159	4159	85	4159	4159
0	0	-0.06	2.22	-0.83	4158	4158	85	4158	4158
0	0	-0.06	2.2	-1.08	4159	4159	85	4159	4159
0	0	-0.06	2.21	-2.84	4159	4159	85	4159	4159
0	0	-0.06	2.2	-0.82	4159	4159	85	4159	4159
0	0	-0.06	2.2	-1.01	4159	4159	86	4159	4159
0	0	-0.06	2.2	-2.92	4159	4159	86	4159	4159
0	0	-0.06	2.21	-1.27	4159	4159	85	4159	4159
0	0	-0.05	2.21	-1.9	4159	4159	85	4159	4159
0	0	-0.05	2.2	-1.23	4159	4159	85	4159	4159
0	0	-0.05	2.2	-2.98	4159	4159	85	4159	4159

0	0	-0.06	2.2	-0.76	4159	4159	86	4159	4159
0	0	-0.06	2.19	-0.86	4159	4159	86	4159	4159
0	0	-0.06	2.2	-1.75	4159	4159	86	4159	4159
0	0	-0.06	2.2	-1.12	4159	4159	85	4159	4159
0	0	-0.06	2.2	-2.28	4159	4159	84	4159	4159
0	0	-0.06	2.21	-2.56	4159	4159	85	4159	4159
0	0	-0.05	2.21	-2.34	4159	4159	85	4159	4159
0	0	-0.06	2.19	-2.96	4159	4159	86	4159	4159
0	0	-0.05	2.2	-2.89	4159	4159	86	4159	4159
0	0	-0.05	2.2	-2.9	4159	4159	86	4159	4159
0	0	-0.06	2.19	-2.14	4159	4159	84	4159	4159
0	0	-0.06	2.2	-0.92	4159	4159	85	4159	4159
0	0	-0.05	2.19	-1.39	4159	4159	85	4159	4159
0	0	-0.06	2.19	-0.87	4159	4159	85	4159	4159
0	0	-0.07	2.19	-1.08	4159	4159	86	4159	4159
0	0	-0.06	2.18	-1.96	4159	4159	86	4159	4159
0	0	-0.05	2.19	-2.39	4159	4159	85	4159	4159
0	0	-0.04	2.2	-1.8	4159	4159	84	4159	4159
0	0	-0.05	2.2	-1.57	4159	4159	85	4159	4159
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0	0	-0.06	2.19	-0.84	4159	4159	85	4159	4159
0	0	-0.06	2.19	-0.92	4159	4159	86	4159	4159
0	0	-0.06	2.21	-0.79	4159	4159	86	4159	4159
0	0	-0.06	2.19	-2.91	4159	4159	86	4159	4159
0	0	-0.06	2.2	-1.2	4159	4159	84	4159	4159
0	0	-0.05	2.19	-2.57	4159	4159	85	4159	4159
0	0	-0.06	2.18	-1.61	4159	4159	85	4159	4159
0	0	-0.06	2.2	-1.32	4159	4159	86	4159	4159
0	0	-0.06	2.2	-2.59	4159	4159	86	4159	4159
0	0	-0.06	2.2	-1.03	4159	4159	86	4159	4159
0	0	-0.07	2.19	-0.87	4159	4159	85	4159	4159
0	0	-0.06	2.18	-2.8	4159	4159	85	4159	4159
0	0	-0.05	2.19	-1.95	4159	4159	85	4159	4159
0	0	-0.06	2.2	-2.87	4159	4159	85	4159	4159
0	0	-0.06	2.2	-2.83	4159	4159	85	4159	4159
0	0	-0.06	2.21	-2.66	4159	4159	86	4159	4159
0	0	-0.07	2.2	-0.83	4159	4159	86	4159	4159
0	0	-0.06	2.18	-2.82	4159	4159	85	4159	4159
0	0	-0.05	2.18	-0.93	4159	4159	84	4159	4159
0	0	-0.05	2.18	-2.86	4159	4159	84	4159	4159
0	0	-0.07	2.2	-0.93	4159	4159	85	4159	4159
0	0	-0.05	2.2	-2.88	4159	4159	86	4159	4159
0	0	-0.05	2.19	-1.07	4159	4159	86	4159	4159
0	0	-0.05	2.19	-0.8	4159	4159	85	4159	4159
0	0	-0.05	2.19	-1.85	4159	4159	85	4159	4159
0	0	-0.06	2.19	-0.9	4159	4159	84	4159	4159
0	0	-0.05	2.19	-3.02	4159	4159	85	4159	4159

0	0	-0.06	2.17	-0.84	4159	4159	85	4159	4159
0	0	-0.06	2.19	-1.85	4159	4159	86	4159	4159
0	0	-0.06	2.19	-1.19	4159	4159	86	4159	4159
0	0	-0.05	2.18	-2.37	4159	4159	85	4159	4159
0	0	-0.06	2.19	-0.85	4159	4159	84	4159	4159
0	0	-0.06	2.18	-2.85	4159	4159	84	4159	4159
0	0	-0.05	2.18	-2.87	4159	4159	85	4159	4159
0	0	-0.06	2.18	-0.89	4159	4159	85	4159	4159
0	0	-0.06	2.18	-0.88	4159	4159	86	4159	4159
0	0	-0.06	2.18	-1.65	4159	4159	86	4159	4159
0	0	-0.05	2.19	-1.52	4159	4159	86	4159	4159
0	0	-0.05	2.18	-1.85	4159	4159	85	4159	4159
0	0	-0.06	2.18	-2.81	4159	4159	85	4159	4159
0	0	-0.05	2.18	-2.91	4159	4159	85	4159	4159
0	0	-0.05	2.18	-2.71	4159	4159	85	4159	4159
0	0	-0.07	2.19	-2.18	4159	4159	86	4159	4159
0	0	-0.06	2.19	-1.88	4159	4159	86	4159	4159
0	0	-0.06	2.21	-1.19	4159	4159	86	4159	4159
0	0	-0.04	2.19	-1.06	4159	4159	85	4159	4159
0	0	-0.06	2.19	-0.85	4159	4159	85	4159	4159
0	0	-0.05	2.18	-0.92	4159	4159	85	4159	4159
0	0	-0.06	2.18	-2.06	4159	4159	85	4159	4159
0	0	-0.06	2.19	-2.12	4159	4159	86	4159	4159
0	0	-0.06	2.19	-1.57	4159	4159	86	4159	4159
0	0	-0.05	2.18	-2.42	4159	4159	85	4159	4159
0	0	-0.06	2.18	-1.13	4159	4159	85	4159	4159
0	0	-0.06	2.18	-1.04	4159	4159	85	4159	4159
0	0	-0.06	2.18	-0.95	4159	4159	85	4159	4159
0	0	-0.05	2.17	-2.74	4159	4159	85	4159	4159

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Conditioning Data

Client:	USSC	Job #:	18-438
Model:	SP2047	Tracking #:	0013
Date(s):		Technician:	SJB

		Average:	331.8	72.2	N/A
Elapsed Time (hrs)	**Scale Reading (lbs)**	**Weight Change (lbs)**	**Flue (°F)**	**Ambient (°F)**	**Catalyst Exit (°F)**
0	48.0	-	330	70	N/A
1	45.6	-2.4	328	72	N/A
2	43.1	-2.5	327	72	N/A
3	40.9	-2.2	331	74	N/A
4	38.4	-2.5	335	74	N/A
5	36.1	-2.3	336	74	N/A
6	33.7	-2.4	326	75	N/A
7	31.2	-2.5	334	76	N/A
8	28.9	-2.3	332	76	N/A
9	47.5	18.6	330	76	N/A
10	45.2	-2.3	328	76	N/A
11	42.6	-2.6	333	75	N/A
12	40.3	-2.3	331	74	N/A
13	38.0	-2.3	329	73	N/A
14	35.6	-2.4	331	72	N/A
15	33.1	-2.5	328	72	N/A
16	30.8	-2.3	326	72	N/A
17	28.3	-2.5	329	71	N/A
18	25.8	-2.5	334	71	N/A
19	23.5	-2.3	335	70	N/A
20	21.0	-2.5	329	70	N/A
21	18.7	-2.3	331	70	N/A
22	16.5	-2.2	330	69	N/A
23	13.8	-2.7	334	68	N/A
24	48.3	34.5	337	69	N/A
25	45.7	-2.6	335	69	N/A
26	43.4	-2.3	328	70	N/A
27	41.2	-2.2	332	70	N/A
28	38.6	-2.6	336	70	N/A
29	36.1	-2.5	331	71	N/A
30	33.5	-2.6	339	73	N/A
31	31.2	-2.3	333	74	N/A
32	29.0	-2.2	329	74	N/A
33	47.9	18.9	331	75	N/A
34	45.4	-2.5	334	75	N/A
35	42.8	-2.6	335	75	N/A
36	40.2	-2.6	338	76	N/A
37	37.7	-2.5	332	75	N/A
38	35.3	-2.4	329	75	N/A
39	32.9	-2.4	330	73	N/A
40	30.4	-2.5	333	73	N/A
41	28.1	-2.3	327	72	N/A
42	25.9	-2.2	323	71	N/A
43	23.5	-2.4	325	71	N/A
44	21.2	-2.3	331	71	N/A
45	18.7	-2.5	334	70	N/A
46	16.1	-2.6	339	69	N/A
47	30.2	14.1	337	69	N/A
48	27.6	-2.6	340	70	N/A
49	25.2	-2.4	336	70	N/A
50	22.9	-2.3	332	71	N/A

Signature/Date:

A note on the test data – Testing was performed in accordance with the ATM included in this appendix, turning off the sampling system between burn category transitions. In order to make the calculation sheet work for determining burn rate and efficiency, the “sampling off” portions of the test were snipped out of the data and the scale weight data was edited to linearize the weight loss over the course of the “sampling on” portions of the test. The complete, unedited, raw data file for the test is included in this file for reference.

Equations and Sample Calculations – ASTM E2779 & E2515

Client: United States Stove Company
Model: SP2047
Tracking #: 0013
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_{Bdb} – Weight of test fuel burned during test run, dry basis, kg

M_{BSidb} – Weight of test fuel burned during test run segment *i* , dry basis, kg

BR – Average dry burn rate over full integrated test run, kg/hr

BR_{Si} – Average dry burn rate over test run segment *i* , kg/hr

V_s – Average gas velocity in the dilution tunnel, ft/sec

Q_{sd} – Average gas flow rate in dilution tunnel, dscf/hr

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

m_n – Total Particulate Matter Collected, mg

C_s - Concentration of particulate matter in tunnel gas, dry basis, corrected to STP, g/dscf

E_T – Total Particulate Emissions, g

PR - Proportional Rate Variation

PM_R – Average particulate emissions for full integrated test run, g/hr

PM_F – Average particulate emission factor for full integrated test run, g/dry kg of fuel burned

M_{Bdb} – Weight of test fuel burned during test run, dry basis, kg
ASTM E2779 equation (1)

$$M_{Bdb} = (M_{Swb} - M_{Ewb})(100/(100 + FM))$$

Where,

FM = average fuel moisture of test fuel, % dry basis
M_{Swb} = weight of test fuel in hopper at start of test run, wet basis, kg
M_{Ewb} = weight of test fuel in hopper at end of test run, wet basis, kg

Sample Calculation:

FM = 6.7 %
M_{Swb} = 19.7 lbs
M_{Ewb} = 0.0 lbs
0.4536 = Conversion factor from lbs to kg

M_{Bdb} = [(19.7 x 0.4536) - (0.0 x 0.4536)] (100/(100 + 6.7)

M_{Bdb} = **8.37** kg

M_{BSidb} – Weight of test fuel burned during test run segment *i* , dry basis, kg
ASTM E2779 equation (2)

$$M_{BSidb} = (MS_{Siwb} - M_{ESiwb})(100/(100 + FM))$$

Where,

M_{SSiwb} = weight of test fuel in hopper at start of test run segment *i* , wet basis, kg

M_{ESiwb} = weight of test fuel in hopper at end of test run segment *i* , wet basis, kg

Sample Calculation (from medium burn rate segment):

FM = 6.7 %

M_{SSiwb} = 13.8 lbs

M_{ESiwb} = 8.1 lbs

0.4536 = Conversion factor from lbs to kg

M_{BSidb} = [(13.8 x 0.4536) - (8.1 x 0.4536)] (100/(100 + 7)

M_{BSidb} = **2.42** kg

BR – Average dry burn rate over full integrated test run, kg/hr
ASTM E2779 equation (3)

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

Where,

θ = Total length of full integrated test run, min

Sample Calculation:

M_{Bdb} = 8.37 kg
θ = 360 min

$$BR = \frac{60 \times 8.37}{360}$$

BR = **1.40** kg/hr

BR_{Si} – Average dry burn rate over test run segment *i* , kg/hr
ASTM E2779 equation (4)

$$BR_{Si} = \frac{60\ M_{BSidb}}{\theta_{Si}}$$

Where,

θ_{Si} = Total length of test run segment *i* , min

Sample Calculation (from medium burn rate segment):

M_{BSidb} = 2.42 kg
θ = 120 min

$$BR = \frac{60 \times 2.42}{120}$$

BR = **1.21** kg/hr

V_s – Average gas velocity in the dilution tunnel, ft/sec
ASTM E2515 equations (9)

$$V_s = F_p \times K_p \times C_P \times \left(\sqrt{\Delta P}\right)_{avg} \times \sqrt{\frac{T_s}{P_s \times M_s}}$$

Where:

F_p = Adjustment factor for center of tunnel pitot tube placement, Fp = $\frac{V_{strav}}{V_{scent}}$, 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:

$$Fp = \frac{15.03}{15.46} = 0.972$$

$$V_s = 0.972 \times 85.49 \times 0.99 \times 0.224 \times \left(\frac{100.0 + 460}{\left(30.00 + \frac{-0.17}{13.6}\right) \times 28.78} \right)^{1/2}$$

V_s = **14.82** 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)

$$Q_{sd} = 3600 \times (1 - B_{ws}) \times v_s \times A \times \frac{T_{std}}{T_s} \times \frac{P_s}{P_{std}}$$

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	=	Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
P_{std}	=	Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 14.82 \times 0.1963 \times \frac{528}{100.0 + 460} \times \frac{30 + \frac{-0.17}{13.6}}{29.92}$$

Q_{sd} = **9699.6** dscf/hr

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

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

Where:

K_1	=	17.64 °R/in. Hg
V_m	=	Volume of gas sample measured at the dry gas meter, dcf
Y	=	Dry gas meter calibration factor, dimensionless
P_{bar}	=	Barometric pressure at the testing site, in. Hg
ΔH	=	Average pressure differential across the orifice meter, in. H_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train A:

$$V_{m(std)} = 17.64 \times 53.238 \times 1.002 \times \frac{\left(30 + \frac{2.21}{13.6}\right)}{(74.6 + 460)}$$

$V_{m(std)}$ = **53.089** dscf

Using equation for Train B:

$$V_{m(std)} = 17.64 \times 53.095 \times 0.997 \times \frac{\left(30.00 + \frac{2.25}{13.6}\right)}{(88.0 + 460)}$$

$V_{m(std)}$ = **51.405** dscf

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 46.77 \times 0.999 \times \frac{\left(\frac{30}{} + \frac{0.00}{13.6}\right)}{(68.2 + 460)}$$

$V_{m(std)}$ = **46.814** 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 + 0.2 + 0.0

m_n = 0.2 mg

Using equation for Train A (remainder):

m_n = 0.2 + 1.5 + 0.3

m_n = 2.0 mg

Train A Aggregate = **2.2** mg

Using equation for Train B:

m_n = 0.2 + 1.5 + 0.5

m_n = **2.2** mg

C_s - Concentration of particulate matter in tunnel gas, dry basis, corrected to standard conditions, 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 A:

$$C_s = 0.001 \times \frac{2.2}{53.09}$$

C_s = **0.00004** g/dscf

For Train B:

$$C_s = 0.001 \times \frac{2.2}{51.40}$$

C_s = **0.00004** g/dscf

For Ambient Train

$$C_r = 0.001 \times \frac{0.0}{46.81}$$

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 A

E_T = (0.000041 - 0.000000) x 9699.6 x 360 /60

E_T = 2.41 g

For Train B

E_T = (0.000043 - 0.000000) x 9699.6 x 360 /60

E_T = 2.49 g

Average

E = 2.45 g

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

7.5% of the average =	0.18
Train A difference =	0.04
Train B difference =	0.04

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 A):

$$PR = \left(\frac{360 \times 0.115 \times 14.82 \times (74.6 + 460) \times (\#\#\#\# + 460)}{1 \times 53.238 \times 15.03 \times (100.0 + 460) \times (67.0 + 460)} \right) \times 100$$

PR = 80 %

PM_R – Average particulate emissions for full integrated test run, g/hr
ASTM E2779 equation (5)

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

Where,

E_T = Total particulate emissions, grams

θ = Total length of full integrated test run, min

Sample Calculation:

E_T (Dual train average) = 2.45 g

θ = 360 min

$PM_R = 60 \times (2.45 / 360)$

PM_R = **0.41** g/hr

PM_F – Average particulate emission factor for full integrated test run, g/dry kg of fuel burned
ASTM E2779 equation (6)

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

Where,

E_T = Total particulate emissions, grams

M_{Bdb} = Weight of test fuel burned during test run, dry basis, kg

Sample Calculation:

E_T (Dual train average) = 2.45 g

M_{Bdb} = 8.37 kg

PM_F = 2.45 / 8.37)

PM_F = **0.29** g/kg

Twin Ports Testing, Inc.
1301 North 3rd Street
Superior, WI 54880
p: 715-392-7114
p: 800-373-2562
f: 715-392-7163
www.twinportstesting.com

Analytical Test Report

Report No: USR:W218-1164-01
Issue No: 1

Client: PFS-TECO
11785 SE Hwy 212
Clackamas, OR 97015
Attention: Sebastian Button

PO No:

Signed: Katy Jahr
Katy Jahr
Chemistry Lab Supervisor
Date of Issue: 12/17/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample Log No:	W218-1164-01	**Sample Date:**	
Sample Designation:	purHeat 12/6/2018	**Sample Time:**	
Sample Recognized As:	Wood Pellets	**Arrival Date:**	12/10/2018

Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		7.19
Ash	ASTM D1102	wt. %	0.53	0.49
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.007	0.006
SO_2	Calculated	lb/mmbtu		0.016
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.27	16.78
Net Cal. Value at Const. Pressure	ISO 1928	J/g	18270	16782
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	19578	18171
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8418	7813
Carbon	ASTM D5373	wt. %	49.40	45.85
Hydrogen*	ASTM D5373	wt. %	6.01	5.57
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen*	ASTM D3176	wt. %	> 43.86	> 40.71
Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft^3		
Fines (Less than 1/8")	TPT CH-P-06	wt.%		
Durability Index	Kansas State	PDI		
Sample Above 1.50"	TPT CH-P-06	wt.%		
Maximum Length (Single Pellet)	TPT CH-P-06	inch		
Diameter, Range	TPT CH-P-05	inch		to
Diameter, Average	TPT CH-P-05	inch		
Stated Bag Weight	TPT CH-P-01	lbs		
Actual Bag Weight	TPT CH-P-01	lbs		

*Note: As received values do not include hydrogen and oxygen in the total moisture.

Comments

PELLET TEST DATA PACKET
ASTM E2779/E2515

Run 1 Data Summary

Client: United States Stove Company
Model: SP2047
Job #: 18-438
Tracking #: 0013
Test Date: 12/6/2018

12/17/2018

Techician Signature Date

TEST RESULTS - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

Burn Rate Summary	
High Burn Rate (dry kg/hr)	2.51
Medium Burn Rate (dry kg/hr)	1.21
Low Burn Rate (dry kg/hr)	1.15
Overall Burn Rate (dry kg/hr)	1.40

48.3% of High Burn Rate
45.8% of High Burn Rate

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft^3)	46.771	53.238	53.095	8.816
Average Gas Velocity in Dilution Tunnel (ft/sec)	14.8			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	9699.6			
Average Gas Meter Temperature (°F)	68.2	74.6	88.0	68.9
Total Sample Volume (dscf)	46.814	53.089	51.405	8.887
Average Tunnel Temperature (°F)	100.0			
Total Time of Test (min)	360			
Total Particulate Catch (mg)	0.0	2.2	2.2	0.2
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0000414	0.0000428	0.0000225
Total PM Emissions (g)	0.00	2.41	2.49	0.22
Particulate Emission Rate (g/hr)	0.00	0.40	0.42	0.22
Emissions Factor (g/kg)	-	0.29	0.30	0.09
Difference from Average Total Particulate Emissions (g)	-	0.04	0.04	-
Difference from Average Emissions Factor (g/kg)	-	0.00	0.00	-

Final Average Results	
Total Particulate Emissions (g)	2.45
Particulate Emission Rate (g/hr)	0.41
Emissions Factor (g/kg)	0.29
HHV Efficiency (%)	74.6%
LHV Efficiency (%)	79.9%
CO Emissions (g/min)	0.36

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	<90 °F	88	OK
Face Velocity	< 30 ft/min	8.2	OK
Leakage Rate	Less than 4% of average sample rate	0.001 cfm	OK
Ambient Temp	55-90 °F	Min: 62 / Max: 70	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
Medium Burn Rate	< 50% of High	48.3%	OK

Overall Pellet Test Efficiency Results

Manufacturer: United States Stove Company
Model: SP2047
Date: 12/06/18
Run: 1
Control #: 18-438
Test Duration: 360
Output Category: Integrated

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	74.6%	79.9%
Combustion Efficiency	99.3%	99.3%
Heat Transfer Efficiency	75.1%	80.4%

Output Rate (kJ/h)	20,387	19,339	**(Btu/h)**
Burn Rate (kg/h)	1.40	3.08	**(lb/h)**
Input (kJ/h)	27,334	25,929	**(Btu/h)**

Test Load Weight (dry kg)	8.38	18.46	**dry lb**
MC wet (%)	6.28		
MC dry (%)	6.70		
Particulate (g)	2.45		
CO (g)	128		
Test Duration (h)	6.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.02	1.05
g/kg Dry Fuel	0.29	15.28
g/h	0.41	21.33
g/min	0.01	0.36
lb/MM Btu Output	0.05	2.43

Air/Fuel Ratio (A/F)	14.65

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

Max Burn Rate Segment Efficiency Results

Manufacturer: United States Stove Company
Model: SP2047
Date: 12/06/18
Run: 1
Control #: 18-438
Test Duration: 60
Output Category: Maximum

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	72.3%	77.4%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	72.7%	77.8%

Output Rate (kJ/h)	35,509	33,684	**(Btu/h)**
Burn Rate (kg/h)	2.51	5.53	**(lb/h)**
Input (kJ/h)	49,118	46,594	**(Btu/h)**

Test Load Weight (dry kg)	2.51	5.53	**dry lb**
MC wet (%)	6.28		
MC dry (%)	6.70		
Particulate (g)	N/A		
CO (g)	7		
Test Duration (h)	1.00		

Emissions	**Particulate**	**CO**
g/MJ Output	N/A	0.20
g/kg Dry Fuel	N/A	2.86
g/h	N/A	7.18
g/min	N/A	0.12
lb/MM Btu Output	N/A	0.47

Air/Fuel Ratio (A/F)	10.56

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

Medium Burn Rate Segment Efficiency Results

Manufacturer: United States Stove Company
Model: SP2047
Date: 12/06/18
Run: 1
Control #: 18-438
Test Duration: 120
Output Category: Medium

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	75.0%	80.3%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	75.3%	80.7%

Output Rate (kJ/h)	17,785	16,871	**(Btu/h)**
Burn Rate (kg/h)	1.21	2.67	**(lb/h)**
Input (kJ/h)	23,727	22,507	**(Btu/h)**

Test Load Weight (dry kg)	2.42	5.34	**dry lb**
MC wet (%)	6.28		
MC dry (%)	6.70		
Particulate (g)	N/A		
CO (g)	30		
Test Duration (h)	2.00		

Emissions	**Particulate**	**CO**
g/MJ Output	N/A	0.83
g/kg Dry Fuel	N/A	12.18
g/h	N/A	14.76
g/min	N/A	0.25
lb/MM Btu Output	N/A	1.93

Air/Fuel Ratio (A/F)	14.78

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

Minimum Burn Rate Segment Efficiency Results

Manufacturer: United States Stove Company
Model: SP2047
Date: 12/06/18
Run: 1
Control #: 18-438
Test Duration: 180
Output Category: Minimum

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	75.2%	80.5%
Combustion Efficiency	98.6%	98.6%
Heat Transfer Efficiency	76.2%	81.6%

Output Rate (kJ/h)	16,898	16,030	**(Btu/h)**
Burn Rate (kg/h)	1.15	2.53	**(lb/h)**
Input (kJ/h)	22,478	21,323	**(Btu/h)**

Test Load Weight (dry kg)	3.44	7.59	**dry lb**
MC wet (%)	6.28		
MC dry (%)	6.70		
Particulate (g)	N/A		
CO (g)	89		
Test Duration (h)	3.00		

Emissions	Particulate	CO
g/MJ Output	N/A	1.75
g/kg Dry Fuel	N/A	25.79
g/h	N/A	29.61
g/min	N/A	0.49
lb/MM Btu Output	N/A	4.07

Air/Fuel Ratio (A/F)	16.71

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

DILUTION TUNNEL & MISC. DATA - ASTM E2779 / E2515

Client:	United States Stove Company	Job #:	18-438
Model:	SP2047	Tracking #:	0013
Run #:	1	Technician:	SJB
Test Start Time:	10:03	Date:	12/6/2018

High Burn End Time (min):	60
Medium Burn End Time (min):	180
Total Sampling Time (min):	360
Recording Interval (min):	1

Meter Box γ Factor:	1.002	(A)
Meter Box γ Factor:	0.997	(B)
Meter Box γ Factor:	0.999	(Ambient)

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	30.01	29.99	30.00
Relative Humidity (%)	19.1	12.1	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	

Ambient Sample Volume: 46.771 ft^3

Induced Draft Check (in. H_2O):	0
Smoke Capture Check (%):	100%
Date Flue Pipe Last Cleaned:	12/6/2018

Sample Train Post-Test Leak Checks

(A)	0.001	cfm @	-15	in. Hg
(B)	0.000	cfm @	-13	in. Hg
(Ambient)	0.002	cfm @	-14	in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H_2O)	Temp (°F)
1	0.044	116
2	0.052	116
3	0.054	116
4	0.042	116
5	0.042	116
6	0.050	116
7	0.048	116
8	0.044	116
Center	0.050	116

Static Pressure: -0.165 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}:	15.03	ft/sec
V_{scent}:	15.46	ft/sec
F_p:	0.972	[ratio]
Initial Tunnel Flow:	158.8	scf/min

TEST FUEL PROPERTIES

Default Fuel Values

Fuel Type:	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

Actual Fuel Used Properties

Pellet Brand:	purHeat
Pellet Fuel Grade:	PFI Premium
HHV (kJ/kg)	19,578
%C	49.4
%H	6.01
%O	44.06
%Ash	0.53
MC (%DB)	6.70

PELLET STOVE PREBURN DATA - ASTM E2779

Client: United States Stove Company
Job #: 18-438
Model: SP2047
Tracking #: 0013
Run #: 1
Technician: SJB
Date: 12/6/2018

Recording Interval (min): 1
Run Time (min): 60

		Average:	-0.075	525	59
Elapsed Time (min)	Scale Reading (lbs)	Weight Change (lbs)	Flue Draft (in H_2O)	Flue (°F)	Ambient (°F)
0	77.0	-	-0.047	238	58
1	76.8	-0.2	-0.028	255	58
2	76.9	0.1	-0.054	269	58
3	76.8	-0.1	-0.042	283	58
4	76.8	0	-0.049	296	58
5	76.6	-0.2	-0.041	309	58
6	76.6	0	-0.037	320	58
7	76.4	-0.2	-0.053	336	59
8	76.4	0	-0.065	348	59
9	76.4	0	-0.060	362	59
10	76.3	-0.1	-0.052	376	59
11	76.1	-0.2	-0.053	393	59
12	76.0	-0.1	-0.054	389	59
13	76.0	0	-0.069	390	59
14	75.9	-0.1	-0.057	395	60
15	75.9	0	-0.058	402	60
16	75.8	-0.1	-0.060	412	60
17	75.7	-0.1	-0.071	421	59
18	75.6	-0.1	-0.061	428	59
19	75.6	0	-0.073	440	59
20	75.4	-0.2	-0.071	455	58
21	75.4	0	-0.080	474	58
22	75.3	-0.1	-0.071	493	58
23	75.2	-0.1	-0.085	512	58
24	75.1	-0.1	-0.074	526	58
25	74.9	-0.2	-0.086	546	58
26	74.8	-0.1	-0.078	552	59
27	74.7	-0.1	-0.083	552	59
28	74.5	-0.2	-0.077	563	59
29	74.4	-0.1	-0.067	572	59
30	74.4	0	-0.083	584	59
31	100.0	25.6	-0.089	598	59
32	74.1	-25.9	-0.094	614	59
33	74.0	-0.1	-0.078	608	59
34	74.0	0	-0.084	606	59
35	73.9	-0.1	-0.089	611	59
36	73.7	-0.2	-0.090	620	59
37	73.6	-0.1	-0.081	624	59
38	73.5	-0.1	-0.093	633	59
39	73.3	-0.2	-0.095	630	59
40	73.3	0	-0.081	627	59
41	73.2	-0.1	-0.088	645	59
42	72.9	-0.3	-0.079	645	59
43	72.9	0	-0.093	646	59
44	72.8	-0.1	-0.088	660	59
45	72.7	-0.1	-0.082	651	60
46	72.6	-0.1	-0.091	646	59

PELLET STOVE PREBURN DATA - ASTM E2779

Client: United States Stove Company
Job #: 18-438
Model: SP2047
Tracking #: 0013
Run #: 1
Technician: SJB
Date: 12/6/2018

47	72.4	-0.2	-0.091	652	59
48	72.4	0	-0.091	658	59
49	72.3	-0.1	-0.092	651	59
50	71.2	-1.1	-0.076	651	59
51	71.2	0	-0.074	651	59
52	70.9	-0.3	-0.081	653	59
53	70.9	0	-0.095	651	59
54	70.7	-0.2	-0.087	655	59
55	70.6	-0.1	-0.090	654	59
56	70.4	-0.2	-0.105	651	59
57	70.4	0	-0.082	647	59
58	70.3	-0.1	-0.087	645	59
59	70.2	-0.1	-0.085	638	59
60	70.1	-0.1	-0.088	636	59

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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		0.050	0.01	67	-0.16		19.7		115	635	84	65
1	0.115	0.115	0.050	2.41	67	-1.34	80	19.6	-0.1	116	633	82	66
2	0.264	0.149	0.050	2.37	67	-2.4	104	19.5	-0.1	116	638	82	66
3	0.415	0.151	0.050	2.38	67	-0.07	105	19.2	-0.3	116	646	84	66
4	0.562	0.147	0.050	2.36	67	-2.48	102	19.2	0.0	116	642	86	66
5	0.712	0.150	0.050	2.34	67	-2.58	104	19.1	-0.1	117	645	86	66
6	0.858	0.146	0.050	2.34	67	-2.55	102	19.0	-0.1	117	643	83	66
7	1.008	0.150	0.050	2.32	67	-0.76	104	18.9	-0.1	116	639	83	66
8	1.154	0.146	0.050	2.36	67	-0.05	102	18.8	-0.1	116	643	84	66
9	1.304	0.150	0.050	2.34	67	0	104	18.7	-0.1	117	647	85	67
10	1.448	0.144	0.050	2.32	67	-2.52	100	18.6	-0.1	117	644	85	67
11	1.598	0.150	0.050	2.33	68	-1.02	104	18.5	-0.1	117	639	83	66
12	1.743	0.145	0.050	2.33	68	-2.18	101	18.4	-0.1	116	642	83	66
13	1.892	0.149	0.050	2.31	68	-2.45	104	18.2	-0.2	117	645	84	67
14	2.037	0.145	0.050	2.30	69	-2.59	100	18.2	0.0	116	637	86	66
15	2.186	0.149	0.050	2.30	68	-0.13	104	18.1	-0.1	117	640	85	67
16	2.330	0.144	0.050	2.29	68	-0.53	100	18.0	-0.1	117	637	83	67
17	2.480	0.150	0.050	2.30	68	0	104	17.9	-0.1	117	638	82	67
18	2.624	0.144	0.050	2.28	68	-0.34	100	17.8	-0.1	117	633	83	67
19	2.774	0.150	0.050	2.28	68	0	104	17.7	-0.1	117	628	85	67
20	2.918	0.144	0.050	2.28	70	-2.41	100	17.6	-0.1	117	634	86	67
21	3.068	0.150	0.050	2.28	69	0	104	17.5	-0.1	117	639	84	67
22	3.212	0.144	0.050	2.29	68	0	100	17.3	-0.2	117	636	83	67
23	3.362	0.150	0.050	2.29	69	-1.51	104	17.2	-0.1	117	636	84	67
24	3.506	0.144	0.050	2.28	68	-0.25	100	17.2	0.0	118	636	85	67
25	3.656	0.150	0.050	2.27	69	-1.48	104	17.1	-0.1	117	631	85	67
26	3.800	0.144	0.050	2.27	69	-0.25	100	17.0	-0.1	117	625	83	67
27	3.950	0.150	0.050	2.26	70	-0.02	104	16.8	-0.2	116	626	83	65
28	4.093	0.143	0.050	2.26	69	-0.24	99	16.7	-0.1	116	629	84	64
29	4.244	0.151	0.050	2.26	69	-2.54	105	16.6	-0.1	115	630	86	63
30	4.387	0.143	0.050	2.28	69	0	99	16.5	-0.1	114	629	84	62
31	4.538	0.151	0.050	2.27	69	-2.52	104	16.5	0.0	114	625	83	63
32	4.682	0.144	0.050	2.26	69	-0.48	100	16.3	-0.2	114	622	83	64

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	4.832	0.150	0.050	2.26	69	0	104	16.2	-0.1	114	621	84	65
34	4.976	0.144	0.050	2.27	70	-1.8	100	16.2	0.0	115	622	86	65
35	5.127	0.151	0.050	2.26	69	0	105	16.1	-0.1	115	624	85	66
36	5.272	0.145	0.050	2.25	69	-0.42	100	16.0	-0.1	116	620	83	66
37	5.422	0.150	0.050	2.25	69	-2.54	104	15.9	-0.1	116	617	83	66
38	5.567	0.145	0.050	2.27	70	0	100	15.8	-0.1	116	618	85	66
39	5.717	0.150	0.050	2.24	70	-2.7	104	15.7	-0.1	116	610	86	66
40	5.861	0.144	0.050	2.26	69	0	100	15.6	-0.1	115	609	85	67
41	6.012	0.151	0.050	2.24	69	-0.17	105	15.5	-0.1	116	613	83	67
42	6.157	0.145	0.050	2.26	69	-2.16	100	15.4	-0.1	116	612	83	67
43	6.307	0.150	0.050	2.27	70	-2.22	104	15.3	-0.1	115	610	85	67
44	6.452	0.145	0.050	2.27	69	0	100	15.1	-0.2	115	605	86	66
45	6.602	0.150	0.050	2.25	70	-0.02	104	15.0	-0.1	115	605	85	67
46	6.747	0.145	0.050	2.24	70	-1.49	100	15.0	0.0	115	605	83	67
47	6.897	0.150	0.050	2.25	71	-0.86	103	14.9	-0.1	115	601	84	67
48	7.042	0.145	0.050	2.23	70	-2.53	100	14.8	-0.1	116	601	86	67
49	7.192	0.150	0.050	2.25	70	0	104	14.7	-0.1	116	600	86	67
50	7.338	0.146	0.050	2.25	70	-0.37	101	14.5	-0.2	116	597	84	67
51	7.487	0.149	0.050	2.25	70	-0.98	103	14.6	0.1	115	592	83	67
52	7.633	0.146	0.050	2.26	70	-2.01	101	14.5	-0.1	115	591	84	67
53	7.782	0.149	0.050	2.26	70	-2.11	103	14.4	-0.1	115	593	86	67
54	7.928	0.146	0.050	2.24	70	-2.27	101	14.3	-0.1	115	592	86	67
55	8.077	0.149	0.050	2.24	70	-0.93	103	14.2	-0.1	115	586	84	68
56	8.224	0.147	0.050	2.25	71	0	101	14.0	-0.2	114	585	83	67
57	8.373	0.149	0.050	2.24	71	-1.79	103	14.0	0.0	114	583	84	67
58	8.519	0.146	0.050	2.25	71	0	101	13.9	-0.1	114	582	86	67
59	8.667	0.148	0.050	2.25	71	-2.4	102	13.9	0.0	113	580	86	67
60	8.816	0.149	0.050	2.23	71	-1	103	13.8	-0.1	114	583	84	67
61	8.953	0.137	0.050	2.40	72	0	93	13.8	0.0	96	430	83	66
62	9.101	0.148	0.050	2.39	71	-2.49	100	13.7	-0.1	97	429	83	65
63	9.253	0.152	0.050	2.38	71	0	103	13.6	-0.1	97	429	84	66
64	9.404	0.151	0.050	2.37	71	-0.18	103	13.5	-0.1	97	428	86	66
65	9.555	0.151	0.050	2.37	70	-0.08	103	13.5	0.0	97	429	87	66

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	9.707	0.152	0.050	2.38	71	0	103	13.4	-0.1	97	429	84	66
67	9.855	0.148	0.050	2.35	72	0	100	13.4	0.0	97	428	83	66
68	10.007	0.152	0.050	2.35	71	0	103	13.3	-0.1	97	428	83	66
69	10.154	0.147	0.050	2.34	72	-1.15	100	13.3	0.0	97	426	84	66
70	10.306	0.152	0.050	2.34	71	0	103	13.2	-0.1	97	426	86	66
71	10.452	0.146	0.050	2.32	71	-0.02	99	13.1	-0.1	97	426	85	67
72	10.606	0.154	0.050	2.31	72	-0.16	104	13.1	0.0	97	424	83	66
73	10.752	0.146	0.050	2.31	70	-0.34	99	13.0	-0.1	97	427	82	66
74	10.904	0.152	0.050	2.33	71	0	103	13.0	0.0	97	427	83	67
75	11.052	0.148	0.050	2.30	71	0	100	12.9	-0.1	97	430	85	66
76	11.202	0.150	0.050	2.32	71	-0.23	102	12.9	0.0	97	428	86	66
77	11.349	0.147	0.050	2.29	71	-0.47	100	12.8	-0.1	98	429	84	67
78	11.500	0.151	0.050	2.30	71	-2.42	103	12.7	-0.1	97	432	83	67
79	11.648	0.148	0.050	2.32	71	-0.05	100	12.7	0.0	97	432	83	67
80	11.797	0.149	0.050	2.30	71	-1.67	101	12.6	-0.1	98	431	84	67
81	11.948	0.151	0.050	2.29	71	0	103	12.6	0.0	97	428	86	67
82	12.096	0.148	0.050	2.30	71	-2.36	100	12.5	-0.1	97	429	85	67
83	12.247	0.151	0.050	2.30	71	0	103	12.5	0.0	97	424	83	66
84	12.394	0.147	0.050	2.28	71	-2.3	100	12.4	-0.1	97	428	82	67
85	12.546	0.152	0.050	2.29	73	0	103	12.4	0.0	97	427	83	67
86	12.692	0.146	0.050	2.30	72	-2.52	99	12.3	-0.1	97	423	85	66
87	12.843	0.151	0.050	2.26	72	-0.44	102	12.3	0.0	98	425	87	67
88	12.989	0.146	0.050	2.30	72	-1.72	99	12.2	-0.1	97	426	85	67
89	13.141	0.152	0.050	2.29	72	-2.38	103	12.2	0.0	97	428	83	67
90	13.287	0.146	0.050	2.29	72	-0.04	99	12.1	-0.1	97	426	82	67
91	13.440	0.153	0.050	2.28	72	-2.5	104	12.1	0.0	98	428	84	67
92	13.586	0.146	0.050	2.28	72	0	99	12.0	-0.1	98	427	85	67
93	13.738	0.152	0.050	2.29	72	-2.35	103	12.0	0.0	98	428	86	67
94	13.885	0.147	0.050	2.27	72	-1.39	100	11.9	-0.1	98	427	83	67
95	14.036	0.151	0.050	2.29	72	-0.03	102	11.9	0.0	97	428	82	67
96	14.183	0.147	0.050	2.30	72	-0.22	100	11.9	0.0	97	425	83	67
97	14.333	0.150	0.050	2.29	72	-0.03	102	11.8	-0.1	97	424	85	67
98	14.482	0.149	0.050	2.28	73	0	101	11.8	0.0	97	425	86	67

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	14.631	0.149	0.050	2.28	72	-0.22	101	11.7	-0.1	97	423	84	67
100	14.781	0.150	0.050	2.28	73	-0.34	102	11.7	0.0	98	423	82	67
101	14.930	0.149	0.050	2.28	73	0	101	11.6	-0.1	98	426	82	67
102	15.081	0.151	0.050	2.27	73	-2.28	102	11.6	0.0	95	424	84	67
103	15.229	0.148	0.050	2.25	73	-0.17	100	11.6	0.0	96	425	86	68
104	15.381	0.152	0.050	2.28	72	-0.57	103	11.5	-0.1	97	428	85	68
105	15.527	0.146	0.050	2.29	73	-2.5	99	11.5	0.0	96	426	83	66
106	15.678	0.151	0.050	2.27	74	-0.09	102	11.5	0.0	96	429	83	66
107	15.825	0.147	0.050	2.28	73	-0.03	99	11.4	-0.1	96	428	84	67
108	15.977	0.152	0.050	2.26	72	-1.29	103	11.4	0.0	96	429	86	67
109	16.124	0.147	0.050	2.28	74	-0.2	99	11.4	0.0	98	430	87	68
110	16.276	0.152	0.050	2.26	74	0	103	11.3	-0.1	99	432	85	67
111	16.423	0.147	0.050	2.27	73	-2.47	100	11.3	0.0	99	432	83	68
112	16.575	0.152	0.050	2.25	74	-0.19	103	11.2	-0.1	100	435	84	68
113	16.722	0.147	0.050	2.26	73	-0.98	100	11.2	0.0	100	438	85	68
114	16.872	0.150	0.050	2.27	73	-0.72	102	11.2	0.0	100	434	88	67
115	17.020	0.148	0.050	2.25	73	0	100	11.1	-0.1	101	436	86	67
116	17.170	0.150	0.050	2.27	74	-0.89	102	11.1	0.0	101	437	84	67
117	17.318	0.148	0.050	2.26	73	-1.21	100	11.1	0.0	100	436	83	67
118	17.468	0.150	0.050	2.25	74	-2.13	102	11.1	0.0	100	437	84	67
119	17.618	0.150	0.050	2.25	73	-1.54	102	11.0	-0.1	100	433	86	67
120	17.767	0.149	0.050	2.25	74	-1.03	101	11.0	0.0	100	432	87	67
121	17.918	0.151	0.050	2.26	74	-1.4	102	10.9	-0.1	100	433	85	68
122	18.065	0.147	0.050	2.26	75	-0.6	99	10.9	0.0	100	432	83	68
123	18.216	0.151	0.050	2.26	74	-0.45	102	10.8	-0.1	99	431	83	68
124	18.362	0.146	0.050	2.24	75	-0.28	99	10.7	-0.1	100	431	84	67
125	18.514	0.152	0.050	2.27	74	-0.35	103	10.7	0.0	98	429	86	68
126	18.660	0.146	0.050	2.26	74	0	99	10.6	-0.1	99	429	85	68
127	18.813	0.153	0.050	2.25	74	-0.89	104	10.6	0.0	100	426	83	68
128	18.960	0.147	0.050	2.25	74	-2.55	100	10.5	-0.1	100	422	83	68
129	19.112	0.152	0.050	2.25	75	-0.98	103	10.4	-0.1	100	424	85	68
130	19.259	0.147	0.050	2.25	74	-1.5	100	10.3	-0.1	100	428	87	68
131	19.411	0.152	0.050	2.26	75	-1.21	103	10.3	0.0	99	427	86	68

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	19.557	0.146	0.050	2.25	75	-1.37	99	10.2	-0.1	99	427	83	68
133	19.708	0.151	0.050	2.24	75	-0.21	102	10.1	-0.1	100	430	83	68
134	19.856	0.148	0.050	2.25	75	0	100	10.1	0.0	100	432	84	68
135	20.005	0.149	0.050	2.24	74	-0.74	101	10.0	-0.1	100	432	86	68
136	20.155	0.150	0.050	2.24	74	-2.5	102	9.9	-0.1	100	428	87	68
137	20.304	0.149	0.050	2.24	74	-2.35	101	9.9	0.0	99	426	84	68
138	20.455	0.151	0.050	2.24	74	-0.78	102	9.8	-0.1	98	426	83	69
139	20.603	0.148	0.050	2.25	75	0	100	9.7	-0.1	99	423	83	68
140	20.755	0.152	0.050	2.25	75	0	103	9.7	0.0	100	422	85	68
141	20.901	0.146	0.050	2.24	74	-2.25	99	9.6	-0.1	100	424	87	68
142	21.052	0.151	0.050	2.25	74	-1.89	102	9.5	-0.1	100	424	85	68
143	21.199	0.147	0.050	2.25	75	-2.29	99	9.5	0.0	100	424	83	68
144	21.350	0.151	0.050	2.25	75	-2.52	102	9.4	-0.1	100	422	82	68
145	21.497	0.147	0.050	2.24	75	-2.33	99	9.4	0.0	100	422	84	68
146	21.650	0.153	0.050	2.25	74	0	104	9.4	0.0	100	422	86	68
147	21.797	0.147	0.050	2.24	75	-0.98	99	9.3	-0.1	100	422	86	68
148	21.948	0.151	0.050	2.24	75	-0.52	102	9.3	0.0	99	422	84	68
149	22.096	0.148	0.050	2.25	75	-2.24	100	9.3	0.0	98	422	83	68
150	22.247	0.151	0.050	2.24	75	-0.56	102	9.2	-0.1	99	420	83	69
151	22.393	0.146	0.050	2.23	75	-0.89	99	9.2	0.0	100	422	85	69
152	22.544	0.151	0.050	2.24	75	-1.24	102	9.2	0.0	99	421	87	69
153	22.693	0.149	0.050	2.24	75	-2.46	101	9.1	-0.1	100	422	86	69
154	22.842	0.149	0.050	2.25	75	-0.52	101	9.1	0.0	100	420	84	69
155	22.993	0.151	0.050	2.24	75	-0.28	102	9.1	0.0	100	422	83	68
156	23.141	0.148	0.050	2.24	75	-0.57	100	9.0	-0.1	100	423	84	68
157	23.292	0.151	0.050	2.24	75	-1.34	102	9.0	0.0	100	423	85	69
158	23.440	0.148	0.050	2.26	75	-0.99	100	8.9	-0.1	100	422	87	69
159	23.591	0.151	0.050	2.24	75	-2.52	102	8.9	0.0	100	423	85	69
160	23.737	0.146	0.050	2.24	75	-1.63	99	8.9	0.0	100	423	83	69
161	23.889	0.152	0.050	2.24	75	-0.48	103	8.8	-0.1	100	424	83	68
162	24.035	0.146	0.050	2.24	76	-0.74	98	8.8	0.0	100	424	84	69
163	24.187	0.152	0.050	2.22	76	-0.47	103	8.7	-0.1	101	426	87	69
164	24.334	0.147	0.050	2.22	75	-2.45	99	8.7	0.0	100	425	86	69

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	24.486	0.152	0.050	2.25	75	0	103	8.6	-0.1	99	427	84	69
166	24.633	0.147	0.050	2.23	75	-0.05	99	8.6	0.0	100	425	83	69
167	24.785	0.152	0.050	2.22	75	0	103	8.6	0.0	99	426	84	69
168	24.932	0.147	0.050	2.23	75	0	99	8.5	-0.1	100	428	86	69
169	25.082	0.150	0.050	2.23	75	-2.25	101	8.5	0.0	100	428	86	68
170	25.230	0.148	0.050	2.23	75	-2.04	100	8.5	0.0	101	429	84	69
171	25.380	0.150	0.050	2.23	76	-0.23	101	8.4	-0.1	100	429	83	69
172	25.528	0.148	0.050	2.23	76	-2.45	100	8.4	0.0	100	427	83	69
173	25.678	0.150	0.050	2.22	76	-2.45	101	8.4	0.0	100	428	85	69
174	25.829	0.151	0.050	2.21	76	-2.19	102	8.3	-0.1	101	426	87	68
175	25.976	0.147	0.050	2.22	76	-2.11	99	8.3	0.0	101	426	85	69
176	26.127	0.151	0.050	2.21	76	-0.01	102	8.2	-0.1	100	425	83	69
177	26.275	0.148	0.050	2.23	76	-0.24	100	8.2	0.0	100	425	83	69
178	26.425	0.150	0.050	2.22	76	-1.73	101	8.1	-0.1	100	421	84	69
179	26.571	0.146	0.050	2.20	76	-2.22	98	8.1	0.0	98	421	86	69
180	26.724	0.153	0.050	2.21	76	-0.5	103	8.1	0.0	99	419	87	69
181	26.868	0.144	0.050	2.30	77	-1.33	97	8.0	-0.1	96	385	85	69
182	27.021	0.153	0.050	2.31	76	-1.88	103	7.9	-0.1	97	386	87	69
183	27.169	0.148	0.050	2.29	76	-2.62	100	7.8	-0.1	97	387	85	69
184	27.322	0.153	0.050	2.29	77	-1.15	103	7.8	0.0	97	390	84	69
185	27.470	0.148	0.050	2.29	76	-1.87	100	7.7	-0.1	97	387	83	69
186	27.622	0.152	0.050	2.26	76	0	102	7.7	0.0	97	385	84	69
187	27.769	0.147	0.050	2.27	77	-2.55	99	7.7	0.0	97	385	86	70
188	27.919	0.150	0.050	2.27	76	-1.76	101	7.7	0.0	97	387	86	69
189	28.067	0.148	0.050	2.28	76	-2.58	100	7.6	-0.1	97	386	84	69
190	28.217	0.150	0.050	2.26	77	-1.08	101	7.6	0.0	97	385	82	69
191	28.365	0.148	0.050	2.24	76	-1.04	100	7.5	-0.1	97	387	83	69
192	28.514	0.149	0.050	2.23	75	-0.14	100	7.4	-0.1	97	389	84	69
193	28.664	0.150	0.050	2.22	76	-2.26	101	7.4	0.0	97	390	87	69
194	28.812	0.148	0.050	2.23	75	-1.09	100	7.4	0.0	97	388	85	69
195	28.962	0.150	0.050	2.22	77	-2.51	101	7.3	-0.1	97	389	83	69
196	29.109	0.147	0.050	2.23	76	0	99	7.3	0.0	98	390	82	69
197	29.260	0.151	0.050	2.24	76	-2.69	102	7.2	-0.1	97	390	83	69

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	29.405	0.145	0.050	2.22	76	-0.45	98	7.2	0.0	97	389	86	69
199	29.556	0.151	0.050	2.23	76	-2.52	102	7.1	-0.1	97	391	86	69
200	29.701	0.145	0.050	2.22	76	-2.41	98	7.1	0.0	97	391	84	69
201	29.852	0.151	0.050	2.21	76	-2.48	101	7.0	-0.1	96	389	83	69
202	29.997	0.145	0.050	2.22	76	-2.43	97	6.9	-0.1	96	389	83	69
203	30.148	0.151	0.050	2.21	76	-0.59	101	6.9	0.0	96	387	84	69
204	30.293	0.145	0.050	2.22	76	-1.34	98	6.9	0.0	97	389	87	69
205	30.444	0.151	0.050	2.21	76	-0.52	102	6.8	-0.1	97	388	87	69
206	30.590	0.146	0.050	2.21	76	0	98	6.9	0.1	97	389	84	69
207	30.741	0.151	0.050	2.22	76	-2.56	102	6.7	-0.2	97	387	83	69
208	30.887	0.146	0.050	2.20	76	-0.74	98	6.7	0.0	97	385	83	69
209	31.038	0.151	0.050	2.21	76	-1.79	102	6.6	-0.1	97	385	84	69
210	31.183	0.145	0.050	2.21	76	-1.38	98	6.7	0.1	97	383	87	69
211	31.334	0.151	0.050	2.20	76	-0.72	102	6.4	-0.3	97	382	85	69
212	31.480	0.146	0.050	2.19	76	-2.29	98	6.5	0.1	97	382	83	69
213	31.630	0.150	0.050	2.21	76	-2.51	101	6.5	0.0	97	384	83	69
214	31.776	0.146	0.050	2.21	76	-1.46	98	6.4	-0.1	97	383	84	69
215	31.925	0.149	0.050	2.21	76	0	100	6.4	0.0	97	384	86	69
216	32.071	0.146	0.050	2.22	76	-2.58	98	6.3	-0.1	97	387	86	70
217	32.221	0.150	0.050	2.17	76	-0.49	101	6.3	0.0	97	386	84	69
218	32.368	0.147	0.050	2.19	76	-1.34	99	6.2	-0.1	96	385	82	69
219	32.517	0.149	0.050	2.21	76	0	100	6.2	0.0	97	384	83	69
220	32.664	0.147	0.050	2.19	76	-2.16	99	6.1	-0.1	97	384	85	69
221	32.812	0.148	0.050	2.18	76	-2.68	99	6.1	0.0	96	388	87	69
222	32.960	0.148	0.050	2.17	76	-2.49	99	6.0	-0.1	96	385	85	69
223	33.108	0.148	0.050	2.20	76	-1.32	99	6.0	0.0	96	389	83	69
224	33.257	0.149	0.050	2.17	77	-1.63	100	5.9	-0.1	96	388	83	70
225	33.404	0.147	0.050	2.18	76	0	99	5.9	0.0	97	389	84	69
226	33.553	0.149	0.050	2.18	76	-0.05	100	5.8	-0.1	97	387	87	70
227	33.699	0.146	0.050	2.19	77	-2.65	98	5.8	0.0	97	387	87	69
228	33.849	0.150	0.050	2.18	77	-0.39	101	5.7	-0.1	97	388	84	70
229	33.995	0.146	0.050	2.18	77	0	98	5.7	0.0	97	389	83	70
230	34.145	0.150	0.050	2.17	76	-0.64	101	5.6	-0.1	97	387	83	69

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	34.291	0.146	0.050	2.19	77	-1.96	98	5.6	0.0	97	385	85	69
232	34.441	0.150	0.050	2.19	77	-0.94	101	5.5	-0.1	97	387	87	69
233	34.586	0.145	0.050	2.17	77	0	97	5.4	-0.1	97	386	85	69
234	34.736	0.150	0.050	2.19	77	-2.61	101	5.3	-0.1	97	383	83	70
235	34.881	0.145	0.050	2.18	77	-1.92	97	5.4	0.1	97	381	83	69
236	35.031	0.150	0.050	2.18	77	-2.12	101	5.3	-0.1	97	382	84	69
237	35.176	0.145	0.050	2.19	77	0	97	5.3	0.0	97	383	86	69
238	35.327	0.151	0.050	2.18	77	-0.67	101	5.3	0.0	97	382	86	69
239	35.471	0.144	0.050	2.17	77	-2.62	97	5.2	-0.1	97	380	83	69
240	35.622	0.151	0.050	2.18	77	0	101	5.1	-0.1	97	379	83	69
241	35.766	0.144	0.050	2.17	77	0	97	5.1	0.0	97	378	84	69
242	35.917	0.151	0.050	2.17	77	-0.52	101	5.1	0.0	96	376	86	69
243	36.062	0.145	0.050	2.16	77	-0.5	97	5.0	-0.1	96	374	86	69
244	36.213	0.151	0.050	2.18	77	0	101	5.0	0.0	96	375	84	69
245	36.358	0.145	0.050	2.16	77	-2.5	97	4.9	-0.1	96	374	83	69
246	36.508	0.150	0.050	2.18	77	0	101	4.9	0.0	96	374	83	69
247	36.653	0.145	0.050	2.15	77	-0.23	97	4.8	-0.1	96	376	85	69
248	36.804	0.151	0.050	2.17	77	0	101	4.9	0.1	96	374	87	70
249	36.949	0.145	0.050	2.17	77	-0.52	97	4.7	-0.2	96	372	85	69
250	37.099	0.150	0.050	2.17	77	-2.68	101	4.7	0.0	96	373	83	69
251	37.244	0.145	0.050	2.18	77	-2.25	97	4.8	0.1	96	372	83	69
252	37.394	0.150	0.050	2.16	77	-1.21	101	4.6	-0.2	96	372	84	69
253	37.539	0.145	0.050	2.14	77	-0.49	97	4.5	-0.1	96	372	87	69
254	37.689	0.150	0.050	2.17	77	-0.41	101	4.5	0.0	95	373	85	69
255	37.834	0.145	0.050	2.16	77	-2.65	97	4.5	0.0	96	375	83	69
256	37.983	0.149	0.050	2.18	77	-0.97	100	4.4	-0.1	96	375	82	69
257	38.129	0.146	0.050	2.17	77	-1.36	98	4.4	0.0	96	379	84	69
258	38.278	0.149	0.050	2.18	77	-2.6	100	4.3	-0.1	96	378	86	69
259	38.423	0.145	0.050	2.18	77	-0.06	97	4.3	0.0	95	377	87	69
260	38.572	0.149	0.050	2.17	77	-0.03	100	4.2	-0.1	94	376	84	69
261	38.717	0.145	0.050	2.17	77	-2.49	97	4.2	0.0	95	377	83	70
262	38.866	0.149	0.050	2.15	77	-0.12	100	4.1	-0.1	95	379	83	69
263	39.013	0.147	0.050	2.17	77	-1.47	99	4.0	-0.1	96	380	85	69

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	39.161	0.148	0.050	2.17	77	-2.51	99	4.1	0.1	96	378	87	69
265	39.308	0.147	0.050	2.16	77	-2.49	99	4.0	-0.1	96	380	86	69
266	39.455	0.147	0.050	2.18	77	-2.59	99	3.9	-0.1	96	379	84	69
267	39.602	0.147	0.050	2.15	77	-0.33	99	3.9	0.0	96	381	83	70
268	39.750	0.148	0.050	2.15	77	-2.63	99	3.8	-0.1	96	382	84	69
269	39.896	0.146	0.050	2.17	77	-2.67	98	3.8	0.0	96	384	85	69
270	40.044	0.148	0.050	2.17	77	-2.52	99	3.8	0.0	96	383	87	69
271	40.191	0.147	0.050	2.16	77	-0.18	99	3.6	-0.2	96	384	85	69
272	40.339	0.148	0.050	2.15	77	-2.4	99	3.7	0.1	96	385	83	69
273	40.486	0.147	0.050	2.16	77	-0.65	99	3.6	-0.1	96	384	83	69
274	40.633	0.147	0.050	2.14	78	-0.12	98	3.6	0.0	96	382	84	70
275	40.781	0.148	0.050	2.16	77	-0.93	99	3.5	-0.1	96	384	87	69
276	40.928	0.147	0.050	2.16	77	-1.4	99	3.5	0.0	96	383	86	70
277	41.076	0.148	0.050	2.15	77	-2.73	99	3.5	0.0	96	380	84	69
278	41.222	0.146	0.050	2.15	78	-0.54	98	3.4	-0.1	96	381	82	70
279	41.370	0.148	0.050	2.13	78	-2.65	99	3.4	0.0	96	380	83	69
280	41.517	0.147	0.050	2.15	78	-0.06	98	3.3	-0.1	96	380	85	69
281	41.665	0.148	0.050	2.16	77	-2.58	99	3.3	0.0	96	382	87	70
282	41.811	0.146	0.050	2.16	77	-2.64	98	3.2	-0.1	97	383	85	69
283	41.959	0.148	0.050	2.14	77	-0.41	99	3.2	0.0	96	381	83	69
284	42.105	0.146	0.050	2.15	77	-1.42	98	3.1	-0.1	96	382	83	69
285	42.254	0.149	0.050	2.15	78	-2.65	100	3.1	0.0	96	380	84	69
286	42.399	0.145	0.050	2.14	78	-1.6	97	3.0	-0.1	95	378	87	70
287	42.548	0.149	0.050	2.14	78	-0.86	100	3.0	0.0	95	377	86	70
288	42.694	0.146	0.050	2.14	77	-0.17	98	2.9	-0.1	96	375	84	70
289	42.843	0.149	0.050	2.14	78	-0.14	100	2.9	0.0	96	374	83	69
290	42.988	0.145	0.050	2.15	78	-0.02	97	2.9	0.0	96	371	84	69
291	43.137	0.149	0.050	2.13	78	-2.28	100	2.8	-0.1	96	371	86	69
292	43.282	0.145	0.050	2.15	79	-1.8	97	2.8	0.0	96	368	86	70
293	43.431	0.149	0.050	2.17	79	-0.19	99	2.9	0.1	95	370	84	69
294	43.576	0.145	0.050	2.16	79	-0.05	97	2.7	-0.2	96	372	83	70
295	43.725	0.149	0.050	2.13	79	-2.39	100	2.7	0.0	96	372	84	70
296	43.870	0.145	0.050	2.15	79	-0.06	97	2.6	-0.1	95	368	85	69

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	44.019	0.149	0.050	2.16	79	-1.36	100	2.6	0.0	96	367	87	69
298	44.163	0.144	0.050	2.15	78	-0.13	96	2.5	-0.1	96	370	85	70
299	44.313	0.150	0.050	2.13	78	-2.47	100	2.5	0.0	95	369	83	69
300	44.457	0.144	0.050	2.14	78	-1.62	96	2.3	-0.2	95	368	83	70
301	44.606	0.149	0.050	2.15	78	0	100	2.4	0.1	95	367	84	70
302	44.750	0.144	0.050	2.16	79	-2.65	96	2.4	0.0	95	368	86	69
303	44.900	0.150	0.050	2.15	79	-0.32	100	2.3	-0.1	95	367	85	69
304	45.044	0.144	0.050	2.15	78	-0.22	96	2.3	0.0	95	365	84	69
305	45.193	0.149	0.050	2.15	78	-0.99	100	2.3	0.0	94	365	83	69
306	45.337	0.144	0.050	2.14	79	-2.63	96	2.2	-0.1	94	366	84	70
307	45.486	0.149	0.050	2.15	79	-2.65	99	2.1	-0.1	94	365	85	70
308	45.630	0.144	0.050	2.14	79	0	96	2.2	0.1	95	366	87	70
309	45.780	0.150	0.050	2.13	79	-1.53	100	2.0	-0.2	95	366	85	69
310	45.924	0.144	0.050	2.14	78	-1.57	96	2.0	0.0	96	366	83	69
311	46.073	0.149	0.050	2.16	79	-2.69	99	2.0	0.0	95	368	83	69
312	46.217	0.144	0.050	2.16	78	-2.29	96	1.9	-0.1	95	366	84	70
313	46.366	0.149	0.050	2.13	78	-2.67	100	1.8	-0.1	95	365	86	69
314	46.510	0.144	0.050	2.13	79	-0.09	96	1.8	0.0	95	365	86	69
315	46.659	0.149	0.050	2.15	78	-0.14	100	1.8	0.0	95	362	84	70
316	46.803	0.144	0.050	2.14	79	-2.51	96	1.7	-0.1	95	364	82	69
317	46.952	0.149	0.050	2.15	80	-2.7	99	1.7	0.0	95	364	83	69
318	47.096	0.144	0.050	2.14	78	-0.52	96	1.7	0.0	95	362	85	69
319	47.245	0.149	0.050	2.15	78	-0.1	100	1.6	-0.1	95	361	87	69
320	47.390	0.145	0.050	2.15	78	-1.44	97	1.6	0.0	95	363	85	69
321	47.539	0.149	0.050	2.14	78	-1.27	100	1.5	-0.1	95	363	83	70
322	47.683	0.144	0.050	2.13	77	-2.59	97	1.5	0.0	95	361	83	69
323	47.832	0.149	0.050	2.14	79	-0.09	99	1.5	0.0	95	362	84	69
324	47.976	0.144	0.050	2.13	78	-2.51	96	1.4	-0.1	94	363	86	69
325	48.125	0.149	0.050	2.11	79	-1.97	99	1.4	0.0	94	364	86	69
326	48.269	0.144	0.050	2.13	78	-0.53	96	1.3	-0.1	93	362	84	69
327	48.418	0.149	0.050	2.12	78	-2.51	100	1.3	0.0	94	359	83	69
328	48.562	0.144	0.050	2.13	78	-2.72	96	1.1	-0.2	94	358	84	69
329	48.711	0.149	0.050	2.14	78	-2.52	100	1.1	0.0	95	358	86	70

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	48.855	0.144	0.050	2.12	78	-0.72	96	1.2	0.1	94	357	87	69
331	49.004	0.149	0.050	2.13	78	-2.19	100	1.1	-0.1	94	357	85	70
332	49.148	0.144	0.050	2.13	78	-0.52	96	1.1	0.0	93	356	83	69
333	49.297	0.149	0.050	2.13	78	-0.29	99	1.1	0.0	93	355	83	70
334	49.441	0.144	0.050	2.12	78	-0.25	96	1.0	-0.1	93	352	84	70
335	49.590	0.149	0.050	2.14	78	-1.73	99	1.0	0.0	93	353	87	69
336	49.733	0.143	0.050	2.12	78	-0.3	95	0.9	-0.1	93	356	86	69
337	49.882	0.149	0.050	2.10	78	-1.67	99	0.8	-0.1	93	355	84	69
338	50.026	0.144	0.050	2.13	78	-0.07	96	0.8	0.0	94	357	83	69
339	50.175	0.149	0.050	2.12	78	-2.17	100	0.8	0.0	94	355	83	69
340	50.319	0.144	0.050	2.13	78	-0.69	96	0.8	0.0	94	354	85	69
341	50.467	0.148	0.050	2.13	78	-1.32	99	0.6	-0.2	94	354	87	69
342	50.612	0.145	0.050	2.12	78	-1.62	97	0.7	0.1	94	354	85	69
343	50.760	0.148	0.050	2.10	78	-0.08	99	0.6	-0.1	94	355	83	69
344	50.904	0.144	0.050	2.10	78	-0.54	96	0.6	0.0	94	354	83	69
345	51.052	0.148	0.050	2.12	78	-0.06	99	0.6	0.0	94	355	84	69
346	51.196	0.144	0.050	2.11	78	-0.16	96	0.5	-0.1	94	355	87	69
347	51.344	0.148	0.050	2.11	78	-0.62	99	0.5	0.0	94	354	86	69
348	51.488	0.144	0.050	2.12	78	-0.84	96	0.4	-0.1	94	357	84	69
349	51.636	0.148	0.050	2.11	78	-0.14	99	0.4	0.0	93	358	83	69
350	51.780	0.144	0.050	2.12	78	-2.52	96	0.3	-0.1	93	356	83	69
351	51.927	0.147	0.050	2.12	78	-2.76	98	0.3	0.0	93	356	85	70
352	52.072	0.145	0.050	2.11	78	-2.71	97	0.3	0.0	93	356	87	70
353	52.219	0.147	0.050	2.11	78	-2.44	98	0.2	-0.1	94	356	86	70
354	52.364	0.145	0.050	2.12	78	-0.08	97	0.2	0.0	94	357	84	69
355	52.510	0.146	0.050	2.11	78	-1.75	98	0.1	-0.1	95	357	83	69
356	52.655	0.145	0.050	2.12	78	-1.91	97	0.1	0.0	94	356	84	70
357	52.802	0.147	0.050	2.11	78	-1.79	98	0.1	0.0	94	358	87	69
358	52.946	0.144	0.050	2.10	78	-1.01	96	0.0	-0.1	94	356	86	69
359	53.092	0.146	0.050	2.10	78	-2.68	98	0.0	0.0	94	357	84	70
360	53.238	0.146	0.050	2.11	78	-0.58	98	0.0	0.0	94	358	83	69
Avg/Tot	53.238	0.148	0.050	2.21	75	-1.17	100			100	433	84	68

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	65	-1		85	0.000	11.55	0.05
1	0.130	0.130	2.42	65	-2.72	93	85	-0.080	11.95	0.02
2	0.277	0.147	2.42	65	-0.55	106	85	-0.080	12.33	0.05
3	0.425	0.148	2.41	65	-2.61	106	84	-0.090	12.24	0.06
4	0.571	0.146	2.40	65	-0.83	105	84	-0.090	12.74	0.12
5	0.719	0.148	2.39	65	-1.21	106	84	-0.080	12.45	0.08
6	0.865	0.146	2.38	66	-1.59	105	85	-0.080	12.96	0.01
7	1.013	0.148	2.38	66	-0.99	106	85	-0.080	12.49	0.02
8	1.159	0.146	2.38	66	-2.53	105	86	-0.080	11.81	0.00
9	1.307	0.148	2.37	66	-2.49	106	85	-0.100	12.13	0.04
10	1.452	0.145	2.38	66	-2.65	104	84	-0.090	12.72	0.06
11	1.600	0.148	2.37	67	-0.79	106	84	-0.070	12.68	0.05
12	1.746	0.146	2.37	67	-1.7	104	85	-0.100	12.07	0.02
13	1.893	0.147	2.36	67	-0.61	105	85	-0.080	13.08	0.04
14	2.039	0.146	2.35	67	-1.24	104	86	-0.090	12.59	0.05
15	2.187	0.148	2.36	68	-2.74	106	85	-0.080	11.96	0.00
16	2.332	0.145	2.36	68	-2.53	104	85	-0.090	12.08	0.02
17	2.480	0.148	2.35	69	-1.06	106	84	-0.090	11.89	0.05
18	2.626	0.146	2.35	69	-2.72	104	85	-0.110	12.08	0.05
19	2.773	0.147	2.34	69	-1.03	105	85	-0.080	11.78	0.03
20	2.919	0.146	2.34	70	-0.62	104	86	-0.080	11.13	0.01
21	3.066	0.147	2.34	70	-1.23	105	86	-0.070	12.45	0.07
22	3.212	0.146	2.33	70	-2.27	104	85	-0.080	12.74	0.05
23	3.360	0.148	2.34	71	-1.32	105	85	-0.100	12.10	0.05
24	3.505	0.145	2.34	71	-0.58	103	85	-0.080	12.27	0.02
25	3.653	0.148	2.34	72	-2.59	105	85	-0.070	12.28	0.03
26	3.799	0.146	2.33	72	-1.69	103	86	-0.080	11.43	0.02
27	3.947	0.148	2.32	72	-2	105	86	-0.080	11.45	0.02
28	4.093	0.146	2.33	73	-1.77	103	86	-0.080	12.22	0.04
29	4.241	0.148	2.32	73	-1.52	105	84	-0.090	11.86	0.02
30	4.387	0.146	2.32	74	-1.01	103	84	-0.100	11.91	0.06
31	4.535	0.148	2.32	74	-2.5	104	85	-0.090	11.53	0.04

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	4.681	0.146	2.33	74	-0.64	103	85	-0.080	11.23	0.01
33	4.830	0.149	2.34	75	-2.14	105	86	-0.080	11.45	0.01
34	4.976	0.146	2.33	75	-1.96	103	86	-0.080	11.08	0.00
35	5.124	0.148	2.32	75	-0.69	104	85	-0.090	11.71	0.02
36	5.269	0.145	2.32	76	-2.53	102	85	-0.090	11.75	0.03
37	5.418	0.149	2.33	76	-2.56	105	85	-0.080	11.75	0.03
38	5.563	0.145	2.32	76	-2.51	102	85	-0.080	11.18	0.03
39	5.712	0.149	2.32	76	-2.13	105	85	-0.080	11.67	0.02
40	5.858	0.146	2.32	77	-1.16	102	86	-0.090	11.03	0.02
41	6.007	0.149	2.31	77	-2.8	105	86	-0.080	11.17	0.02
42	6.152	0.145	2.30	77	-0.93	102	85	-0.090	11.36	0.02
43	6.302	0.150	2.30	78	-1.19	105	84	-0.080	11.34	0.03
44	6.447	0.145	2.31	78	-2.78	101	85	-0.090	10.92	0.00
45	6.597	0.150	2.31	78	-1.76	105	85	-0.080	10.52	0.03
46	6.742	0.145	2.30	79	-2.55	101	86	-0.080	10.86	0.00
47	6.891	0.149	2.31	79	-0.74	104	86	-0.080	11.01	0.03
48	7.036	0.145	2.31	79	-2.72	101	85	-0.070	10.84	0.01
49	7.186	0.150	2.31	79	-1.43	105	85	-0.080	10.80	0.04
50	7.331	0.145	2.29	80	-2.48	101	85	-0.080	10.93	0.02
51	7.482	0.151	2.30	80	-2.7	105	85	-0.070	10.75	0.00
52	7.627	0.145	2.30	80	-1.27	101	86	-0.070	10.25	0.04
53	7.778	0.151	2.32	80	-0.72	105	86	-0.080	10.68	0.01
54	7.923	0.145	2.30	81	-2.6	101	86	-0.080	10.89	0.05
55	8.073	0.150	2.29	81	-2.43	104	85	-0.080	10.30	0.01
56	8.218	0.145	2.31	81	-0.93	101	85	-0.070	10.00	0.00
57	8.369	0.151	2.29	81	-1.27	105	85	-0.080	10.14	0.02
58	8.514	0.145	2.30	82	-1.53	101	85	-0.070	10.28	0.00
59	8.664	0.150	2.30	82	-2.37	104	86	-0.080	10.59	0.00
60	8.810	0.146	2.28	82	-2.56	101	86	-0.080	10.54	0.00
61	8.955	0.145	2.38	77	-2.09	100	85	-0.060	8.15	0.09
62	9.101	0.146	2.37	77	-1.58	101	84	-0.070	8.36	0.11
63	9.253	0.152	2.37	77	-0.66	105	84	-0.070	8.31	0.07

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	9.399	0.146	2.37	77	-1.29	101	84	-0.070	8.13	0.07
65	9.549	0.150	2.35	77	-2.59	103	85	-0.060	8.11	0.10
66	9.695	0.146	2.35	77	-2.64	101	85	-0.060	8.17	0.09
67	9.845	0.150	2.35	77	-1.74	103	86	-0.070	8.27	0.12
68	9.992	0.147	2.35	77	-1.27	101	85	-0.060	8.18	0.09
69	10.141	0.149	2.34	77	-2.51	103	84	-0.080	8.28	0.07
70	10.288	0.147	2.34	77	-1.1	101	84	-0.070	8.29	0.08
71	10.437	0.149	2.33	77	-0.69	103	85	-0.060	8.20	0.05
72	10.584	0.147	2.32	77	-2.7	101	85	-0.060	8.16	0.08
73	10.733	0.149	2.33	77	-1.56	103	86	-0.070	8.13	0.08
74	10.881	0.148	2.32	77	-2.81	102	86	-0.060	8.22	0.09
75	11.029	0.148	2.32	77	-2.37	102	85	-0.070	8.25	0.11
76	11.177	0.148	2.33	77	-0.6	102	84	-0.060	8.35	0.07
77	11.324	0.147	2.32	78	-2.78	101	85	-0.070	8.32	0.09
78	11.472	0.148	2.31	78	-0.65	102	85	-0.070	8.33	0.08
79	11.619	0.147	2.32	78	-2.81	101	85	-0.060	8.62	0.08
80	11.768	0.149	2.31	78	-2.75	103	86	-0.060	8.47	0.09
81	11.914	0.146	2.29	79	-2.35	100	86	-0.060	8.42	0.07
82	12.063	0.149	2.31	79	-0.73	102	85	-0.060	8.12	0.10
83	12.210	0.147	2.31	79	-0.58	101	84	-0.060	8.12	0.09
84	12.359	0.149	2.30	79	-0.8	102	84	-0.070	7.94	0.12
85	12.504	0.145	2.31	80	-0.69	99	85	-0.070	8.03	0.11
86	12.653	0.149	2.31	80	-0.67	102	85	-0.070	8.04	0.08
87	12.799	0.146	2.30	80	-0.68	100	86	-0.070	7.97	0.09
88	12.948	0.149	2.30	80	-2.52	102	85	-0.060	8.08	0.09
89	13.093	0.145	2.29	80	-2.75	99	85	-0.070	8.34	0.09
90	13.243	0.150	2.29	81	-0.65	103	84	-0.060	8.28	0.08
91	13.388	0.145	2.29	81	-2.77	99	85	-0.060	8.09	0.12
92	13.538	0.150	2.30	81	-1.01	103	85	-0.070	8.27	0.07
93	13.683	0.145	2.29	81	-1.1	99	85	-0.060	8.13	0.08
94	13.833	0.150	2.29	82	-0.67	103	86	-0.060	8.25	0.08
95	13.978	0.145	2.29	82	-0.7	99	85	-0.060	8.25	0.07

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	14.128	0.150	2.28	82	-2.08	103	85	-0.060	8.10	0.11
97	14.274	0.146	2.28	82	-0.87	100	84	-0.060	8.18	0.08
98	14.425	0.151	2.28	83	-2.65	103	85	-0.060	8.00	0.11
99	14.570	0.145	2.28	83	-1.33	99	85	-0.060	8.04	0.11
100	14.720	0.150	2.28	83	-1.77	102	85	-0.060	7.89	0.11
101	14.865	0.145	2.29	83	-1.39	99	86	-0.060	8.18	0.15
102	15.015	0.150	2.28	84	-1.68	102	85	-0.060	8.31	0.10
103	15.161	0.146	2.29	84	-2.41	99	84	-0.060	8.15	0.10
104	15.311	0.150	2.28	84	-0.74	102	84	-0.060	8.43	0.09
105	15.456	0.145	2.28	84	-2.76	99	85	-0.050	8.53	0.13
106	15.607	0.151	2.27	85	-2.19	103	85	-0.080	8.58	0.11
107	15.752	0.145	2.28	84	-2.22	99	86	-0.060	8.77	0.08
108	15.902	0.150	2.28	85	-2.55	102	86	-0.060	8.61	0.08
109	16.048	0.146	2.28	85	-2.36	99	86	-0.070	8.56	0.11
110	16.197	0.149	2.28	85	-0.82	101	85	-0.070	8.80	0.15
111	16.342	0.145	2.27	85	-2.79	99	84	-0.060	8.85	0.17
112	16.492	0.150	2.25	86	-1.52	102	84	-0.060	8.81	0.16
113	16.638	0.146	2.27	86	-2.48	99	85	-0.070	8.91	0.11
114	16.788	0.150	2.27	86	-1.19	102	85	-0.060	8.54	0.14
115	16.934	0.146	2.27	86	-0.69	99	85	-0.080	8.56	0.09
116	17.083	0.149	2.27	86	-2.77	101	85	-0.060	8.75	0.09
117	17.229	0.146	2.26	87	-2.72	99	84	-0.070	8.90	0.13
118	17.378	0.149	2.26	87	-1.43	101	84	-0.080	8.79	0.11
119	17.526	0.148	2.26	87	-2.84	101	85	-0.070	8.59	0.10
120	17.674	0.148	2.26	87	-1.65	101	85	-0.060	8.08	0.11
121	17.822	0.148	2.26	87	-0.69	101	85	-0.060	8.41	0.13
122	17.970	0.148	2.27	87	-1.38	101	85	-0.070	8.65	0.12
123	18.118	0.148	2.26	88	-1.3	100	84	-0.060	8.49	0.07
124	18.266	0.148	2.26	88	-1.1	100	84	-0.060	8.39	0.11
125	18.415	0.149	2.27	88	-1.59	101	84	-0.060	8.45	0.05
126	18.562	0.147	2.26	88	-0.98	100	85	-0.070	8.20	0.08
127	18.711	0.149	2.26	88	-0.75	101	85	-0.070	8.16	0.09

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	18.857	0.146	2.26	88	-0.65	99	86	-0.060	8.15	0.09
129	19.006	0.149	2.25	89	-1.86	101	85	-0.060	7.94	0.12
130	19.153	0.147	2.27	89	-2.49	99	84	-0.070	7.88	0.07
131	19.302	0.149	2.25	89	-2.88	101	84	-0.070	7.88	0.07
132	19.449	0.147	2.27	89	-1.59	99	85	-0.060	7.80	0.09
133	19.599	0.150	2.26	89	-2.64	102	85	-0.070	8.03	0.08
134	19.744	0.145	2.25	89	-0.74	98	85	-0.070	8.30	0.06
135	19.894	0.150	2.24	89	-1.68	102	86	-0.070	8.04	0.07
136	20.040	0.146	2.26	90	-2.43	99	85	-0.070	7.97	0.07
137	20.191	0.151	2.26	90	-0.79	102	84	-0.060	8.07	0.04
138	20.337	0.146	2.25	90	-0.82	98	84	-0.060	8.07	0.04
139	20.488	0.151	2.25	90	-2.61	102	85	-0.060	7.86	0.05
140	20.633	0.145	2.26	90	-1.05	98	85	-0.060	7.84	0.09
141	20.784	0.151	2.25	90	-0.71	102	86	-0.060	7.84	0.07
142	20.929	0.145	2.25	90	-2.48	98	86	-0.060	7.88	0.15
143	21.080	0.151	2.24	90	-0.71	102	85	-0.060	7.85	0.08
144	21.226	0.146	2.26	91	-1.46	98	84	-0.070	7.70	0.08
145	21.376	0.150	2.25	91	-2.31	101	84	-0.050	7.80	0.07
146	21.522	0.146	2.25	91	-2.74	98	85	-0.070	7.65	0.09
147	21.672	0.150	2.25	91	-2.86	101	85	-0.070	7.98	0.04
148	21.818	0.146	2.25	91	-2.13	98	86	-0.070	8.08	0.06
149	21.968	0.150	2.25	91	-1.65	101	86	-0.060	7.87	0.07
150	22.115	0.147	2.25	91	-1.47	99	85	-0.060	7.91	0.07
151	22.264	0.149	2.25	91	-2.66	100	84	-0.060	7.46	0.11
152	22.411	0.147	2.23	91	-2.86	99	84	-0.060	8.17	0.06
153	22.561	0.150	2.24	92	-2.81	101	85	-0.070	7.82	0.11
154	22.709	0.148	2.25	92	-2.9	100	85	-0.070	8.02	0.09
155	22.857	0.148	2.24	92	-1.52	100	86	-0.060	7.86	0.11
156	23.006	0.149	2.25	92	-1.63	100	86	-0.060	7.97	0.08
157	23.154	0.148	2.25	92	-0.82	100	85	-0.060	7.94	0.05
158	23.303	0.149	2.24	92	-0.94	100	84	-0.070	7.88	0.10
159	23.451	0.148	2.26	92	-2.79	100	84	-0.060	7.95	0.05

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	23.600	0.149	2.25	92	-2.85	100	85	-0.060	8.29	0.08
161	23.746	0.146	2.25	93	-2.37	98	85	-0.060	8.09	0.09
162	23.896	0.150	2.25	93	-2.25	101	86	-0.060	8.23	0.08
163	24.042	0.146	2.24	93	-2.73	98	86	-0.070	8.29	0.06
164	24.193	0.151	2.25	93	-1.17	101	85	-0.060	8.17	0.05
165	24.339	0.146	2.24	93	-0.91	98	84	-0.060	8.10	0.09
166	24.489	0.150	2.25	93	-0.72	101	84	-0.060	8.34	0.07
167	24.635	0.146	2.23	93	-2.89	98	85	-0.060	8.17	0.04
168	24.787	0.152	2.25	93	-2.35	102	85	-0.060	8.40	0.05
169	24.932	0.145	2.23	93	-2.55	97	86	-0.070	8.21	0.07
170	25.083	0.151	2.25	93	-0.84	102	86	-0.060	7.97	0.08
171	25.229	0.146	2.25	93	-2	98	85	-0.060	8.36	0.06
172	25.380	0.151	2.25	93	-1.77	101	84	-0.080	8.26	0.11
173	25.527	0.147	2.24	93	-2.88	99	85	-0.070	7.92	0.08
174	25.677	0.150	2.24	93	-1.08	101	85	-0.050	7.98	0.08
175	25.823	0.146	2.24	94	-1.6	98	86	-0.050	8.20	0.11
176	25.973	0.150	2.25	94	-1.99	101	86	-0.080	7.93	0.08
177	26.119	0.146	2.23	94	-0.82	98	86	-0.070	7.99	0.03
178	26.269	0.150	2.25	94	-0.87	101	85	-0.060	7.81	0.03
179	26.416	0.147	2.24	94	-1.49	98	84	-0.070	7.63	0.07
180	26.565	0.149	2.24	94	-2.83	100	85	-0.070	7.70	0.04
181	26.697	0.132	2.32	89	-2.71	89	84	-0.060	7.21	0.16
182	26.850	0.153	2.31	89	-2.29	103	85	-0.060	7.33	0.14
183	26.996	0.146	2.32	89	-0.66	99	85	-0.070	7.48	0.16
184	27.147	0.151	2.29	89	-2.26	102	85	-0.070	7.42	0.20
185	27.294	0.147	2.30	89	-2.13	99	85	-0.070	7.67	0.16
186	27.444	0.150	2.29	88	-1.39	101	86	-0.060	7.58	0.17
187	27.592	0.148	2.27	88	-2.77	100	85	-0.060	7.27	0.17
188	27.741	0.149	2.28	88	-2.77	101	84	-0.060	7.49	0.16
189	27.890	0.149	2.27	88	-2.29	101	85	-0.060	7.36	0.19
190	28.039	0.149	2.27	88	-2.49	101	85	-0.060	7.61	0.14
191	28.187	0.148	2.26	88	-0.95	100	85	-0.060	7.47	0.09

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	28.335	0.148	2.27	88	-1.73	100	86	-0.050	7.53	0.13
193	28.483	0.148	2.26	88	-2.87	100	86	-0.060	7.70	0.12
194	28.631	0.148	2.27	88	-0.74	100	85	-0.050	7.78	0.18
195	28.780	0.149	2.26	88	-0.78	101	84	-0.070	7.43	0.24
196	28.926	0.146	2.26	88	-1.25	99	84	-0.060	7.72	0.23
197	29.075	0.149	2.24	88	-2.37	101	85	-0.070	7.44	0.22
198	29.221	0.146	2.25	88	-1.32	99	85	-0.060	7.74	0.10
199	29.370	0.149	2.25	88	-1.98	101	86	-0.060	7.86	0.15
200	29.517	0.147	2.24	89	-2.12	99	86	-0.060	7.56	0.17
201	29.666	0.149	2.24	89	-2.27	100	85	-0.060	7.57	0.16
202	29.812	0.146	2.24	89	-2.93	98	85	-0.060	7.26	0.23
203	29.961	0.149	2.24	89	-2.89	100	85	-0.060	7.52	0.19
204	30.107	0.146	2.25	89	-0.96	99	85	-0.050	7.53	0.22
205	30.256	0.149	2.23	89	-0.78	101	85	-0.060	7.50	0.16
206	30.402	0.146	2.23	89	-0.82	99	86	-0.060	7.37	0.13
207	30.552	0.150	2.23	89	-2.83	101	86	-0.060	7.52	0.16
208	30.698	0.146	2.25	90	-1.84	98	85	-0.070	7.23	0.18
209	30.848	0.150	2.24	90	-2.22	101	85	-0.070	7.13	0.16
210	30.993	0.145	2.22	90	-1.68	98	85	-0.060	7.14	0.11
211	31.143	0.150	2.23	90	-0.95	101	85	-0.060	7.03	0.19
212	31.288	0.145	2.24	90	-1.07	98	86	-0.050	7.03	0.26
213	31.438	0.150	2.23	90	-0.81	101	86	-0.050	7.24	0.23
214	31.583	0.145	2.24	90	-2.28	98	85	-0.060	7.51	0.20
215	31.733	0.150	2.23	91	-1.3	101	85	-0.070	7.45	0.15
216	31.878	0.145	2.21	91	-2.88	98	85	-0.060	7.44	0.17
217	32.029	0.151	2.22	91	-1.15	102	85	-0.050	7.92	0.19
218	32.174	0.145	2.23	91	-2.53	97	85	-0.070	7.52	0.18
219	32.324	0.150	2.23	91	-0.84	101	86	-0.060	7.43	0.24
220	32.469	0.145	2.23	91	-2.11	98	86	-0.060	7.48	0.21
221	32.618	0.149	2.23	91	-1.97	100	85	-0.060	7.87	0.19
222	32.763	0.145	2.23	92	-2.85	97	84	-0.040	7.90	0.19
223	32.913	0.150	2.23	92	-2.06	101	85	-0.050	7.79	0.16

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	33.058	0.145	2.23	92	-0.78	97	85	-0.050	8.01	0.17
225	33.208	0.150	2.20	92	-2.25	101	86	-0.070	7.82	0.18
226	33.353	0.145	2.22	92	-2.68	97	86	-0.050	7.85	0.14
227	33.503	0.150	2.23	92	-1.78	101	86	-0.060	7.37	0.19
228	33.649	0.146	2.22	92	-0.91	98	85	-0.050	7.50	0.15
229	33.797	0.148	2.22	92	-2.12	99	84	-0.060	7.55	0.18
230	33.943	0.146	2.22	92	-2.75	98	85	-0.070	7.57	0.12
231	34.092	0.149	2.22	93	-2.11	100	85	-0.070	7.52	0.16
232	34.238	0.146	2.22	93	-2.18	98	86	-0.070	7.19	0.15
233	34.387	0.149	2.21	93	-2.86	100	86	-0.040	7.31	0.16
234	34.534	0.147	2.21	93	-2.76	98	86	-0.050	7.25	0.17
235	34.683	0.149	2.22	93	-0.84	100	85	-0.040	6.89	0.12
236	34.830	0.147	2.21	93	-1.64	98	85	-0.060	7.22	0.16
237	34.978	0.148	2.21	93	-0.79	99	85	-0.050	7.34	0.10
238	35.126	0.148	2.21	93	-2.89	99	85	-0.040	7.37	0.11
239	35.273	0.147	2.22	93	-0.85	98	86	-0.050	7.37	0.11
240	35.421	0.148	2.22	94	-1.65	99	86	-0.060	7.16	0.12
241	35.568	0.147	2.23	94	-0.93	98	85	-0.070	6.97	0.13
242	35.716	0.148	2.21	94	-2.89	99	85	-0.060	7.10	0.15
243	35.863	0.147	2.20	94	-2.93	98	85	-0.070	6.82	0.15
244	36.012	0.149	2.21	94	-0.81	100	85	-0.050	6.62	0.19
245	36.159	0.147	2.23	94	-1.51	98	86	-0.060	6.91	0.17
246	36.307	0.148	2.20	94	-2.92	99	86	-0.060	7.05	0.18
247	36.454	0.147	2.21	94	-0.81	98	85	-0.060	6.96	0.14
248	36.602	0.148	2.22	94	-1.14	99	85	-0.050	7.10	0.16
249	36.748	0.146	2.22	94	-2.84	98	85	-0.060	6.90	0.21
250	36.897	0.149	2.21	94	-0.79	100	85	-0.060	6.88	0.17
251	37.043	0.146	2.20	94	-2.64	98	85	-0.060	7.08	0.17
252	37.192	0.149	2.22	95	-1.77	99	86	-0.060	7.03	0.14
253	37.338	0.146	2.22	95	-0.84	97	86	-0.060	7.07	0.20
254	37.488	0.150	2.21	95	-1.36	100	85	-0.050	7.34	0.16
255	37.633	0.145	2.21	95	-0.82	97	85	-0.050	7.14	0.20

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	37.782	0.149	2.19	95	-1.15	99	85	-0.060	7.38	0.20
257	37.928	0.146	2.20	95	-0.83	97	85	-0.050	7.49	0.19
258	38.078	0.150	2.20	95	-2.47	100	86	-0.050	7.59	0.22
259	38.223	0.145	2.19	95	-1.3	97	86	-0.060	7.35	0.23
260	38.374	0.151	2.21	95	-1.57	101	86	-0.060	7.16	0.20
261	38.519	0.145	2.20	95	-0.91	97	85	-0.050	7.28	0.17
262	38.668	0.149	2.20	95	-1.8	99	85	-0.050	7.39	0.17
263	38.813	0.145	2.20	95	-2.05	97	85	-0.060	7.61	0.17
264	38.964	0.151	2.22	95	-1.31	101	85	-0.060	7.44	0.23
265	39.109	0.145	2.21	95	-0.98	97	86	-0.050	7.36	0.21
266	39.258	0.149	2.21	95	-1.81	99	86	-0.060	7.50	0.20
267	39.403	0.145	2.21	95	-2.78	97	86	-0.070	7.44	0.16
268	39.554	0.151	2.20	95	-2	101	85	-0.060	7.57	0.16
269	39.699	0.145	2.20	95	-2.62	97	84	-0.070	7.57	0.16
270	39.849	0.150	2.19	96	-2.48	100	85	-0.060	7.87	0.15
271	39.994	0.145	2.22	96	-0.74	97	85	-0.060	7.44	0.19
272	40.144	0.150	2.21	96	-1.28	100	86	-0.070	7.36	0.18
273	40.289	0.145	2.20	96	-2.87	97	86	-0.060	7.34	0.21
274	40.439	0.150	2.20	96	-2.94	100	85	-0.060	7.44	0.16
275	40.584	0.145	2.22	96	-0.83	97	85	-0.060	7.03	0.19
276	40.733	0.149	2.20	96	-1.08	99	85	-0.060	7.38	0.18
277	40.878	0.145	2.21	96	-2.84	97	85	-0.060	7.33	0.19
278	41.027	0.149	2.20	96	-0.82	99	85	-0.060	7.12	0.19
279	41.173	0.146	2.20	96	-1.01	97	86	-0.060	7.07	0.20
280	41.323	0.150	2.20	96	-2.92	100	86	-0.060	7.44	0.15
281	41.468	0.145	2.21	96	-1.27	97	85	-0.060	7.18	0.17
282	41.617	0.149	2.21	96	-1.9	99	85	-0.050	7.39	0.18
283	41.763	0.146	2.20	96	-1.23	97	85	-0.050	7.32	0.16
284	41.912	0.149	2.20	96	-2.98	99	85	-0.050	7.36	0.16
285	42.058	0.146	2.20	96	-0.76	97	86	-0.060	7.49	0.17
286	42.206	0.148	2.19	96	-0.86	98	86	-0.060	7.20	0.17
287	42.353	0.147	2.20	96	-1.75	98	86	-0.060	7.21	0.13

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	42.501	0.148	2.20	96	-1.12	99	85	-0.060	7.06	0.13
289	42.649	0.148	2.20	96	-2.28	99	84	-0.060	6.82	0.15
290	42.797	0.148	2.21	96	-2.56	99	85	-0.060	6.90	0.11
291	42.944	0.147	2.21	96	-2.34	98	85	-0.050	6.87	0.10
292	43.091	0.147	2.19	96	-2.96	98	86	-0.060	6.81	0.10
293	43.239	0.148	2.20	97	-2.89	98	86	-0.050	6.70	0.14
294	43.386	0.147	2.20	97	-2.9	98	86	-0.050	7.14	0.16
295	43.534	0.148	2.19	96	-2.14	99	84	-0.060	7.24	0.14
296	43.681	0.147	2.20	96	-0.92	98	85	-0.060	7.11	0.16
297	43.829	0.148	2.19	96	-1.39	99	85	-0.050	6.58	0.23
298	43.976	0.147	2.19	97	-0.87	98	85	-0.060	7.02	0.19
299	44.123	0.147	2.19	96	-1.08	98	86	-0.070	7.13	0.17
300	44.270	0.147	2.18	96	-1.96	98	86	-0.060	6.97	0.14
301	44.419	0.149	2.19	97	-2.39	99	85	-0.050	6.96	0.16
302	44.565	0.146	2.20	97	-1.8	97	84	-0.040	7.05	0.14
303	44.714	0.149	2.20	97	-1.57	99	85	-0.050	6.90	0.16
304	44.859	0.145	2.20	97	-1.36	96	85	-0.060	6.94	0.15
305	45.008	0.149	2.19	96	-0.84	99	85	-0.060	6.87	0.15
306	45.153	0.145	2.19	97	-0.92	96	86	-0.060	6.89	0.13
307	45.302	0.149	2.21	97	-0.79	99	86	-0.060	6.87	0.13
308	45.448	0.146	2.19	96	-2.91	97	86	-0.060	6.87	0.14
309	45.597	0.149	2.20	97	-1.2	99	84	-0.060	6.90	0.13
310	45.742	0.145	2.19	97	-2.57	96	85	-0.050	6.91	0.15
311	45.891	0.149	2.18	97	-1.61	99	85	-0.060	7.23	0.12
312	46.037	0.146	2.20	97	-1.32	97	86	-0.060	7.20	0.16
313	46.186	0.149	2.20	97	-2.59	99	86	-0.060	6.95	0.14
314	46.331	0.145	2.20	97	-1.03	96	86	-0.060	7.01	0.11
315	46.480	0.149	2.19	96	-0.87	99	85	-0.070	6.86	0.12
316	46.625	0.145	2.18	97	-2.8	96	85	-0.060	6.74	0.12
317	46.775	0.150	2.19	97	-1.95	100	85	-0.050	7.01	0.17
318	46.919	0.144	2.20	97	-2.87	96	85	-0.060	6.76	0.25
319	47.069	0.150	2.20	97	-2.83	100	85	-0.060	6.69	0.18

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	47.214	0.145	2.21	97	-2.66	96	86	-0.060	6.76	0.15
321	47.363	0.149	2.20	97	-0.83	99	86	-0.070	6.81	0.25
322	47.508	0.145	2.18	97	-2.82	96	85	-0.060	6.94	0.20
323	47.658	0.150	2.18	97	-0.93	100	84	-0.050	6.73	0.25
324	47.803	0.145	2.18	97	-2.86	96	84	-0.050	6.84	0.21
325	47.953	0.150	2.20	97	-0.93	100	85	-0.070	6.86	0.23
326	48.098	0.145	2.20	97	-2.88	96	86	-0.050	6.92	0.11
327	48.247	0.149	2.19	97	-1.07	99	86	-0.050	6.78	0.09
328	48.392	0.145	2.19	97	-0.8	96	85	-0.050	6.74	0.14
329	48.542	0.150	2.19	97	-1.85	100	85	-0.050	6.67	0.19
330	48.686	0.144	2.19	97	-0.9	96	84	-0.060	6.66	0.18
331	48.836	0.150	2.19	97	-3.02	100	85	-0.050	6.59	0.16
332	48.981	0.145	2.17	97	-0.84	96	85	-0.060	6.67	0.18
333	49.130	0.149	2.19	97	-1.85	99	86	-0.060	6.69	0.15
334	49.275	0.145	2.19	97	-1.19	96	86	-0.060	6.61	0.12
335	49.424	0.149	2.18	97	-2.37	99	85	-0.050	6.58	0.13
336	49.569	0.145	2.19	97	-0.85	96	84	-0.060	6.63	0.14
337	49.718	0.149	2.18	97	-2.85	99	84	-0.060	6.94	0.16
338	49.863	0.145	2.18	97	-2.87	96	85	-0.050	6.81	0.14
339	50.012	0.149	2.18	97	-0.89	99	85	-0.060	6.88	0.13
340	50.157	0.145	2.18	97	-0.88	96	86	-0.060	6.79	0.16
341	50.307	0.150	2.18	97	-1.65	100	86	-0.060	6.58	0.14
342	50.451	0.144	2.19	97	-1.52	96	86	-0.050	6.73	0.14
343	50.601	0.150	2.18	97	-1.85	100	85	-0.050	6.64	0.13
344	50.745	0.144	2.18	97	-2.81	96	85	-0.060	6.79	0.16
345	50.895	0.150	2.18	97	-2.91	100	85	-0.050	6.70	0.18
346	51.039	0.144	2.18	97	-2.71	96	85	-0.050	6.83	0.16
347	51.189	0.150	2.19	97	-2.18	100	86	-0.070	6.74	0.13
348	51.333	0.144	2.19	97	-1.88	96	86	-0.060	6.73	0.12
349	51.483	0.150	2.21	97	-1.19	99	86	-0.060	6.78	0.11
350	51.627	0.144	2.19	97	-1.06	95	85	-0.040	6.88	0.12
351	51.777	0.150	2.19	97	-0.85	99	85	-0.060	6.90	0.17

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

	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	51.921	0.144	2.18	97	-0.92	95	85	-0.050	6.86	0.14
353	52.070	0.149	2.18	97	-2.06	99	85	-0.060	6.87	0.16
354	52.215	0.145	2.19	97	-2.12	96	86	-0.060	6.83	0.14
355	52.364	0.149	2.19	97	-1.57	99	86	-0.060	6.61	0.19
356	52.508	0.144	2.18	97	-2.42	96	85	-0.050	6.74	0.15
357	52.657	0.149	2.18	97	-1.13	99	85	-0.060	6.66	0.17
358	52.802	0.145	2.18	97	-1.04	96	85	-0.060	6.80	0.14
359	52.951	0.149	2.18	97	-0.95	99	85	-0.060	6.71	0.14
360	53.095	0.144	2.17	97	-2.74	96	85	-0.050	6.98	0.13
Avg/Tot	53.095	0.147	2.25	88	-1.77	100			8.24	0.12

LAB SAMPLE DATA - ASTM E2779 / ASTM E2515

Client: United States Stove Company
Model: SP2047
Run #: 1

Job #: 18-438
Tracking #: 0013
Technician: SJB
Date: 12/6/2018

TRAIN A (1st Hour)

Sample Component	Sample Type	Filter, Probe, or O-Ring #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	T038	86.0	85.8	0.2
B. Rear filter catch	Filter				0.0
C. Probe catch*	Probe				0.0
D. O-Ring catch*	O-Ring				0.0

Sub-Total	Total Particulate, mg:	0.2

TRAIN A (Post 1st hour)

Sample Component	Sample Type	Filter, Probe, or O-Ring #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	T039	174.7	86.6	1.5
B. Rear filter catch	Filter	T040		86.6	
C. Probe catch*	Probe	4A	116183.4	116183.2	0.2
D. O-Ring catch*	O-Ring	4A	3594.1	3593.8	0.3

Sub-Total	Total Particulate, mg:	2.0
Train A Aggregate	Total Particulate, mg:	**2.2**

TRAIN B

Sample Component	Reagent	Filter, Probe, or O-Ring #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	T041	175.2	86.4	1.5
B. Rear filter catch	Filter	T042		87.3	
C. Probe catch*	Probe	4B	116366.1	116365.9	0.2
D. O-Ring catch*	O-Ring	4B	3582.0	3581.5	0.5

Total Particulate, mg:	**2.2**

AMBIENT

Sample Component	Reagent	Filter, Probe, or O-Ring #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Filter catch*	Filter	T043	87.4	87.4	0.0

Total Particulate, mg:	**0.0**

*Particulate catch that results in a negative number, is assumed to be zero for probes and O-rings, negative numbers for filters are assumed to be part of the O-Ring weight.

ASTM E2779 Pellet Heater Run Sheets

Client: United States Stove Company Job Number: 18-438 Tracking #: 0013
Model: SP2047 Run Number: 1 Test Date: 12/6/2018

Pellet Heater Control Settings

High Burn Rate Settings: Air inlet damper set to full open.

Medium Burn Rate Settings: Air inlet damper set to 1/32" inches open from fully closed position.

Low Burn Rate Settings: Air inlet damper set to fully closed position.

Preburn Notes

Preburn Start Time: 9:03

Time	Notes
N/A	N/A

Test Notes

Test Burn Start Time: 10:03

Time	Notes
60 min	Changed 1-hour filter, set to medium burn rate setting, turned off sampling pumps to let burn rate settle down, per EPA ATM guidelines.
120 min	Turned sampling pumps back on for medium burn segment.
240 min	Changed to low test setting, turned off sampling pumps to let burn rate settle down, per EPA ATM guidelines.
270 min	Turned sampling pumps back on for low burn segment.
450 min	End of Test.

Test Burn End Time: 17:33

Background Filter Volume (ft^3): 46.771

Sample Train Leak Check: A: 0.001 @ -15 inHg B: 0.000 @ -13 inHg ABM: 0.002 @ -14 inHg

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO_2 (%): 16.93 CO (%): 4.33

Mid Gas CO_2 (%): 10.00 CO (%): 2.51

Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	9:24	9:30	9:26	17:40	17:42	17:46
CO_2	0.00	10.07	16.93	0.00	9.99	16.88
CO	0.000	2.505	4.330	-0.015	2.497	4.317

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

Technician Signature: Date: 1/29/2019

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

Date/Time In Desiccator: 6/22/2018 - 12:00 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 #
T031	6/25 - 8:00	84.3	6/26 - 8:30	84.1	"	"	"	"	SB	18-434 #2
T032	↓	84.2	↓	84.2	"	"	"	"	SB	18-434 #3
T033		84.4		84.4	"	"	"	"	SB	↓
T034		84.2		84.3	"	"	"	"	SB	↓
T035		85.1		85.1	"	"	"	"	SB	↓
T036		85.5		85.7	"	"	"	"	SB	↓
T037		86.1		86.0	"	"	"	"	SB	↓
T038		85.8		85.8	"	"	"	"	SB	18-438 #1
T039		86.6		86.6	"	"	"	"	SB	↓
T040	↓	86.6	↓	86.6	"	"	"	"	SB	↓
T041	12/4 - 8:00	86.4	12/6 - 8:30	86.4	"	"	"	"	SB	↓
T042	↓	87.2	↓	87.3	"	"	"	"	SB	↓
T043		87.2		87.4	"	"	"	"	SB	↓
T044		86.5	12/7 - 8:30	86.6	"	"	"	"	SB	18-446 #1
T045		87.4	↓	87.4	"	"	"	"	SB	↓
T046		87.9		88.0	"	"	"	"	SB	↓
T047		87.5		87.5	"	"	"	"	SB	↓
T048		87.1		87.1	"	"	"	"	SB	↓
T049		87.4		87.4	"	"	"	"	SB	↓
T050		87.5		87.6	"	"	"	"	SB	18-446 #2
T051		88.0		88.0	"	"	"	"	SB	↓
T052		87.9		88.0	"	"	"	"	SB	↓
T053		89.2		89.2	"	"	"	"	SB	↓
T054		89.5		89.6	"	"	"	"	SB	↓
T055		89.7		89.8	"	"	"	"	SB	↓
T056		89.5		89.6	"	"	"	"	SB	18-446 #3
T057		89.8		89.8	"	"	"	"	SB	↓
T058		89.7		89.6	"	"	"	"	SB	↓
T059		89.7		89.8	"	"	"	"	SB	↓
T060	↓	90.7	↓	90.7	"	"	"	"	SB	↓

Sample Post-Test Analysis Sheet: ☐ Probes ☒ TX40 Filters ☐ O-Rings

Balance ID#: 107 Audit Weight ID# / Weight (mg): _____

Sample ID	Tare (mg)	Date/ Time in Desiccator	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Tech. Initials
T031	84.1	10/30 - 19:10	~~51~~ THIS FILTER WAS WEIGHED AS A PAIR WITH T028 + T029								SB
T032	84.2	10/31 - 16:30	11/2 - 8:00	85.9	11/2 - 15:30	85.9	–	–	–	–	SB
T033	84.4	↓	↓	> 169.8	↓	> 169.8	–	–	–	–	SB
T034	84.3						–	–	–	–	SB
T035	85.1			> 173.9		> 173.8	–	–	–	–	SB
T036	85.7						–	–	–	–	SB
T037	86.0	↓	↓	85.9	↓	86.0	–	–	–	–	SB
T038	85.8	12/6 - 18:00	12/10 - 10:00	85.9	12/11 - 8:00	86.0	–	–	–	–	SB
T039	86.6	↓	↓	> 174.7	↓	> 174.7	–	–	–	–	SB
T040	86.6						–	–	–	–	SB
T041	86.4			> 175.3		> 175.2	–	–	–	–	SB
T042	87.3						–	–	–	–	SB
T043	87.4	↓	↓	87.5	↓	87.4	–	–	–	–	SB
T044	86.6	12/16 - 14:20	12/12 - 9:00	91.1	12/13 - 8:15	91.1	–	–	–	–	SB
T045	87.4	↓	↓	> 178.8	↓	> 178.8	–	–	–	–	SB
T046	88.0					~~182.5~~ SB	–	–	–	–	SB
T047	87.5			> 182.6		> 182.5	–	–	–	–	SB
T048	87.1						–	–	–	–	SB
T049	87.4	↓	↓	87.5	↓	87.4	–	–	–	–	SB
T050	87.6	12/12 - 9:15	12/14 - 9:45	89.7	12/17 - 8:00	89.8	–	–	–	–	SB
T051	88.0	↓	↓	> 175.4	↓	> 175.4	–	–	–	–	SB
T052	88.0						–	–	–	–	SB
T053	89.2			> 182.1		> 182.2	–	–	–	–	SB
T054	89.6						–	–	–	–	SB
T055	89.8	↓		89.9		89.8	–	–	–	–	SB
T056	89.6	12/13 - 8:30		92.7		92.9	–	–	–	–	SB
T057	91.8	↓		> 181.7		> 181.8	–	–	–	–	SB
T058	89.6						–	–	–	–	SB
T059	91.8			> 185.7		> 185.8	–	–	–	–	SB
T060	90.7	↓	↓		↓		–	–	–	–	SB

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

Date/Time In Desiccator: 10/22/2018 - 8:00 Balance ID#: 107 Audit Weight ID# / Weight(mg): 109A/B – 100/200mg

Sample ID	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Tech. Initials	Project/Run #
1A	10/25 - 8:00	115028.5	10/26 - 8:00	115628.6	-	-	-	-	JB	18-434 #1
1B	↓	115902.7	↓	115902.8	-	-	-	-	JB	18-434 #1
2A		116240.2		116240.2	-	-	-	-	JB	18-434 #2
2B		116330.3		116330.3	-	-	-	-	JB	18-434 #2
3A		116073.5		116073.6	-	-	-	-	JB	18-434 #3
3B	↓	116340.3	↓	116340.3	-	-	-	-	JB	18-434 #3
4A	12/4 - 8:00	116183.4	12/6 - 8:00	116183.2	-	-	-	-	JB	18-438 #1
4B	↓	116366.0	12/6 8:00	116365.9	-	-	-	-	JB	18-438 #1
5A		116768.6	12/7 - 8:30	116768.6	-	-	-	-	JB	18-446 #1
5B		116880.5	↓	116880.6	-	-	-	-	JB	18-446 #1
6A		116564.9		116565.0	-	-	-	-	JB	18-446 #2
6B		116117.0		116117.1	-	-	-	-	JB	18-446 #2
7A		116739.7		116739.8	-	-	-	-	JB	18-446 #3
7B	↓	117304.7	↓	117304.8	-	-	-	-	JB	18-446 #3
8A										
8B										
9A										
9B										
10A										
10B										
11A										
11B										
12A										
12B										
13A										
13B										
14A										
14B										

Sample Post-Test Analysis Sheet: ☒ Probes ☐ Filters ☐ O-Rings

Balance ID#: 107 Audit Weight ID# / Weight (mg): 109A/B / 100/200mg

Sample ID	Tare (mg)	Date/ Time in Desiccator	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Tech. Initials
1A	115628.6	10/29 - 13:50	10/30 - 18:00	115628.7	10/31 - 6:00	115628.8	-	-	-	-	SB
1B	115902.8	10/29 - 17:50	10/30 - 18:00	115903.0	10/31 - 6:00	115903.0	-	-	-	-	SB
2A	116240.2	10/30 - 19:10	11/1 - 8:00	116240.5	11/2 - 7:30	116240.5	-	-	-	-	SB
2B	116330.3	10/30 - 19:10	11/1 - 8:00	116330.7	11/2 - 7:30	116330.7	-	-	-	-	SB
3A	116073.6	10/31 - 16:30	11/2 - 7:30	116073.9	11/2 - 15:30	116073.9	-	-	-	-	SB
3B	116340.3	10/31 - 16:30	11/2 - 7:30	116340.7	11/2 - 15:30	116340.6	-	-	-	-	SB
4A	116183.2	12/6 - 18:00	12/10 - 10:00	116183.4	12/11 - 8:00	116183.4	-	-	-	-	SB
4B	116365.9	12/6 - 18:00	12/10 - 10:00	116366.0	12/11 - 8:00	116366.1	-	-	-	-	SB
5A	116768.6	12/10 - 14:20	12/12 - 9:00	116769.4	12/13 - 8:15	116769.3	-	-	-	-	SB
5B	116880.6	12/10 - 14:20	12/12 - 9:00	116881.3	12/13 - 8:15	116881.2	-	-	-	-	SB
6A	116565.0	12/12 - 9:15	12/14 - 9:45	116565.3	12/17 - 8:00	116565.0	12/18 - 8:00	116565.1	-	-	SB
6B	116117.1	12/12 - 9:15	12/14 - 9:45	116117.5	12/17 - 8:00	116117.1	12/18 - 8:00	116117.1	-	-	SB
7A	116739.8	12/13 - 8:30	12/14 - 9:45	116740.5	12/17 - 8:00	116740.2	12/18 - 8:00	116740.2	-	-	SB
7B	117304.8	12/13 - 8:30	12/14 - 9:45	117305.4	12/17 - 8:00	117305.3	-	-	-	-	SB
8A											
8B											
9A											
9B											
10A											
10B											
11A											
11B											
12A											
12B											
13A											
13B											
14A											
14B											

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

Date/Time In Desiccator: 10/22/2018 - 8:00 Balance ID#: 107 Audit Weight ID# / Weight(mg): 109B-200mg

Sample ID	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Tech. Initials	Project/Run #
1A	10/25 - 8:00	3566.2	10/26 - 8:50	3566.1	–	–	–	–	SB	18-434 #1
1B		3554.5		3554.4	–	–	–	–	SB	18-434 #1
2A		3552.4		3552.6	–	–	–	–	SB	18-434 #2
2B		3570.8		3570.8	–	–	–	–	SB	18-434 #2
3A		3579.6		3579.7	–	–	–	–	SB	18-434 #3
3B		3567.8		3567.8	–	–	–	–	SB	18-434 #3
4A	12/4 - 8:00	3593.8	12/6 - 8:00	3593.8	–	–	–	–	SB	18-438 #1
4B		3581.6	12/6 - 8:00	3581.5	–	–	–	–	SB	18-438 #1
5A		3534.3	12/7 - 8:30	3534.1	–	–	–	–	SB	18-446 #1
5B		3530.6		3530.5	–	–	–	–	SB	18-446 #1
6A		3615.2		3615.3	–	–	–	–	SB	18-446 #2
6B		3396.6		3396.6	–	–	–	–	SB	18-446 #2
7A		3573.8		3573.8	–	–	–	–	SB	18-446 #3
7B		3522.0		3522.0	–	–	–	–	SB	18-446 #3
8A										
8B										
9A										
9B										
10A										
10B										
11A										
11B										
12A										
12B										
13A										
13B										
14A										
14B										

Sample Post-Test Analysis Sheet: ☐ Probes ☐ Filters ☒ O-Rings

Balance ID#: 107 Audit Weight ID# / Weight (mg): 109 B- 200 mg

Sample ID	Tare (mg)	Date/ Time in Desiccator	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Date/ Time	Weight (mg)	Tech. Initials
1A	3566.1	10/29-17:50	10/30 - 18:00	3566.4	10/31 - 6:00	3566.5	-	-	-	-	SB
1B	3554.4	10/29-17:50	10/30 - 18:00	3556.6	10/31 - 6:00	3556.7	-	-	-	-	SB
2A	3552.6	10/30 - 19:10	11/1 - 8:00	3552.8	11/2 - 7:30	3552.9	-	-	-	-	SB
2B	3570.8	10/30 - 19:10	11/1 - 8:00	3570.9	11/2 - 7:30	3571.0	-	-	-	-	SB
3A	3579.7	10/31 - 16:30	11/2 - 7:30	3579.9	11/2 - 15:30	3580.0	-	-	-	-	SB
3B	3567.8	10/31 -16'30	11/2 - 7:30	3568.4	11/2- 15:30	3568.3	-	-	-	-	SB
4A	3593.8	12/6 - 18:00	12/10 - 10:00	3594.1	12/11 - 8:00	3594.1	-	-	-	-	SB
4B	3581.5	12/6 - 18:00	12/10 - 10:00	3582.0	12/11 - 8:00	3582.0	-	-	-	-	SB
5A	3534.1	12/10 - 14:20	12/12 - 9:10	3534.2	12/13 - 8:15	3534.1	-	-	-	-	SB
5B	3530.5	12/10 - 14:20	12/12 - 9:10	3530.7	12/13 - 8:15	3530.7	-	-	-	-	SB
6A	3615.3	12/12 - 9:15	12/14 - 9:45	3617.3	12/17 - 8:00	3617.4	-	-	-	-	SB
6B	3396.6	12/12 - 9:15	12/14 - 9:45	3396.7	12/17 - 8:00	3396.7	-	-	-	-	SB
7A	3573.8	12/13 - 8:30	12/14 - 9:45	3573.6	12/17 - 8:00	3573.7	-	-	-	-	SB
7B	3522.0	12/13 - 8:30	12/14 - 9:45	3522.2	12/17 - 8:00	3522.1	-	-	-	-	SB
8A											
8B											
9A											
9B											
10A											
10B											
11A											
11B											
12A											
12B											
13A											
13B											
14A											
14B											

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

DEC 0 6 2018

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Mr. Sebastian Button
Laboratory Supervisor
PFS TECO
11785 SE Hwy 212
Suite 305
Clackamas, OR 97015

Dear Mr. Button,

I am writing in response to your correspondence dated November 16, 2018, requesting an alternative testing procedure for certification of the United States Stove Company Model SP2047 pellet heater. You are planning to certify the SP2047 to the 2020 particulate matter (PM) emission standard under 40 CFR 60, Subpart AAA - Standards of Performance for New Residential Wood Heaters and Forced Air Furnaces (Subpart AAA), section 60.530, using ASTM Method E2779-10 "Standard Test Method for Determining Particulate Matter Emissions from Pellet Heaters." Per section 60.534(a)(1)(i) of Subpart AAA, a pellet heater is to be tested in accordance with ASTM E2779-10.

In your correspondence, you request an alternative certification testing procedure because of the design of the SP2047, in which pellet fuel is gravity fed into the firebox. As the pellet fuel is combusted, it is replaced by uncombusted pellets. ASTM E2779-10 requires a single composite filter to be used in the sampling train during all three specified heat settings: high, medium and low. The high burn rate is tested for one hour and the burn rate is adjusted to the medium burn rate and tested for two hours and, likewise, the low burn rate is tested for three hours. The medium burn rate criteria is less than or equal to 50 percent of the maximum burn rate of the heater.

The test data you provided shows that the medium burn rate criteria are not being met because the burn rate is greater than 50 percent of the maximum burn rate. You also mention that that the SP2047 can burn at the medium burn rate but, due to the gravity fed fueling, it takes time for the heater to stabilize and this cannot be accomplished when following ASTM E2779-10 as written. You would like to use the testing procedure suggested by EPA where the SP2047 would be tested at the high burn rate for one hour and then the sampling train stopped. The heater would then be adjusted to burn at the medium burn rate and given time for this adjustment to stabilize, then testing would be resumed at the medium burn rate for two hours and the sampling train once again stopped. Finally, the heater would be adjusted to the low burn rate and when stabilized, the testing would be resumed for three hours. This approach is consistent with the basis of ASTM E2779-10, but gives the heater the opportunity to perform as designed.

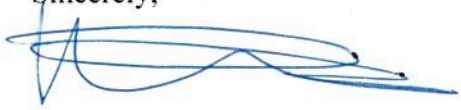
With the caveats discussed below, we approve your alternative test method request for certification testing of the United States Stove Company Model SP2047 pellet heater under 40 CFR 60, Subpart AAA. As required in Subpart AAA, section 60.534(d), the manufacturer or approved test laboratory must also measure the first hour of PM 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 PM emissions per test run. Also, as required in Subpart AAA, section 60.534(e), the manufacturer must have the approved test laboratory measure the efficiency, heat output, and carbon monoxide emissions of the candidate wood heater using CSA Method B415.1-10. For measuring the PM emission concentrations, ASTM Method E2515-11, "Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel," must be used; four inch filters are acceptable.

The SP2047 design incorporates a low setting on its controller, which is the lowest heat output (BTU/hr) setting available to the user and corresponds to the lowest burn rate to be evaluated during certification testing; this is consistent with Subpart AAA, section 60.534(a)(1)(i), which states, "*The burn rate for the low burn category must be no greater than the rate that an operator can achieve in home use and no greater than is advertised by the manufacturer or retailer.*" The unit must be advertised, sold and installed with the same heat exchanger used during the certification test. The following changes to ASTM Method E2515-11 must be followed:

1. Filters must be weighed in pairs to reduce weighing error propagation. See ASTM E2515-11, section 10.2.1, Analytical Procedure.
2. Sample filters must be Pall TX-40 or equivalent Teflon-coated glass fiber filters, and 47 mm, 90 mm, 100 mm, or 110 mm in diameter.
3. Only one point is allowed outside the +/- 10% proportionality range per test run.

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,



for Steffan M. Johnson, Group Leader
Measurement Technology Group

cc: Rochelle Boyd, EPA/OAQPS/SPPD
Chuck French, EPA/OAQPS/SPPD
Rafael Sanchez, EPA/OECA/OC

Nathan Topham, EPA/OAQPS/SPPD
Michael Toney, EPA/OAQPS/AQAD

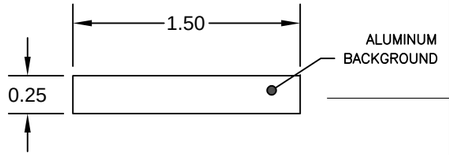
REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	7/18/19	SEH

NOTES:

MATERIAL: 0.012 THK. ALUMINUM / 3M 9472 ADHESIVE BACKED.

FINISH: BLACK BACKGROUND, WHITE TEXT

TEXT: ALL TEXT TO BE 0.06 HEIGHT MINIMUM



11.00

0.1 TEXT HEIGHT

6.00

Model / Modéle: SP2047
Certified to: UL1482(2015) and ULC-S627-2000

Control Number:
☐ 4002719
☐ 4003328

Serial No. / N° de série

Manufacture Date. / Date de Fabrication

U.S. ENVIRONMENTAL PROTECTION AGENCY
Certified to comply with 2020 particulate emission standards. Approved for sale after May 15, 2020. Tested to ASTM E 2779 - 0.41g/hr.

Certifié conforme aux normes d'émission 2020 de particules. Approuvé pour la vente après le 15 mai 2020. Testé selon ASTM E 2779 - 0.41g / hr.

BRECKWELL

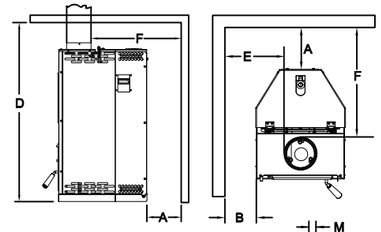
CAUTION: HOT WHILE IN OPERATION - DO NOT TOUCH - KEEP CHILDREN AND CLOTHING AWAY - CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTION. KEEP FURNISHINGS AND OTHER COMBUSTIBLE MATERIALS A CONSIDERABLE DISTANCE AWAY FROM THE APPLIANCE.

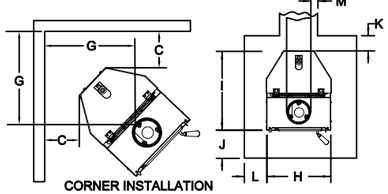
ATTENTION: CHAUD PENDANT LE FONCTIONNEMENT. NE PAS TOUCHER. TENIR LES ENFANTS, LES VÊTEMENTS ET LES MEUBLES À L'ÉCART. LE CONTACT RISQUE DE CAUSER DES BRÛLURES À LA PEAU. VOIR LA PLAQUE SIGNALÉTIQUE ET LES INSTRUCTIONS. NE PAS LAISSER PAS LE POÊLE S'EMBALLER- SI LE POÊLE OU LE RACCORD DE CHEMINÉE ROUGEOIE, LE POÊLE EST EMBALLÉ.

PREVENT HOUSE FIRES: Install and use only in accordance with manufacturer's installation and operating instructions. Contact local building or fire officials about restrictions and installation inspection in your area. In absence of any local codes, installation must meet minimum requirements of NFPA 211. Room heater, solid fuel type, also for use in mobile homes. This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual. The legs or pedestal, if provided, must be installed, and attached as shown in the installation instructions.This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.
DANGER: Risk of Electrical Shock. Disconnect Power Before Servicing Unit. Route power cord away from unit. Do not route power cord under or in front of appliance. Do not obstruct the space beneath the heater. Do Not Use Grate or Elevate Fire - Build Wood Fire Directly on Hearth. Operate only with firebrick in place. For use with solid wood pellet fuel only. Do not add other fuels. Do not burn garbage or flammable fluids such as gasoline, naphtha, or engine oil. Operate only with door closed.
CAUTION: Fully open flue damper before opening the fuel feed door. Keep furnishings and other combustible materials a considerable distance away from this appliance.
PREVENT CREOSOTE FIRES: Inspect and clean chimney frequently. Under certain conditions of use, creosote buildup may occur rapidly.
CHIMNEY: Minimum 6 inch diameter extending at least 15 feet overall measured from the top of the appliance. Refer to manufacturer's instructions and local codes for precautions required for passing chimney through a combustible wall or ceiling. Inspect and clean chimney system frequently in accordance with manufacturer's instructions. Do not run a chimney connector through a combustible wall or ceiling. Chimney must be factory built UL 103/ULC 629; or masonry, with liner. Flue connector pipe must be 6 inch diameter, minimum 24 MSG Black or 26 MSG Blue Steel. Suitable for use in factory-built (z.c.) fireplaces and masonry fireplaces. Do Not Connect This Unit to a Chimney Flue Serving Another Appliance. Do Not over fire - if the heater or chimney connector glows you are over firing. Provide adequate combustion air to the room where the heater is installed. Fully open the combustion air control before opening the fuel feed door. Replace glass with factory supplied 5mm ceramic glass only. Do not substitute alternative materials.

PRÉVENTION DES INCENDIES DE MAISON: N'installer et n'utiliser que conformement aux instructions d'installation et d'utilisation du fabricant. Prendre contact avec les responsables locaux de construction ou de lutte contre l'incendie au sujet des restrictions à l'installation et des exigences d'inspections chez vous. En l'absence de codes locaux, l'installation doit obligatoirement être conforme aux exigences minimales de la norme NFPA 211. Concu pour maisons mobiles. Ce poêle à bois doit être inspecté et réparé périodiquement pour un fonctionnement correct Consultez le manuel du propriétaire pour plus d'informations. Ce est contre les règlements fédéraux pour faire fonctionner ce poêle à bois d'une manière incompatible avec les instructions d'utilisation dans le manuel du propriétaire.
Les Pieds les jambes, pedistal, et l'écran thermique inférieur fournis dolvent oblifatoriement être installés st fixés comme indiqué par les instructions d'installation.
DANGER: Risque de choc électrique. Débrancher l'alimentation avant toute intervention sur l'appareil. Faire passer le cordon d'alimentation à l'écart de l'appareil. Ne pas faire passer le cordon d'slimentation sous l'appareil, ou devant celui-ci. Veuillez à toujours garder la zone au-dessous l'appareil dégagée.
Ne pas utiliser de grille ou Elevate Fire - Construire feu de bois directement sur le foyer. Les briques doivent être en position durant l'utilisation. Pour utilisation avec du bois à granulés uniquement. Ne pas ajouter d'autres combustibles. Ne pas brûler de déchets ni de liquides inflammables leis que de l'essence, du naphte ou de l'huile à moteur. Ne faire fonctionner qu'avec la por te fermée.
ATTENTION: Ouvrir à fond la commande d'arrivée d'air de combustion avant d'ouvrir la porte de chargement. Garder les garnitures et tous autres matériaux combustibles à une distance convenable de cet appareil.
PRÉVENTION DES FEUX DE CRÉOSOTE: Inspecter et ramoner la cheminée fréquemment. Dans certaines conditions d'utilisation, une accumulation de creosote peut survenir rapidement.
CHEMINÉE DE MAÇONNERIE: Gaine de diamètre minimal de 15 cm, longueur minimal de 4,5 m mesuré à partir de l'appareil. Consulter les instructions du fabricant et les code locaux pour les précautions nécessaires à prendre pour faire traverser un mur ou un plafond combustible par une cheminée. Inspecter et ramoner votre cheminée fréquemment conformément aux instructions du fabricant. Ne pas faire traverser un mur ou un plafond combustible par un raccord de cheminée. La cheminée doit obligatoirement être fabriquee en usine conformement à la norme Ul103/ULC 629, ou réalisée en maçonnerie avec un doublage. Le tuyau de raccordement au conduit de fumée doit obligatoirement avoir un diamètre de 6 pouces, et au minimum être en acier noir de calibre standard MSG 24 ou bleu de calibre standard 26 MSG. Approprié pour cheminées industrielles et de maçonnerie. Ne pas raccorder cel appareil à un conduit de cheminée servant à un autre appareil.
Remplacez le verre en utilisant uniquement un verre céramique 5 mm. Ne substituez pas les matériaux spécifiés.
Positionnez le cordon d'alimentation éloigné de l'appareil. Ne positionnez pas le cordon d'alimentation devant ou dessous l'appareil.

CLEARANCE TO COMBUSTIBLE SURFACES / DÉGAMENTS PAR RAPPORT AUX SURFACES COMBUSTIBLES





CORNER INSTALLATION

DO NOT REMOVE OR COVER THIS LABEL / NE PAS RETIRER CETTE ÉTIQUETTE

Cheyenne, WY 82001 Phone: (307) 633]9752 •
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CLEARANCE TO COMBUSTIBLE SURFACES / DÉGAMENTS PAR RAPPORT AUX SURFACES COMBUSTIBLES			
KEY	STOVE TO / PAR RAPPORT AU POÊLE:		
A	BACKWALL / PAROI ARRIÈRE		
B	SIDEWALL / PAROI LATÉRALE		
C	CORNERS / COINS		
D	CEILING HEIGHT / HAUTEUR		
E	SIDEWALL / PAROI LATÉRALE		
F	BACKWALL / PAROI ARRIÈRE		
G	CORNERS/ COINS		
FLOOR PROTECTION / PROTECTION DE PLANCHER			
	EDGE TO STOVE / BORD À LA CUISINIÈRE		
H	STOVE WIDTH / LARGEUR DU POÊLE		
I	STOVE DEPTH / PROFONDEUR DE POÊLE		
J**	FRONT / L'AVANT		
K	BACK / ARRIÈRE		
L*	SIDE / FACE		
M	SIDE OF VENTING / CÔTÉ DE VENTILATION		
* Canadian Installations Require: **Canadian Installations Require:			
* Canadian Installations Nécessitent: **Canadian Installations Nécessitent:			

FLOOR PROTECTOR DIMENSIONS
This heater must have a non-combustible floor protector (ember protection) installed beneath it if the floor is of combustible material. If a floor pad is used, it should be ul listed or equal. The floor pad or non-combustible surface should be 1/2" thick and large enough to extend a under and to each side of the heater as shown.

DIMENSIONS DU PROTECTEUR DE PLANCHER
Cet appareil de chauffage doit être muni d'un protecteur de plancher incombustible (protection contre les braises) installé en dessous si le plancher est en matériaux combustibles. Si un tapis de soi est utilisé, il doit être listé ou égal. Le tapis de sol ou la surface non combustible doit avoir une épaisseur de 1/2 po et être assez grand pour prolonger un dessous et de chaque côté du radiateur, comme illustré.

853358

0.1 TEXT HEIGHT

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TOLERANCES EXCEPT AS NOTED	
HOLES	± .005"
DECIMAL	.XX = 0.03 .XXX = 0.010
ANGULAR	± 2°

DESCRIPTION	SEE NOTES
FINISH	SEE NOTES
REFERENCE	SP2047
SCALE	1:1
DWN BY	SEH
DATE	1/18/19
SIZE	B
REV	A

UNITED STATES STOVE COMPANY
ESTABLISHED 1869

TITLE	NUMBER	SHEET
CERTIFICATION LABEL	853358	1 OF 1

Model SP2047

BRECKWELL

This unit is not intended to be used as a primary source of heat.

- SAVE THESE INSTRUCTIONS. THIS MANUAL WILL HELP YOU TO OBTAIN EFFICIENT, DEPENDABLE SERVICE FROM THE HEATER, AND ENABLE YOU TO ORDER REPAIR PARTS CORRECTLY. KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.
- CAUTION! Please read this entire manual before you install or use your new room heater. Failure to follow instructions may result in property damage, bodily injury, or even death. Improper Installation Could Void Your Warranty!
- SAFETY NOTICE: If this heater is not properly installed, a house fire may result. For your safety, follow the installation instructions. Never use make-shift compromises during the installation of this heater. Contact local building or fire officials about permits, restrictions and installation requirements in your area.

This appliance is Certified for installation in the USA and Canada. Tested per UL 1482 (2015), and ULC-S627-2000. This appliance may be installed in a manufactured or mobile home. Refer to markings on the appliance for additional information.

⚠ CALIFORNIA PROPOSITION 65 WARNING:

This product can expose you to chemicals including carbon monoxide, which is known to the State of California to cause cancer, birth defects and/or other reproductive harm. For more information, go to www.P65warnings.ca.gov

109 East 17th Street, Suite 5478 • Cheyenne, WY 82001 •
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PFS® C US

853357-0503i

INTRODUCTION

The instructions pertaining to the installation of your pellet heater complies with UL 1482 (R2015) & ULC-S627-2000 standards. This manual describes the installation and operation of the Breckwell, SP2047 pellet fired heater. This heater meets the 2020 U.S. Environmental Protection Agency's wood pellet fuel emission limits for wood heaters sold after May 15, 2020. Under specific test conditions this heater has been shown to deliver heat at rates ranging from 16,030 to 33,684 Btu/hr.

Combustible:	Premium Hardwood Pellets
Colors:	Black
Flue Pipe Diameter:	6" (152.5mm)
Flue Pipe Type: (Standard Single Wall or Double Wall):	Black or Blued Steel 2100°F (650°C)
Minimum Chimney Height:	12' (3.7m)
Dimensions	
Overall: Depth x Width x Height:	24.4" X 18.9" X 42.4" (621 mm X 480 mm X 1078 mm)
Door Opening: Width x Height:	11.5" X 12.4" (293 mm X 315 mm) 11.7" X 11.4" (298 mm X 290 mm)
Pyroceramic Glass Door: (Viewing) Width x Height:	10.25" X 10.25" (261 mm X 261 mm) 10.25" X 4.9" (261 mm X 127 mm)

FUEL CONSIDERATIONS

Your pellet stove is designed to burn premium hardwood pellets that comply with Association of Pellet Fuel Industries standards. (Minimum of 40 lbs density per cubic ft, 1/4" to 5/16" diameter, length no greater than 1.5", not less than 8,200 BTU/lb, moisture under 8% by weight, ash under 1% by weight, and salt under 300 parts per million). Pellets that are soft, contain excessive amounts of loose sawdust, have been, or are wet, will result in reduced performance.

Store your pellets in a dry place. DO NOT store the fuel within the installation clearances of the unit or within the space required for refueling and ash removal. Doing so could result in a house fire.

CAUTIONS:

- Hot While In Operation. Keep Children, Clothing And Furniture Away. Contact May Cause Skin Burns.
- Do Not Use Chemicals Or Fluids To Ignite The Fire.
- Do Not Connect To Or Use In Conjunction With Any Air Distribution Ductwork Or System.
- Always Close The Door After The Ignition. Never Operate Heater With Door Left Open (Ajar).

This heater is designed to burn only PFI Premium grade pellets. This appliance can also burn pellets rated as standard after May 16, 2015.

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.

- IMPORTANT: Read this entire manual before installing and operating this product. Failure to do so may result in property damage, bodily injury, or even death. Proper installation of this stove is crucial for safe and efficient operation.
- Contact your local building officials or authorities having jurisdiction to obtain a permit and information on any additional installation restrictions or inspection requirements in your area.
- Do not throw this manual away. This manual has important operating and maintenance instructions that you will need at a later time. Always follow the instructions in this manual.
- This appliance is designed for the use of pelletized fuel that meet or exceed the standard set by the Pellet Fuel Institute(PFI). The use of other fuels will void warranty.
- This appliance is a freestanding heater. It is not intended to be attached to any type of ducting. It is not a furnace.
- HOT WHILE IN OPERATION. Do not touch the hot surfaces of the stove. Educate all children on the dangers of a high-temperature stove. Young children should be supervised when they are in the same room as the stove.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this stove. Keep all such liquids well away from the stove while it is in use.
- Do not place clothing or other flammable items on or near this stove.
- The fuel loading lid and stove top will be hot during operation; therefore, you should always use the provided tool or some type of hand protection when refueling your stove.
- WARNING! DO NOT INSTALL IN SLEEPING ROOM.
- THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.
- A working smoke detector must be installed in the same room as this product.
- Install vent at clearances specified by the vent manufacturer.
- Do not connect the vent to a vent serving any other appliance or stove.
- Do not install a flue damper in the exhaust venting system of this unit.
- 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.
- Your stove requires periodic maintenance and cleaning (see "MAINTENANCE "). Failure to maintain your stove may lead to improper and/or unsafe operation.
- Allow the stove to cool before performing any maintenance or cleaning. Ashes must be disposed in a steel container with a tight fitting lid, and moved outside immediately. The closed container of ashes should be placed on a non-combustible surface or on the ground, well away from all combustible materials, pending final disposal.
- Never try to repair or replace any part of the stove unless instructions for doing so are given in this manual. All other work should be done by a trained technician.
- The exhaust system should be checked monthly during the burning season for any build-up of soot or creosote.
- Use of outside air is required for Canadian installations on this unit, and may be used for tightly constructed homes in the USA.
- Do not operate your stove with the viewing door open. A safety concern may arise from sparks or fumes entering the room.
- Never block free airflow through the open vents of the unit.
- Keep foreign objects out of the fuel chamber.
- This appliance is not intended for commercial use.
- Not intended for primary heat source.
- CARBON MONOXIDE (CO) HAZARD. A buildup of CO fumes is toxic and can be fatal. Carbon Monoxide is a colorless, odorless gas produced during combustion of wood, coal, oil, gas and by other fuel burning appliances. It is important to have a proper draft and adequate replacement air ventilation so fumes are drawn out the chimney. Installed as instructed this stove is designed to be as safe as possible yet it is recommended to install a CO detector. Follow the manufacturer's recommendations for proper installation and use. It is recommended to be placed at table-top level (not near the ceiling) to avoid false alarms. Realize that devices other than a stove (i.e. motor exhaust) can trigger CO alarms.
- If alarm sounds:
  - Recognize the symptoms of CO poisoning (headaches, nausea & drowsiness).
  - Increase ventilation (open windows & doors).
  - Make sure stove doors and/or lids are closed and secured.
  - Check stove for smoking or puffing (open airflow controls).
  - Check chimney & connector pipe for leaks, blockage or down-draft conditions.
  - Check CO device for false alarm.

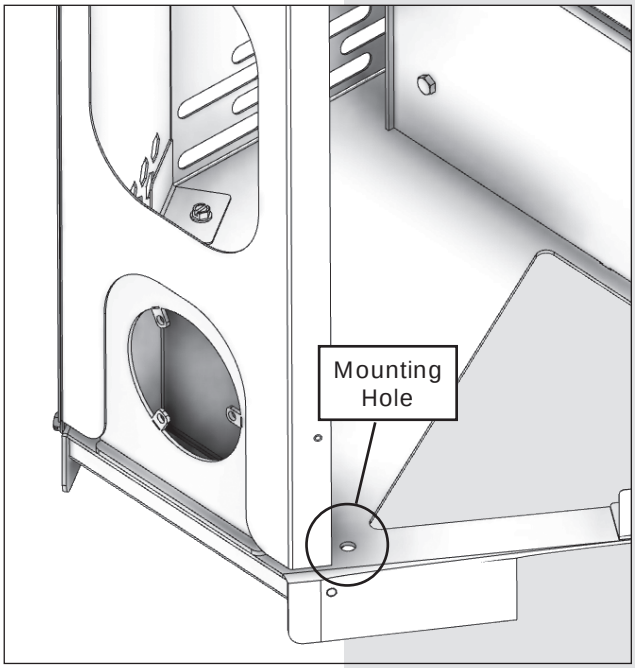
TOOLS AND MATERIALS NEEDED FOR INSTALLATION

CHIMNEY CONNECTOR

You will need a drill with a 1/8" bit to install sheet metal screws into connector pipe. A non-combustible floor protector as specified in this manual. All chimney and chimney connector components required for your particular chimney installation.

MOBILE HOME INSTALLATIONS

Manufactured or Mobile home installations require that the a solid fuel burning appliance be attached to the floor of the mobile home. For this appliance, means are provided within the pedestal area for such. A mounting hole is provided in the rear of the unit. Access the mounting hole through the rear of the unit or by removing the side panel (see illustration). You can then use the means necessary to attach the appliance to the floor. When installed in a mobile home the unit also has to be connected to a source of fresh air from outside the home.



FLOOR PROTECTION (EMBER PROTECTION)

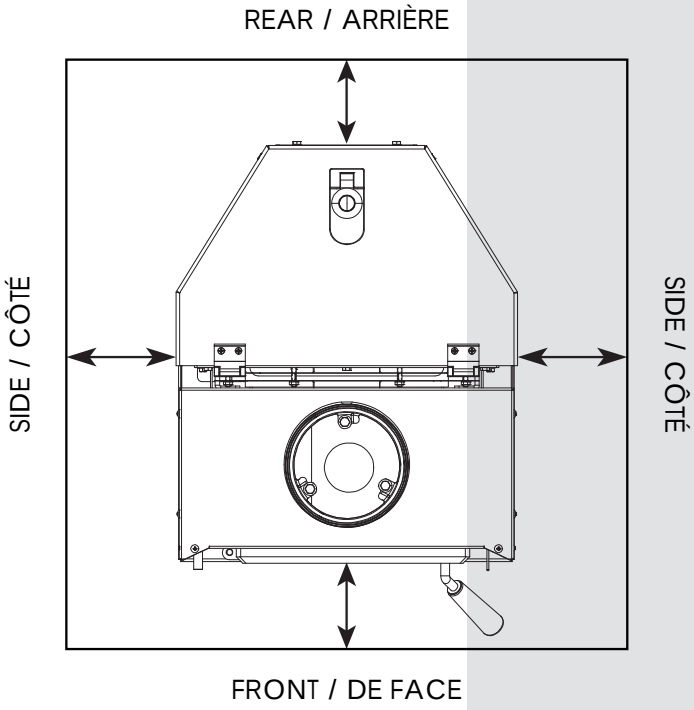
This heater must have a non-combustible floor protector (ember protection) installed beneath it if the floor is of combustible material. If a floor pad is used, it should be UL listed or equal. The floor pad or non-combustible surface should be large enough to extend a minimum of 6" [152mm] in front and 2" [51mm] on each side of the heater. The area under a horizontal run of the chimney connector must also be protected; extending two (2) inches beyond the outer dimension of the horizontal connector.

Canadian installations require a minimum of 18" [450mm] beyond the front of the unit and 8" [200mm] beyond each side of the unit. A Floor Protector of ¼ inch thick is recommended for this installation.

FLOOR PROTECTOR

The minimum sized floor protector for this stove is XXX" X XXX" [XXX mm X XXX mm] . Consult local building codes and fire protection ordinances.

Front	Sides	Rear



SAFETY NOTICE

- IF THIS STOVE IS NOT PROPERLY INSTALLED, A HOUSE FIRE MAY RESULT. TO REDUCE THE RISK OF FIRE, FOLLOW THE INSTALLATION INSTRUCTIONS.
- CONSULT YOUR MUNICIPAL BUILDING DEPARTMENT OR FIRE OFFICIALS ABOUT PERMITS, RESTRICTIONS AND INSTALLATIONS REQUIREMENTS IN YOUR AREA.
- USE SMOKE DETECTORS IN THE ROOM WHERE YOUR STOVE IS INSTALLED.
- KEEP FURNITURE AND DRAPES WELL AWAY FROM THE STOVE.
- NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR "FRESHEN UP" A FIRE IN THIS HEATER. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE HEATER WHILE IT IS IN USE.
- IN THE EVENT OF A CHIMNEY FIRE, PUSH THE AIR CONTROL FULL CLOSED TO DEPRIVE THE FIRE OF OXYGEN. CALL THE FIRE DEPARTMENT.
- A SOURCE OF FRESH AIR INTO THE ROOM OR SPACE HEATED SHALL BE PROVIDED WHEN REQUIRED.
- For Manufactured or Mobile Homes, a room heater and it's chimney shall not void the firestopping required between spaces of the mobile home when the room heater and it's chimney and the combustion air inlet are installed in accordance with the manufacturer's instructions.

POSITIONING THE STOVE

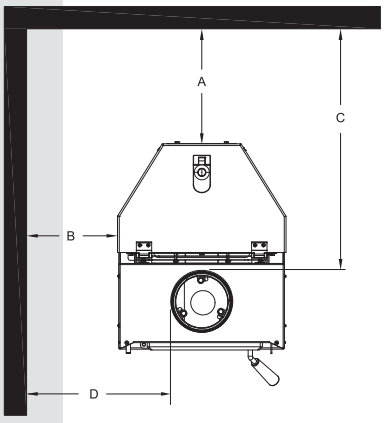
It is very important to position the pellet stove as close as possible to the chimney, and in an area that will favor the most efficient heat distribution possible throughout the house. The stove must therefore be installed in the room where the most time is spent, and in the most spacious room possible. Recall that wood pellet stoves produce radiating heat, the heat we feel when we are close to a wood pellet stove. A wood pellet stove also functions by convection, that is through the displacement of hot air accelerated upwards and its replacement with cooler air.

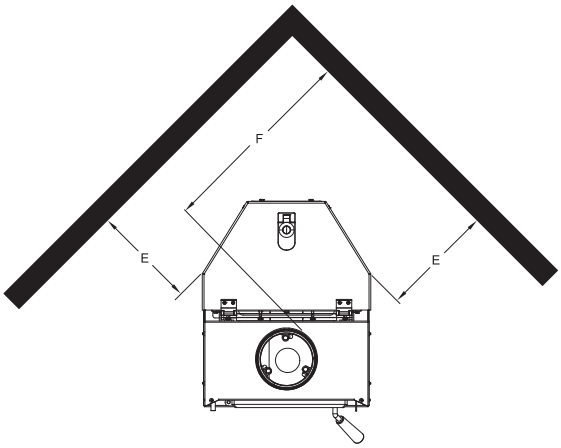
The appliance must not be hooked up to a hot air distribution system since an excessive accumulation of heat may occur.

This appliance must never be installed in a hallway or near a staircase, since it may block the way in case of fire or fail to respect required clearances.

CLEARANCES TO COMBUSTIBLES

It is of utmost importance that the clearances to combustible materials be strictly adhered to during installation of the stove. Clearances may only be reduced by means approved by a regulatory authority. Contact your local safety department or you may consult NFPA 211 if installing in the USA. Refer to the tables below:





Single Wall Pipe [Double Wall Pipe]					
A	B	C	D	E	F

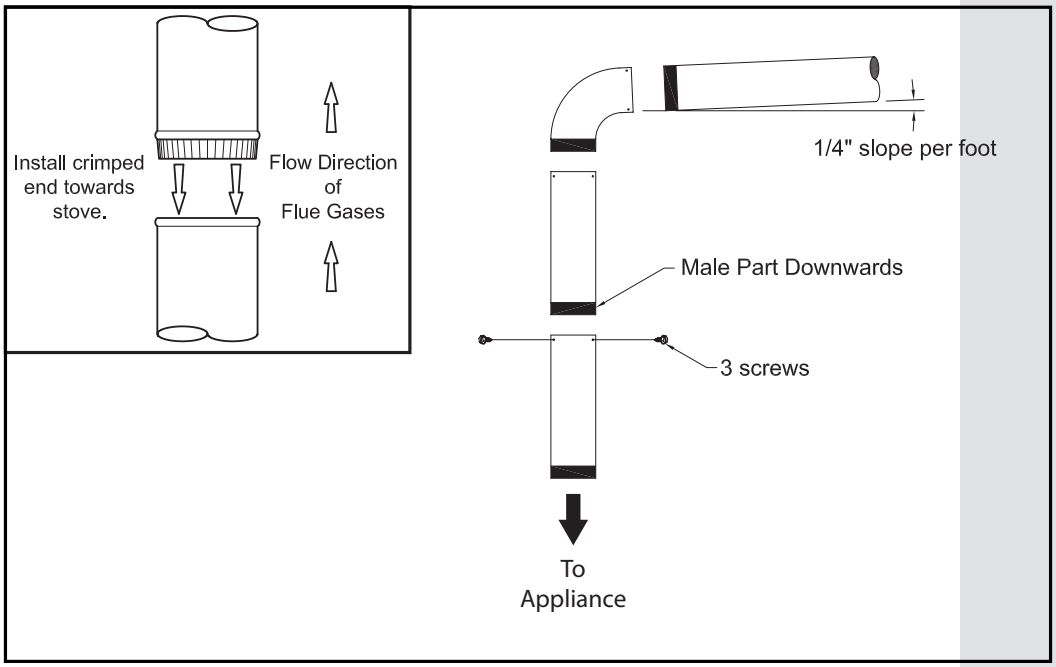
- Floor to ceiling height must be at least 7' (2.13m) in all cases.
- Do not place any combustible material within 4' (1.2m) of the front of the unit.
- Never store your fuel within the specified clearances or within the space required for refueling and ash removal.
- The clearance between the flue pipe and a wall are valid only for vertical walls and for vertical flue pipe.
- The chimney connector must not pass through an attic or roof space, closet or similar concealed space, a floor, or a ceiling.
- For Canadian installations, where passage through a wall, or partition of combustible construction is desired, the installation must conform to CAN/CSA-B365, Installation Code for Solid-Fuel-Burning Appliances and Equipment.
- A flue pipe crossing a combustible wall must have a minimum clearance of 18" (457.2mm).
- To reduce flue clearances from combustible materials, contact your local safety department or consult NFPA 211.

IMPORTANCE OF PROPER DRAFT

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause back puffing into the room and 'plugging' of the chimney. Inadequate draft will cause the appliance to leak smoke into the room through appliance and chimney connector joints. An uncontrollable burn or excessive temperature indicates excessive draft. Take into account the chimney's location to insure it is not too close to neighbors or in a valley which may cause unhealthy or nuisance conditions.

CHIMNEY CONNECTOR (STOVE PIPE)

Your chimney connector and chimney must have the same diameter as the stove outlet (6"). If this is not the case, we recommend you contact your dealer in order to insure there will be no problem with the draft. They must also be a type suitable for burning solid fuel and must be in good condition and kept clean. The stove pipe must be made of aluminized or cold roll steel with a minimum thickness of 0.021" or 0.53 mm. It is strictly forbidden to use galvanized steel. Your smoke pipe should be assembled in such a way that the male section (crimped end) of the pipe faces down. Attach each of the sections to one another with three equidistant metal screws. Seal with furnace cement. The pipe must be short and straight. All sections installed horizontally must slope at least 1/4 inch per foot, with the upper end of the section toward the chimney. Any installation with a horizontal run of chimney pipe must conform to NFPA 211. You may contact NFPA (National Fire Protection Association) and request the latest edition of the NFPA Standard 211. To insure a good draft, the total length of the coupling pipe should never exceed 8' to 10' (2.4m to 3.04m). (Except for cases of vertical installation, cathedral-roof style where the smoke exhaust system can be much longer and connected without problem to the chimney at the ceiling of the room). There should never be more than two 90 degrees elbows in the smoke exhaust system. Installation of a "barometric draft stabilizer" (fireplace register) on a smoke exhaust system is prohibited. Furthermore, installation of a draft damper is not recommended. Indeed, with a controlled combustion pellet stove, the draft is regulated upon intake of the combustion air in the stove and not at the exhaust.

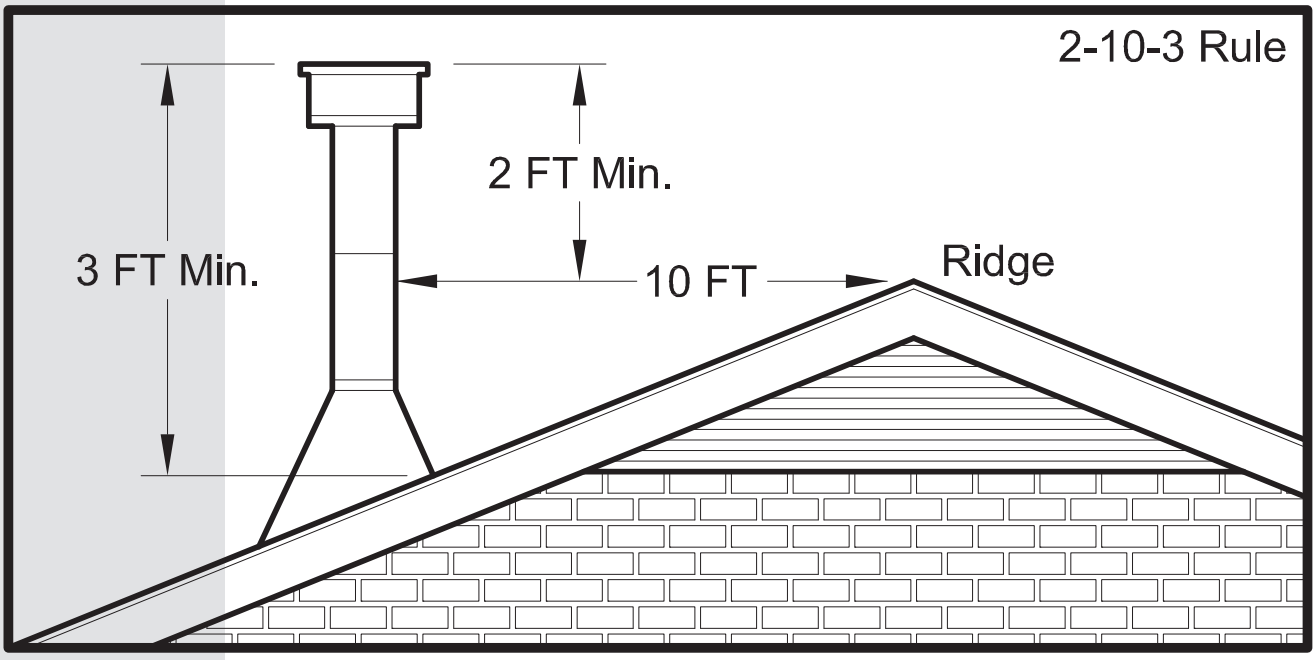


CHIMNEY

Your appliance may be hooked up with a 6" factory built or masonry chimney. If you are using a factory built chimney, it must comply with UL 103 or CAN/ULC-S629 standard; therefore it must be a Type HT (2100°F). It is extremely important that it be installed according to the manufacturer's specifications. If you are using a masonry chimney, it is important that it be built in compliance with the specifications of the National Building Code. It must be lined with fire clay bricks, metal or clay tiles sealed together with fire cement. (Round flues are the most efficient). The interior diameter of the chimney flue must not be smaller than the exhaust outlet of the appliance. A flue which is too small may cause draft problems, while a large flue favours rapid cooling of the gas, and hence the build-up of creosote and the risk of chimney fires. Note that it is the chimney and not the stove which creates the draft effect; your stove's performance is directly dependent on an adequate draft from your chimney.

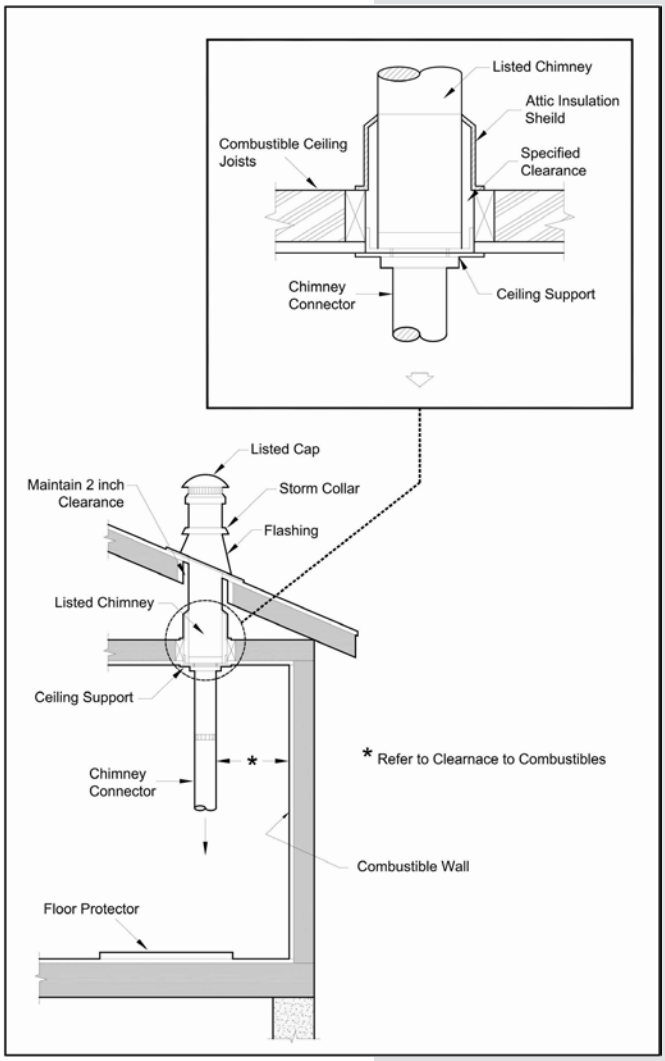
The following recommendations may be useful for the installation of your chimney:

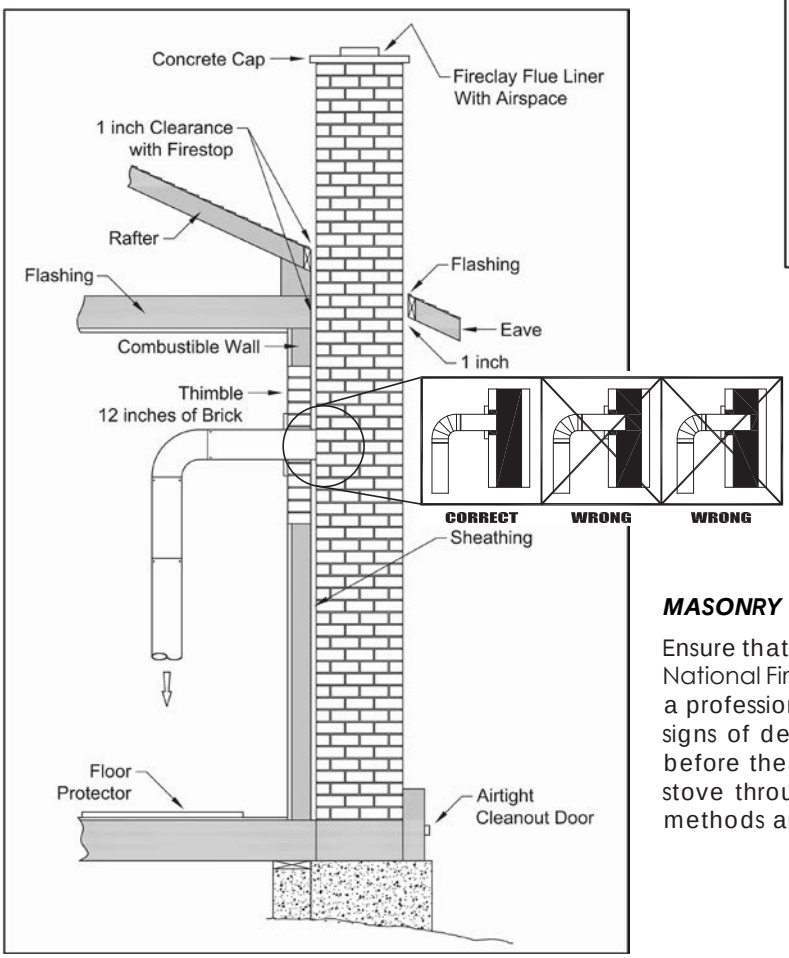
1. Do not connect this unit to a chimney flue serving another appliance.
2. It must rise above the roof at least 3' (0.9m) from the uppermost point of contact.
3. The chimney must exceed any part of the building or other obstruction within a 10' (3.04m) distance by a height of 2' (0.6m).
4. Installation of an interior chimney is always preferable to an exterior chimney. Indeed, the interior chimney will, by definition, be hotter than an exterior chimney, being heated up by the ambient air in the house. Therefore the gas which circulates will cool more slowly, thus reducing the build-up of creosote and the risk of chimney fires.
5. The draft caused by the tendency for hot air to rise will be increased with an interior chimney.
6. Using a fire screen at the extremity of the chimney requires regular inspection in order to insure that it is not obstructed thus blocking the draft, and it should be cleaned when used regularly.
7. All joints must be sealed inside and out.
8. The exterior section of the chimney should be double or triple wall.



FACTORY BUILT CHIMNEY

When a metal prefabricated chimney is used, the manufacturer's installation instructions must be followed. You must also purchase (from the same manufacturer) and install the ceiling support package or wall pass-through and "T" section package, firestops (where needed), insulation shield, roof flashing, chimney cap, etc. Maintain proper clearance to the structure as recommended by the manufacturer. The chimney must be the required height above the roof or other obstructions for safety and proper draft operation. Never substitute alternative materials for any of the manufacturer's specified components or complete the install without using all of the required components.

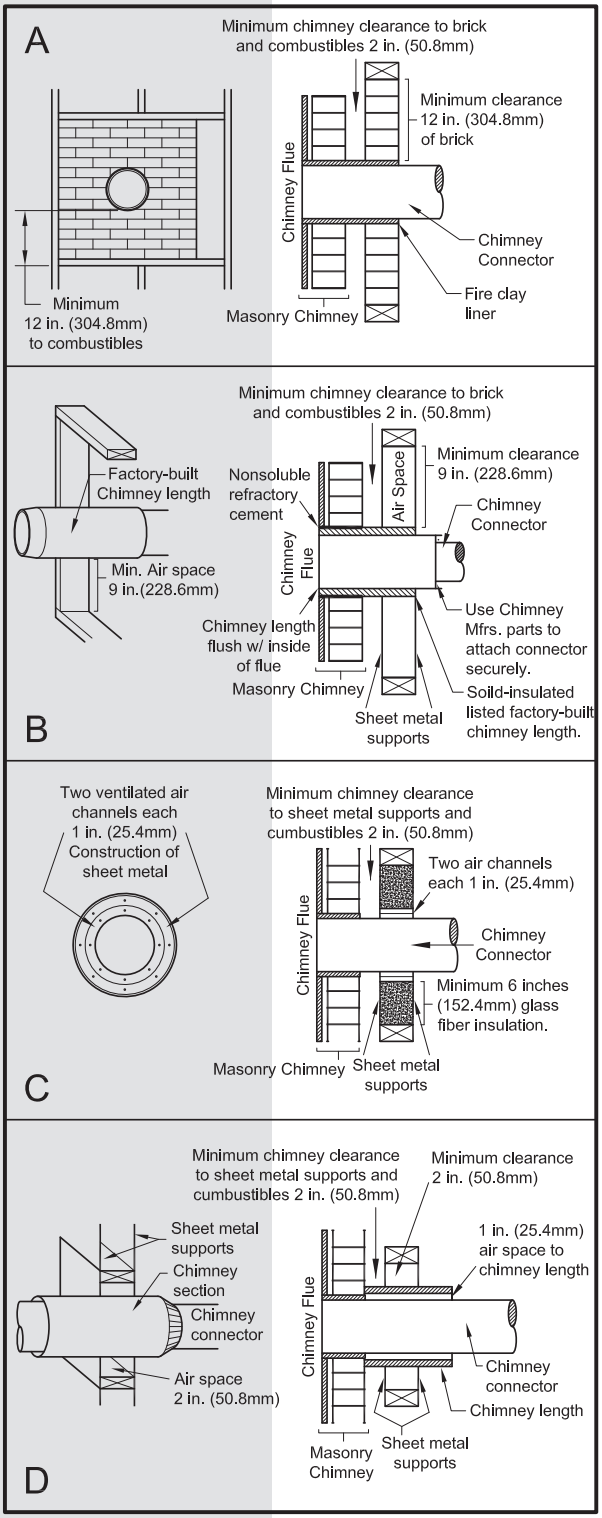




MASONRY CHIMNEY

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

COMBUSTIBLE WALL CHIMNEY CONNECTOR PASS-THROUGHS



Method A. 12" (304.8 mm) Clearance to Combustible Wall Member: Using a minimum thickness 3.5" (89 mm) brick and a 5/8" (15.9 mm) minimum wall thickness clay liner, construct a wall pass-through. The clay liner must conform to ASTM C315 (Standard Specification for Clay Fire Linings) or its equivalent. Keep a minimum of 12" (304.8 mm) of brick masonry between the clay liner and wall combustibles. The clay liner shall run from the brick masonry outer surface to the inner surface of the chimney flue liner but not past the inner surface. Firmly grout or cement the clay liner in place to the chimney flue liner.

Method B. 9" (228.6 mm) Clearance to Combustible Wall Member: Using a 6" (152.4 mm) inside diameter, listed, factory-built Solid-Pak chimney section with insulation of 1" (25.4 mm) or more, build a wall pass-through with a minimum 9" (228.6 mm) air space between the outer wall of the chimney length and wall combustibles. Use sheet metal supports fastened securely to wall surfaces on all sides, to maintain the 9" (228.6 mm) air space. When fastening supports to chimney length, do not penetrate the chimney liner (the inside wall of the Solid-Pak chimney). The inner end of the Solid-Pak chimney section shall be flush with the inside of the masonry chimney flue, and sealed with a non-water soluble refractory cement. Use this cement to also seal to the brick masonry penetration.

Method C. 6" (152.4 mm) Clearance to Combustible Wall Member: Starting with a minimum 24 gauge (.024" [.61 mm]) 6" (152.4 mm) metal chimney connector, and a minimum 24 gauge ventilated wall thimble which has two air channels of 1" (25.4 mm) each, construct a wall pass-through. There shall be a minimum 6" (152.4) mm separation area containing fiberglass insulation, from the outer surface of the wall thimble to wall combustibles. Support the wall thimble, and cover its opening with a 24-gauge minimum sheet metal support. Maintain the 6" (152.4 mm) space. There should also be a support sized to fit and hold the metal chimney connector. See that the supports are fastened securely to wall surfaces on all sides. Make sure fasteners used to secure the metal chimney connector do not penetrate chimney flue liner.

Method D. 2" (50.8 mm) Clearance to Combustible Wall Member: Start with a solid-pak listed factory built chimney section at least 12" (304 mm) long, with insulation of 1" (25.4 mm) or more, and an inside diameter of 8" (2 inches [51 mm] larger than the 6" [152.4 mm] chimney connector). Use this as a pass-through for a minimum 24-gauge single wall steel chimney connector. Keep solid-pak section concentric with and spaced 1" (25.4 mm) off the chimney connector by way of sheet metal support plates at both ends of chimney section. Cover opening with and support chimney section on both sides with 24 gauge minimum sheet metal supports. See that the supports are fastened securely to wall surfaces on all sides. Make sure fasteners used to secure chimney flue liner do not penetrate flue liner.

NOTES:

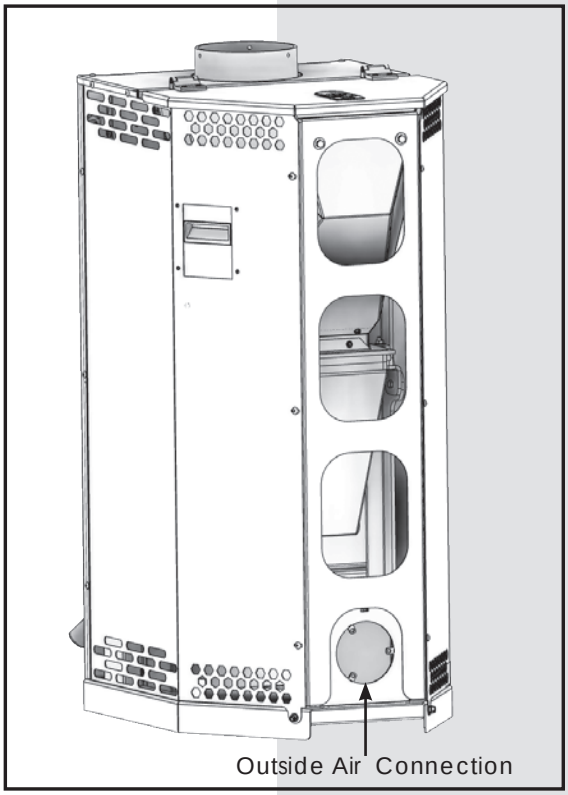
- Connectors to a masonry chimney, excepting method B, shall extend in one continuous section through the wall pass-through system and the chimney wall, to but not past the inner flue liner face.
- A chimney connector shall not pass through an attic or roof space, closet or similar concealed space, or a floor, or ceiling.

OUTSIDE COMBUSTION AIR

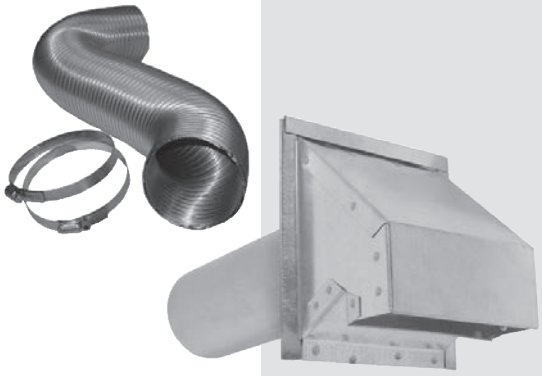
Your appliance may be installed with an outside air intake. This type of installation is also required for Canadian installations, mobile homes and in air tight houses with negative pressure problems. You can purchase this option through your heater dealer or at your local hardware supply store. Installation instructions should be supplied with the air intake kit.

Outside combustion air may be required if:

1. Your appliance does not draw steadily, smoke rollout occurs, fuel burns poorly, or back-drafts occur whether or not there is combustion present.
2. Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-drafts occur whether or not there is combustion present.
3. Opening a window slightly on a calm (windless) day alleviates any of the above symptoms.
4. The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices that exhaust house air.
5. There is excessive condensation on windows in the winter.
6. A ventilation system is installed in the house.



If using outside combustion air, you can purchase a standard 4FAK from your dealer and install it on the rear of the appliance. The inlet tubing used must be rigid and have a minimum material thickness of 0.016 inches. Follow the manufacturer's installation instructions for attaching the 4FAK to the home.



4FAK Installation

HEATING

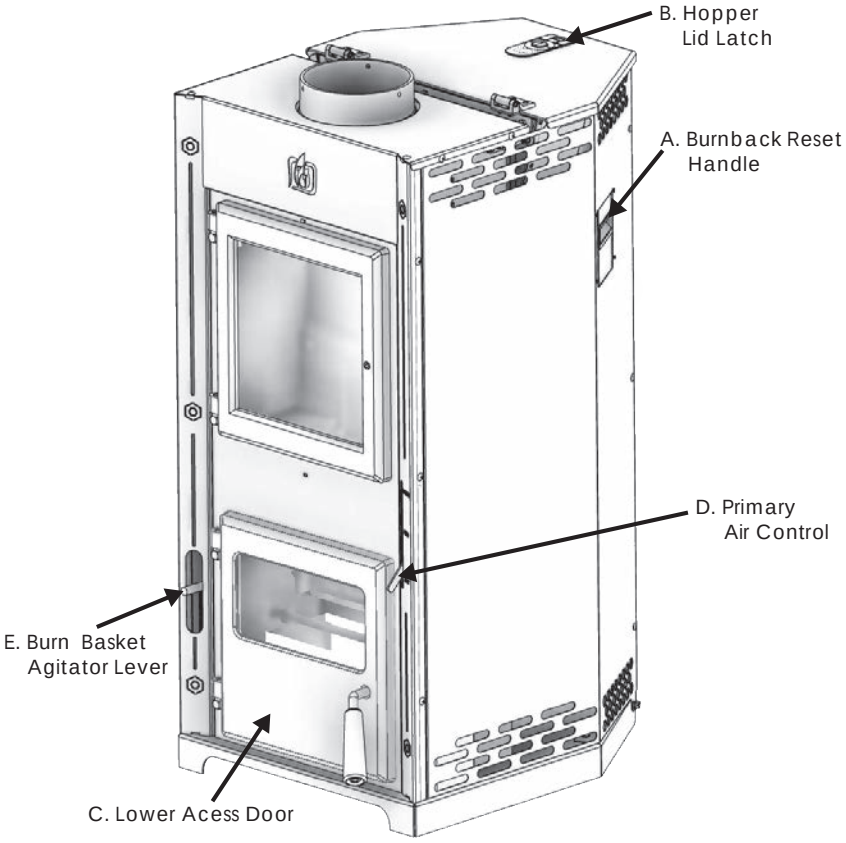
Controlled combustion is the most efficient technique for wood pellet heating because it enables you to select the type of combustion you want for each given situation. The wood pellets will burn slowly if the heater air intake control is adjusted to reduce the oxygen supply in the combustion chamber to a minimum. On the other hand, wood pellets will burn quickly if the air control is adjusted to admit a larger quantity of oxygen in the combustion chamber. The air intake control on your heater is very simple. If you raise the air control lever up as far as if will go, it is fully open. If you push it down until if stops, the combustion air is reduced to the minimum setting. Real operating conditions may give very different results than those obtained during testing according to the overall quality of pellets used, the average size of the pellets, the length of the chimney, altitude and outside air temperature.

A. The unit is equipment with a temperature sensitize burn back control. This will stop the fuel flow if the unit gets to hot, and will also close off the bottom of the hopper from the fire chamber when the unit is running out of fuel. Before each fuelling the control will have to be reset. There is a handle on the right side panel of the unit that is used to reset the control. Lift the handle up and you will hear a click when the control is reset. If the unit is running and needs to be refuelled it MUST be refuelled before the hopper is empty. If you can see the burn back control you will have to let the unit completely cool down before refuelling.

B. The hopper on this unit must be sealed at all times during operation. This is achieved with a gasketed hopper lid, and the lid is locked down with a compression latch. The latch has a button in the middle of it that when pressed the latch will open. After refuelling the lid MUST be closed and latched for proper operation.

C. The lower access door has two main purposes. The first purpose is for lighting the stove. The second purpose is for accessing the ash pan.

D. The primary air control is located on the lower right hand side of the face of the unit. If the control is lifted all the way up the unit damper is set to the maximum burn rate. If it is pushed all the way down it will reduce the combustion air to the minimum burn rate.



E. The unit is equipped with a secondary burn basket in the combustion chamber. The basket can and will need to be agitated as needed. The lever for agitating the basket is located on the lower left hand side of the front of the unit.

THE FIRST FIRES

The first few fires in your new appliance needs to be small so as to cure the fresh paint and preserve it's quality. To do so first check to make sure that the fuel burn back flap is in the open position. If it is closed lift the handle on the right side panel of the unit to reset the flap. Fill the hopper with about half a bag of pellets (approximately 15-20 pounds) of premium wood pellets. Close and latch the hopper lid to insure that it is sealed. Make sure that the air control is set to the maximum setting. Open the lower burn chamber door, and place a ZIP Fire Starter in the ignition port. Once the fire starter is in the port, use a long grill type lighter to ignite the firestarter. After the fire starter is ignited and fully burning make sure that the cover for the ignition port swings back down and covers the ignition port. After checking to make sure the ignition port cover closes to it proper location, close the burn chamber door. If the unit is slow to start the lower combustion chamber door may need to be left cracked for 5-10 minutes until the unit is fully burning. The primary air control need to be left on the maximum setting for the first 30 - 40 minutes after igniting the unit. After 30 - 40 minutes close down the primary air control to a medium or medium low burn rate to maintain a small fire in the unit to properly cure the paint.

CAUTION: Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in this heater. Keep all such liquids well away from the heater while it is in use. Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.

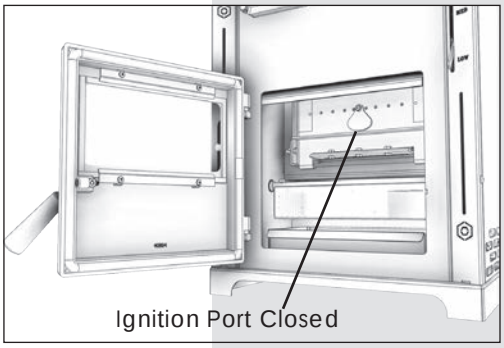
Make sure that there's enough air circulation in the area of installation while curing the appliance. The odors could be present during the first 3 or 4 fires. We suggest opening a window during the curing process. People and animals with lung problems should take precautions during this time. Never start your stove outside. You will not be able to see if you are over heating.

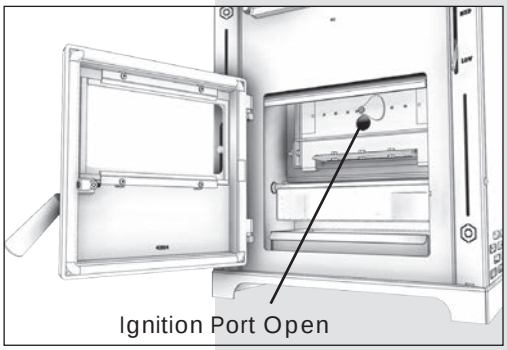
OPERATION

IGNITION

CAUTION:

- Do not ever attempt to light the stove from the bottom of the primary burn grate. Always use the ignition port to start the unit.
- Do not ever attempt to light the stove with the upper chamber access door open.
- Do not ever attempt to light the stove with coals remaining in the fire pot drop tube or on the primary burn grate.
- Do not ever attempt to light the stove without first resetting the burn back control thermostat to the open position.
- Allow the unit to cool to the touch before refueling and lighting, of the unit runs out of fuel, or if the fuel level is below the fuel cut off flap.


Ignition Port Closed


Ignition Port Open

1. Open the hopper lid and check to make sure that the fuel burn back flap is in the open position. If it is not, use the handle on the right side of the unit to reset. Fill the hopper with premium pellets, and close and latch the hopper lid to insure it is sealed.
2. After filling the hopper with pellets, make sure that the air control is set to the maximum setting.
3. Open the lower combustion chamber door to access the ignition port. Swing the ignition port cover to the side and place a ZIP fire starter in the port. Use a long grill type lighter to ignite the fire starter. After the fire starter is ignited check to make sure that the ignition port cover fell back into place covering the port.
4. Once the fire starter is ignited and burning, close the combustion chamber door. If the fire starter and pellets are slow to ignite, it may be necessary to leave the combustion chamber door cracked for 5-10 minutes until the unit is fully burning. NEVER leave the combustion chamber door open for longer than the first 10 minutes, this can cause unsafe burning conditions.
5. After the combustion chamber door is closed, allow the unit to burn on the maximum heat setting for 30-40 minutes before adjusting the damper and reducing the burn rate.

OPERATION

- DO NOT open viewing door during operation.
- DO NOT open the lower combustion chamber door during operation. After the ignition process the door must remain closed and sealed while the unit is being operated. If the door is opened during operation it can cause unsafe burning conditions.
- DO NOT refuel the unit if the fuel level is down to where you can see the fuel burn back flap.

During operation if the fuel level in the hopper gets down to the fuel cut off flap, you can not refuel the unit until it is completely cool. As the unit burns, coals will build up in the secondary burn basket, the basket will need to be agitated periodically to level out the coals. A good example of this is if the coals are building up close to the burn grate the basket needs to be agitated. NOTE: This appliance does not have a "quick" shutdown method. Once the appliance has been charged with fuel, ignited and burning, it will burn until all fuel has been consumed by combustion. Please note that once the fire does cease, the appliance may still be quite warm or HOT and could remain Hot for an undetermined amount of time depending on firing conditions. Experience burning your appliance, will tell you how many pellets to put in the hopper in order to burn for a desired period of time. This unit may run anywhere from 1 - 6 hours on a single XXlb charge depending on the air adjustment setting and quality of fuel used. You may use the below primary air settings as a good starting point when burning your new appliance. Please note that these settings may vary depending on certain factors that may affect combustion.

Primary Air Settings (Slide Damper is located on the right side of stove) (Damper Adjustment: Pulling out on damper increases air)		CAUTION: Never alter the damper slide or the adjustment range to increase firing for any reason. Doing so could result in heater damage and will void your warranty.
Low	Damper lever pushed all the way down	
Medium - Low	Damper lever moved 1/3 of the way up	
Medium - High	Damper lever moved 2/3 of the way up	
High	Damper lever lifted up to the maximum position.	

WARNINGS

- NEVER OVERFIRE YOUR STOVE. IF ANY PART OF THE STOVE STARTS TO GLOW RED, OVER FIRING IS HAPPENING. READJUST THE AIR INTAKE CONTROL AT A LOWER SETTING.
- ATTEMPTS TO ACHIEVE HEAT OUTPUT RATES THAT EXCEED HEATER DESIGN SPECIFICATIONS CAN RESULT IN PERMANENT DAMAGE TO THE HEATER.

VISIBLE SMOKE

The amount of visible smoke being produced can be an effective method of determining how efficiently the combustion process is taking place at the given settings. Visible smoke consist of unburned fuel and moisture leaving your stove. Learn to adjust the air settings of your specific unit to produce the smallest amount of visible smoke. Wood that has not been seasoned properly and has a high wood moisture content will produce excess visible smoke and burn poorly.

RELOADING

If you wish to continue burning your heater after the majority of the fuel has been consumed, make sure to add more fuel before the fuel cut off flap is visible. The fuel cut off functions with heat, as the pellets get lower in the fire pot the flap will close and not be able to be reset until the unit is completely cool.

It is important to note that wood combustion consumes ambient oxygen in the room. In the case of negative pressure, it is a good idea to allow fresh air in the room, either by opening a window slightly or by installing a fresh air intake system on an outside wall.

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 connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote build-up has occurred. If creosote has accumulated (3mm or more), it should be removed to reduce the risk of a chimney fire.

TO PREVENT CREOSOTE BUILD UP

- Always burn PFI certified premium grade pellets. This allows clean burns and higher chimney temperatures, therefore less creosote deposit.
- Leave the air control full open for about 5 min. every time you refuel the appliance to bring it back to proper operating temperatures. The secondary combustion can only take place if the firebox is hot enough.
- Always check for creosote deposit in your chimney once every two months and have your chimney cleaned at least once a year.

If a chimney or creosote fire occurs, close all dampers immediately. Wait for the fire to go out and the heater to cool, then inspect the chimney for damage. If no damage results, perform a chimney cleaning to ensure there is no more creosote deposits remaining in the chimney.

TAMPER WARNING

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.

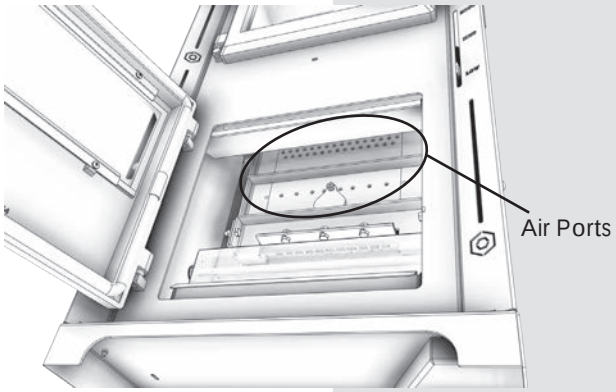
MAINTENANCE

CAUTION: Do not perform maintenance or cleaning on the unit until it has cooled to room temperature completely

Your wood pellet stove is a high efficiency stove however, still requires that maintenance be performed on a regular basis. Maintenance is a vital key in maintaining your stove's efficiency, operation, and longevity. It is important to perform a visual inspection of the appliance every time it is emptied and cleaned, in order to insure that no parts have been damaged, in which case repairs must be performed immediately. Inspect and clean the chimney and connector pipe periodically for creosote buildup or obstructions. Inspection should be done at least monthly during the heater season.

SECONDARY AIR PORTS

Cleaning the Secondary Air Ports regularly will help keep your heater burning clean and efficiently. Remove any ash or creosote build-up from the ports as frequently as needed. A simple brush with a small chimney sweep broom once a day will help reduce or prevent any large deposits from bonding to this surface which could cause premature deterioration of the firebox. Most Creosote formations here can be removed.



ASH DISPOSAL/ ASH PAN AREA

Ashes should be removed from the stove approximately every 2 to 3 days or when there are building up close to the secondary burn basket. Always empty the stove when it is cold, such as in the morning. Never open the lower combustion chamber door to empty the ash pan while the unit is in operation, this could cause an overfire situation. Remove any accumulated ash or fallen pellets from the ash pan area. An Ash Vac greatly aids in this process and can be purchased from your local dealer. Ashes should be placed in a steel container with a tight fitting lid and moved outside immediately. The closed container of ashes should be placed on a non combustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the close container until all cinders have thoroughly cooled. Other waste shall not be placed in this container.

CAUTIONS

- ASHES COULD CONTAIN HOT EMBERS EVEN AFTER TWO DAYS WITHOUT OPERATING THE STOVE.
- KEEP ASH PAN AREA CLEAN.
- THE ASH PAN CAN BECOME VERY HOT. WEAR GLOVES TO PREVENT INJURY.
- NEVER BURN THE STOVE WITH THE ASH TRAP OPEN. THIS WOULD RESULT IN OVER FIRING THE STOVE, DAMAGE TO THE STOVE AND EVEN HOUSE FIRE MAY RESULT.

SMOKE AND CO MONITORS

Burning wood naturally produces smoke and carbon monoxide(CO) emissions. CO is a poisonous gas when exposed to elevated concentrations for extended periods of time. While the modern combustion systems in heaters drastically reduce the amount of CO emitted out the chimney, exposure to the gases in closed or confined areas can be dangerous. Make sure your stove gaskets and chimney joints are in good working order and sealing properly to ensure unintended exposure. It is recommended that you use both smoke and CO monitors in areas having the potential to generate CO.

GLASS

- Inspect and clean the glass regularly in order to detect any cracks. If you spot one, schedule to replace immediately. Do not abuse the glass door by striking or slamming shut. Do not use the stove if the glass is broken.
- If the glass on your stove breaks, replace only with the glass supplied from your heater dealer. Never substitute other materials for the glass.
- To replace the glass, remove the nuts retaining the glass clips inside the door. Remove the clips and replace the damaged piece with a new one. Perform the procedure backwards after replacing. When replacing the glass, you should change the glass gasket to make sure you keep it sealed.
- Never wash the glass with abrasive cleaners or with a product that may scratch. Use a specialized product, available in the stores where pellet stoves are sold. The glass should be washed only when cold, NEVER CLEAN WHEN HOT.

GASKETING

WARNING: Never operate the appliance without a gasket or with a broken one. Damage to the appliance or even house fire may result.

This unit's doors use a 3/4"diameter rope gasket. It is recommended that you check your gaskets twice a month during the heating season and change the gaskets (which makes your stove air tight) once a year, in order to insure good control over the combustion, maximum efficiency and security. To check for a proper seal, you should do a paper slip test. Do so by taking a thin piece of paper about the size and thickness of a dollar bill. Place the paper between the gasket and the sealing surface, then close and latch the door/lid. You should feel a resistance when tugging on the paper slip, which may vary, but should always have resistance. Perform this test on every side of the seal, top, bottom, left and right, if possible. If the paper slip pulls out with little or no resistance, you need to adjust the lid/door and/or replace the gasket. To change the gaskets, simply remove the damaged one, carefully clean the available gasket groove, apply a gasket cement sold for this purpose, and install the new gasket. When installing the gasket, never stretch the gasket. You may light up your stove again approximately 24 hours after having completed this operation.

PAINT

Only clean your stove with a dry soft cloth that will not harm the paint finish. If the paint becomes scratched or damaged, it is possible to give your wood pellet stove a brand new look, by repainting it with a 1200° F heat resistant paint that can be purchased from your dealer. For this purpose, simply scrub the surface to be repainted with fine sand paper, clean it properly, and apply thin coats (2) of paint successively. Remember, if paint is applied to the stove in large amounts or over large spots, you need to follow the First Fires procedure described previously in this manual.

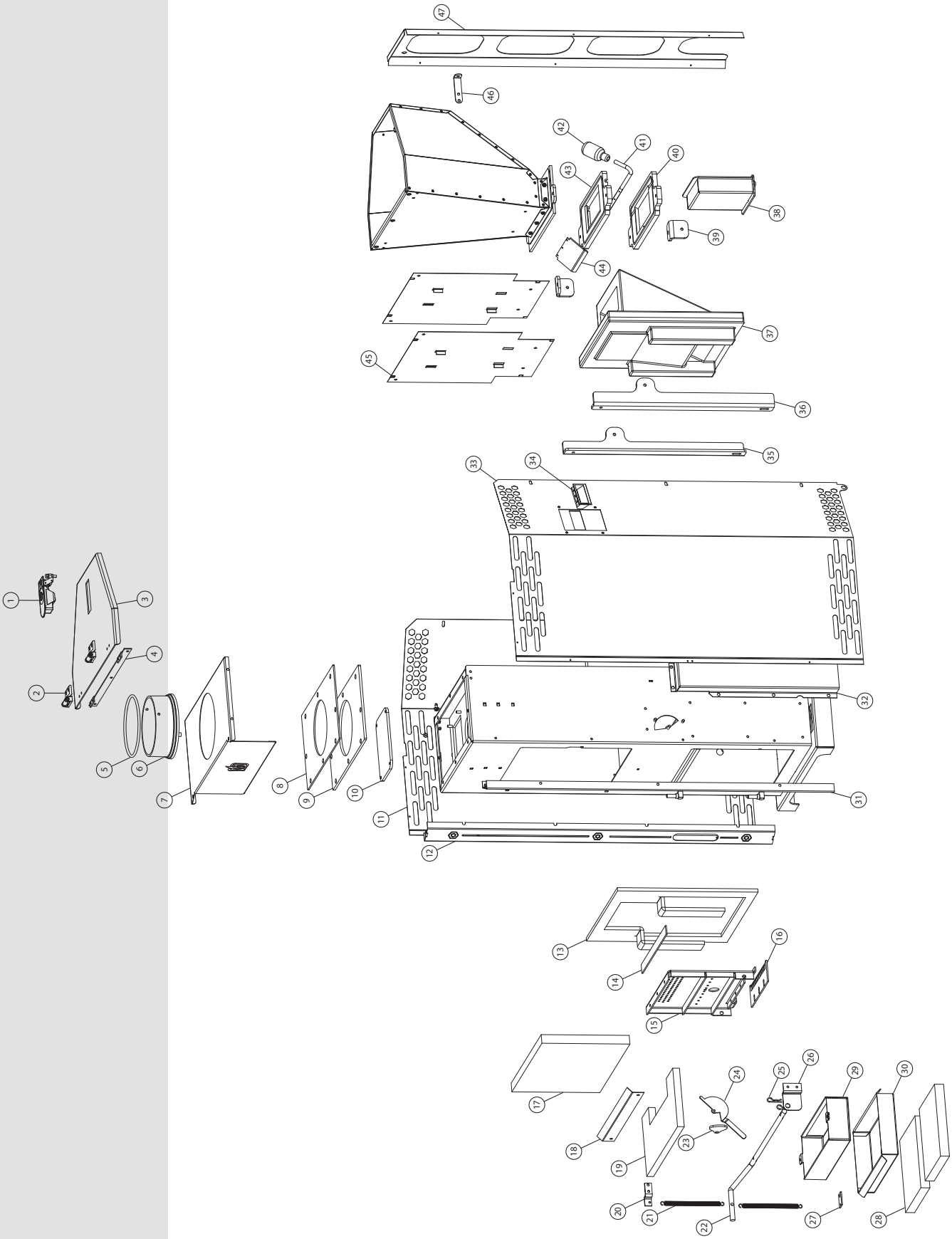
OFF SEASON MAINTENANCE

It is a good idea to give your stove a thorough cleaning at the end of each heating season to decrease the chances of rust occurring during the off-season. Do this, especially, on the inside of your firebox. Wipe the outside of the appliance with a non-abrasive cleaner (Windex) and a rag, allowing it to dry, then touch-up any spots with high temperature paint sold by your local dealer. Spraying the inside of the firebox with a rust inhibitor instead of paint, can also help.

	Weekly	Monthly	Annually or per Ton
Ashes	Emptied		
Lower Burn Chamber	Cleaned		
Primary Burn Grate	Cleaned		
Exhaust Flue		Inspected/ Cleaned	
Secondary Air Ports		Cleaned	
Glass			Cleaned
Top Baffle			Cleaned
Combustion Relief Plate			Inspected
Firepot			Inspected
Fuel Cutoff Flap		Inspected/ Cleaned	
Primary Air Inlet			Inspected
Outside Air Kit			Inspected

TROUBLE SHOOTING

Problem:	Possible Causes:
Extinguished Flame On Low Burn	Poor or lack of adequate draft. Air leaks in the upper burn chamber Too large of gap in upper chamber air wash Air leaks between the upper and lower burn chambers Partially blocked primary burn grate Partially blocked secondary air ports Block in primary air
Extinguished Flame On High Burn	Block or inadequate gap in upper chamber air wash. Excessive continuous draft > 0.1 inches of water column. (NEEDS VERIFIED) Block in primary air
Dirty Glass Or Visible Smoke	Blocked primary burn grate Extinguished flame on low or high burn Inadequate draft
Burn Back Thermostat Fails To Latch Plate Open	Bi-metal switch or mounting bracket is bent Bi-matelic strip is still to warm to reset the flap.
Burn Back Thermostat Fails To Close Plate When All Fuel Is Consumed	Bi-metal switch installed upside down Bi-metal switch or mounting bracket is bent Movement of the counter weight is restricted by the reset handle Pellet or other obstruction physically blocking plate from moving
Significantly Uneven Burn Across The Opening	Leak in the primary burn chamber cover plate Leak in the lower chamber to the upper chamber Significantly uneven air wash gap in the upper burn chamber door Leak in the upper burn chamber
Excessive Pellets Dropping To The Burn Basket	Damaged / significantly warped burn grate Damaged / significantly warped primary burn chamber cover plate. Use of non PFI certified premium wood pellets – poor quality fuel. Burn plate not adjusted properly.
Loud Rumbling	Lower burn chamber door open Large air leak in lower burn chamber Significant imbalance in air from upper to lower burn chambers • Verify proper gap in upper chamber air wash • Verify proper sealing of both upper and lower doors • Verify proper seal from upper to lower burn chamber • Verify proper seal of the fire pot to the unit
Unable To Achieve A Low Burn	Leak in the lower burn chamber allowing too much primary combustion air in. Bent or damaged primary burn control lever Too much draft <= 0.03 Leak in the gasket around the access door
Unable To Reach High Burn	Too little draft Blockage in primary air inlet Dirty primary burn grate or secondary air ports Blockage or resistance in exhaust path
Too High Of A High Burn	Too much draft – Also results in visible smoke during high burn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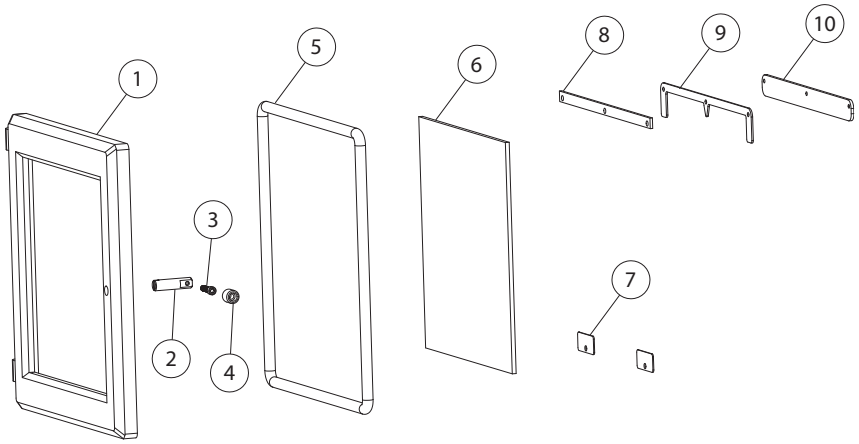
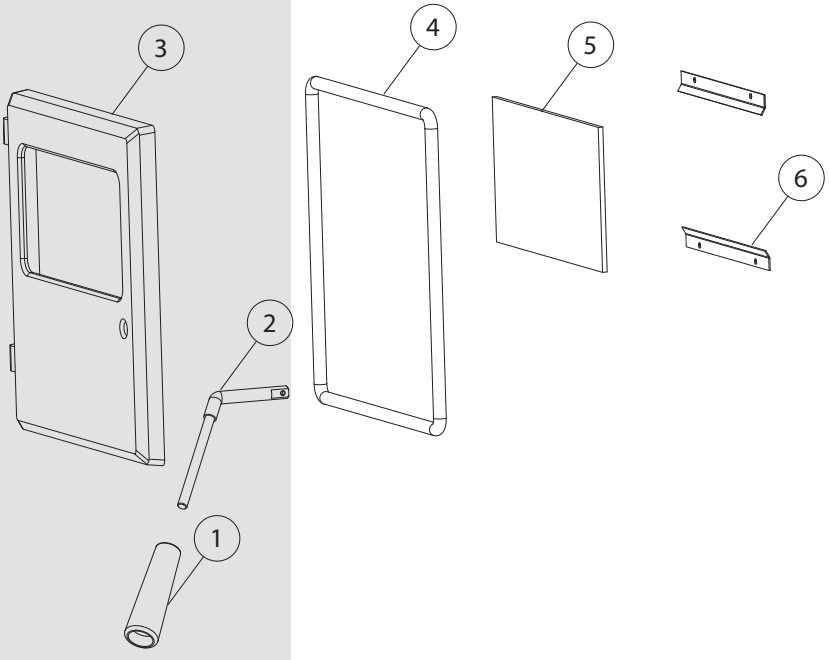
REPLACEMENT PARTS

Key	Part No.	Description	Qty
1	891125	Latch, Hopper Lid	1
2	83968	Offset Hinge	2
3	28646	Hopper Lid	1
4	28974	Led Bracket	1
5	88042	1/4" Rope Gasket	1
6	40292A	6" Flue Collar	1
7	28689	Top, Cabinet	1
8	28650	Top	1
9	88290	Top Gasket	1
10	28645	Pop Off Plate	1
11	28635	Left Side Panel	1
12	28986	Left Shoulder	1
13	88292	Cast Gasket	1
14	88304	Cast Gasket	1
15	610906	Secondary Baffle Weldment	1
16	28641	Burn Grate	1
17	892964	Back Panel	1
18	28644	Brick Retainer	1
19	893063	Top Panel	1
20	28984	Spring Bracket	1
21	83916	Extension Spring - Ø0.50 X 6.00"	2
22	893066	Shaker Rod	1
23	28647	Ignition Flap	1
24	28759	Air Slide	1
25	83529	Hairpin	2
26	28969	Holder	2
27	28985	Base Bracket	1
28	892970	Base Panel	2
29	610905	Burn Basket	1
30	28686	Ash Pan	1
31	28687	Right Shoulder	1
32	28964	Air Cover	1
33	28636	Right Side Panel	1
34	891148	Handle, Plastic	1
35	28973	Cast Strap, Left	1
36	28638	Cast Strap, Right	1
37	892963	Fire Pot	1
38	610802	Fresh Air Box	1
39	28637	Cast Bracket	2
40	40875	Junction Plate, Bottom	1
41	893067	Flue Lever	1
42	40874	Fuel Cutoff Weight	1
43	40876	Junction Plate, Top	1
44	28982	Fuel Cutoff	1
45	28968	Heat Shield	2
46	28842	Hopper Bracket	2
47	28648	Back Panel	1

In order to maintain warranty, components must be replaced using original manufacturers parts purchased through your dealer or directly from the appliance manufacturer. Use of third party components will void the warranty.

Key	Part No.	Description	Qty
1	40865	Viewing Door	1
2	893061	Allen Handle	1
3	83788	Socket Head Screw	1
4	893062	Roller Sleeve	1
5	88227	Rope Gasket	1
6	892965	Viewing Glass	1
7	28722	Glass Clamp	2
8	88313	Air Wash Gasket	1
9	28965	Air Wash Spacer	1
10	28721	Air Clamp	1
11	610800	Door Assembly, Access	1





Key	Part No.	Description	Qty
1	893059	Wooden Thru Handle	1
2	892962	Door Handle	1
3	40864	Access Door	1
4	88227	Rope Gasket	1
5	892961	Bottom Glass	1
6	28631	Glass Clamp	2
7	610755	Door Assembly, Access	1

In order to maintain warranty, components must be replaced using original manufacturers parts purchased through your dealer or directly from the appliance manufacturer. Use of third party components will void the warranty.

SERVICE RECORD

It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed.

SERVICE PROVIDER

Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer's instructions. Always use the manufacturer's specified spare part when replacement is necessary.

Service 01 Date:_____
Engineer Name: _____
License No.: _____
Company: _____
Telephone No.: _____
Stove Inspected: ☐ Chimney Swept: ☐
Items Replaced: _____

Service 02 Date:_____
Engineer Name: _____
License No.: _____
Company: _____
Telephone No.: _____
Stove Inspected: ☐ Chimney Swept: ☐
Items Replaced: _____

Service 03 Date:_____
Engineer Name: _____
License No.: _____
Company: _____
Telephone No.: _____
Stove Inspected: ☐ Chimney Swept: ☐
Items Replaced: _____

Service 04 Date:_____
Engineer Name: _____
License No.: _____
Company: _____
Telephone No.: _____
Stove Inspected: ☐ Chimney Swept: ☐
Items Replaced: _____

Service 05 Date:_____
Engineer Name: _____
License No.: _____
Company: _____
Telephone No.: _____
Stove Inspected: ☐ Chimney Swept: ☐
Items Replaced: _____

Service 06 Date:_____
Engineer Name: _____
License No.: _____
Company: _____
Telephone No.: _____
Stove Inspected: ☐ Chimney Swept: ☐
Items Replaced: _____

Service 07 Date:_____
Engineer Name: _____
License No.: _____
Company: _____
Telephone No.: _____
Stove Inspected: ☐ Chimney Swept: ☐
Items Replaced: _____

Service 08 Date:_____
Engineer Name: _____
License No.: _____
Company: _____
Telephone No.: _____
Stove Inspected: ☐ Chimney Swept: ☐
Items Replaced: _____

HOW TO ORDER REPAIR PARTS / COMMANDE DE PIÈCES DE RECHANGE

This manual will help you obtain efficient, dependable service from your heater, and enable you to order repair parts correctly.

Keep this manual in a safe place for future reference.

When writing, always give the full model number which is on the nameplate attached to the heater.

When ordering repair parts, always give the following information as shown in this list /

Ce guide vous aidera à obtenir un service efficace et fiable de l'appareil de chauffage et vous permettra de commander correctement des pièces de rechange.

Veuillez conserver ce guide dans un endroit sûr à des fins de référence.

Lorsque vous nous écrivez, veuillez indiquer le numéro complet du modèle qui figure sur la plaque signalétique de l'appareil de chauffage.

Lorsque vous commandez des pièces de rechange, veuillez toujours fournir les renseignements suivants, tels que montrés dans cette nomenclature:

1. The part number / le numéro de pièce _____
2. The part description / la partie de la description _____
3. The model number / le numéro de modèle _____
4. The serial number / le numéro de série_____

LIMITED LIFETIME WARRANTY

BRECKWELL

ACADIA HEARTH PRODUCTS LIMITED WARRANTY

The operation of this unit in a manner inconsistent with the owner's manual will void the warranty and is also against federal regulations. Breckwell warrants this product to be free from defects in material and workmanship, to the original retail purchaser only, for the time period identified below, measured from the date of the initial purchase as evidenced on an invoice, canceled check, sales receipt, etc., to receipt of a claim by Breckwell or an authorized dealer, as follows:

Components Covered	Warranty Period
Firebox / Heat Exchanger	Limited Lifetime
Door	Three Year
Cabinets and Trim	One Year
Gaskets	One Year
All Electrical Components (Blower, Auger / Agitator Motor, PC Board, Switches)	One Year
Ceramic Glass	One Year
Firepot	Three Years

Warranty conditions

This warranty only covers Breckwell appliances that are purchased through an Breckwell authorized retailer, dealer or distributor.

This warranty is only valid while the Breckwell appliance remains at the site of original installation. This warranty does not apply to products purchased for rental use.

Problem / Resolution

- As purchaser, you must first contact the dealer and/or the distributor from whom you purchased your heater.
- If within a reasonable period of time, you do not receive satisfactory service from the distributor and/or dealer, write or call Acadia Hearth/ Breckwell, including complete details of the problem and/or problems you are experiencing, details of your installation, your proof of purchase, and the heater serial number and date code.

Claim Procedure

Contact Breckwell for warranty service. You will be asked to provide detailed descriptions and pertinent data, including proof or purchase which will be returned upon request. Providing the heater has been installed and used in accordance with the Owner's Manual supplied with the heater and the issue does not fall under a situation of exclusion, Breckwell will either:

- Replace the defective part free of charge. Parts and/or service replacements made under the terms of this warranty are warranted only for the remaining period of the original heater warranty.
- Replace the heater free of charge. Should the heater be replaced by Breckwell "free of charge", all further warranty obligations are thereby met.
- Where the defect is of a cosmetic (non-functional) nature, Breckwell will bear reasonable expense to repair the heater, including such items as welding, painting, and incidental labor. A "reasonable expense" is defined by terms of this warranty as $30.00/hour with full refund for any purchase of parts.

Warranty Exclusions

This warranty does not cover the following:

- Damage to or changes in surface finishes as a result of normal use. As a heating appliance, some changes in color or interior and exterior surface finishes may occur. This is not a flaw and is not covered under warranty.
- Damage to printed, plated, or enameled surfaces caused by fingerprints, accidents, misuse, scratches, melted items, or other external sources and residues left on the plated surfaces from the use of abrasive cleaners or polishes.
- Repair or replacement of parts that are subject to normal wear and tear during the warranty period. These parts include: paint, pellet, and the discoloration of glass.
- Minor expansion, contraction, or movement of certain parts causing noise. These conditions are normal and complaints related to this noise are not covered by this warranty.
- Damages resulting from: (1) failure to install, operate, or maintain the appliance in accordance with the installation instructions, operating instructions, and listing agent identification label furnished with the appliance; (2) failure to install the appliance in accordance with local building codes and/or authorities having jurisdiction; (3) shipping or improper handling; (4) improper operation, abuse, misuse, continued operation with damaged, corroded or failed components, accident, alteration, or improperly/incorrectly performed repairs; (5) environmental conditions, weather, inadequate ventilation, negative pressure, or drafting caused by tightly sealed constructions, insufficient make-up air supply, or handling devices such as exhaust fans or forced air furnaces or other such causes; (6) use of fuels other than those specified in the operating instructions; (7) installation or use of components not supplied with appliance or any other components not expressly authorized and approved by Breckwell; (8) modification of the appliance not expressly authorized and approved by Breckwell in writing; and/or (9) interruptions or fluctuations of electrical power supply to the appliance.
- Non-Breckwell venting components, hearth components or other accessories used in conjunction with the appliance.
- Breckwell's obligation under this warranty does not extend to the appliance's capability to heat the desired space. Information is provided to assist the consumer and the dealer in selecting the proper appliance for the application. Consideration must be given to appliance location and configuration, environmental conditions, insulation and air tightness of the structure.
- Problems relating to smoking or creosote. Smoking is attributable to inadequate draft due to the design or installation of the flue system or installation of the heater itself. Creosote formation is largely attributable to improper operation of the unit and/or draft as mentioned above.
- Any cost associated with product removal and re-installation, travel, transportation, or shipping.
- Service calls to diagnose trouble (unless authorized in writing by the manufacturer, distributor, or dealer).

This Warranty Is Void If

- The appliance has been over-fired or operated in atmospheres contaminated by chlorine, fluorine, or other damaging chemicals. Over-firing can be identified by, but not limited to, warped plates or tubes, rust colored cast iron, bubbling, cracking and discoloration of steel or enamel finishes.
- The appliance is subjected to prolonged periods of dampness or condensation.
- There is any damage to the appliance or other components due to water or weather damage which is the result of, but not limited to, improper chimney or venting installation.

Limitations Of Liability

The owner's exclusive remedy and Breckwell's sole obligation under this warranty, under any other warranty, express or implied, or in contract, tort or otherwise, shall be limited to replacement, repair, or refund, in Breckwell's sole and absolute discretion. In no event will Breckwell be liable for any incidental or consequential damages. THE LIMITED WARRANTY SET FORTH HEREIN IS THE SOLE WARRANTY PROVIDED TO PURCHASER AND IS IN LIEU OF ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESS OR IMPLIED. BRECKWELL MAKES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT, OTHER THAN (i) THE LIMITED WARRANTY ABOVE, AND (ii) ANY IMPLIED WARRANTIES IMPOSED BY APPLICABLE LAW WHICH CANNOT BE WAIVED OR DISCLAIMED UNDER APPLICABLE LAW. ALL OTHER WARRANTIES OF ANY KIND, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED TO THE FULLEST EXTENT NOT PROHIBITED BY APPLICABLE LAW. This Limited Warranty gives the purchaser specific legal rights; a purchaser may have other rights depending upon where he or she resides. Some states do not allow the exclusion or limitation of special, incidental or consequential damages, or state law may affect the duration of limitations, so the above exclusion and limitations may not be applicable.

Warrantor

The warrantor of record is Acadia Hearth, LLC, 109 E. 17th Street, Suite 5478, Cheyenne, Wyoming 82001. Phone number: 1-833-222-3421 Register your product on line at www.acadiahearth.com. Save your proof of purchase, as documented in a receipt or invoice, with your records for any claims.

Exclusions de la garantie

Cette garantie ne couvre pas ce qui suit :

- Dommage ou modification du fini de la surface causé par une utilisation normale. Comme il s'agit d'un appareil de chauffage, il pourrait se produire une certaine modification de la couleur et des finis de la surface intérieure et extérieure. Il ne s'agit pas d'un défaut et ce n'est pas couvert par la garantie.
- La détérioration des surfaces imprimées, plaquées ou émaillées par les marques de doigts, accidents, abus, égratignures et pièces qui ont fondu ou autres causes externes, ainsi que les résidus laissés sur les surfaces plaquées par l'utilisation de nettoyants ou produits à polir abrasifs.
- La réparation ou le remplacement des pièces soumises à une usure normale pendant la période de garantie. Ces pièces comprennent : peinture, granulés et décoloration de la vitre.
- Bruit causé par la dilatation, contraction ou déplacements mineurs de certaines pièces. Ces conditions sont normales et les réclamations liées à ce bruit ne sont pas couvertes par cette garantie.
- Dommages causés par : (1) l'installation, l'utilisation ou la maintenance de l'appareil sans tenir compte des instructions d'installation et d'utilisation, et sans consulter l'étiquette d'identification de l'agent listé; (2) le non-respect des codes du bâtiment locaux et/ou des autorités ayant juridiction pendant l'installation de l'appareil; (3) l'expédition ou la mauvaise manutention; (4) la mauvaise utilisation, l'abus, l'utilisation continue alors que des composants sont endommagés, corrodés ou défectueux, l'utilisation après un accident, des modifications ou des réparations négligentes/incorrectes; (5) les conditions liées à l'environnement et à la météo, une mauvaise ventilation, une pression négative ou un mauvais tirage en raison de l'étanchéité de la construction, l'approvisionnement insuffisant en air d'appoint ou d'autres dispositifs tels que des ventilateurs de tirage, des chaudières à air pulsé ou toute autre cause; (6) l'utilisation de combustibles autres que ceux mentionnés dans les instructions d'utilisation; (7) l'installation ou l'utilisation de composants qui n'ont pas été fournis avec l'appareil ou de tout autre composant n'ayant pas été expressément autorisé et approuvé par Breckwell; (8) les modifications de l'appareil qui n'ont pas été expressément autorisées et approuvées par écrit par Breckwell; et/ou (9) les interruptions ou fluctuations de l'alimentation électrique de l'appareil.
- Les composants d'évacuation des gaz, composants de l'âtre ou accessoires utilisés avec l'appareil et qui n'ont pas été fournis par Breckwell.
- Les obligations de Breckwell, en vertu de cette garantie, ne couvrent pas la capacité de l'appareil à chauffer l'espace souhaité. Des informations sont fournies pour aider le consommateur et le détaillant lors de la sélection de l'appareil adéquat pour l'application envisagée. On doit tenir compte de l'emplacement et de la configuration de l'appareil, des conditions liées à l'environnement, de l'isolation et de l'étanchéité de la structure.
- Problèmes liés à la fumée ou au créosote. La fumée provient généralement d'un tirage inadéquat en raison de la conception ou de l'installation du système de conduit ou de l'installation de l'appareil de chauffage lui-même. La formation de créosote est largement attribuable au mauvais fonctionnement de l'unité et/ou du tirage, comme il est mentionné ci-dessus.
- Tous les coûts associés à l'enlèvement et à la réinstallation du produit, son déplacement, transport ou expédition.
- Les appels de service afin de diagnostiquer les problèmes (à moins d'être reconnu par écrit par le fabricant, le distributeur ou le détaillant).

Cette garantie est annulée si

- L'appareil a subi une surchauffe ou a été utilisé avec de l'air contaminé par le chlore, le fluor ou d'autres produits chimiques nuisibles. La surchauffe peut être établie, sans s'y limiter, par la déformation des plaques ou tubes, la couleur rouille de la fonte, l'apparition de bulles et de craquelures, et la décoloration des surfaces en acier ou émaillées.
- Si l'appareil est soumis à l'humidité ou à la condensation pendant de longues périodes.
- Dommages causés à l'appareil ou aux autres composants par l'eau ou les intempéries en raison, entre autres, d'une mauvaise installation de la cheminée ou du conduit d'évacuation.

Restrictions de la garantie

Le seul recours du propriétaire et la seule obligation de Breckwell en vertu de cette garantie ou de toute autre garantie, explicite ou tacite, contractuelle, à tort ou à raison, sont limités au remplacement, à la réparation ou au remboursement. En aucun cas, Breckwell ne saurait être tenue responsable des dommages fortuits ou consécutifs. LA GARANTIE LIMITÉE INCLUSE AUX PRÉSENTE EST LA SEULE DISPONIBLE POUR L'ACHETEUR, TENANT LIEU DE TOUTES AUTRES GARANTIES OU DÉCLARATIONS, FORMELLE OU TACITE. BRECKWELL NE FAIT AUCUNE DÉCLARATION OU GARANTIE DE TOUTE SORTE, QU'ELLE SOIT TACITE OU FORMELLE, RELATIVEMENT AU PRODUIT, AUTRE QUE (i) LA GARANTIE LIMITÉE MENTIONNÉE CI-DESSUS, ET (ii) TOUTE GARANTIE TACITE IMPOSÉE PAR LE DROIT APPLICABLE PAR LAQUELLE ELLE NE PEUT ÊTRE ANNULÉE OU DÉCLINÉE SELON LE DROIT APPLICABLE. TOUTES AUTRES GARANTIES DE TOUT GENRE, INCLUANT, MAIS SANS S'Y LIMITER, AUX GARANTIES TACITES DE QUALITÉ MARCHANDE OU D'APTITUDE À L'EMPLOI, SONT DONC AUX PRÉSENTES, DÉCLINÉES ET EXCLUES JUSQU'À LA LIMITE DU DROIT APPLICABLE. Cette garantie limitée confère à l'acheteur des droits juridiques spécifiques; les droits de l'acheteur pourraient différer selon son lieu de résidence. Certains États ne permettent pas l'exclusion ou la limitation de dommages particuliers, accessoires ou indirects, ou des lois d'État peuvent avoir un impact sur la durée des limitations; ainsi, l'exclusion et les limitations précédentes pourraient ne pas s'appliquer.

Garant

Le garant de ce dossier est Acadia Hearth, LLC, 109 E. 17th Street, Suite 5478, Cheyenne, Wyoming 82001. Numéro de téléphone : 1-833-222-3421 Enregistrez votre produit en ligne au www.acadiahearth.com. Conservez votre preuve d'achat, documentée sous forme de facture ou de reçu, en cas de réclamation.

GARANTIE À VIE LIMITÉE

BRECKWELL

GARANTIE LIMITÉE POUR LES PRODUITS ACADIA HEARTH

L'utilisation de cette unité en contradiction avec le manuel de l'utilisateur annulera la garantie, tout en enfreignant les règlementations fédérales. Breckwell garantit, uniquement à l'acheteur au détail original, que ce produit est exempt de défectuosités des matériaux et de qualité de l'exécution, pendant la période indiquée ci-dessous, de la date initiale d'achat prouvée par une facture, un chèque oblitéré, un reçu de vente, etc., de Breckwell ou d'un détaillant autorisé, comme suit :

Conditions de la garantie :

Composants couverts	Période de la garantie
Boîte à feu/échangeur de chaleur	À vie limitée
Porte	Trois ans
Caissons et garniture	Un an
Joints d'étanchéité	Un an
Tous les composants électriques (ventilateur, moteur de la vis sans fin/ agitateur, carte de circuit imprimé, commutateurs)	Un an
Vitre céramique	Un an
Pot à feu	Trois ans

La garantie ne couvre que les appareils Breckwell achetés chez un détaillant ou distributeur Breckwell autorisé.

Cette garantie n'est valide que si l'appareil Breckwell demeure sur le site d'installation d'origine. Cette garantie ne s'applique pas aux produits achetés pour la location.

Problème / Résolution

- En tant qu'acheteur, vous devez d'abord communiquer avec votre détaillant et/ou votre distributeur qui vous a vendu l'appareil de chauffage.
- Si vous ne recevez pas de service satisfaisant dans un délai de temps raisonnable de la part du distributeur et/ou détaillant, écrivez à ou appelez Acadia Hearth/ Breckwell, avec une liste complète du et/ou des problèmes que vous éprouvez, les détails concernant l'installation, votre preuve d'achat et le numéro de série de l'appareil de chauffage ou bien le numéro du code de date.

Procédure de réclamation

Veuillez communiquer avec Breckwell pour obtenir du service sous garantie. On vous demandera de fournir les descriptions et données pertinentes, incluant la preuve d'achat qui sera retournée sur demande. Sous réserve que l'appareil de chauffage ait été installé et utilisé conformément avec le Manuel du propriétaire fourni avec cet appareil de chauffage et que le problème ne porte pas sur une situation d'exclusion, Breckwell :

- Remplacera sans frais la pièce défectueuse. Les pièces et/ou les remplacements d'entretien effectués selon les termes de cette garantie le sont uniquement pour le reste de la période originale de la garantie de l'appareil de chauffage.
- Remplacer l'appareil de chauffage sans frais. Si l'appareil de chauffage doit être remplacé par Breckwell « sans frais », tous les engagements au titre de cette garantie seront respectés.
- Si le défaut est de nature esthétique (non fonctionnel), Breckwell assumera les frais pour réparation de l'appareil de chauffage, incluant les éléments comme la soudure, la peinture et la main-d'œuvre accessoire. Les « frais raisonnables » définis aux termes de cette garantie sont de 30,00 $/heure avec un remboursement complet pour tout achat de pièces.

Established 1974

QUALITY CONTROL SERVICES

LABORATORY EQUIPMENT • SALES • SERVICE • CALIBRATION • REPAIRS
2340 SE 11TH Ave. Portland, Oregon 97214 • Box 14831 Portland, Oregon 97293
(503) 236-2712 • FAX (503) 235-2535 • www.qc-services.com

A2LA ACCREDITED
CERTIFICATE #1550.01

PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI01A05026180111

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	N/A	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	1	QC033	1/11/18	6/27/17	6/2018

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: 17.7°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	1000.1	1000.1	0.5
700	700.3	700.3	0.5
500	499.8	499.8	0.5
300	300.0	300.0	0.5
100	100.0	100.0	0.5
50	50.0	50.0	0.5

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:
2000lbs platform. Has a custom pan.

Comments/Information Concerning this Calibration
1/18 RH = 58.5

Report prepared/reviewed by: _____ **Date:** 1-11-18

Technician: D. Oudeans
Signature: D-Oud

THIS CERTIFICATE SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE APPROVAL OF QUALITY CONTROL SERVICES, INC.

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 #:	053
Serial #:	1902130
Calibration Date:	6/13/2018
Calibration Expiration:	12/13/2018
Barometric Pressure:	29.84 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	1/10/2018
γ Factor:	0.995
Allowable Deviation (±5%):	0.04975
Actual Deviation:	0.01
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)	144.977	146.222	201.016
Standard DGM Temperature (°F)	73.2	73.0	72.0
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)	5.194	5.278	7.307
DGM Temperature (°F)	84.0	90.0	94.0
DGM Pressure (in H_2O)	2.10	2.58	1.4
Time (min)	36.0	32.0	60.0
Net Volume for Standard DGM (ft^3)	5.120	5.164	7.099
Net Volume for DGM (ft^3)	5.194	5.278	7.307

Dry Gas Meter γ Factor	0.999	1.001	1.006
γ Factor Deviation From Average	0.999	1.001	1.006

Average Gas Meter γ Factor: 1.002

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%.

Dry Gas Meter Calibration

Meter Manufacturer:	Apex
Model:	XC-60-ED
Lab ID #:	054
Serial #:	1902133
Calibration Date:	6/13/2018
Calibration Expiration:	12/13/2018
Barometric Pressure:	29.84 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	1/11/2018
γ Factor:	1.000
Allowable Deviation (±5%):	0.05
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)	158.715	148.505	236.136
Standard DGM Temperature (°F)	72.5	73.2	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)	5.777	5.426	8.616
DGM Temperature (°F)	93.5	94.0	90.0
DGM Pressure (in H_2O)	2.50	2.00	1.5
Time (min)	37.0	38.5	71.5
Net Volume for Standard DGM (ft^3)	5.605	5.244	8.339
Net Volume for DGM (ft^3)	5.777	5.426	8.616

Dry Gas Meter γ Factor	1.000	0.997	0.993
γ Factor Deviation From Average	1.000	0.997	0.993

Average Gas Meter γ Factor: 0.997

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%.

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%.

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: 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

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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

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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

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A2LA ACCREDITED
CERTIFICATE #1550.01

PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI0134307497180613

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	6/13/18	1/11/18	12/2018

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. 100.0000	5. 100.0001	9. 100.0001
2. 100.0000	6. 100.0001	10. 100.0001
3. 100.0000	7. 100.0001	Result
4. 100.0000	8. 100.0001	0.00005

ENVIRONMENTAL CONDITIONS
☐ Good ☑ Fair ☐ Poor
Temperature: 22.8°C

A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
200	199.9980	200.0000	0.00015
100	99.9991	100.0000	0.00015
50	49.9995	50.0001	0.00015
20	19.9998	20.0000	0.00015
1	1.0000	1.0000	0.00015
0.1	0.1000	0.1000	0.00015

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	Rice Lake	20 kg to 1mg	2831W	1/3/18	1/2019	20152429

Permanent Information Concerning this Equipment:
6 month calibration cycle. Relative humidity= 47%

Comments/Info Concerning this Calibration:
6/13/18: Adjusted span.

Report prepared/reviewed by: Jake C **Date:** 6/13/18

Technician: J. Colacchio
Signature:

THIS CERTIFICATE SHALL NOT BE REPRODUCED WITHOUT THE APPROVAL OF QUALITY CONTROL SERVICES, INC.

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.

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NIST Traceable
Calibration Report

REPORT NUMBER
1375092

Reference Number: 1200788
PO Number: JSTEINERT013118

PFS-TECO
11785 SE Highway 212
Suite 305
Clackamas, OR 97015 United States

Manufacturer:	Dwyer Instruments Inc.	**Calibration Date:**	02/14/2018
Model Number:	471	**Calibration Due Date:**	02/14/2019
Description:	Air Velocity, Digital Thermo Anemometer	**Condition As Found:**	Limited In Tol See Comments
Asset Number:	#095	**Condition As Left:**	Limited See Comments
Serial Number:	#095		
Procedure:	DS Universal Speed/Time/Temperature		

Remarks:

NIST-traceable calibration performed on the unit referenced above in accordance with customer requirements, published specifications and the lab's standard operating procedures. No adjustments were made to the unit.

This calibration is considered limited due to the requested test range.

Standards Utilized

Asset No.	Manufacturer	Model No.	Description	Cal. Date	Due Date
CP105979	Kanomax	X5602	Air Velocity, Wind Tunnel, Open Jet	01/06/2018	01/31/2019
CP144554	Fluke Corporation	1551A EX	Temperature, Stik Thermometer	01/08/2018	01/31/2019

Calibration Data

FUNCTION TESTED	Nominal Value	As Found	Out of Tol	As Left	Out of Tol	CALIBRATION TOLERANCE
Speed Accuracy Air Velocity	50 ft/min	43		Same		35 to 65 ft/min [EMU 1.3 ft/min][TUR 12:1]
Speed Accuracy Air Velocity	100 ft/min	90		Same		85 to 115 ft/min [EMU 1.5 ft/min][TUR 9.8:1]
Speed Accuracy Air Velocity	150 ft/min	140		Same		135 to 165 ft/min [EMU 1.8 ft/min][TUR 8.3:1]
Speed Accuracy Air Velocity	200 ft/min	192		Same		185 to 215 ft/min [EMU 2.1 ft/min][TUR 7.1:1]
Speed Accuracy Air Velocity	250 ft/min	240		Same		235 to 265 ft/min [EMU 2.4 ft/min][TUR 6.2:1]
Speed Accuracy Air Velocity	300 ft/min	288		Same		285 to 315 ft/min [EMU 2.7 ft/min][TUR 5.6:1]
Speed Accuracy Air Velocity	400 ft/min	395		Same		385 to 415 ft/min [EMU 3.3 ft/min][TUR 4.5:1]
Speed Accuracy Air Velocity	500 ft/min	485		Same		485 to 515 ft/min [EMU 3.9 ft/min][TUR 3.8:1]
Temperature Accuracy	72.0 °F	71.9		Same		70.0 to 74.0 °F [EMU 0.11 °F][TUR 18:1]

Temperature: 23° C
Humidity: 20% RH
Rpt. No.: 1375092

Calibration Performed By:				Quality Reviewer:	
Mathews, Rich	314	Metrologist	847-327-5314	Szplit, Tony	02/14/2018
Name	ID #	Title	Phone	Name	Date

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OAKTON INSTRUMENTS

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.

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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 %

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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**

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

Report and Certificate of Calibration

CAL-CERT CALIBRATION CERTIFICATION
6709 SE Lake Road
Milwaukie, OR 97222
1-800-356-4662
CL-108

www.Cal-Cert.com
"Measure The Difference"

14 Inverness Drive East, Ste B-128
Englewood, CO 80112
1-800-983-7832
CL-157

ACCREDITED
Calibration Laboratory

Report #:	2260-28781-66	**Customer PO#:**	
Customer Name:	PFS TECO		
Customer Address:	11785 SE Highway 212		
City:	Clackamas	**State:** OR	**Zip:** 97015
Contact:	John Steinert		
Service Address:	6709 SE Lake Road, Milwaukie, OR 97222		

Calibration Standards

10-RH/00192 Comark Thermohygrometer S/N 6217150049 Cal Date 11/17/17 Due Date 11/30/18 Vendor CC REPORT # 1573-C-01
L-GB-0/00397 Mitutoyo 83 Piece Gage Block Set S/N 0509020 Cal Date 9/8/16 Due Date 9/30/18 Vendor American Gage REPORT# 83181-2-354224

Instrument Data

Calibration Date:	January 23, 2018	**Reference:**	NAVAIR 17-20MD-07
Calibration Due Date:	January 23, 2019	**Cal-Cert Procedure:**	CP-008
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	General	**Temperature:**	72 °F
Type:	Digital Caliper	**Humidity:**	31% RH
Model Number:	147	**Asset #:**	#092
Serial #:	#092	**Service Location:**	Cal-Cert Lab
Capacity:	6 Inches	**As Found:**	PASS
Resolution:	0.0005 Inches	**As Left:**	PASS

Instrument Range: 6 Inches **Range Resolution:** 0.0005 Inches

Outside Jaws / Linearity

Calibration Standard Inches	As Found Inches	As Left Reading 1 Inches	As Left Reading 2 Inches	Tolerance ± Inches
0.0000	0.0000	0.0000	0.0000	0.0000
0.0500	0.0500	0.0500	0.0500	0.0010
0.3000	0.3000	0.3000	0.3005	0.0010
0.6000	0.6000	0.6000	0.6000	0.0010
1.2000	1.2005	1.2005	1.2000	0.0010
2.4000	2.4000	2.4000	2.4005	0.0010
3.5000	3.5000	3.5000	3.5000	0.0010
5.0000	5.0000	5.0000	5.0000	0.0010
6.0000	6.0000	6.0000	6.0000	0.0010

Expanded Uncertainty ± 0.00129 Inches

Verifications (for information only)

	Target	Measured	Tolerance ±
Resolution Check	0.10050	0.10050	N/A
Depth	1.000	1.00000	N/A
Step	1.000	1.00000	N/A
Inside Jaws	1.000	1.00000	N/A
Inspections			
Jaws Parallel		Acceptable	

Remarks:

We sincerely thank you for your business. Please call us at 1-800-356-4662 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.

Cal-Cert is accredited by the International Accreditation Service, Inc. (IAS) under Calibration Laboratory Code CL-108 & CL-157.
IAS is recognized under the ILAC mutual recognition agreement (MRA).

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC 17025 and ANSI/NCSL Z540.3, and meets the requirements of all applicable references and Cal-Cert procedures listed above.
Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.
All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.
This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: NICOLAS ILLA **Date:** January 23, 2018

Technical Manager: MARSHALL DOYLE **Signature:** MDoyle

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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).

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