



OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE

WASHINGTON, D.C. 20460

December 4, 2024

Robert Beck
President
Thelin Hearth Products, Inc.
63 Laxalt Dr.
Carson City, NV 89706

Re: Renewal of Certificate of Compliance Number 232-19 for Providence Pellet Heater Model

Dear Mr. Beck:

I am pleased to inform Thelin Hearth Products, Inc. that the above-referenced pellet heater model has been approved for renewal of a Certificate of Compliance pursuant to the 2015 New Source Performance Standard (NSPS) for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces at 40 CFR Part 60, Subpart AAA (2015 NSPS) by the United States Environmental Protection Agency. Pursuant to the 2015 NSPS, this renewal will become effective on December 31, 2024, upon expiration of the current Certificate of Compliance for the above-referenced model and will be valid through December 31, 2029. This letter serves as your pellet heater Certificate of Compliance. Please refer to the above-referenced Certificate of Compliance number in all future correspondence.

In accordance with the 2015 NSPS at 40 CFR Part 60, § 60.533(i)(2), a manufacturer of a heater model line may apply to the EPA for renewal of the model line's Certificate of Compliance. To do so, the manufacturer may affirm in writing that the heaters in the model line continue to be similar in all material respects that would affect emissions to the representative heater submitted for testing on which the original Certificate of Compliance was based. In making such an affirmation, the manufacturer also may request a potential waiver from certification testing.

Based on an October 23, 2019,¹ test report by PFS-TECO, an October 23, 2019,² Certification of Conformity by PFS-TECO, and your March 6, 2024, request for renewal of the Certificate of Compliance, the EPA has determined that the model line continues to meet the certification requirements of § 60.533. Therefore, pursuant to §§ 60.533(i)(2) and (i)(3), the EPA is renewing the Certificate of Compliance, and in doing so, the agency is waiving certification testing for the above-

¹ Revised on March 15, 2024.

² Revised on March 15, 2024.

referenced model. You may not advertise for sale, offer for sale, or sell heaters under this Certificate of Compliance after December 31, 2029, without applying for and being issued another Certificate of Compliance with an updated expiration date.

All wood pellet heaters manufactured or sold under this Certificate of Compliance must comply with the EPA labeling requirements found at § 60.536. These provisions require each heater to have a permanent label affixed to it, including the month and year of manufacture, model name or number, serial number, certification test emission value, test method, standard met, and compliance certification statement.

In addition, you must comply with all applicable requirements of the regulation, including:

1. Conducting a third-party certifier-approved quality assurance program that ensures that all units within a model line are similar to the wood heater submitted for certification testing in all respects that would affect emissions and are in compliance with the applicable emission limit, pursuant to § 60.533(m);
2. Applying for recertification whenever any change is made to the above-referenced model that affects or is presumed to affect the particulate matter emission rate for the model line, pursuant to § 60.533(k)(1);
3. Providing an owner's manual that includes the information listed in § 60.536(g)(1) with each affected pellet heater model offered for sale;
4. Placing a copy of the non-Confidential Business Information (non-CBI) certification test report on the manufacturer's website and available to the public within 30 days after the EPA issues a Certificate of Compliance, pursuant to § 60.533(b)(12). If later revised, the up-to-date non-CBI certification test report should remain posted on the manufacturer's website for as long as the model line is manufactured and offered for sale in the United States;
5. Submitting a report to the EPA every two years following the issuance of a Certificate of Compliance for each model line. This report must include the sales for each model by state and certify that no changes in the design or manufacture of this model line have been made that require recertification under § 60.533(k);
6. Retaining records and submitting reports as required at § 60.537; and
7. Submitting heaters for audit testing if selected by the EPA under §§ 60.533(n)(1)(i) and (2)(i).

Failure to comply with these requirements may result in revoking this Certificate of Compliance and enforcement action, including penalties as specified under the Clean Air Act. To promote transparency in implementing the Wood Heater Program, we request that manufacturers submit a copy of the Uniform Resource Locator (URL) or web address where the revised test report is posted to WoodHeaterReports@epa.gov within ten (10) days of posting.

Once we have verified that the revised test report has been posted on the manufacturer's website, the agency will continue to list the above-referenced model in the EPA-Certified Wood Heater Database.

If you have any questions concerning this letter, please contact the Wood Heater Program at WoodHeaterReports@epa.gov.

Sincerely,

Loren Denton, Ph.D.
Director
Monitoring, Assistance, and Media Programs Division
Office of Compliance
Office of Enforcement and Compliance Assurance



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF
ENFORCEMENT AND COMPLIANCE
ASSURANCE

DEC 19 2019

Mr. Robert F. Beck
President
Thelin Hearth Products
63 Laxalt Drive
Carson City, Nevada 89706

Re: Providence Pellet Heater Model Certification Letter Number 232-19

Dear Mr. Beck:

I am pleased to inform Thelin Hearth Products (Thelin) that the above-referenced model has been approved for certification pursuant to the 2015 New Source Performance Standard (NSPS) for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces at 40 CFR Part 60, Subpart AAA (2015 NSPS) by the United States Environmental Protection Agency (EPA). Certification under the 2015 NSPS is valid through December 31, 2024. This letter serves as your pellet heater certification and no separate certification is required. Please refer to the certification number above in all future correspondence.

Based on an October 23, 2019, test report prepared by PFS-TECO and the information provided in your October 24, 2019, application, the above-referenced model is certified as meeting the 2015 NSPS. Under the 2015 NSPS and based on PFS-TECO's October 23, 2019, certification of conformity, the model's emission rate of 1.1 g/hr meets the 2020 NSPS particulate matter emissions limit of 2.0 g/hr. The heat output range and overall heating efficiency for the above-referenced model are 10,461 – 23,746 BTU/hr and 64%, respectively. The carbon monoxide emission rate for this model line is 0.30 g/min.

This certification is valid for the above-referenced model and cannot be transferred to another model line without applying for certification. This certification allows Thelin to manufacture and sell the above-referenced model through December 31, 2024. Thereafter, Thelin may not manufacture, advertise for sale, offer for sale, or sell pellet heaters under this certification without applying for and obtaining another compliance certification.

All pellet heaters manufactured or sold under this certification must comply with EPA labeling requirements found at §60.536. These provisions require each pellet heater to have a permanent label affixed to it that includes the month and year of manufacture, model name or number, serial number, certification test emission value, test method, standard met, and compliance certification statement.

In addition, Thelin must comply with all applicable requirements of the regulation, including:

1. Conducting a third-party certifier-approved quality assurance program which ensures that all units within a model line are similar to the pellet heater submitted for certification testing in all respects that would affect emissions and are in compliance with the applicable emission limit, pursuant to §60.533(m);
2. Applying for recertification whenever any change is made to the above-referenced model that affects or is presumed to affect the particulate matter emission rate for the model line, pursuant to §60.533(k)(1);
3. Providing an owner's manual that includes the information listed in §60.536(g)(1) with each affected pellet heater model offered for sale;
4. Placing a copy of the certification test report and summary on the manufacturer's website. The test report and summary shall be available to the public within 30 days after the EPA issues a certificate of compliance, pursuant to §60.533(b)(12);
5. Submitting a report to the EPA every two years following issuance of a certificate of compliance for each model line. This report must include the sales for each model by state and certify that no changes in the design or manufacture of this model line have been made that require recertification under §60.533(k);
6. Retaining records and submitting reports as required at §60.537; and
7. Submitting pellet heaters for audit testing if selected by the EPA under §60.533(n)(1)(i) and (2)(i).

Failure to comply with these requirements may result in a revocation of this certification and enforcement action, including penalties as specified under the Clean Air Act. To promote transparency in the implementation of the Wood Heater Program, we suggest that manufacturers submit the Uniform Resource Locator (URL) or web address where the test report is posted to WoodHeaterReports@epa.gov within ten (10) days of posting the test report.

Once EPA has verified that the full non-CBI certification test report has been posted on the manufacturer's website, the Agency will add the above-referenced model to the EPA-Certified Wood Heater Database. If you have any questions concerning this letter, please contact Rafael Sanchez of my staff at (202) 564-7028 or via email at sanchez.rafael@epa.gov.

Sincerely,



Martha Segall

Acting Director

Monitoring, Assistance, and Media Programs Division
Office of Compliance

Thelin Hearth Products

Project # 19-501

Model: Providence

Type: Pellet-Fired Fireplace Insert

October 23, 2019

Revised: March 15, 2024

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

Contact: Mr. Robert Beck
Thelin Hearth Products
63 Laxalt Dr.
Carson City, NV 89706
775-241-2586 x105

Prepared by: Aaron Kravitz



**11785 SE Highway 212 – Suite 305
Clackamas, OR 97015-9050
(503) 650-0088
WWW.PFSTECO.COM**

Revision History

Date: 10/23/2019 – Original Issue

Date: 3/15/2024 – The following changes were made per a request from EPA:

- Added a schematic of the dilution tunnel used for testing to Appendix A, see page 71 of Non-CBI Report.
- Added a note on page 4 clarifying conditioning data information.
- Added train precision data as a percentage to data summary page in Appendix A, see page 21 of Non-CBI Report.
- Added an updated Manual to Appendix B with additional information about smoke and CO monitors.

Contents

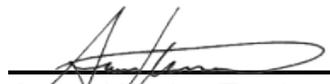
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Affidavit

PFS-TECO was contracted by Thelin Hearth Products to provide testing services for the Providence Pellet-Fired Fireplace Insert per ASTM E2779, *Determining PM Emissions from Pellet Heaters*. All testing and associated procedures were conducted at PFS-TECO's Portland Laboratory on 9/10/2019. PFS-TECO's Portland Laboratory is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015. Testing procedures followed ASTM E2779. Particulate sampling was performed per ASTM E2515, *Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel*.

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

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



Aaron Kravitz, Testing Supervisor

Introduction

Theelin Hearth Products of Carson City, NV, contracted with PFS-TECO to perform EPA certification testing on the Providence Pellet-Fired Room Heater. All testing was performed at PFS-TECO's Portland Laboratory. Testing was performed by Mr. Aaron Kravitz.

Notes

- Prior to start of testing, 50 hours of conditioning was performed by the manufacturer at a medium setting 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

Pellet Heater Identification and Testing

- Appliance Tested: **Providence**
- Serial Number: **N/A – Prototype Unit; PFS Tracking Number 0038**
- Manufacturer: **Thelin Hearth Products**
- Catalyst: **No**
- Heat exchange blower: **Integral**
- Type: **Pellet Stove**
- Style: **Insert**
- Date Received: **Monday, September 09, 2019**
- Testing Period – Start: **Tuesday, September 10, 2019** Finish: **Tuesday, September 10, 2019**
- Test Location: **PFS-TECO Portland Laboratory, 11785 SE HWY 212 - Suite 305, Clackamas, OR 97015**
- Elevation: **≈131 Feet above sea level**
- Test Technician(s): **Aaron Kravitz**
- Observers: **Robert Beck**

Test Procedures and Equipment

All Sampling and analytical procedures were performed by Aaron Kravitz. 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 CO ₂ /CO/O ₂ IR ANALYZER
064	Digital Barometer
109A/B	Troemner 100mg/200mg Audit Weights
107	Sartorius Analytical Balance
051	10 lb audit weight
095	Anemometer
111	Microtector
CC700832	Gas Analyzer Calibration Span Gas
CC170624	Gas Analyzer Calibration Mid Gas

Results

The integrated test run emission rate for test Run 1 was measured to be **1.08 g/hr** with a Higher Heating Values efficiency of **64.0%** and a CO emission rate of **0.30 g/min.** The calculated first hour particulate emission rate was **1.22 g/hr.** The Thelin Hearth Products Model Providence 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

EPA Application 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	9/10/2019	H	1.86	60	23746	1.22	1.08	0.22	0.30	66.2%	64.0%
		M	0.88	120	10999			0.27		64.4%	
		L	0.88	180	10461			0.36		61.2%	
		OA	1.05	360	12394			0.30		64.0%	

Test Run Narrative

Run 1

Run 1 was performed on 9/10/2019 as an attempted integrated test run per ASTM E2779. The overall test duration was 360 minutes. The particulate emissions rate for the integrated test run was 1.08 g/hr. The run had an overall HHV efficiency of 64.0%. 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	75	72	34	42	29.91	4.2	14.7	2.54	360

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	"Hi," Feed trim Max	High Segment: "Hi," Feed trim Max Medium Segment: "Lo," Feed trim 7V Low Segment: "Lo," Feed trim 7V

Appliance Description

Model(s): Providence

Additional Models Discussion: None

Appliance Type: Pellet-Fired Fireplace Insert

Air Introduction System: Air enters the burn chamber by being pulled through the firepot, via the exhaust blower, see air flow diagram in Appendix D.

Combustion Control: Feed rate is electronically controlled via user-selectable controls.

Baffles: N/A

Flue Outlet: 3-inch exhaust outlet located on the bottom/rear of the appliance.

Appliance Dimensions

Providence Dimensions

Height	Width	Depth	Firebox Volume	Weight
28.4"	32"	26.4"	N/A – Pellet Stove	280 lbs

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

Appliance Front



Appliance Left



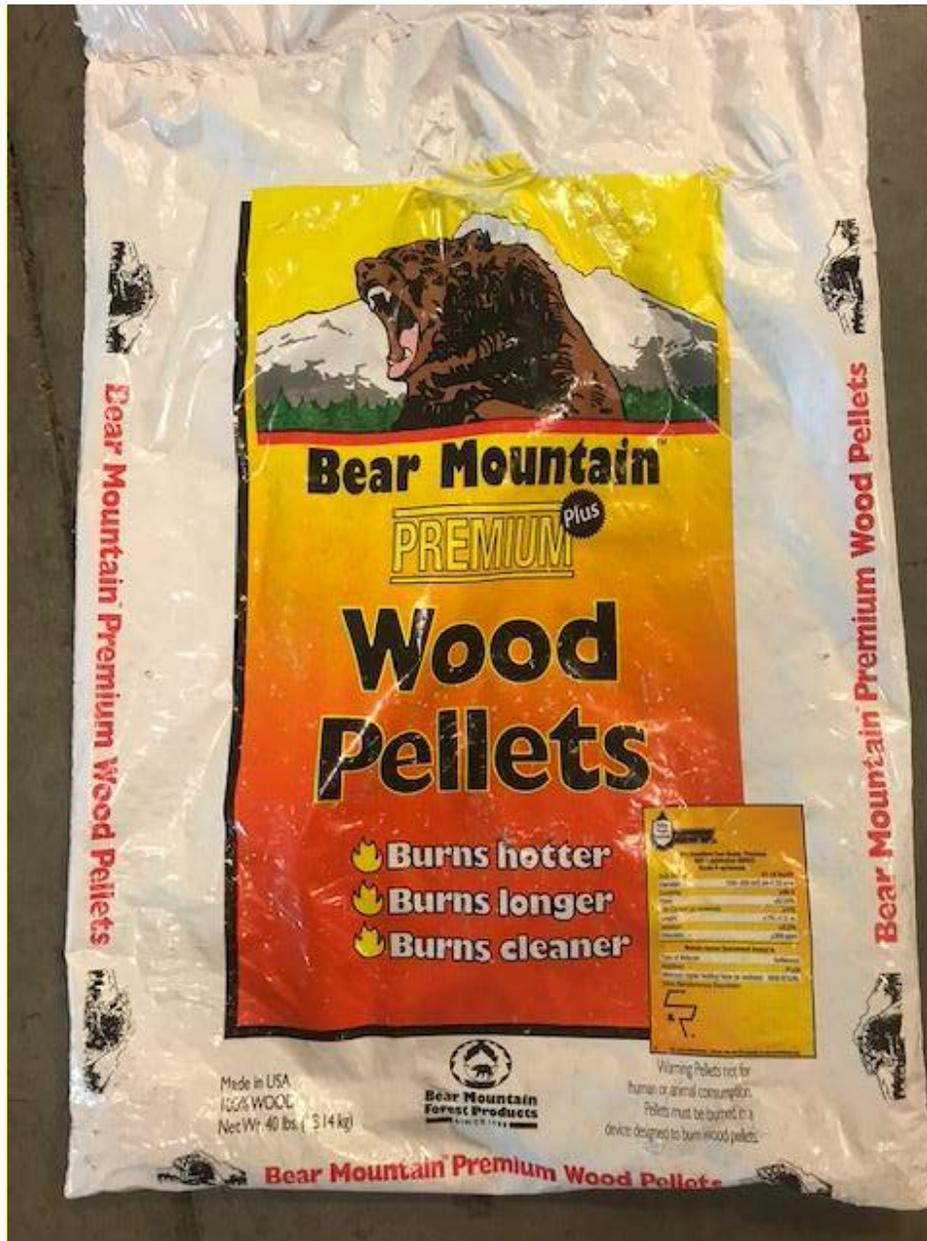
Appliance Right



Appliance Rear



Test Fuel Properties



Test fuel used was Bear Mountain 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

Report No: USR:W219-0755-01
Issue No: 1

Analytical Test Report

Client: PFS-TECO
 4335 NE 81st Ave.
 Portland, OR 97218
Attention: Sebastian Button
PO No: A-Kravitz

Signed: *Stephen Sundeen*
 Stephen Sundeen
 Chemistry Laboratory Manager
Date of Issue: 9/20/2019
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details			
Sample Log No:	W219-0755-01	Sample Date:	8/30/2019
Sample Designation:	Pellet Fuel Analysis - USSC	Sample Time:	10:30 AM
Sample Recognized As:	Wood Pellets	Arrival Date:	9/12/2019

Test Results				
	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		2.48
Ash	ASTM D1102	wt. %	0.24	0.24
Volatile Matter	ASTM D3175	wt. %	80.80	78.79
Fixed Carbon by Difference	ASTM D3172	wt. %	18.96	18.49
Sulfur	ASTM D4239	wt. %	0.034	0.034
SO ₂	Calculated	lb/mmbtu		0.079
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	19.02	18.49
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8752	8535
Carbon	ASTM D5373	wt. %	49.35	48.12
Hydrogen*	ASTM D5373	wt. %	6.14	5.99
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.20
Oxygen*	ASTM D3176	wt. %	> 44.03	> 42.94
<small>*Note: As received values do not include hydrogen and oxygen in the total moisture.</small>				
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		

Comments:

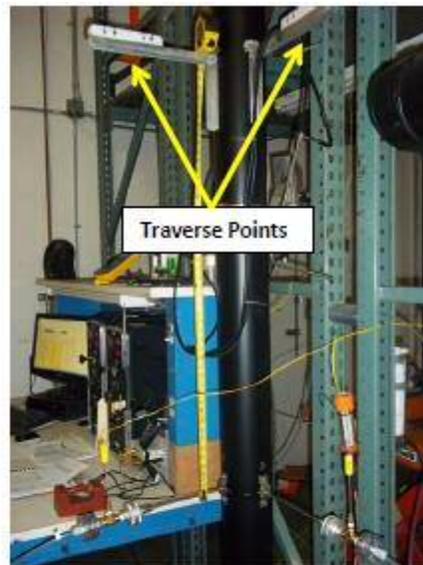
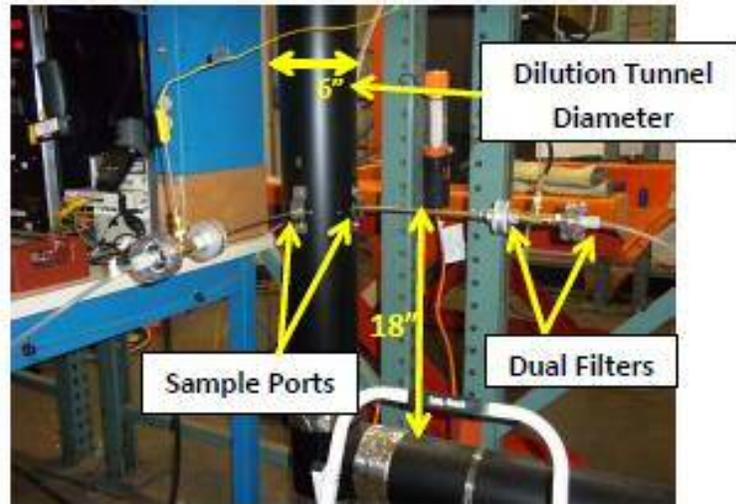


Results issued on this report only reflect the analysis of the sample submitted. Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced, except in their entirety, without the written approval of Twin Ports Testing. Twin Ports Testing Laboratory is accredited to the ISO/IEC 17025:2017 standard by PJLA.

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.

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: 63 Lexalt Drive, Carson City, NV 89706 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 IN ACCORDANCE WITH REQUIREMENTS 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)

Pre-Conditioning Data

Client: Thelin	Job #: 19-501
Model: Providence	Tracking #: 0034
Date(s): 8/29/19 - 9/9/19	Technician: AK

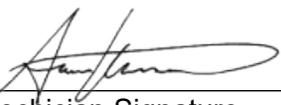
Elapsed Time (hrs)	Flue (°F)	Catalyst Exit (°F)	Notes: Indicate initial air setting and any changes in in setting during conditioning, as well as weight and average moisture content of all fuel additions.
0	66	N/A	+7.9lb pellets, control set to med
1	388	N/A	
2	429	N/A	
3	398	N/A	+12.7lb pellets, control set to med
4	414	N/A	
5	345	N/A	+17.5lb pellets, control set to med
6	372	N/A	
7	326	N/A	
8	320	N/A	
9	267	N/A	
10	235	N/A	
11	244	N/A	
12	272	N/A	+18.9lb pellets, control set to med
13	284	N/A	
14	268	N/A	
15	248	N/A	
16	251	N/A	
17	249	N/A	
18	259	N/A	
19	253	N/A	
20	257	N/A	+15.0lb pellets, control set to med
21	259	N/A	
22	251	N/A	
23	247	N/A	
24	275	N/A	
25	278	N/A	
26	288	N/A	
27	253	N/A	
28	243	N/A	
29	255	N/A	+36.2lb pellets, control set to med
30	249	N/A	
31	243	N/A	
32	245	N/A	
33	304	N/A	
34	295	N/A	
35	282	N/A	
36	259	N/A	
37	262	N/A	
38	263	N/A	
39	251	N/A	
40	263	N/A	
41	262	N/A	
42	268	N/A	
43	276	N/A	
44	283	N/A	
45	250	N/A	
46	248	N/A	
47	263	N/A	
48	258	N/A	
49	244	N/A	
50	257	N/A	

**PELLET TEST DATA PACKET
ASTM E2779/E2515**



Run 1 Data Summary

Client: Thelin
Model: Providence
Job #: 19-501
Tracking #: 0034
Test Date: 9/10/2019



Technician Signature

10/22/2019

Date

TEST RESULTS - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-517
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Burn Rate Summary	
High Burn Rate (dry kg/hr)	1.86
Medium Burn Rate (dry kg/hr)	0.88
Low Burn Rate (dry kg/hr)	0.88
Overall Burn Rate (dry kg/hr)	1.05

47.6% of High Burn Rate
 47.6% of High Burn Rate

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft ³)	0.000	53.246	52.515	8.754
Average Gas Velocity in Dilution Tunnel (ft/sec)	15.9			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	10435.3			
Average Gas Meter Temperature (°F)	72.9	94.3	93.4	83.6
Total Sample Volume (dscf)	0.000	50.906	50.129	8.533
Average Tunnel Temperature (°F)	98.5			
Total Time of Test (min)	360			
Total Particulate Catch (mg)	0.0	5.4	5.1	1.0
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0001061	0.0001017	0.0001172
Total PM Emissions (g)	0.00	6.64	6.37	1.22
Particulate Emission Rate (g/hr)	0.00	1.11	1.06	1.22
Emissions Factor (g/kg)	-	1.06	1.01	0.66
Difference from Average Total Particulate Emissions (g)	-	0.14	0.14	-
Difference from Average Total Particulate Emissions (%)	-	2.1%	2.1%	-
Difference from Average Emissions Factor (g/kg)	-	0.02	0.02	-

Final Average Results	
Total Particulate Emissions (g)	6.51
Particulate Emission Rate (g/hr)	1.08
Emissions Factor (g/kg)	1.04
HHV Efficiency (%)	64.0%
LHV Efficiency (%)	68.4%
CO Emissions (g/min)	0.30

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	83	OK
Face Velocity	< 30 ft/min	13.2	OK
Leakage Rate	Less than 4% of average sample rate	0 cfm	OK
Ambient Temp	55-90 °F	Min: 72 / Max: 76	OK
Negative Probe Weight Evaluation	<5% of Total Catch	Probe Catch Not Negative	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	CHECK 10 MIN. INTERVAL PRO-RATES
Medium Burn Rate	< 50% of High	47.6%	OK

Overall Pellet Test Efficiency Results

Manufacturer: Thelin
Model: Providence
Date: 09/10/19
Run: 1
Control #: 19-501
Test Duration: 360
Output Category: Integrated

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	64.0%	68.4%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	64.3%	68.8%

Output Rate (kJ/h)	13,635	12,934	(Btu/h)
Burn Rate (kg/h)	1.05	2.31	(lb/h)
Input (kJ/h)	21,318	20,223	(Btu/h)

Test Load Weight (dry kg)	6.28	13.85	dry lb
MC wet (%)	2.48		
MC dry (%)	2.54		
Particulate (g)	6.51		
CO (g)	110		
Test Duration (h)	6.00		

Emissions	Particulate	CO
g/MJ Output	0.08	1.34
g/kg Dry Fuel	1.04	17.43
g/h	1.08	18.25
g/min	0.02	0.30
lb/MM Btu Output	0.18	3.11

Air/Fuel Ratio (A/F)	47.11
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VERSION:

2.2

12/14/2009

Max Burn Rate Segment Efficiency Results

Manufacturer: Thelin
Model: Providence
Date: 09/10/19
Run: 1
Control #: 19-501
Test Duration: 60
Output Category: Maximum

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	66.2%	70.8%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	66.5%	71.1%

Output Rate (kJ/h)	25,032	23,746	(Btu/h)
Burn Rate (kg/h)	1.86	4.10	(lb/h)
Input (kJ/h)	37,832	35,888	(Btu/h)

Test Load Weight (dry kg)	1.86	4.10	dry lb
MC wet (%)	2.48		
MC dry (%)	2.54		
Particulate (g)	N/A		
CO (g)	13		
Test Duration (h)	1.00		

Emissions	Particulate	CO
g/MJ Output	N/A	0.54
g/kg Dry Fuel	N/A	7.26
g/h	N/A	13.49
g/min	N/A	0.22
lb/MM Btu Output	N/A	1.25

Air/Fuel Ratio (A/F)	30.24
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VERSION:

2.2

12/14/2009

Medium Burn Rate Segment Efficiency Results

Manufacturer: Thelin
Model: Providence
Date: 09/10/19
Run: 1
Control #: 19-501
Test Duration: 120
Output Category: Medium

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	64.4%	68.8%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	64.7%	69.2%

Output Rate (kJ/h)	11,595	10,999	(Btu/h)
Burn Rate (kg/h)	0.88	1.95	(lb/h)
Input (kJ/h)	18,015	17,089	(Btu/h)

Test Load Weight (dry kg)	1.77	3.90	dry lb
MC wet (%)	2.48		
MC dry (%)	2.54		
Particulate (g)	N/A		
CO (g)	32		
Test Duration (h)	2.00		

Emissions	Particulate	CO
g/MJ Output	N/A	1.40
g/kg Dry Fuel	N/A	18.29
g/h	N/A	16.19
g/min	N/A	0.27
lb/MM Btu Output	N/A	3.24

Air/Fuel Ratio (A/F)	49.52
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VERSION:

2.2

12/14/2009

Minimum Burn Rate Segment Efficiency Results

Manufacturer: Thelin
Model: Providence
Date: 09/10/19
Run: 1
Control #: 19-501
Test Duration: 180
Output Category: Minimum

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	61.2%	65.5%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	61.5%	65.8%

Output Rate (kJ/h)	11,028	10,461	(Btu/h)
Burn Rate (kg/h)	0.88	1.95	(lb/h)
Input (kJ/h)	18,015	17,089	(Btu/h)

Test Load Weight (dry kg)	2.65	5.85	dry lb
MC wet (%)	2.48		
MC dry (%)	2.54		
Particulate (g)	N/A		
CO (g)	64		
Test Duration (h)	3.00		

Emissions	Particulate	CO
g/MJ Output	N/A	1.94
g/kg Dry Fuel	N/A	24.18
g/h	N/A	21.40
g/min	N/A	0.36
lb/MM Btu Output	N/A	4.51

Air/Fuel Ratio (A/F)	55.61
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VERSION:

2.2

12/14/2009

DILUTION TUNNEL & MISC. DATA - ASTM E2779 / E2515

Client: Thelin
 Model: Providence
 Run #: 1
 Test Start Time:

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

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: 0.999 (A)
 Meter Box γ Factor: 0.996 (B)
 Meter Box γ Factor: 0.992 (Ambient)

Induced Draft Check (in. H₂O): 0
 Smoke Capture Check (%): 100%
 Date Flue Pipe Last Cleaned:

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	29.91	29.91	29.91
Relative Humidity (%)	34.0	42.0	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	
Ambient Sample Volume:		0.000	ft ³

Sample Train Post-Test Leak Checks

(A)	0.000	cfm @	-10	in. Hg
(B)	0.000	cfm @	-10	in. Hg
(Ambient)		cfm @		in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H ₂ O)	Temp (°F)
1	0.048	87
2	0.058	87
3	0.062	87
4	0.046	87
5	0.052	87
6	0.068	87
7	0.062	87
8	0.048	87
Center	0.070	87

Dilution Tunnel H₂O: 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 ft²

V_{strav} : 16.08 ft/sec
 V_{scent} : 17.85 ft/sec
 F_p : 0.901 [ratio]

Initial Tunnel Flow: 176.6 scf/min

Static Pressure: -0.190 in. H₂O

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:	Bear Mountain
Pellet Fuel Grade:	PFI Premium
HHV (kJ/kg)	20,357
%C	49.35
%H	6.14
%O	44.27
%Ash	0.24
MC (%DB)	2.54

PELLET STOVE PREBURN DATA - ASTM E2779

Client: <u>Thelin</u>	Job #: <u>19-501</u>
Model: <u>Providence</u>	Tracking #: <u>0034</u>
Run #: <u>1</u>	Technician: <u>AK</u>
	Date: <u>9/10/2019</u>

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

Elapsed Time (min)	Scale Reading (lbs)	Weight Change (lbs)	Average:		
			-0.038	337	74
			Flue Draft (in H ₂ O)	Flue (°F)	Ambient (°F)
0	25.2	-	0.010	76	73
1	25.0	-0.2	0.013	83	73
2	25.0	0	0.003	99	73
3	25.0	0	0.000	121	73
4	25.0	0	-0.015	148	73
5	24.9	-0.1	-0.020	180	73
6	24.8	-0.1	-0.025	223	73
7	24.6	-0.2	-0.032	284	73
8	24.5	-0.1	-0.047	331	73
9	24.3	-0.2	-0.039	350	73
10	24.3	0	-0.050	365	74
11	24.2	-0.1	-0.048	370	74
12	24.2	0	-0.049	372	74
13	24.0	-0.2	-0.054	375	74
14	24.0	0	-0.039	375	74
15	23.9	-0.1	-0.042	376	74
16	23.8	-0.1	-0.043	380	74
17	23.8	0	-0.035	374	74
18	23.7	-0.1	-0.036	364	74
19	23.7	0	-0.042	370	74
20	23.6	-0.1	-0.046	370	74
21	23.5	-0.1	-0.054	372	74
22	23.5	0	-0.045	368	74
23	23.4	-0.1	-0.042	364	74
24	23.3	-0.1	-0.036	366	74
25	23.3	0	-0.033	365	74
26	23.2	-0.1	-0.045	365	74
27	23.2	0	-0.035	364	74
28	23.1	-0.1	-0.042	361	74
29	23.0	-0.1	-0.046	363	74
30	22.9	-0.1	-0.032	362	74
31	22.9	0	-0.034	364	74
32	22.7	-0.2	-0.036	356	74
33	22.9	0.2	-0.031	350	74
34	22.7	-0.2	-0.036	350	74
35	22.7	0	-0.044	353	74
36	22.6	-0.1	-0.046	358	75
37	22.4	-0.2	-0.057	367	74
38	22.4	0	-0.046	365	74
39	22.4	0	-0.033	365	75
40	22.3	-0.1	-0.041	363	74
41	22.3	0	-0.044	371	74
42	22.5	0.2	-0.047	371	75
43	22.1	-0.4	-0.033	368	75
44	22.0	-0.1	-0.054	369	75
45	22.0	0	-0.042	374	75
46	21.9	-0.1	-0.045	369	75

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.070	0.01	77	-0.08		14.2		113	352	73	75
1	0.128	0.128	0.068	2.16	77	-2.3	90	14.1	-0.1	113	356	75	75
2	0.269	0.141	0.060	2.15	77	-2.42	106	14.1	0.0	113	357	76	75
3	0.414	0.145	0.064	2.13	77	-2.54	105	14.0	-0.1	113	362	77	75
4	0.556	0.142	0.077	2.13	77	-2.26	94	13.9	-0.1	113	365	77	75
5	0.698	0.142	0.063	2.12	77	0	104	13.8	-0.1	113	368	78	75
6	0.842	0.144	0.064	2.10	77	-0.32	104	13.8	0.0	113	370	78	75
7	0.983	0.141	0.071	2.09	77	-2.51	97	13.7	-0.1	113	374	78	75
8	1.128	0.145	0.063	2.10	77	-2.07	106	13.6	-0.1	113	369	79	75
9	1.267	0.139	0.068	2.07	78	-2.07	98	13.5	-0.1	114	375	79	75
10	1.411	0.144	0.070	2.09	78	-2.49	100	13.5	0.0	114	379	79	75
11	1.550	0.139	0.070	2.07	78	-1.71	96	13.3	-0.2	114	376	80	75
12	1.695	0.145	0.065	2.06	78	-1.85	104	13.3	0.0	114	378	80	75
13	1.835	0.140	0.063	2.04	78	-1.25	102	13.2	-0.1	114	375	80	75
14	1.978	0.143	0.062	2.06	79	-1.02	105	13.3	0.1	114	373	80	75
15	2.118	0.140	0.068	2.05	79	-2.13	98	13.1	-0.2	114	369	80	75
16	2.259	0.141	0.069	2.06	79	-2.62	98	13.1	0.0	114	372	81	75
17	2.402	0.143	0.065	2.05	80	-0.01	103	13.0	-0.1	115	368	81	75
18	2.546	0.144	0.070	2.26	80	-2.64	99	13.0	0.0	114	369	81	75
19	2.695	0.149	0.068	2.24	80	-2.62	104	12.9	-0.1	114	364	81	75
20	2.840	0.145	0.066	2.26	80	-0.69	103	12.8	-0.1	114	370	81	75
21	2.989	0.149	0.069	2.26	81	-2.65	103	12.7	-0.1	114	375	81	75
22	3.135	0.146	0.062	2.23	81	-2.65	107	12.6	-0.1	114	375	81	75
23	3.284	0.149	0.072	2.23	81	-1.86	101	12.6	0.0	114	366	81	75
24	3.430	0.146	0.066	2.22	82	-2.15	103	12.5	-0.1	114	377	81	75
25	3.578	0.148	0.069	2.23	82	-0.06	103	12.4	-0.1	115	377	81	75
26	3.725	0.147	0.063	2.25	82	-2.27	107	12.4	0.0	115	383	81	75
27	3.873	0.148	0.067	2.23	83	-2.43	104	12.3	-0.1	115	380	81	76
28	4.020	0.147	0.064	2.24	83	0	106	12.2	-0.1	115	383	81	76
29	4.168	0.148	0.070	2.24	83	-1.29	102	12.1	-0.1	115	380	81	75
30	4.315	0.147	0.067	2.23	84	-2.32	103	12.1	0.0	116	382	81	76
31	4.463	0.148	0.068	2.23	84	0	103	12.0	-0.1	115	376	80	76
32	4.611	0.148	0.067	2.23	84	0	104	11.9	-0.1	115	368	80	75

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	4.759	0.148	0.063	2.22	85	-2.36	107	11.9	0.0	115	376	80	75
34	4.907	0.148	0.071	2.24	85	-1.27	101	11.8	-0.1	115	376	80	75
35	5.054	0.147	0.064	2.22	85	-2.57	105	11.7	-0.1	115	376	80	76
36	5.203	0.149	0.072	2.23	85	-2.66	101	11.7	0.0	115	373	80	76
37	5.349	0.146	0.065	2.24	86	-0.15	104	11.6	-0.1	115	371	80	76
38	5.499	0.150	0.062	2.22	86	-2.52	109	11.5	-0.1	115	376	80	76
39	5.645	0.146	0.070	2.24	86	0	100	11.4	-0.1	115	375	79	76
40	5.795	0.150	0.067	2.21	87	-2.76	105	11.4	0.0	115	369	79	76
41	5.941	0.146	0.068	2.24	87	-0.66	101	11.3	-0.1	116	376	79	76
42	6.091	0.150	0.067	2.21	87	-0.62	105	11.2	-0.1	115	375	79	76
43	6.236	0.145	0.072	2.27	87	-0.91	98	11.2	0.0	115	363	79	76
44	6.387	0.151	0.062	2.23	88	-0.46	109	11.1	-0.1	115	362	79	76
45	6.532	0.145	0.075	2.23	88	0	95	11.1	0.0	115	364	79	76
46	6.683	0.151	0.067	2.23	88	0	105	11.0	-0.1	115	362	79	76
47	6.828	0.145	0.072	2.22	88	-2.61	97	10.9	-0.1	115	366	79	76
48	6.979	0.151	0.063	2.24	89	0	108	10.9	0.0	115	364	80	76
49	7.124	0.145	0.067	2.21	89	-2.41	101	10.8	-0.1	115	358	80	76
50	7.275	0.151	0.068	2.23	89	-2.07	104	10.6	-0.2	114	367	80	76
51	7.422	0.147	0.063	2.22	89	-0.07	105	10.6	0.0	115	368	80	76
52	7.573	0.151	0.068	2.25	90	-1.24	104	10.6	0.0	115	364	80	76
53	7.719	0.146	0.065	2.23	90	0	103	10.5	-0.1	115	364	80	76
54	7.869	0.150	0.068	2.23	90	0	103	10.5	0.0	115	357	80	76
55	8.016	0.147	0.071	2.24	90	-0.3	99	10.4	-0.1	115	355	80	75
56	8.166	0.150	0.064	2.20	91	0	106	10.4	0.0	115	361	80	75
57	8.313	0.147	0.065	2.24	91	0	103	10.3	-0.1	114	358	79	75
58	8.462	0.149	0.072	2.23	91	0	99	10.2	-0.1	114	362	79	75
59	8.606	0.144	0.071	2.13	91	0	97	10.1	-0.1	114	361	79	75
60	8.754	0.148	0.075	2.13	91	0	97	10.0	-0.1	114	366	79	75
61	8.899	0.145	0.062	2.16	92	0	104	10.0	0.0	108	353	78	75
62	9.047	0.148	0.062	2.21	92	-0.01	106	10.0	0.0	107	341	79	75
63	9.193	0.146	0.066	2.21	92	-0.13	101	9.9	-0.1	105	327	78	75
64	9.343	0.150	0.071	2.21	92	-2.46	100	9.9	0.0	104	314	78	75
65	9.489	0.146	0.062	2.21	92	-2.63	104	9.9	0.0	103	306	78	74

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	9.638	0.149	0.066	2.19	92	-1.24	103	9.7	-0.2	102	303	78	74
67	9.785	0.147	0.067	2.22	93	-2.55	100	9.8	0.1	101	302	77	74
68	9.934	0.149	0.064	2.20	93	-2.34	104	9.8	0.0	101	302	77	74
69	10.081	0.147	0.065	2.20	93	-0.31	102	9.7	-0.1	100	294	77	74
70	10.230	0.149	0.069	2.21	93	0	100	9.6	-0.1	100	291	77	74
71	10.378	0.148	0.064	2.21	93	0	103	9.5	-0.1	100	287	76	74
72	10.527	0.149	0.060	2.21	93	0	107	9.6	0.1	99	285	76	74
73	10.676	0.149	0.068	2.20	93	-0.09	101	9.6	0.0	99	280	76	74
74	10.823	0.147	0.064	2.19	93	-0.66	102	9.6	0.0	98	278	76	74
75	10.973	0.150	0.063	2.20	93	-2.34	105	9.5	-0.1	98	271	76	74
76	11.119	0.146	0.068	2.21	93	0	98	9.5	0.0	98	273	76	74
77	11.270	0.151	0.072	2.20	93	-0.02	99	9.6	0.1	98	277	76	74
78	11.416	0.146	0.068	2.21	94	0	98	9.4	-0.2	97	273	76	74
79	11.566	0.150	0.065	2.22	94	-0.9	103	9.4	0.0	97	270	76	74
80	11.712	0.146	0.063	2.20	94	-2.33	102	9.4	0.0	97	270	76	74
81	11.862	0.150	0.063	2.18	94	-1.78	105	9.3	-0.1	97	274	76	74
82	12.008	0.146	0.065	2.21	94	-2.22	100	9.3	0.0	97	275	76	74
83	12.159	0.151	0.068	2.19	94	0	102	9.2	-0.1	97	271	76	74
84	12.304	0.145	0.068	2.21	94	-2.57	97	9.2	0.0	96	267	75	74
85	12.455	0.151	0.062	2.21	94	0	106	9.1	-0.1	96	265	75	74
86	12.602	0.147	0.066	2.20	94	-2.42	100	9.1	0.0	97	262	75	74
87	12.753	0.151	0.072	2.19	95	-0.79	98	9.1	0.0	96	261	75	74
88	12.899	0.146	0.067	2.20	95	-0.57	99	9.1	0.0	96	263	75	74
89	13.050	0.151	0.070	2.21	95	0	100	9.0	-0.1	97	269	76	74
90	13.196	0.146	0.068	2.20	95	-1.29	98	9.0	0.0	97	272	76	74
91	13.347	0.151	0.071	2.19	95	-0.85	99	9.0	0.0	97	271	76	74
92	13.493	0.146	0.064	2.21	95	-1.18	101	8.9	-0.1	97	269	76	74
93	13.647	0.154	0.064	2.21	95	-0.88	107	8.9	0.0	97	269	76	74
94	13.793	0.146	0.066	2.22	95	-1.02	99	8.9	0.0	97	264	76	74
95	13.942	0.149	0.067	2.20	95	0	101	8.9	0.0	96	257	75	73
96	14.090	0.148	0.070	2.21	95	-0.33	98	8.8	-0.1	96	254	75	73
97	14.239	0.149	0.065	2.21	95	-0.52	102	8.8	0.0	96	253	75	73
98	14.386	0.147	0.061	2.20	95	-2.2	104	8.9	0.1	96	255	75	73

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	14.535	0.149	0.069	2.19	96	-2.68	99	8.6	-0.3	96	253	75	73
100	14.684	0.149	0.067	2.21	96	-2.44	101	8.7	0.1	96	252	75	73
101	14.832	0.148	0.068	2.19	96	-0.97	99	8.7	0.0	96	250	75	73
102	14.982	0.150	0.070	2.20	96	-1.21	99	8.6	-0.1	96	253	75	72
103	15.129	0.147	0.073	2.21	96	-1.1	95	8.6	0.0	96	253	75	72
104	15.279	0.150	0.070	2.21	96	-2.48	99	8.6	0.0	96	252	75	72
105	15.426	0.147	0.071	2.21	96	-0.83	96	8.5	-0.1	96	255	75	72
106	15.576	0.150	0.070	2.20	96	0	99	8.5	0.0	96	257	75	72
107	15.722	0.146	0.064	2.20	96	-2.3	101	8.5	0.0	96	255	75	72
108	15.872	0.150	0.067	2.24	96	-2.5	101	8.3	-0.2	96	262	75	72
109	16.018	0.146	0.057	2.20	96	-0.13	107	8.4	0.1	96	263	75	72
110	16.170	0.152	0.062	2.21	96	0	107	8.4	0.0	96	258	75	72
111	16.315	0.145	0.062	2.20	96	-2.07	102	8.3	-0.1	96	262	75	72
112	16.466	0.151	0.063	2.20	96	-1.7	105	8.2	-0.1	96	263	75	72
113	16.613	0.147	0.073	2.20	96	0	95	8.2	0.0	96	266	75	72
114	16.764	0.151	0.066	2.21	96	-2.43	103	8.2	0.0	96	263	75	72
115	16.910	0.146	0.070	2.18	96	-0.78	96	8.2	0.0	96	262	75	72
116	17.061	0.151	0.072	2.21	96	-2.6	98	8.2	0.0	96	257	75	72
117	17.207	0.146	0.072	2.21	96	0	95	8.0	-0.2	96	253	75	72
118	17.359	0.152	0.070	2.21	96	0	100	8.1	0.1	96	250	75	72
119	17.505	0.146	0.071	2.20	96	-1.26	96	8.1	0.0	96	259	75	72
120	17.654	0.149	0.063	2.21	96	-1.7	104	8.0	-0.1	96	266	75	72
121	17.801	0.147	0.062	2.20	96	-2.43	103	7.9	-0.1	96	272	75	72
122	17.951	0.150	0.061	2.21	96	-1.59	106	7.8	-0.1	97	274	75	72
123	18.098	0.147	0.066	2.21	96	0	100	7.9	0.1	97	272	75	72
124	18.247	0.149	0.074	2.20	96	0	96	7.8	-0.1	97	278	75	72
125	18.396	0.149	0.075	2.18	96	-0.9	95	7.8	0.0	97	275	75	72
126	18.546	0.150	0.062	2.19	96	-0.51	105	7.8	0.0	97	274	75	72
127	18.695	0.149	0.074	2.20	96	-2.22	96	7.7	-0.1	97	272	75	72
128	18.843	0.148	0.072	2.19	96	-2.41	96	7.7	0.0	97	270	75	72
129	18.993	0.150	0.071	2.19	96	-1.34	98	7.7	0.0	97	267	75	72
130	19.140	0.147	0.075	2.18	96	0	94	7.7	0.0	97	263	75	72
131	19.291	0.151	0.067	2.21	96	-1.78	102	7.7	0.0	97	261	75	72

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
132	19.437	0.146	0.072	2.20	96	-0.57	95	7.6	-0.1	97	261	75	72
133	19.587	0.150	0.064	2.22	96	-2.5	104	7.6	0.0	97	263	75	72
134	19.733	0.146	0.061	2.19	96	-2.09	103	7.5	-0.1	96	265	75	72
135	19.884	0.151	0.073	2.20	96	-1.9	98	7.5	0.0	96	261	75	72
136	20.029	0.145	0.071	2.19	96	-1.73	95	7.5	0.0	96	259	75	72
137	20.181	0.152	0.073	2.20	96	0	98	7.4	-0.1	96	267	75	72
138	20.327	0.146	0.066	2.18	96	-0.49	99	7.4	0.0	96	265	75	72
139	20.479	0.152	0.064	2.20	96	-2.11	105	7.4	0.0	96	260	75	72
140	20.625	0.146	0.069	2.20	96	0	97	7.4	0.0	96	261	75	73
141	20.776	0.151	0.074	2.20	97	-0.62	97	7.3	-0.1	96	263	75	72
142	20.922	0.146	0.076	2.21	97	-2.56	92	7.3	0.0	96	260	75	72
143	21.073	0.151	0.070	2.16	97	-0.63	99	7.2	-0.1	96	259	75	72
144	21.219	0.146	0.071	2.20	97	0	95	7.2	0.0	96	252	75	72
145	21.369	0.150	0.071	2.21	97	0	98	7.2	0.0	96	255	75	72
146	21.515	0.146	0.065	2.20	97	-2.59	100	7.2	0.0	96	259	75	72
147	21.666	0.151	0.068	2.23	97	-2.34	101	7.1	-0.1	96	261	75	72
148	21.813	0.147	0.068	2.21	97	-0.86	98	7.1	0.0	96	259	75	72
149	21.962	0.149	0.062	2.20	97	0	104	6.9	-0.2	96	256	75	72
150	22.110	0.148	0.061	2.19	97	-2.58	104	7.0	0.1	96	261	75	72
151	22.260	0.150	0.066	2.20	97	-1.41	102	6.9	-0.1	96	265	75	72
152	22.409	0.149	0.062	2.20	97	-2.6	104	6.9	0.0	96	265	75	72
153	22.557	0.148	0.069	2.19	97	-2.62	98	6.9	0.0	97	270	75	72
154	22.706	0.149	0.063	2.20	97	-2.05	103	6.9	0.0	96	269	75	72
155	22.854	0.148	0.069	2.21	97	-2.53	98	6.8	-0.1	96	266	75	72
156	23.004	0.150	0.072	2.20	97	0	97	6.8	0.0	96	266	75	72
157	23.150	0.146	0.059	2.22	97	0	105	6.8	0.0	96	264	75	72
158	23.300	0.150	0.070	2.20	97	-0.72	99	6.7	-0.1	96	258	75	73
159	23.446	0.146	0.063	2.18	97	-2.08	101	6.7	0.0	96	260	75	73
160	23.597	0.151	0.070	2.20	97	-1.38	99	6.7	0.0	96	259	75	73
161	23.743	0.146	0.073	2.20	97	-2.15	94	6.6	-0.1	96	261	75	73
162	23.894	0.151	0.066	2.18	97	-2.57	102	6.5	-0.1	96	267	75	73
163	24.040	0.146	0.071	2.20	97	-0.2	95	6.6	0.1	96	269	75	73
164	24.192	0.152	0.069	2.20	97	-2.64	101	6.5	-0.1	96	268	75	73

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
165	24.338	0.146	0.070	2.20	97	-2.33	96	6.4	-0.1	96	263	75	73
166	24.489	0.151	0.070	2.18	97	0	99	6.5	0.1	95	260	75	73
167	24.635	0.146	0.070	2.20	97	-1.92	96	6.5	0.0	96	253	75	73
168	24.786	0.151	0.067	2.17	97	-2.5	102	6.4	-0.1	96	251	75	73
169	24.932	0.146	0.066	2.19	97	0	99	6.4	0.0	95	253	75	73
170	25.083	0.151	0.070	2.20	97	-2.15	99	6.4	0.0	95	259	75	73
171	25.229	0.146	0.062	2.20	97	0	102	6.3	-0.1	95	265	75	73
172	25.379	0.150	0.069	2.20	97	-2.02	99	6.3	0.0	95	263	75	73
173	25.526	0.147	0.069	2.19	97	-0.75	98	6.3	0.0	96	259	75	73
174	25.675	0.149	0.068	2.19	97	-0.13	99	6.2	-0.1	95	259	75	73
175	25.823	0.148	0.070	2.20	97	-2.62	97	6.2	0.0	95	256	75	73
176	25.973	0.150	0.071	2.20	97	-0.45	98	6.1	-0.1	96	259	75	72
177	26.122	0.149	0.068	2.20	97	-0.2	99	6.0	-0.1	95	256	75	72
178	26.270	0.148	0.072	2.19	97	-2.47	96	6.1	0.1	95	253	75	72
179	26.419	0.149	0.058	2.18	97	-0.98	108	6.1	0.0	95	257	75	72
180	26.566	0.147	0.067	2.20	97	-0.51	99	6.0	-0.1	96	263	75	72
181	26.717	0.151	0.063	2.20	97	-2.19	105	6.0	0.0	96	268	75	72
182	26.863	0.146	0.073	2.19	97	0	94	5.9	-0.1	96	267	75	72
183	27.013	0.150	0.068	2.22	97	-2.65	100	5.9	0.0	96	262	75	72
184	27.159	0.146	0.065	2.20	97	-1.6	100	5.9	0.0	95	261	75	72
185	27.310	0.151	0.073	2.20	97	-0.26	97	5.7	-0.2	96	261	75	72
186	27.456	0.146	0.061	2.20	97	-1.15	103	5.9	0.2	95	261	75	72
187	27.607	0.151	0.064	2.20	97	0	104	5.7	-0.2	95	255	75	72
188	27.753	0.146	0.066	2.18	97	-1.16	99	5.7	0.0	95	255	75	72
189	27.905	0.152	0.066	2.20	97	-1.32	103	5.8	0.1	95	256	75	72
190	28.050	0.145	0.071	2.18	97	0	95	5.7	-0.1	95	259	75	73
191	28.202	0.152	0.072	2.19	97	-0.51	99	5.6	-0.1	95	256	75	73
192	28.348	0.146	0.067	2.19	97	0	98	5.5	-0.1	95	258	75	73
193	28.499	0.151	0.062	2.20	97	-0.67	106	5.6	0.1	95	257	75	73
194	28.645	0.146	0.073	2.20	97	-2.21	94	5.6	0.0	95	255	75	73
195	28.795	0.150	0.067	2.19	97	-2.68	101	5.5	-0.1	95	253	75	73
196	28.941	0.146	0.065	2.20	97	-2.7	100	5.5	0.0	95	254	75	73
197	29.091	0.150	0.068	2.22	97	0	100	5.5	0.0	95	263	75	73

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
198	29.238	0.147	0.066	2.19	97	-1.31	100	5.4	-0.1	95	262	75	72
199	29.387	0.149	0.062	2.20	97	-0.58	104	5.3	-0.1	95	262	75	72
200	29.535	0.148	0.070	2.19	97	-2.62	97	5.4	0.1	95	260	75	72
201	29.684	0.149	0.061	2.19	97	-0.67	105	5.3	-0.1	95	266	75	72
202	29.833	0.149	0.066	2.19	97	-1.52	101	5.3	0.0	95	268	75	72
203	29.981	0.148	0.071	2.19	97	-1.06	97	5.2	-0.1	95	270	75	73
204	30.131	0.150	0.061	2.18	97	-2.34	106	5.2	0.0	95	271	75	73
205	30.278	0.147	0.058	2.18	97	0	106	5.2	0.0	95	264	75	72
206	30.428	0.150	0.070	2.19	97	-0.49	99	5.2	0.0	95	256	75	72
207	30.575	0.147	0.075	2.17	97	0	93	5.0	-0.2	95	261	75	72
208	30.725	0.150	0.061	2.20	97	0	106	5.1	0.1	95	267	75	72
209	30.871	0.146	0.062	2.20	97	-1.94	102	5.0	-0.1	95	263	75	72
210	31.021	0.150	0.069	2.20	97	0	99	4.9	-0.1	95	256	75	72
211	31.167	0.146	0.065	2.18	97	0	100	5.0	0.1	95	254	75	72
212	31.319	0.152	0.070	2.20	97	-1.88	100	5.0	0.0	95	259	75	72
213	31.464	0.145	0.062	2.19	97	0	101	4.9	-0.1	95	263	75	72
214	31.615	0.151	0.074	2.19	97	-1.07	97	4.9	0.0	95	259	75	72
215	31.761	0.146	0.067	2.19	98	-2.39	98	4.8	-0.1	95	264	75	72
216	31.913	0.152	0.072	2.21	97	-1.93	99	4.8	0.0	95	263	75	72
217	32.059	0.146	0.067	2.19	97	-1.95	98	4.7	-0.1	95	259	75	72
218	32.210	0.151	0.075	2.20	97	-1	96	4.8	0.1	95	255	74	72
219	32.356	0.146	0.066	2.20	97	-2.09	99	4.6	-0.2	94	251	74	72
220	32.507	0.151	0.065	2.17	97	-1.53	103	4.7	0.1	94	248	74	72
221	32.653	0.146	0.067	2.19	97	-2.49	98	4.5	-0.2	94	252	74	72
222	32.803	0.150	0.071	2.20	97	-0.02	98	4.6	0.1	94	246	74	72
223	32.949	0.146	0.067	2.20	97	-1.15	98	4.6	0.0	94	255	74	72
224	33.099	0.150	0.076	2.18	97	-0.89	95	4.5	-0.1	94	254	74	72
225	33.246	0.147	0.072	2.20	97	-2.62	95	4.5	0.0	94	259	74	72
226	33.395	0.149	0.073	2.20	97	-1.08	96	4.6	0.1	94	256	74	72
227	33.542	0.147	0.073	2.17	97	-2.29	95	4.5	-0.1	94	251	74	72
228	33.691	0.149	0.072	2.20	97	-2.4	97	4.4	-0.1	94	249	74	72
229	33.841	0.150	0.072	2.20	97	0	97	4.3	-0.1	94	256	74	72
230	33.988	0.147	0.069	2.20	97	-2.61	97	4.4	0.1	94	260	74	72

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
231	34.138	0.150	0.068	2.20	97	0	100	4.3	-0.1	94	262	74	72
232	34.285	0.147	0.068	2.18	97	-0.93	98	4.2	-0.1	94	259	74	72
233	34.435	0.150	0.072	2.20	97	-1.26	97	4.2	0.0	94	258	74	72
234	34.582	0.147	0.072	2.18	97	-1.07	95	4.2	0.0	94	258	74	72
235	34.732	0.150	0.061	2.18	97	-0.26	106	4.1	-0.1	94	260	74	72
236	34.878	0.146	0.063	2.21	97	-0.64	101	4.0	-0.1	94	260	74	72
237	35.028	0.150	0.070	2.19	97	0	99	4.0	0.0	94	260	74	72
238	35.173	0.145	0.062	2.18	97	-0.33	101	4.1	0.1	94	260	74	72
239	35.324	0.151	0.073	2.19	97	0	97	4.0	-0.1	94	264	74	72
240	35.470	0.146	0.066	2.20	97	-2.52	99	4.0	0.0	94	262	74	72
241	35.621	0.151	0.067	2.18	97	0	101	4.0	0.0	94	258	74	72
242	35.766	0.145	0.075	2.19	97	-2.35	92	4.0	0.0	94	259	74	72
243	35.917	0.151	0.062	2.18	97	-0.39	106	3.9	-0.1	94	252	74	72
244	36.063	0.146	0.069	2.20	97	-1.08	97	3.9	0.0	94	254	74	72
245	36.214	0.151	0.074	2.18	97	0	97	3.7	-0.2	94	265	74	72
246	36.360	0.146	0.063	2.21	97	-0.16	101	3.8	0.1	94	266	74	72
247	36.511	0.151	0.072	2.17	97	-2.65	98	3.8	0.0	94	265	74	72
248	36.656	0.145	0.063	2.19	97	-0.3	101	3.7	-0.1	94	262	74	72
249	36.807	0.151	0.067	2.19	97	-2.44	101	3.6	-0.1	94	260	74	72
250	36.953	0.146	0.067	2.19	97	-0.08	98	3.7	0.1	95	264	74	72
251	37.103	0.150	0.071	2.20	97	-2.44	98	3.6	-0.1	94	264	74	72
252	37.249	0.146	0.063	2.20	97	-2.27	101	3.6	0.0	94	267	74	72
253	37.398	0.149	0.067	2.17	97	-2.49	100	3.6	0.0	95	266	74	72
254	37.546	0.148	0.062	2.21	97	-1.67	103	3.4	-0.2	94	268	74	72
255	37.695	0.149	0.062	2.21	97	-0.25	104	3.5	0.1	95	268	74	72
256	37.842	0.147	0.064	2.21	97	-2.55	101	3.3	-0.2	95	271	74	72
257	37.990	0.148	0.072	2.19	97	-1.95	96	3.4	0.1	95	268	74	72
258	38.139	0.149	0.069	2.18	97	-0.23	99	3.4	0.0	95	263	74	72
259	38.287	0.148	0.061	2.20	97	0	104	3.3	-0.1	94	263	74	72
260	38.436	0.149	0.063	2.18	97	0	103	3.2	-0.1	94	264	74	72
261	38.584	0.148	0.070	2.18	97	-2.65	97	3.3	0.1	95	262	74	72
262	38.733	0.149	0.063	2.19	97	0	103	3.3	0.0	94	263	74	72
263	38.880	0.147	0.067	2.18	97	-0.78	99	3.0	-0.3	94	256	74	72

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
264	39.030	0.150	0.071	2.18	97	-2.56	98	3.2	0.2	94	262	74	72
265	39.176	0.146	0.069	2.19	97	-1.47	97	3.2	0.0	94	270	74	72
266	39.326	0.150	0.071	2.19	97	0	98	3.0	-0.2	95	268	74	72
267	39.472	0.146	0.068	2.21	97	-2.34	97	3.1	0.1	94	267	74	72
268	39.622	0.150	0.072	2.18	97	-2.03	97	3.1	0.0	94	262	74	72
269	39.768	0.146	0.075	2.18	97	-1.08	93	3.0	-0.1	94	263	74	72
270	39.919	0.151	0.071	2.19	97	0	99	3.0	0.0	94	262	74	72
271	40.064	0.145	0.068	2.21	97	-2.21	97	3.0	0.0	94	265	74	72
272	40.215	0.151	0.064	2.18	97	-1.23	104	2.9	-0.1	94	258	74	72
273	40.360	0.145	0.072	2.18	97	-0.76	94	2.9	0.0	94	256	74	72
274	40.512	0.152	0.062	2.18	97	-0.46	106	2.8	-0.1	94	254	74	72
275	40.657	0.145	0.067	2.20	97	-0.2	97	2.8	0.0	94	260	74	72
276	40.809	0.152	0.062	2.19	97	-0.74	106	2.7	-0.1	94	262	74	72
277	40.954	0.145	0.068	2.20	97	-0.63	97	2.8	0.1	94	259	74	72
278	41.105	0.151	0.068	2.19	97	-0.95	101	2.6	-0.2	94	258	74	72
279	41.251	0.146	0.066	2.17	97	-2.64	99	2.7	0.1	94	260	74	72
280	41.401	0.150	0.064	2.20	97	-0.1	103	2.7	0.0	94	259	74	72
281	41.547	0.146	0.072	2.17	97	-1.03	95	2.6	-0.1	94	263	74	72
282	41.697	0.150	0.069	2.18	97	-0.21	99	2.6	0.0	94	263	74	72
283	41.842	0.145	0.063	2.20	97	0	101	2.6	0.0	94	257	74	72
284	41.992	0.150	0.072	2.18	97	-0.24	97	2.4	-0.2	94	260	75	72
285	42.139	0.147	0.066	2.19	97	0	100	2.5	0.1	94	257	75	72
286	42.288	0.149	0.069	2.18	97	0	99	2.4	-0.1	94	258	74	72
287	42.435	0.147	0.062	2.18	97	-2.71	103	2.5	0.1	94	259	74	72
288	42.584	0.149	0.068	2.18	97	-2.58	99	2.4	-0.1	94	259	74	72
289	42.732	0.148	0.069	2.18	97	-0.31	98	2.4	0.0	94	256	74	72
290	42.881	0.149	0.070	2.19	97	-2.26	98	2.4	0.0	94	254	74	72
291	43.029	0.148	0.069	2.18	97	-1.24	98	2.3	-0.1	94	254	74	72
292	43.181	0.152	0.064	2.19	97	-2.37	105	2.2	-0.1	94	255	74	72
293	43.330	0.149	0.063	2.20	97	-1.31	103	2.3	0.1	94	259	74	72
294	43.477	0.147	0.066	2.21	97	-1.03	99	2.2	-0.1	93	255	74	72
295	43.627	0.150	0.068	2.19	97	0	100	2.1	-0.1	94	259	74	72
296	43.774	0.147	0.066	2.19	97	-1.04	100	2.2	0.1	94	258	74	72

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
297	43.924	0.150	0.070	2.19	97	-2.29	99	2.1	-0.1	94	260	74	72
298	44.069	0.145	0.070	2.19	97	0	95	2.1	0.0	94	259	74	72
299	44.219	0.150	0.071	2.19	97	-0.72	98	2.0	-0.1	94	256	74	72
300	44.365	0.146	0.071	2.16	97	0	95	2.0	0.0	94	268	74	72
301	44.516	0.151	0.062	2.20	97	-2.41	106	2.0	0.0	94	269	74	72
302	44.661	0.145	0.074	2.18	97	-2.07	93	1.9	-0.1	94	260	74	72
303	44.811	0.150	0.065	2.18	97	-0.4	102	1.9	0.0	94	261	74	72
304	44.956	0.145	0.071	2.18	97	0	95	1.9	0.0	94	262	74	72
305	45.108	0.152	0.067	2.18	97	-2.2	102	1.8	-0.1	94	261	74	72
306	45.253	0.145	0.067	2.19	97	-0.43	97	1.8	0.0	94	256	74	72
307	45.405	0.152	0.069	2.17	97	-1.75	101	1.7	-0.1	94	261	74	72
308	45.550	0.145	0.061	2.16	97	-1.2	102	1.8	0.1	94	263	74	72
309	45.701	0.151	0.063	2.18	97	0	105	1.7	-0.1	94	265	74	72
310	45.846	0.145	0.069	2.16	97	-2.25	96	1.7	0.0	94	263	74	72
311	45.997	0.151	0.062	2.17	97	-0.49	106	1.6	-0.1	94	262	74	72
312	46.143	0.146	0.068	2.19	97	-0.16	97	1.5	-0.1	94	264	74	72
313	46.293	0.150	0.067	2.19	97	0	101	1.6	0.1	94	265	74	72
314	46.439	0.146	0.070	2.19	97	-0.75	96	1.5	-0.1	94	269	74	72
315	46.588	0.149	0.073	2.19	97	-0.46	96	1.5	0.0	94	267	74	72
316	46.734	0.146	0.062	2.18	97	0	102	1.3	-0.2	94	275	74	72
317	46.884	0.150	0.068	2.20	97	-0.54	100	1.4	0.1	94	274	74	72
318	47.031	0.147	0.059	2.18	97	0	105	1.4	0.0	95	273	74	72
319	47.179	0.148	0.072	2.20	97	0	96	1.3	-0.1	95	270	74	72
320	47.327	0.148	0.062	2.19	97	-1.72	104	1.3	0.0	95	269	74	72
321	47.475	0.148	0.069	2.17	97	-2.43	98	1.2	-0.1	94	266	74	72
322	47.624	0.149	0.071	2.18	97	-1.84	97	1.2	0.0	95	267	74	72
323	47.772	0.148	0.071	2.17	97	0	97	1.2	0.0	95	267	74	72
324	47.921	0.149	0.065	2.18	97	-0.46	102	1.2	0.0	95	270	74	72
325	48.068	0.147	0.073	2.16	97	0	95	1.1	-0.1	95	266	74	72
326	48.218	0.150	0.067	2.16	97	-2.66	101	1.1	0.0	95	263	74	72
327	48.364	0.146	0.074	2.19	97	-0.01	93	1.1	0.0	95	264	74	72
328	48.514	0.150	0.067	2.18	97	-2.05	101	0.9	-0.2	94	257	74	72
329	48.660	0.146	0.072	2.18	97	-1.11	95	0.9	0.0	94	252	74	72

BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
330	48.810	0.150	0.070	2.18	97	-0.84	99	1.0	0.1	94	245	74	72
331	48.955	0.145	0.072	2.20	97	0	94	1.0	0.0	93	241	74	72
332	49.106	0.151	0.068	2.19	97	-2.12	101	0.9	-0.1	93	246	74	72
333	49.251	0.145	0.068	2.17	97	-2.46	97	0.9	0.0	93	245	74	72
334	49.402	0.151	0.062	2.20	97	0	105	0.8	-0.1	93	246	74	72
335	49.547	0.145	0.057	2.19	97	-1.76	106	0.8	0.0	94	257	74	72
336	49.697	0.150	0.065	2.17	97	0	102	0.7	-0.1	94	256	74	72
337	49.842	0.145	0.068	2.17	97	-1.92	97	0.8	0.1	94	256	74	72
338	49.993	0.151	0.063	2.17	97	0	105	0.7	-0.1	94	264	74	72
339	50.139	0.146	0.067	2.18	97	-0.01	98	0.6	-0.1	94	269	74	72
340	50.290	0.151	0.067	2.18	97	-0.41	101	0.6	0.0	94	272	74	72
341	50.435	0.145	0.066	2.16	97	-0.1	98	0.6	0.0	94	269	74	72
342	50.586	0.151	0.068	2.19	97	-1.22	101	0.7	0.1	95	269	74	72
343	50.731	0.145	0.072	2.18	97	-0.51	94	0.6	-0.1	95	266	74	72
344	50.881	0.150	0.062	2.18	97	-0.62	105	0.5	-0.1	94	261	74	72
345	51.027	0.146	0.076	2.17	97	0	92	0.5	0.0	94	259	74	72
346	51.177	0.150	0.065	2.17	97	-0.02	102	0.4	-0.1	94	252	74	72
347	51.323	0.146	0.069	2.17	97	-1.41	97	0.4	0.0	94	249	74	72
348	51.473	0.150	0.067	2.18	97	0	101	0.3	-0.1	94	245	74	72
349	51.618	0.145	0.071	2.18	97	-2.59	95	0.3	0.0	94	255	74	72
350	51.768	0.150	0.069	2.20	97	-2.54	99	0.3	0.0	93	259	74	72
351	51.914	0.146	0.065	2.18	97	-1.48	100	0.3	0.0	93	253	74	72
352	52.063	0.149	0.067	2.20	97	-2.15	100	0.3	0.0	93	252	74	72
353	52.210	0.147	0.066	2.20	97	-0.5	99	0.2	-0.1	93	249	74	72
354	52.358	0.148	0.071	2.18	97	-1.67	97	0.2	0.0	93	247	74	72
355	52.505	0.147	0.067	2.18	97	-0.06	99	0.2	0.0	93	249	74	72
356	52.654	0.149	0.070	2.19	97	-1.7	98	0.2	0.0	93	251	74	72
357	52.802	0.148	0.074	2.17	97	0	95	0.1	-0.1	93	246	74	72
358	52.950	0.148	0.069	2.18	97	-1.22	98	0.1	0.0	93	244	74	72
359	53.098	0.148	0.071	2.16	97	-0.03	97	0.1	0.0	93	244	74	72
360	53.246	0.148	0.063	2.20	97	0	102	0.0	-0.1	93	247	74	72
Avg/Tot	53.246	0.148	0.067	2.19	94	-1.14	100			99	281	76	73

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
0	0.000		0.00	77	-1		76	0.000	3.46	0.02
1	0.129	0.129	2.16	77	-0.54	92	78	-0.040	3.08	0.00
2	0.265	0.136	2.14	77	-2.09	103	78	-0.040	4.78	0.00
3	0.409	0.144	2.12	77	-2.66	106	79	-0.050	3.91	0.00
4	0.551	0.142	2.14	77	-0.56	95	80	-0.050	4.14	0.04
5	0.695	0.144	2.12	77	-2.8	107	80	-0.040	5.05	0.00
6	0.834	0.139	2.12	77	-2.89	102	80	-0.050	4.76	0.00
7	0.978	0.144	2.12	77	-0.78	100	80	-0.040	4.47	0.00
8	1.118	0.140	2.11	77	-2.52	104	81	-0.040	4.54	0.04
9	1.262	0.144	2.13	77	-2.07	103	81	-0.050	3.44	0.00
10	1.402	0.140	2.11	77	-2.02	98	81	-0.040	5.73	0.01
11	1.544	0.142	2.12	78	-3.03	100	81	-0.060	4.16	0.03
12	1.686	0.142	2.10	78	-2.84	103	82	-0.050	3.74	0.03
13	1.826	0.140	2.11	78	-0.58	104	82	-0.030	5.08	0.00
14	1.971	0.145	2.10	78	-1.04	108	82	-0.050	3.23	0.03
15	2.109	0.138	2.11	79	-2.95	98	82	-0.030	3.86	0.01
16	2.253	0.144	2.09	79	-1.69	102	82	-0.040	3.56	0.02
17	2.393	0.140	2.11	79	-1.35	102	82	-0.040	4.19	0.01
18	2.536	0.143	2.10	80	-2.92	100	82	-0.040	3.91	0.04
19	2.676	0.140	2.09	80	-1.87	99	83	-0.040	3.68	0.01
20	2.818	0.142	2.09	80	-0.49	102	82	-0.050	3.44	0.02
21	2.959	0.141	2.08	80	-1.19	99	82	-0.040	4.68	0.01
22	3.100	0.141	2.07	81	-2.98	105	82	-0.050	4.03	0.02
23	3.244	0.144	2.09	81	-2.92	99	82	-0.050	4.69	0.01
24	3.383	0.139	2.08	81	-1.24	100	82	-0.050	3.36	0.06
25	3.526	0.143	2.08	82	-0.57	100	82	-0.040	5.22	0.03
26	3.665	0.139	2.09	82	-2.82	102	82	-0.050	4.38	0.04
27	3.809	0.144	2.09	82	-2.45	103	82	-0.030	4.66	0.03
28	3.949	0.140	2.08	83	-0.61	102	82	-0.040	4.18	0.06
29	4.091	0.142	2.09	83	-0.55	99	82	-0.040	5.08	0.02
30	4.232	0.141	2.07	83	-0.46	100	82	-0.040	4.04	0.03
31	4.373	0.141	2.07	84	-1.48	99	82	-0.040	4.59	0.00

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
32	4.516	0.143	2.08	84	-0.54	101	82	-0.040	3.21	0.04
33	4.657	0.141	2.06	84	-0.58	103	81	-0.050	3.79	0.02
34	4.801	0.144	2.09	85	-0.59	99	81	-0.050	4.77	0.05
35	4.939	0.138	2.08	85	-2.86	100	81	-0.050	3.76	0.03
36	5.084	0.145	2.06	85	-0.49	99	81	-0.050	3.87	0.03
37	5.224	0.140	2.08	85	-1.17	101	81	-0.040	4.03	0.02
38	5.367	0.143	2.06	86	-0.47	105	81	-0.040	3.55	0.03
39	5.509	0.142	2.09	86	-0.86	98	80	-0.040	4.61	0.05
40	5.649	0.140	2.08	86	-2.94	99	80	-0.040	3.99	0.01
41	5.792	0.143	2.07	87	-2.65	100	81	-0.050	3.45	0.02
42	5.933	0.141	2.08	87	-0.8	100	80	-0.040	5.20	0.00
43	6.078	0.145	2.10	87	-0.57	99	80	-0.050	3.95	0.04
44	6.217	0.139	2.08	87	-0.98	102	80	-0.040	2.73	0.07
45	6.362	0.145	2.07	88	-1.53	97	80	-0.040	4.03	0.00
46	6.501	0.139	2.07	88	-1.42	98	80	-0.040	3.28	0.03
47	6.645	0.144	2.06	88	-1.05	98	80	-0.040	3.64	0.02
48	6.787	0.142	2.07	88	-2.33	103	80	-0.040	4.12	0.02
49	6.930	0.143	2.08	89	-0.82	101	81	-0.020	3.31	0.04
50	7.072	0.142	2.08	89	-0.77	99	81	-0.040	3.99	0.02
51	7.213	0.141	2.08	89	-1.29	102	81	-0.050	4.48	0.03
52	7.356	0.143	2.07	89	-0.58	100	81	-0.050	3.61	0.03
53	7.497	0.141	2.08	89	-1.33	101	81	-0.040	3.09	0.03
54	7.642	0.145	2.08	90	-1.16	101	80	-0.050	4.11	0.02
55	7.782	0.140	2.07	90	-1.04	95	80	-0.050	2.41	0.09
56	7.927	0.145	2.07	90	-0.54	104	80	-0.040	4.29	0.00
57	8.067	0.140	2.05	90	-2.8	100	80	-0.030	3.98	0.01
58	8.212	0.145	2.06	90	-3.07	98	80	-0.040	3.55	0.03
59	8.352	0.140	2.07	91	-2.8	95	80	-0.040	4.18	0.00
60	8.498	0.146	2.17	91	-1.13	97	80	-0.050	3.62	0.03
61	8.643	0.145	2.17	91	-1.66	105	79	-0.050	4.77	0.03
62	8.790	0.147	2.19	91	-1.87	106	79	-0.050	4.24	0.04
63	8.935	0.145	2.14	91	-0.6	101	79	-0.040	2.91	0.09

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
64	9.102	0.167	2.17	91	-0.59	113	79	-0.040	2.13	0.06
65	9.349	0.247	2.16	91	-2.81	178	78	-0.040	1.98	0.06
66	9.496	0.147	2.16	92	-0.7	102	78	-0.040	2.03	0.06
67	9.641	0.145	2.16	92	-3.08	100	78	-0.050	3.12	0.00
68	9.787	0.146	2.16	92	-0.54	103	78	-0.040	3.15	0.01
69	9.933	0.146	2.16	92	-0.81	102	78	-0.040	2.73	0.04
70	10.079	0.146	2.17	92	-0.63	99	77	-0.030	2.44	0.02
71	10.225	0.146	2.17	92	-2.69	103	77	-0.040	2.30	0.06
72	10.371	0.146	2.15	92	-0.57	106	77	-0.040	2.04	0.06
73	10.517	0.146	2.15	92	-1.33	100	77	-0.040	2.59	0.03
74	10.663	0.146	2.16	92	-3.06	103	77	-0.030	2.15	0.05
75	10.809	0.146	2.17	93	-2.61	104	77	-0.020	2.61	0.01
76	10.955	0.146	2.16	93	-2.19	100	77	-0.030	1.80	0.03
77	11.101	0.146	2.16	93	-0.92	97	77	-0.040	3.08	0.01
78	11.246	0.145	2.16	93	-0.91	99	77	-0.040	3.13	0.02
79	11.393	0.147	2.16	93	-3.02	103	77	-0.040	2.04	0.09
80	11.538	0.145	2.15	93	-2.25	103	77	-0.030	2.26	0.04
81	11.685	0.147	2.15	93	-2.7	104	77	-0.040	2.38	0.03
82	11.830	0.145	2.16	93	-3.03	101	77	-0.050	3.44	0.02
83	11.977	0.147	2.17	93	-2.93	100	77	-0.020	2.72	0.01
84	12.122	0.145	2.16	94	-3.04	99	77	-0.030	2.26	0.06
85	12.270	0.148	2.15	94	-2.52	105	77	-0.030	2.07	0.02
86	12.415	0.145	2.16	94	-1.67	100	77	-0.030	2.11	0.07
87	12.563	0.148	2.16	94	-2.87	98	77	-0.030	2.11	0.05
88	12.708	0.145	2.17	94	-1.33	99	77	-0.030	2.40	0.04
89	12.856	0.148	2.17	94	-0.57	99	77	-0.050	2.63	0.03
90	13.000	0.144	2.16	94	-2.91	98	77	-0.030	3.39	0.01
91	13.148	0.148	2.17	94	-1.42	99	77	-0.020	2.75	0.02
92	13.293	0.145	2.17	94	-2.98	102	77	-0.040	2.42	0.03
93	13.441	0.148	2.17	94	-2.96	104	77	-0.040	2.28	0.06
94	13.585	0.144	2.15	94	-2.98	100	77	-0.040	2.67	0.01
95	13.733	0.148	2.17	94	-1.27	101	77	-0.030	1.66	0.07

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
96	13.878	0.145	2.15	94	-1.63	97	76	-0.030	1.77	0.05
97	14.026	0.148	2.16	95	-2.89	103	76	-0.030	1.95	0.04
98	14.170	0.144	2.15	95	-1.69	103	76	-0.030	2.07	0.02
99	14.318	0.148	2.14	95	-2.59	100	76	-0.020	2.10	0.05
100	14.463	0.145	2.17	95	-0.46	99	76	-0.030	2.10	0.01
101	14.611	0.148	2.15	95	-1.57	101	76	-0.030	2.02	0.03
102	14.756	0.145	2.18	95	-0.48	97	76	-0.040	2.30	0.02
103	14.904	0.148	2.17	95	-2.86	97	75	-0.030	2.37	0.02
104	15.049	0.145	2.18	95	-3.1	97	75	-0.030	2.41	0.02
105	15.197	0.148	2.18	95	-1.01	98	75	-0.030	2.04	0.07
106	15.342	0.145	2.16	95	-1.53	97	75	-0.030	2.70	0.04
107	15.490	0.148	2.17	95	-0.52	104	75	-0.030	2.60	0.01
108	15.635	0.145	2.17	95	-0.52	99	75	-0.040	2.09	0.05
109	15.783	0.148	2.18	95	-1.85	110	75	-0.040	3.06	0.02
110	15.928	0.145	2.17	95	-2.9	103	75	-0.020	2.62	0.04
111	16.076	0.148	2.18	95	-0.61	105	75	-0.030	2.22	0.01
112	16.220	0.144	2.17	95	-0.54	102	75	-0.030	2.90	0.02
113	16.369	0.149	2.17	95	-1.47	98	75	-0.040	2.66	0.04
114	16.514	0.145	2.16	95	-1.48	100	75	-0.040	2.68	0.03
115	16.662	0.148	2.17	95	-0.54	99	75	-0.030	2.16	0.04
116	16.807	0.145	2.16	95	-1.84	96	75	-0.030	2.53	0.02
117	16.955	0.148	2.16	95	-0.85	98	75	-0.030	1.76	0.08
118	17.100	0.145	2.17	95	-0.72	97	75	-0.020	1.40	0.07
119	17.248	0.148	2.17	95	-2.7	98	75	-0.020	1.94	0.06
120	17.393	0.145	2.16	95	-2.54	102	75	-0.030	3.14	0.02
121	17.541	0.148	2.17	95	-2.85	105	75	-0.040	3.68	0.02
122	17.686	0.145	2.17	95	-2.37	104	75	-0.040	3.34	0.05
123	17.834	0.148	2.16	95	-0.49	102	75	-0.040	2.70	0.05
124	17.979	0.145	2.16	95	-0.64	94	75	-0.040	2.71	0.01
125	18.127	0.148	2.16	95	-1.78	96	75	-0.040	3.36	0.00
126	18.272	0.145	2.16	95	-0.92	103	76	-0.030	2.58	0.04
127	18.420	0.148	2.15	95	-0.68	96	76	-0.030	2.51	0.01

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
128	18.564	0.144	2.17	95	-0.56	95	76	-0.040	2.23	0.08
129	18.713	0.149	2.16	95	-0.68	99	76	-0.030	2.14	0.04
130	18.858	0.145	2.15	95	-2.48	94	76	-0.040	1.93	0.09
131	19.007	0.149	2.17	95	-2.78	102	76	-0.020	2.10	0.03
132	19.151	0.144	2.17	95	-2.99	95	76	-0.030	2.29	0.04
133	19.299	0.148	2.16	95	-0.76	104	76	-0.030	2.47	0.07
134	19.444	0.145	2.17	95	-0.71	104	76	-0.030	2.51	0.00
135	19.592	0.148	2.17	95	-2.53	97	76	-0.040	2.83	0.03
136	19.737	0.145	2.18	95	-0.59	96	76	-0.040	1.84	0.06
137	19.885	0.148	2.17	95	-3.02	97	76	-0.040	2.33	0.05
138	20.029	0.144	2.15	96	-1.01	99	76	-0.030	2.89	0.03
139	20.178	0.149	2.15	96	-1.93	104	76	-0.040	2.02	0.07
140	20.322	0.144	2.16	96	-2.59	97	76	-0.050	1.99	0.04
141	20.471	0.149	2.15	96	-3.04	97	76	-0.040	2.45	0.00
142	20.615	0.144	2.15	96	-1.37	92	76	-0.040	2.43	0.01
143	20.764	0.149	2.15	96	-0.54	100	76	-0.040	1.86	0.05
144	20.908	0.144	2.15	96	-0.73	96	76	-0.020	2.28	0.03
145	21.057	0.149	2.15	96	-1.51	99	76	-0.020	1.50	0.08
146	21.201	0.144	2.17	96	-2.82	100	76	-0.040	2.42	0.05
147	21.349	0.148	2.16	96	-1.38	100	76	-0.030	2.56	0.04
148	21.494	0.145	2.17	96	-0.62	98	76	-0.030	2.53	0.01
149	21.642	0.148	2.16	96	-0.61	105	76	-0.040	1.90	0.06
150	21.786	0.144	2.15	96	-2.96	103	76	-0.040	2.33	0.03
151	21.935	0.149	2.15	96	-1.13	103	76	-0.030	2.82	0.02
152	22.079	0.144	2.16	96	-2.84	102	76	-0.040	2.83	0.05
153	22.228	0.149	2.15	96	-2.1	100	76	-0.040	2.43	0.03
154	22.372	0.144	2.16	96	-3.02	101	76	-0.040	3.31	0.01
155	22.521	0.149	2.16	96	-1.43	100	76	-0.030	2.33	0.07
156	22.665	0.144	2.16	96	-0.64	95	76	-0.040	2.21	0.04
157	22.814	0.149	2.15	96	-1.52	108	76	-0.030	2.31	0.07
158	22.958	0.144	2.16	96	-2.88	96	76	-0.030	2.15	0.02
159	23.106	0.148	2.15	96	-1.14	104	76	-0.030	1.64	0.07

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
160	23.250	0.144	2.16	96	-2.72	96	76	-0.040	2.37	0.05
161	23.399	0.149	2.16	96	-2.79	97	76	-0.030	2.17	0.08
162	23.543	0.144	2.15	96	-2.53	99	76	-0.050	2.69	0.01
163	23.692	0.149	2.17	96	-0.61	99	76	-0.030	2.94	0.04
164	23.836	0.144	2.16	96	-2.37	97	76	-0.020	2.61	0.05
165	23.985	0.149	2.16	96	-3.05	100	76	-0.030	2.45	0.03
166	24.129	0.144	2.15	96	-1.29	96	76	-0.040	1.86	0.03
167	24.278	0.149	2.15	96	-2.41	100	76	-0.030	1.83	0.06
168	24.422	0.144	2.16	96	-3.01	98	76	-0.030	1.36	0.07
169	24.571	0.149	2.15	96	-0.52	102	76	-0.040	1.98	0.07
170	24.715	0.144	2.15	96	-2.65	96	76	-0.040	2.45	0.03
171	24.863	0.148	2.15	96	-0.49	105	76	-0.030	2.96	0.02
172	25.007	0.144	2.15	96	-2.94	97	76	-0.050	2.80	0.03
173	25.156	0.149	2.14	96	-0.61	100	76	-0.040	2.36	0.02
174	25.300	0.144	2.15	96	-0.59	98	76	-0.040	1.85	0.10
175	25.449	0.149	2.15	96	-1.64	99	76	-0.030	2.24	0.05
176	25.593	0.144	2.16	96	-0.48	96	76	-0.030	1.86	0.04
177	25.742	0.149	2.17	96	-2.87	101	76	-0.040	2.50	0.04
178	25.886	0.144	2.16	96	-1.02	95	76	-0.040	1.73	0.08
179	26.035	0.149	2.16	96	-0.69	109	76	-0.020	2.16	0.01
180	26.179	0.144	2.14	96	-2.25	98	76	-0.030	2.73	0.01
181	26.328	0.149	2.15	96	-1.32	105	76	-0.050	2.78	0.04
182	26.472	0.144	2.15	96	-2.56	94	76	-0.030	3.01	0.04
183	26.621	0.149	2.16	96	-1.89	101	76	-0.030	2.34	0.05
184	26.765	0.144	2.17	96	-1	100	76	-0.030	1.95	0.06
185	26.914	0.149	2.16	96	-0.62	97	76	-0.040	2.14	0.04
186	27.058	0.144	2.16	96	-2.87	103	76	-0.030	2.51	0.06
187	27.207	0.149	2.17	96	-1.13	104	76	-0.020	2.30	0.02
188	27.351	0.144	2.17	96	-1.98	99	76	-0.030	1.68	0.07
189	27.499	0.148	2.16	96	-1.43	102	76	-0.030	2.02	0.05
190	27.643	0.144	2.16	96	-1.96	95	76	-0.030	2.39	0.01
191	27.792	0.149	2.15	96	-2.92	98	76	-0.030	2.54	0.03

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
192	27.936	0.144	2.15	96	-2.73	98	76	-0.020	2.08	0.04
193	28.084	0.148	2.14	96	-2.95	105	76	-0.030	2.53	0.02
194	28.228	0.144	2.15	96	-0.51	94	76	-0.040	2.14	0.05
195	28.377	0.149	2.16	96	-0.9	102	76	-0.030	1.86	0.06
196	28.521	0.144	2.16	96	-1.62	100	76	-0.030	2.00	0.05
197	28.670	0.149	2.16	96	-1.19	101	76	-0.020	2.47	0.04
198	28.814	0.144	2.15	96	-2.91	99	76	-0.040	3.13	0.04
199	28.963	0.149	2.15	96	-1.06	106	76	-0.040	2.27	0.03
200	29.107	0.144	2.15	96	-3.17	96	76	-0.030	2.45	0.05
201	29.255	0.148	2.16	96	-0.92	106	76	-0.040	2.24	0.04
202	29.399	0.144	2.16	96	-1.26	99	76	-0.040	3.07	0.02
203	29.548	0.149	2.17	96	-2.81	99	76	-0.040	2.67	0.02
204	29.692	0.144	2.16	96	-0.7	103	76	-0.040	2.80	0.03
205	29.841	0.149	2.16	96	-2.97	109	76	-0.020	2.81	0.02
206	29.985	0.144	2.16	96	-2.24	96	76	-0.040	1.55	0.09
207	30.134	0.149	2.15	96	-3.11	96	76	-0.040	1.64	0.07
208	30.278	0.144	2.15	96	-3.03	103	76	-0.030	2.91	0.02
209	30.427	0.149	2.17	96	-2.24	106	76	-0.040	2.84	0.01
210	30.571	0.144	2.16	96	-2.29	97	76	-0.030	2.07	0.06
211	30.720	0.149	2.16	96	-3	103	76	-0.030	1.65	0.04
212	30.864	0.144	2.15	96	-1.68	96	76	-0.030	1.88	0.06
213	31.013	0.149	2.15	96	-2.98	106	76	-0.030	2.95	0.02
214	31.157	0.144	2.15	96	-2.12	93	76	-0.030	2.61	0.05
215	31.306	0.149	2.16	96	-0.94	102	76	-0.040	2.02	0.06
216	31.450	0.144	2.17	96	-0.61	95	75	-0.030	2.78	0.06
217	31.599	0.149	2.16	96	-0.51	102	75	-0.010	2.18	0.06
218	31.743	0.144	2.18	96	-3.05	93	75	-0.030	1.95	0.05
219	31.892	0.149	2.16	96	-2.96	102	75	-0.040	1.65	0.08
220	32.036	0.144	2.16	96	-2.94	100	75	-0.020	1.92	0.04
221	32.185	0.149	2.16	96	-2.32	102	75	-0.020	1.74	0.06
222	32.329	0.144	2.15	96	-0.58	95	75	-0.030	2.30	0.04
223	32.478	0.149	2.16	96	-1.26	102	75	-0.030	1.87	0.07

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
224	32.622	0.144	2.17	96	-2.7	92	75	-0.040	3.23	0.00
225	32.771	0.149	2.16	96	-1.25	98	75	-0.030	2.29	0.04
226	32.915	0.144	2.16	96	-0.52	94	75	-0.040	2.58	0.05
227	33.063	0.148	2.16	96	-0.6	97	75	-0.040	2.01	0.04
228	33.208	0.145	2.15	96	-1.37	95	75	-0.030	1.67	0.05
229	33.356	0.148	2.15	96	-2.54	97	75	-0.030	1.80	0.06
230	33.501	0.145	2.15	96	-0.8	97	75	-0.030	3.05	0.05
231	33.649	0.148	2.15	96	-2.79	100	75	-0.030	2.51	0.02
232	33.793	0.144	2.15	96	-1.67	97	75	-0.030	2.33	0.04
233	33.941	0.148	2.15	96	-2.26	97	75	-0.030	2.08	0.06
234	34.086	0.145	2.15	96	-2.42	95	75	-0.030	2.21	0.03
235	34.234	0.148	2.16	96	-2.92	106	75	-0.020	2.23	0.06
236	34.379	0.145	2.17	96	-0.97	102	75	-0.040	2.36	0.02
237	34.527	0.148	2.17	96	-2.39	99	75	-0.030	2.30	0.09
238	34.672	0.145	2.16	96	-0.75	103	75	-0.050	2.35	0.05
239	34.820	0.148	2.15	96	-1.83	97	75	-0.040	2.34	0.06
240	34.965	0.145	2.17	96	-2.2	100	75	-0.030	2.78	0.04
241	35.112	0.147	2.16	96	-0.58	100	75	-0.030	2.01	0.04
242	35.257	0.145	2.16	96	-2.95	93	75	-0.040	1.91	0.06
243	35.405	0.148	2.16	96	-1.07	105	75	-0.040	2.15	0.05
244	35.550	0.145	2.16	96	-2.25	97	75	-0.020	1.45	0.09
245	35.698	0.148	2.16	96	-0.5	96	75	-0.020	2.42	0.05
246	35.843	0.145	2.16	96	-0.98	102	75	-0.040	3.31	0.01
247	35.991	0.148	2.15	96	-3.03	97	75	-0.040	2.73	0.02
248	36.136	0.145	2.16	96	-2.33	102	75	-0.020	2.35	0.06
249	36.284	0.148	2.15	96	-1.44	101	75	-0.040	2.07	0.06
250	36.429	0.145	2.16	96	-0.79	99	75	-0.040	2.11	0.05
251	36.576	0.147	2.15	96	-1.88	97	75	-0.030	2.74	0.01
252	36.722	0.146	2.16	96	-0.46	103	75	-0.020	2.47	0.07
253	36.869	0.147	2.17	96	-1.17	100	75	-0.040	2.76	0.04
254	37.014	0.145	2.16	96	-0.65	103	75	-0.040	2.50	0.04
255	37.162	0.148	2.15	96	-2.42	105	75	-0.040	2.64	0.03

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
256	37.307	0.145	2.16	96	-0.48	101	75	-0.030	2.50	0.07
257	37.454	0.147	2.14	96	-1.68	97	75	-0.030	2.65	0.01
258	37.599	0.145	2.14	96	-2.94	97	75	-0.020	2.26	0.06
259	37.746	0.147	2.16	96	-2.34	105	75	-0.050	1.88	0.05
260	37.892	0.146	2.15	96	-1.12	103	75	-0.040	2.21	0.02
261	38.039	0.147	2.16	96	-2.56	98	75	-0.040	2.40	0.05
262	38.184	0.145	2.17	96	-0.55	102	75	-0.040	2.45	0.01
263	38.331	0.147	2.15	96	-1.06	100	75	-0.040	2.02	0.07
264	38.477	0.146	2.16	96	-1.41	97	75	-0.050	1.71	0.07
265	38.624	0.147	2.16	96	-0.54	99	75	-0.040	2.82	0.04
266	38.770	0.146	2.16	96	-3	97	75	-0.030	3.28	0.01
267	38.916	0.146	2.15	96	-0.52	99	75	-0.040	2.13	0.04
268	39.062	0.146	2.16	96	-2.42	96	75	-0.050	2.13	0.08
269	39.209	0.147	2.15	96	-3.07	95	75	-0.020	2.04	0.03
270	39.355	0.146	2.15	96	-1.22	97	75	-0.030	2.33	0.04
271	39.502	0.147	2.15	96	-0.63	99	75	-0.030	2.25	0.04
272	39.648	0.146	2.16	96	-3.05	102	75	-0.030	2.68	0.03
273	39.794	0.146	2.16	96	-2.96	96	75	-0.040	1.56	0.09
274	39.941	0.147	2.15	96	-2.97	104	75	-0.020	1.95	0.06
275	40.087	0.146	2.15	96	-0.76	100	75	-0.040	2.07	0.03
276	40.233	0.146	2.15	96	-2.98	103	75	-0.020	2.88	0.01
277	40.379	0.146	2.15	96	-0.46	99	75	-0.030	2.45	0.03
278	40.526	0.147	2.15	96	-0.54	99	75	-0.030	2.08	0.04
279	40.671	0.145	2.15	96	-2.68	100	75	-0.030	2.21	0.03
280	40.818	0.147	2.14	96	-2.03	103	75	-0.030	2.30	0.02
281	40.964	0.146	2.15	96	-3.03	96	75	-0.040	2.43	0.04
282	41.111	0.147	2.16	96	-0.65	99	75	-0.030	2.47	0.02
283	41.256	0.145	2.16	96	-1.3	102	75	-0.030	1.38	0.02
284	41.403	0.147	2.14	96	-2.97	97	75	-0.030	0.43	0.02
285	41.548	0.145	2.15	96	-2.88	100	75	-0.030	2.06	0.02
286	41.695	0.147	2.14	96	-2.35	99	75	-0.040	2.03	0.05
287	41.840	0.145	2.15	96	-0.95	103	75	-0.030	2.11	0.04

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
288	41.988	0.148	2.15	96	-1.16	100	75	-0.050	2.21	0.04
289	42.132	0.144	2.14	96	-2.72	97	75	-0.030	1.79	0.04
290	42.280	0.148	2.15	96	-1.08	99	75	-0.040	1.68	0.06
291	42.425	0.145	2.16	96	-2.16	97	75	-0.030	1.85	0.04
292	42.574	0.149	2.14	96	-1.6	104	75	-0.030	2.03	0.01
293	42.719	0.145	2.15	96	-2.98	102	75	-0.020	2.28	0.01
294	42.866	0.147	2.15	96	-0.66	101	75	-0.030	1.99	0.04
295	43.011	0.145	2.15	96	-0.57	98	75	-0.030	1.91	0.04
296	43.159	0.148	2.16	96	-1	102	75	-0.030	2.28	0.03
297	43.304	0.145	2.15	96	-2.23	97	75	-0.030	1.94	0.05
298	43.452	0.148	2.16	96	-0.95	99	75	-0.040	2.44	0.05
299	43.597	0.145	2.16	96	-2.35	96	75	-0.030	2.04	0.03
300	43.745	0.148	2.16	96	-0.55	98	75	-0.030	2.06	0.04
301	43.889	0.144	2.17	96	-0.91	102	75	-0.030	2.87	0.04
302	44.037	0.148	2.16	96	-0.61	96	75	-0.050	2.09	0.04
303	44.182	0.145	2.16	95	-0.96	101	75	-0.040	1.45	0.06
304	44.330	0.148	2.15	96	-2.78	98	75	-0.040	1.98	0.04
305	44.474	0.144	2.15	96	-0.49	98	75	-0.030	2.30	0.00
306	44.622	0.148	2.14	96	-0.74	101	75	-0.030	1.85	0.06
307	44.766	0.144	2.14	96	-2.99	97	75	-0.020	1.92	0.05
308	44.914	0.148	2.15	96	-0.63	106	75	-0.040	2.38	0.04
309	45.059	0.145	2.17	96	-0.56	102	75	-0.050	2.36	0.03
310	45.207	0.148	2.16	96	-3.07	99	75	-0.030	1.97	0.07
311	45.351	0.144	2.16	96	-0.44	102	75	-0.040	2.03	0.05
312	45.500	0.149	2.15	96	-2.05	101	75	-0.030	1.86	0.02
313	45.644	0.144	2.16	96	-0.66	98	75	-0.030	2.04	0.04
314	45.792	0.148	2.15	96	-0.54	99	75	-0.030	2.20	0.03
315	45.936	0.144	2.15	96	-1.94	94	75	-0.030	2.34	0.06
316	46.085	0.149	2.15	96	-1.36	106	75	-0.060	2.43	0.05
317	46.229	0.144	2.15	96	-1.98	97	75	-0.040	2.78	0.03
318	46.378	0.149	2.16	96	-0.43	108	75	-0.040	2.03	0.03
319	46.522	0.144	2.16	96	-0.99	95	75	-0.030	2.43	0.03

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
320	46.670	0.148	2.16	95	-2.39	105	75	-0.040	1.61	0.04
321	46.814	0.144	2.15	95	-3.07	97	75	-0.040	2.05	0.03
322	46.963	0.149	2.13	96	-2.97	99	75	-0.040	1.97	0.03
323	47.106	0.143	2.14	95	-0.72	95	75	-0.030	2.07	0.03
324	47.255	0.149	2.15	96	-0.55	103	75	-0.030	2.23	0.04
325	47.398	0.143	2.15	96	-1.92	93	75	-0.030	2.22	0.01
326	47.547	0.149	2.15	96	-1.56	102	75	-0.040	1.66	0.04
327	47.691	0.144	2.12	96	-0.84	93	75	-0.040	1.70	0.04
328	47.839	0.148	2.14	96	-2.16	101	75	-0.020	2.01	0.04
329	47.983	0.144	2.15	96	-0.61	95	75	-0.030	1.20	0.07
330	48.132	0.149	2.15	96	-2.76	99	75	-0.040	1.29	0.06
331	48.276	0.144	2.15	96	-2.52	95	75	-0.030	1.25	0.04
332	48.424	0.148	2.15	96	-1.23	100	75	-0.040	1.31	0.05
333	48.568	0.144	2.15	96	-0.67	97	75	-0.030	2.00	0.05
334	48.717	0.149	2.15	96	-3.06	105	75	-0.030	1.51	0.03
335	48.860	0.143	2.14	96	-2.07	106	75	-0.040	1.89	0.05
336	49.009	0.149	2.15	96	-1.18	103	75	-0.040	2.96	0.00
337	49.152	0.143	2.14	96	-2.98	97	75	-0.040	1.93	0.05
338	49.301	0.149	2.15	96	-0.52	105	75	-0.030	2.33	0.03
339	49.444	0.143	2.16	96	-0.5	97	75	-0.040	2.73	0.02
340	49.593	0.149	2.15	96	-1.08	102	75	-0.020	2.79	0.03
341	49.737	0.144	2.15	96	-0.57	99	75	-0.040	2.45	0.06
342	49.885	0.148	2.15	96	-2.96	100	75	-0.040	1.89	0.08
343	50.028	0.143	2.15	96	-0.62	94	75	-0.030	2.06	0.05
344	50.177	0.149	2.15	96	-2.71	106	75	-0.030	1.90	0.06
345	50.321	0.144	2.14	96	-2.64	92	75	-0.040	1.48	0.04
346	50.469	0.148	2.15	96	-2.89	102	75	-0.030	1.65	0.06
347	50.613	0.144	2.15	96	-1.33	97	75	-0.020	1.46	0.03
348	50.761	0.148	2.15	96	-2.74	101	75	-0.030	1.22	0.07
349	50.905	0.144	2.15	96	-0.86	95	75	-0.040	1.42	0.05
350	51.054	0.149	2.16	96	-0.73	100	75	-0.030	2.56	0.03
351	51.198	0.144	2.14	96	-0.52	100	75	-0.040	2.23	0.04

BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
352	51.346	0.148	2.15	96	-2.79	101	75	-0.030	1.55	0.07
353	51.490	0.144	2.15	96	-2.38	99	75	-0.030	2.11	0.02
354	51.639	0.149	2.15	96	-2.9	99	75	-0.010	1.43	0.07
355	51.783	0.144	2.15	96	-1.57	98	75	-0.040	1.62	0.07
356	51.931	0.148	2.15	96	-3.08	99	75	-0.030	1.72	0.06
357	52.075	0.144	2.16	96	-2.21	93	75	-0.030	1.91	0.05
358	52.223	0.148	2.14	96	-3.11	99	75	-0.030	1.04	0.09
359	52.367	0.144	2.13	96	-2.69	95	75	-0.040	1.52	0.04
360	52.515	0.148	2.14	96	-2.74	104	75	-0.030	2.01	0.02
Avg/Tot	52.515	0.146	2.14	93	-1.72	100			2.56	0.04

LAB SAMPLE DATA - ASTM E2515

Client: Thelin
 Model: Providence
 Run #: 1

Job #: 19-501
 Tracking #: 0034
 Technician: AK
 Date: 9/10/2019

	Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
Train A Filters - First Hour	3588	115.9	115.9	116.9	1.0
Train A Filters - Remainder	3589	123.5	245.4	249.0	3.6
	3590	121.9			
Train A Probe	9A	116714.2	116714.2	116714.2	0.0
Train A O-Rings	9A	3581.2	3581.2	3582.0	0.8
Train B Filters	3591	115.5	231.5	235.5	4.0
	3592	116.0			
Train B Probe	9B	117919.8	117919.8	117919.9	0.1
Train B O-Rings	9B	3524.1	3524.1	3525.1	1.0
Background Filter			0.0	0.0	

**Placed in
Dessicator on:**

Train A Filters - First Hour	116.8	9/13 10:24	116.9	9/20 10:54		
Train A Filters - Remainder	248.8	9/13 10:24	249.0	9/20 10:55		
Train A Probe	116714.1	9/13 10:23	116714.2	9/20 10:53		
Train A O-Rings	3582.1	9/13 10:23	3582.0	9/20 10:55		
Train B Filters	235.4	9/13 10:25	235.5	9/20 10:54		
Train B Probe	117919.8	9/13 10:24	117919.9	9/20 10:53		
Train B O-Rings	3525.1	9/13 10:24	3525.1	9/20 10:56		
Background Filter						

1st hour Sub-Total, mg:	1.0
Remainder Sub-Total, mg:	4.4
Train 1 Aggregate, mg:	5.4
Train 2 Aggregate, mg:	5.1
Ambient Aggregate, mg:	0.0

ASTM E2779 Pellet Heater Run Sheets

Client: Thelin Job Number: 19-501 Tracking #: 0038
 Model: Providence Run Number: 1 Test Date: 9/10/2019

Pellet Heater Control Settings

High Burn Rate Settings: Control on "High," Fan Trim max

Medium Burn Rate Settings: Control on "Low," Fan Trim 8.0V

Low Burn Rate Settings: Control on "Low," Fan Trim 7.0V

Preburn Notes

Preburn Start Time: 8:30

Time	Notes

Test Notes

Test Burn Start Time: 9:30

Time	Notes
60:00	Changed Filter A Changed to Med settings
180:00	
360:00	

Test Burn End Time: 15:30

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO₂ (%): 16.93 CO (%): 4.33
 Mid Gas CO₂ (%): 10.00 CO (%): 2.51

Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	8:39	8:42	8:40	16:20	16:22	16:23
CO ₂	0.00	10.05	17.01	-0.01	10.03	16.96
CO	0.000	2.480	4.311	-0.003	2.466	4.259

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

Technician Signature: 

Date: 9/26/2019

Equations and Sample Calculations – ASTM E2779 & E2515

Client Thelin
 Model: Providence
 Tracking #: 0034
 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 = 2.54 %
- M_{Swb} = 14.2 lbs
- M_{Ewb} = 0.0 lbs
- 0.4536 = Conversion factor from lbs to kg

$$M_{Bdb} = [(14.2 \times 0.4536) - (0.0 \times 0.4536)] (100/(100 + 2.54))$$

$$M_{Bdb} = \mathbf{6.28 \text{ kg}}$$

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

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

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):

$$FM = 2.54 \%$$

$$M_{SSiwb} = 10.0 \text{ lbs}$$

$$M_{ESiwb} = 6.0 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{BSidb} = [(10.0 \times 0.4536) - (6.0 \times 0.4536)] (100/(100 + 2.54))$$

$$M_{BSidb} = 1.77 \text{ kg}$$

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:

$$M_{Bdb} = 6.28 \quad \text{kg}$$
$$\theta = 360 \quad \text{min}$$

$$BR = \frac{60 \times 6.28}{360}$$

$$BR = \mathbf{1.05} \quad \text{kg/hr}$$

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,

$$\theta_{Si} = \text{Total length of test run segment } i, \text{ min}$$

Sample Calculation (from medium burn rate segment):

$$M_{BSidb} = 1.77 \text{ kg}$$

$$\theta = 120 \text{ min}$$

$$BR = \frac{60 \times 1.77}{120}$$

$$BR = \mathbf{0.88} \text{ kg/hr}$$

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

ASTM E2515 equations (9)

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

Where:

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

Sample calculation:

$$F_p = \frac{16.08}{17.85} = 0.901$$

$$V_s = 0.901 \times 85.49 \times 0.99 \times 0.260 \times \left(\frac{98.5 + 460}{29.91 + \frac{-0.19}{13.6}} \right)^{1/2} \times 28.78$$

$$V_s = \mathbf{15.95 \text{ ft/s}}$$

*The ASTM test standard mistakenly has the square root of the average delta p instead of the average of the square root of delta p. The current EPA Method 2 is also incorrect. This was verified by Mike Toney at EPA.

**The ASTM test standard mistakenly identifies M_s as the dry molecular weight. It should be the wet molecular weight as indicated in EPA Method 2.

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

ASTM E2515 equation (3)

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

Where:

- 3600 = Conversion from seconds to hours (ASTM method uses 60 to convert in minutes)
- B_{ws} = Water vapor in gas stream, proportion by volume; assume 2%
- A = Cross sectional area of dilution tunnel, ft²
- T_{std} = Standard absolute temperature, 528 °R
- P_s = Absolute average gas static pressure in dilution tunnel, = P_{bar} + P_g, in Hg
- T_s = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- P_{std} = Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 15.95 \times 0.1963 \times \frac{528}{98.5 + 460} \times \frac{29.91 + \frac{-0.19}{13.6}}{29.92}$$

$$Q_{sd} = \mathbf{10435.3} \text{ dscf/hr}$$

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

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

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 ₂ O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train A:

$$V_{m(std)} = 17.64 \times 53.246 \times 0.999 \times \frac{\left(29.91 + \frac{2.19}{13.6} \right)}{\left(94.3 + 460 \right)}$$

$$V_{m(std)} = \mathbf{50.906} \text{ dscf}$$

Using equation for Train B:

$$V_{m(std)} = 17.64 \times 52.515 \times 0.996 \times \frac{\left(29.91 + \frac{2.14}{13.6} \right)}{\left(93.4 + 460 \right)}$$

$$V_{m(std)} = \mathbf{50.129} \text{ dscf}$$

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 0.00 \times 0.992 \times \frac{\left(29.91 + \frac{0.00}{13.6} \right)}{\left(72.9 + 460 \right)}$$

$$V_{m(std)} = \mathbf{0.000} \text{ dscf}$$

m_n – Total Particulate Matter Collected, mg

ASTM E2515 Equation (12)

$$m_n = m_p + m_f + m_g$$

Where:

m_p = mass of particulate matter from probe, mg

m_f = mass of particulate matter from filters, mg

m_g = mass of particulate matter from filter seals, mg

Sample Calculation:

Using equation for Train A (first hour):

$$m_n = 0.0 + 1.0 + 0.0$$

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

Using equation for Train A (remainder):

$$m_n = 0.0 + 3.6 + 0.8$$

$$m_n = 4.4 \text{ mg}$$

Train A Aggregate = **5.4 mg**

Using equation for Train B:

$$m_n = 0.1 + 4.0 + 1.0$$

$$m_n = **5.1** \text{ mg}$$

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:

$$C_s = 0.001 \times \frac{5.4}{50.91}$$

$$C_s = \mathbf{0.00011} \text{ g/dscf}$$

For Train B:

$$C_s = 0.001 \times \frac{5.1}{50.13}$$

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

For Ambient Train

$$C_r = 0.001 \times \frac{0.0}{0.00}$$

$$C_r = \mathbf{0.000000} \text{ g/dscf}$$

E_T – Total Particulate Emissions, g
ASTM E2515 equation (15)

$$E_T = (c_s - c_r) \times Q_{std} \times \theta$$

Where:

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

Sample calculation:

For Train A

$$E_T = (\underline{0.000106} - 0.000000) \times \underline{10435.3} \times \underline{360} / 60$$
$$E_T = \underline{6.64} \text{ g}$$

For Train B

$$E_T = (\underline{0.000102} - 0.000000) \times \underline{10435.3} \times \underline{360} / 60$$
$$E_T = \underline{6.37} \text{ g}$$

Average

$$E = \underline{6.51} \text{ g}$$

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

$$7.5\% \text{ of the average} = \underline{0.49}$$

$$\text{Train A difference} = \underline{0.14}$$

$$\text{Train B difference} = \underline{0.14}$$

PR - Proportional Rate Variation

ASTM E2515 equation (16)

$$PR = \left[\frac{\theta \times V_{mi} \times V_s \times T_m \times T_{si}}{\theta_i \times V_m \times V_{si} \times T_{mi} \times T_s} \right] \times 100$$

Where:

- θ = Total sampling time, min
- θ_i = Length of recording interval, min
- V_{mi} = Volume of gas sample measured by the dry gas meter during the "ith" time interval, dcf
- V_m = Volume of gas sample as measured by dry gas meter, dcf
- V_{si} = Average gas velocity in the dilution tunnel during the "ith" time interval, ft/sec
- V_s = Average gas velocity in the dilution tunnel, ft/sec
- T_{mi} = Absolute average dry gas meter temperature during the "ith" time interval, °R
- T_m = Absolute average dry gas meter temperature, °R
- T_{si} = Absolute average gas temperature in the dilution tunnel during the "ith" time interval, °R
- T_s = Absolute average gas temperature in the dilution tunnel, °R

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

$$PR = \left(\frac{360 \times 0.128 \times 15.95 \times (94.3 + 460) \times (#### + 460)}{1 \times 53.246 \times 16.22 \times (98.5 + 460) \times (77.0 + 460)} \right) \times 100$$

$$PR = \underline{90} \%$$

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:

$$E_T \text{ (Dual train average)} = 6.51 \text{ g}$$

$$\theta = 360 \text{ min}$$

$$PM_R = 60 \times (6.51 / 360)$$

$$PM_R = \mathbf{1.08} \text{ g/hr}$$

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:

$$E_T \text{ (Dual train average)} = 6.51 \text{ g}$$

$$M_{Bdb} = 6.28 \text{ kg}$$

$$PM_F = 6.51 / 6.28)$$

$$PM_F = \mathbf{1.04} \text{ g/kg}$$

ASTM E2515 - Glass Filters

Sample	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
3577	121.4	121.5	-	-	SB		
3578	116.1	115.9	-	-	SB	19-510	1
3579	123.6	123.2	123.4	-	SB		
3580	122.4	122.6	-	-	SB		
3581	116.7	116.8	-	-	SB		
3582	116.3	116.2	-	-	SB		
3583	124.1	124.1	-	-	SB	19-511	1
3584	116.3	116.4	-	-	SB		
3585	121.4	121.4	-	-	SB		
3586	124.1	124.1	-	-	SB		
3587	116.4	116.4	-	-	SB		
3588	115.8	115.9	-	-	SB	19-501	1
3589	123.3	123.5	-	-	SB		
3590	121.6	122.0	121.9	-	SB		
3591	115.4	115.5	-	-	SB		
3592	116.2	116.0	-	-	SB		
3593	123.8	123.9	-	-	SB	19-517	1
3594	121.6	121.7	-	-	SB		

Weight 1 Date/Time:	7/24-8:00
Weight 2 Date/Time:	7/25-7:00
Weight 3 Date/Time:	7/26-7:45
Weight 4 Date/Time:	

Sample	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
3595	116.2	116.0	-	-	SB	19-517	1
3596	115.3	115.5	-	-	SB		
3597	123.6	123.8 123.8	-	-	SB		
3598	116.0	115.9	-	-	SB		
3599	121.8	121.8	-	-	SB	19-524	#1
3600	124.2	124.4	-	-	SB		
3601	115.9	116.2	116.2	-	SB		
3602	121.0	121.2	-	-	SB		
3603	115.9	116.0	-	-	SB		
3604	115.5	115.9	115.9	-	SB		
3605	124.3	124.5	-	-	SB	19-524	#2
3606	121.7	121.7	-	-	SB		
3607	115.9	116.0	-	-	SB		
3608	116.2	116.1	-	-	SB		
3609	123.1	122.9	-	-	SB		
3610	122.0	121.7	121.8	-	SB		
3611	115.6	115.6	-	-	SB	19-524	#3
3612	116.3	116.2	-	-	SB		

Weight 1 Date/Time:	7/24-8:00
Weight 2 Date/Time:	7/25-7:00
Weight 3 Date/Time:	7/26-7:45
Weight 4 Date/Time:	

ASTM E2515 - Probes

Sample	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
1A	115630.4	115630.6	-	-	SB	19-509	#6
1B	115908.2	115904.4	-	-	SB		
2A	116241.8	116241.7	-	-	SB	19-509	#
2B	116331.8	116331.6	-	-	SB		
3A	116076.7	116076.8	-	-	SB	19-510	#1
3B	116341.4	116341.4	-	-	SB		
4A	116184.3	116184.2	-	-	SB	19-502	1
4B	116366.9	116366.9	-	-	SB		
5A	116769.5	116769.4	-	-	SB	19-502	2
5B	116877.5	116877.3	-	-	SB		

Weight 1 Date/Time:
7/22 - 7:00

Weight 2 Date/Time:
7/23 - 8:00

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
6A	116545.1	116545.2	-	-	L	19-502	3
6B	116118.4	116118.3	-	-	L		
7A	116741.2	116741.2	-	-	L	19-502	4
7B	117289.3	117289.1	-	-	L	↓	4
8A	116824.4	116824.4	-	-	L	19-511	1
8B	116826.3	116826.2	-	-	L	↓	1
9A	116714.1	116714.2	-	-	L	19-501	↓
9B	117910.9	117910.8	-	-	L	↓	↓
10A	-	116821.1	116821.3	-	L	19-494	#11
10B	-	117904.7	117904.9	-	L	19-494	#11

Weight 1 Date/Time:
8/15 0800

Weight 2 Date/Time:
8/16 0930

Weight 3 Date/Time:
9/5 15:45

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
11A	117636.9	117636.7	-	-	SB	19-494	#2
11B	117490.9	117490.5	117490.7	-	SB	19-494	#2
12A	116889.6	116889.4	-	-	SB	19-494	#3
12B	117957.6	117957.5	-	-	SB	19-494	#3
13A	117456.4	117456.3	-	-	SB	19-494	#4
13B	117055.1	117055.2	-	-	SB	19-494	#4
14A	116818.4	-	116818.2	-	SB	19-494	#5
14B	116772.2	-	116772.0	-	SB	19-494	#5
15A	117410.0	-					
15B	116905.5	-					

Weight 1 Date/Time:
9/5/ 15:45

Weight 2 Date/Time:
9/9 8:00

Weight 3 Date/Time:
9/10 - 1400

Weight 4 Date/Time:

ASTM E2515 - O-Rings

Sample	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
1A	3565.5	3565.4	-	-	SB	19-509	#6
1B	3553.9	3554.1	-	-	SB		
2A	3551.2	3551.4	-	-	SB	19-509	#7
2B	3569.8	3570.0	-	-	SB		
3A	3578.3	3578.5	-	-	SB	19-510	#1
3B	3566.7	3567.3 3566.8	-	-	SB		
4A	3591.2	3591.3	-	-	SB	19-502	1
4B	3578.6	3578.8	-	-	SB		
5A	3532.9	3533.1	-	-	SB	19-502	2
5B	3529.3	3529.5	-	-	SB		

Weight 1 Date/Time:
7/27-715

Weight 2 Date/Time:
7/24-8:00

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
6A	3614.9	3614.7	-	-	A	19-502	3
6B	3395.9	3396.1	-	-	A		
7A	3572.6	3572.7	-	-	A	19-502	4
7B	3521.5	3521.7	-	-	A		
8A	3551.6	3551.5	-	-	A	19-511	1
8B	3585.3	3585.3	-	-	A		
9A	3581.0	3581.2	-	-	A	19-501	#1
9B	3524.0	3524.1	-	-	A		
10A	3430.9	3431.0	-	-	A	19-494	#1
10B	3570.0	3570.2	-	-	A		

Weight 1 Date/Time:
8/15 0800

Weight 2 Date/Time:
8/16 0930

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
11A	3424.3	3424.4	-	-	SB	19-494	#2
11B	4234.1	4234.2	-	-	SB		
12A	3396.0	3396.2	-	-	SB	19-494	#3
12B	3406.4	3406.6	-	-	SB		
13A	3361.1	3361.3	-	-	SB	19-494	#4
13B	3446.2	3446.1	-	-	SB		
14A	3367.2	3367.4	-	-	SB	19-494	#5
14B	3341.4	3341.6	-	-	SB		
15A	3569.9						
15B	3570.7						

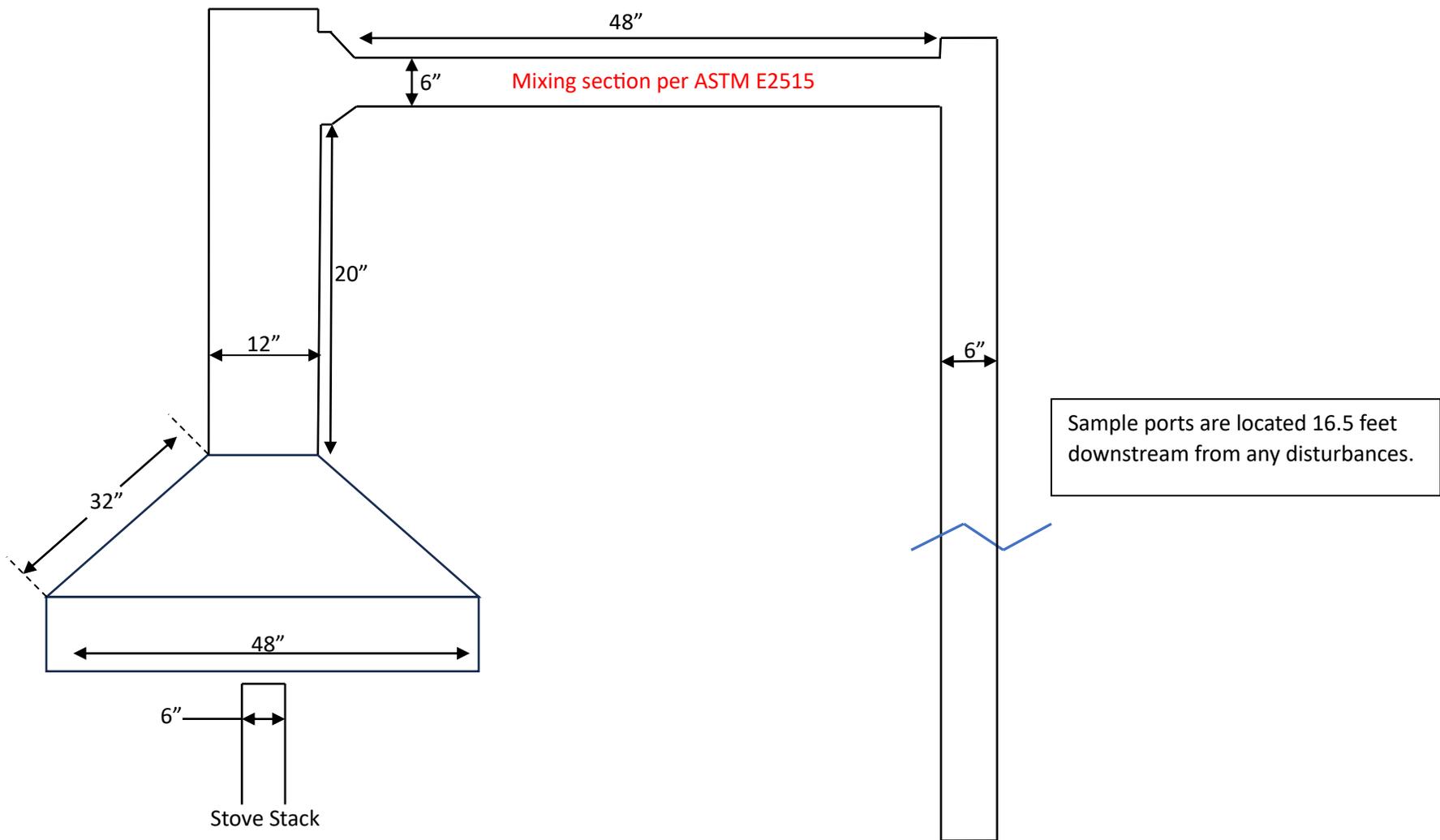
Weight 1 Date/Time:
9/5/10 16:00

Weight 2 Date/Time:
9/9 8:00

Weight 3 Date/Time:

Weight 4 Date/Time:

Booth #1 prior to May 2021





Model/Modèle: Providence

DO NOT REMOVE THIS LABEL

DATE OF MFG. 11/01/11

SERIAL NO. 1220

NE PAS ENLEVER CETTE ÉTIQUETTE



Pellet Fuel room Heater. Also For Use In Mobile Homes/Appareil de chauffage à granulés de bois - Peut également s'utiliser dans les maisons mobiles

Install and use only in accordance with manufacturer's installation and operating instructions. Contact local building officials about restrictions and installation inspection in your area./À installer et utiliser uniquement conformément à la notice d'installation et d'utilisation. Contacter les autorités responsables de la construction sur les restrictions et l'inspection de montage dans votre région.

This pellet fired appliance has been tested and listed for use in manufactured homes in accordance with Oregon Administrative Rules 814-23-900 through 814-23-909, ASTM E1509, ULC S628 and UL 1482.

Cet appareil à granulés de bois a été testé et certifié pour être utilisé dans des maisons préfabriquées conformément aux règlements «Oregon Administrative Rules» 814-23-900 à 814-23-909, ASTM E1509, ULC S628 et UL 1482.

PREVENT HOUSE FIRES

- Install and use only in accordance with the owner's manual provided with this appliance.
- Contact local building or fire officials about restrictions and installation inspections in your area.
- For use with pelletized wood fuel only. Use of other fuels will cause a hazardous condition.
- Do not connect this unit to a chimney flue serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Input Rating - 5.26 Ibt/hr

ÉVITEZ LES INCENDIES

- À installer et utiliser uniquement conformément au manuel d'utilisation fourni avec cet appareil.
- Contacter les autorités locales en matière de feu ou de construction afin de connaître les restrictions des inspecteurs de montage propres à votre région.
- À utiliser uniquement avec des bois de chauffage en granulés. Tout autre combustible causera un danger.
- Ne pas raccorder cet appareil à un conduit de cheminée servant un autre appareil.
- S'assurer que la vitre et la porte de retrait des cendres sont bien fermées lorsque l'appareil est en marche.
- Consommation Thermique - 5,26 Ibt/hr

CAUTION: Special methods are required when passing chimney through a wall or ceiling. Refer to local building codes.

Replace glass only with 5mm ceramic.

Operate this unit only with the fuel hopper lid closed. Failure to do so may result in emission of products of combustion from the hopper under certain conditions. Maintain hopper seal in good condition. Do not overfill the hopper.

WARNING: (Mobile Home) An outside air inlet must be provided for combustion and be unrestricted while unit is in use. The structural integrity of the mobile home floor, walls, ceiling, and roof must be maintained.

DANGER: Risk of electrical shock. Disconnect power before servicing unit. Do not run power cord under appliance.

ATTENTION: Des techniques spéciales sont nécessaires en cas de passage de la cheminée à travers un mur ou un plafond. Consulter les codes locaux du bâtiment.

Remplacer la vitre avec un verre en céramique de 5mm uniquement.

S'assurer que le couvercle de la trémie est bien fermé lorsque l'appareil est en marche. Il y a risque d'émission de produits de combustion de la trémie sous certaines conditions. S'assurer que le joint de la trémie est en bon état. Ne pas trop remplir la trémie.

AVERTISSEMENT: (Maison Mobile) Une arrivée d'air extérieur pour la combustion doit être installée et dégagée lorsque l'appareil est en marche. L'intégrité structurelle du plancher, des murs, du plafond et du toit de la maison mobile doit être maintenue.

DANGER: Risque de choc électrique. Débrancher l'appareil avant tout entretien ou réparation. Ne pas acheminer le cordon d'alimentation sous l'appareil.

INSTALLATION REQUIREMENTS

Refer to local codes and the chimney manufacturer's instructions for precautions required for passing a chimney through a combustible wall or ceiling. Place on non-combustible floor protection which extends 6-inches to the front, and 6-inches to each side, of the fuel opening. See owner's manual for additional clearance information.

VENT TYPE: Use only type "L" pellet vent and connectors (Size 3"/75mm or 4"/100mm).

ELECTRICAL RATING: 120 Volts/2.0 Amps/60Hz/1 Phase

CONDITIONS D'INSTALLATION:

Consulter les codes locaux et les consignes du fabricant de la cheminée pour les précautions nécessaires en cas de passage d'une cheminée par un mur ou un plafond combustibles. Placer sur un protecteur de plancher qui dépasse de 6 po vers l'avant et de 6 po de chaque côté de l'ouverture de combustible. Consulter le manuel d'utilisation pour d'autres informations concernant les dégagements.

TYPE D'ÉVENT: Utiliser seulement un conduit d'évacuation et des raccords de type "L" (Taille 3"/75mm or 4"/100mm).

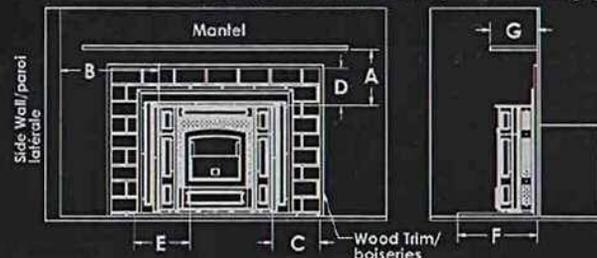
CARACTÉRISTIQUES ÉLECTRIQUES: 120 Volts/2,0 Amps/60Hz/1 Phase

Weight: 24.5 lbs (11.1 kg) Wood Pellets, 6mm diameter

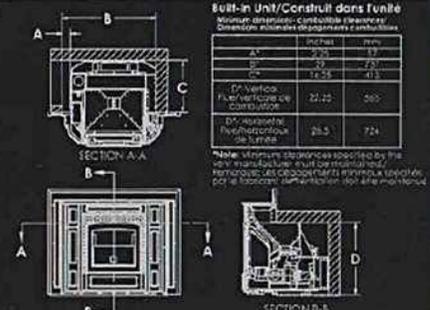
Weight: 24.5 lbs (11.1 kg) Types de combustible: Granulés de bois, 6mm de diamètre, 12mm à 25mm de long

Minimum clearance to combustible materials / Distance minimale aux matériaux combustibles

Masonry or Zero Clearance/Maçonnerie ou à dégagement zéro



	inches	mm
A - Insert top to mantel / Insérez tout en maçonnerie	12	305
B - Insert side to combustible wall / Insérez en côté à mur combustible	5 1/2	140
C - Insert side to wood trim / Insérez en côté à garniture en bois	5 5/16	135
D - Insert top to wood trim / Insérez tout en boiseries	4 1/4	108
E - Floor protection / Protection de plancher	6	152
F - Floor protection - min. 6" from glass / Protection de plancher - doit être de 152mm à partir du verre	16	406
G - Maximum mantel depth / La profondeur maximale maçonnerie	12	305



CAUTION: HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.



ATTENTION: L'APPAREIL EST CHAUD LORSQU'IL TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET LES MEUBLES LOIN DE L'APPAREIL. TOUT CONTACT PEUT CAUSER DES BRÛLURES. VOIR PLAQUE SIGNALÉTIQUE ET CONSIGNES.

U.S. ENVIRONMENTAL PROTECTION AGENCY
Certified to comply with EPA NSPS 2020 emission standards.

DATE OF MANUFACTURE _____ SERIAL NO. _____

FOR USE WITH PELLETIZED WOOD FUEL ONLY

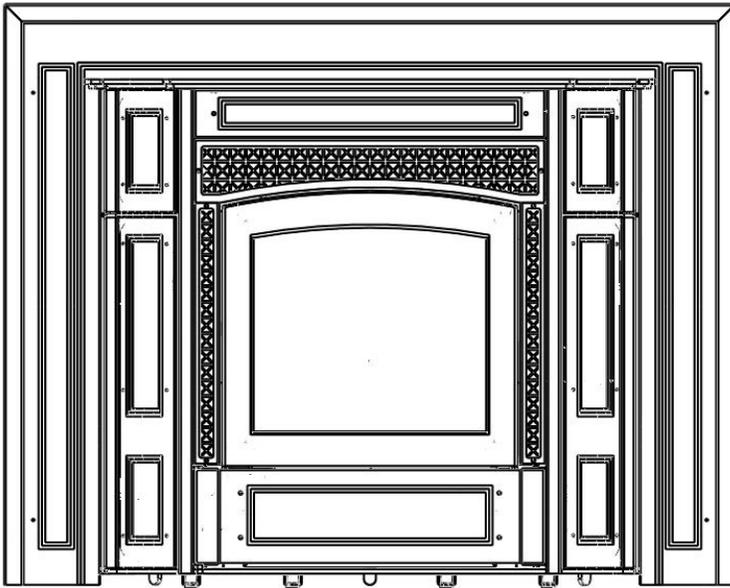
MODEL: PROVIDENCE INSERT/FIREPLACE
EMISSION RATE (GhR) 1.08 EFFICIENCY (CSA B415.1) 64%

This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owner's manual.

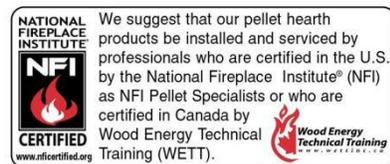
P/N: 00.0075.0208

PROVIDENCE INSERT

Pellet Stove Owner's Manual
Installation and Operating Instructions



Made in the USA by:



SAFETY NOTICE

- STOVE MUST BE PROPERLY INSTALLED AND MAINTAINED OR A HOUSE FIRE MAY RESULT.
- FOR YOUR SAFETY, FOLLOW THE INSTALLATION INSTRUCTIONS.
- CONTACT LOCAL BUILDING OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION AND PERMIT.
- FAILURE TO COMPLY WITH OWNER'S MANUAL INSTRUCTIONS AND INSTALLATION GUIDELINES WILL VOID WARRANTY. SAVE THESE INSTRUCTIONS.

PLEASE LEAVE THIS MANUAL WITH THE OWNER!!

Please read this entire manual before installation and use of the pellet fuel-burning stove. Failure to follow these instructions could result in property damage, bodily injury or even death.

Prov Ins Man Rev d 2024

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SAFETY INFORMATION

Fire Risk

Do not operate appliance before reading and understanding operating instructions.

Failure to operate appliance properly may result in a house fire.

Inspect appliance and components for damage. Damaged parts may impair safe operation.

DO NOT install damaged components.

DO NOT install incomplete components.

DO NOT install substitute components.

Report damaged parts to dealer.

DO NOT connect this unit into a chimney flue servicing another appliance.

DO NOT connect to any air distribution or duct system.

WARNING

THELIN HEARTH PRODUCTS DISCLAIMS ANY RESPONSIBILITY FOR, AND THE WARRANTY WILL BE VOIDED BY THE FOLLOWING ACTIONS:

- MODIFICATION OF APPLIANCE
- INSTALLATION OTHER THAN AS INSTRUCTED IN THIS MANUAL BY THELIN HEARTH PRODUCTS.
- INSTALLATION AND/OR USE OF ANY COMPONENT PART NOT APPROVED BY THELIN HEARTH PRODUCTS.
- OPERATING APPLIANCE WITHOUT FULLY ASSEMBLING ALL COMPONENTS CORRECTLY.

DO NOT over fire. If any external part starts to glow, you are over firing. Reduce feed rate.

Over firing or any such action that may cause a fire hazard including failure to perform regular maintenance as outlined in these instructions will void warranty.

DO NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

CAUTION

TESTED AND APPROVED FOR PREMIUM WOOD PELLETS OF HIGHEST BTU OUTPUT AND LOWEST % OF ASH CONTENT ONLY. BURNING ANY OTHER TYPE OF FUEL WILL VOID YOUR WARRANTY.

Fire Safety

Maintain the designated clearances to combustibles as diagramed in this manual. Insulation must not touch the chimney or venting system. You must maintain the designated airspace clearance around the chimney. This space around the chimney is necessary to allow heat to flow away from the chimney area. Insulation in this area will cause heat buildup, which could ignite wood framing.

The following should be considered when installing any solid fuel appliance:

1. Install at least one smoke detector and CO detector on each floor of your home to ensure safety. They should be located away from the heating appliance and near the sleeping area.
2. Conveniently locate a Class A fire extinguisher near the appliance.
3. Write down and practice an evacuation plan with two escape routes. Check with your local

building code department before you begin your installation. Obtain a building permit in order to meet local building code requirements.

Contact your local dealer if assistance is required before, during and after installation.

Before Start-Up Check List

1. All Safety Warnings have been read and followed.
2. The Owner's Manual has been read.
3. Floor protection requirements have been adhered to.
4. All venting has been properly installed.
5. The proper clearances from the stove and chimney to combustible materials have been followed.
6. The masonry chimney has been inspected by a professional and is clean, or the factory built zero clearance fireplace is installed according to the manufacturer's instructions.
7. A grounded power outlet with a surge protector is available nearby without having to use an extension cord.

WARNINGS

HOT SURFACES! HOT GLASS WILL CAUSE BURNS. SURFACES AND GLASS ARE HOT DURING OPERATION AND DURING COOL-DOWN PERIOD.

DO NOT TOUCH GLASS UNTIL IT IS COOLED.

NEVER ALLOW CHILDREN TO TOUCH GLASS. ALERT CHILDREN TO HAZARDS OF HIGH TEMPERATURES.

HIGH TEMPERATURES MAY IGNITE CLOTHING OR OTHER FLAMMABLE MATERIALS. KEEP CLOTHING, FURNITURE, DRAPERIES AND OTHER FLAMMABLE MATERIALS AWAY FROM HEATER.

FOR USE WITH PELLETIZED WOOD FUEL ONLY

THIS APPLIANCE NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. CONSULT OWNER'S MANUAL FOR FURTHER INFORMATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS APPLIANCE IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THE OWNER'S MANUAL

LABORATORY LISTING LABEL



C **US**

F22-767

Model/Modèle: Providence

DATE OF MFG. SERIAL NO.

DO NOT REMOVE THIS LABEL



THELIN

www.thelinco.com

53 Laurel Dr.
Corvallis, OR 97330

Pellet Fuel Room Heater, Also For use in Mobile Homes/Appareil de chauffage à granulés de bois - Peut également brûler dans les maisons mobiles

Install and use only in accordance with manufacturer's installation and operating instructions. Contact local building officials about restrictions and installation inspection in your area./
Installer uniquement conformément à la notice d'installation et d'utilisation. Contacter les autorités responsables de la construction ou les restrictions et l'inspection de montage dans votre région.

This pellet fired appliance has been tested and listed for use in manufactured homes in accordance with Oregon Administrative Rules 814-23-900 through 814-23-909, ASTM E1509, UL C 562B and UL 1482.

Cet appareil à granulés de bois a été testé et certifié pour être utilisé dans des maisons préfabriquées conformément aux règlements d'Oregon Administrative Rules 814-23-900 à 814-23-909, ASTM E1509, UL C 562B et UL 1482.

PREVENT FIRES

- Install and use only in accordance with the owners manual provided with this appliance.
- Contact local building or fire officials about restrictions and installation inspections in your area.
- Do not use with petroleum wood fuel only. Use of other fuels will cause a hazardous condition.
- Do not connect this unit to a chimney flue serving another appliance.
- Keep sweeping and ash removal doors tightly closed during operation.
- Input Rating - 5.26 btu/hr

CAUTION: Special methods are required when passing chimney through a wall or ceiling. Refer to local building codes.

Replace glass only with 5mm ceramic.

Operate this unit only with the fuel hopper lid closed. Failure to do so may result in emission of products of combustion from the hopper under certain conditions. Maintain hopper seal in good condition. Do not overfill the hopper.

WARNING: (Mobile Home) An outside air inlet must be provided for combustion and be unrestricted while unit is in use. The structural integrity of the mobile home floor, walls, ceiling, and roof must be maintained.

DANGER: Risk of electrical shock. Disconnect power before servicing unit. Do not run power cord under appliance.

ÉVITER LES INCENDIES

- À installer et utiliser uniquement conformément au manuel d'utilisation fourni avec cet appareil.
- Contacter les autorités locales en matière de feu ou de construction afin de connaître les restrictions et les inspections de montage propres à votre région.
- À utiliser uniquement avec des bois de chauffage en granulés. Tout autre combustible causera un danger.
- Ne pas raccorder cet appareil à un conduit de cheminée servant un autre appareil.
- S'assurer que la vitre et la porte de retrait des cendres sont bien fermées lorsque l'appareil est en marche.
- Consommation Thermique - 5,26 btu/hr

ATTENTION: Des techniques spéciales sont nécessaires en cas de passage de la cheminée à travers un mur ou un plafond. Consulter les codes locaux du bâtiment.

Remplacez la vitre avec un verre en céramique de 5mm uniquement.

S'assurer que le couvercle de la trémie est bien fermé lorsque l'appareil est en marche. Il y a risque d'émissions de produits de combustion de la trémie sous certaines conditions. S'assurer que le joint de la trémie est en bon état. Ne pas trop remplir la trémie.

AVERTISSEMENT: (Maison Mobile) Une arrivée d'air extérieur pour la combustion doit être installée et dégagée lorsque l'appareil est en marche. L'intégrité structurelle du plancher, des murs, du plafond et du toit de la maison mobile doit être maintenue.

DANGER: Risque de choc électrique. Débrancher l'appareil avant tout entretien ou réparation. Ne pas cheminer le cordon d'alimentation sous l'appareil.

INSTALLATION REQUIREMENTS
Refer to local codes and then follow manufacturer's instructions for precautions required for passing a chimney through a combustible wall or ceiling. Place on non-combustible floor protection which extends 6-inches to the front, and 6 inches to each side, of the fuel opening. See owner's manual for additional clearance information.

VINT TYPE: Use only type "C" pellet vent and connectors (Size 2"/75mm or 4"/100mm).

ELECTRICAL RATING: 120 Volts/2.0 Amps/60Hz/1 Phase

CONDITIONS D'INSTALLATION:
Consulter les codes locaux et les consignes du fabricant de la cheminée pour les précautions nécessaires en cas de passage d'une cheminée par un mur ou un plafond combustible. Placer sur un protecteur de plancher qui dépasse de 6 po vers l'avant et de 6 po de chaque côté de l'ouverture du combustible. Consultez le manuel d'utilisation pour d'autres informations concernant les engorgements.

TYPE D'ÉVENT: Utilisez seulement un conduit d'évacuation et des raccords de type «C» (Taille 2"/75mm or 4"/100mm)

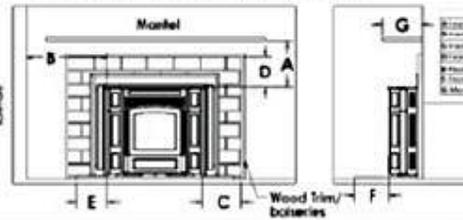
CARACTÉRISTIQUES ÉLECTRIQUES: 120 Volts/2,0 Amps/60Hz/1 Phase

Input rate for wood pellets is 1.26btu/hr (2.39kg/hr)-Weighted average emission: 1.2 g/hr
Weighted average efficiency: 74% Fuel Types: Wood Pellets, 6mm diameter, 12mm to 25mm long

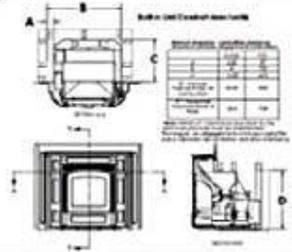
Consommation de granulés de bois: 2,39kg/h (5,26 btu/h)-Émissions moyennes pondérées: 1,2 g/h
Rendement moyen pondéré: 74% - Types de combustible: Granulés de bois, 6mm de diamètre, 12mm à 25mm de long

Minimum clearance to combustible materials / Distance minimale aux matériaux combustibles

Masonry or Iron Clearance/Étay en maçonnerie ou à déviation près



Wall or Ceiling Clearance/Étay en mur ou plafond



CAUTION: HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.



ATTENTION: L'APPAREIL EST CHAUD LORSQU'IL EST EN MARCHÉ. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET LES MEUBLES LOIN DE L'APPAREIL. TOUT CONTACT PEUT CAUSER DES BRÛLURES. VOIR PLAQUE SIGNALÉTIQUE ET CONSIGNES.

U.S. ENVIRONMENTAL PROTECTION AGENCY
Certified to comply with EPA NSPS 2020 emission standards.

FOR USE WITH PELLETIZED WOOD FUEL ONLY

This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owner's manual.

DATE OF MANUFACTURE _____ SERIAL NO. _____

MODEL: PROVIDENCE INSERT/REPLACE
EMISSION RATE (G/H) 1.08 EFFICIENCY (GJ) 8415.1) 84%

FIN: 00 0075.0203

GENERAL INFORMATION

Installation and repair should be done by a qualified service professional. The stove should be inspected before use and at least annually by a service professional. More frequent cleaning may be required due to fuel quality, excessive lint from carpeting, bedding material, etc. It is imperative that control compartments, burn pot and pot holder, and circulating air passageways of the stove be kept clean and free of ash buildup, lint, and dust.

The Providence Insert has been designed and approved for burning **PREMIUM WOOD PELLETS OF HIGHEST BTU OUTPUT AND LOWEST % OF ASH CONTENT ONLY.**

TESTED AND APPROVED FOR PFI APPROVED PREMIUM WOOD PELLETS OF HIGHEST BTU OUTPUT AND LOWEST % OF ASH CONTENT ONLY. BURNING ANY OTHER TYPE OF FUEL WILL VOID YOUR WARRANTY

Burning bio mass fuels in other forms or poor quality pellet fuel is not permitted and will void your warranty and/or could cause a burn back or house fire. **FOR BEST RESULTS THE WOOD PELLET FUEL SHOULD BE ¼" DIAMETER AND APPROXIMATELY 1" LONG.**

Store fuel in a covered, dry area. Pellet bags can absorb moisture and must be kept dry. Never place bags of fuel next to the heater. Keep fuel away from combustible materials and moisture. **NEVER** use gasoline, gasoline type lantern fuels, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire. Keep all such liquids well away from the stove while it is in use.

Pellet ashes should be placed in a metal container with a tight-fitting lid. The closed container of ashes should be placed on a non-combustible floor or the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally disbursed, they

should be retained in the closed container until all cinders have been thoroughly extinguished.

NOTE: During the first few burns (up to 2 – 4 hours) the high-temperature paint and sealant used in the manufacture will emit some odor and smoke. Open doors and windows to the outside for proper ventilation during the first burn cycle and the curing of the paint.

This stove must be electrically grounded according to local codes or, in the absence of local codes, with the National Electrical Code, **National Electrical Code, ANSI/NFPA 70-2020.**

Provide adequate clearances around air openings into the combustion chamber and provide adequate accessibility clearance for servicing and proper operation. Never obstruct the front opening of the heater.

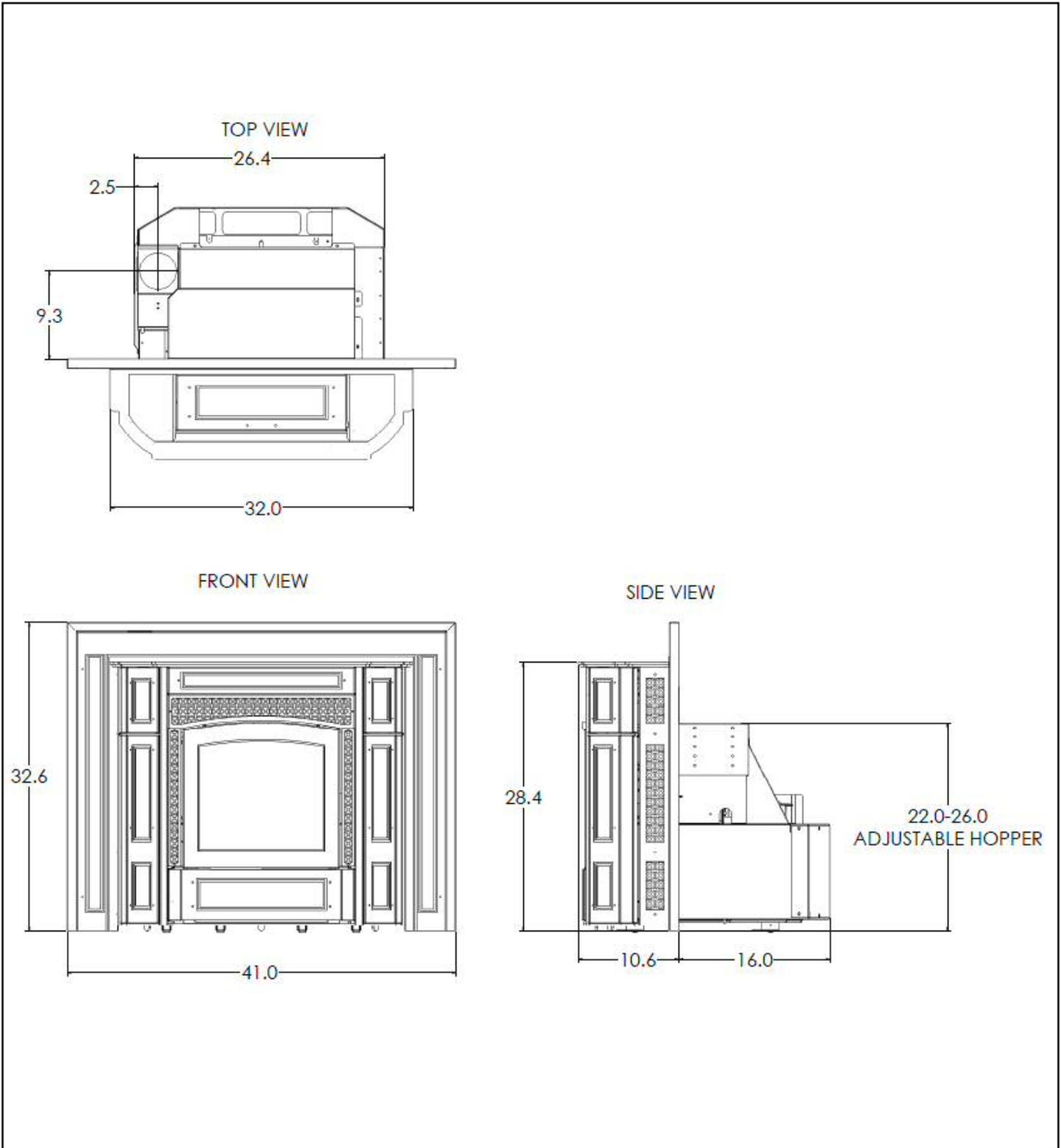
CAUTION: Do not connect this unit to a chimney flue serving another appliance.

WARNING: Do not install a flue damper in the exhaust venting system of this unit.

Under EPA Emission test conditions as calculated per CSA B415.1-22 this heater has shown to deliver heat output at rates ranging from 12,394 to 23,746 Btu/hr.

U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using PFI APPROVED wood pellet fuel.

FIGURE 1 – STOVE DIMENSIONS



VENT INFORMATION

Install vent at clearances specified by vent manufacturer.

Secure 4" pipe or flex to flue flange with 500 degree HIGH-TEMP RTV silicone and using at least three sheet metal screws. Subsequent sections must be attached with three screws also. Each pipe section should be sealed with hi-temp silicone and/or follow vent manufacturer's instructions (see figure 7). **Use only Type L 4" venting systems!**

DO NOT INSTALL A FLUE DAMPER IN THE EXHAUST VENTING SYSTEM OF THIS UNIT.

Termination

DO NOT terminate vent in any enclosed or semi-enclosed area such as carport, garage, attic, crawl space, under a sun deck or porch, narrow walkway or closely fenced area or any location where fumes

can build up and concentrate such as stairwell, covered breezeway, etc.

Distance to openings

- 3 feet minimum above any forced air inlet located within 10 feet.
- 4 ft. minimum below, or 4 ft. horizontally from, or 1 foot minimum above any door, window, or gravity air inlet into any building.
- Permanently closed windows – not less than 1 foot below, horizontally from or above the permanently closed window.
- 2 feet minimum to an adjacent building and 7 feet minimum above grade when located adjacent to public walkways
- Distance to bottom of termination cap and grade should be 12".
- Grade surface must be non-combustible material such as rock, dirt, gravel. Beware of plants, lawn, bushes, and shrubs, which are considered combustible material.
- Consult local building, fire or other official codes. Local codes may be different and require other clearances than described here.

MOBILE HOME INSTALLATION

Mobile home installation should be in accordance with the manufactured home and safety standard (HUD), CFR 3280, PART 24.

The following criteria are mandatory for mobile home installs:

- A. Outside combustion air is mandatory on all mobile home installs. We recommend the Dura Vent wall thimble with outside air hookup built into the thimble. The air inlet must remain unrestricted while unit is in use. See figure 14 for location of outside air hook-up to the left side of the stove.

Metal flex hose must be used for outside air hook-up.

B. Stove must be secured to the floor (use lag bolts) in stove feet

C. The stove must be grounded with #8 solid copper grounding wire or equivalent, terminated at each end with an NEC-approved grounding device.

D. A grounded power outlet with a surge protector is recommended.

E. Clearance to combustibles and floor protection is exactly the same for mobile homes as residential installs.

WARNING:

THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOORS, WALL, CEILING, AND ROOF MUST BE MAINTAINED. DO NOT INSTALL IN SLEEPING ROOM.

INSTALLATION

The Providence Insert may be installed into a Factory Built (Metal) fireplace, Masonry chimney, or as a Built-in fireplace during new construction. Each installation has its own clearance and installation criteria as outlined in this manual.

Follow directions carefully as each of the three installations vary and can be done in several ways. .

Factory Built (Metal) Fireplace Installation

A. Prior to planning placement of the Providence Insert, the chimney MUST be swept of creosote and soot. It should be inspected by a qualified service professional.

B. Mantle clearance to top of insert – 12” (see Figure 2).

C. Make sure the Providence Insert will fit into your existing fireplace by measuring dimension

according to Figures 1 & 2. See Figure 8 for adjustable Hopper Assembly.

D. Exhaust vent pipe and outside combustion air intake (if used) can be configured as shown in figures 3A-3D. The Providence Insert uses 4” type L pipe with a maximum height of 25’.

E. Pellet vent connections must be sealed with a liberal amount of 500 degree HIGH-TEMP RTV silicone and screwed together with at least 3 sheet metal screws.

F. Pellet vent (exhaust vent) termination must be sealed on top of chimney to prevent water from entering fireplace cavity.

G. It is recommended that a metal plate be installed to seal the damper area with clearance hole to allow exhaust vent pipe to pass through. Use non-flammable insulation to seal edges and to prevent heat loss.

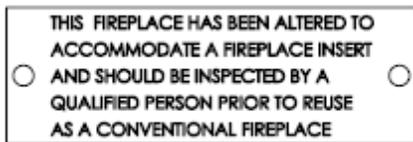
H. Aluminum flex pipe can be used to bring outside air into the stove. Use a stainless hose clamp to crimp flex to stove air intake flange. Outside Air – Aluminum Flex – Must use 3” if over 10’ vertical.

I. When hooking up the outside air you must be sure that a rodent guard is used on through wall installs. Many pellet pipe manufacturers make wall thimbles with the rodent guard built into the thimble.

1. The firebrick (refractory), glass doors, screen rails, screen mesh, and log grates can be removed from a factory built firebox in order to gain minimum fireplace insert opening requirements.

2. Smoke shelves, shields and baffles may be removed from a factory-built fireplace if attached with mechanical fasteners.

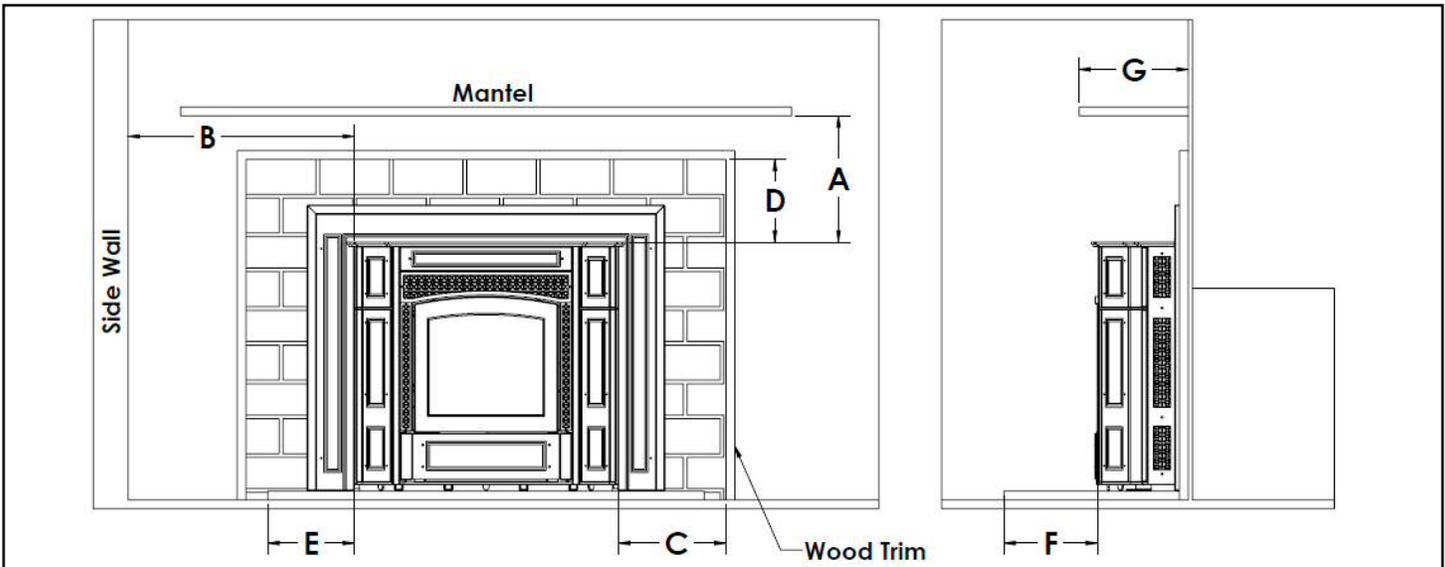
3. Items can only be removed if they are mechanically fastened to the Factory Built (Metal) fireplace. No cutting or other permanent removal of components is allowed. All removed components must be saved so that the Factory Built (Metal) fireplace can be returned to a burnable state.
4. Floor Protection: Hearth extension from door opening required is 6". Floor protection to the side of the door opening is also 6".
5. The enclosed label stating "THIS FIREPLACE HAS BEEN ALTERED TO ACCOMMODATE A FIREPLACE INSERT AND SHOULD BE INSPECTED BY A QUALIFIED PERSON PRIOR TO REUSE AS A CONVENTIONAL FIREPLACE." must be attached to the fireplace with screws or nails.



Masonry Fireplace Installation

- A. Prior to planning placement of the Providence Insert, the chimney MUST be swept of creosote and soot. It should be inspected by a qualified service professional.
- B. Mantle clearance to top of insert – 12" (see Figure 2).
- C. Masonry chimney must be checked for cracks and cleanliness. A re-line is recommended and required in Canada. Venting must run as per Figures 3A-3D.
- D. Make sure the Providence Insert will fit into your existing fireplace by measuring dimension according to Figures 1 & 2. See Figure 8 for adjustable Hopper Assembly.
- E. Exhaust vent pipe and outside combustion air intake (if used) can be configured as shown in figures 3A-3D. The Providence Insert uses 4" type L chimney liner with a maximum height of 25'.
- F. Pellet vent connections must be sealed with a liberal amount of 500 degree HIGH-TEMP RTV silicone and screwed together with at least 3 sheet metal screws.
- G. Pellet vent (exhaust vent) termination must be sealed on top of chimney to prevent water from entering fireplace cavity.
- H. It is recommended that a metal plate be installed to seal the damper area with clearance hole to allow exhaust vent pipe to pass through. Use non-flammable insulation to seal edges and to prevent heat loss.
- I. Aluminum flex pipe can be used to bring outside air into the stove. Use a stainless hose clamp to crimp flex to stove air intake flange. Outside Air – Aluminum Flex – Must use 3" if over 10' vertical.
- J. When hooking up the outside air you must be sure that a rodent guard is used on through wall installs. Many pellet pipe manufacturers make wall thimbles with the rodent guard built into the thimble.
- K. Outside air can be picked up from rear if ash clean out is present (see Figures 3A-3D).

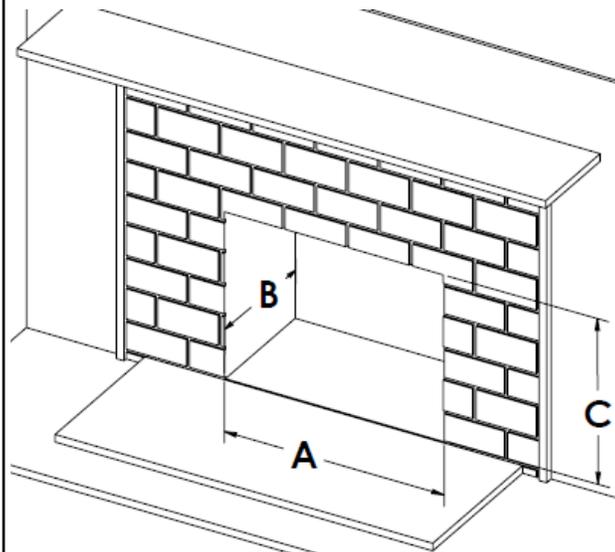
FIGURE 2 – CLEARANCES



Factory Built (Metal) and Masonry Fireplaces

	Inches	Millimeters
A- Insert top to mantel	12	305
B- Insert side to combustable wall	5 1/2	140
C- Insert side to wood trim	5 5/16	135
D- Insert top to wood trim	4 1/4	108
E- Floor protection	6	152
F- Floor protection	6	152
G- Maximum mantel depth	12	305

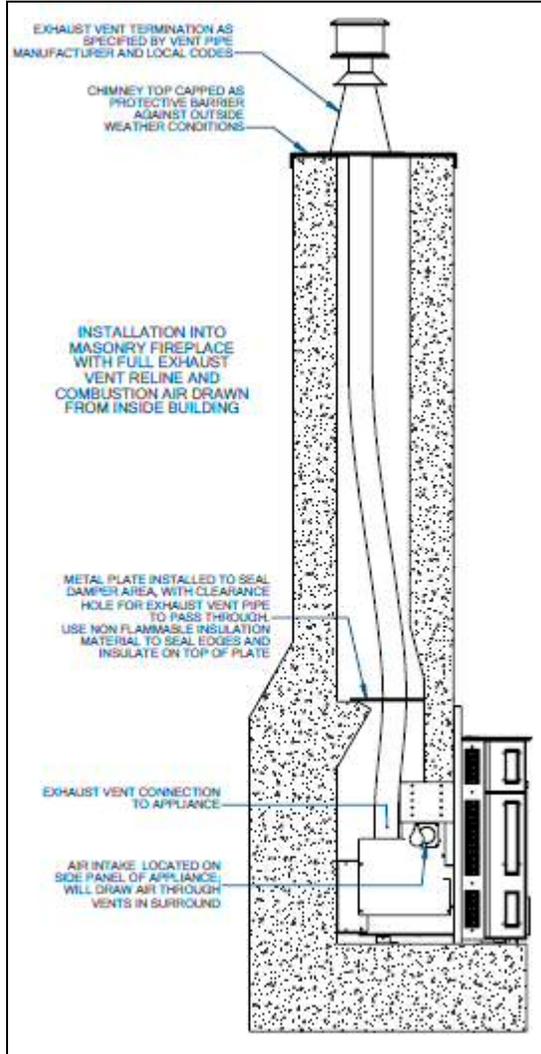
Minimum opening for Factory Built (Metal) and Masonry Fireplaces



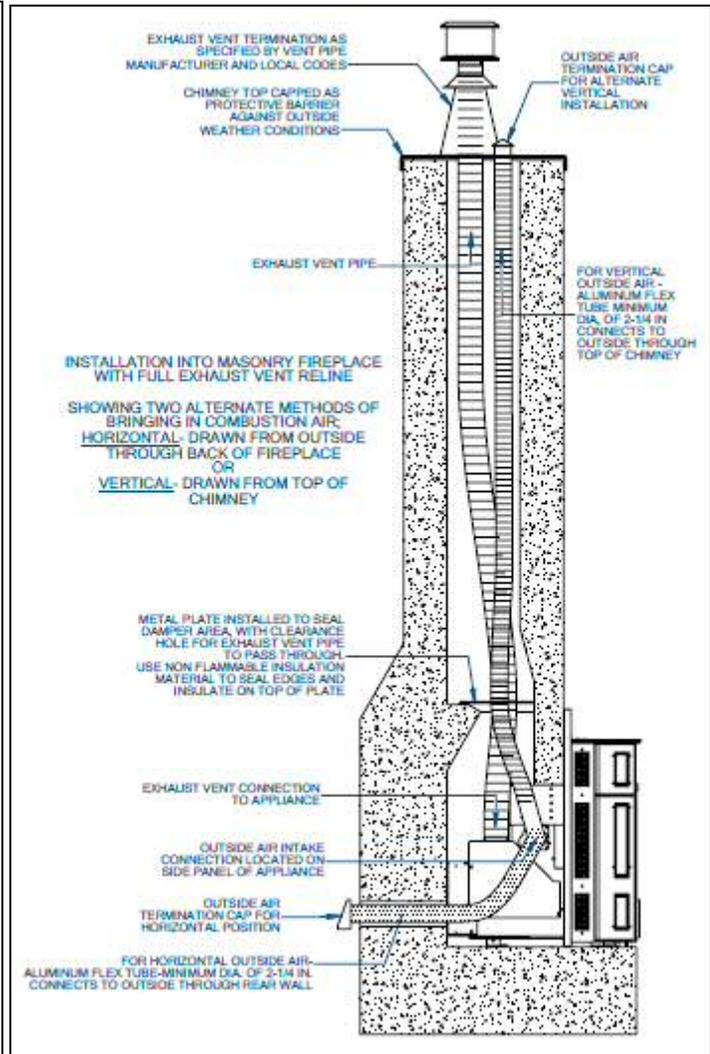
	Inches	Millimeters
A- Width	26.5	673
B- Depth	16.25	413
C- Height- Vertical Flue Venting (adjustable hopper)	22.25- 26.25	565-667
C- Height- Horizontal Flue Venting	27	686

FIGURES 3A-D – FACTORY BUILT (METAL) OR MASONRY FIREPLACE VENTING

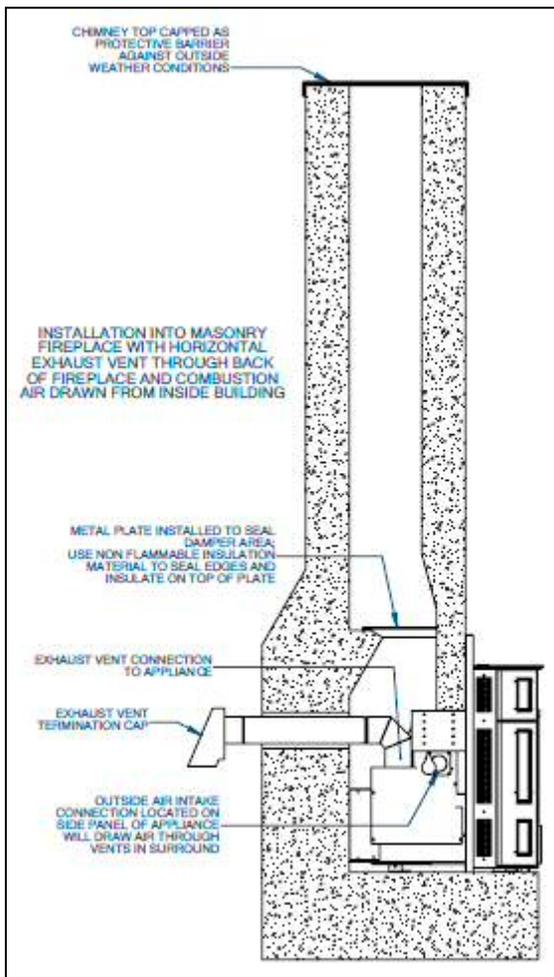
3A- Vertical vent without outside air



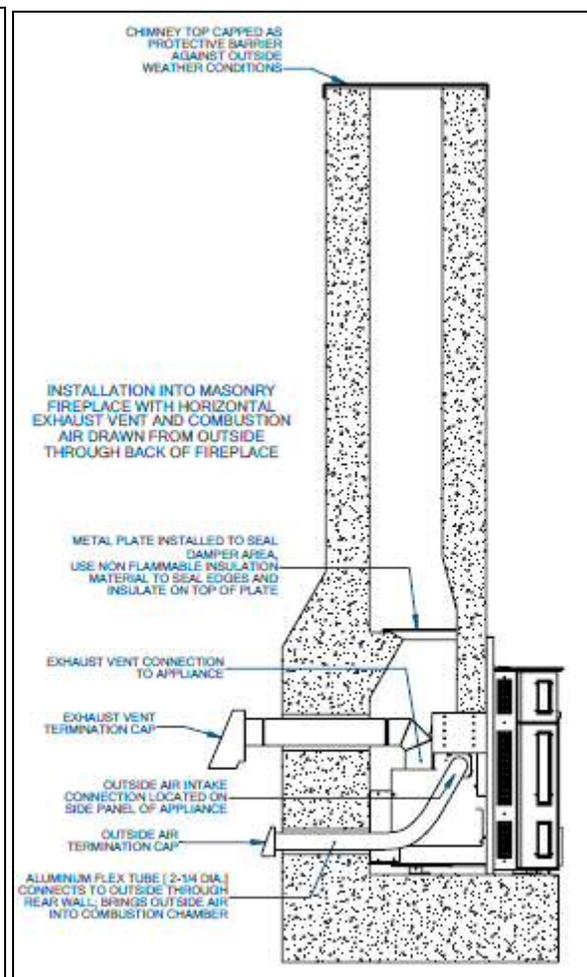
3B- Vertical vent with outside air options



3C- Horizontal vent without outside air



3D- Horizontal vent with outside air



Note: Above installation examples are for reference. All installation must follow local codes and requirements.

Additional Venting

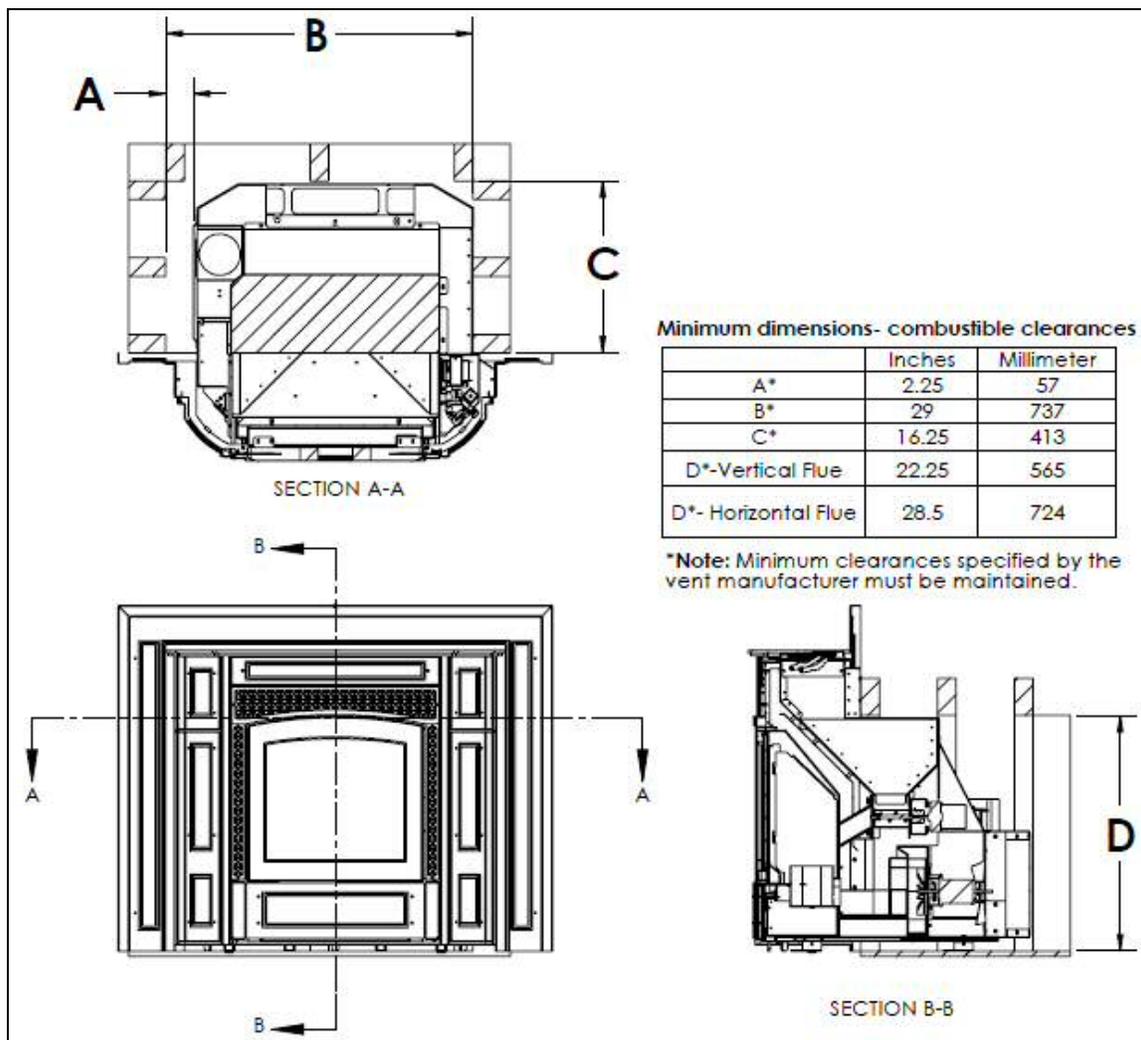
Your Thelin PROVIDENCE Insert is equipped with a blocked flue/high temp safety sensor that will shut the stove off if there is a down draft, blocked flue, or high temperature condition.

If you install the stove on the side of the house that is hit by prevailing winds (usually 30 to 40 mph or greater) there is a chance that the sensor will be activated and the stove will shut off. The solution to this problem is to run the pipe up vertically through the eave and use a high wind cap on the vertical termination.

Outside Air Hook-Up

Make sure a rodent guard is used after penetrating the outside wall. Source a wall thimble with a built-in outside air hook-up and rodent guard screen.

FIGURE 4 - BUILT-IN FIREPLACE CLEARANCES



Illustrations reflect typical installations and are for design purposes and clearances. Actual installation may vary due to individual design preferences.

Installed as Built-In (Wood or Metal Framing)

- A. Maintain clearance to combustibles on sides, back, and top of built-in as per Figure 4.
- B. **Horizontal Installation:** A minimum 2 ft. Type L 4” pipe vertical rise is required with a 2 ft. maximum horizontal run to the outside. **Vertical Installation:** A maximum vertical rise of 25ft. using Type L 4” pipe is required. A maximum of two 90 degree elbows. or two 45 degrees elbows (two 45 degree elbows equate to one 90 degree). The maximum horizontal run between two elbows is 1 ft.
- C. Pellet vent connections must be sealed with a liberal amount of 500 degree HIGH-TEMP RTV silicone and screwed together with at least 3 sheet metal screws.

D. Steps for complete built-in installation are as follows:

1. Build hearth base with non-combustible hearth pad and secure to subfloor. Base should extend 6" in front and 6" to the sides of stove.
2. Allow for the finished front material (i.e., tile, stone, slate) so that when the Providence is inserted into cavity, the front of the stove is flush with the finished material.
3. Install wall thimble with outside air hook-up into wall or chase if applicable (see Figures 5 & 6). Outside air is only required on mobile home installations.
4. Attach outside air flex pipe to left side of insert and exhaust vent pipe to pipe adaptor (see Figures 5 & 6). Outside Air – Aluminum Flex – Must use 3" if over 10' vertical.
5. Slide Providence engine into the cavity until the engine front is flush with hearth face.
6. Install screws into front feet of stove engine to secure it to the floor.

FIGURE 5 – VERTICAL BUILT-IN VENTING

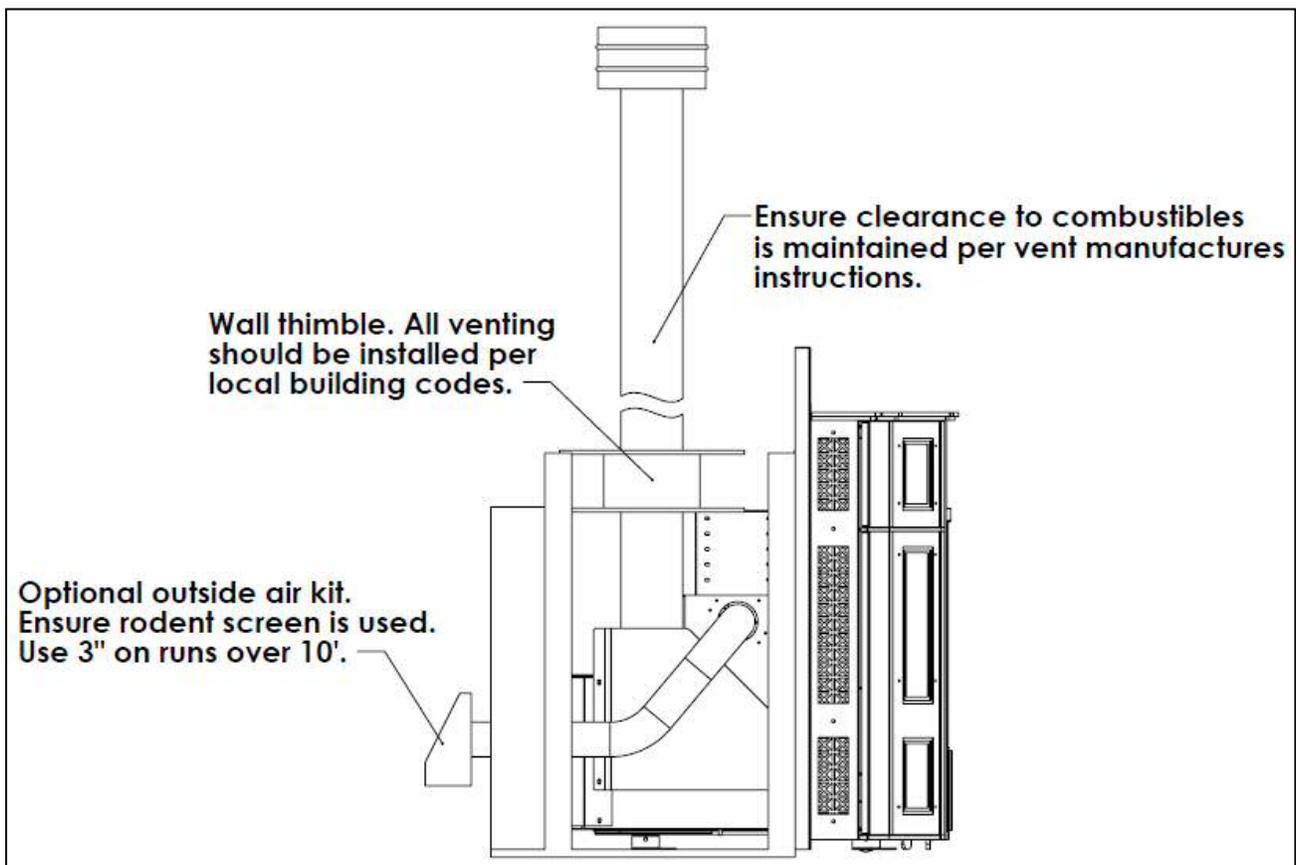
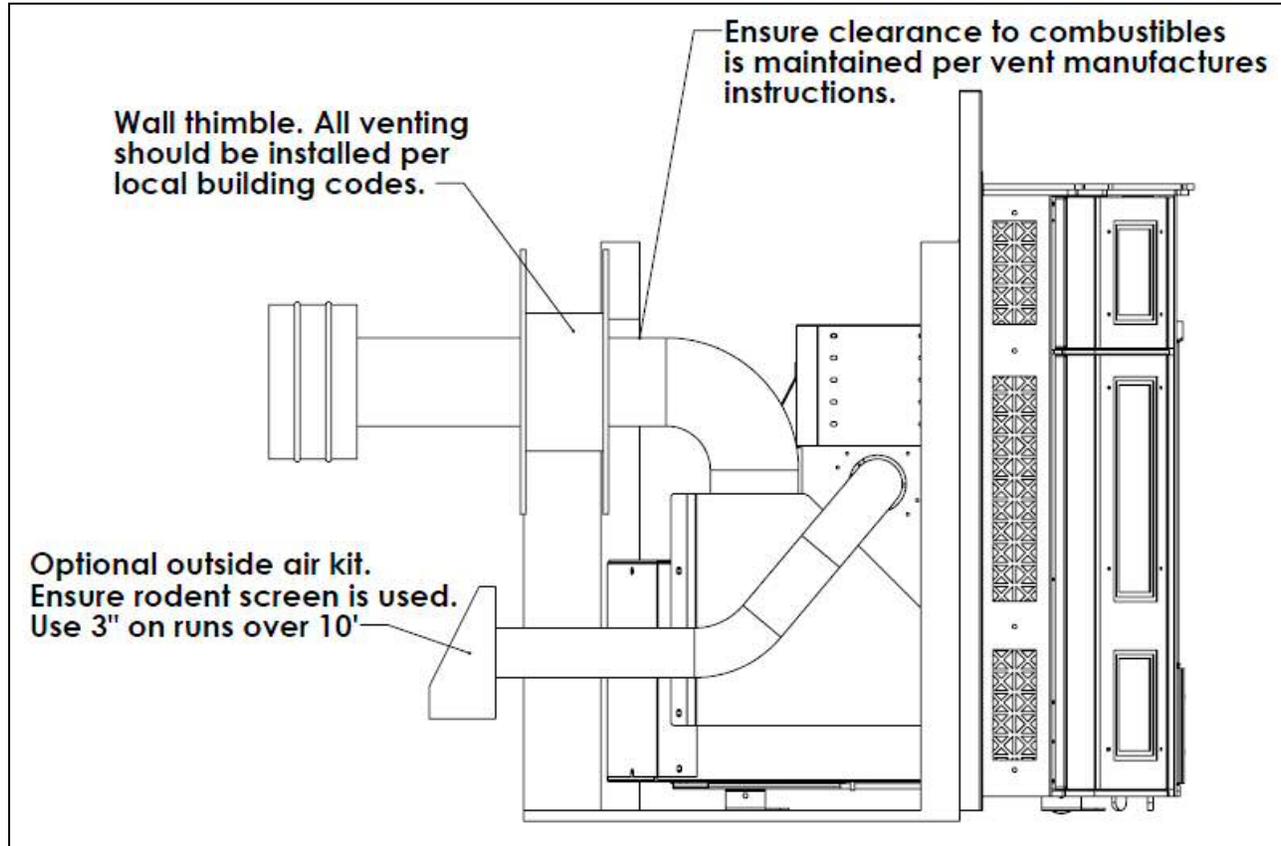


FIGURE 6 – HORIZONTAL BUILT-IN VENTING

Note: Above installation examples are for reference. All installation must follow local codes and requirements.

Additional Venting

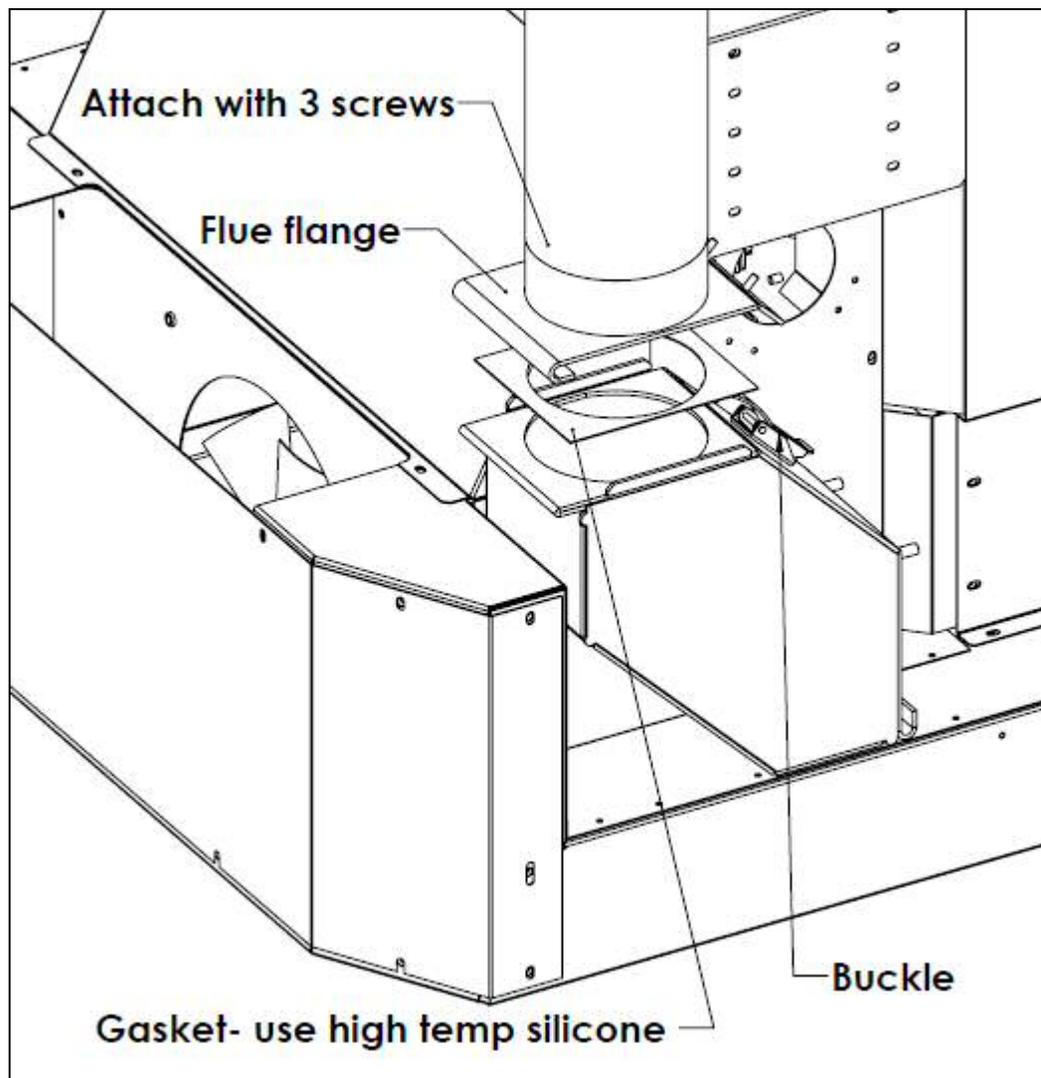
Your Thelin PROVIDENCE Fireplace Insert is equipped with a blocked flue/high temp safety sensor that will shut the stove off if there is a down draft, blocked flue, or high temperature condition.

If you install the stove on the side of the house that is hit by prevailing winds (usually 30 to 40 mph or greater) there is a chance that the sensor will be activated and the stove will shut off. The solution to this problem is to run the pipe up vertically through the eave and use a high wind cap on the vertical termination.

Outside Air Hook-Up

Make sure a rodent guard is used after penetrating the outside wall. Source a wall thimble with a built-in outside air hook-up and rodent guard screen.

FIGURE 7 – PIPE ADAPTOR & HOOK-UP



1. Silicone the top of flue flange with 500 degree HIGH-TEMP RTV silicone and insert flex liner or 4" pipe. Fasten pipe or flex liner with at least 3 sheet metal screws.
2. Silicone the flue gasket to fireplace engine with 500 degree HIGH-TEMP RTV silicone.

FIGURE 8- ADJUSTABLE HOPPER ASSEMBLY

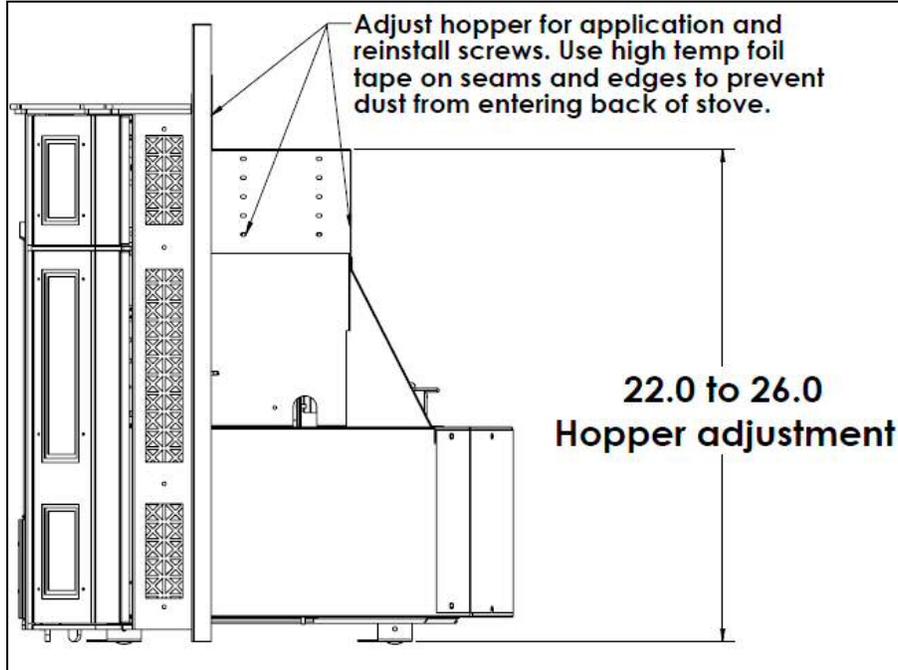
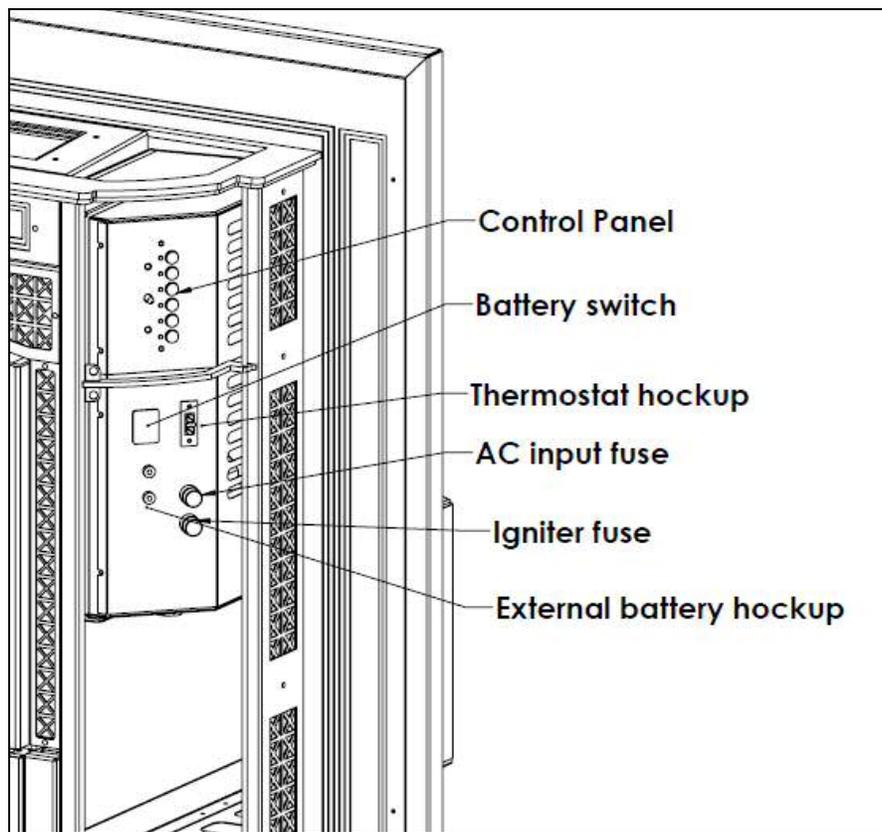


FIGURE 9 - CONTROL PANEL



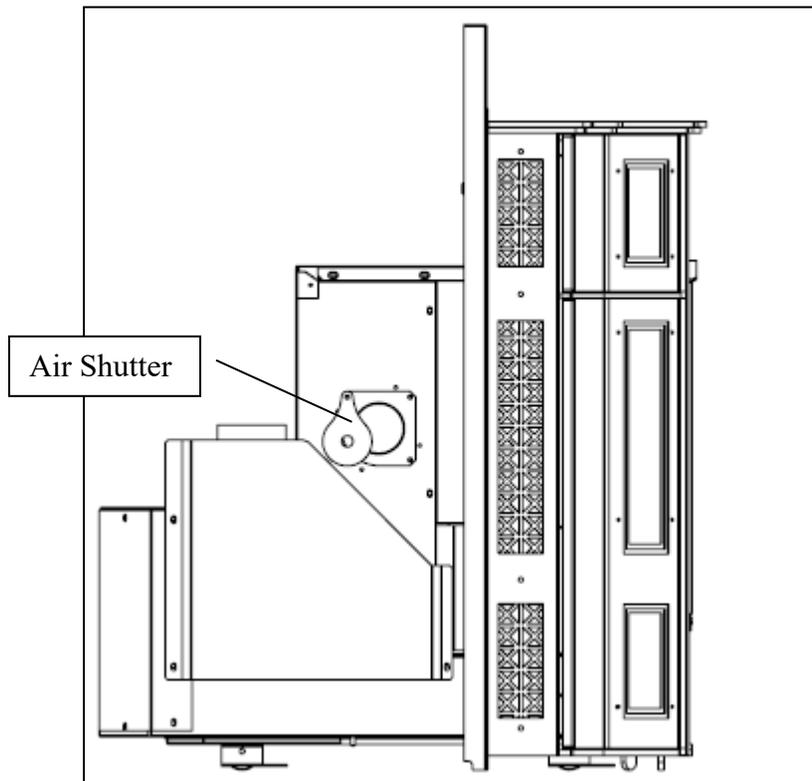
COMBUSTION AIR ADJUSTMENT

Combustion air can be adjusted by rotating the air shutter to close / open the air duct. Air adjustment is critical for proper combustion and stove efficiency.

Adjust the shutter so the flame is bright yellow in appearance and is actively moving (not lazy). Dark flames, smoke or black tips on the flame is an indication of too little air.

If the flue configuration is tall, over 15 feet, the shutter should be closed more than a shorter vent since the higher flue will naturally draft the stove and increase the intake air velocity and volume. This can cause the pellets to be blown out of the firepot and the efficiency of the stove will decrease due to the heat going up the flue instead of through the heat exchanger.

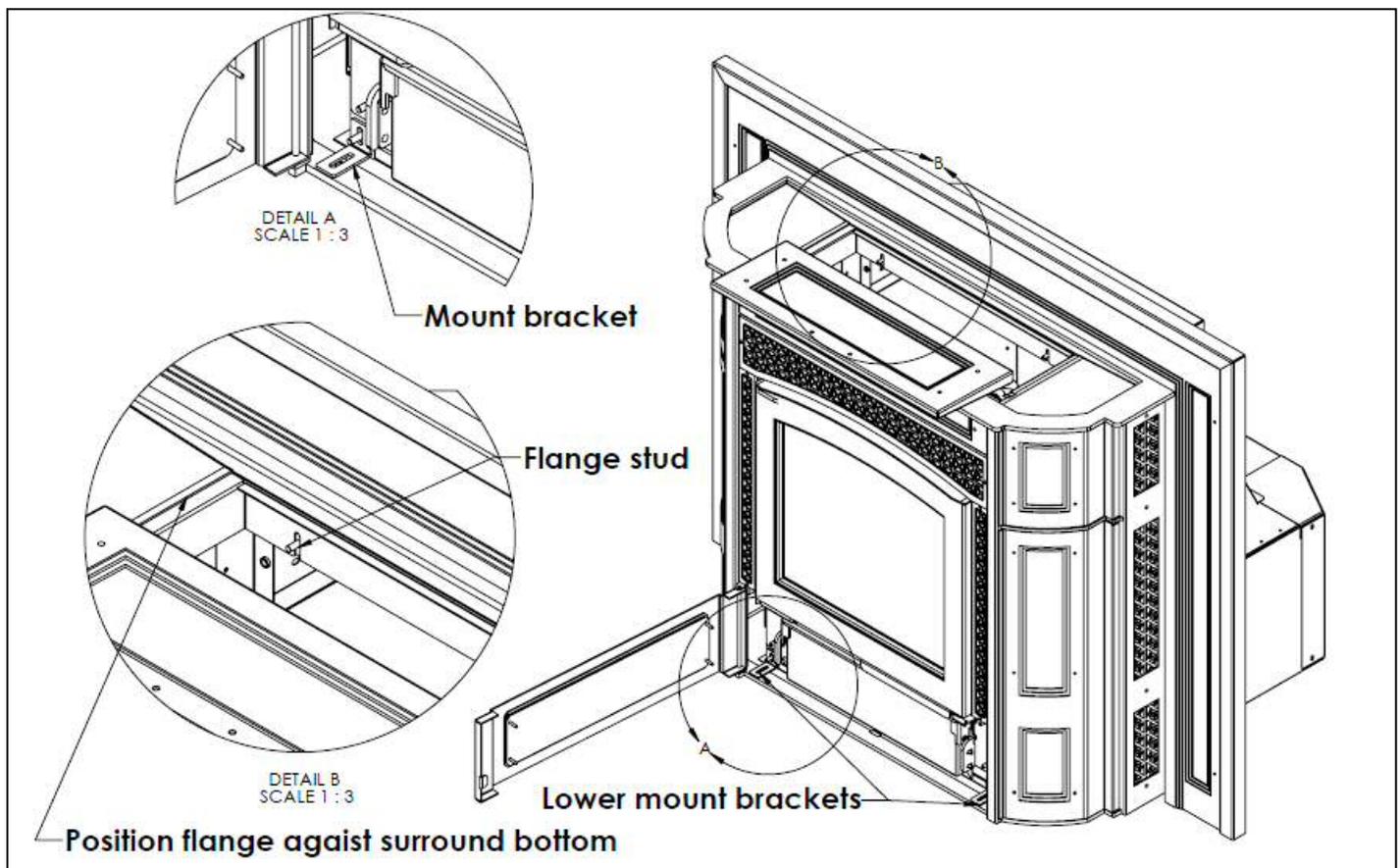
FIGURE 10 – AIR SHUTTER ADJUSTMENT



SURROUND INSTALLATION

1. To install the surround onto the stove engine, first make sure hopper flange assembly located on top of engine can move freely by loosening the four flange stud locknuts. Two in the front and two in the back. Also loosen lower supplied L mount brackets.
2. Carefully position the surround assembly around the stove engine and center the assembly so that there are even gaps around the firebox by lining up the bottom previously loosened L mount brackets with the surround's predrilled holes.
3. Then move hopper flange previously loosened and mate to the underside of top inside of the surround allowing the gasket to meet up with the surround. Tighten the 4 previously loosened locknuts. Tighten the lower L mount brackets with the 2 supplied 10-32 x 3/8" slotted hex-head screws.
4. Install the hopper door assembly by loosening the 4 supplied flange lock nuts (2 on the left, 2 on the right) onto the hopper flange assembly.
5. Once the door is seated on the flange studs, tighten the 4 previously loosened flange lock nuts.

FIGURE 11 – SURROUND INSTALLATION



VENT INFORMATION

Install vent at clearances specified by vent manufacturer.

Secure first section of pipe to adaptor using three sheet metal screws. Subsequent sections must be attached with three screws also. Each section joint should be sealed with hi-temp silicone and/or follow vent manufacturer's instructions (see Figure 7). Use only type L 3" or 4" venting systems.

DO NOT INSTALL A FLUE DAMPER IN THE EXHAUST VENTING SYSTEM OF THIS UNIT.

Termination

DO NOT terminate vent in any enclosed or semi-enclosed area such as carport, garage, attic, crawl space, under a sun deck or porch, narrow walkway or closely fenced area or any location where fumes can build up and concentrate such as stairwell, covered breezeway, etc.

Distance to Openings

- 3 feet minimum above any forced air inlet located within 10 feet
- 4 feet minimum below and horizontally from or 1 foot minimum above any door, window, or gravity air inlet into any building. 12" above, below or to side is allowable with outside air.
- Permanently closed windows – not less than 1 foot below, horizontally from or above the permanently closed window. 6" is allowable with outside air.
- 2 feet minimum to an adjacent building and 7 feet minimum above grade when located adjacent to public walkways
- Distance to bottom of termination cap and grade should be 12"
- Grade surface must be non-combustible material such as rock, dirt, gravel, etc. Beware of plants, lawn, bushes, and shrubs, which are considered combustible material.

- Consult local building, fire or other official codes. Local codes may be different and require other clearances than shown here.

MOBILE HOME INSTALLATION

Mobile home installation should be in accordance with the Manufactured Home and Safety Standard (HUD), CFR 3280, Part 24.

The following criteria are mandatory for mobile home installs:

- A. Outside combustion air is mandatory on all mobile home installs. We recommend the Dura Vent Wall Thimble with outside air hookup built into the thimble. The air inlet must remain unrestricted while unit is in use. See Figure 6 for location of outside air hookup on rear of stove. Metal flex hose must be used for outside air hook-up.
- B. Stove must be secured to the floor (use lag bolts) in stove feet
- C. The stove must be grounded with #8 solid copper grounding wire or equivalent, terminated at each end with an NEC-approved grounding device.
- D. Clearance to combustibles and floor protection is exactly the same for mobile homes as residential installs.

WARNING:

THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOORS, WALL, CEILING, AND ROOF MUST BE MAINTAINED. DO NOT INSTALL IN SLEEPING ROOM.

WALL THERMOSTAT HOOK-UP AND INSTALLATION

A wall thermostat or remote thermostat can be used to automatically control the Providence Insert. You will have the option of utilizing the thermostat to turn the stove on and off from Hi or Medium to Low. This can be done by changing the TYPE setting jumper located on the circuit board (see Figure 17). Type 1 will shut the stove on and off. Type 2 will move the stove from Hi or Medium to Low based on the temperature setting.

Here is the step-by-step procedure for hooking up the thermostat option:

- A. Unplug heater from power supply (both AC and DC).
- B. Locate thermostat terminal. Behind right door (see Figure 9).
- C. Remove metal shunt between terminals and hook up thermostat wires to the two terminals. For remote thermostat, hook up the two receiver wires to the terminals.
- D. Locate thermostat approximately 10 to 12 feet from heater or in the area that you want to remain a steady temperature. This may take some trial and error, especially if the remote thermostat is used.
- E. Make sure all the wiring is complete and batteries are installed into remote receiver and hand-held control before plugging the heater back into the wall outlet.

Important

Any electrical work performed on the Providence Fireplace Insert should be done by qualified personnel. **Always plug AC cord in before DC battery.**

START-UP AND OPERATION

Open hopper lid and make sure all manuals and materials shipped with stove have been removed. Make sure power cord is connected both into stove (connector under control box on right side) and into wall outlet.

Fill hopper with pellets. Capacity of hopper can be adjusted depending upon fireplace opening dimensions (see Figure 8).

Pellet quality is crucial for proper burn, efficiency, and overall performance. Good pellets will give you a bright yellow, vibrant flame with little or no soot and ash build up over 24 hours. Poor quality pellets will burn rich (orange flame) and dirty, black soot and ash will accumulate quickly. Experiment with different brands until you find one that gives you a clean, efficient burn.

Lighting Instructions

The Providence Fireplace Insert is equipped with automatic ignition. Once pellets have been poured into the hopper and the stove is plugged into the wall and venting is in place, you simply push the Low, Medium, or High button and the stove will light. Following is the start-up sequence, which will enable you to check all functions:

When the button is pushed the fan and feed will start in Low mode and the light next to the button will start blinking. The igniter comes on within 30 seconds and you should have ignition and a flame in four to six minutes. After 10 minutes, the light next to the High, Med or Low button will be solid and the stove will be in run mode. At this time you will have three distinct fan and feed speeds: Low, Medium, and High. You can adjust the heat output accordingly by pushing one of the buttons. If the stove does not get hot enough to kick into the run mode it will shut off and you will have to repeat the process. Failure to ignite on the first try usually means the stove firepot is clogged up with ash or the pellet you are using is of poor quality.

Note: Pellets do not feed in the “fan” position. The Fan mode is used for starting the stove if you have to do it manually during power failure when you would use the battery back-up option.

IF YOU ARE USING THE THERMOSTAT OPTION (WALL OR REMOTE) FOLLOW THE THERMOSTAT MANUFACTURER’S INSTRUCTIONS CAREFULLY AND MAKE SURE YOU USE THE BUILT-IN THERMOSTAT TERMINAL LOCATED BEHIND THE RIGHT SIDE DOOR (SEE FIGURE 9).

We recommend that you run the stove on Medium for about 30 minutes to get the heat exchanger hot before turning it to low. You will have to burn the Providence for a few hours in order to determine the best setting for your particular needs.

CONTROL FUNCTIONS

The push-button control settings on the Providence are as follows: OFF, FAN, LOW, MED, HIGH, and CLEAN (see Figure 12).

A. In the LOW position, the PROVIDENCE will feed approximately 2 pounds of pellets per hour. Feed rate will depend upon size and quality of pellets and the feed trim setting.

FIGURE 12 - CONTROL FUNCTIONS



- B. In the MED position, the PROVIDENCE will feed approximately 3.5 pounds of pellets per hour. Feed rate will depend upon size and quality of pellets and the feed trim setting.
- C. In the HIGH position, the PROVIDENCE will feed approximately 5 pounds of pellets per hour. In each setting the fan speed will increase along with the feed rate. Feed rate will depend upon size and quality of pellets and the feed trim setting.
- D. The CLEAN position is to be used only when the heater is not burning and has cooled down for maintenance and cleaning. See “Clean Out” section under maintenance for explanation of this function.
- E. The FAN position is used for manual start during power outage and also can be used to burn up a pile of pellets if the firepot begins to overflow. This usually means a good cleaning is necessary and, once done, the start-up procedure will have to be repeated.
- F. When you wish to turn off your PROVIDENCE, simply push the OFF button and the feed will immediately cease. The fan

will continue to run until the stove cools down and then it will shut off automatically. Sometimes this might take 25 to 30 minutes depending upon ambient temperature.

Remember

Each feed position will fluctuate because the microprocessor automatically adjusts the feed and fan speed based on temperature. This means the pellet feed rate and flame height will change accordingly based on quality of pellet and the amount of heat loss in the dwelling.

HIGH TEMP/FLUE, TRIM, AND BATTERY INDICATORS

High Temp/Flue Indicator

There is a small window (circle) to the left of the fan button. This indicator light will blink red if the following conditions persist:

- A. If the flue pipe or termination cap becomes clogged with ash or soot.
- B. If there is a high wind condition creating flue blockage and hence, a back draft.

The indicator light will come on steady red if there is a Hi-Temp condition such as lint and dust build-up on the plastic fan guard, thus preventing air flow through the stove.

If any of these conditions exist, the stove will shut down and the red light will remain on until the OFF button is pushed. Maintenance and cleaning should be performed before the stove is used again.

Trim Adjustment

To the left of the Medium button there is a small control knob that will allow you to adjust the feed rate on all three settings. If you turn the knob clockwise you will increase the feed rate. If you turn the knob counter-clockwise, you will decrease the feed rate. This button is designed to allow the user to

adjust the feed to a particular brand of pellet and it is, necessarily a trial-and-error endeavor. Find the best feed rate for your heating needs and leave the button in that position.

Battery Light

If you utilize the Thelin Hearth Products battery backup option, and the battery is plugged into the stove, the Battery Light will blink until the battery is fully charged. Read “Battery Backup Operation” for battery hook-up and operation.

Fine Tuning

Because of the variability of pellet quality (length, thickness, density, etc.) you might, from time to time, have to fine-tune your heater to compensate for pellet quality and/or venting configurations. There are two mechanisms available for fine-tuning your PROVIDENCE.

- A. The trim button located on the control panel (see 12 and prior “Trim Button” paragraph).
- B. The Fan Trim Pot Adjustments located on the circuit board (see Figure 17) will allow you to speed up or slow down the fan speed. By using a small slot screwdriver you can adjust fan speed to compensate for poor quality pellets or static pressure created by venting problems. By turning the trim pot clockwise you can increase fan speed on both the HIGH and LOW settings. You will have to experiment with the settings to determine the proper adjustment. Look for a good, brisk flame that is bright yellow, not orange and lazy. This generally indicates a good burn.

BATTERY BACKUP OPERATION

The PROVIDENCE Fireplace Insert is equipped with battery backup technology. To utilize this feature you will have to purchase the optional 12V battery cable and a sealed 12V battery. Your dealer should have these items in stock and if not, please

call the factory. To hook up the battery and engage the 12V backup system, do the following:

- A. Place sealed 12V battery at least one foot from stove but not more than four feet from stove (length of cable).
- B. Connect the red battery cable (+) to the positive terminal on the battery.
- C. Connect the black battery cable (-) to the negative side of the battery.

AFTER PLUGGING IN THE AC LINE CORD, THEN PLUG THE TWO BANANA PLUGS (RED AND BLACK) INTO THE RECEPTACLES ON THE STOVE (SEE FIGURE 9).

WARNING

Make sure the red cable goes to the red terminal and the black cable goes to the black terminal. If you hook these up correctly the BATT light will glow green. If you hook them up backward the BATT light will glow red and the backup will not work. **DO NOT** let the battery terminals touch stove. Failure to install correctly could cause physical harm and short out circuit board and will void the warranty on the heater.

When the battery is properly connected the following will happen automatically:

- A. If the heater is running and there is a power failure, it will automatically switch to battery power. (It happens instantaneously and you will not even notice it.)
- B. When power is restored, the stove will switch back to AC power automatically AND trickle-charge the battery. As long as the stove is plugged into the wall outlet it will keep the battery charged. If you unplug the stove during the summer and leave the battery attached, it will run down the battery and shorten its life.

- C. Run time on the battery will depend upon the amperage of the battery. See your local battery store outlet for details.
- D. If you wish to place the battery eight, ten, or twelve feet from the stove you will need to increase the wire size of the cable. Check with your local electrical professional to make sure you have used the proper gauge wire/cable.
- E. The automatic ignition feature will not work on the battery mode. If the stove is off and the power fails, you will have to light the stove manually with an approved fire starter.

WARNING

Risk of electrical shock. Disconnect power cord before servicing. Do not operate with covers removed. Always turn your heater off and let it cool before cleaning.

MAINTENANCE

The PROVIDENCE requires routine maintenance for maximum performance and prolonged life of parts and components, and it is mandatory for warranty to remain in effect.

Soot and Fly Ash – Formation and Need for Removal: The products of combustion will contain small particles of fly ash. The fly ash will collect in the exhaust venting system and restrict the flow of flue gasses. Incomplete combustion—such as that which occurs during start-up, shut down or incorrect operation of the room heater—will lead to some soot formation which will collect in the exhaust venting system. The exhaust venting system should be inspected at least once every year.

The following procedures should be performed regularly and may require more frequent attention if a low-quality pellet is used.

Daily Maintenance

1. Firepot-

- a. scrape firepot every 1-2 days depending on usage and type of pellet
- b. Ash and clinker build up in the firepot will affect the quality of burn and can cause ignition issues. More frequent cleaning may be necessary with poor quality or high ash fuel.

Weekly Maintenance

1. Ash removal from firebox- approximately every week
 - a. Clean and vacuum ash build up weekly or as needed. See Figures 13 & 14.
 - b. With door open, push clean button and allow fan to run 30-45 seconds to blow excess ash out flue.
2. Glass cleaning- approximately every 1-2 weeks
 - a. Clean glass with stove glass cleaner as needed when fire view is obstructed.
3. Heat exchanger- approximately every 2 weeks
 - a. Remove 2 side baffle plates for access to internal heat exchanger fins. Use brush to remove ash build up. Vacuum heat exchanger and below exhaust channels. See Figure 13.
 - b. With door open, push clean button and allow fan to run 30-45 seconds to blow excess ash out flue.
4. Empty ash pan- approximately every 2-4 weeks

- a. Empty build up ash build up in pan as needed. This is necessary every 2-4 weeks but can be more based on the type of pellet used. See Figure 14.
- b. Cooled ash must be dumped into an airtight metal container. Dispose of ash properly to avoid a fire.

5. Air wash system- approximately every 2-4 weeks

- a. Remove air wash and clean any ash build up.
- b. Be extremely careful not to damage mica plates since they are very fragile.

Monthly Maintenance

1. Exhaust channels- Approximately every month
 - a. Unplug stove from power outlet.
 - b. Remove ash pan. See Figure 14.
 - c. Loosen retaining nuts that hold exhaust port covers in position. See Figure 14.
 - d. Use ash or shop vacuum on one side of U shaped exhaust channel while inserting brush into the other side of the channel. Brush approximately half of the channel around 4-5 times to loosen ash and allow the vacuum to remove the ash from the channel. See Figure 14.
 - e. Repeat process by switching the ports for the vacuum and brush.
 - f. Reinstall items removed in reverse order

- g. With door open, push clean button and allow fan to run 30-45 seconds to blow excess ash out flue.
2. Hopper
 - a. Vacuum hopper to remove excess sawdust. Excessive sawdust can cause feeding issues.
 3. Scrape pellet feed chute with putty knife if soot build-up is present. Build-up on the feed chute will prevent pellets from falling freely into the firepot.
 4. Remove clean-out cover on bottom of the tee (outside, if applicable) and dump excess ash from tee. This should be checked every four to six weeks.

Yearly/ End of Burn Season

Note: The following should only be performed by a qualified individual. If you are unsure how to perform any maintenance tasks, please consult a professional service technician.

1. All of preceding maintenance
2. Combustion blower fan
 - a. Unplug stove from power outlet.
 - b. Remove stove surround and engine as needed to gain access to back of stove. See Figure 10.
 - c. Remove rear access panel. See Figure 15.
 - d. Unplug fan motor electrical connections.
 - e. Loosen 3 retaining nuts on fan flange.
 - f. Loosen 4 screws on fan shroud.

- g. The fan motor is installed with high temperature silicone sealant and will need to be gently worked loose from fan housing.
 - h. Vacuum fan housing and use a soft vacuum brush attachment to remove ash buildup from exhaust fan blade. Ensure all ash is removed evenly from blade since uneven removal can cause a blade balancing issue and possible noise.
 - i. Clean post exhaust fan duct with brush. Vacuum loosened ash. Duct can be cleaned by access through flue cleanout cover. See Figure 15.
 - j. Reinstall fan motor assembly and apply high temperature silicone sealant around flange. Flange must be fully sealed with silicone having a temperature rating of at least 500 degrees F.
 - k. Vacuum stove cabinet and ducts to remove any accumulated dust, fuzz or pet hair.
3. Venting system
 - a. Clean flue venting system as per vent manufactures recommendations.
 - b. Vacuum flue cleanout box to remove ash and buildup.
 - c. Reinstall all components removed.
 - d. Reinstall stove surround and engine.
 - e. With door open, push clean button and allow fan to run 30-45 seconds to blow ash out flue.

FIGURE 13—CLEAN-OUT COVERS

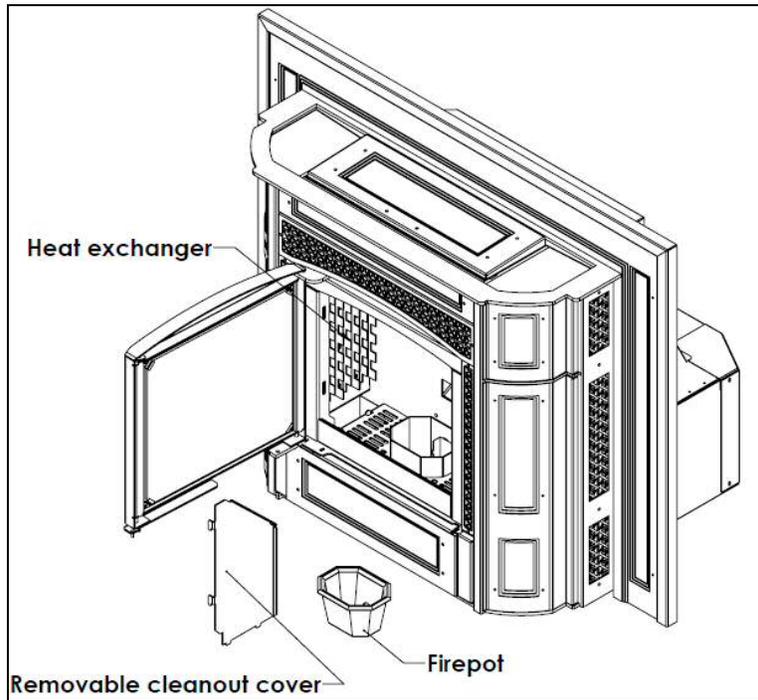


FIGURE 14 – CLEAN-OUT VENT PORT

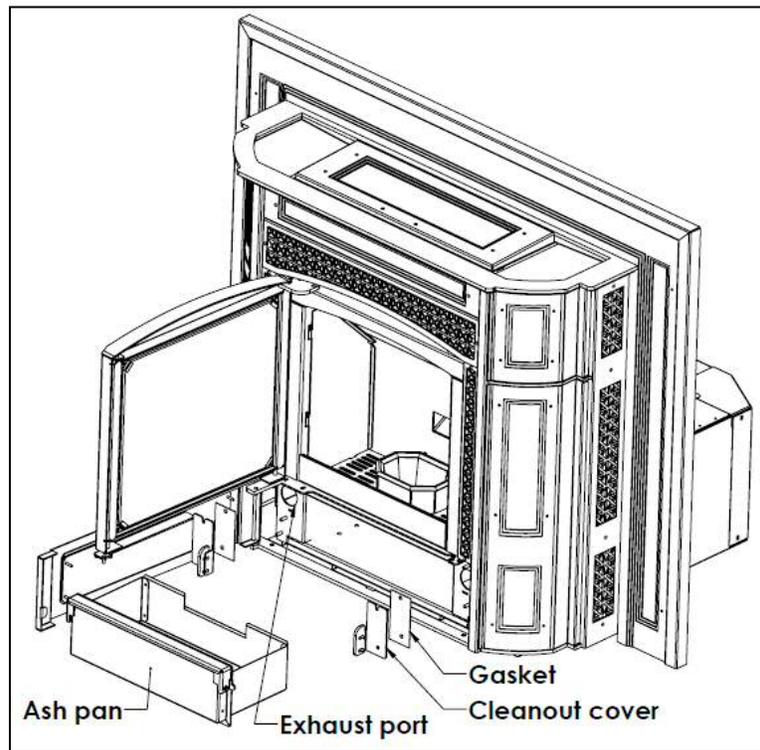
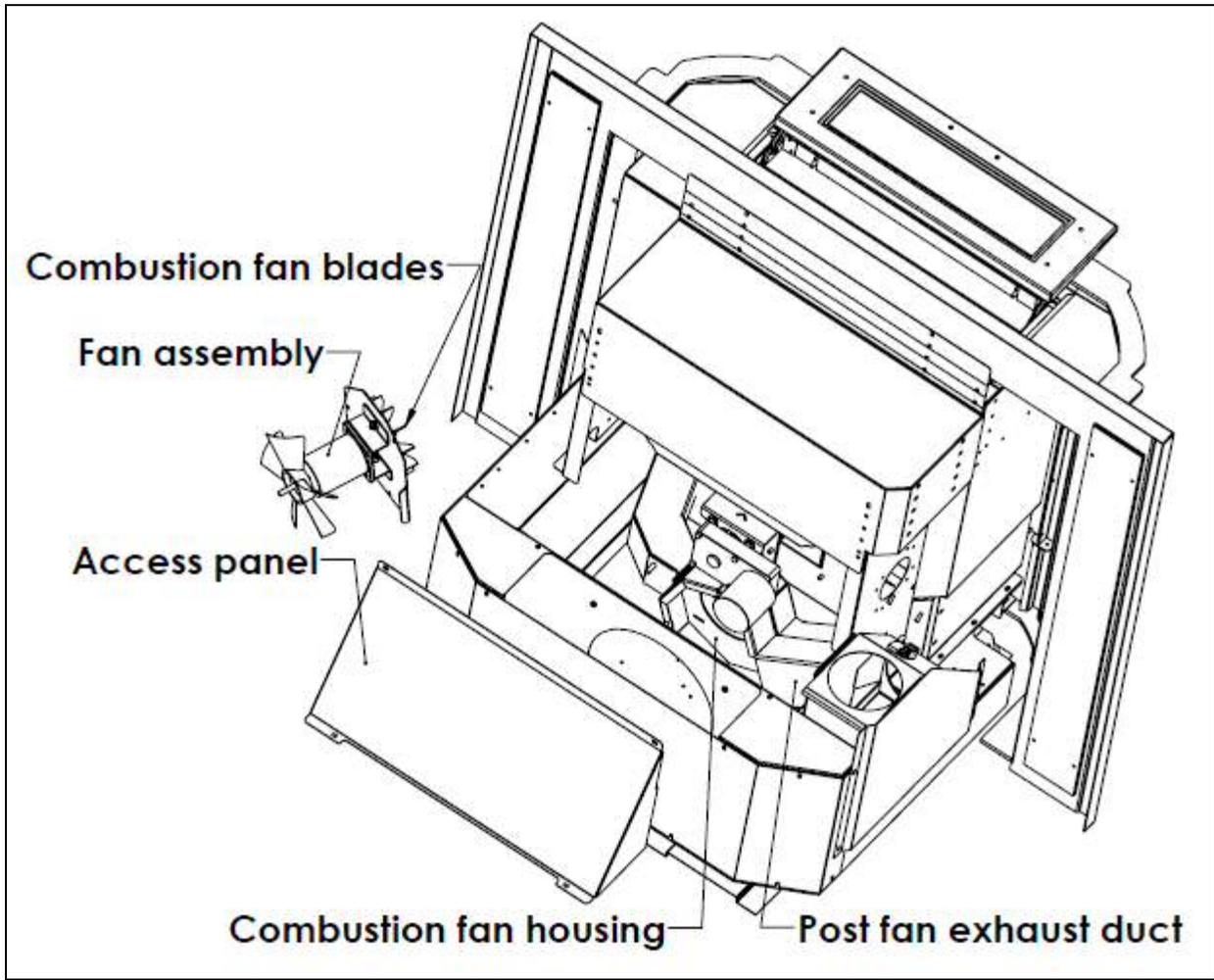


FIGURE 15 – COMBUSTION FAN



TROUBLESHOOTING

The following scenarios are provided in order to help you locate a potential problem in the event the PROVIDENCE is not performing normally or as expected:

1. **Problem:** I loaded the heater with pellets, pushed the LO, MED, or HIGH button, but the pellets did not light.

SOLUTION: CHECK THE POWER CORD TO MAKE SURE IT IS PLUGGED INTO THE WALL AND THE STOVE. (MAKE SURE IT IS PUSHED INTO THE RECEPTACLE ALL THE WAY.) IS THE LED LIGHT BLINKING NEXT TO THE BUTTON YOU PUSHED? IF NOT, CHECK THE IGNITER FUSE BEHIND THE CONTROL TOWER (SEE FIGURE 9)

The igniter fuse is located in the red fuse holder. If you are running the stove on the thermostat, make sure the thermostat is calling for heat. Remember, the timer, on start-up, runs for ten minutes and if the pellets have not lit, then you may have to repeat the startup sequence. Also, on startup the stove only runs on one speed until it gets hot. Temperature activates the T-2 sensor, which tells the stove to kick into the run mode. This usually takes 10 minutes and, if the run temperature is not reached, then the stove shuts off. If this occurs, simply relight the stove in order for the run temperature to be reached.

2. **Problem:** The heater was lit and burning properly, then suddenly it stopped feeding pellets.

Solution: Check pellet supply in hopper and fill if empty. Occasionally, a foreign object, debris, excessive sawdust, or even a child's toy can enter the feed mechanism and jam the auger. To check for this you must empty the hopper of all pellets and inspect the feed system. Remove any foreign object and make sure integrity of the auger system has not been compromised, i.e., auger is not bent or come out of bushing at tip of auger.

CAUTION: Keep fingers and hands clear of the feed mechanism when heater is running.

3. **Problem:** The fire was burning well and then it seemed to begin overfeeding and started filling the firepot and backing up the feed chute, smothering the fire.

Solution: When the pellets are overfeeding it usually means the firepot needs a good cleaning as the holes are blocked with soot and ash and the fire cannot get enough oxygen to sustain a good burn. Poor quality pellets can also create this problem as they will make an incredible amount of ash in a very short time.

4. **Problem:** I pushed the OFF button and the stove kept running.

Solution: This is normal. The fan will keep running until the stove cools down and then it will automatically turn off. This can sometimes take 25 or 30 minutes. If it runs for hours in the off position, then the T-2 sensor may need to be replaced. Call your dealer or factory for help.

5. **Problem:** Fan motor speed varies on its own. Sometimes it surges on its own. It will run on HI or CLEAN but not on LOW.

Solution: Fan motor brushes are wearing out and need to be replaced. Contact your dealer or call factory for replacement brushes. If the motor is also screeching or whining then the bearing might be bad and it is time for a new fan motor.

6. **Problem:** Stove shuts off by itself when running on low.

Solution: Feed trim button is too low for the pellets you are using. Adjust trim button (turn clockwise) until feed rate can maintain fire.

7. **Problem:** I see a flashing green light behind the electrical cover. What does this mean?

Solution: The flashing green light behind the tower means the circuit board is energized. This

is okay. "Green means go." All systems are ready and operational.

FIGURE 16 – REPLACEMENT PARTS LIST

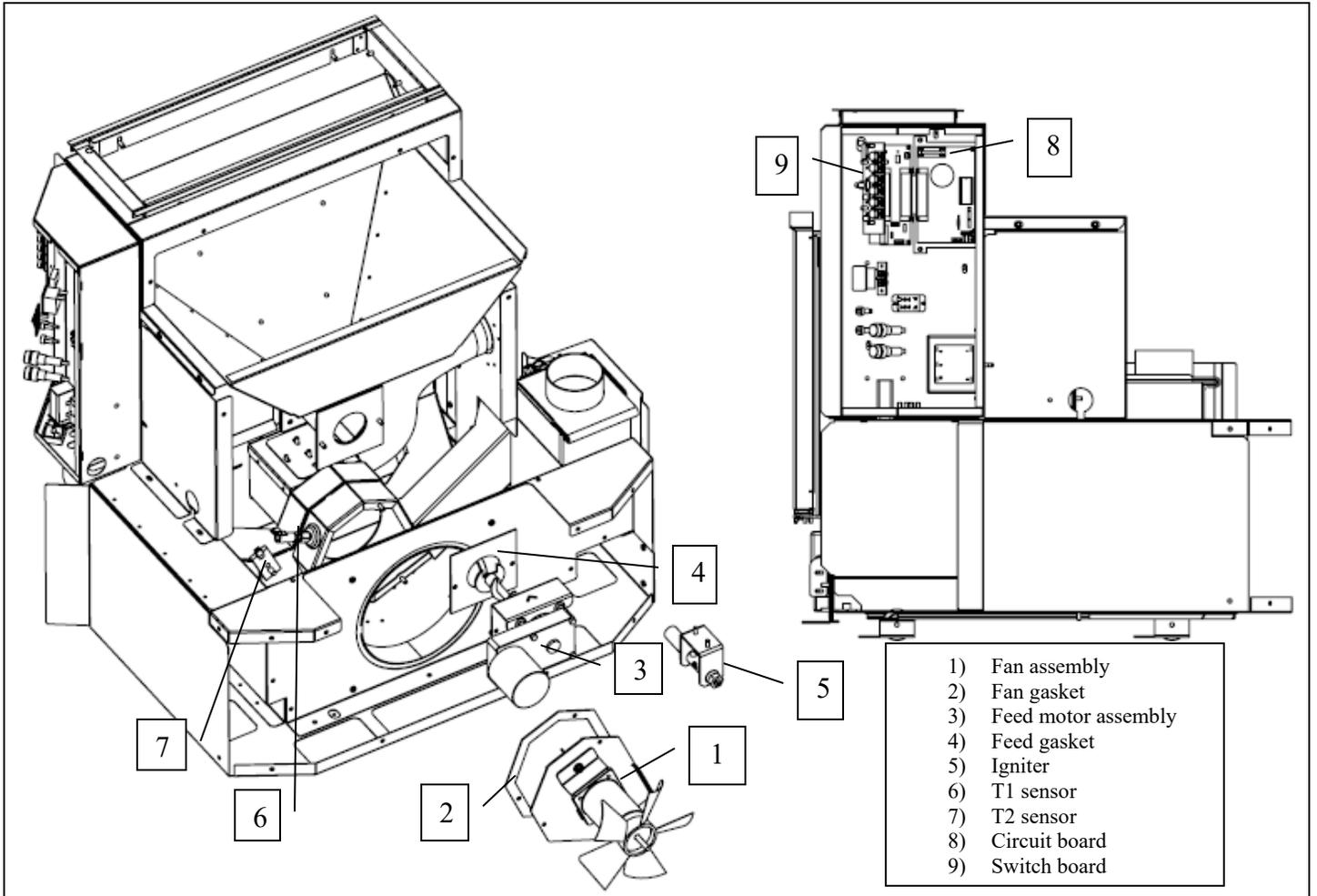


FIGURE 17 – CIRCUIT BOARD DIAGRAM

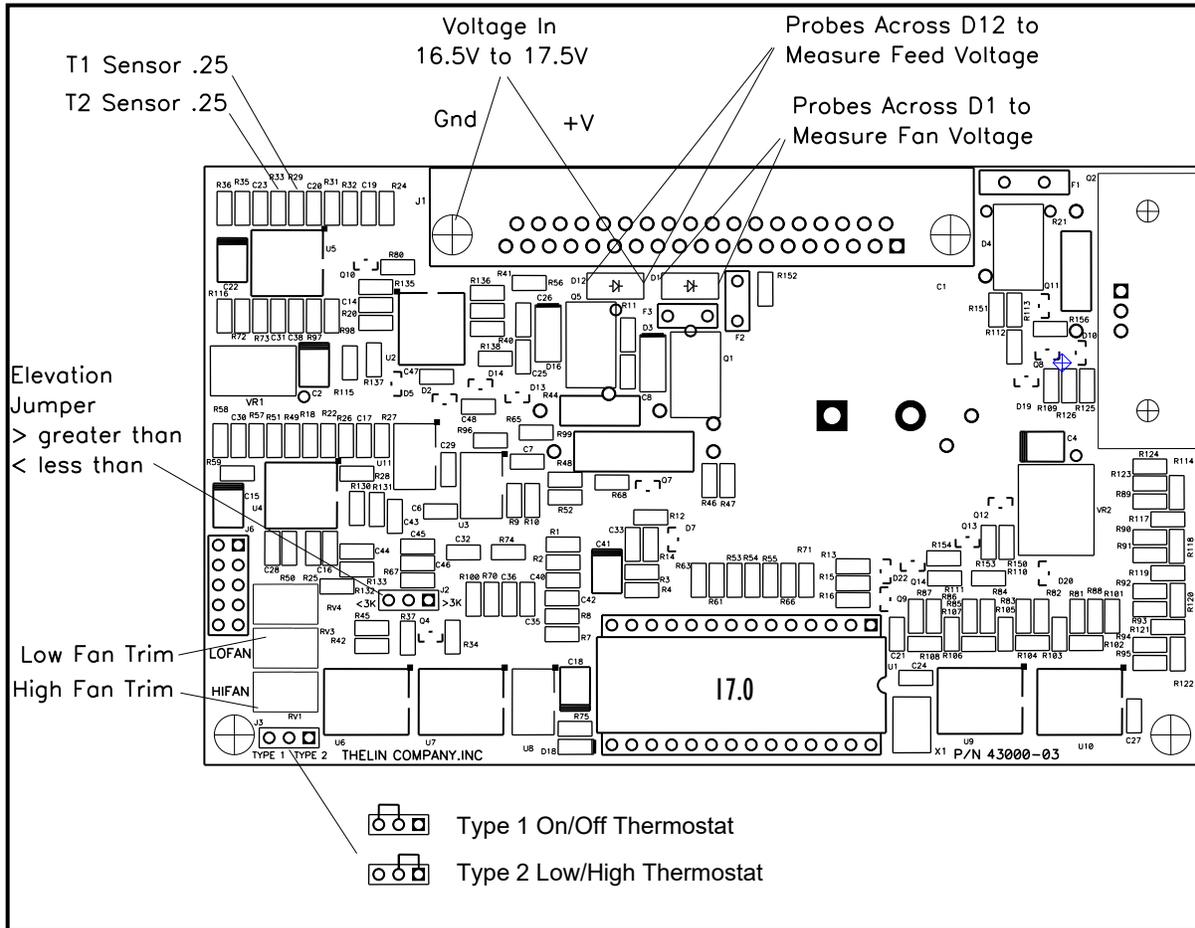


FIGURE 18 - ELECTRICAL SCHEMATIC/WIRING DIAGRAM

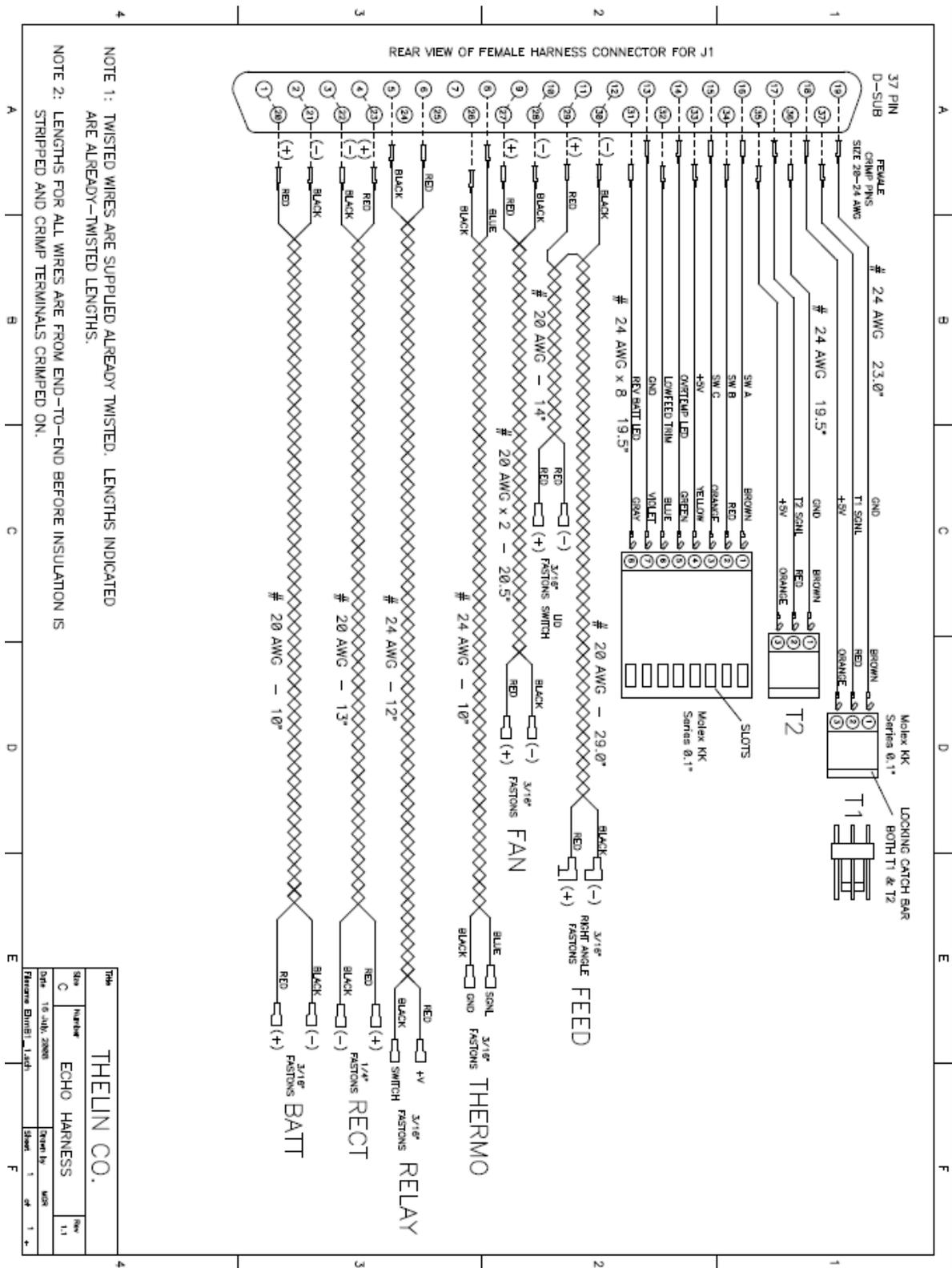
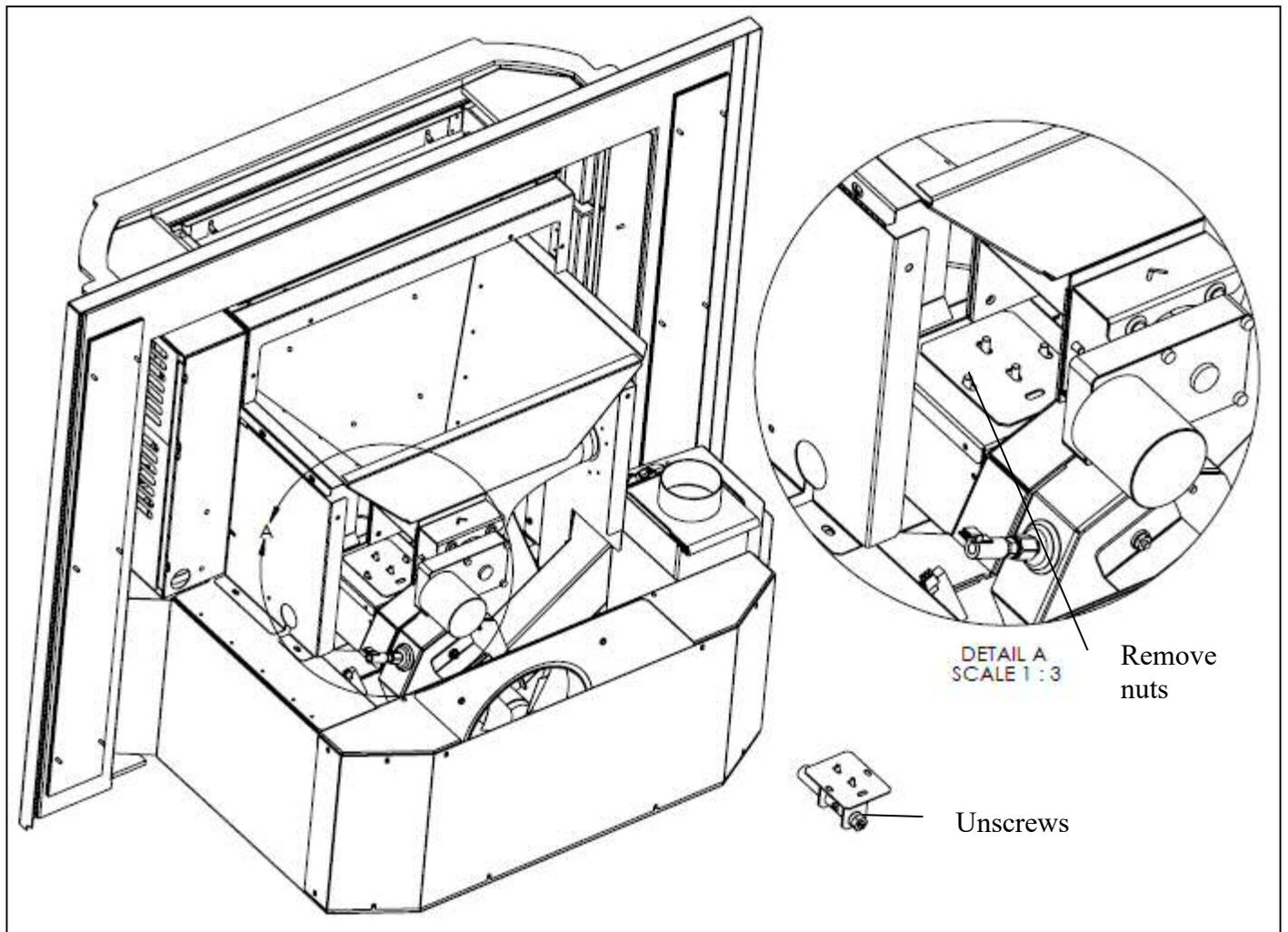


FIGURE 19 - IGNITER LOCATION



1. The bracket holding the igniter is attached to the lid with two 10-32 nuts. The lid attaches to the air chamber with two 10-32 nuts. Also, a gasket (not shown), is installed between the lid and the air chamber.
2. Unscrew the igniter element from tube to replace.

THELIN HEARTH PRODUCTS PELLETT HEATER WARRANTY REPLACEMENT PROGRAM

EFFECTIVE March 1st, 2015

NOTE: PLEASE READ THIS WARRANTY REPLACEMENT PROGRAM CAREFULLY BEFORE APPLYING FOR WARRANTY REPLACEMENTS OR CREDIT.

WARRANTY COVERAGE

Warranted for five years from the date of retail purchase against defects in workmanship to include heater cabinet and body. Warranted for one year from date of retail purchase to include drive mechanism and electronic components. Solely for the benefit of the original purchaser (retain your dated sales receipt as proof of purchase). **Some Dealers may require you to pay a service call or trip charge for any warranty work.**

COVERED

Replacement of defective parts and labor and product return to consumer.

NOT COVERED

Door glass, plating, paint, and gasket. Damages caused by abuse or failure to perform normal maintenance and any related expense. This warranty shall not apply to any defect, malfunction, or failure to conform with the warranty provisions if caused by damage (not resulting from defect or malfunction) due to unreasonable use by purchaser. Consequential damages, incidental damages, or incidental expenses, including damage to property. Some states do not allow the exclusions or limitation or incidental consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights that vary from state to state.

WARRANTY WORK

If you find this unit to be defective in material and/or workmanship within a period of five (5) years from the date of purchase, contact your local dealer from whom you purchased the heater. All warranty work must be authorized by the factory in advance of the repair and an authorization number assigned. A warranty claim form must be completed and signed by both the repair person and the customer. For prompt warranty service, please contact the authorized dealer in your area. Have the following information available to assist the repair person.

HEATER PURCHASE INFORMATION

Date Purchased: _____ Serial Number: _____

Dealer/Retailer where Purchased: _____

Installer/Contractor used for Installation: _____

QUALIFICATION FOR WARRANTY PERFORMANCE

Return product or defective part with proof of purchase and narrative description of defect together with your name and address, freight prepaid to: Thelin Hearth Products, Warranty Division, 63 Laxalt Dr. Carson City, NV 89706. Returned part or product will be repaired or replaced at Thelin Hearth Products option and will be returned to you freight prepaid as soon as practical, but not later than 30 days after receipt.



THELIN HEARTH PRODUCTS
63 Laxalt Dr.
Carson City, NV. 89706



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



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

Report Number: DIRI01A05026181218

A2LA ACCREDITED CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Rice Lake	IQ+355E-2A x 100l	A05026	#041	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
lbs	0.1	QC033	12/18/18	6/13/18	12/2019

FUNCTIONAL CHECKS

SHIFT TEST		LINEARITY		REPEATABILITY		ENVIRONMENTAL CONDITIONS
Test Wt:	Tol:	Test Wt:	Tol:	Test Wt:	Tol:	<input type="checkbox"/> Good <input checked="" type="checkbox"/> Fair <input type="checkbox"/> Poor Temperature: 16.9°C
250	1	HB44	HB44	100	1	
As-Found:		As-Found:		As-Found:		
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	
As-Left:		As-Left:		As-Left:		
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	999.3	1000.2	0.12
700	699.7	700.1	0.12
500	499.7	500.1	0.08
300	299.8	300.1	0.08
100	99.9	100.0	0.05
50	50.0	50.0	0.05

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	11/24/17	11/2019	20172265

Permanent Information Concerning this Equipment:

12 month calibration cycle. 2000lb platform.

Comments/Information Concerning this Calibration

12/18 - RH = 67%. Adjusted span.

Report prepared/reviewed by: ServiceTechDC Date: 12/28/18

Technician: R. Kauble
Signature:

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 #: 53
 Serial #: 1902130
 Calibration Date: 6/14/2019
 Calibration Expiration: 12/14/2019
 Barometric Pressure: 29.97 in. Hg



Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/13/2020
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	12/17/2018
γ Factor:	1.004
Allowable Deviation ($\pm 5\%$):	0.0502
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)	147.373	142.005	143.359
Standard DGM Temperature ($^{\circ}$ F)	71.0	72.0	72.0
Standard DGM Pressure (in H ₂ O)	0.00	0.00	0.0
DGM Initial Volume (ft ³)	0.000	0.000	0.000
DGM Final Volume (ft ³)	5.227	5.114	5.224
DGM Temperature ($^{\circ}$ F)	78.0	85.0	91.0
DGM Pressure (in H ₂ O)	2.67	2.00	1.5
Time (min)	33.0	36.0	42.0
Net Volume for Standard DGM (ft ³)	5.204	5.015	5.063
Net Volume for DGM (ft ³)	5.227	5.114	5.224

Dry Gas Meter γ Factor	1.000	0.998	0.998
γ Factor Deviation From Average	1.000	0.998	0.998

Average Gas Meter γ Factor

0.999

Calculations:

- Deviation = |Average value for all runs - current run value|
- $\gamma = [V_{std} \times (\gamma_{std}) \times (P_{bar} + P_{std}/13.6) \times (T_{DGM} + 460)] / [V_{DGM} \times (T_{std} + 460) \times (P_{bar} + P_{DGM}/13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is $\pm 0.5\%$.

Dry Gas Meter Calibration

Meter Manufacturer: Apex
 Model: XC-60-ED
 Lab ID #: 54
 Serial #: 1902133
 Calibration Date: 6/14/2019
 Calibration Expiration: 12/14/2019
 Barometric Pressure: 29.97 in. Hg



Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/13/2020
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	12/17/2018
γ Factor:	1.000
Allowable Deviation ($\pm 5\%$):	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)	139.967	143.359	139.656
Standard DGM Temperature ($^{\circ}$ F)	72.0	73.0	75.0
Standard DGM Pressure (in H ₂ O)	0.00	0.00	0.0
DGM Initial Volume (ft ³)	0.000	0.000	0.000
DGM Final Volume (ft ³)	5.098	5.242	5.114
DGM Temperature ($^{\circ}$ F)	92.0	93.0	95.0
DGM Pressure (in H ₂ O)	2.99	2.02	1.3
Time (min)	30.0	37.0	45.0
Net Volume for Standard DGM (ft ³)	4.943	5.063	4.932
Net Volume for DGM (ft ³)	5.098	5.242	5.114

Dry Gas Meter γ Factor	0.997	0.995	0.995
γ Factor Deviation From Average	0.997	0.995	0.995

Average Gas Meter γ Factor

0.996

Calculations:

- Deviation = |Average value for all runs - current run value|
- $\gamma = [V_{std} \times (\gamma_{std}) \times (P_{bar} + P_{std}/13.6) \times (T_{DGM} + 460)] / [V_{DGM} \times (T_{std} + 460) \times (P_{bar} + P_{DGM}/13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is $\pm 0.5\%$.



QUALITY CONTROL SERVICES

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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

<u>Material</u>	<u>Assumed Density</u>	<u>Range</u>	<u>Tolerance Class</u>
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/cm³”).

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.

page 1 of 2

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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Member: National Conference of Standards Laboratories and Weights & Measures



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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.

page 2 of 2

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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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.

page 2 of 2

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

Report Number: DIRI0134307497181218

A2LA ACCREDITED CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	ENTRIS224-1S	34307497	#107	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
g	0.0001	QC012	12/18/18	6/13/18	12/2019

FUNCTIONAL CHECKS

ECCENTRICITY		LINEARITY		STANDARD DEVIATION			ENVIRONMENTAL CONDITIONS
Test Wt:	Tol:	Test Wt:	Tol:	Test Wt:	Tol:		
100	0.0003	50 x 4	0.0002	100	0.0001		<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
As-Found:		As-Found:		1. 100.0001	5. 100.0002	9. 100.0001	Good Fair Poor
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	2. 100.0001	6. 100.0001	10. 100.0001	
As-Left:		As-Left:		3. 100.0001	7. 100.0001	Result	Temperature: 21.3°C
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	4. 100.0001	8. 100.0002	0.00004	

A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
200	200.0002	200.0001	0.00014
100	100.0001	100.0001	0.00014
50	50.0003	50.0001	0.00014
20	20.0001	20.0001	0.00014
1	1.0001	1.0000	0.00014
0.1	0.1000	0.1000	0.00014

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	R.L./Troemner	10kg to 1mg	G782	1/3/18	1/2019	20172421

Permanent Information Concerning this Equipment:

12 month calibration cycle.

Comments/Info Concerning this Calibration:

12/18 - RH = 56%. Adjusted span.

Report prepared/reviewed by: ServiceTech X Date: 12/28/18

Technician: R. Kauble

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.



CERTIFICATE OF CALIBRATION

CUSTOMER: PFS-TECO : CLACKAMAS, OR
PO NUMBER: N/A
INST. MANUFACTURER: DWYER
INST. DESCRIPTION: VELOMETER
MODEL NUMBER: 471
SERIAL NUMBER: CP288559 (ID# 095)
RATED UNCERTAINTY: SEE NOTES BELOW.
UNCERTAINTY GIVEN: ± .20% RD ; k=2

CALIBRATION DATE: 03/14/2019
CALIBRATION DUE: 03/14/2020
PROCEDURE: T.O.33K6-4-1769-1
CALIBRATION FLUID: AIR @ 14.7 PSIA 70°F
RECEIVED CONDITION: WITHIN MFG. SPECS.
LEFT CONDITION: WITHIN MFG. SPECS.
AMBIENT CONDITIONS: 762 mm HGA 43% RH 69°F
CERTIFICATE FILE #: 490265.2019

NOTES: ± 3% FS (0-500 / 0-1500) *** ± 4% F.S. (0-5000) *** ± 5% F.S. (0-15000) *** ± 2 °F
NOTES CONT. : Q.MANUAL IM 1.5 REV 2017.1 DATED 7-18-2017

UUT INDICATED	DM.STD. ACTUAL	UUT INDICATED	DM STD. ACTUAL
FT/MIN	FT/MIN	DEG. F	DEG. F
64	65	0 TO 200°F	0 TO 200°F
110	112	43.4	43.5
206	210	69.0	68.9
498	509	99.4	99.2
503	505		
1049	1058		
1497	1514		
509	513		
3419	3460		
4992	5068		
5136	5235		
13928	14232		

STANDARDS USED:

A220: 12" WIND TUNNEL 0 - 8000 FPM CMC ± .203% RD TRACE# 1520423238	DUE	05/23/2019
A24: HART SCIENTIFIC TEMP. STANDARD ±.024 F TRACE# 1520423238	DUE	03/07/2020

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 11133 Winners Circle • Los Alamitos, CA 90720
 Phone (714) 827-1215 • Fax (714) 827-0823

This Calibration Certificate shall not be reproduced, except in full, without approval by DICK MUNNS COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Date:

3/14/2019

Approved by:

Calibration Technician:

D.C.



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 $\pm .00025$ inches water column
- Pressure range: 0 - 2" w.c., positive, negative, or differential pressures
- Non-toxic and inexpensive gage fluid consists of distilled water mixed with a small amount of fluorescein green color concentrate
- Convenient, portable, lightweight and self-contained, the unit requires no external power connections and is operated by a 1.5 volt penlight cell
- A.C. detector current eliminates point plating, fouling and erosion
- Micrometers are manufactured in accordance with ASME B89.1.13-2001, and are traceable to a standard at the National Institute of Standards and Technology
- Three-point mounting, dual leveling adjustment, and circular level vial assure rapid setup
- Durablock® precision-machined acrylic plastic gage body
- Sensitive 0 - 50 microamp D.C. meter acts as a detector and also indicates battery and probe condition
- Heavy 2" thick steel base plate provides steady mounting
- Top-quality glass epoxy circuit board and solid-state, integrated circuit electronics
- Electronic enclosure of tough, molded styrene acrylonitrile provides maximum protection to components yet allows easy access to battery compartment
- Rugged sheet steel cover and carrying case protects the entire unit when not in use
- Accessories included are (2) 3-foot lengths Tygon® tubing, (2) 1/8" pipe thread adapters and 3/4 oz. bottle of fluorescein green color concentrate with wetting agent

Maximum pressure: 100 psig with optional pipe thread connections.

Tygon® is a registered trademark of Saint-Gobain Corporation

DWYER INSTRUMENTS, INC.

P.O. BOX 373

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e-mail: info@dwyer-inst.com



CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

PXPKG TUALATIN OR H
10450 SW TUALATIN SHERWOOD ROAD
TUALATIN OR 97062

Certificate Modification Date: 10/01/2018
Praxair Order Number: 70743165
Part Number: NI CD17CO8E-AS

Fill Date: 09/26/2018
Lot Number: 70086826911
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure and Volume: 1290 psig 140 ft3

Certified Concentration

Expiration Date:	10/01/2026	NIST Traceable
Cylinder Number:	SA17187	Expanded Uncertainty
17.00 %	Carbon dioxide	± 0.3 %
4.31 %	Carbon monoxide	± 0.6 %
16.99 %	Oxygen	± 0.2 %
Balance	Nitrogen	

ProSpec EZ Cert



Certification Information:

Certification Date: 10/01/2018 Term: 96 Months Expiration Date: 10/01/2026

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.
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: 17 %
Certified Concentration: 17.00 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method: NDIR
Last Multipoint Calibration: 09/21/2018

First Analysis Data:		Date	
Z: 0	R: 20.1	C: 17	Conc: 17
R: 20.1	Z: 0	C: 17	Conc: 17
Z: 0	C: 17.01	R: 20.11	Conc: 17.01
UOM: %	Mean Test Assay: 17		%

Reference Standard: Type / Cylinder #: GMIS / CC187238
Concentration / Uncertainty: 20.10 % ±0.24%
Expiration Date: 06/07/2026

Traceable to: SRM # / Sample # / Cylinder #: RGM#CC193512 / NIA / RGM#CC193512
SRM Concentration / Uncertainty: 26.99% / ±0.05%
SRM Expiration Date: 05/15/2023

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: 4.25 %
Certified Concentration: 4.31 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method: NDIR
Last Multipoint Calibration: 09/21/2018

First Analysis Data:		Date	
Z: 0	R: 5	C: 4.31	Conc: 4.31
R: 5	Z: 0	C: 4.3	Conc: 4.3
Z: 0	C: 4.32	R: 5.01	Conc: 4.32
UOM: %	Mean Test Assay: 4.31		%

Reference Standard: Type / Cylinder #: GMIS / CC242633
Concentration / Uncertainty: 5.00 % ±0.543%
Expiration Date: 04/03/2025

Traceable to: SRM # / Sample # / Cylinder #: SRM 2642a / 51-D-23 / FF23106
SRM Concentration / Uncertainty: 7.859% / ±0.039%
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: 17 %
Certified Concentration: 16.99 %
Instrument Used: OXYMAT 5E
Analytical Method: Paramagnetic
Last Multipoint Calibration: 09/04/2018

First Analysis Data:		Date	
Z: 0	R: 20.86	C: 16.99	Conc: 16.99
R: 20.86	Z: 0	C: 16.99	Conc: 16.99
Z: 0	C: 16.99	R: 20.86	Conc: 16.99
UOM: %	Mean Test Assay: 16.99		%

Reference Standard: Type / Cylinder #: GMIS / CC75874
Concentration / Uncertainty: 20.86 % ±0.111%
Expiration Date: 11/07/2025

Traceable to: SRM # / Sample # / Cylinder #: SRM 2659a / 71-E-19 / FF22331
SRM Concentration / Uncertainty: 20.863% / ±0.021%
SRM Expiration Date: 08/23/2021

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

Jose Vasquez

Certified By

Danielle Burns



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

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	

ProSpec EZ Cert



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
Z: 0	R: 14.02	C: 10	Conc: 10	09/05/2018
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
Z: 0	R: 2.48	C: 2.51	Conc: 2.51	09/05/2018
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
Z: 0	R: 9.88	C: 10.49	Conc: 10.49	09/05/2018
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 / NIA / NTRM #DT0010402
SRM Concentration / Uncertainty: 9.875% / ±0.40%
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: José Vasquez

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

Verification of Standardization

of Tape Measure

by
Advanced Calibration Technologies
28111 S.E. Wally Road
Boring, OR 97009
1-800-259-5058



Customer: PFS Teco, Inc	Street: 11785 Southeast Highway 212 Suite 305
City: Clackamas State: OR	Zip: 97015 Location: In House
Machine Manufacturer: Dewalt	Model: 16' Tape Measure
Capacity: 0.000 - 192.000 inches 0.125 Divisions	Serial #: 090
Calibration Cycle: 12 Months	Lab ID#: #090
Previous Calibration Date: January 2019	Calibration Procedure: Ad-Tek SR
Equipment Used: Gauge Blocks S/N: ADGB002	Action Recommended:
If Other, Explain:	

Verification Data

Purpose: This method provides instructions for checking the critical dimensions of the equipment.			
Tolerance: Equipment shall meet the dimensional tolerances specified in the applicable test method.			
Procedure: Verified using manufacturer's procedures.			
Actual Dimensions (inches)	Unit Under Test As Found (inches)	Unit Under Test As Left (inches)	Difference (inches)
0.0000	0.000	0.000	0.000
0.1250	0.050	0.050	-0.075
0.2500	0.250	0.250	0.000
0.5000	0.500	0.500	0.000
0.7500	0.750	0.750	0.000
1.0000	1.000	1.000	0.000
3.0000	3.000	3.000	0.000
5.0000	5.000	5.000	0.000
7.0000	7.000	7.000	0.000
9.0000	9.000	9.000	0.000
12.0000	12.000	12.000	0.000
The overall condition of the device as found:		Within Specification	
The overall condition of the device as left:		Within Specification	
The measurement of uncertainty (MU) was calculated to be:		0.00060	

File No: PFS-101666-0119D0120-AH-SR-090

Temperature: 72.1°F Humidity: 41.1%

The equipment used in the verification of this instrument has been calibrated and is NIST traceable.
The uncertainty of calibration was estimated at the 95% confidence level, coverage factor (k=2).

Remarks:

This certificate of verification is issued as a statement of fact that on the date of verification the above instrument had an accuracy as indicated and was calibrated to meet the requirements of the manufacturer's specifications. This certificate should not be construed or regarded as a guarantee or warranty of any kind that the instrument will retain the same percentage of accuracy as determined on the date when the verification was performed and reported. Ad-Tek, Inc. hereby expressly disclaims any and all liability for damage or loss by all parties arising or resulting from deterioration, obsolescence, malfunction, subsequent calibration performed by another agency or substandard performance of said instrument.

This report and certificate of verification shall not be reproduced except in full, without the written approval of Ad-Tek, Inc.

Service Technician: Alisa Houser Date of Service: January 16, 2019

Technical Manager: Nicole Ostrowski Date Next Due: January 2020

We sincerely appreciate your business and thank you for selecting Advanced Calibration Technologies, Inc. for servicing your equipment.
To reschedule, please call (800) 259-5058. Thank You.

Verification of Standardization

of Calipers

by
Advanced Calibration Technologies
28111 S.E. Wally Road
Boring, OR 97009
1-800-259-5058



Customer: PFS Teco, Inc	Street: 11785 Southeast Highway 212 Suite 305
City: Clackamas State: OR	Zip: 97015 Location: In House
Machine Manufacturer: General	Model: 6" Digital Caliper
Capacity: 0.0000 - 6.0000 inches 0.0005 Divisions	Serial #: 092
Calibration Cycle: 12 Months	Lab ID#: 092
Previous Calibration Date: January 2018	Calibration Procedure: Ad-Tek DC
Equipment Used: Gauge Blocks S/N: ADGB002	Action Recommended:
If Other, Explain:	

Verification Data

Purpose: This method provides instructions for checking the critical dimensions of the inside diameter of the equipment.			
Tolerance: Equipment shall meet the dimensional tolerances specified by the manufacturer for the inside diameter.			
Procedure: Verified using the procedure to meet manufacturer's tolerance for inside diameter.			
Actual Dimensions (inches)	Unit Under Test As Found (inches)	Unit Under Test As Left (inches)	Difference (inches)
0.0000	0.0000	0.0000	0.0000
0.0500	0.0500	0.0500	0.0000
0.1000	0.1000	0.1000	0.0000
0.1010	0.1010	0.1010	0.0000
0.1050	0.1050	0.1050	0.0000
0.1100	0.1100	0.1100	0.0000
0.1500	0.1500	0.1500	0.0000
0.5000	0.5000	0.5000	0.0000
1.0000	1.0000	1.0000	0.0000
3.0000	2.9995	2.9995	-0.0005
5.0000	4.9990	4.9990	-0.0010
The overall condition of the device as found:		Within Specification	
The overall condition of the device as left:		Within Specification	
The measurement of uncertainty (MU) was calculated to be:		0.00062	

This certificate does not reflect measurements for inside jaws, step height, or depth.

File No: PFS-101666-0119D0120-AH-DC-092

Temperature: 68.2°F Humidity: 41.6%

The equipment used in the verification of this instrument has been calibrated and is NIST traceable.
The uncertainty of calibration was estimated at the 95% confidence level, coverage factor (k=2).

Remarks: _____

This certificate of verification is issued as a statement of fact that on the date of verification the above instrument had an accuracy as indicated and was calibrated to meet the requirements of the manufacturer's specifications. This certificate should not be construed or regarded as a guarantee or warranty of any kind that the instrument will retain the same percentage of accuracy as determined on the date when the verification was performed and reported. Ad-Tek, Inc. hereby expressly disclaims any and all liability for damage or loss by all parties arising or resulting from deterioration, obsolescence, malfunction, subsequent calibration performed by another agency or substandard performance of said instrument.

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Service Technician: Alisa Houser Date of Service: January 15, 2019

Technical Manager: Nicole Ostrowski Date Next Due: January 2020

We sincerely appreciate your business and thank you for selecting Advanced Calibration Technologies, Inc. for servicing your equipment.
To reschedule, please call (800) 259-5058. Thank You.