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# Thelin Hearth Products, Inc.

Project # 22-827

Model: Parlor

Type: Pellet-Fired Room Heater

October 26, 2022

**Revised January 9, 2023**

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**ASTM E2779 Standard Test Method for  
Determining Particulate Matter  
Emissions from Pellet Heaters (EPA  
ALT-146)**

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Contact: Mr. Robert Beck  
Thelin Hearth Products, Inc.  
63 Lexalt Dr.  
Carson City, NV 89706  
(775)-241-2586 ext. 105

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Prepared by: Aaron Kravitz, Testing  
Supervisor



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

**[WWW.PFSTECO.COM](http://WWW.PFSTECO.COM)**

## **Revision History:**

Date: October 26, 2022 – Original Issue

Date: January 9, 2023 – The following change was made per request from EPA:

- Alternate test method approval letter added to Appendix A, see page 103 of Non-CBI report.

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## Affidavit

PFS-TECO was contracted by Thelin Hearth Products, Inc. to provide testing services for the Parlor Pellet-Fired Room Heater per ASTM E2779, *Determining PM Emissions from Pellet Heaters*. All testing and associated procedures were conducted at PFS-TECO's Portland Laboratory on 10/6/2022 and 10/10/2022. PFS-TECO's Portland Laboratory is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015. Testing procedures followed EPA ALT-146 / 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.

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Aaron Kravitz, Testing Supervisor

## Introduction

Theelin Hearth Products, Inc. of Carson City, NV, contracted with PFS-TECO to perform EPA certification testing on Parlor 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 heat 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 test was performed in accordance with EPA ALT-146 burn rate settings:
  - 1 Hour at Maximum Burn Setting
  - 2 Hours at Medium Burn Setting (less than the mid-point of the high and low rates)
  - 3 Hours at Minimum Burn Setting

## Pellet Heater Identification and Testing

- Appliance Tested: **Parlor**
- Serial Number: **N/A – Prototype Unit; PFS Tracking #0128**
- Manufacturer: **Thelin Hearth Products, Inc.**
- Catalyst: **No**
- Heat exchange blower: **Integral**
- Type: **Pellet Stove**
- Style: **Free Standing**
- Date Received: **Monday, September 19, 2022**
- Testing Period – Start: **Thursday, October 06, 2022** Finish: **Monday, October 10, 2022**
- 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: **N/A**

## 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
189	Mettler Toledo 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
203	APEX XC-50-DIR Digital Emissions Sampling Box C
055	APEX Ambient sampling box
057	California Analytical ZRE CO2/CO/O2 IR ANALYZER
202	Digital Barometer
109A/B	Troemner 100mg/200mg Audit Weights
107	Sartorius Analytical Balance
097	10 lb audit weight
095	Anemometer
111	Microtector
CC106574	Gas Analyzer Calibration Span Gas
CC139173	Gas Analyzer Calibration Mid Gas

## Results

The integrated test run emission rate for test Run 2 was measured to be **0.92 g/hr** with a Higher Heating Values efficiency of **81%** and a CO emission rate of **0.11 g/min**. The calculated first hour particulate emission rate was **1.1 g/hr**. The Thelin Hearth Products, Inc. Model Parlor Pellet-Fired Room Heater meets the 2020 PM emission standard of  $\leq 2.0$  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								
2	10/10/22	H	1.90	60	28172	1.1	0.92	0.2	0.11	80%	81%
		M	1.41	120	21210			0.1		81%	
		L	0.93	180	14387			0.1		83%	
		OA	1.25	360	18977			0.1		81%	



## Test Run Narrative

### Run 1

Run 1 was performed on 10/6/2022 as an attempted integrated test run per EPA ALT-146/ ASTM E2779. The overall test duration was 360 minutes. The particulate emissions rate for the integrated test run was 1.3 g/hr. The run had an overall HHV efficiency of 82%. A separate filter train C was run for the first hour of the run only. All test results were appropriate and valid, however, the medium burn rate of 1.59 kg/hr exceeds the midpoint of the burn rates of the high and low segments (1.51 kg/hr). Therefore, the burn rate requirements for the integrated test run were not achieved and the run is not valid. See data summary below:

<b>Run 1 Data - **RUN IS INVALID DUE TO MEDIUM BURN RATE**</b>											
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	10/6/2022	H	1.98	60	29471	2.2	1.3	0.22	0.18	80%	82%
		M	1.59	120	24118			0.23		82%	
		L	1.05	180	16297			0.13		83%	
		OA	1.38	360	21123			0.18		82%	

### Run 2

Run 2 was performed on 10/10/2022 as an attempted integrated test run per EPA ALT-146/ ASTM E2779. The overall test duration was 360 minutes. The particulate emissions rate for the integrated test run was 0.92 g/hr. The run had an overall HHV efficiency of 81%. A separate filter train C was run for the first hour of the run only. 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	70	76	54.4	44.4	29.96	4.7	19.0	3.78	360
2	70	76	44.0	38.1	29.93	4.2	17.2	3.78	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
<b>Run 1</b>	"High" selected Trim pot at 1:00	High Segment: "High" selected, Trim pot at 1:00 Medium Segment: "Med" selected, Trim pot at 1:00 Low Segment: "Low" selected, Trim pot at 1:00
<b>Run 2</b>	"High" selected Trim pot at 9:00	High Segment: "High" selected, Trim pot at 9:00 Medium Segment: "Med" selected, Trim pot at 7:00 Low Segment: "Low" selected, Trim pot at 9:00

## Appliance Description

**Model(s):** Parlor

**Appliance Type:** Pellet-Fired Room Heater

**Air Introduction System:** A variable speed combustion fan forces air into the firebox through holes in the bottom of the firepot.

**Combustion Control:** A control panel on the side of the unit is used to select burn rates, which are varied by automatic modulation of the combustion fan and feed system. An automatically controlled distribution bower is also installed.

**Fueling System:** A horizontal auger driven by a gear motor, meters pellets through a drop tube (over feed) to a fire pot in the firebox.

**Baffles:** N/A

**Flue Outlet:** Venting is through a 3" diameter steel pipe, which exits through the back of the unit. The venting system is to be 3" nominal diameter listed type L or type PL vent pipe with all the joints sealed.

## Appliance Dimensions

PARLOR Dimensions

Height	Width	Depth	Firebox Volume	Weight
43"	20"	20"	N/A – Pellet Stove	180 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:W222-0658-01  
**Issue No:** 1

## Analytical Test Report

**Client:** PFS-TECO  
 11785 SE Hwy 212 Ste 305  
 Clackamas, OR 97015  
**Attention:** Sebastian Button  
**PO No:**

**Signed:**  
  
 Amber Anderson  
 Chemist  
**Date of Issue:** 10/17/2022  
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

**Sample Details**  
**Sample Log No:** W222-0658-01  
**Sample Designation:** Wood Pellets  
**Sample Recognized As:** Biomass Pellets  
**Sample Date:**  
**Sample Time:**  
**Arrival Date:** 10/6/2022

	METHOD	UNITS	MOISTURE	
			FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		3.64
Ash	ASTM D1102	wt. %	0.52	0.50
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.014	0.014
SO <sub>2</sub>	Calculated	lb/mmbtu		0.034
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.12	17.37
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8442	8135
Carbon	ASTM D5373	wt. %	44.90	43.26
Hydrogen*	ASTM D5373	wt. %	6.96	6.70
Nitrogen	ASTM D5373	wt. %	0.57	0.55
Oxygen*	ASTM D3176	wt. %	47.04	45.33

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

Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft <sup>3</sup>		
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:**

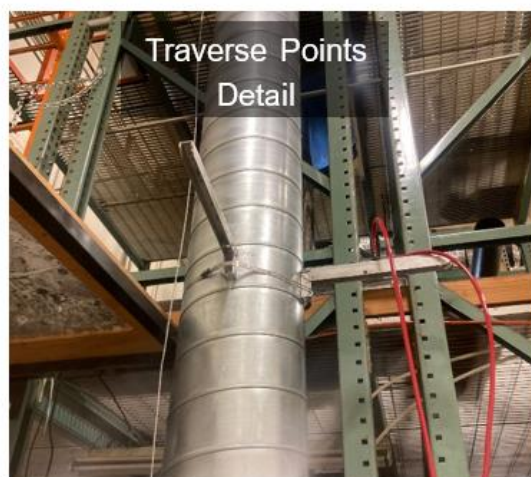
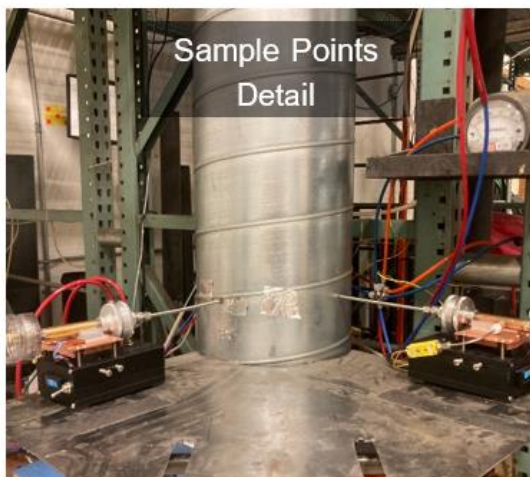
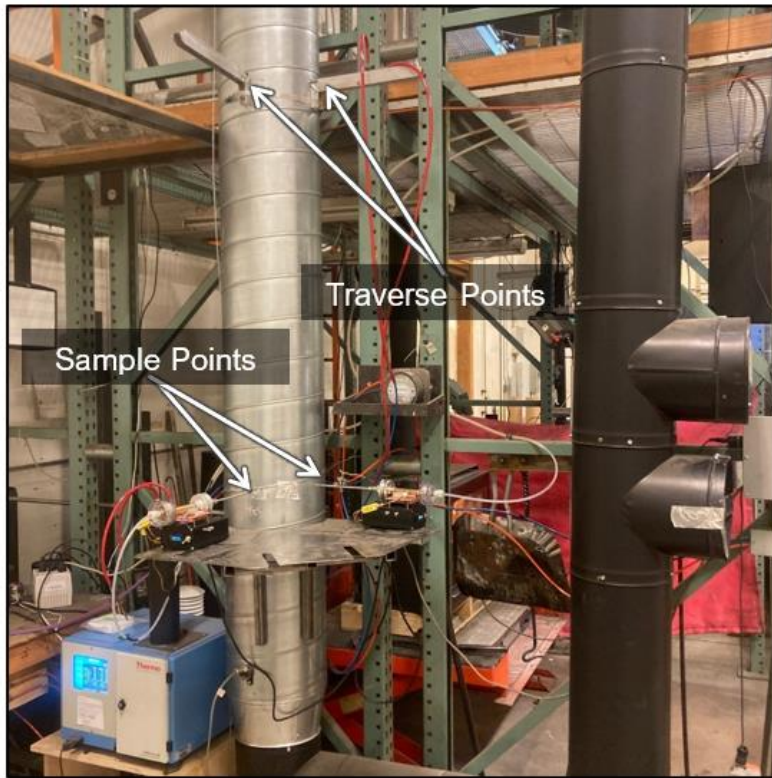


Accreditation #60243

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 2 feet upstream from any disturbances. Flow rate traverse data was collected 8 feet downstream from any disturbances and 4 feet upstream from any disturbances. (See below).





## Sampling Methods

ASTM E2515 was used in collecting particulate samples. The dilution tunnel is 12 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 Dr, 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 INACCORDANCE WITH REQUIREMNTS OF 40CFR PART 60 SUBPART AAA §60.535 (a)(2)(vii)

REPORT # \_\_\_\_\_

DATE SEALED \_\_\_\_\_

MANUFACTURER \_\_\_\_\_

MODEL # \_\_\_\_\_

## Sealed Unit



## List of Appendices

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

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

Appendix B – Labels and Manuals

Appendix C – Equipment Calibration Records

Appendix D – Design Drawings (CBI Report Only)

Appendix E – Manufacturer QAP (CBI Report Only)

## Pre-Conditioning Data

Client: Sierra	Job #: 22-827
Model: Parlor	Tracking #: 128
Date(s): 9/24/22 - 10/6/22	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	406		+23 lb, bear mtn pellets
1	396		
2	337		
3	322		
4	318		
5	335		+41 lb, bear mtn pellets
6	351		
7	314		
8	269		
9	256		
10	257		
11	243		
12	253		
13	245		
14	239		
15	240		
16	243		
17	242		
18	230		
19	221		
20	219		
21	267		+11 lb, bear mtn pellets
22	259		
23	254		
24	252		
25	248		
26	246		+36 lb, bear mtn pellets
27	231		
28	223		
29	220		
30	225		
31	216		
32	209		
33	212		
34	211		
35	203		
36	343		+7 lb, bear mtn pellets
37	325		
38	287		
39	358		
40	368		
41	292		+19 lb, bear mtn pellets
42	266		
43	268		
44	247		
45	230		
46	215		
47	220		
48	235		
49	220		
50	213		

## Equations and Sample Calculations – ASTM E2779 & E2515

Client Thelin  
 Model: Parlor  
 Tracking #: 128  
 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<sub>Bdb</sub> – 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<sub>Swb</sub> = weight of test fuel in hopper at start of test run, wet basis, kg

M<sub>Ewb</sub> = weight of test fuel in hopper at end of test run, wet basis, kg

Sample Calculation:

$$FM = 3.78 \%$$

$$M_{Swb} = 19.0 \text{ lbs}$$

$$M_{Ewb} = 0.0 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{Bdb} = [(19.0 \times 0.4536) - (0.0 \times 0.4536)] (100/(100 + 3.778))$$

$$M_{Bdb} = \mathbf{8.3 \text{ kg}}$$

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

$$M_{BSidb} = (M_{S_{Siwb}} - M_{E_{Siwb}})(100/(100 + FM))$$

Where,

$M_{S_{Siwb}}$  = weight of test fuel in hopper at start of test run segment  $i$ , wet basis, kg

$M_{E_{Siwb}}$  = weight of test fuel in hopper at end of test run segment  $i$ , wet basis, kg

Sample Calculation (from medium burn rate segment):

$$FM = 3.78 \%$$

$$M_{S_{Siwb}} = 14.5 \text{ lbs}$$

$$M_{E_{Siwb}} = 7.2 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{BSidb} = [(14.5 \times 0.4536) - (7.2 \times 0.4536)] (100/(100 + 3.78))$$

$$M_{BSidb} = \mathbf{3.18 \text{ kg}}$$

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

ASTM E2779 equation (3)

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

Where,

$$\theta = \text{Total length of full integrated test run, min}$$

Sample Calculation:

$$M_{Bdb} = 8.30 \quad \text{kg}$$
$$\theta = 360 \quad \text{min}$$

$$BR = \frac{60 \times 8.3}{360}$$

$$BR = 1.38 \quad \text{kg/hr}$$



**BR<sub>Si</sub> – 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):

$$M_{BSidb} = 3.18 \text{ kg}$$

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

$$BR = \frac{60 \times 3.18}{120}$$

$$BR = 1.59 \text{ kg/hr}$$

**$V_s$  – 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
- $\Delta P^*$  = Velocity pressure in the dilution tunnel, in  $H_2O$
- $T_s$  = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- $P_s$  = Absolute average gas static pressure in dilution tunnel, =  $P_{bar} + P_g$ , in Hg
- $P_{bar}$  = Barometric pressure at test site, in. Hg
- $P_g$  = Static pressure of tunnel, in.  $H_2O$ ; (in Hg = in  $H_2O$ /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:

$$F_p = \frac{7.02}{7.96} = 0.882$$

$$V_s = 0.882 \times 85.49 \times 0.99 \times 0.117 \times \left( \frac{83.5 + 460}{29.96 + \frac{-0.17}{13.6}} \right)^{1/2} \times 28.78$$

$$V_s = \mathbf{6.94 \text{ ft/s}}$$

\*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<sub>sd</sub> – Average gas flow rate in dilution tunnel, dscf/hr**

ASTM E2515 equation (3)

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

Where:

- 3600 = Conversion from seconds to hours (ASTM method uses 60 to convert in minutes)
- B<sub>ws</sub> = Water vapor in gas stream, proportion by volume; assume 2%
- A = Cross sectional area of dilution tunnel, ft<sup>2</sup>
- T<sub>std</sub> = Standard absolute temperature, 528 °R
- P<sub>s</sub> = Absolute average gas static pressure in dilution tunnel, = P<sub>bar</sub> + P<sub>g</sub>, in Hg
- T<sub>s</sub> = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- P<sub>std</sub> = Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 6.94 \times 0.7854 \times \frac{528}{83.5 + 460} \times \frac{29.96 + \frac{-0.17}{13.6}}{29.92}$$

**Q<sub>sd</sub> = 18706.4 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
$\Delta H$	=	Average pressure differential across the orifice meter, in. H <sub>2</sub> O
$T_m$	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train A:

$$V_{m(std)} = 17.64 \times 51.562 \times 1 \times \frac{\left( 29.96 + \frac{1.99}{13.6} \right)}{\left( 95.7 + 460 \right)}$$

$$V_{m(std)} = \mathbf{49.277} \text{ dscf}$$

Using equation for Train B:

$$V_{m(std)} = 17.64 \times 51.643 \times 1 \times \frac{\left( 29.96 + \frac{2.03}{13.6} \right)}{\left( 96.0 + 460 \right)}$$

$$V_{m(std)} = \mathbf{49.333} \text{ dscf}$$

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 48.00 \times 1 \times \frac{\left( \underline{29.96} + \frac{0.00}{13.6} \right)}{\left( 72.9 + 460 \right)}$$

$$V_{m(std)} = \mathbf{47.600} \text{ dscf}$$

**$m_n$  – 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):

$$m_n = 0.0 + 3.5 + 0.0$$

$$m_n = 3.5 \text{ mg}$$

Using equation for Train A (remainder):

$$m_n = 0.1 + 0.8 + 0.1$$

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

Train A Aggregate = **4.5 mg**

Using equation for Train B:

$$m_n = 0.0 + 3.2 + 0.2$$

$$m_n = \mathbf{3.4 \text{ mg}}$$

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

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

Where:

- $K_2$  = Constant, 0.001 g/mg  
 $m_n$  = Total mass of particulate matter collected in the sampling train, mg  
 $V_{m(\text{std})}$  = Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train A:

$$C_s = 0.001 \times \frac{4.5}{49.28}$$

$$C_s = \mathbf{0.00009} \text{ g/dscf}$$

For Train B:

$$C_s = 0.001 \times \frac{3.4}{49.33}$$

$$C_s = \mathbf{0.00007} \text{ g/dscf}$$

For Ambient Train

$$C_r = 0.001 \times \frac{0.0}{47.60}$$

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

**E<sub>T</sub> – Total Particulate Emissions, g**

ASTM E2515 equation (15)

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

Where:

- C<sub>s</sub> = Concentration of particulate matter in tunnel gas, g/dscf
- C<sub>r</sub> = Concentration particulate matter room air, g/dscf
- Q<sub>std</sub> = Average dilution tunnel gas flow rate, dscf/hr
- θ = Total time of test run, minutes

Sample calculation:

For Train A

$$E_T = ( \underline{0.000091} - 0.000000 ) \times \underline{18706.4} \times \underline{360} /60$$
$$E_T = \underline{10.25} \text{ g}$$

For Train B

$$E_T = ( \underline{0.000069} - 0.000000 ) \times \underline{18706.4} \times \underline{360} /60$$
$$E_T = \underline{7.74} \text{ g}$$

Average

$$E = \underline{8.99} \text{ g}$$

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

- 7.5% of the average = 0.67
- Train A difference = 1.26
- Train B difference = 1.26

**PR - Proportional Rate Variation**

ASTM E2515 equation (16)

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

Where:

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

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

$$PR = \left( \frac{360 \times 0.133 \times 6.94 \times (95.7 + 460) \times (83.8 + 460)}{1 \times 51.562 \times 6.76 \times (83.5 + 460) \times (71.7 + 460)} \right) \times 100$$

$$PR = \underline{100} \%$$



**PM<sub>R</sub> – 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

$\theta$  = Total length of full integrated test run, min

Sample Calculation:

$$E_T \text{ (Dual train average)} = 8.99 \text{ g}$$

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

$$PM_R = 60 \times ( 8.99 / 360 )$$

$$PM_R = 1.50 \text{ g/hr}$$

**PM<sub>F</sub> – 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<sub>T</sub> = Total particulate emissions, grams

M<sub>Bdb</sub> = Weight of test fuel burned during test run, dry basis, kg

Sample Calculation:

$$E_T \text{ (Dual train average)} = 8.99 \text{ g}$$

$$M_{Bdb} = 8.30 \text{ kg}$$

$$PM_F = 8.99 / 8.30 )$$

$$PM_F = 1.08 \text{ g/kg}$$




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

**Report No:** USR:W222-0658-01  
**Issue No:** 1

# Analytical Test Report

**Client:** PFS-TECO  
 11785 SE Hwy 212 Ste 305  
 Clackamas, OR 97015  
**Attention:** Sebastian Button  
**PO No:**

Signed:   
 Amber Anderson  
 Chemist  
 Date of Issue: 10/17/2022  
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

**Sample Details**  
**Sample Log No:** W222-0658-01      **Sample Date:**  
**Sample Designation:** Wood Pellets      **Sample Time:**  
**Sample Recognized As:** Biomass Pellets      **Arrival Date:** 10/6/2022

Test Results			MOISTURE	AS
	METHOD	UNITS	FREE	RECEIVED
Moisture Total	ASTM E871	wt. %		3.64
Ash	ASTM D1102	wt. %	0.52	0.50
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.014	0.014
SO <sub>2</sub>	Calculated	lb/mmbtu		0.034
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.12	17.37
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8442	8135
Carbon	ASTM D5373	wt. %	44.90	43.26
Hydrogen*	ASTM D5373	wt. %	6.96	6.70
Nitrogen	ASTM D5373	wt. %	0.57	0.55
Oxygen*	ASTM D3176	wt. %	47.04	45.33
*Note: As received values do not include hydrogen and oxygen in the total moisture.				
Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft <sup>3</sup>		
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:**



Accreditation #60243

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



**Run 1 Data Summary**

Client: Thelin  
Model: Parlor  
Job #: 22-827  
Tracking #: 128  
Test Date: 10/6/2022

  
\_\_\_\_\_  
Tehnician Signature

10/26/2022  
\_\_\_\_\_  
Date

## TEST RESULTS - ASTM E2779 / ASTM E2515

Client: Thelin \_\_\_\_\_  
 Model: Parlor \_\_\_\_\_  
 Run #: 1 \_\_\_\_\_

Job #: 22-827 \_\_\_\_\_  
 Tracking #: 128 \_\_\_\_\_  
 Technician: AK \_\_\_\_\_  
 Date: 10/6/2022 \_\_\_\_\_

Burn Rate Summary	
High Burn Rate (dry kg/hr)	1.98
Medium Burn Rate (dry kg/hr)	1.59
Low Burn Rate (dry kg/hr)	1.05
Overall Burn Rate (dry kg/hr)	1.38

Medium Burn Rate Target: < 1.51 dry kg/hr

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft <sup>3</sup> )	47.998	51.562	51.643	8.527
Average Gas Velocity in Dilution Tunnel (ft/sec)	6.9			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	18706.4			
Average Gas Meter Temperature (°F)	72.9	95.7	96.0	78.7
Total Sample Volume (dscf)	48.933	49.277	49.333	8.407
Average Tunnel Temperature (°F)	83.5			
Total Time of Test (min)	360			
Total Particulate Catch (mg)	0.0	3.5	3.4	1.0
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0000710	0.0000689	0.0001189
Total PM Emissions (g)	0.00	7.97	7.74	2.23
Particulate Emission Rate (g/hr)	0.00	1.33	1.29	2.23
Emissions Factor (g/kg)	-	0.96	0.93	1.13
Difference from Average Total Particulate Emissions (g)	-	0.12	0.12	-
Difference from Average Total Particulate Emissions (%)	-	1.5%	1.5%	-
Difference from Average Emissions Factor (g/kg)	-	0.01	0.01	-

Final Average Results	
Total Particulate Emissions (g)	7.85
Particulate Emission Rate (g/hr)	1.31
Emissions Factor (g/kg)	0.95
HHV Efficiency (%)	82.0%
LHV Efficiency (%)	88.8%
CO Emissions (g/min)	0.18

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	80.1	OK
Face Velocity	< 30 ft/min	8.0	OK
Leakage Rate	Less than 4% of average sample rate	0.001 cfm	OK
Ambient Temp	55-90 °F	70 / 76.5	OK
Negative Probe Weight Evaluation	<5% of Total Catch	Probe Catch Not Negative	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	OK
Medium Burn Rate	< midpoint of the high and low burn rates	1.59	Not Acceptable

## Overall Pellet Test Efficiency Results

**Manufacturer:** Thelin  
**Model:** Parlor  
**Date:** 10/06/22  
**Run:** 1  
**Control #:** 22-827  
**Test Duration:** 360  
**Output Category:** Integrated

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

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	82.0%	88.8%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	82.4%	89.2%

<b>Output Rate (kJ/h)</b>	22,267	21,123	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.38	3.05	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	27,153	25,758	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	8.30	18.30	<b>dry lb</b>
<b>MC wet (%)</b>	3.64		
<b>MC dry (%)</b>	3.78		
<b>Particulate (g )</b>	7.85		
<b>CO (g)</b>	64		
<b>Test Duration (h)</b>	6.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.06	0.48
<b>g/kg Dry Fuel</b>	0.95	7.75
<b>g/h</b>	1.31	10.72
<b>g/min</b>	0.02	0.18
<b>lb/MM Btu Output</b>	0.14	1.12

<b>Air/Fuel Ratio (A/F)</b>	12.44
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VERSION:

2.2

12/14/2009

## Max Burn Rate Segment Efficiency Results

**Manufacturer:** Thelin  
**Model:** Parlor  
**Date:** 10/06/22  
**Run:** 1  
**Control #:** 22-827  
**Test Duration:** 60  
**Output Category:** Maximum

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

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	80.1%	86.7%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	80.5%	87.2%

<b>Output Rate (kJ/h)</b>	31,067	29,471	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.98	4.36	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	38,778	36,785	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	1.98	4.36	<b>dry lb</b>
<b>MC wet (%)</b>	3.64		
<b>MC dry (%)</b>	3.78		
<b>Particulate (g )</b>	N/A		
<b>CO (g)</b>	13		
<b>Test Duration (h)</b>	1.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	N/A	0.43
<b>g/kg Dry Fuel</b>	N/A	6.72
<b>g/h</b>	N/A	13.29
<b>g/min</b>	N/A	0.22
<b>lb/MM Btu Output</b>	N/A	0.99

<b>Air/Fuel Ratio (A/F)</b>	11.14
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VERSION:

2.2

12/14/2009

## Medium Burn Rate Segment Efficiency Results

**Manufacturer:** Thelin  
**Model:** Parlor  
**Date:** 10/06/22  
**Run:** 1  
**Control #:** 22-827  
**Test Duration:** 120  
**Output Category:** Medium

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

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	81.5%	88.3%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	81.9%	88.7%

<b>Output Rate (kJ/h)</b>	25,425	24,118	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.59	3.50	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	31,186	29,583	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	3.18	7.01	<b>dry lb</b>
<b>MC wet (%)</b>	3.64		
<b>MC dry (%)</b>	3.78		
<b>Particulate (g )</b>	N/A		
<b>CO (g)</b>	27		
<b>Test Duration (h)</b>	2.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	N/A	0.54
<b>g/kg Dry Fuel</b>	N/A	8.58
<b>g/h</b>	N/A	13.64
<b>g/min</b>	N/A	0.23
<b>lb/MM Btu Output</b>	N/A	1.25

<b>Air/Fuel Ratio (A/F)</b>	11.66
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VERSION:

2.2

12/14/2009



## Minimum Burn Rate Segment Efficiency Results

**Manufacturer:** Thelin  
**Model:** Parlor  
**Date:** 10/06/22  
**Run:** 1  
**Control #:** 22-827  
**Test Duration:** 180  
**Output Category:** Minimum

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

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	83.4%	90.3%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	83.9%	90.8%

<b>Output Rate (kJ/h)</b>	17,180	16,297	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.05	2.31	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	20,590	19,532	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	3.15	6.94	<b>dry lb</b>
<b>MC wet (%)</b>	3.64		
<b>MC dry (%)</b>	3.78		
<b>Particulate (g )</b>	N/A		
<b>CO (g)</b>	24		
<b>Test Duration (h)</b>	3.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	N/A	0.46
<b>g/kg Dry Fuel</b>	N/A	7.61
<b>g/h</b>	N/A	7.99
<b>g/min</b>	N/A	0.13
<b>lb/MM Btu Output</b>	N/A	1.08

<b>Air/Fuel Ratio (A/F)</b>	13.53
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VERSION:

2.2

12/14/2009

## DILUTION TUNNEL & MISC. DATA - ASTM E2779 / E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1  
 Test Start Time: 8:19

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

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

Meter Box  $\gamma$  Factor: 1 (A)  
 Meter Box  $\gamma$  Factor: 1.000 (B)  
 Meter Box  $\gamma$  Factor: 1.000 (C)  
 Meter Box  $\gamma$  Factor: 1.028 (Ambient)  
 Induced Draft Check (in. H<sub>2</sub>O): 0  
 Smoke Capture Check (%): 100%  
 Date Flue Pipe Last Cleaned: 10/4/2022

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	29.95	29.97	29.96
Relative Humidity (%)	54.4	44.4	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	
Ambient Sample Volume:	47.998		ft <sup>3</sup>

Sample Train Post-Test Leak Checks			
(A)	0.000	cfm @	-5 in. Hg
(B)	0.001	cfm @	-4 in. Hg
(C)	0.000	cfm @	-5 in. Hg
(Ambient)	0.000	cfm @	-12 in. Hg

## DILUTION TUNNEL FLOW

### Traverse Data

Point	dP (in H <sub>2</sub> O)	Temp (°F)
1	0.004	85
2	0.012	84
3	0.014	84
4	0.014	84
5	0.012	84
6	0.010	84
7	0.010	84
8	0.014	84
9	0.012	84
10	0.014	84
11	0.012	84
12	0.006	84
Center	0.014	84

Dilution Tunnel H<sub>2</sub>O: 2.00 percent  
 Tunnel Diameter: 12 inches  
 Pitot Tube C<sub>p</sub>: 0.99 [unitless]  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Tunnel Area: 0.7854 ft<sup>2</sup>  
 $V_{strav}$ : 7.018 ft/sec  
 $V_{scent}$ : 7.957 ft/sec  
 $F_p$ : 0.882 [ratio]  
 Initial Tunnel Flow: 314.8 scf/min

Static Pressure: -0.170 in. H<sub>2</sub>O

## 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 Mtn
Pellet Fuel Grade:	PFI Premium
HHV (BTU/lb)	8442
%C	44.9
%H	6.96
%O	47.62
%Ash	0.52
MC (%WB)	3.64

## PELLET STOVE PREBURN DATA - ASTM E2779

Client: <u>Thelin</u>	Job #: <u>22-827</u>
Model: <u>Parlor</u>	Tracking #: <u>128</u>
Run #: <u>1</u>	Technician: <u>AK</u>
	Date: <u>10/6/2022</u>

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

Elapsed Time (min)	Scale Reading (lbs)	Average:		Flue Draft (in H <sub>2</sub> O)	Flue (°F)	Ambient (°F)
		Weight Change (lbs)				
			-0.062		383	69
0	37.9	-		-0.046	238	67
1	37.8	-0.15		-0.050	281	67
2	37.6	-0.14		-0.054	317	67
3	37.5	-0.11		-0.057	343	67
4	37.4	-0.1		-0.057	359	67
5	37.3	-0.09		-0.059	371	68
6	37.3	-0.09		-0.059	378	68
7	37.2	-0.08		-0.058	383	68
8	37.1	-0.08		-0.061	387	68
9	37.0	-0.07		-0.058	389	68
10	36.9	-0.09		-0.061	393	68
11	36.9	-0.06		-0.059	391	68
12	36.8	-0.1		-0.061	395	68
13	36.7	-0.07		-0.061	395	68
14	36.6	-0.07		-0.062	393	68
15	36.5	-0.09		-0.064	394	68
16	36.5	-0.08		-0.063	396	68
17	36.4	-0.08		-0.062	396	69
18	36.3	-0.05		-0.061	392	69
19	36.3	-0.07		-0.060	390	69
20	36.2	-0.08		-0.062	389	69
21	36.1	-0.09		-0.063	393	69
22	36.0	-0.07		-0.061	395	69
23	35.9	-0.08		-0.064	395	69
24	35.9	-0.08		-0.061	396	69
25	35.8	-0.07		-0.062	394	69
26	35.7	-0.07		-0.062	394	69
27	35.6	-0.08		-0.063	396	69
28	35.6	-0.09		-0.063	399	69
29	35.5	-0.08		-0.063	400	69
30	35.4	-0.07		-0.063	401	70
31	35.3	-0.08		-0.063	401	69
32	35.2	-0.08		-0.063	400	70
33	35.2	-0.07		-0.066	398	70
34	35.1	-0.08		-0.065	397	70
35	35.0	-0.07		-0.063	397	70
36	35.0	-0.06		-0.061	395	70
37	34.9	-0.06		-0.061	390	70
38	34.8	-0.06		-0.062	388	70
39	34.8	-0.07		-0.065	387	69
40	34.7	-0.07		-0.062	384	68
41	34.6	-0.08		-0.062	385	68
42	34.6	-0.07		-0.063	383	68
43	34.5	-0.07		-0.064	384	68
44	34.4	-0.08		-0.063	385	69
45	34.3	-0.08		-0.065	388	69
46	34.2	-0.08		-0.063	389	69



# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: ThelinJob #: 22-827Model: ParlorTracking #: 128Run #: 1Technician: AKDate: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.014	1.25	71.9	0.57		19.0		84	390	69	70
1	0.133	0.133	0.013	1.86	71.7	0.71	100	18.9	-0.1	84	391	70	70
2	0.271	0.138	0.014	1.88	71.7	0.73	100	18.9	0.0	84	387	70	70.2
3	0.407	0.136	0.013	1.90	71.8	0.72	102	18.8	-0.1	84	387	70	70
4	0.544	0.137	0.014	1.90	71.8	0.67	99	18.7	-0.1	84	387	70	70.3
5	0.684	0.140	0.014	1.91	71.9	0.75	101	18.6	-0.1	84	389	70	70.2
6	0.818	0.134	0.013	1.92	72	0.74	100	18.6	-0.1	84	388	71	70.2
7	0.960	0.142	0.013	1.93	72.1	0.71	106	18.5	-0.1	84	390	71	70.3
8	1.096	0.136	0.013	1.94	72.3	0.74	102	18.4	-0.1	84	391	71	70.1
9	1.234	0.138	0.013	1.94	72.4	0.78	103	18.4	-0.1	84	391	71	70.2
10	1.376	0.142	0.013	1.95	72.6	0.77	106	18.3	-0.1	85	391	71	70
11	1.511	0.135	0.013	1.96	72.8	0.74	101	18.2	-0.1	85	392	71	70.1
12	1.654	0.143	0.013	1.96	73	0.72	107	18.1	-0.1	84	394	71	70.2
13	1.791	0.137	0.013	1.96	73.2	0.75	102	18.1	-0.1	84	393	72	70.1
14	1.931	0.140	0.013	1.98	73.5	0.76	105	18.0	-0.1	85	392	72	70.3
15	2.073	0.142	0.013	1.99	73.7	0.75	106	17.9	-0.1	84	392	72	70.3
16	2.210	0.137	0.013	1.98	74	0.74	102	17.8	-0.1	84	393	72	70.5
17	2.354	0.144	0.013	1.99	74.2	0.74	108	17.8	-0.1	85	394	72	70.4
18	2.492	0.138	0.014	2.00	74.5	0.76	99	17.7	-0.1	85	395	72	70.4
19	2.632	0.140	0.013	2.01	74.8	0.8	104	17.6	-0.1	84	395	72	70.4
20	2.776	0.144	0.013	2.02	75.1	0.8	107	17.5	-0.1	85	395	72	70.6
21	2.913	0.137	0.014	2.00	75.4	0.77	98	17.4	-0.1	85	396	72	70.7
22	3.059	0.146	0.013	2.02	75.7	0.79	109	17.4	-0.1	85	395	72	70.5
23	3.198	0.139	0.013	2.02	76.1	0.8	103	17.3	-0.1	85	394	73	70.7
24	3.339	0.141	0.013	2.02	76.3	0.8	105	17.2	-0.1	85	393	73	70.5
25	3.483	0.144	0.013	2.03	76.7	0.83	107	17.1	-0.1	85	394	73	70.6
26	3.623	0.140	0.014	2.04	77.1	0.8	100	17.1	-0.1	85	396	73	70.5
27	3.767	0.144	0.013	2.03	77.4	0.78	107	17.0	-0.1	85	396	73	70.5
28	3.907	0.140	0.013	2.03	77.7	0.79	104	16.9	-0.1	85	395	73	70.7
29	4.052	0.145	0.013	2.05	78.1	0.81	108	16.9	-0.1	85	394	73	70.6
30	4.193	0.141	0.013	2.05	78.4	0.82	104	16.8	-0.1	85	394	73	70.6
31	4.336	0.143	0.013	2.05	78.7	0.79	106	16.7	-0.1	85	391	73	70.6
32	4.481	0.145	0.013	2.07	79.1	0.8	107	16.6	-0.1	85	392	73	70.5

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	4.622	0.141	0.013	2.06	79.4	0.82	104	16.6	-0.1	85	394	73	70.6
34	4.767	0.145	0.013	2.05	79.7	0.81	107	16.5	-0.1	85	393	73	70.6
35	4.908	0.141	0.013	2.07	80.1	0.84	104	16.4	-0.1	85	393	73	70.6
36	5.056	0.148	0.013	2.08	80.4	0.84	109	16.3	-0.1	85	395	73	70.7
37	5.197	0.141	0.013	2.08	80.8	0.83	104	16.3	-0.1	85	397	73	70.9
38	5.341	0.144	0.013	2.07	81.1	0.81	106	16.2	-0.1	86	401	73	70.8
39	5.485	0.144	0.013	2.05	81.5	0.85	106	16.1	-0.1	86	404	73	70.9
40	5.629	0.144	0.013	2.08	81.8	0.85	106	16.0	-0.1	86	405	74	70.7
41	5.775	0.146	0.013	2.07	82.1	0.83	108	15.9	-0.1	86	405	74	70.8
42	5.916	0.141	0.013	2.08	82.4	0.85	104	15.9	-0.1	86	406	74	70.8
43	6.063	0.147	0.013	2.07	82.7	0.83	108	15.8	-0.1	86	407	74	70.9
44	6.205	0.142	0.013	2.08	83.1	0.86	104	15.7	-0.1	86	409	74	70.7
45	6.353	0.148	0.013	2.08	83.4	0.84	109	15.6	-0.1	86	404	74	70.7
46	6.496	0.143	0.013	2.09	83.7	0.86	105	15.6	-0.1	86	401	74	70.9
47	6.640	0.144	0.014	2.08	84	0.84	102	15.5	-0.1	86	399	74	70.9
48	6.785	0.145	0.013	2.08	84.2	0.84	106	15.4	-0.1	86	398	74	70.9
49	6.929	0.144	0.013	2.09	84.6	0.82	106	15.3	-0.1	86	399	74	70.9
50	7.077	0.148	0.014	2.10	84.8	0.88	105	15.3	-0.1	86	396	74	70.8
51	7.219	0.142	0.014	2.09	85.1	0.84	100	15.2	-0.1	86	395	74	70.6
52	7.366	0.147	0.014	2.09	85.4	0.84	104	15.1	-0.1	86	396	74	70.8
53	7.508	0.142	0.013	2.10	85.6	0.85	104	15.0	-0.1	86	395	74	71
54	7.657	0.149	0.013	2.08	85.9	0.9	109	15.0	-0.1	86	392	74	71
55	7.801	0.144	0.013	2.11	86.2	0.88	105	14.9	-0.1	86	395	74	70.9
56	7.948	0.147	0.013	2.10	86.4	0.87	107	14.8	-0.1	85	396	74	71
57	8.091	0.143	0.013	2.10	86.7	0.86	104	14.7	-0.1	85	395	74	71
58	8.236	0.145	0.014	2.10	87	0.88	102	14.6	-0.1	85	396	74	71.5
59	8.383	0.147	0.014	2.11	87.2	0.85	103	14.6	-0.1	86	398	74	71.3
60	8.527	0.144	0.014	2.11	87.4	0.86	101	14.5	-0.1	86	401	74	71.3
61	8.675	0.148	0.014	2.10	87.6	0.89	104	14.4	-0.1	85	391	74	71.5
62	8.818	0.143	0.014	2.11	87.9	0.89	100	14.4	-0.1	85	384	74	71.5
63	8.966	0.148	0.014	2.11	88.1	0.89	104	14.3	-0.1	84	380	74	71.4
64	9.109	0.143	0.014	2.11	88.4	0.88	100	14.2	-0.1	84	379	74	71.4
65	9.258	0.149	0.014	2.10	88.6	0.88	104	14.2	-0.1	84	379	74	71.4

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: ThelinJob #: 22-827Model: ParlorTracking #: 128Run #: 1Technician: AKDate: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	9.402	0.144	0.013	2.12	88.8	0.89	105	14.1	-0.1	84	378	74	71.2
67	9.550	0.148	0.013	2.11	89	0.85	108	14.0	-0.1	84	375	74	71.1
68	9.694	0.144	0.013	2.11	89.3	0.88	105	14.0	0.0	84	371	74	71.1
69	9.841	0.147	0.013	2.10	89.5	0.88	107	13.9	-0.1	84	369	74	71.2
70	9.986	0.145	0.014	2.09	89.6	0.9	101	13.8	-0.1	84	371	74	71.3
71	10.132	0.146	0.013	2.10	89.8	0.93	106	13.7	-0.1	84	373	74	71.3
72	10.279	0.147	0.013	2.11	90.1	0.92	107	13.7	-0.1	84	374	74	71.3
73	10.424	0.145	0.013	2.10	90.2	0.9	105	13.6	-0.1	84	372	74	71.4
74	10.572	0.148	0.013	2.10	90.5	0.9	107	13.6	-0.1	84	370	74	71.5
75	10.715	0.143	0.014	2.11	90.7	0.89	100	13.5	-0.1	84	370	74	71.4
76	10.864	0.149	0.013	2.11	90.8	0.9	108	13.4	-0.1	84	368	74	71.4
77	11.007	0.143	0.014	2.11	91	0.92	100	13.4	-0.1	84	369	74	71.3
78	11.156	0.149	0.013	2.11	91.2	0.92	108	13.3	-0.1	84	368	74	71.3
79	11.301	0.145	0.014	2.11	91.4	0.94	101	13.2	-0.1	84	367	74	71.3
80	11.450	0.149	0.014	2.12	91.5	0.94	104	13.2	-0.1	84	365	74	71.3
81	11.594	0.144	0.014	2.12	91.7	0.89	100	13.1	-0.1	83	364	74	71.3
82	11.741	0.147	0.013	2.10	91.9	0.9	106	13.0	-0.1	84	365	74	71.3
83	11.886	0.145	0.013	2.12	92.1	0.91	105	13.0	-0.1	84	364	74	71.4
84	12.032	0.146	0.013	2.10	92.2	0.94	105	12.9	-0.1	84	366	74	71.4
85	12.180	0.148	0.013	2.11	92.3	0.9	107	12.8	-0.1	84	365	74	71.3
86	12.325	0.145	0.013	2.12	92.5	0.91	105	12.8	0.0	83	362	74	71.3
87	12.474	0.149	0.013	2.11	92.6	0.9	107	12.7	-0.1	83	360	74	71.5
88	12.618	0.144	0.013	2.11	92.8	0.93	104	12.6	-0.1	83	358	74	71.6
89	12.767	0.149	0.013	2.11	92.9	0.91	107	12.6	-0.1	83	357	74	71.6
90	12.910	0.143	0.013	2.11	93.1	0.93	103	12.5	-0.1	83	357	74	71.5
91	13.059	0.149	0.013	2.10	93.3	0.94	107	12.4	-0.1	83	357	74	71.7
92	13.203	0.144	0.013	2.11	93.3	0.92	104	12.4	-0.1	83	355	74	71.8
93	13.352	0.149	0.013	2.11	93.5	0.95	107	12.3	-0.1	83	353	74	71.4
94	13.497	0.145	0.013	2.11	93.6	0.97	104	12.3	-0.1	83	353	74	71.5
95	13.645	0.148	0.013	2.10	93.8	0.98	106	12.2	-0.1	83	351	74	71.5
96	13.790	0.145	0.013	2.10	93.8	0.93	104	12.2	0.0	83	347	74	71.5
97	13.937	0.147	0.013	2.10	94	0.95	106	12.1	-0.1	83	345	74	71.7
98	14.083	0.146	0.013	2.10	94.1	0.92	105	12.0	-0.1	83	345	74	71.7

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	14.229	0.146	0.013	2.09	94.3	0.94	105	12.0	-0.1	83	345	74	71.7
100	14.377	0.148	0.014	2.10	94.3	0.98	102	11.9	-0.1	83	343	74	71.8
101	14.522	0.145	0.014	2.10	94.4	0.94	100	11.9	-0.1	83	342	74	71.8
102	14.671	0.149	0.013	2.09	94.6	0.94	107	11.8	-0.1	83	342	74	71.6
103	14.815	0.144	0.013	2.11	94.7	0.92	103	11.7	-0.1	83	342	74	71.5
104	14.964	0.149	0.013	2.09	94.8	0.92	107	11.7	-0.1	83	342	74	71.6
105	15.107	0.143	0.013	2.09	94.9	0.94	103	11.6	-0.1	83	341	74	71.6
106	15.256	0.149	0.014	2.09	95	0.95	103	11.6	-0.1	83	342	74	71.7
107	15.400	0.144	0.013	2.09	95.1	0.96	103	11.5	-0.1	82	341	74	71.6
108	15.550	0.150	0.014	2.11	95.2	0.93	104	11.5	-0.1	83	340	74	71.7
109	15.695	0.145	0.014	2.09	95.3	0.93	100	11.4	-0.1	82	340	74	71.5
110	15.842	0.147	0.013	2.09	95.4	0.95	105	11.3	-0.1	83	340	74	71.5
111	15.987	0.145	0.013	2.08	95.5	0.97	104	11.3	-0.1	83	341	74	71.5
112	16.133	0.146	0.014	2.08	95.6	0.98	101	11.2	0.0	83	340	74	71.7
113	16.280	0.147	0.014	2.09	95.7	0.96	102	11.2	-0.1	83	341	74	71.5
114	16.425	0.145	0.014	2.08	95.7	0.97	100	11.1	-0.1	83	343	74	71.5
115	16.574	0.149	0.013	2.10	95.8	0.98	107	11.0	-0.1	83	344	74	71.6
116	16.718	0.144	0.013	2.09	95.9	0.93	103	11.0	-0.1	83	342	74	71.8
117	16.867	0.149	0.013	2.10	96	0.96	107	10.9	-0.1	83	344	74	71.6
118	17.010	0.143	0.013	2.08	96.1	0.94	102	10.9	-0.1	83	345	74	71.6
119	17.158	0.148	0.013	2.08	96.2	1	106	10.8	-0.1	83	347	74	71.8
120	17.302	0.144	0.013	2.08	96.3	0.97	103	10.7	-0.1	83	347	74	71.7
121	17.450	0.148	0.014	2.06	96.3	0.98	102	10.7	-0.1	83	346	74	71.9
122	17.595	0.145	0.014	2.08	96.4	1.02	100	10.6	-0.1	83	346	74	71.9
123	17.743	0.148	0.013	2.07	96.5	0.99	106	10.5	-0.1	83	346	74	71.9
124	17.887	0.144	0.014	2.07	96.6	1.01	99	10.5	-0.1	83	344	74	71.8
125	18.033	0.146	0.013	2.07	96.7	0.98	104	10.4	0.0	83	341	74	71.9
126	18.179	0.146	0.013	2.07	96.7	1	104	10.4	-0.1	83	338	74	71.9
127	18.324	0.145	0.013	2.06	96.8	0.99	104	10.3	-0.1	83	335	74	72
128	18.472	0.148	0.013	2.08	96.9	1	106	10.3	-0.1	83	333	74	71.9
129	18.617	0.145	0.013	2.07	96.9	1.03	104	10.2	-0.1	83	332	74	71.8
130	18.765	0.148	0.014	2.07	97	0.99	102	10.2	-0.1	83	333	74	71.8
131	18.908	0.143	0.014	2.06	97	0.99	99	10.1	-0.1	83	337	74	71.9



# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
132	19.056	0.148	0.013	2.06	97.1	1.01	106	10.0	-0.1	83	338	74	72
133	19.199	0.143	0.014	2.06	97.2	0.98	99	10.0	-0.1	83	339	74	72.1
134	19.348	0.149	0.013	2.07	97.2	1	107	9.9	-0.1	83	339	74	72.1
135	19.492	0.144	0.014	2.05	97.3	1.01	99	9.9	-0.1	83	339	74	72
136	19.639	0.147	0.014	2.05	97.4	0.98	101	9.8	-0.1	83	339	74	72.1
137	19.783	0.144	0.014	2.05	97.4	1.03	99	9.7	-0.1	83	339	74	72.1
138	19.927	0.144	0.014	2.05	97.5	0.99	99	9.7	-0.1	83	339	74	72
139	20.074	0.147	0.014	2.05	97.5	1.02	101	9.6	-0.1	84	340	74	72.2
140	20.218	0.144	0.014	2.06	97.6	1.04	99	9.5	-0.1	84	341	74	72.1
141	20.366	0.148	0.014	2.03	97.7	1	102	9.5	-0.1	84	343	75	72.2
142	20.508	0.142	0.013	2.04	97.8	1.04	101	9.4	-0.1	84	343	75	72.2
143	20.655	0.147	0.013	2.03	97.8	1.05	105	9.3	-0.1	84	345	75	72.4
144	20.797	0.142	0.014	2.04	97.8	1.01	98	9.3	-0.1	84	343	75	72.4
145	20.946	0.149	0.014	2.04	97.9	1.01	103	9.2	-0.1	84	341	75	72.2
146	21.088	0.142	0.014	2.03	98	1.02	98	9.2	-0.1	84	339	75	72.5
147	21.234	0.146	0.014	2.03	98	1.02	101	9.1	0.0	84	337	75	72.3
148	21.378	0.144	0.013	2.02	98	1.06	103	9.1	-0.1	84	336	75	72.2
149	21.522	0.144	0.013	2.03	98.1	1.04	103	9.0	-0.1	83	336	75	72.2
150	21.669	0.147	0.014	2.04	98.2	1.02	101	9.0	-0.1	84	336	75	72.4
151	21.811	0.142	0.014	2.03	98.2	1.04	98	8.9	-0.1	84	336	75	72.3
152	21.959	0.148	0.014	2.03	98.2	1.06	102	8.9	-0.1	83	333	75	72.3
153	22.099	0.140	0.013	2.02	98.3	1.06	100	8.8	-0.1	84	332	75	72.4
154	22.247	0.148	0.014	2.02	98.4	1.04	102	8.8	-0.1	84	332	75	72.5
155	22.391	0.144	0.013	2.03	98.4	1.02	103	8.7	-0.1	84	332	75	72.5
156	22.536	0.145	0.014	2.03	98.4	1.04	100	8.6	-0.1	84	332	75	72.6
157	22.679	0.143	0.014	2.01	98.5	1.04	98	8.6	-0.1	84	332	75	72.7
158	22.823	0.144	0.014	2.02	98.6	1.04	99	8.5	-0.1	84	332	75	72.8
159	22.969	0.146	0.014	2.02	98.6	1.06	100	8.5	-0.1	84	334	75	72.8
160	23.111	0.142	0.014	2.01	98.6	1.05	98	8.4	-0.1	84	334	75	72.9
161	23.258	0.147	0.013	2.02	98.6	1.1	105	8.3	-0.1	84	335	75	72.8
162	23.399	0.141	0.014	2.00	98.7	1.09	97	8.3	-0.1	84	335	75	73
163	23.546	0.147	0.014	2.00	98.7	1.06	101	8.2	-0.1	84	336	75	72.9
164	23.689	0.143	0.014	2.00	98.7	1.08	98	8.2	-0.1	84	335	75	73

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: ThelinJob #: 22-827Model: ParlorTracking #: 128Run #: 1Technician: AKDate: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
165	23.834	0.145	0.014	2.00	98.7	1.06	100	8.1	-0.1	84	336	75	72.9
166	23.976	0.142	0.013	1.99	98.8	1.09	101	8.0	-0.1	84	336	75	72.9
167	24.119	0.143	0.014	1.99	98.9	1.09	98	8.0	-0.1	85	335	75	73
168	24.266	0.147	0.014	2.00	98.9	1.08	101	7.9	-0.1	85	334	75	73.1
169	24.407	0.141	0.014	1.99	99	1.13	97	7.9	-0.1	85	333	75	73.1
170	24.552	0.145	0.013	1.98	99	1.11	104	7.8	-0.1	85	335	75	73
171	24.693	0.141	0.014	1.98	99	1.13	97	7.7	-0.1	85	336	75	73.1
172	24.839	0.146	0.014	1.98	99.1	1.11	100	7.7	-0.1	85	335	75	73.1
173	24.981	0.142	0.013	1.98	99.1	1.15	101	7.6	-0.1	85	337	75	73.2
174	25.123	0.142	0.014	1.98	99.1	1.11	98	7.6	0.0	85	335	75	73.1
175	25.268	0.145	0.013	1.98	99.2	1.12	103	7.5	-0.1	85	334	75	73.3
176	25.409	0.141	0.013	1.97	99.2	1.14	101	7.4	-0.1	85	335	75	73.3
177	25.553	0.144	0.014	1.97	99.2	1.15	99	7.4	0.0	85	334	75	73.5
178	25.693	0.140	0.014	1.96	99.2	1.16	96	7.3	-0.1	85	334	75	73.3
179	25.839	0.146	0.014	1.96	99.3	1.13	100	7.3	-0.1	85	334	75	73.3
180	25.981	0.142	0.014	2.03	99.3	1.17	98	7.2	-0.1	85	333	75	73.2
181	26.125	0.144	0.014	2.01	99.4	1.15	99	7.2	-0.1	85	327	75	73.5
182	26.271	0.146	0.014	2.02	99.5	1.18	100	7.1	0.0	84	321	75	73.1
183	26.414	0.143	0.013	2.02	99.5	1.17	102	7.1	-0.1	85	317	75	73.2
184	26.561	0.147	0.014	2.02	99.5	1.15	101	7.0	0.0	84	314	75	73.4
185	26.702	0.141	0.014	2.01	99.6	1.16	97	7.0	0.0	84	311	75	73.6
186	26.849	0.147	0.014	2.01	99.6	1.15	101	6.9	0.0	84	308	75	73.2
187	26.991	0.142	0.014	2.00	99.6	1.19	98	6.9	-0.1	84	306	75	73.1
188	27.139	0.148	0.014	2.01	99.7	1.17	102	6.8	-0.1	83	306	75	73.2
189	27.281	0.142	0.014	2.01	99.7	1.17	97	6.8	0.0	84	305	75	73.4
190	27.424	0.143	0.014	2.01	99.7	1.22	98	6.8	-0.1	84	304	75	73.6
191	27.570	0.146	0.014	2.02	99.8	1.21	100	6.7	-0.1	84	304	76	73.3
192	27.713	0.143	0.014	2.01	99.9	1.17	98	6.7	0.0	84	302	76	73.7
193	27.859	0.146	0.014	2.00	99.9	1.2	100	6.6	-0.1	84	300	76	73.7
194	28.000	0.141	0.014	2.00	100	1.21	97	6.6	-0.1	84	300	76	73.4
195	28.147	0.147	0.014	2.00	100	1.22	101	6.5	0.0	84	299	76	73.4
196	28.289	0.142	0.014	2.00	100	1.23	97	6.5	-0.1	84	299	76	73.4
197	28.435	0.146	0.014	1.99	100.1	1.23	100	6.4	0.0	84	298	76	73.3

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
198	28.578	0.143	0.014	1.99	100.1	1.21	98	6.4	0.0	84	295	75	73.5
199	28.720	0.142	0.014	1.98	100.1	1.21	97	6.4	-0.1	84	293	75	73.8
200	28.866	0.146	0.014	1.99	100.2	1.22	100	6.3	0.0	84	291	75	73.4
201	29.008	0.142	0.014	1.98	100.2	1.19	97	6.3	0.0	84	290	75	73.6
202	29.153	0.145	0.014	1.98	100.2	1.21	99	6.2	0.0	83	286	75	73.4
203	29.293	0.140	0.014	1.98	100.3	1.22	96	6.2	0.0	83	284	76	73.4
204	29.440	0.147	0.014	1.99	100.3	1.25	101	6.2	0.0	83	283	75	73.5
205	29.582	0.142	0.014	1.98	100.3	1.23	97	6.1	-0.1	83	283	75	73.5
206	29.725	0.143	0.014	1.98	100.4	1.23	98	6.1	0.0	83	284	75	73.8
207	29.869	0.144	0.014	1.98	100.4	1.23	99	6.0	-0.1	83	283	75	73.6
208	30.011	0.142	0.014	1.97	100.4	1.23	97	6.0	0.0	83	282	75	73.7
209	30.156	0.145	0.014	1.97	100.5	1.24	99	5.9	-0.1	83	281	75	73.4
210	30.295	0.139	0.014	1.96	100.4	1.21	95	5.9	0.0	83	280	75	73.6
211	30.441	0.146	0.014	1.96	100.5	1.22	100	5.9	0.0	83	278	75	73.5
212	30.583	0.142	0.014	1.96	100.6	1.22	97	5.8	0.0	83	277	75	73.5
213	30.727	0.144	0.014	1.96	100.6	1.24	99	5.8	0.0	83	275	75	73.4
214	30.869	0.142	0.014	1.96	100.6	1.25	97	5.8	0.0	83	273	75	73.5
215	31.011	0.142	0.014	1.96	100.6	1.23	97	5.7	0.0	83	271	75	73.7
216	31.156	0.145	0.014	1.96	100.7	1.24	99	5.7	-0.1	83	271	75	73.8
217	31.294	0.138	0.014	1.95	100.7	1.24	94	5.7	0.0	83	270	75	73.4
218	31.440	0.146	0.014	1.94	100.8	1.25	100	5.6	0.0	83	269	75	73.6
219	31.581	0.141	0.014	1.95	100.7	1.26	97	5.6	-0.1	83	269	75	73.6
220	31.723	0.142	0.014	1.95	100.8	1.24	97	5.5	0.0	83	270	75	73.7
221	31.866	0.143	0.014	1.95	100.8	1.23	98	5.5	0.0	83	269	75	74
222	32.007	0.141	0.014	1.95	100.8	1.26	96	5.5	0.0	83	267	75	73.7
223	32.152	0.145	0.014	1.94	100.9	1.28	99	5.4	0.0	83	267	75	73.6
224	32.290	0.138	0.014	1.94	100.9	1.27	94	5.4	0.0	83	266	75	73.8
225	32.436	0.146	0.014	1.94	100.9	1.27	100	5.3	0.0	83	266	75	73.8
226	32.576	0.140	0.014	1.94	101	1.29	96	5.3	0.0	83	266	75	73.8
227	32.717	0.141	0.014	1.93	101	1.25	96	5.3	-0.1	83	267	75	73.8
228	32.861	0.144	0.014	1.93	101	1.28	99	5.2	-0.1	83	267	75	73.8
229	33.001	0.140	0.014	1.93	101	1.28	96	5.2	0.0	83	267	75	73.7
230	33.144	0.143	0.014	1.93	101	1.28	98	5.1	0.0	82	266	75	73.8

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
231	33.284	0.140	0.014	1.93	101.1	1.3	96	5.1	0.0	83	267	75	73.9
232	33.427	0.143	0.014	1.92	101.1	1.3	98	5.1	0.0	82	266	76	73.8
233	33.567	0.140	0.014	1.92	101.1	1.3	96	5.0	0.0	82	266	76	73.9
234	33.708	0.141	0.014	1.93	101.2	1.33	96	5.0	0.0	83	266	76	74
235	33.852	0.144	0.014	1.92	101.2	1.29	98	4.9	0.0	83	264	76	73.9
236	33.989	0.137	0.014	1.91	101.2	1.3	94	4.9	0.0	82	263	76	73.9
237	34.134	0.145	0.014	1.92	101.2	1.31	99	4.9	0.0	83	262	76	74
238	34.273	0.139	0.014	1.91	101.2	1.32	95	4.8	0.0	83	261	76	73.7
239	34.413	0.140	0.015	1.92	101.3	1.31	92	4.8	0.0	82	261	76	73.5
240	34.557	0.144	0.015	1.92	101.3	1.29	95	4.8	0.0	81	261	76	73
241	34.694	0.137	0.015	1.91	101.4	1.3	90	4.7	-0.1	81	263	76	72.7
242	34.838	0.144	0.015	1.90	101.4	1.32	95	4.7	-0.1	81	265	76	72.5
243	34.978	0.140	0.015	1.90	101.5	1.32	92	4.6	-0.1	81	267	75	72.5
244	35.117	0.139	0.015	1.90	101.5	1.31	92	4.6	-0.1	81	268	75	72.2
245	35.260	0.143	0.015	1.90	101.5	1.33	94	4.5	-0.1	81	270	75	72.3
246	35.398	0.138	0.015	1.88	101.5	1.32	91	4.5	0.0	81	270	75	72
247	35.541	0.143	0.014	1.89	101.6	1.32	98	4.4	0.0	81	270	75	72.3
248	35.679	0.138	0.014	1.88	101.5	1.35	94	4.4	-0.1	82	271	75	72.7
249	35.818	0.139	0.014	1.88	101.5	1.34	95	4.4	0.0	82	270	75	72.6
250	35.960	0.142	0.014	1.88	101.5	1.35	97	4.3	0.0	82	271	75	73
251	36.098	0.138	0.014	1.88	101.5	1.35	94	4.3	0.0	82	271	75	73.2
252	36.240	0.142	0.014	1.88	101.5	1.34	97	4.2	-0.1	82	271	75	73.3
253	36.378	0.138	0.014	2.02	101.5	1.44	94	4.2	0.0	82	270	75	73.5
254	36.527	0.149	0.015	2.02	101.5	1.45	98	4.2	-0.1	82	270	75	73.5
255	36.670	0.143	0.014	2.02	101.4	1.46	98	4.1	0.0	82	269	75	73.3
256	36.814	0.144	0.014	2.02	101.5	1.42	98	4.1	-0.1	82	270	75	73.3
257	36.960	0.146	0.014	2.00	101.5	1.44	100	4.0	0.0	82	270	75	73.5
258	37.104	0.144	0.014	2.01	101.6	1.45	98	4.0	0.0	82	270	75	73.5
259	37.250	0.146	0.014	2.00	101.5	1.48	100	3.9	0.0	82	270	75	73.7
260	37.390	0.140	0.014	2.00	101.5	1.46	96	3.9	0.0	82	269	75	73.8
261	37.537	0.147	0.014	2.00	101.6	1.45	100	3.9	0.0	83	270	75	73.7
262	37.680	0.143	0.014	2.01	101.6	1.45	98	3.8	-0.1	83	271	76	73.9
263	37.826	0.146	0.014	2.00	101.6	1.47	100	3.8	-0.1	83	271	76	73.8

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
264	37.968	0.142	0.014	1.98	101.6	1.47	97	3.7	0.0	83	271	76	74
265	38.110	0.142	0.014	2.00	101.6	1.46	97	3.7	-0.1	83	271	76	74.1
266	38.257	0.147	0.014	1.98	101.6	1.47	100	3.7	0.0	83	269	76	74
267	38.398	0.141	0.014	1.99	101.6	1.47	96	3.6	0.0	83	268	76	73.9
268	38.543	0.145	0.014	1.97	101.7	1.49	99	3.6	-0.1	83	268	76	73.9
269	38.684	0.141	0.014	1.98	101.6	1.48	96	3.5	0.0	83	269	76	74
270	38.831	0.147	0.014	1.97	101.7	1.48	100	3.5	-0.1	83	269	76	74.1
271	38.972	0.141	0.014	1.97	101.7	1.49	96	3.4	0.0	83	269	76	74.1
272	39.114	0.142	0.014	1.96	101.7	1.52	97	3.4	0.0	83	269	76	74.1
273	39.259	0.145	0.014	1.97	101.7	1.48	99	3.4	0.0	83	269	76	74.3
274	39.400	0.141	0.014	1.97	101.7	1.5	96	3.3	0.0	83	268	76	74
275	39.545	0.145	0.014	1.96	101.7	1.51	99	3.3	0.0	83	267	76	74.2
276	39.685	0.140	0.014	1.97	101.8	1.52	96	3.3	0.0	83	266	76	74.2
277	39.831	0.146	0.014	1.96	101.8	1.49	100	3.2	0.0	83	265	76	74.4
278	39.972	0.141	0.014	1.96	101.8	1.5	96	3.2	0.0	83	264	76	74.6
279	40.113	0.141	0.014	1.95	101.9	1.49	96	3.1	0.0	82	264	76	74.6
280	40.258	0.145	0.014	1.96	102	1.56	99	3.1	0.0	83	264	76	74.5
281	40.398	0.140	0.014	1.96	102.1	1.5	96	3.1	0.0	84	263	76	74.3
282	40.542	0.144	0.014	1.94	102.1	1.54	98	3.0	0.0	83	263	76	74.3
283	40.681	0.139	0.014	1.94	102.1	1.53	95	3.0	0.0	83	262	76	74.3
284	40.827	0.146	0.014	1.94	102.1	1.52	100	3.0	0.0	83	262	76	74.6
285	40.968	0.141	0.014	1.93	102.1	1.55	96	2.9	0.0	83	261	76	74.3
286	41.109	0.141	0.014	1.95	102.1	1.54	96	2.9	0.0	83	261	76	74.5
287	41.254	0.145	0.014	1.94	102	1.53	99	2.8	0.0	83	263	76	74.4
288	41.393	0.139	0.014	1.93	102	1.57	95	2.8	0.0	83	262	76	74.5
289	41.537	0.144	0.014	1.94	102	1.54	98	2.8	0.0	83	263	76	74.5
290	41.677	0.140	0.014	1.93	102.1	1.54	96	2.7	0.0	83	263	76	74.6
291	41.819	0.142	0.014	1.92	102.1	1.56	97	2.7	0.0	83	262	76	74.4
292	41.961	0.142	0.014	1.93	102.1	1.54	97	2.6	0.0	83	261	76	74.5
293	42.101	0.140	0.014	1.93	102.1	1.56	96	2.6	0.0	83	259	76	74.4
294	42.245	0.144	0.014	1.91	102.2	1.54	98	2.6	0.0	82	259	76	74.4
295	42.383	0.138	0.014	1.92	102.1	1.6	94	2.5	-0.1	83	260	76	74.5
296	42.527	0.144	0.014	1.92	102.1	1.56	98	2.5	0.0	83	259	76	74.6

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
297	42.666	0.139	0.014	1.91	102.1	1.57	95	2.5	0.0	83	259	76	74.7
298	42.806	0.140	0.014	1.90	102.1	1.57	96	2.4	0.0	83	259	76	74.7
299	42.950	0.144	0.014	1.90	102.2	1.59	98	2.4	-0.1	83	260	76	74.7
300	43.087	0.137	0.014	1.91	102.2	1.59	94	2.3	0.0	83	259	76	74.9
301	43.231	0.144	0.014	1.90	102.1	1.59	98	2.3	0.0	83	258	76	74.7
302	43.371	0.140	0.014	1.90	102.2	1.62	96	2.3	0.0	83	258	76	74.9
303	43.510	0.139	0.014	1.88	102.2	1.6	95	2.2	0.0	83	258	76	75
304	43.654	0.144	0.014	1.90	102.3	1.57	98	2.2	0.0	83	258	76	75.3
305	43.791	0.137	0.014	1.90	102.3	1.6	94	2.1	-0.1	83	259	76	74.8
306	43.934	0.143	0.014	1.90	102.3	1.58	98	2.1	0.0	83	260	76	75
307	44.073	0.139	0.014	1.89	102.3	1.57	95	2.1	0.0	83	259	76	74.8
308	44.213	0.140	0.014	1.88	102.3	1.62	96	2.0	0.0	83	258	76	74.8
309	44.355	0.142	0.014	1.88	102.3	1.59	97	2.0	-0.1	83	259	76	75.2
310	44.493	0.138	0.014	1.87	102.4	1.59	94	1.9	0.0	83	260	77	75
311	44.635	0.142	0.014	1.88	102.4	1.62	97	1.9	-0.1	83	261	77	74.8
312	44.774	0.139	0.014	1.86	102.4	1.62	95	1.8	0.0	83	261	77	75.2
313	44.916	0.142	0.014	1.97	102.4	1.67	97	1.8	-0.1	83	262	77	75.2
314	45.059	0.143	0.014	1.97	102.5	1.7	98	1.8	0.0	83	263	77	74.9
315	45.201	0.142	0.014	1.96	102.5	1.68	97	1.7	0.0	83	262	77	75
316	45.346	0.145	0.014	1.97	102.5	1.72	99	1.7	0.0	83	262	77	74.8
317	45.485	0.139	0.014	1.94	102.6	1.7	95	1.7	0.0	84	261	77	74.9
318	45.631	0.146	0.014	1.94	102.6	1.69	100	1.6	0.0	83	261	77	74.9
319	45.773	0.142	0.014	1.94	102.6	1.66	97	1.6	0.0	83	260	77	74.9
320	45.916	0.143	0.014	1.94	102.6	1.72	98	1.5	0.0	83	261	77	75.2
321	46.058	0.142	0.014	1.95	102.6	1.72	97	1.5	0.0	83	261	77	75.6
322	46.200	0.142	0.014	1.94	102.7	1.72	97	1.4	0.0	83	262	77	75.5
323	46.345	0.145	0.014	1.94	102.7	1.73	99	1.4	-0.1	83	262	77	75.2
324	46.483	0.138	0.014	1.93	102.8	1.77	94	1.4	0.0	83	262	77	75.1
325	46.628	0.145	0.014	1.94	102.7	1.73	99	1.3	0.0	83	262	77	75.2
326	46.769	0.141	0.014	1.93	102.8	1.76	96	1.3	0.0	84	261	77	75.2
327	46.911	0.142	0.014	1.93	102.9	1.74	97	1.2	0.0	84	260	77	75.5
328	47.054	0.143	0.014	1.92	102.8	1.72	98	1.2	0.0	84	260	77	75.4
329	47.194	0.140	0.014	1.93	102.8	1.74	96	1.2	0.0	83	260	77	75.6

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
330	47.338	0.144	0.014	1.93	102.9	1.73	98	1.1	0.0	84	258	77	75.6
331	47.477	0.139	0.014	1.93	102.8	1.73	95	1.1	0.0	84	258	77	75.5
332	47.622	0.145	0.014	1.92	102.9	1.73	99	1.1	0.0	83	256	77	75.5
333	47.762	0.140	0.014	1.92	102.9	1.76	96	1.0	0.0	83	255	77	75.3
334	47.902	0.140	0.014	1.91	103	1.75	95	1.0	0.0	83	255	77	75.4
335	48.047	0.145	0.014	1.92	103	1.74	99	1.0	0.0	83	253	77	75.5
336	48.185	0.138	0.014	1.92	102.9	1.77	94	0.9	0.0	83	252	77	75.6
337	48.329	0.144	0.014	1.91	103	1.76	98	0.9	0.0	83	251	77	75.5
338	48.470	0.141	0.014	1.90	103	1.75	96	0.9	0.0	83	252	77	75.9
339	48.611	0.141	0.014	1.90	103	1.78	96	0.8	0.0	83	252	77	75.9
340	48.753	0.142	0.014	1.91	103.1	1.74	97	0.8	0.0	83	253	77	75.8
341	48.893	0.140	0.014	1.90	103.1	1.76	96	0.8	0.0	84	253	77	75.7
342	49.036	0.143	0.014	1.88	103.1	1.77	98	0.7	0.0	84	254	77	75.9
343	49.174	0.138	0.014	1.88	103.1	1.79	94	0.7	0.0	84	256	77	75.6
344	49.318	0.144	0.014	1.87	103.2	1.78	98	0.6	-0.1	83	257	77	76.1
345	49.457	0.139	0.014	1.87	103.2	1.77	95	0.6	0.0	84	257	77	75.7
346	49.598	0.141	0.014	1.87	103.2	1.77	96	0.5	0.0	84	258	77	75.7
347	49.741	0.143	0.014	1.87	103.2	1.78	98	0.5	0.0	84	258	77	75.8
348	49.878	0.137	0.014	1.87	103.2	1.8	93	0.4	-0.1	84	258	77	75.8
349	50.022	0.144	0.014	1.88	103.3	1.81	98	0.4	0.0	84	257	77	76.1
350	50.161	0.139	0.014	1.88	103.3	1.77	95	0.4	0.0	84	256	77	76.2
351	50.299	0.138	0.014	1.87	103.3	1.81	94	0.4	0.0	84	255	77	76.2
352	50.444	0.145	0.014	1.88	103.3	1.82	99	0.3	0.0	84	255	77	76
353	50.580	0.136	0.014	1.87	103.4	1.81	93	0.3	0.0	84	254	77	76.2
354	50.724	0.144	0.014	1.87	103.3	1.81	98	0.2	0.0	84	254	77	76
355	50.862	0.138	0.014	1.87	103.4	1.83	94	0.2	0.0	84	253	77	76.2
356	51.001	0.139	0.014	1.87	103.4	1.8	95	0.2	0.0	84	254	77	76.1
357	51.144	0.143	0.014	1.86	103.4	1.82	98	0.1	0.0	84	254	77	76.1
358	51.280	0.136	0.014	1.86	103.5	1.83	93	0.1	0.0	84	254	77	76.1
359	51.424	0.144	0.014	1.85	103.5	1.82	98	0.0	0.0	84	255	77	76.5
360	51.562	0.138	0.014	1.85	103.5	1.83	94	0.0	0.0	84	256	77	76.3
Avg/Tot	51.562	0.143	0.014	1.99	96	1.20	100			83	316	75	73

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
0	0.000		1.52	73	1.74		72	-0.064	13.27	0.25
1	0.142	0.142	2.12	72.8	1.41	106	73	-0.063	11.88	0.08
2	0.284	0.142	2.12	72.9	1.43	102	73	-0.063	8.58	0.06
3	0.425	0.141	2.12	73	1.55	105	73	-0.061	9.40	0.05
4	0.570	0.145	2.12	73	1.77	104	73	-0.064	10.44	0.06
5	0.710	0.140	2.12	73	1.48	101	74	-0.062	12.19	0.08
6	0.854	0.144	2.11	73.1	1.52	108	74	-0.064	9.89	0.05
7	0.995	0.141	2.12	73.2	1.52	105	74	-0.063	12.32	0.18
8	1.140	0.145	2.13	73.3	1.65	108	74	-0.062	11.65	0.07
9	1.282	0.142	2.13	73.4	1.6	106	74	-0.065	11.46	0.08
10	1.423	0.141	2.12	73.7	1.52	105	74	-0.063	10.52	0.05
11	1.567	0.144	2.12	73.8	1.7	108	74	-0.062	11.42	0.07
12	1.709	0.142	2.12	74	1.71	106	75	-0.064	12.18	0.11
13	1.854	0.145	2.13	74.2	1.71	108	75	-0.063	10.62	0.08
14	1.994	0.140	2.13	74.5	1.51	104	75	-0.064	9.29	0.05
15	2.139	0.145	2.12	74.8	1.67	108	75	-0.064	10.51	0.06
16	2.281	0.142	2.13	75	1.56	106	75	-0.064	11.80	0.09
17	2.425	0.144	2.13	75.2	1.56	107	75	-0.061	11.39	0.07
18	2.567	0.142	2.13	75.5	1.74	102	75	-0.064	12.52	0.13
19	2.709	0.142	2.12	75.8	1.71	106	75	-0.062	11.11	0.06
20	2.854	0.145	2.12	76.1	1.71	108	75	-0.065	10.33	0.06
21	2.997	0.143	2.13	76.5	1.57	102	75	-0.064	11.61	0.07
22	3.142	0.145	2.13	76.7	1.64	108	75	-0.062	11.12	0.06
23	3.283	0.141	2.13	77.1	1.62	105	76	-0.064	9.88	0.05
24	3.428	0.145	2.13	77.4	1.64	108	76	-0.065	10.90	0.06
25	3.570	0.142	2.13	77.7	1.66	105	76	-0.063	11.23	0.07
26	3.716	0.146	2.14	78	1.65	104	76	-0.064	11.88	0.09
27	3.859	0.143	2.13	78.4	1.58	106	76	-0.064	11.09	0.05
28	4.002	0.143	2.14	78.7	1.67	106	76	-0.064	9.68	0.06
29	4.147	0.145	2.13	79	1.67	107	76	-0.062	10.86	0.05
30	4.289	0.142	2.13	79.3	1.71	105	76	-0.059	10.86	0.07
31	4.437	0.148	2.14	79.7	1.59	109	76	-0.062	7.34	0.06



## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
32	4.578	0.141	2.15	80.1	1.66	104	76	-0.062	11.04	0.07
33	4.725	0.147	2.14	80.4	1.6	108	76	-0.063	10.44	0.06
34	4.866	0.141	2.13	80.7	1.59	104	76	-0.059	9.80	0.04
35	5.014	0.148	2.14	81.1	1.6	109	77	-0.062	8.96	0.05
36	5.156	0.142	2.14	81.4	1.66	105	76	-0.062	10.92	0.05
37	5.304	0.148	2.14	81.7	1.6	109	77	-0.065	11.77	0.09
38	5.447	0.143	2.14	82	1.61	105	77	-0.065	12.31	0.12
39	5.591	0.144	2.14	82.3	1.65	106	77	-0.066	12.43	0.08
40	5.736	0.145	2.13	82.6	1.64	107	77	-0.063	11.80	0.06
41	5.880	0.144	2.14	82.9	1.64	106	77	-0.066	10.33	0.06
42	6.026	0.146	2.13	83.3	1.64	107	77	-0.063	11.64	0.09
43	6.170	0.144	2.15	83.6	1.61	106	77	-0.063	11.38	0.06
44	6.317	0.147	2.14	83.8	1.63	108	77	-0.064	12.60	0.13
45	6.460	0.143	2.14	84.2	1.65	105	77	-0.063	9.50	0.05
46	6.607	0.147	2.14	84.5	1.65	108	77	-0.062	9.27	0.05
47	6.749	0.142	2.13	84.7	1.66	100	77	-0.062	10.51	0.06
48	6.897	0.148	2.14	85	1.64	108	77	-0.063	10.44	0.06
49	7.041	0.144	2.14	85.3	1.64	105	77	-0.065	10.57	0.07
50	7.188	0.147	2.14	85.6	1.65	104	77	-0.061	9.90	0.06
51	7.333	0.145	2.14	85.9	1.71	102	77	-0.062	10.53	0.06
52	7.479	0.146	2.14	86.2	1.68	103	77	-0.062	10.98	0.07
53	7.624	0.145	2.14	86.5	1.64	106	77	-0.061	10.96	0.06
54	7.768	0.144	2.14	86.7	1.67	105	77	-0.063	8.21	0.04
55	7.915	0.147	2.14	87	1.63	107	77	-0.063	12.92	0.10
56	8.060	0.145	2.14	87.2	1.65	106	77	-0.062	12.51	0.11
57	8.207	0.147	2.14	87.5	1.67	107	77	-0.063	10.03	0.05
58	8.351	0.144	2.15	87.7	1.69	101	77	-0.063	11.04	0.06
59	8.499	0.148	2.14	88	1.65	104	77	-0.062	11.82	0.07
60	8.643	0.144	2.14	88.3	1.71	101	77	-0.065	11.99	0.09
61	8.790	0.147	2.14	88.5	1.61	103	77	-0.064	12.33	0.12
62	8.933	0.143	2.14	88.7	1.64	100	77	-0.065	10.29	0.06
63	9.081	0.148	2.13	88.9	1.74	104	77	-0.062	10.67	0.06

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
64	9.225	0.144	2.14	89.2	1.75	101	77	-0.065	8.96	0.06
65	9.373	0.148	2.14	89.3	1.63	103	77	-0.063	11.48	0.06
66	9.518	0.145	2.15	89.6	1.66	105	77	-0.062	11.26	0.06
67	9.665	0.147	2.15	89.8	1.72	107	77	-0.062	9.22	0.05
68	9.810	0.145	2.13	90.1	1.62	105	77	-0.061	7.44	0.05
69	9.956	0.146	2.14	90.2	1.73	106	77	-0.064	8.62	0.04
70	10.102	0.146	2.14	90.4	1.64	102	77	-0.061	11.50	0.10
71	10.246	0.144	2.13	90.6	1.72	104	77	-0.062	12.27	0.13
72	10.393	0.147	2.13	90.8	1.68	106	77	-0.061	12.68	0.10
73	10.538	0.145	2.13	91	1.69	105	77	-0.065	9.90	0.06
74	10.686	0.148	2.13	91.2	1.71	107	77	-0.063	8.32	0.04
75	10.830	0.144	2.14	91.5	1.67	100	77	-0.061	10.66	0.05
76	10.979	0.149	2.14	91.6	1.7	108	77	-0.064	10.16	0.05
77	11.122	0.143	2.13	91.8	1.74	99	77	-0.062	11.00	0.06
78	11.271	0.149	2.13	91.9	1.75	108	77	-0.066	10.46	0.05
79	11.414	0.143	2.13	92.1	1.72	99	77	-0.064	10.63	0.06
80	11.562	0.148	2.13	92.3	1.7	103	77	-0.062	9.27	0.05
81	11.706	0.144	2.13	92.4	1.67	100	77	-0.064	9.30	0.05
82	11.854	0.148	2.13	92.7	1.72	107	77	-0.063	11.94	0.08
83	11.998	0.144	2.13	92.8	1.74	104	77	-0.063	11.02	0.07
84	12.146	0.148	2.13	93	1.76	107	77	-0.064	12.27	0.13
85	12.292	0.146	2.13	93	1.67	105	77	-0.060	10.18	0.08
86	12.438	0.146	2.13	93.2	1.65	105	78	-0.061	8.87	0.05
87	12.584	0.146	2.13	93.3	1.66	105	78	-0.062	9.05	0.05
88	12.730	0.146	2.13	93.5	1.69	105	77	-0.057	9.30	0.05
89	12.876	0.146	2.13	93.7	1.76	105	77	-0.061	10.24	0.05
90	13.021	0.145	2.12	93.8	1.66	104	77	-0.062	11.87	0.12
91	13.168	0.147	2.12	94	1.71	106	78	-0.061	11.06	0.09
92	13.313	0.145	2.13	94.1	1.72	104	77	-0.064	9.54	0.05
93	13.461	0.148	2.12	94.2	1.72	106	77	-0.062	10.16	0.05
94	13.606	0.145	2.13	94.4	1.7	104	78	-0.062	8.22	0.05
95	13.754	0.148	2.12	94.4	1.72	106	78	-0.063	11.02	0.07

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
96	13.898	0.144	2.12	94.5	1.68	103	78	-0.060	7.69	0.05
97	14.046	0.148	2.12	94.7	1.76	106	78	-0.058	8.04	0.05
98	14.190	0.144	2.12	94.8	1.7	103	77	-0.062	10.12	0.05
99	14.337	0.147	2.12	94.9	1.69	105	77	-0.060	10.21	0.05
100	14.481	0.144	2.11	95	1.69	99	77	-0.059	8.29	0.05
101	14.630	0.149	2.12	95.1	1.68	103	77	-0.061	9.25	0.05
102	14.774	0.144	2.12	95.2	1.74	103	77	-0.062	10.95	0.07
103	14.922	0.148	2.12	95.3	1.71	106	77	-0.061	10.56	0.09
104	15.067	0.145	2.12	95.5	1.72	104	77	-0.062	11.34	0.09
105	15.214	0.147	2.11	95.6	1.74	105	77	-0.062	9.82	0.06
106	15.359	0.145	2.11	95.6	1.72	100	77	-0.063	10.14	0.05
107	15.505	0.146	2.11	95.8	1.74	104	78	-0.063	10.82	0.06
108	15.651	0.146	2.11	95.9	1.72	101	78	-0.060	8.15	0.04
109	15.795	0.144	2.11	95.9	1.76	99	77	-0.060	10.05	0.05
110	15.943	0.148	2.11	96	1.73	106	78	-0.065	10.51	0.07
111	16.087	0.144	2.10	96.1	1.71	103	77	-0.062	11.00	0.07
112	16.236	0.149	2.11	96.1	1.67	103	78	-0.060	9.85	0.07
113	16.380	0.144	2.11	96.2	1.71	99	77	-0.059	9.39	0.06
114	16.527	0.147	2.10	96.3	1.76	101	77	-0.059	8.00	0.05
115	16.671	0.144	2.10	96.4	1.75	103	77	-0.063	9.37	0.04
116	16.819	0.148	2.10	96.5	1.73	106	78	-0.056	7.45	0.05
117	16.962	0.143	2.10	96.6	1.71	102	78	-0.061	10.70	0.05
118	17.110	0.148	2.10	96.6	1.72	106	77	-0.057	10.98	0.07
119	17.254	0.144	2.10	96.7	1.72	103	77	-0.063	12.94	0.37
120	17.401	0.147	2.10	96.8	1.75	105	77	-0.062	11.20	0.10
121	17.546	0.145	2.09	96.8	1.78	100	77	-0.060	9.90	0.05
122	17.692	0.146	2.08	96.9	1.76	101	77	-0.064	11.71	0.10
123	17.838	0.146	2.09	97	1.72	104	78	-0.060	10.76	0.07
124	17.983	0.145	2.09	97	1.76	100	78	-0.061	10.05	0.06
125	18.128	0.145	2.08	97.1	1.74	104	78	-0.063	7.42	0.04
126	18.273	0.145	2.09	97.2	1.75	104	78	-0.060	8.77	0.05
127	18.420	0.147	2.09	97.2	1.77	105	78	-0.062	8.66	0.04

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
128	18.564	0.144	2.10	97.3	1.74	103	78	-0.062	8.82	0.05
129	18.712	0.148	2.09	97.4	1.75	106	78	-0.061	11.20	0.08
130	18.855	0.143	2.08	97.4	1.74	98	78	-0.060	10.27	0.07
131	19.003	0.148	2.08	97.5	1.79	102	78	-0.062	12.61	0.31
132	19.145	0.142	2.08	97.5	1.79	101	78	-0.060	12.07	0.18
133	19.292	0.147	2.07	97.6	1.8	101	78	-0.061	10.12	0.08
134	19.436	0.144	2.08	97.6	1.79	103	78	-0.064	10.19	0.07
135	19.583	0.147	2.07	97.7	1.77	101	78	-0.061	11.15	0.10
136	19.727	0.144	2.08	97.7	1.75	99	78	-0.061	10.43	0.06
137	19.873	0.146	2.06	97.8	1.79	100	78	-0.063	11.51	0.10
138	20.018	0.145	2.07	97.8	1.68	100	78	-0.062	10.57	0.10
139	20.161	0.143	2.07	97.8	1.73	98	78	-0.061	11.32	0.09
140	20.307	0.146	2.06	97.8	1.75	100	78	-0.062	12.14	0.23
141	20.450	0.143	2.07	98	1.74	98	78	-0.062	12.86	0.24
142	20.597	0.147	2.06	98	1.79	105	78	-0.060	11.44	0.12
143	20.740	0.143	2.05	98.1	1.78	102	78	-0.068	11.90	0.18
144	20.887	0.147	2.06	98.1	1.76	101	78	-0.062	8.70	0.05
145	21.028	0.141	2.06	98.2	1.79	97	78	-0.058	8.91	0.05
146	21.175	0.147	2.05	98.2	1.8	101	78	-0.062	9.04	0.05
147	21.318	0.143	2.05	98.2	1.75	98	78	-0.062	9.28	0.05
148	21.464	0.146	2.05	98.3	1.79	104	78	-0.061	9.90	0.06
149	21.608	0.144	2.05	98.3	1.78	103	78	-0.059	10.75	0.12
150	21.752	0.144	2.05	98.4	1.81	99	78	-0.061	9.87	0.06
151	21.896	0.144	2.05	98.4	1.79	99	78	-0.059	10.68	0.08
152	22.040	0.144	2.04	98.5	1.8	99	78	-0.062	9.73	0.06
153	22.186	0.146	2.04	98.5	1.74	104	78	-0.060	8.89	0.05
154	22.329	0.143	2.05	98.6	1.79	98	78	-0.063	10.21	0.06
155	22.475	0.146	2.05	98.6	1.8	104	78	-0.060	9.37	0.06
156	22.617	0.142	2.04	98.6	1.8	98	78	-0.061	11.99	0.18
157	22.762	0.145	2.04	98.6	1.8	100	78	-0.065	9.93	0.06
158	22.905	0.143	2.05	98.7	1.85	98	78	-0.060	9.81	0.07
159	23.051	0.146	2.04	98.8	1.81	100	78	-0.062	11.20	0.13

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
160	23.194	0.143	2.03	98.8	1.84	98	78	-0.059	11.74	0.15
161	23.338	0.144	2.03	98.8	1.74	103	78	-0.063	10.63	0.10
162	23.481	0.143	2.03	98.9	1.76	98	78	-0.059	11.21	0.08
163	23.624	0.143	2.03	98.9	1.82	98	78	-0.064	10.71	0.07
164	23.770	0.146	2.03	98.9	1.8	100	78	-0.063	12.57	0.31
165	23.912	0.142	2.01	98.9	1.77	98	78	-0.062	11.27	0.10
166	24.057	0.145	2.02	99	1.78	103	78	-0.061	11.09	0.09
167	24.198	0.141	2.01	99.1	1.78	97	78	-0.061	10.97	0.08
168	24.343	0.145	2.01	99.1	1.89	100	78	-0.062	10.23	0.07
169	24.486	0.143	2.01	99.1	1.9	98	78	-0.061	10.22	0.08
170	24.630	0.144	2.01	99.1	1.88	103	78	-0.061	12.26	0.25
171	24.772	0.142	2.01	99.2	1.91	98	78	-0.061	12.50	0.28
172	24.914	0.142	2.00	99.2	1.88	98	78	-0.063	10.73	0.08
173	25.059	0.145	2.00	99.2	1.8	103	78	-0.061	11.03	0.08
174	25.200	0.141	2.00	99.3	1.76	97	78	-0.060	10.60	0.07
175	25.345	0.145	2.00	99.3	1.81	103	78	-0.063	9.09	0.04
176	25.485	0.140	1.99	99.4	1.86	100	78	-0.062	12.48	0.43
177	25.629	0.144	2.00	99.4	1.91	99	78	-0.062	11.55	0.13
178	25.771	0.142	1.98	99.4	1.86	98	78	-0.063	10.51	0.07
179	25.913	0.142	1.98	99.5	1.81	98	78	-0.062	11.61	0.11
180	26.057	0.144	2.02	99.5	1.96	99	78	-0.061	12.28	0.17
181	26.199	0.142	2.02	99.5	1.84	97	78	-0.063	8.60	0.05
182	26.346	0.147	2.02	99.6	1.92	101	78	-0.059	7.71	0.05
183	26.487	0.141	2.02	99.6	1.84	100	78	-0.061	7.84	0.05
184	26.632	0.145	2.02	99.6	1.92	99	78	-0.060	8.38	0.06
185	26.773	0.141	2.01	99.7	1.83	97	78	-0.060	8.68	0.04
186	26.919	0.146	2.01	99.7	1.94	100	78	-0.058	9.26	0.05
187	27.062	0.143	2.01	99.8	1.89	98	78	-0.056	7.04	0.05
188	27.205	0.143	2.01	99.8	1.97	98	78	-0.058	10.67	0.08
189	27.347	0.142	2.00	99.8	1.96	97	78	-0.057	10.85	0.12
190	27.490	0.143	2.01	99.8	1.98	98	78	-0.058	9.53	0.05
191	27.636	0.146	2.01	99.9	1.97	100	78	-0.056	10.06	0.07

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
192	27.776	0.140	2.00	99.9	1.83	96	78	-0.058	9.08	0.05
193	27.921	0.145	2.00	100	1.96	99	78	-0.056	8.71	0.05
194	28.062	0.141	2.00	100	1.98	97	78	-0.060	10.02	0.06
195	28.207	0.145	2.00	100	1.86	99	78	-0.058	9.25	0.05
196	28.349	0.142	1.99	100.1	1.86	97	78	-0.059	10.24	0.07
197	28.491	0.142	1.99	100.1	1.95	97	78	-0.059	10.31	0.10
198	28.634	0.143	1.99	100.2	1.92	98	78	-0.056	6.73	0.04
199	28.775	0.141	1.99	100.1	1.9	97	78	-0.057	6.68	0.03
200	28.920	0.145	1.98	100.2	1.93	99	78	-0.056	9.43	0.05
201	29.060	0.140	1.98	100.2	1.9	96	78	-0.056	8.57	0.04
202	29.204	0.144	1.98	100.3	1.92	99	78	-0.055	9.04	0.05
203	29.346	0.142	1.99	100.3	1.91	97	78	-0.055	6.47	0.03
204	29.489	0.143	1.98	100.4	1.93	98	78	-0.056	7.88	0.04
205	29.631	0.142	1.98	100.4	1.94	97	78	-0.055	9.79	0.07
206	29.772	0.141	1.98	100.5	1.95	96	78	-0.055	10.92	0.15
207	29.917	0.145	1.98	100.4	1.93	99	78	-0.055	9.41	0.05
208	30.057	0.140	1.97	100.5	1.93	96	78	-0.054	8.06	0.04
209	30.200	0.143	1.97	100.5	1.96	98	78	-0.055	9.01	0.05
210	30.341	0.141	1.97	100.6	1.91	96	78	-0.052	8.93	0.07
211	30.485	0.144	1.97	100.6	1.94	98	78	-0.055	8.81	0.06
212	30.626	0.141	1.97	100.6	1.96	96	78	-0.057	6.60	0.04
213	30.766	0.140	1.96	100.6	1.95	96	78	-0.052	5.91	0.03
214	30.910	0.144	1.97	100.6	1.93	98	78	-0.054	7.77	0.04
215	31.051	0.141	1.96	100.7	1.94	96	78	-0.054	7.11	0.03
216	31.195	0.144	1.96	100.6	1.94	99	78	-0.051	8.13	0.04
217	31.334	0.139	1.96	100.7	2.02	95	78	-0.051	8.96	0.05
218	31.478	0.144	1.96	100.7	1.9	98	78	-0.053	8.11	0.04
219	31.618	0.140	1.96	100.7	1.96	96	78	-0.050	8.74	0.06
220	31.758	0.140	1.95	100.7	1.96	96	78	-0.052	10.33	0.08
221	31.901	0.143	1.96	100.7	2.01	98	78	-0.054	8.53	0.04
222	32.042	0.141	1.95	100.7	1.94	96	78	-0.053	7.63	0.04
223	32.185	0.143	1.95	100.8	1.98	98	78	-0.052	7.67	0.04

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
224	32.324	0.139	1.95	100.8	2.05	95	78	-0.053	8.08	0.05
225	32.468	0.144	1.95	100.8	1.95	98	78	-0.055	8.53	0.04
226	32.608	0.140	1.95	100.9	1.94	96	78	-0.054	7.50	0.03
227	32.747	0.139	1.94	100.9	1.97	95	78	-0.051	10.74	0.12
228	32.891	0.144	1.95	100.9	1.99	98	78	-0.052	8.99	0.07
229	33.030	0.139	1.94	100.9	1.98	95	78	-0.054	10.13	0.13
230	33.172	0.142	1.93	100.9	2.01	97	78	-0.053	8.74	0.05
231	33.312	0.140	1.94	100.9	1.96	96	78	-0.054	6.86	0.03
232	33.454	0.142	1.93	100.9	2.01	97	78	-0.053	9.96	0.07
233	33.594	0.140	1.93	101	1.97	96	78	-0.051	8.02	0.04
234	33.733	0.139	1.93	101	1.99	95	78	-0.055	8.16	0.05
235	33.876	0.143	1.93	101	1.99	98	78	-0.052	7.78	0.04
236	34.014	0.138	1.92	101.1	2	94	78	-0.054	8.19	0.06
237	34.156	0.142	1.92	101.1	1.99	97	78	-0.051	7.41	0.05
238	34.296	0.140	1.92	101.1	2	96	78	-0.055	6.93	0.02
239	34.435	0.139	1.92	101.3	1.98	92	78	-0.050	7.63	0.04
240	34.578	0.143	1.93	101.3	2.01	94	78	-0.050	8.22	0.04
241	34.716	0.138	1.92	101.3	1.97	91	78	-0.052	9.19	0.05
242	34.858	0.142	1.91	101.4	2.01	94	78	-0.051	12.27	0.38
243	34.997	0.139	1.92	101.4	2.01	92	78	-0.053	10.67	0.11
244	35.138	0.141	1.91	101.4	2.04	93	78	-0.052	9.22	0.06
245	35.277	0.139	1.91	101.5	2.02	92	78	-0.053	10.42	0.09
246	35.416	0.139	1.91	101.5	2.05	92	78	-0.053	10.45	0.15
247	35.558	0.142	1.90	101.5	2.01	97	78	-0.052	8.40	0.05
248	35.695	0.137	1.90	101.4	2.01	93	78	-0.058	10.39	0.08
249	35.837	0.142	1.90	101.3	2.08	97	78	-0.052	8.03	0.05
250	35.975	0.138	1.90	101.3	2.03	94	78	-0.055	9.01	0.04
251	36.113	0.138	1.89	101.3	2.02	94	78	-0.054	8.09	0.04
252	36.255	0.142	1.89	101.3	1.99	97	78	-0.055	9.58	0.04
253	36.392	0.137	2.01	101.4	2.1	94	78	-0.056	8.86	0.05
254	36.541	0.149	2.01	101.3	2.11	98	78	-0.054	9.28	0.04
255	36.683	0.142	2.01	101.3	2.14	97	78	-0.051	10.49	0.11

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
256	36.828	0.145	2.00	101.3	2.14	99	78	-0.052	10.22	0.10
257	36.971	0.143	2.00	101.4	2.1	98	78	-0.054	9.90	0.09
258	37.112	0.141	1.99	101.3	2.13	96	78	-0.053	9.08	0.06
259	37.257	0.145	2.00	101.4	2.12	99	78	-0.056	10.20	0.12
260	37.399	0.142	2.00	101.3	2.11	97	78	-0.053	9.48	0.08
261	37.544	0.145	1.99	101.4	2.14	99	78	-0.055	8.51	0.04
262	37.684	0.140	1.99	101.5	2.13	96	78	-0.055	10.33	0.11
263	37.828	0.144	1.99	101.4	2.11	98	78	-0.052	9.32	0.06
264	37.970	0.142	1.98	101.5	2.17	97	78	-0.056	10.20	0.08
265	38.113	0.143	1.98	101.5	2.13	98	78	-0.054	8.75	0.05
266	38.255	0.142	1.98	101.5	2.13	97	78	-0.055	7.95	0.04
267	38.397	0.142	1.98	101.4	2.14	97	78	-0.054	7.90	0.04
268	38.541	0.144	1.98	101.5	2.16	98	78	-0.054	9.12	0.05
269	38.681	0.140	1.97	101.5	2.15	96	78	-0.054	10.39	0.08
270	38.825	0.144	1.97	101.6	2.17	98	79	-0.052	10.11	0.08
271	38.966	0.141	1.97	101.6	2.17	96	78	-0.052	10.06	0.09
272	39.110	0.144	1.97	101.6	2.14	98	79	-0.051	9.41	0.06
273	39.251	0.141	1.96	101.7	2.16	96	79	-0.053	8.56	0.05
274	39.391	0.140	1.95	101.6	2.16	96	79	-0.053	9.20	0.06
275	39.534	0.143	1.96	101.6	2.18	98	79	-0.054	7.99	0.04
276	39.675	0.141	1.95	101.7	2.16	96	79	-0.052	8.57	0.04
277	39.819	0.144	1.96	101.7	2.18	98	79	-0.052	9.17	0.06
278	39.958	0.139	1.95	101.8	2.19	95	79	-0.051	7.71	0.04
279	40.102	0.144	1.95	101.8	2.17	98	79	-0.053	8.15	0.03
280	40.242	0.140	1.95	101.9	2.18	96	79	-0.052	9.09	0.05
281	40.382	0.140	1.94	102	2.23	96	79	-0.053	8.97	0.05
282	40.525	0.143	1.95	101.9	2.19	98	79	-0.053	7.95	0.04
283	40.665	0.140	1.94	101.9	2.16	96	79	-0.049	9.30	0.07
284	40.807	0.142	1.94	101.9	2.23	97	79	-0.050	8.93	0.05
285	40.947	0.140	1.94	101.9	2.19	96	79	-0.051	8.06	0.05
286	41.090	0.143	1.94	101.9	2.19	98	79	-0.052	7.68	0.03
287	41.230	0.140	1.93	101.9	2.17	96	79	-0.052	10.08	0.08



## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
288	41.370	0.140	1.93	101.9	2.21	96	79	-0.052	8.40	0.05
289	41.513	0.143	1.94	101.9	2.19	98	79	-0.053	8.73	0.05
290	41.651	0.138	1.93	101.9	2.23	94	79	-0.053	8.86	0.04
291	41.794	0.143	1.92	101.9	2.23	98	79	-0.053	9.44	0.06
292	41.934	0.140	1.92	101.9	2.2	96	79	-0.051	7.68	0.04
293	42.074	0.140	1.92	102	2.22	95	79	-0.050	7.55	0.04
294	42.215	0.141	1.92	102	2.24	96	79	-0.053	6.43	0.02
295	42.354	0.139	1.92	102	2.22	95	79	-0.052	10.72	0.24
296	42.496	0.142	1.91	102.1	2.18	97	79	-0.050	8.82	0.06
297	42.634	0.138	1.91	102.1	2.22	94	79	-0.052	8.00	0.03
298	42.776	0.142	1.91	102.1	2.22	97	79	-0.053	8.95	0.05
299	42.916	0.140	1.91	102.3	2.26	95	79	-0.054	10.05	0.11
300	43.054	0.138	1.91	102.2	2.23	94	79	-0.052	10.02	0.08
301	43.196	0.142	1.90	102.2	2.22	97	79	-0.052	7.17	0.03
302	43.333	0.137	1.90	102.1	2.24	93	79	-0.051	9.00	0.06
303	43.475	0.142	1.90	102.2	2.25	97	79	-0.052	9.79	0.07
304	43.614	0.139	1.90	102.2	2.22	95	79	-0.053	9.32	0.06
305	43.752	0.138	1.89	102.2	2.21	94	79	-0.051	7.85	0.04
306	43.895	0.143	1.89	102.2	2.34	98	79	-0.051	10.71	0.13
307	44.032	0.137	1.89	102.2	2.23	93	79	-0.051	8.63	0.06
308	44.173	0.141	1.89	102.2	2.25	96	79	-0.049	9.13	0.08
309	44.311	0.138	1.89	102.3	2.32	94	79	-0.050	9.53	0.07
310	44.449	0.138	1.88	102.3	2.23	94	79	-0.055	9.91	0.10
311	44.590	0.141	1.88	102.3	2.24	96	79	-0.051	11.55	0.37
312	44.727	0.137	1.88	102.3	2.29	93	79	-0.051	10.92	0.17
313	44.870	0.143	2.07	102.3	2.35	97	79	-0.053	9.59	0.06
314	45.015	0.145	2.07	102.3	2.41	99	79	-0.054	9.85	0.09
315	45.162	0.147	2.07	102.4	2.38	100	79	-0.054	10.01	0.12
316	45.307	0.145	2.07	102.3	2.44	99	79	-0.054	8.72	0.04
317	45.454	0.147	2.07	102.3	2.36	100	79	-0.053	9.21	0.08
318	45.599	0.145	2.06	102.4	2.45	99	79	-0.054	8.62	0.05
319	45.744	0.145	2.06	102.4	2.42	99	79	-0.050	6.71	0.03

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
320	45.890	0.146	2.06	102.4	2.44	100	79	-0.054	9.29	0.08
321	46.033	0.143	2.05	102.5	2.41	97	79	-0.052	10.13	0.15
322	46.180	0.147	2.05	102.6	2.43	100	80	-0.053	10.56	0.19
323	46.324	0.144	2.04	102.6	2.44	98	80	-0.050	10.26	0.14
324	46.472	0.148	2.04	102.6	2.4	101	80	-0.053	9.54	0.06
325	46.614	0.142	2.03	102.7	2.46	97	80	-0.050	9.05	0.05
326	46.761	0.147	2.04	102.7	2.41	100	80	-0.052	8.75	0.05
327	46.903	0.142	2.04	102.9	2.41	97	80	-0.053	9.92	0.09
328	47.050	0.147	2.03	102.8	2.46	100	80	-0.050	7.81	0.05
329	47.192	0.142	2.03	102.8	2.38	97	80	-0.051	9.44	0.08
330	47.339	0.147	2.03	102.8	2.45	100	80	-0.055	7.98	0.03
331	47.483	0.144	2.02	102.8	2.49	98	80	-0.051	7.30	0.02
332	47.627	0.144	2.03	102.7	2.44	98	80	-0.048	7.50	0.03
333	47.771	0.144	2.03	102.9	2.44	98	80	-0.048	8.17	0.04
334	47.915	0.144	2.03	102.9	2.44	98	80	-0.052	8.82	0.04
335	48.061	0.146	2.02	103	2.46	99	80	-0.050	9.12	0.06
336	48.204	0.143	2.02	103	2.45	97	80	-0.051	7.12	0.02
337	48.350	0.146	2.02	103	2.44	99	80	-0.053	6.45	0.02
338	48.492	0.142	2.02	103.1	2.43	97	80	-0.051	10.08	0.07
339	48.637	0.145	2.01	103.2	2.46	99	80	-0.052	9.53	0.06
340	48.780	0.143	2.02	103.1	2.5	97	80	-0.051	9.31	0.06
341	48.926	0.146	2.01	103.1	2.49	99	80	-0.051	9.18	0.05
342	49.069	0.143	2.00	103.1	2.5	97	80	-0.051	9.72	0.08
343	49.212	0.143	2.00	103.1	2.45	97	80	-0.053	10.63	0.14
344	49.355	0.143	2.00	103.1	2.49	97	80	-0.053	11.17	0.21
345	49.498	0.143	2.00	103.1	2.5	97	80	-0.052	9.96	0.13
346	49.644	0.146	2.00	103.1	2.51	100	80	-0.053	9.76	0.08
347	49.785	0.141	1.99	103.2	2.51	96	80	-0.049	9.90	0.08
348	49.930	0.145	1.99	103.2	2.5	99	80	-0.051	9.36	0.07
349	50.071	0.141	1.98	103.4	2.52	96	80	-0.052	9.10	0.07
350	50.216	0.145	1.99	103.4	2.49	99	80	-0.051	8.45	0.05
351	50.359	0.143	1.99	103.4	2.5	97	80	-0.053	8.91	0.04

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
352	50.501	0.142	1.98	103.4	2.5	97	80	-0.051	7.74	0.03
353	50.644	0.143	1.98	103.4	2.51	97	80	-0.050	9.64	0.09
354	50.786	0.142	1.98	103.4	2.49	97	80	-0.052	9.43	0.05
355	50.932	0.146	1.98	103.5	2.49	99	80	-0.047	9.32	0.04
356	51.072	0.140	1.97	103.4	2.49	95	80	-0.051	7.99	0.03
357	51.215	0.143	1.97	103.5	2.51	97	80	-0.049	10.46	0.14
358	51.356	0.141	1.97	103.4	2.49	96	80	-0.050	10.37	0.13
359	51.501	0.145	1.97	103.5	2.55	99	80	-0.050	9.26	0.08
360	51.643	0.142	1.96	103.5	2.56	97	80	-0.054	9.40	0.05
Avg/Tot	51.643	0.143	2.03	96	1.94	100			9.77	0.08

## LAB SAMPLE DATA - ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 1

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/6/2022

		Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
<b>Filters</b>	<b>A - 1st Hour</b>	G00352	123.0	247.0	250.5	3.5
		G00353	124.0			
	<b>B</b>	G00354	122.4	245.5	248.7	3.2
		G00355	123.1			
	<b>C - Post 1st Hour</b>	G00356	123.0	245.9	246.7	0.8
		G00357	122.9			
<b>Amb</b>	G00358	124.1	124.1	124.1	0.0	
<b>Probes</b>	<b>A - 1st Hour</b>	15A	117239.4	117239.4	117239.4	0.0
	<b>B</b>	15B	116752.3	116752.3	116752.3	0.0
	<b>C - Post 1st Hour</b>	15C	116847.5	116847.5	116847.6	0.1
<b>O-rings</b>	<b>A - 1st Hour</b>	15A	3570.7	3570.7	3570.7	0.0
	<b>B</b>	15B	3572.1	3572.1	3572.3	0.2
	<b>C - Post 1st Hour</b>	15C	3397.9	3397.9	3398.0	0.1

**Placed in Dessicator on:** 10/6/2022

<b>Filters</b>	<b>A</b>	250.6	10/7 13:22	250.5	10/13 10:33			
	<b>B</b>	248.8	10/7 13:22	248.7	10/13 10:33			
	<b>C - 1st Hour</b>	246.8	10/7 13:22	246.7	10/13 10:33			
	<b>Amb</b>	124.1	10/7 13:22	124.1	10/13 10:33			
<b>Probes</b>	<b>A</b>	117239.4	10/7 13:22	117239.4	10/13 10:33			
	<b>B</b>	116752.3	10/7 13:24	116752.3	10/13 10:33			
	<b>C - 1st Hour</b>	116847.5	10/7 13:24	116847.6	10/13 10:34			
<b>O-Rings</b>	<b>A</b>	3570.7	10/7 13:22	3570.7	10/13 10:34			
	<b>B</b>	3572.2	10/7 13:22	3572.3	10/13 10:34			
	<b>C - 1st Hour</b>	3397.8	10/7 13:22	3398.0	10/13 10:34			

<b>Train A Aggregate, mg:</b>	<b>3.5</b>
<b>Train B Aggregate, mg:</b>	<b>3.4</b>
<b>Train C Aggregate, mg:</b>	<b>1.0</b>
Ambient Aggregate, mg:	0.0

## ASTM E2779 Wood Heater Run Sheets

Client: Thelin Job Number: 22-827 Tracking #: 128  
 Model: Parlor Run Number: 1 Test Date: 10/6/2022

### Pellet Heater Control Settings

High Burn Rate Settings: Setting: High, trim 1:00  
 Medium Burn Rate Settings: Setting: Med, trim 1:00  
 Low Burn Rate Settings: Setting: Low, trim 1:00

### Preburn Notes

Preburn Start Time: 7:30

Time	Notes
0:00 60:00	Began PB, trim pot set to 1 o'clock position PB end

### Test Notes

Test Burn Start Time: 8:30

Time	Notes
60:00 180:00 360:00	Changed setting to Medium Changed setting to Low Test end

Test Burn End Time: 14:30

### Flue Gas Concentration Measurement

**Calibration Gas Values:** Span Gas CO<sub>2</sub> (%): 17.00 CO (%): 4.31  
 Mid Gas CO<sub>2</sub> (%): 10.09 CO (%): 2.53

### Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	7:18	7:20	7:19	15:05	15:01	15:03
CO <sub>2</sub>	0.00	10.14	17.00	0.07	10.03	16.95
CO	0.000	2.512	4.310	0.038	2.511	4.343

**Flue Gas Probe Leak Check:** Initial: 0 Final: 0

Technician Signature: 

Date: 10/26/2022  
Page 1 of 1

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



**Run 2 Data Summary**

Client: Thelin  
Model: Parlor  
Job #: 22-827  
Tracking #: 128  
Test Date: 10/10/2022

  
\_\_\_\_\_  
Tehician Signature

10/26/2022  
\_\_\_\_\_  
Date

## TEST RESULTS - ASTM E2779 / ASTM E2515

Client: Thelin \_\_\_\_\_  
 Model: Parlor \_\_\_\_\_  
 Run #: 2 \_\_\_\_\_

Job #: 22-827 \_\_\_\_\_  
 Tracking #: 128 \_\_\_\_\_  
 Technician: AK \_\_\_\_\_  
 Date: 10/10/2022 \_\_\_\_\_

Burn Rate Summary	
High Burn Rate (dry kg/hr)	1.90
Medium Burn Rate (dry kg/hr)	1.41
Low Burn Rate (dry kg/hr)	0.93
Overall Burn Rate (dry kg/hr)	1.25

Medium Burn Rate Target: < 1.42 dry kg/hr

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft <sup>3</sup> )	47.998	52.649	52.182	8.601
Average Gas Velocity in Dilution Tunnel (ft/sec)	6.8			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	18418.6			
Average Gas Meter Temperature (°F)	72.8	95.7	95.9	78.7
Total Sample Volume (dscf)	48.896	50.280	49.812	8.463
Average Tunnel Temperature (°F)	82.1			
Total Time of Test (min)	360			
Total Particulate Catch (mg)	0.0	2.6	2.4	0.5
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0000517	0.0000482	0.0000591
Total PM Emissions (g)	0.00	5.71	5.32	1.09
Particulate Emission Rate (g/hr)	0.00	0.95	0.89	1.09
Emissions Factor (g/kg)	-	0.76	0.71	0.57
Difference from Average Total Particulate Emissions (g)	-	0.20	0.20	-
Difference from Average Total Particulate Emissions (%)	-	3.5%	3.5%	-
Difference from Average Emissions Factor (g/kg)	-	0.03	0.03	-

Final Average Results	
Total Particulate Emissions (g)	5.52
Particulate Emission Rate (g/hr)	0.92
Emissions Factor (g/kg)	0.74
HHV Efficiency (%)	81.5%
LHV Efficiency (%)	88.2%
CO Emissions (g/min)	0.11

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	79.6	OK
Face Velocity	< 30 ft/min	8.2	OK
Leakage Rate	Less than 4% of average sample rate	0.001 cfm	OK
Ambient Temp	55-90 °F	69.5 / 75.9	OK
Negative Probe Weight Evaluation	<5% of Total Catch	Probe Catch Not Negative	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	OK
Medium Burn Rate	< midpoint of the high and low burn rates	1.41	OK

## Overall Pellet Test Efficiency Results

**Manufacturer:** Thelin  
**Model:** Parlor  
**Date:** 10/10/22  
**Run:** 2  
**Control #:** 22-827  
**Test Duration:** 360  
**Output Category:** Integrated

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

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	81.5%	88.2%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	81.9%	88.7%

<b>Output Rate (kJ/h)</b>	20,005	18,977	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.25	2.76	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	24,551	23,289	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	7.51	16.55	<b>dry lb</b>
<b>MC wet (%)</b>	3.64		
<b>MC dry (%)</b>	3.78		
<b>Particulate (g )</b>	5.52		
<b>CO (g)</b>	41		
<b>Test Duration (h)</b>	6.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.05	0.34
<b>g/kg Dry Fuel</b>	0.74	5.50
<b>g/h</b>	0.92	6.88
<b>g/min</b>	0.02	0.11
<b>lb/MM Btu Output</b>	0.11	0.80

<b>Air/Fuel Ratio (A/F)</b>	14.56
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VERSION:

2.2

12/14/2009



## Max Burn Rate Segment Efficiency Results

**Manufacturer:** Thelin  
**Model:** Parlor  
**Date:** 10/10/22  
**Run:** 2  
**Control #:** 22-827  
**Test Duration:** 60  
**Output Category:** Maximum

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

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	79.6%	86.2%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	80.0%	86.6%

<b>Output Rate (kJ/h)</b>	29,698	28,172	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.90	4.19	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	37,320	35,402	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	1.90	4.19	<b>dry lb</b>
<b>MC wet (%)</b>	3.64		
<b>MC dry (%)</b>	3.78		
<b>Particulate (g )</b>	N/A		
<b>CO (g)</b>	11		
<b>Test Duration (h)</b>	1.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	N/A	0.36
<b>g/kg Dry Fuel</b>	N/A	5.62
<b>g/h</b>	N/A	10.68
<b>g/min</b>	N/A	0.18
<b>lb/MM Btu Output</b>	N/A	0.84

<b>Air/Fuel Ratio (A/F)</b>	12.61
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VERSION:

2.2

12/14/2009

## Medium Burn Rate Segment Efficiency Results

**Manufacturer:** Thelin  
**Model:** Parlor  
**Date:** 10/10/22  
**Run:** 2  
**Control #:** 22-827  
**Test Duration:** 120  
**Output Category:** Medium

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

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	81.1%	87.8%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	81.5%	88.2%

<b>Output Rate (kJ/h)</b>	22,359	21,210	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.41	3.10	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	27,582	26,165	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	2.81	6.20	<b>dry lb</b>
<b>MC wet (%)</b>	3.64		
<b>MC dry (%)</b>	3.78		
<b>Particulate (g )</b>	N/A		
<b>CO (g)</b>	16		
<b>Test Duration (h)</b>	2.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	N/A	0.37
<b>g/kg Dry Fuel</b>	N/A	5.86
<b>g/h</b>	N/A	8.24
<b>g/min</b>	N/A	0.14
<b>lb/MM Btu Output</b>	N/A	0.86

<b>Air/Fuel Ratio (A/F)</b>	13.70
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VERSION:

2.2

12/14/2009

## Minimum Burn Rate Segment Efficiency Results

**Manufacturer:** Thelin  
**Model:** Parlor  
**Date:** 10/10/22  
**Run:** 2  
**Control #:** 22-827  
**Test Duration:** 180  
**Output Category:** Minimum

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

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	83.0%	89.9%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	83.4%	90.3%

<b>Output Rate (kJ/h)</b>	15,166	14,387	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	0.93	2.05	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	18,274	17,335	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	2.79	6.16	<b>dry lb</b>
<b>MC wet (%)</b>	3.64		
<b>MC dry (%)</b>	3.78		
<b>Particulate (g )</b>	N/A		
<b>CO (g)</b>	14		
<b>Test Duration (h)</b>	3.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	N/A	0.31
<b>g/kg Dry Fuel</b>	N/A	5.12
<b>g/h</b>	N/A	4.77
<b>g/min</b>	N/A	0.08
<b>lb/MM Btu Output</b>	N/A	0.73

<b>Air/Fuel Ratio (A/F)</b>	16.05
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VERSION:

2.2

12/14/2009

## DILUTION TUNNEL & MISC. DATA - ASTM E2779 / E2515

Client: **Thelin**  
 Model: **Parlor**  
 Run #: **2**  
 Test Start Time: **8:47**

Job #: **22-827**  
 Tracking #: **128**  
 Technician: **AK**  
 Date: **10/10/2022**

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

Meter Box  $\gamma$  Factor: **1.000** (A)  
 Meter Box  $\gamma$  Factor: **1.000** (B)  
 Meter Box  $\gamma$  Factor: **0.999** (C)  
 Meter Box  $\gamma$  Factor: **1.028** (Ambient)  
 Induced Draft Check (in. H<sub>2</sub>O): **0**  
 Smoke Capture Check (%): **100%**  
 Date Flue Pipe Last Cleaned: **10/4/2022**

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	29.96	29.9	29.93
Relative Humidity (%)	44.0	38.1	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	
Ambient Sample Volume:	47.998 ft <sup>3</sup>		

**Sample Train Post-Test Leak Checks**

(A)	0.000	cfm @	-5	in. Hg
(B)	0.001	cfm @	-4	in. Hg
(C)	0.000	cfm @	-5	in. Hg
(Ambient)	0.000	cfm @	-12	in. Hg

## DILUTION TUNNEL FLOW

### Traverse Data

Point	dP (in H <sub>2</sub> O)	Temp (°F)
1	0.006	80
2	0.014	80
3	0.014	80
4	0.014	80
5	0.012	80
6	0.008	80
7	0.010	80
8	0.014	80
9	0.014	80
10	0.014	80
11	0.012	80
12	0.006	80
Center	0.015	80

Dilution Tunnel H<sub>2</sub>O: **2.00** percent  
 Tunnel Diameter: **12** inches  
 Pitot Tube C<sub>p</sub>: **0.99** [unitless]  
 Dilution Tunnel MW(dry): **29.00** lb/lb-mole  
 Dilution Tunnel MW(wet): **28.78** lb/lb-mole  
 Tunnel Area: **0.7854** ft<sup>2</sup>

$V_{strav}$ : **7.109** ft/sec  
 $V_{scent}$ : **8.205** ft/sec  
 $F_p$ : **0.866** [ratio]  
 Initial Tunnel Flow: **321.1** scf/min

Static Pressure: **-0.170** in. H<sub>2</sub>O

## 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 Mtn
Pellet Fuel Grade:	PFI Premium
HHV (BTU/lb)	8442
%C	44.9
%H	6.96
%O	47.62
%Ash	0.52
MC (%WB)	3.64

# PELLET STOVE PREBURN DATA - ASTM E2779

Client: <u>Thelin</u>	Job #: <u>22-827</u>
Model: <u>Parlor</u>	Tracking #: <u>128</u>
Run #: <u>2</u>	Technician: <u>AK</u>
	Date: <u>10/10/2022</u>

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

Elapsed Time (min)	Scale Reading (lbs)	Average:			
		Weight Change (lbs)	Flue Draft (in H <sub>2</sub> O)	Flue (°F)	Ambient (°F)
			<b>-0.053</b>	<b>324</b>	<b>68</b>
0	43.0	-	-0.007	85	67
1	43.0	-0.04	-0.012	96	67
2	42.9	-0.04	-0.019	112	66
3	42.9	-0.04	-0.024	128	67
4	42.8	-0.08	-0.030	155	67
5	42.7	-0.11	-0.038	189	67
6	42.6	-0.11	-0.043	221	67
7	42.5	-0.11	-0.046	248	67
8	42.4	-0.11	-0.052	274	67
9	42.3	-0.06	-0.048	290	67
10	42.3	-0.06	-0.051	298	67
11	42.2	-0.06	-0.052	304	67
12	42.1	-0.06	-0.052	308	67
13	42.1	-0.06	-0.053	312	67
14	42.0	-0.07	-0.055	315	67
15	41.9	-0.06	-0.053	317	67
16	41.9	-0.06	-0.055	320	67
17	41.8	-0.05	-0.053	321	67
18	41.8	-0.06	-0.053	322	67
19	41.7	-0.08	-0.055	327	68
20	41.6	-0.09	-0.058	334	68
21	41.5	-0.07	-0.054	338	68
22	41.5	-0.08	-0.055	343	68
23	41.4	-0.09	-0.056	349	68
24	41.3	-0.05	-0.056	351	68
25	41.3	-0.06	-0.057	351	68
26	41.2	-0.07	-0.056	353	68
27	41.1	-0.08	-0.058	355	68
28	41.0	-0.07	-0.057	356	68
29	41.0	-0.06	-0.058	356	68
30	40.9	-0.07	-0.058	354	68
31	40.9	-0.05	-0.058	353	69
32	40.8	-0.08	-0.056	354	69
33	40.7	-0.08	-0.059	355	69
34	40.6	-0.07	-0.058	356	69
35	40.5	-0.08	-0.060	358	69
36	40.5	-0.07	-0.057	360	69
37	40.4	-0.08	-0.060	361	69
38	40.3	-0.06	-0.060	362	69
39	40.3	-0.08	-0.056	362	69
40	40.2	-0.07	-0.059	362	69
41	40.1	-0.07	-0.060	362	69
42	40.1	-0.06	-0.058	363	69
43	40.0	-0.08	-0.058	364	69
44	39.9	-0.07	-0.059	364	69
45	39.8	-0.09	-0.059	367	69
46	39.7	-0.07	-0.060	370	69



# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: ThelinJob #: 22-827Model: ParlorTracking #: 128Run #: 2Technician: AKDate: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.014	0.99	72.1	0.51		17.2		83	372	69	69.5
1	0.141	0.141	0.013	1.91	71.9	0.71	104	17.1	-0.1	83	370	69	69.6
2	0.278	0.137	0.013	1.93	71.9	0.71	101	17.0	-0.1	83	368	70	69.8
3	0.416	0.138	0.013	1.95	71.9	0.68	101	17.0	-0.1	83	367	70	69.8
4	0.557	0.141	0.014	1.96	72	0.73	100	16.9	-0.1	83	366	70	69.9
5	0.694	0.137	0.014	1.97	72.1	0.75	97	16.8	-0.1	83	369	70	70
6	0.837	0.143	0.013	1.98	72.2	0.75	105	16.8	-0.1	83	371	70	69.7
7	0.973	0.136	0.013	1.98	72.3	0.75	100	16.7	-0.1	83	372	70	69.9
8	1.115	0.142	0.014	1.99	72.4	0.76	101	16.6	-0.1	84	376	70	69.9
9	1.256	0.141	0.013	2.00	72.6	0.77	104	16.5	-0.1	84	377	71	69.9
10	1.396	0.140	0.013	2.01	72.7	0.71	103	16.5	-0.1	84	374	71	69.8
11	1.539	0.143	0.013	2.02	72.8	0.76	105	16.4	-0.1	84	374	71	69.9
12	1.677	0.138	0.013	2.02	73.1	0.77	101	16.3	-0.1	84	374	71	69.9
13	1.822	0.145	0.013	2.04	73.3	0.75	106	16.2	-0.1	84	376	71	69.9
14	1.962	0.140	0.013	2.03	73.5	0.77	103	16.2	-0.1	84	376	71	69.8
15	2.102	0.140	0.013	2.05	73.7	0.76	103	16.1	-0.1	84	375	71	70
16	2.246	0.144	0.013	2.04	73.9	0.75	106	16.0	-0.1	84	374	71	70.2
17	2.385	0.139	0.014	2.05	74.2	0.77	98	16.0	-0.1	84	373	72	70.4
18	2.534	0.149	0.013	2.05	74.5	0.75	109	15.9	-0.1	84	370	72	70.2
19	2.675	0.141	0.014	2.07	74.8	0.79	99	15.8	-0.1	84	369	72	70.3
20	2.819	0.144	0.013	2.07	75.1	0.75	105	15.8	-0.1	84	369	72	70.1
21	2.962	0.143	0.014	2.07	75.4	0.79	101	15.7	-0.1	84	366	72	70.2
22	3.103	0.141	0.013	2.09	75.7	0.78	103	15.7	-0.1	84	367	72	70.2
23	3.252	0.149	0.013	2.09	76	0.79	109	15.6	-0.1	84	365	72	70.3
24	3.393	0.141	0.013	2.10	76.4	0.81	103	15.5	-0.1	84	368	72	70.4
25	3.537	0.144	0.013	2.10	76.7	0.79	105	15.4	-0.1	84	372	72	70.3
26	3.679	0.142	0.013	2.11	77.1	0.78	104	15.4	-0.1	84	374	72	70.3
27	3.827	0.148	0.014	2.12	77.4	0.81	104	15.3	-0.1	84	376	72	70.3
28	3.970	0.143	0.013	2.13	77.8	0.82	104	15.2	-0.1	84	376	72	70.7
29	4.119	0.149	0.013	2.12	78.1	0.79	108	15.2	-0.1	84	374	72	70.6
30	4.262	0.143	0.013	2.12	78.5	0.77	104	15.1	-0.1	84	375	73	70.5
31	4.408	0.146	0.014	2.13	78.8	0.78	102	15.0	-0.1	84	376	73	70.4
32	4.553	0.145	0.013	2.14	79.1	0.8	105	14.9	-0.1	84	378	73	70.7

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: ThelinJob #: 22-827Model: ParlorTracking #: 128Run #: 2Technician: AKDate: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	4.700	0.147	0.013	2.14	79.4	0.77	107	14.8	-0.1	84	382	73	70.5
34	4.848	0.148	0.013	2.15	79.8	0.82	107	14.7	-0.1	84	384	73	70.5
35	4.987	0.139	0.013	2.15	80.1	0.81	101	14.6	-0.1	84	385	73	70.5
36	5.139	0.152	0.013	2.13	80.4	0.79	110	14.6	-0.1	84	387	73	70.6
37	5.282	0.143	0.013	2.08	80.8	0.81	104	14.5	0.0	84	383	73	70.4
38	5.426	0.144	0.013	2.04	81.1	0.79	104	14.4	-0.1	85	383	73	70.7
39	5.570	0.144	0.014	2.04	81.4	0.79	100	14.4	-0.1	85	383	73	70.8
40	5.710	0.140	0.013	2.04	81.7	0.78	101	14.3	-0.1	85	384	73	70.6
41	5.857	0.147	0.013	2.05	82.1	0.76	106	14.2	-0.1	85	384	73	70.5
42	6.000	0.143	0.013	2.05	82.4	0.79	103	14.1	-0.1	85	384	73	70.6
43	6.146	0.146	0.013	2.07	82.7	0.79	105	14.1	-0.1	85	384	73	70.7
44	6.285	0.139	0.013	2.05	83	0.77	100	14.0	-0.1	85	381	73	70.7
45	6.433	0.148	0.013	2.06	83.3	0.81	107	13.9	-0.1	85	383	73	70.6
46	6.575	0.142	0.013	2.07	83.6	0.79	102	13.9	-0.1	85	382	73	70.6
47	6.718	0.143	0.013	2.06	83.9	0.81	103	13.8	0.0	85	377	73	70.7
48	6.861	0.143	0.013	2.06	84.1	0.79	103	13.7	-0.1	85	374	73	70.6
49	7.007	0.146	0.013	2.06	84.5	0.8	105	13.6	-0.1	85	376	73	70.7
50	7.153	0.146	0.013	2.08	84.7	0.8	105	13.6	-0.1	85	377	73	70.5
51	7.296	0.143	0.013	2.07	85.1	0.79	103	13.5	-0.1	85	377	73	70.6
52	7.441	0.145	0.013	2.07	85.3	0.79	104	13.4	-0.1	85	377	73	70.7
53	7.582	0.141	0.013	2.08	85.6	0.81	101	13.4	-0.1	85	377	74	70.7
54	7.733	0.151	0.013	2.07	85.8	0.78	108	13.3	0.0	85	374	74	70.9
55	7.875	0.142	0.013	2.08	86.1	0.81	102	13.2	-0.1	85	375	74	70.7
56	8.020	0.145	0.013	2.09	86.4	0.79	104	13.2	-0.1	85	375	74	70.8
57	8.166	0.146	0.014	2.09	86.6	0.79	101	13.1	-0.1	85	376	74	70.7
58	8.311	0.145	0.013	2.08	86.9	0.8	104	13.0	-0.1	85	376	74	70.8
59	8.454	0.143	0.014	2.09	87.2	0.81	99	12.9	-0.1	85	379	74	71.1
60	8.601	0.147	0.014	2.08	87.3	0.79	101	12.8	-0.1	84	375	74	71.2
61	8.747	0.146	0.013	2.09	87.6	0.79	104	12.8	0.0	84	365	74	71
62	8.890	0.143	0.013	2.09	87.8	0.81	102	12.8	0.0	83	361	74	71.2
63	9.041	0.151	0.013	2.09	88	0.81	108	12.7	-0.1	83	357	74	71.2
64	9.180	0.139	0.013	2.08	88.3	0.8	99	12.7	0.0	83	354	74	71
65	9.329	0.149	0.013	2.10	88.5	0.81	106	12.6	-0.1	83	349	74	71.2



# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	9.475	0.146	0.013	2.10	88.8	0.8	104	12.5	0.0	83	347	74	71.2
67	9.625	0.150	0.013	2.12	89	0.81	107	12.5	-0.1	83	347	74	71.2
68	9.768	0.143	0.013	2.11	89.2	0.8	102	12.4	-0.1	83	347	74	71.2
69	9.915	0.147	0.013	2.10	89.4	0.81	105	12.4	-0.1	83	347	74	71.1
70	10.058	0.143	0.013	2.10	89.6	0.83	102	12.3	-0.1	83	347	74	71.2
71	10.206	0.148	0.014	2.10	89.8	0.84	101	12.2	0.0	83	345	74	71.2
72	10.352	0.146	0.014	2.11	90.1	0.81	100	12.2	0.0	82	341	74	71.2
73	10.499	0.147	0.013	2.12	90.2	0.82	104	12.1	-0.1	82	338	74	71.1
74	10.648	0.149	0.013	2.12	90.4	0.82	106	12.1	-0.1	82	337	74	71
75	10.789	0.141	0.014	2.12	90.6	0.83	96	12.0	0.0	82	337	74	71.2
76	10.941	0.152	0.013	2.11	90.8	0.83	108	12.0	-0.1	82	337	74	71.2
77	11.084	0.143	0.013	2.11	91	0.82	101	11.9	0.0	82	336	74	71.2
78	11.231	0.147	0.014	2.12	91.1	0.81	100	11.9	-0.1	82	334	74	71.4
79	11.377	0.146	0.014	2.12	91.3	0.81	100	11.8	-0.1	82	333	74	71.1
80	11.527	0.150	0.013	2.11	91.5	0.81	106	11.7	-0.1	82	334	74	71.1
81	11.672	0.145	0.014	2.13	91.7	0.81	99	11.7	-0.1	82	336	74	71.2
82	11.821	0.149	0.014	2.11	91.8	0.82	102	11.6	-0.1	82	337	74	71.1
83	11.964	0.143	0.013	2.13	92	0.81	101	11.5	-0.1	82	338	74	71.2
84	12.114	0.150	0.013	2.12	92.1	0.84	106	11.5	-0.1	82	341	74	71.3
85	12.260	0.146	0.014	2.12	92.3	0.82	100	11.4	0.0	82	339	74	71.2
86	12.404	0.144	0.013	2.12	92.4	0.82	102	11.4	0.0	82	336	74	71.3
87	12.552	0.148	0.013	2.14	92.5	0.87	105	11.3	-0.1	82	333	74	71.2
88	12.698	0.146	0.013	2.13	92.7	0.78	103	11.3	0.0	82	332	74	71.2
89	12.850	0.152	0.014	2.13	92.9	0.85	104	11.2	-0.1	82	332	74	71.1
90	12.996	0.146	0.014	2.13	93.1	0.83	99	11.2	-0.1	82	334	74	71.3
91	13.146	0.150	0.013	2.13	93.2	0.87	106	11.1	0.0	82	331	74	71.3
92	13.290	0.144	0.013	2.13	93.3	0.82	102	11.1	-0.1	82	330	74	71.3
93	13.438	0.148	0.013	2.13	93.5	0.83	105	11.0	0.0	82	329	74	71.4
94	13.585	0.147	0.014	2.13	93.6	0.81	100	11.0	0.0	82	328	74	71.3
95	13.732	0.147	0.013	2.12	93.7	0.82	104	10.9	-0.1	82	329	74	71.2
96	13.879	0.147	0.014	2.12	93.8	0.83	100	10.8	-0.1	82	330	74	71.2
97	14.030	0.151	0.013	2.13	94	0.84	107	10.8	0.0	82	330	74	71.2
98	14.175	0.145	0.013	2.12	94.1	0.81	102	10.7	-0.1	82	329	74	71.3

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: ThelinJob #: 22-827Model: ParlorTracking #: 128Run #: 2Technician: AKDate: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	14.325	0.150	0.013	2.14	94.3	0.82	106	10.7	0.0	82	329	74	71.3
100	14.471	0.146	0.013	2.14	94.4	0.81	103	10.6	-0.1	82	327	74	71.4
101	14.621	0.150	0.013	2.13	94.5	0.83	106	10.6	0.0	82	326	74	71.3
102	14.764	0.143	0.013	2.13	94.6	0.81	101	10.5	-0.1	82	327	74	71.5
103	14.916	0.152	0.013	2.13	94.7	0.82	107	10.5	0.0	82	324	74	71.5
104	15.060	0.144	0.013	2.13	94.8	0.82	101	10.4	0.0	82	322	74	71.6
105	15.211	0.151	0.013	2.13	94.9	0.84	106	10.4	-0.1	82	321	74	71.5
106	15.355	0.144	0.013	2.13	95	0.83	101	10.3	0.0	82	320	74	71.5
107	15.506	0.151	0.014	2.13	95.1	0.85	102	10.3	-0.1	82	320	74	71.7
108	15.652	0.146	0.013	2.14	95.2	0.82	103	10.2	-0.1	82	321	74	71.6
109	15.801	0.149	0.013	2.14	95.3	0.83	105	10.1	-0.1	82	321	74	71.8
110	15.951	0.150	0.013	2.13	95.4	0.83	106	10.1	0.0	82	321	74	71.7
111	16.095	0.144	0.013	2.14	95.5	0.86	101	10.0	-0.1	82	323	74	71.7
112	16.247	0.152	0.013	2.14	95.7	0.82	107	10.0	-0.1	82	321	74	71.6
113	16.392	0.145	0.013	2.13	95.7	0.84	102	9.9	-0.1	82	321	74	71.6
114	16.544	0.152	0.013	2.14	95.8	0.85	107	9.9	0.0	82	320	74	71.6
115	16.690	0.146	0.013	2.14	95.9	0.84	103	9.8	-0.1	82	321	74	71.8
116	16.841	0.151	0.013	2.14	96	0.85	106	9.8	0.0	82	321	74	71.7
117	16.986	0.145	0.013	2.13	96.1	0.86	102	9.7	-0.1	83	322	74	71.7
118	17.135	0.149	0.013	2.14	96.2	0.86	105	9.6	-0.1	82	324	74	71.9
119	17.282	0.147	0.013	2.13	96.3	0.88	103	9.6	-0.1	82	325	74	71.9
120	17.434	0.152	0.013	2.14	96.4	0.84	107	9.5	0.0	83	323	74	71.9
121	17.578	0.144	0.013	2.14	96.5	0.87	101	9.5	-0.1	83	322	74	71.9
122	17.727	0.149	0.013	2.13	96.6	0.86	105	9.4	-0.1	83	322	74	71.9
123	17.875	0.148	0.013	2.13	96.6	0.89	104	9.3	-0.1	83	324	74	72
124	18.026	0.151	0.013	2.13	96.7	0.83	106	9.3	-0.1	83	326	74	72.2
125	18.169	0.143	0.013	2.14	96.8	0.83	100	9.2	-0.1	83	327	74	72.2
126	18.323	0.154	0.013	2.13	96.8	0.85	108	9.2	0.0	83	326	74	72.3
127	18.469	0.146	0.013	2.13	96.9	0.85	103	9.1	-0.1	83	323	74	72.3
128	18.618	0.149	0.013	2.14	97	0.85	105	9.1	0.0	83	320	74	72.2
129	18.767	0.149	0.013	2.14	97.1	0.84	105	9.0	-0.1	83	319	74	72.1
130	18.917	0.150	0.013	2.13	97.2	0.86	105	9.0	-0.1	83	319	74	72.1
131	19.061	0.144	0.013	2.13	97.3	0.89	101	8.9	-0.1	83	319	74	72.2

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: ThelinJob #: 22-827Model: ParlorTracking #: 128Run #: 2Technician: AKDate: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
132	19.213	0.152	0.013	2.13	97.3	0.84	107	8.9	-0.1	83	320	74	72.3
133	19.360	0.147	0.013	2.14	97.3	0.85	103	8.8	-0.1	83	319	74	72.4
134	19.507	0.147	0.013	2.12	97.4	0.84	103	8.8	0.0	83	318	74	72.4
135	19.654	0.147	0.013	2.13	97.4	0.89	103	8.7	0.0	83	317	74	72.5
136	19.802	0.148	0.014	2.13	97.5	0.87	100	8.7	-0.1	83	316	74	72.5
137	19.954	0.152	0.014	2.13	97.6	0.87	103	8.6	-0.1	83	316	74	72.3
138	20.102	0.148	0.013	2.13	97.6	0.87	104	8.5	-0.1	83	315	74	72.3
139	20.250	0.148	0.013	2.13	97.7	0.87	104	8.5	-0.1	83	313	74	72.2
140	20.396	0.146	0.013	2.13	97.8	0.85	102	8.4	-0.1	83	313	75	72.3
141	20.548	0.152	0.013	2.13	97.9	0.88	107	8.4	0.0	83	311	74	72.4
142	20.692	0.144	0.013	2.13	97.9	0.87	101	8.4	-0.1	83	310	75	72.4
143	20.843	0.151	0.013	2.13	98	0.85	106	8.3	-0.1	83	310	75	72.3
144	20.992	0.149	0.013	2.13	98.1	0.88	104	8.3	0.0	83	310	75	72.7
145	21.142	0.150	0.013	2.14	98.1	0.86	105	8.2	-0.1	83	309	75	72.6
146	21.289	0.147	0.013	2.14	98.1	0.87	103	8.2	0.0	83	308	75	72.6
147	21.440	0.151	0.013	2.12	98.2	0.86	106	8.1	0.0	83	309	75	72.5
148	21.585	0.145	0.013	2.13	98.2	0.87	102	8.0	-0.1	83	310	75	72.5
149	21.736	0.151	0.013	2.14	98.3	0.87	106	8.0	-0.1	83	310	75	72.7
150	21.879	0.143	0.014	2.13	98.4	0.83	97	7.9	0.0	83	310	75	72.7
151	22.031	0.152	0.013	2.13	98.4	0.86	107	7.9	-0.1	83	310	75	72.7
152	22.179	0.148	0.013	2.13	98.5	0.86	104	7.8	0.0	83	309	75	72.7
153	22.330	0.151	0.013	2.13	98.5	0.85	106	7.8	-0.1	83	309	75	72.8
154	22.474	0.144	0.014	2.13	98.6	0.89	97	7.7	-0.1	83	309	75	72.7
155	22.624	0.150	0.013	2.12	98.6	0.89	105	7.7	0.0	83	307	75	72.7
156	22.769	0.145	0.014	2.12	98.7	0.88	98	7.6	-0.1	83	306	75	72.8
157	22.923	0.154	0.014	2.13	98.8	0.85	104	7.6	0.0	83	306	75	72.8
158	23.069	0.146	0.014	2.13	98.9	0.83	98	7.5	-0.1	83	305	75	72.8
159	23.219	0.150	0.014	2.13	98.9	0.86	101	7.5	0.0	83	304	75	72.9
160	23.365	0.146	0.014	2.11	98.9	0.86	98	7.5	0.0	83	303	75	72.7
161	23.515	0.150	0.014	2.13	98.9	0.88	101	7.4	0.0	83	302	75	72.7
162	23.661	0.146	0.014	2.12	99.1	0.9	98	7.4	-0.1	83	302	75	72.8
163	23.814	0.153	0.014	2.12	99.1	0.92	103	7.3	-0.1	83	304	75	72.7
164	23.960	0.146	0.013	2.12	99.1	0.9	102	7.2	-0.1	83	306	75	72.7

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
165	24.110	0.150	0.013	2.12	99.1	0.87	105	7.2	-0.1	83	308	75	72.8
166	24.255	0.145	0.013	2.12	99.2	0.89	101	7.1	-0.1	83	312	75	73
167	24.403	0.148	0.014	2.13	99.2	0.86	100	7.0	-0.1	83	314	75	72.9
168	24.551	0.148	0.013	2.12	99.3	0.85	104	7.0	-0.1	83	316	75	72.9
169	24.702	0.151	0.013	2.12	99.4	0.89	106	6.9	-0.1	83	318	75	73
170	24.850	0.148	0.014	2.11	99.4	0.89	100	6.9	0.0	83	319	75	73.3
171	24.997	0.147	0.014	2.12	99.5	0.88	99	6.8	-0.1	84	319	75	73.4
172	25.146	0.149	0.013	2.12	99.4	0.91	104	6.8	-0.1	84	317	75	73.4
173	25.291	0.145	0.013	2.11	99.5	0.87	101	6.7	0.0	84	316	75	73.3
174	25.443	0.152	0.013	2.11	99.5	0.9	106	6.7	0.0	84	314	75	73.2
175	25.590	0.147	0.013	2.10	99.5	0.89	103	6.6	-0.1	84	312	75	73.3
176	25.740	0.150	0.014	2.11	99.6	0.9	101	6.6	-0.1	84	311	75	73.3
177	25.887	0.147	0.014	2.11	99.7	0.89	99	6.5	-0.1	84	310	75	73.4
178	26.035	0.148	0.013	2.12	99.7	0.87	104	6.5	-0.1	84	311	75	73.4
179	26.183	0.148	0.014	2.12	99.7	0.91	100	6.4	0.0	84	309	75	73.3
180	26.331	0.148	0.014	2.11	99.8	0.9	100	6.4	0.0	84	309	75	73.5
181	26.476	0.145	0.013	2.10	99.8	0.9	101	6.3	-0.1	84	304	75	73.4
182	26.629	0.153	0.013	2.10	99.9	0.91	107	6.3	-0.1	84	300	75	73.4
183	26.774	0.145	0.013	2.11	99.9	0.91	101	6.2	0.0	83	297	75	73.4
184	26.925	0.151	0.014	2.11	99.9	0.88	102	6.2	0.0	83	294	75	73.4
185	27.069	0.144	0.014	2.09	100	0.89	97	6.2	0.0	83	291	75	73.6
186	27.219	0.150	0.013	2.11	100	0.88	105	6.1	0.0	83	287	76	73.5
187	27.364	0.145	0.014	2.11	100	0.91	98	6.1	0.0	83	282	75	73.6
188	27.517	0.153	0.014	2.11	100	0.92	103	6.1	0.0	83	279	75	73.5
189	27.663	0.146	0.014	2.11	100.1	0.89	98	6.0	0.0	83	276	75	73.3
190	27.814	0.151	0.014	2.11	100.1	0.91	102	6.0	0.0	83	274	76	73.6
191	27.958	0.144	0.014	2.11	100.1	0.9	97	5.9	0.0	82	274	75	73.5
192	28.108	0.150	0.014	2.11	100.2	0.9	101	5.9	-0.1	82	276	76	73.6
193	28.257	0.149	0.014	2.11	100.2	0.91	100	5.8	0.0	82	275	76	73.3
194	28.406	0.149	0.014	2.11	100.3	0.92	100	5.8	0.0	82	273	75	73.5
195	28.551	0.145	0.014	2.11	100.3	0.89	97	5.8	0.0	81	270	75	73.1
196	28.699	0.148	0.014	2.11	100.4	0.92	99	5.8	0.0	81	266	75	72.7
197	28.846	0.147	0.015	2.10	100.4	0.89	95	5.7	0.0	81	265	75	72.8

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
198	28.997	0.151	0.014	2.10	100.4	0.91	101	5.7	-0.1	81	264	75	72.9
199	29.145	0.148	0.014	2.09	100.4	0.87	99	5.6	0.0	81	263	75	73
200	29.292	0.147	0.014	2.10	100.5	0.94	99	5.6	0.0	81	262	75	73.4
201	29.442	0.150	0.014	2.10	100.5	0.91	101	5.6	0.0	81	261	75	72.9
202	29.588	0.146	0.014	2.10	100.5	0.91	98	5.5	-0.1	81	262	75	72.7
203	29.736	0.148	0.015	2.11	100.5	0.89	96	5.5	0.0	81	261	75	72.7
204	29.883	0.147	0.015	2.10	100.6	0.93	95	5.4	-0.1	81	262	75	72.9
205	30.035	0.152	0.014	2.10	100.6	0.85	102	5.4	-0.1	81	262	75	72.8
206	30.181	0.146	0.014	2.10	100.6	0.91	98	5.3	0.0	81	264	75	72.7
207	30.329	0.148	0.014	2.11	100.6	0.93	99	5.3	0.0	80	264	75	72.8
208	30.476	0.147	0.014	2.10	100.6	0.89	99	5.3	0.0	80	262	75	72.6
209	30.627	0.151	0.014	2.10	100.7	0.9	101	5.3	0.0	80	261	75	72.7
210	30.772	0.145	0.014	2.10	100.7	0.93	97	5.2	0.0	80	258	75	72.6
211	30.919	0.147	0.014	2.09	100.7	0.93	99	5.2	-0.1	81	257	75	72.5
212	31.066	0.147	0.014	2.09	100.7	0.9	99	5.1	0.0	81	257	75	72.7
213	31.217	0.151	0.014	2.09	100.8	0.9	101	5.1	0.0	81	254	75	72.9
214	31.360	0.143	0.014	2.09	100.8	0.91	96	5.1	0.0	81	254	75	72.4
215	31.513	0.153	0.014	2.09	100.8	0.91	103	5.0	0.0	81	254	75	72.6
216	31.659	0.146	0.014	2.10	100.7	0.92	98	5.0	0.0	81	254	75	72.7
217	31.809	0.150	0.014	2.09	100.8	0.89	101	5.0	0.0	81	252	75	72.9
218	31.955	0.146	0.014	2.10	100.8	0.93	98	4.9	-0.1	81	251	75	72.8
219	32.104	0.149	0.014	2.10	100.8	0.9	100	4.9	0.0	81	251	75	72.8
220	32.248	0.144	0.014	2.10	100.8	0.88	97	4.8	-0.1	81	252	75	72.7
221	32.399	0.151	0.014	2.08	100.8	0.91	101	4.8	0.0	81	252	75	72.8
222	32.545	0.146	0.014	2.09	100.8	0.95	98	4.8	0.0	80	251	75	72.7
223	32.692	0.147	0.014	2.08	100.8	0.91	99	4.8	0.0	80	251	75	72.9
224	32.841	0.149	0.014	2.08	100.8	0.93	100	4.7	0.0	81	250	75	72.9
225	32.987	0.146	0.014	2.08	100.8	0.91	98	4.7	0.0	80	249	75	73.1
226	33.134	0.147	0.014	2.09	100.8	0.94	99	4.7	0.0	80	248	75	73.2
227	33.282	0.148	0.014	2.09	100.8	0.91	99	4.6	0.0	80	247	75	73.5
228	33.433	0.151	0.015	2.09	100.9	0.91	98	4.6	0.0	80	247	75	73.2
229	33.577	0.144	0.014	2.08	100.8	0.91	97	4.6	0.0	80	247	75	73.3
230	33.727	0.150	0.015	2.09	100.8	0.93	97	4.5	0.0	80	246	75	73

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
231	33.868	0.141	0.015	2.08	100.8	0.93	91	4.5	-0.1	80	247	75	72.8
232	34.021	0.153	0.014	2.07	100.9	0.93	103	4.5	0.0	80	246	75	73
233	34.162	0.141	0.015	2.08	100.9	0.93	91	4.4	0.0	80	245	75	72.8
234	34.315	0.153	0.014	2.08	100.9	0.93	103	4.4	0.0	80	243	75	72.9
235	34.459	0.144	0.015	2.07	101	0.94	93	4.4	0.0	80	243	75	73
236	34.607	0.148	0.015	2.07	101	0.94	96	4.3	0.0	80	244	75	73.1
237	34.755	0.148	0.014	2.06	101	0.96	99	4.3	-0.1	81	244	75	73
238	34.903	0.148	0.014	2.07	101	0.93	99	4.3	0.0	81	244	75	72.7
239	35.046	0.143	0.014	2.06	101	0.95	96	4.2	0.0	80	245	75	73
240	35.196	0.150	0.014	2.06	101	0.92	101	4.2	0.0	80	246	75	73.3
241	35.341	0.145	0.014	2.05	101	0.93	97	4.2	0.0	80	245	75	73.3
242	35.485	0.144	0.015	2.07	101	0.95	93	4.1	0.0	80	243	75	73.3
243	35.636	0.151	0.014	2.08	101	0.94	101	4.1	0.0	80	243	75	73.1
244	35.781	0.145	0.014	2.06	101	0.94	97	4.1	0.0	81	242	75	73.4
245	35.931	0.150	0.014	2.06	100.9	0.94	101	4.0	-0.1	80	242	75	73.2
246	36.075	0.144	0.014	2.06	101	0.96	97	4.0	0.0	80	241	75	73.3
247	36.221	0.146	0.014	2.05	101	0.95	98	4.0	0.0	80	241	75	73.3
248	36.367	0.146	0.014	2.06	101	0.96	98	3.9	0.0	80	240	75	73.2
249	36.514	0.147	0.015	2.05	101.1	0.94	95	3.9	0.0	80	239	75	73.3
250	36.660	0.146	0.015	2.05	101.1	0.96	95	3.9	0.0	80	238	75	73.3
251	36.809	0.149	0.014	2.05	101.1	0.93	100	3.9	0.0	80	238	75	73.3
252	36.953	0.144	0.014	2.06	101.1	0.94	96	3.8	-0.1	80	238	75	73.4
253	37.103	0.150	0.014	2.05	101.1	0.96	100	3.8	0.0	80	238	75	73.3
254	37.248	0.145	0.015	2.05	101.2	0.94	94	3.7	0.0	80	238	75	73.2
255	37.391	0.143	0.015	2.05	101.2	0.95	93	3.7	0.0	80	239	75	73.4
256	37.540	0.149	0.015	2.04	101.1	0.95	96	3.7	0.0	80	240	75	73.4
257	37.683	0.143	0.015	2.05	101.2	0.97	93	3.6	0.0	80	241	75	73.8
258	37.833	0.150	0.015	2.05	101.2	0.97	97	3.6	0.0	80	241	75	73.8
259	37.976	0.143	0.014	2.04	101.2	0.96	96	3.5	-0.1	81	242	75	73.9
260	38.127	0.151	0.014	2.03	101.3	0.95	101	3.5	0.0	81	242	75	74.3
261	38.270	0.143	0.015	2.05	101.4	0.96	93	3.5	0.0	81	241	75	74.1
262	38.419	0.149	0.015	2.04	101.3	0.93	96	3.4	0.0	81	241	75	74
263	38.559	0.140	0.015	2.04	101.2	0.97	91	3.4	0.0	81	241	75	73.8

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
264	38.711	0.152	0.015	2.04	101.2	0.96	98	3.4	0.0	81	240	75	74
265	38.852	0.141	0.014	2.05	101.3	0.97	94	3.3	-0.1	81	241	75	74
266	39.003	0.151	0.015	2.03	101.3	0.99	98	3.3	0.0	80	242	75	73.9
267	39.149	0.146	0.015	2.03	101.3	0.98	94	3.3	0.0	80	241	75	73.8
268	39.293	0.144	0.014	2.03	101.4	0.97	96	3.3	0.0	81	241	75	73.9
269	39.438	0.145	0.014	2.03	101.3	0.99	97	3.2	-0.1	81	242	75	74.4
270	39.583	0.145	0.014	2.03	101.3	0.98	97	3.2	0.0	80	242	75	74.2
271	39.728	0.145	0.015	2.03	101.4	0.97	94	3.1	0.0	80	242	75	74.4
272	39.874	0.146	0.015	2.03	101.4	0.97	94	3.1	0.0	80	243	75	74.1
273	40.020	0.146	0.014	2.02	101.4	1.01	98	3.0	-0.1	80	244	75	74.3
274	40.164	0.144	0.014	2.03	101.3	1.02	97	3.0	0.0	81	244	75	74.5
275	40.312	0.148	0.014	2.02	101.4	1.01	99	3.0	0.0	81	245	75	74.4
276	40.454	0.142	0.014	2.02	101.4	0.99	95	2.9	0.0	81	244	75	74.4
277	40.601	0.147	0.015	2.02	101.4	0.98	95	2.9	0.0	80	243	75	73.9
278	40.746	0.145	0.014	2.02	101.4	1	97	2.9	0.0	80	242	75	73.8
279	40.892	0.146	0.015	2.01	101.4	1	94	2.8	0.0	80	242	75	74.2
280	41.034	0.142	0.014	2.01	101.5	0.98	95	2.8	-0.1	80	242	75	74.1
281	41.180	0.146	0.015	2.02	101.4	0.99	94	2.8	0.0	80	242	75	74.1
282	41.328	0.148	0.014	2.02	101.4	1.01	99	2.7	-0.1	80	242	75	74.1
283	41.468	0.140	0.015	2.01	101.5	1.02	91	2.7	0.0	80	242	75	74.3
284	41.615	0.147	0.014	2.01	101.5	1.01	98	2.7	0.0	80	239	75	74.3
285	41.759	0.144	0.014	2.00	101.6	1	96	2.7	0.0	80	238	75	74.3
286	41.907	0.148	0.014	2.01	101.5	1.01	99	2.6	0.0	80	237	75	74.3
287	42.048	0.141	0.015	2.00	101.6	0.99	91	2.6	-0.1	80	237	75	74.4
288	42.194	0.146	0.014	2.01	101.6	1	98	2.6	0.0	81	237	75	74.6
289	42.337	0.143	0.015	2.00	101.7	0.98	93	2.5	0.0	81	237	75	74.6
290	42.481	0.144	0.014	2.00	101.7	1.02	96	2.5	0.0	81	236	75	74.7
291	42.630	0.149	0.015	2.01	101.7	1.03	96	2.5	0.0	81	235	75	74.2
292	42.774	0.144	0.014	2.01	101.7	1.01	96	2.4	0.0	81	235	75	74.2
293	42.920	0.146	0.015	2.00	101.7	1.01	94	2.4	0.0	81	235	75	74.3
294	43.061	0.141	0.014	2.00	101.8	1.04	94	2.4	0.0	81	236	75	74.4
295	43.209	0.148	0.014	2.00	101.8	1	99	2.3	0.0	81	235	75	74.6
296	43.349	0.140	0.015	1.99	101.8	1.03	91	2.3	0.0	81	236	75	74.5

# BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: ThelinJob #: 22-827Model: ParlorTracking #: 128Run #: 2Technician: AKDate: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
297	43.495	0.146	0.014	2.00	101.8	1.04	98	2.3	0.0	80	237	75	74.4
298	43.638	0.143	0.015	1.99	101.9	1.05	92	2.2	0.0	81	239	75	74.8
299	43.781	0.143	0.014	2.06	101.8	1.07	96	2.2	-0.1	81	242	75	75
300	43.929	0.148	0.014	2.06	101.9	1.08	99	2.1	-0.1	81	243	75	74.9
301	44.075	0.146	0.015	2.06	101.8	1.08	94	2.1	0.0	81	245	75	74.7
302	44.224	0.149	0.014	2.06	101.9	1.06	100	2.1	0.0	81	246	76	74.7
303	44.371	0.147	0.014	2.06	101.9	1.08	98	2.1	0.0	81	246	76	74.7
304	44.520	0.149	0.014	2.06	101.9	1.07	100	2.0	-0.1	81	245	76	74.7
305	44.664	0.144	0.014	2.05	101.9	1.09	96	1.9	-0.1	81	245	76	74.7
306	44.813	0.149	0.014	2.05	101.9	1.1	100	1.9	0.0	81	246	76	74.7
307	44.956	0.143	0.014	2.05	101.9	1.09	96	1.9	0.0	82	247	76	74.7
308	45.103	0.147	0.015	2.05	102	1.06	95	1.8	0.0	81	247	76	74.8
309	45.250	0.147	0.014	2.06	102	1.07	98	1.8	0.0	81	247	76	74.8
310	45.397	0.147	0.014	2.05	102	1.14	98	1.8	0.0	82	246	76	74.7
311	45.542	0.145	0.015	2.05	102.1	1.07	94	1.7	-0.1	82	247	76	75
312	45.692	0.150	0.014	2.04	102.1	1.07	100	1.7	0.0	81	247	76	75.1
313	45.837	0.145	0.015	2.05	102.2	1.08	94	1.7	0.0	81	247	76	75
314	45.980	0.143	0.015	2.04	102.2	1.09	92	1.6	-0.1	81	246	76	75
315	46.130	0.150	0.015	2.05	102.2	1.08	97	1.6	0.0	81	247	76	75
316	46.274	0.144	0.015	2.04	102.2	1.09	93	1.5	-0.1	81	247	76	75
317	46.421	0.147	0.014	2.04	102.3	1.11	98	1.5	0.0	81	246	76	75.1
318	46.564	0.143	0.014	2.04	102.3	1.09	96	1.5	0.0	82	244	76	75
319	46.712	0.148	0.015	2.04	102.3	1.08	96	1.4	-0.1	82	244	76	74.9
320	46.855	0.143	0.015	2.03	102.3	1.11	93	1.4	0.0	82	244	76	75.1
321	47.006	0.151	0.014	2.03	102.3	1.11	101	1.4	0.0	81	243	76	75.1
322	47.149	0.143	0.014	2.03	102.3	1.13	96	1.3	0.0	81	243	76	75.1
323	47.296	0.147	0.014	2.03	102.3	1.1	98	1.3	0.0	82	243	76	75.1
324	47.443	0.147	0.014	2.02	102.4	1.12	98	1.3	-0.1	82	243	76	75.4
325	47.586	0.143	0.015	2.03	102.4	1.11	92	1.3	0.0	82	243	76	75.2
326	47.731	0.145	0.015	2.02	102.4	1.13	94	1.2	-0.1	82	243	76	75.2
327	47.876	0.145	0.014	2.03	102.4	1.11	97	1.2	0.0	81	243	76	75.4
328	48.024	0.148	0.015	2.02	102.5	1.14	96	1.1	-0.1	81	244	76	75.4
329	48.168	0.144	0.014	2.02	102.5	1.12	96	1.1	0.0	81	244	76	75.4



## BOX A TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Dilution Tunnel dP (in H <sub>2</sub> O)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
330	48.316	0.148	0.014	2.03	102.5	1.11	99	1.1	-0.1	81	244	76	75.5
331	48.457	0.141	0.014	2.02	102.5	1.13	94	1.0	0.0	81	243	76	75.1
332	48.605	0.148	0.014	2.02	102.5	1.13	99	1.0	0.0	81	243	76	75.3
333	48.748	0.143	0.014	2.01	102.6	1.13	96	0.9	0.0	81	243	76	75.2
334	48.897	0.149	0.014	2.01	102.6	1.12	100	0.9	0.0	82	244	76	75.6
335	49.040	0.143	0.015	2.02	102.6	1.13	92	0.9	0.0	82	243	76	75.5
336	49.188	0.148	0.014	2.01	102.6	1.14	99	0.8	0.0	82	243	76	75.3
337	49.329	0.141	0.014	2.01	102.7	1.14	94	0.8	0.0	82	243	76	75.4
338	49.473	0.144	0.015	2.01	102.7	1.15	93	0.8	0.0	82	244	76	75.4
339	49.623	0.150	0.015	2.01	102.7	1.14	97	0.8	0.0	82	243	76	75.6
340	49.763	0.140	0.014	2.01	102.8	1.14	94	0.7	0.0	82	242	77	75.7
341	49.911	0.148	0.014	2.00	102.8	1.16	99	0.7	0.0	82	243	77	75.7
342	50.054	0.143	0.014	1.98	102.8	1.14	96	0.6	-0.1	82	242	77	75.7
343	50.200	0.146	0.015	1.99	102.8	1.14	94	0.6	0.0	82	243	77	75.7
344	50.345	0.145	0.014	1.99	102.9	1.16	97	0.5	-0.1	82	243	77	75.7
345	50.492	0.147	0.014	1.98	102.9	1.16	98	0.5	0.0	82	243	77	75.4
346	50.632	0.140	0.015	1.98	103	1.15	90	0.5	-0.1	82	246	77	75.4
347	50.776	0.144	0.014	1.99	102.9	1.15	96	0.4	0.0	82	247	77	75.7
348	50.924	0.148	0.014	1.98	103	1.16	99	0.4	0.0	82	247	77	75.6
349	51.067	0.143	0.014	1.99	103	1.19	96	0.4	0.0	82	246	77	75.6
350	51.214	0.147	0.014	1.98	103	1.14	98	0.4	0.0	83	246	77	75.7
351	51.351	0.137	0.014	1.97	103.1	1.16	92	0.3	-0.1	83	246	77	75.8
352	51.499	0.148	0.015	1.98	103.1	1.16	96	0.3	0.0	82	246	77	75.7
353	51.642	0.143	0.014	1.98	103.1	1.18	96	0.2	0.0	82	246	77	75.6
354	51.790	0.148	0.014	1.98	103.1	1.19	99	0.2	0.0	82	246	77	75.7
355	51.932	0.142	0.014	1.96	103.2	1.19	95	0.1	-0.1	82	246	77	75.8
356	52.072	0.140	0.015	1.96	103.2	1.2	90	0.1	0.0	82	247	77	75.8
357	52.219	0.147	0.015	1.97	103.1	1.19	95	0.1	0.0	82	247	77	75.6
358	52.360	0.141	0.014	1.97	103.2	1.18	94	0.1	0.0	82	246	77	75.9
359	52.505	0.145	0.015	1.97	103.1	1.2	94	0.0	-0.1	82	245	77	75.7
360	52.649	0.144	0.014	1.97	103.2	1.2	96	0.0	0.0	82	245	77	75.8
Avg/Tot	52.649	0.146	0.014	2.07	96	0.92	100			82	295	74	73

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
0	0.000		1.24	73.1	1.73		72	-0.058	9.80	0.04
1	0.148	0.148	2.07	72.9	1.77	110	73	-0.058	7.45	0.04
2	0.285	0.137	2.06	73	1.36	102	73	-0.056	8.96	0.04
3	0.429	0.144	2.07	73	1.79	107	73	-0.058	9.88	0.06
4	0.569	0.140	2.07	73	1.65	100	73	-0.058	8.64	0.04
5	0.709	0.140	2.06	73.1	1.48	100	73	-0.058	11.92	0.10
6	0.852	0.143	2.06	73.2	1.45	106	73	-0.059	10.54	0.04
7	0.990	0.138	2.07	73.3	1.66	102	73	-0.059	9.86	0.04
8	1.136	0.146	2.08	73.5	1.45	104	74	-0.059	12.85	0.23
9	1.272	0.136	2.07	73.7	1.53	101	74	-0.058	10.80	0.05
10	1.419	0.147	2.07	73.8	1.46	109	74	-0.058	7.93	0.05
11	1.559	0.140	2.08	74	1.69	104	74	-0.059	9.42	0.04
12	1.696	0.137	2.07	74.1	1.65	101	74	-0.060	9.42	0.05
13	1.842	0.146	2.08	74.4	1.5	108	74	-0.058	11.72	0.05
14	1.982	0.140	2.07	74.7	1.51	103	74	-0.060	9.10	0.04
15	2.122	0.140	2.07	74.8	1.54	103	74	-0.060	8.88	0.04
16	2.262	0.140	2.07	75.1	1.64	103	74	-0.059	7.70	0.04
17	2.406	0.144	2.07	75.3	1.62	102	75	-0.059	8.98	0.05
18	2.549	0.143	2.08	75.6	1.5	105	75	-0.058	6.96	0.04
19	2.690	0.141	2.07	75.9	1.66	100	75	-0.058	9.60	0.04
20	2.834	0.144	2.08	76.2	1.53	106	75	-0.058	8.21	0.04
21	2.974	0.140	2.07	76.6	1.6	99	75	-0.058	7.57	0.04
22	3.116	0.142	2.08	76.9	1.62	105	75	-0.055	10.37	0.04
23	3.258	0.142	2.08	77.1	1.53	104	75	-0.057	8.20	0.04
24	3.403	0.145	2.08	77.5	1.56	107	75	-0.060	9.63	0.04
25	3.542	0.139	2.09	77.8	1.55	102	75	-0.058	12.00	0.07
26	3.683	0.141	2.08	78.1	1.56	104	75	-0.056	9.50	0.04
27	3.827	0.144	2.09	78.4	1.53	102	75	-0.059	10.64	0.04
28	3.969	0.142	2.09	78.7	1.63	104	75	-0.058	9.16	0.04
29	4.116	0.147	2.08	79.1	1.59	108	75	-0.057	7.97	0.05
30	4.257	0.141	2.09	79.4	1.61	103	75	-0.056	10.65	0.05
31	4.401	0.144	2.09	79.7	1.54	102	75	-0.056	11.24	0.08

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
32	4.541	0.140	2.10	80	1.54	102	76	-0.058	11.19	0.09
33	4.688	0.147	2.10	80.3	1.54	108	76	-0.059	12.28	0.08
34	4.830	0.142	2.09	80.7	1.58	104	76	-0.059	11.31	0.05
35	4.969	0.139	2.09	81	1.56	102	76	-0.060	10.61	0.04
36	5.117	0.148	2.09	81.3	1.61	108	76	-0.061	10.85	0.06
37	5.259	0.142	2.10	81.8	1.63	104	76	-0.059	6.70	0.06
38	5.402	0.143	2.10	82	1.62	104	76	-0.058	9.52	0.03
39	5.546	0.144	2.09	82.3	1.55	101	76	-0.059	8.97	0.04
40	5.689	0.143	2.10	82.5	1.58	104	76	-0.060	11.18	0.04
41	5.833	0.144	2.10	82.9	1.57	105	76	-0.057	9.51	0.04
42	5.979	0.146	2.10	83.2	1.6	106	76	-0.059	9.73	0.05
43	6.122	0.143	2.10	83.6	1.61	104	76	-0.059	9.66	0.03
44	6.266	0.144	2.10	83.8	1.6	105	76	-0.058	7.51	0.04
45	6.409	0.143	2.10	84.1	1.55	104	76	-0.059	11.04	0.11
46	6.553	0.144	2.11	84.4	1.57	105	76	-0.057	9.29	0.04
47	6.697	0.144	2.11	84.7	1.57	105	76	-0.057	6.32	0.04
48	6.839	0.142	2.10	84.9	1.58	103	76	-0.057	7.88	0.04
49	6.988	0.149	2.10	85.3	1.57	108	76	-0.058	10.80	0.05
50	7.129	0.141	2.10	85.5	1.58	102	76	-0.060	10.32	0.04
51	7.276	0.147	2.11	85.8	1.59	107	76	-0.059	9.64	0.05
52	7.417	0.141	2.11	86.1	1.58	102	76	-0.060	9.97	0.04
53	7.563	0.146	2.11	86.4	1.57	106	77	-0.057	9.41	0.03
54	7.709	0.146	2.10	86.7	1.59	106	77	-0.057	7.83	0.04
55	7.854	0.145	2.11	86.9	1.59	105	77	-0.057	11.37	0.06
56	7.995	0.141	2.10	87.2	1.6	102	77	-0.059	9.18	0.04
57	8.142	0.147	2.10	87.5	1.59	102	77	-0.059	9.42	0.04
58	8.288	0.146	2.11	87.7	1.6	105	77	-0.059	9.91	0.04
59	8.430	0.142	2.11	87.9	1.58	99	77	-0.060	12.88	0.09
60	8.579	0.149	2.10	88.2	1.61	104	77	-0.064	9.64	0.04
61	8.719	0.140	2.11	88.3	1.59	101	77	-0.060	7.81	0.04
62	8.865	0.146	2.11	88.7	1.58	105	77	-0.058	10.83	0.04
63	9.010	0.145	2.11	88.9	1.59	104	77	-0.061	7.20	0.05

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
64	9.155	0.145	2.11	89.1	1.6	104	77	-0.057	7.25	0.03
65	9.300	0.145	2.12	89.3	1.57	104	77	-0.057	7.96	0.05
66	9.449	0.149	2.12	89.5	1.6	107	77	-0.059	8.44	0.04
67	9.593	0.144	2.11	89.8	1.57	103	77	-0.057	10.05	0.04
68	9.738	0.145	2.12	90	1.6	104	77	-0.058	8.80	0.04
69	9.883	0.145	2.12	90.2	1.55	104	77	-0.056	9.50	0.05
70	10.025	0.142	2.11	90.4	1.64	102	77	-0.060	9.40	0.04
71	10.174	0.149	2.11	90.6	1.64	103	77	-0.058	7.79	0.03
72	10.316	0.142	2.12	90.8	1.61	98	77	-0.055	6.76	0.04
73	10.466	0.150	2.12	91	1.58	107	77	-0.056	7.11	0.04
74	10.609	0.143	2.12	91.2	1.58	102	77	-0.056	7.03	0.04
75	10.755	0.146	2.12	91.3	1.59	101	77	-0.057	10.37	0.04
76	10.900	0.145	2.11	91.5	1.6	104	77	-0.058	8.31	0.05
77	11.048	0.148	2.12	91.7	1.58	106	77	-0.056	7.76	0.04
78	11.189	0.141	2.12	91.9	1.58	97	77	-0.058	7.24	0.05
79	11.339	0.150	2.12	92.1	1.57	103	77	-0.058	7.28	0.04
80	11.483	0.144	2.12	92.2	1.59	103	77	-0.055	9.74	0.05
81	11.631	0.148	2.13	92.4	1.58	102	77	-0.056	9.06	0.05
82	11.776	0.145	2.12	92.6	1.6	100	77	-0.056	8.92	0.04
83	11.919	0.143	2.12	92.7	1.59	102	77	-0.057	10.16	0.06
84	12.067	0.148	2.12	92.9	1.63	106	77	-0.059	11.88	0.09
85	12.213	0.146	2.12	93	1.61	100	77	-0.056	7.00	0.05
86	12.356	0.143	2.12	93.1	1.54	102	77	-0.057	5.41	0.04
87	12.501	0.145	2.12	93.2	1.57	103	77	-0.059	7.93	0.05
88	12.649	0.148	2.12	93.4	1.57	106	77	-0.057	7.77	0.04
89	12.795	0.146	2.12	93.5	1.54	100	77	-0.060	9.09	0.04
90	12.944	0.149	2.13	93.7	1.67	102	77	-0.058	10.49	0.06
91	13.088	0.144	2.12	93.9	1.53	103	77	-0.059	7.16	0.04
92	13.236	0.148	2.12	94	1.57	105	77	-0.059	8.91	0.05
93	13.378	0.142	2.12	94.2	1.57	101	77	-0.059	8.20	0.04
94	13.529	0.151	2.12	94.3	1.61	104	77	-0.058	7.15	0.04
95	13.669	0.140	2.12	94.4	1.59	100	77	-0.055	9.03	0.04

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
96	13.820	0.151	2.12	94.5	1.61	104	77	-0.059	9.49	0.05
97	13.965	0.145	2.12	94.7	1.59	103	77	-0.057	8.72	0.04
98	14.112	0.147	2.12	94.8	1.6	105	77	-0.057	7.88	0.04
99	14.258	0.146	2.12	94.9	1.6	104	77	-0.059	8.52	0.05
100	14.406	0.148	2.12	95	1.6	105	77	-0.055	8.33	0.05
101	14.551	0.145	2.12	95	1.62	103	77	-0.057	6.99	0.04
102	14.695	0.144	2.12	95.2	1.61	102	77	-0.060	9.47	0.05
103	14.843	0.148	2.12	95.3	1.6	105	77	-0.057	6.10	0.04
104	14.986	0.143	2.12	95.4	1.6	102	77	-0.057	8.01	0.04
105	15.135	0.149	2.12	95.5	1.6	106	77	-0.058	9.89	0.06
106	15.278	0.143	2.12	95.5	1.61	102	77	-0.058	8.86	0.05
107	15.428	0.150	2.12	95.7	1.61	103	77	-0.057	7.88	0.05
108	15.571	0.143	2.12	95.8	1.6	102	77	-0.058	10.81	0.06
109	15.722	0.151	2.13	95.9	1.64	107	77	-0.057	9.48	0.05
110	15.866	0.144	2.12	95.9	1.61	102	77	-0.057	8.42	0.05
111	16.012	0.146	2.12	96.1	1.59	104	77	-0.059	10.30	0.05
112	16.159	0.147	2.11	96.1	1.62	104	77	-0.058	7.96	0.05
113	16.305	0.146	2.11	96.2	1.6	104	77	-0.057	9.14	0.04
114	16.451	0.146	2.12	96.3	1.61	104	77	-0.057	6.52	0.03
115	16.600	0.149	2.12	96.4	1.65	106	77	-0.060	10.78	0.06
116	16.744	0.144	2.11	96.4	1.58	102	77	-0.059	8.85	0.06
117	16.892	0.148	2.11	96.5	1.62	105	77	-0.061	10.03	0.06
118	17.035	0.143	2.11	96.7	1.65	101	77	-0.061	11.91	0.12
119	17.185	0.150	2.11	96.7	1.65	106	77	-0.059	9.73	0.06
120	17.330	0.145	2.12	96.8	1.56	103	77	-0.059	7.85	0.05
121	17.479	0.149	2.12	96.9	1.64	106	77	-0.059	7.80	0.04
122	17.621	0.142	2.12	96.9	1.64	101	77	-0.057	9.61	0.04
123	17.771	0.150	2.12	97	1.67	106	77	-0.058	11.61	0.07
124	17.917	0.146	2.12	97.1	1.64	103	77	-0.059	11.10	0.08
125	18.059	0.142	2.11	97.2	1.62	101	77	-0.059	9.94	0.06
126	18.209	0.150	2.12	97.2	1.57	106	77	-0.056	8.80	0.05
127	18.354	0.145	2.11	97.3	1.6	103	77	-0.057	7.38	0.04

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
128	18.500	0.146	2.12	97.4	1.6	103	77	-0.057	6.52	0.04
129	18.647	0.147	2.12	97.4	1.63	104	77	-0.058	9.02	0.04
130	18.796	0.149	2.11	97.5	1.6	106	77	-0.057	10.37	0.10
131	18.939	0.143	2.11	97.6	1.65	101	77	-0.057	9.89	0.05
132	19.090	0.151	2.12	97.6	1.61	107	77	-0.058	9.67	0.06
133	19.233	0.143	2.11	97.6	1.56	101	77	-0.057	8.83	0.04
134	19.380	0.147	2.11	97.7	1.63	104	77	-0.058	9.33	0.05
135	19.524	0.144	2.11	97.8	1.58	102	77	-0.059	8.24	0.05
136	19.672	0.148	2.12	97.8	1.67	101	77	-0.057	9.53	0.05
137	19.818	0.146	2.11	97.9	1.68	100	77	-0.056	9.08	0.04
138	19.967	0.149	2.11	98	1.67	105	77	-0.058	8.73	0.04
139	20.112	0.145	2.11	98	1.62	103	77	-0.057	7.06	0.03
140	20.257	0.145	2.11	98.1	1.6	103	77	-0.056	9.61	0.05
141	20.405	0.148	2.11	98.2	1.62	105	78	-0.056	7.28	0.03
142	20.551	0.146	2.11	98.2	1.62	103	78	-0.058	8.25	0.04
143	20.696	0.145	2.10	98.3	1.6	103	78	-0.056	8.97	0.05
144	20.845	0.149	2.10	98.3	1.61	105	78	-0.057	8.19	0.04
145	20.991	0.146	2.11	98.4	1.63	103	78	-0.056	8.93	0.05
146	21.137	0.146	2.11	98.4	1.59	103	78	-0.054	8.15	0.04
147	21.284	0.147	2.11	98.4	1.61	104	78	-0.054	9.78	0.07
148	21.429	0.145	2.10	98.4	1.66	103	78	-0.057	9.36	0.05
149	21.577	0.148	2.11	98.5	1.6	105	78	-0.056	8.85	0.04
150	21.719	0.142	2.11	98.5	1.6	97	78	-0.057	9.39	0.05
151	21.868	0.149	2.11	98.6	1.6	105	78	-0.057	9.75	0.05
152	22.015	0.147	2.11	98.6	1.62	104	78	-0.059	7.77	0.03
153	22.164	0.149	2.10	98.7	1.63	105	78	-0.057	9.75	0.05
154	22.308	0.144	2.10	98.8	1.62	98	78	-0.057	8.90	0.04
155	22.454	0.146	2.10	98.8	1.61	103	78	-0.054	8.03	0.04
156	22.598	0.144	2.10	98.8	1.62	98	78	-0.059	8.44	0.05
157	22.749	0.151	2.10	98.9	1.62	103	78	-0.059	9.36	0.04
158	22.892	0.143	2.10	98.9	1.63	97	78	-0.059	8.67	0.04
159	23.040	0.148	2.09	99	1.63	101	78	-0.057	8.00	0.03

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
160	23.185	0.145	2.10	99	1.63	99	78	-0.057	8.16	0.04
161	23.331	0.146	2.10	99.1	1.65	99	78	-0.059	8.06	0.04
162	23.477	0.146	2.10	99.1	1.63	99	78	-0.056	7.88	0.05
163	23.627	0.150	2.10	99.2	1.61	102	78	-0.057	11.03	0.09
164	23.772	0.145	2.10	99.2	1.62	102	78	-0.056	10.19	0.06
165	23.919	0.147	2.10	99.2	1.62	104	78	-0.059	11.13	0.09
166	24.062	0.143	2.10	99.2	1.66	101	78	-0.058	12.23	0.09
167	24.208	0.146	2.10	99.3	1.61	99	78	-0.059	11.40	0.10
168	24.354	0.146	2.09	99.3	1.67	103	78	-0.056	11.47	0.10
169	24.502	0.148	2.09	99.4	1.67	105	78	-0.056	11.47	0.10
170	24.649	0.147	2.09	99.4	1.63	100	78	-0.062	9.90	0.07
171	24.794	0.145	2.10	99.4	1.61	99	78	-0.060	9.88	0.06
172	24.942	0.148	2.09	99.5	1.65	105	78	-0.060	9.48	0.06
173	25.084	0.142	2.10	99.5	1.65	100	78	-0.059	8.61	0.04
174	25.235	0.151	2.09	99.5	1.6	107	78	-0.056	8.39	0.04
175	25.378	0.143	2.08	99.6	1.61	101	78	-0.059	6.88	0.04
176	25.527	0.149	2.09	99.7	1.64	101	78	-0.056	9.61	0.05
177	25.670	0.143	2.09	99.7	1.66	97	78	-0.058	8.16	0.05
178	25.815	0.145	2.09	99.7	1.66	102	78	-0.059	9.07	0.04
179	25.962	0.147	2.08	99.8	1.61	100	78	-0.059	8.57	0.05
180	26.107	0.145	2.09	99.7	1.65	99	78	-0.059	9.74	0.05
181	26.253	0.146	2.09	99.8	1.61	103	78	-0.059	9.72	0.05
182	26.403	0.150	2.09	99.8	1.63	106	78	-0.055	8.39	0.04
183	26.548	0.145	2.09	99.9	1.6	102	78	-0.056	6.67	0.04
184	26.694	0.146	2.08	99.9	1.6	99	78	-0.055	7.34	0.04
185	26.840	0.146	2.08	99.9	1.65	99	78	-0.055	6.73	0.03
186	26.982	0.142	2.09	99.9	1.66	100	78	-0.054	5.50	0.03
187	27.129	0.147	2.09	100	1.58	100	78	-0.053	5.18	0.03
188	27.276	0.147	2.09	100	1.62	100	78	-0.052	5.88	0.03
189	27.424	0.148	2.09	100.1	1.6	101	78	-0.052	7.10	0.05
190	27.568	0.144	2.08	100.1	1.65	98	78	-0.054	6.80	0.04
191	27.715	0.147	2.09	100.1	1.62	100	78	-0.051	7.62	0.04

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
192	27.858	0.143	2.08	100.1	1.64	97	78	-0.054	10.00	0.04
193	28.009	0.151	2.08	100.1	1.62	103	78	-0.050	7.48	0.03
194	28.153	0.144	2.08	100.2	1.64	98	78	-0.052	7.02	0.03
195	28.298	0.145	2.09	100.3	1.61	98	78	-0.052	4.76	0.04
196	28.441	0.143	2.08	100.3	1.61	97	78	-0.050	4.95	0.03
197	28.590	0.149	2.08	100.4	1.63	98	78	-0.052	6.75	0.03
198	28.736	0.146	2.08	100.4	1.66	99	78	-0.049	7.65	0.03
199	28.883	0.147	2.08	100.5	1.64	100	78	-0.048	7.19	0.03
200	29.029	0.146	2.08	100.5	1.64	99	78	-0.050	7.63	0.03
201	29.176	0.147	2.09	100.4	1.65	100	78	-0.050	6.66	0.04
202	29.321	0.145	2.07	100.6	1.66	98	78	-0.053	7.94	0.04
203	29.464	0.143	2.08	100.6	1.67	94	78	-0.052	6.69	0.04
204	29.610	0.146	2.08	100.6	1.64	96	78	-0.050	7.75	0.04
205	29.757	0.147	2.07	100.6	1.65	100	78	-0.053	8.72	0.04
206	29.904	0.147	2.08	100.6	1.7	100	78	-0.058	9.99	0.07
207	30.046	0.142	2.07	100.6	1.66	96	78	-0.052	7.98	0.04
208	30.196	0.150	2.08	100.6	1.64	102	78	-0.052	5.82	0.03
209	30.341	0.145	2.08	100.7	1.66	98	78	-0.049	6.37	0.03
210	30.488	0.147	2.07	100.7	1.66	100	78	-0.053	5.75	0.02
211	30.629	0.141	2.07	100.7	1.6	95	78	-0.055	7.21	0.03
212	30.780	0.151	2.07	100.7	1.63	102	78	-0.050	8.23	0.05
213	30.922	0.142	2.07	100.8	1.68	96	78	-0.051	4.99	0.04
214	31.068	0.146	2.08	100.8	1.63	99	78	-0.048	7.68	0.03
215	31.215	0.147	2.07	100.8	1.69	100	78	-0.047	7.51	0.04
216	31.361	0.146	2.07	100.8	1.65	99	78	-0.053	8.28	0.05
217	31.507	0.146	2.07	100.9	1.63	99	78	-0.047	5.60	0.02
218	31.653	0.146	2.07	100.9	1.62	99	78	-0.050	6.89	0.04
219	31.798	0.145	2.07	100.9	1.71	98	78	-0.051	8.14	0.05
220	31.940	0.142	2.07	100.9	1.61	96	78	-0.052	8.23	0.04
221	32.089	0.149	2.07	100.9	1.65	101	78	-0.050	8.63	0.05
222	32.233	0.144	2.07	100.8	1.61	97	78	-0.048	6.32	0.02
223	32.380	0.147	2.06	100.8	1.68	100	78	-0.049	6.38	0.03



## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
224	32.524	0.144	2.07	100.9	1.63	97	78	-0.047	6.29	0.03
225	32.672	0.148	2.07	100.9	1.64	100	78	-0.049	6.00	0.03
226	32.812	0.140	2.06	101	1.64	95	77	-0.048	6.38	0.03
227	32.962	0.150	2.06	101	1.71	101	77	-0.048	6.36	0.02
228	33.105	0.143	2.06	100.8	1.66	93	77	-0.048	7.61	0.04
229	33.252	0.147	2.05	100.8	1.69	99	77	-0.051	8.26	0.04
230	33.396	0.144	2.06	100.8	1.66	94	77	-0.047	6.29	0.04
231	33.541	0.145	2.06	100.9	1.65	95	77	-0.045	8.87	0.04
232	33.687	0.146	2.06	100.8	1.67	99	77	-0.049	5.85	0.03
233	33.830	0.143	2.05	100.9	1.68	93	78	-0.048	6.29	0.03
234	33.978	0.148	2.06	101	1.68	100	77	-0.047	4.90	0.03
235	34.122	0.144	2.06	101	1.68	94	78	-0.048	6.69	0.03
236	34.265	0.143	2.06	101	1.66	93	78	-0.046	8.56	0.04
237	34.411	0.146	2.05	101	1.63	99	78	-0.050	8.45	0.03
238	34.558	0.147	2.05	101	1.66	99	78	-0.051	6.54	0.04
239	34.699	0.141	2.05	101	1.72	95	77	-0.046	8.57	0.05
240	34.848	0.149	2.05	101	1.6	101	78	-0.051	8.48	0.05
241	34.991	0.143	2.05	101	1.7	97	78	-0.049	7.43	0.02
242	35.135	0.144	2.04	101	1.59	94	78	-0.047	5.40	0.03
243	35.280	0.145	2.05	101	1.64	98	78	-0.050	7.81	0.02
244	35.427	0.147	2.04	101	1.68	99	78	-0.046	6.11	0.02
245	35.571	0.144	2.05	101	1.64	97	77	-0.048	6.91	0.02
246	35.717	0.146	2.04	101	1.68	99	77	-0.051	7.49	0.03
247	35.859	0.142	2.04	101	1.68	96	77	-0.048	5.92	0.02
248	36.005	0.146	2.05	100.9	1.7	99	77	-0.047	6.81	0.03
249	36.148	0.143	2.04	101	1.67	93	77	-0.046	6.25	0.02
250	36.294	0.146	2.04	101	1.65	95	77	-0.049	6.79	0.02
251	36.441	0.147	2.05	101	1.69	99	77	-0.047	7.28	0.02
252	36.581	0.140	2.04	101	1.69	95	77	-0.047	7.64	0.04
253	36.730	0.149	2.03	101	1.69	101	77	-0.051	6.69	0.03
254	36.873	0.143	2.04	101.1	1.67	93	78	-0.048	7.49	0.03
255	37.016	0.143	2.04	101	1.63	93	77	-0.048	8.72	0.04

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
256	37.161	0.145	2.04	101	1.68	95	77	-0.049	7.67	0.03
257	37.306	0.145	2.04	101.1	1.71	95	78	-0.045	8.24	0.04
258	37.451	0.145	2.03	101.1	1.7	95	77	-0.047	7.76	0.03
259	37.593	0.142	2.03	101.1	1.7	96	78	-0.048	7.84	0.04
260	37.740	0.147	2.03	101.2	1.7	99	78	-0.049	8.13	0.04
261	37.883	0.143	2.03	101.2	1.67	93	78	-0.051	7.60	0.03
262	38.029	0.146	2.03	101.2	1.66	95	78	-0.048	8.33	0.06
263	38.170	0.141	2.03	101.2	1.66	92	78	-0.046	6.84	0.03
264	38.318	0.148	2.02	101.2	1.72	97	78	-0.046	7.61	0.04
265	38.457	0.139	2.03	101.2	1.69	94	78	-0.045	8.31	0.04
266	38.606	0.149	2.02	101.2	1.72	97	78	-0.051	7.62	0.03
267	38.751	0.145	2.02	101.2	1.72	95	78	-0.049	6.42	0.03
268	38.894	0.143	2.03	101.2	1.72	97	78	-0.047	7.35	0.03
269	39.038	0.144	2.02	101.2	1.7	97	78	-0.047	7.85	0.03
270	39.182	0.144	2.02	101.2	1.71	97	78	-0.047	6.35	0.03
271	39.323	0.141	2.01	101.2	1.7	92	78	-0.050	8.19	0.03
272	39.468	0.145	2.01	101.2	1.73	95	78	-0.047	7.63	0.03
273	39.612	0.144	2.01	101.3	1.72	97	78	-0.050	9.25	0.04
274	39.756	0.144	2.01	101.3	1.7	97	78	-0.047	6.81	0.04
275	39.902	0.146	2.01	101.3	1.72	99	78	-0.050	8.86	0.05
276	40.043	0.141	2.01	101.3	1.72	95	78	-0.048	7.77	0.03
277	40.186	0.143	2.01	101.3	1.71	93	78	-0.049	6.02	0.02
278	40.331	0.145	2.01	101.3	1.72	98	78	-0.050	6.75	0.02
279	40.476	0.145	2.01	101.4	1.74	95	78	-0.047	6.80	0.04
280	40.616	0.140	2.01	101.3	1.71	95	78	-0.047	7.35	0.03
281	40.760	0.144	2.00	101.3	1.7	94	78	-0.047	8.26	0.04
282	40.906	0.146	2.00	101.4	1.72	99	78	-0.052	7.77	0.03
283	41.046	0.140	2.00	101.5	1.74	91	78	-0.050	8.99	0.04
284	41.191	0.145	2.00	101.3	1.69	98	78	-0.049	4.94	0.02
285	41.334	0.143	2.00	101.4	1.73	97	78	-0.048	5.41	0.02
286	41.479	0.145	1.99	101.5	1.65	98	78	-0.046	6.22	0.02
287	41.619	0.140	2.00	101.4	1.75	91	78	-0.048	8.43	0.05

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
288	41.763	0.144	1.99	101.5	1.73	97	78	-0.049	8.60	0.05
289	41.906	0.143	1.99	101.5	1.73	93	78	-0.045	6.02	0.02
290	42.047	0.141	1.99	101.5	1.74	95	78	-0.050	7.41	0.03
291	42.195	0.148	2.00	101.6	1.73	97	78	-0.047	6.38	0.03
292	42.337	0.142	2.00	101.6	1.75	96	78	-0.046	7.14	0.03
293	42.482	0.145	1.99	101.6	1.75	95	78	-0.046	8.05	0.04
294	42.623	0.141	1.99	101.5	1.74	95	78	-0.047	7.40	0.04
295	42.767	0.144	1.99	101.6	1.73	97	78	-0.049	6.53	0.02
296	42.907	0.140	1.99	101.7	1.71	91	78	-0.047	8.35	0.05
297	43.050	0.143	1.98	101.7	1.73	97	78	-0.046	9.68	0.09
298	43.193	0.143	1.98	101.7	1.76	93	78	-0.049	7.88	0.05
299	43.335	0.142	2.08	101.7	1.77	96	78	-0.047	10.92	0.15
300	43.482	0.147	2.09	101.7	1.75	99	78	-0.047	8.81	0.04
301	43.627	0.145	2.08	101.7	1.74	95	78	-0.046	11.04	0.20
302	43.776	0.149	2.08	101.7	1.75	101	78	-0.047	8.10	0.04
303	43.922	0.146	2.08	101.8	1.81	99	78	-0.048	6.96	0.02
304	44.070	0.148	2.08	101.9	1.76	100	78	-0.051	6.58	0.03
305	44.214	0.144	2.07	101.8	1.8	97	78	-0.052	8.41	0.05
306	44.362	0.148	2.07	101.8	1.78	100	78	-0.051	9.26	0.07
307	44.506	0.144	2.08	101.8	1.79	97	78	-0.050	8.80	0.07
308	44.651	0.145	2.08	101.8	1.76	95	78	-0.050	7.54	0.04
309	44.798	0.147	2.07	101.8	1.81	99	78	-0.048	7.25	0.03
310	44.943	0.145	2.07	101.7	1.74	98	78	-0.051	7.40	0.03
311	45.088	0.145	2.07	101.8	1.77	95	78	-0.049	10.07	0.11
312	45.238	0.150	2.07	101.8	1.82	101	78	-0.049	8.25	0.05
313	45.382	0.144	2.07	101.8	1.76	94	78	-0.048	8.17	0.05
314	45.525	0.143	2.07	101.9	1.87	93	79	-0.045	7.35	0.03
315	45.674	0.149	2.07	102	1.85	97	79	-0.050	7.27	0.03
316	45.818	0.144	2.06	102	1.82	94	79	-0.049	9.22	0.06
317	45.963	0.145	2.06	102	1.82	98	79	-0.052	6.96	0.02
318	46.106	0.143	2.06	102	1.81	97	79	-0.046	5.95	0.02
319	46.255	0.149	2.06	102	1.79	97	79	-0.050	7.32	0.02

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
320	46.398	0.143	2.05	102	1.84	93	79	-0.049	7.82	0.02
321	46.548	0.150	2.05	102.1	1.76	101	79	-0.048	7.55	0.03
322	46.691	0.143	2.05	102	1.81	97	79	-0.049	8.01	0.04
323	46.835	0.144	2.05	102	1.82	97	79	-0.048	7.05	0.02
324	46.981	0.146	2.05	102.1	1.83	99	79	-0.049	8.91	0.05
325	47.125	0.144	2.05	102	1.8	94	79	-0.046	6.98	0.02
326	47.270	0.145	2.05	102.1	1.84	95	79	-0.047	8.07	0.03
327	47.416	0.146	2.05	102.1	1.83	99	79	-0.049	8.13	0.02
328	47.561	0.145	2.05	102.1	1.8	95	79	-0.049	8.15	0.03
329	47.705	0.144	2.04	102.2	1.77	97	79	-0.049	7.05	0.03
330	47.850	0.145	2.04	102.3	1.81	98	79	-0.049	7.65	0.03
331	47.995	0.145	2.04	102.2	1.84	98	79	-0.046	7.35	0.02
332	48.141	0.146	2.04	102.3	1.79	99	79	-0.048	8.04	0.03
333	48.285	0.144	2.04	102.3	1.82	97	79	-0.048	9.57	0.07
334	48.432	0.147	2.03	102.3	1.8	99	79	-0.049	9.59	0.07
335	48.574	0.142	2.03	102.4	1.78	93	79	-0.048	7.34	0.03
336	48.723	0.149	2.04	102.4	1.78	101	79	-0.048	6.84	0.03
337	48.863	0.140	2.03	102.4	1.86	95	79	-0.049	7.37	0.03
338	49.009	0.146	2.03	102.4	1.84	95	79	-0.048	9.65	0.06
339	49.155	0.146	2.03	102.5	1.82	95	79	-0.046	7.08	0.02
340	49.299	0.144	2.03	102.6	1.84	97	79	-0.048	6.95	0.02
341	49.443	0.144	2.03	102.5	1.83	97	79	-0.050	8.35	0.03
342	49.590	0.147	2.02	102.5	1.81	99	79	-0.049	8.15	0.04
343	49.732	0.142	2.02	102.6	1.85	93	79	-0.049	9.13	0.06
344	49.878	0.146	2.02	102.5	1.89	99	79	-0.047	9.20	0.09
345	50.024	0.146	2.02	102.6	1.87	99	79	-0.049	7.88	0.03
346	50.164	0.140	2.01	102.6	1.89	91	79	-0.050	10.00	0.12
347	50.310	0.146	2.01	102.7	1.91	99	79	-0.047	10.37	0.16
348	50.454	0.144	2.02	102.7	1.94	97	79	-0.048	7.37	0.02
349	50.600	0.146	2.01	102.7	1.83	99	79	-0.050	7.96	0.03
350	50.742	0.142	2.01	102.8	1.91	96	79	-0.049	7.95	0.04
351	50.886	0.144	2.01	102.7	1.9	97	79	-0.052	8.97	0.04

## BOX B TEST DATA - ASTM E2779 / ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft <sup>3</sup> )	Sample Rate (cfm)	Orifice dH (in H <sub>2</sub> O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
352	51.029	0.143	2.01	102.8	1.86	93	79	-0.049	8.45	0.03
353	51.172	0.143	2.01	102.9	1.9	97	79	-0.046	9.39	0.05
354	51.319	0.147	2.00	102.8	1.84	99	79	-0.050	8.67	0.04
355	51.462	0.143	2.01	102.9	1.86	97	80	-0.052	8.94	0.04
356	51.606	0.144	2.01	102.8	1.88	94	79	-0.048	9.94	0.12
357	51.747	0.141	2.00	102.8	1.9	92	80	-0.053	7.89	0.03
358	51.892	0.145	2.00	103	1.82	98	80	-0.049	6.88	0.01
359	52.034	0.142	2.00	102.8	1.83	93	80	-0.045	8.72	0.03
360	52.182	0.148	2.00	102.9	1.81	100	80	-0.051	7.85	0.03
Avg/Tot	52.182	0.145	2.07	96	1.66	100			8.37	0.04

## LAB SAMPLE DATA - ASTM E2515

Client: Thelin  
 Model: Parlor  
 Run #: 2

Job #: 22-827  
 Tracking #: 128  
 Technician: AK  
 Date: 10/10/2022

		Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
<b>Filters</b>	<b>A - 1st Hour</b>	G00379	245.4	245.4	247.8	2.4
	<b>B</b>	G00380	244.2	244.2	246.5	2.3
<b>C - Post 1st Hour</b>	G00381	243.7	243.7	243.9	0.2	
<b>Amb</b>	G00359	122.6	122.6	122.6	0.0	
<b>Probes</b>	<b>A - 1st Hour</b>	16A	116379.5	116379.5	116379.6	0.1
		16B	115860.7	115860.7	115860.7	0.0
	<b>C - Post 1st Hour</b>	16C	114148.1	114148.1	114148.1	0.0
<b>O-rings</b>	<b>A - 1st Hour</b>	16A	3573.4	3573.4	3573.5	0.1
		16B	3639.3	3639.3	3639.4	0.1
	<b>C - Post 1st Hour</b>	16C	3602.1	3602.1	3602.4	0.3

**Placed in Dessicator on:** 10/10/2022

<b>Filters</b>	<b>A</b>	248.0	10/13 10:39	247.8	10/14 15:13			
	<b>B</b>	246.4	10/13 10:39	246.5	10/14 15:14			
	<b>C - 1st Hour</b>	243.9	10/13 10:40	243.9	10/14 15:14			
	<b>Amb</b>	122.6	10/13 10:40	122.6	10/14 15:14			
			10/5 14:53					
<b>Probes</b>	<b>A</b>	116379.5	10/13 10:40	116379.6	10/14 15:14			
	<b>B</b>	115860.7	10/13 10:40	115860.7	10/14 15:14			
	<b>C - 1st Hour</b>	114148.1	10/13 10:40	114148.1	10/14 15:14			
<b>O-Rings</b>	<b>A</b>	3573.6	10/13 10:40	3573.5	10/14 15:14			
	<b>B</b>	3639.4	10/13 10:40	3639.4	10/14 15:15			
	<b>C - 1st Hour</b>	3602.4	10/13 10:40	3602.4	10/14 15:15			

<b>Train A Aggregate, mg:</b>	<b>2.6</b>
<b>Train B Aggregate, mg:</b>	<b>2.4</b>
<b>Train C Aggregate, mg:</b>	<b>0.5</b>
Ambient Aggregate, mg:	0.0



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

Mr. John Steinert  
Vice President  
PFS TECO  
11785 SE Hwy 212  
Suite 305  
Clackamas, OR 97015

02/04/2022

Dear Mr. Steinert,

I am writing you in response to your correspondence dated February 3, 2022, in which you request the use of an alternative testing procedure to demonstrate compliance with 40 CFR part 60, Subpart AAA – Standards of Performance for New Residential Wood Heaters (Subpart AAA). The Office of Air Quality Planning and Standards, as the delegated authority, must make the determination on any major alternatives to test methods and procedures required under 40 CFR parts 59, 60, 61, 63, and 65. Your proposed alternative test method and our approval decisions are discussed below.

According to the information provided, you seek an alternative test method for use when conducting testing on the United States Stove Company, Model KP5517 pellet heater. Currently, as required by section 60.534(a)(1)(i) of Subpart AAA, a manufacturer has the option to test their appliance in accordance with 40 CFR part 60, Appendix B, Method 28R for a crib fuel appliance or ASTM E2779-10 “Standard Test Method for Determining Particulate Matter Emissions from Pellet Heaters” (ASTM E2779-10) for a pellet fuel appliance. This request seeks an alternative to section 9.4.1.2 of ASTM E2779-10 which specifies test conditions for pellet heaters including the determination of the Medium Burn Rate Category and states that the medium burn rate must be  $\leq 50\%$  of the maximum burn rate.

In your request, you state that the specification for determining the medium burn rate found in ASTM E2779-10 is incorrect, and the Medium Burn Rate Category should be defined as less than 50% of the midpoint point (this is defined in the attached Memo as 50% of the span between the Maximum Burn Rate and the Low Burn Rate) between the high and low burn rates. Furthermore, your request includes a memorandum dated February 2, 2022, titled “Appropriate Calculation of Medium Burn Rate Category in ASTM E-2779 Testing” (attached) which was sent to the EPA’s Office of Enforcement and Compliance Assurance. This memorandum states that an error had been uncovered in determining the appropriate Medium Burn Rate Category in ASTM E2779-10 for compliance pursuant to Subpart AAA. Specifically, section 9.4.1.2 of ASTM E2779-10 states that “the pellet heater shall be operated with the control or controls set in

the position(s) as needed to achieve a burn rate that is  $\leq 50\%$  of the maximum burn rate.” Table 1 of ASTM E2779-10 also notes that the Medium Burn Rate Category test must be  $\leq 50\%$  of the maximum burn rate. The memorandum states that this is incorrect as it assumes that zero is the other bound for determining half of the maximum burn rate, and that the correct approach in determining the Medium Burn Rate Category should be at a level below 50% of the span between the Maximum Burn Rate and the Low Burn Rate (a non-zero value).

We have reviewed your request and agree that the Medium Burn Rate Category should be defined as less than 50% of the span between the high and low burn rates. Meaning that the Medium Burn Rate Category should be at a level below 50% of the span between the Maximum Burn Rate and the Low Burn Rate (a non-zero value).

Based on the information provided and with the caveats set forth below, we are approving your request for an alternative methodology used when calculating the Medium Burn Rate Category to conduct certification testing as required by Subpart AAA, section 60.534(a)(1)(i) on pellet heaters. This approval is based on the understanding that the Medium Burn Rate Category is defined as less than 50% of the span between the high and low burn rates. Additionally, this approval is based on the understanding that the lowest heat output (Btu/hr) setting available to the user, and corresponds to the lowest burn rate to be evaluated during certification testing; this is consistent with Subpart AAA, section 60.534(a)(1), which states: “The burn rate for the low burn category must be no greater than the rate that an operator can achieve in home use and no greater than is advertised by the manufacturer or retailer.”

With this Alternate Test Method, the following changes to ASTM E2779-10 must be followed for certification testing:

1. Medium Burn Rate Category burn rate is defined as:

*Nomenclature:*

*Max* = Maximum burn rate (kg/h)

*Min* = Minimum burn rate (kg/h)

$$\frac{Max+Min}{2} \quad \text{Eq.1}$$

All other requirements of ASTM E-2779-10 must be followed during the testing, and all requirements of 40 CFR part 60, Subpart AAA must be satisfied as described in your test report. A copy of this letter must be included in each certification test report where this alternative test method is utilized.

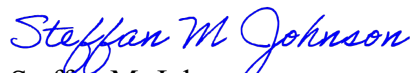
Because this alternative method may be of use to others, we feel that it is reasonable that this approval be broadly applicable to all pellet heaters tested in accordance with ASTM E2779-10 “Standard Test Method for Determining Particulate Matter Emissions from Pellet Heaters” and subject to the requirements of §60.534(a)(1)(i) of Subpart AAA. For this reason, we will post this



letter as ALT-146 on our website at <https://www.epa.gov/emc/broadly-applicable-approved-alternative-test-methods> for use by other interested parties. This alternative method approval is valid until such time that Subpart AAA is revised or replaced to require a different pellet heater certification method, and at such time, this alternative will be reconsidered and possibly withdrawn.

If you have additional questions regarding this approval, please contact Angelina Brashear of my staff at 919-541-4746 or [brashear.angelina@epa.gov](mailto:brashear.angelina@epa.gov).

Sincerely,



Steffan M. Johnson  
Group Leader  
Measurement Technology Group

cc: Angelina Brashear – EPA/OAQPS/AQAD  
Chuck French – EPA/OAQPS/SPPD  
Rafael Sanchez – EPA/OECA  
Robert Scinta – EPA/OECA  
Michael Toney – EPA/OAQPS/AQAD  
Nathan Topham – EPA/OAQPS/SPPD  
John Voorhees – United States Stove Company  
Chet Wayland – EPA/OAQPS/AQAD



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

MEMORANDUM

02/02/2022

**SUBJECT:** Appropriate calculation of Medium Burn Rate Category in ASTM E-2779 Testing

**FROM:** Steffan Johnson  
Group Leader  
Measurement Technology Group  
Air Quality Assessment Division

**STEFFAN  
JOHNSON** Digitally signed by  
STEFFAN JOHNSON  
Date: 2022.02.02  
08:28:07 -05'00'

**TO:** Robert Scinta, P.E.  
Chief, Air Branch  
Monitoring, Assistance, and Media Programs Division  
Office of Compliance, Office of Enforcement and Compliance Assurance

During a recent review of pellet heater compliance test reports, the Measurement Technology Group has uncovered an error in determining the appropriate Medium Burn Rate Category when using ASTM E-2779 for compliance pursuant to 40 CFR 60, subpart AAA. Specifically, the method requirements in section 9.4.1.2 and Table 1 of that test method incorrectly require that the Medium Burn Rate Category must fall below 50% of the maximum burn rate. This is not correct as this requirement assumes then that zero is the other bound for determining half of the maximum.

9.4.1.2 *Medium Burn Rate Category*—For burn rates in the medium segment, except as allowed in 9.4.1.4 or 9.4.1.5, the pellet heater shall be operated with the control or controls set in the position(s) as needed to achieve a burn rate that is  $\leq 50\%$  of the maximum burn rate.

TABLE 1

Burn Rate Segment	Maximum	Medium	Minimum
Description	Maximum achievable	$\leq 50\%$ of Maximum	Minimum achievable
Time at Burn Rate	60 +5 / - 0 minutes	120 +5 / - 0 minutes	180 +5 / - 0 minutes

The correct application of this requirement would be to determine the Medium Burn Rate Category at a level below 50% of the span between the Maximum Burn Rate and the Low Burn Rate (a non-zero value). Ergo, the correct calculation for finding that midpoint of 50% is defined as  $\frac{Max+M}{2}$ .

For example, if the Maximum Burn rate of an appliance is 1.79 kg/hr and the minimum is 1.23 kg/hr, the method would currently place the 50% requirement at 0.895 kg/hr. This is unachievable on this appliance and presents an impossible compliance requirement. Applying the equation laid out above the value of 1.51 is derived and, therefore, presents an appropriate and likely attainable emissions test requirement for the Medium Burn Rate Category.

During your reviews of such emissions tests, as reported to OECA and intended for compliance certification purposes, MTG recommends applying the above procedure in order to ascertain if a Medium Burn Rate was appropriately established during a compliance test.

CC:

Sarah Ayres - OECA

Angelina Brashear – OAQPS

Alice Edwards – Alaska DEC

Chuck French – OAQPS

Robert Lischinsky - OECA

Theresa Lowe - OAQPS

Rafael Sanchez – OECA

Robert Scinta - OECA

Mike Toney – OAQPS

Nathan Topham - OAQPS

Chet Wayland – OAQPS



MODEL No. No. DE MODELE	MAX. BTU INPUT CONSUM. MAX. EN BTU
Parlour 3000	40,000
Gnome	27,000

DATE OF MFG. / DATE DE FABRICATION
SERIAL NUMBER / NO. DE SÉRIE



Listed Room Heater, Pellet Type.

This pellet fire 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 1509-04, UL6 S627-00, UL 1482-00.

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. Above approved.

**CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to local building codes. Do not connect this unit to a chimney flue serving another appliance.

Fire use with pelletized wood fuels only! Use of other fuels will cause a hazardous condition.

**NOTE:** Replace glass only with 5mm ceramic.

**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.

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

**ELECTRICAL RATING:** 120 Volts/2.0 Amps/60Hz/1 Phase - U.K. 24V

Install per H.U.D. 24CFR SEC. 3280.

Appareil de chauffages certifié, de type granulés de bois.

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 1509-04, UL6 S627-00, UL 1482-00.

À installer et utiliser uniquement conformément aux consignes d'installation et d'utilisation du fabricant. Contacter les autorités locales en matière de construction concernant les restrictions et les inspections de montage propres à votre région. Approuvé pour une alcôve.

**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. Ne pas reconnector cet appareil à un conduit de cheminée servant un autre appareil.

À utiliser uniquement avec des bois de chauffage en granulés! Tout autre combustible causera un danger.

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

**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.

**TYPE D'ÉVENT:** Utiliser seulement un conduit d'évacuation et des raccords de type «PL» (Taille 3"/75mm ou 4"/100mm).

**CARACTÉRISTIQUES ÉLECTRIQUES:** 120 Volts/2.0 Amps/60Hz/1 Phase - G.B. 24V

Installer conformément à H.U.D. 24CFR SEC. 3280.

Emission of CO in combustion products: nominal heat output <0.04%  
Reduce heat output <0.06%



Émission de CO dans les produits de combustion: Puissance calorifique nominale <0,04%  
Puissance calorifique réduite <0,06%

Fuel Gas Temperature: 174 Deg. C

Température du gaz de cheminée: 174 Deg. C

Thermal Output: 6.9 KW

Puissance Thermique: 6.9 KW

Energy Efficiency: Nominal heat output 6.9KW 85%  
Reduced heat output 3.7KW 80%

EN 14785:2007  
Residential Space Heating appliance  
fired by wood pellets

Rendement Énergétique: Puissance calorifique nominale 6.9KW 85%  
Puissance calorifique réduite 3.7KW 80%

Fuel Types: Wood Pellets, 6mm diameter,  
12mm to 25mm long

Appareil de chauffage domestique  
alimenté en granulés de bois

Types de Combustible: Granulés de bois, 6mm de diamètre,  
12mm à 25mm de long

CLEARANCES TO COMBUSTIBLES - FREESTANDING HEATER / DÉGAGEMENT AUX COMBUSTIBLES - APPAREIL DE CHAUFFAGE AUTONOME

- A. UNIT TO BACKWALL 1.5" / 40mm
- B. UNIT TO SIDEWALLS 5" / 125mm
- C. UNIT TO DIAGONAL WALL 5" / 125mm
- UNIT TO ALCOVE CEILING 1" / 25mm



- A. APPAREIL AU MUR ARRIÈRE 1.5" / 40mm
- B. APPAREIL AUX MURS LATÉRAUX 5" / 125mm
- C. APPAREIL AU MUR EN DIAGONALE 5" / 125mm
- APPAREIL AU PLAFOND DE L'ALCÔVE 1" / 25mm

INSTALL ON A NON-COMBUSTIBLE FLOOR PROTECTOR EXTENDING 6" IN FRONT OF THE APPLIANCE.

PLACER SUR UN PROTECTEUR DE PLANCHER NON-COMBUSTIBLE, QUI D'ÉPASSE DE 6 PO À L'AVANT DE L'APPAREIL.

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

DATE OF MANUFACTURE	MODEL	EMISSION RATE (G/Hr)
	Parlour 3000	0.92
	Gnome	0.98

SERIAL NO.	Efficiency	HHV
		81%
		75%

**FOR USE WITH PELLETIZED WOOD FUEL ONLY**

ASTM E2779-10/WEPA ALT-148

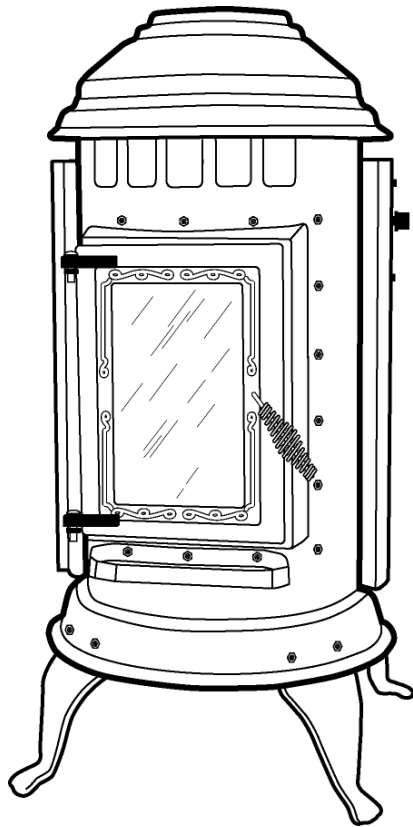
This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owner's manual.

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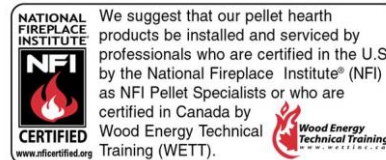
# PARLOUR PELLET 3000

Pellet Heater Owner's Manual  
Installation and Operating Instructions

---



Made in the USA by:



**Please read this entire manual before  
installation.  
Save these instructions.**

## SAFETY NOTICE

- HEATER 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 REQUIREMENTS.
- FAILURE TO COMPLY WITH OWNER'S MANUAL INSTRUCTIONS WILL VOID WARRANTY AND COULD RESULT IN PROPERTY DAMAGE, BODILY INJURY OR EVEN DEATH.

**PLEASE LEAVE THIS MANUAL WITH THE OWNER!!**

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 Intertek W/N 13449	MODEL No. No. DE MODÈLE	MAX. BTU INPUT CONSOM. MAX. EN BTU	DATE OF MFG. / DATE DE FABRICATION	 THELIN HEARTH PRODUCTS www.thelinc.com Carson City, NV 89706	
	Parlour 3000	40,000	SERIAL NUMBER / NO. DE SÉRIE		
		Gnome	27,000		

**Listed Room Heater, Pellet Type.**

This pellet fire 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 1509-04, ULC S627-00, UL 1482-00.

**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. Alcove approved.**

**CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to local building codes. Do not connect this unit to a chimney flue serving another appliance.

**For use with pelletized wood fuels only! Use of other fuels will cause a hazardous condition.**

**NOTE:** Replace glass only with 5mm ceramic.

**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.

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

**ELECTRICAL RATING:** 120 Volts/2.0 Amps/60Hz/1 Phase - U.K. 24V

**Install per H.U.D. 24CFR SEC. 3280.**

**Appareil de chauffages certifié, de type granules de bois.**

Cet appareil à granules 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 1509-04, ULC S627-00, UL 1482-00.

**À installer et utiliser uniquement conformément aux consignes d'installation et d'utilisation du fabricant. Contacter les autorités locales en matière de combustion concernant les restrictions et les inspections de montage propres à votre région. Approuvé pour une alcôve.**

**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. Ne pas reconnector cet appareil à un conduit de cheminée servant un autre appareil.

**À utiliser uniquement avec des bois de chauffage en granules! Tout autre combustible causera un danger.**

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

**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.

**TYPE D'ÉVENT:** Utiliser seulement un conduit d'évacuation et des raccords de type «PL» (Taille 3" / 75mm ou 4" / 100mm).

**CARACTÉRISTIQUES ÉLECTRIQUES:** 120 Volts/2.0 Amps/60Hz/1 Phase - G.B. 24V

**Installer conformément à H.U.D. 24CFR SEC. 3280.**

---

Emission of CO in combustion products: nominal heat output <0.04% Reduce heat output <0.06%	 06 <b>EN 14785:2007</b> Residential Space Heating appliance fired by wood pellets Appareil de chauffage domestique alimenté en granules de bois	Émission de CO dans les produits de combustion: Puissance calorifique nominale <0,04% Puissance calorifique réduite <0,06%
Fuel Gas Temperature: 174 Deg. C Thermal Output: 6.9 kW Energy Efficiency: Nominal heat output 6.9kW 85% Reduced heat output 3.7kW 80% Fuel Types: Wood Pellets, 6mm diameter, 12mm to 25mm long		Temperature du gaz de cheminée: 174 Deg. C Puissance Thermique: 6.9 kW Rendement Énergétique: Puissance calorifique nominale 6.9kW 85% Puissance calorifique réduite 3.7kW 80% Types de Combustible: Granules de bois, 6mm de diamètre, 12mm à 25mm de long

---

**CLEARANCES TO COMBUSTIBLES - FREESTANDING HEATER / DÉGAGEMENT AUX COMBUSTIBLES - APPAREIL DE CHAUFFAGE AUTONOME**

A. UNIT TO BACKWALL 1.5" / 40mm B. UNIT TO SIDEWALLS 5" / 125mm C. UNIT TO DIAGONAL WALL 5" / 125mm UNIT TO ALCOVE CEILING 1" / 25mm		FLOOR PROTECTOR PROTECTION DU PLANCHER 	A. APPAREIL AU MUR ARRIÈRE 1.5" / 40mm B. APPAREIL AUX MURS LATÉRAUX 5" / 125mm C. APPAREIL AU MUR EN DIAGONALE 5" / 125mm APPAREIL AU PLAFOND DE L'ALCÔVE 1" / 25mm PLACER SUR UN PROTECTEUR DE PLANCHER NON-COMBUSTIBLE, QUI DÉPASSE DE 6 PO À L'AVANT DE L'APPAREIL.
---	---	--	---

**INSTALL ON A NON-COMBUSTIBLE FLOOR PROTECTOR EXTENDING 6" IN FRONT OF THE APPLIANCE.**

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

**FOR USE WITH PELLETTIZED WOOD FUEL ONLY**

DATE OF MANUFACTURE MODEL EMISSION RATE (G/HR) Parlour 3000 0.92 Gnome 0.95	SERIAL NO. Efficiency HHV 81% 75% ASTM E2779-10/WEPA ALT-148
--	---

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.

PAI 00 007 0 020011

**LABORATORY LISTING LABEL**



Congratulations on your purchase of Thelin™ Hearth Products Parlour™ 3000 pellet stove! In this manual you will find information on stove specifications, installation instructions, operating guide, how to perform scheduled maintenance, a troubleshooting guide, a detailed parts list and associated diagrams. Also included is your warranty information. Please take the time to read this manual and become familiar with your pellet stove.

If you have any questions or comments, please contact your local Thelin authorized dealer. Thelin dealers are qualified industry professionals who are able to address any questions or comments you might have regarding Thelin products. Thank you for choosing Thelin™.

## **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.

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. PROPER OPERATION WILL MINIMIZE VISIBLE EMISSIONS. IF VISIBLE EMISSIONS ARE PRESENT DURING OPERATION HAVE THE APPLIANCE CLEANED AND INSPECTED.

### **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 overfire. If any external part starts to glow, you are over firing. Reduce feed rate. Overfiring 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 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.

### 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 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 (metal) 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.

### GENERAL INFORMATION

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

The Parlour Pellet 3000 Heater has been designed and approved for burning **wood pellet fuel only**. Burning solid fuel in other forms is not permitted and will void all warranties.

Store fuel in a covered, dry area. Pellet fuel bags can absorb moisture and must be kept dry. Never place fuel bags next to heater. Keep fuel outside of stove clearances to combustible materials.

This unit has been approved for use with a **3" and 4" Type L Pellet Vent System**. On runs in excess of 10' and installations per Figure 10, the 4" pipe must be used.

**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 heater while it is in use.

Ashes must be disposed of in a metal container with a tight-fitting lid and placed on a non-combustible floor or ground, well away from all fuels, pending final disposal.

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

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

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

The heater may be installed as a free-standing unit mounted on a non-combustible protective floor pad or hearth. Or it may be mounted into an existing UL-approved wood stove chimney. Non-combustible floor protection is required and must be used when placing the heater on any combustible material.

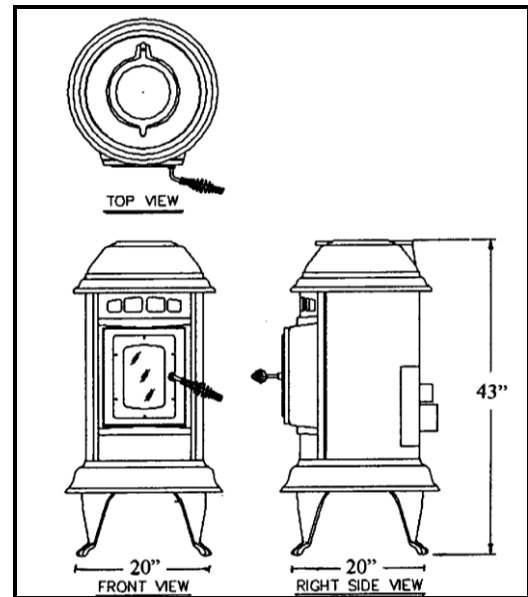
All outside air hook-ups for mobile or modular homes require Thelin Hearth Products' outside air kit — **NO EXCEPTIONS!**

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

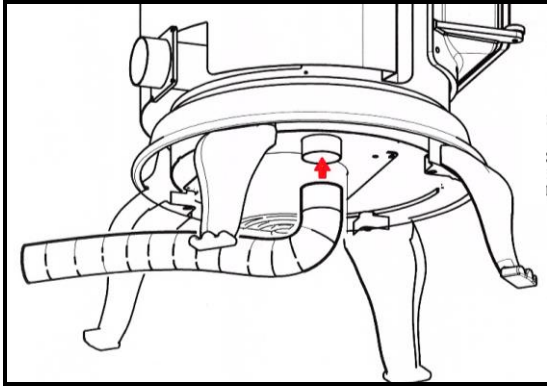
**WARNING:** Do not install a flue damper in the exhaust venting system of this unit.

Under EPA Emission test conditions as calculated per CSA B415.1-22 this heater has shown to deliver heat output at rates ranging from 14,387 to 28,172 Btu/hr.

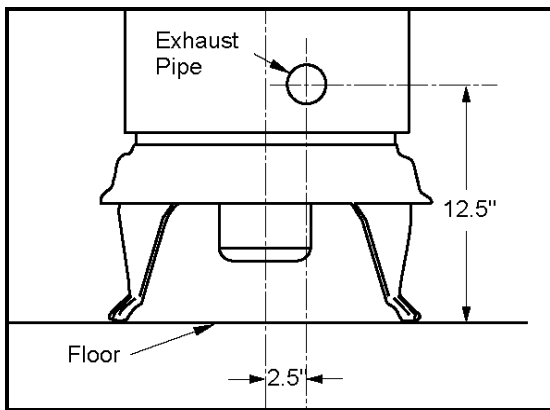
U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using PFI APPROVED wood pellet fuel.



**FIGURE 1 - OVERALL DIMENSIONS**



**FIGURE 2**



**FIGURE 3 - EXHAUST PIPE LOCATION (REAR VIEW)**

**CLEARANCES**

CHECK WITH LOCAL BUILDING OFFICIALS FOR SPECIFIC CODE REQUIREMENTS. A LISTED, TYPE "L" PELLET VENT PIPE IS MANDATORY ON ALL INSTALLATIONS.

Clearance to Combustibles

- Unit to Sidewall .....5" (125 mm)
- Unit to Backwall ..... 1.5" ( 40 mm)
- Unit to Diagonal Wall.....5" (125 mm)
- Unit to Alcove Ceiling ..... 1" ( 25 mm)

**MOBILE OR MODULAR HOME**

Mobile or modular home installation must be in accordance with the Manufactured Home Safety Standard (HUD) CFR3280, Part 24.

**WARNING: DO NOT INSTALL IN SLEEPING ROOM.**

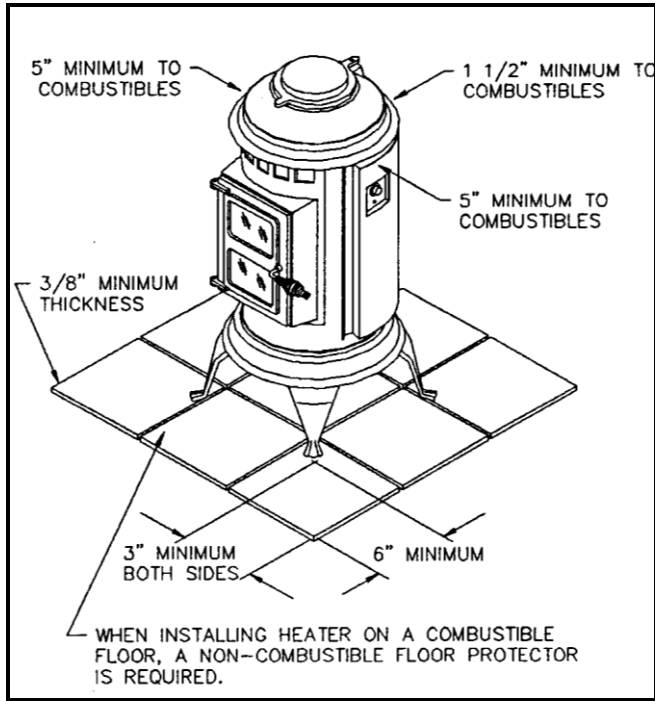
**CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL AND CEILING/ROOF MUST BE MAINTAINED.**

WARNING: Outside combustion air is mandatory in mobile or modular installations. An outside air inlet **MUST** be provided for combustion and ventilation air. The air inlet must remain unrestricted while unit is in use. Outside air connection is located at the bottom, near the front of the heater (see Figure 2). The Outside Air Bypass Kit is mandatory for mobile and modular home installations. The kit contains 2" flex tubing and a box adapter. **Do not hook up unit without this kit.** Secure stove to floor by drilling hole through back two legs and using lag screw to attach to floor. Putty hole after screws are in place. Unit must be electrically grounded to steel frame of mobile home.

Also, the structural integrity of the mobile home floor, walls, and ceiling/roof must be maintained.

Use only listed Type "L" pellet vent components for installation. Failure to use listed pellet vent pipe will void your warranty. See pipe manufacturer instructions for installation instructions.

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



4FIGURE 5

## INSTALLATION

Attachment and securing of the exhaust venting system to the product and to each adjoining sections: All joints for the connector pipe should be fastened with three screws. If vented horizontally, joints should be made gas tight (see Item 9b).

Install vent at clearances specified by the vent manufacturer.

1. When deciding on the location of your heater and vent pipe, try to minimize the alteration and reframing of structural components of the building. Vent pipe must be installed so that access is provided for inspection and cleaning.
2. Avoid installing heater in high-traffic areas. Keep children away from heater when in operation.
3. Outside air required (see Figure 10).
4. **A 3-inch clearance to combustibles must be maintained for horizontal and vertical venting.** When passing through ceilings or walls, you must use a listed wall thimble, making sure all combustible materials and insulation products are a minimum of 3 inches away from the pellet vent pipe. If using the Pellet Pro pipe, a 1" clearance is required.
5. A non-combustible hearth pad must be used if installed on a carpet, wood floor, or other combustible material (see Figure 5).
6. Keep front door of appliance thirty-six (36) inches from combustibles (drapery, furniture).

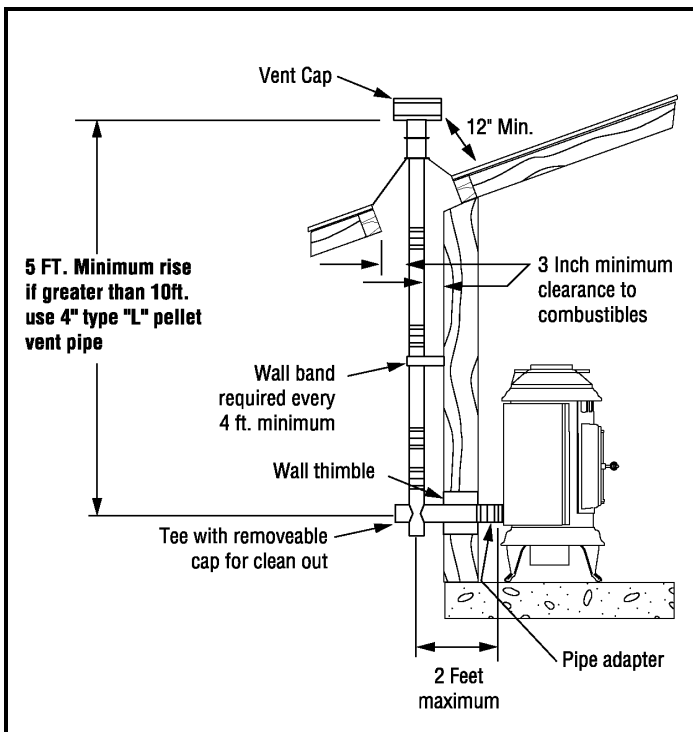


FIGURE 6

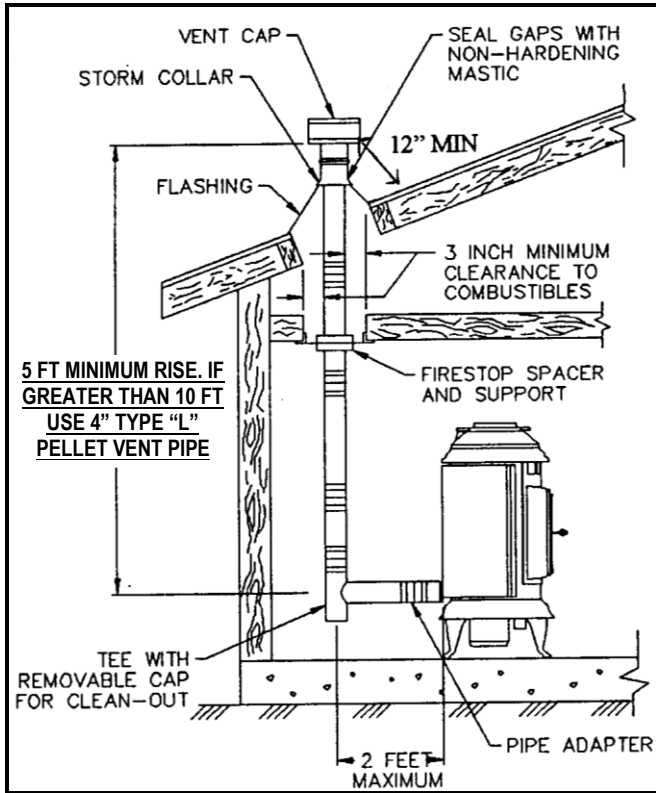


FIGURE 7

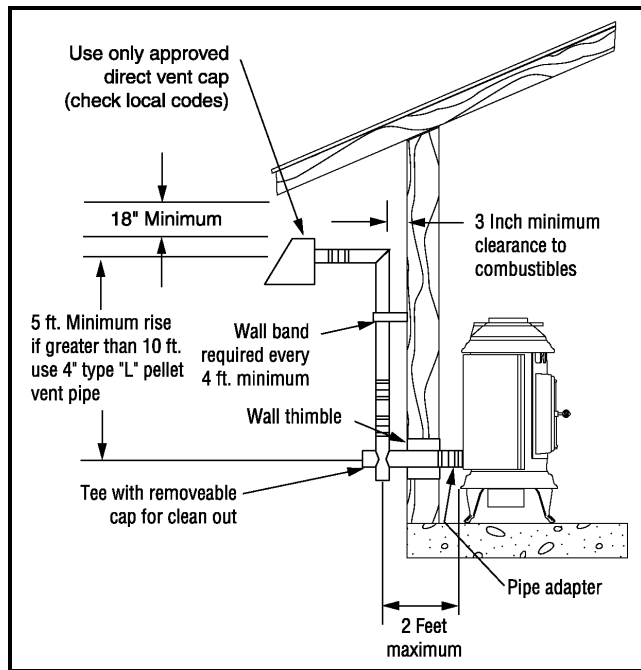


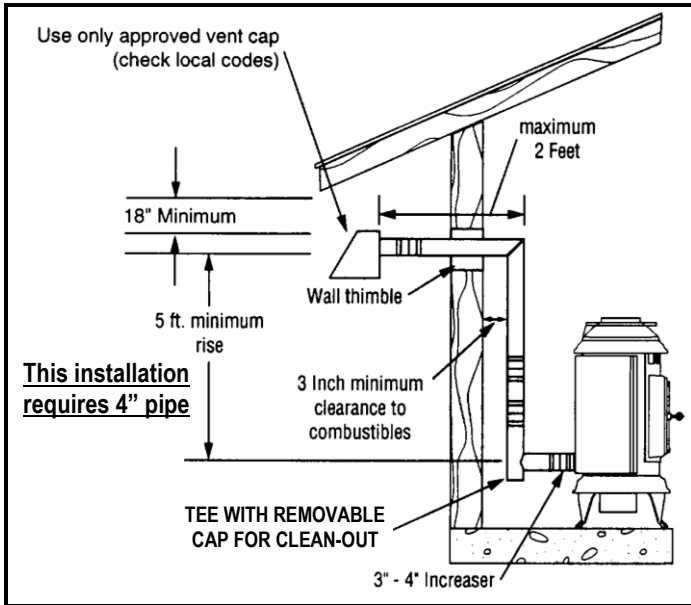
FIGURE 8

When installing the exhaust vent into an existing chimney (see Appendix D), a clean out tee must be installed behind the heater before going up into the chimney. This is necessary in order to remove the fly ash accumulation.

7. Exit termination (distance to openings):
  - a. 3 feet minimum above any forced air inlet located within 10 feet.
  - b. 4 feet minimum below and horizontally or 1 foot minimum above any door, window, or gravity air inlet into any building.
  - c. 2 feet minimum to an adjacent building and 7 feet minimum above grade when located adjacent to public walkways.
8. The pellet heater must be operated with a power source and will not operate using natural draft. If there is a power failure the heater will shut down. If the 12-volt back-up system is installed, the heater will automatically switch to the 12-volt power.

Route the power supply cord so it does not touch any of the exterior components of the heater.

- a. When exiting through the wall with your Type "L" pellet vent pipe, you may go straight out through a wall thimble. You must connect a pellet vent tee at this point and extend the vent pipe at least 5 feet vertically outside to provide good draft and allow the gases to exit. The tee must have a clean out cap for inspection and regular cleaning (see Figure 6). Whenever the pipe run in any installation is 10 feet or more, the use of 4-inch Type "L" vent pipe is required. Horizontal runs must be limited to 2 feet. A wall band is required for every 4 feet minimum on a vertical run at an exterior wall.



**FIGURE 9**

- b. All pellet vent pipe connections including exit at the rear of the heater should be sealed with high temperature silicone (450 degrees) or metallic duct tape. This prevents smoke and soot leakage into the living area. If this is not done, there is a possibility that the room fan will pick up any leakage and blow it into the room. This requirement is waived if the new Dura Vent Pellet Pro pipe is used.
- c. Installation per Figure 9 requires 4" pellet pipe.

## WALL & REMOTE THERMOSTAT INSTALLATION FOR PARLOUR E.I.

A wall or remote thermostat can be hooked to run the Parlour 3000 E.I. automatically. The following is a step-by-step procedure for installing the optional thermostat. Note connection terminals on the bottom right side of the unit (see Figure 10). Use 18/2 thermostat wire for installation.

1. Unplug heater from the wall outlet!
2. Hook up the thermostat wires to terminals (see Figure 10). Remember to remove copper shunt. disconnected. If a remote thermostat is used you

will have to mount the "receiver" to the bottom of the stove with Velcro and then hook up receiver wires to the terminal (see Figure 10). Follow thermostat manufacturer's instructions.

3. Locate thermostat approximately 10 to 12 feet from heater or in an area that requires steady temperature. Run thermostat wires from heater to thermostat along wall or under carpet, etc., and hook wires to thermostat terminals. For the remote find a central location that will maintain room temperature and leave remote in that area.
4. Make sure all wiring is complete before plugging the Parlour back into the wall outlet.
5. You have the option to have the thermostat run the stove either ON/OFF or Hi/Low. Factory setting is ON/OFF. By changing the Type setting jumper on the circuit board (see **Error! Reference source not found.**), you can switch to the Hi/Low mode. This should be done in extremely cold climates so the house will maintain an even temperature and not be cycling on/off constantly.
6. Please be aware that the life of the igniter is affected by the ash build up in the fire pot and the number of times the stove is cycling on/off. If more than four or five times a day, then you should switch to the Hi/Low mode. Check fire pot frequently for ash build up.

**IMPORTANT:** Any electrical work performed on the Parlour should be done by qualified personnel. **Always plug AC cord in before DC battery.**

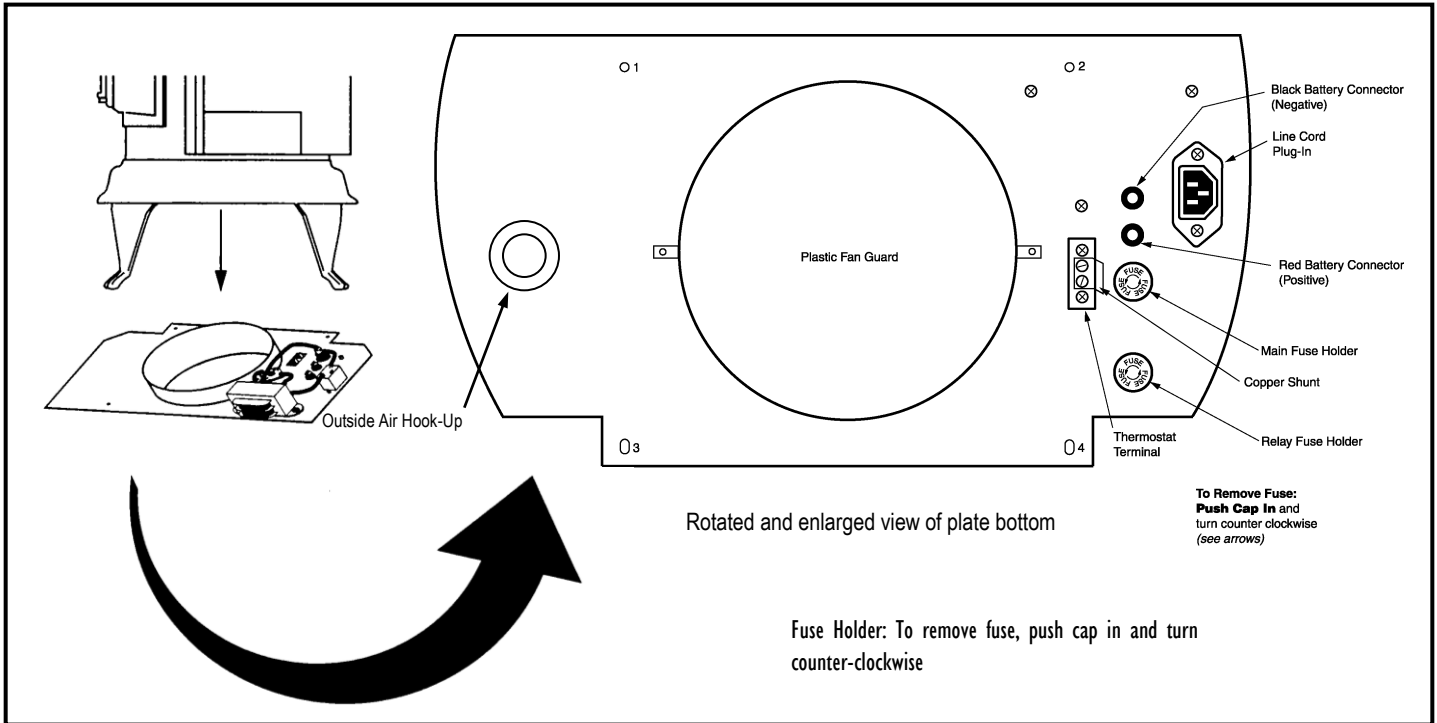


FIGURE 10



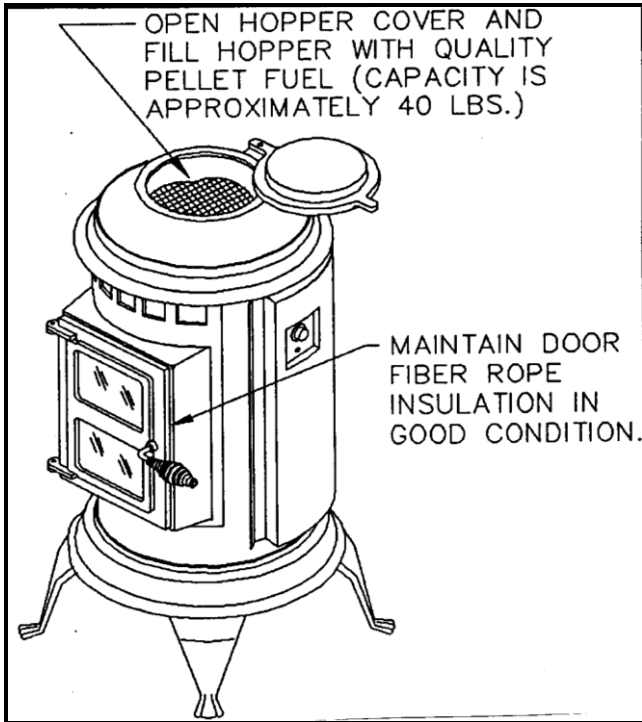


FIGURE 11

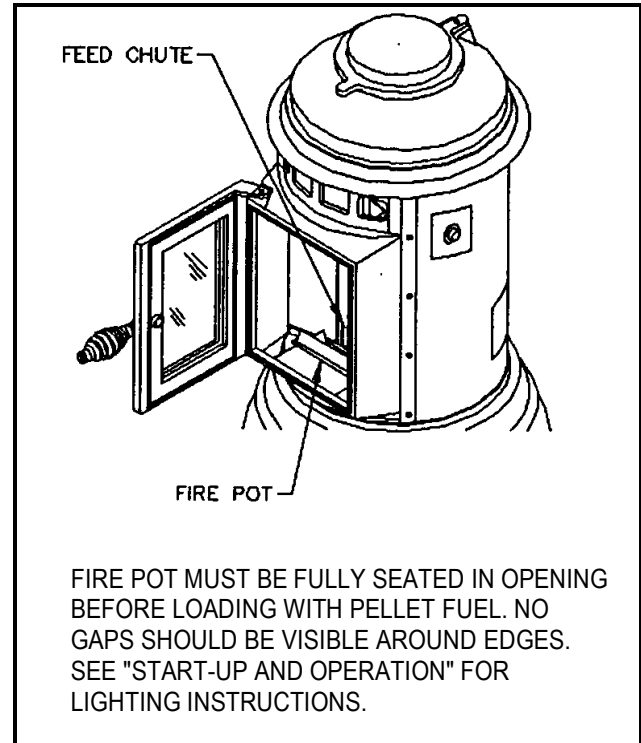


FIGURE 12

## START-UP AND OPERATION

### A. Filling the Hopper and Start-Up

**CAUTION:** Fuel hopper lid must be closed before operating the unit. **DO NOT OVERFILL THE HOPPER!** The Parlour will hold approximately 40 pounds of pellets.

Open the top cover and fill the hopper with pellets (see Figure 11).

Use good-quality pellets that give you a vibrant, yellow flame with little or no soot. Poor quality pellets will burn rich with black sooty smoke and ash will accumulate quickly.

**IMPORTANT:** The quality of pellet varies from brand to brand. This will affect the efficiency of your heater. We suggest that you try several brands until you find one that provides a clean, efficient burn.

**IMPORTANT:** The fire pot must be seated flush and must sit even in the fire pot tray. Air leakage around the fire pot will create a poor burn (see

Figure 12). In case of power outage with battery connected, light the pellets in the fire pot using any approved jelled alcohol lighting fluid.

### B. Lighting Instructions

The Parlour E.I. has automatic ignition. As a result you simply plug in the stove, fill with pellets and push the low, medium or high button on the control panel. When the button is pushed to low, medium or high the igniter will come on and the feed motor will activate and begin feeding pellets. In three or four minutes you should see flame and in six minutes the igniter will shut off. The LED next to the button will blink during the seven-minute start-up period. During the start-up period the heater will only run on “Low.” If the fire does not reach operating temperature during the start up period the stove will shut down and you will have to repeat the process.

**NOTE:** Pellets do not feed in the “Fan” position.

If you choose to use a wall or remote thermostat follow the thermostat manufacturers instructions

carefully and make sure you use the built in thermostat terminals on the bottom of the stove. (See Figure 10) We recommend you run the heater on "High" for about 30 minutes to get the heat exchanger hot before turning it to "Low." You will need to burn the heater for a few hours before deciding which setting is best for your particular needs.

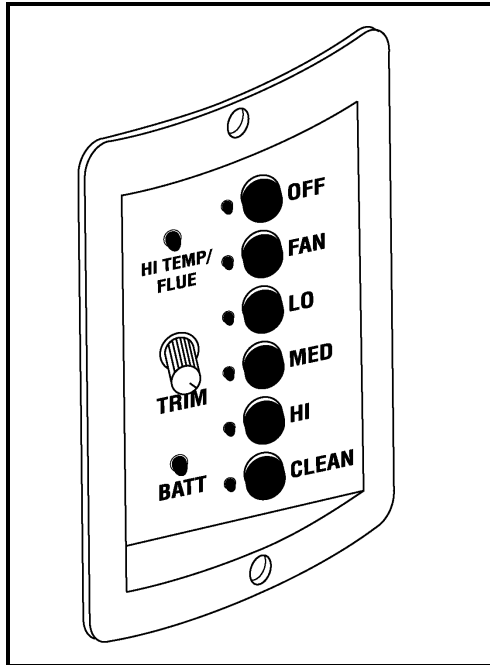


FIGURE 13

### C. Control Functions

The control functions on the ParLOUR are as follows: OFF, FAN, LOW, MED, HIGH, and CLEAN (see Figure 13).

1. Fan Position: In the "Fan" only position the stove will not feed pellets. Use the fan if you need to start the stove manually during power failure and/or you are using the 12V battery back up. The "Fan" position can also be used if pellets pile up and you want them to burn down before feeding more pellets. Remember, if you run in the "Fan" only position, the stove will go through the start-up cycle again when you push "Low," "Med" or "Hi."
2. In the "Low" position, the ParLOUR will feed approximately 1 to 1.5 pounds of pellets per hour. The flame will fluctuate between 1 inch and 6 inches in height.
3. In the "Med" position, the ParLOUR will feed approximately 3 pounds of pellets per hour. The flame will fluctuate from 3 to 8 inches in height.
4. In the "High" position, the ParLOUR will feed approximately 5 pounds of pellets per hour. The flame will fluctuate between 3 inches and a full flame. The fan speed will increase accordingly as the heater automatically adjusts itself based on the temperature inside the heater.
5. The "Clean" position is to be used only when the heater is not burning and you wish to clean out the combustion housing and fan blades. See the "Hopper Clean Out" section under "Maintenance Procedures."
6. After the heater is running for several hours and you wish to turn it off, simply push the button to "Off." If you use a remote or wall thermostat it will turn off the stove automatically when the desired room temperature is reached. **The heater will continue to run until it cools down and it will then automatically shut down at 58 degrees F. or in 25 minutes, whichever comes first.**
7. **REMEMBER:** Each feed position will fluctuate because the microprocessor automatically adjusts the feed and air based on temperature. This means the pellet feed rate and flame height will change accordingly based on quality of pellet and heat loss of dwelling.

**DO NOT OVERFIRE.** If pellets pile up excessively and stove is not burning properly it should be shut down and thoroughly cleaned. Use the "Trim" button to adjust feed rate.

## HIGH TEMP/FLUE AND TRIM INDICATORS

**High Temp/Flue:** There is a small window to the left of the fan button that will blink red if the flue pipe becomes obstructed or there is a high wind condition, creating a back draft. If there is problem with the fan guard becoming blocked due to dust and lint build up then this light will come on and stay steady red. The feed will shut off and the stove will shut down when these two conditions are present. Maintenance is required and thorough cleaning and pipe check must be performed if these conditions persist.

**Battery Light:** When the green light is blinking the battery is charging. When the green light is steady the battery is fully charged. If this light is red, then the battery terminals are plugged in backward.

**Trim Button:** On the left side of the control panel there is a small, round button that will turn clockwise and counter-clockwise. This button allows you to control the feed rate in each setting—Low, Med, and High. By turning the button clockwise you can increase the feed rate in each setting. By turning the button counter-clockwise you can decrease the feed rate.

**Move this button carefully!** It is designed to fine-tune the heater in each position in the event you change brands of pellets and/or live at a higher elevation.

## BATTERY OPERATION

**Always plug AC cord in before DC battery.**

1. The battery must be one foot from the stove to ensure that the terminal does not touch the bottom ring.
2. The Parlour Pellet 12V back-up can be purchased as an option and includes the following components:
  - a. Deep cycle sealed 12-volt gel cell battery (available at most battery stores)

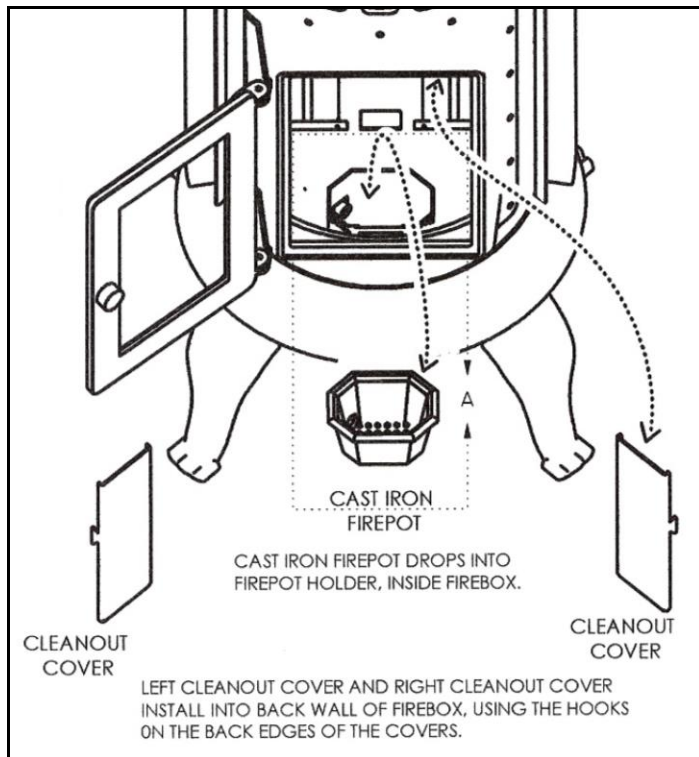
- b. Battery connector cables for hook-up to the heater (available from Thelin)
3. To hook up the battery and engage the 12-volt back-up system, do the following:
    - a. Connect the red battery cable to the (+) positive terminal on the battery. Then plug the red banana plug into the red receptacle on the stove. **The red must be plugged in first before the black.**
    - b. Connect the black battery cable to the (-) negative terminal on the battery. Then plug the black banana plug into the black receptacle on the stove. If you hook up the cables correctly the LED light on the control panel come on and glow green. If hooked up improperly, this LED will glow.

**WARNING: Make sure the red cable goes to the red terminal (positive connector) and the black cable goes to the black terminal (negative connector).**

4. If you decide to purchase your own 12-volt back-up system, we recommend a sealed gel cell battery. **Failure to install the proper battery could cause physical harm to you and/or your property and will also void the heater warranty.**
5. When the battery is properly connected and the heater plugged in, the following will happen automatically:
  - a. The heater will automatically switch to 12-volt power if there is a power failure and switch back when power is restored.
  - b. The battery will be trickle charged as long as the heater is plugged into 110 AC wall outlet. **Do not use extension cords.** The trickle charge will not recharge a low or dead battery, but will keep a charged battery at maximum performance. **Do not unplug stove for the summer and keep**

**battery attached. Battery will drain down and fail to recharge.**

6. If you choose to separate the battery from the heater by lengthening the cables, you must make sure the cable used will carry the current to the heater. For example, if the distance is 10 to 20 feet, then 12-gauge wire must be used. Check with your local electrical professional to make sure you have used the proper gauge wire/cable.
7. The automatic ignition feature will not work on DC power only. The stove can be lit manually with an approved starter material. Call Thelin if you need help with manual lighting.



**FIGURE 14**

## MAINTENANCE PROCEDURES

**CAUTION:** Moving parts may cause injury. DO NOT operate with rear cover removed.

**WARNING:** Risk of electrical shock. Disconnect all power before servicing.

**Always turn your heater off and let it cool before cleaning.**

Your ParLOUR Pellet Heater requires routine maintenance for maximum performance, and it is mandatory for the warranty to remain in effect.

The following procedures should be studied carefully and performed regularly as indicated.

- a. **Soot and Fly Ash: Formation and 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 the flue gases. 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 a year or immediately following the heating season to determine if cleaning is necessary.
- b. When the heater is shut down and cold, you should open door and remove clean out cover. To remove, simply lift up and out from retaining notched cutout on vertical wall (see Figure 14). Clean one side at a time. With one cover removed, leave the door open 1" and push the "Clean" button. Let heater run 30 seconds, push to "Off," and replace cover. Remove the remaining clean out cover and repeat procedure for other side.

**Disposal of Ashes:** 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 ground, well away from all combustible materials pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

- c. Vacuum inside stove ash pockets on both sides of fire pot.
  - d. Remove fire pot by lifting up and out. It may be brushed out or vacuumed. Fire pot should be cleaned regularly. Make sure slots in pot are not plugged. The area around and below the pot should be checked every five or six days depending on how many hours a day you are burning your heater and the quality of the pellets being burned. After a few days you will be able to determine the frequency required for cleaning. Scrape pellet feed chute with putty knife to remove hardened material on which sawdust can accumulate.
  - e. Scrape pellet feed chute with putty knife to remove hardened material on which sawdust can accumulate.
  - f. The tee connector on the vent pipe must have a clean out cap and this must be checked every four to six weeks or whenever you utilize the "Clean" mode on the control dial.
  - g. Fly ash can also accumulate in the vent pipe. Inspect the exhaust system frequently to maintain free flow of exhaust fumes. This depends entirely on the quality of the pellets, so you will initially monitor the buildup in the vent pipe. Those installations going into an existing flue must be installed with a tee connector to allow access to clean the ash from the pellet vent pipe.
1. **Hopper Clean Out:** Vacuum the accumulated saw dust in the hopper weekly. Keep free of debris and foreign material. An accumulation of saw dust can cause irregular pellet feed. For best

results this should be done on a regular basis depending on how often the heater is used. If you burn the heater all of the time, you should do this every eight to ten days.

2. **Cleaning the Exhaust Fan Blade & Heat Exchanger:** The exhaust blower should be checked for excessive fly ash buildup. Regular and routine maintenance utilizing the clean out feature will keep the exhaust blower housing and fan blades clean. This cleaning can only be done when the heater is not burning. For best results, run the fan in the "Clean" position with the door open for approximately 45 seconds or until ash is no longer being picked up by the fan. Remember, you must always check the clean out cap on the tee after utilizing the clean feature (see Figure 14).

**(See Figure 19 for routine stove clean out and maintenance.)**

3. **Cleaning the Fan Guard:** The plastic fan guard on the bottom of the stove must be kept free of lint and dust. Check weekly for lint build-up and vacuum as necessary.
4. **Keeping the Glass Clean:** If soot deposits accumulate on the glass, clean with window glass cleaner and a paper towel when the glass is cold.
5. **Polishing the Gold and Chrome:** All gold and chrome plating used on the Parlour can be cleaned with a soft cloth and non-abrasive cleaner.
6. **Cleaning and Polishing Gold-Plated Parts:** Gold is a soft metal and, therefore, a fragile surface. It will not discolor from heat, but it can easily be scratched. Prior to the first burn it is important to use Kel Kem Spray Gold Cleaner or Flitz Faucet & Fixture Wax and a soft clean cloth to wipe any fingerprints off all gold surfaces or the heat will cause the oil in the fingerprint to remain in the surface permanently.

Always clean the gold surface when the heater is cool!

7. **Check door and window gaskets** for tight seal. Door gasket should contact completely around perimeter. Replacement gaskets are available from your dealer or Thelin Hearth.

*This Parlour Pellet Heater has been safety tested by Warnock Hersey Test Labs in Middleton, Wisconsin.*

## TROUBLESHOOTING

The following scenarios are provided in order to help you locate a difficulty if the heater performs in a manner which would seem to indicate a malfunction:

1. **Problem:** I loaded the heater for start-up, lit the fire starter and pellets, but the fire did not light.

**Solution:** Check power cord to see that it is plugged in tightly to the bottom of the stove. Is the LED light blinking when you push the Low, Medium, or High button? If not, check the fuse for the Igniter located on the bottom of the stove in the red fuse holder. Remember that the timer on start-up runs about six minutes and if the pellets have not lit, then you may have to repeat the start-up sequence. Also, the stove only runs on one speed until a temperature is reached that activates the run mode. This usually takes 15 to 20 minutes, and in extremely cold climates, you might have to repeat the start-up procedure for the stove to reach this temperature.

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

**Solution:** Check pellet supply in hopper. If empty, fill and follow start-up procedure. Occasionally, a foreign object, debris, or an excessive amount of sawdust can enter the feed mechanism and jam the feed chute. If this

happens, you must empty the hopper and check the feed chute to see what is causing the jam. Remove any foreign material or object and restart the heater. CAUTION: Keep fingers and hands clear of the feed mechanism when heater is on.

3. **Problem:** The fire was burning well and then it began to overfeed pellets and started backing up into the pellet feed chute, smothering the fire.

**Solution:** When the pellets are overfeeding, it usually means that the air flow has been reduced. Check the fire pot air intake holes to be sure they are clear. Check to see if fire pot was properly seated in the pot tray. If you use a low-grade pellet and clinkers (fused ash and dirt) form in the bottom of the fire pot and chock the air intake, you might consider changing the brand of pellets to one that burns cleaner. You must let the fire go out before removing and cleaning the fire pot. Never vacuum out the heater when the heater is in operation! The hot ashes can lodge in your vacuum cleaner and cause a fire! You must clean the heat exchanger manifold (see Figure 14) regularly to ensure a good air to fuel ration, thus allowing the heater to "breathe" properly. You must also check the tee and vent pipe to see that they are not clogged and full of ash.

4. **Problem:** The heater was burning well and then soot began forming on the door glass.

**Solution:** Black soot forming on the door glass means that the combustion is not right and the heater needs a good clean out. Some brands of pellets burn much richer than others and you might have to change brands of pellets and/or have the air/fuel settings readjusted by your dealer. It is normal to have the glass cloud up after several hours of burning, but it should wipe off with a good window cleaner. If the glass turns black quickly, then the heater needs a good clean out.

5. **Problem:** We had a power failure and the heater emitted smoke for about five minutes.

**Solution:** If the heater emits smoke during a power failure and you have frequent power failures, then we suggest you purchase the battery back-up system. If the vent pipe is installed according to these instructions, the smoke will siphon out of the pipe in most instances.

6. **Problem:** After several weeks of outstanding performance, the heater suddenly stopped and the red light under the control panel came on. This light is the High Temp/Flue indicator light.

**Solution:** The High Temp/Flue indicator light indicates that fly ash has built up in the exhaust system and/or there is a restriction in the exhaust/flue system. Check the pipe system for excessive ash and clogging, particularly the vent cap. Remove the clean out cap on the tee and make sure that ash has not blocked the exhaust air flow. This automatic shut down in case of flue clogging is a safety feature, and if the shut down occurs it means you have a problem and should consult a service technician and/or clean your pipe and heater thoroughly. If you feel the fly ash build-up is excessive, we suggest you try another pellet brand. In most climates the pellets and fly ash can absorb moisture from the air and create creosote and a severe clogging problem. Keep this in mind when you store and handle your pellets. The heater warranty does not cover the quality of the fuels used or the way they may be handled, either before or after you've purchased them.

7. **Problem:** I turned off the switch and the heater continued running.

**Solution:** This is normal. The exhaust blower will keep running until it cools down and then it will automatically turn off. This can vary by the temperature the exhaust has reached and the temperature of the cooling air.

8. **Problem:** Fan motor speed varies, sometimes running low and sometimes surging. Will run on "High" or "Clean" but not on "Low."

**Solution:** Fan motor brushes are wearing out. Brushes in fan motor need to be replaced. Contact your dealer or call factory for replacement brushes.

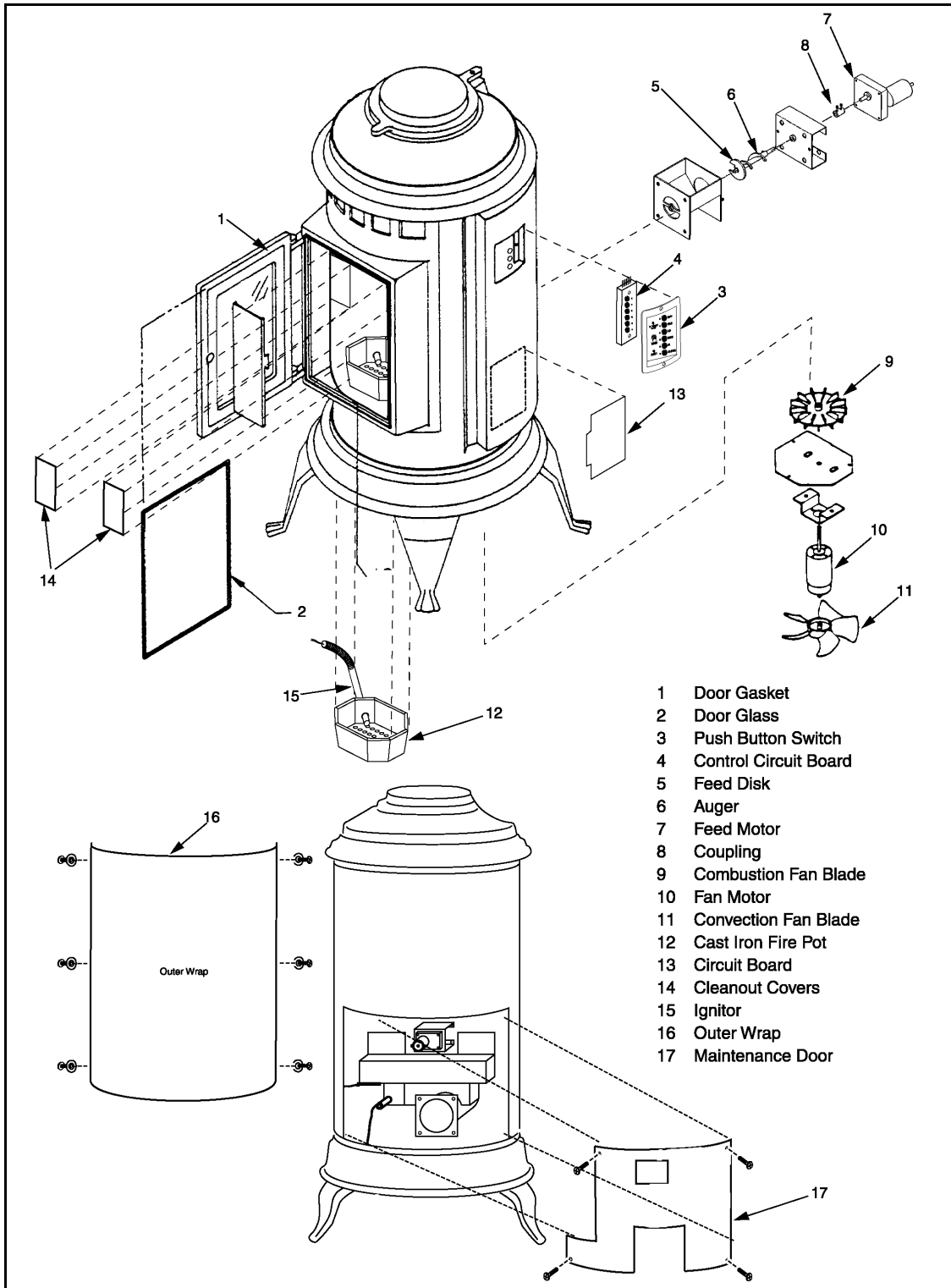
9. **Problem:** Stove shuts off at night when running on low.

**Solution:** Feed is too low. Adjust feed trim button (turn clockwise) until feed can maintain fire.

10. **Problem:** I see a flashing green light behind the outer shield. What does this mean?

**Solution:** The flashing green light behind the outer shield means the circuit board is energized. This is okay. "Green means go." All systems are ready and operational.

FIGURE 15 – REPLACEMENT PARTS LIST 16





**FIGURE 17 - CIRCUIT BOARD DIAGRAM**

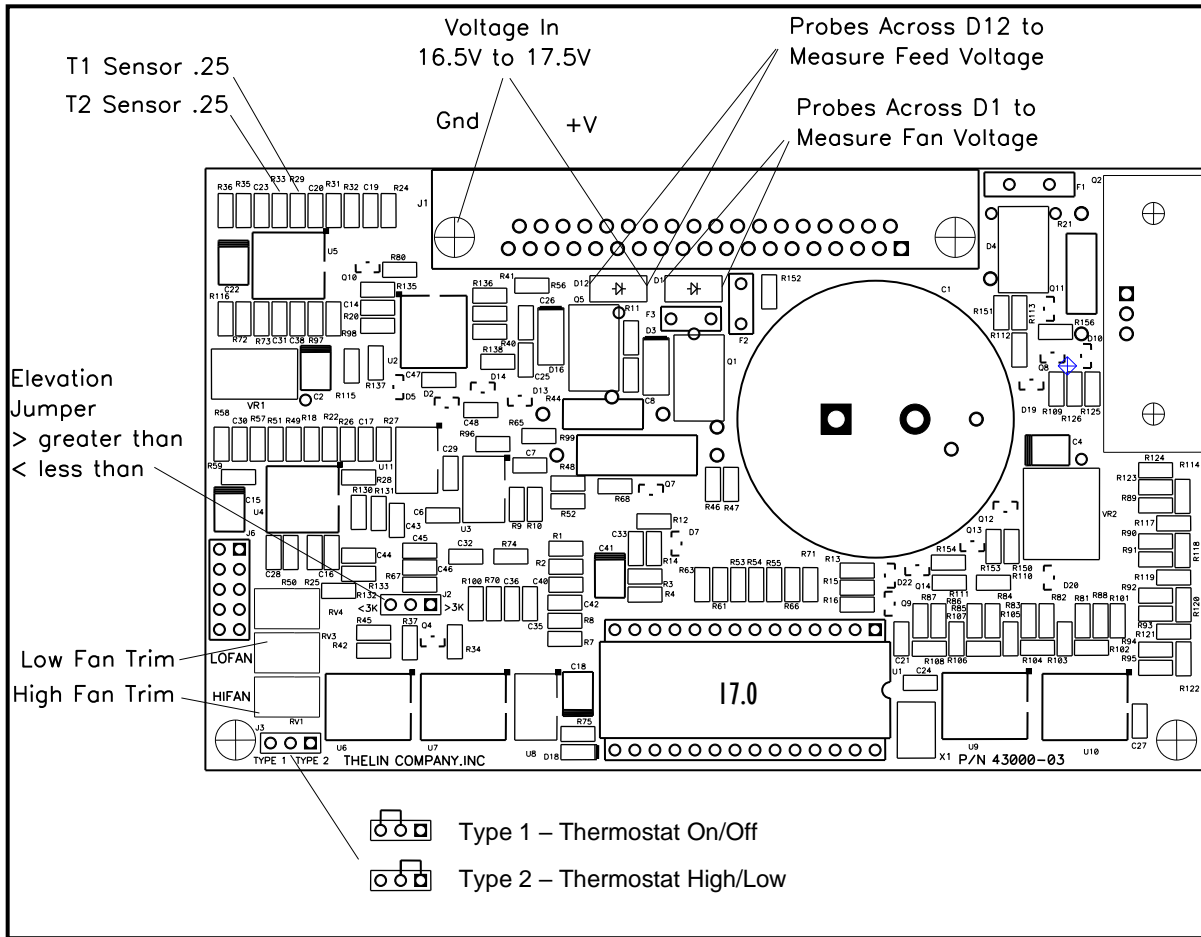


FIGURE 18 - ELECTRICAL SCHEMATIC/WIRING DIAGRAM

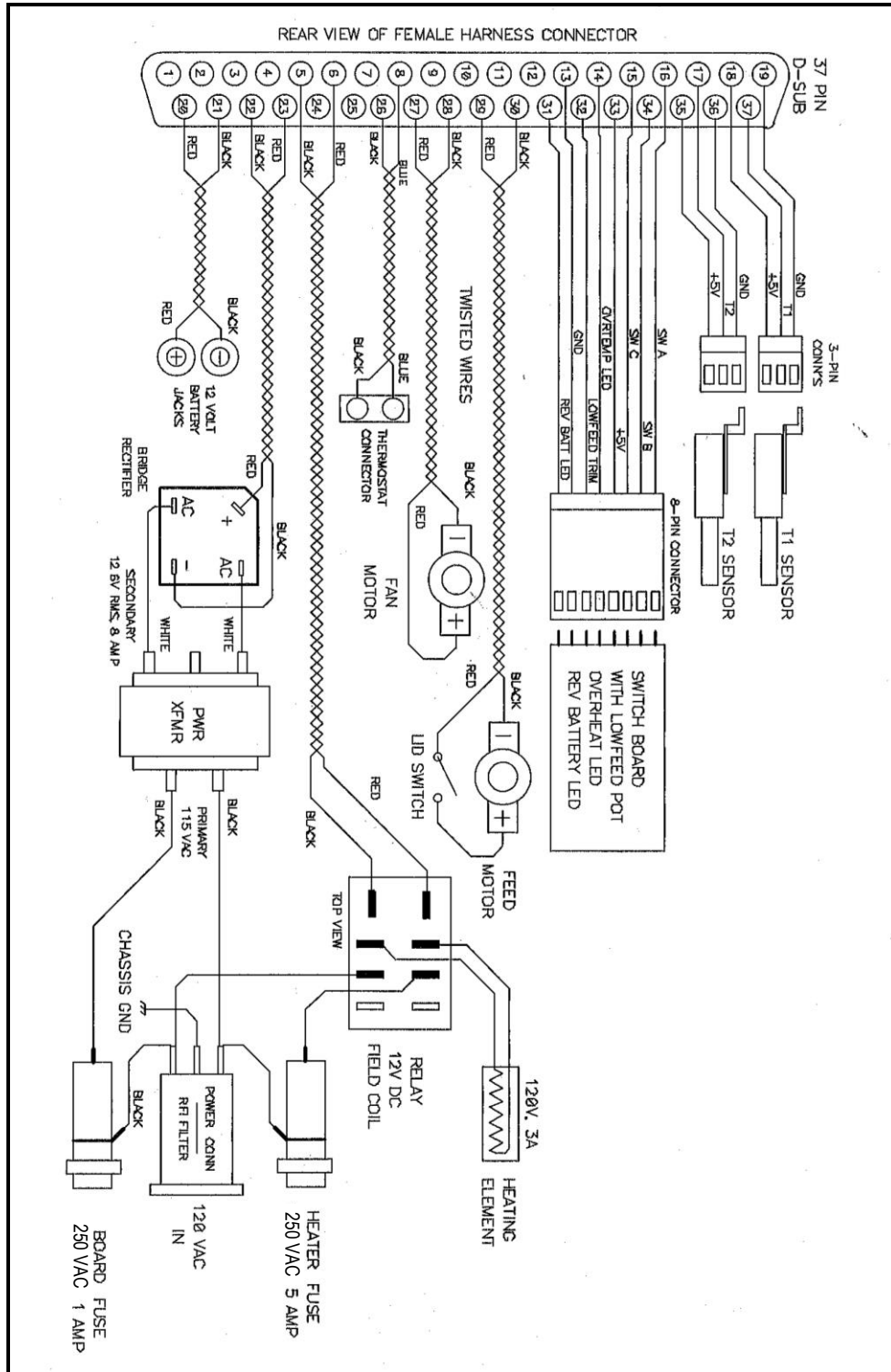
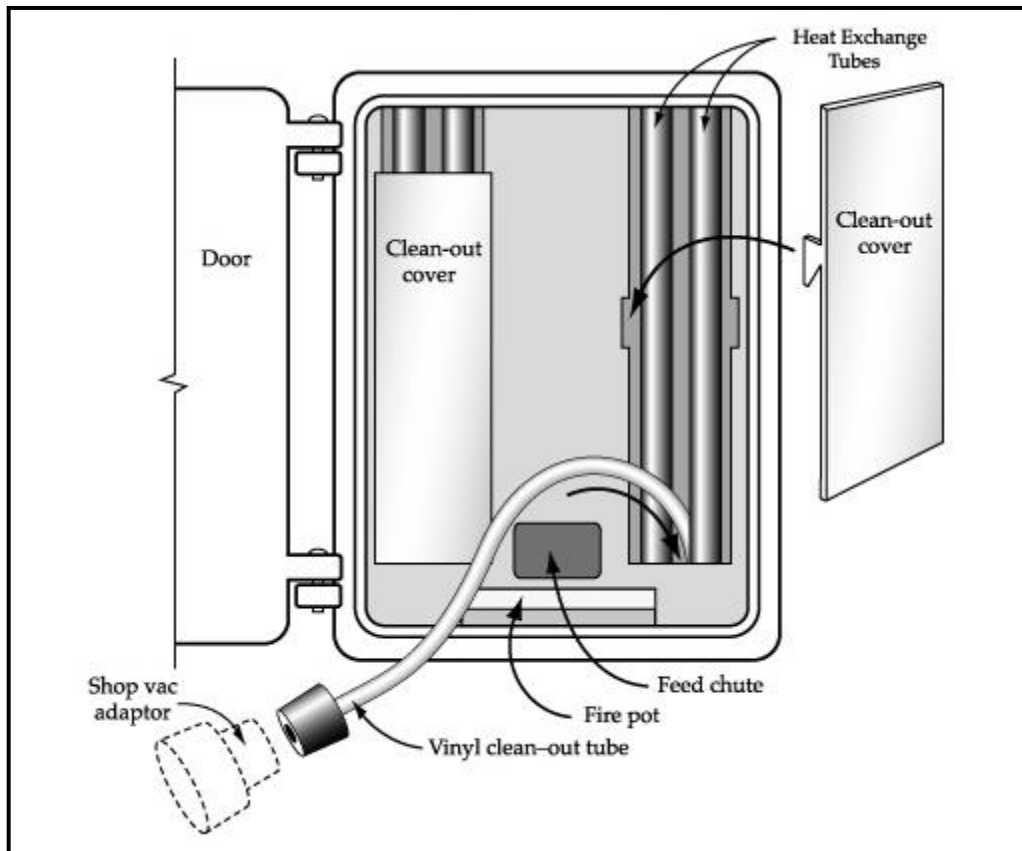


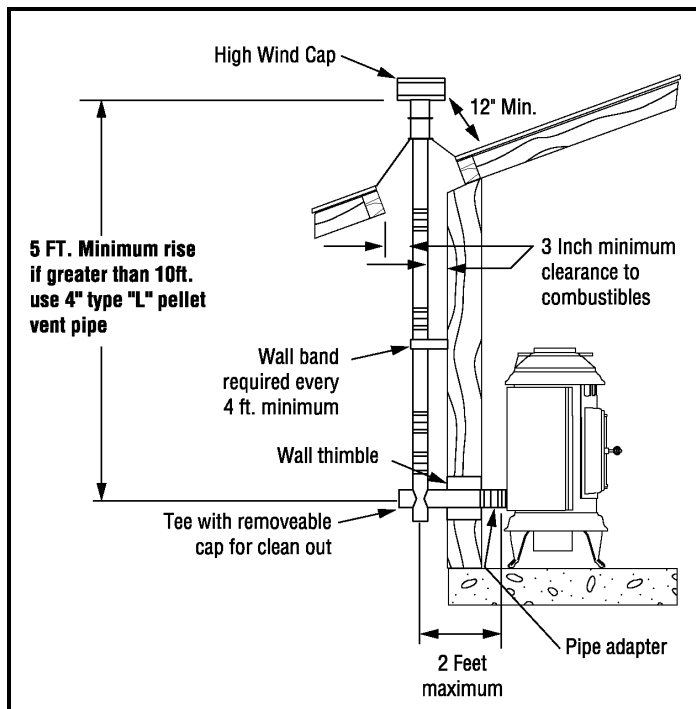
FIGURE 19 – ROUTINE STOVE CLEAN OUT AND MAINTENANCE



The following is a step-by-step procedure to clean out and maintain your pellet stove.

1. **Stove must be shut off and completely cold before performing this maintenance.**
2. Open door; remove fire pot and clean-out covers.
3. Vacuum entire inside area, including heat exchanger tubes, using a pellet vac or shop vac. **Do not use a household vacuum cleaner!**
4. Connect vinyl clean-out tube to pellet vac or shop vac. (An adaptor must be used to connect to a shop vac. These can be purchased at hardware stores or home centers.) Insert the clean-out tube down between the heat exchanger tubes (approx. 4" to 6") as shown in the picture, and vacuum up the debris. Reposition the tube several times to get as much debris as possible. Repeat the procedure at the other set of tubes. **Remove vinyl clean-out tube.**
5. Turn control knob to "clean" position for about 45 seconds.
6. Replace clean-out covers and fire pot. The stove is now ready to use.

## APPENDIX A – WIND WARNING



### Additional Venting Problems

Occasionally, the vent configuration can create a noisy, harmonic condition that will make a noise similar to the one made by blowing over a bullet shell or beer bottle. This sound can be eliminated by closing the air damper located on the bottom front of the stove under the bottom ring.

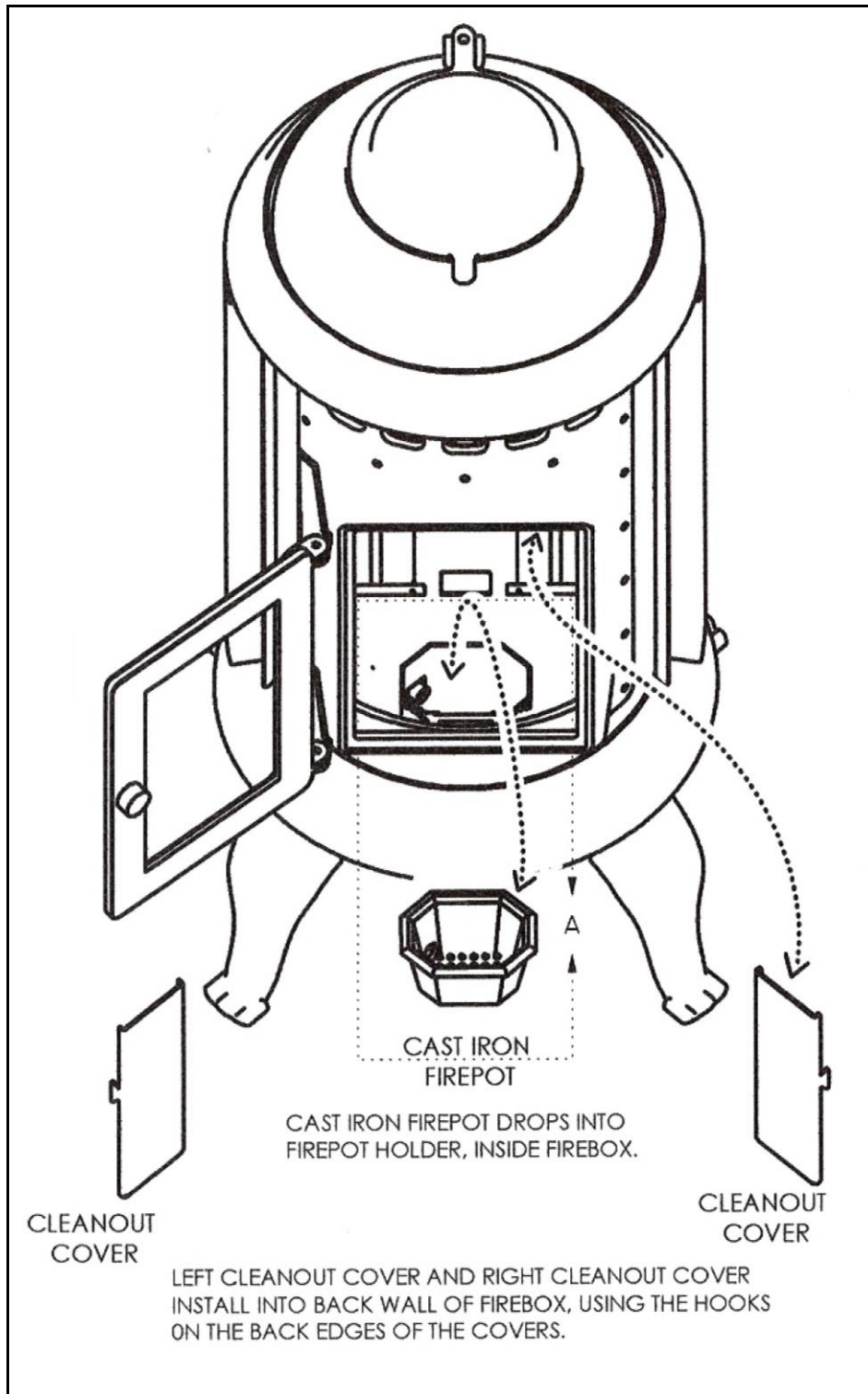
Your Thelin Pellet Stove is equipped with a blocked flue/high temp safety sensor that will shut the stove off if there is a down draft, blocked flue, or high temperature condition.

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 (see diagram).

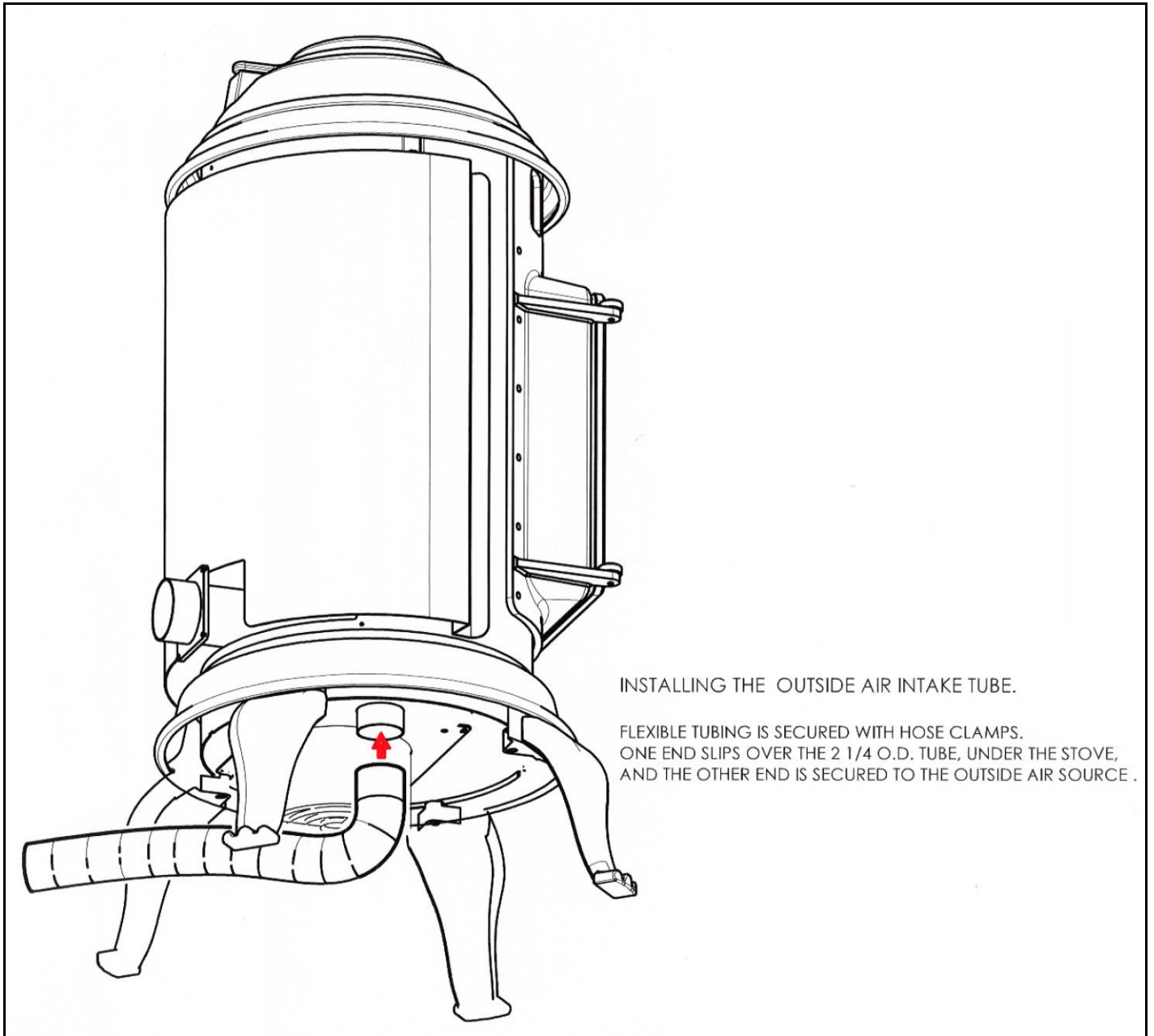
You are welcome to call if you have any questions about this potential problem.

Thelin Hearth Products  
(800) 949-5048

APPENDIX B – E.I. FIREPOT ASSEMBLY



APPENDIX B – OUTSIDE AIR HOOK-UP



## APPENDIX C – FINE TUNING

Because of the variability of pellets (i.e., length thickness, density, quality of sawdust), you might have to—from time to time—fine tune your heater to compensate for pellet quality. Following are some suggestions for fine tuning.

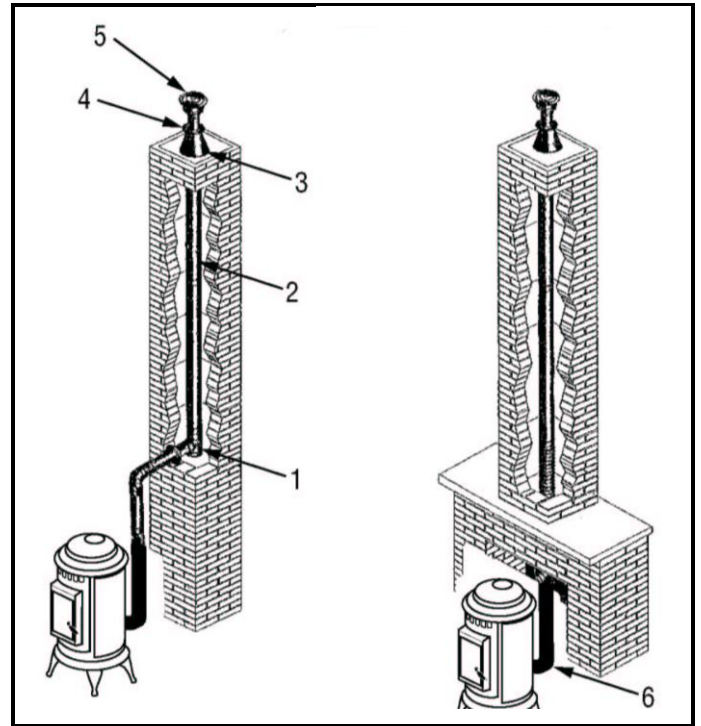
There are three (3) fine-tuning adjustment components:

1. The Trim Button located on the control plate (see Figure 13) will allow you to change the feed rate on each setting (i.e., Hi, Med, Low). By turning the trim button clockwise you can increase the feed rate, and by turning the trim counterclockwise you can decrease the feed rate. For example, if the pellet you are using is a hardwood pellet and longer than 1", then the stove could go out on the low setting for lack of fuel. Turn the trim clockwise to increase fuel and thus sustain the fire.
2. The Fan Trim Pot Adjustment is located on the circuit board (see Figure 17). Please note the two fan trim pots marked on the drawing (lower left hand corner). By using a small slot screwdriver you can adjust fan speeds to compensate for poor pellets or airflow. By turning the trim pots clockwise you can speed up the fan speed on both Hi and Low settings. You will have to experiment with the setting to determine the proper burn. A good, brisk flame that is yellow, not orange, is what indicates a good burn.
3. Outside air hook-up can create combustion problems if the outside air flex tube is longer than 3' (three feet). Increase size of flex tube on runs over 3'. Use 4" flex if you are going up into an existing chimney.

## APPENDIX D – CHIMNEY INSTALLATION CRITERIA

### CHIMNEY INSTALLATION

1. A clean out tee is required on both installations (see items 1 and 6 in illustration).
2. Four-inch pellet vent pipe is required on both chimney and fireplace installs (see item 2 in illustration).
3. Top of chimney must be sealed and flashing used (see item 4 in illustration).
4. Install storm collar above flashing to prevent leakage (see item 4 in illustration).
5. Vertical termination cap (type L pellet) must be used on all installations. If wind conditions are present, then utilize a high-wind cap (see item 5 in illustration).

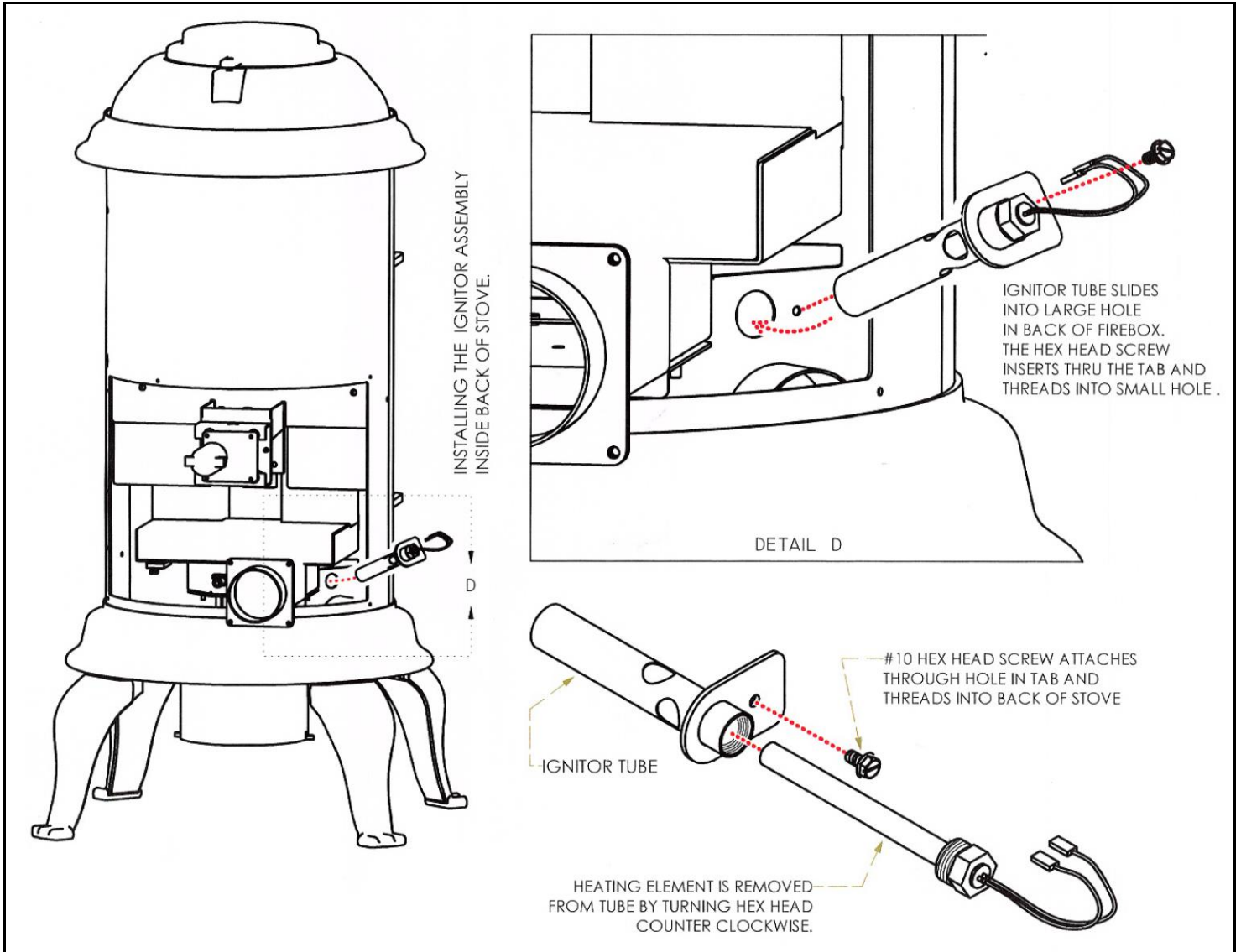


### PELLET QUALITY

Vertical installation into old chimneys are susceptible to creosote build up if not done properly. Poor quality pellets or pellets with a high moisture content **can** also create creosote and the risk of a chimney fire. We suggest trying several bags of different pellets to determine which ones will give you a vibrant, hot flame. Avoid pellets that burn rich (smoky, orange flame), and make sure to keep fire pot clean and free of ash build-up.



APPENDIX E – REPLACEMENT OF IGNITER



## **THELIN HEARTH PRODUCTS PELLET HEATER WARRANTY REPLACEMENT PROGRAM**

**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.

### **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, 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.

### **HEATER PURCHASE INFORMATION**

Date Purchased: \_\_\_\_\_ Serial Number: \_\_\_\_\_

Dealer/Retailer where Purchased: \_\_\_\_\_

Installer/Contractor used for Installation: \_\_\_\_\_



**Theelin Hearth Products, Inc.**  
**63 Laxalt Dr.**  
**Carson City, NV 89706**  
**[www.thelinco.com](http://www.thelinco.com)**

## ASTM E2779 Wood Heater Run Sheets

Client: Thelin Job Number: 22-827 Tracking #: 128  
 Model: Parlor Run Number: 2 Test Date: 10/10/2022

### Pellet Heater Control Settings

High Burn Rate Settings:      Setting: High      Trim Pot: 9:00  
 Medium Burn Rate Settings:    Setting: Med      Trim Pot: 7:00  
 Low Burn Rate Settings:        Setting: Low      Trim Pot: 9:00

### Preburn Notes

Preburn Start Time: 7:47

Time	Notes
0:00 60:00	Began PB PB end

### Test Notes

Test Burn Start Time: 8:47

Time	Notes
60:00 180:00 360:00	Changed settings to Medium Changed settings to Low Test end

Test Burn End Time: 14:47

### Flue Gas Concentration Measurement

**Calibration Gas Values:**      Span Gas      CO<sub>2</sub> (%): 17.00      CO (%): 4.31  
    Mid Gas        CO<sub>2</sub> (%): 10.09      CO (%): 2.53

### Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	7:24	7:27	7:35	14:48	14:49	14:51
CO <sub>2</sub>	0.00	10.16	17.00	0.10	9.90	16.94
CO	0.000	2.522	4.310	-0.009	2.447	4.252

**Flue Gas Probe Leak Check:**      Initial: 0                      Final: 0

Technician Signature: 

Date: 10/26/2022  
Page 1 of 1

# Dry Gas Meter Calibration

Meter Manufacturer: Apex  
 Model: XC-60  
 Lab ID #: 53  
 Serial #: 1902130  
 Calibration Date: 7/25/2022  
 Calibration Expiration: 1/25/2023  
 Barometric Pressure: 29.74 in. Hg



Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/30/2023
Calibration $\gamma$ Factor:	0.9978

Unit Under Test Previous Calibration	
Date	3/21/2022
$\gamma$ Factor:	1.015
Allowable Deviation ( $\pm 5\%$ ):	0.05075
Actual Deviation:	0.02
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)	143.588	142.845	142.939
Standard DGM Temperature ( $^{\circ}$ F)	80.0	80.0	80.0
Standard DGM Pressure (in H <sub>2</sub> O)	0.00	0.00	0.0
DGM Initial Volume (ft <sup>3</sup> )	0.000	0.000	0.000
DGM Final Volume (ft <sup>3</sup> )	5.232	5.241	5.261
DGM Temperature ( $^{\circ}$ F)	105.0	105.0	105.0
DGM Pressure (in H <sub>2</sub> O)	4.58	1.95	1.06
Time (min)			
Net Volume for Standard DGM (ft <sup>3</sup> )	5.071	5.045	5.048
Net Volume for DGM (ft <sup>3</sup> )	5.232	5.241	5.261
Dry Gas Meter $\gamma$ Factor	1.000	1.000	0.999
$\gamma$ Factor Deviation From Average	1.000	1.000	0.999

Average Gas Meter  $\gamma$  Factor 1.000

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  $\pm 0.5\%$ .

# Pressure Gauge Calibration Work Sheet

Gauge Manufacturer: Apex  
 Maximum Range (inH<sub>2</sub>O): 1  
 Instrument ID #: 053 (dP)  
 Calibration Date: 7/26/2022  
 Calibration Expiration: 7/26/2023  
 Barometric Pressure: 29.74 in. Hg



Reference Standard Gauge	
Manufacturer:	Dwyer
Model:	475-000
Instrument ID#:	76
Calibration Expiration Date:	8/3/2022

Calibration Point (inH <sub>2</sub> O)	Reference Gauge Reading (inH <sub>2</sub> O)	Pressure Gauge Reading (inH <sub>2</sub> O)	Difference (Reference - UUT)	% Error of Full Range
0.0 - 0.2	0.14	0.15	0.009	0.9%
0.2 - 0.4	0.30	0.32	0.018	1.8%
0.4 - 0.6	0.46	0.48	0.027	2.7%
0.6 - 0.8	0.62	0.66	0.034	3.4%
0.8 - 1.0	0.82	0.85	0.033	3.3%

Acceptable tolerance is 4%

Technican Signature: \_\_\_\_\_

Date: 7/26/2022

Uncertainty is 0.4 inH<sub>2</sub>O, based on mininum uncertainty ration of 4:1 between standard reference meter and unit under test.

# Emissions Sampling System Thermocouple Calibration Check

*Calibration based on NIST Monograph 175 per ASTM E2515-11  
All thermocouples are type "K"*

Date: 07/25/2022

Sampling System ID Numbers: 053/054

Performed By: S. Button

Calibration Instrument ID Number: 165

Reference Temperature (F)	Acceptable Error (F)	Thermocouple Location						
		FB Left	FB Right	FB Back	FB Top	FB Bottom	Catalyst Exit	Flue
0	± 4.0	1.3	1.3	1.7	1.2	1.2	1.5	2.0
200	± 4.0	201.1	201.0	201.5	200.9	201.0	201.3	201.7
400	± 4.0	401.2	401.0	401.5	400.8	401.0	401.3	401.7
600	± 4.5	601.9	600.9	601.4	600.8	600.9	601.3	601.6
800	± 6.0	801.0	800.9	801.3	800.8	800.8	801.2	801.6

Reference Temperature (F)	Acceptable Error (F)	Thermocouple Location					
		Ambient*	Filter A	Filter B	Meter A	Meter B	Dilution Tunnel
0	± 4.0	0.1	2.2	1.3	1.5	1.6	2.3
200	± 4.0	200.0	201.9	202.5	201.2	201.2	201.9
400	± 4.0	399.9	401.9	402.4	401.2	401.2	402.0
600	± 4.5	600.0	601.9	602.2	601.1	601.2	601.8
800	± 6.0	-	801.8	801.9	801.0	801.0	801.6

\*Ambient Probe is a Type T, Error Limit is ± 0.9 F

Technician Signature: 

Date: 7/25/2022

# Dry Gas Meter Calibration

Meter Manufacturer: Apex  
 Model: XC-60  
 Lab ID #: 54  
 Serial #: 1902133  
 Calibration Date: 7/25/2022  
 Calibration Expiration: 1/25/2023  
 Barometric Pressure: 29.70 in. Hg



Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/30/2023
Calibration $\gamma$ Factor:	0.9978

Unit Under Test Previous Calibration	
Date	3/21/2022
$\gamma$ Factor:	0.985
Allowable Deviation ( $\pm 5\%$ ):	0.04925
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)	146.661	157.228	144.674
Standard DGM Temperature ( $^{\circ}$ F)	81.0	81.0	82.0
Standard DGM Pressure (in H <sub>2</sub> O)	0.00	0.00	0.0
DGM Initial Volume (ft <sup>3</sup> )	0.000	0.000	0.000
DGM Final Volume (ft <sup>3</sup> )	5.390	5.750	5.339
DGM Temperature ( $^{\circ}$ F)	108.0	108.0	109.0
DGM Pressure (in H <sub>2</sub> O)	2.75	4.77	1.28
Time (min)			
Net Volume for Standard DGM (ft <sup>3</sup> )	5.179	5.552	5.109
Net Volume for DGM (ft <sup>3</sup> )	5.390	5.750	5.339
Dry Gas Meter $\gamma$ Factor	1.000	1.000	0.999
$\gamma$ Factor Deviation From Average	1.000	1.000	0.999

Average Gas Meter  $\gamma$  Factor 1.000

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  $\pm 0.5\%$ .

Technician:



# Pressure Gauge Calibration Work Sheet

Gauge Manufacturer: Apex  
 Maximum Range (inH<sub>2</sub>O): 1  
 Instrument ID #: 054 (dP)  
 Calibration Date: 7/26/2022  
 Calibration Expiration: 7/26/2023  
 Barometric Pressure: 29.74 in. Hg



Reference Standard Gauge	
Manufacturer:	Dwyer
Model:	475-000
Instrument ID#:	76
Calibration Expiration Date:	8/3/2022

Calibration Point (inH <sub>2</sub> O)	Reference Gauge Reading (inH <sub>2</sub> O)	Pressure Gauge Reading (inH <sub>2</sub> O)	Difference (Reference - UUT)	% Error of Full Range
0.0 - 0.2	0.13	0.15	0.019	1.9%
0.2 - 0.4	0.36	0.38	0.027	2.7%
0.4 - 0.6	0.50	0.51	0.012	1.2%
0.6 - 0.8	0.62	0.65	0.028	2.8%
0.8 - 1.0	0.91	0.94	0.028	2.8%

Acceptable tolerance is 4%

Technican Signature:

Date: 7/26/2022

# Dry Gas Meter Calibration

Meter Manufacturer:	Apex
Model:	XC-50-DIR
Lab ID #:	203
Serial #:	A2204292
Calibration Date:	7/25/2022
Calibration Expiration:	1/25/2023
Barometric Pressure:	29.77 in. Hg



Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/30/2023
Calibration $\gamma$ Factor:	0.9978

Unit Under Test Previous Calibration	
Date	N/A
$\gamma$ 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)	146.097	151.718	144.533
Standard DGM Temperature ( $^{\circ}$ F)	78.5	79.0	80.0
Standard DGM Pressure (in H <sub>2</sub> O)	0.00	0.00	0.0
DGM Initial Volume (ft <sup>3</sup> )	0.000	0.000	0.000
DGM Final Volume (ft <sup>3</sup> )	5.340	5.541	5.316
DGM Temperature ( $^{\circ}$ F)	100.0	104.0	105.0
DGM Pressure (in H <sub>2</sub> O)	1.00	3.64	1.95
Time (min)			
Net Volume for Standard DGM (ft <sup>3</sup> )	5.159	5.358	5.104
Net Volume for DGM (ft <sup>3</sup> )	5.340	5.541	5.316

Dry Gas Meter $\gamma$ Factor	1.000	1.001	0.998
$\gamma$ Factor Deviation From Average	1.000	1.001	0.998

Average Gas Meter  $\gamma$  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: Apex-AK-600  
 Lab ID #: 55  
 Serial #: 810016  
 Calibration Date: 7/27/2022  
 Calibration Expiration: 7/27/2023  
 Barometric Pressure: 29.86 in. Hg



Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/30/2023
Calibration $\gamma$ Factor:	0.9978

Unit Under Test Previous Calibration	
Date	10/8/2021
$\gamma$ Factor:	0.997
Allowable Deviation ( $\pm 5\%$ ):	0.04985
Actual Deviation:	0.03
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)	165.822	145.728	160.540
Standard DGM Temperature ( $^{\circ}$ F)	75.0	75.0	77.0
Standard DGM Pressure (in H <sub>2</sub> O)	0.00	0.00	0.0
DGM Initial Volume (ft <sup>3</sup> )	0.000	0.000	0.000
DGM Final Volume (ft <sup>3</sup> )	5.745	5.045	5.556
DGM Temperature ( $^{\circ}$ F)	80.0	81.0	82.0
DGM Pressure (in H <sub>2</sub> O)	0.00	0.00	0.0
Time (min)			
Net Volume for Standard DGM (ft <sup>3</sup> )	5.856	5.146	5.669
Net Volume for DGM (ft <sup>3</sup> )	5.745	5.045	5.556
Dry Gas Meter $\gamma$ Factor	1.027	1.029	1.028
$\gamma$ Factor Deviation From Average	1.027	1.029	1.028

Average Gas Meter  $\gamma$  Factor 1.028

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  $\pm 0.5\%$ .

Technician:

# Certificate of Calibration

Certificate Number: 743892



**JJ Calibrations, Inc.**

7724 SE Aspen Summit Drive  
Portland, OR 97266-9217  
Phone 503.786.3005  
FAX 503.786.2994

**PFS TECO**

11785 SE Hwy 212  
Suite 305  
Clackamas, OR 97015

PO: 1033

Order Date: 03/08/2021

Authorized By: N/A



Calibrated on: 03/18/2021

\*Recommended Due: 03/18/2026

Environment: 19 °C 41 % RH

\* As Received: Other - See Remarks

\* As Returned: Other - See Remarks

Action Taken: Calibrated

Technician: 126

Property #: 097  
User: N/A  
Department: N/A  
Make: Unknown  
Model: 10 Lbs.  
Serial #: 097  
Description: Mass  
Procedure: DCN 500901  
Accuracy: Raw Data

Remarks: \* Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit. Uncertainties include the effects of the unit.

Data is provided for your determination of acceptability. Received/returned without accessories.

### Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
484A	Rice Lake	1kg-10kg (Class ASTM 1)	Mass Set,	05/28/2021	699197
503A	Rice Lake	1mg-200g (Class 0)	Mass Set,	09/11/2021	729241
550A	And (A&D) Co.	HP-30K	Balance 30 Kg	12/31/2021	739307
723A	Rice Lake	1mg-200g (Class 0)	Mass Set,	06/09/2021	723431

Parameter

### Measurement Data

Measurement Description	Range	Unit	Reference	Min	Max	*Error	UUT	Uncertainty
<b>Before/After</b>								Accredited = $\bar{U}$
<b>Mass</b>								
Raw Data		g	4535.92370000	0.0000000	0.0000000	0.1785299	4536.1022299 g	3.5E-01 $\bar{U}$

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to either the SI or to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by JCGM 106:2012. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without written approval of JJ Calibrations.

Reviewer

3 Issued 03/25/2021

Rev # 15

Inspector



# CERTIFICATE OF CALIBRATION

<b>CUSTOMER:</b>	<b>PFS-TECO :</b> CLACKAMAS, OR	<b>CALIBRATION DATE:</b>	05/03/2022
<b>PO NUMBER:</b>	1071	<b>CALIBRATION DUE:</b>	05/03/2023
<b>INST. MANUFACTURER:</b>	DWYER	<b>PROCEDURE:</b>	T.O.33K6-4-1769-1
<b>INST. DESCRIPTION:</b>	VELOMETER	<b>CALIBRATION FLUID:</b>	AIR @ 14.7 PSIA 70°F
<b>MODEL NUMBER:</b>	471	<b>RECEIVED CONDITION:</b>	WITHIN MFG. SPECS.
<b>SERIAL NUMBER:</b>	CP288559 ID# 095	<b>LEFT CONDITION:</b>	WITHIN MFG. SPECS.
<b>RATED ACCURACY:</b>	SEE NOTES BELOW.	<b>AMBIENT CONDITIONS:</b>	763mm HGA 51% RH 72°F
<b>UNCERTAINTY GIVEN:</b>	± 0.43% RD ; k=2	<b>CERTIFICATE FILE #:</b>	490265.2021
<b>NOTES:</b>	± 3% FS (0-500 / 0-1500) *** ± 4% F.S. (0-5000) ***± 5% F.S. (0-15000) *** ± 2 °F		

**Q.MANUAL IM 2.0 REV 2020.2 DATED 7-27-2020 \*\*\*\* DECISION RULE : NO PFA%**

UUT INDICATED FT/MIN	DM.STD. ACTUAL FT/MIN	UUT INDICATED DEG. F	DM STD. ACTUAL DEG. F
65	68	0 TO 200°F	0 TO 200°F
129	133	45.1	44.2
260	266	71.7	70.9
498	509	99.3	98.5
526	534		
1039	1058		
1484	1517		
523	534		
3076	3151		
4998	5127		
6752	6907		
14679	15068		

**STANDARDS USED:**

A24: HART SCIENTIFIC TEMP. STANDARD   ± 0.024 F   TRACE# 1617259390	DUE	04/12/2023
A800: FLOW-DYNE SONIC NOZZLE SYSTEM   0 - 1086 CFM ± 0.46% RD.   TRACE# 1329407628, 89576, 152043238	DUE	12/10/2022

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.) and the Unit Under Test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed according to the shown procedure. The use of IAS/ILAC logo indicates calibrations are in accordance to ISO/IEC 17025:2017.

**Dick Munns Company · 11133 Winners Circle, Los Alamitos, CA 90720**

**Phone: 714-827-1215 · www.dickmunns.com**

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.

Issuing Date:

Approved By:

Cal. Technician:

Calibrated at:  Lab

On-Site (Customer's)

05/03/2022

*Richard [Signature]*

D.C.

Page 1 of 1



# QUALITY CONTROL SERVICES

LABORATORY EQUIPMENT • SALES • SERVICE • CALIBRATION • REPAIRS  
2340 SE 11<sup>TH</sup> 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: DIRI0134307497220609

## A2LA ACCREDITED CERTIFICATE OF CALIBRATION WITH DATA

### INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	ENTRIS224-1S	34307497	#107	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
g	0.0001	QC012	6/9/22	1/27/22	1/2023

### 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"/>
<b>As-Found:</b>		<b>As-Found:</b>		1. 100.0000	5. 100.0000	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. 100.0000	
<b>As-Left:</b>		<b>As-Left:</b>		3. 100.0001	7. 100.0000	<b>Result</b>	Temperature: 22.3°C
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	4. 100.0000	8. 100.0001	0.00005	

### A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
200	199.9988	200.0000	0.00017
100	99.9989	100.0000	0.00016
50	49.9994	49.9999	0.00016
20	19.9999	20.0000	0.00015
1	1.0000	1.0000	0.00015
0.1	0.1000	0.1000	0.00015

### CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	R.L./Troemner	10kg to 1mg	G782	4/14/22	4/2023	20220751

#### Permanent Information Concerning this Equipment:

6 month calibration cycle  
1/22 Extra checkpoint to encapsulate user range 0.05g.  
AF= 0.0500g A/L= 0.0500

#### Comments/Info Concerning this Calibration:

6/22: Adjusted Span, RH- 45.3%

Report prepared/reviewed by: KD Date: 6/19/22

Technician: K. Dexter

Signature: [Handwritten 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.



# QUALITY CONTROL SERVICES

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



## Report of Calibration

Firm: PFS-TECO  
Address: 11785 SE Hwy 212, Ste 305  
City/State/Zip: Clackamas, OR 97015

Test Completed: 05/09/22  
Purchase Order: 1067  
Traceable Number: 20220682

Test Item: 200 mg and 100 mg Individual Weights  
Serial No.: Listed in Table

Manufacturer: Troemner  
Customer ID: Listed in Table

<u>Material</u>	<u>Assumed Density</u>	<u>Range</u>	<u>Tolerance Class</u>
Stainless Steel	7.95 g/cm <sup>3</sup>	200 mg & 100 mg	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:

100 g to 1 mg Working Standards Were Calibrated: 07/02/21 Due: 07/31/22 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. 8.0 g/cm<sup>3</sup>).


**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](mailto:dthompson@qc-services.com)

Date: 05/09/22

  
Signature David S. Thompson

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Member: National Conference of Standards Laboratories and Weights & Measures



# QUALITY CONTROL SERVICES

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(503) 236-2712 • FAX (503) 235-2535 • www.qc-services.com



## Report of Calibration

Firm: PFS-TECO  
Address: 11785 SE Hwy 212, Ste 305  
City/State/Zip: Clackamas, OR 97015

Test Completed: 05/09/22  
Purchase Order: 1067  
Traceable Number: 20220682

Test Item: 200 mg and 100 mg Individual Weights  
Serial No.: Listed in Table

Manufacturer: Troemner  
Customer ID: Listed in Table

### Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.93 to 21.94	760.7 to 760.8	47.8 to 47.9

### Conventional Mass Value

Nominal Value	As Found Value (g)	As Found Correction* (mg)	As Left Value (g)	As Left Correction* (mg)	Uncertainty (mg)	Tolerance (mg)
200 mg, 1000101395, #109-B	0.2000082	0.0082	0.2000082	0.0082	0.0014	0.010
100 mg, 1000126267, #109-A	0.1000065	0.0065	0.1000065	0.0065	0.0014	0.010

\*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 ASTM Class 1 tolerances As Found.


**Recalibration Due:** The customer has requested a 5-year calibration cycle. The calibration due date for these weights is 05/09/27. The values listed above were found at the time of calibration. Any number of factors may cause these items to drift out of calibration before the calibration interval has expired.

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 17025:2017 *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 to 2

Quality Control Services, Inc.  
Metrology Laboratory Manager  
E-mail [dthompson@qc-services.com](mailto:dthompson@qc-services.com)

Date: 05/09/22

  
Signature David S. Thompson

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# QUALITY CONTROL SERVICES

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(503) 236-2712 • FAX (503) 235-2535 • www.qc-services.com



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

Report Number: DIRI01C101887027220127

## A2LA ACCREDITED CERTIFICATE OF CALIBRATION WITH DATA

### INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Mettler	IND570 - 1000lbx0.	C101887027	#189	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
lbs	0.02	QC033	1/27/22	N/A	1/2023

### FUNCTIONAL CHECKS

SHIFT TEST		LINEARITY		REPEATABILITY		ENVIRONMENTAL CONDITIONS		
Test Wt:	Tol:	Test Wt:	Tol:	Test Wt:	Tol:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
400	0.10	HB44	HB44	200	0.04	Good	Fair	Poor
As-Found:		As-Found:		As-Found:		Temperature: 20.4°C		
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	999.46	999.96	0.012
600	599.68	599.96	0.011
400	399.80	399.98	0.011
200	199.92	199.98	0.011
100	99.98	99.98	0.011
50	49.98	50.00	0.011

### CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	3/13/20	3/2022	202000041

Permanent Information Concerning this Equipment:

Comments/Information Concerning this Calibration

1/22 RH= 28%. Adjusted span.

Report prepared/reviewed by: JC

Date: 1/27/22

Technician: J. Colacchio

Signature: [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. Calibrations comply with ISO/IEC 17025 and ANSI/Z540-1-1994 quality standards.

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# Aquatech Scientific Instruments LLC

680 Heacock Rd, Suite 204A, Yardley, PA. 19067

web: [www.digitalbarograph.com](http://www.digitalbarograph.com) email: [sales@digitalbarograph.com](mailto:sales@digitalbarograph.com)

PHONE: 215-428-9400 FAX: 267-790-0404

## PRESSURE CALIBRATION TEST REPORT

PREPARED FOR	MODEL	SERIAL #	SB #	DATE	TEMP
SEBASTIAN BUTTON	DBX2	118222	X1177	4/16/2022	68

PRESSURE WHEN SET	INIT OFFSET
997.5	-1.2

**118222**

DRUCK DPI-740	TEST UNIT	CORRECTION	ADJUSTMENT	ZONE	RANGE
1080.0	1080.2	-0.2	-0.20	ZONE 11	>1075
1060.0	1060.1	-0.1	-0.10	ZONE 10	1070
1040.0	1040.1	-0.1	-0.10	ZONE 9	1050
1020.0	1020.1	-0.1	-0.10	ZONE 8	1030
1000.0	1000.1	-0.1	-0.10	ZONE 7	1010
980.0	980.1	-0.1	-0.10	ZONE 6	990
960.0	960.1	-0.1	-0.10	ZONE 5	970
940.0	940.0	0.0	0.00	ZONE 4	950
920.0	920.0	0.0	0.00	ZONE 3	930
900.0	900.0	0.0	0.00	ZONE 2	910
880.0	880.0	0.0	0.00	ZONE 1	890
860.0	860.0	0.0	0.00	ZONE 0	<865

Values represent actual (mb) data of test unit, prior to unit adjustment (calibration)  
Pressure standard used is a NIST traceable instrument GE Druck DPI-740 S/N 74003994  
Pressure standard used is rated at +/-0.15hPa (mb) of true pressure.  
GE Druck DPI-740 S/N 74003994 Calibration Due Date: May 31st, 2022

NOTE: Calibration Due Date of test unit: 1 YEAR FROM TEST DATE



# 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 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

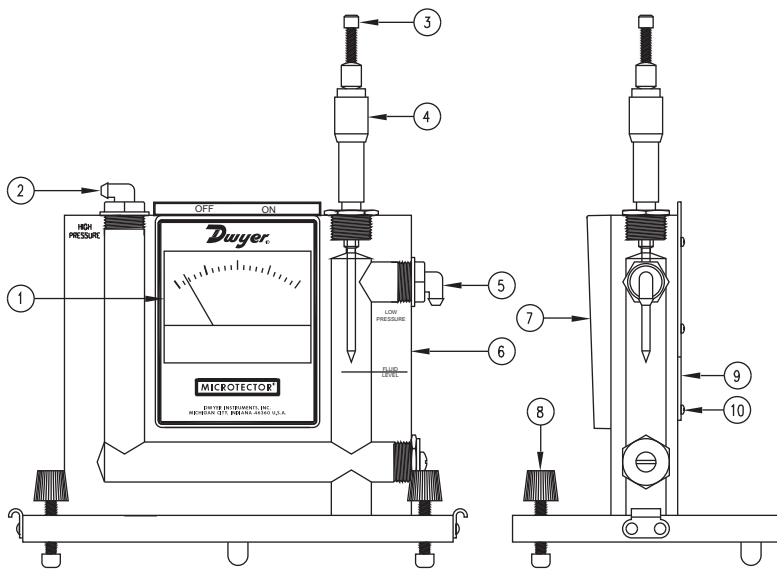
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Phone: 219/879-8000

Fax: 219/872-9057

www.dwyer-inst.com

e-mail: info@dwyer-inst.com



**Microtector® Gage**

### Precision Pressure Measurement

The Microtector® Gage combines the time-proven principles of the Hook Gage type manometer and modern solid-state integrated circuit electronics. It provides an inexpensive means of achieving accuracy and repeatability within  $\pm .00025$  inches water column throughout its 0 to 2 inches w.c. range. It is truly a new standard in precision measuring devices.

### Principles of Operation

A pressure to be measured is applied to the manometer fluid which is displaced in each leg of the manometer by an amount equal to  $1/2$  the applied pressure. A micrometer mounted point is then lowered until it contacts the manometer gage fluid. The instant of contact is detected by completion of a low-power A.C. circuit. Current for this circuit is supplied by a 1.5 volt penlight cell feeding two semiconductor amplifiers which act as a free-running multivibrator operating at a frequency of approximately two kilohertz. Completion of the A.C. circuit activates a bridge rectifier which provides the signal for indication on a sensitive (0 to 50 microamps) D.C. microammeter.

On indication of contact, the operator stops lowering the point and reads the micrometer which indicates one half the applied pressure. By interpolating eight divisions (each being  $.000125$  w.c.) between  $.001$  micrometer graduations, a total accuracy of  $.00025$  can easily be achieved. The micrometer complies with Federal Specification GGG-C-105A and is traceable to a master at the NIST.

### Locating and Opening

Stand the Microtector® Gage and case on a firm flat level surface. Remove cover by releasing the latches and lifting it straight up. If it is necessary to move the gage without case, handle only the base plate or clear acrylic block. **(CAUTION: Do not handle gage by grasping meter-electronic package housing Item 7 on drawing.)**

## Fluid Level

Level the gage by adjusting the two front leveling screws (Item 8 on drawing) until the bubble in the spirit level is centered in the small circle. After leveling the gage, open both rapid shut-off valve tube connectors (Items 2 and 5). Back off the micrometer (Item 4), if necessary, to make sure that the point is not immersed in the gage fluid. The fluid level in the gage should now coincide with the mark on the right hand bore (Item 6) plus or minus approximately 1/32 inch. If the level of fluid is too high, fluid can be removed with an eye dropper pipette or carefully poured out of the right connection (Item 5).

If the level is too low, remove the top left rapid shut-off valve tube connector (Item 2) and add distilled water pre-mixed with the proper amount of green concentrate. (See maintenance instructions for proportions. After correcting the fluid level, re-install the rapid shut-off connectors and, with these in the open position, re-level the Microtector® Gage. The gage is now ready to be zeroed.

## Zeroing

Turn the Micrometer barrel (Item 4) until its lower end just coincides with the zero mark on the scale and the zero on the barrel scale coincides with the vertical line on the internal scale. Note that the internal scale is graduated every .025" from 0 to 1.00 inch and the barrel scale is graduated in one thousandths from 0 to .025". Turn the meter circuit switch at the top of gage to the "on" position. While holding the barrel at the zero position (and with gage level), raise or lower the point by turning the knurled knob (Item 3) until the point is above, but near, the fluid.

Check to be sure that the meter registers zero. Watch the meter, hold the barrel, and lower the point slowly by turning the top knurled knob. As the knob is turned, the point will contact the fluid and the meter pointer will move from zero to some upsacle position.

After making contact, turn the point out of the fluid by turning the micrometer barrel counter-clockwise to a reading of .010 or more. Again, watch the meter and, this time, lower the point by turning the micrometer barrel. The point position where the meter pointer begins to move up scale is the zero position. This position should correspond to the zero reading on the micrometer. Adjust the point in relation to the micrometer barrel by turning the top knob while holding the barrel steady. Repeat lowering the point, watching the meter for contact, and adjusting the point until the zero position and zero reading exactly coincide. The gage is now zeroed and should not be moved.

An alternative method of zeroing and reading can be used wherein, instead of zeroing the gage completely, a zero correction reading is taken and recorded, then subtracted from the final reading. Comparable results can be obtained with either method.

## Positive Pressure Measurement

With the fluid at its proper level, a pressure of 2.0" water column maximum can be measured. Positive pressure should be applied to the top left connection (Item 2) with the micrometer zeroed as described above. This will permit a simple direct reading to be taken.

After an unknown pressure has been applied at the top left connection, the fluid level will drop in the left bore and rise over the point in the right bore. Note that the indicating meter point has moved upsacle because the point is immersed in the fluid. Turn the micrometer counter-clockwise until the point leaves the fluid as indicated by the meter pointer dropping to zero on its scale. Then slowly turn the micrometer down until its point just touches the fluid surface, causing movement of the meter pointer. Withdraw the point and repeat several times, noting each time the micrometer reading where the meter pointer begins. The average of these readings multiplied by two is the pressure applied to the gage. (Avg. reading x 2 = pressure applied in inches w.c. The degree of uncertainty for the operator is indicated by the difference in these readings.

When the readings are complete, the pressure should be removed and the zero setting of Microtector® Gage rechecked. Any change in the zero position will indicate inaccurate readings. Should this happen, the zero-set and pressure measurement procedure should be repeated.

## Negative Pressure or Vacuum Measurement

Zero the gage. Connect the source of vacuum or negative pressure to the right-side gage connection (Item 5) and proceed as described under Positive Pressure Measurement section. Remember that the pressure measured in this way is negative.

## Differential Pressure Measurement

Differential pressures may be measured by connecting the higher (more positive) pressure to the left connection (Item 2) and the lower pressure to the right connection (Item 5).

## Storage

Turn meter circuit switch to "off" position and withdraw the point well clear of fluid (by turning micrometer clockwise) when gage is not in use. This will conserve the batteries and minimize build-up of oxides, etc., on the point. Keep the unit covered and in an area free of strong solvent fumes.

## Maintenance

When the meter reading becomes reduced or the pointer movement gets sluggish (with the circuit on and the point in fluid), the following should be done:

(1) Remove the point (by unscrewing) and clean the tip lightly using fine crocus cloth. Wipe off all grit and dirt with a clean rag; reassemble and recheck meter operation.

(2) If the meter operation continues to be sluggish, replace the size AA, 1.5 volt battery. (Replace the battery at least once a year to avoid deterioration of battery and damage to gage. Leakproof alkaline battery is recommended.)

To replace the battery, remove center screw (Item 10) located in the back of the electronic enclosure. Cover (Item 9) will come off, exposing the battery. Pull the old battery out and push a new battery into the battery holder with the positive (center) terminal to the right (to the end marked with + on the holder).

If the fluid becomes contaminated and requires replacement: empty old fluid from gage; flush out with clear water and replace with distilled water and A-126 fluorescein green color concentrate mixed with 3/4 oz. concentrate to each quart of water.

## CAUTION:

1. Do not substitute other gage fluids, as proper gage operation depends on use of the specified gage fluid to provide proper surface tension, wetting ability and electrolyte capability with unity specific gravity.

If the gage bore is very dirty, a mild soap solution may be used to aid in cleaning prior to flushing with clear water.

2. Do not clean with liquid soaps, special solvent, de-greasers, aromatic hydrocarbons, etc. Such cleaners and solvents may contain chlorine, fluorine, acetone and related compounds that will permanently damage the gage and prevent proper operation.



# CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

**Customer & Order Information**

PXPKG TUALATIN OR H  
10450 SW TUALATIN SHERWOOD ROAD  
TUALATIN OR 97062-9547

Certificate Issuance Date: 10/16/2019  
Praxair Order Number: 71120745  
Part Number: NI CD17CO8E-AS  
Customer PO Number: 79106732

Fill Date: 10/07/2019  
Lot Number: 70086928009  
Cylinder Style & Outlet: AS CGA 590  
Cylinder Pressure and Volume: 1300 psig 99 ft3

**Certified Concentration**

Expiration Date:	10/16/2027	NIST Traceable
Cylinder Number:	CC106574	Expanded Uncertainty
17.00 %	Carbon dioxide	± 0.5 %
4.31 %	Carbon monoxide	± 0.6 %
16.95 %	Oxygen	± 0.2 %
Balance	Nitrogen	

**ProSpec EZ Cert**



**Certification Information:**

Certification Date: 10/16/2019 Term: 96 Months Expiration Date: 10/16/2027

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: 09/18/2019

First Analysis Data:				Date			
Z:	0	R:	19.98	C:	17	Conc:	17
R:	19.98	Z:	0	C:	17	Conc:	17
Z:	0	C:	17.01	R:	19.99	Conc:	17.01
UOM:	%	Mean Test Assay:		17	%		

**Reference Standard:**

Type / Cylinder #: GMIS / CC149981

Concentration / Uncertainty: 19.98 % ±0.279%

Expiration Date: 06/07/2026

**Traceable to:**

SRM # / Sample # / Cylinder #: RGM#CC28033 / N/A / RGM#CC28033

SRM Concentration / Uncertainty: 19.67% / ±0.04%

SRM Expiration Date: 07/15/2021

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:			%		

**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: 09/19/2019

First Analysis Data:				Date			
Z:	0	R:	5	C:	4.31	Conc:	4.31
R:	5	Z:	0	C:	4.31	Conc:	4.31
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: 16.95 %  
Instrument Used: OXYMAT 5E  
Analytical Method: Paramagnetic  
Last Multipoint Calibration: 09/18/2019

First Analysis Data:				Date			
Z:	0	R:	20.88	C:	16.96	Conc:	16.95
R:	20.88	Z:	0	C:	16.96	Conc:	16.95
Z:	0	C:	16.97	R:	20.9	Conc:	16.96
UOM:	%	Mean Test Assay:		16.95	%		

**Reference Standard:**

Type / Cylinder #: GMIS / CC506521

Concentration / Uncertainty: 20.87 % ±0.108%

Expiration Date: 12/14/2026

**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

Jenna Lockman



# CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

**Customer & Order Information**

PXPKG TUALATIN OR H  
10450 SW TUALATIN SHERWOOD ROAD  
TUALATIN OR 97062-9547

Certificate Issuance Date: 10/16/2019  
Praxair Order Number: 71120745  
Part Number: NI CD10CO33E-AS  
Customer PO Number: 79106732

Fill Date: 10/08/2019  
Lot Number: 70086928102  
Cylinder Style & Outlet: AS CGA 590  
Cylinder Pressure and Volume: 2000 psig 140 ft3

Certified Concentration		
Expiration Date:	10/16/2027	NIST Traceable
Cylinder Number:	CC139173	Expanded Uncertainty
10.09 %	Carbon dioxide	± 0.4 %
2.53 %	Carbon monoxide	± 0.6 %
10.48 %	Oxygen	± 0.4 %
Balance	Nitrogen	

**ProSpec EZ Cert**



**Certification Information:**

Certification Date: 10/16/2019    Term: 96 Months    Expiration Date: 10/16/2027

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: 10 %  
Certified Concentration: 10.09 %  
Instrument Used: Horiba VIA-510 S/N 20C194WK  
Analytical Method: NDIR  
Last Multipoint Calibration: 09/18/2019

First Analysis Data:				Date
Z:	0	R:	14	10/16/2019
R:	14	Z:	0	
Z:	0	C:	10.1	
		R:	14.01	
UOM:	%	Mean Test Assay:		10.09 %

**Reference Standard:** Type / Cylinder #: GMIS / CC164230  
Concentration / Uncertainty: 14.00 % ±0.265%  
Expiration Date: 04/16/2027

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

**2. Component: Carbon monoxide**

Requested Concentration: 2.5 %  
Certified Concentration: 2.53 %  
Instrument Used: Horiba VIA-510 S/N UB9UCSYX  
Analytical Method: NDIR  
Last Multipoint Calibration: 09/19/2019

First Analysis Data:				Date
Z:	0	R:	5	10/16/2019
R:	5	Z:	0	
Z:	0	C:	2.54	
		R:	5.01	
UOM:	%	Mean Test Assay:		2.53 %

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

**3. Component: Oxygen**

Requested Concentration: 10.5 %  
Certified Concentration: 10.48 %  
Instrument Used: OXYMAT 5E  
Analytical Method: Paramagnetic  
Last Multipoint Calibration: 09/18/2019

First Analysis Data:				Date
Z:	0	R:	9.88	10/16/2019
R:	9.88	Z:	0	
Z:	0	C:	10.5	
		R:	9.89	
UOM:	%	Mean Test Assay:		10.48 %

**Reference Standard:** Type / Cylinder #: NTRM / DT0010384  
Concentration / Uncertainty: 9.875 % ±0.4%  
Expiration Date: 11/18/2022

**Traceable to:** SRM # / Sample # / Cylinder #: NTRM / 170701 / NTRM DT0010384  
SRM Concentration / Uncertainty: 9.875% / ±0.040%  
SRM Expiration Date: 11/18/2022

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

Analyzed By

Jose Vasquez

Certified By

Jerina Lockman

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