
Hearth & Home Technologies

Project # 24-291

Brand: Vermont Castings by Forge and Flame

Model: Dauntless-C

Type: Wood-Fired Room Heater

May 21, 2025

Revised Date: October 7, 2025

**ASTM E2780 Standard Test Method for
Determining Particulate Matter Emissions
from Wood Heaters
EPA Test Method 28R for Certification and
Auditing of Wood Heaters**

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Revision Summary

Date: May 21, 2025– Original Issue

Date: September 24, 2025- Made the following changes at the request of EPA:

- Added note clarifying traverse points on page 21.
- Added note specifying room air blank position and flow rates on page 21.
- Updated tunnel diagram on page 20 to include test stand.
- Added additional explanation to page 21 describing balance audit procedures.
- Added note regarding negative sample weights to page 4.
- Added note specifying filter size and filter holder material to page 21.
- Cited EPA ALT-154 to page 21.
- Added notes to page 21 specifying ambient temperature and room air velocity measurement positions
- Added “Standard Practices and Schematic” to Appendix A.

Date: October 7, 2025 - Made the following changes at the request of EPA:

- Added Forge & Flame branding to series identification.

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Affidavit

PFS-TECO was contracted by Hearth & Home Technologies to provide testing services for the Vermont Castings by Forge and Flame Dauntless-C (Dauntless-C) Wood-Fired Room Heater per EPA Method 28R, *Certification and Auditing of Wood Heaters*. All testing and associated procedures were conducted at PFS-TECO's Portland Laboratory beginning on 4/9/2025 and ending on 4/14/2025. PFS-TECO's Portland Laboratory is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015. Testing procedures followed EPA Method 28R and ASTM E2780, *Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters*. 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 ANAB to ISO 17020:2012 “Criteria for Bodies Performing Inspections”, and ISO 17025:2017 “Requirements for Testing Laboratories.” PFS-TECO is also accredited by Standards Council of Canada to ISO 17065:2012 “Requirements for Bodies Operating Product Certification Systems.”

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



Aaron Kravitz, Laboratory Manager

Introduction

Hearth & Home Technologies contracted with PFS-TECO to perform EPA certification testing on the Dauntless-C Wood-Fired Room Heater. All testing was performed at PFS-TECO's Portland Laboratory. All testing was performed by Aaron Kravitz.

Notes

- Prior to start of testing, 50 hours of conditioning was performed by the manufacturer at a medium burn setting in accordance with ASTM E2780.
- Prior to start of testing, the dilution tunnel was cleaned with a steel brush.
- A separate, independent, third filter train was utilized to determine 1st hour emissions for all test runs.
- A total of 5 test runs were completed - one test run in each of the 4 specified burn rate categories and one fan confirmation run in category II. All runs have been found to be appropriate, no anomalies occurred. See the Run Narrative section for further detail on each run.
- No negative sample weights were recorded for any run.

Wood Heater Identification and Testing

- Appliance Tested: ***Dauntless-C***
- Serial Number: ***PFS Tracking Number 220***
- Manufacturer: ***Hearth & Home Technologies***
- Catalyst: ***Yes***
- Heat exchange blower: ***Optional***
- Type: ***Wood Stove***
- Style: ***Free Standing Wood Stove***
- Date Received: ***Monday, March 31, 2025***
- Testing Period – Start: ***Wednesday, April 09, 2025***
Finish: ***Monday, April 14, 2025***
- Test Location: ***PFS TECO***
11785 SE Hwy 212
Clackamas, OR 97015
- Elevation: ***~131 Feet above sea level***
- Test Technician(s): ***Aaron Kravitz***
- Observers: ***None***

Test Procedures and Equipment

All Sampling and analytical procedures were performed by Aaron Kravitz. All procedures used are directly from ASTM E2780 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
50	Digiweigh DWP12i Platform Scale
53	APEX XC-60-ED Digital Emissions Sampling Box A
54	APEX XC-60-ED Digital Emissions Sampling Box B
203	APEX XC-50-DIR Digital Emissions Sampling Box C
55	Apex Ambient Air Sample Box
57	California Analytical ZRE CO2/CO/O2 IR ANALYZER
94	Moisture meter calibration block
95	Anemometer
97	10 lb audit weight
107	Sartorius Analytical Balance
109A/B	Troemner 100mg/200mg Audit Weights
111	Microtector
115	Delmhorst Wood Moisture Meter
189	Mettler 3'x3' floor scale w/digital weight indicator
211	Dewalt Tape Measure
215	Temperature Logger
DT0042934	Gas Analyzer Calibration Span Gas
CC341544	Gas Analyzer Calibration Mid Gas

Barometric pressure data was taken from local National Weather Service station KPDX. As PFS and KPDX are at the same altitude, the correction for altitude per ASTM E2515 6.1.2 is 1:1.

Results

A total of 5 test runs were performed on the Dauntless-C. 4 runs are included in the weighted average, while the 5th run was a fan confirmation run and is not included. The weighted average emissions rate for the 4 run test series was measured to be **1.7 g/hr** with a Higher Heating Value efficiency of **75%**. The average CO emission rate for the 4 tests was **1.0 g/min.** The Hearth & Home Model Dauntless-C Wood-Fired Room Heater meets the 2020 cribwood PM emission standard of ≤ 2.0 g/hr per CFR 40 part 60, §60.532 (b).

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

Summary Table

	Cat. 2 ≤ 1.00 kg/hr	Cat. 2 0.80 - 1.25 kg/hr	Cat. 3 1.25 - 1.90 kg/hr	Cat. 4 Max Burn Rate	Fan Confirmation Cat 2
Date	4/11/2025	4/9/2025	4/10/2025	4/11/2025	4/14/2025
Run Number	3	1	2	4	5
Emission Rate (g/hr)	2.07	2.03	1.70	0.92	1.73
Burn Rate (kg/hr)	0.97	1.08	1.44	1.57	1.15
Heat Output (Btu/hr)	13,560	15,230	19,340	21,356	15,466
Overall Efficiency (% HHV)	75%	76%	75%	74%	73%
CO Emissions (g/MJ Output)	4.07	2.98	2.94	3.12	3.49
CO Emissions (g/kg Dry Fuel)	60.56	44.69	43.49	45.70	50.19
CO Emissions (g/min)	0.97	0.80	1.00	1.17	0.95
Emissions – 1 st hr (g/hr)	3.73	2.45	1.19	1.03	5.16
Weighted particulate emission average of 4 test runs: 1.7 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 75%.					
Average CO Emissions Rate: 1.0 g/min					

Test Run Narrative

Run 1

Run 1 was performed on 4/9/2025 as a category 2 test, per EPA Method 28R. The total test time was 277 minutes. The particulate emissions rate for the test was 2.0 g/hr, the burn rate was 1.08 kg/hr with an HHV efficiency of 75.8%. All test results were appropriate and valid. There were no anomalies and all test criteria were met.

Run 2

Run 2 was performed on 4/10/2025 as a category 3 test, per EPA Method 28R. The total test time was 205 minutes. The particulate emissions rate for the test was 1.7 g/hr, the burn rate was 1.44 kg/hr with an HHV efficiency of 74.5%. All test results were appropriate and valid. There were no anomalies and all test criteria were met.

Run 3

Run 3 was performed on 4/11/2025 as an attempted category 1 test, per EPA Method 28R. The total test time was 311 minutes. The particulate emissions rate for the test was 2.1 g/hr, the burn rate was 0.97 kg/hr with an HHV efficiency of 75.0%. All test results were appropriate and valid. There were no anomalies and all test criteria were met. This test meets the burn rate requirements described in EPA Method 28 Section 8.1.1.3.2 as a category 2 test with a burn rate of 1.00 kg/hr or less for wood stoves that cannot be operated at burn rates less than 0.8 kg/hr. This test was performed with the air control set to its lowest setting, it is not possible to operate the stove at a lower air setting. Therefore, this test will be used in lieu of a category 1 test.

Run 4

Run 4 was performed on 4/11/2025 as a category 4 test, per EPA Method 28R. The total test time was 183 minutes. The particulate emissions rate for the test was 0.92 g/hr, the burn rate was 1.57 kg/hr with an HHV efficiency of 74.0%. All test results were appropriate and valid. There were no anomalies and all test criteria were met.

Run 5

Run 5 was performed on 4/14/2025 as a category 2 fan confirmation test, per EPA Method 28R. The total test time was 258 minutes. The particulate emissions rate for the test was 1.7 g/hr, the burn rate was 1.15 kg/hr with an HHV efficiency of 72.5%. All test results were appropriate and valid. There were no anomalies and all test criteria were met. The emission rate is within 1.0 g/hr of the other category 2 test run, so the fan is presumed to have no impact on emissions performance.

Test Conditions Summary

Testing conditions for all runs fell within allowable specifications of the ASTM 2780 and ASTM E2515. A summary of facility conditions, fuel burned, and run times are listed below.

Run	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	66	71.7	37.8	25.6	30.05	15.59	13.25	21.5	277
2	67	68.5	21.9	35.5	30.04	15.45	13.25	23.7	205
3	62	66.3	31.6	22.6	30.11	17.59	13.22	20.3	311
4	70	68.3	23.7	19.9	30.00	16.62	12.83	23.5	183
5	71	72.3	15.4	13.9	29.85	15.92	13.16	21.6	258

Appliance Operation and Test Settings

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

Settings & Run Notes

	Pre-Burn Air Setting	Test Run Air and Fan Settings
Run 1	Air control 1 detent open from fully closed	Air control 1 detent open from fully closed Fan on medium
Run 2	Air control 1 detent closed from fully open	Air control 1 detent closed from fully open Fan on high
Run 3	Air control fully closed	Air control fully closed Fan on medium
Run 4	Air control fully open	Air control fully open Fan on high
Run 5	Air control 1 detent open from fully closed	Air control 1 detent open from fully closed Fan off – fan confirmation

Appliance Description

Model(s): Vermont Castings by Forge and Flame Dauntless-C

Appliance Type: Catalytic Wood-Fired Room Heater

Total Firebox Volume: 1.82 ft³

Usable Firebox Volume: 1.82 ft³

Air Introduction System Primary air is controlled by a Bi-metallic spring thermostat located at the right rear of the stove top. Moving the control arm fully to the left opens the air control, fully to the right closes the air. As the spring heats up, it tightens causing the controlling damper to close. Secondary air is un-controlled, it enters the appliance through an opening located at the rear of the stove on the bottom side. Air travels into the refractory secondary combustion system and enters the flame path through orifices in the refractory walls.

Baffles: An internal baffle is not used; flame path is either directed through a bypass opening when the bypass handle is open, or through the catalyst when closed.

Catalytic Combustor: A ceramic catalytic combustor is located at the lower rear of the firebox.

Combustor Temperature Monitoring System: A combustor monitoring thermometer is located on the left side of the unit and is inserted into the flue gas stream such that it is located within 1" of the catalyst exit.

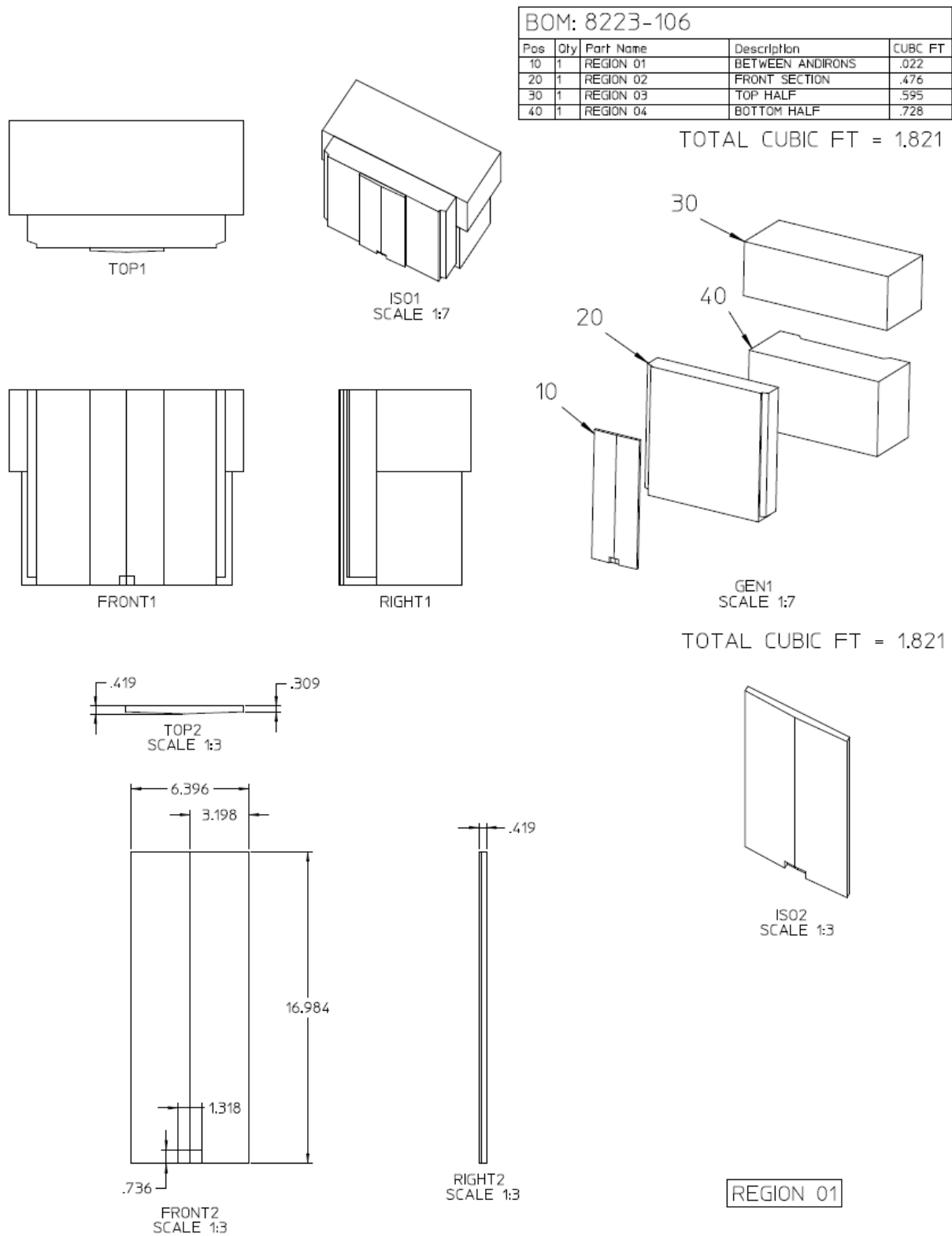
Refractory Insulation: The firebox is lined with 1.25" thick high-density firebrick.

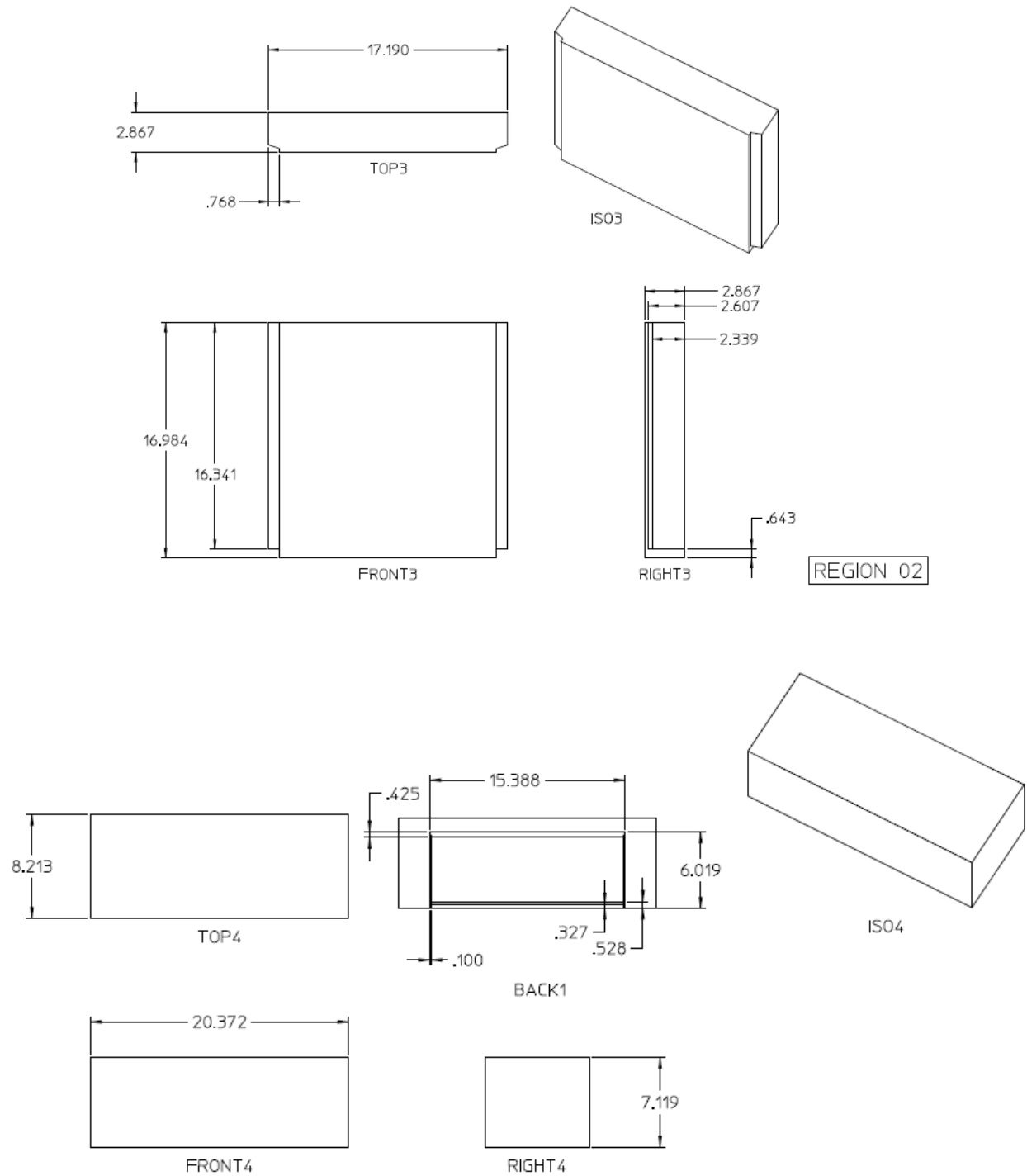
Flue Outlet: 6-inch exhaust outlet located on the top of the appliance.

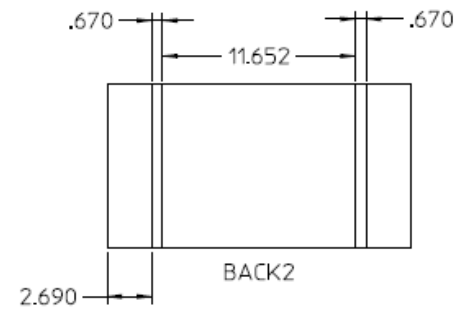
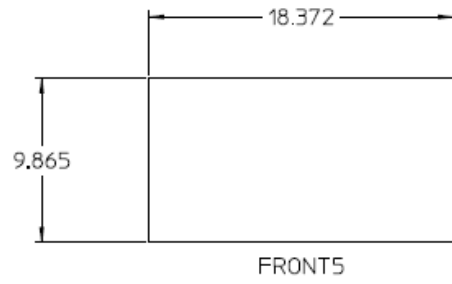
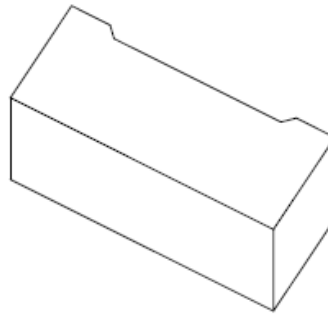
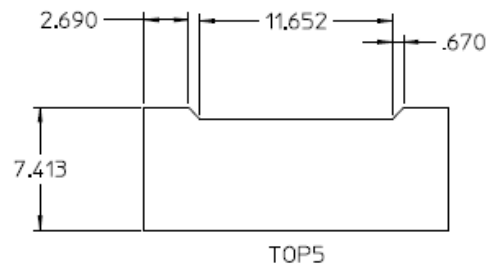
Fan: A distribution fan is available as optional equipment; it features a variable speed control mounted in the power supply cord.

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

Firebox Volume Calculation







REGION 04

Appliance Front



Appliance Left



Appliance Right



Appliance Rear



Test Fuel Properties

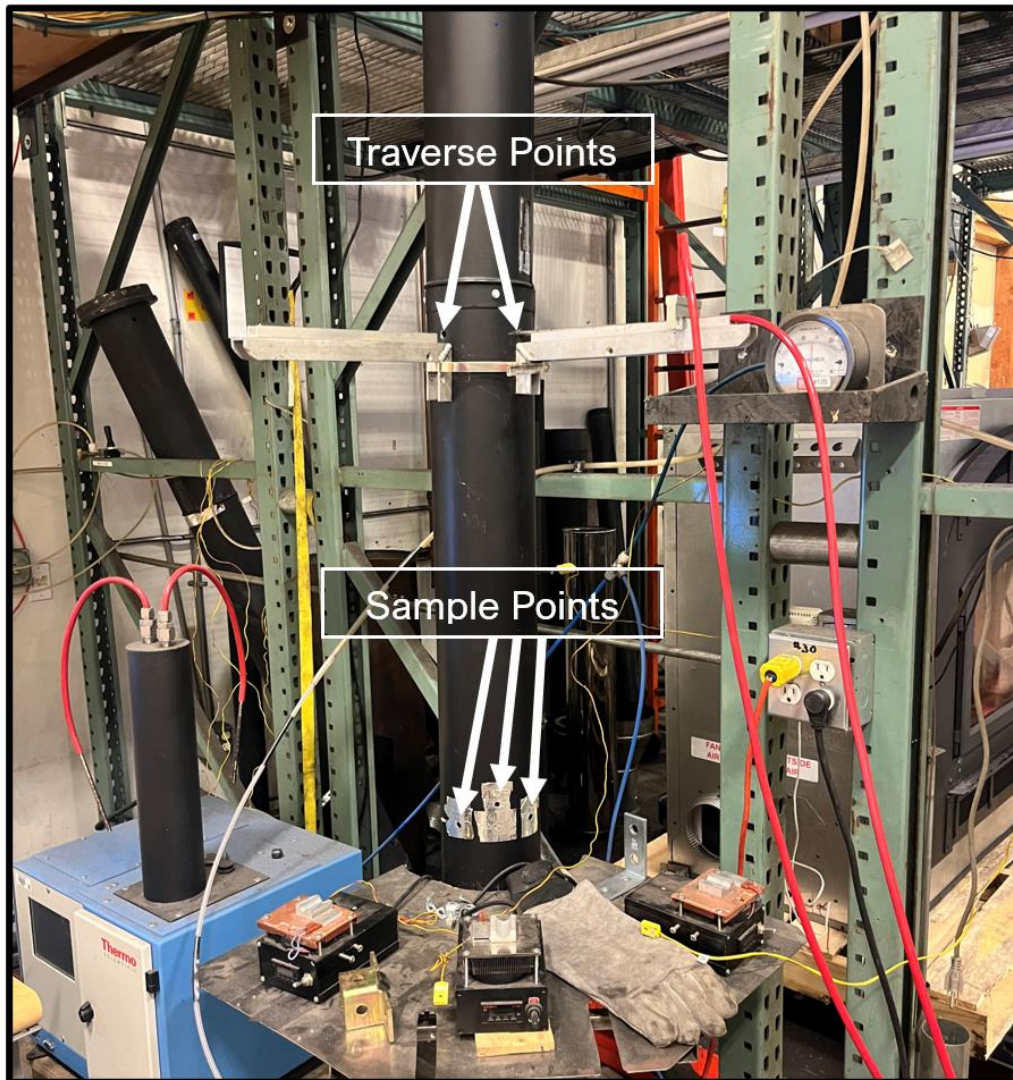
Test fuel used was Douglas Fir dimensional lumber, air-dried to the specified moisture content range. A typical fuel load is pictured below:

Typical Fuel Load



Sampling Locations and Descriptions

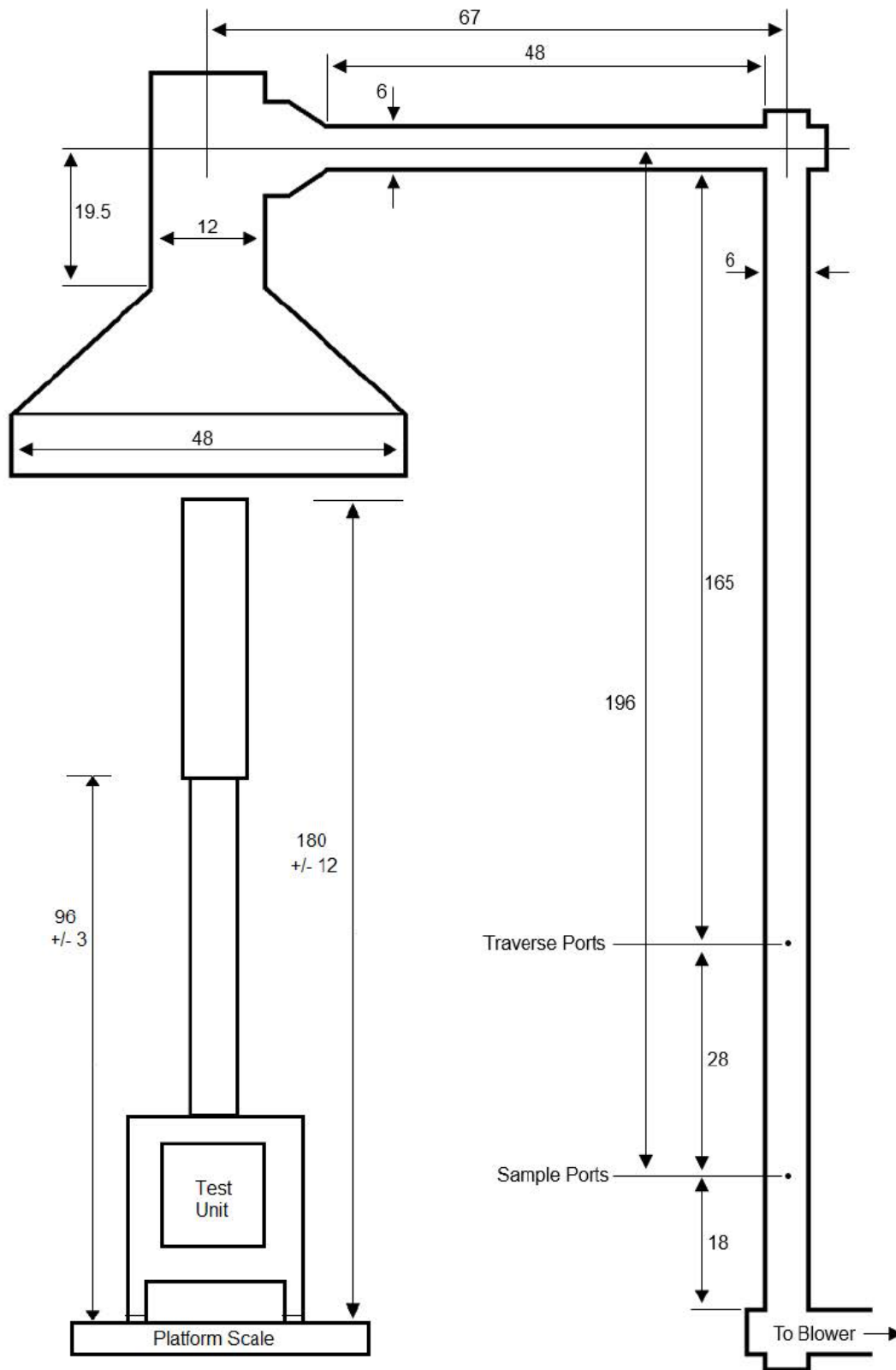
Sample ports are located 16.5 feet downstream from any disturbances and 3.5 feet upstream from any disturbances. Flow rate traverse data was collected 8 feet downstream from any disturbances and 4 feet upstream from any disturbances. (See below).



Dilution Tunnel Information Sheet

As of January 2024

1. Equipment ID number/name of the tunnel:
Emissions Booth #1
2. Physical location of the tunnel (facility address and test bay number):
Booth #1
11785 SE HWY 212, Ste 305
Clackamas, OR 97015
3. Presence (or not) of mixing baffles (EPA 5G):
Not Present
4. Presence (or not) of mixing section (ASTM E2515):
Present
5. A description of the tunnel turns (elbows or tees):
Elbow from hood into mixing section, elbow from mixing section to sampling section,
cleanout tee from sampling section to blower and damper section.
6. Physical diameter of the horizontal flue section:
6"
7. Physical diameter of the tunnel at the sampling location:
6"
8. Photograph showing the tunnel apparatus: See photo and schematic

**Booth #1 Tunnel Schematic**

All dimensions are in inches

Sampling Methods

ASTM E2515 was used in collecting particulate samples. The dilution tunnel was 6 inches in diameter. All sampling conditions per ASTM E2515 were followed. No alternate procedures were used. Additional notes:

- Tunnel traverse points were in accordance with ASTM E2515, located at 0.5" and 1.5" from the tunnel wall in each of the four quadrants.
- The room air blank was located within 10 feet of the dilution tunnel hood, in the same plane as the hood's inlet. For all test runs, room air sample flow rate remained set to 0.230 cfm (approx 0.232 scfm) and did not vary by more than 5% over the course of the run.
- Filters used were 47mm diameter glass fiber.
- Front filter holders were aluminum, rear holders were polycarbonate.
- Ambient temperatures were is monitored by a type T thermocouple probe, located in a 150mm long, 50mm diameter pipe shield located in the 90-degree arc in front of the test unit, between 1-2m away, and in the horizontal plane of the test unit air intake.
- Air velocities were measured within 2 feet of the appliance.

Analytical Methods Description

All sample recovery and analysis procedures followed ASTM E2515 procedures. Balance audits were conducted prior to each sample tare and prior to each post-test weighing. See Appendix A for detailed audit and weighing data. 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 in pairs in accordance with EPA Alt-154 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 and ASTM E2515-11. 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: 352 Mountain House Road, Halifax, PA 17032 for archival.

Sealing Label

ATTENTION:

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

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

REPORT # _____

DATE SEALED _____

MANUFACTURER _____

MODEL # _____

Sealed Unit



List of Appendices

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

Appendix A – Run Data, Filter data, Conditioning, Sample Calculations, Tunnel Schematic

Appendix B – Labels and Manuals

Appendix C –Equipment Calibration Records

Appendix D – Design Drawings (CBI Report Only)

Appendix E – Manufacturer QAP (CBI Report Only)

Appendix A: Test Run Data

EPA Method 28R Weighted Average Emissions

Client: HHT
 Stove Model: Dauntless-C
 Test Dates: 4/9/25 - 4/11/25
 Job Number: 24-291

Signature/Date: _____

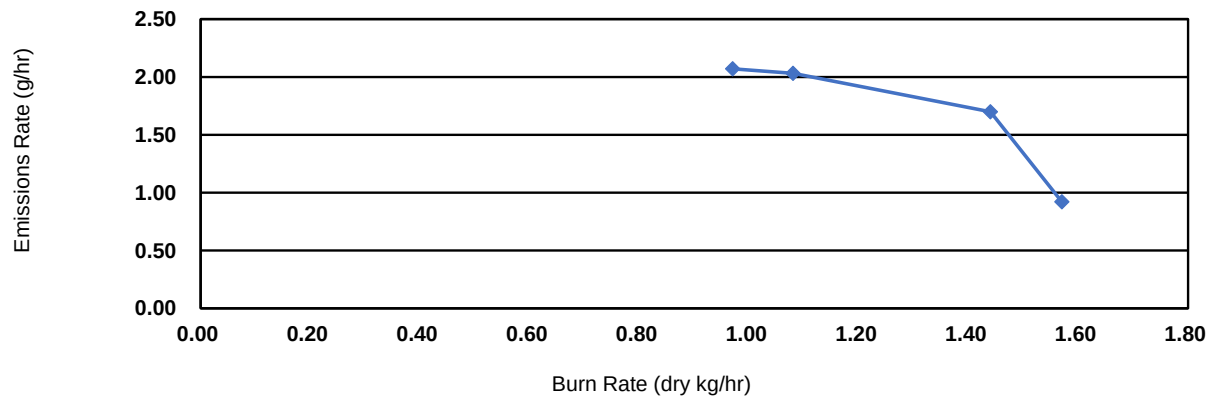


Weighted Average Particulate Emissions (g/hr):	1.7
Weighted Average HHV Efficiency (%):	75%
Weighted Average LHV Efficiency (%):	81%
Average CO Emissions (g/min):	1.0

Individual Run Summaries

Run Number:	3	Run Number:	1
Burn Rate (dry kg/hr):	0.97	Burn Rate (dry kg/hr):	1.08
Emissions Rate (g/hr):	2.07	Emissions Rate (g/hr):	2.03
HHV Efficiency (%):	75.0%	HHV Efficiency (%):	75.8%
LHV Efficiency (%):	81.1%	LHV Efficiency (%):	81.9%
Weighting Percentage (%):	30.50%	Weighting Percentage (%):	25.57%
Run Number:	2	Run Number:	4
Burn Rate (dry kg/hr):	1.44	Burn Rate (dry kg/hr):	1.57
Emissions Rate (g/hr):	1.70	Emissions Rate (g/hr):	0.92
HHV Efficiency (%):	74.5%	HHV Efficiency (%):	74.0%
LHV Efficiency (%):	80.6%	LHV Efficiency (%):	80.0%
Weighting Percentage (%):	24.23%	Weighting Percentage (%):	19.70%

Emission Rate vs Burn Rate Plot



ASTM E2515-11

Sample Collection: Verified – Yes: ☒ No: ☐ (if No Explain)

Four separate, complete particulate sampling trains were used for each run. Filter face velocity at no time exceeded 150mm/sec during any test run. The dry gas meters were calibrated for the flow rates encountered during the test runs.

The 47mm filter holder assemblies consist of an aluminum front housing and polycarbonate rear housing, with the rear housing located 75mm downstream from the front housing. The front filter support frit is stainless steel.

Probe assemblies are constructed from 316 grade stainless steel tubing with an outside diameter of 6.35mm and 310mm length.

A type K thermocouple filter temperature monitor probe is installed behind the front filter housing with its tip directly exposed to the sample gas.

Sample gas drying systems are located prior to each metering system and include temperature sensors.

The metering systems include vacuum gauges, leak-free diaphragm-type pumps, and type K thermocouple temperature sensors. The gas meters have a resolution of 0.001 cubic feet.

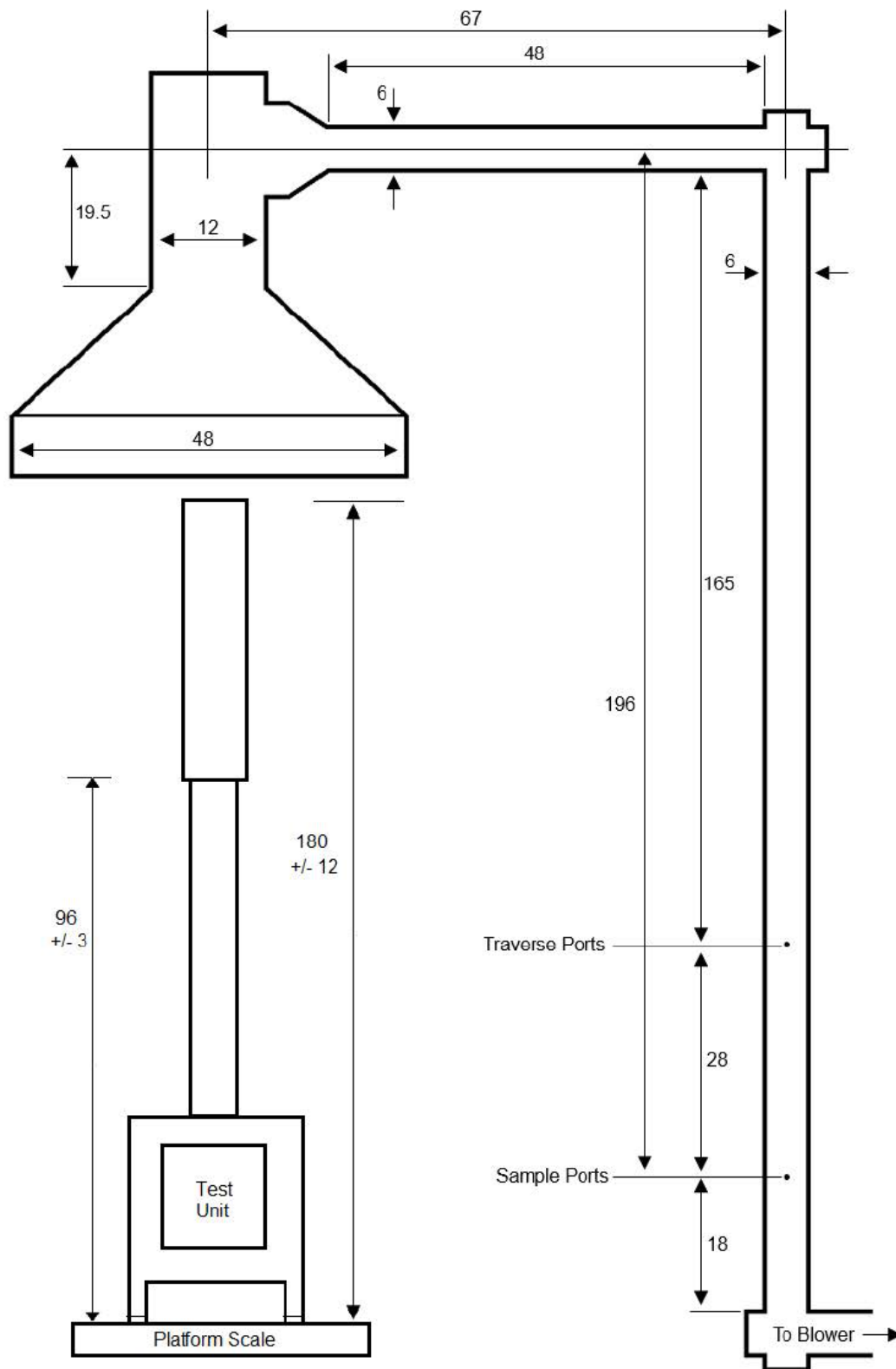
Barometric pressure data was taken from local National Weather Service station KPDX. As PFS and KPDX are at the same altitude, the correction for altitude per ASTM E2515-11 6.1.2 is 1:1.

Dilution tunnel temperature was measured by a type K thermocouple probe.

Dilution tunnel velocity was measured prior to each run by performing a velocity traverse and monitored throughout each run by measuring pitot pressure at the tunnel centroid. Traverses were performed using a Dwyer Model 1430 Microtector in accordance with the instrument owners' manual. This includes leveling and zeroing the instrument prior to each use and performing pre- and post-test leak checks on the pitot tubing.

To monitor and log centroid pitot pressure, the pressure transducer of an Apex Instruments XC-60-DIR sample box was used. Both pieces of equipment offer precision in excess of the ± 0.001 " specified in section 6.1.5 of ASTM E2515-11, and are therefore suitable for use with flows under 800 ft/min. Both pieces of equipment are plumbed to the same pitot tube, which is in accordance with the design shown in Appendix X2 of ASTM E2515-11.

The dilution tunnel is constructed in accordance with the requirements of ASTM E2515-11, as shown below:



Booth #1 Tunnel Schematic

All dimensions are in inches

Sample ports are located 16.3 feet downstream from any disturbances and 1.5 feet upstream from any disturbances. Flow rate traverse data was collected 13.8 feet downstream from any disturbances and 3.8 feet upstream from any disturbances. (See below). Flow is induced and maintained by a centrifugal-type blower.

Test facility temperature is monitored by a type T thermocouple probe, located in a 150mm long, 50mm diameter pipe shield located in the 90-degree arc in front of the test unit, between 1-2m away, and in the horizontal plane of the test unit air intake.

Test facility airflow was measured with an anemometer capable of measuring velocities less than 20 ft/min.

Reagents and Standards: Verified – Yes: ☒ **No:** ☐ **(if No Explain)**

Pall Type A/E Glass fiber 47mm filters having at least 99.95% efficiency at 0.3-micron particles were used.

Test samples were conditioned in an airtight desiccator containing calcium sulfate desiccant, with specific humidity of less than 0.005 g/liter prior to and after the testing.

Acetone was used to clean probe assemblies both prior to pretest desiccation and prior to post-test desiccation.

Calibration and Standardization: Verified – Yes: ☒ **No:** ☐ **(if No Explain)**

The gas metering system is calibrated every six months traceable to NIST and demonstrating an uncertainty of +/- 0.75% of the measured volume. Calibration flow rate range is from 0.05 to 0.30 scfm.

All thermocouples discussed in this report are calibrated traceable to NIST every six months. Both Type T (ambient) and Type K (all others) TCs are monitored by the same piece of equipment, a National Instruments 9213.

The analytical balance has a resolution of 0.1mg and is calibrated traceable to NIST every six months. Before each test and before each weighing of samples (both for tare and final analysis), the balance is audited with a calibrated 200mg weight.

All other measurement equipment used for this test is calibrated traceable to NIST at an appropriate interval. See Appendix C for all calibration records.

Procedures: Verified – Yes: ☒ **No:** ☐ **(if No Explain)**

The following procedures were performed and/or observed prior to testing:

- The dilution tunnel was cleaned with an appropriately sized steel brush.
- Induced draft was evaluated by measuring flue static pressure with the dilution tunnel blower operating and no fire in the appliance. No induced static pressure was observed (all readings <0.005" H2O) in any appliance door/air damper configuration.

- Smoke capture was evaluated by operating the appliance at a high burn rate and visually monitoring smoke collection by the hood. No less than 100% smoke collection was observed at the minimum tunnel flow rate.

Prior to ignition for each run, a velocity traverse was conducted to determine dilution tunnel velocity. Traverse points were determined in accordance with Figures 5 and 6 of ASTM E2515-11, which for a 6" diameter tunnel are 0.5" and 1.5" from either side of the duct, on two axes located at 90° from each other. Velocity calculated in accordance with section 9.3.2, excluding center readings. The pitot tube was placed in the center of the tunnel for the duration of each test run.

Prior to tare analysis, probes were cleaned with acetone, O-rings cleaned of any residue, and filters were visually check for pinhole leaks or irregularities. Filters, O-rings, and probes were desiccated at 20+/-5C for at least 24 hours and weighed at intervals of not less than 6 hours until constant weight was attained. Filters and O-rings were both weighed in pairs.

Tared samples were assembled into three dual filter holder assemblies (A, B, and first hour) and the single ambient filter assembly. Blunt tweezers and surgical gloves were used to avoid damage or contamination of the samples. The three dual filter assemblies were inserted to the appropriate depth in the tunnel (within the 2" diameter centroid, no closer than 1" apart). The ambient filter holder was installed within 10' of the centroid of the dilution tunnel inlet hood, in the same plane and the hood inlet.

Leak checks were performed on sampling systems as follows:

- Leak checks were performed on the pitot tube lines before and after each test run by applying a pressure differential of at least 3" H₂O and sealing the pitot tube opening. Pressure remained stable for at least 15 seconds all checks of both the pressure and suction sides, confirming that no leaks were present.
- All four sampling trains were leak-checked before and after each test run. Pre-test leak checks were conducted at the vacuum level corresponding to each sample pump's flow setting, in accordance with Note 5 of ASTM E2515-11. Post-test checks were conducted at the highest vacuum level encountered during the test, or the pre-test vacuum level, whichever was greater. Of the leak rate limits (0.01 cfm or 4% of sample rate), 4% of the sample rate is lower, and at no point was the measured leakage rate greater than this.
- The portion of the sampling trains from the pumps to the dry gas meters (that is, the positive pressure section of the metering system) was leak checked semiannually during calibration. This check was performed by closing the main inlet valve and pressurizing the outlet of the dry gas meter to at least 7" H₂O, and ensuring the pressure remained stable for at least 1 minute.

Sampling began at the start of each test run as defined by the applicable procedure and continued until the defined end of the test run. Readings were collected at 1-minute intervals. During all test runs, the following conditions were maintained:

- Test facility temperature was between 55 and 90 F.

- Air velocities were less than 50ft/min within 2ft of the appliance
- Filter holder temperatures were no greater than 90 F.
- Sample flow rates were maintained within 10% of the initial proportionality ratio.
- Ambient sample flow rate maintained within 20% of the initial flow rate.

Following each test run and its associated leak checks, samples were recovered by disassembling the filter holder components and replacing them in the desiccator. The outside of the probes was cleaned with acetone prior to desiccation.

Sample weights were determined using the same analytical balance and procedures used for tare weights. Filters, O-rings, and probes were desiccated at 20+/-5C for at least 24 hours and weighed at intervals of not less than 6 hours until constant weight was attained. Filters and O-rings were both weighed in pairs. Components were not exposed to laboratory atmosphere for more than 2 minutes per weighing.

REVISION HISTORY

Version Number	Issue Date	Summary of Changes
Version 1.0	6/9/25	Initial release into the BMS
1.1	9/29/25	Improve wording to better reflect requirements of standard

DOCUMENT APPROVAL

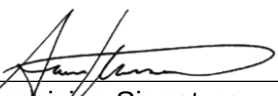
Version Number	Approval Date	Approved by
Version 1.0	6/9/25	John Steinert
1.1	9/29/25	J. Steinert

WOOD STOVE TEST DATA PACKET
ASTM E2780/E2515



Run 1 Data Summary

Client:	HHT
Model:	Dauntless-C
Job #:	24-291
Tracking #:	220
Test Date:	4/9/2025



Technician Signature

5/15/2025

Date

TEST RESULTS - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 1

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/9/2025

Burn Rate (kg/hr):	1.08
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	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft ³)	65.245	46.076	45.148	9.002
Average Gas Velocity in Dilution Tunnel (ft/sec)	18.6			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	12373.6			
Average Gas Meter Temperature (°F)	68.9	93.3	92.7	78.6
Total Sample Volume (dscf)	66.176	45.291	43.803	9.096
Average Tunnel Temperature (°F)	93.3			
Total Time of Test (min)	277			
Total Particulate Catch (mg)	0.0	7.4	7.2	1.8
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0001634	0.0001644	0.0001979
Total PM Emissions (g)	0.00	9.33	9.39	2.45
Particulate Emission Rate (g/hr)	0.00	2.02	2.03	2.45
Emissions Factor (g/kg)	-	1.87	1.88	-
Difference from Average Total Particulate Emissions (g)	-	0.03	0.03	-
Difference from Average Total Particulate Emissions (%)	-	0.3%	0.3%	-
Difference from Average Emissions Factor (g/kg)	-	0.01	0.01	-

Final Average Results	
Total Particulate Emissions (g)	9.36
Particulate Emission Rate (g/hr)	2.03
Emissions Factor (g/kg)	1.88
HHV Efficiency (%)	75.8%
LHV Efficiency (%)	81.9%
CO Emissions (g/min)	0.80

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	9.3	OK
Leakage Rate	Less than 4% of average sample rate	0.001 cfm	OK
Ambient Temp	55-90 °F	Min:65.9/Max:71.9	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
Stove Surface ΔT	<126°F	48.3	OK

B415.1 Efficiency Results

Manufacturer: HHT
Model: Dauntless-C
Date: 04/09/25
Run: 1
Control #: 24-291
Test Duration: 277
Output Category: 2

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	75.8%	81.9%
Combustion Efficiency	97.0%	97.0%
Heat Transfer Efficiency	78.1%	84.4%

Output Rate (kJ/h)	16,055	15,230	(Btu/h)
Burn Rate (kg/h)	1.07	2.36	(lb/h)
Input (kJ/h)	21,176	20,088	(Btu/h)

Test Load Weight (dry kg)	4.94	10.88	dry lb
MC wet (%)	17.66		
MC dry (%)	21.45		
Particulate (g)	9.36		
CO (g)	221		
Test Duration (h)	4.62		

Emissions	Particulate	CO
g/MJ Output	0.13	2.98
g/kg Dry Fuel	1.90	44.69
g/h	2.03	47.77
g/min	0.03	0.80
lb/MM Btu Output	0.29	6.92

Air/Fuel Ratio (A/F)	14.44
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VERSION:

2.4

4/15/2010

WOODSTOVE FUEL DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 1

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/9/2025

Preburn Fuel Information						
Size	Length (in)	Moisture Content (% DB)		Size	Length (in)	Moisture Content (% DB)
2x4	8.00	24.3		2x4	16.00	19.8
2x4	8.00	23.3		2x4	16.00	19.2
2x4	8.00	24.5		2x4	16.00	20.7
2x4	8.00	20.7		2x4	16.00	19.9
2x4	8.00	22.2		2x4	16.00	19.5
2x4	8.00	24.3				
2x4	8.00	22.4				
2x4	16.00	19.1				
Total Fuel Weight (lbs):		15.59	Average Moisture (%DB):		21.5	

Firebox Volume (ft³): 1.82

Total 2x4 Crib Weight, with spacers (lbs): 5.36

Total 4x4 Crib Weight, with spacers (lbs): 7.89

Total Wet Fuel Weight, with spacers (lbs): 13.25

Coal Bed Range (20-25%):

Min (lbs): 2.65

Max (lbs): 3.31

Test Fuel Information						
Size	Length (in)	Weight (lbs)	Moisture Content (%DB)			Dry Weight (lbs)
2x4	15.50	2.12	21.3	19.4	21.0	1.76
2x4	15.50	2.16	19.5	22.6	19.0	1.79
4x4	15.50	3.84	20.7	24.4	20.0	3.16
4x4	15.50	3.53	24.3	24.3	20.9	2.87
Total Dry Weight, no spacers (lbs):						9.57
Total Dry Weight, with spacers (lbs):						10.99

Spacer Moisture Readings (%DB)						
14.5	14.2					
11.7	12.6					
13.1	12.9					
14.0	11.6					
14.0						
13.4						
14.2						
14.5						

Quality Checks	Requirement	Observed	Result
Fuel Density	25 - 36 (lbs/ft ³ , DB)	30.5	OK
Loading Density	6.3 - 7.7 (lbs/ft ³ , WB)	7.28	OK
2x4 Fuel Mix	35 - 65 % of total weight	40%	OK

DILUTION TUNNEL & MISC. DATA - ASTM E2780 / E2515

Client: **HHT**
 Model: **Dauntless-C**
 Run #: **1**
 Test Start Time: **12:42**

Job #: **24-291**
 Tracking #: **220**
 Technician: **AK**
 Date: **4/9/2025**

Total Sampling Time (min): **277**
 Recording Interval (min): **1**

Meter Box γ Factor: **1.019** (A)
 Meter Box γ Factor: **1.005** (B)
 Meter Box γ Factor: **1.024** (C)
 Meter Box γ Factor: **1.012** (Ambient)

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	30.10	30.00	30.05
Relative Humidity (%)	37.8	25.6	
Room Air Velocity (ft/min)	<50	<50	
Pitot Tube Leak Check	0	0	
Ambient Sample Volume:	65.245 ft ³		

Sample Train Leak Checks

	Pre-test	Post-test		
Induced Draft Check (in. H ₂ O):	0	(A) 0.000	cfm @	0 in. Hg
Smoke Capture Check (%):	100%	(B) 0.000	cfm @	0 in. Hg
Date Flue Pipe Last Cleaned:	4/5/2025	(C) 0.000	cfm @	0 in. Hg
Test Fuel Scale Audit (lbs)	10.00	(Ambient) 0.000	cfm @	0 in. Hg
Platform Scale Audit (lbs)	10.0			

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H ₂ O)	Temp (°F)
1	0.054	70
2	0.096	70
3	0.092	70
4	0.078	70
5	0.064	70
6	0.086	70
7	0.088	70
8	0.070	70
Center	0.078	70

Dilution Tunnel H₂O: **2.00** percent
 Tunnel Diameter: **6** inches
 Pitot Tube Cp: **0.99** [unitless]
 Dilution Tunnel MW(dry): **29.00** lb/lb-mole
 Dilution Tunnel MW(wet): **28.78** lb/lb-mole
 Tunnel Area: **0.1963** ft²

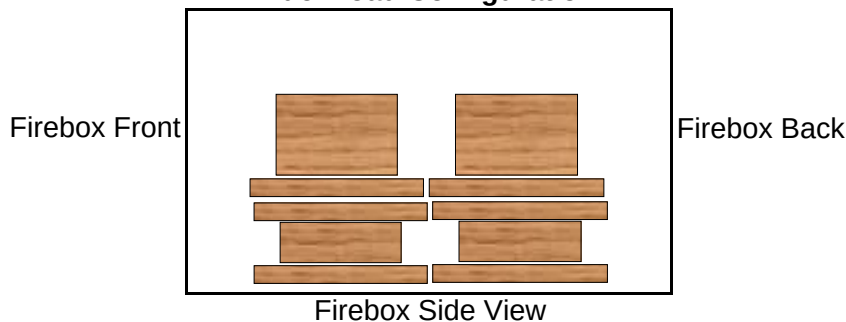
V_{strav} : **18.48** ft/sec
 V_{scent} : **18.49** ft/sec
 F_p : **0.999** [ratio]

Initial Tunnel Flow: **213.5** scf/min

Static Pressure: **-0.150** in. H₂O

TEST FUEL PROPERTIES

Fuel Load Configuration



Actual Fuel Used Properties

Fuel Type: **D. Fir**
 HHV (kJ/kg) **19,810**
 %C **48.73**
 %H **6.87**
 %O **43.9**
 %Ash **0.5**
 MC (%DB) **21.5**

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 1

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/9/2025

Recording Interval (min): 1
Run Time (min): 95

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
0	6.24	-0.078	259	326	434	662	305	397.2	477	66
1	6.08	-0.077	261	328	435	666	303	398.5	463	65
2	5.94	-0.077	264	330	436	665	302	399.2	459	65
3	5.80	-0.077	262	331	438	665	301	399.3	457	65
4	5.66	-0.076	263	332	441	667	297	399.7	457	65
5	5.53	-0.076	264	333	443	668	296	400.7	455	65
6	5.42	-0.074	265	333	446	670	294	401.6	454	66
7	5.33	-0.075	265	334	448	671	294	402.2	451	66
8	5.23	-0.074	264	335	450	667	291	401.3	448	65
9	5.12	-0.074	268	336	450	665	291	401.9	443	65
10	5.06	-0.072	267	337	450	666	289	401.8	441	65
11	4.98	-0.073	267	337	451	667	288	401.8	436	65
12	4.90	-0.073	269	338	450	663	287	401.2	435	65
13	4.83	-0.072	267	338	448	663	286	400.3	434	65
14	4.76	-0.072	270	339	448	662	286	400.9	433	66
15	4.67	-0.072	270	339	447	660	284	399.9	431	66
16	4.62	-0.071	271	339	445	657	284	399.3	428	66
17	4.55	-0.070	270	339	444	652	284	397.7	424	66
18	4.52	-0.069	270	339	442	648	283	396.4	420	66
19	4.47	-0.069	272	339	438	643	281	394.5	414	66
20	4.43	-0.068	271	340	435	641	280	393.3	409	66
21	4.40	-0.066	274	339	431	637	280	392.0	405	66
22	4.38	-0.066	272	339	426	631	280	389.5	400	66
23	4.35	-0.066	273	339	422	625	280	387.6	394	65
24	4.32	-0.064	275	338	417	618	280	385.7	390	66
25	4.28	-0.065	273	338	412	611	280	382.9	388	66
26	4.26	-0.063	275	337	408	602	281	380.6	385	66
27	4.24	-0.064	273	337	404	594	281	377.6	382	66
28	4.22	-0.064	274	336	399	586	282	375.5	378	66
29	4.20	-0.063	275	336	395	578	283	373.2	377	66
30	4.19	-0.061	271	335	391	571	284	370.3	375	66
31	4.15	-0.061	272	335	387	564	283	368.2	371	66
32	4.14	-0.060	274	334	383	558	288	367.2	369	66
33	4.11	-0.061	272	333	380	551	288	364.6	367	66
34	4.10	-0.062	272	333	376	544	286	362.0	365	66
35	4.08	-0.062	271	332	372	539	288	360.5	362	66
36	4.05	-0.062	270	332	369	533	290	358.6	359	66
37	4.04	-0.060	271	331	366	526	290	356.8	358	66
38	4.01	-0.059	270	330	363	522	290	354.9	356	66
39	4.01	-0.062	270	330	360	517	292	353.5	354	66
40	3.99	-0.060	271	329	357	512	292	352.2	352	66
41	3.96	-0.059	270	328	354	507	292	350.3	350	66
42	3.93	-0.059	267	327	352	504	294	348.7	349	66
43	3.91	-0.060	268	327	349	500	294	347.5	347	66
44	3.89	-0.060	267	326	347	496	294	346.1	346	66

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 1

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/9/2025

Recording Interval (min): 1
Run Time (min): 95

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
45	3.87	-0.058	266	326	345	494	294	344.7	344	66
46	3.85	-0.057	266	325	343	491	295	343.8	342	66
47	3.85	-0.057	266	324	341	489	297	343.3	341	66
48	3.81	-0.056	266	324	339	487	295	342.1	341	66
49	3.80	-0.056	264	323	337	485	296	341.1	340	66
50	3.78	-0.057	265	323	335	484	297	340.9	339	66
51	3.76	-0.056	263	323	334	482	297	339.6	338	66
52	3.73	-0.055	263	322	333	480	300	339.5	337	66
53	3.72	-0.056	263	322	331	478	299	338.6	337	66
54	3.71	-0.055	259	321	330	476	302	337.5	337	66
55	3.68	-0.057	260	321	328	473	300	336.4	335	66
56	3.67	-0.056	262	321	327	472	301	336.5	334	66
57	3.65	-0.055	257	320	327	469	303	335.1	333	66
58	3.63	-0.054	259	320	326	467	303	334.9	333	66
59	3.61	-0.057	261	319	325	459	307	333.9	342	67
60	3.56	-0.056	260	319	324	454	303	331.9	337	67
61	3.52	-0.057	258	318	302	450	306	326.6	336	67
62	3.48	-0.056	256	317	274	446	306	319.8	335	67
63	3.45	-0.057	258	316	252	445	301	314.5	333	67
64	3.40	-0.056	256	315	237	443	302	310.6	331	67
65	3.37	-0.055	257	314	225	443	303	308.3	328	67
66	3.33	-0.055	255	314	214	443	301	305.3	325	67
67	3.30	-0.054	254	313	205	442	301	303.2	322	66
68	3.28	-0.053	254	313	199	443	300	301.8	320	66
69	3.25	-0.053	253	312	193	442	298	299.8	317	67
70	3.24	-0.053	258	312	208	443	298	303.9	314	67
71	3.21	-0.052	256	311	219	443	298	305.6	311	66
72	3.20	-0.052	255	311	229	443	296	306.9	309	67
73	3.18	-0.052	259	311	237	443	297	309.5	308	66
74	3.15	-0.053	258	310	244	444	296	310.4	307	67
75	3.14	-0.051	259	310	251	444	295	311.7	306	67
76	3.11	-0.050	260	310	256	445	295	313.1	305	67
77	3.10	-0.051	262	309	261	445	293	313.8	305	67
78	3.08	-0.051	259	309	265	445	294	314.5	304	67
79	3.05	-0.052	259	309	269	446	295	315.6	304	67
80	3.04	-0.051	262	309	272	446	294	316.4	303	67
81	2.99	-0.050	261	309	267	447	295	315.7	302	67
82	2.96	-0.051	264	309	247	446	293	311.8	302	67
83	2.94	-0.050	262	308	233	447	297	309.3	301	67
84	2.90	-0.051	262	308	221	447	298	307.3	301	67
85	2.89	-0.050	265	308	212	447	293	305.2	299	67
86	2.87	-0.051	264	308	204	448	295	303.8	298	66
87	2.84	-0.049	267	308	198	449	294	303.0	297	67
88	2.83	-0.050	266	308	193	449	294	301.8	295	67
89	2.80	-0.050	267	308	189	449	292	300.9	294	67

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Recording Interval (min): 1
 Run Time (min): 95

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
90	2.78	-0.048	268	307	185	450	294	300.7	294	67
91	2.75	-0.050	267	307	181	450	297	300.3	292	67
92	2.74	-0.048	267	307	178	450	295	299.3	291	67
93	2.71	-0.049	268	305	177	450	295	298.9	289	67
94	2.71	-0.048	266	306	174	450	295	298.0	288	67
95	2.67	-0.047	267	305	172	449	294	297.4	286	67

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 1Technician: AKDate: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.077	0.00	72	0.1		13.21		92	292	70	66
1	0.100	0.100	0.078	2.30	72	1.0	-	13.19	-0.02	93	296	71	67
2	0.251	0.151	0.076	2.36	72	1.0	-	13.08	-0.11	93	302	72	67
3	0.399	0.148	0.077	2.40	72	1.0	-	13.05	-0.03	93	314	72	67
4	0.552	0.153	0.079	2.42	72	1.0	-	12.98	-0.07	93	324	72	67
5	0.701	0.149	0.078	2.45	72	1.0	-	12.91	-0.07	93	332	72	67
6	0.856	0.155	0.078	2.47	72	1.0	-	12.83	-0.08	93	325	73	67
7	1.006	0.150	0.076	2.50	72	1.0	-	12.76	-0.07	93	323	73	67
8	1.164	0.158	0.077	2.52	72	1.0	-	12.69	-0.07	93	322	73	67
9	1.317	0.153	0.077	2.55	73	1.0	-	12.62	-0.07	93	323	73	67
10	1.475	0.158	0.077	2.57	73	1.0	91	12.55	-0.07	93	324	73	67
11	1.628	0.153	0.078	2.56	73	1.0	-	12.47	-0.08	93	325	74	67
12	1.785	0.157	0.078	2.59	73	1.0	-	12.38	-0.09	93	327	74	67
13	1.945	0.160	0.077	2.61	73	1.0	-	12.32	-0.06	93	326	74	67
14	2.100	0.155	0.077	2.63	74	1.0	-	12.24	-0.08	93	327	74	66
15	2.260	0.160	0.077	2.63	74	1.0	-	12.16	-0.08	93	331	74	66
16	2.417	0.157	0.078	2.66	74	1.0	-	12.07	-0.09	93	333	74	66
17	2.577	0.160	0.077	2.66	74	1.0	-	11.99	-0.08	93	332	74	67
18	2.736	0.159	0.078	2.66	75	1.0	-	11.92	-0.07	93	332	74	66
19	2.895	0.159	0.077	2.64	75	1.0	-	11.86	-0.06	93	332	75	66
20	3.053	0.158	0.078	2.58	75	1.0	97	11.74	-0.12	93	331	75	67
21	3.207	0.154	0.077	2.58	76	1.0	-	11.66	-0.08	94	332	75	67
22	3.370	0.163	0.078	2.61	76	1.0	-	11.56	-0.10	94	336	75	67
23	3.524	0.154	0.080	2.61	76	1.0	-	11.46	-0.10	94	340	75	67
24	3.683	0.159	0.079	2.61	77	1.0	-	11.37	-0.09	94	343	75	67
25	3.844	0.161	0.079	2.63	77	1.0	-	11.27	-0.10	94	345	75	67
26	4.000	0.156	0.077	2.63	77	1.0	-	11.19	-0.08	94	346	75	67
27	4.162	0.162	0.077	2.64	78	1.0	-	11.09	-0.10	94	345	75	67
28	4.320	0.158	0.077	2.65	78	1.0	-	11.00	-0.09	94	346	75	67
29	4.480	0.160	0.078	2.67	78	1.0	-	10.88	-0.12	95	353	75	67
30	4.641	0.161	0.079	2.66	79	1.0	97	10.77	-0.11	95	362	75	67
31	4.798	0.157	0.079	2.66	79	1.0	-	10.66	-0.11	96	367	76	67

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 1Technician: AKDate: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
32	4.961	0.163	0.075	2.66	79	1.0	-	10.56	-0.10	96	366	76	67
33	5.120	0.159	0.078	2.68	80	1.0	-	10.45	-0.11	95	362	76	67
34	5.281	0.161	0.077	2.67	80	1.0	-	10.40	-0.05	96	360	76	67
35	5.443	0.162	0.076	2.69	80	1.0	-	10.33	-0.07	95	359	76	67
36	5.601	0.158	0.078	2.68	81	1.0	-	10.23	-0.10	96	363	76	67
37	5.766	0.165	0.078	2.69	81	1.0	-	10.12	-0.11	96	367	76	67
38	5.923	0.157	0.078	2.69	81	1.0	-	9.99	-0.13	96	372	76	68
39	6.086	0.163	0.080	2.70	82	1.0	-	9.88	-0.11	97	381	76	68
40	6.249	0.163	0.079	2.71	82	1.0	97	9.73	-0.15	97	389	76	68
41	6.407	0.158	0.078	2.71	82	1.0	-	9.61	-0.12	97	394	76	68
42	6.573	0.166	0.077	2.70	83	1.0	-	9.51	-0.10	97	395	76	68
43	6.733	0.160	0.077	2.71	83	1.0	-	9.43	-0.08	98	395	76	67
44	6.895	0.162	0.077	2.72	83	1.0	-	9.32	-0.11	98	395	76	67
45	7.059	0.164	0.076	2.72	84	1.0	-	9.23	-0.09	98	392	77	67
46	7.220	0.161	0.078	2.72	84	1.0	-	9.12	-0.11	98	393	77	67
47	7.383	0.163	0.078	2.72	84	1.0	-	9.00	-0.12	98	392	77	67
48	7.548	0.165	0.077	2.73	85	1.0	-	8.89	-0.11	98	392	77	67
49	7.707	0.159	0.077	2.73	85	1.0	-	8.77	-0.12	98	392	77	67
50	7.873	0.166	0.078	2.74	85	1.0	98	8.66	-0.11	98	392	77	67
51	8.036	0.163	0.078	2.74	85	1.0	-	8.55	-0.11	98	392	77	67
52	8.197	0.161	0.079	2.73	86	1.0	-	8.45	-0.10	98	393	77	67
53	8.364	0.167	0.078	2.75	86	1.0	-	8.37	-0.08	98	393	77	67
54	8.524	0.160	0.077	2.74	86	1.0	-	8.26	-0.11	99	395	77	67
55	8.689	0.165	0.077	2.75	86	1.1	-	8.17	-0.09	98	394	77	67
56	8.854	0.165	0.077	2.74	87	1.0	-	8.07	-0.10	98	395	77	67
57	9.016	0.162	0.077	2.75	87	1.0	-	7.96	-0.11	98	394	77	67
58	9.180	0.164	0.078	2.75	87	1.0	-	7.88	-0.08	98	392	77	67
59	9.346	0.166	0.080	2.76	87	1.0	-	7.76	-0.12	98	391	77	67
60	9.507	0.161	0.077	2.76	88	1.0	99	7.70	-0.06	98	389	77	67
61	9.673	0.166	0.079	2.75	88	1.0	-	7.60	-0.10	98	389	77	67
62	9.839	0.166	0.077	2.77	88	1.0	-	7.49	-0.11	98	387	77	67
63	10.000	0.161	0.077	2.76	88	1.0	-	7.42	-0.07	98	384	77	67

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 1Technician: AKDate: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
64	10.169	0.169	0.077	2.76	89	1.1	-	7.35	-0.07	98	382	77	67
65	10.331	0.162	0.076	2.77	89	1.0	-	7.25	-0.10	98	380	77	67
66	10.495	0.164	0.078	2.77	89	1.0	-	7.19	-0.06	98	378	77	67
67	10.663	0.168	0.077	2.78	89	1.0	-	7.09	-0.10	98	376	77	67
68	10.825	0.162	0.079	2.77	89	1.1	-	7.01	-0.08	98	373	77	67
69	10.991	0.166	0.078	2.78	90	1.0	-	6.93	-0.08	97	371	77	67
70	11.158	0.167	0.078	2.78	90	1.0	99	6.89	-0.04	97	368	77	67
71	11.320	0.162	0.078	2.77	90	1.0	-	6.81	-0.08	97	364	77	67
72	11.487	0.167	0.076	2.78	90	1.0	-	6.73	-0.08	97	362	77	67
73	11.653	0.166	0.077	2.78	90	1.0	-	6.67	-0.06	97	359	77	67
74	11.817	0.164	0.076	2.78	90	1.0	-	6.59	-0.08	97	357	77	67
75	11.983	0.166	0.076	2.79	91	1.1	-	6.53	-0.06	96	355	77	67
76	12.150	0.167	0.078	2.79	91	1.0	-	6.48	-0.05	96	353	77	67
77	12.314	0.164	0.077	2.79	91	1.0	-	6.41	-0.07	96	353	77	67
78	12.480	0.166	0.077	2.79	91	1.0	-	6.35	-0.06	96	352	77	67
79	12.647	0.167	0.077	2.79	91	1.0	-	6.29	-0.06	96	351	77	67
80	12.811	0.164	0.077	2.79	91	1.0	99	6.21	-0.08	96	350	77	68
81	12.978	0.167	0.076	2.79	91	1.0	-	6.16	-0.05	96	350	77	67
82	13.145	0.167	0.077	2.79	92	1.1	-	6.08	-0.08	96	349	77	68
83	13.309	0.164	0.078	2.80	92	1.1	-	6.04	-0.04	96	349	77	68
84	13.476	0.167	0.078	2.79	92	1.0	-	5.98	-0.06	95	349	77	68
85	13.644	0.168	0.077	2.80	92	1.0	-	5.89	-0.09	96	348	77	68
86	13.808	0.164	0.077	2.80	92	1.0	-	5.82	-0.07	96	347	77	68
87	13.975	0.167	0.077	2.80	92	1.1	-	5.77	-0.05	95	347	77	68
88	14.143	0.168	0.077	2.80	93	1.1	-	5.70	-0.07	95	347	77	68
89	14.307	0.164	0.077	2.82	93	1.0	-	5.64	-0.06	95	347	77	68
90	14.474	0.167	0.077	2.80	93	1.0	100	5.59	-0.05	95	347	77	68
91	14.643	0.169	0.077	2.80	93	1.1	-	5.50	-0.09	95	346	77	68
92	14.807	0.164	0.076	2.81	93	1.0	-	5.43	-0.07	95	346	77	68
93	14.974	0.167	0.076	2.81	93	1.1	-	5.39	-0.04	95	347	77	68
94	15.143	0.169	0.077	2.82	93	1.0	-	5.32	-0.07	95	347	77	67
95	15.307	0.164	0.076	2.81	93	1.0	-	5.26	-0.06	95	347	77	68

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 1Technician: AKDate: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
96	15.474	0.167	0.077	2.80	93	1.0	-	5.19	-0.07	95	346	77	68
97	15.643	0.169	0.078	2.81	94	1.1	-	5.13	-0.06	95	347	77	68
98	15.807	0.164	0.077	2.81	94	1.1	-	5.06	-0.07	95	347	77	68
99	15.975	0.168	0.076	2.81	94	1.0	-	5.00	-0.06	95	347	77	68
100	16.143	0.168	0.078	2.82	94	1.0	100	4.94	-0.06	95	347	77	68
101	16.308	0.165	0.078	2.81	94	1.1	-	4.90	-0.04	95	347	77	68
102	16.475	0.167	0.077	2.81	94	1.1	-	4.85	-0.05	95	346	77	68
103	16.644	0.169	0.077	2.80	94	1.0	-	4.79	-0.06	95	346	77	68
104	16.809	0.165	0.077	2.81	94	1.0	-	4.72	-0.07	95	346	77	68
105	16.977	0.168	0.076	2.81	94	1.1	-	4.66	-0.06	95	345	77	68
106	17.145	0.168	0.077	2.83	94	1.0	-	4.61	-0.05	95	345	77	68
107	17.311	0.166	0.076	2.82	95	1.0	-	4.54	-0.07	95	343	77	68
108	17.479	0.168	0.076	2.81	95	1.0	-	4.51	-0.03	95	344	77	68
109	17.647	0.168	0.078	2.82	95	1.1	-	4.44	-0.07	95	342	77	68
110	17.813	0.166	0.079	2.82	95	1.1	99	4.39	-0.05	95	342	77	68
111	17.981	0.168	0.076	2.82	95	1.1	-	4.36	-0.03	95	341	77	68
112	18.149	0.168	0.078	2.82	95	1.1	-	4.29	-0.07	95	340	77	68
113	18.314	0.165	0.078	2.82	95	1.0	-	4.25	-0.04	95	339	77	68
114	18.483	0.169	0.076	2.81	95	1.0	-	4.22	-0.03	95	338	77	68
115	18.652	0.169	0.077	2.81	95	1.1	-	4.15	-0.07	95	336	77	68
116	18.817	0.165	0.076	2.82	95	1.1	-	4.09	-0.06	94	335	77	68
117	18.986	0.169	0.076	2.82	95	1.1	-	4.05	-0.04	94	333	77	68
118	19.155	0.169	0.077	2.81	95	1.1	-	4.05	0.00	94	332	77	68
119	19.320	0.165	0.078	2.82	95	1.0	-	3.99	-0.06	94	331	77	68
120	19.488	0.168	0.076	2.82	96	1.1	99	3.95	-0.04	94	329	77	68
121	19.658	0.170	0.075	2.82	96	1.0	-	3.90	-0.05	94	327	77	68
122	19.824	0.166	0.077	2.82	96	1.1	-	3.85	-0.05	94	326	77	68
123	19.990	0.166	0.075	2.82	96	1.1	-	3.82	-0.03	94	325	77	68
124	20.162	0.172	0.076	2.82	96	1.0	-	3.78	-0.04	94	323	77	68
125	20.329	0.167	0.077	2.82	96	1.1	-	3.73	-0.05	94	321	77	68
126	20.494	0.165	0.076	2.82	96	1.1	-	3.68	-0.05	94	320	77	68
127	20.664	0.170	0.078	2.81	96	1.1	-	3.65	-0.03	94	319	77	68

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
128	20.833	0.169	0.076	2.82	96	1.1	-	3.63	-0.02	94	319	77	68
129	20.998	0.165	0.077	2.83	96	1.0	-	3.59	-0.04	94	318	77	68
130	21.168	0.170	0.076	2.84	96	1.0	101	3.54	-0.05	94	317	77	68
131	21.338	0.170	0.077	2.83	96	1.1	-	3.50	-0.04	93	316	77	68
132	21.503	0.165	0.077	2.83	96	1.1	-	3.47	-0.03	93	314	77	69
133	21.672	0.169	0.077	2.83	96	1.0	-	3.42	-0.05	94	313	77	69
134	21.841	0.169	0.076	2.83	96	1.1	-	3.42	0.00	94	313	77	69
135	22.008	0.167	0.077	2.82	96	1.0	-	3.33	-0.09	93	311	77	69
136	22.177	0.169	0.075	2.83	97	1.0	-	3.34	0.01	93	310	77	69
137	22.346	0.169	0.076	2.83	97	1.0	-	3.24	-0.10	93	308	77	69
138	22.511	0.165	0.077	2.82	97	1.0	-	3.23	-0.01	93	308	77	69
139	22.681	0.170	0.076	2.81	97	1.1	-	3.20	-0.03	93	307	77	69
140	22.851	0.170	0.077	2.83	97	1.0	100	3.13	-0.07	93	305	77	68
141	23.017	0.166	0.077	2.84	97	1.1	-	3.11	-0.02	93	305	77	68
142	23.185	0.168	0.075	2.83	97	1.1	-	3.09	-0.02	93	304	77	68
143	23.356	0.171	0.075	2.82	97	1.1	-	3.06	-0.03	92	303	77	68
144	23.523	0.167	0.077	2.83	97	1.1	-	3.01	-0.05	92	303	77	68
145	23.690	0.167	0.076	2.83	97	1.1	-	2.97	-0.04	92	303	77	68
146	23.861	0.171	0.075	2.83	97	1.1	-	2.91	-0.06	92	302	77	68
147	24.029	0.168	0.077	2.82	97	1.1	-	2.89	-0.02	92	301	77	68
148	24.194	0.165	0.077	2.83	97	1.1	-	2.87	-0.02	92	300	77	69
149	24.365	0.171	0.076	2.84	97	1.0	-	2.83	-0.04	92	299	77	69
150	24.535	0.170	0.074	2.84	97	1.1	101	2.80	-0.03	91	298	77	69
151	24.701	0.166	0.077	2.84	97	1.0	-	2.73	-0.07	92	297	76	69
152	24.870	0.169	0.076	2.83	97	1.0	-	2.70	-0.03	92	297	76	69
153	25.040	0.170	0.077	2.85	97	1.1	-	2.66	-0.04	92	295	76	69
154	25.207	0.167	0.076	2.83	97	1.1	-	2.63	-0.03	92	294	76	69
155	25.376	0.169	0.077	2.83	97	1.0	-	2.58	-0.05	92	294	76	69
156	25.546	0.170	0.078	2.83	97	1.1	-	2.57	-0.01	91	294	76	68
157	25.711	0.165	0.078	2.84	97	1.1	-	2.51	-0.06	91	294	76	68
158	25.882	0.171	0.076	2.84	97	1.0	-	2.48	-0.03	91	293	76	68
159	26.052	0.170	0.076	2.84	97	1.0	-	2.47	-0.01	91	293	76	69

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 1Technician: AKDate: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
160	26.218	0.166	0.075	2.82	97	1.1	101	2.42	-0.05	91	292	76	68
161	26.385	0.167	0.076	2.84	97	1.0	-	2.41	-0.01	91	291	76	68
162	26.558	0.173	0.075	2.83	97	1.1	-	2.38	-0.03	91	291	76	69
163	26.726	0.168	0.076	2.83	97	1.0	-	2.34	-0.04	91	290	76	69
164	26.891	0.165	0.077	2.84	97	1.0	-	2.29	-0.05	91	289	76	69
165	27.062	0.171	0.076	2.84	98	1.1	-	2.26	-0.03	92	289	76	69
166	27.233	0.171	0.076	2.84	97	1.1	-	2.22	-0.04	92	289	76	69
167	27.398	0.165	0.076	2.84	98	1.0	-	2.18	-0.04	92	288	77	69
168	27.567	0.169	0.075	2.83	98	1.1	-	2.15	-0.03	92	288	77	69
169	27.737	0.170	0.076	2.83	98	1.0	-	2.12	-0.03	92	287	77	69
170	27.905	0.168	0.076	2.84	98	1.1	101	2.10	-0.02	92	288	77	69
171	28.074	0.169	0.076	2.84	98	1.1	-	2.06	-0.04	92	287	77	69
172	28.244	0.170	0.074	2.84	98	1.0	-	2.04	-0.02	93	287	77	70
173	28.410	0.166	0.074	2.84	98	1.1	-	1.98	-0.06	92	287	77	70
174	28.580	0.170	0.076	2.83	98	1.1	-	1.95	-0.03	93	287	77	70
175	28.751	0.171	0.075	2.84	98	1.1	-	1.93	-0.02	93	287	77	70
176	28.917	0.166	0.076	2.83	98	1.1	-	1.89	-0.04	93	287	77	70
177	29.085	0.168	0.076	2.83	98	1.1	-	1.86	-0.03	93	286	77	70
178	29.257	0.172	0.075	2.84	98	1.1	-	1.81	-0.05	93	286	77	70
179	29.426	0.169	0.076	2.84	98	1.0	-	1.79	-0.02	93	286	77	70
180	29.591	0.165	0.076	2.83	98	1.1	100	1.75	-0.04	93	285	77	70
181	29.762	0.171	0.076	2.85	98	1.1	-	1.71	-0.04	93	285	77	70
182	29.933	0.171	0.075	2.84	98	1.1	-	1.69	-0.02	93	284	78	70
183	30.100	0.167	0.075	2.84	98	1.1	-	1.65	-0.04	93	283	78	70
184	30.270	0.170	0.076	2.84	98	1.1	-	1.63	-0.02	93	282	78	70
185	30.440	0.170	0.075	2.84	98	1.1	-	1.61	-0.02	93	281	78	70
186	30.606	0.166	0.075	2.84	99	1.1	-	1.58	-0.03	93	280	78	70
187	30.777	0.171	0.076	2.83	99	1.1	-	1.57	-0.01	93	279	78	70
188	30.948	0.171	0.074	2.84	99	1.1	-	1.55	-0.02	93	278	78	70
189	31.114	0.166	0.074	2.84	99	1.1	-	1.51	-0.04	93	277	78	70
190	31.282	0.168	0.076	2.84	99	1.1	101	1.50	-0.01	93	276	78	70
191	31.455	0.173	0.074	2.84	99	1.1	-	1.47	-0.03	93	275	78	71

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
192	31.624	0.169	0.077	2.83	99	1.1	-	1.44	-0.03	93	273	78	71
193	31.790	0.166	0.075	2.84	99	1.1	-	1.41	-0.03	93	272	78	71
194	31.961	0.171	0.074	2.84	99	1.1	-	1.40	-0.01	93	270	78	71
195	32.132	0.171	0.075	2.84	99	1.1	-	1.37	-0.03	92	269	78	71
196	32.299	0.167	0.074	2.84	99	1.1	-	1.36	-0.01	92	268	78	71
197	32.469	0.170	0.074	2.83	99	1.1	-	1.35	-0.01	92	267	78	71
198	32.640	0.171	0.077	2.84	99	1.1	-	1.34	-0.01	92	267	78	71
199	32.806	0.166	0.074	2.85	99	1.1	-	1.33	-0.01	92	265	78	71
200	32.977	0.171	0.074	2.84	99	1.1	101	1.30	-0.03	92	264	78	71
201	33.149	0.172	0.075	2.85	99	1.0	-	1.30	0.00	92	263	78	71
202	33.317	0.168	0.074	2.84	99	1.1	-	1.29	-0.01	92	263	78	71
203	33.484	0.167	0.076	2.85	99	1.0	-	1.27	-0.02	92	262	78	71
204	33.656	0.172	0.076	2.84	100	1.1	-	1.26	-0.01	92	261	78	71
205	33.827	0.171	0.075	2.85	100	1.1	-	1.24	-0.02	92	261	78	71
206	33.994	0.167	0.075	2.84	100	1.1	-	1.23	-0.01	92	260	78	71
207	34.164	0.170	0.074	2.85	100	1.1	-	1.20	-0.03	92	259	78	71
208	34.335	0.171	0.074	2.86	100	1.1	-	1.20	0.00	92	258	78	71
209	34.502	0.167	0.076	2.85	100	1.1	-	1.17	-0.03	92	257	78	71
210	34.673	0.171	0.073	2.85	100	1.1	102	1.16	-0.01	92	256	78	71
211	34.845	0.172	0.073	2.85	100	1.1	-	1.14	-0.02	92	255	78	71
212	35.012	0.167	0.073	2.85	100	1.1	-	1.14	0.00	92	254	79	71
213	35.181	0.169	0.075	2.86	100	1.1	-	1.14	0.00	92	254	79	71
214	35.353	0.172	0.074	2.84	100	1.1	-	1.10	-0.04	91	253	79	71
215	35.523	0.170	0.073	2.85	100	1.1	-	1.10	0.00	91	252	79	71
216	35.690	0.167	0.074	2.85	100	1.1	-	1.07	-0.03	91	251	79	71
217	35.861	0.171	0.075	2.85	100	1.1	-	1.05	-0.02	91	251	79	71
218	36.032	0.171	0.073	2.85	100	1.1	-	1.02	-0.03	91	252	79	71
219	36.200	0.168	0.073	2.86	100	1.1	-	1.01	-0.01	91	251	79	71
220	36.371	0.171	0.074	2.85	100	1.1	102	0.98	-0.03	91	251	79	71
221	36.542	0.171	0.075	2.85	100	1.1	-	0.97	-0.01	91	251	79	71
222	36.709	0.167	0.076	2.84	101	1.1	-	0.94	-0.03	91	251	79	71
223	36.878	0.169	0.074	2.86	101	1.1	-	0.92	-0.02	91	250	79	71

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
224	37.052	0.174	0.075	2.86	101	1.1	-	0.90	-0.02	91	250	79	71
225	37.222	0.170	0.075	2.86	101	1.1	-	0.89	-0.01	91	250	79	71
226	37.389	0.167	0.074	2.86	101	1.1	-	0.87	-0.02	91	250	79	71
227	37.560	0.171	0.074	2.85	101	1.1	-	0.87	0.00	91	250	79	71
228	37.732	0.172	0.073	2.87	101	1.1	-	0.83	-0.04	91	250	79	71
229	37.900	0.168	0.074	2.87	101	1.1	-	0.82	-0.01	91	250	79	71
230	38.071	0.171	0.075	2.86	101	1.1	102	0.79	-0.03	91	250	79	71
231	38.243	0.172	0.074	2.86	101	1.0	-	0.78	-0.01	91	250	79	71
232	38.411	0.168	0.075	2.86	101	1.1	-	0.76	-0.02	91	250	79	71
233	38.580	0.169	0.075	2.87	101	1.1	-	0.74	-0.02	91	250	79	71
234	38.752	0.172	0.074	2.86	101	1.1	-	0.72	-0.02	91	250	79	71
235	38.924	0.172	0.074	2.86	101	1.1	-	0.71	-0.01	91	250	79	71
236	39.091	0.167	0.074	2.86	101	1.1	-	0.69	-0.02	91	251	79	71
237	39.262	0.171	0.075	2.86	101	1.1	-	0.66	-0.03	91	252	79	71
238	39.434	0.172	0.075	2.87	101	1.1	-	0.64	-0.02	91	251	79	71
239	39.601	0.167	0.074	2.86	101	1.1	-	0.62	-0.02	91	251	79	71
240	39.773	0.172	0.074	2.86	101	1.1	102	0.60	-0.02	91	252	79	71
241	39.945	0.172	0.074	2.86	101	1.1	-	0.58	-0.02	91	252	79	71
242	40.114	0.169	0.073	2.86	101	1.1	-	0.57	-0.01	91	252	79	71
243	40.281	0.167	0.076	2.86	101	1.1	-	0.55	-0.02	91	252	79	71
244	40.454	0.173	0.074	2.87	101	1.0	-	0.54	-0.01	91	252	79	71
245	40.625	0.171	0.073	2.86	101	1.1	-	0.52	-0.02	91	252	79	71
246	40.794	0.169	0.073	2.87	101	1.1	-	0.50	-0.02	91	253	79	71
247	40.965	0.171	0.074	2.87	101	1.0	-	0.47	-0.03	91	253	79	71
248	41.136	0.171	0.073	2.87	102	1.1	-	0.46	-0.01	91	254	79	71
249	41.304	0.168	0.074	2.87	102	1.1	-	0.45	-0.01	91	255	79	71
250	41.474	0.170	0.073	2.87	102	1.1	102	0.44	-0.01	91	255	79	71
251	41.648	0.174	0.074	2.87	102	1.1	-	0.42	-0.02	91	255	79	71
252	41.818	0.170	0.073	2.87	102	1.1	-	0.40	-0.02	91	254	79	71
253	41.985	0.167	0.074	2.86	102	1.1	-	0.39	-0.01	91	254	79	71
254	42.157	0.172	0.073	2.86	102	1.1	-	0.36	-0.03	91	254	79	71
255	42.329	0.172	0.073	2.88	102	1.1	-	0.35	-0.01	91	254	79	71

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
256	42.497	0.168	0.073	2.86	102	1.1	-	0.34	-0.01	91	254	79	71
257	42.668	0.171	0.076	2.86	102	1.1	-	0.32	-0.02	91	254	79	71
258	42.841	0.173	0.072	2.87	102	1.1	-	0.30	-0.02	91	254	79	71
259	43.009	0.168	0.074	2.86	102	1.0	-	0.29	-0.01	91	254	79	71
260	43.177	0.168	0.074	2.87	102	1.1	102	0.27	-0.02	91	254	79	71
261	43.350	0.173	0.074	2.87	102	1.1	-	0.26	-0.01	90	254	79	72
262	43.522	0.172	0.074	2.87	102	1.1	-	0.24	-0.02	90	254	79	72
263	43.690	0.168	0.073	2.86	102	1.1	-	0.23	-0.01	90	253	79	72
264	43.861	0.171	0.073	2.86	102	1.1	-	0.21	-0.02	91	254	79	71
265	44.033	0.172	0.074	2.87	102	1.1	-	0.19	-0.02	91	254	79	71
266	44.201	0.168	0.074	2.88	102	1.1	-	0.18	-0.01	91	254	79	71
267	44.371	0.170	0.073	2.88	102	1.1	-	0.16	-0.02	91	254	79	71
268	44.545	0.174	0.073	2.87	102	1.1	-	0.14	-0.02	91	253	79	71
269	44.715	0.170	0.073	2.87	102	1.1	-	0.12	-0.02	91	253	79	71
270	44.883	0.168	0.073	2.88	102	1.1	102	0.12	0.00	91	253	79	71
271	45.054	0.171	0.073	2.87	102	1.1	-	0.08	-0.04	91	252	79	72
272	45.227	0.173	0.075	2.87	102	1.1	-	0.07	-0.01	90	252	79	72
273	45.395	0.168	0.073	2.88	102	1.1	-	0.05	-0.02	90	253	79	72
274	45.567	0.172	0.073	2.87	102	1.1	-	0.03	-0.02	90	252	79	72
275	45.739	0.172	0.074	2.88	102	1.1	-	0.02	-0.01	90	252	79	72
276	45.908	0.169	0.074	2.86	102	1.1	-	0.01	-0.01	90	252	79	72
277	46.076	0.168	0.073	2.86	102	1.1	103	0.00	-0.01	90	253	79	72
Avg/Tot	46.076	0.166	0.076	2.78	93.3	1.0	100			93.3	308.9	77.1	68.9

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
0	0.000		0.01	71	0.7		73	-0.049	8.96	0.327
1	0.117	0.117	2.60	71	1.6	-	73	-0.053	8.15	0.064
2	0.274	0.157	2.61	71	2.1	-	74	-0.055	7.02	0.033
3	0.433	0.159	2.61	71	1.8	-	74	-0.053	8.07	0.024
4	0.587	0.154	2.61	71	1.7	-	74	-0.058	8.41	0.020
5	0.746	0.159	2.61	71	1.6	-	75	-0.060	8.74	0.020
6	0.901	0.155	2.61	72	1.6	-	75	-0.059	8.44	0.039
7	1.059	0.158	2.61	72	1.6	-	75	-0.058	7.18	0.077
8	1.216	0.157	2.62	72	1.9	-	75	-0.058	7.14	0.043
9	1.373	0.157	2.62	72	1.6	-	75	-0.059	7.26	0.078
10	1.532	0.159	2.62	72	1.6	97	75	-0.058	7.65	0.105
11	1.687	0.155	2.62	72	2.1	-	75	-0.059	7.70	0.093
12	1.847	0.160	2.62	73	2.1	-	76	-0.059	8.47	0.155
13	2.002	0.155	2.62	73	1.6	-	76	-0.059	8.24	0.204
14	2.161	0.159	2.62	73	1.7	-	76	-0.059	7.26	0.120
15	2.320	0.159	2.62	73	1.8	-	76	-0.060	8.88	0.157
16	2.475	0.155	2.62	74	1.8	-	76	-0.060	8.41	0.163
17	2.636	0.161	2.62	74	1.8	-	76	-0.060	8.51	0.241
18	2.791	0.155	2.62	74	2.0	-	76	-0.058	8.09	0.323
19	2.950	0.159	2.63	74	1.8	-	76	-0.059	7.86	0.334
20	3.110	0.160	2.63	75	2.0	99	76	-0.061	7.93	0.289
21	3.265	0.155	2.62	75	2.1	-	76	-0.061	8.30	0.288
22	3.427	0.162	2.63	75	2.1	-	76	-0.060	8.84	0.411
23	3.582	0.155	2.63	76	2.0	-	76	-0.063	9.53	0.489
24	3.742	0.160	2.63	76	1.8	-	76	-0.062	9.76	0.504
25	3.902	0.160	2.63	76	1.6	-	76	-0.060	9.70	0.490
26	4.058	0.156	2.63	77	1.7	-	77	-0.062	9.32	0.439
27	4.220	0.162	2.64	77	1.9	-	77	-0.061	9.21	0.397
28	4.376	0.156	2.63	77	2.1	-	77	-0.062	9.09	0.413
29	4.536	0.160	2.63	78	2.0	-	77	-0.065	9.55	0.559
30	4.697	0.161	2.64	78	1.6	99	77	-0.064	11.22	0.735
31	4.852	0.155	2.63	78	2.1	-	77	-0.064	10.79	0.677

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 1Technician: AKDate: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
32	5.015	0.163	2.64	79	1.6	-	77	-0.064	10.49	0.694
33	5.172	0.157	2.64	79	1.9	-	77	-0.064	9.73	0.729
34	5.333	0.161	2.64	79	2.0	-	77	-0.064	9.29	0.670
35	5.493	0.160	2.64	80	1.9	-	77	-0.062	9.33	0.690
36	5.650	0.157	2.65	80	1.7	-	77	-0.065	9.69	0.697
37	5.813	0.163	2.65	80	1.8	-	77	-0.065	10.18	0.615
38	5.970	0.157	2.63	81	2.1	-	77	-0.065	10.57	0.580
39	6.131	0.161	2.65	81	1.6	-	77	-0.068	11.64	1.053
40	6.291	0.160	2.64	81	1.7	98	77	-0.068	12.25	1.315
41	6.450	0.159	2.64	82	1.7	-	77	-0.068	12.38	1.256
42	6.611	0.161	2.64	82	1.7	-	78	-0.068	12.38	1.042
43	6.771	0.160	2.64	82	1.7	-	78	-0.070	11.83	0.745
44	6.930	0.159	2.64	83	1.7	-	78	-0.067	11.26	0.615
45	7.093	0.163	2.64	83	1.7	-	78	-0.068	11.04	0.674
46	7.250	0.157	2.64	83	1.8	-	78	-0.067	11.08	0.691
47	7.412	0.162	2.64	84	1.6	-	78	-0.067	11.23	0.628
48	7.574	0.162	2.65	84	1.9	-	78	-0.068	11.48	0.630
49	7.732	0.158	2.65	84	1.6	-	78	-0.066	11.56	0.619
50	7.895	0.163	2.65	84	2.1	99	78	-0.066	11.30	0.626
51	8.054	0.159	2.65	85	1.6	-	78	-0.068	11.31	0.608
52	8.216	0.162	2.65	85	2.1	-	78	-0.068	11.42	0.579
53	8.378	0.162	2.65	85	1.8	-	78	-0.066	11.48	0.546
54	8.537	0.159	2.66	86	1.6	-	78	-0.069	11.74	0.566
55	8.699	0.162	2.65	86	2.1	-	78	-0.069	11.56	0.577
56	8.861	0.162	2.66	86	2.1	-	78	-0.066	11.45	0.551
57	9.020	0.159	2.65	86	1.8	-	78	-0.069	11.33	0.505
58	9.184	0.164	2.66	87	1.7	-	78	-0.066	11.16	0.490
59	9.344	0.160	2.66	87	1.6	-	78	-0.069	11.01	0.484
60	9.505	0.161	2.66	87	2.0	99	78	-0.066	10.76	0.476
61	9.669	0.164	2.66	87	1.6	-	78	-0.068	10.60	0.453
62	9.828	0.159	2.66	87	1.7	-	78	-0.067	10.49	0.439
63	9.991	0.163	2.66	88	1.9	-	78	-0.068	10.29	0.404

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
64	10.153	0.162	2.66	88	1.6	-	78	-0.067	10.36	0.393
65	10.313	0.160	2.67	88	2.1	-	78	-0.066	10.24	0.370
66	10.477	0.164	2.66	88	1.6	-	78	-0.066	10.36	0.389
67	10.639	0.162	2.67	89	2.1	-	78	-0.066	10.39	0.392
68	10.799	0.160	2.67	89	2.0	-	78	-0.064	10.12	0.376
69	10.964	0.165	2.66	89	2.0	-	78	-0.065	9.74	0.373
70	11.123	0.159	2.66	89	1.6	99	78	-0.064	9.44	0.365
71	11.287	0.164	2.67	89	1.7	-	78	-0.063	9.29	0.348
72	11.450	0.163	2.66	90	2.1	-	78	-0.064	9.29	0.352
73	11.611	0.161	2.67	90	2.1	-	78	-0.063	9.32	0.348
74	11.774	0.163	2.66	90	1.8	-	78	-0.062	9.31	0.345
75	11.937	0.163	2.67	90	1.9	-	78	-0.062	9.36	0.345
76	12.098	0.161	2.67	90	1.7	-	78	-0.061	9.36	0.337
77	12.262	0.164	2.67	91	2.1	-	78	-0.062	9.40	0.341
78	12.425	0.163	2.67	91	2.1	-	78	-0.061	9.41	0.352
79	12.585	0.160	2.67	91	1.6	-	78	-0.062	9.44	0.359
80	12.751	0.166	2.68	91	2.0	100	78	-0.059	9.49	0.363
81	12.911	0.160	2.67	91	1.8	-	78	-0.063	9.70	0.338
82	13.074	0.163	2.68	91	1.6	-	78	-0.063	9.64	0.354
83	13.239	0.165	2.68	91	1.7	-	78	-0.062	9.68	0.352
84	13.400	0.161	2.68	92	1.6	-	78	-0.060	9.72	0.362
85	13.564	0.164	2.67	92	2.1	-	78	-0.062	9.79	0.351
86	13.727	0.163	2.67	92	1.9	-	78	-0.060	9.81	0.354
87	13.890	0.163	2.68	92	2.0	-	78	-0.062	9.83	0.351
88	14.053	0.163	2.67	92	2.0	-	78	-0.062	9.88	0.353
89	14.217	0.164	2.67	92	2.0	-	78	-0.063	9.96	0.350
90	14.378	0.161	2.67	92	1.7	100	78	-0.062	9.93	0.362
91	14.543	0.165	2.68	93	1.6	-	78	-0.060	9.94	0.359
92	14.706	0.163	2.68	93	1.7	-	78	-0.060	9.97	0.362
93	14.867	0.161	2.67	93	1.8	-	78	-0.062	9.99	0.373
94	15.033	0.166	2.68	93	1.8	-	78	-0.062	10.02	0.372
95	15.195	0.162	2.68	93	1.8	-	78	-0.062	9.99	0.375

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
96	15.358	0.163	2.68	93	1.7	-	78	-0.061	9.98	0.372
97	15.524	0.166	2.67	93	1.6	-	78	-0.061	10.01	0.353
98	15.684	0.160	2.67	93	1.9	-	78	-0.061	10.01	0.354
99	15.849	0.165	2.68	93	1.6	-	78	-0.062	9.93	0.358
100	16.014	0.165	2.68	94	2.1	100	78	-0.061	9.92	0.351
101	16.174	0.160	2.68	94	1.6	-	78	-0.062	9.85	0.344
102	16.340	0.166	2.68	94	1.8	-	78	-0.061	9.85	0.321
103	16.503	0.163	2.68	94	1.6	-	78	-0.063	9.88	0.297
104	16.666	0.163	2.68	94	1.7	-	78	-0.061	9.87	0.285
105	16.830	0.164	2.68	94	1.9	-	78	-0.061	9.75	0.310
106	16.994	0.164	2.68	94	1.6	-	78	-0.061	9.71	0.305
107	17.156	0.162	2.68	94	1.7	-	78	-0.060	9.69	0.292
108	17.321	0.165	2.68	94	1.6	-	78	-0.061	9.57	0.308
109	17.486	0.165	2.69	94	1.8	-	78	-0.060	9.44	0.307
110	17.648	0.162	2.68	95	1.6	99	78	-0.060	9.29	0.324
111	17.813	0.165	2.69	95	2.0	-	78	-0.060	9.15	0.323
112	17.977	0.164	2.68	95	2.0	-	78	-0.059	9.01	0.316
113	18.139	0.162	2.68	95	1.7	-	78	-0.060	8.83	0.328
114	18.305	0.166	2.69	95	1.6	-	78	-0.060	8.69	0.336
115	18.469	0.164	2.68	95	1.8	-	78	-0.060	8.62	0.339
116	18.631	0.162	2.68	95	1.6	-	78	-0.059	8.53	0.326
117	18.798	0.167	2.69	95	1.6	-	78	-0.059	8.44	0.330
118	18.959	0.161	2.68	95	1.6	-	78	-0.059	8.37	0.330
119	19.123	0.164	2.68	95	2.0	-	78	-0.058	8.36	0.315
120	19.289	0.166	2.69	95	2.0	99	78	-0.058	8.26	0.309
121	19.450	0.161	2.69	95	2.1	-	78	-0.059	8.21	0.302
122	19.616	0.166	2.69	95	2.1	-	78	-0.058	8.19	0.299
123	19.781	0.165	2.68	95	1.6	-	78	-0.059	8.14	0.303
124	19.942	0.161	2.68	96	1.6	-	78	-0.058	8.14	0.297
125	20.108	0.166	2.68	96	1.8	-	78	-0.057	8.11	0.288
126	20.272	0.164	2.68	96	1.7	-	78	-0.057	8.04	0.287
127	20.435	0.163	2.69	96	2.1	-	78	-0.058	8.06	0.290

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
128	20.600	0.165	2.69	96	1.6	-	78	-0.057	8.07	0.280
129	20.765	0.165	2.69	96	1.6	-	78	-0.056	8.04	0.293
130	20.928	0.163	2.69	96	1.7	100	78	-0.058	7.95	0.301
131	21.093	0.165	2.68	96	1.6	-	78	-0.056	7.91	0.301
132	21.257	0.164	2.69	96	1.9	-	78	-0.056	7.90	0.302
133	21.419	0.162	2.68	96	2.0	-	78	-0.055	7.87	0.299
134	21.584	0.165	2.68	96	1.6	-	78	-0.055	7.85	0.294
135	21.750	0.166	2.69	96	1.6	-	78	-0.056	8.08	0.298
136	21.912	0.162	2.69	96	2.1	-	78	-0.055	7.96	0.291
137	22.078	0.166	2.68	96	1.7	-	78	-0.056	7.87	0.293
138	22.243	0.165	2.69	96	1.7	-	78	-0.057	7.86	0.289
139	22.404	0.161	2.69	96	2.1	-	78	-0.057	7.80	0.292
140	22.570	0.166	2.69	96	1.6	100	78	-0.055	7.83	0.296
141	22.734	0.164	2.69	96	1.7	-	78	-0.055	7.76	0.293
142	22.896	0.162	2.68	96	2.1	-	78	-0.055	7.73	0.291
143	23.064	0.168	2.69	97	1.9	-	78	-0.054	7.73	0.302
144	23.227	0.163	2.69	97	1.6	-	78	-0.056	7.73	0.297
145	23.390	0.163	2.69	97	1.6	-	78	-0.054	7.76	0.308
146	23.557	0.167	2.69	97	1.6	-	78	-0.055	7.74	0.302
147	23.720	0.163	2.69	97	1.9	-	78	-0.055	7.65	0.312
148	23.883	0.163	2.69	97	1.8	-	78	-0.056	7.59	0.314
149	24.050	0.167	2.69	97	1.7	-	78	-0.053	7.66	0.309
150	24.212	0.162	2.68	97	1.7	100	77	-0.053	7.69	0.304
151	24.377	0.165	2.69	97	1.8	-	77	-0.054	7.69	0.304
152	24.543	0.166	2.69	97	2.0	-	77	-0.052	7.63	0.305
153	24.705	0.162	2.69	97	1.6	-	77	-0.054	7.61	0.307
154	24.871	0.166	2.69	97	1.7	-	77	-0.053	7.56	0.302
155	25.036	0.165	2.69	97	1.6	-	77	-0.052	7.54	0.305
156	25.199	0.163	2.69	97	1.7	-	77	-0.054	7.55	0.300
157	25.364	0.165	2.69	97	1.9	-	77	-0.053	7.54	0.301
158	25.530	0.166	2.69	97	1.6	-	77	-0.054	7.51	0.294
159	25.691	0.161	2.69	97	1.6	-	77	-0.054	7.52	0.289

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
160	25.858	0.167	2.68	97	1.6	101	77	-0.054	7.56	0.295
161	26.022	0.164	2.69	97	2.1	-	77	-0.052	7.58	0.301
162	26.185	0.163	2.69	97	2.1	-	77	-0.052	7.60	0.294
163	26.351	0.166	2.69	97	1.6	-	77	-0.052	7.63	0.294
164	26.516	0.165	2.69	97	2.1	-	77	-0.051	7.62	0.290
165	26.679	0.163	2.69	97	1.9	-	77	-0.051	7.65	0.289
166	26.844	0.165	2.69	97	2.1	-	77	-0.051	7.51	0.300
167	27.010	0.166	2.69	97	1.9	-	77	-0.050	7.57	0.301
168	27.173	0.163	2.69	97	1.7	-	77	-0.050	7.65	0.301
169	27.338	0.165	2.69	97	1.6	-	78	-0.052	7.64	0.300
170	27.503	0.165	2.69	97	1.6	100	78	-0.050	7.66	0.306
171	27.666	0.163	2.68	97	1.8	-	78	-0.049	7.67	0.312
172	27.831	0.165	2.68	97	2.0	-	78	-0.048	7.65	0.317
173	27.996	0.165	2.69	97	2.0	-	78	-0.048	7.64	0.314
174	28.159	0.163	2.68	97	2.1	-	78	-0.050	7.58	0.312
175	28.325	0.166	2.68	97	1.9	-	78	-0.050	7.42	0.327
176	28.490	0.165	2.68	98	1.8	-	78	-0.051	7.35	0.332
177	28.652	0.162	2.68	98	1.9	-	78	-0.050	7.33	0.332
178	28.819	0.167	2.69	98	1.6	-	78	-0.048	7.41	0.337
179	28.984	0.165	2.69	98	2.1	-	78	-0.048	7.37	0.330
180	29.146	0.162	2.69	98	2.1	100	78	-0.050	7.34	0.336
181	29.312	0.166	2.69	98	1.9	-	79	-0.049	7.28	0.331
182	29.477	0.165	2.68	98	1.6	-	79	-0.048	7.25	0.332
183	29.639	0.162	2.68	98	1.6	-	79	-0.048	7.22	0.328
184	29.806	0.167	2.69	98	2.1	-	79	-0.050	7.12	0.334
185	29.970	0.164	2.69	98	2.1	-	79	-0.046	7.10	0.331
186	30.133	0.163	2.68	98	2.0	-	79	-0.049	6.95	0.308
187	30.300	0.167	2.69	98	1.6	-	79	-0.049	6.67	0.284
188	30.464	0.164	2.68	98	1.6	-	79	-0.048	6.50	0.285
189	30.627	0.163	2.69	98	2.0	-	79	-0.049	6.40	0.287
190	30.795	0.168	2.69	98	1.7	100	79	-0.049	6.28	0.282
191	30.957	0.162	2.68	98	2.1	-	79	-0.049	6.19	0.288

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
192	31.121	0.164	2.69	98	1.6	-	79	-0.050	6.11	0.281
193	31.288	0.167	2.68	98	2.1	-	79	-0.047	6.05	0.288
194	31.450	0.162	2.68	98	2.0	-	79	-0.047	5.99	0.287
195	31.615	0.165	2.68	98	1.6	-	79	-0.046	5.94	0.294
196	31.782	0.167	2.68	98	1.7	-	79	-0.046	5.85	0.300
197	31.944	0.162	2.68	98	1.7	-	79	-0.047	5.94	0.309
198	32.109	0.165	2.68	98	1.7	-	79	-0.045	5.89	0.290
199	32.276	0.167	2.68	99	1.6	-	79	-0.047	5.78	0.283
200	32.438	0.162	2.68	99	1.9	100	79	-0.048	5.68	0.284
201	32.604	0.166	2.68	99	1.6	-	79	-0.047	5.63	0.280
202	32.770	0.166	2.69	99	2.0	-	79	-0.045	5.58	0.286
203	32.932	0.162	2.69	99	1.6	-	79	-0.046	5.50	0.283
204	33.098	0.166	2.68	99	1.6	-	80	-0.048	5.49	0.298
205	33.264	0.166	2.68	99	1.8	-	79	-0.046	5.47	0.293
206	33.426	0.162	2.68	99	1.7	-	80	-0.045	5.42	0.296
207	33.592	0.166	2.68	99	1.7	-	80	-0.045	5.39	0.301
208	33.758	0.166	2.69	99	1.9	-	80	-0.045	5.40	0.290
209	33.920	0.162	2.69	99	1.9	-	80	-0.045	5.38	0.297
210	34.087	0.167	2.68	99	1.6	102	80	-0.045	5.27	0.289
211	34.252	0.165	2.68	99	1.9	-	80	-0.045	5.20	0.290
212	34.415	0.163	2.68	99	1.6	-	80	-0.044	5.19	0.295
213	34.581	0.166	2.68	99	2.1	-	80	-0.045	5.14	0.288
214	34.746	0.165	2.68	99	1.6	-	80	-0.044	5.08	0.299
215	34.909	0.163	2.69	99	2.1	-	80	-0.044	5.90	0.280
216	35.076	0.167	2.68	99	1.6	-	80	-0.044	6.89	0.241
217	35.241	0.165	2.68	99	1.7	-	80	-0.044	6.94	0.227
218	35.404	0.163	2.69	99	2.0	-	80	-0.044	6.90	0.227
219	35.570	0.166	2.69	100	1.6	-	80	-0.044	6.81	0.217
220	35.735	0.165	2.69	100	1.7	101	80	-0.045	6.78	0.218
221	35.899	0.164	2.68	100	1.6	-	80	-0.045	6.78	0.216
222	36.065	0.166	2.68	100	1.7	-	80	-0.045	6.77	0.218
223	36.230	0.165	2.69	100	1.9	-	80	-0.044	6.78	0.213

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
224	36.394	0.164	2.68	100	1.6	-	80	-0.044	6.70	0.206
225	36.560	0.166	2.69	100	2.1	-	80	-0.044	6.97	0.206
226	36.725	0.165	2.68	100	1.6	-	80	-0.045	6.96	0.185
227	36.889	0.164	2.69	100	1.9	-	80	-0.044	6.94	0.180
228	37.055	0.166	2.69	100	1.6	-	80	-0.044	6.95	0.190
229	37.221	0.166	2.69	100	1.9	-	80	-0.042	6.86	0.189
230	37.384	0.163	2.69	100	1.6	101	80	-0.046	6.98	0.191
231	37.550	0.166	2.69	100	2.1	-	80	-0.043	7.05	0.188
232	37.716	0.166	2.69	100	1.6	-	80	-0.043	7.06	0.178
233	37.879	0.163	2.68	100	1.6	-	80	-0.043	7.11	0.181
234	38.045	0.166	2.69	100	1.6	-	80	-0.043	7.10	0.184
235	38.211	0.166	2.69	100	2.1	-	80	-0.044	7.09	0.185
236	38.374	0.163	2.68	100	1.6	-	80	-0.043	7.18	0.191
237	38.540	0.166	2.69	100	1.6	-	80	-0.044	7.35	0.185
238	38.706	0.166	2.69	100	1.5	-	80	-0.045	7.28	0.178
239	38.870	0.164	2.68	100	1.6	-	80	-0.045	7.24	0.186
240	39.035	0.165	2.69	100	1.6	101	80	-0.044	7.23	0.188
241	39.201	0.166	2.69	100	1.7	-	80	-0.041	7.20	0.191
242	39.365	0.164	2.68	100	1.8	-	80	-0.045	7.19	0.190
243	39.530	0.165	2.69	100	1.9	-	80	-0.045	7.16	0.192
244	39.696	0.166	2.69	100	2.0	-	80	-0.045	7.12	0.204
245	39.860	0.164	2.68	100	2.1	-	80	-0.045	7.06	0.208
246	40.026	0.166	2.68	101	1.6	-	80	-0.044	7.05	0.210
247	40.191	0.165	2.69	101	1.8	-	80	-0.044	7.07	0.223
248	40.355	0.164	2.67	101	1.6	-	80	-0.045	7.06	0.241
249	40.521	0.166	2.68	101	2.1	-	80	-0.045	6.92	0.238
250	40.687	0.166	2.69	101	2.1	101	80	-0.046	6.85	0.244
251	40.851	0.164	2.68	101	1.7	-	80	-0.044	6.85	0.239
252	41.017	0.166	2.68	101	2.1	-	80	-0.044	6.77	0.237
253	41.183	0.166	2.69	101	1.7	-	80	-0.044	6.69	0.236
254	41.346	0.163	2.68	101	2.0	-	80	-0.045	6.68	0.249
255	41.512	0.166	2.69	101	1.8	-	80	-0.045	6.65	0.246

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
256	41.678	0.166	2.69	101	1.9	-	80	-0.044	6.59	0.261
257	41.842	0.164	2.68	101	1.6	-	80	-0.044	6.57	0.260
258	42.008	0.166	2.69	101	2.0	-	80	-0.044	6.57	0.258
259	42.174	0.166	2.68	101	1.9	-	80	-0.046	6.52	0.257
260	42.338	0.164	2.68	101	1.9	101	80	-0.044	6.52	0.254
261	42.503	0.165	2.69	101	1.7	-	80	-0.044	6.40	0.263
262	42.670	0.167	2.68	101	2.0	-	80	-0.046	6.37	0.267
263	42.833	0.163	2.68	101	2.1	-	80	-0.046	6.35	0.266
264	42.999	0.166	2.69	101	1.7	-	80	-0.046	6.28	0.271
265	43.165	0.166	2.69	101	2.1	-	80	-0.044	6.36	0.270
266	43.329	0.164	2.68	101	1.7	-	80	-0.046	6.34	0.286
267	43.495	0.166	2.68	101	2.1	-	80	-0.044	6.28	0.278
268	43.661	0.166	2.68	101	1.7	-	80	-0.046	6.26	0.278
269	43.825	0.164	2.68	101	1.9	-	80	-0.045	6.27	0.281
270	43.991	0.166	2.68	101	1.8	101	80	-0.046	6.20	0.288
271	44.157	0.166	2.69	101	1.8	-	80	-0.047	6.19	0.287
272	44.320	0.163	2.68	101	2.0	-	80	-0.047	6.13	0.291
273	44.486	0.166	2.68	101	2.0	-	80	-0.046	6.07	0.292
274	44.653	0.167	2.69	101	2.1	-	80	-0.044	6.12	0.305
275	44.816	0.163	2.69	101	1.8	-	80	-0.045	6.06	0.311
276	44.982	0.166	2.68	101	1.6	-	80	-0.046	6.02	0.313
277	45.148	0.166	2.69	101	1.6	102	80	-0.045	6.02	0.319
Avg/Tot	45.148	0.163	2.66	92.7	1.8	100	78.2	-0.055	8.14	0.332

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 1

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
0	-0.001		-0.01	73	0.0		71
1	0.119	0.120	1.00	73	1.5	-	71
2	0.264	0.145	1.01	73	1.5	-	71
3	0.408	0.144	1.02	73	1.4	-	71
4	0.553	0.145	1.01	73	1.5	-	71
5	0.698	0.145	1.02	73	1.5	-	72
6	0.843	0.145	1.02	73	1.5	-	72
7	0.988	0.145	1.03	73	1.5	-	72
8	1.136	0.148	1.04	73	1.6	-	72
9	1.283	0.147	1.04	73	1.5	-	72
10	1.430	0.147	1.05	73	1.6	96	72
11	1.578	0.148	1.05	74	1.5	-	72
12	1.726	0.148	1.05	74	1.5	-	73
13	1.874	0.148	1.05	74	1.6	-	73
14	2.022	0.148	1.05	74	1.5	-	73
15	2.170	0.148	1.05	74	1.6	-	73
16	2.319	0.149	1.05	74	1.5	-	73
17	2.467	0.148	1.05	74	1.5	-	73
18	2.616	0.149	1.05	75	1.7	-	73
19	2.764	0.148	1.05	75	1.7	-	73
20	2.913	0.149	1.05	75	1.5	99	73
21	3.062	0.149	1.05	75	1.7	-	73
22	3.211	0.149	1.05	76	1.6	-	74
23	3.360	0.149	1.05	76	1.5	-	74
24	3.510	0.150	1.06	76	1.5	-	74
25	3.659	0.149	1.06	76	1.7	-	74
26	3.809	0.150	1.06	76	1.5	-	74
27	3.959	0.150	1.07	77	1.6	-	74
28	4.109	0.150	1.07	77	1.7	-	74
29	4.260	0.151	1.07	77	1.6	-	74
30	4.410	0.150	1.08	78	1.5	99	74
31	4.561	0.151	1.08	78	1.6	-	74

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 1

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/9/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
32	4.712	0.151	1.08	79	1.6	-	74
33	4.863	0.151	1.09	79	1.5	-	74
34	5.014	0.151	1.08	79	1.5	-	74
35	5.165	0.151	1.08	79	1.6	-	74
36	5.317	0.152	1.08	80	1.7	-	74
37	5.470	0.153	1.08	80	1.5	-	75
38	5.622	0.152	1.08	81	1.6	-	75
39	5.775	0.153	1.09	81	1.5	-	75
40	5.927	0.152	1.09	81	1.7	99	75
41	6.079	0.152	1.10	82	1.5	-	75
42	6.231	0.152	1.09	82	1.7	-	75
43	6.384	0.153	1.09	82	1.5	-	75
44	6.537	0.153	1.09	83	1.6	-	75
45	6.691	0.154	1.09	83	1.5	-	75
46	6.844	0.153	1.10	83	1.6	-	75
47	6.998	0.154	1.10	84	1.6	-	75
48	7.150	0.152	1.10	84	1.7	-	75
49	7.304	0.154	1.09	84	1.6	-	75
50	7.458	0.154	1.10	84	1.7	100	75
51	7.612	0.154	1.10	85	1.5	-	75
52	7.766	0.154	1.11	85	1.5	-	75
53	7.920	0.154	1.11	85	1.5	-	75
54	8.074	0.154	1.10	86	1.6	-	75
55	8.228	0.154	1.10	86	1.7	-	75
56	8.383	0.155	1.11	86	1.5	-	75
57	8.538	0.155	1.11	86	1.7	-	75
58	8.691	0.153	1.11	87	1.7	-	76
59	8.846	0.155	1.10	87	1.5	-	76
60	9.001	0.155	1.10	87	1.5	101	76
Avg/Tot	9.002	0.150	1.05	78.6	1.5	99	73.8

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 1

Technician: AK

Date: 4/9/2025

Stove ΔT: 48

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	268	304	170	439	296	295.5	958.8
1	269	303	176	418	296	292.3	994.2
2	266	302	188	402	297	291.1	1072.3
3	265	302	199	388	295	289.7	1112.9
4	261	299	211	377	295	288.6	1127.1
5	266	298	221	369	292	289.3	1121.0
6	261	295	209	361	291	283.4	1138.6
7	260	293	201	352	295	280.2	1140.3
8	257	290	197	345	293	276.4	1130.7
9	255	289	193	339	294	274.0	1125.7
10	252	285	190	333	288	269.8	1128.0
11	253	283	188	328	291	268.5	1131.6
12	249	281	186	327	289	266.4	1141.1
13	247	278	186	323	286	263.9	1116.5
14	245	276	185	320	281	261.4	1137.3
15	243	274	184	317	285	260.5	1180.1
16	240	272	183	318	283	259.1	1157.7
17	237	270	184	325	280	259.2	1159.8
18	237	267	184	329	278	259.2	1145.5
19	235	266	185	332	275	258.5	1137.1
20	232	264	184	335	276	258.2	1141.9
21	230	262	185	337	272	257.0	1185.4
22	230	260	185	338	272	257.2	1254.5
23	230	260	185	342	269	257.3	1266.0
24	227	258	186	348	270	257.8	1272.5
25	226	257	187	351	269	258.1	1241.4
26	225	256	189	355	265	258.0	1232.9
27	225	255	190	358	263	258.0	1219.8
28	223	254	191	363	263	258.6	1241.6
29	222	253	191	376	259	260.1	1381.8
30	221	252	192	390	255	262.1	1406.0
31	219	252	195	402	258	265.2	1393.6
32	221	251	198	409	255	266.6	1331.9
33	220	251	200	409	251	266.3	1303.2
34	218	250	201	409	253	266.1	1317.7
35	218	249	202	409	252	265.9	1335.4
36	216	249	202	409	250	265.3	1379.9
37	216	249	203	411	248	265.2	1415.5
38	216	248	204	421	245	266.5	1494.2
39	214	248	207	426	245	268.0	1570.1
40	213	247	211	433	243	269.5	1599.7
41	214	247	216	441	243	272.0	1613.1
42	212	248	221	450	240	273.9	1584.5
43	212	247	225	455	238	275.5	1473.3
44	213	247	228	460	237	276.9	1432.3
45	212	247	228	467	235	277.6	1415.5
46	211	247	228	473	233	278.3	1430.9
47	211	247	227	478	234	279.6	1408.9

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 1

Technician: AK

Date: 4/9/2025

Stove ΔT: 48

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	210	247	226	483	233	279.9	1407.1
49	210	248	226	485	233	280.3	1375.2
50	210	248	225	485	230	279.4	1370.3
51	210	248	224	488	230	279.9	1377.5
52	211	248	224	492	226	280.0	1376.2
53	211	249	223	490	227	280.0	1391.0
54	209	250	223	490	226	279.6	1388.5
55	211	251	223	491	225	280.1	1368.3
56	210	252	223	492	222	279.7	1342.7
57	211	252	223	493	221	280.1	1325.7
58	210	253	222	495	221	280.1	1312.4
59	210	254	222	496	221	280.5	1301.3
60	212	255	221	498	217	280.6	1283.5
61	212	257	220	499	216	280.8	1268.9
62	211	258	219	499	215	280.3	1258.0
63	211	259	218	500	216	280.7	1238.7
64	211	261	216	503	215	281.1	1236.0
65	210	262	215	501	214	280.3	1225.7
66	211	264	213	501	210	279.9	1227.0
67	212	266	212	501	214	280.6	1216.3
68	211	268	211	498	211	279.7	1202.2
69	212	270	209	496	212	279.8	1183.6
70	213	273	207	493	210	279.2	1167.3
71	212	276	206	491	209	278.7	1156.9
72	211	279	204	489	211	278.7	1151.9
73	212	282	202	486	209	278.1	1146.3
74	213	285	201	484	208	278.2	1142.5
75	212	289	200	482	205	277.6	1140.8
76	213	292	198	480	206	277.9	1140.7
77	212	295	197	478	204	277.3	1142.3
78	212	298	196	477	206	277.7	1145.3
79	213	301	195	474	203	277.1	1147.8
80	212	304	195	472	203	277.2	1152.1
81	213	307	194	471	201	277.2	1155.5
82	212	309	193	470	203	277.3	1156.8
83	214	312	192	469	201	277.4	1159.4
84	214	314	192	469	201	277.9	1160.5
85	213	317	191	468	202	278.1	1160.3
86	213	319	191	468	201	278.4	1163.2
87	214	321	190	469	201	278.9	1161.2
88	213	323	190	469	201	279.2	1164.8
89	214	325	190	469	199	279.4	1168.4
90	213	326	190	469	199	279.4	1168.3
91	213	328	190	470	199	279.8	1170.2
92	213	330	190	471	199	280.5	1175.6
93	214	332	190	472	197	281.1	1177.7
94	213	333	190	473	198	281.3	1179.5
95	213	334	189	474	198	281.5	1182.0

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 1

Technician: AK

Date: 4/9/2025

Stove ΔT: 48

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	213	335	189	475	197	281.9	1179.8
97	214	337	189	477	197	282.8	1180.5
98	214	338	189	477	196	282.8	1177.2
99	216	339	189	478	195	283.5	1175.4
100	215	340	189	480	195	283.9	1170.9
101	214	341	189	479	196	283.9	1165.8
102	216	343	189	480	194	284.2	1163.2
103	215	344	188	480	194	284.0	1164.2
104	215	344	189	479	194	284.1	1151.4
105	215	345	189	480	194	284.5	1150.9
106	216	346	189	479	193	284.5	1147.8
107	215	347	189	478	194	284.5	1146.3
108	215	348	188	478	193	284.3	1140.9
109	214	349	188	478	191	284.1	1135.7
110	217	349	188	478	193	284.9	1126.9
111	217	350	187	478	193	285.1	1121.9
112	216	351	187	478	193	284.8	1119.0
113	217	351	186	478	191	284.6	1114.8
114	217	352	186	477	192	284.6	1105.3
115	217	352	185	477	193	284.6	1096.6
116	218	353	185	476	191	284.2	1090.0
117	216	354	184	475	191	283.8	1081.3
118	217	354	183	473	190	283.5	1074.8
119	217	355	182	472	191	283.4	1065.7
120	218	355	181	471	192	283.1	1058.7
121	217	356	181	469	190	282.5	1052.2
122	217	356	180	467	190	282.0	1045.9
123	217	356	179	465	190	281.4	1040.9
124	217	356	178	464	190	281.1	1033.8
125	219	356	177	463	190	280.9	1030.5
126	218	357	176	461	190	280.3	1028.3
127	218	357	175	461	190	280.3	1025.8
128	219	357	175	460	189	279.9	1024.0
129	217	356	173	459	190	279.1	1022.8
130	218	357	172	458	190	279.1	1020.8
131	218	357	171	457	191	278.7	1019.5
132	218	356	170	455	191	278.0	1014.2
133	218	356	170	453	190	277.4	1007.5
134	219	356	169	453	187	276.9	1010.1
135	220	355	169	454	188	277.0	997.5
136	215	355	168	455	188	276.2	993.0
137	218	355	168	456	186	276.5	987.6
138	218	354	167	455	190	276.7	984.4
139	218	353	167	455	189	276.4	980.2
140	217	354	166	456	189	276.3	976.9
141	217	353	166	456	189	276.3	971.8
142	218	353	165	457	184	275.4	969.3
143	219	353	165	457	187	276.1	968.8

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 1

Technician: AK

Date: 4/9/2025

Stove ΔT: 48

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	218	353	163	457	189	276.0	967.8
145	219	352	163	457	188	275.9	962.4
146	220	352	162	457	185	275.3	958.7
147	217	352	162	458	187	274.9	960.5
148	219	351	161	456	189	275.2	959.2
149	218	351	160	455	187	274.5	956.8
150	216	351	160	454	185	273.2	955.5
151	220	350	160	453	188	274.0	954.6
152	219	349	159	451	189	273.3	954.7
153	220	349	159	450	188	273.0	954.8
154	219	348	158	449	187	272.2	952.9
155	220	348	158	448	189	272.4	952.3
156	219	348	157	446	188	271.5	950.7
157	218	347	157	445	187	270.9	948.1
158	219	347	157	444	188	271.0	943.8
159	220	347	157	444	186	270.5	943.5
160	219	346	156	443	186	270.1	944.0
161	220	346	156	443	188	270.6	942.1
162	220	346	155	443	189	270.7	940.5
163	220	346	155	443	186	269.9	940.4
164	219	346	155	443	189	270.4	939.4
165	221	345	154	442	186	269.8	939.7
166	221	346	154	441	189	270.0	943.3
167	221	345	154	440	188	269.6	945.2
168	220	345	153	438	188	268.9	946.2
169	221	345	153	437	187	268.6	949.5
170	222	344	153	435	187	268.3	955.5
171	222	344	153	434	187	267.7	956.8
172	222	345	153	433	188	267.9	955.7
173	222	344	153	432	187	267.4	955.3
174	223	343	153	431	187	267.3	959.6
175	222	344	153	430	187	267.2	962.5
176	222	342	153	429	187	266.6	960.3
177	224	343	153	428	187	266.8	962.8
178	223	342	153	427	188	266.4	959.5
179	221	342	153	426	187	265.8	958.1
180	223	341	153	426	187	265.8	955.0
181	222	341	153	425	190	266.0	954.3
182	223	341	153	424	188	265.5	947.6
183	223	340	153	423	189	265.6	946.0
184	223	339	153	422	188	264.9	941.9
185	223	339	153	422	188	264.7	924.9
186	223	338	152	424	188	265.1	897.0
187	224	337	152	425	188	265.1	882.0
188	224	336	152	426	188	265.0	874.5
189	226	335	151	427	188	265.4	865.9
190	224	334	151	427	187	264.6	859.0
191	224	333	150	428	189	264.8	852.7

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 1

Technician: AK

Date: 4/9/2025

Stove ΔT: 48

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
192	225	332	149	428	189	264.5	847.2
193	225	330	149	427	189	263.9	843.7
194	226	329	148	426	190	263.9	840.1
195	225	328	148	425	189	262.8	837.7
196	225	327	147	422	189	262.0	840.0
197	225	325	146	421	188	261.0	832.2
198	226	324	146	420	187	260.4	823.8
199	225	323	145	418	187	259.7	818.7
200	225	321	145	417	188	259.1	810.7
201	225	320	144	416	187	258.5	810.9
202	224	319	144	415	189	258.1	805.7
203	224	317	143	414	189	257.2	801.3
204	225	315	143	412	188	256.4	802.1
205	224	314	142	410	189	255.8	798.6
206	226	312	142	408	187	254.8	798.0
207	225	311	141	406	188	254.2	792.0
208	226	309	141	406	187	253.7	788.2
209	225	308	141	404	188	252.9	784.0
210	226	306	140	402	187	252.4	780.9
211	224	305	140	401	187	251.2	777.9
212	225	304	139	399	188	251.0	774.2
213	223	302	139	398	188	249.9	771.4
214	223	300	139	396	189	249.5	779.1
215	224	299	138	397	188	249.0	794.7
216	222	298	138	399	190	249.2	799.2
217	223	296	138	399	189	248.8	800.0
218	224	296	137	399	189	248.8	801.9
219	224	294	137	399	188	248.4	806.4
220	224	293	137	399	188	248.2	805.8
221	223	292	137	399	188	247.8	807.2
222	223	292	137	399	189	247.9	803.1
223	223	291	137	400	189	247.9	801.7
224	224	291	137	400	187	247.6	818.6
225	222	290	137	401	189	247.8	826.4
226	223	289	137	402	189	247.9	828.6
227	223	288	136	403	188	247.7	828.8
228	221	287	136	404	188	247.3	829.3
229	222	287	136	405	188	247.7	832.3
230	223	287	136	406	188	248.0	837.8
231	224	287	136	406	189	248.2	837.6
232	223	287	136	408	189	248.7	829.7
233	222	285	136	409	189	248.2	824.6
234	222	285	136	410	188	248.1	826.7
235	223	285	136	410	190	248.8	827.6
236	224	285	137	411	191	249.3	828.4
237	224	284	137	414	189	249.4	828.1
238	223	284	137	414	190	249.5	828.0
239	224	283	137	415	191	250.1	829.7

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 1

Technician: AK

Date: 4/9/2025

Stove ΔT: 48

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
240	224	283	137	415	191	250.0	831.0
241	223	283	137	415	193	250.1	831.2
242	223	282	137	415	192	249.9	834.1
243	224	282	137	415	192	250.1	838.8
244	224	282	137	415	192	249.9	846.5
245	224	282	138	414	193	250.1	847.3
246	224	281	138	414	192	249.7	848.1
247	225	281	138	413	191	249.5	851.0
248	225	281	138	413	193	249.8	845.7
249	224	280	138	412	193	249.6	843.2
250	224	280	138	412	194	249.5	840.5
251	225	280	138	412	194	249.8	833.2
252	225	280	138	412	195	249.9	830.0
253	225	279	139	412	194	249.7	832.9
254	226	279	138	411	194	249.6	830.4
255	225	279	138	411	195	249.5	834.9
256	225	279	138	411	195	249.5	837.1
257	225	278	138	410	195	249.0	834.0
258	226	278	138	410	195	249.3	832.4
259	226	277	138	410	195	249.1	831.5
260	226	277	138	410	196	249.5	829.6
261	226	276	138	411	196	249.4	829.2
262	226	276	139	412	197	249.7	831.4
263	226	275	139	412	196	249.5	831.7
264	226	275	139	411	196	249.5	833.3
265	227	274	139	411	197	249.4	832.3
266	226	274	138	410	197	249.1	829.6
267	227	273	138	410	198	249.2	825.9
268	228	272	138	410	198	249.0	824.5
269	227	272	138	410	198	249.0	823.9
270	226	271	138	409	198	248.5	823.7
271	227	270	138	409	197	248.4	822.6
272	228	270	138	409	197	248.2	822.0
273	228	269	138	409	200	248.6	823.3
274	227	268	138	409	198	247.9	822.8
275	227	268	138	407	198	247.5	822.3
276	228	267	138	407	197	247.3	822.8
277	228	266	138	406	198	247.2	823.9
Average	221.9	305.0	170.5	432.6	207.4	267.5	1032.0

LAB SAMPLE DATA - ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 1

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/9/2025

		Sample ID	Tare, mg	Final, mg	Catch, mg
Filters	A	G01237	246.0	253.2	7.2
	B	G01238	238.1	245.1	7.0
	C - 1st Hour	G01239	237.5	239.0	1.5
	Amb	G01240	238.4	238.4	0.0
Probes	A	7A	116559.2	116559.3	0.1
	B	7B	117129.8	117129.8	0.0
	C - 1st Hour	7C	116551.7	116551.7	0.0
O-rings	A	7A	3567.6	3567.7	0.1
	B	7B	3518.7	3518.9	0.2
	C - 1st Hour	7C	3400.2	3400.5	0.3

Placed in Dessicator on: 4/9/2025

Balance Audit (mg):

		200.0		200.0					
		Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time
Filters	A	253.4	4/16 10:30	253.2	4/18 15:00				
	B	245.2	4/16 10:30	245.1	4/18 15:00				
	C - 1st Hour	238.9	4/16 10:30	239.0	4/18 15:00				
	Amb	238.4	4/16 10:30	238.4	4/18 15:00				
Probes	A	116559.5	4/16 10:30	116559.3	4/18 15:00				
	B	117129.9	4/16 10:30	117129.8	4/18 15:00				
	C - 1st Hour	116551.8	4/16 10:30	116551.7	4/18 15:00				
O-Rings	A	3567.7	4/16 10:30	3567.7	4/18 15:00				
	B	3518.9	4/16 10:30	3518.9	4/18 15:00				
	C - 1st Hour	3400.4	4/16 10:30	3400.5	4/18 15:00				

Train A Aggregate, mg:	7.4
Train B Aggregate, mg:	7.2
Train C Aggregate, mg:	1.8
Ambient, mg:	0.0

ASTM E2780 Wood Heater Run Sheets

Client: HHT Job Number: 24-291 Tracking #: 220
Model: Dauntless-C Run Number: 1 Test Date: 4/9/2025

Wood Heater Run Notes

Test Control Settings

Primary Air Setting(s): 1 detent open from fully closed
Targeted Burn Category: II

Preburn Notes

Time	Notes
58:00 95:00	Stirred Coals PB End

Test Notes

Test Burn Start Time: 12:42 Test Fuel Loaded by: 30 seconds
Door Closed: 45 seconds Air Control Set at: 300 seconds
Other Loading Notes: Bypass closed @ 0:50, fan on medium @ 5:00

Time	Notes
	-None-

Test Burn End Time: 17:19

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO₂ (%): 17.32 CO (%): 4.350
Mid Gas CO₂ (%): 10.00 CO (%): 2.500

Calibration Results:

	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
Time	10:28	10:29	10:30	19:15	19:16	19:17
CO ₂	0.00	17.32	10.22	-0.02	17.25	10.16
CO	0.000	4.350	2.533	-0.046	4.289	2.489

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

Technician Signature: 

Date: 4/25/25

ASTM E2780 Wood Heater Run Sheets

Client: HHT
Model: Dauntless-C

Job Number: 24-291
Run Number: 1

Tracking #: 220
Test Date: 4/9/2025



Test Fuel Front/Side View



Test Fuel Iso View



Test Fuel Loaded in Stove



Air Setting

Technician Signature: _____

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

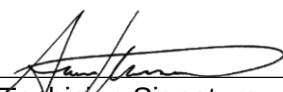
Date: 4/25/25

WOOD STOVE TEST DATA PACKET
ASTM E2780/E2515



Run 2 Data Summary

Client:	HHT
Model:	Dauntless-C
Job #:	24-291
Tracking #:	220
Test Date:	4/10/2025



Technician Signature

5/15/2025

Date

TEST RESULTS - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 2

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/10/2025

Burn Rate (kg/hr):	1.44
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	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft ³)	47.141	33.841	33.251	8.944
Average Gas Velocity in Dilution Tunnel (ft/sec)	18.3			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	12009.1			
Average Gas Meter Temperature (°F)	69.4	90.3	89.9	77.5
Total Sample Volume (dscf)	47.741	33.421	32.409	9.050
Average Tunnel Temperature (°F)	98.7			
Total Time of Test (min)	205			
Total Particulate Catch (mg)	0.0	4.7	4.6	0.9
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0001406	0.0001419	0.0000994
Total PM Emissions (g)	0.00	5.77	5.82	1.19
Particulate Emission Rate (g/hr)	0.00	1.69	1.70	1.19
Emissions Factor (g/kg)	-	1.17	1.18	-
Difference from Average Total Particulate Emissions (g)	-	0.03	0.03	-
Difference from Average Total Particulate Emissions (%)	-	0.5%	0.5%	-
Difference from Average Emissions Factor (g/kg)	-	0.01	0.01	-

Final Average Results	
Total Particulate Emissions (g)	5.80
Particulate Emission Rate (g/hr)	1.70
Emissions Factor (g/kg)	1.18
HHV Efficiency (%)	74.5%
LHV Efficiency (%)	80.6%
CO Emissions (g/min)	1.00

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	80.2	OK
Face Velocity	< 30 ft/min	9.4	OK
Leakage Rate	Less than 4% of average sample rate	0.001 cfm	OK
Ambient Temp	55-90 °F	Min:66.8/Max:70.9	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
Stove Surface ΔT	<126°F	101.6	OK

B415.1 Efficiency Results

Manufacturer: HHT
Model: Dauntless-C
Date: 04/10/25
Run: 2
Control #: 24-291
Test Duration: 205
Output Category: 3

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	74.5%	80.6%
Combustion Efficiency	97.1%	97.1%
Heat Transfer Efficiency	76.8%	83.0%

Output Rate (kJ/h)	20,387	19,340	(Btu/h)
Burn Rate (kg/h)	1.38	3.04	(lb/h)
Input (kJ/h)	27,349	25,943	(Btu/h)

Test Load Weight (dry kg)	4.72	10.40	dry lb
MC wet (%)	19.16		
MC dry (%)	23.70		
Particulate (g)	5.80		
CO (g)	205		
Test Duration (h)	3.42		

Emissions	Particulate	CO
g/MJ Output	0.08	2.94
g/kg Dry Fuel	1.23	43.49
g/h	1.70	60.03
g/min	0.03	1.00
lb/MM Btu Output	0.19	6.84

Air/Fuel Ratio (A/F)	13.25
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VERSION:

2.4

4/15/2010

WOODSTOVE FUEL DATA - ASTM E2780

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Preburn Fuel Information						
Size	Length (in)	Moisture Content (% DB)		Size	Length (in)	Moisture Content (% DB)
2x4	8.00	23.7		2x4	16.00	19.7
2x4	8.00	21.2		2x4	16.00	19.0
2x4	8.00	24.8		2x4	16.00	19.8
2x4	8.00	21.2		2x4	16.00	20.7
2x4	8.00	19.4		2x4	16.00	21.6
2x4	8.00	19.2				
2x4	8.00	25.0				
2x4	16.00	24.2				
Total Fuel Weight (lbs):		15.45	Average Moisture (%DB):		21.5	

Firebox Volume (ft³): 1.82
 Total 2x4 Crib Weight, with spacers (lbs): 5.36
 Total 4x4 Crib Weight, with spacers (lbs): 7.89
 Total Wet Fuel Weight, with spacers (lbs): 13.25

Coal Bed Range (20-25%):

Min (lbs): 2.65
 Max (lbs): 3.31

Test Fuel Information						
Size	Length (in)	Weight (lbs)	Moisture Content (%DB)			Dry Weight (lbs)
2x4	15.50	2.24	24.5	24.7	24.6	1.80
2x4	15.50	2.20	24.6	24.6	24.2	1.77
4x4	15.50	3.59	23.8	23.4	21.6	2.92
4x4	15.50	3.48	24.1	20.9	23.4	2.83
Total Dry Weight, no spacers (lbs):						9.32
Total Dry Weight, with spacers (lbs):						10.88

Spacer Moisture Readings (%DB)						
12.7	12.4					
11.6	12.2					
11.4	10.6					
12.3	11.3					
12.2						
12.0						
11.0						
11.1						

Quality Checks	Requirement	Observed	Result
Fuel Density	25 - 36 (lbs/ft ³ , DB)	29.7	OK
Loading Density	6.3 - 7.7 (lbs/ft ³ , WB)	7.28	OK
2x4 Fuel Mix	35 - 65 % of total weight	40%	OK

DILUTION TUNNEL & MISC. DATA - ASTM E2780 / E2515

Client: **HHT**
 Model: **Dauntless-C**
 Run #: **2**
 Test Start Time: **11:30**

Job #: **24-291**
 Tracking #: **220**
 Technician: **AK**
 Date: **4/10/2025**

Total Sampling Time (min): **205**
 Recording Interval (min): **1**

Meter Box γ Factor: **1.019** (A)
 Meter Box γ Factor: **1.005** (B)
 Meter Box γ Factor: **1.024** (C)
 Meter Box γ Factor: **1.012** (Ambient)

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	30.06	30.01	30.04
Relative Humidity (%)	21.9	35.5	
Room Air Velocity (ft/min)	<50	<50	
Pitot Tube Leak Check	0	0	
Ambient Sample Volume:		47.141	ft ³

Sample Train Leak Checks

	Pre-test	Post-test		
Induced Draft Check (in. H ₂ O):	0	(A) 0.000	cfm @	-6 in. Hg
Smoke Capture Check (%):	100%	(B) 0.000	cfm @	-6 in. Hg
Date Flue Pipe Last Cleaned:	4/5/2025	(C) 0.001	cfm @	-7 in. Hg
Test Fuel Scale Audit (lbs)	10.00	(Ambient) 0.000	cfm @	-13 in. Hg
Platform Scale Audit (lbs)	10.0			

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H ₂ O)	Temp (°F)
1	0.060	72
2	0.090	72
3	0.094	72
4	0.080	72
5	0.066	72
6	0.090	72
7	0.086	72
8	0.068	72
Center	0.080	72

Dilution Tunnel H₂O: **2.00** percent
 Tunnel Diameter: **6** inches
 Pitot Tube Cp: **0.99** [unitless]
 Dilution Tunnel MW(dry): **29.00** lb/lb-mole
 Dilution Tunnel MW(wet): **28.78** lb/lb-mole
 Tunnel Area: **0.1963** ft²

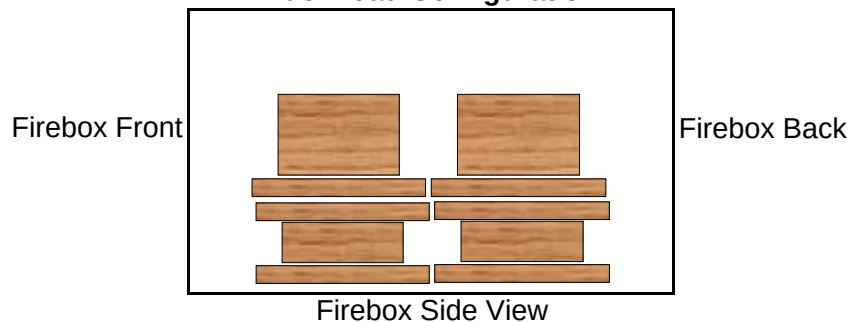
V_{strav}: **18.63** ft/sec
 V_{scent}: **18.78** ft/sec
 F_p: **0.992** [ratio]

Initial Tunnel Flow: **214.3** scf/min

Static Pressure: **-0.150** in. H₂O

TEST FUEL PROPERTIES

Fuel Load Configuration



Actual Fuel Used Properties

Fuel Type: **D. Fir**
 HHV (kJ/kg) **19,810**
 %C **48.73**
 %H **6.87**
 %O **43.9**
 %Ash **0.5**
 MC (%DB) **23.7**

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 2

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/10/2025

Recording Interval (min): 1
Run Time (min): 80

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
0	9.98	-0.075	191	313	185	531	195	283.1	416	64
1	9.83	-0.074	192	314	184	537	189	282.9	416	64
2	9.69	-0.075	193	314	182	542	189	284.0	415	64
3	9.52	-0.075	195	314	181	548	192	286.1	415	65
4	9.39	-0.075	195	315	180	553	193	287.3	416	65
5	9.23	-0.075	197	315	180	557	195	288.8	415	65
6	9.05	-0.074	198	315	180	562	190	288.8	414	65
7	8.86	-0.074	199	315	180	566	188	289.6	414	65
8	8.69	-0.074	201	315	180	572	195	292.5	416	65
9	8.51	-0.075	201	315	181	578	191	293.2	416	65
10	8.33	-0.074	202	315	181	583	190	294.0	416	65
11	8.17	-0.074	204	315	181	586	190	295.2	417	65
12	8.02	-0.074	205	315	182	589	188	295.8	418	65
13	7.89	-0.073	206	314	182	591	188	296.2	420	65
14	7.75	-0.073	207	314	182	594	190	297.5	420	65
15	7.60	-0.074	209	314	182	595	196	299.2	421	65
16	7.47	-0.075	211	313	182	596	193	299.1	422	65
17	7.34	-0.073	212	314	182	595	188	298.3	422	65
18	7.23	-0.074	212	313	182	597	193	299.4	421	65
19	7.11	-0.073	213	313	182	598	195	300.1	421	65
20	7.01	-0.073	214	313	182	600	192	300.3	421	65
21	6.89	-0.074	215	314	182	602	189	300.2	420	65
22	6.80	-0.073	214	313	182	605	194	301.5	419	65
23	6.72	-0.072	216	313	181	609	192	302.2	419	65
24	6.62	-0.074	218	313	180	613	197	304.2	418	65
25	6.53	-0.071	219	314	180	616	195	304.5	418	65
26	6.45	-0.070	219	314	179	618	197	305.0	416	65
27	6.35	-0.072	219	314	178	620	193	304.6	416	65
28	6.27	-0.070	220	314	177	622	192	305.0	415	65
29	6.18	-0.071	220	314	177	623	191	305.1	415	65
30	6.10	-0.071	220	315	176	625	194	305.8	415	65
31	6.01	-0.073	223	315	175	627	196	307.2	415	65
32	5.92	-0.072	223	315	175	630	198	308.3	416	65
33	5.83	-0.072	224	315	175	634	197	309.0	417	66
34	5.74	-0.071	224	315	175	637	195	309.3	417	65
35	5.65	-0.071	225	316	176	639	193	309.8	417	65
36	5.55	-0.074	224	316	176	647	195	311.6	417	65
37	5.45	-0.072	225	316	176	657	200	314.6	418	65
38	5.38	-0.072	225	317	176	665	202	316.9	418	65
39	5.28	-0.071	229	317	176	670	203	319.0	415	66
40	5.21	-0.071	229	319	176	673	207	320.7	413	65
41	5.15	-0.071	231	320	175	674	204	320.9	410	66
42	5.09	-0.069	232	322	175	678	206	322.6	407	66
43	5.03	-0.069	233	323	173	682	207	323.6	404	66
44	4.97	-0.069	233	325	172	683	209	324.4	400	65

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 2

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/10/2025

Recording Interval (min): 1
Run Time (min): 80

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
45	4.91	-0.067	236	326	171	680	208	324.1	397	65
46	4.86	-0.069	237	327	169	677	212	324.5	395	65
47	4.81	-0.065	239	330	168	676	210	324.4	393	66
48	4.76	-0.069	239	331	167	672	210	323.8	390	65
49	4.72	-0.067	240	332	165	667	211	323.0	387	65
50	4.67	-0.068	241	333	164	655	212	321.0	385	65
51	4.63	-0.065	240	334	163	644	210	318.1	382	65
52	4.58	-0.067	243	335	161	635	211	317.0	379	65
53	4.55	-0.066	242	336	160	628	211	315.5	377	66
54	4.51	-0.065	243	336	158	622	213	314.3	375	65
55	4.47	-0.066	244	336	157	615	214	313.3	374	65
56	4.38	-0.068	247	337	156	579	215	306.6	389	65
57	4.28	-0.069	246	337	156	577	215	306.2	393	65
58	4.21	-0.069	249	337	157	577	219	307.7	392	65
59	4.16	-0.069	248	337	159	573	219	307.3	392	66
60	4.11	-0.067	251	337	161	572	216	307.4	391	66
61	4.02	-0.068	254	337	185	569	223	313.5	389	66
62	3.98	-0.069	255	336	203	567	221	316.5	391	66
63	3.93	-0.068	255	337	220	566	222	320.0	392	66
64	3.89	-0.066	259	337	235	566	223	324.0	391	66
65	3.85	-0.067	261	336	249	566	224	327.1	391	65
66	3.81	-0.066	263	336	261	565	222	329.5	391	65
67	3.77	-0.066	266	336	272	564	227	333.1	391	65
68	3.72	-0.066	267	335	282	563	228	335.2	391	65
69	3.68	-0.067	269	335	291	563	227	336.9	391	66
70	3.64	-0.066	272	335	299	561	228	339.2	391	66
71	3.61	-0.067	274	335	305	561	232	341.3	390	66
72	3.58	-0.066	276	334	311	561	233	343.1	389	66
73	3.53	-0.066	279	335	317	560	232	344.5	389	66
74	3.50	-0.067	281	335	322	560	235	346.4	389	66
75	3.46	-0.068	282	335	325	558	238	347.7	388	66
76	3.42	-0.066	284	335	329	559	237	348.7	387	67
77	3.39	-0.067	288	335	332	558	240	350.6	388	66
78	3.36	-0.066	288	335	335	558	245	352.3	388	66
79	3.33	-0.066	292	336	337	558	242	352.8	389	66
80	3.30	-0.065	293	336	339	557	247	354.5	389	67

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 2Technician: AKDate: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.073	0.07	71	0.2		12.86		95	374	69	67
1	0.096	0.096	0.072	2.19	71	0.9	-	12.80	-0.06	95	383	70	67
2	0.243	0.147	0.073	2.24	70	0.9	-	12.70	-0.10	96	392	70	67
3	0.388	0.145	0.074	2.28	70	1.0	-	12.58	-0.12	96	399	71	67
4	0.536	0.148	0.075	2.30	71	1.0	-	12.48	-0.10	97	406	71	67
5	0.685	0.149	0.073	2.32	71	0.9	-	12.39	-0.09	98	411	71	67
6	0.835	0.150	0.075	2.34	71	1.0	-	12.26	-0.13	98	411	72	67
7	0.985	0.150	0.074	2.37	71	1.0	-	12.12	-0.14	98	414	72	67
8	1.136	0.151	0.074	2.38	71	0.9	-	11.99	-0.13	99	415	72	67
9	1.288	0.152	0.074	2.41	71	0.9	-	11.86	-0.13	98	414	72	67
10	1.441	0.153	0.074	2.42	71	0.9	90	11.75	-0.11	99	416	73	67
11	1.593	0.152	0.073	2.45	71	1.0	-	11.61	-0.14	98	413	73	67
12	1.748	0.155	0.074	2.47	72	1.0	-	11.50	-0.11	98	410	73	67
13	1.899	0.151	0.074	2.47	72	1.0	-	11.38	-0.12	99	409	73	67
14	2.055	0.156	0.074	2.47	72	1.0	-	11.26	-0.12	99	410	73	67
15	2.209	0.154	0.073	2.48	72	1.0	-	11.13	-0.13	98	411	73	68
16	2.368	0.159	0.073	2.52	73	0.9	-	11.00	-0.13	98	411	73	68
17	2.518	0.150	0.071	2.54	73	0.9	-	10.84	-0.16	99	410	74	68
18	2.676	0.158	0.074	2.55	73	1.0	-	10.72	-0.12	99	410	74	68
19	2.830	0.154	0.073	2.55	73	1.0	-	10.56	-0.16	99	413	74	68
20	2.987	0.157	0.074	2.55	74	1.0	96	10.41	-0.15	100	417	74	68
21	3.146	0.159	0.074	2.55	74	1.0	-	10.29	-0.12	99	416	74	68
22	3.300	0.154	0.073	2.56	75	1.0	-	10.18	-0.11	99	415	74	68
23	3.460	0.160	0.073	2.58	75	1.0	-	10.05	-0.13	99	413	74	68
24	3.616	0.156	0.074	2.60	75	1.0	-	9.94	-0.11	99	411	74	68
25	3.776	0.160	0.073	2.60	76	1.0	-	9.83	-0.11	99	413	75	68
26	3.932	0.156	0.073	2.61	76	1.0	-	9.66	-0.17	99	411	75	69
27	4.092	0.160	0.071	2.62	76	1.0	-	9.53	-0.13	99	410	75	68
28	4.252	0.160	0.074	2.62	77	1.0	-	9.47	-0.06	99	409	75	68
29	4.407	0.155	0.073	2.63	77	1.0	-	9.33	-0.14	99	409	75	68
30	4.571	0.164	0.075	2.64	77	1.0	98	9.22	-0.11	99	410	75	68
31	4.728	0.157	0.072	2.65	78	1.0	-	9.10	-0.12	99	412	75	69

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 2Technician: AKDate: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
32	4.891	0.163	0.072	2.66	78	1.0	-	8.99	-0.11	99	412	75	69
33	5.052	0.161	0.072	2.64	78	1.0	-	8.81	-0.18	99	413	75	69
34	5.207	0.155	0.073	2.65	79	1.0	-	8.73	-0.08	100	414	75	68
35	5.372	0.165	0.074	2.67	79	1.0	-	8.59	-0.14	100	416	75	69
36	5.530	0.158	0.074	2.68	79	1.0	-	8.44	-0.15	99	418	75	69
37	5.691	0.161	0.075	2.68	80	1.0	-	8.31	-0.13	100	418	76	69
38	5.853	0.162	0.073	2.68	80	1.0	-	8.22	-0.09	100	420	76	69
39	6.012	0.159	0.073	2.69	81	1.0	-	8.07	-0.15	99	421	76	69
40	6.178	0.166	0.073	2.69	81	1.0	99	7.92	-0.15	100	423	76	69
41	6.337	0.159	0.073	2.68	81	1.0	-	7.77	-0.15	99	424	76	69
42	6.497	0.160	0.074	2.70	82	1.0	-	7.70	-0.07	100	425	76	69
43	6.661	0.164	0.071	2.70	82	1.0	-	7.59	-0.11	100	427	76	69
44	6.821	0.160	0.074	2.69	82	1.0	-	7.46	-0.13	101	430	76	69
45	6.983	0.162	0.073	2.71	82	1.0	-	7.31	-0.15	101	431	76	69
46	7.148	0.165	0.074	2.71	83	1.0	-	7.18	-0.13	101	431	76	69
47	7.306	0.158	0.074	2.71	83	1.0	-	7.06	-0.12	101	431	76	69
48	7.472	0.166	0.074	2.72	83	1.0	-	6.94	-0.12	101	429	76	69
49	7.633	0.161	0.075	2.72	84	1.0	-	6.86	-0.08	101	428	76	69
50	7.795	0.162	0.073	2.73	84	1.0	100	6.74	-0.12	102	428	76	69
51	7.961	0.166	0.075	2.73	84	1.0	-	6.65	-0.09	102	428	76	69
52	8.121	0.160	0.074	2.73	85	1.0	-	6.57	-0.08	102	427	77	70
53	8.285	0.164	0.074	2.73	85	1.0	-	6.49	-0.08	103	427	77	70
54	8.450	0.165	0.074	2.74	85	1.0	-	6.36	-0.13	103	427	77	70
55	8.612	0.162	0.073	2.74	85	1.0	-	6.23	-0.13	103	429	77	69
56	8.779	0.167	0.073	2.74	86	1.0	-	6.11	-0.12	103	429	77	70
57	8.942	0.163	0.075	2.73	86	1.0	-	6.00	-0.11	103	428	77	70
58	9.102	0.160	0.074	2.74	86	1.0	-	5.90	-0.10	103	428	77	70
59	9.270	0.168	0.074	2.76	87	1.0	-	5.80	-0.10	103	429	77	70
60	9.432	0.162	0.074	2.76	87	1.0	100	5.72	-0.08	104	430	77	70
61	9.595	0.163	0.073	2.76	87	1.0	-	5.65	-0.07	104	429	77	70
62	9.763	0.168	0.071	2.76	87	1.0	-	5.53	-0.12	104	428	77	70
63	9.924	0.161	0.074	2.77	88	1.0	-	5.44	-0.09	104	425	77	70

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 2Technician: AKDate: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
64	10.090	0.166	0.073	2.76	88	1.0	-	5.30	-0.14	104	423	77	70
65	10.255	0.165	0.073	2.76	88	1.0	-	5.21	-0.09	104	422	77	70
66	10.418	0.163	0.073	2.77	88	1.0	-	5.11	-0.10	104	422	78	70
67	10.584	0.166	0.073	2.77	88	1.0	-	5.01	-0.10	104	422	78	70
68	10.750	0.166	0.074	2.77	89	1.0	-	4.91	-0.10	104	420	78	70
69	10.913	0.163	0.072	2.77	89	1.0	-	4.83	-0.08	103	419	78	70
70	11.079	0.166	0.074	2.77	89	1.0	100	4.77	-0.06	104	417	78	70
71	11.246	0.167	0.074	2.77	89	1.0	-	4.69	-0.08	104	415	78	70
72	11.412	0.166	0.073	2.77	90	1.0	-	4.65	-0.04	104	414	78	70
73	11.577	0.165	0.074	2.78	90	1.0	-	4.59	-0.06	104	411	78	70
74	11.743	0.166	0.073	2.79	90	1.0	-	4.51	-0.08	104	408	78	70
75	11.905	0.162	0.073	2.77	90	1.0	-	4.44	-0.07	104	407	78	70
76	12.072	0.167	0.074	2.78	90	1.0	-	4.37	-0.07	104	405	78	70
77	12.239	0.167	0.072	2.78	91	1.0	-	4.32	-0.05	104	402	78	70
78	12.402	0.163	0.073	2.78	91	1.0	-	4.23	-0.09	103	400	78	70
79	12.570	0.168	0.074	2.79	91	1.0	-	4.21	-0.02	103	398	78	70
80	12.740	0.170	0.073	2.79	91	1.0	101	4.14	-0.07	103	397	78	71
81	12.903	0.163	0.073	2.79	91	1.0	-	4.09	-0.05	104	396	78	70
82	13.069	0.166	0.072	2.80	91	1.0	-	4.00	-0.09	104	395	78	70
83	13.236	0.167	0.074	2.79	92	1.0	-	3.94	-0.06	103	393	78	71
84	13.399	0.163	0.073	2.79	92	1.0	-	3.91	-0.03	103	390	78	71
85	13.568	0.169	0.074	2.80	92	1.0	-	3.84	-0.07	103	388	78	70
86	13.735	0.167	0.074	2.80	92	1.0	-	3.78	-0.06	103	386	78	71
87	13.898	0.163	0.074	2.80	92	1.0	-	3.75	-0.03	102	384	78	70
88	14.068	0.170	0.073	2.81	92	1.0	-	3.70	-0.05	103	382	78	71
89	14.235	0.167	0.074	2.80	93	1.0	-	3.66	-0.04	103	380	79	70
90	14.399	0.164	0.073	2.80	93	1.0	101	3.57	-0.09	102	378	78	70
91	14.568	0.169	0.075	2.81	93	1.0	-	3.53	-0.04	102	376	78	70
92	14.736	0.168	0.072	2.81	93	1.0	-	3.49	-0.04	102	374	78	70
93	14.899	0.163	0.072	2.79	93	1.0	-	3.42	-0.07	102	371	79	70
94	15.069	0.170	0.075	2.81	93	1.0	-	3.37	-0.05	102	369	79	71
95	15.237	0.168	0.072	2.81	93	1.0	-	3.32	-0.05	101	367	79	71

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 2Technician: AKDate: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
96	15.401	0.164	0.072	2.81	94	1.0	-	3.30	-0.02	101	365	79	71
97	15.570	0.169	0.072	2.81	94	1.0	-	3.27	-0.03	101	363	79	71
98	15.740	0.170	0.074	2.82	94	1.0	-	3.21	-0.06	102	361	79	71
99	15.903	0.163	0.074	2.81	94	1.0	-	3.16	-0.05	102	359	79	70
100	16.072	0.169	0.073	2.83	94	1.0	101	3.12	-0.04	101	357	79	70
101	16.243	0.171	0.074	2.81	94	1.0	-	3.08	-0.04	101	355	79	71
102	16.409	0.166	0.071	2.81	94	1.0	-	3.02	-0.06	101	353	79	71
103	16.574	0.165	0.074	2.82	94	1.0	-	2.97	-0.05	101	351	79	71
104	16.743	0.169	0.074	2.82	95	1.0	-	2.92	-0.05	100	349	78	71
105	16.910	0.167	0.072	2.82	95	1.0	-	2.87	-0.05	100	349	78	70
106	17.078	0.168	0.074	2.82	95	1.0	-	2.84	-0.03	100	348	78	71
107	17.247	0.169	0.071	2.83	95	1.0	-	2.80	-0.04	100	346	78	71
108	17.413	0.166	0.073	2.83	95	1.0	-	2.75	-0.05	100	346	79	71
109	17.582	0.169	0.073	2.83	95	1.0	-	2.70	-0.05	100	344	79	70
110	17.751	0.169	0.073	2.81	95	1.0	101	2.65	-0.05	100	342	79	71
111	17.916	0.165	0.073	2.82	95	1.0	-	2.60	-0.05	99	343	79	71
112	18.086	0.170	0.074	2.83	95	1.0	-	2.57	-0.03	100	343	79	71
113	18.256	0.170	0.073	2.83	96	1.0	-	2.52	-0.05	100	342	79	71
114	18.421	0.165	0.073	2.83	96	1.0	-	2.46	-0.06	100	341	79	70
115	18.589	0.168	0.073	2.82	96	1.0	-	2.40	-0.06	99	340	79	70
116	18.760	0.171	0.075	2.83	96	1.0	-	2.37	-0.03	99	339	79	70
117	18.927	0.167	0.073	2.83	96	1.0	-	2.31	-0.06	99	339	79	71
118	19.093	0.166	0.073	2.82	96	1.1	-	2.27	-0.04	99	339	79	71
119	19.265	0.172	0.073	2.83	96	1.0	-	2.19	-0.08	99	338	79	70
120	19.433	0.168	0.074	2.83	96	1.0	101	2.13	-0.06	99	338	79	70
121	19.598	0.165	0.074	2.84	96	1.0	-	2.06	-0.07	99	337	79	70
122	19.769	0.171	0.073	2.84	96	1.0	-	2.00	-0.06	99	337	79	70
123	19.939	0.170	0.073	2.83	96	1.0	-	1.96	-0.04	99	337	79	70
124	20.105	0.166	0.074	2.83	97	1.0	-	1.91	-0.05	99	337	79	71
125	20.274	0.169	0.073	2.84	97	1.0	-	1.86	-0.05	100	336	79	71
126	20.445	0.171	0.074	2.85	97	1.0	-	1.80	-0.06	99	334	79	71
127	20.613	0.168	0.072	2.84	97	1.0	-	1.75	-0.05	99	333	79	71

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 2Technician: AKDate: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
128	20.783	0.170	0.074	2.83	97	1.0	-	1.75	0.00	98	331	78	71
129	20.951	0.168	0.073	2.85	97	1.0	-	1.72	-0.03	98	332	78	71
130	21.117	0.166	0.073	2.85	97	1.0	101	1.66	-0.06	98	331	78	71
131	21.286	0.169	0.073	2.85	97	1.0	-	1.64	-0.02	98	330	78	71
132	21.458	0.172	0.072	2.84	97	1.0	-	1.60	-0.04	98	328	78	71
133	21.625	0.167	0.072	2.84	97	1.0	-	1.59	-0.01	98	327	78	71
134	21.792	0.167	0.072	2.84	97	1.0	-	1.53	-0.06	98	326	78	71
135	21.963	0.171	0.072	2.84	97	1.0	-	1.51	-0.02	98	325	78	70
136	22.133	0.170	0.074	2.85	97	1.0	-	1.48	-0.03	98	324	78	70
137	22.299	0.166	0.073	2.84	97	1.0	-	1.46	-0.02	98	324	79	71
138	22.469	0.170	0.074	2.85	97	1.0	-	1.42	-0.04	98	323	78	71
139	22.639	0.170	0.073	2.85	97	1.0	-	1.40	-0.02	98	322	79	70
140	22.808	0.169	0.074	2.84	98	1.0	101	1.37	-0.03	98	322	79	70
141	22.977	0.169	0.072	2.84	98	1.0	-	1.35	-0.02	98	321	79	70
142	23.147	0.170	0.072	2.85	98	1.0	-	1.32	-0.03	98	320	78	70
143	23.317	0.170	0.074	2.85	98	1.0	-	1.30	-0.02	98	319	78	70
144	23.486	0.169	0.073	2.85	98	1.0	-	1.27	-0.03	98	317	78	70
145	23.658	0.172	0.073	2.85	98	1.0	-	1.24	-0.03	98	317	78	70
146	23.824	0.166	0.073	2.83	98	1.0	-	1.24	0.00	98	315	78	70
147	23.990	0.166	0.073	2.85	98	1.0	-	1.20	-0.04	98	314	78	70
148	24.162	0.172	0.075	2.85	98	1.0	-	1.18	-0.02	98	312	78	70
149	24.333	0.171	0.073	2.84	98	1.0	-	1.16	-0.02	98	312	78	70
150	24.499	0.166	0.073	2.85	98	1.0	101	1.15	-0.01	98	311	78	70
151	24.669	0.170	0.074	2.85	98	1.0	-	1.12	-0.03	97	310	78	70
152	24.840	0.171	0.074	2.86	98	1.0	-	1.09	-0.03	97	308	78	70
153	25.008	0.168	0.073	2.85	98	1.0	-	1.07	-0.02	97	308	78	70
154	25.178	0.170	0.073	2.84	98	1.0	-	1.06	-0.01	97	306	78	70
155	25.349	0.171	0.073	2.85	98	1.0	-	1.04	-0.02	97	306	78	70
156	25.516	0.167	0.073	2.86	98	1.0	-	1.01	-0.03	97	305	78	70
157	25.684	0.168	0.074	2.85	98	1.0	-	0.97	-0.04	97	303	78	70
158	25.858	0.174	0.073	2.85	98	1.0	-	0.99	0.02	97	303	78	70
159	26.027	0.169	0.073	2.85	98	1.0	-	0.96	-0.03	97	302	78	70

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 2Technician: AKDate: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
160	26.196	0.169	0.074	2.84	98	1.0	101	0.95	-0.01	97	301	78	70
161	26.367	0.171	0.073	2.85	98	1.0	-	0.93	-0.02	96	300	78	70
162	26.538	0.171	0.073	2.86	98	1.0	-	0.90	-0.03	96	300	78	70
163	26.704	0.166	0.073	2.85	98	1.0	-	0.87	-0.03	96	298	78	69
164	26.874	0.170	0.073	2.86	98	1.0	-	0.87	0.00	96	298	78	69
165	27.045	0.171	0.073	2.85	98	1.0	-	0.85	-0.02	96	297	78	69
166	27.213	0.168	0.073	2.86	98	1.0	-	0.83	-0.02	96	296	78	69
167	27.382	0.169	0.073	2.87	98	1.0	-	0.81	-0.02	96	295	78	70
168	27.554	0.172	0.072	2.86	98	1.0	-	0.78	-0.03	96	293	78	69
169	27.723	0.169	0.074	2.86	98	1.0	-	0.74	-0.04	96	290	78	69
170	27.889	0.166	0.073	2.85	98	1.0	101	0.71	-0.03	96	289	78	69
171	28.064	0.175	0.074	2.86	99	1.0	-	0.69	-0.02	96	287	78	69
172	28.235	0.171	0.073	2.86	99	1.0	-	0.67	-0.02	95	286	78	69
173	28.400	0.165	0.073	2.86	99	1.0	-	0.64	-0.03	95	285	78	69
174	28.571	0.171	0.072	2.86	99	1.0	-	0.63	-0.01	95	284	78	69
175	28.741	0.170	0.073	2.86	99	1.1	-	0.60	-0.03	95	283	78	69
176	28.908	0.167	0.072	2.86	99	1.0	-	0.57	-0.03	95	282	78	69
177	29.079	0.171	0.074	2.86	99	1.0	-	0.55	-0.02	95	281	78	69
178	29.251	0.172	0.073	2.86	99	1.0	-	0.52	-0.03	95	280	78	69
179	29.420	0.169	0.073	2.86	99	1.0	-	0.50	-0.02	95	280	78	69
180	29.590	0.170	0.073	2.85	99	1.0	101	0.48	-0.02	94	279	78	69
181	29.762	0.172	0.074	2.87	99	1.0	-	0.46	-0.02	94	278	78	69
182	29.931	0.169	0.073	2.86	99	1.0	-	0.43	-0.03	94	277	78	69
183	30.098	0.167	0.075	2.86	99	1.0	-	0.41	-0.02	94	276	78	69
184	30.269	0.171	0.073	2.86	99	1.0	-	0.39	-0.02	94	276	78	69
185	30.440	0.171	0.074	2.86	99	1.0	-	0.36	-0.03	94	275	78	69
186	30.607	0.167	0.075	2.87	99	1.0	-	0.37	0.01	93	274	78	69
187	30.778	0.171	0.073	2.86	99	1.1	-	0.34	-0.03	93	275	78	69
188	30.951	0.173	0.072	2.86	99	1.0	-	0.32	-0.02	93	274	78	69
189	31.119	0.168	0.073	2.86	99	1.1	-	0.30	-0.02	93	274	78	69
190	31.286	0.167	0.072	2.85	99	1.0	101	0.29	-0.01	93	273	78	69
191	31.459	0.173	0.074	2.86	99	1.0	-	0.26	-0.03	93	272	77	69

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
192	31.630	0.171	0.074	2.86	99	1.0	-	0.23	-0.03	93	271	77	69
193	31.798	0.168	0.074	2.85	99	1.0	-	0.22	-0.01	93	271	77	69
194	31.969	0.171	0.074	2.86	99	1.0	-	0.19	-0.03	92	270	77	69
195	32.140	0.171	0.073	2.87	99	1.0	-	0.18	-0.01	92	270	77	69
196	32.310	0.170	0.072	2.87	99	1.0	-	0.17	-0.01	92	269	77	69
197	32.480	0.170	0.073	2.86	99	1.0	-	0.14	-0.03	92	268	77	69
198	32.651	0.171	0.074	2.86	99	1.0	-	0.12	-0.02	92	267	77	69
199	32.820	0.169	0.073	2.86	99	1.0	-	0.10	-0.02	92	267	77	69
200	32.987	0.167	0.075	2.86	99	1.0	101	0.09	-0.01	92	266	77	69
201	33.160	0.173	0.073	2.88	99	1.0	-	0.07	-0.02	91	266	77	68
202	33.330	0.170	0.072	2.87	99	1.0	-	0.06	-0.01	91	266	77	68
203	33.499	0.169	0.074	2.86	99	1.0	-	0.04	-0.02	91	266	77	68
204	33.672	0.173	0.072	2.86	99	1.0	-	0.03	-0.01	91	265	77	69
205	33.841	0.169	0.074	2.87	99	1.0	101	0.00	-0.03	91	264	77	69
Avg/Tot	33.841	0.165	0.073	2.75	90.3	1.0	100			98.7	356.6	77.0	69.4

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
0	0.000		0.08	70	1.3		71	-0.065	10.90	0.140
1	0.109	0.109	2.58	70	1.8	-	72	-0.071	9.88	0.025
2	0.262	0.153	2.58	70	2.0	-	73	-0.071	11.62	0.483
3	0.421	0.159	2.58	70	2.0	-	73	-0.073	11.43	0.111
4	0.575	0.154	2.59	70	2.0	-	74	-0.073	11.60	0.159
5	0.733	0.158	2.58	70	1.9	-	74	-0.077	11.79	0.154
6	0.887	0.154	2.58	70	2.0	-	74	-0.074	11.71	0.155
7	1.045	0.158	2.59	71	1.7	-	74	-0.074	11.85	0.209
8	1.202	0.157	2.59	71	2.0	-	75	-0.074	12.38	0.589
9	1.356	0.154	2.59	71	2.0	-	75	-0.075	11.81	0.573
10	1.516	0.160	2.60	71	1.9	97	75	-0.075	11.39	0.634
11	1.670	0.154	2.59	71	1.8	-	75	-0.075	11.41	0.725
12	1.827	0.157	2.59	71	1.6	-	75	-0.072	10.76	0.504
13	1.985	0.158	2.60	72	2.1	-	75	-0.075	11.37	0.419
14	2.141	0.156	2.60	72	1.5	-	76	-0.073	11.63	0.382
15	2.302	0.161	2.60	72	1.7	-	76	-0.073	11.88	0.463
16	2.457	0.155	2.59	72	1.7	-	76	-0.075	11.98	0.504
17	2.613	0.156	2.60	73	1.8	-	76	-0.072	11.94	0.530
18	2.768	0.155	2.59	73	1.7	-	76	-0.073	11.84	0.640
19	2.927	0.159	2.60	73	1.6	-	76	-0.074	12.29	1.845
20	3.085	0.158	2.60	74	2.0	99	76	-0.072	12.36	1.762
21	3.239	0.154	2.60	74	1.9	-	76	-0.071	12.12	1.084
22	3.400	0.161	2.60	74	1.9	-	76	-0.072	11.77	0.909
23	3.555	0.155	2.60	75	1.6	-	76	-0.071	11.46	0.739
24	3.714	0.159	2.61	75	2.1	-	76	-0.071	11.39	0.597
25	3.873	0.159	2.61	75	2.0	-	77	-0.071	11.54	0.617
26	4.029	0.156	2.61	76	1.5	-	77	-0.071	11.63	0.633
27	4.190	0.161	2.62	76	1.7	-	77	-0.071	11.72	0.602
28	4.346	0.156	2.62	76	2.1	-	77	-0.070	11.66	0.451
29	4.504	0.158	2.61	77	2.1	-	77	-0.071	11.77	0.395
30	4.664	0.160	2.62	77	2.0	99	77	-0.071	11.79	0.407
31	4.821	0.157	2.62	77	1.6	-	77	-0.071	12.05	0.435

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
32	4.985	0.164	2.62	78	1.6	-	77	-0.070	12.20	0.525
33	5.141	0.156	2.62	78	2.1	-	77	-0.069	12.29	0.511
34	5.298	0.157	2.62	78	2.0	-	77	-0.070	12.32	0.493
35	5.458	0.160	2.63	79	1.9	-	77	-0.072	12.41	0.582
36	5.615	0.157	2.62	79	1.7	-	77	-0.072	12.50	0.667
37	5.777	0.162	2.63	79	1.8	-	77	-0.071	12.45	0.809
38	5.934	0.157	2.62	80	1.6	-	77	-0.073	12.61	0.872
39	6.095	0.161	2.63	80	1.7	-	77	-0.071	12.81	1.042
40	6.257	0.162	2.63	80	1.9	100	77	-0.072	12.87	1.351
41	6.412	0.155	2.62	81	2.1	-	77	-0.070	12.80	1.524
42	6.575	0.163	2.63	81	1.9	-	77	-0.072	12.80	1.523
43	6.732	0.157	2.63	81	1.7	-	78	-0.073	12.80	1.409
44	6.893	0.161	2.64	82	2.1	-	78	-0.073	12.89	1.088
45	7.054	0.161	2.64	82	2.1	-	78	-0.071	12.91	0.796
46	7.212	0.158	2.63	82	1.6	-	78	-0.072	12.88	0.624
47	7.373	0.161	2.63	83	1.8	-	78	-0.073	12.82	0.489
48	7.533	0.160	2.64	83	1.7	-	78	-0.072	12.67	0.316
49	7.693	0.160	2.64	83	1.7	-	78	-0.069	12.54	0.207
50	7.855	0.162	2.64	83	2.0	100	78	-0.072	12.49	0.182
51	8.013	0.158	2.64	84	1.6	-	78	-0.070	12.53	0.185
52	8.175	0.162	2.64	84	1.9	-	78	-0.071	12.53	0.174
53	8.337	0.162	2.65	84	1.7	-	79	-0.070	12.50	0.149
54	8.495	0.158	2.64	84	1.6	-	79	-0.071	12.54	0.123
55	8.659	0.164	2.65	85	1.6	-	79	-0.070	12.47	0.096
56	8.821	0.162	2.64	85	1.7	-	79	-0.072	12.49	0.115
57	8.979	0.158	2.65	85	2.0	-	79	-0.071	12.43	0.098
58	9.141	0.162	2.64	86	2.0	-	79	-0.069	12.39	0.087
59	9.301	0.160	2.66	86	1.6	-	79	-0.070	12.58	0.134
60	9.462	0.161	2.64	86	1.7	100	79	-0.070	12.69	0.198
61	9.625	0.163	2.65	86	1.7	-	79	-0.070	12.74	0.250
62	9.784	0.159	2.65	87	1.6	-	79	-0.071	12.75	0.314
63	9.948	0.164	2.66	87	1.6	-	79	-0.069	12.60	0.284

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
64	10.107	0.159	2.66	87	1.6	-	79	-0.070	12.33	0.255
65	10.270	0.163	2.66	87	2.0	-	79	-0.069	12.22	0.122
66	10.433	0.163	2.66	88	1.9	-	80	-0.070	12.11	0.079
67	10.592	0.159	2.66	88	1.6	-	80	-0.068	12.06	0.061
68	10.755	0.163	2.66	88	1.7	-	80	-0.068	11.91	0.041
69	10.917	0.162	2.66	88	1.6	-	80	-0.069	11.59	0.027
70	11.078	0.161	2.66	89	1.6	100	80	-0.069	11.10	0.026
71	11.241	0.163	2.66	89	1.6	-	80	-0.070	10.69	0.037
72	11.406	0.165	2.65	89	1.7	-	80	-0.068	10.40	0.034
73	11.566	0.160	2.65	89	1.7	-	80	-0.068	10.17	0.053
74	11.728	0.162	2.66	89	1.7	-	80	-0.068	10.00	0.047
75	11.888	0.160	2.66	90	2.1	-	80	-0.069	9.78	0.043
76	12.052	0.164	2.67	90	1.8	-	80	-0.067	9.59	0.057
77	12.214	0.162	2.66	90	2.0	-	80	-0.068	9.51	0.088
78	12.376	0.162	2.67	90	2.1	-	80	-0.067	9.48	0.106
79	12.539	0.163	2.67	90	1.6	-	80	-0.067	9.65	0.069
80	12.705	0.166	2.67	90	2.0	101	80	-0.066	9.42	0.084
81	12.866	0.161	2.67	91	1.7	-	80	-0.066	9.19	0.131
82	13.027	0.161	2.67	91	1.7	-	80	-0.066	9.01	0.162
83	13.190	0.163	2.66	91	1.7	-	80	-0.067	8.63	0.249
84	13.350	0.160	2.66	91	2.0	-	80	-0.064	8.55	0.265
85	13.517	0.167	2.67	91	1.6	-	80	-0.066	8.44	0.280
86	13.677	0.160	2.68	92	1.9	-	80	-0.065	8.34	0.280
87	13.840	0.163	2.67	92	2.1	-	80	-0.065	8.23	0.297
88	14.005	0.165	2.67	92	1.6	-	80	-0.064	8.26	0.316
89	14.166	0.161	2.67	92	2.1	-	80	-0.065	8.17	0.330
90	14.330	0.164	2.67	92	1.6	100	80	-0.064	8.12	0.335
91	14.493	0.163	2.66	92	2.1	-	80	-0.063	8.03	0.335
92	14.655	0.162	2.68	92	1.6	-	80	-0.064	7.95	0.332
93	14.819	0.164	2.67	93	2.0	-	80	-0.063	7.93	0.328
94	14.982	0.163	2.68	93	1.7	-	80	-0.063	7.91	0.323
95	15.144	0.162	2.68	93	1.8	-	80	-0.062	7.90	0.321

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
96	15.309	0.165	2.67	93	2.0	-	80	-0.063	7.86	0.327
97	15.473	0.164	2.68	93	1.9	-	80	-0.062	7.73	0.334
98	15.634	0.161	2.67	93	1.9	-	80	-0.064	7.73	0.329
99	15.799	0.165	2.68	93	2.0	-	80	-0.061	7.81	0.334
100	15.963	0.164	2.68	94	1.8	101	80	-0.062	7.84	0.332
101	16.127	0.164	2.67	94	2.1	-	80	-0.061	7.79	0.329
102	16.293	0.166	2.69	94	1.9	-	80	-0.060	7.77	0.332
103	16.452	0.159	2.68	94	2.1	-	80	-0.061	7.80	0.336
104	16.616	0.164	2.68	94	1.7	-	80	-0.061	7.80	0.334
105	16.782	0.166	2.68	94	2.1	-	80	-0.060	7.79	0.338
106	16.943	0.161	2.68	94	1.9	-	80	-0.060	7.78	0.341
107	17.108	0.165	2.68	94	2.1	-	80	-0.060	7.79	0.336
108	17.272	0.164	2.69	94	1.7	-	80	-0.059	7.78	0.336
109	17.434	0.162	2.68	95	1.7	-	80	-0.060	7.83	0.344
110	17.599	0.165	2.69	95	1.9	100	80	-0.060	7.87	0.346
111	17.763	0.164	2.69	95	1.7	-	80	-0.060	7.91	0.347
112	17.926	0.163	2.68	95	1.8	-	80	-0.060	7.91	0.365
113	18.091	0.165	2.68	95	2.1	-	80	-0.059	7.91	0.375
114	18.255	0.164	2.69	95	1.8	-	80	-0.059	7.97	0.384
115	18.418	0.163	2.68	95	1.6	-	80	-0.060	8.04	0.382
116	18.582	0.164	2.68	95	1.6	-	80	-0.059	8.24	0.357
117	18.748	0.166	2.69	95	1.6	-	80	-0.057	8.36	0.360
118	18.910	0.162	2.68	95	1.6	-	80	-0.060	8.45	0.358
119	19.075	0.165	2.68	96	1.7	-	80	-0.058	8.54	0.358
120	19.240	0.165	2.69	96	1.8	100	80	-0.059	8.63	0.363
121	19.401	0.161	2.69	96	2.1	-	80	-0.059	8.98	0.342
122	19.567	0.166	2.68	96	2.0	-	80	-0.057	9.03	0.328
123	19.731	0.164	2.69	96	1.6	-	80	-0.060	9.09	0.326
124	19.894	0.163	2.68	96	2.0	-	80	-0.058	9.04	0.335
125	20.061	0.167	2.69	96	1.7	-	80	-0.059	8.93	0.326
126	20.223	0.162	2.69	96	1.6	-	80	-0.056	8.46	0.318
127	20.389	0.166	2.68	96	2.0	-	80	-0.061	7.92	0.325

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
128	20.556	0.167	2.69	96	1.6	-	79	-0.057	7.70	0.345
129	20.716	0.160	2.69	96	1.9	-	80	-0.059	7.58	0.362
130	20.880	0.164	2.69	96	2.1	100	80	-0.058	7.36	0.388
131	21.046	0.166	2.69	96	2.0	-	80	-0.057	7.18	0.385
132	21.208	0.162	2.69	96	1.6	-	80	-0.056	7.03	0.377
133	21.373	0.165	2.69	97	1.6	-	80	-0.056	6.95	0.373
134	21.540	0.167	2.70	97	2.1	-	80	-0.056	6.85	0.366
135	21.701	0.161	2.69	97	1.6	-	80	-0.056	6.75	0.371
136	21.868	0.167	2.69	97	2.0	-	80	-0.056	6.74	0.371
137	22.033	0.165	2.69	97	2.1	-	80	-0.057	6.70	0.374
138	22.195	0.162	2.69	97	1.7	-	80	-0.054	6.70	0.388
139	22.361	0.166	2.69	97	1.6	-	80	-0.055	6.68	0.385
140	22.526	0.165	2.69	97	1.6	100	80	-0.057	6.69	0.385
141	22.688	0.162	2.69	97	1.6	-	80	-0.058	6.64	0.387
142	22.855	0.167	2.69	97	1.6	-	80	-0.054	6.66	0.372
143	23.023	0.168	2.69	97	2.1	-	80	-0.056	6.56	0.378
144	23.185	0.162	2.69	97	1.6	-	80	-0.053	6.48	0.382
145	23.351	0.166	2.69	97	1.7	-	80	-0.055	6.43	0.382
146	23.513	0.162	2.69	97	1.9	-	80	-0.055	6.33	0.388
147	23.677	0.164	2.70	97	1.9	-	79	-0.052	6.21	0.388
148	23.843	0.166	2.69	97	2.1	-	80	-0.054	6.13	0.382
149	24.008	0.165	2.70	97	2.0	-	79	-0.054	6.06	0.388
150	24.171	0.163	2.70	98	1.7	100	79	-0.053	5.98	0.428
151	24.337	0.166	2.69	98	2.1	-	79	-0.053	5.94	0.430
152	24.502	0.165	2.70	98	1.6	-	79	-0.056	5.85	0.436
153	24.666	0.164	2.70	98	2.0	-	79	-0.052	5.82	0.446
154	24.832	0.166	2.69	98	1.8	-	79	-0.053	5.80	0.447
155	24.997	0.165	2.70	98	1.6	-	79	-0.053	5.72	0.445
156	25.160	0.163	2.69	98	2.0	-	79	-0.053	5.71	0.448
157	25.326	0.166	2.69	98	1.7	-	79	-0.051	5.63	0.443
158	25.491	0.165	2.70	98	2.1	-	79	-0.052	5.58	0.447
159	25.655	0.164	2.69	98	2.1	-	79	-0.052	5.52	0.449

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
160	25.824	0.169	2.69	98	1.6	100	79	-0.053	5.51	0.456
161	25.989	0.165	2.70	98	1.5	-	79	-0.052	5.51	0.461
162	26.153	0.164	2.70	98	1.7	-	79	-0.052	5.46	0.457
163	26.315	0.162	2.70	98	2.1	-	79	-0.053	5.45	0.462
164	26.481	0.166	2.70	98	1.7	-	79	-0.053	5.43	0.457
165	26.645	0.164	2.70	98	2.1	-	79	-0.051	5.43	0.450
166	26.810	0.165	2.69	98	1.6	-	79	-0.053	5.38	0.451
167	26.976	0.166	2.70	98	2.0	-	79	-0.051	5.54	0.451
168	27.140	0.164	2.70	98	1.6	-	79	-0.049	5.46	0.461
169	27.305	0.165	2.70	98	1.9	-	79	-0.051	6.50	0.322
170	27.471	0.166	2.70	98	1.6	100	79	-0.050	6.51	0.295
171	27.637	0.166	2.70	98	1.6	-	79	-0.050	6.41	0.290
172	27.803	0.166	2.70	98	1.7	-	79	-0.051	6.34	0.289
173	27.967	0.164	2.71	98	1.8	-	79	-0.049	6.28	0.288
174	28.130	0.163	2.70	98	2.1	-	79	-0.050	6.30	0.293
175	28.296	0.166	2.70	98	2.1	-	79	-0.048	6.31	0.297
176	28.462	0.166	2.71	98	1.8	-	79	-0.050	6.26	0.299
177	28.625	0.163	2.70	98	2.0	-	79	-0.049	6.20	0.302
178	28.791	0.166	2.71	98	2.0	-	79	-0.049	6.18	0.307
179	28.957	0.166	2.70	98	2.1	-	79	-0.050	6.13	0.312
180	29.123	0.166	2.70	98	2.0	100	79	-0.049	6.15	0.311
181	29.289	0.166	2.70	98	2.1	-	79	-0.050	6.08	0.310
182	29.453	0.164	2.71	98	1.6	-	79	-0.048	6.06	0.316
183	29.615	0.162	2.71	98	1.6	-	78	-0.049	6.05	0.318
184	29.782	0.167	2.71	98	2.0	-	78	-0.046	6.12	0.319
185	29.948	0.166	2.70	98	2.1	-	78	-0.048	6.13	0.316
186	30.111	0.163	2.70	99	1.6	-	78	-0.049	6.10	0.314
187	30.278	0.167	2.70	98	1.6	-	78	-0.049	6.07	0.317
188	30.444	0.166	2.71	99	1.8	-	78	-0.051	6.04	0.319
189	30.606	0.162	2.70	99	2.1	-	78	-0.049	6.08	0.318
190	30.773	0.167	2.70	99	1.6	100	78	-0.050	6.04	0.317
191	30.939	0.166	2.70	99	2.1	-	78	-0.048	5.93	0.298

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
192	31.102	0.163	2.70	99	2.0	-	78	-0.048	5.90	0.299
193	31.269	0.167	2.71	99	1.6	-	78	-0.047	5.88	0.300
194	31.435	0.166	2.71	99	2.1	-	78	-0.049	5.80	0.299
195	31.597	0.162	2.70	99	2.1	-	78	-0.049	5.77	0.299
196	31.766	0.169	2.70	99	1.8	-	78	-0.049	5.88	0.302
197	31.933	0.167	2.71	98	1.6	-	78	-0.047	5.91	0.304
198	32.093	0.160	2.70	99	1.6	-	78	-0.049	5.95	0.304
199	32.260	0.167	2.71	99	1.6	-	78	-0.047	5.87	0.302
200	32.426	0.166	2.71	99	1.8	100	78	-0.047	5.91	0.298
201	32.589	0.163	2.71	99	2.1	-	78	-0.047	5.89	0.304
202	32.756	0.167	2.71	99	2.0	-	78	-0.049	5.70	0.312
203	32.922	0.166	2.71	99	2.0	-	78	-0.048	5.53	0.332
204	33.088	0.166	2.71	99	2.0	-	78	-0.048	5.44	0.332
205	33.251	0.163	2.71	99	1.6	100	78	-0.049	5.42	0.329
Avg/Tot	33.251	0.162	2.65	89.9	1.8	100	78.5	-0.061	8.84	0.387

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 2

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
0	0.000		0.03	72	0.5		69
1	0.118	0.118	0.98	72	1.6	-	70
2	0.260	0.142	0.98	72	1.4	-	70
3	0.404	0.144	0.99	72	1.6	-	70
4	0.548	0.144	1.00	72	1.6	-	70
5	0.692	0.144	1.00	72	1.6	-	70
6	0.836	0.144	1.00	72	1.6	-	70
7	0.980	0.144	1.00	72	1.7	-	71
8	1.125	0.145	1.01	72	1.6	-	71
9	1.272	0.147	1.02	72	1.5	-	71
10	1.418	0.146	1.03	72	1.5	96	71
11	1.565	0.147	1.02	72	1.5	-	71
12	1.711	0.146	1.03	73	1.6	-	71
13	1.858	0.147	1.02	73	1.5	-	72
14	2.005	0.147	1.03	73	1.6	-	72
15	2.155	0.150	1.03	73	1.6	-	72
16	2.302	0.147	1.03	73	1.5	-	72
17	2.447	0.145	1.02	74	1.6	-	72
18	2.594	0.147	1.03	74	1.6	-	72
19	2.741	0.147	1.03	74	1.6	-	72
20	2.889	0.148	1.03	75	1.5	99	72
21	3.037	0.148	1.04	75	1.5	-	73
22	3.186	0.149	1.04	75	1.6	-	73
23	3.334	0.148	1.04	75	1.6	-	73
24	3.483	0.149	1.04	75	1.5	-	73
25	3.631	0.148	1.04	75	1.6	-	73
26	3.780	0.149	1.05	76	1.7	-	73
27	3.929	0.149	1.05	76	1.6	-	73
28	4.078	0.149	1.05	76	1.5	-	73
29	4.227	0.149	1.05	77	1.7	-	73
30	4.377	0.150	1.05	77	1.7	99	73
31	4.526	0.149	1.06	77	1.7	-	73

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 2

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/10/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
32	4.678	0.152	1.05	78	1.5	-	73
33	4.828	0.150	1.05	78	1.7	-	73
34	4.976	0.148	1.06	78	1.5	-	73
35	5.126	0.150	1.06	78	1.7	-	74
36	5.277	0.151	1.06	79	1.6	-	74
37	5.429	0.152	1.05	79	1.5	-	74
38	5.580	0.151	1.06	79	1.7	-	74
39	5.732	0.152	1.06	80	1.6	-	74
40	5.886	0.154	1.07	80	1.6	101	74
41	6.036	0.150	1.07	80	1.5	-	74
42	6.188	0.152	1.07	81	1.7	-	74
43	6.340	0.152	1.08	81	1.7	-	74
44	6.491	0.151	1.08	81	1.6	-	74
45	6.643	0.152	1.07	82	1.7	-	74
46	6.795	0.152	1.07	82	1.5	-	74
47	6.948	0.153	1.07	82	1.5	-	74
48	7.101	0.153	1.07	82	1.7	-	74
49	7.255	0.154	1.08	83	1.5	-	74
50	7.408	0.153	1.08	83	1.6	102	74
51	7.560	0.152	1.08	83	1.5	-	75
52	7.713	0.153	1.07	84	1.5	-	75
53	7.867	0.154	1.08	84	1.7	-	75
54	8.021	0.154	1.08	84	1.7	-	75
55	8.175	0.154	1.09	84	1.5	-	75
56	8.330	0.155	1.09	85	1.7	-	75
57	8.481	0.151	1.09	85	1.6	-	75
58	8.635	0.154	1.08	85	1.7	-	75
59	8.790	0.155	1.08	86	1.5	-	75
60	8.944	0.154	1.09	86	1.7	102	75
Avg/Tot	8.944	0.149	1.03	77.5	1.6	100	72.8

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 2

Technician: AK

Date: 4/10/2025

Stove ΔT: 102

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	294	336	343	544	254	354.2	1189.8
1	295	336	345	515	251	348.5	1437.0
2	298	335	349	495	253	345.9	1409.0
3	297	336	356	477	254	343.9	1367.3
4	295	334	362	464	258	342.5	1363.6
5	292	330	312	458	262	330.7	1352.6
6	291	328	283	451	265	323.6	1371.9
7	289	325	263	452	265	318.8	1421.0
8	288	323	248	467	264	317.9	1397.6
9	282	320	237	478	260	315.5	1377.5
10	283	318	228	474	264	313.5	1389.6
11	281	315	222	474	266	311.5	1319.6
12	284	312	216	467	267	309.1	1336.2
13	278	310	212	462	268	305.8	1363.5
14	280	307	208	458	268	304.1	1382.2
15	278	305	206	458	261	301.4	1391.9
16	277	302	204	459	264	301.2	1390.8
17	247	295	204	466	246	291.4	1397.2
18	265	297	203	483	257	301.0	1522.0
19	272	295	203	503	255	305.4	1530.2
20	271	292	203	516	259	308.3	1477.0
21	270	291	204	530	259	310.5	1453.6
22	269	289	204	545	255	312.4	1435.0
23	268	287	204	559	258	315.1	1405.5
24	269	285	203	573	258	317.6	1412.7
25	268	284	202	580	253	317.3	1417.4
26	266	282	202	586	252	317.4	1429.4
27	263	281	201	590	252	317.5	1404.4
28	263	280	201	595	247	316.9	1396.9
29	262	278	200	593	252	316.9	1396.3
30	260	276	200	587	249	314.4	1431.3
31	257	276	200	586	247	313.1	1462.8
32	256	274	200	589	246	313.0	1467.9
33	257	273	202	589	241	312.1	1471.4
34	257	271	201	590	248	313.5	1484.8
35	255	270	202	591	247	312.8	1495.1
36	255	268	203	591	245	312.6	1510.6
37	254	268	205	592	237	311.3	1521.7
38	253	267	206	595	238	311.7	1558.7
39	250	266	208	598	239	312.1	1579.6
40	254	265	209	601	236	313.0	1594.4
41	252	265	211	602	237	313.3	1598.2
42	251	263	213	604	238	313.8	1601.6
43	252	263	215	610	232	314.6	1583.9
44	253	263	216	617	240	317.7	1570.2
45	252	262	216	624	236	317.8	1556.1
46	252	262	217	628	237	319.3	1547.7
47	251	261	217	631	236	319.1	1520.8

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 2

Technician: AK

Date: 4/10/2025

Stove ΔT: 102

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	252	261	217	637	236	320.4	1494.8
49	250	262	216	640	236	320.8	1481.6
50	250	261	215	641	234	320.2	1478.6
51	248	261	215	642	231	319.4	1479.5
52	252	261	214	643	231	320.3	1470.1
53	250	262	214	643	231	319.8	1466.5
54	252	260	213	642	228	318.8	1459.4
55	250	260	213	638	228	317.6	1475.7
56	251	260	212	635	228	317.4	1459.3
57	252	261	211	637	227	317.6	1453.6
58	253	260	211	637	228	317.7	1464.1
59	251	260	210	634	226	316.0	1480.0
60	255	260	209	630	224	315.7	1494.2
61	254	262	209	625	223	314.6	1494.3
62	254	262	209	625	222	314.4	1485.4
63	254	263	209	629	222	315.4	1479.0
64	256	263	209	633	223	316.7	1444.0
65	255	264	209	638	222	317.6	1433.4
66	257	264	208	640	220	317.8	1425.3
67	257	265	207	642	220	318.0	1405.0
68	257	264	206	641	218	317.2	1384.7
69	258	265	205	640	217	316.8	1358.2
70	258	265	204	638	218	316.5	1336.5
71	258	267	202	635	214	315.3	1320.9
72	261	267	201	633	213	314.9	1306.1
73	259	267	199	630	216	314.0	1288.9
74	259	268	197	626	214	313.0	1274.1
75	259	269	196	622	209	310.7	1255.4
76	260	268	193	611	215	309.4	1241.1
77	261	269	192	601	214	307.5	1229.5
78	259	270	190	592	213	304.8	1222.6
79	261	271	188	585	213	303.5	1214.7
80	260	271	187	578	211	301.4	1198.2
81	262	273	186	573	211	300.7	1188.1
82	261	273	184	569	211	299.5	1183.1
83	257	273	183	564	207	296.8	1169.3
84	259	274	182	561	210	297.1	1159.4
85	258	276	180	558	210	296.4	1146.5
86	259	276	179	556	204	294.9	1135.6
87	259	278	178	553	207	294.9	1129.1
88	258	279	176	549	207	293.9	1124.3
89	258	280	175	545	205	292.6	1114.3
90	254	282	174	541	199	289.8	1102.6
91	256	283	173	539	203	290.6	1091.8
92	254	284	171	537	202	289.4	1079.7
93	254	286	170	536	198	288.6	1072.3
94	255	287	169	536	198	288.8	1065.6
95	252	289	167	534	200	288.4	1058.8

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 2

Technician: AK

Date: 4/10/2025

Stove ΔT : 102

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	253	290	166	531	203	288.8	1050.9
97	254	292	165	529	202	288.5	1040.5
98	253	293	164	527	203	287.8	1033.2
99	252	295	163	523	192	284.8	1028.0
100	251	297	161	520	199	285.6	1023.8
101	250	299	160	517	196	284.4	1016.6
102	252	301	159	513	199	284.8	1013.0
103	250	303	158	510	199	284.0	1011.1
104	253	306	157	508	201	284.8	1007.0
105	249	307	156	507	198	283.3	1004.6
106	250	309	156	505	197	283.2	999.4
107	250	312	155	504	196	283.3	996.6
108	250	313	154	504	194	282.9	997.7
109	246	316	153	503	195	282.6	996.7
110	248	318	152	502	189	281.8	997.8
111	246	320	152	502	191	282.3	1006.1
112	247	321	152	503	196	283.5	1012.3
113	247	322	151	503	195	283.5	1017.0
114	245	324	150	506	196	284.2	1019.8
115	245	326	150	522	192	287.0	1005.5
116	248	327	150	542	195	292.5	1000.8
117	248	329	150	556	192	294.9	1003.6
118	247	330	149	568	190	296.9	1003.8
119	246	332	149	576	187	297.9	1009.3
120	247	333	149	582	188	299.8	1011.7
121	249	333	148	591	192	302.6	1003.8
122	247	335	148	602	190	304.4	1005.9
123	248	336	148	610	189	306.2	1009.9
124	250	337	148	616	191	308.2	1002.2
125	250	337	148	620	190	309.1	980.6
126	249	337	148	619	189	308.4	969.2
127	253	339	147	612	188	307.8	970.0
128	252	338	147	602	191	305.9	969.2
129	253	338	147	590	190	303.5	971.3
130	252	336	146	582	190	301.0	962.7
131	254	335	145	573	190	299.4	956.9
132	252	335	145	568	189	297.7	949.0
133	254	333	144	562	190	296.5	943.4
134	254	331	144	556	188	294.4	942.4
135	253	330	143	550	189	293.0	940.8
136	254	329	143	544	188	291.3	939.9
137	253	327	142	538	188	289.5	940.8
138	254	325	141	531	189	288.0	941.1
139	253	323	141	526	189	286.3	939.3
140	252	321	141	520	189	284.5	936.5
141	253	320	140	514	188	283.0	931.9
142	252	318	140	508	187	281.2	926.9
143	249	317	140	504	188	279.4	921.4

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 2

Technician: AK

Date: 4/10/2025

Stove ΔT: 102

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	253	315	139	499	187	278.5	917.0
145	253	314	139	494	187	277.3	913.8
146	252	313	139	490	187	276.1	909.1
147	251	312	138	485	188	274.9	902.4
148	253	311	138	480	187	273.7	899.9
149	251	310	137	477	187	272.3	902.4
150	251	309	137	473	186	271.1	898.8
151	251	308	137	470	186	270.2	897.2
152	250	307	136	466	188	269.3	894.2
153	250	306	136	462	186	267.9	891.9
154	247	306	136	459	186	266.6	888.5
155	248	305	135	456	187	266.1	885.1
156	249	304	135	453	184	264.8	880.5
157	249	303	135	449	185	264.2	876.4
158	248	302	135	447	186	263.5	873.0
159	247	301	134	445	187	262.8	870.8
160	247	301	134	443	186	262.0	868.1
161	248	300	133	440	184	261.0	866.7
162	248	299	133	438	185	260.4	863.8
163	248	299	133	435	184	259.5	859.8
164	246	298	132	434	185	259.0	854.0
165	248	297	132	432	185	258.6	848.4
166	245	296	131	430	184	257.1	847.7
167	244	296	131	428	185	256.8	845.7
168	244	295	131	426	183	255.7	808.4
169	245	295	130	424	185	255.6	792.1
170	245	294	130	424	184	255.4	786.1
171	244	293	129	424	185	255.1	783.4
172	244	292	129	425	185	254.8	780.6
173	244	292	128	426	183	254.6	778.6
174	241	292	127	427	183	253.9	779.0
175	243	292	127	428	184	254.7	775.3
176	245	292	127	429	184	255.3	774.2
177	243	291	126	429	184	254.6	771.5
178	243	291	126	429	184	254.6	770.2
179	243	291	125	430	183	254.5	768.5
180	245	291	125	430	183	254.7	766.5
181	245	291	124	430	182	254.5	762.7
182	243	290	124	430	183	254.1	760.9
183	247	291	124	430	183	254.8	759.8
184	246	291	123	431	183	254.6	758.7
185	247	290	123	430	183	254.6	754.9
186	248	291	123	431	183	254.9	753.6
187	246	290	123	432	183	254.8	750.0
188	248	291	122	431	182	254.9	746.2
189	248	290	122	432	182	254.6	742.3
190	249	290	122	432	182	255.0	735.3
191	250	290	121	433	180	254.9	730.7

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 2Technician: AKDate: 4/10/2025Stove ΔT: 102

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
192	249	289	121	433	181	254.5	728.5
193	249	289	121	433	180	254.3	724.3
194	249	288	120	434	180	254.1	721.1
195	249	288	120	434	182	254.6	716.5
196	250	287	120	434	181	254.3	715.3
197	251	286	119	434	181	254.0	713.9
198	253	285	119	435	180	254.4	708.7
199	253	285	119	435	182	254.5	708.0
200	252	284	118	436	183	254.6	705.3
201	253	283	118	435	182	254.2	705.0
202	256	282	117	434	181	254.1	709.1
203	257	281	117	433	182	253.8	707.4
204	259	280	117	430	180	253.1	704.8
205	257	279	117	429	182	252.6	700.8
Average	255.3	294.4	172.4	526.4	209.2	291.5	1112.4

LAB SAMPLE DATA - ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 2

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/10/2025

		Sample ID	Tare, mg	Final, mg	Catch, mg
Filters	A	G01241	237.8	241.8	4.0
	B	G01242	230.4	234.8	4.4
	C - 1st Hour	G01243	237.2	237.9	0.7
	Amb	G01244	237.3	237.3	0.0
Probes	A	8A	116634.3	116634.5	0.2
	B	8B	116666.5	116666.6	0.1
	C - 1st Hour	8C	116663.7	116663.7	0.0
O-rings	A	8A	3548.2	3548.7	0.5
	B	8B	3352.2	3352.3	0.1
	C - 1st Hour	8C	3582.0	3582.2	0.2

Placed in Dessicator on: 4/10/2025

Balance Audit (mg):

		200.0		200.0					
		Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time
Filters	A	242.0	4/16 10:30	241.8	4/18 15:00				
	B	234.9	4/16 10:30	234.8	4/18 15:00				
	C - 1st Hour	238.1	4/16 10:30	237.9	4/18 15:00				
	Amb	237.4	4/16 10:30	237.3	4/18 15:00				
Probes	A	116634.7	4/16 10:30	116634.5	4/18 15:00				
	B	116666.8	4/16 10:30	116666.6	4/18 15:00				
	C - 1st Hour	116663.7	4/16 10:30	116663.7	4/18 15:00				
O-Rings	A	3548.7	4/16 10:30	3548.7	4/18 15:00				
	B	3352.2	4/16 10:30	3352.3	4/18 15:00				
	C - 1st Hour	3582.4	4/16 10:30	3582.2	4/18 15:00				

Train A Aggregate, mg:	4.7
Train B Aggregate, mg:	4.6
Train C Aggregate, mg:	0.9
Ambient, mg:	0.0

ASTM E2780 Wood Heater Run Sheets

Client: HHT Job Number: 24-291 Tracking #: 220
Model: Dauntless-C Run Number: 2 Test Date: 4/10/2025

Wood Heater Run Notes

Test Control Settings

Primary Air Setting(s): 1 detent closed from fully open
Targeted Burn Category: III

Preburn Notes

Time	Notes
55:00 80:00	Stirred Coals PB End

Test Notes

Test Burn Start Time: 11:30 Test Fuel Loaded by: 25 seconds
Door Closed: 40 seconds Air Control Set at: 300 seconds
Other Loading Notes: Bypass closed @ 0:45, fan on high @ 5:00

Time	Notes
	-None-

Test Burn End Time: 14:55

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO₂ (%): 17.32 CO (%): 4.350
Mid Gas CO₂ (%): 10.00 CO (%): 2.500

Calibration Results:

	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
Time	9:55	9:56	9:57	15:14	15:15	15:16
CO ₂	0.00	17.32	10.12	0.03	17.37	10.31
CO	0.000	4.350	2.528	0.009	4.479	2.579

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

Technician Signature: 

Date: 4/25/25

ASTM E2780 Wood Heater Run Sheets

Client: HHT
Model: Dauntless-C

Job Number: 24-291
Run Number: 2

Tracking #: 220
Test Date: 4/10/2025



Test Fuel Front/Side View



Test Fuel Iso View



Test Fuel Loaded in Stove



Air Setting

Technician Signature: _____



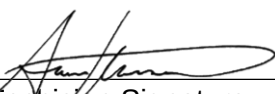
Date: 4/25/25

WOOD STOVE TEST DATA PACKET
ASTM E2780/E2515



Run 3 Data Summary

Client:	HHT
Model:	Dauntless-C
Job #:	24-291
Tracking #:	220
Test Date:	4/11/2025



Technician Signature

5/15/2025

Date

TEST RESULTS - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 3

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Burn Rate (kg/hr):	0.97
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	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft ³)	71.678	51.151	50.587	8.680
Average Gas Velocity in Dilution Tunnel (ft/sec)	17.5			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	11808.6			
Average Gas Meter Temperature (°F)	62.5	88.4	88.4	75.8
Total Sample Volume (dscf)	73.724	50.817	49.555	8.831
Average Tunnel Temperature (°F)	86.4			
Total Time of Test (min)	311			
Total Particulate Catch (mg)	0.1	8.8	8.9	2.8
Particulate Concentration, dry-standard (g/dscf)	0.0000014	0.0001732	0.0001796	0.0003171
Total PM Emissions (g)	0.08	10.52	10.91	3.73
Particulate Emission Rate (g/hr)	0.02	2.03	2.10	3.73
Emissions Factor (g/kg)	-	2.09	2.17	-
Difference from Average Total Particulate Emissions (g)	-	0.20	0.20	-
Difference from Average Total Particulate Emissions (%)	-	1.8%	1.8%	-
Difference from Average Emissions Factor (g/kg)	-	0.04	0.04	-

Final Average Results	
Total Particulate Emissions (g)	10.71
Particulate Emission Rate (g/hr)	2.07
Emissions Factor (g/kg)	2.13
HHV Efficiency (%)	75.0%
LHV Efficiency (%)	81.1%
CO Emissions (g/min)	0.97

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	72.8	OK
Face Velocity	< 30 ft/min	9.2	OK
Leakage Rate	Less than 4% of average sample rate	0 cfm	OK
Ambient Temp	55-90 °F	Min:60.9/Max:66.3	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
Stove Surface ΔT	<126°F	110.8	OK

B415.1 Efficiency Results

Manufacturer: HHT
Model: Dauntless-C
Date: 04/11/25
Run: 3
Control #: 24-291
Test Duration: 311
Output Category: 2

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	75.0%	81.1%
Combustion Efficiency	95.9%	95.9%
Heat Transfer Efficiency	78.3%	84.6%

Output Rate (kJ/h)	14,295	13,560	(Btu/h)
Burn Rate (kg/h)	0.96	2.12	(lb/h)
Input (kJ/h)	19,049	18,070	(Btu/h)

Test Load Weight (dry kg)	4.98	10.99	dry lb
MC wet (%)	16.90		
MC dry (%)	20.34		
Particulate (g)	10.71		
CO (g)	302		
Test Duration (h)	5.18		

Emissions	Particulate	CO
g/MJ Output	0.14	4.07
g/kg Dry Fuel	2.15	60.56
g/h	2.07	58.23
g/min	0.03	0.97
lb/MM Btu Output	0.34	9.47

Air/Fuel Ratio (A/F)	15.23
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VERSION:

2.4

4/15/2010

WOODSTOVE FUEL DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 3

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Preburn Fuel Information						
Size	Length (in)	Moisture Content (% DB)		Size	Length (in)	Moisture Content (% DB)
2x4	8.00	19.6		2x4	16.00	23.6
2x4	8.00	19.9		2x4	16.00	24.5
2x4	8.00	20.1		2x4	16.00	22.3
2x4	8.00	21.5		2x4	16.00	24.5
2x4	8.00	22.3		2x4	16.00	22.6
2x4	8.00	19.7				
2x4	8.00	19.3				
2x4	16.00	21.5				
Total Fuel Weight (lbs):		17.59	Average Moisture (%DB):		21.6	

Firebox Volume (ft³): 1.82

Total 2x4 Crib Weight, with spacers (lbs): 5.31

Total 4x4 Crib Weight, with spacers (lbs): 7.91

Total Wet Fuel Weight, with spacers (lbs): 13.22

Coal Bed Range (20-25%):

Min (lbs): 2.64

Max (lbs): 3.31

Test Fuel Information						
Size	Length (in)	Weight (lbs)	Moisture Content (%DB)			Dry Weight (lbs)
2x4	15.50	2.18	19.9	19.6	19.7	1.82
2x4	15.50	2.07	20.3	21.2	19.2	1.72
4x4	15.50	3.64	19.6	22.6	19.5	3.02
4x4	15.50	3.77	21.9	21.6	19.0	3.12
Total Dry Weight, no spacers (lbs):						9.68
Total Dry Weight, with spacers (lbs):						11.08

Spacer Moisture Readings (%DB)						
10.3	12.3					
11.4	12.2					
10.5	11.5					
10.5	10.5					
12.4						
12.3						
12.0						
11.0						

Quality Checks	Requirement	Observed	Result
Fuel Density	25 - 36 (lbs/ft ³ , DB)	30.8	OK
Loading Density	6.3 - 7.7 (lbs/ft ³ , WB)	7.26	OK
2x4 Fuel Mix	35 - 65 % of total weight	40%	OK

DILUTION TUNNEL & MISC. DATA - ASTM E2780 / E2515

Client: **HHT**
 Model: **Dauntless-C**
 Run #: **3**
 Test Start Time: **11:44**

Job #: **24-291**
 Tracking #: **220**
 Technician: **AK**
 Date: **4/11/2025**

Total Sampling Time (min): **311**
 Recording Interval (min): **1**

Meter Box γ Factor: **1.019** (A)
 Meter Box γ Factor: **1.005** (B)
 Meter Box γ Factor: **1.024** (C)
 Meter Box γ Factor: **1.012** (Ambient)

Induced Draft Check (in. H₂O): **0**
 Smoke Capture Check (%): **100%**
 Date Flue Pipe Last Cleaned: **4/5/2025**
 Test Fuel Scale Audit (lbs): **10.00**
 Platform Scale Audit (lbs): **10.0**

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	30.16	30.05	30.11
Relative Humidity (%)	31.6	22.6	
Room Air Velocity (ft/min)	<50	<50	
Pitot Tube Leak Check	0	0	
Ambient Sample Volume:		71.678	ft ³

Sample Train Leak Checks

	Pre-test	Post-test		
(A)	0.000	0.000	cfm @	-7 in. Hg
(B)	0.000	0.000	cfm @	-7 in. Hg
(C)	0.000	0.000	cfm @	-7 in. Hg
(Ambient)	0.000	0.000	cfm @	-12 in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H ₂ O)	Temp (°F)
1	0.052	74
2	0.088	74
3	0.088	74
4	0.066	74
5	0.060	74
6	0.086	74
7	0.088	74
8	0.064	74
Center	0.076	74

Dilution Tunnel H₂O: **2.00** percent
 Tunnel Diameter: **6** inches
 Pitot Tube Cp: **0.99** [unitless]
 Dilution Tunnel MW(dry): **29.00** lb/lb-mole
 Dilution Tunnel MW(wet): **28.78** lb/lb-mole
 Tunnel Area: **0.1963** ft²

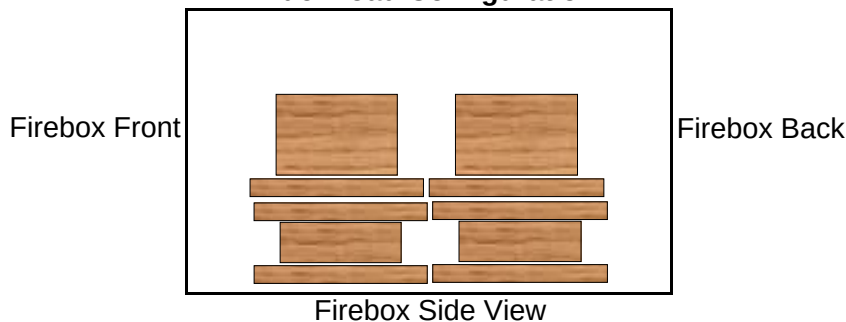
V_{strav} : **17.98** ft/sec
 V_{scent} : **18.30** ft/sec
 F_p : **0.982** [ratio]

Initial Tunnel Flow: **206.6** scf/min

Static Pressure: **-0.150** in. H₂O

TEST FUEL PROPERTIES

Fuel Load Configuration



Actual Fuel Used Properties

Fuel Type: **D. Fir**
 HHV (kJ/kg): **19,810**
 %C: **48.73**
 %H: **6.87**
 %O: **43.9**
 %Ash: **0.5**
 MC (%DB): **20.3**

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 3

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Recording Interval (min): 1
Run Time (min): 82

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
0	5.26	-0.076	334	267	430	672	216	383.6	465	67
1	5.12	-0.074	332	271	432	681	212	385.3	450	67
2	5.04	-0.074	334	273	435	685	215	388.4	442	67
3	4.95	-0.072	334	276	438	685	212	388.9	438	66
4	4.89	-0.071	334	279	440	674	212	387.8	436	67
5	4.79	-0.073	333	281	441	666	209	386.1	430	67
6	4.79	-0.071	334	284	407	659	215	379.7	428	66
7	4.72	-0.072	336	285	368	651	211	370.4	426	67
8	4.63	-0.071	335	288	339	647	211	363.8	424	66
9	4.57	-0.069	333	290	317	644	209	358.5	418	67
10	4.52	-0.068	328	291	299	636	213	353.4	411	66
11	4.47	-0.067	330	294	284	625	211	348.8	404	67
12	4.42	-0.067	326	295	270	615	214	344.1	395	66
13	4.36	-0.065	323	298	258	606	211	339.1	388	66
14	4.32	-0.064	321	299	248	599	213	335.8	383	66
15	4.28	-0.064	321	301	238	591	213	332.7	375	65
16	4.25	-0.063	316	303	230	583	215	329.3	370	65
17	4.22	-0.061	316	305	223	574	214	326.2	366	66
18	4.17	-0.061	314	307	216	566	212	323.1	363	65
19	4.15	-0.061	314	308	211	560	212	321.1	359	66
20	4.12	-0.058	313	310	206	554	215	319.7	353	66
21	4.08	-0.060	308	312	201	551	215	317.3	351	65
22	4.05	-0.059	306	313	197	547	216	315.5	348	65
23	4.04	-0.058	304	315	193	544	216	314.4	345	66
24	4.01	-0.057	305	316	189	542	225	315.4	340	66
25	3.99	-0.058	304	316	186	541	223	314.0	336	66
26	3.98	-0.056	299	317	183	540	225	312.8	332	66
27	3.96	-0.055	298	319	180	538	226	312.2	330	67
28	3.96	-0.055	298	320	177	537	231	312.6	327	67
29	3.91	-0.056	297	320	176	536	231	312.0	326	67
30	3.86	-0.056	295	321	173	523	235	309.4	340	67
31	3.84	-0.055	292	322	171	531	234	309.9	328	67
32	3.77	-0.053	294	323	184	535	238	314.7	321	67
33	3.75	-0.053	291	324	198	539	239	318.1	319	67
34	3.73	-0.052	290	325	210	540	239	320.9	319	67
35	3.70	-0.052	291	326	220	540	239	323.2	316	67
36	3.69	-0.053	289	325	230	540	243	325.2	316	67
37	3.66	-0.053	285	325	238	539	240	325.4	316	67
38	3.64	-0.052	285	326	246	538	244	327.7	315	67
39	3.63	-0.052	287	326	252	537	245	329.3	315	66
40	3.60	-0.053	285	326	258	535	247	330.0	314	67
41	3.57	-0.053	285	325	263	534	246	330.8	314	66
42	3.56	-0.054	286	325	267	534	242	330.6	313	66
43	3.52	-0.054	285	324	271	533	240	330.5	313	65
44	3.52	-0.053	285	324	274	531	245	331.7	311	64

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 3

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Recording Interval (min): 1
Run Time (min): 82

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
45	3.49	-0.053	282	323	277	529	238	329.8	311	65
46	3.46	-0.053	283	323	280	528	239	330.4	309	64
47	3.43	-0.054	282	322	282	527	236	329.6	307	64
48	3.40	-0.053	284	321	284	524	239	330.3	307	63
49	3.40	-0.053	280	321	285	522	243	330.2	307	64
50	3.37	-0.052	281	320	287	519	247	330.8	308	64
51	3.36	-0.054	280	320	288	516	246	330.1	308	64
52	3.32	-0.051	280	319	289	516	243	329.5	306	64
53	3.31	-0.053	279	319	290	515	238	328.2	304	64
54	3.28	-0.052	280	318	291	513	237	327.8	304	63
55	3.25	-0.051	282	318	291	512	240	328.5	304	63
56	3.23	-0.053	281	318	292	512	240	328.5	303	63
57	3.19	-0.052	279	317	292	510	239	327.5	301	63
58	3.19	-0.053	282	317	293	510	241	328.4	302	63
59	3.17	-0.051	280	316	293	508	240	327.4	301	63
60	3.15	-0.051	280	316	293	508	239	327.3	300	63
61	3.13	-0.052	281	315	293	508	242	327.7	299	63
62	3.09	-0.053	281	315	293	508	241	327.6	299	62
63	3.09	-0.049	281	315	293	507	243	327.8	299	62
64	3.06	-0.052	281	314	293	507	242	327.4	298	62
65	3.04	-0.052	281	314	293	506	242	327.3	298	63
66	3.02	-0.052	279	314	293	506	240	326.2	297	62
67	3.01	-0.051	280	313	293	504	244	326.7	297	62
68	2.98	-0.051	280	313	292	504	240	325.7	296	62
69	2.94	-0.053	280	313	292	502	240	325.4	296	62
70	2.93	-0.051	281	312	292	500	242	325.5	295	62
71	2.91	-0.051	281	312	292	499	242	325.2	296	62
72	2.88	-0.052	279	312	291	498	241	324.3	295	62
73	2.87	-0.050	281	312	291	498	242	324.7	294	62
74	2.83	-0.051	280	311	291	497	242	323.9	293	62
75	2.81	-0.052	280	310	290	496	242	323.8	293	61
76	2.82	-0.050	282	311	290	496	245	324.6	293	62
77	2.78	-0.051	281	311	289	496	243	324.0	293	62
78	2.76	-0.050	279	311	289	496	242	323.3	291	62
79	2.73	-0.050	279	310	289	495	245	323.5	291	62
80	2.72	-0.050	279	311	288	495	242	323.2	291	62
81	2.70	-0.050	280	310	288	494	245	323.6	291	61
82	2.65	-0.052	279	310	288	495	244	323.0	291	62

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.071	0.01	70	0.0		13.22		86	304	67	62
1	0.100	0.100	0.072	2.19	70	0.9	-	13.14	-0.08	87	313	67	62
2	0.242	0.142	0.072	2.25	70	1.0	-	13.05	-0.09	88	324	68	62
3	0.391	0.149	0.071	2.29	70	0.9	-	12.95	-0.10	89	333	68	62
4	0.535	0.144	0.071	2.30	70	1.0	-	12.86	-0.09	89	342	68	62
5	0.687	0.152	0.072	2.33	70	1.0	-	12.76	-0.10	89	348	68	62
6	0.833	0.146	0.069	2.34	70	0.9	-	12.72	-0.04	89	342	68	62
7	0.985	0.152	0.072	2.36	70	0.9	-	12.68	-0.04	89	341	68	62
8	1.132	0.147	0.072	2.37	70	0.9	-	12.64	-0.04	88	343	68	62
9	1.285	0.153	0.072	2.38	70	0.9	-	12.60	-0.04	88	340	69	62
10	1.433	0.148	0.072	2.40	70	0.9	90	12.57	-0.03	89	340	69	62
11	1.587	0.154	0.071	2.41	70	1.0	-	12.47	-0.10	89	340	69	62
12	1.735	0.148	0.072	2.42	70	0.9	-	12.38	-0.09	90	342	69	62
13	1.890	0.155	0.073	2.44	71	1.0	-	12.28	-0.10	91	346	69	63
14	2.040	0.150	0.070	2.45	71	1.0	-	12.16	-0.12	91	350	69	63
15	2.196	0.156	0.072	2.47	71	0.9	-	12.07	-0.09	91	351	69	62
16	2.347	0.151	0.072	2.48	71	0.9	-	11.97	-0.10	90	352	69	61
17	2.503	0.156	0.071	2.50	71	1.0	-	11.88	-0.09	90	351	69	61
18	2.655	0.152	0.071	2.50	72	1.0	-	11.77	-0.11	91	353	70	61
19	2.810	0.155	0.072	2.51	72	1.0	-	11.65	-0.12	91	357	70	62
20	2.966	0.156	0.071	2.53	72	0.9	96	11.54	-0.11	91	361	70	62
21	3.121	0.155	0.072	2.54	73	1.0	-	11.41	-0.13	91	358	70	62
22	3.279	0.158	0.071	2.55	73	1.0	-	11.31	-0.10	91	354	70	62
23	3.431	0.152	0.071	2.56	73	0.9	-	11.20	-0.11	90	352	70	62
24	3.591	0.160	0.073	2.57	73	1.0	-	11.12	-0.08	91	350	70	62
25	3.745	0.154	0.072	2.57	74	1.0	-	11.01	-0.11	91	348	70	62
26	3.903	0.158	0.070	2.59	74	0.9	-	10.90	-0.11	91	348	70	62
27	4.059	0.156	0.071	2.58	74	1.0	-	10.79	-0.11	91	349	70	62
28	4.217	0.158	0.071	2.61	75	1.0	-	10.69	-0.10	90	349	70	62
29	4.377	0.160	0.071	2.61	75	1.0	-	10.59	-0.10	90	349	70	61
30	4.531	0.154	0.072	2.61	75	1.0	98	10.50	-0.09	90	351	70	62
31	4.693	0.162	0.072	2.62	76	1.0	-	10.40	-0.10	91	353	70	61

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
32	4.849	0.156	0.070	2.62	76	1.0	-	10.27	-0.13	91	357	70	61
33	5.008	0.159	0.070	2.63	76	1.0	-	10.15	-0.12	92	363	70	61
34	5.168	0.160	0.070	2.63	77	1.0	-	10.01	-0.14	92	370	70	61
35	5.325	0.157	0.072	2.65	77	1.0	-	9.89	-0.12	92	373	70	61
36	5.486	0.161	0.072	2.64	77	1.0	-	9.79	-0.10	92	375	70	62
37	5.643	0.157	0.071	2.65	78	1.0	-	9.67	-0.12	91	376	70	61
38	5.804	0.161	0.071	2.66	78	1.0	-	9.56	-0.11	91	377	70	61
39	5.964	0.160	0.071	2.66	78	1.0	-	9.45	-0.11	92	376	70	62
40	6.123	0.159	0.072	2.67	79	1.0	98	9.35	-0.10	92	375	70	62
41	6.285	0.162	0.072	2.67	79	1.0	-	9.24	-0.11	91	376	70	61
42	6.443	0.158	0.072	2.67	79	1.0	-	9.15	-0.09	91	374	70	61
43	6.605	0.162	0.072	2.68	79	1.0	-	9.06	-0.09	92	374	70	61
44	6.767	0.162	0.071	2.68	80	1.0	-	8.95	-0.11	92	374	70	61
45	6.925	0.158	0.072	2.68	80	1.0	-	8.83	-0.12	93	375	70	61
46	7.089	0.164	0.071	2.69	80	1.0	-	8.73	-0.10	93	376	71	61
47	7.248	0.159	0.073	2.69	80	1.0	-	8.64	-0.09	92	377	71	62
48	7.409	0.161	0.073	2.69	81	1.0	-	8.52	-0.12	92	378	71	62
49	7.574	0.165	0.072	2.71	81	1.0	-	8.42	-0.10	92	379	71	61
50	7.730	0.156	0.070	2.70	81	1.0	99	8.33	-0.09	92	380	71	62
51	7.896	0.166	0.072	2.71	82	1.0	-	8.23	-0.10	92	380	70	61
52	8.055	0.159	0.072	2.71	82	1.0	-	8.12	-0.11	93	380	70	61
53	8.218	0.163	0.072	2.72	82	1.0	-	8.01	-0.11	93	382	70	61
54	8.382	0.164	0.071	2.72	82	1.0	-	7.93	-0.08	92	382	71	61
55	8.541	0.159	0.071	2.72	82	1.0	-	7.83	-0.10	92	382	70	61
56	8.705	0.164	0.071	2.72	83	1.0	-	7.76	-0.07	92	383	70	61
57	8.868	0.163	0.071	2.73	83	1.0	-	7.66	-0.10	93	383	70	61
58	9.027	0.159	0.070	2.74	83	1.0	-	7.58	-0.08	93	385	71	61
59	9.194	0.167	0.070	2.73	83	1.0	-	7.49	-0.09	93	384	71	61
60	9.354	0.160	0.072	2.74	83	1.0	100	7.40	-0.09	93	381	71	61
61	9.517	0.163	0.070	2.73	84	1.0	-	7.32	-0.08	93	378	71	61
62	9.681	0.164	0.070	2.74	84	1.0	-	7.21	-0.11	92	375	70	61
63	9.842	0.161	0.072	2.74	84	1.0	-	7.15	-0.06	92	373	71	61

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
64	10.006	0.164	0.072	2.73	84	1.0	-	7.06	-0.09	92	370	71	61
65	10.172	0.166	0.071	2.75	84	1.0	-	6.99	-0.07	92	368	71	61
66	10.330	0.158	0.072	2.74	85	1.0	-	6.91	-0.08	93	363	71	61
67	10.497	0.167	0.073	2.74	85	1.0	-	6.85	-0.06	93	358	71	61
68	10.659	0.162	0.071	2.75	85	1.0	-	6.78	-0.07	92	355	70	61
69	10.821	0.162	0.072	2.76	85	1.0	-	6.72	-0.06	92	352	71	61
70	10.988	0.167	0.073	2.75	85	1.0	99	6.64	-0.08	91	350	70	62
71	11.148	0.160	0.073	2.75	85	1.0	-	6.61	-0.03	91	348	70	61
72	11.313	0.165	0.071	2.76	86	1.0	-	6.55	-0.06	91	346	70	61
73	11.479	0.166	0.071	2.76	86	1.0	-	6.49	-0.06	91	344	70	61
74	11.640	0.161	0.072	2.75	86	1.0	-	6.41	-0.08	91	342	70	61
75	11.804	0.164	0.071	2.76	86	1.0	-	6.35	-0.06	90	340	70	61
76	11.971	0.167	0.070	2.76	86	1.0	-	6.29	-0.06	90	340	70	62
77	12.131	0.160	0.070	2.76	86	1.0	-	6.24	-0.05	89	338	70	62
78	12.297	0.166	0.069	2.77	86	1.0	-	6.16	-0.08	89	338	70	62
79	12.462	0.165	0.072	2.77	87	1.0	-	6.10	-0.06	89	338	70	62
80	12.624	0.162	0.071	2.77	87	1.0	99	6.04	-0.06	90	339	70	62
81	12.791	0.167	0.070	2.76	87	1.0	-	5.98	-0.06	90	340	70	62
82	12.953	0.162	0.072	2.76	87	1.0	-	5.91	-0.07	90	340	70	62
83	13.118	0.165	0.073	2.77	87	1.0	-	5.85	-0.06	91	340	70	62
84	13.285	0.167	0.071	2.76	87	1.0	-	5.78	-0.07	90	340	70	63
85	13.446	0.161	0.070	2.77	87	1.0	-	5.73	-0.05	90	339	70	62
86	13.612	0.166	0.070	2.79	87	1.0	-	5.67	-0.06	89	339	70	62
87	13.778	0.166	0.071	2.78	88	1.0	-	5.61	-0.06	90	338	70	62
88	13.941	0.163	0.072	2.77	88	1.0	-	5.58	-0.03	90	336	70	62
89	14.105	0.164	0.070	2.78	88	1.0	-	5.52	-0.06	90	335	70	62
90	14.272	0.167	0.070	2.78	88	1.0	101	5.42	-0.10	89	333	70	62
91	14.435	0.163	0.072	2.78	88	1.0	-	5.37	-0.05	89	332	70	62
92	14.600	0.165	0.070	2.79	88	1.0	-	5.32	-0.05	89	332	70	62
93	14.767	0.167	0.070	2.78	88	1.0	-	5.28	-0.04	89	329	70	62
94	14.928	0.161	0.072	2.77	88	1.0	-	5.23	-0.05	88	329	70	62
95	15.096	0.168	0.072	2.77	88	1.0	-	5.16	-0.07	89	330	70	62

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
96	15.262	0.166	0.073	2.79	89	1.0	-	5.11	-0.05	89	329	70	62
97	15.424	0.162	0.071	2.78	89	1.0	-	5.05	-0.06	90	328	70	63
98	15.593	0.169	0.070	2.79	89	1.0	-	5.00	-0.05	90	327	70	63
99	15.757	0.164	0.069	2.78	89	1.0	-	4.96	-0.04	89	328	70	63
100	15.919	0.162	0.072	2.79	89	1.0	100	4.91	-0.05	89	328	70	62
101	16.089	0.170	0.070	2.79	89	1.0	-	4.87	-0.04	88	328	70	62
102	16.251	0.162	0.072	2.78	89	1.0	-	4.84	-0.03	88	326	70	62
103	16.417	0.166	0.070	2.79	89	1.0	-	4.77	-0.07	89	326	71	62
104	16.585	0.168	0.070	2.79	89	1.0	-	4.73	-0.04	88	324	70	62
105	16.747	0.162	0.072	2.80	89	1.0	-	4.68	-0.05	88	325	70	62
106	16.914	0.167	0.073	2.79	90	1.0	-	4.63	-0.05	88	326	70	62
107	17.080	0.166	0.072	2.79	90	1.0	-	4.58	-0.05	87	325	70	62
108	17.243	0.163	0.070	2.79	90	1.0	-	4.55	-0.03	88	325	70	62
109	17.410	0.167	0.070	2.80	90	1.0	-	4.51	-0.04	88	323	70	62
110	17.577	0.167	0.072	2.79	90	1.0	100	4.44	-0.07	88	321	70	62
111	17.741	0.164	0.072	2.79	90	1.0	-	4.42	-0.02	88	320	70	62
112	17.907	0.166	0.072	2.80	90	1.0	-	4.38	-0.04	88	320	70	62
113	18.074	0.167	0.070	2.80	90	1.0	-	4.32	-0.06	88	320	70	62
114	18.238	0.164	0.073	2.79	90	1.0	-	4.29	-0.03	88	320	70	62
115	18.404	0.166	0.070	2.79	90	1.0	-	4.24	-0.05	88	318	70	62
116	18.570	0.166	0.071	2.80	90	1.0	-	4.21	-0.03	87	319	70	61
117	18.734	0.164	0.070	2.78	90	1.0	-	4.18	-0.03	88	317	70	62
118	18.900	0.166	0.072	2.79	90	1.0	-	4.14	-0.04	88	316	70	62
119	19.068	0.168	0.071	2.79	90	1.0	-	4.09	-0.05	88	314	70	62
120	19.231	0.163	0.070	2.79	90	1.0	100	4.06	-0.03	88	314	70	62
121	19.398	0.167	0.068	2.80	90	1.0	-	4.00	-0.06	88	314	70	62
122	19.566	0.168	0.071	2.79	91	1.0	-	3.97	-0.03	88	313	70	62
123	19.728	0.162	0.071	2.79	91	1.0	-	3.92	-0.05	88	313	70	62
124	19.896	0.168	0.072	2.81	91	1.0	-	3.88	-0.04	88	312	70	62
125	20.063	0.167	0.072	2.80	91	1.0	-	3.84	-0.04	88	311	70	63
126	20.225	0.162	0.071	2.79	91	1.0	-	3.80	-0.04	88	309	70	63
127	20.393	0.168	0.071	2.80	91	1.0	-	3.77	-0.03	88	309	70	62

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
128	20.560	0.167	0.071	2.79	91	1.0	-	3.71	-0.06	88	307	70	62
129	20.722	0.162	0.071	2.80	91	1.0	-	3.66	-0.05	88	307	70	62
130	20.891	0.169	0.072	2.80	91	1.0	100	3.61	-0.05	87	306	70	62
131	21.058	0.167	0.069	2.80	91	1.0	-	3.58	-0.03	87	305	70	62
132	21.220	0.162	0.070	2.80	91	1.0	-	3.54	-0.04	87	305	70	62
133	21.390	0.170	0.072	2.80	91	1.0	-	3.52	-0.02	87	305	70	62
134	21.555	0.165	0.069	2.79	91	1.0	-	3.48	-0.04	87	304	70	62
135	21.719	0.164	0.072	2.80	91	1.0	-	3.45	-0.03	87	304	70	62
136	21.889	0.170	0.071	2.80	91	1.0	-	3.41	-0.04	87	304	70	62
137	22.053	0.164	0.069	2.79	91	1.0	-	3.37	-0.04	87	303	70	62
138	22.217	0.164	0.070	2.81	91	1.0	-	3.34	-0.03	87	303	70	62
139	22.387	0.170	0.071	2.81	91	1.0	-	3.30	-0.04	87	303	70	63
140	22.552	0.165	0.073	2.80	91	1.0	99	3.26	-0.04	87	303	70	62
141	22.715	0.163	0.072	2.81	91	1.0	-	3.23	-0.03	87	302	70	63
142	22.885	0.170	0.069	2.79	91	1.0	-	3.18	-0.05	87	300	70	62
143	23.049	0.164	0.071	2.80	91	1.0	-	3.15	-0.03	88	299	70	62
144	23.214	0.165	0.070	2.80	91	1.0	-	3.12	-0.03	87	299	70	62
145	23.384	0.170	0.071	2.80	91	1.0	-	3.09	-0.03	87	298	70	62
146	23.548	0.164	0.072	2.80	91	1.0	-	3.05	-0.04	87	298	70	63
147	23.713	0.165	0.070	2.81	92	1.0	-	3.02	-0.03	87	297	70	63
148	23.883	0.170	0.071	2.80	92	1.0	-	2.98	-0.04	87	296	70	63
149	24.047	0.164	0.070	2.79	92	1.0	-	2.94	-0.04	87	295	70	63
150	24.212	0.165	0.071	2.80	92	1.0	99	2.91	-0.03	86	295	70	62
151	24.382	0.170	0.069	2.81	92	1.0	-	2.88	-0.03	86	295	70	62
152	24.546	0.164	0.070	2.80	92	1.0	-	2.83	-0.05	86	294	70	62
153	24.712	0.166	0.070	2.80	92	1.0	-	2.81	-0.02	87	293	70	63
154	24.881	0.169	0.070	2.80	92	1.0	-	2.76	-0.05	87	291	70	63
155	25.045	0.164	0.071	2.81	92	1.0	-	2.72	-0.04	87	291	70	62
156	25.211	0.166	0.070	2.81	92	1.0	-	2.68	-0.04	86	291	70	63
157	25.381	0.170	0.069	2.82	92	1.0	-	2.65	-0.03	86	291	70	63
158	25.544	0.163	0.070	2.81	92	1.0	-	2.61	-0.04	86	291	70	63
159	25.711	0.167	0.071	2.81	92	1.0	-	2.57	-0.04	86	291	70	63

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
160	25.880	0.169	0.070	2.81	92	1.0	101	2.53	-0.04	86	292	70	63
161	26.044	0.164	0.072	2.80	92	1.0	-	2.49	-0.04	86	290	70	63
162	26.210	0.166	0.071	2.81	92	1.0	-	2.46	-0.03	87	289	70	63
163	26.380	0.170	0.071	2.82	92	1.0	-	2.42	-0.04	87	289	70	63
164	26.544	0.164	0.070	2.81	92	1.0	-	2.39	-0.03	86	289	70	63
165	26.710	0.166	0.072	2.82	92	1.0	-	2.37	-0.02	86	289	70	63
166	26.880	0.170	0.071	2.82	92	1.0	-	2.33	-0.04	86	288	70	63
167	27.044	0.164	0.069	2.81	92	1.0	-	2.30	-0.03	86	288	70	63
168	27.210	0.166	0.069	2.82	92	1.0	-	2.28	-0.02	85	287	70	63
169	27.380	0.170	0.069	2.81	92	1.0	-	2.24	-0.04	85	287	70	63
170	27.544	0.164	0.072	2.81	92	1.0	100	2.21	-0.03	86	286	70	63
171	27.710	0.166	0.071	2.82	92	1.0	-	2.18	-0.03	86	286	70	63
172	27.881	0.171	0.070	2.81	92	1.0	-	2.14	-0.04	86	284	70	63
173	28.045	0.164	0.072	2.81	92	1.0	-	2.12	-0.02	86	283	70	63
174	28.210	0.165	0.069	2.81	92	1.0	-	2.08	-0.04	86	283	70	63
175	28.381	0.171	0.071	2.81	92	1.0	-	2.05	-0.03	86	283	70	63
176	28.546	0.165	0.069	2.81	92	1.0	-	2.03	-0.02	85	282	70	63
177	28.711	0.165	0.069	2.81	92	1.0	-	2.00	-0.03	85	282	70	63
178	28.882	0.171	0.068	2.81	92	1.0	-	1.97	-0.03	85	284	70	63
179	29.047	0.165	0.070	2.81	92	1.0	-	1.94	-0.03	85	285	70	63
180	29.212	0.165	0.070	2.83	92	1.0	100	1.93	-0.01	85	285	70	63
181	29.382	0.170	0.072	2.82	92	1.0	-	1.91	-0.02	85	284	70	63
182	29.548	0.166	0.072	2.81	92	1.0	-	1.87	-0.04	86	283	70	63
183	29.712	0.164	0.071	2.82	93	1.0	-	1.84	-0.03	86	282	70	63
184	29.883	0.171	0.069	2.82	93	1.0	-	1.81	-0.03	86	282	70	63
185	30.048	0.165	0.072	2.81	93	1.0	-	1.80	-0.01	85	282	70	63
186	30.213	0.165	0.070	2.82	93	1.0	-	1.78	-0.02	85	281	70	63
187	30.383	0.170	0.070	2.82	93	1.0	-	1.76	-0.02	85	280	70	63
188	30.550	0.167	0.070	2.81	93	1.0	-	1.75	-0.01	84	279	70	63
189	30.713	0.163	0.070	2.81	93	1.0	-	1.74	-0.01	84	278	70	63
190	30.884	0.171	0.070	2.82	93	1.0	101	1.72	-0.02	85	278	70	63
191	31.051	0.167	0.070	2.83	93	1.0	-	1.68	-0.04	85	276	70	63

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
192	31.214	0.163	0.072	2.81	93	1.0	-	1.67	-0.01	84	275	70	62
193	31.384	0.170	0.069	2.82	93	1.0	-	1.66	-0.01	84	274	70	62
194	31.552	0.168	0.071	2.81	93	1.0	-	1.64	-0.02	84	273	70	62
195	31.716	0.164	0.072	2.81	93	1.0	-	1.60	-0.04	83	272	70	62
196	31.885	0.169	0.072	2.82	93	1.0	-	1.60	0.00	83	270	70	62
197	32.054	0.169	0.070	2.81	93	1.0	-	1.59	-0.01	84	270	70	62
198	32.217	0.163	0.069	2.81	93	1.0	-	1.58	-0.01	84	269	70	63
199	32.386	0.169	0.071	2.83	93	1.0	-	1.57	-0.01	84	267	70	63
200	32.555	0.169	0.071	2.82	93	1.0	101	1.54	-0.03	84	265	70	62
201	32.719	0.164	0.069	2.81	93	1.0	-	1.51	-0.03	84	266	70	62
202	32.887	0.168	0.071	2.81	93	1.0	-	1.50	-0.01	83	265	70	62
203	33.057	0.170	0.071	2.80	93	1.0	-	1.47	-0.03	83	262	70	62
204	33.220	0.163	0.068	2.81	93	1.0	-	1.45	-0.02	84	260	70	62
205	33.388	0.168	0.073	2.81	93	1.0	-	1.44	-0.01	84	259	70	62
206	33.557	0.169	0.072	2.82	93	1.0	-	1.42	-0.02	84	258	70	62
207	33.722	0.165	0.071	2.81	93	1.0	-	1.40	-0.02	84	258	70	62
208	33.889	0.167	0.070	2.81	93	1.0	-	1.38	-0.02	84	256	70	63
209	34.058	0.169	0.071	2.82	93	1.0	-	1.36	-0.02	84	256	70	63
210	34.224	0.166	0.070	2.81	93	1.0	100	1.36	0.00	84	256	70	62
211	34.391	0.167	0.069	2.81	93	1.0	-	1.34	-0.02	84	255	70	62
212	34.559	0.168	0.069	2.82	93	1.0	-	1.32	-0.02	84	255	70	62
213	34.725	0.166	0.070	2.81	93	1.0	-	1.29	-0.03	84	253	70	62
214	34.893	0.168	0.069	2.82	93	1.0	-	1.28	-0.01	84	253	70	62
215	35.062	0.169	0.069	2.83	93	1.0	-	1.26	-0.02	84	253	70	62
216	35.227	0.165	0.071	2.81	93	1.0	-	1.23	-0.03	83	252	70	62
217	35.395	0.168	0.071	2.81	93	1.0	-	1.23	0.00	83	252	70	62
218	35.564	0.169	0.069	2.82	93	1.0	-	1.21	-0.02	83	251	70	62
219	35.729	0.165	0.071	2.82	93	1.0	-	1.19	-0.02	83	250	70	63
220	35.897	0.168	0.071	2.82	93	1.0	101	1.18	-0.01	84	248	70	63
221	36.065	0.168	0.072	2.81	93	1.0	-	1.16	-0.02	84	248	70	63
222	36.230	0.165	0.071	2.82	93	1.0	-	1.15	-0.01	84	246	70	63
223	36.399	0.169	0.072	2.81	93	1.0	-	1.13	-0.02	83	247	70	63

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
224	36.568	0.169	0.070	2.81	93	1.0	-	1.12	-0.01	83	247	70	63
225	36.732	0.164	0.070	2.82	93	1.0	-	1.10	-0.02	83	247	70	63
226	36.901	0.169	0.071	2.81	93	1.0	-	1.08	-0.02	83	246	70	63
227	37.070	0.169	0.069	2.82	93	1.0	-	1.08	0.00	83	246	70	62
228	37.234	0.164	0.070	2.82	93	1.0	-	1.06	-0.02	83	245	70	62
229	37.402	0.168	0.071	2.82	93	1.0	-	1.04	-0.02	83	245	70	62
230	37.572	0.170	0.069	2.82	93	1.0	101	1.03	-0.01	83	244	70	62
231	37.736	0.164	0.069	2.81	93	1.0	-	1.00	-0.03	83	243	70	62
232	37.903	0.167	0.068	2.83	93	1.0	-	0.99	-0.01	82	243	70	63
233	38.073	0.170	0.071	2.80	93	1.0	-	0.97	-0.02	82	243	70	62
234	38.238	0.165	0.069	2.81	93	1.0	-	0.96	-0.01	82	242	70	62
235	38.404	0.166	0.069	2.82	93	1.0	-	0.95	-0.01	82	242	70	62
236	38.575	0.171	0.069	2.80	93	1.0	-	0.93	-0.02	83	242	70	62
237	38.741	0.166	0.069	2.82	93	1.0	-	0.92	-0.01	83	241	70	62
238	38.906	0.165	0.071	2.83	93	1.0	-	0.91	-0.01	83	241	70	62
239	39.077	0.171	0.071	2.82	93	1.0	-	0.89	-0.02	83	241	70	63
240	39.243	0.166	0.072	2.81	93	1.0	100	0.87	-0.02	83	241	70	63
241	39.407	0.164	0.070	2.81	93	1.0	-	0.86	-0.01	82	240	70	63
242	39.578	0.171	0.070	2.82	93	1.0	-	0.85	-0.01	82	240	70	63
243	39.746	0.168	0.071	2.81	93	1.0	-	0.84	-0.01	83	239	70	62
244	39.909	0.163	0.070	2.81	93	1.0	-	0.82	-0.02	83	237	70	62
245	40.079	0.170	0.071	2.81	93	1.0	-	0.80	-0.02	83	236	70	62
246	40.248	0.169	0.071	2.81	93	1.0	-	0.78	-0.02	82	235	70	62
247	40.412	0.164	0.069	2.81	93	1.0	-	0.77	-0.01	82	235	70	62
248	40.581	0.169	0.069	2.83	93	1.0	-	0.76	-0.01	82	235	70	62
249	40.751	0.170	0.069	2.82	93	1.0	-	0.75	-0.01	82	234	70	62
250	40.914	0.163	0.068	2.81	93	1.0	101	0.74	-0.01	82	233	70	62
251	41.083	0.169	0.070	2.82	93	1.0	-	0.72	-0.02	83	233	70	62
252	41.252	0.169	0.069	2.83	93	1.0	-	0.71	-0.01	83	232	70	62
253	41.417	0.165	0.069	2.82	93	1.0	-	0.70	-0.01	82	232	70	62
254	41.585	0.168	0.068	2.82	93	1.0	-	0.67	-0.03	82	231	70	62
255	41.753	0.168	0.071	2.82	93	1.0	-	0.66	-0.01	81	229	70	63

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
256	41.919	0.166	0.069	2.81	93	1.0	-	0.65	-0.01	82	228	70	63
257	42.087	0.168	0.068	2.82	93	1.0	-	0.63	-0.02	82	227	70	62
258	42.256	0.169	0.069	2.82	93	1.0	-	0.62	-0.01	82	225	70	62
259	42.422	0.166	0.068	2.82	93	1.0	-	0.60	-0.02	82	223	70	62
260	42.589	0.167	0.069	2.81	93	1.0	102	0.57	-0.03	82	223	70	62
261	42.758	0.169	0.070	2.82	93	1.0	-	0.57	0.00	82	223	70	62
262	42.923	0.165	0.069	2.82	93	1.0	-	0.54	-0.03	82	222	70	62
263	43.091	0.168	0.069	2.82	93	1.0	-	0.53	-0.01	82	222	70	62
264	43.260	0.169	0.070	2.82	93	1.0	-	0.52	-0.01	82	221	70	62
265	43.425	0.165	0.068	2.81	93	1.0	-	0.51	-0.01	82	221	70	62
266	43.593	0.168	0.071	2.82	93	1.0	-	0.48	-0.03	82	220	70	63
267	43.762	0.169	0.069	2.82	93	1.0	-	0.46	-0.02	81	220	70	63
268	43.927	0.165	0.068	2.82	93	1.0	-	0.46	0.00	82	219	70	63
269	44.096	0.169	0.072	2.82	93	1.0	-	0.45	-0.01	82	218	70	63
270	44.265	0.169	0.070	2.81	93	1.0	101	0.43	-0.02	82	218	70	63
271	44.430	0.165	0.069	2.82	93	1.0	-	0.42	-0.01	82	218	70	63
272	44.597	0.167	0.070	2.82	93	1.0	-	0.41	-0.01	82	217	70	64
273	44.767	0.170	0.070	2.82	93	1.0	-	0.40	-0.01	82	217	70	64
274	44.932	0.165	0.069	2.82	93	1.0	-	0.39	-0.01	82	216	70	64
275	45.098	0.166	0.071	2.82	93	1.0	-	0.36	-0.03	82	217	70	64
276	45.270	0.172	0.070	2.81	93	1.0	-	0.36	0.00	82	216	70	64
277	45.436	0.166	0.071	2.82	93	1.0	-	0.35	-0.01	82	216	70	64
278	45.601	0.165	0.069	2.83	93	1.0	-	0.34	-0.01	83	216	70	65
279	45.772	0.171	0.070	2.82	93	1.0	-	0.33	-0.01	83	215	70	64
280	45.939	0.167	0.070	2.82	93	1.0	101	0.32	-0.01	83	215	70	65
281	46.103	0.164	0.070	2.82	93	1.0	-	0.30	-0.02	83	216	70	65
282	46.274	0.171	0.071	2.82	93	1.0	-	0.30	0.00	83	215	70	65
283	46.443	0.169	0.070	2.81	93	1.0	-	0.28	-0.02	83	216	70	65
284	46.607	0.164	0.071	2.81	93	1.0	-	0.28	0.00	82	215	70	65
285	46.777	0.170	0.068	2.84	93	1.0	-	0.26	-0.02	83	216	71	65
286	46.947	0.170	0.068	2.82	93	1.0	-	0.25	-0.01	83	216	71	65
287	47.111	0.164	0.070	2.82	93	1.0	-	0.24	-0.01	82	216	71	65

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 3

Technician: AK

Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
288	47.280	0.169	0.070	2.83	94	1.0	-	0.23	-0.01	82	216	71	65
289	47.449	0.169	0.070	2.84	94	1.0	-	0.22	-0.01	82	215	71	65
290	47.615	0.166	0.068	2.83	94	1.0	102	0.21	-0.01	82	215	71	65
291	47.784	0.169	0.070	2.82	94	1.0	-	0.20	-0.01	82	214	71	65
292	47.953	0.169	0.069	2.84	94	1.0	-	0.19	-0.01	82	214	71	65
293	48.119	0.166	0.071	2.84	94	1.0	-	0.17	-0.02	82	213	71	65
294	48.288	0.169	0.071	2.84	94	1.1	-	0.16	-0.01	82	213	71	65
295	48.458	0.170	0.071	2.83	94	1.0	-	0.16	0.00	82	213	71	65
296	48.623	0.165	0.070	2.84	94	1.0	-	0.15	-0.01	82	212	71	66
297	48.793	0.170	0.071	2.84	94	1.0	-	0.13	-0.02	82	212	71	66
298	48.963	0.170	0.070	2.84	94	1.0	-	0.12	-0.01	82	211	71	66
299	49.128	0.165	0.070	2.84	94	1.0	-	0.11	-0.01	82	211	71	66
300	49.296	0.168	0.070	2.83	94	1.1	102	0.11	0.00	82	211	71	66
301	49.468	0.172	0.071	2.84	94	1.0	-	0.09	-0.02	82	210	71	66
302	49.635	0.167	0.070	2.84	94	1.0	-	0.08	-0.01	82	209	71	66
303	49.800	0.165	0.070	2.83	94	1.0	-	0.08	0.00	81	209	71	66
304	49.971	0.171	0.069	2.84	94	1.0	-	0.06	-0.02	81	209	71	66
305	50.141	0.170	0.070	2.83	94	1.0	-	0.06	0.00	81	208	71	66
306	50.306	0.165	0.068	2.83	95	1.0	-	0.04	-0.02	81	208	71	66
307	50.476	0.170	0.069	2.84	95	1.0	-	0.04	0.00	81	207	71	66
308	50.646	0.170	0.069	2.83	95	1.0	-	0.02	-0.02	81	207	71	66
309	50.812	0.166	0.070	2.83	95	1.0	-	0.01	-0.01	81	207	71	66
310	50.982	0.170	0.068	2.84	95	1.0	102	0.01	0.00	81	206	71	66
311	51.151	0.169	0.068	2.85	95	1.0	102	0.00	-0.01	81	206	71	66
Avg/Tot	51.151	0.164	0.071	2.75	88.4	1.0	100			86.4	291.5	70.1	62.5

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
0	0.000		0.01	70	0.7		69	-0.054	10.04	0.334
1	0.109	0.109	2.63	69	2.0	-	69	-0.060	8.91	0.082
2	0.267	0.158	2.61	70	2.0	-	70	-0.061	9.93	0.113
3	0.422	0.155	2.62	69	1.7	-	70	-0.064	10.51	0.107
4	0.581	0.159	2.62	69	1.8	-	70	-0.066	10.02	0.150
5	0.736	0.155	2.62	69	1.5	-	70	-0.067	10.57	0.140
6	0.894	0.158	2.62	70	1.5	-	70	-0.065	10.16	0.239
7	1.052	0.158	2.62	70	1.8	-	71	-0.065	9.59	0.187
8	1.206	0.154	2.63	70	1.6	-	71	-0.067	9.86	0.166
9	1.366	0.160	2.64	70	1.6	-	71	-0.063	9.40	0.214
10	1.521	0.155	2.64	70	1.7	96	71	-0.064	8.69	0.206
11	1.679	0.158	2.63	70	2.1	-	71	-0.063	8.95	0.244
12	1.837	0.158	2.63	70	1.9	-	71	-0.064	9.83	0.304
13	1.993	0.156	2.63	71	1.6	-	71	-0.066	10.20	0.473
14	2.152	0.159	2.63	71	1.8	-	71	-0.068	9.93	0.502
15	2.308	0.156	2.63	71	2.1	-	72	-0.068	10.25	0.509
16	2.467	0.159	2.63	71	1.6	-	71	-0.067	9.63	0.648
17	2.623	0.156	2.63	72	2.1	-	72	-0.066	9.17	0.566
18	2.781	0.158	2.63	72	2.0	-	72	-0.067	9.41	0.616
19	2.940	0.159	2.63	72	1.7	-	72	-0.068	10.05	0.712
20	3.095	0.155	2.64	72	1.6	100	72	-0.069	10.43	0.789
21	3.256	0.161	2.64	73	1.6	-	72	-0.069	10.76	0.885
22	3.411	0.155	2.63	73	1.5	-	72	-0.066	9.95	0.684
23	3.571	0.160	2.64	73	2.0	-	72	-0.066	9.37	0.561
24	3.730	0.159	2.64	74	1.6	-	72	-0.066	9.50	0.589
25	3.885	0.155	2.63	74	1.6	-	72	-0.065	9.50	0.586
26	4.046	0.161	2.65	74	1.7	-	72	-0.065	9.67	0.612
27	4.202	0.156	2.64	74	1.8	-	72	-0.067	9.73	0.642
28	4.362	0.160	2.65	75	1.8	-	72	-0.067	9.69	0.667
29	4.522	0.160	2.65	75	2.1	-	72	-0.066	9.84	0.703
30	4.677	0.155	2.64	75	2.0	100	72	-0.067	10.00	0.748
31	4.839	0.162	2.64	76	1.7	-	72	-0.068	10.23	0.788

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
32	4.996	0.157	2.65	76	1.7	-	72	-0.066	10.52	0.858
33	5.156	0.160	2.65	76	1.5	-	72	-0.069	11.01	0.917
34	5.316	0.160	2.65	77	1.7	-	72	-0.069	12.12	1.387
35	5.472	0.156	2.65	77	1.6	-	72	-0.070	12.24	1.107
36	5.635	0.163	2.65	77	1.8	-	72	-0.071	11.57	0.856
37	5.791	0.156	2.65	78	1.7	-	72	-0.070	11.48	0.795
38	5.952	0.161	2.66	78	1.8	-	72	-0.070	11.36	0.734
39	6.112	0.160	2.66	78	2.0	-	72	-0.070	11.11	0.676
40	6.269	0.157	2.66	78	1.9	99	72	-0.069	10.91	0.707
41	6.431	0.162	2.66	79	1.6	-	72	-0.069	10.97	0.702
42	6.589	0.158	2.66	79	1.7	-	72	-0.071	11.01	0.709
43	6.750	0.161	2.67	79	1.7	-	72	-0.070	10.95	0.740
44	6.911	0.161	2.66	80	1.8	-	72	-0.069	11.14	0.811
45	7.069	0.158	2.67	80	1.7	-	72	-0.067	11.20	0.863
46	7.230	0.161	2.66	80	1.5	-	72	-0.068	11.53	0.810
47	7.391	0.161	2.66	80	1.6	-	72	-0.069	11.63	0.770
48	7.550	0.159	2.67	81	1.6	-	72	-0.070	11.54	0.807
49	7.713	0.163	2.67	81	2.0	-	72	-0.070	11.64	0.767
50	7.871	0.158	2.67	81	1.6	100	72	-0.069	11.63	0.714
51	8.033	0.162	2.67	81	1.8	-	72	-0.069	11.81	0.713
52	8.194	0.161	2.67	82	1.7	-	72	-0.069	11.87	0.672
53	8.353	0.159	2.68	82	1.6	-	72	-0.070	11.82	0.690
54	8.515	0.162	2.68	82	1.8	-	72	-0.071	11.81	0.663
55	8.676	0.161	2.68	82	1.6	-	72	-0.071	11.83	0.651
56	8.835	0.159	2.67	83	1.5	-	72	-0.070	11.83	0.630
57	8.999	0.164	2.67	83	2.0	-	72	-0.069	11.93	0.608
58	9.157	0.158	2.68	83	1.6	-	72	-0.069	11.98	0.601
59	9.320	0.163	2.68	83	1.7	-	72	-0.069	11.88	0.578
60	9.482	0.162	2.68	83	1.6	100	72	-0.070	11.54	0.639
61	9.642	0.160	2.69	84	1.7	-	72	-0.069	11.01	0.817
62	9.804	0.162	2.68	84	1.6	-	72	-0.069	10.72	0.788
63	9.966	0.162	2.69	84	2.1	-	72	-0.068	10.77	0.779

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
64	10.126	0.160	2.69	84	1.8	-	72	-0.068	10.85	0.793
65	10.290	0.164	2.69	85	2.1	-	72	-0.068	10.62	0.754
66	10.449	0.159	2.69	85	1.6	-	72	-0.068	10.17	0.690
67	10.612	0.163	2.69	85	1.6	-	72	-0.066	9.81	0.602
68	10.775	0.163	2.69	85	2.0	-	72	-0.065	9.61	0.544
69	10.935	0.160	2.69	85	1.6	-	72	-0.066	9.54	0.502
70	11.097	0.162	2.68	85	1.9	99	72	-0.067	9.48	0.489
71	11.261	0.164	2.69	86	1.7	-	72	-0.065	9.48	0.481
72	11.420	0.159	2.69	86	2.1	-	72	-0.063	9.52	0.472
73	11.585	0.165	2.69	86	1.8	-	72	-0.064	9.58	0.472
74	11.746	0.161	2.69	86	1.7	-	72	-0.064	9.65	0.482
75	11.907	0.161	2.70	86	2.1	-	72	-0.063	9.74	0.489
76	12.072	0.165	2.70	86	1.6	-	72	-0.065	9.75	0.499
77	12.231	0.159	2.70	87	2.0	-	72	-0.063	9.79	0.512
78	12.395	0.164	2.70	87	1.8	-	72	-0.064	9.81	0.518
79	12.558	0.163	2.69	87	1.6	-	72	-0.065	9.89	0.536
80	12.719	0.161	2.69	87	1.5	99	72	-0.064	9.92	0.536
81	12.882	0.163	2.70	87	1.6	-	72	-0.063	10.01	0.545
82	13.046	0.164	2.70	87	1.5	-	72	-0.063	10.09	0.556
83	13.206	0.160	2.70	87	1.5	-	72	-0.063	10.10	0.563
84	13.371	0.165	2.70	88	1.6	-	72	-0.064	10.18	0.578
85	13.533	0.162	2.70	88	1.7	-	72	-0.064	10.21	0.572
86	13.694	0.161	2.70	88	1.8	-	72	-0.064	10.16	0.539
87	13.859	0.165	2.71	88	1.9	-	72	-0.064	10.14	0.473
88	14.020	0.161	2.70	88	1.7	-	72	-0.062	10.10	0.435
89	14.184	0.164	2.70	88	1.5	-	72	-0.063	9.98	0.418
90	14.347	0.163	2.70	88	2.0	101	72	-0.062	9.87	0.405
91	14.508	0.161	2.71	88	1.7	-	72	-0.060	9.81	0.383
92	14.672	0.164	2.70	89	1.7	-	72	-0.062	9.77	0.363
93	14.835	0.163	2.70	89	2.0	-	72	-0.062	9.74	0.339
94	14.997	0.162	2.70	89	2.1	-	71	-0.062	9.69	0.311
95	15.161	0.164	2.70	89	1.7	-	72	-0.061	9.66	0.314

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
96	15.325	0.164	2.71	89	2.1	-	72	-0.060	9.73	0.296
97	15.485	0.160	2.70	89	2.1	-	72	-0.062	9.70	0.283
98	15.651	0.166	2.71	89	2.0	-	72	-0.061	9.67	0.274
99	15.813	0.162	2.70	89	1.6	-	72	-0.061	9.60	0.276
100	15.975	0.162	2.71	89	2.1	100	72	-0.061	9.48	0.290
101	16.141	0.166	2.70	89	1.6	-	72	-0.062	9.45	0.289
102	16.301	0.160	2.70	90	2.1	-	72	-0.061	9.39	0.278
103	16.466	0.165	2.70	90	1.6	-	72	-0.061	9.33	0.280
104	16.631	0.165	2.71	90	2.0	-	72	-0.061	9.25	0.295
105	16.791	0.160	2.70	90	1.7	-	72	-0.061	9.11	0.320
106	16.956	0.165	2.71	90	1.6	-	72	-0.063	9.07	0.316
107	17.120	0.164	2.70	90	1.8	-	71	-0.062	8.97	0.327
108	17.282	0.162	2.71	90	1.9	-	71	-0.059	8.93	0.335
109	17.445	0.163	2.71	90	2.1	-	72	-0.061	8.91	0.333
110	17.610	0.165	2.71	90	1.6	99	72	-0.061	8.81	0.337
111	17.771	0.161	2.71	90	2.1	-	71	-0.060	8.67	0.334
112	17.936	0.165	2.71	90	2.0	-	71	-0.060	8.59	0.343
113	18.100	0.164	2.70	90	2.0	-	71	-0.061	8.58	0.354
114	18.261	0.161	2.70	90	1.5	-	71	-0.060	8.56	0.345
115	18.427	0.166	2.71	91	2.1	-	71	-0.061	8.81	0.306
116	18.589	0.162	2.71	91	1.7	-	71	-0.061	8.72	0.319
117	18.752	0.163	2.71	91	1.9	-	71	-0.059	8.60	0.345
118	18.918	0.166	2.70	91	1.6	-	71	-0.060	8.61	0.354
119	19.078	0.160	2.70	91	1.6	-	72	-0.058	8.47	0.360
120	19.243	0.165	2.71	91	1.6	100	71	-0.058	8.35	0.362
121	19.408	0.165	2.71	91	1.7	-	72	-0.059	8.33	0.372
122	19.569	0.161	2.71	91	2.0	-	72	-0.060	8.28	0.373
123	19.734	0.165	2.70	91	2.0	-	71	-0.059	8.20	0.369
124	19.898	0.164	2.71	91	2.1	-	72	-0.059	8.16	0.369
125	20.060	0.162	2.72	91	1.5	-	72	-0.060	8.11	0.362
126	20.224	0.164	2.70	91	1.9	-	72	-0.058	8.06	0.356
127	20.389	0.165	2.71	91	1.6	-	72	-0.059	8.04	0.356

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
128	20.551	0.162	2.70	91	2.0	-	72	-0.059	7.93	0.347
129	20.715	0.164	2.71	91	1.8	-	72	-0.057	7.95	0.378
130	20.880	0.165	2.71	91	1.6	100	72	-0.058	7.93	0.383
131	21.041	0.161	2.70	91	2.1	-	72	-0.058	7.85	0.378
132	21.207	0.166	2.71	91	1.5	-	71	-0.059	7.77	0.395
133	21.370	0.163	2.71	91	2.0	-	71	-0.057	7.73	0.399
134	21.532	0.162	2.70	91	1.6	-	72	-0.058	7.70	0.402
135	21.698	0.166	2.72	91	2.1	-	71	-0.056	7.65	0.401
136	21.861	0.163	2.72	91	1.6	-	71	-0.058	7.61	0.394
137	22.024	0.163	2.71	91	1.6	-	71	-0.057	7.63	0.391
138	22.190	0.166	2.71	91	2.1	-	71	-0.056	7.64	0.382
139	22.351	0.161	2.71	92	2.0	-	71	-0.057	7.62	0.383
140	22.515	0.164	2.71	92	1.8	99	71	-0.058	7.55	0.380
141	22.681	0.166	2.71	92	1.6	-	72	-0.056	7.52	0.381
142	22.842	0.161	2.71	92	1.6	-	72	-0.057	7.52	0.380
143	23.007	0.165	2.71	92	1.8	-	72	-0.055	7.53	0.381
144	23.171	0.164	2.71	92	1.7	-	72	-0.055	7.48	0.380
145	23.333	0.162	2.71	92	1.7	-	72	-0.056	7.43	0.370
146	23.498	0.165	2.71	92	1.6	-	72	-0.056	7.39	0.376
147	23.663	0.165	2.71	92	1.6	-	72	-0.058	7.37	0.373
148	23.825	0.162	2.71	92	1.5	-	72	-0.056	7.32	0.377
149	23.990	0.165	2.71	92	1.5	-	72	-0.055	7.27	0.369
150	24.154	0.164	2.71	92	2.1	99	72	-0.056	7.27	0.376
151	24.316	0.162	2.71	92	1.5	-	72	-0.057	7.23	0.374
152	24.481	0.165	2.71	92	1.8	-	72	-0.055	7.19	0.374
153	24.646	0.165	2.71	92	2.1	-	72	-0.056	7.76	0.363
154	24.808	0.162	2.70	92	1.5	-	72	-0.055	8.13	0.333
155	24.973	0.165	2.71	92	2.1	-	72	-0.055	8.04	0.329
156	25.137	0.164	2.71	92	1.6	-	72	-0.057	7.96	0.333
157	25.299	0.162	2.70	92	1.6	-	72	-0.056	7.87	0.340
158	25.466	0.167	2.71	92	2.0	-	72	-0.057	7.67	0.353
159	25.629	0.163	2.70	92	1.8	-	72	-0.057	7.61	0.357

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
160	25.791	0.162	2.71	92	2.1	100	72	-0.058	7.52	0.362
161	25.958	0.167	2.71	92	2.1	-	72	-0.054	7.38	0.354
162	26.119	0.161	2.71	92	2.0	-	72	-0.054	7.32	0.365
163	26.283	0.164	2.71	92	1.9	-	72	-0.053	7.24	0.365
164	26.449	0.166	2.71	92	1.5	-	72	-0.056	7.16	0.360
165	26.611	0.162	2.71	92	1.5	-	72	-0.055	7.14	0.355
166	26.776	0.165	2.71	92	1.5	-	72	-0.055	7.00	0.364
167	26.941	0.165	2.71	92	2.1	-	72	-0.055	6.90	0.368
168	27.102	0.161	2.71	92	1.8	-	72	-0.055	6.83	0.364
169	27.268	0.166	2.71	92	1.8	-	72	-0.054	6.80	0.365
170	27.432	0.164	2.71	92	1.8	100	72	-0.054	6.72	0.368
171	27.595	0.163	2.71	92	2.0	-	72	-0.053	6.68	0.369
172	27.760	0.165	2.71	92	2.0	-	72	-0.055	6.65	0.370
173	27.925	0.165	2.71	92	2.0	-	72	-0.053	6.61	0.360
174	28.087	0.162	2.71	92	2.1	-	72	-0.055	6.62	0.368
175	28.252	0.165	2.71	92	1.9	-	72	-0.055	6.57	0.362
176	28.416	0.164	2.71	93	1.6	-	72	-0.055	6.53	0.378
177	28.579	0.163	2.71	92	2.0	-	72	-0.054	6.48	0.373
178	28.744	0.165	2.71	93	1.6	-	72	-0.055	6.40	0.382
179	28.909	0.165	2.71	93	1.9	-	72	-0.057	6.32	0.418
180	29.071	0.162	2.71	93	1.8	100	72	-0.052	6.37	0.484
181	29.236	0.165	2.71	93	1.7	-	72	-0.054	6.35	0.486
182	29.400	0.164	2.71	93	1.6	-	72	-0.055	6.32	0.481
183	29.562	0.162	2.70	93	1.6	-	72	-0.055	6.27	0.477
184	29.729	0.167	2.71	93	1.9	-	72	-0.053	6.15	0.469
185	29.892	0.163	2.71	93	1.7	-	72	-0.053	6.14	0.470
186	30.055	0.163	2.71	93	2.1	-	72	-0.055	6.18	0.471
187	30.222	0.167	2.71	93	1.5	-	72	-0.055	6.08	0.463
188	30.384	0.162	2.71	93	2.0	-	72	-0.054	6.04	0.461
189	30.547	0.163	2.71	93	1.7	-	72	-0.053	5.93	0.465
190	30.714	0.167	2.71	93	2.1	100	72	-0.053	5.88	0.460
191	30.875	0.161	2.70	93	1.5	-	72	-0.052	5.81	0.453

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
192	31.040	0.165	2.71	93	1.7	-	71	-0.053	5.75	0.451
193	31.206	0.166	2.72	93	2.0	-	71	-0.052	5.66	0.451
194	31.368	0.162	2.71	93	2.0	-	71	-0.052	5.63	0.454
195	31.533	0.165	2.71	93	1.6	-	71	-0.053	5.64	0.451
196	31.698	0.165	2.72	93	1.5	-	71	-0.053	5.56	0.453
197	31.860	0.162	2.71	93	1.8	-	71	-0.054	5.50	0.449
198	32.026	0.166	2.71	93	1.5	-	71	-0.052	5.48	0.448
199	32.190	0.164	2.70	93	2.0	-	71	-0.053	5.30	0.433
200	32.353	0.163	2.71	93	1.6	100	71	-0.053	5.21	0.433
201	32.518	0.165	2.71	93	2.0	-	71	-0.052	5.13	0.427
202	32.683	0.165	2.71	93	1.8	-	71	-0.050	5.27	0.440
203	32.846	0.163	2.71	93	1.7	-	71	-0.050	6.23	0.372
204	33.010	0.164	2.71	93	2.0	-	71	-0.049	6.40	0.356
205	33.175	0.165	2.71	93	1.9	-	71	-0.049	6.31	0.349
206	33.338	0.163	2.72	93	2.1	-	71	-0.049	6.21	0.353
207	33.503	0.165	2.71	93	1.6	-	71	-0.050	6.14	0.354
208	33.669	0.166	2.72	93	1.5	-	71	-0.050	6.08	0.360
209	33.831	0.162	2.71	93	2.0	-	71	-0.050	6.05	0.366
210	33.996	0.165	2.71	93	1.5	100	71	-0.050	6.01	0.373
211	34.161	0.165	2.71	93	1.6	-	71	-0.048	5.92	0.372
212	34.323	0.162	2.72	93	2.0	-	71	-0.049	6.17	0.372
213	34.489	0.166	2.71	93	1.5	-	71	-0.050	6.25	0.362
214	34.653	0.164	2.71	93	2.0	-	71	-0.049	6.20	0.360
215	34.815	0.162	2.71	93	1.8	-	71	-0.048	6.14	0.358
216	34.983	0.168	2.72	93	1.7	-	71	-0.050	6.09	0.363
217	35.146	0.163	2.72	93	2.1	-	71	-0.050	6.05	0.363
218	35.309	0.163	2.72	93	1.9	-	71	-0.048	5.97	0.369
219	35.476	0.167	2.71	93	2.0	-	71	-0.048	5.90	0.351
220	35.638	0.162	2.71	93	1.8	100	71	-0.046	5.87	0.357
221	35.801	0.163	2.72	93	1.9	-	71	-0.046	5.85	0.358
222	35.968	0.167	2.71	93	1.8	-	71	-0.047	5.83	0.362
223	36.130	0.162	2.70	93	1.6	-	71	-0.047	5.80	0.375

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
224	36.295	0.165	2.72	93	1.5	-	71	-0.047	5.74	0.385
225	36.461	0.166	2.71	93	2.1	-	71	-0.049	5.73	0.392
226	36.623	0.162	2.71	93	1.6	-	71	-0.048	5.72	0.395
227	36.788	0.165	2.71	93	2.1	-	71	-0.048	5.72	0.396
228	36.953	0.165	2.71	93	1.6	-	71	-0.048	5.78	0.387
229	37.114	0.161	2.71	93	2.0	-	71	-0.046	5.86	0.377
230	37.280	0.166	2.71	93	2.0	100	71	-0.048	5.83	0.380
231	37.445	0.165	2.71	93	1.8	-	71	-0.047	5.77	0.375
232	37.608	0.163	2.72	93	2.0	-	71	-0.049	5.71	0.381
233	37.773	0.165	2.71	93	1.6	-	71	-0.048	5.64	0.376
234	37.938	0.165	2.71	93	1.6	-	71	-0.047	5.64	0.388
235	38.100	0.162	2.71	93	1.7	-	71	-0.048	5.59	0.388
236	38.265	0.165	2.71	93	1.6	-	71	-0.046	5.60	0.400
237	38.430	0.165	2.71	93	1.6	-	71	-0.045	5.58	0.404
238	38.593	0.163	2.71	93	1.9	-	71	-0.046	5.51	0.393
239	38.757	0.164	2.71	93	2.0	-	71	-0.046	5.51	0.409
240	38.923	0.166	2.72	93	2.0	100	71	-0.046	5.46	0.412
241	39.085	0.162	2.71	93	1.6	-	71	-0.046	5.42	0.417
242	39.251	0.166	2.71	93	1.7	-	71	-0.046	5.41	0.410
243	39.416	0.165	2.71	93	1.6	-	71	-0.044	5.30	0.400
244	39.578	0.162	2.71	93	1.5	-	71	-0.046	5.30	0.370
245	39.743	0.165	2.71	93	2.0	-	71	-0.047	5.26	0.360
246	39.908	0.165	2.71	93	1.7	-	71	-0.047	5.22	0.369
247	40.070	0.162	2.70	93	1.6	-	71	-0.047	5.14	0.361
248	40.237	0.167	2.71	93	2.1	-	71	-0.048	5.11	0.367
249	40.400	0.163	2.71	93	1.8	-	71	-0.044	5.06	0.375
250	40.563	0.163	2.71	93	2.1	100	71	-0.045	5.08	0.375
251	40.731	0.168	2.71	93	1.8	-	71	-0.044	5.04	0.380
252	40.893	0.162	2.71	93	2.1	-	71	-0.045	5.01	0.383
253	41.056	0.163	2.71	93	1.8	-	71	-0.045	5.05	0.376
254	41.223	0.167	2.71	93	1.9	-	71	-0.044	5.17	0.393
255	41.384	0.161	2.70	93	2.0	-	71	-0.043	5.37	0.374

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
256	41.549	0.165	2.72	93	1.7	-	71	-0.044	5.42	0.357
257	41.716	0.167	2.71	93	1.9	-	71	-0.044	5.46	0.337
258	41.877	0.161	2.71	93	1.7	-	71	-0.043	5.49	0.332
259	42.043	0.166	2.71	93	2.1	-	71	-0.042	5.52	0.325
260	42.208	0.165	2.71	93	1.5	101	71	-0.045	5.55	0.323
261	42.370	0.162	2.71	93	1.9	-	71	-0.045	5.57	0.320
262	42.536	0.166	2.71	93	1.7	-	71	-0.043	5.52	0.321
263	42.700	0.164	2.71	93	1.6	-	71	-0.042	5.50	0.330
264	42.863	0.163	2.71	93	1.9	-	71	-0.042	5.44	0.336
265	43.029	0.166	2.71	93	2.1	-	71	-0.042	5.37	0.330
266	43.193	0.164	2.71	93	1.6	-	71	-0.045	5.32	0.338
267	43.356	0.163	2.71	93	1.7	-	71	-0.042	5.31	0.345
268	43.521	0.165	2.71	93	1.6	-	71	-0.041	5.28	0.346
269	43.686	0.165	2.72	93	1.9	-	71	-0.042	5.27	0.349
270	43.849	0.163	2.71	93	2.1	100	71	-0.041	5.24	0.361
271	44.014	0.165	2.71	93	2.1	-	71	-0.040	5.18	0.358
272	44.179	0.165	2.71	93	2.0	-	71	-0.042	5.13	0.369
273	44.342	0.163	2.71	93	1.6	-	71	-0.043	5.11	0.371
274	44.507	0.165	2.71	93	2.0	-	71	-0.042	5.04	0.374
275	44.672	0.165	2.71	93	1.9	-	71	-0.041	4.99	0.376
276	44.834	0.162	2.71	93	2.0	-	71	-0.041	5.01	0.389
277	45.000	0.166	2.71	93	1.8	-	71	-0.040	4.95	0.388
278	45.165	0.165	2.71	93	2.0	-	71	-0.040	4.90	0.391
279	45.326	0.161	2.70	93	1.8	-	71	-0.042	4.88	0.400
280	45.493	0.167	2.71	93	1.5	100	71	-0.039	4.85	0.405
281	45.657	0.164	2.71	93	2.0	-	71	-0.041	4.81	0.422
282	45.819	0.162	2.70	93	1.6	-	72	-0.043	4.76	0.429
283	45.986	0.167	2.71	93	2.0	-	72	-0.039	4.77	0.436
284	46.149	0.163	2.70	93	1.5	-	72	-0.041	4.75	0.440
285	46.312	0.163	2.71	93	1.8	-	72	-0.042	4.75	0.445
286	46.479	0.167	2.71	93	1.6	-	72	-0.040	4.72	0.445
287	46.641	0.162	2.71	93	2.0	-	72	-0.039	4.69	0.454

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
288	46.805	0.164	2.71	93	1.6	-	72	-0.042	4.67	0.454
289	46.972	0.167	2.71	93	1.9	-	72	-0.041	4.64	0.453
290	47.134	0.162	2.71	93	1.6	101	72	-0.041	4.61	0.450
291	47.299	0.165	2.72	93	1.7	-	72	-0.040	4.60	0.450
292	47.465	0.166	2.71	94	1.9	-	72	-0.041	4.56	0.451
293	47.627	0.162	2.71	94	1.6	-	72	-0.041	4.53	0.451
294	47.793	0.166	2.71	94	1.6	-	72	-0.040	4.49	0.450
295	47.958	0.165	2.71	94	2.1	-	72	-0.042	4.48	0.448
296	48.120	0.162	2.71	94	1.7	-	72	-0.041	4.45	0.449
297	48.286	0.166	2.71	94	2.1	-	72	-0.040	4.44	0.449
298	48.451	0.165	2.71	94	1.8	-	72	-0.038	4.42	0.453
299	48.613	0.162	2.71	94	1.8	-	72	-0.040	4.39	0.467
300	48.779	0.166	2.71	94	1.7	101	73	-0.040	4.34	0.466
301	48.944	0.165	2.71	94	1.8	-	73	-0.041	4.32	0.469
302	49.107	0.163	2.71	94	1.8	-	73	-0.040	4.27	0.462
303	49.273	0.166	2.71	94	2.0	-		-0.040	4.24	0.460
304	49.438	0.165	2.71	94	2.0	-	73	-0.041	4.25	0.461
305	49.601	0.163	2.71	94	2.1	-	73	-0.040	4.23	0.459
306	49.766	0.165	2.71	94	2.1	-	73	-0.038	4.20	0.455
307	49.931	0.165	2.71	94	2.1	-	73	-0.039	4.17	0.455
308	50.094	0.163	2.70	94	2.0	-	73	-0.038	4.12	0.454
309	50.259	0.165	2.70	94	2.0	-	73	-0.037	4.16	0.453
310	50.424	0.165	2.71	94	1.6	101	73	-0.039	4.12	0.456
311	50.587	0.163	2.71	94	2.1	100	73	-0.040	4.11	0.457
Avg/Tot	50.587	0.163	2.69	88.4	1.8	100	71.4	-0.055	7.58	0.444

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 3

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
0	-0.002		-0.01	71	0.0		67
1	0.111	0.113	0.95	71	1.4	-	67
2	0.252	0.141	0.96	71	1.6	-	67
3	0.390	0.138	0.95	71	1.4	-	67
4	0.531	0.141	0.97	71	1.4	-	67
5	0.670	0.139	0.96	71	1.4	-	67
6	0.810	0.140	0.96	71	1.5	-	67
7	0.952	0.142	0.98	71	1.5	-	67
8	1.092	0.140	0.98	71	1.6	-	67
9	1.233	0.141	0.98	71	1.5	-	68
10	1.376	0.143	0.99	71	1.5	96	68
11	1.518	0.142	0.99	71	1.4	-	68
12	1.660	0.142	0.99	72	1.6	-	68
13	1.802	0.142	0.99	72	1.5	-	68
14	1.947	0.145	1.00	72	1.5	-	68
15	2.090	0.143	1.00	72	1.4	-	68
16	2.232	0.142	1.00	72	1.5	-	68
17	2.375	0.143	0.99	72	1.6	-	68
18	2.519	0.144	1.01	72	1.4	-	68
19	2.663	0.144	1.00	72	1.6	-	68
20	2.806	0.143	0.99	73	1.5	99	68
21	2.949	0.143	0.99	73	1.6	-	68
22	3.093	0.144	1.01	73	1.6	-	68
23	3.238	0.145	1.01	73	1.4	-	68
24	3.382	0.144	1.01	73	1.6	-	68
25	3.526	0.144	1.00	74	1.5	-	68
26	3.669	0.143	1.00	74	1.6	-	68
27	3.813	0.144	1.01	74	1.4	-	68
28	3.959	0.146	1.02	75	1.6	-	69
29	4.104	0.145	1.02	75	1.5	-	69
30	4.249	0.145	1.01	75	1.6	100	69
31	4.394	0.145	1.01	75	1.4	-	68

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 3

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
32	4.539	0.145	1.01	76	1.5	-	69
33	4.684	0.145	1.02	76	1.5	-	69
34	4.831	0.147	1.03	77	1.5	-	69
35	4.977	0.146	1.03	77	1.5	-	69
36	5.123	0.146	1.03	77	1.5	-	69
37	5.270	0.147	1.03	77	1.5	-	69
38	5.416	0.146	1.02	78	1.5	-	69
39	5.563	0.147	1.02	78	1.4	-	69
40	5.709	0.146	1.03	78	1.6	100	69
41	5.856	0.147	1.03	78	1.6	-	69
42	6.003	0.147	1.03	79	1.5	-	69
43	6.150	0.147	1.04	79	1.5	-	69
44	6.298	0.148	1.04	79	1.6	-	69
45	6.446	0.148	1.05	79	1.6	-	69
46	6.594	0.148	1.05	80	1.4	-	69
47	6.742	0.148	1.05	80	1.5	-	69
48	6.891	0.149	1.05	80	1.6	-	69
49	7.039	0.148	1.05	81	1.4	-	69
50	7.187	0.148	1.05	81	1.5	102	69
51	7.336	0.149	1.05	81	1.5	-	69
52	7.484	0.148	1.05	81	1.4	-	69
53	7.633	0.149	1.05	82	1.5	-	69
54	7.782	0.149	1.05	82	1.5	-	69
55	7.931	0.149	1.05	82	1.5	-	69
56	8.080	0.149	1.06	82	1.6	-	69
57	8.230	0.150	1.06	83	1.5	-	69
58	8.379	0.149	1.06	83	1.6	-	69
59	8.528	0.149	1.06	83	1.5	-	69
60	8.678	0.150	1.06	83	1.5	102	69
Avg/Tot	8.680	0.145	1.00	75.8	1.5	100	68.2

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 3

Technician: AK

Date: 4/11/2025

Stove ΔT: 111

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	285	310	287	482	245	321.7	942.2
1	286	309	288	458	246	317.5	1171.1
2	284	308	290	441	246	313.7	1278.0
3	283	308	293	427	249	312.1	1246.8
4	281	306	298	417	246	309.5	1269.2
5	278	304	302	408	246	307.6	1241.4
6	278	302	282	397	248	301.3	1239.7
7	273	300	262	388	246	293.7	1296.0
8	272	297	247	389	249	290.7	1237.8
9	271	295	237	404	245	290.3	1187.2
10	268	292	227	420	247	290.8	1191.4
11	264	290	220	422	250	289.3	1213.0
12	260	288	215	417	249	285.5	1266.1
13	259	285	210	408	241	280.7	1268.4
14	256	283	208	407	242	279.2	1294.6
15	256	281	205	407	240	277.8	1300.9
16	252	279	203	406	243	276.5	1254.9
17	250	277	202	403	241	274.6	1267.6
18	250	275	200	403	239	273.4	1302.7
19	248	274	199	409	241	274.4	1356.9
20	246	271	199	428	241	276.9	1362.1
21	243	270	200	446	237	279.4	1267.8
22	243	270	201	457	232	280.5	1225.2
23	242	268	200	466	235	282.0	1231.1
24	242	266	199	475	235	283.2	1226.0
25	237	265	198	481	233	282.6	1238.5
26	237	264	196	485	228	282.0	1247.0
27	235	263	195	483	229	281.0	1260.6
28	235	262	194	480	229	279.9	1278.7
29	232	261	193	478	234	279.6	1299.9
30	232	260	193	481	228	278.8	1316.2
31	233	259	193	484	228	279.5	1345.9
32	231	259	193	491	229	280.5	1405.3
33	231	258	194	493	228	280.7	1528.0
34	229	258	197	495	222	280.2	1525.5
35	228	257	200	500	219	280.8	1486.5
36	227	256	204	501	222	281.8	1488.4
37	227	255	206	496	222	281.4	1483.0
38	226	255	209	494	221	280.9	1426.5
39	225	255	211	495	219	280.8	1405.0
40	226	254	211	498	218	281.1	1414.1
41	223	255	211	503	215	281.4	1409.1
42	223	254	212	512	215	283.0	1377.6
43	223	254	212	521	212	284.4	1379.0
44	221	254	211	519	208	282.7	1374.4
45	222	254	211	518	211	283.3	1418.4
46	222	255	211	520	208	283.3	1388.1
47	222	255	212	514	212	282.8	1386.1

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 3

Technician: AK

Date: 4/11/2025

Stove ΔT: 111

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	221	255	212	509	206	280.4	1395.2
49	220	256	212	506	205	279.8	1404.6
50	220	256	212	506	205	279.8	1414.9
51	220	257	212	506	205	280.0	1419.4
52	219	258	213	506	201	279.2	1414.6
53	220	258	213	503	201	279.0	1407.7
54	220	259	214	501	198	278.3	1413.0
55	219	260	214	497	200	278.0	1422.5
56	219	260	215	494	200	277.4	1431.8
57	219	261	215	492	198	277.2	1432.0
58	219	262	216	489	198	276.7	1422.1
59	217	263	216	487	196	275.9	1393.8
60	217	264	217	485	193	275.3	1357.1
61	217	265	216	484	194	275.3	1322.3
62	217	266	215	483	195	275.1	1302.7
63	218	267	214	482	193	274.9	1303.6
64	217	269	213	481	190	274.1	1292.2
65	217	272	212	479	191	274.1	1262.3
66	218	274	211	477	192	274.2	1231.7
67	218	277	208	475	191	273.6	1202.7
68	218	280	206	473	190	273.3	1188.3
69	218	283	204	471	189	272.9	1175.8
70	217	286	201	470	187	272.3	1169.3
71	218	289	199	468	189	272.8	1162.9
72	218	292	197	468	189	272.7	1160.0
73	217	294	194	467	187	271.9	1161.3
74	216	297	193	467	187	272.0	1160.2
75	216	300	191	466	189	272.2	1150.5
76	211	301	190	466	182	270.0	1151.9
77	206	303	189	466	179	268.5	1161.5
78	214	307	188	466	181	271.2	1164.8
79	215	309	187	465	186	272.1	1160.9
80	215	312	186	465	183	272.2	1160.8
81	215	313	185	464	187	272.8	1162.4
82	214	314	185	465	185	272.7	1178.0
83	212	316	185	465	184	272.3	1196.4
84	214	318	184	465	187	273.6	1196.1
85	215	320	184	465	184	273.7	1198.4
86	215	323	184	465	184	274.1	1162.9
87	214	324	183	464	184	273.8	1144.0
88	215	325	183	462	184	273.6	1156.9
89	201	326	184	461	173	269.0	1158.3
90	213	328	182	460	175	271.5	1152.0
91	213	329	182	459	172	270.8	1144.2
92	213	332	181	458	175	271.7	1134.4
93	213	334	180	457	175	271.8	1134.6
94	214	334	179	455	180	272.4	1122.6
95	212	335	178	454	175	270.9	1120.1

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 3

Technician: AK

Date: 4/11/2025

Stove ΔT: 111

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	212	336	178	453	171	269.7	1104.9
97	214	337	177	453	171	270.4	1099.4
98	212	339	177	452	175	270.9	1098.2
99	213	340	176	451	176	271.3	1113.6
100	215	342	175	450	178	271.9	1092.3
101	214	343	175	450	177	271.4	1082.7
102	215	344	174	449	175	271.3	1078.2
103	215	345	174	449	176	271.6	1080.0
104	214	346	173	448	176	271.3	1081.4
105	214	346	173	448	178	271.6	1080.2
106	213	347	173	447	175	271.1	1077.7
107	214	348	172	447	175	271.1	1072.6
108	214	348	172	446	177	271.4	1070.2
109	215	349	172	446	174	271.2	1069.5
110	213	349	171	445	175	270.7	1062.4
111	213	349	171	444	176	270.6	1061.0
112	215	351	171	444	174	270.7	1056.7
113	215	350	170	443	175	270.4	1054.7
114	216	350	170	442	178	271.0	1054.5
115	213	352	169	441	172	269.5	1054.5
116	215	351	169	440	176	270.0	1058.0
117	214	351	169	440	174	269.5	1060.0
118	215	351	168	440	175	269.8	1047.9
119	214	352	168	439	173	269.3	1040.0
120	214	352	168	438	175	269.5	1041.2
121	214	352	168	439	173	269.0	1028.8
122	215	351	168	440	176	270.0	1020.0
123	215	351	167	443	175	270.3	1016.2
124	214	352	166	445	177	270.8	1005.5
125	216	351	166	449	176	271.5	998.0
126	216	351	166	453	177	272.6	991.5
127	216	351	165	453	177	272.3	988.1
128	215	351	164	452	173	271.1	1001.0
129	217	350	164	450	176	271.2	995.3
130	216	351	163	448	174	270.2	991.4
131	215	349	163	446	176	269.7	997.8
132	216	348	162	443	174	268.7	1000.5
133	216	349	162	442	172	268.0	1000.1
134	216	347	161	439	173	267.2	997.1
135	216	346	161	438	173	266.9	999.6
136	215	344	160	436	176	266.2	1007.7
137	216	345	160	433	171	265.0	1009.8
138	215	343	160	432	176	265.1	999.2
139	216	343	160	432	175	265.1	993.1
140	216	342	159	433	174	264.7	990.6
141	215	341	159	432	174	264.2	989.4
142	216	339	159	433	174	264.1	984.4
143	215	339	159	433	173	263.9	978.7

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 3

Technician: AK

Date: 4/11/2025

Stove ΔT: 111

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	216	338	158	436	174	264.3	974.1
145	216	336	158	438	175	264.4	969.3
146	216	334	157	442	173	264.3	965.1
147	212	334	157	443	169	262.8	968.3
148	214	333	157	444	169	263.2	966.1
149	212	332	156	444	172	263.2	961.2
150	215	331	156	444	172	263.5	960.8
151	215	330	156	443	174	263.5	957.0
152	215	329	155	442	172	262.6	942.1
153	214	328	154	444	173	262.6	930.7
154	216	327	153	445	174	263.2	928.4
155	216	327	153	449	172	263.3	930.9
156	217	326	153	453	173	264.3	932.6
157	215	326	152	457	173	264.5	930.9
158	217	326	152	462	174	266.0	931.5
159	217	325	151	465	171	265.9	930.3
160	219	324	151	469	174	267.2	927.5
161	219	323	151	471	175	267.8	925.4
162	219	322	150	474	174	267.8	925.5
163	219	321	150	475	174	267.8	922.9
164	218	320	149	475	172	267.0	921.7
165	219	319	149	475	173	266.9	919.4
166	220	318	148	473	175	266.7	917.1
167	220	317	148	472	172	265.7	914.4
168	220	315	148	472	173	265.5	911.9
169	221	313	148	470	174	265.1	909.3
170	220	313	147	468	175	264.4	908.9
171	221	311	147	467	174	263.7	905.9
172	218	309	147	464	169	261.5	901.2
173	219	307	147	463	168	260.7	903.0
174	218	307	147	462	170	260.6	899.1
175	222	306	146	460	172	261.1	897.7
176	222	304	146	457	173	260.4	892.4
177	221	303	145	454	174	259.5	890.2
178	221	302	145	449	172	257.5	914.2
179	222	300	145	443	173	256.3	934.9
180	221	298	145	437	174	255.0	936.6
181	220	297	145	433	174	253.6	935.3
182	222	296	145	428	173	252.7	931.2
183	221	295	145	425	173	251.7	923.4
184	221	294	145	422	172	250.8	918.8
185	221	292	145	419	173	249.8	911.6
186	220	290	145	416	171	248.5	903.2
187	219	289	145	414	168	246.9	897.6
188	220	289	145	411	170	246.9	890.1
189	219	287	144	409	173	246.4	882.6
190	219	286	144	406	169	244.8	876.5
191	218	285	143	405	169	243.7	869.6

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 3

Technician: AK

Date: 4/11/2025

Stove ΔT: 111

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
192	218	284	142	403	167	242.7	861.8
193	219	282	142	400	168	242.4	855.5
194	218	282	142	398	168	241.4	852.0
195	217	280	141	396	168	240.5	848.3
196	218	279	140	395	168	240.0	843.4
197	218	278	140	393	169	239.6	839.4
198	219	277	139	391	170	239.2	830.5
199	219	275	139	388	171	238.3	822.4
200	218	275	138	386	168	237.0	815.5
201	218	274	138	386	165	236.1	815.7
202	217	273	137	386	168	236.0	801.2
203	217	272	136	387	166	235.5	795.5
204	216	271	136	388	166	235.3	791.2
205	217	271	135	389	169	235.8	789.7
206	218	270	134	389	170	236.1	788.8
207	216	269	134	390	165	234.8	785.9
208	214	269	133	391	167	234.6	784.8
209	216	269	133	392	168	235.5	782.2
210	217	269	132	393	170	236.0	777.8
211	216	269	132	393	168	235.6	777.6
212	217	270	131	393	165	235.2	775.6
213	216	270	130	394	164	234.7	772.6
214	217	269	130	394	168	235.3	768.5
215	216	270	129	395	170	235.9	766.0
216	217	270	129	395	167	235.6	763.7
217	218	270	129	395	169	235.9	761.5
218	216	269	128	393	171	235.5	754.5
219	215	270	128	393	165	233.8	751.6
220	214	270	127	393	164	233.7	749.5
221	213	270	127	393	167	234.0	748.0
222	214	270	127	393	169	234.6	749.1
223	217	270	126	392	171	235.4	750.4
224	215	271	126	392	172	234.9	750.1
225	215	270	126	391	172	234.8	749.9
226	216	271	126	391	169	234.6	747.3
227	215	270	125	391	169	234.1	744.9
228	217	271	125	392	166	234.2	738.8
229	216	270	125	391	170	234.4	737.4
230	215	270	125	391	167	233.6	733.5
231	216	270	125	392	170	234.4	732.5
232	215	270	124	392	165	233.3	731.0
233	216	270	124	392	165	233.2	734.1
234	216	269	123	392	168	233.5	730.5
235	216	268	123	390	168	233.2	733.7
236	217	268	123	389	168	233.1	734.1
237	216	267	123	389	171	233.2	727.0
238	216	266	123	389	171	233.0	731.6
239	217	266	122	388	172	233.0	729.6

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 3

Technician: AK

Date: 4/11/2025

Stove ΔT: 111

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
240	217	266	122	388	170	232.5	728.2
241	216	265	122	387	169	232.0	725.7
242	216	265	122	387	168	231.6	719.7
243	216	264	122	386	168	231.2	703.7
244	217	263	122	386	166	230.7	695.8
245	216	262	121	385	167	230.1	694.2
246	216	261	121	385	167	229.8	691.0
247	216	261	120	384	168	229.9	689.7
248	217	260	120	384	168	229.6	687.7
249	216	259	120	383	166	228.7	686.1
250	216	258	119	382	169	228.8	687.5
251	217	258	119	382	169	228.8	683.2
252	217	257	119	381	165	227.6	675.9
253	217	256	118	380	166	227.4	671.8
254	211	254	118	377	163	224.5	656.2
255	215	252	118	376	166	225.5	645.9
256	215	253	117	376	164	225.1	636.4
257	217	251	117	376	165	225.0	629.8
258	216	251	116	375	165	224.5	627.2
259	218	250	116	376	167	225.3	623.7
260	220	249	115	376	166	225.3	619.7
261	222	248	115	376	167	225.7	617.9
262	223	248	115	376	167	225.5	618.3
263	224	247	114	376	164	225.1	618.4
264	224	246	114	376	167	225.1	618.9
265	224	245	113	375	168	225.1	617.1
266	225	244	113	375	170	225.5	617.0
267	227	243	113	375	167	224.7	615.8
268	228	243	113	375	165	224.6	616.1
269	229	242	113	374	168	224.9	615.6
270	232	240	112	373	168	225.0	617.6
271	233	240	112	372	170	225.2	616.4
272	232	239	112	372	168	224.6	616.2
273	233	238	112	371	167	224.1	618.0
274	234	237	112	370	169	224.2	617.6
275	235	236	112	369	170	224.4	617.5
276	236	236	112	368	170	224.2	617.1
277	237	235	112	367	170	224.0	616.5
278	238	234	112	366	169	223.7	618.2
279	238	233	112	364	172	223.6	618.5
280	239	232	112	363	171	223.2	622.6
281	239	232	112	362	171	223.1	629.5
282	239	230	112	361	172	222.8	629.9
283	240	230	112	359	171	222.2	629.8
284	240	229	112	358	171	221.8	631.3
285	240	228	112	357	171	221.4	631.5
286	241	227	112	356	170	221.1	631.8
287	240	226	112	355	171	220.7	630.8

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 3Technician: AKDate: 4/11/2025Stove ΔT: 111

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
288	241	226	112	354	171	220.7	629.0
289	240	225	112	353	171	220.0	627.3
290	240	224	112	352	171	219.7	625.4
291	240	223	112	351	170	219.1	622.4
292	242	223	112	350	170	219.2	620.5
293	240	222	112	349	170	218.4	618.3
294	241	221	112	348	170	218.4	616.3
295	241	221	112	347	170	218.1	615.8
296	240	220	112	346	170	217.3	614.4
297	240	220	112	345	170	217.4	613.3
298	241	219	111	344	169	216.9	616.6
299	239	218	111	343	169	216.1	616.5
300	236	218	111	342	170	215.4	615.6
301	236	217	111	341	170	215.0	613.1
302	238	216	111	340	169	214.7	611.8
303	239	216	111	339	169	214.8	610.0
304	239	215	111	338	169	214.4	607.0
305	235	214	111	337	167	212.8	604.6
306	236	213	111	336	169	212.9	602.7
307	234	213	111	335	169	212.5	599.5
308	236	212	111	334	168	212.4	597.2
309	236	212	111	333	167	211.8	595.7
310	236	211	110	332	167	211.2	594.7
311	235	211	110	331	168	210.9	592.1
Average	224.0	284.8	159.5	425.0	183.0	255.3	960.3

LAB SAMPLE DATA - ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 3

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

		Sample ID	Tare, mg	Final, mg	Catch, mg
Filters	A	G01245	236.9	245.6	8.7
	B	G01246	237.6	246.2	8.6
	C - 1st Hour	G01247	237.7	240.2	2.5
	Amb	G01248	236.7	236.8	0.1
Probes	A	9A	116531.2	116531.3	0.1
	B	9B	117738.7	117738.9	0.2
	C - 1st Hour	9C	116603.6	116603.6	0.0
O-rings	A	9A	3576.3	3576.3	0.0
	B	9B	3519.4	3519.5	0.1
	C - 1st Hour	9C	3422.1	3422.4	0.3

Placed in Dessicator on: 4/11/2025

Balance Audit (mg):		200.0		200.0		200.0			
		Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time
Filters	A	245.6	4/16 10:30	245.6	4/18 15:00				
	B	246.3	4/16 10:30	246.2	4/18 15:00				
	C - 1st Hour	240.1	4/16 10:30	240.2	4/18 15:00				
	Amb	236.8	4/16 10:30	236.8	4/18 15:00				
Probes	A	116531.5	4/16 10:30	116531.3	4/18 15:00				
	B	117739.0	4/16 10:30	117738.9	4/18 15:00				
	C - 1st Hour	116603.7	4/16 10:30	116603.6	4/18 15:00				
O-Rings	A	3576.6	4/16 10:30	3576.3	4/18 15:00	3576.3	4/21 13:30		
	B	3519.7	4/16 10:30	3519.5	4/18 15:00				
	C - 1st Hour	3422.8	4/16 10:30	3422.4	4/18 15:00	3422.4	4/21 13:30		

Train A Aggregate, mg:	8.8
Train B Aggregate, mg:	8.9
Train C Aggregate, mg:	2.8
Ambient, mg:	0.1

ASTM E2780 Wood Heater Run Sheets

Client: HHT Job Number: 24-291 Tracking #: 220
Model: Dauntless-C Run Number: 3 Test Date: 4/11/2025

Wood Heater Run Notes

Test Control Settings

Primary Air Setting(s): Fully closed
Targeted Burn Category: I

Preburn Notes

Time	Notes
29:00 82:00	Stirred Coals PB End

Test Notes

Test Burn Start Time: 11:44 Test Fuel Loaded by: 25 seconds
Door Closed: 45 seconds Air Control Set at: 300 seconds
Other Loading Notes: Bypass closed @ 0:50, fan on med @ 5:00

Time	Notes
	-None-

Test Burn End Time: 16:55

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO₂ (%): 17.32 CO (%): 4.350
Mid Gas CO₂ (%): 10.00 CO (%): 2.500

Calibration Results:

	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
Time	10:47	10:48	10:49	18:08	18:10	18:11
CO ₂	0.00	17.35	10.32	-0.01	17.34	10.34
CO	0.000	4.351	2.541	-0.011	4.337	2.564

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

Technician Signature: 

Date: 4/25/25

ASTM E2780 Wood Heater Run Sheets

Client: HHT
Model: Dauntless-C

Job Number: 24-291
Run Number: 3

Tracking #: 220
Test Date: 4/11/2025



Test Fuel Front/Side View



Test Fuel Iso View



Test Fuel Loaded in Stove



Air Setting

Technician Signature: _____

Dauntless

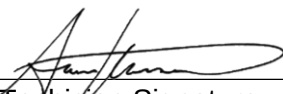
Date: 4/25/25

WOOD STOVE TEST DATA PACKET
ASTM E2780/E2515



Run 4 Data Summary

Client:	HHT
Model:	Dauntless-C
Job #:	24-291
Tracking #:	220
Test Date:	4/11/2025



Technician Signature

5/15/2025

Date

TEST RESULTS - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 4

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Burn Rate (kg/hr):	1.57
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	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft ³)	42.007	30.469	29.745	8.738
Average Gas Velocity in Dilution Tunnel (ft/sec)	17.6			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	11554.1			
Average Gas Meter Temperature (°F)	69.3	91.8	91.9	80.7
Total Sample Volume (dscf)	42.502	29.982	28.853	8.777
Average Tunnel Temperature (°F)	97.1			
Total Time of Test (min)	183			
Total Particulate Catch (mg)	0.1	2.5	2.3	0.8
Particulate Concentration, dry-standard (g/dscf)	0.0000024	0.0000834	0.0000797	0.0000911
Total PM Emissions (g)	0.08	2.86	2.73	1.03
Particulate Emission Rate (g/hr)	0.03	0.94	0.89	1.03
Emissions Factor (g/kg)	-	0.60	0.57	-
Difference from Average Total Particulate Emissions (g)	-	0.06	0.06	-
Difference from Average Total Particulate Emissions (%)	-	2.3%	2.3%	-
Difference from Average Emissions Factor (g/kg)	-	0.01	0.01	-

Final Average Results	
Total Particulate Emissions (g)	2.79
Particulate Emission Rate (g/hr)	0.92
Emissions Factor (g/kg)	0.58
HHV Efficiency (%)	74.0%
LHV Efficiency (%)	80.0%
CO Emissions (g/min)	1.17

Quality Checks	Requirement	Observed	Result
Dual Train Precision	Each train within 7.5% of average emissions (in grams), or emission factors within 0.5 g/kg	See Above	OK
Filter Temps	<90 °F	80.3	OK
Face Velocity	< 30 ft/min	9.4	OK
Leakage Rate	Less than 4% of average sample rate	0.001 cfm	OK
Ambient Temp	55-90 °F	Min:68.2/Max:70.2	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
Stove Surface ΔT	<126°F	71.2	OK

B415.1 Efficiency Results

Manufacturer: HHT
Model: Dauntless-C
Date: 04/11/25
Run: 4
Control #: 24-291
Test Duration: 183
Output Category: 3

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	74.0%	80.0%
Combustion Efficiency	96.9%	96.9%
Heat Transfer Efficiency	76.4%	82.6%

Output Rate (kJ/h)	22,513	21,356	(Btu/h)
Burn Rate (kg/h)	1.54	3.38	(lb/h)
Input (kJ/h)	30,416	28,853	(Btu/h)

Test Load Weight (dry kg)	4.68	10.32	dry lb
MC wet (%)	19.05		
MC dry (%)	23.53		
Particulate (g)	2.79		
CO (g)	214		
Test Duration (h)	3.05		

Emissions	Particulate	CO
g/MJ Output	0.04	3.12
g/kg Dry Fuel	0.60	45.70
g/h	0.92	70.17
g/min	0.02	1.17
lb/MM Btu Output	0.09	7.24

Air/Fuel Ratio (A/F)	12.27
-----------------------------	-------

VERSION:

2.4

4/15/2010

DILUTION TUNNEL & MISC. DATA - ASTM E2780 / E2515

Client: **HHT**
 Model: **Dauntless-C**
 Run #: **4**
 Test Start Time: **19:19**

Job #: **24-291**
 Tracking #: **220**
 Technician: **AK**
 Date: **4/11/2025**

Total Sampling Time (min): **183**
 Recording Interval (min): **1**

Meter Box γ Factor: **1.019** (A)
 Meter Box γ Factor: **1.005** (B)
 Meter Box γ Factor: **1.024** (C)
 Meter Box γ Factor: **1.012** (Ambient)

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	30.03	29.97	30.00
Relative Humidity (%)	23.7	19.9	
Room Air Velocity (ft/min)	<50	<50	
Pitot Tube Leak Check	0	0	
Ambient Sample Volume:		42.007	ft ³

Sample Train Leak Checks

	Pre-test	Post-test		
Induced Draft Check (in. H ₂ O):	0		(A)	0.000 0.000 cfm @ -7 in. Hg
Smoke Capture Check (%):	100%		(B)	0.000 0.000 cfm @ -6 in. Hg
Date Flue Pipe Last Cleaned:	4/5/2025		(C)	0.000 0.001 cfm @ -7 in. Hg
Test Fuel Scale Audit (lbs)	10.00		(Ambient)	0.000 0.000 cfm @ -12 in. Hg
Platform Scale Audit (lbs)	10.0			

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H ₂ O)	Temp (°F)
1	0.052	74
2	0.088	74
3	0.088	74
4	0.066	74
5	0.060	74
6	0.086	74
7	0.088	74
8	0.064	74
Center	0.076	74

Dilution Tunnel H₂O: **2.00** percent
 Tunnel Diameter: **6** inches
 Pitot Tube Cp: **0.99** [unitless]
 Dilution Tunnel MW(dry): **29.00** lb/lb-mole
 Dilution Tunnel MW(wet): **28.78** lb/lb-mole
 Tunnel Area: **0.1963** ft²

V_{strav} : **18.02** ft/sec

V_{scent} : **18.34** ft/sec

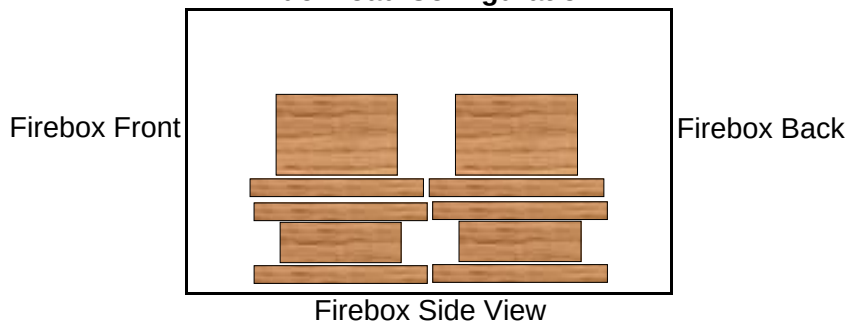
F_p : **0.982** [ratio]

Initial Tunnel Flow: **206.2** scf/min

Static Pressure: **-0.150** in. H₂O

TEST FUEL PROPERTIES

Fuel Load Configuration



Actual Fuel Used Properties

Fuel Type: **D. Fir**
 HHV (kJ/kg): **19,810**
 %C: **48.73**
 %H: **6.87**
 %O: **43.9**
 %Ash: **0.5**
 MC (%DB): **23.5**

WOODSTOVE FUEL DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 4

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Preburn Fuel Information						
Size	Length (in)	Moisture Content (% DB)		Size	Length (in)	Moisture Content (% DB)
2x4	8.00	19.0		2x4	16.00	21.3
2x4	8.00	21.7		2x4	16.00	24.5
2x4	8.00	21.3		2x4	16.00	21.0
2x4	8.00	22.6		2x4	16.00	19.9
2x4	8.00	24.5		2x4	16.00	19.5
2x4	8.00	20.8				
2x4	8.00	25.0				
2x4	16.00	23.5				
Total Fuel Weight (lbs):		16.62	Average Moisture (%DB):		21.9	

Firebox Volume (ft³): 1.82

Total 2x4 Crib Weight, with spacers (lbs): 5.14

Total 4x4 Crib Weight, with spacers (lbs): 7.69

Total Wet Fuel Weight, with spacers (lbs): 12.83

Coal Bed Range (20-25%):

Min (lbs): 2.57

Max (lbs): 3.21

Test Fuel Information						
Size	Length (in)	Weight (lbs)	Moisture Content (%DB)			Dry Weight (lbs)
2x4	15.50	2.12	24.2	24.6	22.7	1.71
2x4	15.50	1.92	25.0	24.7	24.9	1.54
4x4	15.50	3.42	22.3	21.3	22.0	2.81
4x4	15.50	3.73	23.7	22.4	24.6	3.02
Total Dry Weight, no spacers (lbs):						9.07
Total Dry Weight, with spacers (lbs):						10.56

Spacer Moisture Readings (%DB)						
10.5	11.6					
10.3	10.4					
11.7	12.1					
10.8	10.7					
10.1						
9.9						
11.1						
10.0						

Quality Checks	Requirement	Observed	Result
Fuel Density	25 - 36 (lbs/ft ³ , DB)	28.9	OK
Loading Density	6.3 - 7.7 (lbs/ft ³ , WB)	7.05	OK
2x4 Fuel Mix	35 - 65 % of total weight	40%	OK

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 4

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Recording Interval (min): 1
Run Time (min): 97

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
0	13.64	-0.107	278	272	198	597	200	309.0	1122	72
1	13.30	-0.100	280	273	200	587	204	308.6	704	71
2	13.07	-0.095	281	272	205	571	199	305.6	577	71
3	12.85	-0.093	284	271	214	553	200	304.6	523	70
4	12.67	-0.091	285	270	225	539	196	303.1	497	70
5	12.51	-0.089	286	269	237	527	198	303.5	483	70
6	12.34	-0.086	289	269	247	517	203	304.9	476	70
7	12.21	-0.086	290	268	258	511	205	306.1	470	70
8	12.07	-0.087	291	267	267	508	204	307.1	466	70
9	11.93	-0.085	290	266	276	505	203	307.8	461	70
10	11.82	-0.085	293	265	283	501	205	309.4	457	70
11	11.70	-0.083	296	265	290	494	206	310.2	454	71
12	11.59	-0.082	299	264	296	488	207	310.5	452	70
13	11.48	-0.081	298	263	302	478	208	309.5	452	70
14	11.37	-0.082	300	262	307	471	205	309.0	452	70
15	11.24	-0.082	302	261	312	467	208	310.0	455	69
16	11.11	-0.082	302	260	317	468	208	311.1	461	70
17	10.96	-0.083	303	259	323	471	208	312.9	468	69
18	10.86	-0.084	305	257	278	473	204	303.6	475	69
19	10.72	-0.084	306	256	257	477	201	299.3	480	69
20	10.57	-0.084	306	255	242	483	199	297.1	481	69
21	10.40	-0.082	310	254	231	486	197	295.7	479	69
22	10.22	-0.083	311	253	224	489	195	294.3	476	69
23	10.04	-0.085	315	252	218	495	196	295.1	474	69
24	9.85	-0.082	318	252	213	499	195	295.4	469	70
25	9.62	-0.081	321	251	209	502	196	295.7	467	69
26	9.43	-0.082	322	251	205	507	197	296.1	464	69
27	9.29	-0.081	324	251	202	512	197	297.1	463	69
28	9.11	-0.081	329	251	200	520	197	299.3	461	69
29	8.94	-0.081	330	251	198	529	198	301.2	462	69
30	8.77	-0.082	334	251	197	539	198	303.7	462	69
31	8.59	-0.081	335	251	196	549	195	305.3	461	70
32	8.41	-0.079	335	251	196	559	198	307.6	461	70
33	8.25	-0.080	337	251	196	568	198	309.8	459	70
34	8.04	-0.081	337	252	195	577	198	311.8	460	70
35	7.88	-0.081	338	253	195	586	199	314.1	458	70
36	7.71	-0.082	339	253	195	595	198	316.0	458	69
37	7.53	-0.080	339	254	194	604	198	317.9	452	70
38	7.39	-0.079	337	255	194	611	196	318.6	449	69
39	7.22	-0.079	337	256	194	614	199	320.0	454	69
40	7.08	-0.080	334	256	194	618	198	319.9	457	70
41	6.91	-0.079	331	257	194	626	199	321.5	458	70
42	6.76	-0.079	333	258	195	632	199	323.2	456	70
43	6.61	-0.079	334	259	195	639	202	325.9	457	70
44	6.46	-0.079	332	259	195	644	200	326.0	460	70

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 4

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Recording Interval (min): 1
Run Time (min): 97

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
45	6.34	-0.078	329	260	196	649	202	327.4	456	70
46	6.21	-0.079	327	262	196	655	197	327.5	459	70
47	6.07	-0.079	329	263	197	660	201	329.8	459	70
48	5.96	-0.078	329	263	197	661	202	330.6	459	70
49	5.82	-0.079	329	264	197	665	201	331.0	459	70
50	5.71	-0.078	327	265	198	668	200	331.6	459	70
51	5.59	-0.078	327	266	198	671	200	332.5	461	70
52	5.46	-0.078	329	268	198	679	202	335.1	462	70
53	5.33	-0.079	325	269	199	679	201	334.5	463	70
54	5.24	-0.077	322	270	199	676	202	333.7	464	69
55	5.13	-0.078	324	271	199	677	203	334.8	463	70
56	5.07	-0.077	322	272	199	678	200	334.3	461	70
57	5.01	-0.076	324	273	199	678	199	334.5	461	70
58	4.91	-0.076	320	274	198	679	200	334.1	457	70
59	4.85	-0.075	321	276	197	677	201	334.3	454	70
60	4.79	-0.075	322	276	195	676	204	334.4	449	70
61	4.69	-0.074	321	277	193	673	205	333.7	444	70
62	4.67	-0.072	320	279	190	669	201	331.7	440	70
63	4.62	-0.072	320	280	187	665	201	330.6	435	70
64	4.56	-0.072	320	281	184	659	203	329.5	430	70
65	4.49	-0.072	323	282	181	657	202	329.1	427	70
66	4.46	-0.071	325	283	178	653	205	329.1	423	70
67	4.40	-0.070	324	285	176	649	201	326.9	419	70
68	4.35	-0.070	325	286	173	644	204	326.3	417	70
69	4.31	-0.070	326	286	171	637	205	324.9	415	70
70	4.25	-0.069	330	287	169	631	206	324.4	412	70
71	4.20	-0.070	332	289	167	623	205	323.3	410	70
72	4.15	-0.068	333	289	165	616	203	321.4	406	70
73	4.09	-0.069	338	290	163	610	210	321.9	403	70
74	4.06	-0.068	344	290	162	603	208	321.5	401	70
75	4.04	-0.067	343	292	160	598	206	320.0	397	70
76	4.01	-0.066	349	293	158	594	209	320.5	394	70
77	3.86	-0.066	341	293	157	582	217	317.9	399	70
78	3.84	-0.066	341	295	179	594	220	325.6	394	70
79	3.80	-0.067	338	295	194	598	217	328.5	394	70
80	3.77	-0.067	336	296	208	601	219	331.8	395	71
81	3.74	-0.067	338	297	221	600	222	335.6	397	70
82	3.70	-0.067	340	298	232	599	222	338.1	398	70
83	3.66	-0.066	342	298	243	596	224	340.6	399	70
84	3.63	-0.067	340	299	252	594	226	342.1	399	69
85	3.59	-0.067	340	300	261	591	226	343.6	400	70
86	3.53	-0.067	338	301	268	589	225	344.1	400	70
87	3.50	-0.066	336	302	275	586	231	345.8	401	70
88	3.47	-0.065	335	303	281	583	234	347.0	401	70
89	3.43	-0.065	341	303	286	580	234	349.1	402	70

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Recording Interval (min): 1
 Run Time (min): 97

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
90	3.42	-0.066	342	305	291	578	236	350.4	401	70
91	3.38	-0.065	336	306	295	576	237	350.1	402	70
92	3.34	-0.066	335	306	300	573	238	350.4	402	70
93	3.33	-0.066	335	307	303	571	238	350.7	403	70
94	3.30	-0.066	341	309	306	568	241	353.1	402	69
95	3.25	-0.065	331	310	310	566	241	351.5	402	70
96	3.22	-0.066	332	311	312	564	241	351.9	403	70
97	3.21	-0.067	336	312	315	560	243	353.3	404	70

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 4Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.069	0.00	78	0.1		12.75		100	384	73	70
1	0.105	0.105	0.070	2.35	78	0.9	-	12.68	-0.07	101	389	74	70
2	0.254	0.149	0.070	2.38	77	1.0	-	12.57	-0.11	101	396	74	70
3	0.407	0.153	0.070	2.40	77	1.0	-	12.46	-0.11	101	398	74	70
4	0.562	0.155	0.069	2.41	77	0.9	-	12.34	-0.12	100	399	75	70
5	0.715	0.153	0.070	2.44	77	1.0	-	12.24	-0.10	100	397	75	70
6	0.871	0.156	0.070	2.44	77	1.0	-	12.10	-0.14	100	402	75	70
7	1.024	0.153	0.070	2.46	77	1.0	-	11.97	-0.13	101	406	75	69
8	1.180	0.156	0.071	2.49	77	1.0	-	11.86	-0.11	100	407	75	70
9	1.332	0.152	0.069	2.49	77	0.9	-	11.75	-0.11	100	409	75	69
10	1.491	0.159	0.070	2.51	78	0.9	92	11.62	-0.13	100	413	76	70
11	1.645	0.154	0.070	2.54	78	0.9	-	11.48	-0.14	101	420	76	70
12	1.804	0.159	0.069	2.54	78	0.9	-	11.34	-0.14	101	424	76	69
13	1.959	0.155	0.068	2.55	78	1.0	-	11.19	-0.15	102	426	76	70
14	2.117	0.158	0.070	2.57	78	0.9	-	11.07	-0.12	102	426	76	70
15	2.277	0.160	0.070	2.59	78	1.0	-	10.93	-0.14	102	425	76	70
16	2.431	0.154	0.069	2.59	79	1.0	-	10.77	-0.16	102	426	76	70
17	2.591	0.160	0.069	2.60	79	1.0	-	10.63	-0.14	102	426	76	70
18	2.748	0.157	0.070	2.61	79	1.0	-	10.48	-0.15	101	425	77	70
19	2.908	0.160	0.070	2.62	79	1.0	-	10.36	-0.12	101	425	77	70
20	3.072	0.164	0.069	2.63	80	1.0	97	10.22	-0.14	101	423	77	70
21	3.228	0.156	0.070	2.63	80	1.0	-	10.09	-0.13	102	424	77	70
22	3.392	0.164	0.070	2.65	80	1.0	-	9.96	-0.13	101	424	77	70
23	3.550	0.158	0.070	2.65	80	1.0	-	9.82	-0.14	101	425	77	70
24	3.711	0.161	0.068	2.66	81	1.0	-	9.70	-0.12	101	427	77	70
25	3.875	0.164	0.070	2.67	81	1.0	-	9.55	-0.15	101	428	77	70
26	4.032	0.157	0.069	2.67	81	1.0	-	9.41	-0.14	101	429	77	70
27	4.197	0.165	0.070	2.68	82	1.0	-	9.28	-0.13	101	429	77	70
28	4.356	0.159	0.068	2.68	82	1.0	-	9.15	-0.13	101	431	77	70
29	4.519	0.163	0.068	2.70	82	1.0	-	9.01	-0.14	101	431	77	70
30	4.683	0.164	0.069	2.70	82	1.0	99	8.88	-0.13	101	432	77	70
31	4.843	0.160	0.069	2.71	83	1.0	-	8.74	-0.14	101	433	77	70

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 4Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
32	5.007	0.164	0.069	2.72	83	1.0	-	8.63	-0.11	101	434	77	70
33	5.167	0.160	0.069	2.71	83	1.0	-	8.50	-0.13	101	436	78	70
34	5.327	0.160	0.070	2.72	84	1.0	-	8.37	-0.13	102	437	78	70
35	5.494	0.167	0.070	2.73	84	1.0	-	8.22	-0.15	102	439	78	70
36	5.655	0.161	0.069	2.74	84	1.0	-	8.09	-0.13	102	442	78	70
37	5.822	0.167	0.069	2.74	85	1.0	-	7.94	-0.15	102	443	78	70
38	5.987	0.165	0.069	2.74	85	1.0	-	7.80	-0.14	102	445	78	70
39	6.149	0.162	0.070	2.74	85	1.0	-	7.66	-0.14	102	445	78	70
40	6.314	0.165	0.068	2.74	85	1.0	100	7.53	-0.13	102	445	78	70
41	6.479	0.165	0.070	2.75	86	1.0	-	7.40	-0.13	102	446	78	70
42	6.641	0.162	0.070	2.76	86	1.0	-	7.27	-0.13	102	446	78	70
43	6.807	0.166	0.069	2.76	86	1.0	-	7.13	-0.14	102	448	78	70
44	6.974	0.167	0.070	2.77	87	1.0	-	7.01	-0.12	102	449	78	70
45	7.134	0.160	0.069	2.76	87	1.0	-	6.89	-0.12	102	450	78	70
46	7.301	0.167	0.069	2.75	87	1.0	-	6.76	-0.13	102	450	78	70
47	7.467	0.166	0.068	2.78	87	1.0	-	6.64	-0.12	102	450	78	70
48	7.629	0.162	0.069	2.78	88	1.0	-	6.52	-0.12	102	450	78	70
49	7.799	0.170	0.070	2.78	88	1.0	-	6.40	-0.12	102	450	78	70
50	7.959	0.160	0.070	2.78	88	1.1	100	6.29	-0.11	102	450	78	70
51	8.123	0.164	0.070	2.79	88	1.0	-	6.19	-0.10	102	450	78	70
52	8.293	0.170	0.070	2.79	89	1.0	-	6.08	-0.11	102	450	78	70
53	8.459	0.166	0.070	2.80	89	1.0	-	5.98	-0.10	102	448	78	70
54	8.624	0.165	0.070	2.80	89	1.0	-	5.87	-0.11	102	447	78	70
55	8.794	0.170	0.069	2.80	89	1.0	-	5.77	-0.10	102	445	78	70
56	8.957	0.163	0.071	2.79	90	1.0	-	5.68	-0.09	102	443	78	70
57	9.123	0.166	0.070	2.80	90	1.0	-	5.56	-0.12	101	444	78	70
58	9.293	0.170	0.069	2.81	90	1.0	-	5.48	-0.08	101	443	78	70
59	9.457	0.164	0.069	2.80	90	1.0	-	5.40	-0.08	101	443	78	70
60	9.623	0.166	0.069	2.80	90	1.0	101	5.31	-0.09	101	442	78	70
61	9.793	0.170	0.070	2.82	91	1.0	-	5.21	-0.10	101	442	78	70
62	9.957	0.164	0.070	2.82	91	1.0	-	5.13	-0.08	101	439	78	70
63	10.123	0.166	0.069	2.81	91	1.0	-	5.05	-0.08	101	438	78	70

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 4Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
64	10.294	0.171	0.070	2.83	91	1.0	-	4.98	-0.07	101	437	78	70
65	10.459	0.165	0.068	2.83	91	1.0	-	4.90	-0.08	101	435	78	70
66	10.622	0.163	0.069	2.83	92	1.0	-	4.81	-0.09	101	434	78	70
67	10.793	0.171	0.070	2.82	92	1.0	-	4.74	-0.07	101	432	78	70
68	10.958	0.165	0.070	2.83	92	1.0	-	4.66	-0.08	101	431	78	70
69	11.127	0.169	0.068	2.84	92	1.0	-	4.58	-0.08	101	430	78	70
70	11.297	0.170	0.069	2.83	92	1.0	101	4.51	-0.07	100	430	78	69
71	11.465	0.168	0.069	2.84	92	1.0	-	4.44	-0.07	100	429	78	70
72	11.630	0.165	0.069	2.83	93	1.0	-	4.37	-0.07	100	429	78	70
73	11.800	0.170	0.069	2.84	93	1.0	-	4.29	-0.08	100	427	78	70
74	11.970	0.170	0.069	2.85	93	1.0	-	4.23	-0.06	100	426	78	70
75	12.134	0.164	0.069	2.85	93	1.0	-	4.16	-0.07	100	424	78	70
76	12.303	0.169	0.069	2.84	93	1.0	-	4.09	-0.07	100	423	78	70
77	12.473	0.170	0.069	2.85	93	1.0	-	4.03	-0.06	100	421	78	70
78	12.639	0.166	0.070	2.84	94	1.0	-	3.97	-0.06	100	420	78	70
79	12.808	0.169	0.070	2.85	94	1.0	-	3.89	-0.08	100	418	78	70
80	12.978	0.170	0.069	2.85	94	1.0	101	3.84	-0.05	100	416	78	70
81	13.144	0.166	0.069	2.86	94	1.0	-	3.79	-0.05	99	414	78	70
82	13.314	0.170	0.069	2.86	94	1.0	-	3.72	-0.07	99	412	78	70
83	13.480	0.166	0.068	2.85	94	1.0	-	3.67	-0.05	99	410	78	70
84	13.646	0.166	0.070	2.85	94	1.0	-	3.61	-0.06	99	408	78	70
85	13.817	0.171	0.070	2.85	94	1.0	-	3.55	-0.06	99	405	78	70
86	13.990	0.173	0.069	2.86	95	1.0	-	3.50	-0.05	99	403	78	70
87	14.157	0.167	0.069	2.85	95	1.0	-	3.45	-0.05	98	400	78	70
88	14.324	0.167	0.069	2.86	95	1.0	-	3.39	-0.06	98	398	78	70
89	14.495	0.171	0.068	2.86	95	1.0	-	3.33	-0.06	98	396	78	70
90	14.665	0.170	0.070	2.86	95	1.0	101	3.29	-0.04	98	394	78	70
91	14.831	0.166	0.069	2.86	95	1.0	-	3.23	-0.06	98	393	78	70
92	15.001	0.170	0.069	2.86	95	1.0	-	3.19	-0.04	98	391	78	70
93	15.171	0.170	0.070	2.87	95	1.0	-	3.14	-0.05	98	389	78	69
94	15.339	0.168	0.069	2.86	95	1.0	-	3.09	-0.05	97	388	78	70
95	15.508	0.169	0.070	2.86	95	1.0	-	3.04	-0.05	97	386	78	70

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 4

Technician: AK

Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
96	15.678	0.170	0.069	2.86	96	1.0	-	3.01	-0.03	97	384	78	70
97	15.845	0.167	0.069	2.87	96	1.0	-	2.96	-0.05	97	382	77	69
98	16.016	0.171	0.070	2.87	96	1.0	-	2.91	-0.05	97	381	78	70
99	16.184	0.168	0.068	2.85	96	1.0	-	2.86	-0.05	97	380	77	69
100	16.350	0.166	0.070	2.87	96	1.0	100	2.82	-0.04	97	380	77	69
101	16.519	0.169	0.069	2.87	96	1.0	-	2.76	-0.06	97	378	77	69
102	16.694	0.175	0.070	2.87	96	1.0	-	2.73	-0.03	96	377	77	70
103	16.863	0.169	0.069	2.87	96	1.0	-	2.68	-0.05	96	376	77	69
104	17.030	0.167	0.069	2.86	96	1.0	-	2.63	-0.05	96	375	77	69
105	17.200	0.170	0.069	2.87	96	1.0	-	2.58	-0.05	96	372	77	69
106	17.371	0.171	0.071	2.88	96	1.0	-	2.54	-0.04	96	371	77	69
107	17.540	0.169	0.068	2.88	96	1.0	-	2.50	-0.04	96	369	77	69
108	17.710	0.170	0.070	2.88	96	1.0	-	2.44	-0.06	96	368	77	69
109	17.881	0.171	0.069	2.89	96	1.0	-	2.40	-0.04	96	367	77	69
110	18.048	0.167	0.070	2.89	96	1.0	100	2.36	-0.04	96	365	77	69
111	18.217	0.169	0.069	2.88	97	1.0	-	2.30	-0.06	96	364	77	69
112	18.390	0.173	0.069	2.88	97	1.0	-	2.26	-0.04	95	362	77	69
113	18.559	0.169	0.068	2.88	97	1.0	-	2.22	-0.04	95	360	77	69
114	18.722	0.163	0.069	2.87	97	1.0	-	2.18	-0.04	95	361	77	69
115	18.894	0.172	0.069	2.89	97	1.0	-	2.14	-0.04	95	360	77	69
116	19.066	0.172	0.070	2.88	97	1.0	-	2.11	-0.03	95	360	77	69
117	19.233	0.167	0.069	2.89	97	1.0	-	2.07	-0.04	95	359	77	69
118	19.407	0.174	0.069	2.88	97	1.0	-	2.02	-0.05	95	358	77	69
119	19.578	0.171	0.069	2.88	97	1.0	-	1.98	-0.04	95	358	77	69
120	19.746	0.168	0.069	2.89	97	1.0	101	1.95	-0.03	95	358	77	69
121	19.915	0.169	0.068	2.88	97	1.0	-	1.90	-0.05	94	357	77	69
122	20.089	0.174	0.068	2.89	97	1.0	-	1.87	-0.03	94	357	77	69
123	20.258	0.169	0.068	2.89	97	1.0	-	1.82	-0.05	94	357	77	69
124	20.425	0.167	0.070	2.88	97	1.0	-	1.79	-0.03	94	356	77	69
125	20.597	0.172	0.070	2.89	97	1.0	-	1.75	-0.04	94	356	76	69
126	20.768	0.171	0.069	2.88	97	1.0	-	1.72	-0.03	94	355	76	69
127	20.937	0.169	0.068	2.88	97	1.0	-	1.68	-0.04	94	354	76	69

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 4Technician: AKDate: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
128	21.107	0.170	0.068	2.89	97	1.0	-	1.66	-0.02	93	354	76	69
129	21.279	0.172	0.069	2.88	97	1.0	-	1.63	-0.03	93	352	76	69
130	21.444	0.165	0.071	2.89	97	1.0	100	1.60	-0.03	93	350	76	69
131	21.614	0.170	0.067	2.89	97	1.0	-	1.56	-0.04	93	350	76	69
132	21.787	0.173	0.068	2.89	98	1.0	-	1.53	-0.03	93	350	76	69
133	21.956	0.169	0.068	2.88	98	1.0	-	1.50	-0.03	93	349	76	69
134	22.126	0.170	0.068	2.88	98	1.0	-	1.46	-0.04	93	347	76	69
135	22.298	0.172	0.070	2.88	98	1.0	-	1.44	-0.02	93	347	76	69
136	22.469	0.171	0.069	2.90	98	1.0	-	1.40	-0.04	93	347	76	69
137	22.638	0.169	0.070	2.89	98	1.0	-	1.36	-0.04	93	345	76	69
138	22.809	0.171	0.069	2.88	98	1.0	-	1.32	-0.04	93	344	76	69
139	22.981	0.172	0.068	2.89	98	1.0	-	1.28	-0.04	93	344	76	69
140	23.148	0.167	0.069	2.89	98	1.0	100	1.25	-0.03	93	343	76	69
141	23.318	0.170	0.070	2.89	98	1.0	-	1.20	-0.05	93	343	76	69
142	23.490	0.172	0.068	2.90	98	1.0	-	1.18	-0.02	93	343	76	69
143	23.662	0.172	0.069	2.89	98	1.0	-	1.13	-0.05	93	342	76	69
144	23.829	0.167	0.069	2.89	98	1.0	-	1.10	-0.03	93	341	76	69
145	23.997	0.168	0.068	2.88	98	1.0	-	1.07	-0.03	93	341	76	69
146	24.169	0.172	0.069	2.90	98	1.0	-	1.04	-0.03	93	341	76	69
147	24.337	0.168	0.069	2.89	98	1.0	-	1.00	-0.04	93	342	76	69
148	24.511	0.174	0.068	2.88	98	1.0	-	0.97	-0.03	92	342	76	69
149	24.683	0.172	0.068	2.88	98	1.0	-	0.93	-0.04	92	341	76	69
150	24.852	0.169	0.069	2.88	98	1.0	101	0.91	-0.02	92	341	76	69
151	25.019	0.167	0.069	2.88	98	1.0	-	0.87	-0.04	92	341	76	69
152	25.192	0.173	0.068	2.89	98	1.0	-	0.83	-0.04	92	340	76	69
153	25.363	0.171	0.067	2.90	98	1.0	-	0.80	-0.03	92	340	76	69
154	25.531	0.168	0.069	2.88	98	1.0	-	0.77	-0.03	92	339	76	69
155	25.702	0.171	0.068	2.89	98	1.0	-	0.75	-0.02	92	338	76	69
156	25.871	0.169	0.068	2.88	98	1.0	-	0.71	-0.04	92	338	76	69
157	26.038	0.167	0.069	2.89	98	1.0	-	0.67	-0.04	92	338	76	69
158	26.211	0.173	0.070	2.87	98	1.0	-	0.64	-0.03	92	337	76	69
159	26.385	0.174	0.069	2.89	98	1.0	-	0.62	-0.02	92	337	76	69

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
160	26.555	0.170	0.069	2.89	98	1.0	101	0.60	-0.02	92	335	76	69
161	26.722	0.167	0.068	2.88	98	1.0	-	0.56	-0.04	91	334	76	69
162	26.893	0.171	0.067	2.90	98	1.0	-	0.53	-0.03	91	334	76	69
163	27.064	0.171	0.070	2.89	98	1.0	-	0.51	-0.02	91	333	76	69
164	27.230	0.166	0.070	2.87	98	1.0	-	0.47	-0.04	91	334	76	69
165	27.401	0.171	0.069	2.89	98	1.0	-	0.44	-0.03	91	332	76	68
166	27.576	0.175	0.069	2.87	98	1.0	-	0.41	-0.03	91	331	75	68
167	27.743	0.167	0.068	2.88	98	1.0	-	0.39	-0.02	91	331	75	68
168	27.913	0.170	0.069	2.90	98	1.0	-	0.36	-0.03	91	330	75	69
169	28.086	0.173	0.069	2.87	98	1.0	-	0.34	-0.02	91	330	75	69
170	28.254	0.168	0.070	2.89	98	1.0	100	0.31	-0.03	91	329	75	68
171	28.424	0.170	0.069	2.89	98	1.0	-	0.29	-0.02	91	329	75	69
172	28.595	0.171	0.070	2.88	98	1.0	-	0.26	-0.03	91	328	75	69
173	28.763	0.168	0.067	2.88	98	1.0	-	0.23	-0.03	91	329	75	69
174	28.934	0.171	0.068	2.88	98	1.0	-	0.22	-0.01	91	328	75	69
175	29.106	0.172	0.069	2.89	98	1.0	-	0.18	-0.04	91	329	75	69
176	29.278	0.172	0.068	2.87	98	1.0	-	0.17	-0.01	91	328	75	69
177	29.443	0.165	0.068	2.88	98	1.0	-	0.15	-0.02	91	328	75	69
178	29.615	0.172	0.069	2.89	98	1.0	-	0.11	-0.04	91	327	75	68
179	29.787	0.172	0.068	2.90	98	1.0	-	0.08	-0.03	91	326	75	68
180	29.959	0.172	0.069	2.89	98	1.0	100	0.06	-0.02	91	325	75	68
181	30.127	0.168	0.069	2.88	98	1.0	-	0.03	-0.03	90	323	75	68
182	30.298	0.171	0.069	2.88	98	1.0	-	0.01	-0.02	90	322	75	68
183	30.469	0.171	0.068	2.90	98	1.0	102	0.00	-0.01	90	322	75	68
Avg/Tot	30.469	0.166	0.069	2.79	91.8	1.0	100			97.1	388.2	76.7	69.3

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
0	0.000		0.01	78	0.7		76	-0.065	9.69	0.232
1	0.097	0.097	2.64	78	1.8	-	77	-0.070	9.78	0.024
2	0.257	0.160	2.64	78	1.9	-	77	-0.071	11.82	0.342
3	0.418	0.161	2.65	77	1.9	-	78	-0.071	11.41	0.089
4	0.577	0.159	2.64	78	1.8	-	78	-0.071	11.04	0.023
5	0.739	0.162	2.64	78	2.0	-	78	-0.070	11.20	0.051
6	0.895	0.156	2.64	78	1.6	-	78	-0.073	10.64	0.042
7	1.056	0.161	2.64	78	2.0	-	78	-0.073	12.20	0.372
8	1.215	0.159	2.64	78	2.0	-	79	-0.072	11.94	0.301
9	1.372	0.157	2.64	78	1.6	-	79	-0.073	11.03	0.212
10	1.534	0.162	2.64	78	1.8	97	79	-0.074	11.97	0.319
11	1.690	0.156	2.62	78	1.6	-	79	-0.076	12.55	0.910
12	1.850	0.160	2.63	78	1.7	-	79	-0.077	12.85	1.165
13	2.010	0.160	2.62	78	1.7	-	79	-0.077	12.33	0.923
14	2.167	0.157	2.63	78	1.9	-	79	-0.076	12.08	0.995
15	2.328	0.161	2.63	79	2.1	-	79	-0.075	12.02	1.025
16	2.485	0.157	2.63	79	1.8	-	79	-0.075	12.00	0.996
17	2.643	0.158	2.63	79	2.1	-	79	-0.076	12.38	1.500
18	2.802	0.159	2.63	79	1.7	-	79	-0.076	12.04	0.956
19	2.960	0.158	2.63	80	1.6	-	80	-0.074	12.00	0.814
20	3.123	0.163	2.63	80	2.0	100	80	-0.075	11.85	0.704
21	3.282	0.159	2.63	80	1.8	-	80	-0.076	11.85	0.685
22	3.442	0.160	2.64	80	1.9	-	80	-0.075	12.08	0.693
23	3.602	0.160	2.63	81	1.8	-	80	-0.074	12.26	0.684
24	3.760	0.158	2.64	81	1.7	-	80	-0.076	12.48	0.682
25	3.921	0.161	2.63	81	1.9	-	80	-0.075	12.56	0.687
26	4.081	0.160	2.64	81	1.6	-	80	-0.075	12.68	0.767
27	4.239	0.158	2.64	82	1.8	-	80	-0.076	12.78	0.786
28	4.402	0.163	2.65	82	1.9	-	80	-0.075	12.68	0.644
29	4.559	0.157	2.63	82	1.6	-	80	-0.077	12.62	0.576
30	4.720	0.161	2.64	83	1.7	101	80	-0.076	12.49	0.538
31	4.881	0.161	2.65	83	2.0	-	80	-0.075	12.57	0.597

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
32	5.039	0.158	2.65	83	1.9	-	80	-0.076	12.64	0.584
33	5.200	0.161	2.65	83	2.0	-	80	-0.076	12.76	0.621
34	5.358	0.158	2.64	84	1.6	-	80	-0.076	12.89	0.624
35	5.520	0.162	2.64	84	1.9	-	80	-0.079	13.06	0.879
36	5.681	0.161	2.64	84	2.0	-	80	-0.077	13.18	1.261
37	5.843	0.162	2.65	85	2.0	-	80	-0.077	13.24	1.337
38	6.004	0.161	2.64	85	1.6	-	80	-0.076	13.24	1.167
39	6.166	0.162	2.65	85	1.8	-	80	-0.078	13.15	1.194
40	6.324	0.158	2.64	85	2.1	101	80	-0.077	13.08	1.263
41	6.488	0.164	2.65	86	2.1	-	80	-0.076	13.03	1.141
42	6.646	0.158	2.65	86	2.1	-	80	-0.077	13.06	0.910
43	6.809	0.163	2.65	86	1.7	-	80	-0.077	13.08	0.789
44	6.970	0.161	2.65	87	1.6	-	80	-0.078	13.03	0.791
45	7.130	0.160	2.64	87	1.7	-	80	-0.078	13.01	0.793
46	7.292	0.162	2.64	87	1.8	-	80	-0.077	13.09	0.812
47	7.455	0.163	2.65	87	2.1	-	80	-0.078	13.11	0.771
48	7.614	0.159	2.65	88	1.8	-	80	-0.078	13.15	0.684
49	7.779	0.165	2.66	88	1.7	-	80	-0.078	13.16	0.587
50	7.935	0.156	2.66	88	1.7	101	80	-0.077	13.15	0.503
51	8.098	0.163	2.66	88	2.1	-	80	-0.078	13.00	0.421
52	8.260	0.162	2.65	89	1.9	-	80	-0.076	12.87	0.334
53	8.423	0.163	2.67	89	2.1	-	80	-0.076	12.77	0.260
54	8.586	0.163	2.66	89	1.8	-	80	-0.076	12.68	0.236
55	8.749	0.163	2.67	89	1.6	-	80	-0.076	12.60	0.207
56	8.909	0.160	2.66	89	1.7	-	80	-0.075	12.46	0.175
57	9.073	0.164	2.66	90	2.1	-	80	-0.074	12.35	0.140
58	9.235	0.162	2.67	90	1.8	-	80	-0.076	12.22	0.142
59	9.396	0.161	2.66	90	2.0	-	80	-0.076	12.01	0.158
60	9.561	0.165	2.67	90	1.7	101	80	-0.074	11.67	0.151
61	9.720	0.159	2.66	91	1.9	-	80	-0.074	11.52	0.120
62	9.884	0.164	2.68	91	2.0	-	80	-0.075	11.37	0.085
63	10.047	0.163	2.67	91	1.9	-	80	-0.075	11.29	0.057

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
64	10.208	0.161	2.68	91	1.7	-	80	-0.074	11.18	0.041
65	10.372	0.164	2.67	91	1.7	-	80	-0.073	11.10	0.036
66	10.532	0.160	2.68	92	2.1	-	80	-0.073	11.09	0.042
67	10.693	0.161	2.67	92	1.6	-	80	-0.074	11.13	0.044
68	10.857	0.164	2.67	92	1.8	-	80	-0.074	11.06	0.045
69	11.023	0.166	2.67	92	2.0	-	80	-0.074	11.06	0.051
70	11.184	0.161	2.67	92	1.9	100	80	-0.074	10.96	0.040
71	11.350	0.166	2.68	92	1.6	-	80	-0.072	10.85	0.059
72	11.511	0.161	2.67	93	1.9	-	80	-0.074	10.74	0.088
73	11.673	0.162	2.68	93	1.6	-	80	-0.073	10.69	0.102
74	11.839	0.166	2.68	93	2.1	-	80	-0.073	10.77	0.058
75	11.999	0.160	2.68	93	2.1	-	80	-0.072	10.63	0.068
76	12.164	0.165	2.69	93	1.7	-	80	-0.072	10.45	0.091
77	12.328	0.164	2.68	93	1.9	-	80	-0.072	10.33	0.113
78	12.489	0.161	2.68	94	1.8	-	80	-0.072	10.14	0.148
79	12.654	0.165	2.69	94	1.6	-	80	-0.071	9.95	0.181
80	12.818	0.164	2.68	94	1.5	101	80	-0.071	9.84	0.207
81	12.979	0.161	2.68	94	1.5	-	80	-0.072	9.69	0.218
82	13.143	0.164	2.68	94	2.1	-	80	-0.070	9.39	0.254
83	13.306	0.163	2.69	94	1.7	-	80	-0.072	9.21	0.276
84	13.467	0.161	2.68	94	1.6	-	80	-0.072	9.14	0.284
85	13.632	0.165	2.68	95	1.8	-	80	-0.069	9.06	0.295
86	13.799	0.167	2.69	95	1.8	-	80	-0.070	9.02	0.295
87	13.960	0.161	2.68	95	1.8	-	80	-0.069	8.94	0.305
88	14.126	0.166	2.69	95	1.9	-	79	-0.070	8.89	0.306
89	14.289	0.163	2.68	95	2.0	-	79	-0.071	8.81	0.307
90	14.452	0.163	2.69	95	1.9	100	79	-0.068	8.71	0.316
91	14.618	0.166	2.68	95	1.8	-	79	-0.067	8.67	0.323
92	14.779	0.161	2.69	95	2.1	-	79	-0.067	8.58	0.318
93	14.943	0.164	2.69	95	1.6	-	79	-0.069	8.42	0.321
94	15.109	0.166	2.69	95	1.6	-	79	-0.069	8.37	0.322
95	15.270	0.161	2.69	96	2.1	-	79	-0.068	8.31	0.324

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
96	15.436	0.166	2.69	96	1.5	-	79	-0.069	8.25	0.332
97	15.601	0.165	2.69	96	1.6	-	79	-0.066	8.12	0.330
98	15.762	0.161	2.69	96	2.1	-	79	-0.067	8.16	0.336
99	15.925	0.163	2.69	96	2.1	-	79	-0.068	8.16	0.350
100	16.089	0.164	2.69	96	1.6	99	79	-0.067	8.14	0.361
101	16.252	0.163	2.69	96	2.1	-	79	-0.068	8.04	0.362
102	16.419	0.167	2.69	96	1.6	-	79	-0.066	8.00	0.358
103	16.584	0.165	2.70	96	2.1	-	79	-0.066	7.99	0.362
104	16.746	0.162	2.69	96	1.9	-	79	-0.066	7.88	0.357
105	16.911	0.165	2.69	96	2.0	-	79	-0.067	7.82	0.354
106	17.076	0.165	2.69	96	2.1	-	79	-0.066	7.84	0.355
107	17.239	0.163	2.69	97	2.0	-	79	-0.067	7.97	0.357
108	17.404	0.165	2.69	97	2.0	-	79	-0.066	8.06	0.351
109	17.570	0.166	2.69	97	1.6	-	79	-0.065	7.97	0.345
110	17.732	0.162	2.69	97	1.6	100	79	-0.068	7.88	0.336
111	17.898	0.166	2.70	97	1.8	-	79	-0.065	7.91	0.325
112	18.062	0.164	2.69	97	1.8	-	79	-0.066	7.93	0.313
113	18.224	0.162	2.69	97	1.8	-	79	-0.064	7.83	0.333
114	18.389	0.165	2.70	97	1.9	-	79	-0.067	7.76	0.341
115	18.552	0.163	2.70	97	1.7	-	78	-0.066	7.72	0.351
116	18.715	0.163	2.70	97	1.7	-	78	-0.063	7.65	0.361
117	18.882	0.167	2.70	97	1.8	-	78	-0.066	7.65	0.360
118	19.048	0.166	2.70	97	2.1	-	78	-0.066	7.60	0.372
119	19.211	0.163	2.70	97	1.6	-	78	-0.065	7.54	0.375
120	19.379	0.168	2.70	97	2.0	100	78	-0.065	7.47	0.374
121	19.541	0.162	2.70	97	1.7	-	78	-0.065	7.49	0.374
122	19.705	0.164	2.70	97	2.1	-	78	-0.064	7.64	0.342
123	19.872	0.167	2.70	97	1.6	-	78	-0.064	7.54	0.348
124	20.033	0.161	2.69	97	2.0	-	78	-0.065	7.48	0.357
125	20.198	0.165	2.69	97	1.9	-	78	-0.064	7.43	0.355
126	20.365	0.167	2.70	97	1.7	-	78	-0.065	7.32	0.345
127	20.527	0.162	2.69	97	2.1	-	78	-0.062	7.19	0.350

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
128	20.692	0.165	2.71	98	1.7	-	78	-0.066	7.07	0.338
129	20.859	0.167	2.70	98	1.6	-	78	-0.065	6.95	0.346
130	21.018	0.159	2.71	98	1.7	99	78	-0.062	6.84	0.362
131	21.184	0.166	2.70	98	2.0	-	78	-0.062	6.81	0.368
132	21.349	0.165	2.70	98	1.6	-	78	-0.064	6.80	0.369
133	21.511	0.162	2.69	98	1.5	-	78	-0.064	6.73	0.378
134	21.680	0.169	2.70	98	1.7	-	78	-0.063	6.81	0.365
135	21.846	0.166	2.70	98	2.1	-	78	-0.063	6.81	0.366
136	22.008	0.162	2.70	98	1.6	-	78	-0.064	7.09	0.344
137	22.174	0.166	2.69	98	1.8	-	78	-0.063	7.33	0.333
138	22.339	0.165	2.70	98	1.9	-	78	-0.062	8.61	0.273
139	22.502	0.163	2.70	98	1.6	-	78	-0.064	8.34	0.264
140	22.668	0.166	2.70	98	1.9	99	78	-0.064	8.22	0.258
141	22.833	0.165	2.70	98	1.8	-	78	-0.062	8.15	0.246
142	22.996	0.163	2.71	98	1.5	-	78	-0.064	8.13	0.240
143	23.162	0.166	2.70	98	1.9	-	78	-0.063	8.08	0.232
144	23.327	0.165	2.70	98	2.0	-	78	-0.061	8.00	0.232
145	23.487	0.160	2.69	98	1.9	-	78	-0.062	7.88	0.231
146	23.652	0.165	2.70	98	2.0	-	78	-0.061	7.81	0.239
147	23.818	0.166	2.70	98	1.6	-	78	-0.061	7.72	0.245
148	23.984	0.166	2.69	98	2.0	-	78	-0.063	7.67	0.252
149	24.149	0.165	2.70	98	1.6	-	78	-0.063	7.62	0.257
150	24.314	0.165	2.70	98	1.6	100	77	-0.062	7.58	0.258
151	24.477	0.163	2.69	98	1.7	-	77	-0.061	7.52	0.265
152	24.643	0.166	2.69	98	1.7	-	77	-0.061	7.54	0.266
153	24.808	0.165	2.71	98	1.8	-	77	-0.060	7.46	0.281
154	24.971	0.163	2.70	98	1.7	-	77	-0.062	7.40	0.287
155	25.137	0.166	2.70	98	1.7	-	77	-0.061	7.35	0.290
156	25.299	0.162	2.70	98	2.1	-	77	-0.063	7.32	0.293
157	25.462	0.163	2.70	98	1.7	-	77	-0.061	7.27	0.294
158	25.631	0.169	2.70	98	1.6	-	77	-0.063	7.20	0.289
159	25.796	0.165	2.70	98	2.0	-	77	-0.059	7.15	0.292

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
160	25.959	0.163	2.69	98	1.6	100	77	-0.063	7.08	0.295
161	26.125	0.166	2.70	98	1.6	-	77	-0.060	7.02	0.300
162	26.290	0.165	2.69	98	2.0	-	77	-0.063	7.01	0.306
163	26.452	0.162	2.69	98	1.8	-	77	-0.062	6.99	0.306
164	26.617	0.165	2.70	98	1.7	-	77	-0.060	6.91	0.309
165	26.780	0.163	2.70	98	1.6	-	77	-0.061	6.89	0.308
166	26.946	0.166	2.69	98	1.6	-	77	-0.061	6.86	0.315
167	27.113	0.167	2.70	98	1.6	-	77	-0.060	6.98	0.301
168	27.277	0.164	2.70	98	2.1	-	77	-0.059	7.02	0.293
169	27.440	0.163	2.70	98	1.9	-	77	-0.058	7.02	0.297
170	27.604	0.164	2.70	98	1.9	99	77	-0.059	7.05	0.300
171	27.770	0.166	2.70	98	1.7	-	77	-0.061	7.03	0.305
172	27.934	0.164	2.70	98	2.1	-	77	-0.062	7.03	0.307
173	28.098	0.164	2.70	98	1.9	-	77	-0.061	7.01	0.320
174	28.264	0.166	2.70	98	1.9	-	77	-0.058	7.00	0.324
175	28.428	0.164	2.70	98	1.6	-	77	-0.059	6.99	0.343
176	28.595	0.167	2.70	98	2.1	-	77	-0.062	6.95	0.357
177	28.754	0.159	2.70	98	1.6	-	77	-0.059	7.04	0.339
178	28.922	0.168	2.70	98	2.0	-	77	-0.062	7.00	0.337
179	29.089	0.167	2.70	98	1.6	-	77	-0.062	7.14	0.278
180	29.251	0.162	2.70	98	1.5	99	77	-0.059	7.07	0.254
181	29.417	0.166	2.71	98	1.7	-	77	-0.061	6.96	0.255
182	29.583	0.166	2.70	98	1.9	-	77	-0.060	7.01	0.267
183	29.745	0.162	2.70	98	1.9	101	77	-0.062	7.02	0.261
Avg/Tot	29.745	0.163	2.66	91.9	1.8	100	78.7	-0.069	9.57	0.393

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 4

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
0	-0.002		-0.02	76	0.1		73
1	0.113	0.115	0.92	76	1.4	-	73
2	0.252	0.139	0.92	76	1.5	-	74
3	0.393	0.141	0.94	75	1.4	-	74
4	0.536	0.143	0.94	76	1.5	-	74
5	0.676	0.140	0.93	76	1.5	-	74
6	0.818	0.142	0.95	76	1.4	-	74
7	0.960	0.142	0.95	76	1.6	-	74
8	1.102	0.142	0.95	76	1.4	-	74
9	1.244	0.142	0.96	76	1.5	-	74
10	1.388	0.144	0.97	76	1.4	96	75
11	1.531	0.143	0.96	76	1.4	-	75
12	1.674	0.143	0.96	76	1.5	-	75
13	1.817	0.143	0.96	76	1.6	-	75
14	1.960	0.143	0.97	76	1.4	-	75
15	2.104	0.144	0.97	77	1.6	-	75
16	2.248	0.144	0.96	77	1.4	-	75
17	2.388	0.140	0.96	77	1.5	-	75
18	2.532	0.144	0.98	77	1.6	-	75
19	2.677	0.145	0.97	77	1.5	-	76
20	2.823	0.146	0.97	77	1.6	99	76
21	2.967	0.144	0.97	77	1.6	-	76
22	3.111	0.144	0.97	78	1.5	-	76
23	3.256	0.145	0.98	78	1.6	-	76
24	3.402	0.146	0.99	78	1.6	-	76
25	3.547	0.145	0.99	78	1.6	-	76
26	3.693	0.146	0.98	79	1.5	-	76
27	3.838	0.145	0.98	79	1.7	-	76
28	3.984	0.146	0.98	79	1.5	-	76
29	4.130	0.146	0.98	80	1.6	-	76
30	4.276	0.146	0.98	80	1.6	101	76
31	4.423	0.147	0.99	80	1.6	-	76

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 4

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/11/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
32	4.570	0.147	1.00	81	1.5	-	76
33	4.715	0.145	1.00	81	1.5	-	76
34	4.862	0.147	1.00	82	1.6	-	76
35	5.010	0.148	1.00	82	1.6	-	76
36	5.157	0.147	1.00	82	1.5	-	76
37	5.307	0.150	1.00	82	1.6	-	77
38	5.455	0.148	1.00	83	1.7	-	77
39	5.603	0.148	1.00	83	1.6	-	77
40	5.751	0.148	0.99	83	1.6	102	77
41	5.899	0.148	0.99	83	1.6	-	77
42	6.048	0.149	1.00	84	1.5	-	77
43	6.196	0.148	1.00	84	1.6	-	77
44	6.344	0.148	1.00	84	1.7	-	77
45	6.493	0.149	1.00	85	1.5	-	77
46	6.642	0.149	1.00	85	1.5	-	77
47	6.790	0.148	1.00	85	1.7	-	77
48	6.939	0.149	1.00	86	1.7	-	77
49	7.089	0.150	1.00	86	1.7	-	77
50	7.235	0.146	1.00	86	1.7	102	77
51	7.385	0.150	1.00	86	1.6	-	77
52	7.534	0.149	1.00	87	1.6	-	77
53	7.686	0.152	1.01	87	1.7	-	77
54	7.836	0.150	1.01	87	1.7	-	77
55	7.986	0.150	1.01	88	1.6	-	77
56	8.136	0.150	1.00	88	1.6	-	77
57	8.286	0.150	1.01	88	1.6	-	77
58	8.436	0.150	1.01	88	1.7	-	77
59	8.586	0.150	1.01	88	1.6	-	77
60	8.736	0.150	1.02	89	1.5	102	77
Avg/Tot	8.738	0.146	0.97	80.7	1.5	100	75.7

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 4

Technician: AK

Date: 4/11/2025

Stove ΔT: 71

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	343	314	268	543	239	341.3	1082.8
1	343	314	242	508	242	329.8	1340.2
2	340	315	224	489	245	322.4	1344.2
3	328	313	212	471	242	313.2	1304.3
4	332	312	203	468	242	311.3	1284.2
5	331	310	197	460	241	308.0	1245.7
6	330	309	193	454	240	305.2	1364.3
7	322	308	190	452	241	302.5	1356.5
8	322	305	189	455	245	303.0	1279.7
9	314	304	187	448	237	297.9	1356.6
10	309	302	186	454	232	296.6	1456.4
11	314	299	187	476	240	303.3	1498.2
12	311	297	189	496	238	306.0	1416.7
13	302	294	191	516	241	308.9	1407.1
14	298	292	192	533	233	309.4	1407.1
15	298	290	193	556	238	314.8	1390.0
16	296	288	193	572	229	315.5	1450.1
17	291	286	193	553	238	312.1	1387.2
18	295	283	194	535	240	309.3	1383.4
19	290	282	194	527	240	306.5	1355.8
20	286	279	194	536	236	306.2	1343.9
21	288	278	194	550	239	309.7	1353.0
22	282	276	193	566	236	310.8	1369.9
23	281	275	193	578	230	311.1	1400.6
24	281	273	193	583	226	311.2	1414.7
25	281	271	194	587	230	312.3	1449.3
26	281	270	194	586	232	312.5	1456.9
27	276	269	195	591	227	311.5	1434.7
28	276	268	196	599	222	312.1	1425.4
29	276	266	196	606	229	314.6	1404.9
30	270	265	196	610	225	313.3	1406.4
31	272	264	196	617	228	315.5	1414.2
32	272	263	196	621	221	314.8	1436.0
33	268	262	197	626	219	314.4	1447.5
34	268	261	197	623	219	313.5	1507.1
35	267	261	198	623	220	313.9	1536.3
36	267	261	200	626	224	315.3	1525.9
37	265	260	201	628	222	315.4	1528.3
38	268	260	203	629	215	314.8	1551.0
39	261	260	204	630	214	313.6	1568.3
40	261	259	205	631	213	313.9	1565.8
41	262	259	206	633	213	314.6	1555.2
42	262	259	207	635	218	316.2	1546.4
43	264	259	208	640	219	317.7	1513.3
44	262	258	208	642	218	317.7	1514.3
45	259	258	208	644	210	316.0	1518.4
46	263	258	209	645	215	317.9	1511.3
47	258	258	209	642	216	316.7	1499.4

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 4

Technician: AK

Date: 4/11/2025

Stove ΔT: 71

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	260	258	209	640	212	315.9	1485.8
49	264	258	209	638	215	316.7	1471.1
50	261	258	209	638	215	316.3	1442.2
51	261	258	209	637	212	315.4	1429.4
52	261	258	208	637	214	315.4	1419.3
53	259	258	207	633	212	313.7	1423.8
54	258	258	206	626	208	311.1	1422.0
55	266	258	205	623	211	312.4	1403.3
56	263	258	204	625	210	312.0	1382.4
57	267	257	203	627	211	312.7	1395.3
58	269	258	202	626	210	312.9	1401.8
59	260	258	201	623	205	309.3	1388.3
60	265	258	200	619	208	309.7	1373.2
61	266	258	198	615	202	307.8	1355.2
62	265	258	197	609	201	306.0	1347.3
63	271	257	196	607	206	307.3	1336.8
64	268	257	194	604	201	304.9	1326.6
65	265	257	193	599	201	303.0	1324.7
66	273	257	192	592	204	303.7	1327.2
67	269	257	191	586	202	300.9	1325.3
68	272	257	190	581	199	299.8	1320.8
69	274	257	188	576	195	298.1	1313.2
70	273	257	188	571	196	296.8	1303.3
71	277	257	187	566	198	296.9	1289.7
72	276	257	186	561	194	295.0	1284.9
73	281	257	185	558	197	295.5	1274.6
74	284	257	184	555	199	295.9	1267.6
75	283	257	183	552	194	293.7	1257.0
76	285	257	183	550	197	294.4	1248.4
77	290	257	182	548	195	294.2	1237.7
78	287	257	181	547	193	293.0	1224.9
79	290	257	180	546	192	293.0	1213.8
80	295	257	179	546	196	294.2	1201.5
81	295	257	178	546	190	293.1	1183.7
82	299	257	177	546	195	294.7	1169.8
83	301	257	175	547	195	295.1	1156.8
84	301	257	174	547	194	294.8	1145.5
85	304	257	173	549	192	294.8	1137.3
86	305	256	171	549	193	295.1	1130.3
87	304	256	170	551	192	294.7	1120.2
88	307	257	169	552	194	295.5	1113.6
89	312	257	168	552	195	296.8	1110.2
90	311	257	167	552	195	296.3	1108.6
91	309	256	166	552	191	294.8	1103.7
92	313	256	165	551	195	295.8	1096.5
93	311	257	164	550	189	294.0	1093.2
94	311	256	163	548	193	294.0	1087.6
95	311	257	162	546	190	293.1	1085.2

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 4

Technician: AK

Date: 4/11/2025

Stove ΔT: 71

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	313	256	161	545	192	293.2	1082.5
97	314	256	160	545	188	292.5	1070.1
98	320	256	159	546	194	294.8	1064.6
99	316	256	158	545	194	293.9	1064.9
100	310	256	157	543	189	291.2	1059.3
101	316	255	157	544	189	292.2	1052.2
102	317	256	156	543	190	292.2	1051.4
103	318	256	155	544	187	291.8	1043.5
104	318	255	154	547	187	292.2	1034.7
105	319	255	153	550	187	293.1	1029.1
106	316	256	153	553	188	292.9	1021.3
107	318	255	152	557	183	292.9	1017.1
108	316	256	151	561	183	293.2	1013.7
109	317	256	151	565	187	295.1	1005.9
110	317	256	150	568	186	295.6	998.9
111	320	256	149	575	186	297.4	1000.7
112	318	256	148	571	185	295.6	1009.6
113	315	256	148	568	182	293.9	1013.3
114	313	256	147	563	183	292.5	1018.0
115	313	256	147	555	184	291.1	1020.8
116	311	256	147	550	181	288.8	1022.6
117	310	256	146	544	185	288.2	1025.9
118	310	256	146	540	181	286.5	1024.7
119	314	256	146	536	186	287.3	1026.5
120	310	256	145	531	182	284.9	1026.7
121	312	256	145	529	181	284.4	1030.7
122	309	256	145	527	181	283.6	1028.0
123	312	256	145	526	182	284.1	1024.5
124	310	255	145	525	176	282.0	1020.6
125	311	255	145	523	181	283.0	1018.6
126	310	255	144	520	177	281.3	1015.3
127	308	255	144	518	179	280.8	1009.7
128	310	255	144	517	180	281.1	1000.6
129	303	255	144	516	179	279.2	994.1
130	304	255	144	514	178	278.9	989.9
131	308	256	143	511	181	279.7	986.0
132	308	255	143	508	181	278.9	980.7
133	305	255	142	506	178	277.2	975.2
134	306	255	142	504	179	277.1	970.5
135	307	255	142	502	179	276.9	971.3
136	300	255	141	500	175	274.3	971.4
137	301	256	141	511	176	276.9	962.7
138	299	256	140	519	178	278.6	965.8
139	300	256	140	522	176	278.9	969.6
140	301	257	140	522	180	279.9	970.4
141	298	258	139	522	177	278.8	968.7
142	297	258	139	523	179	279.1	963.3
143	299	259	139	522	181	279.8	959.5

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 4

Technician: AK

Date: 4/11/2025

Stove ΔT: 71

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	298	259	138	523	179	279.5	956.2
145	298	260	138	524	179	279.9	952.8
146	297	262	138	524	179	279.8	950.3
147	296	262	138	523	177	279.1	946.2
148	293	263	138	523	178	279.0	944.2
149	292	264	137	523	178	278.8	939.5
150	288	265	137	523	176	277.9	935.9
151	290	266	137	524	180	279.2	934.6
152	290	267	137	525	180	279.6	932.7
153	289	268	136	525	176	278.9	930.5
154	288	270	136	524	179	279.4	929.9
155	287	271	136	523	179	279.2	927.9
156	286	272	136	520	179	278.6	929.9
157	288	273	136	518	179	278.8	930.3
158	285	274	135	516	177	277.4	927.4
159	286	275	135	513	180	277.8	925.2
160	284	277	135	511	180	277.3	924.3
161	281	277	135	509	181	276.7	922.9
162	279	278	135	507	178	275.3	920.7
163	273	279	134	504	174	272.9	917.8
164	277	280	134	502	178	274.1	915.3
165	273	281	135	500	176	273.0	914.0
166	276	281	134	498	179	273.6	911.0
167	275	282	134	497	178	273.0	907.8
168	277	283	134	495	178	273.1	909.2
169	277	283	133	494	179	273.2	910.3
170	275	284	133	492	180	272.9	910.2
171	276	285	133	492	179	272.8	911.9
172	272	285	133	491	178	271.6	912.2
173	272	286	133	489	179	271.6	913.6
174	273	286	132	489	179	271.7	913.5
175	274	286	132	487	177	271.2	914.3
176	273	287	132	487	180	271.7	912.7
177	272	287	132	486	180	271.3	913.4
178	271	287	132	484	179	270.5	886.4
179	270	287	132	484	181	270.8	876.6
180	272	287	132	484	183	271.4	870.7
181	270	287	131	485	179	270.4	871.2
182	268	288	131	486	179	270.2	869.9
183	269	288	130	488	176	270.1	869.9
Average	291.1	267.0	168.6	548.1	198.5	294.6	1166.3

LAB SAMPLE DATA - ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 4

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/11/2025

		Sample ID	Tare, mg	Final, mg	Catch, mg
Filters	A	G01249	231.1	233.5	2.4
	B	G01250	240.1	242.0	1.9
	C - 1st Hour	G01251	236.3	237.0	0.7
	Amb	G01252	237.0	237.1	0.1
Probes	A	10A	116647.0	116647.1	0.1
	B	10B	117754.3	117754.5	0.2
	C - 1st Hour	10C	116728.9	116728.9	0.0
O-rings	A	10A	3355.2	3355.2	0.0
	B	10B	3566.5	3566.7	0.2
	C - 1st Hour	10C	3360.2	3360.3	0.1

Placed in Dessicator on: 4/11/2025

Balance Audit (mg):

		200.0		200.0					
		Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time
Filters	A	233.3	4/18 15:00	233.5	4/21 13:30				
	B	241.9	4/18 15:00	242.0	4/21 13:30				
	C - 1st Hour	236.9	4/18 15:00	237.0	4/21 13:30				
	Amb	237.0	4/18 15:00	237.1	4/21 13:30				
Probes	A	116647.1	4/18 15:00	116647.1	4/21 13:30				
	B	117754.5	4/18 15:00	117754.5	4/21 13:30				
	C - 1st Hour	116728.9	4/18 15:00	116728.9	4/21 13:30				
O-Rings	A	3355.3	4/18 15:00	3355.2	4/21 13:30				
	B	3566.6	4/18 15:00	3566.7	4/21 13:30				
	C - 1st Hour	3360.4	4/18 15:00	3360.3	4/21 13:30				

Train A Aggregate, mg:	2.5
Train B Aggregate, mg:	2.3
Train C Aggregate, mg:	0.8
Ambient, mg:	0.1

ASTM E2780 Wood Heater Run Sheets

Client: HHT Job Number: 24-291 Tracking #: 220
Model: Dauntless-C Run Number: 4 Test Date: 4/11/2025

Wood Heater Run Notes

Test Control Settings

Primary Air Setting(s): Fully open
Targeted Burn Category: IV

Preburn Notes

Time	Notes
97:00	PB End

Test Notes

Test Burn Start Time: 19:19 Test Fuel Loaded by: 35 seconds
Door Closed: 50 seconds Air Control Set at: 0 seconds
Other Loading Notes: Bypass closed @ 0:55, fan on high @ 5:00

Time	Notes
	-None-

Test Burn End Time: 22:22

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO₂ (%): 17.32 CO (%): 4.350
Mid Gas CO₂ (%): 10.00 CO (%): 2.500

Calibration Results:

	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
Time	18:08	18:10	18:11	4/12 9:31	4/12 9:32	4/12 9:33-0
CO ₂	-0.01	17.34	10.34	-0.09	17.22	10.20
CO	-0.011	4.337	2.564	-0.028	4.450	2.529

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

Technician Signature: 

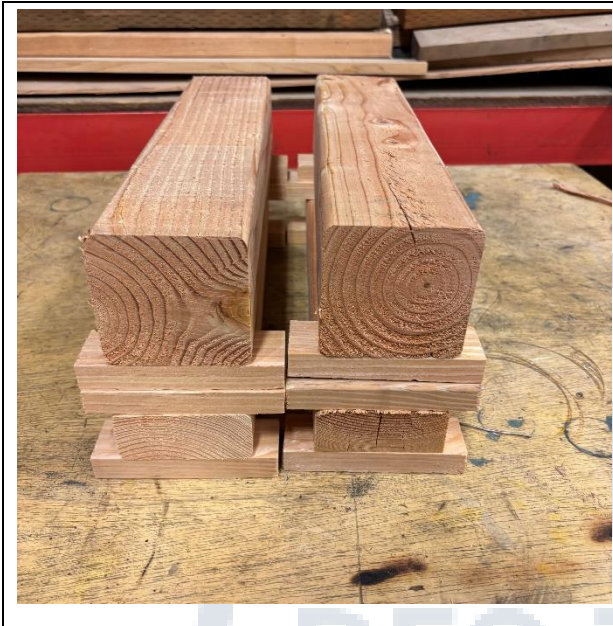
Date: 4/25/25

ASTM E2780 Wood Heater Run Sheets

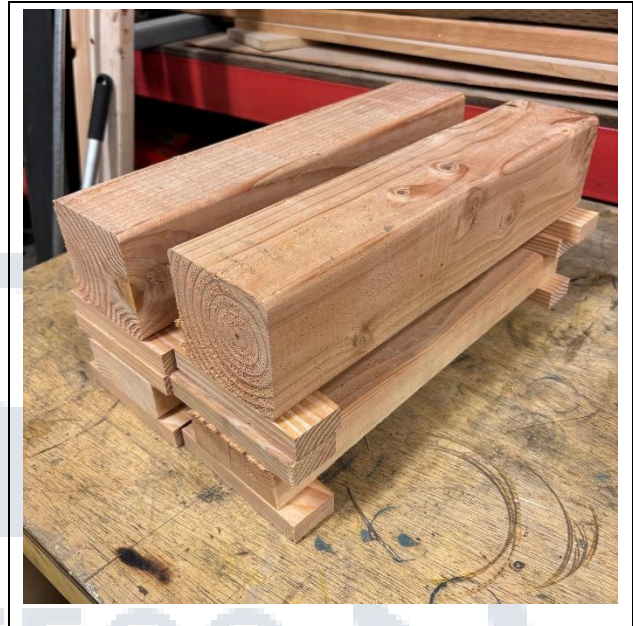
Client: HHT
Model: Dauntless-C

Job Number: 24-291
Run Number: 4

Tracking #: 220
Test Date: 4/11/2025



Test Fuel Front/Side View



Test Fuel Iso View



Test Fuel Loaded in Stove



Air Setting

Technician Signature: _____

A handwritten signature in black ink, appearing to be "A. H. H.", written over a horizontal line.

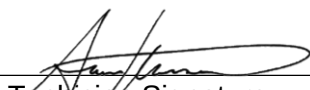
Date: 4/25/25

WOOD STOVE TEST DATA PACKET
ASTM E2780/E2515



Run 5 Data Summary

Client:	HHT
Model:	Dauntless-C
Job #:	24-291
Tracking #:	220
Test Date:	4/14/2025



Technician Signature

5/15/2025

Date

TEST RESULTS - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 5

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/14/2025

Burn Rate (kg/hr):	1.15
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	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft ³)	59.336	43.309	42.082	8.666
Average Gas Velocity in Dilution Tunnel (ft/sec)	18.1			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	11867.9			
Average Gas Meter Temperature (°F)	72.5	95.5	95.0	81.5
Total Sample Volume (dscf)	59.372	42.115	40.376	8.646
Average Tunnel Temperature (°F)	96.7			
Total Time of Test (min)	258			
Total Particulate Catch (mg)	0.3	6.1	6.3	3.8
Particulate Concentration, dry-standard (g/dscf)	0.0000051	0.0001448	0.0001560	0.0004395
Total PM Emissions (g)	0.26	7.13	7.70	5.16
Particulate Emission Rate (g/hr)	0.06	1.66	1.79	5.16
Emissions Factor (g/kg)	-	1.44	1.55	-
Difference from Average Total Particulate Emissions (g)	-	0.29	0.29	-
Difference from Average Total Particulate Emissions (%)	-	3.8%	3.8%	-
Difference from Average Emissions Factor (g/kg)	-	0.06	0.06	-

Final Average Results	
Total Particulate Emissions (g)	7.42
Particulate Emission Rate (g/hr)	1.73
Emissions Factor (g/kg)	1.50
HHV Efficiency (%)	72.5%
LHV Efficiency (%)	78.4%
CO Emissions (g/min)	0.95

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	82.3	OK
Face Velocity	< 30 ft/min	9.4	OK
Leakage Rate	Less than 4% of average sample rate	0 cfm	OK
Ambient Temp	55-90 °F	Min:70.7/Max:73.7	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
Stove Surface ΔT	<126°F	21.1	OK

B415.1 Efficiency Results

Manufacturer: HHT
Model: Dauntless-C
Date: 04/14/25
Run: 5
Control #: 24-291
Test Duration: 258
Output Category: 2

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	72.5%	78.4%
Combustion Efficiency	96.7%	96.7%
Heat Transfer Efficiency	75.0%	81.0%

Output Rate (kJ/h)	16,304	15,466	(Btu/h)
Burn Rate (kg/h)	1.14	2.50	(lb/h)
Input (kJ/h)	22,487	21,332	(Btu/h)

Test Load Weight (dry kg)	4.88	10.76	dry lb
MC wet (%)	17.75		
MC dry (%)	21.58		
Particulate (g)	7.42		
CO (g)	245		
Test Duration (h)	4.30		

Emissions	Particulate	CO
g/MJ Output	0.11	3.49
g/kg Dry Fuel	1.52	50.19
g/h	1.73	56.97
g/min	0.03	0.95
lb/MM Btu Output	0.25	8.12

Air/Fuel Ratio (A/F)	15.91
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VERSION:

2.4

4/15/2010

WOODSTOVE FUEL DATA - ASTM E2780

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Preburn Fuel Information						
Size	Length (in)	Moisture Content (% DB)		Size	Length (in)	Moisture Content (% DB)
2x4	8.00	19.2		2x4	16.00	25.0
2x4	8.00	24.7		2x4	16.00	22.4
2x4	8.00	22.4		2x4	16.00	21.0
2x4	8.00	19.5		2x4	16.00	19.2
2x4	8.00	19.5		2x4	16.00	19.4
2x4	8.00	19.9				
2x4	8.00	24.5				
2x4	16.00	23.7				
Total Fuel Weight (lbs):		15.92	Average Moisture (%DB):		21.6	

Firebox Volume (ft³): 1.82
 Total 2x4 Crib Weight, with spacers (lbs): 5.16
 Total 4x4 Crib Weight, with spacers (lbs): 8.00
 Total Wet Fuel Weight, with spacers (lbs): 13.16

Coal Bed Range (20-25%):

Min (lbs): 2.63
 Max (lbs): 3.29

Test Fuel Information						
Size	Length (in)	Weight (lbs)	Moisture Content (%DB)			Dry Weight (lbs)
2x4	15.50	2.09	23.6	19.8	24.2	1.71
2x4	15.50	2.05	22.8	19.0	19.1	1.70
4x4	15.50	3.81	19.2	23.2	24.0	3.12
4x4	15.50	3.68	20.5	19.1	24.5	3.03
Total Dry Weight, no spacers (lbs):						9.56
Total Dry Weight, with spacers (lbs):						10.94

Spacer Moisture Readings (%DB)						
11.1	11.3					
11.1	12.0					
10.7	11.9					
11.1	10.9					
10.2						
10.0						
11.8						
11.3						

Quality Checks	Requirement	Observed	Result
Fuel Density	25 - 36 (lbs/ft ³ , DB)	30.5	OK
Loading Density	6.3 - 7.7 (lbs/ft ³ , WB)	7.23	OK
2x4 Fuel Mix	35 - 65 % of total weight	39%	OK

DILUTION TUNNEL & MISC. DATA - ASTM E2780 / E2515

Client: **HHT**
 Model: **Dauntless-C**
 Run #: **5**
 Test Start Time: **14:14**

Job #: **24-291**
 Tracking #: **220**
 Technician: **AK**
 Date: **4/14/2025**

Total Sampling Time (min): **258**
 Recording Interval (min): **1**

Meter Box γ Factor: **1.019** (A)
 Meter Box γ Factor: **1.005** (B)
 Meter Box γ Factor: **1.024** (C)
 Meter Box γ Factor: **1.012** (Ambient)

Induced Draft Check (in. H₂O): **0**
 Smoke Capture Check (%): **100%**
 Date Flue Pipe Last Cleaned: **4/5/2025**
 Test Fuel Scale Audit (lbs): **10.00**
 Platform Scale Audit (lbs): **10.0**

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	29.89	29.80	29.85
Relative Humidity (%)	15.4	13.9	
Room Air Velocity (ft/min)	<50	<50	
Pitot Tube Leak Check	0	0	
Ambient Sample Volume:		59.336	ft ³

Sample Train Leak Checks

	Pre-test	Post-test		
(A)	0.000	0.000	cfm @	-7 in. Hg
(B)	0.000	0.000	cfm @	-7 in. Hg
(C)	0.001	0.000	cfm @	-7 in. Hg
(Ambient)	0.000	0.000	cfm @	-12 in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H ₂ O)	Temp (°F)
1	0.052	70
2	0.090	70
3	0.094	70
4	0.070	70
5	0.064	70
6	0.088	70
7	0.086	70
8	0.074	70
Center	0.066	70

Dilution Tunnel H₂O: **2.00** percent
 Tunnel Diameter: **6** inches
 Pitot Tube Cp: **0.99** [unitless]
 Dilution Tunnel MW(dry): **29.00** lb/lb-mole
 Dilution Tunnel MW(wet): **28.78** lb/lb-mole
 Tunnel Area: **0.1963** ft²

V_{strav} : **18.39** ft/sec

V_{scent} : **17.07** ft/sec

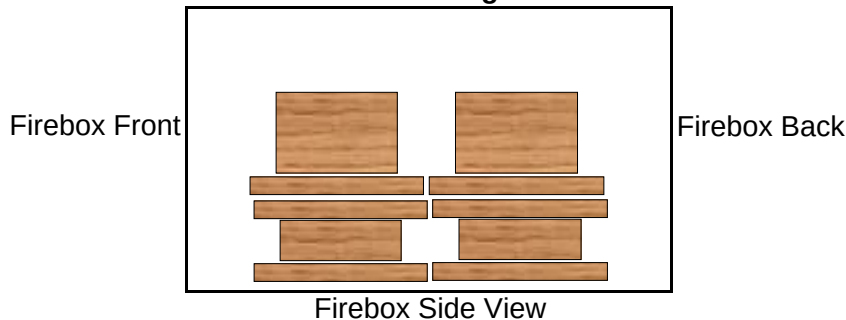
F_p : **1.077** [ratio]

Initial Tunnel Flow: **211.1** scf/min

Static Pressure: **-0.140** in. H₂O

TEST FUEL PROPERTIES

Fuel Load Configuration



Actual Fuel Used Properties

Fuel Type:	D. Fir
HHV (kJ/kg)	19,810
%C	48.73
%H	6.87
%O	43.9
%Ash	0.5
MC (%DB)	21.6

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 5

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/14/2025

Recording Interval (min): 1
Run Time (min): 82

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
0	5.93	-0.077	297	299	422	693	293	401.1	463	71
1	5.78	-0.077	299	300	424	694	290	401.5	457	71
2	5.70	-0.078	303	301	427	691	290	402.3	452	71
3	5.57	-0.076	301	302	431	687	289	402.1	451	71
4	5.48	-0.076	300	303	434	684	289	402.1	450	71
5	5.42	-0.075	303	305	436	679	286	401.9	450	71
6	5.32	-0.074	305	305	439	675	285	401.9	448	71
7	5.22	-0.074	303	306	441	670	283	400.6	446	71
8	5.14	-0.073	305	306	443	665	283	400.5	444	71
9	5.08	-0.073	302	307	443	660	283	399.2	440	71
10	5.01	-0.073	302	308	443	654	280	397.5	435	71
11	4.91	-0.072	303	308	442	648	280	396.2	432	71
12	4.84	-0.070	303	308	441	641	279	394.5	428	71
13	4.78	-0.071	302	309	439	635	277	392.4	425	71
14	4.73	-0.071	302	309	437	630	278	391.3	421	71
15	4.67	-0.071	303	310	434	627	274	389.7	418	71
16	4.64	-0.070	304	310	431	623	273	388.3	414	71
17	4.59	-0.068	300	310	429	619	275	386.3	412	71
18	4.49	-0.069	299	310	426	616	271	384.5	409	71
19	4.44	-0.067	301	311	423	613	271	383.6	407	71
20	4.41	-0.066	301	310	419	611	272	382.5	403	71
21	4.40	-0.066	302	311	416	608	271	381.5	400	71
22	4.34	-0.066	301	310	412	606	270	379.5	396	71
23	4.30	-0.066	298	311	408	601	271	377.7	393	71
24	4.28	-0.066	301	311	404	597	267	376.2	391	71
25	4.25	-0.065	300	311	401	593	266	374.1	387	71
26	4.21	-0.065	298	311	397	585	269	371.8	385	71
27	4.17	-0.064	300	310	393	580	265	369.6	383	71
28	4.14	-0.064	299	310	389	575	267	368.0	380	71
29	4.12	-0.063	299	310	385	568	264	365.1	378	71
30	4.08	-0.064	296	310	382	563	262	362.6	377	71
31	4.08	-0.063	293	310	378	557	266	360.7	375	71
32	4.04	-0.063	295	309	375	551	266	359.0	372	71
33	4.00	-0.062	294	309	372	544	264	356.8	371	71
34	3.98	-0.062	293	309	369	537	263	354.3	369	71
35	3.96	-0.061	293	308	365	531	264	352.4	368	71
36	3.92	-0.061	292	308	362	526	264	350.4	365	71
37	3.91	-0.060	294	307	360	522	261	348.8	363	71
38	3.87	-0.060	291	307	357	516	262	346.6	362	71
39	3.86	-0.061	290	306	354	511	261	344.6	361	71
40	3.87	-0.060	291	305	352	506	262	343.3	358	71
41	3.84	-0.060	290	306	350	501	261	341.4	356	71
42	3.82	-0.059	288	305	347	497	263	339.8	355	71
43	3.80	-0.059	288	304	345	493	258	337.5	353	71
44	3.78	-0.059	287	303	342	488	262	336.5	351	71

WOODSTOVE PREBURN DATA - ASTM E2780

Client: HHT

Model: Dauntless-C

Run #: 5

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/14/2025

Recording Interval (min): 1
Run Time (min): 82

Elapsed Time (min)	Scale Reading (lbs)	Flue Draft (in H ₂ O)	Temperatures (°F)							
			FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Flue	Ambient
45	3.75	-0.061	286	302	340	485	261	334.7	349	70
46	3.75	-0.058	286	302	338	482	262	333.7	347	71
47	3.73	-0.058	286	301	336	478	262	332.5	347	71
48	3.73	-0.058	286	300	334	475	260	330.9	344	71
49	3.72	-0.059	284	299	332	471	261	329.3	343	71
50	3.70	-0.057	282	298	330	468	261	327.6	341	71
51	3.68	-0.057	284	298	328	465	259	326.8	339	70
52	3.69	-0.057	283	297	326	464	258	325.6	338	71
53	3.65	-0.056	284	297	325	464	258	325.3	336	71
54	3.62	-0.058	283	296	323	463	258	324.4	334	71
55	3.60	-0.056	279	295	321	463	257	323.0	332	71
56	3.55	-0.055	282	295	319	463	258	323.5	331	71
57	3.53	-0.054	280	294	318	464	258	322.8	331	70
58	3.51	-0.054	280	293	316	465	259	322.5	329	71
59	3.48	-0.056	279	292	315	465	260	322.2	328	71
60	3.47	-0.056	281	292	313	466	259	322.1	327	71
61	3.44	-0.054	277	292	312	467	258	321.1	325	71
62	3.42	-0.055	280	291	310	468	257	321.4	324	71
63	3.38	-0.055	276	291	309	469	259	320.8	324	71
64	3.37	-0.055	280	290	308	470	258	320.9	323	71
65	3.34	-0.057	279	290	306	471	257	320.6	322	71
66	3.32	-0.054	280	290	305	472	257	320.6	321	71
67	3.31	-0.054	279	290	304	471	257	320.3	320	71
68	3.29	-0.054	281	289	303	472	254	319.8	319	71
69	3.27	-0.055	279	289	301	473	255	319.7	318	71
70	3.24	-0.054	280	288	300	473	256	319.3	318	71
71	3.23	-0.053	280	289	299	475	254	319.3	318	71
72	3.22	-0.055	280	288	298	475	256	319.3	317	71
73	3.19	-0.054	281	288	297	477	252	318.8	316	71
74	3.19	-0.053	282	288	296	476	250	318.5	315	71
75	3.16	-0.051	280	288	295	476	253	318.3	313	71
76	3.12	-0.055	280	288	294	475	250	317.3	314	71
77	3.11	-0.053	277	287	293	474	251	316.5	314	71
78	3.09	-0.052	280	288	292	472	251	316.6	313	71
79	3.05	-0.053	279	287	291	472	251	315.9	313	71
80	3.07	-0.053	281	287	291	469	251	315.6	313	71
81	3.04	-0.053	280	286	290	466	251	314.6	312	71
82	3.01	-0.054	281	286	289	464	250	314.0	312	71

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.062	0.01	74	0.1		13.08		93	321	74	71
1	0.101	0.101	0.063	2.26	74	0.9	-	13.04	-0.04	94	331	75	71
2	0.246	0.145	0.063	2.31	74	0.9	-	12.94	-0.10	94	341	75	71
3	0.399	0.153	0.063	2.34	74	0.9	-	12.83	-0.11	95	351	76	71
4	0.546	0.147	0.062	2.36	74	0.9	-	12.74	-0.09	96	361	76	71
5	0.701	0.155	0.062	2.38	75	1.0	-	12.64	-0.10	96	366	76	71
6	0.850	0.149	0.063	2.40	75	1.0	-	12.60	-0.04	96	362	76	71
7	1.005	0.155	0.062	2.41	75	0.9	-	12.56	-0.04	95	352	76	71
8	1.156	0.151	0.062	2.44	75	1.0	-	12.48	-0.08	95	348	76	71
9	1.311	0.155	0.061	2.44	75	0.9	-	12.41	-0.07	95	348	77	71
10	1.462	0.151	0.060	2.46	75	1.0	90	12.28	-0.13	95	352	77	71
11	1.618	0.156	0.062	2.48	75	1.0	-	12.20	-0.08	95	357	77	71
12	1.774	0.156	0.062	2.50	76	1.0	-	12.13	-0.07	95	355	77	71
13	1.929	0.155	0.063	2.52	76	1.0	-	12.03	-0.10	95	357	77	71
14	2.087	0.158	0.062	2.53	76	1.0	-	11.92	-0.11	95	356	77	71
15	2.241	0.154	0.061	2.55	76	0.9	-	11.84	-0.08	95	356	77	71
16	2.402	0.161	0.062	2.57	77	0.9	-	11.74	-0.10	96	361	77	71
17	2.558	0.156	0.062	2.57	77	1.0	-	11.61	-0.13	96	364	78	71
18	2.716	0.158	0.062	2.58	77	1.0	-	11.50	-0.11	97	370	78	71
19	2.877	0.161	0.061	2.60	77	1.0	-	11.39	-0.11	97	373	78	71
20	3.033	0.156	0.062	2.60	78	0.9	97	11.26	-0.13	97	372	78	71
21	3.194	0.161	0.063	2.60	78	1.0	-	11.17	-0.09	96	370	78	71
22	3.352	0.158	0.061	2.63	78	1.0	-	11.08	-0.09	96	368	78	71
23	3.513	0.161	0.061	2.63	79	1.0	-	11.00	-0.08	96	368	78	71
24	3.674	0.161	0.060	2.64	79	1.0	-	10.92	-0.08	96	369	78	72
25	3.832	0.158	0.061	2.65	80	1.0	-	10.82	-0.10	95	371	78	72
26	3.995	0.163	0.062	2.65	80	1.0	-	10.71	-0.11	95	370	78	72
27	4.155	0.160	0.062	2.67	80	1.0	-	10.64	-0.07	96	371	78	72
28	4.316	0.161	0.062	2.67	81	1.0	-	10.50	-0.14	95	372	78	72
29	4.480	0.164	0.062	2.67	81	1.0	-	10.36	-0.14	95	374	78	72
30	4.638	0.158	0.061	2.68	81	1.0	98	10.26	-0.10	95	376	78	72
31	4.803	0.165	0.062	2.68	82	1.0	-	10.15	-0.11	96	375	78	72

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
32	4.963	0.160	0.061	2.69	82	1.0	-	10.09	-0.06	96	375	78	71
33	5.126	0.163	0.062	2.69	82	1.0	-	9.97	-0.12	96	377	78	71
34	5.290	0.164	0.062	2.70	83	1.0	-	9.84	-0.13	97	383	78	71
35	5.450	0.160	0.062	2.71	83	1.0	-	9.70	-0.14	98	391	79	72
36	5.614	0.164	0.062	2.71	84	1.0	-	9.61	-0.09	97	397	78	72
37	5.779	0.165	0.060	2.72	84	1.0	-	9.44	-0.17	97	402	78	72
38	5.938	0.159	0.061	2.71	84	1.0	-	9.32	-0.12	98	407	79	72
39	6.106	0.168	0.063	2.73	85	1.0	-	9.20	-0.12	98	410	79	72
40	6.267	0.161	0.062	2.73	85	1.0	99	9.09	-0.11	98	413	79	72
41	6.430	0.163	0.061	2.74	85	1.0	-	9.00	-0.09	98	416	79	72
42	6.597	0.167	0.062	2.74	86	1.0	-	8.91	-0.09	98	420	79	72
43	6.758	0.161	0.060	2.74	86	1.0	-	8.79	-0.12	97	423	79	72
44	6.924	0.166	0.061	2.74	86	1.0	-	8.62	-0.17	97	424	79	72
45	7.089	0.165	0.062	2.75	87	1.0	-	8.54	-0.08	97	429	79	72
46	7.253	0.164	0.062	2.75	87	1.0	-	8.40	-0.14	99	430	79	72
47	7.418	0.165	0.063	2.76	87	1.0	-	8.28	-0.12	100	432	79	72
48	7.584	0.166	0.063	2.75	87	1.0	-	8.17	-0.11	100	436	79	72
49	7.747	0.163	0.061	2.77	88	1.0	-	8.01	-0.16	101	438	79	72
50	7.913	0.166	0.063	2.75	88	1.0	99	7.93	-0.08	101	439	79	72
51	8.080	0.167	0.063	2.77	88	1.0	-	7.82	-0.11	101	441	79	72
52	8.242	0.162	0.062	2.77	89	1.0	-	7.73	-0.09	101	442	79	72
53	8.409	0.167	0.061	2.77	89	1.0	-	7.63	-0.10	101	442	79	72
54	8.576	0.167	0.062	2.78	89	1.0	-	7.51	-0.12	101	443	79	72
55	8.738	0.162	0.062	2.78	89	1.0	-	7.41	-0.10	101	443	79	72
56	8.907	0.169	0.061	2.77	90	1.0	-	7.30	-0.11	101	444	79	72
57	9.074	0.167	0.063	2.79	90	1.0	-	7.20	-0.10	102	445	79	72
58	9.236	0.162	0.062	2.77	90	1.0	-	7.11	-0.09	102	448	80	72
59	9.405	0.169	0.061	2.80	90	1.0	-	7.02	-0.09	103	447	80	72
60	9.573	0.168	0.061	2.80	91	1.0	100	6.90	-0.12	102	447	80	72
61	9.735	0.162	0.061	2.80	91	1.0	-	6.81	-0.09	102	449	80	72
62	9.905	0.170	0.061	2.81	91	1.0	-	6.72	-0.09	102	449	80	72
63	10.072	0.167	0.062	2.80	91	1.0	-	6.63	-0.09	102	449	80	72

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
64	10.235	0.163	0.061	2.79	92	1.0	-	6.55	-0.08	102	449	80	72
65	10.405	0.170	0.062	2.80	92	1.0	-	6.45	-0.10	102	449	80	73
66	10.573	0.168	0.063	2.80	92	1.0	-	6.37	-0.08	103	448	80	73
67	10.736	0.163	0.061	2.79	92	1.0	-	6.27	-0.10	103	448	80	73
68	10.905	0.169	0.062	2.80	93	1.0	-	6.17	-0.10	103	448	80	73
69	11.074	0.169	0.060	2.81	93	1.0	-	6.09	-0.08	102	448	80	72
70	11.238	0.164	0.062	2.81	93	1.0	100	6.04	-0.05	103	447	80	72
71	11.407	0.169	0.062	2.82	93	1.0	-	5.95	-0.09	103	444	80	73
72	11.577	0.170	0.061	2.82	93	1.0	-	5.88	-0.07	103	444	80	73
73	11.741	0.164	0.061	2.81	93	1.0	-	5.79	-0.09	102	443	80	73
74	11.909	0.168	0.061	2.82	94	1.0	-	5.72	-0.07	102	442	80	73
75	12.079	0.170	0.061	2.83	94	1.0	-	5.66	-0.06	103	441	80	73
76	12.244	0.165	0.062	2.82	94	1.0	-	5.59	-0.07	102	441	80	73
77	12.412	0.168	0.060	2.82	94	1.0	-	5.50	-0.09	102	441	80	73
78	12.581	0.169	0.061	2.82	94	1.0	-	5.44	-0.06	102	439	80	72
79	12.748	0.167	0.061	2.84	95	1.0	-	5.37	-0.07	102	439	80	72
80	12.917	0.169	0.061	2.82	95	1.0	100	5.29	-0.08	102	438	80	72
81	13.086	0.169	0.062	2.83	95	1.0	-	5.22	-0.07	102	437	80	73
82	13.251	0.165	0.062	2.82	95	1.0	-	5.15	-0.07	102	435	80	73
83	13.421	0.170	0.060	2.83	95	1.0	-	5.09	-0.06	102	433	80	73
84	13.591	0.170	0.061	2.83	95	1.0	-	5.03	-0.06	102	432	80	73
85	13.757	0.166	0.060	2.84	95	1.0	-	4.96	-0.07	102	431	80	73
86	13.925	0.168	0.061	2.83	96	1.0	-	4.90	-0.06	102	428	80	73
87	14.097	0.172	0.061	2.83	96	1.0	-	4.84	-0.06	101	427	80	73
88	14.264	0.167	0.062	2.83	96	1.0	-	4.80	-0.04	102	425	80	73
89	14.430	0.166	0.062	2.85	96	1.0	-	4.74	-0.06	102	424	80	73
90	14.602	0.172	0.063	2.84	96	1.0	100	4.69	-0.05	102	423	80	73
91	14.771	0.169	0.062	2.83	96	1.0	-	4.62	-0.07	102	421	80	73
92	14.937	0.166	0.063	2.84	96	1.0	-	4.55	-0.07	102	420	80	73
93	15.107	0.170	0.062	2.85	97	1.0	-	4.51	-0.04	102	418	80	73
94	15.277	0.170	0.060	2.85	97	1.0	-	4.44	-0.07	102	416	80	73
95	15.445	0.168	0.061	2.84	97	1.0	-	4.37	-0.07	101	415	80	73

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
96	15.615	0.170	0.061	2.84	97	1.0	-	4.33	-0.04	101	414	80	73
97	15.785	0.170	0.062	2.85	97	1.0	-	4.26	-0.07	101	412	80	73
98	15.951	0.166	0.061	2.84	97	1.0	-	4.21	-0.05	101	411	80	73
99	16.122	0.171	0.061	2.85	97	1.0	-	4.14	-0.07	101	409	80	73
100	16.293	0.171	0.062	2.86	97	1.0	100	4.08	-0.06	101	407	80	73
101	16.460	0.167	0.061	2.85	97	1.0	-	4.04	-0.04	101	406	80	73
102	16.628	0.168	0.061	2.85	98	1.0	-	3.98	-0.06	101	405	80	73
103	16.800	0.172	0.060	2.85	98	1.1	-	3.92	-0.06	100	403	80	73
104	16.970	0.170	0.062	2.85	98	1.0	-	3.89	-0.03	100	401	80	73
105	17.137	0.167	0.062	2.85	98	1.0	-	3.82	-0.07	100	401	80	73
106	17.307	0.170	0.061	2.84	98	1.0	-	3.76	-0.06	100	399	80	73
107	17.478	0.171	0.061	2.86	98	1.1	-	3.71	-0.05	101	398	80	73
108	17.647	0.169	0.061	2.85	98	1.0	-	3.66	-0.05	101	397	80	73
109	17.817	0.170	0.062	2.86	98	1.0	-	3.62	-0.04	100	396	80	73
110	17.989	0.172	0.061	2.87	98	1.0	100	3.56	-0.06	100	394	80	73
111	18.155	0.166	0.062	2.85	98	1.0	-	3.51	-0.05	100	393	80	73
112	18.324	0.169	0.062	2.86	98	1.0	-	3.49	-0.02	100	392	80	73
113	18.498	0.174	0.061	2.87	99	1.0	-	3.42	-0.07	100	389	80	73
114	18.668	0.170	0.062	2.85	99	1.0	-	3.38	-0.04	100	388	80	73
115	18.835	0.167	0.062	2.85	99	1.0	-	3.35	-0.03	100	387	80	73
116	19.006	0.171	0.061	2.86	99	1.1	-	3.30	-0.05	100	385	80	73
117	19.177	0.171	0.062	2.88	99	1.0	-	3.24	-0.06	99	384	80	73
118	19.346	0.169	0.061	2.86	99	1.0	-	3.19	-0.05	99	382	80	74
119	19.516	0.170	0.061	2.86	99	1.0	-	3.16	-0.03	99	381	80	73
120	19.689	0.173	0.061	2.87	99	1.0	101	3.14	-0.02	100	379	80	73
121	19.856	0.167	0.061	2.86	99	1.0	-	3.07	-0.07	99	378	80	74
122	20.025	0.169	0.060	2.87	99	1.0	-	3.02	-0.05	99	376	80	73
123	20.198	0.173	0.061	2.87	99	1.0	-	2.98	-0.04	99	375	80	73
124	20.370	0.172	0.062	2.86	99	1.0	-	2.91	-0.07	100	375	80	74
125	20.537	0.167	0.060	2.87	99	1.0	-	2.88	-0.03	99	374	80	74
126	20.708	0.171	0.061	2.87	100	1.0	-	2.84	-0.04	99	373	80	74
127	20.880	0.172	0.060	2.87	100	1.0	-	2.80	-0.04	99	371	80	74

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
128	21.047	0.167	0.061	2.87	100	1.0	-	2.75	-0.05	99	371	80	73
129	21.219	0.172	0.062	2.86	100	1.0	-	2.70	-0.05	99	371	80	73
130	21.391	0.172	0.062	2.87	100	1.0	100	2.66	-0.04	99	370	80	73
131	21.561	0.170	0.060	2.86	100	1.0	-	2.63	-0.03	98	368	80	73
132	21.728	0.167	0.062	2.87	100	1.1	-	2.58	-0.05	98	367	80	73
133	21.901	0.173	0.061	2.88	100	1.0	-	2.54	-0.04	98	366	80	73
134	22.072	0.171	0.061	2.87	100	1.0	-	2.51	-0.03	97	365	80	73
135	22.241	0.169	0.060	2.87	100	1.1	-	2.48	-0.03	98	364	80	73
136	22.412	0.171	0.060	2.87	100	1.0	-	2.45	-0.03	98	362	80	73
137	22.585	0.173	0.061	2.88	100	1.0	-	2.42	-0.03	98	362	80	73
138	22.752	0.167	0.062	2.87	100	1.0	-	2.36	-0.06	98	361	80	73
139	22.922	0.170	0.060	2.87	100	1.0	-	2.34	-0.02	98	361	80	73
140	23.095	0.173	0.061	2.87	100	1.0	100	2.30	-0.04	97	361	80	73
141	23.267	0.172	0.061	2.87	100	1.0	-	2.26	-0.04	97	359	80	73
142	23.435	0.168	0.062	2.87	101	1.0	-	2.24	-0.02	97	358	80	73
143	23.606	0.171	0.061	2.87	101	1.0	-	2.21	-0.03	98	357	80	73
144	23.778	0.172	0.062	2.88	101	1.0	-	2.17	-0.04	97	356	80	74
145	23.946	0.168	0.061	2.88	101	1.0	-	2.15	-0.02	97	356	80	74
146	24.117	0.171	0.061	2.87	101	1.1	-	2.12	-0.03	97	355	80	73
147	24.291	0.174	0.062	2.87	101	1.0	-	2.10	-0.02	97	352	80	73
148	24.461	0.170	0.063	2.87	101	1.0	-	2.10	0.00	97	350	80	73
149	24.628	0.167	0.060	2.87	101	1.0	-	2.06	-0.04	97	349	80	73
150	24.801	0.173	0.061	2.88	101	1.0	101	2.03	-0.03	97	348	80	73
151	24.972	0.171	0.061	2.88	101	1.1	-	2.00	-0.03	97	347	80	73
152	25.142	0.170	0.062	2.88	101	1.0	-	1.99	-0.01	97	346	80	73
153	25.313	0.171	0.062	2.87	101	1.0	-	1.97	-0.02	96	345	80	73
154	25.486	0.173	0.060	2.87	101	1.0	-	1.94	-0.03	96	342	80	73
155	25.655	0.169	0.061	2.87	101	1.0	-	1.92	-0.02	96	340	80	73
156	25.824	0.169	0.061	2.88	101	1.0	-	1.90	-0.02	96	340	80	73
157	25.997	0.173	0.060	2.88	101	1.0	-	1.87	-0.03	96	339	80	73
158	26.169	0.172	0.060	2.87	101	1.0	-	1.85	-0.02	96	337	80	73
159	26.338	0.169	0.061	2.88	101	1.0	-	1.82	-0.03	96	337	80	73

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
160	26.510	0.172	0.061	2.87	101	1.0	101	1.81	-0.01	96	335	80	73
161	26.683	0.173	0.061	2.87	101	1.0	-	1.77	-0.04	96	334	80	73
162	26.851	0.168	0.061	2.87	101	1.0	-	1.75	-0.02	96	333	80	73
163	27.021	0.170	0.061	2.88	101	1.0	-	1.75	0.00	96	333	80	73
164	27.194	0.173	0.061	2.87	101	1.0	-	1.71	-0.04	96	331	80	73
165	27.367	0.173	0.061	2.87	101	1.0	-	1.68	-0.03	96	330	80	73
166	27.535	0.168	0.060	2.88	101	1.0	-	1.67	-0.01	96	329	80	73
167	27.707	0.172	0.060	2.88	101	1.0	-	1.65	-0.02	95	329	80	73
168	27.880	0.173	0.061	2.88	101	1.0	-	1.65	0.00	96	327	80	73
169	28.048	0.168	0.060	2.89	102	1.1	-	1.60	-0.05	96	327	80	73
170	28.219	0.171	0.059	2.90	101	1.1	101	1.58	-0.02	96	327	80	73
171	28.393	0.174	0.061	2.88	102	1.0	-	1.54	-0.04	96	327	80	73
172	28.566	0.173	0.060	2.89	102	1.0	-	1.51	-0.03	96	325	80	73
173	28.734	0.168	0.060	2.88	102	1.0	-	1.49	-0.02	96	324	80	73
174	28.906	0.172	0.061	2.89	102	1.0	-	1.47	-0.02	96	322	80	73
175	29.078	0.172	0.061	2.87	102	1.0	-	1.45	-0.02	96	322	80	73
176	29.247	0.169	0.061	2.88	102	1.0	-	1.43	-0.02	96	322	80	73
177	29.418	0.171	0.060	2.89	102	1.0	-	1.42	-0.01	96	322	80	72
178	29.591	0.173	0.061	2.88	102	1.0	-	1.40	-0.02	96	321	80	72
179	29.764	0.173	0.060	2.88	102	1.1	-	1.40	0.00	95	321	80	72
180	29.933	0.169	0.060	2.88	102	1.0	102	1.39	-0.01	94	321	80	73
181	30.105	0.172	0.060	2.88	102	1.0	-	1.39	0.00	94	320	80	73
182	30.277	0.172	0.060	2.88	102	1.0	-	1.36	-0.03	94	320	80	73
183	30.446	0.169	0.060	2.88	102	1.0	-	1.32	-0.04	94	319	80	73
184	30.617	0.171	0.060	2.89	102	1.0	-	1.31	-0.01	94	318	80	73
185	30.791	0.174	0.060	2.88	102	1.0	-	1.28	-0.03	94	317	80	73
186	30.964	0.173	0.060	2.89	102	1.0	-	1.28	0.00	94	316	80	73
187	31.132	0.168	0.061	2.88	102	1.1	-	1.26	-0.02	94	316	80	72
188	31.304	0.172	0.060	2.88	102	1.0	-	1.22	-0.04	94	315	80	72
189	31.477	0.173	0.060	2.87	102	1.1	-	1.22	0.00	94	314	80	73
190	31.646	0.169	0.061	2.88	102	1.0	101	1.19	-0.03	94	313	80	73
191	31.817	0.171	0.060	2.90	102	1.1	-	1.18	-0.01	94	313	80	73

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
192	31.990	0.173	0.059	2.89	102	1.0	-	1.17	-0.01	94	313	80	73
193	32.163	0.173	0.061	2.88	102	1.0	-	1.17	0.00	94	312	80	73
194	32.332	0.169	0.060	2.86	102	1.0	-	1.13	-0.04	94	310	80	73
195	32.504	0.172	0.060	2.89	102	1.0	-	1.13	0.00	94	311	80	73
196	32.678	0.174	0.060	2.88	102	1.0	-	1.12	-0.01	94	309	80	73
197	32.846	0.168	0.061	2.87	102	1.1	-	1.10	-0.02	94	308	80	73
198	33.017	0.171	0.060	2.88	102	1.0	-	1.09	-0.01	94	308	80	73
199	33.190	0.173	0.061	2.88	102	1.0	-	1.07	-0.02	94	308	80	72
200	33.363	0.173	0.060	2.88	102	1.0	101	1.05	-0.02	94	307	80	73
201	33.532	0.169	0.059	2.87	102	1.0	-	1.03	-0.02	94	306	80	72
202	33.704	0.172	0.059	2.87	102	1.0	-	1.04	0.01	93	307	80	72
203	33.877	0.173	0.060	2.88	102	1.0	-	1.02	-0.02	93	306	80	72
204	34.046	0.169	0.060	2.87	102	1.0	-	1.00	-0.02	93	305	80	73
205	34.216	0.170	0.059	2.88	102	1.0	-	0.99	-0.01	93	305	80	72
206	34.390	0.174	0.060	2.88	102	1.0	-	0.96	-0.03	93	306	80	72
207	34.563	0.173	0.060	2.88	102	1.0	-	0.95	-0.01	93	304	80	73
208	34.732	0.169	0.060	2.89	102	1.0	-	0.94	-0.01	92	304	79	73
209	34.904	0.172	0.059	2.88	102	1.0	-	0.93	-0.01	93	304	79	73
210	35.077	0.173	0.060	2.88	102	1.0	101	0.92	-0.01	92	304	79	73
211	35.246	0.169	0.060	2.89	102	1.0	-	0.91	-0.01	92	302	79	73
212	35.416	0.170	0.059	2.88	102	1.0	-	0.90	-0.01	92	302	79	72
213	35.590	0.174	0.060	2.88	102	1.0	-	0.86	-0.04	92	301	79	72
214	35.763	0.173	0.058	2.88	102	1.0	-	0.84	-0.02	93	300	79	72
215	35.933	0.170	0.059	2.88	102	1.0	-	0.84	0.00	92	300	79	72
216	36.104	0.171	0.060	2.88	102	1.0	-	0.81	-0.03	92	299	79	72
217	36.278	0.174	0.060	2.88	102	1.0	-	0.78	-0.03	92	298	79	72
218	36.447	0.169	0.061	2.88	102	1.0	-	0.78	0.00	93	299	79	73
219	36.616	0.169	0.060	2.87	102	1.0	-	0.76	-0.02	93	299	79	72
220	36.791	0.175	0.060	2.89	102	1.0	101	0.75	-0.01	93	298	79	72
221	36.963	0.172	0.060	2.88	102	1.0	-	0.73	-0.02	93	297	79	72
222	37.133	0.170	0.059	2.89	102	1.0	-	0.70	-0.03	93	297	79	72
223	37.305	0.172	0.059	2.88	102	1.0	-	0.70	0.00	93	296	79	73

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
224	37.478	0.173	0.059	2.89	102	1.0	-	0.67	-0.03	93	296	79	72
225	37.648	0.170	0.059	2.88	102	1.0	-	0.65	-0.02	92	295	79	72
226	37.817	0.169	0.059	2.87	102	1.0	-	0.64	-0.01	92	296	79	72
227	37.991	0.174	0.060	2.88	102	1.0	-	0.62	-0.02	92	296	79	72
228	38.163	0.172	0.059	2.89	102	1.0	-	0.60	-0.02	92	295	79	72
229	38.333	0.170	0.060	2.89	102	1.0	-	0.59	-0.01	92	296	79	73
230	38.506	0.173	0.060	2.89	102	1.0	101	0.55	-0.04	92	296	79	73
231	38.679	0.173	0.060	2.88	102	1.1	-	0.54	-0.01	92	294	79	73
232	38.850	0.171	0.059	2.88	102	1.0	-	0.53	-0.01	92	295	79	72
233	39.019	0.169	0.060	2.88	102	1.0	-	0.51	-0.02	92	294	79	73
234	39.192	0.173	0.061	2.88	102	1.0	-	0.51	0.00	91	295	79	72
235	39.365	0.173	0.059	2.89	102	1.1	-	0.48	-0.03	92	294	79	72
236	39.537	0.172	0.061	2.89	102	1.0	-	0.44	-0.04	92	294	79	73
237	39.706	0.169	0.060	2.89	102	1.0	-	0.43	-0.01	92	294	79	72
238	39.880	0.174	0.060	2.88	102	1.0	-	0.41	-0.02	91	294	79	72
239	40.051	0.171	0.059	2.88	102	1.0	-	0.39	-0.02	92	294	79	72
240	40.220	0.169	0.060	2.86	102	1.0	101	0.36	-0.03	92	295	79	72
241	40.393	0.173	0.060	2.88	102	1.0	-	0.35	-0.01	92	294	79	72
242	40.566	0.173	0.060	2.89	102	1.0	-	0.33	-0.02	91	295	79	72
243	40.735	0.169	0.060	2.89	102	1.1	-	0.30	-0.03	91	295	79	72
244	40.906	0.171	0.060	2.88	102	1.0	-	0.29	-0.01	92	294	79	72
245	41.081	0.175	0.059	2.89	102	1.0	-	0.25	-0.04	92	294	79	72
246	41.253	0.172	0.060	2.88	102	1.0	-	0.24	-0.01	92	295	79	72
247	41.422	0.169	0.060	2.89	102	1.0	-	0.23	-0.01	92	294	79	73
248	41.595	0.173	0.059	2.87	102	1.0	-	0.21	-0.02	92	294	79	73
249	41.767	0.172	0.060	2.88	102	1.0	-	0.19	-0.02	92	293	79	73
250	41.937	0.170	0.060	2.88	102	1.0	101	0.15	-0.04	92	294	79	73
251	42.107	0.170	0.059	2.88	102	1.0	-	0.12	-0.03	92	293	79	72
252	42.282	0.175	0.060	2.88	102	1.0	-	0.11	-0.01	92	293	79	73
253	42.455	0.173	0.060	2.88	102	1.0	-	0.10	-0.01	92	293	79	73
254	42.623	0.168	0.060	2.88	102	1.0	-	0.08	-0.02	92	294	79	72
255	42.796	0.173	0.060	2.89	102	1.0	-	0.06	-0.02	92	293	79	73

BOX A TEST DATA - ASTM E2780 / ASTM E2515

Client: <u>HHT</u>	Job #: <u>24-291</u>
Model: <u>Dauntless-C</u>	Tracking #: <u>220</u>
Run #: <u>5</u>	Technician: <u>AK</u>
	Date: <u>4/14/2025</u>

Elapsed Time (min)	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
	Gas Meter (ft ³)	Sample Rate (cfm)	Dilution Tunnel dP (in H ₂ O)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
256	42.969	0.173	0.060	2.88	102	1.0	-	0.04	-0.02	92	293	79	73
257	43.138	0.169	0.061	2.88	102	1.0	-	0.02	-0.02	92	293	79	73
258	43.309	0.171	0.059	2.89	102	1.0	102	0.00	-0.02	92	293	79	72
Avg/Tot	43.309	0.168	0.061	2.80	95.5	1.0	100			96.7	360.4	79.3	72.5

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
0	0.000		0.01	74	0.7		77	-0.055	5.63	0.378
1	0.106	0.106	2.58	74	1.7	-	77	-0.059	6.88	0.100
2	0.264	0.158	2.57	74	1.9	-	78	-0.061	7.51	0.086
3	0.422	0.158	2.58	74	2.1	-	78	-0.062	8.93	0.129
4	0.578	0.156	2.58	74	1.9	-	78	-0.064	8.86	0.221
5	0.736	0.158	2.58	74	2.1	-	79	-0.065	8.66	0.323
6	0.891	0.155	2.59	74	1.5	-	79	-0.063	8.61	0.360
7	1.051	0.160	2.59	74	2.1	-	79	-0.062	8.10	0.268
8	1.206	0.155	2.58	75	2.1	-	79	-0.062	6.53	0.146
9	1.365	0.159	2.59	75	2.1	-	79	-0.063	6.80	0.185
10	1.523	0.158	2.58	75	2.1	97	79	-0.064	7.39	0.234
11	1.678	0.155	2.58	75	1.5	-	79	-0.064	8.56	0.378
12	1.839	0.161	2.58	75	1.8	-	79	-0.064	8.06	0.453
13	1.993	0.154	2.58	76	1.6	-	79	-0.065	7.38	0.371
14	2.153	0.160	2.58	76	2.0	-	80	-0.063	7.26	0.308
15	2.312	0.159	2.60	76	1.6	-	80	-0.064	7.09	0.388
16	2.467	0.155	2.59	76	1.6	-	80	-0.065	7.21	0.427
17	2.628	0.161	2.59	77	2.1	-	80	-0.066	8.04	0.607
18	2.783	0.155	2.60	77	2.1	-	80	-0.069	8.90	0.742
19	2.942	0.159	2.59	77	1.5	-	80	-0.066	9.17	0.797
20	3.101	0.159	2.59	78	2.1	100	80	-0.067	8.82	0.740
21	3.258	0.157	2.59	78	1.5	-	80	-0.066	8.11	0.588
22	3.419	0.161	2.60	78	2.1	-	80	-0.066	7.58	0.514
23	3.575	0.156	2.60	79	2.1	-	80	-0.066	7.59	0.498
24	3.734	0.159	2.59	79	1.6	-	80	-0.064	7.87	0.609
25	3.894	0.160	2.60	79	1.6	-	80	-0.065	7.99	0.636
26	4.051	0.157	2.60	80	1.9	-	80	-0.067	8.10	0.632
27	4.213	0.162	2.61	80	1.6	-	80	-0.065	8.28	0.652
28	4.369	0.156	2.61	80	1.8	-	80	-0.067	8.37	0.659
29	4.529	0.160	2.61	81	1.8	-	80	-0.065	8.49	0.683
30	4.690	0.161	2.61	81	2.1	100	80	-0.066	8.63	0.702
31	4.847	0.157	2.60	81	1.7	-	80	-0.065	8.73	0.710

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
32	5.009	0.162	2.61	82	1.7	-	80	-0.066	8.60	0.676
33	5.166	0.157	2.61	82	2.1	-	80	-0.068	8.73	0.672
34	5.327	0.161	2.61	82	1.6	-	80	-0.068	9.10	0.746
35	5.487	0.160	2.61	83	2.0	-	81	-0.069	10.26	1.074
36	5.645	0.158	2.62	83	1.9	-	80	-0.069	11.18	1.896
37	5.808	0.163	2.62	83	2.0	-	80	-0.070	11.36	1.567
38	5.964	0.156	2.60	84	1.6	-	81	-0.069	11.39	1.309
39	6.126	0.162	2.62	84	2.1	-	81	-0.070	11.41	1.067
40	6.287	0.161	2.61	84	1.6	100	81	-0.069	11.39	0.921
41	6.445	0.158	2.61	85	1.6	-	81	-0.070	11.40	0.812
42	6.607	0.162	2.62	85	1.6	-	81	-0.070	11.43	0.782
43	6.768	0.161	2.63	85	1.7	-	80	-0.072	11.48	0.924
44	6.927	0.159	2.62	86	1.6	-	81	-0.072	11.45	1.014
45	7.090	0.163	2.63	86	1.8	-	81	-0.072	11.40	1.168
46	7.248	0.158	2.63	86	2.1	-	81	-0.073	11.48	1.351
47	7.411	0.163	2.63	87	1.9	-	81	-0.070	11.57	1.247
48	7.572	0.161	2.63	87	1.8	-	81	-0.072	11.54	1.194
49	7.731	0.159	2.62	87	1.6	-	81	-0.073	11.55	1.041
50	7.894	0.163	2.63	87	1.6	99	81	-0.073	11.53	0.853
51	8.055	0.161	2.63	88	2.0	-	81	-0.074	11.51	0.686
52	8.215	0.160	2.63	88	1.6	-	81	-0.074	11.61	0.625
53	8.379	0.164	2.63	88	2.1	-	81	-0.073	11.51	0.595
54	8.538	0.159	2.63	88	1.8	-	81	-0.073	11.31	0.410
55	8.700	0.162	2.64	89	2.1	-	81	-0.073	11.27	0.300
56	8.863	0.163	2.64	89	1.7	-	81	-0.073	11.49	0.321
57	9.022	0.159	2.63	89	2.1	-	81	-0.074	11.54	0.306
58	9.185	0.163	2.63	89	1.8	-	81	-0.074	11.54	0.289
59	9.348	0.163	2.63	90	2.1	-	82	-0.073	11.61	0.275
60	9.507	0.159	2.63	90	1.7	100	82	-0.074	11.59	0.245
61	9.673	0.166	2.64	90	1.8	-	82	-0.073	11.55	0.228
62	9.832	0.159	2.64	91	1.8	-	82	-0.073	11.47	0.221
63	9.995	0.163	2.64	91	1.8	-	82	-0.074	11.42	0.210

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
64	10.158	0.163	2.64	91	1.7	-	82	-0.074	11.40	0.214
65	10.318	0.160	2.64	91	1.7	-	82	-0.074	11.30	0.190
66	10.482	0.164	2.64	91	1.6	-	82	-0.074	11.19	0.174
67	10.644	0.162	2.64	92	1.6	-	82	-0.072	11.06	0.158
68	10.805	0.161	2.65	92	2.0	-	82	-0.073	11.03	0.144
69	10.969	0.164	2.64	92	2.1	-	82	-0.072	10.95	0.141
70	11.132	0.163	2.64	92	1.7	100	82	-0.073	10.69	0.120
71	11.292	0.160	2.64	93	1.6	-	82	-0.073	10.53	0.119
72	11.458	0.166	2.65	93	1.6	-	82	-0.074	10.34	0.147
73	11.618	0.160	2.64	93	1.9	-	82	-0.072	10.25	0.121
74	11.781	0.163	2.65	93	1.8	-	82		10.21	0.099
75	11.946	0.165	2.65	93	1.6	-	82	-0.074	10.22	0.097
76	12.106	0.160	2.65	94	2.0	-	82	-0.073	10.15	0.095
77	12.270	0.164	2.65	94	1.7	-	82	-0.074	10.06	0.109
78	12.434	0.164	2.64	94	1.6	-	82	-0.073	9.93	0.111
79	12.596	0.162	2.65	94	1.6	-	82	-0.072	9.80	0.107
80	12.759	0.163	2.65	94	1.6	100	82	-0.072	9.69	0.106
81	12.923	0.164	2.65	94	2.1	-	82	-0.071	9.55	0.106
82	13.085	0.162	2.65	95	1.8	-	82	-0.071	9.41	0.095
83	13.249	0.164	2.66	95	1.9	-	82	-0.071	9.32	0.087
84	13.413	0.164	2.65	95	1.8	-	82	-0.071	9.21	0.086
85	13.573	0.160	2.65	95	1.6	-	82	-0.069	9.14	0.093
86	13.740	0.167	2.65	95	2.0	-	82	-0.071	9.07	0.099
87	13.902	0.162	2.65	95	1.7	-	82	-0.070	9.02	0.103
88	14.064	0.162	2.66	95	1.6	-	82	-0.070	8.94	0.111
89	14.230	0.166	2.66	96	1.6	-	82	-0.070	8.83	0.117
90	14.391	0.161	2.65	96	1.9	100	82	-0.071	8.77	0.131
91	14.556	0.165	2.67	96	2.0	-	82	-0.070	8.68	0.134
92	14.721	0.165	2.66	96	2.1	-	82	-0.069	8.65	0.145
93	14.882	0.161	2.66	96	2.0	-	82	-0.069	8.61	0.153
94	15.047	0.165	2.65	96	1.6	-	82	-0.070	8.53	0.162
95	15.211	0.164	2.65	96	1.9	-	82	-0.069	8.49	0.184

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
96	15.373	0.162	2.66	96	1.7	-	82	-0.068	8.40	0.197
97	15.538	0.165	2.65	97	1.9	-	82	-0.069	8.27	0.203
98	15.703	0.165	2.66	97	1.6	-	82	-0.069	8.23	0.217
99	15.865	0.162	2.65	97	1.8	-	82	-0.071	8.15	0.221
100	16.029	0.164	2.65	97	2.1	99	82	-0.068	8.09	0.227
101	16.194	0.165	2.66	97	2.0	-	82	-0.067	8.02	0.233
102	16.357	0.163	2.65	97	1.6	-	82	-0.068	7.98	0.244
103	16.522	0.165	2.66	97	2.0	-	82	-0.067	7.91	0.263
104	16.687	0.165	2.67	97	1.6	-	82	-0.067	7.91	0.265
105	16.848	0.161	2.66	97	1.6	-	82	-0.069	7.89	0.269
106	17.014	0.166	2.66	98	2.0	-	82	-0.068	7.90	0.267
107	17.178	0.164	2.66	98	1.5	-	82	-0.066	7.90	0.267
108	17.340	0.162	2.65	98	1.6	-	82	-0.066	7.92	0.270
109	17.507	0.167	2.66	98	1.6	-	82	-0.066	7.86	0.281
110	17.670	0.163	2.67	98	2.1	100	82	-0.068	7.82	0.282
111	17.833	0.163	2.67	98	1.6	-	82	-0.064	7.75	0.283
112	18.000	0.167	2.66	98	2.0	-	82	-0.066	7.70	0.279
113	18.162	0.162	2.67	98	2.1	-	82	-0.064	7.57	0.273
114	18.326	0.164	2.66	98	1.6	-	82	-0.066	7.50	0.264
115	18.493	0.167	2.66	98	2.0	-	82	-0.064	7.44	0.263
116	18.654	0.161	2.66	98	2.0	-	82	-0.066	7.41	0.270
117	18.820	0.166	2.67	98	2.1	-	82	-0.065	7.35	0.258
118	18.986	0.166	2.67	99	2.0	-	82	-0.065	7.39	0.269
119	19.148	0.162	2.66	99	2.0	-	82	-0.065	7.37	0.259
120	19.314	0.166	2.66	99	1.6	100	82	-0.064	7.36	0.261
121	19.479	0.165	2.67	99	1.6	-	82	-0.065	7.37	0.258
122	19.641	0.162	2.67	99	1.6	-	82	-0.063	7.40	0.258
123	19.807	0.166	2.67	99	2.1	-	82	-0.064	7.39	0.256
124	19.972	0.165	2.67	99	1.5	-	82	-0.067	7.31	0.256
125	20.134	0.162	2.66	99	1.6	-	82	-0.062	7.29	0.261
126	20.300	0.166	2.66	99	2.0	-	82	-0.062	7.19	0.257
127	20.465	0.165	2.66	99	1.6	-	82	-0.065	7.18	0.262

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
128	20.628	0.163	2.67	99	2.0	-	82	-0.062	7.21	0.265
129	20.794	0.166	2.66	99	1.6	-	82	-0.064	7.14	0.263
130	20.959	0.165	2.66	99	1.6	100	82	-0.061	7.07	0.262
131	21.122	0.163	2.67	99	1.7	-	82	-0.064	7.00	0.270
132	21.287	0.165	2.66	99	1.6	-	82	-0.061	6.97	0.261
133	21.452	0.165	2.67	100	2.1	-	82	-0.064	6.86	0.261
134	21.615	0.163	2.66	100	1.8	-	82	-0.063	6.71	0.265
135	21.781	0.166	2.66	100	2.0	-	82	-0.064	6.70	0.262
136	21.946	0.165	2.66	100	2.0	-	82	-0.062	6.68	0.262
137	22.109	0.163	2.66	100	1.6	-	82	-0.061	6.68	0.257
138	22.274	0.165	2.66	100	2.0	-	82	-0.062	6.70	0.258
139	22.440	0.166	2.66	100	1.7	-	82	-0.062	6.71	0.261
140	22.603	0.163	2.66	100	1.6	100	82	-0.061	6.65	0.262
141	22.768	0.165	2.66	100	1.9	-	82	-0.063	6.62	0.264
142	22.934	0.166	2.66	100	1.6	-	82	-0.062	6.54	0.269
143	23.097	0.163	2.66	100	1.6	-	82	-0.064	6.51	0.264
144	23.263	0.166	2.66	100	1.8	-	82	-0.063	6.44	0.263
145	23.429	0.166	2.66	100	2.0	-	82	-0.061	6.23	0.254
146	23.591	0.162	2.66	100	1.8	-	82	-0.061	6.10	0.248
147	23.757	0.166	2.67	100	1.7	-	82	-0.061	6.03	0.247
148	23.922	0.165	2.67	100	2.1	-	82	-0.059	5.94	0.245
149	24.085	0.163	2.66	100	2.1	-	82	-0.060	5.84	0.240
150	24.251	0.166	2.66	100	2.0	100	82	-0.060	5.73	0.239
151	24.416	0.165	2.65	100	1.6	-	82	-0.060	5.61	0.240
152	24.579	0.163	2.66	100	1.8	-	82	-0.060	5.55	0.238
153	24.746	0.167	2.67	101	2.1	-	82	-0.058	5.49	0.234
154	24.910	0.164	2.66	101	1.6	-	82	-0.059	5.47	0.232
155	25.073	0.163	2.66	101	2.1	-	82	-0.058	5.45	0.233
156	25.241	0.168	2.66	101	1.6	-	82	-0.058	5.39	0.231
157	25.405	0.164	2.66	101	1.8	-	82	-0.058	5.41	0.225
158	25.568	0.163	2.66	101	1.6	-	82	-0.060	5.41	0.226
159	25.736	0.168	2.66	101	1.6	-	82	-0.061	5.42	0.221

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
160	25.899	0.163	2.66	101	2.1	100	82	-0.059	5.42	0.222
161	26.063	0.164	2.66	101	1.6	-	82	-0.057	5.50	0.225
162	26.230	0.167	2.67	101	1.9	-	82	-0.058	5.51	0.230
163	26.393	0.163	2.66	101	2.0	-	82	-0.057	5.57	0.225
164	26.557	0.164	2.67	101	1.9	-	82	-0.055	5.59	0.224
165	26.725	0.168	2.67	101	1.7	-	81	-0.057	5.58	0.220
166	26.888	0.163	2.67	101	2.1	-	81	-0.059	5.55	0.225
167	27.052	0.164	2.67	101	1.7	-	81	-0.057	5.51	0.223
168	27.220	0.168	2.67	101	1.8	-	81	-0.056	5.52	0.233
169	27.383	0.163	2.67	101	2.0	-	81	-0.060	5.54	0.230
170	27.548	0.165	2.67	101	1.8	101	81	-0.058	5.50	0.231
171	27.715	0.167	2.67	101	1.9	-	81	-0.058	5.52	0.234
172	27.878	0.163	2.67	101	1.6	-	81	-0.058	5.84	0.247
173	28.043	0.165	2.67	101	1.9	-	82	-0.056	6.03	0.213
174	28.210	0.167	2.66	101	1.7	-	82	-0.059	5.59	0.217
175	28.373	0.163	2.67	101	2.0	-	82	-0.056	5.34	0.241
176	28.537	0.164	2.67	101	2.1	-	82	-0.057	5.32	0.241
177	28.705	0.168	2.66	101	2.1	-	82	-0.057	5.27	0.244
178	28.867	0.162	2.67	101	1.7	-	82	-0.056	5.22	0.255
179	29.032	0.165	2.67	101	1.9	-	81	-0.056	5.15	0.263
180	29.200	0.168	2.66	101	1.6	101	81	-0.055	5.16	0.260
181	29.362	0.162	2.66	101	1.9	-	81	-0.055	5.10	0.261
182	29.528	0.166	2.66	101	1.6	-	81	-0.057	5.03	0.266
183	29.695	0.167	2.67	101	1.6	-	81	-0.057	5.01	0.274
184	29.857	0.162	2.67	101	2.0	-	81	-0.056	5.01	0.277
185	30.023	0.166	2.66	101	1.6	-	81	-0.055	5.01	0.276
186	30.190	0.167	2.66	101	1.7	-	81	-0.055	5.03	0.279
187	30.353	0.163	2.66	101	2.1	-	81	-0.057	5.06	0.284
188	30.518	0.165	2.67	101	1.7	-	81	-0.055	5.05	0.285
189	30.686	0.168	2.67	102	2.1	-	81	-0.054	5.04	0.286
190	30.848	0.162	2.67	102	1.6	100	81	-0.055	4.99	0.283
191	31.014	0.166	2.67	102	1.6	-	81	-0.055	5.00	0.291

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
192	31.181	0.167	2.67	102	1.9	-	81	-0.056	4.94	0.287
193	31.343	0.162	2.67	102	1.7	-	81	-0.055	4.95	0.289
194	31.510	0.167	2.67	102	1.8	-	81	-0.055	4.91	0.293
195	31.677	0.167	2.66	102	1.8	-	81	-0.055	4.89	0.292
196	31.839	0.162	2.66	102	2.0	-	81	-0.055	4.87	0.293
197	32.005	0.166	2.67	102	1.8	-	81	-0.053	4.92	0.293
198	32.172	0.167	2.67	102	2.1	-	81	-0.053	4.93	0.293
199	32.334	0.162	2.66	102	1.6	-	81	-0.054	4.94	0.297
200	32.500	0.166	2.67	102	2.1	100	81	-0.055	4.95	0.293
201	32.667	0.167	2.66	102	1.6	-	81	-0.055	4.93	0.296
202	32.829	0.162	2.67	102	1.8	-	81	-0.053	4.92	0.303
203	32.996	0.167	2.67	102	2.0	-	81	-0.055	4.88	0.306
204	33.163	0.167	2.66	102	1.7	-	81	-0.054	4.82	0.312
205	33.325	0.162	2.67	102	1.7	-	81	-0.053	4.78	0.313
206	33.491	0.166	2.67	102	1.6	-	81	-0.054	4.76	0.321
207	33.658	0.167	2.67	102	2.1	-	81	-0.054	4.69	0.328
208	33.820	0.162	2.67	102	1.9	-	81	-0.053	4.62	0.333
209	33.987	0.167	2.67	102	1.7	-	81	-0.056	4.56	0.332
210	34.153	0.166	2.66	102	1.6	101	80	-0.053	4.53	0.332
211	34.316	0.163	2.67	102	1.7	-	80	-0.053	4.49	0.332
212	34.482	0.166	2.66	102	2.1	-	80	-0.053	4.47	0.324
213	34.649	0.167	2.66	102	1.8	-	80	-0.054	4.44	0.332
214	34.811	0.162	2.67	102	2.0	-	80	-0.054	4.42	0.336
215	34.978	0.167	2.67	102	1.6	-	80	-0.052	5.21	0.334
216	35.144	0.166	2.67	102	1.8	-	80	-0.053	5.65	0.300
217	35.307	0.163	2.67	102	1.7	-	80	-0.053	5.71	0.304
218	35.473	0.166	2.67	102	2.0	-	80	-0.052	5.71	0.302
219	35.639	0.166	2.67	102	2.0	-	80	-0.052	5.69	0.297
220	35.802	0.163	2.67	102	2.1	100	80	-0.052	5.65	0.290
221	35.969	0.167	2.67	102	2.0	-	80	-0.053	5.65	0.277
222	36.135	0.166	2.66	102	1.9	-	80	-0.053	5.64	0.276
223	36.298	0.163	2.67	102	2.0	-	80	-0.054	5.60	0.284

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
224	36.464	0.166	2.67	102	1.7	-	80	-0.051	5.57	0.284
225	36.630	0.166	2.66	102	1.7	-	80	-0.053	5.54	0.285
226	36.793	0.163	2.67	102	1.7	-	80	-0.052	5.51	0.294
227	36.960	0.167	2.67	102	1.8	-	80	-0.052	5.51	0.292
228	37.126	0.166	2.67	102	1.9	-	80	-0.052	5.48	0.316
229	37.289	0.163	2.67	102	1.5	-	80	-0.052	5.47	0.299
230	37.456	0.167	2.67	102	1.6	101	80	-0.051	5.46	0.305
231	37.622	0.166	2.67	102	1.6	-	80	-0.052	5.45	0.310
232	37.785	0.163	2.67	102	1.6	-	80	-0.052	5.42	0.312
233	37.952	0.167	2.67	102	2.1	-	80	-0.050	5.39	0.313
234	38.118	0.166	2.67	102	1.9	-	80	-0.053	5.72	0.318
235	38.280	0.162	2.67	102	2.1	-	80	-0.052	5.87	0.300
236	38.449	0.169	2.67	102	2.1	-	80	-0.052	5.75	0.301
237	38.613	0.164	2.66	102	1.6	-	80	-0.051	5.67	0.299
238	38.776	0.163	2.67	102	2.1	-	80	-0.052	5.72	0.307
239	38.943	0.167	2.67	102	2.1	-	80	-0.052	5.84	0.298
240	39.109	0.166	2.67	102	1.8	100	80	-0.052	5.85	0.293
241	39.272	0.163	2.67	102	1.9	-	80	-0.052	5.84	0.306
242	39.438	0.166	2.67	102	2.1	-	80	-0.052	5.85	0.305
243	39.604	0.166	2.67	102	1.8	-	80	-0.051	5.83	0.299
244	39.767	0.163	2.67	102	2.0	-	80	-0.052	5.83	0.295
245	39.934	0.167	2.67	102	1.9	-	80	-0.051	5.80	0.303
246	40.100	0.166	2.67	102	1.6	-	80	-0.051	5.80	0.303
247	40.263	0.163	2.67	102	1.8	-	80	-0.050	6.09	0.297
248	40.430	0.167	2.67	102	1.8	-	80	-0.052	6.08	0.276
249	40.596	0.166	2.66	102	2.1	-	80	-0.054	5.96	0.274
250	40.758	0.162	2.67	102	1.8	100	80	-0.052	5.92	0.272
251	40.925	0.167	2.67	102	1.7	-	80	-0.053	5.91	0.276
252	41.091	0.166	2.67	102	2.1	-	80	-0.050	5.87	0.275
253	41.254	0.163	2.67	102	1.6	-	80	-0.052	5.83	0.271
254	41.420	0.166	2.67	102	1.6	-	80	-0.052	5.82	0.270
255	41.587	0.167	2.67	102	1.6	-	80	-0.053	5.80	0.270

BOX B TEST DATA - ASTM E2780 / ASTM E2515

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data							Flue Gas Data		
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H ₂ O)	CO ₂ (%)	CO (%)
256	41.749	0.162	2.67	102	1.7	-	80	-0.052	5.79	0.278
257	41.916	0.167	2.67	102	2.0	-	80	-0.051	5.81	0.282
258	42.082	0.166	2.67	102	1.6	101	80	-0.050	5.79	0.283
Avg/Tot	42.082	0.163	2.64	95.0	1.8	100	81.0	-0.062	7.35	0.339

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 5

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
0	-0.001		-0.04	76	0.1		75
1	0.114	0.115	0.88	76	1.6	-	75
2	0.252	0.138	0.87	76	1.4	-	75
3	0.391	0.139	0.88	76	1.6	-	75
4	0.531	0.140	0.88	76	1.5	-	75
5	0.669	0.138	0.88	76	1.4	-	75
6	0.811	0.142	0.90	76	1.5	-	75
7	0.951	0.140	0.89	76	1.6	-	75
8	1.091	0.140	0.89	76	1.6	-	76
9	1.233	0.142	0.91	76	1.5	-	76
10	1.375	0.142	0.91	76	1.5	96	76
11	1.516	0.141	0.90	76	1.5	-	76
12	1.658	0.142	0.91	77	1.5	-	76
13	1.801	0.143	0.92	77	1.5	-	76
14	1.943	0.142	0.91	77	1.5	-	76
15	2.085	0.142	0.91	77	1.6	-	76
16	2.228	0.143	0.92	77	1.6	-	76
17	2.371	0.143	0.92	77	1.6	-	76
18	2.514	0.143	0.91	78	1.6	-	77
19	2.656	0.142	0.91	78	1.7	-	77
20	2.800	0.144	0.92	78	1.6	99	77
21	2.943	0.143	0.92	78	1.6	-	77
22	3.086	0.143	0.91	79	1.6	-	77
23	3.229	0.143	0.91	79	1.6	-	77
24	3.373	0.144	0.92	79	1.6	-	77
25	3.519	0.146	0.93	80	1.5	-	77
26	3.663	0.144	0.93	80	1.5	-	77
27	3.807	0.144	0.91	80	1.7	-	77
28	3.951	0.144	0.90	81	1.6	-	77
29	4.096	0.145	0.91	81	1.7	-	77
30	4.242	0.146	0.92	81	1.5	100	77
31	4.388	0.146	0.92	81	1.5	-	77

BOX C TEST DATA - ASTM E2780 / ASTM E2515

Client: HHT

Model: Dauntless-C

Run #: 5

Job #: 24-291

Tracking #: 220

Technician: AK

Date: 4/14/2025

Elapsed Time (min)	Particulate Sampling Data						
	Gas Meter (ft ³)	Sample Rate (cfm)	Orifice dH (in H ₂ O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)
32	4.533	0.145	0.91	81	1.6	-	77
33	4.679	0.146	0.90	82	1.5	-	77
34	4.825	0.146	0.90	82	1.6	-	77
35	4.971	0.146	0.90	82	1.7	-	77
36	5.117	0.146	0.90	83	1.6	-	77
37	5.263	0.146	0.91	83	1.7	-	77
38	5.410	0.147	0.92	83	1.6	-	77
39	5.557	0.147	0.92	84	1.6	-	77
40	5.704	0.147	0.92	84	1.7	101	77
41	5.851	0.147	0.92	85	1.7	-	77
42	5.998	0.147	0.92	85	1.7	-	77
43	6.146	0.148	0.92	85	1.6	-	77
44	6.293	0.147	0.92	86	1.7	-	77
45	6.440	0.147	0.92	86	1.5	-	77
46	6.588	0.148	0.92	86	1.6	-	77
47	6.735	0.147	0.92	86	1.6	-	77
48	6.883	0.148	0.92	87	1.6	-	77
49	7.031	0.148	0.92	87	1.5	-	78
50	7.179	0.148	0.92	87	1.6	100	78
51	7.327	0.148	0.92	87	1.5	-	78
52	7.475	0.148	0.93	87	1.7	-	78
53	7.623	0.148	0.93	88	1.5	-	78
54	7.772	0.149	0.93	88	1.5	-	78
55	7.920	0.148	0.94	88	1.7	-	78
56	8.069	0.149	0.94	89	1.6	-	78
57	8.218	0.149	0.94	89	1.7	-	78
58	8.367	0.149	0.94	89	1.6	-	78
59	8.516	0.149	0.94	89	1.6	-	78
60	8.665	0.149	0.94	90	1.6	101	78
Avg/Tot	8.666	0.144	0.90	81.5	1.5	99	76.7

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025Stove ΔT: 21

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	280	286	288	452	247	310.7	873.0
1	280	286	288	432	246	306.5	965.7
2	281	285	289	416	247	303.5	1082.3
3	279	285	290	405	246	300.8	1085.2
4	276	283	293	396	245	298.6	1081.6
5	274	282	297	389	247	297.5	1079.6
6	273	280	301	384	245	296.6	1118.8
7	269	278	305	376	246	294.8	1038.0
8	270	277	309	370	245	294.2	1028.3
9	267	275	312	365	242	292.3	1054.9
10	265	273	315	366	244	292.6	1121.5
11	263	271	318	367	241	292.0	1119.3
12	262	269	322	366	241	291.9	1077.3
13	259	267	324	365	240	291.1	1050.8
14	257	266	328	368	239	291.3	1054.4
15	256	264	330	379	241	293.9	1054.8
16	256	262	332	394	239	296.6	1139.6
17	254	260	334	403	238	298.0	1195.7
18	253	258	337	410	236	298.9	1222.3
19	251	258	341	419	236	300.8	1203.6
20	250	256	344	425	234	302.0	1138.1
21	249	255	348	424	232	301.5	1105.2
22	245	253	350	421	234	300.4	1089.8
23	245	252	352	417	230	299.4	1123.1
24	243	250	353	416	227	297.7	1127.6
25	239	248	355	414	228	296.9	1128.9
26	243	248	357	415	229	298.3	1135.1
27	239	246	359	417	223	296.6	1141.3
28	232	244	360	423	221	296.0	1155.4
29	237	244	362	431	224	299.5	1165.7
30	238	243	364	439	221	300.8	1168.1
31	239	242	365	445	224	303.0	1158.6
32	238	241	367	452	224	304.2	1163.3
33	241	241	368	459	221	306.1	1199.9
34	239	241	370	473	221	308.8	1322.8
35	238	240	372	481	217	309.5	1436.5
36	235	239	376	488	215	310.6	1454.9
37	235	239	381	494	216	312.9	1465.5
38	237	239	386	501	218	316.2	1468.8
39	238	239	392	506	216	318.0	1473.5
40	236	239	397	510	213	318.9	1479.0
41	234	238	402	513	211	319.5	1483.5
42	238	237	408	514	210	321.3	1510.9
43	227	237	413	517	206	320.0	1520.3
44	229	237	419	521	210	323.0	1538.2
45	231	237	423	526	206	324.4	1549.9
46	234	237	429	530	209	327.8	1549.3
47	234	238	433	537	210	330.2	1552.9

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 5

Technician: AK

Date: 4/14/2025

Stove ΔT: 21

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	235	237	438	542	209	332.2	1545.8
49	234	238	442	547	206	333.6	1530.8
50	233	238	446	551	208	335.1	1515.2
51	234	238	450	559	207	337.5	1517.8
52	235	240	453	563	206	339.3	1512.7
53	236	240	455	551	205	337.4	1475.5
54	236	241	458	542	206	336.5	1461.6
55	236	241	460	539	206	336.4	1471.7
56	236	241	462	542	205	337.3	1473.7
57	237	242	463	542	204	337.8	1469.3
58	237	242	466	543	203	338.2	1467.4
59	238	242	467	545	204	339.1	1465.5
60	241	243	469	545	203	340.0	1460.7
61	241	244	470	546	202	340.3	1457.2
62	242	244	471	546	203	341.2	1456.8
63	242	244	473	544	203	341.0	1460.9
64	243	244	474	543	203	341.2	1454.7
65	245	246	475	543	201	341.8	1443.0
66	245	246	475	542	202	341.9	1434.7
67	247	246	475	543	201	342.5	1428.4
68	250	247	476	548	201	344.1	1443.3
69	248	247	475	550	201	344.4	1424.7
70	250	247	476	553	200	345.3	1420.3
71	252	249	476	560	200	347.1	1411.3
72	254	250	475	565	199	348.4	1377.7
73	254	251	474	567	199	348.9	1389.9
74	255	251	473	563	199	348.3	1393.1
75	256	251	473	559	199	347.3	1391.7
76	257	252	471	555	198	346.6	1382.5
77	257	253	470	552	198	346.1	1373.7
78	258	253	470	549	197	345.4	1360.0
79	261	253	469	546	197	345.2	1346.9
80	262	254	467	547	195	345.1	1325.3
81	261	254	466	547	198	345.4	1316.5
82	264	255	465	547	197	345.5	1308.9
83	264	255	463	548	198	345.6	1302.6
84	266	256	461	548	197	345.6	1292.1
85	265	257	459	548	198	345.4	1283.5
86	268	257	458	549	198	345.8	1273.4
87	267	258	456	550	197	345.7	1264.0
88	267	259	454	552	198	345.9	1254.2
89	267	259	452	552	197	345.4	1241.9
90	267	260	450	552	198	345.3	1235.5
91	271	261	448	553	197	346.0	1232.3
92	272	261	447	554	198	346.1	1225.9
93	273	262	444	554	198	346.2	1221.5
94	273	262	442	554	197	345.6	1213.2
95	274	263	441	554	196	345.4	1205.2

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025Stove ΔT: 21

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	274	263	439	553	198	345.3	1197.8
97	277	264	437	553	197	345.6	1192.2
98	276	265	435	553	196	344.9	1182.1
99	277	265	433	552	197	344.7	1176.8
100	278	266	431	551	197	344.6	1169.0
101	277	267	429	550	196	343.7	1163.9
102	279	267	427	551	196	343.9	1159.2
103	279	267	425	549	197	343.5	1156.7
104	281	268	424	549	195	343.5	1148.1
105	282	269	422	549	196	343.3	1142.6
106	283	269	419	549	196	343.2	1139.4
107	282	270	418	549	196	343.0	1137.1
108	281	270	416	549	195	342.2	1134.4
109	282	270	414	549	196	342.1	1130.1
110	282	271	412	549	197	342.2	1130.6
111	285	271	410	549	196	342.2	1118.0
112	285	272	409	548	197	341.9	1107.4
113	286	272	407	549	195	341.6	1096.9
114	285	272	405	548	194	340.7	1088.9
115	288	273	403	545	197	340.9	1084.2
116	291	273	401	543	195	340.5	1078.8
117	289	274	399	538	195	338.8	1077.1
118	288	273	397	534	197	337.7	1071.2
119	290	274	395	531	196	337.3	1067.2
120	290	274	393	530	196	336.5	1066.4
121	292	274	392	527	197	336.1	1061.9
122	293	274	390	527	194	335.5	1060.0
123	294	274	388	526	194	335.3	1056.4
124	294	275	386	526	195	335.3	1055.7
125	296	275	385	530	195	336.2	1049.6
126	297	275	383	531	195	336.3	1054.4
127	297	275	382	533	193	336.1	1051.9
128	298	275	380	536	195	336.9	1052.0
129	298	276	379	538	195	337.1	1047.4
130	299	275	377	540	194	337.2	1045.5
131	302	276	376	542	193	337.4	1036.3
132	297	276	374	542	194	336.6	1035.6
133	300	277	373	541	194	336.9	1036.6
134	300	276	371	539	193	335.8	1042.5
135	300	277	371	537	193	335.3	1043.5
136	300	277	369	533	193	334.3	1039.1
137	300	277	368	529	192	333.1	1040.6
138	298	277	367	523	193	331.7	1043.8
139	298	277	366	519	194	330.6	1042.7
140	297	276	364	515	193	329.0	1042.9
141	297	277	364	512	194	328.6	1043.7
142	296	277	362	509	193	327.3	1042.3
143	296	276	361	506	193	326.4	1034.2

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 5

Technician: AK

Date: 4/14/2025

Stove ΔT: 21

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	297	277	361	503	191	325.7	1014.4
145	294	276	359	498	193	324.1	999.8
146	295	276	358	495	193	323.4	993.2
147	294	276	357	493	193	322.5	981.2
148	293	276	355	490	193	321.4	972.8
149	292	275	355	487	191	320.1	963.3
150	294	275	353	485	192	319.8	955.6
151	292	276	352	482	191	318.4	948.0
152	292	275	350	480	191	317.7	940.6
153	290	275	349	477	190	316.2	934.5
154	289	275	347	475	192	315.6	928.2
155	291	274	345	474	190	314.9	922.1
156	289	274	344	473	190	314.1	917.0
157	290	274	342	471	191	313.6	912.5
158	287	274	341	471	190	312.6	907.1
159	289	274	339	470	188	312.2	901.7
160	287	274	338	471	190	311.7	898.0
161	286	275	336	470	188	311.0	893.5
162	283	274	335	470	191	310.5	892.3
163	283	275	334	469	190	309.9	889.0
164	282	275	332	471	188	309.5	886.2
165	282	275	331	473	189	309.7	884.2
166	280	275	330	473	188	309.1	882.1
167	279	275	328	472	190	308.6	883.4
168	280	276	327	473	190	309.1	881.9
169	281	276	326	472	187	308.4	880.9
170	279	276	324	471	188	307.6	879.3
171	280	277	323	467	187	306.7	885.4
172	278	277	322	474	187	307.6	871.0
173	277	278	321	475	187	307.6	868.4
174	277	278	320	472	186	306.5	881.9
175	276	278	319	470	186	305.8	885.3
176	274	279	318	467	188	305.2	883.2
177	274	279	317	463	187	303.9	884.0
178	273	279	316	460	186	302.8	883.4
179	274	280	316	457	186	302.4	879.7
180	272	279	315	454	187	301.2	876.3
181	272	278	314	451	188	300.8	875.1
182	271	278	313	448	187	299.6	874.9
183	269	279	313	445	188	298.7	871.6
184	267	279	312	442	189	297.6	866.8
185	268	279	311	440	187	296.9	863.6
186	268	279	310	438	186	296.2	862.2
187	268	279	310	436	186	295.6	860.2
188	267	280	309	434	186	295.1	856.8
189	267	280	308	432	185	294.4	853.3
190	266	281	308	430	186	294.1	851.9
191	264	281	307	428	185	293.1	849.0

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHT

Job #: 24-291

Model: Dauntless-C

Tracking #: 220

Run #: 5

Technician: AK

Date: 4/14/2025

Stove ΔT: 21

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
192	264	281	306	427	185	292.5	846.1
193	263	282	305	426	185	292.0	845.2
194	261	282	304	424	185	291.3	842.3
195	261	283	304	422	184	290.6	840.2
196	262	283	303	420	184	290.3	841.5
197	260	283	302	419	183	289.5	841.9
198	260	284	301	418	184	289.3	843.1
199	259	284	301	417	184	289.0	843.1
200	258	285	300	417	183	288.6	845.3
201	258	285	299	417	183	288.3	844.6
202	256	284	299	416	184	287.8	844.9
203	256	284	298	415	185	287.6	843.7
204	254	284	297	415	184	286.9	844.0
205	253	284	297	414	185	286.4	846.0
206	255	284	296	413	185	286.5	846.1
207	254	284	296	412	184	285.9	845.6
208	253	284	295	410	182	284.8	842.5
209	252	284	295	409	183	284.7	838.7
210	252	285	294	408	183	284.2	834.3
211	252	285	294	406	181	283.6	829.2
212	252	285	293	404	182	283.4	828.1
213	251	285	293	403	182	282.7	825.5
214	250	285	292	402	181	282.0	829.5
215	249	285	292	402	182	281.9	825.7
216	249	285	291	403	181	282.0	825.9
217	249	286	291	405	181	282.3	826.0
218	247	286	290	405	181	281.9	825.6
219	248	287	290	406	181	282.1	823.2
220	247	287	289	406	180	281.8	818.1
221	247	288	289	407	179	282.1	816.9
222	247	289	288	408	180	282.4	818.3
223	246	290	288	409	179	282.2	817.3
224	245	291	287	410	178	282.1	818.3
225	246	291	287	411	180	282.9	818.7
226	244	292	286	411	180	282.4	817.3
227	244	292	286	412	180	282.6	818.7
228	245	293	285	412	180	283.1	817.0
229	243	294	285	413	180	282.9	817.3
230	242	295	285	413	180	283.0	817.3
231	242	296	284	414	180	283.1	818.7
232	242	296	284	414	179	283.2	818.5
233	243	298	284	414	179	283.6	823.0
234	243	298	283	416	179	283.9	819.7
235	243	299	283	418	179	284.2	817.4
236	243	299	282	420	178	284.5	814.7
237	242	300	282	422	177	284.9	824.5
238	243	300	282	425	178	285.6	831.0
239	241	301	282	428	179	286.2	833.7

WOODSTOVE SURFACE TEMPERATURE DATA

Client: HHTJob #: 24-291Model: Dauntless-CTracking #: 220Run #: 5Technician: AKDate: 4/14/2025Stove ΔT : 21

Elapsed Time (min)	Temperature Data (°F)						
	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
240	241	301	282	430	178	286.5	837.3
241	242	301	282	431	177	286.6	839.6
242	243	301	282	433	179	287.4	840.2
243	243	301	281	434	177	287.3	842.4
244	244	301	281	435	177	287.7	844.2
245	244	301	282	436	176	287.6	845.7
246	243	300	282	437	176	287.7	842.6
247	245	300	282	438	176	288.2	832.4
248	245	299	281	440	176	288.2	831.4
249	245	299	281	440	176	288.3	831.0
250	247	299	281	441	176	288.7	827.8
251	247	298	281	442	177	289.0	825.3
252	246	298	281	443	175	288.6	824.8
253	247	297	281	444	176	288.8	824.7
254	249	297	280	445	176	289.3	823.8
255	248	297	280	446	175	289.3	826.2
256	248	296	280	447	175	289.0	825.6
257	249	295	280	447	175	289.1	827.8
258	251	295	280	447	176	289.6	829.7
Average	263.1	270.7	360.1	477.7	197.3	313.8	1065.8

LAB SAMPLE DATA - ASTM E2515

Client: HHT
 Model: Dauntless-C
 Run #: 5

Job #: 24-291
 Tracking #: 220
 Technician: AK
 Date: 4/14/2025

		Sample ID	Tare, mg	Final, mg	Catch, mg
Filters	A	G01269	237.3	243.3	6.0
	B	G01270	237.5	243.3	5.8
	C - 1st Hour	G01271	235.9	239.2	3.3
	Amb	G01272	236.8	237.1	0.3
Probes	A	11A	116877.0	116877.1	0.1
	B	11B	117349.6	117349.7	0.1
	C - 1st Hour	11C	116198.4	116198.6	0.2
O-rings	A	11A	3418.6	3418.6	0.0
	B	11B	4230.2	4230.6	0.4
	C - 1st Hour	11C	3583.4	3583.7	0.3

Placed in Dessicator on: 4/14/2025

Balance Audit (mg):

		200.0		200.0					
		Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time	Weight (mg)	Date/Time
Filters	A	243.2	4/18 15:00	243.3	4/21 13:30				
	B	243.3	4/18 15:00	243.3	4/21 13:30				
	C - 1st Hour	239.2	4/18 15:00	239.2	4/21 13:30				
	Amb	237.0	4/18 15:00	237.1	4/21 13:30				
Probes	A	116877.0	4/18 15:00	116877.1	4/21 13:30				
	B	117349.7	4/18 15:00	117349.7	4/21 13:30				
	C - 1st Hour	116198.6	4/18 15:00	116198.6	4/21 13:30				
O-Rings	A	3418.6	4/18 15:00	3418.6	4/21 13:30				
	B	4230.5	4/18 15:00	4230.6	4/21 13:30				
	C - 1st Hour	3583.7	4/18 15:00	3583.7	4/21 13:30				

Train A Aggregate, mg:	6.1
Train B Aggregate, mg:	6.3
Train C Aggregate, mg:	3.8
Ambient, mg:	0.3

ASTM E2780 Wood Heater Run Sheets

Client: HHT Job Number: 24-291 Tracking #: 220
Model: Dauntless-C Run Number: 5 Test Date: 4/14/2025

Wood Heater Run Notes

Test Control Settings

Primary Air Setting(s): Open 1 detent from fully closed
Targeted Burn Category: II

Preburn Notes

Time	Notes
82:00	PB End

Test Notes

Test Burn Start Time: 14:14 Test Fuel Loaded by: 25 seconds
Door Closed: 30 seconds Air Control Set at: 300 seconds
Other Loading Notes: Bypass closed @ 0:35, fan off- fan confirmation

Time	Notes
	-None-

Test Burn End Time: 18:32

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO₂ (%): 17.32 CO (%): 4.350
Mid Gas CO₂ (%): 10.00 CO (%): 2.500

Calibration Results:

	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
Time	13:19	13:20	13:21	20:41	20:42	20:43
CO ₂	0.00	17.32	10.32	-0.06	17.01	10.23
CO	0.000	4.348	2.506	-0.038	4.203	2.450

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

Technician Signature: 

Date: 4/25/25

ASTM E2780 Wood Heater Run Sheets

Client: HHT
Model: Dauntless-C

Job Number: 24-291
Run Number: 5

Tracking #: 220
Test Date: 4/14/2025



Test Fuel Front/Side View



Test Fuel Iso View



Test Fuel Loaded in Stove



Air Setting

Technician Signature: _____

[Handwritten Signature]

Date: 4/25/25

ASTM E2515 - Glass Fiber Filters

Paired Filter Weights

Date:	1/27/25	1/30/25	-	-			
Time:	0830	0915	-	-			
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
G01221	244.9	244.9	-	-	A	24-367	#4
G01222	244.2	244.2	-	-	A		
G01223	241.4	241.5	-	-	A		
G01224	245.4	245.6	-	-	A		
G01225	244.3	244.2	-	-	A		#5
G01226	242.9	242.9	-	-	A		
G01227	244.2	244.0	-	-	A		
G01228	244.1	244.2	-	-	A		
G01229	243.9	244.1	-	-	A	24-392	#1
G01230	243.7	243.7	-	-	A		
G01231	243.6	243.7	-	-	A		
G01232	242.6	242.7	-	-	A		
G01233	243.7	243.8	-	-	A		#2
G01234	244.1	244.3	-	-	A		
G01235	244.2	244.2	-	-	A		
G01236	243.3	243.5	-	-	A		

Date:	4/7/25	4/8/25					
Time:	10:00am	2:30pm					
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
G01237	246.0	246.0	-	-	A	24-201	#1
G01238	238.1	238.1	-	-	A		
G01239	237.5	237.5	-	-	A		
G01240	238.3	238.4	-	-	A		
G01241	238.2	237.8	-	-	A		#2
G01242	230.3	230.4	-	-	A		
G01243	237.1	237.2	-	-	A		
G01244	237.2	237.3	-	-	A		
G01245	237.0	236.9	-	-	A		#3
G01246	237.4	237.6	-	-	A		
G01247	237.5	237.7	-	-	A		
G01248	236.7	236.7	-	-	A		
G01249	230.9	231.1	-	-	A		#4
G01250	240.0	240.1	-	-	A		
G01251	236.4	236.3	-	-	A		
G01252	237.2	237.0	-	-	A		

ASTM E2515 - Glass Fiber Filters

Paired Filter Weights

Date:							
Time:							
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
G01253							
G01254							
G01255							
G01256							
G01257							
G01258							
G01259							
G01260							
G01261							
G01262							
G01263							
G01264							
G01265							
G01266							
G01267							
G01268							

Date:	4/11/25	4/14/25	-	-			
Time:	9:19	9:00	-	-			
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
G01269	237.4	237.3	-	-	A	24-201	#5
G01270	237.6	237.5	-	-	A	↓	↓
G01271	236.0	235.9	-	-	A	↓	↓
G01272	236.9	236.8	-	-	A	↓	↓
G01273	236.6	236.6	-	-	A	25-404	#1
G01274	237.5	237.4	-	-	A	↓	↓
G01275	236.6	236.6	-	-	A	↓	↓
G01276	236.0	236.0	-	-	A	↓	↓
G01277	236.8	236.7	-	-	A		
G01278	236.5	236.4	-	-	A		
G01279	236.0	235.9	-	-	A		
G01280	235.9	235.9	-	-	A		
G01281	237.1	236.9	-	-	A		
G01282	235.8	235.9	-	-	A		
G01283	236.9	236.9	-	-	A		
G01284	237.0	236.9	-	-	A		

ASTM E2515 - Probe Samples 1-10

Date:	1/20/25	1/27/25	1/30/25				
Time:	09:30	08:20	12:30				
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
1A	115627.4	115627.6	-	-	A	24-367	#2
1B	115902.5	115902.7	-	-	A		
1C	116433.3	116433.5	-	-	A		
2A	116058.0	116058.5	116058.4	-	A	24-367	#3
2B	116173.8	116174.5	116174.3	-	A		
2C	116429.0	116429.2	-	-	A		
3A	115881.1	115881.3	-	-	A	24-367	#4
3B	116121.0	116121.2	-	-	A		
3C	116618.4	116618.6	-	-	A		
4A	116023.7	116024.0	116023.9	-	A	24-367	#5
4B	116182.7	116183.0	116182.9	-	A		
4C	116998.2	116998.6	116998.5	-	A		
5A	116757.7	116757.8	-	-	A	24-392	#1
5B	116875.9	116875.9	-	-	A		
5C	115855.6	115855.9	115856.0	-	A		

Date:	2/26/25	2/28/25					
Time:	15:15	10:15					
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
6A	116384.0	116384.2	-	-	A	24-392	A #1/2
6B	115955.8	115956.0	-	-	A		
6C	115129.3	115129.3	-	-	A		
7A	116559.2	116559.2	-	-	A	24-291	#1
7B	117129.7	117129.8	-	-	A		
7C	116551.7	116551.7	-	-	A		
8A	116634.4	116634.3	-	-	A	24-291	#2
8B	116666.5	116666.5	-	-	A		
8C	116663.6	116663.7	-	-	A		
9A	116531.3	116531.2	-	-	A	24-291	#3
9B	117738.7	117738.7	-	-	A		
9C	116603.7	116603.6	-	-	A		
10A	116647.1	116647.0	-	-	A	24-291	#4
10B	117754.4	117754.3	-	-	A		
10C	116729.1	116728.9	-	-	A		

ASTM E2515 - Probe Samples 11-20

Date:	4/11/25	4/11/25	4/14/25				
Time:	9:45a	20:30	10:30				
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
11A	116876.8	116877.0	-	-	A	24-201	#5
11B	117349.4	117349.6	-	-	L		
11C	116197.6	116198.6	116198.4	-	A		
12A	116719.2	116719.7	116719.6	-	A	25-404	#1
12B	117782.1	117782.5	117782.3	-	A		
12C	117180.4	117180.6	-	-	A		
13A	117320.5	117320.8	117320.7	-	A		
13B	116946.5	116946.7	-	-	A		
13C	115653.7	115653.7	-	-	A		
14A	116637.0	116637.2	-	-	A		
14B	116627.8	116627.8	-	-	A		
14C	116536.6	116537.0	116537.0	-	A		
15A	117249.3	117249.5	-	-	A		
15B	116761.5	116761.9	116761.8	-	A		
15C	116848.2	116848.5	116848.6	-	A		

Date:							
Time:							
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
16A							
16B							
16C							
17A							
17B							
17C							
18A							
18B							
18C							
19A							
19B							
19C							
20A							
20B							
20C							

ASTM E2515 - O-Ring Samples 1-10

Paired Weights

Date:	1/20/25	1/27/25	1/30/25	2/3/24			
Time:	0930	0830	1230	0400			
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
1A	3565.8	3565.2	3565.0	-	A	24-317	#2
1B	3554.2	3553.7	3553.5	-	A		
1C	4164.8	4163.7	4163.5	-	A		
2A	3550.9	3550.3	3550.1	-	A	24-317	#3
2B	3570.2	3569.4	3569.0	3569.1	A		
2C	3387.5	3386.2	3385.9	3386.0	A		
3A	3577.4	3576.4	3576.2	-	A	24-367	#14
3B	3565.6	3564.7	3564.6	-	A		
3C	3610.7	3618.7	3618.6	-	A		
4A	3373.2	3371.8	3371.4	3371.5	A	24-367	#5
4B	3577.0	3576.3	3575.9	3576.1	A		
4C	3368.9.0	3367.8	3367.1	3367.3	A		
5A	3533.6	3532.7	3532.5	-	A	24-392	#1
5B	3528.9	3528.1	3528.0	-	A		
5C	3372.2	3370.8	3370.7	-	A		

Date:	2/26/24	2/28/24					
Time:	15:00	10:00					
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
6A	3388.2	3388.4	-	-	A	24-392	#2
6B	3608.8	3609.0	-	-	A		
6C	3394.9	3395.1	-	-	A		
7A	3567.4	3567.6	-	-	A	24-291	#1
7B	3518.7	3518.7	-	-	A		
7C	3400.2	3400.2	-	-	A		
8A	3548.2	3548.2	-	-	A	24-291	#2
8B	3352.1	3352.2	-	-	A		
8C	3582.0	3582.0	-	-	A		
9A	3576.2	3576.3	-	-	A	24-291	#3
9B	3519.3	3519.4	-	-	A		
9C	3421.9.9	3422.1	-	-	A		
10A	3355.1	3355.2	-	-	A	24-291	#4
10B	3566.5	3566.5	-	-	A		
10C	3360.3	3360.2	-	-	A		

ASTM E2515 - O-Ring Samples 11-20

Paired Weights

Date:	4/11/25	4/11/25	4/14/25				
Time:	9:30 a-	20:15	10:00				
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
11A	3419.2	3418.5	3418.6	-	A	24-201	#5
11B	4230.8	4230.3	4230.2	-	A		
11C	3583.9	3583.5	3583.4	-	A		
12A	3581.5	3581.5	35 ⁴ -	-	A	25-404	#1
12B	3611.2	3611.2	-	-	A		
12C	3546.9	3546.8	-	-	A		
13A	3591.9	3592.2	3592.9	-	A		
13B	3637.3	3637.3	-	-	A		
13C	4404.6	4404.6	-	-	A		
14A	3338.3	3338.3	-	-	A		
14B	3362.6	3362.7	-	-	A		
14C	3438.9	3439.0	-	-	A		
15A	3567.7	3567.4	3567.6	-	A		
15B	3568.9	3569.0	-	-	A		
15C	3392.1	3392.3	-	-	A		

Date:							
Time:							
	Weight 1	Weight 2	Weight 3	Weight 4	Initial	Project	Run
16A							
16B							
16C							
17A							
17B							
17C							
18A							
18B							
18C							
19A							
19B							
19C							
20A							
20B							
20C							

Pre-Conditioning Data

Client: HHT	Job #: 24-291
Model: Dauntless-C	Tracking #: 220
Date(s): 2/12/25 - 3/11/25	Technician: HHT

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. All conditioning performed at Medium BR settings.
0	1310	208	2/12 Air Control - 4 clicks from open, 9 lbs of fuel added, 21% MC
1	487	1607	
2	386	1137	
3	357	1403	2/12 Air Control - 4 clicks from open, 12.63 lbs of fuel added, 21% MC
4	413	1506	
5	328	1088	
6	287	833	
7	1017	122	2/13 Air Control - 4 clicks from open, 15.17 lbs of fuel added, 20.0% MC
8	587	1240	
9	396	1449	
10	302	1052	2/13 Air Control - 4 clicks from open, 13.24 lbs of fuel added, 20.8% MC
11	389	1471	
12	328	1014	
13	303	874	
14	1265	213	2/18 Air Control - 3 clicks from open, 9.42 lbs of fuel added, 22% MC
15	435	1201	
16	434	1575	
17	420	1490	2/18 Air Control - 3 clicks from open, 13.51 lbs of fuel added, 21.8% MC
18	406	1588	
19	341	1100	
20	304	939	
21	286	824	
22	1050	194	2/19 Air Control - 2 clicks from open, 12.94 lbs of fuel added 21.5% MC
23	465	1384	
24	422	1331	
25	367	1291	
26	227	67	2/27/25 Air Control - 2 clicks from open, 11.7 lbs of fuel added 23.2% MC
27	532	403	
28	424	1333	
29	393	1193	2/27/25 Air Control - 2 clicks from open, 12.72 lbs of fuel added 23.2% MC
30	402	1405	
31	365	991	
32	293	752	
33	477	1164	3/5/25 Air Control - 2 clicks from open, 13.71 lbs of fuel added 21.8% MC
34	434	1510	
35	389	1381	3/5/25 Air Control - 2 clicks from open, 13.76 lbs of fuel added 21.8% MC
36	381	1402	
37	332	1061	
38	308	906	
39	1501	156	3/10/25 Air Control - 2 clicks from open, 13.93 lbs of fuel added 21.2% MC
40	444	1534	
41	388	1311	
42	373	1266	3/10/25 Air Control - 2 clicks from open, 11.43 lbs of fuel added 21.2% MC
43	380	1442	
44	336	1052	
45	289	804	
46	191	106	3/11/25 Air Control - 2 clicks from open, 6.93 lbs of fuel added 22.5% MC
47	276	1462	3/11/25 Air Control - 2 clicks from open, 12.2 lbs of fuel added 22.5% MC
48	249	1358	
49	378	1339	3/11/25 Air Control - 2 clicks from open, 12.48 lbs of fuel added 22.5% MC
50	398	1520	

Sample Calculations – ASTM E2780 & E2515

Client: HHT
 Model: Dauntless-C
 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_{Sdb} – Weight of test fuel spacers, dry basis, kg

M_{Cdb} – Weight of test fuel crib, excluding nails and spacers, dry basis, kg

D_{Cdb} - Density of fuel crib, excluding spacers and nails, dry basis, lbs/ft³

M_{FTAdb} - Total weight of fuel crib excluding nails, dry basis, kg

BR – Dry burn rate, kg/hr

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

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

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

m_n – Total particulate matter collected, mg

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

E_T – Total particulate emissions, g

PR - Proportional rate variation

PM_R – Particulate emissions for test run, g/hr

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

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

ASTM E2780 equation (1)

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

Where,

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

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

Sample Calculation:

$$FM_S = 13.4 \%$$

$$M_{Swb} = 1.6 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{Sdb} = [(1.6 \times 0.4536) (100/(100 + 13.4))]$$

$$M_{Sdb} = \mathbf{0.64 \text{ kg}}$$

M_{Cdb}— Weight of test fuel crib, excluding nails and spacers, dry basis, kg

ASTM E2780 equation (2)

$$M_{Cdb} = \Sigma[(M_{CPnwb})(100/(100 + FM_{CPn}))]$$

Where,

M_{CPnwb} = weight of each test fuel piece n in fuel crib, excluding nails and spacers, wet basis, kg

FM_{CPn} = Average fuel moisture of test fuel n in fuel crib, % dry basis

Sample Calculation (test fuel piece 1):

$$M_{CPnwb} = 2.12$$

$$FM_{CPn} = 20.6$$

$$= 2.1 (100/(100+ 20.6)$$

$$= 1.8 \text{ lbs}$$

Total dry crib weight, excluding spacers = 9.57 lbs

$$M_{Cdb} = \mathbf{4.34 \text{ kg}}$$

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

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

Where,

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

Sample calculation:

$$V_C = 542.5 \text{ in}^3$$

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

$$D_{Cdb} = 9.57 / 542.5 * 1728$$

$$= \mathbf{30.5 \text{ lbs/ft}^3}$$

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

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

Sample calculation:

$$M_{FTAdb} = 0.64 + 4.34$$

$$= 4.98 \text{ kg}$$

BR – dry burn rate, kg/hr

ASTM E2780 equation (5)

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

Where,

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

Sample Calculation:

$$M_{Bdb} = 4.98 \quad \text{kg}$$

$$\theta = 277 \quad \text{min}$$

$$BR = \frac{60 \times 4.98}{277}$$

$$BR = \mathbf{1.08} \quad \text{kg/hr}$$

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

ASTM E2515 equations (9)

$$V_s = F_p \times k_p \times C_p \times (\sqrt{\Delta P})_{avg} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

Where:

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

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

Sample calculation:

$$F_p = \frac{18.48}{18.49} = 0.999$$

$$V_s = 0.999 \times 85.49 \times 0.99 \times 0.276 \times \left(\left(\frac{93.3}{30.05} + \frac{460}{-0.15} \right) \times \frac{28.78}{13.6} \right)^{1/2}$$

$$V_s = 18.65 \text{ ft/s}$$

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

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

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

ASTM E2515 equation (3)

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

Where:

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

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 18.65 \times 0.1963 \times \frac{528}{93.3 + 460} \times \frac{30.05 + \frac{-0.15}{13.6}}{29.92}$$

$$Q_{sd} = \mathbf{12373.6} \quad \text{dscf/hr}$$

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

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

Where:

K_1	=	17.64 °R/in. Hg
V_m	=	Volume of gas sample measured at the dry gas meter, dcf
Y	=	Dry gas meter calibration factor, dimensionless
P_{bar}	=	Barometric pressure at the testing site, in. Hg
ΔH	=	Average pressure differential across the orifice meter, in. H ₂ O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train A:

$$V_{m(std)} = 17.64 \times 46.076 \times 1.019 \times \frac{\left(30.05 + \frac{2.78}{13.6} \right)}{\left(93.3 + 460 \right)}$$

$$V_{m(std)} = \mathbf{45.291} \text{ dscf}$$

Using equation for Train B:

$$V_{m(std)} = 17.64 \times 45.148 \times 1.005 \times \frac{\left(30.05 + \frac{2.66}{13.6} \right)}{\left(92.7 + 460 \right)}$$

$$V_{m(std)} = \mathbf{43.803} \text{ dscf}$$

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 65.25 \times 1.012 \times \frac{\left(\underline{30.05} + \frac{0.00}{13.6} \right)}{\left(68.9 + 460 \right)}$$

$$V_{m(std)} = \mathbf{66.176} \text{ dscf}$$

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:

$$m_n = 0.1 + 7.2 + 0.1$$

$$m_n = 7.4 \text{ mg}$$

Using equation for Train B:

$$m_n = 0 + 7 + 0.2$$

$$m_n = 7.2 \text{ mg}$$

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

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

Where:

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

Sample calculation:

For Train A:

$$C_s = 0.001 \times \frac{7.4}{45.29}$$

$$C_s = 0.00016 \text{ g/dscf}$$

For Train B

$$C_s = 0.001 \times \frac{7.2}{43.80}$$

$$C_s = 0.00016 \text{ g/dscf}$$

For Ambient Train

$$C_r = 0.001 \times \frac{0.0}{66.18}$$

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

E_T – Total Particulate Emissions, g

ASTM E2515 equation (15)

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

Where:

C _s	=	Concentration of particulate matter in tunnel gas, g/dscf
C _r	=	Concentration particulate matter room air, g/dscf
Q _{std}	=	Average dilution tunnel gas flow rate, dscf/hr
θ	=	Total time of test run, minutes

Sample calculation:

For Train A

$$E_T = (0.000163 - 0.000000) \times 12373.6 \times 277 / 60$$

$$E_T = 9.33 \text{ g}$$

For Train B

$$E_T = (0.000164 - 0.000000) \times 12373.6 \times 277 / 60$$

$$E_T = 9.39 \text{ g}$$

Average

$$E = 9.36 \text{ g}$$

PR - Proportional Rate Variation

ASTM E2515 equation (16)

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

Where:

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

Sample calculation (for the first 10-min interval of Train 1):

$$PR = \left(\frac{277 \times 1.475 \times 18.65 \times (92.8 + 460) \times (93.3 + 460)}{10 \times 46.076 \times 18.76 \times (93.3 + 460) \times (72.7 + 460)} \right) \times 100$$

$$PR = 91 \%$$

PM_R – Particulate emissions for test run, g/hr

ASTM E2780 equation (6)

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

Where,

E_T = Total particulate emissions, grams

θ = Total length of full integrated test run, min

Sample Calculation:

$$E_T \text{ (Dual train average)} = 9.36 \text{ g}$$

$$\theta = 277 \text{ min}$$

$$PM_R = 60 \times (9.36 / 277)$$

$$PM_R = 2.03 \text{ g/hr}$$

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

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

Sample Calculation:

$$\begin{aligned} E_T (\text{Dual train average}) &= 9.36 \text{ g} \\ M_{Bdb} &= 4.98 \text{ kg} \\ PM_F &= 9.36 / 4.98 \\ PM_F &= \mathbf{1.88} \text{ g/kg} \end{aligned}$$

Stack Loss Efficiency and CO emissions calculations are done in accordance with CSA B415.1, using the password protected excel spreadsheet provided with the test standard. No alterations or alternative calculations are used for determining efficiency or CO emissions. The following pages are a sample of the calculations page from the B415.1 Spreadsheet (V2_4 - Dated April 15, 2010).

Manufacturer: HHT
Model: Dauntless-C
Date: 04/09/25
Run: 1
Control #: 24-291
Test Duration: 277 min

	HHV	LHV
Eff	75.82%	81.94%
Comb Eff	97.04%	97.04%
HT Eff	78.12%	84.44%
Output	16,055	kJ/h
Burn Rate	1.07	kg/h
Grams CO	221	g
Input	21,176	kJ/h
MC wet	17.66	
Averages	0.33	8.14

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

Ultimate CO₂
CO_{2-ult} 19.64
F₀
1.061

Air Fuel
Dry Molecular W
Dry Moles Exhaust
Air Fuel Ratio
Overall Heating Efficiency: 75.82%
Combustion Efficiency: 97.04%
Heat Transfer Efficiency: 78.12%
Heat Output: 15,230 Btu/h 16,055 kJ/h
Heat Input: 20,088 Btu/h 21,176 kJ/h
Burn Duration: 4.62 h
Burn Rate: 2.36 lb/h 1.069 kg/h
Stack Temp: 309.0 Deg. F 153.9 Deg. C

INPUT DATA				Oxygen Calculation			Input Data		Combust Eff	Heat Transfer	Net Eff	Air Fuel	Wet Wt
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO ₂ [d]	Excess Air EA	Total O ₂	Calc. % O ₂ [g]	Flue Gas (°C)	Room Temp (°C)	%	%	%	Ratio	Now Wt
0	5.99	0.33	8.96	111.6%	20.33	11.21	144.6	19.1	97.4%	79.9%	77.8%	12.7	5.99
1	5.98	0.06	8.15	139.2%	20.40	12.22	146.4	19.1	99.8%	79.0%	78.8%	14.4	5.98
2	5.93	0.03	7.02	178.5%	20.47	13.44	149.9	19.2	100.2%	77.2%	77.3%	16.8	5.93
3	5.92	0.02	8.07	142.6%	20.41	12.32	156.6	19.3	100.2%	78.1%	78.3%	14.7	5.92
4	5.89	0.02	8.41	133.1%	20.38	11.97	162.3	19.2	100.2%	78.0%	78.2%	14.1	5.89
5	5.86	0.02	8.74	124.3%	20.36	11.61	166.9	19.3	100.2%	78.1%	78.2%	13.6	5.86
6	5.82	0.04	8.44	131.7%	20.38	11.92	162.9	19.3	100.0%	78.0%	78.0%	14.0	5.82
7	5.79	0.08	7.18	170.6%	20.46	13.24	161.5	19.3	99.6%	76.4%	76.1%	16.3	5.79
8	5.76	0.04	7.14	173.4%	20.47	13.30	161.2	19.2	100.0%	76.3%	76.3%	16.5	5.76
9	5.73	0.08	7.26	167.5%	20.46	13.15	161.6	19.2	99.6%	76.5%	76.2%	16.1	5.73
10	5.69	0.11	7.65	153.4%	20.43	12.73	162.3	19.3	99.3%	77.0%	76.5%	15.3	5.69
11	5.66	0.09	7.70	152.0%	20.43	12.68	162.9	19.3	99.5%	77.0%	76.6%	15.2	5.66
12	5.62	0.16	8.47	127.6%	20.37	11.82	163.8	19.4	98.9%	77.9%	77.1%	13.7	5.62
13	5.59	0.20	8.24	132.5%	20.38	12.04	163.2	19.3	98.4%	77.7%	76.4%	14.0	5.59
14	5.55	0.12	7.26	166.2%	20.45	13.13	164.1	19.2	99.1%	76.2%	75.6%	16.0	5.55
15	5.52	0.16	8.88	117.4%	20.34	11.38	166.1	19.1	98.9%	78.2%	77.3%	13.1	5.52
16	5.48	0.16	8.41	129.2%	20.37	11.89	167.4	19.1	98.8%	77.5%	76.6%	13.8	5.48
17	5.44	0.24	8.51	124.5%	20.36	11.73	166.9	19.1	98.1%	77.7%	76.2%	13.5	5.44
18	5.41	0.32	8.09	133.5%	20.38	12.13	166.7	19.2	97.2%	77.1%	74.9%	14.0	5.41
19	5.38	0.33	7.86	139.6%	20.40	12.37	166.6	18.8	97.0%	76.8%	74.5%	14.4	5.38
20	5.33	0.29	7.93	139.1%	20.40	12.33	166.2	18.8	97.5%	76.9%	75.0%	14.4	5.33
21	5.29	0.29	8.30	128.9%	20.37	11.93	166.7	19.2	97.6%	77.4%	75.5%	13.8	5.29
22	5.25	0.41	8.84	112.3%	20.33	11.28	168.8	19.3	96.6%	77.8%	75.2%	12.7	5.25
23	5.20	0.49	9.53	96.1%	20.28	10.51	171.1	19.2	96.2%	78.4%	75.4%	11.8	5.20
24	5.16	0.50	9.76	91.4%	20.26	10.25	172.8	19.2	96.1%	78.5%	75.4%	11.5	5.16
25	5.11	0.49	9.70	92.8%	20.27	10.33	173.7	19.3	96.2%	78.4%	75.4%	11.6	5.11
26	5.08	0.44	9.32	101.4%	20.30	10.76	174.2	19.3	96.5%	77.9%	75.2%	12.1	5.08
27	5.03	0.40	9.21	104.4%	20.31	10.90	173.8	19.3	96.8%	77.9%	75.4%	12.3	5.03
28	4.99	0.41	9.09	106.7%	20.31	11.02	174.4	19.3	96.7%	77.7%	75.1%	12.4	4.99
29	4.94	0.56	9.55	94.3%	20.27	10.44	178.1	19.3	95.6%	77.9%	74.5%	11.6	4.94
30	4.89	0.74	11.22	64.3%	20.15	8.57	183.2	19.4	95.0%	79.0%	75.0%	9.8	4.89
31	4.84	0.68	10.79	71.3%	20.18	9.05	186.0	19.3	95.2%	78.4%	74.7%	10.2	4.84
32	4.79	0.69	10.49	75.7%	20.20	9.37	185.7	19.3	95.0%	78.2%	74.3%	10.5	4.79
33	4.74	0.73	9.73	87.8%	20.25	10.16	183.5	19.3	94.4%	77.6%	73.2%	11.2	4.74
34	4.72	0.67	9.29	97.1%	20.28	10.65	182.3	19.4	94.6%	77.2%	73.1%	11.8	4.72
35	4.69	0.69	9.33	96.1%	20.28	10.61	181.6	19.4	94.5%	77.3%	73.1%	11.7	4.69
36	4.64	0.70	9.69	89.1%	20.25	10.21	183.8	19.4	94.6%	77.5%	73.4%	11.3	4.64
37	4.59	0.62	10.18	82.0%	20.23	9.74	186.1	19.5	95.5%	77.9%	74.4%	10.9	4.59

Ratio (A/F)	
Weight (M _g)	29.79
st Gas (N _p):	501.82
o (A/F)	14.44

%HC
0.88

Combustion Efficiency: 97.04%
 Total Input (kJ): 97,764
 Total Output (kJ): 74,120
 Efficiency: 75.82%
 Total CO (g): 220.56

Moisture of Wood (wet basis): 17.6616
 Initial Dry Weight W_{t_{do}} (kg): 4.94
 Moisture Content Dry 21.45

Load Weight (kg): **5.99**
 Fuel Heating **HHV** **LHV**
 Value in kJ/kg - CV: **19,810** **18,329** Btu/lb **HHV** **8522.5**

66.43	1.77	64.18	97807	4.06	6.87	2.74	19810.00	17.66	79.45	21.08	2.09	7.13	0.03	0.21	39.12
% Wet Consumed	Dry Wt. Now	% Dry Consumed	Total Input	Fuel Properties				Mw Moisture Fuel Burnt	Mass Balance (moles/100 mole dry flue gas)					kg Wood per 100 mole dfp	
x	W _{t_{dn}}	y		Carbon /12= [a]	Hydrogen /1= [b]	Oxygen /16= [c]	Calorific Value		[h]	[u]	[w]	[j]	[k]	Nk	CO ₂
0.00	4.94	0.00	0	4.06	6.87	2.74	19810.00	17.66	79.51	21.09	2.29	7.82	0.03	0.23	39.25
0.15	4.93	0.15	555	4.06	6.87	2.74	19810.00	17.66	79.57	21.11	2.02	6.96	-0.01	0.20	40.55
0.98	4.89	0.98	518	4.06	6.87	2.74	19810.00	17.66	79.51	21.09	1.73	5.99	-0.02	0.17	40.72
1.21	4.88	1.21	370	4.06	6.87	2.74	19810.00	17.66	79.58	21.11	1.99	6.87	-0.02	0.20	40.77
1.74	4.85	1.74	518	4.06	6.87	2.74	19810.00	17.66	79.61	21.12	2.07	7.15	-0.02	0.21	40.79
2.27	4.82	2.27	555	4.06	6.87	2.74	19810.00	17.66	79.63	21.12	2.15	7.43	-0.02	0.21	40.79
2.88	4.79	2.88	555	4.06	6.87	2.74	19810.00	17.66	79.60	21.11	2.08	7.19	-0.01	0.21	40.69
3.41	4.77	3.41	518	4.06	6.87	2.74	19810.00	17.66	79.50	21.09	1.79	6.15	-0.01	0.18	40.44
3.94	4.74	3.94	518	4.06	6.87	2.74	19810.00	17.66	79.51	21.09	1.77	6.09	-0.02	0.18	40.65
4.47	4.71	4.47	518	4.06	6.87	2.74	19810.00	17.66	79.51	21.09	1.81	6.22	-0.01	0.18	40.43
5.00	4.69	5.00	555	4.06	6.87	2.74	19810.00	17.66	79.52	21.09	1.91	6.56	-0.01	0.19	40.29
5.60	4.66	5.60	629	4.06	6.87	2.74	19810.00	17.66	79.53	21.10	1.92	6.60	-0.01	0.19	40.36
6.28	4.62	6.28	555	4.06	6.87	2.74	19810.00	17.66	79.55	21.10	2.13	7.30	0.00	0.21	40.06
6.74	4.60	6.74	518	4.06	6.87	2.74	19810.00	17.66	79.52	21.09	2.08	7.13	0.01	0.21	39.78
7.34	4.57	7.34	592	4.06	6.87	2.74	19810.00	17.66	79.49	21.08	1.82	6.25	0.00	0.18	40.17
7.95	4.54	7.95	629	4.06	6.87	2.74	19810.00	17.66	79.58	21.11	2.23	7.64	0.00	0.22	40.08
8.63	4.51	8.63	629	4.06	6.87	2.74	19810.00	17.66	79.54	21.10	2.11	7.24	0.00	0.21	40.01
9.24	4.48	9.24	555	4.06	6.87	2.74	19810.00	17.66	79.52	21.09	2.16	7.38	0.02	0.21	39.61
9.77	4.45	9.77	481	4.06	6.87	2.74	19810.00	17.66	79.45	21.08	2.08	7.08	0.03	0.21	39.12
10.22	4.43	10.22	666	4.06	6.87	2.74	19810.00	17.66	79.43	21.07	2.03	6.90	0.03	0.20	39.01
11.13	4.39	11.13	740	4.06	6.87	2.74	19810.00	17.66	79.46	21.08	2.03	6.92	0.02	0.20	39.27
11.73	4.36	11.73	666	4.06	6.87	2.74	19810.00	17.66	79.48	21.08	2.12	7.23	0.02	0.21	39.34
12.49	4.32	12.49	740	4.06	6.87	2.74	19810.00	17.66	79.47	21.08	2.29	7.78	0.04	0.23	38.82
13.25	4.28	13.25	703	4.06	6.87	2.74	19810.00	17.66	79.48	21.08	2.48	8.41	0.05	0.25	38.61
13.93	4.25	13.93	703	4.06	6.87	2.74	19810.00	17.66	79.49	21.08	2.54	8.62	0.06	0.25	38.59
14.69	4.21	14.69	666	4.06	6.87	2.74	19810.00	17.66	79.49	21.08	2.52	8.55	0.05	0.25	38.64
15.29	4.18	15.29	666	4.06	6.87	2.74	19810.00	17.66	79.48	21.08	2.41	8.20	0.05	0.24	38.79
16.05	4.14	16.05	703	4.06	6.87	2.74	19810.00	17.66	79.50	21.09	2.38	8.08	0.04	0.24	38.96
16.73	4.11	16.73	777	4.06	6.87	2.74	19810.00	17.66	79.48	21.08	2.35	7.99	0.04	0.23	38.86
17.64	4.06	17.64	851	4.06	6.87	2.74	19810.00	17.66	79.45	21.07	2.51	8.48	0.06	0.25	38.31
18.47	4.02	18.47	814	4.06	6.87	2.74	19810.00	17.66	79.48	21.08	2.97	10.00	0.09	0.30	38.01
19.30	3.98	19.30	777	4.06	6.87	2.74	19810.00	17.66	79.48	21.08	2.85	9.61	0.08	0.28	38.12
20.06	3.95	20.06	777	4.06	6.87	2.74	19810.00	17.66	79.45	21.07	2.77	9.36	0.09	0.28	37.99
20.89	3.90	20.89	592	4.06	6.87	2.74	19810.00	17.66	79.39	21.06	2.60	8.74	0.09	0.26	37.64
21.27	3.89	21.27	444	4.06	6.87	2.74	19810.00	17.66	79.38	21.06	2.47	8.34	0.08	0.25	37.76
21.80	3.86	21.80	629	4.06	6.87	2.74	19810.00	17.66	79.38	21.05	2.49	8.38	0.08	0.25	37.69
22.56	3.82	22.56	777	4.06	6.87	2.74	19810.00	17.66	79.40	21.06	2.58	8.69	0.09	0.26	37.76
23.39	3.78	23.39	888	4.06	6.87	2.74	19810.00	17.66	79.47	21.08	2.68	9.04	0.07	0.27	38.22

Moisture Content M_{Cwb} : 17.66159

Dry kg : 4.94

CA: 49

HY: 7

OX: 43.9

LHV
7885.2

62.40	1.56	0.13	398.30	34.27	11.92	426.99	5342.12	4006.78	3892.97	3850.52	5172.26	4657.50	293.64	58051.97	65117.90
Moles per kg of Dry Wood					Moisture Present	Stack Temp K	Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent						Room Temp K		
O ₂	CO	HC	N ₂	H ₂ O			CO ₂	O ₂	CO	N ₂	CH ₄	H ₂ O		CO ₂	O ₂
49.12	1.43	0.13	348.45	34.26	11.92	417.71	4997.02	3760.43	3656.69	3616.17	4810.80	4375.80	292.26	196.13	184.70
60.81	0.32	-0.05	396.00	34.63	11.92	419.59	5075.75	3818.13	3712.43	3671.37	4889.98	4442.38	292.26	205.80	232.18
77.94	0.19	-0.10	461.18	34.72	11.92	423.09	5219.79	3923.51	3814.15	3772.12	5035.27	4563.87	292.32	212.54	305.81
62.21	0.12	-0.08	401.89	34.69	11.92	429.76	5494.95	4124.37	4007.95	3964.10	5313.74	4795.30	292.43	224.05	256.59
58.06	0.10	-0.08	386.24	34.68	11.92	435.48	5737.88	4301.54	4178.84	4133.39	5560.00	4999.36	292.37	234.07	249.73
54.22	0.09	-0.07	371.74	34.67	11.92	440.04	5926.06	4438.23	4310.55	4263.89	5751.95	5156.58	292.48	241.74	240.63
57.49	0.19	-0.07	383.85	34.65	11.92	436.09	5759.43	4317.04	4193.73	4148.15	5582.33	5017.12	292.48	234.35	248.20
74.53	0.43	-0.06	447.54	34.64	11.92	434.65	5698.53	4272.69	4150.98	4105.79	5520.44	4966.07	292.48	230.42	318.43
75.73	0.24	-0.09	452.67	34.69	11.92	434.37	5693.16	4269.07	4147.56	4102.38	5514.35	4962.01	292.32	231.45	323.32
73.21	0.43	-0.05	442.54	34.63	11.92	434.71	5705.09	4277.66	4155.82	4110.58	5526.69	4971.87	292.37	230.67	313.16
67.07	0.55	-0.03	418.98	34.58	11.92	435.43	5731.32	4296.57	4174.00	4128.60	5553.75	4993.56	292.48	230.89	288.18
66.43	0.49	-0.04	416.75	34.59	11.92	436.09	5759.43	4317.04	4193.73	4148.15	5582.33	5017.12	292.48	232.46	286.78
55.88	0.73	0.02	376.10	34.49	11.92	436.98	5792.72	4341.07	4216.85	4171.06	5616.61	5044.70	292.59	232.07	242.56
58.08	0.98	0.05	383.67	34.42	11.92	436.37	5771.15	4325.57	4201.96	4156.30	5594.25	5026.94	292.48	229.57	251.21
72.68	0.66	-0.02	439.85	34.56	11.92	437.21	5810.55	4354.43	4229.83	4183.90	5633.90	5060.23	292.37	233.40	316.47
51.39	0.71	0.02	359.21	34.48	11.92	439.21	5901.38	4420.78	4293.86	4247.33	5725.73	5136.70	292.21	236.55	227.18
56.57	0.78	0.02	378.60	34.48	11.92	440.54	5957.78	4461.77	4333.36	4286.46	5783.20	5183.85	292.21	238.40	252.41
54.61	1.12	0.08	370.16	34.37	11.92	440.04	5934.51	4444.76	4316.95	4270.21	5759.70	5164.25	292.26	235.09	242.74
58.67	1.56	0.13	384.18	34.26	11.92	439.87	5925.35	4438.01	4310.41	4263.73	5750.58	5156.44	292.32	231.78	260.36
61.36	1.66	0.14	394.07	34.24	11.92	439.71	5930.97	4442.69	4315.07	4268.32	5755.01	5162.05	291.98	231.38	272.58
61.08	1.43	0.11	393.68	34.30	11.92	439.32	5914.53	4430.73	4303.55	4256.91	5738.25	5148.30	291.98	232.26	270.61
56.60	1.37	0.11	376.94	34.31	11.92	439.82	5923.00	4436.30	4308.77	4262.10	5748.18	5154.47	292.32	233.00	251.08
49.55	1.80	0.18	348.96	34.16	11.92	441.98	6008.37	4498.02	4368.17	4320.98	5835.89	5225.36	292.48	233.27	222.86
42.58	1.98	0.22	322.10	34.08	11.92	444.26	6109.15	4571.38	4438.89	4391.04	5938.36	5309.79	292.37	235.88	194.66
40.52	1.99	0.23	314.28	34.07	11.92	445.98	6182.26	4624.40	4489.96	4441.65	6013.10	5370.75	292.37	238.60	187.40
41.15	1.95	0.22	316.78	34.09	11.92	446.82	6213.44	4646.80	4511.48	4462.99	6045.45	5396.42	292.48	240.09	191.23
44.81	1.83	0.19	330.99	34.13	11.92	447.37	6237.05	4663.91	4527.96	4479.32	6069.62	5416.09	292.48	241.93	209.01
46.09	1.68	0.17	336.27	34.18	11.92	446.98	6220.52	4651.93	4516.42	4467.88	6052.70	5402.32	292.48	242.37	214.41
47.10	1.77	0.18	339.83	34.16	11.92	447.59	6246.50	4670.76	4534.55	4485.85	6079.30	5423.96	292.48	242.77	219.99
41.88	2.24	0.26	318.68	34.00	11.92	451.21	6400.23	4782.08	4641.72	4592.06	6236.88	5551.87	292.48	245.20	200.29
29.02	2.49	0.32	269.28	33.89	11.92	456.32	6616.36	4938.20	4791.94	4740.95	6459.22	5731.11	292.54	251.46	143.30
31.97	2.39	0.30	280.74	33.93	11.92	459.15	6739.78	5027.39	4877.76	4826.01	6586.12	5833.53	292.48	256.95	160.73
33.93	2.51	0.31	287.79	33.90	11.92	458.82	6725.50	5017.09	4867.85	4816.19	6571.40	5821.70	292.48	255.48	170.24
39.30	2.82	0.35	307.19	33.83	11.92	456.65	6632.73	4950.13	4803.45	4752.35	6475.84	5744.85	292.48	249.68	194.56
43.29	2.72	0.33	322.54	33.87	11.92	455.43	6576.24	4909.12	4763.93	4713.19	6418.18	5697.68	292.59	248.34	212.49
42.87	2.79	0.34	320.76	33.85	11.92	454.76	6547.75	4888.53	4744.12	4693.56	6388.87	5674.04	292.59	246.76	209.55
39.80	2.72	0.33	309.37	33.86	11.92	456.98	6642.77	4957.16	4810.15	4759.01	6486.65	5752.84	292.59	250.86	197.28
36.60	2.31	0.28	298.50	33.97	11.92	459.21	6735.82	5024.21	4874.61	4822.91	6582.77	5829.74	292.65	257.47	183.89

SUMS					AVERAGE	SUMS							
124769.14	410420.35	31776.37	463208.38	161092.79	4728.19	23632.02	2877.31	20754.71	74174.56	2889.46	220.56	11.65	
Energy Losses (kJ/kg of Dry Fuel)					Total Loss Rate								
Flue Gas Constituent						Total Loss	Chemical Loss 1	Sensible and Latent Loss	Total Output	Chem Loss 2	Grams Produced		
CO	N ₂	CH ₄	H ₂ O Comb	H ₂ O Fuel MC							CO	HC	
410.73	1260.05	116.23	1656.43	576.11	4400.39	0.00	0	0.00	0	0	0.00	0.00	
91.32	1453.86	-46.01	1676.26	576.91	4190.31	117.41	1	116.16	438	1	0.25	-0.02	
54.90	1739.63	-87.28	1684.95	578.35	4488.91	117.39	-1	118.24	401	-1	0.14	-0.04	
34.78	1593.14	-73.81	1691.51	581.11	4307.37	80.46	-1	81.19	290	-1	0.06	-0.02	
27.87	1596.48	-70.99	1698.28	583.54	4318.98	112.95	-1	114.07	405	-1	0.07	-0.03	
26.83	1585.05	-65.96	1703.18	585.42	4316.88	120.95	-1	122.05	434	-1	0.07	-0.03	
54.01	1592.25	-58.30	1697.51	583.76	4351.77	121.93	0	122.06	433	0	0.15	-0.03	
124.47	1837.50	-50.80	1694.92	583.15	4738.08	123.91	2	122.02	394	2	0.32	-0.02	
70.29	1857.01	-77.17	1697.66	583.10	4685.66	122.53	0	122.73	396	0	0.18	-0.04	
124.67	1819.11	-48.81	1694.90	583.22	4716.92	123.35	2	121.41	395	2	0.32	-0.02	
158.87	1729.81	-24.42	1692.99	583.48	4659.80	130.56	4	126.86	424	4	0.43	-0.01	
139.96	1728.75	-32.10	1694.64	583.76	4634.24	147.16	3	143.79	482	3	0.43	-0.02	
210.47	1568.74	15.16	1690.42	584.08	4543.50	127.30	6	121.07	428	6	0.57	0.01	
282.69	1594.65	44.83	1686.56	583.87	4673.38	122.21	8	113.76	396	8	0.72	0.02	
190.73	1840.30	-18.03	1694.59	584.27	4841.72	144.70	5	139.62	447	5	0.56	-0.01	
203.59	1525.66	18.48	1693.23	585.18	4489.87	142.58	7	135.62	486	7	0.63	0.01	
222.92	1622.87	19.78	1694.71	585.74	4636.83	147.24	8	139.65	482	8	0.69	0.01	
322.33	1580.66	67.79	1688.77	585.51	4722.90	132.33	11	121.55	423	11	0.88	0.03	
448.71	1638.05	119.40	1682.84	585.42	4966.56	120.60	14	106.99	360	14	1.06	0.05	
476.05	1682.00	127.95	1682.10	585.48	5057.56	170.05	20	150.01	496	20	1.56	0.08	
411.37	1675.86	98.96	1684.81	585.32	4959.20	185.27	19	166.46	555	19	1.50	0.07	
392.40	1606.57	96.79	1685.26	585.39	4850.49	163.09	16	146.86	503	16	1.29	0.06	
518.65	1507.86	164.31	1680.28	586.24	4913.45	183.56	25	158.38	557	25	1.89	0.11	
569.63	1414.34	197.47	1679.51	587.24	4878.74	173.15	27	146.28	530	27	1.97	0.13	
572.89	1395.93	201.89	1681.11	587.97	4865.79	172.69	27	145.56	530	27	1.98	0.13	
561.43	1413.78	195.77	1682.66	588.28	4873.24	163.85	25	138.73	502	25	1.84	0.12	
525.62	1482.62	174.21	1685.70	588.51	4907.60	165.01	23	141.80	501	23	1.72	0.10	
482.82	1502.40	152.93	1687.58	588.35	4870.85	172.87	22	150.61	530	22	1.67	0.10	
507.72	1524.41	162.78	1687.23	588.60	4933.51	193.52	26	167.58	584	26	1.94	0.11	
644.95	1463.40	232.58	1683.89	590.13	5060.44	217.41	37	180.22	634	37	2.70	0.18	
716.62	1276.64	283.60	1684.34	592.26	4948.23	203.34	41	162.82	611	41	2.87	0.21	
688.40	1354.86	266.46	1689.72	593.48	5010.61	196.55	37	159.63	581	37	2.63	0.19	
723.64	1386.07	279.64	1687.85	593.34	5096.27	199.91	39	161.11	577	39	2.76	0.20	
811.86	1459.88	312.00	1681.65	592.43	5302.06	158.46	33	125.35	434	33	2.36	0.17	
783.36	1520.21	293.35	1682.12	591.87	5331.74	119.51	24	95.72	325	24	1.71	0.12	
802.30	1505.51	302.57	1680.30	591.58	5338.58	169.53	35	134.93	460	35	2.48	0.17	
781.63	1472.30	297.56	1683.53	592.52	5275.68	206.95	42	165.21	570	42	2.98	0.21	
665.01	1439.62	249.17	1691.51	593.44	5080.12	227.74	40	187.35	660	40	2.90	0.20	



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Mr. Ken Morgan
Technical Services Director
OMNI-Test Laboratories, INC
Post Office Box 301367
Portland, Oregon, 97294

01/21/2025

Dear Mr. Morgan,

This letter is a modification of my original response letter dated December 13, 2024. This modification is made to include approval to use this alternative 40 CFR part 60, Subpart QQQQ - Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces (Subpart QQQQ). The approval to also use this alternative on central heaters under Subpart QQQQ should have been included in the original response letter. These letters are written in response to your emails and letter dated November 20, 2023, requesting that the Environmental Protection Agency approve for use an alternative test method (ATM) for demonstrating compliance with New Source Performance Standard (NSPS) Subpart AAA, Standards of Performance for New Residential Wood Heaters (Subpart AAA). Specifically, the filter weighing procedures as outlined in ASTM E2515-11 to determine compliance for wood heaters under 40 CFR Part 60. 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.

Your letter outlines concerns with the gravimetric analysis of the pair of filters used to capture particulate during each compliance test. Specifically, you state that the method suggests that weighing filters and filter assemblies in pairs will reduce measurement error, but that the method provides direction inconsistent with achieving error reduction.

As detailed in your letter ASTM E2515-11 section 9.4.4 states:

"9.4.4 Desiccate the filters, filter gaskets, and the probe assemblies at 20 +/- 5.6°C (68 +/- 10°F) and ambient pressure for at least 24 h. Weigh each component at intervals of not less than 6 h until a constant weight is achieved. Record results to the nearest 0.1 mg. During each weighing, the period for which the components are exposed to the laboratory environment shall be less than 2 min. The filter gaskets can be weighed in sets to be used in each filter holder and kept in an identified container at all times except during sampling and weighing. The filter holder assembly after the front filter need not

be desiccated or weighed.”

As shown above, section 9.4.4 states that “...the filter gaskets may be weighed in pairs”, however it does not say that you may do so for the filter tares.

In contrast, section 10.2.1 of ASTM E2515-11 states:

“10.2.1 Desiccate the filters and filter gaskets at 20 +/- 5.6°C (68 +/-10°F) and ambient pressure for at least 24 h. Weigh each component at intervals of at least 6 h until a constant weight is achieved. Report the results to the nearest 0.1 mg. Filters and filter gaskets may be weighed directly without a Petri dish. They may be weighed in pairs (front and back filters and front and back filter gaskets from same filter train) to reduce handling and weighing errors. During each weighing, the components shall not be exposed to the laboratory atmosphere for longer than 2 min. For the room air background sample filter and filter gasket, treat negative particulate catch weights as “zero” when determining total room air particulate weight in accordance with 10.2.”

Additionally, you point out that section 10.2.1 allows, during post-test analysis, the filters to be weighed in pairs. You also assert that not only does this section state that filters may be weighed in pairs, but it also expresses that it is advantageous to do in order to reduce handling and weighing errors.

Furthermore, during our recent discussions of this issue, you pointed out that since ASTM E2515-11 does not specify that filters may be weighed in pairs during pre-test processing, doing so would likely lead to concerns regarding whether proper procedures were being followed. Also, in response to our inquiry of whether ASTM E2515-11 could be followed as written, where one would weigh both filters independently during pre-test processing (clause 9.4.4) and in pairs during post-test processing (section 10.2.1), you point out that this defeats the intent of section 10.2.1 in that more measurements are being performed than necessary and this goes against the stated intent of reducing handling and weighing errors.

It is your opinion, given the language in ASTM E2515-11 discussed above, that the authors originally intended that both filter gaskets and filters should be weighed in pairs during both pre-test and post-test procedures in order to reduce such errors (as evidenced by the language in section 10.2.1). Based on this, you are asking for consideration and approval of an alternative test method that would allow pre-test processing (taring) of filters in pairs as is currently allowed for filter gaskets in section 9.4.4. As you state, you seek this alternative because the errors imposed by the extra weighing of independent filters can account for a very high degree of error on today’s cleaner stoves where a ± 0.1 mg of measured catch can mean ± 0.2 grams of emissions under ordinary conditions. In light of these circumstances, we agree that appropriate paired weighings must be done during both pre and post test weighings.

We have reviewed your request to perform the pre-test processing (taring) of filters in pairs as is currently allowed for filter gaskets in section 9.4.4 when conducting testing of wood heaters under Subpart AAA. Because of the similarities in the requirements, we are also approving this alternative for use on central heaters under Subpart QQQQ. This approval is contingent on the following conditions:

- All of the pieces of the filter and filter assemblies that are tared together during pre-test assessment must also be weighed together when the post-test gravimetric assessment is made and the results of these assessments must be recorded to the nearest 0.1 mg. Please note that this alternative method approval is valid until such time that Subpart AAA and QQQQ are revised or replaced to require a different certification method, and at such time, this alternative will be reconsidered and possibly withdrawn. A copy of this letter must be included in each certification test report where this alternative test method is utilized.

Since this alternative test method may be of interest to others performing testing as described in ASTM2515-11 on wood heaters subject to 40 CFR 60, Subpart AAA or central heaters subject to Subpart QQQQ, we believe it is reasonable to make it broadly applicable. Therefore, we will post this letter as ALT-154 on the EPA website at <https://www.epa.gov/emc/broadly-applicable-approved-alternative-test-methods> for use by other interested parties.

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

Sincerely,

Steffan M. Johnson, Group Leader
Measurement Technology Group

cc: Shannon Banner, EPA/OAQPS/SPPD
Lessard, Patrick, EPA/OAQPS/SPPD
Rafael Sanchez, EPA/OECA
Robert Scinta, EPA/OECA
Michael Toney, EPA/OAQPS/AQAD
Mark Turner, EPA/OAQPS/SPPD
Richard Wayland, EPA/OAQPS/AQAD

Appendix B: Labels & Manuals

Owner's Manual

Operation & Care

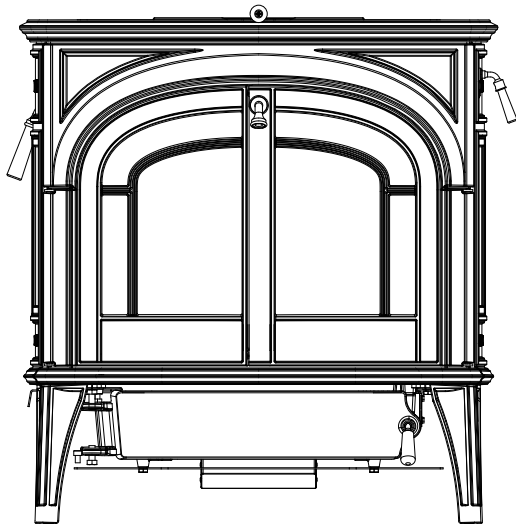
INSTALLER: Leave this manual with party responsible for use and operation.

OWNER: Retain this manual for future reference.

Contact your dealer with questions on installation, operation, or service.

VERMONT CASTINGS™
BY FORGE & FLAME

Dauntless-C Wood Stove



Installation and service of this appliance should be performed by qualified personnel. Hearth & Home Technologies recommends HHT Factory Trained or NFI certified professionals.



This heater meets the U.S. Environmental Protection Agency's emission limits for wood heaters sold on or after May 15, 2020.

WARNING



If the information in these instructions is not followed exactly, a fire may result causing property damage, personal injury, or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not over fire - If appliance or chimney connector glows, you are over firing. Over firing will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may cause house fire.

WARNING



HOT SURFACES!

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

Hot glass will cause burns.

- Do not touch glass until it is cooled
- NEVER allow children to touch glass
- Keep children away
- CAREFULLY SUPERVISE children in same room as fireplace.
- Alert children and adults to hazards of high temperatures
- **High temperatures may ignite clothing or other flammable materials.**
- Keep clothing, furniture, draperies and other flammable materials away.

NOTE

To obtain a French translation of this manual, please contact your dealer or visit www.vermontcastings.com

Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez www.vermontcastings.com

Congratulations on Your Purchase of the Dauntless-C Wood Stove

Thank you for choosing the Dauntless-C Wood Stove from Forge & Flame. We take pride in American craftsmanship, and your cast-iron stove has been built with precision and care to deliver years of reliable performance.

As you get to know your new stove, you'll appreciate how its timeless cast-iron design not only adds character to your space but also provides exceptional functionality. Cast iron's unique ability to absorb and radiate heat ensures efficient and consistent warmth.

Forge & Flame wood stoves are among the cleanest-burning models available today. However, achieving optimal performance depends not only on the quality of the stove but also on how it's operated. Please read this manual carefully to ensure you understand the proper use and maintenance of your stove.

We are committed to your satisfaction and support. That's why we work exclusively with a trusted network of Authorized Dealers, selected for their expertise and dedication to customer service. If you have questions about your stove or its performance, don't hesitate to contact your dealer.

This manual contains essential instructions for operating and maintaining your Dauntless-C Wood Stove. We encourage you to read it thoroughly and keep it on hand as a reference throughout the life of your appliance.

Please read this entire manual before you install and use your new stove. Failure to follow instructions may result in property damage, bodily injury, or even death.

Note: Cast iron is an artisan-crafted material, produced using techniques that date back nearly 2,000 years. Due to the inherently primitive nature of the casting process, slight variations between parts are normal and contribute to the unique character of a hand-built cast iron appliance.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage.

For assistance or additional information, consult a qualified installer, service agency or your dealer.

Serial No.

Model Name

Test Lab & Report No.

MODEL / MODÈLE: "Dauntless-C"
Case sold for room heater
 Homologue poêle à combustible solide
 Suitable for Mobile-home installation - USA Only

Serial No.
N° de série:

BARCODE LABEL

Tested and Listed by OMNI-Test Laboratories, Inc.
Report #Rapport #0001
Tested to / Testé à: ASTM E2515, ASTM E2780, Method 8BR, UL 1482-2022, ULC S627 and CAN/CSA B415.1.
 Install and use only in accordance with manufacturer's installation and operation instructions. Contact local building or fire officials about restrictions and installation inspection in your area. Install only with legs provided in accordance with installation instructions.
WARNING: Risk of flame and smoke spillage. Do not obstruct the space beneath the heater.
 Fuel: Use with solid wood only. Do not burn other fuels.
 Build a fire directly on grate only. Do not elevate fire. Keep the doors fully closed.
Chimney: Use a minimum 6" diameter factory built high temperature (H.T.) chimney which is listed to UL-103-1985 (2100°F) or 8" X 8" nominal or larger approved masonry chimney with flue liner.
 Do not connect this unit to a chimney flue serving another appliance.
 Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur rapidly.
Chimney Connector: Use a minimum 6" diameter 24 gauge chimney connector. Install chimney connector at least 18" from ceiling. Refer to local building codes and installation manual for precautions for passing a chimney or chimney connector through a combustible wall or ceiling.
Floor Protection U.S.: Use a type 1, thermal RVU or greater or a noncombustible floor protector such as 1/4" non-asbestos mineral board or equivalent or 24 gauge sheet metal. The floor protector is required under the stove and must extend 16" from the front, 8" from the sides and rear. It must extend under the chimney connector and 2" to either side. The floor protector may be covered with a noncombustible decorative material if desired.
Floor Protection Canada: When installed on a combustible floor, a noncombustible floor protector is required under the heater. The floor protector must extend 457 mm (18 in.) to the front and 203 mm (8 in.) to the sides and rear.
Optional Components: Fan Kit Part No. 1-10-586167, 115V 60Hz 1.1 FLA
 Replace glass only with 5mm ceramic glass.
 Do not remove or cover this label.
CAUTION: Burning of materials other than the specified fuels may make the Catalyst in the combustor inactive. The combustor is fragile, handle carefully. The durability of the catalytic device has not been evaluated as part of the certification.
Danger, Risk of electrical shock. Disconnect power before servicing unit.
 Combustion air cannot be obstructed. Damper must be open before opening doors.
 Do not overfill. Glowing parts indicate overfiring.
 The space heater must be installed with the legs provided, attached as shown in the installation instructions.

US ENVIRONMENTAL PROTECTION AGENCY
 Certified to comply with 2020, particulate emissions standards using cord wood at 1.7 g/hr. This wood heater contains a combustor which needs periodic inspection and replacement for proper operation. Consult the Owner's Manual for further information. The Environmental Regulations to operate this wood heater in a manner consistent with operating instructions in the Owner's Manual.

VERMONT CASTINGS
BY FORGE & FLAME
 Made in U.S.A. of US and imported parts / Fabriqué aux États-Unis d'Amérique par des pièces d'origine américaine et pièces importées.

Minimum Clearances to combustible Construction /
Minimum De Déplacement Jusqu'à la construction combustible
 The clearances shown below are for use with single wall connector pipe

A = Unit to Sidewall	14"	A = Entre le mur latéral et l'appareil	357 mm
B = Unit to Backwall	14"	B = Entre le mur arrière et l'appareil	357 mm
C = Chimney Connector to Sidewall	23.5"	C = Entre le tuyau et le mur latéral	597 mm
D = Chimney Connector to Backwall	15"	D = Entre le tuyau et le mur arrière	381 mm
E = Unit to Adjacent Wall	15"	E = Entre le mur adjacent et l'appareil	381 mm
F = Sides (Floor Protection)	6"	F = Côtés (la protection de plancher)	152 mm
G = Front Glass (Floor Protection)	16"	G = Devant, par rapport au verre	457 mm
H = Rear (Floor Protection)	6"	H = Arrière (la protection de plancher)	152 mm
I = Top of Stove to Ceiling	57.5"	I = du haut du poêle au plafond	1461 mm
J = Chimney Connector to Ceiling	18"	J = raccord de cheminée au plafond	457 mm

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

ATTENTION: CHAUD LORS DU FONCTIONNEMENT. NE TOUCHEZ PAS L'APPAREIL-GARDEZ LES ENFANTS ET LES VÊTEMENTS ÉLOIGNÉS-TOUT CONTACT PEUT ENTRAÎNER DES BRÛLURES DE LA PEAU. RÉFÉREZ-VOUS À LA PLAQUE SIGNALÉTIQUE ET AU MODE D'EMPLOI. GARDEZ LE MOBILIER ET LES AUTRES MATÉRIEAUX COMBUSTIBLES BIEN À L'ÉCART DE L'APPAREIL.

Year Code

25	26	27	28
29	30	31	32
33	34	35	36

Date of Manufacture / Date de fabrication:

JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
-----	-----	-----	-----	-----	------	------	-----	------	-----	-----	-----

Manufactured by / Fabriqué par: Hearth and Home Technologies 352 Mountain House Road, Halifax PA 17032

8223-930A

Mfg. Date



Safety Alert Key:

- **DANGER!** Indicates a hazardous situation which, if not avoided will result in death or serious injury.
 - **WARNING!** Indicates a hazardous situation which, if not avoided could result in death or serious injury.
 - **CAUTION!** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
 - **NOTICE:** Indicates practices which may cause damage to the appliance or to property.
-

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➔ = Contains updated information

A. Warranty Policy

Hearth & Home Technologies LLC

LIMITED WARRANTY

Hearth & Home Technologies LLC ("HHT") extends the following warranty for HHT gas, wood, pellet and electric hearth appliances (each a "Product" and collectively, the "Product(s)") and certain component parts set forth in the table below ("Component Part(s)") that are purchased from a HHT authorized dealer or distributor.

WARRANTY COVERAGE:

HHT warrants that the Products and their Component Parts will be free from defects in materials and workmanship for the applicable period of Warranty coverage set forth in the table below ("Warranty Period"). If a Product or Component Parts are found to be defective in materials or workmanship during the applicable Warranty Period, HHT will, at our discretion, repair the applicable Component Part(s), replace the applicable Component Part(s), or refund the purchase price of the applicable Product(s). The maximum amount recoverable under this Warranty is limited to the purchase price of the Product. This Warranty is transferable from the original purchaser to subsequent owners, but the Warranty Period will not be extended in duration or expanded in coverage for any such transfer. This Warranty is subject to conditions, exclusions, and limitations as described below.

WARRANTY PERIOD:

Warranty coverage begins at the date of installation. In the case of new home constructions, Warranty coverage begins six months after invoice of the final sale of the Product(s) by an independent, authorized HHT dealer or distributor. However, the Warranty coverage shall commence no later than 24 months following the date of Product shipment from HHT, regardless of the installation or purchase date.

Warranty Period		HHT Manufactured Appliances and Venting				
Component Parts	Labor	Gas	Pellet	Wood	Electric	Component Parts Covered by this Warranty
1 Year		X	X	X		All parts including handles, external enameled components and other material except as covered by Warranty Conditions, Warranty Exclusions, and Warranty Limitations listed
2 Years					X	All parts except as covered by Warranty Conditions, Warranty Exclusions, and Warranty Limitations listed
			X	X		Glass, Electrical components limited to heating element/igniters, Top feed auger assembly, Blowers, Junction Box, Remotes/Wall switches, linear actuator, power cord, vacuum switch, snap disc, wire harnesses and thermocouple
		X				Electrical components limited to modules, remotes/wall switches, valves, pilots, blowers, junction boxes, wire harnesses, transformers and lights (excluding light bulbs)
		X		X		Cement Refractory Panels, Glass Liner Panels
3 years			X			Firepots, burnpots, Harman mechanical feeders
5 years		X		X		Catalysts, Vented and Vent Free burners and logs
10 years	1 year	X				Burners, logs and metal/fiber refractory components of HHT manufactured fireplaces or stoves, venting due to poor workmanship
10 years	3 years		X	X		Castings, Medallions & Baffles, FlexBurn® System (engine, inner cover, access cover and fireback), Firebox and heat exchanger, HHT Chimney & Terminations, Manifolds
20 years	3 years	X				Firebox and heat exchanger
All purchased replacement parts and optional accessories						
1 Year	None	X	X	X	X	All purchased replacement parts and optional accessories

WARRANTY CONDITIONS:

- Because HHT cannot control the quality of any Products sold by unauthorized sellers, this Warranty only covers Products that are purchased through an HHT authorized dealer or distributor unless otherwise prohibited by law; a list of HHT authorized dealers is available on the HHT branded websites.
- This Warranty is only valid while the applicable Product remains at the site of original installation.
- This Warranty is only valid in the country in which the HHT authorized dealer or distributor that sold the applicable Product is authorized to sell applicable Product.
- Contact your installing distributor or dealer for Warranty service. If the installing dealer or distributor is unable to provide necessary parts, contact the nearest HHT authorized dealer or supplier. Additional service fees may apply if you are seeking Warranty service from a dealer other than the dealer from whom you originally purchased the applicable Product.
- No HHT consumer should bear cost of warranty service or costs incurred while servicing warranty claims (i.e., travel, gas, or mileage) when the service is performed within the terms of this Warranty. Check with your dealer or distributor in advance for any costs to you when arranging a warranty call. Travel and shipping charges for parts are not covered by this Warranty.

WARRANTY EXCLUSIONS:

This Warranty does not cover the following:

- Changes in surface finishes as a result of normal use. As a heating appliance, some changes in color of interior and exterior surface finishes may occur. This is not a flaw and is not covered under the Warranty.
- Damage to printed, plated, or enameled surfaces caused by fingerprints, accidents, misuse, scratches, melted items or other external sources and residues left on the plated surfaces from the use of abrasive cleaners or polishes.
- Repair or replacement of parts that are subject to normal wear and tear during the Warranty Period are not covered. These parts include: paint, wood and pellet gaskets, firebricks, wood grates, flame guides, batteries and the discoloration of glass.
- Minor expansion, contraction, or movement of certain parts causing noise. These conditions are normal and complaints related to this noise are not covered by this Warranty.
- Damages resulting from: (1) failure to install, operate, or maintain the applicable Product in accordance with the installation instructions, operating instructions, and listing agent identification label furnished with the applicable Product; (2) failure to install the applicable Product in accordance with local building codes; (3) shipping or improper handling; (4) improper operation, abuse, misuse, continued operation with damaged, corroded or failed components, accident, or improperly/incorrectly performed repairs; (5) environmental conditions, inadequate ventilation, negative pressure, or drafting caused by tightly sealed constructions, insufficient make-up air supply, or handling devices such as exhaust fans or forced air furnaces or other such causes; (6) use of fuels other than those specified in the operation instructions; (7) installation or use of components not supplied with the applicable Product or any other components not expressly authorized and approved by HHT; (8) modification of the appliance not expressly authorized and approved by HHT in writing; and/or (9) interruptions or fluctuations of electrical power supply to the applicable Product.
- Non-HHT venting components, hearth connections or other accessories used in conjunction with the applicable Product.
- Any part of a pre-existing fireplace system in which an insert or a decorative gas applicable Product is installed.
- HHT's obligation under this Warranty does not extend to the Product's capability to heat the desired space. Information is provided to assist the consumer and the dealer in selecting the proper Product for the application. Consideration must be given to the Product location and configuration, environmental conditions, insulation and air tightness of the structure.

This warranty is void if:

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

LIMITATIONS OF REMEDIES AND LIABILITY:

- **EXCEPT TO THE EXTENT PROVIDED BY LAW, HHT MAKES NO EXPRESS WARRANTIES OTHER THAN THE WARRANTY SPECIFIED HEREIN. The owner's exclusive remedy and HHT's sole obligation under this Warranty or in contract, tort or otherwise, shall be limited to, at HHT's sole option, replacement of the Component Part(s), repair of the Component Part(s), or refund of the original purchase price of the applicable Product(s). In no event will HHT be liable for any incidental or consequential damages caused by defects in the applicable Product. Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights and you may also have other rights which vary from State to State. THE DURATION OF ANY IMPLIED WARRANTY IS LIMITED TO DURATION OF THE EXPRESSED WARRANTY SPECIFIED ABOVE FOR THE APPLICABLE PRODUCT. Some States do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.**

1 Product Listing and Important Safety Information

A. Appliance Certification

MODEL:	Dauntless-C Wood Stove
LABORATORY:	PFS-TECO, OMNI-Test Laboratories Inc.
REPORT NO.	24-291, 0061WS104S
TYPE:	Solid Fuel Type Room Heaters
STANDARD(s):	ASTM E2515, ASTM E2780, Method 28R, UL 1482-2022, ULC S627 and CAN/CSA B415.1

B. BTU & Efficiency Specifications

EPA Report #:	
EPA Certified Emissions:	1.7 g/hr
*LHV Tested Efficiency:	81%
**HHV Tested Efficiency:	75%
***EPA BTU Output:	13,600 - 21,400
****Peak BTU/Hour Output:	36,900
Vent Size:	6 Inch (152 mm)
Firebox Size:	1.8 cu. ft.
Outside Air Size:	3 Inch
Recommended Length:	16 Inch
Max. Wood Length:	18 Inch
Fuel Orientation:	East, West
Fuel	Seasoned Cordwood (20% moisture or less)
*Weighted average LHV efficiency using Douglas Fir dimensional lumber and data collected during EPA emissions test.	
**Weighted average HHV efficiency using Douglas Fir dimensional lumber and data collected during EPA emissions test.	
***Efficiencies are based on test results calculated using B415; these calculated efficiencies are then used to calculate output BTU's.	
****A peak BTU out of the appliance calculated using the maximum first hour burn rate from the High EPA Test and the BTU content of cord wood (8600) times the efficiency.	

The Vermont Castings Dauntless-C Wood Appliance meets the U.S. Environmental Protection Agency Certified to comply with the 2020 particulate emission standards.



NOTE: Hearth & Home Technologies, manufacturer of this appliance, reserves the right to alter its products, their specifications and/or price without notice.

Vermont Castings by Forge & Flame is a registered trademark of Hearth & Home Technologies.

C. California



WARNING

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

D. Mobile Home Approved (USA ONLY)

- This appliance is approved for mobile home installations in the USA when not installed in a sleeping room and when an outside combustion air inlet is provided.
- The structural integrity of the mobile home floor, ceiling, and walls must be maintained.
- The appliance must be properly grounded to the frame of the mobile home with #8 copper ground wire, and chimney must be listed to UL103 HT or a listed UL-1777 full length six inch (152mm) diameter liner must be used.
- Mobile Home Brackets must be installed in a mobile home installation. (supplied with stove)

E. Glass Specifications

This appliance is equipped with 5mm ceramic glass. Replace glass only with 5mm ceramic glass. Please contact your dealer for replacement glass.



WARNING



Fire Risk.

Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by, the following actions:

- Installation and use of any damaged appliance.
- Modification of the appliance.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.
- Operating appliance without fully assembling all components.
- Operating appliance without legs attached (if supplied with appliance).
- Do NOT Overfire - If appliance or chimney connector glows, you are overfiring.

Any such action that may cause a fire hazard.

2 Operating Instructions

A. The Dauntless-C Controls

In the United States it is against the law to operate this wood heater in a manner inconsistent with the operating instructions in this manual.

Two controls regulate the performance of the Dauntless-C: a **primary air control** supplies oxygen for the fire, and a **damper** directs air flow within the stove to activate and deactivate the combustion system, Figure 2.1.

Symbols on the stove are reminders of the correct directions for using the controls. The words 'Left' and 'Right' in these directions are *facing the stove*.

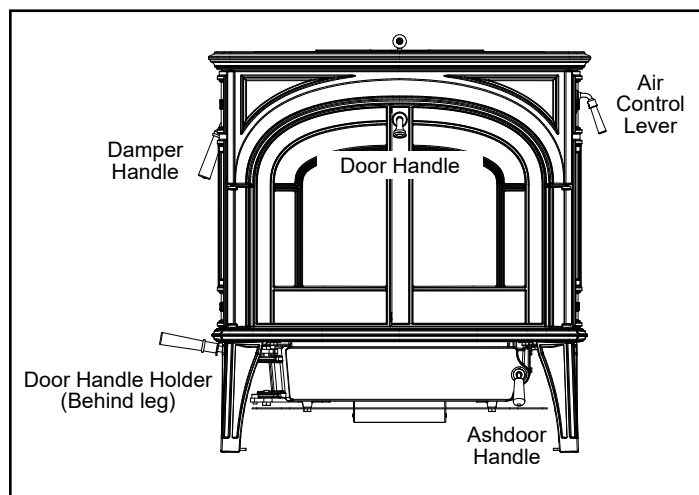


Figure 2.1 - The Dauntless-C controls are conveniently located and easy to operate.

A Single Air Control Regulates Heat Output and Burn Time: The **primary air control lever**, on the right of the stove, controls the amount of incoming air for starting, maintaining, and reviving a fire.

Once the air control is manually set, a bi-metallic thermostat automatically maintains the heat output at a constant level for a more even heat over the life of the burn.

More air entering the stove makes the fire burn hotter and faster, while less air prolongs the burn at a lower heat output level.

For the greatest air supply and maximum heat output (but the shortest burn time), move the lever toward the front of the stove. For a fire that will last longer with less heat, move the lever toward the rear of the unit, Figure 2.2.

**WARNING**

This wood heater has a manufactured-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.

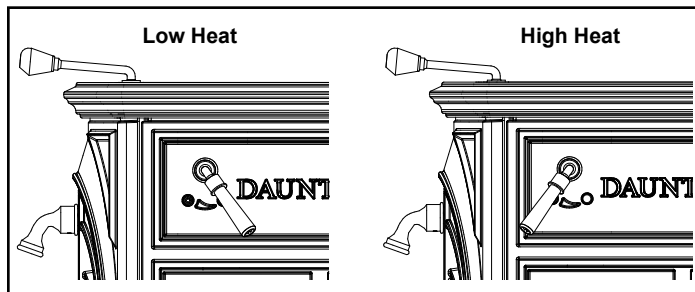


Figure 2.2 - The handle may be positioned anywhere between the two extremes for different heat levels.

A Damper Directs Air Flow Within the Stove:

The **damper handle** on the left side of the stove operates the damper to direct air flow within the stove.

The damper is **open** when the handle points to the **rear**, enabling smoke to pass directly into the chimney. The damper must be open when starting or reviving a fire, and whenever the griddle or doors are opened.

The damper is **closed** when the handle points **down**. Smoke travels through the secondary combustion system where it can be further burned, before passing up the chimney, Figure 2.3.

The damper should always be either fully open or fully closed. There are no intermediate positions. When closing the damper, be sure to pull firmly enough to snap the handle into the locked position.

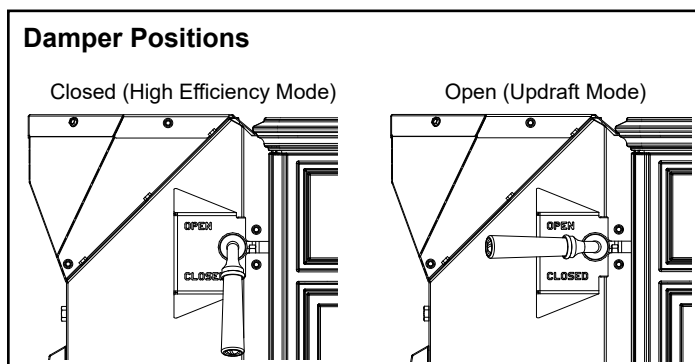


Figure 2.3 - The damper is either open or closed. There are no intermediate positions.

B. Conditioning Your Stove

Cast iron is extremely strong, but it can be broken with a sharp blow from a hammer or from the thermal shock of rapid and extreme temperature change.

The cast plates expand and contract with changes in temperature. When you first begin using your Dauntless-C, minimize thermal stress by letting the plates adjust gradually during three or four initial break-in fires.

C. Wood Burning Operation

Burn only solid wood in the Dauntless-C Wood Stove, and burn it directly on the grate. Do not elevate the fuel. Do not burn coal or other fuels. In the United States, it is against the law to operate this wood heater in a manner inconsistent with operating instructions in this manual.

The bypass damper must be open when starting a fire or when refueling.

Do not use chemicals or fluids to start the fire. Do not burn garbage. Never use flammable fluids such as gasoline, gasoline type lantern fuel, kerosene, charcoal lighter fluid, naphtha, engine oil or similar liquids to start or "freshen up" a fire in this heater. Keep all such liquids well away from the heater while it is in use.

The following procedures are important for reliable, clean and efficient operation of your woodstove. Recommend 16" logs Properly seasoned (up to a year for denser woods) Split to 3" to 6" cross sections

Cold start: When starting your stove at room temperature and when no burning coals are present the following kindling procedure has been found to be the most reliable.

Stack about 4 lbs of finely split kindling (1" diameter or less 10 to 20 pcs) in a 'log cabin' style directly against the rear wall. Place a small amount of newspaper on top of this pile with one or two small pieces of kindling on top. This is referred to as a top down method and while providing a slower start, also serves to preheat the combustion properly resulting in a reliable start., Figure 2.4.

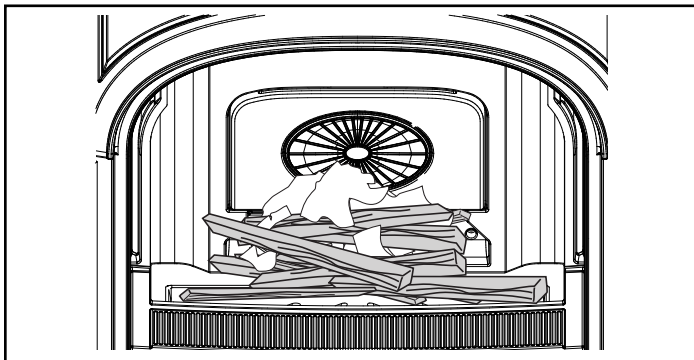


Figure 2.4 - Start the fire with newspaper and dry kindling.

With the bypass damper open and the primary air set to its highest position, light the newspaper. Leave the front door cracked until the kindling ignites, then close the doors.

After most of the kindling has burned into coals (15 to 20 minutes), open the front doors and push remaining coals and unburned wood against the rear wall. Add several pieces of larger split wood between 2 to 3 inches in diameter (about 6 lbs) directly against the rear wall and on top of the kindling coals. Close the doors and bypass to engage the combustion system. The air should remain on high for up to one hour or until the wood is mostly converted to coals.

After a hot bed of coals is produced, open the door and bypass damper and push the remaining coals again toward the rear wall. Add large pieces of wood starting against the rear wall and on top of the coals (4 to 5 pcs). Note: The stove is designed to be filled to the top. Close the doors and bypass immediately after loading the stove.

Ideally, allow this wood load to burn at the highest air setting for the entire wood load. If this is not possible, the wood should burn for at least 30 minutes prior to reducing the primary air setting.

D. Ways to Add Fuel

The griddle lifts for convenient top-loading of logs, and is the easiest way to add fuel, Figure 2.5.

However, the front doors open as well for adding an occasional log to the fire. The Dauntless-C Wood Stove is not approved for operation with the front doors open.

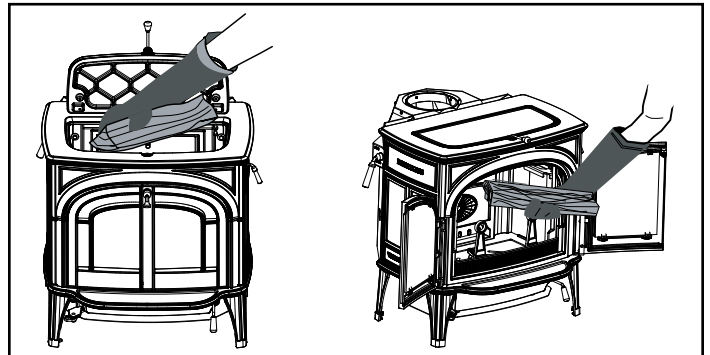


Figure 2.5 - Top loading is the best way to add fuel during regular use. Front loading is useful for kindling a fire.

To open the front doors, insert the handle into the door latch stub and turn it clockwise, Figure 2.6.

To close them, always close the left door first. Turn the handle in the right door to the left and up (to the open position) and close it. Finally, push on the door as you turn the handle counterclockwise. The doors will draw in slightly, and the handle should offer some resistance as you turn it to the closed position.

To reduce the risk of breaking the glass, avoid striking the glass or slamming the doors.

When you are not using the door handle, store it in the holder behind the right front leg of the stove.

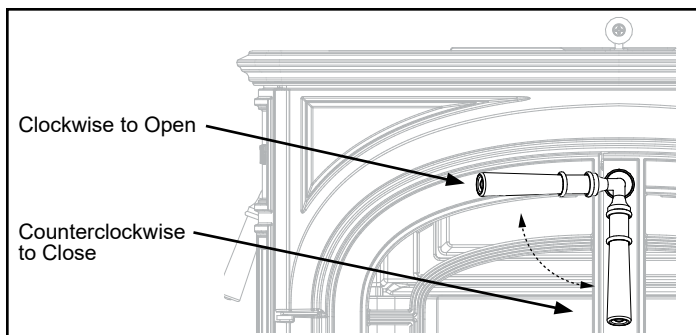


Figure 2.6 - To open the front doors, turn the handle clockwise.

For best results when refueling, wear long-cuffed stove gloves to protect your hands and forearms.

Reloading a hot stove: When a wood load is added to a hot bed of coals (continuous use), open the bypass damper and either the top or front loading doors. Stir the hot coals to allow ash to fall through the grate. Hot coals should then be pushed against the rear wall and leveled depending on the amount of coals. Add fresh wood and close the loading door and bypass damper. If the coals are glowing and hot, it is possible to set the air control to any setting immediately after loading the stove.

Reloading a warm stove: If the stove is relatively cold (for instance after a long overnight burn), the coal bed may need to be re-energized prior to adding a large load of wood. Open the bypass damper and either the top or front loading door. Stir the coals to allow ash to fall through the grate. Push the remaining coals toward the rear wall. Close the door(s) and bypass damper and set the primary air to the highest position. Allow the coals to re-ignite and heat the system for 10 to 15 minutes. Once the coals are glowing, a fresh batch of wood may be added following the “hot stove” procedure above.

A proper bed of coals is critical to the performance of the Dauntless stove. The rear refractory wall of the stove should be almost entirely white in color with proper operation. This indicates the combustion system is running at a proper elevated temperature. If the rear wall is black with creosote or develops a dark brown color, it is likely that the coal bed is not sufficiently large enough or hot enough. Revisit the above instructions and adjust the amount of kindling or time at high air settings to get the system hotter. Wood size or excessive moisture may also cause lower than desirable stove temperatures.

While not required, operating your stove with the combustor installed creates optimum conditions for secondary combustion and will increase your efficiency up to 15% on low burn, making sure you get the most heat out of each load of wood.

The catalytic combustor is a “honeycomb” coated with the catalytic material. The combustor sits at the bottom of the secondary combustion chamber. Smoke, gases and particulates that are not fully combusted during the secondary combustion process pass through the catalyst, creating a tertiary burn. This results in higher efficiency and lower emissions.

The catalyst will initiate combustion of smoke and particulates at 500° - 600°F (260° - 315°C), half the temperature normally required for unaided secondary combustion. If you followed the startup operation steps in the previous section the stove will be sufficiently hot to allow the catalytic combustor to work. Once the catalytic combustor starts working, heat generated by burning the smoke will keep it working.

To determine whether the catalytic combustor is operating, refer to the temperature probe which shows the operating range of the catalytic combustor. This is located on the back of the stove and is viewed from the top.

NOTE: It will take several minutes after closing the bypass damper for the temperature probe to fully adjust to the new temperature. If the probe indicator is below the operate catalyst range, add fuel or open the bypass damper to allow the fire to further build before engaging the catalyst again.

If the probe indicator is above the operate catalyst range, the catalytic combustor is running too hot and may be damaged. In many cases, decreasing the primary air can reduce the catalyst temperature and adding less wood with each loading can also help if overheating is persistent. Do not add wood to the stove if the probe reads above the operate catalyst range.

Avoid using a full load of very dry wood in the firebox, such as dry slab wood or wood with below 14% moisture content. This may result in continuous very high temperatures in the secondary combustion area and damage the catalytic combustor.

Never burn treated wood, garbage, solvents or trash. All of these may poison the catalyst and prevent it from operating properly. Never burn cardboard or loose paper except for kindling purposes. Never burn coal; doing so can produce soot or large flakes of char or fly ash that can coat the catalytic combustor and cause smoke to spill into the room. Coal smoke can also poison the catalyst so that it won't operate properly.

NOTE: The catalytic combustor is fragile and will crack if subjected to thermal shock. Thermal shock can occur when refueling with wet wood or closing the bypass damper too early after refueling.



WARNING

DO NOT OPERATE THE STOVE WITH THE ASH DOOR OPEN. OPERATION WITH THE ASH DOOR OPEN CAN CAUSE AN OVER-FIRING CONDITION TO OCCUR. OVER-FIRING THE STOVE IS DANGEROUS AND CAN RESULT IN PROPERTY DAMAGE, INJURY OR LOSS OF LIFE.

Andirons Help Protect the Glass: Your stove has andirons to keep logs away from the glass panels. The andirons are essential to maintain clear fire viewing, and should be left in place. Since the andirons may slightly hinder refueling through the front doors, most stove owners will prefer the convenience of top loading through the griddle. Do not place fuel between the andirons and the doors.

Burn Only High-Quality Wood: The Dauntless-C is designed to burn natural wood only; do not burn fuels other than that for which it was designed.

IMPORTANT: Do not burn any type of artificial or synthetic materials such as fire starter logs (containing wax) in this appliance. Never burn liquid-based fuels such as kerosene, gasoline or alcohol.

Burning any materials not allowed in these instructions, or over-firing the stove, may void the warranty.

You'll enjoy the best results when burning wood that has been adequately air-dried. The wood should be 16" - 18" (406-457 mm) in length. Avoid burning "green" wood that has not been properly seasoned. (**Note:** Properly seasoned firewood has a moisture content below 20 percent.) Do not burn construction materials; they often contain chemicals and metals that can damage the inside surfaces of the stove and pollute the air. Do not burn ocean driftwood; when it burns, the salt it contains will attack the cast iron.

The best hardwood fuels include oak, maple, beech, ash, and hickory that has been split, stacked, and air-dried outside under cover for at least one year.

If hardwood is not available, you can burn softwoods that include tamarack, yellow pine, white pine, Eastern red cedar, fir, and redwood. These should also be properly dried.

Store split wood under cover to keep it dry. Even for short-term storage, be sure to keep wood a safe distance from the stove and keep it out of the areas around the stove used for refueling and ash removal.

Surface Thermometer is a Valuable Guide to Operation

An optional surface thermometer tells you when to adjust the air control, and when to refuel, Figure 2.7.

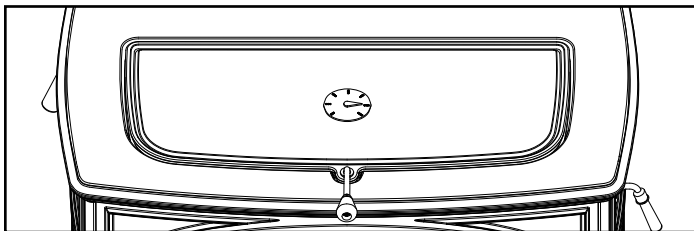


Figure 2.7 - Take temperature readings with a thermometer located in the middle of the griddle.

For example, when the thermometer registers at least 450°F (230°C) on the stove top after start-up you know the stove is hot enough and it may be time to close the damper if a sufficient ember bed has also been established. Note that the stove will warm up much sooner than the chimney, though; a warm chimney is the key to easy, effective stove operation. When thermometer readings drop below 350°F. (175°C) it's time to adjust the air control for a higher burn rate or to reload the stove. A temperature reading over 650°F. (340°C) is a sign to reduce the air supply to slow the burn rate.

Use the following temperature ranges as a guide:

- Readings in the 350°-500°F. (175°-260°C) range indicate low to medium heat output.
- 500°-600°F. (260°-315°C) readings indicate medium heat output.
- Readings of 600°-650°F. (315-340°C) indicate high heat output. Operating your Dauntless-C continuously at griddle temperatures higher than 650° F (340°C) may damage the cast iron or enamel finish.

Use the Air Control Settings that Work Best for You:

No single air control setting will fit every situation. Each installation will differ depending on the quality of the fuel, the amount of heat desired, and how long you wish the fire to burn; outdoor air temperature and pressure also affect draft.

The control setting also depends on your particular installation's "draft," or the force that moves air from the stove up through the chimney. Draft is affected by such things as the length, type, and location of the chimney, local geography, nearby obstructions, and other factors.

Too much draft may cause excessive temperatures in the Dauntless-C, and could even damage the stove. On the other hand, too little draft can cause backpuffing into the room and/or the "plugging" of the chimney.

How do you know if your draft is excessively high or low? Symptoms of too much draft include an uncontrollable burn or a glowing-red stove part. Signs of weak draft are smoke leaking into the room through the stove or chimney connector joints or low heat output.

In some newer homes that are well-insulated and weather-tight, poor draft may result from an insufficient air supply in the house. In such instances, an open window near the stove on the windward side of the house can provide the combustion air supply needed.

Another option for getting more combustion air to the stove is to duct air directly from outside to the stove. In some areas provisions for outside combustion air are required in all new construction.

When first using the stove, keep track of the air control settings. You will quickly find that a specific setting will give you a fixed amount of heat. It may take a week or two to determine the amount of heat and the length of burn you should expect from various settings.

Most installations do not require a large amount of combustion air, especially if adequate draft is available. Do not for any reason attempt to increase the firing of your heater by altering the air control adjustment range outlined in these directions.

E. Ash Disposal

(Refer to the first page of the Operation section.)

DO NOT OPERATE THE STOVE WITH THE ASH DOOR OPEN. OPERATION WITH THE ASH DOOR OPEN CAN CAUSE AN OVER-FIRING CONDITION TO OCCUR. OVER-FIRING THE STOVE IS DANGEROUS AND CAN RESULT IN PROPERTY DAMAGE, INJURY OR LOSS OF LIFE.

Routine ash removal is important for ease of maintenance, and is important for the stove's durability. Remove ash before it reaches the top of the ash pan. Check the level at least once a day. Every few days, clear any ash from the outer edges of the firebox. Most of the ash will fall through the grate. Stir the ash with a shovel or poker so that it falls through the grate slots.

IMPORTANT: Check the level of ash in the ash pan before reloading the stove. If the ash level is close to the top edge of the pan, empty the pan according to this procedure:

- Open the damper.
- Open the griddle or front doors, and use a shovel or poker to stir excess ash through the ash slots in the grate down into the ash pan.
- Close the griddle or doors, and unlatch the ash door, Figure 2.8. It will pivot, swinging the ash pan out of the stove.

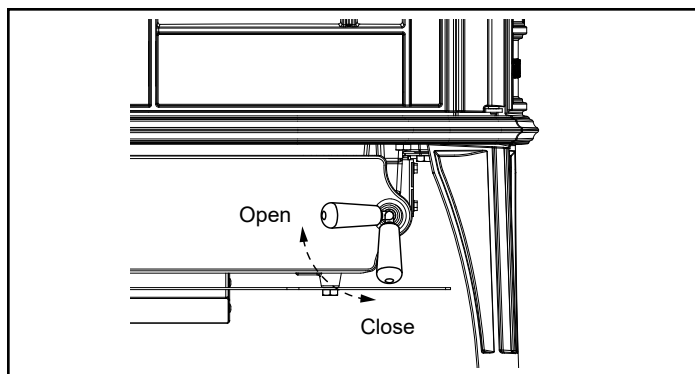


Figure 2.8- Turn the ashdoor handle clockwise to open and counterclockwise to close.

- Slide the cover onto the pan, making sure it is securely closed, Figure 2.9.

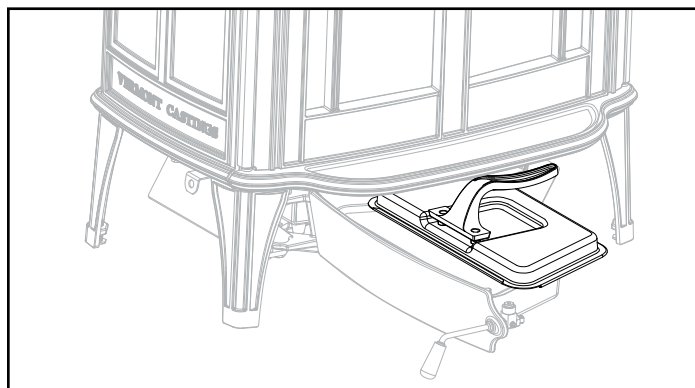


Figure 2.9 - Be sure the cover is securely attached before removing the ash pan.

- Remove the ash pan, making sure to keep it level.
- To keep the cover from sliding off and to keep ash from falling on the floor, do not tilt the ash pan forward.
- If the stove is in operation, close the ash door while disposing of the ash. You may need to lift the latch end of the door slightly to align the latch with the mating part on the stove bottom.
- Properly dispose of the ash in a metal container with a tight-fitting lid. Store the container outdoors away from all combustible material.
- Return the ash pan to its original position in the stove, and close and latch the ash door.



WARNING

Do not operate the stove with the ash door open. This will result in over-firing, and could cause damage to the stove, void the warranty, or even lead to a house fire.

Empty the ash pan regularly, typically every one to three days. The frequency will vary depending on how you operate your Dauntless-C: ash will accumulate faster at higher heat outputs.

Removed ash should be placed outdoors in a metal container with a tight-fitting lid. Keep the closed container of ash on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ash is disposed of by burial in soil or otherwise locally dispersed, it should be kept in the closed container until all cinders have thoroughly cooled.



CAUTION

Never use your household or shop vacuum cleaner to remove ash from the stove; always remove and dispose of the ash properly.

F. Opacity (Visible Smoke)

This is the measure of how cleanly your appliance is burning. Opacity is measured in percent; 100% opacity is when an object is totally obscured by the smoke column from a chimney, and 0% opacity means that no smoke column can be seen. As you become familiar with your appliance, you should periodically check the opacity. This will allow you to know how to burn as nearly smoke-free as possible (goal of 0% opacity).



WARNING



Fire Risk

- DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPTHA OR ENGINE OIL.

- Do NOT burn treated wood or wood with salt (driftwood).
- May generate carbon monoxide if burn material other than wood.

May result in illness or possible death.



WARNING



Fire Risk

Keep combustible materials, gasoline and other flammable vapors and liquids clear of appliance.

- Combustible materials may ignite.
- Do NOT store flammable materials in the appliance's vicinity.
- DO NOT USE GASOLINE, LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID OR SIMILAR LIQUIDS TO START OR "FRESHEN UP" A FIRE IN THIS Appliance.
- Keep all such liquids well away from the appliance while it is in use.



CAUTION

When burning your first fire, you will experience smoke and odor from the appliance resulting from the curing of paint and burning off of any oils remaining from manufacturing.

OPEN WINDOWS DURING INITIAL BURN TO DISSIPATE SMOKE AND ODORS!

- Odors may be irritating to sensitive individuals.
- Smoke detectors may activate.

G. Negative Pressure



WARNING



Asphyxiation Risk

- Negative pressure can cause spillage of combustion fumes, soot and carbon monoxide.
- Appliance needs to draft properly for safety.

Negative pressure results from the imbalance of air available for the appliance to operate properly. It can be strongest in lower levels of the house.

Causes include:

- Exhaust fans (kitchen, bath, etc.)
- Range hoods
- Combustion air requirements for furnaces, water appliances and other combustion appliances
- Clothes dryers
- Location of return-air vents to furnace or air conditioning
- Imbalances of the HVAC air handling system
- Upper level air leaks such as:
 - Recessed lighting
 - Attic hatch
 - Duct leaks

To minimize the effects of negative air pressure:

- Install outside air to the stove with the intake facing prevailing winds during the heating season
- Ensure adequate outdoor air for all combustion appliances and exhaust equipment
- Ensure furnace and air conditioning return vents are not located in the immediate vicinity of the appliance
- Avoid installing the appliance near doors, walkways or small isolated spaces
- Recessed lighting should be a "sealed can" design
- Attic hatches weather stripped or sealed
- Attic mounted duct work and air handler joints and seams taped or sealed

H. Important Information

Creosote is a by-product of slow wood-burning. It's an organic tar that can condense inside the flue when the exhaust is present, moving slowly, and cools below 290°F (130°C). Once condensed, creosote becomes highly flammable and can lead to chimney fires if it heats up again. Because creosote formation is directly influenced by chimney draft, it's important to optimize both your installation and operation to maintain strong draft and minimize buildup.

Since slow-moving, cooling exhaust is a primary cause of creosote accumulation, it's important to match the chimney size to the stove's outlet. This not only improves performance but also enhances safety. In Canada, building codes require that any stove or insert vented through a fireplace chimney must have a properly sized liner. In the U.S., the National Fire Protection Association (NFPA) recommends installing a liner if the flue's cross-sectional area is more than three times larger than the stove or inserts outlet. Some jurisdictions adopt these NFPA guidelines as part of their local building codes.

Fuel: Even the best stove installation will not perform well with poor fuel. The best fuel is hardwood that has air-dried 12-18 months. Softwood burns, but not as long as hardwood. 'Green' wood contains a lot of moisture; it will burn, but some of the heat potential is used to boil the extra moisture from the wood. This reduces the amount of heat that reaches your home and can contribute to a creosote problem. There are moisture meters available for firewood; you can also judge your wood by its appearance and weight (Moisture content of 20% or less is best). If you get it green, lift a piece and get a sense of its weight; it can lose a third or more of its weight as it dries. Also look at the ends of a log; as it dries it shrinks and often cracks. The more weathered and cracked a piece is, the drier it is.

Dry wood burns cleanly and easily, especially with a good chimney draft. However, extremely dry wood can be too volatile for modern stoves. It may release combustible gases too quickly, potentially overwhelming the combustion system. If you hear a rumbling or roaring sound, similar to a propane torch, it's a sign that your stove may be over-firing—a condition that should be addressed to prevent damage or unsafe operation.

Back-puffing occurs when a fire generates volatile gases faster than the chimney draft can vent them from the firebox. These gases accumulate until they become hot and concentrated enough to ignite suddenly. If your stove is back-puffing, allow it to cool down. To help prevent this, open the damper to improve airflow to the flue, increase air intake into the firebox, avoid overloading the stove with firewood, and ensure the wood you're using isn't too dry.

Draft Testing: A simple way to check your chimney draft is to start by closing the stove's damper and waiting a few minutes to let the airflow stabilize. Then, try adjusting the air control - open and close it slowly to see if it affects the strength of the fire. Be patient; results aren't always immediate. It can take a few minutes for changes in airflow to influence the fire's behavior.

If there's no noticeable change when adjusting the air control, the draft may not be strong enough yet. In that case, reopen the damper and continue managing the fire using the air inlet until the chimney warms up and draft improves.

By observing how your burning habits affect stove performance and learning how your system responds, you'll be able to fine-tune your routine for better efficiency, improved safety, and more consistent heat.

Conclusion: Wood-burning is more of an art than a science. Once your stove and chimney system are properly installed, success depends largely on your technique—especially your timing and attention to detail. By observing how your burning habits affect stove performance and making small adjustments, you'll gain a deeper understanding of your system. With care and consistency, you'll enjoy efficient, safe, and reliable heating for years to come.

3 Maintenance

Keep Your Stove Looking New and Working Its Best

Let the fire in the stove go out and allow the stove to cool completely before beginning any maintenance procedure.

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

Care of the Cast Iron Surface

An occasional dusting with a dry rag will keep the painted cast iron of your Dauntless-C looking new.

The stove's paint can be touched up as needed. First, mask the areas, such as enameled parts, glass, or handles, around the spot to be painted. Clean the spot with a wire brush. Remove the griddle and set it aside. It is normal for the griddle to darken after use. You can clean it with a fine-bristle wire brush, or steel wool.

Then, touch up the stove with high temperature stove paint. Apply the paint sparingly; two light coats of paint are better than a single heavy one.

Care of the Porcelain Enamel Surface

Use a dry or slightly damp rag or soft brush to remove spills or stains. For difficult jobs that require a cleaning agent, use only a kitchen appliance cleaner or polish recommended for use on enamel surfaces.

If porcelain enamel becomes chipped or scratched during use, apply "enamel epoxy" to the damaged area and allow to dry. Once the epoxy has dried, sand the area to blend with surrounding area and apply appropriate color touch-up paint. Allow to dry completely before operating stove.

A. Cleaning and Replacement of Glass

Most of the carbon deposits on the glass will burn off during hot fires.

However, the ash residue that accumulates on the glass surface should be removed regularly to prevent etching. To clean the glass, follow this procedure:

- Be sure the glass is completely cool.
- Clean the glass with water or a cleaner made especially for this purpose. Do not use abrasive cleaners. Use cleaning agents sparingly and be sure to keep them off the outer surfaces of the stove.
- Rinse the glass thoroughly.
- Dry the glass completely.

Replace Broken Glass Immediately

Do not operate your stove if the glass in the doors is damaged.

If you need to replace the glass, use only high temperature 5 mm ceramic glass. Do not use substitutes.

Removing the Glass

1. Remove the right and left door assemblies by removing (4) 1/4-20 bolts located inside the door opening, Figure 3.1.

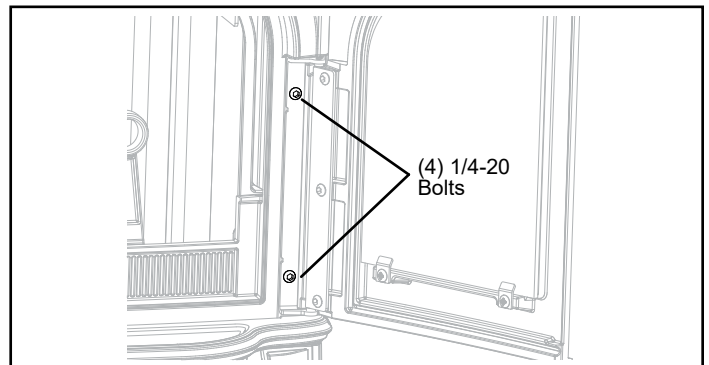


Figure 3.1

2. Place the doors face down on a padded work surface. Be especially careful with enameled doors.
3. Remove the screws that hold the glass retainer clips in place, and remove the clips.
4. Carefully lift the broken glass panel from the door.

Installing the Glass

Check the gasket around the window; it should be soft and resilient so that the glass will seal properly against the door. Replace the gasket if it has hardened or if it is compressed.

1. Center the glass on the gasket.
2. Secure the glass on both doors with the retainer clips. Tighten all screws, Figure 3.2.
3. Replace the doors on the stove.
4. Open and close the doors to check that they fit and work properly. Adjust as necessary.

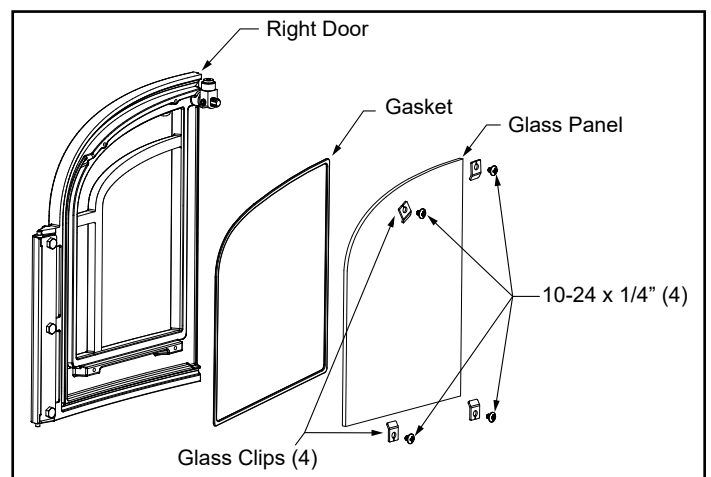


Figure 3.2 - Exploded view of the glass assembly for the right door.

B. Damper Adjustment (as Needed)

The tension on the Dauntless-C's damper is adjustable to compensate for compression of the gasket that seals the damper to the upper fireback. To adjust the damper:

1. Remove the griddle. Loosen the lock nut at the center of the damper, Figure 3.3.
2. Turn the pressure screw approximately one half turn clockwise with an Allen wrench provided with your stove.
3. Tighten the lock nut. Prevent the pressure screw from turning as you tighten the nut. Re-test the damper.

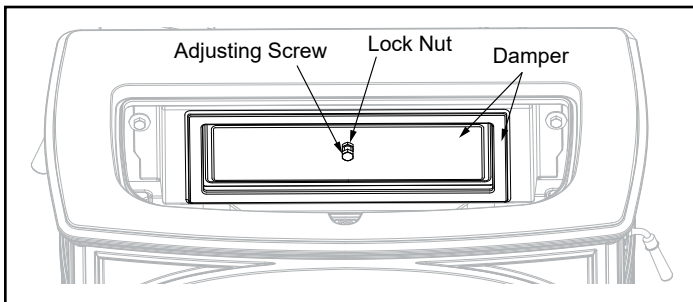


Figure 3.3 - Adjust the damper with the Allen wrench.

Tighten the Damper Handle as Needed

A handle on the left side of the stove controls the damper. The handle attaches to the damper rod with a set screw. Periodically check the set screw and tighten as necessary.

C. Door Latch Adjustment

The front door of the stove should close securely to prevent accidental opening and should close tightly to prevent air from leaking into the fire chamber. The door handle will be positioned vertically when the door is closed.

Over a period of time, the gasket around the door will compress and the latch may need adjustment. To adjust the handle, follow this procedure:

1. Remove and retain the lock nut with a 9/16" wrench, Figure 3.4.
2. Loosen the set screw with a 1/8" Allen wrench.
3. Rotate the pawl 180°. Replace the lock nut. Tighten the set screw, Figure 3.4.
4. Additional adjustment can be made by removing the flat washer. Or any combination of washer removal and/or pawl rotation.

Test the door seal. Close the door on a dollar bill and attempt to pull it free. If the bill is freed with little resistance, the gasket isn't snug enough at that spot. Continue to make small adjustments until the setting is right.

If additional adjusting of the latch does not enable the door to seal sufficiently in one area, try adjusting the gasket in that area. Pack more cement or a smaller diameter gasket into the channel beneath the gasket so the main gasket is raised and makes contact with the door frame. If this procedure doesn't solve the problem, replace the gasket. Instructions for gasket replacement are given later in this section.

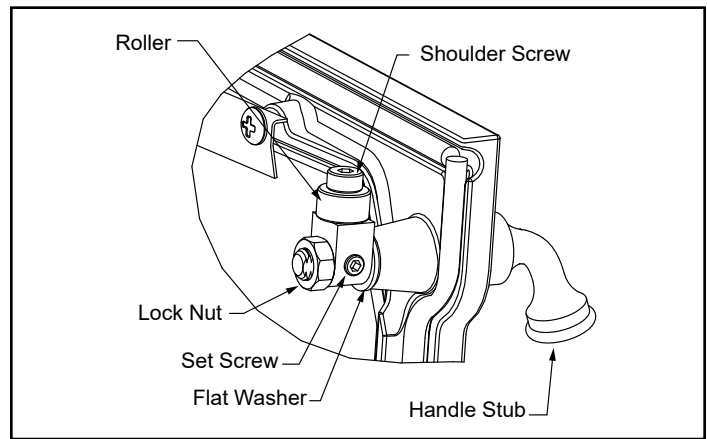


Figure 3.4 - Rotate pawl and/or remove flat washer to adjust latch.

D. Gasket Replacement (as needed)

Your Dauntless-C uses fiberglass rope gaskets to make a tight seal between some parts. With use, particularly on moving parts, gaskets can become brittle and compressed and can begin to lose their effectiveness. These will need periodic replacement.

The sizes of replaceable gasket are listed below, along with their applications.

Gasket Diameter.....And the Parts it Seals

5/16" The griddle to the stove top (wire reinforced gasket)

3/8" The damper to the damper frame

5/16" The front doors to the stove front; and the doors to each other.

3/8" The ash door to the front of the bottom panel

3/16" The outer glass panes to the door

If you need to change a gasket, first obtain an appropriate replacement from your Vermont Castings' Authorized Dealer.

Wait until the fire is out and the stove has cooled. Be sure to follow the standard safety procedure for working with dusty materials: wear safety goggles and a dust mask.

The procedure for replacing gaskets is the same, regardless of the gasket location. Follow these steps:

1. Remove the existing gasket by grasping an end and pulling firmly, Figure 3.5.

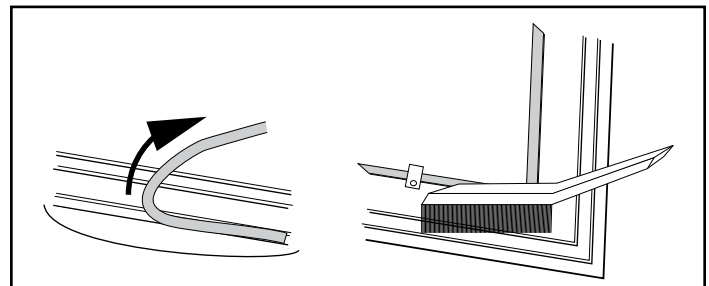


Figure 3.5 - Remove gasket then clean channel with wire brush.

2. Use a wire brush or the tip of a screwdriver to clean the channel of any remaining cement or bits of gasket. Remove stubborn deposits of cement with a cold chisel if necessary, Figure 3.5.
3. Determine the correct length of the appropriate-sized gasket by laying it out in the channel. Allow an extra 1-2" (25-50 mm), and mark the spot to be cut.
4. Remove the gasket from the channel, place it on a wood cutting surface, and cut it at the marked spot with a utility knife.
- Twist the ends slightly to keep the gasket from unraveling.
5. Lay an unbroken 1/8" (3 mm) bead of silicone or cement in the newly-cleaned channel, Figure 3.6.

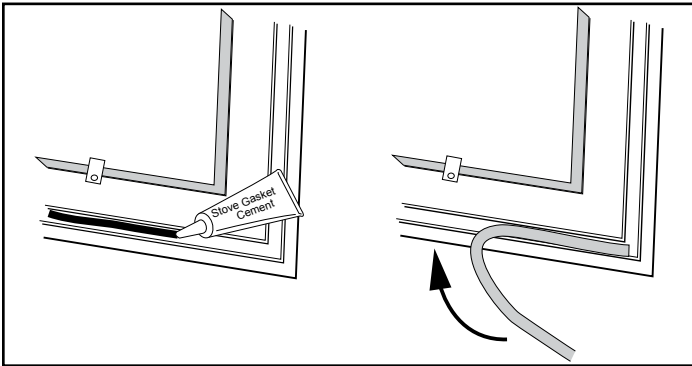


Figure 3.6 - Lay a bead of gasket silicone or cement then press gasket in place.

6. Starting at one end, press the gasket into the channel, Figure 3.6. Ensure a good joint where the gasket meets before trimming any excess. Do not overlap the gasket ends or leave ends with ragged edges.
7. Firmly press the gasketed part against its mating surface to ensure the gasket seats evenly in its channel. You can do this by closing and latching the door, or by gently tapping the part into place with a rubber mallet or a hammer and a block of wood.
8. Clean any excess cement from around the channel, and allow the cement securing the new gasket to dry thoroughly.
9. After regasketing the stove's doors, adjustment may be necessary. Initially, you may need to loosen the latch to accommodate the new gasket; after a few weeks, it may require tightening as the gasket compresses with use.

All Gasketed Construction Gaskets

Other gaskets create seals between non-moving parts and are not subject to the same wear and deterioration as those on moving components. These gaskets typically do not require replacement unless the associated parts are disassembled and reassembled. In such cases, replacement should be performed by a qualified service technician. Refer to the service parts list for the correct gasket specifications.

E. The Chimney System

Creosote

Your Dauntless-C is designed to reduce creosote build-up significantly. However, regular chimney inspection and maintenance must still be performed. For safety, good stove performance, and to protect your chimney and chimney connector, inspect your chimney and chimney connector on a regular schedule. Clean the system if necessary. Failure to keep the chimney and connector system clean can result in a serious chimney fire.



WARNING

Inspect and Clean Chimney Frequently – Under certain conditions of use, creosote buildup may occur rapidly.

When wood is burned slowly, it produces tar, organic vapors and moisture that combine to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire within the flue system that can damage the chimney and overheat adjacent combustible material. If a significant layer of creosote has accumulated —1/8" (3 mm) or more — it should be removed to reduce the risk of a chimney fire.

You can never be too safe. Contact your local fire authority for information on what to do in the event of a chimney fire, and have a clearly understood plan on how to handle one.

If you do experience a chimney fire, act promptly to:

- Close the damper and air control lever.
- Get everyone out of the house.
- Call the Fire Department.

Inspect the system every two weeks during the heating season as part of a regular maintenance schedule. To inspect the chimney, let the stove cool completely. Then, using a mirror and a strong light, sight up through the flue collar into the chimney flue. If you cannot inspect the flue system in this fashion, the stove must be disconnected to provide better viewing access.

Clean the chimney using a brush the same size and shape as the flue liner. Flexible fiberglass rods are used to run the brush up and down the liner, causing any deposits to fall to the bottom of the chimney where they can be removed through the clean-out door.

Clean the chimney connector by disconnecting the sections, taking them outside, and removing any deposits with a stiff wire brush. Reinstall the connector sections after cleaning, being sure to secure the joints between individual sections with sheet metal screws.

If you cannot inspect or clean the chimney yourself, contact your local dealer or a professional chimney sweep.

F. Maintenance Schedule

The Stove

After First Week of Burning:

- Check damper ramp adjustment and damper tightness. When closing the damper, there should be a distinct stop as the handle rotates to the closed position. If the damper handle does not click over into the closed position or if the damper falls open on its own after manually closing the damper, the damper ramp needs to be tightened to ensure damper sealing and positive engagement of the damper system. Refer to page 16 for instructions on how to adjust the damper ramp.

Daily:

- Clear any ash build-up from around the air holes and combustion flow path in the lower fireback.
- Ashes should be removed before they reach the top of the ash pan. Check accumulation at least once a day.
- Keep the area around the stove clear of any combustible materials such as wood, furniture or clothing.

Two Months:

- Check door handle to be sure it is working properly. Gasketing becomes compressed after a period of time. Adjust handle tightness if necessary.
- Check leg bolts and heat shield screws; tighten if necessary.
- Inspect the catalytic combustor for fly ash accumulation and physical damage. Clean the catalytic combustor as needed.

Annual Spring Cleaning:

- Check gasketing for wear, and replace if necessary.
- Remove ashes from the ash pan and replace with a moisture absorbing material (such as kitty litter) to keep the interior of the stove dry.
- Clean the dust from the inner sides of bottom, rear or pipe heat shields if your stove is equipped with them. Clean surfaces are better heat reflectors than dirty surfaces.
- Touch up the black paint.
- Inspect for and remove ash build-up behind the combustion package. This should be done in conjunction with annual cleaning of the chimney connector. Inspect the passage behind the combustion package (a mirror will be helpful) and vacuum away ash using a flexible vacuum hose inserted in the passage, Figure 3.7.

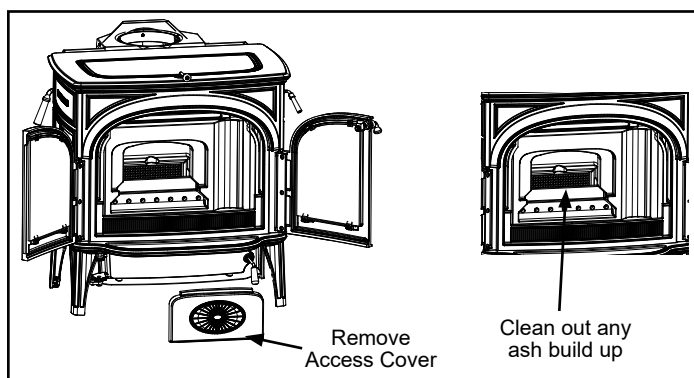


Figure 3.7 - Inspect and clean out ash accumulation behind the combustion system.

The Chimney Connector

Two Weeks:

- Inspect the chimney connector and chimney. Clean if necessary.

Two Months:

- Inspect the chimney and chimney connector. Pay particular attention to the horizontal runs of chimney connector, and the elbows. Clean the system if necessary.

Annual Spring Cleaning:

- Disassemble the chimney connector and take it outdoors for inspection and cleaning. Replace weak sections of connector.
- Inspect the chimney for signs of deterioration. Repairs to a masonry chimney should be made by a professional mason. Replace damaged sections of prefabricated chimney. Your local dealer or a chimney sweep can help determine when replacement is necessary.
- Thoroughly clean the chimney.

G. The Catalytic Combustor



BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METALS, FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

NOTE

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

The Dauntless-C is designed to operate with a catalytic combustor, providing higher efficiencies when the catalyst is active. If the catalytic combustor becomes non-functional, it must be replaced. Continuing to use a non-active catalytic combustor will result in sluggish combustion and visible smoke from the venting system. To maintain optimal performance, the catalytic combustor should be replaced promptly. Operating the unit with a non-functional combustor can lead to damage or excessive creosote buildup in the venting system. Under normal conditions, the catalytic combustor should remain effective for five to seven years, depending on the amount of wood burned. However, it is crucial to periodically inspect the combustor to ensure it is operating correctly and to determine when replacement is necessary.

When to Suspect a Catalytic Combustor Problem

The most effective way to evaluate the performance of your Dauntless-C's catalytic combustor is by observing the amount of smoke exiting the chimney—both when the catalytic combustor is active and when it is not. Follow these steps:

- With a fire burning, the catalytic combustor properly activated, and the damper closed to route smoke through it as described in the Operation Section, go outside and observe the smoke exiting the chimney.
- Next, open the stove damper and check the smoke leaving the chimney again.

When the stove damper is open and exhaust bypasses the catalytic combustor, you should notice significantly more smoke. However, be careful not to confuse smoke with steam from wet wood; steam dissipates quickly in the air, while smoke lingers. Keep in mind that for combustion to occur, the stove should be hot, with a 2"-3" established coal bed.

If this test reveals a problem, consider other potential factors, such as changes in weather or fuel quality. In warmer weather, draft is weaker compared to colder winter months, which can cause fires to burn sluggishly. Under these conditions, small, hot fires are an effective solution.

NOTE

Burning "green" (insufficiently seasoned) wood will result in poorer performance than burning properly seasoned fuel. Reloading with green wood can also thermal shock the catalyst, resulting in cracking, or the eventual fallout, of the honeycomb substrate. You may have to run your stove hotter (more air) to achieve acceptable performance using green or wet wood.

Additionally, consider any changes in your operating routine. After ruling out other possible causes for performance decline, inspect and clean the catalytic combustor if necessary. Be sure to protect any surfaces where you place stove parts during this process.

Inspecting the Catalytic Combustor

Remove the access door and inner firebrick. Inspect the area in and around the catalytic combustor for fly ash or debris, and carefully remove any buildup if necessary, Figure 3.8.

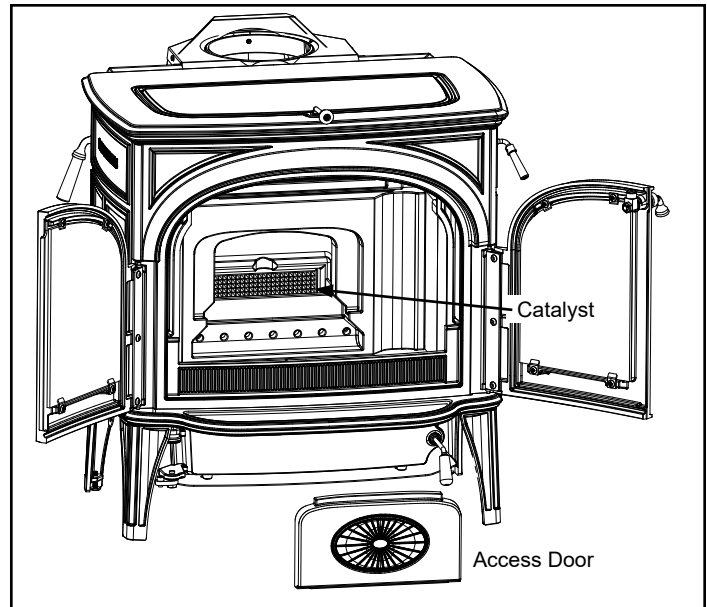


Figure 3.8 - Inspect the catalytic combustor.

Cleaning the catalytic combustor

Note: A fragile interam gasket is installed around the catalytic combustor; it is recommended to replace the gasket if the catalytic combustor is removed.

1. Inspect the honeycomb structure of the catalytic combustor for any buildup of fly ash. If debris is present, remove the combustor and clean it outdoors by gently blowing air through it. Do not insert any objects into the honeycomb. Use a vacuum or a can of compressed air to clear out the fly ash by directing airflow through the combustor.
2. Inspect the catalytic combustor for signs of damage or degradation. While minor hairline cracks do not impact performance, the catalyst should remain largely intact. If the combustor is broken into pieces or has missing sections, it must be replaced. Contact your local Vermont Castings Authorized Dealer to obtain a replacement catalytic combustor.
3. If the catalytic combustor is clean and in good condition, install a new interam gasket around it, then re-install the combustor into the stove and replace the refractory access door.

4 Troubleshooting Guide

With proper installation, operation, and maintenance your wood appliance will provide years of trouble-free service. If you do experience a problem, this troubleshooting guide will assist you or a qualified service person in the diagnosis of a problem and the corrective action to be taken.

Start Fire Problems	Possible Cause	Solution
• Can not get fire started • Excessive smoke spillage • Burns too slowly • Not enough heat output	Not enough kindling/paper or no kindling/paper	Use dry kindling, more paper. Arrange kindling & wood for air movement.
	Not enough air for fire to ignite	Check for restricted termination cap
		Check for blockage of outside air kit (if installed).
		Check for flue blockage.
		Pre-warm flue before starting fire (refer to Building a Fire Section).
		Check for adequate vent height (refer to Chimney Height Section).
		Refer to Negative Pressure section
	Wood condition is too wet, too large	Use dry, seasoned wood (refer to Seasoned Wood Section).
	Bed of coals not established before adding wood	Start with paper & kindling to establish bed of coals (refer to Building a Fire Section).
Fire burns too fast	Flue blockage such as birds' nests or leaves in termination cap	Have chimney inspected for creosote and cleaned by a certified chimney sweep.
	Down draft or negative pressure Competition with exhaust devices	Do not use exhaust fans during start-up (refer to Negative Pressure Section).
	Extremely dry or soft wood	Mix in hardwood.
		Mix in larger pieces of wood after fire is established.
Overdrafting		Check for correct vent height; too much vertical height creates overdrafting.
		Check location of vent termination (refer to Chimney Termination Requirement Section).
Low Heat Output	Coal Bed too small	Open damper. Establish deeper coal bed and move coals to the rear of the firebox.
Excessive Coal Bed	Operating on high for extended periods	Reduce burn rate and allow coals to burn down before reloading.

Contact your dealer for additional information regarding operation and troubleshooting.
Visit www.forgnflame.com to locate a dealer.

5 Reference Materials

A. Service & Maintenance Log

[illegible]

B. Service Parts List

VERMONT CASTINGS™ Service Parts

Dauntless

0002235 (Classic Black)

0002236 (Biscuit) - Ending Manufacturing Date: Feb 2022

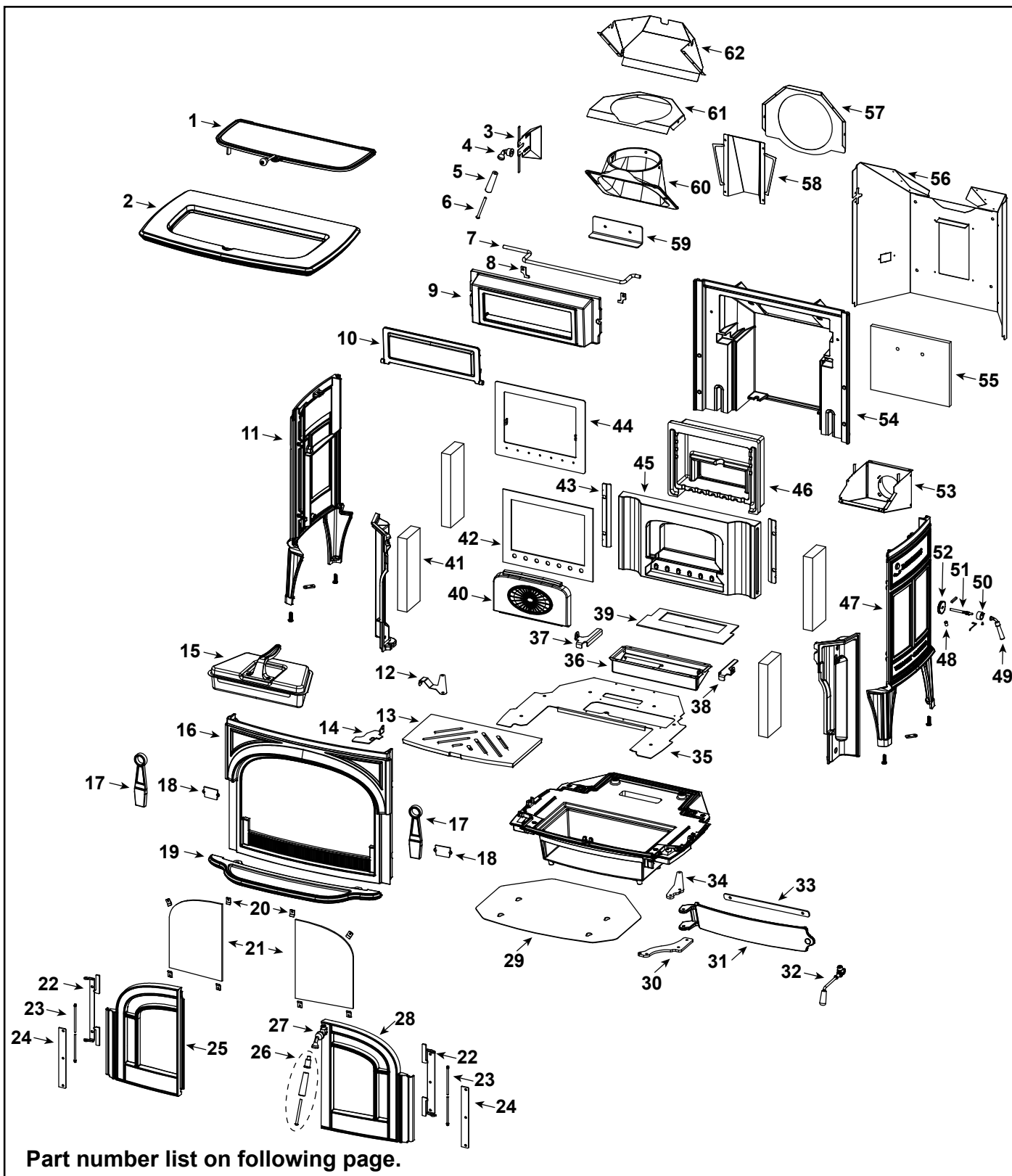
0002237 (Majolica Brown)

0002238 (Bordeaux)

0002239 (Twilight)

Beginning Manufacturing Date: May 2020

Ending Manufacturing Date: Active



IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.


**Stocked
at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
#1 Griddle Assembly				
1	Griddle Assembly w/Brackets		SRV1-10-586134	
1.1	Griddle Brackets (Includes Left & Right, Dowel Pins & Retainers)		SRV3000731	
	Dowel Pin	Qty 2 req	30007368	
1.2	Griddle		4-00-586134A	
1.3	Handle Assembly, Griddle		1-00-586170	Y
	Knob, Griddle	Maple, Black	1600661	
	Bushing, Griddle Handle (Qty 2 req)	Pkg of 10	1201900-10	
	#10 External Tooth Lock Washer	Pkg of 100	3-30-0001-100	
2	Top	Classic Black	4-00-586135A	
		Biscuit	4-00-586135-32A	
		Majolica Brown	4-00-586135-31A	
		Bordeaux	4-00-586135-33A	
		Twilight	4-00-586135-30A	
	Gasket, 5/16 Wire w/Core	10 Ft	1-00-1203668	Y
	Gasket, 3/8 Adhesive (Top)	15 Ft	1-00-30002422	Y
3	Cover, Damper Rod		SRV2-00-586191	
4	Damper Steel Handle w/Set Screw		30002720A	
5	Handle, Damper	Maple, Black	1600664	Y
6	Philips RD HD 1/4-20x3	Pkg of 10	1201310-10	
7	Damper Rod		SRV3-40-586164	
	Damper Adjuster		SRV2-00-586201	
	Damper Rod Repair Kit		SRV8787-019	
8	Damper Shaft Retainers	Pkg of 2	SRV2-00-586186	
9	Damper Frame		4-00-586184A	
	Gasket, 5/16 Fiberglass Low (Inside)	15 Ft	1-00-1203588	Y
	Gasket, 3/8 Adhesive (Outside)	15 Ft	1-00-30002422	Y

Additional service part numbers appear on following page.

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**Stocked
at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
10	Damper Plate		4-00-586200A	
	CS Hex Head 1/4-20 x 3/8	Pkg of 10	1201337-10	
	Screw 1/4-20 x 1/2 Black	Pkg of 10	1201338-10	
	Screw 1/4-20 x 1 Black	Pkg of 10	1201376-10	
	Hex Jam Nut, 1/4-20	Pkg of 10	3-30-8015-10	
	Fasteners for Damper Assembly to Back Casting			
	Screw 1/4-20 x 1 Black	Pkg of 10	1201376-10	
	Flat Washer	Pkg of 10	1202470-10	
	Nut, Hex	Pkg of 10	1203210-10	
11	Side, Left	Classic Black	4-00-586123A	
		Biscuit	4-00-586123-32A	
		Majolica Brown	4-00-586123-31A	
		Bordeaux	4-00-586123-33A	
		Twilight	4-00-586123-30A	
	LVL Bolt, 1/4-20x1	Pkg of 10	1201745-10	
	Gasket, 3/8 Adhesive	15 Ft	1-00-30002422	Y
	Mobile Home Bracket	Pkg of 2	SRV586189	
12	Front Handle Holder		SRV2-00-586197	
13	Ash Grate		3-00-586122A	
14	Air Control Baffle		SRV2-00-586148	
15	Ash Pan Assembly		30007339	
16	Front	Classic Black	4-00-586121A	
		Biscuit	4-00-586121-32A	
		Majolica Brown	4-00-586121-31A	
		Bordeaux	4-00-586121-33A	
		Twilight	4-00-586121-30A	
	Gasket, 3/8 Adhesive	15 Ft	1-00-30002422	Y
17	Andiron	Qty 2 req	3-00-586128A	
18	Mounting Plate, Andiron	Qty 2 req	SRV2-00-586169	
	HHCS 1/4-20x3/8	Pkg of 10	1201337-10	
19	Ash Lip	Classic Black	3-00-586144A	
		Biscuit	3-00-586144-32A	
		Majolica Brown	3-00-586144-31A	
		Bordeaux	3-00-586144-33A	
		Twilight	3-00-586144-30A	
	TRS HD PH 10-24 x 1/2	Pkg of 10	1200998-10	

Additional service part numbers appear on following page.

Beginning Manufacturing Date: May 2020

Ending Manufacturing Date: Active

IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.


**Stocked
at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
20	Glass Clip (Qty 4 req per Door)	Pkg of 4	SRV2-00-586207	
	Glass Clip Screw, 10-24x1/4 (Qty 4 req per Door)	Pkg of 10	1200980-10	
21	Glass, Load Door	Qty 1 req, per Door	SRV3-40-586138	
	Glass Gasket, 3/16 PSA	10 Ft	1-00-1186258229	Y
22	Door Hinge Set, Left & Right		SRV2-00-586204	
23	Door Pins	Qty 2 req, per Door	30002727	Y
24	Hinge Clamp Plate	Qty 1 req, per Door	SRV2-00-586205	
	BHSCS 1/4-20X3/8 (Hinge Bracket to Door)	Pkg of 10	3-30-3014-10	Y
25	Door, Left	Classic Black	4-00-586126A	
		Biscuit	4-00-586126-32A	
		Majolica Brown	4-00-586126-31A	
		Bordeaux	4-00-586126-33A	
		Twilight	4-00-586126-30A	
	Gasket, Door 5/16 Med	15 Ft	1-00-1203588	Y
	BHSCS 1/4-20 x 3/8 (Door to Stove Front)	Pkg of 10	3-30-3014-10	Y
26	Wood Handle w/Lifter		30004175K	Y
	Damper Handle	Wood	1600664	Y
	Damper Handle Screw	Pkg of 10	1201310-10	Y
	Insert Lifter		30002714	Y
27	Latch Assembly, Front Door		SRV1-10-586145	Y
	Front Steel Handle/Shaft		30002717	
	Spring Washer	Pkg of 10	63D0069-10	
	Pawl Assembly		30005157	Y
	Flat Washer, 10mm	Pkg of 10	1202560-10	
	Nut Jam, 3/8-16 Top Lock	Pkg of 10	1203290-10	
28	Door, Right	Classic Black	4-00-586127A	
		Biscuit	4-00-586127-32A	
		Majolica Brown	4-00-586127-31A	
		Bordeaux	4-00-586127-33A	
		Twilight	4-00-586127-30A	
	Gasket, Door 5/16 Med	15 Ft	1-00-1203588	Y
	BHSCS 1/4-20 x 3/8 (Door to Stove Front)	Pkg of 10	3-30-3014-10	Y
29	Bottom Heat Shield		SRV2-00-586165	
30	Lower Mount Bracket, Ash Door		SRV2-00-586143	
	Washer 5/16	Pkg of 10	7000-579/10	
	Screw 1/4-20 x 3/4, Black	Pkg of 10	1201374-10	

Additional service part numbers appear on following page.

IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.


**Stocked
at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
31	Ash Door		4-00-586206A	
	Gasket, Ash Door 3/8 Fiberglass Low	15 Ft	1-00-1203589	Y
#32 Ash Door Handle Assembly				
32	Handle Assembly, Ash Door		SRV1-10-1600663	
32.1	Handle, Ash Door	Hardwood, Black	1600663	
32.2	Shaft, Handle		30005301	
32.3	Spring Washer	Pkg of 10	63D0069-10	
32.4	Flat Washer, 10mm	Pkg of 10	1202560-10	
32.5	Pawl Assembly		30005157	Y
32.6	Nut Jam, 3/8-16 Top Lock	Pkg of 10	1203290-10	
33	Ash Pan Bracket		30007376A	
34	Upper Mount, Ash Door		SRV2-00-586142	
35	Bottom Air Cover		SRV2-00-586147	
36	Air Control Assembly		SRV1-10-586156	
37	Brick Clip, Left		SRV2-00-586193	
38	Brick Clip, Right		SRV2-00-586194	
39	Gasket, Refractory		SRV3-44-586168	
40	Access Cover, Refractory		SRV3-40-586152	
41	Firebrick, Cut 9 3/4 x 3 1/4 x 1 1/4	Qty 4 req	SRV2-00-586192	
42	Insulation, Fiberfrax (Replace during Engine, Fireback or SS Fireback replacement)		SRV3-44-586196	
43	Brick Clip, Rear	Qty 2 req	SRV2-00-586153	
44	SS Fireback Plate		SRV2-00-586188	
45	Fireback, Refractory		SRV3-40-586151	
46	Refractory Engine		30007299A	
	CS Hex Head, 1/4-20 x 3/8	Pkg of 10	1201337-10	
	CS Hex Head, 1/4-20 x 5/8	Pkg of 10	1201372-10	

Additional service part numbers appear on following page.

IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.


**Stocked
at Depot**

ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
47	Side, Right	Classic Black	4-00-586124A	
		Biscuit	4-00-586124-32A	
		Majolica Brown	4-00-586124-31A	
		Bordeaux	4-00-586124-33A	
		Twilight	4-00-586124-30A	
	LVL Bolt, 1/4-20x1	Pkg of 10	1201745-10	
	Gasket, 3/8 ADHES	15 Ft	1-00-30002422	Y
	Mobile Home Bracket	Pkg of 2	SRV586189	
48	Ball Plunger 5/16 x 1/2		3-31-5500	
49	Primary Air Control Handle Assembly	Wood, Maple, Black	SRV1-10-586149	Y
	Thermostat Handle, Knob	Wood, Maple, Black	1600660	
	Round Head SL 8-32 x 2	Pkg of 10	1202560-10	
50	Thermostat Stub w/Set Screw		30002716	
	Cable Assembly	Call Tech	SRV30007519	
51	Air Control		SRV1-10-1601430	
52	Air Control Wheel		SRV2-00-586163	
53	Outside Air Box Assembly		SRV1-10-586161	
54	Rear Housing		4-00-586129A	
	Gasket, 3/8 Adhesive (Side Openings)	15 Ft	1-00-30002422	Y
	Gasket, 7/16 PSA (Refractory Opening)	15 Ft	1-00-30001910	Y
55	Insulation Board, Back		SRV3-44-586183	
56	Air Jacket, Rear		SRV2-00-586177	
57	Heat Shield, Rear Cover, Rear Vent		SRV2-00-586175	
58	Air Inlet		SRV2-00-586173	
59	Exhaust Diverter		SRV2-00-586182	
60	Flue Collar, 6 "	Classic Black	4-00-250102A	
	Gasket, 3/8 Adhesive	15 Ft	1-00-30002422	Y
61	Heat Shield, Cover, Top Vent		SRV2-00-586176	
62	Heat Shield Common		SRV2-00-586174	
	Outside Air Kit		1-10-09542	
	Finish Bag		SRV1-00-586209	
	Touch-up Paint		3-42-19905	
	Catalyst Performance Package (Catalyst, Temp Probe, Bracket, & Install Items)		0003406	
	Temp Probe Bracket		SRV2-00-586179	
	Catalyst Ceramic		SRV8340-006	
	Cooking Grill		0003407	
	Bracket, Grill Front		SRV2-00-586211	
	Fan Kit		0003410	

C. Contact Information



Please contact your Vermont Castings dealer with any questions or concerns.
For the number of your nearest Vermont Castings dealer log onto www.forgenflame.com

CAUTION



DO NOT DISCARD THIS MANUAL

- Important operating and maintenance instructions included.
- Read, understand and follow these instructions for safe installation and operation.
- Leave this manual with party responsible for use and operation.



We recommend that you record the following pertinent information for your heating appliance.

Date purchased/installed: _____

Serial Number: _____ Location on appliance: _____

Dealership purchased from: _____ Dealer phone: _____

Notes: _____

This product may be covered by one or more of the following patents: (United States) 5341794, 5263471, 6688302, 7216645, 7047962 or other U.S. and foreign patents pending.



Installation Manual

Installation & Appliance Set-Up

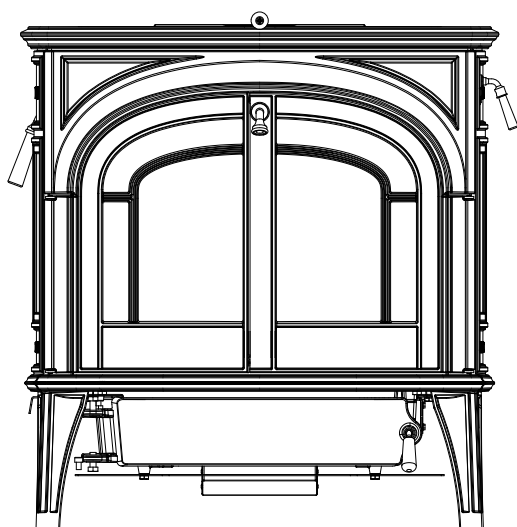
INSTALLER: Leave this manual with party responsible for use and operation.

OWNER: Retain this manual for future reference.

NOTICE: DO NOT DISCARD THIS MANUAL

VERMONT  CASTINGS™
BY FORGE & FLAME

Dauntless-C Wood Stove



Installation and service of this appliance should be performed by qualified personnel. Hearth & Home Technologies recommends HHT Factory Trained or NFI certified professionals.



WARNING



If the information in these instructions is not followed exactly, a fire may result causing property damage, personal injury, or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not over fire - If appliance or chimney connector glows, you are over firing. Over firing will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may cause house fire.

WARNING



HOT SURFACES!

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

Hot glass will cause burns.

- Do not touch glass until it is cooled
- NEVER allow children to touch glass
- Keep children away
- CAREFULLY SUPERVISE children in same room as fireplace.
- Alert children and adults to hazards of high temperatures
- **High temperatures may ignite clothing or other flammable materials.**
- Keep clothing, furniture, draperies and other flammable materials away.

NOTE

To obtain a French translation of this manual, please contact your dealer or visit www.vermontcastings.com

Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez www.vermontcastings.com

Safety Alert Key:

- **DANGER!** Indicates a hazardous situation which, if not avoided will result in death or serious injury.
 - **WARNING!** Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 - **CAUTION!** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
 - **NOTICE:** Indicates practices which may cause damage to the appliance or to property.
-

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→ = Contains updated information

1 Product Listing and Important Safety Information

A. Appliance Certification

MODEL:	Dauntless-C Wood Stove
LABORATORY:	PFS-TECO, OMNI-Test Laboratories Inc.
REPORT NO.	24-291, 0061WS104S
TYPE:	Solid Fuel Type Room Heaters
STANDARD(s):	ASTM E2515, ASTM E2780, Method 28R, UL 1482-2022, ULC S627 and CAN/CSA B415.1

B. BTU & Efficiency Specifications

EPA Report #:	
EPA Certified Emissions:	1.7 g/hr
*LHV Tested Efficiency:	81%
**HHV Tested Efficiency:	75%
***EPA BTU Output:	13,600 - 21,400
****Peak BTU/Hour Output:	36,900
Vent Size:	6 Inch (152 mm)
Firebox Size:	1.8 cu. ft.
Outside Air Size:	3 Inch
Recommended Length:	16 Inch
Max. Wood Length:	18 Inch
Fuel Orientation:	East, West
Fuel	Seasoned Cordwood (20% moisture or less)
*Weighted average LHV efficiency using Douglas Fir dimensional lumber and data collected during EPA emissions test.	
**Weighted average HHV efficiency using Douglas Fir dimensional lumber and data collected during EPA emissions test.	
***Efficiencies are based on test results calculated using B415; these calculated efficiencies are then used to calculate output BTU's.	
****A peak BTU out of the appliance calculated using the maximum first hour burn rate from the High EPA Test and the BTU content of cord wood (8600) times the efficiency.	

The Dauntless-C Wood Appliance meets the U.S. Environmental Protection Agency Certified to comply with the 2020 particulate emission standards.



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

C. Mobile Home Approved (USA ONLY)

- This appliance is approved for mobile home installations in the USA when not installed in a sleeping room and when an outside combustion air inlet is installed.
- The structural integrity of the mobile home floor, ceiling, and walls must be maintained.
- The unit must be bolted to the floor. This can be done using an appropriate fastener for the application.
- The appliance must be properly grounded to the frame of the mobile home with #8 copper ground wire, and chimney must be listed to UL103 HT or a listed UL-1777 full length six" (152mm) diameter liner must be used.
- Mobile Home Brackets must be installed in a mobile home installation, supplied with stove.

D. Glass Specifications

This appliance is equipped with 5mm ceramic glass. Replace glass only with 5mm ceramic glass. Please contact your dealer for replacement glass.

WARNING



Fire Risk.

Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by, the following actions:

- Installation and use of any damaged appliance.
- Modification of the appliance.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.
- Operating appliance without fully assembling all components.
- Operating appliance without legs attached (if supplied with it).
- Do NOT Over fire - If appliance or chimney connector glows, you are over firing.

Any such action that may cause a fire hazard.

NOTE: This installation must conform with local codes. In the absence of local codes you must comply with the UL1482-11, UL 737-11, (UM) 84-HUD and NPFA211 in the U.S.A. and the ULC S627-00 and CAN/CSA-B365 Installation Codes in Canada. **NOT APPROVED FOR MOBILE HOME INSTALLATIONS IN CANADA!**

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage.

For assistance or additional information, consult a qualified installer, service agency or your dealer.

NOTE: Hearth & Home Technologies, manufacturer of this appliance, reserves the right to alter its products, their specifications and/or price without notice.

Hearth & Home Technologies WILL NOT warranty appliances that exhibit evidence of over-firing. Evidence of over-firing includes, but is not limited to:

- Warped Damper
- Deteriorated refractory
- Deteriorated interior components

E. Non-Combustible Materials

Material which will not ignite and burn, composed of any combination of the following:

- | | |
|------------|-----------|
| - Steel | - Plaster |
| - Brick | - Iron |
| - Concrete | - Tile |
| - Glass | - Slate |

Materials reported as passing **ASTM E 136, Standard Test Method for Behavior of Metals, in a Vertical Tube Furnace of 750° C.**

F. Combustible Materials

Material made of/or surfaced with any of the following materials:

- | | |
|----------------|------------------------|
| - Wood | - Compressed Paper |
| - Plant Fibers | - Plastic |
| - Plywood/OSB | - Sheet Rock (drywall) |

Any material that can ignite and burn: flame proofed or not, plastered or non-plastered.

G. California



WARNING

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

2 Getting Started

A. Design and Installation Considerations

Consideration must be given to:

- Safety
- Convenience
- Traffic flow
- Chimney and chimney connector required

It's a smart idea to plan your installation on paper first, using exact measurements for clearances, floor protection, and appliance placement before starting any work. If you're not connecting to an existing chimney, be sure to locate the stove where there's a clear, unobstructed path for a factory-built, listed chimney to pass safely through the ceiling and roof.

We recommend that a qualified building inspector and your insurance company representative review your plans before and after installation.

If this appliance is in an area where children may be near it is recommended that you purchase a decorative barrier to go in front of the appliance. Remember to always keep children away while it is operating and do not let anyone operate this appliance unless they are familiar with these operating instructions.



CAUTION

Check building codes prior to installation.

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



WARNING



Asphyxiation Risk

- **DO NOT CONNECT THIS APPLIANCE TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.**
- **DO NOT CONNECT TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.**

May allow flue gases to enter the house.

B. Fire Safety

To provide reasonable fire safety, the following should be given serious consideration:

1. Install at least one smoke detector on each floor of your home to ensure your safety. They should be located away from the heating appliance and close to the sleeping areas. Follow the smoke detector manufacturer's placement and installation instructions, and be sure to maintain regularly.

2. A conveniently located Class A fire extinguisher to contend with small fires resulting from burning embers.
3. A CO detector should be installed in the room with the appliance.
4. A practiced evacuation plan, consisting of at least two escape routes.
5. A plan to deal with a chimney fire as follows:

In the event of a chimney fire:

- a. Evacuate the house immediately
- b. Notify fire department.

Notice: Hearth & Home Technologies assumes no responsibility for the improper performance of the appliance system caused by:

- Inadequate draft due to environmental conditions
- Down drafts
- Tight sealing construction of the structure
- Mechanical exhausting devices
- Over drafting caused by excessive chimney heights
- Ideal performance is a chimney height of 16 feet (4.88m) measured from the base of the appliance.

C. Negative Pressure



WARNING



Asphyxiation Risk

- Negative pressure can cause spillage of combustion fumes, soot and carbon monoxide.
- Appliance needs to draft properly for safety.

Negative pressure results from the imbalance of air available for the appliance to operate properly. It can be strongest in lower levels of the house.

Causes include:

- Exhaust fans (kitchen, bath, etc.)
- Range hoods
- Combustion air requirements for furnaces, water appliances and other combustion appliances
- Clothes dryers
- Location of return-air vents to furnace or air conditioning
- Imbalances of the HVAC air handling system
- Upper level air leaks such as:
 - Recessed lighting
 - Attic hatch
 - Duct leaks

To minimize the effects of negative air pressure:

- Install outside air to the stove with the intake facing prevailing winds during the heating season
- Ensure adequate outdoor air for all combustion appliances and exhaust equipment
- Ensure furnace and air conditioning return vents are not located in the immediate vicinity of the appliance
- Avoid installing the appliance near doors, walkways or small isolated spaces
- Recessed lighting should be a “sealed can” design
- Attic hatches weather stripped or sealed
- Attic mounted duct work and air handler joints and seams taped or sealed
- Basement installations should be avoided

WARNING



Fire Risk.

Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by, the following actions:

- Installation and use of any damaged appliance.
- Modification of the appliance.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.
- Operating appliance without fully assembling all components.
- Operating appliance without legs attached (if supplied with appliance).
- Do NOT Over fire - If appliance or chimney connector glows, you are over firing.

Any such action that may cause a fire hazard.

E. Inspect Appliance and Components

- Remove appliance and components from packaging and inspect for damage.
- Report to your dealer any parts damaged in shipment.
- **Read all the instructions before starting the installation. Follow these instructions carefully during the installation to ensure maximum safety and benefit.**

WARNING



Fire Risk

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.

D. Tools And Supplies Needed

Before beginning the installation be sure the following tools and building supplies are available:

- | | |
|---|-------------------------------|
| • Reciprocating saw | • Framing material |
| • Pliers | • High temp caulking material |
| • Hammer | • Gloves |
| • Phillips screwdriver | • Framing square |
| • Flat blade screwdriver | • Electric drill and bits |
| • Plumb line | • Safety glasses |
| • Level | • Tape measure |
| • Misc. screws and nails | |
| • 1/2-3/4 in. length, #6 or #8 self-drilling screws | |

F. Install Checklist

ATTENTION INSTALLER: Follow this Standard Work Checklist

This standard work checklist is to be used by the installer in conjunction with, not instead of, the instructions contained in this installation manual

Customer: _____

Date Installed: _____

Lot/Address: _____

Location of Appliance: _____

Installer: _____

Dealer/ Distributor Phone #: _____

Serial #: _____

Model : _____

WARNING! Risk of Fire or Explosion! Failure to install appliance according to these instructions can lead to a fire or explosion.

Appliance Install

Verified clearance to combustibles.

Appliance is leveled and connector is secured to appliance.

Hearth extension size/height decided.

Outside Air Installed.

Floor protection requirements have been met.

If appliance is connected to a masonry chimney, it should be cleaned and inspected by a professional. If installed to a factory built metal chimney, the chimney must be installed according to the manufacturer's instructions and clearances.

YES IF NO, WHY?

☐	_____
☐	_____
☐	_____
☐	_____
☐	_____
☐	_____

Chimney

Chimney configuration complies with diagrams.

Chimney installed, locked and secured in place with proper clearance.

Chimney meets recommended height requirements (Minimum 16 Feet).

Roof flashing installed and sealed.

Terminations installed and sealed.

☐	_____
☐	_____
☐	_____
☐	_____
☐	_____

Clearances

Combustible materials not installed on non-combustible areas.

Verified all clearances meet installation manual requirements.

Mantels and wall projections comply with installation manual requirements.

Protective hearth strips and hearth extensions installed per manual requirements.

☐	_____
☐	_____
☐	_____
☐	_____

Appliance Setup

All packaging and protective materials removed.

Firebrick/Refractory, baffle and ceramic blanket (if applicable) installed correctly

All labels have been removed from the door.

All packaging materials are removed from inside/under the appliance.

Manual bag and all of its contents are removed from inside/under the appliance and given to the party responsible for use and operation.

☐	_____
☐	_____
☐	_____
☐	_____
☐	_____

Hearth & Home Technologies recommends the following:

- Photographing the installation and copying this checklist for your file.
- That this checklist remain visible at all times on the appliance until the installation is complete.

Comments: Further description of the issues, who is responsible (Installer/Builder/Other Trades, etc.) and corrective action needed:

Comments communicated to party responsible _____ by _____ on _____
(Builder/Gen. Contractor) (Installer) (Date)

3 Dimensions and Clearances

A. Appliance Dimensions

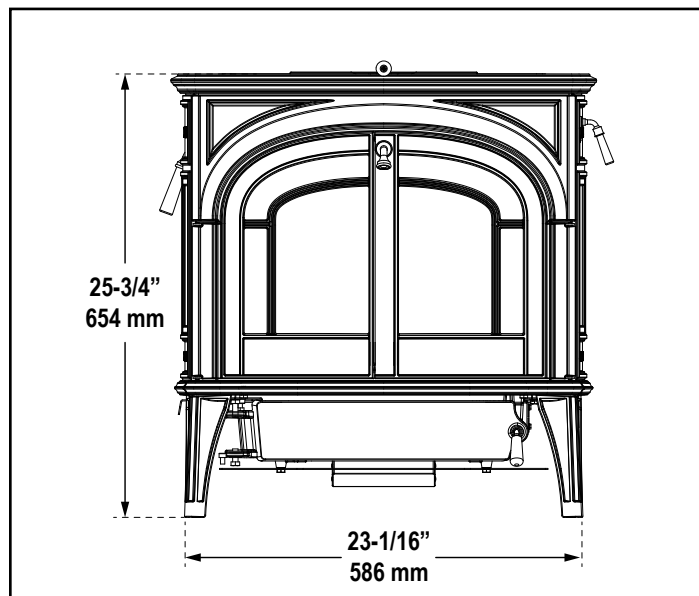


Figure 3.1 - Front View

NOTE: Flue Collar size is 6" (152mm) diameter (ID)

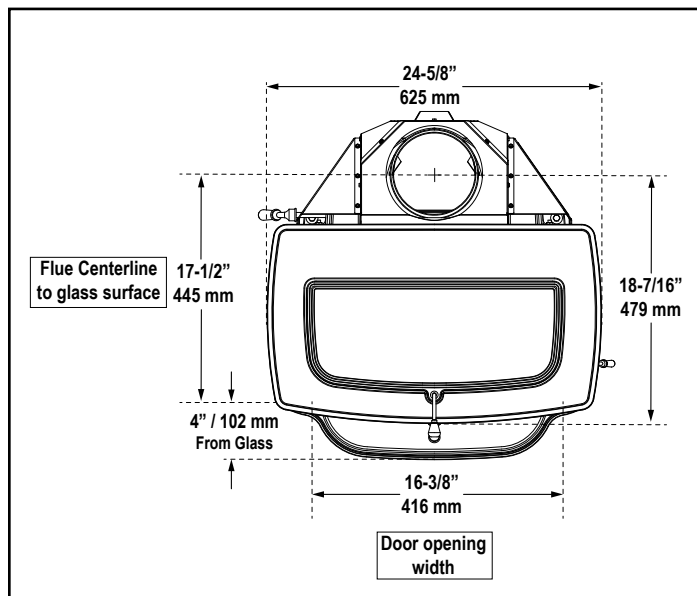


Figure 3.3 - Top View

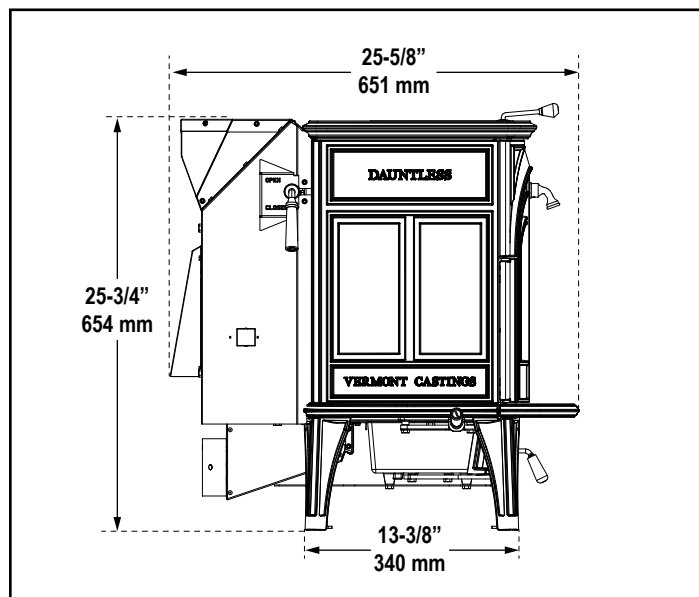


Figure 3.2 - Side View - Top Vent

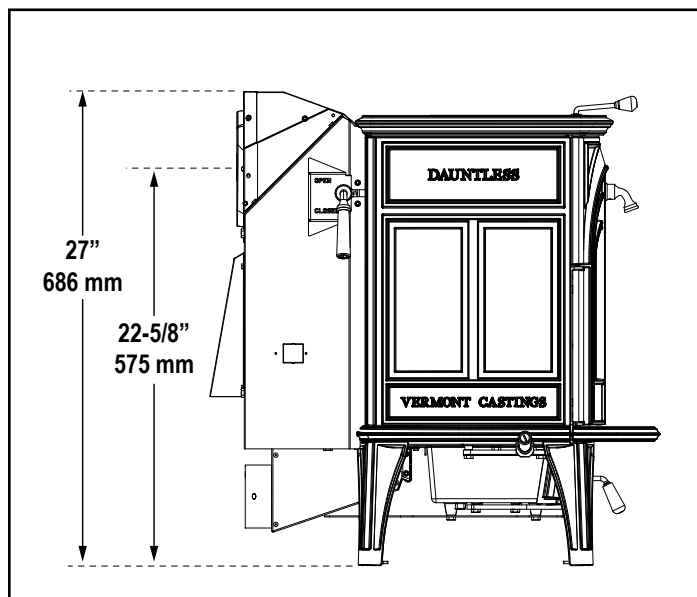


Figure 3.4 - Side View - Rear Vent

B. Hearth Protection Requirements



CAUTION

Hearth and Home Technologies does not recommend adhesive based vinyl flooring due to thermal expansion. Floating-style flooring (LVP - luxury vinyl plank or LVT – luxury vinyl tile) can be used, but it will reach temperatures up to 110 °F in a room with ambient temperature of 70 °F. Consult flooring specifications to ensure compatibility.

HHT recommends wood stoves and inserts have 57 inches of alternative flooring in front of the stove before using LVP/LVT regardless if they sit flush on the floor or are elevated on a raised hearth.

For all other flooring, continue to follow clearance to combustible requirements in the installation manual.

NOTICE: Clearances that do not meet the minimum guidelines could result in damage or buckling to the vinyl flooring and is done at the installer's or homeowner's risk.

FLOOR PROTECTION: It is necessary to install a Type I floor protector. (Spark & Ember protection ONLY)

Floor protector must be non-combustible material extending under the appliance to a minimum of 16" (406 mm) in front of glass, and 8" (203 mm) to both sides of the fuel loading door. Open the door and measure 8" (203 mm) from the side edge of the opening in the face of the appliance. *See exception.

In Canada, similar floor protection must be provided 18" (457 mm) in front and 8" (203 mm) from the sides and rear of the appliance, Figure 3.6

***EXCEPTION:** Non-combustible floor protections must extend beneath the flue pipe when installed with horizontal venting and extend 2" (51 mm) beyond each side, Figure 3.6.



WARNING



Fire Risk

Hearth pads must be installed exactly as specified. High temperatures or hot embers may ignite concealed combustibles.

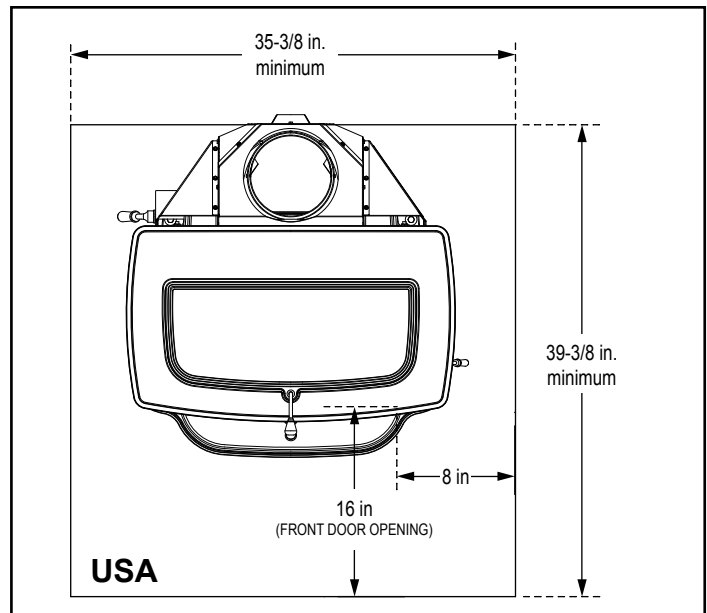


Figure 3.5

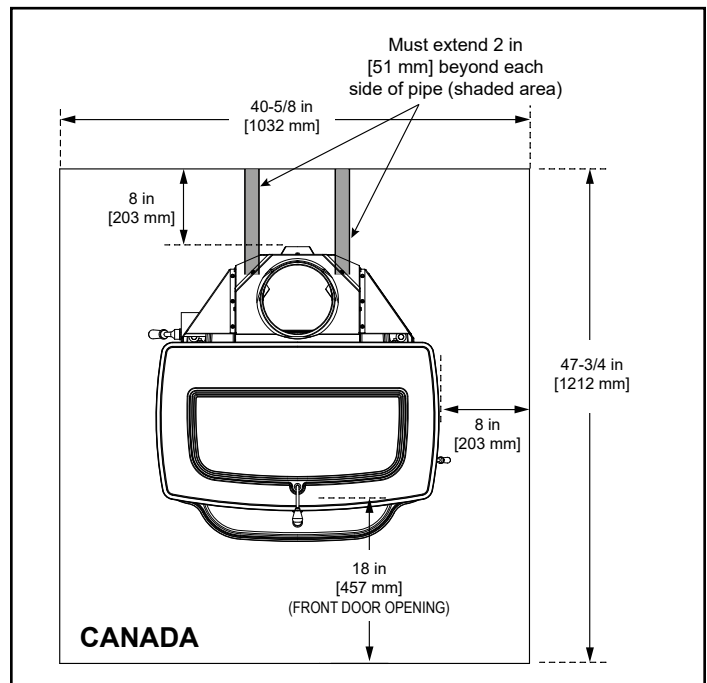


Figure 3.6

C. Clearances to Combustibles

Minimum Clearances to Combustible Materials								
Note: A, C and F Dimensions are to the center of the flue collar								
Installation: Full Vertical								
	A	B	C	D	E	F	G	H*
Single Wall Pipe	18"	14"	26-1/2"	14"	15"	19-1/2"	57-1/2"	18"
Double Wall Pipe	16"	12"	24-1/2"	12"	7"	12"	57-1/2"	18"
Installation: 90 Degree Elbow off Top of Appliance through back wall								
Single Wall Pipe	16"	12"	24-1/2"	12"	15"	19-1/2"	57-1/2"	18"
Installation: Horizontal Through the Wall								
Single Wall Pipe		10"	26-1/2"	14"				
Alcove, Double Wall Pipe		12"		18"			38"	

For Factory Alcove: 6" diameter listed Double wall air insulated connector pipe with UL103 HT listed factory built Class A Chimney or Masonry chimney. Maximum depth Alcove shall be no more than 48" (1219 mm) and the referenced Alcove clearances. Canada must comply with CAN/ULC-S269 M87 for the 650° factory built chimney.

*Follow pipe manufacturers clearances as required.

NOTE: Double wall pipe clearances are for US installations **ONLY**. Canadian installations must conform with local code. In the absence of local codes you must comply with the ULC S627-00 and CAN/CSA-B365.

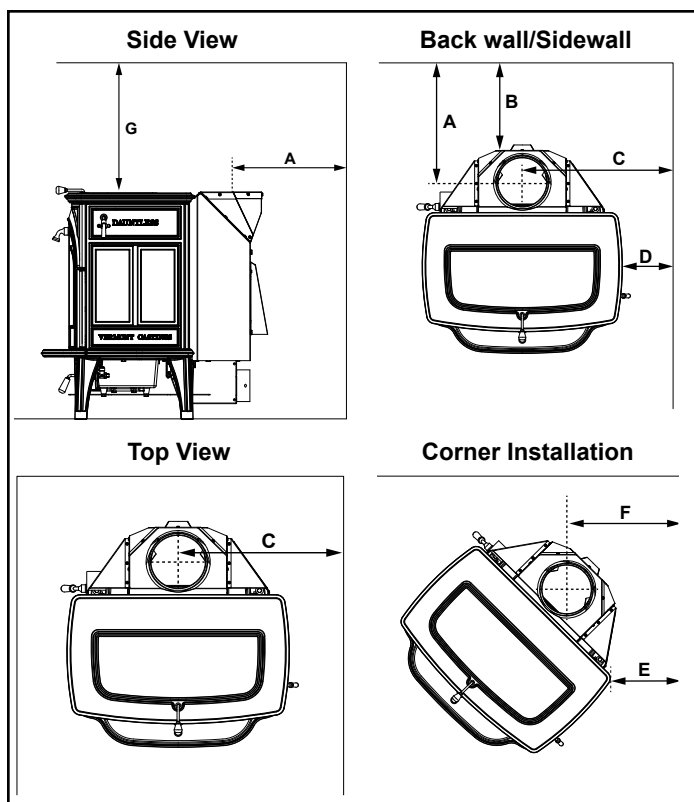


Figure 3.7 - Alcove Clearances are for double wall pipe only.

WARNING

Fire Risk

- Comply with all minimum clearances to combustibles as specified.
- Failure to comply may cause house fire.

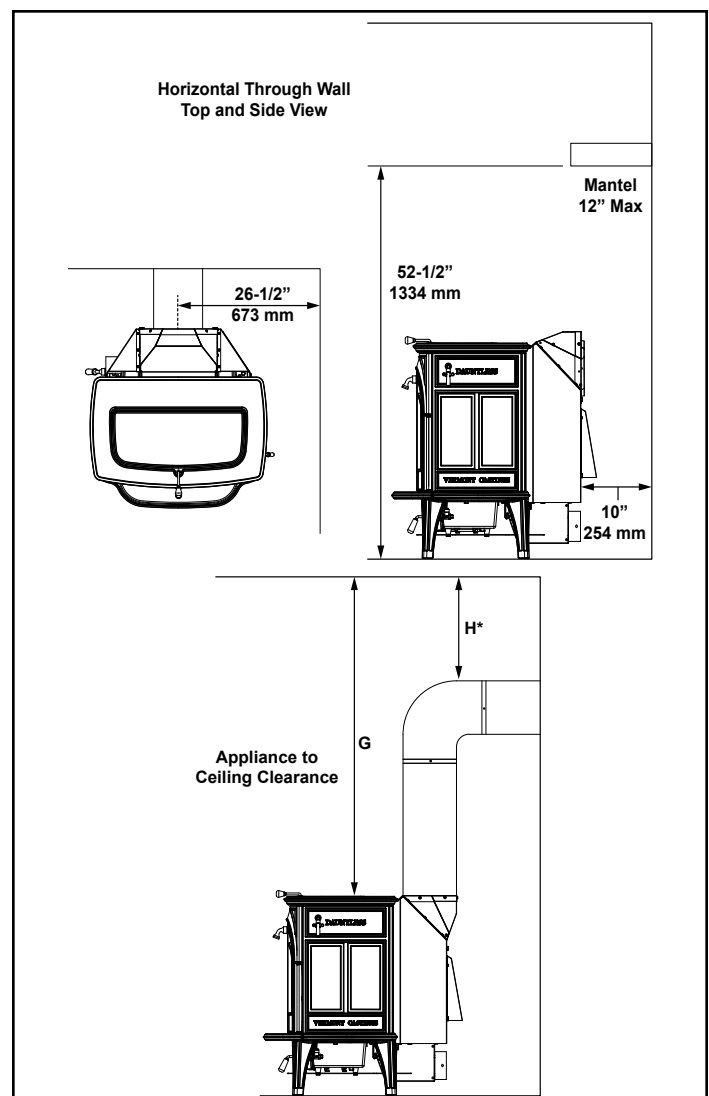


Figure 3.8

D. Fireplace Installation

Note: If mantle clearance specifications are not listed or to reduce mantle clearances you can follow NFPA211 regulations to assure safe installation of this product. Please consult with your local building inspector before attempting any clearance reductions.

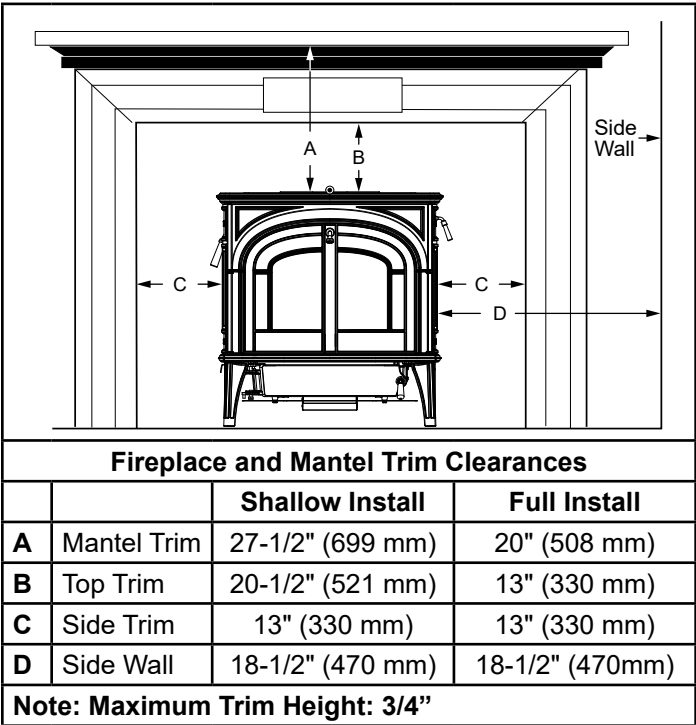


Figure 3.9 - Maintain clearances to combustible components of the mantel piece.

Shallow Installation: If the unit is not installed completely within the fireplace:

The minimum clearance to a mantle is shown in Figure 3.10.

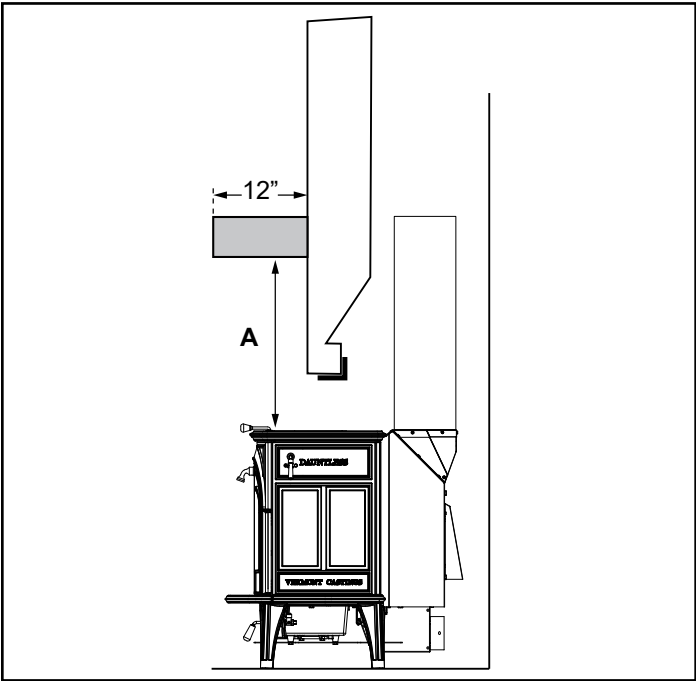


Figure 3.10

Full Installation: If the unit is completely installed in the firebox (unit face flush or behind fireplace front) the minimum clearance to the mantle is shown in Figure 3.11.

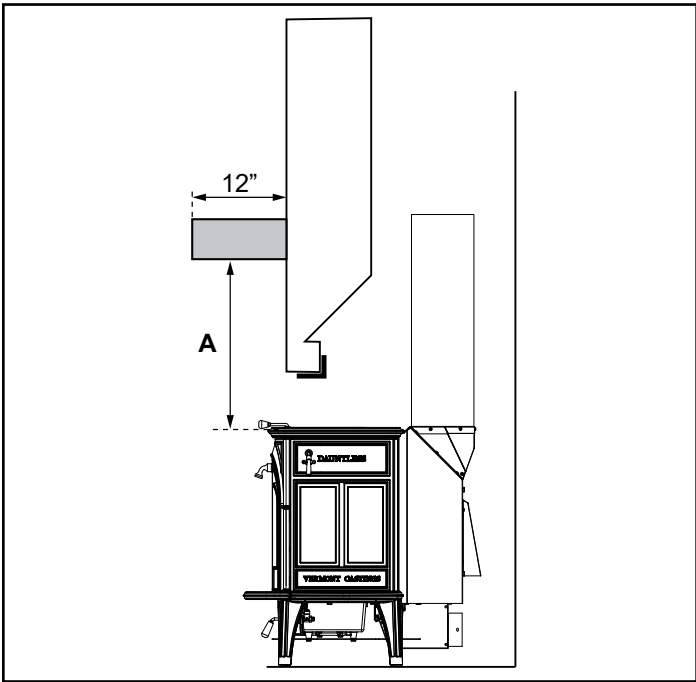


Figure 3.11

Disclaimers:

- Extended floor protection may be required for shallow installs, follow floor protection requirements.
- Full insertion installation may not allow use of the top load door depending on the fireplace height.

E. Locating Your Appliance & Chimney

Location of the appliance and chimney will affect performance. As shown in Figure 3.12 the chimney should:

- Install through the warm space enclosed by the building envelope. This helps to produce more draft, especially during lighting and die down of the fire.
- Penetrate the highest part of the roof. This minimizes the affects of wind turbulence and down drafts.

- Consider the appliance location in order to avoid floor and ceiling attic joists and rafters.
- Locate termination cap away from trees, adjacent structures, uneven roof lines and other obstructions.

Your local dealer is the expert in your geographic area and can usually make suggestions or discover solutions that will easily correct your flue problem.

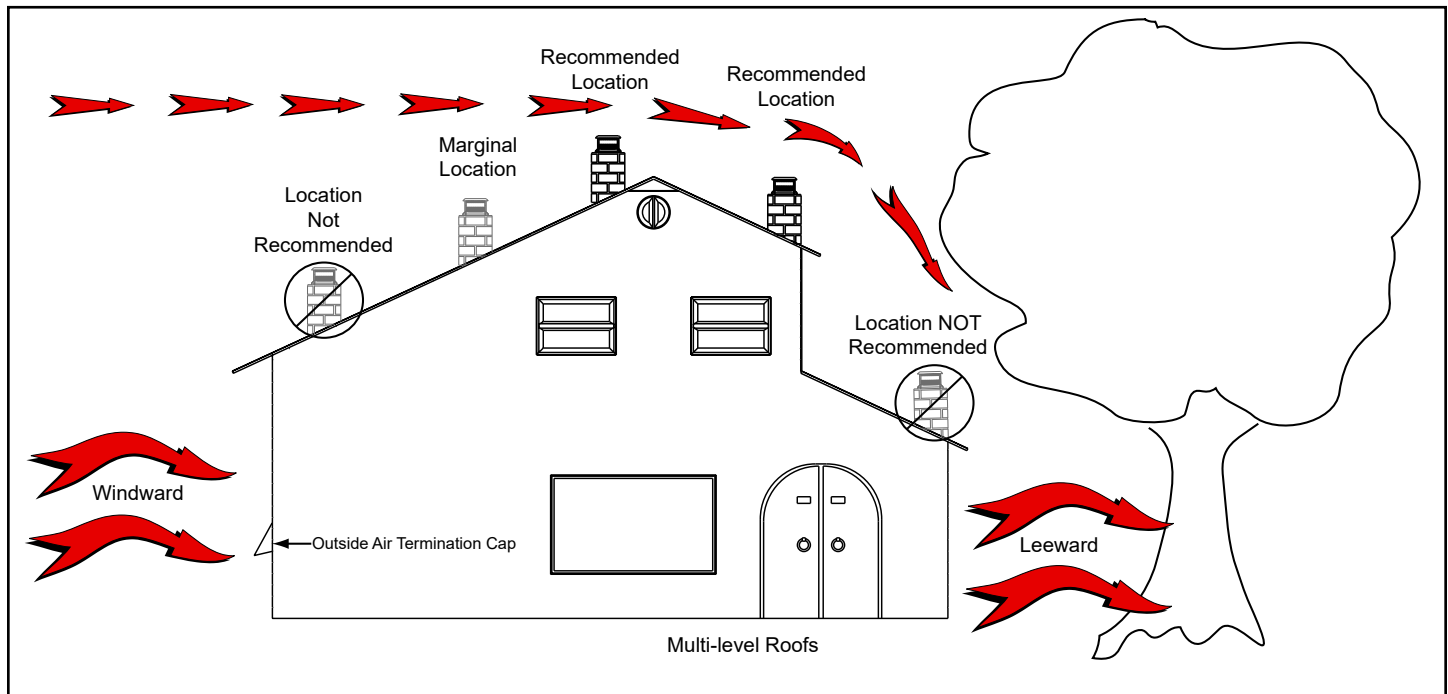


Figure 3.12

F. Chimney Termination Requirements

Follow manufacturer's instructions for clearance, securing flashing and terminating the chimney, Figures 3.13 & 3.14.

- Must have an approved and Listed cap
- Must not be located where it will become plugged by snow or other material
- Must terminate at least 3 feet (91 cm) above the roof and at least 2 feet (61 cm) above any portion of the roof within 10 feet (305 cm).
- Must be located away from trees or other structures

NOTICE:

- Chimney performance may vary.
- Trees, buildings, roof lines and wind conditions affect performance.
- Chimney height may need adjustment if smoking or overdraft occurs.

NOTICE: Locating the appliance in a basement or in a location of considerable air movement can cause intermittent smoke spillage from appliance. Do not locate appliance near

- Frequently open doors
- Central heat outlets or returns

G. Chimney Location (2-10-3 Rule)

These are safety requirements and are not meant to assure proper flue draft.

This appliance is made with a 6" (152 mm) diameter chimney connector as the flue collar on the appliance.

- Changing the diameter of the chimney can affect draft and cause poor performance.
- It is not recommended to use offsets and elbows at altitudes above 4000 feet above sea level and or when there are other factors that affect flue draft.

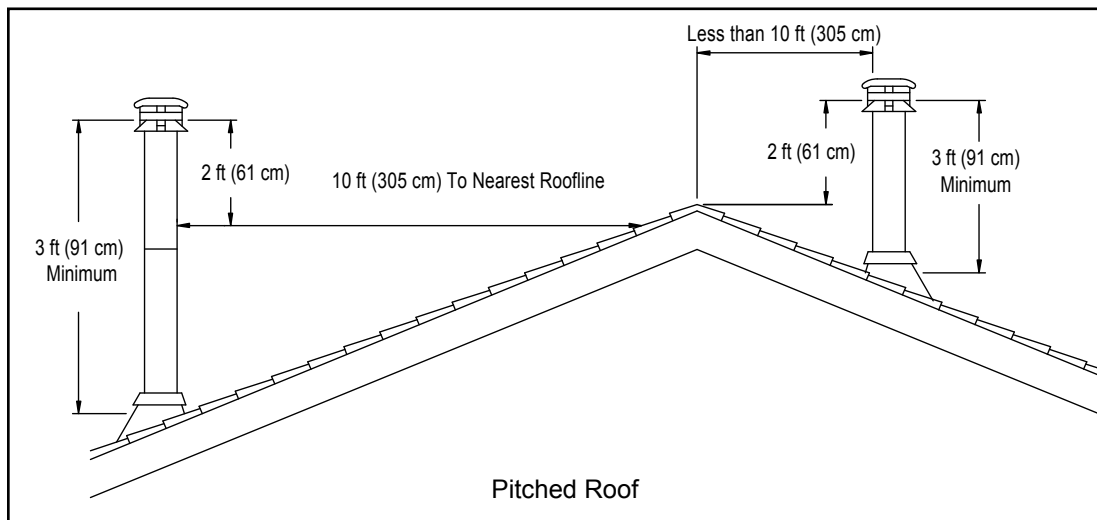


Figure 3.13

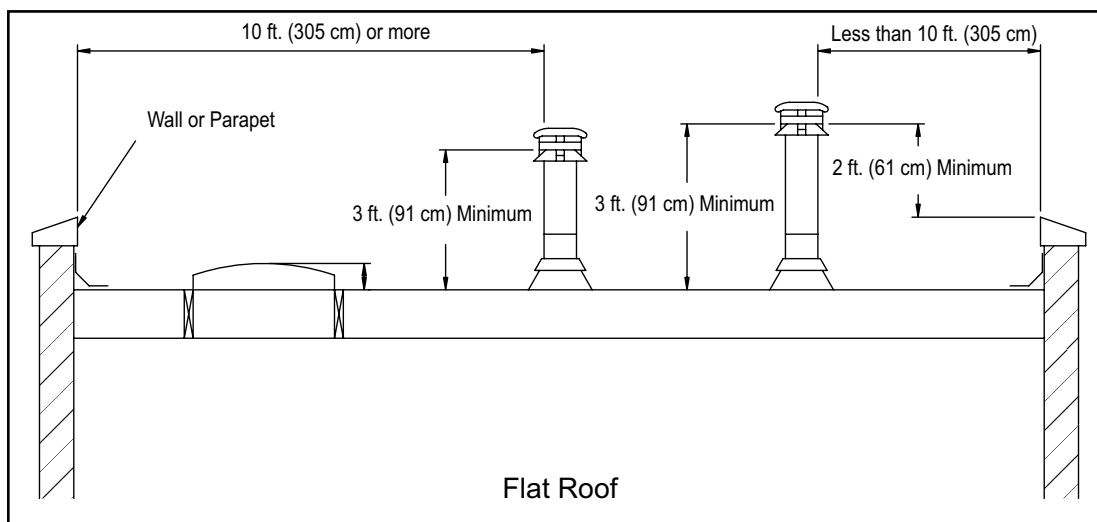


Figure 3.14

4 Chimneys & Venting

A. Venting & Draft Management

A stove is part of a complete system, which includes the chimney, the operator, the fuel, and the home. The performance of the stove depends on how well all parts of the system are matched. When the stove, chimney, and other components work together effectively, the system performs optimally.

Wood stove operation relies on natural (unforced) draft, which occurs when the exhaust is hotter and lighter than the outdoor air at the top of the chimney. The larger the temperature difference, the stronger the draft. As hot gases rise through the chimney, they create suction, or “draw,” which pulls air into the stove to support combustion. A weak draft is indicated by a slow, lazy fire with the air inlets fully open, while a strong draft results in a brisk fire supported solely by air entering the stove through the normal inlets.

Stove air inlets are passive—they regulate how much air can enter the stove but do not actively move air into it.

The design of your installation—whether using a steel or masonry chimney, whether it’s inside or outside the house, and whether it matches the stove’s outlet size—will affect how quickly the system warms up and operates effectively. With an airtight stove, which limits air entry into the firebox, it’s crucial that the chimney keeps the exhaust warm all the way to the outdoors. Some chimneys perform this better than others.

Draft, Chimney Height & Performance: This appliance was tested with a 15-foot chimney using a combination of single-wall chimney connector and insulated Class A pipe. The stove requires a draft between 0.03 and 0.065 inches of H₂O. Draft measurements should be taken with an active fire, the damper closed, and the air control set to maximum. If the draft is below 0.03 inches of H₂O, the stove may have difficulty operating with the damper closed, and there may be back-puffing into the room at lower burn settings.

If the chimney draft is too low, you may need to increase vertical height or reduce the number of elbows/tees in the system. The venting system should not exceed 180° of turns (for example, two 90° elbows, four 45° elbows, or any combination). Two 45° elbows are preferred over a single 90° elbow, as they create less draft reduction and are suitable for installations with low draft.

For tall chimney systems—particularly internal Class A systems—the draft may exceed 0.65 inches of H₂O, leading to short burn times, difficulty controlling the burn rate, and the risk of overfiring. While stack dampers were once recommended in these cases, manufacturers are no longer allowed to specify them for EPA-certified models. It’s essential to review and test the chimney system for draft prior to installing the stove.

Masonry Chimney: Masonry chimneys, while traditional, may not perform well with an airtight stove. Masonry acts as a heat sink, absorbing a significant amount of heat and potentially cooling the chimney gases enough to reduce draft. Larger chimneys take longer to warm up, and outdoor masonry chimneys, especially oversized ones, are particularly difficult to heat and maintain a strong draft.

Steel Chimney: Factory-made steel chimneys often feature an insulation layer around the inner flue, which helps the chimney warm up faster than masonry. Although steel chimneys lack the aesthetic appeal of masonry, they offer better performance by retaining heat and maintaining a stronger draft.

Indoor/Outdoor Location: To keep the smoke warm and maintain optimal draft, it’s best to locate the chimney inside the house. This allows the house to act as insulation for the flue and helps retain heat within the system. An indoor chimney will not lose heat to the outdoors, meaning it requires less energy from the stove to warm up and stay warm.

Single Venting: Each airtight stove requires its own dedicated flue. Venting an airtight stove into a flue that also serves an open fireplace or a less efficient stove can weaken the draft. This happens because the draft may pull air through these other channels, similar to a vacuum cleaner with a hole in the hose. In extreme cases, this can cause a negative draft reversal, which is a dangerous condition.

Flue Sizing: The chimney flue size should match the stove’s flue outlet. An oversized flue can be detrimental. For example, venting a stove with a 6-inch flue collar (28 square inches) into a 10x10-inch flue can slow the gases by up to one-third, allowing them to cool more rapidly, which weakens the draft. If the oversized flue is outdoors, it will also absorb heat from the exhaust, cooling it further and reducing draft strength.

Masonry flues, especially those serving fireplaces, are often oversized for stoves. They can take a long time to heat up, leading to poor performance. The best solution for an oversized flue is to install an insulated steel chimney liner of the same diameter as the stove’s flue outlet. This keeps the exhaust warm and enhances draft. A non-insulated liner is a second option; while it retains the exhaust’s original size, it takes longer to warm up since the air around the liner also needs to heat up.

B. Venting Components

Chimney Connector: It is also known as flue pipe or appliance pipe. The chimney connector joins the appliance to the chimney. It must be a 6" (152 mm) minimum diameter 24 gauge mild steel black or 26 gauge blued steel, or an approved air-insulated double wall venting pipe.

Thimble: A manufactured or site-constructed device installed in combustible walls through which the chimney connector passes to the chimney. It is intended to keep the walls from igniting. Site constructed thimbles must meet NFPA 211 Standards. Prefabricated must be suitable for use with selected chimney and meet UL103 Type HT Standards. Follow instructions provided by the manufacturer for manufactured thimbles for masonry chimney and prefabricated chimneys.

Chimney: The chimney can be new or existing, masonry or prefabricated and must meet the following minimum requirements specified in Section 4B.

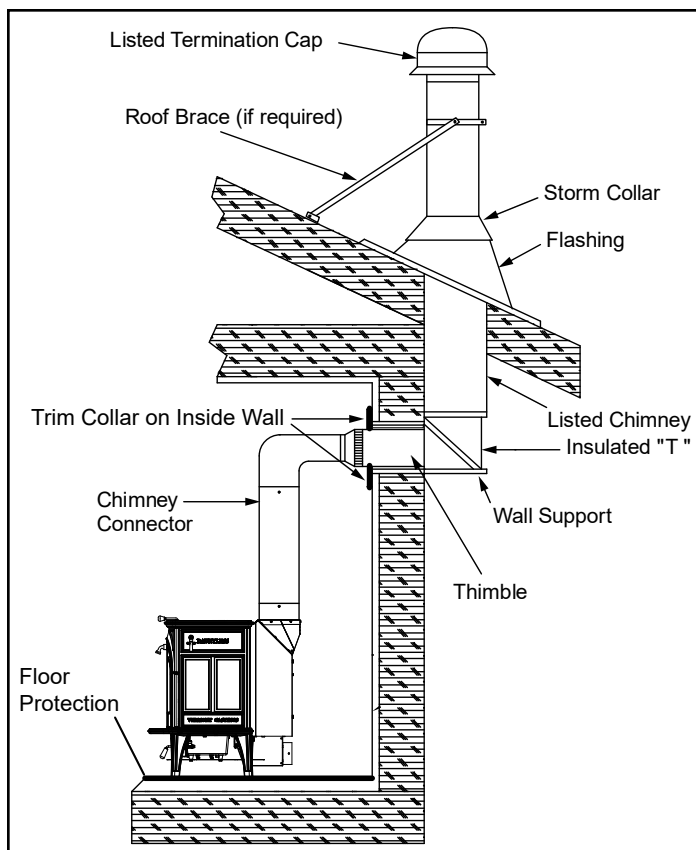


Figure 4.1 - Prefabricated Exterior Chimney

C. Chimney Systems

Prefabricated Metal Chimney:

- Must be minimum 6" (152 mm) diameter (ID) high temperature chimney listed to UL 103 HT (2100 °F) or ULC S629M.
- Must use components required by the manufacturer for installation.
- Must maintain clearances required by the manufacturer for installation.
- Refer to manufacturers instructions for installation.

NOTE: In Canada when using a factory-built chimney it must be safety listed, **Type UL103 HT (2100 °F) CLASS "A"** or conforming to **CAN/ULC-S629M, STANDARD FOR 650 °C FACTORY-BUILT CHIMNEYS.**

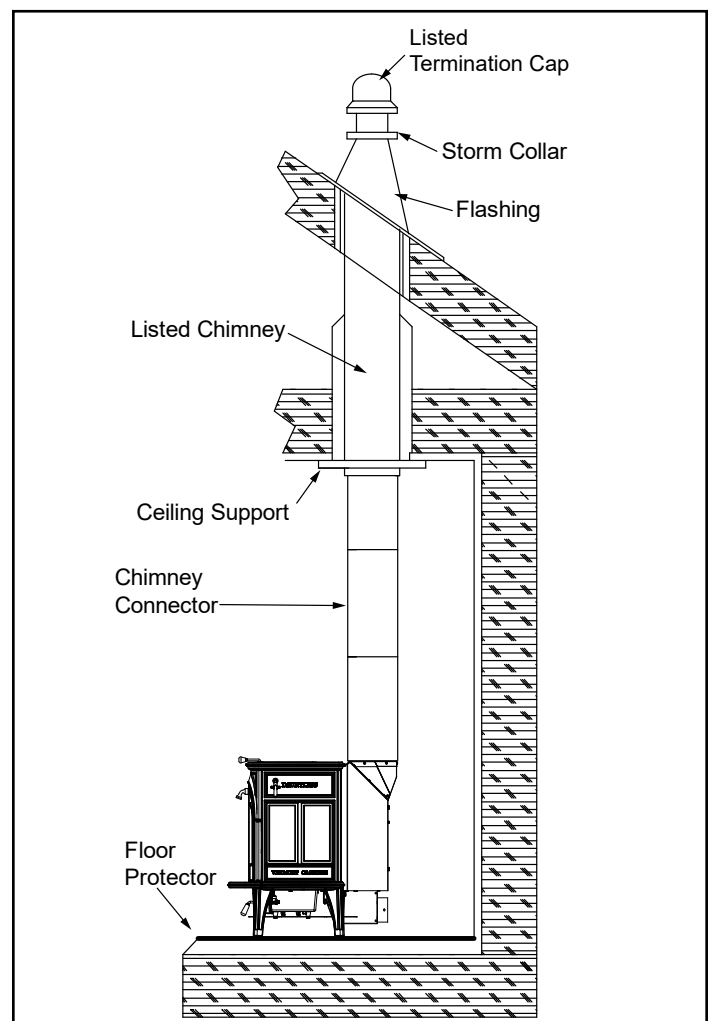


Figure 4.2 - Prefabricated Interior Chimney

Thimble

Site constructed for masonry chimney installation:

Components:

- A minimum length of 12" (305 mm) (longer for thicker walls) of solid insulated factory-built chimney length constructed to UL 103 Type HT 6" (152 mm) inside diameter. Chimney needs to extend a minimum of 2" (51 mm) from the interior wall and a minimum of 1" (25 mm) from the exterior wall.
- Wall spacer, trim collar and wall band to fit solid pack chimney selected.
- Minimum 8" (203 mm) diameter clay liner section (if not already present in chimney) and refractory mortar.
- When jurisdiction requires install approved chimney liner in masonry chimney.

Air Clearances:

- Masonry chimney clearance must meet NFPA 211 minimum requirement of 2" (51 mm) to sheet metal supports and combustibles.
- Minimum of 1" (25 mm) clearance around the chimney connector.
- Top of wall opening is a minimum of 13-1/2" (343 mm) from ceiling or 4-1/2" (114 mm) below minimum clearance specified by chimney connector manufacturer. NFPA 211 minimum vertical clearance of 18" (457 mm) from chimney connector and ceiling or minimum recommended by chimney connector manufacturer, Figure 4.3

Instructions:

1. Open inside wall at proper height for the chimney connector to enter the masonry chimney, Figure 4.3
2. Entry hole to masonry chimney must be lined with an 8" (203 mm) minimum diameter clay liner, or equivalent, secured with refractory mortar.
3. Construct a 17" x 17" (432 mm x 432 mm) outside dimension frame from 2 x 2 framing lumber to fit into wall opening. Inside opening of frame should be no less than 14" x 14" (356 mm x 356 mm), Figure 4.4. Attach the wall spacer to the chimney side of the frame.
5. Nail the frame into the wall opening. The spacer should be on the chimney side.
6. Insert the section of the solid insulated chimney into the outer wall of the masonry chimney.
7. Tightly secure the length of the solid insulated chimney with the wall band to the masonry chimney.
8. Insert a section of chimney connector into the chimney. Make sure it does not protrude past the edge of the clay chimney liner inside the chimney.
9. Seal the end of the chimney connector to the clay liner with refractory mortar.
10. Install trim collar around the sold pack chimney section.

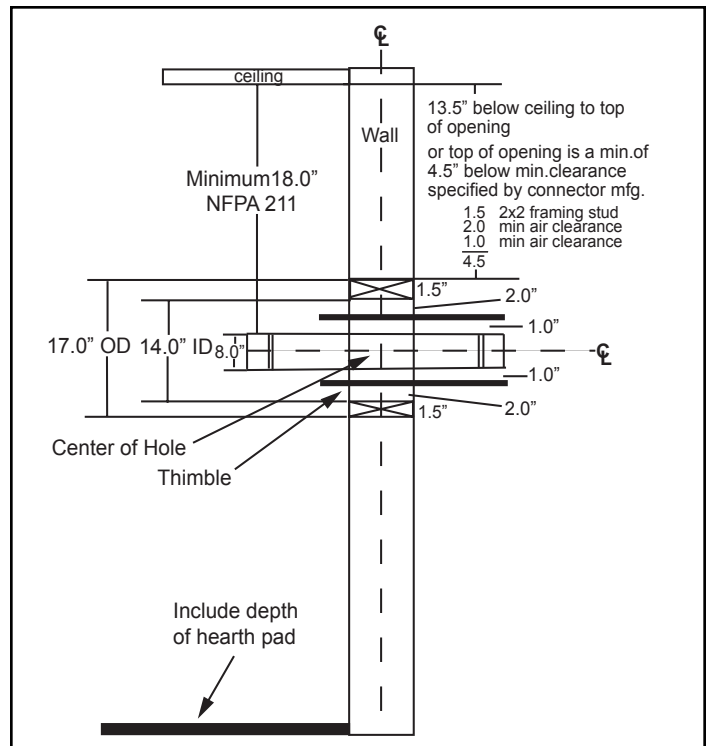


Figure 4.3

Solid Pack Chimney with Metal Supports as a Thimble

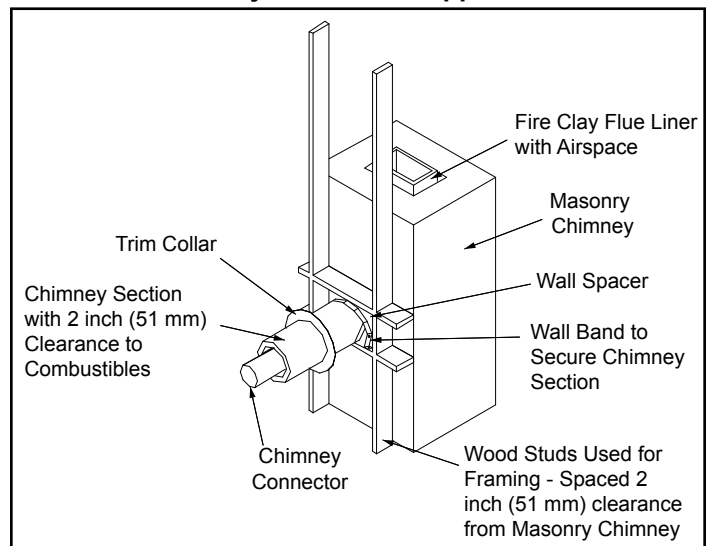


Figure 4.4

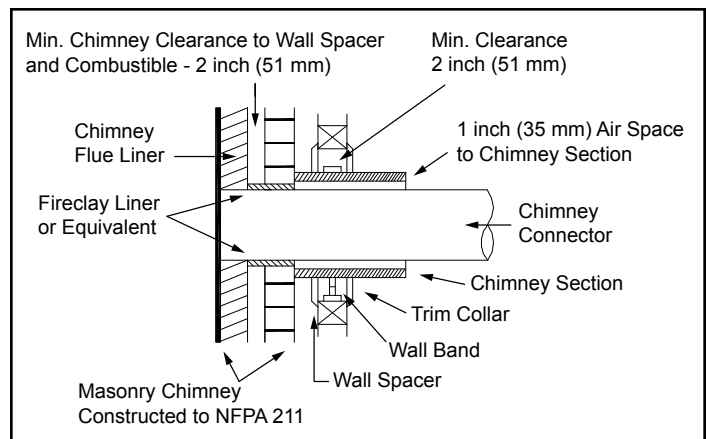


Figure 4.5

! WARNING



Fire Risk

Do NOT pack insulation or other combustibles between spacers.

- ALWAYS maintain specified clearances around venting and spacers.
- Install spacers as specified.

Failure to keep insulation or other material away from vent pipe may cause fire.

! WARNING



Fire Risk

Inspection of Chimney:

- Chimney must be in good condition.
- Meets minimum standard of NFPA 211
- Factory-built chimney must be 6" (152mm) UL103 HT.

! WARNING



Asphyxiation Risk

- DO NOT CONNECT THIS APPLIANCE TO A CHIMNEY FLUE SERVICING ANOTHER APPLIANCE.
- DO NOT CONNECT TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.

May allow flue gases to enter the house.

! WARNING

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to the owner's information manual provided with this appliance. For assistance or additional information consult a qualified installer, service agency or your dealer.

D. Installing Chimney Components

Chimney Connector

Single wall connector or appliance pipe: This must be at least 24 gauge mild steel or 26 gauge blue steel. The sections must be attached to the appliance and to each other with the crimped (male) end pointing toward the appliance. All joints, including the connection at the flue collar, should be secured with 3 sheet metal screws. Make sure to follow the minimum clearances to combustibles. Where passage through the wall, or partition of combustible construction is desired in Canada, the installation shall conform to CAN/CSA-B365.

Factory-built (Double-Wall) listed chimney connector: A listed connector (vented) must be used when installing this appliance in a mobile home. The listed connectors must conform to each other to ensure a proper fit and seal.

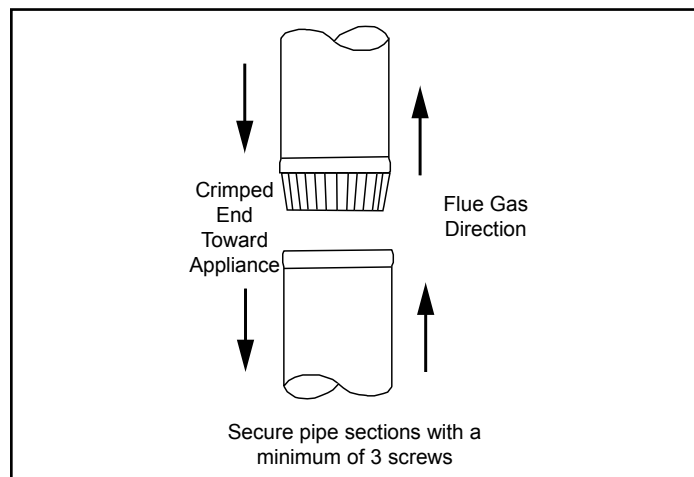


Figure 4.6 - Chimney Connector (Appliance Pipe)

! WARNING



Fire Risk

Follow Chimney Connector Manufacturer's Instructions for Proper Installation.

ONLY use connector:

- Within the room, between appliance and ceiling or wall.
- Connector shall NOT pass through:
- Attic or roof space
 - Closet or similar concealed space
 - Floor or ceiling

Maintain minimum clearances to combustibles

5 Appliance Set-Up

A. Removing Unit from Skid

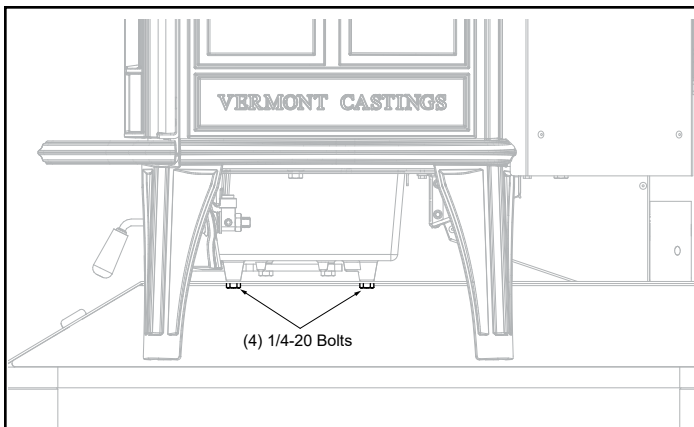


Figure 5.1 - Remove unit from shipping brackets.

Remove the unit from the shipping brackets by removing (2) 1/4-20 hex head bolts from each shipping bracket, leaving brackets attached to the skid, Figure 5.1. (Save the 1/4-20 hex head bolts as they will be needed later to install heat shield.)

NOTE: When moving the stove, lift the stove to take weight off the legs whenever possible. Dragging or sliding the stove, especially across rough surfaces can cause the legs to break.

B. Assembly

Set Up Your Stove: Cast iron stoves are heavy, and it will take two to four people to move your Dauntless-C into position.

Wipe the protective coating of oil from the griddle with a clean dry rag or a paper towel.

Install the handle on the griddle. Open front door and push up on griddle and assemble the handle, Figure 5.2.

With the handle pointing 45° from its final position, tighten the nut as far as possible with the pliers. Move the handle to its final position while still holding the nut with the pliers.

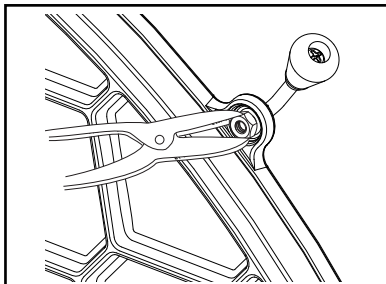


Figure 5.2 - Attach the griddle handle.



CAUTION

Overtightening can strip tapped threads.

Install the Bottom Heat Shield:

NOTE: The Bottom Heat Shield is required in most installations. Refer to Floor Protection, in the Dimensions and Clearances Section of this manual for further details.

1. Align the bottom heat shield holes with the four bolts removed from the shipping brackets
2. Pass all four bolts through the large end of the keyholes and then pulling the shield forward to engage the smaller ends of the keyhole slots, Figure 5.3.
3. Attach the heat shield sides by passing the slots over the bolt heads. Tighten the hex head bolts.

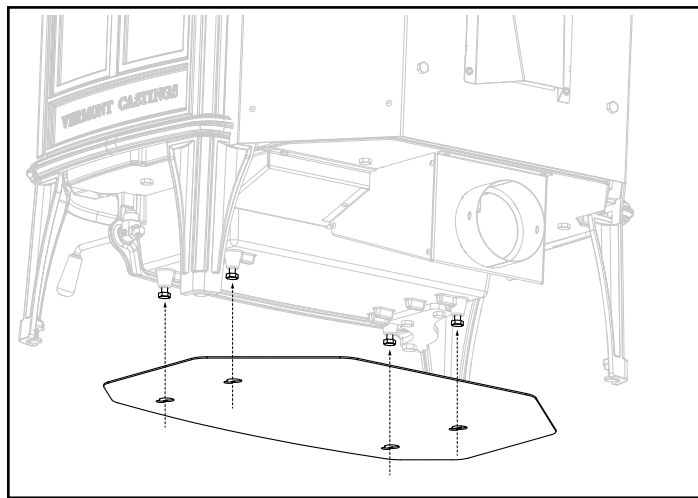


Figure 5.3 - Attach the bottom heat shield.

Adjust the Leg Levelers: Lift the stove slightly so there is no weight on the leg while making the adjustment.



WARNING

The flue collar heat shield must be installed in all installations.

Attach the Damper Handle: Use the 1/4"-20 x 3" screw to attach the damper handle to the damper stub on the left side.

Assemble the Removable Insert Handle: The wooden removable insert handle opens and closes the front doors. Remove after each use, and store it in the handle holder behind the left front leg. Assemble the handle by passing the 3-3/8" screw through the wooden shaft and into the bright metal nub, Figure 5.4. Tighten carefully until snug.

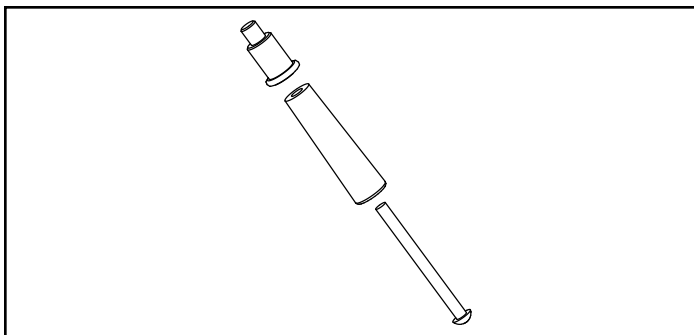


Figure 5.4 - Assemble the fall away door handle.

Storing the Handle: Use the removable handle to open or close the doors. After using it, remove the handle so it will not get hot. Store the handle in the handle holder installed behind the left front leg, Figure 5.5.

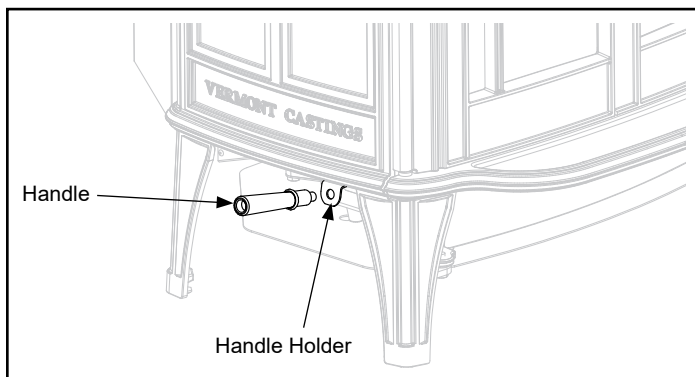


Figure 5.5 - Handle holder and heat shield positions.

C. Smoke and CO Detectors & Safety Tips

Smoke and CO Detectors: The use of smoke and carbon monoxide (CO) detectors throughout the home is strongly advised, even if not required by building codes or insurance regulations. It is a good idea to install a smoke detector in the living areas and each bedroom. Follow the smoke/CO detector manufacturers placement and installation instructions and maintain regularly.

You may not, however, wish to install a detector in the immediate vicinity of the stove. Depending on the sensitivity of the unit, the alarm can be set off while you are tending the fire or emptying the ashes. If you install a detector in the same room, locate it as far away from the stove as possible.

Safety Tips: Conveniently locate a “Class A” fire extinguisher to contend with small fires. Be sure the fire extinguisher works and is clearly visible. All occupants of the house should know where it is, and how it operates. Have heavy stove gloves available near the stove. Have special safety accessories (e.g., Child Guard Screen) available for use if small children will be in the home.

In the event of a stove pipe or chimney fire....

- Evacuate the house immediately
- Notify the fire department
- If the fire isn’t too threatening, closing down the stove tight, (damper, primary air, all doors) will help to smother the fire.
- Inspect your stove, vent pipe and chimney for any damage caused by the fire and correct any damage before using your stove again.



WARNING



Fire Risk

- Do not leave the fire unattended when the door is unlatched.
- Unstable firewood could fall out of the firebox creating a fire hazard to your home.

D. Reversible Flue Collar (If necessary)

Tools Required: Phillips head screwdriver.

The flue collar is reversible for either a top or rear venting installation. The appliance is shipped with the flue collar in the top vent position.

Converting Collar For Rear Vent Installation:

1. Remove (10) #8 Tek screws from the heat shield cover and heat shield. Remove heat shield and cover, Figure 5.6.
2. Remove (2) 1/4-20 pan head screws from the flue collar. Remove flue collar, Figure 5.6.
3. Turn flue collar to horizontal position. Inspect rope gasket located on the rear cast housing to ensure a leak free seal. Re-install flue collar, heat shield and heat shield cover, Figure 5.7.

Note: There is a knockout on the rear air jacket that will need to be removed prior to installing the flue collar for it to fit properly to the unit, Figure 5.7.

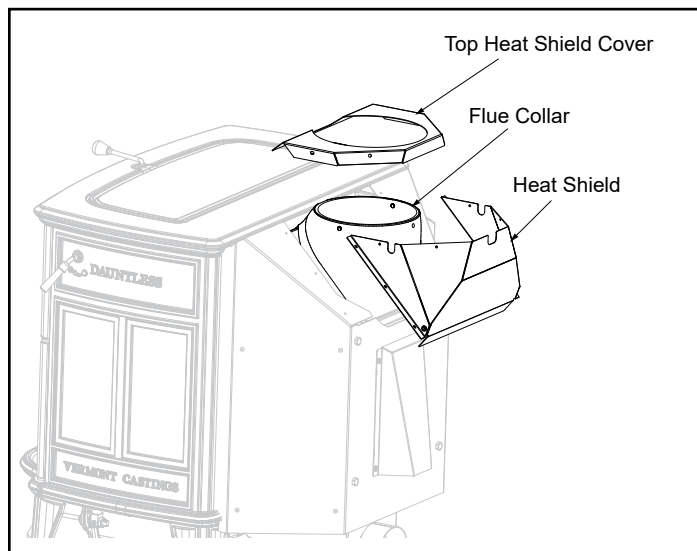


Figure 5.6

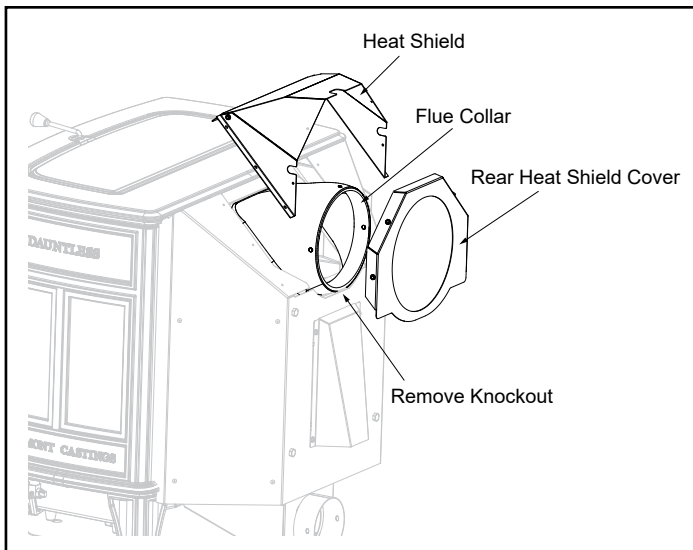


Figure 5.7

E. Outside Air Installation

A source of air (oxygen) is necessary in order for combustion to take place. Whatever combustion air is consumed by the fire must be replaced. Air is replaced via air leakage around windows and under doors. In homes that have tightly sealed doors and windows, an outside air source is needed. An Outside Air box is installed from factory to accommodate outside air. An optional outside air kit is available

Items Needed for Installation (not supplied):

- Phillips head screw driver
- Wire ties
- Plastic outside air vent
- 3" Flex or Rigid Duct
- 3" Outside Air Termination Cap with Screen
- Silicone sealant
- Drills and saws necessary for cutting holes through the wall or flooring in your home.

1. Remove all materials from packing box.
2. Using a #2 Phillips screw driver attach the flex adapter to the appliance using 4 screws. Figure 5.8 & 5.9.
3. Floor & Rear Installation: Cut a 3" (76 mm) hole in outside wall or floor to accommodate outside air piping. Use 3" (76 mm) aluminum metal flex or rigid piping to directly connect outside air to appliance intake. Use the supplied termination cap with a rodent screen. Seal between the wall (or floor) and the pipe with silicone to prevent moisture penetration.

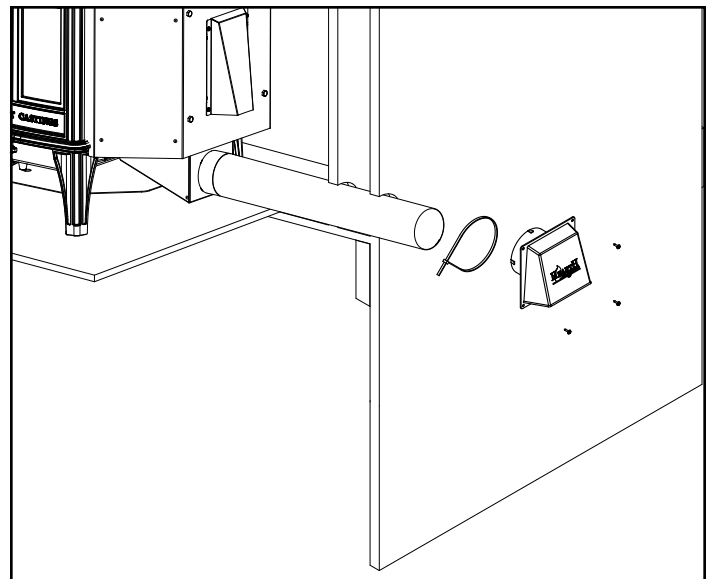


Figure 5.8 - Rear Installation

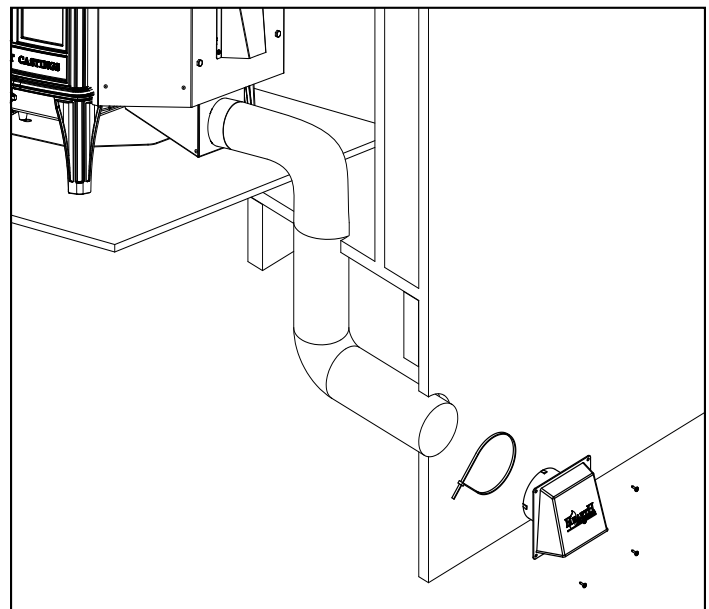


Figure 5.9 - Floor Installation

WARNING



Fire Risk - Asphyxiation Risk

Do not draw outside combustion air from:

- Wall, floor or ceiling cavity
- Enclosed space such as an attic or garage
- Close proximity to exhaust vents or chimneys

Fumes or odor may result



Outside air inlet must be located to prevent blockage from Leaves, Snow or ice, Other debris. Blockage may cause combustion air starvation.

- Fire will not burn properly
- Smoke spillage occurs when door is opened due to air starvation

6

Mobile Home Installation - Approved for USA Installation ONLY!

You must use Mobile Home Brackets located in the manual pack for installation in a mobile home.

1. An outside air inlet must be provided for combustion.
2. The stove must be permanently secured to the floor using the mobile home brackets supplied in the manual pack along with screws or lag bolts (not supplied), Figure 6.1.

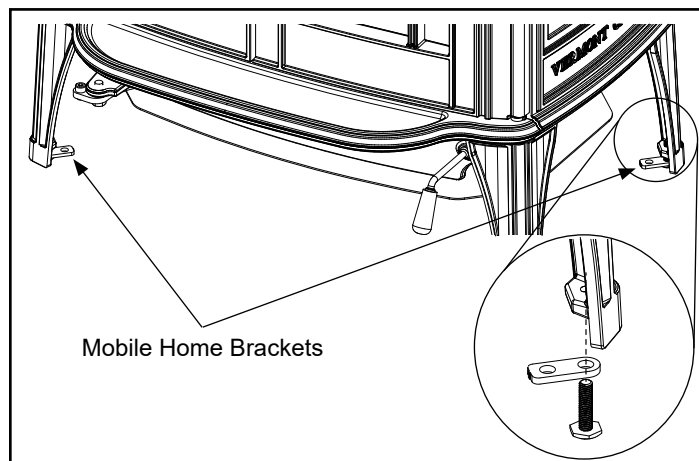


Figure 6.1

3. Appliance must be grounded with #8 solid copper grounding wire or equivalent and terminated at each end with N.E.C. approved grounding device.
4. Appliance must be installed with an approved UL103 HT ventilated chimney connector, UL103 HT chimney, and terminal cap with spark arrestor. Never use a single wall connector (appliance pipe) in a mobile home installation. Use only double-wall connector pipe, Dura-Vent DVL, Selkirk Metalbestos DS or Security DL double-wall connector or any listed double-wall connector pipe.
5. In Canada, this appliance must be connected to a 6" (152 mm) factory-built chimney conforming to CAN/ULC-629M, STANDARD FOR FACTORY BUILT CHIMNEYS.
6. Follow the chimney and chimney connector manufacturer's instructions when installing the flue system for use in a mobile home.
7. Maintain clearance to combustibles.
8. Floor protection requirements must be followed precisely.
9. Use silicone to create an effective vapor barrier at the location where the chimney or other component penetrates to the exterior of the structure.

NOTE: Offsets from the vertical, not exceeding 45°, are allowed per Section 905(a) of the Uniform Mechanical Code (UMC). Offsets greater than 45° are considered horizontal and are also allowed, providing the horizontal run does not exceed 75% of the vertical height of the vent. Construction, clearance and termination must be in compliance with the UMC Table 9C. This installation must also comply with NFPA 211.

NOTE: Top sections of chimney must be removable to allow maximum clearance of 13.5 feet (411cm) from ground level for transportation purposes.

10. Burn wood only. Other types of fuels may generate poisonous gases (e.g., carbon monoxide).
11. If appliance burns poorly while an exhaust blower is on in home, (i.e., range hood), increase combustion air.
12. Installation shall be in accordance with the Manufacturers Home & Safety Standard (HUD) CFR 3280, Part 24.

CAUTION

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

Do NOT cut through:

- Floor joist, wall, studs or ceiling trusses.
- Any supporting material that would affect the structural integrity.

WARNING



Asphyxiation Risk

NEVER INSTALL IN A SLEEPING ROOM.
Consumes oxygen in the room.

Please contact your authorized dealer with any questions or concerns.
For the number of your nearest dealer log onto www.forgenflame.com

CAUTION		
	DO NOT DISCARD THIS MANUAL - Important operating and maintenance instructions included. - Read, understand and follow these instructions for safe installation and operation. - Leave this manual with party responsible for use and operation.	

We recommend that you record the following pertinent information for your heating appliance.

Date purchased/installed: _____

Serial Number: _____ Location on appliance: _____

Dealership purchased from: _____ Dealer phone: _____

Notes: _____

This product may be covered by one or more of the following patents: (United States) 5341794, 5263471, 6688302, 7216645, 7047962 or other U.S. and foreign patents pending.

Appendix C: Calibrations



QUALITY CONTROL SERVICES

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



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

Report Number: DIRI0182484A0912013i241204

A2LA ACCREDITED CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Digiweigh	DWP12i 300kg x 0.	82484A0912013i	#050	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
kg	0.01	QC033	12/4/24	12/28/23	12/2025

FUNCTIONAL CHECKS

SHIFT TEST		LINEARITY		REPEATABILITY		ENVIRONMENTAL CONDITIONS
Test Wt:	Tol:	Test Wt:	Tol:	Test Wt:	Tol:	
100	0.05	HB44	HB44	100	0.01	
As-Found:		As-Found:		As-Found:		
Pass: ☒	Fail: ☐	Pass: ☒	Fail: ☐	Pass: ☒	Fail: ☐	
As-Left:		As-Left:		As-Left:		
Pass: ☒	Fail: ☐	Pass: ☒	Fail: ☐	Pass: ☒	Fail: ☐	

☐	☒	☐
Good	Fair	Poor
Temperature: 17.2°C		

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
400	399.98	399.98	0.006
200	200.00	200.00	0.005
100	100.00	100.00	0.005
75	75.00	75.00	0.005
50	50.00	50.00	0.005
25	25.00	25.00	0.005

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	7/26/24	7/2026	20221688

Permanent Information Concerning this Equipment:

12 month calibration cycle. Scale calibrates in kg only.

Comments/Information Concerning this Calibration

12/04/2024: RH-37%

Report prepared/reviewed by: TLP

Date: 12.04.2024

Technician: T. Peterson

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.

Member: National Conference of Standards Laboratories and Weights & Measures

Dry Gas Meter Calibration

DUT

Manufacturer: Apex
 Model: XC-60
 Lab ID #: 53
 Serial #: 1902130
 Calibration Date: 2/1/2025
 Calibration Expiration: 8/1/2025
 Barometric Pressure: 30.02 in. Hg



Equipment Used:	Ref. Std. DGM	Thermometer	Barometer	Manometer
Manufacturer: Apex		NI	Aquatech	Dwyer
Model: SK25DA		9213	DBX2	W17AE
Lab ID#: 47		215	202	124
Calibration Expiration Date: 5/1/2025		2/26/2025	6/17/2025	6/16/2025
Calibration γ Factor: 0.998				

Use in accordance with EPA Method 5, sections 10.3 and 16.1. Use only calibrated, NIST traceable reference standard DGM. Calibrate over expected operating flow range of DUT.

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	236.809	287.051	244.102
Standard DGM Temperature (°F)	70.6	70.3	71.8
Standard DGM Pressure (in H ₂ O)	0.00	0.00	0.0
DGM Initial Volume (ft ³)	0.000	0.000	0.000
DGM Final Volume (ft ³)	8.217	10.148	8.812
DGM Temperature (°F)	80.2	86.9	91.0
DGM Pressure (in H ₂ O)	3.43	2.25	1.38
Net Volume for Standard DGM (ft ³)	8.363	10.137	8.620
Net Volume for DGM (ft ³)	8.217	10.148	8.812
Dry Gas Meter γ Factor	1.025	1.022	1.008
γ Factor Deviation From Average	0.007	0.004	0.011

Average Gas Meter γ Factor

1.019

Measurement Uncertainty: Total measurement uncertainty +/- 0.748% RD, K=2

Calculations:

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

Dry Gas Meter Calibration

DUT

Manufacturer: Apex
 Model: XC-60
 Lab ID #: 54
 Serial #: 1902133
 Calibration Date: 2/1/2025
 Calibration Expiration: 8/1/2025
 Barometric Pressure: 30.02 in. Hg



Equipment Used:	Ref. Std. DGM	Thermometer	Barometer	Manometer
Manufacturer: Apex		NI	Aquatech	Dwyer
Model: SK25DA		9213	DBX2	W17AE
Lab ID#: 47		215	202	124
Calibration Expiration Date: 5/1/2025		2/26/2025	6/17/2025	6/16/2025
Calibration γ Factor: 0.998				

Use in accordance with EPA Method 5, sections 10.3 and 16.1. Use only calibrated, NIST traceable reference standard DGM. Calibrate over expected operating flow range of DUT.

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	145.607	267.121	243.468
Standard DGM Temperature (°F)	63.5	66.0	67.5
Standard DGM Pressure (in H ₂ O)	0.00	0.00	0.0
DGM Initial Volume (ft ³)	0.000	0.000	0.000
DGM Final Volume (ft ³)	5.095	9.615	8.854
DGM Temperature (°F)	69.9	81.0	89.9
DGM Pressure (in H ₂ O)	2.93	1.93	3.42
Net Volume for Standard DGM (ft ³)	5.142	9.433	8.598
Net Volume for DGM (ft ³)	5.095	9.615	8.854
Dry Gas Meter γ Factor	1.012	1.002	1.002
γ Factor Deviation From Average	0.007	0.003	0.004

Average Gas Meter γ Factor

1.005

Measurement Uncertainty: Total measurement uncertainty +/- 0.748% RD, K=2

Calculations:

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

Report and Certificate of Calibration



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Toll Free
800-356-4662

Address
5777 SE International Way
Milwaukie, OR 97222

Local
503-654-9620



Report #: 38860-203325-21 **Customer PO#:** 1126
Customer Name: PFS TECO
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas **State:** OR **Zip:** 97015
Contact: Ethan Frederick
Service Address: 11785 SE Highway 212, Suite 305 Clackamas, OR 97015

Calibration Standards

10-01442 Compound Gauge Fluke SN: 4582643 Cal: 01/24/2025 Due: 01/31/2026 Vendor: Fluke Report #: EVL1027223
14-01349 Thermo-Hygrometer Comark SN: 06210350162 Cal: 08/23/2024 Due: 08/31/2025 Vendor: Cal-Cert Range: 122 °F 95 %RH Report #: 36408-71148-5

Instrument Data

Calibration Date:	February 27, 2025	Reference:	ASME B40.100
Recommended Due Date:	February 27, 2026	Cal-Cert Procedure:	CP-003
Calibration Frequency:	12 Months	Indicating System:	Digital
Manufacturer:	Newport Industries	Temperature:	66 °F
Type:	Pressure Transducer	Humidity:	41% RH
Model Number:	Unknown	Cal Factor:	None
Serial #:	Unknown	Asset #:	54B
Capacity:	1 In H2O	Service Location:	Service Address
Tolerance:	± 1.00% of Span	As Found:	Pass
Gauge Class:	A	As Left:	Pass

Instrument Range:		Range Resolution:		Mode Verified:		Pressure		
Instrument Range:	1.00	Range Resolution:	0.01	Mode Verified:	Pressure			
UUT Reading	Standard As Found	Standard Verification Reading #1	Error	Standard Verification Reading #2	Error	Tolerance	Expanded Uncertainty ±	
In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.005	
0.10	0.1058	0.1058	0.01	0.1024	0.00	0.01	0.01	
0.25	0.2534	0.2534	0.00	0.2546	0.00	0.01	0.006	
0.50	0.5056	0.5056	0.01	0.5073	0.01	0.01	0.007	
0.75	0.7502	0.7502	0.00	0.7589	0.01	0.01	0.023	
1.00	1.0081	1.0081	0.01	1.0051	0.01	0.01	0.009	
0.75	0.7533	0.7533	0.00	0.7544	0.00	0.01	0.006	
0.50	0.5079	0.5079	0.01	0.5036	0.00	0.01	0.012	
0.25	0.2584	0.2584	0.01	0.2576	0.01	0.01	0.006	
0.10	0.1096	0.1096	0.01	0.1083	0.01	0.01	0.006	
0.00	0.0000	0.0000	0.00	0.0000	0.00	0.01	0.005	

Manufacturer: Newport Industries

Type: Pressure Transducer

Serial #: Unknown

Remarks:

--

**We sincerely thank you for your business. Please call us at 503-654-9620 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.**

Cal-Cert is accredited by A2LA under Calibration Laboratory Code #4986.01. A2LA is recognized under the ILAC mutual recognition agreement (MRA).
--

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC 17025 and ANSI/NCSL Z540.1, and meets the requirements of all applicable references and Cal-Cert procedures listed above. Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.

All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.

This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: Samuel Owens

Date: February 27, 2025

Quality Manager: Tony Lewandowski

Signature:



Report and Certificate of Calibration



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800-356-4662

Address
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Milwaukie, OR 97222

Local
503-654-9620



Report #: 38860-203326-21 **Customer PO#:** 1126
Customer Name: PFS TECO
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas **State:** OR **Zip:** 97015
Contact: Ethan Frederick
Service Address: 11785 SE Highway 212, Suite 305 Clackamas, OR 97015

Calibration Standards

10-01442 Compound Gauge Fluke SN: 4582643 Cal: 01/24/2025 Due: 01/31/2026 Vendor: Fluke Report #: EVL1027223
14-01349 Thermo-Hygrometer Comark SN: 06210350162 Cal: 08/23/2024 Due: 08/31/2025 Vendor: Cal-Cert Range: 122 °F 95 %RH Report #: 36408-71148-5

Instrument Data

Calibration Date:	February 27, 2025	Reference:	ASME B40.100
Recommended Due Date:	February 27, 2026	Cal-Cert Procedure:	CP-003
Calibration Frequency:	12 Months	Indicating System:	Digital
Manufacturer:	Newport Industries	Temperature:	66 °F
Type:	Pressure Transducer	Humidity:	43% RH
Model Number:	Unknown	Cal Factor:	None
Serial #:	Unknown	Asset #:	54C
Capacity:	5 In H2O	Service Location:	Service Address
Tolerance:	± 1.00% of Span	As Found:	Pass
Gauge Class:	A	As Left:	Pass

Instrument Range:		Range Resolution:		Mode Verified:		Pressure		
UUT Reading	Standard As Found	Standard Verification Reading #1	Error	Standard Verification Reading #2	Error	Tolerance	Expanded Uncertainty ±	
In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	
0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.005	
0.50	0.4690	0.4690	-0.03	0.5120	0.01	0.05	0.112	
1.25	1.2455	1.2455	0.00	1.2373	-0.01	0.05	0.022	
2.50	2.4891	2.4891	-0.01	2.4813	-0.02	0.05	0.021	
3.75	3.7327	3.7327	-0.02	3.7142	-0.04	0.05	0.048	
5.00	4.9519	4.9519	-0.05	4.9562	-0.04	0.05	0.013	
3.75	3.7261	3.7261	-0.02	3.7208	-0.03	0.05	0.015	
2.50	2.4775	2.4775	-0.02	2.4740	-0.03	0.05	0.011	
1.25	1.2316	1.2316	-0.02	1.2336	-0.02	0.05	0.007	
0.50	0.4971	0.4971	0.00	0.4990	0.00	0.05	0.007	
0.00	0.0000	0.0000	0.00	0.0000	0.00	0.05	0.005	

Manufacturer: Newport Industries

Type: Pressure Transducer

Serial #: Unknown

Remarks:

--

**We sincerely thank you for your business. Please call us at 503-654-9620 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.**

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This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: Samuel Owens

Date: February 27, 2025

Quality Manager: Tony Lewandowski

Signature:



Dry Gas Meter Calibration

DUT

Manufacturer: Apex
 Model: XC-50-DIR
 Lab ID #: 203
 Serial #: A2204292
 Calibration Date: 2/1/2025
 Calibration Expiration: 8/1/2025
 Barometric Pressure: 30.02 in. Hg



Equipment Used:	Ref. Std. DGM	Thermometer	Barometer	Manometer
Manufacturer: Apex		NI	Aquatech	Dwyer
Model: SK25DA		9213	DBX2	W17AE
Lab ID#: 47		215	202	124
Calibration Expiration Date: 5/1/2025		2/26/2025	6/17/2025	6/16/2025
Calibration γ Factor: 0.998				

Use in accordance with EPA Method 5, sections 10.3 and 16.1. Use only calibrated, NIST traceable reference standard DGM. Calibrate over expected operating flow range of DUT.

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	166.553	142.180	215.972
Standard DGM Temperature (°F)	66.2	65.6	68.1
Standard DGM Pressure (in H ₂ O)	0.00	0.00	0.0
DGM Initial Volume (ft ³)	0.000	0.000	0.000
DGM Final Volume (ft ³)	5.748	5.020	7.675
DGM Temperature (°F)	72.1	80.1	84.0
DGM Pressure (in H ₂ O)	1.10	0.81	1.41
Net Volume for Standard DGM (ft ³)	5.882	5.021	7.627
Net Volume for DGM (ft ³)	5.748	5.020	7.675
Dry Gas Meter γ Factor	1.030	1.024	1.018
γ Factor Deviation From Average	0.006	0.000	0.006

Average Gas Meter γ Factor

1.024

Measurement Uncertainty: Total measurement uncertainty +/- 0.748% RD, K=2

Calculations:

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

Report and Certificate of Calibration



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Milwaukie, OR 97222

Local
503-654-9620



Report #: 38860-203319-21 **Customer PO#:** 1126
Customer Name: PFS TECO
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas **State:** OR **Zip:** 97015
Contact: Ethan Frederick
Service Address: 11785 SE Highway 212, Suite 305 Clackamas, OR 97015

Calibration Standards

10-01442 Compound Gauge Fluke SN: 4582643 Cal: 01/24/2025 Due: 01/31/2026 Vendor: Fluke Report #: EVL1027223
14-01349 Thermo-Hygrometer Comark SN: 06210350162 Cal: 08/23/2024 Due: 08/31/2025 Vendor: Cal-Cert Range: 122 °F 95 %RH Report #: 36408-71148-5

Instrument Data

Calibration Date:	February 27, 2025	Reference:	ASME B40.100
Recommended Due Date:	February 27, 2026	Cal-Cert Procedure:	CP-003
Calibration Frequency:	12 Months	Indicating System:	Digital
Manufacturer:	Red Lion	Temperature:	66 °F
Type:	Pressure Transducer	Humidity:	43% RH
Model Number:	Unknown	Cal Factor:	None
Serial #:	Unknown	Asset #:	203B
Capacity:	1 In H2O	Service Location:	Service Address
Tolerance:	± 1.00% of Span	As Found:	Pass
Gauge Class:	A	As Left:	Pass

Instrument Range: 1.00		Range Resolution: 0.001		Mode Verified: Pressure			
UUT Reading	Standard As Found	Standard Verification Reading #1	Error	Standard Verification Reading #2	Error	Tolerance	Expanded Uncertainty ±
In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	In H2O
0.000	0.00	0.00	0.00	0.00	0.00	0.01	0.0005
0.100	0.0929	0.0929	-0.01	0.0992	0.00	0.01	0.0164
0.250	0.2473	0.2473	0.00	0.2488	0.00	0.01	0.0039
0.500	0.4955	0.4955	0.00	0.4990	0.00	0.01	0.0091
0.750	0.7533	0.7533	0.00	0.7427	-0.01	0.01	0.0276
1.000	1.0045	1.0045	0.00	0.9909	-0.01	0.01	0.0354
0.750	0.7462	0.7462	0.00	0.7517	0.00	0.01	0.0143
0.500	0.4976	0.4976	0.00	0.4925	-0.01	0.01	0.0132
0.250	0.2431	0.2431	-0.01	0.2447	-0.01	0.01	0.0042
0.100	0.1020	0.1020	0.00	0.1008	0.00	0.01	0.0031
0.000	0.0000	0.0000	0.00	0.0000	0.00	0.01	0.0005

Manufacturer: Red Lion

Type: Pressure Transducer

Serial #: Unknown

Remarks:

**We sincerely thank you for your business. Please call us at 503-654-9620 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.**

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A2LA is recognized under the ILAC mutual recognition agreement (MRA).**

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC 17025 and ANSI/NCSL Z540.1, and meets the requirements of all applicable references and Cal-Cert procedures listed above. Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.

All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.

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Service Engineer: Samuel Owens

Date: February 27, 2025

Quality Manager: Tony Lewandowski

Signature: 

Report and Certificate of Calibration

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CALIBRATION CERTIFICATION



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Report #: 38860-203320-21 **Customer PO#:** 1126
Customer Name: PFS TECO
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas **State:** OR **Zip:** 97015
Contact: Ethan Frederick
Service Address: 11785 SE Highway 212, Suite 305 Clackamas, OR 97015

Calibration Standards

10-01442 Compound Gauge Fluke SN: 4582643 Cal: 01/24/2025 Due: 01/31/2026 Vendor: Fluke Report #: EVL1027223
14-01349 Thermo-Hygrometer Comark SN: 06210350162 Cal: 08/23/2024 Due: 08/31/2025 Vendor: Cal-Cert Range: 122 °F 95 %RH Report #: 36408-71148-5

Instrument Data

Calibration Date:	February 27, 2025	Reference:	ASME B40.100
Recommended Due Date:	February 27, 2026	Cal-Cert Procedure:	CP-003
Calibration Frequency:	12 Months	Indicating System:	Digital
Manufacturer:	Red Lion	Temperature:	66 °F
Type:	Pressure Transducer	Humidity:	43% RH
Model Number:	Unknown	Cal Factor:	None
Serial #:	Unknown	Asset #:	203C
Capacity:	5 In H2O	Service Location:	Service Address
Tolerance:	± 1.00% of Span	As Found:	Pass
Gauge Class:	A	As Left:	Pass

Instrument Range: 5.00		Range Resolution: 0.01		Mode Verified: Pressure				
UUT Reading	Standard As Found	Standard Verification Reading #1	Error	Standard Verification Reading #2	Error	Tolerance	Expanded Uncertainty ±	
In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	In H2O	
0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.005	
0.50	0.5048	0.5048	0.00	0.4973	0.00	0.05	0.02	
1.25	1.2453	1.2453	0.00	1.2210	-0.03	0.05	0.063	
2.50	2.4656	2.4656	-0.03	2.4846	-0.02	0.05	0.049	
3.75	3.7075	3.7075	-0.04	3.7111	-0.04	0.05	0.011	
4.20	4.1508	4.1508	-0.05	4.1511	-0.05	0.05	0.007	
3.75	3.7093	3.7093	-0.04	3.7095	-0.04	0.05	0.007	
2.50	2.4595	2.4595	-0.04	2.4755	-0.02	0.05	0.042	
1.25	1.2296	1.2296	-0.02	1.2305	-0.02	0.05	0.006	
0.50	0.4982	0.4982	0.00	0.5109	0.01	0.05	0.033	
0.00	0.0000	0.0000	0.00	0.0000	0.00	0.05	0.005	

Manufacturer: Red Lion

Type: Pressure Transducer

Serial #: Unknown

Remarks:

Device stopped reading at 4.27

**We sincerely thank you for your business. Please call us at 503-654-9620 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.**

**Cal-Cert is accredited by A2LA under Calibration Laboratory Code #4986.01.
A2LA is recognized under the ILAC mutual recognition agreement (MRA).**

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC 17025 and ANSI/NCSL Z540.1, and meets the requirements of all applicable references and Cal-Cert procedures listed above. Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.

All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.

This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: Samuel Owens

Date: February 27, 2025

Quality Manager: Tony Lewandowski

Signature:



Dry Gas Meter Calibration

DUT

Manufacturer: Apex
 Model: XC-60
 Lab ID #: 55
 Serial #: 810016
 Calibration Date: 2/1/2025
 Calibration Expiration: 8/1/2025
 Barometric Pressure: 30.02 in. Hg



Equipment Used:	Ref. Std. DGM	Thermometer	Barometer	Manometer
Manufacturer: Apex		NI	Aquatech	Dwyer
Model: SK25DA		9213	DBX2	W17AE
Lab ID#: 47		215	202	124
Calibration Expiration Date: 5/1/2025		2/26/2025	6/17/2025	6/16/2025
Calibration γ Factor: 0.998				

Use in accordance with EPA Method 5, sections 10.3 and 16.1. Use only calibrated, NIST traceable reference standard DGM. Calibrate over expected operating flow range of DUT.

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	148.998	157.125	207.888
Standard DGM Temperature (°F)	70.2	71.1	69.8
Standard DGM Pressure (in H ₂ O)	0.00	0.00	0.0
DGM Initial Volume (ft ³)	0.000	0.000	0.000
DGM Final Volume (ft ³)	5.249	5.608	7.444
DGM Temperature (°F)	80.0	82.2	83.8
DGM Pressure (in H ₂ O)	0.00	0.00	0.00
Net Volume for Standard DGM (ft ³)	5.262	5.549	7.341
Net Volume for DGM (ft ³)	5.249	5.608	7.444

Dry Gas Meter γ Factor	1.019	1.008	1.010
γ Factor Deviation From Average	1.019	1.008	1.010

Average Gas Meter γ Factor

1.012

Measurement Uncertainty: Total measurement uncertainty +/- 0.748% RD, K=2

Calculations:

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

Report and Certificate of Calibration



Portland Laboratory
5777 SE International Way
Milwaukie, OR 97222
800-356-4662
503-654-9620

Anaheim Laboratory
120 S. Chaparral Ct Suite 110
Anaheim Hills, CA 92808
888-700-4100
714-696-5300

www.Cal-Cert.com

Report #: 36866-28785-3646 **Customer PO#:** 1122
Customer Name: PFS TECO
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas **State:** OR **Zip:** 97015
Contact: Ethan Frederick
Service Address: 5777 SE International Way Milwaukie, OR 97222

Calibration Standards

10-00391 | Thermo-Hygrometer | Comark | SN: 6217150001 | Cal: 05/02/2024 | Due: 04/30/2025 | Vendor: Cal-Cert | Range: 122 °F 95 %RH | Report #: 34722-30759-4525
LP-01158 | Electrical Meter | Keithley | SN: 1388607 | Cal: 07/24/2023 | Due: 07/31/2025 | Vendor: Techmaster Electronics | Report #: TSV-0-545118

Instrument Data

Calibration Date:	September 25, 2024	Reference:	Manufactures Tolerances
Recommended Due Date:	September 25, 2025	Cal-Cert Procedure:	CP-080
Calibration Frequency:	12 Months	Indicating System:	Digital
Manufacturer:	Delmhorst	Temperature:	72 °F
Type:	Resistivity Meter	Humidity:	49% RH
Model Number:	MCS-1	Asset #:	#094
Serial #:	#094	Service Location:	Cal-Cert Lab
Capacity:	120 Megaohms	As Found:	Pass
Tolerance:	1.00 % of indication	As Left:	Pass

Instrument Range:		120 Megaohms		Resolution:	0.001	Mode Verified:	Resistance
Standard Reading	UUT As Found	UUT Reading #1	Error	UUT Reading #2	Error	OUT OF TOLERANCE	
0.000	0.000	0.000	0.000	0.000	0.000		
1,100,000	1,095,000	1,095,000	-5,000.000	1,095,000	-5,000.000		
120,000,000	120,830,000	120,830,000	830,000.000	120,830,000	830,000.000		

Expanded Uncertainty± 2.50 Megaohms

Remarks:

We sincerely thank you for your business. Please call us at 503-654-9620 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ANSI/NCSL Z540.1, and meets the requirements of all applicable references and Cal-Cert procedures listed above.

Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.

All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.

This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: Brent Enbysk

Date: September 25, 2024

Quality Manager: Jason Wimmer

Signature:

Resistivity Meter CF-080-01

Revision 7

7/24/2017



CERTIFICATE OF CALIBRATION

CUSTOMER: PFS-TECO : CLACKAMAS, OR
PO NUMBER: 1120
INST. MANUFACTURER: DWYER
INST. DESCRIPTION: VELOMETER
MODEL NUMBER: 471
SERIAL NUMBER: CP288559 ID# 095
RATED ACCURACY: SEE NOTES BELOW.
UNCERTAINTY GIVEN: $\pm 0.43\%$ RD ; k=2
NOTES: $\pm 3.0\%$ FS (0-500 / 0-1500) ** $\pm 4.0\%$ F.S. (0-5000) ** $\pm 5.0\%$ F.S. (0-15000) ** $\pm 2^\circ\text{F}$

CALIBRATION DATE: 06/17/2024
CALIBRATION DUE: 06/17/2025
PROCEDURE: T.O.33K6-4-1769-1
CALIBRATION FLUID: AIR @ 14.7 PSIA 70°F
RECEIVED CONDITION: WITHIN MFG. SPECS.
LEFT CONDITION: WITHIN MFG. SPECS.
AMBIENT CONDITIONS: 763mm HGA 53% RH 70°F
CERTIFICATE FILE #: 490265.2024

Q.MANUAL IM 2.0 REV 2020.2 DATED 7-27-2020

DECISION RULE: SIMPLE ACCEPTANCE. MEASUREMENT UNCERTAINTIES NOT TAKEN INTO CONSIDERATION WHEN DETERMINING PASS/FAIL

UUT	DM.STD.	UUT	DM STD.
INDICATED	ACTUAL	INDICATED	ACTUAL
FT/MIN	FT/MIN	DEG. F	DEG. F
70	73	0 TO 200°F	0 TO 200°F
126	130	44.7	44.1
242	249	71.8	71.0
495	508	99.9	99.3
521	533		
1039	1066		
1490	1530		
507	522		
3214	3311		
4998	5156		
6975	7182		
14853	15322		

STANDARDS USED:

A312 $\pm .02\%$ RD -140 TO 1372 DEG °C TRACE# 2023004415	DUE	11/13/24
A800 flow nozzles +/- .2% RD (.2-5, 5-100, 100-1650 SCFM)TRACE# 144613547,1424683640,1583314714	DUE	02/14/25

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)

Page 1 of 1

06/17/2024

[Signature]

[Signature]

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



0723.01

Calibration

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

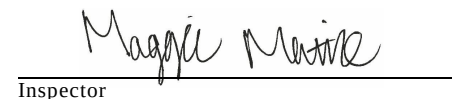
Measurement Description	Range	Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After								Accredited = $\bar{u}$
Mass								
Raw Data		g	4535.92370000	0.0000000	0.0000000	0.1785299	4536.1022299 g	3.5E-01 $\bar{u}$

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/NCCL 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



QUALITY CONTROL SERVICES

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

Report Number: DIRI0134307497241204

A2LA ACCREDITED **CERTIFICATE OF CALIBRATION WITH DATA**

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	ENTRIS224-1S	34307497	#107	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
g	0.0001	QC012	12/4/24	6/12/24	6/2025

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		Good	Fair	Poor
As-Found:		As-Found:		1. 100.0000	5. 99.9999	9. 99.9999	Temperature: 20.8°C		
Pass: ☒	Fail: ☐	Pass: ☒	Fail: ☐	2. 100.0000	6. 100.0000	10. 100.0000			
As-Left:		As-Left:		3. 100.0000	7. 100.0000	Result			
Pass: ☒	Fail: ☐	Pass: ☒	Fail: ☐	4. 99.9999	8. 99.9999	0.00005			

A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
200	200.0007	199.9999	0.00017
100	100.0006	99.9999	0.00016
50	50.0004	50.0000	0.00015
20	20.0003	20.0000	0.00015
0.1	0.0999	0.0999	0.00015
0.05	0.0498	0.0499	0.00015

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	Rice Lake	20 kg to 1mg	2831W	3/31/24	3/2025	20240774

Permanent Information Concerning this Equipment:

6 month calibration cycle

Comments/Info Concerning this Calibration:

12/04/2024: Adjusted span. RH=36%

Report prepared/reviewed by: TLP

Date: 12-04-2024

Technician: E.J. Yasko

Signature: [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. Results relate only to the item(s) tested. Unless otherwise noted, statements of conformity do not include measurement

Member: National Conference of Standards Laboratories and Weights & Measures

PT ID: DIRI01



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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 ³	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/cm³).

Uncertainty Statement: The uncertainty conforms to the ISO Guide to the Expressions of Uncertainty in Measurement. Uncertainty as reported is based on a coverage factor $k=2$ for an approximate 95 percent level of uncertainty. Uncertainty components include the standard deviation of the process, the uncertainty of the standard used, an uncertainty component associated with the potential drift of the standard used, and the estimated uncertainty related to measuring and determining the air buoyancy effect.

Conventional Mass Values are listed on page 2 of this report.

page 1 of 2

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 05/09/22


Signature David S. Thompson

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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

Date: 05/09/22


Signature David S. Thompson

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

Report Number: DIRI01C101887027241204

A2LA ACCREDITED CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Mettler	IND570 - 1000lhx0.	C101887027	#189	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
lbs	0.02	QC033	12/4/24	12/28/23	12/2025

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: Tol: 400 0.10	Test Wt: Tol: HB44 HB44	Test Wt: Tol: 200 0.04	☐ ☒ ☐ Good Fair Poor
As-Found: Pass: ☒ Fail: ☐	As-Found: Pass: ☒ Fail: ☐	As-Found: Pass: ☒ Fail: ☐	Temperature: 16.1°C
As-Left: Pass: ☒ Fail: ☐	As-Left: Pass: ☒ Fail: ☐	As-Left: Pass: ☒ Fail: ☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	1000.02	1000.02	0.012
600	599.92	599.92	0.011
400	399.94	399.94	0.011
200	199.94	199.94	0.011
100	99.98	99.98	0.011
50	49.98	49.98	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	7/26/24	7/2026	20221688

Permanent Information Concerning this Equipment:

Comments/Information Concerning this Calibration

12/04/2024: RH = 38%

Report prepared/reviewed by: TUP

Date: 12-04-2024

Technician: E.J. Vasko

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.

Member: National Conference of Standards Laboratories and Weights & Measures

PT ID: DIRI01

Report and Certificate of Calibration



www.Cal-Cert.com

Toll Free
800-356-4662

Address
5777 SE International Way
Milwaukie, OR 97222

Local
503-654-9620



Report #: 39356-1216146-4847 **Customer PO#:** 1128
Customer Name: PFS TECO
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas **State:** OR **Zip:** 97015
Contact: Ethan Frederick
Service Address: 5777 SE International Way Milwaukie, OR 97222

Calibration Standards

10-00027 Gage Block Set Mitutoyo SN: 975536 Cal: 03/28/2023 Due: 03/31/2025 Vendor: Cal-Cert Report #: 28026-56355-5
10-00954 Gage Block Set Shars SN: 120018 Cal: 05/26/2023 Due: 05/26/2025 Vendor: American Gage Report #: 109141
LP-01346 Thermo-Hygrometer Comark SN: 06210350198 Cal: 03/08/2024 Due: 03/31/2025 Vendor: Cal-Cert Range: 122 °F 95 %RH Report #: 33563-67215-3616

Instrument Data

Calibration Date:	March 5, 2025	Reference:	Manufacturer's Spec
Calibration Due Date:	March 5, 2027	Cal-Cert Procedure:	CP-115
Calibration Frequency:	24 Months	Indicating System:	Scaling
Manufacturer:	Craftsman	Temperature:	66 °F
Type:	Tape Measure	Humidity:	40% RH
Model Number:	CMHT37365	Asset #:	211
Serial #:	Unknown	Service Location:	Cal-Cert Lab
Capacity:	25.00 Feet	As Found:	Pass
		As Left:	Pass

Instrument Range:	25.000 Feet	Range Resolution:	0.06250 Feet
	Calibration Standard	As Found Reading	Verification Reading #1
			Verification Reading #2
	0.0000	0.0000	0.0000
	0.5000	0.5000	0.5000
	1.0000	1.0000	1.0000
	12.0000	12.0000	12.0000
	48.0000	48.0000	48.0000
	96.0000	96.0000	96.0000
	192.0000	192.0000	192.0000

Expanded Uncertainty ± 0.07217 Feet

Remarks:

We sincerely thank you for your business. Please call us at 503-654-9620 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.

Cal-Cert is accredited by A2LA under Calibration Laboratory Code #4986.01.
A2LA is recognized under the ILAC mutual recognition agreement (MRA).

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC 17025 and ANSI/NC SL Z540.1, and meets the requirements of all applicable references and Cal-Cert procedures listed above.

Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.

All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.

This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: Justin Royce

Date: March 5, 2025

Quality Manager: Tony Lewandowski

Signature:

Report and Certificate of Calibration



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Toll Free
800-356-1662

Address
5777 SE International Way
Milwaukie, OR 97222

Local
503-654-9620



Report #: 38860-206391-21 **Customer PO#:** 1126
Customer Name: PFS TECO
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas **State:** OR **Zip:** 97015
Contact: Ethan Frederick
Service Address: 11785 SE Highway 212, Suite 305 Clackamas, OR 97015

Calibration Standards

14-00235 Thermocouple Meter Tegan SN: T-276988 Cal: 08/23/2024 Due: 08/31/2025 Vendor: Cal-Cert Range: 2400 °F Report #: 36408-30865-3646
14-01349 Thermo-Hygrometer Comark SN: 06210350162 Cal: 08/23/2024 Due: 08/31/2025 Vendor: Cal-Cert Range: 122 °F 95 %RH Report #: 36408-71148-5

Instrument Data

Calibration Date:	February 28, 2025	Reference:	Navair 17-20ST-95
Recommended Due Date:	February 28, 2026	Cal-Cert Procedure:	CP-013
Calibration Frequency:	12 Months	Indicating System:	Computer
Manufacturer:	National Instruments	Temperature:	61 °F
Type:	Data Logger	Humidity:	45% RH
Model Number:	NI 9213	Asset #:	215 Booth 1
Serial #:	1B182FB	Service Location:	Service Address
Resolution:	0.1 °F	As Found:	Pass
Capacity:	2,500 °F	As Left:	Pass
Tolerance:	± 3.0 °F		
Thermocouple Type:	K		

Thermocouple LOGGING FUNCTION

Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Tunnel	0.00	0.40	0.40	0.50	0.45	0.784
	500.00	500.10	500.10	500.30	0.20	
	1000.00	1000.10	1000.10	1000.20	0.15	
	1500.00	1499.70	1499.70	1500.40	0.05	
	2000.00	2000.10	2000.10	2000.20	0.15	
	2400.00	2399.90	2399.90	2400.00	-0.05	
	0.00	0.50	0.50	0.40	0.45	

Thermocouple LOGGING FUNCTION

Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Flue	0.00	0.30	0.30	0.40	0.35	0.511
	500.00	500.10	500.10	500.20	0.15	
	1000.00	1000.10	1000.10	1000.20	0.15	
	1500.00	1500.00	1500.00	1500.10	0.05	
	2000.00	1999.80	1999.80	1999.90	-0.15	
	2400.00	2399.80	2399.80	2399.80	-0.20	
	0.00	0.00	0.00	0.20	0.10	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Filter A	0.00	0.10	0.10	0.10	0.10	0.436
	500.00	500.00	500.00	500.00	0.00	
	1000.00	1000.00	1000.00	1000.00	0.00	
	1500.00	1500.10	1500.10	1500.00	0.05	
	2000.00	1999.80	1999.80	1999.80	-0.20	
	2400.00	2399.70	2399.70	2399.70	-0.30	
	0.00	0.10	0.10	0.00	0.05	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Back	0.00	0.00	0.00	0.00	0.00	0.511
	500.00	499.90	499.90	499.90	-0.10	
	1000.00	999.90	999.90	999.90	-0.10	
	1500.00	1499.90	1499.90	1499.90	-0.10	
	2000.00	1999.70	1999.70	1999.60	-0.35	
	2400.00	2399.50	2399.50	2399.70	-0.40	
	0.00	0.00	0.00	0.00	0.00	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Catalyst	0.00	(0.30)	(0.30)	(0.30)	0.30	0.738
	500.00	499.70	499.70	499.70	-0.30	
	1000.00	999.60	999.60	999.70	-0.35	
	1500.00	1499.60	1499.60	1499.50	-0.45	
	2000.00	1999.40	1999.40	1999.40	-0.60	
	2400.00	2399.40	2399.40	2399.40	-0.60	
	0.00	(0.30)	(0.30)	0.30	0.00	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Meter A	0.00	-0.40	-0.40	-0.40	0.40	0.436
	500.00	499.50	499.50	499.50	-0.50	
	1000.00	999.50	999.50	999.50	-0.50	
	1500.00	1499.50	1499.50	1499.40	-0.55	
	2000.00	1999.30	1999.30	1999.40	-0.65	
	2400.00	2399.20	2399.20	2399.20	-0.80	
	0.00	0.00	0.00	0.00	0.00	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Left	0.00	-0.40	-0.40	-0.40	0.40	0.436
	500.00	499.50	499.50	499.50	-0.50	
	1000.00	999.50	999.50	999.50	-0.50	
	1500.00	1499.50	1499.50	1499.50	-0.50	
	2000.00	1999.20	1999.20	1999.30	-0.75	
	2400.00	2399.30	2399.30	2399.20	-0.75	
	0.00	-0.40	-0.40	-0.40	0.40	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Right	0.00	-0.50	-0.50	-0.50	0.50	0.436
	500.00	499.40	499.40	499.50	-0.55	
	1000.00	999.40	999.40	999.50	-0.55	
	1500.00	1499.30	1499.30	1499.30	-0.70	
	2000.00	1999.30	1999.30	1999.20	-0.75	
	2400.00	2399.10	2399.10	2399.10	-0.90	
	0.00	-0.50	-0.50	-0.40	0.45	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Filter B	0.00	0.00	0.00	0.00	0.00	0.436
	500.00	500.80	500.80	500.80	0.80	
	1000.00	1000.40	1000.40	1000.40	0.40	
	1500.00	1500.00	1500.00	1500.00	0.00	
	2000.00	1999.40	1999.40	1999.50	-0.55	
	2400.00	2399.10	2399.10	2399.10	-0.90	
	0.00	0.00	0.00	0.00	0.00	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Top	0.00	-0.50	-0.50	-0.50	0.50	0.511
	500.00	499.50	499.50	499.40	-0.55	
	1000.00	999.40	999.40	999.50	-0.55	
	1500.00	1499.40	1499.40	1499.40	-0.60	
	2000.00	1999.20	1999.20	1999.20	-0.80	
	2400.00	2399.10	2399.10	2398.90	-1.00	
	0.00	-0.50	-0.50	-0.50	0.50	

Remarks:

We sincerely thank you for your business. Please call us at 503-654-9620 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.

Cal-Cert is accredited by A2LA under Calibration Laboratory Code #4986.01.
A2LA is recognized under the ILAC mutual recognition agreement (MRA).

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC 17025 and ANSI/NCCL Z540.1, and meets the requirements of all applicable references and Cal-Cert procedures listed above.

Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.

All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.

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Service Engineer: Samuel Owens

Date: February 28, 2025

Quality Manager: Tony Lewandowski

Signature: 

Report and Certificate of Calibration



www.Cal-Cert.com

Toll Free
800-356-1662

Address
5777 SE International Way
Milwaukie, OR 97222

Local
503-654-9620



Report #: 38860-206391-21-B **Customer PO#:** 1126
Customer Name: PFS TECO
Customer Address: 11785 SE Highway 212, Suite 305
City: Clackamas **State:** OR **Zip:** 97015
Contact: Ethan Frederick
Service Address: 11785 SE Highway 212, Suite 305 Clackamas, OR 97015

Calibration Standards

14-00235 Thermocouple Meter Tegan SN: T-276988 Cal: 08/23/2024 Due: 08/31/2025 Vendor: Cal-Cert Range: 2400 °F Report #: 36408-30865-3646
14-01349 Thermo-Hygrometer Comark SN: 06210350162 Cal: 08/23/2024 Due: 08/31/2025 Vendor: Cal-Cert Range: 122 °F 95 %RH Report #: 36408-71148-5

Instrument Data

Calibration Date:	February 28, 2025	Reference:	Navair 17-20ST-95
Recommended Due Date:	February 28, 2026	Cal-Cert Procedure:	CP-013
Calibration Frequency:	12 Months	Indicating System:	Computer
Manufacturer:	National Instruments	Temperature:	65 °F
Type:	Data Logger	Humidity:	40% RH
Model Number:	NI 9213	Asset #:	215 Booth 1
Serial #:	1B182FB	Service Location:	Service Address
Resolution:	0.1 °F	As Found:	Pass
Capacity:	2,400 °F	As Left:	Pass
Tolerance:	± 3.0 °F		
Thermocouple Type:	K		

Thermocouple LOGGING FUNCTION

Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Bottom	0.00	-0.60	-0.60	-0.60	0.60	0.511
	500.00	499.30	499.30	499.50	-0.60	
	1000.00	999.40	999.40	999.40	-0.60	
	1500.00	1499.30	1499.30	1499.30	-0.70	
	2000.00	1999.10	1999.10	1999.20	-0.85	
	2400.00	2399.00	2399.00	2399.00	-1.00	
	0.00	-0.60	-0.60	-0.60	0.60	

Thermocouple LOGGING FUNCTION

Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Meter B	0.00	-0.60	-0.60	-0.60	0.60	0.436
	500.00	499.50	499.50	499.50	-0.50	
	1000.00	999.40	999.40	999.50	-0.55	
	1500.00	1499.40	1499.40	1499.40	-0.60	
	2000.00	1999.20	1999.20	1999.30	-0.75	
	2400.00	2399.10	2399.10	2399.10	-0.90	
	0.00	-0.60	-0.60	-0.60	0.60	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Meter C	0.00	2.50	2.50	2.80	2.65	0.738
	500.00	502.40	502.40	502.60	2.50	
	1000.00	1002.30	1002.30	1002.60	2.45	
	1500.00	1502.70	1502.70	1502.70	2.70	
	2000.00	2002.70	2002.70	2002.30	2.50	
	2400.00	2402.80	2402.80	2403.40	3.10	
	0.00	2.80	2.80	2.80	2.80	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Filter C	0.00	-0.20	-0.20	-0.20	0.20	0.511
	500.80	499.80	499.80	499.60	-1.10	
	1000.40	999.70	999.70	999.60	-0.75	
	1500.00	1499.50	1499.50	1499.50	-0.50	
	1999.40	1999.40	1999.40	1999.40	0.00	
	2399.10	2399.20	2399.20	2399.20	0.10	
	0.00	-0.20	-0.20	-0.20	0.20	

Thermocouple LOGGING FUNCTION						
Channel	Calibration Standard	UUT As Found	UUT As Left Reading 1	UUT As Left Reading 2	As Left Error	Expanded Uncertainty±
Ambient	0.00	0.00	0.00	0.00	0.00	0.436
	20.00	18.20	18.20	18.20	-1.80	
	40.00	38.20	38.20	38.20	-1.80	
	60.00	58.10	58.10	58.20	-1.85	
	80.00	78.40	78.40	78.40	-1.60	
	100.00	98.40	98.40	98.30	-1.65	
	0.00	0.00	0.00	0.00	0.00	

Remarks:

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All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.

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Service Engineer:

Samuel Owens

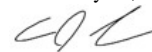
Date:

February 28, 2025

Quality Manager:

Tony Lewandowski

Signature:



Report #: 38860-206391-21-B

Data Logger 10 Channel 6 Point (PCC) CF-013-03

Revision 12 7/24/2017

IN CASE OF EMERGENCY: CALL 1-800-645-4633

SDS ID: P-18-0301-H

DO NOT REMOVE THIS LABEL

Lot No. 70086426104

Cylinder No. DT0042934

Part No. NI CD17CO8E-AS

Volume: 99 ft³

Fill Date: 09/17/2024

Expiration Date: 09/26/2032



ProSpec

By Linde



Linde Gas & Equipment Inc.

6760 S. Alameda

Los Angeles, CA 90008

UN1956

Compressed gas, n.o.s. (Nitrogen,
Oxygen)



EPA Protocol

Molar Concentration	Component	CAS
17.32 %	Carbon dioxide	124-38-9
4.35 %	Carbon monoxide	630-08-0
16.96 %	Oxygen	7782-44-7
Balance	Nitrogen	7727-37-9

Danger



CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED. MAY DAMAGE FERTILITY OR THE UNBORN CHILD. CAUSES DAMAGE TO ORGANS THROUGH PROLONGED OR REPEATED EXPOSURE. MAY INCREASE RESPIRATION AND HEART RATE. ASPHYXIATING EVEN WITH ADEQUATE OXYGEN.

TLV:

Carbon dioxide 50 ppm
Carbon monoxide 25 ppm

Obtain special instructions before use; Do not handle until all safety precautions have been read and understood; Do not breathe gas/vapors; Vapor exposed skin thoroughly after handling; Do not eat, drink or smoke when using this product; Wear protective gloves/protective clothing/eye protection/face protection; IF EXPOSED OR CONCERNED: Get medical advice/attention; Get medical advice/attention; Contact supplier for any special requirements; Dispose of contents/container in accordance with local/regional/national/international regulations. Use only with equipment rated for cylinder pressure; Do not open valve until connected to equipment prepared for use; Close valve after each use and when empty; Protect from sunlight when ambient temperature exceeds 52°C (125°F); Avoid breathing gas, vapors; IF INHALED: Remove person to fresh air and keep comfortable for breathing; Call a POISON CENTER or doctor/physician.

FIRST AID

IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.
IF IN EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are irrigated.



Compressed gas, n.o.s.
(Carbon Monoxide, Carbon Dioxide, Oxygen,
Nitrogen)

UN1956

SPG 5P10162.5VM2
Part Number

Primary Standard, +/- 0.02% Absolute

2.500 % Carbon Monoxide
10.00 % Carbon Dioxide
10.00 % Oxygen
Balance Nitrogen

CAS:	630-08-0
CAS:	124-38-9
CAS:	7782-44-7
CAS:	7727-37-9

DANGER: CAUSES DAMAGE TO ORGANS THROUGH PROLONGED OR REPEATED EXPOSURE. CONTAINS GAS UNDER PRESSURE; MAY EXPLODE WHEN HEATED. MAY DAMAGE FERTILITY OR THE UNBORN CHILD. MAY INCREASE RESPIRATION AND HEARTRATE. Use only with equipment of compatible materials of construction and rated for cylinder pressure. Protect from sunlight when ambient temperature exceeds 52C (125F). Use a back flow preventive device in the piping. Close valve after each use and when empty. Do not open valve until connected to equipment prepared for use. Obtain special instructions before use. Protect from sunlight. Store in a well-ventilated place. IF exposed or concerned: Get medical advice. Store locked up. Dispose of contents/container in accordance with container/supplier owner instructions. Do not handle until all safety precautions have been read and understood. Do not breathe gas. Wash hands thoroughly after handling. Do not eat, drink, or smoke when using this product. Wear protective gloves, protective clothing, eye protection, and/or face protection. Read and follow the Safety Data Sheet (SDS) before use.

FIRST AID: IF ON SKIN: wash with plenty of water. IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing. IF exposed or concerned: Get medical advice.



WARNING: This product can expose you to Carbon Monoxide which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Lot No: 1-053-122
Serial Number: CC341544
SPG 5P10162.5VM2
Part Number
PO #: 206483
Expires: 2-2024

NorLAB

To Order Call: 800-657-6672

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Norco, Inc.
808 W. Cowen Road
Boise, Idaho 83705