Evaluation Report

Non - CBI

MF Fire, Inc

Model: Nova 2C

Report Number: 0552WS004E

***OMNI*-Test Laboratories, Inc.**

Product Testing & Certification

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Evaluation Report

Particulate Emissions of a Wood-Fired Freestanding Room Heater, Catalytic type.

Non - CBI

MF Fire, Inc

Model : Nova 2C

Prepared For:	MF Fire, Inc 3031 Washington Boulevard, Suite G Baltimore, MD 21230 USA
Prepared By:	OMNI-Test Laboratories, Inc. 13327 NE Airport Way Portland, OR 97230 (503) 643-3788
Test Period:	03/10/25 - 03/12/25
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** AUTHORIZED SIGNATORIES **

This Evaluation Report was drafted, reviewed, and approved by the following qualified OMNI representatives:

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Report Issue Date:
September 16, 2025

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1. INTRODUCTION

1.1 Purpose of Test Program

The MF Fire, Inc model Nova 2C Wood-Fired Freestanding Room Heater, Catalytic type is an appliance designed for use in residential heating applications and is identified as being an affected facility under the US Environmental Protection Agency's jurisdiction (EPA SCC code 2104008320) and is subject to the US EPA's performance requirements. MF Fire, Inc contracted with OMNI to test the particulate emissions of the appliance in accordance with EPA regulations.

Testing was performed by OMNI at OMNI-Test Laboratories facility located at 13327 NE Airport Way - Portland, Oregon (45.563° latitude, -122.525° longitude and at an altitude of 30 feet above sea level). The unit was received in good condition and logged in on 12/19/24, then assigned and labeled with OMNI ID #2497. OMNI representatives Riley Tiegs, Joe McShane conducted the certification testing and completed all testing by 03/12/25. This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this section. The results in this report are limited to the item submitted.

1.2 Executive Summary

Average Emission-Rate :	**1.38**	g/hr.
Average Efficiency (HHV) :	**78.0**	%
Heat Output Range :	**19012 - 21009**	Btu/hr.
Average Carbon Monoxide Emission Rate:	**0.515**	g/min.

Figure 1 - Emissions Plot by Burn-Rate

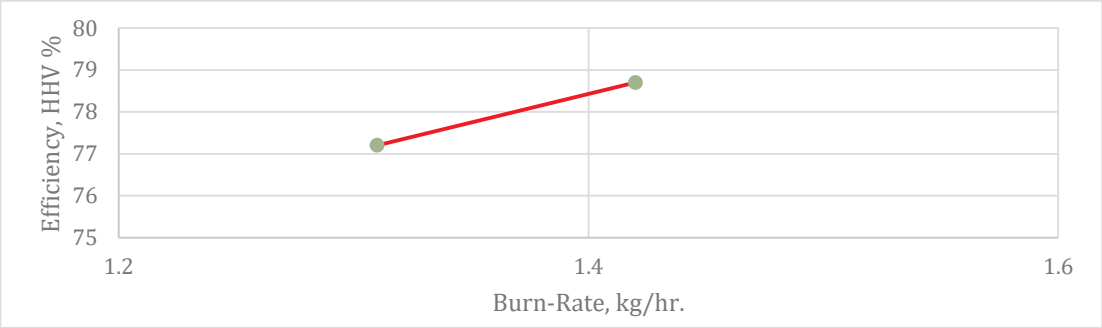


Figure 2 - Efficiency Plot (HHV) by Burn-Rate

2. Materials and Methods

2.1 - Test Methodology

The testing methodology used for the evaluation of the appliance described in this report is composed of four distinct aspects:

- **Particulate Matter Emissions:**

  The Model: Nova 2C wood stove was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standards of Performance for New Residential Wood Heaters using ASTM E2515-11 "Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel". ALT -154 was also used during this evaluation.

- **Appliance Operation Procedure:**

  The Model: Nova 2C wood stove was fueled and operated following written instructions from the manufacturer and in accordance with ASTM E2780-10 (2017) "Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters" in conjunction with EPA Method 28R.

- **Stack Loss Efficiency:**

  Stack-loss efficiencies were evaluated following CSA B415.1:22 "Performance testing of solid-biofuel-burning heating appliance". It is also used to calculate the emissions of carbon monoxide. Example calculations for CSA B415.1:22 are not provided in this report because OMNI uses software provided by CSA. Printouts of the software's reporting is provided in the test data section of this report for each test run.

- **Applicable Alternate Test Method(s):**

  ALT-154 was used during this evaluation. See Appendix A for a copy of this alternate method.

2.2 Description of Appliance Under Test

The Nova 2C is a catalytic wood heater designed for residential use. The appliance is made of mild steel and is lined with ceramic blanket and 1.25" thick refractory. Nova 2C is available in two configurations, Nova 2C and Nova 2C Tower. Nova 2C can be optionally equipped with 3” (standard, shown above), 6”, or 9” legs. Nova 2C Tower is available with no legs (standard, shown above) or 6” legs. Additionally, both Nova 2C and Nova 2C Tower can be used in either a rear vent or a top vent configuration, to best fit your home and preferences.

Type

Wood-Fired Freestanding Room Heater, Catalytic

Figure 3 - Pedestal Version

Figure 4 - Leg Version

Materials of Construction

The unit is constructed primarily of mild steel. The firebox is lined with firebrick over insulation blanket.

Air Introduction System
Appliance air enters through a hole at the rear of the firebox and is channeled from there to the primary and secondary air circuits. There is an automated, timer based control for this air source that partially closes a damper-style device after approximately 35 minutes. This automated control is activated by the user after fuel loading per the manufacturer's instructions.

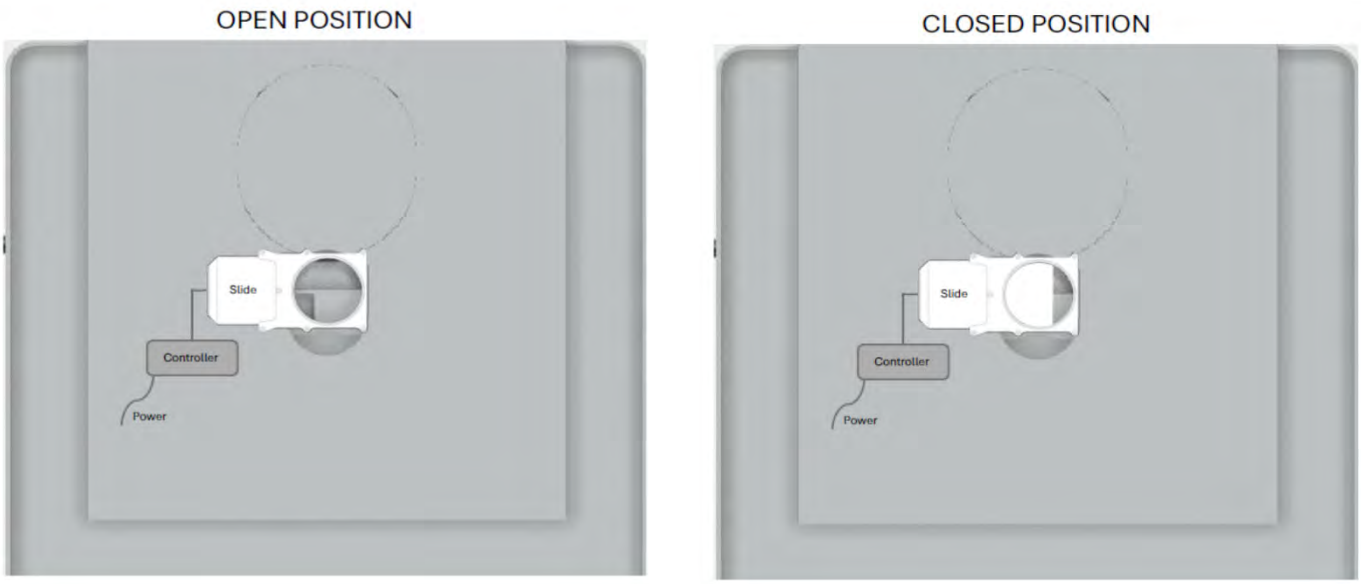


Figure 5 - Air Introduction

Emissions Controls:

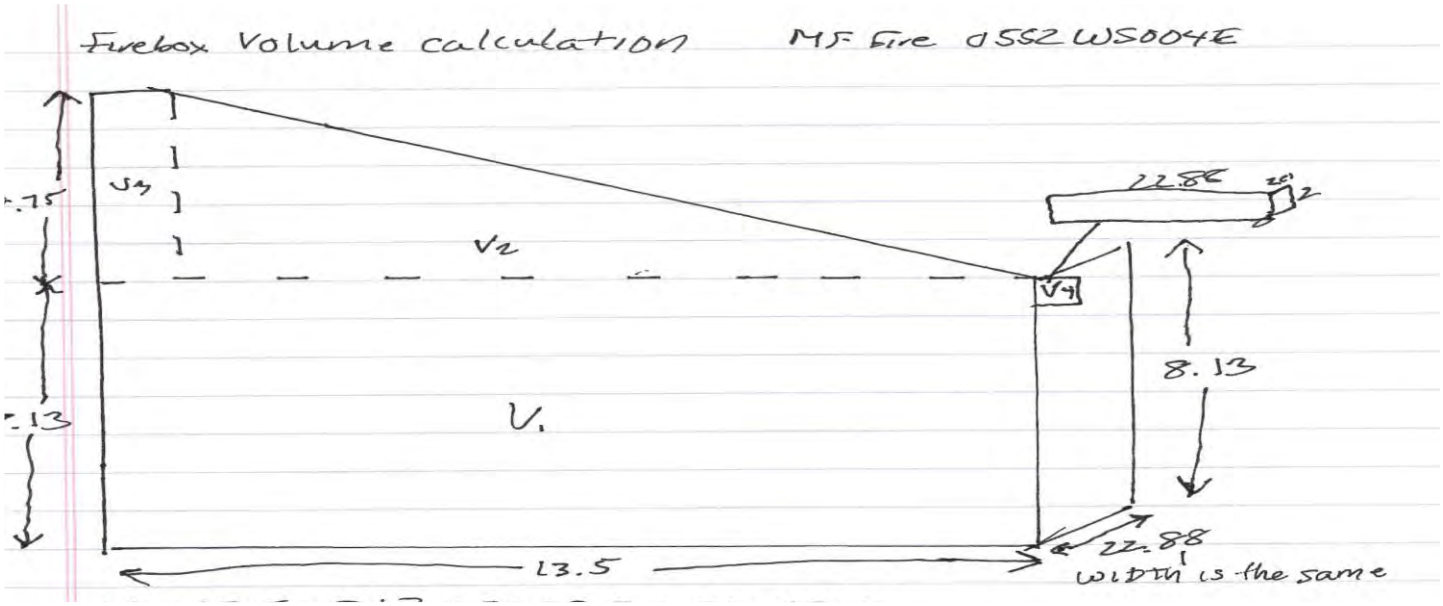
Appliance utilizes secondary air and a catalyst as for its emissions control.

Internal Baffles:
Appliance baffling system is comprised of secondary air tubes and the catalyst enclosure located at the top of the stove.

Flue Outlet:
The 6” diameter flue outlet is located at the rear of the top of the appliance. Appliance can be operated with rear exit as well as top exit.

Other Features:
A 120V blower motor is an optional component for the NOVA 2C.

Usable Firebox Volume:



Firebox Volume dimensions were measured and verified at OMNI Test Labs.

Figure 6 - Firebox Volume Calculation

$V_1 = 13.5 \times 8.13 \times 22.88 = 2,511.1944$

$V_2 = (11.84 \times 8.75 \times 22.88) \div 2 = 1185.184$

$V_3 = 8.75 \times 1.66 \times 22.88 = 332.332$

$V_4 = 2 \times 2 \times 22.88 = 91.52$

$2,511.1944 + 1185.184 + 332.332 + 91.52 = 4,120.2304 \text{ inch}^3$

$4,120.2304 \div 1728 = 2.384 =$ Total firebox volume

V_4 was determined to be not usable & was subtracted from the total.

$4,120.2304 - 91.52 = 4028.7104$

$4028.7104 \div 1728 = 2.33 \text{ ft}^3$

Usable firebox volume: 2.33 ft^3

2.2.1 Model Variants

Nova 2C is available in two configurations, Nova 2C and Nova 2C Tower. Nova 2C can be optionally equipped with 3” (standard, shown above), 6”, or 9” legs. Nova 2C Tower is available with no legs (standard, shown above) or 6” legs. Additionally, both Nova 2C and Nova 2C Tower can be used in either a rear vent or a top vent configuration, to best fit your home and preferences.

2.3 Appliance Installation

The appliance was placed on a 1000 lb. capacity scale and fitted with a section of 6-inch diameter single wall connector pipe that extended upward to a height approximately eight feet from the top surface of the scale. Six-inch solid pack chimney was added further extending the total flue conveyance pipe upward to an over-all height of 15 feet as measured from the top of the platform scale. The lower portion of the solid pack chimney was fitted with a 3/8-inch diameter hole where a flue gas probe was inserted and with a 3/16” diameter hole where a shielded Type K thermocouple probe was inserted. A 3/8” diameter hole was drilled into the lower single wall connector pipe within 1 foot of the appliance and a draft probe was inserted. All joining sections of pipe and flue attachment were sealed with furnace cement. Type K thermocouples were attached to the top, bottom, back, left and right sides of the appliance for surface temperature measurement. Type K temperature probe was installed within an inch of the catalyst exit.

Figure 7 - Test structure and general work area

Figure 8 - Emissions testing area

2.4 Appliance Conditioning

The appliance conditioning was conducted by MF Fire in Baltimore Maryland (21230). There was a total of 51 hours of conditioning. See Appendix B of this report for the data.

2.5 Dilution Tunnel

OMNI's facility uses permanent and dedicated dilution tunnels that are designed and are maintained to meet the specifications of the dilution tunnel prescribed in ASTM E2515. The dilution tunnel was cleaned on 05/23/24 immediately prior to the test series. Prior to testing, sample point and traverse point locations are verified to ensure their locations are within the prescribed specifications. Collection hood, tunnel diameter, and mixing section length are also verified to be within specifications. Test booth ambient temperature probe is located approximately four feet away from the platform scale in a 45° offset from the front of the platform scale. Room air draft was measured within two feet of the platform scale. Background sampling was conducted approximately 4 feet from the dilution tunnel hood.

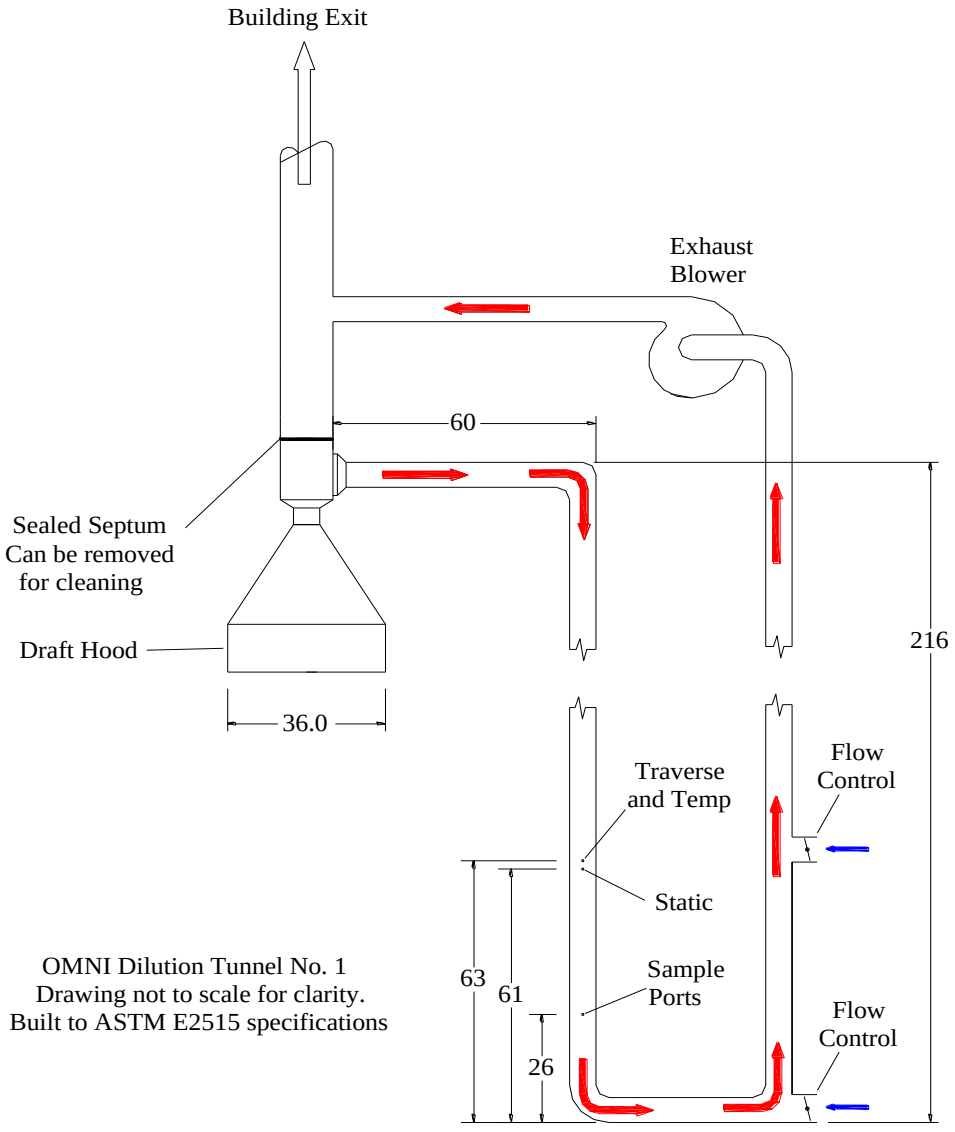


Figure 9 - Dilution Tunnel at OMNI-Test Laboratories Portland, Oregon Facility

2.6 Particulate Sampling Systems

The sampling systems consisted of two independent datalogging systems, each managing two dry gas meters (a total of four dry gas meter sampling systems). One of the dual systems was designated for sampling of Trains A and B for the duration of test(s), and the other dual system was designated for sampling of the First Hour emissions with one dry gas meter system (Train C) and background ambient particulate (Train D) with the other. Each of these system trains were arranged identically and in accordance with Section 6 of ASTM E2515. The only exceptions are; 1) the pressure drop through an orifice on the exhaust end of each meter were monitored with a monometer to aid in identifying and responding to changes in the sample flow rates during operation as well as being used to account for internal meter pressures.

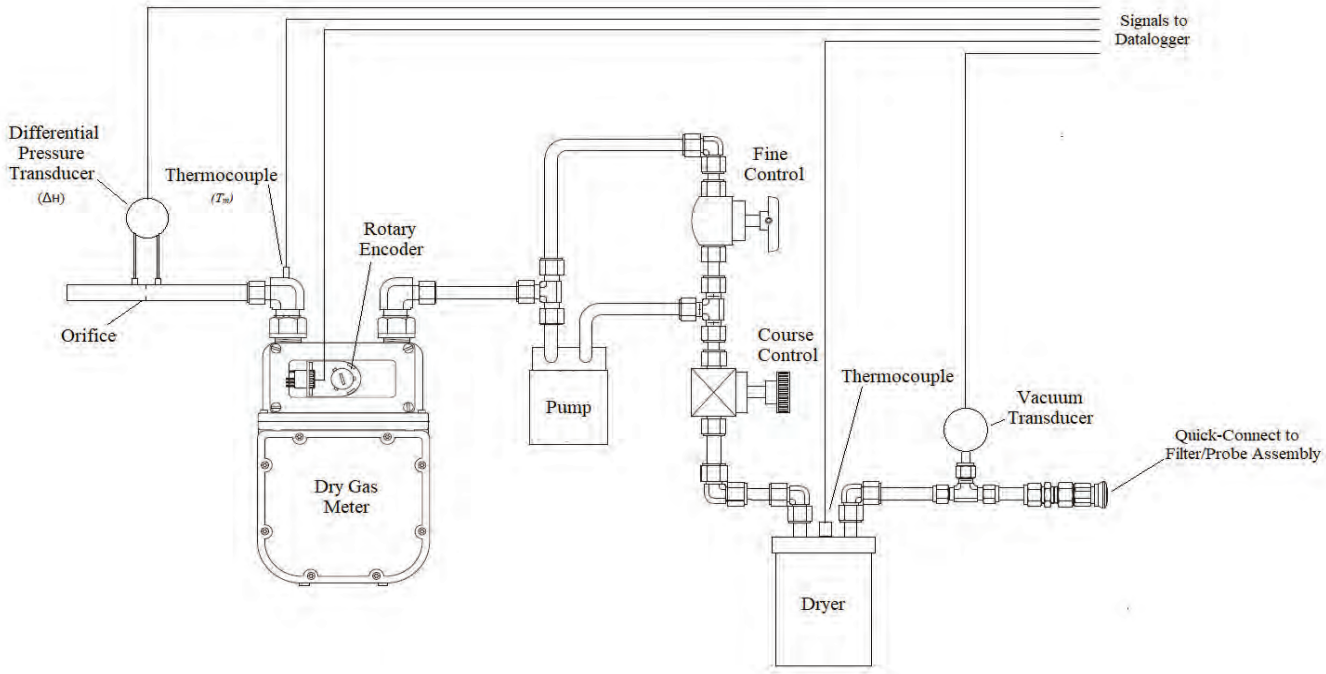


Figure 10 - Sampling System (typical) Used At OMNI-Test Laboratories

2.7 Particulate Sampling Probes and Filters

The probes used were 1/4" OD stainless steel. The probe holders used were made of aluminum, the O-ring seals used were 47mm x 3mm diameter Vitron and the filters used were PALL A/E glass Fiber, 1µm, 47mm diameter.

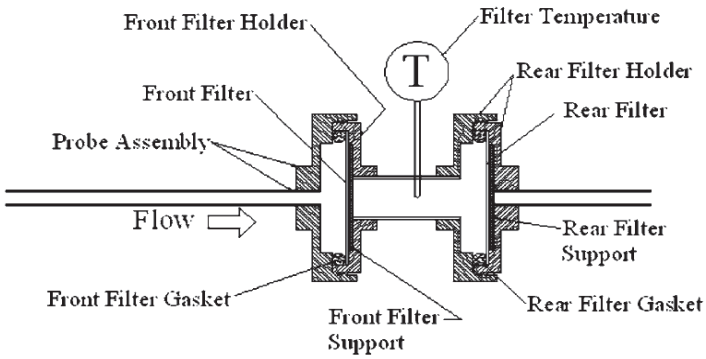


Figure 11 - Sample Probe Assembly as specified in ASTM E2515-11

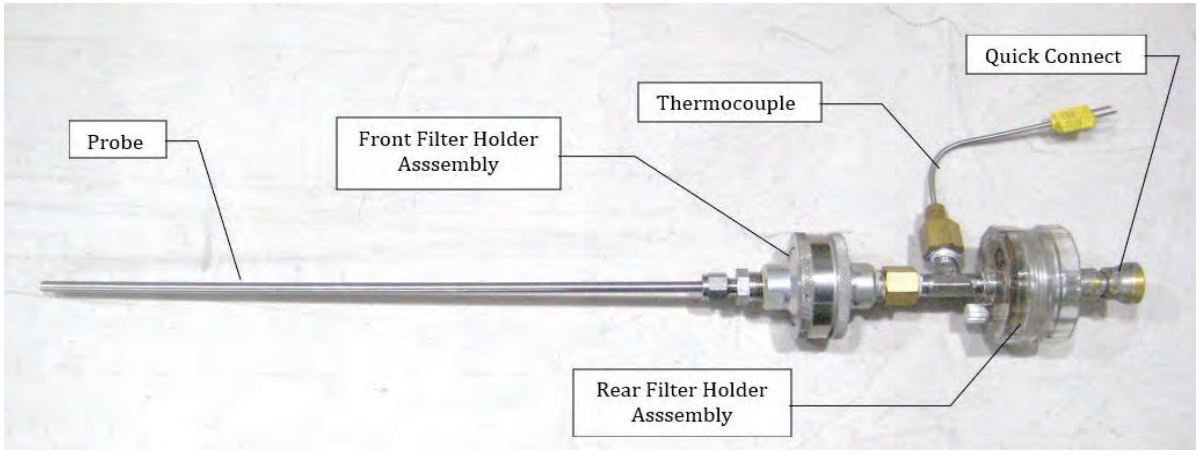


Figure 12 - Sample Probe used by OMNI

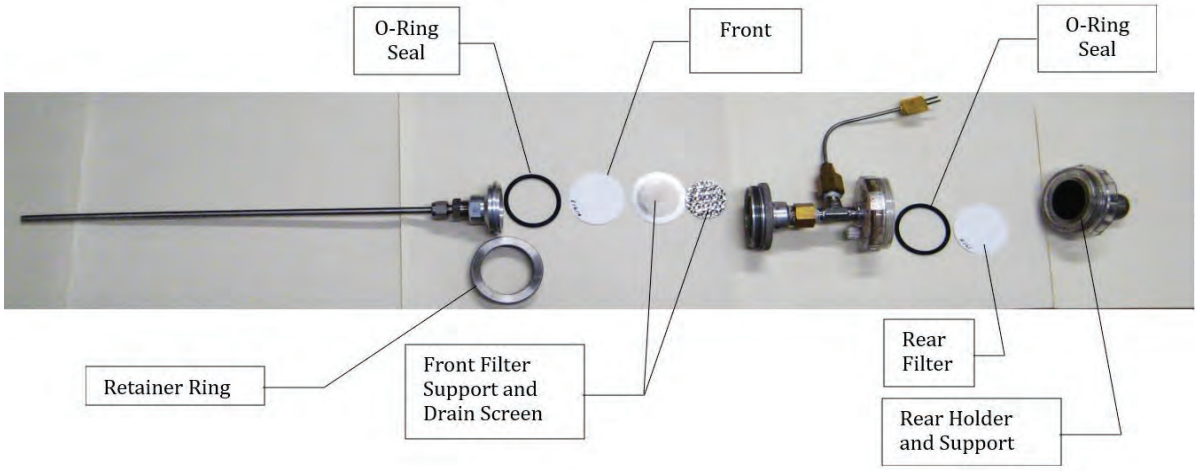


Figure 13 - Exploded View of Sample Probe Assembly used by OMNI

Clause 6.1.1 of ASTM E2515-11 requires that the filter face velocity shall not exceed 150 mm/sec (30 ft/sec). The O-ring seal covers a narrow portion of the perimeter of the filter thus reducing it's effective diameter from 47mm to 43mm. The area used in subsequent calculations of the filter face velocity is therefore based on 43mm diameter.

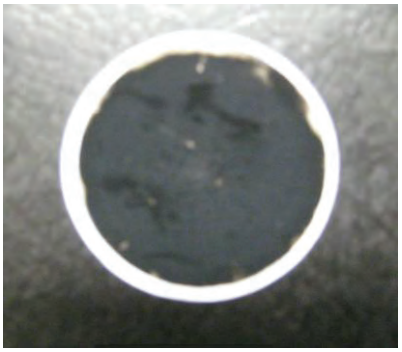


Figure 14 - Effective facial area of sample filter (file photo, not from the evaluation in this report)

2.8 Flue Gas Sampling Equipment

Carbon dioxide (CO_2) and carbon monoxide (CO) concentration measurements of the flue gases are required by CSA B415.1 to determine stack loss based efficiencies. Oxygen measurements are not taken as CSA B415.1 calculates oxygen empirically using mass-balance equations based upon the measured CO_2 and CO concentrations.

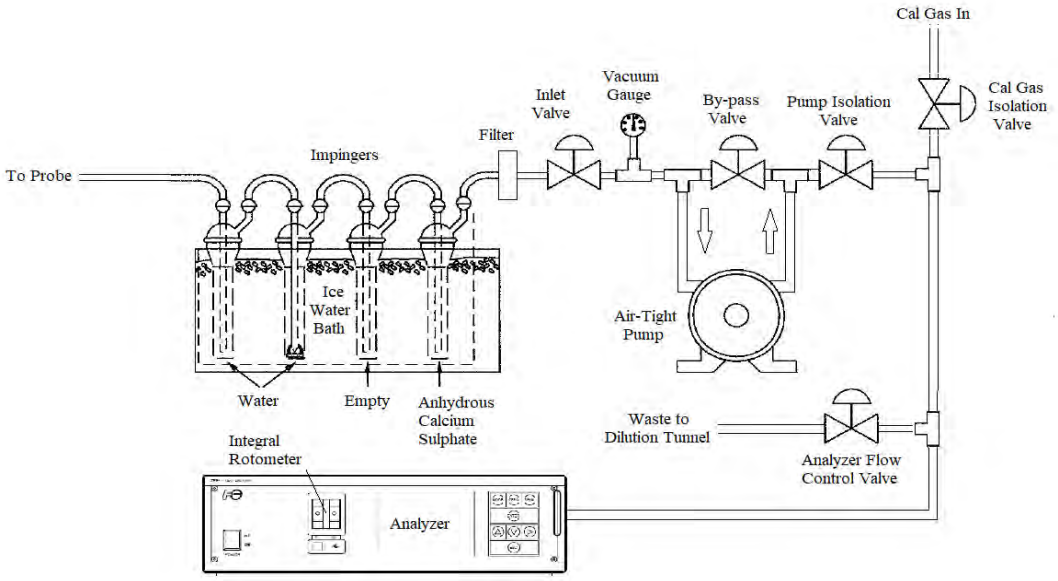


Figure 15 - Flue Gas Measurement System

2.9 Gravimetric Analysis Equipment

All taring of filters, Probes and O-Ring seals take place in a dedicated room for this purpose with ample facility for the preparation and handling of tared reagents as well as post-test processing. Upon test program completion, all filters are placed in plastic petri dishes, marked and stored for a period of 6 months.

NOTE: F-Class Audit weights are used immediately before each weighing to ensure accuracy of analytical scale. Immediately before assembly of sample probe, filter tares are checked to ensure they are within 0.1 mg of the recorded tare value.

Figure 16 - Analytical Scale and Desiccator

Figure 17 - Additional Desiccators

2.10 Test Fuel Acquisition

ASTM E2780, clause 3.2.3 requires Douglas-fir, untreated, standard or better grade with agency grade stamp: D. Fir or Douglas Fir. Green air dried Douglas Fir. A sizable lot of suitable Douglas-fir lumber with appropriate marking was acquired from a local home improvement store in Portland. All testing, including preburn, was performed with this selection of fuel.

Figure 18 - Typical of all stampings on the fuel lot **(used test fuel)**

2.11 Specific Manufacturer's Written Operating Instructions

Preburn

Preburn wood load should consist of 2 loads of 2x4's. We have found that one preburn will not meet a fully volatilized preburn weight so two preburns should be used. Each load should be approximately 14 pounds consisting of 4 pieces at 16 inches. And 5-7 pieces at 10 inches, please refer to the pictures below.

For the entirety of preburn the catalyst bypass should be left shut. The fan should be left off for the first crib.

First load should be loaded in the stove as pictured below.

When starting the first load leave the door open until the catalyst reaches approximately 650 degrees fahrenheit.

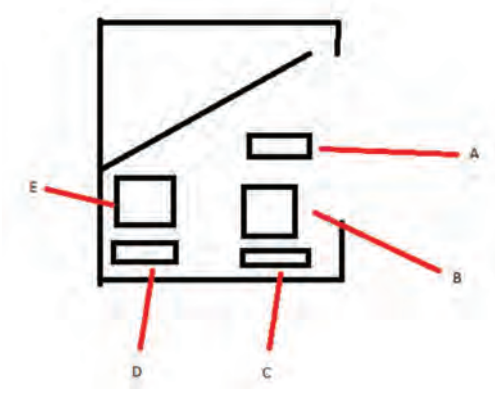
The second load should be loaded once the stove weight reaches the bottom of the stove's coal bed limit. The second load should be loaded as pictured below.

Once loaded the fan should be turned on at the high setting.

Once weight reaches .1 pound above **bottom end** of coal bed range, break down the coals. Make sure the back is packed down along with the middle to ensure airflow the that the wood load will fit. Leave the rest of the coal bed fluffy. Load the stove and start the run at the **bottom end** of the coal bed.

Test Run

The test load should consist of 5 pieces at 16 inches, using a mix of 3 2x4's and 2 4x4's.



Note: At load the bypass should be opened the moment before the door is open (no sooner) and should be left open as little as possible. Fan remain on high.

Loading

- Open bypass (handle pointed down)
- Open door
- Load very quickly

    - Take care that the front fuel load is stable so it cannot fall against the glass.
- Close bypass (handle pointed to rear of stove)
- Crack door to an estimated 3” crack
- Press button to initiate Eco-Regulator
- Leave door open for 3 minutes
- Shut door

3. Test Results

3.1 - Test Result Tables

Table 1 - Individual test run result summaries
Sorted primarily by inclusion in Weighted Average, secondarily by burn-rate

				Uncorrected[1]		Corrected[2]		Efficiency, %		
Run No.	Date	Category	BR, kg/hr.	ER. g/hr.	First Hour	ER, g/hr.	First Hour	HHV	LHV	Included in SA? (1 = yes)*
1	3/10/2025	III	1.42	1.42	4.22	1.42	4.22	78.7	85.0	1
2	3/11/2025	III	1.31	1.33	5.03	1.33	5.03	77.2	83.5	1
3	3/12/2025	III	1.57	1.26	5.50	1.26	5.50	76.7	82.9	0

Number of runs included in Straight Average 2

Table 2 - Straight Average

Run No.	Burn-Rate, kg/hr.	ER, g/hr.	Efficiency, %		Contribution %
			HHV	LHV	
1	1.42	1.42	78.7	85.0	50.00
2	1.31	1.33	77.2	83.5	50.00
Averages	1.37	1.38	77.95	84.25	100.00

[1] *For Tables 1, Uncorrected refers to gravimetric analysis that takes negative filter weights as a negative value in cases where filter residue was transferred to (stuck to) O-ring gaskets to account for the mass transfer.*

Table 3 - Heat Output and CO Emissions (CSA B415.1:22)
Sorted primarily by inclusion in Weighted Average, secondarily by Burn-Rate

Run No.	Burn-Rate kg/hr.	Heat Input [1] Btu/hr.	Heat Output [1] (HHV) Btu/hr.	CO Emissions g/MJ	g/kg	g/hr	g/min
1	1.42	26708	21,009	0.8	12.48	17.74	0.296
2	1.31	24614	19,012	2.20	33.62	44.04	0.734
3	1.57	29348	22,504	1.95	29.66	46.32	0.772
			Average of All runs	1.65	25.25	36.03	0.601
			Average of runs included in Weighed Average Only	1.50	23.05	30.89	0.515

[1] *Based on a calorific value of 8516.77 Btu/dry pound. (Source: CSA B415.1:22 for Douglas-fir)*

Table 4 - Test Facility Conditions
Sorted by Run Number

	Room Temperature, °F		Barometric Pressure, in Hg		Room Air Relative Humidity, %		Room Air Velocity, fpm	
Run No.	Before	After	Before	After	Before	After	Before	After
1	70	69	30.04	29.91	49	39	6	12
2	72	70	29.73	29.61	45	42	13	11
3	68	68	29.5	29.42	49	46	12	17

Table 5 - Preburn Test Fuel load description
Sorted by Run Number

Run No.	Number of Pieces	Pre-Test Fuel Weight, lb.	Pre-Test Moisture %, Dry Basis	Coal Bed Weight lb.
1	18	28.0	22.8	3.5
2	16	29.2	23.2	3.5
3	24	43.3	22.6	3.4

Table 6 - Test Fuel Properties
Sorted by Run Number

Run No.	*Mass lb., Wet*	*Mass, lb. Dry*	*Moisture content %, wb*	*Moisture content %, db*	*Length In.*	*Density lb./ft3*	*Loading Density lb./ft3*	*2 x 4 pieces used*	*4 x 4 pieces used*	*Direction [1] E/W or N/S*
1	17.24	14.20	17.63	21.4	19.1	28.22	7.18	3	2	E/W
2	17.2	14.05	18.27	22.35	19.1	28.20	7.16	3	2	E/W
3	16.9	13.75	18.53	22.74	19.1	27.87	7.03	3	2	E/W

[1] *"E/W" means "East-West", meaning the lengths of the fuel pieces ran from right-to-left within the firebox relative to the firebox door opening. "N/S" means "North-South", meaning the lengths of the fuel pieces ran front-to-rear within the firebox relative to the firebox door opening.*

Table 7 - Dilution Tunnel Gas Measurements Summary
Sorted by Run Number

Run no.	*Length of test, min*	*Velocity, ft/sec*	*Flow Rate, dscfm*	*Temperature °F*
1	272	19.126	215.6	81.3
2	292	19.056	213.8	78.4
3	240	19.362	211.6	88.6

Table 8 - Appliance Average Surface Temperature Data
Sorted by Run Number

Run No.	*Beginning*	*Ending*	*Δ T*
1	399	327	71.5
2	333	244	89.6
3	397	319	77.5

4. Discussion

4.1 The Test Series - Started March 11, 2024

The plan for this test series required a minimum of 3 test runs:
(1) A single burn rate
(2) Confirmation of burn rate
(3) Fan confirmation

A total of 3 tests were ultimately performed:
Test run 1 - Determining burn rate as single burn rate appliance. Determined burn rate 1.43kg/hr (CAT III).
Test run 2 - Confirming burn rate with a second run. Determined burn rate 1.31kg/hr (CAT III)
Test run 3 - Fan confirmation test with determined burn rate of 1.57kg/hr.

Appliance burn rate for Run 1 and Run 2 averaged to being 1.37kg/hr, both test runs meet standard criteria for single burn rate appliance in clause X1.4.2 in ASTM 2780.

As a standard operating practice, for each test run within this series a small kindling fire with scrap fuel was created within the cold appliance and allowed to burn somewhat robustly. The remaining coals were removed and the platform scale was re-zeroed. A suitable amount of the live coals were then placed back into the fire chamber to provide ignition source of the preburn. The intention of this process is to eliminate any moisture mass that may have accumulated in the appliance refractory materials. All tests performed were then carried out following the manufacturer's written instructions/recommendations as a guideline.

4.2 - Individual Test Run Narratives

Run 1 - March 10, 2025

Two preburns were conducted on this run as per manufacturers instructions. The first one weighing 14.27lbs was loaded immediately after the stove was tared and a coal bed was established. Once the first preburn burnt down to 3.5lbs a second preburn weighing 13.69lbs was loaded. Once the second preburn burnt down to 3.6lbs the coals were leveled and at 3.5lbs preburn was stopped. Background sampling was outside of proportionality range for one minute, this was because the technician cannot monitor proportionality and load the wood stove at the same time. Adjustments were made shortly after as allowed in the test method. Additional data was provided to show that in ten minute increments proportionality was well within the specified range in ASTM E2515.

During the pre-burn, the sample train probes were assembled, the continuous gas analyzers were calibrated and the velocity traverse measurements were made. Upon completion of the pre-burn, the remaining coals were raked and leveled. The platform scale was zeroed, and loading of the appliance and initiation of the sampling pumps were done simultaneously. During the pre-burn and approximately 2.5hours prior to test start. the test fuel was measured for moisture.

Sampling portion Start-up Procedures

Fuel Loading:	Fuel completely loaded by 57 seconds.
Door:	Fuel loading door closed at 180 seconds.
Air Control:	Automatic air control timer started immediately after loading the test fuel
Secondary Air:	Non-Adjustable
Convection Fan:	On

Figure 19 - Run 1 - Test Fuel

Figure 20 - Run 1 - Freshly Loaded Stove

At exactly one hour from the start of sampling, the first-hour (Sample Train C) was stopped and a leak check was immediately performed on it. The test continued without incident until it ended with zero mass remaining on the scale at 272 minutes from the start of the test and a resulting dry burn-rate of 1.42 kg/hr.

Upon completion of the sampling portion of the test, all remaining sampling trains (A, B and ambient background) were leak-checked. Other tasks performed were (but not limited to) leak checking of pitot tube, recording of environmental conditions, post-test verification of continuous gas analyzers and placement of disassembled sample probe elements in desiccator.

No sampling anomalies occurred, this test run was determined to be valid and appropriate for inclusion of a straight average.

Run 2 - March 11, 2025

Two preburns were conducted on this run as per manufacturers instructions. The first one weighing 14.72lbs was loaded immediately after the stove was tared and a coal bed was established. Once the first preburn burnt down to 3.5lbs a second preburn weighing 14.47lbs was loaded. Once the second preburn burnt down to 3.6lbs the coals were leveled and at 3.5lbs preburn was stopped.

During the pre-burn, the sample train probes were assembled, the continuous gas analyzers were calibrated and the velocity traverse measurements were made. Upon completion of the pre-burn, the remaining coals were raked and leveled. The platform scale was zeroed, and loading of the appliance and initiation of the sampling pumps were done simultaneously. During the pre-burn and approximately 2.0 hours prior to test start. the test fuel was measured for moisture.

Sampling portion Start-up Procedures

Fuel Loading:	Fuel completely loaded by 90 seconds.
Door:	Fuel loading door closed at 180 seconds.
Air Control:	Automatic air control timer started immediately after loading the test fuel
Secondary Air:	Non-Adjustable
Convection Fan:	On

Figure 21 - Run 2 - Test Fuel

Figure 22 - Run 2 - Freshly Loaded Stove

At exactly one hour from the start of sampling, the first-hour (Sample Train C) was stopped and a leak check was immediately performed on it. The test continued without incident until it ended with zero mass remaining on the scale at 292 minutes from the start of the test and a resulting dry burn-rate of 1.31kg/hr.

Upon completion of the sampling portion of the test, all remaining sampling trains (A, B and ambient background) were leak-checked. Other tasks performed were (but not limited to) leak checking of pitot tube, recording of environmental conditions, post-test verification of continuous gas analyzers and placement of disassembled sample probe elements in desiccator.

No sampling anomalies occurred, this test run was determined to be valid and appropriate for inclusion of a straight average.

Run 3 - March 12, 2025

Two preburns were prepared at the start of this test. During the first preburn, the door was left open longer than what the manufacturer intended in their instructions. There for a third preburn was prepared once the stove burnt down to the coal bed level. The first preburn weighed 14.26lbs, followed by a 14.52lbs preburn, and a 14.48lbs preburn. At 3.5lbs the coals were leveled and preburn was stopped at 3.4lbs.

During the pre-burn, the sample train probes were assembled, the continuous gas analyzers were calibrated and the velocity traverse measurements were made. Upon completion of the pre-burn, the remaining coals were raked and leveled. The platform scale was zeroed, and loading of the appliance and initiation of the sampling pumps were done simultaneously. During the pre-burn and approximately 2.0 hours prior to test start. the test fuel was measured for moisture.

Sampling portion Start-up Procedures

Fuel Loading:	Fuel completely loaded by 40 seconds.
Door:	Fuel loading door closed at 180 seconds.
Air Control:	Automatic air control timer started immediately after loading the test fuel
Secondary Air:	Non-Adjustable
Convection Fan:	Off

Figure 23 - Run 3 - Test Fuel

Figure 24 - Run 2 - Freshly Loaded Stove

At exactly one hour from the start of sampling, the first-hour (Sample Train C) was stopped and a leak check was immediately performed on it. The test continued without incident until it ended with zero mass remaining on the scale at 239 minutes from the start of the test and a resulting dry burn-rate of 1.57kg/hr.

Upon completion of the sampling portion of the test, all remaining sampling trains (A, B and ambient background) were leak-checked. Other tasks performed were (but not limited to) leak checking of pitot tube, recording of environmental conditions, post-test verification of continuous gas analyzers and placement of disassembled sample probe elements in desiccator.

No sampling anomalies occurred, this test run was determined to be valid and appropriate for inclusion of a fan confirmation test.

5. Test Data by Run

The data presented in this section is arranged as follows:

1. Test Run 1 as follows:
    a. Run 1 cover page
    b. Emissions Test Results
    c. CSA B415 Results and Data
    d. Test Fuel Properties
    e. Velocity Traverse and Supplemental Data
    f. Pre-Burn Data
    g. Sample Train A and Dilution Tunnel Data
    h. Sample Train B and Appliance Temperature Data
    i. Sample Train C (First Hour) Data
    j. Sample Train D (Background) and Flue Gas Data

Run 1 Test Data

Test Date:	3/10/2025
Manufacturer:	MF Fire
Model	Nova 2

Contents, in the following order:

Wood Heater Test Results

ASTM E2780 / ASTM E2515

Manufacturer: MF Fire
Model: Nova 2
Project No.: 0552WS004E
Tracking No.: 2497
Run: 1
Test Date: 03/10/25

Burn-Rate Result

1.42 kg/hr

Particulate Emissions Results

	Average of Trains A and B		First Hour	
	Uncorrected	*Corrected*	*Uncorrected*	*Corrected*
Total Emissions - E_T, g	6.43	6.43	4.22	4.22
Emission Rate, g/hr	**1.42**	1.42	**4.22**	4.22
Emissions Factor, g/kg	1.00	1.00	n/a	n/a

Dilution Tunnel Flow Parameters

	First Hour	Duration of Test
Average Tunnel Temperature, °F	95.9	81.3
Average Tunnel Gas Velocity (vs), feet/second	19.251	19.126
Average Tunnel Gas Flow Rate(Qsd), DSCF/hr	12677.1	12933.4
Average Delta p, in. H2O	0.118	0.120
Tunnel Static Pressure, in. H2O	#REF!	#REF!
Total Time of Test, Min	60	272

Particulate Sample Measurement Parameters

	Uncorrected				*Corrected*			
	AMBIENT	Train A	Train B	First Hour	AMBIENT	Train A	Train B	First Hour
Total Sample Volume (V_m), ft^3	41.201	43.873	44.215	9.571	41.201	43.873	44.215	9.571
Average Gas Meter Temperature, °F	79	89	89	73	79	89	89	73
Total Sample Volume (V_{mstd}), DSCF	40.748	42.912	43.775	9.603	40.748	42.912	43.775	9.603
Total Particulates (mn), mg - m_n	0.1	4.8	4.7	3.2	0.1	4.8	4.7	3.2
Particulate Concentration (C_s - C_r) g/DSCF	0.00000	0.00011	0.00011	0.00033	0.00000	0.00011	0.00011	0.00033
Total Particulate Emissions (ET), grams	n/a	6.56	6.30	4.22	n/a	6.56	6.30	4.22
Particulate Emission Rate, g/hr	n/a	1.45	1.39	4.22	n/a	1.45	1.39	4.22
Emissions Factor, g/kg	n/a	1.02	0.98	n/a	n/a	1.02	0.98	n/a
Difference, ET from from Average ET, grams	n/a	0.13	-0.13	n/a	n/a	0.13	-0.13	n/a

Test Methodology Specifications and Quality Checks

Parameter	*Requirement*	*Measured / Observed*			*Complies?*
		First Hour	*Train 1*	*Train 2*	
Filter Temperature, °F	< 90	72	68	66	✓
Filter Face Velocity, fpm	< 30	8.73	8.89	8.89	✓
Dryer Exit Temperature, °F	< 80	61	62	54	✓
Tunnel Velocity, fpm	>800	1,155	1,148		✓
First Hour Leakage Rate	0.006	0.001			✓
Train A Leakage Rate	0.006		0.002		✓
Train B Leakage Rate	0.007			0.002	✓
Leakage Rate Limits (cfm) are < 4% of average sample rate or < 0.01 cfm, which ever is less					
Negative Probe Weight	=> 0	0	0.1	0.1	✓
Pro-Rate Variation	< 90 for < 10% of θ	0.00%	0.00%	0.00%	✓
	> 110 for < 10% of θ	0.00%	0.000%	0.00%	✓
	# Readings < 80%	0	0	0	✓
	# Readings > 120%	0	0	0	✓
Ambient Temp, °F (min)	> 55		68.5		✓
Ambient Temp, °F	< 90		72.2		✓
Trains A and B					
Either A or B must conform	(*A*) < 7.5%		2.05%		✓
	(*B*) < 0.5 g/kg		0.04		✓
Stove Surface ΔT	<= 125 °F		71		✓
Room Air Velocity	< 50 fpm		12		✓

OMNI Test Laboratories

Manufacturer:	MF Fire	**Technicians:**	R Tiegs
Model:	Nova 2		
Date:	03/10/25		
Run:	1		
Control #:	2497		
Test Duration:	272		
Output Category:			

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	78.7%	85.0%
Combustion Efficiency	99.4%	99.4%
Heat Transfer Efficiency	79%	85.5%

Output Rate (kJ/h)	22,147	21,009	**(Btu/h)**
Burn Rate (kg/h)	1.42	3.13	**(lb/h)**
Input (kJ/h)	28,155	26,708	**(Btu/h)**

Test Load Weight (dry kg)	6.44	14.20	**dry lb**
MC wet (%)	17.63		
MC dry (%)	21.40		
Particulate (g)	6.43		
CO (g)	80		
Test Duration (h)	4.53		

Emissions	Particulate	CO
g/MJ Output	0.06	0.80
g/kg Dry Fuel	1.00	12.48
g/h	1.42	17.74
lb/MM Btu Output	0.15	1.86

Air/Fuel Ratio (A/F)	9.55

VERSION: **2.4** **4/15/2010**

Test Fuel Properties

ASTM E2780

Manufacturer : MF Fire
Model : Nova 2
Tracking No. : 2497
Project No. : 0552WS004E
Test Date : 3/10/2025
Run No. : 1

Moisture Meter Cal	
Cal Block	Measured
12.0	12.0
22.0	22.0

Firebox Volume : 2.33 ft^3
% 2 x 4 Required : 35 - 65 %
Ideal Fuel Weight : 16.31 lb.
Minimum Fuel Weight : 14.68 lb.
Maximum Fuel Weight : 17.94 lb.

Fuel Piece Data

PC #	Weight, lb	Size	Length, In	Moisture Readings, Dry Basis %			Average MC, % db	Dry Weight, lb.	Volume, ft3	Wet Weights, lb 4 x 4	Wet Weights, lb 2 x 4	Dry Weights, lb 4 x 4	Dry Weights, lb 2 x 4
1	2.00	2x4	19.125	22.5	22.4	20.3	21.7	1.64	0.0581		2.0		1.64
2	2.24	2x4	19.125	21.4	19.7	20.0	20.4	1.86	0.0581		2.2		1.86
3	2.28	2x4	19.125	23.2	21.6	19.5	21.4	1.88	0.0581		2.3		1.88
4	4.47	4x4	19.125	23.8	24.7	20.0	22.8	3.64	0.1356	4.5		3.64	
5	4.30	4x4	19.125	22.8	20.4	20.1	21.1	3.55	0.1356	4.3		3.55	
6													
7													
8													
9													

Spacer Data

Moisture Readings, Dry Basis % (One reading per spacer)								
14.8	20.8	23.2	22.6					
25.3	16.9	17.2	16.8					
20.4	24.5	16.9	25.0					
13.5	15.8	25.8	15.6					

Avg : 19.7

Assembled Crib Fuel Load with Spacers Attatched

PC #	Weight, lb with Spacers	Size	4 x 4s	2 x 4s
1	2.24	2x4		2.2400
2	2.75	2x4		2.7500
3	2.76	2x4		2.7600
4	4.70	4x4	4.70	
5	4.79	4x4	4.79	
6				
7				
8				
9				

Combined Mass of 4 x 4s 9.5 lb
Combined Mass of 2 x 4s 7.8 lb

Total Wet Mass of Fuel Load **17.2** lb

Fuel Load Properties

Type	Number of Pieces	Wet Weight, lb.	Dry Weight, lb.	Fuel Loading Density, lb/ft^3 Wet Basis	Fuel Loading Density, lb/ft^3 Dry Basis	Dry Fuel Density, lb/ft^3	Wet Fuel Density, lb/ft^3	Moisture, % Dry Basis	Moisture, % Wet Basis
2 x 4	3	6.5	5.38	7.40	6.09	28.22	34.32	21.40	17.63
4 x 4	2	8.8	7.19						
Spacers	16	2.0	1.63						
Totals		17.2	14.20						

Compliance Checks

	Fuel Load, Wet Lb.	Load Density, lb/ft^3 of FB vol	Fuel Density, lb/ft^3	% of Fuel load mass which is 2x4	Fuel Load Peices Mositure, % db
Measured	17.2	7.40	28.22	45	21.5
Required	14.7 - 17.9	6.3 - 7.7	25 - 36	35 - 65	19 -25
Complies ?	Yes	Yes	Yes	Yes	Yes

Dilution Tunnel Velocity Traverse and Supplementary Data

ASTM E2515-11

Run:	1	Tracking No.:	2497
Manufacturer:	MF Fire	Project No.:	0552WS004E
Model:	Nova 2	Test Date:	3/10/2025

Dillution Tunnel Velocity Traverse

Pitot Location

Traverse Point	*% of Diameter*	*Inches into Tunnel*	*dP in. H_2O*	*Tunnel Temp, °F*	*$dP^{1/2}$*
X1	6.7	0.5 *	0.068	94	0.261
X2	25.0	0.00	0.104	94	0.322
X3	75.0	0.00	0.098	94	0.313
X4	93.3	-0.5 *	0.066	94	0.257
Y1	6.7	0.5 *	0.070	93	0.265
Y2	25.0	0.00	0.102	94	0.319
Y3	75.0	0.00	0.094	93	0.307
Y4	93.3	-0.5 *	0.040	93	0.200
Center	50.0	0.00	0.116	94	0.341

Tunnel Static Pressure	-0.400	*in. H_2O*
Tunnel Moisture	2.00	%
Tunnel Diameter	6.00	inches
Pitot Tube C_p	0.99	inches
Tunnel Molecular Weight	29	(dry)
Tunnel Molecular Weight	28.78	(M_s, wet)
Tunnel Area	0.1963495	*ft^2*
K_p	85.49	constant
$P_s=P_{bar}$+Tunnel Static	30.010588	in HG

** Probe location must be no closer than 0.50 in to tunnel wall*

$$V_{strav} = K_p C_p \sqrt{\Delta p}_{avg} \sqrt{\frac{T_{s,avg}}{P_s M_s}} = 19.0047$$

$$V_{scent} = K_p C_p \sqrt{\Delta p}_{center} \sqrt{\frac{T_{s,center}}{P_s M_s}} = 23.0862$$

$$F_P = V_{strav} / V_{scent} = 0.823$$

$$Initial\ Tunnel\ Velocity, V_s = F_P K_p C_p \sqrt{\Delta p}_{avg} \sqrt{\frac{T_{s,avg}}{P_s M_s}} = 15.645\ ft/sec$$

Supplementary Data and Information

Environment

	Test Start	Test End
Time of Day	14:57	19:29
Barometric Pressure, in. Hg	30.04	29.910
Room Air Velocity, fpm	6	12.000
Room Air Temperature, °F	70	69.000
Room Relative Humidity, %	49.0	39.000
Platform Scale Audit, lb.	20.0	20.00

Leak Checks

Pitot and associated tubing, (pass/fail)[1]	pass	pass

See sampling box worksheets for sampling boxes

Dillution Tunnel

Date last cleaned	3/10/2025	
Smoke Capture, % (visual)[2]	100	
Draft Inducement, (pass/fail)[3]	pass	
Static Pressure, in. H_2O	-0.400	-0.400

1 Both sides (independantly) of the pitot system are brought under a minimum vacuum of 3 in. H_2O and then sealed. Any indiction of pressure loss is deemed a fail.

2 Create a smoking condition during start of pre-burn activites and using adequate lighting pointed upward and aroud tunnel hood, visually observe if 100% of visible smoke is being captured by the hood. If not, increase flow tunnel flow and / or re-assess chimney proximity to draft hood as required and repeat until 100% capture is observed.

3 With the appliance installed and the dillution tunnel flow turned-off, observe the flue draft gauge while turning the dulution tunnel on. Any detectible response by the draft gauge associated with activation of the tunnel flow indicates that draft inducemnt is occuring. Determine the cause (i.e. flue chimnet too deep into tunnel?) before continuing.

Preburn Data

ASTM E2780

Run: 1

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E
Test Date: 3/10/25
Beginning Clock Time: 10:52

Coal Bed Range (lb):	3.4 (min)	4.3 (max)

Preburn Fuel Data

8 pieces @	16 inches					
7 pieces @	10 inches					
3 pieces @	20 inches					
Fuel Moisture Readings (% DB):						
25.3	20.4	23.6	24.8			
23.5	20.9	23.8	19.8			
25.3	25.3	19.1	20.1			
25.6	20.5	22.8				
21.4	23	24.5				
Avg Preburn Moisture (% DB):	**22.76**					

			Temperatures (°F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H_2O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat Exit	Avg. FB	Stack	Ambient
184	8.55	-0.081	474.8	335.6	198.2	364.9	334.3	963.3	342	455	68.4
185	8.37	-0.082	485.8	335	201.9	368.4	336	979.3	345	460.7	68.6
186	8.17	-0.083	497	335.3	205.5	372	338.5	990.9	350	465.2	68.8
187	7.97	-0.085	507.9	334.7	209.4	375.9	342.3	996.2	354	468.6	68.9
188	7.82	-0.083	515.2	334.8	213.1	380	344.1	1013.8	357	473.9	69
189	7.62	-0.087	529.4	334.6	217.3	384.9	348.7	1026.4	363	479.2	69.2
190	7.46	-0.085	537.6	334.8	221.5	389.3	352.4	1035.7	367	482	69.4
191	7.27	-0.084	550.4	334.9	225.9	394.3	354.1	1044.7	372	485.7	69.6
192	7.07	-0.082	554.1	333.5	229.4	396	355.1	1021.5	374	453.5	69.7
193	6.93	-0.085	556.6	334.5	231.2	401.7	358.8	1027.1	377	475	69.9
194	6.77	-0.081	564	334.8	234.3	407.2	363.9	1042.9	381	482	70.1
195	6.57	-0.083	565.3	334.8	238.4	409.9	364.3	1059.7	383	486.8	70.2
196	6.4	-0.082	573.7	334.8	242.6	416.6	367.7	1068.7	387	490.4	70.4
197	6.24	-0.082	580.3	334.7	245.4	420.6	371.9	1077.3	391	492.1	70.6
198	6.08	-0.077	583.7	335.7	249.4	423.9	374.2	1084.4	393	495.4	70.8
199	5.94	-0.079	586.6	336	252.7	427.1	376.3	1076.7	396	494.6	70.9
200	5.8	-0.078	586.8	336.7	255.4	429.2	381.1	1062.9	398	491.3	71.2
201	5.66	-0.084	586.2	336.7	257.2	429.8	384.5	1046.2	399	486.8	71.5
202	5.55	-0.076	581.6	337.4	260.1	433.3	387.1	1030.5	400	485.3	71.6
203	5.46	-0.079	577.9	338.9	261.8	435	388.1	1020.9	400	482.4	71.7
204	5.38	-0.074	575.4	339.2	263.3	433.9	390.3	1011.7	400	480.1	71.8
205	5.28	-0.081	569.7	340.5	264.1	436.7	388.9	1001.2	400	477.6	71.8
206	5.19	-0.078	559.6	341.6	264.7	437.5	394.7	987.1	400	473.5	71.9
207	5.12	-0.073	553.3	343.1	264.8	438.3	395	966.8	399	468.8	72.1
208	5.06	-0.078	542	344.5	264.3	436.8	392.7	956	396	462.7	72.2
209	4.97	-0.074	530.8	345.1	263.4	437.7	395.4	942.3	394	457.3	72.3
210	4.95	-0.072	519.4	347.2	261.9	437.3	393.8	925.8	392	452.5	72.3
211	4.87	-0.074	508.5	348.2	260.2	436.5	394.9	909.1	390	446.8	72.3
212	4.85	-0.074	491.6	349.5	258.5	435.8	394.7	893.8	386	440.8	72.5
213	4.79	-0.067	478.1	351	256.5	436.5	393.6	880.8	383	436.1	72.6
214	4.76	-0.067	465.8	352.5	253.9	435.8	392.7	868.6	380	431.4	72.6
215	4.7	-0.067	453	353.6	251.5	435	392.4	857	377	427.1	72.7
216	4.66	-0.07	445.6	355.1	249.1	434.4	391.4	845.5	375	422	72.7
217	4.6	-0.074	432.9	357	247.1	434.4	389.4	835.6	372	419.5	72.7
218	4.56	-0.067	423.5	358.4	245	433.1	386.4	826.9	369	416	72.7
219	4.53	-0.069	413.8	359.9	242.7	431.8	386.4	818.7	367	412.5	72.7
220	4.48	-0.065	407.5	361.2	239.7	432.5	384.9	811.9	365	409.6	72.7
221	4.47	-0.066	401.1	362.7	237.5	431.6	384.6	805.2	364	406.4	72.7
222	4.4	-0.069	395	364.1	235.8	429.8	381.8	799.3	361	404	72.7
223	4.37	-0.066	389.2	365.3	233.6	427.8	384.6	793.5	360	400.5	72.8
224	4.34	-0.066	383.5	366.4	231.6	427.9	379.4	788.2	358	398.3	72.8
225	4.29	-0.063	379.1	368.1	229.5	425.8	378.9	783.3	356	396.8	72.9

			Temperatures (°F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H_2O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat Exit	Avg. FB	Stack	Ambient
226	4.26	-0.063	375	369.5	227.8	425.2	379.3	778.5	355	394	72.8
227	4.21	-0.061	371.5	371	225.9	424.2	375.6	774.1	354	391.4	72.8
228	4.17	-0.063	366.8	372.4	224.2	422.9	376	770	352	389.6	72.8
229	4.14	-0.063	364.4	373.8	222.5	422	374	766.1	351	388.7	72.6
230	4.09	-0.065	361.2	374.5	221.1	420.3	373.6	762.5	350	386.7	72.6
231	4.07	-0.061	358.4	375.9	219.5	419.9	373.4	759.4	349	385.5	72.6
232	4.04	-0.054	356	376.7	217.8	416.8	373	750.1	348	368.6	72.5
233	3.94	-0.063	353.3	378.1	216.9	415.6	369.1	750.8	347	376.7	72.6
234	3.93	-0.067	352.2	379.7	215.5	416.1	368.1	749.8	346	378.9	72.6
235	3.87	-0.062	347.1	380.5	214.2	414.7	366.9	747.9	345	378.6	72.5
236	3.88	-0.062	345.2	381.6	213.2	413.7	367	745.5	344	377.8	72.4
237	3.83	-0.06	343.1	382.7	211.7	412.8	365.8	743.4	343	377.7	72.3
238	3.76	-0.06	342.4	383	211	411.6	366.6	741	343	376.6	72.2
239	3.76	-0.061	340.1	384.4	209.8	410.1	365	737.8	342	376.1	72.3
240	3.69	-0.061	339.3	383.9	208.8	407.3	364.4	734.7	341	374.7	72.1
241	3.66	-0.065	338.2	385.8	207.6	408.4	364.2	732.5	341	373.8	72.1
242	3.63	-0.065	335.9	386.2	206.4	408.4	360.9	730.7	340	372.9	72.1
243	3.58	-0.064	334.4	388.2	205.7	408.1	361.8	729.3	340	371.5	72
244	3.49	-0.066	331.8	388.8	207.9	407.1	361.6	702.1	339	390	71.9

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0122
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.012
Sampling Box ID: 692

Test Start Time: 14:57
Test Length: 272 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.002 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
Tot / Avg		17.3	**43.873**	**0.161**	**1.24**	**88.9**	**2.12**	**67.66**	**61.54**	**70.26**	**100.0**	**81.3**	**0.120**	**0.346**	**19.13**
Minimum	0.0	0.0	0.000	0.137	0.01	71	0.30	65	47	69	91.1	71	0.112	0.335	18.76
Max	17.2	0.2	43.873	0.166	1.28	94	2.27	71	63	72	108.2	127	0.125	0.354	19.70
0	17.2		0.000		0.01	71	0.30	64.9	47.4	72		97	0.116	0.341	19.70
1	17.1	0.1	0.137	0.137	1.24	71	2.18	66.7	53.8	72	91.1	127	0.114	0.338	19.24
2	17.0	0.1	0.295	0.158	1.22	71	2.19	67.8	55.7	72	108.2	123	0.116	0.341	19.46
3	16.8	0.2	0.453	0.158	1.22	71	2.22	68.5	57.5	72	107.5	124	0.113	0.336	19.40
4	16.6	0.2	0.611	0.158	1.22	71	2.20	68.7	58.9	72	106.2	110	0.120	0.346	19.45
5	16.5	0.1	0.767	0.156	1.22	71	2.19	68.4	58.3	72	102.8	102	0.117	0.342	19.43
6	16.4	0.1	0.925	0.158	1.22	71	2.17	68.3	58.3	71	103.3	98	0.120	0.346	19.33
7	16.3	0.1	1.082	0.157	1.22	71	2.15	68.3	58.4	71	102.5	97	0.118	0.344	19.33
8	16.2	0.1	1.239	0.157	1.21	71	2.14	68.4	58.6	71	102.6	96	0.117	0.342	19.19
9	16.1	0.1	1.399	0.160	1.21	72	2.14	68.5	58.9	71	104.9	96	0.118	0.344	19.18
10	16.0	0.2	1.552	0.153	1.21	72	2.16	68.6	59.6	71	100.0	96	0.120	0.346	19.30
11	15.8	0.2	1.709	0.157	1.20	72	2.16	68.8	60.7	71	102.0	98	0.121	0.348	19.44
12	15.6	0.2	1.864	0.155	1.19	72	2.17	69	61.2	70	99.9	98	0.125	0.354	19.66
13	15.5	0.1	2.021	0.157	1.20	72	2.10	69	61.5	70	100.8	98	0.120	0.346	19.62
14	15.3	0.2	2.176	0.155	1.19	73	2.18	69.1	61.2	70	100.4	98	0.117	0.342	19.30
15	15.2	0.1	2.333	0.157	1.25	73	2.27	69.2	61	70	102.4	98	0.121	0.348	19.34
16	15.0	0.2	2.494	0.161	1.25	73	2.23	69.3	61	70	104.7	98	0.118	0.344	19.38
17	14.9	0.1	2.653	0.159	1.24	73	2.18	69.4	60.8	70	103.1	98	0.122	0.349	19.42
18	14.7	0.1	2.815	0.162	1.24	73	2.18	69.5	60.8	70	105.0	98	0.117	0.342	19.37
19	14.6	0.1	2.973	0.158	1.25	74	2.20	69.6	60.7	70	102.9	98	0.118	0.344	19.21
20	14.5	0.1	3.132	0.159	1.25	74	2.23	69.6	60.6	70	103.6	98	0.120	0.346	19.34
21	14.3	0.2	3.290	0.158	1.24	74	2.19	69.7	60.4	70	102.4	98	0.120	0.346	19.42
22	14.2	0.1	3.450	0.160	1.24	75	2.22	69.8	60.4	70	103.4	98	0.120	0.346	19.42
23	14.0	0.1	3.610	0.160	1.24	75	2.16	69.9	60.8	70	103.4	98	0.120	0.346	19.42
24	13.9	0.2	3.768	0.158	1.23	75	2.16	70	61.2	70	102.3	99	0.118	0.344	19.35
25	13.7	0.2	3.927	0.159	1.24	75	2.17	70	61.5	70	103.5	99	0.117	0.342	19.24
26	13.5	0.1	4.087	0.160	1.24	76	2.23	70.1	61.5	70	104.0	99	0.122	0.349	19.40
27	13.3	0.2	4.248	0.161	1.23	76	2.16	70.2	61.8	70	104.1	100	0.118	0.344	19.45
28	13.2	0.2	4.406	0.158	1.23	76	2.14	70.2	61.8	70	103.1	100	0.112	0.335	19.04
29	13.0	0.2	4.564	0.158	1.23	76	2.22	70.3	61.8	70	104.5	100	0.115	0.339	18.92
30	12.8	0.2	4.723	0.159	1.23	77	2.22	70.4	61.8	70	104.5	100	0.120	0.346	19.25
31	12.6	0.2	4.880	0.157	1.23	77	2.14	70.5	61.7	70	101.9	101	0.119	0.345	19.42
32	12.5	0.2	5.040	0.160	1.23	77	2.14	70.5	61.6	70	103.9	101	0.115	0.339	19.22
33	12.3	0.2	5.199	0.159	1.23	78	2.13	70.5	61.6	70	104.4	101	0.114	0.338	19.02
34	12.1	0.2	5.356	0.157	1.22	78	2.20	70.6	61.5	70	103.6	102	0.115	0.339	19.03
35	11.9	0.2	5.516	0.160	1.23	78	2.25	70.6	61.7	70	105.0	102	0.119	0.345	19.24
36	11.7	0.2	5.677	0.161	1.23	79	2.25	70.6	61.8	70	105.2	102	0.113	0.336	19.17
37	11.6	0.1	5.835	0.158	1.22	79	2.23	70.4	62	70	103.1	96	0.118	0.344	19.07
38	11.4	0.1	5.993	0.158	1.23	79	2.13	70.2	61.2	70	101.5	93	0.124	0.352	19.44
39	11.3	0.1	6.152	0.159	1.23	79	2.19	70.2	60.1	70	101.0	92	0.116	0.341	19.32
40	11.2	0.1	6.309	0.157	1.22	80	2.20	70	59.7	70	100.2	90	0.120	0.346	19.14

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0122
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.012
Sampling Box ID: 692

Test Start Time: 14:57
Test Length: 272 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.002 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
41	11.1	0.1	6.470	0.161	1.23	80	2.12	69.9	59.9	70	102.4	90	0.122	0.349	19.36
42	11.0	0.1	6.629	0.159	1.23	80	2.11	69.9	60	70	101.1	89	0.114	0.338	19.11
43	10.9	0.1	6.788	0.159	1.22	81	2.10	69.8	60.1	70	101.6	89	0.122	0.349	19.10
44	10.8	0.1	6.948	0.160	1.23	81	2.27	69.8	59.9	70	101.7	88	0.118	0.344	19.25
45	10.7	0.1	7.110	0.162	1.24	81	2.24	69.8	59.9	71	102.9	88	0.118	0.344	19.08
46	10.6	0.1	7.270	0.160	1.24	81	2.25	69.7	59.8	70	102.2	88	0.116	0.341	19.00
47	10.5	0.1	7.428	0.158	1.23	82	2.25	69.7	59.7	70	101.1	87	0.118	0.344	18.99
48	10.4	0.1	7.586	0.158	1.23	82	2.13	69.6	59.7	70	100.2	87	0.124	0.352	19.31
49	10.3	0.1	7.746	0.160	1.24	82	2.09	69.6	59.7	70	100.4	87	0.119	0.345	19.34
50	10.2	0.1	7.905	0.159	1.21	82	2.18	69.5	59.6	71	99.9	87	0.121	0.348	19.22
51	10.1	0.1	8.065	0.160	1.24	83	2.24	69.4	59.6	71	100.4	86	0.123	0.351	19.38
52	10.1	0.1	8.226	0.161	1.25	83	2.08	69.4	59.6	71	100.9	86	0.117	0.342	19.21
53	10.0	0.1	8.385	0.159	1.22	83	2.25	69.3	59.5	70	100.4	86	0.120	0.346	19.09
54	9.9	0.1	8.547	0.162	1.24	83	2.05	69.3	59.5	70	102.1	86	0.121	0.348	19.25
55	9.8	0.1	8.708	0.161	1.24	84	2.07	69.3	59.6	70	101.7	86	0.113	0.336	18.97
56	9.7	0.1	8.868	0.160	1.23	84	2.13	69.2	59.6	70	102.4	86	0.116	0.341	18.76
57	9.5	0.1	9.025	0.157	1.23	84	2.13	69.2	59.6	70	100.5	86	0.117	0.342	18.92
58	9.5	0.1	9.185	0.160	1.23	84	2.19	69.2	59.7	70	101.6	86	0.119	0.345	19.04
59	9.4	0.1	9.346	0.161	1.23	85	2.17	69.2	59.8	70	101.3	86	0.122	0.349	19.24
60	9.3	0.1	9.506	0.160	1.23	85	2.09	69.2	59.8	70	100.2	86	0.118	0.344	19.20
61	9.2	0.1	9.665	0.159	1.22	85	2.06	69.2	59.8	71	100.1	86	0.118	0.344	19.04
62	9.1	0.1	9.828	0.163	1.23	85	2.16	69.1	59.9	71	103.1	86	0.117	0.342	19.00
63	9.0	0.1	9.990	0.162	1.25	85	2.15	69.2	60	71	102.0	86	0.123	0.351	19.20
64	8.8	0.1	10.150	0.160	1.24	85	2.15	69.1	60	71	100.0	86	0.119	0.345	19.28
65	8.8	0.1	10.310	0.160	1.22	86	2.20	69.1	60.1	71	100.6	86	0.115	0.339	18.96
66	8.7	0.1	10.468	0.158	1.24	86	2.13	69.1	60.1	71	99.9	86	0.121	0.348	19.05
67	8.5	0.1	10.629	0.161	1.24	86	2.20	69.1	60.2	71	100.7	86	0.123	0.351	19.37
68	8.5	0.1	10.789	0.160	1.24	87	2.12	69.1	60.2	71	99.1	86	0.122	0.349	19.41
69	8.4	0.1	10.948	0.159	1.25	87	2.04	69.1	60.3	71	99.0	86	0.117	0.342	19.17
70	8.3	0.1	11.111	0.163	1.23	87	2.11	69.1	60.3	71	102.5	86	0.118	0.344	19.00
71	8.2	0.1	11.271	0.160	1.25	87	2.20	69.1	60.2	71	100.8	85	0.119	0.345	19.08
72	8.1	0.1	11.434	0.163	1.24	87	2.07	69	60.1	71	102.2	85	0.120	0.346	19.16
73	8.0	0.1	11.594	0.160	1.24	87	2.26	69	60.1	71	99.8	85	0.121	0.348	19.24
74	7.9	0.1	11.755	0.161	1.24	88	2.05	69	60.1	71	100.5	85	0.117	0.342	19.11
75	7.8	0.1	11.914	0.159	1.25	88	2.16	69	60.2	71	100.0	85	0.117	0.342	18.95
76	7.8	0.1	12.074	0.160	1.24	88	2.22	69	60.3	71	100.9	85	0.118	0.344	18.99
77	7.7	0.1	12.234	0.160	1.23	88	2.04	69	60.5	71	100.4	85	0.120	0.346	19.11
78	7.6	0.1	12.396	0.162	1.24	88	2.18	69	60.7	71	101.4	85	0.117	0.342	19.07
79	7.5	0.0	12.557	0.161	1.24	88	2.25	69	60.9	71	101.3	85	0.116	0.341	18.90
80	7.5	0.1	12.717	0.160	1.24	89	2.02	69	61	71	100.8	85	0.119	0.345	18.98
81	7.4	0.1	12.880	0.163	1.23	89	2.24	69	61.2	71	102.1	84	0.119	0.345	19.10
82	7.3	0.1	13.041	0.161	1.23	89	2.25	69	61.3	71	100.8	85	0.117	0.342	19.02
83	7.2	0.1	13.203	0.162	1.24	89	2.24	69	61.5	71	101.2	85	0.123	0.351	19.19
84	7.1	0.1	13.364	0.161	1.24	89	2.04	69	61.5	71	100.0	85	0.118	0.344	19.23

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0122
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.012
Sampling Box ID: 692

Test Start Time: 14:57
Test Length: 272 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.002 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
85	7.0	0.1	13.521	0.157	1.23	89	2.16	69	61.6	71	97.6	85	0.121	0.348	19.14
86	7.0	0.1	13.682	0.161	1.24	89	2.21	69	61.6	71	100.1	85	0.119	0.345	19.18
87	6.9	0.1	13.844	0.162	1.23	89	2.06	69	61.7	71	100.6	85	0.121	0.348	19.18
88	6.8	0.1	14.005	0.161	1.24	89	2.13	69	61.7	71	99.8	84	0.121	0.348	19.26
89	6.7	0.0	14.165	0.160	1.22	90	2.25	69	61.8	71	98.9	84	0.121	0.348	19.26
90	6.7	0.1	14.329	0.164	1.24	90	2.01	69	61.8	71	101.6	84	0.119	0.345	19.18
91	6.6	0.1	14.491	0.162	1.24	90	2.05	69	61.9	71	100.7	84	0.119	0.345	19.10
92	6.5	0.1	14.652	0.161	1.25	90	2.02	69.1	62	71	100.2	85	0.120	0.346	19.14
93	6.4	0.1	14.813	0.161	1.24	90	2.05	69	62	71	100.3	84	0.117	0.342	19.06
94	6.3	0.1	14.973	0.160	1.23	90	2.10	69.1	62.1	71	99.5	84	0.123	0.351	19.18
95	6.3	0.1	15.132	0.159	1.24	90	2.18	69.1	62.1	71	98.3	85	0.120	0.346	19.30
96	6.2	0.1	15.294	0.162	1.24	91	2.00	69.1	62.1	71	100.2	85	0.119	0.345	19.14
97	6.1	0.1	15.455	0.161	1.23	91	2.19	69.1	62.2	71	99.8	85	0.122	0.349	19.22
98	6.0	0.1	15.615	0.160	1.24	91	2.23	69.1	62.2	71	98.9	84	0.119	0.345	19.22
99	6.0	0.1	15.776	0.161	1.21	91	2.09	69.1	62.3	71	99.8	84	0.119	0.345	19.10
100	5.9	0.0	15.941	0.165	1.23	91	2.11	69.1	62.3	71	102.7	84	0.118	0.344	19.06
101	5.8	0.1	16.102	0.161	1.22	91	2.24	69.1	62.3	71	100.6	84	0.117	0.342	18.98
102	5.8	0.1	16.263	0.161	1.24	91	2.02	69.1	62.3	71	101.0	84	0.116	0.341	18.90
103	5.7	0.1	16.424	0.161	1.24	91	2.02	69.1	62.4	71	101.4	84	0.115	0.339	18.82
104	5.7	0.0	16.585	0.161	1.24	92	2.00	69.2	62.4	71	101.4	84	0.117	0.342	18.86
105	5.6	0.1	16.745	0.160	1.24	92	2.00	69.2	62.5	71	100.4	84	0.118	0.344	18.98
106	5.5	0.1	16.906	0.161	1.24	92	2.21	69.2	62.5	71	100.6	84	0.117	0.342	18.98
107	5.5	0.0	17.067	0.161	1.22	92	2.22	69.1	62.6	71	100.4	84	0.120	0.346	19.06
108	5.4	0.1	17.228	0.161	1.26	92	2.12	69.1	62.6	71	100.3	84	0.116	0.341	19.02
109	5.3	0.1	17.393	0.165	1.24	92	2.07	69.2	62.7	71	103.0	84	0.119	0.345	18.98
110	5.3	0.0	17.555	0.162	1.24	92	2.06	69.2	62.7	71	101.1	84	0.117	0.342	19.02
111	5.2	0.1	17.716	0.161	1.24	92	2.23	69.1	62.7	71	100.3	84	0.119	0.345	19.02
112	5.1	0.0	17.877	0.161	1.24	92	2.06	69.2	62.8	71	99.7	84	0.123	0.351	19.25
113	5.1	0.1	18.038	0.161	1.24	92	2.16	69.2	62.8	71	98.7	84	0.122	0.349	19.37
114	5.0	0.1	18.201	0.163	1.25	92	2.09	69.1	62.8	71	100.1	83	0.118	0.344	19.17
115	5.0	0.0	18.360	0.159	1.23	92	2.01	69.1	62.8	71	98.5	83	0.118	0.344	19.00
116	4.9	0.1	18.521	0.161	1.26	92	2.09	69.1	62.8	71	100.0	83	0.119	0.345	19.04
117	4.8	0.0	18.682	0.161	1.24	92	2.03	69	62.8	71	99.6	83	0.121	0.348	19.15
118	4.8	0.1	18.844	0.162	1.24	92	2.13	69	62.7	71	99.8	82	0.120	0.346	19.19
119	4.7	0.1	19.009	0.165	1.24	92	2.05	68.9	62.7	71	101.7	82	0.119	0.345	19.10
120	4.7	0.0	19.171	0.162	1.24	92	2.00	68.9	62.7	71	100.3	82	0.117	0.342	18.98
121	4.6	0.1	19.332	0.161	1.24	93	2.00	68.9	62.7	71	100.2	82	0.117	0.342	18.89
122	4.5	0.0	19.494	0.162	1.25	93	2.23	68.8	62.7	71	100.6	81	0.121	0.348	19.05
123	4.5	0.1	19.655	0.161	1.24	93	2.23	68.8	62.7	71	99.3	81	0.119	0.345	19.12
124	4.4	0.0	19.818	0.163	1.26	92	2.01	68.8	62.7	71	100.3	81	0.121	0.348	19.12
125	4.4	0.1	19.977	0.159	1.24	93	2.06	68.7	62.7	71	98.1	81	0.116	0.341	19.00
126	4.3	0.1	20.138	0.161	1.23	93	2.19	68.7	62.6	71	99.3	81	0.124	0.352	19.11
127	4.3	0.0	20.299	0.161	1.24	93	2.23	68.6	62.6	71	98.6	80	0.120	0.346	19.27
128	4.2	0.1	20.464	0.165	1.24	93	2.23	68.6	62.7	71	101.0	80	0.120	0.346	19.11

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 1
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Model: Nova 2
Tracking No.: 2497
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Test Start Time: 14:57
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Sample Train Leak Checks

Pre-test 0.002 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
129	4.2	0.0	20.627	0.163	1.26	93	2.04	68.5	62.6	71	99.8	80	0.123	0.351	19.23
130	4.1	0.1	20.789	0.162	1.24	93	2.08	68.5	62.6	71	99.0	80	0.119	0.345	19.18
131	4.1	0.0	20.951	0.162	1.25	93	2.22	68.4	62.6	71	99.4	80	0.120	0.346	19.06
132	4.0	0.1	21.112	0.161	1.24	93	2.19	68.4	62.6	71	99.2	79	0.118	0.344	19.02
133	4.0	0.0	21.274	0.162	1.24	93	2.00	68.3	62.6	71	99.5	79	0.123	0.351	19.13
134	3.9	0.1	21.434	0.160	1.24	93	2.14	68.3	62.6	71	97.8	79	0.120	0.346	19.21
135	3.9	0.0	21.596	0.162	1.24	93	2.12	68.3	62.6	70	99.0	79	0.121	0.348	19.12
136	3.8	0.1	21.758	0.162	1.25	93	2.21	68.3	62.6	70	99.3	79	0.119	0.345	19.08
137	3.8	0.0	21.922	0.164	1.24	93	2.05	68.2	62.6	70	100.6	78	0.121	0.348	19.08
138	3.7	0.0	22.084	0.162	1.25	93	2.13	68.2	62.5	70	99.2	78	0.120	0.346	19.11
139	3.7	0.1	22.247	0.163	1.24	93	2.06	68.2	62.6	70	99.9	78	0.119	0.345	19.03
140	3.7	0.0	22.409	0.162	1.26	93	2.17	68.1	62.5	71	99.6	78	0.119	0.345	18.99
141	3.6	0.1	22.571	0.162	1.24	93	2.09	68.1	62.5	71	99.1	78	0.125	0.354	19.22
142	3.6	0.0	22.733	0.162	1.24	93	2.03	68.1	62.5	70	98.1	78	0.122	0.349	19.34
143	3.5	0.1	22.895	0.162	1.23	93	2.15	68	62.5	70	98.3	77	0.120	0.346	19.14
144	3.5	0.0	23.055	0.160	1.25	94	2.22	68	62.5	70	97.7	77	0.121	0.348	19.10
145	3.4	0.1	23.218	0.163	1.26	93	2.18	68	62.5	70	99.7	77	0.119	0.345	19.05
146	3.4	0.0	23.379	0.161	1.25	93	2.10	67.9	62.4	70	98.7	77	0.120	0.346	19.01
147	3.4	0.0	23.544	0.165	1.23	93	2.03	67.8	62.5	70	100.8	77	0.123	0.351	19.17
148	3.3	0.1	23.706	0.162	1.25	93	2.05	67.8	62.4	70	98.6	77	0.120	0.346	19.17
149	3.3	0.0	23.867	0.161	1.24	94	2.03	67.8	62.4	70	98.3	77	0.119	0.345	19.01
150	3.2	0.1	24.031	0.164	1.24	94	2.15	67.8	62.4	70	100.5	77	0.121	0.348	19.04
151	3.2	0.0	24.193	0.162	1.25	93	2.23	67.7	62.4	70	98.8	76	0.122	0.349	19.16
152	3.1	0.0	24.355	0.162	1.25	93	2.02	67.7	62.4	70	98.4	76	0.122	0.349	19.20
153	3.1	0.1	24.514	0.159	1.26	94	2.00	67.6	62.3	70	96.6	76	0.121	0.348	19.16
154	3.0	0.0	24.676	0.162	1.27	94	1.98	67.6	62.4	70	98.6	76	0.121	0.348	19.12
155	3.0	0.0	24.840	0.164	1.24	94	2.12	67.6	62.5	70	99.9	76	0.121	0.348	19.12
156	3.0	0.0	25.005	0.165	1.24	94	2.04	67.5	62.4	70	100.7	76	0.119	0.345	19.03
157	2.9	0.0	25.167	0.162	1.23	94	2.23	67.5	62.4	70	99.3	76	0.119	0.345	18.95
158	2.9	0.1	25.329	0.162	1.23	94	1.98	67.4	62.4	70	99.3	76	0.121	0.348	19.03
159	2.9	0.0	25.491	0.162	1.24	94	2.23	67.4	62.3	70	99.1	76	0.119	0.345	19.04
160	2.8	0.1	25.652	0.161	1.25	94	2.22	67.4	62.2	70	98.1	76	0.125	0.354	19.19
161	2.7	0.1	25.816	0.164	1.23	94	2.22	67.4	62.2	70	99.0	76	0.123	0.351	19.35
162	2.7	0.0	25.979	0.163	1.25	94	2.20	67.3	62.2	70	98.4	76	0.121	0.348	19.19
163	2.7	0.1	26.138	0.159	1.24	94	2.00	67.3	62.2	70	96.8	76	0.119	0.345	19.03
164	2.7	0.0	26.300	0.162	1.25	94	2.08	67.3	62.2	70	98.9	76	0.122	0.349	19.07
165	2.6	0.0	26.464	0.164	1.24	94	2.22	67.3	62.2	70	99.9	76	0.120	0.346	19.11
166	2.5	0.1	26.627	0.163	1.25	94	2.19	67.3	62.3	70	99.7	76	0.117	0.342	18.91
167	2.6	0.0	26.790	0.163	1.26	94	2.23	67.2	62.3	70	100.0	76	0.122	0.349	18.99
168	2.5	0.1	26.952	0.162	1.25	94	2.20	67.3	62.4	70	99.1	76	0.118	0.344	19.03
169	2.5	0.0	27.114	0.162	1.25	94	2.12	67.2	62.4	70	99.2	76	0.120	0.346	18.95
170	2.4	0.0	27.276	0.162	1.26	94	2.06	67.2	62.4	70	99.2	76	0.120	0.346	19.03
171	2.4	0.1	27.438	0.162	1.24	94	2.11	67.1	62.4	70	98.7	75	0.123	0.351	19.14
172	2.4	0.0	27.601	0.163	1.24	94	2.06	67.1	62.5	70	99.0	76	0.120	0.346	19.14

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:57
Test Length: 272 min
Recording Interval: 1 min

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0122
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.012
Sampling Box ID: 692

Sample Train Leak Checks

Pre-test 0.002 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
173	2.3	0.0	27.761	0.160	1.26	94	2.20	67.1	62.5	70	97.6	76	0.119	0.345	18.99
174	2.3	0.1	27.926	0.165	1.24	94	2.16	67.1	62.6	70	100.8	75	0.122	0.349	19.06
175	2.3	0.0	28.088	0.162	1.24	94	1.98	67	62.5	70	98.5	75	0.121	0.348	19.14
176	2.2	0.0	28.250	0.162	1.24	94	2.10	67	62.6	70	98.0	75	0.125	0.354	19.26
177	2.2	0.0	28.412	0.162	1.24	94	2.23	67	62.6	71	97.8	75	0.120	0.346	19.21
178	2.2	0.0	28.576	0.164	1.24	94	2.12	66.9	62.6	71	99.5	75	0.121	0.348	19.05
179	2.1	0.1	28.738	0.162	1.25	94	2.05	66.9	62.6	71	98.9	75	0.118	0.344	18.97
180	2.1	0.0	28.900	0.162	1.24	94	2.12	66.8	62.6	71	99.1	75	0.121	0.348	18.97
181	2.1	0.0	29.063	0.163	1.25	94	2.02	66.8	62.6	71	99.4	75	0.121	0.348	19.09
182	2.0	0.1	29.221	0.158	1.24	94	2.13	66.7	62.5	70	96.2	75	0.120	0.346	19.05
183	2.0	0.1	29.385	0.164	1.25	94	2.04	66.7	62.5	71	100.1	75	0.119	0.345	18.97
184	2.0	0.0	29.551	0.166	1.24	94	2.01	66.7	62.5	71	101.6	75	0.120	0.346	18.97
185	1.9	0.0	29.714	0.163	1.23	94	2.21	66.7	62.6	71	99.6	75	0.120	0.346	19.01
186	1.9	0.0	29.876	0.162	1.25	94	2.11	66.6	62.6	71	98.6	74	0.123	0.351	19.12
187	1.9	0.0	30.038	0.162	1.24	94	2.04	66.5	62.5	71	98.3	74	0.120	0.346	19.12
188	1.8	0.0	30.200	0.162	1.25	94	2.16	66.5	62.5	71	98.3	74	0.123	0.351	19.12
189	1.8	0.1	30.363	0.163	1.24	94	2.21	66.5	62.5	71	98.8	74	0.121	0.348	19.16
190	1.8	0.0	30.527	0.164	1.24	94	2.14	66.5	62.5	71	99.2	74	0.124	0.352	19.20
191	1.8	0.0	30.689	0.162	1.24	94	2.16	66.4	62.5	71	97.8	74	0.122	0.349	19.24
192	1.7	0.1	30.849	0.160	1.26	94	2.07	66.4	62.5	71	96.7	74	0.122	0.349	19.16
193	1.7	0.0	31.014	0.165	1.24	94	2.01	66.3	62.5	71	100.0	74	0.120	0.346	19.07
194	1.7	0.0	31.176	0.162	1.23	94	2.17	66.3	62.5	71	98.5	74	0.121	0.348	19.03
195	1.7	0.0	31.339	0.163	1.25	94	2.15	66.3	62.4	71	99.0	73	0.122	0.349	19.11
196	1.6	0.1	31.503	0.164	1.25	94	2.06	66.2	62.5	71	99.1	73	0.124	0.352	19.22
197	1.6	0.0	31.665	0.162	1.24	94	2.19	66.2	62.4	71	97.8	73	0.120	0.346	19.14
198	1.6	0.0	31.828	0.163	1.24	94	2.15	66.2	62.4	71	98.8	73	0.122	0.349	19.06
199	1.5	0.1	31.991	0.163	1.26	94	2.01	66.1	62.4	71	98.9	73	0.121	0.348	19.10
200	1.5	0.0	32.153	0.162	1.23	94	1.99	66.1	62.3	71	98.6	73	0.118	0.344	18.94
201	1.5	0.1	32.313	0.160	1.24	94	2.19	66	62.3	70	98.0	73	0.119	0.345	18.86
202	1.5	0.0	32.479	0.166	1.25	94	2.20	66	62.3	70	101.9	73	0.118	0.344	18.86
203	1.5	0.0	32.642	0.163	1.26	94	2.19	66	62.3	70	99.5	73	0.124	0.352	19.06
204	1.4	0.0	32.805	0.163	1.24	94	2.15	65.9	62.3	70	98.9	73	0.119	0.345	19.10
205	1.4	0.0	32.967	0.162	1.24	94	2.20	65.9	62.2	70	98.8	73	0.118	0.344	18.86
206	1.4	0.0	33.129	0.162	1.25	93	2.05	65.8	62.2	70	99.4	73	0.119	0.345	18.86
207	1.4	0.0	33.291	0.162	1.26	94	2.11	65.8	62.2	70	99.0	73	0.122	0.349	19.01
208	1.4	0.0	33.455	0.164	1.25	93	2.03	65.7	62.1	70	99.5	73	0.122	0.349	19.13
209	1.3	0.1	33.618	0.163	1.27	94	2.14	65.7	62.2	70	98.4	73	0.124	0.352	19.21
210	1.3	0.0	33.781	0.163	1.26	94	2.00	65.7	62.1	70	98.5	73	0.119	0.345	19.09
211	1.3	0.0	33.943	0.162	1.24	94	2.01	65.6	62	70	98.5	73	0.121	0.348	18.97
212	1.3	0.0	34.106	0.163	1.24	94	2.07	65.6	62.1	70	99.1	73	0.122	0.349	19.09
213	1.2	0.0	34.268	0.162	1.26	94	2.21	65.6	62.1	70	98.0	73	0.123	0.351	19.17
214	1.2	0.0	34.431	0.163	1.24	94	2.15	65.7	62.1	70	98.3	73	0.123	0.351	19.21
215	1.2	0.0	34.595	0.164	1.24	94	2.01	65.7	62.1	70	98.6	73	0.125	0.354	19.29
216	1.2	0.0	34.757	0.162	1.24	93	2.02	65.6	62.1	70	97.6	73	0.119	0.345	19.13

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0122
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.012
Sampling Box ID: 692

Test Start Time: 14:57
Test Length: 272 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.002 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
217	1.2	0.0	34.920	0.163	1.26	94	2.19	65.6	62.1	70	98.9	73	0.122	0.349	19.01
218	1.2	0.0	35.082	0.162	1.26	94	2.00	65.6	62	70	98.2	72	0.122	0.349	19.13
219	1.1	0.0	35.244	0.162	1.25	94	1.99	65.6	62	70	98.0	72	0.121	0.348	19.09
220	1.1	0.0	35.407	0.163	1.25	94	2.18	65.5	62	70	98.9	72	0.120	0.346	19.01
221	1.1	0.0	35.571	0.164	1.24	94	2.09	65.5	62	70	99.4	72	0.124	0.352	19.13
222	1.1	0.0	35.734	0.163	1.23	94	2.15	65.5	62	70	98.4	72	0.121	0.348	19.17
223	1.1	0.0	35.896	0.162	1.25	93	2.12	65.5	62	70	97.9	72	0.123	0.351	19.13
224	1.0	0.1	36.059	0.163	1.24	93	2.16	65.5	62	70	98.7	73	0.120	0.346	19.09
225	1.0	0.0	36.221	0.162	1.25	93	2.06	65.4	62	70	98.4	72	0.121	0.348	19.01
226	1.0	0.0	36.383	0.162	1.24	93	2.00	65.5	62	70	98.5	73	0.121	0.348	19.05
227	1.0	0.0	36.547	0.164	1.26	93	2.19	65.4	62	70	99.6	72	0.121	0.348	19.05
228	1.0	0.0	36.710	0.163	1.27	93	1.98	65.3	61.9	70	98.8	72	0.123	0.351	19.12
229	0.9	0.1	36.872	0.162	1.25	93	2.04	65.3	61.9	70	97.8	72	0.122	0.349	19.16
230	0.9	0.0	37.035	0.163	1.23	93	2.16	65.3	61.9	69	98.7	72	0.120	0.346	19.04
231	0.9	0.0	37.197	0.162	1.25	93	2.07	65.3	61.9	70	98.3	72	0.123	0.351	19.08
232	0.9	0.0	37.359	0.162	1.24	93	2.08	65.3	61.9	70	98.1	72	0.121	0.348	19.12
233	0.8	0.0	37.523	0.164	1.24	93	2.12	65.3	61.9	70	99.5	72	0.120	0.346	19.00
234	0.8	0.0	37.686	0.163	1.26	93	2.07	65.3	61.8	69	99.2	72	0.121	0.348	19.00
235	0.8	0.0	37.848	0.162	1.25	93	2.00	65.2	61.8	69	98.4	72	0.122	0.349	19.08
236	0.8	0.0	38.011	0.163	1.24	93	2.00	65.2	61.8	69	98.7	72	0.122	0.349	19.12
237	0.8	0.1	38.173	0.162	1.25	93	1.98	65.2	61.8	69	97.9	72	0.123	0.351	19.16
238	0.7	0.0	38.335	0.162	1.26	93	2.18	65.1	61.8	69	98.0	72	0.120	0.346	19.08
239	0.7	0.0	38.499	0.164	1.26	93	2.01	65.2	61.8	69	99.6	72	0.121	0.348	19.00
240	0.7	0.0	38.662	0.163	1.25	93	2.13	65.2	61.8	69	99.2	72	0.120	0.346	19.00
241	0.7	0.0	38.825	0.163	1.25	93	2.03	65.1	61.8	69	99.4	72	0.119	0.345	18.92
242	0.6	0.1	38.988	0.163	1.24	93	2.15	65.1	61.8	69	99.7	72	0.119	0.345	18.88
243	0.7	0.0	39.150	0.162	1.25	93	2.02	65.1	61.7	69	98.9	72	0.122	0.349	18.99
244	0.6	0.0	39.313	0.163	1.24	93	2.18	65.1	61.7	69	98.8	72	0.123	0.351	19.15
245	0.6	0.0	39.475	0.162	1.26	93	2.18	65.1	61.7	69	97.5	72	0.125	0.354	19.27
246	0.6	0.0	39.640	0.165	1.24	93	2.14	65.1	61.7	69	98.9	72	0.124	0.352	19.31
247	0.5	0.0	39.802	0.162	1.25	93	2.02	65.1	61.7	69	97.4	72	0.121	0.348	19.15
248	0.5	0.0	39.965	0.163	1.24	93	2.03	65.1	61.7	69	98.4	72	0.124	0.352	19.15
249	0.5	0.0	40.128	0.163	1.25	93	2.13	65	61.7	69	98.5	71	0.120	0.346	19.11
250	0.5	0.0	40.290	0.162	1.24	93	2.20	65	61.7	69	98.5	71	0.119	0.345	18.91
251	0.5	0.0	40.452	0.162	1.24	93	2.05	65	61.6	69	98.7	71	0.123	0.351	19.03
252	0.5	0.0	40.616	0.164	1.27	93	2.14	65	61.7	69	99.2	71	0.123	0.351	19.19
253	0.5	0.0	40.779	0.163	1.28	93	2.02	65	61.7	69	98.3	71	0.122	0.349	19.15
254	0.4	0.1	40.942	0.163	1.25	93	2.03	65	61.7	69	98.6	71	0.121	0.348	19.07
255	0.4	0.0	41.105	0.163	1.25	93	2.05	64.9	61.6	69	98.7	71	0.122	0.349	19.07
256	0.4	0.0	41.267	0.162	1.26	93	2.02	64.9	61.6	69	98.2	71	0.120	0.346	19.03
257	0.4	0.0	41.430	0.163	1.25	93	2.05	65	61.6	69	99.2	71	0.120	0.346	18.95
258	0.4	0.0	41.593	0.163	1.27	93	2.13	64.9	61.6	69	99.2	71	0.122	0.349	19.03
259	0.3	0.0	41.757	0.164	1.25	93	2.09	64.9	61.6	69	99.5	71	0.121	0.348	19.07
260	0.3	0.0	41.920	0.163	1.25	93	2.19	64.8	61.6	69	99.2	71	0.118	0.344	18.91

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:57
Test Length: 272 min
Recording Interval: 1 min

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0122
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.012
Sampling Box ID: 692

Sample Train Leak Checks

Pre-test 0.002 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
261	0.3	0.0	42.082	0.162	1.26	93	2.15	64.8	61.6	69	98.9	71	0.122	0.349	18.95
262	0.3	0.0	42.245	0.163	1.26	93	2.04	64.8	61.6	69	99.0	71	0.122	0.349	19.10
263	0.2	0.0	42.407	0.162	1.26	93	2.18	64.8	61.6	69	98.0	71	0.122	0.349	19.10
264	0.2	0.0	42.569	0.162	1.25	93	2.11	64.7	61.5	69	97.7	71	0.125	0.354	19.22
265	0.2	0.0	42.733	0.164	1.25	93	2.07	64.7	61.6	69	98.6	71	0.122	0.349	19.22
266	0.2	0.0	42.897	0.164	1.25	93	2.07	64.7	61.5	69	99.0	71	0.120	0.346	19.02
267	0.2	0.0	43.059	0.162	1.25	93	2.03	64.7	61.6	69	98.6	71	0.120	0.346	18.94
268	0.2	0.0	43.222	0.163	1.25	93	2.16	64.7	61.5	69	99.0	71	0.124	0.352	19.10
269	0.1	0.0	43.384	0.162	1.24	93	2.09	64.7	61.6	69	97.7	71	0.122	0.349	19.18
270	0.1	0.0	43.546	0.162	1.25	93	2.22	64.7	61.5	69	98.0	71	0.119	0.345	18.98
271	0.1	0.0	43.710	0.164	1.25	93	2.04	64.7	61.5	69	100.0	71	0.120	0.346	18.90
272	0.0	0.1	43.873	0.163	1.25	93	2.13	64.7	61.5	69	99.3	71	0.122	0.349	19.02

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:57
Total Sampling Time: 272 min
Recording Interval: 1 min

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0244
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.024
Sampling Box ID: 691

Sample Train Leak Checks
Pre-test 0.005 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 8 in. Hg

Elapsed Time (min)	**Train B Sampling System**								**Appliance Temperatures, °F**						
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*	*Top*	*Bottom*	*Back*	*Left*	*Right*	*Catalyst Exit*	*Average Stove Surface (Tot = Δ T)*
Tot / Avg	**44.215**	**0.163**	**1.25**	**88.8**	**2.28**	**66.50**	**54.33**	**100.0**	**344.6**	**341.6**	**174.3**	**366.1**	**327.0**	**724.4**	**71.5**
Minimum	0.000	0.144	0.12	68	0.39	63	43	95.4	261	327	158	320	291	327	327
Max	44.215	0.166	1.27	95	2.34	67	57	108.5	477	391	217	408	360	441	441
0	0.000		0.12	68	0.39	63.4	48.2		330	389	208	407	360	699	399
1	0.144	0.144	1.31	68	2.45	64.6	43.6	95.5	323	388	210	405	360	632	386
2	0.303	0.159	1.28	68	3.29	65.4	43.1	108.5	316	389	213	403	358	610	381
3	0.463	0.160	1.27	68	3.10	65.9	43.1	108.5	305	390	216	402	355	610	380
4	0.623	0.160	1.28	68	2.75	66.1	43.4	107.4	302	391	217	400	355	682	391
5	0.785	0.162	1.28	68	2.94	66	43.6	106.5	300	390	212	398	350	701	392
6	0.947	0.162	1.28	68	2.93	66.2	43.9	105.7	299	390	206	397	349	712	392
7	1.106	0.159	1.28	69	3.16	66.2	44.2	103.5	295	389	201	393	344	715	390
8	1.264	0.158	1.28	69	2.56	66.4	44.4	102.9	293	389	196	391	341	711	387
9	1.424	0.160	1.27	69	4.00	66.5	44.7	104.6	291	389	192	388	336	714	385
10	1.583	0.159	1.26	69	3.01	66.8	45	103.6	293	388	189	385	334	736	387
11	1.743	0.160	1.26	69	2.78	67	45.3	103.7	297	387	187	382	329	775	393
12	1.904	0.161	1.26	70	2.85	67.1	45.7	103.5	308	387	185	380	325	795	397
13	2.063	0.159	1.25	70	3.10	67.1	46.1	101.8	319	386	184	377	322	802	398
14	2.222	0.159	1.26	70	2.58	67.2	46.4	102.7	327	385	183	375	319	798	398
15	2.384	0.162	1.26	70	2.86	67.3	46.7	105.3	336	384	182	375	317	789	397
16	2.545	0.161	1.26	70	2.81	67.4	47	104.4	344	385	181	374	313	794	398
17	2.702	0.157	1.26	71	3.04	67.5	47.2	101.5	347	384	179	373	312	799	399
18	2.861	0.159	1.25	72	2.35	67.7	47.6	102.7	348	383	178	374	310	798	399
19	3.022	0.161	1.28	71	2.51	67.8	47.8	104.5	349	382	177	375	307	796	398
20	3.184	0.162	1.28	72	2.45	67.9	48.1	105.2	353	381	176	378	306	795	398
21	3.344	0.160	1.29	72	2.42	67.9	48.4	103.3	353	381	175	379	304	795	398
22	3.504	0.160	1.25	72	2.36	68	48.6	103.1	354	380	174	381	301	795	397
23	3.664	0.160	1.25	72	2.27	68.1	48.9	103.1	361	379	173	381	300	829	404
24	3.829	0.165	1.23	73	2.26	68.1	49.1	106.5	369	378	173	384	298	843	408
25	3.991	0.162	1.23	73	2.28	68.2	49.4	105.0	377	378	173	385	296	841	408
26	4.151	0.160	1.25	74	2.30	68.2	49.7	103.6	383	377	174	386	295	841	409
27	4.309	0.158	1.24	74	2.34	68.3	50	101.7	393	377	174	387	294	856	414
28	4.470	0.161	1.24	74	2.35	68.4	50.3	104.6	400	376	175	388	293	856	415
29	4.632	0.162	1.24	74	2.33	68.6	50.8	106.7	409	376	176	388	292	859	417
30	4.793	0.161	1.23	75	2.36	68.7	51.1	105.4	415	375	178	389	291	871	420
31	4.953	0.160	1.24	75	2.36	68.8	51.3	103.4	423	374	179	388	292	883	423
32	5.114	0.161	1.23	76	2.35	68.9	51.5	104.1	430	373	181	390	295	891	427
33	5.278	0.164	1.23	76	2.30	68.9	51.7	107.2	439	373	183	392	296	904	431
34	5.441	0.163	1.23	76	2.36	68.9	51.9	107.1	447	372	186	392	298	908	434
35	5.602	0.161	1.23	76	2.35	69	52.1	105.2	453	372	187	395	301	915	437
36	5.759	0.157	1.24	77	2.24	69	52.2	102.2	463	371	189	395	305	921	441
37	5.920	0.161	1.23	77	2.29	68.9	52.4	104.6	471	370	190	396	308	906	440
38	6.084	0.164	1.23	78	2.35	68.8	52.6	104.8	475	369	189	399	311	900	440
39	6.245	0.161	1.24	78	2.33	68.7	52.7	101.8	475	369	188	401	313	895	440
40	6.405	0.160	1.23	78	2.23	68.6	52.8	101.6	477	369	186	402	315	884	439

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0244
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.024
Sampling Box ID: 691

Test Start Time: 14:57
Total Sampling Time: 272 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.005 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 8 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
41	6.569	0.164	1.24	78	2.35	68.5	53	103.9	472	368	185	403	317	873	436
42	6.731	0.162	1.24	78	2.24	68.5	53.2	102.5	469	368	184	405	318	863	434
43	6.893	0.162	1.24	79	2.22	68.4	53.3	103.0	463	367	183	405	319	858	433
44	7.055	0.162	1.24	79	2.26	68.3	53.4	102.5	465	366	183	404	319	852	431
45	7.213	0.158	1.25	79	2.17	68.2	53.5	99.9	459	366	182	405	320	854	431
46	7.374	0.161	1.25	80	2.36	68.1	53.6	102.4	453	365	181	407	321	849	429
47	7.536	0.162	1.25	80	2.30	68.1	53.6	103.1	454	365	181	407	319	842	428
48	7.699	0.163	1.25	80	2.17	68	53.8	102.8	450	364	180	406	320	836	426
49	7.861	0.162	1.24	81	2.31	68	54	101.2	449	363	180	408	319	836	426
50	8.022	0.161	1.25	81	2.32	67.9	53.9	100.7	450	363	179	407	320	839	426
51	8.187	0.165	1.25	82	2.20	67.9	54.1	102.9	449	362	178	407	319	841	426
52	8.348	0.161	1.24	82	2.22	67.8	54.2	100.4	448	360	178	407	320	842	426
53	8.510	0.162	1.24	82	2.28	67.8	54.3	101.7	449	359	178	404	320	841	425
54	8.670	0.160	1.24	82	2.29	67.8	54.4	100.3	449	358	178	406	320	838	425
55	8.832	0.162	1.24	82	2.18	67.8	54.5	101.9	447	357	177	405	320	837	424
56	8.993	0.161	1.25	83	2.36	67.7	54.6	102.5	444	356	177	404	320	835	423
57	9.155	0.162	1.24	83	2.17	67.7	54.7	103.2	442	355	177	404	320	832	422
58	9.316	0.161	1.25	83	2.17	67.7	54.9	101.7	441	354	177	403	321	829	421
59	9.480	0.164	1.25	83	2.25	67.7	54.9	102.7	440	353	177	403	321	828	420
60	9.645	0.165	1.25	84	2.34	67.6	55	102.8	435	353	176	402	322	828	419
61	9.807	0.162	1.25	84	2.16	67.6	55.1	101.4	437	352	177	402	324	828	420
62	9.968	0.161	1.23	84	2.18	67.6	55.2	101.2	434	351	177	402	324	828	419
63	10.129	0.161	1.26	84	2.32	67.5	55.3	100.8	433	350	177	402	327	831	420
64	10.289	0.160	1.24	84	2.33	67.5	55.3	99.4	435	350	177	401	329	834	421
65	10.453	0.164	1.23	84	2.34	67.4	55.4	102.6	436	349	177	401	330	839	422
66	10.614	0.161	1.25	85	2.33	67.4	55.5	101.2	440	348	177	400	333	846	424
67	10.776	0.162	1.24	85	2.30	67.4	55.6	100.7	441	348	178	399	335	853	426
68	10.937	0.161	1.24	86	2.32	67.4	55.6	99.1	443	347	179	399	336	857	427
69	11.102	0.165	1.25	85	2.16	67.3	55.7	102.1	448	346	179	397	339	854	427
70	11.264	0.162	1.25	86	2.15	67.3	55.7	101.3	449	346	179	397	340	850	427
71	11.428	0.164	1.25	86	2.31	67.2	55.8	102.7	449	345	180	396	340	846	426
72	11.590	0.162	1.25	86	2.18	67.2	55.8	101.0	451	344	180	396	343	841	426
73	11.752	0.162	1.25	87	2.27	67.2	55.9	100.5	451	343	181	394	345	835	425
74	11.911	0.159	1.25	87	2.22	67.2	56	98.6	449	342	181	392	346	829	423
75	12.073	0.162	1.26	87	2.17	67.2	56	101.2	444	342	181	392	347	822	421
76	12.236	0.163	1.25	87	2.32	67.2	56	102.1	439	340	181	390	348	816	419
77	12.399	0.163	1.24	87	2.26	67.2	56.1	101.6	437	340	181	390	350	811	418
78	12.561	0.162	1.25	88	2.14	67.2	56.1	100.7	433	339	181	388	350	808	416
79	12.726	0.165	1.25	87	2.30	67.2	56.1	103.1	432	339	181	388	350	806	416
80	12.888	0.162	1.25	87	2.31	67.1	56.1	101.5	425	338	181	387	352	803	414
81	13.049	0.161	1.24	88	2.26	67.1	56.1	100.3	425	337	181	387	352	801	414
82	13.211	0.162	1.25	88	2.35	67.2	56.2	100.7	421	336	181	385	353	803	413
83	13.375	0.164	1.25	88	2.14	67.2	56.3	101.8	421	336	181	385	354	807	414
84	13.535	0.160	1.25	89	2.30	67.2	56.3	98.7	421	335	181	385	353	807	414

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0244
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.024
Sampling Box ID: 691

Test Start Time: 14:57
Total Sampling Time: 272 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.005 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 8 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
85	13.697	0.162	1.24	88	2.18	67.1	56.3	100.0	419	335	181	384	355	807	413
86	13.859	0.162	1.24	89	2.32	67.1	56.4	100.1	419	334	181	383	355	807	413
87	14.021	0.162	1.25	89	2.20	67.2	56.4	99.9	418	333	181	383	355	806	413
88	14.187	0.166	1.25	89	2.22	67.2	56.5	102.1	419	333	181	382	356	807	413
89	14.350	0.163	1.25	89	2.30	67.2	56.5	100.1	416	332	181	383	356	809	413
90	14.514	0.164	1.25	90	2.33	67.1	56.5	100.9	414	332	181	383	356	811	413
91	14.676	0.162	1.24	90	2.28	67.2	56.6	100.0	414	332	181	382	357	814	413
92	14.838	0.162	1.25	89	2.13	67.2	56.6	100.1	410	331	181	383	357	817	413
93	15.000	0.162	1.24	90	2.13	67.2	56.6	100.2	410	331	181	383	359	818	414
94	15.160	0.160	1.27	90	2.35	67.1	56.6	98.8	407	332	181	382	359	819	413
95	15.323	0.163	1.25	90	2.32	67.1	56.6	100.0	403	331	182	383	360	820	413
96	15.486	0.163	1.24	90	2.28	67.1	56.7	100.1	402	331	182	384	360	822	413
97	15.649	0.163	1.24	91	2.29	67.1	56.7	100.3	400	330	183	383	360	825	413
98	15.814	0.165	1.24	91	2.17	67.2	56.8	101.2	398	330	183	384	360	827	414
99	15.976	0.162	1.24	91	2.23	67.2	56.8	99.7	395	330	183	383	359	826	413
100	16.138	0.162	1.26	90	2.13	67.2	56.9	100.1	393	330	183	383	359	826	412
101	16.301	0.163	1.26	91	2.17	67.2	56.8	101.0	389	329	183	382	359	825	411
102	16.464	0.163	1.25	91	2.31	67.2	56.9	101.4	388	330	183	383	359	824	411
103	16.628	0.164	1.25	91	2.29	67.2	56.9	102.5	387	330	183	383	359	821	410
104	16.788	0.160	1.25	91	2.15	67.2	57	100.1	386	330	183	383	358	816	409
105	16.950	0.162	1.25	92	2.24	67.2	57	100.8	382	330	182	381	357	812	407
106	17.112	0.162	1.25	92	2.19	67.2	56.9	100.4	381	330	182	382	357	810	407
107	17.278	0.166	1.25	91	2.26	67.2	57	102.7	380	330	182	382	355	804	406
108	17.440	0.162	1.25	91	2.16	67.2	56.9	100.2	378	331	181	381	355	800	404
109	17.603	0.163	1.25	92	2.26	67.3	57	101.0	377	331	181	381	353	797	403
110	17.767	0.164	1.25	92	2.19	67.2	57	101.6	376	331	181	380	352	794	402
111	17.930	0.163	1.25	92	2.16	67.3	57	100.8	375	332	180	380	350	792	401
112	18.092	0.162	1.25	92	2.12	67.3	57	99.5	374	331	180	378	349	789	400
113	18.252	0.160	1.25	92	2.29	67.3	57	97.3	373	331	180	378	348	789	400
114	18.414	0.162	1.26	92	2.34	67.3	57.1	98.7	372	331	179	377	347	790	400
115	18.577	0.163	1.26	93	2.13	67.3	57	100.2	371	331	179	376	346	790	399
116	18.743	0.166	1.25	93	2.28	67.3	57.1	102.3	369	332	179	375	345	790	398
117	18.907	0.164	1.25	93	2.24	67.3	57.1	100.6	367	331	178	373	343	788	397
118	19.070	0.163	1.25	93	2.17	67.3	57.1	99.5	366	332	178	372	343	786	396
119	19.233	0.163	1.23	93	2.18	67.3	57.2	99.6	365	332	178	372	343	784	395
120	19.395	0.162	1.26	93	2.33	67.3	57.1	99.5	366	332	177	371	342	782	395
121	19.557	0.162	1.25	93	2.22	67.3	57.2	100.0	364	332	176	370	341	780	394
122	19.720	0.163	1.25	93	2.30	67.3	57.2	100.4	364	332	176	368	340	777	393
123	19.882	0.162	1.25	93	2.25	67.3	57.2	99.0	361	332	176	367	339	775	392
124	20.045	0.163	1.24	92	2.26	67.3	57.1	99.5	361	332	176	367	340	773	392
125	20.207	0.162	1.25	93	2.33	67.3	57.1	99.2	359	332	175	366	339	771	390
126	20.373	0.166	1.25	94	2.28	67.3	57	101.5	359	332	175	365	338	767	389
127	20.535	0.162	1.25	94	2.16	67.2	57	98.3	359	331	175	363	338	762	388
128	20.698	0.163	1.26	93	2.12	67.2	56.9	98.9	359	332	174	362	337	760	387

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:57
Total Sampling Time: 272 min
Recording Interval: 1 min

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0244
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.024
Sampling Box ID: 691

Sample Train Leak Checks
Pre-test 0.005 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 8 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
129	20.861	0.163	1.25	93	2.34	67.2	56.9	99.0	359	331	174	362	336	758	387
130	21.024	0.163	1.24	94	2.12	67.2	56.9	98.8	358	331	174	362	337	757	386
131	21.188	0.164	1.25	94	2.33	67.1	56.8	99.8	357	331	173	361	336	751	385
132	21.348	0.160	1.25	93	2.25	67.1	56.8	97.7	359	329	173	361	336	738	383
133	21.510	0.162	1.26	94	2.16	67.2	56.9	98.7	360	330	173	360	335	728	381
134	21.673	0.163	1.24	93	2.31	67.2	56.9	98.8	356	331	172	360	336	721	379
135	21.838	0.165	1.25	94	2.22	67.2	56.8	100.0	355	331	172	359	335	716	378
136	22.001	0.163	1.25	94	2.33	67.2	56.8	99.0	355	331	171	359	334	711	377
137	22.164	0.163	1.26	94	2.14	67.2	56.8	99.1	353	331	171	358	334	708	376
138	22.328	0.164	1.26	94	2.22	67.2	56.8	99.6	350	331	171	358	334	705	375
139	22.492	0.164	1.25	94	2.15	67.2	56.8	99.6	346	331	170	357	335	703	374
140	22.654	0.162	1.24	94	2.32	67.2	56.8	98.7	345	331	170	357	335	701	373
141	22.817	0.163	1.26	94	2.23	67.2	56.8	98.7	342	331	170	356	334	699	372
142	22.976	0.159	1.26	94	2.33	67.1	56.7	95.4	342	331	170	356	334	697	372
143	23.140	0.164	1.24	94	2.32	67.1	56.6	98.6	340	330	170	354	333	695	370
144	23.305	0.165	1.25	94	2.28	67.1	56.6	99.8	340	330	170	355	333	693	370
145	23.469	0.164	1.25	94	2.15	67.1	56.6	99.4	337	329	170	355	333	692	370
146	23.633	0.164	1.25	94	2.20	67	56.6	99.6	335	331	170	355	333	691	369
147	23.796	0.163	1.26	95	2.30	67	56.5	98.6	335	330	170	354	332	690	369
148	23.958	0.162	1.26	94	2.12	66.9	56.4	97.6	333	327	170	354	332	689	368
149	24.121	0.163	1.25	94	2.12	66.9	56.4	98.7	332	329	170	354	331	689	367
150	24.283	0.162	1.25	94	2.23	66.9	56.4	98.4	331	328	171	353	331	688	367
151	24.446	0.163	1.25	95	2.21	66.9	56.4	98.5	331	329	171	354	331	687	367
152	24.608	0.162	1.24	94	2.16	66.8	56.3	97.5	329	327	171	353	331	687	366
153	24.774	0.166	1.26	94	2.27	66.8	56.3	99.9	330	327	171	353	331	686	366
154	24.937	0.163	1.26	94	2.15	66.8	56.2	98.3	327	328	171	353	331	685	366
155	25.100	0.163	1.26	94	2.12	66.8	56.2	98.4	327	328	171	353	331	684	366
156	25.262	0.162	1.24	94	2.26	66.8	56.2	98.0	327	328	171	353	332	683	366
157	25.425	0.163	1.25	94	2.20	66.7	56.1	99.0	325	328	172	352	331	683	365
158	25.588	0.163	1.24	94	2.14	66.6	56.1	99.0	323	329	172	354	329	682	365
159	25.751	0.163	1.26	95	2.20	66.6	56	98.8	323	329	171	354	329	682	365
160	25.915	0.164	1.25	95	2.32	66.6	56.1	98.9	323	330	171	354	330	681	365
161	26.076	0.161	1.26	94	2.20	66.5	56	96.4	321	329	171	355	330	680	364
162	26.239	0.163	1.25	95	2.32	66.4	56	97.5	320	329	172	354	328	680	364
163	26.405	0.166	1.26	94	2.31	66.4	55.9	100.1	318	328	172	355	329	681	364
164	26.568	0.163	1.25	95	2.32	66.4	55.9	98.6	317	328	172	355	329	681	364
165	26.730	0.162	1.24	94	2.27	66.5	56	97.8	315	328	172	355	329	681	363
166	26.894	0.164	1.25	95	2.12	66.4	55.8	99.4	313	328	173	356	328	680	363
167	27.057	0.163	1.25	95	2.32	66.3	55.7	99.1	310	328	173	356	329	678	363
168	27.221	0.164	1.24	94	2.15	66.4	55.7	99.4	310	328	174	355	329	677	362
169	27.385	0.164	1.25	94	2.28	66.3	55.7	99.5	312	328	174	354	330	674	362
170	27.548	0.163	1.25	94	2.18	66.3	55.6	98.9	308	328	174	355	329	672	361
171	27.708	0.160	1.26	94	2.16	66.3	55.6	96.6	308	328	174	356	328	670	361
172	27.874	0.166	1.25	95	2.28	66.3	55.5	99.9	307	328	174	356	329	669	360

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:57
Total Sampling Time: 272 min
Recording Interval: 1 min

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0244
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.024
Sampling Box ID: 691

Sample Train Leak Checks
Pre-test 0.005 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 8 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
173	28.037	0.163	1.25	95	2.33	66.3	55.5	98.4	305	328	174	355	328	667	359
174	28.200	0.163	1.24	95	2.11	66.3	55.5	98.6	305	329	174	356	327	665	359
175	28.364	0.164	1.26	95	2.20	66.2	55.4	98.8	304	329	174	356	328	663	359
176	28.527	0.163	1.25	95	2.14	66.2	55.4	97.7	304	329	174	356	328	661	359
177	28.692	0.165	1.26	95	2.11	66.2	55.4	98.7	301	329	174	357	329	660	358
178	28.855	0.163	1.26	94	2.28	66.3	55.4	98.0	301	329	174	357	327	658	358
179	29.018	0.163	1.25	94	2.11	66.2	55.4	98.7	300	329	174	356	329	658	358
180	29.178	0.160	1.25	94	2.26	66.2	55.3	97.0	298	329	174	358	328	657	357
181	29.344	0.166	1.26	94	2.28	66.2	55.3	100.4	299	329	174	357	329	657	357
182	29.507	0.163	1.26	95	2.19	66.2	55.3	98.3	299	329	174	357	326	656	357
183	29.671	0.164	1.27	95	2.18	66.2	55.3	99.2	298	330	174	357	328	655	357
184	29.834	0.163	1.26	94	2.15	66.2	55.3	98.8	298	328	174	357	326	655	356
185	29.999	0.165	1.25	94	2.19	66.2	55.3	99.9	298	329	174	356	328	654	356
186	30.162	0.163	1.27	95	2.26	66.2	55.3	98.3	298	330	173	358	327	653	356
187	30.325	0.163	1.26	94	2.30	66.1	55.2	97.9	298	331	173	358	325	652	356
188	30.488	0.163	1.26	94	2.27	66.1	55.2	98.0	296	330	173	358	326	651	356
189	30.651	0.163	1.26	95	2.29	66.1	55.2	97.9	295	330	173	358	327	649	355
190	30.814	0.163	1.26	95	2.22	66	55.2	97.6	295	331	173	357	325	648	355
191	30.977	0.163	1.26	94	2.30	66	55.2	97.5	294	331	172	358	327	646	355
192	31.141	0.164	1.26	95	2.14	66	55.1	98.1	294	332	172	356	325	644	354
193	31.305	0.164	1.26	95	2.17	66	55.1	98.5	294	332	172	357	326	643	354
194	31.469	0.164	1.26	94	2.19	65.9	55.1	98.8	291	332	172	356	326	642	353
195	31.632	0.163	1.26	94	2.16	65.9	55.1	98.1	293	331	172	355	324	640	352
196	31.795	0.163	1.25	95	2.12	65.9	55.1	97.6	291	332	171	356	325	638	352
197	31.958	0.163	1.26	94	2.20	65.8	55	97.4	290	332	171	353	325	637	351
198	32.121	0.163	1.26	95	2.26	65.8	55	97.8	290	333	171	355	325	635	352
199	32.284	0.163	1.26	95	2.32	65.7	55	97.9	289	332	171	354	324	634	351
200	32.448	0.164	1.25	94	2.13	65.7	55	98.9	288	333	170	354	325	633	350
201	32.612	0.164	1.26	94	2.27	65.7	55	99.5	287	333	170	353	324	631	350
202	32.776	0.164	1.25	94	2.26	65.6	54.9	99.7	286	333	170	353	324	630	349
203	32.939	0.163	1.27	95	2.28	65.5	54.9	98.6	287	333	170	353	323	629	349
204	33.103	0.164	1.26	94	2.12	65.6	54.9	98.6	286	333	169	353	323	628	349
205	33.265	0.162	1.25	95	2.31	65.5	54.9	97.8	285	333	169	352	322	627	348
206	33.428	0.163	1.25	95	2.12	65.5	54.9	99.0	285	333	169	352	324	626	348
207	33.591	0.163	1.27	95	2.28	65.5	54.9	98.6	285	334	169	351	324	626	348
208	33.755	0.164	1.26	95	2.17	65.4	54.8	98.5	283	333	169	350	322	626	347
209	33.918	0.163	1.25	95	2.32	65.3	54.8	97.4	284	334	168	351	323	625	347
210	34.083	0.165	1.26	94	2.12	65.3	54.8	98.7	283	334	168	350	321	625	347
211	34.246	0.163	1.26	95	2.23	65.3	54.8	98.1	284	335	168	350	321	625	347
212	34.409	0.163	1.26	95	2.27	65.3	54.8	98.0	282	334	167	349	322	624	346
213	34.572	0.163	1.26	94	2.14	65.2	54.7	97.6	283	335	167	349	321	623	346
214	34.735	0.163	1.26	95	2.14	65.2	54.7	97.3	282	334	167	349	321	622	346
215	34.898	0.163	1.26	94	2.13	65.1	54.6	97.0	281	335	167	347	320	622	345
216	35.061	0.163	1.25	94	2.13	65.1	54.5	97.3	280	335	166	347	319	621	345

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:57
Total Sampling Time: 272 min
Recording Interval: 1 min

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0244
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.024
Sampling Box ID: 691

Sample Train Leak Checks
Pre-test 0.005 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 8 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
217	35.225	0.164	1.25	94	2.30	65	54.5	98.5	279	336	166	347	319	621	345
218	35.389	0.164	1.25	95	2.19	65	54.5	98.5	279	334	166	346	320	620	344
219	35.553	0.164	1.25	95	2.24	65	54.6	98.2	278	334	166	346	318	621	344
220	35.716	0.163	1.26	94	2.12	65	54.5	98.0	279	335	165	343	318	621	344
221	35.880	0.164	1.26	94	2.18	65	54.5	98.5	278	333	165	345	318	621	343
222	36.043	0.163	1.26	94	2.14	64.9	54.5	97.5	278	335	165	344	318	621	343
223	36.206	0.163	1.26	94	2.21	64.9	54.5	97.5	278	333	165	344	316	621	343
224	36.369	0.163	1.25	95	2.23	64.9	54.4	97.7	277	334	164	343	317	621	343
225	36.532	0.163	1.26	95	2.17	64.8	54.4	98.0	278	334	164	342	316	622	343
226	36.697	0.165	1.25	94	2.13	64.8	54.4	99.3	277	334	164	342	315	621	342
227	36.861	0.164	1.26	95	2.21	64.8	54.4	98.6	278	334	164	340	315	621	342
228	37.025	0.164	1.26	95	2.23	64.7	54.3	98.3	276	333	164	341	316	621	342
229	37.188	0.163	1.26	95	2.33	64.7	54.4	97.5	277	334	163	340	316	621	342
230	37.351	0.163	1.26	95	2.18	64.7	54.4	97.7	276	333	163	340	315	621	341
231	37.514	0.163	1.26	95	2.31	64.7	54.4	97.9	275	333	163	339	314	620	341
232	37.677	0.163	1.26	95	2.11	64.7	54.4	97.7	275	333	163	337	313	620	340
233	37.841	0.164	1.25	95	2.28	64.6	54.3	98.4	274	333	162	336	314	619	340
234	38.004	0.163	1.26	94	2.17	64.6	54.3	98.2	274	333	162	337	314	618	340
235	38.169	0.165	1.26	94	2.14	64.6	54.3	99.2	274	333	162	337	313	616	339
236	38.333	0.164	1.26	94	2.11	64.6	54.3	98.3	273	333	162	336	311	615	338
237	38.496	0.163	1.26	94	2.17	64.6	54.3	97.5	273	333	162	335	313	614	338
238	38.659	0.163	1.27	95	2.24	64.6	54.3	97.6	272	333	161	335	312	613	338
239	38.822	0.163	1.26	94	2.13	64.6	54.3	98.0	272	332	161	334	311	613	337
240	38.985	0.163	1.26	94	2.27	64.5	54.3	98.3	270	332	161	333	310	612	336
241	39.148	0.163	1.27	94	2.19	64.5	54.2	98.4	270	332	161	332	311	611	336
242	39.312	0.164	1.25	94	2.28	64.5	54.2	99.3	271	332	160	332	311	609	336
243	39.476	0.164	1.26	95	2.13	64.5	54.2	99.1	269	331	160	332	310	608	335
244	39.640	0.164	1.26	94	2.29	64.5	54.2	98.3	269	331	160	331	309	607	335
245	39.804	0.164	1.26	94	2.19	64.5	54.1	97.7	267	331	160	331	309	607	334
246	39.967	0.163	1.26	94	2.30	64.4	54.1	96.7	266	331	159	331	309	607	334
247	40.130	0.163	1.27	94	2.23	64.5	54.1	97.0	266	331	159	330	308	607	334
248	40.293	0.163	1.25	94	2.29	64.4	54.1	97.4	266	331	159	329	309	607	334
249	40.456	0.163	1.26	94	2.22	64.4	54.1	97.4	266	331	159	330	308	607	333
250	40.619	0.163	1.26	95	2.26	64.4	54.1	98.0	265	330	159	328	308	607	333
251	40.783	0.164	1.27	94	2.28	64.4	54.1	98.8	265	331	159	328	307	607	333
252	40.946	0.163	1.26	94	2.30	64.4	54.1	97.6	267	330	159	328	308	607	333
253	41.109	0.163	1.26	94	2.17	64.4	54	97.3	266	330	159	328	307	607	333
254	41.273	0.164	1.25	94	2.24	64.4	54	98.2	265	329	158	327	307	606	332
255	41.436	0.163	1.25	94	2.15	64.4	54	97.8	265	330	159	327	306	606	332
256	41.601	0.165	1.26	94	2.15	64.4	54	99.1	264	330	159	327	306	605	332
257	41.765	0.164	1.26	94	2.27	64.4	54.1	98.8	263	330	159	326	306	605	331
258	41.928	0.163	1.26	94	2.30	64.4	54	98.2	262	329	159	326	305	604	331
259	42.091	0.163	1.26	94	2.18	64.4	54	97.9	263	330	159	326	305	604	331
260	42.254	0.163	1.25	94	2.13	64.4	54	98.2	262	329	159	326	302	604	330

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.0244
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.024
Sampling Box ID: 691

Test Start Time: 14:57
Total Sampling Time: 272 min
Recording Interval: 1 min

Sample Train Leak Checks

Pre-test 0.005 cfm @ 24 in. Hg
Post-Test 0.002 cfm @ 8 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
261	42.417	0.163	1.26	94	2.30	64.4	54	98.5	262	328	159	324	303	604	330
262	42.580	0.163	1.24	94	2.22	64.4	54	98.1	263	328	159	324	302	604	330
263	42.744	0.164	1.27	94	2.14	64.4	54	98.2	262	329	159	324	302	604	330
264	42.908	0.164	1.26	93	2.30	64.4	54	97.9	262	327	159	321	303	603	329
265	43.072	0.164	1.26	94	2.27	64.5	54.1	97.6	262	328	159	322	301	603	329
266	43.236	0.164	1.26	94	2.28	64.5	54.1	98.1	263	327	159	322	301	602	329
267	43.399	0.163	1.25	94	2.19	64.4	54	98.2	261	328	159	322	299	602	328
268	43.562	0.163	1.26	94	2.16	64.4	54	98.0	262	327	159	321	300	601	328
269	43.725	0.163	1.26	94	2.21	64.4	54	97.4	262	327	159	320	300	600	328
270	43.888	0.163	1.26	94	2.28	64.4	54	97.7	262	327	160	320	299	600	328
271	44.051	0.163	1.27	94	2.13	64.4	54.1	98.4	263	328	159	320	298	600	328
272	44.215	0.164	1.26	94	2.29	64.4	54.1	98.9	261	327	160	320	298	599	327

Train C - First Hour Particulate Sampling

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Start Time: 14:57
Total Sampling Time: 60 min
Recording Interval: 1 min

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.00742
Meter Box Y Regression Factor: 0
Meter Box Dynamic Y: 1.007
Sample Box ID: 335

Sample Train Leak Checks
Pre-test 0.006 cfm @ 18.5 in. Hg
Post-Test 0.001 cfm @ 10.5 in. Hg

Elapsed Time (min)	**Train C Sampling System**							
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*
Tot / Avg	**9.571**	**0.160**	**1.02**	**73.4**	**2.39**	**70.6**	**61.0**	**100.8**
Minimum	0.000	0.149	0.05	69	0.61	66	58	95.7
Max	9.571	0.163	1.07	77	2.48	72	64	106.4
0	0.000		0.05	69	0.61	65.7	60.3	
1	0.149	0.149	1.07	69	2.44	67.3	59.7	95.7
2	0.310	0.161	1.06	70	2.46	68.3	59.5	106.4
3	0.470	0.160	1.06	70	2.46	69	59.5	105.2
4	0.631	0.161	1.06	70	2.43	69.3	59.5	104.7
5	0.790	0.159	1.05	70	2.48	69.3	59.6	101.4
6	0.950	0.160	1.05	70	2.41	69.3	59.7	101.4
7	1.110	0.160	1.05	70	2.46	69.4	59.8	101.2
8	1.269	0.159	1.05	70	2.37	69.5	59.9	100.7
9	1.431	0.162	1.04	70	2.46	69.7	60	103.0
10	1.588	0.157	1.04	71	2.47	69.8	60.1	99.5
11	1.747	0.159	1.04	71	2.47	70	60.2	100.2
12	1.906	0.159	1.04	71	2.38	70.2	60.4	99.5
13	2.065	0.159	1.04	71	2.42	70.3	60.6	99.0
14	2.225	0.160	1.04	71	2.47	70.4	60.8	100.6
15	2.383	0.158	1.03	71	2.47	70.6	61	100.0
16	2.542	0.159	1.04	71	2.36	70.6	61.1	100.4
17	2.702	0.160	1.04	72	2.44	70.7	61.3	100.8
18	2.863	0.161	1.04	72	2.45	70.8	61.4	101.4
19	3.021	0.158	1.04	72	2.43	70.9	61.6	100.0
20	3.179	0.158	1.04	72	2.39	70.9	61.8	100.1
21	3.338	0.159	1.03	72	2.36	71	62	100.2
22	3.498	0.160	1.03	72	2.39	71.1	62.3	100.6
23	3.656	0.158	1.03	73	2.47	71.2	62.4	99.3
24	3.816	0.160	1.03	73	2.42	71.2	62.6	100.9
25	3.974	0.158	1.03	73	2.38	71.2	62.8	100.2
26	4.134	0.160	1.03	73	2.46	71.3	63	101.3
27	4.296	0.162	1.03	73	2.39	71.4	63.3	102.1
28	4.454	0.158	1.03	73	2.47	71.5	63.4	100.5
29	4.612	0.158	1.03	74	2.46	71.6	63.6	101.9
30	4.770	0.158	1.03	74	2.44	71.6	63.7	101.4
31	4.931	0.161	1.03	74	2.39	71.7	63.8	102.1
32	5.089	0.158	1.03	74	2.45	71.9	64	100.3

Train C - First Hour Particulate Sampling

Run: 1
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Start Time: 14:57
Total Sampling Time: 60 min
Recording Interval: 1 min

Test Date: 3/10/25

Meter Box Y Regression Offset: 1.00742
Meter Box Y Regression Factor: 0
Meter Box Dynamic Y: 1.007
Sample Box ID: 335

Sample Train Leak Checks
Pre-test 0.006 cfm @ 18.5 in. Hg
Post-Test 0.001 cfm @ 10.5 in. Hg

Elapsed Time (min)	**Train C Sampling System**							
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*
33	5.249	0.160	1.03	74	2.41	71.9	64.1	102.7
34	5.409	0.160	1.03	75	2.37	72	64.3	103.3
35	5.568	0.159	1.03	75	2.47	72.1	64.4	102.2
36	5.730	0.162	1.03	75	2.44	72.1	64.2	103.9
37	5.890	0.160	1.04	75	2.44	72	61.5	102.5
38	6.047	0.157	1.03	75	2.44	71.8	61	99.1
39	6.207	0.160	1.04	75	2.46	71.6	60.9	100.0
40	6.367	0.160	1.03	75	2.38	71.5	61	100.5
41	6.527	0.160	1.04	75	2.40	71.3	60.9	100.2
42	6.687	0.160	1.04	75	2.35	71.3	60.9	100.2
43	6.846	0.159	1.04	75	2.38	71.1	60.8	100.1
44	7.007	0.161	1.04	75	2.45	71	60.7	100.8
45	7.170	0.163	1.04	75	2.37	71	60.6	102.0
46	7.329	0.159	1.04	75	2.39	71	60.6	100.1
47	7.490	0.161	1.03	76	2.45	70.8	60.4	101.6
48	7.647	0.157	1.03	76	2.46	70.7	60.2	98.2
49	7.807	0.160	1.04	76	2.36	70.7	60.1	99.1
50	7.968	0.161	1.04	76	2.38	70.6	60.1	99.8
51	8.127	0.159	1.04	76	2.46	70.5	59.8	98.5
52	8.288	0.161	1.04	76	2.39	70.4	59.6	99.6
53	8.448	0.160	1.04	76	2.42	70.3	59.4	99.7
54	8.611	0.163	1.04	76	2.42	70.3	59.2	101.5
55	8.771	0.160	1.04	76	2.45	70.3	59	99.9
56	8.932	0.161	1.04	77	2.46	70.2	58.9	101.8
57	9.089	0.157	1.04	77	2.42	70.2	58.7	99.3
58	9.251	0.162	1.04	77	2.46	70.2	58.6	101.8
59	9.410	0.159	1.03	77	2.38	70.2	58.4	99.1
60	9.571	0.161	1.04	77	2.39	70.1	58.3	99.9

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 272 min

Recording Interval 1 min

Sample Train Leak Checks

Pre-test cfm @ in. Hg

Post-Test cfm @ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
Tot / Avg	**41.201**	**0.151**	**1.03**	**79.8**	**1.89**	**281.06**	**-0.182**	**546.2**	**0.11**	**11.78**
Minimum	0.000	0.122	0.73	71	1.54	215.20	-1.944	437.0	0.03	0.86
Max	41.201	0.155	1.07	82	2.01	456.70	-0.058	547.0	1.37	16.20
0	0.000		0.02	71	0.50	375.7	-0.168	437.0	0.04	5.61
1	0.122	0.122	0.73	71	1.54	360.5	-0.508	547.0	0.16	0.86
2	0.259	0.137	1.07	71	1.99	404.2	-0.513	547.0	0.05	2.54
3	0.412	0.153	1.06	71	2.01	409.2	-0.520	547.0	0.07	3.35
4	0.564	0.152	1.06	71	1.91	392.6	-0.508	547.0	0.10	7.64
5	0.716	0.152	1.06	71	1.91	376.1	-0.514	547.0	0.05	6.07
6	0.866	0.150	1.05	72	1.88	372.6	-0.507	547.0	0.08	4.41
7	1.017	0.151	1.05	72	1.96	370.6	-0.506	547.0	0.09	3.92
8	1.168	0.151	1.05	72	1.92	367.5	-0.488	547.0	0.08	4.32
9	1.322	0.154	1.05	72	1.90	368.2	-0.511	547.0	0.07	6.44
10	1.470	0.148	1.05	72	1.92	376.2	-0.516	547.0	0.07	9.30
11	1.621	0.151	1.05	72	1.91	390.1	-0.519	547.0	0.10	10.88
12	1.772	0.151	1.05	72	1.91	401	-0.502	547.0	0.08	11.45
13	1.921	0.149	1.04	73	1.91	405.5	-0.512	547.0	0.08	9.27
14	2.072	0.151	1.04	73	1.90	405.3	-0.519	547.0	0.05	8.35
15	2.223	0.151	1.04	73	1.89	402.5	-0.514	547.0	0.05	8.40
16	2.373	0.150	1.04	73	1.89	402.2	-0.499	547.0	0.06	9.39
17	2.524	0.151	1.04	73	1.89	403.7	-0.509	547.0	0.06	8.46
18	2.678	0.154	1.05	73	1.90	404.6	-0.512	547.0	0.07	8.19
19	2.826	0.148	1.04	74	1.89	405	-0.502	547.0	0.07	8.12
20	2.975	0.149	1.04	74	1.90	404.9	-0.502	547.0	0.06	8.05
21	3.125	0.150	1.04	74	1.90	404	-0.496	547.0	0.07	7.82
22	3.276	0.151	1.03	74	1.92	403.1	-0.529	547.0	0.05	8.96
23	3.427	0.151	1.04	74	1.91	408.9	-0.535	547.0	0.05	10.76
24	3.577	0.150	1.03	74	1.90	417.2	-0.523	539.0	0.04	11.77
25	3.728	0.151	1.04	75	1.89	421.8	-0.520	513.0	0.05	10.93
26	3.879	0.151	1.04	75	1.89	423.1	-0.537	527.0	0.04	10.86
27	4.031	0.152	1.04	75	1.90	427.9	-0.522	547.0	0.06	11.69
28	4.182	0.151	1.03	75	1.91	430.4	-0.539	500.0	0.04	11.13
29	4.330	0.148	1.03	75	1.88	432.3	-0.531	547.0	0.03	10.92
30	4.481	0.151	1.04	75	1.88	436.9	-0.533	547.0	0.06	12.14
31	4.632	0.151	1.03	76	1.89	441.7	-0.527	547.0	0.07	13.22
32	4.783	0.151	1.04	76	1.88	445.2	-0.533	547.0	0.05	13.15

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 272 min

Recording Interval 1 min

Sample Train Leak Checks

Pre-test cfm @ in. Hg

Post-Test cfm @ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
33	4.934	0.151	1.04	76	1.90	450.3	-0.527	547.0	0.07	13.28
34	5.084	0.150	1.04	76	1.91	452.8	-0.525	547.0	0.07	13.78
35	5.234	0.150	1.04	76	1.89	455.2	-0.541	547.0	0.05	13.41
36	5.388	0.154	1.03	76	1.91	456.7	-0.533	547.0	0.06	13.20
37	5.538	0.150	1.03	76	1.89	410.8	-0.527	547.0	1.37	16.20
38	5.687	0.149	1.03	76	1.91	387.9	-0.525	547.0	0.35	14.63
39	5.838	0.151	1.03	77	1.89	374.8	-0.527	547.0	0.15	13.33
40	5.989	0.151	1.04	77	1.91	364.4	-0.509	547.0	0.08	12.78
41	6.139	0.150	1.03	77	1.90	355.7	-0.513	547.0	0.07	12.42
42	6.290	0.151	1.03	77	1.91	348.4	-0.503	547.0	0.07	12.28
43	6.441	0.151	1.03	77	1.91	343.8	-0.505	547.0	0.09	12.65
44	6.592	0.151	1.03	77	1.89	339.1	-0.518	547.0	0.07	12.46
45	6.746	0.154	1.03	77	1.91	336.6	-0.505	547.0	0.07	12.78
46	6.897	0.151	1.04	78	1.91	333.3	-0.510	547.0	0.05	13.41
47	7.047	0.150	1.03	78	1.89	329.7	-0.517	547.0	0.05	13.18
48	7.195	0.148	1.03	78	1.89	326.1	-0.518	547.0	0.05	12.89
49	7.346	0.151	1.04	78	1.90	323.5	-0.501	547.0	0.10	13.16
50	7.497	0.151	1.03	78	1.89	321.5	-0.502	547.0	0.11	13.16
51	7.648	0.151	1.03	78	1.91	320.2	-0.519	547.0	0.11	13.05
52	7.800	0.152	1.03	78	1.89	318.8	-0.505	547.0	0.14	13.03
53	7.951	0.151	1.03	78	1.92	317.5	-0.509	547.0	0.15	13.05
54	8.103	0.152	1.04	78	1.89	316.6	-0.512	547.0	0.18	13.32
55	8.255	0.152	1.03	79	1.89	316	-0.509	547.0	0.18	13.64
56	8.406	0.151	1.03	79	1.90	315.8	-0.518	547.0	0.11	13.62
57	8.555	0.149	1.03	79	1.91	315.4	-0.508	547.0	0.11	14.09
58	8.707	0.152	1.04	79	1.92	315.3	-0.511	547.0	0.10	14.48
59	8.858	0.151	1.04	79	1.92	314.8	-0.494	547.0	0.11	14.63
60	9.009	0.151	1.03	79	1.88	314.5	-0.507	547.0	0.09	14.68
61	9.159	0.150	1.03	79	1.92	314.7	-1.939	547.0	0.10	14.73
62	9.314	0.155	1.03	79	1.89	314.3	-1.944	547.0	0.10	14.96
63	9.465	0.151	1.03	79	1.91	314.8	-0.089	547.0	0.09	15.04
64	9.617	0.152	1.03	79	1.90	315.3	-0.089	547.0	0.16	15.43
65	9.768	0.151	1.04	79	1.89	315.9	-0.086	547.0	0.21	15.44
66	9.916	0.148	1.04	80	1.88	317.4	-0.088	547.0	0.34	15.72
67	10.067	0.151	1.03	80	1.91	318.7	-0.089	547.0	0.37	15.81
68	10.218	0.151	1.03	80	1.90	318.5	-0.091	547.0	0.25	15.43

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 272 min

Recording Interval 1 min

Sample Train Leak Checks

Pre-test cfm @ in. Hg

Post-Test cfm @ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
69	10.370	0.152	1.03	80	1.90	316.9	-0.081	547.0	0.11	14.61
70	10.522	0.152	1.03	80	1.88	316.1	-0.080	547.0	0.13	14.47
71	10.673	0.151	1.03	80	1.92	314.3	-0.087	547.0	0.11	14.13
72	10.826	0.153	1.03	80	1.90	312.6	-0.087	547.0	0.11	13.69
73	10.977	0.151	1.03	80	1.91	310.8	-0.083	547.0	0.07	13.60
74	11.129	0.152	1.03	80	1.92	307.8	-0.086	547.0	0.08	13.39
75	11.278	0.149	1.03	80	1.89	305.9	-0.083	547.0	0.07	13.23
76	11.429	0.151	1.03	80	1.87	303.5	-0.087	547.0	0.08	13.26
77	11.581	0.152	1.03	80	1.89	301.9	-0.086	547.0	0.07	13.34
78	11.732	0.151	1.03	80	1.87	301	-0.082	547.0	0.07	13.59
79	11.883	0.151	1.03	80	1.89	299.9	-0.086	547.0	0.08	13.74
80	12.034	0.151	1.03	80	1.89	299.1	-0.081	547.0	0.08	13.87
81	12.188	0.154	1.03	80	1.86	297.8	-0.081	547.0	0.08	13.98
82	12.340	0.152	1.03	81	1.88	298.9	-0.082	547.0	0.11	14.34
83	12.492	0.152	1.03	81	1.92	299.1	-0.083	547.0	0.12	14.42
84	12.642	0.150	1.04	81	1.92	299.3	-0.083	547.0	0.14	14.48
85	12.791	0.149	1.04	81	1.90	299.1	-0.079	547.0	0.13	14.52
86	12.943	0.152	1.03	81	1.88	298.9	-0.084	547.0	0.12	14.41
87	13.094	0.151	1.03	81	1.87	298.5	-0.079	547.0	0.16	14.38
88	13.246	0.152	1.03	81	1.88	298	-0.078	547.0	0.15	14.15
89	13.398	0.152	1.04	81	1.88	298.8	-0.074	547.0	0.14	14.18
90	13.551	0.153	1.03	81	1.93	298.4	-0.085	547.0	0.14	14.23
91	13.702	0.151	1.03	81	1.89	298.7	-0.078	547.0	0.10	14.03
92	13.854	0.152	1.03	81	1.88	299.1	-0.079	547.0	0.10	14.07
93	14.006	0.152	1.03	81	1.91	299.6	-0.073	547.0	0.11	14.02
94	14.158	0.152	1.04	81	1.91	299.9	-0.079	547.0	0.11	13.91
95	14.307	0.149	1.04	81	1.92	299.9	-0.082	547.0	0.11	13.46
96	14.457	0.150	1.03	81	1.91	299.6	-0.080	547.0	0.12	13.40
97	14.609	0.152	1.03	81	1.91	300.1	-0.082	547.0	0.14	13.62
98	14.761	0.152	1.03	81	1.91	299.9	-0.079	547.0	0.11	13.46
99	14.913	0.152	1.03	81	1.93	300.4	-0.082	547.0	0.12	13.48
100	15.067	0.154	1.03	81	1.89	300.2	-0.075	547.0	0.12	13.29
101	15.217	0.150	1.03	82	1.92	300.1	-0.076	547.0	0.11	13.32
102	15.369	0.152	1.03	82	1.91	299.4	-0.081	547.0	0.12	13.38
103	15.521	0.152	1.03	82	1.89	299.4	-0.075	547.0	0.13	13.37
104	15.673	0.152	1.03	82	1.90	298.2	-0.072	547.0	0.12	13.28

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 272 min

Recording Interval 1 min

Sample Train Leak Checks

Pre-test cfm @ in. Hg

Post-Test cfm @ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
105	15.822	0.149	1.03	82	1.93	297.4	-0.083	547.0	0.11	13.11
106	15.974	0.152	1.04	82	1.88	296.4	-0.081	547.0	0.12	13.24
107	16.125	0.151	1.04	82	1.92	295.4	-0.078	547.0	0.11	13.17
108	16.276	0.151	1.03	82	1.89	294.2	-0.082	547.0	0.12	13.26
109	16.431	0.155	1.03	82	1.90	293.3	-0.074	547.0	0.13	13.26
110	16.583	0.152	1.03	82	1.88	291.7	-0.074	547.0	0.12	13.22
111	16.735	0.152	1.04	82	1.93	290.2	-0.079	547.0	0.12	13.09
112	16.885	0.150	1.04	82	1.89	289.8	-0.078	547.0	0.12	13.03
113	17.037	0.152	1.03	82	1.92	289.4	-0.076	547.0	0.14	13.01
114	17.189	0.152	1.03	82	1.93	289.8	-0.081	547.0	0.14	13.00
115	17.338	0.149	1.03	82	1.89	288.8	-0.073	547.0	0.14	12.93
116	17.490	0.152	1.03	82	1.93	288.4	-0.081	547.0	0.14	12.95
117	17.642	0.152	1.04	82	1.89	287.4	-0.077	547.0	0.13	12.96
118	17.793	0.151	1.04	82	1.92	287	-0.071	547.0	0.13	12.98
119	17.947	0.154	1.03	82	1.90	286.2	-0.071	547.0	0.14	12.89
120	18.099	0.152	1.03	82	1.88	285.4	-0.079	547.0	0.13	12.82
121	18.252	0.153	1.03	82	1.91	284.5	-0.069	547.0	0.13	12.81
122	18.403	0.151	1.04	82	1.91	283.8	-0.078	547.0	0.13	12.78
123	18.554	0.151	1.04	82	1.88	283.2	-0.081	547.0	0.13	12.86
124	18.706	0.152	1.03	82	1.89	282.6	-0.074	547.0	0.13	12.79
125	18.855	0.149	1.03	82	1.87	282	-0.080	547.0	0.13	12.80
126	19.007	0.152	1.03	82	1.93	281.3	-0.077	547.0	0.12	12.96
127	19.159	0.152	1.03	82	1.91	280.1	-0.075	547.0	0.11	13.00
128	19.313	0.154	1.03	82	1.91	279.6	-0.076	547.0	0.11	13.06
129	19.465	0.152	1.03	82	1.91	278.2	-0.068	547.0	0.12	13.08
130	19.617	0.152	1.03	82	1.91	277.2	-0.076	547.0	0.11	13.03
131	19.769	0.152	1.03	82	1.88	276.5	-0.073	547.0	0.10	13.14
132	19.921	0.152	1.03	82	1.89	274.1	-0.071	547.0	0.07	13.09
133	20.073	0.152	1.04	82	1.92	271	-0.076	547.0	0.08	13.04
134	20.222	0.149	1.04	82	1.90	268.4	-0.073	547.0	0.08	12.93
135	20.373	0.151	1.03	82	1.87	265.9	-0.074	547.0	0.08	12.82
136	20.526	0.153	1.03	82	1.93	263.6	-0.069	547.0	0.08	12.79
137	20.680	0.154	1.03	82	1.89	261.4	-0.065	547.0	0.09	12.72
138	20.832	0.152	1.04	82	1.92	259.9	-0.071	547.0	0.09	12.47
139	20.983	0.151	1.04	82	1.88	258.5	-0.070	547.0	0.09	12.55
140	21.136	0.153	1.03	82	1.92	257.2	-0.071	547.0	0.08	12.66

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 272 min

Recording Interval 1 min

Sample Train Leak Checks

Pre-test cfm @ in. Hg

Post-Test cfm @ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
141	21.288	0.152	1.03	82	1.92	255.9	-0.073	547.0	0.09	12.72
142	21.440	0.152	1.03	82	1.87	255.3	-0.072	547.0	0.09	12.72
143	21.592	0.152	1.04	82	1.87	253.8	-0.069	547.0	0.10	12.74
144	21.741	0.149	1.04	82	1.90	253	-0.069	547.0	0.09	12.81
145	21.893	0.152	1.04	82	1.93	252.3	-0.068	547.0	0.08	12.77
146	22.045	0.152	1.04	82	1.91	251.6	-0.070	547.0	0.09	12.79
147	22.200	0.155	1.04	82	1.86	250.9	-0.072	547.0	0.09	12.72
148	22.352	0.152	1.04	82	1.92	250.2	-0.066	547.0	0.08	12.75
149	22.503	0.151	1.04	82	1.87	249.5	-0.063	547.0	0.09	12.75
150	22.655	0.152	1.03	82	1.88	248.6	-0.071	547.0	0.09	12.73
151	22.807	0.152	1.03	82	1.88	247.8	-0.069	547.0	0.08	12.79
152	22.960	0.153	1.04	82	1.92	247.5	-0.068	547.0	0.09	12.77
153	23.109	0.149	1.03	82	1.87	246.8	-0.070	547.0	0.08	12.74
154	23.261	0.152	1.04	82	1.91	246.9	-0.067	547.0	0.08	12.70
155	23.412	0.151	1.03	82	1.86	246.9	-0.065	547.0	0.08	12.67
156	23.567	0.155	1.03	82	1.94	246.7	-0.074	547.0	0.08	12.76
157	23.719	0.152	1.04	82	1.91	246.3	-0.068	547.0	0.09	12.73
158	23.871	0.152	1.04	82	1.90	245.7	-0.068	547.0	0.09	12.75
159	24.023	0.152	1.04	82	1.86	245.5	-0.067	547.0	0.08	12.82
160	24.174	0.151	1.04	82	1.86	244.8	-0.068	547.0	0.08	12.79
161	24.326	0.152	1.04	82	1.93	243.9	-0.064	547.0	0.09	12.79
162	24.479	0.153	1.03	82	1.86	242.8	-0.068	547.0	0.09	12.47
163	24.628	0.149	1.04	82	1.89	243.5	-0.069	547.0	0.09	12.33
164	24.780	0.152	1.04	82	1.89	243.4	-0.070	547.0	0.10	12.26
165	24.934	0.154	1.04	82	1.92	243.2	-0.066	547.0	0.09	12.19
166	25.086	0.152	1.03	82	1.89	242.6	-0.073	547.0	0.09	12.21
167	25.238	0.152	1.03	82	1.92	242.2	-0.068	547.0	0.09	12.25
168	25.390	0.152	1.03	82	1.89	241.8	-0.070	547.0	0.08	12.21
169	25.543	0.153	1.04	82	1.92	241.8	-0.065	547.0	0.08	12.31
170	25.694	0.151	1.04	82	1.89	241	-0.067	547.0	0.09	12.22
171	25.845	0.151	1.03	82	1.93	240.2	-0.072	547.0	0.09	12.21
172	25.998	0.153	1.03	82	1.86	239.9	-0.069	547.0	0.08	12.27
173	26.147	0.149	1.03	82	1.92	239.4	-0.070	547.0	0.08	12.29
174	26.302	0.155	1.04	82	1.93	238.1	-0.063	547.0	0.08	12.31
175	26.453	0.151	1.04	82	1.90	237.6	-0.068	547.0	0.08	12.29
176	26.605	0.152	1.04	82	1.91	236.8	-0.063	547.0	0.08	12.23

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 272 min

Recording Interval 1 min

Sample Train Leak Checks

Pre-test cfm @ in. Hg

Post-Test cfm @ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
177	26.757	0.152	1.03	81	1.86	236	-0.065	547.0	0.08	12.23
178	26.910	0.153	1.04	82	1.91	235.9	-0.065	547.0	0.08	12.21
179	27.062	0.152	1.04	82	1.93	235.6	-0.065	547.0	0.08	12.24
180	27.213	0.151	1.04	81	1.87	234.9	-0.065	547.0	0.08	12.01
181	27.365	0.152	1.04	82	1.91	234.7	-0.072	547.0	0.08	11.96
182	27.514	0.149	1.04	81	1.86	234	-0.064	547.0	0.08	11.98
183	27.666	0.152	1.03	81	1.87	233.4	-0.065	547.0	0.08	11.99
184	27.821	0.155	1.04	81	1.90	232.5	-0.069	547.0	0.08	11.97
185	27.973	0.152	1.04	82	1.91	231.8	-0.062	547.0	0.08	11.91
186	28.125	0.152	1.03	81	1.91	231.8	-0.075	547.0	0.08	11.85
187	28.277	0.152	1.03	81	1.92	231	-0.066	547.0	0.09	11.65
188	28.429	0.152	1.04	81	1.92	230.6	-0.068	547.0	0.09	11.60
189	28.582	0.153	1.04	81	1.88	230.1	-0.066	547.0	0.09	11.53
190	28.733	0.151	1.04	81	1.90	228.9	-0.066	547.0	0.09	11.45
191	28.885	0.152	1.03	81	1.91	228.2	-0.066	547.0	0.10	11.42
192	29.034	0.149	1.03	81	1.87	227.7	-0.063	547.0	0.10	11.40
193	29.189	0.155	1.04	81	1.91	227.1	-0.066	547.0	0.10	11.44
194	29.341	0.152	1.04	81	1.87	226.4	-0.065	547.0	0.10	11.40
195	29.493	0.152	1.04	81	1.91	226.2	-0.061	547.0	0.10	11.45
196	29.645	0.152	1.04	81	1.87	225.6	-0.071	547.0	0.10	11.39
197	29.797	0.152	1.04	81	1.91	225.1	-0.065	547.0	0.10	11.36
198	29.949	0.152	1.04	81	1.87	224.9	-0.059	547.0	0.10	11.37
199	30.101	0.152	1.04	81	1.90	224.4	-0.067	547.0	0.10	11.33
200	30.253	0.152	1.04	81	1.90	223.7	-0.061	547.0	0.10	11.35
201	30.402	0.149	1.04	81	1.87	223.1	-0.067	547.0	0.10	11.33
202	30.557	0.155	1.04	81	1.90	222.8	-0.067	547.0	0.10	11.26
203	30.709	0.152	1.03	81	1.91	222.1	-0.065	547.0	0.10	11.25
204	30.861	0.152	1.04	81	1.88	221.2	-0.059	547.0	0.10	11.28
205	31.013	0.152	1.04	81	1.91	221.3	-0.068	547.0	0.10	11.25
206	31.165	0.152	1.04	81	1.90	221.4	-0.061	547.0	0.11	11.25
207	31.317	0.152	1.04	81	1.92	221.3	-0.061	547.0	0.11	11.27
208	31.469	0.152	1.04	81	1.91	221.1	-0.062	547.0	0.11	11.10
209	31.621	0.152	1.03	81	1.90	221	-0.068	547.0	0.11	11.10
210	31.773	0.152	1.04	81	1.87	220.4	-0.061	547.0	0.11	10.95
211	31.925	0.152	1.04	81	1.91	219.7	-0.064	547.0	0.11	10.81
212	32.077	0.152	1.04	81	1.91	220.2	-0.066	547.0	0.11	10.64

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 272 min

Recording Interval 1 min

Sample Train Leak Checks

Pre-test cfm @ in. Hg

Post-Test cfm @ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
213	32.229	0.152	1.03	81	1.92	219.8	-0.061	547.0	0.11	10.65
214	32.382	0.153	1.03	81	1.90	219.3	-0.063	547.0	0.11	10.57
215	32.534	0.152	1.04	81	1.89	219	-0.063	547.0	0.11	10.55
216	32.685	0.151	1.04	81	1.90	218.4	-0.068	547.0	0.11	10.59
217	32.837	0.152	1.04	81	1.88	218.4	-0.064	547.0	0.11	10.53
218	32.989	0.152	1.03	81	1.89	217.8	-0.060	547.0	0.12	10.58
219	33.142	0.153	1.04	81	1.91	217.9	-0.067	547.0	0.12	10.61
220	33.294	0.152	1.04	81	1.89	218	-0.065	547.0	0.12	10.56
221	33.445	0.151	1.04	81	1.91	217.6	-0.061	547.0	0.12	10.55
222	33.597	0.152	1.04	81	1.91	218.1	-0.061	547.0	0.12	10.52
223	33.750	0.153	1.03	81	1.88	218	-0.064	547.0	0.12	10.47
224	33.902	0.152	1.04	81	1.89	217.7	-0.067	547.0	0.12	10.47
225	34.054	0.152	1.04	81	1.88	217.7	-0.063	547.0	0.13	10.43
226	34.205	0.151	1.04	81	1.89	218.2	-0.058	547.0	0.12	10.48
227	34.357	0.152	1.04	81	1.89	218.1	-0.065	547.0	0.13	10.41
228	34.510	0.153	1.03	81	1.91	218.2	-0.069	547.0	0.13	10.38
229	34.662	0.152	1.04	81	1.87	218.8	-0.064	547.0	0.13	10.39
230	34.815	0.153	1.04	81	1.92	218.5	-0.060	547.0	0.13	10.33
231	34.966	0.151	1.04	81	1.90	218.8	-0.065	547.0	0.13	10.33
232	35.118	0.152	1.04	81	1.91	219.2	-0.065	547.0	0.12	10.32
233	35.270	0.152	1.03	81	1.86	219.1	-0.066	547.0	0.12	10.27
234	35.423	0.153	1.04	81	1.92	218.6	-0.060	547.0	0.12	10.19
235	35.575	0.152	1.05	81	1.90	218.2	-0.062	547.0	0.11	10.15
236	35.726	0.151	1.04	81	1.89	217.7	-0.064	547.0	0.12	10.08
237	35.878	0.152	1.04	81	1.88	217.6	-0.062	547.0	0.12	10.09
238	36.031	0.153	1.03	81	1.89	217.8	-0.064	547.0	0.12	10.06
239	36.183	0.152	1.04	81	1.90	218	-0.060	547.0	0.12	10.13
240	36.336	0.153	1.04	81	1.88	217.6	-0.064	547.0	0.12	10.07
241	36.487	0.151	1.04	81	1.91	217	-0.067	547.0	0.11	10.02
242	36.639	0.152	1.04	81	1.90	217	-0.066	547.0	0.11	10.18
243	36.791	0.152	1.04	81	1.90	216.5	-0.063	547.0	0.11	10.12
244	36.944	0.153	1.04	81	1.91	216.3	-0.061	547.0	0.12	10.10
245	37.096	0.152	1.05	81	1.91	216.3	-0.068	547.0	0.12	10.09
246	37.247	0.151	1.04	81	1.87	215.8	-0.063	547.0	0.12	10.21
247	37.399	0.152	1.04	81	1.90	216	-0.066	547.0	0.12	10.21
248	37.552	0.153	1.03	81	1.88	215.7	-0.063	547.0	0.13	10.21

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 272 min

Recording Interval 1 min

Sample Train Leak Checks

Pre-test ____ cfm @ ____ in. Hg

Post-Test ____ cfm @ ____ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
249	37.705	0.153	1.04	81	1.89	215.7	-0.059	547.0	0.13	10.22
250	37.857	0.152	1.04	81	1.92	215.6	-0.065	547.0	0.13	10.20
251	38.008	0.151	1.04	80	1.90	215.5	-0.073	547.0	0.14	9.83
252	38.160	0.152	1.04	81	1.88	216	-0.067	547.0	0.14	9.78
253	38.313	0.153	1.04	81	1.88	216.1	-0.065	547.0	0.14	9.75
254	38.465	0.152	1.04	80	1.89	215.2	-0.061	547.0	0.14	9.78
255	38.617	0.152	1.04	80	1.91	215.6	-0.068	547.0	0.14	9.73
256	38.768	0.151	1.04	80	1.89	215.6	-0.067	547.0	0.14	9.76
257	38.921	0.153	1.04	80	1.90	215.8	-0.066	547.0	0.14	9.75
258	39.073	0.152	1.04	80	1.89	215.8	-0.065	547.0	0.14	9.72
259	39.226	0.153	1.04	80	1.89	215.8	-0.063	547.0	0.15	9.77
260	39.378	0.152	1.04	80	1.91	215.7	-0.064	547.0	0.15	9.72
261	39.529	0.151	1.04	80	1.89	215.4	-0.069	547.0	0.15	9.73
262	39.681	0.152	1.04	80	1.92	215.7	-0.065	547.0	0.15	9.78
263	39.834	0.153	1.04	80	1.90	215.7	-0.061	547.0	0.15	9.80
264	39.986	0.152	1.04	80	1.90	216.2	-0.065	547.0	0.15	9.78
265	40.138	0.152	1.04	80	1.88	216.3	-0.069	547.0	0.15	9.82
266	40.289	0.151	1.04	80	1.90	216.3	-0.071	547.0	0.15	9.82
267	40.441	0.152	1.04	80	1.89	216.4	-0.062	547.0	0.15	9.80
268	40.594	0.153	1.03	80	1.89	216.1	-0.062	547.0	0.15	9.84
269	40.746	0.152	1.04	80	1.90	215.9	-0.061	547.0	0.15	9.90
270	40.899	0.153	1.04	80	1.88	215.8	-0.066	547.0	0.14	9.88
271	41.049	0.150	1.04	80	1.89	216.1	-0.066	547.0	0.14	9.79
272	41.201	0.152	1.04	80	1.88	215.7	-0.062	547.0	0.15	9.83

Train D - Ambient Background and Flue Gas Data

Run: 1 **Test Date:** 3/10/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.00563

Meter Box Y Regression Factor: 0

Meter Box Dynamic Y: 1.006

Sample Box ID: 336

Test Start Time: 14:57

Total Sampling Time 2720 min

Recording Interval 10 min

Sample Train Leak Checks

Pre-test ____ cfm @ ____ in. Hg

Post-Test ____ cfm @ ____ in. Hg

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
Tot / Avg	**41.201**	**0.147**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Minimum	0.000	0.030	0.00	0	0.00	0.00	0.000	0.0	0.00	0.00
Max	41.201	0.152	0.00	0	0.00	0.00	0.000	0.0	0.00	0.00
0	0.000									
10	1.470	0.147								
20	2.975	0.151								
30	4.481	0.151								
40	5.989	0.151								
50	7.497	0.151								
60	9.009	0.151								
70	10.522	0.151								
80	12.034	0.151								
90	13.551	0.152								
100	15.067	0.152								
110	16.583	0.152								
120	18.099	0.152								
130	19.617	0.152								
140	21.136	0.152								
150	22.655	0.152								
160	24.174	0.152								
170	25.694	0.152								
180	27.213	0.152								
190	28.733	0.152								
200	30.253	0.152								
210	31.773	0.152								
220	33.294	0.152								
230	34.815	0.152								
240	36.336	0.152								
250	37.857	0.152								
260	39.378	0.152								
270	40.899	0.152								
272	41.201	0.030								

Gravimetric Lab Data

ASTM E2515

Manufacturer:	MF Fire
Model:	Nova 2
Tracking No.:	2497
Project No.:	0552WS004E
Run #:	1
Test Date:	3/10/25

OMNI Eq. ID Numbers	
Analytical Scale	637
Audit Weight Set:	283A,
Analytical Scale	
Hydrometer	715,709
Filters are weighed	In Pairs

Train A

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights Final, mg	Tare, mg	Particulate, mg Uncorrected	Corrected
FilterPairs	3.10.2025 / 19:33	Filter	F519	243.9	239.2	4.7	4.7
			F519a				
Probe catch*	3.10.2025 / 19:33	Probe	29	114276.5	114276.4	0.1	0.1
lter seals catch*	3.10.2025 / 19:33	Seals	S937	3335.8	3335.8	0.0	0.0
				Total Particulate, mg:		**4.8**	**4.8**

Train B

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights Final, mg	Tare, mg	Particulate, mg Uncorrected	Corrected
FilterPairs	3.10.2025 / 19:33	Filter	F520	241.4	238.2	3.2	3.2
			F520A				
Probe catch*	3.10.2025 / 19:33	Probe	56	118641.5	118641.4	0.1	0.1
lter seals catch*	3.10.2025 / 19:33	Seals	S938	3412.0	3410.6	1.4	1.4
		Sub-Total		Total Particulate, mg:		**4.7**	**4.7**

Train C - *First Hour*

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights Final, mg	Tare, mg	Particulate, mg Uncorrected	Corrected
FilterPairs	3.10.2025 / 16:00	Filter	F531	239.7	236.5	3.2	3.2
			F531A				
Probe catch*		Probe	8	115594.3	115594.3	0.0	0.0
lter seals catch*		Seals	S939	3390.4	3390.4	0.0	0.0
				Total Particulate, mg:		**3.2**	**3.2**

Train D - *Ambient Background*

Sample Component	Date / Time in Dessicator	Reagent	Filter # or	Weights Final, mg	Tare, mg	Particulate, mg
Filter catch*	3.10.2025 / 19:33	Filter	F525	120.7	120.6	0.1
				Total Particulate, mg:		**0.1**

Final (mg) - Tare (mg) = Particulate (mg)

NOTE: The Uncorrected values are those where any negative filter weights are taken as a negative value. This can possibly occur when filter matter adheres the O-ring seals and thereby transfers some mass to the O-ring. The Corrected values reflect where any negative filter weights are taken as ZERO, thus not accounting for any transfer of mass and resultingly over-reporting. Corrected values were added to this analysis to report the "Corrected" results in this report in response to a request by the US EPA. In cases where the Final weight minus the Tare weight of the Ambient filter occurs, it is taken as a ZERO. Any negative probe weights are evaluated pursuant to clause of ASTM E25215 (or appropriatelt associated test standard as defined in the introduction of this report).

Technician Signature:_____ Reviewed By:_____

OMNI-Test Laboratories, Inc.

ASTM E2780 Wood Heater Test Notes

Client: MF Fire Project Number: 0552WS004E Run Number: 1
Model: Nova 2 Tracking Number: 2497 Date: 3-10-2025
Test Crew: JM RT

Test Fuel Properties

Equipment			
Device	**OMNI Number**	**Cal Date**	**Cal Due**
Tape Measure	730	12/6/2023	11/8/2025
Moisture Meter	340	N/A-VBV	N/A - VBV
Moisture Reference	431	10/18/2024	10/18/2025
Fuel Scale	745	9/25/2024	9/25/2025
Fuel Scale Audit Weight	132, 274	See eq list	See eq list
Fuel Species / Type	Douglas fir, untreated and air dried, standard grade or better dimensional lumber.		

Calibration Verifications			
Moisture Meter 340		Fuel Preparation Scale	
12% Reference :	12.0	10.0 lb. Reference Audit :	10.00
22% Reference :	22.0		

Pre-Burn Fuel								
Piece No.	Length, In.	Moisture % db	Piece No.	Length, In.	Moisture % db	Piece No.	Length, In.	Moisture % db
1	10	25.3	7	10	20.9	13	20	19.1
2	10	23.5	8	16	25.3	14	20	22.8
3	10	25.3	9	16	20.5	15	16	24.5
4	10	25.6	10	16	23.0	16	16	24.8
5	10	21.4	11	16	23.6	17	16	19.8
6	10	20.4	12	20	23.8	18	16	20.1
Total Weight, lb.		14.27		Time of Day	11:21	Room Temp. °F		65
		13.69			11:40			65

Test Fuel Charge						
Piece No.	**Weight, Lb.**	**Length, In.**	**Moisture Measurements**			**Lumber Type**
12.24	2.00	19.125	22.5	22.4	20.3	2X4
22.75	2.24	19.125	21.4	19.7	20.0	2X4
32.76	2.28	19.125	23.2	21.6	19.5	2X4
44.70	4.47	19.125	23.8	24.7	20.0	4X4
54.79	4.30	19.125	22.8	20.4	20.1	4X4
6						
7						
8						
Spacer Moisture Readings						
14.8	16.9	16.9	15.6			
25.3	25.8	24.5				
20.4	22.6	15.8				
13.5	16.8	23.2				
20.8	25.0	17.2				
Time of Day		12:30		Room Temp. °F		65
Total weight 2x4 with spacers, lb.		7.75		Total weight 4x4 with spacers, lb.		9.49
				Total weight of fuel charge, Lb.		17.24

Technician Signature: [signature] Date: 3-20-2025

OMNI-Test Laboratories, Inc.

ASTM E2780 Wood Heater Test Notes

Client: MF Fire Project Number: 0552WS00495 Run Number: 1
Model: NOVA2 Tracking Number: 2497 Date: 03-10-2025
Test Crew: RT JM

Supplemental Data

Test Booth No. E1 Sampling Start Time: 14:57 Sampling End Time: 19:29

Tunnel Cleaned Date 3-10-2025 % Smoke Capture 100 Induced Draft NONE in.H_2O

Systems Leak Checks			
System	Pre-Test	Post-Test	Sampling Probe Change-out
Pitot	0.00 @ 3"	0.00 @ 3"	
Train A	0.002 @ 24"	0.002 @ 7.00	
Train B	0.005 @ 24"	0.002 @ 8.00	
Train C	0.003 @ 18.5	0.001 @ 10.5	

Velocity Traverse, 6-inch tunnel			
Location	Microtector (in. H_2O)	Δp (in. H_2O)	Tunnel Temp., °F
Center	.058	.116	94
1	.034	.068	94
2	.052	~~.098~~ .101	94
3	.049	.098	94
4	.033	.066	94
5	.035	.070	93
6	.051	.102	94
7	.047	.094	93
8	.020	.040	93
Tunnel Static (in. H_2O)		Pre-Test	Post-Test
		-.40	-.40

Miscellaneous Parameters			
Item	Initial	Final	Equipment No.
Room Air Velocity, ft/min.	6	12	737
Scale Audit, lb. (20-80 % of fuel load)	20.0	20.0	132,274
Room Relative Humidity, %	49	39	716
Barometric Pressure, in. Hg	30.04	29.91	716
Room Temperature, °F	70	69	A716

Flue Gas Continuous Analyzer						
Analyzer ID	594	Response Time, sec.	27.79	Leak Check Performed?	✓	
Bias Checks	Concentration:	4,060.	Pre-Test Response		Post-Test Response	
Concentration	Bottle No.	Value, %	Pre-Test Response		Post-Test Response	
			Zero	Span	Zero	Span
CO2 % Span	CC506601	16.88	Ø	16.88	Ø	16.80
CO % Span	CC506601	4.07	Ø	4.07	Ø	4.03
CO ppm Span	CC305741	502	Ø	498	Ø	485
Zero	TC3AAV483	Ø	Ø		Ø	

Technician Signature: Date: 3-10-2025

OMNI-Test Laboratories, Inc.

ASTM E2780 Wood Heater Test Notes

Client: ME FIRE Project Number: 0552WS0048 Run Number: 1

Model: NOVA2 Tracking Number: 2497 Date: 3/10/2025

Test Crew: RT JM

Primary Air Control Settings

Single Burn Rate

Secondary:

Tertiary/Pilot:

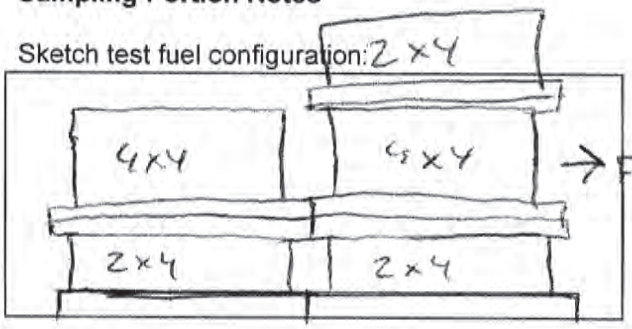
Fan: High

Preburn Notes

Time	Notes
1052	Kindling lit
1130	First Preburn loaded
1245	At 3.5 lbs second preburn was loaded
1257	Weight discrepancy due to gas train biascheck (0.4lbs)
1306	Gas probe reinstalled
1456	At 3.6lbs coal bed was leveled, preburn stopped at 3.5lbs

Sampling Portion Notes

Sketch test fuel configuration:



Start up procedures & Timeline:

Bypass: Used to load fuel

Fuel loaded by: 57

Door closed at: 180 seconds

Primary air: NA

Notes:

Time	Notes
1457	Test start
1557	first hour sampling

Technician Signature:

Date: 3-10-2025

OMNI-Test Laboratories, Inc.

ASTM E2780 Wood Heater Test Notes

Client: MF Fire Project Number: 0552WS004E Run Number: 1
Model: Nova 2 Tracking Number: 2497 Date: 03-10-2025
Test Crew: RT, JM

Gravimetric Analysis Sheet

Assembled By:
Joseph McShane

Date/Time in Desiccator:
1st hour 16:00
Remainder 19:33

	Weighing's				
	Date/Time: 3-11-2025 8:45	Date/Time: 3-12-2025 7:45	Date/Time: 3-13-25 755	Date/Time: 3-17-2025 8:10	Date/Time: 3-19-25
	R/H %: 10, 0.7	R/H %: 9, 1.0	R/H %: 5, 5.3	R/H %: 7, 0.3	R/H %: 5, 0.7
	Temp: 68.3	Temp: 67.7	Temp: 66.9	Temp: 68.3	Temp: 66.7
	100 mg Audit 100.0	100 mg Audit 100.0	100 mg Audit 100.0	100 mg Audit 100.0	100 mg Audit 100.0
	200 mg Audit: 200.0	200 mg Audit: 200.1	200 mg Audit: 200.0	200 mg Audit: 200.0	200 mg Audit: 200.0
	2 g Audit: 2000.2	2 g Audit: 2000.2	2 g Audit: 2000.2	2 g Audit: 2000.2	2 g Audit: 2000.2
	100 g Audit: 99997.9	100 g Audit 99997.8	100 g Audit 99997.7	100 g Audit 99997.8	100 g Audit 99997.8
	Initials: JM	Initials: RT	Initials: RT	Initials: RT	Initials: RT

Train	Element	ID #	Tare (mg)	v	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A	Filter Pair	F519/ F519A	239.2		244.0	243.9✓			
	Probe	29	114276.4		114276.9	114276.5	114776.5✓		
	O-Ring Set	5937	3335.8		3337.9	3336.4	3336.3	3335.8	3335.8
B	Front Filter	F520/ F520A	238.2		241.3	241.4✓			
	Probe	56	118641.4		118642.4	118642.0	118641.5✓		
	O-Ring Set	5938	3410.6		3414.8	3413.4	3413.4	3412.7	3412.0
C (1st hr)	Front Filter	F531/ F531A	236.5		239.8	239.7✓			
	Probe	8	115594.3		115595.0	115594.3	115594.3✓		
	O-Ring Set	5939	3390.4		3390.9	3390.8	3390.8	3390.4	3390.4✓
BG	Filter	F525	120.6		120.7	120.7✓			

Technician Signature: _____ Date: _____

Equations and Sample Calculations – ASTM E2780 & E2515

Manufacturer	MF Fire
Model:	Nova 2
Project Number:	0
Run Number:	1

Sample calculations of each equation used in the refernced standards for this test run.

Summary of INPUT values necessary for calculations

Global Input Parameters for Equations		Value	Source
FM_S	- Average moisture of test fuel spacers, % dry basis	19.69	Fuel Properties Work Sheet
M_{Swb}	- Weight of Test Fuel Spacers, wet basis, kg	1.95	Fuel Properties Work Sheet
M_{CPnwb}	- Weight of each test fuel piece n in fuel crib, excluding nails and spacers, wet basis , kg	[1]Varies	Fuel Properties Work Sheet
FM_{CPn}	- Average fuel Fuel moisture in fuel crib, % dry basis	[1]Varies	Fuel Properties Work Sheet
V_C	- Volume of Fuel Crib, ft^3 (less spacers)	0.445	Fuel Properties Work Sheet
V_{SCENT}	- Average gas velocity at the center of the dilution tunnel calculated after the Pitot tube traverse, ft/sec	0.00	Traverse Worksheet
V_{STRAV}	- Average gas velocity calculated after the multipoint Pitot traverse	15.64	Traverse Worksheet
θ	- Duration of test, min	272	*Train A Worksheet*
P_{bar}	- Barometric pressure (average) at the testing site, in. Hg	29.98	*Traverse Worksheet*
Pg	- Tunnel Static Pressure	-0.4	*Traverse Worksheet*

[1] *Denotes that this pararmeter for each individual piece of fuel is calculated in the Test Fuel Properties worksheet and the input values are pulled into these sample caculations.*

Sample Train Input Parameters for Equations		Train A	Train B	Train C	Train D
V_m	- Volume of gas sample measured at the dry gas meter, dcf	43.873	44.215	9.571	41.201
Y	Dry gas meter calibration factor	1.012	1.024	1.007	1.006
ΔH	- Average pressure differential across the orifice meter, in. H_2O	1.24	1.25	1.02	1.03
T_m	- Temperature of Dry Gas Meter, °F	88.9	88.8	73.4	79.0
Uncorrected Sample Mass					
m_p	- mass of particulate matter from probe, mg	0.1	0.1	0.0	n/a
m_f	- mass of particulate matter from filters, mg	4.7	3.2	3.2	0.1
m_g	- mass of particulate matter from filter seals, mg	0.0	1.4	0.0	n/a
Corrected Sample Mass					
m_p	- mass of particulate matter from probe, mg	0.1	0.1	0.0	n/a
m_f	- mass of particulate matter from filters, mg	4.7	3.2	3.2	n/a
m_g	- mass of particulate matter from filter seals, mg	0.0	1.4	0.0	n/a

M_{Sdb} – Weight of test fuel spacers, dry basis, kg - ASTM E2780 equation (1)

$$M_{Sdb} = (M_{Swb})\left(\frac{100}{100 + FM_S}\right)$$

Where,

FM_S = average moisture of test fuel spacers, % dry basis
M_{Swb} = weight of test fuel spacers, wet basis, kg

Sample Calculation:

FM_S = 19.69 %, dry basis
M_{Swb} = 1.95 lb.
0.4536 = Conversion factor, lb. → kg

M_{Sdb} = ((1.95 x 0.4536) (100 / (100 + 19.69))

M_{Sdb} = **0.739** kg

MCdb– Weight of test fuel crib, excluding nails and spacers, dry basis, kg - ASTM E2780 equation (2)

$$M_{Cdb} = \sum (M_{CPnwb})\left(\frac{100}{100 + FM_{CPn}}\right)$$

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:

ΣM_{CPnwb} = 15.29 lb.
FM_{CPn} = 21.49 %, dry basis
0.4536 = Conversion factor, lb. → kg

M_{Cdb} = x 0.4536 x (100 / (100 + 15.29))

M_{Cdb} = **5.71** kg

DCdb - 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 = Volume of Fuel Crib, ft³ (less spacers)

Sample Calculation:

M_{Cdb} = 12.59 lb
V_C = 0.445 ft^3

D_{Cdb} = 12.59 / 0.445

D_{Cdb} = **28.25** lb/ft3

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

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

Sample Calculation:

M_{Sdb} = 0.739
M_{Cdb} = 5.71

M_{FTAdb} = 0.739 + 5.71

M_{FTAdb} = **6.45** kg

BR – dry burn rate, kg/hr - ASTM E2780 equation (5)

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

Sample Calculation:

M_{FTAdb} = 6.448
θ = 272

BR = (60 x 6.448) / 272

BR = **1.42** kg / hr

***Vs* – Average gas velocity in the dilution tunnel, ft/sec** - ASTM E2515 equation (9)

$$V_S = F_P \times K_P \times C_P \times \left(\sqrt{\Delta P}\right)_{avg} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

Where

F_P = Adjustment factor for center of tunnel pitot tube placement, where $F_P = V_{STRAV} / V_{SCENT}$

V_{SCENT} = Dilution tunnel velocity, at the center, ft/sec

V_{STRAV} = Dilution tunnel velocity, multi-point pitot traverse, ft/sec

K_P = Pitot tube constant, 85.49

C_P = Pitot tube coefficient: 0.99, unitless

$\Delta P^{1/2}_{AVG}$ = Velocity pressure in the dilution tunnel, in H_2O

$T_{S\,(avg)}$ = Absolute average gas temperature in the dilution tunnel, °R

P_S = Absolute average gas static pressure in tunnel, = Pbar + Pg , where Pbar = Barometric Pressure, in. Hg, Pg = Static pressure in tunnel, Hg (in H_2O / 13.6)

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

(Duration of Test)

F_P = 0.823

$\Delta P^{1/2}_{AVG}$ = 0.346

$T_{S\,(avg)}$ = 541

Pbar = 29.98

Pg = -0.4

Ps = 29.95

V_S = 0.823 x 85.49 x 0.99 x 0.346 x √ [(541 / (29.95 x 28.78)]

V_S = **19.126** ft/sec

(First Hour of Test)

F_P = 0.823

$\Delta P^{1/2}_{AVG}$ = 0.344

$T_{S\,(avg)}$ = 556

Pbar = 29.98

Pg = -0.4

Ps = 29.95

V_S = 0.823 x 85.49 x 0.99 x 0.344 x √ [(556 / (29.95 x 28.78)]

V_S = **19.251** ft/sec

Q_{std} – Average gas flow rate in dilution tunnel, dscf/hr - ASTM E2515 equation (3)

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

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} = solute temperature, 528 °R
P_s = Absolute average gas static pressure in dilution tunnel, = Pbar + Pg , 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

(Duration of Test):

B_{ws} = 0.02
A = 0.19635
P_s = 29.95
$T_{s(avg)}$ = 541
Vs = 19.13

Qstd = 3600 x (1 - 0.02) x 19.126 x 0.19635 x (528 / 541) x (29.95 / 29.92)

Qstd = **12933.4** dscf/hr

(First Hour):

B_{ws} = 0.02
A = 0.19635
P_s = 29.95
$T_{s(avg)}$ = 556
Vs = 19.251

Qstd = 3600 x (1 - 0.02) x 19.251 x 0.1963 x (528 / 556) x (29.95 / 29.92)

Qstd = **12677.1** dscf/hr

Vm(std) – Volume of Gas Sampled (Corrected), 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_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Train A

$$V_{m(std)} = 17.64 \times 43.873 \times 1.012 \times \frac{\left(29.98 + \frac{1.24}{13.6}\right)}{(88.9 + 460)}$$

$V_{m(std)}$ = **42.912** dscf

Train B

$$V_{m(std)} = 17.64 \times 44.215 \times 1.024 \times \frac{\left(29.98 + \frac{1.25}{13.6}\right)}{(89 + 460)}$$

$V_{m(std)}$ = **43.775** dscf

Train C (1st Hour)

$$V_{m(std)} = 17.64 \times 9.57 \times 1.007 \times \frac{\left(\underline{30.04} + \frac{1.02}{13.6}\right)}{(73.4 + 460)}$$

$V_{m(std)}$ = **9.603** dscf

Train D (Background)

$$V_{m(std)} = 17.64 \times 41.20 \times 1.006 \times \frac{\left(\underline{29.98} + \frac{1.03}{13.6}\right)}{(79.0 + 460)}$$

$V_{m(std)}$ = **40.748** dscf

mn – 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 Calculations (Uncorrected):

Train A
m_n = 0.1 + 4.7 + 0.0
m_n = **4.8** mg

Train B
m_n = 0.1 + 3.2 + 1.4
m_n = **4.7** mg

Train C (1st hour)
m_n = 0.0 + 3.2 + 0
m_n = **3.2** mg

Train D (Background)
$m_n = m_f$ = 0.1
m_n = **0.1** mg

Sample Calculations (Corrected):

Train A
m_n = 0.1 + 4.7 + 0.0
m_n = **4.8** mg

Train B
m_n = 0.1 + 3.2 + 1.4
m_n = **4.7** mg

Train C (1st hour)
m_n = 0.0 + 3.2 + 0
m_n = **3.2** mg

Train D (Background)
$m_n = m_f$ = 0.1
m_n = **0.1** mg

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

g/dscf - ASTM E2515 equation (13)

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

Where:

K_2 = Constant, 0.001 g/mg

m_n = Total mass of particulate matter collected in the sampling train, mg

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

Sample Calculations (Uncorrected):

Train A

$$C_s = 0.001 \times \frac{4.8}{42.91}$$

C_s = **0.000112** g/dscf

Train B

$$C_s = 0.001 \times \frac{4.7}{43.78}$$

C_s = **0.0001074** g/dscf

Train C (1st Hour)

$$Cs = 0.001 \times \frac{3.2}{9.60}$$

Cs = **0.000333** g/dscf

Train D (Background)

$$C_r = 0.001 \times \frac{0.1}{40.75}$$

C_r = **0.000000** g/dscf

Sample Calculations (Corrected):

Train A

$$C_s = 0.001 \times \frac{4.8}{42.91}$$

C_s = **0.000112** g/dscf

Train B

$$C_s = 0.001 \times \frac{4.7}{43.78}$$

C_s = **0.0001074** g/dscf

Train C (1st Hour)

$$Cs = 0.001 \times \frac{3.2}{9.60}$$

Cs = **0.000333** g/dscf

Train D (Background)

$$C_r = 0.001 \times \frac{0.1}{40.75}$$

C_r = **0.000000** g/dscf

ET – 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 calculations (uncorrected)

Train A

E_T = (0.000112 - 0.000000) x 12933.4 x 272 / 60

E_T = **6.56** g

Train B

E_T = (0.000107 - 0.000000) x 12933.4 x 272 / 60

E_T = **6.30** g

First Hour

E_T = (0.000333 - 0.000000) x 12677.1 x 60 / 60

E_T = 4.22 g

Trains A and B Average

E = **6.43** g

Sample calculations (Corrected)

Train A

E_T = (0.000112 - 0.000000) x 12933.4 x 272 / 60

E_T = **6.56** g

Train B

E_T = (0.000107 - 0.000000) x 12933.4 x 272 / 60

E_T = **6.30** g

First Hour

E_T = (0.000333 - 0.000000) x 12677.1 x 60 / 60

E_T = **4.22** g

Trains A and B Average

E_T = **6.43** g

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 (Uncorrected)

Train A

E_T = 6.56 g

θ = 272 min

$PM_R = 60 \times (6.56 / 272)$

PM_R = **1.45** g/hr

Train B

E_T = 6.30 g

θ = 272 min

$PM_R = 60 \times (6.30 / 272)$

PM_R = **1.39** g/hr

A and B Average

E_T = **1.42** g

First Hour

E_T = 4.22 g

θ = 60 min

$PM_R = 60 \times (4.22 / 60)$

PM_R = **4.22** g/hr

Sample Calculation (Corrected)

Train A

E_T = 6.56 g

θ = 272 min

$PM_R = 60 \times (6.56 / 272)$

PM_R = **1.45** g/hr

Train B

E_T = 6.30 g

θ = 272 min

$PM_R = 60 \times (6.30 / 272)$

PM_R = **1.39** g/hr

A and B Average

E_T = **1.42** g

First Hour

E_T = 4.22 g

θ = 60 min

$PM_R = 60 \times (4.22 / 60)$

PM_R = **4.22** 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 (Uncorrected)

Train A

E_T = 6.56 g
M_{FTAdb} = 6.45 kg
PM_F = 6.56 / 6.45
PM_F = **1.02** g/kg

Train B

E_T = 6.30 g
M_{FTAdb} = 6.45 kg
PM_F = 6.30 / 6.45
PM_F = **0.98** g/kg

Sample Calculation (Corrected)

Train A

E_T = 6.56 g
M_{FTAdb} = 6.45 kg
PM_F = 6.56 / 6.45
PM_F = **1.02** g/kg

Train B

E_T = 6.30 g
M_{FTAdb} = 6.45 kg
PM_F = 6.30 / 6.45
PM_F = **0.98** g/kg

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:			Train A	Train B	Train C
θ	=	Total sampling time, min	272	272	60
θ_i	=	Length of recording interval, min	1	1	1
V_{mi}	=	Volume of gas sample measured by the dry gas meter during the “ith” time interval, dcf	0.158	0.159	0.161
V_m	=	Volume of gas sample as measured by dry gas meter, dcf	43.873	44.215	9.571
V_{si}	=	Average gas velocity in the dilution tunnel during the "ith" time interval, ft/sec	19.354	19.354	19.354
V_s	=	Average gas velocity in the dilution tunnel, ft/sec	19.127	19.127	19.261
T_{mi}	=	Absolute average dry gas meter temperature during the "ith" time interval, ^oR	530.7	528.2	529.5
T_m	=	Absolute average dry gas meter temperature, ^oR	548.9	548.8	533.4
T_{si}	=	Absolute average gas temperature in the dilution tunnel during the "ith" time interv	584.9	584.9	584.9
T_s	=	Absolute average gas temperature in the dilution tunnel, ^oR	541.3	541.3	555.9

NOTE: These sample calculations are for the Second interval of each train)

Train A PR = $\left(\frac{272 \times 0.158 \times 19.127 \times 549 \times 585}{1 \times 43.873 \times 19.354 \times 531 \times 541}\right)$ X 100 = 108.2 %

Train B PR = $\left(\frac{272 \times 0.159 \times 19.127 \times 549 \times 585}{1 \times 44.215 \times 19.354 \times 528 \times 541}\right)$ X 100 = 108.5 %

Train B PR = $\left(\frac{60 \times 0.161 \times 19.261 \times 533 \times 585}{1 \times 9.571 \times 19.354 \times 530 \times 556}\right)$ X 100 = 106.5 %

VERSION: 2.4 4/15/2010

Manufacturer:	MF Fire		**Appliance Type:**	Cat	(Cat, Non
Model:	Nova 2				
Date:	3/10/2025		**Temp. Units**	F	(F or C)
Run:	1		**Weight Units**	lb	(kg or lb)
Control #:	2497				
Test Duration:	272				
Output Category:			**Fuel Data**		
				D. Fir	
Wood Moisture (% wet):	17.63		**HHV**	19,810	kJ/kg
Load Weight (lb wet):	17.24		**%C**	48.73	
Burn Rate (dry kg/h):	1.42		**%H**	6.87	
Total Particulate Emissions:	6.43	g	**%O**	43.9	
			%Ash	0.5	

Averages	**0.11**	**11.78**	**#DIV/0!**	**281.06**	**70.26**	
				Temp. (ºF)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	17.24	0.04	5.61		375.7	72.1
1	17.09	0.16	0.86		360.5	72.2
2	16.97	0.05	2.54		404.2	72.2
3	16.81	0.07	3.35		409.2	72.0
4	16.63	0.10	7.64		392.6	71.7
5	16.52	0.05	6.07		376.1	71.5
6	16.42	0.08	4.41		372.6	71.4
7	16.34	0.09	3.92		370.6	71.1
8	16.24	0.08	4.32		367.5	71.0
9	16.14	0.07	6.44		368.2	70.8
10	15.96	0.07	9.30		376.2	70.7
11	15.77	0.10	10.88		390.1	70.6
12	15.58	0.08	11.45		401.0	70.4
13	15.45	0.08	9.27		405.5	70.4
14	15.27	0.05	8.35		405.3	70.2
15	15.15	0.05	8.40		402.5	70.2
16	14.98	0.06	9.39		402.2	70.1
17	14.86	0.06	8.46		403.7	70.0
18	14.72	0.07	8.19		404.6	70.0
19	14.58	0.07	8.12		405.0	70.0
20	14.46	0.06	8.05		404.9	69.9
21	14.29	0.07	7.82		404.0	69.5

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
22	14.15	0.05	8.96		403.1	69.7
23	14.02	0.05	10.76		408.9	69.7
24	13.85	0.04	11.77		417.2	69.7
25	13.65	0.05	10.93		421.8	69.7
26	13.51	0.04	10.86		423.1	69.6
27	13.33	0.06	11.69		427.9	69.6
28	13.15	0.04	11.13		430.4	69.7
29	12.97	0.03	10.92		432.3	69.8
30	12.82	0.06	12.14		436.9	69.9
31	12.61	0.07	13.22		441.7	69.9
32	12.45	0.05	13.15		445.2	70.0
33	12.26	0.07	13.28		450.3	70.0
34	12.06	0.07	13.78		452.8	70.1
35	11.87	0.05	13.41		455.2	70.2
36	11.67	0.06	13.20		456.7	70.1
37	11.55	1.37	16.20		410.8	70.2
38	11.42	0.35	14.63		387.9	70.2
39	11.29	0.15	13.33		374.8	70.2
40	11.17	0.08	12.78		364.4	70.4
41	11.09	0.07	12.42		355.7	70.3
42	10.98	0.07	12.28		348.4	70.3
43	10.88	0.09	12.65		343.8	70.4
44	10.78	0.07	12.46		339.1	70.2
45	10.66	0.07	12.78		336.6	70.5
46	10.56	0.05	13.41		333.3	70.4
47	10.47	0.05	13.18		329.7	70.4
48	10.39	0.05	12.89		326.1	70.4
49	10.28	0.096	13.157		323.5	70.4
50	10.22	0.109	13.158		321.5	70.5
51	10.11	0.109	13.05		320.2	70.5
52	10.05	0.14	13.028		318.8	70.5
53	9.95	0.15	13.048		317.5	70.4
54	9.87	0.182	13.318		316.6	70.3
55	9.77	0.178	13.637		316	70.3
56	9.67	0.113	13.615		315.8	70.4
57	9.54	0.106	14.094		315.4	70.4
58	9.45	0.103	14.481		315.3	70.3
59	9.37	0.106	14.631		314.8	70.4
60	9.26	0.089	14.675		314.5	70.4

Run 1 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
61	9.16	0.104	14.727		314.7	70.5
62	9.07	0.096	14.964		314.3	70.5
63	8.97	0.09	15.04		314.8	70.5
64	8.83	0.164	15.429		315.3	70.5
65	8.75	0.205	15.435		315.9	70.5
66	8.66	0.342	15.721		317.4	70.5
67	8.54	0.371	15.811		318.7	70.5
68	8.45	0.254	15.432		318.5	70.5
69	8.36	0.113	14.613		316.9	70.6
70	8.26	0.132	14.466		316.1	70.7
71	8.17	0.112	14.132		314.3	70.8
72	8.07	0.106	13.689		312.6	70.7
73	7.98	0.068	13.596		310.8	70.8
74	7.93	0.08	13.392		307.8	70.8
75	7.84	0.073	13.23		305.9	70.9
76	7.77	0.076	13.261		303.5	71
77	7.67	0.071	13.344		301.9	70.9
78	7.58	0.072	13.586		301	71
79	7.54	0.084	13.737		299.9	71
80	7.46	0.084	13.867		299.1	71
81	7.36	0.081	13.979		297.8	70.9
82	7.28	0.114	14.338		298.9	71
83	7.18	0.124	14.416		299.1	71
84	7.10	0.139	14.477		299.3	71
85	7.04	0.13	14.52		299.1	71
86	6.95	0.123	14.41		298.9	71
87	6.88	0.157	14.382		298.5	71.1
88	6.77	0.152	14.15		298	71.1
89	6.73	0.143	14.176		298.8	71.1
90	6.66	0.139	14.225		298.4	71.1
91	6.57	0.103	14.034		298.7	71
92	6.48	0.104	14.068		299.1	71.1
93	6.40	0.114	14.015		299.6	71.2
94	6.34	0.109	13.912		299.9	71.1
95	6.28	0.112	13.457		299.9	71.1
96	6.18	0.119	13.402		299.6	71.2
97	6.12	0.139	13.622		300.1	71
98	6.03	0.114	13.458		299.9	71.1
99	5.95	0.12	13.475		300.4	71

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
100	5.90	0.118	13.285		300.2	71.2
101	5.82	0.114	13.32		300.1	71.1
102	5.75	0.123	13.375		299.4	71.2
103	5.69	0.13	13.369		299.4	71
104	5.65	0.121	13.28		298.2	70.9
105	5.57	0.108	13.109		297.4	71.1
106	5.50	0.118	13.235		296.4	70.9
107	5.45	0.113	13.17		295.4	70.8
108	5.37	0.124	13.261		294.2	71
109	5.30	0.125	13.26		293.3	71
110	5.26	0.12	13.215		291.7	70.8
111	5.16	0.118	13.087		290.2	70.9
112	5.14	0.12	13.032		289.8	71
113	5.06	0.135	13.005		289.4	70.9
114	4.98	0.141	12.999		289.8	70.9
115	4.95	0.138	12.929		288.8	70.9
116	4.87	0.135	12.946		288.4	70.9
117	4.84	0.134	12.96		287.4	71
118	4.77	0.132	12.981		287	71
119	4.69	0.135	12.89		286.2	70.8
120	4.65	0.13	12.823		285.4	71
121	4.58	0.127	12.813		284.5	70.8
122	4.53	0.127	12.78		283.8	70.8
123	4.47	0.126	12.856		283.2	70.8
124	4.44	0.126	12.792		282.6	70.8
125	4.37	0.127	12.802		282	70.8
126	4.30	0.115	12.962		281.3	70.6
127	4.27	0.112	12.996		280.1	70.7
128	4.20	0.112	13.056		279.6	70.7
129	4.16	0.122	13.084		278.2	70.7
130	4.09	0.109	13.032		277.2	70.6
131	4.06	0.098	13.137		276.5	70.7
132	4.00	0.073	13.092		274.1	70.6
133	3.95	0.076	13.039		271	70.6
134	3.89	0.078	12.929		268.4	70.5
135	3.88	0.079	12.823		265.9	70.2
136	3.80	0.081	12.785		263.6	70.4
137	3.78	0.09	12.715		261.4	70.4
138	3.73	0.092	12.466		259.9	70.3

Run 1 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
139	3.67	0.089	12.55		258.5	70.4
140	3.65	0.084	12.66		257.2	70.5
141	3.58	0.09	12.719		255.9	70.5
142	3.56	0.087	12.718		255.3	70.4
143	3.50	0.095	12.741		253.8	70.3
144	3.48	0.085	12.806		253	70.3
145	3.41	0.081	12.769		252.3	70.3
146	3.37	0.087	12.793		251.6	70.3
147	3.35	0.087	12.724		250.9	70.3
148	3.29	0.083	12.748		250.2	70.3
149	3.26	0.089	12.754		249.5	70.3
150	3.20	0.086	12.734		248.6	70.2
151	3.18	0.084	12.792		247.8	70.2
152	3.14	0.087	12.767		247.5	70.2
153	3.08	0.083	12.74		246.8	70.2
154	3.04	0.082	12.701		246.9	70.2
155	3.00	0.082	12.67		246.9	70.3
156	2.96	0.083	12.761		246.7	70.2
157	2.93	0.085	12.73		246.3	70
158	2.86	0.085	12.752		245.7	70
159	2.87	0.08	12.821		245.5	70
160	2.80	0.084	12.791		244.8	70.2
161	2.74	0.089	12.787		243.9	70.1
162	2.74	0.092	12.467		242.8	70.2
163	2.68	0.093	12.333		243.5	70.1
164	2.65	0.095	12.258		243.4	70.2
165	2.61	0.088	12.185		243.2	70.2
166	2.54	0.089	12.21		242.6	70.2
167	2.55	0.086	12.247		242.2	70.2
168	2.49	0.084	12.212		241.8	70.2
169	2.47	0.082	12.311		241.8	70.3
170	2.44	0.085	12.223		241	70.2
171	2.37	0.085	12.208		240.2	70.3
172	2.35	0.084	12.268		239.9	70.3
173	2.32	0.079	12.289		239.4	70.4
174	2.25	0.078	12.308		238.1	70.4
175	2.25	0.077	12.293		237.6	70.4
176	2.21	0.077	12.233		236.8	70.4
177	2.16	0.076	12.234		236	70.5

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
178	2.16	0.076	12.206		235.9	70.5
179	2.11	0.076	12.237		235.6	70.5
180	2.08	0.076	12.009		234.9	70.5
181	2.07	0.078	11.96		234.7	70.5
182	2.00	0.077	11.975		234	70.4
183	1.95	0.077	11.985		233.4	70.6
184	1.95	0.078	11.968		232.5	70.6
185	1.92	0.08	11.914		231.8	70.6
186	1.89	0.082	11.847		231.8	70.6
187	1.87	0.086	11.646		231	70.6
188	1.84	0.088	11.601		230.6	70.6
189	1.79	0.087	11.531		230.1	70.6
190	1.77	0.09	11.45		228.9	70.5
191	1.77	0.097	11.421		228.2	70.5
192	1.72	0.095	11.402		227.7	70.6
193	1.68	0.096	11.439		227.1	70.5
194	1.69	0.098	11.401		226.4	70.5
195	1.66	0.095	11.453		226.2	70.5
196	1.60	0.097	11.386		225.6	70.5
197	1.59	0.099	11.364		225.1	70.5
198	1.58	0.098	11.366		224.9	70.5
199	1.53	0.1	11.332		224.4	70.5
200	1.54	0.1	11.35		223.7	70.5
201	1.49	0.102	11.326		223.1	70.4
202	1.49	0.102	11.264		222.8	70.4
203	1.47	0.101	11.253		222.1	70.4
204	1.44	0.099	11.275		221.2	70.4
205	1.41	0.104	11.252		221.3	70.2
206	1.38	0.107	11.253		221.4	70.3
207	1.38	0.108	11.265		221.3	70.3
208	1.36	0.107	11.1		221.1	70.3
209	1.29	0.11	11.101		221	70.2
210	1.29	0.11	10.945		220.4	70.3
211	1.27	0.112	10.814		219.7	70.2
212	1.27	0.113	10.637		220.2	70.2
213	1.24	0.108	10.646		219.8	70.2
214	1.20	0.108	10.566		219.3	70.2
215	1.19	0.111	10.552		219	70.1
216	1.18	0.111	10.588		218.4	70

Run 1 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
217	1.17	0.111	10.532		218.4	70
218	1.15	0.117	10.577		217.8	70
219	1.10	0.121	10.608		217.9	70
220	1.08	0.124	10.559		218	69.9
221	1.09	0.122	10.548		217.6	69.9
222	1.07	0.122	10.518		218.1	69.9
223	1.06	0.122	10.467		218	69.8
224	1.00	0.124	10.471		217.7	69.8
225	0.97	0.128	10.428		217.7	69.7
226	0.98	0.123	10.475		218.2	69.7
227	0.96	0.126	10.411		218.1	69.6
228	0.96	0.128	10.376		218.2	69.5
229	0.89	0.125	10.394		218.8	69.5
230	0.90	0.132	10.327		218.5	69.4
231	0.89	0.127	10.331		218.8	69.5
232	0.86	0.123	10.322		219.2	69.5
233	0.83	0.124	10.274		219.1	69.5
234	0.81	0.117	10.187		218.6	69.4
235	0.80	0.111	10.153		218.2	69.4
236	0.80	0.116	10.078		217.7	69.4
237	0.75	0.117	10.094		217.6	69.4
238	0.73	0.121	10.06		217.8	69.4
239	0.70	0.119	10.134		218	69.3
240	0.70	0.116	10.071		217.6	69.3
241	0.68	0.111	10.022		217	69.2
242	0.63	0.113	10.175		217	69.2
243	0.65	0.114	10.116		216.5	69.2
244	0.62	0.12	10.102		216.3	69.2
245	0.60	0.123	10.09		216.3	69.2
246	0.57	0.123	10.206		215.8	69.2
247	0.54	0.123	10.212		216	69.1
248	0.54	0.125	10.205		215.7	69.1
249	0.52	0.129	10.222		215.7	69
250	0.49	0.126	10.202		215.6	69
251	0.47	0.135	9.83		215.5	69
252	0.46	0.137	9.778		216	69
253	0.47	0.138	9.746		216.1	68.9
254	0.42	0.137	9.781		215.2	69
255	0.40	0.138	9.729		215.6	68.9

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
256	0.38	0.142	9.761		215.6	68.9
257	0.38	0.142	9.748		215.8	69
258	0.36	0.142	9.724		215.8	68.8
259	0.32	0.147	9.766		215.8	68.8
260	0.30	0.148	9.716		215.7	68.9
261	0.27	0.15	9.732		215.4	68.8
262	0.28	0.152	9.783		215.7	68.7
263	0.24	0.154	9.799		215.7	68.7
264	0.22	0.153	9.779		216.2	68.7
265	0.19	0.147	9.823		216.3	68.7
266	0.18	0.15	9.818		216.3	68.7
267	0.17	0.147	9.796		216.4	68.6
268	0.15	0.146	9.836		216.1	68.6
269	0.14	0.147	9.899		215.9	68.6
270	0.10	0.142	9.879		215.8	68.6
271	0.07	0.141	9.789		216.1	68.5
272	0.00	0.146	9.829		215.7	68.5

Run 1 B415

Run 2 Test Data

Test Date: 3/11/2025
Manufacturer: MF Fire
Model Nova 2

Contents, in the following order:

Wood Heater Test Results

ASTM E2780 / ASTM E2515

Manufacturer: MF Fire
Model: Nova 2
Project No.: 0552WS004E
Tracking No.: 2497
Run: 2
Test Date: 03/11/25

Burn-Rate Result

1.31 kg/hr

Particulate Emissions Results

	Average of Trains A and B		First Hour	
	Uncorrected	*Corrected*	*Uncorrected*	*Corrected*
Total Emissions - E_T, g	6.45	6.45	5.03	5.03
Emission Rate, g/hr	**1.33**	1.33	**5.03**	5.03
Emissions Factor, g/kg	1.01	1.01	n/a	n/a

Dilution Tunnel Flow Parameters

		First Hour	Duration of Test
Average Tunnel Temperature, °F		92.6	78.4
Average Tunnel Gas Velocity (vs), feet/second		19.207	19.056
Average Tunnel Gas Flow Rate(Qsd)	DSCF/hr	12618.9	12826.2
	DSCF/m	210.3	213.8
Average Delta p, in. H2O		0.120	0.121
Tunnel Static Pressure, in. H2O		-0.380	-0.380
Total Time of Test, Min		60	292

Particulate Sample Measurement Parameters

	Uncorrected				*Corrected*			
	AMBIENT	Train A	Train B	First Hour	AMBIENT	Train A	Train B	First Hour
Total Sample Volume (V_m), ft^3	45.357	47.148	47.801	9.547	45.357	47.148	47.801	9.547
Average Gas Meter Temperature, °F	79	88	88	72	79	88	88	72
Total Sample Volume (V_{mstd}), DSCF	44.867	45.842	46.092	9.534	44.867	45.842	46.092	9.534
Total Particulates (mn), mg - m_n	0.0	4.5	5.0	3.8	0.0	4.5	5.0	3.8
Particulate Concentration (C_s - C_r), g/DSCF	0.00000	0.00010	0.00011	0.00040	0.00000	0.00010	0.00011	0.00040
Total Particulate Emissions (ET), grams	n/a	6.13	6.77	5.03	n/a	6.13	6.77	5.03
Particulate Emission Rate, g/hr	n/a	1.26	1.39	5.03	n/a	1.26	1.39	5.03
Emissions Factor, g/kg	n/a	0.96	1.06	n/a	n/a	0.96	1.06	n/a
Difference, ET from from Average ET, grams	n/a	-0.32	0.32	n/a	n/a	-0.32	0.32	n/a

Test Methodology Specifications and Quality Checks

Parameter	*Requirement*	*Measured / Observed*			*Complies?*
		First Hour	*Train 1*	*Train 2*	
Filter Temperature, °F	< 90	71	66	65	✓
Filter Face Velocity, fpm	< 30	8.68	8.89	9.00	✓
Dryer Exit Temperature, °F	< 80	59	62	56	✓
Tunnel Velocity, fpm	>800	1,152	1,143		✓
First Hour Leakage Rate	0.006	0.003			✓
Train A Leakage Rate	0.006		0.005		✓
Train B Leakage Rate	0.007			0.001	✓
Leakage Rate Limits (cfm) are < 4% of average sample rate or < 0.01 cfm, which ever is less					
Negative Probe Weight	=> 0	0	0	0.1	✓
Pro-Rate Variation	< 90 for < 10% of θ	0.00%	0.00%	0.00%	✓
	> 110 for < 10% of θ	0.00%	0.000%	0.00%	✓
	# Readings < 80%	0	0	0	✓
	# Readings > 120%	0	0	0	✓
Ambient Temp, °F	> 55		67.3		✓
Ambient Temp, °F	< 90		72.5		✓
Trains A and B Precision	(*A*) < 7.5%		4.99%		✓
Either A or B must conform	(*B*) < 0.5 g/kg		0.10		✓
Stove Surface ΔT	<= 125 °F		90		✓
Room Air Velocity	< 50 fpm		13		✓

OMNI Test Laboratories

Manufacturer:	MF Fire	**Technicians:**	R Tiegs
Model:	Nova 2		
Date:	03/11/25		
Run:	2		
Control #:	2497		
Test Duration:	292		
Output Category:			

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	77.2%	83.5%
Combustion Efficiency	97.8%	97.8%
Heat Transfer Efficiency	79%	85.3%

Output Rate (kJ/h)	20,042	19,012	**(Btu/h)**
Burn Rate (kg/h)	1.31	2.89	**(lb/h)**
Input (kJ/h)	25,948	24,614	**(Btu/h)**

Test Load Weight (dry kg)	6.37	14.05	**dry lb**
MC wet (%)	18.27		
MC dry (%)	22.35		
Particulate (g)	6.45		
CO (g)	214		
Test Duration (h)	4.87		

Emissions	**Particulate**	**CO**
g/MJ Output	0.07	2.20
g/kg Dry Fuel	1.01	33.62
g/h	1.33	44.04
lb/MM Btu Output	0.15	5.11

Air/Fuel Ratio (A/F)	10.85

VERSION: **2.4** **4/15/2010**

Test Fuel Properties

ASTM E2780

Manufacturer : MF Fire
Model : Nova 2
Tracking No. : 2497
Project No. : 0552WS004E
Test Date : 3/11/2025
Run No. : 2

Moisture Meter Cal	
Cal Block	Measured
12.0	12.0
22.0	22.0

Firebox Volume : **2.330** ft^3
% 2 x 4 Required : 35 - 65 %
Ideal Fuel Weight : 16.31 lb.
Minimum Fuel Weight : 14.68 lb.
Maximum Fuel Weight : 17.94 lb.

Fuel Piece Data

PC #	Weight, lb	Size	Length, In	Moisture Readings, Dry Basis %			Average MC, % db	Dry Weight, lb.	Volume, ft3	Wet Weights, lb 4 x 4	Wet Weights, lb 2 x 4	Dry Weights, lb 4 x 4	Dry Weights, lb 2 x 4
1	2.15	2x4	19.13	19.4	20.6	20.9	20.3	1.79	0.0581		2.2		1.79
2	1.97	2x4	19.13	23.8	21.7	24.8	23.4	1.60	0.0581		2.0		1.60
3	2.20	2x4	19.13	23.8	23.8	22.6	23.4	1.78	0.0581		2.2		1.78
4	4.62	4x4	19.13	22.5	21.3	22.5	22.1	3.78	0.1356	4.6		3.78	
5	4.44	4x4	19.13	24.3	21.9	22.4	22.9	3.61	0.1356	4.4		3.61	
6													
7													
8													
9													

Spacer Data

Moisture Readings, Dry Basis % (One reading per spacer)								
19.3	24.9	24.4	20.4					
24.2	21.1	22.1	22.2					
22.2	17.9	20.5	22.5					
21.4	21.7	18.7	24.7					

Avg : 21.8

Assembled Crib Fuel Load with Spacers Attatched

PC #	Weight, lb with Spacers	Size	4 x 4s	2 x 4s
1	5.08	4x4	5.08	
2	4.66	4x4	4.66	
3	2.60	2x4		2.6000
4	2.18	2x4		2.1800
5	2.67	2x4		2.6700
6				
7				
8				
9				

Combined Mass of 4 x 4s 9.7 lb
Combined Mass of 2 x 4s 7.5 lb

Total Wet Mass of Fuel Load **17.2** lb

Fuel Load Properties

Type	*Number of Pieces*	*Wet Weight, lb.*	*Dry Weight, lb.*	*Fuel Loading Density, lb/ft³* Wet Basis	*Fuel Loading Density, lb/ft³* Dry Basis	Dry Fuel Density, lb/ft³	Wet Fuel Density, lb/ft³	*Moisture, %* Dry Basis	*Moisture, %* Wet Basis
2 x 4	3	6.3	5.17	7.38	6.03	28.20	34.52	22.35	18.27
4 x 4	2	9.1	7.40						
Spacers	16	1.8	1.49						
Totals		17.2	14.05						

Compliance Checks

	Fuel Load, Wet Lb.	Load Density, lb/ft³ of FB vol	Fuel Density, lb/ft³	% of Fuel load mass which is 2x4	Fuel Load Peices Mositure, % db
Measured	17.2	7.38	28.20	43	22.4
Required	14.7 - 17.9	6.3 - 7.7	25 - 36	35 - 65	19 -25
Complies ?	Yes	Yes	Yes	Yes	Yes

Dilution Tunnel Velocity Traverse and Supplementary Data

ASTM E2515-11

Run:	2	Tracking No.:	2497
Manufacturer:	MF Fire	Project No.:	0552WS004E
Model:	Nova 2	Test Date:	3/11/2025

Dilution Tunnel Velocity Traverse

Pitot Location

Traverse Point	*% of Diameter*	*Inches into Tunnel*	*dP in. H_2O*	*Tunnel Temp, °F*	*$dP^{1/2}$*
X1	6.7	0.5*	0.070	99.2	0.265
X2	25.0	1.50	0.100	100.2	0.316
X3	75.0	4.50	0.092	100.5	0.303
X4	93.3	5.5*	0.070	97.3	0.265
Y1	6.7	0.5*	0.068	97.4	0.261
Y2	25.0	1.50	0.106	97.7	0.326
Y3	75.0	4.50	0.092	97.7	0.303
Y4	93.3	0.5*	0.050	98	0.224
Center	50.0	3.00	0.120	98.7	0.346

Tunnel Static Pressure	-0.380	*in. H_2O*
Tunnel Moisture	2.00	%
Tunnel Diameter	6.00	inches
Pitot Tube C_p	0.99	inches
Tunnel Molecular Weight	29	(dry)
Tunnel Molecular Weight	28.78	(M_S, wet)
Tunnel Area	0.1963495	ft^2
K_p	85.49	constant
$P_s=P_{bar}$+Tunnel Static	29.702059	in HG

** Probe location must be no closer than 0.50" from tunnel wall*

$$V_{strav} = K_p C_p \sqrt{\Delta p}_{avg} \sqrt{\frac{T_{s,avg}}{P_s M_s}} = 19.3428$$

$$V_{scent} = K_p C_p \sqrt{\Delta p}_{center} \sqrt{\frac{T_{s,center}}{P_s M_s}} = 23.7024$$

$$F_P = V_{strav} / V_{scent} = 0.816$$

$$Initial\ Tunnel\ Velocity, V_s = F_P K_p C_p \sqrt{\Delta p}_{avg} \sqrt{\frac{T_{s,avg}}{P_s M_s}} = 15.785\ ft/sec$$

Supplementary Data and Information

Environment

	Test Start	Test End
Time of Day	12:02	
Barometric Pressure, in. Hg	29.73	29.61
Room Air Velocity, fpm	13	11
Room Air Temperature, °F	72	70
Room Relative Humidity, %	45.0	42.0
Platform Scale Audit, lb.	10.0,20.0	10.0,20.0

Leak Checks

Pitot and associated tubing, (pass/fail)[1]	pass	pass

See sampling box worksheets for sampling boxes

Dillution Tunnel

Date last cleaned	3/10/2025	
Smoke Capture, % (visual)[2]	100	
Draft Inducement, (pass/fail)[3]	pass	
Static Pressure, in. H_2O	-0.380	-0.380

1 Both sides (independantly) of the pitot system are brought under a minimum vacuum of 3 in. H_2O and then sealed. Any indiction of pressure loss is deemed a fail.

2 Create a smoking condition during start of pre-burn activites and using adequate lighting pointed upward and aroud tunnel hood, visually observe if 100% of visible smoke is being captured by the hood. If not, increase flow tunnel flow and / or re-assess chimney proximity to draft hood as required and repeat until 100% capture is observed.

3 With the appliance installed and the dillution tunnel flow turned-off, observe the flue draft gauge while turning the dulution tunnel on. Any detectible response by the draft gauge associated with activation of the tunnel flow indicates that draft inducemnt is occuring. Determine the cause (i.e. flue chimnet too deep into tunnel?) before continuing.

Preburn Data

ASTM E2780

Run: 2

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E
Test Date: 3/11/25
Beginning Clock Time: 8:03

Coal Bed Range (lb):	3.4 (min)	4.3 (max)

Preburn Fuel Data

12 pieces @ 16 inches
11 pieces @ 20 inches
pieces @ inches

Fuel Moisture Readings (% DB):

23.8	21.6	24.2	23			
25.3	23.8	21				
24.6	22.7	22.4				
23.8	20.1	24.8				
22.7	21.6	24.7				

Avg Preburn Moisture (% DB): **23.13**

			Temperatures (°F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H_2O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat Exit	Avg. FB	Stack	Ambient
180	7.5	-0.088	545.2	316.1	239.8	407.8	365.8	1018.9	375	475.3	70.9
181	7.37	-0.089	547.2	317	242	411.1	369.3	1020.2	377	474.9	71
182	7.17	-0.09	549.9	318.1	244	414.3	370.4	1025.8	379	474.9	71.2
183	7.06	-0.089	553.5	318.6	246.1	416.8	374.7	1030.7	382	475.8	71.4
184	6.88	-0.094	553.5	318.8	247.6	420.8	375.3	1032.5	383	476.9	71.6
185	6.74	-0.09	556.5	319.8	248.6	422.3	379.5	1043.2	385	478	71.7
186	6.61	-0.088	560.3	319.9	250.7	424.4	383.5	1059.6	388	480.9	71.7
187	6.47	-0.09	562.4	320.2	251.9	426.7	384.8	1067.6	389	482.1	71.7
188	6.35	-0.088	561	321.1	252.3	428	385.5	1070.2	390	485	72
189	6.24	-0.09	563.5	322.2	253.1	427.5	389.4	1076.2	391	487.3	72.1
190	6.06	-0.085	565.5	322.1	253.7	428	392.7	1072.6	392	489.1	72.3
191	5.96	-0.086	564.6	322.6	254	429.4	393.9	1058.3	393	480.5	72.4
192	5.87	-0.086	564.4	323.3	254.3	429.1	396.9	1055.9	394	482.9	72.6
193	5.75	-0.088	562.5	324.2	254.9	428.9	398.2	1052	394	483.1	72.7
194	5.64	-0.085	560.8	324.8	255.4	428.6	399.3	1042.9	394	481.5	72.8
195	5.55	-0.085	558.4	326.1	255.6	430.1	401.5	1034.2	394	479.6	72.9
196	5.45	-0.085	551.1	327	254.7	430	400	1027.1	393	477.9	73.1
197	5.33	-0.085	548.2	327.6	254.9	429.5	404.2	1022.3	393	475.1	73.2
198	5.25	-0.083	542.3	327.5	254.9	429.1	402.6	1014.5	391	472.9	73.2
199	5.18	-0.083	535.6	328.5	255.5	428.1	406.7	994.2	391	469.5	73.3
200	5.08	-0.08	530.5	328.9	255.3	428	407.8	973.1	390	465	73.4
201	5.04	-0.082	521.2	329.2	254.5	427.9	403.9	956.1	387	460	73.6
202	4.97	-0.08	514.4	331.2	254	427.5	407.6	942.3	387	455.4	73.6
203	4.88	-0.08	508.5	331.8	253.1	427.4	411	931.6	386	452.5	73.7
204	4.84	-0.079	499.4	331.8	252.8	426.7	414.2	921.1	385	449.2	73.7
205	4.76	-0.077	493.1	333	252.2	425.6	410.5	910.6	383	444.9	73.7
206	4.71	-0.079	482.6	333.9	251.1	425.4	414.7	898.2	382	441.4	73.7
207	4.67	-0.075	475.7	335.5	250	424.1	414.7	887.9	380	437.4	73.7
208	4.63	-0.075	465.3	335.9	248.7	423.9	412	877	377	432.5	73.4
209	4.56	-0.079	459.1	337.4	246.8	422.2	414.1	866.9	376	428.8	73.7
210	4.55	-0.077	451.7	339	245.3	422	411.5	857.5	374	424.3	73.7
211	4.49	-0.073	442.5	339.4	243.7	421.3	410.9	848.2	372	420.5	73.7
212	4.47	-0.075	432.8	340.2	242	419	410.4	839.7	369	416.8	73.7
213	4.44	-0.072	428	341.2	240.2	418.8	409.5	831.5	368	414	73.7
214	4.36	-0.077	419.6	341.8	238.2	417.9	412.2	824.4	366	410.2	73.7
215	4.36	-0.072	413.7	343.1	236.7	415.8	409.9	818.7	364	407.8	73.6
216	4.29	-0.07	406.9	343.5	234.6	415.3	409.4	813.5	362	405.7	73.7
217	4.29	-0.077	402.3	344.2	232.9	413.7	408.9	808.6	360	404.3	73.6
218	4.23	-0.075	396.9	344.6	231.6	412.4	408	804.3	359	401.4	73.6
219	4.18	-0.073	392.9	346	229.9	410.6	403.6	799.8	357	400.4	73.6
220	4.16	-0.07	388.8	346	228.3	411.2	404.3	796.1	356	398	73.5
221	4.1	-0.071	385.8	346.8	226.6	410.4	405.4	792.6	355	396.2	73.4
222	4.07	-0.074	382.8	349	225.2	407.6	402.4	789.6	353	395.5	73.4

			Temperatures (°F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H_2O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat Exit	Avg. FB	Stack	Ambient
223	4.04	-0.071	381.3	348.8	224.1	408.1	399.5	787	352	393.6	73.4
224	3.98	-0.067	378	350.1	222.4	406.5	399.6	784.4	351	392.5	73.3
225	3.97	-0.07	374.2	350.5	220.9	406	396.1	782	350	391.8	73.3
226	3.91	-0.07	371.9	350.6	220	404.5	394.8	780.4	348	390.7	73.4
227	3.86	-0.073	369	350.6	218.5	402.7	397	778.3	348	389.9	73.3
228	3.87	-0.069	367	350.9	217.6	400.7	395.7	776.7	346	388.7	73.2
229	3.79	-0.07	364.2	351	216.7	400.3	393.3	774.9	345	387.1	72.7
230	3.77	-0.075	362.8	352.9	216.1	401.5	390.8	771.6	345	386.4	72.9
231	3.77	-0.068	360.6	352.1	214.8	399.9	387.4	765.2	343	383.6	72.8
232	3.7	-0.071	356.6	352.6	214	398.3	387.8	760.7	342	381.1	72.7
233	3.68	-0.071	354.5	353	212.7	398	388.2	757.4	341	379.4	72.7
234	3.64	-0.067	350.8	354.9	211.3	398.4	385.9	754.3	340	377.9	72.7
235	3.6	-0.07	349.4	356.7	210	398.6	383.4	750.8	340	375.7	72.6
236	3.58	-0.069	344.3	356	212.4	397.9	384.6	708.9	339	394.8	72.6
237	3.56	-0.069	339	356.8	211.4	395.9	381.8	704	337	373.3	72.7
238	3.55	-0.065	333.4	358.3	209.1	397.1	378.5	711.7	335	369	72.6
239	3.51	-0.067	329.9	360	206.2	396.3	377.6	712.8	334	365.9	72.5

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Test Start Time: 12:02
Test Length: 292 min
Recording Interval: 1 min

Sample Train Leak Checks

Pre-test	0.002	cfm @	15.15	in. Hg
Post-Test	0.005	cfm @	5.5	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
Tot / Avg		17.2	**47.148**	**0.161**	**1.23**	**88.0**	**2.12**	**65.73**	**61.52**	**69.95**	**100.0**	**78.4**	**0.121**	**0.347**	**19.06**
Minimum	0.0	0.0	0.000	0.138	-0.01	72	0.05	63	50	67	91.0	72	0.114	0.338	18.67
Max	17.2	0.3	47.148	0.166	1.27	92	2.28	69	62	73	108.4	121	0.126	0.355	19.61
0	17.2		0.000		-0.01	72	0.05	62.8	50.1	73		88	0.116	0.341	19.54
1	17.2	0.0	0.138	0.138	1.24	72	2.23	64.1	54.9	72	91.0	121	0.116	0.341	19.13
2	17.1	0.1	0.298	0.160	1.23	72	2.18	65	56.1	72	108.4	120	0.121	0.348	19.61
3	17.0	0.1	0.455	0.157	1.22	72	2.19	65.4	56.8	72	104.6	116	0.117	0.342	19.61
4	16.9	0.1	0.615	0.160	1.23	72	2.10	65.4	57.3	72	105.5	97	0.117	0.342	19.26
5	16.8	0.0	0.774	0.159	1.22	72	2.16	65.2	57.7	72	103.7	92	0.120	0.346	19.17
6	16.8	0.1	0.931	0.157	1.22	72	2.15	65.1	57.9	71	101.5	90	0.123	0.351	19.34
7	16.7	0.1	1.091	0.160	1.21	72	2.15	65.1	58.1	71	102.8	88	0.119	0.345	19.27
8	16.6	0.0	1.248	0.157	1.21	72	2.14	65.1	58.3	71	101.1	87	0.121	0.348	19.17
9	16.6	0.1	1.405	0.157	1.21	72	2.12	65.2	58.5	71	101.1	87	0.120	0.346	19.20
10	16.5	0.1	1.564	0.159	1.21	72	2.12	65.1	58.7	71	102.0	86	0.123	0.351	19.27
11	16.4	0.1	1.721	0.157	1.22	72	2.11	65.2	58.8	71	100.2	86	0.123	0.351	19.38
12	16.3	0.1	1.879	0.158	1.20	73	2.11	65.3	58.9	70	100.7	86	0.121	0.348	19.30
13	16.2	0.2	2.036	0.157	1.20	73	2.14	65.3	59.1	70	100.8	87	0.118	0.344	19.11
14	16.0	0.1	2.191	0.155	1.20	73	2.14	65.3	59.4	70	100.3	88	0.119	0.345	19.05
15	15.8	0.2	2.349	0.158	1.19	73	2.10	65.7	59.8	70	102.5	90	0.119	0.345	19.11
16	15.7	0.2	2.504	0.155	1.18	73	2.11	65.7	60	70	100.7	91	0.118	0.344	19.10
17	15.4	0.3	2.661	0.157	1.19	73	2.15	66.1	60.2	70	101.9	93	0.121	0.348	19.20
18	15.1	0.2	2.816	0.155	1.19	73	2.10	66.3	60.4	70	100.4	94	0.120	0.346	19.31
19	14.9	0.3	2.972	0.156	1.18	74	2.14	66.6	60.6	69	100.9	96	0.121	0.348	19.34
20	14.6	0.3	3.128	0.156	1.18	74	2.10	66.9	60.7	69	101.2	97	0.118	0.344	19.28
21	14.3	0.3	3.283	0.155	1.17	74	2.14	67.1	60.7	69	100.6	98	0.123	0.351	19.38
22	14.1	0.3	3.440	0.157	1.22	74	2.24	67.4	60.8	70	101.6	99	0.119	0.345	19.44
23	13.8	0.3	3.598	0.158	1.22	74	2.21	67.5	60.9	69	102.8	99	0.117	0.342	19.21
24	13.6	0.3	3.758	0.160	1.22	75	2.18	67.7	60.9	70	104.7	100	0.119	0.345	19.21
25	13.3	0.3	3.917	0.159	1.23	75	2.24	67.8	61	70	104.3	100	0.115	0.339	19.14
26	13.0	0.2	4.075	0.158	1.22	75	2.13	67.9	61.1	70	103.8	101	0.120	0.346	19.19
27	12.8	0.3	4.236	0.161	1.22	75	2.23	68.1	61.2	70	105.1	101	0.120	0.346	19.40
28	12.5	0.3	4.394	0.158	1.23	76	2.23	68.2	61.3	70	102.2	102	0.123	0.351	19.53
29	12.3	0.3	4.551	0.157	1.21	76	2.22	68.2	61.3	70	101.3	102	0.119	0.345	19.50
30	12.0	0.3	4.710	0.159	1.20	76	2.25	68.3	61.3	70	103.1	102	0.120	0.346	19.38
31	11.8	0.2	4.869	0.159	1.22	77	2.23	68.4	61.4	70	103.3	103	0.120	0.346	19.43
32	11.5	0.3	5.027	0.158	1.20	77	2.19	68.5	61.5	70	102.9	104	0.116	0.341	19.28
33	11.2	0.3	5.185	0.158	1.20	77	2.24	68.6	61.5	70	103.9	104	0.115	0.339	19.08
34	11.0	0.3	5.344	0.159	1.22	77	2.23	68.7	61.4	70	104.8	104	0.119	0.345	19.21
35	10.7	0.2	5.501	0.157	1.19	78	2.17	68.8	61.5	70	103.2	105	0.114	0.338	19.17
36	10.5	0.3	5.660	0.159	1.21	78	2.22	69	61.4	70	104.9	105	0.116	0.341	19.05
37	10.2	0.3	5.817	0.157	1.22	78	2.16	68.5	61.2	71	103.3	100	0.116	0.341	19.09
38	10.1	0.2	5.974	0.157	1.22	79	2.18	68.2	61.3	71	101.9	95	0.121	0.348	19.21
39	9.9	0.1	6.133	0.159	1.21	79	2.14	67.8	61.5	71	102.0	92	0.119	0.345	19.27
40	9.8	0.2	6.294	0.161	1.19	79	2.23	67.4	61.6	71	102.8	90	0.121	0.348	19.23

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 12:02
Test Length: 292 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	15.15	in. Hg
Post-Test	0.005	cfm @	5.5	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
41	9.7	0.1	6.448	0.154	1.20	79	2.24	67.2	61.6	71	98.3	89	0.118	0.344	19.17
42	9.5	0.1	6.608	0.160	1.21	80	2.25	67.1	61.7	72	102.0	88	0.121	0.348	19.15
43	9.4	0.1	6.765	0.157	1.21	80	2.18	67.2	61.7	71	99.8	87	0.120	0.346	19.21
44	9.3	0.1	6.923	0.158	1.20	80	2.28	67	61.7	72	100.2	86	0.120	0.346	19.16
45	9.2	0.1	7.082	0.159	1.22	80	2.12	66.7	61.8	72	100.7	86	0.121	0.348	19.18
46	9.1	0.1	7.240	0.158	1.20	81	2.19	66.5	61.8	72	100.0	85	0.119	0.345	19.13
47	9.0	0.1	7.399	0.159	1.21	81	2.14	66.2	61.8	72	100.5	84	0.122	0.349	19.16
48	9.0	0.1	7.558	0.159	1.21	81	2.25	66	61.8	72	100.1	84	0.121	0.348	19.23
49	8.9	0.1	7.715	0.157	1.20	81	2.24	65.7	61.8	72	98.7	83	0.121	0.348	19.18
50	8.8	0.1	7.875	0.160	1.22	82	2.20	65.6	61.8	72	100.7	83	0.120	0.346	19.13
51	8.7	0.1	8.034	0.159	1.21	82	2.24	65.4	61.8	72	100.2	83	0.120	0.346	19.09
52	8.6	0.1	8.192	0.158	1.21	82	2.09	65.4	61.7	72	99.5	82	0.121	0.348	19.12
53	8.5	0.1	8.353	0.161	1.23	82	2.25	65.4	61.7	72	100.9	82	0.122	0.349	19.19
54	8.5	0.0	8.514	0.161	1.21	83	2.21	65.5	61.7	72	100.6	81	0.121	0.348	19.18
55	8.3	0.1	8.671	0.157	1.22	83	2.14	65.6	61.6	72	97.9	81	0.124	0.352	19.25
56	8.3	0.1	8.829	0.158	1.23	83	2.24	65.7	61.6	72	98.2	81	0.121	0.348	19.25
57	8.2	0.1	8.990	0.161	1.22	83	2.23	65.7	61.5	72	100.3	81	0.121	0.348	19.13
58	8.1	0.1	9.150	0.160	1.23	84	2.24	65.8	61.5	72	100.1	80	0.120	0.346	19.08
59	8.1	0.1	9.309	0.159	1.21	84	2.22	65.8	61.5	72	99.6	80	0.120	0.346	19.04
60	8.0	0.1	9.469	0.160	1.22	84	2.07	65.9	61.5	72	100.1	80	0.121	0.348	19.08
61	7.9	0.1	9.630	0.161	1.23	84	2.14	65.9	61.5	72	100.8	81	0.119	0.345	19.04
62	7.8	0.1	9.790	0.160	1.24	84	2.06	65.9	61.4	72	100.2	80	0.121	0.348	19.04
63	7.7	0.1	9.949	0.159	1.24	85	2.17	65.9	61.3	72	99.3	80	0.121	0.348	19.11
64	7.6	0.1	10.111	0.162	1.23	85	2.07	65.9	61.1	72	101.3	80	0.118	0.344	18.99
65	7.6	0.1	10.272	0.161	1.23	85	2.15	66	61	72	100.9	80	0.121	0.348	18.99
66	7.5	0.1	10.434	0.162	1.23	85	2.09	66	60.6	72	101.4	80	0.119	0.345	19.03
67	7.4	0.1	10.595	0.161	1.24	85	2.05	66	60.2	72	100.4	80	0.123	0.351	19.11
68	7.3	0.1	10.755	0.160	1.23	86	2.22	66	59.9	72	99.6	80	0.118	0.344	19.07
69	7.2	0.1	10.918	0.163	1.24	86	2.17	65.9	59.6	72	101.8	80	0.121	0.348	18.99
70	7.1	0.1	11.076	0.158	1.24	86	2.04	66	59.5	72	98.4	79	0.122	0.349	19.14
71	7.1	0.1	11.236	0.160	1.25	86	2.12	66	59.5	72	99.2	79	0.121	0.348	19.14
72	7.0	0.1	11.397	0.161	1.23	86	2.04	66.1	59.6	72	99.9	79	0.121	0.348	19.10
73	6.9	0.1	11.559	0.162	1.24	86	2.13	66.1	59.7	72	100.4	79	0.123	0.351	19.18
74	6.8	0.1	11.720	0.161	1.24	86	2.07	66	59.7	72	99.5	79	0.121	0.348	19.18
75	6.7	0.1	11.881	0.161	1.23	87	2.21	66	59.7	72	99.6	79	0.122	0.349	19.14
76	6.7	0.1	12.041	0.160	1.22	87	2.11	66	59.6	71	98.7	79	0.125	0.354	19.30
77	6.6	0.1	12.204	0.163	1.24	87	2.07	66	59.6	72	100.2	79	0.120	0.346	19.21
78	6.5	0.0	12.365	0.161	1.24	87	2.03	66	59.5	72	99.8	79	0.119	0.345	18.97
79	6.5	0.0	12.527	0.162	1.23	87	2.15	66	59.5	72	100.7	78	0.123	0.351	19.09
80	6.4	0.1	12.690	0.163	1.22	87	2.05	66	59.4	72	100.9	79	0.119	0.345	19.09
81	6.3	0.1	12.851	0.161	1.24	88	2.22	66.1	59.4	72	99.7	79	0.123	0.351	19.09
82	6.3	0.0	13.013	0.162	1.24	88	2.21	66	59.3	72	100.1	79	0.120	0.346	19.13
83	6.2	0.1	13.175	0.162	1.24	88	2.21	66	59.4	72	99.9	78	0.124	0.352	19.17
84	6.1	0.1	13.333	0.158	1.23	88	2.04	66.1	59.4	72	97.0	78	0.123	0.351	19.28

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 12:02
Test Length: 292 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	15.15	in. Hg
Post-Test	0.005	cfm @	5.5	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
85	6.1	0.0	13.494	0.161	1.24	88	2.21	66.1	59.6	71	98.8	78	0.121	0.348	19.16
86	6.0	0.1	13.657	0.163	1.25	88	2.22	66.1	59.8	71	100.5	79	0.122	0.349	19.13
87	5.9	0.1	13.818	0.161	1.24	88	2.04	66	60.1	71	99.6	79	0.118	0.344	19.01
88	5.9	0.0	13.980	0.162	1.25	88	2.20	66.1	60.3	71	100.9	79	0.119	0.345	18.89
89	5.8	0.1	14.141	0.161	1.24	89	2.08	66.1	60.5	71	100.3	78	0.120	0.346	18.97
90	5.7	0.1	14.302	0.161	1.23	89	2.19	66	60.7	71	99.9	78	0.121	0.348	19.04
91	5.7	0.0	14.465	0.163	1.24	89	2.17	66	60.9	71	100.9	78	0.120	0.346	19.04
92	5.6	0.1	14.627	0.162	1.24	89	2.18	66	61	71	99.9	78	0.124	0.352	19.16
93	5.5	0.1	14.791	0.164	1.26	89	2.20	66.1	61.1	71	100.4	78	0.124	0.352	19.32
94	5.4	0.0	14.952	0.161	1.24	89	2.16	66	61.1	71	98.4	78	0.121	0.348	19.20
95	5.4	0.1	15.113	0.161	1.23	89	2.05	66	61.2	71	99.3	78	0.118	0.344	18.96
96	5.3	0.1	15.275	0.162	1.25	89	2.10	66	61.3	71	100.6	78	0.120	0.346	18.92
97	5.3	0.0	15.435	0.160	1.26	89	2.01	66	61.3	71	99.0	78	0.123	0.351	19.12
98	5.2	0.1	15.596	0.161	1.23	89	2.02	66	61.4	71	99.3	78	0.118	0.344	19.04
99	5.2	0.0	15.757	0.161	1.23	89	2.10	66	61.4	71	99.8	78	0.120	0.346	18.92
100	5.1	0.1	15.919	0.162	1.25	90	2.13	66.1	61.5	71	100.1	78	0.124	0.352	19.15
101	5.0	0.1	16.082	0.163	1.24	90	2.22	66	61.5	71	100.1	78	0.119	0.345	19.12
102	5.0	0.0	16.244	0.162	1.24	90	2.21	66	61.6	70	99.9	78	0.121	0.348	18.99
103	4.9	0.1	16.406	0.162	1.24	90	2.23	66	61.6	71	100.0	78	0.121	0.348	19.07
104	4.8	0.0	16.567	0.161	1.23	90	2.02	66	61.6	71	99.3	77	0.120	0.346	19.03
105	4.8	0.1	16.728	0.161	1.25	90	2.18	65.9	61.6	71	99.1	77	0.123	0.351	19.10
106	4.7	0.0	16.892	0.164	1.24	90	2.03	66	61.7	71	100.5	77	0.122	0.349	19.18
107	4.7	0.0	17.056	0.164	1.25	90	2.07	65.9	61.7	71	100.6	77	0.120	0.346	19.06
108	4.6	0.1	17.218	0.162	1.24	90	2.08	65.9	61.8	71	99.7	77	0.122	0.349	19.07
109	4.6	0.0	17.380	0.162	1.23	90	2.21	65.8	61.8	71	99.3	76	0.123	0.351	19.18
110	4.5	0.1	17.541	0.161	1.24	90	2.01	65.8	61.8	71	98.5	76	0.121	0.348	19.13
111	4.4	0.0	17.703	0.162	1.22	90	2.19	65.8	61.8	71	99.5	77	0.120	0.346	19.01
112	4.4	0.0	17.864	0.161	1.24	90	2.03	65.8	61.8	71	99.1	77	0.122	0.349	19.06
113	4.3	0.1	18.025	0.161	1.23	90	2.22	65.8	61.8	71	98.7	76	0.123	0.351	19.17
114	4.3	0.0	18.187	0.162	1.24	90	2.04	65.8	61.8	71	99.0	76	0.121	0.348	19.13
115	4.2	0.1	18.349	0.162	1.23	90	2.13	65.8	61.8	71	99.2	76	0.123	0.351	19.13
116	4.1	0.1	18.511	0.162	1.23	90	2.15	65.7	61.8	71	99.2	76	0.121	0.348	19.12
117	4.1	0.1	18.674	0.163	1.23	91	2.05	65.8	61.9	71	100.0	76	0.120	0.346	19.00
118	4.1	0.0	18.836	0.162	1.23	91	2.13	65.8	61.9	71	99.4	76	0.124	0.352	19.12
119	4.0	0.1	18.998	0.162	1.25	90	2.11	65.7	61.9	71	99.0	76	0.121	0.348	19.16
120	3.9	0.1	19.163	0.165	1.24	91	2.22	65.7	61.9	71	100.5	76	0.126	0.355	19.24
121	3.9	0.1	19.324	0.161	1.24	91	2.02	65.7	61.9	71	97.8	76	0.122	0.349	19.28
122	3.8	0.0	19.487	0.163	1.22	91	2.06	65.7	61.9	71	99.6	76	0.119	0.345	19.00
123	3.8	0.1	19.650	0.163	1.25	91	2.20	65.7	62	71	100.4	76	0.121	0.348	18.96
124	3.8	0.0	19.813	0.163	1.23	91	2.21	65.6	61.9	71	100.3	76	0.121	0.348	19.04
125	3.7	0.1	19.975	0.162	1.26	91	2.07	65.7	62	71	99.4	76	0.121	0.348	19.04
126	3.7	0.0	20.133	0.158	1.24	91	2.15	65.6	62	71	96.8	76	0.122	0.349	19.08
127	3.6	0.0	20.296	0.163	1.25	91	2.01	65.6	61.9	70	99.4	75	0.125	0.354	19.23
128	3.6	0.0	20.459	0.163	1.25	91	2.19	65.6	61.9	70	99.4	75	0.117	0.342	19.03

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 12:02
Test Length: 292 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	15.15	in. Hg
Post-Test	0.005	cfm @	5.5	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
129	3.6	0.0	20.622	0.163	1.24	91	2.05	65.6	62	70	100.1	75	0.123	0.351	18.95
130	3.5	0.0	20.784	0.162	1.24	91	2.21	65.6	62	70	99.1	75	0.123	0.351	19.18
131	3.5	0.1	20.945	0.161	1.23	91	2.02	65.5	62	70	98.0	75	0.122	0.349	19.14
132	3.5	0.0	21.107	0.162	1.24	91	2.22	65.6	62	70	99.1	75	0.119	0.345	18.98
133	3.4	0.0	21.273	0.166	1.23	91	2.19	65.6	62	70	102.1	75	0.120	0.346	18.90
134	3.4	0.0	21.436	0.163	1.24	91	2.15	65.6	61.9	70	100.3	75	0.121	0.348	18.98
135	3.4	0.0	21.599	0.163	1.25	91	2.09	65.6	61.9	69	100.1	75	0.120	0.346	18.99
136	3.3	0.1	21.761	0.162	1.24	91	2.00	65.6	61.9	70	100.1	75	0.115	0.339	18.75
137	3.3	0.0	21.923	0.162	1.24	91	2.21	65.6	61.8	70	100.7	75	0.120	0.346	18.75
138	3.2	0.1	22.085	0.162	1.24	91	2.19	65.6	61.7	70	100.1	75	0.121	0.348	18.99
139	3.2	0.0	22.246	0.161	1.25	91	2.07	65.7	61.8	70	98.8	75	0.121	0.348	19.03
140	3.2	0.0	22.409	0.163	1.25	92	2.20	65.6	61.8	70	99.9	75	0.121	0.348	19.03
141	3.1	0.0	22.571	0.162	1.24	91	2.20	65.6	61.8	70	98.8	75	0.125	0.354	19.18
142	3.1	0.0	22.734	0.163	1.26	92	2.20	65.6	61.9	70	98.9	75	0.122	0.349	19.22
143	3.1	0.0	22.895	0.161	1.23	92	2.14	65.6	61.9	70	98.2	75	0.119	0.345	18.98
144	3.1	0.0	23.057	0.162	1.25	92	2.20	65.6	61.9	70	99.5	75	0.121	0.348	18.94
145	3.0	0.1	23.223	0.166	1.24	92	2.07	65.6	61.9	70	102.1	75	0.119	0.345	18.94
146	3.0	0.0	23.387	0.164	1.25	92	2.04	65.6	61.9	70	100.7	74	0.122	0.349	18.98
147	3.0	0.0	23.549	0.162	1.22	92	2.18	65.6	62	70	99.3	74	0.120	0.346	19.01
148	2.9	0.1	23.711	0.162	1.26	92	2.03	65.6	62	70	99.1	74	0.122	0.349	19.01
149	2.9	0.0	23.874	0.163	1.24	92	2.02	65.6	62	70	99.8	74	0.119	0.345	18.97
150	2.9	0.0	24.036	0.162	1.24	91	2.03	65.5	62	70	99.9	74	0.117	0.342	18.77
151	2.8	0.1	24.198	0.162	1.23	92	2.10	65.5	62	70	100.1	74	0.122	0.349	18.89
152	2.8	0.0	24.362	0.164	1.24	92	2.17	65.5	62	70	100.6	74	0.121	0.348	19.05
153	2.7	0.0	24.522	0.160	1.25	92	2.08	65.5	62.1	70	98.1	74	0.118	0.344	18.89
154	2.7	0.0	24.685	0.163	1.25	92	2.03	65.5	62.1	70	100.5	74	0.120	0.346	18.85
155	2.7	0.0	24.847	0.162	1.24	92	2.14	65.6	62.1	70	99.6	74	0.122	0.349	19.01
156	2.6	0.1	25.009	0.162	1.24	92	2.18	65.6	62.1	70	99.0	75	0.121	0.348	19.06
157	2.6	0.0	25.172	0.163	1.24	92	2.02	65.5	62.1	70	99.9	74	0.118	0.344	18.90
158	2.6	0.0	25.335	0.163	1.24	92	2.03	65.5	62.1	70	100.8	74	0.117	0.342	18.74
159	2.6	0.0	25.501	0.166	1.24	92	2.15	65.5	62.1	70	102.7	74	0.121	0.348	18.85
160	2.5	0.0	25.663	0.162	1.25	92	2.12	65.5	62.2	70	99.5	74	0.121	0.348	19.01
161	2.5	0.0	25.826	0.163	1.25	92	2.06	65.5	62.1	70	99.3	74	0.125	0.354	19.17
162	2.4	0.0	25.988	0.162	1.23	92	2.08	65.5	62.1	70	98.3	74	0.121	0.348	19.17
163	2.5	0.0	26.151	0.163	1.26	92	2.15	65.5	62.2	70	99.2	74	0.122	0.349	19.05
164	2.4	0.1	26.315	0.164	1.25	92	2.05	65.5	62.1	70	99.9	74	0.123	0.351	19.13
165	2.4	0.0	26.478	0.163	1.25	92	2.15	65.5	62.1	70	98.9	74	0.124	0.352	19.20
166	2.4	0.0	26.637	0.159	1.24	92	2.14	65.5	62.1	70	96.5	74	0.120	0.346	19.09
167	2.3	0.1	26.800	0.163	1.26	92	2.16	65.5	62.2	70	99.5	74	0.122	0.349	19.01
168	2.3	0.0	26.962	0.162	1.26	92	2.17	65.5	62.2	70	99.1	74	0.120	0.346	19.01
169	2.3	0.0	27.125	0.163	1.24	92	2.05	65.5	62.2	70	99.7	74	0.122	0.349	19.01
170	2.2	0.1	27.289	0.164	1.25	92	2.19	65.5	62.2	70	100.3	74	0.120	0.346	19.01
171	2.2	0.0	27.454	0.165	1.26	92	2.12	65.5	62.2	70	100.8	74	0.123	0.351	19.05
172	2.2	0.0	27.617	0.163	1.24	92	2.11	65.5	62.2	70	99.4	74	0.121	0.348	19.09

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 12:02
Test Length: 292 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	15.15	in. Hg
Post-Test	0.005	cfm @	5.5	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
173	2.2	0.0	27.780	0.163	1.26	92	2.14	65.5	62.1	70	99.7	74	0.119	0.345	18.93
174	2.1	0.1	27.942	0.162	1.24	92	2.18	65.5	62.2	69	99.3	74	0.123	0.351	19.01
175	2.1	0.0	28.104	0.162	1.24	92	2.08	65.5	62.2	70	98.8	74	0.122	0.349	19.13
176	2.1	0.0	28.267	0.163	1.24	92	2.10	65.6	62.2	70	99.6	74	0.118	0.344	18.93
177	2.0	0.0	28.431	0.164	1.26	92	2.05	65.5	62.2	70	100.6	74	0.123	0.351	18.97
178	2.0	0.0	28.594	0.163	1.25	92	2.17	65.5	62.2	70	99.6	74	0.121	0.348	19.09
179	2.0	0.0	28.757	0.163	1.24	92	2.15	65.6	62.2	70	99.5	74	0.121	0.348	19.01
180	2.0	0.0	28.920	0.163	1.25	92	2.05	65.6	62.2	70	99.3	74	0.125	0.354	19.17
181	1.9	0.1	29.079	0.159	1.24	92	2.07	65.6	62.2	70	96.6	74	0.119	0.345	19.09
182	1.9	0.0	29.242	0.163	1.24	92	2.05	65.5	62.2	70	99.5	74	0.122	0.349	18.97
183	1.9	0.0	29.406	0.164	1.24	92	2.10	65.5	62.2	70	100.4	74	0.120	0.346	19.01
184	1.9	0.0	29.569	0.163	1.27	92	2.07	65.5	62.2	70	99.7	74	0.121	0.348	18.97
185	1.9	0.0	29.734	0.165	1.24	92	2.17	65.5	62.2	70	101.3	74	0.118	0.344	18.89
186	1.8	0.0	29.897	0.163	1.25	92	2.14	65.5	62.3	70	100.0	74	0.123	0.351	18.96
187	1.8	0.0	30.059	0.162	1.24	92	2.04	65.4	62.3	70	98.9	74	0.121	0.348	19.08
188	1.8	0.0	30.222	0.163	1.25	92	2.05	65.4	62.3	70	99.5	74	0.120	0.346	18.96
189	1.8	0.0	30.385	0.163	1.25	92	2.09	65.4	62.3	70	99.6	74	0.123	0.351	19.04
190	1.8	0.0	30.549	0.164	1.25	92	2.03	65.4	62.3	70	99.7	74	0.123	0.351	19.16
191	1.7	0.0	30.712	0.163	1.25	92	2.18	65.4	62.3	70	99.1	74	0.120	0.346	19.04
192	1.7	0.0	30.874	0.162	1.23	92	2.17	65.4	62.3	70	99.0	74	0.121	0.348	18.96
193	1.7	0.0	31.037	0.163	1.24	92	2.03	65.4	62.3	70	99.7	74	0.121	0.348	19.00
194	1.7	0.0	31.199	0.162	1.26	92	2.16	65.4	62.2	70	99.1	74	0.120	0.346	18.96
195	1.7	0.0	31.360	0.161	1.25	92	2.02	65.4	62.3	70	99.0	74	0.117	0.342	18.80
196	1.7	0.0	31.523	0.163	1.25	92	2.14	65.4	62.3	69	100.7	74	0.119	0.345	18.76
197	1.6	0.0	31.686	0.163	1.24	92	2.12	65.3	62.2	69	100.4	73	0.121	0.348	18.92
198	1.6	0.0	31.851	0.165	1.24	92	2.00	65.3	62.2	69	101.0	73	0.121	0.348	19.00
199	1.6	0.0	32.014	0.163	1.25	92	2.01	65.3	62.2	70	99.6	73	0.121	0.348	19.00
200	1.6	0.0	32.176	0.162	1.24	92	2.01	65.3	62.2	69	99.3	73	0.118	0.344	18.88
201	1.6	0.0	32.338	0.162	1.24	92	2.18	65.3	62.2	70	99.6	73	0.121	0.348	18.88
202	1.5	0.1	32.502	0.164	1.21	92	2.17	65.3	62.2	69	100.6	73	0.120	0.346	18.96
203	1.5	0.0	32.665	0.163	1.24	92	2.05	65.3	62.2	69	99.9	73	0.120	0.346	18.92
204	1.5	0.0	32.828	0.163	1.24	92	2.08	65.3	62.2	69	99.6	73	0.124	0.352	19.08
205	1.5	0.0	32.991	0.163	1.23	92	2.02	65.3	62.2	69	98.8	73	0.123	0.351	19.19
206	1.4	0.0	33.153	0.162	1.24	92	2.00	65.4	62.2	69	98.0	73	0.123	0.351	19.15
207	1.4	0.0	33.315	0.162	1.24	92	2.15	65.3	62.2	69	98.3	73	0.121	0.348	19.07
208	1.4	0.0	33.478	0.163	1.25	92	2.21	65.3	62.2	69	99.2	73	0.122	0.349	19.03
209	1.4	0.0	33.639	0.161	1.23	92	2.22	65.3	62.2	69	98.0	73	0.122	0.349	19.07
210	1.4	0.0	33.801	0.162	1.24	92	2.11	65.3	62.2	69	98.4	73	0.123	0.351	19.11
211	1.4	0.0	33.966	0.165	1.24	92	2.03	65.2	62.2	69	100.3	73	0.120	0.346	19.03
212	1.3	0.0	34.129	0.163	1.24	92	2.16	65.3	62.2	69	99.4	73	0.122	0.349	18.99
213	1.3	0.1	34.291	0.162	1.23	92	2.04	65.2	62.2	69	98.9	73	0.120	0.346	18.99
214	1.3	0.0	34.454	0.163	1.25	92	2.17	65.2	62.2	69	99.3	73	0.124	0.352	19.06
215	1.3	0.0	34.618	0.164	1.25	92	1.99	65.3	62.2	69	99.8	73	0.119	0.345	19.02
216	1.3	0.0	34.780	0.162	1.23	92	2.07	65.3	62.3	69	99.1	73	0.120	0.346	18.87

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 12:02
Test Length: 292 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	15.15	in. Hg
Post-Test	0.005	cfm @	5.5	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
217	1.3	0.0	34.943	0.163	1.25	92	2.17	65.2	62.3	69	100.2	73	0.118	0.344	18.83
218	1.2	0.0	35.105	0.162	1.24	92	2.05	65.2	62.3	69	99.3	73	0.124	0.352	18.99
219	1.2	0.0	35.268	0.163	1.24	92	1.99	65.2	62.2	69	99.3	73	0.120	0.346	19.07
220	1.2	0.0	35.430	0.162	1.24	92	2.21	65.2	62.3	69	98.9	73	0.120	0.346	18.91
221	1.2	0.0	35.594	0.164	1.26	92	2.00	65.2	62.2	69	100.5	73	0.120	0.346	18.91
222	1.2	0.0	35.754	0.160	1.23	92	2.19	65.2	62.2	69	98.4	73	0.117	0.342	18.79
223	1.1	0.0	35.919	0.165	1.24	92	2.06	65.2	62.2	69	101.4	73	0.124	0.352	18.94
224	1.1	0.0	36.082	0.163	1.25	92	2.15	65.2	62.2	69	99.3	73	0.121	0.348	19.10
225	1.1	0.0	36.244	0.162	1.24	92	2.02	65.3	62.3	69	98.7	73	0.120	0.346	18.95
226	1.1	0.0	36.406	0.162	1.24	92	2.05	65.3	62.3	69	99.3	73	0.119	0.345	18.87
227	1.1	0.0	36.570	0.164	1.25	92	2.12	65.3	62.2	69	100.5	73	0.122	0.349	18.95
228	1.1	0.0	36.733	0.163	1.23	92	1.98	65.3	62.3	69	99.9	73	0.117	0.342	18.87
229	1.1	0.0	36.896	0.163	1.25	92	2.20	65.3	62.3	69	100.7	73	0.117	0.342	18.67
230	1.0	0.0	37.058	0.162	1.23	92	2.09	65.3	62.3	69	100.6	73	0.117	0.342	18.67
231	1.0	0.0	37.220	0.162	1.24	92	2.05	65.3	62.3	69	100.1	73	0.121	0.348	18.83
232	1.0	0.0	37.382	0.162	1.24	92	2.00	65.2	62.3	69	99.4	73	0.120	0.346	18.94
233	1.0	0.0	37.546	0.164	1.25	92	2.09	65.3	62.4	69	100.3	73	0.121	0.348	18.95
234	1.0	0.0	37.709	0.163	1.24	92	2.04	65.3	62.3	69	99.7	73	0.120	0.346	18.95
235	0.9	0.0	37.872	0.163	1.25	92	2.22	65.2	62.3	69	100.3	73	0.116	0.341	18.75
236	0.9	0.1	38.031	0.159	1.24	92	2.09	65.2	62.3	69	98.5	73	0.118	0.344	18.67
237	0.9	0.0	38.197	0.166	1.22	92	2.01	65.2	62.2	69	102.5	72	0.121	0.348	18.86
238	0.9	0.0	38.359	0.162	1.24	92	2.18	65.2	62.3	69	99.3	73	0.120	0.346	18.94
239	0.9	0.0	38.522	0.163	1.22	92	2.02	65.2	62.3	69	99.8	73	0.120	0.346	18.90
240	0.8	0.0	38.686	0.164	1.25	92	2.14	65.2	62.3	69	100.6	72	0.119	0.345	18.86
241	0.8	0.0	38.848	0.162	1.24	92	2.00	65.2	62.3	69	99.1	72	0.124	0.352	19.02
242	0.8	0.0	39.011	0.163	1.24	92	2.10	65.2	62.3	69	99.1	72	0.121	0.348	19.10
243	0.8	0.0	39.173	0.162	1.24	92	2.10	65.2	62.3	69	98.8	73	0.119	0.345	18.90
244	0.8	0.0	39.335	0.162	1.24	92	2.00	65.2	62.3	69	99.4	73	0.120	0.346	18.87
245	0.8	0.0	39.498	0.163	1.24	92	2.17	65.2	62.4	69	99.8	72	0.122	0.349	18.98
246	0.8	0.0	39.662	0.164	1.25	92	2.20	65.2	62.3	69	99.9	73	0.122	0.349	19.06
247	0.7	0.0	39.825	0.163	1.24	92	2.20	65.2	62.3	69	98.9	72	0.124	0.352	19.14
248	0.7	0.1	39.987	0.162	1.25	92	2.21	65.2	62.3	69	98.3	73	0.120	0.346	19.06
249	0.7	0.0	40.150	0.163	1.25	92	2.06	65.2	62.3	69	99.4	73	0.121	0.348	18.94
250	0.7	0.0	40.312	0.162	1.22	92	2.16	65.2	62.3	69	99.2	72	0.119	0.345	18.90
251	0.7	0.0	40.474	0.162	1.24	92	2.19	65.2	62.3	69	99.5	72	0.119	0.345	18.82
252	0.7	0.0	40.639	0.165	1.25	92	2.04	65.2	62.3	69	101.3	72	0.122	0.349	18.94
253	0.7	0.0	40.802	0.163	1.24	92	2.06	65.2	62.3	68	99.5	73	0.121	0.348	19.02
254	0.6	0.0	40.965	0.163	1.24	92	2.16	65.2	62.3	69	99.3	73	0.122	0.349	19.02
255	0.6	0.0	41.127	0.162	1.25	92	2.01	65.2	62.3	69	99.0	73	0.118	0.344	18.90
256	0.6	0.0	41.289	0.162	1.24	92	2.19	65.2	62.3	69	99.3	72	0.122	0.349	18.90
257	0.6	0.0	41.451	0.162	1.26	92	2.11	65.2	62.3	69	98.8	72	0.123	0.351	19.10
258	0.6	0.0	41.615	0.164	1.22	92	2.12	65.2	62.3	69	99.5	72	0.122	0.349	19.10
259	0.6	0.0	41.778	0.163	1.23	92	2.17	65.3	62.3	68	99.1	73	0.121	0.348	19.02
260	0.5	0.0	41.941	0.163	1.24	92	2.21	65.2	62.3	68	99.3	73	0.122	0.349	19.02

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 12:02
Test Length: 292 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	15.15	in. Hg
Post-Test	0.005	cfm @	5.5	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
261	0.5	0.0	42.103	0.162	1.24	92	2.13	65.2	62.3	68	98.5	72	0.123	0.351	19.10
262	0.5	0.0	42.266	0.163	1.24	92	2.00	65.2	62.3	68	99.2	72	0.119	0.345	18.98
263	0.5	0.0	42.428	0.162	1.24	92	2.18	65.2	62.3	68	99.2	72	0.120	0.346	18.86
264	0.5	0.0	42.591	0.163	1.24	92	2.14	65.3	62.2	68	99.5	72	0.125	0.354	19.10
265	0.5	0.0	42.755	0.164	1.25	92	2.06	65.2	62.3	68	100.0	72	0.115	0.339	18.90
266	0.5	0.0	42.917	0.162	1.24	92	2.12	65.3	62.3	68	99.4	72	0.124	0.352	18.86
267	0.5	0.0	43.080	0.163	1.23	92	2.11	65.3	62.2	68	99.1	72	0.125	0.354	19.25
268	0.4	0.0	43.242	0.162	1.24	92	2.01	65.3	62.2	68	97.9	72	0.120	0.346	19.09
269	0.4	0.0	43.405	0.163	1.23	92	2.05	65.2	62.2	68	99.2	72	0.122	0.349	18.98
270	0.4	0.0	43.567	0.162	1.22	92	2.04	65.2	62.2	68	98.7	72	0.122	0.349	19.06
271	0.4	0.0	43.731	0.164	1.24	92	2.16	65.3	62.3	68	99.9	72	0.120	0.346	18.98
272	0.4	0.0	43.894	0.163	1.25	92	2.16	65.3	62.3	68	99.5	72	0.122	0.349	18.98
273	0.4	0.0	44.056	0.162	1.23	92	2.20	65.3	62.3	68	98.8	72	0.121	0.348	19.02
274	0.4	0.0	44.219	0.163	1.23	92	2.12	65.3	62.2	68	99.2	72	0.123	0.351	19.06
275	0.3	0.0	44.381	0.162	1.22	92	2.22	65.3	62.3	68	98.7	73	0.119	0.345	18.98
276	0.3	0.0	44.543	0.162	1.25	92	2.10	65.3	62.3	68	98.9	72	0.123	0.351	18.98
277	0.3	0.0	44.707	0.164	1.24	92	2.14	65.3	62.3	68	100.0	72	0.120	0.346	19.02
278	0.3	0.0	44.870	0.163	1.24	92	2.01	65.3	62.3	68	99.2	72	0.124	0.352	19.05
279	0.3	0.0	45.033	0.163	1.24	92	2.14	65.3	62.3	68	99.0	72	0.121	0.348	19.09
280	0.3	0.0	45.196	0.163	1.25	92	2.01	65.3	62.3	68	98.9	72	0.124	0.352	19.10
281	0.3	0.0	45.358	0.162	1.24	92	2.08	65.2	62.4	68	98.7	72	0.117	0.342	18.94
282	0.2	0.0	45.520	0.162	1.24	92	2.14	65.3	62.3	68	99.5	72	0.120	0.346	18.78
283	0.2	0.0	45.683	0.163	1.25	92	2.02	65.3	62.4	68	100.2	72	0.120	0.346	18.90
284	0.2	0.0	45.847	0.164	1.24	92	2.21	65.2	62.4	68	100.4	72	0.121	0.348	18.94
285	0.2	0.0	46.010	0.163	1.25	92	2.17	65.2	62.4	68	99.5	72	0.122	0.349	19.01
286	0.2	0.0	46.172	0.162	1.24	92	2.13	65.2	62.4	68	99.1	72	0.117	0.342	18.86
287	0.2	0.0	46.334	0.162	1.24	92	2.21	65.2	62.4	68	99.5	72	0.122	0.349	18.86
288	0.2	0.0	46.496	0.162	1.26	92	2.11	65.2	62.4	68	99.4	72	0.118	0.344	18.89
289	0.1	0.0	46.660	0.164	1.23	92	2.00	65.2	62.4	68	100.8	72	0.119	0.345	18.77
290	0.1	0.0	46.823	0.163	1.25	92	2.19	65.3	62.3	67	100.2	72	0.121	0.348	18.89
291	0.1	0.0	46.986	0.163	1.23	92	2.00	65.3	62.3	67	100.0	72	0.118	0.344	18.86
292	0.0	0.1	47.148	0.162	1.23	92	2.17	65.3	62.2	67	99.3	72	0.123	0.351	18.94

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Test Start Time: 12:02
Total Sampling Time: 292 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.002 cfm @ 17.4 in. Hg
Post-Test 0.001 cfm @ 6.5 in. Hg

Elapsed Time (min)	**Train B Sampling System**								**Appliance Temperatures, °F**						
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*	*Top*	*Bottom*	*Back*	*Left*	*Right*	*Catalyst Exit*	*Average Stove Surface (Tot = Δ T)*
Tot / Avg	**47.801**	**0.164**	**1.26**	**87.7**	**2.29**	**65.27**	**55.78**	**100.0**	**331.3**	**321.9**	**173.1**	**351.3**	**326.1**	**731.7**	**89.6**
Minimum	0.000	0.139	0.03	68	0.03	62	45	90.9	238	292	143	275	269	528	244
Max	47.801	0.168	1.29	94	2.38	66	58	108.1	564	361	248	429	394	1067	385
0	0.000		0.03	68	0.03	62.4	48.9		329	361	206	396	375	712	333
1	0.139	0.139	1.25	69	2.39	63.3	46.1	90.9	320	359	206	394	376	637	331
2	0.300	0.161	1.24	69	2.35	64	45.4	108.1	308	360	209	392	373	558	328
3	0.460	0.160	1.24	68	2.33	64.4	45.1	105.7	298	360	210	390	368	528	325
4	0.621	0.161	1.23	68	2.27	64.4	45	105.3	288	360	207	386	368	567	322
5	0.782	0.161	1.23	68	2.33	64.4	44.9	104.2	281	361	201	382	362	613	317
6	0.941	0.159	1.23	68	2.29	64.4	44.9	101.9	275	360	194	378	359	632	313
7	1.101	0.160	1.24	69	2.28	64.5	45	101.9	270	360	189	373	353	642	309
8	1.262	0.161	1.23	69	2.29	64.6	45.1	102.7	267	359	184	370	351	649	306
9	1.422	0.160	1.22	69	2.29	64.7	45.2	102.1	262	360	179	365	344	650	302
10	1.581	0.159	1.21	69	2.27	64.8	45.4	101.1	259	358	175	360	342	648	299
11	1.740	0.159	1.22	69	2.29	64.8	45.5	100.6	256	357	171	356	338	641	296
12	1.901	0.161	1.22	70	2.27	64.9	45.6	101.7	256	357	168	350	333	632	293
13	2.058	0.157	1.21	70	2.30	65.1	45.9	100.0	258	355	165	346	332	654	291
14	2.216	0.158	1.21	70	2.28	65.1	46.1	101.3	260	355	163	342	329	682	290
15	2.376	0.160	1.20	70	2.30	65.5	46.3	102.9	269	354	161	339	326	763	290
16	2.533	0.157	1.20	70	2.27	65.6	46.6	101.1	283	353	161	337	322	825	291
17	2.690	0.157	1.20	70	2.31	65.9	46.9	101.0	299	353	162	335	321	883	294
18	2.849	0.159	1.19	71	2.28	66.1	47.1	102.1	322	351	164	335	319	947	298
19	3.005	0.156	1.20	71	2.28	66.3	47.4	100.0	346	351	168	335	316	979	303
20	3.162	0.157	1.19	71	2.27	66.5	47.6	101.0	371	350	173	336	314	1001	309
21	3.319	0.157	1.18	71	2.28	66.7	47.8	101.0	395	349	179	339	315	1013	315
22	3.477	0.158	1.26	71	2.36	67	48.1	101.3	417	347	185	340	316	1023	321
23	3.639	0.162	1.25	71	2.44	67.2	48.3	104.5	435	347	192	346	317	1037	327
24	3.802	0.163	1.24	72	2.37	67.3	48.5	105.8	455	346	197	348	321	1043	333
25	3.964	0.162	1.25	72	2.40	67.4	48.7	105.3	469	346	203	354	323	1050	339
26	4.125	0.161	1.24	72	2.36	67.5	48.9	104.8	485	345	208	356	326	1051	344
27	4.289	0.164	1.23	73	2.44	67.7	49.2	106.1	501	343	212	361	330	1056	349
28	4.446	0.157	1.25	73	2.42	67.8	49.5	100.6	512	344	217	365	333	1065	354
29	4.609	0.163	1.25	73	2.46	67.8	49.6	104.2	522	343	221	369	335	1067	358
30	4.770	0.161	1.23	74	2.45	68	49.9	103.4	530	343	225	372	338	1066	362
31	4.929	0.159	1.24	74	2.39	68.1	50.1	102.3	539	343	230	378	343	1062	366
32	5.089	0.160	1.23	75	2.48	68.2	50.3	103.3	543	343	234	382	347	1060	370
33	5.251	0.162	1.21	75	2.46	68.2	50.5	105.5	547	342	238	386	349	1061	372
34	5.411	0.160	1.22	75	2.48	68.2	50.7	104.4	553	342	240	392	354	1062	376
35	5.569	0.158	1.22	75	2.39	68.3	50.9	102.9	560	342	243	396	359	1063	380
36	5.728	0.159	1.23	76	2.40	68.4	51.1	104.0	561	342	246	400	362	1064	382
37	5.890	0.162	1.22	76	2.37	67.9	51.3	105.6	564	340	248	403	367	1042	385
38	6.048	0.158	1.22	76	2.48	67.7	51.5	101.6	562	340	244	408	372	1012	385
39	6.207	0.159	1.22	76	2.39	67.4	51.7	101.1	557	341	240	412	377	1002	385
40	6.370	0.163	1.22	76	2.37	67	51.8	103.1	551	342	236	415	376	990	384

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Test Start Time: 12:02
Total Sampling Time: 292 min
Recording Interval: 1 min

Sample Train Leak Checks

Pre-test 0.002 cfm @ 17.4 in. Hg
Post-Test 0.001 cfm @ 6.5 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
41	6.528	0.158	1.23	76	2.39	66.6	52	99.9	544	343	232	419	382	982	384
42	6.687	0.159	1.23	77	2.46	66	52.2	100.5	535	342	229	421	380	975	382
43	6.847	0.160	1.23	78	2.45	65.6	52.4	100.7	529	342	227	424	385	961	381
44	7.008	0.161	1.23	78	2.47	65.3	52.6	101.1	524	342	224	426	385	943	380
45	7.168	0.160	1.23	78	2.46	64.8	52.8	100.4	510	342	222	426	387	928	377
46	7.328	0.160	1.24	78	2.32	64.9	53	100.3	502	342	220	428	392	919	377
47	7.488	0.160	1.25	79	2.36	64.8	53.2	100.2	495	342	219	428	389	915	375
48	7.650	0.162	1.23	79	2.33	64.7	53.4	101.0	486	342	217	429	393	911	373
49	7.812	0.162	1.24	79	2.33	65	53.6	100.8	478	341	214	429	391	903	371
50	7.973	0.161	1.24	80	2.46	65.3	53.8	100.2	474	341	212	429	392	894	370
51	8.134	0.161	1.26	80	2.45	65.4	53.9	100.4	468	340	210	428	388	886	367
52	8.296	0.162	1.23	80	2.36	65.4	54.1	100.9	463	340	208	429	393	879	366
53	8.461	0.165	1.25	81	2.28	65.5	54.2	102.3	458	339	207	428	393	869	365
54	8.624	0.163	1.25	80	2.45	65.6	54.4	100.8	451	339	205	425	394	861	363
55	8.784	0.160	1.25	81	2.28	65.6	54.6	98.7	449	338	204	425	391	856	361
56	8.946	0.162	1.25	81	2.27	65.6	54.7	99.7	446	338	202	425	392	848	360
57	9.109	0.163	1.26	81	2.39	65.6	54.9	100.6	439	336	201	423	391	839	358
58	9.271	0.162	1.26	81	2.43	65.6	55	100.3	434	337	200	423	387	831	356
59	9.435	0.164	1.26	82	2.42	65.7	55.3	101.6	431	336	198	421	390	827	355
60	9.598	0.163	1.25	82	2.25	65.7	55.4	100.9	426	335	197	419	389	825	353
61	9.763	0.165	1.26	83	2.36	65.7	55.6	102.2	425	335	196	418	382	826	351
62	9.927	0.164	1.26	82	2.25	65.7	55.7	101.6	423	334	195	417	386	830	351
63	10.091	0.164	1.26	83	2.40	65.6	55.8	101.4	422	333	194	415	383	835	349
64	10.255	0.164	1.26	83	2.35	65.6	55.9	101.4	423	333	193	415	380	839	349
65	10.418	0.163	1.27	83	2.40	65.7	56	101.0	424	332	192	414	379	843	348
66	10.585	0.167	1.27	84	2.41	65.7	56.1	103.4	427	331	191	412	379	846	348
67	10.749	0.164	1.26	83	2.37	65.7	56.3	101.1	429	331	191	412	376	846	348
68	10.913	0.164	1.28	84	2.38	65.7	56.3	101.0	428	330	190	411	374	843	346
69	11.077	0.164	1.26	84	2.39	65.7	56.4	101.3	429	328	190	409	372	839	346
70	11.239	0.162	1.27	84	2.23	65.7	56.5	99.8	429	328	189	408	370	840	345
71	11.403	0.164	1.28	84	2.26	65.7	56.5	100.6	429	327	188	408	369	842	344
72	11.568	0.165	1.27	84	2.40	65.7	56.6	101.3	428	327	189	406	372	842	344
73	11.733	0.165	1.27	85	2.37	65.7	56.7	101.1	428	327	188	405	370	841	344
74	11.896	0.163	1.26	85	2.24	65.7	56.8	99.6	427	326	188	405	369	840	343
75	12.060	0.164	1.26	86	2.36	65.7	56.8	100.2	424	326	187	404	371	835	342
76	12.223	0.163	1.27	85	2.23	65.7	56.9	99.3	424	325	187	403	371	829	342
77	12.386	0.163	1.27	85	2.22	65.6	56.9	99.1	420	324	186	401	368	825	340
78	12.550	0.164	1.27	86	2.33	65.7	57	100.5	418	323	186	401	370	821	340
79	12.713	0.163	1.26	86	2.25	65.7	57.1	100.1	414	324	186	401	372	815	339
80	12.880	0.167	1.26	86	2.30	65.7	57.1	102.2	410	323	185	401	371	819	338
81	13.044	0.164	1.26	86	2.32	65.7	57.1	100.4	407	322	185	400	372	826	337
82	13.208	0.164	1.26	86	2.40	65.6	57.2	100.2	403	322	185	400	364	829	335
83	13.373	0.165	1.27	87	2.38	65.6	57.2	100.6	400	321	184	399	365	831	334
84	13.534	0.161	1.26	87	2.22	65.6	57.2	97.7	396	321	184	398	367	829	333

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Test Start Time: 12:02
Total Sampling Time: 292 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.002 cfm @ 17.4 in. Hg
Post-Test 0.001 cfm @ 6.5 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
85	13.698	0.164	1.27	87	2.21	65.6	57.2	99.5	395	320	184	397	365	827	332
86	13.861	0.163	1.26	87	2.38	65.6	57.3	99.2	392	321	184	396	361	825	331
87	14.025	0.164	1.26	87	2.36	65.6	57.3	100.2	389	320	183	395	363	823	330
88	14.188	0.163	1.27	87	2.38	65.6	57.3	100.3	386	320	183	395	360	822	329
89	14.352	0.164	1.26	88	2.39	65.6	57.4	100.9	384	319	183	393	361	821	328
90	14.516	0.164	1.27	88	2.21	65.6	57.4	100.4	382	318	182	394	359	819	327
91	14.681	0.165	1.26	88	2.36	65.6	57.5	100.8	379	319	182	392	360	815	326
92	14.845	0.164	1.27	88	2.29	65.6	57.5	99.9	377	319	182	391	358	812	325
93	15.012	0.167	1.26	88	2.27	65.6	57.5	101.0	377	319	181	391	357	810	325
94	15.177	0.165	1.25	88	2.34	65.6	57.5	99.7	373	318	181	390	355	807	323
95	15.340	0.163	1.26	88	2.22	65.5	57.6	99.3	373	318	181	389	355	804	323
96	15.504	0.164	1.27	89	2.20	65.5	57.6	100.6	370	317	180	389	356	802	323
97	15.665	0.161	1.25	88	2.19	65.6	57.6	98.3	369	317	180	387	355	800	322
98	15.829	0.164	1.26	88	2.33	65.6	57.7	99.9	366	317	179	387	352	798	320
99	15.992	0.163	1.27	89	2.34	65.5	57.7	99.8	365	317	179	386	352	797	320
100	16.157	0.165	1.27	89	2.26	65.6	57.8	100.6	363	317	178	384	349	795	318
101	16.321	0.164	1.28	89	2.19	65.5	57.8	99.5	361	316	178	383	351	794	318
102	16.485	0.164	1.27	89	2.19	65.6	57.8	99.9	360	317	178	383	346	793	317
103	16.650	0.165	1.26	89	2.22	65.6	57.9	100.6	359	315	177	381	348	791	316
104	16.815	0.165	1.25	90	2.35	65.6	58	100.4	358	316	177	380	349	790	316
105	16.979	0.164	1.25	89	2.24	65.6	58	99.6	356	316	177	379	347	788	315
106	17.143	0.164	1.25	89	2.22	65.6	58.1	99.2	353	316	176	378	346	788	314
107	17.310	0.167	1.27	89	2.19	65.6	58.1	101.1	352	315	176	378	345	787	313
108	17.474	0.164	1.27	90	2.31	65.6	58.1	99.6	351	316	176	376	345	786	312
109	17.638	0.164	1.27	90	2.38	65.5	58.1	99.2	350	315	175	375	341	784	311
110	17.802	0.164	1.26	90	2.19	65.5	58.1	99.0	348	314	175	373	342	783	310
111	17.966	0.164	1.27	90	2.31	65.5	58.2	99.4	347	314	175	374	342	782	310
112	18.128	0.162	1.26	90	2.18	65.5	58.2	98.3	347	314	174	373	338	781	309
113	18.292	0.164	1.26	90	2.20	65.5	58.2	99.1	347	314	174	372	338	781	309
114	18.456	0.164	1.27	90	2.33	65.5	58.3	98.9	347	314	174	370	338	781	309
115	18.621	0.165	1.28	90	2.25	65.5	58.3	99.6	347	314	174	370	338	779	309
116	18.786	0.165	1.26	90	2.38	65.5	58.4	99.6	347	314	174	369	336	777	308
117	18.951	0.165	1.26	90	2.20	65.5	58.4	99.8	346	313	174	368	336	775	307
118	19.115	0.164	1.27	91	2.38	65.5	58.4	99.2	346	314	173	367	337	773	307
119	19.279	0.164	1.27	91	2.30	65.4	58.3	98.8	346	314	174	367	337	769	307
120	19.446	0.167	1.27	91	2.25	65.4	58.3	100.3	346	313	173	366	337	768	307
121	19.611	0.165	1.26	91	2.19	65.4	58.4	98.7	344	312	173	367	334	771	306
122	19.775	0.164	1.25	91	2.22	65.3	58.4	98.7	342	312	173	368	335	771	306
123	19.939	0.164	1.25	91	2.25	65.3	58.4	99.6	339	311	173	366	334	768	305
124	20.103	0.164	1.27	91	2.20	65.3	58.3	99.4	338	311	173	367	334	761	305
125	20.268	0.165	1.25	91	2.34	65.3	58.3	99.8	335	312	173	368	334	752	304
126	20.429	0.161	1.26	91	2.20	65.2	58.3	97.2	333	312	173	368	333	740	304
127	20.594	0.165	1.26	91	2.20	65.2	58.3	99.1	329	312	173	369	333	728	303
128	20.759	0.165	1.26	91	2.25	65.1	58.2	99.2	325	312	172	369	332	719	302

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 12:02
Total Sampling Time: 292 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Sample Train Leak Checks

Pre-test 0.002 cfm @ 17.4 in. Hg
Post-Test 0.001 cfm @ 6.5 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
129	20.925	0.166	1.26	91	2.26	65.2	58.3	100.5	323	312	172	368	332	711	302
130	21.090	0.165	1.27	92	2.21	65.2	58.3	99.5	320	312	172	369	331	705	301
131	21.254	0.164	1.27	91	2.35	65.1	58.2	98.4	318	312	171	368	330	701	300
132	21.419	0.165	1.27	91	2.25	65.1	58.2	99.5	315	312	171	368	327	698	298
133	21.586	0.167	1.26	91	2.37	65.1	58.2	101.3	314	311	171	367	327	695	298
134	21.751	0.165	1.26	91	2.37	65.1	58.1	100.1	311	311	170	366	328	693	297
135	21.916	0.165	1.27	92	2.24	65.1	58.2	99.8	309	312	170	367	328	692	297
136	22.080	0.164	1.27	92	2.25	65.1	58.2	99.8	307	311	170	367	326	691	296
137	22.244	0.164	1.27	92	2.19	65.1	58.3	100.5	306	312	170	367	325	691	296
138	22.409	0.165	1.28	92	2.37	65.1	58.2	100.5	305	311	169	366	327	693	296
139	22.571	0.162	1.27	91	2.25	65.1	58.2	97.9	305	311	169	364	326	695	295
140	22.735	0.164	1.27	92	2.36	65	58.1	99.0	304	311	169	365	326	695	295
141	22.900	0.165	1.28	91	2.29	65	58	99.2	303	310	169	363	324	694	294
142	23.065	0.165	1.27	92	2.27	65	58	98.7	302	311	169	365	326	694	294
143	23.230	0.165	1.27	92	2.19	65	58	99.2	301	311	169	364	324	693	294
144	23.395	0.165	1.26	92	2.26	65	58	99.9	301	310	169	364	325	691	294
145	23.562	0.167	1.27	92	2.25	65	57.9	101.2	301	311	169	364	326	690	294
146	23.728	0.166	1.26	92	2.34	65	57.9	100.4	300	311	169	363	326	689	294
147	23.893	0.165	1.26	92	2.29	65	57.9	99.5	299	311	169	363	327	688	294
148	24.058	0.165	1.27	92	2.21	65	57.9	99.5	299	311	169	363	325	692	293
149	24.223	0.165	1.26	92	2.36	65	57.9	99.6	299	312	169	362	326	695	294
150	24.387	0.164	1.26	92	2.29	65	57.9	99.6	298	312	169	361	325	700	293
151	24.552	0.165	1.27	92	2.30	65	57.9	100.4	299	312	168	360	324	703	293
152	24.717	0.165	1.27	92	2.27	65	57.8	99.6	300	313	168	360	323	704	293
153	24.878	0.161	1.27	92	2.35	65	57.9	97.2	300	313	168	359	324	702	293
154	25.042	0.164	1.27	92	2.20	65	57.8	99.6	301	313	168	359	324	702	293
155	25.207	0.165	1.27	92	2.34	65	57.8	99.9	301	313	168	358	323	703	293
156	25.372	0.165	1.27	92	2.36	65	57.8	99.4	301	314	169	357	324	702	293
157	25.537	0.165	1.27	92	2.33	65	57.7	99.7	302	314	169	357	325	703	293
158	25.702	0.165	1.26	92	2.20	65	57.7	100.5	302	314	169	356	325	702	293
159	25.869	0.167	1.27	92	2.35	65	57.7	101.8	303	314	169	357	325	702	293
160	26.034	0.165	1.27	93	2.28	65	57.7	99.8	303	315	169	355	326	701	293
161	26.199	0.165	1.28	93	2.28	65	57.7	99.0	302	315	169	355	324	700	293
162	26.364	0.165	1.28	93	2.21	65	57.6	98.6	302	316	169	354	323	699	293
163	26.530	0.166	1.28	93	2.31	65	57.6	99.5	302	317	169	353	325	699	293
164	26.695	0.165	1.27	93	2.23	65	57.6	98.9	302	317	169	353	322	699	292
165	26.861	0.166	1.28	93	2.30	65	57.6	99.1	301	317	168	352	324	701	292
166	27.022	0.161	1.28	92	2.29	65	57.6	96.2	300	317	168	351	325	701	292
167	27.187	0.165	1.27	93	2.29	65	57.6	99.1	301	318	168	351	322	702	292
168	27.352	0.165	1.26	93	2.33	65	57.5	99.3	299	318	168	349	323	702	291
169	27.516	0.164	1.27	93	2.30	65	57.5	98.8	299	318	168	349	323	703	291
170	27.681	0.165	1.28	93	2.22	65	57.6	99.4	300	319	168	347	323	704	291
171	27.849	0.168	1.27	93	2.34	65	57.5	101.0	300	320	168	347	321	704	291
172	28.014	0.165	1.27	93	2.35	65	57.5	99.0	300	321	168	347	320	703	291

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Test Start Time: 12:02
Total Sampling Time: 292 min
Recording Interval: 1 min

Sample Train Leak Checks

Pre-test 0.002 cfm @ 17.4 in. Hg
Post-Test 0.001 cfm @ 6.5 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
173	28.179	0.165	1.26	93	2.19	65	57.5	99.3	300	321	167	346	319	703	291
174	28.343	0.164	1.25	93	2.28	65	57.5	98.9	300	321	167	345	321	706	291
175	28.508	0.165	1.27	93	2.35	65	57.4	99.0	301	322	167	345	321	708	291
176	28.673	0.165	1.25	93	2.32	65	57.5	99.3	300	322	167	344	319	706	290
177	28.838	0.165	1.27	93	2.22	64.9	57.4	99.6	299	322	167	344	319	706	290
178	29.003	0.165	1.27	93	2.33	65	57.4	99.2	300	322	166	342	319	704	290
179	29.168	0.165	1.27	93	2.21	64.9	57.4	99.1	299	323	166	342	318	701	290
180	29.333	0.165	1.27	93	2.33	65	57.4	98.9	299	323	166	341	318	697	289
181	29.497	0.164	1.27	93	2.27	64.9	57.4	98.1	298	323	166	341	315	694	288
182	29.662	0.165	1.28	93	2.22	64.9	57.4	99.2	298	323	166	339	317	690	288
183	29.826	0.164	1.27	93	2.22	64.9	57.3	98.8	297	322	165	338	315	687	288
184	29.992	0.166	1.28	93	2.31	64.9	57.4	100.0	296	323	165	339	314	682	287
185	30.159	0.167	1.27	93	2.22	64.9	57.4	100.8	295	324	164	338	315	678	287
186	30.324	0.165	1.27	93	2.22	64.9	57.4	99.6	294	323	164	337	315	674	286
187	30.489	0.165	1.27	93	2.24	64.9	57.3	99.1	293	323	164	336	313	671	286
188	30.654	0.165	1.27	93	2.23	64.9	57.3	99.1	292	324	163	336	313	667	285
189	30.819	0.165	1.27	93	2.33	64.9	57.3	99.2	291	324	163	335	313	664	285
190	30.983	0.164	1.27	93	2.25	64.9	57.2	98.1	290	324	163	334	313	661	285
191	31.148	0.165	1.27	94	2.33	64.9	57.2	98.7	289	324	163	333	311	658	284
192	31.313	0.165	1.27	94	2.32	64.8	57.2	99.1	288	324	162	332	312	656	284
193	31.478	0.165	1.27	93	2.29	64.9	57.2	99.3	287	324	162	332	309	654	283
194	31.643	0.165	1.27	93	2.33	64.8	57.2	99.3	286	325	162	331	309	652	282
195	31.805	0.162	1.27	94	2.33	64.9	57.2	98.0	286	324	162	331	310	650	282
196	31.970	0.165	1.27	94	2.20	64.9	57.3	100.3	285	323	161	330	310	649	282
197	32.135	0.165	1.27	93	2.35	64.8	57.2	100.0	285	324	161	329	309	647	281
198	32.302	0.167	1.28	93	2.22	64.8	57.2	100.6	284	324	161	328	308	646	281
199	32.467	0.165	1.26	93	2.18	64.8	57.2	99.2	283	324	161	328	306	646	280
200	32.633	0.166	1.28	93	2.24	64.9	57.2	100.1	283	324	160	327	305	645	280
201	32.798	0.165	1.26	93	2.20	64.8	57.1	99.8	282	324	160	327	306	645	280
202	32.963	0.165	1.26	93	2.30	64.8	57.1	99.6	282	324	160	326	305	645	279
203	33.128	0.165	1.25	94	2.21	64.8	57.1	99.5	281	324	159	326	302	644	279
204	33.293	0.165	1.26	93	2.36	64.8	57	99.2	281	324	159	325	305	641	279
205	33.458	0.165	1.28	94	2.24	64.8	57.1	98.5	279	323	159	325	304	638	278
206	33.622	0.164	1.26	94	2.32	64.8	57.1	97.6	279	324	159	324	304	637	278
207	33.787	0.165	1.25	93	2.29	64.8	57.1	98.5	278	324	159	323	303	637	277
208	33.951	0.164	1.26	94	2.19	64.8	57.1	98.2	277	324	158	323	300	637	276
209	34.113	0.162	1.27	94	2.32	64.8	57.1	97.0	276	323	158	322	302	636	276
210	34.278	0.165	1.26	93	2.37	64.8	57.1	98.6	275	323	158	322	300	635	276
211	34.445	0.167	1.28	93	2.28	64.7	57	99.9	275	323	157	322	301	633	275
212	34.610	0.165	1.27	94	2.25	64.7	57.1	99.0	274	323	157	321	300	632	275
213	34.775	0.165	1.27	94	2.36	64.8	57.1	99.0	273	323	157	321	300	631	275
214	34.940	0.165	1.27	93	2.35	64.8	57.1	98.9	272	322	157	320	300	632	274
215	35.105	0.165	1.26	93	2.35	64.8	57.1	98.8	271	322	157	319	300	634	274
216	35.270	0.165	1.27	93	2.28	64.8	57	99.3	270	322	156	319	298	635	273

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Test Start Time: 12:02
Total Sampling Time: 292 min
Recording Interval: 1 min

Sample Train Leak Checks
Pre-test 0.002 cfm @ 17.4 in. Hg
Post-Test 0.001 cfm @ 6.5 in. Hg

Elapsed Time (min)	**Train B Sampling System**								**Appliance Temperatures, °F**						
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*	*Top*	*Bottom*	*Back*	*Left*	*Right*	*Catalyst Exit*	*Average Stove Surface (Tot = Δ T)*
217	35.435	0.165	1.27	93	2.21	64.8	57	99.8	271	322	156	318	298	637	273
218	35.600	0.165	1.27	94	2.35	64.8	57	99.5	270	322	156	318	297	637	273
219	35.766	0.166	1.26	93	2.33	64.8	57	99.5	270	322	155	317	296	637	272
220	35.930	0.164	1.27	93	2.37	64.8	57	98.5	270	321	155	315	294	636	271
221	36.095	0.165	1.26	93	2.27	64.8	57	99.5	269	320	155	315	297	635	271
222	36.257	0.162	1.26	93	2.28	64.8	57	98.1	270	320	155	314	295	634	271
223	36.425	0.168	1.26	93	2.17	64.8	57	101.6	269	320	155	313	296	633	270
224	36.589	0.164	1.27	93	2.31	64.8	57	98.3	268	319	154	313	295	634	270
225	36.754	0.165	1.25	93	2.23	64.8	57	98.9	269	318	154	312	295	634	270
226	36.918	0.164	1.26	93	2.17	64.8	57	99.0	268	318	154	311	295	635	269
227	37.083	0.165	1.26	94	2.37	64.8	57	99.5	268	318	154	311	293	632	268
228	37.247	0.164	1.27	94	2.36	64.9	57	98.9	267	317	154	310	295	626	268
229	37.412	0.165	1.26	94	2.29	64.8	57	100.2	266	318	154	309	294	621	268
230	37.577	0.165	1.27	93	2.24	64.8	56.9	100.8	266	317	153	309	294	618	268
231	37.742	0.165	1.27	94	2.21	64.8	56.9	100.3	265	317	153	307	293	616	267
232	37.907	0.165	1.25	93	2.38	64.8	56.9	99.6	264	316	153	307	295	614	267
233	38.072	0.165	1.27	94	2.34	64.9	57	99.3	264	316	153	307	292	614	266
234	38.237	0.165	1.26	94	2.19	64.8	57	99.3	263	315	153	306	293	614	266
235	38.403	0.166	1.26	93	2.25	64.8	56.9	100.5	263	315	153	306	293	614	266
236	38.565	0.162	1.26	93	2.37	64.8	56.9	98.8	263	313	152	305	293	614	265
237	38.733	0.168	1.26	93	2.25	64.8	57	102.1	263	314	152	304	293	614	265
238	38.897	0.164	1.28	94	2.18	64.8	56.9	98.9	262	314	152	303	294	613	265
239	39.062	0.165	1.27	93	2.35	64.8	56.9	99.4	262	314	152	304	294	612	265
240	39.227	0.165	1.26	93	2.34	64.8	56.9	99.7	261	313	152	303	292	612	264
241	39.392	0.165	1.26	93	2.36	64.8	56.9	99.3	261	312	152	303	294	612	264
242	39.556	0.164	1.27	93	2.18	64.8	57	98.1	260	312	152	302	294	610	264
243	39.721	0.165	1.27	93	2.27	64.8	56.9	99.0	260	312	152	301	292	609	263
244	39.886	0.165	1.27	93	2.32	64.8	57	99.7	259	312	152	301	292	611	263
245	40.050	0.164	1.27	93	2.36	64.8	56.9	98.9	258	311	152	300	292	613	263
246	40.215	0.165	1.27	93	2.30	64.8	57	98.9	257	311	151	300	291	613	262
247	40.380	0.165	1.26	93	2.24	64.9	57	98.5	258	310	151	300	290	613	262
248	40.545	0.165	1.26	94	2.36	64.8	57	98.5	256	309	151	299	289	612	261
249	40.710	0.165	1.26	93	2.36	64.9	56.9	99.0	256	310	151	299	289	612	261
250	40.875	0.165	1.26	93	2.19	64.8	56.9	99.5	256	310	151	299	288	611	261
251	41.040	0.165	1.27	93	2.34	64.8	56.9	99.8	256	309	150	298	287	610	260
252	41.206	0.166	1.27	93	2.36	64.8	57	100.2	255	308	150	297	287	610	260
253	41.371	0.165	1.29	93	2.34	64.8	57	99.2	255	308	150	297	286	611	259
254	41.536	0.165	1.27	92	2.28	64.8	57	99.0	254	308	150	297	285	611	259
255	41.701	0.165	1.27	93	2.20	64.9	57	99.3	254	308	149	296	285	611	258
256	41.866	0.165	1.27	93	2.32	64.8	57	99.6	253	308	149	296	283	610	258
257	42.031	0.165	1.28	93	2.24	64.8	56.9	99.0	253	307	149	294	283	610	257
258	42.196	0.165	1.27	93	2.35	64.9	56.9	98.5	253	307	149	294	281	608	257
259	42.360	0.164	1.28	93	2.31	64.9	57	98.1	253	307	149	294	283	607	257
260	42.525	0.165	1.28	93	2.35	64.8	56.9	98.9	252	306	149	293	283	605	257

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 12:02
Total Sampling Time: 292 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Sample Train Leak Checks

Pre-test 0.002 cfm @ 17.4 in. Hg
Post-Test 0.001 cfm @ 6.5 in. Hg

Elapsed Time (min)	**Train B Sampling System**								**Appliance Temperatures, °F**						
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*	*Top*	*Bottom*	*Back*	*Left*	*Right*	*Catalyst Exit*	*Average Stove Surface (Tot = Δ T)*
261	42.690	0.165	1.27	93	2.31	64.8	57	98.7	252	306	148	293	281	605	256
262	42.854	0.164	1.28	93	2.19	64.8	57	98.2	252	307	148	293	281	605	256
263	43.019	0.165	1.27	93	2.27	64.8	56.9	99.5	252	306	148	292	280	604	255
264	43.184	0.165	1.27	93	2.22	64.8	57	99.1	251	306	148	291	280	603	255
265	43.349	0.165	1.26	93	2.24	64.8	56.9	99.0	251	305	148	290	278	602	254
266	43.513	0.164	1.26	93	2.19	64.9	57	99.1	250	305	148	290	280	602	255
267	43.678	0.165	1.26	93	2.36	64.8	57	98.7	250	305	147	289	280	602	254
268	43.843	0.165	1.26	93	2.23	64.8	57	98.1	250	305	147	289	278	602	254
269	44.009	0.166	1.28	93	2.32	64.8	57	99.4	249	303	147	288	278	603	253
270	44.174	0.165	1.27	93	2.32	64.8	57	98.9	249	304	147	286	278	605	253
271	44.339	0.165	1.27	93	2.36	64.9	57	98.9	249	303	147	287	278	608	253
272	44.504	0.165	1.27	93	2.20	64.9	57	99.1	248	303	147	286	276	608	252
273	44.669	0.165	1.27	93	2.23	64.9	57.1	99.0	248	302	147	286	277	605	252
274	44.834	0.165	1.27	93	2.27	64.9	57.1	98.8	247	301	146	285	276	602	251
275	44.999	0.165	1.25	93	2.32	64.9	57.1	98.9	247	302	146	285	274	600	251
276	45.163	0.164	1.26	93	2.19	64.9	57.1	98.5	246	301	146	284	274	600	250
277	45.328	0.165	1.25	93	2.33	64.9	57	99.0	247	301	146	284	276	600	251
278	45.493	0.165	1.27	93	2.18	64.9	57	98.8	246	300	146	283	274	601	250
279	45.657	0.164	1.27	94	2.24	64.9	57	98.0	246	300	145	282	275	602	250
280	45.822	0.165	1.27	93	2.28	64.9	57.1	98.5	246	299	145	280	274	602	249
281	45.987	0.165	1.27	93	2.20	64.9	57.1	98.9	246	299	145	280	274	602	249
282	46.151	0.164	1.27	93	2.27	64.9	57.1	99.2	246	298	145	280	274	599	249
283	46.316	0.165	1.27	94	2.36	64.9	57.1	99.8	245	297	145	280	272	597	248
284	46.481	0.165	1.26	93	2.37	64.9	57.1	99.4	245	296	145	279	273	595	248
285	46.646	0.165	1.29	94	2.35	64.8	57.1	99.1	244	296	145	278	271	593	247
286	46.811	0.165	1.27	93	2.31	64.9	57.1	99.3	244	295	144	278	272	592	247
287	46.977	0.166	1.27	93	2.37	64.9	57.2	100.3	243	295	144	278	270	591	246
288	47.142	0.165	1.26	93	2.18	64.9	57.1	99.6	242	293	144	276	270	590	245
289	47.307	0.165	1.26	93	2.30	64.9	57.1	99.8	241	294	144	276	269	587	245
290	47.472	0.165	1.26	93	2.37	64.9	57.2	99.9	240	293	143	275	269	586	244
291	47.636	0.164	1.28	93	2.35	64.9	57.2	99.1	239	293	143	275	269	584	244
292	47.801	0.165	1.27	93	2.37	64.9	57.2	99.6	238	292	143	275	270	580	244

Train C - First Hour Particulate Sampling

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Start Time: 12:02
Total Sampling Time: 60 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.01
Meter Box Y Regression Factor: 0
Meter Box Dynamic Y: 1.010
Sample Box ID: 371

Sample Train Leak Checks
Pre-test 0.002 cfm @ 18.6 in. Hg
Post-Test 0.003 cfm @ 10.5 in. Hg

Elapsed Time (min)	**Train C Sampling System**							
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*
Tot / Avg	**9.547**	**0.159**	**1.00**	**71.7**	**2.42**	**68.5**	**58.9**	**101.1**
Minimum	0.000	0.150	0.01	69	0.06	64	51	96.3
Max	9.547	0.162	1.06	75	2.53	71	63	106.8
0	0.000		0.01	69	0.06	64.1	51.3	
1	0.150	0.150	1.06	69	2.48	65.6	53.6	96.3
2	0.312	0.162	1.06	69	2.47	66.5	54.1	106.8
3	0.473	0.161	1.05	69	2.45	67	54.3	104.5
4	0.633	0.160	1.05	69	2.41	67	54.6	102.8
5	0.793	0.160	1.05	69	2.48	66.9	54.8	101.8
6	0.955	0.162	1.04	69	2.44	66.9	55.1	102.2
7	1.114	0.159	1.04	69	2.48	66.9	55.3	99.7
8	1.274	0.160	1.04	69	2.44	67	55.5	100.5
9	1.435	0.161	1.04	69	2.39	67.1	55.6	101.2
10	1.594	0.159	1.03	69	2.43	67.2	55.7	99.6
11	1.755	0.161	1.04	69	2.42	67.2	55.9	100.3
12	1.914	0.159	1.03	70	2.38	67.3	56.1	99.0
13	2.073	0.159	1.03	70	2.43	67.3	56.2	99.7
14	2.233	0.160	1.03	70	2.42	67.5	56.4	101.1
15	2.392	0.159	1.03	70	2.42	67.7	56.5	100.8
16	2.552	0.160	1.03	70	2.46	67.7	56.7	101.6
17	2.711	0.159	1.02	70	2.49	68.1	56.9	101.0
18	2.869	0.158	1.02	70	2.43	68.4	57.1	100.1
19	3.029	0.160	1.03	70	2.46	68.7	57.3	101.3
20	3.188	0.159	1.02	71	2.44	69	57.4	101.0
21	3.347	0.159	1.02	71	2.45	69.3	57.6	101.1
22	3.506	0.159	1.02	71	2.43	69.6	57.8	100.9
23	3.665	0.159	1.02	71	2.51	69.8	58	101.5
24	3.823	0.158	1.01	71	2.46	69.9	58.2	101.5
25	3.981	0.158	1.02	71	2.50	70	58.4	101.8
26	4.141	0.160	1.01	71	2.42	70.1	58.5	103.3
27	4.302	0.161	1.01	71	2.41	70.3	58.7	103.4
28	4.458	0.156	1.02	72	2.50	70.3	58.9	99.4
29	4.616	0.158	1.01	72	2.53	70.4	59	100.5
30	4.775	0.159	1.01	72	2.53	70.5	59.2	101.6
31	4.934	0.159	1.01	72	2.47	70.5	59.3	101.8
32	5.092	0.158	1.01	72	2.42	70.7	59.5	101.6

Train C - First Hour Particulate Sampling

Run: 2
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Start Time: 12:02
Total Sampling Time: 60 min
Recording Interval: 1 min

Test Date: 3/11/25

Meter Box Y Regression Offset: 1.01
Meter Box Y Regression Factor: 0
Meter Box Dynamic Y: 1.010
Sample Box ID: 371

Sample Train Leak Checks
Pre-test 0.002 cfm @ 18.6 in. Hg
Post-Test 0.003 cfm @ 10.5 in. Hg

Elapsed Time (min)	**Train C Sampling System**							
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*
33	5.251	0.159	1.01	72	2.46	70.7	59.7	103.3
34	5.409	0.158	1.01	72	2.53	70.8	59.8	103.0
35	5.568	0.159	1.01	72	2.48	70.9	60	103.5
36	5.726	0.158	1.01	72	2.53	71	60.1	103.4
37	5.885	0.159	1.01	72	2.53	70.5	60.2	103.8
38	6.043	0.158	1.00	73	2.52	70.4	60.4	101.9
39	6.201	0.158	1.01	73	2.44	70.5	60.5	100.8
40	6.363	0.162	1.00	73	2.47	70.2	60.7	102.9
41	6.518	0.155	1.01	73	2.53	69.9	60.9	98.4
42	6.677	0.159	1.00	73	2.44	69.5	61	101.0
43	6.835	0.158	1.01	73	2.44	69.2	61.1	100.1
44	6.995	0.160	1.01	73	2.45	68.8	61.3	101.1
45	7.153	0.158	1.01	74	2.53	68.4	61.4	99.8
46	7.312	0.159	1.01	74	2.51	68	61.5	100.4
47	7.471	0.159	1.01	74	2.52	67.8	61.7	100.3
48	7.630	0.159	1.01	74	2.51	67.7	61.9	99.9
49	7.790	0.160	1.01	74	2.52	67.6	62	100.4
50	7.948	0.158	1.01	74	2.42	67.6	62.1	99.3
51	8.108	0.160	1.02	74	2.45	67.6	62.3	100.8
52	8.268	0.160	1.02	74	2.50	67.7	62.4	100.7
53	8.429	0.161	1.02	75	2.45	67.6	62.5	101.0
54	8.590	0.161	1.02	75	2.45	67.7	62.7	100.7
55	8.746	0.156	1.02	75	2.40	67.6	62.7	97.4
56	8.906	0.160	1.02	75	2.40	67.7	62.9	99.6
57	9.067	0.161	1.02	75	2.48	67.7	63.1	100.5
58	9.226	0.159	1.02	75	2.39	67.7	63.2	99.6
59	9.387	0.161	1.03	75	2.40	67.6	63.3	101.1
60	9.547	0.160	1.02	75	2.42	67.7	63.4	100.4

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 12:02
Total Sampling Time 292 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
Tot / Avg	**45.357**	**0.155**	**1.08**	**78.5**	**1.94**	**272.35**	**-0.058**	**543.1**	**0.20**	**10.16**
Minimum	0.000	0.148	1.03	70	1.87	197.30	-0.103	328.0	0.03	0.73
Max	45.357	0.159	1.40	81	2.26	504.90	-0.037	547.0	2.15	16.57
0	0.000		-0.01	70	0.03	364.8	-0.070	547.0	0.08	4.08
1	0.148	0.148	1.06	70	1.89	342.1	-0.078	547.0	0.13	0.73
2	0.300	0.152	1.06	70	1.89	349.8	-0.087	547.0	0.12	1.01
3	0.451	0.151	1.06	70	1.91	357.7	-0.086	547.0	0.14	1.34
4	0.602	0.151	1.06	70	1.87	334.2	-0.084	547.0	0.08	4.00
5	0.755	0.153	1.05	70	1.92	329.9	-0.081	547.0	0.07	3.47
6	0.907	0.152	1.05	70	1.90	329.8	-0.082	547.0	0.07	3.45
7	1.058	0.151	1.05	70	1.91	330	-0.086	547.0	0.07	3.12
8	1.209	0.151	1.04	70	1.90	329.8	-0.086	547.0	0.07	3.03
9	1.359	0.150	1.04	70	1.90	330.7	-0.086	547.0	0.07	3.12
10	1.510	0.151	1.04	71	1.88	331.5	-0.082	547.0	0.08	3.14
11	1.661	0.151	1.04	71	1.89	329.4	-0.082	547.0	0.07	3.60
12	1.812	0.151	1.04	71	1.91	328.8	-0.087	547.0	0.06	5.35
13	1.963	0.151	1.03	71	1.91	337.6	-0.085	547.0	0.07	7.75
14	2.114	0.151	1.04	71	1.89	347.5	-0.090	547.0	0.06	6.96
15	2.264	0.150	1.04	71	1.88	365	-0.091	547.0	0.18	14.10
16	2.414	0.150	1.04	71	1.88	384.9	-0.090	547.0	0.07	11.17
17	2.564	0.150	1.03	71	1.89	403.2	-0.097	547.0	0.38	14.87
18	2.715	0.151	1.03	71	1.87	425.4	-0.097	547.0	0.71	15.54
19	2.866	0.151	1.03	71	1.89	442	-0.103	547.0	0.59	15.34
20	3.017	0.151	1.03	72	1.90	455.2	-0.097	547.0	1.01	16.24
21	3.167	0.150	1.03	72	1.88	463.9	-0.098	547.0	0.94	16.32
22	3.321	0.154	1.40	72	2.26	470.9	-0.100	547.0	0.89	16.40
23	3.477	0.156	1.09	72	1.95	477.6	-0.100	547.0	0.65	16.43
24	3.632	0.155	1.09	72	1.96	480.7	-0.099	547.0	0.98	16.15
25	3.786	0.154	1.09	72	1.93	484.5	-0.102	547.0	0.76	16.33
26	3.940	0.154	1.09	72	1.97	488.7	-0.094	547.0	1.18	16.35
27	4.098	0.158	1.09	73	1.95	491.1	-0.098	547.0	0.61	16.27
28	4.250	0.152	1.09	73	1.97	494.6	-0.098	547.0	0.68	16.40
29	4.404	0.154	1.09	73	1.92	497	-0.100	547.0	0.77	16.30
30	4.559	0.155	1.09	73	1.94	500.1	-0.097	547.0	1.57	16.39
31	4.714	0.155	1.09	73	1.95	500.9	-0.097	547.0	1.60	16.37
32	4.868	0.154	1.09	73	1.93	503.1	-0.095	547.0	1.92	16.56

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016

Meter Box Y Regression Factor:

Meter Box Dynamic Y: 1.016

Sample Box ID: 372

Test Start Time: 12:02

Total Sampling Time 292 min

Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
33	5.023	0.155	1.08	73	1.94	504.3	-0.097	547.0	1.56	16.54
34	5.178	0.155	1.09	74	1.94	504.9	-0.099	547.0	1.38	16.57
35	5.332	0.154	1.09	74	1.94	504.2	-0.098	547.0	1.51	16.48
36	5.487	0.155	1.09	74	1.94	504.7	-0.101	547.0	1.66	16.37
37	5.642	0.155	1.08	74	1.93	476.7	-0.089	547.0	2.14	15.58
38	5.796	0.154	1.09	74	1.97	442.7	-0.090	547.0	2.15	15.48
39	5.951	0.155	1.09	74	1.94	424.5	-0.084	547.0	0.43	15.17
40	6.109	0.158	1.08	74	1.95	411	-0.084	547.0	0.22	14.54
41	6.261	0.152	1.09	75	1.92	400.7	-0.087	547.0	0.19	14.38
42	6.415	0.154	1.08	75	1.96	392.5	-0.084	547.0	0.31	13.41
43	6.570	0.155	1.08	75	1.96	383.7	-0.081	547.0	0.20	12.87
44	6.726	0.156	1.09	75	1.94	375.5	-0.082	547.0	0.17	12.24
45	6.880	0.154	1.08	75	1.97	367.6	-0.078	547.0	0.09	12.06
46	7.035	0.155	1.08	75	1.97	360.8	-0.079	547.0	0.06	12.18
47	7.190	0.155	1.08	75	1.96	354.8	-0.075	547.0	0.05	11.76
48	7.344	0.154	1.09	76	1.95	349.5	-0.074	547.0	0.08	11.82
49	7.499	0.155	1.08	76	1.95	345.7	-0.073	547.0	0.08	11.84
50	7.654	0.155	1.08	76	1.97	341.9	-0.077	547.0	0.09	12.10
51	7.809	0.155	1.09	76	1.96	337.8	-0.074	544.0	0.05	12.09
52	7.964	0.155	1.08	76	1.96	334.1	-0.070	431.0	0.04	12.06
53	8.122	0.158	1.08	76	1.96	330.2	-0.070	331.0	0.03	11.73
54	8.276	0.154	1.08	76	1.94	326.7	-0.075	328.0	0.03	11.90
55	8.429	0.153	1.08	76	1.96	323.5	-0.069	343.0	0.03	11.88
56	8.585	0.156	1.08	77	1.95	319.8	-0.067	399.0	0.04	11.58
57	8.739	0.154	1.09	77	1.95	316.6	-0.070	443.0	0.04	11.21
58	8.894	0.155	1.08	77	1.95	313.4	-0.065	478.0	0.05	11.19
59	9.050	0.156	1.08	77	1.93	311.5	-0.070	496.0	0.05	11.18
60	9.205	0.155	1.09	77	1.93	309.6	-0.066	547.0	0.06	11.19
61	9.359	0.154	1.08	77	1.97	308.2	-0.069	547.0	0.07	11.77
62	9.514	0.155	1.08	77	1.98	308.4	-0.064	547.0	0.10	12.35
63	9.670	0.156	1.09	77	1.94	309.3	-0.074	547.0	0.13	12.84
64	9.824	0.154	1.08	77	1.95	309.5	-0.065	547.0	0.18	13.14
65	9.980	0.156	1.08	77	1.97	309.6	-0.069	547.0	0.19	13.19
66	10.138	0.158	1.08	78	1.96	309.7	-0.066	547.0	0.22	13.30
67	10.292	0.154	1.08	78	1.94	309.3	-0.063	547.0	0.09	13.02
68	10.448	0.156	1.09	78	1.93	308.5	-0.070	547.0	0.09	12.88

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 12:02
Total Sampling Time 292 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
69	10.603	0.155	1.08	78	1.98	306.7	-0.070	547.0	0.12	12.71
70	10.755	0.152	1.08	78	1.93	306.5	-0.069	547.0	0.19	12.89
71	10.911	0.156	1.08	78	1.96	306.4	-0.068	547.0	0.23	13.31
72	11.067	0.156	1.08	78	1.95	305.8	-0.066	547.0	0.13	13.30
73	11.221	0.154	1.08	78	1.96	305.5	-0.064	547.0	0.09	12.97
74	11.377	0.156	1.08	78	1.98	305.4	-0.067	547.0	0.11	13.54
75	11.533	0.156	1.08	78	1.95	305	-0.066	547.0	0.07	12.96
76	11.687	0.154	1.09	78	1.97	303.5	-0.064	547.0	0.08	13.00
77	11.843	0.156	1.08	79	1.96	301.8	-0.062	547.0	0.07	12.94
78	11.999	0.156	1.08	79	1.97	300	-0.060	547.0	0.06	12.06
79	12.153	0.154	1.08	79	1.94	297.8	-0.061	547.0	0.06	11.71
80	12.312	0.159	1.09	79	1.94	296.8	-0.059	547.0	0.09	11.39
81	12.467	0.155	1.09	79	1.94	295.6	-0.060	547.0	0.09	11.60
82	12.622	0.155	1.08	79	1.92	295.6	-0.062	547.0	0.10	11.69
83	12.778	0.156	1.08	79	1.97	296	-0.061	547.0	0.09	11.93
84	12.931	0.153	1.09	79	1.95	295.3	-0.059	547.0	0.09	11.79
85	13.085	0.154	1.09	79	1.95	295.1	-0.055	547.0	0.09	11.74
86	13.241	0.156	1.08	79	1.97	294.8	-0.067	547.0	0.10	11.66
87	13.398	0.157	1.09	79	1.94	294.3	-0.071	547.0	0.10	11.49
88	13.552	0.154	1.09	79	1.94	293.7	-0.060	547.0	0.10	11.62
89	13.708	0.156	1.08	79	1.97	292.5	-0.064	547.0	0.10	11.58
90	13.864	0.156	1.09	79	1.93	291.6	-0.058	547.0	0.10	11.69
91	14.019	0.155	1.08	79	1.97	290.6	-0.058	547.0	0.09	11.80
92	14.175	0.156	1.08	79	1.94	289.7	-0.058	547.0	0.09	11.62
93	14.333	0.158	1.08	79	1.92	288.7	-0.060	547.0	0.09	11.76
94	14.488	0.155	1.08	79	1.92	288	-0.061	547.0	0.09	11.64
95	14.644	0.156	1.08	79	1.94	287.7	-0.055	547.0	0.09	11.58
96	14.799	0.155	1.09	79	1.97	287.3	-0.054	547.0	0.09	11.62
97	14.952	0.153	1.08	80	1.98	286.4	-0.057	547.0	0.09	11.48
98	15.108	0.156	1.08	80	1.94	284.3	-0.055	547.0	0.09	11.47
99	15.264	0.156	1.09	80	1.94	283.5	-0.058	547.0	0.09	11.43
100	15.419	0.155	1.08	80	1.96	283.2	-0.064	547.0	0.09	11.28
101	15.575	0.156	1.08	80	1.97	281.9	-0.053	547.0	0.09	11.21
102	15.731	0.156	1.08	80	1.93	281.2	-0.060	547.0	0.10	11.19
103	15.886	0.155	1.09	80	1.97	280.2	-0.058	547.0	0.10	11.15
104	16.042	0.156	1.08	80	1.97	279.6	-0.057	547.0	0.10	11.09

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 12:02
Total Sampling Time 292 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
105	16.198	0.156	1.09	80	1.94	278.8	-0.054	547.0	0.10	11.16
106	16.353	0.155	1.08	80	1.95	279.1	-0.057	547.0	0.09	11.31
107	16.512	0.159	1.09	80	1.92	278.7	-0.060	547.0	0.10	11.22
108	16.667	0.155	1.09	80	1.94	278.3	-0.060	547.0	0.10	11.36
109	16.823	0.156	1.08	80	1.95	278.1	-0.060	547.0	0.10	11.47
110	16.980	0.157	1.09	80	1.97	277.9	-0.056	547.0	0.10	11.51
111	17.134	0.154	1.09	80	1.97	277.5	-0.053	547.0	0.09	11.58
112	17.288	0.154	1.08	80	1.97	276.2	-0.059	547.0	0.10	11.70
113	17.444	0.156	1.08	80	1.96	276.5	-0.052	547.0	0.10	11.63
114	17.599	0.155	1.08	80	1.92	276.3	-0.059	547.0	0.10	11.74
115	17.755	0.156	1.08	80	1.93	275.9	-0.059	547.0	0.09	11.84
116	17.912	0.157	1.09	80	1.98	275.1	-0.060	547.0	0.10	11.89
117	18.066	0.154	1.09	80	1.94	274.9	-0.051	547.0	0.10	11.74
118	18.223	0.157	1.08	80	1.92	274.6	-0.054	547.0	0.08	12.06
119	18.379	0.156	1.09	80	1.95	273.6	-0.051	547.0	0.09	11.98
120	18.537	0.158	1.09	80	1.98	271.7	-0.058	547.0	0.09	11.67
121	18.693	0.156	1.08	80	1.95	271.2	-0.057	547.0	0.10	11.44
122	18.848	0.155	1.09	80	1.97	270	-0.051	547.0	0.09	11.36
123	19.004	0.156	1.08	80	1.97	268	-0.054	547.0	0.09	11.18
124	19.161	0.157	1.08	80	1.97	266.4	-0.050	547.0	0.08	11.00
125	19.316	0.155	1.09	80	1.95	264.3	-0.052	547.0	0.08	10.52
126	19.469	0.153	1.09	80	1.98	261.6	-0.051	547.0	0.07	10.50
127	19.626	0.157	1.08	80	1.95	258.6	-0.051	547.0	0.07	10.55
128	19.781	0.155	1.09	80	1.96	256.6	-0.049	547.0	0.07	10.54
129	19.937	0.156	1.08	80	1.97	254	-0.048	547.0	0.07	10.63
130	20.094	0.157	1.08	80	1.94	251.7	-0.052	547.0	0.07	10.68
131	20.249	0.155	1.09	80	1.96	249.9	-0.049	547.0	0.08	10.60
132	20.405	0.156	1.08	80	1.92	248	-0.052	547.0	0.08	10.66
133	20.564	0.159	1.09	80	1.94	246.5	-0.049	547.0	0.08	10.61
134	20.719	0.155	1.09	80	1.97	245.3	-0.046	547.0	0.08	10.79
135	20.876	0.157	1.09	80	1.97	244.3	-0.044	547.0	0.09	10.70
136	21.031	0.155	1.09	80	1.95	243.2	-0.053	547.0	0.09	10.68
137	21.187	0.156	1.08	80	1.93	241.7	-0.050	547.0	0.10	10.77
138	21.343	0.156	1.08	80	1.95	241.5	-0.053	547.0	0.11	10.73
139	21.496	0.153	1.09	80	1.96	241.2	-0.050	547.0	0.10	10.71
140	21.652	0.156	1.09	80	1.98	240.8	-0.051	547.0	0.10	10.85

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 12:02
Total Sampling Time 292 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
141	21.808	0.156	1.08	80	1.95	240.1	-0.051	547.0	0.10	10.69
142	21.963	0.155	1.09	80	1.96	238.9	-0.051	547.0	0.10	10.56
143	22.120	0.157	1.08	80	1.93	238.6	-0.046	547.0	0.10	10.69
144	22.276	0.156	1.08	80	1.92	238.5	-0.046	547.0	0.10	10.58
145	22.434	0.158	1.09	80	1.95	237.7	-0.056	547.0	0.10	10.55
146	22.590	0.156	1.08	80	1.98	237.1	-0.050	547.0	0.10	10.62
147	22.746	0.156	1.09	80	1.97	236.6	-0.048	547.0	0.11	10.62
148	22.901	0.155	1.08	80	1.96	237.1	-0.046	547.0	0.11	10.64
149	23.058	0.157	1.09	80	1.96	237.5	-0.046	547.0	0.11	10.86
150	23.214	0.156	1.09	80	1.94	238.3	-0.042	547.0	0.12	11.15
151	23.370	0.156	1.08	80	1.94	238.4	-0.046	547.0	0.11	10.88
152	23.526	0.156	1.08	80	1.96	238.7	-0.050	547.0	0.11	10.93
153	23.679	0.153	1.09	80	1.95	239.1	-0.046	547.0	0.11	10.95
154	23.835	0.156	1.09	80	1.96	238.5	-0.046	547.0	0.12	11.18
155	23.992	0.157	1.09	80	1.96	238.7	-0.055	547.0	0.12	10.92
156	24.147	0.155	1.09	80	1.96	238.8	-0.055	547.0	0.12	10.68
157	24.303	0.156	1.08	80	1.94	238.6	-0.051	547.0	0.12	10.63
158	24.460	0.157	1.09	80	1.97	238.4	-0.050	547.0	0.12	10.59
159	24.617	0.157	1.09	80	1.95	238.8	-0.053	547.0	0.12	10.48
160	24.774	0.157	1.09	80	1.94	238.8	-0.050	547.0	0.12	10.15
161	24.930	0.156	1.09	80	1.95	238.3	-0.051	547.0	0.12	10.14
162	25.085	0.155	1.08	80	1.96	238.5	-0.050	547.0	0.12	10.01
163	25.242	0.157	1.09	80	1.95	237.9	-0.051	547.0	0.12	10.14
164	25.397	0.155	1.09	80	1.96	237.6	-0.048	547.0	0.13	9.97
165	25.554	0.157	1.08	80	1.94	237.4	-0.046	547.0	0.13	10.03
166	25.708	0.154	1.09	80	1.95	237.5	-0.049	547.0	0.13	10.09
167	25.863	0.155	1.09	80	1.96	238.1	-0.054	547.0	0.13	9.96
168	26.019	0.156	1.08	80	1.95	237.7	-0.050	547.0	0.14	10.10
169	26.175	0.156	1.08	80	1.94	238.1	-0.049	547.0	0.14	10.09
170	26.331	0.156	1.09	80	1.96	238.2	-0.045	547.0	0.14	10.16
171	26.489	0.158	1.08	80	1.96	237.9	-0.053	547.0	0.13	9.96
172	26.646	0.157	1.09	80	1.94	237.8	-0.054	547.0	0.13	10.05
173	26.801	0.155	1.09	80	1.93	238.1	-0.048	547.0	0.14	9.88
174	26.957	0.156	1.09	80	1.93	238.5	-0.053	547.0	0.15	9.91
175	27.113	0.156	1.09	80	1.94	239	-0.050	547.0	0.14	9.72
176	27.269	0.156	1.08	80	1.97	238.2	-0.048	547.0	0.13	9.85

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 12:02
Total Sampling Time 292 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
177	27.425	0.156	1.08	80	1.97	238.5	-0.046	547.0	0.14	9.75
178	27.581	0.156	1.08	80	1.95	238	-0.047	547.0	0.14	9.81
179	27.737	0.156	1.08	80	1.93	237	-0.045	547.0	0.13	9.71
180	27.893	0.156	1.08	80	1.97	236.4	-0.047	547.0	0.14	9.69
181	28.046	0.153	1.09	80	1.96	235.4	-0.049	547.0	0.14	9.57
182	28.202	0.156	1.08	80	1.95	234.9	-0.049	547.0	0.13	9.50
183	28.358	0.156	1.08	80	1.95	233.9	-0.046	547.0	0.13	9.41
184	28.514	0.156	1.09	80	1.96	233.2	-0.047	547.0	0.13	9.41
185	28.672	0.158	1.08	80	1.95	232.2	-0.050	547.0	0.13	9.38
186	28.829	0.157	1.09	80	1.94	231.7	-0.047	547.0	0.12	9.10
187	28.984	0.155	1.08	81	1.94	231	-0.051	547.0	0.12	9.10
188	29.141	0.157	1.08	80	1.97	230.4	-0.049	547.0	0.12	8.98
189	29.297	0.156	1.09	80	1.93	229.2	-0.047	547.0	0.12	9.09
190	29.452	0.155	1.08	81	1.96	228.1	-0.053	547.0	0.12	9.15
191	29.609	0.157	1.09	80	1.98	227.7	-0.053	547.0	0.11	9.05
192	29.764	0.155	1.08	80	1.96	226.7	-0.049	547.0	0.12	9.04
193	29.920	0.156	1.08	81	1.95	225.7	-0.048	547.0	0.12	9.05
194	30.076	0.156	1.08	80	1.94	224.9	-0.050	547.0	0.11	9.02
195	30.229	0.153	1.08	80	1.96	223.9	-0.048	547.0	0.12	9.04
196	30.385	0.156	1.09	80	1.97	223.2	-0.046	547.0	0.12	8.99
197	30.542	0.157	1.08	81	1.92	222.8	-0.046	547.0	0.12	9.11
198	30.699	0.157	1.09	80	1.97	221.7	-0.048	547.0	0.12	9.06
199	30.856	0.157	1.08	80	1.97	221.1	-0.044	547.0	0.12	9.06
200	31.012	0.156	1.08	80	1.94	220.3	-0.046	547.0	0.12	9.20
201	31.167	0.155	1.09	80	1.93	220.2	-0.044	547.0	0.13	9.27
202	31.323	0.156	1.08	81	1.95	219.3	-0.045	547.0	0.14	9.12
203	31.480	0.157	1.09	80	1.96	219.1	-0.045	547.0	0.12	8.99
204	31.635	0.155	1.08	80	1.94	218.7	-0.049	547.0	0.11	8.91
205	31.792	0.157	1.09	80	1.94	217.9	-0.043	547.0	0.12	8.95
206	31.947	0.155	1.09	80	1.94	217.4	-0.046	547.0	0.13	8.73
207	32.103	0.156	1.08	80	1.97	217.3	-0.046	547.0	0.12	8.73
208	32.259	0.156	1.08	80	1.93	217.3	-0.042	547.0	0.12	8.79
209	32.412	0.153	1.08	80	1.98	216.6	-0.043	547.0	0.13	8.87
210	32.568	0.156	1.08	80	1.96	216.5	-0.048	547.0	0.12	8.74
211	32.727	0.159	1.08	80	1.96	216.3	-0.049	547.0	0.12	8.60
212	32.882	0.155	1.09	80	1.98	215.7	-0.045	547.0	0.12	8.69

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 12:02
Total Sampling Time 292 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
213	33.039	0.157	1.08	80	1.94	215.6	-0.047	547.0	0.14	8.07
214	33.195	0.156	1.09	80	1.93	215.2	-0.052	547.0	0.15	8.24
215	33.350	0.155	1.09	80	1.93	215.4	-0.055	547.0	0.15	8.26
216	33.507	0.157	1.09	80	1.97	215.8	-0.044	547.0	0.16	8.43
217	33.663	0.156	1.09	80	1.96	215.8	-0.049	547.0	0.16	8.43
218	33.818	0.155	1.08	80	1.97	215.8	-0.048	547.0	0.16	8.46
219	33.975	0.157	1.09	80	1.97	215.6	-0.049	547.0	0.15	8.34
220	34.130	0.155	1.09	80	1.95	215.3	-0.044	547.0	0.15	8.55
221	34.287	0.157	1.09	80	1.97	215.2	-0.046	547.0	0.15	8.75
222	34.440	0.153	1.09	80	1.95	214.6	-0.046	547.0	0.15	8.69
223	34.598	0.158	1.09	80	1.96	214.7	-0.043	547.0	0.16	8.82
224	34.755	0.157	1.08	80	1.94	214.7	-0.040	547.0	0.16	8.90
225	34.911	0.156	1.08	80	1.93	214.2	-0.043	547.0	0.17	8.82
226	35.066	0.155	1.08	80	1.94	214	-0.043	547.0	0.17	8.83
227	35.222	0.156	1.08	80	1.97	213.8	-0.046	547.0	0.13	8.84
228	35.379	0.157	1.09	80	1.97	212.8	-0.046	547.0	0.13	8.81
229	35.534	0.155	1.08	80	1.96	212.1	-0.045	547.0	0.13	8.76
230	35.690	0.156	1.08	80	1.96	211.4	-0.049	547.0	0.13	8.84
231	35.846	0.156	1.08	80	1.94	211.2	-0.046	547.0	0.13	8.80
232	36.001	0.155	1.08	80	1.92	210.4	-0.046	547.0	0.13	8.92
233	36.158	0.157	1.08	80	1.97	210	-0.049	547.0	0.14	8.75
234	36.314	0.156	1.09	80	1.94	209.3	-0.041	547.0	0.14	8.77
235	36.470	0.156	1.08	80	1.93	208.8	-0.044	547.0	0.14	8.73
236	36.623	0.153	1.08	80	1.97	208.6	-0.049	547.0	0.14	8.68
237	36.781	0.158	1.08	80	1.94	208.4	-0.039	547.0	0.13	8.60
238	36.938	0.157	1.08	80	1.94	207.6	-0.043	547.0	0.14	8.62
239	37.094	0.156	1.09	80	1.94	207.9	-0.044	547.0	0.14	8.63
240	37.249	0.155	1.09	80	1.93	207.6	-0.048	547.0	0.14	8.64
241	37.405	0.156	1.08	80	1.94	207	-0.048	547.0	0.14	8.56
242	37.562	0.157	1.09	80	1.96	207	-0.045	547.0	0.13	7.83
243	37.717	0.155	1.08	80	1.94	206.9	-0.050	547.0	0.14	7.77
244	37.873	0.156	1.08	80	1.92	207	-0.043	547.0	0.14	7.79
245	38.030	0.157	1.08	80	1.94	206.8	-0.044	547.0	0.14	7.79
246	38.185	0.155	1.08	80	1.97	206.7	-0.040	547.0	0.14	7.82
247	38.342	0.157	1.09	80	1.97	206	-0.040	547.0	0.14	7.81
248	38.497	0.155	1.09	80	1.93	205.8	-0.042	547.0	0.14	7.77

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire

Model: Nova 2

Tracking No.: 2497

Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016

Meter Box Y Regression Factor:

Meter Box Dynamic Y: 1.016

Sample Box ID: 372

Test Start Time: 12:02

Total Sampling Time 292 min

Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
249	38.653	0.156	1.08	80	1.94	205.4	-0.043	547.0	0.15	7.78
250	38.809	0.156	1.08	80	1.94	205.1	-0.041	547.0	0.15	7.86
251	38.965	0.156	1.09	80	1.93	204.9	-0.048	547.0	0.14	7.76
252	39.121	0.156	1.08	80	1.97	204.6	-0.046	547.0	0.15	7.64
253	39.277	0.156	1.09	80	1.96	204.6	-0.046	547.0	0.15	7.50
254	39.433	0.156	1.08	80	1.95	204	-0.044	547.0	0.15	7.49
255	39.589	0.156	1.08	80	1.93	204.2	-0.044	547.0	0.16	7.53
256	39.745	0.156	1.09	80	1.95	204	-0.042	547.0	0.15	7.52
257	39.900	0.155	1.08	80	1.94	204.4	-0.038	547.0	0.15	7.51
258	40.057	0.157	1.08	80	1.97	204.6	-0.044	547.0	0.15	7.65
259	40.213	0.156	1.08	80	1.92	204	-0.043	547.0	0.15	7.54
260	40.368	0.155	1.08	80	1.93	203.4	-0.050	547.0	0.16	7.53
261	40.525	0.157	1.08	80	1.93	203.2	-0.047	547.0	0.16	7.60
262	40.680	0.155	1.08	80	1.92	203.1	-0.049	547.0	0.15	7.50
263	40.836	0.156	1.08	80	1.96	202.6	-0.050	547.0	0.16	7.53
264	40.992	0.156	1.08	80	1.92	202.8	-0.044	547.0	0.16	7.51
265	41.147	0.155	1.09	80	1.97	203	-0.043	547.0	0.16	7.49
266	41.304	0.157	1.08	80	1.94	202.4	-0.038	547.0	0.16	7.43
267	41.460	0.156	1.08	80	1.96	202.6	-0.042	547.0	0.16	7.50
268	41.615	0.155	1.09	80	1.95	202.6	-0.041	547.0	0.17	7.54
269	41.771	0.156	1.08	80	1.95	202.2	-0.046	547.0	0.18	7.60
270	41.928	0.157	1.09	80	1.93	202.2	-0.044	547.0	0.18	7.60
271	42.083	0.155	1.08	80	1.97	202.9	-0.047	547.0	0.19	7.70
272	42.239	0.156	1.08	80	1.93	203.2	-0.043	547.0	0.15	7.69
273	42.395	0.156	1.09	80	1.97	202.6	-0.037	547.0	0.16	7.64
274	42.550	0.155	1.08	80	1.93	201.9	-0.042	547.0	0.16	7.61
275	42.707	0.157	1.08	80	1.97	201.5	-0.041	547.0	0.16	7.57
276	42.863	0.156	1.08	80	1.97	201.3	-0.042	547.0	0.16	7.48
277	43.018	0.155	1.08	80	1.92	201.1	-0.046	547.0	0.17	7.49
278	43.175	0.157	1.08	80	1.97	200.9	-0.047	547.0	0.17	7.47
279	43.330	0.155	1.09	80	1.97	201.1	-0.044	547.0	0.17	7.40
280	43.486	0.156	1.09	80	1.92	201.4	-0.039	547.0	0.17	7.41
281	43.642	0.156	1.08	80	1.94	200.8	-0.039	547.0	0.16	7.46
282	43.797	0.155	1.08	80	1.98	200.7	-0.041	547.0	0.15	7.43
283	43.954	0.157	1.08	80	1.97	199.8	-0.046	547.0	0.16	7.38
284	44.110	0.156	1.08	80	1.94	199.5	-0.049	547.0	0.16	7.45

Train D - Ambient Background and Flue Gas Data

Run: 2 **Test Date:** 3/11/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 12:02
Total Sampling Time 292 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
285	44.265	0.155	1.08	80	1.93	199.1	-0.048	547.0	0.15	7.29
286	44.421	0.156	1.08	80	1.96	199.3	-0.046	547.0	0.15	7.24
287	44.578	0.157	1.09	80	1.97	198.8	-0.041	547.0	0.16	7.20
288	44.732	0.154	1.08	80	1.95	198.9	-0.037	547.0	0.14	7.12
289	44.889	0.157	1.08	80	1.94	198.3	-0.041	547.0	0.13	7.45
290	45.045	0.156	1.08	80	1.99	198.6	-0.044	547.0	0.13	7.33
291	45.200	0.155	1.08	80	1.93	198.2	-0.043	547.0	0.12	7.35
292	45.357	0.157	1.09	80	1.97	197.3	-0.048	547.0	0.11	7.28

Gravimetric Lab Data

ASTM E2515

Manufacturer:	MF Fire
Model:	Nova 2
Tracking No.:	2497
Project No.:	0552WS004E
Run No.:	2
Test Date:	3/11/25

OMNI Eq. ID Numbers	
Analytical Scale	
Audit Weight Set:	
Analytical Scale	
Hydrometer	
Filters are weighed	In Pairs

Train A

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights			
				Final, mg	Tare, mg	Particulate, mg	
						Uncorrected	Corrected
FilterPairs	3/19/24 @ 21:15	Filter	F532	240.9	237.3	3.6	3.6
			F532A				
Probe catch*	3/19/24 @ 21:15	Probe	82	116288.0	116288.0	0.0	0.0
lter seals catch*	3/19/24 @ 21:15	Seals	S943	4166.6	4165.7	0.9	0.9
				Total Particulate, mg:		**4.5**	**4.5**

Train B

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights			
				Final, mg	Tare, mg	Particulate, mg	
						Uncorrected	Corrected
FilterPairs	3/19/24 @ 21:15	Filter	F533	242.6	237.7	4.9	4.9
			F533A				
Probe catch*	3/19/24 @ 21:15	Probe	OES6	113706.7	113706.6	0.1	0.1
lter seals catch*	3/19/24 @ 21:15	Seals	S944	3385.5	3385.5	0.0	0.0
		Sub-Total		Total Particulate, mg:		**5.0**	**5.0**

Train C - *First Hour*

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights			
				Final, mg	Tare, mg	Particulate, mg	
						Uncorrected	Corrected
FilterPairs	3/19/24 @ 21:15	Filter	F534	240.9	237.3	3.6	3.6
			F534A				
Probe catch*	3/19/24 @ 21:15	Probe	83	117541.7	117541.7	0.0	0.0
lter seals catch*	3/19/24 @ 21:15	Seals	S945	4151.4	4151.2	0.2	0.2
				Total Particulate, mg:		**3.8**	**3.8**

Train D - *Ambient Background*

Sample Component	Date / Time in Dessicator	Reagent	Filter # or	Weights		
				Final, mg	Tare, mg	Particulate, mg
Filter catch*	3/19/24 @ 21:15	Filter	F537	116.2	116.2	0.0
				Total Particulate, mg:		**0.0**

Final (mg) - Tare (mg) = Particulate (mg)

NOTE: The Uncorrected values are those where any negative filter weights are taken as a negative value. This can possibly occur when filter matter adheres the O-ring seals and thereby transfers some mass to the O-ring. The Corrected values reflect where any negative filter weights are taken as ZERO, thus not accounting for any transfer of mass and resultingly over-reporting. Corrected values were added to this analysis to report the "Corrected" results in this report in response to a request by the US EPA. In cases where the Final weight minus the Tare weight of the Ambient filter occurs, it is taken as a ZERO. Any negative probe weights are evaluated pursuant to clause of ASTM E25215 (or appropriatelt associated test standard as defined in the introduction of this report).

Technician Signature:_____ Reviewed By:_____

Run 2 - Run Notes

Manufacturer	MF Fire
Model:	Nova 2
Project Number:	0552WS004E
Run Number:	2
Test Date:	3/11/2025

This supplemental section of miscellaneous run notes is comprised of the following:

- Appliance Operation Notes
- Velocity Traverse / Supplementa Run Notes
- Test Fuel Notes
- Gravimetric Analysis Notes

OMNI-Test Laboratories, Inc.

ASTM E2780 Wood Heater Test Notes

Client: MF Fire | Project Number: 0552WS004E | Run Number: 2
Model: Nova2 | Tracking Number: 2497 | Date: 3-11-2025
Test Crew: JM RT

Test Fuel Properties

Equipment			
Device	**OMNI Number**	**Cal Date**	**Cal Due**
Tape Measure	730	12/6/2023	11/8/2025
Moisture Meter	340	N/A-VBU	N/A-VBU
Moisture Reference	431	10/18/2024	10/18/2025
Fuel Scale	745		
Fuel Scale Audit Weight	132		
Fuel Species / Type	Douglas fir, untreated and air dried, standard grade or better dimensional lumber.		

Calibration Verifications			
Moisture Meter		Fuel Preparation Scale	
12% Reference :	12	10.0 lb. Reference Audit :	10.00
22% Reference :	22		

Pre-Burn Fuel

Piece No.	Length, In.	Moisture % db	Piece No.	Length, In.	Moisture % db	Piece No.	Length, In.	Moisture % db
1	16	23.8	7	20	23.8	13	20	22.4
2	16	25.3	8	20	22.7	14	20	24.8
3	16	24.6	9	16	20.1	15	20	24.7
4	16	23.8	10	16	21.6	16	10	23.0
5	20	22.7	11	16	24.2	17		
6	20	21.6	12	16	21.0	18		
Total Weight, lb.		14.72 14.47	Time of Day		8:00 9:30	Room Temp. °F		65 65

Test Fuel Charge

Piece No.	Weight, Lb.	Length, In.	Moisture Measurements			Lumber Type
12.6	2.16	19.125	19.4	20.6	20.9	2X4
22.18	1.97	19.125	23.8	21.7	24.8	2X4
32.67	2.20	19.125	23.8	23.8	22.6	2X4
45.08	4.65462	19.125	27.5	21.3	22.5	4X4
54.66	4.44	19.125	24.3	21.9	22.4	4X4
6						
7						
8						

Spacer Moisture Readings

19.3	21.1	20.5	24.7			
24.2	17.9	18.7				
22.2	21.7	20.4				
21.4	24.9	22.2				
24.9	22.1	22.5				
Time of Day		10:03		Room Temp. °F		65
Total weight 2x4 with spacers, lb.		7.46		Total weight 4x4 with spacers, lb.		9.74
				Total weight of fuel charge, Lb.		17.19

Technician Signature: [signature] Date: 3-11-2025

OMNI-Test Laboratories, Inc. **ASTM E2780 Wood Heater Test Notes**

Client: MF Fire Project Number: 0552WS004E Run Number: 2

Model: Nova2 Tracking Number: 2497 Date: 3-11-2025

Test Crew: RT, JM

Supplemental Data

Test Booth No. E1 Sampling Start Time: 12:02 Sampling End Time: _____

Tunnel Cleaned Date 3-10-2025 % Smoke Capture 100 Induced Draft None in.H_2O

Systems Leak Checks			
System	**Pre-Test**	**Post-Test**	**Sampling Probe Change-out**
Pitot	0.00 @ 3	0.00 @ 5	
Train A	0.002 @ 15.15	0.005 @ 5.5	
Train B	0.002 @ 17.40	0.001 @ 6.5	
Train C	0.001 @ 18.6	0003 @ 10.5	

Velocity Traverse, 6-inch tunnel			
Location	Microtector (in. H_2O)	Δp (in. H_2O)	Tunnel Temp., °F
Center	.060	.120	98.7
1	.035	.070	99.2
2	.050	.100	100.2
3	.046	.092	100.5
4	.035	.070	97.3
5	.034	.068	97.4
6	.053	.106	97.7
7	.046	.092	97.7
8	.025	.050	98.0
Tunnel Static (in. H_2O)		Pre-Test	Post-Test
		-0.38	-0.38

Miscellaneous Parameters			
Item	**Initial**	**Final**	**Equipment No.**
Room Air Velocity, ft/min.	13	11	737
Scale Audit, lb. (20-80 % of fuel load)	20.0, 100	20.0, 10.0	132, 274
Room Relative Humidity, %	45	42	716
Barometric Pressure, in. Hg	29.73	29.61	716
Room Temperature, °F	72	70.0	716

Flue Gas Continuous Analyzer						
Analyzer ID		Response Time, sec.	30.89	Leak Check Performed?	✓	
Bias Checks	Concentration:	Ø	Pre-Test Response		Post-Test Response	
Concentration	Bottle No.	Value, %	Pre-Test Response		Post-Test Response	
			Zero	Span	Zero	Span
CO2 % Span	CC506601	16.88	Ø	16.88		~~14.98~~ → 16.76
CO % Span	CC506601	4.07	Ø	4.07		4.052
CO ppm Span	CC305741	5,02	Ø	5,02		496
Zero	TC34AM183	Ø	Ø			

Technician Signature: _____ Date: 3-11-2025

OMNI-Test Laboratories, Inc.

ASTM E2780 Wood Heater Test Notes

Client: MF Fire Project Number: 05S2WSOOTE Run Number: 2

Model: NOVA 2 Tracking Number: Date: 3-11-2025

Test Crew: JM RT

Primary Air Control Settings

Secondary:

Tertiary/Pilot:

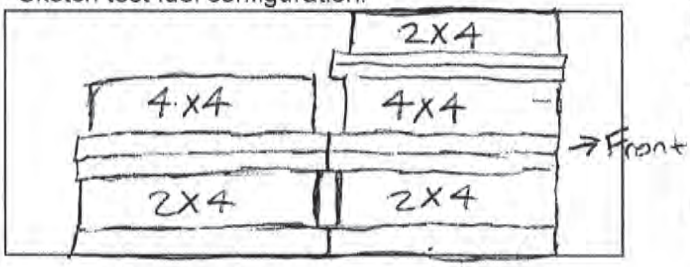
Fan: High

Preburn Notes

Time	Notes
0829	First preburn fuel loaded
0941	At 3.5 lbs 2nd preburn was loaded
1158	At 3.6 lbs coal bed was leveled
1202	At 3.5 lbs preburn was stopped

Sampling Portion Notes

Sketch test fuel configuration:



Start up procedures & Timeline:

Bypass: Used to load fuel

Fuel loaded by: 90 seconds

Door closed at: 180 seconds

Primary air:

Notes:

Time	Notes
1202	Test start
1307	first hour sampling stopped

Technician Signature:

Date: 3-11-2025

OMNI-Test Laboratories, Inc. **ASTM E2780 Wood Heater Test Notes**

Client:_____ Project Number:_____ Run Number: 2

Model:_____ Tracking Number:_____ Date: 3-14-2025

Test Crew:_____

Gravimetric Analysis Sheet

Assembled By: RTiegs

Date/Time in Desiccator:

3/11/25 1305 first hour

3-11-2025 Remainder 1705

Train	Element	ID #	Tare (mg)	v	Weighing's				
					Date/Time: 3-12-2025 745	Date/Time: 3-13-25 900	Date/Time: 3-17-2025 820	Date/Time: 3-19-25 1130	Date/Time:
					R/H %: 9, 1.0	R/H %: 5, 5.3	R/H %: 7, 0.3	R/H %: 5, 0.7	R/H %:
					Temp: 67.7	Temp: 66.9	Temp: 68.3	Temp: 68.7	Temp:
					100 mg Audit 100.0	100 mg Audit 100.0	100 mg Audit 100.0	100 mg Audit 100.0	100 mg Audit
					200 mg Audit: 200.1	200 mg Audit: 200.0	200 mg Audit: 200.0	200 mg Audit: 200.0	200 mg Audit:
					2 g Audit: 2000.2	2 g Audit: 2000.2	2 g Audit: 2000.2	2 g Audit: 2000.2	2 g Audit:
					100 g Audit: 99997.8	100 g Audit 99997.8	100 g Audit 99997.8	100 g Audit 99997.8	100 g Audit
					Initials: KT	Initials: RT	Initials: RT	Initials: RT	Initials:
A	Filter Pair	FS32 FS32A	237.3	✓	241.0	~~239.9~~ 240.9 ✓			
	Probe	82	116288.0	✓	116288.1	116288.0 ✓			
	O-Ring Set	5943	4165.7	✓	4167.0	4167.0 ✓	4166.6	4166.6 ✓	
B	Front Filter	FS33 FS33A	237.7	✓	242.9	242.6	242.6 ✓		
	Probe	OES6	113706.6	✓	113706.7	113706.7 ✓			
	O-Ring Set	5944	3385.5	✓	3385.7	3385.5 ✓	3385.5 ✓		
C (1st hr)	Front Filter	FS34 FS34A	237.3 ~~3385.5~~	✓	241.0	240.9 ✓			
	Probe	83	117541.7	✓	117541.7	117541.7 ✓			
	O-Ring Set	5945	~~4151.0~~ 4151.2	✓	4151.8	4151.4	4151.4 ✓		
BG	Filter	FS26	123.2	✓	123.2	123.2 ✓			

Technician Signature: _____ Date: 3-20-2025

Equations and Calculations – ASTM E2780 & E2515

Manufacturer	MF Fire
Model:	Nova 2
Project Number:	0552WS004E
Run Number:	2

Sample calculations of each equation used in the refernced standards for this test run.

Summary of INPUT values necessary for calculations

	Global Input Parameters for Equations	Value	Source
FM_S	- Average moisture of test fuel spacers, % dry basis	21.76	Fuel Properties Work Sheet
M_{Swb}	- Weight of Test Fuel Spacers, wet basis, kg	1.81	Fuel Properties Work Sheet
M_{CPnwb}	- Weight of each test fuel piece n in fuel crib, excluding nails and spacers, wet basis , kg	[1]Varies	Fuel Properties Work Sheet
FM_{CPn}	- Average fuel Fuel moisture in fuel crib, % dry basis	[1]Varies	Fuel Properties Work Sheet
V_C	- Volume of Fuel Crib, ft^3 (less spacers)	0.445	Fuel Properties Work Sheet
V_{SCENT}	- Average gas velocity at the center of the dilution tunnel calculated after the Pitot tube traverse, ft/sec	0.00	Traverse Worksheet
V_{STRAV}	- Average gas velocity calculated after the multipoint Pitot traverse	15.79	Traverse Worksheet
θ	- Duration of test, min	292	*Train A Worksheet*
P_{bar}	- Barometric pressure (average) at the testing site, in. Hg	29.67	*Traverse Worksheet*
Pg	- Tunnel Static Pressure	-0.38	*Traverse Worksheet*

[1] *Denotes that this pararmeter for each individual piece of fuel is calculated in the Test Fuel Properties worksheet and the input values are pulled into these sample caculations.*

	Sample Train Input Parameters for Equations	Train A	Train B	Train C	Train D
V_m	- Volume of gas sample measured at the dry gas meter, dcf	47.148	47.801	9.547	45.357
Y	Dry gas meter calibration factor	1.015	1.006	1.010	1.016
ΔH	- Average pressure differential across the orifice meter, in. H_2O	1.23	1.26	1.00	1.08
T_m	- Temperature of Dry Gas Meter, °F	88.0	87.7	71.7	79.0
Uncorrected Sample Mass					
m_p	- mass of particulate matter from probe, mg	0.0	0.1	0.0	n/a
m_f	- mass of particulate matter from filters, mg	3.6	4.9	3.6	0.0
m_g	- mass of particulate matter from filter seals, mg	0.9	0.0	0.2	n/a
Corrected Sample Mass					
m_p	- mass of particulate matter from probe, mg	0.0	0.1	0.0	n/a
m_f	- mass of particulate matter from filters, mg	3.6	4.9	3.6	n/a
m_g	- mass of particulate matter from filter seals, mg	0.9	0.0	0.2	n/a

M_{Sdb} – Weight of test fuel spacers, dry basis, kg - ASTM E2780 equation (1)

$$M_{Sdb} = (M_{Swb})\left(\frac{100}{100 + FM_S}\right)$$

Where,

FM_S = average moisture of test fuel spacers, % dry basis
M_{Swb} = weight of test fuel spacers, wet basis, kg

Sample Calculation:

FM_S = 21.76 %, dry basis
M_{Swb} = 1.81 lb.
0.4536 = Conversion factor, lb. → kg

M_{Sdb} = ((1.81 x 0.4536) (100 / (100 + 21.76))

M_{Sdb} = **0.674** kg

MCdb– Weight of test fuel crib, excluding nails and spacers, dry basis, kg - ASTM E2780 equation (2)

$$M_{Cdb} = \sum (M_{CPnwb})\left(\frac{100}{100 + FM_{CPn}}\right)$$

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:

ΣM_{CPnwb} = 15.38 lb.
FM_{CPn} = 22.42 %, dry basis
0.4536 = Conversion factor, lb. → kg

M_{Cdb} = 15.38 x 0.4536 x (100 / (100 + 22.42))

M_{Cdb} = **5.70** kg

DCdb - 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 = Volume of Fuel Crib, ft^3 (less spacers)

Sample Calculation:

M_{Cdb} = 12.56 lb
V_C = 0.445 ft^3

D_{Cdb} = 12.56 / 0.445

D_{Cdb} = **28.20** lb/ft^3

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

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

Sample Calculation:

M_{Sdb} = 0.674
M_{Cdb} = 5.70

M_{FTAdb} = 0.674 + 5.7

M_{FTAdb} = **6.37** kg

BR – dry burn rate, kg/hr - ASTM E2780 equation (5)

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

Sample Calculation:

M_{FTAdb} = 6.373
θ = 292

BR = (60 x 6.373) / 292

BR = **1.31** kg / hr

***Vs* – Average gas velocity in the dilution tunnel, ft/sec** - ASTM E2515 equation (9)

$$V_S = F_P \times K_P \times C_P \times \left(\sqrt{\Delta P}\right)_{avg} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

Where

F_P = Adjustment factor for center of tunnel pitot tube placement, where $F_P = V_{STRAV} / V_{SCENT}$

V_{SCENT} = Dilution tunnel velocity, at the center, ft/sec

V_{STRAV} = Dilution tunnel velocity, multi-point pitot traverse, ft/sec

K_P = Pitot tube constant, 85.49

C_P = Pitot tube coefficient: 0.99, unitless

$\Delta P^{1/2}_{AVG}$ = Velocity pressure in the dilution tunnel, in H_2O

$T_{S\,(avg)}$ = Absolute average gas temperature in the dilution tunnel, °R

P_S = Absolute average gas static pressure in tunnel, = Pbar + Pg , where Pbar = Barometric Pressure, in. Hg, Pg = Static pressure in tunnel, Hg (in H_2O / 13.6)

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

(Duration of Test)

F_P = 0.8161

$\Delta P^{1/2}_{AVG}$ = 0.3473

$T_{S\,(avg)}$ = 538.3505

Pbar = 29.6700

Pg = -0.3800

Ps = 29.6421

V_S = 0.816 x 85.49 x 0.99 x 0.347 x √ [(538 / (29.64 x 28.78)]

V_S = **19.056** ft/sec

(First Hour of Test)

F_P = 0.8161

$\Delta P^{1/2}_{AVG}$ = 0.3459

$T_{S\,(avg)}$ = 552.6410

Pbar = 29.7300

Pg = -0.3800

Ps = 29.7021

V_S = 0.816 x 85.49 x 0.99 x 0.346 x √ [(553 / (29.7 x 28.78)]

V_S = **19.207** ft/sec

Q_{std} – Average gas flow rate in dilution tunnel, dscf/hr - ASTM E2515 equation (3)

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

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} = solute temperature, 528 °R
P_s = Absolute average gas static pressure in dilution tunnel, = Pbar + Pg , 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

(Duration of Test):

B_{ws} = 0.02
A = 0.19635
P_s = 29.64
$T_{s(avg)}$ = 538
Vs = 19.06

Qstd = 3600 x (1 - 0.02) x 19.056 x 0.19635 x (528 / 538) x (29.64 / 29.92)

Qstd = **12826.2** dscf/hr

(First Hour):

B_{ws} = 0.02
A = 0.19635
P_s = 29.70
$T_{s(avg)}$ = 553
Vs = 19.207

Qstd = 3600 x (1 - 0.02) x 19.207 x 0.1963 x (528 / 553) x (29.7 / 29.92)

Qstd = **12618.9** dscf/hr

Vm(std) – Volume of Gas Sampled (Corrected), 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_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Train A

$$V_{m(std)} = 17.64 \times 47.148 \times 1.015 \times \frac{\left(29.67 + \frac{1.23}{13.6}\right)}{(88.0 + 460)}$$

$V_{m(std)}$ = **45.842** dscf

Train B

$$V_{m(std)} = 17.64 \times 47.801 \times 1.006 \times \frac{\left(29.67 + \frac{1.26}{13.6}\right)}{(88 + 460)}$$

$V_{m(std)}$ = **46.092** dscf

Train C (1st Hour)

$$V_{m(std)} = 17.64 \times 9.55 \times 1.010 \times \frac{\left(\underline{29.73} + \frac{1.00}{13.6}\right)}{(71.7 + 460)}$$

$V_{m(std)}$ = **9.534** dscf

Train D (Background)

$$V_{m(std)} = 17.64 \times 45.36 \times 1.016 \times \frac{\left(\underline{29.67} + \frac{1.08}{13.6}\right)}{(79.0 + 460)}$$

$V_{m(std)}$ = **44.867** dscf

mn – 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 Calculations (Uncorrected):

Train A
m_n = 0.0 + 3.6 + 0.9
m_n = **4.5** mg

Train B
m_n = 0.1 + 4.9 + 0.0
m_n = **5.0** mg

Train C (1st hour)
m_n = 0.0 + 3.6 + 0.2
m_n = **3.8** mg

Train D (Background)
$m_n = m_f$ = 0.0
m_n = **0.0** mg

Sample Calculations (Corrected):

Train A
m_n = 0.0 + 3.6 + 0.9
m_n = **4.5** mg

Train B
m_n = 0.1 + 4.9 + 0.0
m_n = **5.0** mg

Train C (1st hour)
m_n = 0.0 + 3.6 + 0.2
m_n = **3.8** mg

Train D (Background)
$m_n = m_f$ = 0.0
m_n = **0.0** mg

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

g/dscf - ASTM E2515 equation (13)

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

Where:

K_2 = Constant, 0.001 g/mg

m_n = Total mass of particulate matter collected in the sampling train, mg

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

Sample Calculations (Uncorrected):

Train A

$$C_s = 0.001 \times \frac{4.5}{45.84}$$

C_s = **0.000098** g/dscf

Train B

$$C_s = 0.001 \times \frac{5.0}{46.09}$$

C_s = **0.0001085** g/dscf

Train C (1st Hour)

$$Cs = 0.001 \times \frac{3.8}{9.53}$$

Cs = **0.000399** g/dscf

Train D (Background)

$$C_r = 0.001 \times \frac{0.0}{44.87}$$

C_r = **0.000000** g/dscf

Sample Calculations (Corrected):

Train A

$$C_s = 0.001 \times \frac{4.5}{45.84}$$

C_s = **0.000098** g/dscf

Train B

$$C_s = 0.001 \times \frac{5.0}{46.09}$$

C_s = **0.0001085** g/dscf

Train C (1st Hour)

$$Cs = 0.001 \times \frac{3.8}{9.53}$$

Cs = **0.000399** g/dscf

Train D (Background)

$$C_r = 0.001 \times \frac{0.0}{44.87}$$

C_r = **0.000000** g/dscf

ET – 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 calculations (uncorrected)

Train A

E_T = (0.000098 - 0.000000) x 12826.2 x 292 / 60

E_T = **6.13** g

Train B

E_T = (0.000108 - 0.000000) x 12826.2 x 292 / 60

E_T = **6.77** g

First Hour

E_T = (0.000399 - 0.000000) x 12618.9 x 60 / 60

E_T = 5.03 g

Trains A and B Average

E = **6.45** g

Sample calculations (Corrected)

Train A

E_T = (0.000098 - 0.000000) x 12826.2 x 292 / 60

E_T = **6.13** g

Train B

E_T = (0.000108 - 0.000000) x 12826.2 x 292 / 60

E_T = **6.77** g

First Hour

E_T = (0.000399 - 0.000000) x 12618.9 x 60 / 60

E_T = **5.03** g

Trains A and B Average

E_T = **6.45** g

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 (Uncorrected)

Train A

E_T = 6.13 g

θ = 292 min

$PM_R = 60 \times (6.13 / 292)$

PM_R = **1.26** g/hr

Train B

E_T = 6.77 g

θ = 292 min

$PM_R = 60 \times (6.77 / 292)$

PM_R = **1.39** g/hr

A and B Average

E_T = **1.33** g/hr

First Hour

E_T = 5.03 g

θ = 60 min

$PM_R = 60 \times (5.03 / 60)$

PM_R = **5.03** g/hr

Sample Calculation (Corrected)

Train A

E_T = 6.13 g

θ = 292 min

$PM_R = 60 \times (6.13 / 292)$

PM_R = **1.26** g/hr

Train B

E_T = 6.77 g

θ = 292 min

$PM_R = 60 \times (6.77 / 292)$

PM_R = **1.39** g/hr

A and B Average

E_T = **1.33** g

First Hour

E_T = 5.03 g

θ = 60 min

$PM_R = 60 \times (5.03 / 60)$

PM_R = **5.03** 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 (Uncorrected)

Train A

E_T = 6.13 g
M_{FTAdb} = 6.37 kg
PM_F = 6.13 / 6.37
PM_F = **0.96** g/kg

Train B

E_T = 6.77 g
M_{FTAdb} = 6.37 kg
PM_F = 6.77 / 6.37
PM_F = **1.06** g/kg

Sample Calculation (Corrected)

Train A

E_T = 6.13 g
M_{FTAdb} = 6.37 kg
PM_F = 6.13 / 6.37
PM_F = **0.96** g/kg

Train B

E_T = 6.77 g
M_{FTAdb} = 6.37 kg
PM_F = 6.77 / 6.37
PM_F = **1.06** g/kg

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:			Train A	Train B	Train C
θ	=	Total sampling time, min	292	292	60
θ_i	=	Length of recording interval, min	1	1	1
V_{mi}	=	Volume of gas sample measured by the dry gas meter during the “ith” time interval, dcf	0.16	0.161	0.162
V_m	=	Volume of gas sample as measured by dry gas meter, dcf	47.148	47.801	9.547
V_{si}	=	Average gas velocity in the dilution tunnel during the "ith" time interval, ft/sec	19.372	19.372	19.372
V_s	=	Average gas velocity in the dilution tunnel, ft/sec	19.057	19.057	19.234
T_{mi}	=	Absolute average dry gas meter temperature during the "ith" time interval, ^oR	531.5	528.6	528.6
T_m	=	Absolute average dry gas meter temperature, ^oR	548.0	547.7	531.7
T_{si}	=	Absolute average gas temperature in the dilution tunnel during the "ith" time interv	580.4	580.4	580.4
T_s	=	Absolute average gas temperature in the dilution tunnel, ^oR	538.4	538.4	552.6

NOTE: These sample calculations are for the Second interval of each train)

Train A PR = $\left(\frac{292 \times 0.16 \times 19.057 \times 548 \times 580}{1 \times 47.148 \times 19.372 \times 532 \times 538}\right)$ X 100 = 108.4 %

Train B PR = $\left(\frac{292 \times 0.161 \times 19.057 \times 548 \times 580}{1 \times 47.801 \times 19.372 \times 529 \times 538}\right)$ X 100 = 108.1 %

Train B PR = $\left(\frac{60 \times 0.162 \times 19.234 \times 532 \times 580}{1 \times 9.547 \times 19.372 \times 529 \times 553}\right)$ X 100 = 106.8 %

CSA B415.1-11 Efficiency Results

Manufacturer	MF Fire
Model:	Nova 2
Project Number:	0552WS004E
Run Number:	2
Test Date:	3/11/2025

Efficiency results reported herein are based on a stack-loss method in accordance with CSA B415.1:22 "Performance testing of solid-biofuel-burning heating appliance". OMNI uses the spreadsheet provided by CSA that is to be used in conjunction with the current version of the test standard. The most recent version of the software is version 2.4, dated April 15, 2010. OMNI received confirmation from CSA on October 18, 2023 that this is the current version of the software.

VERSION: 2.4 4/15/2010

Manufacturer:	MF Fire	**Appliance Type:**	Cat (Cat, Non
Model:	Nova 2		
Date:	3/11/2025	**Temp. Units**	F (F or C)
Run:	2	**Weight Units**	lb (kg or lb)
Control #:	2497		
Test Duration:	292		
Output Category:			

		Fuel Data		
			D. Fir	
Wood Moisture (% wet):	18.27	**HHV**	19,810	kJ/kg
Load Weight (lb wet):	17.19	**%C**	48.73	
Burn Rate (dry kg/h):	1.31	**%H**	6.87	
Total Particulate Emissions:	6.45 g	**%O**	43.9	
		%Ash	0.5	

Averages	**0.20**	**10.16**	**#DIV/0!**	**272.35**	**69.95**	
				Temp. (ºF)		
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	17.19	0.08	4.08		364.8	72.5
1	17.14	0.13	0.73		342.1	72.3
2	17.08	0.12	1.01		349.8	71.8
3	17.00	0.14	1.34		357.7	72.0
4	16.87	0.08	4.00		334.2	72.0
5	16.83	0.07	3.47		329.9	71.6
6	16.77	0.07	3.45		329.8	71.4
7	16.67	0.07	3.12		330.0	71.3
8	16.63	0.07	3.03		329.8	71.1
9	16.57	0.07	3.12		330.7	70.9
10	16.49	0.08	3.14		331.5	70.8
11	16.42	0.07	3.60		329.4	70.5
12	16.33	0.06	5.35		328.8	70.3
13	16.16	0.07	7.75		337.6	70.0
14	16.03	0.06	6.96		347.5	70.0
15	15.84	0.18	14.10		365.0	69.8
16	15.66	0.07	11.17		384.9	69.6
17	15.36	0.38	14.87		403.2	69.6
18	15.14	0.71	15.54		425.4	69.5
19	14.87	0.59	15.34		442.0	69.4
20	14.61	1.01	16.24		455.2	69.4
21	14.34	0.94	16.32		463.9	69.3

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
22	14.08	0.89	16.40		470.9	69.5
23	13.82	0.65	16.43		477.6	69.4
24	13.55	0.98	16.15		480.7	69.6
25	13.27	0.76	16.33		484.5	69.6
26	13.04	1.18	16.35		488.7	69.7
27	12.77	0.61	16.27		491.1	69.8
28	12.51	0.68	16.40		494.6	70.1
29	12.26	0.77	16.30		497.0	70.0
30	12.01	1.57	16.39		500.1	69.9
31	11.77	1.60	16.37		500.9	70.2
32	11.49	1.92	16.56		503.1	70.2
33	11.22	1.56	16.54		504.3	70.0
34	10.96	1.38	16.57		504.9	69.8
35	10.73	1.51	16.48		504.2	70.1
36	10.48	1.66	16.37		504.7	69.8
37	10.22	2.14	15.58		476.7	70.9
38	10.05	2.15	15.48		442.7	71.2
39	9.93	0.43	15.17		424.5	71.0
40	9.77	0.22	14.54		411.0	71.2
41	9.65	0.19	14.38		400.7	71.2
42	9.53	0.31	13.41		392.5	71.5
43	9.42	0.20	12.87		383.7	71.3
44	9.31	0.17	12.24		375.5	71.6
45	9.21	0.09	12.06		367.6	71.7
46	9.13	0.06	12.18		360.8	71.8
47	9.04	0.05	11.76		354.8	71.9
48	8.96	0.08	11.82		349.5	71.7
49	8.87	0.075	11.835		345.7	71.7
50	8.75	0.088	12.096		341.9	72
51	8.67	0.048	12.093		337.8	72
52	8.59	0.038	12.055		334.1	71.9
53	8.51	0.027	11.73		330.2	71.8
54	8.46	0.03	11.899		326.7	71.9
55	8.34	0.03	11.875		323.5	71.8
56	8.28	0.036	11.578		319.8	71.9
57	8.21	0.04	11.214		316.6	71.8
58	8.13	0.045	11.194		313.4	71.7
59	8.07	0.046	11.177		311.5	71.9
60	7.98	0.057	11.188		309.6	71.8

Run 2 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
61	7.90	0.071	11.773		308.2	71.6
62	7.82	0.097	12.35		308.4	71.7
63	7.73	0.127	12.841		309.3	71.8
64	7.64	0.182	13.139		309.5	71.8
65	7.55	0.188	13.192		309.6	71.8
66	7.47	0.223	13.296		309.7	71.8
67	7.38	0.093	13.016		309.3	71.8
68	7.27	0.092	12.878		308.5	71.6
69	7.19	0.12	12.713		306.7	71.6
70	7.12	0.185	12.889		306.5	71.7
71	7.06	0.232	13.311		306.4	71.8
72	6.97	0.131	13.299		305.8	71.6
73	6.88	0.089	12.973		305.5	71.6
74	6.80	0.114	13.537		305.4	71.7
75	6.72	0.072	12.963		305	71.7
76	6.66	0.076	12.999		303.5	71.4
77	6.55	0.074	12.935		301.8	71.5
78	6.50	0.063	12.057		300	71.6
79	6.46	0.057	11.711		297.8	71.6
80	6.36	0.089	11.387		296.8	71.5
81	6.28	0.091	11.601		295.6	71.5
82	6.25	0.099	11.685		295.6	71.6
83	6.17	0.09	11.933		296	71.6
84	6.09	0.086	11.79		295.3	71.6
85	6.05	0.09	11.735		295.1	71
86	5.98	0.096	11.657		294.8	71.1
87	5.88	0.096	11.493		294.3	71.4
88	5.85	0.097	11.617		293.7	71.2
89	5.75	0.095	11.578		292.5	71.3
90	5.69	0.096	11.691		291.6	71.3
91	5.66	0.092	11.798		290.6	71.4
92	5.58	0.093	11.616		289.7	71.3
93	5.49	0.094	11.762		288.7	71.2
94	5.44	0.094	11.637		288	71.1
95	5.37	0.087	11.575		287.7	71.1
96	5.31	0.09	11.624		287.3	71.1
97	5.26	0.086	11.483		286.4	71
98	5.18	0.09	11.472		284.3	71.1
99	5.15	0.092	11.428		283.5	71.1

Run 2 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
100	5.08	0.093	11.279		283.2	71.1
101	4.97	0.094	11.214		281.9	71
102	4.95	0.1	11.19		281.2	70.3
103	4.88	0.099	11.146		280.2	70.8
104	4.83	0.099	11.092		279.6	70.9
105	4.76	0.095	11.16		278.8	70.8
106	4.72	0.093	11.307		279.1	70.9
107	4.68	0.097	11.221		278.7	70.7
108	4.58	0.098	11.361		278.3	70.9
109	4.55	0.097	11.468		278.1	70.9
110	4.46	0.098	11.509		277.9	70.8
111	4.42	0.093	11.577		277.5	70.8
112	4.38	0.098	11.7		276.2	70.8
113	4.30	0.098	11.627		276.5	70.8
114	4.27	0.096	11.744		276.3	70.7
115	4.19	0.093	11.835		275.9	70.7
116	4.13	0.095	11.891		275.1	70.7
117	4.06	0.095	11.742		274.9	70.7
118	4.05	0.084	12.056		274.6	70.7
119	3.98	0.09	11.983		273.6	70.7
120	3.92	0.09	11.672		271.7	70.7
121	3.86	0.096	11.443		271.2	70.7
122	3.84	0.089	11.359		270	70.6
123	3.77	0.086	11.181		268	70.6
124	3.77	0.081	11		266.4	70.6
125	3.70	0.08	10.519		264.3	70.6
126	3.66	0.073	10.495		261.6	70.5
127	3.63	0.072	10.551		258.6	70.4
128	3.59	0.071	10.538		256.6	70.3
129	3.57	0.07	10.63		254	70.4
130	3.54	0.072	10.683		251.7	70.3
131	3.48	0.079	10.597		249.9	70.1
132	3.45	0.081	10.662		248	70.3
133	3.42	0.084	10.61		246.5	69.9
134	3.39	0.083	10.786		245.3	69.7
135	3.36	0.089	10.699		244.3	69.4
136	3.30	0.092	10.684		243.2	69.6
137	3.29	0.103	10.771		241.7	69.9
138	3.21	0.11	10.729		241.5	69.9

Run 2 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
139	3.21	0.101	10.712		241.2	70
140	3.18	0.102	10.852		240.8	70
141	3.14	0.1	10.694		240.1	69.9
142	3.10	0.098	10.556		238.9	70
143	3.07	0.101	10.685		238.6	69.9
144	3.05	0.1	10.583		238.5	69.9
145	2.97	0.099	10.549		237.7	69.8
146	2.96	0.101	10.615		237.1	69.9
147	2.96	0.109	10.624		236.6	69.9
148	2.90	0.109	10.637		237.1	69.9
149	2.89	0.111	10.861		237.5	69.9
150	2.85	0.118	11.147		238.3	70
151	2.79	0.114	10.875		238.4	70
152	2.77	0.112	10.933		238.7	70
153	2.74	0.114	10.954		239.1	70.1
154	2.70	0.121	11.178		238.5	70
155	2.68	0.119	10.923		238.7	70
156	2.63	0.122	10.677		238.8	69.8
157	2.58	0.124	10.626		238.6	69.9
158	2.58	0.124	10.593		238.4	70
159	2.55	0.124	10.48		238.8	69.9
160	2.50	0.117	10.148		238.8	69.9
161	2.46	0.118	10.135		238.3	69.9
162	2.44	0.119	10.006		238.5	69.9
163	2.45	0.124	10.135		237.9	69.9
164	2.35	0.132	9.973		237.6	69.9
165	2.37	0.133	10.029		237.4	69.8
166	2.35	0.131	10.087		237.5	69.9
167	2.27	0.129	9.963		238.1	69.8
168	2.28	0.135	10.099		237.7	69.7
169	2.25	0.137	10.09		238.1	69.6
170	2.18	0.138	10.155		238.2	69.8
171	2.18	0.129	9.963		237.9	69.8
172	2.16	0.13	10.049		237.8	69.8
173	2.15	0.135	9.877		238.1	69.7
174	2.09	0.148	9.911		238.5	69.4
175	2.07	0.137	9.718		239	69.7
176	2.07	0.133	9.849		238.2	69.8
177	2.04	0.141	9.751		238.5	69.8

Run 2 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
178	2.00	0.141	9.81		238	69.8
179	1.97	0.13	9.711		237	69.6
180	1.98	0.138	9.694		236.4	69.6
181	1.93	0.139	9.568		235.4	69.6
182	1.89	0.129	9.495		234.9	69.7
183	1.88	0.129	9.406		233.9	69.7
184	1.87	0.126	9.412		233.2	69.8
185	1.85	0.125	9.382		232.2	69.8
186	1.81	0.123	9.099		231.7	69.7
187	1.80	0.122	9.101		231	69.8
188	1.78	0.119	8.979		230.4	69.6
189	1.76	0.116	9.088		229.2	69.7
190	1.75	0.118	9.149		228.1	69.7
191	1.72	0.114	9.047		227.7	69.7
192	1.70	0.117	9.044		226.7	69.7
193	1.68	0.116	9.046		225.7	69.5
194	1.67	0.111	9.023		224.9	69.5
195	1.66	0.115	9.044		223.9	69.5
196	1.65	0.117	8.987		223.2	69.2
197	1.60	0.119	9.106		222.8	69.3
198	1.57	0.121	9.056		221.7	69.4
199	1.57	0.123	9.057		221.1	69.5
200	1.55	0.122	9.195		220.3	69.3
201	1.55	0.126	9.273		220.2	69.5
202	1.50	0.135	9.123		219.3	69.4
203	1.47	0.118	8.985		219.1	69.2
204	1.48	0.114	8.905		218.7	69.2
205	1.46	0.12	8.948		217.9	69.3
206	1.44	0.126	8.725		217.4	69.3
207	1.42	0.119	8.731		217.3	69.4
208	1.39	0.124	8.788		217.3	69.2
209	1.38	0.126	8.871		216.6	69.1
210	1.37	0.124	8.739		216.5	69.1
211	1.35	0.123	8.598		216.3	69.2
212	1.34	0.123	8.691		215.7	69.1
213	1.29	0.138	8.066		215.6	69.1
214	1.30	0.146	8.239		215.2	69.2
215	1.28	0.149	8.26		215.4	69.2
216	1.25	0.159	8.432		215.8	69.1

Run 2 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
217	1.26	0.158	8.425		215.8	69
218	1.24	0.161	8.462		215.8	69.1
219	1.20	0.148	8.337		215.6	69
220	1.19	0.15	8.545		215.3	68.8
221	1.18	0.153	8.747		215.2	68.9
222	1.15	0.154	8.69		214.6	68.8
223	1.13	0.155	8.82		214.7	68.9
224	1.12	0.161	8.901		214.7	68.9
225	1.10	0.165	8.819		214.2	69
226	1.08	0.166	8.83		214	69
227	1.06	0.127	8.841		213.8	69
228	1.06	0.125	8.814		212.8	69
229	1.05	0.125	8.764		212.1	69
230	1.01	0.129	8.835		211.4	68.9
231	0.99	0.131	8.795		211.2	68.8
232	0.98	0.133	8.92		210.4	68.8
233	0.97	0.137	8.752		210	68.9
234	0.96	0.139	8.768		209.3	68.8
235	0.93	0.138	8.726		208.8	68.7
236	0.88	0.137	8.684		208.6	68.6
237	0.88	0.134	8.603		208.4	68.9
238	0.88	0.139	8.624		207.6	68.9
239	0.85	0.135	8.626		207.9	68.8
240	0.84	0.137	8.635		207.6	68.9
241	0.80	0.14	8.556		207	68.8
242	0.82	0.127	7.831		207	68.8
243	0.79	0.136	7.771		206.9	68.8
244	0.79	0.142	7.793		207	68.5
245	0.78	0.141	7.785		206.8	68.7
246	0.76	0.142	7.816		206.7	68.6
247	0.74	0.138	7.812		206	68.5
248	0.69	0.139	7.772		205.8	68.7
249	0.68	0.145	7.775		205.4	68.6
250	0.68	0.145	7.862		205.1	68.6
251	0.67	0.141	7.763		204.9	68.7
252	0.65	0.148	7.641		204.6	68.6
253	0.66	0.149	7.504		204.6	68.3
254	0.62	0.151	7.49		204	68.5
255	0.60	0.155	7.534		204.2	68.5

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
256	0.59	0.152	7.517		204	68.5
257	0.58	0.15	7.508		204.4	68.6
258	0.58	0.152	7.648		204.6	68.5
259	0.57	0.152	7.543		204	68.4
260	0.53	0.155	7.529		203.4	68.3
261	0.52	0.164	7.595		203.2	68.3
262	0.50	0.153	7.496		203.1	68.3
263	0.50	0.155	7.529		202.6	68.3
264	0.48	0.159	7.505		202.8	68.2
265	0.48	0.16	7.493		203	68.1
266	0.45	0.163	7.433		202.4	68.1
267	0.46	0.164	7.499		202.6	68.2
268	0.44	0.169	7.538		202.6	68.2
269	0.40	0.178	7.598		202.2	68.2
270	0.38	0.181	7.595		202.2	68.2
271	0.37	0.189	7.703		202.9	68.1
272	0.39	0.15	7.685		203.2	68.1
273	0.37	0.155	7.644		202.6	68.1
274	0.35	0.155	7.614		201.9	68.2
275	0.31	0.159	7.565		201.5	68.2
276	0.31	0.163	7.477		201.3	68.2
277	0.30	0.172	7.489		201.1	68.2
278	0.28	0.173	7.47		200.9	68.2
279	0.29	0.171	7.396		201.1	68
280	0.28	0.166	7.408		201.4	68.2
281	0.26	0.16	7.458		200.8	68.2
282	0.22	0.151	7.432		200.7	68.1
283	0.21	0.16	7.376		199.8	68.1
284	0.17	0.156	7.445		199.5	68.1
285	0.19	0.154	7.286		199.1	68.2
286	0.18	0.154	7.237		199.3	68.1
287	0.17	0.157	7.199		198.8	68.1
288	0.15	0.142	7.117		198.9	68.1
289	0.11	0.125	7.452		198.3	67.7
290	0.07	0.133	7.325		198.6	67.3
291	0.08	0.122	7.346		198.2	67.4
292	-0.02	0.11	7.276		197.3	67.4

Run 2 B415

Run 3 Test Data

Test Date: 3/12/2025
Manufacturer: MF Fire
Model Nova 2

Contents, in the following order:

Wood Heater Test Results

ASTM E2780 / ASTM E2515

Manufacturer: MF Fire
Model: Nova 2
Project No.: 0552WS004E
Tracking No.: 2497
Run: 3
Test Date: 03/12/25

Burn-Rate Result

1.57 kg/hr

Particulate Emissions Results

	Average of Trains A and B		First Hour	
	Uncorrected	*Corrected*	*Uncorrected*	*Corrected*
Total Emissions - E_T, g	5.01	5.01	5.50	5.50
Emission Rate, g/hr	**1.26**	1.26	**5.50**	5.50
Emissions Factor, g/kg	0.80	0.80	n/a	n/a

Dilution Tunnel Flow Parameters

		First Hour	Duration of Test
Average Tunnel Temperature, °F		103.8	88.6
Average Tunnel Gas Velocity (vs), feet/second		19.509	19.362
Average Tunnel Gas Flow Rate(Qsd)	DSCF/hr	12466.3	12697.9
	DSCF/m	207.8	211.6
Average Delta p, in. H2O		0.121	0.122
Tunnel Static Pressure, in. H2O		-0.380	-0.380
Total Time of Test, Min		60	239

Particulate Sample Measurement Parameters

	Uncorrected				*Corrected*			
	AMBIENT	Train A	Train B	First Hour	AMBIENT	Train A	Train B	First Hour
Total Sample Volume (V_m), ft^3	37.321	38.83	38.976	9.619	37.321	38.830	38.976	9.619
Average Gas Meter Temperature, °F	79	89	87	72	79	89	87	72
Total Sample Volume (V_{mstd}), DSCF	36.656	37.428	37.349	9.526	36.656	37.428	37.349	9.526
Total Particulates (mn), mg - m_n	0.0	3.5	3.9	4.2	0.0	3.5	3.9	4.2
Particulate Concentration (C_s - C_r), g/DSCF	0.00000	0.00009	0.00010	0.00044	0.00000	0.00009	0.00010	0.00044
Total Particulate Emissions (ET), grams	n/a	4.73	5.28	5.50	n/a	4.73	5.28	5.50
Particulate Emission Rate, g/hr	n/a	1.19	1.33	5.50	n/a	1.19	1.33	5.50
Emissions Factor, g/kg	n/a	0.76	0.85	n/a	n/a	0.76	0.85	n/a
Difference, ET from from Average ET, grams	n/a	-0.28	0.28	n/a	n/a	-0.28	0.28	n/a

Test Methodology Specifications and Quality Checks

Parameter	*Requirement*	*Measured / Observed*			*Complies?*
		First Hour	*Train 1*	*Train 2*	
Filter Temperature, °F	< 90	73	67	66	✓
Filter Face Velocity, fpm	< 30	8.78	8.89	8.89	✓
Dryer Exit Temperature, °F	< 80	58	61	59	✓
Tunnel Velocity, fpm	>800	1,171	1,162		✓
First Hour Leakage Rate	0.006	0.001			✓
Train A Leakage Rate	0.006		0.001		✓
Train B Leakage Rate	0.007			0.002	✓
Leakage Rate Limits (cfm) are < 4% of average sample rate or < 0.01 cfm, which ever is less					
Negative Probe Weight	=> 0	0	0.1	0	✓
Pro-Rate Variation	< 90 for < 10% of θ	0.00%	0.00%	0.00%	✓
	> 110 for < 10% of θ	0.00%	0.000%	0.00%	✓
	# Readings < 80%	0	0	0	✓
	# Readings > 120%	0	0	0	✓
Ambient Temp, °F	> 55		68		✓
Ambient Temp, °F	< 90		74.4		✓
Trains A and B Precision	(*A*) < 7.5%		5.51%		✓
Either A or B must conform	(*B*) < 0.5 g/kg		0.09		✓
Stove Surface ΔT	<= 125 °F		77		✓
Room Air Velocity	< 50 fpm		17		✓

OMNI Test Laboratories

Manufacturer:	MF Fire	**Technicians:**	R Tiegs
Model:	Nova 2		
Date:	03/12/25		
Run:	3		
Control #:	2497		
Test Duration:	240		
Output Category:			

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	76.7%	82.9%
Combustion Efficiency	98.0%	98.0%
Heat Transfer Efficiency	78%	84.5%

Output Rate (kJ/h)	23,723	22,504	**(Btu/h)**
Burn Rate (kg/h)	1.56	3.44	**(lb/h)**
Input (kJ/h)	30,938	29,348	**(Btu/h)**

Test Load Weight (dry kg)	6.25	13.77	**dry lb**
MC wet (%)	18.53		
MC dry (%)	22.74		
Particulate (g)	5.005		
CO (g)	185		
Test Duration (h)	4.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.05	1.95
g/kg Dry Fuel	0.80	29.66
g/h	1.25	46.32
lb/MM Btu Output	0.12	4.54

Air/Fuel Ratio (A/F)	9.26

VERSION: **2.4** **4/15/2010**

Test Fuel Properties

ASTM E2780

Manufacturer : MF Fire
Model : Nova 2
Tracking No. : 2497
Project No. : 0552WS004E
Test Date : 3/12/2025
Run No. : 3

Moisture Meter Cal	
Cal Block	Measured
12.0	12.0
22.0	22.0

Firebox Volume : **2.400** ft^3
% 2 x 4 Required : 35 - 65 %
Ideal Fuel Weight : 16.8 lb.
Minimum Fuel Weight : 15.12 lb.
Maximum Fuel Weight : 18.48 lb.

Fuel Piece Data

PC #	Weight, lb	Size	Length, In	Moisture Readings, Dry Basis %			Average MC, % db	Dry Weight, lb.	Volume, ft3	Wet Weights, lb 4 x 4	Wet Weights, lb 2 x 4	Dry Weights, lb 4 x 4	Dry Weights, lb 2 x 4
1	1.99	2x4	19.13	22.4	24.8	23.8	23.7	1.61	0.0581		2.0		1.61
2	2.01	2x4	19.13	23.8	23.2	22.4	23.1	1.63	0.0581		2.0		1.63
3	1.98	2x4	19.13	24.4	21.3	21.7	22.5	1.62	0.0581		2.0		1.62
4	4.68	4x4	19.13	21.2	23.8	24.9	23.3	3.80	0.1356	4.7		3.80	
5	4.61	4x4	19.13	24.3	22.4	21.1	22.6	3.76	0.1356	4.6		3.76	
6													
7													
8													
9													

Spacer Data

Moisture Readings, Dry Basis % (One reading per spacer)								
19.7	20.8	22.3	20.6					
23.3	17.6	21.1	15.1					
23.2	21.0	17.3	17.2					
21.7	21.1	20.9	22.4					

Avg : 20.3

Assembled Crib Fuel Load with Spacers Attatched

PC #	Weight, lb with Spacers	Size	4 x 4s	2 x 4s
1	5.07	4x4	5.07	
2	4.82	4x4	4.82	
3	2.39	2x4		2.3900
4	2.42	2x4		2.4200
5	2.18	2x4		2.1800
6				
7				
8				
9				

Combined Mass of 4 x 4s 9.9 lb
Combined Mass of 2 x 4s 7.0 lb

Total Wet Mass of Fuel Load **16.9** lb

Fuel Load Properties

Type	*Number of Pieces*	*Wet Weight, lb.*	*Dry Weight, lb.*	*Fuel Loading Density, lb/ft³* Wet Basis	*Fuel Loading Density, lb/ft³* Dry Basis	Dry Fuel Density, lb/ft^3	Wet Fuel Density, lb/ft^3	*Moisture, %* Dry Basis	*Moisture, %* Wet Basis
2 x 4	3	6.0	4.86	7.03	5.73	27.87	34.28	22.74	18.53
4 x 4	2	9.3	7.56						
Spacers	16	1.6	1.34						
Totals		16.9	13.75						

Compliance Checks

	Fuel Load, Wet Lb.	Load Density, lb/ft^3 of FB vol	Fuel Density, lb/ft^3	% of Fuel load mass which is 2x4	Fuel Load Peices Mositure, % db
Measured	16.9	7.03	27.87	41	23.0
Required	15.1 - 18.5	6.3 - 7.7	25 - 36	35 - 65	19 -25
Complies ?	Yes	Yes	Yes	Yes	Yes

Dilution Tunnel Velocity Traverse and Supplementary Data

ASTM E2515-11

Run:	3	Tracking No.:	2497
Manufacturer:	MF Fire	Project No.:	0552WS004E
Model:	Nova 2	Test Date:	3/12/2025

Dilution Tunnel Velocity Traverse

Pitot Location

Traverse Point	*% of Diameter*	*Inches into Tunnel*	*dP in. H_2O*	*Tunnel Temp, °F*	*$dP^{1/2}$*
X1	6.7	0.5*	0.070	104.5	0.265
X2	25.0	1.50	0.102	105.5	0.319
X3	75.0	4.50	0.098	102.1	0.313
X4	93.3	5.5*	0.070	103.9	0.265
Y1	6.7	0.5*	0.066	104.8	0.257
Y2	25.0	1.50	0.102	104.2	0.319
Y3	75.0	4.50	0.090	104.6	0.300
Y4	93.3	0.5*	0.040	103.7	0.200
Center	50.0	3.00	0.118	104.5	0.344

Tunnel Static Pressure	-0.380	*in. H_2O*
Tunnel Moisture	2.00	%
Tunnel Diameter	6.00	inches
Pitot Tube C_p	0.99	inches
Tunnel Molecular Weight	29	(dry)
Tunnel Molecular Weight	28.78	(M_S, wet)
Tunnel Area	0.1963495	ft^2
K_p	85.49	constant
$P_s=P_{bar}$+Tunnel Static	29.472059	in HG

** Probe location must be no closer than 0.50" from tunnel wall*

$$V_{strav} = K_p C_p \sqrt{\Delta p}_{avg} \sqrt{\frac{T_{s,avg}}{P_s M_s}} = 19.3083$$

$$V_{scent} = K_p C_p \sqrt{\Delta p}_{center} \sqrt{\frac{T_{s,center}}{P_s M_s}} = 23.7177$$

$$F_P = V_{strav} / V_{scent} = 0.814$$

$$Initial\ Tunnel\ Velocity, V_s = F_P K_p C_p \sqrt{\Delta p}_{avg} \sqrt{\frac{T_{s,avg}}{P_s M_s}} = 15.719 \ ft/sec$$

Supplementary Data and Information

Environment

	Test Start	Test End
Time of Day	14:06	
Barometric Pressure, in. Hg	29.50	29.42
Room Air Velocity, fpm	12	17
Room Air Temperature, °F	68	68
Room Relative Humidity, %	49.0	46.0
Platform Scale Audit, lb.	10.0,20.0	10.0,20.0

Leak Checks

Pitot and associated tubing, (pass/fail)[1]	pass	pass

See sampling box worksheets for sampling boxes

Dillution Tunnel

Date last cleaned	3/10/2025	
Smoke Capture, % (visual)[2]	100	
Draft Inducement, (pass/fail)[3]	pass	
Static Pressure, in. H_2O	-0.380	-0.380

1 Both sides (independantly) of the pitot system are brought under a minimum vacuum of 3 in. H_2O and then sealed. Any indiction of pressure loss is deemed a fail.

2 Create a smoking condition during start of pre-burn activites and using adequate lighting pointed upward and aroud tunnel hood, visually observe if 100% of visible smoke is being captured by the hood. If not, increase flow tunnel flow and / or re-assess chimney proximity to draft hood as required and repeat until 100% capture is observed.

3 With the appliance installed and the dillution tunnel flow turned-off, observe the flue draft gauge while turning the dulution tunnel on. Any detectible response by the draft gauge associated with activation of the tunnel flow indicates that draft inducemnt is occuring. Determine the cause (i.e. flue chimnet too deep into tunnel?) before continuing.

Preburn Data

ASTM E2780

Run: 3

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E
Test Date: 3/12/25
Beginning Clock Time: 8:43

Coal Bed Range (lb):	3.4 (min)	4.2 (max)

Preburn Fuel Data

12 pieces @ 16 inches
11 pieces @ 20 inches
pieces @ inches

Fuel Moisture Readings (% DB):

21.6	26.4	19.9	21.1	19.5		
25.3	20.3	24.7	23	24.5		
23.3	24.3	19.9	23.8	21.6		
23.8	18.8	21.4	22.3	22.2		
23.2	24.8	22.2	24.9			

Avg Preburn Moisture (% DB): **22.62**

			Temperatures (°F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H_2O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat Exit	Avg. FB	Stack	Ambient
294	6.62	-0.089	376.4	420.3	408.4	423.1	401.6	1140.6	406	508.7	72.6
295	6.56	-0.086	213.9	420.5	410.3	424.2	402.1	1142	374	509.1	72.5
296	6.35	-0.086	366	421.2	412.1	427.9	403.9	1138.5	406	508.7	72.5
297	6.26	-0.086	497.5	420.8	413.8	427.9	401.4	1133.9	432	510.3	72.7
298	6.16	-0.085	550	421.6	415.5	429	404.7	1132.9	444	511.5	72.7
299	6.05	-0.09	578.2	422	417	431.4	405.7	1128.2	451	511.8	72.7
300	5.92	-0.086	573.1	422.6	418.2	436.3	406.7	1124.2	451	512.3	72.7
301	5.78	-0.084	576.5	423.3	419.7	438.8	402.6	1121.5	452	511	73
302	5.71	-0.082	580.3	423.3	420.4	441	403.7	1107.1	454	510.6	73.1
303	5.62	-0.084	579.4	423.5	420.9	442.8	403.5	1095.4	454	508.2	73.2
304	5.52	-0.083	577.8	424	420.7	440	402.1	1080.4	453	506.2	73.3
305	5.43	-0.082	581.6	424.5	420.4	443.5	403.9	1074.2	455	504.6	73.3
306	5.35	-0.082	572	424.6	420.3	445.3	403.6	1066.8	453	501.7	73.5
307	5.26	-0.085	565.1	425.4	419.6	447.9	401.6	1054.9	452	498.6	73.6
308	4.75	-0.081	564.9	426.2	418.9	447.2	401.7	1037.8	452	488.1	73.4
309	4.68	-0.08	556.2	426.6	418.5	448.3	403.9	1019.3	451	483.6	73.7
310	5.05	-0.08	547.8	427.2	417.9	445.9	404.2	1005.6	449	484.5	73.9
311	4.8	-0.079	546.7	427.5	417.3	444.4	401.9	991.1	448	481	73.9
312	4.52	-0.08	544.4	428.7	416.8	444.6	402.3	980.8	447	475.2	74.1
313	4.96	-0.08	536.8	429.3	415.6	446.5	400.8	968.2	446	476.4	74
314	4.88	-0.08	527	429.7	414.7	443.9	403.4	955.8	444	475.1	74.1
315	4.86	-0.076	517.4	430.5	413.3	443.3	406.5	942	442	472.3	74.2
316	4.78	-0.077	504.9	431.2	412	443.3	404.3	925.7	439	469.3	74.1
317	4.77	-0.079	500.1	431.7	410.4	441.5	407.2	912.3	438	464.8	73.9
318	4.71	-0.078	498.8	432.1	409.2	437.6	406.8	901.7	437	461.3	74.3
319	4.67	-0.078	484.6	432.9	407.5	437.6	404.4	892.4	433	457.6	74.5
320	4.62	-0.082	480.5	433.6	405.7	438.2	406.8	883.6	433	454	74.5
321	4.55	-0.076	471.3	433.9	403.7	438	407.2	876.3	431	450.4	74.6
322	4.54	-0.073	467.3	434.7	401.8	433.1	405.9	868.2	429	446.9	74.6
323	4.5	-0.074	459.3	435.8	399.7	433	406	860.8	427	444	74.6
324	4.47	-0.073	454.6	436.1	397.2	433.6	402.1	855.2	425	441.1	74.6
325	4.44	-0.076	443.7	437.2	394.7	432.7	405.7	848.7	423	438.5	74.5
326	4.38	-0.07	448	438	392.2	431.4	403.3	842.3	423	434.5	74.4
327	4.36	-0.072	433.4	439.1	389.4	431.8	401.6	834.1	419	425.4	74.5
328	4.3	-0.072	428.2	439.6	386.9	431.3	400.9	831.3	417	427.2	74.5
329	4.27	-0.071	428.8	440.1	384.5	430.3	400.3	827.1	417	426.1	74.4
330	4.26	-0.071	420.7	441.6	382.2	429.3	402.5	822.6	415	424.7	74.3
331	4.19	-0.07	416.3	443	380.1	428.6	397.6	817.6	413	422.5	74.4
332	4.17	-0.069	420	443.2	377.9	426.3	397.2	814.3	413	420.7	74.5
333	4.13	-0.072	419.8	444.3	376	425	397.7	811.8	413	419.4	74.4
334	4.07	-0.07	409	445.8	374	423.8	395.9	809.1	410	417.9	74.5
335	4.06	-0.073	404.1	446.7	372.4	423.8	395.6	805.2	409	416.5	74.4

			Temperatures (°F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H_2O)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat Exit	Avg. FB	Stack	Ambient
336	3.99	-0.071	412.5	447.2	370.7	423.1	393.6	802	409	415	74.2
337	3.97	-0.069	404.9	448.1	368.8	422.2	392.6	801.7	407	413.2	74.1
338	3.94	-0.069	402.6	449.2	367.4	421.2	390.8	799.2	406	412.4	74
339	3.89	-0.068	400.1	450.2	365.8	420.6	391	799	406	410.8	73.8
340	3.87	-0.072	403	450.9	364.3	420.8	389.1	799.5	406	410.3	73.6
341	3.82	-0.07	401.9	451.7	363.2	418.9	389.9	798.2	405	409.2	73.6
342	3.76	-0.07	406.8	453.1	362	418.7	388.6	797.1	406	408.2	73.5
343	3.74	-0.072	398.4	454.4	360.8	416.6	386.6	794.5	403	407.4	73.5
344	3.68	-0.069	393.8	455.5	359.9	417.3	387.2	793.1	403	406.2	73.5
345	3.66	-0.068	392.5	456.5	358.9	416.5	385.3	792.7	402	405.9	73.5
346	3.65	-0.067	390.7	457.2	357.4	415.2	384.3	791.4	401	404.8	73.6
347	3.59	-0.071	396.9	458.7	356.6	413.5	385.7	790.1	402	405.1	73.5
348	3.57	-0.069	394.3	460.1	355.9	413.9	384.7	790.8	402	404.8	73.6
349	3.53	-0.073	393.4	461.1	355.1	409.3	383	790.9	400	404	73.6
350	3.46	-0.07	393.8	462.1	354	411.2	381.6	791.6	401	403.4	73.6
351	3.44	-0.067	381.9	464.1	356	411	383.5	731.1	399	413	73.8
352	3.43	-0.069	380.2	465.4	354.8	411	383.1	736.7	399	400.3	73.6
353	3.4	-0.069	382.1	466.3	352.7	409.2	379.9	745.8	398	397	73.7

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Test Length: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	18.5	in. Hg
Post-Test	0.001	cfm @	7	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
Tot / Avg		16.9	**38.830**	**0.162**	**1.23**	**88.9**	**2.07**	**66.63**	**61.44**	**71.42**	**100.0**	**88.6**	**0.122**	**0.349**	**19.36**
Minimum	0.0	0.0	0.000	0.139	-0.01	73	0.06	64	49	68	93.4	78	0.115	0.339	18.96
Max	16.9	0.3	38.830	0.166	1.29	94	2.23	70	63	74	105.7	132	0.128	0.358	20.01
0	16.9		0.000		-0.01	74	0.06	63.6	48.7	74		98	0.117	0.342	19.86
	16.8		0.000		0.01	74	0.06	63.6	48.6	73		127	0.117	0.342	19.37
1	16.7	0.1	0.139	0.139	1.23	73	2.21	65.6	55.2	73	93.4	129	0.120	0.346	19.76
2	16.5	0.2	0.298	0.159	1.22	73	2.04	66.8	57.3	73	105.6	132	0.122	0.349	20.01
3	16.4	0.2	0.458	0.160	1.21	73	2.17	67	58.4	73	104.4	111	0.120	0.346	19.85
4	16.2	0.2	0.618	0.160	1.29	73	2.23	66.9	58.6	73	102.9	105	0.122	0.349	19.62
5	16.1	0.1	0.780	0.162	1.26	73	2.17	67	58.6	73	104.8	103	0.115	0.339	19.35
6	16.0	0.1	0.942	0.162	1.26	73	2.20	67.1	59	72	105.3	101	0.122	0.349	19.32
7	15.8	0.2	1.106	0.164	1.27	74	2.14	67.3	59.6	72	105.7	102	0.123	0.351	19.63
8	15.7	0.2	1.268	0.162	1.24	74	2.20	67.6	60.2	72	103.9	102	0.119	0.345	19.52
9	15.5	0.2	1.429	0.161	1.25	74	2.18	67.8	60.5	72	104.0	103	0.120	0.346	19.41
10	15.3	0.2	1.590	0.161	1.25	74	2.15	67.8	60.6	72	103.9	103	0.123	0.351	19.58
11	15.2	0.1	1.751	0.161	1.25	74	2.18	67.9	60.7	72	103.1	103	0.123	0.351	19.70
12	15.0	0.2	1.913	0.162	1.23	74	2.16	67.9	60.8	72	103.4	103	0.122	0.349	19.66
13	14.9	0.1	2.074	0.161	1.25	74	2.16	68	60.9	72	103.1	103	0.121	0.348	19.58
14	14.7	0.1	2.234	0.160	1.24	75	2.16	68	60.8	72	102.7	103	0.122	0.349	19.58
15	14.5	0.2	2.394	0.160	1.24	75	2.17	68.2	60.9	72	102.4	104	0.124	0.352	19.71
16	14.3	0.2	2.556	0.162	1.22	75	2.18	68.5	61	72	103.6	105	0.120	0.346	19.64
17	14.1	0.2	2.715	0.159	1.22	75	2.18	68.7	61.1	72	102.5	106	0.119	0.345	19.46
18	13.9	0.2	2.875	0.160	1.21	75	2.14	68.9	61.1	72	103.6	107	0.121	0.348	19.51
19	13.6	0.2	3.034	0.159	1.23	76	2.19	69	61.2	72	103.0	107	0.118	0.344	19.49
20	13.4	0.2	3.194	0.160	1.23	76	2.18	69.1	61.2	72	104.3	108	0.116	0.341	19.29
21	13.2	0.2	3.353	0.159	1.23	76	2.13	69.2	61.3	72	104.2	108	0.118	0.344	19.30
22	13.0	0.2	3.512	0.159	1.21	76	2.14	69.3	61.3	72	103.8	109	0.119	0.345	19.43
23	12.8	0.2	3.672	0.160	1.24	77	2.18	69.4	61.3	72	103.8	109	0.121	0.348	19.56
24	12.6	0.2	3.832	0.160	1.23	77	2.15	69.5	61.4	72	103.4	109	0.119	0.345	19.56
25	12.4	0.2	3.991	0.159	1.22	77	2.19	69.6	61.5	72	103.0	109	0.119	0.345	19.48
26	12.2	0.2	4.152	0.161	1.23	77	2.15	69.7	61.5	72	104.5	110	0.119	0.345	19.49
27	11.9	0.2	4.312	0.160	1.22	78	2.14	69.8	61.5	72	103.7	110	0.120	0.346	19.54
28	11.7	0.2	4.470	0.158	1.22	78	2.20	70	61.5	72	102.2	111	0.120	0.346	19.59
29	11.5	0.3	4.629	0.159	1.21	78	2.20	70	61.5	73	103.1	111	0.116	0.341	19.43
30	11.3	0.2	4.790	0.161	1.21	78	2.13	70	61.5	73	105.0	112	0.119	0.345	19.40
31	11.0	0.2	4.949	0.159	1.22	79	2.21	70.1	61.6	73	103.5	112	0.119	0.345	19.53
32	10.8	0.2	5.107	0.158	1.20	79	2.14	70.2	61.5	73	102.2	112	0.121	0.348	19.61
33	10.6	0.2	5.268	0.161	1.23	79	2.13	70.3	61.5	73	104.0	113	0.118	0.344	19.58
34	10.4	0.2	5.427	0.159	1.20	80	2.13	70.4	61.6	73	103.0	113	0.120	0.346	19.55
35	10.1	0.3	5.585	0.158	1.22	80	2.22	70.4	61.7	73	101.9	111	0.120	0.346	19.61
36	9.9	0.2	5.745	0.160	1.22	80	2.20	70.2	61.8	73	102.5	105	0.120	0.346	19.54
37	9.8	0.2	5.905	0.160	1.22	81	2.21	69.9	61.8	74	101.7	102	0.123	0.351	19.59
38	9.6	0.2	6.063	0.158	1.21	81	2.23	69.7	62	74	99.9	101	0.121	0.348	19.59
39	9.5	0.1	6.223	0.160	1.22	81	2.23	69.4	62	74	101.1	100	0.121	0.348	19.49

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Test Length: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	18.5	in. Hg
Post-Test	0.001	cfm @	7	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
40	9.4	0.1	6.383	0.160	1.21	81	2.17	69.2	62	74	100.8	99	0.125	0.354	19.63
41	9.3	0.1	6.543	0.160	1.23	82	2.20	69.1	62.1	74	100.2	98	0.121	0.348	19.62
42	9.1	0.1	6.701	0.158	1.23	82	2.21	68.9	62.1	74	99.1	97	0.123	0.351	19.52
43	9.0	0.2	6.863	0.162	1.23	82	2.18	68.8	62	74	101.4	97	0.123	0.351	19.59
44	8.9	0.1	7.023	0.160	1.22	83	2.21	68.8	62	74	99.9	97	0.123	0.351	19.59
45	8.8	0.1	7.183	0.160	1.22	83	2.08	68.7	62	74	100.0	96	0.122	0.349	19.54
46	8.6	0.2	7.342	0.159	1.21	83	2.17	68.8	62	74	99.5	96	0.122	0.349	19.50
47	8.5	0.1	7.504	0.162	1.23	83	2.13	68.8	62	74	101.5	96	0.121	0.348	19.46
48	8.4	0.1	7.665	0.161	1.24	84	2.20	68.8	62.1	74	100.7	96	0.124	0.352	19.54
49	8.2	0.1	7.825	0.160	1.23	84	2.10	68.7	62.1	74	99.5	95	0.123	0.351	19.60
50	8.1	0.1	7.985	0.160	1.21	84	2.20	68.7	62.1	74	99.6	94	0.120	0.346	19.43
51	8.0	0.1	8.147	0.162	1.23	84	2.16	68.7	62.2	74	101.7	95	0.119	0.345	19.26
52	7.9	0.1	8.309	0.162	1.24	85	2.20	68.6	62.2	74	101.8	95	0.123	0.351	19.39
53	7.8	0.1	8.469	0.160	1.22	85	2.08	68.7	62.1	74	99.5	95	0.125	0.354	19.63
54	7.6	0.1	8.629	0.160	1.21	85	2.18	68.6	62.2	74	99.4	94	0.118	0.344	19.43
55	7.5	0.1	8.791	0.162	1.23	86	2.08	68.6	62.2	74	101.4	94	0.122	0.349	19.31
56	7.4	0.2	8.953	0.162	1.23	86	2.20	68.5	62.2	74	101.3	94	0.121	0.348	19.42
57	7.3	0.1	9.114	0.161	1.25	86	2.04	68.6	62.3	74	100.4	94	0.121	0.348	19.38
58	7.2	0.1	9.275	0.161	1.24	86	2.16	68.5	62.3	74	100.4	94	0.122	0.349	19.42
59	7.0	0.1	9.436	0.161	1.23	86	2.19	68.4	62.3	74	100.2	93	0.121	0.348	19.41
60	7.0	0.1	9.599	0.163	1.25	87	2.19	68.4	62.3	74	101.1	93	0.125	0.354	19.53
61	6.9	0.1	9.761	0.162	1.24	87	2.19	68.4	62.3	74	99.8	93	0.124	0.352	19.64
62	6.7	0.1	9.922	0.161	1.25	87	2.15	68.3	62.3	74	99.0	93	0.123	0.351	19.56
63	6.7	0.1	10.083	0.161	1.24	87	2.10	68.3	62.2	74	99.6	93	0.120	0.346	19.40
64	6.6	0.1	10.245	0.162	1.22	87	2.06	68.2	62.2	74	101.1	93	0.118	0.344	19.20
65	6.5	0.1	10.409	0.164	1.25	88	2.07	68.2	62.2	74	102.4	92	0.124	0.352	19.36
66	6.4	0.1	10.571	0.162	1.24	88	2.03	68.1	62.1	74	100.2	92	0.122	0.349	19.51
67	6.3	0.1	10.733	0.162	1.25	88	2.16	68.1	62	74	99.7	92	0.124	0.352	19.50
68	6.2	0.0	10.895	0.162	1.25	88	2.09	68.1	61.9	74	99.4	92	0.125	0.354	19.62
69	6.1	0.1	11.058	0.163	1.23	88	2.03	68.1	61.9	74	100.0	91	0.121	0.348	19.50
70	6.1	0.1	11.220	0.162	1.24	89	2.16	68.1	61.6	74	99.9	91	0.122	0.349	19.37
71	6.0	0.1	11.384	0.164	1.25	89	2.04	68.1	61.3	74	101.6	91	0.119	0.345	19.29
72	5.9	0.1	11.547	0.163	1.25	89	2.13	68.1	61.1	74	101.0	91	0.123	0.351	19.32
73	5.8	0.1	11.710	0.163	1.24	89	2.06	68	60.9	74	100.9	89	0.118	0.344	19.27
74	5.8	0.1	11.873	0.163	1.25	89	2.09	67.9	60.8	74	101.0	89	0.122	0.349	19.22
75	5.7	0.1	12.035	0.162	1.23	89	2.04	67.8	60.7	74	100.2	89	0.121	0.348	19.34
76	5.6	0.1	12.198	0.163	1.22	90	2.12	67.8	60.7	74	100.5	90	0.122	0.349	19.34
77	5.5	0.0	12.362	0.164	1.25	90	2.04	67.7	60.6	74	101.3	90	0.119	0.345	19.27
78	5.5	0.1	12.526	0.164	1.24	90	2.03	67.7	60.6	74	101.4	89	0.123	0.351	19.30
79	5.4	0.1	12.689	0.163	1.25	90	2.09	67.6	60.5	74	100.3	89	0.122	0.349	19.42
80	5.4	0.0	12.852	0.163	1.26	90	2.02	67.6	60.5	74	100.4	89	0.119	0.345	19.26
81	5.3	0.1	13.015	0.163	1.25	90	2.07	67.5	60.5	74	100.6	89	0.123	0.351	19.29
82	5.2	0.1	13.178	0.163	1.26	90	2.07	67.5	60.5	74	100.5	88	0.118	0.344	19.25
83	5.2	0.0	13.341	0.163	1.26	90	2.15	67.4	60.4	73	101.0	88	0.119	0.345	19.08

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Test Length: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test 0.002 cfm @ 18.5 in. Hg
Post-Test 0.001 cfm @ 7 in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
84	5.0	0.1	13.505	0.164	1.25	91	2.13	67.4	60.4	73	101.6	88	0.122	0.349	19.24
85	5.0	0.0	13.669	0.164	1.26	91	2.15	67.3	60.3	73	100.6	88	0.125	0.354	19.48
86	5.0	0.1	13.833	0.164	1.25	91	2.09	67.2	60.3	73	99.4	88	0.127	0.356	19.67
87	4.9	0.1	13.996	0.163	1.25	91	2.06	67.2	60.3	73	98.6	88	0.122	0.349	19.56
88	4.8	0.0	14.159	0.163	1.25	91	2.00	67.1	60.3	73	99.5	88	0.121	0.348	19.32
89	4.8	0.1	14.323	0.164	1.26	91	2.02	67.1	60.3	73	100.9	88	0.120	0.346	19.24
90	4.7	0.1	14.485	0.162	1.25	91	2.03	67	60.2	73	99.6	88	0.123	0.351	19.31
91	4.7	0.0	14.649	0.164	1.25	91	2.13	67	60.3	73	100.5	88	0.121	0.348	19.35
92	4.6	0.1	14.813	0.164	1.24	91	2.01	66.9	60.3	73	100.8	88	0.119	0.345	19.19
93	4.5	0.0	14.977	0.164	1.26	91	2.16	66.9	60.2	73	101.0	87	0.123	0.351	19.27
94	4.5	0.1	15.141	0.164	1.25	91	2.04	66.9	60.2	73	100.4	87	0.122	0.349	19.38
95	4.4	0.1	15.305	0.164	1.26	92	2.01	66.8	60.2	73	100.4	87	0.120	0.346	19.26
96	4.4	0.0	15.468	0.163	1.26	92	2.15	66.8	60.3	73	100.2	87	0.121	0.348	19.22
97	4.3	0.1	15.632	0.164	1.26	92	2.12	66.8	60.3	73	100.5	87	0.124	0.352	19.38
98	4.2	0.0	15.795	0.163	1.22	92	2.14	66.8	60.4	72	99.4	87	0.122	0.349	19.42
99	4.2	0.1	15.958	0.163	1.25	92	2.08	66.8	60.5	72	99.3	87	0.123	0.351	19.38
100	4.1	0.1	16.122	0.164	1.24	92	2.15	66.7	60.6	72	99.8	87	0.124	0.352	19.45
101	4.1	0.0	16.287	0.165	1.27	92	2.02	66.7	60.6	72	99.8	87	0.127	0.356	19.61
102	4.0	0.1	16.451	0.164	1.25	92	2.15	66.7	60.6	72	98.4	87	0.128	0.358	19.76
103	3.9	0.1	16.615	0.164	1.27	92	2.03	66.7	60.5	72	98.4	86	0.122	0.349	19.56
104	3.9	0.1	16.779	0.164	1.24	92	2.15	66.7	60.4	72	100.1	86	0.116	0.341	19.09
105	3.8	0.1	16.943	0.164	1.26	92	2.11	66.8	60.3	72	101.7	86	0.119	0.345	18.96
106	3.8	0.0	17.107	0.164	1.27	92	2.12	66.8	60.1	72	101.2	86	0.123	0.351	19.24
107	3.7	0.1	17.271	0.164	1.26	92	2.11	66.8	60	72	100.2	86	0.121	0.348	19.32
108	3.6	0.0	17.435	0.164	1.24	92	2.02	66.9	59.9	72	100.2	86	0.121	0.348	19.24
109	3.6	0.1	17.598	0.163	1.26	92	2.03	66.9	59.8	72	100.1	86	0.118	0.344	19.12
110	3.5	0.0	17.763	0.165	1.27	92	2.03	66.9	59.8	72	101.2	86	0.125	0.354	19.27
111	3.5	0.1	17.928	0.165	1.27	93	2.07	67	60.1	72	100.6	86	0.120	0.346	19.36
112	3.4	0.1	18.093	0.165	1.27	93	2.11	66.9	60.2	72	100.7	86	0.122	0.349	19.24
113	3.4	0.0	18.256	0.163	1.24	93	2.01	66.9	60.4	72	99.2	86	0.125	0.354	19.43
114	3.3	0.1	18.418	0.162	1.24	93	2.09	66.9	60.6	72	98.0	86	0.123	0.351	19.47
115	3.3	0.0	18.580	0.162	1.22	93	2.09	66.7	60.7	72	98.4	86	0.120	0.346	19.27
116	3.2	0.1	18.743	0.163	1.22	93	2.00	66.6	60.8	72	99.8	85	0.120	0.346	19.15
117	3.1	0.0	18.906	0.163	1.24	93	2.02	66.6	61	72	99.9	86	0.122	0.349	19.23
118	3.1	0.1	19.070	0.164	1.25	93	2.08	66.6	61.1	71	100.1	86	0.123	0.351	19.35
119	3.0	0.1	19.233	0.163	1.24	93	2.12	66.5	61.3	72	98.9	85	0.124	0.352	19.43
120	2.9	0.1	19.395	0.162	1.23	93	2.12	66.5	61.5	72	97.9	85	0.124	0.352	19.46
121	2.9	0.0	19.558	0.163	1.23	93	2.11	66.4	61.7	72	98.6	85	0.122	0.349	19.38
122	2.9	0.0	19.720	0.162	1.24	93	2.02	66.4	61.8	71	98.5	85	0.122	0.349	19.31
123	2.8	0.1	19.883	0.163	1.25	93	2.00	66.4	61.9	72	99.2	85	0.122	0.349	19.30
124	2.8	0.1	20.047	0.164	1.24	93	2.09	66.4	62	71	99.7	85	0.123	0.351	19.34
125	2.7	0.0	20.210	0.163	1.24	93	2.01	66.3	62.1	72	98.8	85	0.124	0.352	19.42
126	2.7	0.0	20.373	0.163	1.22	93	2.07	66.3	62.2	71	98.4	85	0.125	0.354	19.51
127	2.6	0.0	20.536	0.163	1.24	93	2.00	66.3	62.3	71	98.3	85	0.123	0.351	19.47

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Test Start Time: 14:06
Test Length: 239 min
Recording Interval: 1 min

Sample Train Leak Checks

Pre-test	0.002	cfm	@	18.5	in. Hg
Post-Test	0.001	cfm	@	7	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
128	2.6	0.1	20.699	0.163	1.24	93	2.00	66.3	62.3	71	98.7	85	0.122	0.349	19.35
129	2.5	0.0	20.861	0.162	1.24	93	2.10	66.2	62.3	71	98.2	85	0.125	0.354	19.42
130	2.5	0.0	21.024	0.163	1.24	93	2.08	66.2	62.3	71	98.7	85	0.121	0.348	19.38
131	2.5	0.0	21.188	0.164	1.22	93	2.05	66.1	62.3	71	99.7	85	0.122	0.349	19.26
132	2.4	0.1	21.351	0.163	1.23	93	2.08	66.1	62.3	71	99.4	85	0.121	0.348	19.26
133	2.4	0.0	21.515	0.164	1.23	93	2.09	66.1	62.3	71	99.8	85	0.124	0.352	19.34
134	2.3	0.1	21.677	0.162	1.24	93	1.99	66.1	62.3	71	98.4	84	0.120	0.346	19.29
135	2.3	0.0	21.840	0.163	1.25	93	2.04	66.1	62.3	71	99.2	84	0.123	0.351	19.25
136	2.3	0.0	22.003	0.163	1.25	93	2.11	66.1	62.4	71	99.3	84	0.120	0.346	19.25
137	2.3	0.0	22.165	0.162	1.24	93	2.00	66.1	62.4	71	98.7	84	0.123	0.351	19.25
138	2.2	0.1	22.330	0.165	1.25	93	2.02	66	62.5	71	100.7	84	0.118	0.344	19.17
139	2.2	0.0	22.493	0.163	1.25	93	2.09	66	62.5	71	99.8	84	0.122	0.349	19.13
140	2.2	0.0	22.657	0.164	1.25	93	2.02	66	62.5	71	100.0	84	0.122	0.349	19.28
141	2.1	0.0	22.819	0.162	1.21	94	2.11	65.9	62.5	71	98.3	84	0.123	0.351	19.32
142	2.1	0.1	22.982	0.163	1.24	94	1.98	65.9	62.5	71	98.6	83	0.124	0.352	19.39
143	2.1	0.0	23.145	0.163	1.23	94	2.07	65.9	62.5	71	98.4	83	0.123	0.351	19.39
144	2.1	0.0	23.308	0.163	1.25	94	2.11	65.9	62.5	71	98.6	83	0.122	0.349	19.31
145	2.0	0.0	23.472	0.164	1.25	94	2.10	65.9	62.4	71	99.6	83	0.121	0.348	19.23
146	2.0	0.1	23.636	0.164	1.25	94	2.10	65.8	62.4	71	99.6	83	0.123	0.351	19.26
147	2.0	0.0	23.799	0.163	1.24	93	2.02	65.8	62.5	71	98.5	83	0.125	0.354	19.42
148	2.0	0.0	23.962	0.163	1.24	94	2.04	65.7	62.4	71	98.1	82	0.123	0.351	19.41
149	1.9	0.0	24.125	0.163	1.23	94	2.04	65.7	62.5	71	98.3	83	0.123	0.351	19.34
150	1.9	0.0	24.288	0.163	1.23	94	1.99	65.7	62.5	71	98.4	83	0.125	0.354	19.42
151	1.9	0.0	24.451	0.163	1.23	93	2.00	65.7	62.4	71	97.9	83	0.125	0.354	19.50
152	1.9	0.0	24.615	0.164	1.24	94	2.10	65.7	62.4	71	98.5	82	0.123	0.351	19.42
153	1.9	0.0	24.779	0.164	1.25	94	2.04	65.7	62.4	71	99.1	82	0.121	0.348	19.25
154	1.8	0.0	24.942	0.163	1.26	94	2.00	65.6	62.4	71	99.1	82	0.121	0.348	19.17
155	1.8	0.0	25.106	0.164	1.25	94	2.08	65.6	62.4	71	99.6	82	0.124	0.352	19.29
156	1.8	0.1	25.269	0.163	1.24	94	2.04	65.6	62.4	71	98.4	82	0.124	0.352	19.41
157	1.8	0.0	25.432	0.163	1.24	94	1.98	65.5	62.3	71	97.9	82	0.126	0.355	19.49
158	1.7	0.0	25.595	0.163	1.26	94	2.11	65.5	62.3	71	98.0	82	0.121	0.348	19.37
159	1.7	0.0	25.758	0.163	1.23	94	1.98	65.5	62.4	71	98.6	82	0.123	0.351	19.26
160	1.7	0.0	25.923	0.165	1.24	94	1.99	65.5	62.4	71	100.2	82	0.120	0.346	19.22
161	1.7	0.0	26.086	0.163	1.24	94	2.08	65.5	62.4	71	99.1	82	0.123	0.351	19.21
162	1.7	0.0	26.249	0.163	1.26	94	1.97	65.4	62.3	70	98.7	82	0.123	0.351	19.33
163	1.7	0.0	26.412	0.163	1.24	94	2.10	65.5	62.3	70	98.4	82	0.123	0.351	19.32
164	1.6	0.0	26.575	0.163	1.25	94	2.00	65.5	62.3	70	98.3	81	0.124	0.352	19.36
165	1.6	0.1	26.738	0.163	1.23	94	2.04	65.5	62.3	70	98.3	82	0.122	0.349	19.32
166	1.6	0.0	26.901	0.163	1.23	94	2.10	65.5	62.4	70	98.3	82	0.125	0.354	19.36
167	1.5	0.1	27.066	0.165	1.25	94	2.10	65.4	62.3	70	99.5	82	0.121	0.348	19.32
168	1.5	0.0	27.230	0.164	1.25	94	2.05	65.4	62.3	70	99.4	82	0.121	0.348	19.16
169	1.5	0.0	27.393	0.163	1.23	94	1.99	65.5	62.3	70	98.7	81	0.126	0.355	19.36
170	1.5	0.0	27.556	0.163	1.25	94	2.08	65.4	62.4	70	98.2	82	0.121	0.348	19.36
171	1.5	0.0	27.720	0.164	1.23	94	1.97	65.3	62.3	70	99.2	81	0.122	0.349	19.20

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Test Length: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Sample Train Leak Checks

Pre-test	0.002	cfm @	18.5	in. Hg
Post-Test	0.001	cfm @	7	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
172	1.4	0.0	27.882	0.162	1.23	94	2.10	65.3	62.3	70	98.0	81	0.124	0.352	19.31
173	1.4	0.0	28.045	0.163	1.23	94	2.01	65.3	62.3	70	98.1	81	0.125	0.354	19.43
174	1.4	0.0	28.209	0.164	1.24	94	2.10	65.3	62.3	70	98.5	81	0.123	0.351	19.39
175	1.4	0.0	28.373	0.164	1.25	94	1.98	65.3	62.3	70	98.7	81	0.123	0.351	19.31
176	1.4	0.0	28.537	0.164	1.25	94	1.99	65.2	62.3	70	98.8	81	0.124	0.352	19.35
177	1.3	0.0	28.700	0.163	1.24	94	2.11	65.2	62.3	70	98.3	81	0.121	0.348	19.27
178	1.3	0.1	28.863	0.163	1.24	94	2.10	65.1	62.3	70	98.7	81	0.122	0.349	19.19
179	1.3	0.0	29.026	0.163	1.24	94	2.01	65.1	62.3	70	98.9	81	0.121	0.348	19.19
180	1.3	0.0	29.189	0.163	1.25	94	1.97	65.1	62.3	70	98.9	80	0.122	0.349	19.18
181	1.3	0.0	29.352	0.163	1.23	93	2.03	65.1	62.3	70	98.7	80	0.123	0.351	19.26
182	1.2	0.0	29.516	0.164	1.26	93	1.99	65.1	62.2	70	99.1	80	0.122	0.349	19.26
183	1.2	0.0	29.681	0.165	1.24	94	2.01	65.1	62.3	70	100.0	80	0.120	0.346	19.14
184	1.2	0.0	29.844	0.163	1.23	94	2.11	65.1	62.3	70	98.9	80	0.124	0.352	19.22
185	1.2	0.0	30.007	0.163	1.26	94	1.99	65.1	62.3	70	98.3	80	0.124	0.352	19.38
186	1.2	0.0	30.171	0.164	1.23	93	2.10	65.1	62.1	70	98.8	80	0.121	0.348	19.26
187	1.1	0.1	30.334	0.163	1.24	93	2.07	65	62.1	70	98.9	80	0.120	0.346	19.10
188	1.1	0.0	30.497	0.163	1.24	93	2.07	65	62.1	69	98.9	80	0.125	0.354	19.26
189	1.1	0.0	30.660	0.163	1.26	93	2.11	65	62.1	69	98.4	80	0.121	0.348	19.30
190	1.1	0.0	30.824	0.164	1.25	93	1.99	65	62.1	69	99.3	80	0.121	0.348	19.14
191	1.1	0.0	30.988	0.164	1.25	93	2.11	65	62.2	70	99.4	80	0.124	0.352	19.26
192	1.0	0.1	31.151	0.163	1.25	93	2.02	65	62.2	69	98.3	80	0.123	0.351	19.33
193	1.0	0.0	31.314	0.163	1.24	93	2.08	64.9	62.2	69	98.2	80	0.123	0.351	19.29
194	1.0	0.0	31.478	0.164	1.24	93	2.06	64.9	62.2	69	99.2	80	0.120	0.346	19.17
195	1.0	0.0	31.641	0.163	1.24	93	1.98	64.9	62.3	69	98.8	80	0.124	0.352	19.21
196	0.9	0.0	31.803	0.162	1.24	93	2.11	64.9	62.3	69	98.2	80	0.119	0.345	19.17
197	0.9	0.0	31.968	0.165	1.24	93	2.08	64.9	62.3	69	100.3	79	0.122	0.349	19.09
198	0.9	0.0	32.132	0.164	1.25	93	2.12	64.9	62.3	69	99.5	80	0.123	0.351	19.24
199	0.9	0.0	32.295	0.163	1.25	93	1.98	64.8	62.3	69	98.5	80	0.122	0.349	19.25
200	0.9	0.0	32.458	0.163	1.24	93	1.98	64.8	62.2	69	98.3	80	0.125	0.354	19.33
201	0.8	0.0	32.622	0.164	1.23	93	2.10	64.8	62.2	69	98.8	80	0.121	0.348	19.29
202	0.8	0.0	32.785	0.163	1.24	93	2.12	64.8	62.2	69	98.4	79	0.123	0.351	19.20
203	0.8	0.0	32.948	0.163	1.23	93	2.02	64.8	62.2	69	98.7	79	0.120	0.346	19.16
204	0.8	0.0	33.111	0.163	1.25	93	1.98	64.8	62.2	69	98.7	79	0.125	0.354	19.24
205	0.8	0.0	33.275	0.164	1.26	93	2.02	64.8	62.3	69	98.8	80	0.123	0.351	19.36
206	0.7	0.1	33.439	0.164	1.27	93	2.11	64.7	62.3	69	98.6	80	0.124	0.352	19.33
207	0.7	0.0	33.602	0.163	1.24	93	2.09	64.8	62.1	69	98.0	80	0.124	0.352	19.36
208	0.7	0.0	33.766	0.164	1.24	93	2.09	64.7	61.8	69	98.7	80	0.122	0.349	19.29
209	0.7	0.0	33.929	0.163	1.25	93	1.99	64.7	61.5	69	98.6	80	0.121	0.348	19.17
210	0.7	0.0	34.092	0.163	1.23	93	2.04	64.8	61.3	69	98.7	80	0.124	0.352	19.25
211	0.6	0.1	34.255	0.163	1.25	93	2.13	64.8	61	69	98.3	80	0.123	0.351	19.33
212	0.6	0.0	34.419	0.164	1.23	93	1.98	64.9	61	69	98.9	80	0.122	0.349	19.25
213	0.6	0.0	34.583	0.164	1.25	93	2.15	64.9	61.1	68	99.1	79	0.123	0.351	19.25
214	0.6	0.0	34.746	0.163	1.24	93	2.03	64.9	61.3	69	98.4	80	0.123	0.351	19.28
215	0.5	0.0	34.910	0.164	1.24	93	2.13	64.9	61.4	68	99.0	80	0.122	0.349	19.25

Train A - Particulate Sampling and Dilution Tunnel Data

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.015
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.015
Sampling Box ID: 335

Test Start Time: 14:06
Test Length: 239 min
Recording Interval: 1 min

Sample Train Leak Checks

Pre-test	0.002	cfm @	18.5	in. Hg
Post-Test	0.001	cfm @	7	in. Hg

θ	Fuel Consumption		Train A Sampling System									Dilution Tunnel			
Elapsed Time (min)	*Scale Reading (lb.)*	*Weight Change*	*Meter Volume (ft^3)*	*Sample Rate (CFM)*	*Meter Δ H (" H_2O)*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Room Ambient (°F)*	*Pro - Rate*	*Tunnel Temp (°F)*	*Center dP (" H_2O)*	$\sqrt{dP}$	*vs*
216	0.5	0.0	35.073	0.163	1.24	93	2.00	64.9	61.4	68	98.7	79	0.121	0.348	19.17
217	0.5	0.0	35.236	0.163	1.24	93	2.03	64.9	61.5	68	98.8	79	0.123	0.351	19.20
218	0.5	0.0	35.399	0.163	1.23	93	2.09	64.9	61.6	68	98.4	80	0.124	0.352	19.32
219	0.5	0.0	35.562	0.163	1.23	93	2.03	64.9	61.7	68	98.4	80	0.120	0.346	19.21
220	0.4	0.0	35.726	0.164	1.25	93	2.06	64.9	61.7	68	99.3	79	0.124	0.352	19.21
221	0.4	0.0	35.890	0.164	1.24	93	2.13	64.8	61.6	68	99.2	79	0.121	0.348	19.24
222	0.4	0.0	36.053	0.163	1.24	93	1.96	64.9	61.8	68	98.6	79	0.123	0.351	19.20
223	0.4	0.0	36.216	0.163	1.24	93	2.06	64.8	61.8	68	98.3	79	0.125	0.354	19.36
224	0.4	0.0	36.379	0.163	1.23	93	2.08	64.8	61.9	68	98.1	79	0.121	0.348	19.28
225	0.3	0.0	36.542	0.163	1.24	93	2.02	64.7	61.9	68	98.5	79	0.123	0.351	19.20
226	0.3	0.0	36.705	0.163	1.23	93	2.05	64.7	61.9	68	98.9	79	0.119	0.345	19.12
227	0.3	0.0	36.869	0.164	1.26	93	1.97	64.7	61.9	68	99.5	79	0.125	0.354	19.19
228	0.3	0.0	37.033	0.164	1.23	93	2.00	64.7	62	68	99.1	79	0.121	0.348	19.27
229	0.3	0.0	37.196	0.163	1.23	93	1.96	64.7	61.9	68	98.5	79	0.123	0.351	19.19
230	0.3	0.0	37.359	0.163	1.23	93	1.96	64.7	62	68	98.4	78	0.124	0.352	19.31
231	0.2	0.1	37.523	0.164	1.24	93	1.99	64.6	61.9	68	98.7	78	0.122	0.349	19.26
232	0.2	0.1	37.686	0.163	1.26	93	2.02	64.6	62	68	98.3	78	0.123	0.351	19.22
233	0.2	0.0	37.849	0.163	1.24	93	2.11	64.6	61.9	68	98.1	78	0.125	0.354	19.34
234	0.2	0.0	38.015	0.166	1.24	93	2.07	64.6	61.9	68	99.6	78	0.123	0.351	19.34
235	0.2	0.0	38.177	0.162	1.24	93	2.11	64.5	61.8	68	97.1	78	0.126	0.355	19.37
236	0.1	0.1	38.340	0.163	1.26	93	1.98	64.6	61.9	68	97.7	78	0.122	0.349	19.33
237	0.1	0.0	38.504	0.164	1.24	93	2.00	64.5	61.9	68	98.9	78	0.122	0.349	19.18
238	0.1	0.0	38.667	0.163	1.26	93	2.04	64.5	61.9	68	98.6	78	0.122	0.349	19.18
239	0.0	0.1	38.830	0.163	1.25	93	1.99	64.5	61.9	68	98.6	78	0.123	0.351	19.22

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Total Sampling Time: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Sample Train Leak Checks

Pre-test 0.002 cfm @ 18.5 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

Elapsed Time (min)	**Train B Sampling System**								**Appliance Temperatures, °F**						
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*	*Top*	*Bottom*	*Back*	*Left*	*Right*	*Catalyst Exit*	*Average Stove Surface (Tot = Δ T)*
Tot / Avg	**38.976**	**0.163**	**1.23**	**87.2**	**2.24**	**66.29**	**58.50**	**100.0**	**433.6**	**410.5**	**343.8**	**395.8**	**309.2**	**829.5**	**77.5**
Minimum	0.000	0.146	0.04	69	0.03	63	49	94.6	324	379	290	331	271	593	319
Max	38.976	0.166	1.28	94	2.32	67	62	107.7	623	471	393	448	380	1124	441
0	0.000		0.04	69	0.03	63.4	50.3		376	467	352	408	380	747	397
	0.000		0.11	69	0.48	63.4	50.1		376	468	354	408	322	644	386
1	0.146	0.146	1.19	69	2.17	64.6	48.8	98.2	371	470	359	408	319	593	385
2	0.308	0.162	1.25	69	2.41	65.4	48.7	107.7	365	471	363	404	318	608	384
3	0.470	0.162	1.25	69	2.38	65.4	48.7	105.8	370	471	362	403	318	679	385
4	0.631	0.161	1.26	69	2.37	65.5	48.7	103.7	363	471	356	400	317	729	381
5	0.793	0.162	1.25	69	2.33	65.7	48.7	104.9	360	471	351	395	315	750	378
6	0.956	0.163	1.24	70	2.34	65.9	48.8	106.0	356	470	345	396	314	768	376
7	1.118	0.162	1.24	69	2.35	66.2	48.9	104.5	366	470	340	396	311	812	377
8	1.279	0.161	1.24	70	2.35	66.5	49	103.4	371	469	337	393	309	866	376
9	1.439	0.160	1.23	70	2.33	66.8	49.1	103.4	388	469	335	391	306	927	378
10	1.600	0.161	1.23	70	2.31	66.5	49.1	104.0	396	468	334	387	303	909	377
11	1.762	0.162	1.23	70	2.32	66.4	49.3	103.8	402	467	333	390	301	914	379
12	1.922	0.160	1.23	71	2.31	66.6	49.4	102.2	401	466	331	386	299	913	377
13	2.082	0.160	1.22	71	2.32	66.8	49.6	102.5	401	465	329	385	298	912	376
14	2.242	0.160	1.22	70	2.31	67	49.7	102.7	406	464	328	384	296	897	376
15	2.403	0.161	1.23	71	2.29	67.4	49.9	103.1	405	463	327	384	294	894	375
16	2.563	0.160	1.21	71	2.28	67.7	50.1	102.4	418	462	327	379	292	951	376
17	2.722	0.159	1.22	72	2.31	67.9	50.3	102.5	442	462	329	384	292	995	382
18	2.881	0.159	1.22	72	2.32	68	50.4	102.9	464	460	332	384	291	1017	386
19	3.042	0.161	1.21	72	2.33	68.1	50.5	104.3	480	460	334	387	291	1028	390
20	3.200	0.158	1.20	72	2.33	68.2	50.7	103.0	498	459	337	389	291	1027	395
21	3.358	0.158	1.20	72	2.34	68.2	50.8	103.5	513	458	340	389	291	1034	398
22	3.518	0.160	1.20	72	2.29	68.2	51	104.5	523	457	342	393	292	1035	402
23	3.678	0.160	1.26	73	2.44	68.3	51.1	103.8	531	457	344	395	292	1051	404
24	3.840	0.162	1.25	73	2.44	68.3	51.4	104.7	549	455	347	397	292	1062	408
25	4.003	0.163	1.26	74	2.43	68.4	51.5	105.5	551	455	350	399	293	1080	410
26	4.165	0.162	1.24	74	2.38	68.4	51.6	105.1	561	455	353	402	293	1087	413
27	4.328	0.163	1.25	74	2.45	68.4	51.7	105.6	567	454	357	405	296	1094	416
28	4.492	0.164	1.25	74	2.43	68.6	51.8	106.1	571	453	361	405	296	1100	417
29	4.654	0.162	1.24	74	2.45	68.7	52	105.1	581	452	365	409	298	1105	421
30	4.815	0.161	1.25	75	2.43	68.8	52.2	105.0	589	452	370	413	301	1108	425
31	4.977	0.162	1.25	75	2.39	68.9	52.5	105.4	598	451	374	416	304	1113	428
32	5.139	0.162	1.24	75	2.42	68.9	52.5	104.8	606	450	378	418	306	1118	431
33	5.301	0.162	1.26	75	2.32	69	52.7	104.7	607	449	383	422	310	1121	434
34	5.465	0.164	1.24	76	2.44	69	52.8	106.2	618	449	387	422	312	1124	438
35	5.626	0.161	1.24	76	2.38	68.7	52.9	103.9	623	448	392	427	316	1121	441
36	5.788	0.162	1.25	77	2.32	68.6	53.1	103.8	610	448	393	430	318	1079	440
37	5.949	0.161	1.24	77	2.34	68.5	53.3	102.3	604	448	391	432	321	1063	439
38	6.111	0.162	1.25	77	2.37	68.5	53.5	102.4	604	448	390	436	323	1050	440
39	6.274	0.163	1.24	78	2.40	68.6	53.6	103.0	602	448	388	436	326	1036	440

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Total Sampling Time: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Sample Train Leak Checks

Pre-test 0.002 cfm @ 18.5 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
40	6.438	0.164	1.25	78	2.30	68.7	53.8	103.2	597	448	387	440	327	1026	440
41	6.600	0.162	1.26	78	2.43	68.7	54	101.5	591	448	386	438	329	1021	438
42	6.762	0.162	1.25	79	2.38	68.7	54.2	101.6	580	447	384	443	331	1017	437
43	6.925	0.163	1.25	79	2.35	68.7	54.3	102.1	585	446	383	443	331	1014	438
44	7.088	0.163	1.26	79	2.38	68.7	54.5	101.8	576	446	382	442	333	1009	436
45	7.251	0.163	1.25	79	2.37	68.7	54.6	101.8	578	445	381	444	333	1007	436
46	7.415	0.164	1.25	80	2.43	68.7	54.8	102.5	573	444	380	444	335	1012	435
47	7.579	0.164	1.25	80	2.27	68.6	55	102.7	570	443	379	447	335	1011	435
48	7.742	0.163	1.25	80	2.43	68.6	55.2	101.9	567	443	379	447	336	1009	434
49	7.906	0.164	1.26	80	2.29	68.6	55.4	102.0	571	442	378	447	337	1007	435
50	8.069	0.163	1.24	81	2.39	68.6	55.6	101.4	567	441	377	448	338	995	434
51	8.232	0.163	1.26	81	2.26	68.6	55.8	102.3	566	440	377	447	338	989	433
52	8.396	0.164	1.26	81	2.29	68.6	56	103.0	561	439	376	444	339	990	432
53	8.560	0.164	1.24	81	2.24	68.6	56.1	102.0	555	438	376	447	339	989	431
54	8.722	0.162	1.24	82	2.37	68.5	56.3	100.6	557	438	375	443	340	986	430
55	8.886	0.164	1.24	82	2.36	68.5	56.4	102.6	556	437	375	445	340	983	431
56	9.048	0.162	1.24	83	2.34	68.5	56.6	101.2	551	436	375	444	340	980	429
57	9.211	0.163	1.24	83	2.22	68.5	56.9	101.6	545	435	375	446	340	977	428
58	9.373	0.162	1.24	83	2.36	68.4	57	100.9	550	434	375	445	340	976	429
59	9.535	0.162	1.25	83	2.34	68.3	57.1	100.8	551	433	375	445	339	976	429
60	9.698	0.163	1.25	84	2.33	68.2	57.3	101.0	552	432	376	444	339	975	428
61	9.862	0.164	1.25	83	2.29	68.2	57.4	100.9	549	431	376	443	339	974	428
62	10.026	0.164	1.27	84	2.23	68.2	57.6	100.8	553	430	377	446	340	973	429
63	10.190	0.164	1.25	84	2.34	68.2	57.8	101.4	544	429	377	442	339	973	426
64	10.354	0.164	1.26	85	2.20	68.2	58	102.2	540	429	378	445	338	968	426
65	10.517	0.163	1.26	85	2.33	68.1	58.1	101.6	532	428	378	444	336	958	424
66	10.680	0.163	1.25	85	2.35	68.1	58.3	100.7	526	427	379	446	337	945	423
67	10.844	0.164	1.25	85	2.29	68	58.3	100.9	527	426	379	446	336	934	423
68	11.007	0.163	1.26	85	2.35	68	58.4	99.9	525	426	380	445	336	922	422
69	11.171	0.164	1.25	86	2.31	68	58.5	100.4	515	425	380	442	336	913	419
70	11.335	0.164	1.25	85	2.31	67.9	58.6	101.0	517	424	380	443	335	904	420
71	11.500	0.165	1.26	86	2.33	67.9	58.7	102.1	515	423	380	443	335	896	419
72	11.665	0.165	1.26	86	2.24	67.8	58.8	102.1	507	423	381	441	334	889	417
73	11.830	0.165	1.25	87	2.20	67.8	58.9	102.0	502	422	381	439	331	884	415
74	11.994	0.164	1.25	86	2.21	67.8	59.1	101.5	503	422	381	440	333	878	416
75	12.158	0.164	1.26	87	2.34	67.7	59.2	101.3	504	421	380	441	332	873	416
76	12.322	0.164	1.25	87	2.32	67.7	59.3	100.9	498	420	380	439	332	869	414
77	12.486	0.164	1.26	87	2.20	67.6	59.4	101.1	493	419	380	438	332	866	412
78	12.650	0.164	1.26	87	2.23	67.6	59.4	101.2	499	419	379	438	332	862	413
79	12.814	0.164	1.26	87	2.28	67.5	59.6	100.7	492	418	379	436	331	860	411
80	12.979	0.165	1.27	87	2.21	67.5	59.6	101.4	489	418	379	435	330	857	410
81	13.143	0.164	1.27	88	2.20	67.5	59.7	101.0	486	417	378	433	330	856	409
82	13.308	0.165	1.25	88	2.25	67.4	59.8	101.5	483	417	377	433	330	853	408
83	13.472	0.164	1.26	88	2.24	67.3	59.8	101.4	488	416	377	434	329	849	409

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Total Sampling Time: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Sample Train Leak Checks

Pre-test 0.002 cfm @ 18.5 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
84	13.637	0.165	1.27	88	2.21	67.3	59.9	102.0	479	415	376	433	329	848	406
85	13.802	0.165	1.27	89	2.27	67.2	59.9	100.9	472	415	376	433	329	846	405
86	13.968	0.166	1.25	89	2.30	67.2	60	100.3	475	414	376	431	329	843	405
87	14.132	0.164	1.26	88	2.31	67.1	60.1	99.0	474	413	375	430	328	841	404
88	14.297	0.165	1.26	88	2.31	67.1	60.1	100.5	475	413	374	430	327	838	404
89	14.461	0.164	1.26	89	2.33	67.1	60.1	100.6	469	412	373	428	327	838	402
90	14.626	0.165	1.27	89	2.23	67	60.2	101.2	468	411	373	427	326	836	401
91	14.790	0.164	1.27	89	2.30	67	60.3	100.3	466	411	373	428	325	835	400
92	14.955	0.165	1.27	89	2.31	67	60.3	101.2	468	410	372	429	325	834	401
93	15.119	0.164	1.26	89	2.29	66.9	60.4	100.7	463	410	372	428	324	833	399
94	15.284	0.165	1.25	90	2.22	66.9	60.4	100.8	463	409	371	428	324	832	399
95	15.449	0.165	1.26	90	2.23	66.9	60.5	100.7	467	409	371	427	324	832	399
96	15.613	0.164	1.26	90	2.29	66.9	60.6	100.5	457	408	370	427	324	832	397
97	15.778	0.165	1.27	90	2.31	66.9	60.6	100.8	456	407	369	426	323	831	396
98	15.943	0.165	1.26	90	2.26	66.9	60.7	100.2	464	407	369	426	322	829	398
99	16.108	0.165	1.27	90	2.18	66.9	60.7	100.2	455	406	369	424	322	826	395
100	16.273	0.165	1.26	90	2.22	66.8	60.7	100.0	456	406	368	425	321	825	395
101	16.439	0.166	1.27	90	2.20	66.8	60.8	100.0	456	405	367	423	320	825	394
102	16.604	0.165	1.24	90	2.30	66.8	60.8	98.6	455	405	367	420	320	823	393
103	16.769	0.165	1.26	91	2.30	66.7	60.9	98.7	458	404	366	422	320	822	394
104	16.934	0.165	1.25	91	2.27	66.7	60.9	100.3	456	404	366	422	319	820	393
105	17.099	0.165	1.28	90	2.29	66.6	60.9	101.9	448	403	365	422	320	819	392
106	17.264	0.165	1.27	90	2.32	66.6	61	101.5	450	402	365	421	319	819	391
107	17.429	0.165	1.27	90	2.23	66.5	61	100.5	452	402	364	421	319	818	392
108	17.594	0.165	1.27	91	2.32	66.5	61.1	100.5	453	401	364	420	319	817	391
109	17.759	0.165	1.27	91	2.24	66.6	61.3	101.0	449	401	363	418	319	816	390
110	17.924	0.165	1.27	91	2.29	66.6	61.3	100.9	447	400	363	418	317	817	389
111	18.089	0.165	1.27	91	2.27	66.5	61.2	100.2	450	400	362	415	318	816	389
112	18.254	0.165	1.26	91	2.25	66.5	61.3	100.3	447	399	362	414	317	815	388
113	18.417	0.163	1.23	91	2.23	66.5	61.3	98.9	456	399	362	415	317	813	390
114	18.580	0.163	1.22	91	2.25	66.4	61.3	98.3	447	398	362	413	318	813	388
115	18.743	0.163	1.25	91	2.27	66.4	61.2	98.6	449	398	361	414	318	813	388
116	18.907	0.164	1.24	91	2.14	66.4	61.2	100.0	447	397	361	415	318	813	388
117	19.070	0.163	1.24	92	2.23	66.3	61.2	99.5	450	397	361	414	317	813	388
118	19.232	0.162	1.24	92	2.17	66.3	61.2	98.4	458	396	361	415	318	813	389
119	19.395	0.163	1.24	92	2.26	66.3	61.2	98.4	452	396	360	415	318	812	388
120	19.557	0.162	1.24	92	2.21	66.3	61.3	97.5	455	396	360	415	318	812	389
121	19.720	0.163	1.24	92	2.14	66.2	61.3	98.2	455	396	360	414	318	811	389
122	19.883	0.163	1.22	92	2.26	66.2	61.3	98.6	451	395	360	412	318	811	387
123	20.047	0.164	1.24	92	2.15	66.2	61.3	99.4	452	395	360	413	318	812	388
124	20.210	0.163	1.24	92	2.26	66.2	61.3	98.7	444	395	359	412	318	814	385
125	20.373	0.163	1.25	92	2.27	66.1	61.2	98.4	447	394	359	410	318	814	386
126	20.535	0.162	1.26	92	2.23	66.1	61.2	97.4	449	394	359	410	318	813	386
127	20.697	0.162	1.24	92	2.28	66.1	61.3	97.3	450	394	358	410	319	812	386

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Total Sampling Time: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Sample Train Leak Checks
Pre-test 0.002 cfm @ 18.5 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
128	20.860	0.163	1.24	92	2.14	66	61.3	98.3	445	394	358	409	319	810	385
129	21.023	0.163	1.23	92	2.25	66	61.3	98.4	440	394	358	410	320	808	384
130	21.187	0.164	1.24	92	2.27	66	61.3	98.9	438	393	358	410	319	808	384
131	21.350	0.163	1.24	92	2.25	66	61.4	98.7	440	393	358	410	320	808	384
132	21.513	0.163	1.23	92	2.25	66	61.4	99.0	436	393	358	411	320	808	384
133	21.676	0.163	1.22	92	2.26	66.1	61.5	98.7	438	392	358	411	321	806	384
134	21.838	0.162	1.24	92	2.14	66	61.5	98.0	434	392	358	409	322	807	383
135	22.001	0.163	1.23	92	2.20	66.1	61.6	98.7	427	392	358	410	321	808	382
136	22.164	0.163	1.24	92	2.25	66	61.6	98.8	431	392	358	410	323	805	383
137	22.328	0.164	1.22	92	2.27	66	61.6	99.4	428	392	358	408	323	799	382
138	22.492	0.164	1.23	93	2.21	65.9	61.5	99.6	426	392	358	406	322	795	381
139	22.655	0.163	1.22	93	2.17	65.8	61.4	99.2	417	392	357	405	323	792	379
140	22.818	0.163	1.24	93	2.20	65.8	61.4	98.9	419	392	356	406	322	790	379
141	22.980	0.162	1.24	92	2.26	65.8	61.4	97.8	415	392	356	405	321	788	378
142	23.143	0.163	1.23	92	2.15	65.7	61.4	98.1	413	391	355	402	321	784	376
143	23.306	0.163	1.23	93	2.16	65.7	61.3	97.9	407	391	354	402	320	779	375
144	23.469	0.163	1.23	93	2.15	65.7	61.4	98.1	406	391	353	401	319	777	374
145	23.633	0.164	1.23	93	2.27	65.7	61.4	99.0	405	391	352	398	318	775	373
146	23.797	0.164	1.25	92	2.17	65.7	61.4	99.1	399	391	350	398	317	772	371
147	23.960	0.163	1.23	93	2.21	65.6	61.4	98.0	399	391	349	399	317	770	371
148	24.122	0.162	1.25	93	2.26	65.5	61.4	97.0	395	392	348	394	316	768	369
149	24.285	0.163	1.24	93	2.14	65.5	61.3	97.8	396	391	346	396	316	765	369
150	24.448	0.163	1.25	92	2.15	65.4	61.3	97.9	393	391	345	393	315	762	367
151	24.611	0.163	1.24	93	2.18	65.5	61.4	97.4	393	391	344	393	315	760	367
152	24.775	0.164	1.22	93	2.14	65.5	61.4	98.0	388	391	342	390	313	757	365
153	24.939	0.164	1.24	93	2.26	65.4	61.4	98.5	381	392	341	388	313	756	363
154	25.102	0.163	1.23	93	2.16	65.3	61.3	98.5	386	392	339	387	312	754	363
155	25.265	0.163	1.24	93	2.25	65.3	61.3	98.4	384	391	338	385	311	751	362
156	25.428	0.163	1.23	93	2.17	65.3	61.3	97.8	379	392	337	384	311	749	360
157	25.591	0.163	1.25	93	2.20	65.2	61.2	97.4	379	392	335	383	310	748	360
158	25.754	0.163	1.24	93	2.25	65.3	61.2	97.5	378	392	334	382	310	747	359
159	25.917	0.163	1.24	93	2.18	65.3	61.2	98.0	372	392	333	380	309	746	357
160	26.081	0.164	1.23	93	2.25	65.3	61.2	99.0	374	391	331	380	308	745	357
161	26.245	0.164	1.25	93	2.15	65.3	61.3	99.1	372	391	330	380	307	743	356
162	26.408	0.163	1.24	93	2.14	65.3	61.2	98.2	371	391	329	379	306	742	355
163	26.571	0.163	1.24	93	2.15	65.3	61.2	97.8	371	391	328	377	306	742	355
164	26.734	0.163	1.23	93	2.16	65.2	61.2	97.7	376	391	327	377	304	741	355
165	26.896	0.162	1.23	93	2.17	65.2	61.2	97.2	368	391	326	375	305	741	353
166	27.059	0.163	1.24	93	2.27	65.2	61.2	97.8	370	391	325	375	305	740	353
167	27.222	0.163	1.24	93	2.18	65.2	61.1	97.8	365	391	324	373	303	739	351
168	27.387	0.165	1.25	93	2.26	65.2	61.1	99.4	366	391	323	372	302	737	351
169	27.551	0.164	1.23	94	2.21	65.1	61.1	98.6	364	391	322	373	302	736	350
170	27.714	0.163	1.23	93	2.25	65.1	61.2	97.6	359	391	321	372	302	735	349
171	27.877	0.163	1.23	93	2.25	65	61	98.0	363	391	320	371	301	736	349

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Start Time: 14:06
Total Sampling Time: 239 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Sample Train Leak Checks

Pre-test 0.002 cfm @ 18.5 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

Elapsed Time (min)	Train B Sampling System								Appliance Temperatures, °F						
	Meter Volume (ft^3)	Sample Rate (CFM)	Meter Δ H	Meter Temp (°F)	Filter Vac (in. Hg)	Filter Temp (°F)	Dryer Temp (°F)	Pro - Rate	Top	Bottom	Back	Left	Right	Catalyst Exit	Average Stove Surface (Tot = Δ T)
172	28.039	0.162	1.23	93	2.24	65	61	97.5	365	391	319	370	300	737	349
173	28.202	0.163	1.24	93	2.18	65	61	97.5	362	391	318	367	300	736	348
174	28.365	0.163	1.24	93	2.22	65	61.1	97.2	365	391	317	367	299	736	348
175	28.529	0.164	1.23	94	2.14	65	61	98.1	361	391	316	366	298	736	346
176	28.693	0.164	1.22	93	2.19	64.9	61	98.2	362	391	316	365	298	736	346
177	28.857	0.164	1.24	93	2.17	64.9	61	98.4	359	390	315	366	297	736	345
178	29.020	0.163	1.22	93	2.25	64.9	61	98.1	361	390	314	364	297	735	345
179	29.183	0.163	1.23	93	2.15	64.9	60.9	98.4	351	390	314	364	296	735	343
180	29.346	0.163	1.24	93	2.25	64.9	60.9	98.3	354	390	313	361	296	735	343
181	29.508	0.162	1.24	93	2.15	64.8	60.9	97.5	357	390	312	361	295	735	343
182	29.672	0.164	1.23	94	2.16	64.8	60.9	98.5	360	390	312	361	294	735	343
183	29.835	0.163	1.24	93	2.18	64.8	60.8	98.2	358	390	311	359	293	735	342
184	29.999	0.164	1.24	93	2.25	64.8	60.8	98.9	351	390	311	360	293	735	341
185	30.163	0.164	1.24	94	2.16	64.8	60.8	98.3	357	389	310	359	293	735	342
186	30.326	0.163	1.24	93	2.23	64.8	60.8	97.6	353	389	309	359	293	736	341
187	30.489	0.163	1.24	94	2.14	64.8	60.9	98.3	351	389	309	356	293	736	340
188	30.652	0.163	1.24	93	2.22	64.8	61	98.3	354	389	308	356	292	736	340
189	30.814	0.162	1.24	94	2.24	64.8	60.9	97.1	353	388	308	356	292	736	339
190	30.978	0.164	1.24	93	2.23	64.9	61	98.6	354	388	307	356	290	737	339
191	31.141	0.163	1.24	93	2.26	64.9	60.9	98.2	352	388	307	356	290	737	338
192	31.305	0.164	1.25	93	2.18	64.8	60.9	98.2	348	388	306	354	289	736	337
193	31.469	0.164	1.24	94	2.26	64.7	60.8	98.1	356	387	305	354	289	735	338
194	31.632	0.163	1.23	93	2.15	64.7	60.7	98.0	352	387	305	354	288	735	337
195	31.795	0.163	1.24	93	2.18	64.7	60.8	98.1	349	387	305	353	287	735	336
196	31.958	0.163	1.25	93	2.25	64.7	60.8	98.1	345	387	304	353	288	734	335
197	32.120	0.162	1.25	94	2.26	64.7	60.7	97.8	349	386	304	353	286	735	335
198	32.284	0.164	1.23	93	2.25	64.7	60.7	98.8	344	386	303	352	286	736	334
199	32.447	0.163	1.25	94	2.27	64.6	60.7	97.8	346	386	303	349	286	738	334
200	32.611	0.164	1.24	93	2.26	64.7	60.7	98.2	345	386	302	349	285	740	333
201	32.775	0.164	1.24	93	2.19	64.6	60.6	98.2	350	385	301	348	285	739	334
202	32.938	0.163	1.24	93	2.25	64.6	60.6	97.8	348	385	301	348	284	737	333
203	33.101	0.163	1.22	94	2.23	64.5	60.5	98.0	345	385	301	347	284	734	332
204	33.264	0.163	1.24	94	2.16	64.5	60.6	97.9	344	385	300	347	283	731	332
205	33.426	0.162	1.24	93	2.26	64.6	60.6	96.9	349	385	300	348	284	729	333
206	33.590	0.164	1.26	93	2.18	64.5	60.6	97.9	343	384	300	347	282	727	331
207	33.753	0.163	1.23	93	2.15	64.5	60.6	97.3	351	384	299	346	282	725	332
208	33.917	0.164	1.25	94	2.18	64.6	60.7	98.0	351	383	298	346	281	723	332
209	34.081	0.164	1.24	93	2.26	64.7	60.8	98.5	352	383	298	345	281	722	332
210	34.244	0.163	1.22	93	2.13	64.7	60.8	98.0	350	383	297	344	281	721	331
211	34.407	0.163	1.24	93	2.15	64.7	60.8	97.7	349	382	297	344	281	719	331
212	34.570	0.163	1.23	94	2.25	64.7	60.8	97.6	346	382	297	344	280	714	330
213	34.732	0.162	1.23	94	2.11	64.6	60.7	97.2	343	382	297	344	279	709	329
214	34.895	0.163	1.24	94	2.26	64.7	60.8	97.6	342	381	297	342	278	706	328
215	35.059	0.164	1.24	93	2.25	64.8	60.7	98.3	339	381	296	342	280	706	327

Train B - Particulate Sampling and Appliance Temperatures

ASTM E2515

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.006
Meter Box Y Regression Slope: 0
Meter Box Dynamic Y: 1.006
Sampling Box ID: 336

Test Start Time: 14:06
Total Sampling Time: 239 min
Recording Interval: 1 min

Sample Train Leak Checks

Pre-test 0.002 cfm @ 18.5 in. Hg
Post-Test 0.002 cfm @ 7 in. Hg

Elapsed Time (min)	**Train B Sampling System**								**Appliance Temperatures, °F**						
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*	*Top*	*Bottom*	*Back*	*Left*	*Right*	*Catalyst Exit*	*Average Stove Surface (Tot = Δ T)*
216	35.223	0.164	1.24	93	2.14	64.7	60.6	98.6	343	381	296	343	279	706	328
217	35.386	0.163	1.23	93	2.15	64.7	60.5	98.1	340	381	296	342	278	704	327
218	35.549	0.163	1.23	93	2.25	64.7	60.5	97.7	335	381	295	339	278	702	326
219	35.712	0.163	1.23	94	2.12	64.6	60.4	97.7	336	381	295	341	278	701	326
220	35.875	0.163	1.23	94	2.27	64.7	60.5	98.0	336	381	295	341	278	700	326
221	36.037	0.162	1.25	94	2.14	64.6	60.4	97.3	333	380	295	339	277	700	325
222	36.200	0.163	1.23	94	2.16	64.6	60.5	97.8	332	381	295	339	278	700	325
223	36.364	0.164	1.23	94	2.12	64.5	60.3	98.1	336	380	294	339	277	700	325
224	36.528	0.164	1.24	93	2.13	64.5	60.4	98.0	329	380	294	337	276	700	323
225	36.691	0.163	1.23	93	2.24	64.5	60.3	97.8	330	380	294	337	276	700	323
226	36.854	0.163	1.23	93	2.14	64.4	60.3	98.2	324	380	294	337	275	699	322
227	37.017	0.163	1.23	93	2.27	64.4	60.3	98.1	327	380	294	337	275	697	323
228	37.179	0.162	1.23	94	2.12	64.3	60.2	97.1	329	380	294	336	274	696	322
229	37.342	0.163	1.24	93	2.14	64.3	60.2	97.7	328	380	293	335	274	698	322
230	37.505	0.163	1.23	94	2.27	64.3	60.2	97.6	330	380	293	335	274	700	322
231	37.670	0.165	1.23	93	2.13	64.3	60.2	98.5	328	380	293	335	273	702	322
232	37.834	0.164	1.24	93	2.14	64.3	60.3	98.2	327	379	293	335	273	704	321
233	37.997	0.163	1.23	93	2.18	64.2	60.2	97.4	324	379	292	333	273	705	320
234	38.163	0.166	1.24	93	2.15	64.3	60.3	98.9	329	379	292	333	272	705	321
235	38.322	0.159	1.23	94	2.23	64.3	60.4	94.6	326	379	292	332	272	706	320
236	38.485	0.163	1.25	93	2.25	64.4	60.4	97.0	330	379	291	334	271	709	321
237	38.648	0.163	1.23	93	2.24	64.2	60.3	97.5	328	379	291	331	271	707	320
238	38.811	0.163	1.23	94	2.19	64.2	60.3	97.9	331	379	290	331	272	701	320
239	38.976	0.165	1.24	94	2.26	64.2	60.3	99.0	326	379	290	331	271	695	319

Train C - First Hour Particulate Sampling

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Start Time: 14:06
Total Sampling Time: 60 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.01
Meter Box Y Regression Factor: 0
Meter Box Dynamic Y: 1.010
Sample Box ID: 371

Sample Train Leak Checks
Pre-test 0.003 cfm @ 15 in. Hg
Post-Test 0.001 cfm @ 10.84 in. Hg

Elapsed Time (min)	**Train C Sampling System**							
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*
Tot / Avg	**9.619**	**0.160**	**1.01**	**72.0**	**2.39**	**70.9**	**57.7**	**101.1**
Minimum	0.000	0.150	0.00	68	0.04	65	50	95.2
Max	9.619	0.164	1.06	76	2.52	73	63	104.1
0	0.000		0.00	68	0.04	64.8	50	
1	0.150	0.150	1.03	68	2.39	66.6	51.9	95.2
2	0.309	0.159	1.02	68	2.39	67.7	52.2	103.9
3	0.468	0.159	1.01	68	2.42	68.5	52.4	102.8
4	0.626	0.158	1.01	69	2.40	68.5	52.7	100.4
5	0.785	0.159	1.01	69	2.33	68.5	52.8	99.7
6	0.943	0.158	1.00	69	2.39	68.6	53	99.7
7	1.101	0.158	1.01	69	2.34	68.8	53.2	100.1
8	1.260	0.159	1.00	69	2.35	68.9	53.5	99.9
9	1.417	0.157	1.00	69	2.32	69.3	53.7	98.3
10	1.575	0.158	1.00	69	2.35	69.6	53.9	99.6
11	1.732	0.157	1.00	69	2.32	69.6	54.1	98.9
12	1.891	0.159	1.00	69	2.38	69.7	54.3	99.4
13	2.048	0.157	1.00	70	2.40	69.8	54.4	98.0
14	2.206	0.158	1.00	70	2.39	70	54.6	98.9
15	2.363	0.157	1.00	70	2.39	70	54.8	98.4
16	2.521	0.158	1.00	70	2.39	70.2	55	98.8
17	2.678	0.157	0.99	70	2.39	70.5	55.2	98.1
18	2.836	0.158	0.99	70	2.32	70.6	55.4	99.6
19	2.992	0.156	0.99	71	2.40	70.9	55.6	98.8
20	3.150	0.158	0.99	71	2.34	71	55.7	100.1
21	3.307	0.157	0.99	71	2.41	71.2	55.9	100.2
22	3.464	0.157	0.99	71	2.39	71.3	56.1	100.7
23	3.621	0.157	0.98	71	2.41	71.5	56.3	100.4
24	3.779	0.158	0.99	71	2.39	71.6	56.5	100.5
25	3.942	0.163	1.05	72	2.45	71.8	56.8	103.4
26	4.103	0.161	1.05	72	2.51	72	57	102.4
27	4.265	0.162	1.05	72	2.51	72.1	57.2	103.3
28	4.427	0.162	1.05	72	2.46	72.1	57.4	103.3
29	4.588	0.161	1.04	72	2.41	72.2	57.6	102.5
30	4.750	0.162	1.05	72	2.41	72.3	57.8	103.5
31	4.912	0.162	1.05	72	2.50	72.4	58	104.1
32	5.074	0.162	1.05	73	2.43	72.5	58.2	104.0

Train C - First Hour Particulate Sampling

Run: 3
Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Start Time: 14:06
Total Sampling Time: 60 min
Recording Interval: 1 min

Test Date: 3/12/25

Meter Box Y Regression Offset: 1.01
Meter Box Y Regression Factor: 0
Meter Box Dynamic Y: 1.010
Sample Box ID: 371

Sample Train Leak Checks
Pre-test 0.003 cfm @ 15 in. Hg
Post-Test 0.001 cfm @ 10.84 in. Hg

Elapsed Time (min)	**Train C Sampling System**							
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Filter Temp (°F)*	*Dryer Temp (°F)*	*Pro - Rate*
33	5.235	0.161	1.05	73	2.52	72.6	58.4	102.8
34	5.397	0.162	1.05	73	2.44	72.8	58.6	103.5
35	5.559	0.162	1.04	73	2.43	72.8	58.8	103.8
36	5.720	0.161	1.04	73	2.48	72.9	59	102.9
37	5.882	0.162	1.05	73	2.50	72.6	59.2	102.8
38	6.045	0.163	1.05	73	2.44	72.3	59.4	102.7
39	6.206	0.161	1.04	73	2.44	72.2	59.6	100.9
40	6.367	0.161	1.05	74	2.51	72.1	59.7	101.0
41	6.530	0.163	1.05	74	2.43	72.1	59.9	102.0
42	6.692	0.162	1.05	74	2.43	72	60.1	100.9
43	6.854	0.162	1.05	74	2.44	72	60.3	101.0
44	7.016	0.162	1.05	74	2.51	71.9	60.5	101.0
45	7.179	0.163	1.05	74	2.44	71.9	60.7	101.4
46	7.340	0.161	1.04	74	2.50	71.8	60.8	100.2
47	7.503	0.163	1.05	74	2.47	71.8	61.1	101.6
48	7.666	0.163	1.05	75	2.41	71.7	61.2	101.8
49	7.828	0.162	1.05	75	2.51	71.6	61.4	101.0
50	7.990	0.162	1.05	75	2.44	71.6	61.5	100.5
51	8.153	0.163	1.05	75	2.43	71.6	61.8	101.2
52	8.316	0.163	1.05	75	2.50	71.4	61.9	102.1
53	8.479	0.163	1.05	75	2.40	71.5	62	102.2
54	8.641	0.162	1.05	75	2.51	71.4	62.2	100.7
55	8.804	0.163	1.05	75	2.40	71.4	62.3	101.2
56	8.967	0.163	1.06	75	2.50	71.3	62.5	102.0
57	9.130	0.163	1.05	76	2.48	71.2	62.6	101.9
58	9.292	0.162	1.05	76	2.43	71.2	62.7	101.1
59	9.455	0.163	1.06	76	2.50	71.2	63	101.7
60	9.619	0.164	1.06	76	2.43	71.1	63.1	102.2

Train D - Ambient Background and Flue Gas Data

Run: 3 **Test Date:** 3/12/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 14:06
Total Sampling Time 240 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter Δ H*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
Tot / Avg	**37.321**	**0.156**	**1.07**	**78.2**	**1.93**	**330.60**	**-0.065**	**530.5**	**0.26**	**12.02**
Minimum	0.000	0.152	1.07	71	1.90	256.70	-0.103	365.0	0.03	0.98
Max	37.321	0.160	1.11	80	2.03	529.80	-0.044	547.0	3.12	17.37
0	0.000		-0.01	71	0.04	396.3	-0.069	547.0	0.07	4.65
1	0.152	0.152	1.11	71	1.92	400.2	-0.094	547.0	0.14	0.98
2	0.309	0.157	1.11	71	2.01	417.8	-0.094	547.0	0.07	2.68
3	0.465	0.156	1.11	71	2.03	433.8	-0.092	547.0	0.09	4.53
4	0.621	0.156	1.10	71	1.96	404.6	-0.088	547.0	0.07	6.60
5	0.777	0.156	1.10	71	1.96	399.6	-0.090	547.0	0.09	6.49
6	0.932	0.155	1.10	71	1.94	398.9	-0.094	547.0	0.08	6.77
7	1.087	0.155	1.10	71	1.94	401.4	-0.094	547.0	0.09	7.27
8	1.242	0.155	1.09	71	1.96	409	-0.090	547.0	0.14	8.93
9	1.397	0.155	1.09	71	1.95	421.6	-0.095	547.0	0.14	11.73
10	1.551	0.154	1.08	71	1.95	435.9	-0.099	547.0	0.17	12.31
11	1.706	0.155	1.09	72	1.95	438.7	-0.095	547.0	0.08	9.29
12	1.861	0.155	1.09	72	1.94	442.4	-0.094	547.0	0.11	8.09
13	2.015	0.154	1.08	72	1.95	444.2	-0.096	547.0	0.10	8.09
14	2.169	0.154	1.08	72	1.93	444.6	-0.094	547.0	0.10	7.95
15	2.324	0.155	1.08	72	1.96	443.8	-0.093	547.0	0.08	8.81
16	2.478	0.154	1.08	72	1.95	445.9	-0.102	547.0	0.12	11.94
17	2.633	0.155	1.08	72	1.96	458.7	-0.095	547.0	0.33	15.26
18	2.788	0.155	1.08	72	1.93	467.9	-0.096	547.0	0.32	16.02
19	2.942	0.154	1.08	73	1.95	477.1	-0.097	547.0	0.16	14.84
20	3.096	0.154	1.08	73	1.93	483.9	-0.103	547.0	0.37	15.62
21	3.251	0.155	1.08	73	1.95	488.1	-0.100	547.0	0.19	14.37
22	3.406	0.155	1.08	73	1.94	492.1	-0.100	547.0	0.17	14.11
23	3.559	0.153	1.08	73	1.94	493.4	-0.099	547.0	0.16	14.32
24	3.714	0.155	1.07	73	1.94	496.2	-0.097	547.0	0.19	14.80
25	3.868	0.154	1.08	73	1.93	499.2	-0.096	547.0	0.17	15.10
26	4.022	0.154	1.08	73	1.95	503.1	-0.096	547.0	0.27	15.39
27	4.176	0.154	1.07	74	1.93	506.6	-0.097	547.0	0.32	15.58
28	4.331	0.155	1.07	74	1.93	509.5	-0.098	547.0	0.27	15.97
29	4.486	0.155	1.08	74	1.91	512.6	-0.100	547.0	0.66	16.88
30	4.639	0.153	1.07	74	1.95	517.3	-0.100	547.0	0.51	16.54
31	4.794	0.155	1.07	74	1.92	519.7	-0.097	547.0	0.86	16.95
32	4.949	0.155	1.07	74	1.93	521.4	-0.095	547.0	0.86	17.00

Train D - Ambient Background and Flue Gas Data

Run: 3 **Test Date:** 3/12/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 14:06
Total Sampling Time 240 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
33	5.102	0.153	1.07	75	1.95	524.5	-0.096	547.0	0.99	17.11
34	5.257	0.155	1.07	75	1.95	526.2	-0.097	547.0	1.11	17.21
35	5.412	0.155	1.07	75	1.96	529.8	-0.094	547.0	1.21	17.37
36	5.566	0.154	1.08	75	1.93	520.4	-0.090	547.0	1.27	17.32
37	5.720	0.154	1.07	75	1.94	479.1	-0.088	547.0	3.12	17.02
38	5.875	0.155	1.07	75	1.94	459.3	-0.089	547.0	1.81	16.98
39	6.030	0.155	1.08	76	1.96	445.8	-0.083	547.0	0.67	16.44
40	6.184	0.154	1.07	76	1.95	434.6	-0.085	547.0	0.41	16.21
41	6.338	0.154	1.07	76	1.96	425.9	-0.083	547.0	0.28	15.88
42	6.493	0.155	1.07	76	1.95	418.3	-0.082	547.0	0.19	15.91
43	6.647	0.154	1.07	76	1.93	413.2	-0.083	547.0	0.25	15.95
44	6.802	0.155	1.07	76	1.92	409.3	-0.082	547.0	0.58	16.24
45	6.957	0.155	1.07	76	1.93	405.8	-0.081	547.0	1.27	16.62
46	7.112	0.155	1.07	77	1.93	403.1	-0.078	547.0	0.79	16.57
47	7.266	0.154	1.07	77	1.91	401.1	-0.083	547.0	1.01	17.10
48	7.421	0.155	1.07	77	1.95	399.7	-0.077	547.0	1.01	17.08
49	7.576	0.155	1.07	77	1.95	398.1	-0.085	547.0	1.14	16.94
50	7.730	0.154	1.07	77	1.92	395	-0.079	547.0	0.61	16.65
51	7.885	0.155	1.07	77	1.94	391.8	-0.079	547.0	0.36	16.05
52	8.040	0.155	1.07	77	1.95	387.8	-0.075	547.0	0.65	15.85
53	8.194	0.154	1.07	77	1.95	386.2	-0.072	547.0	1.32	15.63
54	8.350	0.156	1.07	77	1.95	386.3	-0.076	547.0	1.99	15.71
55	8.505	0.155	1.07	78	1.94	385.2	-0.076	547.0	2.38	15.82
56	8.659	0.154	1.07	78	1.96	384.2	-0.080	547.0	2.51	15.80
57	8.814	0.155	1.07	78	1.95	383.4	-0.077	547.0	2.36	16.03
58	8.969	0.155	1.07	78	1.96	381.6	-0.073	547.0	2.19	15.95
59	9.124	0.155	1.07	78	1.94	379.9	-0.079	547.0	1.67	16.03
60	9.278	0.154	1.07	78	1.93	378.5	-0.077	547.0	1.11	16.19
61	9.434	0.156	1.07	78	1.92	377	-0.073	547.0	0.76	16.05
62	9.589	0.155	1.08	78	1.94	374.9	-0.073	547.0	0.52	15.96
63	9.744	0.155	1.07	78	1.94	373.2	-0.071	547.0	0.28	15.86
64	9.900	0.156	1.07	78	1.92	371.7	-0.071	547.0	0.12	15.67
65	10.055	0.155	1.07	78	1.91	369.8	-0.071	547.0	0.07	15.56
66	10.209	0.154	1.07	79	1.95	367.7	-0.070	547.0	0.06	15.38
67	10.365	0.156	1.07	79	1.95	364.7	-0.074	547.0	0.05	15.22
68	10.521	0.156	1.07	79	1.95	361.8	-0.066	530.0	0.04	15.12

Train D - Ambient Background and Flue Gas Data

Run: 3 **Test Date:** 3/12/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 14:06
Total Sampling Time 240 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
69	10.675	0.154	1.07	79	1.93	358.4	-0.076	478.0	0.04	15.08
70	10.830	0.155	1.07	79	1.95	355.4	-0.068	490.0	0.04	14.99
71	10.986	0.156	1.08	79	1.95	352.4	-0.068	502.0	0.05	14.82
72	11.141	0.155	1.07	79	1.94	349.4	-0.072	477.0	0.04	14.66
73	11.296	0.155	1.07	79	1.93	347.1	-0.062	432.0	0.03	14.59
74	11.452	0.156	1.08	79	1.93	345.6	-0.066	415.0	0.03	14.38
75	11.606	0.154	1.07	79	1.96	343.2	-0.063	377.0	0.03	14.32
76	11.762	0.156	1.07	79	1.92	341.1	-0.064	448.0	0.04	14.19
77	11.918	0.156	1.08	79	1.92	339.5	-0.061	459.0	0.04	14.01
78	12.072	0.154	1.07	79	1.96	337.5	-0.065	465.0	0.04	13.91
79	12.228	0.156	1.07	79	1.92	335.7	-0.064	451.0	0.04	13.83
80	12.384	0.156	1.08	79	1.96	334	-0.065	442.0	0.04	13.80
81	12.538	0.154	1.07	80	1.95	332.3	-0.062	435.0	0.04	13.74
82	12.694	0.156	1.07	79	1.92	331	-0.060	440.0	0.04	13.71
83	12.850	0.156	1.08	80	1.94	329.7	-0.064	365.0	0.03	13.63
84	13.004	0.154	1.07	80	1.94	328.2	-0.065	430.0	0.04	13.52
85	13.160	0.156	1.07	80	1.92	327.9	-0.064	437.0	0.04	13.50
86	13.316	0.156	1.08	80	1.93	326.3	-0.063	403.0	0.03	13.50
87	13.471	0.155	1.08	80	1.94	325.3	-0.063	436.0	0.04	13.46
88	13.627	0.156	1.07	80	1.94	324	-0.058	429.0	0.03	13.54
89	13.783	0.156	1.08	80	1.93	322.9	-0.059	420.0	0.03	13.47
90	13.937	0.154	1.08	80	1.94	322.3	-0.065	445.0	0.04	13.43
91	14.093	0.156	1.07	80	1.94	321.1	-0.058	469.0	0.04	13.36
92	14.249	0.156	1.08	80	1.96	320	-0.064	501.0	0.04	13.30
93	14.404	0.155	1.07	80	1.95	319.7	-0.061	519.0	0.04	13.29
94	14.560	0.156	1.07	80	1.96	319.2	-0.068	527.0	0.04	13.11
95	14.716	0.156	1.08	80	1.95	318.7	-0.059	543.0	0.05	13.21
96	14.870	0.154	1.07	80	1.95	317.7	-0.062	547.0	0.05	13.18
97	15.027	0.157	1.07	80	1.95	316.9	-0.060	547.0	0.05	13.19
98	15.182	0.155	1.08	80	1.92	316.8	-0.063	547.0	0.05	13.21
99	15.337	0.155	1.07	80	1.90	316.4	-0.062	539.0	0.05	13.23
100	15.494	0.157	1.08	80	1.94	315.4	-0.060	512.0	0.04	13.26
101	15.649	0.155	1.08	80	1.95	315.2	-0.058	547.0	0.05	13.12
102	15.804	0.155	1.07	80	1.93	314.4	-0.065	543.0	0.05	13.18
103	15.961	0.157	1.08	80	1.95	313.4	-0.062	546.0	0.05	13.23
104	16.116	0.155	1.08	80	1.93	313.6	-0.069	494.0	0.04	13.27

Train D - Ambient Background and Flue Gas Data

Run: 3 **Test Date:** 3/12/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 14:06
Total Sampling Time 240 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
105	16.271	0.155	1.08	80	1.94	313	-0.058	490.0	0.04	13.30
106	16.428	0.157	1.08	80	1.92	312.6	-0.067	515.0	0.04	13.28
107	16.583	0.155	1.08	80	1.92	312.3	-0.059	508.0	0.04	13.46
108	16.739	0.156	1.08	80	1.94	311.9	-0.061	524.0	0.04	13.36
109	16.895	0.156	1.08	80	1.92	310.9	-0.090	524.0	0.05	13.35
110	17.050	0.155	1.08	80	1.95	310.4	-0.061	516.0	0.04	13.23
111	17.206	0.156	1.07	80	1.92	309.7	-0.058	547.0	0.05	12.95
112	17.363	0.157	1.08	80	1.95	309.1	-0.066	408.0	0.04	13.82
113	17.518	0.155	1.08	80	1.95	308.4	-0.065	438.0	0.04	13.97
114	17.674	0.156	1.07	80	1.94	308.4	-0.063	413.0	0.03	13.98
115	17.831	0.157	1.08	80	1.93	308.7	-0.064	435.0	0.03	13.98
116	17.985	0.154	1.08	80	1.94	308.2	-0.063	459.0	0.04	14.02
117	18.142	0.157	1.07	80	1.95	307.9	-0.057	463.0	0.04	13.99
118	18.298	0.156	1.08	80	1.95	307	-0.059	481.0	0.05	13.89
119	18.453	0.155	1.07	80	1.93	306.5	-0.067	456.0	0.04	13.66
120	18.609	0.156	1.08	80	1.93	305.7	-0.059	465.0	0.04	13.71
121	18.765	0.156	1.08	80	1.94	305.4	-0.058	468.0	0.03	13.77
122	18.920	0.155	1.07	80	1.94	304.5	-0.060	485.0	0.04	13.69
123	19.077	0.157	1.08	80	1.91	304.2	-0.062	503.0	0.04	13.62
124	19.232	0.155	1.08	80	1.92	303.8	-0.052	547.0	0.05	13.44
125	19.388	0.156	1.07	80	1.95	303.3	-0.062	547.0	0.06	13.29
126	19.544	0.156	1.07	80	1.92	303.1	-0.062	547.0	0.05	13.25
127	19.699	0.155	1.08	80	1.94	303	-0.067	547.0	0.06	13.22
128	19.855	0.156	1.07	80	1.95	302.8	-0.054	547.0	0.05	13.22
129	20.011	0.156	1.07	80	1.90	301.4	-0.063	546.0	0.05	13.39
130	20.166	0.155	1.08	80	1.92	300.6	-0.056	508.0	0.05	13.18
131	20.322	0.156	1.07	80	1.95	300.2	-0.065	547.0	0.04	12.95
132	20.479	0.157	1.08	80	1.95	299.7	-0.059	547.0	0.05	12.85
133	20.634	0.155	1.08	80	1.93	299.2	-0.064	547.0	0.06	12.21
134	20.790	0.156	1.07	80	1.93	298	-0.061	547.0	0.08	11.73
135	20.946	0.156	1.08	80	1.93	297.2	-0.062	547.0	0.08	11.76
136	21.101	0.155	1.08	80	1.95	296.9	-0.054	547.0	0.08	11.51
137	21.257	0.156	1.08	80	1.91	296.6	-0.058	547.0	0.08	11.38
138	21.413	0.156	1.08	80	1.92	295.5	-0.061	547.0	0.08	11.30
139	21.568	0.155	1.08	80	1.94	294.3	-0.067	547.0	0.09	11.44
140	21.725	0.157	1.08	80	1.93	293.5	-0.057	547.0	0.09	11.36

Train D - Ambient Background and Flue Gas Data

Run: 3 **Test Date:** 3/12/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 14:06
Total Sampling Time 240 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
141	21.881	0.156	1.08	80	1.93	292.9	-0.060	547.0	0.09	11.37
142	22.036	0.155	1.08	80	1.94	291.8	-0.058	547.0	0.10	11.27
143	22.193	0.157	1.08	80	1.93	290.6	-0.058	547.0	0.08	10.51
144	22.348	0.155	1.08	80	1.96	289.7	-0.056	547.0	0.09	10.41
145	22.504	0.156	1.08	80	1.93	289.2	-0.052	547.0	0.10	10.35
146	22.660	0.156	1.07	80	1.95	288.3	-0.058	547.0	0.10	10.32
147	22.815	0.155	1.08	80	1.92	287.3	-0.057	547.0	0.10	10.24
148	22.971	0.156	1.07	80	1.93	286	-0.059	547.0	0.10	10.15
149	23.128	0.157	1.08	80	1.92	284.8	-0.054	547.0	0.11	10.12
150	23.283	0.155	1.08	80	1.94	284.4	-0.055	547.0	0.11	10.13
151	23.439	0.156	1.07	80	1.94	283.4	-0.055	547.0	0.09	10.18
152	23.596	0.157	1.08	80	1.92	282.6	-0.052	547.0	0.11	10.08
153	23.750	0.154	1.07	80	1.96	282	-0.057	547.0	0.11	10.12
154	23.907	0.157	1.07	80	1.95	280.8	-0.054	547.0	0.12	10.05
155	24.063	0.156	1.08	80	1.91	280.2	-0.057	547.0	0.11	10.08
156	24.218	0.155	1.08	80	1.95	279.5	-0.056	547.0	0.12	10.03
157	24.375	0.157	1.08	80	1.95	278.6	-0.052	547.0	0.12	10.16
158	24.530	0.155	1.08	80	1.93	277.6	-0.056	547.0	0.12	10.23
159	24.686	0.156	1.08	80	1.91	277.2	-0.053	547.0	0.12	10.17
160	24.843	0.157	1.07	80	1.92	276.3	-0.057	547.0	0.12	10.23
161	24.998	0.155	1.08	80	1.92	276.2	-0.052	547.0	0.12	10.19
162	25.154	0.156	1.07	80	1.96	275.2	-0.059	547.0	0.13	10.29
163	25.310	0.156	1.07	80	1.95	274.3	-0.049	547.0	0.13	10.27
164	25.465	0.155	1.08	80	1.91	274.6	-0.057	547.0	0.13	10.18
165	25.621	0.156	1.07	80	1.92	274.4	-0.051	547.0	0.13	10.14
166	25.778	0.157	1.08	80	1.92	273.8	-0.057	547.0	0.13	10.25
167	25.933	0.155	1.08	80	1.94	273.9	-0.055	547.0	0.13	10.16
168	26.089	0.156	1.07	80	1.95	273.7	-0.050	547.0	0.13	10.27
169	26.246	0.157	1.08	80	1.93	273.2	-0.056	547.0	0.14	10.28
170	26.401	0.155	1.08	80	1.95	272.9	-0.050	547.0	0.13	10.23
171	26.558	0.157	1.08	80	1.95	271.8	-0.054	547.0	0.14	10.13
172	26.713	0.155	1.08	80	1.92	271.6	-0.051	547.0	0.13	10.11
173	26.869	0.156	1.08	80	1.94	271.5	-0.055	547.0	0.14	10.13
174	27.025	0.156	1.08	80	1.94	270.8	-0.049	547.0	0.14	10.06
175	27.181	0.156	1.08	80	1.95	270.9	-0.052	547.0	0.14	9.95
176	27.337	0.156	1.08	80	1.91	270.4	-0.050	547.0	0.15	9.98

Train D - Ambient Background and Flue Gas Data

Run: 3 **Test Date:** 3/12/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 14:06
Total Sampling Time 240 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
177	27.493	0.156	1.08	80	1.95	270.3	-0.055	547.0	0.15	10.07
178	27.648	0.155	1.08	80	1.92	270.7	-0.058	547.0	0.15	10.14
179	27.805	0.157	1.07	80	1.92	269.9	-0.053	547.0	0.15	10.09
180	27.962	0.157	1.08	80	1.94	269.3	-0.057	547.0	0.15	10.10
181	28.117	0.155	1.08	80	1.95	268.6	-0.053	547.0	0.15	10.02
182	28.273	0.156	1.08	80	1.93	268.7	-0.052	547.0	0.15	9.96
183	28.429	0.156	1.08	80	1.94	269	-0.052	547.0	0.15	9.95
184	28.584	0.155	1.08	80	1.93	269.1	-0.053	547.0	0.16	9.90
185	28.741	0.157	1.08	80	1.95	269.2	-0.052	547.0	0.16	9.85
186	28.897	0.156	1.08	80	1.93	269.5	-0.057	547.0	0.16	9.77
187	29.053	0.156	1.08	80	1.93	268.9	-0.050	547.0	0.16	9.83
188	29.209	0.156	1.07	80	1.95	268.6	-0.049	547.0	0.16	9.69
189	29.365	0.156	1.08	80	1.94	268.5	-0.051	547.0	0.17	9.71
190	29.521	0.156	1.08	80	1.92	268.9	-0.050	547.0	0.17	9.64
191	29.677	0.156	1.08	80	1.94	268.3	-0.051	547.0	0.17	9.69
192	29.833	0.156	1.08	80	1.92	268.3	-0.049	547.0	0.16	9.65
193	29.989	0.156	1.07	80	1.94	268.3	-0.055	547.0	0.17	9.67
194	30.146	0.157	1.08	80	1.95	267.6	-0.053	547.0	0.18	9.69
195	30.300	0.154	1.08	80	1.91	267.5	-0.056	547.0	0.18	9.65
196	30.457	0.157	1.08	80	1.92	267.9	-0.051	547.0	0.17	9.57
197	30.613	0.156	1.08	80	1.92	267.8	-0.050	547.0	0.17	9.60
198	30.768	0.155	1.08	80	1.93	267.7	-0.055	547.0	0.18	9.58
199	30.925	0.157	1.08	80	1.96	267.5	-0.051	547.0	0.18	9.66
200	31.080	0.155	1.08	80	1.94	267.7	-0.054	547.0	0.20	9.49
201	31.236	0.156	1.08	80	1.93	267.7	-0.047	547.0	0.18	9.43
202	31.393	0.157	1.08	80	1.94	267.4	-0.053	547.0	0.18	9.45
203	31.548	0.155	1.08	80	1.93	267.5	-0.050	547.0	0.19	9.50
204	31.704	0.156	1.07	80	1.91	267.2	-0.049	547.0	0.17	9.44
205	31.861	0.157	1.08	80	1.95	266.4	-0.056	547.0	0.16	9.53
206	32.016	0.155	1.08	80	1.92	266.9	-0.053	547.0	0.16	9.49
207	32.172	0.156	1.07	80	1.91	266.9	-0.055	547.0	0.17	9.48
208	32.329	0.157	1.08	80	1.91	266.3	-0.052	547.0	0.16	9.47
209	32.484	0.155	1.08	79	1.95	265.8	-0.051	547.0	0.17	9.41
210	32.641	0.157	1.08	79	1.95	265.3	-0.054	547.0	0.16	9.31
211	32.797	0.156	1.08	79	1.93	264.1	-0.049	547.0	0.17	9.36
212	32.952	0.155	1.08	79	1.93	263.7	-0.056	547.0	0.15	9.53

Train D - Ambient Background and Flue Gas Data

Run: 3 **Test Date:** 3/12/2025

Manufacturer: MF Fire
Model: Nova 2
Tracking No.: 2497
Project No.: 0552WS004E

Meter Box Y Regression Offset: 1.016
Meter Box Y Regression Factor:
Meter Box Dynamic Y: 1.016
Sample Box ID: 372

Test Start Time: 14:06
Total Sampling Time 240 min
Recording Interval 1 min

Elapsed Time (min)	**Ambient Sampling System**					**Flue Gas Data**				
	Meter Volume (ft^3)	*Sample Rate (CFM)*	*Meter ΔH*	*Meter Temp (°F)*	*Filter Vac (in. Hg)*	*Stack Temp (°F)*	*Draft (In. H_2O)*	*CO (ppm)*	*CO (%)*	*CO_2 (%)*
213	33.109	0.157	1.08	79	1.91	263.1	-0.053	547.0	0.14	9.48
214	33.264	0.155	1.08	79	1.92	262.1	-0.046	547.0	0.15	9.48
215	33.421	0.157	1.08	79	1.93	261.8	-0.049	547.0	0.14	9.39
216	33.577	0.156	1.08	79	1.94	261.8	-0.047	547.0	0.16	9.36
217	33.732	0.155	1.08	79	1.94	261.3	-0.049	547.0	0.15	9.32
218	33.889	0.157	1.07	79	1.96	261.3	-0.049	547.0	0.15	9.37
219	34.045	0.156	1.08	79	1.92	259.9	-0.050	547.0	0.14	9.36
220	34.201	0.156	1.08	79	1.96	259.2	-0.049	547.0	0.15	9.37
221	34.357	0.156	1.08	79	1.91	259	-0.056	547.0	0.16	9.32
222	34.513	0.156	1.08	79	1.93	258.3	-0.053	547.0	0.15	9.42
223	34.668	0.155	1.08	79	1.95	258.8	-0.045	547.0	0.16	9.38
224	34.825	0.157	1.08	79	1.92	258.9	-0.049	547.0	0.16	9.17
225	34.981	0.156	1.08	79	1.94	258.7	-0.050	547.0	0.17	9.36
226	35.137	0.156	1.08	79	1.92	257.9	-0.048	547.0	0.16	9.13
227	35.293	0.156	1.08	79	1.95	258.3	-0.048	547.0	0.16	9.17
228	35.448	0.155	1.08	79	1.92	258.8	-0.045	547.0	0.16	8.78
229	35.605	0.157	1.07	79	1.95	257.8	-0.055	547.0	0.18	8.84
230	35.761	0.156	1.08	79	1.96	257.6	-0.052	547.0	0.20	8.83
231	35.916	0.155	1.08	79	1.94	258.1	-0.054	547.0	0.19	9.10
232	36.073	0.157	1.08	79	1.95	258.5	-0.044	547.0	0.21	9.08
233	36.229	0.156	1.09	79	1.93	258.4	-0.052	547.0	0.20	8.85
234	36.384	0.155	1.08	79	1.95	258.3	-0.048	547.0	0.19	8.91
235	36.544	0.160	1.08	79	1.93	258.6	-0.044	547.0	0.19	9.11
236	36.697	0.153	1.08	79	1.94	258.3	-0.048	547.0	0.20	9.08
237	36.853	0.156	1.08	79	1.94	258.6	-0.047	547.0	0.22	9.07
238	37.010	0.157	1.08	79	1.94	258.4	-0.057	547.0	0.15	8.94
239	37.165	0.155	1.08	79	1.93	258.3	-0.049	547.0	0.16	8.92
240	37.321	0.156	1.08	79	1.93	256.7	-0.054	547.0	0.16	8.83

Gravimetric Lab Data

ASTM E2515

Manufacturer:	MF Fire
Model:	Nova 2
Tracking No.:	2497
Project No.:	0552WS004E
Run No.:	3
Test Date:	3/12/25

OMNI Eq. ID Numbers	
Analytical Scale	
Audit Weight Set:	
Analytical Scale	
Hydrometer	
Filters are weighed	In Pairs

Train A

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights: Final, mg	Weights: Tare, mg	Particulate, mg: Uncorrected	Particulate, mg: Corrected
FilterPairs	3/19/24 @ 21:15	Filter	F535	245.0	242.1	2.9	2.9
			F535A				
Probe catch*	3/19/24 @ 21:15	Probe	68	116839.2	116839.1	0.1	0.1
lter seals catch*	3/19/24 @ 21:15	Seals	S946	3407.0	3406.5	0.5	0.5
				Total Particulate, mg:		**3.5**	**3.5**

Train B

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights: Final, mg	Weights: Tare, mg	Particulate, mg: Uncorrected	Particulate, mg: Corrected
FilterPairs	3/19/24 @ 21:15	Filter	F538	243.7	241.3	2.4	2.4
			F538a				
Probe catch*	3/19/24 @ 21:15	Probe	OES4	114149.1	114149.1	0.0	0.0
lter seals catch*	3/19/24 @ 21:15	Seals	S949	3377.3	3375.8	1.5	1.5
			Sub-Total	Total Particulate, mg:		**3.9**	**3.9**

Train C - *First Hour*

Sample Component	Date / Time in Dessicator	Reagent	Filter, Probe or Dish #	Weights: Final, mg	Weights: Tare, mg	Particulate, mg: Uncorrected	Particulate, mg: Corrected
FilterPairs	3/19/24 @ 21:15	Filter	F537	244.8	241.3	3.5	3.5
			F537a				
Probe catch*	3/19/24 @ 21:15	Probe	36	114884.2	114884.2	0.0	0.0
lter seals catch*	3/19/24 @ 21:15	Seals	S948	3285.0	3284.3	0.7	0.7
				Total Particulate, mg:		**4.2**	**4.2**

Train D - *Ambient Background*

Sample Component	Date / Time in Dessicator	Reagent	Filter # or	Weights: Final, mg	Weights: Tare, mg	Particulate, mg
Filter catch*	3/19/24 @ 21:15	Filter	F537	116.2	116.2	0.0
				Total Particulate, mg:		**0.0**

Final (mg) - Tare (mg) = Particulate (mg)

NOTE: The Uncorrected values are those where any negative filter weights are taken as a negative value. This can possibly occur when filter matter adheres the O-ring seals and thereby transfers some mass to the O-ring. The Corrected values reflect where any negative filter weights are taken as ZERO, thus not accounting for any transfer of mass and resultingly over-reporting. Corrected values were added to this analysis to report the "Corrected" results in this report in response to a request by the US EPA. In cases where the Final weight minus the Tare weight of the Ambient filter occurs, it is taken as a ZERO. Any negative probe weights are evaluated pursuant to clause of ASTM E25215 (or appropriatelt associated test standard as defined in the introduction of this report).

Technician Signature:_____ Reviewed By:_____

Run 3 - Run Notes

Manufacturer	MF Fire
Model:	Nova 2
Project Number:	0552WS004E
Run Number:	3
Test Date:	3/12/2025

This supplemental section of miscellaneous run notes is comprised of the following:

- Appliance Operation Notes
- Velocity Traverse / Supplementa Run Notes
- Test Fuel Notes
- Gravimetric Analysis Notes

ASTM E2780 Wood Heater Test Notes

Client: MF-Fire Project Number: 0582WS004E Run Number: 3
Model: Nova 7 Tracking Number: 2497 Date: 3-12-25
Test Crew: RTJM

Test Fuel Properties

Equipment			
Device	**OMNI Number**	**Cal Date**	**Cal Due**
Tape Measure	730	12-6-2023	11/8/2025
Moisture Meter	340	VBU	VBU
Moisture Reference	431	10/18/2024	10/18/2025
Fuel Scale	745	9/25/2024	9/25/2025
Fuel Scale Audit Weight	134,274	See Eq 1.5	See Eq 1.5
Fuel Species / Type	Douglas fir, untreated and air dried, standard grade or better dimensional lumber.		

Calibration Verifications			
Moisture Meter		Fuel Preparation Scale	
12% Reference :	12.0	10.0 lb. Reference Audit :	10.00, 20.00
22% Reference :	22.0		

Pre-Burn Fuel								
Piece No.	Length, In.	Moisture % db	Piece No.	Length, In.	Moisture % db	Piece No.	Length, In.	Moisture % db
1	16	18.8	7	19.25	22.2	13	20	19.5
2	16	24.8	8	19.25	21.1	14	20	24.5
3	16	19.9	9	16	23.0	15	19.125	21.6
4	16	24.7	10	16	23.8	16	19.125	22.2
5	19.25	19.9	11	16	22.3	17		
6	19.25	21.4	12	16	24.9	18		
Total Weight, lb.		14.26	Time of Day		8:30	Room Temp. °F		65
		14.52			9:10			65

Test Fuel Charge					
Piece No.	**Weight, Lb.**	**Moisture Measurements**			**Lumber Type**
1	2.39/1.99	22.4	24.8	23.8	2x4
2	2.42/2.01	23.8	23.2	22.4	2x4
3	2.18 / 1.98	24.4	21.3	21.7	2x4
4	5.07 / 4.68	21.2	23.8	24.9	4x4
5	4.82 / 4.61	24.3	22.4	21.1	4x4
6					
7					
8					
Spacer Moisture Readings					
19.7	20.8	22.3	20.6		
23.3	17.6	21.1	15.1		
23.2	21.0	17.3	17.2		
21.7	21.1	20.9	22.4		
Time of Day			Room Temp. °F		
Total weight 2x4 with spacers, lb.		6.99	Total weight 4x4 with spacers, lb.		9.90
			Total weight of fuel charge, Lb.		16.90

Technician Signature: _____ Date: 3-20-2025

ASTM E2780 Wood Heater Test Notes

Client: _____ Project Number: _____ Run Number: 3

Model: _____ Tracking Number: _____ Date: _____

Test Crew: _____

Test Fuel Properties

Equipment			
Device	**OMNI Number**	**Cal Date**	**Cal Due**
Tape Measure			
Moisture Meter			
Moisture Reference			
Fuel Scale			
Fuel Scale Audit Weight			
Fuel Species / Type	Douglas fir, untreated and air dried, standard grade or better dimensional lumber.		

Calibration Verifications			
Moisture Meter		Fuel Preparation Scale	
12% Reference :		10.0 lb. Reference Audit :	
22% Reference :			

Pre-Burn Fuel								
Piece No.	Length, In.	Moisture % db	Piece No.	Length, In.	Moisture % db	Piece No.	Length, In.	Moisture % db
1	16	21.6	7	20	20.3	13		
2	16	25.3	8	~~Resaw~~	29.3	14		
3	16	23.3	9	10	21.1	15		
4	16	23.8	10			16		
5	20	23.2	11			17		
6	20	26.4	12			18		
Total Weight, lb.		14.48	Time of Day		10:28	Room Temp. °F		65

Test Fuel Charge						
Piece No.	**Weight, Lb.**	**Length, In.**	**Moisture Measurements**			**Lumber Type**
1						
2						
3						
4						
5						
6						
7						
8						
Spacer Moisture Readings						
Time of Day				Room Temp. °F		
Total weight 2x4 with spacers, lb.				Total weight 4x4 with spacers, lb.		
				Total weight of fuel charge, Lb.		

Technician Signature: _____ Date: 3-12-2025

OMNI-Test Laboratories, Inc.

ASTM E2780 Wood Heater Test Notes

Client: MF Fire Project Number: 0552WS0546 Run Number: 3
Model: NOVA 2 Tracking Number: 2497 Date: 3-12-2025
Test Crew: RT JM

Supplemental Data

Test Booth No. E1 Sampling Start Time: _____ Sampling End Time: _____

Tunnel Cleaned Date 3-10-25 % Smoke Capture 100 Induced Draft NONE in.H_2O

Systems Leak Checks			
System	Pre-Test	Post-Test	Sampling Probe Change-out
Pitot	0.00 @ 3"	0.00 @ 3"	
Train A	0.002 @ 18.5	0.002 @ 7"	
Train B	0.002 @ 18.5	0.002 @ 7"	
Train C	0.003 @ 15.0	0.001 @ 10.84	

Velocity Traverse, 6-inch tunnel			
Location	Microtector (in. H_2O)	Δp (in. H_2O)	Tunnel Temp., °F
Center	.059	.118	104.5
1	.035	.070	104.5
2	.051	.102	105.5
3	.049	.098	102.1
4	.035	.070	103.9
5	.033	.066	104.8
6	.051	.102	104.2
7	.045	.090	104.6
8	.020	.040	103.7
Tunnel Static (in. H_2O)		Pre-Test	Post-Test
		-0.38	-0.38

Miscellaneous Parameters			
Item	Initial	Final	Equipment No.
Room Air Velocity, ft/min.	12	17	737
Scale Audit, lb. (20-80 % of fuel load)	10.0, 20.0	10.0, 20.0	132, 274
Room Relative Humidity, %	49	46	716
Barometric Pressure, in. Hg	29.50	29.42	716
Room Temperature, °F	68	68	716

Flue Gas Continuous Analyzer						
Analyzer ID	594	Response Time, sec.	28.74	Leak Check Performed?	✓	
Bias Checks	Concentration:		Pre-Test Response		Post-Test Response	
Concentration	Bottle No.	Value, %	Pre-Test Response		Post-Test Response	
			Zero	Span	Zero	Span
CO2 % Span	CC506601	16.88	0	16.88	0	16.77
CO % Span	CC506601	4.07	0	4.07	0	4.05
CO ppm Span	CC305741	502	0	502	0	497
Zero	TC3AW123	0	0		0	

Technician Signature: _____ Date: 3-12-2025

OMNI-Test Laboratories, Inc.

ASTM E2780 Wood Heater Test Notes

Client: MF Fire Project Number: 0552WS00042 Run Number: 3
Model: NOVA2 Tracking Number: 2497 Date: 3-12-2025
Test Crew: RT JM

Primary Air Control Settings

Secondary: ______
Tertiary/Pilot: ______
Fan: off

Preburn Notes

Time	Notes
0957	At 1.5 lbs second preburn was loaded
11:43	Third preburn was loaded
1321	Stack gas bias check & response time. Weight dropped by 0.5 lbs
1326	Weight added back in due to flue gas probe being reinstalled
1403	At 3.5 lbs, coals were leveled
1406	Preburn stopped at 3.41 lbs

*NOTE – first preburn door was left open, therefor it was repeated using 2nd preburn, a third preburn was prepared.

Sampling Portion Notes

Sketch test fuel configuration:

Start up procedures & Timeline:
Bypass: Used to load fuel
Fuel loaded by: 40
Door closed at: 180 seconds
Primary air:
Notes:

Time	Notes
1406	Test start
1506	first hour sampling stopped

Technician Signature: [signature] Date: 3-12-2025

OMNI-Test Laboratories, Inc. **ASTM E2780 Wood Heater Test Notes**

Client: MF fire Project Number: USC 2WS 0040 Run Number: 3

Model: NOVA 2 Tracking Number: 2497 Date: 3-12-2025

Test Crew: RT JM

Gravimetric Analysis Sheet

Assembled By: RT/EG

Date/Time in Desiccator: 1830 3-12-2025

Weighing's					
Date/Time:	3-13-25 800	3-17-2025 8:10	3-19-2025		
R/H %:	55.3	70.3	50.7		
Temp:	66.9	68.3	68.7		
100 mg Audit	100.0	100.0	100.0		
200 mg Audit:	200.0	200.0	200.0		
2 g Audit:	2000.2	2000.2	2000.2		
100 g Audit:	99997.8	99997.8	99997.8		
Initials:	RT	RT	RT		

Train	Element	ID #	Tare (mg)	√	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A	Filter Pair	F535 F535A	242.1		245.2	244.9	245.0 ✓		
	Probe	68	116839.1		116839.2	116839.1 ✓			
	O-Ring Set	5946	3406.5		3407.0	3407.0 ✓			
B (~~F538 F538A~~)	Front Filter	F536 F536A	241.3 ~~241.9~~		243.7	243.7 ✓			
	Probe	OES4	114149.1		114149.2	114149.1 ✓			
	O-Ring Set	5949 ~~5947~~	3375.8 ~~4129.9~~		3378.0	3377.3	3377.3 ✓		
C (1st hr)	Front Filter	F537 F537A	241.3		245.1	244.7	244.8 ✓		
	Probe	36	114884.2		114884.2	114884.2 ✓			
	O-Ring Set	5948	3284.3		3285.0	3285.0 ✓			
BG	Filter	F527	116.2		116.2	116.2 ✓			

Technician Signature: [signature] Date: 3/20/2025

Equations and Calculations – ASTM E2780 & E2515

Manufacturer	MF Fire
Model:	Nova 2
Project Number:	0552WS004E
Run Number:	3

Sample calculations of each equation used in the refernced standards for this test run.

Summary of INPUT values necessary for calculations

	Global Input Parameters for Equations	Value	Source
FM_S	- Average moisture of test fuel spacers, % dry basis	20.33	Fuel Properties Work Sheet
M_{Swb}	- Weight of Test Fuel Spacers, wet basis, kg	1.61	Fuel Properties Work Sheet
M_{CPnwb}	- Weight of each test fuel piece n in fuel crib, excluding nails and spacers, wet basis , kg	[1]Varies	Fuel Properties Work Sheet
FM_{CPn}	- Average fuel Fuel moisture in fuel crib, % dry basis	[1]Varies	Fuel Properties Work Sheet
V_C	- Volume of Fuel Crib, ft^3 (less spacers)	0.445	Fuel Properties Work Sheet
V_{SCENT}	- Average gas velocity at the center of the dilution tunnel calculated after the Pitot tube traverse, ft/sec	0.00	Traverse Worksheet
V_{STRAV}	- Average gas velocity calculated after the multipoint Pitot traverse	15.72	Traverse Worksheet
θ	- Duration of test, min	239	*Train A Worksheet*
P_{bar}	- Barometric pressure (average) at the testing site, in. Hg	29.46	*Traverse Worksheet*
Pg	- Tunnel Static Pressure	-0.38	*Traverse Worksheet*

[1] *Denotes that this pararmeter for each individual piece of fuel is calculated in the Test Fuel Properties worksheet and the input values are pulled into these sample caculations.*

	Sample Train Input Parameters for Equations	Train A	Train B	Train C	Train D
V_m	- Volume of gas sample measured at the dry gas meter, dcf	38.83	38.976	9.619	37.321
Y	Dry gas meter calibration factor	1.015	1.006	1.010	1.016
ΔH	- Average pressure differential across the orifice meter, in. H_2O	1.23	1.23	1.01	1.07
T_m	- Temperature of Dry Gas Meter, °F	88.9	87.2	72.0	79.0
Uncorrected Sample Mass					
m_p	- mass of particulate matter from probe, mg	0.1	0.0	0.0	n/a
m_f	- mass of particulate matter from filters, mg	2.9	2.4	3.5	0.0
m_g	- mass of particulate matter from filter seals, mg	0.5	1.5	0.7	n/a
Corrected Sample Mass					
m_p	- mass of particulate matter from probe, mg	0.1	0.0	0.0	n/a
m_f	- mass of particulate matter from filters, mg	2.9	2.4	3.5	n/a
m_g	- mass of particulate matter from filter seals, mg	0.5	1.5	0.7	n/a

M_{Sdb} – Weight of test fuel spacers, dry basis, kg - ASTM E2780 equation (1)

$$M_{Sdb} = (M_{Swb})\left(\frac{100}{100 + FM_S}\right)$$

Where,

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

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

Sample Calculation:

FM_S = 20.33 %, dry basis

M_{Swb} = 1.61 lb.

0.4536 = Conversion factor, lb. → kg

M_{Sdb} = ((1.61 x 0.4536) (100 / (100 + 20.33))

M_{Sdb} = **0.607** kg

MCdb– Weight of test fuel crib, excluding nails and spacers, dry basis, kg - ASTM E2780 equation (2)

$$M_{Cdb} = \sum (M_{CPnwb})\left(\frac{100}{100 + FM_{CPn}}\right)$$

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:

ΣM_{CPnwb} = 15.27 lb.

FM_{CPn} = 23.03 %, dry basis

0.4536 = Conversion factor, lb. → kg

M_{Cdb} = 15.27 x 0.4536 x (100 / (100 + 23.0333333333333))

M_{Cdb} = **5.63** kg

DCdb - 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 = Volume of Fuel Crib, ft³ (less spacers)

Sample Calculation:

M_{Cdb} = 12.41 lb
V_C = 0.445 ft^3

D_{Cdb} = 12.41 / 0.445

D_{Cdb} = **27.86** lb/ft^3

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

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

Sample Calculation:

M_{Sdb} = 0.607
M_{Cdb} = 5.63

M_{FTAdb} = 0.607 + 5.63

M_{FTAdb} = **6.24** kg

BR – dry burn rate, kg/hr - ASTM E2780 equation (5)

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

Sample Calculation:

M_{FTAdb} = 6.237
θ = 239

BR = (60 x 6.237) / 239

BR = **1.57** kg / hr

***Vs* – Average gas velocity in the dilution tunnel, ft/sec** - ASTM E2515 equation (9)

$$V_S = F_P \times K_P \times C_P \times \left(\sqrt{\Delta P}\right)_{avg} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

Where

F_P = Adjustment factor for center of tunnel pitot tube placement, where $F_P = V_{STRAV} / V_{SCENT}$

V_{SCENT} = Dilution tunnel velocity, at the center, ft/sec

V_{STRAV} = Dilution tunnel velocity, multi-point pitot traverse, ft/sec

K_P = Pitot tube constant, 85.49

C_P = Pitot tube coefficient: 0.99, unitless

$\Delta P^{1/2}_{AVG}$ = Velocity pressure in the dilution tunnel, in H_2O

$T_{S\,(avg)}$ = Absolute average gas temperature in the dilution tunnel, °R

P_S = Absolute average gas static pressure in tunnel, = Pbar + Pg , where Pbar = Barometric Pressure, in. Hg, Pg = Static pressure in tunnel, Hg (in H_2O / 13.6)

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

(Duration of Test)

F_P = 0.8141

$\Delta P^{1/2}_{AVG}$ = 0.3492

$T_{S\,(avg)}$ = 548.6274

Pbar = 29.4600

Pg = -0.3800

Ps = 29.4321

V_S = 0.814 x 85.49 x 0.99 x 0.349 x √ [(549 / (29.43 x 28.78)]

V_S = **19.362** ft/sec

(First Hour of Test)

F_P = 0.8141

$\Delta P^{1/2}_{AVG}$ = 0.3473

$T_{S\,(avg)}$ = 563.8213

Pbar = 29.5000

Pg = -0.3800

Ps = 29.4721

V_S = 0.814 x 85.49 x 0.99 x 0.347 x √ [(564 / (29.47 x 28.78)]

V_S = **19.509** ft/sec

Q_{std} – Average gas flow rate in dilution tunnel, dscf/hr - ASTM E2515 equation (3)

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

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} = solute temperature, 528 °R
P_s = Absolute average gas static pressure in dilution tunnel, = Pbar + Pg , 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

(Duration of Test):

B_{ws} = 0.02
A = 0.19635
P_s = 29.43
$T_{s(avg)}$ = 549
Vs = 19.36

Qstd = 3600 x (1 - 0.02) x 19.362 x 0.19635 x (528 / 549) x (29.43 / 29.92)

Qstd = **12697.9** dscf/hr

(First Hour):

B_{ws} = 0.02
A = 0.19635
P_s = 29.47
$T_{s(avg)}$ = 564
Vs = 19.509

Qstd = 3600 x (1 - 0.02) x 19.509 x 0.1963 x (528 / 564) x (29.47 / 29.92)

Qstd = **12466.3** dscf/hr

Vm(std) – Volume of Gas Sampled (Corrected), 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_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Train A

$$V_{m(std)} = 17.64 \times 38.830 \times 1.015 \times \frac{\left(29.46 + \frac{1.23}{13.6}\right)}{(88.9 + 460)}$$

$V_{m(std)}$ = **37.428** dscf

Train B

$$V_{m(std)} = 17.64 \times 38.976 \times 1.006 \times \frac{\left(29.46 + \frac{1.23}{13.6}\right)}{(87 + 460)}$$

$V_{m(std)}$ = **37.349** dscf

Train C (1st Hour)

$$V_{m(std)} = 17.64 \times 9.62 \times 1.010 \times \frac{\left(\underline{29.50} + \frac{1.01}{13.6}\right)}{(72.0 + 460)}$$

$V_{m(std)}$ = **9.526** dscf

Train D (Background)

$$V_{m(std)} = 17.64 \times 37.32 \times 1.016 \times \frac{\left(\underline{29.46} + \frac{1.07}{13.6}\right)}{(79.0 + 460)}$$

$V_{m(std)}$ = **36.656** dscf

mn – 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 Calculations (Uncorrected):

Train A
m_n = 0.1 + 2.9 + 0.5
m_n = **3.5** mg

Train B
m_n = 0.0 + 2.4 + 1.5
m_n = **3.9** mg

Train C (1st hour)
m_n = 0.0 + 3.5 + 0.7
m_n = **4.2** mg

Train D (Background)
$m_n = m_f$ = 0.0
m_n = **0.0** mg

Sample Calculations (Corrected):

Train A
m_n = 0.1 + 2.9 + 0.5
m_n = **3.5** mg

Train B
m_n = 0.0 + 2.4 + 1.5
m_n = **3.9** mg

Train C (1st hour)
m_n = 0.0 + 3.5 + 0.7
m_n = **4.2** mg

Train D (Background)
$m_n = m_f$ = 0.0
m_n = **0.0** mg

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

g/dscf - ASTM E2515 equation (13)

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

Where:

K_2 = Constant, 0.001 g/mg

m_n = Total mass of particulate matter collected in the sampling train, mg

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

Sample Calculations (Uncorrected):

Train A

$$C_s = 0.001 \times \frac{3.5}{37.43}$$

C_s = **0.000094** g/dscf

Train B

$$C_s = 0.001 \times \frac{3.9}{37.35}$$

C_s = **0.0001044** g/dscf

Train C (1st Hour)

$$Cs = 0.001 \times \frac{4.2}{9.53}$$

Cs = **0.000441** g/dscf

Train D (Background)

$$C_r = 0.001 \times \frac{0.0}{36.66}$$

C_r = **0.000000** g/dscf

Sample Calculations (Corrected):

Train A

$$C_s = 0.001 \times \frac{3.5}{37.43}$$

C_s = **0.000094** g/dscf

Train B

$$C_s = 0.001 \times \frac{3.9}{37.35}$$

C_s = **0.0001044** g/dscf

Train C (1st Hour)

$$Cs = 0.001 \times \frac{4.2}{9.53}$$

Cs = **0.000441** g/dscf

Train D (Background)

$$C_r = 0.001 \times \frac{0.0}{36.66}$$

C_r = **0.000000** g/dscf

ET – 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 calculations (uncorrected)

Train A

E_T = (0.000094 - 0.000000) x 12697.9 x 239 / 60

E_T = **4.73** g

Train B

E_T = (0.000104 - 0.000000) x 12697.9 x 239 / 60

E_T = **5.28** g

First Hour

E_T = (0.000441 - 0.000000) x 12466.3 x 60 / 60

E_T = 5.50 g

Trains A and B Average

E = **5.01** g

Sample calculations (Corrected)

Train A

E_T = (0.000094 - 0.000000) x 12697.9 x 239 / 60

E_T = **4.73** g

Train B

E_T = (0.000104 - 0.000000) x 12697.9 x 239 / 60

E_T = **5.28** g

First Hour

E_T = (0.000441 - 0.000000) x 12466.3 x 60 / 60

E_T = **5.50** g

Trains A and B Average

E_T = **5.01** g

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 (Uncorrected)

Train A

E_T = 4.73 g

θ = 239 min

$PM_R = 60 \times (4.73 / 239)$

PM_R = **1.19** g/hr

Train B

E_T = 5.28 g

θ = 239 min

$PM_R = 60 \times (5.28 / 239)$

PM_R = **1.33** g/hr

A and B Average

E_T = **1.26** g/hr

First Hour

E_T = 5.50 g

θ = 60 min

$PM_R = 60 \times (5.50 / 60)$

PM_R = **5.50** g/hr

Sample Calculation (Corrected)

Train A

E_T = 4.73 g

θ = 239 min

$PM_R = 60 \times (4.73 / 239)$

PM_R = **1.19** g/hr

Train B

E_T = 5.28 g

θ = 239 min

$PM_R = 60 \times (5.28 / 239)$

PM_R = **1.33** g/hr

A and B Average

E_T = **1.26** g

First Hour

E_T = 5.50 g

θ = 60 min

$PM_R = 60 \times (5.50 / 60)$

PM_R = **5.50** 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 (Uncorrected)

Train A

E_T = 4.73 g
M_{FTAdb} = 6.24 kg
PM_F = 4.73 / 6.24
PM_F = **0.76** g/kg

Train B

E_T = 5.28 g
M_{FTAdb} = 6.24 kg
PM_F = 5.28 / 6.24
PM_F = **0.85** g/kg

Sample Calculation (Corrected)

Train A

E_T = 4.73 g
M_{FTAdb} = 6.24 kg
PM_F = 4.73 / 6.24
PM_F = **0.76** g/kg

Train B

E_T = 5.28 g
M_{FTAdb} = 6.24 kg
PM_F = 5.28 / 6.24
PM_F = **0.85** g/kg

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:			Train A	Train B	Train C
θ	=	Total sampling time, min	239	239	60
θ_i	=	Length of recording interval, min	1	1	1
V_{mi}	=	Volume of gas sample measured by the dry gas meter during the “ith” time interval, dcf	0.139	0.146	0.159
V_m	=	Volume of gas sample as measured by dry gas meter, dcf	38.83	38.976	9.619
V_{si}	=	Average gas velocity in the dilution tunnel during the "ith" time interval, ft/sec	19.566	19.566	19.566
V_s	=	Average gas velocity in the dilution tunnel, ft/sec	19.364	19.364	19.532
T_{mi}	=	Absolute average dry gas meter temperature during the "ith" time interval, ^oR	533.4	529.0	528.3
T_m	=	Absolute average dry gas meter temperature, ^oR	548.9	547.2	532.0
T_{si}	=	Absolute average gas temperature in the dilution tunnel during the "ith" time interv	587.9	587.9	587.9
T_s	=	Absolute average gas temperature in the dilution tunnel, ^oR	548.6	548.6	563.8

NOTE: These sample calculations are for the Second interval of each train)

Train A PR = $\left(\frac{239 \times 0.139 \times 19.364 \times 549 \times 588}{1 \times 38.83 \times 19.566 \times 533 \times 549}\right)$ X 100 = 93.4 %

Train B PR = $\left(\frac{239 \times 0.146 \times 19.364 \times 547 \times 588}{1 \times 38.976 \times 19.566 \times 529 \times 549}\right)$ X 100 = 98.2 %

Train B PR = $\left(\frac{60 \times 0.159 \times 19.532 \times 532 \times 588}{1 \times 9.619 \times 19.566 \times 528 \times 564}\right)$ X 100 = 104.0 %

CSA B415.1-11 Efficiency Results

Manufacturer	MF Fire
Model:	Nova 2
Project Number:	0552WS004E
Run Number:	3
Test Date:	3/12/2025

Efficiency results reported herein are based on a stack-loss method in accordance with CSA B415.1:22 "Performance testing of solid-biofuel-burning heating appliance". OMNI uses the spreadsheet provided by CSA that is to be used in conjunction with the current version of the test standard. The most recent version of the software is version 2.4, dated April 15, 2010. OMNI received confirmation from CSA on October 18, 2023 that this is the current version of the software.

VERSION: 2.4 4/15/2010

Manufacturer:	MF Fire		**Appliance Type:**	Cat	(Cat, Non
Model:	Nova 2				
Date:	3/12/2025		**Temp. Units**	F	(F or C)
Run:	3		**Weight Units**	lb	(kg or lb)
Control #:	2497				
Test Duration:	240				
Output Category:			**Fuel Data**		
				D. Fir	
Wood Moisture (% wet):	18.53		**HHV**	19,810	kJ/kg
Load Weight (lb wet):	16.90		**%C**	48.73	
Burn Rate (dry kg/h):	1.56		**%H**	6.87	
Total Particulate Emissions:	5.005	g	**%O**	43.9	
			%Ash	0.5	

Averages	**0.26**	**12.02**	**#DIV/0!**	**330.60**	**71.42**
				Temp. (ºF)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	16.90	0.07	4.65		396.3	73.7
1	16.83	0.14	0.98		400.2	73.4
2	16.71	0.07	2.68		417.8	73.4
3	16.53	0.09	4.53		433.8	73.2
4	16.37	0.07	6.60		404.6	73.1
5	16.22	0.09	6.49		399.6	73.0
6	16.13	0.08	6.77		398.9	72.7
7	15.99	0.09	7.27		401.4	72.4
8	15.83	0.14	8.93		409.0	72.4
9	15.66	0.14	11.73		421.6	72.4
10	15.46	0.17	12.31		435.9	72.3
11	15.28	0.08	9.29		438.7	72.3
12	15.17	0.11	8.09		442.4	72.2
13	14.97	0.10	8.09		444.2	72.0
14	14.86	0.10	7.95		444.6	72.0
15	14.74	0.08	8.81		443.8	71.9
16	14.50	0.12	11.94		445.9	71.9
17	14.27	0.33	15.26		458.7	71.9
18	14.05	0.32	16.02		467.9	71.9
19	13.85	0.16	14.84		477.1	71.8
20	13.62	0.37	15.62		483.9	71.7
21	13.38	0.19	14.37		488.1	71.8

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
22	13.19	0.17	14.11		492.1	71.9
23	12.98	0.16	14.32		493.4	71.7
24	12.77	0.19	14.80		496.2	71.9
25	12.56	0.17	15.10		499.2	72.0
26	12.37	0.27	15.39		503.1	72.2
27	12.15	0.32	15.58		506.6	72.2
28	11.94	0.27	15.97		509.5	72.3
29	11.70	0.66	16.88		512.6	72.4
30	11.45	0.51	16.54		517.3	72.5
31	11.26	0.86	16.95		519.7	72.6
32	11.03	0.86	17.00		521.4	72.7
33	10.79	0.99	17.11		524.5	72.9
34	10.55	1.11	17.21		526.2	72.9
35	10.35	1.21	17.37		529.8	73.1
36	10.09	1.27	17.32		520.4	73.0
37	9.91	3.12	17.02		479.1	73.3
38	9.75	1.81	16.98		459.3	73.6
39	9.60	0.67	16.44		445.8	73.8
40	9.46	0.41	16.21		434.6	73.8
41	9.35	0.28	15.88		425.9	73.9
42	9.26	0.19	15.91		418.3	73.9
43	9.14	0.25	15.95		413.2	74.0
44	8.98	0.58	16.24		409.3	74.0
45	8.87	1.27	16.62		405.8	73.9
46	8.76	0.79	16.57		403.1	74.1
47	8.58	1.01	17.10		401.1	74.1
48	8.46	1.01	17.08		399.7	74.0
49	8.36	1.141	16.939		398.1	74.2
50	8.24	0.612	16.65		395	74.2
51	8.11	0.36	16.051		391.8	74.1
52	8.02	0.65	15.847		387.8	74.2
53	7.89	1.319	15.634		386.2	74.3
54	7.75	1.993	15.712		386.3	74.3
55	7.64	2.378	15.822		385.2	74.3
56	7.51	2.506	15.801		384.2	74.4
57	7.35	2.362	16.028		383.4	74.2
58	7.28	2.193	15.948		381.6	74.4
59	7.16	1.674	16.028		379.9	74.4
60	7.04	1.113	16.191		378.5	74.4

Run 3 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
61	6.95	0.763	16.047		377	74.3
62	6.85	0.522	15.957		374.9	74.4
63	6.73	0.282	15.86		373.2	74.2
64	6.67	0.119	15.67		371.7	74.3
65	6.56	0.069	15.557		369.8	74.4
66	6.47	0.059	15.382		367.7	74.4
67	6.37	0.047	15.217		364.7	74.2
68	6.28	0.044	15.118		361.8	74.2
69	6.23	0.039	15.082		358.4	74.2
70	6.13	0.037	14.988		355.4	74.2
71	6.07	0.045	14.821		352.4	74.1
72	5.97	0.038	14.659		349.4	74.1
73	5.90	0.033	14.591		347.1	74
74	5.82	0.031	14.382		345.6	74
75	5.76	0.029	14.319		343.2	74
76	5.68	0.04	14.191		341.1	73.9
77	5.58	0.038	14.012		339.5	73.8
78	5.53	0.037	13.911		337.5	73.6
79	5.47	0.038	13.83		335.7	73.6
80	5.39	0.037	13.803		334	73.6
81	5.35	0.038	13.741		332.3	73.6
82	5.26	0.038	13.705		331	73.7
83	5.20	0.03	13.629		329.7	73.6
84	5.17	0.037	13.516		328.2	73.4
85	5.04	0.039	13.501		327.9	73.4
86	5.03	0.033	13.504		326.3	73.1
87	4.96	0.035	13.459		325.3	73.2
88	4.89	0.033	13.542		324	73.2
89	4.84	0.033	13.468		322.9	73
90	4.78	0.035	13.433		322.3	72.8
91	4.69	0.038	13.355		321.1	72.9
92	4.65	0.043	13.3		320	72.9
93	4.58	0.042	13.289		319.7	72.9
94	4.53	0.044	13.111		319.2	72.7
95	4.46	0.05	13.206		318.7	72.6
96	4.39	0.049	13.177		317.7	72.5
97	4.35	0.045	13.191		316.9	72.5
98	4.26	0.05	13.206		316.8	72.5
99	4.24	0.045	13.229		316.4	72.3

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
100	4.17	0.044	13.258		315.4	72.4
101	4.09	0.046	13.12		315.2	72.1
102	4.05	0.046	13.178		314.4	72
103	3.99	0.045	13.232		313.4	72.2
104	3.93	0.042	13.272		313.6	72.1
105	3.87	0.044	13.295		313	71.9
106	3.77	0.041	13.284		312.6	71.9
107	3.76	0.039	13.455		312.3	71.9
108	3.69	0.044	13.358		311.9	71.7
109	3.64	0.046	13.348		310.9	71.7
110	3.56	0.04	13.23		310.4	71.7
111	3.54	0.05	12.951		309.7	71.7
112	3.48	0.035	13.815		309.1	71.8
113	3.36	0.036	13.972		308.4	71.8
114	3.35	0.032	13.984		308.4	71.8
115	3.25	0.034	13.978		308.7	71.8
116	3.25	0.04	14.018		308.2	71.7
117	3.16	0.038	13.988		307.9	71.7
118	3.14	0.047	13.886		307	71.6
119	3.07	0.035	13.658		306.5	71.4
120	3.01	0.043	13.706		305.7	71.5
121	2.93	0.034	13.772		305.4	71.6
122	2.91	0.04	13.685		304.5	71.6
123	2.88	0.042	13.62		304.2	71.4
124	2.81	0.049	13.438		303.8	71.5
125	2.75	0.059	13.292		303.3	71.4
126	2.71	0.05	13.245		303.1	71.5
127	2.68	0.063	13.219		303	71.3
128	2.64	0.05	13.219		302.8	71.3
129	2.56	0.045	13.391		301.4	71.3
130	2.53	0.047	13.184		300.6	71.4
131	2.48	0.043	12.953		300.2	71.3
132	2.46	0.051	12.847		299.7	71.4
133	2.40	0.058	12.207		299.2	71.3
134	2.38	0.076	11.731		298	71.3
135	2.32	0.083	11.756		297.2	71.3
136	2.28	0.079	11.508		296.9	71.3
137	2.25	0.082	11.38		296.6	71.2
138	2.26	0.078	11.302		295.5	71.1

Run 3 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
139	2.20	0.087	11.435		294.3	71.2
140	2.17	0.088	11.357		293.5	71.2
141	2.16	0.093	11.366		292.9	71.1
142	2.14	0.097	11.273		291.8	71.1
143	2.07	0.077	10.507		290.6	71
144	2.07	0.09	10.41		289.7	71.1
145	2.05	0.095	10.351		289.2	71.1
146	2.04	0.1	10.315		288.3	70.8
147	1.99	0.101	10.242		287.3	71
148	1.98	0.102	10.146		286	71
149	1.97	0.107	10.119		284.8	70.9
150	1.94	0.112	10.134		284.4	70.9
151	1.90	0.088	10.176		283.4	70.9
152	1.89	0.109	10.082		282.6	71
153	1.87	0.112	10.124		282	70.8
154	1.85	0.122	10.046		280.8	70.9
155	1.81	0.111	10.082		280.2	70.9
156	1.80	0.117	10.028		279.5	70.8
157	1.75	0.121	10.157		278.6	70.8
158	1.77	0.12	10.229		277.6	70.6
159	1.74	0.123	10.172		277.2	70.6
160	1.70	0.12	10.23		276.3	70.6
161	1.68	0.116	10.194		276.2	70.5
162	1.69	0.127	10.287		275.2	70.6
163	1.67	0.126	10.271		274.3	70.4
164	1.65	0.128	10.183		274.6	70.3
165	1.60	0.129	10.139		274.4	70.4
166	1.55	0.133	10.248		273.8	70.4
167	1.57	0.134	10.157		273.9	70.4
168	1.52	0.13	10.272		273.7	70.3
169	1.52	0.135	10.278		273.2	70
170	1.50	0.131	10.226		272.9	70.1
171	1.48	0.143	10.13		271.8	70
172	1.47	0.131	10.11		271.6	70.1
173	1.44	0.142	10.133		271.5	70.2
174	1.41	0.138	10.057		270.8	70.1
175	1.37	0.14	9.949		270.9	70
176	1.38	0.152	9.981		270.4	70.1
177	1.36	0.15	10.069		270.3	70

Run 3 B415

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
178	1.34	0.152	10.139		270.7	70
179	1.29	0.148	10.091		269.9	70
180	1.28	0.148	10.101		269.3	69.9
181	1.26	0.154	10.017		268.6	69.9
182	1.25	0.148	9.959		268.7	69.9
183	1.22	0.154	9.948		269	69.8
184	1.19	0.156	9.901		269.1	69.8
185	1.18	0.156	9.85		269.2	69.8
186	1.17	0.16	9.767		269.5	69.7
187	1.15	0.164	9.827		268.9	69.6
188	1.08	0.157	9.694		268.6	69.7
189	1.06	0.168	9.708		268.5	69.4
190	1.08	0.166	9.637		268.9	69.4
191	1.06	0.172	9.693		268.3	69.4
192	1.05	0.163	9.647		268.3	69.5
193	0.99	0.167	9.665		268.3	69.4
194	0.99	0.175	9.692		267.6	69.4
195	0.97	0.178	9.65		267.5	69.4
196	0.97	0.166	9.567		267.9	69.4
197	0.94	0.168	9.604		267.8	69.4
198	0.90	0.182	9.578		267.7	69.3
199	0.88	0.178	9.656		267.5	69.3
200	0.89	0.196	9.485		267.7	69.3
201	0.86	0.183	9.434		267.7	69.2
202	0.84	0.179	9.445		267.4	69.1
203	0.81	0.187	9.503		267.5	69.1
204	0.79	0.167	9.442		267.2	69.2
205	0.78	0.161	9.531		266.4	69.2
206	0.77	0.164	9.489		266.9	69.2
207	0.72	0.17	9.482		266.9	68.9
208	0.70	0.156	9.465		266.3	68.8
209	0.67	0.168	9.406		265.8	68.8
210	0.69	0.163	9.306		265.3	68.7
211	0.67	0.168	9.355		264.1	68.6
212	0.62	0.154	9.529		263.7	68.5
213	0.61	0.136	9.477		263.1	68.5
214	0.58	0.147	9.483		262.1	68.4
215	0.56	0.144	9.393		261.8	68.5
216	0.53	0.158	9.361		261.8	68.4

Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Temp. (ºF) Flue Gas	Room Temp
217	0.50	0.152	9.322		261.3	68.3
218	0.48	0.15	9.372		261.3	68.4
219	0.48	0.143	9.358		259.9	68.2
220	0.45	0.154	9.371		259.2	68.4
221	0.42	0.158	9.318		259	68.4
222	0.39	0.151	9.419		258.3	68.3
223	0.38	0.158	9.377		258.8	68.4
224	0.37	0.16	9.174		258.9	68.4
225	0.36	0.165	9.364		258.7	68.4
226	0.34	0.156	9.132		257.9	68.4
227	0.30	0.155	9.167		258.3	68.2
228	0.28	0.155	8.78		258.8	68.2
229	0.27	0.18	8.836		257.8	68.2
230	0.26	0.198	8.833		257.6	68.3
231	0.26	0.194	9.098		258.1	68.3
232	0.21	0.205	9.077		258.5	68.2
233	0.16	0.199	8.849		258.4	68.2
234	0.18	0.191	8.912		258.3	68.1
235	0.17	0.187	9.107		258.6	68.2
236	0.15	0.199	9.082		258.3	68.2
237	0.10	0.217	9.072		258.6	68
238	0.08	0.154	8.942		258.4	68.1
239	0.10	0.155	8.917		258.3	68
240	-0.02	0.16	8.827		256.7	68.1

Tare Sheet: (check one) **Probes**____ **47mm Filters** X **100mm Filters**____ **O-Ring Pair**____

Prepared By: Balance ID #: Thermohygrometer ID #: Audit Weight ID #/Mass: /

Placed in Dessicator: Date: 2-4-24 Time: 1400 ID #	Date: 2-5-2025 Time: 0945 RH %: 5 T (°F): 66.8 Audit: 100.0 300.1	Date: 3-6-2025 Time: 0845 RH %: 5 T (°F): 66.4 Audit: 100.1 300.1	Date: 3-7-2025 Time: 1045 RH %: 4 T (°F): 66.1 Audit: 100.0 300.1	Date: Time: RH %: T (°F): Audit:	Date Used	Project Number	Run No.
FS31/FS31A	236.8	236.4	236.5 ✓		3-10-25	0552WS004E	1
FS32/FS32A	237.6	237.1	237.3 ✓		3-11-2025	0552WS004E	2
FS33/FS33A	237.7	237.7 ✓			↓	↓	↓
FS34/FS34A	237.3	237.3 ✓			↓	↓	↓
FS35/FS35A	242.2	242.1 ✓			3-12-2025	0552WS004E	3
FS36/FS36A	241.7	241.9 ✓			↓	NOT USED	↓
FS37/FS37A	241.2	241.3 ✓			↓	↓	↓
FS38/FS38A	241.3	241.3 ✓			3-12-2026	0552WS004E	3

[redacted]

Initials: KT	Initials: JM	Initials: RO	Initials:

Final Technician Signature: Date: 4-2-2025 Evaluator signature:

Tare Sheet: (check one) Probes_____ 47mm Filters ✓ 100mm Filters_____ O-Ring Pair_____

Prepared By: Balance ID #: Thermohygrometer ID #: Audit Weight ID #/Mass: 1

Placed in Dessicator: Date: 12/11/24 Time: 14:35 ID #	Date: 12/12/24 Time: 16:40 RH %: 14.3 T (°F): 67.6 Audit: 100.1 200.0	Date: 12/16/24 Time: 15:00 RH %: 15.6 T (°F): 66.6 Audit: 100.0 200.1	Date: Time: RH %: T (°F): Audit:	Date: Time: RH %: T (°F): Audit:	Date Used	Project Number	Run No.
[redacted]							
F525	120.5	120.6			3-10-25	0552WS004E	1
F526	123.3	123.2			3-11-25	0552WS004E	2
F527	116.0	116.2			3-12-25	0552WS004E	3
F528	115.8	115.8					
F529	121.8	122.0					
F530	115.6	115.8					
	Initials: TT	Initials: TT	Initials:	Initials:			

Final Technician Signature: Tony Tong Date: 12/16/24 Evaluator signature: M. Morga

Control No. P-SFDP-0002.xls, Effective date: 2/1/2017

Tare Sheet: (check one) **Probes**____ **47mm Filters**____ **100mm Filters**____ **O-Ring Pair** ✓

Prepared By: Balance ID #: Thermohygrometer ID #: Audit Weight ID #/Mass: /

Placed in Dessicator: Date: 2-9-25 Time: 1400 ID #	Date: 2-5-2025 Time: 1000 RH %: 0.2% T (°F): 70.1 Audit: 3000.3 5000.0	Date: 3-6-2025 Time: 0900 RH %: 1.8% T (°F): 69.8 Audit: 3000.3 5000.0	Date: 3-7-2025 Time: 1055 RH %: 3.8 T (°F): 69.8 Audit: 3000.3 4999.9	Date: Time: RH %: T (°F): Audit:	Date Used	Project Number	Run No.
5946	3406.5	3406.5 ✓			3-12-2024	0552WS0046	3
5947	4129.8	4129.9 ✓			↓	↓ NOT USED	↓
5948	3284.3	3284.3 ✓			↓	↓	↓
5949	3375.9	3375.6	3375.8 ✓		3-12-2025	0552WS0046	3

[redacted]

Initials: KT	Initials: JM	Initials: RD	Initials:

Final Technician Signature: [signature] Date: 4-2-25 Evaluator signature: [signature]

Tare Sheet: (check one) **Probes** ✓ **47mm Filters**____ **100mm Filters**____ **O-Ring Pair**____

Prepared By: Balance ID #: Thermohygrometer ID #: Audit Weight ID #/Mass: 1

Placed in Dessicator: Date: 2-4-25 Time: 1400 / ID #	Date: 3-5-2025 Time: 1015 RH %: 9 T (°F): 66.8 99997.7 Audit: 101998.0	Date: 3-6-2025 Time: 08:00 RH %: 5 T (°F): 66.3 99997.6 Audit: 101998.1	Date: 3-7-2025 Time: 1030 RH %: 41 T (°F): 66.1 99997.5 Audit: 101998.0	Date: Time: RH %: T (°F): Audit:	Date Used	Project Number	Run No.
68	116839.1	116839.1 ✓			3-12-2025	0552WS004E	3
OES4	114149.0	114149.1 ✓			↓	↓	↓
36	114884.2	114884.2 ✓			↓	↓	↓
[redacted]							
Initials: RT	Initials: JM	Initials: RT	Initials:				

Final Technician Signature: [signature] Date: 4-2-25 Evaluator signature: [signature]

Control No. P-SFDP-0002.xls, Effective date: 2/1/2017

Tare Sheet: (check one) **Probes**_____ **47mm Filters**_____ **100mm Filters**_____ **O-Ring Pair**_____

Prepared By: Balance ID #: Thermohygrometer ID #: Audit Weight ID #/Mass: /

Placed in Dessicator: Date: 1-15-25 Time: 13:30 ID #	Date: 1-22-25 Time: 1252 RH %: 17.7 T (°F): 67.0 Audit: 5000.1 / 1000.3	Date: 1-23-2025 Time: 1000 RH %: 14.9 T (°F): 67.8 Audit: 5000.1 / 1000.6	Date: 2-18-2025 Time: 800 RH %: 12.4 T (°F): 66.9 Audit: 5000.0 / 1000.0	Date: 2-24-2025 Time: 807 RH %: 15.6 T (°F): 67.6 Audit: 999.9 / 5000.1	Date Used	Project Number	Run No.
[redacted]							
5937	3335.8		3335.8 ✓		3-10-25	0552W5004E	1
5938	3410.8		3410.6 ✓		↓	↓	↓
5939	3390.6		3390.4 ✓		↓	↓	↓
[redacted]							
5943	4165.8		4165.7 ✓		3-11-2025	0552W5004E	2
5944	3385.6		3385.5 ✓		↓	↓	↓
5945	4151.1 ✓		4151.0	4151.2 ✓	↓	↓	↓
	Initials: KO	Initials: RT	Initials: RT	Initials: RT			

Final Technician Signature: _____ Date: 4-2-2025

Evaluator signature: _____

Control No. P-SFDP-0002.xls, Effective date: 2/1/2017

Tare Sheet: (check one) **Probes**____ **47mm Filters** ✓ **100mm Filters**____ **O-Ring Pair**____

Prepared By: Balance ID #: Thermohygrometer ID #: Audit Weight ID #/Mass: /

Placed in Dessicator: Date: 12/11/24 Time: 14:15	Date: 12/12/24 Time: 16:20 RH %: 14.3 T (°F): 67.6 Audit: 200.0 200.1	Date: 12/16/24 Time: 14:30 RH %: 11.4 T (°F): 69.4 Audit: 200.0 199.9	Date: Time: RH %: T (°F): Audit:	Date: Time: RH %: T (°F): Audit:	Date Used	Project Number	Run No.
ID #							
[redacted]							
F519/519A	239.1	239.2	/		3-10-25	0552WS004E	1
F520/520A	238.2	238.2	/		↓	↓	↓
	Initials: TT	Initials: TT	Initials:	Initials:			

Final Technician Signature: Tony Tong Date: 12/16/24 Evaluator signature: [signature]

Control No. P-SFDP-0002.xls, Effective date: 2/1/2017

Tare Sheet: (check one) **Probes**_____ **47mm Filters**_____ **100mm Filters**_____ **O-Ring Pair**_____

Prepared By: Balance ID #: Thermohygrometer ID #: Audit Weight ID #/Mass: /

Placed in Dessicator: Date: 1-15-25 Time: 1450 ID #	Date: 1-22-25 Time: 1450 RH %: 15.9 T (°F): 67.6 Audit: 99998.0 101984	Date: 1-23-25 Time: 1000 RH %: 16.9 T (°F): 67.8 Audit: 99998.2 101998.5	Date: 2-17-25 Time: 12:06 RH %: 12.8 T (°F): 65.3 Audit: 99997.6 101999	Date: 2-18-25 Time: 0740 RH %: 12.4 T (°F): 66.9 Audit: 99997.7 101998.0	Date Used	Project Number	Run No.
[redacted]							
29	114276.0		114276.2	114276.4✓	3-10-25	0552WS004E	1
56	118641.6		118641.4✓		3-10-25	0552WS004E	1
8	115594.6		115594.1	115594.3✓	3-10-25	0552WS004E	1
82	116288.3		116288.0	116288.0✓	3-11-2025	0552WS004E	2
0E56	113707.1		113706.7	113706.6✓	↓	↓	↓
83	117542.2		117541.5	117541.7✓	↓	↓	↓
	Initials: RT	Initials:	Initials: RT	Initials: RT			

Final Technician Signature: _____ Date: 4-2-25 Evaluator signature: _____

Control No. P-SFDP-0002.xls, Effective date: 2/1/2017

6. Appliance Engineering Drawings

(CBI Report Only)

7. Appliance Labeling and Owner's Manual(s)

DO NOT REMOVE THIS LABEL Contact local building or fire officials about installation and restrictions in your area. Suitable for use in a conventional residential installation. For use with solid wood fuel only.

Solid Fuel Room Heater
Report Number 0552WS004E

Tested to UL 1482 – 2011(R2015), ULC-S627-00 (R2016), and ULC S628-93 (R2016)

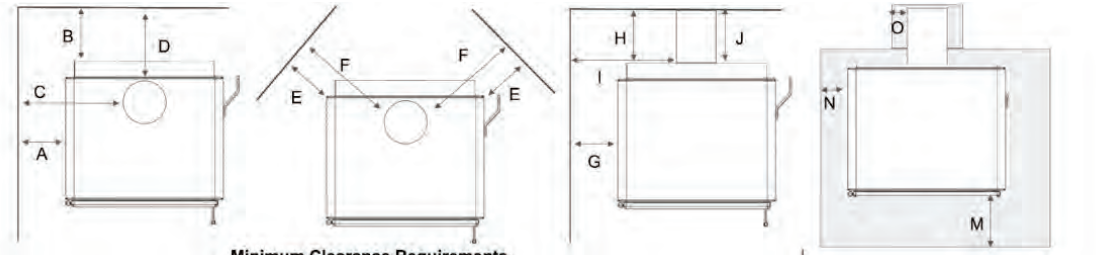
Nova 2C
Model #004

Serial Number

Prevent House Fires: Install and use only in accordance with the manufacturer's installation and operating instructions found in the Owner's Manual. Contact your local building or fire officials about restrictions and installation inspection in your area. Refer to local building codes and manufacturer's instructions for precautions required for passing a chimney through a combustible wall or ceiling. Do not run a chimney connector through a combustible wall or ceiling. Do not connect this unit to a chimney flue serving another appliance. Clearances may be reduced by methods specified in NFPA 211, listed wall shields, pipe shields, or other means approved by local building or fire officials. Do not overfire, if the chimney connector glows, you are overfiring. Inspect and clean chimney frequently – under certain conditions of use creosote buildup may occur rapidly. Do not use grate or elevate fire – build wood directly on hearth.

This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. Consult the Owner's Manual for further information. It is against the law to operate this wood heater in a manner inconsistent with operating instructions in the Owner's Manual, or if the catalytic element is deactivated or removed. CAUTION: the catalytic combustor used in this appliance (part #N11) is fragile and must be handled carefully. Burn only dry wood. The burning of metal foils, plastic, garbage, sulphur and diesel oil will render the catalyst in the combustor inactive. The performance and durability of the catalytic combustor has not been evaluated as part of the certification.

Standard residential freestanding installations require a 6" diameter, minimum 24 MSG black chimney connector pipe with listed UL-103 HT factory-built chimney, suitable for use with solid fuels or masonry chimney. If installed on a combustible floor, a noncombustible floor protector must be used. Floor protection must be made of a non-combustible material and at least 0.018" (0.45 mm) thick. For a Nova 2C equipped with 6" legs and ash lip, Nova 2C equipped with 9" legs, and for all Nova 2C Tower configurations, only Type 1 ember protection is required. For Nova 2C equipped with 3" legs and an ash lip, Type 2 thermal protection with minimum R-value of 1.35 is required. For Nova 2C equipped with 3" legs (no ash lip), Type 2 thermal protection with minimum R-value of 2.0 is required. Do not obstruct the space beneath the heater. Operate with doors closed. The unit must be installed with provided legs or tower when installed as a free-standing stove. When installed as a fireplace insert this unit is for installation on non-combustible hearths only. This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.



Minimum Clearance Requirements

		Single Wall Connector Pipe	Double Wall Connector Pipe	Double Wall Connector Pipe with Rear Heat Shield	Double Wall Connector Pipe with Reduced Clearance Kit
A	Sidewall to unit	22" (559 mm)	20" (508 mm)	20" (508 mm)	22" (559 mm)
B	Backwall to unit	20" (508 mm)	14" (356 mm)	6" (152 mm)	9" (229 mm)
C	Sidewall to connector	31" (787 mm)	29" (736 mm)	29" (736 mm)	31" (787 mm)
D	Backwall to connector	23" (584 mm)	17" (432 mm)	9" (229 mm)	12.5" (318 mm)
E	Corner to unit	14" (356 mm)	9" (229 mm)	-	9" (229 mm)
F	Corner to connector	23" (585 mm)	18" (457 mm)	-	18" (457 mm)
G	Sidewall to unit	22" (559 mm)			
H	Backwall to unit	16" (406 mm)			
I	Sidewall to connector	31" (787 mm)			
J	Backwall to connector	16" (406 mm)			
K	Top of unit to ¾" trim	10" (254 mm)			
L	Top of unit to 10" mantel	14" (356 mm)			

Floor Protection		
M	Front	16" US/18" CAN
N	Side	8" (203 mm)
O	Chimney Connector	2" (51mm)

Floor Protection Requirements

Leg Height	With Ash Lip	Without Ash Lip
3"	R = 1.35	R = 2.0
6"	Type 1	R = 1.35
9"	Type 1	Type 1
Tower	Type 1	Type 1

Manufactured by:
MF Fire, Inc.
3031 Washington Blvd
Suite G
Baltimore, MD, USA
www.mffire.com

Replace glass only with 5 mm ceramic glass

CAUTION

HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAME-PLATE AND INSTRUCTIONS.

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards for single burn rate heaters. This single burn rate wood heater is not approved for use with a flue damper. Certified average emissions rate of 1.38 g/hr, tested to EPA Method 28R and ASTM E2515-11. 78% efficiency.

DATE OF MANUFACTURE: _____

NOVA 2C AND NOVA 2C TOWER OWNER'S MANUAL

Safety Notice: Please save these instructions for future reference. Please check our website for the most up to date version of this manual. Please read this entire manual before you install and use your new room heater. Failure to follow instructions may result in property damage, bodily injury, or even death. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Do not install Nova 2C in a mobile home!

Manufactured by: MF Fire, Inc. 3031 Washington Blvd STE G, Baltimore, MD, USA. Report Number 0552WS004E, 0552WS004S

MFFIRE

EM O-TL C US

Tips/Tricks

Table of Contents

Safety Precautions

Installation

- Nova 2C must be properly installed to prevent house fires. Please strictly adhere to the installation instructions.

- Nova 2C must be connected to a listed high temperature chimney or approved masonry chimney with liner.

- We recommend you use smoke and CO detectors.

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

- Contact your local building officials to obtain information on any local wood stove installation requirements.

- Carefully route all power cords through to avoid contact with hot stove surfaces.

- Do not connect to or use Nova 2C in conjunction with any air distribution ductwork unless specifically approved for such installations.

Operation

- Nova 2C is hot while in operation. Keep children, clothing and furniture away as contact may cause skin burns.

- Do not touch Nova 2C while hot. Young children should be supervised around Nova 2C.

- Keep all flammable objects (fabrics, paper, wood, etc.) at least 1 yd (1 m) from the front of the Nova 2C.

- Nova 2C has been designed for the burning of cordwood only. Do not attempt to burn any other type of fuel in Nova 2C.

- Do not burn garbage; lawn clippings or yard waste; materials containing rubber, including tires; materials including plastic; waste petroleum products, paints or paint thinners, or asphalt products; materials containing asbestos; construction or demolition debris; railroad ties or pressure-treated wood; manure or animal remains; sale water driftwood or other previously salt water saturated wood; unseasoned wood; or paper products, cardboard, plywood, or particle board (the prohibition against burning these materials does not prohibit the use of paper, cardboard, or similar substances for the purposes of starting a fire.)

- Do not use chemicals or fluids to start the fire.

- Never use gasoline, gasoline- type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in this stove. Keep all such liquids well away from the stove while it is in use.

- The viewing door of Nova 2C must be shut and latched during operation.

- Do not use additional grates, andirons, or other means for supporting the fuel.

- Never obstruct airflow through the inlet vents or exhaust vents.

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

- Never over-fire Nova 2C, as it could lead to a house fire. If the unit or chimney connector glows, you have over-fired the unit.

- 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.

Maintenance

In addition to the items below, please check out additional common maintenance and operation tips by scanning the QR code below:

- Allow Nova 2C to cool before conducting any maintenance.

- Never attempt to modify or repair the appliance beyond instructions given in this manual.

- Inspect the catalytic combustor at least monthly.

- Empty the ash regularly and dispose of it in a metal container with a tight lid.

- Inspect the chimney connector at least twice monthly.

Features and Specifications

Configurations

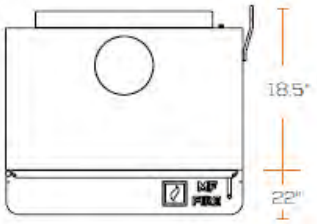
Nova 2C *Nova 2C Tower*

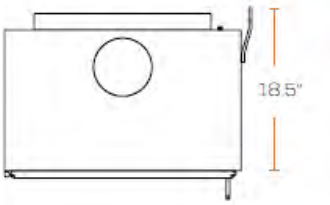
Nova 2C is available in two configurations, Nova 2C and Nova 2C Tower. Nova 2C can be optionally equipped with 3” (standard, shown above), 6”, or 9” legs. Nova 2C Tower is available with no legs (standard, shown above) or 6” legs.

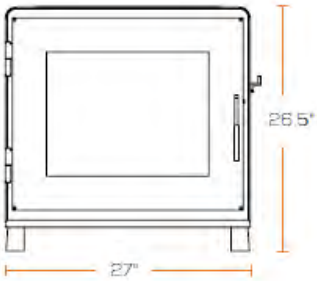
Additionally, both Nova 2C and Nova 2C Tower can be used in either a rear vent or a top vent configuration, to best fit your home and preferences.

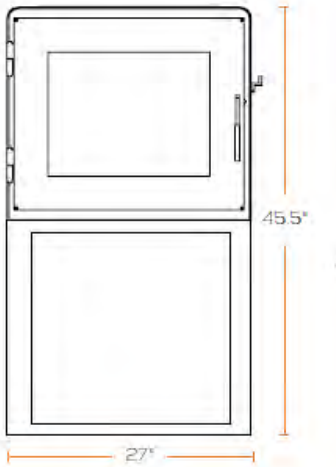
Dimensions

Dimensions shown are for the standard configurations. All clearances, front, side, corner, back and top, are measured from the largest dimensions.









NOVA 2

Height with 3" legs	26.5"
Width (w/o bypass)	27"
Depth w/ 4" ash lip	22"
Depth w/o 4" ash lip	18.5"
Side to center of flue collar	13.5"
Height to center rear flue collar	21.5"
Back to center top flue collar	6.25"

NOVA 2 TOWER

Height with tower	45.5"
Width (w/o bypass)	27"
Depth	18.5"
Side to center of flue collar	13.5"
Height to center rear flue collar	40.5"
Back to center top flue collar	6.25"

Heating Specifications

Nova 2C is equipped with a 2.4 ft.^{3} firebox and accepts logs up to 18" in length.

Nova 2C has a 2,500 sq. ft. (175 m^2) approximate maximum heating capacity. Heating capacity will vary depending on the home's floor plan, degree of insulation, and the outside temperature.

Nova 2C has a 20,010 BTU per hour (6 kW) EPA certified heat release rate, with actual heat release rates ranging from 9,000 to 50,000 BTU per hour (2.5 to 15 kW) depending on user loading and reloading.

Performance and Draft

Draft is the driving force that pulls air through the appliance and up the chimney. The draft of your chimney system depends a variety of factors including the height of your chimney, chimney cap type, local geography and topography, nearby obstructions, the pressure within your home, and other factors. Inadequate draft can cause smoke back puffing into the room, while too strong of a draft may cause damage to your stove and chimney system.

Negative pressure within the home may also cause back puffing or poor performance of your stove. Negative pressure can be caused by:

- Tightly sealed home
- Closely located HVAC return air vents
- Bathroom exhaust fans and kitchen range hoods
- Clothes dryers
- Other combustion appliance combustion air requirements (furnace, hot water appliance, etc.)

MF Fire assumes no responsibility or liability for improper performance of the stove due to down drafts, tightly sealed homes, negative pressure in the home, environmental conditions affecting draft, improper installation, or overfiring caused by excessive chimney height.

Emissions and Efficiency

U.S. Environmental Protection Agency certified to comply with 2020 particulate emission standards for single burn rate heaters. This single burn rate wood heater is not approved for use with a flue damper. This heater meets the 2020 U.S. EPA's crib wood emission limits for wood heaters. Tested to EPA ASTM E2780-10, ASTM 2515-11, and CSA B415.1-10. This heater has been shown to deliver an average Emissions rate of 1.38 grams/hour and 78% HHV Efficiency

Safety Listings

Nova 2C is available for sale in the United States and Canada has been listed with OMNI-Test Laboratories and is tested and compliant in accordance with UL 1482 – 2011(R2015), ULC-S627-00 (R2016), and ULC S628-93 (R2016)

Label

Nova 2C comes with a metal certification label on a chain affixed to the bottom back of the stove. This label is in English and French. For safekeeping, the label may be affixed to the air duct of the stove during installation.

Stove Installation

Safety Notice: Please read this entire manual before you install and use your new room heater. Failure to follow instructions may result in property damage, bodily injury, or even death. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Do not install Nova 2C in a mobile home!

Planning the Installation

Proper care and attention to service helps to protect you from unnecessary fires and carbon monoxide poisonings. To get the best service and wood stove installation for your Nova 2C wood stove, we recommend Installers or Chimney Sweeps certified by the National Fireplace Institute (NFI) or the Chimney Safety Institute of America (CSIA).

To locate one of the more than 2,000 active NFI or CSIA Certified installers across North America, please use the installer locator on our website: https://mffire.com/installers/

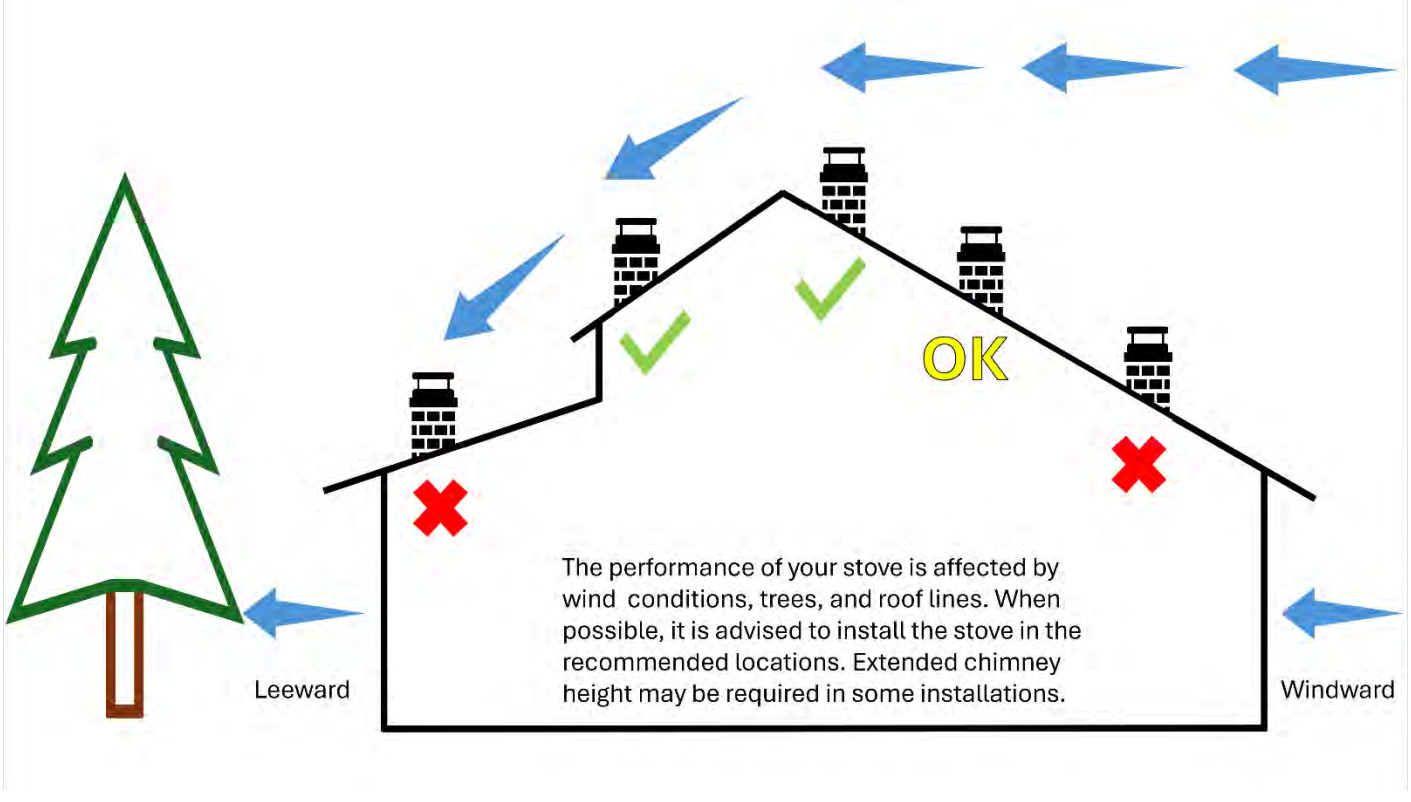
Check with your local building officials and your home insurance company before installation. When this room heater is improperly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.
If there are any major dents or other damage to your stove, please report to MF Fire prior to installation.

Stove Placement Requirements

Nova 2C must be placed in a room with a source of fresh air. The minimum room height that the stove can be installed in is 8 feet.

Nova 2C must be placed so that no combustibles are within or can swing within 36" (914mm) of the front of the stove (drapes, doors, etc.).

Caution: Avoid makeshift compromises during stove placement or installation. Failure to follow instructions may result in property damage, bodily injury, or even death.

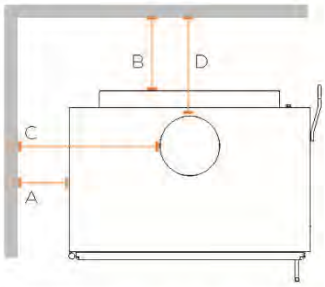

OK
The performance of your stove is affected by wind conditions, trees, and roof lines. When possible, it is advised to install the stove in the recommended locations. Extended chimney height may be required in some installations.
Leeward
Windward

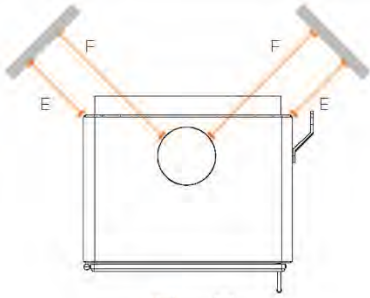
Minimum Clearance and Floor Protection Requirements

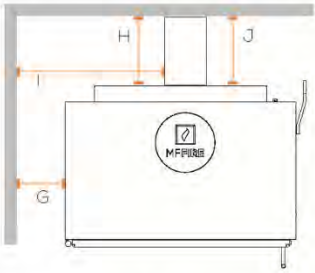
Nova 2C may be installed as a top vent with a ceiling exit in either a standard or corner configuration, or as a rear vent with a direct rear exit. The minimum clearance requirements are listed in the table below. Clearances may be reduced following methods in NFPA 211, listed wall shields, pipe shields, or other means approved by local building or fire officials.

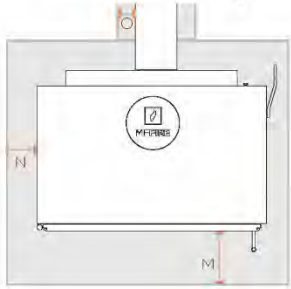
Nova 2C must be installed on a non-combustible surface or with adequate floor protection. Floor protection must extend around the front, sides, and rear of the stove, according to listed clearance requirements below.

Floor protection must be listed to UL 1618. Floor protection must be made of a non-combustible material and at least 0.018” (0.45 mm) thick. For a Nova 2C equipped with 6” legs and ash lip, Nova 2C equipped with 9” legs, and for all Nova 2C Tower configurations, only Type 1 ember protection is required. For Nova 2C equipped with 3” legs and an ash lip, Type 2 thermal protection with minimum R-value of 1.35 is required. For Nova 2C equipped with 3” legs (no ash lip), Type 2 thermal protection with minimum R-value of 2.0 is required.









MINIMUM CLEARANCE REQUIREMENTS

		Single Wall Connector Pipe	Double Wall Connector Pipe	Double Wall Connector Pipe with Reduced Clearance Kit
A	Sidewall to unit	22" (559 mm)	20" (508 mm)	22" (508 mm)
B	Backwall to unit	20" (508 mm)	14" (356 mm)	9" (228 mm)
C	Sidewall to connector	31" (787 mm)	29" (736 mm)	31" (787 mm)
D	Backwall to connector	23" (584 mm)	17" (432 mm)	12.5 (318 mm)
E	Corner to unit	14" (356 mm)	9" (229 mm)	9" (229 mm)
F	Corner to connector	23" (585 mm)	18" (457 mm)	18" (457 mm)
G	Sidewall to unit	22" (559 mm)		
H	Backwall to unit	16" (406 mm)		
I	Sidewall to connector	31" (787 mm)		
J	Backwall to connector	16" (406 mm)		
K	Top of unit to ¾" trim	10" (254 mm)		
L	Top of unit to 10" mantel	14" (356 mm)		
	Floor Protection			
M	Front	16" US/18" CAN		
N	Side	8" (203 mm)		
O	Chimney Connector	2" (51 mm)		

FLOOR PROTECTION REQUIREMENTS

Leg Height	With Ash Lip	Without Ash Lip
3"	R = 1.35	R = 2.0
6"	Type 1	R = 1.35
9"	Type 1	Type 1
Tower	Type 1	Type 1
Bench	Type 1	Type 1

Chimney Connector Requirements

A chimney connector is required from the flue collar of the stove to the factory-built chimney or a masonry chimney. The chimney connector must be 6” (152 mm) diameter and at minimum 24 gauge black steel. Aluminum or galvanized steel is not allowed – these materials cannot withstand the flue temperatures and may give off toxic fumes when heated.

The chimney connector may not pass through a ceiling, attic, roof, closet, or similar other concealed space, or a floor or ceiling. Per, ULC, where passage through a wall, or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365, Installation Code for Solid-Fuel- Burning Appliances and Equipment

Use listed UL 103 HT chimney – see “Chimney Requirements for details. DO NOT USE CONNECTOR PIPE AS CHIMNEY.

The chimney connector should be as short and direct as possible. No more than 180^{o} of elbows (two 90^{o} elbows or two 45^{o} and one 90^{o} elbow, etc.) may be used for the entire chimney system. Horizontal runs should slope upwards at least 1/4” (6 mm) per foot and be a maximum 36” (914 mm) long.

NOTE: Additional elbows may be allowed if draft is sufficient. Whenever elbows are used the draft is adversely affected. Additional chimney height may be required to boost draft. Poor draft may cause adverse effects such as smoke out of the door when reloading.

The chimney connector must be installed with the crimped end pointing downwards. This prevents creosote or condensation from leaking to the exterior of the pipe.

The chimney connector must be fastened to the stove and each adjoining section and kept clean.

Chimney Requirements

The minimum chimney height, as measured from the stove top, is 15 feet. Do not connect Nova 2C to a chimney flue serving any other appliance or use in conjunction with any air distribution ductwork, unless specifically approved.

This room heater must be connected to:

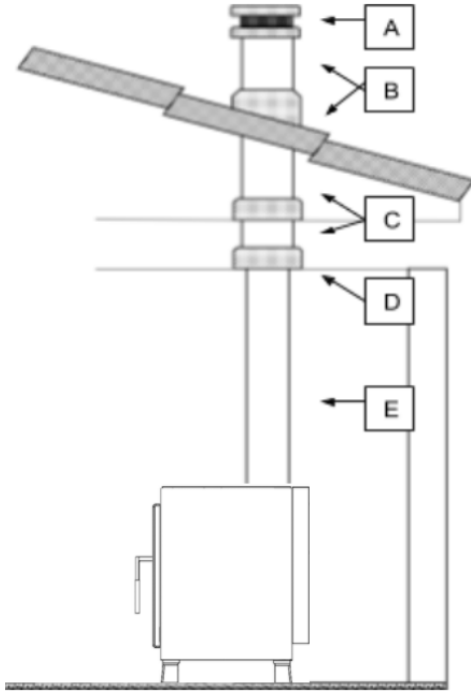
1. A 6” (150 mm) diameter, UL 103 HT chimney, from a single manufacturer

   OR

2. A code approved masonry chimney with a flue liner.

Standard Chimney Arrangement

A. Chimney termination
   a. Minimum height: 15’ (4.5m)
   b. Maximum height: 33’ (10 m)
B. Roof penetration
C. Chimney sections
D. Ceiling penetration
E. Chimney connector

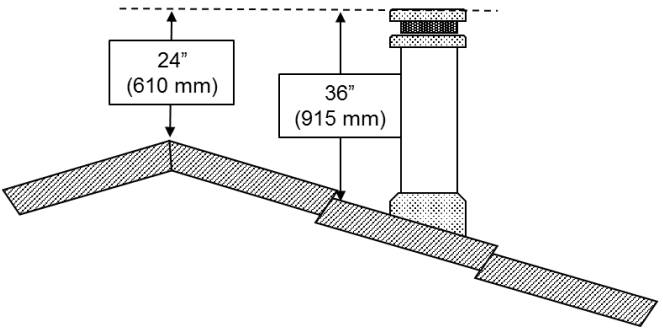


Chimney Termination Requirements

The chimney must have an approved cap (to prevent water from entering).

The chimney must not be located where it could become plugged by snow or other material.

The chimney must terminate at least 3' (914 mm) above the roof and at least 2' (610 mm) above any portion of the roof within 10' (3 m). This is commonly know as the 3-2-10 rule and is critical for proper stove performance and draft.

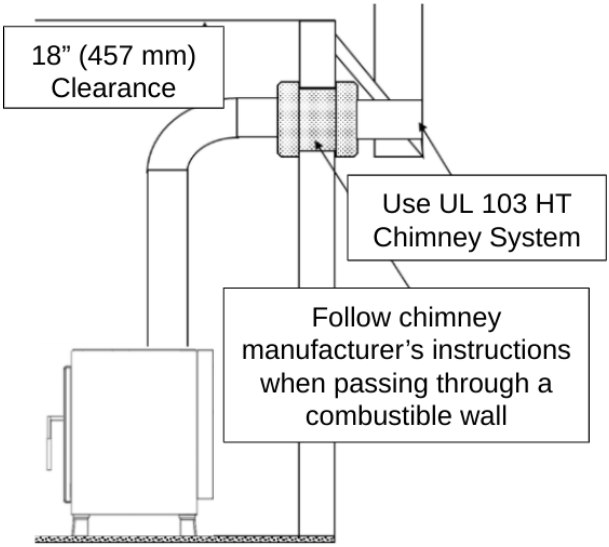


Exterior Factory-Built Chimney: Special Installation

Nova 2C may be used in conjunction with an exterior factory-built chimney provided that the chimney meets UL 103 HT requirements.

Special care must be taken regarding the wall thimble, or penetration from the chimney connector pipe to the exterior chimney, if the wall thimble must pass through an exterior wall. Here all chimney manufacturer's instructions must be followed, including guidance on spacing to combustible surfaces, piping requirements, and liner requirements. Check with local authorities before installation to ensure all requirements are met.

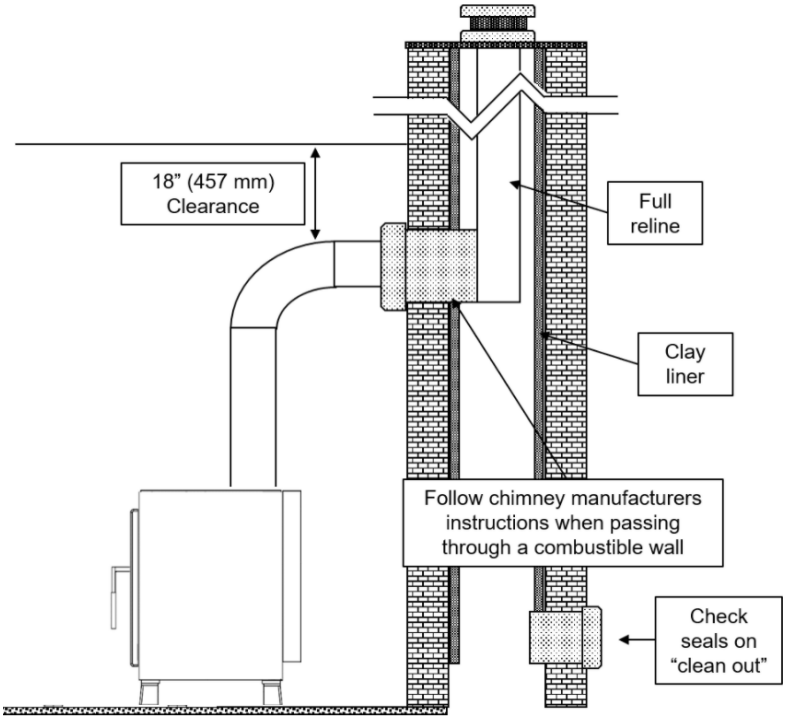
Floor protection is required 2" on both sides of the chimney connector for any horizontal runs.



Masonry Chimney: Special Installation

Nova 2C may be used in conjunction with a masonry chimney provided all installation instructions are followed.

We strongly recommend a full reline when installing the Nova 2C in a masonry chimney. If the chimney does not have a clay tile liner, a full reline is required. The chimney must be clean, undamaged, and meet all local building codes.

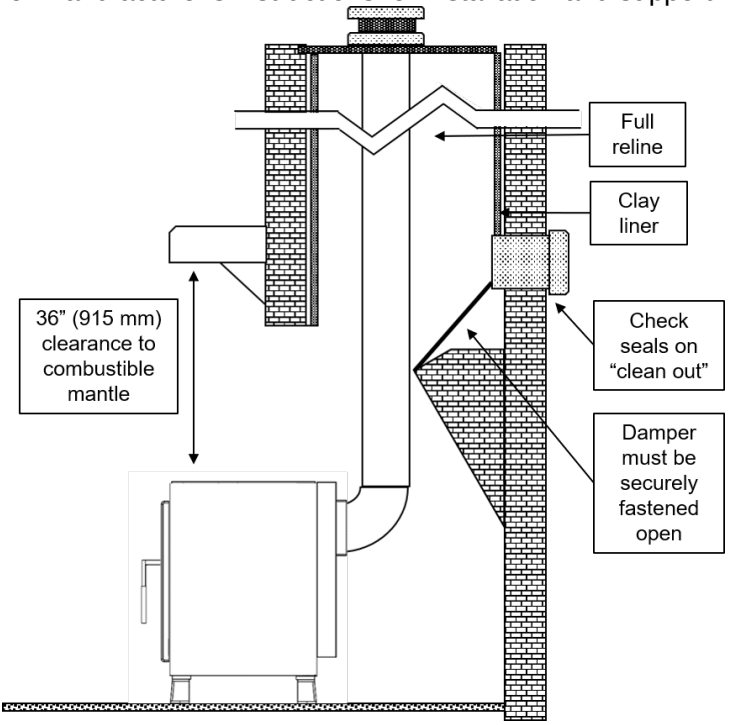


Special care must be taken regarding the wall thimble, or penetration from the chimney connector pipe to the masonry chimney, if the wall thimble must pass through a combustible exterior wall. Here all chimney manufacturer's instructions must be followed, including guidance on spacing to combustible surfaces, piping requirements, and liner requirements. Check with local authorities before installation to ensure all requirements are met.

Hearth Mount in Masonry Fireplace: Special Installation

Nova 2C may be used in conjunction with a masonry fireplace provided all installation instructions are followed.

The entire fireplace must be clean, undamaged, and meet all local building codes. This installation requires a full reline. The liner must be a stainless steel chimney connector or flexible vent pipe. Follow the liner manufacturer's instructions for installation and support.



Installing Legs, Tower, and Ash Lip (Optional)

Nova 2C will arrive bolted to a pallet with legs and leg bolts packed separately. The leg securement bolts are located inside the firebox and labeled “Leg Pad Bolts”. If ordered with the optional ash lip, the ash lip will contain two spacer plates for the rear legs, four longer bolts, and two filler pieces for the ash lip when used in the 6” position. To install the legs follow the steps below.

Step 1: Unbolt Nova 2C from the pallet and gently rock back onto a soft surface such as a rug or a blanket. If installing the ash lip follow step 2, if not go directly to step 3.

NOTE: If you are installing the Nova 2C Tower, refer to Appendix A now.

Step 2: Press the ash lip up against the bottom of the stove such that two appropriate holes (front for 4” ash lip, rear for 6” ash lip) are over the leg pad holes. Note: In Step 3, installation will require the included longer leg bolts for installing the ash lip.

Place spacer plates over the leg pads on the rear legs of the stove.

Step 3: Position a front stove leg so that the hole in the leg aligns with the hole in the leg pad. Insert the bolt and washer through the leg, into the leg pad hole. Rotate the leg so the solid sides are parallel to the outside edges of the stove. Use a wrench tighten the bolt. Repeat for all four legs.

Configuring the Optional Rear Vent

Nova 2C can be configured as either a top venting or a rear venting stove. Nova 2C will arrive in the top vent configuration. To switch to the rear vent configuration, the following procedure may be followed. Scan this QR code to watch a video!

Tips/Tricks

Step 1: Remove the rear blocker plate collar, secured with 4 bolts and 1 washer each, and access panel, secured with 6 bolts and no washers, from the back of the stove as shown below.

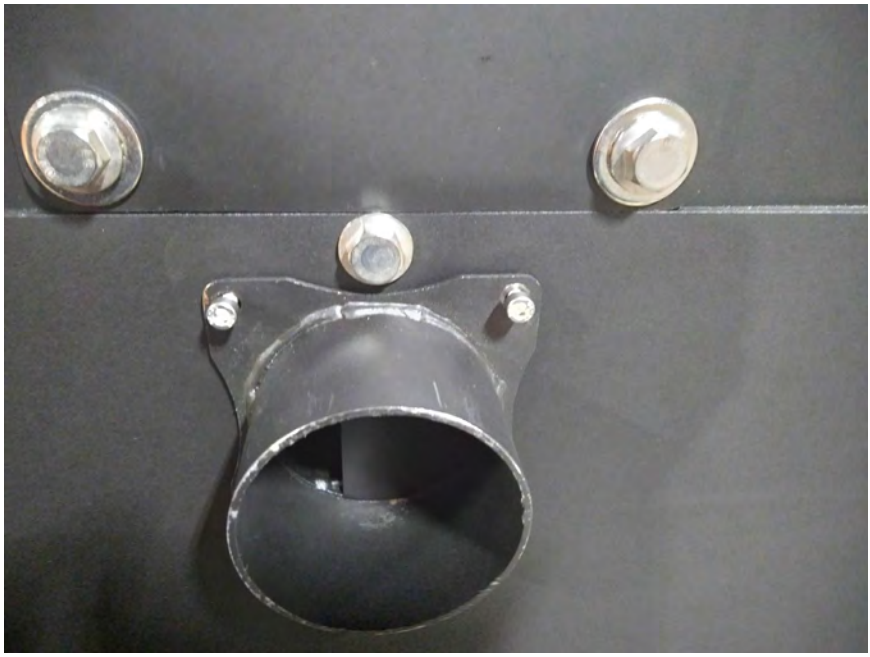
Step 2: Next, reach inside the back of the stove and remove the spacer plate and the flue collar, secured with 4 bolts and 2 washers each, located on the inside top of the stove.

Step 3: The blocker plate that was removed from the rear of the stove can then be inserted over the opening at the top of the stove, the spacer plate placed below, and the entire assembly secured to the top of the stove with bolts ash shown below. Before tightening bolts, be sure that no gaps exist between the blocker plate and the top of the stove whereby smoke may escape. If necessary, gasket cement can be placed between the plate and the top of the stove.

Step 4: Replace the access plate and install the flue collar, as shown below.

Installing the Air Inlet Pipe

Nova 2 comes with an air inlet pipe to cover the air inlets on the rear of the stove and prevent interference with the blower in a freestanding configuration. To attach, simply bolt over the air inlets on the rear of the stove with the pre-installed bolts, as shown below.



Installing the Bypass Handle

Nova 2C comes with the bypass handle detached for safety during transport.

Step 1: Remove the set screw from the bypass handle.

Step 2: To install the bypass handle simply slide the handle over the bypass rod on the back of the right side of the stove such that the handle is pointed towards the rear of the stove, with the bent portion of the handle angled away from the stove as shown below. OPEN = Bypass Open, CLOSED = Combustor Engaged/Bypass Closed

Step 3: Rotate the bypass handle on the bypass rod until the set screw hole is aligned with the hole in the bypass handle. Insert the set screw and tighten into the hole. Tighten the set screw, wiggle the handle, tighten the set screw, wiggle the handle, etc. until the handle is tight and there is no wiggle.

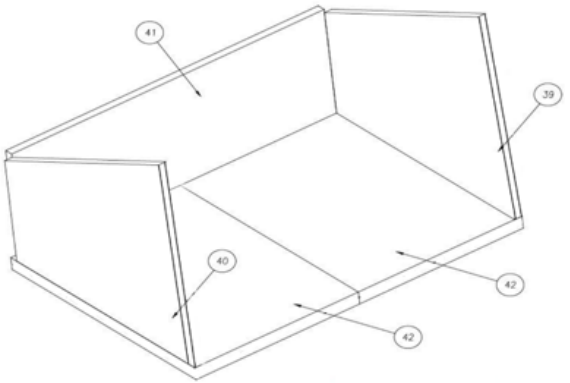
Insulation and Fire Brick

Nova 2C comes equipped with a two-part insulation strategy to maintain clean, efficient fires and a long-lasting coal bed. The insulation blanket maintains efficient and long-lasting heat while the fire bricks provide a durable platform for your fire and maintain smooth even heating.

The insulation is pre-installed in the firebox, while the fire bricks must be installed before the first fire and should be installed following the procedure below. Gloves and safety glasses should be worn during installation.

Step 1: Unpack the fire bricks that accompany your Nova 2C, and ensure all pieces are present. The fire bricks received with your stove may not have the corresponding numbers in the steps below.

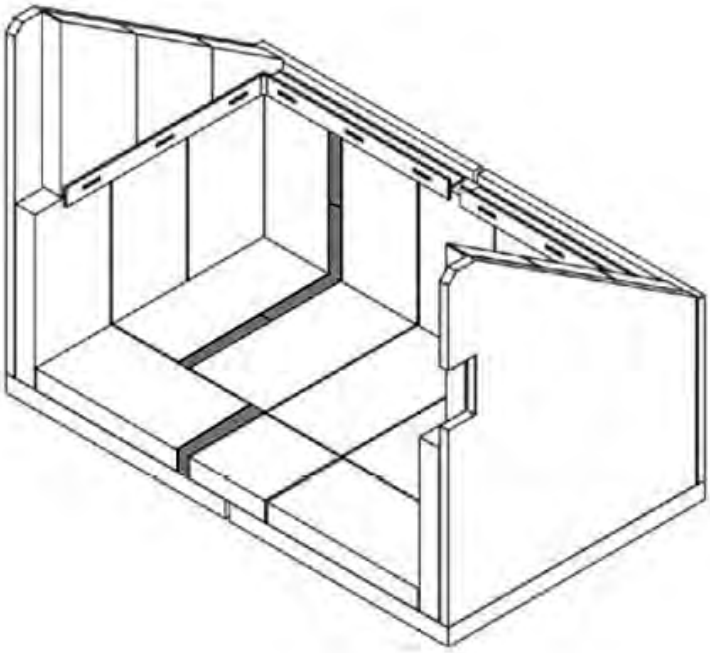
Step 2: The insulation blanket will be pre-installed as shown below.



Step 3: Next, install the fire bricks. The first fire bricks to install are the five rear wall bricks and then the three bricks on the left and right sidewall. A small gap may exist in between the corner of the fire bricks in the rear corners of the firebox Next, install the seven fire bricks on the floor of Nova 2C. Push all fire bricks up against the side and back walls. You may have a gap in the middle of the firebox as shown below. These can be filled with the brick slivers contained within your fire brick boxes.

Tips/Tricks

Lastly, the partial bricks that make up the second row of bricks on the side of the stove should be installed. To hold this row of bricks in place, the two T-bar retainers need to be inserted on top of the vertical row of fire bricks on both sides of the stove.



Occasionally due to small variations in components and materials, it is normal for the bricks to have differing degrees of fit in any stove, but the specific fit and tolerance will not change or impact your stove performance. This includes slight gaps or a tight fit. In the event some bricks are tight, some adjustment or manual force may be needed to install these pieces. Slight gaps will be filled with ash from your first few fires.

Catalytic Combustor

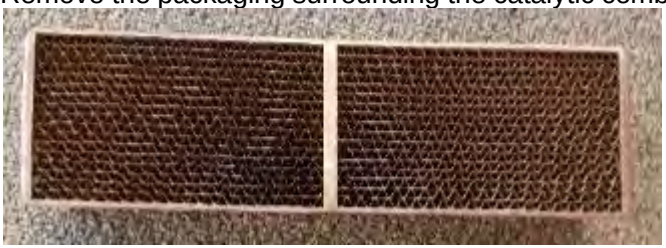
The Nova 2C catalytic combustor (Part # N11) is a long rectangular piece with a honeycomb-like structure.

It can easily be installed as a final step prior to using your stove. Nova 2C may not be operated without the catalytic combustor properly installed. To prevent improper operation, Nova 2C has a special catalytic combustor swing door that stops airflow if the catalytic combustor is improperly installed.

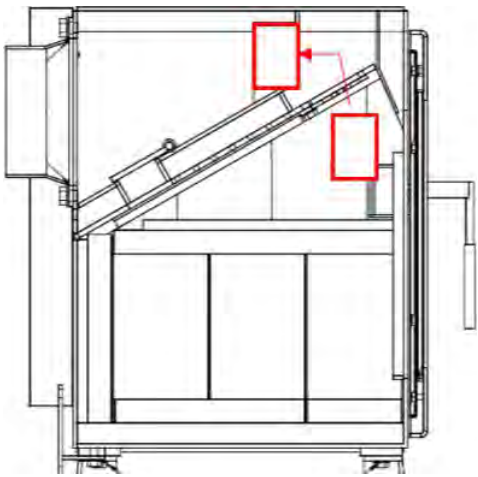
To install the catalytic combustor and flame shield follow the steps below and watch the video using this QR code.

Tips/Tricks

Step 1: Remove the packaging surrounding the catalytic combustor.



Step 2: Slide the catalytic combustor through the rectangular opening. The mesh sides should be facing the front and rear of the stove as shown in the diagram below.



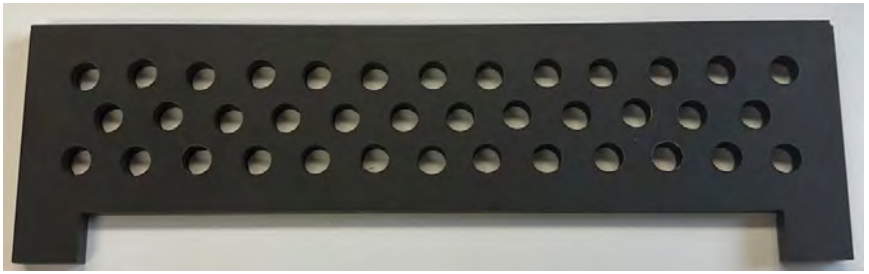
Step 3: Slide the catalytic combustor into the holding box, pushing back the combustor door, and sliding the combustor back as far as it can go in the holding box. The combustor may be a snug fit, which is normal.

Step 4: Insert the ‘U’ shaped retaining peg in the front of the catalytic combustor. The combustor retaining peg may be in the top of the stove in front of the combustor.

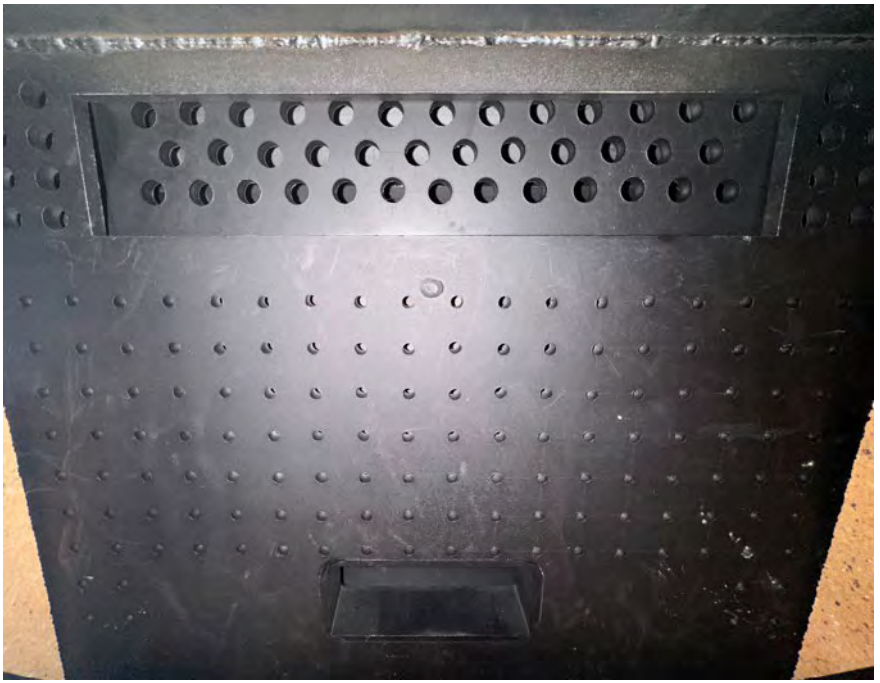
Caution: Without this retaining peg the catalytic combustor may slide forward, preventing the stove from operating as intended.

Step 6: Install the flame shield.

To install the flame shield (shown below), take the flame shield and angle it up into baffle opening where the combustor passed through. Next, lay the flame shield flat with the two tabs pointed towards the rear of the stove.



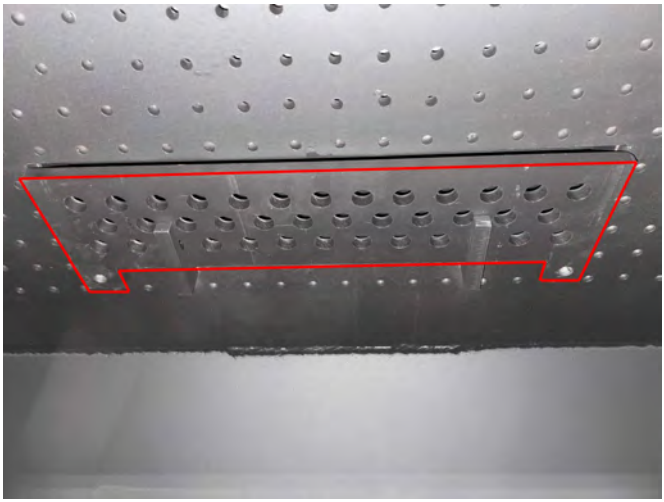
Flame shield



Flame shield final position

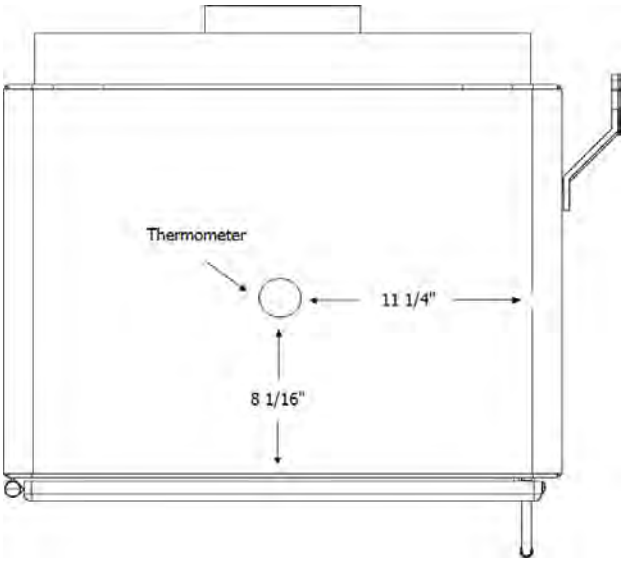
Bypass Restrictor Plate

Unpack the bypass restrictor plate from within the cardboard packaging within your stove. The bypass restrictor plate should be placed on the underside of the bypass opening at the rear of the firebox as shown below. The tabs should point towards the rear of the fire box. NOTE: this part is the same and interchangeable with the flame shield noted in the Catalytic Combustor section.



Stove Top Thermometer

The stove top thermometer is an accessory that can be used to help determine when to close the catalytic combustor bypass on your Nova 2C. The thermometer should be placed on the stove top, 8” from the front of the stove and 11.25” from the side of the stove. For most uses, when the thermometer reads “ENGAGE CATALYST”, the catalytic combustor bypass can be swung closed (to the rear of the stove).



Initial Curing

During the first burn of your wood stove, the paint on the stove may off-gas as part of its final curing process. This is to be expected. Open windows and ventilation means are recommended. Please refer to the Exterior Paint section for additional details.

Operation

Nova 2C is built to be simple and easy to use. It just works. We designed Nova 2C with no dampers to play with. Just build a fire, sit back and enjoy. Below are written operation instructions. We also **highly recommend watching** our series of videos on how to best operate your stove by scanning this QR code.

Quick Start/Operations Videos

Bypass

Nova 2C is equipped with a bypass lever for the catalytic combustor. The bypass handled is located on the right side of the stove and should be operated with the included fall-away handle. When not used, the fall-away handle can be stored on the rear of the unit.

The bypass should always be used in conjunction with the front-loading door. Prior to opening the stove door, the bypass should be rotated forward to the open position. The door may then be opened. To minimize smoke spillage when reloading, open the door slowly, cracking it for 30 seconds before fully opening. After reloading your stove the door may be closed and then the bypass rotated to the closed position. By operating the two in conjunction with one another you may minimize smoke spillage and maximize the efficiency of your stove.

Starting a Fire

We strongly recommend a top-down fire for burning in Nova 2C. In the top-down fire method, larger pieces of wood are first placed on the floor of the wood stove fire box, with smaller pieces of wood, kindling, and newspaper on top. Take a match or lighter to the newspaper, and the fire will burn slowly into the kindling and to the larger logs underneath. It may take a few tries to build a fire with the top-down fire in order to get it just right, but the result is a cleaner, easier, and by far the best way to build a fire in a wood stove.

Step 1: Establish draft

If starting from a cold start it is important to establish draft in your chimney before filling the stove with wood. Chimney's draft when they are hotter than the air outside the chimney. Particularly on warm mornings in the spring or the fall, the chimney can be colder than the outside air. In this situation, air will flow down your chimney, through your stove, and into the room.

To remedy this, simply open the bypass and ignite a few pieces of newspaper up near the bypass opening until the flames are noticeably drawn (or sucked in) towards the bypass opening in the rear of the stove.

Step 2: Build the base
Set larger logs on the floor of your wood stove firebox.
In beginning to build a fire, it is necessary to begin with a solid foundation of wood. The pieces should be at least 3 – 5 inches in diameter.

Step 3: Build the fire ladder
Set a 2nd layer of medium logs atop the larger logs in a crisscross fashion. It is best to choose medium logs which are approximately 50%-75% of the size of the larger logs. Then, place a third layer of small logs atop the medium logs in a crisscross fashion. The small wood pieces should be approximately 1-2 inches in diameter.

The initial fire you build will catch the smallest logs and these in turn will catch the medium logs which will in turn catch the largest logs.

Step 4: Place the kindling
Set fine kindling on top of small logs. Typically, we place wood splits, heavy-duty cardboard, or both.

Step 5: Prepare the ignition material
We like using knots of newspaper as our ignition material. To make a newspaper knot, tear a sheet of newspaper, twist it together to create a rope-like piece, and tie into a knot. Place three or four knots above the kindling evenly throughout the width of the fire box.

Step 6. Light the fire
Be sure the bypass is still open (see Bypass section) and then ignite the newspaper. Leave the door open just a crack, being sure to monitor the fire at all times when the door is open. Ignite the newspaper knots. This can be done quickly with a long match or stick lighter. After three minutes, close the front door

Step 7. Press the Eco-Regulator button
By pressing this button, a 35-minute timer will start. After 35-minutes, the Eco-Regulator will close the slide damper automatically.

Step 8. Closs the bypass
When the stove thermometer reaches the ENGAGE zone, close the bypass.

Controlling the Burn

Your Nova 2C has only one burn mode – perfect. If you would like more or less heat out of your Nova 2C, simply load more or less wood into your stove.

Reloading

The best time to reload your wood stove is when there are hot coals remaining and there is none or limited active flaming. When reloading, if there is a large coal bed (glowing red coals, covering the entire bottom, at least an inch deep), there is no need to use kindling or newspaper. To reload, open the bypass and then slowly open the front door. Fill the firebox chamber with logs, taking care not to stack the logs too close or touching the front door glass. Then simply shut the door and walk away. Close the bypass when the provided thermometer reads “ENGAGE CATALYST”.

Wood Selection

Use ONLY untreated wood in your Nova 2C. The use of any other fuel may result in unsafe burning conditions that could cause damage to your stove. When choosing wood, you should use non-resinous, seasoned hardwoods if possible. Examples of appropriate hardwoods are oak, ash, and maple. Seasoned wood is wood with between 15-20% moisture content. To test the moisture content, split a piece of wood and use your wood moisture meter on the interior center of the wood. Store this wood in a dry place and remote from your Nova 2C.

Why does dry wood matter? It burns much more efficiently, increasing heat output from the stove and reducing creosote buildup in the chimney. Refer to our website blog posts for additional information regarding non-resinous, seasoned hardwoods.

Ordinary Operating Sounds

During the typical operation of your Nova 2C, the wood stove will make occasional creaking noises. This is completely normal and is likely caused by the heating and cooling of the stove.

Regular Maintenance and Troubleshooting

Wood stoves, even those as clean as Nova 2C, must be cleaned frequently because soot, ash, and creosote may accumulate.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

Glass

Caution: Do not clean the glass while hot. Glass could shatter causing burns and permanent damage.

The glass will accumulate some soot through the course of regular burning. More soot will accumulate during slow burns than during hotter burns. Sooting is worse with unseasoned or resinous woods. To clean the glass, the unit should be allowed to cool. Use a soft cloth and a non-ammonia, non-abrasive cleaner. There are many options for wood stove glass cleaner, including on the MF Fire website.

Sooting may also be a result of a loose door or glass seal. If there is smoke leakage around the edges of the glass, the glass seal may be improved by tightening the various bolts and nuts securing the glass to the door. Tighten with hand tools only. Machine tightening may result in glass breakage. Do not over tighten.

Disposal of Ashes

Ashes should be placed in a steel container with a tight-fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

Door Gaskets

Inspect all gaskets and door seals before each use. Nova 2C should be operated with the front door tightly shut.

Catalytic Combustor

This wood heater contains a catalytic combustor to help achieve a clean burn. It is important to periodically monitor the operation of the catalytic combustor to ensure it is properly functioning, and not clogged. A clogged or otherwise non-functioning combustor will result in poor performance, smoke leakage, a loss of heating efficiency, and an increase in creosote and emissions.

Your catalytic combustor should be visually inspected at least monthly to check its condition. Do not attempt to inspect the catalytic combustor unless the stove is cool and not currently in use. To inspect the catalytic combustor simply open the door of your wood heater, remove the catalytic combustor flame shield, and removing the combustor retaining peg. Next, pull the catalytic combustor forward and remove it from the stove for inspection. If there is some ash on the catalytic combustor, use a soft bristled brush or vacuum to clean off the ash.

A properly functioning catalytic combustor maintains temperatures in excess of 600 °F. Following cleaning, if the catalytic combustor does not function, it may need to be replaced. For replacement instructions refer to the Catalytic Combustor Replacement section of this owner's manual.

You can find a video on how to remove your catalytic combustor by scanning this QR code:

Monthly Maintenance

Creosote – Formation and Need for Removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire.

The chimney and chimney connector should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

The use of unseasoned (wet, green) and/or resinous wood will increase the formation of creosote.

If you are not confident in performing a creosote inspection, contact a local chimney sweep to perform an inspection. Excess creosote buildup may cause a chimney fire that may result in property damage, injury, or death.

Gasket

There is a gasketing located on the front door, and on the front door glass. The gasket in these areas should be visually inspected for any signs of deterioration or smoke leakage into the room. If the gasket is deteriorating, contact MF Fire for a replacement gasket.

Annual Maintenance

Exterior Paint

To fix areas on the exterior of the stove that have been scratched or scraped, simply use aerosol stove paint. The paint needed for color match touch-up is Stove Bright Satin Black (1990).

Paint should only ever be applied while the stove is cool (room temperature). After applying the paint, the newly painted area may appear darker than original until it is cured. When using the stove next, the curing process may give off some fumes.

Glass

In the event of broken door glass, a new pane of glass must be installed before usage may continue. **Do not operate with broken glass!**

To prevent broken glass, avoid striking the glass, slamming the door shut, or building the fire too close to the glass.

To replace broken glass, carefully open the front door while the stove is cool. Remove large shards with gloves and dispose of appropriately. Then carefully unscrew the interior door frame, taking care to keep all screws.

Replace the glass with official MF Fire replacement glass. Do not use unauthorized substitute materials. Contact your place of purchase if replacement glass is needed.

When replacing glass, ensure the glass is properly surrounded by graphene impregnated wood stove gasket, and centered over the window opening.

Catalytic Combustor Replacement

If you suspect that your catalytic combustor is not working, the catalytic combustor should be removed and inspected to identify the source of the problem.

CAUTION: DO NOT OPERATE THE NOVA 2C WOOD HEATER WITH CATALYTIC COMBUSTOR REMOVED!

To access the catalytic combustor follow the instructions in the catalytic combustor installation section of this manual.

If any cracking or peeling is observed, the catalytic combustor must be immediately replaced. Please contact your place of purchase for a replacement catalytic combustor.

If you are unsure if the catalytic combustor is working properly, it should first be cleaned following the cleaning instructions in this manual. Then, a test can be performed. Start a new fire per the instructions in this manual. Next, you can compare the smoke exiting the chimney with the bypass open and then with the bypass closed. After the fire is established and the thermometer is in the ENGAGE zone, perform a visual test of the smoke exiting the chimney. First, open the bypass, wait a few minutes and then observe the smoke exiting the chimney. Now close the bypass, wait a few minutes and observe the smoke exiting from the chimney. There should be significantly less smoke exiting the chimney when the bypass is closed (catalytic combustor engaged).

Safety Notice: Burn untreated wood only. Burning materials such as treated wood, metal foil, coal, plastic, garbage, sulphur, or oil may damage the catalytic combustor. Excessive smoking indicates the combustor has failed and requires replacement.

Appendix A: Nova 2C Tower Assembly

Nova 2C Tower ships with the Nova 2C stove, a Nova 2C Tower Pedestal, and optionally 6” pedestal legs.

To assemble the Nova 2C Tower, follow all instructions and guidelines above and the additional guidance below. Please note, Nova 2C must be attached to the Nova 2C Tower Pedestal before the installation of ceramic fiberboard and firebricks.

Attaching the Nova 2C Tower Pedestal

CAUTION: Nova 2C and Nova 2C Tower are heavy. To avoid injury, at least two people should be used to perform all assembly steps involving heavy lifting.

Step 1: If installing the optional Nova 2C Tower 6” legs, carefully rotate the Nova 2C Tower Pedestal on to its side on a soft surface, such as a blanket or carpet as shown below.

Skip to Step 3 if you did not order optional 6” pedestal legs.

Step 2: Using the bolts and washers provided, tightly fasten the 6” legs to the bottom of the pedestal using a socket or adjustable wrench. The hollow side of the legs should point towards the center of the stove, with the flush square surface attached to the stove, as in the image below.

Step 3: Carefully rotate Nova 2C Tower Pedestal into the upright position and place in its final position. Follow all requirements in the Stove Placement Requirements section. Your Nova 2C Tower must be level and sturdy prior to continuing to Step 4.

Step 4: Carefully place Nova 2C on top of the Nova 2C Tower Pedestal ensuring the leg pad holes are aligned with the holes on top of the pedestal. The front of the Nova 2C should face the same direction as the wood storage opening of the pedestal.

Step 5: Using a socket or adjustable wrench, secure the Nova 2C stove to the Nova 2C Tower Pedestal from the underside using the four bolts and four washers provided. At this point, Nova 2C should be very secure to the Nova 2C Tower Pedestal.

Step 6: Using gloves, place blanket insulation and sheet metal shield into the top of the pedestal. These next steps will require both hands and the proper order of operations to complete properly.

Step 7: While facing the pedestal, first place the metal shield and insulation directly on top of the fixed clips on the left-hand side. Next, the metal shield and insulation should be elevated above the clip holders on the right-hand side. Then, using your other hand, slide the two clips into place as shown in the pictures below. The metal shield can then be set down on top of the clips.

Step 8: To insert the removable ash tray, simply slide between the bottom of the stove and the top of the pedestal, as shown below.

To remove the tray, insert the included ash tray handle as shown below, and slide partially out. The same handle can be used to push the tray back into place. When not in use, the ash tray handle may be stored inside the pedestal base.

Appendix B: Lifetime Limited Warranty

To register your stove, go to mffire.com/myproduct. Please provide pictures of your beautiful new installation. Specific exclusions to this warranty are paint, gasket, glass, fasteners, and fire bricks. This warranty is subject to sections A and B. Mileage/labor charges, unless specified below, are not covered by warranty. Labor charges are subject to defined maximum limits by MF Fire. Additional service charges above the defined maximum limits may be charged by the service technician.

Component	Coverage Period			Labor Coverage Period
	Limited Lifetime	5 years	2 years	Years
Firebox, door frame (welds only)	✓			5
Tower or Bench assembly	✓			
Insert Surround Kit assembly	✓			
Bypass plate assembly		✓		2
Bypass handle		✓		2
Catalytic combustor (N11)	✓			
Combustor swing door assembly			✓	1
Air duct(s)			✓	2
Ash lip			✓	2
Ash pan			✓	1
Front door handle assembly			✓	1
Wooden door handle			✓	1
Room blower fan and associated components			✓	1
AES insulation		✓		2
Fire brick retainers			✓	2
Ash retainer		✓		2
Cast iron legs		✓		2
All components not mentioned above are subject to a one-year warranty coverage period.				

A. If warranty service is needed

1. If you discover a problem that you believe is covered by this warranty, you must report it to the place of purchase WITHIN 30 DAYS, indicating model name and serial number.
2. MF Fire has the option of either repairing or replacing the defective component.
3. Any appliance or part thereof that is repaired or replaced during the limited warranty period will be warranted under the terms of the original limited warranty for a period not to exceed the remaining term of the original limited warranty.

B. Conditions and Exclusions

1. This device must be installed, operated, and maintained at all times in accordance with the instructions in the Owner's Manual. Any alteration, willful abuse, accident, neglect, or misuse of the product shall nullify this warranty.
2. This warranty only applies to the initial owner and residence as registered. A wood stove that has been resold or relocated is not covered under warranty.
3. Discoloration and minor expansion, contraction, or movement of certain parts and potential resulting noise, is normal and not a defect and, therefore, not covered under warranty.
4. This warranty does not cover misuse of the stove. Misuse includes over-firing or use of any fuel not recommended by the manual. Misuse of the wood stove can cause serious damage and will void the warranty.
5. Damage to the appliance while it is in transit is not covered by this warranty but is subject to a claim against the carrier.
6. The warranty, as outlined within this document, does not apply to the chimney components or other accessories used in conjunction with the installation or use of the stove.
7. MF Fire is not responsible for inadequate performance caused by environmental conditions.
8. Limited Lifetime is defined as up to seven years.
9. Exclusions to this lifetime limited warranty include: injury, loss of use, damage, failure to function due to accident, negligence, misuse, improper installation, alteration or adjustment of the manufacturer's settings of components, lack of proper and regular maintenance, damage incurred while the appliance is in transit, alteration, or act of God.
10. Damage to surfaces caused by fingerprints, scratches, melted items, or other external sources left on the surfaces from the use of abrasive cleaners is not covered in this warranty.
11. Damage to the surfaces from over-firing is not covered in this warranty.

12. MF Fire is free of liability for any damages caused by the appliance, as well as inconvenience expenses and materials. Incidental or consequential damages are not covered by this warranty.
13. This warranty does not cover any loss or damage incurred by the use or removal of any component or apparatus to or from the Nova.
14. Any statement or representation of products and their performance contained in MF Fire advertising, packaging literature, or printed material is not part of this limited lifetime warranty.
15. MF Fire will not cover the cost of the removal or re-installation of hearths, facing, mantels, venting or other components.
16. This lifetime warranty is the only warranty supplied by MF Fire, the manufacturer of the appliance. All other warranties, whether express or implied, are hereby expressly disclaimed and purchaser's recourse is expressly limited to the warranties set forth herein.
17. Should a return be required, MF Fire will instruct on proper packaging procedures prior to having the part returned. The return shipping address is: MF Fire, 3031 Washington Boulevard, Baltimore, MD 21230.

BORN IN | **MARYLAND**

MF **FIRE**

8. Quality Assurance / Quality Control

8.1 OMNI's Quality Statement

OMNI's Testing capabilities and Evaluation credentials are covered under the requirements of ISO/IEC Standards, which are utilized by the recognized ILAC Accreditation Agencies to ensure that OMNI's services maintain quality and consistency. This includes the appliance Data/Results (associated with the Construction Evaluation and Performance Evaluation), which are summarized in this specific Report, and are maintained through diligent adherence to the accreditation standards. The Testing, Data Evaluation, Document Review, and Evaluation Report are all conducted and adhere to the system and process/procedures requirements of ISO/IEC 17025, as well as the those set forth by each agency's own program guidelines.

Along with the ISO/IEC 17025 and accreditation agency requirements, OMNI incorporates its own procedures and company policies. These are reviewed (at minimum) on an annual basis, through both internal and external audits of OMNI's Quality Management System. A short list of agencies that accredit OMNI for approval to conduct the scope of services provided, please read the list below.

OMNI’s scope of accreditation includes (but is not limited to), the following agencies:

- **International Accreditation Service, Inc. (IAS):** Approved to Test and complete an Evaluation of specified appliances (covered in OMNI's scope of testing certificate) to confirm compliance with performance standard criteria and (ID #TL-130). Also approved for Certification of United States products to the applicable U.S. safety standards (ID #PCA-156) and Inspection/Surveillance of those products (ID #AA-706).
- **Standards Council of Canada (SCC):** Approved for Certification of Canadian products to Canadian safety standards.

  EPA Recognition and Approval: Approved under 40 CFR 60 by the United States EPA as a Test Lab, 3rd Party Certification Body, and an Inspection agency.

If this Evaluation Report is used in an appliance's Certification, an Initial Factory Audit will need to be completed before a Certification can be issued (this may be waived after a client's first Certification has been completed and the client has maintained their Listings in good standing). If the appliance covered in this Report is Certified and Listed on OMNI's Public Listing Directory (PLD), then this Report may be used as a reference document to conduct the annual Quality Control and Product Inspections, which is required to maintain the appliance Listing. If discrepancies are found between the appliance and the information in this Report during the annual inspections, and the owner(s) of the Listing appliance fails to produce evidence or data to resolve said discrepancies, especially in cases that may jeopardize an end-user's safety, then OMNI reserves the right to revoke the appliance Listing.

8.2 - Manufacturer's Quality Assurance Plan (QAP) - (CBI Report Only)

8.3 Equipment and Calibrations

Equipment List

Item No.	Eq. No.	Description	Cal Date	Cal Due
1	340	Moisture Meter	VBU[1]	
2	730	Tape Measure	12/6/2023	12/6/2028
3	431	Moisture Meter Calibrator	10/18/2024	10/18/2025
4	745	Digital Bench Scale	9/25/2024	8/1/2025
5	132	10.00lb audit weight	2/15/2023	2/15/2028
6	274	10.00lb audit weight	4/7/2023	4/7/2028
7	737	Hot-Wire Thermoanemometer	7/1/2024	7/31/2025
8	716	Digital Barometer	11/7/2024	5/7/2025
9	185	Platform Scale	8/26/2024	8/26/2025
10	335	Sample Box (First Hour)	1/8/2025	7/8/2025
11	336	Sample Box (Background)	1/8/2025	7/8/2025
12	691	Sample Box (Train B)	2/11/2025	8/11/2025
13	692	Sample Box (Train A)	2/11/2025	8/11/2025
14	410	Traverse Microtector	5/14/2024	5/14/2025
15	637	Lab Mg Scale	8/26/2024	8/1/2025
16	283a	Precision Weight Set	10/24/2023	10/24/2028
17	273	100mg audit weight	9/10/2024	9/10/2029
18	594	Gas Analyzer	VBU[2]	
19	733	Lab Temperature Humidity Meter	3/14/2025	3/14/2026
20	709	Lab Temperature Humidity Meter	3/6/2023	3/6/2028
21	CC506601	Span Gas, 16.88% CO_2, 4.07%CO	6/20/2023	6/20/2031
22	CC305741	Span Gas, 500 ppm CO	6/6/2023	6/1/2028
23	TC3AAM183	Nitrogen (Zero Gas)		
24	352	Humidity & Temp. Logger- Model: Spectrum SP-2000-20R	10/22/2024	10/22/2026
25	394	Differential Pressure Gauge (Magnehilic) 0-1" WC	3/8/2024	3/8/2029
26	318	Thermometer (Handheld Digital)	3/4/2025	3/4/2026

VBU[1] - Verified Before Use using Item No. 3 prior of each test.

VBU[2] - Calibrated and verified before use using Items 21,22,23 before each test run.

Certificate of Calibration

Certificate Number: 791395

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 230427
Order Date: 03/30/2023
Authorized By: N/A

Property #: OMNI-00274
User: N/A
Department: N/A
Make: Rice Lake
Model: 10 Lbs. (Class F)
Serial #: OMNI-00274
Description: Mass
Procedure: DCN 500901
Accuracy: Class F (±450mg)

Calibrated on: 04/07/2023
*Recommended Due: 04/07/2028
Environment: 20 °C 44 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 175

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.

Received and returned with no case.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
550A	And (A&D) Co.	HP-30K	Analytical Balance, 30Kg	02/07/2024	785492
92A	Rice Lake	1oz to 10 lbs (Class F)	Mass Set,	11/18/2023	759449

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After							Accredited = ✓
Mass							
10 Lbs.	g	4535.9240	4535.474	4536.374	0.324	4535.600 g	3.6E-01 ✓

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

Reviewer

3 Issued 04/07/2023 Rev # 15

Inspector

Certificate of Calibration

Certificate Number: 821552

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 240499
Order Date: 09/09/2024
Authorized By: N/A

Property #: OMNI-00273
User: N/A
Department: N/A
Make: Ohaus
Model: 100 mg
Serial #: OMNI-00273
Description: Mass
Procedure: DCN 500901
Accuracy: Class F (±0.43mg)

Calibrated on: 09/10/2024
*Recommended Due: 09/10/2029
Environment: 21 °C 57 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 126

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.

Received/returned with case.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
723A	Rice Lake	1mg-200g (Class 0)	Mass Set,	12/12/2024	804865
801A	Sartorius	MSE6.6S	Analytical Balance	01/08/2025	807470

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After							Accredited = ✓
Mass							
Mass	mg	100.00000	99.5700	100.4300	0.0064	100.0064 mg	2.9E-02 ✓

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the SI through an NMI such as but not limited to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by ILAC G8:2019. A test uncertainty ratio (TUR) of 4:1, if achievable, is maintained. Where uncertainties are reported, see uncertainties to calculate TUR to determine your possible Risk. The results reported herein apply only to the calibration of the item described above. JJ Calibrations does not alter or update software of the UUT, version stays the same unless otherwise noted. This report may not be reproduced, except in full, without written approval of JJ Calibrations

Reviewer

3 Issued 09/10/2024 Rev # 15

Inspector

CALIBRATED BY TRANSCAT CERTIFICATE OF CALIBRATION

Customer: OMNI-TEST LABORATORIES INC
13327 NE AIRPORT WAY
PORTLAND, OR 97230

PO Number: 230453

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT
ANAB AC-2489.08

ilac-MRA

Certificate/SO Number: 19-E6W3O-20-1 Revision 0

Manufacturer: Troemner/Talboys
Model Number: 100 g - 200 mg
Description: Weight Set, 8 Pcs, Class F
Serial Number: 47883
ID: OMNI-00283A

As-Found: In Tolerance
As-Left: In Tolerance

Issue Date: Oct 24, 2023
Calibration Date: Oct 24, 2023
Due Date: Oct 24, 2028

Calibrated To: Manufacturer Specification
Calibration Procedure: 6-AC11601-3

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2017. Accredited calibrations performed within the Lab Scope of Accreditation are indicated by the presence of the Accrediting Body Logo and Certificate Number. Any measurements on an accredited calibration not covered by the Lab Scope of Accreditation are listed in the notes section of the certificate. SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual QAC-P01-000, the customer Purchase Order and/or Quality Agreement requirements, ISO 9001:2015, ANSI/NCSL Z540.1-1994 (R2002), and ISO 10012:2003, as applicable. When specified contractually, the requirements of ISO TS16949:2009, 10CFR21, 10CFR50 App. B, ASME NQA-1:2012, and ANSI/NCSL Z540.3-2006 (R2013) are also covered.

Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are listed on this certificate.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology(NIST), or the National Research Council of Canada (NRC), or other national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review upon written request at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested. Recorded calibration data is valid at the time of calibration within the stated uncertainties at the environmental conditions noted. The determination of compliance to the specification is specific to the model/serial no./ID no. referenced above based on the tolerances shown; these tolerances are either the original equipment manufacturers(OEM's) warranted specifications or the client's requested specifications. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. Limitations on the uses of this instrument are detailed in the OEM's operating instructions. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Date Received: October 13, 2023
Service Level : R9

Customer Number: 1-599076-000

CALIBRATED BY TRANSCAT

CERTIFICATE OF CALIBRATION

Customer: OMNI-TEST LABORATORIES INC
13327 NE AIRPORT WAY
PORTLAND, OR 97230

PO Number: 230453

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ANAB AC-2489.08

Certificate/SO Number: 19-E6W3O-20-1 Revision 0

As Found/As Left Data

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Cal Process Uncertainty (k=2; ±)	Measurement Uncertainty (k=2; ±)	Units	TUR
Test Environment Ambient Temperature - W1										
Ambient Temperature					20.000 °C					
Test Environment Ambient Relative Humidity - W1										
Relative Humidity					40.00 %RH					
Test Environment Barometric Pressure - W1										
Barometric Presssure					29.751 "Hg@0°C					
Mass Measurement - W1	100.0000g	±(0.02 g)	99.9800	100.0200	99.9982 g		0.00025	0.00025	g	80.0 : 1
Mass Measurement - W2	50.0000g	±(0.01 g)	49.9900	50.0100	49.9994 g		0.00015	0.00015	g	66.7 : 1
Mass Measurement - W3	20.0000g	±(0.004 g)	19.9960	20.0040	20.0010 g		0.000087	0.000087	g	46.0 : 1
Mass Measurement - W4	10.0000g	±(0.002 g)	9.9980	10.0020	9.9998 g		0.000062	0.000062	g	32.3 : 1
Mass Measurement - W5	5.000000g	±(0.001501 g)	4.998499	5.001501	4.999870 g		0.000045	0.000045	g	33.4 : 1
Mass Measurement - W6	2.000000g	±(0.001122 g)	1.998878	2.001122	2.000407 g		0.000032	0.000032	g	35.1 : 1
Mass Measurement - W7	1.00000g	±(0.0009 g)	0.99910	1.00090	1.00011 g		0.000025	0.000025	g	36.0 : 1
Mass Measurement - W8	200.0000mg	±(0.5395 mg)	199.4605	200.5395	200.0602 mg		0.0047	0.0047	mg	100.0 : 1

Date Received: October 13, 2023
Service Level : R9

Customer Number: 1-599076-000

CALIBRATED BY TRANSCAT

CERTIFICATE OF CALIBRATION

Customer: OMNI-TEST LABORATORIES INC
13327 NE AIRPORT WAY
PORTLAND, OR 97230

PO Number: 230453

ANAB ACCREDITED CALIBRATION AND DIMENSIONAL MEASUREMENT ANAB AC-2489.08

Certificate/SO Number: 19-E6W3O-20-1 Revision 0

Field not applicable

Date Received: October 13, 2023
Service Level : R9

Customer Number: 1-599076-000

CALIBRATED BY TRANSCAT CERTIFICATE OF CALIBRATION

Customer: OMNI-TEST LABORATORIES INC
13327 NE AIRPORT WAY
PORTLAND, OR 97230

PO Number: 230453

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT
ANAB AC-2489.08

Certificate/SO Number: 19-E6W3O-20-1 Revision 0

Traceable Standards

Asset	Manufacturer	Model Number	Description	Cal Date	Due Date	Traceability Number	Use
19-321	Fluke	2626-H	Hygro-Thermometer, Probe,	31-May-23	31-Mar-24	19-&19-321-22-1	AF/AL
19-Mass3	Transcat	Echelon III	Transfer Mass Standard Set	23-Oct-23	23-Nov-23	19-&19-Mass3-99-1	AF/AL
19-P100	Troemner	7210-1	Weight Set, 5 kg to 1 g, Class 1	4-Oct-23	31-Oct-24	19-&19-P100-19-1	AF/AL
19-P126	Druck Inc.	DPI 740 (22 to 34 inHg)	Barometer	22-Mar-23	31-Mar-24	19-&19-P126-17-1	AF/AL
19-P129	Mettler Toledo	XPE2004SC	Comparator Balance	25-Oct-22	31-Oct-23	19-&19-P129-15-1	AF/AL
19-P142	Mettler Toledo	UMX5	Micro Balance	25-Oct-22	31-Oct-23	19-&19-P142-13-1	AF/AL

The use of the standard is defined as: AF - used for as-found readings, AL - used for as-left readings.

Environmental Data

Temperature	Relative Humidity	Temp / RH Asset	Lab Area	Lab Description
68.80°F /20.44°C	40.20%	19-321	E2C	Echelon II (10 kg)

Decision Rule

When compliance statements are present, they are reported without factoring in the effects of uncertainty and comply with the guidelines as follows: The acceptance zone is defined as: less than or equal to the high limit, and/or greater than or equal to the low limit. The rejection zones are defined as greater than the high limit and/or less than the low limit. Single measurement results in the acceptance zone are identified as in-tolerance. Single measurement results in the rejection zone are identified as out-of-tolerance (OOT). When all measurement results are in the acceptance zone for repeated measurements, for the same characteristic, the test is identified as in-tolerance. For repeated characteristic measurements, a single measurement result in the rejection zone, will cause the test to be identified as out-of-tolerance (OOT). Data rejection for cause, (outliers) is permitted after the â€œDetermining and Verifying Out Of Tolerance(OOT) and/or Op Fail Readingsâ€□ procedure outlined in this document has been completed and the anomalous reading cannot be repeated, and the anomalous reading does not represent the system under test. Statements of conformity are binary.

CALIBRATED BY TRANSCAT

CERTIFICATE OF CALIBRATION

Customer: OMNI-TEST LABORATORIES INC
13327 NE AIRPORT WAY
PORTLAND, OR 97230

PO Number: 230453

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ANAB AC-2489.08

ilac-MRA

Certificate/SO Number: 19-E6W3O-20-1 Revision 0

Legend

Topic	Description
Accuracy	UUT specification that establishes expected tolerances and a time limit (calibration interval) over which the instrument is expected to hold these tolerances
As Found	Initial measurement results
As Left	Measurement results after adjustment and/or repair
Blank Data Field	Test is not applicable for the UUT
Cal Process Uncertainty (CPU)	The uncertainty of calibration process for the reported measurement result
Calibration Date	Indicates the date that the calibration was completed
Cover Factor (k)	A measure of uncertainty that defines an interval about the measurement result
Due Date	Indicates the end of the calibration cycle as requested by the customer
Issue Date	Indicates the date that the calibration has passed the Data Review Process and was signed by an authorized signatory or the date that a revision to the original certificate has been issued
Low / High Limits	Establishes UUT acceptable performance limits for the test measurement
Measurement Uncertainty	The dispersion of the values attributed to a measured quantity
OOA	Out of Acceptance (#)
OOT	Out of Tolerance (*)
Setpoints	Measurement target values
Traceability	Unbroken chain of comparisons relating an instrument's measurements to a known standard(s)
Traceability Number	Unique identifier(s) used to document traceability of calibration standards
TUR	Test Uncertainty Ratio, ratio of the tolerance or specification of the test measurement in relation to the uncertainty in measurement results
UUT	Unit Under test

CALIBRATED BY TRANSCAT

CERTIFICATE OF CALIBRATION

Customer: OMNI-TEST LABORATORIES INC
13327 NE AIRPORT WAY
PORTLAND, OR 97230

PO Number: 230453

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
CALIBRATION AND DIMENSIONAL MEASUREMENT
ANAB AC-2489.08

ilac-MRA

Certificate/SO Number: 19-E6W3O-20-1 Revision 0

Calibrated At:
1503 E Orangethorpe Ave
Fullerton, CA 92831

Facility Responsible:
1503 E Orangethorpe Ave
Fullerton, CA 92831
800-828-1470

Calibrated By:
Electronically Signed By:
Vianey Manriquez

Vianey Manriquez	Oct 24, 2023
Calibration Technician	07:33:18 -04:00

Reviewed By:
Electronically Signed By:
Cody Viers for

Mathew Bundy	Oct 24, 2023
Lab Manager	10:58:21 -04:00

Unit Barcode: 0900B531163

Date Received: October 13, 2023
Service Level : R9

Customer Number: 1-599076-000

CERTIFICATE OF CALIBRATION

CUSTOMER:	**OMNI-TEST LABORATORIES, INC.** PORTLAND OR	**CALIBRATION DATE:**	***01/08/25***
PO NUMBER:	240516	**CALIBRATION DUE:**	07/08/25
INST. MANUFACTURER:	APEX INSTRUMENTS	**PROCEDURE:**	NAVAIR 17-20MG-02
INST. DESCRIPTION:	AIR SAMPLER	**CALIBRATION FLUID:**	AIR @ 14.7 PSIA 70 F
MODEL NUMBER:	XC-60-EP	**AS RECEIVED:**	WITHIN SPECS.
SERIAL NUMBER:	***N/A; ID# OMNI-00336***	**AS RETURNED:**	WITHIN SPECS.
RATED ACCURACY:	+/-1% RD.	**AMBIENT CONDITIONS:**	765 mm HGA 45 % RH 72 F
UNCERTAINTY GIVEN:	TOTAL measurement uncertainty: +/- .221 % RD. K=2	**CERTIFICATE FILE #:**	***552344.2025***

NOTES: **REFERENCE CONDITIONS: 760mmHGA & 70 DEG. F QM.IM 2.0 REV. DATED 7-27-2020**
DECISION RULE: SIMPLE ACCEPTANCE. MEASUREMENT UNCERTAINTIES NOT TAKEN INTO CONSIDERATION WHEN DETERMINING PASS/FAIL

TEST POINT NUMBER	UUT INDICATED M3/HR PD.METER	DM.STD. ACTUAL M3/HR PD.METER	CORRECTION FACTOR
1	0.050	0.0495	1.0101
2	0.100	0.0989	1.0111
3	0.250	0.2482	1.0073
4	0.500	0.4977	1.0046
5	1.000	0.9960	1.0040
6	1.500	1.4954	1.0031
7	2.000	1.9948	1.0026
8	2.500	2.4945	1.0022
		AVERAGE	1.0056251

TEMPERATURE F DEG.	TEMPERATURE F DEG.
70	70.03

STANDARDS USED:		
A24 TEMP.STD.:HART SCIENTIFIC +/-.19 F (+/-.04 C) TRACE# 1683031933	DUE	06/24/25
A5 VOLUME PROVER +/- .049% BY VOLUME + TRACE NUMBERS. 2-1200 ACFM TRACE# 1649766843,06290041521	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

Issuing Date: 1/8/2025

Approved By:

Cal. Technician:

Calibrated at: X Lab
__ On-Site (Customer's)

Differential Pressure Gauge Calibration/Verification

Instrument to be calibrated

Eq. No,	00336B		
Description	Manometer, ΔH	Date	2/10/2025
Max Range	4	Expires	8/10/2025
Units	Inches of Water		

Reference Gauge

Eq. No.	OMNI-00633
Cal Due Date	10/2/2025
Units	Inches of Water
MU	0.0057
k=	2

Range of Calibration Point	Ref Value	DUT Response	Error
0-20 % of Max Range 0 - 0.8	0.418	0.419	0.001
20 - 40 % of Max Range 0.8 - 1.6	1.376	1.375	-0.001
40-60 % of Max Range 1.6 - 2.4	2.221	2.222	0.001
60-80 % of Max Range 2.4 - 3.2	2.862	2.858	-0.004
80-100% of Max Range 3.2 - 4	3.969	3.961	-0.008

Measurement Uncertianty = ± 0.0096 In. H2O, k=2

Ken Morgan		2/10/25
Technician	Signature	Date

Received: 09/23/24

Making our world more productive

DocNumber: 551950

Linde Gas & Equipment Inc.
5700 S. Alameda Street
Los Angeles CA 90058
Tel: 323-585-2154
Fax: 714-542-6689
PGVP ID: F22023

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

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

Certificate Issuance Date: 06/20/2023
Linde Order Number: 72440820
Part Number: NI CD17CO8E-AS
Customer PO Number: 80449472

Fill Date: 06/16/2023
Lot Number: 70086316710
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure and Volume: 1290 psig 99 ft3

Certified Concentration

ProSpec EZ Cert

Expiration Date: 06/20/2031		NIST Traceable
Cylinder Number: CC506601		Expanded Uncertainty
16.88 %	Carbon dioxide	± 0.15 %
4.07 %	Carbon monoxide	± 0.03 %
17.14 %	Oxygen	± 0.04 %
Balance	Nitrogen	

Certification Information:

Certification Date: 06/20/2023 Term: 96 Months Expiration Date: 06/20/2031

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Uncertainty above is expressed as absolute expanded uncertainty at a level of confidence of approximately 95% with a coverage factor k = 2. Do Not Use this Standard if Pressure is less than 100 PSIG.

CO2 responses have been corrected for Oxygen IR Broadening effect.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Cantidate)

1. **Component:** Carbon dioxide

Requested Concentration: 17 %
Certified Concentration: 16.88 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method: NDIR
Last Multipoint Calibration: 05/30/2023

First Analysis Data:						Date	06/20/2023
Z:	0	R:	19.34	C:	16.89	Conc:	16.88
R:	19.35	Z:	0	C:	16.89	Conc:	16.88
Z:	0	C:	16.88	R:	19.36	Conc:	16.87
UOM:	%				Mean Test Assay:		16.88 %

Reference Standard: Type / Cylinder #: NTRM / CC725981
Concentration / Uncertainty: 19.34 % ±0.16 %
Expiration Date: 01/12/2027
Traceable to: SRM # / Sample # / Cylinder #: NTRM / 190701 / CC725973
SRM Concentration / Uncertainty: 19.34% / ±0.16%
SRM Expiration Date: 01/12/2027

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

2. **Component:** Carbon monoxide

Requested Concentration: 4.25 %
Certified Concentration: 4.07 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method: NDIR
Last Multipoint Calibration: 05/30/2023

First Analysis Data:						Date	06/20/2023
Z:	0	R:	7.81	C:	4.09	Conc:	4.08
R:	7.85	Z:	0	C:	4.07	Conc:	4.06
Z:	0	C:	4.08	R:	7.8	Conc:	4.07
UOM:	%				Mean Test Assay:		4.07 %

Reference Standard: Type / Cylinder #: GMIS / CC187322
Concentration / Uncertainty: 7.81 % ±0.04 %
Expiration Date: 04/03/2025
Traceable to: SRM # / Sample # / Cylinder #: SRM 2642a / 51-D-23 / FF23106
SRM Concentration / Uncertainty: 7.859% / ±0.039%
SRM Expiration Date: 07/15/2019

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

3. **Component:** Oxygen

Requested Concentration: 17 %
Certified Concentration: 17.14 %
Instrument Used: Siemens Oxymat 6E S/N 7MB20211AA000CA1
Analytical Method: Paramagnetic
Last Multipoint Calibration: 05/30/2023

First Analysis Data:						Date	06/20/2023
Z:	0	R:	24.96	C:	17.16	Conc:	17.16
R:	24.97	Z:	0	C:	17.1	Conc:	17.1
Z:	0	C:	17.14	R:	24.94	Conc:	17.14
UOM:	%				Mean Test Assay:		17.14 %

Reference Standard: Type / Cylinder #: GMIS / DT0025134
Concentration / Uncertainty: 24.96 % ±0.04 %
Expiration Date: 12/14/2026
Traceable to: SRM # / Sample # / Cylinder #: SRM 2659a / 71-E-19 / FF22331
SRM Concentration / Uncertainty: 20.863% / ±0.021%
SRM Expiration Date: 02/27/2026

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

Analyzed By: Courtney Zielke

Certified By: Nelson Ma

Certificate of Calibration

Certificate Number: 824767

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 240508
Order Date: 10/24/2024
Authorized By: N/A

Property #: OMNI-00716
User: N/A
Department: N/A
Make: Control Company
Model: 6530
Serial #: 221461635
Description: Thermohygrometer / Barometer
Procedure: 403406
Accuracy: ±3%RH, ±.4°C(0.8°F), ±4mbar

Calibrated on: 11/07/2024
*Recommended Due: 05/07/2025
Environment: 23 °C 40 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 128

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.

TUR<4:1. See Uncertainties to calculate TUR to determine your possible Risk.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
925A	RH Systems	CGS-240	Humidity Generator	04/04/2025	811937

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After							Accredited = ✓
Humidity							
	100 %	20.2030	17.203	23.203	2.797	23.000 %	6E-01 ✓
	100 %	49.6850	46.685	52.685	2.685	47.000 %	6E-01 ✓
	100 %	80.0420	77.042	83.042	0.042	80.000 %	6E-01 ✓
Temperature							
	60 °C	9.9440	9.544	10.344	0.056	10.000 °C	7.5E-02 ✓
	60 °C	25.0220	24.622	25.422	0.022	25.000 °C	7.5E-02 ✓
	60 °C	55.3940	54.994	55.794	0.394	55.000 °C	7.5E-02 ✓
Barometer							
	inHg	29.980	29.87	30.09	0.08	29.90 inHg	1.8E-01 ✓

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the SI through an NMI such as but not limited to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by ILAC G8:2019. A test uncertainty ratio (TUR) of 4:1, if achievable, is maintained. Where uncertainties are reported, see uncertainties to calculate TUR to determine your possible Risk. The results reported herein apply only to the calibration of the item described above. JJ Calibrations does not alter or update software of the UUT, version stays the same unless otherwise noted. This report may not be reproduced, except in full, without written approval of JJ Calibrations

Reviewer

3 Issued 11/08/2024 Rev # 15

Inspector

CERTIFICATE OF CALIBRATION

CUSTOMER:	**OMNI-TEST LABORATORIES, INC.** PORTLAND OR	**CALIBRATION DATE:**	***01/08/25***
PO NUMBER:	240516	**CALIBRATION DUE:**	07/08/25
INST. MANUFACTURER:	APEX INSTRUMENTS	**PROCEDURE:**	NAVAIR 17-20MG-02
INST. DESCRIPTION:	AIR SAMPLER	**CALIBRATION FLUID:**	AIR @ 14.7 PSIA 70 F
MODEL NUMBER:	XC-60-EP	**AS RECEIVED:**	WITHIN SPECS.
SERIAL NUMBER:	***N/A; ID# OMNI-00335***	**AS RETURNED:**	WITHIN SPECS.
RATED ACCURACY:	+/-1% RD.	**AMBIENT CONDITIONS:**	765 mm HGA 45 % RH 72 F
UNCERTAINTY GIVEN:	TOTAL measurement uncertainty: +/- .221 % RD. K=2	**CERTIFICATE FILE #:**	***552345.2025***

NOTES: **REFERENCE CONDITIONS: 760mmHGA & 70 DEG. F QM.IM 2.0 REV. DATED 7-27-2020**
DECISION RULE: SIMPLE ACCEPTANCE. MEASUREMENT UNCERTAINTIES NOT TAKEN INTO CONSIDERATION WHEN DETERMINING PASS/FAIL

TEST POINT NUMBER	UUT INDICATED M3/HR PD.METER	DM.STD. ACTUAL M3/HR PD.METER	CORRECTION FACTOR
1	0.050	0.0492	1.0163
2	0.100	0.0985	1.0152
3	0.250	0.2478	1.0089
4	0.500	0.4972	1.0056
5	1.000	0.9955	1.0045
6	1.500	1.4948	1.0035
7	2.000	1.9942	1.0029
8	2.500	2.4939	1.0024
		AVERAGE	1.0074190

TEMPERATURE F DEG.	TEMPERATURE F DEG.
69	68.98

STANDARDS USED:		
A24 TEMP.STD.:HART SCIENTIFIC +/-.19 F (+/-.04 C) TRACE# 1683031933	DUE	06/24/25
A5 VOLUME PROVER +/- .049% BY VOLUME + TRACE NUMBERS. 2-1200 ACFM TRACE# 1649766843,06290041521	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

Issuing Date: 1/8/2025

Approved By:

Cal. Technician:

Calibrated at: ☒ Lab
☐ On-Site (Customer's)

Differential Pressure Gauge Calibration/Verification

Instrument to be calibrated

Eq. No,	00335B		
Description	Manometer, ΔH	Date	2/10/2025
Max Range	4	Expires	8/10/2025
Units	Inches of Water		

Reference Gauge

Eq. No.	OMNI-00633
Cal Due Date	10/2/2025
Units	Inches of Water
MU	0.0057
k=	2

Range of Calibration Point	Ref Value	DUT Response	Error
0-20 % of Max Range 0 - 0.8	0.392	0.394	0.002
20 - 40 % of Max Range 0.8 - 1.6	1.402	1.405	0.003
40-60 % of Max Range 1.6 - 2.4	2.125	2.126	0.001
60-80 % of Max Range 2.4 - 3.2	2.912	2.908	-0.004
80-100% of Max Range 3.2 - 4	3.876	3.87	-0.006

Measurement Uncertianty = ± 0.0098 In. H2O, k=2

Ken Morgan		2/10/25
Technician	Signature	Date

Established 1974

QUALITY CONTROL SERVICES

LABORATORY EQUIPMENT • SALES • SERVICE • CALIBRATION • REPAIRS

2340 SE 11TH Ave. Portland, Oregon 97214 • Box 14831 Portland, Oregon 97293

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A2LA ACCREDITED
CERTIFICATE #1550.01

OMNI-Test Laboratories, Inc.
13327 NE Airport Way
Portland, OR 97230

Report Number: OMNE03AE83723924240925

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Adam	GFK165aH	AE83723924	N/A	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	0.01	QC033	9/25/24	N/A	8/2025

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 50 Tol: 0.10	Test Wt: HB44 Tol: HB44	Test Wt: 50 Tol: 0.10	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 23.7°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
150	150.20	150.20	0.005
100	100.13	99.99	0.005
75	75.06	79.99	0.005
50	50.04	49.99	0.005
25	25.02	24.99	0.005
10	10.02	10.00	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
Avoirdupois Weight	Rice Lake	10lb to 0.001lb	95473	2/25/24	2/2026	20240410

Permanent Information Concerning this Equipment:

Comments/Information Concerning this Calibration

9/24 - Adjusted span. RH = 59%

Report prepared/reviewed by: _____ **Date:** 9-25-24 **Technician:** D.Oudeans **Signature:** _____

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy. Calibrations comply with ISO/IEC 17025 and ANSI/Z540-1-1994 quality standards.

Member: National Conference of Standards Laboratories and Weights & Measures

PT ID: OMNE03

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625 East Bunker Court
Vernon Hills, Illinois 60061
PH: 866-466-6225
Fax: 847-327-2993
www.innocalsolutions.com

NIST Traceable
Calibration Report

REPORT NUMBER
1769963

Reference Number: 175228700
PO Number: 240506

Omni-Test Laboratories, Inc.
13327 NE Airport Way
Portland, OR 97230 United States

ilac-MRA A2LA ACCREDITED CERT #1746.01

Manufacturer:	Digi-Sense	**Calibration Date**	11/07/2024
Model Number:	20250-16	**Calibration Due Date**	11/07/2025
Description:	Air Velocity, Hot Wire Anemometer	**Condition As Found:**	Out of Tolerance
Asset Number:	OMNI-00737	**Condition As Left:**	In Tolerance After Adjustment
Serial Number:	230544726		
Procedure:	DS Digi-Sense 20250-16		

Remarks:
NIST-traceable calibration performed on the unit referenced above in accordance with customer requirements, published specifications and the lab's standard operating procedures. Unit was received out-of-tolerance as indicated in the as-found data; adjustments were successful in bringing unit within specifications. As-left data reflects measurements taken after adjustments.

Standards Used

Standard ID	Manufacturer	Model Number	Description	Cal Date	Due Date
CP105979	Kanomax	X5602	Air Velocity, Wind Tunnel, Open Jet	7/01/2024	7/31/2025
CP144552	Fluke Corporation	1551A EX	Temperature, Stik Thermometer	7/10/2024	7/31/2025

Calibration Data

Function Tested	Nominal / Reference Value	Measured Value	OOT	Calibration Tolerance *g = Guard Banding Applied*	TUR	EMU
Air Velocity Accuracy	5.00 m/s					
As Found	5.00	4.89		4.74 to 5.26 m/s	6.2:1	± 0.042 m/s
As Left	5.00	5.02		4.74 to 5.26 m/s	6.2:1	± 0.042 m/s
	10.00 m/s					
As Found	10.00	9.70		9.49 to 10.51 m/s	11:1	± 0.045 m/s
As Left	10.00	9.96		9.49 to 10.51 m/s	11:1	± 0.045 m/s
	15.00 m/s					
As Found	15.00	14.26		14.24 to 15.76 m/s	8.1:1	± 0.094 m/s
As Left	15.00	15.01		14.24 to 15.76 m/s	8.1:1	± 0.094 m/s
	20.00 m/s					
As Found	20.00	18.45	X	18.99 to 21.01 m/s	8.1:1	± 0.12 m/s
As Left	20.00	20.04		18.99 to 21.01 m/s	8.1:1	± 0.12 m/s
	25.00 m/s					
As Found	25.00	22.18	X	23.74 to 26.26 m/s	8.1:1	± 0.16 m/s
As Left	25.00	25.06		23.74 to 26.26 m/s	8.1:1	± 0.16 m/s
Temperature Accuracy	25.0 °C					
As Found	25.0	25.0		24.0 to 26.0 °C	13:1	± 0.077 °C
As Left	25.0	25.0		24.0 to 26.0 °C	13:1	± 0.077 °C

Temperature: 23 °C
Humidity: 36 %RH
Rpt. No.: 1769963

Calibration Performed By:		Quality Reviewer:	
Chris Lu	Technician, Metrology	James Alexander	11/7/2024
Name	Title	Name	Date

Established 1974

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A2LA ACCREDITED
CERTIFICATE #1550.01

OMNI-Test Laboratories, Inc.
13327 NE Airport Way
Portland, OR 97230

Report Number: OMNE03B729400181250217

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Mettler	MS104TS	B729400181	OMNI-00637	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
g	0.0001	qcs012	2/17/25	8/26/24	8/2025

FUNCTIONAL CHECKS

ECCENTRICITY
Test Wt: 50 Tol: 0.0001
As-Found: Pass: ☑ Fail: ☐
As-Left: Pass: ☑ Fail: ☐

LINEARITY
Test Wt: 20x4 Tol: 0.0001
As-Found: Pass: ☑ Fail: ☐
As-Left: Pass: ☑ Fail: ☐

STANDARD DEVIATION
Test Wt: 100 Tol: 0.0001

1. 99.9999	5. 100.0001	9. 100.0000
2. 100.0000	6. 100.0000	10. 100.0001
3. 99.9999	7. 100.0000	Result
4. 99.9999	8. 99.9999	0.00007

ENVIRONMENTAL CONDITIONS
☐ Good ☑ Fair ☐ Poor
Temperature: 17.2°C

A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
100	100.0005	100.0001	0.00020
80	80.0008	80.0001	0.00020
50	50.0006	50.0001	0.00019
20	20.0003	20.0000	0.00019
1	1.0001	1.0000	0.00019
0.1	0.0999	0.1000	0.00019

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	Rice Lake	10 kg to 1 mg	D123	7/1/24	7/2025	20241353

Permanent Information Concerning this Equipment:
6 month cycle

Comments/Info Concerning this Calibration:
2/25 - Cleaned, leveled, & adjusted span. RH = 34%

Report prepared/reviewed by: [signature] **Date:** 2/17/25 **Technician:** D.Oudeans
Signature: [signature]

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation and readability of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy. Calibrations comply with ISO/IEC 17025 and ANSI/Z540-1-1994 quality standards. Results relate only to the item(s) tested. Unless otherwise noted, statements of conformity do not include measurement

PT ID: OMNE03

Quality Control Services
Report of Service and Calibration

2340 S.E. 11TH AVENUE
PORTLAND, OR 97214
PHONE 503-236-2712
78658

Sold To OMNI-Test Laboratories, Inc. PT ID: OMNE03 P.O. No: INVOICE
Address PO Box 301367 Contact: Michael Castillo
City Portland, OR 97294 Phone: 503-643-3788
Ship To 13327 NE Airport Way Portland, OR 97230 Email: mcastillo@omni-test.com

No	Item	Make	Model	Serial Number	Location	Contact	Rate	Date Svc'd 2025	Tech	Cust ID
1	Balance	Mettler	MS104TS	B729400181	Lab	Michael Castillo	$195.00	2-17	RO	OMNI-00637

Service / Calibration Documentation Requirements
- ☐ Certificate of Calibration
- ☐ Calibration with Data
- ☒ A2LA Certificate

Received By: _____ Date: _____

Comments: _____

Certificate of Calibration

Certificate Number: 829802

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 250524
Order Date: 02/10/2025
Authorized By: N/A

Property #: OMNI-00733
User: N/A
Department: N/A
Make: Omega
Model: THDP-10
Serial #: 220348
Description: Thermohygrometer
Procedure: 403436
Accuracy: Temp ± 0.6° C , RH ± 3%

Calibrated on: 03/14/2025
*Recommended Due: 03/14/2026
Environment: 23 °C 37 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 135

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.

TUR<4:1. See Uncertainties to calculate TUR to determine your possible Risk.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
925A	RH Systems	CGS-240	Humidity Generator	04/04/2025	811937

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After							Accredited = ✓
Temperature							
	0 °C	0.1140	-0.486	0.714	0.186	0.300 °C	1E-01 ✓
	20 °C	20.0580	19.458	20.658	0.058	20.000 °C	1E-01 ✓
	30 °C	30.5650	29.965	31.165	0.565	30.000 °C	1E-01 ✓
	50 °C	50.0030	49.403	50.603	0.103	49.900 °C	1E-01 ✓
Relative Humidity							
	25 %	29.8440	26.844	32.844	1.256	31.100 %	1.2E+00 ✓
	50 %	50.0140	47.014	53.014	1.086	51.100 %	1.2E+00 ✓
	75 %	75.0980	72.098	78.098	1.502	76.600 %	1.2E+00 ✓

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the SI through an NMI such as but not limited to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by ILAC G8:2019. A test uncertainty ratio (TUR) of 4:1, if achievable, is maintained. Where uncertainties are reported, see uncertainties to calculate TUR to determine your possible Risk. The results reported herein apply only to the calibration of the item described above. JJ Calibrations does not alter or update software of the UUT, version stays the same unless otherwise noted. This report may not be reproduced, except in full, without written approval of JJ Calibrations

Reviewer

3 Issued 03/17/2025 Rev # 15

Inspector

Certificate of Calibration

Certificate Number: 788485

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 230420
Order Date: 02/16/2023
Authorized By: N/A

Property #: OMNI-00709
User: N/A
Department: N/A
Make: Omega
Model: RH81
Serial #: 10361019
Description: Thermohygrometer
Procedure: DCN 401013/403410
Accuracy: RH ±3%, TEMP ±1°C(±1.8°F)

Calibrated on: 03/06/2023
*Recommended Due: 03/06/2028
Environment: 23 °C 35 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 173

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.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
925A	RH Systems	CGS-240	Humidity Generator	02/22/2024	789080

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After							Accredited = ✓
Relative Humidity							
	RH	25.00	22.0	28.0	0.3	25.3 RH	6.3E-01 ✓
	RH	50.00	47.0	53.0	1.3	48.7 RH	6.3E-01 ✓
	RH	75.00	72.0	78.0	0.7	74.3 RH	6.3E-01 ✓
Temperature							
	℃	20.0	19	21	0	20 ℃	2.8E-01 ✓
	℃	30.00	29.0	31.0	0.6	29.4 ℃	2.8E-01 ✓
	℃	40.60	39.6	41.6	0.4	40.2 ℃	2.8E-01 ✓

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

Reviewer

3 Issued 03/08/2023 Rev # 15

Inspector

Certificate of Calibration

Certificate Number: 824107

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 240504
Order Date: 10/10/2024
Authorized By: N/A

Property #: OMNI 00431
User: N/A
Department: N/A
Make: Delmhorst
Model: MCS-1
Serial #: OMNI 00431
Description: Moisture Calibrator
Procedure: Raw Data
Accuracy: Raw Data

Calibrated on: 10/18/2024
*Recommended Due: 10/18/2025
Environment: 22 °C 43 % RH
* As Received: Other - See Remarks
* As Returned: Other - See Remarks
Action Taken: Calibrated
Technician: 128

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.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
582A	Fluke	8508A	8 1/2 Reference Mtr	10/07/2025	819058

Measurement Data

Parameter / Measurement Description	Range	Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After								Accredited = ✓
Resistance								
12 %		MOhm	120.000	0.00	0.00	0.91	120.91 MOhm	5.7E-01 ✓
22 %		MOhm	1.100000	0.00000	0.00000	0.00105	1.10105 MOhm	5.7E-01 ✓

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the SI through an NMI such as but not limited to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by ILAC G8:2019. A test uncertainty ratio (TUR) of 4:1, if achievable, is maintained. Where uncertainties are reported, see uncertainties to calculate TUR to determine your possible Risk. The results reported herein apply only to the calibration of the item described above. JJ Calibrations does not alter or update software of the UUT, version stays the same unless otherwise noted. This report may not be reproduced, except in full, without written approval of JJ Calibrations

Reviewer

3 Issued 10/19/2024 Rev # 15

Inspector

Received 06/22/23

Making our world more productive

Linde Gas & Equipment Inc.
5700 S. Alameda Street
Los Angeles, CA 90058
Tel: 323-585-2154
Fax: 714-542-6689

Customer & Order Information:

LGEPKG TUALATIN OR H
10450 SW TUALATIN SHERWOOD ROAD,
TUALATIN, OR 97062-9547

Linde Order Number: **72440818**
Customer PO Number: **80449468**

Certificate Issuance Date: **6/6/2023**

Certification Date: **6/6/2023**
Lot Number: **70086313906**
Part Number: **NI CD15C5P-AS**
DocNumber: **683272**
Expiration Date: **6/1/2028**

CERTIFICATE OF ANALYSIS

Primary Standard

Component	Requested Concentration (Molar)	Certified Concentration (Molar)	Analytical Reference	Analytical Uncertainty
Carbon dioxide	**15 %**	**15.00 %**	**1**	**± 0.02% Abs.**
Carbon monoxide	**500 ppm**	**502 ppm**	**1**	**± 1%**
Nitrogen	**Balance**	**Balance**		

Cylinder Style: **AS**
Cylinder Pressure @ 70 F: **2000 psig**
Cylinder Volume: **150 ft3**
Valve Outlet Connection: **CGA 350**
Cylinder Number(s): **CC305741**

Fill Date: **5/19/2023**
Analysis Date: **6/1/2023**

Filling Method: **Gravimetric**

Analyst: **Ying Yu**

Approved Signer: **Amalia Real**

Key to Analytical Techniques:

Reference	Analytical Instrument - Analytical Principle
1	Mettler ID5 - Gravimetric Method

Received 6/22/2023

The gas calibration cylinder standard prepared by Linde Gas & Equipment Inc. is considered a certified standard. It is prepared by gravimetric, volumetric, or partial pressure techniques. The calibration standard provided is certified against Linde Gas & Equipment Inc. Reference Materials which are traceable to the International System of Units (SI) through either weights traceable to the National Institute of Standards and Technology (NIST) or Measurement Canada, or through NIST Standard Reference Materials or equivalent where available.

Note: All expressions for concentration (e.g., % or ppm) are for gas phase, by mole unless otherwise noted. Analytical uncertainty is expressed as a Relative % unless otherwise noted.

Certificate of Calibration

Certificate Number: 806340

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 230462
Order Date: 11/30/2023
Authorized By: N/A

Property #: OMNI-00730
User: N/A
Department: N/A
Make: Starrett
Model: TX34-16ME
Serial #: 23275596
Description: Tape Measure, 16'/5m
Procedure: 500614
Accuracy: ±1 Division

Calibrated on: 12/06/2023
*Recommended Due: 12/06/2028
Environment: 20 °C 48 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 175

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.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
591A	Mitutoyo	PH-3500	Optical Comparator	09/19/2024	801238

Measurement Data

Parameter / Measurement Description	Range	Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After								Accredited = ✓
Length								
1-2" (16ths)		Inch	1.00000	0.9375	1.0625	0.0005	1.0005 Inch	3.6E-02 ✓
191-192" (16ths)		Inch	1.00000	0.9375	1.0625	0.0005	1.0005 Inch	3.6E-02 ✓
1-2" (32nds)		Inch	1.000000	0.96875	1.03125	0.00050	0.99950 Inch	1.8E-02 ✓
191-192" (32nds)		Inch	1.000000	0.96875	1.03125	0.00000	1.00000 Inch	1.8E-02 ✓

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the SI through an NMI such as but not limited to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by ILAC G8:2019. Unless otherwise stated, a test uncertainty ratio (TUR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above.

Reviewer

3 Issued 12/07/2023 Rev # 15

Inspector

Dry Gas Meter Calibration Verification

Calibration/Verification Date: 2/11/2025 Expiry Date: 8/11/2025

D.U.T Model: Apex, model XC-50-NK

D.U.T OMNI Eq. No.: OMNI-00692

Equipment Used	Manufacturer/ Model	OMNI Eq. No.	Cal Expiration Date	Average y-factor	y-factor Slope	y-factor intercept	Value	Value or %
Reference DGM:	Sensus S-275	OMNI-00330	5/1/2025	1.00179	0.0002145	1.0013147	0.42	%
Barometer:	Traceable	OMNI-00715	7/5/2025				0.18	Value
Manometer:	Dwyer	OMNI-00633	10/2/2025				0.0058	Value
Thermometer:	NI/USB-9213	OMNI-00753	2/10/2025				0.999	Value

D.U.T Previous y-factor: 1.020

Using Reference Meter Average, or Linear Trend y-Factor? Average

Calibration Verification Parameters	Run 1	Run 2	Run 3
Pbar - Barometric Pressure, In. Hg	**30.36**	**30.36**	**30.36**
Pref - Reference Meter Pressure, In. H_2O (ΔH)	**-0.334**	**-0.282**	**-0.364**
Tref,b - Beginning Reference Meter Temperature, °F	**52.9**	**53.1**	**53.1**
Tref, e - Ending Reference Meter Temperature, °F	**53.0**	**53.2**	**53.1**
Vref,b - Beginning Reference Meter Reading, ft^3	**458.500**	**463.800**	**469.015**
Vref,e - Ending Reference Meter Reading, ft^3	**463.601**	**468.764**	**474.247**
Pmeter- Meter DUT Pressure, In. H_2O (ΔH)	**1.24**	**0.91**	**1.54**
Tmeter,b - Meter DUT Temperature, Beginning	**60.5**	**69.1**	**74.9**
Tmeter, e - Meter DUT Temperature, Ending	**68.9**	**74.9**	**78.0**
Vmeter,b - Beginning Meter DUT Reading	**0.000**	**0.000**	**0.000**
Vmeter,e - Ending Meter DUT Reading	**5.168**	**5.097**	**5.345**
θ - Time for Run, min	**33.05**	**39.00**	**29.97**
YR - Reference Meter y-factor (Average)	1.002	1.002	1.002
VR -Indicated Total volume of Reference Meter, ft3 (Vref,e-Vref,b)	5.101	4.964	5.232
VM - Indicated Total Volume of Meter DUT, ft3 (Vmeter,e - Vmeter,b)	5.168	5.097	5.345
TR - Average Temperature of Reference Meter, °R	512.95	513.15	513.1
PR - Pressure of Reference Meter (Pb + Pref), In. Hg	30.335	30.339	30.333
TM - Average Temperature of Meter DUT, °R	524.7	532.0	536.5
PM - Pressure of Meter DUT (Pb + Pmeter), In. Hg	30.451	30.427	30.473
CFM - Meter DUT Flow-rate, cfm (VM / θ)	0.156	0.131	0.178
Meter DUT calculated y factor $y = (VR \times YR \times PR \times TM) / (VM \times PM \times TR)$	1.0076	1.0086	1.0205
Uncertainty ± % RD (k=1)	0.488%	0.488%	0.487%
Average Meter DUT y-factor	**1.0122**		
Meter DUT y-factor deviation from average	0.0046	0.0037	0.0083
Acceptability (< 0.020)	Good	Good	Good
Comparison with previous calibration (%)	1.239	1.142	0.053
Acceptability (<5%)	Good	Good	Good

Measurement Uncertianty = ± 0.975 % RD, k=2

Conducted as specified in EPA Method 5, sections 10.3 and 16.1.

Ken Morgan
Technician

Signature

2/11/25
Date

Dry Gas Meter Calibration Verification

Calibration/Verification Date: 2/11/2025 Expiry Date: 8/11/2025

D.U.T Model: Apex, model XC-50-NK

D.U.T OMNI Eq. No.: OMNI-00691

Equipment Used	Manufacturer/ Model	OMNI Eq. No.	Cal Expiration Date	Average y-factor	y-factor Slope	y-factor intercept	Value	Value or %
Reference DGM:	Sensus S-275	OMNI-00330	5/1/2025	1.00179	0.0002145	1.0013147	0.42	%
Barometer:	Traceable	OMNI-00715	7/5/2025				0.18	Value
Manometer:	Dwyer	OMNI-00633	10/2/2025				0.0058	Value
Thermometer:	NI/USB-9213	OMNI-00753	2/10/2025				0.999	Value

D.U.T Previous y-factor: 1.020

Using Reference Meter Average, or Linear Trend y-Factor? Average

Calibration Verification Parameters	Run 1	Run 2	Run 3
Pbar - Barometric Pressure, In. Hg	**30.34**	**30.33**	**30.31**
Pref - Reference Meter Pressure, In. H_2O (ΔH)	**-0.302**	**-0.284**	**-0.356**
Tref,b - Beginning Reference Meter Temperature, °F	**49.6**	**49.6**	**49.8**
Tref, e - Ending Reference Meter Temperature, °F	**49.6**	**49.7**	**49.7**
Vref,b - Beginning Reference Meter Reading, ft^3	**478.100**	**484.500**	**492.300**
Vref,e - Ending Reference Meter Reading, ft^3	**484.322**	**492.050**	**497.557**
Pmeter- Meter DUT Pressure, In. H_2O (ΔH)	**1.20**	**0.94**	**1.53**
Tmeter,b - Meter DUT Temperature, Beginning	**57.1**	**67.5**	**74.1**
Tmeter, e - Meter DUT Temperature, Ending	**66.9**	**73.8**	**75.3**
Vmeter,b - Beginning Meter DUT Reading	**0.000**	**0.000**	**0.000**
Vmeter,e - Ending Meter DUT Reading	**6.206**	**7.663**	**5.373**
θ - Time for Run, min	**39.00**	**56.00**	**29.00**
YR - Reference Meter y-factor (Average)	1.002	1.002	1.002
VR -Indicated Total volume of Reference Meter, ft3 (Vref,e-Vref,b)	6.222	7.550	5.257
VM - Indicated Total Volume of Meter DUT, ft3 (Vmeter,e - Vmeter,b)	6.206	7.663	5.373
TR - Average Temperature of Reference Meter, °R	509.6	509.65	509.75
PR - Pressure of Reference Meter (Pb + Pref), In. Hg	30.318	30.309	30.284
TM - Average Temperature of Meter DUT, °R	522.0	530.7	534.7
PM - Pressure of Meter DUT (Pb + Pmeter), In. Hg	30.428	30.399	30.423
CFM - Meter DUT Flow-rate, cfm (VM / θ)	0.159	0.137	0.185
Meter DUT calculated y factor $y = (VR \times YR \times PR \times TM) / (VM \times PM \times TR)$	1.0251	1.0246	1.0234
Uncertainty ± % RD (k=1)	0.488%	0.488%	0.488%
Average Meter DUT y-factor	**1.0244**		
Meter DUT y-factor deviation from average	0.0007	0.0003	0.0009
Acceptability (< 0.020)	Good	Good	Good
Comparison with previous calibration (%)	0.508	0.464	0.345
Acceptability (<5%)	Good	Good	Good

Measurement Uncertianty = ± 0.977 % RD, k=2

Conducted as specified in EPA Method 5, sections 10.3 and 16.1.

Ken Morgan
Technician

Signature

2/11/25
Date

Certificate of Calibration

Certificate Number: 814407

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 240483
Order Date: 04/30/2024
Authorized By: N/A

Property #: OMNI-00410
User: N/A
Department: N/A
Make: Dwyer
Model: 1430
Serial #: OMNI-00410
Description: Microtector
Procedure: 500908
Accuracy: ±0.00025" WC

Calibrated on: 05/14/2024
*Recommended Due: 05/14/2025
Environment: 20 °C 49 % RH
* As Received: Limited
* As Returned: Limited
Action Taken: Calibrated
Technician: 135

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.

Previous limit continued. Limited calibration: Only micrometer head calibrated. Test Uncertainty Ratio = 1.71:1. Received and returned with case.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
21A	Mojave	36" X 48"	Surface Plate	09/13/2024	801235
913A	Starrett	SS88.A1	Gage Block Set, 88 Pieces	08/03/2024	797425

Measurement Data

Parameter / Measurement Description	Range	Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After								Accredited = ✓
Length								
		Inch	0.1300	0.129	0.131	0.000	0.130 Inch	5.8E-04 ✓
		Inch	0.3850	0.384	0.386	0.000	0.385 Inch	5.8E-04 ✓
		Inch	0.6150	0.614	0.616	0.000	0.615 Inch	5.8E-04 ✓
		Inch	0.8700	0.869	0.871	0.000	0.870 Inch	5.8E-04 ✓
		Inch	1.0000	0.999	1.001	0.000	1.000 Inch	5.8E-04 ✓

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the SI through an NMI such as but not limited to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by ILAC G8:2019. Unless otherwise stated, a test uncertainty ratio (TUR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. JJ Calibrations does not alter or update software of the UUT, version stays the same unless otherwise noted. This report may not be reproduced, except in full,

Reviewer

3 Issued 05/18/2024 Rev # 15

Inspector

Certificate of Calibration

Certificate Number: 809188

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 1564/240469
Order Date: 02/01/2024
Authorized By: N/A

Property #: OMNI-00394
User: N/A
Department: N/A
Make: Dwyer
Model: 2001
Serial #: R070831GR73
Description: Magnehelic Pressure Gage, 0-1.0 InH2O
Procedure: DCN 500792
Accuracy: ±2% FS

Calibrated on: 03/08/2024
*Recommended Due: 03/08/2029
Environment: 20 °C 32 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 111

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.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
847A	Fluke	RPM4	Reference Pressure Monitor	06/01/2024	787534

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty	Accredited = ü
Before/After								
Pressure								
	In/H20	0.20630	0.1863	0.2263	0.0063	0.2000 In/H20	5.9E-03	ü
	In/H20	0.40650	0.3865	0.4265	0.0065	0.4000 In/H20	5.9E-03	ü
	In/H20	0.60740	0.5874	0.6274	0.0074	0.6000 In/H20	5.9E-03	ü
	In/H20	0.80610	0.7861	0.8261	0.0061	0.8000 In/H20	5.9E-03	ü
	In/H20	1.00770	0.9877	1.0277	0.0077	1.0000 In/H20	5.9E-03	ü

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the SI through an NMI such as but not limited to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by ILAC G8:2019. Unless otherwise stated, a test uncertainty ratio (TUR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above.

Reviewer

3 Issued 03/12/2024 Rev # 15

Inspector

Certificate of Calibration

Certificate Number: 830345

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 250525
Order Date: 02/20/2025
Authorized By: N/A

Property #: OMNI-00318
User: N/A
Department: N/A
Make: Fluke
Model: 52 II
Serial #: 89160126
Description: Thermometer
Procedure: 400048
Accuracy: ±0.05%+.3°C

Calibrated on: 03/04/2025
*Recommended Due: 03/04/2026
Environment: 22 °C 39 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 126

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.

TUR<4:1. See Uncertainties to calculate TUR to determine your possible Risk. Received/returned with cover.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
804A	Fluke	5522A	Calibrator, SC1100 Option	01/10/2026	823539
880A	Hart Scientific	1502A	Precision Digital Thermometer	06/10/2025	816135
889A	Fluke	5618B	PRT	09/13/2025	816153

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After							Accredited = Ü
Thermocouple Type K							
T1 @ 0mV	-190 °C	0.00	-0.3	0.3	0.2	0.2 °C	1.9E-01 Ü
T1 @ 0.9193mV	1200 °C	23.00	22.7	23.3	0.1	23.1 °C	3E-01 Ü
T1 @ -5.8914mV	-190 °C	-200.00	-200.7	-199.3	0.3	-199.7 °C	3.8E-01 Ü
T1 @ 40.8853mV	1200 °C	990.00	989.2	990.8	0.2	990.2 °C	3E-01 Ü
T1 @ 54.8864mV	1200 °C	1372.0	1371	1373	0	1372 °C	4.6E-01 Ü
T2 @ 0mV	-190 °C	0.00	-0.3	0.3	0.2	0.2 °C	1.9E-01 Ü
T2 @ 0.9193mV	1200 °C	23.00	22.7	23.3	0.1	23.1 °C	3E-01 Ü
T2 @ -5.8914mV	-190 °C	-200.00	-200.7	-199.3	0.5	-199.5 °C	3.8E-01 Ü
T2 @ 40.8853mV	1200 °C	990.00	989.2	990.8	0.2	990.2 °C	3E-01 Ü
T2 @ 54.8864mV	1200 °C	1372.0	1371	1373	0	1372 °C	4.6E-01 Ü

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the SI through an NMI such as but not limited to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by ILAC G8:2019. A test uncertainty ratio (TUR) of 4:1, if achievable, is maintained. Where uncertainties are reported, see uncertainties to calculate TUR to determine your possible Risk. The results reported herein apply only to the calibration of the item described above. JJ Calibrations does not alter or update software of the UUT, version stays the same unless otherwise noted. This report may not be reproduced, except in full, without written approval of JJ Calibrations

Reviewer

3 Issued 03/12/2025 Rev # 15

Inspector

Date

10/22/2024

	Reference OMNI-00291		Logger OMNI-00352	
Time	Thermometer F	Humidity %	Temperature F	Humidity %
15:30	67.5	50.1	67.6	52.2
15:45	67.6	49.6	67.5	47.2
16:00	67.7	48.8	67.6	46.7
16:15	67.7	49.7	67.7	46.9
16:30	67.9	49.5	67.8	46.8
Average:	67.7	49.5	67.7	48.0
	Temp Percent Deviation	**-0.04%**	**Humidity Percent Deviation**	**-3.19%**

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A2LA ACCREDITED
CERTIFICATE #1550.01

OMNI-Test Laboratories, Inc.
13327 NE Airport Way
Portland, OR 97230

Report Number: OMNE03AE83723924240925

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Adam	GFK165aH	AE83723924	OMNI-00745	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	0.01	QC033	9/25/24	N/A	8/2025

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 50 Tol: 0.10	Test Wt: HB44 Tol: HB44	Test Wt: 50 Tol: 0.10	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 23.7°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
150	150.20	150.20	0.005
100	100.13	99.99	0.005
75	75.06	74.99	0.005
50	50.04	49.99	0.005
25	25.02	24.99	0.005
10	10.02	10.00	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
Avoirdupois Weight	Rice Lake	10lb to 0.001lb	95473	2/25/24	2/2026	20240410

Permanent Information Concerning this Equipment:

9/9/2025: The results listed only apply to the item calibrated.

Comments/Information Concerning this Calibration

9/24 - Adjusted span. RH = 59%
09/09/2025: Amended calibration certificate issued to correctly state the As Left weighings at75 lbs. as 74.99lbs. A copy of the scale landscape included with amended certificate. (TG)

Report prepared/reviewed by: T. Greene **Date:** 09.09.2025 **Technician:** D.Oudeans
Report revised by: T. Greene, Field SVS. Mgr. **Date:** 09.09.2025 **Signature:** T. Greene for D. Oudeans

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.

Scale Landscape

OMNI-Test Laboratories, Inc. *13327 NE Airport Way* *Portland, OR 97230*

Item	Serial Number											Std9
Make	Location											Limit9
Model	Contact	Environmental	Linearity	Std1	Std2	Std3	Std4	Std5	Std6	Std7	Std8	Std10
	Customer ID #	Corners	Repeatability	Limit1	Limit2	Limit3	Limit3	Limit5	Limit6	Limit7	Limit8	Limit10
1				150	100	75	50	25	10			
				0.20	0.20	0.20	0.10	0.10	0.10			
				AF - 150.20	AF - 100.13	AF - 75.06	AF - 50.04	AF - 25.02	AF - 10.02	AF -	AF -	AF -
				AL - 150.00	AL - 49.99	AL - 74.99	AL - 49.99	AL - 24.99	AL - 10.00	AL -	AL -	AL -

Scale	AE83723924	Environmental	Linearity	
Adam	Lab	G F P	TstWt: HB44	
GFK165aH	Michael Castillo	Temp:	Tol: HB44	
Eng Units		Shi? Test	A-F F	
lbs	LstCal:	TstWt: 50	A-L F	
Readability	CalDue:	Tol. 0.10	Repeatability	
0.01	Tech= 10	A-F F	TstWt: 50	
Cal Date: 4/25/24		A-L F	Tol: 0.10	
Std(s) ID=	PW0990C4, 95433		A-F	
A2LA Cert	Cal Due: 8/2025		A-L	

Permanent information concerning this instrument

The standards and limits for this instrument are: **GENERIC** 23.7°C **Information concerning this calibration**

span cal

299

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A2LA ACCREDITED
CERTIFICATE #1550.01

OMNI-Test Laboratories, Inc.
13327 NE Airport Way
Portland, OR 97230

Report Number: OMNE03AE83723924240925

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Adam	GFK165aH	AE83723924	N/A	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	0.01	QC033	9/25/24	N/A	8/2025

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 50 Tol: 0.10	Test Wt: HB44 Tol: HB44	Test Wt: 50 Tol: 0.10	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 23.7°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
150	150.20	150.20	0.005
100	100.13	99.99	0.005
75	75.06	79.99	0.005
50	50.04	49.99	0.005
25	25.02	24.99	0.005
10	10.02	10.00	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
Avoirdupois Weight	Rice Lake	10lb to 0.001lb	95473	2/25/24	2/2026	20240410

Permanent Information Concerning this Equipment:

Comments/Information Concerning this Calibration

9/24 - Adjusted span. RH = 59%

Report prepared/reviewed by: _____ **Date:** 9-25-24 **Technician:** D.Oudeans **Signature:** _____

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy. Calibrations comply with ISO/IEC 17025 and ANSI/Z540-1-1994 quality standards.

Member: National Conference of Standards Laboratories and Weights & Measures

PT ID: OMNE03

Temperature Calibration/Verification
EPA Method 28R, ASTM E2515

Booth	Temperature Monitor Type	Equipment Number
E1	National Instruments Datalogger NI-USB 9213	00753

Reference Meter Eq. No.	Reference Meter Calibration Due Date
00373	11-07-25

Calibration/Verification Performed By	Date	Ambient Temperature, °F	Barometric Pressure, In. Hg
K. Morgan	2-10-25	53	30.36

	Input Temperature, °F							
Channel Tag	0	100	300	500	700	1000	1500	2000
Dry Gas Meter A	-0.6	99.5	299.5	499.5	699.5	999.6	1499.6	1999.6
Dryer A	-1.1	99.1	299.1	499.1	699.0	999.0	1499.0	1999.1
Filter A	-1.2	99.0	299.0	499.0	699.0	999.0	1499.0	1999.1
Dry Gas Meter B	-1.1	99.0	299.0	499.0	699.0	999.0	1499.0	1999.1
Dryer B	-1.1	99.0	299.0	499.0	699.0	999.0	1499.0	1999.1
Filter B	-1.1	99.0	299.0	499.0	699.0	999.0	1499.0	1999.0
Dry Gas Meter C	-1.2	99.0	299.0	499.0	699.0	999.1	1499.0	1999.0
Dryer C	0.2	100.2	300.2	500.2	700.2	1000.2	1500.2	2000.1
Filter C	0.2	100.2	300.2	500.2	700.1	1000.3	1500.2	2000.1
Dry Gas Meter D	0.2	100.2	300.2	500.2	700.2	1000.3	1500.2	2000.2
Ambient	-1.2	99.0	299.0	499.0	699.0	999.0	1499.0	1999.0
Stack	-0.9	99.1	299.1	499.1	699.1	999.1	1499.1	1999.1
Dilution Tunnel	-0.8	99.3	299.3	499.2	699.3	999.3	1499.2	1999.2
Catalyst	-0.9	99.2	299.2	499.2	699.2	999.2	1499.2	1999.2
Fire Box Top	-0.9	99.2	299.2	499.2	699.2	999.2	1499.2	1999.2
Fire Box Bottom	-0.9	99.2	299.2	499.2	699.2	999.2	1499.2	1999.0
Fire Box Back	-1.0	99.1	299.1	499.1	699.1	999.1	1499.0	1999.0
Fire Box Left	-1.0	99.1	299.1	499.1	699.1	999.1	1499.1	1999.1
Fire Box Right	-1.0	99.1	299.1	499.1	699.1	999.1	1499.1	1999.0

754

Ken Morgan
Technician

K. Morgan
Signature

2-10-25
Date

Certificate of Calibration

Certificate Number: 824447

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: 240507
Order Date: 10/17/2024
Authorized By: N/A

Property #: OMNI-00373
User: N/A
Department: N/A
Make: Omega
Model: CL24
Serial #: T-210520
Description: Thermometer/Calibrator
Procedure: 400379
Accuracy: Refer to Mfg. Specs.

Calibrated on: 11/07/2024
*Recommended Due: 11/07/2025
Environment: 22 °C 44 % RH
* As Received: Within Tolerance
* As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 175

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.

TUR<4:1. See Uncertainties to calculate TUR to determine your possible risk. Received and returned with probes, cord, case, and manual.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
702A	Fluke	5522A	Calibrator	08/26/2025	818893
880A	Hart Scientific	1502A	Precision Digital Thermometer	06/10/2025	816135
601A	Burns Engineering	200G05B085	INDUSTRIAL PRT	09/29/2025	802942

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After							Accredited = Ü
Thermocouple Type K							
Measure	-50 °C	-50.00	-50.3	-49.7	0.2	-49.8 °C	2.1E-01 Ü
Measure	0 °C	0.00	-0.3	0.3	0.1	0.1 °C	1.9E-01 Ü
Measure	100 °C	100.00	99.7	100.3	0.1	100.1 °C	1.9E-01 Ü
Measure	500 °C	500.00	499.7	500.3	0.1	500.1 °C	3E-01 Ü
Measure	1000 °C	1000.00	999.6	1000.4	0.1	1000.1 °C	3E-01 Ü
Thermocouple Type J							
Measure	0 °C	0.00	-0.3	0.3	0.3	-0.3 °C	1.7E-01 Ü
Measure	100 °C	100.00	99.7	100.3	0.3	99.7 °C	1.7E-01 Ü
Thermocouple Type T							
Measure	0 °C	0.00	-0.3	0.3	0.1	-0.1 °C	1.9E-01 Ü
Measure	100 °C	100.00	99.7	100.3	0.3	99.7 °C	1.9E-01 Ü
Thermocouple Type K							
Source	-50 °C	-49.750	-50.05	-49.45	0.25	-50.00 °C	2.1E-01 Ü
Source	0 °C	0.210	-0.09	0.51	0.21	0.00 °C	1.9E-01 Ü
Source	100 °C	100.250	99.95	100.55	0.25	100.00 °C	1.9E-01 Ü
Source	500 °C	500.290	499.99	500.59	0.29	500.00 °C	3E-01 Ü
Source	1000 °C	1000.390	999.99	1000.79	0.39	1000.00 °C	3E-01 Ü
Thermocouple Type J							
Source	0 °C	0.10	-0.2	0.4	0.1	0.0 °C	1.7E-01 Ü
Source	100 °C	100.180	99.88	100.48	0.18	100.00 °C	1.7E-01 Ü
Thermocouple Type T							
Source	0 °C	0.250	-0.05	0.55	0.25	0.00 °C	1.9E-01 Ü
Source	100 °C	100.160	99.86	100.46	0.16	100.00 °C	1.9E-01 Ü

8.4 - Archival of Appliance Specimen

The tested unit was sealed by OMNI-Test Laboratories after the completion of certification testing. This unit will be stored at the manufacturer's premises in the sealed state until 5 years after the certification testing at the following address:

MF Fire, Inc
12921 Bikle Rd, Smithsburg,
MD 21783
USA

Nova 2 Secured

Typical Seal Applied

9. References

U.S. EPA 40 CFR Part 60, Subpart AAA – "Standards of Performance for New Residential Wood Heaters"

ASTM E2515-11, "Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel", ASTM International, West Conshohocken, PA, 2011, www.astm.org

ASTM E2780-10 (2017) "Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters", ASTM International, West Conshohocken, PA, 2011, www.astm.org

Mark's Standard Handbook for Mechanical Engineers, 9th edition (1986)

CSA B415.1:22 "Performance testing of solid-biofuel-burning heating appliance"

EPA Method 1 - Sample and Velocity Traverses for Stationary Sources

EPA Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 5G - Particulate Matter Wood Heaters from a Dilution Tunnel

EPA Method 28R - Certification and Auditing of Wood Heaters

EPA Source Classification Codes (SCCs) - https://sor-scc-api.epa.gov/sccwebservices/sccsearch/

EPA Method 7E—Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)

10. Appendices

Appendix A - ALT-154

Appendix B - Conditioning data

Appendix C - Catalyst Thermometer Approval

Appendix D - Laboratory Ambient Temperature Data

Appendix A

EPA ALT - 154

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 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

Conditioning data

MF Fire
3031 Washington Boulevard, Suite G
Baltimore, MD 21230
Nova 2

All conditioning was conducted using untreated wood with moisture content between 19%-25%.

Time (Hour)	Weight (lb)	Flue Temp (F)	Cat temp (F)	Date	Technician
0	16.8	363	711	11/4/2024	R. Fisher
1	6.4	489	998	11/4/2024	
2	1.6	410	838	11/4/2024	
3	0.4	323	699	11/4/2024	
4	17.1	299	777	11/5/2024	R. Fisher
5	6.6	401	1001	11/5/2024	
6	1.5	389	804	11/5/2024	
7	0.2	286	737	11/5/2024	
8	16.6	321	801	11/6/2024	R. Fisher
9	6.9	501	947	11/6/2024	
10	1.4	429	712	11/6/2024	
11	0.2	319	641	11/6/2024	
12	16.8	333	891	11/7/2024	R. Fisher
13	7	494	989	11/7/2024	
14	2.1	393	758	11/7/2024	
15	0.7	300	688	11/7/2024	
16	17.4	282	795	11/11/2024	R. Fisher
17	8.1	524	1088	11/11/2024	
18	2.1	388	798	11/11/2024	
19	0.6	312	661	11/11/2024	
20	17.1	326	878	11/14/2024	R. Fisher
21	8.4	531	1071	11/14/2024	
22	2.5	379	809	11/14/2024	
23	0.6	301	701	11/14/2024	
24	16.8	296	698	11/21/2024	R. Fisher
25	6.6	449	914	11/21/2024	
26	1.4	319	786	11/21/2024	
27	0.3	309	682	11/21/2024	
28	16.6	390	881	11/22/2024	R. Fisher
29	7.1	413	901	11/22/2024	
30	1.3	347	842	11/22/2024	
31	0.5	276	792	11/22/2024	
32	17.3	235	754	11/22/2024	
33	7.9	338	1087	11/22/2024	
34	1.9	324	698	11/22/2024	
35	0.6	292	665	11/22/2024	
36	16.7	221	823	11/24/2024	R. Fisher
37	5.9	318	888	11/24/2024	
38	1.3	313	771	11/24/2024	

39	0.1	273	614	11/24/2024	
40	16.9	265	601	11/24/2024	
41	6.5	329	1002	11/24/2024	
42	1.8	315	898	11/24/2024	
43	0.4	271	823	11/24/2024	
44	17.3	385	801	11/25/2024	R. Fisher
45	7.4	360	1086	11/25/2024	
46	2	335	911	11/25/2024	
47	0.7	313	769	11/25/2024	
48	16.6	287	770	11/25/2024	
49	6.9	311	811	11/25/2024	
50	1.7	268	715	11/25/2024	
51	0.3	240	672	11/25/2024	

Appendix C

Catalyst Thermometer Approval

MF Fire Nova Application for U.S. EPA Wood Heater Certification

33 messages

Ryan Fisher <ryan@mffire.com> Thu, May 3, 2018 at 12:26 PM
To: WoodHeaterReports@epa.gov
Cc: aldridge.amanda@epa.gov, "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>, Paul LaPorte <paul@mffire.com>, Information <info@mffire.com>, Kelli O'Brien <kelli@clearstak.com>

To whom it may concern,

Attached please find our application for U.S. EPA Wood Heater Certification for MF Fire's second wood stove, Nova as well as a packet titled "Model Nova EPA Report (CBI) which includes:

- Certification test report prepared by an EPA-approved test laboratory, Clearstak LLC
- Certification of conformity by an EPA-approved third-party certifier, UL LLC
- Quality assurance plan
- Additional required supporting information.

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Two additional comments:

- When requesting the ISO certificates from the third party certifier, UL LLC, the response provided to MF Fire from UL LLC was "We had to provide those Cert. copies at the time we received the Third Party Accreditation. EPA has those Certs on File. We do not need to provide those again."

- MF Fire filled out the application to the best of our understanding. MF Fire was slightly unclear on what the EPA is looking for in the required manufacturer statements in sections 2, 4, 7, and 8. The requirements of sections 2, 4, 7, and 8 are clear, but please inform MF Fire if the form was not filled out as intended by the EPA.

Thank you for your consideration,

Ryan Fisher
COO, MF Fire
Ryan@MFFire.com
Direct Cell: 240-285-4225
Main Office: 1-855-MFFire1

2 attachments

EPA NSPS Affected Source Application Form_MF Fire Nova 050318.pdf
500K

Model Nova EPA Report (CBI).pdf
4680K

Ryan Fisher <ryan@mffire.com> Mon, Aug 20, 2018 at 3:02 PM
To: WoodHeaterReports@epa.gov
Cc: Amanda Aldridge <aldridge.amanda@epa.gov>, "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>, Paul LaPorte <paul@mffire.com>, Information <info@mffire.com>, Kelli O'Brien <kelli@clearstak.com>

To whom it may concern,

I am emailing to receive an update on this submission. If you could please provide an update on when the decision/approval can be expected, it would much appreciated.

Best regards,

Ryan Fisher
COO, MF Fire
Ryan@MFFire.com
Direct Cell: 240-285-4225
Main Office: 1-855-MFFire1

[Quoted text hidden]

Sanchez, Rafael <Sanchez.Rafael@epa.gov> Mon, Aug 20, 2018 at 3:16 PM
To: Ryan Fisher <ryan@mffire.com>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, Information <info@mffire.com>, Kelli O'Brien <kelli@clearstak.com>

Hi Ryan,

Thank you for contacting the U.S. Environmental Protection Agency (EPA). I am currently working on your certification request. It should take a few weeks to get it through our management chain and get you a certification determination.

Rafael Sanchez, Ph.D.

Wood Heater Program Lead

Air Branch

Monitoring, Assistance, and Media Programs Division

Office of Compliance

U.S. Environmental Protection Agency (EPA)

Room 7149-D

1200 Pennsylvania Ave., NW

MS:2227A

Washington, DC 20460

202-564-7028

202-564-0050 fax

Please make a note of the new inbox for wood heater certification requests: WoodHeaterReports@epa.gov

317

If you have a wood heater question, please visit the USEPA Wood Heater Compliance Monitoring Program website at http://www2.epa.gov/compliance/wood-heater-compliance-monitoring-program. On that web page, you will find information about the EPA wood heater compliance program including the List of EPA Certified Wood Heaters.

[Quoted text hidden]

Ryan Fisher <ryan@mffire.com> Mon, Aug 20, 2018 at 3:18 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, Kelli O'Brien <kelli@clearstak.com>

Hi Rafael,

Thank you very much for the quick response and update. Have a great day.

Best regards,

Ryan Fisher
COO, MF Fire
Ryan@MFFire.com

Direct Cell: 240-285-4225
Main Office: 1-855-MFFire1

[Quoted text hidden]

Sanchez, Rafael <Sanchez.Rafael@epa.gov> Mon, Aug 20, 2018 at 3:49 PM
To: Ryan Fisher <ryan@mffire.com>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, Information <info@mffire.com>, Kelli O'Brien <kelli@clearstak.com>

Hi Ryan,

I did a quick review for completeness on your test report. Below are some findings or deficiencies:

1. Table 5 Emissions Summary B: CO value should be presented in g/min. Please covert units to the specified units.
2. There is no narration or description of test runs. Please address.

318

(5) All documentation pertaining to a valid certification test, including the complete test report and, for all test runs: Raw data sheets, laboratory technician notes, calculations and test results. Documentation must include the items specified in the applicable test methods. Documentation must include discussion of each test run and its appropriateness and validity, and must include detailed discussion of all anomalies, whether all burn rate

categories were achieved, any data not used in the calculations and, for any test runs not completed, the data collected during the test run and the reason(s) that the test run was not completed and why. The burn rate for the low burn rate category must be no greater than the rate that an operator can achieve in home use and no greater than is advertised by the manufacturer or retailer. The test report must include a summary table that clearly presents the individual and overall emission rates, efficiencies and heat outputs.

3. **No owner's manual. Please submit one.**
4. **Test report doesn't mention the application of the 3/6/18 alternative test method. The Operation Procedures section should note that ATM was used.**
5. **The CBI test report should be sent separately via US Mail or dropbox (not email) and not combined with the non-CBI test report.**
6. **There is no data for run #2 nor narration. Please provide data.**

Please address above-referenced deficiencies and resubmit test reports by 8/24/18. If you have further questions, please let me know.

Rafael Sanchez, Ph.D.

Wood Heater Program Lead

Air Branch

Monitoring, Assistance, and Media Programs Division

Office of Compliance

U.S. Environmental Protection Agency (EPA)

Room 7149-D

1200 Pennsylvania Ave., NW

MS:2227A

Washington, DC 20460

202-564-7028

202-564-0050 fax

Please make a note of the new inbox for wood heater certification requests: WoodHeaterReports@epa.gov

If you have a wood heater question, please visit the USEPA Wood Heater Compliance Monitoring Program website at http://www2.epa.gov/compliance/wood-heater-compliance-monitoring-program. On that web page, you will find information about the EPA wood heater compliance program including the List of EPA Certified Wood Heaters.

From: Ryan Fisher [mailto:ryan@mffire.com]
Sent: Thursday, May 03, 2018 12:26 PM
To: WoodHeaterReports <WoodHeaterReports@epa.gov>
Cc: Aldridge, Amanda <Aldridge.Amanda@epa.gov>; Sanchez, Rafael <Sanchez.Rafael@epa.gov>; Paul LaPorte <paul@mffire.com>; Information <info@mffire.com>; Kelli O'Brien <kelli@clearstak.com>

[Quoted text hidden]

[Quoted text hidden]

Ryan Fisher <ryan@mffire.com> Mon, Aug 20, 2018 at 3:56 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, Kelli O'Brien <kelli@clearstak.com>

Rafael,

Thank you for this notice. We will be addressing these items immediately.

Best regards,

[Quoted text hidden]

Ryan Fisher <ryan@mffire.com> Tue, Aug 21, 2018 at 1:54 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>
Cc: Kelli O'Brien <kelli@clearstak.com>, "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>

Hi Rafael,

The Owner's Manual is attached. Would you like this in the report or does this email attachment suffice? Should the CBI report be mailed to the address in your email signature?

Thank you,

Ryan Fisher
COO, MF Fire
Ryan@MFFire.com
Direct Cell: 240-285-4225
Main Office: 1-855-MFFire1

321

[Quoted text hidden]

Nova Owners Manual.pdf
549K

Kelli O'Brien <kelli@clearstak.com> Tue, Aug 21, 2018 at 2:02 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>, Ryan Fisher <ryan@mffire.com>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, Information <info@mffire.com>

Rafael - Sorry, I am not sure how that happened. Non-CBI report (only) attached with page 14 included.
[Quoted text hidden]

CSL-00010_FRM-000021 Lab ReportV3 NON-CBI.pdf
13052K

Ryan Fisher <ryan@mffire.com> Tue, Aug 21, 2018 at 2:24 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>

Ryan Fisher
COO, MF Fire

Ryan@MFFire.com
Direct Cell: 240-285-4225
Main Office: 1-855-MFFire1

[Quoted text hidden]

CSL-00010_FRM-000021 Lab ReportV3 NON-CBI.pdf
13052K

Ryan Fisher <ryan@mffire.com> Tue, Aug 21, 2018 at 2:24 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>

Ryan Fisher
COO, MF Fire
Ryan@MFFire.com
Direct Cell: 240-285-4225
Main Office: 1-855-MFFire1

---------- Forwarded message ----------
From: **Kelli O'Brien** <kelli@clearstak.com>
Date: Tue, Aug 21, 2018 at 2:02 PM
[Quoted text hidden]

CSL-00010_FRM-000021 Lab ReportV3 NON-CBI.pdf
13052K

Sanchez, Rafael <Sanchez.Rafael@epa.gov> Tue, Aug 21, 2018 at 2:46 PM
To: Kelli O'Brien <kelli@clearstak.com>, Ryan Fisher <ryan@mffire.com>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, Information <info@mffire.com>

Hi Ryan,

Per our conversation, below are additional deficiencies that I identified after submission of the owner's manual.

1. **The test report should include an engineering diagram showing the location of the temperature sensor.** Per WH rule: (h) Temperature sensor requirement.

An affected wood heater equipped with a catalytic combustor must be equipped with a temperature sensor that can monitor combustor gas stream temperatures within or immediately downstream [within 2.54 centimeters. 60.532.

2. Owner's manual should have the following statements for catalytic equipped heaters: 60.536

''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.''

323

3. *Smoke and Carbon Monoxide*

Emissions and Monitors Owner's manual must include:

(a) Discussion of smoke and carbon monoxide (CO) emissions, including the CO data submitted in the certification application and expected variations for different operating conditions;

(b) Recommendation to have smoke monitors; and

(c) Recommendation to have monitors for areas that are expected to generate CO, *e.g.*, heater fueling areas, pellet fuel bulk storage areas, sheds containing hydronic heaters. **Appendix I to Part 60 (page 13753)**

For your convenience, I have attached a copy of the regulations. Please submit the above information by 8/24/18. If you have further questions, please let me know.

(1 inch)]**Rafael Sanchez, Ph.D.**

Wood Heater Program Lead

Air Branch

Monitoring, Assistance, and Media Programs Division

Office of Compliance

U.S. Environmental Protection Agency (EPA)

Room 7149-D

1200 Pennsylvania Ave., NW

MS:2227A

Washington, DC 20460

202-564-7028

202-564-0050 fax

Please make a note of the new inbox for wood heater certification requests: WoodHeaterReports@epa.gov

If you have a wood heater question, please visit the USEPA Wood Heater Compliance Monitoring Program website at http://www2.epa.gov/compliance/wood-heater-compliance-monitoring-program. On that web page, you will find information about the EPA wood heater compliance program including the List of EPA Certified Wood Heaters.

This message may contain sensitive and/or privileged information. If you believe you have received this e-mail in error, please notify me and delete the e-mail immediately.

From: Kelli O'Brien [mailto:kelli@clearstak.com]
Sent: Tuesday, August 21, 2018 12:05 PM

[Quoted text hidden]

[Quoted text hidden]

WH rule.pdf
2496K

Kelli O'Brien <kelli@clearstak.com> Tue, Aug 21, 2018 at 2:59 PM
To: Ryan Fisher <Ryan@mffire.com>

Since this is an engineering drawing I can merge it into Appendix A of the CBI copy. Just send me the drawing when you figure things out on your end.
[Quoted text hidden]

WH rule.pdf
2496K

Ryan Fisher <ryan@mffire.com> Thu, Aug 23, 2018 at 3:23 PM
To: Paul LaPorte <paul@mffire.com>

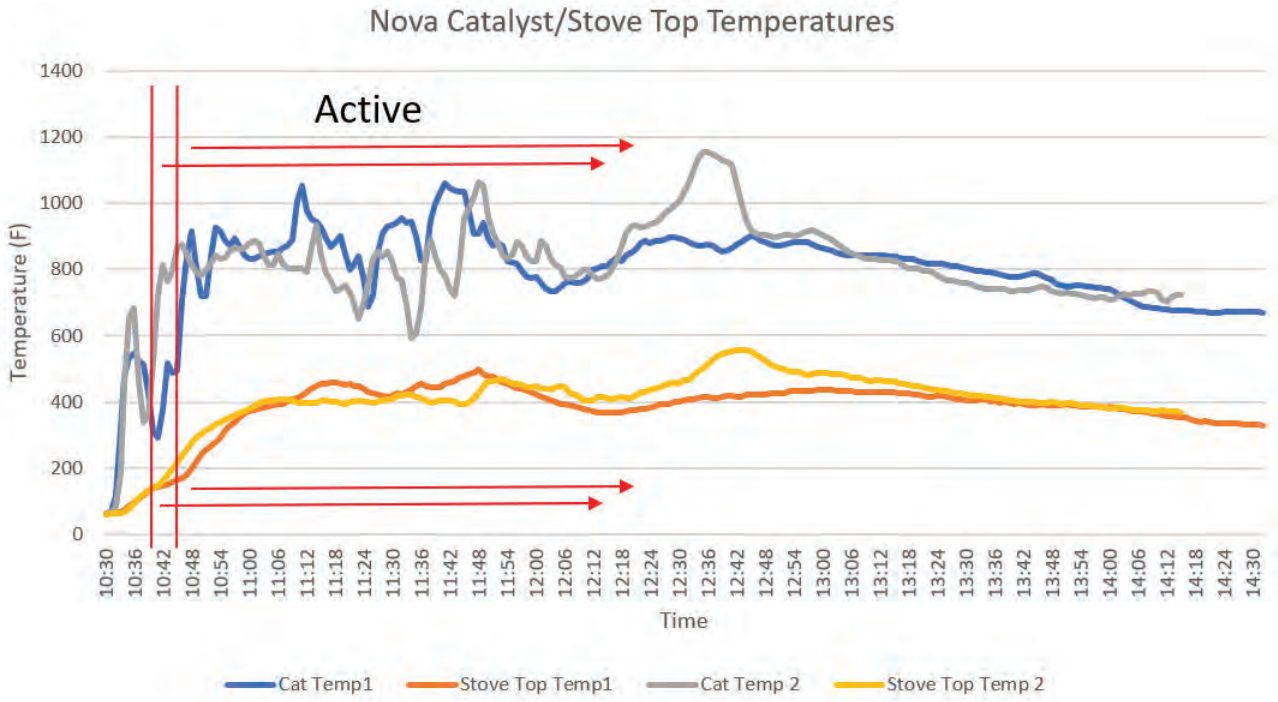
Hi Rafael,

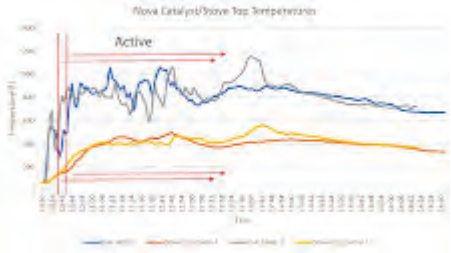
Per our discussion this week, we would like to use a magnetic thermometer placed on top of the stove (Nova) within 1" of the exhaust of the catalytic combustor. The stove top temperature provides a reliable reference to post-catalytic combustor temperature regarding when a user should engage the bypass. Engaging the catalytic combustor via the bypass is recommended at or above 500 F. As you can see from the temperature graphs below from our EPA testing (below and attached), this is reliably seen when the stove top temperature above the catalytic exhaust reaches 200 F. The magnetic thermometer proposed for the stove top of Nova would read "Active" when the stove top thermometer reaches 200 F and above. This, combined with Owner's Manual instruction on using the thermometer and bypass, allows simple instruction to the user on when to engage the catalytic combustor via the bypass.

We see precedent in the market in at least one instance: the Woodstock Soapstone Absolute Steel Hybrid 211 which is certified for 2020. According to the Owner's Manual for this stove, a *stove pipe* thermometer is used to tell the user when to engage the catalytic combustor. We believe our stove top thermometer located within 1" of catalytic combustor exhaust is just as, if not more, effective than a stove pipe thermometer for informing the user on when to engage the catalytic combustor.

I have attached an edit to our engineering drawings detailing this placement.

Please see the pictures below and attached and let me know if you have any questions. We look forward to getting this wrapped up as soon as possible.


Nova Catalyst/Stove Top Temperatures
Active
Temperature (F)
1400
1200
1000
800
600
400
200
0
10:30
10:36
10:42
10:48
10:54
11:00
11:06
11:12
11:18
11:24
11:30
11:36
11:42
11:48
11:54
12:00
12:06
12:12
12:18
12:24
12:30
12:36
12:42
12:48
12:54
13:00
13:06
13:12
13:18
13:24
13:30
13:36
13:42
13:48
13:54
14:00
14:06
14:12
14:18
14:24
14:30
Time
Cat Temp1
Stove Top Temp1
Cat Temp 2
Stove Top Temp 2



Post Cat, Stove Top Temperatures (NOVA).JPG
82K

Magnetic Thermometer.html
2532K

Ryan Fisher <ryan@mffire.com> Thu, Aug 23, 2018 at 4:14 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>

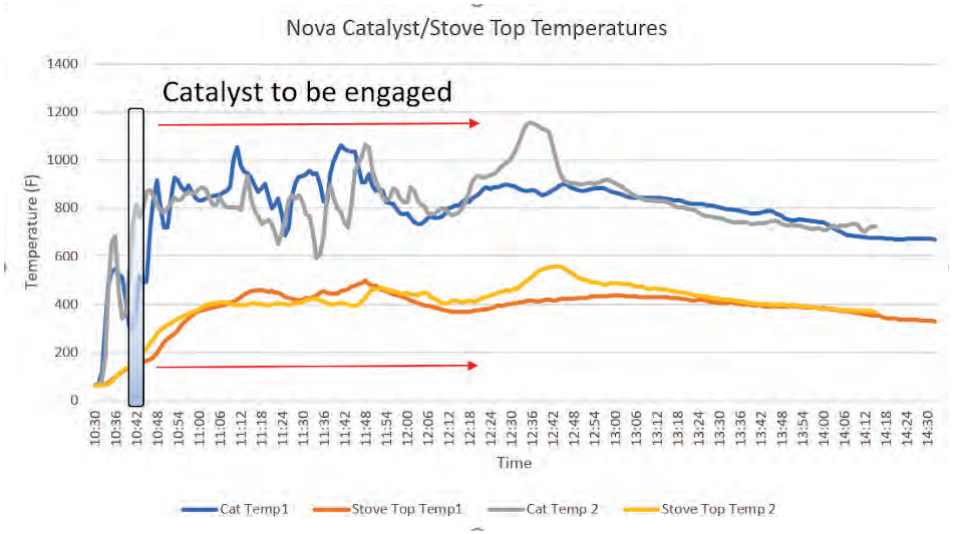
Hi Rafael,

Per our discussion this week, we would like to use a magnetic thermometer placed on top of the stove (Nova) within 1" of the exhaust of the catalytic combustor. The stove top temperature provides a reliable reference to post-catalytic combustor temperature regarding when a user should engage the bypass. Engaging the catalytic combustor via the bypass is recommended at or above 500 F in the exhaust near the catalytic combustor. As you can see from the temperature graphs below from our EPA testing (below and attached), this is reliably seen when the stove top temperature above the catalytic combustor exhaust area reaches 200 F. The blue shaded rectangle on the graph encompasses the area on both tests where the 500 F post-catalytic combustor temperature is met. The magnetic thermometer proposed for the stove top of Nova would read "Active" when the stove top thermometer reaches 200 F and above. An example picture of this style thermometer is attached. This, combined with Owner's Manual instruction on using the thermometer and bypass, allows simple instruction to the user on when to engage the catalytic combustor via the bypass.

We see precedent in the market in at least one instance: the Woodstock Soapstone Absolute Steel Hybrid 211 which is certified for 2020. According to the Owner's Manual for this stove, a *stove pipe* thermometer is used to tell the user when to engage the catalytic combustor. We believe our stove top thermometer located within 1" of catalytic combustor exhaust is just as, if not more, effective than a stove pipe thermometer for informing the user on when to engage the catalytic combustor.

I have attached an edit to our engineering drawings detailing this placement. The edit can be seen on the Nova-01 drawing in the top left view. The location of the thermometer is 1" from the catalytic combustor effluent in the horizontal plane, and less than 1" from the catalytic combustor in the vertical plane.

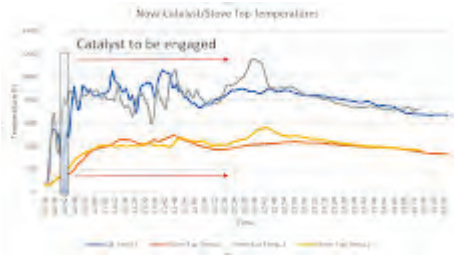
Please see the pictures below and attached and let me know if you have any questions. We look forward to getting this wrapped up as soon as possible. Best regards,



Ryan Fisher
COO, MF Fire
Ryan@MFFire.com
Direct Cell: 240-285-4225
Main Office: 1-855-MFFire1

On Tue, Aug 21, 2018 at 2:46 PM, Sanchez, Rafael <Sanchez.Rafael@epa.gov> wrote:
[Quoted text hidden]

3 attachments



Post Cat, Stove Top Temperatures (NOVA).JPG
83K

Magnetic Thermometer.html
2532K

Nova-01_082318.pdf
432K

Sanchez, Rafael <Sanchez.Rafael@epa.gov> Fri, Aug 24, 2018 at 10:35 AM
To: Ryan Fisher <ryan@mffire.com>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, "Toney, Mike" <Toney.Mike@epa.gov>

Hi Ryan,

I had one of my colleague, Mike Toney, review the eng diagrams and other information. To continue our review, we need to know where the temp sensor is in relation to the cat combustor as shown in plain view cc (from the back of the stove in inches.) Please submit by 8/28/18.

Ryan, I noticed you mentioned the Woodstock hybrid heater and its owner's manual. Is that OM from a recent model or one that was manufactured back in 2015?

[Quoted text hidden]

Ryan Fisher <ryan@mffire.com> Fri, Aug 24, 2018 at 2:16 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, "Toney, Mike" <Toney.Mike@epa.gov>

Hi Rafael,

I have attached an updated drawing that details the distance I believe you are requesting. I think you are requesting the distance form the magnetic thermometer to the top of the catalytic combustor. That distance is 13/16" and I had it added to the bottom-right drawing in the attached drawing. I had this shown from a side cut view because I thought it would be most clear. Please check it out and let me know if you need an additional dimension specified.

Regarding the Woodstock Soapstone model I referred to, I am referring to the documentation on their website which shows a test date of Jan 5 - 14 2016 with a report date of February 2016.

Best,

Ryan Fisher
COO, MF Fire
Ryan@MFFire.com
Direct Cell: 240-285-4225
Main Office: 1-855-MFFire1

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Nova-01_082418.pdf
443K

Ryan Fisher <ryan@mffire.com> Sat, Aug 25, 2018 at 8:59 PM
To: ryanmffire@outlook.com

---------- Forwarded message ---------
From: **Ryan Fisher** <ryan@mffire.com>
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[Quoted text hidden]

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2 attachments

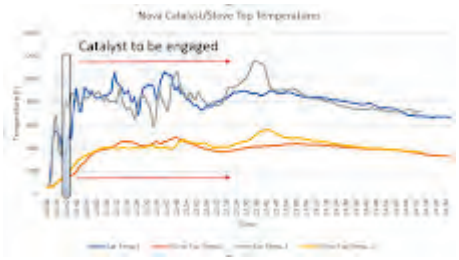

image002.png
51K

Nova-01_082418.pdf
443K

Ryan Fisher <ryan@mffire.com> Tue, Aug 28, 2018 at 8:55 PM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>
Cc: Amanda Aldridge <aldridge.amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, "Toney, Mike" <Toney.Mike@epa.gov>

Hi Rafael,

I hope all is well. I wanted to follow up and see if this was the information your were requesting and if there was any additional information we could provide for your review.

Thank you,
Ryan Fisher
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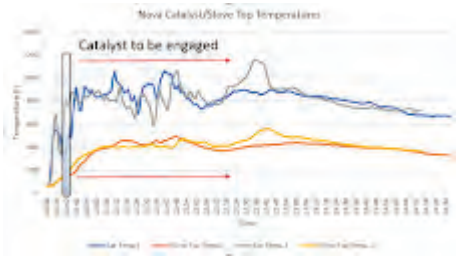

image002.png
51K

Sanchez, Rafael <Sanchez.Rafael@epa.gov> Wed, Aug 29, 2018 at 3:26 PM
To: Ryan Fisher <ryan@mffire.com>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, "Toney, Mike" <Toney.Mike@epa.gov>

Hi Ryan,

I tried to leave a message but it seems that you are out of the country. I wanted to follow up on the owner's manual and whether you were able to add the required regulatory text.

I will need to get an updated copy of the OM to continue with my review. Thanks.

[Quoted text hidden]

Ryan Fisher <ryan@mffire.com> Thu, Aug 30, 2018 at 9:27 AM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>
Cc: Amanda Aldridge <aldridge.amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, "Toney, Mike" <Toney.Mike@epa.gov>

Hi Rafael,

Thanks for the email. I have attached our updated Owner's Manual for this product. The required language around catalytic combustor, smoke and carbon monoxide detectors is on page 4. The average carbon monoxide test result is listed on page 6.

Please let me know if you require any additional information. I am out of the country and on a different time schedule, so email is likely easiest - thank you.

Best regards,
Ryan Fisher
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Nova Owners Manual.pdf
551K

Ryan Fisher <ryan@mffire.com> Tue, Sep 4, 2018 at 7:51 AM
To: "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>
Cc: Amanda Aldridge <aldridge.amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, "Toney, Mike" <Toney.Mike@epa.gov>

Hi Rafael,

I hope all is well. I wanted to check in and see how the review of the Owner's Manual and catalytic thermometer discussion were going and if there is anything additional information or material you may require. I recognize you need a mailed copy of the CBI report. We will send this ASAP when we receive acknowledgement that our proposed catalytic thermometer placement is acceptable.

Best regards,
Ryan Fisher
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Sanchez, Rafael <Sanchez.Rafael@epa.gov> Tue, Sep 4, 2018 at 12:36 PM
To: Ryan Fisher <ryan@mffire.com>
Cc: "Aldridge, Amanda" <Aldridge.Amanda@epa.gov>, Paul LaPorte <paul@mffire.com>, "Toney, Mike" <Toney.Mike@epa.gov>

Hi Ryan,

332

Thank you for the additional information. I have reviewed the submitted information and after consultation within EPA, I am recommending certification. The next step is an internal management review. This step should take about two weeks. Let me know if you need additional information.

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Appendix D

Laboratory Ambient Temperature Data

Lab Test Conditions 3/9/2025 – 3/13/2025

3/9/2025	12:01:00 AM	61.27	44.2
3/9/2025	12:06:00 AM	61.20	44.3
3/9/2025	12:11:00 AM	61.20	44.3
3/9/2025	12:16:00 AM	61.12	44.3
3/9/2025	12:21:00 AM	61.12	44.3
3/9/2025	12:26:00 AM	61.12	44.3
3/9/2025	12:31:00 AM	61.12	44.3
3/9/2025	12:36:00 AM	61.05	44.4
3/9/2025	12:41:00 AM	61.05	44.4
3/9/2025	12:46:00 AM	60.98	44.5
3/9/2025	12:51:00 AM	60.98	44.6
3/9/2025	12:56:00 AM	60.98	44.5
3/9/2025	1:01:00 AM	60.91	44.5
3/9/2025	1:06:00 AM	60.91	44.5
3/9/2025	1:11:00 AM	60.84	44.6
3/9/2025	1:16:00 AM	60.84	44.6
3/9/2025	1:21:00 AM	60.84	44.6
3/9/2025	1:26:00 AM	60.75	44.6
3/9/2025	1:31:00 AM	60.75	44.6
3/9/2025	1:36:00 AM	60.75	44.7
3/9/2025	1:41:00 AM	60.67	44.7
3/9/2025	1:46:00 AM	60.67	44.7
3/9/2025	1:51:00 AM	60.67	44.7
3/9/2025	1:56:00 AM	60.60	44.7
3/9/2025	3:01:00 AM	60.60	44.8

3/9/2025	3:06:00 AM	60.60	44.8
3/9/2025	3:11:00 AM	60.53	44.8
3/9/2025	3:16:00 AM	60.53	44.8
3/9/2025	3:21:00 AM	60.46	44.8
3/9/2025	3:26:00 AM	60.46	44.8
3/9/2025	3:31:00 AM	60.46	45.0
3/9/2025	3:36:00 AM	60.46	45.0
3/9/2025	3:41:00 AM	60.39	45.0
3/9/2025	3:46:00 AM	60.39	45.0
3/9/2025	3:51:00 AM	60.39	45.0
3/9/2025	3:56:00 AM	60.30	45.0
3/9/2025	4:01:00 AM	60.30	45.0
3/9/2025	4:06:00 AM	60.22	44.9
3/9/2025	4:11:00 AM	60.22	44.9
3/9/2025	4:16:00 AM	60.22	44.9
3/9/2025	4:21:00 AM	60.15	45.0
3/9/2025	4:26:00 AM	60.15	44.9
3/9/2025	4:31:00 AM	60.15	45.0
3/9/2025	4:36:00 AM	60.08	45.1
3/9/2025	4:41:00 AM	60.08	45.0
3/9/2025	4:46:00 AM	60.08	45.1
3/9/2025	4:51:00 AM	60.01	45.1
3/9/2025	4:56:00 AM	60.01	45.1
3/9/2025	5:01:00 AM	60.01	45.1
3/9/2025	5:06:00 AM	59.94	45.1
3/9/2025	5:11:00 AM	59.94	45.1

3/9/2025	5:16:00 AM	59.94	45.2
3/9/2025	5:21:00 AM	59.85	45.1
3/9/2025	5:26:00 AM	59.85	45.1
3/9/2025	5:31:00 AM	59.85	45.2
3/9/2025	5:36:00 AM	59.77	45.2
3/9/2025	5:41:00 AM	59.77	45.1
3/9/2025	5:46:00 AM	59.77	45.2
3/9/2025	5:51:00 AM	59.77	45.1
3/9/2025	5:56:00 AM	59.70	45.1
3/9/2025	6:01:00 AM	59.70	45.2
3/9/2025	6:06:00 AM	59.70	45.2
3/9/2025	6:11:00 AM	59.70	45.2
3/9/2025	6:16:00 AM	59.63	45.2
3/9/2025	6:21:00 AM	59.63	45.2
3/9/2025	6:26:00 AM	59.63	45.2
3/9/2025	6:31:00 AM	59.56	45.2
3/9/2025	6:36:00 AM	59.56	45.1
3/9/2025	6:41:00 AM	59.49	45.1
3/9/2025	6:46:00 AM	59.49	45.2
3/9/2025	6:51:00 AM	59.49	45.2
3/9/2025	6:56:00 AM	59.49	45.2
3/9/2025	7:01:00 AM	59.40	45.2
3/9/2025	7:06:00 AM	59.40	45.2
3/9/2025	7:11:00 AM	59.40	45.2
3/9/2025	7:16:00 AM	59.32	45.2
3/9/2025	7:21:00 AM	59.32	45.3

3/9/2025	7:26:00 AM	59.32	45.2
3/9/2025	7:31:00 AM	59.32	45.2
3/9/2025	7:36:00 AM	59.25	45.2
3/9/2025	7:41:00 AM	59.25	45.2
3/9/2025	7:46:00 AM	59.25	45.3
3/9/2025	7:51:00 AM	59.25	45.3
3/9/2025	7:56:00 AM	59.18	45.3
3/9/2025	8:01:00 AM	59.18	45.3
3/9/2025	8:06:00 AM	59.18	45.3
3/9/2025	8:11:00 AM	59.18	45.3
3/9/2025	8:16:00 AM	59.11	45.3
3/9/2025	8:21:00 AM	59.11	45.3
3/9/2025	8:26:00 AM	59.11	45.4
3/9/2025	8:31:00 AM	59.02	45.3
3/9/2025	8:36:00 AM	59.02	45.3
3/9/2025	8:41:00 AM	59.02	45.3
3/9/2025	8:46:00 AM	59.02	45.3
3/9/2025	8:51:00 AM	59.02	45.3
3/9/2025	8:56:00 AM	59.02	45.3
3/9/2025	9:01:00 AM	58.95	45.3
3/9/2025	9:06:00 AM	58.95	45.2
3/9/2025	9:11:00 AM	58.95	45.2
3/9/2025	9:16:00 AM	58.95	45.2
3/9/2025	9:21:00 AM	58.95	45.2
3/9/2025	9:26:00 AM	58.95	45.2
3/9/2025	9:31:00 AM	58.95	45.2

3/9/2025	9:36:00 AM	58.95	45.1
3/9/2025	9:41:00 AM	58.95	45.1
3/9/2025	9:46:00 AM	58.95	45.1
3/9/2025	9:51:00 AM	58.95	45.1
3/9/2025	9:56:00 AM	58.95	45.1
3/9/2025	10:01:00 AM	58.95	45.1
3/9/2025	10:06:00 AM	59.02	45.1
3/9/2025	10:11:00 AM	59.02	45.0
3/9/2025	10:16:00 AM	59.02	45.1
3/9/2025	10:21:00 AM	59.02	45.0
3/9/2025	10:26:00 AM	59.02	45.0
3/9/2025	10:31:00 AM	59.02	45.2
3/9/2025	10:36:00 AM	59.02	45.0
3/9/2025	10:41:00 AM	59.02	45.0
3/9/2025	10:46:00 AM	59.02	45.0
3/9/2025	10:51:00 AM	59.11	45.0
3/9/2025	10:56:00 AM	59.11	45.0
3/9/2025	11:01:00 AM	59.11	45.0
3/9/2025	11:06:00 AM	59.11	44.9
3/9/2025	11:11:00 AM	59.11	44.9
3/9/2025	11:16:00 AM	59.18	44.9
3/9/2025	11:21:00 AM	59.18	44.9
3/9/2025	11:26:00 AM	59.18	44.9
3/9/2025	11:31:00 AM	59.25	44.8
3/9/2025	11:36:00 AM	59.25	44.8
3/9/2025	11:41:00 AM	59.32	44.9

3/9/2025	11:46:00 AM	59.32	44.8
3/9/2025	11:51:00 AM	59.40	44.8
3/9/2025	11:56:00 AM	59.40	44.8
3/9/2025	12:01:00 PM	59.49	44.6
3/9/2025	12:06:00 PM	59.49	44.6
3/9/2025	12:11:00 PM	59.56	44.6
3/9/2025	12:16:00 PM	59.56	44.6
3/9/2025	12:21:00 PM	59.63	44.6
3/9/2025	12:26:00 PM	59.70	44.6
3/9/2025	12:31:00 PM	59.70	44.5
3/9/2025	12:36:00 PM	59.77	44.4
3/9/2025	12:41:00 PM	59.77	44.4
3/9/2025	12:46:00 PM	59.85	44.4
3/9/2025	12:51:00 PM	59.85	44.4
3/9/2025	12:56:00 PM	59.94	44.4
3/9/2025	1:01:00 PM	59.94	44.3
3/9/2025	1:06:00 PM	60.04	44.3
3/9/2025	1:11:00 PM	60.04	44.2
3/9/2025	1:16:00 PM	60.12	44.2
3/9/2025	1:21:00 PM	60.12	44.2
3/9/2025	1:26:00 PM	60.19	44.1
3/9/2025	1:31:00 PM	60.19	44.0
3/9/2025	1:36:00 PM	60.30	44.0
3/9/2025	1:41:00 PM	60.30	44.0
3/9/2025	1:46:00 PM	60.39	44.0
3/9/2025	1:51:00 PM	60.39	44.0

3/9/2025	1:56:00 PM	60.49	43.9
3/9/2025	2:01:00 PM	60.49	43.9
3/9/2025	2:06:00 PM	60.49	43.8
3/9/2025	2:11:00 PM	60.57	43.7
3/9/2025	2:16:00 PM	60.64	43.7
3/9/2025	2:21:00 PM	60.64	43.7
3/9/2025	2:26:00 PM	60.71	43.6
3/9/2025	2:31:00 PM	60.71	43.5
3/9/2025	2:36:00 PM	60.78	43.5
3/9/2025	2:41:00 PM	60.78	43.4
3/9/2025	2:46:00 PM	60.87	43.4
3/9/2025	2:51:00 PM	60.87	43.4
3/9/2025	2:56:00 PM	60.98	43.2
3/9/2025	3:01:00 PM	60.98	43.2
3/9/2025	3:06:00 PM	60.98	43.2
3/9/2025	3:11:00 PM	61.05	43.3
3/9/2025	3:16:00 PM	61.05	43.1
3/9/2025	3:21:00 PM	61.12	43.1
3/9/2025	3:26:00 PM	61.12	43.1
3/9/2025	3:31:00 PM	61.20	43.1
3/9/2025	3:36:00 PM	61.20	43.1
3/9/2025	3:41:00 PM	61.27	42.9
3/9/2025	3:46:00 PM	61.27	42.9
3/9/2025	3:51:00 PM	61.36	42.9
3/9/2025	3:56:00 PM	61.36	42.9
3/9/2025	4:01:00 PM	61.43	42.7

3/9/2025	4:06:00 PM	61.43	42.7
3/9/2025	4:11:00 PM	61.50	42.7
3/9/2025	4:16:00 PM	61.50	42.7
3/9/2025	4:21:00 PM	61.50	42.6
3/9/2025	4:26:00 PM	61.57	42.6
3/9/2025	4:31:00 PM	61.57	42.6
3/9/2025	4:36:00 PM	61.65	42.6
3/9/2025	4:41:00 PM	61.65	42.5
3/9/2025	4:46:00 PM	61.72	42.5
3/9/2025	4:51:00 PM	61.72	42.4
3/9/2025	4:56:00 PM	61.72	42.4
3/9/2025	5:01:00 PM	61.79	42.4
3/9/2025	5:06:00 PM	61.79	42.3
3/9/2025	5:11:00 PM	61.88	42.2
3/9/2025	5:16:00 PM	61.88	42.2
3/9/2025	5:21:00 PM	61.88	42.0
3/9/2025	5:26:00 PM	61.95	41.9
3/9/2025	5:31:00 PM	61.95	41.9
3/9/2025	5:36:00 PM	61.95	41.7
3/9/2025	5:41:00 PM	62.02	41.5
3/9/2025	5:46:00 PM	62.02	41.5
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3/9/2025	5:56:00 PM	62.02	41.2
3/9/2025	6:01:00 PM	62.02	41.1
3/9/2025	6:06:00 PM	62.10	40.9
3/9/2025	6:11:00 PM	62.10	40.8

3/9/2025	6:16:00 PM	62.10	40.8
3/9/2025	6:21:00 PM	62.10	40.6
3/9/2025	6:26:00 PM	62.10	40.5
3/9/2025	6:31:00 PM	62.17	40.5
3/9/2025	6:36:00 PM	62.17	40.5
3/9/2025	6:41:00 PM	62.17	40.5
3/9/2025	6:46:00 PM	62.17	40.5
3/9/2025	6:51:00 PM	62.24	40.5
3/9/2025	6:56:00 PM	62.24	40.4
3/9/2025	7:01:00 PM	62.24	40.4
3/9/2025	7:06:00 PM	62.24	40.4
3/9/2025	7:11:00 PM	62.24	40.4
3/9/2025	7:16:00 PM	62.24	40.3
3/9/2025	7:21:00 PM	62.24	40.2
3/9/2025	7:26:00 PM	62.24	40.2
3/9/2025	7:31:00 PM	62.31	40.2
3/9/2025	7:36:00 PM	62.31	40.2
3/9/2025	7:41:00 PM	62.31	40.2
3/9/2025	7:46:00 PM	62.31	40.2
3/9/2025	7:51:00 PM	62.31	40.1
3/9/2025	7:56:00 PM	62.31	40.1
3/9/2025	8:01:00 PM	62.31	40.1
3/9/2025	8:06:00 PM	62.31	40.0
3/9/2025	8:11:00 PM	62.31	39.9
3/9/2025	8:16:00 PM	62.31	39.9
3/9/2025	8:21:00 PM	62.31	40.0

3/9/2025	8:26:00 PM	62.31	40.0
3/9/2025	8:31:00 PM	62.31	40.0
3/9/2025	8:36:00 PM	62.31	40.0
3/9/2025	8:41:00 PM	62.31	39.8
3/9/2025	8:46:00 PM	62.31	39.9
3/9/2025	8:51:00 PM	62.31	39.8
3/9/2025	8:56:00 PM	62.31	40.0
3/9/2025	9:01:00 PM	62.31	40.0
3/9/2025	9:06:00 PM	62.31	40.0
3/9/2025	9:11:00 PM	62.31	40.0
3/9/2025	9:16:00 PM	62.31	40.0
3/9/2025	9:21:00 PM	62.31	40.0
3/9/2025	9:26:00 PM	62.31	40.0
3/9/2025	9:31:00 PM	62.31	40.0
3/9/2025	9:36:00 PM	62.31	40.0
3/9/2025	9:41:00 PM	62.31	40.0
3/9/2025	9:46:00 PM	62.31	40.0
3/9/2025	9:51:00 PM	62.31	40.0
3/9/2025	9:56:00 PM	62.24	40.1
3/9/2025	10:01:00 PM	62.24	40.1
3/9/2025	10:06:00 PM	62.24	40.3
3/9/2025	10:11:00 PM	62.24	40.3
3/9/2025	10:16:00 PM	62.24	40.3
3/9/2025	10:21:00 PM	62.24	40.3
3/9/2025	10:26:00 PM	62.24	40.4
3/9/2025	10:31:00 PM	62.24	40.5

3/9/2025	10:36:00 PM	62.17	40.5
3/9/2025	10:41:00 PM	62.17	40.7
3/9/2025	10:46:00 PM	62.17	40.7
3/9/2025	10:51:00 PM	62.17	40.7
3/9/2025	10:56:00 PM	62.17	40.7
3/9/2025	11:01:00 PM	62.10	40.9
3/9/2025	11:06:00 PM	62.10	40.9
3/9/2025	11:11:00 PM	62.10	40.9
3/9/2025	11:16:00 PM	62.02	41.0
3/9/2025	11:21:00 PM	62.02	41.0
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3/9/2025	11:31:00 PM	62.02	41.2
3/9/2025	11:36:00 PM	62.02	41.3
3/9/2025	11:41:00 PM	61.95	41.4
3/9/2025	11:46:00 PM	61.95	41.4
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3/10/2025	12:01:00 AM	61.95	41.6
3/10/2025	12:06:00 AM	61.88	41.7
3/10/2025	12:11:00 AM	61.88	41.8
3/10/2025	12:16:00 AM	61.88	41.8
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3/10/2025	12:46:00 AM	61.72	42.3
3/10/2025	12:51:00 AM	61.72	42.3
3/10/2025	12:56:00 AM	61.65	42.3
3/10/2025	1:01:00 AM	61.65	42.3
3/10/2025	1:06:00 AM	61.57	42.4
3/10/2025	1:11:00 AM	61.57	42.5
3/10/2025	1:16:00 AM	61.57	42.5
3/10/2025	1:21:00 AM	61.57	42.5
3/10/2025	1:26:00 AM	61.50	42.7
3/10/2025	1:31:00 AM	61.50	42.7
3/10/2025	1:36:00 AM	61.43	42.7
3/10/2025	1:41:00 AM	61.43	42.9
3/10/2025	1:46:00 AM	61.43	42.9
3/10/2025	1:51:00 AM	61.36	42.9
3/10/2025	1:56:00 AM	61.36	43.0
3/10/2025	2:01:00 AM	61.27	43.0
3/10/2025	2:06:00 AM	61.27	43.0
3/10/2025	2:11:00 AM	61.27	43.0
3/10/2025	2:16:00 AM	61.20	43.2
3/10/2025	2:21:00 AM	61.20	43.2
3/10/2025	2:26:00 AM	61.12	43.3
3/10/2025	2:31:00 AM	61.12	43.3
3/10/2025	2:36:00 AM	61.12	43.3
3/10/2025	2:41:00 AM	61.05	43.3
3/10/2025	2:46:00 AM	61.05	43.4
3/10/2025	2:51:00 AM	61.05	43.4

3/10/2025	2:56:00 AM	60.98	43.5
3/10/2025	3:01:00 AM	60.98	43.4
3/10/2025	3:06:00 AM	60.98	43.5
3/10/2025	3:11:00 AM	60.91	43.6
3/10/2025	3:16:00 AM	60.91	43.5
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3/10/2025	3:26:00 AM	60.84	43.5
3/10/2025	3:31:00 AM	60.84	43.6
3/10/2025	3:36:00 AM	60.75	43.6
3/10/2025	3:41:00 AM	60.75	43.6
3/10/2025	3:46:00 AM	60.75	43.6
3/10/2025	3:51:00 AM	60.67	43.6
3/10/2025	3:56:00 AM	60.67	43.8
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3/10/2025	4:26:00 AM	60.46	43.9
3/10/2025	4:31:00 AM	60.46	44.0
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3/10/2025	4:41:00 AM	60.39	44.0
3/10/2025	4:46:00 AM	60.39	44.1
3/10/2025	4:51:00 AM	60.39	44.1
3/10/2025	4:56:00 AM	60.39	44.1
3/10/2025	5:01:00 AM	60.30	44.2

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3/10/2025	5:11:00 AM	60.22	44.1
3/10/2025	5:16:00 AM	60.22	44.3
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3/10/2025	5:31:00 AM	60.15	44.3
3/10/2025	5:36:00 AM	60.15	44.4
3/10/2025	5:41:00 AM	60.15	44.4
3/10/2025	5:46:00 AM	60.08	44.4
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3/10/2025	7:36:00 AM	61.05	42.3
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3/10/2025	9:16:00 AM	59.18	45.5
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3/10/2025	9:26:00 AM	59.18	45.5

3/10/2025	9:31:00 AM	59.18	45.5
3/10/2025	9:36:00 AM	59.07	45.5
3/10/2025	9:41:00 AM	58.98	45.5
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3/10/2025	9:51:00 AM	58.98	45.6
3/10/2025	9:56:00 AM	58.98	45.6
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3/10/2025	10:11:00 AM	58.84	45.6
3/10/2025	10:16:00 AM	58.84	45.9
3/10/2025	10:21:00 AM	58.84	46.1
3/10/2025	10:26:00 AM	58.84	45.9
3/10/2025	10:31:00 AM	59.07	46.0
3/10/2025	10:36:00 AM	59.25	45.7
3/10/2025	10:41:00 AM	59.43	45.6
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3/10/2025	11:26:00 AM	61.27	43.6
3/10/2025	11:31:00 AM	61.36	43.3
3/10/2025	11:36:00 AM	61.36	43.2

3/10/2025	11:41:00 AM	61.36	43.2
3/10/2025	11:46:00 AM	61.23	43.2
3/10/2025	11:51:00 AM	61.23	43.2
3/10/2025	11:56:00 AM	61.23	43.2
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3/10/2025	12:26:00 PM	61.32	43.6
3/10/2025	12:31:00 PM	61.39	43.6
3/10/2025	12:36:00 PM	61.50	43.6
3/10/2025	12:41:00 PM	61.72	43.4
3/10/2025	12:46:00 PM	61.99	43.1
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3/10/2025	1:06:00 PM	62.73	42.5
3/10/2025	1:11:00 PM	62.83	42.0
3/10/2025	1:16:00 PM	62.83	41.4
3/10/2025	1:21:00 PM	63.03	41.4
3/10/2025	1:26:00 PM	63.28	41.2
3/10/2025	1:31:00 PM	63.45	41.1
3/10/2025	1:36:00 PM	63.66	41.1
3/10/2025	1:41:00 PM	63.81	40.7
3/10/2025	1:46:00 PM	64.00	40.7

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3/10/2025	2:11:00 PM	64.85	39.4
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3/10/2025	2:21:00 PM	65.19	38.8
3/10/2025	2:26:00 PM	65.34	39.4
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3/10/2025	3:06:00 PM	66.25	37.7
3/10/2025	3:11:00 PM	66.34	37.6
3/10/2025	3:16:00 PM	66.42	37.8
3/10/2025	3:21:00 PM	66.42	37.0
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3/10/2025	3:31:00 PM	66.56	37.1
3/10/2025	3:36:00 PM	66.70	37.1
3/10/2025	3:41:00 PM	66.78	37.4
3/10/2025	3:46:00 PM	66.88	37.0
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3/10/2025	3:56:00 PM	67.01	36.7

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3/10/2025	5:11:00 PM	67.37	36.5
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3/10/2025	5:51:00 PM	66.78	36.4
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3/10/2025	6:21:00 PM	66.22	36.7
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3/10/2025	8:16:00 PM	65.66	38.0

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3/10/2025	9:06:00 PM	67.08	36.8
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3/10/2025	10:51:00 PM	66.42	38.2
3/10/2025	10:56:00 PM	66.34	38.3
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3/10/2025	11:41:00 PM	66.18	38.2
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3/10/2025	11:56:00 PM	66.49	38.0
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3/11/2025	2:11:00 AM	66.22	38.9
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3/11/2025	2:46:00 AM	66.07	38.6

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3/11/2025	3:11:00 AM	66.38	38.3
3/11/2025	3:16:00 AM	66.49	38.2
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3/11/2025	3:41:00 AM	66.85	37.6
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3/11/2025	3:51:00 AM	66.94	37.3
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3/11/2025	5:46:00 AM	66.00	38.6
3/11/2025	5:51:00 AM	66.00	38.4
3/11/2025	5:56:00 AM	66.00	38.5
3/11/2025	6:01:00 AM	66.00	38.5
3/11/2025	6:06:00 AM	66.00	38.4
3/11/2025	6:11:00 AM	66.07	38.4
3/11/2025	6:16:00 AM	66.15	38.2
3/11/2025	6:21:00 AM	66.15	38.2
3/11/2025	6:26:00 AM	66.31	38.2
3/11/2025	6:31:00 AM	66.31	38.1
3/11/2025	6:36:00 AM	66.42	38.0
3/11/2025	6:41:00 AM	66.49	38.0
3/11/2025	6:46:00 AM	66.56	37.8
3/11/2025	6:51:00 AM	66.56	37.8
3/11/2025	6:56:00 AM	66.70	37.6
3/11/2025	7:01:00 AM	66.78	37.4
3/11/2025	7:06:00 AM	66.88	37.5

3/11/2025	7:11:00 AM	66.97	37.3
3/11/2025	7:16:00 AM	67.08	37.2
3/11/2025	7:21:00 AM	67.15	37.1
3/11/2025	7:26:00 AM	67.15	37.0
3/11/2025	7:31:00 AM	67.23	36.9
3/11/2025	7:36:00 AM	67.23	36.8
3/11/2025	7:41:00 AM	67.33	37.0
3/11/2025	7:46:00 AM	67.33	37.1
3/11/2025	7:51:00 AM	67.33	37.3
3/11/2025	7:56:00 AM	67.33	37.3
3/11/2025	8:01:00 AM	67.26	37.2
3/11/2025	8:06:00 AM	67.19	37.2
3/11/2025	8:11:00 AM	67.05	37.2
3/11/2025	8:16:00 AM	66.94	37.4
3/11/2025	8:21:00 AM	66.94	37.2
3/11/2025	8:26:00 AM	66.74	37.4
3/11/2025	8:31:00 AM	66.74	37.5
3/11/2025	8:36:00 AM	66.56	37.5
3/11/2025	8:41:00 AM	66.49	37.5
3/11/2025	8:46:00 AM	66.38	37.6
3/11/2025	8:51:00 AM	66.22	37.7
3/11/2025	8:56:00 AM	65.86	38.0
3/11/2025	9:01:00 AM	65.48	38.5
3/11/2025	9:06:00 AM	65.41	38.7
3/11/2025	9:11:00 AM	65.52	38.6
3/11/2025	9:16:00 AM	65.52	38.6

3/11/2025	9:21:00 AM	65.52	38.8
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3/11/2025	9:41:00 AM	65.23	39.4
3/11/2025	9:46:00 AM	65.23	39.2
3/11/2025	9:51:00 AM	65.12	39.4
3/11/2025	9:56:00 AM	64.96	39.4
3/11/2025	10:01:00 AM	64.96	39.5
3/11/2025	10:06:00 AM	64.96	39.5
3/11/2025	10:11:00 AM	64.96	39.6
3/11/2025	10:16:00 AM	64.78	39.9
3/11/2025	10:21:00 AM	64.78	39.9
3/11/2025	10:26:00 AM	64.78	39.9
3/11/2025	10:31:00 AM	64.71	39.9
3/11/2025	10:36:00 AM	64.63	40.0
3/11/2025	10:41:00 AM	64.63	40.1
3/11/2025	10:46:00 AM	64.63	40.1
3/11/2025	10:51:00 AM	64.56	40.2
3/11/2025	10:56:00 AM	64.56	40.2
3/11/2025	11:01:00 AM	64.56	40.2
3/11/2025	11:06:00 AM	64.56	40.2
3/11/2025	11:11:00 AM	64.56	40.2
3/11/2025	11:16:00 AM	64.56	40.2
3/11/2025	11:21:00 AM	64.56	40.3
3/11/2025	11:26:00 AM	64.56	40.3

3/11/2025	11:31:00 AM	64.56	40.4
3/11/2025	11:36:00 AM	64.56	40.3
3/11/2025	11:41:00 AM	64.56	40.3
3/11/2025	11:46:00 AM	64.56	40.3
3/11/2025	11:51:00 AM	64.56	40.4
3/11/2025	11:56:00 AM	64.56	40.6
3/11/2025	12:01:00 PM	64.47	40.6
3/11/2025	12:06:00 PM	64.47	40.8
3/11/2025	12:11:00 PM	64.47	40.8
3/11/2025	12:16:00 PM	64.47	40.8
3/11/2025	12:21:00 PM	64.47	40.9
3/11/2025	12:26:00 PM	64.63	40.9
3/11/2025	12:31:00 PM	64.63	40.8
3/11/2025	12:36:00 PM	64.63	40.9
3/11/2025	12:41:00 PM	64.78	40.7
3/11/2025	12:46:00 PM	64.78	40.8
3/11/2025	12:51:00 PM	64.89	40.8
3/11/2025	12:56:00 PM	64.89	40.9
3/11/2025	1:01:00 PM	64.96	40.8
3/11/2025	1:06:00 PM	65.03	40.8
3/11/2025	1:11:00 PM	65.03	40.8
3/11/2025	1:16:00 PM	65.12	40.6
3/11/2025	1:21:00 PM	65.19	40.4
3/11/2025	1:26:00 PM	65.19	40.1
3/11/2025	1:31:00 PM	65.19	40.3
3/11/2025	1:36:00 PM	65.26	40.4

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3/11/2025	1:46:00 PM	65.34	40.1
3/11/2025	1:51:00 PM	65.34	40.1
3/11/2025	1:56:00 PM	65.34	39.9
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3/11/2025	2:06:00 PM	65.34	39.8
3/11/2025	2:11:00 PM	65.34	39.8
3/11/2025	2:16:00 PM	65.34	39.8
3/11/2025	2:21:00 PM	65.34	39.7
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3/11/2025	2:46:00 PM	65.48	39.9
3/11/2025	2:51:00 PM	65.48	39.9
3/11/2025	2:56:00 PM	65.55	39.9
3/11/2025	3:01:00 PM	65.55	39.7
3/11/2025	3:06:00 PM	65.55	39.7
3/11/2025	3:11:00 PM	65.55	39.7
3/11/2025	3:16:00 PM	65.55	39.6
3/11/2025	3:21:00 PM	65.55	39.6
3/11/2025	3:26:00 PM	65.55	39.6
3/11/2025	3:31:00 PM	65.55	39.7
3/11/2025	3:36:00 PM	65.55	39.7
3/11/2025	3:41:00 PM	65.55	39.7
3/11/2025	3:46:00 PM	65.62	39.7

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3/11/2025	3:56:00 PM	65.62	39.8
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3/11/2025	4:16:00 PM	65.62	39.8
3/11/2025	4:21:00 PM	65.62	39.8
3/11/2025	4:26:00 PM	65.62	39.9
3/11/2025	4:31:00 PM	65.62	39.9
3/11/2025	4:36:00 PM	65.71	39.9
3/11/2025	4:41:00 PM	65.71	39.8
3/11/2025	4:46:00 PM	65.71	39.5
3/11/2025	4:51:00 PM	65.71	39.6
3/11/2025	4:56:00 PM	65.71	39.7
3/11/2025	5:01:00 PM	65.71	39.7
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3/11/2025	5:16:00 PM	65.89	39.7
3/11/2025	5:21:00 PM	65.97	39.5
3/11/2025	5:26:00 PM	66.04	39.5
3/11/2025	5:31:00 PM	66.04	39.6
3/11/2025	5:36:00 PM	66.04	39.6
3/11/2025	5:41:00 PM	65.97	39.6
3/11/2025	5:46:00 PM	65.97	39.6
3/11/2025	5:51:00 PM	65.89	39.5
3/11/2025	5:56:00 PM	65.82	39.6

3/11/2025	6:01:00 PM	65.82	39.7
3/11/2025	6:06:00 PM	65.75	39.8
3/11/2025	6:11:00 PM	65.66	39.8
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3/11/2025	6:21:00 PM	65.59	39.8
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3/11/2025	6:31:00 PM	65.52	40.0
3/11/2025	6:36:00 PM	65.44	40.1
3/11/2025	6:41:00 PM	65.37	40.0
3/11/2025	6:46:00 PM	65.37	40.1
3/11/2025	6:51:00 PM	65.30	40.2
3/11/2025	6:56:00 PM	65.23	40.2
3/11/2025	7:01:00 PM	65.23	40.4
3/11/2025	7:06:00 PM	65.16	40.5
3/11/2025	7:11:00 PM	65.07	40.5
3/11/2025	7:16:00 PM	65.07	40.6
3/11/2025	7:21:00 PM	64.96	40.5
3/11/2025	7:26:00 PM	64.96	40.6
3/11/2025	7:31:00 PM	64.89	40.6
3/11/2025	7:36:00 PM	64.89	40.7
3/11/2025	7:41:00 PM	64.81	40.7
3/11/2025	7:46:00 PM	64.74	40.7
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3/11/2025	7:56:00 PM	64.67	40.9
3/11/2025	8:01:00 PM	64.67	40.9
3/11/2025	8:06:00 PM	64.56	40.9

3/11/2025	8:11:00 PM	64.56	41.1
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3/11/2025	8:21:00 PM	64.40	41.1
3/11/2025	8:26:00 PM	64.40	41.2
3/11/2025	8:31:00 PM	64.33	41.2
3/11/2025	8:36:00 PM	64.33	41.3
3/11/2025	8:41:00 PM	64.26	41.4
3/11/2025	8:46:00 PM	64.18	41.4
3/11/2025	8:51:00 PM	64.18	41.5
3/11/2025	8:56:00 PM	64.11	41.5
3/11/2025	9:01:00 PM	64.11	41.6
3/11/2025	9:06:00 PM	64.04	41.6
3/11/2025	9:11:00 PM	64.04	41.7
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3/11/2025	9:26:00 PM	63.88	41.9
3/11/2025	9:31:00 PM	63.81	41.9
3/11/2025	9:36:00 PM	63.81	41.9
3/11/2025	9:41:00 PM	63.81	41.9
3/11/2025	9:46:00 PM	63.73	42.0
3/11/2025	9:51:00 PM	63.73	42.1
3/11/2025	9:56:00 PM	63.66	42.1
3/11/2025	10:01:00 PM	63.66	42.1
3/11/2025	10:06:00 PM	63.59	42.3
3/11/2025	10:11:00 PM	63.59	42.4
3/11/2025	10:16:00 PM	63.52	42.4

3/11/2025	10:21:00 PM	63.52	42.3
3/11/2025	10:26:00 PM	63.45	42.3
3/11/2025	10:31:00 PM	63.45	42.4
3/11/2025	10:36:00 PM	63.36	42.4
3/11/2025	10:41:00 PM	63.36	42.6
3/11/2025	10:46:00 PM	63.36	42.6
3/11/2025	10:51:00 PM	63.28	42.6
3/11/2025	10:56:00 PM	63.28	42.6
3/11/2025	11:01:00 PM	63.21	42.6
3/11/2025	11:06:00 PM	63.21	42.6
3/11/2025	11:11:00 PM	63.14	42.6
3/11/2025	11:16:00 PM	63.14	42.7
3/11/2025	11:21:00 PM	63.07	42.7
3/11/2025	11:26:00 PM	63.07	42.7
3/11/2025	11:31:00 PM	63.00	42.8
3/11/2025	11:36:00 PM	63.00	42.8
3/11/2025	11:41:00 PM	63.00	42.9
3/11/2025	11:46:00 PM	62.92	42.9
3/11/2025	11:51:00 PM	62.92	43.0
3/11/2025	11:56:00 PM	62.92	43.0
3/12/2025	12:01:00 AM	62.83	43.1
3/12/2025	12:06:00 AM	62.83	43.1
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3/12/2025	12:16:00 AM	62.76	43.2
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3/12/2025	12:26:00 AM	62.69	43.3

3/12/2025	12:31:00 AM	62.69	43.3
3/12/2025	12:36:00 AM	62.62	43.3
3/12/2025	12:41:00 AM	62.62	43.4
3/12/2025	12:46:00 AM	62.62	43.4
3/12/2025	12:51:00 AM	62.55	43.4
3/12/2025	12:56:00 AM	62.55	43.4
3/12/2025	1:01:00 AM	62.55	43.4
3/12/2025	1:06:00 AM	62.55	43.5
3/12/2025	1:11:00 AM	62.47	43.5
3/12/2025	1:16:00 AM	62.47	43.6
3/12/2025	1:21:00 AM	62.47	43.6
3/12/2025	1:26:00 AM	62.40	43.6
3/12/2025	1:31:00 AM	62.40	43.7
3/12/2025	1:36:00 AM	62.40	43.7
3/12/2025	1:41:00 AM	62.31	43.8
3/12/2025	1:46:00 AM	62.31	43.8
3/12/2025	1:51:00 AM	62.31	43.9
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3/12/2025	2:06:00 AM	62.24	44.0
3/12/2025	2:11:00 AM	62.17	44.0
3/12/2025	2:16:00 AM	62.17	44.0
3/12/2025	2:21:00 AM	62.17	44.1
3/12/2025	2:26:00 AM	62.10	44.1
3/12/2025	2:31:00 AM	62.10	44.1
3/12/2025	2:36:00 AM	62.17	44.2

3/12/2025	2:41:00 AM	62.31	44.0
3/12/2025	2:46:00 AM	62.47	44.0
3/12/2025	2:51:00 AM	62.62	44.0
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3/12/2025	3:01:00 AM	62.92	43.6
3/12/2025	3:06:00 AM	63.07	43.4
3/12/2025	3:11:00 AM	63.25	43.3
3/12/2025	3:16:00 AM	63.36	43.2
3/12/2025	3:21:00 AM	63.45	43.0
3/12/2025	3:26:00 AM	63.52	42.8
3/12/2025	3:31:00 AM	63.52	42.8
3/12/2025	3:36:00 AM	63.52	42.8
3/12/2025	3:41:00 AM	63.52	42.8
3/12/2025	3:46:00 AM	63.52	42.8
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3/12/2025	3:56:00 AM	63.45	42.6
3/12/2025	4:01:00 AM	63.45	42.6
3/12/2025	4:06:00 AM	63.36	42.9
3/12/2025	4:11:00 AM	63.36	42.9
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3/12/2025	4:21:00 AM	63.28	43.1
3/12/2025	4:26:00 AM	63.21	43.1
3/12/2025	4:31:00 AM	63.21	43.2
3/12/2025	4:36:00 AM	63.14	43.3
3/12/2025	4:41:00 AM	63.14	43.3
3/12/2025	4:46:00 AM	63.28	43.1

3/12/2025	4:51:00 AM	63.45	43.2
3/12/2025	4:56:00 AM	63.55	43.0
3/12/2025	5:01:00 AM	63.66	43.0
3/12/2025	5:06:00 AM	63.73	42.9
3/12/2025	5:11:00 AM	63.73	42.7
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3/12/2025	5:26:00 AM	63.66	42.7
3/12/2025	5:31:00 AM	63.66	42.8
3/12/2025	5:36:00 AM	63.59	42.7
3/12/2025	5:41:00 AM	63.59	42.9
3/12/2025	5:46:00 AM	63.48	42.9
3/12/2025	5:51:00 AM	63.41	43.1
3/12/2025	5:56:00 AM	63.41	43.2
3/12/2025	6:01:00 AM	63.32	43.2
3/12/2025	6:06:00 AM	63.32	43.4
3/12/2025	6:11:00 AM	63.21	43.4
3/12/2025	6:16:00 AM	63.21	43.6
3/12/2025	6:21:00 AM	63.14	43.7
3/12/2025	6:26:00 AM	63.14	43.6
3/12/2025	6:31:00 AM	63.28	43.5
3/12/2025	6:36:00 AM	63.41	43.4
3/12/2025	6:41:00 AM	63.52	43.3
3/12/2025	6:46:00 AM	63.59	43.3
3/12/2025	6:51:00 AM	63.59	43.1
3/12/2025	6:56:00 AM	63.59	43.1

3/12/2025	7:01:00 AM	63.59	43.0
3/12/2025	7:06:00 AM	63.59	43.2
3/12/2025	7:11:00 AM	63.52	43.1
3/12/2025	7:16:00 AM	63.52	43.3
3/12/2025	7:21:00 AM	63.45	43.2
3/12/2025	7:26:00 AM	63.45	43.6
3/12/2025	7:31:00 AM	63.45	43.6
3/12/2025	7:36:00 AM	63.36	43.7
3/12/2025	7:41:00 AM	63.36	43.7
3/12/2025	7:46:00 AM	63.36	44.0
3/12/2025	7:51:00 AM	63.36	44.0
3/12/2025	7:56:00 AM	63.36	44.4
3/12/2025	8:01:00 AM	63.25	44.6
3/12/2025	8:06:00 AM	63.25	45.1
3/12/2025	8:11:00 AM	63.18	45.3
3/12/2025	8:16:00 AM	63.18	45.3
3/12/2025	8:21:00 AM	63.36	45.4
3/12/2025	8:26:00 AM	63.59	45.0
3/12/2025	8:31:00 AM	63.84	45.0
3/12/2025	8:36:00 AM	64.11	45.1
3/12/2025	8:41:00 AM	64.33	44.7
3/12/2025	8:46:00 AM	64.60	44.4
3/12/2025	8:51:00 AM	64.71	44.1
3/12/2025	8:56:00 AM	64.78	44.3
3/12/2025	9:01:00 AM	64.78	44.2
3/12/2025	9:06:00 AM	64.78	44.5

3/12/2025	9:11:00 AM	64.78	44.5
3/12/2025	9:16:00 AM	64.78	44.9
3/12/2025	9:21:00 AM	64.85	44.9
3/12/2025	9:26:00 AM	64.85	44.8
3/12/2025	9:31:00 AM	64.85	45.2
3/12/2025	9:36:00 AM	64.85	45.3
3/12/2025	9:41:00 AM	64.85	45.2
3/12/2025	9:46:00 AM	64.78	45.2
3/12/2025	9:51:00 AM	64.78	45.3
3/12/2025	9:56:00 AM	64.78	45.4
3/12/2025	10:01:00 AM	64.78	45.6
3/12/2025	10:06:00 AM	64.78	45.6
3/12/2025	10:11:00 AM	64.78	45.8
3/12/2025	10:16:00 AM	64.71	45.8
3/12/2025	10:21:00 AM	64.71	46.1
3/12/2025	10:26:00 AM	64.63	46.1
3/12/2025	10:31:00 AM	64.56	46.2
3/12/2025	10:36:00 AM	64.56	46.3
3/12/2025	10:41:00 AM	64.56	46.4
3/12/2025	10:46:00 AM	64.47	46.4
3/12/2025	10:51:00 AM	64.47	46.7
3/12/2025	10:56:00 AM	64.47	46.7
3/12/2025	11:01:00 AM	64.40	46.7
3/12/2025	11:06:00 AM	64.40	46.7
3/12/2025	11:11:00 AM	64.40	46.8
3/12/2025	11:16:00 AM	64.40	46.8

3/12/2025	11:21:00 AM	64.40	46.8
3/12/2025	11:26:00 AM	64.47	47.0
3/12/2025	11:31:00 AM	64.47	47.0
3/12/2025	11:36:00 AM	64.47	47.1
3/12/2025	11:41:00 AM	64.47	47.3
3/12/2025	11:46:00 AM	64.56	47.2
3/12/2025	11:51:00 AM	64.56	47.2
3/12/2025	11:56:00 AM	64.56	47.2
3/12/2025	12:01:00 PM	64.56	47.2
3/12/2025	12:06:00 PM	64.56	47.2
3/12/2025	12:11:00 PM	64.56	47.1
3/12/2025	12:16:00 PM	64.44	47.1
3/12/2025	12:21:00 PM	64.36	47.1
3/12/2025	12:26:00 PM	64.36	47.1
3/12/2025	12:31:00 PM	64.36	47.1
3/12/2025	12:36:00 PM	64.36	47.1
3/12/2025	12:41:00 PM	64.29	47.1
3/12/2025	12:46:00 PM	64.29	47.1
3/12/2025	12:51:00 PM	64.29	47.1
3/12/2025	12:56:00 PM	64.29	47.1
3/12/2025	1:01:00 PM	64.29	47.2
3/12/2025	1:06:00 PM	64.29	47.3
3/12/2025	1:11:00 PM	64.29	47.2
3/12/2025	1:16:00 PM	64.36	47.2
3/12/2025	1:21:00 PM	64.36	47.2
3/12/2025	1:26:00 PM	64.36	47.1

3/12/2025	1:31:00 PM	64.47	47.1
3/12/2025	1:36:00 PM	64.47	47.1
3/12/2025	1:41:00 PM	64.56	47.1
3/12/2025	1:46:00 PM	64.56	47.3
3/12/2025	1:51:00 PM	64.56	47.3
3/12/2025	1:56:00 PM	64.67	47.3
3/12/2025	2:01:00 PM	64.67	47.3
3/12/2025	2:06:00 PM	64.67	47.3
3/12/2025	2:11:00 PM	64.74	47.2
3/12/2025	2:16:00 PM	64.74	47.2
3/12/2025	2:21:00 PM	64.81	47.2
3/12/2025	2:26:00 PM	64.81	47.3
3/12/2025	2:31:00 PM	64.81	47.2
3/12/2025	2:36:00 PM	64.92	47.2
3/12/2025	2:41:00 PM	64.92	47.2
3/12/2025	2:46:00 PM	64.99	47.2
3/12/2025	2:51:00 PM	64.99	47.1
3/12/2025	2:56:00 PM	64.99	47.0
3/12/2025	3:01:00 PM	64.99	46.9
3/12/2025	3:06:00 PM	64.99	46.9
3/12/2025	3:11:00 PM	64.99	46.7
3/12/2025	3:16:00 PM	64.92	46.6
3/12/2025	3:21:00 PM	64.92	46.6
3/12/2025	3:26:00 PM	64.92	46.4
3/12/2025	3:31:00 PM	64.85	46.3
3/12/2025	3:36:00 PM	64.85	46.2

3/12/2025	3:41:00 PM	64.78	46.2
3/12/2025	3:46:00 PM	64.67	46.5
3/12/2025	3:51:00 PM	64.60	46.5
3/12/2025	3:56:00 PM	64.60	46.3
3/12/2025	4:01:00 PM	64.60	46.4
3/12/2025	4:06:00 PM	64.51	46.4
3/12/2025	4:11:00 PM	64.51	46.4
3/12/2025	4:16:00 PM	64.51	46.4
3/12/2025	4:21:00 PM	64.44	46.5
3/12/2025	4:26:00 PM	64.44	46.5
3/12/2025	4:31:00 PM	64.44	46.7
3/12/2025	4:36:00 PM	64.36	46.7
3/12/2025	4:41:00 PM	64.36	46.9
3/12/2025	4:46:00 PM	64.29	46.9
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3/12/2025	4:56:00 PM	64.22	47.1
3/12/2025	5:01:00 PM	64.15	47.3
3/12/2025	5:06:00 PM	64.15	47.3
3/12/2025	5:11:00 PM	64.08	47.3
3/12/2025	5:16:00 PM	64.08	47.3
3/12/2025	5:21:00 PM	64.00	47.3
3/12/2025	5:26:00 PM	64.00	47.5
3/12/2025	5:31:00 PM	63.84	48.1
3/12/2025	5:36:00 PM	63.84	47.8
3/12/2025	5:41:00 PM	63.84	47.8
3/12/2025	5:46:00 PM	63.84	47.8

3/12/2025	5:51:00 PM	63.73	47.9
3/12/2025	5:56:00 PM	63.73	48.0
3/12/2025	6:01:00 PM	63.63	47.9
3/12/2025	6:06:00 PM	63.63	48.1
3/12/2025	6:11:00 PM	63.52	48.1
3/12/2025	6:16:00 PM	63.52	47.9
3/12/2025	6:21:00 PM	63.52	47.9
3/12/2025	6:26:00 PM	63.52	47.9
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3/12/2025	6:41:00 PM	63.59	47.8
3/12/2025	6:46:00 PM	63.59	47.8
3/12/2025	6:51:00 PM	63.59	47.8
3/12/2025	6:56:00 PM	63.59	47.6
3/12/2025	7:01:00 PM	63.59	47.6
3/12/2025	7:06:00 PM	63.59	47.6
3/12/2025	7:11:00 PM	63.59	47.6
3/12/2025	7:16:00 PM	63.52	47.6
3/12/2025	7:21:00 PM	63.52	47.7
3/12/2025	7:26:00 PM	63.52	47.5
3/12/2025	7:31:00 PM	63.52	47.5
3/12/2025	7:36:00 PM	63.52	47.5
3/12/2025	7:41:00 PM	63.52	47.5
3/12/2025	7:46:00 PM	63.45	47.5
3/12/2025	7:51:00 PM	63.45	47.5
3/12/2025	7:56:00 PM	63.45	47.5

3/12/2025	8:01:00 PM	63.45	47.6
3/12/2025	8:06:00 PM	63.36	47.5
3/12/2025	8:11:00 PM	63.36	47.5
3/12/2025	8:16:00 PM	63.36	47.5
3/12/2025	8:21:00 PM	63.36	47.4
3/12/2025	8:26:00 PM	63.36	47.6
3/12/2025	8:31:00 PM	63.28	47.5
3/12/2025	8:36:00 PM	63.28	47.5
3/12/2025	8:41:00 PM	63.28	47.5
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3/12/2025	8:51:00 PM	63.21	47.5
3/12/2025	8:56:00 PM	63.21	47.5
3/12/2025	9:01:00 PM	63.14	47.5
3/12/2025	9:06:00 PM	63.14	47.5
3/12/2025	9:11:00 PM	63.14	47.5
3/12/2025	9:16:00 PM	63.14	47.7
3/12/2025	9:21:00 PM	63.14	47.7
3/12/2025	9:26:00 PM	63.28	47.5
3/12/2025	9:31:00 PM	63.48	47.4
3/12/2025	9:36:00 PM	63.63	47.2
3/12/2025	9:41:00 PM	63.77	47.0
3/12/2025	9:46:00 PM	63.91	46.8
3/12/2025	9:51:00 PM	64.04	46.6
3/12/2025	9:56:00 PM	64.04	46.5
3/12/2025	10:01:00 PM	64.11	46.5
3/12/2025	10:06:00 PM	64.11	46.4

3/12/2025	10:11:00 PM	64.11	46.3
3/12/2025	10:16:00 PM	64.11	46.3
3/12/2025	10:21:00 PM	64.11	46.1
3/12/2025	10:26:00 PM	64.04	46.1
3/12/2025	10:31:00 PM	64.04	46.1
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3/12/2025	10:41:00 PM	63.97	46.4
3/12/2025	10:46:00 PM	63.88	46.5
3/12/2025	10:51:00 PM	63.88	46.4
3/12/2025	10:56:00 PM	63.81	46.3
3/12/2025	11:01:00 PM	63.81	46.3
3/12/2025	11:06:00 PM	63.70	46.4
3/12/2025	11:11:00 PM	63.70	46.4
3/12/2025	11:16:00 PM	63.63	46.5
3/12/2025	11:21:00 PM	63.55	46.5
3/12/2025	11:26:00 PM	63.55	46.5
3/12/2025	11:31:00 PM	63.48	46.6
3/12/2025	11:36:00 PM	63.41	46.6
3/12/2025	11:41:00 PM	63.41	46.7
3/12/2025	11:46:00 PM	63.28	46.7
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3/12/2025	11:56:00 PM	63.18	46.8
3/13/2025	12:01:00 AM	63.10	46.8
3/13/2025	12:06:00 AM	63.10	46.8
3/13/2025	12:11:00 AM	63.03	46.8
3/13/2025	12:16:00 AM	63.03	46.8

3/13/2025	12:21:00 AM	62.92	47.0
3/13/2025	12:26:00 AM	62.92	47.0
3/13/2025	12:31:00 AM	62.83	47.0
3/13/2025	12:36:00 AM	62.76	47.0
3/13/2025	12:41:00 AM	62.76	47.1
3/13/2025	12:46:00 AM	62.69	47.1
3/13/2025	12:51:00 AM	62.62	47.0
3/13/2025	12:56:00 AM	62.62	47.2
3/13/2025	1:01:00 AM	62.51	47.2
3/13/2025	1:06:00 AM	62.51	47.2
3/13/2025	1:11:00 AM	62.51	47.3
3/13/2025	1:16:00 AM	62.40	47.3
3/13/2025	1:21:00 AM	62.40	47.3
3/13/2025	1:26:00 AM	62.47	47.3
3/13/2025	1:31:00 AM	62.62	47.1
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3/13/2025	1:51:00 AM	63.21	46.4
3/13/2025	1:56:00 AM	63.36	46.1
3/13/2025	2:01:00 AM	63.48	46.0
3/13/2025	2:06:00 AM	63.63	45.7
3/13/2025	2:11:00 AM	63.73	45.6
3/13/2025	2:16:00 AM	63.88	45.3
3/13/2025	2:21:00 AM	64.00	45.1
3/13/2025	2:26:00 AM	64.08	44.9

3/13/2025	2:31:00 AM	64.08	44.9
3/13/2025	2:36:00 AM	64.08	44.9
3/13/2025	2:41:00 AM	64.08	44.8
3/13/2025	2:46:00 AM	64.00	44.8
3/13/2025	2:51:00 AM	64.00	44.8
3/13/2025	2:56:00 AM	63.88	44.8
3/13/2025	3:01:00 AM	63.88	44.8
3/13/2025	3:06:00 AM	63.77	44.8
3/13/2025	3:11:00 AM	63.77	44.8
3/13/2025	3:16:00 AM	63.66	44.8
3/13/2025	3:21:00 AM	63.66	44.8
3/13/2025	3:26:00 AM	63.55	44.9
3/13/2025	3:31:00 AM	63.48	45.0
3/13/2025	3:36:00 AM	63.41	45.0
3/13/2025	3:41:00 AM	63.41	45.1
3/13/2025	3:46:00 AM	63.25	45.1
3/13/2025	3:51:00 AM	63.25	45.1
3/13/2025	3:56:00 AM	63.14	45.2
3/13/2025	4:01:00 AM	63.03	45.2
3/13/2025	4:06:00 AM	63.03	45.3
3/13/2025	4:11:00 AM	62.92	45.3
3/13/2025	4:16:00 AM	62.83	45.5
3/13/2025	4:21:00 AM	62.76	45.5
3/13/2025	4:26:00 AM	62.76	45.5
3/13/2025	4:31:00 AM	62.83	45.4
3/13/2025	4:36:00 AM	62.96	45.3

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3/13/2025	4:51:00 AM	63.32	44.8
3/13/2025	4:56:00 AM	63.41	44.6
3/13/2025	5:01:00 AM	63.52	44.5
3/13/2025	5:06:00 AM	63.63	44.3
3/13/2025	5:11:00 AM	63.73	44.1
3/13/2025	5:16:00 AM	63.84	43.9
3/13/2025	5:21:00 AM	63.84	43.7
3/13/2025	5:26:00 AM	63.84	43.7
3/13/2025	5:31:00 AM	63.84	43.7
3/13/2025	5:36:00 AM	63.84	43.7
3/13/2025	5:41:00 AM	63.73	43.6
3/13/2025	5:46:00 AM	63.73	43.6
3/13/2025	5:51:00 AM	63.63	43.6
3/13/2025	5:56:00 AM	63.55	43.7
3/13/2025	6:01:00 AM	63.48	43.9
3/13/2025	6:06:00 AM	63.41	44.0
3/13/2025	6:11:00 AM	63.41	44.0
3/13/2025	6:16:00 AM	63.28	44.1
3/13/2025	6:21:00 AM	63.21	44.1
3/13/2025	6:26:00 AM	63.14	44.1
3/13/2025	6:31:00 AM	63.07	44.2
3/13/2025	6:36:00 AM	63.00	44.2
3/13/2025	6:41:00 AM	62.92	44.4
3/13/2025	6:46:00 AM	62.83	44.4

3/13/2025	6:51:00 AM	62.76	44.5
3/13/2025	6:56:00 AM	62.76	44.5
3/13/2025	7:01:00 AM	62.76	44.5
3/13/2025	7:06:00 AM	62.92	44.4
3/13/2025	7:11:00 AM	63.00	44.2
3/13/2025	7:16:00 AM	63.14	44.1
3/13/2025	7:21:00 AM	63.25	43.9
3/13/2025	7:26:00 AM	63.25	43.4
3/13/2025	7:31:00 AM	63.41	43.4
3/13/2025	7:36:00 AM	63.52	43.1
3/13/2025	7:41:00 AM	63.66	43.0
3/13/2025	7:46:00 AM	63.81	42.9
3/13/2025	7:51:00 AM	63.91	42.9
3/13/2025	7:56:00 AM	64.08	42.7
3/13/2025	8:01:00 AM	64.08	42.5
3/13/2025	8:06:00 AM	64.15	42.5
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3/13/2025	8:21:00 AM	64.08	42.5
3/13/2025	8:26:00 AM	64.08	42.7
3/13/2025	8:31:00 AM	63.81	42.3
3/13/2025	8:36:00 AM	63.55	41.5
3/13/2025	8:41:00 AM	63.55	41.6
3/13/2025	8:46:00 AM	63.55	42.1
3/13/2025	8:51:00 AM	63.41	42.7
3/13/2025	8:56:00 AM	63.41	42.5

3/13/2025	9:01:00 AM	63.32	42.6
3/13/2025	9:06:00 AM	63.45	42.7
3/13/2025	9:11:00 AM	63.55	42.7
3/13/2025	9:16:00 AM	63.66	42.3
3/13/2025	9:21:00 AM	63.73	42.5
3/13/2025	9:26:00 AM	63.73	42.4
3/13/2025	9:31:00 AM	63.84	42.4
3/13/2025	9:36:00 AM	63.97	41.9
3/13/2025	9:41:00 AM	64.08	41.9
3/13/2025	9:46:00 AM	64.22	41.7
3/13/2025	9:51:00 AM	64.29	41.7
3/13/2025	9:56:00 AM	64.40	41.6
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3/13/2025	10:06:00 AM	64.67	41.1
3/13/2025	10:11:00 AM	64.74	41.4
3/13/2025	10:16:00 AM	64.89	41.4
3/13/2025	10:21:00 AM	64.99	41.2
3/13/2025	10:26:00 AM	65.12	40.8
3/13/2025	10:31:00 AM	65.23	40.9
3/13/2025	10:36:00 AM	65.23	40.7
3/13/2025	10:41:00 AM	65.37	40.3
3/13/2025	10:46:00 AM	65.37	40.2
3/13/2025	10:51:00 AM	65.37	39.8
3/13/2025	10:56:00 AM	65.37	40.1
3/13/2025	11:01:00 AM	65.44	39.6
3/13/2025	11:06:00 AM	65.44	39.6

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3/13/2025	11:16:00 AM	65.59	39.5
3/13/2025	11:21:00 AM	65.59	39.0
3/13/2025	11:26:00 AM	65.66	39.5
3/13/2025	11:31:00 AM	65.66	39.4
3/13/2025	11:36:00 AM	65.82	39.2
3/13/2025	11:41:00 AM	65.82	39.3
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3/13/2025	11:51:00 AM	65.82	38.9
3/13/2025	11:56:00 AM	65.93	39.1
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3/13/2025	12:06:00 PM	66.04	38.9
3/13/2025	12:11:00 PM	66.11	38.9
3/13/2025	12:16:00 PM	66.11	38.5
3/13/2025	12:21:00 PM	66.11	38.8
3/13/2025	12:26:00 PM	66.18	38.7
3/13/2025	12:31:00 PM	66.18	38.5
3/13/2025	12:36:00 PM	65.86	36.6
3/13/2025	12:41:00 PM	66.11	36.6
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3/13/2025	12:51:00 PM	66.31	37.9
3/13/2025	12:56:00 PM	66.31	38.1
3/13/2025	1:01:00 PM	66.42	38.0
3/13/2025	1:06:00 PM	66.42	38.2
3/13/2025	1:11:00 PM	66.42	38.3
3/13/2025	1:16:00 PM	66.49	38.3

3/13/2025	1:21:00 PM	66.56	38.2
3/13/2025	1:26:00 PM	66.56	38.3
3/13/2025	1:31:00 PM	66.56	38.0
3/13/2025	1:36:00 PM	66.38	37.9
3/13/2025	1:41:00 PM	66.60	38.0
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3/13/2025	1:51:00 PM	66.78	38.3
3/13/2025	1:56:00 PM	66.78	38.0
3/13/2025	2:01:00 PM	66.85	38.1
3/13/2025	2:06:00 PM	66.85	38.1
3/13/2025	2:11:00 PM	66.85	38.1
3/13/2025	2:16:00 PM	66.85	38.1
3/13/2025	2:21:00 PM	66.94	38.1
3/13/2025	2:26:00 PM	66.94	38.1
3/13/2025	2:31:00 PM	66.94	38.1
3/13/2025	2:36:00 PM	66.94	38.1
3/13/2025	2:41:00 PM	66.94	38.1
3/13/2025	2:46:00 PM	66.94	38.1
3/13/2025	2:51:00 PM	66.94	38.4
3/13/2025	2:56:00 PM	66.78	38.4
3/13/2025	3:01:00 PM	66.67	38.5
3/13/2025	3:06:00 PM	66.67	38.6
3/13/2025	3:11:00 PM	66.56	38.7
3/13/2025	3:16:00 PM	66.49	38.9
3/13/2025	3:21:00 PM	66.49	39.0
3/13/2025	3:26:00 PM	66.42	39.1

3/13/2025	3:31:00 PM	66.31	39.3
3/13/2025	3:36:00 PM	66.11	39.6
3/13/2025	3:41:00 PM	66.11	39.6
3/13/2025	3:46:00 PM	66.11	39.5
3/13/2025	3:51:00 PM	66.00	39.7
3/13/2025	3:56:00 PM	66.00	39.6
3/13/2025	4:01:00 PM	66.00	39.9
3/13/2025	4:06:00 PM	66.00	39.9
3/13/2025	4:11:00 PM	66.00	39.9
3/13/2025	4:16:00 PM	66.00	39.8
3/13/2025	4:21:00 PM	66.07	39.8
3/13/2025	4:26:00 PM	66.07	39.6
3/13/2025	4:31:00 PM	66.18	39.6
3/13/2025	4:36:00 PM	66.18	39.6
3/13/2025	4:41:00 PM	66.34	39.6
3/13/2025	4:46:00 PM	66.42	39.3
3/13/2025	4:51:00 PM	66.49	39.3
3/13/2025	4:56:00 PM	66.49	39.2
3/13/2025	5:01:00 PM	66.34	38.9
3/13/2025	5:06:00 PM	66.42	38.7
3/13/2025	5:11:00 PM	66.34	38.5
3/13/2025	5:16:00 PM	65.37	37.2
3/13/2025	5:21:00 PM	64.67	36.5
3/13/2025	5:26:00 PM	64.08	36.3
3/13/2025	5:31:00 PM	63.59	36.3
3/13/2025	5:36:00 PM	63.14	36.7

3/13/2025	5:41:00 PM	62.55	37.6
3/13/2025	5:46:00 PM	62.44	38.4
3/13/2025	5:51:00 PM	63.03	38.1
3/13/2025	5:56:00 PM	63.41	37.9
3/13/2025	6:01:00 PM	63.63	37.9
3/13/2025	6:06:00 PM	63.77	38.0
3/13/2025	6:11:00 PM	63.88	38.0
3/13/2025	6:16:00 PM	63.97	38.1
3/13/2025	6:21:00 PM	64.08	38.3
3/13/2025	6:26:00 PM	64.08	38.4
3/13/2025	6:31:00 PM	64.15	38.5
3/13/2025	6:36:00 PM	64.22	38.5
3/13/2025	6:41:00 PM	64.22	38.6
3/13/2025	6:46:00 PM	64.29	38.7
3/13/2025	6:51:00 PM	64.29	38.9
3/13/2025	6:56:00 PM	64.29	39.0
3/13/2025	7:01:00 PM	64.29	39.1
3/13/2025	7:06:00 PM	64.29	39.1
3/13/2025	7:11:00 PM	64.36	39.2
3/13/2025	7:16:00 PM	64.36	39.2
3/13/2025	7:21:00 PM	64.36	39.4
3/13/2025	7:26:00 PM	64.36	39.4
3/13/2025	7:31:00 PM	64.36	39.4
3/13/2025	7:36:00 PM	64.36	39.4
3/13/2025	7:41:00 PM	64.29	39.6
3/13/2025	7:46:00 PM	64.29	39.4

3/13/2025	7:51:00 PM	64.29	39.6
3/13/2025	7:56:00 PM	64.22	39.6
3/13/2025	8:01:00 PM	64.22	39.7
3/13/2025	8:06:00 PM	64.22	39.7
3/13/2025	8:11:00 PM	64.15	39.7
3/13/2025	8:16:00 PM	64.15	39.7
3/13/2025	8:21:00 PM	64.08	39.9
3/13/2025	8:26:00 PM	64.08	39.9
3/13/2025	8:31:00 PM	64.08	39.8
3/13/2025	8:36:00 PM	64.00	39.9
3/13/2025	8:41:00 PM	63.91	40.2
3/13/2025	8:46:00 PM	63.91	40.2
3/13/2025	8:51:00 PM	63.91	40.2
3/13/2025	8:56:00 PM	63.84	40.2
3/13/2025	9:01:00 PM	63.84	40.2
3/13/2025	9:06:00 PM	63.77	40.4
3/13/2025	9:11:00 PM	63.77	40.4
3/13/2025	9:16:00 PM	63.70	40.4
3/13/2025	9:21:00 PM	63.70	40.4
3/13/2025	9:26:00 PM	63.63	40.4
3/13/2025	9:31:00 PM	63.55	40.4
3/13/2025	9:36:00 PM	63.55	40.5
3/13/2025	9:41:00 PM	63.48	40.4
3/13/2025	9:46:00 PM	63.48	40.4
3/13/2025	9:51:00 PM	63.41	40.6
3/13/2025	9:56:00 PM	63.41	40.6

3/13/2025	10:01:00 PM	63.28	40.6
3/13/2025	10:06:00 PM	63.28	40.7
3/13/2025	10:11:00 PM	63.21	40.6
3/13/2025	10:16:00 PM	63.21	40.7
3/13/2025	10:21:00 PM	63.10	40.8
3/13/2025	10:26:00 PM	63.10	40.7
3/13/2025	10:31:00 PM	63.03	40.7
3/13/2025	10:36:00 PM	63.03	40.8
3/13/2025	10:41:00 PM	62.92	40.8
3/13/2025	10:46:00 PM	62.92	40.8
3/13/2025	10:51:00 PM	62.83	40.9
3/13/2025	10:56:00 PM	62.76	40.9
3/13/2025	11:01:00 PM	62.76	40.9
3/13/2025	11:06:00 PM	62.69	40.9
3/13/2025	11:11:00 PM	62.62	40.9
3/13/2025	11:16:00 PM	62.62	40.9
3/13/2025	11:21:00 PM	62.55	40.9
3/13/2025	11:26:00 PM	62.47	41.0
3/13/2025	11:31:00 PM	62.47	41.0
3/13/2025	11:36:00 PM	62.40	41.0
3/13/2025	11:41:00 PM	62.40	41.2
3/13/2025	11:46:00 PM	62.31	41.2
3/13/2025	11:51:00 PM	62.24	41.3
3/13/2025	11:56:00 PM	62.24	41.2

11. Revision History

Closure Date	Project # / CR ID #	Technician / Evaluator	Report Sect.	Report Item	Summary of Changes
5/22/2024	0552WS004E	R Tiegs J McShane Ken Morgan	All	All	First edition of Non CBI report
5/27/2025	0552WS004E Edition 001	K. Morgan	All	All	Minor editorial changes.
9/16/2025	0552WS004E Edition 002	K. Morgan	2.5	Page 13	Dilution tunnel description revised to indicate location room air temperature measurements, room air velocity measurements and room air background PM.
			8.3	Page 301	Calibration document for all temperature sensors was absent in original report, this has been added.
			8.3	Page 295	Calibration document for tunnel static pressure manometer was absent in original report. This has been added.
			8.3	Page 298	Calibration document for Test Fuel Scale contained a typo ("74.99" versus "79.99") An amended document from calibration provider with notes has been added.
			2.9	Page 16	Added note about auditing of filter tares and analytical balance.
			4.2	Page 26	An explanation has been provided for the background sampling volume for the first minute of sampling being outside of proportional range.
			7	Pages 214-265	Manual Revised, Edits made to Fuel Warnings, Warranty Information and Catalyst Failure Instructions.
			2.2	Page 10	Added statement to Firebox Volume Calculation clarifying that dimensions used in the calculation were measured and verified by OMNI.
			5	Pages 95-96	Preburn data for run 2 has been replaced with the correct dataset.
			4.2	Pages 26, 28, 30	The original hand-written notes clearly indicate the time of day of the fuel moisture measurements. The corresponding number of hours between these measurements and the start of the sampling portion of each test is now indicated in section 4.2 for each respective test.