



TEST REPORT

TEST OF A NON-CATALYTIC WOOD HEATER FOR EMISSIONS AND EFFICIENCY

PER EPA METHODS 28R, ASTM E2515, ASTM E2780 & ALT-154, MAY 2015

Client:

Morso Jernstoberi A/S
Furvej 6, 7900 Nykobing Morso
Denmark

Model name: 2B Standard

Attention: Rafael Sanchez

TESTED BY:

Services Polytests inc.
695-B Gaudette
St-Jean-sur-Richelieu, QC, J3B 7S7

TEST DATES: March 27th to 30th 2025

REPORT DATE: April 8th 2025

Revision1: February 16th 2026

Project number: PI-20329

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Tested:

Maxime Martin

written by:

Danick Power, P. Eng

Verified by third party certifier (PFS):

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Revision list:

Revision 1 (February 16th 2026):

1. Appendix 13 instruction to the lab, updated with date and version.
2. Report updated additional table 2.8 to reflect that the room air sample flow rate remains within 20% of the initial rate
3. Section 4.1 updated for clarification on filters material: Gelman A/E 61631 binder free, 47 mm diameter filters
4. Appendix 8 updated to Specify holder materials
5. Appendix 15 updated to include ALT-154, section 1.1 and 3.4 updated for ALT-154.
6. Appendix 2 corrected to remove duplicate and all proportionality are compliant, no reading outside 10%
7. Moisture measurements done within 4 h of test: Moisture calibration done at 7:00 am each day of test, info can be found in appendix 1 p.2 of the technician note package for each test. Moisture content of the wood taken right after (within the next hour, so between 7:00 and 8:00 am of each day of test).
8. Wood temperature measurement, clarification in appendix 1 technician wood measurement not sheet, temperature taken in deg. C, example p.26, 27 NBCI report
9. section 1.4 BC fir (Douglas fir) 19% to 25% moisture content, used for preburn
10. Appendix 1 updated for TYPOS, No traverse point within 0.50 In of the duct wall.
11. Appendix 15 updated to included document (email replies) with all addressed irregularities from February 6th 2026 email.

List of appendixes

- APPENDIX 1: Raw data, forms and results
- APPENDIX 2: Proportionality results
- APPENDIX 3: Calibration data
- APPENDIX 4: Unit pre burn
- APPENDIX 5: Participants
- APPENDIX 6: Drawings and specifications
- APPENDIX 7: Operator's manual
- APPENDIX 8: Photographs of test set up
- APPENDIX 9: Test load photographs
- APPENDIX 10: Laboratory Operating Procedures
- APPENDIX 11: Sample calculations
- APPENDIX 12: Volume calculations
- APPENDIX 13: Operating instruction
- APPENDIX 14: Drawing Air flow pattern
- APPENDIX 15: 30-day notice, WHA, other

1 INTRODUCTION

1.1 GENERAL

Laboratory

- Location: Services Polytests Inc., 695-B Gaudette St-Jean-sur-Richelieu QC, Canada J3B 7S7
- Elevation: 100 feet above sea level

Test program

- Purpose: unit qualification NSPS 2020
- Test dates: March 27th to 30th 2025
- Test methods used:
 - o Particulate emissions: ASTM E2780-10; ASTM E2515-11 methods 28R as referred into 40 CFR Part 60 Subpart AAA
 - o Efficiency: CSA B415.1-10
 - o ALT-154 for weighting filters in pair.

1.2 TEST UNIT INFORMATION

General

- Unit tested: 2B Standard
- **Appliance Manufacturer:** Morsø Jernstøberi A/S
- **Wood Stove Model:** 2B Standard
- **Type:** Freestanding, radiant-type wood fired room heater.
- **WOOD HEATER DESCRIPTION**
- **Materials of Construction:** The unit is constructed primarily of cast iron with a stainless-steel secondary combustion air supplying baffle. The firebox is lined with molded vermiculite firebricks. The feed door has a 150 mm by 130 mm glass panel and an 8 mm diameter fiberglass gasket.
- **Air Introduction System:** Air enters the firebox through a spin-draft located at the front of the appliance at the top of the fuel-loading door. Secondary air enters the appliance through the upper back and supplies a three-step, tiered hollow baffle.
-
- **Combustion Control Mechanisms:** The combustion air inlet is controlled by a spindraft located at the top of the fuel-loading door in the center of the appliance. Only the primary combustion air is adjustable, the secondary combustion air is fixed.
- **Combustor:** N/A
- **Internal Baffles:** A hollow, tiered baffle with a cast iron extension baffle is mounted in the upper portion of the firebox. The flame path is forced to the front of the firebox where it travels up through the opening between the baffle and primary air manifold. A ceramic wool blanket is employed on the top of the baffle.
- **Other Features:** None
- **Flue Outlet:** The 6" diameter flue outlet is located at the rear top end of the appliance.

1.3 RESULTS

Emission results obtained

- Weighted Average Emissions Rate: 1,3 g/hr
- Weighted Average Overall Efficiency: 75 %

Conformity: NSPS Phase 2020, CSA B-415.1-22

1.4 PRETEST INFORMATION

- Unit condition: The unit was received by carrier in good condition in February 2025. The 50hrs of aging was done by the Manufacturer at medium burn rate. Fuel: BC FIR (Douglas fir) between 19% and 25%. (All data in Appendix 4).

Set up

- Venting system type: 6-inch steel pipe and insulated chimney
- System height from floor: 15 feet
- Particularities: none

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Test Date (YYYY-MM-DD)	Emission Rate (g/hr)	Burn Rate (kg/hr)	1st hour Emission Rate (g/hr)	CSA B415.1 CO emission Gr/hr	CSA B415.1 emission Gr/Mj	Heat output (BTU/HR)	(OHE) % HHV
1	2025-03-27	0,55	0,734	1,42	56,56	0,05	10 661	77,28%
2	2025-03-28	0,90	0,957	1,55	39,86	0,06	14 009	77,84%
3	2025-03-29	2,07	1,273	2,44	40,00	0,11	17 620	73,62%
4	2025-03-30	1,74	1,426	2,35	42,06	0,08	19 519	72,82%

2.2 WEIGHTED AVERAGE CALCULATION

Test No.	Burn Rate (Kg/hr)	(E) Ave. Emission Rate g/hr	(OHE) % HHV	Heat Output (BTU/HR)	CSA B415.1 CO emission g/min
2	0,73	0,549	77,3%	10 661	0,94
3	0,96	0,902	77,8%	14 009	0,66
4	1,27	2,066	73,6%	17 620	0,67
1	1,43	1,737	72,8%	19 519	0,70
Weighted particulate emission average of 4 test runs: 1,3 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 75 %.					
Average Co 0,74 gr/min					

2.3 TEST FACILITY CONDITIONS

Run Number	Room Temperature		Barometric pressure		Relative humidity		Air Velocity	
	Before (F)	After (F)	Before (in.Hg)	After (in.Hg)	Before (%)	After (%)	Before (ft/min)	After (ft/min)
1	71	75	29,589	29,471	26,5	24,7	0	0
2	69	71	29,471	29,441	28,3	26,9	0	0
3	69	72	29,678	29,678	29,7	28,6	0	0
4	69	75	29,855	29,884	23,9	22	0	0

2.4 FUEL QUALITIES

Run Number	Pre-test Load			Test Load						
	Loading Weight Wet Basis (lbs)	Moisture Content Dry Basis (%)	Coal bed Weight (lbs)	Weight Wet Basis (lbs)	Density Wet Basis (lbs/cuft)	Moisture Content Dry Basis (%)	Piece Length (in.)	Number of 2X4's	Number of 4x4's	Number of Spacers
1	5,29	20,29	3,2	4,75	6,901	20,61	15,625	2	0	6
2	5,91	20,45	1,1	4,83	7,026	20,53	15,625	2	0	6
3	6,00	20,71	1,1	4,87	7,078	21,05	15,625	2	0	6
4	5,66	20,34	1,0	4,88	7,090	20,91	15,625	2	0	6

2.5 DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA (ASTM E2515)

Average dilution tunnel measurements				Sample Data			
Run Number	Burn Rate (Min)	Tunnel Velocity (ft/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1	146	1064,08	540,61	26,611	26,830	0,70	0,70
2	114	1058,51	540,64	20,721	20,884	0,90	0,90
3	86	1073,81	550,33	15,627	15,799	1,60	1,50
4	77	1127,57	556,34	14,385	14,570	1,10	1,20

2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)			
	Train 1	Train 2	Train 1	Train 2	% Deviation	Deviation g/kg
1	1923,77	1908,08	1,34	1,33	0,47%	0,007
2	1914,09	1899,20	1,72	1,71	0,43%	0,008
3	1922,50	1901,60	3,07	2,85	3,81%	0,124
4	1954,78	1930,01	2,15	2,31	3,66%	0,089

2.7 GENERAL SUMMARY OF RESULTS

Run Number	Burn Rate (kg/hr)	Average Surface Temperature (F)	Change in surface Temperature (F)	Initial Draft (in. H2O)	static pressure tunnel (in. H2O) neg.	Primary Air Setting	Run Time (min)
1	0,734	393,97	-83,1	0,064	0,160	minimum	146
2	0,957	430,01	-75,7	0,076	0,160	cat2 setting	114
3	1,273	473,69	-38,3	0,086	0,150	cat3	86
4	1,426	486,43	-20,8	0,095	0,170	maximum	77

2.8 BLANK SAMPLING FLOW RATE

Run Number	Initial flow rate blank sampling (cuft/min)	Average flow rate blank sampling (cuft/min)
1	0,18	0,178
2	0,18	0,179
3	0,18	0,180
4	0,18	0,184

3 PROCESS DESCRIPTION

3.1 DISCUSSION

The heater has been received in a good shape by a carrier in March 2025. The 50hrs Pre-burn has been done by the Manufacturer with crib wood at medium heat draw. The wood heater is equipped with air control handle located at the front of the heater above the door. No convection fan can be sold with the appliance, Stove is mainly made of Cast Iron and inside of the firebox covered with vermiculite.

3.2 UNIT DIMENSIONS

Baffle

- Location: between top of combustion chamber and hearth
- Restriction: at the front of unit
- Dimensions: covers the hearth area minus the restriction at front
- Material: Stainless-steel baffle, covered with wool

Bricks

- Vermiculite 25mm Thick cover all back and sides and bottom

Flue gas exhaust

- Location: top
- Dimensions: 6 in. diameter
- Material: Cast Iron

Gasket

- Refer to appendix 6 for all details and location

Overall unit dimension

- Firebox dimensions: All dimension and calculation can be found in appendix 12
- Usable volume: 0,688 cuft.
- Overall heater dimension: 12 ¾ -inch-wide, 28 inch deep, 27 ¾ high

Convection fan

- None

Catalyst

- None

3.3 AIR SUPPLY SYSTEM

Description

- Primary air: Through a spinner-draft above the door which delivers an air wash down the door window (no air channels).
- Secondary air: From the top back of the stove through a combustion air-supplying baffle, that have three rows of $\varnothing 3$ holes

Characterization

The following table shows the inlet and outlet sections of each system. The air introduction system number is referred to on a set of drawings in Appendix 6.

AIR INTRODUCTION SYSTEM		INLET (mm ²)			OUTLET
Identification	Type	Imin	Imax	Controlled	(mm ²)
A *	Primary	407	905	Yes	905
B *	Secondary	396	396	NO	1000
C *	Pilot	None	None	NO	None

* This section would be filled by measuring and comparing with the manufacturer's drawings included in the test report.

A Outlet:

905 mm²

Drawing reference: 2B-161 Morsø 2B Standard combustion air settings

A Inlet:

max: $2 \times \text{PI}() \times (72 \text{ mm}/2) \times 4 \text{ mm} = 905 \text{ mm}^2$

min: $2 \times \text{PI}() \times (72 \text{ mm}/2) \times 1.8 \text{ mm} = 407 \text{ mm}^2$

Drawing Reference: 2B-161 Morsø 2B Standard combustion air settings

B Outlet:

1000 mm²

Drawing reference: 2B-161 Morsø 2B Standard combustion air settings

B Inlet:

$56 \times \varnothing 3 = 396 \text{ mm}^2$

Drawing Reference: 2B-161 Morsø 2B Standard combustion air settings

3.4 OPERATION DURING TEST

All runs have been found appropriate, no anomalies happened and all runs below have been validate and found. All pieces have been loaded front to back (longest dimension). Filters have been weighted in pair as per the ALT-154.

Run #1

This run was performed on March 27th 2025. It lasted 146 minutes and a category 1 burn rate was obtained at 0,73 kg/hr & emission at 0,55 gr/hr. The air inlet damper was fully closed at the minimum setting. the burn rate for the low burn rate category is no greater than the rate that an operator can achieve in home use.

Run #2

This run was performed on March 28th 2025. It lasted 114 minutes and a category 2 burn rate was obtained at 0,96 kg/hr & emission at 0,90 gr/hr. The air inlet damper was at category 2 setting.

Run #3

This run was performed on March 29th 2025. It lasted 86 minutes and a category 3 burn rate was obtained at 1,27 kg/hr & emission at 2,07 gr/hr. The air inlet damper was at category 3 setting

Run #4

This run was performed on March 30th 2025. It lasted 77 minutes and the maximum burn rate was obtained at 1,43 kg/hr & emission at 1,74 gr/hr. The air inlet damper was fully open at the maximum setting.

- Details: Refer to the front page of each test run data sheets found in appendix for the detailed test sequence showing air supply settings and adjustments, fuel bed adjustments and operational specifics of the test unit.

Test fuel cribs

- Type of wood: Douglas fir, grade c or better, 19 to 25% dry basis moisture content
- Description: for each test, description of the fuel crib is found on the front page of each test run data sheet together with photograph in appendix.

3.5 START-UP OPERATION

The complete manufacturer's firing procedure of each burn rate category is fully described in appendix 13.

3.6 SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel. The tunnel has two elbows ahead of the sampling section. The sampling section is a continuous 8-inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard pitot tube, thermocouple is installed on the pitot tube to measure the dry bulb temperature. MC is assumed, as allowed, to be 2%. Tunnel samplers are located downstream of the pitot tube and upstream from the end of this section. All detail of dilution tunnel can be found in appendix 8.

3.7 DRAWINGS

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix 6.

3.8 EMISSIONS EFFICIENCY TESTING EQUIPMENT LIST

The complete test equipment list together with all corresponding calibration data can be found in Appendix 3.

4 SAMPLING METHODS

4.1 PARTICULATE SAMPLING

Particulates were sampled in strict accordance with ASTM E2515. This method uses two identical sampling systems with Gelman A/E 61631 binder free, 47 mm diameter filters. The dryers used in the sample systems are filled with "Drierite" before each test run.

5 QUALITY ASSURANCE

5.1 INSTRUMENT CALIBRATION

5.1.1 GAS METERS

At the conclusion of each test program the gas meters are verified using the reference dry gas meter. This process involves sampling the train operation for 1 cubic foot of volume. With readings made to .01 fr', the resolution is 1 %, giving an accuracy higher than the 2% required by the standard.

5.1.2 SCALES

Before each test program, the different scales used are checked with traceable calibration weights to ensure their accuracy.

5.1.3 GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with NBS traceable gases. A mid-scale multi-component calibration gas is then analyzed (values are recorded). At the conclusion of a test, the instruments are checked again with zero, span and calibration gases (values are recorded only). The drift in each meter is then calculated and must not exceed 5% of the scale used for the test.

5.2 TEST METHOD PROCEDURES

5.2.1 LEAK CHECK PROCEDURES

Before and after each test, each sample train is tested for leaks. Leakage rates are measured and must not exceed 0.02 CFM or 4% of the sampling rate. Leak checks are performed checking the entire sampling train. Pre-test and post-test leak checks are conducted with a vacuum of 5 inches of mercury. Vacuum is monitored during each test and the highest vacuum reached is then used for the post-test vacuum value. If leakage limits are not met, the test run is rejected. During these tests, the vacuum is typically less than 2 inches of mercury. Thus, leakage rates reported are expected to be much higher than actual leakage during the tests.

5.2.2 TUNNEL VELOCITY FLOW MEASUREMENT

The tunnel velocity is calculated from a center point pitot tube signal multiplied by an adjustment factor. This factor is determined by a traverse of the tunnel as prescribed in EPA Method 1. Final tunnel velocities and flow rates are calculated from EPA Method 2, Equation 6.9 and 6.10. (Tunnel cross sectional area is the average from both lines of traverse.)

Pitot tubes are cleaned before each test and leak checks are conducted after each test.

5.2.3 PM SAMPLING PROPORTIONALITY (ASTM E2515)

Proportionalities were calculated in accordance with ASTM E2515. The data and results are found in appendix.

APPENDIX 1: Raw data, forms and results

Date: 2025.03.27 Manufacturer: Morso Model: 2B
Project #: PI 20329 Run: 1 Tech: M.N Reviewer: DP

- Handling 25 LBS stand pipe
- After 2 min close Door
- At 100 LBS insert prebail
- After 30 sec close Door
- At 47 LBS close air inlet minimum setting
- At 12 LBS (62 min) insert load
- After 2 min close Door
- At 5 min close air inlet minimum setting

TEST LOAD CONFIGURATION

Date: 2025-03-27

Manufacturer: Morsu

PRE / POST CHECKS

Model: 2B

Project #: PI 20329

Run: 1

Tech: M.M

Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
<u>EM 334</u>	<u>7:00</u>	<u>ok</u>	<u>ok</u>

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check (tunnel velocity)

Picture.....

<u>0</u> (max50 Fpm)	<u>0</u> (max50 Fpm)
<u>0</u>	NA
4 sides <u>ok</u>	<u>ok</u>

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O)

Traverse before ignition.....

<u>2025-03-27</u>
<u>2025-03-27</u>
<u>ok</u>
<u>ok</u>

Temperature System:

Ambient (65°-90°F)

<u>ok</u>	°F
-----------	----

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

Pictures for report.....

<u>ok</u>	
<u>ok</u>	
<u>ok</u>	
Side	<u>ok</u>
Coal bed	<u>ok</u>
Load	<u>ok</u>
Load in stove	<u>ok</u>
Fuel adjustment	<u>ok</u>
	<u>ok</u>

Load Length 5/6 of firebox Length +/- 1 inch.....



Date: 2025-03-27

Project #: PI 20329

Manufacturer: Mars

Model: 2B

Run: 1

Tech: M.M

Reviewer: [Signature]

Leakage Checks Tunnel Samplers

	Train 1		Train 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-7	-7	-7	-7
Final 1 minute DGM (Liter)	127786 58	128998 01	883732 75	884532 21
Initial 1 minute DGM (Liter)	127786 56	128998 00	883732 74	884532 20
Change (Liter)	002	001	001	001
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2025-03-27
Project #: PI 2315

Manufacturer: Mars
Run: 1

Model: 2B
Reviewer: DS

Tech: M.M

Leakage Checks Tunnel Samplers

	System 1 st hour		Ambient	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm	-7	-7	-7	-7
Vacuum (inches Hg.)	-7	-7	-7	-7
Final 1 minute DGM (Liter)	115530	116719	62855699	62932335
Initial 1 minute DGM (Liter)	115530	116719	62855690	62932320
Change (Liter)	0	0	009	015
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2025-03-27 Manufacturer: Mars Model: 2B
Project #: PT 20324 Run: 1 Tech: M.H. Reviewer: DP

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotameter Reading (mm/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

Leakage Checks Pitot

Plugged Probe	Pre-Test 3 H2O static	Pre-Test 0.4-0.5 H2O velocity	Post Test 3 H2O Static	Post Test 0.4-0.5 H2O velocity
Vacuum (inches Hg.)	3	.5	3	.4
Check OK (no change after 15 sec.)	OK	OK	OK	OK



Date: 2025-03-27 Project #: PT 20325 Manufacturer: Mars Model: 2B
Run: 1 Tech: M.M. Reviewer: [Signature]

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	100 Kg, Class F	100 Kg
Wood	EM-090	44 lbs, Class F	44 lbs
Analytical	EM 335	100.0 mg, Class S	100.0 mg
Analytical	EM 129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg
PLATFORM SCALE: 20%-80% of ideal test load weight, ± 0.1 lbs or 1%
WOOD SCALE: 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 2025-03-27

 Manufacturer: Moriso

 Model: 2B

 Project #: PI 20329

 Run: 1

 Tech: M.H.

 Reviewer: DO

FOR TUNNELS < 12 in

 Barometric pressure (P_{bar}) _____ (KPa.) Static pressure (P_q) _____ (inches w.c.)

Inside diameter: Port A _____ Port B _____

 Tunnel cross sectional area: .1963Ft²

Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
Tunnel diameter	6 po	7 po	8 po		
A - Centroid	3.00	3.50	4	0.075	66.95
B - Centroid	3.00	3.50	4	0.074	66.80
A-1	0.40 0.50	0.50	0.50	0.061	66.95
A-2	1.50	1.75	2	0.074	66.98
A-3	4.50	5.25	6	0.066	66.98
A-4	5.60 5.50	6.5	7.5	0.060	66.80 66.90
B-1	0.40 0.50	0.50	0.50	0.060	66.80
B-2	1.50	1.75	2	0.070	66.75
B-3	4.50	5.25	6	0.073	66.75
B-4	5.60 5.50	6.5	7.5	0.060	66.81
				AVERAGE	

Date: _____ Manufacturer: _____ Model: _____

Project #: _____ Run: _____ Tech: _____ Reviewer: _____

FOR TUNNELS 12 in

Barometric pressure (P_{bar}) _____ (KPa.) Static pressure (P_q) _____ (inches w.c.)

Pitot tube type: Standard

Traverse Point	Position (inches)	Velocity Head Δp (inches H_2O)	Tunnel Temperature ($^{\circ}F$)
A Center	6		
B Center	6		
A-1	0.53		
A-2	1.75		
A-3	3.55		
A-4	8.45		
A-5	10.25		
A-6	11.47		
B-1	0.53		
B-2	1.75		
B-3	3.55		
B-4	8.45		
B-5	10.25		
B-6	11.47		

CONTINUOUS ANALYZERS

 Date: 2025-03-27

 Manufacturer: Morso

 Model: 2B

 Project #: PI 20329

 Run: 1

 Tech: M.H

 Reviewer: SO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3056	3000	1021	1000
Tolerance CO	0	+/- 0.02	0056	+/- 0.15	0021	+/- 0.05
CO ₂	0	0	1801	1800	978	1000
Tolerance CO ₂	0	+/- 0.02	001	+/- 0.5	022	+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	3049	1015	0	0.02	0007	0.15	0006	0.05	✓	
CO ₂	0	1806	980	0	0.02	003	0.5	002	0.5	✓	



TEST DATA LOG

Date: 2025-03-27 Project #: pI 20325 Manufacturer: MORSO Model: 2b Run: 1 Tech: J-M Reviewer: [Signature]

RAW DRY GAS METER READINGS

Test	System 1 st hour	System 1	System 2	Blank
	Final (Liter) 1167.15	128597.53	884531.26	629321.74
	Initial (Liter) 1155.36	127787.21	883733.45	628559.82

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100.2	99.8
Dry Bulb (F):	70.4	74.5
Humidity (%):	26.5	24.7

Date: 2015-09-27

TESTING THROUGH YOUR REALITY

Manufacturer: *Moss*

FUEL DATA

Model: 2 B

Project #: pI 20329

Run: 1

Tech: *MM*

Reviewer:

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

[illegible]

TEST LOAD WEIGHT: 5294 lbs

Wood Temperature: 21°C

2

Date 025-03-27

FUEL DATA

Date 025-03-27

Manufacturer: M. S. S.

Model: 2B

Project #: OT 20329

Run: 1

Tech: M. M.

Reviewer: SP

FUEL DESCRIPTION:

Type of wood:

TEST LOAD

[illegible]

TEST LOAD WEIGHT: 4,748 lbs Min 20%: Max 25%:

Wood Temperature: 21°C

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2025-03-24 Project #: 0120329 Manufacturer: MOC 50 Model: 20 Tech: M.H. Reviewer: S

TEST FILTERS						
SYSTEM 1 st hour			SYSTEM 1			
Pre-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Probe & Housing Number	Front & Back Filter Number	gaskets
Date	20	117-118	1	21	119-120	5
2025-03-24	108 8403	02561	3 3378	108 7335	02571	5 0059
2025-03-27	108 8404	02562	3 3378	108 7334	02573	5 0060

TEST FILTERS						
SYSTEM 1 st hour			SYSTEM 1			
Post-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Probe & Housing Number	Front & Back Filter Number	gaskets
Date	20	117-118	2-1	21-20	119-120	5
2025-03-27	108 8406	02566	3 3399	108 7340	02578	5 0074
2025-03-31	108 8405	02566	3 3381	108 7336	02574	5 0067
2025-04-07	108 8405	02566	3 3381	108 7335	02574	5 0066

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2025-03-24 Manufacturer: MVS Model: 215
 Project #: PI 20329 Run: 1 Tech: MM Reviewer: SS

TEST FILTERS						
SYSTEM 2						
Pre-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date 2025-03-24 15:15
Date	Time					
2025-03-24	17:00	109 1637	02544	4 9768	0 1287	
2025-03-27	9:00	109 1638	02545	4 9767	0 1286	
TEST FILTERS						
SYSTEM 2						
Post-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date 2025-03-24 15:15
Date	Time					
2025-03-27	15:30	109 1642	02550	4 9785	0 1288	
2025-03-31	9:00	109 1639	02548	4 9771	0 1287	
2025-04-07	13:00	109 1639	02548	4 9771	0 1287	

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage: MOR

Description du test

Test standard	EPA
Run #	1
Date	27-03-2025
Technicien	M.M
Project #	PI 20329

Description de l'unité

Manufacturier	MORSO	
Modèle	2B	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	0,688	cu ft.
Appliance weight empty	n.a	lbs
Appliance weight full	n.a	lbs

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	n.a	BTU/h Donnée fournie par le manfacturier
Targeted category	1	
Targeted output	n.a	BTU/h
Cp steel	n.a	BTU/lb-°F

Échantillonnage

targeted Blank sampling rate	0,18	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,986	
Equipment number (DGM #1):	EM 178	Dimensionless
Calibration Factor (DGM #2):	1,010	
Equipment number (DGM #2):	EM 318	Dimensionless
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	EM 179	Dimensionless
Calibration Factor (DGM 1st Hr):	1,000	
Equipment number (DGM 1st Hr):	EM 130	Dimensionless

Tunnel

Targeted tunnel flow rate	400	scfm
Tunnel diameter	8	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20329
Date 27-03-2025
Technicien M.M

Fuel data

Fuel type	Dimension
Fuel specie	D. Fir
HHV	19810,0 kJ/kg
%C	48,7
%H	6,9
%O	43,9
%Ash	0,5
HHV	8519,2 Btu/lb
LHV	7451,0 Btu/lb

Default Fuel Values

	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

	Start	End
Barometer (kPa):	100,2	99,8
Barometer (in.Hg):	29,589049	29,47092891
Dry Bulb (F):	70,4	74,5
Humidity (%):	26,5	24,7
Air velocity (ft/min)	0	0

DGM #1st hour	Final:	1167,150	cuft
	Initial:	1155,360	cuft
DGM #1	Final:	4541,379	cuft
	Initial:	4512,763	cuft
DGM #2	Final:	31236,927	cuft
	Initial:	31208,753	cuft
DGM room	Final:	22224,288	cuft
	Initial:	22197,381	cuft

	Final:	1167,150	cuft
	Initial:	1155,360	cuft
	Final:	128597,530	Liter
	Initial:	127787,210	Liter
	Final:	884531,260	Liter
	Initial:	883733,450	Liter
	Final:	629321,740	Liter
	Initial:	628559,820	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

207

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	PI 20329
Date	27-03-2025
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,16 in. H2O (absolute value)
 Barometer: 29,900 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

PITOT CONSTANT=
0,951

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,075	66,95	0,2739
B center	0,074	66,8	0,2720
A1	0,061	66,95	0,2470
A2	0,074	66,98	0,2720
A3	0,066	66,98	0,2569
A4	0,060	66,9	0,2449
B1	0,060	66,8	0,2449
B2	0,070	66,8	0,2646
B3	0,073	66,8	0,2702
B4	0,062	66,8	0,2490
AVERAGE	0,0675	66,8670	0,2595

Project nu.	PI 20329
Date	27-03-2025
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date	Heure	Test end date & time
	probe	front/ Back	gasket	probe	front/ Back	gasket	probe	front/ Back	gasket	Filter			
Number	20	117-118	1	21	119-120	5	43	121-122	13	123			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	108,8403	0,2561	3,3378	108,7335	0,2572	5,0059	109,1637	0,2544	4,9768	0,1287	2025-03-24	17:00	
Before (6)	108,8404	0,2562	3,3378	108,7334	0,2573	5,0060	109,1638	0,2545	4,9767	0,1286	2025-03-27	09:00	
After (1)	108,8406	0,2566	3,3399	108,7340	0,2578	5,0074	109,1642	0,2550	4,9785	0,1288	2025-03-27	15:30	
After (2)	108,8405	0,2566	3,3381	108,7336	0,2574	5,0067	109,1639	0,2548	4,9771	0,1287	2025-03-31	09:00	
After (3)	108,8405	0,2566	3,3381	108,7335	0,2574	5,0066	109,1639	0,2548	4,9771	0,1287	2025-04-07	13:00	
After (4)													
After (5)													
After (6)	108,8405	0,2566	3,3381	108,7335	0,2574	5,0066	109,1639	0,2548	4,9771	0,1287	2025-04-07	13:00	2025-03-24 15:15
Difference	0,0001	0,0004	0,0003	0,0001	0,0001	0,0006	0,0001	0,0003	0,0004	0,0001			
Total (mg)		0,8			0,8			0,8		0,1			
Total ajusté (mg)		0,70			0,70			0,70					

Project nu.	PI 20329
Date	27-03-2025
Technicien	M.M

Manufacturer: MORSO
Model: 2B

Run: 1
Project #: PI 20329
Test Duration: 146 min

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

Overall Heating Efficiency: 77,28%
Combustion Efficiency: 94,72%
Heat Transfer Efficiency: 81,59%

	HHV	LHV
Eff	77,28%	83,53%
Comb Eff	94,72%	94,72%
HT Eff	81,59%	88,19%
Output	11 238	kJ/h
Burn Rate	0,73	kg/h
Grams CO	138	g
Input	14 542	kJ/h
MC wet	17,08	

Ultimate CO₂
CO_{2-ult} 19,64
F₀
1,062

Heat Output:	10 661 Btu/h
Heat Input:	13 794 Btu/h
Burn Duration:	2,43 h
Burn Rate:	1,62 lb/h
Stack Temp:	216,5 Deg. F

	Averages		1,14	9,08	1,19	20,27	10,62	102,70	21,37	0,89	0,83	#DIV/0!
INPUT DATA				Oxygen Calculation			Input Data		Combust	Heat		
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO ₂ [d]	Excess Air EA	Total O ₂	Calc. % O ₂ [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Net Eff %	
0,00	2,15	0,46	3,01	466,6%	20,71	17,47	128,8	21,6	90,3%	67,5%	61,0%	
1,00	2,08	0,44	2,51	566,7%	20,75	18,02	138,2	21,7	89,2%	61,3%	54,7%	
2,00	2,03	0,37	6,47	187,2%	20,49	13,83	177,5	21,7	96,0%	73,6%	70,7%	
3,00	2,03	0,28	8,26	129,9%	20,38	11,97	199,9	21,7	97,6%	74,9%	73,1%	
4,00	1,94	0,17	9,48	103,7%	20,30	10,74	215,7	21,7	98,8%	75,4%	74,5%	
5,00	1,94	0,11	11,02	76,6%	20,21	9,13	183,4	21,6	99,4%	79,3%	78,8%	
6,00	1,89	0,16	11,71	65,5%	20,16	8,37	162,7	21,6	99,1%	81,1%	80,3%	
7,00	1,85	0,24	11,33	69,7%	20,18	8,72	153,8	21,6	98,4%	81,4%	80,1%	
8,00	1,85	0,26	11,67	64,7%	20,15	8,36	150,1	21,7	98,4%	81,8%	80,5%	
9,00	1,80	0,22	12,02	60,5%	20,13	8,00	148,6	21,6	98,7%	82,1%	81,0%	
10,00	1,76	0,17	12,92	50,2%	20,08	7,08	148,6	21,6	99,1%	82,6%	81,8%	
11,00	1,71	0,11	13,67	42,5%	20,03	6,31	149,0	21,7	99,4%	82,9%	82,4%	
12,00	1,71	0,10	13,63	43,1%	20,03	6,35	148,4	21,7	99,5%	82,9%	82,5%	
13,00	1,67	0,09	13,38	45,8%	20,05	6,63	147,7	21,6	99,6%	82,8%	82,5%	
14,00	1,62	0,08	13,44	45,2%	20,05	6,56	147,8	21,6	99,6%	82,9%	82,6%	
15,00	1,58	0,25	15,46	25,0%	19,90	4,31	153,4	21,6	98,7%	83,3%	82,2%	
16,00	1,53	0,77	16,68	12,6%	19,79	2,73	155,7	21,6	96,3%	83,4%	80,3%	
17,00	1,49	0,40	16,51	16,1%	19,82	3,11	156,6	21,6	98,0%	83,4%	81,8%	
18,00	1,44	0,35	16,51	16,5%	19,83	3,14	157,0	21,6	98,3%	83,4%	82,0%	
19,00	1,39	0,26	16,41	17,8%	19,84	3,30	157,7	21,6	98,8%	83,4%	82,3%	
20,00	1,35	0,28	16,40	17,8%	19,84	3,30	157,3	21,6	98,6%	83,4%	82,2%	
21,00	1,35	0,25	16,25	19,0%	19,85	3,47	155,7	21,6	98,8%	83,4%	82,4%	
22,00	1,30	0,15	16,00	21,6%	19,87	3,80	154,6	21,7	99,3%	83,4%	82,8%	
23,00	1,26	0,13	16,05	21,4%	19,87	3,76	153,9	21,6	99,4%	83,5%	83,0%	
24,00	1,21	0,15	16,22	20,0%	19,86	3,57	153,2	21,6	99,3%	83,5%	82,9%	
25,00	1,17	0,21	16,63	16,6%	19,83	3,09	153,9	21,7	99,0%	83,6%	82,8%	
26,00	1,17	0,63	16,37	15,6%	19,82	3,14	154,1	21,7	96,9%	83,4%	80,8%	
27,00	1,12	0,73	16,22	15,9%	19,82	3,24	153,8	21,7	96,4%	83,3%	80,3%	
28,00	1,08	0,66	16,15	16,8%	19,83	3,35	153,6	21,7	96,7%	83,4%	80,6%	
29,00	1,03	0,68	16,18	16,5%	19,83	3,31	153,4	21,7	96,7%	83,4%	80,6%	
30,00	0,99	0,67	16,08	17,3%	19,83	3,42	153,2	21,7	96,7%	83,3%	80,6%	
31,00	0,94	0,65	16,10	17,3%	19,83	3,41	152,5	21,7	96,8%	83,4%	80,7%	
32,00	0,93	0,69	16,04	17,5%	19,84	3,46	151,8	21,7	96,6%	83,4%	80,6%	
33,00	0,90	0,82	16,59	12,8%	19,79	2,79	152,4	21,7	96,1%	83,5%	80,2%	
34,00	0,85	1,04	16,96	9,1%	19,75	2,27	153,2	21,8	95,2%	83,5%	79,5%	
35,00	0,80	1,41	16,99	6,7%	19,72	2,03	153,5	21,8	93,6%	83,4%	78,0%	
36,00	0,76	1,65	16,58	7,7%	19,74	2,33	153,2	21,8	92,4%	83,2%	76,9%	
37,00	0,76	1,54	16,48	9,0%	19,75	2,50	152,2	21,8	92,9%	83,2%	77,3%	
38,00	0,71	1,28	16,34	11,5%	19,78	2,79	151,1	21,7	93,9%	83,3%	78,3%	
39,00	0,67	1,02	16,27	13,6%	19,80	3,02	150,2	21,8	95,1%	83,4%	79,3%	
40,00	0,67	0,81	15,89	17,6%	19,84	3,54	147,7	21,8	95,9%	83,5%	80,1%	
41,00	0,62	0,53	15,39	23,4%	19,89	4,23	145,4	21,8	97,3%	83,6%	81,3%	
42,00	0,62	0,54	15,24	24,4%	19,90	4,38	143,4	21,8	97,2%	83,6%	81,2%	
43,00	0,58	0,53	15,39	23,4%	19,89	4,23	142,0	21,9	97,3%	83,7%	81,4%	
44,00	0,53	0,39	15,67	22,4%	19,88	4,02	141,2	21,9	98,0%	83,9%	82,2%	
45,00	0,53	0,14	15,89	22,6%	19,88	3,92	139,3	21,8	99,3%	84,1%	83,6%	
46,00	0,49	0,09	15,37	27,1%	19,92	4,50	137,6	21,8	99,6%	84,1%	83,8%	
47,00	0,49	0,04	14,91	31,4%	19,95	5,02	135,6	21,8	99,9%	84,1%	83,9%	
48,00	0,49	0,02	14,45	35,7%	19,98	5,52	132,8	21,8	100,0%	84,1%	84,1%	
49,00	0,44	0,01	14,01	40,1%	20,01	6,00	130,2	21,7	100,0%	84,1%	84,1%	
50,00	0,44	0,01	13,51	45,3%	20,05	6,53	127,7	21,7	100,1%	84,0%	84,1%	
51,00	0,40	0,01	12,69	54,6%	20,10	7,40	124,5	21,7	100,1%	83,9%	84,0%	
52,00	0,40	0,02	11,91	64,7%	20,15	8,23	121,1	21,7	100,1%	83,8%	83,9%	
53,00	0,40	0,03	11,04	77,4%	20,21	9,15	117,5	21,7	100,0%	83,6%	83,7%	
54,00	0,40	0,07	9,99	95,3%	20,28	10,25	114,6	21,7	99,7%	83,3%	83,0%	
55,00	0,35	0,13	9,32	108,0%	20,32	10,94	111,6	21,7	99,2%	83,1%	82,4%	
56,00	0,35	0,20	8,86	116,8%	20,34	11,38	108,5	21,6	98,5%	83,0%	81,7%	
57,00	0,35	0,29	8,53	122,7%	20,36	11,68	106,1	21,6	97,6%	82,9%	80,9%	
58,00	0,35	0,37	8,34	125,4%	20,36	11,84	104,0	21,7	96,8%	82,9%	80,3%	
59,00	0,35	0,44	8,10	130,0%	20,38	12,06	102,0	21,6	96,1%	82,8%	79,6%	
60,00	0,35	0,54	7,84	134,3%	20,39	12,28	100,2	21,5	94,9%	82,7%	78,5%	
61,00	0,30	0,62	7,64	137,7%	20,39	12,44	98,2	21,6	94,1%	82,7%	77,8%	
62,00	0,31	0,72	7,21	147,7%	20,42	12,85	96,6	21,6	92,8%	82,4%	76,5%	
63,00	0,35	0,83	7,00	151,0%	20,42	13,01	95,1	21,6	91,6%	82,3%	75,4%	
64,00	0,31	0,92	6,88	151,9%	20,43	13,09	93,6	21,6	90,6%	82,3%	74,5%	
65,00	0,30	0,96	6,88	150,5%	20,42	13,06	92,5	21,6	90,3%	82,4%	74,3%	
66,00	0,30	1,01	6,86	149,7%	20,42	13,06	91,1	21,7	89,8%	82,5%	74,0%	
67,00	0,30	0,97	6,86	150,9%	20,42	13,08	89,4	21,7	90,2%	82,6%	74,5%	
68,00	0,30	0,95	6,90	150,3%	20,42	13,05	88,4	21,6	90,3%	82,8%	74,7%	
69,00	0,30	0,96	6,93	149,1%	20,42	13,01	87,4	21,5	90,3%	82,9%	74,9%	
70,00	0,30	0,96	6,96	147,8%	20,42	12,97	86,5	21,6	90,3%	83,0%	74,9%	
71,00	0,30	0,97	6,98	147,1%	20,42	12,95	85,6	21,4	90,3%	83,1%	75,0%	
72,00	0,30	1,01	6,94	147,0%	20,41	12,97	84,6	21,2	89,9%	83,1%	74,7%	
73,00	0,26	1,01	6,98	146,1%	20,41	12,93	83,7	21,1	89,9%	83,2%	74,8%	
74,00	0,26	1,04	6,96	145,5%	20,41	12,93	83,0	21,1	89,5%	83,2%	74,5%	
75,00	0,30	1,08	6,97	144,1%	20,41	12,90	82,4	21,1	89,3%	83,3%	74,3%	
76,00	0,26	1,10	6,94	144,4%	20,41	12,92	82,0	20,3	89,0%	83,2%	74,1%	
77,00	0,26	1,16	6,85	145,2%	20,41	12,98	81,5	20,4	88,4%	83,1%	73,5%	
78,00	0,26	1,23	6,69	148,0%	20,42	13,11	80,6	20,5	87,5%	83,0%	72,7%	
79,00	0,26	1,35	6,51	149,9%	20,42	13,24	79,8	20,6	86,2%	82,9%	71,4%	
80,00	0,26	1,40	6,41	151,8%	20,42	13,32	78,9	20,7	85,6%	82,9%	71,0%	
81,00	0,26	1,45	6,37	151,1%	20,42	13,32	78,3	20,7	85,1%	82,9%	70,5%	
82,00	0,26	1,46	6,39	150,2%	20,42	13,30	78,3	20,7	85,1%	82,9%	70,5%	
83,00	0,26	1,46	6,36	151,1%	20,42	13,33	77,5	20,8	85,0%	82,9%	70,4%	
84,00	0,26	1,48	6,34	151,0%	20,42	13,34	77,1	20,9	84,8%	83,0%	70,3%	
85,00	0,21	1,52	6,32	150,4%	20,42	13,34	76,4	20,9	84,4%	83,0%	70,1%	
86,00	0,22	1,57	6,24	151,3%	20,42	13,40	76,1	21,0	83,8%	82,9%	69,5%	
87,00	0,21	1,52	6,26	152,5%	20,43	13,41	75,5	21,0	84,3%	83,0%	70,0%	
88,00	0,21	1,62	6,23	150,5%	20,42	13,39	75,3	21,0	83,4%	82,9%	69,2%	
89,00	0,21	1,62	6,23	150,4%	20,42	13,39	74,5	20,9	83,4%	83,0%	69,2%	
90,00	0,21	1,65	6,08	154,1%	20,43	13,53	74,4	20,9	82,8%	82,9%	68,6%	
91,00	0,21	1,63	6,04	156,1%	20,43	13,58	73,9	21,0	83,0%	82,9%	68,8%	
92,00	0,21	1,71	5,93	157,0%	20,44	13,65	73,4	21,0	82,0%	82,8%	67,9%	

93,00	0,21	1,63	5,95	159,3%	20,44	13,68	73,1	21,0	82,7%	82,9%	68,6%
94,00	0,17	1,60	5,96	159,7%	20,44	13,68	72,6	21,0	83,0%	83,0%	68,9%
95,00	0,17	1,70	5,86	159,6%	20,44	13,73	72,2	21,1	81,9%	82,9%	67,9%
96,00	0,17	1,68	5,88	159,7%	20,44	13,72	71,8	21,1	82,1%	82,9%	68,1%
97,00	0,17	1,73	5,78	161,5%	20,44	13,80	71,6	21,1	81,5%	82,8%	67,5%
98,00	0,17	1,73	5,73	163,2%	20,45	13,85	71,2	21,1	81,4%	82,8%	67,4%
99,00	0,17	1,78	5,68	163,1%	20,45	13,87	71,1	21,1	80,8%	82,7%	66,9%
100,00	0,17	1,82	5,70	161,2%	20,44	13,83	70,7	21,1	80,6%	82,8%	66,7%
101,00	0,17	1,81	5,68	162,1%	20,45	13,86	70,5	21,0	80,6%	82,8%	66,7%
102,00	0,17	1,74	5,73	162,9%	20,45	13,84	70,1	21,1	81,3%	82,9%	67,4%
103,00	0,17	1,72	5,73	163,6%	20,45	13,86	69,6	21,1	81,5%	83,0%	67,6%
104,00	0,17	1,71	5,73	164,0%	20,45	13,86	69,4	21,0	81,6%	83,0%	67,7%
105,00	0,17	1,71	5,75	163,4%	20,45	13,85	68,9	21,0	81,6%	83,1%	67,8%
106,00	0,17	1,76	5,71	162,9%	20,45	13,85	68,8	21,0	81,1%	83,0%	67,4%
107,00	0,12	1,78	5,67	163,5%	20,45	13,89	68,4	21,2	80,8%	83,0%	67,1%
108,00	0,12	1,80	5,68	162,4%	20,45	13,86	68,2	21,2	80,7%	83,0%	67,0%
109,00	0,12	1,80	5,72	161,5%	20,44	13,83	67,9	21,1	80,8%	83,1%	67,2%
110,00	0,12	1,80	5,68	162,6%	20,45	13,87	67,6	21,1	80,7%	83,1%	67,1%
111,00	0,12	1,81	5,67	162,7%	20,45	13,87	67,5	21,1	80,6%	83,1%	66,9%
112,00	0,12	1,82	5,76	158,9%	20,44	13,76	67,3	21,1	80,7%	83,2%	67,2%
113,00	0,12	1,85	5,73	159,0%	20,44	13,78	67,3	21,1	80,4%	83,1%	66,9%
114,00	0,12	1,89	5,72	158,4%	20,44	13,78	66,9	21,1	80,1%	83,1%	66,6%
115,00	0,12	1,88	5,65	161,0%	20,44	13,85	66,6	21,1	80,0%	83,1%	66,5%
116,00	0,09	1,89	5,68	159,2%	20,44	13,81	66,5	21,0	79,9%	83,1%	66,5%
117,00	0,12	1,85	5,78	157,6%	20,44	13,73	66,1	21,1	80,6%	83,3%	67,1%
118,00	0,12	1,90	5,62	161,4%	20,44	13,88	65,8	21,1	79,8%	83,1%	66,3%
119,00	0,08	1,97	5,52	162,3%	20,45	13,94	65,5	21,2	78,9%	83,0%	65,5%
120,00	0,08	2,07	5,35	164,6%	20,45	14,06	65,4	21,2	77,7%	82,8%	64,3%
121,00	0,08	2,03	5,32	167,2%	20,45	14,12	65,2	21,2	77,9%	82,8%	64,5%
122,00	0,08	1,98	5,45	164,2%	20,45	14,01	65,0	21,2	78,6%	83,0%	65,3%
123,00	0,08	2,00	5,50	161,8%	20,44	13,94	64,7	21,2	78,6%	83,1%	65,3%
124,00	0,08	2,00	5,40	165,4%	20,45	14,05	64,4	21,2	78,4%	83,0%	65,1%
125,00	0,08	2,03	5,30	167,8%	20,46	14,14	64,4	21,1	77,8%	82,9%	64,5%
126,00	0,08	2,05	5,29	167,7%	20,46	14,14	64,4	21,2	77,6%	82,9%	64,3%
127,00	0,04	2,07	5,25	168,3%	20,46	14,17	64,5	21,1	77,4%	82,8%	64,1%
128,00	0,08	2,11	5,15	170,5%	20,46	14,25	64,1	21,2	76,8%	82,7%	63,5%
129,00	0,08	2,15	5,12	170,2%	20,46	14,26	64,0	21,2	76,4%	82,7%	63,2%
130,00	0,08	2,15	5,15	169,0%	20,46	14,23	63,9	21,3	76,5%	82,7%	63,3%
131,00	0,05	2,09	5,19	169,9%	20,46	14,23	63,7	21,3	77,0%	82,8%	63,8%
132,00	0,04	2,07	5,24	168,9%	20,46	14,19	63,2	21,2	77,4%	82,9%	64,2%
133,00	0,03	2,07	5,15	171,8%	20,46	14,27	62,9	21,2	77,1%	82,9%	63,9%
134,00	0,03	2,05	5,16	172,8%	20,46	14,29	62,7	21,2	77,3%	82,9%	64,1%
135,00	0,03	2,02	5,14	174,4%	20,47	14,32	62,5	21,2	77,5%	82,9%	64,2%
136,00	0,03	2,01	5,11	175,9%	20,47	14,36	62,4	21,2	77,4%	82,9%	64,2%
137,00	0,03	1,99	5,09	177,3%	20,47	14,39	62,2	21,2	77,5%	82,9%	64,3%
138,00	0,03	1,98	5,09	178,0%	20,47	14,40	62,1	21,2	77,6%	83,0%	64,4%
139,00	0,03	1,97	5,14	176,4%	20,47	14,35	62,1	21,3	77,9%	83,0%	64,7%
140,00	0,03	1,97	5,17	175,2%	20,47	14,31	61,8	21,3	78,0%	83,1%	64,8%
141,00	0,03	2,01	5,11	176,2%	20,47	14,36	61,3	21,3	77,5%	83,1%	64,3%
142,00	0,03	2,01	5,09	176,6%	20,47	14,38	61,3	21,3	77,4%	83,0%	64,2%
143,00	0,03	2,06	5,01	178,0%	20,47	14,44	61,1	21,4	76,7%	82,9%	63,6%
144,00	0,03	2,02	5,12	175,1%	20,47	14,34	61,0	21,3	77,4%	83,1%	#DIV/0!
145,00	0,03	1,92	5,20	175,7%	20,47	14,30	61,0	21,3	78,4%	83,3%	65,3%
146,00	0,00	1,88	5,78	156,4%	20,43	13,71	60,9	21,3	80,3%	83,9%	67,4%

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,55 g/hr

Test Duration: 146 min

Burn Rate : 0,73 Dry kg/hr

PRESSURE FACTOR: DGM 1st hr 0,962
 DGM 1 0,949
 DGM 2 0,955
 DGM 3 0,987

BAROMETRIC PRESSURE

Average: 29,52998888 in Hg
 Start: 29,58904886 in Hg
 End: 29,47092891 in Hg

TEMPERATURE FACTORS DGM 1st hr 0,989
 DGM 1 0,993
 DGM 2 0,987
 DGM 3 0,995

DGM VALUES

DGM 1st hr Final: 1167,150 Cuft
 Initial: 1155,360 Cuft

VOLUMES SAMPLED DGM 1st hr 11,225 SCft
 DGM 1 26,611 SCft
 DGM 2 26,830 SCft
 DGM 3 26,116 SCft

DGM 1 Final: 4541,379 Cuft
 Initial: 4512,763 Cuft

DGM 2 Final: 31236,927 Cuft
 Initial: 31208,753 Cuft

TOTAL TUNNEL VOLUME : 51193

DGM #3 Final: 22224,288 Cuft
 Initial: 22197,381 Cuft

SAMPLE RATIOS

Sample Train 1st Hr: 1874,3
 Sample Train 1: 1923,8
 Sample Train 2: 1908,1

TEMPERATURES

DGM 1st hr 533,613 °R
 DGM 1 531,541 °R
 DGM 2 534,782 °R

Particulate concentration

Sample Train 1st Hr 0,000071 g/dscf
 Sample Train 1 0,000030 g/dscf
 Sample Train 2 0,000030 g/dscf
 Room 0,000004 g/dscf

CALIBRATION FACTORS

DGM 1st hr 1,0000
 DGM 1 0,9860
 DGM 2 1,0100
 DGM #3 0,9880

TOTAL EMISSIONS

Sample Train 1st Hr 1,42 g
 Sample Train 1 1,34 g
 Sample Train 2 1,33 g

TUNNEL FLOW RATE: 350,6 Dscfm

PARTICULATE CATCH

Total Sample Train 1: 0,80 mg
 Total Sample Train 2: 0,80 mg
 Total Sample Train 1 1st hour: 0,80 mg

EMISSION RATES

Sample Train 1st Hr 1,42 g/hr
 Sample Train 1 0,55 g/hr
 Sample Train 2 0,55 g/hr

DEVIATION: 0,47%

Cs Train 1 Train 2 Train 1st Hr
 3,006E-05 2,9818E-05 7,127E-05

* Time	Elapsed min	Raw data row	Weight Remaining lbs	* CO %	* CO ₂ %	*1 Room Temp °F	*2 Room Temp °F	*3 Tunnel Dry Bulb °F	*4 Unit Top °F	*5 Unit Back °F	*6 Unit R.Side °F	*7 Unit L.Side °F	*8 Unit Bottom °F	Mass flow Reading cuft/min	DGM 1st hour Inlet 1st hour °F	DGM 1st hour Outlet 1st hour °F	Filter 1st hour Temp °F	DGM 1 Reading cuft/min	DGM 1 Inlet 1 °F	DGM 1 Outlet 1 °F	Filter 1 Temp °F	Mass flow 2 Reading cuft/min	DGM 2 Inlet 1 °F	DGM 2 Outlet 1 °F	Filter 2 Temp °F	Tunnel Velocity Pressure in wc	Flue draft Pressure in wc	Filter 1st hr in Hg	Filter 1 in Hg	Filter 2 in Hg	Change in Surf Temp
0	207.00	4,7	0,5	3,0	263,8	70,8	103,3	476,1	399,3	394,8	375,6	410,2	0,19	73,1	73,2	74,2	0,21	70,7	72,3	73,8	0,21	71,0	71,3	74,2	0,08	0,06	-0,83	-1,18	-1,14	0,0	
1	208,0	4,5	2,5	3,0	260,8	70,8	104,9	460,1	395,9	392,8	374,9	414,4	0,19	73,1	73,2	74,2	0,21	70,7	72,3	73,8	0,21	71,0	71,3	74,2	0,08	0,06	-0,75	-1,10	-1,04	7,7	
2	209,0	4,5	4,0	6,5	351,5	70,8	105,9	472,8	393,1	375,4	375,4	418,8	0,19	73,2	73,3	74,2	0,18	70,7	72,0	74,4	0,18	71,5	71,4	75,2	0,08	0,07	-0,75	-1,11	-0,95	1,5	
3	210,0	4,5	0,3	8,3	391,7	71,1	109,8	496,4	403,8	391,8	374,3	422,0	0,19	73,0	73,3	74,8	0,18	70,7	71,8	74,6	0,18	71,6	71,5	75,4	0,08	0,07	-0,75	-1,10	-0,95	6,5	
4	211,4	4,5	0,2	11,7	420,3	71,1	112,9	502,1	419,0	379,9	379,9	432,4	0,19	73,0	73,3	74,8	0,18	70,7	71,8	74,6	0,18	71,6	71,5	75,4	0,08	0,07	-0,75	-1,10	-0,95	19,5	
5	212,0	4,3	0,1	11,0	362,2	70,9	107,9	87,9	538,3	399,7	371,5	427,2	0,18	73,0	73,6	75,0	0,18	70,8	71,7	74,8	0,18	71,9	71,6	75,8	0,08	0,07	-0,74	-1,11	-0,94	13,7	
6	213,0	4,2	0,2	11,7	324,9	70,9	86,3	542,6	395,7	383,6	369,2	429,6	0,19	73,0	73,3	75,0	0,18	70,8	71,6	74,7	0,18	72,1	71,7	75,7	0,08	0,07	-0,74	-1,11	-0,94	12,9	
7	214,0	4,1	0,2	11,3	308,9	70,9	86,3	549,0	392,3	382,1	367,6	431,4	0,19	72,9	73,3	75,0	0,18	70,9	71,6	74,7	0,18	72,3	71,8	75,6	0,08	0,06	-0,74	-1,10	-0,94	13,3	
8	215,0	4,1	0,3	10,2	311,7	71,1	85,0	551,0	387,9	378,1	364,1	432,4	0,19	72,9	73,3	75,0	0,18	71,0	71,6	74,8	0,18	72,4	71,8	75,6	0,08	0,06	-0,73	-1,10	-0,94	13,1	
9	216,0	4,0	0,2	12,0	299,4	70,9	86,0	561,0	387,9	378,1	364,5	433,4	0,19	72,9	73,3	75,1	0,18	71,0	71,5	74,9	0,18	72,6	71,9	75,7	0,08	0,06	-0,74	-1,10	-0,95	12,9	
10	217,0	3,9	0,2	12,9	299,5	70,9	86,1	566,4	379,8	377,1	364,7	434,0	0,19	73,0	73,3	75,2	0,18	71,0	71,5	75,0	0,18	72,7	72,0	75,8	0,08	0,06	-0,74	-1,10	-0,94	13,0	
11	218,0	3,8	0,1	13,7	300,1	71,0	86,0	571,4	375,6	375,9	362,7	434,7	0,19	73,0	73,3	75,2	0,18	71,0	71,4	75,0	0,18	72,8	72,1	75,9	0,08	0,06	-0,74	-1,10	-0,94	12,8	
12	219,0	3,8	0,1	13,6	299,1	71,0	85,5	575,4	371,3	374,7	361,6	435,8	0,19	73,0	73,4	75,3	0,18	71,0	71,4	75,1	0,18	73,0	72,3	75,9	0,08	0,06	-0,74	-1,10	-0,94	12,6	
13	220,0	3,7	0,1	13,4	297,8	71,0	84,9	577,8	367,3	373,7	360,7	435,5	0,19	73,1	73,4	75,3	0,18	71,1	71,4	75,1	0,18	73,1	72,3	75,9	0,08	0,06	-0,73	-1,10	-0,95	11,8	
14	221,0	3,6	0,1	13,4	298,0	71,0	84,6	581,5	363,4	373,0	359,9	435,3	0,19	73,1	73,4	75,3	0,18	71,1	71,5	75,2	0,18	73,3	72,4	75,9	0,07	0,06	-0,73	-1,10	-0,94	11,4	
15	222,0	3,5	0,2	15,5	308,1	70,9	85,3	594,1	359,9	372,2	359,4	434,7	0,19	73,1	73,4	75,4	0,18	71,2	71,5	75,3	0,18	73,5	72,5	76,0	0,08	0,07	-0,74	-1,10	-0,95	12,7	
16	223,0	3,4	0,8	16,7	312,3	70,9	85,1	608,5	356,6	371,9	358,8	433,6	0,19	73,1	73,4	75,4	0,18	71,2	71,5	75,3	0,18	73,7	72,6	76,1	0,08	0,07	-0,73	-1,11	-0,95	14,7	
17	224,0	3,3	0,4	16,5	313,9	70,9	85,3	620,8	353,5	371,3	358,5	432,3	0,19	73,2	73,4	75,5	0,18	71,2	71,5	75,4	0,18	73,8	72,7	76,1	0,08	0,07	-0,73	-1,11	-0,94	16,1	
18	225,0	3,2	0,4	16,5	314,6	71,0	85,2	629,6	351,0	371,3	358,3	430,7	0,19	73,2	73,4	75,5	0,18	71,2	71,6	75,5	0,18	74,0	72,8	76,2	0,08	0,07	-0,73	-1,10	-0,94	17,0	
19	226,0	3,1	0,3	16,4	315,8	70,9	85,2	637,2	349,3	371,6	358,3	429,0	0,19	73,2	73,4	75,5	0,18	71,3	71,6	75,5	0,18	74,1	72,8	76,3	0,08	0,07	-0,74	-1,11	-0,95	17,9	
20	227,0	3,0	0,3	16,4	315,1	70,9	85,2	643,2	348,2	371,7	358,5	427,2	0,19	73,3	73,4	75,6	0,18	71,3	71,6	75,6	0,18	74,2	72,9	76,3	0,08	0,07	-0,73	-1,10	-0,95	18,6	
21	228,0	3,0	0,3	16,2	312,2	70,9	85,4	644,0	347,7	372,1	358,8	425,4	0,19	73,3	73,4	75,6	0,18	71,3	71,7	75,6	0,18	74,4	73,0	76,3	0,08	0,06	-0,72	-1,11	-0,94	18,5	
22	229,0	2,9	0,2	16,0	310,2	71,0	85,4	644,8	347,5	372,7	359,2	423,5	0,19	73,3	73,5	75,6	0,18	71,4	71,7	75,7	0,18	74,4	73,1	76,4	0,08	0,07	-0,73	-1,11	-0,94	18,3	
23	230,0	2,8	0,1	16,1	309,1	70,9	85,1	645,7	347,6	373,1	359,5	421,5	0,19	73,3	73,5	75,7	0,18	71,4	71,7	75,7	0,18	74,6	73,2	76,5	0,08	0,07	-0,78	-1,11	-0,95	18,3	
24	231,0	2,7	0,2	16,0	307,8	71,0	85,2	646,6	347,5	373,6	359,2	421,5	0,19	73,3	73,5	75,7	0,18	71,4	71,7	75,7	0,18	74,6	73,2	76,5	0,08	0,07	-0,78	-1,11	-0,95	18,3	
25	232,0	2,6	0,2	16,6	309,1	70,9	85,1	651,6	348,7	374,7	360,9	417,4	0,19	73,5	73,5	75,8	0,18	71,4	71,8	75,8	0,18	74,7	73,3	76,5	0,08	0,07	-0,73	-1,11	-0,95	19,4	
26	233,0	2,6	0,6	16,4	309,3	71,0	85,5	654,1	349,0	375,5	361,9	415,4	0,19	73,5	73,5	75,8	0,18	71,5	71,8	75,8	0,18	74,8	73,4	76,6	0,08	0,07	-0,73	-1,11	-0,94	20,0	
27	234,0	2,5	0,7	16,2	308,8	71,1	85,2	655,6	349,9	376,5	362,8	413,5	0,19	73,5	73,6	75,9	0,18	71,5	71,8	75,9	0,18	74,9	73,5	76,6	0,08	0,06	-0,73	-1,11	-0,95	20,5	
28	235,0	2,4	0,4	16,2	308,2	71,0	85,2	657,5	349,6	376,5	363,6	413,2	0,19	73,5	73,6	75,9	0,18	71,5	71,8	75,9	0,18	74,9	73,5	76,6	0,08	0,06	-0,73	-1,11	-0,95	20,9	
29	236,0	2,3	0,7	16,2	308,2	71,1	85,3	659,1	352,0	378,5	364,6	409,6	0,19	73,7	73,6	75,9	0,18	71,5	71,9	76,0	0,18	75,0	73,6	76,6	0,08	0,06	-0,74	-1,10	-0,94	21,6	
30	237,0	2,2	0,7	16,1	307,7	71,0	85,4	661,3	353,4	379,7	365,5	407,7	0,19	73,7	73,6	76,0	0,18	71,5	71,9	76,0	0,18	75,1	73,7	76,7	0,07	0,06	-0,73	-1,10	-0,94	22,3	
31	238,0	2,1	1,1	16,1	306,5	71,1	85,4	663,6	354,7	380,6	366,6	407,7	0,19	73,7	73,6	76,1	0,18	71,5	71,9	76,0	0,18	75,1	73,7	76,7	0,07	0,06	-0,73	-1,10	-0,94	22,3	
32	239,0	2,1	0,7	16,0	305,2	71,1	85,6	665,4	356,3	381,5	366,9	404,2	0,19	73,7	73,7	76,1	0,18	71,5	71,9	76,1	0,18	75,3	73,9	76,8	0,08	0,06	-0,75	-1,11	-0,94	23,7	
33	240,0	2,0	0,8	16,6	306,4	71,1	85,3	669,1	358,0	382,3	367,6	402,6	0,18	73,8	73,7	76,1	0,18	71,5	72,0	76,2	0,18	75,4	73,9	76,8	0,08	0,06	-0,73	-1,11	-0,94	24,7	
34	241,0	1,9	1,0	17,0	307,7	71,3	85,2	672,8	359,6	383,5	368,1	401,0	0,19	73,8	73,7	76,1	0,18	71,5	72,0	76,2	0,18	75,4	74,0	76,8	0,08	0,06	-0,73	-1,11	-0,95	25,8	
35	242,0	1,8	1,4	17,2	308,4	71,2	85,2	676,2	361,0	384,4	369,5	401,9	0,19	73,8	73,7	76,1	0,18	71,5	72,0	76,2	0,18	75,4	74,0	76,8	0,08	0,06	-0,73	-1,11	-0,95	26,8	
36	243,0	1,7	1,7	16,7	308,8	71,2	84,9	678,9	363,5	385,1	369,3	398,0	0,19	73,9	73,8	76,1	0,18	71,6	72,0	76,2	0,18	75,6	74,2	76,8	0,08	0,06	-0,73	-1,11	-0,94	27,8	
37	244,0	1,7	1,5	16,5	306,0	71,2	84,7	680,2	365,4	386,4	369,9	396,5	0,19	73,9	73,8	76,1	0,18	71,6	72,1	76,2	0,18	75,6	74,3	76,9	0,08	0,06	-0,74	-1,11	-0,94	28,5	
38	245,0	1,6	1,3	16,1	305,2	71,1	84,7	681,2	367,6	387,6	371,0	396,5	0,19	73,9	73,8	76,1	0,18	71,6	72,1	76,2	0,18	75,7	74,3	76,9	0,08	0,06	-0,74	-1,11	-0,94	29,2	
39	246,0	1,5	1,0	16,3	302,4	71,2	84,9	679,0	369,5	388,7	371,0	393,9	0,19	73,9	73,9	76,2	0,18	71,6	72,1	76,3	0,18	75,7	74,4	76,9	0,08	0,06	-0,74	-1,11	-0,94	29,2	
40	247,0	1,5	0,8	15,9	297,8	71,2	84,4	674,9	372,2	390,0	371,7	392,8	0,19	74,0	73,9	76,2	0,18	71,7	72,1	76,3	0,18	75,8	74,4	76,9	0,08	0,06	-0,75	-1,11	-0,94	29,1	
41	248,0	1,4	0,7	15,4	293,																										

115	322.0	0,3	1,9	5,6	151,8	70,0	75,5	325,4	404,9	324,7	320,3	391,5	0,00	71,8	72,1	72,4	0,18	71,1	71,5	73,3	0,18	75,8	74,7	73,4	0,07	0,03	0,07	-1,16	-0,98	-57,8
116	323,0	0,2	1,9	5,7	151,7	69,9	76,6	324,9	404,0	323,8	319,5	391,1	0,00	71,8	72,0	72,4	0,18	71,2	71,5	73,3	0,18	75,8	74,7	73,5	0,07	0,03	0,07	-1,15	-0,98	-58,6
117	324,0	0,3	1,8	5,8	151,0	70,0	76,5	323,6	402,6	322,6	318,4	390,6	0,00	71,8	72,0	72,3	0,18	71,2	71,6	73,3	0,18	75,8	74,7	73,4	0,07	0,03	0,07	-1,15	-0,98	-59,6
118	325,0	0,3	1,9	5,6	150,5	69,9	76,1	322,6	401,0	321,6	317,9	390,0	0,00	71,8	72,0	72,3	0,18	71,1	71,6	73,3	0,18	75,8	74,7	73,4	0,07	0,03	0,06	-1,16	-0,98	-60,6
119	326,0	0,2	2,0	5,5	149,9	70,2	76,2	321,1	399,4	319,8	316,7	389,5	0,00	71,8	72,0	72,3	0,18	71,1	71,6	73,3	0,18	75,8	74,7	73,4	0,07	0,03	0,06	-1,14	-0,98	-61,9
120	327,0	0,2	2,1	5,4	149,7	70,1	76,4	319,5	398,3	319,1	315,8	389,0	0,00	71,8	72,0	72,3	0,18	71,2	71,6	73,3	0,18	75,9	74,8	73,4	0,08	0,03	0,06	-1,15	-0,97	-62,8
121	328,0	0,2	2,0	5,3	149,4	70,1	76,5	319,1	397,3	318,5	315,5	388,5	0,00	71,8	72,0	72,3	0,18	71,2	71,6	73,2	0,18	75,8	74,8	73,4	0,07	0,03	0,06	-1,15	-0,98	-63,4
122	329,0	0,2	2,0	5,5	149,0	70,2	76,2	318,4	395,9	317,7	314,2	388,0	0,00	71,8	72,0	72,3	0,18	71,2	71,6	73,2	0,18	75,8	74,9	73,4	0,08	0,03	0,07	-1,15	-0,98	-64,3
123	330,0	0,2	2,0	5,5	148,5	70,1	76,3	317,0	394,3	316,6	313,6	387,5	0,00	71,8	72,0	72,2	0,18	71,3	71,6	73,2	0,18	75,7	74,9	73,3	0,07	0,03	0,06	-1,15	-0,98	-65,4
124	331,0	0,2	2,0	5,4	147,9	70,1	76,7	315,7	393,5	315,7	313,0	386,9	0,00	71,8	72,0	72,3	0,18	71,3	71,6	73,2	0,18	75,8	74,9	73,3	0,07	0,03	0,06	-1,15	-0,98	-66,2
125	332,0	0,2	2,0	5,3	148,0	70,1	76,6	315,3	392,1	315,4	312,5	386,5	0,00	71,8	72,0	72,2	0,18	71,4	71,7	73,2	0,18	75,9	74,9	73,4	0,07	0,03	0,06	-1,15	-0,98	-66,9
126	333,0	0,2	2,1	5,3	147,9	70,1	76,0	314,3	391,2	314,7	311,6	386,1	0,00	71,9	72,0	72,2	0,18	71,4	71,7	73,2	0,18	75,8	74,9	73,3	0,07	0,03	0,06	-1,15	-0,98	-67,6
127	334,0	0,1	2,1	5,3	148,0	70,0	76,1	313,5	390,0	314,1	311,4	385,6	0,00	71,9	72,0	72,2	0,18	71,4	71,7	73,1	0,18	75,7	74,9	73,3	0,07	0,03	0,06	-1,16	-0,99	-68,3
128	335,0	0,2	2,1	5,2	147,4	70,2	75,9	312,7	389,1	313,2	310,9	385,2	0,00	71,9	72,1	72,2	0,18	71,4	71,8	73,1	0,18	75,7	75,0	73,3	0,07	0,03	0,06	-1,15	-0,98	-69,0
129	336,0	0,2	2,1	5,1	147,2	70,2	75,6	311,7	387,7	312,2	309,9	384,7	0,00	71,9	72,1	72,2	0,18	71,5	71,8	73,1	0,18	75,8	75,0	73,3	0,07	0,03	0,06	-1,15	-0,98	-69,9
130	337,0	0,2	2,1	5,2	147,0	70,3	75,5	310,4	386,9	311,9	309,6	384,3	0,00	71,9	72,1	72,2	0,18	71,5	71,8	73,1	0,18	75,8	75,1	73,2	0,07	0,03	0,06	-1,14	-0,98	-70,6
131	338,0	0,1	2,1	5,2	146,7	70,3	75,8	309,6	385,8	311,1	308,6	383,8	0,00	72,0	72,1	72,2	0,18	71,6	71,8	73,1	0,18	75,8	75,1	73,2	0,07	0,03	0,06	-1,14	-0,98	-71,4
132	339,0	0,1	2,1	5,2	145,8	70,2	76,1	309,1	384,8	310,6	308,3	383,3	0,00	72,0	72,1	72,2	0,18	71,6	71,9	73,1	0,18	75,8	75,1	73,2	0,08	0,03	0,06	-1,14	-0,98	-72,0
133	340,0	0,1	2,1	5,2	145,2	70,2	75,9	307,9	384,0	310,0	307,5	382,9	0,00	72,0	72,2	72,2	0,18	71,6	71,9	73,1	0,18	75,9	75,2	73,3	0,08	0,03	0,05	-1,13	-0,98	-72,7
134	341,0	0,1	2,0	5,2	144,8	70,2	76,0	307,1	382,9	309,3	306,9	382,5	0,00	72,0	72,2	72,2	0,18	71,6	71,9	73,1	0,18	76,0	75,2	73,2	0,07	0,03	0,07	-1,13	-0,97	-73,5
135	342,0	0,1	2,0	5,1	144,5	70,2	75,8	305,7	381,6	308,2	306,2	382,0	0,00	72,0	72,1	72,2	0,18	71,6	71,9	73,1	0,18	75,9	75,3	73,2	0,08	0,03	0,05	-1,13	-0,97	-74,4
136	343,0	0,1	2,0	5,1	144,3	70,2	76,4	304,7	380,5	307,2	305,1	381,4	0,00	72,0	72,2	72,2	0,18	71,6	71,9	73,1	0,18	75,9	75,3	73,3	0,08	0,03	0,06	-1,14	-0,97	-75,4
137	344,0	0,1	2,0	5,1	143,9	70,2	76,0	304,2	379,4	306,7	304,8	380,9	0,00	72,0	72,2	72,2	0,18	71,6	71,9	73,1	0,18	76,0	75,3	73,2	0,07	0,03	0,06	-1,13	-0,98	-76,0
138	345,0	0,1	2,0	5,1	143,8	70,2	75,8	303,0	378,4	306,2	304,4	380,6	0,00	72,0	72,2	72,2	0,18	71,7	72,0	73,1	0,18	76,0	75,3	73,3	0,07	0,03	0,06	-1,13	-0,98	-76,7
139	346,0	0,1	2,0	5,1	143,8	70,3	75,6	303,0	376,8	305,5	303,8	380,1	0,00	72,0	72,2	72,2	0,18	71,7	71,9	73,0	0,18	76,0	75,2	73,2	0,08	0,03	0,06	-1,13	-0,98	-77,4
140	347,0	0,1	2,0	5,2	143,2	70,3	75,8	301,7	375,5	304,3	302,7	379,6	0,00	72,1	72,2	72,2	0,18	71,7	72,0	73,0	0,18	76,0	75,3	73,2	0,08	0,03	0,06	-1,13	-0,97	-78,4
141	348,0	0,1	2,0	5,1	142,4	70,4	76,1	300,5	374,2	303,4	301,9	379,0	0,00	72,1	72,2	72,2	0,18	71,7	72,0	73,1	0,18	76,1	75,3	73,2	0,07	0,03	0,05	-1,12	-0,97	-79,4
142	349,0	0,1	2,0	5,1	142,3	70,4	75,8	300,2	373,1	302,8	301,4	378,4	0,00	72,1	72,2	72,2	0,18	71,7	72,0	73,0	0,18	76,1	75,4	73,2	0,07	0,03	0,06	-1,13	-0,98	-80,0
143	350,0	0,1	2,1	5,0	142,0	70,5	75,8	298,9	371,1	301,4	300,4	377,9	0,00	72,1	72,3	72,2	0,18	71,7	72,0	73,0	0,18	75,9	75,4	73,2	0,07	0,03	0,05	-1,12	-0,98	-81,3
144	351,0	0,1	2,0	5,1	141,8	70,4	76,2	298,7	370,4	301,2	299,8	377,5	0,00	72,1	72,3	72,2	0,18	71,7	72,0	73,1	0,18	75,9	75,4	73,2	0,08	0,03	0,05	-1,13	-0,98	-81,7
145	352,0	0,1	1,9	5,2	141,9	70,3	75,6	298,0	369,2	300,6	299,6	377,0	0,00	72,1	72,3	72,2	0,18	71,7	72,0	73,0	0,18	75,9	75,4	73,2	0,07	0,03	0,05	-1,12	-0,97	-82,3
146	353,0	0,0	1,9	5,8	141,7	70,3	75,6	297,5	367,7	299,8	299,1	376,6	0,00	72,2	72,3	72,2	0,18	71,7	72,0	73,0	0,18	75,9	75,4	73,2	0,08	0,03	0,05	-1,13	-0,98	-83,1

unit preburn
data 2025-03-27 epa pi 20329 run 1

Time	Flue	Room	scale	Right	Back	bottom	Top	Left
acquisition	temp	temp						
minutes	°F	°F	lbs	°F	°F	°F	°F	°F
1	66,82	66,67	2,41	67,26	67,00	67,08	67,48	67,18
2	93,16	66,83	2,37	67,49	67,00	67,10	72,67	67,92
3	117,37	66,86	2,37	67,83	67,04	67,09	80,57	69,57
4	130,91	66,90	2,27	68,13	67,15	67,18	90,69	68,95
5	144,91	66,77	2,27	68,75	67,42	67,50	99,83	69,13
6	154,46	66,78	2,27	69,79	67,81	68,04	107,17	69,90
7	165,90	66,84	2,17	71,40	68,31	68,78	114,37	71,12
8	182,93	66,80	2,17	73,62	68,91	69,63	125,74	72,78
9	214,27	66,84	2,07	76,45	69,61	70,57	141,97	74,78
10	269,65	66,81	1,97	79,70	70,39	71,56	171,83	77,05
11	278,76	66,85	1,97	83,32	71,28	72,60	195,06	79,64
12	283,93	66,83	1,87	87,15	72,37	73,74	213,53	82,66
13	278,53	66,92	1,86	91,03	73,66	75,02	226,56	86,23
14	271,22	66,88	1,77	94,92	75,22	76,54	235,25	90,25
15	286,50	66,90	1,77	98,94	76,92	78,38	248,23	94,67
16	307,31	66,80	1,67	102,98	78,74	80,59	265,55	99,73
17	317,48	66,97	1,57	106,91	80,70	83,25	281,86	105,25
18	318,14	67,03	1,57	111,12	82,80	86,35	295,02	110,96
19	319,84	67,14	1,47	115,27	84,99	90,07	307,85	116,90
20	324,65	67,36	1,47	119,48	87,25	94,47	320,54	122,87
21	335,14	67,58	1,37	123,67	89,67	99,45	332,78	128,93
22	333,77	67,78	1,28	127,61	92,17	104,97	343,38	135,05
23	334,15	67,80	1,27	131,67	94,77	110,88	351,81	141,04
24	342,95	67,92	1,17	135,63	97,46	117,00	360,92	146,66
25	361,08	68,03	1,07	140,52	100,30	123,26	376,40	153,41
26	366,14	68,14	1,07	145,13	103,37	129,54	390,05	160,76
27	378,28	68,28	4,79	149,92	106,90	135,92	401,71	169,75
28	357,74	68,25	6,07	156,23	111,26	142,58	400,87	179,17
29	348,73	68,43	6,07	163,80	116,12	149,14	403,51	184,99
30	372,97	68,64	5,97	171,26	120,75	155,52	415,21	190,66
31	387,88	68,64	5,87	177,95	124,96	161,52	429,41	196,20
32	411,19	68,83	5,77	184,34	128,79	167,11	449,80	201,56
33	433,61	68,89	5,67	190,25	132,07	172,11	473,81	206,82
34	437,91	69,05	5,57	195,59	135,14	176,68	492,32	211,56
35	440,80	69,33	5,48	200,49	137,68	180,69	507,83	216,17
36	442,56	69,27	5,37	205,32	140,25	184,36	520,73	219,75
37	445,00	69,50	5,27	209,79	142,80	187,89	532,55	223,86
38	448,96	69,45	5,17	213,92	145,25	191,36	543,15	227,68
39	453,07	69,34	5,07	217,86	147,70	194,89	553,05	231,47
40	452,78	69,35	4,97	221,94	150,20	198,48	560,92	235,29
41	458,51	69,34	4,86	225,88	152,65	202,12	570,31	238,98
42	464,28	69,86	4,67	230,08	155,41	205,86	579,05	242,68
43	406,42	69,92	4,57	234,34	158,27	209,63	585,95	246,36
44	358,07	70,05	4,57	239,31	161,34	213,54	578,95	250,34
45	329,65	69,95	4,47	244,33	164,40	217,63	565,13	253,80
46	310,92	70,10	4,47	249,64	167,50	221,80	552,19	257,78
47	297,24	70,17	4,37	254,85	170,56	225,89	539,99	261,51
48	288,81	70,16	4,37	259,88	173,43	229,91	531,12	265,03
49	281,53	70,16	4,27	264,51	176,47	233,71	522,85	267,75
50	276,49	70,26	4,18	268,90	179,18	237,37	517,04	270,17
51	273,97	70,26	4,17	273,05	181,95	240,84	512,94	272,32
52	272,03	70,31	4,08	276,65	184,74	244,19	510,23	274,18
53	271,38	70,15	4,08	280,06	187,36	247,43	509,46	275,76
54	271,14	70,23	3,97	283,08	189,88	250,53	510,39	277,33
55	271,07	70,29	3,97	286,10	192,36	253,53	511,69	278,84
56	271,16	70,29	3,87	289,10	195,09	256,44	513,98	280,13
57	272,84	70,31	3,77	291,75	197,72	259,27	517,37	281,67
58	274,70	69,97	3,77	294,42	200,20	261,95	523,12	282,83
59	276,59	70,35	3,67	297,09	202,58	264,61	529,74	284,30
60	279,74	70,38	3,58	299,79	205,28	267,28	540,40	285,92
61	285,79	70,49	3,57	302,48	207,93	269,95	552,82	287,47
62	291,07	70,56	3,47	305,02	210,62	272,65	566,65	289,39
63	292,35	70,64	3,38	307,41	213,20	275,40	578,13	291,24
64	293,53	70,76	3,27	310,34	215,71	278,26	587,97	293,51
65	293,19	70,68	3,17	312,96	218,41	281,12	595,78	295,59
66	291,02	70,66	3,17	315,77	221,19	284,01	598,91	297,96
67	286,14	71,02	3,07	318,86	223,83	286,86	596,35	300,46
68	282,89	70,94	2,97	321,96	226,31	289,65	594,23	303,01

unit preburn
data 2025-03-27 epa pi 20329 run 1

69	282,26	70,61	2,92	325,17	229,26	292,49	592,53	305,52
70	288,64	70,96	2,87	328,50	231,95	295,30	602,52	308,17
71	288,48	70,97	2,77	332,08	234,81	298,01	606,32	311,08
72	287,16	71,00	2,67	335,27	237,93	300,82	606,99	313,60
73	284,59	70,94	2,68	338,72	241,15	303,60	607,99	316,12
74	283,68	70,96	2,57	342,30	244,33	306,46	608,47	318,89
75	283,55	70,94	2,57	345,68	247,41	309,50	609,84	321,77
76	287,55	71,07	2,47	348,97	250,69	312,53	616,51	323,76
77	290,39	70,70	2,37	352,50	254,10	315,63	626,61	326,40
78	295,00	71,03	2,27	355,70	257,46	318,72	635,43	328,81
79	297,07	71,20	2,17	358,98	260,95	321,90	646,61	331,33
80	297,85	71,18	2,17	362,32	264,89	325,09	653,04	333,70
81	296,23	71,37	2,07	365,19	269,14	328,28	657,01	335,89
82	292,74	71,27	1,97	368,17	274,14	331,35	656,03	338,11
83	289,30	71,14	1,97	371,03	278,93	334,44	653,82	340,20
84	284,98	71,26	1,87	373,84	284,22	337,54	647,96	342,50
85	281,34	70,92	1,77	376,52	289,65	340,70	640,64	344,66
86	276,51	70,90	1,77	378,75	295,52	343,89	633,85	346,56
87	273,84	70,99	1,67	380,80	301,19	347,11	628,75	348,54
88	269,77	71,28	1,59	383,12	307,16	350,30	622,22	350,31
89	266,81	71,36	1,57	384,80	312,62	353,31	615,79	352,23
90	262,45	71,71	1,57	386,52	319,02	356,52	608,58	353,81
91	256,95	71,31	1,47	388,15	325,52	359,69	601,70	355,39
92	251,87	71,33	1,47	389,85	332,21	362,96	594,24	357,47
93	247,11	70,93	1,47	391,18	338,31	366,29	587,05	358,77
94	242,47	71,23	1,37	392,01	344,41	369,62	579,51	360,27
95	239,56	71,22	1,37	393,12	350,72	373,05	573,87	361,58
96	237,54	71,17	1,37	393,66	356,93	376,60	567,68	363,05
97	235,21	71,34	1,27	394,36	363,50	380,35	562,56	364,16
98	232,20	71,25	1,27	394,46	368,98	384,01	558,32	365,12
99	227,83	70,96	1,27	394,28	374,22	387,79	553,21	365,92
100	223,69	70,82	1,27	394,56	379,33	391,63	544,34	367,37
101	218,17	70,41	1,18	394,11	383,84	395,49	533,07	368,45
102	213,72	70,73	1,17	394,41	388,60	399,36	522,08	370,39
103	209,52	70,82	1,27	393,52	391,99	403,21	511,97	370,54
104	206,30	70,89	1,17	393,47	395,93	406,94	502,96	371,97



Date: 2025-03-28

Manufacturer: Morsø

Model: 2B

Project #: PI 20329

Run: 2

Tech: *h h*

Reviewer: *ly*

- 2.5 LBS kneeling STAND FINE
- After 2 min close Door
- At 10 LBS insert pre load
- After 2 min close Door
- At 64 LBS set air inlet medium setting
- At 1.1 LBS insert Load
- After 1 min close Door
- At 5 min air inlet medium setting

TEST LOAD CONFIGURATION

Date: 2025-03-28

 Manufacturer: Moriso
PRE / POST CHECKS

 Model: 2B

 Project #: PI 20329

 Run: 2

 Tech: M.M.

 Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334	7:00	ok	ok

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check (tunnel velocity)

Picture.....

0 (max50 Fpm)	(max50 Fpm)
ok	NA
4 sides ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O)

Traverse before ignition.....

2025-03-27
2025-03-27
ok
ok

Temperature System:

Ambient (65°-90°F)

ok	°F
----	----

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

Pictures for report.....

ok
ok
ok
Side ok
Coal bed ok
Load ok
Load in stove ok
Fuel adjustment ok
ok

Load Length 5/6 of firebox Length +/- 1 inch.....



Date: 2025-03-28

Project #: PI 20329

Leakage Checks Tunnel Samplers

Manufacturer: Mors

Run: 2

Tech: MM

Model: 2B

Reviewer: [Signature]

Train 1		Train 2		
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-7	-7	-7	-7
Final 1 minute DGM (Liter)	128598.59	129233.27	884534.44	885160.00
Initial 1 minute DGM (Liter)	128598.59	129233.27	884534.42	885160.00
Change (Liter)				
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2025-03-18

Project #: PL 20329

Manufacturer: Mors

Run: 2

Tech: M.J.

Model: 2B

Reviewer: [Signature]

Leakage Checks Tunnel Samplers

	System 1 st hour		Ambient	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm	-7	-7	-7	-7
Vacuum (inches Hg.)				
Final 1 minute DGM (Liter)	1167 32	1179 37	629324 96	629937 25
Initial 1 minute DGM (Liter)	1167 32	1179 37	629324 96	629937 25
Change (Liter)	0	0	0	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2025-03-28

Project #: 0120329

Manufacturer: M or So

Run: 2

Tech: M. M

Model: 2B

Reviewer: 150

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotameter Reading (mm/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

Leakage Checks Pitot

Plugged Probe	Pre-Test 3 H2O static	Pre-Test 0.4-0.5 H2O velocity	Post Test 0.4-0.5 H2O velocity
Vacuum (inches Hg.)	3	4	5
Check OK (no change after 15 sec.)	OK	OK	OK



Date: 2025-03-28

Manufacturer: Mors

Model: 2B

Project #: 2025-03-28

Run: 2

Tech: M

Reviewer: D

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	10.00 Kg, Class F	10.00 Kg
Wood	EM-090	440 lbs, Class F	440 lbs
Analytical	EM-335	100.0 mg, Class S	100.0 mg
Analytical	EM-125	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg

PLATFORM SCALE 20%-80% of ideal test load weight, ± 0.1 lbs or 1%

WOOD SCALE 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 2025-07-28

Manufacturer: MORSO

Model: 2B

Project #: PT 2032

Run: 2

Tech: JR

Reviewer: JP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) _____ (KPa.)

Static pressure (P_q) _____ (inches w.c.)

Inside diameter: Port A _____ Port B _____

Tunnel cross sectional area: .1963Ft²

Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
Tunnel diameter	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.069	69.86
B - Centroid	3.00	3.50	4	0.069	69.94
A-1	0.40 0.50	0.50	0.50	0.056	69.86
A-2	1.50	1.75	2	0.068	69.93
A-3	4.50	5.25	6	0.067	69.93
A-4	5.60 5.50	6.5	7.5	0.055	69.85
B-1	0.40 0.50	0.50	0.50	0.055	69.94
B-2	1.50	1.75	2	0.062	69.88
B-3	4.50	5.25	6	0.070	69.88
B-4	5.60 5.50	6.5	7.5	0.054	69.82
AVERAGE					

Date: _____ Manufacturer: _____ Model: _____

Project #: _____ Run: _____ Tech: _____ Reviewer: _____

FOR TUNNELS 12 in

Barometric pressure (P_{bar}) _____ (KPa.) Static pressure (P_q) _____ (inches w.c.)

Pitot tube type: Standard

Traverse Point	Position (inches)	Velocity Head Δ_p (inches H_2O)	Tunnel Temperature ($^{\circ}F$)
A Center	6		
B Center	6		
A-1	0.53		
A-2	1.75		
A-3	3.55	NA	
A-4	8.45		
A-5	10.25		
A-6	11.47		
B-1	0.53		
B-2	1.75		
B-3	3.55		
B-4	8.45		
B-5	10.25		
B-6	11.47		

CONTINUOUS ANALYZERS

 Date: 2025-03-28

 Manufacturer: Morso

 Model: 2B

 Project #: PI 20329

 Run: 2

 Tech: MJR

 Reviewer: [Signature]
Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3.059 3.065	3.000	1.018	1.000
Tolerance CO	0	+/- 0.02	0.059	+/- 0.15	0.018	+/- 0.05
CO ₂	0	0	17.97	18.00	9.74	10.00
Tolerance CO ₂	0	+/- 0.02	0.03	+/- 0.5	0.26	+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	3.051	1.013	0	0.02	0.008	0.15	0.005	0.05	✓	
CO ₂	0	17.92	9.78	0	0.02	0.05	0.5	0.04	0.5	✓	



TEST DATA LOG

Date: 2025-03-28 Manufacturer: MORSO Model: 2B
Project #: PI 20329 Run: 2 Tech: MJS Reviewer: JS

RAW DRY GAS METER READINGS

Test	System 1 st hour	System 1	System 2	Blank
	Final (Liter) 1179.32	129232.80	885159.00	629922.30
Initial (Liter)	1167.42	128599.84	884535.71	629325.04

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	99.8	99.7
Dry Bulb (F):	70.4	71.4
Humidity (%):	28.3	26.5



FUEL DATA

Date: 2025-03-28 Manufacturer: Mor-so Model: 2B
 Project #: PI 20325 Run: 2 Tech: M.R. Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry) *					
150 X 350 X 15 5/8 in.	1250 lbs.	205	199	207	202	197	
150 X 350 X 15 5/8 in.	1242 lbs.	212	207	203	214	208	
X X in.	lbs.						
150 X 350 X 6 in.	0570 lbs.	195	202	206	198	199	
150 X 350 X 6 in.	0576 lbs.	201	207	199	211	206	
150 X 350 X 6 in.	0604 lbs.	211	209	205	203	207	
150 X 350 X 6 in.	0670 lbs.	205	199	198	202	204	
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						
X X in.	lbs.						

TEST LOAD WEIGHT: 591 lbs

Wood Temperature: 21°C
DP



FUEL DATA

Date: 2025-03-28 Manufacturer: Moroso Model: 2B

Project #: PI 2032A Run: 2 Tech: MJM Reviewer: [Signature]

FUEL DESCRIPTION:

Type of wood:

TEST LOAD

[illegible]

TEST LOAD WEIGHT: 4836 lbs Min 20%: Max 25%:

Wood Temperature: 21°C

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Manufacturer: Moriso

Model: 2B

Date: 2025-03-28

Project #: PI 20329

Run: 2

Tech: M.H.

Reviewer: JD

TEST FILTERS						
SYSTEM 1 st hour				SYSTEM 1		
Pre-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Probe & Housing Number	Front & Back Filter Number	gaskets
Date	Time					
2025-03-27	17:00	124 125	3	10	126 127	6
		02593	4 1052	94 6351	02592	4 1803
2025-03-28	9:00	02593	4 1053	94 6352	02592	4 1804

TEST FILTERS						
SYSTEM 1 st hour				SYSTEM 1		
Post-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Probe & Housing Number	Front & Back Filter Number	gaskets
Date	Time					
2025-03-28	14:00	124 125	3	10	126 127	6
		02595	4 1067	94 6369	02596	4 1816
2025-03-31	9:00	02595	4 1058	94 6354	02595	4 1808
2025-04-07	17:00	02595	4 1058	94 6354	02596	4 1808

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2025-03-28

Manufacturer: Mors

Model: 20

Project #: 2020329

Run: 2

Tech: Jm

Reviewer:

TEST FILTERS						
SYSTEM 2						
Pre-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	
Date	Time					
2025-03-27	17:00	945348	02621	50069	01322	
2025-03-28	9:00	945347	02620	50068	01323	
TEST FILTERS						
SYSTEM 2						
Post-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time					
2025-03-28	14:00	945360	02623	50083	01327	2025-03-25 13:45
2025-03-31	9:00	945349	02622	50075	01324	
2025-04-07	13:00	945348	02622	50075	01324	

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage: MOR

Description du test

Test standard	EPA
Run #	2
Date	28-03-2025
Technicien	M.M
Project #	PI 20329

Description de l'unité

Manufacturier	MORSO	
Modèle	2B	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	0,688	cu ft.
Appliance weight empty	n.a	lbs
Appliance weight full	n.a	lbs

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	n.a	BTU/h Donnée fournie par le manfacturier
Targeted category	2	
Targeted output	n.a	BTU/h
Cp steel	n.a	BTU/lb-°F

Échantillonnage

targeted Blank sampling rate	0,18	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,986	
Equipment number (DGM #1):	EM 178	Dimensionless
Calibration Factor (DGM #2):	1,010	
Equipment number (DGM #2):	EM 318	Dimensionless
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	EM 179	Dimensionless
Calibration Factor (DGM 1st Hr):	1,000	
Equipment number (DGM 1st Hr):	EM 130	Dimensionless

Tunnel

Targeted tunnel flow rate	350	scfm
Tunnel diameter	8	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20329
Date	28-03-2025
Technicien	M.M

Fuel data

Fuel type	Dimension
Fuel specie	D. Fir
HHV	19810,0 kJ/kg
%C	48,7
%H	6,9
%O	43,9
%Ash	0,5
HHV	8519,2 Btu/lb
LHV	7451,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

	Start	End
Barometer (kPa):	99,8	99,7
Barometer (in.Hg):	29,470929	29,44139892
Dry Bulb (F):	70,4	71,4
Humidity (%):	28,3	26,9
Air velocity (ft/min)	0	0

DGM #1st hour	Final:	1179,320	cuft
	Initial:	1167,420	cuft

DGM #1	Final:	4563,813	cuft
	Initial:	4541,461	cuft

DGM #2	Final:	31259,096	cuft
	Initial:	31237,084	cuft

DGM room	Final:	22245,497	cuft
	Initial:	22224,405	cuft

	Final:	1179,320	cuft
	Initial:	1167,420	cuft

	Final:	129232,800	Liter
	Initial:	128599,840	Liter

	Final:	885159,000	Liter
	Initial:	884535,710	Liter

	Final:	629922,300	Liter
	Initial:	629325,040	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

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Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	PI 20329
Date	28-03-2025
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,16 in. H2O (absolute value)
 Barometer: 29,900 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

PITOT CONSTANT=
0,950

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,069	69,86	0,2627
B center	0,069	69,94	0,2627
A1	0,056	69,86	0,2366
A2	0,068	69,93	0,2608
A3	0,067	69,93	0,2588
A4	0,055	69,85	0,2345
B1	0,055	69,9	0,2345
B2	0,062	69,9	0,2490
B3	0,070	69,9	0,2646
B4	0,054	69,8	0,2324
AVERAGE	0,0625	69,8890	0,2497

Project nu.	PI 20329
Date	28-03-2025
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date	Heure	Test end date & time
	probe	front/ Back	gasket	probe	front/ Back	gasket	probe	front/ Back	gasket	Filter			
Number	006	124-125	3	10	126	6	12	128	129	9	130		
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	61,3701	0,2593	4,1052	94,6351	0,2592	4,1803	94,5348	0,2621	5,0069	0,1322	2025-03-27	17:00	
Before (6)	61,3701	0,2593	4,1053	94,6352	0,2592	4,1804	94,5347	0,2620	5,0068	0,1323	2025-03-28	09:00	
After (1)	61,3704	0,2595	4,1067	94,6369	0,2596	4,1816	94,5360	0,2623	5,0083	0,1327	2025-03-28	14:00	
After (2)	61,3703	0,2595	4,1058	94,6354	0,2595	4,1808	94,5349	0,2622	5,0075	0,1324	2025-03-31	09:00	
After (3)	61,3703	0,2595	4,1058	94,6354	0,2596	4,1808	94,5348	0,2622	5,0075	0,1324	2025-04-07	13:00	
After (4)													
After (5)													
After (6)	61,3703	0,2595	4,1058	94,6354	0,2596	4,1808	94,5348	0,2622	5,0075	0,1324	2025-04-07	13:00	2025-03-25 13:45
Difference	0,0002	0,0002	0,0005	0,0002	0,0004	0,0004	0,0001	0,0002	0,0007	0,0001			
Total (mg)		0,9			1			1		0,1			
Total ajusté (mg)		0,80			0,90			0,90					

Project nu. PI 20329
Date 28-03-2025
Technicien M.M

Manufacturer: MORSO
Model: 2B

Run: 2
Project #: PI 20329
Test Duration: 114 min

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

Overall Heating Efficiency: 77,84%
Combustion Efficiency: 97,24%
Heat Transfer Efficiency: 80,05%

	HHV	LHV
Eff	77,84%	84,13%
Comb Eff	97,24%	97,24%
HT Eff	80,05%	86,52%
Output	14 767	kJ/h
Burn Rate	0,96	kg/h
Grams CO	76	g
Input	18 972	kJ/h
MC wet	17,04	

Ultimate CO₂
CO_{2-ult} 19,64
F₀
1,062

Heat Output:	14 009 Btu/h
Heat Input:	17 997 Btu/h
Burn Duration:	1,90 h
Burn Rate:	2,11 lb/h
Stack Temp:	285,9 Deg. F

		Averages		0,75	8,85	1,41	20,31	11,09	141,10	20,48	0,91	0,79	#DIV/0!
INPUT DATA				Oxygen Calculation				Input Data		Combust	Heat	Net	
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO ₂ [d]	Excess Air EA	Total O ₂	Calc. % O ₂ [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %		
0,00	2,19	0,26	2,95	512,4%	20,73	17,65	144,5	20,3	94,8%	63,6%	60,3%		
1,00	2,08	0,19	9,93	94,1%	20,27	10,25	175,0	20,4	98,7%	78,8%	77,8%		
2,00	2,03	0,08	10,32	89,0%	20,25	9,90	216,3	20,3	99,6%	76,3%	76,0%		
3,00	1,94	0,08	13,12	48,8%	20,07	6,91	239,9	20,3	99,7%	77,4%	77,1%		
4,00	1,89	0,08	12,95	50,7%	20,08	7,09	253,3	20,3	99,6%	76,5%	76,2%		
5,00	1,85	0,21	14,60	32,6%	19,96	5,26	225,4	20,2	98,9%	79,1%	78,3%		
6,00	1,80	0,21	15,62	24,1%	19,89	4,17	211,0	20,3	98,9%	80,4%	79,6%		
7,00	1,76	0,13	15,29	27,4%	19,92	4,57	205,5	20,3	99,4%	80,6%	80,1%		
8,00	1,71	0,10	15,31	27,5%	19,92	4,56	202,6	20,3	99,6%	80,7%	80,4%		
9,00	1,67	0,10	15,47	26,2%	19,91	4,39	202,6	20,3	99,6%	80,8%	80,5%		
10,00	1,58	0,11	15,42	26,4%	19,91	4,43	201,9	20,3	99,5%	80,8%	80,4%		
11,00	1,53	0,09	15,31	27,6%	19,92	4,57	201,7	20,3	99,6%	80,8%	80,4%		
12,00	1,49	0,10	15,46	26,2%	19,91	4,40	202,0	20,3	99,5%	80,8%	80,4%		
13,00	1,44	0,09	15,38	27,0%	19,92	4,50	201,2	20,3	99,6%	80,8%	80,5%		
14,00	1,39	0,08	15,41	26,8%	19,92	4,47	201,2	20,4	99,7%	80,9%	80,6%		
15,00	1,35	0,08	15,37	27,1%	19,92	4,51	201,2	20,4	99,6%	80,8%	80,6%		
16,00	1,30	0,09	15,44	26,5%	19,91	4,43	200,3	20,4	99,6%	80,9%	80,6%		
17,00	1,26	0,11	15,47	26,1%	19,91	4,39	200,5	20,5	99,5%	80,9%	80,5%		
18,00	1,21	0,10	15,54	25,6%	19,91	4,32	200,6	20,4	99,5%	80,9%	80,5%		
19,00	1,17	0,11	15,52	25,7%	19,91	4,33	200,1	20,5	99,5%	81,0%	80,6%		
20,00	1,12	0,11	15,57	25,3%	19,90	4,28	200,2	20,5	99,5%	81,0%	80,6%		
21,00	1,08	0,10	15,43	26,5%	19,91	4,44	198,3	20,4	99,5%	81,0%	80,6%		
22,00	1,03	0,08	15,23	28,3%	19,93	4,66	196,4	20,3	99,6%	81,0%	80,7%		
23,00	0,99	0,08	15,18	28,8%	19,93	4,72	195,5	20,4	99,7%	81,0%	80,8%		
24,00	0,94	0,08	15,38	27,1%	19,92	4,50	194,5	20,5	99,6%	81,2%	80,9%		
25,00	0,90	0,09	15,44	26,5%	19,91	4,43	193,6	20,5	99,6%	81,3%	80,9%		
26,00	0,90	0,09	15,47	26,2%	19,91	4,39	193,0	20,6	99,6%	81,3%	81,0%		
27,00	0,80	0,12	15,74	23,9%	19,89	4,10	192,8	20,5	99,5%	81,4%	81,0%		
28,00	0,76	0,14	15,92	22,3%	19,88	3,89	192,2	20,6	99,3%	81,5%	81,0%		
29,00	0,76	0,15	16,19	20,3%	19,86	3,60	192,4	20,6	99,3%	81,6%	81,0%		
30,00	0,71	0,18	16,40	18,5%	19,85	3,36	190,8	20,7	99,1%	81,8%	81,1%		
31,00	0,67	0,18	16,36	18,7%	19,85	3,39	189,9	20,7	99,1%	81,8%	81,1%		
32,00	0,62	0,19	16,30	19,1%	19,85	3,46	189,9	20,7	99,1%	81,8%	81,0%		
33,00	0,58	0,19	16,36	18,6%	19,85	3,39	189,9	20,6	99,1%	81,8%	81,0%		
34,00	0,58	0,21	16,01	21,2%	19,87	3,76	188,7	20,6	99,0%	81,7%	80,9%		
35,00	0,53	0,15	15,33	26,9%	19,92	4,51	187,2	20,7	99,2%	81,5%	80,9%		
36,00	0,49	0,07	14,32	36,5%	19,99	5,64	184,3	20,6	99,7%	81,2%	81,0%		
37,00	0,49	0,06	13,43	45,7%	20,05	6,59	180,3	20,7	99,8%	81,0%	80,8%		
38,00	0,44	0,05	13,04	50,1%	20,08	7,01	176,7	20,7	99,9%	81,0%	80,9%		
39,00	0,40	0,07	12,57	55,4%	20,11	7,50	173,2	20,6	99,7%	80,9%	80,7%		
40,00	0,40	0,05	12,06	62,2%	20,14	8,05	169,2	20,7	99,8%	80,9%	80,8%		
41,00	0,40	0,03	11,32	73,0%	20,19	8,85	165,2	20,7	100,0%	80,7%	80,7%		
42,00	0,35	0,03	10,53	86,0%	20,24	9,70	161,4	20,6	100,1%	80,4%	80,4%		
43,00	0,35	0,03	9,90	97,8%	20,28	10,37	158,3	20,6	100,1%	80,1%	80,1%		
44,00	0,35	0,03	9,18	113,3%	20,33	11,14	154,8	20,7	100,1%	79,7%	79,7%		
45,00	0,35	0,05	8,39	132,8%	20,38	11,97	151,1	20,7	99,9%	79,2%	79,1%		
46,00	0,30	0,09	7,69	152,5%	20,43	12,69	147,7	20,7	99,5%	78,6%	78,2%		
47,00	0,30	0,13	7,35	162,5%	20,45	13,03	144,8	20,6	99,0%	78,4%	77,6%		
48,00	0,30	0,18	7,17	167,2%	20,45	13,19	142,2	20,7	98,5%	78,4%	77,2%		
49,00	0,30	0,23	7,07	169,1%	20,46	13,28	139,4	20,7	97,8%	78,5%	76,8%		
50,00	0,30	0,29	6,97	170,8%	20,46	13,35	137,1	20,7	97,2%	78,5%	76,3%		
51,00	0,30	0,34	6,87	172,5%	20,46	13,43	134,8	20,7	96,5%	78,6%	75,8%		
52,00	0,26	0,39	6,77	174,2%	20,47	13,50	132,7	20,6	95,9%	78,6%	75,4%		
53,00	0,27	0,47	6,54	180,4%	20,48	13,71	130,5	20,6	95,0%	78,4%	74,5%		
54,00	0,26	0,58	6,24	187,9%	20,49	13,96	128,5	20,7	93,4%	78,1%	73,0%		
55,00	0,26	0,66	6,14	188,9%	20,49	14,02	126,7	20,6	92,5%	78,1%	72,2%		
56,00	0,26	0,74	6,06	188,9%	20,49	14,06	125,0	20,6	91,5%	78,1%	71,4%		
57,00	0,26	0,79	5,98	190,2%	20,49	14,12	123,5	20,5	90,8%	78,1%	70,9%		
58,00	0,26	0,84	5,95	189,4%	20,49	14,13	122,0	20,5	90,2%	78,1%	70,5%		
59,00	0,26	0,90	5,91	188,3%	20,49	14,13	120,4	20,5	89,5%	78,2%	70,0%		
60,00	0,26	0,95	5,88	187,5%	20,49	14,13	119,3	20,6	88,9%	78,3%	69,6%		
61,00	0,24	0,81	6,19	180,3%	20,48	13,88	118,0	20,4	90,8%	79,0%	71,7%		
62,00	0,22	0,74	6,31	178,8%	20,47	13,80	116,6	20,4	91,8%	79,3%	72,8%		
63,00	0,22	0,73	6,29	179,6%	20,48	13,82	115,7	20,4	91,8%	79,4%	72,9%		
64,00	0,22	0,77	6,29	178,3%	20,47	13,80	114,8	20,4	91,4%	79,5%	72,7%		
65,00	0,22	0,81	6,23	179,3%	20,48	13,85	113,9	20,4	90,9%	79,5%	72,3%		
66,00	0,22	0,85	6,21	178,4%	20,47	13,84	113,3	20,4	90,5%	79,5%	71,9%		
67,00	0,22	0,88	6,21	177,0%	20,47	13,82	112,3	20,4	90,1%	79,6%	71,7%		
68,00	0,22	0,92	6,18	177,0%	20,47	13,84	111,4	20,4	89,8%	79,6%	71,4%		
69,00	0,19	0,95	6,14	177,1%	20,47	13,86	111,1	20,3	89,4%	79,5%	71,1%		
70,00	0,21	0,97	6,11	177,4%	20,47	13,88	110,2	20,3	89,1%	79,6%	70,9%		
71,00	0,17	0,98	6,03	180,2%	20,48	13,96	109,5	20,4	88,9%	79,5%	70,7%		
72,00	0,17	1,03	5,95	181,4%	20,48	14,01	109,2	20,4	88,3%	79,4%	70,1%		
73,00	0,17	1,08	5,72	188,8%	20,49	14,23	108,4	20,3	87,4%	79,1%	69,1%		
74,00	0,17	1,13	5,59	192,3%	20,50	14,34	107,7	20,4	86,6%	78,9%	68,4%		
75,00	0,17	1,13	5,56	193,7%	20,50	14,38	106,8	20,3	86,6%	79,0%	68,4%		
76,00	0,17	1,15	5,49	195,5%	20,50	14,43	106,2	20,4	86,2%	78,9%	68,0%		
77,00	0,17	1,17	5,54	192,7%	20,50	14,37	105,7	20,4	86,1%	79,1%	68,1%		
78,00	0,17	1,24	5,43	194,7%	20,50	14,45	105,3	20,4	85,2%	78,9%	67,2%		
79,00	0,12	1,31	5,26	199,0%	20,51	14,59	104,1	20,4	84,2%	78,7%	66,2%		
80,00	0,12	1,35	5,18	200,4%	20,51	14,65	103,6	20,4	83,5%	78,6%	65,6%		
81,00	0,12	1,39	5,08	203,2%	20,51	14,73	103,0	20,4	82,8%	78,4%	65,0%		
82,00	0,12	1,46	5,00	204,2%	20,51	14,79	102,5	20,4	82,0%	78,3%	64,2%		
83,00	0,12	1,53	4,88	206,7%	20,52	14,88	102,2	20,4	81,0%	78,0%	63,2%		
84,00	0,12	1,58	4,83	206,5%	20,52	14,90	101,4	20,4	80,3%	78,0%	62,6%		
85,00	0,12	1,60	4,83	205,8%	20,52	14,89	100,8	20,4	80,2%	78,1%	62,6%		
86,00	0,12	1,63	4,76	207,6%	20,52	14,95	100,2	20,4	79,7%	78,0%	62,2%		
87,00	0,12	1,62	4,78	207,1%	20,52	14,93	99,6	20,4	79,8%	78,0%	62,3%		
88,00	0,10	1,63	4,73	209,2%	20,52	14,98	99,1	20,4	79,6%	78,1%	62,1%		
89,00	0,08	1,63	4,84	203,7%	20,51	14,86	98,2	20,4	80,0%	78,4%	62,7%		
90,00	0,08	1,61	4,76	208,6%	20,52	14,96	97,7	20,4	79,9%	78,3%	62,6%		
91,00	0,08	1,53	4,66	217,0%	20,53	15,10	97,1	20,4	80,3%	78,2%	62,9%		
92,00	0,08	1,52	4,65	218,2%	20,53	15,12	96,7	20,4	80,4%	78,3%	62,9%		

93,00	0,08	1,52	4,64	219,0%	20,53	15,14	96,1	20,4	80,3%	78,3%	62,9%
94,00	0,08	1,52	4,52	225,0%	20,54	15,26	95,5	20,4	80,0%	78,1%	62,5%
95,00	0,08	1,54	4,47	226,8%	20,54	15,30	95,1	20,3	79,6%	78,1%	62,1%
96,00	0,08	1,55	4,41	229,2%	20,55	15,36	94,5	20,4	79,3%	78,0%	61,9%
97,00	0,08	1,56	4,38	230,6%	20,55	15,38	94,0	20,4	79,2%	78,0%	61,8%
98,00	0,08	1,54	4,38	231,6%	20,55	15,40	93,4	20,4	79,3%	78,1%	61,9%
99,00	0,08	1,54	4,38	231,7%	20,55	15,40	92,9	20,5	79,4%	78,2%	62,1%
100,00	0,08	1,50	4,46	229,4%	20,55	15,33	92,5	20,5	80,0%	78,4%	62,7%
101,00	0,03	1,52	4,45	229,0%	20,55	15,34	92,0	20,5	79,8%	78,5%	62,6%
102,00	0,03	1,56	4,41	229,0%	20,55	15,35	91,3	20,6	79,2%	78,5%	62,2%
103,00	0,03	1,60	4,38	228,3%	20,54	15,36	91,0	20,5	78,8%	78,4%	61,8%
104,00	0,03	1,58	4,37	230,5%	20,55	15,39	90,4	20,5	78,9%	78,5%	61,9%
105,00	0,03	1,59	4,46	224,7%	20,54	15,28	90,3	20,5	79,2%	78,7%	62,3%
106,00	0,03	1,60	4,40	227,4%	20,54	15,34	89,3	20,5	78,8%	78,7%	62,0%
107,00	0,03	1,65	4,33	228,5%	20,55	15,39	89,4	20,5	78,1%	78,5%	61,3%
108,00	0,03	1,67	4,34	226,5%	20,54	15,36	89,1	20,6	77,9%	78,5%	61,2%
109,00	0,02	1,67	4,32	228,0%	20,54	15,39	88,8	20,6	77,9%	78,5%	61,2%
110,00	0,02	1,66	4,24	232,9%	20,55	15,48	88,3	20,6	77,7%	78,4%	60,9%
111,00	0,02	1,62	4,26	233,7%	20,55	15,48	87,9	20,6	78,1%	78,6%	#DIV/0!
112,00	0,02	1,64	4,21	236,1%	20,55	15,53	87,6	20,6	77,8%	78,5%	#DIV/0!
113,00	0,02	1,65	4,11	241,3%	20,56	15,63	87,1	20,6	77,3%	78,3%	60,6%
114,00	0,00	1,64	4,02	247,1%	20,57	15,72	86,5	20,6	77,1%	78,2%	60,3%

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,90 g/hr

Test Duration: 114 min

Burn Rate : 0,96 Dry kg/hr

PRESSURE FACTOR: DGM 1st hr 0,961
 DGM 1 0,944
 DGM 2 0,951
 DGM 3 0,984

BAROMETRIC PRESSURE

Average: 29,45616391 in Hg
 Start: 29,47092891 in Hg
 End: 29,44139892 in Hg

TEMPERATURE FACTORS DGM 1st hr 0,992
 DGM 1 0,996
 DGM 2 0,988
 DGM 3 0,998

DGM VALUES

DGM 1st hr Final: 1179,320 Cuft
 Initial: 1167,420 Cuft

VOLUMES SAMPLED DGM 1st hr 11,352 SCft
 DGM 1 20,721 SCft
 DGM 2 20,884 SCft
 DGM 3 20,482 SCft

DGM 1 Final: 4563,813 Cuft
 Initial: 4541,461 Cuft

DGM 2 Final: 31259,096 Cuft
 Initial: 31237,084 Cuft

TOTAL TUNNEL VOLUME : 39662

DGM #3 Final: 22245,497 Cuft
 Initial: 22224,405 Cuft

SAMPLE RATIOS

Sample Train 1st Hr: 1838,8
 Sample Train 1: 1914,1
 Sample Train 2: 1899,2

TEMPERATURES

DGM 1st hr 532,142 °R
 DGM 1 530,375 °R
 DGM 2 534,257 °R

Particulate concentration

Sample Train 1st Hr 0,000079 g/dscf
 Sample Train 1 0,000048 g/dscf
 Sample Train 2 0,000048 g/dscf
 Room 0,000005 g/dscf

CALIBRATION FACTORS

DGM 1st hr 1,0000
 DGM 1 0,9860
 DGM 2 1,0100
 DGM #3 0,9880

TOTAL EMISSIONS

Sample Train 1st Hr 1,55 g
 Sample Train 1 1,72 g
 Sample Train 2 1,71 g

TUNNEL FLOW RATE: 347,9 Dscfm

PARTICULATE CATCH

Total Sample Train 1: 1,00 mg
 Total Sample Train 2: 1,00 mg
 Total Sample Train 1 1st hour: 0,90 mg

EMISSION RATES

Sample Train 1st Hr 1,55 g/hr
 Sample Train 1 0,91 g/hr
 Sample Train 2 0,90 g/hr

DEVIATION: 0,43%

Cs Train 1 Train 2 Train 1st Hr
 4,826E-05 4,7884E-05 7,928E-05

* Elapsed Time	Raw data row	Weight Remaining	* CO	* CO ₂	* %F	*1 Room Temp	*2 Room Temp	*3 Tunnel Dry Bulb	*4 Unit Top	*5 Unit Back	*6 Unit R.Side	*7 Unit L.Side	*8 Unit Bottom	Mass flow Reading	DGM 1st hour Inlet 1	DGM 1st hour Inlet 2	Filter 1st hour Temp	DGM 1 Reading	DGM 1 Inlet 1	DGM 1 Outlet 1	Filter 1 Temp	Mass flow 2 Reading	DGM 2 Inlet 1	DGM 2 Outlet 1	Filter 2 Temp	Tunnel Velocity Pressure	Flue draft Pressure	Filter 1st hr	Filter 1	Filter 2	Change in Surf Temp
min	min	lbs	%	%	%F	%F	%F	%F	%F	%F	%F	%F	%F	cuft/min	of	of	of	cuft/min	of	of	of	cuft/min	of	of	of	in wc	in wc	in. Hg	in. Hg	in. Hg	%
0	198.00	4.8	0.3	3.0	292.2	68.5	101.8	516.2	390.4	414.3	397.6	431.8	0.19	70.7	71.0	71.4	0.20	69.2	70.7	70.9	0.20	69.6	69.8	71.0	0.07	0.06	-0.78	-1.44	-1.25	0.0	
1	199.0	4.0	0.1	9.9	217.4	68.5	71.2	296.6	417.0	416.9	417.0	417.0	0.19	70.9	71.3	72.4	0.19	69.2	70.7	72.4	0.18	69.5	69.9	72.4	0.07	0.04	-0.67	-1.17	-0.98	0.7	
2	200.0	4.5	0.1	10.3	421.3	68.5	88.5	543.0	405.5	417.5	396.8	441.8	0.19	70.9	71.2	72.1	0.18	69.2	70.4	72.0	0.18	70.1	69.9	72.4	0.08	0.08	-0.66	-1.18	-0.98	0.8	
3	201.0	4.3	0.1	13.1	463.9	68.5	89.7	589.8	402.9	417.4	395.0	446.7	0.19	70.9	71.2	72.2	0.18	69.2	70.3	72.2	0.18	70.2	70.0	72.6	0.08	0.09	-0.65	-1.18	-0.98	20.3	
4	202.0	4.3	0.1	13.6	488.0	68.5	88.1	684.1	407.3	410.7	398.5	451.3	0.19	71.0	71.3	72.3	0.18	69.2	70.0	72.4	0.18	70.0	70.0	72.9	0.07	0.09	-0.64	-1.17	-0.98	29.3	
5	203.0	4.1	0.2	14.6	437.6	68.4	87.0	654.6	402.7	415.0	391.8	455.0	0.19	71.0	71.3	72.4	0.18	69.1	70.1	72.4	0.18	70.5	70.3	73.7	0.07	0.08	-0.65	-1.18	-0.98	30.7	
6	204.0	4.0	0.2	15.6	411.8	68.6	85.8	667.3	400.9	413.2	390.1	458.0	0.19	71.0	71.3	72.5	0.18	69.1	70.1	72.5	0.18	70.6	70.2	73.0	0.07	0.08	-0.67	-1.18	-0.98	35.8	
7	205.0	3.9	0.1	15.3	401.9	68.5	85.0	676.3	399.3	412.0	388.8	460.0	0.19	71.1	71.4	72.5	0.18	69.2	70.1	72.5	0.18	70.8	70.3	73.7	0.07	0.08	-0.66	-1.17	-0.98	37.2	
8	206.0	3.8	0.1	15.3	396.6	68.5	86.4	684.1	398.5	410.7	388.5	461.3	0.19	71.1	71.4	72.6	0.18	69.2	70.1	72.6	0.18	71.0	70.4	73.6	0.07	0.08	-0.66	-1.18	-0.98	38.4	
9	207.0	3.7	0.1	15.5	396.6	68.5	86.4	692.3	395.5	409.4	386.9	462.6	0.19	71.2	71.4	72.8	0.18	69.2	70.0	72.8	0.18	71.1	70.5	73.3	0.08	0.08	-0.65	-1.18	-0.97	39.3	
10	208.0	3.5	0.1	15.4	395.4	68.5	86.4	698.9	393.9	408.3	386.6	462.9	0.19	71.2	71.5	72.9	0.18	69.2	70.0	72.9	0.18	71.2	70.5	73.4	0.08	0.08	-0.66	-1.18	-0.97	40.1	
11	209.0	3.4	0.1	15.3	395.0	68.5	86.4	704.3	392.4	407.3	386.4	463.3	0.19	71.3	71.5	73.0	0.18	69.2	70.0	73.0	0.18	71.4	70.7	73.5	0.08	0.08	-0.66	-1.18	-0.99	40.6	
12	210.0	3.3	0.1	15.5	395.5	68.5	85.3	709.6	391.8	407.2	387.3	464.2	0.19	71.3	71.5	73.1	0.18	69.2	69.9	73.1	0.18	71.5	70.8	73.7	0.07	0.08	-0.65	-1.18	-0.99	41.9	
13	211.0	3.2	0.1	15.4	394.2	68.5	84.4	713.2	390.5	406.7	387.0	463.5	0.19	71.3	71.5	73.2	0.18	69.2	69.9	73.1	0.18	71.6	70.9	73.7	0.07	0.08	-0.65	-1.18	-0.98	42.1	
14	212.0	3.1	0.2	15.4	394.1	68.7	84.8	716.7	389.7	405.0	387.7	463.2	0.19	71.4	71.6	73.3	0.18	69.2	69.9	73.2	0.18	71.8	71.0	73.8	0.08	0.08	-0.65	-1.17	-0.98	42.2	
15	213.0	3.0	0.1	15.4	394.2	68.8	86.1	719.6	388.9	404.9	388.5	465.0	0.19	71.5	71.6	73.4	0.18	69.3	70.0	73.4	0.18	72.1	71.1	73.9	0.08	0.08	-0.66	-1.18	-0.99	42.4	
16	214.0	2.9	0.1	15.4	392.6	68.8	87.1	721.2	388.5	404.8	389.1	458.6	0.19	71.5	71.6	73.5	0.18	69.4	70.0	73.5	0.18	72.2	71.2	74.0	0.08	0.08	-0.66	-1.18	-0.99	42.3	
17	215.0	2.8	0.1	15.5	392.8	68.9	85.1	724.8	388.3	405.0	390.6	456.6	0.19	71.6	71.7	73.6	0.18	69.4	70.0	73.6	0.18	72.3	71.4	74.1	0.07	0.08	-0.65	-1.18	-0.99	43.0	
18	216.0	2.7	0.1	15.5	393.1	68.7	85.8	727.5	388.3	404.9	391.8	454.6	0.19	71.7	71.7	73.7	0.18	69.5	70.0	73.7	0.18	72.3	71.5	74.2	0.08	0.08	-0.67	-1.18	-0.99	43.4	
19	217.0	2.6	0.1	15.5	392.2	68.8	85.8	729.0	388.4	405.2	393.0	452.3	0.19	71.7	71.8	73.8	0.18	69.5	70.0	73.7	0.18	72.5	71.6	74.3	0.08	0.08	-0.66	-1.18	-0.99	43.5	
20	218.0	2.5	0.1	15.6	392.3	69.0	84.9	729.1	389.1	405.9	394.2	449.7	0.19	71.8	71.8	73.9	0.18	69.6	70.1	73.8	0.18	72.7	71.8	74.3	0.08	0.08	-0.66	-1.18	-0.99	43.5	
21	219.0	2.4	0.1	15.4	389.0	68.8	84.5	726.1	389.1	405.3	395.1	447.5	0.19	71.9	71.9	73.9	0.18	69.6	70.1	73.8	0.18	72.2	71.9	74.4	0.08	0.06	-0.66	-1.18	-0.98	42.5	
22	220.0	2.3	0.1	15.2	385.5	68.6	85.0	726.7	389.0	406.0	396.4	448.8	0.18	71.9	71.9	73.9	0.18	69.7	70.2	73.9	0.18	73.0	72.1	74.4	0.08	0.07	-0.66	-1.19	-0.98	42.7	
23	221.0	2.2	0.1	15.2	384.0	68.7	85.0	723.6	390.4	406.5	397.1	442.2	0.19	71.9	71.9	74.0	0.18	69.6	70.2	74.0	0.18	73.2	72.1	74.5	0.08	0.08	-0.66	-1.19	-0.99	41.9	
24	222.0	2.1	0.1	15.2	382.3	68.7	85.0	720.7	390.8	407.3	398.8	443.5	0.19	72.0	72.0	74.1	0.18	69.7	70.3	74.1	0.18	73.5	72.2	74.5	0.07	0.07	-0.67	-1.19	-0.97	41.8	
25	223.0	2.0	0.1	15.4	380.5	68.8	85.7	724.3	392.0	407.3	392.0	437.7	0.18	71.9	72.0	74.2	0.18	69.7	70.3	74.1	0.18	73.5	72.4	74.6	0.08	0.08	-0.67	-1.18	-0.98	42.2	
26	224.0	2.0	0.1	15.5	379.3	69.1	85.7	725.5	393.4	408.5	401.8	435.5	0.19	72.0	72.1	74.2	0.18	69.8	70.3	74.2	0.18	73.6	72.5	74.7	0.07	0.07	-0.66	-1.18	-0.98	42.9	
27	225.0	1.8	0.1	15.7	379.0	69.0	85.0	728.1	394.9	409.6	402.9	433.5	0.19	72.1	72.1	74.3	0.18	69.7	70.4	74.3	0.18	73.6	72.6	74.8	0.08	0.07	-0.67	-1.20	-0.99	43.7	
28	226.0	1.7	0.1	15.8	378.8	69.1	85.0	730.8	396.1	410.9	404.0	434.2	0.19	72.1	72.2	74.4	0.18	69.7	70.4	74.3	0.18	73.7	72.7	74.8	0.08	0.07	-0.68	-1.20	-1.00	44.4	
29	227.0	1.7	0.1	16.2	378.3	69.0	85.1	733.2	397.7	411.4	405.5	429.8	0.19	72.1	72.2	74.4	0.18	69.7	70.4	74.3	0.18	73.6	72.7	74.8	0.08	0.07	-0.68	-1.20	-1.00	45.4	
30	228.0	1.6	0.2	16.4	375.5	69.2	84.1	737.6	399.6	411.8	407.0	428.0	0.18	72.2	72.2	74.5	0.18	69.7	70.4	74.3	0.18	73.7	72.9	74.8	0.08	0.08	-0.69	-1.19	-1.00	46.7	
31	229.0	1.5	0.2	16.3	373.8	69.3	84.1	735.5	399.5	411.8	406.9	427.3	0.19	72.3	72.3	74.5	0.18	69.8	70.5	74.4	0.18	73.9	73.0	74.9	0.07	0.07	-0.69	-1.20	-1.01	49.0	
32	230.0	1.4	0.2	16.3	373.8	69.3	85.4	742.7	403.4	414.4	409.4	425.3	0.19	72.3	72.3	74.5	0.18	69.8	70.5	74.4	0.18	73.9	73.0	74.9	0.07	0.07	-0.69	-1.20	-1.01	49.0	
33	231.0	1.3	0.2	16.4	373.8	69.1	84.4	745.8	405.4	415.5	411.0	424.0	0.18	72.3	72.4	74.6	0.18	69.8	70.5	74.5	0.18	74.0	73.0	75.0	0.07	0.07	-0.70	-1.21	-1.00	50.3	
34	232.0	1.3	0.2	16.0	371.7	69.1	84.9	747.3	407.6	416.3	412.6	422.9	0.19	72.5	72.4	74.6	0.18	69.8	70.5	74.5	0.18	74.1	73.1	75.0	0.08	0.07	-0.70	-1.20	-1.01	51.3	
35	233.0	1.2	0.1	15.9	369.2	69.3	84.2	750.0	409.0	418.0	414.0	424.0	0.19	72.6	72.6	74.7	0.18	69.9	70.5	74.5	0.18	74.2	73.2	75.0	0.08	0.07	-0.70	-1.20	-1.01	50.0	
36	234.0	1.1	0.1	14.3	363.8	69.1	84.1	736.2	412.6	418.7	415.7	421.1	0.19	72.6	72.6	74.7	0.18	69.9	70.5	74.5	0.18	74.2	73.3	75.0	0.08	0.07	-0.71	-1.20	-1.01	50.8	
37	235.0	1.1	0.1	13.4	356.5	69.3	83.8	725.7	415.1	419.8	417.3	420.4	0.19	72.6	72.5	74.7	0.18	69.9	70.6	74.5	0.18	74.2	73.5	75.0	0.08	0.07	-0.71	-1.20	-1.01	49.6	
38	236.0	1.0	0.1	13.0	350.5	69.5	83.0	715.2	417.9	420.5	415.2	419.6	0.19	72.7	72.7	74.8	0.18	69.9	70.6	74.5	0.18	74.3	73.6	75.0	0.08	0.07	-0.71	-1.20	-1.01	48.6	
39	237.0	0.9	0.1	12.6	343.7	69.2	83.6	704.5	420.2	421.3	419.7	419.2	0.18	72.7	72.7	74.8	0.18	69.9	70.7	74.6	0.18	74.4	73.7	75.0	0.08	0.07	-0.71	-1.21	-1.02	46.9	
40	238.0	0.9	0.1	12.1	336.5	69.3	83.2	691.4	422.9	421.5	420.4	419.0	0.19	72.8	72.7	74.8	0.18	69.9	70.7	74.5	0.18	74.4	73.9	74.9	0.08	0.07	-0				

Time	Flue	Room	scale	Right	Back	bottom	Top	Left
acquisition	temp	temp						
minutes	°F	°F	lbs	°F	°F	°F	°F	°F
1	67,57	67,37	2,47	68,32	68,25	68,32	68,29	68,28
2	79,94	67,40	2,47	68,36	68,25	68,31	69,05	68,50
3	118,88	67,33	2,37	69,50	68,23	68,31	72,93	70,79
4	165,11	67,38	2,27	70,99	68,31	68,32	89,09	72,95
5	221,71	67,44	2,27	71,37	68,48	68,43	118,15	71,62
6	242,37	67,42	2,17	72,93	68,87	68,65	137,23	71,74
7	273,90	67,08	2,07	75,63	69,48	69,04	163,42	72,80
8	329,48	67,11	1,97	79,17	70,37	69,64	211,82	74,59
9	372,90	67,06	1,87	83,61	71,50	70,60	259,88	77,08
10	388,50	67,14	1,67	88,79	72,82	71,99	300,12	80,16
11	409,64	67,22	1,57	94,54	74,43	73,78	343,47	83,97
12	431,27	67,43	1,47	100,96	76,35	76,00	384,66	88,63
13	457,50	67,52	1,37	108,02	78,76	78,75	427,41	93,89
14	481,80	67,74	1,17	115,36	81,75	81,97	477,10	100,06
15	485,99	67,92	1,07	122,85	85,38	85,77	520,02	106,89
16	487,35	67,77	0,10	130,59	89,79	90,32	552,40	114,44
17	391,41	67,65	6,77	140,76	95,43	96,84	529,45	129,13
18	389,44	67,72	6,67	148,22	101,57	103,30	515,20	134,58
19	387,84	67,74	6,57	155,15	107,62	110,37	505,83	142,86
20	390,76	67,84	6,47	161,79	113,16	117,60	501,39	150,84
21	389,76	67,83	6,47	168,40	117,94	124,68	497,81	157,88
22	387,48	67,92	6,47	174,56	121,89	131,23	493,49	165,48
23	362,19	68,02	6,37	180,75	125,02	137,35	484,27	171,96
24	319,49	67,89	6,27	186,37	127,78	142,96	469,83	177,42
25	309,24	68,05	6,27	191,71	129,94	147,95	461,25	182,73
26	303,10	67,95	6,17	196,52	131,95	152,75	457,08	186,77
27	297,77	67,86	6,17	200,90	133,63	157,25	451,59	190,08
28	290,87	67,64	6,09	205,18	135,05	161,56	446,68	193,00
29	286,94	67,86	6,07	209,21	136,29	165,71	441,44	196,04
30	283,67	67,82	5,97	213,33	137,53	169,79	438,15	198,56
31	284,15	67,72	5,97	217,55	138,81	173,80	436,27	200,44
32	280,54	67,86	5,95	221,00	139,76	177,69	432,63	202,21
33	272,48	67,83	5,87	224,18	140,80	181,51	425,52	203,89
34	263,03	67,80	5,87	226,77	141,66	185,24	416,92	205,23
35	256,59	67,85	5,77	229,01	142,66	188,90	408,84	206,51
36	254,49	67,92	5,77	230,71	143,57	192,45	401,47	207,35
37	252,60	67,93	5,67	231,92	144,25	195,89	395,48	207,99
38	251,08	67,87	5,67	232,88	145,17	199,21	390,26	208,48
39	250,48	67,78	5,58	233,61	146,00	202,47	385,68	208,96
40	250,24	67,70	5,57	233,83	146,94	205,62	381,69	209,28
41	250,34	67,66	5,57	234,13	147,85	208,67	379,52	209,62
42	253,45	67,62	5,47	234,06	148,66	211,65	378,66	209,83
43	257,86	67,73	5,46	233,98	149,61	214,62	380,04	209,88
44	264,40	67,67	5,37	234,04	150,43	217,50	383,78	210,23
45	272,85	67,64	5,27	233,79	151,42	220,30	390,18	210,30
46	285,57	67,72	5,17	234,13	152,49	223,08	400,35	210,67
47	295,82	67,66	5,17	234,30	153,57	225,87	412,65	210,98
48	307,26	67,68	5,07	234,81	154,66	228,67	428,14	211,59
49	316,50	67,65	4,97	235,53	155,72	231,52	444,29	212,10
50	325,99	67,50	4,87	236,67	157,08	234,32	462,10	213,29
51	334,55	67,52	4,77	237,49	158,17	237,13	479,97	214,38
52	342,81	67,83	4,76	238,64	159,48	239,90	498,01	215,80
53	351,12	67,91	4,67	240,00	160,85	242,69	516,36	217,71
54	361,84	67,78	4,57	241,80	162,35	245,50	537,62	219,91
55	367,55	67,80	4,47	243,68	163,94	248,28	557,79	222,27
56	372,06	67,87	4,37	246,05	165,87	250,98	574,86	225,39
57	377,51	67,88	4,27	248,47	167,58	253,81	593,15	228,06
58	384,34	67,84	4,17	251,18	169,36	256,42	612,95	231,40
59	388,58	67,96	3,97	254,11	171,31	259,10	630,10	235,11
60	391,97	68,03	3,93	257,52	173,46	261,37	645,37	239,24
61	392,94	68,04	3,81	261,02	175,56	264,01	658,55	243,45
62	391,99	68,04	3,71	265,00	177,80	266,76	667,14	248,24
63	385,35	68,23	3,65	269,34	180,03	269,80	665,99	253,56
64	381,29	68,29	3,57	273,76	182,32	272,87	663,99	259,00
65	379,57	68,29	3,47	278,38	184,49	275,95	661,80	264,78
66	376,85	68,38	3,37	283,10	186,79	279,07	659,85	270,77
67	374,35	68,40	3,27	287,74	188,66	282,17	658,98	276,43
68	373,95	68,46	3,27	292,45	191,06	285,26	659,02	282,50

69	371,99	68,26	3,07	296,77	193,33	288,33	659,88	288,47
70	372,20	68,55	3,07	301,75	195,75	291,53	659,64	294,35
71	371,55	68,42	2,97	305,96	198,27	294,86	661,68	300,11
72	372,53	68,47	2,87	310,59	201,19	298,22	662,63	305,56
73	373,03	68,19	2,77	314,78	203,97	301,76	665,61	310,96
74	372,91	68,39	2,67	319,70	207,04	305,30	668,59	316,20
75	370,82	68,43	2,67	324,11	210,12	308,80	669,66	321,27
76	368,41	68,26	2,57	328,49	213,48	312,43	672,79	326,24
77	369,02	68,57	2,47	332,89	217,22	316,05	676,36	331,06
78	369,16	68,57	2,37	337,62	221,09	319,80	679,02	335,37
79	367,70	68,58	2,37	341,93	225,20	323,46	683,47	339,31
80	367,29	68,47	2,27	346,22	229,55	327,03	684,47	342,98
81	366,45	68,57	2,17	350,00	234,44	330,75	687,02	346,20
82	365,13	68,72	2,07	353,99	239,80	334,49	687,31	349,34
83	360,87	68,69	2,07	357,67	245,30	338,30	683,36	352,64
84	357,59	68,65	1,97	361,71	251,24	342,25	678,30	355,60
85	354,20	68,73	1,87	365,16	257,32	346,19	673,99	358,58
86	352,52	68,73	1,77	368,69	263,49	350,13	668,87	361,32
87	351,12	68,64	1,77	372,03	269,46	354,03	665,94	363,72
88	350,11	68,58	1,67	375,67	276,04	357,91	664,97	366,62
89	349,57	68,62	1,67	378,65	282,50	361,90	664,09	369,48
90	348,26	68,68	1,57	381,61	289,16	365,61	663,79	371,14
91	348,59	68,47	1,47	384,18	295,91	369,46	664,56	373,87
92	347,48	68,67	1,47	387,16	302,85	373,40	667,02	375,73
93	344,62	68,66	1,37	389,65	309,51	377,31	667,43	377,87
94	340,99	68,69	1,28	392,50	316,30	381,35	664,33	380,07
95	333,95	68,77	1,27	394,88	323,19	385,41	657,22	382,55
96	327,23	68,74	1,27	397,46	329,89	389,58	648,45	384,25
97	319,49	68,85	1,27	399,49	336,87	393,99	635,61	386,08
98	312,09	68,94	1,17	401,34	343,66	398,57	623,92	387,71
99	304,63	68,87	1,17	403,26	350,44	403,09	610,91	389,27
100	296,96	68,95	1,17	404,99	357,41	407,69	598,21	390,89
101	290,24	68,89	1,17	407,02	364,53	412,12	585,08	391,91
102	283,79	68,80	1,17	408,13	371,17	416,77	572,02	392,72
103	277,64	68,73	1,07	410,13	377,58	421,65	560,05	393,48
104	273,29	68,68	1,17	411,70	383,79	426,63	547,80	394,33

Date: 2025-03-29

Manufacturer: Morso

Model: 2b

Project #: PI 20329

Run: 3

Tech: M.M.

Reviewer: SD

- kindling 2x4s stand PINE
- After 2 min close Door
- Set immediately air setting medium High setting
- At 100 lbs insert preload
- close Door immediately
- At 100 lbs insert load
- close door

TEST LOAD CONFIGURATION

Date: 2025-03-29

 Manufacturer: Morse
PRE / POST CHECKS

 Model: 2B

 Project #: PI 2329

 Run: 3

 Tech: MM

 Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334	71:00	ok	ok

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check (tunnel velocity)

Picture.....

0 (max50 Fpm)	0 (max50 Fpm)
ok	NA
4 sides ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O)

Traverse before ignition.....

2025-03-27
2025-03-27
ok
ok

Temperature System:

Ambient (65°-90°F)

ok	°F
----	----

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

Pictures for report.....

ok	
ok	
ok	
Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok
	ok

Load Length 5/6 of firebox Length +/- 1 inch.....

Date: 05-03-20Manufacturer: MorsModel: 2BProject #: PT 2320Run: 3Tech: M.MReviewer: DR

Leakage Checks Tunnel Samplers

	Train 1		Train 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-7	-7	-7	-7
Final 1 minute DGM (Liter)	129 233 85	129 709 40	885 632 04	885 162 38
Initial 1 minute DGM (Liter)	129 233 85	129 709 40	885 632 04	885 162 38
Change (Liter)	0	0	0	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2025-03-25

Project #: P120325

Leakage Checks Tunnel Samplers

Manufacturer: Morse

Run: 3

Tech: M.R.

Model: 2B

Reviewer: JS

	System 1 st hour		Ambient	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm	-7	-7	-7	-7
Vacuum (inches Hg.)				
Final 1 minute DGM (Liter)	1179.53	1191.54	629936.70	630387.13
Initial 1 minute DGM (Liter)	1179.53	1191.54	629936.70	630387.12
Change (Liter)	0	0	0	0.01
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2025-03-29

Manufacturer: Morse

Model: 2B

Project #: PT 2325

Run: 3

Tech: MM

Reviewer: JS

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotameter Reading (mm/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

Leakage Checks Pitot

Plugged Probe	Pre-Test 3 H ₂ O static	Pre-Test 0.4-0.5 H ₂ O velocity	Post Test 0.4-0.5 H ₂ O velocity
Vacuum (inches Hg.)	3	0.4	0.4
Check OK (no change after 15 sec.)	OK	OK	OK



Date: 2025-03-29

Project #: PI 20309

Manufacturer: Morse

Run: 3

Tech: M.H.

Model: 2B

Reviewer: [Signature]

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	1000 Kg, Class F	1000 Kg
Wood	EM-090	44 lbs, Class F	44 lbs
Analytical	EM-335	100.0 mg, Class S	100.0 mg
Analytical	EM-129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg
PLATFORM SCALE: 20%-80% of ideal test load weight, ± 0.1 lbs or 1%
WOOD SCALE: 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 02-03-29

 Manufacturer: Morse

 Model: 2B

 Project #: PI 20329

 Run: 3

 Tech: M.M.

 Reviewer: SD

FOR TUNNELS < 12 in

 Barometric pressure (P_{bar}) _____ (KPa.)

 Static pressure (P_s) _____ (inches w.c.)

Inside diameter: Port A _____ Port B _____

 Tunnel cross sectional area: .1963 ft²

Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δp (inches H ₂ O)	Tunnel Temperature (°F)
Tunnel diameter	6 po	7 po	8 po		
A - Centroid	3.00	3.50	4	0.079	68.42
B - Centroid	3.00	3.50	4	0.078	69.27
A-1	0.40 0.50 SD	0.50	0.50	0.065	68.42
A-2	1.50	1.75	2	0.078	69.25
A-3	4.50	5.25	6	0.068	69.25
A-4	5.60 5.50 SD	6.5	7.5	0.064	69.36
B-1	0.40 0.50 SD	0.50	0.50	0.064	69.27
B-2	1.50	1.75	2	0.076	69.28
B-3	4.50	5.25	6	0.064	69.28
B-4	5.60 5.50 SD	6.5	7.5	0.065	69.31
				AVERAGE	

Date: _____ Manufacturer: _____ Model: _____

Project #: _____ Run: _____ Tech: _____ Reviewer: _____

FOR TUNNELS 12 in

Barometric pressure (P_{bar}) _____ (KPa.) Static pressure (P_q) _____ (inches w.c.)

Pitot tube type: Standard

Traverse Point	Position (inches)	Velocity Head Δp (inches H_2O)	Tunnel Temperature ($^{\circ}F$)
A Center	6		
B Center	6		
A-1	0.53		
A-2	1.75		
A-3	3.55		
A-4	8.45		
A-5	10.25		
A-6	11.47		
B-1	0.53		
B-2	1.75		
B-3	3.55		
B-4	8.45		
B-5	10.25		
B-6	11.47		

CONTINUOUS ANALYZERS

Date: 2025-03-29 Manufacturer: Morso Model: 215
 Project #: PT 20329 Run: 3 Tech: MM Reviewer: DO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3051	3.000	1.020	1.000
Tolerance CO	0	+/- 0.02	0.051	+/- 0.15	0.020	+/- 0.05
CO ₂	0	0	1804	18.00	9.74	10.00
Tolerance CO ₂	0	+/- 0.02	0.04	+/- 0.5	0.26	+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	3046	1.014	0.111 2.111	0.02	0.005 0.006	0.15	0.006	0.05	✓	
CO ₂	0	18.01	9.78	0.111 0.111	0.02	0.031 0.031	0.5	0.04	0.5	✓	



TEST DATA LOG

Date: 2025-03-29 Project #: PJ 20329 Manufacturer: Morsis Run: 3 Tech: M. M. Model: 2B Reviewer: D

RAW DRY GAS METER READINGS

Test	Final (Liter)	System 1 st hour	System 1	System 2	Blank
		1191.48	129708.91	885031.04	630386.68
	Initial (Liter)	1179.60	129234.51	885163.04	629938.78

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100.5	100.5
Dry Bulb (F):	69.3	72.1
Humidity (%):	29.7	28.6

Date: 2025-07-29Manufacturer: Morso

FUEL DATA

Model: 2BProject #: PT 2.329Run: 3Tech: mmReviewer: BD

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size			Weight		Meter Moisture Content (% dry) *				
1.50	X 3.50	X 15 5/8 in.	2090	lbs.	216	209	217	212	209
1.50	X 3.50	X 15 9/16 in.	2060	lbs.	206	21	215	213	20
1.50	X 3.50	X 6 in.	0582	lbs.	203	199	206	207	198
1.50	X 3.50	X 6 in.	0650	lbs.	196	199	203	198	201
1.50	X 3.50	X 6 in.	0620	lbs.	193	197	201	202	195
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					
	X	X in.		lbs.					

TEST LOAD WEIGHT: 6002 lbsWood Temperature: 21 °CBD



FUEL DATA

Date: 2025-03-29 Manufacturer: Morso Model: 2B
Project #: GI 20309 Run: 3 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

TEST LOAD

[illegible]

TEST LOAD WEIGHT: 487 lbs Min 20%: Max 25%:

Wood Temperature: 21°C

TEST FILTERS						
SYSTEM 1 st hour				SYSTEM 1		
Pre-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Probe & Housing Number	Front & Back Filter Number	gaskets
Date	Time					
2025-03-27	17:00	27-28	2	19	29-30	10
2025-03-29	17:00	02570	4 1888	109 0881	02567	4 1666
		02571	4 1888	109 0880	02567	4 1665

TEST FILTERS						
SYSTEM 1 st hour				SYSTEM 1		
Post-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Probe & Housing Number	Front & Back Filter Number	gaskets
Date	Time					
2025-03-29	13:30	27-28	2	19	29-30	10
2025-03-31	17:00	02581	4 1899	109 0882	02578	4 1679
2025-04-07	13:00	02580	4 1892	109 0881	02578	4 1671
		02580	4 1892	109 0881	02577	4 1671

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2025-03-29 Project #: PI 20329 Manufacturer: M or SD Tech: M.M Model: 2B Reviewer: SD

TEST FILTERS					
SYSTEM 2			TEST FILTERS		
Pre-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	
Date	31	31-32	60	33	
Time					
2025-03-29 17:00	110 1267	02576	41847	01287	
2025-03-29 19:00	110 1267	02576	41847	01287	
TEST FILTERS					
SYSTEM 2			TEST FILTERS		
Post-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	31	31-32	60	33	2025-03-26
Time					13:30
2025-03-29 13:30	110 1269	02584	41861	01289	
2025-03-31 19:00	110 1268	02584	41853	01289	
2025-04-07 13:00	110 1269	02585	41853	01288	

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage: MOR

Description du test

Test standard	EPA
Run #	3
Date	29-03-2025
Technicien	M.M
Project #	PI 20329

Description de l'unité

Manufacturier	MORSO	
Modèle	2B	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	0,688	cu ft.
Appliance weight empty	n.a	lbs
Appliance weight full	n.a	lbs

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	n.a	BTU/h Donnée fournie par le manfacturier
Targeted category	3	
Targeted output	n.a	BTU/h
Cp steel	n.a	BTU/lb-°F

Échantillonnage

targeted Blank sampling rate	0,18	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,986	
Equipment number (DGM #1):	EM 178	Dimensionless
Calibration Factor (DGM #2):	1,010	
Equipment number (DGM #2):	EM 318	Dimensionless
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	EM 179	Dimensionless
Calibration Factor (DGM 1st Hr):	1,000	
Equipment number (DGM 1st Hr):	EM 130	Dimensionless

Tunnel

Targeted tunnel flow rate	400	scfm
Tunnel diameter	8	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20329
Date 29-03-2025
Technicien M.M

Fuel data

Fuel type	Dimension
Fuel specie	D. Fir
HHV	19810,0 kJ/kg
%C	48,7
%H	6,9
%O	43,9
%Ash	0,5
HHV	8519,2 Btu/lb
LHV	7451,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

	Start	End
Barometer (kPa):	100,5	100,5
Barometer (in.Hg):	29,677639	29,67763883
Dry Bulb (F):	69,3	72,1
Humidity (%):	29,7	28,6
Air velocity (ft/min)	0	0

DGM #1st hour	Final:	1191,480	cuft
	Initial:	1179,600	cuft

Final:	1191,480	cuft
Initial:	1179,600	cuft

DGM #1	Final:	4580,627	cuft
	Initial:	4563,874	cuft

Final:	129708,910	Liter
Initial:	129234,510	Liter

DGM #2	Final:	31275,766	cuft
	Initial:	31259,238	cuft

Final:	885631,040	Liter
Initial:	885163,040	Liter

DGM room	Final:	22261,896	cuft
	Initial:	22246,079	cuft

Final:	630386,680	Liter
Initial:	629938,780	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

191

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	PI 20329
Date	29-03-2025
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,15 in. H2O (absolute value)
 Barometer: 29,900 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

PITOT CONSTANT=
0,944

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,079	68,42	0,2811
B center	0,078	69,27	0,2793
A1	0,065	68,42	0,2550
A2	0,078	69,25	0,2793
A3	0,068	69,25	0,2608
A4	0,064	69,36	0,2530
B1	0,064	69,3	0,2530
B2	0,076	69,3	0,2757
B3	0,064	69,3	0,2530
B4	0,065	69,3	0,2550
AVERAGE	0,0701	69,1110	0,2645

Project nu.	PI 20329
Date	29-03-2025
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date	Heure	Test end date & time
	probe	front/ Back	gasket	probe	front/ Back	gasket	probe	front/ Back	gasket	Filter			
Number	001	27-28	2	19	29-30	10	31	31-32	60	33			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	61,1048	0,2570	4,1888	109,0881	0,2567	4,1666	110,1267	0,2576	4,1847	0,1287	2025-03-27	17:00	
Before (6)	61,1047	0,2571	4,1888	109,0880	0,2567	4,1665	110,1267	0,2576	4,1847	0,1287	2025-03-29	09:00	
After (1)	61,1053	0,2581	4,1899	109,0882	0,2578	4,1679	110,1269	0,2584	4,1861	0,1289	2025-03-29	13:30	
After (2)	61,1048	0,2580	4,1892	109,0881	0,2578	4,1671	110,1268	0,2584	4,1853	0,1288	2025-03-31	09:00	
After (3)	61,1048	0,2580	4,1892	109,0881	0,2577	4,1671	110,1268	0,2585	4,1853	0,1288	2025-04-07	13:00	
After (4)													
After (5)													
After (6)	61,1048	0,2580	4,1892	109,0881	0,2577	4,1671	110,1268	0,2585	4,1853	0,1288	2025-04-07	13:00	2025-03-26 13:30
Difference	0,0001	0,0009	0,0004	0,0001	0,0010	0,0006	0,0001	0,0009	0,0006	0,0001			
Total (mg)		1,4			1,7			1,6		0,1			
Total ajusté (mg)		1,30			1,60			1,50					

Project nu.	PI 20329
Date	29-03-2025
Technicien	M.M

Manufacturer: MORSO
Model: 2B

Run: 3
Project #: PI 20329
Test Duration: 86 min

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

Overall Heating Efficiency: 73,62%
Combustion Efficiency: 98,03%
Heat Transfer Efficiency: 75,10%

	HHV	LHV
Eff	73,62%	79,58%
Comb Eff	98,03%	98,03%
HT Eff	75,10%	81,17%
Output	18 575	kg/h
Burn Rate	1,27	kg/h
Grams CO	57	g
Input	25 229	kg/h
MC wet	17,39	

Ultimate CO₂
CO_{2-ult} 19,64
F₀
1,061

Heat Output:	17 620 Btu/h
Heat Input:	23 933 Btu/h
Burn Duration:	1,43 h
Burn Rate:	2,81 lb/h
Stack Temp:	402,1 Deg. F

Averages		0,41	8,14	1,76	20,38	12,03	205,33	20,93	0,95	0,72	0,69
INPUT DATA				Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO ₂ [d]	Excess Air EA	Total O ₂	Calc. % O ₂ [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Net Eff %
0,00	2,21	0,12	3,01	528,1%	20,73	17,66	179,1	20,6	98,5%	56,8%	56,0%
1,00	2,08	0,28	11,95	60,6%	20,13	8,04	213,4	20,7	98,2%	77,9%	76,6%
2,00	2,03	0,23	14,73	31,3%	19,95	5,10	246,5	20,8	98,8%	78,0%	77,1%
3,00	1,98	0,16	14,95	30,0%	19,94	4,92	258,6	20,7	99,2%	77,6%	76,9%
4,00	1,89	0,14	14,85	31,1%	19,95	5,04	267,7	20,8	99,3%	77,0%	76,5%
5,00	1,80	0,17	15,03	29,3%	19,94	4,83	271,4	20,8	99,2%	76,9%	76,3%
6,00	1,76	0,14	14,49	34,3%	19,97	5,42	271,6	20,8	99,3%	76,6%	76,0%
7,00	1,71	0,14	14,35	35,5%	19,98	5,56	274,7	20,8	99,3%	76,3%	75,7%
8,00	1,62	0,17	14,50	33,9%	19,97	5,39	275,4	21,0	99,1%	76,4%	75,7%
9,00	1,53	0,15	14,14	37,5%	20,00	5,79	275,0	20,9	99,2%	76,1%	75,5%
10,00	1,49	0,14	13,94	39,6%	20,01	6,00	274,9	21,0	99,3%	76,0%	75,4%
11,00	1,44	0,12	13,39	45,3%	20,05	6,59	272,9	20,9	99,4%	75,6%	75,1%
12,00	1,39	0,13	13,33	46,0%	20,05	6,66	272,1	20,9	99,3%	75,6%	75,1%
13,00	1,34	0,12	13,05	49,1%	20,07	6,96	270,7	20,9	99,4%	75,5%	75,0%
14,00	1,26	0,12	12,80	52,0%	20,09	7,22	269,2	20,9	99,4%	75,3%	74,8%
15,00	1,21	0,12	12,44	56,5%	20,11	7,62	267,1	20,9	99,4%	75,1%	74,7%
16,00	1,12	0,12	12,36	57,5%	20,12	7,70	265,7	20,9	99,4%	75,1%	74,7%
17,00	1,12	0,12	12,60	54,4%	20,10	7,44	265,7	20,9	99,4%	75,4%	74,9%
18,00	1,03	0,12	12,72	53,0%	20,09	7,31	264,5	20,9	99,4%	75,5%	75,1%
19,00	0,99	0,12	12,57	54,9%	20,10	7,48	262,8	21,0	99,4%	75,5%	75,1%
20,00	0,94	0,10	12,60	54,6%	20,10	7,45	262,0	21,0	99,5%	75,6%	75,2%
21,00	0,90	0,10	12,43	56,8%	20,11	7,64	261,2	21,0	99,5%	75,5%	75,1%
22,00	0,85	0,10	12,59	54,8%	20,10	7,46	260,3	21,0	99,5%	75,7%	75,3%
23,00	0,80	0,10	12,67	53,9%	20,10	7,38	259,4	21,0	99,5%	75,8%	75,5%
24,00	0,76	0,09	12,80	52,4%	20,09	7,24	259,3	21,0	99,6%	75,9%	75,6%
25,00	0,67	0,10	13,13	48,5%	20,07	6,89	259,5	21,0	99,5%	76,2%	75,8%
26,00	0,67	0,10	13,48	44,7%	20,04	6,52	259,3	21,1	99,5%	76,5%	76,1%
27,00	0,58	0,10	13,57	43,7%	20,04	6,42	259,3	21,0	99,5%	76,6%	76,2%
28,00	0,53	0,12	13,67	42,4%	20,03	6,29	258,8	21,0	99,4%	76,7%	76,2%
29,00	0,51	0,13	13,89	40,1%	20,01	6,06	258,2	21,2	99,3%	76,9%	76,4%
30,00	0,49	0,12	13,36	45,7%	20,05	6,63	256,5	21,1	99,4%	76,6%	76,1%
31,00	0,41	0,10	11,96	62,9%	20,14	8,13	252,2	21,2	99,5%	75,6%	75,2%
32,00	0,40	0,08	10,84	79,9%	20,22	9,34	248,4	21,1	99,7%	74,7%	74,4%
33,00	0,40	0,04	10,01	95,4%	20,28	10,25	243,3	21,2	99,9%	74,0%	74,0%
34,00	0,35	0,03	8,81	122,3%	20,36	11,54	237,1	21,2	100,1%	72,7%	72,7%
35,00	0,35	0,03	7,57	158,4%	20,44	12,85	230,2	21,2	100,2%	70,9%	71,1%
36,00	0,35	0,04	6,64	194,2%	20,50	13,84	223,1	21,2	100,1%	69,3%	69,4%
37,00	0,30	0,05	6,26	211,3%	20,52	14,24	217,3	21,2	100,0%	68,8%	68,8%
38,00	0,30	0,07	6,06	220,4%	20,54	14,44	212,3	21,2	99,7%	68,8%	68,6%
39,00	0,30	0,09	5,93	226,1%	20,54	14,57	208,1	21,1	99,4%	68,8%	68,4%
40,00	0,29	0,13	5,83	229,5%	20,55	14,65	203,9	21,1	98,9%	69,0%	68,2%
41,00	0,30	0,17	5,73	232,9%	20,55	14,73	200,1	21,0	98,3%	69,1%	67,9%
42,00	0,26	0,20	5,72	231,9%	20,55	14,73	196,8	21,1	97,9%	69,4%	68,0%
43,00	0,26	0,23	5,68	232,6%	20,55	14,76	194,0	21,0	97,4%	69,6%	67,8%
44,00	0,26	0,26	5,61	234,7%	20,55	14,81	191,6	21,0	97,0%	69,7%	67,6%
45,00	0,26	0,27	5,60	234,3%	20,55	14,81	189,0	21,0	96,8%	70,0%	67,7%
46,00	0,26	0,30	5,47	240,6%	20,56	14,94	186,5	21,0	96,4%	69,8%	67,3%
47,00	0,26	0,35	5,29	248,5%	20,57	15,11	183,8	21,0	95,5%	69,5%	66,4%
48,00	0,22	0,38	5,22	250,4%	20,57	15,16	181,1	20,9	95,0%	69,6%	66,1%
49,00	0,22	0,41	5,12	254,9%	20,57	15,25	179,5	21,0	94,5%	69,5%	65,7%
50,00	0,22	0,45	5,07	255,8%	20,58	15,28	177,2	20,9	93,9%	69,6%	65,4%
51,00	0,22	0,48	5,04	256,0%	20,58	15,30	175,5	21,0	93,5%	69,7%	65,2%
52,00	0,22	0,51	5,04	254,3%	20,57	15,28	173,7	21,0	93,1%	69,9%	65,1%
53,00	0,22	0,54	5,09	249,3%	20,57	15,21	172,3	20,9	92,8%	70,2%	65,2%
54,00	0,22	0,56	5,06	249,9%	20,57	15,23	170,6	20,9	92,4%	70,3%	65,0%
55,00	0,21	0,56	5,07	248,7%	20,57	15,22	169,7	20,8	92,4%	70,5%	65,1%
56,00	0,17	0,59	5,07	246,9%	20,57	15,20	168,4	20,8	92,0%	70,6%	65,0%
57,00	0,17	0,58	5,15	242,3%	20,56	15,11	167,3	20,8	92,2%	71,1%	65,5%
58,00	0,17	0,58	5,09	246,3%	20,57	15,18	166,3	20,9	92,1%	71,0%	65,4%
59,00	0,17	0,62	5,04	247,2%	20,57	15,22	165,6	20,8	91,6%	70,9%	64,9%
60,00	0,17	0,65	5,02	246,5%	20,57	15,22	164,4	20,9	91,2%	71,0%	64,7%
61,00	0,17	0,67	5,01	246,2%	20,57	15,23	163,5	20,8	90,9%	71,0%	64,6%
62,00	0,12	0,70	4,99	245,2%	20,56	15,22	162,4	20,9	90,4%	71,1%	64,3%
63,00	0,12	0,71	4,99	244,5%	20,56	15,22	161,6	20,9	90,3%	71,2%	64,3%
64,00	0,12	0,74	4,97	243,9%	20,56	15,22	160,7	20,8	89,9%	71,2%	64,1%
65,00	0,12	0,76	4,87	248,8%	20,57	15,32	160,0	20,8	89,5%	71,0%	63,6%
66,00	0,12	0,77	4,87	248,2%	20,57	15,31	158,8	20,9	89,4%	71,2%	63,6%
67,00	0,12	0,76	4,79	253,9%	20,57	15,40	157,1	20,8	89,4%	71,1%	63,6%
68,00	0,12	0,74	4,47	276,9%	20,60	15,76	155,7	20,9	89,0%	70,1%	62,4%
69,00	0,12	0,78	4,47	274,1%	20,59	15,73	154,5	20,8	88,4%	70,3%	62,2%
70,00	0,08	0,81	4,53	267,6%	20,59	15,65	153,6	20,9	88,2%	70,7%	62,3%
71,00	0,08	0,84	4,47	270,0%	20,59	15,70	152,9	20,8	87,7%	70,5%	61,8%
72,00	0,08	0,86	4,31	279,6%	20,60	15,85	151,3	20,8	87,0%	70,1%	61,0%
73,00	0,08	0,88	4,29	280,2%	20,60	15,87	150,7	20,8	86,7%	70,1%	60,7%
74,00	0,08	0,90	4,29	278,2%	20,60	15,85	150,1	20,8	86,4%	70,2%	60,7%
75,00	0,08	0,89	4,35	274,7%	20,59	15,80	149,0	20,8	86,6%	70,6%	61,1%
76,00	0,08	0,89	4,36	273,6%	20,59	15,78	148,4	20,9	86,7%	70,7%	61,3%
77,00	0,03	0,91	4,36	272,5%	20,59	15,77	147,7	20,9	86,4%	70,8%	61,2%
78,00	0,03	0,92	4,36	272,2%	20,59	15,77	147,3	20,8	86,3%	70,8%	61,2%
79,00	0,03	0,93	4,39	269,5%	20,59	15,74	146,8	20,8	86,3%	71,0%	61,3%
80,00	0,03	0,94	4,43	266,0%	20,59	15,69	146,2	20,8	86,3%	71,3%	61,5%
81,00	0,03	0,94	4,46	264,1%	20,58	15,66	145,7	20,8	86,4%	71,4%	61,7%
82,00	0,03	0,94	4,48	262,6%	20,58	15,63	145,0	20,7	86,4%	71,6%	61,9%
83,00	0,03	0,94	4,50	261,5%	20,58	15,62	144,0	20,8	86,4%	71,8%	62,1%
84,00	0,03	0,95	4,41	266,7%	20,59	15,70	143,8	20,8	86,1%	71,5%	61,6%
85,00	0,03	0,98	4,35	268,3%	20,59	15,75	142,5	20,8	85,5%	71,5%	61,1%
86,00	0,00	1,00	4,32	269,2%	20,59	15,77	142,2	20,8	85,2%	71,4%	60,9%

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 2,07 g/hr

Test Duration: 86 min

Burn Rate : 1,27 Dry kg/hr

PRESSURE FACTOR: DGM 1st hr 0,966
 DGM 1 0,951
 DGM 2 0,958
 DGM 3 0,992

BAROMETRIC PRESSURE

Average: 29,67763883 in Hg
 Start: 29,67763883 in Hg
 End: 29,67763883 in Hg

TEMPERATURE FACTORS DGM 1st hr 0,991
 DGM 1 0,995
 DGM 2 0,988
 DGM 3 0,997

DGM VALUES

DGM 1st hr Final: 1191,480 Cuft
 Initial: 1179,600 Cuft

VOLUMES SAMPLED DGM 1st hr 11,379 SCft
 DGM 1 15,627 SCft
 DGM 2 15,799 SCft
 DGM 3 15,452 SCft

DGM 1 Final: 4580,627 Cuft
 Initial: 4563,874 Cuft

DGM 2 Final: 31275,766 Cuft
 Initial: 31259,238 Cuft

TOTAL TUNNEL VOLUME : 30043

DGM #3 Final: 22261,896 Cuft
 Initial: 22246,079 Cuft

SAMPLE RATIOS

Sample Train 1st Hr: 1842,0
 Sample Train 1: 1922,5
 Sample Train 2: 1901,6

TEMPERATURES

DGM 1st hr 532,731 °R
 DGM 1 530,621 °R
 DGM 2 534,347 °R

Particulate concentration

Sample Train 1st Hr **0,000123** g/dscf
 Sample Train 1 **0,000109** g/dscf
 Sample Train 2 **0,000101** g/dscf
 Room **0,000006** g/dscf

CALIBRATION FACTORS

DGM 1st hr 1,0000
 DGM 1 0,9860
 DGM 2 1,0100
 DGM #3 0,9880

TOTAL EMISSIONS

Sample Train 1st Hr **2,44** g
 Sample Train 1 **3,07** g
 Sample Train 2 **2,85** g

TUNNEL FLOW RATE: 349,3 Dscfm

PARTICULATE CATCH

Total Sample Train 1: 1,70 mg
 Total Sample Train 2: 1,60 mg
 Total Sample Train 1 1st hour: 1,40 mg

EMISSION RATES

Sample Train 1st Hr **2,44** g/hr
 Sample Train 1 **2,14** g/hr
 Sample Train 2 **1,99** g/hr

DEVIATION: 3,81%

Cs Train 1 Train 2 Train 1st Hr
 0,0001088 0,00010128 0,000123

* Time	Elapsed Time min	Raw data row	* Weight Remaining		* CO %	* CO ₂ %	*1 Flue Gas %	*2 Room Temp	*3 Unit Dry Bulb	*4 Unit Top	*5 Unit Back	*6 Unit R.Side	*7 Unit L.Side	*8 Unit Bottom	Mass flow Reading 1st hour	DGM 1st hour Inlet T	DGM 1st hour Outlet T	Filter 1st hour Temp	DGM 1 Reading	DGM 1 Inlet T	DGM 1 Outlet T	Filter 1 Temp	Mass flow 2 Reading	DGM 2 Inlet T	DGM 2 Outlet T	Filter 2 Temp	Tunnel Velocity Pressure in wc	Flue draft Pressure in wc	Filter 1st hr in Hg	Filter 1 in Hg	Filter 2 in Hg	Change in Surface Temp.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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Time acquisition minutes	Flue	Room	scale	Right	Back	bottom	Top	Left
	temp	temp						
	°F	°F	lbs	°F	°F	°F	°F	°F
1	67,38	67,36	2,47	67,64	67,56	67,65	67,73	67,77
2	100,68	67,38	2,47	68,22	67,61	67,67	71,72	69,17
3	142,05	67,40	2,37	69,01	67,63	67,67	91,25	70,51
4	265,47	67,31	2,27	69,12	67,74	67,69	155,93	69,63
5	327,54	67,26	2,07	70,18	67,98	67,78	217,83	69,68
6	342,83	67,20	1,97	72,63	68,43	68,00	265,07	70,54
7	366,95	67,32	1,87	76,45	69,09	68,24	306,58	72,27
8	374,07	67,38	1,77	81,46	69,96	68,64	340,10	74,96
9	367,91	67,42	1,67	87,18	71,15	69,20	358,93	78,48
10	365,32	67,36	1,67	93,03	72,57	69,98	373,52	82,39
11	371,93	67,45	1,57	98,82	74,25	71,00	387,19	87,01
12	381,95	67,54	1,47	104,71	76,16	72,25	404,04	92,25
13	390,81	67,58	1,37	110,53	78,30	73,85	422,41	98,10
14	398,26	67,61	1,27	116,40	80,71	75,74	442,30	104,88
15	409,16	67,69	1,17	122,10	83,35	78,00	464,09	111,45
16	425,58	67,74	1,07	128,10	86,27	80,63	489,11	118,16
17	443,90	67,75	1,94	134,14	89,58	83,71	519,73	126,13
18	383,23	67,76	6,79	143,42	94,00	87,67	500,00	136,10
19	357,58	67,85	6,77	150,06	99,04	91,79	485,29	144,74
20	356,26	67,85	6,77	156,50	104,02	96,40	474,39	154,05
21	356,68	67,84	6,67	160,97	108,61	101,32	468,10	162,57
22	366,83	67,76	6,57	165,89	112,73	106,35	468,13	170,72
23	340,00	67,77	6,57	172,35	116,33	111,49	459,52	178,20
24	316,09	67,87	6,57	178,27	119,46	116,56	445,20	184,83
25	301,07	67,85	6,47	183,38	122,19	121,51	430,56	190,78
26	302,76	67,81	6,47	187,43	124,46	126,24	419,44	195,88
27	297,45	67,77	6,37	190,82	126,37	130,76	410,44	200,42
28	282,92	67,71	6,37	193,21	128,14	135,12	399,10	204,16
29	270,80	67,86	6,37	195,51	129,83	139,34	388,01	207,92
30	275,92	67,91	6,28	197,26	131,28	143,46	380,01	211,09
31	307,34	67,83	6,27	198,66	132,56	147,53	385,00	213,80
32	330,41	67,84	6,18	199,45	133,83	151,55	394,23	215,87
33	344,18	67,84	6,07	200,32	135,10	155,64	403,54	217,82
34	358,48	67,82	5,97	200,78	136,19	159,94	415,21	219,43
35	372,41	67,88	5,97	201,53	137,36	164,52	427,52	221,34
36	382,63	67,93	5,77	202,06	138,43	169,40	441,80	222,94
37	383,63	67,85	5,77	202,71	139,63	174,56	451,36	224,69
38	395,80	67,90	5,67	203,66	140,70	179,93	462,42	226,58
39	408,92	67,85	5,57	204,87	141,87	185,45	479,77	228,63
40	413,06	67,91	5,48	206,59	143,18	191,09	493,41	231,17
41	421,64	67,91	5,37	208,47	144,63	196,72	508,94	233,90
42	429,49	67,81	5,27	210,66	146,09	202,38	523,89	236,78
43	440,90	67,73	5,07	213,17	147,78	208,07	541,13	240,17
44	449,05	67,92	4,97	215,80	149,61	213,77	557,49	243,82
45	452,20	68,08	4,87	219,03	151,47	219,38	570,48	247,45
46	454,22	68,01	4,77	222,44	153,64	225,01	581,69	251,18
47	458,86	68,00	4,67	226,39	155,85	230,65	593,40	255,26
48	462,52	67,98	4,57	230,85	158,05	236,25	603,53	259,67
49	466,54	68,04	4,47	235,57	160,39	241,95	612,54	263,94
50	475,65	68,15	4,27	240,64	162,66	247,71	628,09	268,45
51	477,96	68,25	4,17	246,22	165,25	253,43	639,21	272,77
52	485,18	68,33	4,07	251,74	168,10	259,10	653,84	277,12
53	491,71	68,40	3,87	257,43	171,52	264,29	671,02	281,69
54	498,09	68,38	3,77	263,37	175,35	269,46	688,04	286,27
55	500,89	68,36	3,67	269,12	179,56	275,11	701,76	290,94
56	502,45	68,43	3,47	275,10	184,24	280,90	712,40	295,75
57	502,30	68,27	3,37	281,07	189,17	286,63	719,45	300,08
58	499,50	68,56	3,27	286,88	194,48	292,54	723,59	305,57
59	495,15	68,44	3,17	292,43	200,17	298,61	724,80	310,86
60	490,59	68,30	3,07	298,16	205,98	304,68	723,83	315,88
61	487,40	68,39	2,97	303,83	212,15	310,72	721,14	321,27
62	483,44	68,58	2,87	309,15	218,37	316,62	715,41	326,39
63	480,26	68,61	2,77	314,74	224,94	322,54	711,09	331,64
64	478,03	68,60	2,67	319,93	231,49	328,38	707,40	336,40
65	475,62	68,76	2,57	324,92	238,17	334,09	701,51	341,15
66	470,74	68,74	2,47	329,49	244,69	339,68	697,06	345,37
67	467,23	68,80	2,47	334,57	251,52	345,26	689,99	349,76
68	465,72	68,80	2,33	338,73	258,62	350,70	685,23	354,00

69	462,78	68,89	2,27	343,37	265,57	356,05	680,43	357,94
70	458,97	68,72	2,17	347,15	272,72	361,10	674,51	361,60
71	457,21	68,62	2,07	350,91	279,95	366,27	671,26	364,79
72	458,66	65,74	2,02	352,25	286,60	371,00	668,58	365,04
73	461,55	64,35	1,97	356,24	294,00	375,73	669,64	369,54
74	462,47	64,58	1,87	360,30	301,49	380,68	672,84	373,66
75	460,46	65,20	1,77	363,68	309,17	386,00	674,41	377,00
76	456,82	65,79	1,67	367,60	316,79	391,12	673,00	380,54
77	451,15	66,36	1,63	371,34	323,77	396,19	669,68	383,58
78	446,40	66,80	1,47	375,24	330,57	401,23	663,68	386,84
79	444,58	67,21	1,47	379,23	337,08	406,25	660,00	389,96
80	446,11	67,67	1,47	383,41	343,64	411,10	659,46	392,64
81	443,60	68,01	1,28	387,82	350,25	416,20	657,99	395,84
82	436,77	68,38	1,27	391,52	356,94	421,53	654,63	398,37
83	430,23	68,62	1,27	396,28	363,98	426,91	649,90	401,05
84	423,51	68,82	1,27	400,82	371,37	432,21	641,95	403,63
85	416,90	68,91	1,17	404,84	378,17	437,46	633,96	405,34
86	411,49	69,00	1,17	409,31	385,57	442,68	623,89	407,16
87	406,12	69,10	1,07	412,38	392,89	448,05	615,34	408,82



Date: 2025-03-30 Manufacturer: M or so Model: 2B
Project #: PI 20329 Run: 41 Tech: M.H Reviewer: V

- kindling 2.5 LBS STAND FIRE
- At 2.4 LBS close DOOR
- At 100 LBS insert preload
- close DOOR immediately
- At 100 LBS insert Load
- close DOOR immediately

TEST LOAD CONFIGURATION

Date: 2025-03-26

Manufacturer: Morso

PRE / POST CHECKS

Model: JB

Project #: PI 20329

Run: 4

Tech: MM

Reviewer: SP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM 334	7:15	ok	ok

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check (tunnel velocity)

Picture.....

0 (max50 Fpm)	0 (max50 Fpm)
0	NA
4 sides 0 1/2	0 1/2

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O)

Traverse before ignition.....

2025-03-27
2025-03-27
ok
ok

Temperature System:

Ambient (65°-90°F)

ok	°F
----	----

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

Pictures for report.....

ok	
ok	
ok	
Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok
	ok

Load Length 5/6 of firebox Length +/- 1 inch.....

Date: 25-03-30

Project #: PI 20319

Leakage Checks Tunnel Samplers

Manufacturer: Mors

Run: 4

Tech: M.M

Model: 2B

Reviewer: R

	Train 1		Train 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-7	-7	-7	-7
Final 1 minute DGM (Liter)	129710 25	130145 51	885633 20	886064 32
Initial 1 minute DGM (Liter)	129710 25	130145 51	885633 20	886064 32
Change (Liter)	φ	φ	002	φ
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	0/L	0/L	0/L	0/L



Date: 2025-03-30

Project #: 01 10329

Manufacturer: Morse

Run: 4

Tech: M, N

Model: 2B

Reviewer: D

Leakage Checks Tunnel Samplers

	System 1 st hour		Ambient	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm				
Vacuum (inches Hg.)	-7	-7	-7	-7
Final 1 minute DGM (Liter)	1191 68	1203 67	630387 38	630798 00
Initial 1 minute DGM (Liter)	1191 68	1203 67	630387 38	630798 00
Change (Liter)	0	0	0	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2025-03-30

Manufacturer: Morse

Model: 2B

Project #: 0120329

Run: 4

Tech: MJM

Reviewer: JS

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotameter Reading (mml/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

Leakage Checks Pitot

Plugged Probe	Pre-Test 3 H2O static	Pre-Test 0.4-0.5 H2O velocity	Post Test 3 H2O Static	Post Test 0.4-0.5 H2O velocity
Vacuum (inches Hg.)	3	0.4	3	0.5
Check OK (no change after 15 sec.)	OK	OK	OK	OK



Date: 2025-03-30
Project #: PJ 20325

Manufacturer: Morsco
Run: 4
Tech: M.H

Model: 2B
Reviewer: [Signature]

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	1000 Kg, Class F	1000 Kg
Wood	EM-090	440 lbs, Class F	440 lbs
Analytical	EM-335	100,000mg, Class S	100.0 mg
Analytical	EM-125	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg
PLATFORM SCALE: 20%-80% of ideal test load weight, ± 0.1 lbs or 1%
WOOD SCALE: 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 02-03-30

 Manufacturer: Mor So

 Model: 2B

 Project #: PI 20329

 Run: 4

 Tech: M.H

 Reviewer: DP

FOR TUNNELS < 12 in

 Barometric pressure (P_{bar}) _____ (KPa.)

 Static pressure (P_q) _____ (inches w.c.)

Inside diameter: Port A _____ Port B _____

 Tunnel cross sectional area: .1963Ft²

Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δp (inches H ₂ O)	Tunnel Temperature (°F)
Tunnel diameter	6 po	7 po	8 po		
A - Centroid	3.00	3.50	4	0.076	72.81
B - Centroid	3.00	3.50	4	0.076	72.64
A-1	0.40 0.50	0.50	0.50	0.062	72.81
A-2	1.50	1.75	2	0.078	72.86
A-3	4.50	5.25	6	0.073	72.86
A-4	5.60 5.50	6.5	7.5	0.061	72.72
B-1	0.40 0.50	0.50	0.50	0.061	72.64
B-2	1.50	1.75	2	0.074	72.60
B-3	4.50	5.25	6	0.076	72.60
B-4	5.60 5.50	6.5	7.5	0.062	72.51
AVERAGE					

Date: _____ Manufacturer: _____ Model: _____
 Project #: _____ Run: _____ Tech: _____ Reviewer: _____

FOR TUNNELS 12 in

Barometric pressure (P_{bar}) _____ (KPa.) Static pressure (P_q) _____ (inches w.c.)
 Pitot tube type: Standard

Traverse Point	Position (inches)	Velocity Head Δp (inches H_2O)	Tunnel Temperature ($^{\circ}F$)
A Center	6		
B Center	6		
A-1	0.53		
A-2	1.75		
A-3	3.55		
A-4	8.45		
A-5	10.25		
A-6	11.47		
B-1	0.53		
B-2	1.75		
B-3	3.55		
B-4	8.45		
B-5	10.25		
B-6	11.47		

CONTINUOUS ANALYZERS

Date: 2025-03-30

Manufacturer: Morse

Model: 2B

Project #: PI 2029

Run: 4

Tech: MJ

Reviewer: SP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3021	3000	1021	1000
Tolerance CO	0	+/- 0.02	0021	+/- 0.15	0021	+/- 0.05
CO ₂	0	0	1804	1800	972	1000
Tolerance CO ₂	0	+/- 0.02	004	+/- 0.5	018	+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	3015	1015	0	0.02	0.06	0.15	0.06	0.05	✓	
CO ₂	0	1801	978	0	0.02	0.03	0.5	0.06	0.5	✓	



TEST DATA LOG

Date: 2025-03-30 Manufacturer: M or S Model: 2B
Project #: PI 20329 Run: 4 Tech: MJM Reviewer: SP

RAW DRY GAS METER READINGS

		System 1 st hour	System 1	System 2	Blank
Test	Final (Liter)	120362	130145.68	88583440	63079760
	Initial (Liter)	119178	129711.29	88563432	63038865

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	1011	1012
Dry Bulb (F):	70.3	74.5
Humidity (%):	23.9	22.0



Date: 2025-03-30 Manufacturer: Mor So Model: 2B
 Project #: PL 20329 Run: 4 Tech: JK Reviewer: DP

FUEL DATA

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size			Weight		Meter Moisture Content (% dry) *				
1.50	x 3.50	x 15.5 in.	1954	lbs.	206	209	211	202	204
1.50	x 3.50	x 15.5 in.	1774	lbs.	199	203	206	202	198
	x	x in.		lbs.					
1.50	x 3.50	x 6 in.	0680	lbs.	191	198	202	205	206
1.50	x 3.50	x 6 in.	0564	lbs.	194	193	201	198	199
1.50	x 3.50	x 6 in.	0686	lbs.	207	212	213	205	203
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					
	x	x in.		lbs.					

TEST LOAD WEIGHT: 5656 lbs

Wood Temperature: 21°C



Date: 2015-03-30

Manufacturer: Mor So

FUEL DATA

Model: LB

Project #: 01 60 329

Run: 6.4

Tech: M-J

Reviewer:

FUEL DESCRIPTION:

Type of wood:

TEST LOAD

[illegible]

TEST LOAD WEIGHT: 488 lbs Min 20%: Max 25%:

Wood Temperature: 21°C

Date: 2025-03-29

Project #: PI 20329

Manufacturer: Morso

Run: 4

Tech: MN

Reviewer: SO

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Model: 2B

TEST FILTERS						
SYSTEM 1 st hour				SYSTEM 1		
Pre-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Probe & Housing Number	Front & Back Filter Number	gaskets
Date	Time					
2025-03-29	17:00	002	20-21	11	003	22-23
		610959	02580	42221	614514	02559
2025-03-30	9:00	610958	02579	42220	614513	02558
						50
						49741
						49742

TEST FILTERS						
SYSTEM 1 st hour				SYSTEM 1		
Post-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Probe & Housing Number	Front & Back Filter Number	gaskets
Date	Time					
2025-03-30	13:00	002	20-21	11	003	22-23
		610960	02584	42230	614514	02558
2025-04-06	9:00	610959	02586	42226	614513	02558
2025-04-07	13:00	610959	02586	42225	614513	02558
						50
						49757
						49754
						49754

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2025-03-29 Manufacturer: Moro Model: 25
 Project #: PT 20329 Run: 4 Tech: M Reviewer: JP

TEST FILTERS						
SYSTEM 2						
Pre-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	
Date	Time					
2025-03-29	17:00	951443	02565	50288	01298	
2025-03-30	9:00	951444	02564	50287	01297	
TEST FILTERS						
SYSTEM 2						
Post-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time					
2025-03-30	13:00	951448	02568	50297	01298	2025-03-27 12:45
2025-04-06	9:00	951445	02567	50296	01298	
2025-04-07	13:00	951445	02567	50296	01298	

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage: MOR

Description du test

Test standard	EPA
Run #	4
Date	30-03-2025
Technicien	M.M
Project #	PI 20329

Description de l'unité

Manufacturier	MORSO	
Modèle	2B	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	0,688	cu ft.
Appliance weight empty	n.a	lbs
Appliance weight full	n.a	lbs

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	n.a	BTU/h Donnée fournie par le manfacturier
Targeted category	4	
Targeted output	n.a	BTU/h
Cp steel	n.a	BTU/lb-°F

Échantillonnage

targeted Blank sampling rate	0,18	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,986	
Equipment number (DGM #1):	EM 178	Dimensionless
Calibration Factor (DGM #2):	1,010	
Equipment number (DGM #2):	EM 318	Dimensionless
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	EM 179	Dimensionless
Calibration Factor (DGM 1st Hr):	1,000	
Equipment number (DGM 1st Hr):	EM 130	Dimensionless

Tunnel

Targeted tunnel flow rate	400	scfm
Tunnel diameter	8	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20329
Date 30-03-2025
Technicien M.M

Fuel data

Fuel type	Dimension
Fuel specie	D. Fir
HHV	19810,0 kJ/kg
%C	48,7
%H	6,9
%O	43,9
%Ash	0,5
HHV	8519,2 Btu/lb
LHV	7451,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

	Start	End
Barometer (kPa):	101,1	101,2
Barometer (in.Hg):	29,854819	29,88434875
Dry Bulb (F):	70,3	74,5
Humidity (%):	23,9	22
Air velocity (ft/min)	0	0

DGM #1st hour	Final:	1203,620	cuft
	Initial:	1191,780	cuft

	Final:	1203,620	cuft
	Initial:	1191,780	cuft

DGM #1	Final:	4596,030	cuft
	Initial:	4580,711	cuft

	Final:	130145,080	Liter
	Initial:	129711,290	Liter

DGM #2	Final:	31291,034	cuft
	Initial:	31275,882	cuft

	Final:	886063,400	Liter
	Initial:	885634,320	Liter

DGM room	Final:	22276,407	cuft
	Initial:	22261,966	cuft

	Final:	630797,600	Liter
	Initial:	630388,650	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

167

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	PI 20329
Date	30-03-2025
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,17 in. H2O (absolute value)
 Barometer: 29,900 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

PITOT CONSTANT=
0,958

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,076	72,81	0,2757
B center	0,076	72,64	0,2757
A1	0,062	72,81	0,2490
A2	0,078	72,86	0,2793
A3	0,073	72,86	0,2702
A4	0,061	72,72	0,2470
B1	0,061	72,6	0,2470
B2	0,074	72,6	0,2720
B3	0,076	72,6	0,2757
B4	0,062	72,5	0,2490
AVERAGE	0,0699	72,7050	0,2641

Project nu.	PI 20329
Date	30-03-2025
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date	Heure	Test end date & time
	probe	front/ Back	gasket	probe	front/ Back	gasket	probe	front/ Back	gasket	Filter			
Number	002	20-21	11	003	22-23	50	13	24,25	61	26			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	61,0959	0,2580	4,2221	61,4514	0,2559	4,9741	95,1443	0,2565	5,0288	0,1298	2025-03-29	17:00	
Before (6)	61,0958	0,2579	4,2220	61,4513	0,2558	4,9742	95,1444	0,2564	5,0287	0,1297	2025-03-30	09:00	
After (1)	61,0960	0,2584	4,2230	61,4514	0,2558	4,9757	95,1448	0,2568	5,0297	0,1298	2025-03-30	13:00	
After (2)	61,0959	0,2586	4,2226	61,4513	0,2558	4,9754	95,1445	0,2567	5,0296	0,1298	2025-04-06	09:00	
After (3)	61,0959	0,2586	4,2225	61,4513	0,2558	4,9754	95,1445	0,2567	5,0296	0,1298	2025-04-07	13:00	
After (4)													
After (5)													
After (6)	61,0959	0,2586	4,2225	61,4513	0,2558	4,9754	95,1445	0,2567	5,0296	0,1298	2025-04-07	13:00	2025-03-27 12:45
Difference	0,0001	0,0007	0,0005	0,0000	0,0000	0,0012	0,0001	0,0003	0,0009	0,0001			
Total (mg)		1,3			1,2			1,3		0,1			
Total ajusté (mg)		1,20			1,10			1,20					

Project nu.	PI 20329
Date	30-03-2025
Technicien	M.M

Manufacturer: MORSO
Model: 2B

Run: 4
Project #: PI 20329
Test Duration: 77 min

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

Overall Heating Efficiency: 72,82%
Combustion Efficiency: 98,14%
Heat Transfer Efficiency: 74,20%

	HHV	LHV
Eff	72,82%	78,71%
Comb Eff	98,14%	98,14%
HT Eff	74,20%	80,20%
Output	20 576	kJ/h
Burn Rate	1,43	kg/h
Grams CO	54	g
Input	28 255	kJ/h
MC wet	17,30	

Ultimate CO₂
CO_{2-ult} 19,64
F₀
1,062

Heat Output:	19 519 Btu/h
Heat Input:	26 803 Btu/h
Burn Duration:	1,28 h
Burn Rate:	3,14 lb/h
Stack Temp:	439,0 Deg. F

	Averages		0,40	8,47	1,70	20,35	11,69	225,90	21,50	0,95	0,71	0,67
INPUT DATA												
Elapsed Time	Weight	%	%	Excess	Oxygen Calculation		Input Data		Combust	Heat	Net	
	Remaining (kg)	CO [e]	CO ₂ [d]	Air EA	Total	Calc. %	Flue	Room	Eff	Transfer	Eff	
					O ₂	O ₂ [g]	Gas (°C)	Temp (°C)	%	%	%	
0,00	2,21	0,10	4,09	368,8%	20,66	16,52	211,2	20,8	99,2%	59,9%	59,4%	
1,00	2,08	0,19	11,52	67,8%	20,17	8,56	257,2	20,9	98,9%	74,8%	73,9%	
2,00	2,03	0,22	15,26	26,9%	19,92	4,55	278,2	20,7	98,9%	76,7%	75,9%	
3,00	1,94	0,19	15,08	28,7%	19,93	4,76	285,0	20,9	99,1%	76,3%	75,6%	
4,00	1,89	0,15	14,88	30,7%	19,95	5,00	290,1	20,9	99,3%	75,9%	75,3%	
5,00	1,80	0,16	14,90	30,5%	19,95	4,97	292,9	20,9	99,2%	75,7%	75,1%	
6,00	1,76	0,18	15,13	28,3%	19,93	4,71	295,5	20,8	99,1%	75,7%	75,1%	
7,00	1,67	0,23	15,49	25,0%	19,90	4,30	298,7	20,9	98,8%	75,8%	75,0%	
8,00	1,58	0,22	15,12	28,0%	19,93	4,69	298,4	20,9	98,9%	75,6%	74,7%	
9,00	1,48	0,19	14,38	34,8%	19,98	5,50	296,8	20,9	99,0%	75,1%	74,4%	
10,00	1,45	0,17	14,15	37,1%	19,99	5,75	294,9	20,9	99,1%	75,0%	74,3%	
11,00	1,42	0,18	14,16	37,0%	19,99	5,75	293,9	20,9	99,1%	75,1%	74,4%	
12,00	1,34	0,17	13,97	38,9%	20,01	5,95	292,6	21,0	99,1%	75,0%	74,3%	
13,00	1,28	0,15	13,55	43,4%	20,04	6,41	290,8	21,0	99,2%	74,8%	74,2%	
14,00	1,21	0,15	13,18	47,4%	20,06	6,81	287,9	21,0	99,2%	74,6%	74,0%	
15,00	1,16	0,13	12,75	52,5%	20,09	7,28	285,9	21,0	99,3%	74,3%	73,8%	
16,00	1,09	0,12	12,61	54,3%	20,10	7,43	284,3	21,0	99,3%	74,3%	73,8%	
17,00	1,03	0,14	12,93	50,3%	20,08	7,08	283,1	21,0	99,3%	74,6%	74,1%	
18,00	0,98	0,14	12,77	52,2%	20,09	7,25	282,9	21,0	99,3%	74,5%	73,9%	
19,00	0,91	0,15	12,82	51,6%	20,08	7,20	281,5	21,1	99,2%	74,6%	74,0%	
20,00	0,87	0,15	12,73	52,5%	20,09	7,28	279,5	21,1	99,2%	74,7%	74,1%	
21,00	0,82	0,15	12,80	51,7%	20,08	7,21	279,3	21,2	99,2%	74,7%	74,1%	
22,00	0,75	0,14	12,70	53,0%	20,09	7,32	278,0	21,3	99,2%	74,7%	74,2%	
23,00	0,71	0,13	12,85	51,3%	20,08	7,17	277,5	21,3	99,3%	74,9%	74,4%	
24,00	0,66	0,13	13,02	49,3%	20,07	6,98	276,9	21,3	99,3%	75,1%	74,6%	
25,00	0,59	0,14	12,97	49,8%	20,07	7,04	276,6	21,3	99,2%	75,1%	74,5%	
26,00	0,55	0,13	12,76	52,4%	20,09	7,26	275,3	21,2	99,3%	74,9%	74,4%	
27,00	0,50	0,12	12,93	50,5%	20,08	7,09	274,4	21,4	99,4%	75,2%	74,7%	
28,00	0,46	0,11	12,98	50,0%	20,08	7,04	274,1	21,3	99,4%	75,2%	74,8%	
29,00	0,44	0,11	12,85	51,5%	20,08	7,17	272,3	21,3	99,4%	75,2%	74,8%	
30,00	0,39	0,11	12,13	60,6%	20,13	7,95	269,3	21,4	99,5%	74,7%	74,3%	
31,00	0,37	0,09	11,09	75,7%	20,20	9,07	263,9	21,4	99,5%	73,9%	73,6%	
32,00	0,34	0,08	10,12	92,6%	20,27	10,11	257,6	21,6	99,7%	73,1%	72,9%	
33,00	0,32	0,06	9,32	109,5%	20,32	10,97	252,6	21,8	99,8%	72,3%	72,2%	
34,00	0,31	0,05	8,91	119,2%	20,35	11,41	247,6	21,7	99,9%	72,1%	72,0%	
35,00	0,31	0,04	7,97	145,4%	20,41	12,43	241,2	21,7	100,1%	70,8%	70,9%	
36,00	0,30	0,04	6,92	182,5%	20,48	13,55	235,1	21,6	100,1%	68,9%	69,0%	
37,00	0,31	0,04	6,46	202,3%	20,51	14,03	229,7	21,8	100,1%	68,2%	68,2%	
38,00	0,26	0,06	6,13	217,7%	20,53	14,38	224,7	21,7	99,9%	67,7%	67,6%	
39,00	0,26	0,08	5,96	224,9%	20,54	14,54	219,9	21,8	99,5%	67,7%	67,4%	
40,00	0,26	0,12	5,86	228,4%	20,55	14,62	215,5	21,8	99,0%	67,9%	67,2%	
41,00	0,26	0,15	5,81	229,5%	20,55	14,66	212,0	21,7	98,6%	68,1%	67,2%	
42,00	0,25	0,17	5,85	226,4%	20,54	14,61	208,6	21,7	98,3%	68,6%	67,4%	
43,00	0,22	0,20	5,79	228,0%	20,54	14,66	205,5	21,7	97,9%	68,7%	67,3%	
44,00	0,22	0,22	5,74	229,6%	20,55	14,70	203,0	21,6	97,6%	68,8%	67,2%	
45,00	0,22	0,24	5,68	232,0%	20,55	14,75	200,7	21,7	97,3%	68,9%	67,0%	
46,00	0,22	0,25	5,59	236,4%	20,55	14,84	199,0	21,7	97,2%	68,8%	66,9%	
47,00	0,22	0,29	5,42	244,3%	20,56	15,00	196,2	21,7	96,5%	68,6%	66,2%	
48,00	0,21	0,31	5,35	246,7%	20,57	15,06	193,8	21,7	96,1%	68,6%	66,0%	
49,00	0,17	0,35	5,15	256,6%	20,58	15,24	191,1	21,7	95,4%	68,2%	65,1%	
50,00	0,17	0,39	5,07	259,8%	20,58	15,31	189,2	21,7	94,8%	68,2%	64,6%	
51,00	0,17	0,41	5,04	260,7%	20,58	15,34	187,1	21,7	94,5%	68,3%	64,6%	
52,00	0,17	0,44	5,01	260,5%	20,58	15,35	185,4	21,8	94,0%	68,4%	64,3%	
53,00	0,17	0,45	4,94	264,5%	20,58	15,42	183,5	21,8	93,8%	68,4%	64,1%	
54,00	0,14	0,45	4,96	263,1%	20,58	15,40	182,1	21,8	93,8%	68,6%	64,4%	
55,00	0,12	0,51	4,89	263,9%	20,58	15,44	180,0	21,8	92,9%	68,7%	63,8%	
56,00	0,12	0,65	4,61	273,5%	20,59	15,66	177,9	21,9	90,5%	67,8%	61,4%	
57,00	0,12	0,72	4,53	274,4%	20,59	15,71	175,8	21,9	89,4%	67,7%	60,5%	
58,00	0,12	0,77	4,40	279,8%	20,60	15,81	173,7	21,9	88,5%	67,5%	59,7%	
59,00	0,12	0,82	4,32	282,6%	20,60	15,87	172,3	21,9	87,6%	67,3%	58,9%	
60,00	0,12	0,86	4,26	283,6%	20,60	15,91	170,8	21,8	86,9%	67,2%	58,4%	
61,00	0,12	0,89	4,25	282,4%	20,60	15,91	168,9	21,7	86,5%	67,4%	58,3%	
62,00	0,08	0,92	4,20	284,2%	20,60	15,95	167,3	21,8	86,0%	67,4%	58,0%	
63,00	0,10	0,94	4,12	288,2%	20,61	16,01	166,4	21,8	85,5%	67,2%	57,5%	
64,00	0,08	0,95	4,11	288,0%	20,61	16,02	165,1	21,8	85,3%	67,4%	57,5%	
65,00	0,08	0,95	4,16	284,7%	20,60	15,97	164,0	21,9	85,4%	67,7%	57,8%	
66,00	0,08	0,94	4,18	283,2%	20,60	15,95	163,2	21,9	85,6%	68,0%	58,2%	
67,00	0,08	0,96	4,26	276,3%	20,60	15,85	162,7	21,9	85,6%	68,4%	58,5%	
68,00	0,08	0,99	4,33	269,4%	20,59	15,77	161,4	21,9	85,4%	68,9%	58,8%	
69,00	0,08	1,00	4,26	273,6%	20,59	15,83	160,6	22,0	85,1%	68,7%	58,5%	
70,00	0,03	1,02	4,20	276,9%	20,60	15,89	159,6	21,9	84,7%	68,5%	58,0%	
71,00	0,03	1,01	4,15	280,6%	20,60	15,94	158,7	21,9	84,6%	68,5%	58,0%	
72,00	0,03	1,04	4,08	284,2%	20,60	16,01	157,4	21,9	84,1%	68,3%	57,5%	
73,00	0,03	1,05	4,02	287,3%	20,61	16,06	156,6	21,9	83,7%	68,2%	57,1%	
74,00	0,03	1,08	3,97	288,7%	20,61	16,09	155,7	21,9	83,2%	68,1%	56,7%	
75,00	0,03	1,09	3,95	289,9%	20,61	16,11	155,2	21,9	83,1%	68,1%	56,5%	
76,00	0,03	1,08	3,92	292,8%	20,61	16,15	154,0	21,9	83,0%	68,1%	56,6%	
77,00	0,02	1,08	3,91	294,1%	20,61	16,17	153,0	21,9	83,0%	68,2%	56,6%	

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 1,74 g/hr

Test Duration: 77 min

Burn Rate : 1,43 Dry kg/hr

PRESSURE FACTOR: DGM 1st hr 0,971
 DGM 1 0,959
 DGM 2 0,965
 DGM 3 0,998

BAROMETRIC PRESSURE

Average: 29,86958376 in Hg
 Start: 29,85481876 in Hg
 End: 29,88434875 in Hg

TEMPERATURE FACTORS DGM 1st hr 0,989
 DGM 1 0,993
 DGM 2 0,987
 DGM 3 0,995

DGM VALUES

DGM 1st hr Final: 1203,620 Cuft
 Initial: 1191,780 Cuft

VOLUMES SAMPLED DGM 1st hr 11,367 SCft
 DGM 1 14,385 SCft
 DGM 2 14,570 SCft
 DGM 3 14,172 SCft

DGM 1 Final: 4596,030 Cuft
 Initial: 4580,711 Cuft

DGM 2 Final: 31291,034 Cuft
 Initial: 31275,882 Cuft

TOTAL TUNNEL VOLUME : 28121

DGM #3 Final: 22276,407 Cuft
 Initial: 22261,966 Cuft

SAMPLE RATIOS

Sample Train 1st Hr: 1927,7
 Sample Train 1: 1954,8
 Sample Train 2: 1930,0

TEMPERATURES

DGM 1st hr 534,112 °R
 DGM 1 531,812 °R
 DGM 2 535,060 °R

Particulate concentration

Sample Train 1st Hr **0,000114** g/dscf
 Sample Train 1 **0,000083** g/dscf
 Sample Train 2 **0,000089** g/dscf
 Room **0,000007** g/dscf

CALIBRATION FACTORS

DGM 1st hr 1,0000
 DGM 1 0,9860
 DGM 2 1,0100
 DGM #3 0,9880

TOTAL EMISSIONS

Sample Train 1st Hr **2,35** g
 Sample Train 1 **2,15** g
 Sample Train 2 **2,31** g

TUNNEL FLOW RATE: 365,2 Dscfm

PARTICULATE CATCH

Total Sample Train 1: 1,20 mg
 Total Sample Train 2: 1,30 mg
 Total Sample Train 1 1st hour: 1,30 mg

EMISSION RATES

Sample Train 1st Hr **2,35** g/hr
 Sample Train 1 **1,67** g/hr
 Sample Train 2 **1,80** g/hr

DEVIATION: 3,66%

Cs Train 1 Train 2 Train 1st Hr
 8,342E-05 8,9224E-05 0,0001144

* Time	Elapsed Time min	Raw data row	* Weight Remaining lbs	* CO %	* CO ₂ %	*1 Flue Gas °F	*2 Room Temp °F	*3 Tunnel Dry Bulb °F	*4 Unit Top °F	*5 Unit Back °F	*6 Unit R.Side °F	*7 Unit L.Side °F	*8 Unit Bottom °F	Mass flow Reading 1st hour cuft/min	DGM 1st hour Inlet T °F	DGM 1st hour Outlet T °F	Filter 1st hour Temp °F	DGM 1 Reading cuft/min	DGM 1 Inlet T °F	DGM 1 Outlet T °F	Filter 1 Temp °F	Mass flow 2 Reading cuft/min	DGM 2 Inlet T °F	DGM 2 Outlet T °F	Filter 2 Temp °F	Tunnel Velocity Pressure in wc	Flue draft Pressure in wc	Filter 1st hr in. Hg	Filter 1 in. Hg	Filter 2 in. Hg	Change in Surf Temp °F
0	167.00		4.9	0.1	4.1	412.2	69.4	111.2	627.3	364.3	397.6	425.8	431.3	0.19	71.6	71.6	72.5	0.18	69.7	71.3	73.1	0.18	70.0	70.1	73.6	0.08	0.08	-0.77	-1.20	-1.03	0.0
1	168.0		4.5	0.2	11.5	494.9	69.5	100.2	667.0	372.4	399.7	428.5	440.9	0.19	71.9	71.7	72.8	0.18	69.7	71.1	74.0	0.18	70.3	70.1	74.0	0.08	0.10	-0.72	-1.16	-0.97	12.4
2	169.0		4.5	0.2	15.3	532.7	69.3	101.1	716.8	379.4	400.6	430.0	449.7	0.19	72.0	71.8	73.1	0.18	69.8	71.0	74.6	0.18	70.6	70.2	74.1	0.08	0.09	-0.72	-1.16	-0.97	26.1
3	170.0		4.3	0.2	15.1	545.0	69.6	100.1	752.7	384.7	403.1	432.8	457.4	0.19	72.2	71.9	73.3	0.18	69.9	70.9	75.0	0.18	70.9	70.4	74.7	0.08	0.10	-0.72	-1.16	-0.97	36.9
4	171.0		4.2	0.2	15.1	554.2	69.6	100.1	778.9	393.2	403.2	433.2	479.4	0.19	72.4	72.3	73.8	0.18	70.9	71.5	75.5	0.18	71.1	70.5	75.1	0.08	0.10	-0.72	-1.16	-0.97	47.4
5	172.0		4.0	0.2	14.9	559.3	69.6	103.1	802.7	390.4	404.9	433.6	469.3	0.19	72.5	72.0	73.8	0.18	70.0	70.8	76.0	0.18	71.3	70.6	75.4	0.08	0.09	-0.73	-1.18	-0.98	50.9
6	173.0		3.9	0.2	15.1	564.0	69.5	103.2	819.1	392.0	406.1	433.5	473.4	0.19	72.7	72.2	74.1	0.18	70.1	70.7	76.4	0.18	71.4	70.8	75.7	0.08	0.10	-0.74	-1.17	-0.98	55.5
7	174.0		3.7	0.2	15.5	569.6	69.6	105.1	832.2	392.5	407.5	433.3	476.6	0.19	72.8	72.2	74.4	0.18	70.1	70.7	76.8	0.18	71.6	70.9	76.0	0.08	0.10	-0.74	-1.18	-0.98	59.2
8	175.0		3.5	0.2	15.1	569.1	69.6	104.1	841.1	393.4	409.6	433.1	479.4	0.19	72.9	72.3	74.7	0.18	70.2	70.6	77.2	0.18	71.8	71.0	76.3	0.08	0.10	-0.74	-1.18	-0.98	62.5
9	176.0		3.3	0.2	14.4	566.2	69.6	103.6	846.5	393.7	411.9	433.1	481.4	0.19	73.0	72.4	74.9	0.18	70.2	70.6	77.4	0.18	71.9	71.2	76.5	0.08	0.10	-0.75	-1.19	-0.99	64.0
10	177.0		3.2	0.2	14.2	562.9	69.7	104.7	843.0	394.2	413.4	432.9	483.2	0.19	73.2	72.5	75.2	0.18	70.2	70.6	77.7	0.18	72.1	71.4	76.8	0.08	0.10	-0.75	-1.19	-0.99	64.1
11	178.0		3.1	0.2	14.2	561.0	69.8	104.8	842.5	394.7	415.8	432.7	483.9	0.19	73.3	72.6	75.5	0.18	70.3	70.6	78.1	0.18	72.3	71.5	77.1	0.08	0.10	-0.75	-1.19	-0.99	64.7
12	179.0		3.0	0.2	14.0	558.7	69.7	104.4	840.9	395.3	418.0	432.7	482.0	0.19	73.4	72.7	75.7	0.18	70.4	70.6	78.4	0.18	72.4	71.6	77.4	0.08	0.10	-0.75	-1.19	-0.98	64.5
13	180.0		2.8	0.1	13.6	555.4	69.9	104.4	839.5	396.8	420.2	433.1	482.5	0.19	73.5	72.8	76.0	0.18	70.5	70.6	78.6	0.18	72.6	71.8	77.6	0.08	0.10	-0.75	-1.20	-0.99	65.2
14	181.0		2.7	0.2	13.2	550.3	69.9	104.3	833.2	398.1	422.9	433.1	481.9	0.19	73.6	76.2	76.2	0.18	70.6	70.7	78.9	0.18	72.8	72.0	77.8	0.08	0.09	-0.76	-1.19	-0.99	64.6
15	182.0		2.6	0.1	12.7	546.7	69.8	103.9	826.4	399.1	424.6	433.5	480.6	0.19	73.6	72.9	76.5	0.18	70.6	70.7	79.1	0.18	72.9	72.1	78.0	0.08	0.09	-0.76	-1.19	-0.99	63.6
16	183.0		2.4	0.1	12.6	543.8	69.8	102.6	821.9	401.5	427.4	434.1	479.0	0.19	73.7	73.0	76.7	0.18	70.7	70.8	79.3	0.18	73.1	72.3	78.2	0.08	0.09	-0.76	-1.19	-0.99	63.5
17	184.0		2.3	0.1	12.9	541.6	69.8	103.3	817.0	402.9	428.9	434.0	477.7	0.19	73.8	73.1	76.9	0.18	70.8	70.8	79.5	0.18	73.3	72.4	78.4	0.08	0.09	-0.77	-1.19	-0.99	62.9
18	185.0		2.2	0.1	12.8	541.2	69.9	102.1	815.1	405.5	431.1	434.4	475.8	0.19	73.9	73.2	77.1	0.18	70.8	70.8	79.6	0.18	73.4	72.6	78.5	0.08	0.09	-0.77	-1.19	-0.99	63.1
19	186.0		2.0	0.1	12.8	538.6	70.0	102.5	811.5	407.3	432.4	435.3	474.3	0.19	74.0	73.3	77.2	0.18	70.8	70.8	79.8	0.18	73.6	72.8	78.7	0.08	0.10	-0.77	-1.19	-0.99	62.9
20	187.0		1.9	0.1	12.7	535.0	70.0	102.9	804.6	409.8	434.4	434.7	472.9	0.19	74.0	73.3	77.5	0.18	70.9	70.9	80.0	0.18	73.7	73.0	78.9	0.08	0.09	-0.77	-1.19	-0.99	62.0
21	188.0		1.8	0.2	12.8	534.7	70.2	101.7	805.2	412.5	435.2	435.2	471.3	0.19	74.0	73.4	77.6	0.18	71.0	71.0	80.1	0.18	73.9	73.2	79.0	0.08	0.09	-0.78	-1.20	-0.99	62.7
22	189.0		1.7	0.1	12.7	532.4	70.3	102.4	803.2	415.3	437.0	435.9	470.3	0.19	74.0	73.5	77.8	0.18	71.0	71.0	80.3	0.18	74.0	73.4	79.2	0.08	0.09	-0.79	-1.20	-0.99	63.1
23	190.0		1.6	0.1	12.8	531.5	70.3	102.7	802.1	418.4	438.5	436.4	469.1	0.19	74.1	73.5	78.0	0.18	71.1	71.1	80.4	0.18	74.2	73.5	79.4	0.08	0.09	-0.78	-1.20	-1.00	63.7
24	191.0		1.5	0.1	13.0	530.4	70.4	102.3	804.7	421.3	439.6	436.2	466.2	0.19	74.1	73.6	78.2	0.18	71.1	71.1	80.5	0.18	74.3	73.7	79.5	0.08	0.09	-0.80	-1.20	-0.99	65.2
25	192.0		1.3	0.1	13.0	529.8	70.4	102.0	805.5	425.3	441.8	438.0	467.6	0.19	74.3	73.7	78.3	0.18	71.2	71.2	80.6	0.18	74.6	73.9	79.6	0.08	0.09	-0.80	-1.20	-0.99	66.4
26	193.0		1.2	0.1	12.8	527.6	70.2	101.7	805.0	429.2	443.3	439.3	467.3	0.19	74.4	73.8	78.4	0.18	71.3	71.2	80.8	0.18	74.6	74.0	79.7	0.08	0.09	-0.80	-1.19	-1.00	67.6
27	194.0		1.1	0.1	12.9	525.9	70.5	100.3	804.5	432.7	445.0	439.6	466.0	0.19	74.4	73.9	78.5	0.18	71.4	71.3	80.8	0.18	74.8	74.1	79.8	0.08	0.09	-0.81	-1.19	-1.00	68.3
28	195.0		0.9	0.0	8.0	466.1	71.0	97.2	718.3	466.8	454.4	447.1	467.9	0.19	75.4	74.6	78.3	0.18	70.8	71.4	80.9	0.18	74.9	74.2	79.9	0.08	0.09	-0.81	-1.19	-1.00	69.1
29	196.0		1.0	0.1	12.9	522.2	70.3	100.8	803.3	440.2	446.5	440.3	465.2	0.19	74.5	74.0	78.8	0.18	71.5	71.5	81.0	0.18	74.9	74.4	80.0	0.08	0.09	-0.82	-1.20	-1.00	69.8
30	197.0		0.9	0.1	12.1	516.8	70.5	100.1	797.1	445.0	448.4	441.8	465.4	0.19	74.6	74.1	78.9	0.18	71.5	71.6	81.1	0.18	75.0	74.6	80.0	0.08	0.09	-0.83	-1.21	-1.02	70.3
31	198.0		0.7	0.1	11.1	507.1	70.7	100.2	792.7	450.2	451.7	445.2	465.1	0.19	74.7	74.2	79.0	0.18	71.6	71.6	81.2	0.18	75.1	74.6	80.1	0.08	0.09	-0.84	-1.21	-1.02	70.4
32	199.0		0.8	0.1	10.1	495.6	70.8	100.4	769.0	453.2	451.1	443.8	466.1	0.19	74.9	74.2	79.2	0.18	71.7	71.7	81.2	0.18	75.3	75.0	80.3	0.08	0.09	-0.84	-1.21	-1.02	67.4
33	200.0		0.7	0.1	9.3	486.7	71.2	99.2	752.5	457.6	452.2	444.9	466.3	0.19	75.2	74.3	79.2	0.18	71.8	71.8	81.2	0.18	75.5	75.2	80.3	0.09	0.09	-0.84	-1.21	-1.01	65.5
34	201.0		0.7	0.1	8.9	477.7	71.1	98.4	737.9	462.7	454.1	446.6	466.8	0.19	75.4	74.5	79.3	0.18	71.9	71.8	81.2	0.18	75.6	75.3	80.3	0.09	0.09	-0.84	-1.20	-1.02	64.4
35	202.0		0.7	0.0	8.0	466.1	71.0	97.2	718.3	466.8	454.4	447.1	467.9	0.19	75.4	74.6	78.3	0.18	70.8	71.4	80.9	0.18	74.9	74.2	79.9	0.08	0.08	-0.84	-1.20	-1.02	61.6
36	203.0		0.7	0.0	6.9	455.1	70.9	97.2	698.8	471.2	455.8	447.8	468.5	0.19	75.3	74.6	79.4	0.18	72.0	72.0	81.2	0.18	75.9	75.6	80.3	0.09	0.08	-0.85	-1.20	-1.02	59.2
37	204.0		0.7	0.0	6.5	445.4	71.2	96.6	679.4	475.3	455.0	448.3	469.8	0.19	75.3	74.7	79.4	0.18	72.1	72.1	81.1	0.18	75.9	75.8	80.3	0.08	0.08	-0.86	-1.19	-1.01	56.5
38	205.0		0.6	0.1	6.1	436.5	71.1	95.4	661.7	478.4	456.0	448.5	470.3	0.19	75.2	74.7	79.5	0.18	72.1	72.1	81.1	0.18	76.0	75.9	80.3	0.08	0.08	-0.86	-1.18	-1.01	53.9
39	206.0		0.6	0.1	6.0	427.9	71.3	94.3	645.2	483.8	458.8	448.7	471.0	0.19	75.2	74.8	79.4	0.18	72.2	72.2	81.0	0.18	76.1	76.0	80.2	0.08	0.08	-0.85	-1.17	-1.01	51.6
40	207.0		0.6	0.1	5.9	419.9	71.3	95.8	631.4	487.6	455.7	448.9	471.1	0.19	75.3																

Time acquisition minutes	Flue	Room	scale	Right	Back	bottom	Top	Left
	temp	temp						
	°F	°F	lbs	°F	°F	°F	°F	°F
1	67,94	67,61	2,47	68,22	67,75	67,87	68,27	67,99
2	93,81	67,79	2,47	68,90	67,82	67,89	71,45	69,06
3	139,59	67,65	2,37	69,80	67,84	67,88	88,32	70,06
4	244,59	67,48	2,27	69,62	67,93	67,90	139,06	69,44
5	373,47	67,66	2,07	70,17	68,14	67,98	222,92	69,43
6	440,14	67,58	1,97	71,57	68,45	68,16	324,26	70,02
7	487,09	67,68	1,77	73,92	69,04	68,55	412,80	71,39
8	506,01	67,71	1,67	77,63	69,87	69,20	479,40	73,97
9	501,39	67,74	1,47	82,84	71,06	70,17	521,98	78,00
10	502,88	67,75	1,37	90,18	72,63	71,40	555,63	83,44
11	494,07	67,87	1,18	98,72	74,58	72,98	573,13	89,91
12	489,59	67,94	1,17	107,39	77,01	74,91	585,16	97,22
13	467,84	67,98	1,07	115,72	80,01	77,38	582,84	105,29
14	445,60	68,00	0,97	122,89	83,71	80,50	571,91	116,04
15	391,63	67,99	6,49	130,40	88,57	84,80	539,61	129,23
16	374,97	68,00	6,37	136,03	93,84	89,38	521,11	136,59
17	379,61	67,95	6,37	142,95	98,82	94,70	508,94	145,05
18	382,17	67,91	6,27	149,37	103,23	100,46	502,89	153,20
19	385,62	67,93	6,18	155,17	107,16	106,50	499,39	160,68
20	392,63	67,94	6,07	160,03	110,71	112,45	495,39	167,63
21	394,72	67,79	6,07	165,63	113,79	118,26	491,50	174,43
22	404,61	67,86	5,97	171,00	116,53	123,76	491,51	180,45
23	409,22	68,01	5,87	175,94	118,94	129,07	494,44	185,75
24	416,19	68,12	5,77	180,27	121,19	134,05	499,72	190,46
25	422,77	68,19	5,67	184,12	123,25	138,90	506,19	194,57
26	427,41	68,19	5,57	187,64	125,17	143,59	513,78	198,52
27	432,48	68,28	5,48	190,81	127,10	148,18	522,20	202,14
28	443,89	68,32	5,37	193,74	128,78	152,63	533,07	205,56
29	459,45	68,36	5,27	196,59	130,70	157,04	553,49	208,91
30	474,50	68,32	5,17	199,12	132,69	161,39	575,49	211,72
31	480,00	68,38	4,97	201,72	134,69	165,70	593,52	214,73
32	488,31	68,37	4,87	204,79	136,61	170,03	609,58	218,22
33	491,53	68,43	4,77	207,37	138,66	174,38	622,37	221,67
34	492,56	68,35	4,67	210,50	140,76	178,76	631,65	225,55
35	490,80	68,50	4,57	213,96	143,12	183,22	636,16	230,38
36	493,09	68,55	4,40	217,29	145,33	187,74	642,37	234,70
37	495,73	68,49	4,27	221,20	147,90	192,31	650,41	240,01
38	500,52	68,48	4,17	225,19	150,56	197,01	658,63	245,48
39	503,58	68,46	4,07	229,27	153,15	201,75	666,47	250,94
40	511,67	68,55	3,97	234,13	155,83	206,54	676,27	257,12
41	516,28	68,39	3,77	238,48	158,74	211,45	689,22	262,81
42	518,56	68,44	3,67	243,48	161,68	216,45	700,33	268,88
43	522,37	68,59	3,57	248,84	164,77	221,49	711,60	275,25
44	533,00	68,83	3,37	254,24	168,05	226,59	727,04	280,84
45	537,53	68,74	3,27	259,58	171,57	231,79	742,06	286,43
46	536,29	68,79	3,16	266,23	175,63	237,10	750,73	292,51
47	539,39	68,71	2,97	272,34	179,94	242,58	760,82	298,03
48	542,56	68,71	2,87	278,76	184,52	248,15	771,89	303,69
49	542,70	68,88	2,77	285,27	189,71	253,79	776,69	309,43
50	539,45	68,98	2,67	292,00	195,22	259,60	778,88	314,97
51	539,59	68,93	2,47	299,00	201,27	265,49	782,40	320,89
52	540,26	69,06	2,37	305,92	207,28	271,56	784,92	326,52
53	537,63	69,09	2,27	312,51	213,87	277,64	786,67	331,67
54	527,41	69,23	2,17	319,39	220,88	283,56	781,13	336,89
55	521,01	69,29	2,07	326,73	227,92	289,92	771,06	342,28
56	516,01	69,30	1,97	333,36	235,66	296,76	762,70	347,38
57	505,97	69,45	1,87	339,60	243,32	303,72	748,59	352,23
58	499,67	69,25	1,77	346,03	251,15	310,64	737,72	357,72
59	495,04	69,38	1,74	351,54	259,29	317,91	727,42	362,61
60	495,14	69,45	1,67	356,76	267,41	325,24	720,64	367,80
61	494,56	69,45	1,57	361,65	275,19	332,91	716,88	372,65
62	492,92	69,36	1,57	366,21	283,43	341,05	714,92	377,67
63	491,66	69,47	1,47	370,32	291,73	349,60	711,50	382,67
64	484,97	69,42	1,37	373,97	299,64	358,40	708,60	387,18
65	478,30	69,32	1,27	377,23	307,66	367,41	701,99	391,79
66	472,87	69,45	1,27	380,86	315,25	376,53	694,20	396,35
67	467,49	69,42	1,17	383,82	323,37	385,62	685,83	400,91
68	464,19	69,41	1,17	386,32	330,48	394,69	678,13	405,24

data 2025-03-30 epa pi 20329 run 4
unit preburn

69	462,04	69,42	1,07	389,76	338,82	403,84	673,99	409,65
70	457,40	69,46	1,07	391,63	346,77	413,00	666,81	414,41
71	452,42	69,52	1,05	393,93	355,00	422,19	659,26	418,48

APPENDIX 2: Proportionality results

Average	Average	Average	Average								Average
17,73	Inlet +	Inlet +	Inlet +								0,277
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2		
	Temp.	Temp.	Temp.	97,47	99,39	98,30	System 1st Hr	System 1	System 2		SQRT
Velocity	Meter 1st Hr	Meter 1	Meter 2	Proportional Rates			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P
				PR1st hour	PR1	PR2				Time	
Ft/Sec	Deg. R	Deg. R	Deg. R	%	%	%	(ft3)	(ft3)	(ft3)	min	(in H2O)2
18,204	533,264	531,5	531,2				0,182	0,202	0,210	0	0,279
18,175	533,264	531,4	531,3	99,4	99,4	98,8	0,182	0,189	0,194	1	0,281
17,924	533,234	531,3	531,5	99,9	99,9	99,4	0,181	0,175	0,179	2	0,278
18,004	533,167	531,3	531,6	99,5	99,9	99,2	0,181	0,175	0,179	3	0,279
17,966	533,152	531,3	531,7	100,0	100,3	99,7	0,181	0,175	0,179	4	0,278
17,781	533,157	531,2	531,8	99,7	100,5	100,2	0,180	0,175	0,179	5	0,276
17,931	533,135	531,2	531,9	99,3	99,1	98,7	0,181	0,175	0,179	6	0,279
17,837	533,103	531,2	532,0	99,6	99,6	99,1	0,181	0,175	0,179	7	0,278
17,914	533,126	531,2	532,1	99,2	99,4	98,6	0,181	0,175	0,179	8	0,279
17,926	533,121	531,3	532,3	99,2	99,3	98,7	0,181	0,175	0,179	9	0,279
17,986	533,145	531,2	532,4	99,0	99,0	98,4	0,181	0,175	0,179	10	0,280
17,926	533,158	531,2	532,5	99,3	99,4	98,7	0,181	0,175	0,179	11	0,279
18,150	533,200	531,2	532,6	98,0	98,1	97,4	0,181	0,175	0,179	12	0,283
17,849	533,218	531,2	532,7	99,6	99,5	98,8	0,182	0,175	0,178	13	0,278
17,304	533,226	531,3	532,9	102,5	102,8	102,0	0,181	0,175	0,178	14	0,270
18,148	533,247	531,3	533,0	98,0	98,0	97,3	0,182	0,175	0,178	15	0,283
17,881	533,264	531,3	533,1	99,4	99,5	98,5	0,181	0,175	0,178	16	0,278
17,854	533,299	531,4	533,3	99,6	99,6	98,7	0,181	0,175	0,178	17	0,278
17,913	533,316	531,4	533,4	99,3	99,3	98,2	0,182	0,175	0,178	18	0,279
17,914	533,324	531,4	533,5	99,2	99,4	98,5	0,181	0,175	0,178	19	0,279
17,913	533,352	531,5	533,6	99,1	99,1	98,4	0,181	0,175	0,178	20	0,279
18,092	533,377	531,5	533,7	97,8	98,2	97,5	0,181	0,175	0,178	21	0,282
17,858	533,404	531,5	533,7	99,5	99,4	98,7	0,181	0,175	0,178	22	0,278
18,087	533,429	531,6	533,9	98,2	98,2	97,3	0,181	0,175	0,178	23	0,282
17,930	533,447	531,6	533,9	98,9	99,2	98,2	0,181	0,175	0,178	24	0,279
17,912	533,495	531,6	534,0	99,1	99,1	98,4	0,181	0,175	0,178	25	0,279
17,859	533,519	531,6	534,1	99,6	99,5	98,6	0,182	0,175	0,178	26	0,278
17,973	533,551	531,6	534,2	98,9	99,0	97,9	0,181	0,175	0,178	27	0,280
17,854	533,590	531,6	534,2	99,4	99,7	98,7	0,181	0,175	0,178	28	0,278
18,147	533,623	531,7	534,3	97,9	97,9	97,0	0,181	0,175	0,178	29	0,282
17,558	533,664	531,7	534,4	101,6	101,2	100,2	0,182	0,175	0,178	30	0,273
17,996	533,702	531,7	534,5	98,7	98,7	97,7	0,181	0,175	0,178	31	0,280
17,956	533,737	531,7	534,6	98,8	99,1	98,0	0,181	0,175	0,178	32	0,279
17,739	533,750	531,8	534,7	99,6	100,3	99,2	0,180	0,175	0,178	33	0,276
17,853	533,774	531,8	534,7	99,4	99,5	98,5	0,181	0,175	0,178	34	0,278
17,972	533,804	531,8	534,8	98,7	98,8	97,9	0,181	0,175	0,178	35	0,280
18,259	533,839	531,8	534,9	97,2	97,5	96,2	0,181	0,175	0,178	36	0,284
17,964	533,859	531,8	534,9	98,5	99,0	97,8	0,181	0,175	0,178	37	0,280
17,669	533,896	531,9	535,0	100,2	100,4	99,2	0,181	0,175	0,178	38	0,275
17,850	533,911	531,9	535,0	99,4	99,2	98,5	0,181	0,175	0,178	39	0,278
17,900	533,943	531,9	535,1	99,1	99,2	97,9	0,181	0,175	0,178	40	0,279
17,851	533,941	531,9	535,1	99,5	99,3	98,2	0,182	0,175	0,177	41	0,278
17,779	533,966	531,9	535,2	99,6	99,7	98,9	0,181	0,175	0,178	42	0,277
17,807	533,989	531,9	535,2	99,4	99,5	98,5	0,181	0,175	0,178	43	0,278
17,895	534,010	531,9	535,2	99,0	99,0	97,8	0,181	0,175	0,177	44	0,279
18,071	534,012	531,9	535,2	98,0	98,1	97,1	0,181	0,175	0,177	45	0,282
17,773	534,038	531,9	535,3	99,6	99,6	98,5	0,181	0,175	0,178	46	0,277
17,946	534,042	531,9	535,3	98,5	98,9	97,4	0,181	0,175	0,177	47	0,280
17,904	534,067	532,0	535,4	98,7	98,7	97,8	0,181	0,175	0,177	48	0,279
17,939	534,089	532,0	535,5	98,7	98,5	97,4	0,181	0,175	0,177	49	0,280
17,996	534,099	532,0	535,5	98,1	98,3	97,4	0,181	0,175	0,178	50	0,281
17,941	534,082	532,0	535,5	98,6	98,5	97,5	0,181	0,175	0,178	51	0,280
17,768	534,030	532,1	535,6	99,4	99,8	98,8	0,181	0,175	0,178	52	0,277
17,883	534,000	532,1	535,6	98,7	99,1	97,6	0,181	0,175	0,177	53	0,279
17,990	533,976	532,0	535,6	98,7	98,3	97,3	0,182	0,175	0,177	54	0,281
17,690	533,952	532,0	535,6	99,8	99,8	98,3	0,181	0,175	0,177	55	0,276
17,941	533,918	532,0	535,6	98,3	98,7	97,4	0,181	0,175	0,177	56	0,280
17,868	533,887	532,0	535,6	98,8	98,7	97,5	0,181	0,175	0,177	57	0,279
17,795	533,883	532,0	535,6	98,8	99,1	98,1	0,181	0,175	0,177	58	0,278
17,838	533,880	532,0	535,6	98,7	98,6	97,7	0,181	0,175	0,178	59	0,279
17,887	533,769	531,9	535,7	0,0	98,3	97,1	0,000	0,175	0,177	60	0,280
17,832	533,689	532,0	535,7	0,0	98,9	97,7	0,000	0,175	0,177	61	0,279
17,843	533,619	532,0	535,7	0,0	98,8	97,9	0,000	0,175	0,178	62	0,279
17,776	533,586	532,0	535,7	0,0	99,0	97,8	0,000	0,175	0,178	63	0,278
17,787	533,537	532,0	535,7	0,0	99,1	97,9	0,000	0,175	0,177	64	0,278
17,830	533,488	531,9	535,7	0,0	98,5	97,3	0,000	0,175	0,177	65	0,279
17,942	533,440	532,0	535,8	0,0	98,0	96,8	0,000	0,175	0,177	66	0,281
17,948	533,430	532,0	535,8	0,0	98,1	96,9	0,000	0,175	0,177	67	0,281
17,885	533,411	532,0	535,7	0,0	98,3	97,3	0,000	0,175	0,178	68	0,280
17,865	533,370	531,9	535,6	0,0	98,1	97,1	0,000	0,175	0,178	69	0,280
17,803	533,332	531,9	535,7	0,0	98,6	97,5	0,000	0,175	0,178	70	0,279
17,881	533,312	531,9	535,7	0,0	98,3	97,3	0,000	0,175	0,178	71	0,280
18,045	533,264	531,8	535,6	0,0	97,2	96,1	0,000	0,175	0,178	72	0,283
17,915	533,223	531,7	535,5	0,0	98,0	96,9	0,000	0,175	0,177	73	0,280
17,753	533,191	531,7	535,4	0,0	98,9	97,9	0,000	0,175	0,178	74	0,278
17,870	533,165	531,6	535,4	0,0	98,5	97,5	0,000	0,175	0,178	75	0,280
17,720	533,069	531,5	535,3	0,0	98,9	97,8	0,000	0,175	0,178	76	0,278
17,619	532,942	531,3	535,1	0,0	99,6	98,3	0,000	0,175	0,178	77	0,276
17,675	532,813	531,2	535,0	0,0	99,2	98,2	0,000	0,175	0,178	78	0,277

17,685	532,729	531,1	535,0	0,0	99,5	98,2	0,000	0,175	0,178	79	0,277
17,864	532,660	531,1	535,0	0,0	98,2	97,3	0,000	0,175	0,178	80	0,280
17,738	532,601	531,1	534,9	0,0	98,9	97,8	0,000	0,175	0,178	81	0,278
17,610	532,572	531,1	535,0	0,0	99,6	98,4	0,000	0,175	0,178	82	0,276
17,802	532,547	531,1	535,0	0,0	98,5	97,4	0,000	0,175	0,178	83	0,279
17,849	532,521	531,1	534,9	0,0	98,4	97,2	0,000	0,175	0,178	84	0,280
17,731	532,510	531,1	534,9	0,0	99,0	97,8	0,000	0,175	0,178	85	0,278
17,718	532,482	531,1	535,0	0,0	99,0	97,7	0,000	0,175	0,178	86	0,278
17,913	532,460	531,1	535,0	0,0	98,0	96,7	0,000	0,175	0,178	87	0,281
17,788	532,411	531,1	535,0	0,0	98,6	97,3	0,000	0,175	0,177	88	0,279
17,962	532,372	531,1	535,0	0,0	97,7	96,4	0,000	0,175	0,177	89	0,282
17,690	532,346	531,1	535,0	0,0	99,2	98,0	0,000	0,175	0,177	90	0,277
18,021	532,312	531,0	535,0	0,0	97,6	96,2	0,000	0,175	0,178	91	0,283
17,838	532,279	531,0	534,9	0,0	98,2	97,3	0,000	0,175	0,178	92	0,280
17,729	532,263	531,0	534,9	0,0	99,0	97,7	0,000	0,175	0,178	93	0,278
17,798	532,270	531,0	534,9	0,0	98,8	97,4	0,000	0,175	0,178	94	0,279
17,831	532,236	531,0	534,9	0,0	98,5	97,2	0,000	0,176	0,178	95	0,280
17,733	532,223	531,0	534,9	0,0	98,9	97,7	0,000	0,175	0,178	96	0,278
17,815	532,222	531,1	534,9	0,0	98,7	97,2	0,000	0,175	0,178	97	0,279
17,641	532,228	531,1	534,9	0,0	99,3	98,1	0,000	0,175	0,178	98	0,277
17,781	532,216	531,1	534,9	0,0	98,4	97,4	0,000	0,175	0,178	99	0,279
17,483	532,189	531,1	534,9	0,0	100,3	99,1	0,000	0,175	0,178	100	0,274
17,425	532,178	531,1	534,9	0,0	100,4	99,3	0,000	0,175	0,178	101	0,273
17,731	532,164	531,2	534,9	0,0	99,0	97,7	0,000	0,175	0,178	102	0,278
17,608	532,166	531,2	534,9	0,0	99,4	98,3	0,000	0,175	0,178	103	0,276
17,897	532,159	531,2	534,9	0,0	97,9	96,8	0,000	0,175	0,178	104	0,281
17,418	532,167	531,2	534,9	0,0	100,9	99,4	0,000	0,175	0,178	105	0,273
17,469	532,153	531,2	535,0	0,0	100,0	98,9	0,000	0,175	0,178	106	0,274
17,603	532,124	531,2	535,1	0,0	99,5	98,4	0,000	0,175	0,178	107	0,276
17,474	532,111	531,3	535,2	0,0	100,1	98,9	0,000	0,175	0,178	108	0,274
17,537	532,110	531,4	535,3	0,0	99,8	98,7	0,000	0,175	0,178	109	0,275
17,589	532,084	531,3	535,2	0,0	99,6	98,3	0,000	0,175	0,178	110	0,276
17,482	532,070	531,3	535,2	0,0	100,1	99,1	0,000	0,175	0,178	111	0,274
17,471	532,031	531,3	535,2	0,0	100,1	99,0	0,000	0,175	0,178	112	0,274
17,473	532,011	531,3	535,2	0,0	99,9	98,8	0,000	0,175	0,178	113	0,274
17,413	531,986	531,3	535,2	0,0	100,5	99,2	0,000	0,175	0,178	114	0,273
17,395	531,952	531,3	535,2	0,0	100,3	99,2	0,000	0,175	0,178	115	0,273
17,416	531,930	531,4	535,2	0,0	100,5	99,2	0,000	0,175	0,177	116	0,273
17,176	531,927	531,4	535,2	0,0	101,9	100,7	0,000	0,175	0,178	117	0,270
17,409	531,910	531,3	535,3	0,0	100,6	99,1	0,000	0,175	0,178	118	0,273
17,351	531,921	531,4	535,3	0,0	101,0	99,4	0,000	0,175	0,177	119	0,272
17,591	531,921	531,4	535,3	0,0	99,3	98,1	0,000	0,175	0,177	120	0,276
17,294	531,900	531,4	535,3	0,0	101,1	99,9	0,000	0,175	0,177	121	0,271
17,459	531,908	531,4	535,3	0,0	100,1	98,9	0,000	0,175	0,177	122	0,274
17,050	531,899	531,5	535,3	0,0	102,6	101,2	0,000	0,175	0,177	123	0,268
17,419	531,909	531,5	535,3	0,0	100,4	99,3	0,000	0,175	0,177	124	0,273
17,400	531,914	531,5	535,4	0,0	100,6	99,3	0,000	0,175	0,178	125	0,273
17,288	531,940	531,6	535,4	0,0	100,9	100,0	0,000	0,175	0,178	126	0,271
17,348	531,941	531,5	535,3	0,0	100,9	99,5	0,000	0,175	0,178	127	0,272
17,346	531,966	531,6	535,4	0,0	100,8	99,4	0,000	0,175	0,177	128	0,272
17,335	531,983	531,6	535,4	0,0	100,8	99,5	0,000	0,175	0,177	129	0,272
17,219	532,018	531,7	535,4	0,0	101,3	100,3	0,000	0,175	0,178	130	0,271
17,344	532,039	531,7	535,4	0,0	100,6	99,9	0,000	0,175	0,178	131	0,272
17,506	532,064	531,7	535,5	0,0	100,0	98,6	0,000	0,175	0,178	132	0,275
17,528	532,078	531,7	535,5	0,0	99,6	98,5	0,000	0,175	0,177	133	0,275
17,408	532,082	531,8	535,6	0,0	100,4	99,1	0,000	0,175	0,177	134	0,273
17,522	532,069	531,8	535,6	0,0	99,8	98,4	0,000	0,175	0,177	135	0,275
17,591	532,091	531,8	535,6	0,0	99,3	98,3	0,000	0,175	0,178	136	0,276
17,347	532,093	531,8	535,6	0,0	100,8	99,6	0,000	0,175	0,178	137	0,272
17,344	532,119	531,8	535,6	0,0	100,7	99,3	0,000	0,175	0,177	138	0,272
17,438	532,129	531,8	535,6	0,0	100,2	99,0	0,000	0,175	0,177	139	0,274
17,582	532,134	531,9	535,7	0,0	99,5	98,1	0,000	0,175	0,178	140	0,276
17,408	532,141	531,9	535,7	0,0	100,4	99,2	0,000	0,175	0,177	141	0,273
17,344	532,157	531,9	535,7	0,0	100,6	99,6	0,000	0,175	0,178	142	0,272
17,424	532,178	531,8	535,6	0,0	100,2	98,9	0,000	0,175	0,177	143	0,274
17,589	532,195	531,8	535,6	0,0	99,3	98,1	0,000	0,175	0,177	144	0,276
17,341	532,223	531,9	535,6	0,0	100,8	99,3	0,000	0,175	0,177	145	0,272
17,695	532,246	531,9	535,7	0,0	98,8	97,3	0,000	0,175	0,177	146	0,278

Average	Average	Average	Average								Average
17,64	Inlet +	Inlet +	Inlet +								0,276
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2		
Tunnel	Temp.	Temp.	Temp.	98,24	99,64	98,59	System 1st Hr	System 1	System 2		SQRT
Velocity	Meter 1st Hr	Meter 1	Meter 2	Proportional Rates			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P
				PR1st hour	PR1	PR2				Time	
Ft/Sec	Deg. R	Deg. R	Deg. R	%	%	%	(ft3)	(ft3)	(ft3)	min	(in H2O)2
17,834	531,082	530,0	529,7				0,182	0,192	0,199	0	0,273
17,977	531,082	529,9	529,9	98,5	99,8	99,7	0,182	0,183	0,189	1	0,278
17,922	531,075	529,8	530,0	98,2	99,7	99,2	0,182	0,175	0,179	2	0,278
17,891	531,092	529,7	530,1	98,7	99,9	99,7	0,182	0,175	0,179	3	0,277
17,955	531,105	529,7	530,2	98,4	99,8	99,3	0,182	0,175	0,179	4	0,278
17,597	531,145	529,6	530,3	99,8	101,2	100,8	0,182	0,175	0,179	5	0,273
17,520	531,174	529,6	530,4	99,8	101,5	101,1	0,181	0,175	0,179	6	0,272
17,710	531,253	529,6	530,6	98,6	99,9	99,6	0,181	0,175	0,179	7	0,276
17,750	531,269	529,6	530,7	98,7	99,9	99,4	0,182	0,175	0,178	8	0,276
17,767	531,297	529,6	530,8	98,6	100,2	99,5	0,182	0,175	0,178	9	0,276
17,943	531,346	529,6	530,9	97,6	99,1	98,4	0,182	0,175	0,178	10	0,279
17,828	531,382	529,6	531,0	98,2	99,6	99,1	0,181	0,175	0,178	11	0,277
17,567	531,379	529,6	531,1	99,4	101,1	100,5	0,181	0,175	0,178	12	0,273
17,853	531,438	529,5	531,2	97,6	99,3	98,7	0,181	0,175	0,178	13	0,278
17,682	531,496	529,6	531,4	98,6	100,4	99,7	0,181	0,175	0,178	14	0,275
17,785	531,576	529,7	531,6	99,0	100,2	99,3	0,183	0,175	0,178	15	0,276
17,714	531,593	529,7	531,7	99,0	100,5	99,7	0,182	0,175	0,178	16	0,275
17,568	531,639	529,7	531,8	99,3	101,0	100,2	0,181	0,175	0,178	17	0,273
17,986	531,701	529,7	531,9	97,3	98,8	98,0	0,182	0,175	0,178	18	0,280
17,877	531,764	529,8	532,1	97,9	99,5	98,7	0,182	0,175	0,178	19	0,278
17,746	531,817	529,8	532,2	99,1	100,1	99,2	0,183	0,175	0,178	20	0,276
17,854	531,875	529,9	532,4	97,5	99,2	98,5	0,181	0,175	0,178	21	0,278
17,745	531,912	529,9	532,5	97,8	100,0	99,2	0,180	0,175	0,178	22	0,276
17,685	531,894	529,9	532,7	98,8	100,3	99,5	0,181	0,175	0,178	23	0,275
17,737	531,886	529,9	532,7	98,7	100,0	99,1	0,182	0,175	0,178	24	0,276
17,875	531,984	530,0	532,9	97,4	99,6	98,5	0,181	0,175	0,178	25	0,278
17,516	532,037	530,1	533,0	99,8	101,3	100,5	0,181	0,175	0,178	26	0,272
17,744	532,092	530,1	533,1	98,6	99,9	99,1	0,182	0,175	0,178	27	0,276
17,656	532,094	530,1	533,2	99,3	100,3	99,5	0,182	0,175	0,178	28	0,275
17,746	532,110	530,0	533,2	99,0	99,9	99,1	0,182	0,175	0,178	29	0,276
17,731	532,182	530,0	533,3	97,7	99,9	98,8	0,180	0,175	0,178	30	0,276
17,737	532,246	530,1	533,4	98,8	99,9	99,0	0,182	0,175	0,178	31	0,276
17,450	532,292	530,1	533,4	100,1	101,7	100,7	0,181	0,175	0,178	32	0,271
17,498	532,325	530,1	533,5	99,0	101,2	100,5	0,180	0,175	0,178	33	0,272
17,744	532,427	530,2	533,6	98,3	99,9	98,8	0,181	0,175	0,178	34	0,276
17,614	532,484	530,2	533,7	99,0	100,4	99,5	0,181	0,175	0,177	35	0,274
17,730	532,548	530,2	533,8	98,6	100,1	98,9	0,182	0,175	0,178	36	0,276
17,726	532,589	530,2	533,9	98,0	99,8	98,9	0,181	0,175	0,178	37	0,276
17,840	532,656	530,3	534,0	97,6	99,2	98,0	0,181	0,175	0,178	38	0,278
17,834	532,697	530,3	534,1	96,9	99,1	98,1	0,180	0,175	0,177	39	0,278
17,731	532,763	530,3	534,2	98,1	99,6	98,5	0,181	0,175	0,177	40	0,276
17,596	532,775	530,4	534,2	98,5	100,3	99,2	0,181	0,175	0,177	41	0,274
17,829	532,794	530,4	534,3	97,5	99,1	98,1	0,181	0,175	0,177	42	0,278
17,579	532,802	530,4	534,4	98,5	100,6	99,4	0,181	0,175	0,178	43	0,274
17,772	532,825	530,5	534,5	97,6	99,0	98,0	0,181	0,175	0,177	44	0,277
17,574	532,862	530,6	534,6	98,6	100,4	98,9	0,181	0,175	0,177	45	0,274
17,574	532,887	530,6	534,7	98,6	100,3	99,2	0,181	0,175	0,177	46	0,274
17,687	532,871	530,6	534,8	98,1	99,3	98,3	0,181	0,175	0,177	47	0,276
17,775	532,883	530,7	534,8	97,2	98,9	97,8	0,181	0,175	0,177	48	0,278
17,842	532,890	530,6	534,9	97,0	98,3	97,2	0,181	0,175	0,177	49	0,279
17,666	532,893	530,6	534,8	97,3	99,4	98,4	0,180	0,175	0,177	50	0,276
17,865	532,895	530,6	534,8	96,6	98,1	97,5	0,181	0,175	0,178	51	0,279
17,905	532,892	530,6	534,8	96,6	98,1	97,0	0,181	0,175	0,178	52	0,280
17,835	532,897	530,6	534,9	96,8	98,5	97,3	0,181	0,175	0,177	53	0,279
17,596	532,879	530,5	534,9	98,5	99,7	98,6	0,182	0,175	0,177	54	0,275
17,833	532,864	530,5	534,9	96,9	98,4	97,2	0,181	0,175	0,177	55	0,279
17,536	532,815	530,5	534,9	98,2	100,1	99,0	0,181	0,175	0,177	56	0,274
17,528	532,777	530,6	535,0	98,1	100,0	98,9	0,181	0,175	0,177	57	0,274
17,764	532,794	530,6	535,0	96,8	98,8	97,3	0,181	0,175	0,177	58	0,278
17,533	532,785	530,6	535,0	98,1	100,2	98,9	0,181	0,175	0,177	59	0,274
17,573	532,757	530,6	535,0	98,1	99,5	98,5	0,181	0,175	0,177	60	0,275
17,463	532,605	530,7	535,1	0,0	100,3	99,1	0,000	0,175	0,177	61	0,273
17,754	532,501	530,8	535,3	0,0	98,7	97,3	0,000	0,175	0,177	62	0,278
17,757	532,379	530,8	535,4	0,0	98,6	97,5	0,000	0,175	0,177	63	0,278
17,519	532,281	530,8	535,5	0,0	99,8	98,9	0,000	0,175	0,177	64	0,274
17,344	532,232	530,8	535,5	0,0	101,0	99,8	0,000	0,175	0,177	65	0,271
17,694	532,151	530,8	535,5	0,0	98,7	97,9	0,000	0,175	0,177	66	0,277
17,587	532,110	530,8	535,6	0,0	99,4	98,5	0,000	0,175	0,177	67	0,275
17,632	532,029	530,9	535,7	0,0	99,3	98,1	0,000	0,175	0,177	68	0,276
17,632	532,008	530,9	535,7	0,0	99,0	98,0	0,000	0,175	0,177	69	0,276
17,683	531,943	530,9	535,7	0,0	98,8	97,6	0,000	0,175	0,177	70	0,277
17,806	531,888	530,8	535,8	0,0	98,3	97,2	0,000	0,175	0,177	71	0,279
17,507	531,843	530,8	535,8	0,0	99,9	98,3	0,000	0,175	0,177	72	0,274
17,682	531,835	530,9	535,8	0,0	98,6	97,5	0,000	0,175	0,177	73	0,277
17,620	531,821	530,8	535,7	0,0	99,4	97,8	0,000	0,175	0,177	74	0,276
17,740	531,762	530,8	535,7	0,0	98,4	97,3	0,000	0,175	0,177	75	0,278
17,554	531,742	530,7	535,7	0,0	99,3	98,2	0,000	0,175	0,177	76	0,275
17,436	531,731	530,7	535,7	0,0	100,0	98,9	0,000	0,175	0,177	77	0,273
17,434	531,711	530,7	535,7	0,0	100,0	98,8	0,000	0,175	0,177	78	0,273

17,638	531,712	530,7	535,7	0,0	99,1	97,7	0,000	0,175	0,177	79	0,276
17,376	531,695	530,8	535,8	0,0	100,6	99,2	0,000	0,175	0,177	80	0,272
17,677	531,674	530,8	535,8	0,0	98,9	97,9	0,000	0,175	0,177	81	0,277
17,671	531,663	530,8	535,9	0,0	98,9	97,5	0,000	0,175	0,177	82	0,277
17,489	531,640	530,8	535,9	0,0	99,6	98,4	0,000	0,175	0,177	83	0,274
17,497	531,626	530,8	535,9	0,0	99,8	98,3	0,000	0,175	0,177	84	0,274
17,306	531,589	530,9	535,9	0,0	100,8	99,5	0,000	0,175	0,177	85	0,271
17,424	531,581	530,8	535,9	0,0	99,8	98,7	0,000	0,175	0,177	86	0,273
17,491	531,546	530,8	535,9	0,0	99,8	98,5	0,000	0,175	0,177	87	0,274
17,480	531,537	530,8	535,9	0,0	99,7	98,5	0,000	0,175	0,177	88	0,274
17,606	531,507	530,7	535,9	0,0	98,9	97,8	0,000	0,175	0,177	89	0,276
17,603	531,462	530,8	535,9	0,0	99,1	97,6	0,000	0,175	0,177	90	0,276
17,599	531,473	530,8	535,9	0,0	99,1	97,6	0,000	0,175	0,177	91	0,276
17,598	531,453	530,8	535,9	0,0	99,0	97,6	0,000	0,175	0,177	92	0,276
17,418	531,432	530,8	535,9	0,0	99,9	98,7	0,000	0,175	0,177	93	0,273
17,359	531,402	530,7	535,9	0,0	100,4	99,0	0,000	0,175	0,177	94	0,272
17,538	531,384	530,7	535,9	0,0	99,4	98,0	0,000	0,175	0,177	95	0,275
17,597	531,354	530,7	535,9	0,0	99,0	97,6	0,000	0,175	0,177	96	0,276
17,342	531,337	530,7	535,9	0,0	100,5	99,2	0,000	0,175	0,177	97	0,272
17,476	531,297	530,7	535,8	0,0	99,4	98,4	0,000	0,175	0,177	98	0,274
17,651	531,280	530,6	535,8	0,0	98,8	97,2	0,000	0,175	0,177	99	0,277
17,350	531,252	530,6	535,8	0,0	100,1	99,2	0,000	0,175	0,177	100	0,272
17,691	531,249	530,5	535,7	0,0	98,4	97,2	0,000	0,175	0,177	101	0,278
17,417	531,217	530,5	535,7	0,0	100,1	98,7	0,000	0,175	0,177	102	0,273
17,525	531,200	530,4	535,7	0,0	99,3	97,9	0,000	0,175	0,177	103	0,275
17,712	531,190	530,4	535,7	0,0	98,4	97,1	0,000	0,175	0,177	104	0,278
17,464	531,171	530,4	535,7	0,0	99,5	98,2	0,000	0,175	0,177	105	0,274
17,606	531,145	530,5	535,7	0,0	99,1	97,7	0,000	0,175	0,177	106	0,276
17,470	531,158	530,5	535,6	0,0	99,7	98,3	0,000	0,175	0,177	107	0,274
17,584	531,132	530,4	535,6	0,0	98,8	97,8	0,000	0,175	0,177	108	0,276
17,410	531,132	530,4	535,6	0,0	100,1	98,7	0,000	0,175	0,177	109	0,273
17,446	531,120	530,3	535,5	0,0	99,9	98,4	0,000	0,175	0,177	110	0,274
17,466	531,103	530,3	535,5	0,0	99,6	98,4	0,000	0,175	0,177	111	0,274
17,533	531,099	530,3	535,5	0,0	99,3	98,0	0,000	0,175	0,177	112	0,275
17,452	531,087	530,3	535,5	0,0	99,8	98,4	0,000	0,175	0,177	113	0,274
17,475	531,094	530,3	535,6	0,0	99,8	98,1	0,000	0,175	0,177	114	0,274

Average	Average	Average	Average								Average
17,90	Inlet +	Inlet +	Inlet +								0,280
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2		
Tunnel	Temp.	Temp.	Temp.	98,32	99,65	98,28	System 1st Hr	System 1	System 2		SQRT
Velocity	Meter 1st Hr	Meter 1	Meter 2	Proportional Rates			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P
				PR1st hour	PR1	PR2				Time	
Ft/Sec	Deg. R	Deg. R	Deg. R	%	%	%	(ft3)	(ft3)	(ft3)	min	(in H2O)2
18,160	530,974	529,5	529,1				0,183	0,178	0,181	0	0,277
17,992	530,974	529,6	529,4	100,3	101,9	101,4	0,183	0,177	0,181	1	0,278
17,996	531,078	529,6	529,6	99,0	100,6	99,9	0,183	0,177	0,180	2	0,280
17,923	531,188	529,7	529,8	99,2	100,9	100,2	0,183	0,177	0,180	3	0,279
17,870	531,291	529,7	530,1	99,6	101,2	100,3	0,183	0,177	0,180	4	0,278
17,925	531,431	529,7	530,3	99,3	100,8	100,2	0,183	0,176	0,180	5	0,279
18,059	531,576	529,8	530,5	98,5	100,3	99,3	0,183	0,177	0,180	6	0,281
17,962	531,658	529,8	530,7	99,3	100,8	100,1	0,183	0,176	0,180	7	0,279
17,824	531,691	529,9	530,9	100,0	101,5	100,7	0,183	0,176	0,180	8	0,277
17,824	531,775	529,9	531,0	99,1	101,5	100,6	0,181	0,176	0,180	9	0,277
17,882	531,875	530,0	531,2	99,7	101,3	100,5	0,183	0,176	0,180	10	0,278
17,817	531,979	529,9	531,4	99,8	101,5	100,4	0,183	0,176	0,180	11	0,277
18,050	532,085	529,9	531,6	98,5	100,2	99,3	0,183	0,176	0,180	12	0,281
17,990	532,180	529,9	531,8	98,5	100,5	99,5	0,182	0,176	0,180	13	0,280
18,035	532,268	529,9	532,1	98,2	100,1	99,1	0,182	0,176	0,180	14	0,281
17,864	532,319	529,9	532,2	99,2	101,2	100,0	0,183	0,177	0,179	15	0,278
17,804	532,383	529,9	532,4	99,9	101,4	100,5	0,183	0,176	0,180	16	0,277
17,927	532,458	529,9	532,5	98,9	100,8	99,7	0,182	0,176	0,180	17	0,279
17,861	532,505	530,0	532,7	99,3	101,1	99,7	0,183	0,176	0,179	18	0,278
18,040	532,574	530,0	532,9	98,2	100,4	98,8	0,182	0,177	0,179	19	0,281
17,979	532,644	530,0	533,1	98,6	100,5	99,1	0,183	0,177	0,179	20	0,280
17,976	532,690	530,0	533,2	98,5	100,2	99,1	0,182	0,176	0,179	21	0,280
17,859	532,761	530,1	533,4	99,1	101,2	99,8	0,182	0,176	0,179	22	0,278
17,917	532,785	530,2	533,6	98,8	100,8	99,5	0,182	0,177	0,179	23	0,279
18,033	532,830	530,3	533,7	98,5	100,0	98,8	0,183	0,176	0,179	24	0,281
18,031	532,885	530,3	533,9	98,4	100,1	98,7	0,183	0,176	0,179	25	0,281
17,919	532,969	530,3	534,0	98,9	100,8	99,1	0,182	0,176	0,179	26	0,279
17,870	533,026	530,4	534,1	99,3	101,1	99,7	0,183	0,176	0,179	27	0,278
17,892	533,080	530,4	534,2	99,1	101,4	99,8	0,182	0,176	0,179	28	0,278
17,860	533,154	530,4	534,4	99,2	101,0	99,6	0,183	0,176	0,179	29	0,278
17,799	533,239	530,4	534,5	99,5	101,4	99,7	0,182	0,176	0,179	30	0,277
17,861	533,289	530,4	534,6	99,0	101,2	99,5	0,182	0,176	0,178	31	0,278
17,884	533,337	530,4	534,7	98,5	100,4	99,0	0,182	0,176	0,179	32	0,279
17,979	533,382	530,4	534,8	97,6	99,8	98,4	0,182	0,176	0,179	33	0,281
17,876	533,405	530,5	534,9	98,7	100,4	99,0	0,183	0,176	0,179	34	0,279
17,916	533,411	530,5	535,0	98,0	100,0	98,7	0,182	0,176	0,179	35	0,280
17,703	533,432	530,5	535,0	99,3	101,1	99,6	0,182	0,176	0,179	36	0,277
17,830	533,457	530,5	535,1	97,8	100,1	98,5	0,182	0,176	0,178	37	0,279
17,893	533,463	530,6	535,2	98,0	99,8	98,3	0,182	0,176	0,178	38	0,280
17,988	533,422	530,6	535,2	97,6	99,0	97,6	0,183	0,176	0,178	39	0,282
17,931	533,389	530,7	535,3	97,1	99,4	97,7	0,181	0,176	0,178	40	0,281
17,983	533,364	530,7	535,4	97,2	98,8	97,4	0,182	0,176	0,178	41	0,282
18,110	533,355	530,8	535,4	96,4	98,2	96,5	0,182	0,176	0,178	42	0,284
17,972	533,360	530,8	535,5	97,4	98,9	97,3	0,183	0,176	0,178	43	0,282
17,966	533,379	530,9	535,6	96,8	99,1	97,5	0,182	0,176	0,178	44	0,282
17,783	533,316	531,0	535,7	97,9	99,8	98,3	0,182	0,176	0,179	45	0,279
18,172	533,265	531,1	535,8	95,6	97,7	95,9	0,182	0,176	0,178	46	0,285
17,901	533,272	531,1	535,8	97,2	99,2	97,7	0,182	0,176	0,178	47	0,281
17,666	533,259	531,1	535,8	97,8	100,2	98,6	0,181	0,176	0,178	48	0,277
17,888	533,231	531,1	535,8	97,4	99,0	97,5	0,182	0,176	0,178	49	0,281
17,932	533,206	531,1	535,8	97,6	98,6	97,3	0,183	0,176	0,178	50	0,282
17,823	533,173	531,1	535,8	98,1	99,4	97,8	0,183	0,176	0,178	51	0,280
17,941	533,204	531,1	535,8	96,6	98,7	97,1	0,182	0,176	0,178	52	0,282
17,799	533,186	531,1	535,8	97,6	99,6	97,8	0,182	0,176	0,178	53	0,280
17,914	533,183	531,1	535,8	97,2	98,7	97,5	0,183	0,176	0,178	54	0,281
17,609	533,165	531,1	535,8	98,5	100,5	99,1	0,182	0,176	0,179	55	0,277
17,697	533,105	531,1	535,8	98,0	99,6	98,3	0,182	0,176	0,178	56	0,278
17,910	533,086	531,1	535,8	96,7	98,7	97,0	0,182	0,176	0,178	57	0,282
17,800	533,067	531,1	535,9	97,6	99,2	97,8	0,183	0,176	0,178	58	0,280
18,043	533,068	531,1	536,0	96,4	97,8	96,5	0,183	0,176	0,178	59	0,284
17,792	533,054	531,1	536,0	97,4	99,3	97,7	0,182	0,176	0,178	60	0,280
17,843	532,881	531,1	536,0	0,0	98,8	97,4	0,000	0,176	0,178	61	0,281
17,798	532,750	531,1	536,0	0,0	99,4	97,8	0,000	0,176	0,178	62	0,280
17,857	532,679	531,2	536,0	0,0	99,0	97,4	0,000	0,176	0,178	63	0,281
17,907	532,612	531,2	535,9	0,0	98,6	97,0	0,000	0,176	0,178	64	0,282
17,722	532,552	531,2	535,9	0,0	99,4	98,1	0,000	0,176	0,178	65	0,279
18,060	532,510	531,2	535,8	0,0	97,3	95,8	0,000	0,176	0,178	66	0,284
18,005	532,453	531,1	535,8	0,0	97,8	96,5	0,000	0,176	0,178	67	0,283
17,881	532,432	531,1	535,8	0,0	98,4	96,8	0,000	0,176	0,178	68	0,282
17,910	532,393	531,1	535,7	0,0	98,4	96,8	0,000	0,176	0,178	69	0,282
17,826	532,384	531,1	535,7	0,0	98,6	97,2	0,000	0,176	0,178	70	0,281
17,893	532,359	531,1	535,7	0,0	98,3	96,8	0,000	0,176	0,178	71	0,282
17,673	532,336	531,1	535,6	0,0	99,8	98,2	0,000	0,176	0,178	72	0,278
18,054	532,298	531,1	535,6	0,0	97,4	96,0	0,000	0,176	0,178	73	0,284
17,819	532,272	531,1	535,6	0,0	98,9	97,4	0,000	0,176	0,178	74	0,281
17,766	532,262	531,1	535,7	0,0	99,1	97,7	0,000	0,176	0,179	75	0,280
17,904	532,229	531,1	535,6	0,0	98,2	96,8	0,000	0,176	0,179	76	0,282
18,072	532,206	531,1	535,7	0,0	97,2	95,7	0,000	0,176	0,178	77	0,285
17,816	532,156	531,1	535,6	0,0	98,5	97,2	0,000	0,176	0,178	78	0,281

17,928	532,147	531,1	535,6	0,0	98,0	96,5	0,000	0,176	0,178	79	0,283
17,749	532,125	531,1	535,6	0,0	99,1	97,4	0,000	0,176	0,178	80	0,280
17,867	532,084	531,1	535,7	0,0	98,4	96,9	0,000	0,176	0,178	81	0,282
17,856	532,082	531,1	535,7	0,0	98,4	96,8	0,000	0,176	0,178	82	0,282
17,863	532,052	531,1	535,7	0,0	98,3	96,8	0,000	0,176	0,178	83	0,282
17,747	532,044	531,1	535,7	0,0	99,1	97,4	0,000	0,176	0,178	84	0,280
17,916	532,013	531,1	535,7	0,0	98,0	96,4	0,000	0,176	0,178	85	0,283
17,797	532,014	531,1	535,7	0,0	98,7	97,1	0,000	0,176	0,178	86	0,281

Average	Average	Average	Average								Average
18,79	Inlet +	Inlet +	Inlet +								0,289
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2		
	Temp.	Temp.	Temp.	98,42	96,95	95,46	System 1st Hr	System 1	System 2		SQRT
Velocity	Meter 1st Hr	Meter 1	Meter 2	Proportional Rates			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P
				PR1st hour	PR1	PR2				Time	
Ft/Sec	Deg. R	Deg. R	Deg. R	%	%	%	(ft3)	(ft3)	(ft3)	min	(in H2O)2
18,899	531,803	530,5	530,0				0,184	0,178	0,182	0	0,287
18,658	531,803	530,4	530,2	99,9	98,5	97,7	0,184	0,178	0,182	1	0,286
18,557	531,900	530,4	530,4	100,6	99,2	98,4	0,184	0,177	0,181	2	0,284
18,598	532,067	530,4	530,6	100,3	98,9	97,8	0,184	0,177	0,181	3	0,285
18,648	532,171	530,4	530,8	100,3	99,2	98,2	0,184	0,177	0,181	4	0,285
18,824	532,264	530,4	531,0	99,4	98,2	97,1	0,184	0,177	0,181	5	0,288
18,767	532,417	530,4	531,1	99,7	98,6	97,7	0,184	0,177	0,181	6	0,287
18,779	532,510	530,4	531,3	99,9	98,9	97,8	0,184	0,177	0,181	7	0,287
18,781	532,611	530,4	531,4	99,8	98,7	97,4	0,184	0,178	0,181	8	0,287
18,656	532,719	530,4	531,6	100,3	99,1	98,1	0,184	0,177	0,181	9	0,285
18,791	532,854	530,4	531,7	99,9	98,8	97,4	0,184	0,177	0,181	10	0,287
18,677	532,950	530,5	531,9	100,4	99,3	98,4	0,184	0,177	0,181	11	0,285
18,727	533,049	530,5	532,0	100,0	99,1	97,8	0,184	0,178	0,181	12	0,286
18,844	533,162	530,6	532,2	99,3	98,3	97,2	0,183	0,178	0,181	13	0,288
18,727	533,229	530,6	532,4	99,9	98,8	97,4	0,183	0,177	0,180	14	0,286
18,644	533,276	530,7	532,5	100,5	99,3	98,0	0,184	0,177	0,180	15	0,285
18,700	533,368	530,7	532,7	99,8	98,9	97,6	0,183	0,177	0,181	16	0,286
18,651	533,453	530,8	532,8	100,2	99,1	97,7	0,184	0,177	0,180	17	0,285
18,691	533,526	530,8	533,0	99,8	98,5	97,3	0,184	0,177	0,180	18	0,286
18,929	533,608	530,8	533,2	98,3	97,6	96,3	0,183	0,177	0,180	19	0,290
18,646	533,654	530,9	533,4	100,1	99,2	97,6	0,183	0,177	0,180	20	0,285
18,625	533,696	531,0	533,5	99,9	98,8	97,6	0,183	0,177	0,180	21	0,285
18,282	533,764	531,0	533,7	101,8	100,9	99,5	0,183	0,177	0,180	22	0,280
18,925	533,806	531,1	533,9	98,6	97,5	96,2	0,183	0,177	0,180	23	0,290
18,689	533,917	531,1	534,1	99,6	98,7	97,1	0,183	0,177	0,180	24	0,286
18,978	533,994	531,2	534,2	98,1	97,0	95,7	0,183	0,177	0,180	25	0,291
18,925	534,087	531,2	534,3	98,4	97,2	95,8	0,183	0,177	0,180	26	0,290
18,718	534,130	531,3	534,5	99,1	98,2	96,7	0,183	0,177	0,180	27	0,287
18,807	534,192	531,5	534,6	99,0	98,0	96,4	0,183	0,177	0,180	28	0,288
18,843	534,256	531,5	534,7	98,5	97,6	96,0	0,183	0,177	0,180	29	0,289
18,695	534,345	531,6	534,8	99,2	98,0	96,6	0,183	0,177	0,180	30	0,287
18,844	534,457	531,6	535,0	98,5	97,6	96,0	0,183	0,177	0,180	31	0,289
18,952	534,586	531,7	535,2	97,8	96,8	95,4	0,183	0,177	0,180	32	0,291
19,023	534,748	531,8	535,3	97,2	96,2	94,8	0,183	0,177	0,180	33	0,292
19,032	534,929	531,9	535,5	96,8	96,0	94,3	0,183	0,177	0,179	34	0,292
19,011	534,972	532,0	535,6	97,1	95,9	94,4	0,183	0,177	0,179	35	0,292
19,014	534,962	532,0	535,8	96,9	96,0	94,3	0,183	0,177	0,179	36	0,292
18,887	534,962	532,1	535,8	97,5	96,4	94,8	0,183	0,177	0,179	37	0,291
18,695	534,980	532,1	536,0	98,3	97,4	95,7	0,183	0,177	0,179	38	0,288
18,905	535,014	532,2	536,0	96,9	96,1	94,5	0,183	0,177	0,179	39	0,291
18,867	535,051	532,2	536,1	97,7	96,4	95,0	0,183	0,177	0,180	40	0,290
18,791	535,090	532,3	536,2	97,5	96,8	94,9	0,183	0,177	0,179	41	0,290
18,940	535,077	532,3	536,3	96,7	95,8	94,4	0,183	0,177	0,179	42	0,292
18,764	535,082	532,3	536,4	97,7	96,9	95,1	0,183	0,177	0,179	43	0,289
18,618	535,093	532,4	536,5	98,3	97,5	95,9	0,183	0,177	0,179	44	0,287
18,827	535,098	532,5	536,6	97,1	96,2	94,6	0,183	0,177	0,179	45	0,291
18,778	535,116	532,5	536,6	97,4	96,5	94,8	0,183	0,177	0,179	46	0,290
18,761	535,178	532,5	536,8	97,3	96,5	94,7	0,183	0,177	0,179	47	0,290
18,878	535,230	532,5	536,8	96,7	95,7	94,0	0,183	0,177	0,179	48	0,291
18,818	535,235	532,5	536,8	97,1	96,2	94,4	0,183	0,177	0,179	49	0,291
18,818	535,240	532,5	536,9	97,2	96,1	94,5	0,183	0,177	0,179	50	0,291
18,932	535,235	532,5	536,9	96,4	95,6	93,6	0,183	0,177	0,179	51	0,292
18,887	535,206	532,6	537,0	96,5	95,6	93,8	0,183	0,177	0,179	52	0,292
18,971	535,193	532,6	537,1	96,1	95,0	93,3	0,183	0,177	0,179	53	0,293
18,786	535,230	532,6	537,1	96,8	95,8	94,2	0,183	0,177	0,179	54	0,291
18,771	535,232	532,6	537,2	97,0	95,9	94,3	0,183	0,177	0,179	55	0,290
18,603	535,197	532,7	537,3	97,8	96,7	95,1	0,183	0,177	0,179	56	0,288
18,835	535,187	532,6	537,3	96,5	95,5	93,9	0,183	0,177	0,179	57	0,291
18,770	535,227	532,7	537,3	96,9	95,9	94,3	0,183	0,177	0,179	58	0,290
18,789	535,215	532,7	537,3	96,9	95,7	94,1	0,183	0,177	0,179	59	0,291
18,999	535,256	532,7	537,3	95,7	94,6	93,0	0,183	0,177	0,179	60	0,294
18,719	535,072	532,7	537,3	0,0	96,1	94,5	0,000	0,177	0,179	61	0,290
18,652	534,941	532,7	537,3	0,0	96,4	94,7	0,000	0,177	0,179	62	0,289
18,866	534,866	532,8	537,4	0,0	95,0	93,5	0,000	0,177	0,179	63	0,292
18,932	534,797	532,8	537,3	0,0	94,7	93,3	0,000	0,176	0,179	64	0,293
18,937	534,770	532,7	537,3	0,0	94,8	93,3	0,000	0,176	0,179	65	0,293
18,811	534,756	532,7	537,2	0,0	95,3	93,8	0,000	0,176	0,179	66	0,291
18,858	534,747	532,7	537,2	0,0	95,1	93,4	0,000	0,177	0,179	67	0,292
18,866	534,762	532,7	537,2	0,0	95,0	93,5	0,000	0,177	0,179	68	0,292
18,517	534,751	532,8	537,2	0,0	96,9	95,0	0,000	0,177	0,179	69	0,287
18,690	534,742	532,8	537,1	0,0	96,0	94,3	0,000	0,177	0,179	70	0,290
18,576	534,724	532,8	537,1	0,0	96,5	94,8	0,000	0,177	0,179	71	0,288
18,972	534,712	532,8	537,1	0,0	94,5	93,0	0,000	0,177	0,179	72	0,294
18,857	534,709	532,9	537,1	0,0	95,0	93,4	0,000	0,177	0,179	73	0,292
18,963	534,699	532,9	537,1	0,0	94,4	92,8	0,000	0,177	0,179	74	0,294
18,737	534,705	532,9	537,1	0,0	95,4	94,0	0,000	0,176	0,179	75	0,291
18,851	534,704	532,9	537,1	0,0	95,0	93,5	0,000	0,177	0,179	76	0,292
18,795	534,677	532,9	537,2	0,0	95,3	93,7	0,000	0,177	0,179	77	0,291

APPENDIX 3: Calibration data

TEST DATA PACKAGE

CLIENT	Morso	PROJECT NUMBER	PI-20329
PRODUCT	Wood heater	SAMPLE ID#	QI-20515
MODEL	2B Standard		
STANDARDS	EPA, Method 28R, ASTM E2515-11,		

TEST EQUIPMENT

ITEM	EQUIPMENT TYPE	MANUFACTURER	EQUIPMENT #	CALIBRATION DUE DATE	COMPLIES WITH STANDARD REQUIREMENTS
1	Digital Manometer	Dwyer	EM-006	2025 May	Y
2	Digital Manometer	Dwyer	EM-249	2025 May	Y
3	Data acquisition System	Keithley	EM-147	2025 May	Y
4	analytical scale 200gr.	Ohaus	EM-051	2025 May	Y
5	Weight 2kg	N/A	EM-090	2027 MARS	Y
6	Pitot tube	Dwyer	EM-296	Verif. before use	Y
7	Scale 0-1000lbs Rough Deck	Rice lake	EM-114 / EM-137	2025 September	Y
8	Gas analyzer	Siemen's	EM-118	Verification before use	Y
9	Vacuum gauge	Dwyer	EM-126	2025 May	Y
10	Vacuum gauge	Dwyer	EM-127	2025 May	Y
11	Calibration weight 100mg	Troemer	EM-335	2027-March	y
12	Calibration weight 200g	Troemer	EM-129	2027 March	Y
13	Temperature humidity meter	Fluke	EM-136	2026 January	Y
14	Digital manometer	Dwyer	EM 313	2025 May	Y
15	Measuring tape	Stanley	EM-224	2025 May	Y
16	Chronometer	Extech	EM-175	2026 January	Y
17	Dry gas meter	Shinagawa	EM-178	2025 July	Y
18	Dry gas meter	Shinagawa	EM-179	2025 July	Y
19	Dry gas meter	Shinagawa	EM-318	2025 July	Y
20	Dry gas meter	Am. meter	EM-130	2025 July	Y
21	Calibration gas	Praxair	EM-336	2030	Y
22	Calibration gas	Praxair	EM-338	2030	Y
23	20 ch. card Thermocouple	Keithley	EM-015	2025 June	Y
24	20 ch. card Thermocouple	Keithley	EM-154	2025 June	Y
25	Barometer	Control company	EM 333	2025 June	Y
26	Vane anemometer	Omega	EM-153	2026 January	Y
27	Weight 10kg	N/A	EM-205	2026 MARS	Y
28	Calibration block	Delmhorst	EM-334	2026 January	Y
29	Vacuum gauge	Dwyer	EM-340	2025 May	y



Instrumentation
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Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2024-05-23
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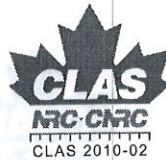
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9106
Address:	695 B rue Gaudette	Required Accuracy:	+/-0.25"H2O
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Digitale
Model #:	MS-321-LCD	Measurement Type:	Pressure
Serial #:	E47U020014	Range:	0-0.5"H2O
Location:	N.A.	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression	Certification #:	2023009508
Serial #:	3330050	Certification Date:	2023-11-23
Certified by:	Alpha Controls	Next Certification:	2024-11-23
Comments:			
Calibrator:	Fluke 744	Certification #:	AC24041903
Serial #:	8180008	Certification Date:	2024-05-09
Certified by:	alpha Controls	Next Certification:	2025-05-09
Comments:			



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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2024-05-23
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CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
0.0000 "H2O	0.000 "H2O	-0.002 "H2O	-0.002 "H2O	-0.002 "H2O	-0.002 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.2500 "H2O	0.250 "H2O	0.247 "H2O	-0.003 "H2O	0.247 "H2O	-0.003 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.5000 "H2O	0.500 "H2O	0.500 "H2O	0.000 "H2O	0.500 "H2O	0.000 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.7500 "H2O	0.750 "H2O	0.750 "H2O	0.000 "H2O	0.750 "H2O	0.000 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
1.0000 "H2O	1.000 "H2O	0.996 "H2O	-0.004 "H2O	0.996 "H2O	-0.004 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.7500 "H2O	0.7500 "H2O	0.750 "H2O	0.000 "H2O	0.750 "H2O	0.000 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.5000 "H2O	0.5000 "H2O	0.500 "H2O	0.000 "H2O	0.500 "H2O	0.000 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.2500 "H2O	0.2500 "H2O	0.247 "H2O	-0.0030 "H2O	0.247 "H2O	-0.0030 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.0000 "H2O	0.0000 "H2O	-0.002 "H2O	-0.0020 "H2O	-0.002 "H2O	-0.0020 "H2O	+/-0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.0000 "H2O	0.0000 V.DC.	0.0021 V.DC.	+0.0021 V.DC.	0.0021 V.DC.	+0.0021 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.2500 "H2O	2.5000 V.DC.	2.4823 V.DC.	-0.0177 V.DC.	2.4823 V.DC.	-0.0177 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.5000 "H2O	5.0000 V.DC.	4.9896 V.DC.	-0.0104 V.DC.	4.9896 V.DC.	-0.0104 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.7500 "H2O	7.5000 V.DC.	7.4895 V.DC.	-0.0105 V.DC.	7.4895 V.DC.	-0.0105 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
1.0000 "H2O	10.0000 V.DC.	9.9608 V.DC.	-0.0392 V.DC.	9.9608 V.DC.	-0.0392 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.7500 "H2O	7.5000 V.DC.	7.4892 V.DC.	-0.0108 V.DC.	7.4892 V.DC.	-0.0108 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.5000 "H2O	5.0000 V.DC.	4.9893 V.DC.	-0.0107 V.DC.	4.9893 V.DC.	-0.0107 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.2500 "H2O	2.5000 V.DC.	2.4825 V.DC.	-0.0175 V.DC.	2.4825 V.DC.	-0.0175 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.0000 "H2O	0.0000 V.DC.	0.0022 V.DC.	+0.0022 V.DC.	0.0022 V.DC.	+0.0022 V.DC.	+/-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						

Environmental Conditions: Temperature: 22 °C Humidity: 47 %RH

Comments:



Instrumentation
Saint-Laurent inc.
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St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

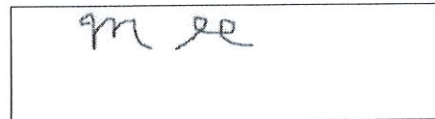
CERTIFICATE #	CE-EM-006 2024-05-23
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CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2024-05-23
Next Calibration:	2025-05-23
Certificate Date:	2024-05-23

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution $k=2$.
- The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
- The results presented in this certificate relate only to objects subject to calibration.
- It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
- The date format used in this certificate is: YYYY-MM-DD.

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



Marc Gingras - Technicien

[Signature] May 28th 2024



Instrumentation
Saint-Laurent^{inc.}
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-015/2 2024-12-02	
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9101
Address:	695 B rue Gaudette	Required Accuracy:	+/- 4.0°F
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Calibration Frequency:(days)	181
INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	Input Type:	Temp
Manufacturer:	Keithley	Output Type:	Digitale
Model #:	7700	Measurement Type:	Temperature
Serial #:	1213648	Range:	Divers
Location:	N/A	Version:	Machine: N.A.
CALIBRATORS SPECIFICATION			
Calibrator:	Thermometre digital 6412	Certification #:	6412-15020243
Serial #:	240300851	Certification Date:	2024-04-09
Certified by:	ITM-Control company	Next Certification:	2026-04-09
Comments:			



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Certified ISO 17025



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Phone: (450) 473-6169
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2024-12-02
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CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
662.0 °F	662.0 °F	662.3 °F	+0.3 °F	662.3 °F	+0.3 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 201 (Flue) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.6 °F	-1.4 °F	480.6 °F	-1.4 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 202 (Right) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.9 °F	-1.1 °F	480.9 °F	-1.1 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 203 (Back) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	481.0 °F	-1.0 °F	481.0 °F	-1.0 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 204 (Bottom) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.5 °F	-1.5 °F	480.5 °F	-1.5 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 205 (Top) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.1 °F	-1.9 °F	480.1 °F	-1.9 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 206 (Left) en type "K" En Loop avec EM-015						
662.0 °F	662.0 °F	664.1 °F	+2.1 °F	664.1 °F	+2.1 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 207 (Catalyst) en type "K" En Loop avec EM-015						
77.0 °F	77.0 °F	76.9 °F	-0.1 °F	76.9 °F	-0.1 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 209 (DGM 1st HR IN) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	-0.2 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 210 (DGM out 1st hr) en type "J" En Loop avec EM-015						
80.0 °F	80.0 °F	79.9 °F	-0.1 °F	79.9 °F	-0.1 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 211 (wetbulb tunnel) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	76.5 °F	-0.5 °F	76.5 °F	-0.5 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 215 (DGM 1 In) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	76.1 °F	-0.9 °F	76.1 °F	-0.9 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 216 (DGM 1 out) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	-0.2 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 217 (DGM 2 In) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	77.1 °F	+0.1 °F	77.1 °F	+0.1 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 218 (DGM 2 out) en type "J" En Loop avec EM-015						
85.0 °F	85.0 °F	84.9 °F	-0.1 °F	84.9 °F	-0.1 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 220 (Filter 1st Hour) en type "T" En Loop avec EM-015						

Environmental Conditions:	Temperature: 20 °C	Humidity: 30 %RH
The calibration was carried out at the client on-site using the method of comparison to the standard measurement.		
Comments:		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE		CALIBRATION CONFORMITY	
Calibration Date:	2024-12-02	Before	After
Next Calibration:	2025-06-01	Compliant: X	X
Certificate Date:	2024-12-02	Non Compliant:	



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(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE # CE-EM-015/2 2024-12-02

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution $k=2$.
- The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
- The results presented in this certificate relate only to objects subject to calibration.
- It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
- The date format used in this certificate is: YYYY-MM-DD.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the accreditation body. Neither CLAS nor the accreditation body guarantee the accuracy of individual calibrations by accredited laboratories.

Benoit Larocque - Tech

Dec 4th 2024

Mettler-Toledo Inc.
Service Division
1900 Polaris Parkway
Columbus, OH, 43240
1-800-METTLER



Accredited by the American Association
for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1788.01

ISO 17025 Accredited
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

Company: Services Polytests
Address: 695-B Rue Gaudette
City: Saint-Jean-Sur-Richelieu Contact: Danick Power
Zip / Postal: J3B 7S7
State / Province: Quebec

Weighing Device

Manufacturer: Ohaus Instrument Type: Weighing Instrument
Model: AR2140 Asset Number: EM-051
Serial No.: M3658329010091 Terminal Model: NA
Building: N/A Terminal Serial No.: NA
Floor: N/A Terminal Asset No.: NA
Room: N/A

Range	Max. Capacity	Readability (d)
1	210 g	0.0001 g

Procedure

Calibration Guideline: ASTM E898 - 20
METTLER TOLEDO Work Instruction: 30260953

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight. As Left 100g, 200g

	Temperature		Humidity		Environmental conditions have been verified to ensure the accuracy of the calibration.
As Found	Start: 20.8 °C	End: 21.8 °C	Start: 49.7 %	End: 45.0 %	
As Left	Start: 22.1 °C	End: 22.3 °C	Start: 44.8 %	End: 44.1 %	

This certificate is issued in accordance with the conditions of accreditation granted by A2LA, which is based on ISO/IEC 17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards.

As Found Calibration Date: 05-11-2024
As Left Calibration Date: 05-11-2024
Issue Date: 05-11-2024
Date of next calibration by customer request: 30-11-2025

Authorized A2LA Signatory:

Vladimir Kriuchkov

Measurement Results

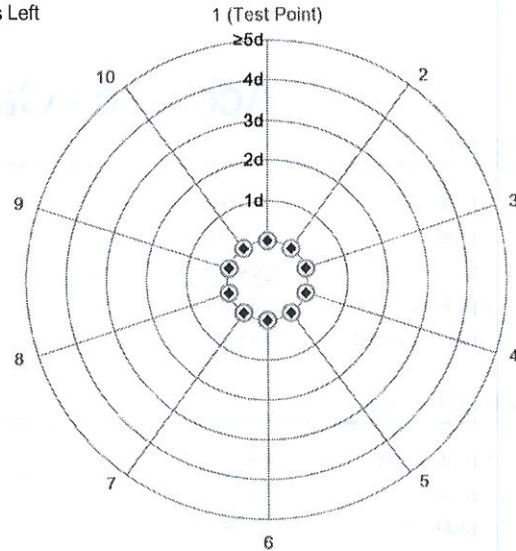
Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0008 g	100.0000 g
2	100.0008 g	100.0000 g
3	100.0008 g	100.0000 g
4	100.0008 g	100.0000 g
5	100.0008 g	100.0000 g
6	100.0008 g	100.0000 g
7	100.0008 g	100.0000 g
8	100.0008 g	100.0000 g
9	100.0008 g	100.0000 g
10	100.0008 g	100.0000 g

Standard Deviation	0.00000 g	0.00000 g
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○ As Found
◆ As Left



The "d" in the graph represents the readability of the range/interval in which the test was performed.

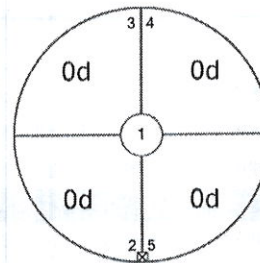
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

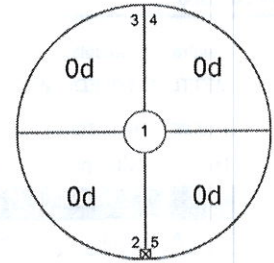
Test Load: 100 g

Position	As Found	As Left
1	0.0000 g	0.0000 g
2	0.0000 g	0.0000 g
3	0.0000 g	0.0000 g
4	0.0000 g	0.0000 g
5	0.0000 g	0.0000 g

Maximum Deviation	0.0000 g	0.0000 g
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As Found



As Left

The "d" in the graph represents the readability of the range/interval in which the test was performed.

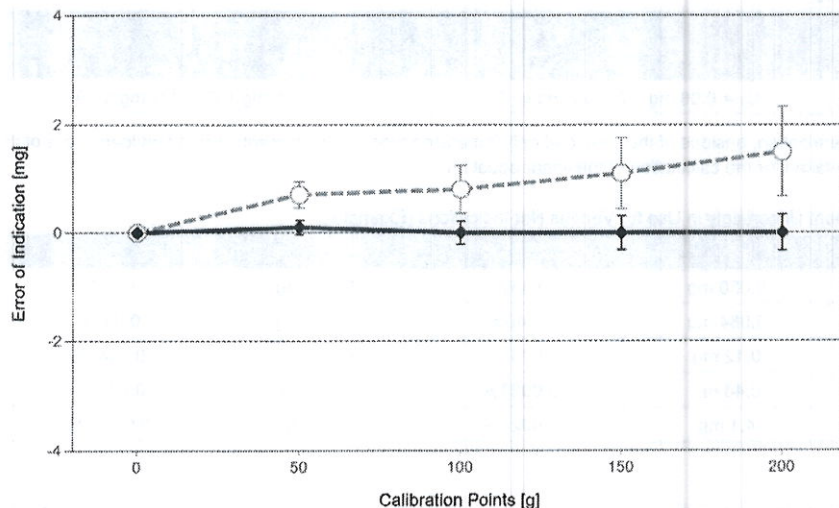
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.06 mg	2
2	50.0000 g	50.0007 g	0.0007 g	0.24 mg	2
3	100.0000 g	100.0008 g	0.0008 g	0.44 mg	2
4	150.0000 g	150.0011 g	0.0011 g	0.66 mg	2
5	200.0001 g	200.0016 g	0.0015 g	0.83 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.06 mg	2
2	50.0000 g	50.0001 g	0.0001 g	0.13 mg	2
3	100.0000 g	100.0000 g	0.0000 g	0.21 mg	2
4	150.0000 g	150.0000 g	0.0000 g	0.31 mg	2
5	200.0001 g	200.0001 g	0.0000 g	0.33 mg	2



○ As Found

◆ As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The expanded measurement uncertainty is reported as the standard measurement uncertainty multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.
The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	2022-VladimirKriuchkov	Date of Issue:	17-07-2024
Certificate Number:	220803092-1	Calibration Due Date:	31-07-2025

Remarks

The balance is ready for use.

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: $4 K$

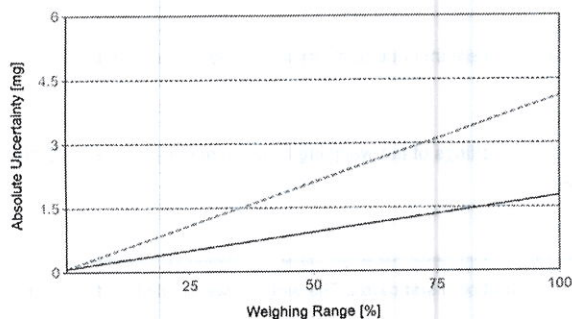
Linearization of Uncertainty Equation

	Range		As Found	As Left
	d	Max		
1	0.0001 g	210 g	$U_1 = 0.08 \text{ mg} + 0.0192 \text{ mg/g} \cdot R$	$U_1 = 0.08 \text{ mg} + 0.00804 \text{ mg/g} \cdot R$

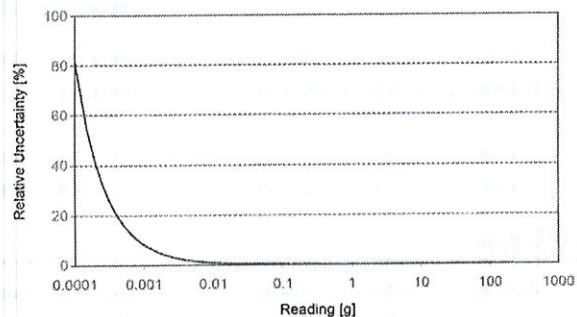
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.0210 g	0.080 mg	0.38%	0.080 mg	0.38%
0.2100 g	0.084 mg	0.040%	0.082 mg	0.039%
2.1000 g	0.12 mg	0.0057%	0.097 mg	0.0046%
21.0000 g	0.48 mg	0.0023%	0.25 mg	0.0012%
210.0000 g	4.1 mg	0.0020%	1.8 mg	0.00084%



As Found



As Left

Custom Tolerance Assessment

Assessment done without considering measurement uncertainty.

One or more of the measurements from the attached calibration certificate were assessed against customer-defined tolerances.

	As Found	As Left
Overall	✗	✓
Repeatability	✓	✓
Eccentricity	✓	✓
Error of Indication	✗	✓

Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0008 g	100.0000 g
2	100.0008 g	100.0000 g
3	100.0008 g	100.0000 g
4	100.0008 g	100.0000 g
5	100.0008 g	100.0000 g
6	100.0008 g	100.0000 g
7	100.0008 g	100.0000 g
8	100.0008 g	100.0000 g
9	100.0008 g	100.0000 g
10	100.0008 g	100.0000 g

Standard Deviation	0.00000 g	0.00000 g
Tolerance	0.00010 g ✓	0.00010 g ✓

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	0.0000 g	0.0000 g
2	0.0000 g	0.0000 g
3	0.0000 g	0.0000 g
4	0.0000 g	0.0000 g
5	0.0000 g	0.0000 g

Maximum Deviation	0.0000 g	0.0000 g
Tolerance	0.0003 g ✓	0.0003 g ✓

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Tolerance	
1	0.0000 g	0.0000 g	0.0000 g	0.0001 g	✓
2	50.0000 g	50.0007 g	0.0007 g	0.0002 g	✗
3	100.0000 g	100.0008 g	0.0008 g	0.0004 g	✗
4	150.0000 g	150.0011 g	0.0011 g	0.0006 g	✗
5	200.0001 g	200.0016 g	0.0015 g	0.0004 g	✗

As Left

	Reference Value	Indication	Error of Indication	Tolerance	
1	0.0000 g	0.0000 g	0.0000 g	0.0001 g	✓
2	50.0000 g	50.0001 g	0.0001 g	0.0002 g	✓
3	100.0000 g	100.0000 g	0.0000 g	0.0004 g	✓
4	150.0000 g	150.0000 g	0.0000 g	0.0006 g	✓
5	200.0001 g	200.0001 g	0.0000 g	0.0004 g	✓



5 NOV 2024

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-223
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	Calibration date :	04-03-2022

Technician:
Coutu, Daniel

David Llorens

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	Date approved :	04-03-2022
Precision class :	ASTM 6	Next Calibration :	04-03-2027
Density :	7.95g/cm ³	CCN accreditation # :	668
Identification (if unique) :	EM-090	CLAS Certification # :	2010-01

Test conditions :	Temp °C: 21.05	kPa Pressure: 102.3	Humidity: 49.4
--------------------------	----------------	---------------------	----------------

NOTES:

For weight calibration, we use the procedure "Comparaison individuelle" PDL-09-MG-001 and the procedure "Détermination des incertitudes" PDL-09-MG-002. This certificate cannot be copied without written approval from Dispersion Laboratory. The results presented in these pages relate only to objects subjected to calibration.

REMARKS:

March 2022

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-223
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	CCN Accreditation # :	668
		CLAS Certification # :	2010-01
		Precision class :	ASTM 6
		Calibration date :	04-03-2022
Mass :	2 kg	Follow-up date :	04-03-2027

CALIBRATION RESULTS, CONVENTIONAL MASS:

[illegible]

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-223
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	CCN Accreditation # :	668
		CLAS Certification # :	2010-01
		Precision class :	ASTM 6
		Calibration date :	04-03-2022
Mass :	2 kg	Follow-up date :	04-03-2027

CALIBRATION RESULTS, CORRECTIONS:

[illegible]

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

BALANCES

The following balances are used for calibration purposes :

> 5 kg to 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg to 5 kg :	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g to 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g to 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

We are also using these balances in our automated procedure :

> 200 g to 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Our balances are periodically verified, according to our PDL-11-MG-001 control procedure.

UNCERTAINTIES:

The following uncertainties exist :

1. *Uncertainty associated with the weighting process.*
2. *Uncertainty associated with air density.*
3. *Uncertainty associated with the measurement standard.*
4. *Uncertainty associated with the density of the mass being calibrated.*

The uncertainty of the weighing process includes long-term reproducibility.

Uncertainties specified in this report are expanded uncertainties representing a confidence level of approximately 95% obtained by multiplying the combined standard uncertainty by a coverage factor of $k = 2$. For more detailed information refer to the GUM (Guide to the Expression of Uncertainty in Measurement, 1995 Edition)

TRACEABILITY

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and their traceability to recognized national measurement standards and to the International System of Units (SI). This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither the CLAS nor the SCC guarantees the accuracy of individual calibration by accredited laboratories.

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

USED REFERENCES

Item	Serial #	Manufacturer	Calibration date	Due date
300g Labo	96-0888-50-2	Denver Instrument Company	01-10-2020	31-03-2022
1kg-1mg Labo	MT-01	Mettler Toledo	01-10-2020	31-03-2022
2kg Labo	96-0888-50-3	Denver Instrument Company	01-10-2020	31-03-2022
1kg Labo	96-088850-1	Denver Instrument Company	01-10-2020	31-03-2022
5kg Labo	129099	Mettler Toledo	01-10-2020	31-03-2022
10kg Labo	DI000G991	Dispersion	23-03-2021	31-03-2022
20kg Labo	69976	Mettler Toledo	06-10-2021	31-10-2022
1 mg-10kg	4000028011	Troemner	15-10-2021	31-10-2022
2kg Labo	129098	Mettler Toledo	01-10-2020	31-03-2022

ENVIRONMENTAL CONDITIONS

Item	Serial #	Manufacturer	Calibration date	Due date
THE004	107080	Control Company	04-03-2021	31-03-2022

Mettler-Toledo Inc.
Service Division
1900 Polaris Parkway
Columbus, OH 43240
1-800-METTLER



Accredited by the American Association
for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1902.01

ISO 17025 Registered
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

Company: Services Polytests
Address: 695-B Rue Gaudette
City: Saint-Jean-Sur-Richelieu Contact: Danick Power
Zip / Postal: J3B 7S7
State / Province: Quebec

Weighing Device

Manufacturer: RICE LAKE Instrument Type: Weighing Instrument
Model: 4X4HP-10K Asset Number: EM-114 EM-137
Serial No.: C18395 Terminal Model: IQ+355
Building: N/A Terminal Serial No.: 164851
Floor: N/A Terminal Asset No.: N/A
Room: N/A

Range	Max. Capacity	Readability (d)
1	400 kg	0.05 kg

Procedure

Calibration Guideline: ASTM E898 - 20
METTLER TOLEDO Work Instruction: 30260953

This calibration certificate including procedures and uncertainty estimation also complies with EURAMET cg-18 v 4.0.

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight.

The calibration was agreed with the user below the maximum capacity of the balance.

	Temperature		Humidity	
As Found	Start: 21.0 °C	End: 21.0 °C	Start: 61.2 %	End: 61.2 %
As Left	Start: 21.0 °C	End: 21.0 °C	Start: 61.2 %	End: 61.2 %

Environmental conditions have been verified to ensure the accuracy of the calibration.

This certificate is issued in accordance with the conditions of accreditation granted by A2LA, which is based on ISO/IEC 17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards.

As Found Calibration Date: 11-09-2024
As Left Calibration Date: 11-09-2024
Issue Date: 12-09-2024
Requested Next Calibration Date: 30-09-2025

Authorized A2LA Signatory:

Angel Estrella Gonzalez

[Signature]
16 sept 2024

Measurement Results

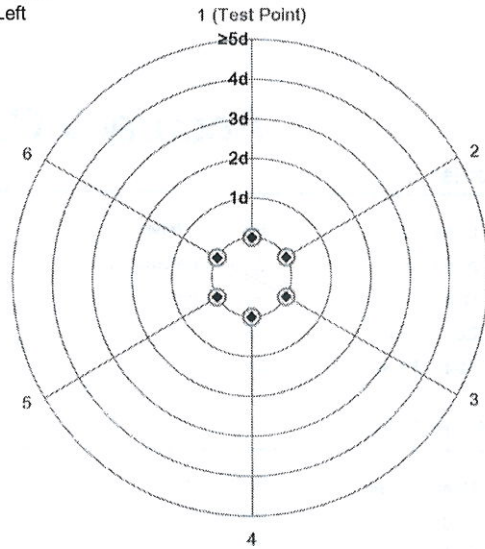
Repeatability

Test Load: 70 kg

	As Found	As Left
1	69.95 kg	70.00 kg
2	69.95 kg	70.00 kg
3	69.95 kg	70.00 kg
4	69.95 kg	70.00 kg
5	69.95 kg	70.00 kg
6	69.95 kg	70.00 kg

Standard Deviation	0.000 kg	0.000 kg
--------------------	----------	----------

○ As Found
◆ As Left



The "d" in the graph represents the readability of the range/interval in which the test was performed.

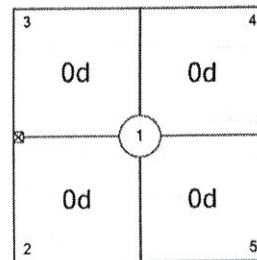
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

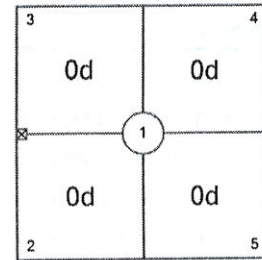
Test Load: 50 kg

Position	As Found	As Left
1	49.95 kg	50.00 kg
2	49.95 kg	50.00 kg
3	49.95 kg	50.00 kg
4	49.95 kg	50.00 kg
5	49.95 kg	50.00 kg

Maximum Deviation	0.00 kg	0.00 kg
-------------------	---------	---------



As Found



As Left

The "d" in the graph represents the readability of the range/interval in which the test was performed.

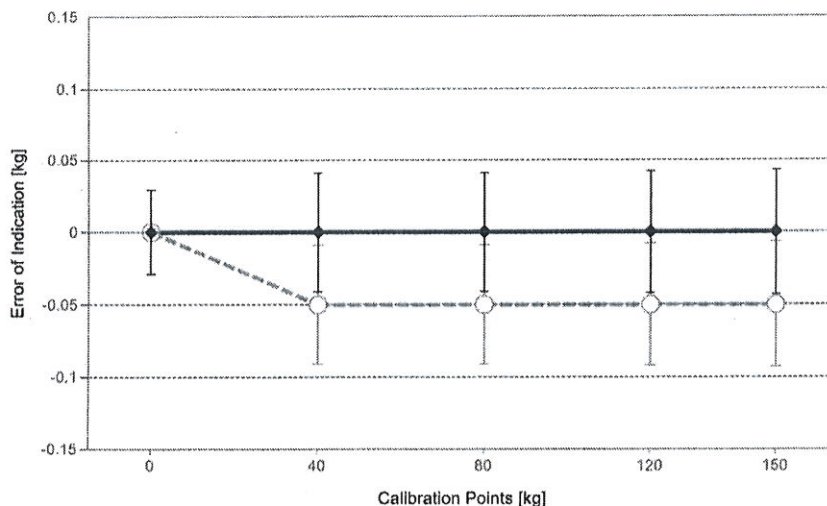
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	40 kg	39.95 kg	-0.05 kg	0.041 kg	2
3	80 kg	79.95 kg	-0.05 kg	0.041 kg	2
4	120 kg	119.95 kg	-0.05 kg	0.042 kg	2
5	150 kg	149.95 kg	-0.05 kg	0.043 kg	2
6	0 kg	0.00 kg	0.00 kg	0.029 kg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	40 kg	40.00 kg	0.00 kg	0.041 kg	2
3	80 kg	80.00 kg	0.00 kg	0.041 kg	2
4	120 kg	120.00 kg	0.00 kg	0.042 kg	2
5	150 kg	150.00 kg	0.00 kg	0.043 kg	2
6	0 kg	0.00 kg	0.00 kg	0.029 kg	2



○ As Found

◆ As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to ASTM E898 and EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated. The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML M1

Weight Set No.:	57071	Date of Issue:	10-01-2024
Certificate Number:	220736435-1	Calibration Due Date:	10-01-2025

Weight Set 2: OIML M1

Weight Set No.:	T01 à T50 (20 kg)	Date of Issue:	20-03-2024
Certificate Number:	1411302	Calibration Due Date:	20-03-2025

Remarks

N/A

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $10.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 21 K

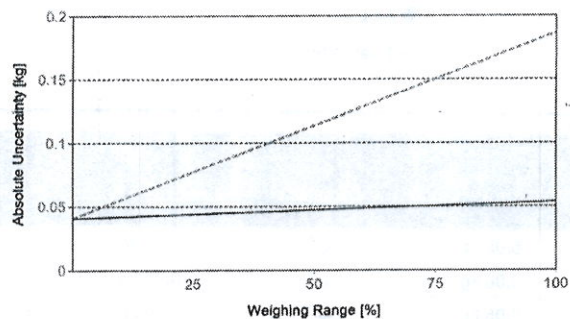
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.05 kg	150 kg	$U_1 = 41 \text{ g} + 0.973 \text{ g/kg} \cdot R$	$U_1 = 41 \text{ g} + 0.0863 \text{ g/kg} \cdot R$

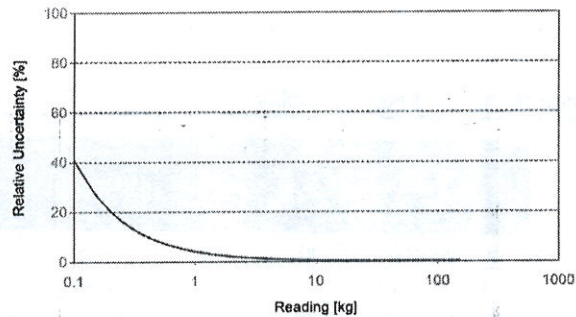
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
1.50 kg	0.042 kg	2.8%	0.041 kg	2.7%
15.00 kg	0.056 kg	0.37%	0.042 kg	0.28%
30.00 kg	0.070 kg	0.23%	0.044 kg	0.15%
75.00 kg	0.11 kg	0.15%	0.047 kg	0.063%
150.00 kg	0.19 kg	0.12%	0.054 kg	0.036%



As Found



As Left

Handbook 44 Tolerance Assessment(Maintenance)

Assessment done without considering measurement uncertainty.

The measurements from the attached calibration certificate were assessed against the Tolerances defined by NIST Handbook 44.

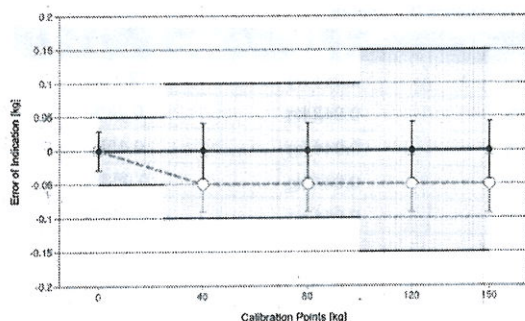
The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

Overall **As Found** ✓ **As Left** ✓

✓ = Passed
✗ = Failed

Weighing Device

Range	Max. Capacity	Readability (d)	Verification Scale Interval (e)	Class
1	400 kg	0.05 kg	0.05 kg	III



Tolerances according to NIST Handbook 44

Test Load		Tolerance
From	To	
0.00 kg	0.00 kg	0.0125 kg
0.05 kg	25.00 kg	0.05 kg
25.05 kg	100.00 kg	0.1 kg
100.05 kg	150.00 kg	0.15 kg

○ As Found

◆ As Left

— Tolerance

Eccentricity and Repeatability

Test	Test Load	Tolerance	As Found		As Left	
			Max. Error / Range	Result	Max. Error / Range	Result
Eccentricity (Max. Error)	50 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
Eccentricity (Range)	50 kg	0.1 kg	0.00 kg	✓	0.00 kg	✓
Repeatability (Max. Error)	70 kg	0.1 kg	0.05 kg	✓	0.00 kg	✓
Repeatability (Range)	70 kg	0.10 kg	0.00 kg	✓	0.00 kg	✓

Max. Error: Maximum of the absolute values of the individual errors.

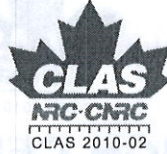
Range: Difference between largest and smallest measurement value.

Error of Indication

	Reference Value	Tolerance	As Found		As Left	
			Error of Indication	Result	Error of Indication	Result
1	0 kg	0.05 kg	0.00 kg	✓	0.00 kg	✓
2	40 kg	0.10 kg	-0.05 kg	✓	0.00 kg	✓
3	80 kg	0.10 kg	-0.05 kg	✓	0.00 kg	✓
4	120 kg	0.15 kg	-0.05 kg	✓	0.00 kg	✓
5	150 kg	0.15 kg	-0.05 kg	✓	0.00 kg	✓
6	0 kg	0.05 kg	0.00 kg	✓	0.00 kg	✓



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



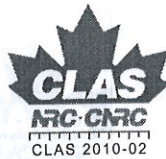
80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-126 2024-05-23	
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9106
Address:	695 B rue Gaudette	Required Accuracy:	+/- 1"Hg
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Calibration Frequency:(days)	365
INSTRUMENT SPECIFICATION			
Instrument Type:	Pressure Gauge	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Digitale
Model #:	DPG200	Measurement Type:	Pressure
Serial #:	N.A.	Range:	0-28"Hg
Location:	N.A.	Version:	Machine: N.A.
CALIBRATORS SPECIFICATION			
Calibrator:	Crystal XP2i 300	Certification #:	2023007594
Serial #:	866756	Certification Date:	2023-09-22
Certified by:	Alpha Controls	Next Certification:	2024-09-22
Comments:			
Calibrator:	Fluke 744	Certification #:	AC24041903
Serial #:	8180008	Certification Date:	2024-05-09
Certified by:	alpha Controls	Next Certification:	2025-05-09
Comments:			



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-126 2024-05-23					
CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
0.00 "Hg	0.00 "Hg	0.19 "Hg	+0.19 "Hg	0.19 "Hg	+0.19 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-7.50 "Hg	-7.50 "Hg	-7.42 "Hg	+0.08 "Hg	-7.42 "Hg	+0.08 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-15.00 "Hg	-15.00 "Hg	-15.04 "Hg	-0.04 "Hg	-15.04 "Hg	-0.04 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-22.50 "Hg	-22.50 "Hg	-22.65 "Hg	-0.15 "Hg	-22.65 "Hg	-0.15 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-28.00 "Hg	-28.00 "Hg	-28.50 "Hg	-0.50 "Hg	-28.50 "Hg	-0.50 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-22.50 "Hg	-22.50 "Hg	-22.87 "Hg	-0.37 "Hg	-22.87 "Hg	-0.37 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-15.00 "Hg	-15.00 "Hg	-15.04 "Hg	-0.04 "Hg	-15.04 "Hg	-0.04 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-7.50 "Hg	-7.50 "Hg	-7.42 "Hg	+0.08 "Hg	-7.42 "Hg	+0.08 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-7.50 "Hg	-7.50 "Hg	-7.42 "Hg	+0.08 "Hg	-7.42 "Hg	+0.08 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
0.00 "Hg	10.0000 V.DC.	10.0963	+0.0963 V.DC.	10.0963	+0.0963 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-7.50 "Hg	8.0000 V.DC.	8.0805 V.DC.	+0.0805 V.DC.	8.0805 V.DC.	+0.0805 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-15.00 "Hg	6.0000 V.DC.	6.0539 V.DC.	+0.0539 V.DC.	6.0539 V.DC.	+0.0539 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-22.50 "Hg	4.0000 V.DC.	4.0068 V.DC.	+0.0068 V.DC.	4.0068 V.DC.	+0.0068 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-28.00 "Hg	2.5333 V.DC.	2.5532 V.DC.	+0.0199 V.DC.	2.5532 V.DC.	+0.0199 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-22.50 "Hg	4.0000 V.DC.	4.0065 V.DC.	+0.0065 V.DC.	4.0065 V.DC.	+0.0065 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-22.50 "Hg	4.0000 V.DC.	4.0065 V.DC.	+0.0065 V.DC.	4.0065 V.DC.	+0.0065 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-22.50 "Hg	4.0000 V.DC.	4.0065 V.DC.	+0.0065 V.DC.	4.0065 V.DC.	+0.0065 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-22.50 "Hg	4.0000 V.DC.	4.0065 V.DC.	+0.0065 V.DC.	4.0065 V.DC.	+0.0065 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
Environmental Conditions: Temperature: 22 °C Humidity: 47 %RH							
Comments:							

5F09106

Version: 2024.04.05



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

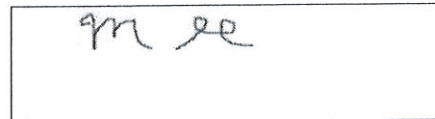
CERTIFICATE #	CE-EM-126 2024-05-23
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CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2024-05-23
Next Calibration:	2025-05-23
Certificate Date:	2024-05-23

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution $k=2$.
- The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
- The results presented in this certificate relate only to objects subject to calibration.
- It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
- The date format used in this certificate is: YYYY-MM-DD.

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.

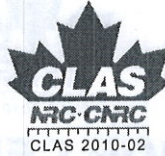


Marc Gingras - Technicien

[Signature] 28 Mai 2024



Instrumentation
Saint-Laurent Inc.
Certified ISO 17025



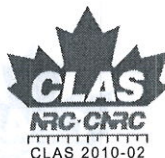
80 rue de la montagne
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Phone: (450) 473-6169
Fax: (450) 473-5207
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CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-127 2024-05-23	
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9106
Address:	695 B rue Gaudette	Required Accuracy:	+/- 1"Hg
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Calibration Frequency:(days)	365
INSTRUMENT SPECIFICATION			
Instrument Type:	Pressure Gauge	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Digitale
Model #:	DPG200	Measurement Type:	Pressure
Serial #:	N.A.	Range:	0-28"Hg
Location:	N.A.	Version:	Machine: N.A.
CALIBRATORS SPECIFICATION			
Calibrator:	Crystal XP2i 300	Certification #:	2023007594
Serial #:	866756	Certification Date:	2023-09-22
Certified by:	Alpha Controls	Next Certification:	2024-09-22
Comments:			
Calibrator:	Fluke 744	Certification #:	AC24041903
Serial #:	8180008	Certification Date:	2024-05-09
Certified by:	alpha Controls	Next Certification:	2025-05-09
Comments:			



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



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(Québec), J0N 1M0
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Fax: (450) 473-5207
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-127 2024-05-23
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CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-7.50 "Hg	-7.50 "Hg	-7.48 "Hg	+0.02 "Hg	-7.48 "Hg	+0.02 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-15.00 "Hg	-15.00 "Hg	-15.01 "Hg	-0.01 "Hg	-15.01 "Hg	-0.01 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-22.50 "Hg	-22.50 "Hg	-22.48 "Hg	+0.02 "Hg	-22.48 "Hg	+0.02 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-28.00 "Hg	-28.00 "Hg	-28.01 "Hg	-0.01 "Hg	-28.01 "Hg	-0.01 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-22.50 "Hg	-22.50 "Hg	-22.48 "Hg	+0.02 "Hg	-22.48 "Hg	+0.02 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-15.00 "Hg	-15.00 "Hg	-15.01 "Hg	-0.01 "Hg	-15.01 "Hg	-0.01 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
-7.50 "Hg	-7.50 "Hg	-7.48 "Hg	+0.02 "Hg	-7.48 "Hg	+0.02 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+/- 1.0 "Hg	± 0.5 "Hg
Compliant	Verification of the indicator						
0.00 "Hg	10.0000 V.DC.	10.0048	+0.0048 V.DC.	10.0048	+0.0048 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-7.50 "Hg	8.0000 V.DC.	8.0248 V.DC.	+0.0248 V.DC.	8.0248 V.DC.	+0.0248 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-15.00 "Hg	6.0000 V.DC.	6.0114 V.DC.	+0.0114 V.DC.	6.0114 V.DC.	+0.0114 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-22.50 "Hg	4.0000 V.DC.	4.0157 V.DC.	+0.0157 V.DC.	4.0157 V.DC.	+0.0157 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-28.00 "Hg	2.5333 V.DC.	2.5300 V.DC.	-0.0033 V.DC.	2.5300 V.DC.	-0.0033 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-22.50 "Hg	4.0000 V.DC.	4.0136 V.DC.	+0.0136 V.DC.	4.0136 V.DC.	+0.0136 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-15.00 "Hg	6.0000 V.DC.	6.0144 V.DC.	+0.0144 V.DC.	6.0144 V.DC.	+0.0144 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
-7.50 "Hg	8.0000 V.DC.	8.0208 V.DC.	+0.0208 V.DC.	8.0208 V.DC.	+0.0208 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.00 "Hg	10.0000 V.DC.	10.068 V.DC.	+0.0680 V.DC.	10.068 V.DC.	+0.0680 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						

Environmental Conditions:	Temperature: 22 °C	Humidity: 47 %RH
Comments:		



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CALIBRATION CERTIFICATE

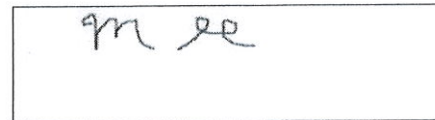
CERTIFICATE #	CE-EM-127 2024-05-23
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CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2024-05-23
Next Calibration:	2025-05-23
Certificate Date:	2024-05-23

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
- The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
- The results presented in this certificate relate only to objects subject to calibration.
- It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
- The date format used in this certificate is: YYYY-MM-DD.

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



Marc Gingras - Technicien

[Signature] 28 May 2024

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-221
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	Calibration date :	04-03-2022

Technician:
Coutu, Daniel

David Llorens

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	Date approved :	04-03-2022
Precision class :	ASTM 1	Next Calibration :	04-03-2027
Density :	7.95g/cm ³	CCN accreditation # :	668
Identification (if unique) :	1000026013	CLAS Certification # :	2010-01

Test conditions :	Temp °C:	21.05	kPa Pressure:	102.3	Humidity:	49.4
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NOTES:

For weight calibration, we use the procedure "Comparaison individuelle" PDL-09-MG-001 and the procedure "Détermination des incertitudes" PDL-09-MG-002. This certificate cannot be copied without written approval from Dispersion Laboratory. The results presented in these pages relate only to objects subjected to calibration.

REMARKS:

March 2022

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-221
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	CCN Accreditation # :	668
		CLAS Certification # :	2010-01
		Precision class :	ASTM 1
		Calibration date :	04-03-2022
Mass :	200 g	Follow-up date :	04-03-2027

CALIBRATION RESULTS, CONVENTIONAL MASS:

[illegible]

*Applicable only for adjusted masses **Falls outside of the specified class

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-221
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	CCN Accreditation # :	668
		CLAS Certification # :	2010-01
		Precision class :	ASTM 1
		Calibration date :	04-03-2022
Mass :	200 g	Follow-up date :	04-03-2027

CALIBRATION RESULTS, CORRECTIONS:

[illegible]

*Applicable only for adjusted masses **Falls outside of the specified class

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

BALANCES

The following balances are used for calibration purposes :

> 5 kg to 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg to 5 kg :	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g to 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g to 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

We are also using these balances in our automated procedure :

> 200 g to 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Our balances are periodically verified, according to our PDL-11-MG-001 control procedure.

UNCERTAINTIES:

The following uncertainties exist :

1. *Uncertainty associated with the weighting process.*
2. *Uncertainty associated with air density.*
3. *Uncertainty associated with the measurement standard.*
4. *Uncertainty associated with the density of the mass being calibrated.*

The uncertainty of the weighing process includes long-term reproducibility.

Uncertainties specified in this report are expanded uncertainties representing a confidence level of approximately 95% obtained by multiplying the combined standard uncertainty by a coverage factor of $k = 2$. For more detailed information refer to the GUM (Guide to the Expression of Uncertainty in Measurement, 1995 Edition)

TRACEABILITY

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and their traceability to recognized national measurement standards and to the International System of Units (SI). This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither the CLAS nor the SCC guarantees the accuracy of individual calibration by accredited laboratories.

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

USED REFERENCES

Item	Serial #	Manufacturer	Calibration date	Due date
300g Labo	96-0888-50-2	Denver Instrument Company	01-10-2020	31-03-2022
1kg-1mg Labo	MT-01	Mettler Toledo	01-10-2020	31-03-2022
2kg Labo	96-0888-50-3	Denver Instrument Company	01-10-2020	31-03-2022
1kg Labo	96-088850-1	Denver Instrument Company	01-10-2020	31-03-2022
5kg Labo	129099	Mettler Toledo	01-10-2020	31-03-2022
10kg Labo	DI000G991	Dispersion	23-03-2021	31-03-2022
20kg Labo	69976	Mettler Toledo	06-10-2021	31-10-2022
1 mg-10kg	4000028011	Troemner	15-10-2021	31-10-2022
2kg Labo	129098	Mettler Toledo	01-10-2020	31-03-2022

ENVIRONMENTAL CONDITIONS

Item	Serial #	Manufacturer	Calibration date	Due date
THE004	107080	Control Company	04-03-2021	31-03-2022

CERTIFICAT D'ÉTALONNAGE # 24942

Date d'étalonnage : 2025-01-06

Date d'émission du certificat : 2025-01-09

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Étalonnage d'un
Débitmètre à déplacement positif American Meter Company DTM-200A S/N : 99A274209

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols qui est conforme à la norme ISO/IEC 17025: 2017, à la norme ISO 9001 – 2015 ainsi qu'à toutes autres exigences de qualité définies dans la description d'achat des clients. Les résultats ne sont valides que pour l'objet soumis à l'essai ou à l'étalonnage. Si applicable, la règle de décision est décrite au certificat.

TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

ÉTALONNAGE DE MATÉRIEL DE MESURE ET D'ESSAI

Pour connaître la portée de mesurage du laboratoire d'étalonnage, veuillez consulter la page Web du Réseau canadien d'étalonnage du Conseil national de recherches du Canada. Ce laboratoire a été accrédité par le Conseil canadien des normes dans le cadre du programme du Service d'évaluation des laboratoires d'étalonnage (CLAS) et figure à : nrc.canada.ca.

Le présent document fait partie du certificat d'accréditation remis par le Conseil canadien des normes (CCN) à Polycontrols. La version originale est affichée dans le répertoire des organismes de certification accrédités par le CCN sur le site Web du CCN au www.ccn.ca.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
	Lectures Initiales = Lectures finales, aucun ajustement
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 6 mois


Bernard Poirier
Métrologiste


Responsable du laboratoire

Certificat d'étalonnage # 24942

Numéro de série:	99A274209	Station de mesure:	3
Date d'étalonnage:	2025-01-06	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-130	Règle de décision:	Méthode #3

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500371423	2025-02-13
Fluke molbloc_120 slpm	2E2-S	237	1500373170	2025-03-07
Fluke molbox1+	Molbox1+	2089	1500373373	2025-03-11
RTD Mist	M22	3061002	2024005919	2025-07-12
Module 44.5 PSI avec Baro 163671	Module 30	160659	2024004347	2025-05-22

Spécifications finales de l'appareil
Condition d'étalonnage

Gaz	Air	Gaz	Air
Température d'opération	20 °C	Température ambiante	21 °C
Pression à l'entrée		Pression ambiante	1015.48 mbar
Pression à la sortie		Orientation	Verticale
Température de référence		Élastomère	
Pression de référence		Valve	
Étendue d'échelle	0-200 ACFH		
Signal de sortie	Afficheur		
Alimentation			
Tolérance	±2 %O.R.		

Lectures finales

Débit du test ACFH	Instrument en test ft³	Valeurs mesurées			Référence calculée ft³	Erreur calculée ft³	Tolérance acceptable ft³	Incertitude k = 2 ft³	TUR
		Pression PSIA	Température °C	Référence ft³					
10.4624	1.740	14.736	21.10	1.746	1.741	-0.001	0.035	0.008	>4
118.8765	19.970	14.814	21.06	19.950	19.787	0.183	0.396	0.049	>4
197.5565	33.110	14.945	20.82	33.490	32.899	0.211	0.658	0.081	>4



POLYCONTROLS

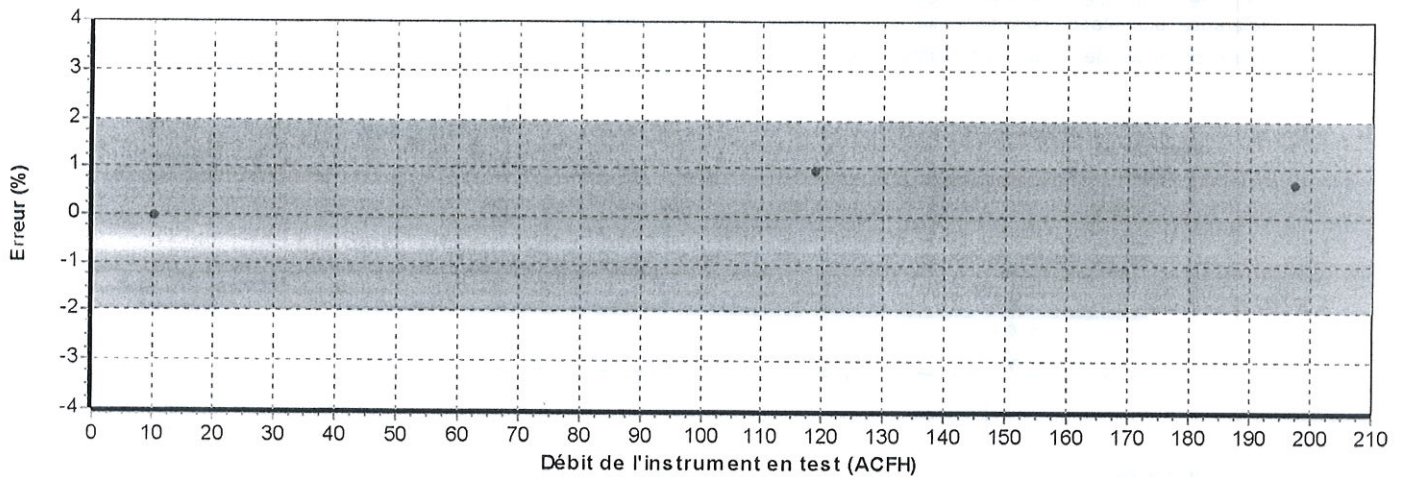


Certificat d'étalonnage # 24942

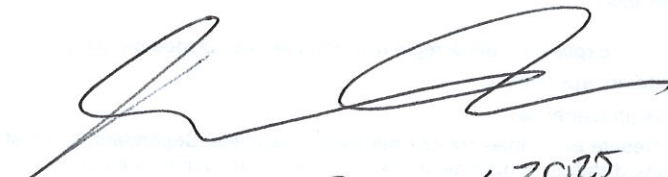
Numéro de série: 99A274209
Date d'étalonnage: 2025-01-06
Identification de l'instrument: EM-130

Station de mesure: 3
Procédure: POS-CAL-005
Règle de décision: Méthode #3

Résultats finaux



Voir l'annexe pour la règle de décision


13 JAN 2025

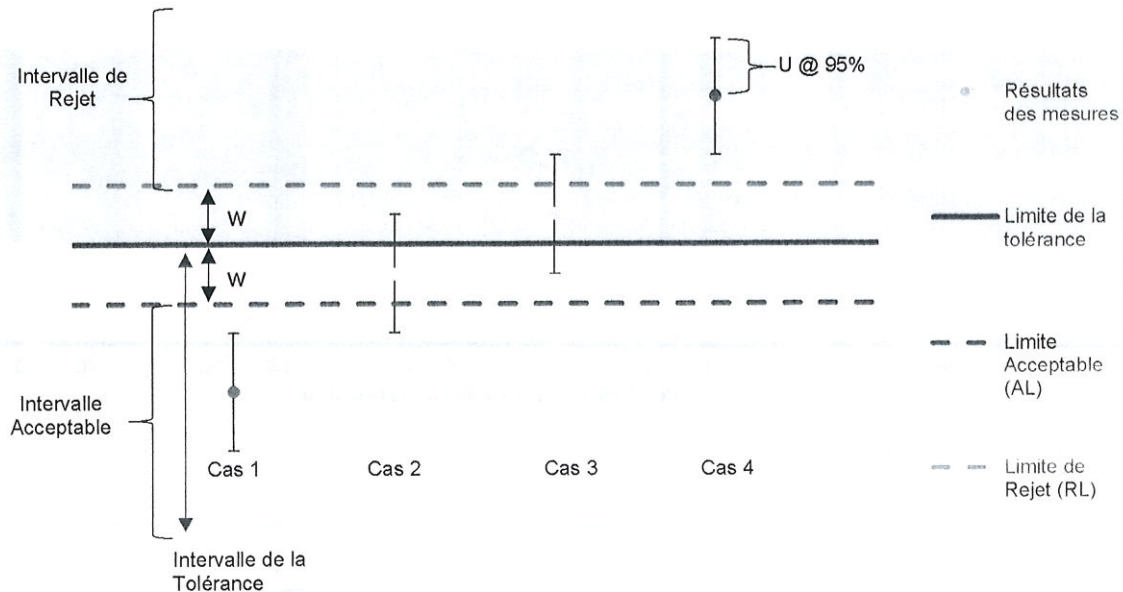
$F_c : 1.00$

Annexe pour la règle de décision

Méthode #3 Statut de Conformité Non-binaire avec Bande de Garde en considérant l'incertitude de la mesure directement

Cette méthode tient compte d'une bande de garde pour définir l'intervalle acceptable et de rejet. La limite acceptable de résultat de la mesure est calculée selon la méthode mathématique suivante $AL = TL - w$ et de rejet $RL = TL + w$, dont $w = rU$. Le multiple r de l'incertitude combinée élargie U peut être défini selon la table 1 section 5.2 du document ILAC G8 : 2019. L'incertitude de la mesure U est une incertitude combinée élargie ayant un niveau de confiance de 95% ($k = 2$). La règle de conformité non-binaire avec bande de garde est définie lorsqu'il y a quatre choix sur le statut de l'essai : dans la tolérance, acceptation conditionnelle, rejet conditionnel, et hors tolérance.

Les conformités de l'essai sont définies telles que :



Explication de la règle Non-Binaire avec Bande de Garde

Cas 1 – Inférieur à la limite acceptable AL

Statut : Dans les tolérances (In tolerance)

- Le résultat de la mesure est à l'intérieur de l'intervalle acceptable. Cependant, l'estimation du risque en assumant la probabilité d'une distribution normale d'être à l'extérieur de la limite de la tolérance est $< 2.5\%$. L'incertitude de l'essai est directement prise en considération. *Couleur verte.*

Cas 2 – Inférieur à la limite de la tolérance TL, supérieur à la limite acceptable AL

Statut : Dans les tolérances-Conditionnel

- Le résultat de la mesure est à l'extérieur de l'intervalle acceptable mais inférieur à la limite de la tolérance. Cependant, la valeur observée est située dans la bande de garde $w = TL - AL$ et le statut du résultat est conditionnel à l'évaluation du risque du client. L'incertitude de la mesure est directement prise en considération. *Couleur jaune.*

Cas 3 – Supérieur à la limite de la tolérance, inférieur à RL

Statut : Hors tolérance-Conditionnel

- Le résultat de la mesure est supérieur à la limite de la tolérance mais à l'extérieur de l'intervalle de rejet. Cependant, la valeur observée est située dans la bande de garde $w = TL - RL$ et le statut du résultat est conditionnel à l'évaluation du risque du client. L'incertitude de la mesure est directement prise en considération. *Couleur jaune.*

Cas 4 – Supérieur à la limite de rejet RL

Statut : Hors-tolérance (Out of tolerance)

- Le résultat de la mesure est à l'intérieur de l'intervalle de rejet. L'incertitude de l'essai est directement prise en considération. *Couleur rouge.*

Fox Valley Metrology
 3114 Medalist Drive
 Oshkosh, WI 54902
 (920) 426-5894 • Fax (920) 426-8120
<https://www.FoxValleyMetrology.com>

CERTIFICATE OF CALIBRATION



Certificate No. ACT-1272

CERTIFICATION NUMBER CP003-27831-690 FOR Polytests Services Inc. 695 B rue Gaudette St-Jean-sur-Richelieu, QC, Canada J3B 7S7 TEST INSTRUMENT Thermohygrometer MAKE Fluke MODEL 971 RANGE -4 to 100°F/ 5 to 95%RH CUSTOMER LOCATION CONDITION RECEIVED In Tolerance CONDITION RETURNED In Tolerance CALIBRATED BY Rodney Kalata REVIEWED/ISSUED D.P. 01/09/2025 CALIBRATION LOCATION FVM ENVIRONMENT 71.6°F, 37.7%RH, 29.38inHg CALIBRATION DATE 01/03/2025 RECALIBRATION DUE 01/03/2026		IDENTIFICATION EM-136 SERIAL NUMBER 10610860 PURCHASE ORDER # 100617 PROCEDURES FOLLOWED EL-033A rev. 1 EL-034A rev. 1 STANDARDS USED <table border="1"> <thead> <tr> <th>INSTRUMENT</th> <th>SERIAL NUMBER</th> <th>TRACE NUMBER</th> <th>NEXT CAL</th> </tr> </thead> <tbody> <tr> <td>FVS-275E</td> <td>16783134</td> <td>C0134-20963-690</td> <td>05/31/2025</td> </tr> <tr> <td>FVS-471</td> <td>1012820</td> <td>C0310-32592-548</td> <td>11/30/2025</td> </tr> </tbody> </table>	INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL	FVS-275E	16783134	C0134-20963-690	05/31/2025	FVS-471	1012820	C0310-32592-548	11/30/2025
INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL											
FVS-275E	16783134	C0134-20963-690	05/31/2025											
FVS-471	1012820	C0310-32592-548	11/30/2025											

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
Temperature	(°F)	(°F)	(°F)	(°F)	(°F)	
	60.0	59.0	61.0	60.9	60.9	3.6E-1
	70.0	69.0	71.0	70.5	70.5	3.6E-1
Humidity	(RH)	(RH)	(RH)	(RH)	(RH)	
	25.0	22.5	27.5	27.0	27.0	9.0E-1
	50.0	47.5	52.5	49.8	49.8	9.0E-1
	75.0	72.5	77.5	72.7	72.7	9.0E-1

[Signature]
 13 Jan 2025

■ This certificate shall not be altered in any form or reproduced, except in full, without prior written approval from originating lab. These results relate only to the item(s) calibrated. Form Revision 10: 06/04/2024
 ■ Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.
 ■ The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-147 2024-05-23
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CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9101
Address:	695 B rue Gaudette	Required Accuracy:	+/- 2.0C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Calibration Frequency:(days)	365

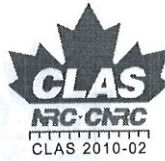
INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	Input Type:	Divers
Manufacturer:	Keithley	Output Type:	Digital
Model #:	2700	Measurement Type:	Temperature
Serial #:	1349443	Range:	Divers
Location:	N.A.	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION	
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 28/04/2024



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-147 2024-05-23
---------------	----------------------

CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
EntrySource	GivenValue	ActualValue	Initial Deviation	Post Calib	Final Deviation	Tolerance	Incertitude
Conformity	Voir Commentaire						

Environmental Conditions:	Temperature: 22 °C	Humidity: 47 %RH
Comments:	Data Acquisition system Conforme	
	Les 2 slot de l'enregistreur ont été vérifiés.	

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2024-05-23
Next Calibration:	2025-05-23
Certificate Date:	2024-05-23

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
 - The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
 - The results presented in this certificate relate only to objects subject to calibration.
 - It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
 - The date format used in this certificate is: YYYY-MM-DD.

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.

M. Gingras

Marc Gingras - Technicien

GRAFTEL

An  Company

CERTIFICATE OF CALIBRATION

Traceable to the SI through the National Institute of Standards and Technology

Calibration Certificate No: 121888

Customer Information

Customer: Services Polytests

Address: 695-B Gaudette St-Jean-sur-richelieu J3B 7S7

Customer PO #: 100620



Calibration Procedure Information

Procedure: Air Velocity Calibration

Revision #: 1

Calibration Standards Information

Graftel ID	Model #	Description	CAL Due
10187	PTB210	Vaisala Ambient Pressure	11/30/2025
10100		Graftel Temperature	10/17/2025
10171	FC0332-2W	Furness DeltaP Meter, 0 to 0.4"H2O	11/30/2025
10086	FC0332	Furness Controls DeltaP Meter, 0 to 4"H2O	11/30/2025
T1830459	VAISALA / H MW95D	Vaisala Temp/RH Logger, Velocity Lab	6/30/2025
51203	760-100A	Paroscientific Absolute Pressure	2/28/2025

Calibrated Device Information

Manufacturer: Omega

Description: Anemometer

Method Used: Pitot Tube

Model #: HHF143

Rated Accuracy: See Attachments

Accuracy Specified By: Omega

Instrument ID: EM153

Range: 40 to 7800 fpm

Condition: Functional

Serial #: 1015949

Calibration Date: 01/27/2025

Calibration Due: 01/27/2026

Comments: Calibration Range: 100-5000 fpm

The calibrations within the certificate/report are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or another National Metrology Institute. The reported calibration uncertainty has a confidence level of 95% (k=2). A calibration uncertainty ratio of 4:1 was maintained unless required uncertainty is supported by analysis. Graftel Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2017, ANSI/NC SL Z540-1-1994 and ISO 9001. All results contained within this certificate relate only to item(s) calibrated. This certificate shall not be reproduced except in full and with the written consent of Graftel. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.


Performed By
Philip Davis
Calibration Technician
01/27/2025

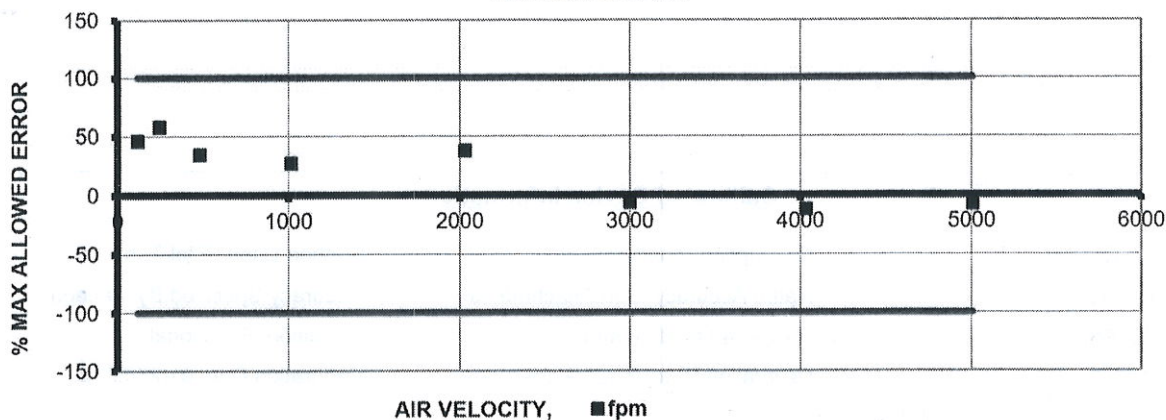

Approved/Issued By
Janelle Gabriel
QA Specialist
01/28/2025

ATTACHMENT TO CALIBRATION CERTIFICATE 121888
AS FOUND / AS LEFT DATA

Page 2 of 2

Reading From Standard,	Lower Limit of Meter Reading,	Measured Reading From Meter,	Upper Limit of Meter Reading,	Error,	Measurement Uncertainty (k=2)	CMC (k=2)	STATUS
Actual Air Velocity							
fpm	fpm	fpm	fpm	fpm	fpm	fpm	STATUS
118	116	119	120	1	3	3	Pass
246	243	248	249	2	4	4	Pass
481	475	483	487	2	6	6	Pass
1015	1004	1018	1026	3	11	11	Pass
2030	2009	2038	2051	8	20	20	Pass
3000	2969	2998	3031	-2	29	29	Pass
4034	3993	4029	4075	-5	38	38	Pass
5006	4955	5002	5057	-4	47	47	Pass

ERROR CHART



Instrument Specifications

Test Fluid:	Air	
Lower Velocity Range:	40	fpm
Upper Velocity Range:	7800	fpm
Velocity Resolution:	1	
Velocity Accuracy:	±(1% Reading + 1 digit)	

Laboratory Ambient Conditions

Pressure:	14.33	psia
Humidity:	21.01	%RH
Temperature:	70.04	°F

WATER FLOW • AIR FLOW • TEMPERATURE • PRESSURE • HUMIDITY

GRAFTEL
 An  Company

Traceable to SI through NIST

WWW.GRAFTEL.COM

95 CHANCELLOR DRIVE, ROSELLE, ILLINOIS 60172

PHONE: (847) 364-2600

[Signature]
 2025-01-28



Instrumentation
Saint-Laurent^{inc.}
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-154/2 2024-12-02	
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9101
Address:	695 B rue Gaudette	Required Accuracy:	+/- 4.0°F
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Calibration Frequency:(days)	181
INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	Input Type:	Temp
Manufacturer:	Keithley	Output Type:	Digitale
Model #:	7700	Measurement Type:	Temperature
Serial #:	1306774	Range:	Divers
Location:	N/A	Version:	Machine: N.A.
CALIBRATORS SPECIFICATION			
Calibrator:	Thermometre digital 6412	Certification #:	6412-15020243
Serial #:	240300851	Certification Date:	2024-04-09
Certified by:	ITM-Control company	Next Certification:	2026-04-09
Comments:			



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154/2 2024-12-02
---------------	------------------------

CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
85.0 °F	85.0 °F	84.7 °F	-0.3 °F	84.7 °F	-0.3 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 111 (Filter 1) en type "T" En Loop avec EM-154						
85.0 °F	85.0 °F	83.0 °F	-2.0 °F	83.0 °F	-2.0 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 112 (Filter 2) en type "T" En Loop avec EM-154						
125.0 °F	125.0 °F	124.2 °F	-0.8 °F	124.2 °F	-0.8 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 113 (Tunnel) en type "J" En Loop avec EM-154						
70.0 °F	70.0 °F	69.2 °F	-0.8 °F	69.2 °F	-0.8 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 114 (Room) en type "J" En Loop avec EM-154						
100.0 °F	100.0 °F	99.8 °F	-0.2 °F	99.8 °F	-0.2 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 115 (Dry bulb tunnel) en type "J" En Loop avec EM-154						
70.0 °F	70.0 °F	69.7 °F	-0.3 °F	69.7 °F	-0.3 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 116 (Analyzer gaz) en type "J" En Loop avec EM-154						

Environmental Conditions: Temperature: 20 °C Humidity: 31 %RH

The calibration was carried out at the client on-site using the method of comparison to the standard measurement.

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE

Calibration Date:	2024-12-02
Next Calibration:	2025-06-01
Certificate Date:	2024-12-02

CALIBRATION CONFORMITY

	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
 - The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
 - The results presented in this certificate relate only to objects subject to calibration.
 - It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
 - The date format used in this certificate is: YYYY-MM-DD.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the accreditation body. Neither CLAS nor the accreditation body guarantee the accuracy of individual calibrations by accredited laboratories.


Benoit Larocque - Tech


Dec 4th 2024

Fox Valley Metrology

3114 Medalist Drive
Oshkosh, WI 54902
(920) 426-5894 • Fax (920) 426-8120
<https://www.FoxValleyMetrology.com>

CERTIFICATE OF CALIBRATION



Certificate No. ACT-1272

CERTIFICATION NUMBER CP008-54054-682	IDENTIFICATION EM-175								
FOR Polytests Services Inc. 695 B rue Gaudette St-Jean-sur-Richelieu, QC, Canada J3B 7S7	SERIAL NUMBER 								
TEST INSTRUMENT Stopwatch	PURCHASE ORDER # 100617								
MAKE Extech Instruments	PROCEDURES FOLLOWED EL-019B rev. 1								
MODEL 365510	STANDARDS USED								
CUSTOMER LOCATION	<table border="1"><thead><tr><th>INSTRUMENT</th><th>SERIAL NUMBER</th><th>TRACE NUMBER</th><th>NEXT CAL</th></tr></thead><tbody><tr><td>FVS-275E</td><td>16783134</td><td>C0134-20963-690</td><td>05/31/2025</td></tr></tbody></table>	INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL	FVS-275E	16783134	C0134-20963-690	05/31/2025
INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL						
FVS-275E	16783134	C0134-20963-690	05/31/2025						
CONDITION RECEIVED In Tolerance									
CONDITION RETURNED In Tolerance									
CALIBRATED BY Wyatt LeBouton									
REVIEWED/ISSUED D.P. 01/09/2025									
CALIBRATION LOCATION FVM									
ENVIRONMENT 72.9°F, 22.7°C, 40.0%RH									
CALIBRATION DATE 01/08/2025									
RECALIBRATION DUE 01/08/2026									

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
Time Interval	(s)	(s)	(s)	(s)	(s)	
1 minute	60.00	59.50	60.50	60.00	60.00	5.8E-1
	60.00	59.50	60.50	60.08	60.08	5.8E-1
5 minute	300.00	299.50	300.50	300.07	300.07	6.3E-1
	300.00	299.50	300.50	300.08	300.08	6.3E-1


13 JAN 2025

■ This certificate shall not be altered in any form or reproduced, except in full, without prior written approval from originating lab. These results relate only to the item(s) calibrated. Form Revision 10: 06/04/2024

■ Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.")

Uncertainties expressed in nominal units.

■ The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

CERTIFICAT D'ÉTALONNAGE # 24944**Date d'étalonnage : 2025-01-06****Date d'émission du certificat : 2025-01-09**

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Étalonnage d'un
Débitmètre à déplacement positif Shinigawa DCDA-2c S/N : 23544

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols qui est conforme à la norme ISO/IEC 17025: 2017, à la norme ISO 9001 – 2015 ainsi qu'à toutes autres exigences de qualité définies dans la description d'achat des clients. Les résultats ne sont valides que pour l'objet soumis à l'essai ou à l'étalonnage. Si applicable, la règle de décision est décrite au certificat.

TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

ÉTALONNAGE DE MATÉRIEL DE MESURE ET D'ESSAI

Pour connaître la portée de mesurage du laboratoire d'étalonnage, veuillez consulter la page Web du Réseau canadien d'étalonnage du Conseil national de recherches du Canada. Ce laboratoire a été accrédité par le Conseil canadien des normes dans le cadre du programme du Service d'évaluation des laboratoires d'étalonnage (CLAS) et figure à: nrc.canada.ca.

Le présent document fait partie du certificat d'accréditation remis par le Conseil canadien des normes (CCN) à Polycontrols. La version originale est affichée dans le répertoire des organismes de certification accrédités par le CCN sur le site Web du CCN au www.ccn.ca.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 6 mois
	Tolérance ajustée à la demande du client
	Valeur de l'instrument corrigée = Lecture de l'afficheur de l'instrument * K facteur (0.986)


Hassan Habli
Métrologiste
Responsable du laboratoire

Certificat d'étalonnage # 24944

Numéro de série:	23544	Station de mesure:	3
Date d'étalonnage:	2025-01-06	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-178	Règle de décision:	Méthode #3

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500371423	2025-02-13
Fluke molbloc_120 slpm	2E2-S	237	1500373170	2025-03-07
Fluke molbox1+	Molbox1+	2089	1500373373	2025-03-11
RTD Mist	M22	3061002	2024005919	2025-07-12
Module 44.5 PSI avec Baro 163671	Module 30	160659	2024004347	2025-05-22

Spécifications finales de l'appareil
Condition d'étalonnage

Gaz	Air	Gaz	Air
Température d'opération		Température ambiante	22 °C
Pression à l'entrée		Pression ambiante	1014.18 mbar
Pression à la sortie		Orientation	Horizontale
Température de référence		Élastomère	
Pression de référence		Valve	
Étendue d'échelle	10-2000 ALH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±2 %O.R.		

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées			Référence calculée L	Erreur calculée L	Tolérance acceptable L	Incertitude k = 2 L	TUR
		Pression PSIA	Température °C	Référence L					
342.439	57.280	14.722	21.026	53.020	57.014	0.266	1.140	0.189	>4
1326.993	222.140	14.745	20.786	206.170	221.174	0.966	4.423	0.733	4
2154.344	359.390	14.778	20.720	334.880	358.358	1.032	7.167	0.877	4



POLYCONTROLS

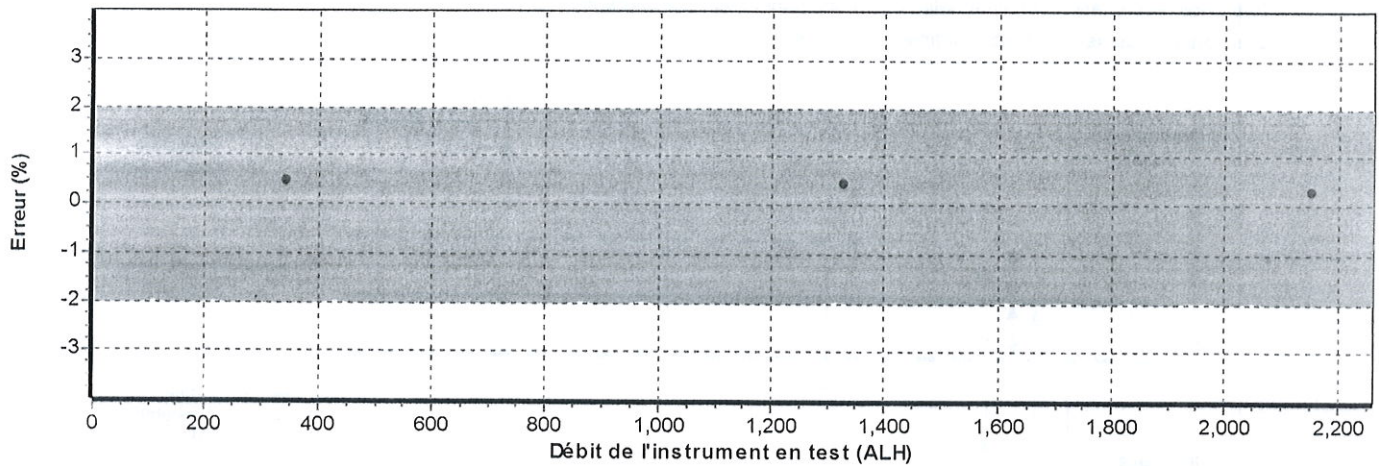


Certificat d'étalonnage # 24944

Numéro de série: 23544
Date d'étalonnage: 2025-01-06
Identification de l'instrument: EM-178

Station de mesure: 3
Procédure: POS-CAL-005
Règle de décision: Méthode #3

Résultats finaux



Voir l'annexe pour la règle de décision

13 JANV 2025

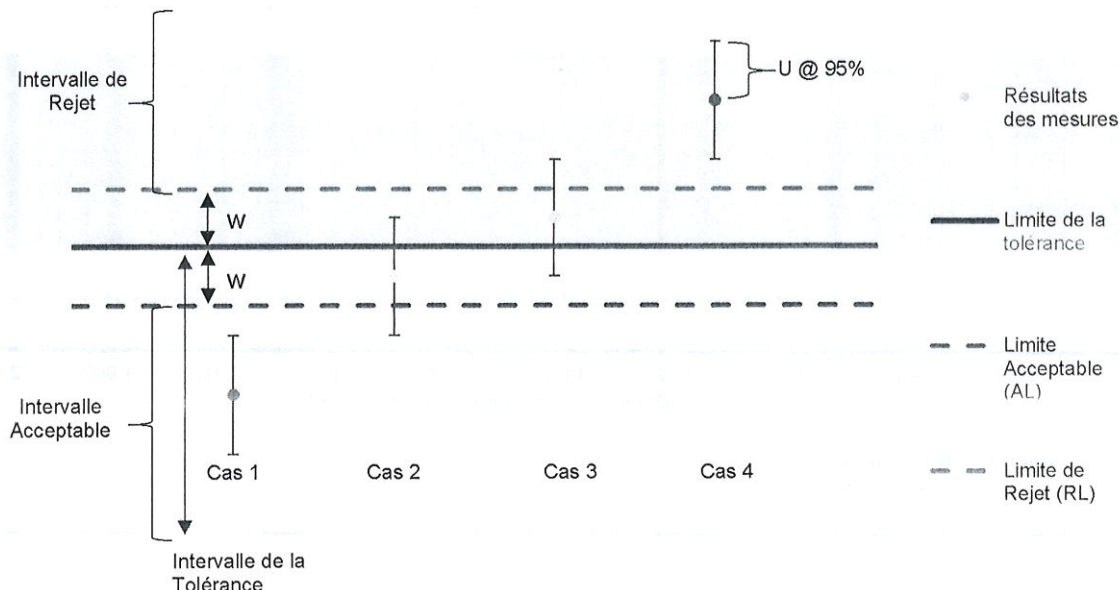
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Annexe pour la règle de décision

Méthode #3 Statut de Conformité Non-binaire avec Bande de Garde en considérant l'incertitude de la mesure directement

Cette méthode tient compte d'une bande de garde pour définir l'intervalle acceptable et de rejet. La limite acceptable du résultat de la mesure est calculée selon la méthode mathématique suivante $AL = TL - w$ et de rejet $RL = TL + w$, dont $w = rU$. Le multiple r de l'incertitude combinée élargie U peut être défini selon la table 1 section 5.2 du document ILAC G8 : 2019. L'incertitude de la mesure U est une incertitude combinée élargie ayant un niveau de confiance de 95% ($k = 2$). La règle de conformité non-binaire avec bande de garde est définie lorsqu'il y a quatre choix sur le statut de l'essai : dans la tolérance, acceptation conditionnelle, rejet conditionnel, et hors tolérance.

Les conformités de l'essai sont définies telles que :



Explication de la règle Non-Binaire avec Bande de Garde

Cas 1 – Inférieur à la limite acceptable AL

Statut : Dans les tolérances (In tolerance)

- Le résultat de la mesure est à l'intérieur de l'intervalle acceptable. Cependant, l'estimation du risque en assumant la probabilité d'une distribution normale d'être à l'extérieur de la limite de la tolérance est $< 2.5\%$. L'incertitude de l'essai est directement prise en considération. *Couleur verte.*

Cas 2 – Inférieur à la limite de la tolérance TL, supérieur à la limite acceptable AL

Statut : Dans les tolérances-Conditionnel

- Le résultat de la mesure est à l'extérieur de l'intervalle acceptable mais inférieur à la limite de la tolérance. Cependant, la valeur observée est située dans la bande de garde $w = TL - AL$ et le statut du résultat est conditionnel à l'évaluation du risque du client. L'incertitude de la mesure est directement prise en considération. *Couleur jaune.*

Cas 3 – Supérieur à la limite de la tolérance, inférieur à RL

Statut : Hors tolérance-Conditionnel

- Le résultat de la mesure est supérieur à la limite de la tolérance mais à l'extérieur de l'intervalle de rejet. Cependant, la valeur observée est située dans la bande de garde $w = TL - RL$ et le statut du résultat est conditionnel à l'évaluation du risque du client. L'incertitude de la mesure est directement prise en considération. *Couleur jaune.*

Cas 4 – Supérieur à la limite de rejet RL

Statut : Hors-tolérance (Out of tolerance)

- Le résultat de la mesure est à l'intérieur de l'intervalle de rejet. L'incertitude de l'essai est directement prise en considération. *Couleur rouge.*



POLYCONTROLS



CERTIFICAT D'ÉTALONNAGE # 24943

Date d'étalonnage : 2025-01-06

Date d'émission du certificat : 2025-01-09

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Étalonnage d'un
Débitmètre à déplacement positif Shinigawa DCDA-2c S/N : 23543

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols qui est conforme à la norme ISO/IEC 17025: 2017, à la norme ISO 9001 – 2015 ainsi qu'à toutes autres exigences de qualité définies dans la description d'achat des clients. Les résultats ne sont valides que pour l'objet soumis à l'essai ou à l'étalonnage. Si applicable, la règle de décision est décrite au certificat.

TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, ANSI/NCCL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

ÉTALONNAGE DE MATÉRIEL DE MESURE ET D'ESSAI

Pour connaître la portée de mesurage du laboratoire d'étalonnage, veuillez consulter la page Web du Réseau canadien d'étalonnage du Conseil national de recherches du Canada. Ce laboratoire a été accrédité par le Conseil canadien des normes dans le cadre du programme du Service d'évaluation des laboratoires d'étalonnage (CLAS) et figure à : nrc.canada.ca.

Le présent document fait partie du certificat d'accréditation remis par le Conseil canadien des normes (CCN) à Polycontrols. La version originale est affichée dans le répertoire des organismes de certification accrédités par le CCN sur le site Web du CCN au www.ccn.ca.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 6 mois
	Tolérance ajustée à la demande du client
	Valeur de l'instrument corrigée = Lecture de l'afficheur de l'instrument * K facteur (0.988)


Hassan Habli
Métrologiste


Responsable du laboratoire

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Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com



Certificat d'étalonnage # 24943

Numéro de série:	23543	Station de mesure:	3
Date d'étalonnage:	2025-01-06	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-179	Règle de décision:	Méthode #3

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500371423	2025-02-13
Fluke molbloc_120 slpm	2E2-S	237	1500373170	2025-03-07
Fluke molbox1+	Molbox1+	2089	1500373373	2025-03-11
RTD Mist	M22	3061002	2024005919	2025-07-12
Module 44.5 PSI avec Baro 163671	Module 30	160659	2024004347	2025-05-22

Spécifications finales de l'appareil

Condition d'étalonnage

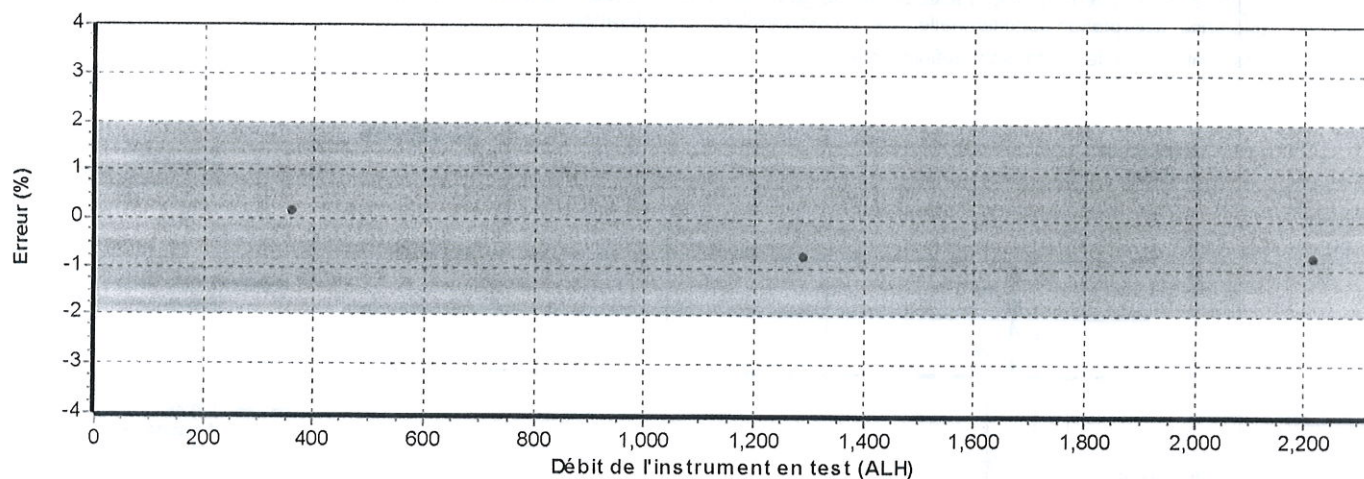
Gaz	Air	Gaz	Air
Température d'opération		Température ambiante	22 °C
Pression à l'entrée		Pression ambiante	1014.94 mbar
Pression à la sortie		Orientation	Horizontale
Température de référence		Élastomère	
Pression de référence		Valve	
Étendue d'échelle	10-2000 ALH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±2 %O.R.		

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées			Référence calculée L	Erreur calculée L	Tolérance acceptable L	Incertitude k = 2 L	TUR
		Pression PSIA	Température °C	Référence L					
359.170	59.873	14.724	20.810	55.650	59.790	0.083	1.196	0.198	>4
1291.388	213.704	14.749	20.796	200.810	215.368	-1.664	4.307	0.714	>4
2215.875	366.548	14.792	20.839	345.360	369.379	-2.831	7.388	0.904	>4

Certificat d'étalonnage # 24943

Numéro de série:	23543	Station de mesure:	3
Date d'étalonnage:	2025-01-06	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-179	Règle de décision:	Méthode #3

Résultats finaux


Voir l'annexe pour la règle de décision



13 JANV 2025

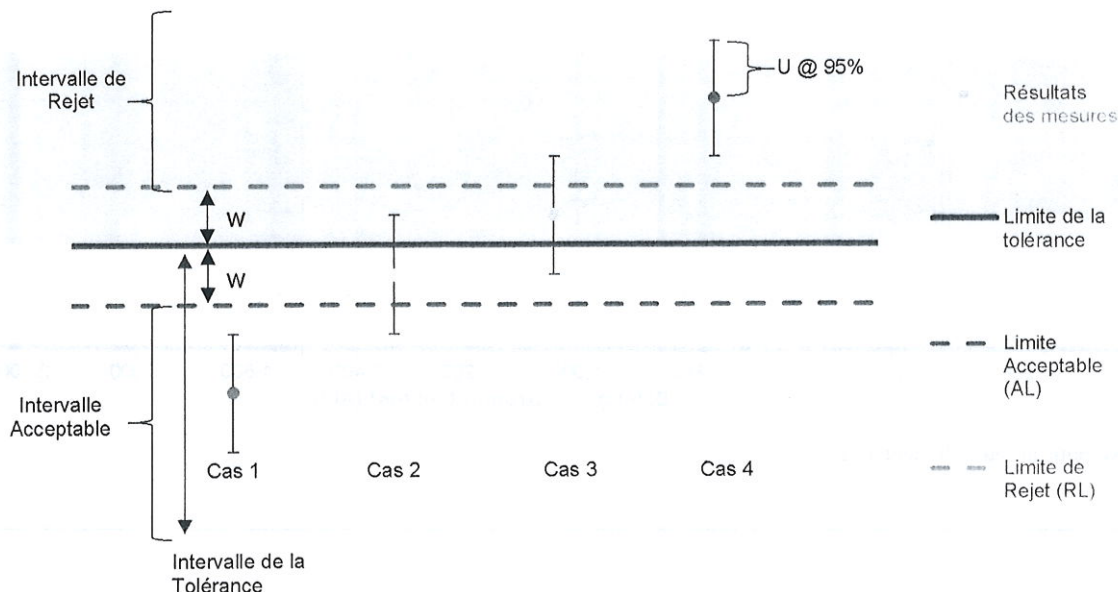
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Annexe pour la règle de décision

Méthode #3 Statut de Conformité Non-binaire avec Bande de Garde en considérant l'incertitude de la mesure directement

Cette méthode tient compte d'une bande de garde pour définir l'intervalle acceptable et de rejet. La limite acceptable du résultat de la mesure est calculée selon la méthode mathématique suivante $AL = TL - w$ et de rejet $RL = TL + w$, dont $w = rU$. Le multiple r de l'incertitude combinée élargie U peut être défini selon la table 1 section 5.2 du document ILAC G8 : 2019. L'incertitude de la mesure U est une incertitude combinée élargie ayant un niveau de confiance de 95% ($k = 2$). La règle de conformité non-binaire avec bande de garde est définie lorsqu'il y a quatre choix sur le statut de l'essai : dans la tolérance, acceptation conditionnelle, rejet conditionnel, et hors tolérance.

Les conformités de l'essai sont définies telles que :



Explication de la règle Non-Binaire avec Bande de Garde

Cas 1 – Inférieur à la limite acceptable AL

Statut : Dans les tolérances (In tolerance)

- Le résultat de la mesure est à l'intérieur de l'intervalle acceptable. Cependant, l'estimation du risque en assumant la probabilité d'une distribution normale d'être à l'extérieur de la limite de la tolérance est $< 2.5\%$. L'incertitude de l'essai est directement prise en considération. *Couleur verte.*

Cas 2 – Inférieur à la limite de la tolérance TL, supérieur à la limite acceptable AL

Statut : Dans les tolérances-Conditionnel

- Le résultat de la mesure est à l'extérieur de l'intervalle acceptable mais inférieur à la limite de la tolérance. Cependant, la valeur observée est située dans la bande de garde $w = TL - AL$ et le statut du résultat est conditionnel à l'évaluation du risque du client. L'incertitude de la mesure est directement prise en considération. *Couleur jaune.*

Cas 3 – Supérieur à la limite de la tolérance, inférieur à RL

Statut : Hors tolérance-Conditionnel

- Le résultat de la mesure est supérieur à la limite de la tolérance mais à l'extérieur de l'intervalle de rejet. Cependant, la valeur observée est située dans la bande de garde $w = TL - RL$ et le statut du résultat est conditionnel à l'évaluation du risque du client. L'incertitude de la mesure est directement prise en considération. *Couleur jaune.*

Cas 4 – Supérieur à la limite de rejet RL

Statut : Hors-tolérance (Out of tolerance)

- Le résultat de la mesure est à l'intérieur de l'intervalle de rejet. L'incertitude de l'essai est directement prise en considération. *Couleur rouge.*

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

David Llorens, Quality Manager

March 2022 page 1 of 5

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-222
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	CCN Accreditation # :	668
		CLAS Certification # :	2010-01
		Precision class :	NIST F
		Calibration date :	04-03-2022
Mass :	10 kg	Follow-up date :	04-03-2026

CALIBRATION RESULTS, CONVENTIONAL MASS:

[illegible]

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

BALANCES

The following balances are used for calibration purposes :

> 5 kg to 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg to 5 kg :	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g to 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g to 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

We are also using these balances in our automated procedure :

> 200 g to 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Our balances are periodically verified, according to our PDL-11-MG-001 control procedure.

UNCERTAINTIES:

The following uncertainties exist :

1. *Uncertainty associated with the weighting process.*
2. *Uncertainty associated with air density.*
3. *Uncertainty associated with the measurement standard.*
4. *Uncertainty associated with the density of the mass being calibrated.*

The uncertainty of the weighing process includes long-term reproducibility.

Uncertainties specified in this report are expanded uncertainties representing a confidence level of approximately 95% obtained by multiplying the combined standard uncertainty by a coverage factor of $k = 2$. For more detailed information refer to the GUM (Guide to the Expression of Uncertainty in Measurement, 1995 Edition)

TRACEABILITY

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and their traceability to recognized national measurement standards and to the International System of Units (SI). This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither the CLAS nor the SCC guarantees the accuracy of individual calibration by accredited laboratories.

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
 www.dispersion.ca 1.866.390.5066

USED REFERENCES

Item	Serial #	Manufacturer	Calibration date	Due date
300g Labo	96-0888-50-2	Denver Instrument Company	01-10-2020	31-03-2022
1kg-1mg Labo	MT-01	Mettler Toledo	01-10-2020	31-03-2022
2kg Labo	96-0888-50-3	Denver Instrument Company	01-10-2020	31-03-2022
1kg Labo	96-088850-1	Denver Instrument Company	01-10-2020	31-03-2022
5kg Labo	129099	Mettler Toledo	01-10-2020	31-03-2022
10kg Labo	DI000G991	Dispersion	23-03-2021	31-03-2022
20kg Labo	69976	Mettler Toledo	06-10-2021	31-10-2022
1 mg-10kg	4000028011	Troemner	15-10-2021	31-10-2022
2kg Labo	129098	Mettler Toledo	01-10-2020	31-03-2022

ENVIRONMENTAL CONDITIONS

Item	Serial #	Manufacturer	Calibration date	Due date
THE004	107080	Control Company	04-03-2021	31-03-2022



CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-224 2024-05-30
----------------------	-----------------------------

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	ISL-022
Required Accuracy:	+/- 1/32"
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Ruban à mesurer	Input Type:	Mesure
Manufacturer:	Stanley	Output Type:	N/A
Model #:	Leverlock 12'	Measurement Type:	Inch
Serial #:	N/A	Range:	0 à 12'
Location:	Portable	Version:	Machine: N/A

CALIBRATORS SPECIFICATION			
Calibrator:	tape a mesurer	Certification #:	TB-57338710
Serial #:	23036922	Certification Date:	2023-09-06
Certified by:	Starrett	Next Certification:	2024-09-06
Comments:			



CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-224 2024-05-30						
CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	
Comment							
1.00 "	1.00 "	1.00 "	0.00 "	1.00 "	0.00 "	+/- 1/32 "	
36.00 "	36.00 "	36.00 "	0.00 "	36.00 "	0.00 "	+/- 1/32 "	
72.00 "	72.00 "	72.00 "	0.00 "	72.00 "	0.00 "	+/- 1/32 "	
108.00 "	108.00 "	108.00 "	0.00 "	108.00 "	0.00 "	+/- 1/32 "	
132.00 "	132.00 "	132.00 "	0.00 "	132.00 "	0.00 "	+/- 1/32 "	
Environmental Conditions: Temperature: 22 °C Humidity: 35 %RH							
Comments:							

CALIBRATION DATE/ISSUANCE OF CERTIFICATE		CALIBRATION CONFORMITY	
Calibration Date:	2024-05-30		
Next Calibration:	2025-05-30		
Certificate Date:	2024-05-30		
		Before	After
		X	X

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
 - The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
 - The results presented in this certificate relate only to objects subject to calibration.
 - It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
 - The date format used in this certificate is: YYYY-MM-DD.

M L L

Martin Langlais - Technicien

[Signature]

JUN 3 2024



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



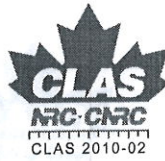
80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-6207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2024-05-23		
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9106
Address:	695 B rue Gaudette	Required Accuracy:	+/- 0.25 "H2O
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Calibration Frequency:(days)	365
INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Voltage
Model #:	MS-321-LCD	Measurement Type:	Pressure
Serial #:	N/A	Range:	0 à 0.10 "H2O
Location:	Banc de test	Version:	Machine: N/A
CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression	Certification #:	2023009508
Serial #:	3330050	Certification Date:	2023-11-23
Certified by:	Alpha Controls	Next Certification:	2024-11-23
Comments:			
Calibrator:	Fluke 744	Certification #:	AC24041903
Serial #:	8180008	Certification Date:	2024-05-09
Certified by:	alpha Controls	Next Certification:	2025-05-09
Comments:			



**Instrumentation
Saint-Laurent** inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2024-05-23						
CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
0.0000 "H2O	0.0000 "H2O	-0.0023 "H2O	-0.0023 "H2O	0.0002 "H2O	+0.0002 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.1250 "H2O	0.1250 "H2O	0.1216 "H2O	-0.0034 "H2O	0.1294 "H2O	+0.0044 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.2500 "H2O	0.2500 "H2O	0.2437 "H2O	-0.0063 "H2O	0.2585 "H2O	+0.0085 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.3750 "H2O	0.3750 "H2O	0.3684 "H2O	-0.0066 "H2O	0.3616 "H2O	-0.0134 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.5000 "H2O	0.5000 "H2O	0.4695 "H2O	-0.0305 "H2O	0.4998 "H2O	-0.0002 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.3750 "H2O	0.3750 "H2O	0.3684 "H2O	-0.0066 "H2O	0.3684 "H2O	-0.0066 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.2500 "H2O	0.2500 "H2O	0.0560 "H2O	-0.1940 "H2O	0.2598 "H2O	+0.0098 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.1250 "H2O	0.1250 "H2O	0.1216 "H2O	-0.0034 "H2O	0.1274 "H2O	+0.0024 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.0000 "H2O	0.0000 "H2O	-0.0023 "H2O	-0.0023 "H2O	0.0002 "H2O	+0.0002 "H2O	+/- 0.25	± 0.10 "H2O
Compliant	Verification of the indicator						
0.0000 "H2O	0.0000 V.DC.	0.0051 V.DC.	+0.0051 V.DC.	0.0007 V.DC.	+0.0007 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.1250 "H2O	2.5000 V.DC.	2.4066 V.DC.	-0.0934 V.DC.	2.5706 V.DC.	+0.0706 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.2500 "H2O	5.0000 V.DC.	4.8750 V.DC.	-0.1250 V.DC.	5.1851 V.DC.	+0.1851 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.3750 "H2O	7.5000 V.DC.	7.3406 V.DC.	-0.1594 V.DC.	7.7234 V.DC.	+0.2234 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Non-	Verification of the analogic output						
0.5000 "H2O	10.0000 V.DC.	9.5053 V.DC.	-0.4947 V.DC.	9.6432 V.DC.	-0.3568 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Non-	Verification of the analogic output						
0.3750 "H2O	7.5000 V.DC.	7.3406 V.DC.	-0.1594 V.DC.	7.7235 V.DC.	+0.2235 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Non-	Verification of the analogic output						
0.2500 "H2O	5.0000 V.DC.	4.8750 V.DC.	-0.1250 V.DC.	5.1855 V.DC.	+0.1855 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.1250 "H2O	2.5000 V.DC.	2.4066 V.DC.	-0.0934 V.DC.	2.5705 V.DC.	+0.0705 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
0.0000 "H2O	0.00 V.DC.	0.0050 V.DC.	+0.0050 V.DC.	0.0050 V.DC.	+0.0050 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output						
Environmental Conditions: Temperature: 22 °C Humidity: 47 %RH							
Comments:							

5F09106

Version: 2024.04.05



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2024-05-23
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CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2024-05-23
Next Calibration:	2025-05-23
Certificate Date:	2024-05-23

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
- The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
- The results presented in this certificate relate only to objects subject to calibration.
- It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
- The date format used in this certificate is: YYYY-MM-DD.

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M. Gingras

Marc Gingras - Technicien

[Signature] 26 MAI 2024



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



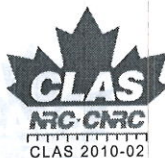
80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-313 2024-05-23	
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9106
Address:	695 B rue Gaudette	Required Accuracy:	+/- 0.25"H2O
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Calibration Frequency:(days)	365
INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Voltage
Model #:	MS-321-LCD	Measurement Type:	Pressure
Serial #:	N.A.	Range:	0 a 0.1 inchh20
Location:	N.A.	Version:	Machine: N.A.
CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression	Certification #:	2023009508
Serial #:	3330050	Certification Date:	2023-11-23
Certified by:	Alpha Controls	Next Certification:	2024-11-23
Comments:			
Calibrator:	Fluke 744	Certification #:	AC24041903
Serial #:	8180008	Certification Date:	2024-05-09
Certified by:	alpha Controls	Next Certification:	2025-05-09
Comments:			



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



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CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-313 2024-05-23												
CALIBRATION RESULTS														
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty							
Conformity	Comment													
0.0000 "H2O	0.0000 "H2O	0.0017 "H2O	+0.0017 "H2O	0.0000 "H2O	0.0000 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.0250 "H2O	0.0250 "H2O	0.0334 "H2O	+0.0084 "H2O	0.0247 "H2O	-0.0003 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.0500 "H2O	0.0500 "H2O	0.0588 "H2O	+0.0088 "H2O	0.0500 "H2O	0.0000 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.0750 "H2O	0.0750 "H2O	0.0842 "H2O	+0.0092 "H2O	0.0752 "H2O	+0.0002 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.1000 "H2O	0.1000 "H2O	0.1095 "H2O	+0.0095 "H2O	0.1003 "H2O	+0.0003 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.0750 "H2O	0.0750 "H2O	0.0844 "H2O	+0.0094 "H2O	0.0750 "H2O	0.0000 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.0500 "H2O	0.0500 "H2O	0.0585 "H2O	+0.0085 "H2O	0.0501 "H2O	+0.0001 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.0250 "H2O	0.0250 "H2O	0.0331 "H2O	+0.0081 "H2O	0.0248 "H2O	-0.0002 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.0000 "H2O	0.0000 "H2O	0.0018 "H2O	+0.0018 "H2O	0.0000 "H2O	0.0000 "H2O	+/- 0.25	± 0.10 "H2O							
Compliant	Verification of the indicator													
0.0000 "H2O	0.0000 V.DC.	0.1873 V.DC.	+0.1873 V.DC.	0.0041 V.DC.	+0.0041 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
0.0250 "H2O	2.5000 V.DC.	3.3528 V.DC.	+0.8528 V.DC.	2.4985 V.DC.	-0.0015 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
0.0500 "H2O	5.0000 V.DC.	5.8866 V.DC.	+0.8866 V.DC.	5.0312 V.DC.	+0.0312 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
0.0750 "H2O	7.5000 V.DC.	8.5487 V.DC.	+1.0487 V.DC.	7.5149 V.DC.	+0.0149 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
0.1000 "H2O	10.0000 V.DC.	10.6707	+0.6707 V.DC.	10.0119	+0.0119 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
0.0750 "H2O	0.00 V.DC.	8.5489 V.DC.	+8.5489 V.DC.	7.5146 V.DC.	+7.5146 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
0.0500 "H2O	0.00 V.DC.	5.8863 V.DC.	+5.8863 V.DC.	5.0314 V.DC.	+5.0314 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
0.0250 "H2O	0.00 V.DC.	3.3529 V.DC.	+3.3529 V.DC.	2.4986 V.DC.	+2.4986 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
0.0000 "H2O	0.00 V.DC.	0.1870 V.DC.	+0.1870 V.DC.	0.0038 V.DC.	+0.0038 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.							
Compliant	Verification of the analogic output													
Environmental Conditions: Temperature: 22 °C Humidity: 47 %RH														
Comments:														

5F09106

Version: 2024.04.05



Instrumentation
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Certified ISO 17025



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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-313 2024-05-23									
CALIBRATION DATE/ISSUANCE OF CERTIFICATE										
Calibration Date:	2024-05-23									
Next Calibration:	2025-05-23									
Certificate Date:	2024-05-23									
CALIBRATION CONFORMITY										
	<table border="1"><thead><tr><th></th><th>Before</th><th>After</th></tr></thead><tbody><tr><td>Compliant:</td><td></td><td>X</td></tr><tr><td>Non Compliant:</td><td>X</td><td></td></tr></tbody></table>		Before	After	Compliant:		X	Non Compliant:	X	
	Before	After								
Compliant:		X								
Non Compliant:	X									

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gm ee

Marc Gingras - Technicien

[Signature] 28 MA' 2024

CERTIFICAT D'ÉTALONNAGE # 24946

Date d'étalonnage : 2025-01-06

Date d'émission du certificat : 2025-01-09

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Étalonnage d'un
Débitmètre à déplacement positif Shinigawa DCSDa-2C S/N : S8020

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols qui est conforme à la norme ISO/IEC 17025: 2017, à la norme ISO 9001 – 2015 ainsi qu'à toutes autres exigences de qualité définies dans la description d'achat des clients. Les résultats ne sont valides que pour l'objet soumis à l'essai ou à l'étalonnage. Si applicable, la règle de décision est décrite au certificat.

TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

ÉTALONNAGE DE MATÉRIEL DE MESURE ET D'ESSAI

Pour connaître la portée de mesurage du laboratoire d'étalonnage, veuillez consulter la page Web du Réseau canadien d'étalonnage du Conseil national de recherches du Canada. Ce laboratoire a été accrédité par le Conseil canadien des normes dans le cadre du programme du Service d'évaluation des laboratoires d'étalonnage (CLAS) et figure à: nrc.canada.ca.

Le présent document fait partie du certificat d'accréditation remis par le Conseil canadien des normes (CCN) à Polycontrols. La version originale est affichée dans le répertoire des organismes de certification accrédités par le CCN sur le site Web du CCN au www.ccn.ca.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Lectures initiales dans les tolérances-conditionnelles Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 6 mois Tolérance ajustée à la demande du client Valeur de l'instrument corrigée = Lecture de l'afficheur de l'instrument * 1.01 K facteur


Hassan Habli
Métrologiste
Responsable du laboratoire

Certificat d'étalonnage # 24946

Numéro de série:	S8020	Station de mesure:	3
Date d'étalonnage:	2025-01-06	Procédure:	POS-CAL-005
Identification de l'instrument:	EM 318	Règle de décision:	Méthode #3

Instrument de mesure de référence utilisé pour l'étalonnage initial

Description	Modèle	# Série	Traçabilité	Date dû
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500371423	2025-02-13
Fluke molbloc_120 slpm	2E2-S	237	1500373170	2025-03-07
Fluke molbox1+	Molbox1+	2089	1500373373	2025-03-11
RTD Mist	M22	3061002	2024005919	2025-07-12
Module 44.5 PSI avec Baro 163671	Module 30	160659	2024004347	2025-05-22

Spécifications initiales de l'appareil
Condition d'étalonnage

Gaz	Air	Gaz	Air
Température d'opération		Température ambiante	22 °C
Pression à l'entrée		Pression ambiante	1012.82 mbar
Pression à la sortie		Orientation	
Température de référence		Élastomère	
Pression de référence		Valve	
Étendue d'échelle	10-2000 ALH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±2 %O.R.		

Lectures initiales

Débit du test ALH	Instrument en test L	Valeurs mesurées			Référence calculée L	Erreur calculée L	Tolérance acceptable L	Incertitude k = 2 L	TUR
		Pression PSIA	Température °C	Référence L					
336.688	66.000	14.669	20.792	62.310	67.191	-1.191	1.344	0.223	>4
1329.984	218.400	14.699	20.740	205.730	221.352	-2.952	4.427	0.734	>4
2136.539	354.200	14.754	20.693	332.150	355.984	-1.784	7.120	0.871	>4



POLYCONTROLS

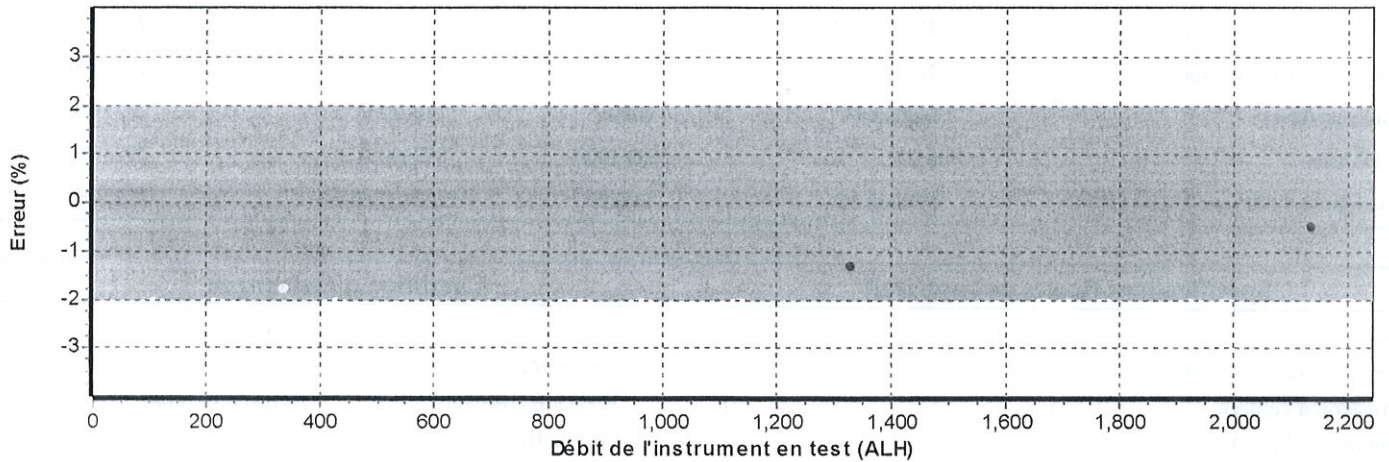


Certificat d'étalonnage # 24946

Numéro de série: S8020
Date d'étalonnage: 2025-01-06
Identification de l'instrument: EM 318

Station de mesure: 3
Procédure: POS-CAL-005
Règle de décision: Méthode #3

Résultats initiaux



Voir l'annexe pour la règle de décision

Certificat d'étalonnage # 24946

Numéro de série:	S8020	Station de mesure:	3
Date d'étalonnage:	2025-01-06	Procédure:	POS-CAL-005
Identification de l'instrument:	EM 318	Règle de décision:	Méthode #3

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500371423	2025-02-13
Fluke molbloc_120 slpm	2E2-S	237	1500373170	2025-03-07
Fluke molbox1+	Molbox1+	2089	1500373373	2025-03-11
RTD Mist	M22	3061002	2024005919	2025-07-12
Module 44.5 PSI avec Baro 163671	Module 30	160659	2024004347	2025-05-22

Spécifications finales de l'appareil
Condition d'étalonnage

Gaz	Air	Gaz	Air
Température d'opération		Température ambiante	22 °C
Pression à l'entrée		Pression ambiante	1009.92 mbar
Pression à la sortie		Orientation	
Température de référence		Élastomère	
Pression de référence		Valve	
Étendue d'échelle	10-2000 ALH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±2 %O.R.		

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées			Référence calculée L	Erreur calculée L	Tolérance acceptable L	Incertitude k = 2 L	TUR
		Pression PSIA	Température °C	Référence L					
336.695	66.660	14.669	20.792	62.310	67.192	-0.532	1.344	0.223	≥4
1330.013	220.584	14.699	20.740	205.730	221.356	-0.772	4.427	0.542	≥4
2136.571	357.742	14.754	20.693	332.150	355.989	1.753	7.120	0.871	≥4



POLYCONTROLS

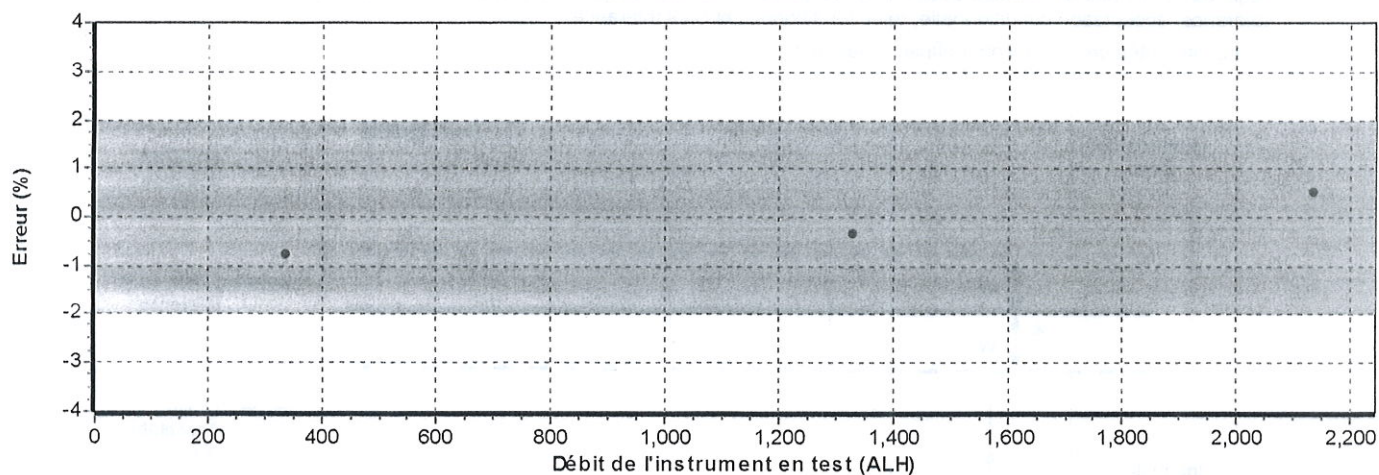


Certificat d'étalonnage # 24946

Numéro de série: S8020
Date d'étalonnage: 2025-01-06
Identification de l'instrument: EM 318

Station de mesure: 3
Procédure: POS-CAL-005
Règle de décision: Méthode #3

Résultats finaux



Voir l'annexe pour la règle de décision

[Signature]
13 JANV 2025

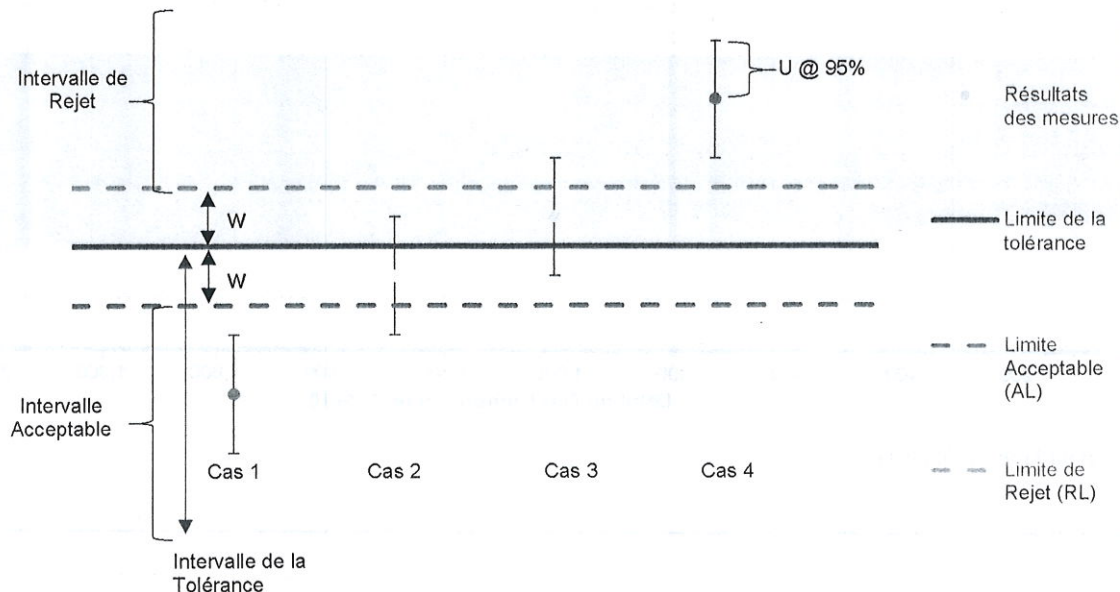
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Annexe pour la règle de décision

Méthode #3 Statut de Conformité Non-binaire avec Bande de Garde en considérant l'incertitude de la mesure directement

Cette méthode tient compte d'une bande de garde pour définir l'intervalle acceptable et de rejet. La limite acceptable du résultat de la mesure est calculée selon la méthode mathématique suivante $AL = TL - w$ et de rejet $RL = TL + w$, dont $w = rU$. Le multiple r de l'incertitude combinée élargie U peut être défini selon la table 1 section 5.2 du document ILAC G8 : 2019. L'incertitude de la mesure U est une incertitude combinée élargie ayant un niveau de confiance de 95% ($k = 2$). La règle de conformité non-binaire avec bande de garde est définie lorsqu'il y a quatre choix sur le statut de l'essai : dans la tolérance, acceptation conditionnelle, rejet conditionnel, et hors tolérance.

Les conformités de l'essai sont définies telles que :



Explication de la règle Non-Binaire avec Bande de Garde

Cas 1 – Inférieur à la limite acceptable AL

Statut : Dans les tolérances (In tolerance)

- Le résultat de la mesure est à l'intérieur de l'intervalle acceptable. Cependant, l'estimation du risque en assumant la probabilité d'une distribution normale d'être à l'extérieur de la limite de la tolérance est $< 2.5\%$. L'incertitude de l'essai est directement prise en considération. *Couleur verte.*

Cas 2 – Inférieur à la limite de la tolérance TL, supérieur à la limite acceptable AL

Statut : Dans les tolérances-Conditionnel

- Le résultat de la mesure est à l'extérieur de l'intervalle acceptable mais inférieur à la limite de la tolérance. Cependant, la valeur observée est située dans la bande de garde $w = TL - AL$ et le statut du résultat est conditionnel à l'évaluation du risque du client. L'incertitude de la mesure est directement prise en considération. *Couleur jaune.*

Cas 3 – Supérieur à la limite de la tolérance, inférieur à RL

Statut : Hors tolérance-Conditionnel

- Le résultat de la mesure est supérieur à la limite de la tolérance mais à l'extérieur de l'intervalle de rejet. Cependant, la valeur observée est située dans la bande de garde $w = RL - TL$ et le statut du résultat est conditionnel à l'évaluation du risque du client. L'incertitude de la mesure est directement prise en considération. *Couleur jaune.*

Cas 4 – Supérieur à la limite de rejet RL

Statut : Hors-tolérance (Out of tolerance)

- Le résultat de la mesure est à l'intérieur de l'intervalle de rejet. L'incertitude de l'essai est directement prise en considération. *Couleur rouge.*



CERTIFICATE OF CALIBRATION



Certificate Number: 2024011524

Page 1 of 2

Manufacturer: Control Company
Model: 4199
Description: Barometer
Serial: 210758578
ID: EM 333
Customer: SERVICES POLYTESTS
695-B GUADETTE
ST-JEAN-SUR-RICHELIEU QC
J3B 7S7

RMA: AC24121479
PO: 100618
Barcode: AL00042136
Received Conditions: Pass
Calibration Date: 20-Dec-2024
Calibration Due: 20-Jun-2025
Temperature: 23.83°C
Humidity: 20.3%RH

STATEMENT OF UNCERTAINTY: The reported expanded uncertainty of measurement is stated as the standard measurement uncertainty multiplied by the coverage factor $K = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 percent. Alpha Controls & Instrumentation Inc. certifies this instrument was calibrated on the date shown using standards traceable to NIST /NRC or accepted intrinsic standards and in compliance with ISO/IEC-17025:2005 and ANSI/NC SL Z540-1.

Statement of compliance is made applying guardbanding strategy and taking measurement uncertainty directly into account as defined in ILAC G8. Guardbanding is limited and compliance to specification is indeterminate when $TUR < 1$.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only. Functional tests are not covered by our scope of accreditation.

This certificate shall not be reproduced except in full without written approval of Alpha Controls and Instrumentation Inc.

STANDARDS USED

Description	Model	ID	Cal Date	Due Date
Pressure Controller/Calibrator	DH Instruments PPC3	PRE-CAL-04	27-Jun-2024	30-Jun-2025
Reference Pressure Monitor	Fluke RPM4	PRE-MTR-04	26-Jun-2024	30-Jun-2025

Notes: None.

Performed by:

Tony Wheaton

Technician

(digitally signed on 20-Dec-2024 3:19 pm)

QA Reviewed by:

Slava Peciurov

Lab Manager

(signed and issued on 20-Dec-2024 3:46 pm)

Quality Management System is assessed and registered by Intertek as conforming to the requirements of ISO9001

Alpha Controls & Instrumentation Inc., 2900 John St., Unit 4, Markham, ON L3R 5G3 www.alphacontrols.com (800) 567-8686

Procedure:	FOUND-LEFT						
Pressure/Vacuum: CAL VER /DHI PPC3 (2.3.A)	Pass						

Test Description	True Value	Test Results	Specification	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
MEASUREMENT UNITS: mmHg a							
747.544	747.54	747.2	±1.00	746.5	748.5	P	9.5e-002

END OF CERTIFICATE

JAN. 7th 2025

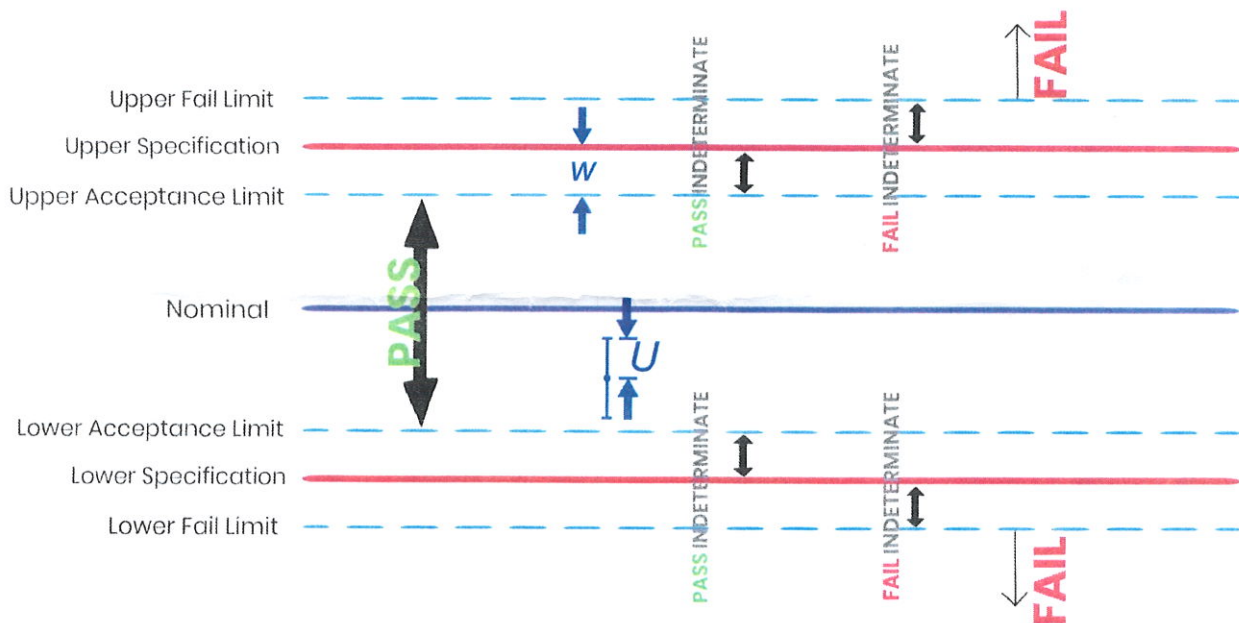


When conformance to specification is made - measurement uncertainty is taken directly into account, as per ILAC-G8:09/2019. The decision rule is based on the Guard Banding approach, where the acceptance limits are reduced by guard band length of 'w' proportional to the expanded uncertainty value 'U' with 95% confidence level ($k=2$). When $w=1U$, then probability of a false acceptance is less than 2.5%.

Statements of conformity are reported as:

Symbol	Definition	Description
P	Pass	The measured result is within the Acceptance limit.
<P>	Pass Indeterminate	The measured result is within Specification, but outside of the Acceptance Limit.
<F>	Fail Indeterminate	The measured result is outside of Specification, but within the Fail Limit.
F	Fail	The measured result is outside of the Fail Limit.

Graphical Representation of Guard Banding:



Fox Valley Metrology

3114 Medalist Drive
Oshkosh, WI 54902
(920) 426-5894 • Fax (920) 426-8120
<https://www.FoxValleyMetrology.com>

**CERTIFICATE OF
CALIBRATION**

Certificate No. ACT-1272

CERTIFICATION NUMBER CP008-53532-682	IDENTIFICATION EM-334								
FOR Polytests Services Inc. 695 B rue Gaudette St-Jean-sur-Richelieu, QC, Canada J3B 7S7	SERIAL NUMBER 								
TEST INSTRUMENT Resistance Standard	PURCHASE ORDER # 100617								
MAKE Delmhorst Instrument Co.	PROCEDURES FOLLOWED EL-010A rev. 1								
MODEL MCS-1	STANDARDS USED								
RANGE (1.1M to 120M) ohms	<table><tr><th>INSTRUMENT</th><th>SERIAL NUMBER</th><th>TRACE NUMBER</th><th>NEXT CAL</th></tr><tr><td>FVS-275E</td><td>16783134</td><td>C0134-20963-690</td><td>05/31/2025</td></tr></table>	INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL	FVS-275E	16783134	C0134-20963-690	05/31/2025
INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL						
FVS-275E	16783134	C0134-20963-690	05/31/2025						
CUSTOMER LOCATION									
CONDITION RECEIVED In Tolerance									
CONDITION RETURNED In Tolerance									
CALIBRATED BY Wyatt LeBouton									
REVIEWED/ISSUED D.P. 01/09/2025									
CALIBRATION LOCATION FVM									
ENVIRONMENT 72.9°F, 22.7°C, 40.0%RH									
CALIBRATION DATE 01/08/2025									
RECALIBRATION DUE 01/08/2026									

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
Resistance	(Mohm)	(Mohm)	(Mohm)	(Mohm)	(Mohm)	
12% 'Pad'	120.00	119.76	120.24	120.07	120.07	6.0E-3
22% 'Pad'	1.100	1.078	1.122	1.097	1.097	6.0E-4

13 JANU 2025

■ This certificate shall not be altered in any form or reproduced, except in full, without prior written approval from originating lab. These results relate only to the item(s) calibrated. Form Revision 10: 06/04/2024

■ Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.")

Uncertainties expressed in nominal units.

■ The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-225
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	Calibration date :	14-03-2022

Technician:
Coutu, Daniel

David Llorens

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	Date approved :	14-03-2022
Precision class :	ASTM 1	Next Calibration :	14-03-2027
Density :	7.96g/cm ³	CCN accreditation # :	668
Identification (if unique) :	DI000J378	CLAS Certification # :	2010-01

Test conditions :	Temp °C:	21.16	kPa Pressure:	100.64	Humidity:	47.97
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NOTES:

For weight calibration, we use the procedure "Comparaison individuelle" PDL-09-MG-001 and the procedure "Détermination des incertitudes" PDL-09-MG-002. This certificate cannot be copied without written approval from Dispersion Laboratory. The results presented in these pages relate only to objects subjected to calibration.

REMARKS:

[Signature]
March 2022

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	Certificate Number :	157-77C603-225
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	CCN Accreditation # :	668
		CLAS Certification # :	2010-01
		Precision class :	ASTM 1
		Calibration date :	14-03-2022
Mass :	100 mg	Follow-up date :	14-03-2027

CALIBRATION RESULTS, CONVENTIONAL MASS:

[illegible]

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

BALANCES

The following balances are used for calibration purposes :

> 5 kg to 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg to 5 kg	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g to 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g to 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

We are also using these balances in our automated procedure :

> 200 g to 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Our balances are periodically verified, according to our PDL-11-MG-001 control procedure.

UNCERTAINTIES:

The following uncertainties exist :

1. *Uncertainty associated with the weighting process.*
2. *Uncertainty associated with air density.*
3. *Uncertainty associated with the measurement standard.*
4. *Uncertainty associated with the density of the mass being calibrated.*

The uncertainty of the weighing process includes long-term reproducibility.

Uncertainties specified in this report are expanded uncertainties representing a confidence level of approximately 95% obtained by multiplying the combined standard uncertainty by a coverage factor of $k = 2$. For more detailed information refer to the GUM (Guide to the Expression of Uncertainty in Measurement, 1995 Edition)

TRACEABILITY

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and their traceability to recognized national measurement standards and to the International System of Units (SI). This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither the CLAS nor the SCC guarantees the accuracy of individual calibration by accredited laboratories.

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

USED REFERENCES

Item	Serial #	Manufacturer	Calibration date	Due date
300g Labo	96-0888-50-2	Denver Instrument Company	01-10-2020	31-03-2022
1kg-1mg Labo	MT-01	Mettler Toledo	01-10-2020	31-03-2022
2kg Labo	96-0888-50-3	Denver Instrument Company	01-10-2020	31-03-2022
1kg Labo	96-088850-1	Denver Instrument Company	01-10-2020	31-03-2022
5kg Labo	129099	Mettler Toledo	01-10-2020	31-03-2022
10kg Labo	DI000G991	Dispersion	23-03-2021	31-03-2022
20kg Labo	69976	Mettler Toledo	06-10-2021	31-10-2022
1 mg-10kg	4000028011	Troemner	15-10-2021	31-10-2022
2kg Labo	129098	Mettler Toledo	01-10-2020	31-03-2022

ENVIRONMENTAL CONDITIONS

Item	Serial #	Manufacturer	Calibration date	Due date
THE004	107080	Control Company	04-03-2021	31-03-2022

CERTIFICATE OF ANALYSIS

Grade of Product: PRIMARY STANDARD

Customer:	AIR LIQUIDE CANADA	Reference Number:	160-402375016-1
Part Number:	X04NI77P15A0003	Cylinder Volume:	153.0 CF
Cylinder Number:	EB0118140	Cylinder Pressure:	2016 PSIG
Laboratory:	124 - Plumsteadville - PA	Valve Outlet:	350
Analysis Date:	Mar 07, 2022		
Lot Number:	160-402375016-1		

Expiration Date: Mar 07, 2030

Primary Standard Gas Mixtures are traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Req Conc	Actual Concentration (Mole %)	Analytical Uncertainty
OXYGEN	2.000 %	2.005 %	+/- 0.02%
CARBON MONOXIDE	3.000 %	3.000 %	+/- 0.02%
CARBON DIOXIDE	18.00 %	18.00 %	+/- 0.02%
NITROGEN	Balance		

Notes: GROSS WEIGHT: 29.581 KG

NET WEIGHT: 5.442 KG

P/N A1336386

PO#89404761



EM-336

[Signature]
June 2022

[Signature]
Approved for Release



CERTIFICATE OF ANALYSIS

Customer: SERVICES POLYTESTS INC., (S2232)
695B, GAUDETTE
ST-JEAN SUR RICHELIEU QC
J3B 7S7

Analysis Date: 3/4/2022 9:44:18AM
Product code: A1334811
Grade: PRIMARY
Size: 44
CGA #: 590

Servitrex barcode No: T2H6H8N
Work order number: 1607008
Pressure: 1450 psig
Volume: 4.7M3
Expiry date: 03/04/2025

COMPONENTS	NOMINAL CONCENTRATION	ANALYSIS RESULTS
CARBON DIOXIDE	10.0000 % Molar	10.00 % Molar
CARBON MONOXIDE	1.0000 % Molar	1.002 % Molar
OXYGEN	10.0000 % Molar	10.00 % Molar
NITROGEN	BALANCE	BALANCE

Analysis performed by:

Tobi Erinle
TOBI ERINLE - LAB TECHNICIAN

Verified by:

AD

This Air Liquide Canada mixture is traceable to NIST

METHOD OF ANALYSIS:

Method of analysis is based on principles of gas chromatography and as documented in Air Liquide Canada operating procedure, where applicable, FID, TCD, PDHID, FT-IR, FPD, NO/NOx and SO2 chemiluminescence, hygrometer, and electrochemical cells and paramagnetic cell. Detectors were used in conjunction with packed or capillary columns calibrated flow meters and dilution calibrated system.

ANALYTICAL ACCURACY:

Quality	Concentration	Blend Tolerance	AA
PRIMARY	5%-50%	+/-1%	+/-1%
	0.5%-5%	+/-2%	
	1ppm-0.5%	+/-5%	
CERTIFIED	5%-50%	+/-5%	+/-2%
	0.5%-5%	+/-10%	+/-2%
	1ppm-0.5%	+/-20%	+/-5%
UNANALYZE	5%-50%	+/-10%	
	<5%	+/-20%	

EM-338
[Signature]
June 2022

This mixture was certified by a combination of weight and analysis (depending on component) using scales certified against weights traceable to the Institute for National Measurement Standards (INMS) of the National Research Council of Canada (NRCC), Report # W-021221-13857 (MTL) and CA3033-022-050621-ACC (Calgary) or calibration standards prepared in that manner.

How to contact us & order



E-mail within your region:

specgas.atlantic@airliquide.com
specgas.qc@airliquide.com

specgas.on@airliquide.com
specgas.ab@airliquide.com

specgas.midwest@airliquide.com
specgas.pacific@airliquide.com



Customer Solution Center 1 800 217-2688



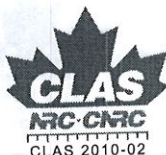
Online 24/7 through My.Airliquide.ca



Air Liquide Mobile App



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE # CE-EM-340 2024-05-23	
CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7
CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	+/- 1.0 inHg
Calibration Frequency:(days)	365
INSTRUMENT SPECIFICATION	
Instrument Type:	Pressure Gauge
Manufacturer:	Dwyer
Model #:	DPG200
Serial #:	S799031-0001
Location:	N.A.
Input Type:	Pression
Output Type:	Digitale
Measurement Type:	Pressure
Range:	-29.93 to 0 inHg
Version:	Machine: N.A.
CALIBRATORS SPECIFICATION	
Calibrator:	Crystal XP2i 300
Serial #:	866756
Certified by:	Alpha Controls
Comments:	
Certification #:	2023007594
Certification Date:	2023-09-22
Next Certification:	2024-09-22
Calibrator:	Fluke 744
Serial #:	8180008
Certified by:	alpha Controls
Comments:	
Certification #:	AC24041903
Certification Date:	2024-05-09
Next Certification:	2025-05-09



Instrumentation
Saint-Laurent Inc.
Certified ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-340 2024-05-23					
CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
-7.50 "Hg	-7.50 "Hg	-7.51 "Hg	-0.01 "Hg	-7.51 "Hg	-0.01 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
-15.00 "Hg	-15.00 "Hg	-15.03 "Hg	-0.03 "Hg	-15.03 "Hg	-0.03 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
-22.50 "Hg	-22.50 "Hg	-22.55 "Hg	-0.05 "Hg	-22.55 "Hg	-0.05 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
-28.00 "Hg	-28.00 "Hg	-28.06 "Hg	-0.06 "Hg	-28.06 "Hg	-0.06 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
-22.50 "Hg	-22.50 "Hg	-22.55 "Hg	-0.05 "Hg	-22.55 "Hg	-0.05 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
-15.00 "Hg	-15.00 "Hg	-15.03 "Hg	-0.03 "Hg	-15.03 "Hg	-0.03 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
-7.50 "Hg	-7.50 "Hg	-7.51 "Hg	-0.01 "Hg	-7.51 "Hg	-0.01 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+/- 1.0 "Hg	+/- 0.5 "Hg
Compliant	Verification of the indicator						
0.00 "Hg	20.00 mA	19.99 mA	-0.01 mA	19.99 mA	-0.01 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
-7.50 "Hg	16.00 mA	15.99 mA	-0.01 mA	15.99 mA	-0.01 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
-15.00 "Hg	12.00 mA	11.97 mA	-0.03 mA	11.97 mA	-0.03 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
-22.50 "Hg	8.00 mA	7.94 mA	-0.06 mA	7.94 mA	-0.06 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
-28.00 "Hg	5.00 mA	5.08 mA	+0.08 mA	5.08 mA	+0.08 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
-22.50 "Hg	8.00 mA	7.94 mA	-0.06 mA	7.94 mA	-0.06 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
-15.00 "Hg	12.00 mA	11.97 mA	-0.03 mA	11.97 mA	-0.03 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
-7.50 "Hg	16.00 mA	15.99 mA	-0.01 mA	15.99 mA	-0.01 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
0.00 "Hg	20.00 mA	19.99 mA	-0.01 mA	19.99 mA	-0.01 mA	+/- 0.5 mA	+/- 0.0045
Compliant	Verification of the analogic output						
Environmental Conditions:		Temperature: 22 °C		Humidity: 47 %RH			
Comments:							



Instrumentation
Saint-Laurent inc.
Certified ISO 17025



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St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE # CE-EM-340 2024-05-23

CALIBRATION DATE/ISSUANCE OF CERTIFICATE		
Calibration Date:		2024-05-23
Next Calibration:		2025-05-23
Certificate Date:		2024-05-23

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- Reported uncertainties represent a 95 % of confidence level assuming a normal distribution $k=2$.
- The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
- The results presented in this certificate relate only to objects subject to calibration.
- It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
- The date format used in this certificate is: YYYY-MM-DD.

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.

M. Gingras

Marc Gingras - Technicien

[Signature] 28 Mai 2024

Mettler-Toledo Inc.
Service Division
1900 Polaris Parkway
Columbus, OH 43240
1-800-METTLER



Accredited by the American Association
for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1902.01

ISO 17025 Registered
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

Company: Services Polytests
Address: 695-B Rue Gaudette
City: Saint-Jean-Sur-Richelieu Contact: Danick Power
Zip / Postal: J3B 7S7
State / Province: Quebec

Weighing Device

Manufacturer: Ohaus Instrument Type: Weighing Instrument
Model: Balance Asset Number: EM-204
Serial No.: 8336030305 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: N/A Terminal Asset No.: N/A
Room: N/A

Range	Max. Capacity	Readability (d)
1	30000 g	1 g

Procedure

Calibration Guideline: ASTM E898 - 20
METTLER TOLEDO Work Instruction: 30260953

This calibration certificate including procedures and uncertainty estimation also complies with EURAMET cg-18 v 4.0.

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight.

	Temperature		Humidity	
As Found	Start: 21.0 °C	End: 21.0 °C	Start: 61.2 %	End: 61.2 %
As Left	Start: 21.0 °C	End: 21.0 °C	Start: 61.2 %	End: 61.2 %

Environmental conditions have been verified to ensure the accuracy of the calibration.

This certificate is issued in accordance with the conditions of accreditation granted by A2LA, which is based on ISO/IEC 17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards.

As Found Calibration Date: 11-09-2024
As Left Calibration Date: 11-09-2024
Issue Date: 11-09-2024
Requested Next Calibration Date: 30-09-2025

Authorized A2LA Signatory:

Angel Estrella Gonzalez

Measurement Results

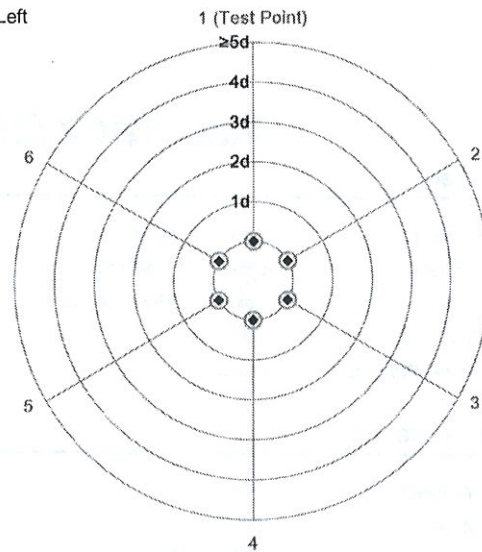
Repeatability

Test Load: 15000 g

	As Found	As Left
1	14995 g	15000 g
2	14995 g	15000 g
3	14995 g	15000 g
4	14995 g	15000 g
5	14995 g	15000 g
6	14995 g	15000 g

○ As Found
◆ As Left

Standard Deviation	0.0 g	0.0 g
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The "d" in the graph represents the readability of the range/interval in which the test was performed.

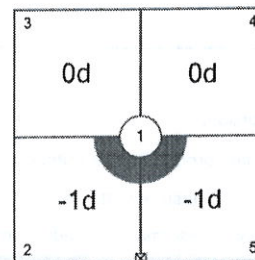
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

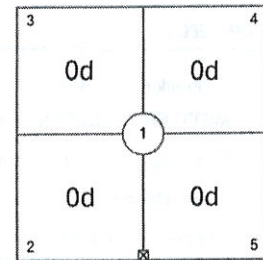
Test Load: 10000 g

Position	As Found	As Left
1	9997 g	10000 g
2	9996 g	10000 g
3	9997 g	10000 g
4	9997 g	10000 g
5	9996 g	10000 g

Maximum Deviation	1 g	0 g
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As Found



As Left

The "d" in the graph represents the readability of the range/interval in which the test was performed.

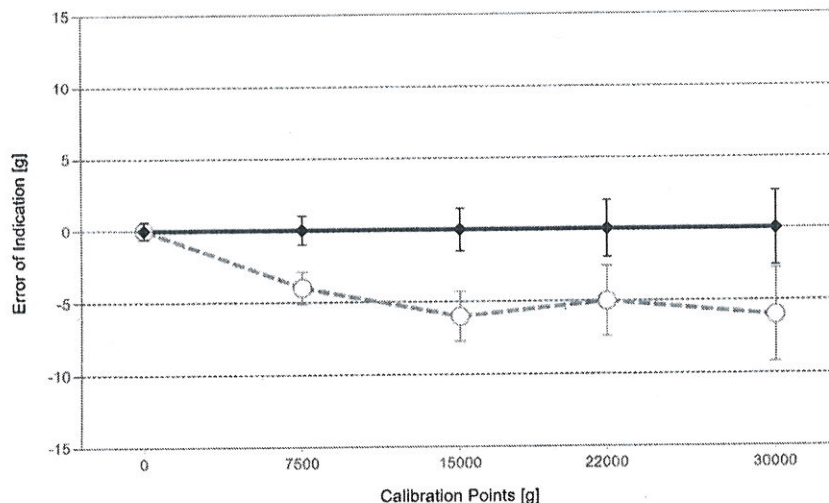
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 g	0 g	0 g	0.6 g	2
2	7500 g	7496 g	-4 g	1.1 g	2
3	15000 g	14994 g	-6 g	1.7 g	2
4	22000 g	21995 g	-5 g	2.4 g	2
5	30000 g	29994 g	-6 g	3.2 g	2
6	0 g	0 g	0 g	0.6 g	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 g	0 g	0 g	0.6 g	2
2	7500 g	7500 g	0 g	1.0 g	2
3	15000 g	15000 g	0 g	1.5 g	2
4	22000 g	22000 g	0 g	2.0 g	2
5	30000 g	30000 g	0 g	2.6 g	2
6	0 g	0 g	0 g	0.6 g	2



○ As Found

◆ As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to ASTM E898 and EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.
The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML M1

Weight Set No.:	57071	Date of Issue:	10-01-2024
Certificate Number:	220736435-1	Calibration Due Date:	10-01-2025

Weight Set 2: OIML M1

Weight Set No.:	T01 à T50 (20 kg)	Date of Issue:	20-03-2024
Certificate Number:	1411302	Calibration Due Date:	20-03-2025

Remarks

N/A

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $10.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 21 K

Linearization of Uncertainty Equation

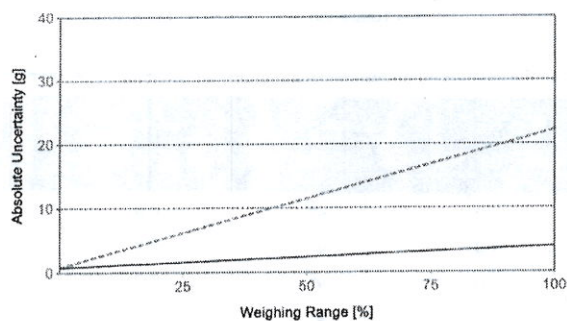
	Range		As Found	As Left
	d	Max		
1	1 g	30000 g	$U_1 = 816 \text{ mg} + 0.712 \text{ mg/g} \cdot R$	$U_1 = 816 \text{ mg} + 0.107 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

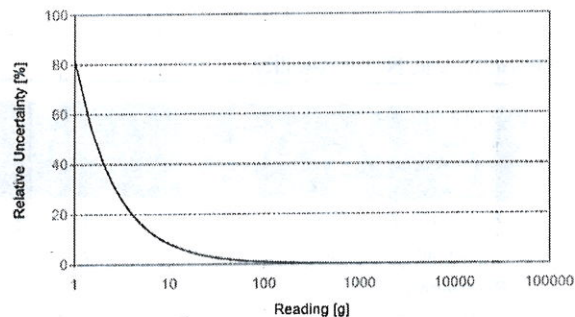
The linear approximation of the uncertainty in use should be regarded as information only. The underlying distribution of the errors of indication does not stipulate a stable approximation function [applies to As Found equation].

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
30 g	0.84 g	2.8%	0.82 g	2.7%
300 g	1.0 g	0.34%	0.85 g	0.28%
3000 g	3.0 g	0.098%	1.1 g	0.038%
15000 g	11 g	0.077%	2.4 g	0.016%
30000 g	22 g	0.074%	4.0 g	0.013%



As Found



As Left

[Signature]
12 sept 2024

Handbook 44 Tolerance Assessment(Maintenance)

Assessment done without considering measurement uncertainty.

The measurements from the attached calibration certificate were assessed against the Tolerances defined by NIST Handbook 44.

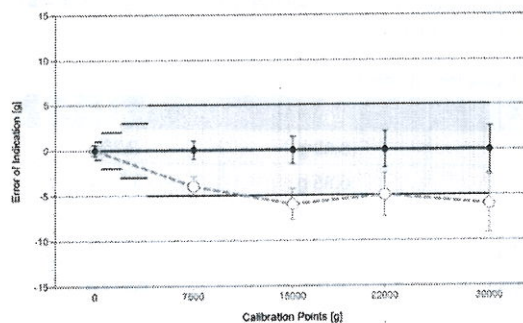
The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

Overall **As Found**  **As Left** 

 = Passed
 = Failed

Weighing Device

Range	Max. Capacity	Readability (d)	Verification Scale Interval (e)	Class
1	30000 g	1 g	1 g	III



Tolerances according to NIST Handbook 44

Test Load		Tolerance
From	To	
0 g	0 g	0.25 g
1 g	500 g	1 g
501 g	2000 g	2 g
2001 g	4000 g	3 g
4001 g	30000 g	5 g

 As Found

 As Left

 Tolerance

Eccentricity and Repeatability

Test	Test Load	Tolerance	As Found		As Left	
			Max. Error / Range	Result	Max. Error / Range	Result
Eccentricity (Max. Error)	10000 g	5 g	4 g	✓	0 g	✓
Eccentricity (Range)	10000 g	5 g	1 g	✓	0 g	✓
Repeatability (Max. Error)	15000 g	5 g	5 g	✓	0 g	✓
Repeatability (Range)	15000 g	5 g	0 g	✓	0 g	✓

Max. Error: Maximum of the absolute values of the individual errors.

Range: Difference between largest and smallest measurement value.

Error of Indication

	Reference Value	Tolerance	As Found		As Left	
			Error of Indication	Result	Error of Indication	Result
1	0 g	1 g	0 g	✓	0 g	✓
2	7500 g	5 g	-4 g	✓	0 g	✓
3	15000 g	5 g	-6 g	✗	0 g	✓
4	22000 g	5 g	-5 g	✓	0 g	✓
5	30000 g	5 g	-6 g	✗	0 g	✓
6	0 g	1 g	0 g	✓	0 g	✓

APPENDIX 4: Unit pre burn

Morsø 2B Standard pre-test conditioning						
Last 50+ hours at medium burnrate						
Date dd.mm.yyyy	Time (hour)	Fuel added (kg)	Fuel moisture (% wet basis)			Flue gas temperature (C°)
			piece no.1	piece no. 2	piece no.3	
12.12.2024	0	2.212*	17.8/17.4/17.3	18.2/17.9/18.1	18.8/18.6/18.6	18.82
	0.93	2 254	19.1/18.8/19.2	19.0/19.0/18.9	17.4/17.9/17.5	150.98
	1					161.61
	1.84	2 358	17.1/17.2/16.9	16.8/16.9/16.6	16.8/16.8/16.7	159.89
	2					195.81
	3					115.48
	3.23	2 266	19.9/20.0/19.9	19.0/19.3/19.0	19.1/19.4/19.2	106.95
	4					154.66
	4.58	2 222	17.8/17.4/17.7	16.1/16.7/16.7	16.8/16.8/16.8	111.05
	5					181.66
	6					108.93
	6.16	2 388	19.8/19.9/19.9	18.8/18.6/18.6	18.7/18.4/18.3	111.45
	7					149.07
	7.51	2 386	17.0/16.9/17.0	16.9/17.0/17.3	17.4/17.4/17.2	116.28
11.12.2024	8					191.33
	9					111.65
	10					96.30
	11					63.56
	12					36.24
	0	2.203*	18.4/18.5/18.4	18.8/18.4/18.8	17.9/18.2/18.2	18.87
	1	2 306	18.1/18.1/18.1	18.2/18.1/18.1	18.0/18.2/18.2	149.52
	2					140.85
	2.10	2 294	19.0/19.5/19.3	19.9/19.8/20.0	19.7/19.9/19.9	132.68
	3					139.64
	3.71	2 262	18.7/18.7/18.7	18.6/18.7/18.5	18.5/18.3/18.3	107.82
	4					182.13
	4.78	2 240	16.9/17.0/17.0	17.1/17.3/17.1	16.7/16.8/16.7	124.31
	5					197.45
	6	2 246	16.6/16.6/16.2	16.9/17.0/17.0	17.0/17.1/17.1	124.17
	7					139.99
	7.42	2 382	18.1/18.2/18.3	17.8/17.7/17.7	18.3/18.5/18.7	109.89
	8					187.32
	9					109.62
	10					90.56
	11					55.44
	12					32.54
10.12.2024	0	2.103*	17.1/17.1/17.3	16.8/16.6/16.5	16.5/16.5/16.1	18.61
	0.79	2 143	18.4/18.7/18.6	18.7/18.8/18.4	17.4/17.4/17.6	182.40
	1					157.67
	1.85	2 320	19.1/19.2/19.3	18.8/19.0/19.0	19.3/19.4/19.2	148.56
	2					189.92
	3					137.79
	3.37	2 146	19.5/19.8/19.6	19.4/19.4/19.6	19.3/19.3/19.5	122.31
	4					173.20
	4.75	2,352	18.9/18.8/19.0	19.0/19.1/18.9	19.1/19.4/19.4	122.24
	5					191.90
	6					128.48
	6.22	2 108	19.7/19.7/19.9	19.9/19.7/19.6	19.5/19.5/19.5	122.03

Pre-test conditioning of Morsø 2B Standard wood stove

	7					150.82
	7.41	2 370	18.8/18.8/18.6	19.1/19.0/19.0	19.2/19.1/19.1	117.76
	8					174.39
	9					112.75
	10					94.33
	11					62.54
	12					34.91
04.12.2024	0	2.423*	16.8/16.7/16.9	16.9/16.9/16.8	17.0/16.8/16.8	18.69
	0.86	2 225	16.5/16.7/16.7	16.5/16.4/16.4	16.2/16.4/16.4	152.21
	1					164.13
	1.87	2 256	16.8/16.8/16.7	17.0/17.0/17.0	17.0/17.0/17.1	144.06
	2					182.72
	3					138.78
	3.40	2 266	16.0/16.0/16.2	16.3/16.3/16.3	16.1/16.5/16.5	127.63
	4					176.43
	4.83	2 398	17.7/17.5/17.5	17.8/17.8/17.6	17.6/17.5/17.5	127.74
	5					190.21
	6					141.94
	6.37	2 160	16.6/16.4/16.6	16.0/16.3/16.1	16.7/16.8/16./8	128.71
	7					181.9
	7.69	2 390	18.3/18.0/18.1	18.5/18.7/18.7	18.0/18.4/18.4	126.39
03.12.2024	8					182.42
	9					109.64
	10					91.92
	0	2.269*	16.9/16.8/16.8	16.5/16.5/16.5	16.5/16.6/16.6	18.94
	1					160.27
	1.26	2 175	16.5/16.5/16.5	16.4/16.6/16.7	16.4/16.5/16.5	146.55
	2					163.72
	2.07	2 290	16.5/16.5/16.4	16.6/16.6/16.6	16.7/16.7/16.5	158.49
	3					152.86
	3.82	2 270	17.0/17.0/16.9	16.8/16.7/16.7	16.9/17.0/17.1	118.34
	4					169.8
	5					137.09
	5.46	2 324	16.8/16.8/16.9	16.7/16.7/16.6	17.0/16.9/16.9	129.23
	6					193.63
02.12.2024	6.82	2 310	16.5/16.5/16.4	16.5/16.5/16.5	16.9/16.8/16.8	130.22
	7					195.39
	8					137.37
	8.40	2 343	17.1/17.0/17.1	17.2/17.0/17.4	17.3/17.3/17.5	123.38
	9					195.49
	10					102.16
	0	2.292*	18.8/18.5/18.6	18.2/18.2/18.2	18.1/18.2/18.3	18.26
	1					123.91
	1.42	2 304	16.8/16.7/16.8	16.7/16.7/16.5	16.6/16.6/16.5	152.26
	2					193.25
	2.43	2 248	16.8/16.7/16.7	16.5/16.4/16.6	16.1/16.0/16.0	153.8
	3					180.56
	4					116.17
	4.02	2 250	17.9/17.9/17.7	17.9/17.9./17.6	17.8/17.6/17.6	117.7
	5					148.43
28.11.2024	5.64	2 240	17.8/17.9/17.8	17.7/17.8/17.7	17.5/17.5/17.3	120.05
	6					185.88
	7					109.15
	8					73.56
	9					56.99
	10					37.15
	0	2.148*	18.0/18.1/18.1	17.9/18.0/18.0	18.2/18.3/18.4	19.10

Pre-test conditioning of Morsø 2B Standard wood stove

1					167.04
1.55	2 215	16.5/16.6/16.9	16.9/17.0/17.0	17.2/17.2/17.0	157.51
2					189.5
2.44	2 275	16.9/16.9/16.9	16.8/16.7/16.7	16.9/17.0/17.0	159.54
3					196.09
3.81	2 175	16.1/16.1/16.4	16.2/16.3/16.5	16.0/16.0/16.1	132.07
4					176.56
5					139.97
5.49	2 166	16.8/16.8/16.7	16.7/16.7/16.4	16.5/16.3/16.5	125.2
6					191.22
6.91	2 024	17.9/17.9/17.8	17.7/17.5/17.5	18.0/18.2/17.9	131.03
7					152.36
8					136.1
8.48	2 396	16.9/16.8/16.9	16.4/16.4/16.4	16.4/16.5/16.6	123
9					183.33
10					113.62

*pieces cut into kindling

Fuel load consist of three piece of Douglas crib wood. Each piece has three moisture measurements.

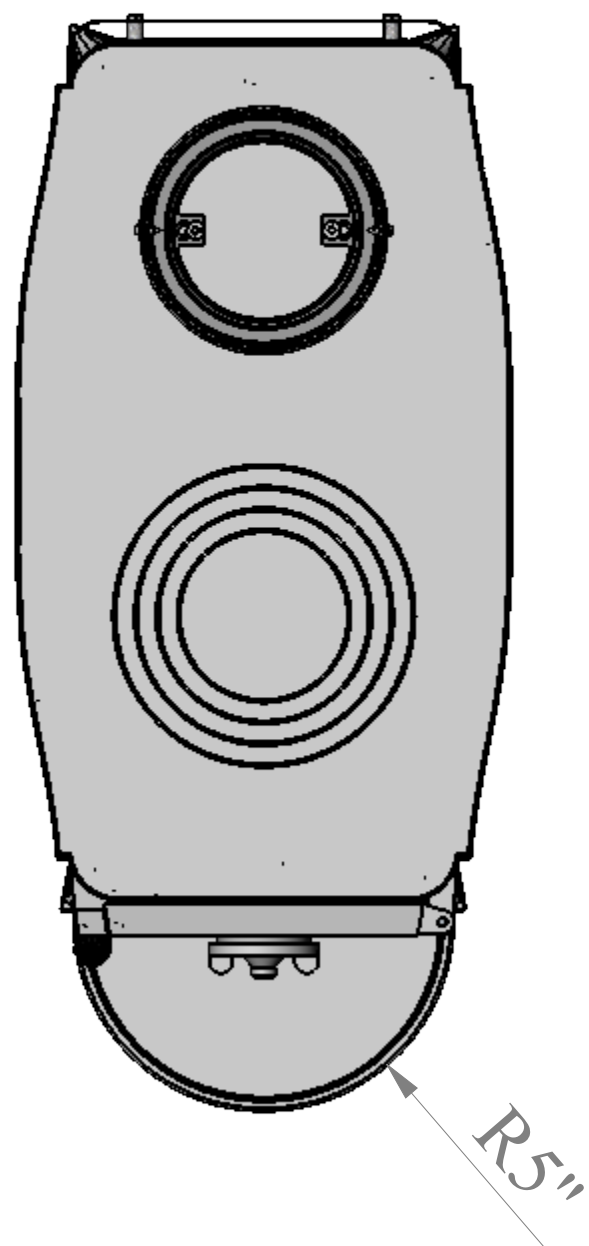
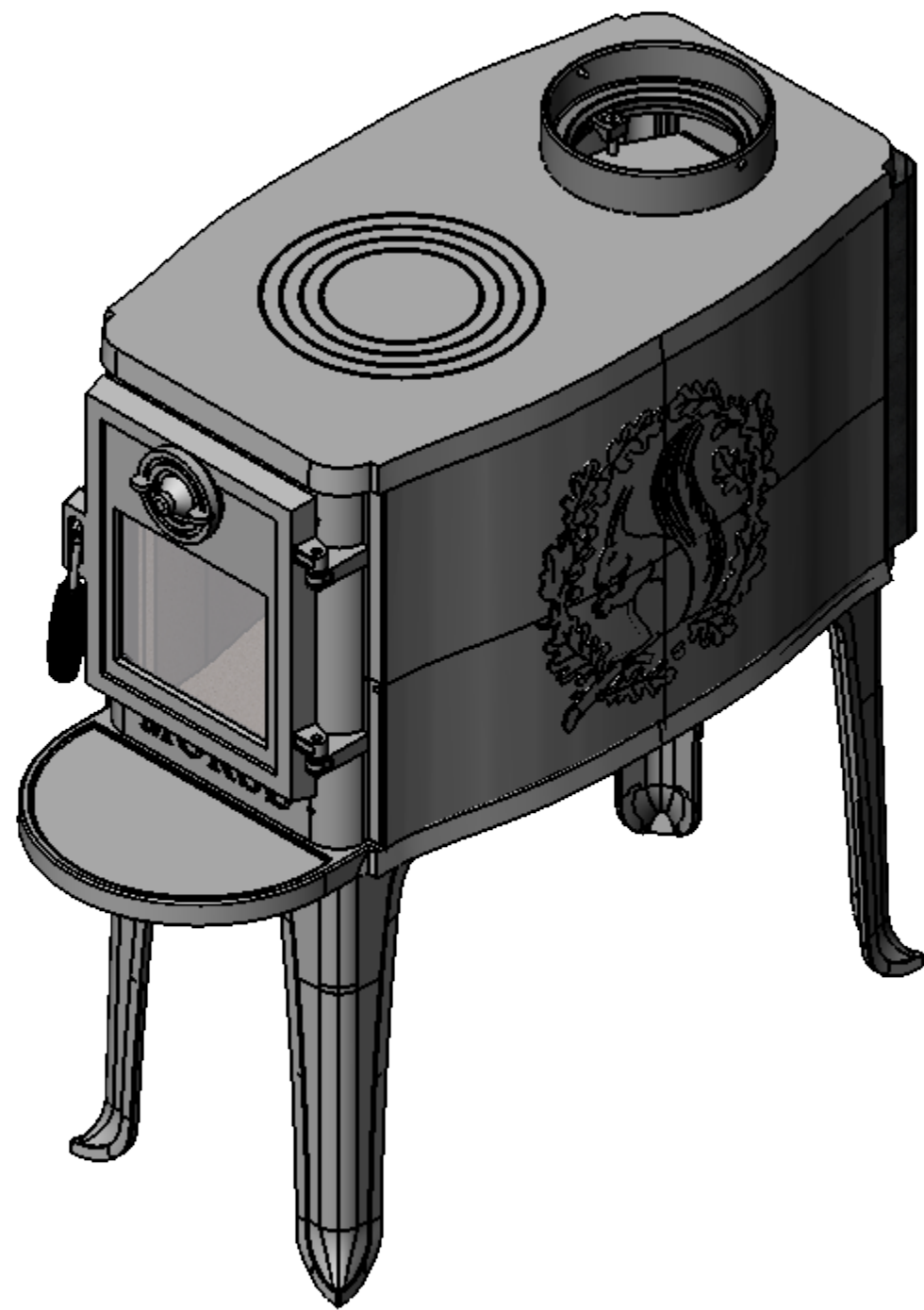
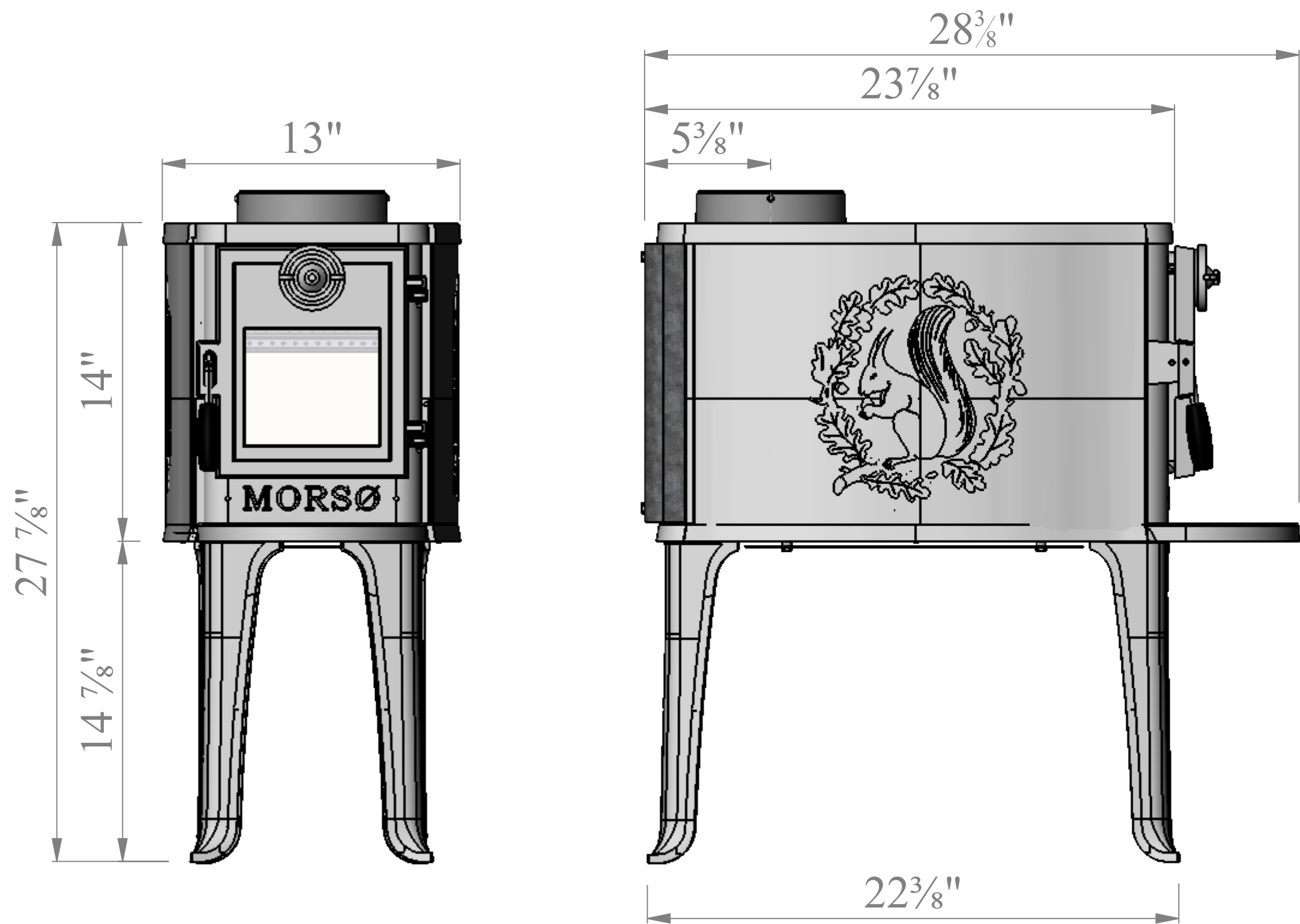


APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
www.polytests.com

Maxime Martin
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

APPENDIX 6: Drawings and specifications



		b	Added inches and two more view.		RSV	07.07.2010
		Rev. Revisions			Sign.:	Date:
		Title:			Construction:	RSV 07.06.07
Dim. without indication of margin acc. to DS/ISO 2768-1 m		Maalskitse 2B Standard radiant NA Morsø 2B Standard			Released:	
Material:					Format:	A2
Weight:	80,14 kg				Scale:	1:5
Model no.					Itemno.:	
Drawingtype:	Dimension Skecth				Drawing no.:	
Location of file:	U:\uudv\Tegninger\18&2B\2B Classic & 2B Standard Assembly.3LDASM				2B-125 b	

APPENDIX 7: Operator's manual

morsø

By appointment to The Royal Danish Court

morsø

Installation and Operating Instructions

Morsø 2B Standard

For use in North America



Save these instructions

MORSØ JERNSTØBERI A/S · DK-7900 NYKØBING MORS
E-Mail: info@morsoe.com · Website: www.morsoe.com

Enjoy your new Morsø stove!

We congratulate you on your choice of a Morsø stove. Morsø has been producing some of the world's best stoves since 1853. If you follow this installation- and operating instruction carefully, we can assure you many years of warmth and pleasure.

Contents

1.0	Installation of your Morsø stove	Page no.
1.1	Unpacking the stove	5
1.2	Checking loose parts in the stove	5
1.3	The chimney / flue system	7
1.4	Flue connection	8
1.5	Connection to the existing chimney	8
1.6	Positioning the stove	10
2.0	Operation	13
2.1	Before you start firing	13
2.2	Lighting & loading intervals	15
3.0	Maintenance	18
3.1	Exterior maintenance	18
3.2	Internal maintenance	18
3.3	Cleaning the stove & the flue	20
3.4	Leaving the stove for extended periods	21
3.5	Parts diagram for model Morsø 2B Standard	22
3.6	Parts list for model Morsø 2B Standard	23

Read this entire manual before you install and use your new room heater. If this room heater is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Failure to follow instructions may result in property damage, bodily injury, or even death.

Do not tamper with or alter the original construction of the wood stove. Modifications can lead to serious safety hazards, including fire, carbon monoxide poisoning, and voiding of the warranty. Always use the stove as designed and follow the manufacturer's instructions.

Contact local building officials about restrictions and installation inspection requirements in your area.

Save these instructions

Optional Accessories

A wide range of accessories (such as handling gloves, fireside tools, glass cleaner and heat-proof paint) are available for use with your Morsø stove. They help with day-to-day running and maintenance. Contact your Morsø dealer for more information.

The Morsø 2B Standard has been certified by PFS TECO.

The test standards are UL-1482-2012 (R2015) for the United States and ULC-S627-00 for Canada.



The stove is listed for burning wood only. Do not burn other fuels.

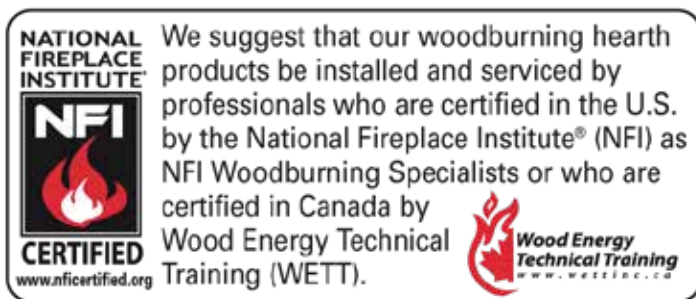
U.S. ENVIRONMENTAL PROTECTION AGENCY. Certified to comply with 2020 particulate emission standards using crib wood.

Average particulate emission using EPA Method 28R crib wood test method: 1.3 g/h

Under specific test conditions this heater has been shown to deliver heat at rates ranging from 10,661 to 19,519 Btu/hr.

This appliance was determined to have an average higher heating efficiency value of 75 % when tested in accordance with B415.1."

This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.



Cast iron

Cast iron is a live material. There are no two ovens that are identical. This is partly due to the tolerances of the casting process, partly because the ovens are a work of craftsmanship. Minor unevennesses may also occur in the cast iron surface.

1.0 Installation of your Morsø stove

The installation must conform standard CAN/CSA-B365, Installation Code For Solid-Fuel-Burning Appliances and Equipment

Make-shift compromises during installation can have consequences, the Installation of the woodburning stoves must be safe and legal.

If your Morsø stove is not installed correctly, it may cause a house fire. To reduce the risk of fire, the installation instructions must be followed carefully. Contact the local building officials about restrictions and installation inspection in your area.

Do not install in any fireplace.

Before you start installing your stove, make sure that:

- The stove and chimney connection are placed far enough from combustible materials to meet all clearance requirements.
- The floor protection must be adequate and must be made correctly according to the requirements.

All necessary approvals are needed from the local building officials.

The data plate, which is located on the back of the stove, provides information regarding safety testing information, name of certified testing laboratory, and installation requirements.

Installation requirements vary in different districts, and the local building officials have the final authorization to approve your installation. You should discuss the installation with them before beginning. Please ask your dealer for further information.

Do not connect to any air distribution duct or system.

Important: If the installation instructions are not followed carefully, it may cause dangerous situations like chimney - and house fires. Follow the instructions carefully and do not deviate from them as it may cause injuries to people or property.

1.1 Unpacking the stove

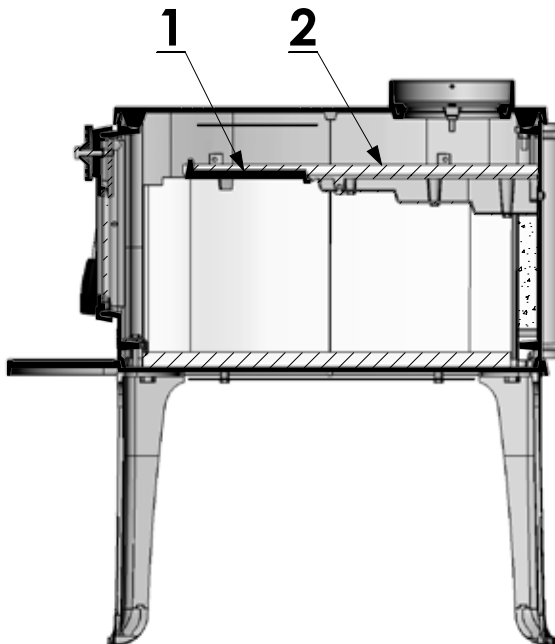
2B Standard: After removing the outer packaging, flatten it and lay onto the floor close to the stove; this can then act as protective work surface during the assembly process.

Next, remove the legs and bolts from inside the stove. Gently lay the stove onto its back and unscrew it from the wooden pallet. Using the bolts supplied, now screw the legs into position on the underside of the base. The stove should now be lifted and moved into the upright position, avoiding excess load on the back legs. Do not use the bolts used for securing the fire chamber to the wooden pallet.

1.2 Checking loose parts in the stove

After unpacking, check that the fire bricks are firmly in position and have not shifted in transit. Check also that the air control works freely.

Before starting the initial fire, make sure that the baffle (1) and insulation (2) over the baffle are placed correctly, as shown on the images below.



How to fit the Vertical Baffle

Lead the vertical baffle through the door as shown below (picture 1 & 2). Place the baffle into the right position (picture 3 & 4). The baffle insulation is placed on the baffle.



Standard Accessories

A Morsø glove and ceramic flue connection gasket are standard accessories that usually can be found in the ashpan or firebox area.

1.3 The chimney / flue system

Note that the flue system must be independently secured and must not rely on the stove for support. Do not install the chimney directly at the outlet of the appliance.

A chimney connector (flue pipe) is required unless the appliance is specifically approved for that type of installation. A chimney connector is included with the heater.

The stove must not be connected to a chimney flue serving any other appliance.
(Several flues may run up a single chimney stack; use one flueway per appliance).

Use a code-approved masonry chimney with a flue liner or listed type HT factory-built chimney.

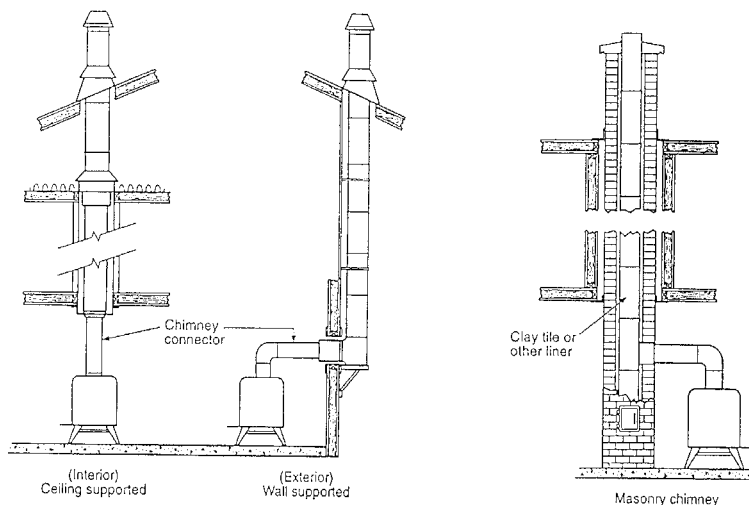
High Temperature (H.T.) Chimney Standard UL-103-1985 (2100° F.) or a code-approved masonry chimney with flue liner for the USA, and High Temperature (650°C) Standard ULC S-629 for Canada.

The internal dimensions of the chimney connector and chimney must not be less than 6 inches diameter (or equivalent cross section), and should not be significantly larger than this. Too large a section will tend to allow the flue gases to cool excessively, causing sluggishness or unpredictability in the stove's performance.

We recommend the length of the chimney system should be at least 16 feet (not required) above the stove in normal domestic situations, measured from the flue collar to the top of the chimney.

Local conditions like for example - roof constructions, large trees nearby and high altitude, may influence the chimney draft and height. Therefore, contact the local professional chimney sweep or your Morsø dealer.

Typical Factory-Built or Masonry Chimney Installations



Be sure that all connectors between the chimney parts and the heater are sealed properly so the chimney is airtight from the heater to the chimney outlet.

1.4 Flue Connection

A flue collar is placed in the firebox area.

Use a 24 MSG black or blue chimney connector or listed double wall chimney connector. Refer to local codes and the chimney manufacturer's instructions for precautions required for passing a chimney through a combustible wall or ceiling. Remember to secure the chimney connector with a minimum of three screws to the product and to each adjoining section. Position the stove and connect to the flue system.

Wear gloves and protective eyewear when drilling, cutting or joining sections of chimney connector.

1.5 Connection to the existing chimney

A chimney connector is the double-wall or single-wall pipe that connects the stove to the chimney. The chimney itself is the masonry or prefabricated structure that encloses the flue. Chimney connectors are used only to connect the stove to the chimney.

Double-wall connectors must be tested and listed for use with solid-fuel burning appliances. Single-wall connectors should be made of 24 gauge or heavier gauge steel. Do not use galvanized connector; it cannot withstand the high-temperatures that smoke and exhaust gases can reach, and may release toxic fumes under high heat. The connector must be 6 inches (150mm) in diameter.

If possible, do not pass the chimney connector through a combustible wall or ceiling. If passage through a combustible wall is unavoidable, refer to the sections on Wall Pass-Throughs. Do not pass the connector through an attic, a closet or similar concealed space when installing the chimney connectors.

It is important to keep the flue gases moving smoothly in the right direction. Do not vent into a large void at this location; rather form one continuous section all the way up. Use mild bends (e.g. 45° vs. 90°) rather than sharp angles where a change of direction is required. All parts of the venting must be accessible for cleaning purposes.

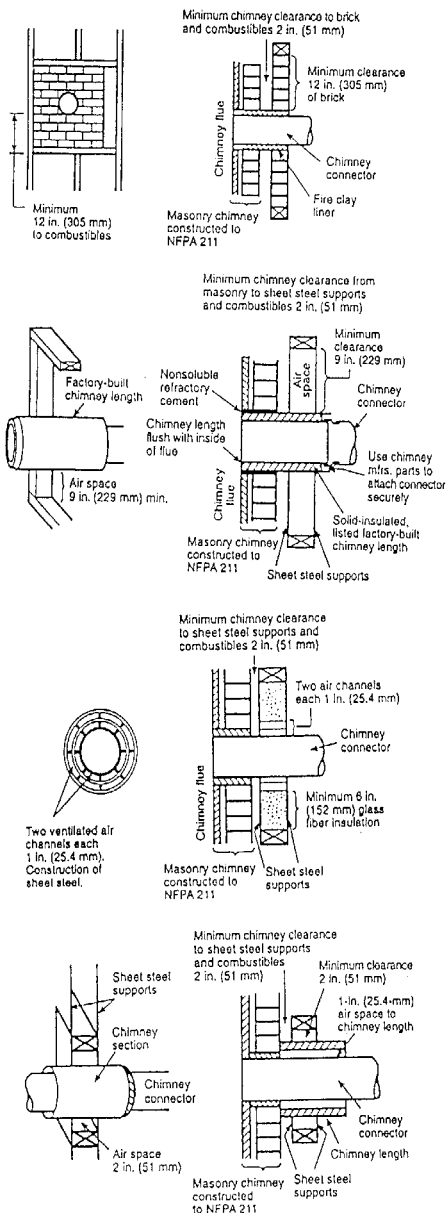
In horizontal runs of chimney, maintain a distance of 18 inches from the ceiling. Keep it as short and direct as possible, with no more than two 90 degree turns. Slope horizontal runs of connector upward 1/4 inch per foot (20 mm per metre) going from the stove toward the chimney. The recommended maximum length of a horizontal run is 3 feet (1 metre), and the total length should be no longer than 8 feet (2.5 metres).

Information on assembling and installing connectors is provided by the manufacturer's instructions exactly as you assemble the connector and attach it to the stove and chimney.

Be sure the installed stove and chimney connector are correct distances from near by combustible materials. See the clearance paragraph page 11.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365.

Chimney Connector Systems and Clearances from Combustible Walls for Residential Heating Appliances



- A Minimum 3.5-in thick brick masonry all framed into combustible wall with a minimum of 12-in brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.
- B Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1-in. or more of insulation with a minimum 9-in. air space between the outer wall of the chimney length and combustibles.
- C Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1-in. air channels, separated from combustibles by a minimum of 6-in. of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.
- D Solid insulated, listed factory-built chimney length with an inside diameter 2-in. larger than the chimney connector and having 1-in. or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2-in. air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12-in. chimney section spaced 1-in. away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel supports securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

1.6 Positioning the stove

Distance to walls and lintel

When the stove is positioned near combustible materials, observe all current local and national building regulations with regards to clearances. Whatever regulations apply to your area, do not in any case install the stove within 8 inches of combustible materials around the sides or 16 inches above the top of the stove (fireplace installations require greater clearances above the stove - see below in the clearance chart). These distances may need to be increased if the materials are sensitive to heat. Note also that wall paper and other decorative materials may become detached with the effects of heat and care should be taken to ensure that they do not fall towards the stove in such an event.

When the stove is positioned near non-combustible materials, a gap of 4 inches or more is recommended for cleaning purposes and to ensure that heat circulates around the stove and out into the room.

This heater heaters meets the requirements of CAN/ULC-S627 and are suitable for installation on a combustible floor and do not require radiant floor protection.Please read below regarding floor protection from falling embers.

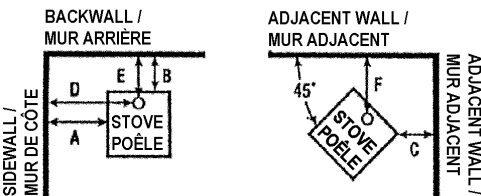
Clearance requirements for 2B Standard without shields (Singlewall connector)

CLEARANCE REQUIREMENTS	STANDARD RESIDENTIAL INSTALLATION (SINGLEWALL CONNECTOR)	
	USA	CANADA
A. Sidewall to unit	26"	26" (660 mm)
B. Backwall to unit	16"	16" (406 mm)
C. Cornerwall to unit	16"	16" (406 mm)
D. Sidewall to connector	29"	29" (737 mm)
E. Backwall to connector	18"	18" (457 mm)
F. Cornerwall to connector	19"	19" (483 mm)
G. Unit to ceiling	-	-
H. Floor to ceiling	-	-

Clearance requirements for 2B Standard with Convection shields (Singlewall connector)

CLEARANCE REQUIREMENTS	STANDARD RESIDENTIAL INSTALLATION (SINGLEWALL CONNECTOR)	
	USA	CANADA
A. Sidewall to unit	26"	26" (660 mm)
B. Backwall to unit	16"	16" (406 mm)
C. Cornerwall to unit	16"	16" (406 mm)
D. Sidewall to connector	26"	26" (606 mm)
E. Backwall to connector	23"	23" (583 mm)
F. Cornerwall to connector	19"	19" (483 mm)
G. Unit to ceiling	-	-
H. Floor to ceiling	-	-

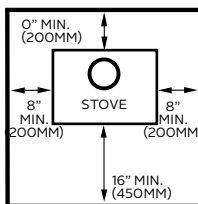
MINIMUM CLEARANCES TO COMBUSTIBLES: DEGAGEMENTS MINIMAUX AUX MATERIAUX COMBUSTIBLES:



Clearance requirements for 2B Standard with & without shields (Doublewall connector)

CLEARANCE REQUIREMENTS	STANDARD RESIDENTIAL INSTALLATION (DOUBLEWALL CONNECTOR)	
	USA	CANADA
A. Sidewall to unit	20"	20" (508 mm)
B. Backwall to unit	12"	12" (305 mm)
C. Cornerwall to unit	16"	16" (406 mm)
D. Sidewall to connector	26"	26" (660 mm)
E. Backwall to connector	14"	14" (356 mm)
F. Cornerwall to connector	19"	19" (483 mm)
G. Unit to ceiling	-	-
H. Floor to ceiling	-	-

FLOOR PROTECTION REQUIREMENTS



FLOOR PROTECTOR MUST BE NON-COMBUSTIBLE MATERIAL. IT MUST EXTEND BENEATH HEATER, AND TO THE FRONT / SIDES / REAR AS INDICATED

Floor protection requirements	Non-combustible materials beneath stove	
	USA	Canada
A. Extending distance, back	-	200 mm
B. Extending distance, right side	6"	200 mm
C. Extending distance, left side	6"	200 mm
D. Extending distance, front	16"	450 mm

In the US, floor protection must be constructed of a non-combustible material and installed to extend beneath the heater and 16" to the front and 6" to the sides of the fuel loading door and ash removal openings.

In Canada, to comply with CSA B365, Installation Code for Solid-Fuel-Burning Appliances and Equipment, any combustible covering beneath the appliance and/or within the area extending horizontally at least 450 mm (18 in) beyond the appliance on any side equipped with a door, and at least 200 mm (8 in) beyond the appliance on other sides, shall be protected by a continuous, durable, non-combustible pad that will provide ember protection. The 450 mm (18 in) ember protection required on any side with a door shall extend for the full width of the appliance plus the 200 mm (8 in) required on each side of the appliance without a door. Where an appliance is installed less than 200 mm (8 in) from a wall, the ember pad need only extend to the base of the wall. An ember pad shall not be placed on top of a carpet unless the pad is structurally supported to prevent displacement and distortion.

Distance to furniture

The recommended minimum distance from stove to furniture is 30 inches. Note that some furniture is more easily affected by heat and may need to be moved to a greater distance. This is your responsibility.

In addition other combustible materials, away from the stove. In general, a distance of 30 inches must be maintained between the stove and moveable combustible item such as drying clothes, newspapers, firewood etc.

DO NOT INSTALL IN A TRANSPORTABLE BUILDING / MOBILE HOME**Note:****Acid Protection**

If acid-washing the masonry around the stove, protect the stove surface with an acid-proof cover.

Fresh Air Inlet

Unless there is deemed to be sufficient ambient leakage of air into the room via doorways, windows and the like, a dedicated fresh air inlet will be needed. This inlet should have 2 square inches (1250 square mm) of free air space. This is particularly important where the room is well sealed, or where an extractor hood or ventilation system disturbs the natural air pressure. Such an inlet should not be on a wall that is usually subject to negative pressure from normal wind pattern. Avoid placing the inlet directly across the room from the stove, thus causing a cold air draft.

2.0 Operation

2.1 Before you start firing

For use with solid wood fuel only. Do not overfire, if heater or chimney connector glows you are overfiring. Inspect and clean chimney frequently. Under certain conditions of use creosote buildup may occur rapidly. Because of risk of smoke and flame spillage, operate only with door fully closed.

CAUTION:

Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.

DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE

DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS

DO NOT USE A GRATE, ANDIRONS, OR OTHER WAYS OF ELEVATING THE FIRE - BUILD FIRE DIRECTLY ON HEARTH.

DO NOT USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER OR FLUID OR SIMILAR LIQUIDS TO START OR FRESHEN UP A FIRE IN THIS HEATER. KEEP ALL SUCH LIQUIDS AWAY FROM THE HEATER WHILE IT IS IN USE

Do Not Burn:

- **Garbage;**
- **Lawn clippings or yard waste;**
- **Materials containing rubber, including tires;**
- **Materials containing 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;**
- **Salt water driftwood or other previously salt-water saturated materials;**
- **Unseasoned wood; or**
- **Paper products, cardboard, plywood, or particleboard. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected wood heater.**

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

Choosing your fuel

All types of natural wood can be burned on your stove, but they must be well-seasoned and dry. Once the wood is cut to length, it should be split down middle - to suit the dimensions given below - to allow moisture to evaporate. Cut the wood to a length of max 18 inches (45 cm) and approx. 3 to 3.5 inches (7-8 cm) in section. If you can weigh your wood, aim for around 2-4 lbs/ piece. For correct combustion and heat output, wood fuel should contain no more than 20% moisture; this can easily be checked by using the Morsø Moisture Meter (part # 62929900).

To naturally season wood fuel, stack and store it under cover in an airy location where fresh air can move through each piece. Some soft woods may take as little as one good summer to season whereas harder woods such as oak, maple, and elm may require seasoning up to 18 months. Avoid overly dry wood that is gray in color as under certain conditions it can cause performance problems, such as back-puffing and sluggishness. Well seasoned wood will be light to hold and will show signs of cracking from the center-out in the ends. If your wood spits or sizzles when burnt, and your stove's door glass persistently mists up, your wood is not properly seasoned. Never use drift wood (from the sea), whose salt content may cause corrosion, nor construction wood that may have been impregnated with chemicals.

To optimize efficiency:

Burning wet wood has a negative impact on efficiency

The efficiency of the wood heater is primarily influenced by its location. The stove is mainly designed to heat the room where it is installed.

Main Living Area. Placing the wood heater in the main living area maximizes efficiency, as it directly heats the space where most time is spent.

Basement. Installing the heater in the basement can be less efficient if heat does not adequately circulate to upper levels. Proper insulation and airflow management are crucial for effective heating.

Outdoors in Sub-Freezing Temperatures. Using the wood heater outdoors in very cold conditions significantly reduces efficiency. The heater must work harder to maintain warmth, leading to increased fuel consumption and less effective heating.

CAUTION Do not place fuel within the installation clearances for the stove or within the space required for loading fuel and ash removal.

Starting the First Fire

The initial fire should be small, so that the stove paint can cure and the main plates of the stove can settle into position. Some fumes will be given off by the paint. Ventilate the room during this phase.

The setting of the air control, lighting techniques and loading intervals will depend on chimney draft, the fuel used, the heat required and so on. Some basic techniques are outlined below.

IMPORTANT

To ensure proper combustion and prevent airflow blockage, never overload the firebox with wood. Use up to the recommended load of 7 lbs. Ensure the wood does not extend beyond the top edge of the backwall stone lining. The area in front of and just below the stainless-steel secondary air supply tubes, located on the baffle plate, is exclusively reserved for volatile gas combustion.

In principle

Your stove is fitted with Primary and Secondary air inlets.

Primary Air is controlled using the spinner on the door. Open the spinner will allow a supply of preheated air to enter the firebox via the 'airwash' system situated inside the stove and above the glass.

The secondary air is injected into the flue gases above the fire resulting in a cleaner, more efficient combustion process. The supply of secondary air is fixed open and is not adjustable.

For extra safety, your stove has been fitted with a removable handle on the frontdoor. The secondary air is injected into the flue gases above the fire resulting in a cleaner, more efficient combustion process. The supply of secondary air is fixed open and is not adjustable.

2.2 Lighting and loading intervals

When first lighting the stove, a large volume of air is needed. When the stove is cold, you should leave the door open an inch or two for the first few minutes and open the primary air supply completely. While the door is open, do not leave the stove unattended.

To form a reasonable bed of ash on the floor of the stove, you should use 2-4 pounds of dry kindling at the initial lighting. If possible, maintain a 1-1.5 inch (2-3 cm) layer of ash on the floor of the combustion chamber for added insulation.

1. We recommend using the “top-down” method to light your wood-burning stove. It is the most environmentally-friendly method of lighting. Use two firelighters and approx. 2-4 lbs of dry kindling sticks to quickly create a glowing layer of wood. Place the firelighters directly under the top layer of kindling sticks. This minimizes soot formation on the glass. Soot formation on the glass is often caused by too vigorous burning in contact with cold surfaces. If you avoid the formation of soot when lighting the fire and build up a layer of hot embers, you will have minimal soot formation when getting the fire burning again later.



2. Ensure the air supply is fully open by turning the air spinner controller counterclockwise all the way.

3. Light the fire.



4. After lighting, partially close the door, leaving it open an inch or two to allow in plenty of combustion air.



5. When the chimney is warm after about 5-10 minutes, the frontdoor should be closed. A suitable layer of ember will be formed after about 15-20 minutes.

6. When ready to reload, use a poker to spread the ember across the firebox floor, bringing plenty towards the front of the stove.

7. Refuelling of your stove should be done while there are still glowing embers in the bed. Spread the embers across the bottom, but concentrated mostly towards the front of the stove. We recommend using fuel load with a weight of 4 lbs (2 pieces) and up to 7 lbs (5 pieces).



Always keep the fuel load beneath the lowest secondary air nozzles. The space in front of and above the lowest air nozzles is reserved for volatile gas combustion only.

When refuelling your stove, it is recommended that you open the stove door gently for the first 1-2", then wait for a few seconds for the pressure in the flue to equalise; you are now safe to proceed and open it all the way. By using this technique smoke spillage can be eliminated particularly in poor chimney draft conditions. The stove door should not be opened when the stove is being fired vigorously.



8. Close the frontdoor. Leave the primary air supply fully open. The new fuel will ignite in a minute or two

9. After a few minutes, adjust the primary air supply based on your heating requirements. Turn the air spinner controller counterclockwise for more air and heat, and clockwise to reduce air and heat. If you plan to use the minimum low burn rate (air spinner controller in the fully closed position), first allow the fire to establish properly by burning at a medium rate for about 15 minutes. To achieve a medium burn rate, move the air spinner controller 1.5 turns clockwise from the fully open position.



10. For refueling, add a layer of wood while there are still plenty of live embers, Repeat steps 5-8.

When refuelling your stove, it is recommended that you open the stove door gently for the first 1-2", then wait for a few seconds for the pressure in the flue to equalise; you are now safe to proceed and open it all the way. By using this technique smoke spillage can be eliminated particularly in poor chimney draft conditions. The stove door should not be opened when the stove is being fired vigorously.

Do not for any reason attempt to increase the firing of your heater by altering the air control adjustment range outlined in these directions.

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.

Warning: Fireplace stoves must never be left unattended with doors open.

If doors are left partly open, gas and flame may be drawn out of the fireplace stove opening, creating risks from both fire and smoke. We recommend you to fit a smoke detector in the room where the stove is installed.

DO NOT OVERFIRE THIS HEATER. Overfiring may cause a house fire, or can result in permanent damage to the stove. If any part of the stove glows, you are overfiring.

The maximum recommended weight of wood fuel per load is 3,5 kg/7 lbs (approx 5 split logs).

Under normal firing, the average flue temperature in the stove pipe, measured 20 cm above the stove, is approx. 300° C (550°F). The maximum flue temperature in the stove pipe must not exceed 450° C (750°F). If the flue temperature exceeds 450°C (750°F), it is considered as over firing and may cause premature wear and tear of the stove.

To help gauge the correct running temperature of your stove, we recommend you use the Morsø Flue Gas Thermometer (part No. 62901200). The Flue Gas Thermometer magnetically attaches onto the stove pipe approx 20 cm (8") above the stove's top plate and measures the surface temperature of the stove pipe. Please see your authorized Morsø Dealer for availability.

Draft conditions

If smoke or fumes come out of your stove when lightning up and reloading, or if the fire simply will not respond, a poor draft is almost certainly to blame. (In a very few cases, there may be insufficient fresh air getting into the room - see installation advice above). Take advice from your stove supplier on how best to upgrade your flue system to improve draft.

Rules of woodburning

If you want less heat, put fewer logs on the stove and reduce the amount of air. It is still important to maintain a good layer of embers.

Less heat - less wood - less air

Greater heat - more wood - more air

Soot deposits will settle on the glass if the stove is run too slowly or if your wood is not well seasoned.

Carbon monoxide detectors

It is required in some jurisdictions to install smoke and carbon monoxide detectors where heaters are installed. Install at least one smoke detector on each floor of your home to ensure your safety. It should be located away from the wood appliance and close to the sleeping areas. Locating a smoke detector too close to a wood appliance can cause the smoke detector alarm to sound if a puff of smoke is emitted while the wood appliance door is open during reloading. Follow the smoke detector manufacturers placement, installation, and maintenance instructions

3.0 Maintenance

When performing maintenance on your stove, always protect yourself, using safety goggles and gloves

3.1 Exterior Maintenance

The stove surface is painted with heat-resistant Senotherm paint. It is best kept clean by vacuuming with a soft brush attachment or by wiping with a lint-free cloth.

Over a period of time, the painted surface may become slightly grey. A can of Morsø touch-up spray paint should be available from your stove supplier. This can be applied - in accordance with the instructions - in just a few minutes. When first firing after touching up, the stove will give off a slight smell as the paint cures. Make sure to ventilate the room well during this phase.

3.2 Internal maintenance

Glass

If the stove is generally run at the correct temperatures, there should be little or no dirt on the glass. If dirt does settle during lighting, most will burn off as temperatures increase. For heavier deposits that will not burn off, use Morsø glass cleaner, applied when the glass is cold, in accordance with the instructions. Never use abrasive cleaners on the glass surface.

Reasons for dirty glass

- Fuel too wet
- Logs too large or not split
- Combustion temperatures too low

**Do not clean the glass while hot
Replace broken glass immediately.**

Do not operate your stove if the glass in the door is damaged.

If you need to replace the glass, it should be replaced with the high temperature ceramic glass supplied by Morsø, contact your Morsø dealer.

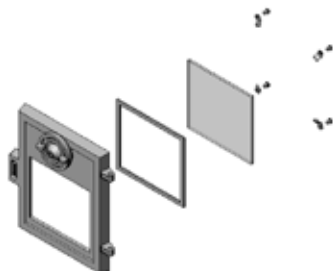
Installing the glass

Never install the glass when the stove is in function.

Ceramic glass replacement

Ceramic glass cannot be recycled because it has a higher melting point than ordinary glass. If ceramic glass is mixed with ordinary glass, the raw material is spoiled, and the reclaiming process may be halted. Take care that the ovenproof glass does not end up among ordinary recycled waste. That will be a great benefit to the environment.

Note: Should be handed in to a recycling station as ceramic glass.



1. Lift the door off the hinges and place it face down on a sheet of cardboard or other non-abrasive fabric.
2. Unscrew the 4 bolts that secure the glass. (In the event that a bolt sheers off when being unscrewed, remove the remaining body of the bolt by drilling down its centre with 1/8 inch high speed steel drill bit. Smaller drill bits may be successful, but do not use a larger bit. Make sure the bit stays away from the edges of the bolt - this may damage the thread in the cast iron).
3. Remove the old ceramic gaskets and clean up the surface underneath with wire wool or emery paper to remove loose particles.
4. Place the new gasket material in position around the perimeter of the window area, making sure to pinch them to the length in such a way that they make a continuous seal. Leave no gaps.
5. Place the new glass in position on the strips and screw home the fresh bolts and fitting by hand.
6. Finally, give each of the bolts an extra half turn or so. The glass should held tight enough by that cleaning will not dislodge it. Do not over-tighten the bolts as this may put excessive pressure on the glass, resulting in cracking - important!

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

Internal service parts

The flame-path equipment - consisting of the ashpan, grate, firebricks, Cast iron fire plates, glass, baffle and flue collar - are subject to the extremes of heat produced by the fire. From time to time, one or other of these parts may need replacing as a matter of routine maintenance.

Stone replacement

When replacing the stones, unscrew at the rear of the stove the heat reflector, which is mounted with 4 screws. This provides access to the 2 bolts that hold the smoke baffle in place. Remove these bolts so that the smoke baffle inside the stove can be raised. Raise the smoke baffle so that the old stones can be removed from the stove and the new ones can be installed. The side stones are placed in the grooves in the vermiculite bottom plate. Once the stones have been properly put into place, lower the smoke baffle down onto the stones and re-bolt it securely to the cast rear of the stove. Finally, reinstall the rear heat reflector with its 4 screws.

NOTE: The flame-path equipment, the ceramic rope and the paint finish are not covered by guarantee.

All of these service parts can be bought from your Morsø dealer, and we recommend that damaged parts are replaced as soon as possible to avoid collateral damage. Should the baffle be distorted by an overfire, the stove will still function, although its efficiency may be compromised. Replace it as soon as possible.

Reasons for fast internal wear and tear

- Persistent heavy firing
- Soot and ashes left to accumulate

Gasket

The gasket around the perimeter of the door may harden over a period of time. It should be replaced if it becomes difficult to close the doors or if air starts to leak in around the perimeter of the doors, causing the fire to become a little less controllable. A Morsø rope gasket kit is available from your stove supplier.

3.3 Cleaning the Stove and the Flue

Check for soot above the baffle plate and around the flue outlet every month or so to start with. If the stove suddenly becomes sluggish, check for a soot fall around the flue collar or in the flue/chimney.

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.

Clean the flue/chimney - all the way from the stove to the flue terminal point above the house. A good routine is to clean the flue after each heating season in any case, and inspect prior to the season to ensure that bird's nests or other blockages have not occurred during the off season.

Remove the ash according to this procedure:

Open the front door, and use a shovel.

Dispose the ash in a metal 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.

Caution:

Never empty a stove in operation.

Never use your household or shop vacuum cleaner to remove ash from the stove; always remove and dispose of the ash properly.

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. When burning wood, 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.

Chimney sweeping

Inspect the system regularly during the heating season as part of a regular maintenance schedule. To inspect the chimney, let the stove cool completely. Then, using a mirror, sight up through the flue collar into the chimney flue. If you cannot inspect the flue system in this fashion, the stove must be disconnected to provide better viewing access.

Clean the chimney using a brush the same size and shape as the flue liner. Run the brush up and down the liner, causing any deposits to fall to the bottom of the chimney where they can be removed through the clean-out door.

Clean the chimney connector disconnecting the sections, taking them outside, and removing any deposits with a stiff wire brush. Reinstall the connector sections after cleaning, being sure to secure the joints between individual sections with sheet metal screws.

If you cannot inspect or clean the chimney yourself, contact your local Morsø Dealer or a professional chimney sweep.

If you do experience a chimney fire, act promptly and:

1. Close the air control.
2. Get everyone out of the house.
3. Call the Fire Department.

Annual maintenance

Before the heating season, perform a thorough cleaning, inspection and repair:

Thoroughly clean the chimney and chimney connector.

Inspect the chimney for damage and deterioration. Replace weak sections of prefabricated chimney. Have a mason make repairs to a masonry chimney.

Inspect the chimney connector and replace any damaged sections.

Check gasketing for wear or compression, and replace if necessary.

Check the glass for cracking; replace if needed.

Check door and handle for tightness. Adjust if needed.

ALWAYS USE ORIGINAL MORSØ SPAREPARTS

3.4 Leaving the stove for extended periods

Important:

If the stove is to be left unused for any period of time, clean it out thoroughly and leave the air control slightly open to allow airflow. Make sure that the flue does not allow rainwater to come anywhere near the stove; install a chimney cap, but do not block off the flue completely.

These measures should ensure there is a slight movement of air through the stove, and that the body of the stove remains dry, right into the corners.

Any ash left within an unfired stove can attract moisture like blotting paper. If moisture is allowed to settle within the stove, rust will form. Rust expands as it takes a grip. This can lead to undue pressure on the stove joints, and this in turn may result in damage to the stove.

NOTE: It is best to thoroughly clean the stove after the heating season has concluded. Adding a dessicant, such as kitter litter, into the ash pan helps absorb moisture during the summer months. Be sure to remove this prior to the heating season.

Thank you for buying a morsø stove.

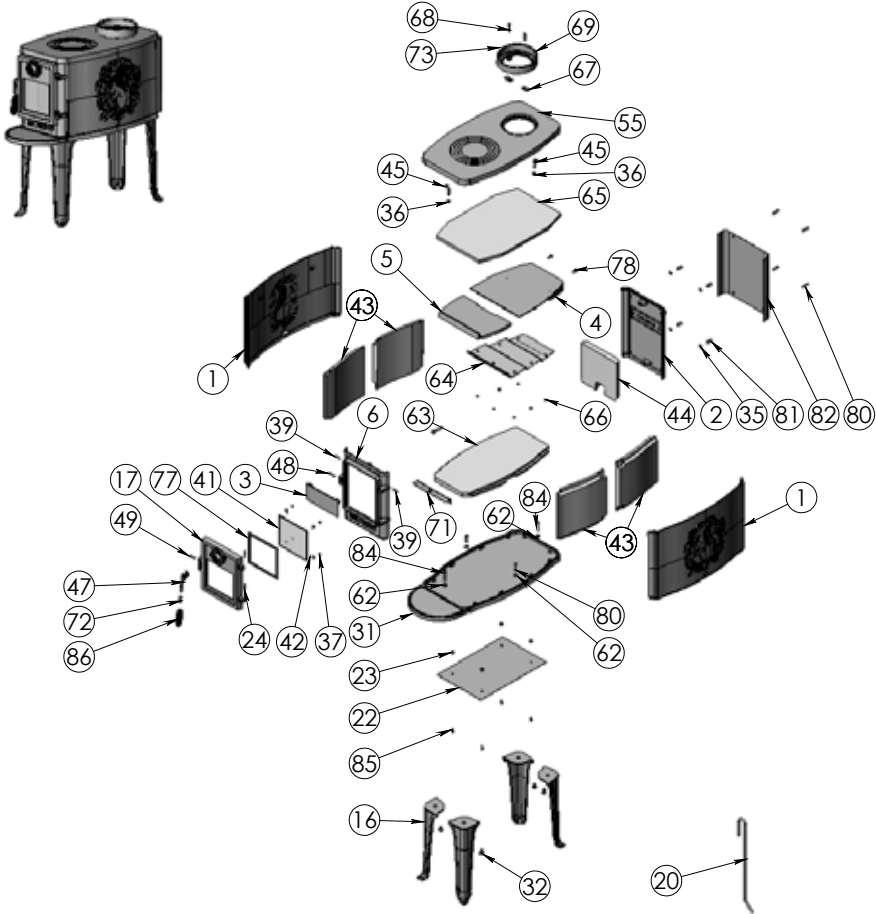
We hope you have many years of carefree warmth in its company. Some initial experimentation with loading and running techniques will decide your normal routine. If you have any problems after this short learning phase, please refer to your stove dealer. Should they be unable to help for any reason, please contact us in writing at the address on the front of this publication.

We highly recommend lubrication of hinges and closing mechanisms once per year or as needed, not only to ensure smooth functioning and longevity, but also to mitigate wear and tear.

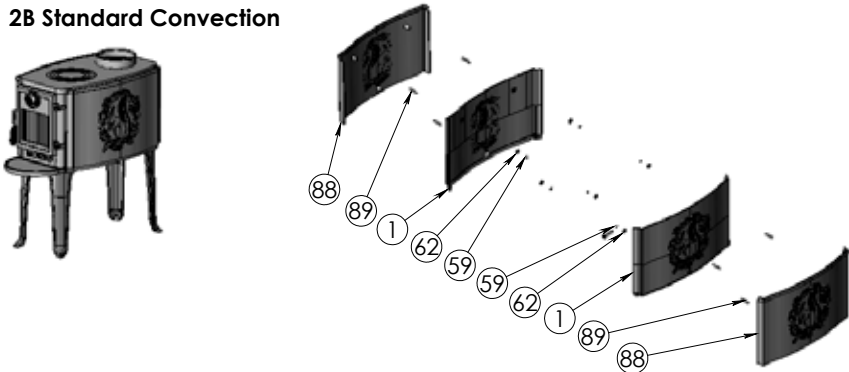
We recommend copper grease as a lubricant or another equally heat-resistant grease.

3.5 Parts diagram for model Morsø 2B Standard

2B Standard Radiant



2B Standard Convection



3.6 Parts list for model Morsø 2B Standard

Pos. No.	Parts	2B Standard without shields	2B Standard with convection shields
1	Squirrel side panel	54200321	44200521
2	Rear plate	44203721	44203721
3	Smoke valve	44200800	44200800
4	Horizontal baffle	44203600	44203600
5	Vertical baffle	34203800	34203800
6	Front	44201521	44201521
16	Leg	44200121	44200121
17	Door	44204421	44204421
20	Poker	541075	541075
22	Radiation shield - base	54137000	54137000
23	Distance tube	541439	541439
24	Hinge pin	541808	541808
31	Base	44204021	44204021
32	Screw	-	-
35	Washer	-	-
36	Screw	-	-
37	Screw	-	-
39	Screw	-	-
41	Door glass	790715	790715
42	Glass clips	790743	790743
43	Side brick	79209000	79209000
44	Rear brick	79209100	79209100
45	Bolt	-	-
47	Clasp	79127000	79127000
48	Pin	791868	791868
49	Pin	791869	791869
55	Top plate	44200721	44200721
59	Nut	-	-
62	Washer	-	-
63	Brick - base	79209300	79209300
64	Baffle - stainless steel	71209061	71209061
65	Insulation	79077100	79077100
66	Screw	-	-
67	Fitting for cover w. thread	44256700	44256700
68	Screw	-	-
69	Flue collar	44145921	44145921
71	Radiation shield - front	71209161	71209161
72	Fitting for handle	75140161	75140161
73	Screw	-	-
77	Tightening tape for glass	79074200	79074200
78	Screw	-	-
80	Screw	-	-
81	Distance tube	542635	542635
82	Conv. back rear plate	54201221	54201221
84	Screw	-	-
85	Screw	-	-
86	Bakelite handle 36 mm	79118300	79118300
87	Washer	-	-
88	Conv. Squirrel side panel	-	44204121
89	Screw	-	-

MORSØ 10 YEAR WARRANTY CERTIFICATE

Behind every Morsø stove is more than 160 years of dedicated stove design and manufacturing experience. Quality control has always been at the heart of the production process and detailed measures have been put into place at all key stages of the build. Accordingly, provided that the stove has been supplied by an authorised Morsø dealer, Morsø will offer a 10-Year Manufacturers warranty against manufacturing defect to any of the main exterior body parts of its stoves.

Warranty Information

Limited Warranty

Morsø warrants that the wood stove is free from defects in material and workmanship under normal use and service, subject to the terms and conditions outlined below. The warranty period is valid for 10 years from the date of purchase.

What Is Covered:

This warranty covers replacement or repair of parts that are defective due to materials or workmanship.

What Is Not Covered:

The warranty does not cover damage resulting from:

- Improper installation or use not in accordance with the owner's manual, including in relation to applicable public regulations and Morsø's assembly and firing instructions.
- Damage caused by overheating and firing with the wrong fuel.
- Normal wear and tear, such as discoloration of surfaces. Wear parts, i.e. parts that wear out during normal use (e.g. smoke deflector plates, grates, refractory stones/plates as well as glass and sealing materials). The provisions of the Sales Act on liability for defects apply to these parts.
- Repairs or modifications not authorized by Morsø.
- In the event of lack of maintenance and breakage of the product's surface treatment, corrosion can occur. The warranty does not cover such occurrences. The provisions of the Sales Act on liability for defects also apply here.
- Malfunctions caused by local conditions, draft problems or damage/faults to the chimney.

Void Conditions:

This warranty is void if this wood heater is not installed, operated, and maintained in accordance with the instructions provided in this manual or if it is used to burn materials for which it is not certified by the EPA. The warranty is also void if any unauthorized modifications are made to the heater.

How To Exercise Your Warranty

To make a warranty claim, follow these steps:

1. Contact Morsø Customer Service via email at **info@morsoe.com** or by phone at **+45 96691900**
2. Provide the following information:
 - Proof of purchase (receipt or invoice).
 - Model number and serial number of the stove.
 - A detailed description of the issue, including photographs if possible
3. Morsø will evaluate the claim and, if approved, provide instructions for repair, replacement, or service.

For detailed warranty terms, please visit:

Morsø Warranty Page **<https://morsoe.com/us/customer-service/indoor/warrantystoves>**



**Stove manufacturer
Address**

Phone Number

**Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark
+45 96691900**

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[illegible]

IMPORTANT!

How to heat safely for the environment and yourself!

- **Use only dry wood**

Use only dry (max. 20% moisture content) and untreated wood. The fuel must be split and 8 - 12 cm thick.

- **Light**

Light with dry kindling (use 1 - 2 kg). Leave the door ajar and stay close to the stove during the lighting phase.

- **Good layer of embers**

Be certain to have a good layer of embers before refilling. The wood should light within 2 minutes. If the logs do not ignite it may, in an extreme case, cause the flue gases to ignite which may pose a risk to material damage or personal injury.

- **Refuelling**

When refuelling use 2 - 3 pieces of wood - no more than 2 - 2.5 kg.

- **Ensure adequate air**

I.e. clear and yellow flames.

- **Never burn overnight**



By appointment to The Royal Danish Court

morsø

Morsø Jernstøberi A/S -05.05..2025 - 72207600

morsø



morsø

Manuel d'installation et d'utilisation

Morsø 2B Standard 2020

Pour utilisation en Amérique du Nord



Enregistrez ces instructions

MORSØ JERNSTØBERI A/S · DK-7900 NYKØBING MORS
E-Mail: info@morsoe.com · Website: www.morsoe.com

Félicitations pour l'acquisition de votre nouveau poêle Morsø !

Morsø, le plus important fournisseur sur le marché danois, fabrique des poêles-cheminées de haute qualité depuis 1853. En suivant les présentes instructions, nous sommes persuadés que votre nouveau poêle vous apportera plaisir et satisfaction durant de nombreuses années.

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Avant d'installer et d'utiliser votre nouvel appareil de chauffage, veuillez lire ce manuel en entier. Une mauvaise installation de cet appareil de chauffage peut entraîner un incendie.

****Ne modifiez pas ou n'altérez pas la construction originale du poêle à bois.****

Les modifications peuvent entraîner de graves dangers pour la sécurité, notamment des risques d'incendie, d'intoxication au monoxyde de carbone, et l'annulation de la garantie. Utilisez toujours le poêle tel qu'il a été conçu et suivez les instructions du fabricant.

Suivez les instructions d'installation pour limiter ce risque d'incendie. Le non-respect des instructions peut entraîner des dommages matériels, corporels ou même mortels.

Contactez l'administration locale de construction concernant les restrictions et équipements d'inspection dans votre région.

Conservez ces instructions

Accessoires en option

Une gamme étendue d'accessoires (tels que gants de manipulation, ustensiles de cheminée, nettoyant pour vitre et peinture résistant à la chaleur) est disponible pour une utilisation adaptée à votre poêle Morsø. Ils facilitent l'entretien et l'utilisation de chaque jour. Contactez votre revendeur Morsø pour plus d'informations.

Le 2B Standard 2020 de Morsø de Morsø a été certifié par les services d'inspection PFS TECO. Les standards du test sont UL-1482-2011 (R2015) pour les États Unis et ULC- S627-00 pour le Canada.



Le poêle est répertorié uniquement pour brûler du bois. Ne brûler aucun autre combustible.

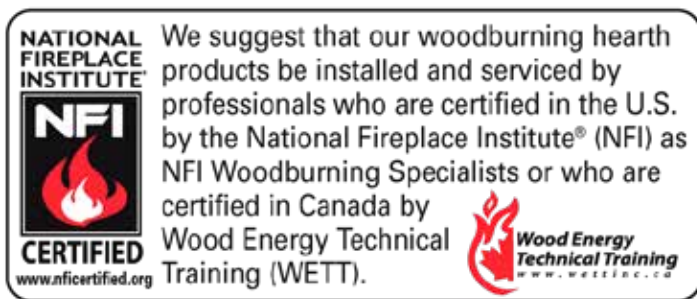
U.S. ENVIRONMENTAL PROTECTION AGENCY. Certifié conforme aux normes d'émission de particules 2020 en utilisant du bois de corde.

L'émission moyenne de particules en utilisant la méthode de test du bois de crèche EPA Méthode 28 est 1,3 g / h.

Sous conditions spécifiques de test, on a pu constater que le rendement calorifique varie entre 10,661 et 19,519 Btu/hr

Un essai effectué conformément à la norme CSA B415.1 a montré que ce poêle avait un rendement moyen de chauffage supérieur à 75 %.

Ce poêle doit être révisé et réparé périodiquement pour une utilisation correcte. Il est contre la loi fédérale d'utiliser ce poêle contredit les instructions de ce manuel.



La fonte

La fonte n'est pas un matériau inerte. Raison pour laquelle il n'y a pas deux poêles identiques. Ceci en raison des marges de tolérance de la fonte et de la fabrication artisanale des poêles. De fines irrégularités sont normales sur la surface de la fonte.

1.0 Installation de votre poêle Morsø

L'installation doit être conforme à la norme CAN/CSA-B365, Code d'installation des appareils à combustibles solides et du matériel connexe.

Faire des impasses pendant l'installation peut avoir des conséquences, l'installation des poêles à bois doit être sûre et légale.

Si votre poêle Morsø n'est pas installé correctement, cela peut provoquer un incendie. Pour réduire le risque d'incendie, les instructions d'installation doivent être suivies avec soin. Contactez les responsables locaux de la construction au sujet des restrictions et des exigences d'inspection et d'installation dans votre région.

Ne pas installer dans une cheminée.

Avant de commencer l'installation de votre poêle, assurez-vous que :

- Le poêle et le raccord de cheminée sont placés suffisamment loin des matériaux de combustion afin de remplir toutes les conditions d'espacement.
- La protection du sol est adéquate et correctement effectuée conformément aux conditions.

Contactez l'administration locale de construction pour toutes les approbations nécessaires.

La plaque d'informations située à l'arrière du poêle fournit les informations nécessaires concernant les données de test de sécurité, le nom du laboratoire de test agréé et les conditions d'installations.

Les conditions d'installation diffèrent selon les districts et l'administration locale de construction a le pouvoir d'autorisation définitive pour approuver votre installation. Discutez de l'installation avec eux avant de commencer. Pour plus d'informations, contactez votre vendeur.

Ne connectez aucun conduit ou système de distribution d'air.

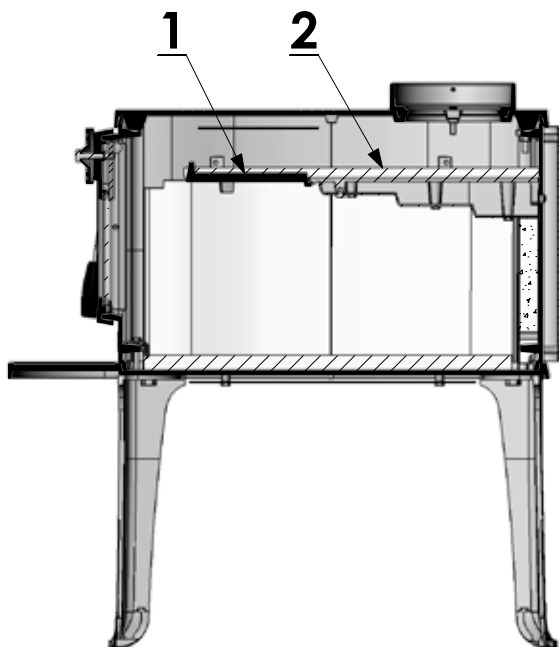
Important : Si vous ne suivez pas attentivement les instructions d'installation, il peut en résulter des situations dangereuses comme des incendies de cheminée ou de maison. Suivez attentivement les instructions et ne vous en écarter pas car cela peut entraîner des dégâts corporels ou matériels.

1.1 Déballage du poêle

2B Standard : après le déballage, dévissez la chambre de combustion de la palette avant de la poser tranquillement sur le côté. Pour éviter tout dommage du poêle et du sol, vous pouvez utiliser l'emballage en carton comme protection. Déballez les pieds fournis avec le poêle et vissez-les sur le socle en fonte à l'aide des boulons joints - Ne pas utiliser les boulons qui servent à fixer la chambre de combustion à la palette en bois.

1.2 Vérifier les pièces mobiles dans le poêle

Après le déballage, vérifiez que les briques réfractaires sont fermement en place et n'ont pas bougé pendant le transport. Vérifiez également que le contrôle d'air fonctionne librement. Avant le premier allumage, assurez-vous que le déflecteur (1) et l'isolation (2) au-dessus du déflecteur sont placés correctement, selon les illustrations ci-dessous.



Pose du déflecteur vertical

Faites passer le déflecteur vertical par la porte, comme indiqué ci-dessous (illustrations 1 et 2). Placez le déflecteur dans la position correcte (illustrations 3 et 4). Placez l'isolation sur le déflecteur.



Accessoires standard

Le gant Morsø et le joint étanche de raccord de tuyau céramique sont des accessoires standard et se trouvent habituellement dans le cendrier ou le foyer.

1.3 Le système de cheminée/conduit

Remarque : le système de conduit doit être sécurisé de façon indépendante et ne doit pas reposer sur le poêle.

Le poêle ne doit pas être raccordé à un conduit de cheminée servant à un autre appareil. (Plusieurs tuyaux peuvent parcourir une seule souche de cheminée ; utilisez un seul tuyau par appareil).

Utilisez une cheminée maçonnée de type résidentiel ou une cheminée d'usine de type HT répertoriée.

Cheminée Haute Température (H.T.) Standard UL-103-1985 (2100° F) pour les États-Unis et Standard Haute Température (650° C) ULC S-629 pour le Canada.

Les dimensions internes du raccord de cheminée et de la cheminée ne doivent pas être inférieures à 6 pouces (150 mm) de diamètre (ou coupe transversale équivalente) et ne doivent être beaucoup plus grandes. Une coupe trop grande a tendance à laisser les gaz du conduit refroidir excessivement, causant ainsi lenteur ou imprévisibilité de fonctionnement du poêle.

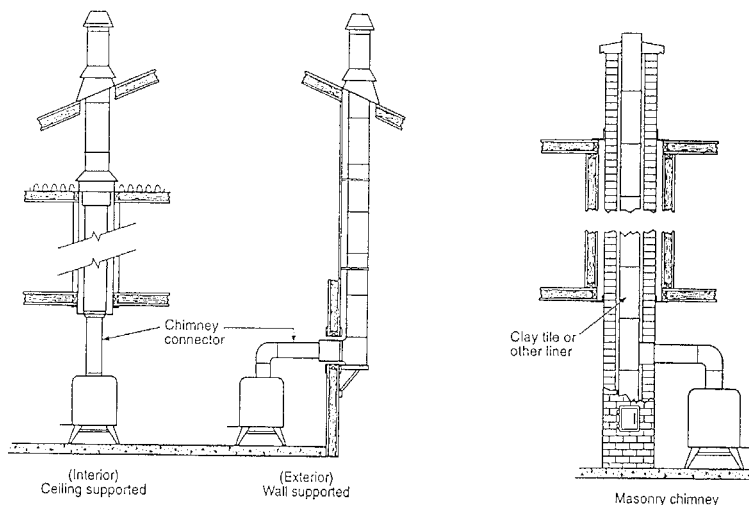
Nous conseillons que la longueur de la cheminée est au moins de 16 pieds (4,90 m) (pas indispensable) au-dessus du poêle dans des situations ménagères normales, mesurée du collier de serrage du tuyau à l'extrémité supérieure de la cheminée.

Les conditions locales comme, par exemple, la construction du toit, de gros arbres à proximité et une altitude élevée, peuvent avoir une influence sur le tirage et la hauteur de la cheminée. Veuillez donc contacter les ramoneurs professionnels locaux ou votre concessionnaire Morsø.

N'installez pas la cheminée directement à la sortie du poêle.

Un raccord de cheminée (conduit de fumée) est requis, sauf si l'appareil est spécifiquement approuvé pour ce type d'installation. Un raccord de cheminée est fourni avec le poêle.

Installations typiques de cheminée usine ou maçonnée



Assurez-vous que tous les raccords entre les pièces de la cheminée et le poêle soient correctement scellés afin que la cheminée soit hermétique entre le poêle et la sortie de cheminée.

1.4 Connexion du conduit

Un collier de serrage de tuyau est placé dans la zone du foyer.

Utilisez un raccord de cheminée bleu ou noir de 24 MSG ou un raccord de cheminée à double paroi répertorié. Reportez-vous aux règlements locaux et aux instructions du fabricant de la cheminée concernant les précautions à respecter pour faire passer une cheminée à travers un mur ou un plafond combustible. Pensez à sécuriser le raccord de cheminée avec au moins trois vis au produit et à chaque section contiguë.

Positionnez le poêle et connectez le système de conduit.

Portez des gants et des lunettes de protection lors du perçage, coupage ou assemblage des sections du raccord de cheminée.

1.5 Connexion à une cheminée déjà en place

Un raccord de cheminée est le tuyau à double ou simple paroi qui relie le poêle à la cheminée. La cheminée elle-même est la structure maçonnée ou préfabriquée qui contient le tuyau. Les raccords de cheminée permettent de relier le poêle à la cheminée.

Les raccords à double paroi doivent être testés et répertoriés pour une utilisation avec des appareils à combustibles solides. Les raccords à paroi simple doivent être faits en acier de calibre 24 ou plus. N'utilisez pas de raccords galvanisés : ils ne résistent pas aux hautes températures atteintes par la fumée et les gaz d'échappement et qui peuvent dégager des vapeurs toxiques sous grande chaleur. Le raccord doit avoir un diamètre de 6 pouces (150 mm).

Si possible, évitez de faire passer le raccord de cheminée à travers un mur ou un plafond combustible. Si cela est inévitable, référez-vous aux sections sur Traverser les murs. Ne faites pas passer le raccord à travers un grenier, un placard ou tout espace confiné semblable lors de l'installation des raccords de cheminée.

Il est primordial de garder les gaz du tuyau en déplacement doux dans la bonne direction. Ne déviez pas dans un grand vide à cet endroit ; formez plutôt une section continue jusqu'en haut. Utilisez des courbures moyennes (par ex. 45° au lieu de 90°) plutôt que des angles aigus lorsqu'un changement de direction est nécessaire. Toutes les parties du conduit doivent être accessibles pour des raisons de nettoyage.

Dans les tronçons de cheminée horizontaux, maintenez un espacement de 18 pouces (455 mm) du plafond. Gardez-les aussi courts et directs que possible avec des coudes n'excédant pas 90 degrés. Inclinez les tronçons horizontaux de raccords de ¼ par pied (20mm par mètre) en partant du poêle vers la cheminée. La longueur maximum recommandée d'un tronçon horizontal est de 3 pieds (1 mètre) et la longueur totale ne doit pas dépasser 8 pieds (2,5 mètres).

Les informations sur l'assemblage et l'installation des raccords sont fournies par les instructions du fabricant, comme vous assemblez et fixez le raccord au poêle et à la cheminée.

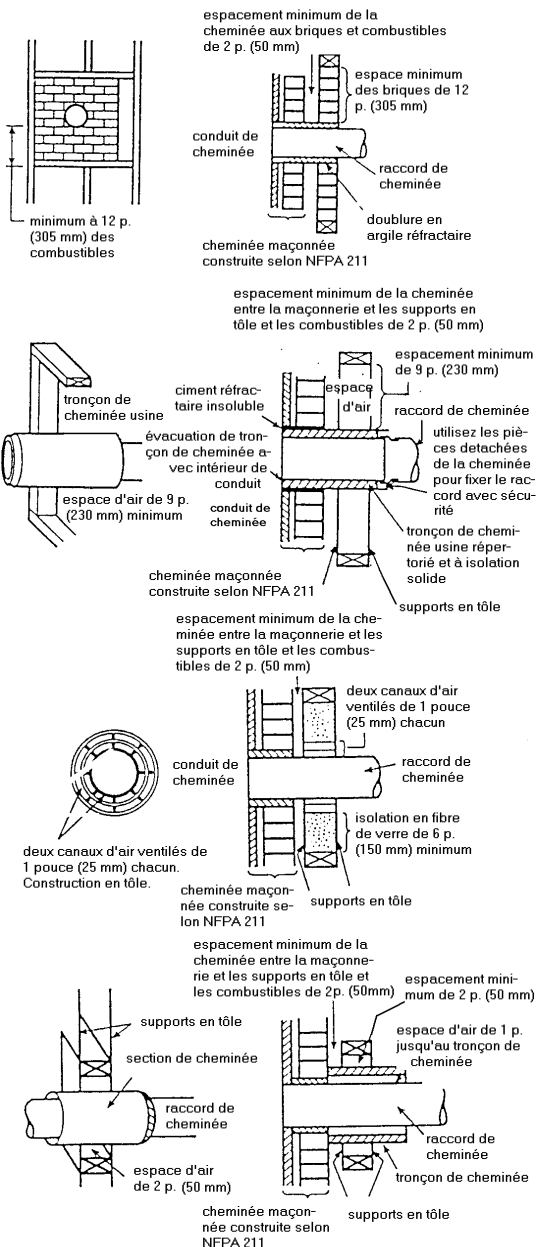
Assurez-vous que le poêle et le raccord de cheminée installés se trouvent à une distance correcte des matériaux de combustion proches. Voir le paragraphe sur les espacements page .

Si le conduit passe par une paroi ou une cloison de construction inflammable, l'installation doit être conforme à la norme CAN/CSA-B365.

Ce poêle est conforme aux exigences de CAN/ULC-S627 et peut être installé sur un sol combustible et ne nécessite pas de protection de sol radiant.

Veuillez lire ci-dessous ce qui concerne la protection du sol contre les chutes de braises.

Systèmes de raccord de cheminée et autorisations des appareil de chauffage ménagers à travers les murs inflammables



1.6 Positionnement du poêle

Distance avec murs et linteaux

Si le poêle se trouve à proximité de matériaux combustibles, consultez tous les règlements de constructions locaux et nationaux en vigueur en ce qui concernent les espacements. Quels que soient les règlements qui s'appliquent à votre région, n'installez en aucun cas le poêle à moins de 8 pouces (205 mm) des matériaux combustibles sur les côtés et à moins de 16 pouces (405 mm) au-dessus du poêle (des installations des poêles demandent plus d'espacement au-dessus du poêle - voir le graphique des distances en dessous). Il peut s'avérer nécessaire d'augmenter ces distances si les matériaux sont sensibles à la chaleur. Notez également que les papiers peints et autres matériaux de décoration peuvent se détacher sous l'effet de la chaleur. Prenez garde à ce qu'ils ne tombent pas sur le poêle, le cas échéant.

Si le poêle se trouve à proximité de matériaux non combustibles, un espace de 4 pouces (100 mm) ou plus est recommandé pour des raisons de nettoyage et afin d'assurer la circulation de la chaleur autour du poêle et dans toute la pièce.

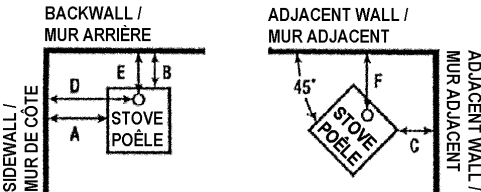
Conditions d'espacement pour 2B Standard sans protecteur (raccord à simple paroi)

Conditions d'espacement requises:	Installation résidentielle standard (raccord à simple paroi)	
	États-Unis	Canada
A. De la paroi latérale à l'unité	26"	26" (660 mm)
B. De la paroi arrière à l'unité	16"	16" (406 mm)
C. De la paroi d'angle à l'unité	16"	16" (406 mm)
D. De la paroi latérale au raccord	29"	29" (737 mm)
E. De la paroi arrière au raccord	18"	18" (457 mm)
F. De la paroi d'angle au raccord	19"	19" (483 mm)
G. De l'unité au plafond	-	-
H. Du sol au plafond	-	-

Conditions d'espacement – 2B Standard avec protecteur de convection (raccord à simple paroi)

Conditions d'espacement requises:	Installation résidentielle standard (raccord à simple paroi)	
	États-Unis	Canada
A. De la paroi latérale à l'unité	26"	26" (660 mm)
B. De la paroi arrière à l'unité	16"	16" (406 mm)
C. De la paroi d'angle à l'unité	16"	16" (406 mm)
D. De la paroi latérale au raccord	26"	26" (606 mm)
E. De la paroi arrière au raccord	23"	23" (583 mm)
F. De la paroi d'angle au raccord	19"	19" (483 mm)
G. De l'unité au plafond	-	-
H. Du sol au plafond	-	-

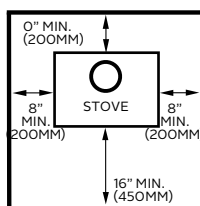
MINIMUM CLEARANCES TO COMBUSTIBLES: DEGAGEMENTS MINIMAUX AUX MATERIAUX COMBUSTIBLES:



Conditions d'espacement pour 2B Standard avec et sans protecteurs (raccord à double paroi)

Conditions d'espacement requises:	Installation résidentielle standard (raccord à double paroi)	
	États-Unis	Canada
A. De la paroi latérale à l'unité	20"	20" (508 mm)
B. De la paroi arrière à l'unité	12"	12" (305 mm)
C. De la paroi d'angle à l'unité	16"	16" (406 mm)
D. De la paroi latérale au raccord	26"	26" (660 mm)
E. De la paroi arrière au raccord	14"	14" (356 mm)
F. De la paroi d'angle au raccord	19"	19" (483 mm)
G. De l'unité au plafond	-	-
H. Du sol au plafond	-	-

EXIGENCES PROTECTION DU SOL



LE PROTÉCTEUR DE PLANCHER DOIT ÊTRE D'UN MATÉRIEL INCOMBUSTIBLE. IL DOIT S'ÉTENDRE EN DESSEUS DE L'APPAREIL ET AU DEVANT, AUX CÔTÉS ET À L'ARRIÈRE DE L'APPAREIL COMME INDIQUE

Exigences de protection du sol	Matériaux incombustibles sous le poêle	
	États-Unis	Canada
A. Distance de prolongement, arrière	-	200 mm
B. Distance de prolongement, côté droit	6"	200 mm
C. Distance de prolongement, côté gauche	6"	200 mm
D. Distance de prolongement, avant	16"	450 mm

Sur le sol

Aux États-Unis, la protection de sol doit être réalisée en matériau non combustible et installée de façon à s'étendre sous le poêle ainsi que 16" à l'avant et 6" sur les côtés de la porte de chargement de combustibles et des ouvertures de retrait des cendres.

Au Canada, pour se conformer à la norme CSA B365, Code d'installation des appareils à combustibles solides et du matériel connexe, toute couche de combustible sous l'appareil et/ou dans la zone qui s'étend horizontalement à au moins 450 mm (18 po) au-delà de l'appareil sur les côtés équipés d'une porte, et au moins 200 mm (8 po) au-delà de l'appareil des autres côtés, doit être protégée par une protection de braise continue, durable et non combustible qui assurera une protection totale. La protection contre les braises de 450 mm (18 po) requise de chaque côté d'une porte doit s'étendre sur toute la largeur du poêle plus les 200 mm (8 po) requis de chaque côté de l'unité sans porte. Lorsqu'un poêle est installé à moins de 200 mm (8 po) d'un mur, la protection contre les braises doit seulement s'étendre jusqu'à la base du mur. Une protection contre les braises ne doit pas être placée au-dessus d'un tapis à moins qu'elle ne soit structurellement soutenue pour empêcher le déplacement et la déformation.

Distance des meubles

La distance minimum recommandée entre le poêle et les meubles est de 30 pouces (760 mm). Veuillez noter que certains meubles sont plus facilement affectés par la chaleur et peuvent par conséquent nécessiter d'être plus éloignés. Ceci est votre responsabilité.

De plus, maintenez tout autre matériau combustible éloignés du poêle. En général, une distance de 30 pouces (760 mm) doit être conservée entre le poêle et les objets inflammables mobiles tels que chiffons, journaux, bois de chauffage, etc.

NE PAS INSTALLER DANS UNE CARAVANE / MOBILE HOME

Remarque :

Protection de l'acide

En cas de lavage à l'acide de la maçonnerie autour du poêle, protégez la surface du poêle avec une couverture résistante à l'acide.

Entrée d'air frais

A moins que la circulation d'air dans la pièce par les portes, fenêtres et autre soit jugée suffisante, une entrée d'air frais est nécessaire. Cette entrée d'air doit avoir un espace d'air libre de 2 pouces carrés (1250 mm carrés). Ceci est particulièrement important lorsque la pièce est bien scellée ou lorsqu'une hotte aspirante ou un système de ventilation perturbe la pression naturelle de l'air. Une telle entrée d'air ne doit pas se trouver sur un mur habituellement sujet à une pression négative du déplacement habituel du vent. Evitez de placer l'entrée d'air directement à l'opposé du poêle dans la pièce créant ainsi un courant d'air froid.

2.0 Fonctionnement

2.1 Avant d'allumer le feu

Pour une utilisation avec des combustibles solides uniquement. Ne poussez pas trop le feu, si l'appareil ou le raccord de cheminée devient incandescent, le feu est trop fort. Inspectez et nettoyez fréquemment la cheminée. Dans certaines conditions d'utilisation, la formation de crésote peut arriver rapidement. A cause des risques de débordement de fumée et de flammes, opérez uniquement avec la porte fermée.

Attention :

Chaud pendant le fonctionnement. Tenir les enfants, vêtements et meubles éloignés. Risque de brûlures cutanées en cas de contact. Ne pas utiliser de produits chimiques ni de liquides pour l'allumage. Ne pas brûler de déchets ni de liquides inflammables.

Ne pas utiliser d'essence, de pétrole à lampe, de kérosène, d'allumeur ou de liquide à charbon de bois ou tout autre liquide pour démarrer ou relancer un feu dans ce poêle.

Tenir tous ces liquides éloignés du poêle pendant son fonctionnement.

Ne brûlez pas :

- Ordures;
- Déchets de pelouse ou de jardin;
- Matériaux contenant du caoutchouc, y compris les pneus;
- Matériaux contenant du plastique;
- Produits pétroliers usagés, peintures ou diluants pour peinture, ou produits à base d'asphalte;
- Matériaux contenant de l'amiante;
- Débris de construction ou de démolition;
- Traverses de chemin de fer ou bois traité sous pression;
- Fumier ou restes d'animaux;
- Bois flotté d'eau salée ou autres matériaux précédemment saturés d'eau salée;
- Bois non bien sec; ou
- Produits en papier, carton, contreplaqué ou panneaux de particules. L'interdiction de brûler ces matériaux n'interdit pas l'utilisation d'allume-feu fabriqués à partir de papier, carton, sciure, cire et substances similaires dans le but d'allumer un feu dans un poêle à bois concerné.

Brûler ces matériaux peut entraîner la libération de fumées toxiques ou rendre le poêle inefficace et causer de la fumée.

Choisir votre combustible

Vous pouvez brûler tous les types de bois naturel dans ce poêle mais ils doivent être bien secs. Une fois coupé en longueur, couper le bois en deux - conformément aux dimensions mentionnées ci-dessous - pour permettre à l'humidité de s'évaporer.

Couper le bois à une longueur maximale de 12 pouces (30 cm) et d'un diamètre d'environ 3 à 3,5 pouces (7 à 8 cm). Si vous pouvez peser votre bois, comptez environ 1,0 kg. Pour une combustion optimale et un bon dégagement de chaleur, le bois doit pas contenir plus de 20% d'humidité; ceci peut facilement être contrôlé à l'aide de l'hygromètre Morsø (article #62929900)

Stockez les bûches couvertes dans un endroit bien aéré, où l'air peut circuler entre les bûches. Certains bois tendres peuvent n'avoir besoin que d'un bel été pour sécher, alors que certains bois plus durs, comme p.ex. le chêne, l'érable et l'orme peuvent prendre jusqu'à 18 mois. Éviter du bois trop sec, souvent d'une couleur tirant sur le gris, car dans certaines conditions, cela peut poser des problèmes de rendement tels que lenteur et projection d'étincelles. Un bois bien sec est léger à manipuler et présente des fentes du centre vers les extrémités. Si votre bois crépité ou grésille en brûlant et que de la suie persiste à se former sur la porte vitrée du poêle, votre bois n'est pas suffisamment sec.

N'utilisez jamais de dérive (de la mer) dont le contenu salé peut entraîner de la corrosion, ni du bois de construction pouvant être imprégné de produits chimiques.

Pour optimiser la performance

Brûler du bois humide a un effet négatif sur le rendement de l'appareil.

L'efficacité du poêle à bois est principalement influencée par son emplacement. Le poêle est principalement conçu pour chauffer la pièce où il est installé.

Espace de vie principal. Placer le poêle à bois dans l'espace de vie principal maximise l'efficacité, car il chauffe directement l'espace où l'on passe le plus de temps.

Sous-sol. Installer le poêle au sous-sol peut être moins efficace si la chaleur ne circule pas adéquatement vers les niveaux supérieurs. Une bonne isolation et une gestion appropriée de la circulation de l'air sont cruciales pour un chauffage efficace.

Extérieur par des températures glaciales. Utiliser le poêle à bois à l'extérieur dans des conditions très froides réduit considérablement l'efficacité. Le poêle doit travailler plus dur pour maintenir la chaleur, ce qui entraîne une consommation accrue de combustible et un chauffage moins efficace.

Attention: Ne placez pas de combustible dans l'espacement libre requis à proximité du poêle ni dans l'espace destiné au chargement du combustible ou au vidage des cendres.

Allumage

Au début, faites un petit feu pour que la peinture s'accoutume et que les plaques principales du poêle se mettent en place. La peinture peut dégager des vapeurs. Aérez la pièce pendant cette phase. Le réglage de l'aération, les techniques d'allumage et les intervalles d'alimentation dépendent du tirage de la cheminée, du combustible utilisé, de la chaleur voulue, etc. Quelques techniques de base sont soulignées ci-dessous.

IMPORTANT

Pour garantir une combustion optimale et éviter l'obstruction du flux d'air, ne surchargez jamais le foyer avec du bois. Utilisez une charge recommandée allant jusqu'à 6 lbs. Assurez-vous que le bois ne dépasse pas le bord supérieur du revêtement en pierre de la paroi arrière. La zone située devant et juste en dessous des tubes d'alimentation en air secondaire en acier inoxydable, situés sur la plaque déflectrice, est exclusivement réservée à la combustion des gaz volatils.

En principe:

Votre poêle est équipé d'entrées d'air primaire et secondaire.

L'air primaire est contrôlé grâce au levier situé sous le rebord à cendres du poêle. Pour ouvrir l'admission d'air, déplacer le levier de contrôle vers le bas. De l'air préchauffé pénètre alors dans la chambre de combustion via le système de "nettoyage d'air" situé à l'intérieur du poêle et au dessus de la vitre. L'air secondaire arrive vers la chambre de combustion grâce au déflecteur spécialement conçu, situé derrière la chambre de combustion.

L'air secondaire est injecté dans les gaz du conduit à la fois au dessus et en face du feu, rendant ainsi le processus de combustion plus propre et plus efficace. L'admission d'air secondaire est constamment ouverte et n'est pas réglable. Pour plus de sécurité, votre poêle est équipé d'une poignée amovible. Lorsqu'elle n'est pas utilisée, on peut la ranger grâce au goujon au pied droit du poêle.

2.2 Allumage et intervalles d'alimentation

Le premier allumage du poêle nécessite un volume d'air important. Lorsque le poêle est froid, laissez la porte entrouverte de 2 ou 3 cm pendant les premières minutes et ouvrez complètement l'entrée d'air primaire. Ne laissez pas le poêle sans surveillance tant que la porte est ouverte.

Afin de constituer un lit de cendres raisonnable au fond du poêle, utilisez 2 à 4 livres de petit bois sec lors du premier allumage. Maintenez en permanence une couche de 1 à 1,5 pouces (2 à 3 cm) de cendres au fond de la chambre de combustion à chaque fois.

1. Lorsqu'on allume un poêle à bois, il est recommandé d'utiliser la méthode d'allumage Top Down. C'est la méthode d'allumage la plus respectueuse de l'environnement. Pour obtenir rapidement la formation d'une couche de braises, utiliser pour l'allumage

2 sachets allume-feu, ainsi que 2 kg environ de bois d'allumage. Poser les allume-feu juste en-dessous de la couche supérieure de petit bois.

Il est important de commencer avec précaution, de telle sorte que la combustion se développe lentement. De cette manière, la formation de suie sur la vitre est faible. En effet, l'encrassement de la vitre est souvent dû à une combustion trop violente et au fait que les flammes entrent en contact avec des surfaces froides. En évitant la formation de suie lors de l'allumage et en faisant en sorte d'obtenir une couche de braises chaudes, la formation de suie sera minime lors des étapes suivantes d'alimentation.

3. Assurez-vous que l'alimentation en air est entièrement ouverte en tournant le régulateur d'air (air spinner controller) dans le sens anti-horaire jusqu'à la butée.

4. Allumez le feu.

5. Après l'allumage, fermez partiellement les portes en les laissant entrouverte de 2 ou 3 cm pour laisser entrer suffisamment d'air de combustion.

6. Lorsque la cheminée est chaude après 5 à 10 minutes, fermez la porte. Un lit de braises convenable se forme au bout de 15 à 20 minutes.



7. Au moment de recharger, repartez les braises dans le foyer en les rapprochant surtout vers l'avant du poêle.

8. Poser trois morceaux de bois sur les braises. Laissez ½ pouce (1 cm) ou plus entre chaque morceau.

Gardez toujours la charge de combustible en dessous des buses d'air secondaire les plus basses. L'espace situé devant et au-dessus de ces buses est exclusivement réservé à la combustion des gaz volatils.

9. Après quelques minutes, ajustez l'alimentation en air primaire en fonction de vos besoins de chauffage. Tournez le régulateur d'air dans le sens antihoraire pour augmenter l'apport d'air et la chaleur, et dans le sens horaire pour les réduire. Si vous prévoyez d'utiliser le taux de combustion minimum (régulateur d'air en position complètement fermée), laissez d'abord le feu s'établir correctement en le faisant brûler à un taux moyen pendant environ 15 minutes. Pour atteindre un taux de combustion moyen, tournez le régulateur d'air d'un tour et demi dans le sens horaire à partir de la position complètement ouverte.

10. Après quelques minutes, réglez l'entrée d'air primaire en fonction de la chaleur voulue.

11. Anticipez chaque alimentation et souvenez-vous de n'ajouter qu'une modeste couche de bois tant qu'il y a beaucoup de braises. Reprenez les points 6 à 9

N'essayez en aucun cas d'accroître le feu de votre poêle en modifiant le réglage du contrôle d'air décrit dans ces instructions.

Attention : Les poêles à feu de bois ne doivent jamais être laissés sans surveillance la porte ouverte.

Cet appareil de chauffage à bois a un taux de combustion minimal inférieur fixé par le fabricant et qu'il convient de ne pas modifier. Les règles fédérales interdisent de modifier ce réglage ou d'effectuer sur ce poêle toute autre intervention contrevenant aux instructions de service figurant dans le présent manuel

Si vous laissez les portes entrouvertes, gaz et flammes peuvent sortir du foyer par l'ouverture, créant ainsi des risques d'incendie et de fumée. Nous vous conseillons d'installer un détecteur de fumée dans la pièce où vous installez le poêle.



NE PROVOQUER JAMAIS DE SURCHAUFFE. Toute surchauffe peut entraîner un incendie ou des dégâts permanents pour le poêle. Si n'importe quelle pièce du poêle devient incandescente, vous êtes en surchauffe.

Le poids maximal de bois recommandé par charge est de 3,5 kg/7 lbs (environ 5 bûches).

Dans des conditions de chauffage normales, la température moyenne à l'intérieur du tuyau du poêle, mesurée à 20 cm au-dessus du poêle est d'env. 300° C (550°F). La température maximale dans le tuyau du poêle ne doit pas excéder 450° C (750°F). Une température du poêle dépassant 450° C (750°F) est considérée comme surchauffe et peut être la cause d'une usure prématurée du poêle.

Pour permettre de mesurer correctement la température de fonctionnement de votre poêle, nous recommandons l'utilisation du Thermomètre à gaz pour poêle Morsø (article # 62901200). Le Thermomètre à gaz pour poêle est magnétique; il se fixe sur le tuyau du poêle, à environ 20 cm (8") au-dessus de la plaque supérieur du poêle, et mesure la température de surface du tuyau du poêle. Disponible auprès de votre distributeur Morsø agréé.

Conditions de tirage

Si de la fumée ou des émanations se dégagent du poêle lors de l'allumage et de l'alimentation ou si tout simplement le feu ne prend pas, ceci est sûrement dû à un faible tirage. (Dans très peu de cas, pas assez d'air frais entre dans la pièce – voir les conseils d'installation plus haut). Demandez conseil à votre vendeur pour savoir comment améliorer votre système de tuyauterie pour accroître le tirage.

Règles de feu de bois

Pour avoir moins de chaleur, mettez moins de bûches dans le poêle et réduisez la quantité d'air. Il est toujours important de maintenir une bonne couche de braises.

Moins de chaleur – moins de bois – moins d'air

Plus de chaleur – plus de bois – plus d'air

Des dépôts de suie se font sur la vitre si le poêle fonctionne trop lentement ou si votre bois n'est pas assez sec.

Il est fortement conseillé de ne pas laisser le poêle allumé pendant la nuit. En plus des effets nocifs sur l'environnement, le rendement du bois serait mauvais puisque les gaz qu'il contient ne s'enflamment pas à basse température mais se fixent sous forme de suie (gaz non consumés) dans la cheminée et le poêle.

Détecteurs de monoxyde de carbone

Dans certaines juridictions, l'installation de détecteurs de fumée et d'oxyde de carbone dans les lieux où sont placés des appareils de chauffage est obligatoire. Pour assurer votre sécurité, installez au moins un détecteur de fumée à chaque étage de votre maison. Il devra être placé à distance de l'appareil à bois et à proximité des espaces de repos. En effet, en plaçant un détecteur de fumée trop près du poêle, l'alarme risque de se déclencher si un rejet de fumée intervient lorsqu'on ouvre la porte pour remettre du bois. Suivez les instructions du fabricant de détecteurs de fumée concernant l'emplacement, l'installation et l'entretien.

3.0 Entretien

Lors de l'entretien de votre poêle, portez toujours des lunettes et des gants de protection.

3.1 Entretien extérieur

La surface du poêle est peinte avec la peinture résistant à la chaleur Senotherm. Nettoyez de préférence avec un aspirateur équipé d'un embout à brosse souple ou en essuyant avec un chiffon anti-peluche.

Au bout d'un certain temps, la surface peinte peut devenir légèrement grise. Vous pouvez trouver une boîte de peinture en spray pour retouche Morsø chez votre revendeur. Il suffit de quelques minutes – en suivant les instructions – pour l'appliquer. Lors du premier allumage après une retouche, une légère odeur peut se dégager du poêle le temps de l'accoutumance de la peinture. Assurez-vous de bien aérer la pièce pendant cette période.

3.2 Entretien intérieur

Vitre

Si le poêle est généralement utilisé aux températures correctes, la vitre ne devrait être que peu ou pas sale. Si de la saleté se dépose lors de l'allumage, la majeure partie brûlera au fur et à mesure que la température augmente. En cas de dépôts plus importants qui ne brûlent pas, utilisez le nettoyant pour vitres Morsø. Appliquez sur la vitre froide en suivant les instructions. N'utilisez jamais de nettoyants abrasifs sur la surface vitrée.

Causes possibles de vitre sale

- Combustible trop humide
- Bûches trop grandes ou non fendues
- Température de combustion trop basse

Ne pas nettoyer le verre lorsqu'il est chaud

Remplacez immédiatement toute vitre cassée.

N'utilisez pas votre poêle si la vitre de la porte est endommagée.

Si vous devez changer la vitre, utilisez du verre céramique à haute température fourni par Morsø. Contactez votre concessionnaire Morsø.

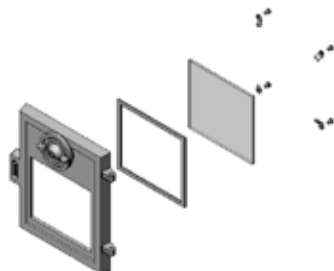
Installer la vitre

N'installez jamais la vitre lors du fonctionnement du poêle.

Remplacement du verre céramique

Le verre céramique ne peut pas être recyclé, car sa température de fusion est trop élevée. Si le verre céramique est mélangé au verre normal, la matière première est dénaturée et le processus de recyclage du verre peut être interrompu. Veillez à ce que le verre réfractaire ne soit pas traité comme matériau à recycler normal. Vous contribuerez beaucoup à la protection de l'environnement.

ATTENTION ! Doit être déposé comme verre céramique dans une station de collecte des déchets.



1. Soulevez la porte pour la sortir de ses gonds et posez-la face avant vers le bas sur des cartons ou tout autre tissu non abrasif.
2. Dévissez les quatre boulons qui maintiennent la vitre. (Au cas où un boulon se casserait lors du dévissage, retirer le reste du boulon en perçant au centre avec une mèche de perceuse acier grande vitesse de 1/8 de pouce (3 mm). Des mèches plus petites peuvent également convenir mais n'utilisez en aucun cas de mèche plus grande. Assurez-vous que la mèche ne touche pas les bords du boulon – ceci pouvant endommager le filetage dans la fonte).
3. Retirez le joint d'étanchéité en céramique usagé et nettoyez la surface en dessous avec de la paille de fer ou du papier de verre pour éliminer les particules.
4. Mettez en place le nouveau joint d'étanchéité tout autour de l'emplacement de la vitre en vous assurant de bien le pincer tout le long de façon à faire un joint continu. Ne laissez aucun espace.
5. Placez la nouvelle vitre sur les bandes et revissez les boulons et équipements à la main.
6. Enfin, donnez environ un demi-tour supplémentaire aux boulons. La vitre doit être tenue assez fermement de manière à ne pas bouger pendant le nettoyage. Ne vissez pas les boulons trop fort car cela entraîne une pression excessive sur la vitre risquant de la casser - important !

Afin de réduire le risque de casser la vitre, évitez de frapper sur la vitre ou de claquer la porte.

Pièces de rechange intérieures

L'équipement feu – comprenant le cendrier, la grille, les briques réfractaires, plaques de fonte pour protection feu, la vitre, le déflecteur et le collier de serrage du tuyau – est soumis à une chaleur extrême produite par le feu. De temps en temps, il peut s'avérer nécessaire de remplacer une de ces pièces pour des raisons d'entretien routinier.

Remplacement des pierres

Lors du remplacement des pierres, dévisser à l'arrière du poêle la plaque de rayonnement, fixée avec 4 vis. Cela permet d'accéder aux 2 boulons, maintenant en place la chicane pour la fumée. Retirer ces boulons de manière à pouvoir lever la chicane pour la fumée à l'intérieur du poêle. Lever la chicane pour la fumée afin de pouvoir sortir la pierre du poêle et installer la nouvelle. Placer les pierres latérales dans les rainures de la plaque de fond en vermiculite. Lorsque les pierres sont placées correctement, abaisser la chicane pour la fumée sur les pierres et la revisser sur le côté arrière en fonte du poêle.

Pour terminer, monter la plaque de rayonnement arrière avec les 4 vis.

REMARQUE : L'équipement feu, la corde céramique et la finition de peinture ne sont pas couverts par la garantie.

Toutes ces pièces de rechange sont en vente chez votre concessionnaire Morsø et nous vous recommandons de remplacer toute pièce endommagée aussi tôt que possible afin d'éviter des dégâts supplémentaires.

Si le déflecteur est déformé par une surchauffe, le poêle continue à fonctionner même si sa performance peut être compromise. Remplacez-le dès que possible.

Causes possibles d'usure interne rapide

- Feu fort et persistant
- Accumulation de suie et de cendres

Joint d'étanchéité

Le joint entourant le périmètre des portes peut durcir avec le temps. Remplacez-les s'il devient difficile de fermer les portes ou si l'air commence à s'infiltrer autour des portes, causant ainsi un feu un peu moins contrôlable. Un jeu de joint Morsø est en disponible chez votre revendeur.

3.3 Nettoyage du poêle et du conduit

Vérifiez la présence de suie au-dessus de la plaque du déflecteur et autour de la sortie du tuyau environ tous les mois pour commencer. Si le poêle devient soudain lent, regardez si de la suie est tombée autour du collier de serrage du tuyau ou dans le tuyau/ la cheminée.

Effectuez une inspection de la cheminée et du raccord de cheminée au moins tous les deux mois pendant la saison de chauffage pour détecter la formation éventuelle de créosote. S'il y a de créosote il faut l'éliminer pour réduire le risque d'un feu de cheminée.

Nettoyez le tuyau/ la cheminée – sur toute la longueur du poêle jusqu'à l'extrémité du tuyau sur le toit de la maison.

Une bonne habitude est de nettoyer le tuyau après chaque saison de chauffage dans tous les cas et d'inspecter avant chaque saison pour vous assurer qu'aucun nid d'oiseau ou autre bouchon ne s'est constitué pendant la saison de non-utilisation.

Retirez les cendres selon cette procédure :

Ouvrez les portes avant et utilisez une pelle ou un tisonnier pour remuer l'excès de cendres et la faire tomber dans les cendriers à travers les fentes de la grille. Retirez le cendrier en prenant soin de bien le tenir horizontal.

Jetez les cendres dans un récipient en métal avec un couvercle hermétique.

Placez le récipient fermé contenant les cendres sur un sol non inflammable ou sur la terre, bien éloigné de tout matériau combustible en attendant l'enlèvement définitif. Si vous vous débarrassez des cendres en les enterrant ou en les dispersant, gardez-les dans le récipient fermé jusqu'à leur refroidissement complet. Remettez le cendrier en place et fermez le poêle.

Attention:

Ne jamais vider un poêle en train de fonctionner.

Ne jamais utiliser votre aspirateur ménager ou professionnel pour enlever les cendres du poêle; toujours éliminer les cendres correctement.

Créosote – Formation et élimination.

Lorsque le bois brûle lentement, il produit du goudron et d'autres vapeurs organiques qui s'associent avec l'humidité émise pour former du créosote. Les vapeurs de créosote se condensent dans le conduit de cheminée relativement froid lors d'un feu brûlant faiblement. Il en résulte que les résidus de créosote s'accumulent sur la paroi du tuyau. Une fois enflammé, le créosote crée un feu extrêmement chaud. Vérifiez la cheminée et le conduit de cheminée au moins deux fois par mois pendant la saison de chauffage pour contrôler l'absence de formation de créosote. En cas de dépôt de créosote, éliminez-le pour diminuer le risque de feu de cheminée.

Nous recommandons vivement la lubrification des charnières et des mécanismes de fermeture une fois par an ou selon les besoins. Non seulement pour garantir un fonctionnement optimal et la longévité, mais aussi pour réduire l'usure.

Nous recommandons d'utiliser une graisse au cuivre en tant que produit de lubrification ou autre graisse de lubrification aussi thermorésistante à la chaleur.

Ramonage de la cheminée

Inspectez le système régulièrement au cours de la saison de chauffage comme partie intégrante d'un programme d'entretien régulier. Pour inspecter la cheminée, laissez le poêle refroidir complètement. Puis, à l'aide d'un miroir, regardez par le collier du tuyau dans le conduit de cheminée. Si vous ne pouvez pas inspecter le système de conduit de cette façon, déconnectez le poêle pour faciliter l'accès.

Nettoyez la cheminée à l'aide d'une brosse de la même forme et taille que le tuyau. Faites coulisser la brosse de haut en bas et inversement dans le conduit afin de faire tomber tous les dépôts en bas de la cheminée où vous pouvez les évacuer grâce à la porte de nettoyage.

Nettoyez le raccord de cheminée en déconnectant les sections, mettez-les à l'extérieur et éliminez tous les dépôts avec une brosse dure. Remettez les sections du raccord en place après le nettoyage en vous assurant de sécuriser les joints entre chaque section avec des vis en tôle. Si vous ne pouvez pas inspecter ou nettoyer la cheminée vous-même, contactez votre concessionnaire Morsø ou un ramoneur professionnel.

En cas de feu de cheminée, agissez rapidement et :

1. Fermez le contrôle d'air.
2. Faites sortir tout le monde de la maison.
3. Appelez les pompiers.

Entretien annuel

Avant la saison de chauffage, effectuez un nettoyage en profondeur, inspectez et réparez : Nettoyez la cheminée et le raccord de cheminée à fond.

Vérifiez si la cheminée est abîmée ou usée. Remplacez les sections faibles de la cheminée préfabriquée. Faites faire les réparations par un maçon pour la cheminée maçonnée.

Inspectez le raccord de cheminée et remplacez les sections endommagées.

Vérifiez l'usure ou la compression de l'étanchéité et remplacez si nécessaire.

Vérifiez si la vitre est craquelée; remplacez si nécessaire.

Vérifiez si la porte et les poignées ferment bien. Ajustez si nécessaire.

UTILISEZ TOUJOURS DES PIÈCES DE RECHANGAGE D'ORIGINE MORSØ

3.4 Périodes prolongées de non-utilisation du poêle

Important:

Si vous n'utilisez pas le poêle pendant une période quelconque, nettoyez-le en profondeur et laissez l'aération légèrement ouvert pour laisser l'air circuler. Assurez-vous que le tuyau ne laisse pas entrer d'eau de pluie près du poêle ; installez un chapeau sur la cheminée mais ne bouchez pas complètement le tuyau.

Ces mesures permettent d'assurer un léger courant d'air dans le poêle et au corps du poêle de rester sec, dans les moindres recoins.

Les cendres laissées dans un poêle qui ne brûle pas attirent l'humidité comme du papier buvard. Si vous laissez l'humidité s'installer dans le poêle, de la rouille se forme. La rouille s'étend dès qu'elle prend prise. Ceci peut entraîner une pression excessive sur les joints du poêle, endommageant ainsi ultérieurement le poêle.

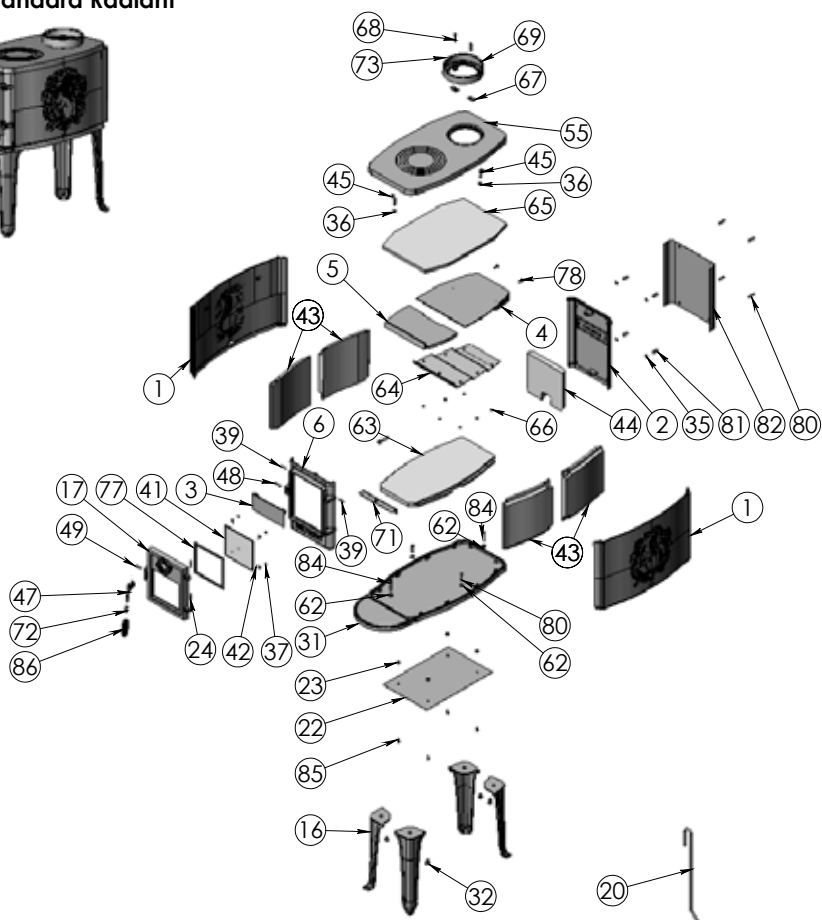
REMARQUE : Il est préférable de nettoyer à fond le poêle à la fin de la saison de chauffage. Ajouter un dessicatif, comme de la litière pour chat, dans le cendrier aide à absorber l'humidité pendant les mois d'été. Assurez-vous de l'enlever avant la saison de chauffage.

Nous vous remercions d'avoir acheté un poêle Morsø

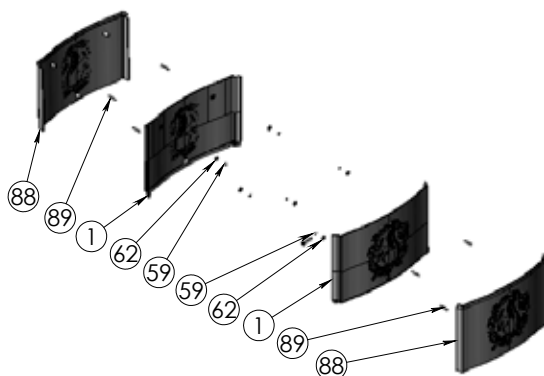
Nous vous souhaitons des années de chaleur sans souci en sa compagnie. Après quelques expérimentations initiales avec les techniques d'alimentation et de fonctionnement, vous trouverez vos habitudes. En cas de problèmes après cette courte phase d'apprentissage, adressez-vous au vendeur de votre poêle. Si celui-ci est dans l'impossibilité de vous aider, veuillez nous contacter par écrit à l'adresse figurant sur la première page de cette publication.

3.5 Schéma des pièces détachées pour le modèle Morsø 2B Standard

2B Standard Radiant



2B Standard Convection



3.6 Liste des pièces détachées pour le modèle Morsø 2B Standard

Pos. No.	Parts	2B Standard poêle à rayonnement	2B Standard poêle à convection
1	Panneau latéral Ecureuil	54200321	44200521
2	Plaque arrière	44203721	44203721
3	Valve à fumée	44200800	44200800
4	Déфлекteur horizontal	44203600	44203600
5	Déфлекteur vertical	44203800	44203800
6	Face frontale	44201521	44201521
16	Pied	44200121	44200121
17	Porte	44204421	44204421
20	Tisonnier	541075	541075
22	Écran de protection radiant - base	54137000	54137000
23	Tube d'éloignement	541439	541439
24	Axe de charnière	541808	541808
31	Base	44204021	44204021
32	Vis	-	-
35	Rondelle	-	-
36	Vis	-	-
37	Vis	-	-
39	Vis	-	-
41	Porte vitrée	790715	790715
42	Clip vitre	790743	790743
43	Brique, latérale	79209000	79209000
44	Brique, arrière	79209100	79209100
45	Boulon	-	-
47	Fixation	79127000	79127000
48	Pivot	791868	791868
49	Pivot	791869	791869
55	Plaque supérieure	44200721	44200721
59	Boulon	-	-
62	Rondelle	-	-
63	Brique, arrière	79209300	79209300
64	Déфлекteur, inoxydable	71209061	71209061
65	Isolation	79077100	79077100
66	Vis	-	-
67	Équipement à filetage pour couvercle	44256700	44256700
68	Vis	-	-
69	Collier de serrage du tuyau	44145921	44145921
71	Écran de protection radiant, face	71209161	71209161
72	Équipement pour poignée	75140161	75140161
73	Vis	-	-
77	Bande de serrage pour vitre	79074200	79074200
78	Vis	-	-
80	Vis	-	-
81	Tube d'éloignement	542635	542635
82	Plaque arrière à conv.	54201221	54201221
84	Vis	-	-
85	Vis	-	-
86	Poignée bakélite 36 mm	79118300	79118300
87	Rondelle	-	-
88	Panneau latéral Ecureuil conv.	-	44204121
89	Vis	-	-

Enregistrement de la garantie du produit droits de garantie

CERTIFICAT DE GARANTIE DE 10 ANS DE MORSØ

Derrière chaque poêle Morsø, il y a plus de 160 ans d'expérience en conception et fabrication de poêles. Le contrôle de la qualité a toujours été au cœur du processus de production, avec des mesures détaillées mises en place à chaque étape clé de fabrication. En conséquence, à condition que le poêle ait été fourni par un revendeur agréé Morsø, Morsø offre une garantie fabricant de 10 ans contre tout défaut de fabrication sur les principales parties extérieures de ses poêles.

Informations sur la Garantie

Garantie limitée

Morsø garantit que le poêle à bois est exempt de défauts matériels et de fabrication en cas d'utilisation et d'entretien normaux, sous réserve des termes et conditions décrits ci-dessous. La période de garantie est valide pendant 10 ans à compter de la date d'achat.

Ce qui est couvert :

Cette garantie couvre le remplacement ou la réparation des pièces présentant des défauts dus à des matériaux ou à une fabrication défectueuse.

Ce qui n'est pas couvert :

La garantie ne couvre pas les dommages résultant de :

- Une installation ou une utilisation incorrecte, non conforme au manuel d'utilisation, y compris en ce qui concerne les réglementations publiques applicables et les instructions d'assemblage et d'allumage de Morsø.
- Des dommages causés par une surchauffe ou l'utilisation de combustibles inappropriés.
- Une usure normale, telle que la décoloration des surfaces. Les pièces d'usure, c'est-à-dire celles qui s'usent lors d'une utilisation normale (par exemple, les plaques de déflecteur de fumée, les grilles, les pierres/réflecteurs réfractaires ainsi que le verre et les matériaux d'étanchéité). Les dispositions de la loi sur les ventes en matière de responsabilité pour défauts s'appliquent à ces pièces.
- Des réparations ou modifications non autorisées par Morsø.
- En cas de manque d'entretien ou de dégradation du traitement de surface du produit, la corrosion peut survenir. La garantie ne couvre pas ces occurrences. Les dispositions de la loi sur les ventes en matière de responsabilité pour défauts s'appliquent également ici.
- Les dysfonctionnements causés par des conditions locales, des problèmes de tirage ou des dommages/défauts de la cheminée.

Conditions d'annulation :

Cette garantie est annulée si ce poêle à bois n'est pas installé, utilisé et entretenu conformément aux instructions fournies dans ce manuel, ou s'il est utilisé pour brûler des matériaux pour lesquels il n'est pas certifié par l'EPA. La garantie est également annulée en cas de modifications non autorisées apportées au poêle.

Comment Faire Valoir Votre Garantie

Pour déposer une réclamation au titre de la garantie, suivez ces étapes :

1. Contactez le service clientèle de Morsø par e-mail à **info@morsoe.com** ou par téléphone au **+45 96691900**.
2. Fournissez les informations suivantes :
 - Preuve d'achat (reçu ou facture)..
 - Numéro de modèle et numéro de série du poêle
 - Une description détaillée du problème, accompagnée de photos si possible.
3. Morsø évaluera la réclamation et, si elle est approuvée, fournira des instructions pour la réparation, le remplacement ou l'entretien.

Pour les termes détaillés de la garantie, veuillez consulter :

Page de Garantie Morsø. <https://morsoe.com/us/customer-service/indoor/warrantystoves>



Fabricant du poêle :

Adresse

Numéro de téléphone

Morsø Jernstøberi A/S

Furvej 6

7900 Nykøbing Mors

Denmark

+45 96691900

[illegible]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

IMPORTANT!

Comment chauffer en toute sécurité pour l'environnement et pour vous-même!

- **Utiliser uniquement du bois sec**

Utiliser uniquement du bois sec (teneur en humidité max. de 20%) et non traité. Le combustible doit être coupé en deux et faire de 8 à 12 cm d'épaisseur.

- **Allumer**

Allumer avec du bois d'allumage sec (utiliser 1 - 2 kg). Laisser la porte entrouverte et rester à proximité du poêle pendant la phase d'allumage.

- **Obtenir une bonne couche de braises**

S'assurer d'avoir une bonne couche de braises avant d'alimenter le feu. Le bois doit s'allumer en 2 minutes. Si les bûches ne s'allument pas, dans des circonstances extrêmes, cela peut provoquer l'allumage des gaz de combustion, ce qui présente un risque de dommages matériels et de préjudices corporels.

- **Alimenter le feu**

Pour alimenter le feu, utiliser 2 ou 3 morceaux de bois (pas plus de 2 - 2,5 kg).

- **Garantir une ventilation adéquate**

C'est-à-dire des flammes claires et jaunes.

- **Ne jamais laisser brûler toute la nuit**



By appointment to The Royal Danish Court

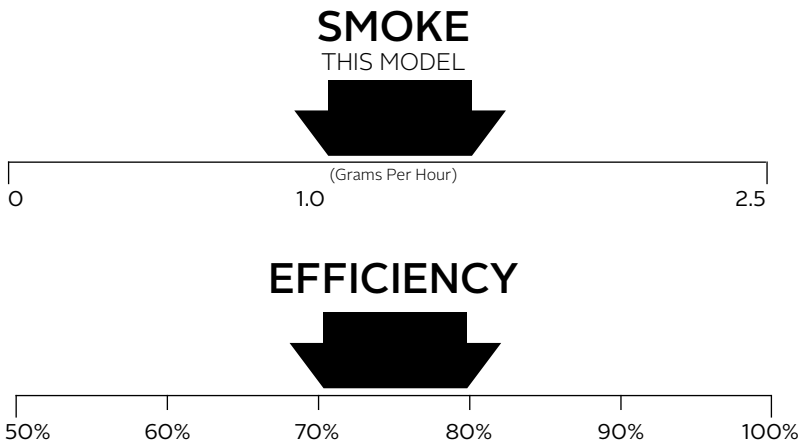
morsø

Morsø Jernstøberi A/S -05.05.2025 - 72208400

Manufactured by: Morsø
Model: 2B Standard

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards using cord wood.



Particulate emission using EPA Method 28R test method:

Emission
1.3 g/h

Wood heaters with higher efficiencies cost less to operate.

HEAT OUTPUT
10,661 to 19,519 Btu/Hr

Use this to choose the right size appliance for your needs.
ASK DEALER FOR HELP

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.

APPENDIX 8: Photographs of test set up

Dilution picture Dia 6 no. EG-030

Polytests Services Inc. 695 B rue Gaudette, St-Jean-sur-Richelieu Québec, Canada, J3B 7S7



Velocity ports at 90 degrees and tunnel temperature sensor location

Particulate sample extraction ports located 48 inches under (requirement $4D=24$ inches minimum) velocity ports and 16 inches above downstream Tee. (Requirement $2D=12$ inches minimum)

Adjustable damper for flow adjustments

Extraction blower



Last elbow from
horizontal run

6 inches diameter
stainless steel pipe

Velocity ports located 132
inches downstream of the
last elbow (requirement
 $8D=48$ inches minimum)
and 48 inches upstream of
the sampling ports
(requirement $4D=24$
inches minimum)

the room air blank is
within 10 feet of the
dilution tunnel hood.

Total length between hood and sampling port : 22 feet.



60 inches horizontal run between two elbows. Mixing section, No mixing baffle. 6 inches diameter pipe

Two 6 inches elbow with horizontal mixing section.

Hood diameter 32 (requirement $4D=24$ inches minimum) inches and height of 24 inches (requirement $3D=18$ inches minimum)

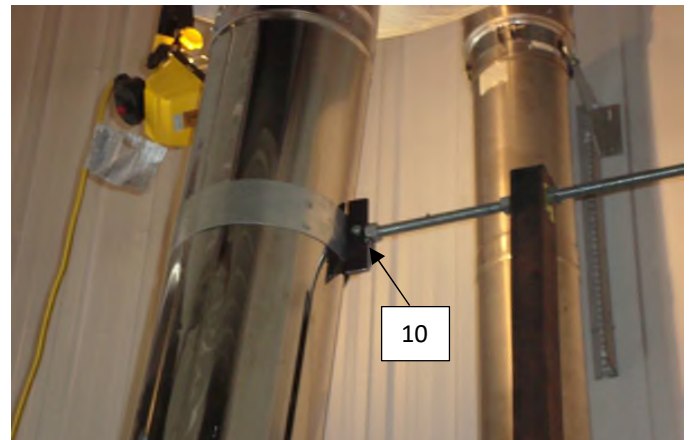
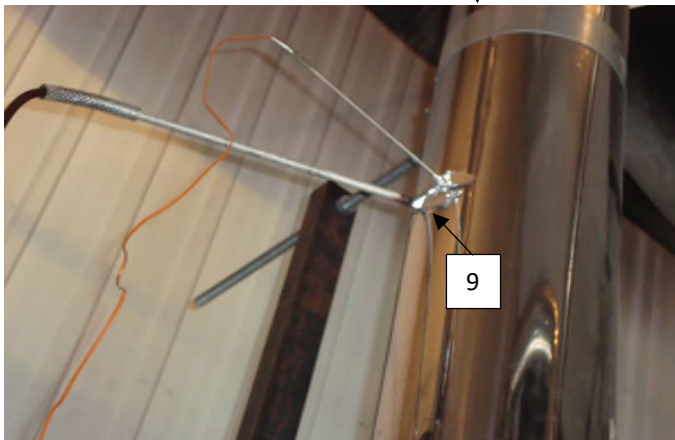
All pipe joints are sealed.

Stack sampling



Gas analysis and temperature probe

chimney support



9

 : Temperature and gas analyser sampling ports located 9 feet above platform

10

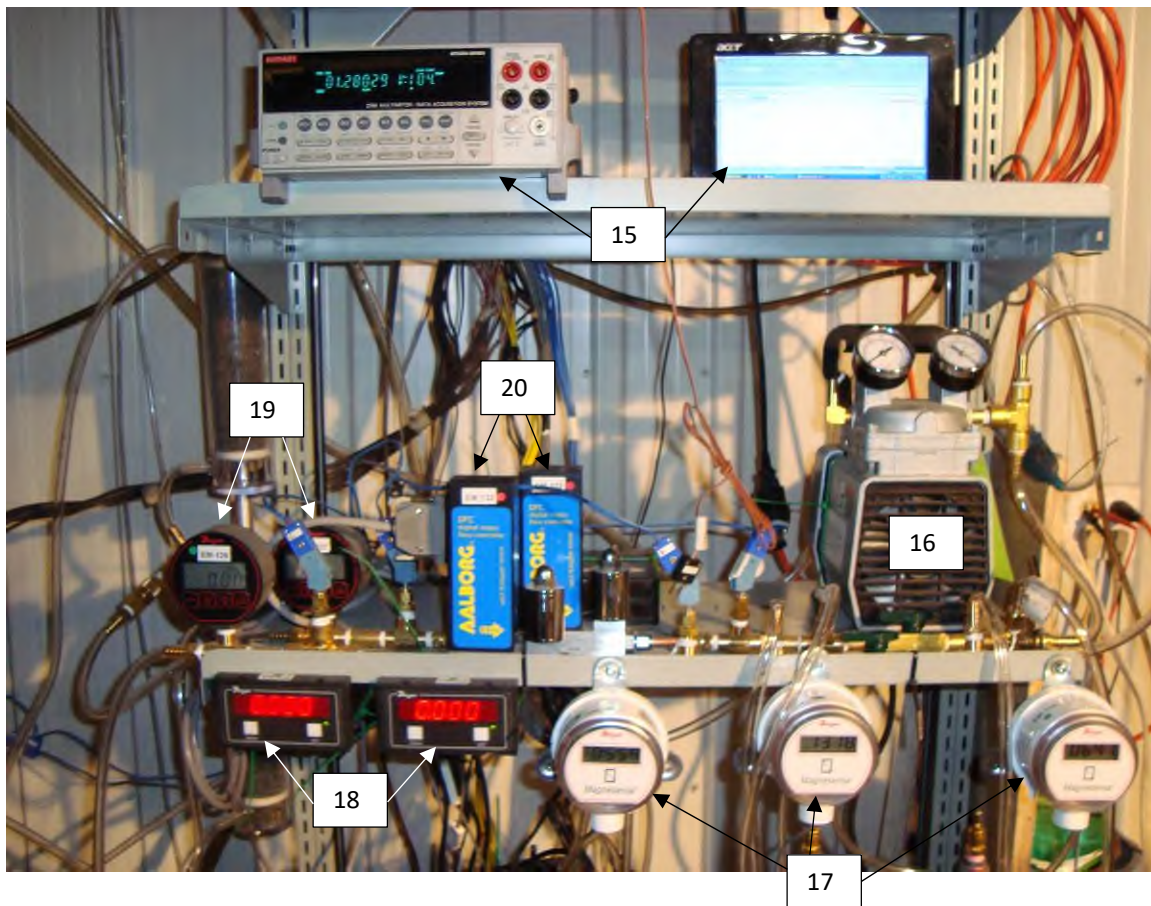
 : Exhaust system support bracket

Draft sampling



14 : Draft sampling port located 6 in. from the flue outlet

Equipment's



15 : Acquisition system

16 : Vacuum pump

17 : Digital manometer

18 : Digital read out for mass flow meter

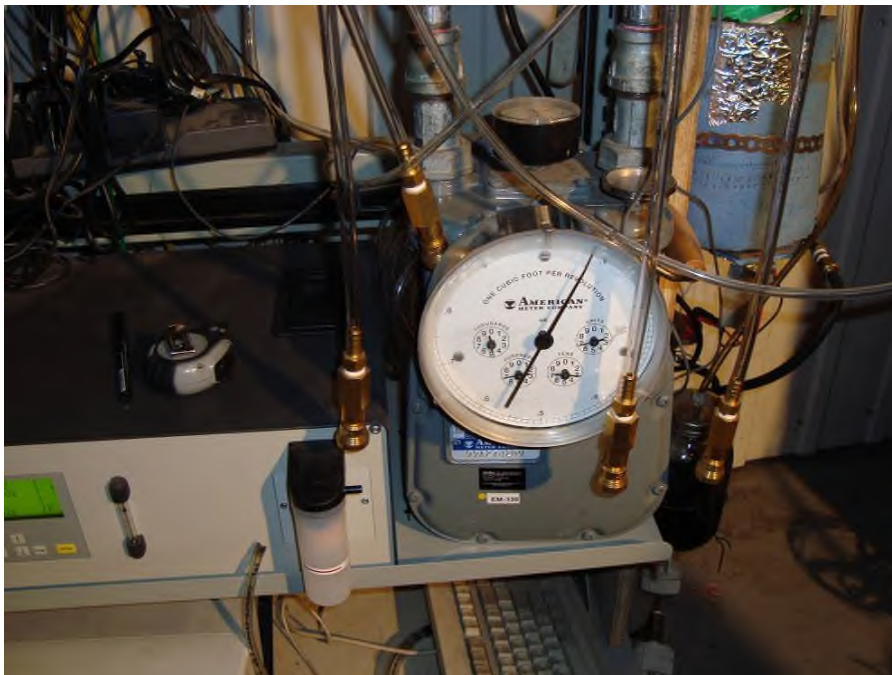
19 : Digital vacuum gage

20 : Mass flow meter

Gaz analyser



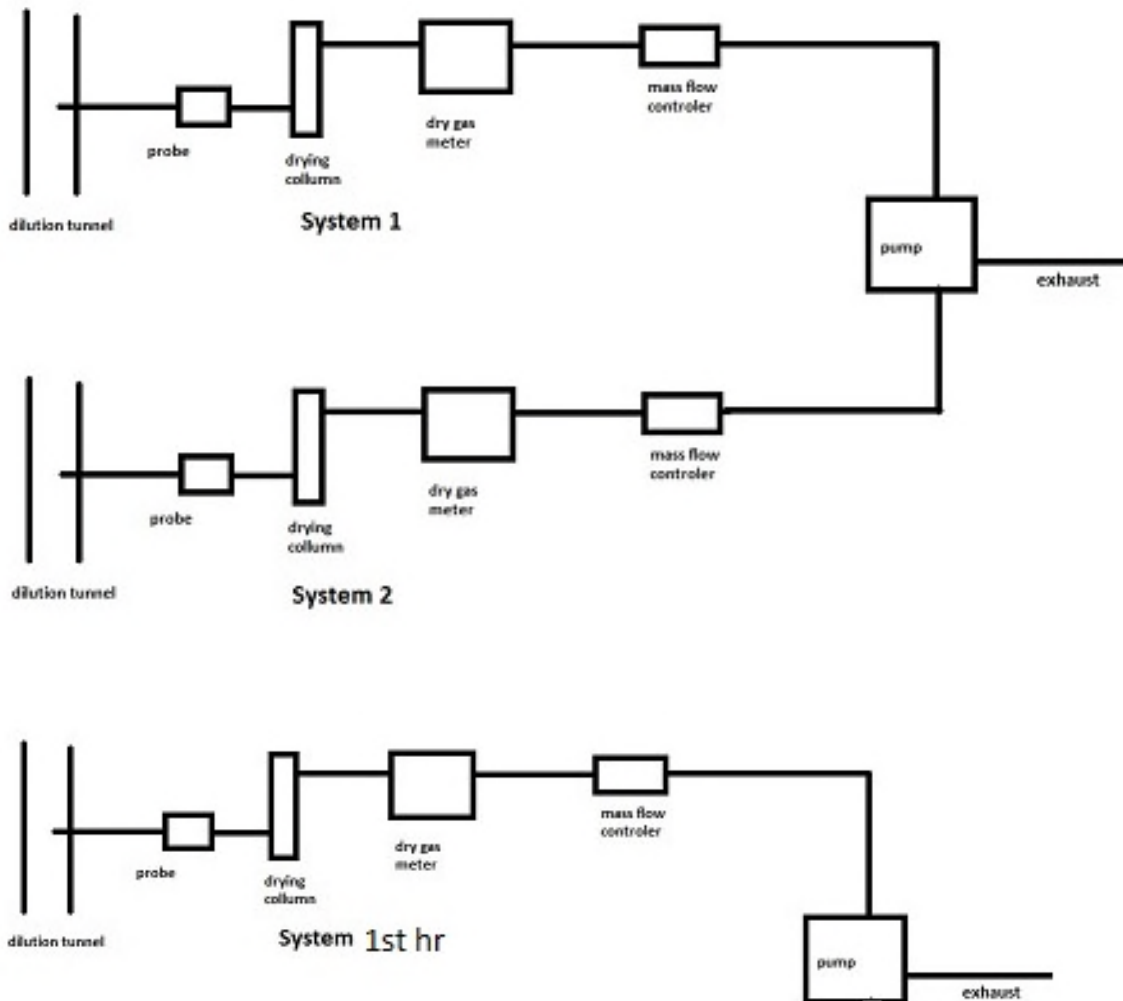
Reference dry gas meter



Dry gas meter for train 1, train 2 and room filter.



Dilution tunnel sample system



Dilution tunnel

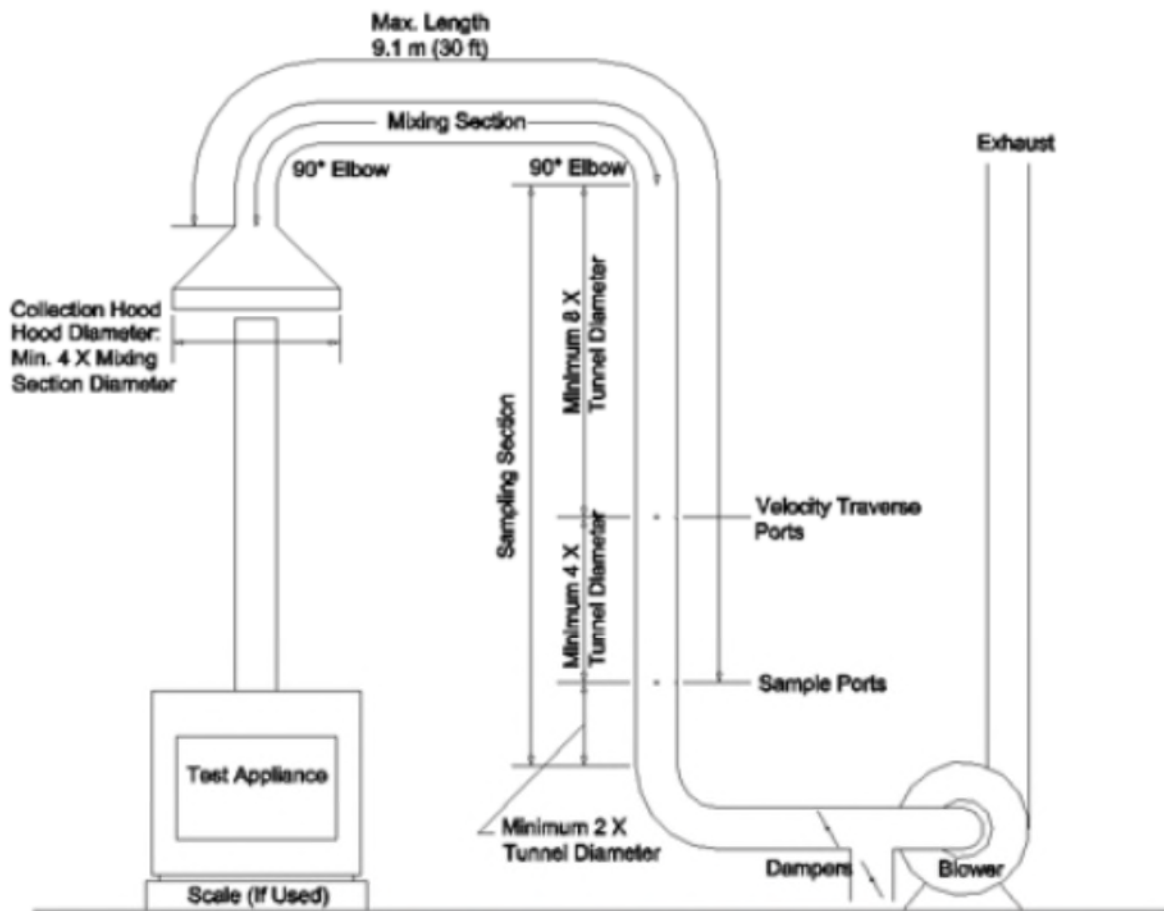


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

Sampling filter holders



Back filter holder The Pall (Gelman) 1119,
polycarbonate

Thermocouple

Front filter holder The Pall (Gelman) 1235
Aluminium

Seamless stainless steel probe corrosion
resistant, 12in. long, $\frac{1}{4}$ (O.D.)

The test facility temperature monitor is located on the horizontal plane that includes the primary air intake opening for the test appliance. Locate the temperature monitor 1 to 2 m (3.3 to 6.6 ft) from the front of the test appliance in the 90° sector in front of the test Appliance

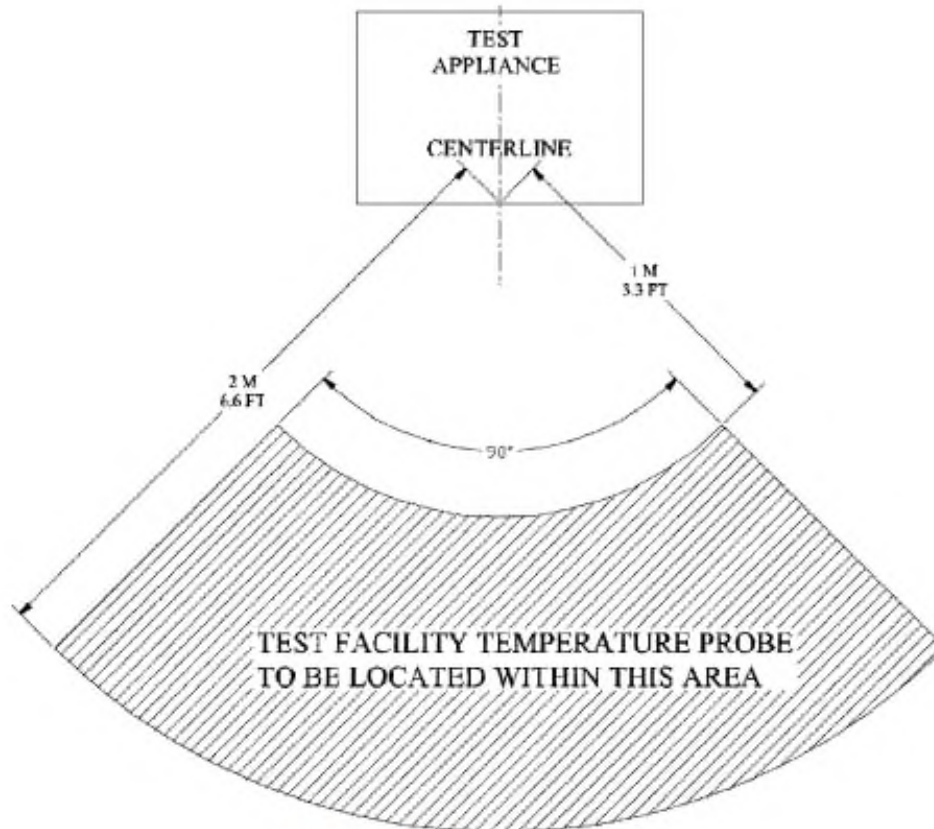


FIG. 8 Test Facility Temperature Monitor

APPENDIX 9: Test load photographs

Front view stove setup



Left side view of the Stove



Back side view of the stove



Right side view of the stove

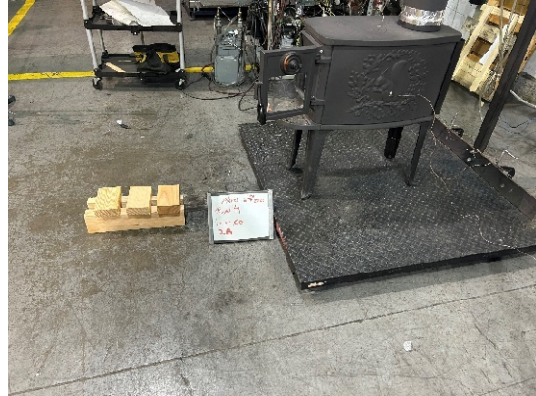


Run 1, March 27th 2025

Testing load



Preburn load



Charcoal / coal bed for load



Load in stove



Run 2, March 28th 2025

Testing load



Preburn load



Charcoal / coal bed for load



Load in stove



Run 3 March 29th 2025

Testing load



Preburn load



Charcoal / coal bed for load



Load in stove



Run 4 March 30th 2025

Testing load



Preburn load



Charcoal / coal bed for load



Load in stove



Sealed Stove



APPENDIX 10: Laboratory Operating Procedures

POLYTESTS Services inc.

SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

INTRODUCTION

This document provides a step-by-step guide for the technician conducting tests to EPA standard requirements. Procedures outlined here, when followed, will result in tests in conformance with EPA Methods 28R, ASTM E2780, ASTM E2515, ASTM E2618, Method 28WHH, Method 28 PTS, Method ALT-125, ASTM E3053, ALT-134, ASTM E2779

The primary measurements to be made are particulate emissions rates. The technician's duties include the following steps.

1. Incoming inspection of test units.
2. Set-up of test units.
3. Preliminary testing to establish unit operating procedures and familiarity with operating controls.
4. Calibration of test equipment.
5. Set-up, checking and operation of sampling apparatus.
6. Conduct of tests including complete record keeping and data recording for non-automated functions.
7. Operation of hardware and software included in automatic data acquisition system.
8. Review and analysis of data at test completion to ensure test validity.

The technician running this test must be familiar with the following documents, which are to be kept in the laboratory at all times.

EPA METHODS

1. EPA METHODS 28R
2. ASTM E2780
3. ASTM E2515
4. ASTM E2618
5. METHOD 28WHH
6. METHOD 28 PTS
7. ALT-125
8. ASTM E3053
9. ALT-134
10. ASTM E2779

POLYTESTS Services inc.

SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

I. APPLIANCE INSPECTION AND SET-UP

A. INCOMING INSPECTION

1. Check for completeness of unit including parts, accessories, installation and operating instructions, drawings and specifications etc. Note any discrepancies or missing parts or information.
2. Check for shipping damage. If damage has occurred, notify the laboratory manager. In some cases, repairs may be made, provided the manufacturer and laboratory manager concur that repairs will not affect the unit's performance. If damage is irreparable, a new unit will need to be obtained.
3. Note whether unit is catalytic or non-catalytic.
4. Mark unit with manufacturer's name, model number, work order number and date received.
5. If unit is safety listed, note label data including listing agency and serial number. If unit is not listed, mark all data sheets "UNLISTED". Test results will not be released until unit passes safety tests without modification unless authorized by laboratory manager.

B. UNIT SET-UP

1. All new units must be operated for a breaking in period as follows.

- a) Fifty (50) hours at medium burn rate with Douglas Fir scrap or cordwood. Between 18% and 25% MC.

During these break-in runs the unit may be connected to a lab chimney and fuel additions noted into the corresponding data acquisition file. For catalytic units, a thermocouple must be installed in the catalyst.

Record catalyst temperature at 1-hour intervals or on chart recorder. Operating should continue until data shows at least fifty (50) hours of operation with catalyst temperature in excess of 500 degrees Fahrenheit (active range).

For non-catalytic units a stack thermocouple should be installed and stack temperature recorded at 1-hour intervals. 50 hours minimum burn time with a stack temperature of at least 250 degrees Fahrenheit is required.

Once break-in is completed, allow unit to cool. Clean unit thoroughly.

POLYTESTS Services inc.

SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

2. Unit is to be placed on scale for testing. Prior to proceeding with verification process, scale should be turned on and allowed to warm up for one (1) hour minimum. Zero scale and check calibration with standard weights. One (1) 1 kg weight and one (1) 2 kg weight are provided for this purpose. Use scale verification test form no. EPA-7-TP to record results. If scale fails to reproduce weights within tolerance, check with laboratory manager before proceeding.
3. If scale checks out, place unit on scale and align so chimney will be centered in hood.
4. Attach chimney connector and chimney. Be sure all joints are sealed below sampling points. Chimney and connector should be cleaned with a wire brush. Be sure chimney connector terminates and chimney starts at proper level above scale platform. Chimney must be supported from scale so that it does not touch test enclosure or hood walls.
5. Thermocouples should be attached to surfaces of unit prior to testing. EPA requires a thermocouple on the bottom of the firebox. This must be installed prior to putting the unit on the scale. In some cases, the required thermocouple locations will be inaccessible on finished units. These units should have thermocouples installed by the manufacturer during construction. Check with the laboratory manager if problems are encountered in proper thermocouple attachment.
6. Measure firebox dimensions and record on data forms nos. EPA-2-TP. Make a three-dimensional sketch of the firebox including firebrick, baffles and obstructions. Calculate firebox volume in cubic feet with both addition and subtraction methods using forms nos. EPA-3-TP and EPA-4-TP. See Section 6.2.4 of EPA Method 28 for details of firebox volume determination.
7. If unit is catalytically equipped, additional thermocouples must be installed upstream and downstream of catalyst. Thermocouples should also be placed in the primary and secondary combustion chambers of all units.
8. Plug thermocouples into data acquisition system jacks making a check of locations and jack numbers for each test on data form no. EPA-5-TP.
9. Note that inserts are tested as if they are freestanding stoves.
10. Dilution tunnel should be cleaned prior to each certification test series and at anytime a higher burn rate follows a lower test burn rate.

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SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

II. SAMPLING SYSTEM – SET-UP

A. GAS ANALYSIS

1. Instruments should be turned on and allowed to warm up for one (1) hour minimum.
2. Calibrate analyzers as follows:

NOTE: Prior to proceeding with calibration, make sure to use NIST traceable calibration gas bottles. Adjust flow meter, if necessary, at each instrument to required flow value.

- a) Using span gas, adjust span control to values specified on calibration gas label.
- b) Using nitrogene, adjust zero controls to provide a 0.00 analyzer readout.
- c) Repeat a) and b) until no further adjustment is required.
- d) Check readout vs. calibration gases (2) labels.

The CO₂ and CO analyzers are “ZEROED” on nitrogen. The O₂ analyzer is spanned on air and set for 20.9%. It is zeroed on nitrogen as well.

3. Check for response time synchronization.
 - a) With no fire in unit, allow reading to stabilize (O₂ should be 20.93, CO and CO₂ should equal 0).
 - b) Flow the calibration gas in the unit and start stop watch. Note the time required for each unit to reach .90 of the calibration gas bottle value. If all three analyzers reach this value within 15 seconds of each other, synchronization is adequate. If not, contact the laboratory manager. Synchronization is adjusted by internal instrument setting.
4. Set-up sample clean-up and water collection train as follows.
 - a) Load impingers as follows:
Impinger #1: 100 ml distilled water and 5 ml H₂SO₄
Impinger #2: 100 ml distilled water and 5 ml H₂SO₄
Impinger #3: Empty
Impinger #4: 200 – 300 grams silica gel (dry)
 - b) Place impingers in container and connect with “U TUBES”. Grease carefully on bottom half of ball joint so that grease will not get into tubes.

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SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

- c) Connect filter to first impinger and sample line to last impinger.
- e. Leak check system as follows.
 - 1) Plug probe.
 - 2) Turn on sample system.
 - 3) Observe sample flow rotometer and vacuum gauge. If necessary, use vacuum; adjust valve to set vacuum to the maximum inches Hg.
 - 4) If the float in rotometer does not stabilize below 10 on scale, system must be resealed.
 - 5) Repeat leak check procedure until satisfactory results are obtained.
- f) Just prior to starting test, fill impinger container with water and ice and record ambient conditions on data form no. EPA-8-TP.

B. DILUTION TUNNEL SAMPLE TRAIN SET-UP

- 1. Filters and holders.
 - a) Clean probes and filter holder front housings carefully and desiccate for at least 48 hours prior to use.
 - b) Filters should be numbered and filter and probe combinations labeled prior to use.
 - c) Weigh desiccated filters and probe-filter units on analytical balance. Record weights data form no. EPA-10-TP. Note that probe and front half of front filter are to be weighed as a unit.
 - d) Carefully assemble filter holder units and connect to sampling systems. Check "DRIERITE" columns for adequate dry absorbent (blue).
- 2. Leak checking.
 - a) Each sample system is to be checked for leakage prior to inserting probes in tunnel.
 - b) Plug probes and start samplers, adjust pump bypass valve to produce a vacuum reading of 10 inches Hg. (NOTE: During test, vacuum must not exceed 10 inches unless posttest leak check shows acceptable results.)
 - c) Allow vacuum indication to stabilize for two (2) minutes, then record time and dry gas (DGM₁) and (DGM₂) meter readings. Wait ten (10) minutes and record dry gas meter readings again (DGM₃, DGM₄).

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SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

NOTE: If mark, system is leaking too much and all seals should be checked.

d) Calculate leakage rate as follows.

1) System 1: $\frac{(DGM_3 - DGM_1)}{10} = CFM_1$

2) System 2: $\frac{(DGM_4 - DGM_2)}{10} = CFM_2$

If CFM_1 or CFM_2 is greater than .02 CFM, leakage is unacceptable and system must be resealed.

If CFM_1 or CFM_2 is greater than $0.04 \times \text{sample rate}$, leakage is unacceptable. For most tests, the sample rate will be about 0.15 CFM, thus leakage rates in excess of $0.04 \times 0.15 = 0.006$ CFM are not acceptable. Record leakage rates on form no. EPA-5-TP

e) Once leakage check is satisfactory, unplug probe and set flow to appropriate rate for test. This should be done in the minimum amount of time necessary and with the probes in ambient air. Do not insert probes in tunnel until the start of the test run. When flow is established, replug probes to prevent contamination.

III. TEST CONDUCT

A. FUEL LOAD

1. Determine optimum load weight by multiplying firebox volume in cubic feet by 7 or (10 and 12 for cordwood method). This is the load weight on an as-fired basis.
2. Determine piece size to obtain the requested load configuration and meet the test load weight criteria. The load should consist of the following: **TO BE DETERMINED**
3. Weigh out test load and adjust weight by shortening all pieces equally if necessary. Record individual piece load on form no. EPA-11-TP.

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SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

4. Measure and record moisture content of each fuel piece using Delmhorst moisture meter. Determine if fuel load moisture content is in required range. If not, construct new load using wood with required moisture content. All wood in the humidity chamber should be within range. Contact project manager if you cannot find suitable pieces. Record moisture of each individual piece load on form no. EPA-11-TP.

B. UNIT START-UP

1. Before lighting a fire, turn on dilution tunnel and set tunnel velocity to 500ft/min Record readings on data form no. EPA-9-TP.
2. Check draft imposed on cold stove with all inlets closed and a draft gauge in the chimney. If draft is greater than 0.005 inches water column, adjust tunnel to stack gap until draft is less than 0.005.
3. Check for ambient airflow around unit with hot wire anemometer. Must be less than 50 ft/min.
4. Check all equipment for proper operation. Analyzers should be on and in sample mode. Computer should be loaded with test program and awaiting test start command.
5. Zero scale and start fire with uncolored newspaper and kindling representing 10 % of test load with the same type of fuel.
6. Once kindling is burning well after 5 minutes, add splitted pieces having a bottom surface around 4 sq. inches and representing 25% of test load weight. Operate at high fire for 15 minutes. Then adjust settings to intended test run levels as per the manufacturers.
7. Following addition of pretest fuel load (splitted pieces), start computer for data logging.
8. All fuel additions, air intake settings and operational characteristics shall be noted with associated time stamp on form no. EPA-1-TP.

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C. TEST RUN

1. Once the targeted test fuel bed weight is obtained, the test is to be started as follows:

- a) Insert the sample probes into the tunnel being careful not to hit sides of tunnel with probe tip.
- b) Check tunnel pitot tube for proper position. (Pitot should be carefully cleaned prior to each test.)
- c) Turn on probe sample systems and stack sampler.
- d) Open stove door, rake coals and load stove as follows: **TO BE DETERMINED**
- e) Close door or follow manufacturer's start-up procedures. (Five (5) minutes maximum time before all doors and controls must be set to final positions for duration of test. 15 minutes or 15% of lad burned allowed for ALT-125 method))
- f) An alarm will sound an audible signal at the (10) minutes intervals. This signals a reading interval. You must verify at each interval that the following readings are correctly logged by the data acquisition system and make observations of any unusual or non-routine events that could occur.

- 1) Rotometer readings.
- 2) Tunnel pitot tube reading.

(Zero regularly between readings)

- 3) Gas meter readings.
- 4) Temperature readings.
- 5) Draft reading
- 6) Test load weight
- 7) CO, CO₂ and O₂ readings
- 8) Observations of any unusual or non-routine events.

- g) During the test, any condition approaching unacceptable limits will be noted. The filter probes and housings are installed in small holders just outside the tunnel. If the filter temperature gets too high, you will have to increase the water flow through the cooling unit until acceptable temperatures are obtained. In between readings, check on other equipment. Be sure dryers and filters are working and monitor impinger train for proper water and ice levels etc.
- h) When the fuel charge is consumed, it will signal end of test and shut down the sampling systems. When this occurs,

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remove filter holder and probes from tunnel and impingers from sample line.

IV. POST TEST PROCEDURES

A. SAMPLE RECOVERY – FILTER TRAINS

1. Carefully clean outside of probes and filter housings with alcohol.
2. Disassemble filter holder and transfer filters to clean petri dish. Scrape gasket with scalpel and collect any loose material on filters.
3. Place probe and front half of first filter holders (still assembled) and filters in desiccator. Allow 48-hour desiccation before weighing.
4. Weigh probe filter holder units and filters at six (6) hour intervals minimum until weight change between weightings is less than 0.2 mg. Record all weights taken on data form no. EPA-10-TP.

B. CALCULATION OF RESULTS

The computer program carries out all final calculations. When run, it will ask for data from forms used during the test. Enter data as called for.

GENERAL

This guide cannot cover every possible contingency, which may develop during a particular test program. Many questions, which may arise, can be answered by a complete understanding of the test standards and their intent. When in doubt on any detail, check with the laboratory manager and be sure you understand the procedures involved.

It is critical that all spaces on the data forms be properly filled in. Each test must be represented by a complete record of what was done and when.

APPENDIX 11: Sample calculations

Validation du fichier de calcul avec les équations provenant des normes:

ASTM E2515-11

ASTME2618

Dry burn rate (BR)

Equation used

B415.1, 13.4

$$BR = \left[\frac{60W_{WD}}{\theta} \right] \left[\frac{100 - \%M_W}{100} \right]$$

Nomenclature

BR	Dry wood burn rate, kg/hr (lb/hr)
W_{WD}	Total mass of wood burned (wet basis) during the test run, kg (lb)
θ	Total time of test run, minutes
$\%M_W$	Average moisture in test fuel charge, wet basis, % To convert from dry basis to wet basis: % moisture wet basis =

Sample calculation

Data

W_{WD}	4,748 lbs
θ	146 min
$\%M_W$	17,08 %

Calculation

BR	0,734 Dry kg/hr
----	-----------------

Volume of gas sample corrected to dry standard conditions ($V_{m(std)}$)

Equation used

ASTM 2515, equation 6

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

Nomenclature

$V_{m(std)}$	Volume of gas sample , corrected to standard conditions, dscm ³ (dscf)
K_1	17.64 R/in Hg
V_m	Volume of gas sample
Y	DGM calibration factor
P_{bar}	Barometric pressure mmHg (in Hg)
ΔH	Average pressure at the outlet of the dry gas meter mm water (in. Water)
T_m	Absolute average dry gas meter temperature K (R)

Sample calculation

Data

V_m	28,17 dcf
Y	1,01
P_{bar}	29,53 in Hg
ΔH	-0,9578 in Hg
T_m	534,8 R

Calculation

$V_{m(std)}$	26,82 dscf
--------------	------------

Total amount of particulate matter collected (m_n)

Equation used

ASTM 2515, equation 12

$$m_n = F_1 + F_2 + \Delta PF$$

Nomenclature

m_n Total amount of particulate matter collected, mg

$F_1 + F_2$ Particulate matter collected on filters, mg

ΔPF Post-test weight gain of probe and filter holder assembly, mg

Sample calculation

Data

$F_1 + F_2$ 0,0003 g

ΔPF 0,001 g

Calculation

m_n 0,800 mg

Calculation based of train 2 data

Particulate concentration (C_s)

Equation used

ASTM 2515, equation 13

$$C_s = (0,001 \text{ g/mg}) \times \left(\frac{m_n}{V_{m(\text{std})}} \right)$$

Nomenclature

C_s	Concentration of particulate matter in stack gas or dilution tunnel, dry basis, corrected to standard conditions, g/dsm ³ (g/dscf)
m_n	Total amount of particulate matter collected in the sampling train, mg
$V_{m(\text{std})}$	Volume of gas sample measured corrected to dry standard conditions, dsm ³ (dscf)

Sample calculation

Data

m_n	0,800 mg
$V_{m(\text{std})}$	26,82 dscf

Calculation

C_s	0,000030 g/dscf
Calculation based of train 2 data	

Particulate concentration for room air (C_r)

Equation used

ASTM 2515, equation 14

$$C_r = (0,001 \text{ g/mg}) \times \left(\frac{m_r}{V_{mr(std)}} \right)$$

Nomenclature

C_r	Concentration of particulate matter in room air, dry basis, corrected to standard conditions, g/dsm ³ (g/dscf)
m_r	Total amount of particulate matter collected in the sampling train, mg
$V_{mr(std)}$	Volume of room air sample measured corrected to dry standard conditions, dsm ³ (dscf)

Sample calculation

Data

m_r	0,100 mg
$V_{mr(std)}$	26,12 dscf

Calculation

C_r	0,000004 g/dscf
Calculation based of train 2 data	

Adjustment factor for alternative pitot tube placement (FP)

Equation used

ASTM 2515, equation 1

$$F_P = \frac{V_{strav}}{V_{scent}}$$

Nomenclature

V_{strav}	Average gas velocity caclulated after the Pitot tube traverse
V_{scent}	Average gas velocity at the center of the dilution tunnel cacluated after the multi-point Pitot traverse
F_P	Adjustment factor for center of tunnel pitot tube placement

Sample calculation

Data

V_{strav}	0,259546272
V_{scent}	0,272945344

Calculation

F_P	0,950909
-------	----------

Average dilution tunnel gas velocity (V_s)

Equation used

ASTM 2515, equation 9

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

Nomenclature

V_s	Average dilution tunnel gas velocity, m/s (ft/s)
K_p	Pitot tube constant For the metric units: $34.97 \text{ m/sec} \left[\frac{\left(\frac{\text{g}}{\text{g-mole}} \right) (\text{mm Hg})}{(^{\circ}\text{K})(\text{mm H}_2\text{O})} \right]^{1/2}$ For English units: $85.49 \text{ ft/sec} \left[\frac{\left(\frac{\text{lb}}{\text{lb-mole}} \right) (\text{in Hg})}{(^{\circ}\text{R})(\text{in H}_2\text{O})} \right]^{1/2}$
C_p	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
F_p	Pitot tube correction factor
$(\sqrt{\Delta P})_{avg}$	Average square root of each individual velocity head (ΔP)
P_{bar}	Barometric pressure at measurement site, mm H ₂ O (in. H ₂ O)
P_g	Stack static pressure, mm Hg (in. Hg)
P_s	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
M_s	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78 or 29 for CSA B415
t_s	Dilution tunnel temperature, $^{\circ}\text{C}$ ($^{\circ}\text{F}$)
T_s	Absolute dilution tunnel temperature, $^{\circ}\text{K}$ ($^{\circ}\text{R}$), or $273 + t_s$ for metric units, $460 + t_s$ for English units

Sample calculation

Data

K_p	85,49
C_p	0,99
F_p	0,951
$(\sqrt{\Delta P})_{avg}$	0,2773 in H ₂ O ^{1/2}
P_{bar}	29,53 in Hg
P_g	0,28 in H ₂ O
P_s	29,55 in Hg
M_s	29 lb/lb-mol
t_s	80,61 F
T_s	540,61 R

Calculation

V_s	17,7247 ft/s
-------	--------------

Average dilution tunnel gas flow rate (Qstd)

Equation used

ASTM 2515, equation 3

$$Q_{std} = 60(1 - B_{ws})V_s A \left(\frac{T_{std}}{T_s} \right) \left(\frac{P_s}{P_{std}} \right)$$

Nomenclature

Q_{std}	Total gas flow rate corrected to dry standard conditions, dsm^3/min (dscf/min)
60	Conversion factor minutes per hour
B_{ws}	Water vapour in the dilution tunnel stream, proportion by volume (may be assumed to be 2%)
V_s	Average dilution tunnel gas velocity, m/s (ft/s)
A	Cross-sectional area of dilution tunnel, m^2 (ft^2)
T_{std}	Standard absolute temperature, 293 °K (528°R)
T_s	Absolute average dilution tunnel temperature, °K (°R), or $273 + t_s$ for metric units, $460 + t_s$ for English units
t_s	Dilution tunnel temperature, °C (°F)
P_s	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
P_{bar}	Barometric pressure at measurement site, mm Hg (in. Hg)
P_g	Dilution tunnel static pressure, mm Hg (in. Hg)
P_{std}	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

Sample calculation

Data

B_{ws}	0,02
V_s	17,725
A	0,349 ft^2
T_{std}	528 R
T_s	540,61 R
P_s	29,550 in Hg
P_{std}	29,92 in Hg

Calculation

Q_{std}	350,93 dscf/min
-----------	-----------------

Particulate emission rate (E)

Equation used

$$E = (C_S - C_r)Q_{std}$$

Nomenclature

E	Particulate emission rate, g/hr
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm ³ (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm ³ (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm ³ /min (dscf/min)

Sample calculation

Data

C_S	0,000030 g/dscf
C_r	0,000004 g/dscf
Q_{std}	350,93 dscf/min

Calculation

E	0,01 g/min
E	0,55 g/h

Calculation based on train 2 data.

Total particulate emission rate (E_T)

Equation used

ASTM 2515, equation 15

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

Nomenclature

E_T	Total particulate emission, g
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm ³ (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm ³ (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm ³ /min (dscf/min)
θ	Total sampling time, min

Sample calculation

Data

C_S	0,000030 g/dscf
C_r	0,000004 g/dscf
Q_{std}	350,93 dscf/min
θ	146 min

Calculation

E 1,33 g
Calculation based on train 2 data.

Average gas velocity in dilution tunnel during each min interval, i, of the test run

Equation used

ASTM 2515, equation 10

$$v_{si} = F_p K_p C_p \sqrt{\Delta p_i} \sqrt{\frac{T_{si}}{P_s M_s}}$$

Nomenclature

	Average gas velocity in dilution tunnel during each min interval, i of the test run
v_{si}	m/sec (ft/sec)
F_p	Pitot tube correction factor
K_p	Pitot tube constant
	For the metric units: $34.97 \text{ m/sec} \left[\frac{\left(\frac{g}{g\text{-mole}} \right) (mm \text{ Hg})}{(^{\circ}K) (mm \text{ H}_2\text{O})} \right]^{1/2}$
	For English units: $85.49 \text{ ft/sec} \left[\frac{\left(\frac{lb}{lb\text{-mole}} \right) (in \text{ Hg})}{(^{\circ}R) (in \text{ H}_2\text{O})} \right]^{1/2}$
C_p	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
Δp_i	interval, i, of the test run
T_{si}	Absolute average gas temperature in the dilution tunnel during the i^{th} minutes
P_s	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{\text{bar}} + P_g$
M_s	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78

Sample calculation

Data

i=1		i=2	
F_p	0,951	F_p	0,951
K_p	85,49	K_p	85,49
C_p	0,99	C_p	0,99
Δp_i	0,079 in H ₂ O	Δp_i	0,077 in H ₂ O
T_{si}	553,9 R	T_{si}	549,5 R
P_s	29,55 in Hg	P_s	29,55 in Hg
M_s	29 lb/lb-mol	M_s	29 lb/lb-mol

Calculation

i=1		i=2	
v_{si}	18,16 ft/sec	v_{si}	17,91 ft/sec

Percent of proportional sampling rate (PR)

Equation used

B415, equation 13.1

$$PR = \left(\frac{\theta V_{mi(std)} V_S T_m T_{Si}}{\theta_i V_m V_{Si} T_{mi} T_S} \right) \times 100$$

Nomenclature

PR	Percent of proportional sampling rate (%)
θ	Total sampling time, min
θ_i	Time of interval, 1 min
V_m	Volume of gas sample measured by the DGM, dsm ³ (dscf)
$V_{mi(std)}$	Volume of gas sample measured by the digital mass flow controller during the i th 1 minutes interval, dsm ³ (dscf)
V_S	Average gas velocity in the dilution tunnel, ft/min
V_{Si}	Average gas velocity in the dilution tunnel during the i th 10 minutes interval, ft/min
T_m	Absolute average digital mass flow controller temperature, K (R)
T_{mi}	Absolute average digital mass flow controller temperature during the i th 1 minutes
T_S	Absolute average gas temperature in the dilution tunnel, K (R)
T_{Si}	Absolute average gas temperature in the dilution tunnel during the i th 1 minutes

Sample calculation

Data

train =1			train =2		
θ	146	min	θ	146	min
θ_i	1	min	θ_i	1	min
V_m	26,61	dcf	V_m	26,83	dcf
$V_{mi(std)}$	0,181	cuft	$V_{mi(std)}$	0,1804	cuft
V_S	17,73	ft/sec	V_S	17,73	ft/sec
V_{Si}	18,175	ft/sec	V_{Si}	18,175	ft/sec
T_m	531,5	R	T_m	534,8	R
T_{mi}	531,38	R	T_{mi}	531,31	R
T_S	540,61	R	T_S	540,61	R
T_{Si}	553,9	R	T_{Si}	553,9	R

Calculation

train=1		train=2	
PR	99,4 %	PR	98,8 %

Filter face velocity check

Equation used

$$FV_{max} = \frac{V_{mL}}{1} \times \frac{1}{F_A}$$

Nomenclature

FV_{max}	Maximum filter face velocity during the test run, m/min (ft/min)
V_{mL}	Largest 1 minute interval metered gas volume value recorded during the test run, dm ³ (dcf)
F_A	Filter area exposed to gas sample during train operation, m ² (ft ²)

Sample calculation

Data

V_{mL}	0,210 dcf
F_A	0,0116 ft ²

Calculation

FV_{max}	18,10 ft/min
------------	--------------

Dual train precision

Equation used

$$\frac{\text{Train 1} - \text{average train 1 and train 2}}{\text{average train 1 and train 2}} \times 100 \leq 7.5\%$$

Nomenclature

Dual train precision	Deviation between emission's train 1 and 2
Train 1	Total emission for train 1
Train 2	Total emission for train 2

Sample calculation

Data

Train 1	1,34 g
Train 2	1,33 g

Calculation

Dual train precision	0,47 %
----------------------	--------

Analyzer drift checks

Equation used

$$Drift = \frac{\Delta R}{span} \times 100$$

Nomenclature

Drift	The change in analyzer response to calibration gas over the duration of the test run
ΔR	The difference between the analyzer response at the end of the test run and the
Span	The upper limit of the instrument range, ppmv or %

Sample calculation

Data

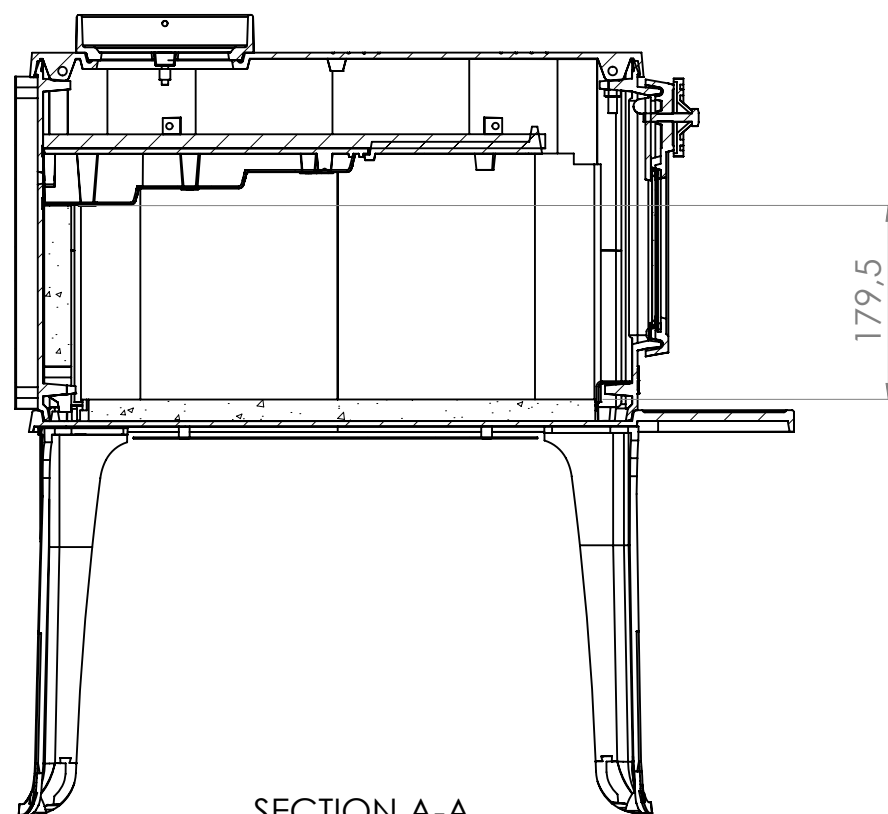
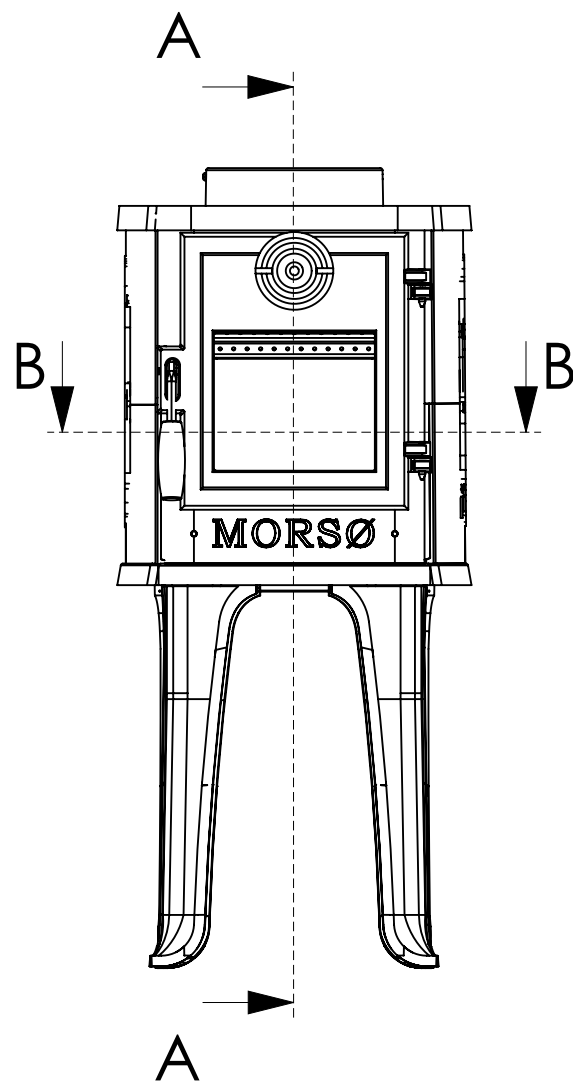
ΔR	0,015 %
Span	5 %

Calculation

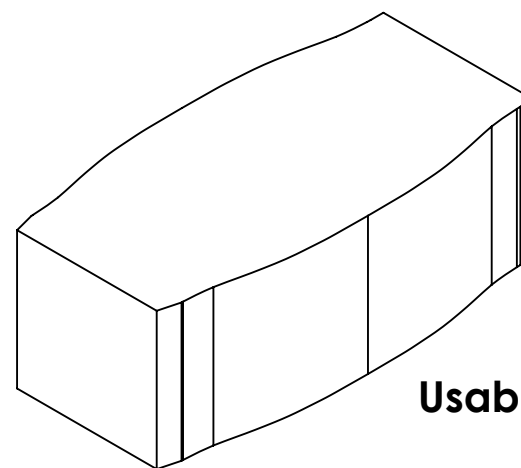
Drift	0,30 %
-------	--------

Calculated with CO concentration values.

APPENDIX 12: Volume calculations



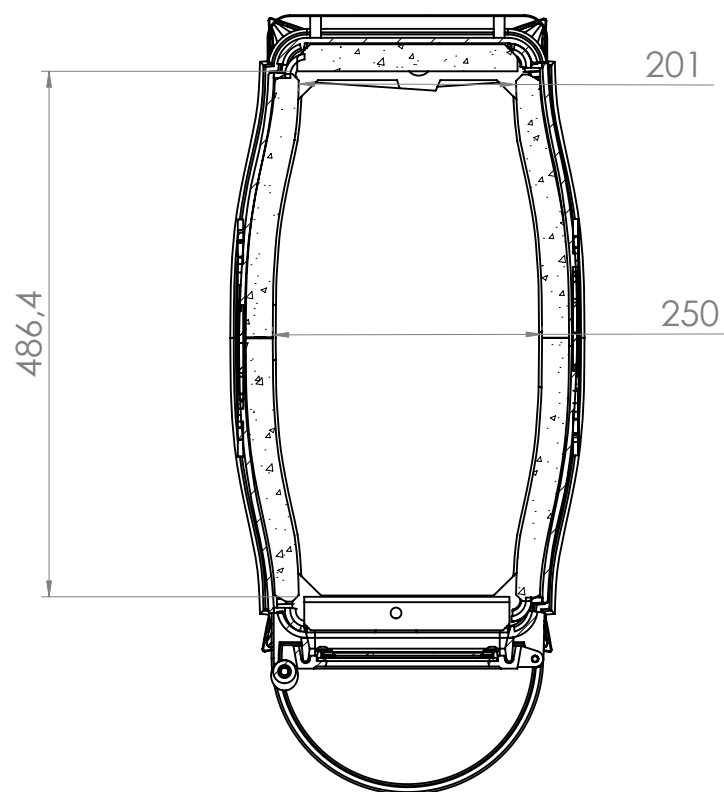
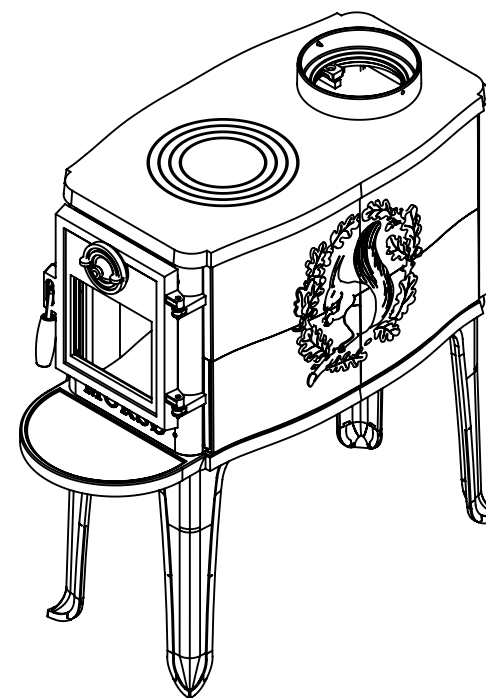
SECTION A-A
SCALE 1 : 7



Usable firebox volume:

0.019483 m³
0,688049 ft³

(SolidWorks CAD calculation)



SECTION B-B
SCALE 1 : 7

Firebox Width:

Measured from the inner edge of one side insulation stone to the inner edge of the opposite side insulation stone.

Firebox Height:

Measured from the surface of the hearth to the uppermost edge of the back insulation stone.

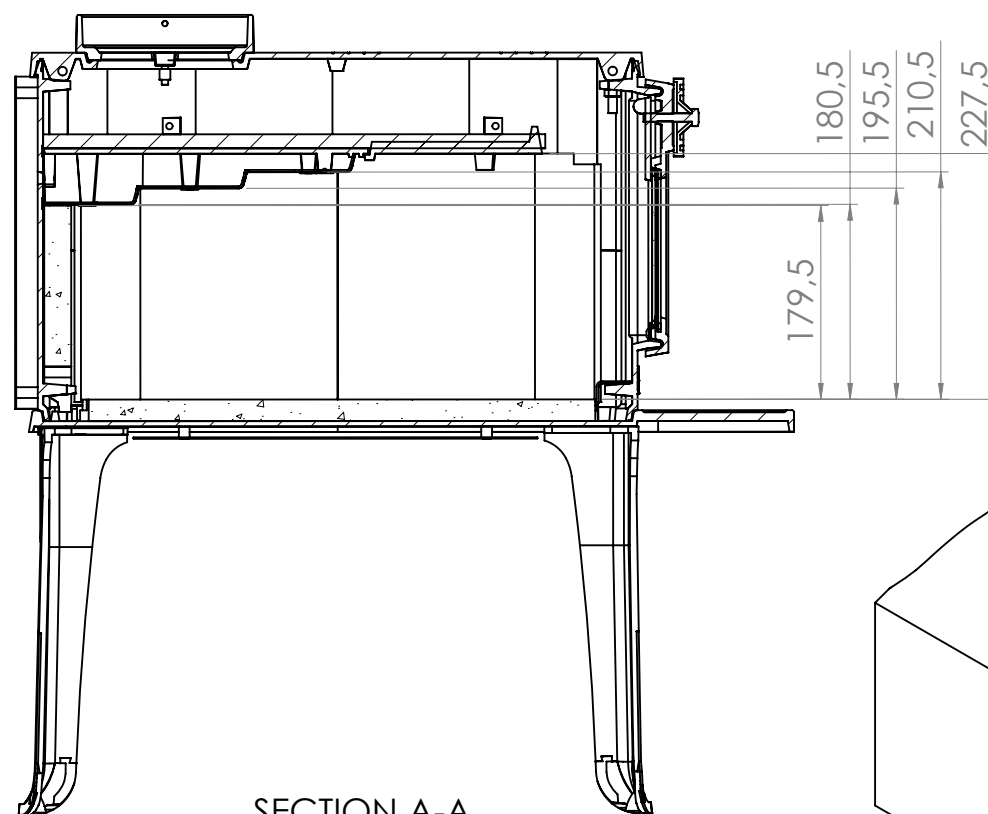
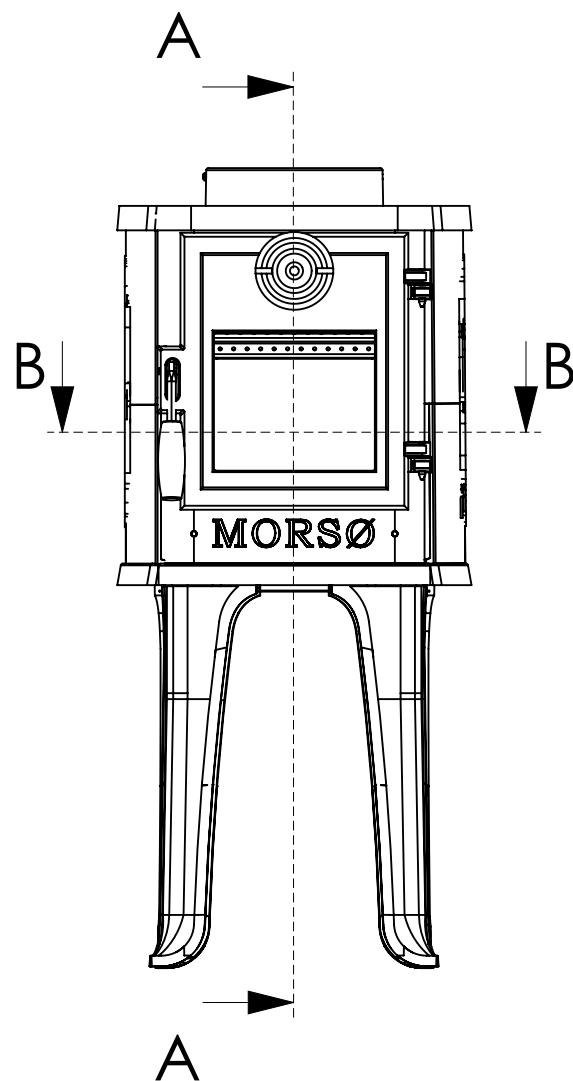
Firebox Depth:

Measured from the back insulation stone to the interior edge of the front door frame.

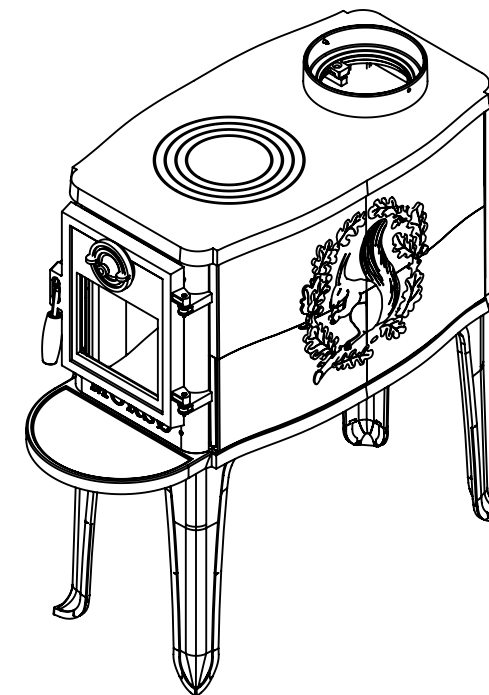
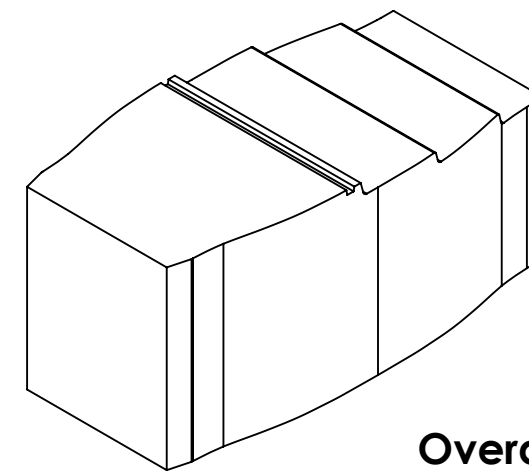
Rev. Revisions		Sign.:	Date:
Title:		Construction:	FJN 09.01.2025
Morsø 2B Standard		Released:	
Usable firebox volume		Format:	A3
		Scale:	1:7
		Itemno.:	
		Drawing no.:	2B-155

Dim. without indication of margin acc. to DS/ISO 2768-1 m	
Material:	
Weight kg:	
Model no.	
Drawingtype:	Dimension Skecth
Location of file:	C:\MorsøPDM\Projects\Ovne\2B\2B Classic & 2B Standard Assembly.SLDASM





SECTION A-A
SCALE 1 : 7

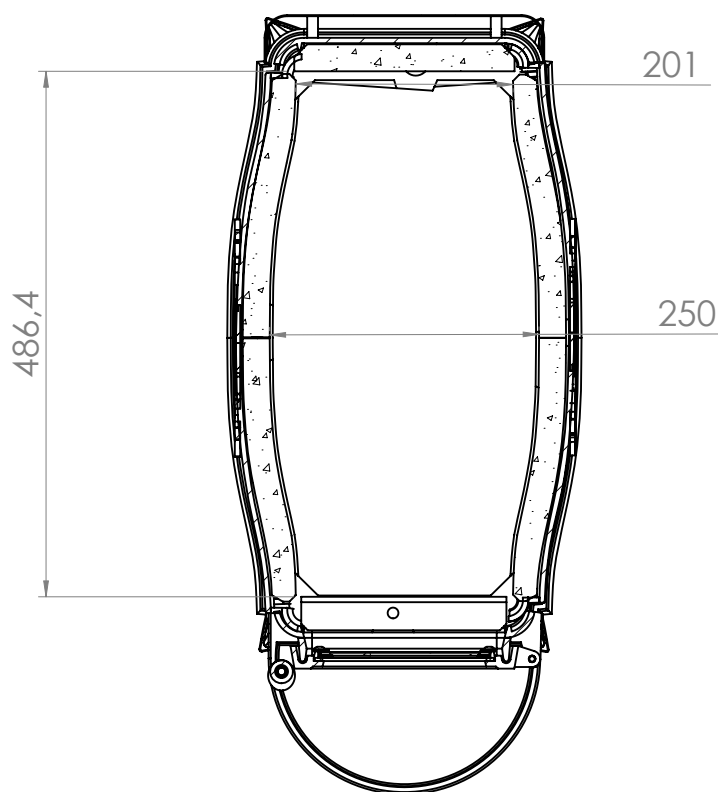


Overall firebox volume:

0.023239 m³

0.820662 ft³

(SolidWorks CAD calculation)



SECTION B-B
SCALE 1 : 7

Firebox Width:

Measured from the inner edge of one side insulation stone to the inner edge of the opposite side insulation stone.

Firebox Height:

Measured from the surface of the hearth up to the surface of the baffle.

Firebox Depth:

Measured from the back insulation stone to the interior edge of the front door frame.

Rev.	Revisions	Sign.:	Date:
		FJN	09.01.2025
Title:		Construction:	
Morsø 2B Standard		Released:	
Overall firebox volume		Format:	A3
		Scale:	1:7
		Itemno.:	
		Drawing no.:	2B-156

Dim. without indication of margin acc. to DS/ISO 2768-1 m	
Material:	
Weight kg:	
Model no.	
Drawingtype:	Dimension Skecth
Location of file:	C:\MorsøPDM\Projects\Ovne\2B\2B Classic & 2B Standard Assembly.SLDASM



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APPENDIX 13: Operating instruction



Operating instruction Morso 2B Standard

Maximum burn rate

- Air damper fully open
- Start the fire with 2.5lbs of kindling
- Keep the door open for a good ignition
- At 1.0 lbs insert warmup preload and close the door
- In the coal bed allowable range, insert the load
- Close the door with air damper fully open

Medium high burn rate (cat3)

- Air damper Cat3 setting. (1/2 turns from fully open)
- Start the fire with 2.5lbs of kindling
- Keep the door open for a good ignition,
- At 1.0 lbs insert warmup preload and close the door
- In the coal bed allowable range, insert the load,
- close the door with air damper Cat3 setting. (1/2 turns from fully open)

Medium low burn rate (Cat2)

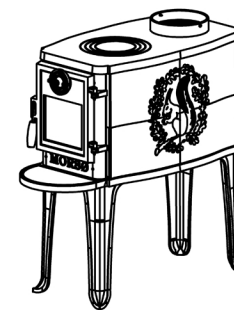
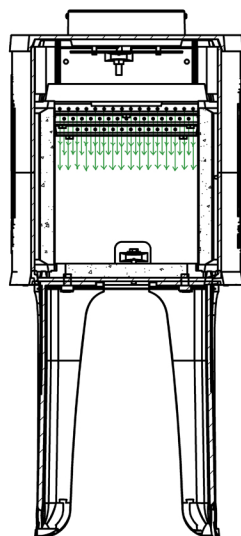
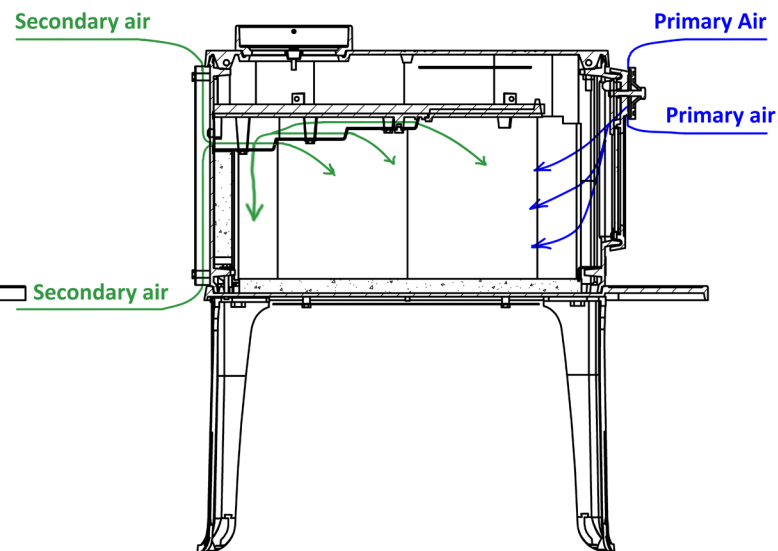
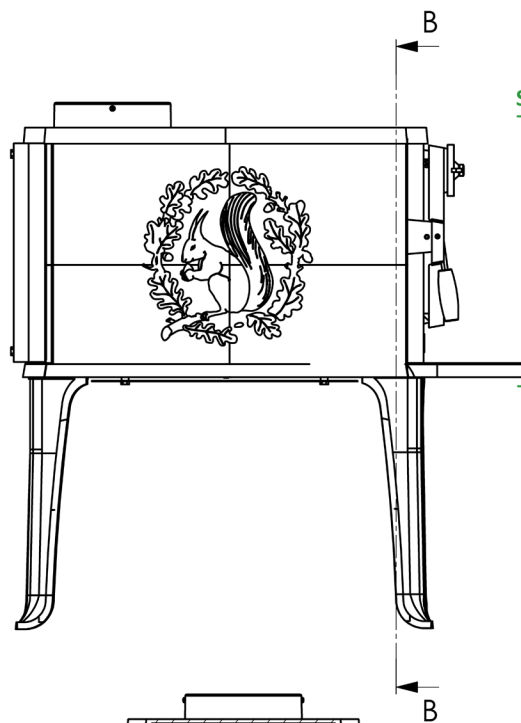
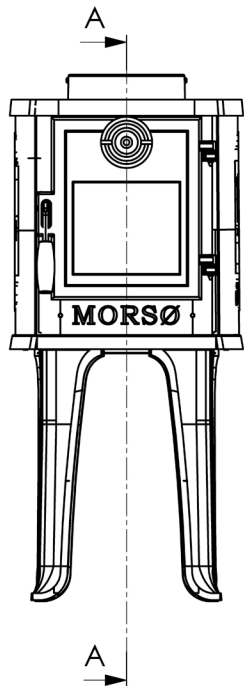
- Air damper fully open
- Start the fire with 2.5lbs of kindling
- Keep the door open for a good ignition
- At 1.0 lbs insert warmup preload and close the door
- At 6.4 lbs set the air control to Cat2 setting. (2 turns from fully open)
- In the coal bed allowable range, insert the load,
- At 1 minutes close the door with air damper fully open
- At 5 minutes set the air inlet to minimum (2 turns from fully open)

Minimum burn rate

- Air damper fully open
- Start the fire with 2.5lbs of kindling
- Keep the door open for a good ignition
- At 1.0 lbs insert warmup preload and close the door
- At 4.7 lbs set the air control to minimum (fully close)
- In the coal bed allowable range, insert the load,
- At 2 minutes close the door with air damper fully open
- At 5 minutes set the air inlet to minimum (fully close)

VI March 1st 2025

APPENDIX 14: Drawing Air flow pattern



Rev. Revisions		Sign.:	Date:
Title:		Construction:	FJN 24.03.2020
Morsø 2B Standard 2020		Released:	
Air flow		Format:	A2
		Scale:	1:5
		Itemno.:	
		Drawing no.:	
		2B-113	

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APPENDIX 15: WHA, CoC, 30 Day notice, Other

From: Sanchez, Rafael <Sanchez.Rafael@epa.gov>

Sent: 6. februar 2026 19:27

To: Frank Juel Nielsen <FJN@morsoe.com>

Cc: Yellin, Patrick <Yellin.Patrick@epa.gov>; Little, Eleana <Little.Eleana@epa.gov>; WoodHeaterReports <WoodHeaterReports@epa.gov>

Subject: Request for Revised Certification Test Report to Address Documentation Problems or Irregularities: Morso Jernstoberi 2B Standard Model

Importance: High

Dear Mr. Nielsen,

We have completed our review of the Morso Jernstoberi 2B Standard certification test report dated 4/8/2025, and have identified several irregularities that must be addressed before we can proceed with your certification request.

In the revised test report, please address the inconsistencies in the documentation and the missing information outlined below.

Identified Irregularity	Description/Correction Needed	Answers from lab
Missing Information – Manufacturer's Instructions to the lab	Attach the Manufacturer's Instructions (MI) provided to the lab (document ID, version, date).	Instruction updated with version and date
Missing Information – Do Manufacturer's Instructions meet method requirements?	Confirm instructions meet the applicable method(s).	Yes, instruction appendix 13 from the report match the method 28R requirements.
Missing Information – Do Manufacturer's Instructions match the owner's manual?	Confirm instructions match the owner's manual.	Tested with Method 28R crib wood, cannot match directly owner's manual real life operation.
Missing Information – Sample flow rate for ambient air (cfm)	Report on the ambient/dilution tunnel volumetric flow used (target and actual mean $\pm$ SD).	Report updated additional table 2.8 to reflect that the room air sample flow rate remains within 20% of the initial rate

Identified Irregularity	Description/Correction Needed	Answers from lab
Missing Information – Dry gas meter calibration range – Min (cfm), Max (cfm)	Include the DGM calibration certificate and min/max calibrated flow.	On each calibration certificate of each Dry Gas meter, you can find the range from 10 Cubic Feet per hour to 200 Cubic feet per hour. Or from 340 Liter per hour to 2200 liter per hour. All information already on certificate appendix 3
Missing Information – Dilution tunnel temp sensor – cal date – Filter temp sensor – cal date – Flue gas temp sensor – cal date – Test facility temp monitor – cal date – Thermocouples (temperature sensors) stoves – cal date	Attach calibration sheets for all temperature sensors and label application. Include IDs, location/application, calibration date, range, accuracy, and certificate number. Note: EM-015/2 and EM-154/2 (12/2/2024) are already included.	already all identify for example p126 EM-015/2 & EM-0154/2 are a list of all thermocouple calibrated with results refer to a location, example: (p.126 with flue identify as no.201 flue temp, all others can be found into the actual report listed and identified.
Missing Information – Average dilution tunnel velocity (ft/min)	Report Average dilution tunnel velocity (ft/min).	Already in the report Table 2.5 Tunnel Velocity (ft/min), for each test.
Clarification Needed – Filter material	In the revised test report, identify the exact filter media used (manufacturer, catalog/part number) and confirm the material.	Section 4.1 updated for clarification on filters material: Gelman A/E 61631 binder free, 47 mm diameter filters
Missing Information – Front filter holder material – Filter holders – aluminum or PTFE	Specify holder materials and any coatings.	Appendix 8 updated to Specify holder materials
Missing Information – Filters weighed in pairs? (y/n) – ALT-154 included?	Attach the ALT-154 authorization letter.	Appendix 15 updated to include ALT-154

Identified Irregularity	Description/Correction Needed	Answers from lab
Clarification Needed – Proportional sampling requirements met	Correct Appendix 2 to include PR for all runs; remove duplicates; show the acceptance criterion.	Appendix 2 corrected to remove duplicate and all proportionality are compliant, no reading outside 10%
Missing Information – Stove temperature readings (5 thermocouples and avg)	Compute and report the average of the five stove thermocouples for each time stamp or at least per burn phase/run.	All data provided in appendix 1, all temperature reading every minute for each 5 face and average is already in NCBI report p39, 66,91 & 116
Missing Information – Moisture measurements done within 4 h of test?	Add timestamps for fuel moisture determinations within 4 h of start.	Moisture measurements done within 4 h of test: Moisture calibration done at 7:00 am each day of test, info can be found in appendix 1 p.2 of the technician note package for each test. Moisture content of the wood taken right after (within the next hour, so between 7:00 and 8:00 am of each day of test
Missing Information – Fuel temperature (or temperature of room where fuel has been stored for 24 h before moisture determination)	Report fuel temperature or storage-room ambient at the time of moisture measurement, per run.	Clarification already in report appendix 1 wood temperature 21C on each technician note wood measurement sheet
Missing Information – Pre-burn fuel species	State pre-burn fuel species and any relevant lot ID.	section 1.4 BC fir (Douglas fir) 19% to 25% moisture content, used for preburn

You are required to submit both a revised Confidential Business Information (CBI) report and a non-CBI report to the EPA within ten (10) business days of receiving this email. Ensure that the revised reports are clearly marked as revised, include revision dates, and provide summary tables outlining the changes made and their locations within the reports. Additionally, please submit an updated Certification of Conformity that includes a history of revisions page. If you have any questions, please let me know.

Rafael Sanchez, Ph.D.

Senior Environmental Engineer

Regulatory Determinations Branch

Regulatory Assistance Division

Office of Clean Air Programs

Office of Air and Radiation

U.S. Environmental Protection Agency (EPA)

1200 Pennsylvania Ave., NW

MS:2227A

Washington, DC 20460

202-564-7028

Questions about Wood Heaters or EPA Certifications? Please send your questions to

WoodHeaterReports@epa.gov

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW
RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

Disclaimer: The statutory provisions and the EPA regulations described in this document contain legally binding requirements. This document is not a substitute for those provisions or regulations, nor is it a regulation itself. In the event of a discrepancy, please refer to 40 CFR PART 60 Subparts AAA AND QQQQ, Sections 60.533 and 60.5475. This document may be revised periodically without public notice. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at sanchez.rafael@epa.gov.

- ▶ The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to WoodHeaterReports@epa.gov.
- ▶ This notice must be received by the EPA at least 30 days before the start of testing.

GENERAL INFORMATION

Manufacturer's Name:
Morsø Jernstøberi A/S

Appliance Type (Circle One):	Adjustable Burn Rate Wood Heater	Pellet Stove	Single Burn Rate Heater	Hydronic Heater	Forced Air Furnace	Other:
Hydronic Heater Type (Circle One):	Traditional	Full Storage	Partial Storage	Indoor/Outdoor	Other:	
Forced-Air Furnace Type (Circle One):	Small (less than 65,000 BTU/hr heat output)		Large (greater than 65,000 BTU/hr heat output)		Other:	
Fuel Type:	Crib	Pellet	Cordwood	Other:		

Model Name and Number:
2B Standard

Catalyst: Yes _____ No X _____

Mailing Address:
Morsø Jernstøberi A/S

Street Address:
Furvej 6

City:
Nykøbing Mors

State/Country:
Denmark

ZIP Code:
7900

Phone:
+45 96 69 19 00

Fax:
N/A

Web Site:
www.morsoe.com

Address of Manufacturing Facility:
Furvej 6

City:
Nykøbing Mors

State/Country:
Denmark

ZIP Code:
7900

EPA APPROVED TEST LABORATORY

Name and Title of Authorized Representative: Danick Power, Vice-President Operations

Company: Services Polytests inc.

**U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
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Phone: 450 741-3636	E-mail: Dpower@polytests.com	Fax: N/A
City: St-Jean-sur-Richelieu	State/country: Quebec, Canada	ZIP Code: J3B 7S7
EPA APPROVED THIRD-PARTY CERTIFIER		
Name and Title of Authorized Representative: John Steinert, General Manager Hearth Products		
Company: PFS TECO		
Phone: (503)650-0088	E-mail: John.steinert@pfsteco.com	Fax: N/A
City: Clackamas	State/ Country: Oregon, USA	ZIP Code: 97015
COMPLIANCE TEST INFORMATION		
Test Method(s): EPA Method 28R, ASTM E2780, ASTM E2515, CSA-B415.1-10		
Date(s) of Proposed Test: Marts 27 th , 2025 and following workdays		
Testing Location: Polytests Services Inc. 695 B rue Gaudette, St-Jean-sur-Richelieu Québec, Canada, J3B 7S7 450.741.3636		

**U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW
RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES**

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- ▶ The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to WoodHeaterReports@epa.gov.
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Frank Juel Nielsen, R&D Engineer

Print Name and Title of Authorized Official



Signature

February 25, 2025
Date

Remarks:

v1



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

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

01/21/2025

Dear Mr. Morgan,

This letter is a modification of my original response letter dated December 13, 2024. This modification is made to include approval to use this alternative 40 CFR part 60, Subpart QQQQ - Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces (Subpart QQQQ). The approval to also use this alternative on central heaters under Subpart QQQQ should have been included in the original response letter. These letters are written in response to your emails and letter dated November 20, 2023, requesting that the Environmental Protection Agency approve for use an alternative test method (ATM) for demonstrating compliance with New Source Performance Standard (NSPS) Subpart AAA, Standards of Performance for New Residential Wood Heaters (Subpart AAA). Specifically, the filter weighing procedures as outlined in ASTM E2515-11 to determine compliance for wood heaters under 40 CFR Part 60. The Office of Air Quality Planning and Standards, as the delegated authority, must make the determination on any major alternatives to test methods and procedures required under 40 CFR parts 59, 60, 61, 63, and 65. Your proposed alternative test method and our approval decisions are discussed below.

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

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

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

be desiccated or weighed.”

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

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

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

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

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

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

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

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

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

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

Sincerely,

**STEFFAN
JOHNSON**

Digitally signed by
STEFFAN JOHNSON
Date: 2025.01.21
07:20:30 -05'00'

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

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
2015 Standards of Performance for New Residential Wood Heaters, New Residential
Hydronic Heaters and Forced-Air Furnaces Application
40 CFR PART 60 SUBPARTS AAA AND QQQQ

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**APPLICATION FOR A CERTIFICATE OF COMPLIANCE PURSUANT TO 40 CFR
PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW
RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES**

GENERAL INFORMATION

Manufacturer's Name: Morso Jernstoberi A/S

Heater Type (Circle One):	Adjustable Burn Rate Wood Heater					
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Hydronic Heater Type (Circle One):					
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Forced-Air Furnace Type (Circle One):				
--	--	--	--	--

Fuel Tested:	Crib				
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Test Method(s): Method 28R, ASTM E 2515; ASTM E 2780	Catalyst: No
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Model Name and Design Number (The model name and design number must clearly distinguish one model from another. The name and design number cannot include the EPA symbol or logo or name or derivatives such as "EPA):
2B Standard

Physical Address (Street number and Address, not P.O. Box): Furvej 6	Mailing Address: Furvej 6
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City: Nykøbing Mors	State:	ZIP Code: 7900
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Phone: +45 96 69 19 00	Email: info@morsoe.com	Website: www.morsoe.com
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EPA Submission Date of 30-day Notice:
February 25, 2025

MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION

Name:
Frank Juel Nielsen

Position/Title:
R&D Engineer

Address:
Furvej 6

City: Nykøbing Mors	State:	ZIP Code: 7900
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Phone: +45 96 69 19 38	E-mail: fjn@morsoe.com	Website: www.morsoe.com
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Remarks:

**APPLICATION FOR A CERTIFICATE OF COMPLIANCE PURSUANT TO 40 CFR
PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW
RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES**

EPA-APPROVED TEST LABORATORY

Name of Test Laboratory:

Polytests Services inc.

Name of Person Authorized or Responsible for Conducting Compliance Test: Danick Power

Position/Title: VP operation

Address: 695-B Gaudette,

City: St-Jean-sur-Richelieu

State: Quebec, Canada

ZIP Code: J3B 7S7

Phone: 450 741-3636

Email: dpower@polytests.com

Website: www.polytests.com

Remarks:

EPA-Approved Third-Party Certifier

Name of Certifier Entity: PFS TECO

Name of Person Authorized or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity:
John Steinert

Position/Title:

Vice-President Hearth Products Division

Address: 11785 SE Highway 212, Suite 305

City: Clackamas

State: Oregon, USA

ZIP Code: 97015

Phone: (503)650-0088

Email: john.steinert@pfsteco.com

Website: https://www.pfsteco.com/

Remarks:

COMPLIANCE STATEMENTS AND ACKNOWLEDGEMENTS – SECTIONS 60.533(B) AND 60.5475(B) INSTRUCTIONS: PLEASE READ THE BELOW STATEMENTS AND AFFIRMATIONS AND ADDRESS ACCORDINGLY.	
FOR EMISSIONS DATA SUMMARY TABLES SEE ATTACHMENTS	
1. Engineering Drawings Statement	We affirm that the engineering drawings and specifications provided include all components affecting emissions, as outlined in 40 CFR §60.533(b)(k)(2)-(4) and §60.5475(b). These drawings designate the dimensions and tolerances of all relevant components. It is affirmed that the tolerances specified cannot reasonably be anticipated to cause non-compliance with emission limits.
2. Firebox Statement Requirement	We affirm that the test wood stove submitted for certification testing is identical in all material respects to the commercial wood stoves being produced and marketed. This includes all components, materials, and dimensions that may affect emissions or efficiency.
3. CBI	We affirm that all CBI is clearly identified and submitted separately to the EPA CBI Office as per the procedures outlined in the EPA guidelines. Non-CBI emissions data necessary for compliance determination are included within the application
4. Valid Certification Statement	We affirm that all test reports, raw data sheets, and associated documentation are complete and comply with the requirements of 40 CFR §60.537(f) and §60.5475(f). The submission includes explanations of anomalies, if any, and a clear summary of results.
5. Warranties	We affirm that the warranty provided complies with the EPA requirements. It includes a statement that the warranty is void if the unit is not operated per the owner's manual or if unauthorized materials are burned. Clear instructions for exercising the warranty are included in the owner's manual, referencing text as per Appendix I to 40 CFR Part 60.
6. Q/A Statement	We affirm the existence and implementation of a quality assurance program meeting the requirements of 40 CFR §60.533(m).
7. Laboratory Sealing of Unit	We affirm that the laboratory-sealed units used for certification testing are stored in their sealed state for a minimum of five years post-certification testing, as required by EPA regulations.
8. Statements that the wood heaters manufactured under this certificate will be—	We affirm that all wood heaters manufactured under this certification are materially identical to the certified test unit and are labeled as per 40 CFR §60.536 and §60.5478. Each unit is accompanied by a compliant owner's manual available on our website
9. Third Party Certification Statement	We affirm that contracts with EPA-approved laboratories and certifiers meet all the requirements outlined in 40 CFR §60.533(f).
10. Approved laboratory/third party Statement	We affirm that the EPA-approved laboratory (PolyTest Services Inc.) and the EPA-approved third-party certifier (PFS TECO) are authorized to submit information on behalf of the manufacturer, including any information claimed as Confidential Business Information (CBI).

11. Manufacturer's Website Certification Test Reports Availability Statement We affirm that the certification test report and summary will be made publicly available on our website within 30 days of certification issuance	
12. Transferability Acknowledgement Statement We affirm acknowledgment that the certification is non-transferable without EPA approval.	
13. Statement about Selling Wood Heaters without an EPA Certificate We affirm acknowledgment that it is unlawful to sell or distribute any uncertified wood heater under this application.	
Print Name and Title: Frank Juel Nielsen, R&D Engineer Date: May 9, 2025	
Signature of responsible representative of the manufacturer certifying the accuracy of the above statements: 	
The authorized or responsible party whose signature is above is certifying that the manufacturer has complied with and will continue to comply with all requirements of the 2015 NSPS for compliance certification and that the manufacturer remains responsible for compliance regardless of any error by the test laboratory or third-party certifier.	

Attachments

Instructions: Please complete the section applicable to your certification request. You may substitute your own data tables in lieu of the ones shown below provided that all the information is captured.

WOOD BURNING HEATERS

I. Test Method 28R for Certification and Auditing of Wood Heaters

A. SUMMARY RESULTS – ADJUSTABLE WOOD BURNING HEATERS

Test No.	Burn Rate (Kg/hr)	(E) Ave. Emission Rate g/hr	(OHE) % HHV	Heat Output (BTU/HR)	CSA B415.1 CO emission g/min
2	0,73	0,549	77,3%	10 661	0,94
3	0,96	0,902	77,8%	14 009	0,66
4	1,27	2,066	73,6%	17 620	0,67
1	1,43	1,737	72,8%	19 519	0,70
Weighted particulate emission average of 4 test runs: 1,3 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 75 %.					
Average Co 0,74 gr/min					