



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
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Denmark

Model name: 2B Classic

Attention: Rafael Sanchez

TESTED BY:

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

TEST DATES: April 13th to 16th 2026

REPORT DATE: April 20th 2026

Project number: PI-20355

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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: April 13th to 16th 2026
- 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 Classic
- **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 145 mm by 158 mm glass panel and one 870 mm by 8 mm glass fiber gasket. The ash door is sealed with one 570 mm by 8 mm glass fiber 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 spin draft on the fuel-loading door.
- **Combustor:** N/A.
- **Internal Baffles:** A stainless-steel baffle with a ceramic blanket 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.
- **Other Features:** N/ A.
- **Flue Outlet:** The 6" diameter flue outlet is located at the top of the unit.

1.3 RESULTS

Emission results obtained

- Weighted Average Emissions Rate: 1,6 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 March 2026. 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	2026-04-13	2,26	1,598	2,04	44,15	0,10	22 017	73,29%
2	2026-04-14	0,80	1,376	0,77	41,61	0,04	19 147	74,03%
3	2026-04-15	2,62	0,856	4,77	77,05	0,20	12 444	77,35%
4	2026-04-16	0,48	0,821	1,01	63,87	0,04	11 811	76,55%

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
4	0,82	0,475	76,6%	11 811	1,06
3	0,86	2,624	77,4%	12 444	1,28
2	1,38	0,803	74,0%	19 147	0,69
1	1,60	2,256	73,3%	22 017	0,74
Weighted particulate emission average of 4 test runs: 1,6 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 75 %.					
Average Co 0,94 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	75	76	30,268	30,150	32,4	29,4	0	0
2	72	71	29,943	30,002	26	23,4	0	0
3	71	73	30,357	30,298	25,5	24,8	0	0
4	72	71	30,091	29,943	23,4	21,9	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	5,20	21,03	1,0	4,59	6,694	20,31	16	2	0	6
2	5,50	20,43	1,0	4,57	6,666	20,41	16	2	0	6
3	5,54	21,23	1,1	4,52	6,593	19,68	16	2	0	6
4	5,48	20,02	1,1	4,77	6,958	19,72	16	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	65	1017,80	574,19	12,236	12,440	2,50	2,60
2	75	998,62	557,20	14,141	14,470	1,00	1,10
3	120	1020,86	547,73	22,612	22,992	5,00	5,40
4	132	1000,92	543,64	24,755	25,185	1,10	1,00

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	965,50	949,69	2,42	2,47	1,10%	0,031
2	967,02	945,04	0,97	1,04	3,61%	0,042
3	1018,16	1001,32	5,09	5,41	3,01%	0,185
4	1000,24	983,18	1,10	0,99	5,68%	0,066

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	1,598	448,43	37,8	0,078	-0,176	maximum open	65
2	1,376	441,12	-21,6	0,073	-0,169	medium	75
3	0,856	358,33	-36,5	0,047	-0,178	minimum	120
4	0,821	366,95	-72,6	0,061	-0,172	minimum	132

2.8 BLANK SAMPLING FLOW RATE

Run Number	Initial flow rate blank sampling (cuft/min)	Average flow rate blank sampling (cuft/min)
1	0,200	0,20
2	0,190	0,19
3	0,200	0,20
4	0,200	0,20

3 PROCESS DESCRIPTION

3.1 DISCUSSION

The heater has been received in a good shape by a carrier in March 2026. 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: 0,686 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 (mm ²)
Identification	Type	Imin	Imax	Controlled	
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-164 Morsø 2B Classic 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-164 Morsø 2B Classic combustion air settings

B Outlet:

1000 mm²

Drawing reference: 2B-164 Morsø 2B Classic combustion air settings

B Inlet:

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

Drawing Reference: 2B-164 Morsø 2B Classic 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 April 13th 2026. It lasted 65 minutes and the maximum burn rate was obtained at 1,60 kg/hr & emission at 2,26 gr/hr. The air inlet damper was fully open at the maximum setting.

Run #2

This run was performed on April 14th 2026. It lasted 86 minutes and a category 3 burn rate was obtained at 1,38 kg/hr & emission at 0,80 gr/hr. The air inlet damper was at category 3 setting

Run #3

This run was performed on April 15th 2026. It lasted 120 minutes and a category 2 burn rate was obtained at 0,86 kg/hr & emission at 2,62 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 #4

This run was performed on April 16th 2026. It lasted 132 minutes and a category 2 burn rate was obtained at 0,82 kg/hr & emission at 0,48 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.

- 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. Two attempts were done at the minimum air setting, the stove wasn't able to burn less than 0.8 kg/hr.

Test fuel cribs

- Type of wood: Douglas fir, grade c or better, 19 to 25% dry basis moisture content measurement done within 4 of the tests, all wood keeps in storage room at 21°C all the time, maintain by central heating system.
- 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 6-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

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	13-04-2026
Technicien	M.M
Project #	PI 20355

Description de l'unité

Manufacturier	MORSO	
Modèle	2B CLASSIC	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	0,686	cu ft.
Appliance weight empty	n.a	lbs
Firebox maximum lenght	19,125	inch

Paramètres du test

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

Échantillonnage

Targeted Blank sampling rate	0,20	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):	0,989	
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	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20355
Date 13-04-2026
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):	102,5	102,1
Barometer (in.Hg):	30,268239	30,15011865
Dry Bulb (F):	75,105164	75,69
Humidity (%):	32,4	29,4
Air velocity (ft/min)	0	0

DGM #1st hour	Final:	3180,700	cuft
	Initial:	3168,920	cuft

DGM #1	Final:	13206,851	cuft
	Initial:	13193,839	cuft

DGM #2	Final:	4406,741	cuft
	Initial:	4393,833	cuft

DGM room	Final:	28214,977	cuft
	Initial:	28202,024	cuft

	Final:	3180,700	cuft
	Initial:	3168,920	cuft

	Final:	373976,380	Liter
	Initial:	373607,900	Liter

	Final:	124785,000	Liter
	Initial:	124419,500	Liter

	Final:	798959,150	Liter
	Initial:	798592,360	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 20355
Date	13-04-2026
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: -0,176197798 in. H₂O
 Barometer: 30,268 in. Hg

tunnel of 12" and more, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
y center			0,0000
x center			0,0000
y1			0,0000
y2			0,0000
y3			0,0000
y4			0,0000
y5			0,0000
y6			0,0000
x1			0,0000
x2			0,0000
x3			0,0000
x4			0,0000
x5			0,0000
x6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

Taverse Point	% of Diameter
1	4.4
2	14.6
3	29.6
Center	50.0
4	70.4
5	85.4
6	95.6

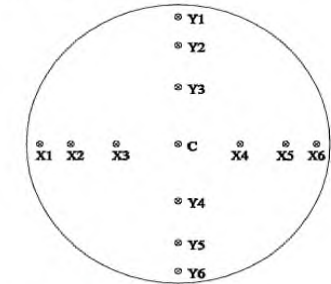


FIG. 5 Dilution Tunnel Diameter Equal To or Greater Than 0.3 m (12 in.) Traverse Point Table

PITOT CONSTANT=
0,892

Tunnel less than 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
y center	0,071	73,55	0,2665
x center	0,070	73,79	0,2646
y1	0,057	73,55	0,2387
y2	0,066	73,7	0,2569
y3	0,061	73,7	0,2470
y4	0,056	73,69	0,2366
x1	0,056	73,8	0,2366
x2	0,061	74,0	0,2470
x3	0,074	74,0	0,2720
x4	0,057	74,0	0,2387
AVERAGE	0,0629	73,7690	0,2505

Taverse Point	% of Diameter
1	6.7 *
2	25.0
Center	50.0
3	75.0
4	93.3 *

* No closer than 12.7 mm
(0.50 in.) to tunnel wall

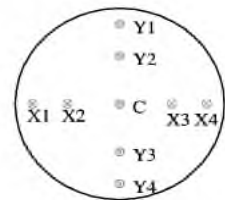


FIG. 6 Dilution Tunnel Diameter Less Than 0.3 m (12 in.) Traverse Point Table

Project nu.	PI 20355
Date	13-04-2026
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date (yy/mm/dd)	Heure	Test end date & time
	probe	front/ Back	gasket	probe	front/ Back	gasket	probe	front/ Back	gasket	Filter			
Number	001	921-922	01	17	923-924	63	36	925-926	106	927			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	61,1036	0,2524	5,0096	108,9398	0,2522	3,3180	107,7235	0,2541	4,1150	0,1250	2026-04-09	17:00	
Before (6)	61,1037	0,2524	5,0097	108,9397	0,2521	3,3181	107,7236	0,2542	4,1151	0,1251	2026-04-13	10:00	
After (1)	61,1042	0,2539	5,0112	108,9402	0,2527	3,3225	107,7241	0,2548	4,1181	0,1253	2026-04-13	13:30	
After (2)	61,1038	0,2537	5,0105	108,9398	0,2526	3,3201	107,7237	0,2548	4,1171	0,1252	2026-04-20	08:00	
After (3)	61,1038	0,2537	5,0105	108,9398	0,2526	3,3201	107,7237	0,2548	4,1171	0,1252	2026-04-21	09:00	
After (4)													
After (5)													
After (6)	61,1038	0,2537	5,0105	108,9398	0,2526	3,3201	107,7237	0,2548	4,1171	0,1252	2026-04-21	09:00	2026-04-13 13:15
Difference	0,0001	0,0013	0,0008	0,0001	0,0005	0,0020	0,0001	0,0006	0,0020	0,0001			
Total (mg)		2,2			2,6			2,7		0,1			
Total ajusté (mg)		2,10			2,50			2,60					

Project nu.	PI 20355
Date	13-04-2026
Technicien	M.M

Manufacturer: MORSO
Model: 2B CLASSIC

Run: 1
Project #: PI 20355
Test Duration: 65 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: 73,29%
Combustion Efficiency: 98,34%
Heat Transfer Efficiency: 74,53%

	HHV	LHV
Eff	73,29%	79,22%
Comb Eff	98,34%	98,34%
HT Eff	74,53%	80,55%
Output	23 210	kJ/h
Burn Rate	1,60	kg/h
Grams CO	48	g
Input	31 667	kJ/h
MC wet	16,88	

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

Heat Output:	22 017 Btu/h
Heat Input:	30 039 Btu/h
Burn Duration:	1,08 h
Burn Rate:	3,52 lb/h
Stack Temp:	397,6 Deg. F

	Averages	0,24	7,70	1,84	20,42	12,60	203,15	24,42	0,97	0,73	0,71
INPUT DATA		Oxygen Calculation									
Elapsed Time	Weight	%	%	Excess	Total		Input Data		Combust	Heat	Net
	Remaining (kg)	CO [e]	CO ₂ [d]	Air EA	O ₂	Calc. %	Flue Gas (°C)	Room Temp (°C)	%	Transfer %	Eff %
0,00	2,08	0,16	4,50	322,1%	20,63	16,06	204,9	23,9	98,1%	63,8%	62,6%
1,00	1,99	0,19	8,91	115,7%	20,34	11,33	220,5	23,8	98,6%	74,4%	73,3%
2,00	1,94	0,19	11,02	75,2%	20,20	9,08	227,8	24,0	98,8%	76,5%	75,6%
3,00	1,85	0,17	11,26	71,9%	20,19	8,84	234,2	24,1	98,9%	76,3%	75,5%
4,00	1,81	0,20	11,65	65,7%	20,16	8,41	238,7	24,0	98,7%	76,4%	75,4%
5,00	1,71	0,22	11,78	63,6%	20,15	8,25	240,7	24,1	98,6%	76,4%	75,3%
6,00	1,66	0,21	11,54	67,2%	20,16	8,52	241,0	24,1	98,7%	76,1%	75,2%
7,00	1,58	0,19	11,30	70,9%	20,18	8,78	241,1	24,2	98,8%	75,9%	75,0%
8,00	1,54	0,18	11,22	72,3%	20,19	8,88	241,0	24,1	98,9%	75,8%	75,0%
9,00	1,45	0,17	11,16	73,4%	20,19	8,95	241,6	24,3	98,9%	75,7%	74,9%
10,00	1,39	0,17	11,09	74,5%	20,20	9,03	241,4	24,3	99,0%	75,7%	74,9%
11,00	1,35	0,15	10,94	77,0%	20,21	9,19	241,9	24,3	99,1%	75,5%	74,8%
12,00	1,26	0,19	11,32	70,7%	20,18	8,77	243,3	24,2	98,9%	75,8%	74,9%
13,00	1,22	0,20	11,40	69,3%	20,17	8,67	243,2	24,3	98,8%	75,9%	74,9%
14,00	1,17	0,20	11,22	72,0%	20,19	8,86	242,5	24,3	98,7%	75,7%	74,8%
15,00	1,13	0,15	10,63	82,4%	20,23	9,53	241,6	24,4	99,1%	75,2%	74,5%
16,00	1,03	0,15	10,51	84,2%	20,24	9,65	240,0	24,4	99,1%	75,1%	74,4%
17,00	0,99	0,15	10,46	85,1%	20,24	9,70	239,3	24,4	99,1%	75,1%	74,4%
18,00	0,95	0,14	10,45	85,5%	20,24	9,72	238,2	24,4	99,2%	75,2%	74,6%
19,00	0,86	0,15	10,61	82,6%	20,23	9,54	238,3	24,4	99,1%	75,4%	74,7%
20,00	0,81	0,15	10,76	80,1%	20,22	9,39	238,6	24,5	99,1%	75,5%	74,8%
21,00	0,77	0,16	10,92	77,3%	20,21	9,21	238,8	24,4	99,0%	75,7%	74,9%
22,00	0,73	0,16	10,94	77,1%	20,21	9,19	239,2	24,5	99,0%	75,7%	75,0%
23,00	0,67	0,16	10,97	76,4%	20,20	9,15	239,2	24,5	99,0%	75,7%	75,0%
24,00	0,63	0,16	11,25	72,1%	20,19	8,85	240,0	24,5	99,0%	76,0%	75,2%
25,00	0,58	0,18	11,58	66,9%	20,16	8,49	240,2	24,6	98,9%	76,3%	75,4%
26,00	0,50	0,21	11,68	65,2%	20,15	8,37	239,4	24,5	98,7%	76,4%	75,4%
27,00	0,50	0,17	11,07	74,7%	20,20	9,04	237,7	24,6	98,9%	75,9%	75,1%
28,00	0,45	0,11	9,78	98,5%	20,29	10,45	233,8	24,7	99,4%	74,7%	74,2%
29,00	0,41	0,08	8,94	117,9%	20,34	11,37	229,7	24,7	99,6%	73,8%	73,5%
30,00	0,36	0,06	8,40	132,2%	20,38	11,95	225,4	24,7	99,8%	73,3%	73,2%
31,00	0,36	0,05	7,86	148,3%	20,42	12,53	221,1	24,7	99,9%	72,7%	72,6%
32,00	0,31	0,05	7,51	159,8%	20,44	12,90	217,3	24,7	100,0%	72,4%	72,4%
33,00	0,27	0,03	7,34	166,6%	20,45	13,10	214,5	24,7	100,2%	72,3%	72,4%
34,00	0,27	0,03	7,09	175,8%	20,47	13,37	210,8	24,6	100,1%	72,1%	72,2%
35,00	0,27	0,04	6,70	191,6%	20,50	13,78	206,3	24,5	100,1%	71,6%	71,7%
36,00	0,27	0,05	6,12	218,1%	20,53	14,38	202,0	24,6	100,0%	70,6%	70,6%
37,00	0,22	0,06	5,63	245,3%	20,56	14,90	197,5	24,7	99,9%	69,6%	69,6%
38,00	0,22	0,08	5,19	272,9%	20,59	15,37	193,7	24,8	99,5%	68,5%	68,2%
39,00	0,22	0,11	5,04	281,6%	20,60	15,51	190,3	24,6	99,1%	68,4%	67,8%
40,00	0,22	0,13	5,01	282,5%	20,60	15,53	187,1	24,6	98,7%	68,7%	67,8%
41,00	0,18	0,15	4,64	309,5%	20,62	15,90	183,2	24,6	98,2%	67,7%	66,5%
42,00	0,22	0,20	4,49	318,2%	20,63	16,03	180,1	24,6	97,3%	67,5%	65,7%
43,00	0,18	0,24	4,61	305,0%	20,62	15,89	177,8	24,5	96,8%	68,3%	66,2%
44,00	0,22	0,26	4,75	291,9%	20,61	15,73	175,8	24,5	96,5%	69,2%	66,7%
45,00	0,18	0,29	4,79	287,3%	20,61	15,68	173,4	24,6	96,1%	69,6%	66,9%
46,00	0,18	0,30	4,79	285,4%	20,60	15,66	171,3	24,6	95,8%	70,0%	67,0%
47,00	0,18	0,33	4,84	279,6%	20,60	15,59	169,6	24,6	95,4%	70,4%	67,1%
48,00	0,18	0,35	4,87	275,8%	20,59	15,55	167,8	24,6	95,2%	70,7%	67,3%
49,00	0,13	0,35	4,79	282,1%	20,60	15,63	165,9	24,4	95,1%	70,6%	67,2%
50,00	0,13	0,34	4,76	285,5%	20,60	15,68	164,2	24,5	95,3%	70,8%	67,4%
51,00	0,13	0,34	4,72	287,5%	20,61	15,71	162,6	24,6	95,2%	70,9%	67,4%
52,00	0,13	0,35	4,79	281,7%	20,60	15,63	161,3	24,5	95,1%	71,3%	67,7%
53,00	0,13	0,36	4,79	281,5%	20,60	15,63	159,6	24,5	95,0%	71,5%	67,9%
54,00	0,09	0,37	4,76	283,1%	20,60	15,66	158,7	24,4	94,8%	71,5%	67,8%
55,00	0,09	0,38	4,74	283,2%	20,60	15,67	157,1	24,4	94,6%	71,6%	67,7%
56,00	0,09	0,41	4,64	289,0%	20,61	15,76	155,6	24,4	94,1%	71,5%	67,3%
57,00	0,09	0,43	4,64	287,2%	20,61	15,75	154,2	24,4	93,7%	71,7%	67,2%
58,00	0,09	0,45	4,61	288,1%	20,61	15,77	152,5	24,4	93,4%	71,8%	67,0%
59,00	0,09	0,48	4,63	284,5%	20,60	15,74	151,6	24,3	92,9%	71,9%	66,9%
60,00	0,09	0,51	4,49	292,8%	20,61	15,87	150,1	24,3	92,3%	71,7%	66,1%
61,00	0,04	0,54	4,39	298,2%	20,61	15,95	149,0	24,2	91,7%	71,4%	65,5%
62,00	0,04	0,56	4,33	302,2%	20,62	16,01	147,8	24,2	91,4%	71,4%	65,2%
63,00	0,04	0,56	4,31	303,6%	20,62	16,03	146,3	24,2	91,3%	71,5%	65,2%
64,00	0,04	0,60	4,17	311,9%	20,63	16,16	145,1	24,3	90,4%	71,1%	64,3%
65,00	0,00	0,65	4,05	317,9%	20,63	16,25	143,8	24,3	89,5%	70,8%	63,4%

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 2,26 g/hr

Test Duration: 65 min

Burn Rate : 1,60 Dry kg/hr

PRESSURE FACTOR: DGM 1st hr 0,976
 DGM 1 0,970
 DGM 2 0,971
 DGM 3 1,010

BAROMETRIC PRESSURE

Average: 30,20917863 in Hg
 Start: 30,26823861 in Hg
 End: 30,15011865 in Hg

TEMPERATURE FACTORS DGM 1st hr 0,982
 DGM 1 0,984
 DGM 2 0,983
 DGM 3 0,985

DGM VALUES

DGM 1st hr Final: 3180,700 Cuft
 Initial: 3168,920 Cuft

VOLUMES SAMPLED DGM 1st hr 11,297 SCft
 DGM 1 12,236 SCft
 DGM 2 12,440 SCft
 DGM 3 12,743 SCft

DGM 1 Final: 13206,851 Cuft
 Initial: 13193,839 Cuft

DGM 2 Final: 4406,741 Cuft
 Initial: 4393,833 Cuft

TOTAL TUNNEL VOLUME : 11814

DGM #3 Final: 28214,977 Cuft
 Initial: 28202,024 Cuft

SAMPLE RATIOS

Sample Train 1st Hr: 965,3
 Sample Train 1: 965,5
 Sample Train 2: 949,7

TEMPERATURES

DGM 1st hr 537,507 °R
 DGM 1 536,857 °R
 DGM 2 537,010 °R

Particulate concentration

Sample Train 1st Hr 0,000195 g/dscf
 Sample Train 1 0,000212 g/dscf
 Sample Train 2 0,000217 g/dscf
 Room 0,000008 g/dscf

CALIBRATION FACTORS

DGM 1st hr 1,0000
 DGM 1 0,9860
 DGM 2 1,0100
 DGM #3 0,9890

TOTAL EMISSIONS

Sample Train 1st Hr 2,04 g
 Sample Train 1 2,42 g
 Sample Train 2 2,47 g

TUNNEL FLOW RATE: 181,8 Dscfm

PARTICULATE CATCH

Total Sample Train 1: 2,60 mg
 Total Sample Train 2: 2,70 mg
 Total Sample Train 1 1st hour: 2,20 mg

EMISSION RATES

Sample Train 1st Hr 2,04 g/hr
 Sample Train 1 2,23 g/hr
 Sample Train 2 2,28 g/hr

DEVIATION: 1,10%

Cs Train 1 Train 2 Train 1st Hr
 0,0002125 0,00021704 0,0001947

* 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 cuft/min	DGM 1st hour 1st hour Inlet T °F	DGM 1st hour 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	173.00	4,6	0,2	4,5	400,9	75,1	141,8	531,0	370,2	412,4	399,2	164,0	0,19	75,5	74,4	75,2	0,19	75,3	76,0	78,1	0,19	75,8	74,0	78,5	0,08	0,08	-0,84	-1,10	-1,03	0,0	
1	174,0	4,6	0,2	8,9	428,9	74,8	120,7	621,7	389,6	416,0	404,3	166,5	0,19	76,1	74,4	75,4	0,19	75,8	75,8	78,7	0,19	76,1	74,1	80,1	0,08	0,08	-0,82	-1,07	-1,01	22,4	
2	175,0	4,3	0,2	11,0	442,0	75,2	119,1	691,7	388,3	419,0	408,4	168,9	0,19	76,2	74,5	75,6	0,19	76,0	75,7	79,0	0,19	76,1	74,2	80,8	0,08	0,07	-0,83	-1,07	-1,01	39,9	
3	176,0	4,1	0,2	11,3	453,5	75,4	119,4	745,1	394,3	421,3	411,6	171,4	0,19	76,4	74,6	75,8	0,19	76,1	75,6	79,5	0,19	76,1	74,3	81,4	0,08	0,08	-0,82	-1,08	-1,02	53,4	
4	177,0	4,0	0,2	11,2	461,6	75,0	119,2	771,1	398,3	422,8	413,3	173,9	0,19	76,5	74,7	76,0	0,19	76,2	75,9	79,9	0,19	76,2	74,3	81,9	0,08	0,07	-0,83	-1,09	-1,03	61,8	
5	178,0	3,8	0,2	11,8	465,3	75,3	119,4	798,3	402,4	423,8	414,7	176,2	0,19	76,5	74,7	76,2	0,19	76,3	75,6	80,2	0,19	76,3	74,4	82,3	0,08	0,08	-0,84	-1,09	-1,03	67,7	
6	179,0	3,6	0,2	11,5	465,8	75,4	119,5	813,9	405,6	424,1	415,1	178,6	0,19	76,7	74,8	76,5	0,19	76,5	75,5	80,6	0,19	76,4	74,5	82,8	0,08	0,08	-0,84	-1,10	-1,03	72,1	
7	180,0	3,5	0,2	11,3	466,0	75,5	120,2	825,2	408,1	424,4	415,9	180,9	0,19	76,8	74,9	76,7	0,19	76,5	75,5	81,0	0,19	76,4	74,6	83,3	0,08	0,08	-0,85	-1,11	-1,04	75,5	
8	181,0	3,4	0,2	11,2	465,9	75,0	120,6	830,4	410,5	424,7	416,3	183,2	0,19	77,0	75,0	76,5	0,19	76,5	75,6	81,4	0,19	76,4	74,7	83,7	0,08	0,08	-0,86	-1,10	-1,03	77,6	
9	182,0	3,2	0,2	11,2	466,9	75,7	120,6	831,4	412,9	424,6	416,5	185,5	0,19	77,0	75,1	77,2	0,19	76,5	75,5	81,8	0,19	76,5	74,7	84,1	0,07	0,08	-0,87	-1,11	-1,06	78,8	
10	183,0	3,2	0,2	11,1	466,6	75,7	120,8	829,4	415,4	424,9	416,9	187,6	0,19	77,2	75,1	77,5	0,19	76,5	75,5	82,1	0,19	76,5	74,8	84,5	0,07	0,08	-0,87	-1,11	-1,04	79,5	
11	184,0	3,0	0,2	10,9	467,4	75,2	121,5	829,5	418,3	425,1	417,4	189,8	0,19	77,5	75,2	77,8	0,19	76,5	75,5	82,5	0,19	76,6	74,9	84,9	0,07	0,08	-0,87	-1,11	-1,06	80,8	
12	185,0	2,8	0,2	11,3	470,0	75,6	121,9	827,0	421,3	426,5	417,9	191,9	0,19	77,4	75,3	78,1	0,19	76,6	75,5	82,9	0,19	76,6	74,9	85,2	0,08	0,08	-0,87	-1,12	-1,06	81,5	
13	186,0	2,7	0,2	11,4	469,8	75,7	121,9	822,0	424,4	427,4	418,5	193,9	0,19	77,6	75,4	78,4	0,19	76,6	75,6	83,2	0,19	76,6	75,0	85,6	0,08	0,08	-0,89	-1,12	-1,07	81,9	
14	187,0	2,6	0,2	11,2	468,5	75,7	122,0	815,0	428,0	428,4	419,6	195,9	0,19	77,5	76,7	78,7	0,19	76,7	75,6	83,6	0,19	76,7	75,1	85,9	0,08	0,08	-0,90	-1,12	-1,07	82,0	
15	188,0	2,5	0,1	10,6	466,8	75,9	121,9	807,1	431,7	429,2	420,5	197,9	0,19	77,9	75,6	79,0	0,19	76,8	75,7	83,9	0,19	76,8	75,2	86,2	0,08	0,08	-0,90	-1,14	-1,08	81,9	
16	189,0	2,3	0,2	10,5	463,9	75,9	121,7	798,3	435,5	430,4	421,7	199,8	0,19	78,1	75,7	79,2	0,19	76,8	75,7	84,1	0,19	76,9	75,3	86,5	0,08	0,08	-0,91	-1,14	-1,09	81,8	
17	190,0	2,2	0,2	10,5	462,7	75,9	121,3	788,5	439,4	431,4	422,8	201,6	0,19	78,2	75,8	79,5	0,19	76,9	75,8	84,4	0,19	77,0	75,4	86,8	0,08	0,08	-0,92	-1,15	-1,10	81,4	
18	191,0	2,1	0,1	10,5	460,8	76,0	120,6	781,2	443,3	432,2	424,1	203,5	0,19	78,5	76,8	79,8	0,19	76,9	75,8	84,6	0,19	77,0	75,5	87,0	0,08	0,08	-0,92	-1,15	-1,11	81,5	
19	192,0	1,9	0,1	10,6	460,9	76,0	120,9	775,4	447,0	433,7	425,4	205,2	0,19	78,4	76,0	80,0	0,19	77,0	75,8	84,9	0,19	77,1	75,6	87,3	0,07	0,08	-0,93	-1,16	-1,11	82,0	
20	193,0	1,8	0,2	10,8	461,4	76,1	120,8	767,8	451,2	434,7	426,7	206,9	0,19	78,5	76,1	80,3	0,19	77,0	75,9	85,2	0,19	77,1	75,6	87,5	0,08	0,08	-0,94	-1,16	-1,12	82,1	
21	194,0	1,7	0,2	10,9	461,8	76,0	121,3	764,2	455,2	435,9	428,2	208,6	0,19	78,5	76,1	80,6	0,19	77,1	75,9	85,4	0,19	77,2	75,7	87,7	0,08	0,08	-0,96	-1,17	-1,13	83,1	
22	195,0	1,6	0,2	10,9	462,5	76,1	121,2	760,5	459,5	436,9	429,7	210,1	0,19	78,5	76,2	80,8	0,19	77,1	75,9	85,7	0,19	77,3	75,9	88,0	0,08	0,08	-0,97	-1,17	-1,14	84,0	
23	196,0	1,5	0,2	11,0	462,6	76,2	121,6	759,4	463,9	437,6	431,5	211,7	0,19	78,7	76,3	81,0	0,19	77,2	76,1	85,9	0,19	77,3	75,9	88,2	0,08	0,08	-0,98	-1,19	-1,15	85,5	
24	197,0	1,4	0,2	11,3	464,0	76,1	121,8	758,8	468,8	438,6	433,3	213,3	0,19	78,8	76,4	81,2	0,19	77,3	76,1	86,2	0,19	77,4	76,0	88,4	0,07	0,08	-1,01	-1,20	-1,17	87,2	
25	198,0	1,3	0,2	11,6	464,3	76,2	121,8	754,5	473,7	439,5	435,1	214,8	0,19	78,8	76,5	81,5	0,19	77,3	76,2	86,4	0,19	77,5	76,1	88,7	0,08	0,08	-1,03	-1,23	-1,20	88,2	
26	199,0	1,1	0,2	11,7	463,0	76,2	121,4	754,2	478,7	440,4	436,8	216,2	0,19	78,9	76,6	81,7	0,19	77,4	76,2	86,5	0,19	77,5	76,2	88,8	0,08	0,08	-1,05	-1,24	-1,21	89,9	
27	200,0	1,1	0,2	11,1	459,9	76,2	120,7	751,5	484,0	441,4	438,8	217,7	0,19	79,0	76,6	81,9	0,19	77,5	76,3	86,7	0,19	77,6	76,3	89,0	0,08	0,08	-1,07	-1,26	-1,23	91,3	
28	201,0	1,0	0,1	9,8	452,8	76,5	119,6	749,3	489,0	442,2	440,7	219,1	0,19	79,0	76,7	82,1	0,19	77,6	76,4	86,8	0,19	77,6	76,4	89,0	0,08	0,08	-1,08	-1,26	-1,23	92,7	
29	202,0	0,9	0,1	8,9	445,5	76,5	119,3	750,7	494,5	443,4	442,4	220,5	0,19	79,1	76,8	82,3	0,19	77,7	76,5	86,9	0,19	77,8	76,5	89,1	0,08	0,08	-1,07	-1,26	-1,23	94,9	
30	203,0	0,8	0,1	8,4	437,7	76,5	118,2	752,9	500,0	444,0	444,3	221,8	0,19	79,2	76,9	82,5	0,19	77,7	76,5	87,0	0,19	77,8	76,6	89,2	0,08	0,08	-1,08	-1,26	-1,24	97,2	
31	204,0	0,8	0,1	7,9	429,9	76,5	117,5	756,4	505,3	445,1	446,1	223,2	0,19	79,2	77,0	82,6	0,19	77,8	76,6	87,1	0,19	77,9	76,7	89,2	0,08	0,08	-1,09	-1,26	-1,24	99,8	
32	205,0	0,7	0,0	7,5	423,1	76,5	116,8	762,1	510,9	446,1	447,5	224,5	0,19	79,3	77,0	82,8	0,19	77,8	76,6	87,2	0,19	77,9	76,8	89,3	0,08	0,08	-1,10	-1,26	-1,25	102,9	
33	206,0	0,6	0,0	7,3	418,2	76,4	116,6	767,6	516,1	447,2	449,0	225,8	0,19	79,3	77,1	82,9	0,19	77,8	76,7	87,2	0,19	78,0	76,9	89,3	0,07	0,07	-1,10	-1,26	-1,25	105,8	
34	207,0	0,6	0,0	7,1	411,4	76,4	115,9	765,3	521,4	448,2	450,2	227,2	0,19	79,3	77,2	83,0	0,19	77,8	76,7	87,3	0,19	78,0	76,9	89,4	0,08	0,07	-1,09	-1,26	-1,24	107,1	
35	208,0	0,6	0,0	6,7	403,4	76,2	114,8	745,9	526,2	449,0	450,8	228,5	0,19	79,3	77,2	83,2	0,19	77,9	76,8	87,3	0,19	78,0	77,0	89,4	0,08	0,07	-1,11	-1,26	-1,25	104,7	
36	209,0	0,6	0,0	6,1	395,5	76,2	113,9	719,5	530,9	449,7	451,9	229,8	0,19	79,3	77,3	83,3	0,19	77,9	76,8	87,3	0,19	78,0	77,1	89,4	0,08	0,07	-1,10	-1,26	-1,25	101,0	
37	210,0	0,5	0,1	5,6	387,4	76,5	113,4	695,2	535,1	450,0	452,9	231,0	0,19	79,3	77,3	83,4	0,19	77,9	76,9	87,3	0,19	78,0	77,2	89,4	0,08	0,07	-1,11	-1,25	-1,24	97,5	
38	211,0	0,5	0,1	5,2	380,6	76,6	112,6	674,5	538,3	451,0	453,4	232,4	0,19	79,4	77,4	83,5	0,19	77,9	76,9	87,3	0,19	78,0	77,3	89,3	0,08	0,07	-1,11	-1,25	-1,24	94,5	
39	212,0	0,5	0,1	5,0	374,5	76,4	111,4	655,3	541,3	450,9	453,5	233,7	0,19	79,4	77,4	83,6	0,19	77,9	77,0	87,3	0,19	78,0	77,3	89,2	0,08	0,07	-1,12	-1,24	-1,25	91,6	
40	213,0	0,5	0,1	5,0	368,8	76,2	110,7	639,0	543,5	450,7	453,5	234,9	0,19	79,4	77,5	83,6	0,19	77,9	77,0	87,3	0,19	78,0	77,4	89,2	0,08	0,07	-1,11	-1,25	-1,24	88,9	

DATA 2026-04-13 PI 20355 EPA RUN 1 CAT 4
unit preburn

Time acquisition minutes	Flue	Room	scale	Right	Back	bottom	Top	Left
	temp	temp						
	°F	°F	lbs	°F	°F	°F	°F	°F
1	73,66	71,25	2,58	76,02	69,45	68,88	156,46	69,66
2	89,94	71,17	2,58	79,85	69,63	68,91	186,53	69,71
3	115,03	71,08	2,48	84,22	70,00	68,93	223,32	69,77
4	134,66	71,20	2,38	88,72	69,87	69,00	259,53	70,17
5	204,72	71,15	2,27	93,10	70,16	69,10	280,24	70,87
6	261,52	71,27	2,17	97,67	70,71	69,17	295,43	72,12
7	301,05	71,36	1,97	102,48	71,61	69,24	308,80	74,24
8	338,25	71,18	1,78	107,48	72,80	69,37	321,75	77,33
9	346,81	71,36	1,68	112,01	74,45	69,47	332,79	81,55
10	346,08	71,65	1,59	116,52	76,40	69,66	341,41	86,84
11	341,48	71,80	1,47	120,92	78,76	69,88	348,40	93,12
12	338,08	71,84	1,37	125,58	81,38	70,14	362,66	99,77
13	341,83	71,66	1,27	130,50	84,18	70,46	373,30	106,14
14	347,34	71,54	1,18	135,22	87,24	70,79	381,83	112,37
15	352,27	71,87	1,08	139,65	90,44	71,20	385,90	118,90
16	358,96	71,82	1,08	143,99	93,75	71,67	389,53	125,15
17	363,76	71,99	5,17	148,66	97,76	72,20	391,68	126,83
18	309,06	71,96	5,97	149,54	102,41	72,80	395,15	132,47
19	292,25	72,00	5,96	153,23	106,24	73,47	400,79	139,03
20	291,38	71,85	5,96	160,93	110,35	74,18	409,42	144,83
21	295,25	72,07	5,87	168,16	114,28	74,94	397,61	149,90
22	293,29	72,17	5,87	174,29	117,76	75,74	413,75	153,88
23	278,82	72,20	5,77	179,82	121,19	76,59	447,23	158,19
24	285,00	72,20	5,67	184,79	124,11	77,51	473,55	160,74
25	305,41	71,94	5,58	189,27	126,73	78,53	487,11	163,50
26	316,82	72,13	5,58	193,31	129,03	79,56	498,07	167,04
27	330,69	72,23	5,48	197,02	131,21	80,65	465,32	170,62
28	333,29	72,20	5,36	200,44	133,37	81,84	454,86	174,22
29	335,36	72,31	5,27	203,49	135,55	83,06	321,38	177,79
30	345,11	72,35	5,07	206,35	137,85	84,34	327,64	181,69
31	347,63	72,44	4,97	208,98	140,25	85,70	338,97	185,87
32	348,91	72,64	4,88	211,55	142,93	87,09	348,06	190,17
33	351,74	72,45	4,78	214,17	145,73	88,56	352,54	194,55
34	355,07	72,59	4,68	216,98	148,84	90,07	356,38	199,05
35	360,65	72,56	4,57	220,14	152,11	91,65	362,39	203,57
36	364,85	72,56	4,41	223,59	155,65	93,27	368,89	208,24
37	367,35	72,69	4,27	227,50	159,33	94,97	373,44	213,00
38	369,11	72,62	4,18	231,76	163,11	96,69	377,12	217,89
39	371,97	72,80	4,08	236,26	167,00	98,47	398,26	222,74
40	374,17	72,65	3,98	241,57	171,07	100,27	427,60	227,81
41	377,53	72,73	3,88	247,52	175,20	102,11	446,74	232,91
42	380,29	72,80	3,77	254,17	179,45	104,02	456,48	238,11
43	385,34	72,99	3,58	261,36	183,78	105,94	470,40	243,34
44	389,04	73,06	3,48	269,15	188,11	107,90	483,57	248,60
45	390,50	73,14	3,38	277,10	192,57	109,89	497,64	253,87
46	395,83	72,76	3,28	285,48	197,13	111,89	489,21	259,12
47	400,91	73,28	3,19	293,81	201,82	113,90	514,94	264,31
48	404,93	73,20	3,07	302,15	206,93	115,94	560,13	269,77
49	410,08	73,23	2,87	310,53	212,05	118,00	531,02	275,18
50	415,65	73,49	2,78	318,71	217,54	120,11	555,44	281,01
51	419,20	73,52	2,68	326,74	223,26	122,24	753,21	287,06
52	422,25	73,68	2,50	334,41	229,21	124,36	742,44	293,12
53	425,65	73,75	2,49	341,82	235,24	126,46	630,86	299,51
54	426,67	73,82	2,27	348,92	241,52	128,62	561,12	305,99
55	426,95	73,51	2,17	355,69	247,92	130,73	563,26	312,41
56	424,97	73,64	2,08	362,36	254,44	132,85	552,33	318,93
57	424,36	73,89	1,92	368,51	261,42	135,00	548,80	325,64
58	423,34	74,05	1,88	374,19	268,35	137,19	527,02	332,21
59	422,56	74,17	1,79	379,49	275,40	139,37	527,43	338,62
60	421,38	74,08	1,69	384,39	282,85	141,54	527,48	344,86
61	419,90	73,84	1,59	388,92	290,59	143,73	457,67	351,27
62	418,91	74,03	1,48	393,14	298,34	145,89	480,02	357,53
63	417,56	74,18	1,38	397,00	306,43	148,08	450,81	363,47
64	414,16	74,05	1,38	400,46	314,79	150,32	488,05	369,38
65	411,09	74,49	1,28	403,66	323,40	152,59	439,35	375,01
66	409,49	74,33	1,18	406,77	331,96	154,87	441,09	380,53
67	406,59	74,33	1,18	409,26	340,73	157,14	437,80	385,46
68	405,43	74,06	1,09	411,75	349,88	159,43	433,63	390,30

DATA 2026-04-13 PI 20355 EPA RUN 1 CAT 4
unit preburn

69	402,36	74,45	0,99	414,23	359,32	161,75	443,86	394,93
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Date: 2006-04-13 Manufacturer: Morse Model: 2B classic
Project #: pt 2355 Run: 1 Tech: MM Reviewer: DP

Model: 2B classic

Reviewer: 

- Air control Full open
- Handling 26Lbs stand ring
- After Air close Door
- At 100Lbs insert preload
- Close Door immediately
- At 100Lbs insert Load
- Close Door immediately

TEST LOAD CONFIGURATION

Date: 2026-04-13

Manufacturer: Morso

PRE / POST CHECKS

Model: 2B classic

Project #: PT 2-355

Run: 1

Tech: MM

Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM 334	9:00	ok	ok

Pre-Test

Post-Test

Facility Conditions:

Smoke Capture Check (tunnel velocity)

ok	NA
4 sides ok	ok

Picture.....

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

2026-04-13

Date Dilution Tunnel Cleaned.....

2026-04-13

Induced Draft Check (max 0.005 H₂O)

ok

Traverse before ignition.....

ok

Temperature System:

Ambient (65°-90°F) Y/N.....

ok

Proportional Checks:

Thermocouple check.....

ok

Pitot Clean.....

ok

Pitot verification.....

ok

Pictures for report.....

Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok
Load Length 5/6 of firebox Length +/- 1 inch.....	ok



Date: 2-26-04 - 13

Project #: PI 10355

Leakage Checks Tunnel Samplers

Manufacturer: Morsø

Run: 1

Tech: MJM

Model: 2B classic

Reviewer: DO

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.)	-6	-6	-6	-6
Final 1 minute DGM (Liter)	373.66, 45	373.977, 48	124.418, 10	124.786, 58
Initial 1 minute DGM (Liter)	373.606, 39	373.977, 48	124.418, 04	124.786, 54
Change (Liter)	0.06	0	0.06	0.04
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2020-04-13

Project #: PI 20356

Leakage Checks Tunnel Samplers

Manufacturer: Morse

Run: 1

Tech: M.H.

Model: 2B classic

Reviewer: [Signature]

	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.)	-6	-6	-6	-6
Final 1 minute DGM (Liter)	3168 89	3180 75	798589 "	798959 89
Initial 1 minute DGM (Liter)	3168 89	3180 75	798589 "	798959 89
Change (Liter)	✓	✓	✓	0.01
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	0.1	0.1	0.1	0.1



Date: 2022-04-13 Project #: PT 20355 Manufacturer: Morso Model: 2B classic
Run: 1 Tech: MM Reviewer: SP

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-6	-6
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	.4	3	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok



Date: 2026-04-13

Project #: PI 20355

Manufacturer: Morso

Run: 1

Tech: M.M

Model: 2B classic

Reviewer: DP

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	200.0000 g, Class S	200.0000 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: 2026-04-13

 Manufacturer: Morse
CONTINUOUS ANALYZERS

 Model: 2 B classic

 Project #: PI 20355

 Run: 1

 Tech: M.M.

 Reviewer: BP

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: .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	0.71	73.55
B - Centroid	3.00	3.50	4	0.70	73.75
A-1	0.50	0.50	0.50	0.57	73.55
A-2	1.50	1.75	2	0.66	73.70
A-3	4.50	5.25	6	0.61	73.70
A-4	5.60	6.5	7.5	0.56	73.69
B-1	0.50	0.50	0.50	0.56	73.79
B-2	1.50	1.75	2	0.61	73.96
B-3	4.50	5.25	6	0.61 0.74 M.M.	73.96
B-4	5.60	6.5	7.5	0.57	74.00
				AVERAGE	

CONTINUOUS ANALYZERS

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		

N.A

Date: 2020-04-13

 Manufacturer: Morse

 Model: 2B Classic

 Project #: PI 20355

 Run: 1

 Tech: MM

 Reviewer: SP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3080	3000	1031	1000
Tolerance CO	0	+/- 0.02	0080	+/- 0.15	0031	+/- 0.05
CO ₂	0	0	1792	1800	976	1000
Tolerance CO ₂	0	+/- 0.02	008	+/- 0.5	004	+/- 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	3008	1026	0	0.02	0012	0.15	0005	0.05	✓	
CO ₂	0	1790	980	0	0.02	002	0.5	004	0.5	✓	



TEST DATA LOG

Date: 2020 04 13 Project #: PI 20355 Manufacturer: Monsie Model: 2B classic
Run: 1 Tech: M, M Reviewer: DP

RAW DRY GAS METER READINGS

Test		System 1 st hour (Cuft)	System 1 (Liter)	System 2 (Liter)	Blank (Liter)
	Final	316.70	373976.38	124785.00	798959.15
	Initial	3168.92	373607.90	124419.50	798592.36

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102.5	102.1
Humidity (%):	32.4	29.4
Air Velocity (max 50ft/Min)	0	0



M_TP-EPA – V16 – November 2025

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Manufacturer: MORSE

Model: 2B 4551

Date: 2026-04-13

Project #: PT 2355

Run: 1

Tech: MM

Reviewer: NO

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					
2026-04-09	17:00	021 922	01	17	923- 924	63
		02524	5 0096	108 9398	02522	3 380
2026-04-13	10:00	02524	5 0097	108 9397	02521	3 381

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					
2026-04-13	13:30	02539	5 0112	17	923- 924	63
		02537	5 0105	108 9402	02527	3 3225
2026-04-20	8:00	02537	5 0105	108 9398	02526	3 3201
2026-04-21	9:00	02537	5 0105	108 9398	02526	3 3201



DILUTION TUNNEL PARTICULATE SAMPLER DATA

Manufacturer: Moss

Model: DB 255

Date: 2026-04-13

Project #: PT 20355

Run: 1

Tech: M.M

Reviewer: DP

TEST FILTERS

SYSTEM 2		TEST FILTERS		
Pre-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets
Date	Time			
2026-04-09	17:00	36	925-94	923
		107 7235	02541	01250
2026-04-13	10:00	107 7236	02542	01251

TEST FILTERS

SYSTEM 2		TEST FILTERS		
Post-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets
Date	Time			
2026-04-13	13:30	36	925-94	923
		107 7241	02548	01253
2026-04-20	8:00	107 7237	02548	01252
2026-04-24	9:00	107 7237	02548	01252

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	14-04-2026
Technicien	M.M
Project #	PI 20335

Description de l'unité

Manufacturier	MORSO	
Modèle	2B CLASSIC	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	0,685	cu ft.
Appliance weight empty	n.a	lbs
Firebox maximum lenght	19,125	inch

Paramètres du test

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

Échantillonnage

Targeted Blank sampling rate	0,20	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):	0,989	
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	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20335
Date 14-04-2026
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):	101,4	101,6
Barometer (in.Hg):	29,943409	30,00246871
Dry Bulb (F):	71,557358	71,31
Humidity (%):	26	23,4
Air velocity (ft/min)	0	0

DGM #1st hour	Final:	3192,750	cuft
	Initial:	3180,930	cuft

DGM #1	Final:	13222,063	cuft
	Initial:	13206,974	cuft

DGM #2	Final:	4421,915	cuft
	Initial:	4406,904	cuft

DGM room	Final:	28229,896	cuft
	Initial:	28215,093	cuft

	Final:	3192,750	cuft
	Initial:	3180,930	cuft

	Final:	374407,120	Liter
	Initial:	373979,850	Liter

	Final:	125214,700	Liter
	Initial:	124789,610	Liter

	Final:	799381,620	Liter
	Initial:	798962,440	Liter

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

156

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

Project nu.	PI 20335
Date	14-04-2026
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: -0,168870309 in. H₂O
 Barometer: 29,943 in. Hg

tunnel of 12" and more, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
y center			0,0000
x center			0,0000
y1			0,0000
y2			0,0000
y3			0,0000
y4			0,0000
y5			0,0000
y6			0,0000
x1			0,0000
x2			0,0000
x3			0,0000
x4			0,0000
x5			0,0000
x6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

Taverse Point	% of Diameter
1	4.4
2	14.6
3	29.6
Center	50.0
4	70.4
5	85.4
6	95.6

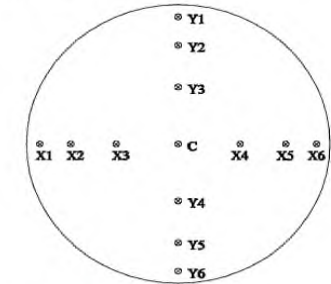


FIG. 5 Dilution Tunnel Diameter Equal To or Greater Than 0.3 m (12 in.) Traverse Point Table

PITOT CONSTANT=
0,909

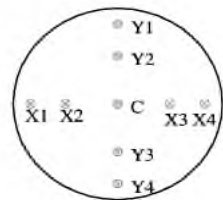
Tunnel less than 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
y center	0,071	71,98	0,2665
x center	0,070	71,92	0,2646
y1	0,057	71,98	0,2387
y2	0,068	71,95	0,2608
y3	0,059	71,95	0,2429
y4	0,057	71,89	0,2387
x1	0,057	71,9	0,2387
x2	0,069	72,0	0,2627
x3	0,076	72,0	0,2757
x4	0,057	72,1	0,2387
AVERAGE	0,0641	71,9600	0,2528

Taverse Point	% of Diameter
1	6.7 *
2	25.0
Center	50.0
3	75.0
4	93.3 *

* No closer than 12.7 mm
(0.50 in.) to tunnel wall

FIG. 6 Dilution Tunnel Diameter Less Than 0.3 m (12 in.) Traverse Point Table



Project nu.	PI 20335
Date	14-04-2026
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date (yy/mm/dd)	Heure	Test end date & time
	probe	front/ Back	gasket	probe	front/ Back	gasket	probe	front/ Back	gasket	Filter			
Number	16	914-915	5	33	916-917	17	41	918-919	65	920			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	108,7498	0,2525	4,1795	109,3621	0,2538	4,1910	110,3650	0,2570	4,9966	0,1270	2026-04-13	17:00	
Before (6)	108,7498	0,2524	4,1794	109,3622	0,2537	4,1910	110,3651	0,2569	4,9965	0,1270	2026-04-14	09:00	
After (1)	108,7500	0,2528	4,1805	109,3626	0,2544	4,1921	110,3655	0,2571	4,9988	0,1270	2026-04-14	12:30	
After (2)	108,7500	0,2526	4,1798	109,3623	0,2542	4,1914	110,3651	0,2573	4,9972	0,1270	2026-04-20	08:00	
After (3)	108,7500	0,2526	4,1798	109,3623	0,2542	4,1914	110,3651	0,2573	4,9972	0,1270	2026-04-21	09:00	
After (4)													
After (5)													
After (6)	108,7500	0,2526	4,1798	109,3623	0,2542	4,1914	110,3651	0,2573	4,9972	0,1270	2026-04-21	09:00	2026-04-14 12:15
Difference	0,0002	0,0002	0,0004	0,0001	0,0005	0,0004	0,0000	0,0004	0,0007	0,0000			
Total (mg)		0,8			1			1,1		0			
Total ajusté (mg)		0,80			1,00			1,10					

Project nu. PI 20335
 Date 14-04-2026
 Technicien M.M

Manufacturer: MORSO
Model: 2B CLASSIC

Run: 2
Project #: PI 20335
Test Duration: 75 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: 74,03%
Combustion Efficiency: 98,20%
Heat Transfer Efficiency: 75,38%

	HHV	LHV
Eff	74,03%	80,01%
Comb Eff	98,20%	98,20%
HT Eff	75,38%	81,48%
Output	20 185	kJ/h
Burn Rate	1,38	kg/h
Grams CO	52	g
Input	27 267	kJ/h
MC wet	16,95	

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

Heat Output:	19 147 Btu/h
Heat Input:	25 866 Btu/h
Burn Duration:	1,25 h
Burn Rate:	3,03 lb/h
Stack Temp:	361,0 Deg. F

	Averages	0,30	7,21	2,06	20,44	13,08	182,86	22,17	0,96	0,73	#DIV/0!
INPUT DATA											
Elapsed Time	Weight	%	%	Excess	Oxygen Calculation		Input Data		Combust	Heat	Net
	Remaining (kg)	CO [e]	CO ₂ [d]	Air EA	Total O ₂	Calc. % O ₂ [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %
0,00	2,07	0,08	2,99	541,2%	20,74	17,71	187,8	22,0	99,6%	55,1%	54,8%
1,00	1,94	0,20	7,75	147,3%	20,42	12,57	202,3	22,0	98,3%	73,9%	72,7%
2,00	1,85	0,13	10,87	78,4%	20,21	9,27	212,6	22,0	99,2%	77,2%	76,6%
3,00	1,85	0,13	11,50	68,8%	20,17	8,60	219,4	21,9	99,3%	77,4%	76,8%
4,00	1,77	0,15	11,75	65,1%	20,15	8,33	222,7	21,8	99,2%	77,4%	76,7%
5,00	1,67	0,17	11,90	62,9%	20,14	8,16	224,7	22,1	99,0%	77,4%	76,6%
6,00	1,62	0,19	11,86	62,9%	20,14	8,18	226,8	22,1	98,8%	77,2%	76,3%
7,00	1,58	0,18	11,67	65,9%	20,16	8,40	226,9	22,2	98,9%	77,0%	76,2%
8,00	1,54	0,17	11,62	66,7%	20,16	8,46	227,6	21,9	99,0%	76,9%	76,2%
9,00	1,45	0,16	11,43	69,5%	20,17	8,66	226,9	22,0	99,1%	76,8%	76,1%
10,00	1,40	0,15	11,30	71,4%	20,18	8,80	226,9	22,0	99,1%	76,7%	76,0%
11,00	1,35	0,16	11,19	73,2%	20,19	8,93	226,9	22,0	99,1%	76,6%	75,9%
12,00	1,31	0,14	10,92	77,5%	20,21	9,21	225,8	21,8	99,1%	76,4%	75,7%
13,00	1,22	0,13	10,92	77,6%	20,21	9,22	225,0	21,8	99,2%	76,4%	75,8%
14,00	1,18	0,12	10,78	80,3%	20,22	9,39	224,4	21,9	99,3%	76,4%	75,8%
15,00	1,13	0,11	10,71	81,5%	20,23	9,46	223,4	22,1	99,4%	76,4%	75,9%
16,00	1,09	0,10	10,64	82,9%	20,23	9,54	223,0	22,0	99,5%	76,3%	75,9%
17,00	1,03	0,10	10,53	84,9%	20,24	9,66	222,0	22,1	99,5%	76,3%	75,9%
18,00	0,95	0,09	10,32	88,8%	20,25	9,89	220,6	22,0	99,5%	76,1%	75,8%
19,00	0,95	0,08	10,19	91,3%	20,26	10,03	219,0	22,1	99,6%	76,1%	75,8%
20,00	0,86	0,08	10,32	88,9%	20,25	9,89	218,2	22,5	99,6%	76,3%	76,0%
21,00	0,81	0,08	10,35	88,4%	20,25	9,86	218,1	22,3	99,7%	76,4%	76,1%
22,00	0,77	0,08	10,45	86,6%	20,24	9,76	217,5	22,4	99,7%	76,5%	76,3%
23,00	0,73	0,08	10,56	84,6%	20,24	9,63	218,1	22,2	99,6%	76,6%	76,3%
24,00	0,67	0,08	10,72	81,9%	20,23	9,47	218,1	22,0	99,6%	76,7%	76,4%
25,00	0,63	0,10	10,87	79,1%	20,22	9,29	218,9	21,6	99,5%	76,8%	76,4%
26,00	0,58	0,11	11,11	75,2%	20,20	9,04	218,9	21,8	99,4%	77,0%	76,6%
27,00	0,54	0,12	11,14	74,4%	20,20	9,00	219,7	21,7	99,3%	77,0%	76,5%
28,00	0,50	0,10	11,09	75,5%	20,20	9,06	220,4	22,0	99,4%	76,9%	76,5%
29,00	0,45	0,11	11,22	73,3%	20,19	8,91	219,7	22,3	99,4%	77,1%	76,7%
30,00	0,41	0,10	10,65	82,8%	20,23	9,53	216,1	22,1	99,5%	76,8%	76,4%
31,00	0,36	0,06	9,37	108,2%	20,32	10,91	212,9	22,3	99,8%	75,6%	75,4%
32,00	0,36	0,04	8,80	122,1%	20,36	11,54	209,9	22,3	100,0%	75,0%	75,0%
33,00	0,31	0,04	8,52	129,6%	20,37	11,84	207,5	22,4	100,0%	74,8%	74,8%
34,00	0,31	0,03	7,76	152,0%	20,43	12,65	203,5	22,4	100,1%	73,9%	74,0%
35,00	0,31	0,03	6,33	208,5%	20,52	14,17	198,4	22,3	100,2%	71,3%	71,5%
36,00	0,27	0,06	5,42	258,9%	20,58	15,13	193,2	22,5	99,9%	69,2%	69,1%
37,00	0,27	0,09	5,01	285,6%	20,60	15,55	188,4	22,5	99,4%	68,3%	67,9%
38,00	0,31	0,12	4,78	301,2%	20,62	15,78	184,6	22,7	98,8%	67,8%	67,1%
39,00	0,27	0,16	4,66	307,9%	20,62	15,88	181,2	22,3	98,2%	67,8%	66,6%
40,00	0,22	0,18	4,66	305,4%	20,62	15,87	178,6	22,5	97,7%	68,2%	66,6%
41,00	0,27	0,21	4,63	306,2%	20,62	15,89	175,9	22,6	97,3%	68,4%	66,6%
42,00	0,22	0,25	4,62	303,7%	20,62	15,88	173,1	22,6	96,7%	68,7%	66,5%
43,00	0,22	0,29	4,57	304,3%	20,62	15,90	170,5	22,4	95,9%	68,9%	66,1%
44,00	0,22	0,33	4,48	308,3%	20,62	15,97	167,7	22,4	95,2%	68,9%	65,6%
45,00	0,22	0,37	4,44	308,7%	20,62	16,00	165,4	22,5	94,5%	69,1%	65,3%
46,00	0,22	0,40	4,42	307,1%	20,62	16,00	163,1	22,5	93,9%	69,3%	65,1%
47,00	0,22	0,43	4,40	306,6%	20,62	16,00	160,7	22,3	93,5%	69,5%	65,0%
48,00	0,22	0,45	4,42	303,9%	20,62	15,98	158,8	22,5	93,2%	69,9%	65,2%
49,00	0,18	0,45	4,51	296,1%	20,61	15,88	156,9	22,2	93,2%	70,5%	65,7%
50,00	0,18	0,46	4,52	295,0%	20,61	15,87	155,6	22,1	93,2%	70,7%	65,9%
51,00	0,18	0,45	4,56	291,8%	20,61	15,82	154,0	22,1	93,3%	71,1%	66,3%
52,00	0,18	0,46	4,56	291,7%	20,61	15,82	152,2	22,2	93,2%	71,3%	66,5%
53,00	0,18	0,46	4,52	294,3%	20,61	15,86	150,5	22,3	93,1%	71,4%	66,5%
54,00	0,18	0,46	4,55	292,0%	20,61	15,83	148,8	22,3	93,2%	71,8%	66,9%
55,00	0,16	0,46	4,48	298,1%	20,61	15,91	147,3	22,3	93,2%	71,7%	66,8%
56,00	0,13	0,48	4,45	298,4%	20,61	15,92	146,1	22,3	92,8%	71,8%	66,7%
57,00	0,13	0,48	4,40	302,7%	20,62	15,98	144,7	22,3	92,7%	71,8%	66,5%
58,00	0,13	0,50	4,37	303,0%	20,62	16,00	143,6	22,2	92,3%	71,9%	66,3%
59,00	0,13	0,53	4,28	308,0%	20,62	16,07	142,3	22,0	91,7%	71,7%	65,7%
60,00	0,13	0,56	4,25	308,6%	20,62	16,09	140,9	22,0	91,2%	71,7%	65,5%
61,00	0,09	0,50	4,49	293,9%	20,61	15,87	140,0	22,3	92,5%	72,8%	67,3%
62,00	0,09	0,49	4,49	294,0%	20,61	15,87	139,1	22,3	92,6%	72,9%	67,6%
63,00	0,09	0,50	4,50	293,0%	20,61	15,86	137,9	22,0	92,5%	73,1%	67,6%
64,00	0,09	0,54	4,39	298,4%	20,61	15,95	137,0	22,1	91,7%	72,9%	66,8%
65,00	0,09	0,57	4,37	297,6%	20,61	15,96	135,9	22,3	91,2%	72,9%	66,5%
66,00	0,09	0,59	4,41	293,0%	20,61	15,91	135,5	22,4	91,0%	73,1%	66,6%
67,00	0,04	0,64	4,30	297,7%	20,61	16,00	134,3	22,3	90,0%	72,9%	65,6%
68,00	0,04	0,68	4,24	299,2%	20,62	16,04	133,5	22,3	89,4%	72,8%	65,0%
69,00	0,04	0,70	4,21	300,1%	20,62	16,05	132,2	22,2	89,1%	72,9%	64,9%
70,00	0,04	0,71	4,17	302,4%	20,62	16,09	131,5	22,1	88,8%	72,8%	64,6%
71,00	0,04	0,73	4,22	297,1%	20,61	16,03	130,8	21,8	88,6%	73,0%	64,7%
72,00	0,04	0,74	4,14	302,4%	20,62	16,11	129,9	22,0	88,2%	72,9%	#DIV/0!
73,00	0,04	0,77	4,10	303,6%	20,62	16,14	129,1	22,1	87,8%	72,9%	#DIV/0!
74,00	0,04	0,78	4,08	304,7%	20,62	16,15	128,3	22,2	87,6%	72,9%	63,9%
75,00	0,00	0,79	4,05	305,7%	20,62	16,17	127,3	21,8	87,3%	72,9%	63,7%

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,80 g/hr

Test Duration: 75 min

Burn Rate : 1,38 Dry kg/hr

PRESSURE FACTOR: DGM 1st hr 0,973
 DGM 1 0,961
 DGM 2 0,965
 DGM 3 1,002

BAROMETRIC PRESSURE

Average: 29,97293872 in Hg
 Start: 29,94340873 in Hg
 End: 30,00246871 in Hg

TEMPERATURE FACTORS DGM 1st hr 0,988
 DGM 1 0,990
 DGM 2 0,989
 DGM 3 0,993

DGM VALUES

DGM 1st hr Final: 3192,750 Cuft
 Initial: 3180,930 Cuft

VOLUMES SAMPLED DGM 1st hr 11,367 SCft
 DGM 1 14,141 SCft
 DGM 2 14,470 SCft
 DGM 3 14,558 SCft

DGM 1 Final: 13222,063 Cuft
 Initial: 13206,974 Cuft

DGM 2 Final: 4421,915 Cuft
 Initial: 4406,904 Cuft

TOTAL TUNNEL VOLUME : 13675

DGM #3 Final: 28229,896 Cuft
 Initial: 28215,093 Cuft

SAMPLE RATIOS

Sample Train 1st Hr: 962,4
 Sample Train 1: 967,0
 Sample Train 2: 945,0

TEMPERATURES

DGM 1st hr 534,494 °R
 DGM 1 533,577 °R
 DGM 2 533,846 °R

Particulate concentration

Sample Train 1st Hr 0,000070 g/dscf
 Sample Train 1 0,000071 g/dscf
 Sample Train 2 0,000076 g/dscf
 Room 0,000000 g/dscf

CALIBRATION FACTORS

DGM 1st hr 1,0000
 DGM 1 0,9860
 DGM 2 1,0100
 DGM #3 0,9890

TOTAL EMISSIONS

Sample Train 1st Hr 0,77 g
 Sample Train 1 0,97 g
 Sample Train 2 1,04 g

TUNNEL FLOW RATE: 182,3 Dscfm

PARTICULATE CATCH

Total Sample Train 1: 1,00 mg
 Total Sample Train 2: 1,10 mg
 Total Sample Train 1 1st hour: 0,80 mg

EMISSION RATES

Sample Train 1st Hr 0,77 g/hr
 Sample Train 1 0,77 g/hr
 Sample Train 2 0,83 g/hr

DEVIATION: 3,61%

Cs Train 1 Train 2 Train 1st Hr
 7,071E-05 7,6017E-05 7,038E-05

* 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 cuft/min	DGM 1st hour 1st hour Inlet T °F	DGM 1st hour 1st hour Outlet T °F	Filter 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	156.00	4,6	0,1	3,0	370,0	71,6	107,6	624,1	422,9	422,4	411,0	169,9	0,19	73,3	72,3	72,5	0,19	72,5	73,4	73,7	0,19	73,4	71,3	75,0	0,07	0,07	-0,79	-1,21	-1,06	0,0	
1	157,0	4,3	0,2	7,7	396,2	71,5	101,6	649,7	432,6	424,7	415,8	172,7	0,19	74,0	72,3	72,7	0,19	73,0	73,2	75,1	0,19	73,5	71,4	75,3	0,07	0,07	-0,76	-1,18	-1,01	9,0	
2	158,0	4,1	0,1	10,9	414,7	71,6	101,5	686,1	439,0	425,3	419,7	175,7	0,19	74,2	72,4	72,8	0,19	73,1	73,1	75,6	0,19	73,4	71,5	77,1	0,07	0,07	-0,75	-1,18	-1,02	19,1	
3	159,0	4,1	0,1	11,5	426,9	71,4	102,7	715,4	443,7	424,3	422,1	178,7	0,19	74,1	72,5	73,0	0,19	73,0	73,0	76,1	0,19	73,3	71,6	77,7	0,07	0,07	-0,76	-1,17	-1,01	26,8	
4	160,0	3,9	0,2	11,7	432,9	71,2	102,7	743,5	445,6	421,7	425,1	181,1	0,19	74,5	72,3	72,8	0,19	73,4	72,8	77,9	0,19	73,6	71,6	78,2	0,07	0,07	-0,75	-1,18	-1,02	33,7	
5	161,0	3,7	0,2	11,9	436,5	71,7	102,5	756,0	450,6	423,6	424,9	184,3	0,19	74,2	72,6	73,2	0,19	73,3	72,9	76,8	0,19	73,5	71,7	78,7	0,07	0,08	-0,76	-1,18	-1,03	37,8	
6	162,0	3,6	0,2	11,9	440,3	71,7	102,2	768,8	452,4	422,7	425,2	187,0	0,19	74,2	72,6	73,4	0,19	73,4	72,9	77,2	0,19	73,5	71,8	79,1	0,07	0,08	-0,77	-1,18	-1,02	41,1	
7	163,0	3,5	0,2	11,7	440,5	72,0	102,7	775,2	454,3	421,3	425,2	189,6	0,19	74,3	72,7	73,6	0,19	73,4	72,9	77,5	0,19	73,5	71,8	79,5	0,07	0,08	-0,77	-1,18	-1,03	43,1	
8	164,0	3,4	0,2	11,6	441,6	71,9	102,9	782,4	455,6	421,7	425,1	192,1	0,19	74,4	72,8	73,8	0,19	73,4	72,8	77,9	0,19	73,5	71,9	79,9	0,07	0,08	-0,76	-1,18	-1,03	45,9	
9	165,0	3,2	0,2	11,4	440,4	71,6	103,0	781,8	456,6	421,5	425,3	194,6	0,19	74,5	72,8	74,0	0,19	73,4	72,8	78,2	0,19	73,5	71,9	80,2	0,07	0,08	-0,76	-1,18	-1,03	45,9	
10	166,0	3,2	0,2	11,3	440,3	71,5	103,4	783,1	457,7	421,6	425,2	196,9	0,19	74,6	72,9	74,2	0,19	73,4	72,8	78,5	0,19	73,5	72,0	80,6	0,07	0,08	-0,77	-1,19	-1,04	46,8	
11	167,0	3,0	0,2	11,2	440,3	71,7	103,3	782,5	456,7	422,2	425,5	199,3	0,19	74,7	73,0	74,4	0,19	73,5	72,8	78,8	0,19	73,6	72,0	80,9	0,07	0,08	-0,77	-1,19	-1,04	47,6	
12	168,0	2,9	0,1	10,9	438,5	71,3	102,7	777,6	459,6	422,5	425,3	201,6	0,19	74,7	73,0	74,6	0,19	73,5	72,8	79,1	0,19	73,6	72,1	81,2	0,07	0,08	-0,77	-1,18	-1,04	47,2	
13	169,0	2,7	0,1	10,9	437,0	71,2	102,7	773,3	460,7	423,4	425,9	203,7	0,19	74,8	73,1	74,8	0,19	73,6	72,8	79,3	0,19	73,7	72,1	81,5	0,07	0,08	-0,77	-1,18	-1,04	47,3	
14	170,0	2,6	0,1	10,8	435,8	71,5	103,1	769,6	462,0	424,1	425,9	205,8	0,19	74,9	73,1	75,1	0,19	73,7	72,8	79,6	0,19	73,8	72,2	81,8	0,07	0,07	-0,77	-1,19	-1,05	47,4	
15	171,0	2,5	0,1	10,7	434,1	71,8	102,6	766,6	463,4	424,8	426,5	207,9	0,19	75,0	73,2	75,3	0,19	73,6	72,8	79,8	0,19	73,8	72,2	82,1	0,07	0,07	-0,78	-1,18	-1,05	47,8	
16	172,0	2,4	0,1	10,6	433,4	71,6	102,7	764,5	465,5	425,8	427,1	209,8	0,19	75,0	73,3	75,5	0,19	73,6	72,8	80,1	0,19	73,8	72,3	82,3	0,07	0,08	-0,77	-1,19	-1,04	48,5	
17	173,0	2,3	0,1	10,5	431,5	71,8	102,5	760,5	467,6	426,6	427,8	211,7	0,19	75,1	73,3	75,7	0,19	73,7	72,8	80,3	0,19	73,8	72,4	82,5	0,07	0,08	-0,77	-1,19	-1,04	48,8	
18	174,0	2,1	0,1	10,3	429,1	71,7	102,3	756,7	470,1	427,8	428,5	213,6	0,19	75,1	73,4	76,0	0,19	73,8	72,9	80,5	0,19	73,9	72,4	82,8	0,07	0,07	-0,79	-1,18	-1,05	49,3	
19	175,0	2,1	0,1	10,2	426,2	71,7	102,3	752,8	472,9	429,3	429,7	215,3	0,19	75,2	73,4	76,2	0,19	73,9	72,9	80,8	0,19	74,0	72,5	83,0	0,07	0,07	-0,79	-1,18	-1,04	49,9	
20	176,0	1,9	0,1	10,3	424,8	72,5	102,4	748,9	475,7	429,9	430,4	217,0	0,19	75,3	73,5	76,4	0,19	73,8	72,9	81,0	0,19	74,0	72,6	83,2	0,07	0,07	-0,78	-1,19	-1,05	50,3	
21	177,0	1,8	0,1	10,4	424,6	72,1	102,1	748,6	478,8	431,1	431,3	218,6	0,19	75,3	73,6	76,6	0,19	73,9	73,0	81,1	0,19	74,0	72,7	83,3	0,07	0,07	-0,80	-1,19	-1,05	51,6	
22	178,0	1,7	0,1	10,4	423,6	72,2	102,2	748,8	482,1	432,3	432,6	220,2	0,19	75,3	73,6	76,8	0,19	73,9	73,0	81,3	0,19	74,0	72,7	83,5	0,07	0,07	-0,80	-1,20	-1,05	53,1	
23	179,0	1,6	0,1	10,6	424,6	72,0	101,9	750,5	485,5	433,7	433,9	221,7	0,19	75,4	73,6	77,0	0,19	73,9	73,0	81,5	0,19	74,0	72,8	83,7	0,07	0,07	-0,81	-1,20	-1,06	55,0	
24	180,0	1,7	0,1	10,7	424,6	71,9	101,9	754,9	487,7	434,9	434,7	223,3	0,19	75,4	73,8	77,1	0,19	73,9	73,2	81,6	0,19	74,0	72,8	83,9	0,07	0,07	-0,81	-1,20	-1,06	55,0	
25	181,0	1,4	0,1	10,9	426,0	72,0	102,2	762,2	492,5	437,0	437,2	224,6	0,19	75,2	73,7	77,2	0,19	73,5	72,9	81,8	0,19	73,7	72,8	84,0	0,07	0,07	-0,82	-1,21	-1,06	60,3	
26	182,0	1,3	0,1	11,1	426,0	71,3	101,9	770,2	496,2	438,3	436,9	226,0	0,19	75,1	73,7	77,4	0,19	73,4	72,9	81,9	0,19	73,6	72,8	84,1	0,07	0,07	-0,83	-1,21	-1,06	63,4	
27	183,0	1,2	0,1	11,1	427,4	71,1	101,5	777,9	500,0	439,1	437,6	227,3	0,19	75,1	73,8	77,6	0,19	73,5	72,9	82,0	0,19	73,6	72,8	84,2	0,07	0,07	-0,84	-1,23	-1,08	66,3	
28	184,0	1,1	0,1	11,5	428,7	71,1	102,4	787,6	504,4	442,1	438,7	228,5	0,19	75,1	73,9	77,7	0,19	73,6	72,9	82,2	0,19	73,6	72,9	84,3	0,07	0,08	-0,85	-1,23	-1,09	68,8	
29	185,0	1,0	0,1	11,2	427,4	72,1	101,7	794,5	508,9	442,5	440,7	229,8	0,19	75,4	73,9	77,9	0,19	73,8	73,0	82,3	0,19	73,9	73,0	84,4	0,07	0,07	-0,86	-1,25	-1,12	73,2	
30	186,0	0,9	0,1	10,6	421,0	71,7	101,8	786,7	513,2	443,4	441,9	230,9	0,19	75,5	73,9	78,0	0,19	73,9	73,1	82,4	0,19	73,9	73,0	84,5	0,08	0,07	-0,89	-1,27	-1,13	73,2	
31	187,0	0,9	0,1	9,4	415,5	72,5	102,5	795,5	517,5	445,2	445,2	232,0	0,19	75,5	74,0	78,1	0,19	73,9	73,5	82,5	0,19	74,0	73,5	84,5	0,07	0,07	-0,90	-1,28	-1,14	70,8	
32	188,0	0,8	0,0	8,8	409,9	72,1	101,0	747,7	522,6	446,3	445,2	233,2	0,19	75,5	74,0	78,3	0,19	74,0	73,2	82,6	0,19	74,0	73,1	84,6	0,07	0,07	-0,90	-1,28	-1,15	68,9	
33	189,0	0,7	0,0	8,5	405,5	72,4	101,0	733,0	527,1	447,4	446,8	234,3	0,19	75,6	74,0	78,3	0,19	74,0	73,2	82,6	0,19	74,0	73,2	84,6	0,07	0,07	-0,91	-1,28	-1,15	67,6	
34	190,0	0,7	0,0	7,8	398,4	72,2	100,4	714,1	531,2	448,5	448,2	235,4	0,19	75,7	74,1	78,4	0,19	74,1	73,2	82,7	0,19	74,1	73,2	84,6	0,07	0,07	-0,91	-1,28	-1,15	65,4	
35	191,0	0,7	0,0	6,3	389,1	72,2	99,1	691,3	535,3	449,9	449,1	236,5	0,19	75,7	74,1	78,5	0,19	74,1	73,2	82,6	0,19	74,2	73,3	84,6	0,07	0,07	-0,91	-1,28	-1,15	62,3	
36	192,0	0,6	0,1	5,4	379,7	72,5	98,8	668,4	539,1	450,5	450,1	237,5	0,19	75,8	74,2	78,6	0,19	74,1	73,3	82,7	0,19	74,2	73,3	84,6	0,07	0,07	-0,91	-1,28	-1,14	59,0	
37	193,0	0,6	0,1	5,0	371,1	72,6	97,8	647,7	542,2	450,9	451,1	238,6	0,19	75,8	74,2	78,7	0,19	74,2	73,3	82,7	0,19	74,3	73,4	84,5	0,07	0,07	-0,91	-1,28	-1,14	56,0	
38	194,0	0,7	0,1	4,8	364,2	72,8	97,5	630,2	545,2	451,9	451,2	239,6	0,19	75,8	74,2	78,8	0,19	74,2	73,3	82,7	0,19	74,3	73,5	84,5	0,08	0,07	-0,91	-1,28	-1,14	53,5	
39	195,0	0,6	0,2	4,7	358,2	72,2	97,0	614,4	547,3	452,1	450,9	240,5	0,19	75,8	74,3	78,9	0,19	74,2	73,3	82,6	0,19	74,2	73,5	84,5	0,07	0,06	-0,91	-1,28	-1,14	51,0	
40	196,0	0,5	0,2	4,7	353,4	72,4	96,3	600,6	548,5	451,3	450,2	241,6	0,19	75,8	74,3	79,0	0,19	74,3	73,4	82,6	0,19	74,3	73,6	84,4	0,07	0,06	-0,91	-1,26	-1,15	48,4	

DATA 2026-04-14 PI 20355 EPA RUN 2 CAT 3
unit preburn

Time acquisition minutes	Flue	scale	Right	Back	bottom	Top	Left
	temp						
	°F	lbs	°F	°F	°F	°F	°F
1	70,59	5,75	70,48	68,33	67,97	69,32	68,32
2	78,12	2,48	70,73	68,45	67,96	69,53	68,32
3	105,74	2,39	71,27	68,38	67,99	69,54	68,35
4	132,65	2,30	71,42	68,45	68,04	69,56	68,62
5	171,55	2,17	71,81	68,73	68,12	97,92	69,10
6	216,06	2,17	71,79	69,24	68,26	106,78	70,04
7	272,47	1,98	71,83	69,98	68,44	122,55	71,87
8	320,45	1,88	72,02	71,00	68,59	156,46	74,59
9	325,15	1,69	71,86	72,35	68,79	186,53	78,34
10	321,34	1,69	72,20	74,06	69,04	223,32	83,04
11	326,63	1,59	72,38	76,04	69,31	259,53	88,43
12	337,74	1,38	72,50	78,27	69,61	332,79	94,52
13	338,68	1,38	110,90	80,74	69,93	341,41	100,90
14	345,38	1,18	117,31	83,47	70,31	348,40	107,31
15	347,81	1,18	123,58	86,39	70,71	362,66	113,58
16	343,63	1,08	129,75	89,53	71,22	373,30	119,75
17	347,62	4,57	132,94	93,01	71,73	381,83	122,94
18	303,90	6,38	136,36	97,11	72,37	385,90	126,36
19	289,60	6,38	142,27	100,73	73,00	389,53	132,27
20	286,59	6,28	147,32	104,38	73,71	391,68	137,32
21	293,82	6,28	151,90	107,88	74,46	395,15	141,90
22	294,16	6,16	156,03	111,09	75,25	400,79	146,03
23	298,41	6,07	160,14	114,02	76,08	409,42	150,14
24	300,08	6,07	163,30	116,74	76,96	397,61	153,30
25	301,93	5,97	165,64	119,23	77,87	413,75	155,64
26	306,26	5,87	168,44	121,60	78,82	447,23	158,44
27	312,26	5,87	171,30	123,86	79,83	473,55	161,30
28	314,30	5,77	173,52	126,02	80,88	487,11	163,52
29	321,38	5,68	175,56	128,09	82,00	498,07	165,56
30	330,04	5,58	177,76	130,18	83,18	465,32	167,76
31	333,51	5,48	180,53	132,38	84,38	454,86	170,53
32	330,42	5,36	183,91	134,49	85,62	321,38	173,91
33	326,37	5,27	187,68	136,81	86,92	327,64	177,68
34	325,61	5,27	191,58	139,10	88,26	338,97	181,58
35	334,30	5,17	195,43	141,33	89,63	348,06	185,43
36	340,23	4,98	199,64	143,67	91,05	352,54	189,64
37	344,76	4,88	204,07	146,12	92,48	356,38	194,07
38	349,30	4,78	208,60	148,88	93,95	362,39	198,60
39	353,59	4,68	213,11	151,85	95,48	368,89	203,11
40	356,02	4,57	217,76	155,06	96,98	373,44	207,76
41	358,98	4,47	222,46	158,55	98,53	377,12	212,46
42	361,68	4,37	227,26	162,17	100,12	398,26	217,26
43	362,51	4,22	232,05	165,93	101,71	427,60	222,05
44	366,22	4,08	236,90	169,91	103,31	446,74	226,90
45	372,70	3,98	241,78	174,00	104,96	456,48	231,78
46	376,81	3,89	246,78	178,38	106,64	470,40	236,78
47	380,44	3,77	251,72	182,82	108,31	483,57	241,72
48	386,93	3,67	256,93	187,62	109,99	497,64	246,93
49	392,88	3,48	262,14	192,72	111,70	489,21	252,14
50	396,64	3,38	267,55	198,12	113,45	514,94	257,55
51	402,20	3,28	273,15	203,63	115,22	560,13	263,15
52	408,49	3,07	278,94	209,44	117,03	531,02	268,94
53	412,59	2,97	284,86	215,48	118,87	555,44	274,86
54	415,98	2,88	290,97	221,58	120,74	753,21	280,97
55	419,07	2,78	297,04	227,78	122,60	742,44	287,04
56	420,89	2,59	303,15	234,30	124,51	630,86	293,15
57	421,32	2,49	309,16	240,72	126,43	561,12	299,16
58	422,05	2,39	315,39	247,36	128,36	563,26	305,39
59	421,76	2,27	321,65	254,13	130,32	552,33	311,65
60	422,28	2,18	328,09	261,05	132,30	548,80	318,09
61	421,48	2,08	334,41	267,88	134,32	527,02	324,41
62	419,27	1,98	340,70	274,78	136,34	527,43	330,70
63	419,58	1,88	346,71	281,80	138,41	527,48	336,71
64	418,33	1,79	353,03	289,10	140,51	457,67	343,03

DATA 2026-04-14 PI 20355 EPA RUN 2 CAT 3
unit preburn

65	416,41	1,65	359,12	296,65	142,62	480,02	349,12
66	415,22	1,59	364,93	304,55	144,77	450,81	354,93
67	413,72	1,48	370,75	312,89	146,87	488,05	360,75
68	411,17	1,48	376,05	321,88	149,07	439,35	366,05
69	407,95	1,38	381,45	331,51	151,28	441,09	371,45
70	402,66	1,28	386,90	342,16	153,52	437,80	376,90
71	399,45	1,19	392,43	353,01	155,77	433,63	382,43
72	397,43	1,19	406,35	364,32	158,07	443,86	387,63
73	393,52	1,09	411,63	375,96	160,36	531,00	392,75
74	389,45	0,99	414,28	387,48	162,68	621,69	397,56
75	383,25	0,99	417,00	399,32	165,06	678,12	402,40
76	373,89	0,97	419,37	411,14	167,44	662,03	406,92



POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2026-04-14 Manufacturer: Morso Model: 2B classic
Project #: PT 20355 Run: 2 Tech: MM Reviewer: SP

- Kindling 25 LBS 51M1 FIRE
- air inlet 1/2 turn closed from Full open
- At 2min close Door
- At 100 LBS insert preload
- close Door immediately
- At 100 LBS insert Load
- close Door immediately

TEST LOAD CONFIGURATION

Date: 2026-04-14

Manufacturer: Moriso

PRE / POST CHECKS

Model: 2B class:2

Project #: PI 26355

Run: 2

Tech: M.M

Reviewer: SP

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:

Smoke Capture Check (tunnel velocity)

<u>ok</u>	<u>NA</u>
4 sides <u>ok</u>	<u>ok</u>

Picture

Wood Heater Conditions:

Date Wood Heater Stack Cleaned

Date Dilution Tunnel Cleaned

Induced Draft Check (max 0.005 H₂O)

Traverse before ignition

<u>2025-02-13</u>
<u>2025-02-13</u>
<u>ok</u>
<u>ok</u>

Temperature System:

Ambient (65°-90°F) Y/N

<u>ok</u>

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: 2026-02-14

Project #: PI 2355

Leakage Checks Tunnel Samplers

Manufacturer: Morso

Run: 2

Tech: M.M

Model: 2B Classic

Reviewer: DE

	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.)	-6	-6	-6	-6
Final 1 minute DGM (Liter)	373978 25	374407 70	124788 10	125215 75
Initial 1 minute DGM (Liter)	373978 19	374407 68	124788 01	125215 75
Change (Liter)	0.6	0.02	0.09	0.04
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2026-04-14

Project #: PI 6355

Manufacturer: Morso

Run: 2

Tech: M.M.

Model: 2B class

Reviewer: RP

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.)	-6	-6	-6	-6
Final 1 minute DGM (Liter)	3180 83	3192 81	798960 24	799381 91
Initial 1 minute DGM (Liter)	3180 83	3192 81	798960 24	799381 91
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: 02-07-14
Project #: 01 6355

Manufacturer: Morso
Run: 2

Model: 2B Classic

Tech: M, M

Reviewer: ISO

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-6	-6
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	0.4	0.5
Check OK (no change after 15 sec.)	OK	OK	OK



Date: 2020-04-19
Project #: 10J 6355

Manufacturer: Moss
Run: 2

Tech: MM
Model: 2B Classic
Reviewer: ISO

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	44 lbs, Class F	44 lbs
Analytical	EM-335	100.0 mg, Class S	100.0 mg
Analytical	EM-129	200.0000 g, Class S	200.0000 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: 2026-04-14 Manufacturer: MORSO Model: 2B classic
 Project #: PI 20355 Run: 2 Tech: M.M Reviewer: DE

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	0.071	71.98
B - Centroid	3.00	3.50	4	0.070	71.92
A-1	0.50	0.50	0.50	0.057	71.98
A-2	1.50	1.75	2	0.068	71.95
A-3	4.50	5.25	6	0.059	71.95
A-4	5.60	6.5	7.5	0.057	71.89
B-1	0.50	0.50	0.50	0.057	71.92
B-2	1.50	1.75	2	0.069	71.98
B-3	4.50	5.25	6	0.076	71.98
B-4	5.60	6.5	7.5	0.057	72.05
				AVERAGE	

CONTINUOUS ANALYZERS

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	N.A	
B-4	8.45		
B-5	10.25		
B-6	11.47		

Date: 2026-04-14

 Manufacturer: Morso
CONTINUOUS ANALYZERS

 Model: 2B classic

 Project #: PT 20355

 Run: 2

 Tech: M.M

 Reviewer: DP
Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3.080	3.000	1.032	1.000
Tolerance CO	0	+/- 0.02	0.080	+/- 0.15	0.032	+/- 0.05
CO ₂	0	0	18.06	18.00	9.82	10.00
Tolerance CO ₂	0	+/- 0.02	0.06	+/- 0.5	0.18	+/- 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	3.082	1.028	0	0.02	0.002	0.15	0.004	0.05	✓	
CO ₂	0	18.01	9.80	0	0.02	0.05	0.5	0.02	0.5	✓	

TEST DATA LOG

Date: 2026-04-14 Manufacturer: Morso Model: 2B classic
 Project #: PT 20355 Run: 2 Tech: J.M. Reviewer: [Signature]

RAW DRY GAS METER READINGS

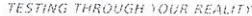
Test	Final	System 1 st hour (Cuft)	System 1 (Liter)	System 2 (Liter)	Blank (Liter)
	Initial				
		3192.75	374 407.12 34mm.	125214.70	799381.62
		3180.93	373979.85	124789.61	798962.44

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	1014	1016
Humidity (%):	261	234
Air Velocity (max 50ft/Min)	0	0



M TP-EPA – V16 – November 2025



Reviewer: SP

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Model: JB 415312

TEST FILTERS					
SYSTEM 2			TEST FILTERS		
Pre-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time				
2026-04-13	17:00	110 3650	4 9966	0 1270	
2026-04-14	09:00	110 3651	4 9965	0 1270	
SYSTEM 2			TEST FILTERS		
Post-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time				
2026-04-14	12:30	110 3655	4 9988	0 1270	2026-04-14
2026-04-20	08:00	110 3651	4 9972	0 1270	12:15
2026-04-21	09:00	110 3651	4 9972	0 1270	

Date: 2026-04-14

Project #: PI-20555

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Manufacturer: 17050

Model: ZB Classic

Run: 2 Tech: MM

Reviewer: SL

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					
2026-04-13	17:00	108 7498	5	109 3621	02538	41910
2026-04-14	9:00	108 7498	41794	109 3623	02537	41910

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					
2026-04-14	12:30	108 7500	41805	109 3626	02544	41911
2026-04-20	8:00	108 7500	41798	109 3623	02542	41914
2026-04-21	9:00	108 7500	41798	109 3623	02542	41914

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	15-04-2026
Technicien	M.M
Project #	PI 20355

Description de l'unité

Manufacturier	MORSO	
Modèle	2B CLASSIC	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	0,685	cu ft.
Appliance weight empty	n.a	lbs
Firebox maximum lenght	19,125	inch

Paramètres du test

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

Échantillonnage

Targeted Blank sampling rate	0,20	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):	0,989	
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	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20355
Date 15-04-2026
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):	102,8	102,6
Barometer (in.Hg):	30,356829	30,2977686
Dry Bulb (F):	71,270271	72,97
Humidity (%):	25,5	24,8
Air velocity (ft/min)	0	0

DGM #1st hour	Final:	3204,760	cuft
	Initial:	3192,940	cuft

Final:	3204,760	cuft
Initial:	3192,940	cuft

DGM #1	Final:	13245,852	cuft
	Initial:	13222,136	cuft

Final:	375080,760	Liter
Initial:	374409,180	Liter

DGM #2	Final:	4445,520	cuft
	Initial:	4422,034	cuft

Final:	125883,110	Liter
Initial:	125218,050	Liter

DGM room	Final:	28254,112	cuft
	Initial:	28230,386	cuft

Final:	800067,350	Liter
Initial:	799395,480	Liter

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

155

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

Project nu.	PI 20355
Date	15-04-2026
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: -0,17836475 in. H2O
 Barometer: 30,357 in. Hg

tunnel of 12" and more, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
y center			0,0000
x center			0,0000
y1			0,0000
y2			0,0000
y3			0,0000
y4			0,0000
y5			0,0000
y6			0,0000
x1			0,0000
x2			0,0000
x3			0,0000
x4			0,0000
x5			0,0000
x6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

Taverse Point	% of Diameter
1	4.4
2	14.6
3	29.6
Center	50.0
4	70.4
5	85.4
6	95.6

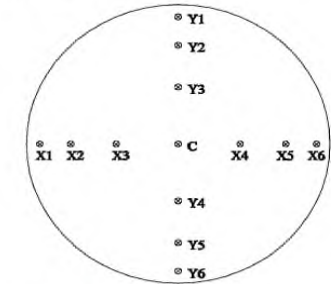


FIG. 5 Dilution Tunnel Diameter Equal To or Greater Than 0.3 m (12 in.) Traverse Point Table

PITOT CONSTANT=
0,907

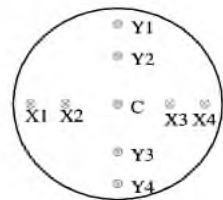
Tunnel less than 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
y center	0,075	73,41	0,2739
x center	0,074	73,69	0,2720
y1	0,061	73,41	0,2470
y2	0,069	73,44	0,2627
y3	0,066	73,44	0,2569
y4	0,061	73,64	0,2470
x1	0,061	73,7	0,2470
x2	0,066	73,8	0,2569
x3	0,079	73,8	0,2811
x4	0,064	73,8	0,2530
AVERAGE	0,0676	73,6170	0,2597

Taverse Point	% of Diameter
1	6.7 *
2	25.0
Center	50.0
3	75.0
4	93.3 *

* No closer than 12.7 mm
(0.50 in.) to tunnel wall

FIG. 6 Dilution Tunnel Diameter Less Than 0.3 m (12 in.) Traverse Point Table



Project nu.	PI 20355
Date	15-04-2026
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date (yy/mm/dd)	Heure	Test end date & time
	probe	front/ Back	gasket	probe	front/ Back	gasket	probe	front/ Back	gasket	Filter			
Number	009	907-908	13	21	909-910	60	31	911-912	64	913			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	61,4511	0,2528	4,1531	108,7333	0,2521	4,1910	110,1267	0,2510	4,1971	0,1262	2026-04-14	17:00	
Before (6)	61,4512	0,2529	4,1530	108,7334	0,2522	4,1911	110,1266	0,2509	4,1970	0,1263	2026-04-15	10:00	
After (1)	61,4512	0,2575	4,1543	108,7335	0,2569	4,1923	110,1267	0,2557	4,1980	0,1263	2026-04-15	14:15	
After (2)	61,4512	0,2569	4,1538	108,7335	0,2567	4,1915	110,1267	0,2556	4,1976	0,1263	2026-04-20	08:00	
After (3)	61,4512	0,2569	4,1538	108,7335	0,2567	4,1915	110,1267	0,2556	4,1976	0,1263	2026-04-21	09:00	
After (4)													
After (5)													
After (6)	61,4512	0,2569	4,1538	108,7335	0,2567	4,1915	110,1267	0,2556	4,1976	0,1263	2026-04-21	09:00	2026-04-15 14:00
Difference	0,0000	0,0040	0,0008	0,0001	0,0045	0,0004	0,0001	0,0047	0,0006	0,0000			
Total (mg)		4,8			5			5,4		0			
Total ajusté (mg)		4,80			5,00			5,40					

Project nu.	PI 20355
Date	15-04-2026
Technicien	M.M

Manufacturer: MORSO
Model: 2B CLASSIC

Run: 3
Project #: PI 20355
Test Duration: 120 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: 77,35%
Combustion Efficiency: 93,89%
Heat Transfer Efficiency: 82,39%

	HHV	LHV
Eff	77,35%	83,61%
Comb Eff	93,89%	93,89%
HT Eff	82,39%	89,04%
Output	13 118	kJ/h
Burn Rate	0,86	kg/h
Grams CO	154	g
Input	16 958	kJ/h
MC wet	16,44	

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

Heat Output:	12 444 Btu/h
Heat Input:	16 087 Btu/h
Burn Duration:	2,00 h
Burn Rate:	1,89 lb/h
Stack Temp:	200,0 Deg. F

Averages		0,88	7,39	1,59	20,39	12,56	93,45	22,41	0,90	0,83	#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	2,05	0,87	4,63	257,2%	20,58	15,51	109,1	21,8	87,6%	77,3%	67,7%
1,00	1,98	0,28	6,24	201,0%	20,51	14,13	111,6	22,0	97,0%	80,3%	77,9%
2,00	1,98	0,45	2,55	553,7%	20,74	17,96	117,1	22,1	89,1%	67,0%	59,7%
3,00	1,98	0,38	5,01	264,6%	20,58	15,39	129,1	21,8	94,9%	75,9%	72,0%
4,00	1,94	0,34	5,66	227,1%	20,54	14,71	141,0	21,9	95,9%	76,0%	72,9%
5,00	1,90	0,30	6,27	198,9%	20,51	14,08	151,5	21,9	96,8%	76,1%	73,7%
6,00	1,85	0,21	7,36	159,3%	20,44	12,97	146,3	22,0	98,1%	78,5%	77,0%
7,00	1,81	0,46	7,29	153,4%	20,43	12,90	123,9	21,8	95,5%	80,3%	76,7%
8,00	1,81	0,77	5,47	215,1%	20,53	14,68	113,0	21,8	90,4%	78,6%	71,0%
9,00	1,76	0,76	5,52	213,2%	20,53	14,63	107,5	21,9	90,6%	79,4%	71,9%
10,00	1,76	0,78	5,48	213,6%	20,53	14,65	104,2	22,0	90,2%	79,7%	71,9%
11,00	1,71	0,79	5,52	211,4%	20,52	14,61	102,0	21,8	90,2%	80,0%	72,1%
12,00	1,71	0,81	5,60	206,5%	20,52	14,51	100,7	21,6	90,0%	80,2%	72,2%
13,00	1,67	0,79	5,79	198,3%	20,51	14,32	100,0	21,9	90,6%	80,6%	73,0%
14,00	1,62	0,75	6,11	186,6%	20,49	14,01	100,3	21,7	91,4%	81,0%	74,1%
15,00	1,62	0,75	6,19	182,9%	20,48	13,91	100,0	21,9	91,5%	81,2%	74,3%
16,00	1,62	0,77	6,16	183,4%	20,48	13,94	99,8	21,9	91,2%	81,1%	74,0%
17,00	1,58	0,76	6,37	175,5%	20,47	13,72	100,0	21,9	91,6%	81,4%	74,5%
18,00	1,54	0,75	6,55	169,0%	20,46	13,53	100,1	21,6	91,9%	81,6%	74,9%
19,00	1,53	0,70	6,91	158,1%	20,44	13,18	100,7	21,8	92,7%	81,9%	76,0%
20,00	1,49	0,62	7,54	140,7%	20,40	12,55	102,4	22,0	94,0%	82,4%	77,5%
21,00	1,45	0,51	8,43	119,7%	20,35	11,66	103,9	22,0	95,6%	83,0%	79,4%
22,00	1,45	0,40	8,82	113,0%	20,33	11,31	105,3	22,1	96,7%	83,3%	80,5%
23,00	1,39	0,33	10,08	88,6%	20,25	10,00	107,4	21,9	97,6%	83,8%	81,8%
24,00	1,35	0,30	10,59	80,3%	20,22	9,48	108,9	22,0	97,9%	84,0%	82,3%
25,00	1,30	0,33	11,24	69,9%	20,18	8,78	111,0	22,2	97,8%	84,2%	82,4%
26,00	1,31	0,36	11,75	62,3%	20,14	8,21	113,0	22,0	97,7%	84,2%	82,3%
27,00	1,26	0,42	11,65	62,7%	20,14	8,28	114,0	22,0	97,3%	84,1%	81,8%
28,00	1,22	0,58	12,08	55,2%	20,10	7,74	114,7	22,0	96,3%	84,2%	81,1%
29,00	1,17	0,55	11,81	58,9%	20,12	8,03	115,3	22,2	96,4%	84,1%	81,1%
30,00	1,13	0,52	11,77	59,8%	20,13	8,10	115,4	22,2	96,6%	84,0%	81,2%
31,00	1,09	0,57	11,75	59,4%	20,13	8,09	115,8	22,1	96,3%	84,0%	80,8%
32,00	1,03	0,59	11,77	59,0%	20,12	8,07	116,7	22,2	96,2%	83,9%	80,7%
33,00	0,99	0,59	11,81	58,4%	20,12	8,01	117,0	22,3	96,2%	83,9%	80,7%
34,00	0,94	0,63	11,98	55,7%	20,11	7,81	116,9	22,1	95,9%	84,0%	80,6%
35,00	0,94	0,68	12,00	55,0%	20,10	7,77	117,3	22,1	95,6%	83,9%	80,3%
36,00	0,90	0,77	12,13	52,3%	20,09	7,58	117,6	22,3	95,1%	84,0%	79,9%
37,00	0,86	0,87	12,18	50,5%	20,08	7,47	118,2	22,4	94,5%	83,9%	79,3%
38,00	0,81	0,95	12,21	49,2%	20,07	7,38	118,7	22,3	94,1%	83,9%	78,9%
39,00	0,77	1,05	12,31	47,1%	20,06	7,23	118,9	22,4	93,6%	83,9%	78,5%
40,00	0,77	1,11	12,32	46,2%	20,05	7,17	119,1	22,5	93,2%	83,8%	78,1%
41,00	0,72	1,12	12,23	47,2%	20,06	7,27	118,7	22,4	93,1%	83,8%	78,0%
42,00	0,67	1,08	12,18	48,2%	20,06	7,35	118,5	22,2	93,3%	83,8%	78,2%
43,00	0,63	1,11	12,17	47,9%	20,06	7,34	118,0	22,4	93,2%	83,8%	78,1%
44,00	0,63	1,05	12,08	49,6%	20,07	7,47	117,5	22,2	93,5%	83,8%	78,4%
45,00	0,58	0,81	11,89	54,6%	20,10	7,80	116,9	22,4	94,8%	83,9%	79,5%
46,00	0,54	0,65	11,88	56,7%	20,11	7,91	116,6	22,4	95,8%	84,0%	80,4%
47,00	0,54	0,65	11,88	56,8%	20,11	7,91	116,2	22,4	95,8%	84,0%	80,5%
48,00	0,49	0,62	11,93	56,6%	20,11	7,88	115,8	22,7	96,0%	84,1%	80,7%
49,00	0,45	0,52	11,88	58,4%	20,12	7,98	115,2	22,6	96,6%	84,1%	81,3%
50,00	0,41	0,54	11,80	59,2%	20,13	8,06	114,2	22,5	96,5%	84,1%	81,2%
51,00	0,41	0,41	11,53	64,5%	20,15	8,41	112,7	22,6	97,3%	84,2%	81,9%
52,00	0,41	0,17	11,02	75,5%	20,20	9,09	111,0	22,6	98,9%	84,2%	83,3%
53,00	0,36	0,09	10,58	84,2%	20,24	9,61	109,7	22,7	99,6%	84,1%	83,7%
54,00	0,36	0,07	10,34	88,8%	20,25	9,88	108,5	22,7	99,7%	84,1%	83,8%
55,00	0,35	0,08	10,16	91,9%	20,26	10,07	106,9	22,6	99,6%	84,1%	83,8%
56,00	0,31	0,09	9,94	95,8%	20,28	10,29	105,5	22,7	99,5%	84,1%	83,7%
57,00	0,31	0,07	9,68	101,4%	20,30	10,58	104,2	22,6	99,7%	84,0%	83,8%
58,00	0,31	0,04	9,14	113,9%	20,33	11,17	102,7	22,7	100,0%	83,9%	83,9%
59,00	0,26	0,05	8,54	128,7%	20,37	11,81	101,0	22,6	99,9%	83,6%	83,6%
60,00	0,27	0,11	7,74	150,2%	20,42	12,63	99,2	22,6	99,3%	83,2%	82,6%
61,00	0,41	0,67	6,67	177,4%	20,47	13,60	97,4	22,7	95,6%	82,3%	78,7%
62,00	0,27	0,55	6,23	189,9%	20,49	13,99	96,0	22,7	93,7%	81,8%	76,7%
63,00	0,26	0,63	6,08	193,0%	20,50	14,11	94,5	22,6	92,7%	81,8%	75,8%
64,00	0,22	0,68	5,93	197,4%	20,50	14,24	93,1	22,4	92,0%	81,7%	75,1%
65,00	0,22	0,73	5,81	200,2%	20,51	14,33	92,0	22,6	91,3%	81,6%	74,5%
66,00	0,27	0,78	5,78	199,4%	20,51	14,34	90,8	22,7	90,6%	81,7%	74,1%
67,00	0,22	0,79	5,78	198,8%	20,51	14,33	89,5	22,6	90,5%	81,8%	74,1%
68,00	0,22	0,81	5,76	198,7%	20,51	14,34	88,4	22,7	90,3%	81,9%	74,0%
69,00	0,22	0,82	5,71	200,5%	20,51	14,38	87,3	22,6	90,1%	82,0%	73,9%
70,00	0,22	0,85	5,73	198,5%	20,51	14,35	86,3	22,7	89,8%	82,1%	73,7%
71,00	0,22	0,90	5,69	198,1%	20,50	14,36	85,5	22,7	89,3%	82,1%	73,3%
72,00	0,22	0,92	5,65	198,9%	20,51	14,40	84,5	22,8	88,9%	82,1%	73,0%
73,00	0,22	0,96	5,63	198,3%	20,51	14,40	83,7	22,7	88,5%	82,2%	72,7%
74,00	0,18	0,98	5,58	199,3%	20,51	14,44	82,9	22,6	88,1%	82,2%	72,4%
75,00	0,22	1,01	5,62	196,4%	20,50	14,38	82,2	22,6	87,9%	82,3%	72,4%
76,00	0,22	1,03	5,65	194,0%	20,50	14,33	81,4	22,7	87,8%	82,4%	72,3%
77,00	0,18	1,03	5,64	194,5%	20,50	14,35	80,5	22,7	87,7%	82,5%	72,3%
78,00	0,18	1,06	5,60	194,8%	20,50	14,37	79,9	22,6	87,4%	82,5%	72,1%
79,00	0,18	1,08	5,61	193,6%	20,50	14,35	79,0	22,6	87,1%	82,6%	71,9%
80,00	0,18	1,10	5,54	195,6%	20,50	14,41	78,3	22,7	86,8%	82,6%	71,7%
81,00	0,18	1,13	5,56	193,8%	20,50	14,38	77,6	22,7	86,6%	82,7%	71,6%
82,00	0,18	1,15	5,46	197,0%	20,50	14,47	77,0	22,6	86,1%	82,6%	71,1%
83,00	0,13	1,17	5,41	198,4%	20,51	14,51	76,3	22,7	85,8%	82,6%	70,9%
84,00	0,18	1,18	5,43	197,2%	20,50	14,48	75,7	22,7	85,7%	82,7%	70,9%
85,00	0,18	1,18	5,41	197,9%	20,50	14,50	74,9	22,6	85,7%	82,8%	70,9%
86,00	0,18	1,20	5,38	198,6%	20,51	14,53	74,2	22,5	85,5%	82,8%	70,7%
87,00	0,13	1,22	5,36	198,3%	20,51	14,53	73,8	22,5	85,2%	82,8%	70,5%
88,00	0,13	1,26	5,30	199,8%	20,51	14,58	73,3	22,7	84,7%	82,8%	70,1%
89,00	0,13	1,28	5,23	201,9%	20,51	14,64	72,5	22,5	84,4%	82,7%	69,8%
90,00	0,13	1,31	5,23	200,4%	20,51	14,62	72,0	22,7	84,0%	82,8%	69,6%
91,00	0,13	1,34	5,18	201,4%	20,51	14,66	71,5	22,7	83,7%	82,8%	69,3%
92,00	0,09	1,34	5,17	202,0%	20,51	14,68	70,9	22,7	83,6%	82,8%	69,2%

93,00	0,11	1,35	5,15	202,3%	20,51	14,69	70,5	22,6	83,5%	82,8%	69,1%
94,00	0,13	1,36	5,12	203,1%	20,51	14,71	70,0	22,5	83,2%	82,8%	68,9%
95,00	0,13	1,38	5,08	203,9%	20,51	14,74	69,4	22,6	83,0%	82,9%	68,8%
96,00	0,09	1,38	5,05	205,3%	20,52	14,77	69,0	22,7	82,9%	82,9%	68,7%
97,00	0,09	1,37	5,13	202,2%	20,51	14,69	68,5	22,5	83,2%	83,0%	69,1%
98,00	0,09	1,38	5,10	203,0%	20,51	14,72	68,0	22,7	83,0%	83,1%	68,9%
99,00	0,09	1,36	5,12	203,2%	20,51	14,72	67,4	22,7	83,3%	83,2%	69,2%
100,00	0,09	1,37	5,12	202,9%	20,51	14,71	66,9	22,7	83,2%	83,2%	69,2%
101,00	0,09	1,36	5,17	201,1%	20,51	14,66	66,4	22,5	83,4%	83,3%	69,5%
102,00	0,09	1,34	5,23	199,0%	20,51	14,61	66,1	22,6	83,8%	83,4%	69,9%
103,00	0,09	1,35	5,25	197,8%	20,50	14,58	65,6	22,5	83,7%	83,5%	69,9%
104,00	0,09	1,35	5,28	196,3%	20,50	14,55	65,0	22,6	83,8%	83,6%	70,1%
105,00	0,04	1,35	5,33	194,2%	20,50	14,50	64,7	22,6	83,9%	83,7%	70,2%
106,00	0,09	1,35	5,30	195,5%	20,50	14,53	64,3	22,7	83,8%	83,7%	70,2%
107,00	0,04	1,32	5,43	190,9%	20,49	14,40	63,9	22,7	84,3%	83,9%	70,8%
108,00	0,09	1,36	5,36	192,2%	20,50	14,45	63,7	22,7	83,8%	83,9%	70,3%
109,00	0,04	1,40	5,24	195,7%	20,50	14,56	63,4	22,7	83,2%	83,7%	69,7%
110,00	0,04	1,44	5,19	196,4%	20,50	14,59	63,1	22,7	82,7%	83,7%	69,2%
111,00	0,04	1,46	5,12	198,5%	20,51	14,65	62,9	22,6	82,3%	83,6%	68,8%
112,00	0,04	1,48	5,06	200,3%	20,51	14,71	62,6	22,7	81,9%	83,6%	68,5%
113,00	0,04	1,51	5,01	201,4%	20,51	14,75	62,1	22,7	81,5%	83,6%	68,1%
114,00	0,04	1,57	4,97	200,4%	20,51	14,75	61,9	22,8	80,9%	83,5%	67,6%
115,00	0,04	1,55	4,97	201,0%	20,51	14,76	61,5	22,6	81,0%	83,5%	67,7%
116,00	0,04	1,50	4,97	203,2%	20,51	14,79	61,2	22,8	81,5%	83,7%	68,2%
117,00	0,04	1,52	4,99	201,7%	20,51	14,76	60,8	22,7	81,4%	83,7%	#DIV/0!
118,00	0,04	1,58	4,91	203,0%	20,51	14,82	60,7	22,7	80,6%	83,6%	#DIV/0!
119,00	0,04	1,64	4,86	202,1%	20,51	14,83	60,5	22,6	79,9%	83,5%	66,7%
120,00	0,00	1,66	4,83	203,0%	20,51	14,86	60,2	22,8	79,6%	83,5%	66,5%

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 2,62 g/hr

Test Duration: 120 min

Burn Rate : 0,86 Dry kg/hr

PRESSURE FACTOR: DGM 1st hr 0,990
 DGM 1 0,977
 DGM 2 0,981
 DGM 3 1,014

BAROMETRIC PRESSURE

Average: 30,32729858 in Hg
 Start: 30,35682857 in Hg
 End: 30,2977686 in Hg

TEMPERATURE FACTORS DGM 1st hr 0,990
 DGM 1 0,989
 DGM 2 0,988
 DGM 3 0,992

DGM VALUES

DGM 1st hr Final: 3204,760 Cuft
 Initial: 3192,940 Cuft

VOLUMES SAMPLED DGM 1st hr 11,592 SCft
 DGM 1 22,612 SCft
 DGM 2 22,992 SCft
 DGM 3 23,591 SCft

DGM 1 Final: 13245,852 Cuft
 Initial: 13222,136 Cuft

DGM 2 Final: 4445,520 Cuft
 Initial: 4422,034 Cuft

TOTAL TUNNEL VOLUME : 23023

DGM #3 Final: 28254,112 Cuft
 Initial: 28230,386 Cuft

SAMPLE RATIOS

Sample Train 1st Hr: 993,1
 Sample Train 1: 1018,2
 Sample Train 2: 1001,3

TEMPERATURES

DGM 1st hr 533,245 °R
 DGM 1 533,620 °R
 DGM 2 534,534 °R

Particulate concentration

Sample Train 1st Hr 0,000414 g/dscf
 Sample Train 1 0,000221 g/dscf
 Sample Train 2 0,000235 g/dscf
 Room 0,000000 g/dscf

CALIBRATION FACTORS

DGM 1st hr 1,0000
 DGM 1 0,9860
 DGM 2 1,0100
 DGM #3 0,9890

TOTAL EMISSIONS

Sample Train 1st Hr 4,77 g
 Sample Train 1 5,09 g
 Sample Train 2 5,41 g

TUNNEL FLOW RATE: 191,9 Dscfm

PARTICULATE CATCH

Total Sample Train 1: 5,00 mg
 Total Sample Train 2: 5,40 mg
 Total Sample Train 1 1st hour: 4,80 mg

EMISSION RATES

Sample Train 1st Hr 4,77 g/hr
 Sample Train 1 2,55 g/hr
 Sample Train 2 2,70 g/hr

DEVIATION: 3,01%

Cs Train 1 Train 2 Train 1st Hr
 0,0002211 0,00023486 0,0004141

* Elapsed Time min	Raw data row	Weight Remaining lbs	* CO %	* CO ₂ %	*1 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 cuft/min	DGM 1st hour Inlet 1st hour °F	DGM 1st hour Outlet 1st hour °F	Filter 1st hour °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 wc	Filter 1 in wc	Filter 2 in wc	Change in Surf Temp °F
0	155.00	4.5	0.9	4.6	228.4	71.3	103.4	402.2	425.5	387.3	379.9	179.7	0.19	72.5	72.1	72.0	0.19	72.0	73.0	72.8	0.19	72.7	71.0	72.3	0.08	0.05	-0.76	-1.19	-1.05	0.0
1	156.0	4.4	0.3	5.6	231.0	71.3	103.4	402.2	425.5	387.3	379.9	179.7	0.19	72.5	72.1	72.0	0.19	72.0	73.0	72.8	0.19	72.7	71.0	72.3	0.08	0.05	-0.69	-1.19	-0.96	-2.7
2	157.0	4.4	0.5	2.6	242.8	71.3	95.3	383.2	428.4	378.8	378.8	183.0	0.19	73.1	72.1	72.2	0.19	72.6	72.7	74.6	0.19	72.8	71.1	73.5	0.08	0.05	-0.70	-1.13	-0.96	-2.9
3	158.0	4.4	0.4	5.0	264.5	71.3	93.8	399.1	422.4	384.6	377.4	184.7	0.19	73.1	72.1	72.3	0.19	72.6	72.6	74.8	0.19	72.7	71.2	73.6	0.08	0.06	-0.69	-1.14	-0.97	-0.2
4	159.0	4.4	0.3	5.2	285.8	71.3	93.8	402.1	427.0	385.0	377.4	184.7	0.19	73.1	72.1	72.3	0.19	72.6	72.6	74.8	0.19	72.7	71.2	73.6	0.08	0.06	-0.69	-1.14	-0.97	3.0
5	160.0	4.2	0.3	6.3	304.7	71.3	95.8	445.1	421.6	372.7	372.7	187.8	0.19	73.1	72.2	72.5	0.19	72.6	72.4	75.4	0.19	72.6	71.3	74.1	0.08	0.06	-0.69	-1.13	-0.96	6.1
6	161.0	4.1	0.2	7.4	295.4	71.6	93.3	468.3	416.8	375.5	369.8	189.3	0.19	73.1	72.2	72.6	0.19	72.6	72.3	75.6	0.19	72.5	71.3	74.3	0.08	0.05	-0.69	-1.13	-0.97	9.0
7	162.0	4.0	0.5	7.3	254.9	71.3	90.0	462.5	412.4	371.6	366.8	190.8	0.19	73.1	72.2	72.7	0.19	72.6	72.3	75.5	0.19	72.5	71.3	74.3	0.08	0.05	-0.69	-1.13	-0.97	5.9
8	163.0	4.0	0.8	5.5	235.4	71.2	89.0	452.1	407.8	368.9	362.0	192.2	0.19	73.1	72.3	72.8	0.19	72.6	72.3	75.4	0.19	72.5	71.4	74.3	0.08	0.05	-0.68	-1.13	-0.97	2.1
9	164.0	3.9	0.8	5.5	225.5	71.4	88.3	444.5	403.3	366.9	360.6	193.5	0.19	73.1	72.2	72.9	0.19	72.7	72.2	75.5	0.19	72.5	71.5	74.4	0.08	0.04	-0.68	-1.14	-0.97	-1.2
10	165.0	3.9	0.8	5.5	219.5	71.7	88.2	438.3	398.4	364.6	357.4	194.8	0.19	73.1	72.3	73.1	0.19	72.7	72.2	75.5	0.19	72.5	71.6	74.4	0.08	0.04	-0.68	-1.14	-0.97	-4.2
11	166.0	3.8	0.8	5.5	215.6	71.9	87.9	433.4	396.0	362.3	354.2	196.2	0.19	73.1	72.3	73.2	0.19	72.7	72.2	75.6	0.19	72.5	71.6	74.0	0.08	0.04	-0.69	-1.13	-0.97	-5.9
12	167.0	3.8	0.8	5.6	213.2	71.0	87.7	430.4	389.6	360.0	351.1	197.3	0.19	73.1	72.3	73.3	0.19	72.7	72.2	75.7	0.19	72.5	71.7	74.7	0.08	0.04	-0.68	-1.13	-0.97	-9.2
13	168.0	3.7	0.8	5.8	212.1	71.3	87.6	428.0	385.1	358.0	348.1	198.5	0.19	73.1	72.3	73.4	0.19	72.7	72.2	75.8	0.19	72.6	71.7	74.8	0.08	0.05	-0.68	-1.13	-0.98	-11.4
14	169.0	3.6	0.7	1.1	212.5	71.1	87.7	427.4	381.2	356.1	345.4	199.6	0.19	73.1	72.3	73.6	0.19	72.8	72.2	75.9	0.19	72.5	71.8	74.9	0.08	0.05	-0.68	-1.13	-0.98	-13.0
15	170.0	3.6	0.8	6.2	212.0	71.4	87.5	427.6	376.6	354.0	342.5	200.7	0.19	73.1	72.4	73.6	0.19	72.8	72.2	76.0	0.19	72.6	71.8	75.0	0.08	0.04	-0.69	-1.13	-0.97	-14.6
16	171.0	3.6	0.8	6.2	211.6	71.4	87.5	427.2	372.6	351.7	339.8	201.7	0.19	73.1	72.4	73.8	0.19	72.8	72.2	76.1	0.19	72.6	71.9	75.1	0.08	0.05	-0.69	-1.13	-0.99	-16.3
17	172.0	3.5	0.8	6.4	212.0	71.4	87.0	428.3	368.6	350.4	336.9	202.6	0.19	73.1	72.4	73.9	0.19	72.8	72.2	76.1	0.19	72.7	72.0	75.2	0.08	0.04	-0.69	-1.13	-0.97	-17.5
18	173.0	3.4	0.8	6.5	212.1	71.0	86.1	429.8	364.8	348.2	334.2	203.5	0.19	73.1	72.4	74.0	0.19	72.9	72.2	76.2	0.19	72.7	72.1	75.2	0.08	0.05	-0.68	-1.12	-0.98	-18.8
19	174.0	3.4	0.7	6.9	213.3	71.3	87.0	432.7	361.4	346.6	331.8	204.3	0.19	73.2	72.4	74.1	0.19	72.9	72.2	76.2	0.19	72.7	72.2	75.3	0.08	0.04	-0.68	-1.13	-0.98	-19.6
20	175.0	3.3	0.6	7.5	216.3	71.6	86.5	440.1	357.9	344.9	328.8	205.0	0.19	73.2	72.4	74.1	0.19	73.0	72.2	76.3	0.19	72.8	72.3	75.3	0.08	0.05	-0.67	-1.13	-0.97	-19.5
21	176.0	3.2	0.5	8.4	219.0	72.6	87.3	449.5	354.6	344.0	326.8	205.7	0.19	73.3	72.5	74.2	0.19	73.0	72.3	76.4	0.19	72.8	72.3	75.5	0.08	0.05	-0.68	-1.12	-0.97	-18.8
22	177.0	3.2	0.4	8.8	221.5	71.8	87.6	459.6	351.6	343.3	324.9	206.4	0.19	73.3	72.5	74.3	0.19	73.0	72.3	76.5	0.19	72.8	72.4	75.6	0.08	0.05	-0.68	-1.12	-0.97	-17.7
23	178.0	3.1	0.3	10.1	225.4	71.4	88.1	471.2	348.8	342.1	323.1	207.0	0.19	73.4	72.5	74.4	0.19	73.0	72.3	76.6	0.19	72.8	72.5	75.7	0.08	0.05	-0.69	-1.12	-0.97	-16.5
24	179.0	2.9	0.3	11.2	231.9	71.9	88.9	499.4	344.3	341.3	320.6	208.1	0.19	73.4	72.5	74.4	0.19	73.1	72.3	76.9	0.19	72.9	72.6	75.9	0.08	0.05	-0.68	-1.12	-0.97	-15.1
25	180.0	2.9	0.3	11.2	231.9	71.9	88.9	499.4	344.3	341.3	320.6	208.1	0.19	73.4	72.5	74.4	0.19	73.1	72.3	76.9	0.19	72.9	72.6	75.9	0.08	0.05	-0.68	-1.12	-0.97	-15.1
26	181.0	2.9	0.4	11.7	235.3	71.6	88.9	513.7	342.5	341.5	319.9	208.6	0.19	73.4	72.6	74.6	0.19	73.1	72.3	76.9	0.19	72.9	72.7	76.0	0.08	0.05	-0.68	-1.12	-0.98	-9.7
27	182.0	2.8	0.4	11.7	237.3	71.6	89.2	523.8	341.2	342.3	319.4	209.0	0.19	73.5	72.6	74.7	0.19	73.2	72.4	77.1	0.19	72.9	72.7	76.1	0.08	0.05	-0.68	-1.12	-0.98	-7.8
28	183.0	2.7	0.4	11.8	238.4	71.6	89.4	534.1	340.6	341.6	318.6	209.4	0.19	73.5	72.6	74.8	0.19	73.2	72.4	77.2	0.19	72.9	72.7	76.2	0.08	0.05	-0.69	-1.12	-0.98	-4.4
29	184.0	2.6	0.5	11.8	239.6	72.0	89.0	538.8	341.5	343.6	319.9	209.9	0.19	73.5	72.6	74.9	0.19	73.3	72.5	77.3	0.19	73.1	72.9	76.3	0.08	0.05	-0.68	-1.12	-0.97	-4.2
30	185.0	2.5	0.5	11.8	239.6	72.0	89.5	544.3	343.3	344.6	320.6	210.3	0.19	73.6	72.6	75.0	0.19	73.4	72.5	77.4	0.19	73.1	72.9	76.4	0.08	0.05	-0.68	-1.12	-0.98	-2.3
31	186.0	2.5	0.5	11.8	240.5	71.8	89.5	545.1	345.6	345.1	321.5	210.6	0.19	73.7	72.7	75.1	0.19	73.5	72.6	77.5	0.19	73.3	73.1	76.5	0.08	0.05	-0.70	-1.12	-0.98	-0.3
32	187.0	2.3	0.6	11.8	242.0	71.9	89.4	555.2	348.6	347.0	322.5	211.0	0.19	73.7	72.7	75.1	0.19	73.5	72.6	77.5	0.19	73.3	73.1	76.5	0.08	0.05	-0.70	-1.12	-0.98	1.9
33	188.0	2.2	0.6	11.8	242.5	72.1	89.6	559.6	352.1	348.6	324.0	211.2	0.19	73.7	72.7	75.2	0.19	73.5	72.6	77.6	0.19	73.3	73.1	76.6	0.08	0.05	-0.69	-1.12	-0.97	4.2
34	189.0	2.1	0.6	12.0	242.5	71.9	89.5	564.3	355.8	349.9	325.3	211.6	0.19	73.7	72.8	75.3	0.19	73.6	72.7	77.7	0.19	73.4	73.2	76.7	0.07	0.05	-0.69	-1.11	-0.97	6.5
35	190.0	2.1	0.6	12.0	242.5	71.9	89.5	564.3	355.8	349.9	325.3	211.6	0.19	73.7	72.8	75.3	0.19	73.6	72.7	77.7	0.19	73.4	73.2	76.7	0.07	0.05	-0.69	-1.11	-0.97	6.5
36	191.0	2.0	0.8	12.1	243.6	72.1	90.2	573.0	363.4	353.7	328.5	212.1	0.19	73.8	72.8	75.4	0.19	73.6	72.7	77.9	0.19	73.4	73.3	76.8	0.08	0.05	-0.70	-1.11	-0.99	11.2
37	192.0	1.9	0.9	12.2	244.8	72.3	90.3	577.2	367.3	355.9	330.3	212.3	0.19	73.9	72.8	75.5	0.19	73.6	72.8	77.9	0.19	73.4	73.4	76.9	0.08	0.05	-0.70	-1.12	-0.99	13.7
38	193.0	1.8	1.0	12.3	245.6	72.2	90.6	581.2	370.5	359.2	332.2	212.6	0.19	74.0	72.9	75.6	0.19	73.7	72.9	78.0	0.19	73.5	73.5	77.0	0.08	0.05	-0.71	-1.12	-0.99	16.2
39	194.0	1.7	1.0	12.3	245.9	72.4	90.6	584.5	375.7	360.4	332.0	212.7	0.19	74.0	72.9	75.6	0.19	73.7	72.8	78.1	0.19	73.5	73.5	77.1	0.08	0.05	-0.70	-1.11	-0.98	18.6
40	195.0	1.7	1.1	12.3	246.3	72.4	90.6	587.3	379.6	362.8	335.9	212.8	0.19	74.0	72.9	75.6	0.19	73.7	72.8	78.2	0.19	73.6	73.5	77.2	0.08	0.05	-0.70	-1.11	-0.98	20.8
41	196.0	1.6	1.1	12.3	246.6	72.4	90.6	590.1	383.6	3																				

115	270.0	0.1	1.6	5.0	142.8	72.6	82.7	323.6	406.0	330.1	345.4	211.8	0.00	73.8	74.0	74.9	0.19	74.4	74.2	77.6	0.19	74.3	78.5	77.2	0.08	0.02	0.02	-1.05	-0.96	-31.5
116	271.0	0.1	1.5	5.0	142.1	73.0	83.4	321.7	404.4	328.4	344.4	211.5	0.00	73.8	74.0	74.9	0.19	74.4	74.2	77.6	0.19	74.3	78.6	77.2	0.08	0.02	0.03	-1.06	-0.96	-32.8
117	272.0	0.1	1.5	5.0	141.5	72.8	83.5	320.5	403.3	327.8	343.5	211.2	0.00	73.8	74.0	74.9	0.19	74.3	74.2	77.6	0.19	74.3	78.6	77.2	0.08	0.02	0.03	-1.05	-0.95	-33.7
118	273.0	0.1	1.6	4.9	141.2	72.9	83.5	319.2	402.1	326.5	342.6	210.8	0.00	73.8	73.9	74.9	0.19	74.3	74.2	77.6	0.19	74.3	78.6	77.1	0.08	0.02	0.03	-1.06	-0.97	-34.7
119	274.0	0.1	1.6	4.9	140.9	72.7	83.6	318.0	400.4	325.5	341.7	210.5	0.00	73.8	73.9	74.9	0.19	74.2	74.2	77.5	0.19	74.2	78.6	77.1	0.08	0.02	0.03	-1.05	-0.96	-35.7
120	275.0	0.0	1.7	4.8	140.4	73.0	83.3	316.9	399.2	325.2	340.7	210.2	0.00	73.7	73.9	74.9	0.19	74.2	74.2	77.5	0.19	74.2	78.6	77.1	0.08	0.02	0.03	-1.05	-0.96	-36.5

DATA 2026-04-15 PI 20355 EPA RUN 3 CAT 1
unit preburn

Time acquisition minutes	Flue	scale	Right	Back	bottom	Top	Left
	temp						
	°F	lbs	°F	°F	°F	°F	°F
1	69,51	2,48	68,64	68,01	67,47	68,87	67,95
2	71,51	2,87	68,65	68,11	67,51	70,45	67,98
3	100,51	2,38	69,60	68,81	67,52	76,40	68,04
4	126,19	2,26	71,21	68,74	67,56	99,03	68,48
5	195,82	2,17	71,63	69,02	67,70	157,34	69,18
6	258,24	2,07	72,56	69,52	67,83	238,11	70,30
7	322,43	1,87	74,35	70,47	67,96	343,88	72,17
8	370,68	1,68	77,31	71,68	68,07	452,14	74,83
9	402,35	1,47	81,60	73,43	68,26	545,44	78,72
10	393,28	1,37	88,40	75,88	68,44	587,19	84,41
11	399,58	1,18	96,34	79,03	68,61	617,58	91,79
12	402,09	1,08	105,50	82,97	68,80	638,40	100,59
13	396,98	8,43	115,62	88,31	69,07	620,25	107,54
14	299,75	6,47	122,12	95,36	69,35	549,37	112,04
15	272,30	6,37	130,39	101,44	69,69	502,72	120,38
16	265,69	6,37	137,00	107,39	70,04	463,71	126,64
17	263,59	6,27	141,30	112,79	70,42	431,54	131,17
18	260,63	6,27	145,84	117,53	70,89	405,12	135,36
19	264,86	6,16	150,47	121,64	71,35	383,97	139,52
20	284,98	6,06	155,26	125,63	71,88	384,05	143,69
21	302,51	5,96	159,57	129,10	72,45	403,12	149,50
22	305,42	5,86	163,40	132,62	73,04	412,12	154,02
23	311,64	5,77	166,51	136,50	73,67	421,42	157,70
24	329,11	5,57	170,54	140,80	74,37	441,11	161,23
25	357,13	5,48	174,25	145,93	75,16	478,47	164,42
26	368,82	5,26	178,03	151,95	75,94	511,98	167,48
27	378,33	5,16	181,81	158,49	76,88	544,56	171,11
28	381,46	5,17	186,38	165,47	77,78	564,30	174,80
29	327,84	4,97	191,81	172,84	78,74	566,24	178,56
30	296,87	4,87	198,31	180,08	79,73	550,23	182,87
31	278,48	4,68	204,53	186,85	80,78	531,17	187,30
32	267,92	4,68	212,04	192,91	81,87	517,63	192,01
33	261,06	4,56	219,21	198,06	83,02	506,57	196,69
34	258,79	4,47	226,02	202,52	84,18	500,44	201,06
35	258,63	4,47	232,43	206,16	85,32	499,05	205,01
36	260,51	4,27	238,47	209,39	86,53	502,43	208,72
37	264,11	4,27	243,90	212,33	87,79	511,62	212,12
38	266,48	4,17	249,19	214,96	89,02	523,49	215,30
39	269,00	4,08	253,99	217,36	90,28	534,60	218,44
40	270,62	3,98	258,89	219,77	91,57	545,31	221,56
41	271,59	3,88	263,52	222,05	92,89	554,15	224,80
42	271,76	3,77	268,16	224,21	94,22	562,52	228,14
43	271,10	3,67	272,86	226,40	95,57	568,94	231,86
44	270,73	3,57	277,41	228,71	96,94	574,02	235,67
45	272,22	3,48	281,85	230,91	98,33	581,05	239,82
46	274,88	3,38	286,44	233,15	99,72	587,55	244,02
47	276,79	3,28	291,08	235,46	101,11	597,56	248,33
48	277,41	3,18	295,55	237,95	102,54	608,41	253,06
49	278,82	3,07	300,13	240,46	104,00	617,07	257,72
50	280,51	2,97	305,01	243,08	105,46	626,14	262,47
51	281,77	2,78	309,67	245,69	106,90	634,64	267,29
52	281,70	2,68	314,50	248,57	108,40	639,77	272,16
53	282,66	2,58	319,39	251,50	109,90	643,68	276,93
54	282,74	2,49	323,74	254,38	111,38	645,85	281,65
55	282,18	2,39	328,61	257,71	112,93	649,05	286,68
56	279,67	2,17	333,20	260,86	114,45	649,51	291,41
57	277,06	2,17	337,70	264,32	116,00	648,32	296,17
58	274,57	2,08	342,39	267,90	117,60	648,10	300,80
59	272,90	1,98	346,91	271,74	119,20	648,29	305,64
60	270,98	1,98	351,62	275,67	120,83	648,17	310,16
61	269,31	1,88	356,07	279,77	122,43	648,59	314,97
62	267,24	1,79	360,62	284,18	124,11	646,38	319,60
63	264,52	1,69	365,11	288,80	125,76	646,33	324,13
64	262,99	1,69	369,48	293,53	127,48	644,57	328,63

DATA 2026-04-15 PI 20355 EPA RUN 3 CAT 1
unit preburn

65	259,54	1,59	373,53	298,41	129,17	638,91	332,87
66	257,12	1,59	377,24	303,59	130,92	633,41	337,34
67	252,88	1,47	381,04	308,97	132,68	628,87	341,81
68	248,71	1,47	384,48	314,59	134,47	619,29	346,10
69	243,60	1,38	387,68	320,30	136,24	608,89	350,35
70	238,19	1,38	390,65	326,27	138,04	595,00	354,54
71	233,31	1,38	393,38	332,54	139,86	582,49	358,70
72	229,10	1,38	395,31	338,83	141,69	568,24	362,55
73	225,53	1,38	397,16	345,35	143,50	556,06	366,08
74	222,48	1,38	398,65	351,91	145,35	545,16	369,49
75	219,45	1,28	399,57	358,37	147,16	534,30	372,47
76	216,09	1,28	400,34	364,63	148,99	524,01	375,14
77	213,24	1,28	400,67	370,40	150,82	514,02	377,24
78	209,69	1,28	400,78	376,20	152,62	505,10	379,58
79	207,30	1,28	400,71	381,56	154,41	495,57	380,82
80	204,97	1,28	400,54	386,42	156,21	487,48	382,27
81	202,90	1,28	399,85	391,03	157,98	480,42	383,65
82	200,78	1,18	399,54	395,35	159,76	472,73	384,49
83	198,71	1,18	399,11	399,23	161,50	465,62	385,04
84	196,23	1,28	398,51	403,02	163,24	459,43	385,48
85	194,32	1,18	397,66	406,42	164,98	453,48	385,74
86	192,47	1,18	396,78	409,34	166,70	447,37	385,60
87	190,95	1,18	396,28	411,98	168,41	442,82	385,48
88	188,94	1,18	395,00	414,45	170,11	437,85	385,18
89	187,40	1,18	394,24	416,79	171,76	433,83	384,79
90	185,70	1,18	393,29	419,07	173,42	428,52	384,26
91	184,10	1,18	392,13	420,91	175,02	423,96	383,09
92	182,35	1,09	390,63	422,65	176,63	419,51	382,23
93	180,91	1,09	389,86	423,80	178,21	415,51	381,60



POLYTESTS

TESTING THROUGH YOUR REALITY

Date: 2026-04-18

Manufacturer: Morso

Model: 2B classic
PT 2 M.M

Project #: PT 20355

Run: 3

Tech: M M

Reviewer: DO

- Loading @ 5 LBS slow fine
- After 2min close Door
- At 100 LBS insert preload
- close Door immediately
- At 500 LBS close air inlet (minimum setting)
- At 11 LBS insert Load
- After 1min close Door
- At 5min close air inlet (minimum setting)

TEST LOAD CONFIGURATION

Date: 2026-04-15

Manufacturer: Morso

PRE / POST CHECKS

Model: 2B Classic

Project #: PI 20355

Run: 3

Tech: M.M

Reviewer: JS

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
<u>EM 334</u>	<u>9:00</u>	<u>ok</u>	<u>ok</u>

Pre-Test

Post-Test

Facility Conditions:

Smoke Capture Check (tunnel velocity)

<u>ok</u>	NA
4 sides <u>ok</u>	<u>ok</u>

Picture.....

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

2026-04-13

Date Dilution Tunnel Cleaned.....

2026-04-13

Induced Draft Check (max 0.005 H₂O)

ok

Traverse before ignition.....

ok

Temperature System:

Ambient (65°-90°F) Y/N.....

ok

Proportional Checks:

Thermocouple check.....

ok

Pitot Clean.....

ok

Pitot verification.....

ok

Pictures for report.....

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.....

ok



Date: 2020-04-15

Project #: PJ 60355

Leakage Checks Tunnel Samplers

Manufacturer: Morso

Run: 3

Tech: MM

Model: 2B class 2

Reviewer: DO

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)
Vacuum (inches Hg.)	-6	-6	-6
Final 1 minute DGM (Liter)	374 408 38	375 081 31	125 884 16
Initial 1 minute DGM (Liter)	374 408 35	375 081 29	125 884 10
Change (Liter)	0.03	0.02	0.06
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)			
Check OK	OK	OK	OK



Date: 2020-04-15 Manufacturer: Morse

Model: BB classic

Project #: PI 20355

Run: 3

Tech: MR

Reviewer: ISO

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.)	-6	-6	-6	-6
Final 1 minute DGM (Liter)	3192 88	3204 82	799392 72	800067 70
Initial 1 minute DGM (Liter)	3192 88	3204 82	799392 72	800067 70
Change (Liter)	Ø	Ø	Ø	Ø
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2026-04-15

Manufacturer: Monso

Model: 2B classic

Project #: PJ 2355

Run: 3

Tech: mjm

Reviewer: [Signature]

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-6	-6
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	0.4	.4
Check OK (no change after 15 sec.)	OK	OK	OK



Date: 2024-04-15

Project #: PI 20355

Manufacturer: Mosso

Run: 3

Tech: MM

Model: BCL550

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	100.0 mg, Class S	100.0 mg
Analytical	EM-125	200.0000 g, Class S	200.0000 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: 2026-04-15

 Manufacturer: Moroso

 Model: 2B classic

 Project #: PI 20355

 Run: 3

 Tech: M.M

 Reviewer: 80

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: .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	0.075	73.41
B - Centroid	3.00	3.50	4	0.074	73.69
A-1	0.50	0.50	0.50	0.061	73.41
A-2	1.50	1.75	2	0.069	73.44
A-3	4.50	5.25	6	0.066	73.44
A-4	5.60	6.5	7.5	0.061	73.64
B-1	0.50	0.50	0.50	0.061	73.69
B-2	1.50	1.75	2	0.066	73.81
B-3	4.50	5.25	6	0.079	73.81
B-4	5.60	6.5	7.5	0.064	73.83
				AVERAGE	

CONTINUOUS ANALYZERS

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	N.A.	
B-2	1.75		
B-3	3.55		
B-4	8.45		
B-5	10.25		
B-6	11.47		

Date: 2026-04-15

 Manufacturer: Moroso

 Model: 2B classic

 Project #: PI 20355

 Run: 3

 Tech: J.M.

 Reviewer: DO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3085	3000	1034	1000
Tolerance CO	0	+/- 0.02	0085	+/- 0.15	0034	+/- 0.05
CO ₂	0	0	1801	1800	985	1000
Tolerance CO ₂	0	+/- 0.02	001	+/- 0.5	015	+/- 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	3087	1039	0	0.02	0002	0.15	0005	0.05	✓	
CO ₂	0	1804	986	0	0.02	003	0.5	001	0.5	✓	

TEST DATA LOG

Date: 2026-04-15 Manufacturer: Mosco Model: 2B classic
 Project #: pt 20355 Run: 3 Tech: MM Reviewer: [Signature]

RAW DRY GAS METER READINGS

Test	Final	System 1 st hour (Cuft)	System 1 (Liter)	System 2 (Liter)	Blank (Liter)
	Initial				
		3204.76	375080.76	125883.11	800.062.35
		3192.94	374409.18	125218.05	799395.48

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102.8	103.6
Humidity (%):	25.5	24.8
Air Velocity (max 50ft/Min)	0	0



M TP-EPA – V16 – November 2025

Date: 2026-04-15

Project #: PI 2-355

Manufacturer: M or so

Run: 3

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Model: 2B class 55

Tech: M. M

Reviewer: SD

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					
2026-04-14	17:00	907-908	13	21	907-910	60
		02528	41531	108 7333	02521	41910
2026-04-15	10:00	02529	41530	108 7334	02522	41911

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					
2026-04-15	14:15	907-908	13	21	907-910	60
		02575	41543	108 7335	02569	41923
2026-04-20	8:00	02569	41538	108 7335	02567	41915
2026-04-21	9:00	02569	41538	108 7335	02567	41915



DILUTION TUNNEL PARTICULATE SAMPLER DATA

Manufacturer: MORSE

Date: 2026-04-15

Run: 3

Tech: MM

Model: DB classic

Reviewer: SS

Project #: PI 6355

TEST FILTERS					
SYSTEM 2			TEST FILTERS		
Pre-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	
Date	Time				
2026-04-14	17:00	911-912	64	913	
		02510	41971	01262	
2026-04-15	10:00	02509	41970	01263	
SYSTEM 2			TEST FILTERS		
Post-test Weight Record	Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time				
2026-04-15	14:15	911-912	64	913	2026-04-15
		02557	41980	01263	MM
2026-04-20	8:00	02556	41976	01263	14:00
2026-04-21	9:00	02556	41976	01263	

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	16-04-2026
Technicien	M.M
Project #	PI 20355

Description de l'unité

Manufacturier	MORSO	
Modèle	2B CLASSIC	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	0,685	cu ft.
Appliance weight empty	n.a	lbs
Firebox maximum lenght	19,125	inch

Paramètres du test

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

Échantillonnage

Targeted Blank sampling rate	0,20	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):	0,989	
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	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20355
Date 16-04-2026
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):	101,9	101,4
Barometer (in.Hg):	30,091059	29,94340873
Dry Bulb (F):	71,801895	71,17
Humidity (%):	23,4	21,9
Air velocity (ft/min)	0	0

DGM #1st hour	Final:	3217,120	cuft
	Initial:	3204,980	cuft

DGM #1	Final:	13272,223	cuft
	Initial:	13245,950	cuft

DGM #2	Final:	4471,702	cuft
	Initial:	4445,659	cuft

DGM room	Final:	28280,533	cuft
	Initial:	28254,212	cuft

	Final:	3217,120	cuft
	Initial:	3204,980	cuft

	Final:	375827,490	Liter
	Initial:	375083,520	Liter

	Final:	126624,500	Liter
	Initial:	125887,040	Liter

	Final:	800815,510	Liter
	Initial:	800070,180	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 20355
Date	16-04-2026
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: -0,17176841 in. H2O
 Barometer: 30,091 in. Hg

tunnel of 12" and more, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
y center			0,0000
x center			0,0000
y1			0,0000
y2			0,0000
y3			0,0000
y4			0,0000
y5			0,0000
y6			0,0000
x1			0,0000
x2			0,0000
x3			0,0000
x4			0,0000
x5			0,0000
x6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

Taverse Point	% of Diameter
1	4.4
2	14.6
3	29.6
Center	50.0
4	70.4
5	85.4
6	95.6

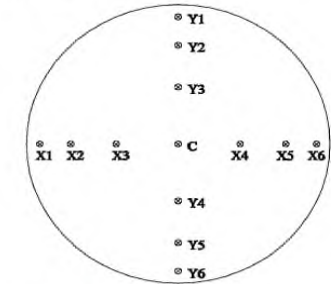


FIG. 5 Dilution Tunnel Diameter Equal To or Greater Than 0.3 m (12 in.) Traverse Point Table

PITOT CONSTANT=
0,910

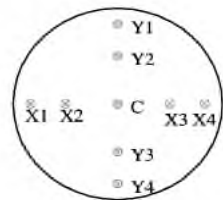
Tunnel less than 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
y center	0,075	71,46	0,2739
x center	0,074	71,51	0,2720
y1	0,061	71,46	0,2470
y2	0,068	71,37	0,2608
y3	0,067	71,37	0,2588
y4	0,061	71,41	0,2470
x1	0,062	71,5	0,2490
x2	0,067	71,5	0,2588
x3	0,080	71,5	0,2828
x4	0,063	71,4	0,2510
AVERAGE	0,0678	71,4440	0,2601

Taverse Point	% of Diameter
1	6.7 *
2	25.0
Center	50.0
3	75.0
4	93.3 *

* No closer than 12.7 mm
(0.50 in.) to tunnel wall

FIG. 6 Dilution Tunnel Diameter Less Than 0.3 m (12 in.) Traverse Point Table



Project nu.	PI 20355
Date	16-04-2026
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date (yy/mm/dd)	Heure	Test end date & time
	probe	front/ Back	gasket	probe	front/ Back	gasket	probe	front/ Back	gasket	Filter			
Number	15	900-901	6	30	902-903	16	37	904-905	18	906			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	108,7756	0,2470	5,0450	110,2126	0,2486	4,9749	107,9751	0,2518	4,1828	0,1256	2026-04-15	17:00	
Before (6)	108,7755	0,2469	5,0449	110,2125	0,2486	4,9748	107,9752	0,2517	4,1829	0,1257	2026-04-16	09:30	
After (1)	108,7763	0,2474	5,0462	110,2130	0,2494	4,9763	107,9757	0,2526	4,1854	0,1258	2026-04-16	14:15	
After (2)	108,7757	0,2472	5,0455	110,2126	0,2493	4,9752	107,9753	0,2521	4,1835	0,1258	2026-04-20	08:00	
After (3)	108,7757	0,2472	5,0455	110,2126	0,2493	4,9752	107,9753	0,2521	4,1835	0,1258	2026-04-21	09:00	
After (4)													
After (5)													
After (6)	108,7757	0,2472	5,0455	110,2126	0,2493	4,9752	107,9753	0,2521	4,1835	0,1258	2026-04-21	09:00	2026-04-16 14:00
Difference	0,0002	0,0003	0,0006	0,0001	0,0007	0,0004	0,0001	0,0004	0,0006	0,0001			
Total (mg)		1,1			1,2			1,1		0,1			
Total ajusté (mg)		1,00			1,10			1,00					

Project nu.

Date

Technicien

PI 20355

16-04-2026

M.M

Manufacturer: MORSO
Model: 2B CLASSIC

Run: 4
Project #: PI 20355
Test Duration: 132 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: 76,55%
Combustion Efficiency: 94,93%
Heat Transfer Efficiency: 80,64%

	HHV	LHV
Eff	76,55%	82,74%
Comb Eff	94,93%	94,93%
HT Eff	80,64%	87,16%
Output	12 451	kJ/h
Burn Rate	0,82	kg/h
Grams CO	141	g
Input	16 265	kJ/h
MC wet	16,47	

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

Heat Output:	11 811 Btu/h
Heat Input:	15 429 Btu/h
Burn Duration:	2,20 h
Burn Rate:	1,81 lb/h
Stack Temp:	207,8 Deg. F

Averages				1,75	20,42	12,95	97,93	22,18	0,90	0,82	#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	2,16	0,20	3,61	415,5%	20,69	16,98	133,1	22,1	96,9%	70,5%	68,3%
1,00	2,07	0,31	2,60	574,9%	20,75	17,99	156,3	22,2	92,9%	58,2%	54,1%
2,00	2,03	0,17	7,01	173,8%	20,47	13,38	168,0	22,0	98,6%	75,9%	74,8%
3,00	1,98	0,05	8,53	129,0%	20,37	11,82	179,4	21,9	99,9%	77,2%	77,1%
4,00	1,90	0,06	9,52	104,9%	20,31	10,75	186,8	22,1	99,8%	77,8%	77,6%
5,00	1,94	0,08	9,55	103,9%	20,30	10,71	192,4	22,0	99,6%	77,4%	77,1%
6,00	1,85	0,22	10,50	83,3%	20,23	9,62	164,1	22,2	98,5%	80,3%	79,1%
7,00	1,81	0,20	9,46	103,5%	20,30	10,75	148,0	22,1	98,6%	80,6%	79,5%
8,00	1,81	0,24	8,67	120,4%	20,35	11,56	139,9	21,9	98,1%	80,5%	78,9%
9,00	1,76	0,26	8,59	122,0%	20,36	11,64	135,0	21,9	97,9%	80,8%	79,1%
10,00	1,71	0,26	8,59	121,9%	20,36	11,63	132,0	22,0	97,9%	81,0%	79,3%
11,00	1,71	0,29	8,46	124,7%	20,36	11,76	130,0	22,0	97,6%	81,1%	79,1%
12,00	1,67	0,26	8,77	117,4%	20,34	11,44	129,2	21,9	97,9%	81,4%	79,7%
13,00	1,62	0,20	9,28	107,4%	20,31	10,94	129,2	22,1	98,6%	81,9%	80,7%
14,00	1,58	0,14	9,92	95,1%	20,28	10,28	129,4	22,2	99,1%	82,3%	81,6%
15,00	1,53	0,15	10,43	85,7%	20,24	9,74	130,3	22,2	99,1%	82,6%	81,8%
16,00	1,49	0,18	10,72	80,2%	20,22	9,41	131,0	22,0	98,9%	82,7%	81,7%
17,00	1,49	0,20	10,86	77,6%	20,21	9,25	131,3	21,9	98,7%	82,7%	81,6%
18,00	1,45	0,21	10,92	76,4%	20,20	9,17	131,4	21,8	98,6%	82,7%	81,6%
19,00	1,39	0,21	10,87	77,3%	20,21	9,23	131,3	22,0	98,7%	82,7%	81,6%
20,00	1,35	0,21	10,89	77,0%	20,21	9,21	131,2	22,3	98,7%	82,8%	81,6%
21,00	1,30	0,21	10,97	75,6%	20,20	9,12	131,3	22,2	98,6%	82,8%	81,6%
22,00	1,26	0,23	11,04	74,3%	20,20	9,04	131,1	22,3	98,5%	82,8%	81,6%
23,00	1,26	0,24	11,09	73,3%	20,19	8,98	130,8	22,3	98,4%	82,9%	81,6%
24,00	1,22	0,25	11,16	72,2%	20,19	8,90	131,1	22,4	98,3%	82,9%	81,5%
25,00	1,17	0,28	11,24	70,6%	20,18	8,80	131,0	22,4	98,2%	82,9%	81,4%
26,00	1,13	0,30	11,27	69,8%	20,18	8,76	130,8	22,3	98,0%	82,9%	81,3%
27,00	1,13	0,32	11,29	69,2%	20,17	8,73	130,7	22,4	97,9%	83,0%	81,2%
28,00	1,08	0,43	11,33	66,9%	20,16	8,61	131,4	22,4	97,1%	82,9%	80,5%
29,00	1,03	0,49	11,40	65,1%	20,15	8,50	131,2	22,4	96,7%	82,9%	80,2%
30,00	0,99	0,47	11,58	62,9%	20,14	8,32	131,2	22,4	96,9%	83,0%	80,4%
31,00	0,99	0,53	11,73	60,3%	20,13	8,14	131,7	22,5	96,6%	83,0%	80,2%
32,00	0,94	0,57	11,70	60,1%	20,13	8,14	131,6	22,4	96,2%	83,0%	79,9%
33,00	0,85	0,59	11,76	59,0%	20,12	8,07	131,8	22,4	96,2%	83,0%	79,8%
34,00	0,85	0,65	11,86	57,0%	20,11	7,93	132,1	22,5	95,8%	83,0%	79,5%
35,00	0,81	0,75	11,85	55,9%	20,11	7,88	132,3	22,5	95,1%	83,0%	78,9%
36,00	0,81	0,85	11,91	53,8%	20,10	7,76	132,4	22,5	94,5%	82,9%	78,4%
37,00	0,77	1,00	11,96	51,6%	20,08	7,63	132,9	22,5	93,7%	82,9%	77,7%
38,00	0,72	1,06	11,89	51,7%	20,08	7,66	133,1	22,5	93,3%	82,8%	77,3%
39,00	0,67	0,93	12,16	50,1%	20,08	7,45	132,6	22,6	94,2%	83,0%	78,2%
40,00	0,67	0,82	12,03	52,9%	20,09	7,65	131,9	22,5	94,8%	83,0%	78,7%
41,00	0,63	0,93	11,66	56,0%	20,11	7,98	130,4	22,5	94,0%	82,9%	77,9%
42,00	0,58	0,54	11,40	64,5%	20,15	8,48	129,0	22,5	96,4%	83,0%	80,0%
43,00	0,58	0,23	11,15	72,7%	20,19	8,92	127,1	22,4	98,6%	83,2%	82,0%
44,00	0,54	0,12	10,91	78,1%	20,21	9,25	124,5	22,3	99,3%	83,2%	82,7%
45,00	0,49	0,08	10,51	85,5%	20,24	9,69	121,9	22,5	99,6%	83,2%	82,9%
46,00	0,49	0,05	10,02	95,1%	20,28	10,23	119,9	22,5	99,9%	83,1%	83,0%
47,00	0,49	0,05	9,61	103,4%	20,30	10,67	118,2	22,6	99,9%	83,0%	82,9%
48,00	0,45	0,05	9,49	105,9%	20,31	10,79	116,6	22,5	99,9%	83,0%	82,9%
49,00	0,45	0,04	9,39	108,2%	20,32	10,90	115,2	22,6	100,0%	83,1%	83,1%
50,00	0,45	0,03	9,31	110,3%	20,32	11,00	113,3	22,6	100,1%	83,2%	83,2%
51,00	0,45	0,03	9,20	112,9%	20,33	11,12	112,0	22,6	100,1%	83,2%	83,3%
52,00	0,42	0,03	9,03	116,9%	20,34	11,30	110,6	22,6	100,1%	83,2%	83,3%
53,00	0,40	0,03	8,73	124,2%	20,36	11,62	109,0	22,6	100,1%	83,1%	83,2%
54,00	0,41	0,04	8,13	140,5%	20,40	12,25	106,8	22,6	100,0%	82,9%	82,9%
55,00	0,36	0,09	7,42	161,7%	20,44	12,98	105,1	22,6	99,5%	82,4%	82,0%
56,00	0,36	0,13	7,13	170,4%	20,46	13,26	103,3	22,6	99,0%	82,3%	81,4%
57,00	0,36	0,23	6,79	180,0%	20,48	13,58	101,8	22,6	97,8%	82,0%	80,2%
58,00	0,36	0,33	6,52	186,7%	20,49	13,80	100,1	22,5	96,5%	81,9%	79,0%
59,00	0,36	0,42	6,32	191,1%	20,49	13,96	98,5	22,3	95,3%	81,7%	77,9%
60,00	0,36	0,54	6,08	197,1%	20,50	14,16	97,1	22,3	93,8%	81,5%	76,4%
61,00	0,36	0,68	5,73	206,6%	20,52	14,45	95,6	22,4	91,8%	81,1%	74,5%
62,00	0,36	0,75	5,55	211,8%	20,52	14,60	94,4	22,5	90,7%	81,0%	73,4%
63,00	0,31	0,81	5,48	212,1%	20,52	14,64	93,2	22,4	89,9%	81,0%	72,8%
64,00	0,36	0,84	5,45	212,3%	20,52	14,65	92,0	22,4	89,5%	81,1%	72,5%
65,00	0,31	0,85	5,47	211,0%	20,52	14,63	90,8	22,4	89,4%	81,2%	72,6%
66,00	0,31	0,87	5,45	210,7%	20,52	14,64	89,7	22,4	89,1%	81,3%	72,4%
67,00	0,31	0,88	5,47	209,5%	20,52	14,61	88,6	22,4	89,1%	81,4%	72,5%
68,00	0,31	0,89	5,48	208,2%	20,52	14,59	87,6	22,3	89,0%	81,6%	72,6%
69,00	0,31	0,89	5,50	207,3%	20,52	14,57	86,5	22,3	89,0%	81,7%	72,7%
70,00	0,31	0,90	5,52	206,1%	20,52	14,55	85,8	22,4	88,9%	81,8%	72,7%
71,00	0,31	0,93	5,48	206,2%	20,52	14,57	84,7	22,3	88,5%	81,9%	72,5%
72,00	0,31	0,95	5,47	206,3%	20,52	14,58	83,9	22,3	88,3%	81,9%	72,4%
73,00	0,26	0,95	5,48	205,5%	20,52	14,56	83,0	22,3	88,4%	82,0%	72,5%
74,00	0,26	0,95	5,48	205,2%	20,51	14,55	82,2	22,2	88,3%	82,1%	72,5%
75,00	0,26	0,94	5,35	212,4%	20,52	14,71	81,4	22,2	88,2%	82,1%	72,4%
76,00	0,26	0,92	5,35	213,2%	20,53	14,71	80,6	22,3	88,4%	82,2%	72,6%
77,00	0,26	0,91	5,37	213,0%	20,53	14,70	80,0	22,2	88,6%	82,3%	72,9%
78,00	0,22	0,91	5,43	209,7%	20,52	14,63	79,3	22,1	88,7%	82,4%	73,1%
79,00	0,22	0,92	5,48	206,6%	20,52	14,57	78,6	22,2	88,6%	82,6%	73,2%
80,00	0,22	0,95	5,52	203,8%	20,51	14,52	77,7	22,1	88,4%	82,7%	73,1%
81,00	0,22	0,96	5,40	209,0%	20,52	14,64	76,9	22,3	88,1%	82,6%	72,8%
82,00	0,22	0,97	5,42	207,4%	20,52	14,61	76,4	22,1	88,0%	82,7%	72,7%
83,00	0,22	0,98	5,42	207,0%	20,52	14,61	75,6	22,2	87,9%	82,8%	72,7%
84,00	0,22	1,00	5,45	204,4%	20,51	14,56	75,1	22,2	87,7%	82,9%	72,7%
85,00	0,22	1,02	5,45	203,5%	20,51	14,55	74,4	22,2	87,5%	82,9%	72,6%
86,00	0,17	1,03	5,49	201,3%	20,51	14,51	73,8	22,3	87,5%	83,0%	72,6%
87,00	0,17	1,08	5,42	202,0%	20,51	14,55	73,2	22,3	86,8%	83,0%	72,0%
88,00	0,17	1,10	5,46	199,5%	20,51	14,50	72,6	22,3	86,7%	83,1%	72,0%
89,00	0,17	1,10	5,44	200,4%	20,51	14,52	71,9	22,2	86,7%	83,1%	72,1%
90,00	0,17	1,13	5,43	199,7%	20,51	14,52	71,4	22,1	86,3%	83,2%	71,8%
91,00	0,17	1,13	5,46	197,9%	20,50	14,48	71,0	22,3	86,3%	83,2%	71,9%
92,00	0,17	1,14	5,44	198,5%	20,51	14,49	70,4	22,1	86,3%	83,3%	71,8%

93,00	0,17	1,16	5,51	194,5%	20,50	14,41	69,9	22,1	86,1%	83,4%	71,8%
94,00	0,17	1,21	5,30	202,1%	20,51	14,61	69,2	22,1	85,2%	83,2%	70,9%
95,00	0,17	1,29	5,13	205,9%	20,52	14,74	68,6	22,1	84,0%	83,0%	69,8%
96,00	0,13	1,33	5,10	205,6%	20,52	14,75	68,3	22,2	83,5%	83,0%	69,3%
97,00	0,13	1,35	5,07	205,9%	20,52	14,77	67,9	22,1	83,2%	83,0%	69,0%
98,00	0,13	1,39	5,05	205,0%	20,51	14,77	67,5	22,2	82,8%	83,0%	68,7%
99,00	0,09	1,42	5,03	204,4%	20,51	14,77	67,0	22,2	82,4%	83,0%	68,4%
100,00	0,10	1,40	4,55	229,7%	20,55	15,29	66,6	22,2	81,3%	82,5%	67,0%
101,00	0,09	1,42	4,30	243,6%	20,56	15,56	66,4	21,8	80,3%	82,0%	65,9%
102,00	0,09	1,43	4,26	245,4%	20,56	15,59	65,8	22,0	80,1%	82,1%	65,7%
103,00	0,09	1,43	4,26	245,4%	20,56	15,59	65,5	21,9	80,1%	82,1%	65,8%
104,00	0,09	1,43	4,28	243,6%	20,56	15,56	65,1	22,1	80,1%	82,2%	65,9%
105,00	0,09	1,44	4,30	242,1%	20,56	15,54	64,7	22,0	80,1%	82,3%	65,9%
106,00	0,09	1,42	4,28	244,2%	20,56	15,57	64,2	21,9	80,3%	82,3%	66,1%
107,00	0,09	1,43	4,32	241,3%	20,56	15,52	63,7	22,0	80,3%	82,5%	66,2%
108,00	0,09	1,44	4,34	239,3%	20,56	15,49	63,4	22,0	80,2%	82,5%	66,2%
109,00	0,09	1,45	4,34	238,9%	20,56	15,49	63,0	22,0	80,1%	82,6%	66,2%
110,00	0,09	1,40	4,21	250,0%	20,57	15,66	62,7	22,0	80,3%	82,5%	66,2%
111,00	0,09	1,40	4,15	254,1%	20,57	15,72	62,5	22,1	80,1%	82,4%	66,0%
112,00	0,09	1,43	4,12	254,1%	20,57	15,74	62,2	22,0	79,6%	82,4%	65,6%
113,00	0,04	1,43	4,08	256,6%	20,58	15,78	61,8	21,9	79,4%	82,3%	65,4%
114,00	0,04	1,45	4,10	254,0%	20,57	15,75	61,5	22,0	79,3%	82,4%	65,4%
115,00	0,04	1,50	4,02	256,3%	20,58	15,81	61,1	21,9	78,5%	82,3%	64,6%
116,00	0,04	1,53	3,98	256,2%	20,58	15,83	60,8	22,0	78,0%	82,3%	64,2%
117,00	0,04	1,55	3,95	257,3%	20,58	15,86	60,7	21,9	77,6%	82,2%	63,8%
118,00	0,04	1,57	3,94	256,8%	20,58	15,86	60,2	21,8	77,4%	82,2%	63,7%
119,00	0,04	1,57	3,97	254,2%	20,57	15,82	59,9	21,8	77,5%	82,3%	63,8%
120,00	0,04	1,59	3,89	258,3%	20,58	15,89	59,7	21,7	77,1%	82,2%	63,3%
121,00	0,04	1,61	3,85	259,6%	20,58	15,92	59,4	21,6	76,7%	82,1%	62,9%
122,00	0,04	1,63	3,83	259,6%	20,58	15,93	59,0	21,7	76,4%	82,1%	62,7%
123,00	0,04	1,64	3,77	262,9%	20,58	15,99	58,8	21,7	76,1%	82,1%	62,4%
124,00	0,04	1,68	3,62	271,0%	20,59	16,13	58,4	21,7	75,0%	81,8%	61,4%
125,00	0,04	1,72	3,53	273,9%	20,59	16,20	58,2	21,7	74,1%	81,6%	60,5%
126,00	0,04	1,74	3,48	276,0%	20,60	16,24	57,9	21,7	73,7%	81,5%	60,1%
127,00	0,04	1,75	3,44	278,4%	20,60	16,28	57,7	21,8	73,4%	81,5%	59,8%
128,00	0,04	1,77	3,42	278,3%	20,60	16,29	57,5	21,8	73,1%	81,5%	59,6%
129,00	0,04	1,79	3,40	278,8%	20,60	16,31	57,2	21,8	72,8%	81,5%	59,4%
130,00	0,04	1,79	3,40	278,4%	20,60	16,30	56,9	21,7	72,8%	81,5%	#DIV/0!
131,00	0,04	1,78	3,40	278,8%	20,60	16,30	56,7	21,7	72,9%	81,6%	59,4%
132,00	0,00	1,79	3,42	276,7%	20,60	16,28	56,4	21,8	72,9%	81,6%	59,6%

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,48 g/hr

Burn Rate : 0,82 Dry kg/hr

Test Duration: 132 min

PRESSURE FACTOR: DGM 1st hr 0,980
 DGM 1 0,966
 DGM 2 0,970
 DGM 3 1,003

BAROMETRIC PRESSURE

Average: 30,0172337 in Hg
 Start: 30,09105867 in Hg
 End: 29,94340873 in Hg

TEMPERATURE FACTORS DGM 1st hr 0,989
 DGM 1 0,990
 DGM 2 0,987
 DGM 3 0,993

DGM VALUES

DGM 1st hr Final: 3217,120 Cuft
 Initial: 3204,980 Cuft

VOLUMES SAMPLED DGM 1st hr 11,768 SCft
 DGM 1 24,755 SCft
 DGM 2 25,185 SCft
 DGM 3 25,923 SCft

DGM 1 Final: 13272,223 Cuft
 Initial: 13245,950 Cuft

DGM 2 Final: 4471,702 Cuft
 Initial: 4445,659 Cuft

TOTAL TUNNEL VOLUME : 24761

DGM #3 Final: 28280,533 Cuft
 Initial: 28254,212 Cuft

SAMPLE RATIOS

Sample Train 1st Hr: 956,4
 Sample Train 1: 1000,2
 Sample Train 2: 983,2

TEMPERATURES

DGM 1st hr 534,008 °R
 DGM 1 533,521 °R
 DGM 2 534,902 °R

Particulate concentration

Sample Train 1st Hr 0,000093 g/dscf
 Sample Train 1 0,000048 g/dscf
 Sample Train 2 0,000044 g/dscf
 Room 0,000004 g/dscf

CALIBRATION FACTORS

DGM 1st hr 1,0000
 DGM 1 0,9860
 DGM 2 1,0100
 DGM #3 0,9890

TOTAL EMISSIONS

Sample Train 1st Hr 1,01 g
 Sample Train 1 1,10 g
 Sample Train 2 0,99 g

TUNNEL FLOW RATE: 187,6 Dscfm

PARTICULATE CATCH

Total Sample Train 1: 1,20 mg
 Total Sample Train 2: 1,10 mg
 Total Sample Train 1 1st hour: 1,10 mg

EMISSION RATES

Sample Train 1st Hr 1,01 g/hr
 Sample Train 1 0,50 g/hr
 Sample Train 2 0,45 g/hr

DEVIATION: 5,68%

Cs Train 1 Train 2 Train 1st Hr
 4,847E-05 4,3677E-05 9,348E-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 1st hour	DGM 1st hour Inlet 1st hour	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 Out 1	Filter 2 Temp	Tunnel Velocity Pressure	Flue draft Pressure	Filter 1st hr in wc	Filter 1 2nd hr in wc	Filter 2 2nd hr in wc	Change in Temp
min		lbs	%	%										°F cuft/min	°F	°F	°F	cuft/min	°F	°F	°F	cuft/min	°F	°F	°F	in wc	in wc	in wc	in wc	in wc	°F
0	262.00	4.8	0.2	3.6	271.5	71.8	109.8	475.6	393.7	394.2	399.3	177.1	0.19	73.2	72.5	72.1	0.19	72.6	73.4	72.4	0.19	73.7	71.8	74.0	0.07	0.05	-0.71	-1.16	-1.03	0.0	
1	263.0	4.6	0.2	3.4	269.9	71.9	109.8	475.6	393.7	394.2	399.3	177.1	0.19	73.2	72.5	72.1	0.19	72.6	73.4	72.4	0.19	73.7	71.9	74.1	0.07	0.05	-0.69	-1.13	-1.00	3.3	
2	264.0	4.4	0.2	7.0	334.4	71.5	109.8	475.6	393.7	393.7	404.4	181.1	0.19	73.7	72.6	72.3	0.19	73.0	73.2	73.3	0.19	73.6	71.9	75.5	0.07	0.07	-0.68	-1.14	-0.99	11.3	
3	265.0	4.4	0.1	8.5	354.9	71.5	97.2	549.8	402.6	392.5	405.3	183.2	0.19	73.7	72.7	72.4	0.19	73.1	73.1	73.6	0.19	73.6	72.0	75.8	0.08	0.07	-0.68	-1.14	-0.99	18.7	
4	266.0	4.4	0.1	8.7	360.4	71.5	97.2	549.8	402.6	392.5	405.3	183.2	0.19	73.7	72.7	72.4	0.19	73.1	73.1	73.6	0.19	73.6	72.0	75.8	0.08	0.07	-0.68	-1.14	-0.99	25.2	
5	267.0	4.3	0.1	9.6	378.3	71.6	99.4	606.4	401.7	390.1	404.5	187.3	0.19	73.7	72.7	72.6	0.19	73.1	73.0	74.2	0.19	73.5	72.1	76.6	0.08	0.07	-0.68	-1.14	-1.00	30.0	
6	268.0	4.0	0.2	10.5	327.4	71.9	93.2	607.9	400.8	388.7	403.6	189.4	0.19	73.8	72.8	72.7	0.19	73.2	72.9	74.2	0.19	73.5	72.1	76.5	0.07	0.06	-0.68	-1.14	-0.99	30.1	
7	269.0	4.0	0.2	9.5	298.4	71.8	91.1	596.4	400.3	387.9	402.3	191.5	0.19	73.8	72.8	72.9	0.19	73.2	72.9	74.3	0.19	73.5	72.2	76.4	0.08	0.06	-0.68	-1.14	-1.00	27.7	
8	270.0	4.0	0.3	8.7	270.0	71.4	88.1	585.1	399.7	385.1	393.5	190.6	0.19	73.9	72.9	73.0	0.19	73.2	72.9	74.3	0.19	73.5	72.2	76.3	0.08	0.06	-0.68	-1.13	-0.99	25.2	
9	271.0	3.9	0.3	8.6	274.9	71.4	87.9	575.9	399.4	385.5	398.9	195.5	0.19	74.0	72.9	73.1	0.19	73.2	72.9	74.3	0.19	73.5	72.3	76.3	0.07	0.06	-0.68	-1.14	-0.99	23.1	
10	272.0	3.8	0.3	8.6	269.5	71.6	88.0	568.6	399.5	384.3	397.4	197.4	0.19	74.0	72.9	73.2	0.19	73.3	72.9	74.4	0.19	73.5	72.4	76.3	0.08	0.05	-0.67	-1.13	-0.99	21.5	
11	273.0	3.8	0.3	8.5	265.9	71.6	88.1	563.1	399.3	382.5	395.4	199.2	0.19	74.0	73.0	73.3	0.19	73.3	72.9	74.5	0.19	73.5	72.4	76.3	0.07	0.05	-0.68	-1.13	-0.99	19.9	
12	274.0	3.7	0.3	8.8	264.6	71.5	88.7	560.9	399.1	381.5	393.7	201.0	0.19	74.1	73.0	73.4	0.19	73.3	72.9	74.6	0.19	73.6	72.5	76.4	0.07	0.06	-0.67	-1.13	-0.99	19.3	
13	275.0	3.6	0.2	9.3	264.5	71.7	88.0	561.1	398.7	379.8	391.6	202.7	0.19	74.1	73.1	73.5	0.19	73.3	72.9	74.7	0.19	73.6	72.6	76.5	0.08	0.06	-0.67	-1.13	-0.99	18.8	
14	276.0	3.5	0.1	9.9	264.9	71.9	88.1	565.7	398.3	378.5	389.6	204.3	0.19	74.1	73.1	73.6	0.19	73.3	72.9	74.8	0.19	73.6	72.6	76.5	0.08	0.06	-0.67	-1.13	-0.99	19.3	
15	277.0	3.4	0.1	10.4	266.6	72.0	87.9	571.3	398.2	377.7	387.5	205.8	0.19	74.1	73.1	73.7	0.19	73.3	72.9	74.9	0.19	73.6	72.7	76.6	0.08	0.06	-0.68	-1.14	-0.99	20.1	
16	278.0	3.3	0.2	10.7	267.8	71.6	88.5	575.8	398.1	376.3	385.7	207.2	0.19	74.2	73.1	73.8	0.19	73.4	72.9	75.0	0.19	73.6	72.7	76.7	0.07	0.06	-0.68	-1.13	-0.99	20.6	
17	279.0	3.3	0.2	10.9	268.4	71.4	88.1	581.6	397.7	375.4	383.7	208.6	0.19	74.2	73.2	73.9	0.19	73.4	72.9	75.1	0.19	73.7	72.8	76.8	0.08	0.05	-0.68	-1.13	-0.99	21.4	
18	280.0	3.2	0.2	10.9	268.5	71.3	87.2	586.7	397.6	375.0	382.4	209.9	0.19	74.2	73.2	74.0	0.19	73.4	72.9	75.2	0.19	73.7	72.8	76.8	0.07	0.06	-0.67	-1.13	-0.99	22.5	
19	281.0	3.1	0.2	10.9	268.4	71.6	87.6	590.5	397.8	374.6	380.8	211.1	0.19	74.2	73.2	74.1	0.19	73.4	72.9	75.3	0.19	73.7	72.9	76.9	0.07	0.06	-0.67	-1.13	-0.99	23.0	
20	282.0	3.0	0.2	10.9	268.1	72.1	87.7	593.8	397.8	374.6	379.7	212.2	0.19	74.2	73.2	74.1	0.19	73.4	72.9	75.4	0.19	73.7	72.9	77.0	0.08	0.05	-0.67	-1.13	-1.00	23.6	
21	283.0	2.9	0.2	11.0	268.4	72.0	88.0	596.3	398.3	374.6	378.8	213.3	0.19	74.3	73.3	74.2	0.19	73.5	72.9	75.4	0.19	73.5	73.0	77.0	0.07	0.06	-0.67	-1.13	-0.99	24.5	
22	284.0	2.8	0.2	11.0	267.9	72.1	87.7	599.4	398.7	375.1	378.0	214.3	0.19	74.3	73.3	74.3	0.19	73.5	72.9	75.5	0.19	73.8	73.0	77.1	0.08	0.06	-0.68	-1.13	-0.99	25.1	
23	285.0	2.8	0.2	11.1	267.5	72.2	88.2	601.7	399.1	375.6	377.4	215.2	0.19	74.3	73.3	74.4	0.19	73.5	72.9	75.6	0.19	73.8	73.1	77.2	0.08	0.05	-0.67	-1.13	-0.99	25.8	
24	286.0	2.7	0.2	11.2	267.8	72.3	88.2	604.9	399.4	375.6	377.9	216.0	0.19	74.3	73.3	74.4	0.19	73.5	72.9	75.6	0.19	73.8	73.1	77.2	0.08	0.05	-0.67	-1.13	-0.99	26.8	
25	287.0	2.6	0.3	11.2	267.8	72.3	87.7	607.6	400.4	376.3	376.5	216.9	0.19	74.4	73.3	74.5	0.19	73.6	73.0	75.7	0.19	73.8	73.2	77.3	0.08	0.05	-0.67	-1.13	-0.99	27.8	
26	288.0	2.5	0.3	11.3	267.5	72.2	87.7	609.1	400.9	378.1	376.2	217.6	0.19	74.4	73.3	74.6	0.19	73.6	73.0	75.8	0.19	73.9	73.3	77.3	0.08	0.05	-0.68	-1.13	-0.99	28.4	
27	289.0	2.5	0.3	11.3	267.3	72.3	87.8	611.3	401.6	378.8	375.9	218.3	0.19	74.4	73.4	74.6	0.19	73.7	73.0	75.9	0.19	73.9	73.3	77.3	0.08	0.05	-0.68	-1.13	-0.99	29.2	
28	290.0	2.4	0.4	11.3	268.3	72.3	87.7	614.7	402.3	378.8	376.2	219.4	0.19	74.4	73.4	74.7	0.19	73.7	73.0	75.9	0.19	73.9	73.4	77.4	0.08	0.05	-0.68	-1.13	-0.99	30.0	
29	291.0	2.3	0.5	11.4	268.1	72.3	87.4	617.4	402.8	380.8	376.0	219.5	0.19	74.5	73.4	74.7	0.19	73.8	73.0	75.9	0.19	74.0	73.5	77.4	0.08	0.05	-0.67	-1.12	-0.99	31.2	
30	292.0	2.2	0.5	11.6	268.1	72.3	87.3	621.1	403.5	381.8	376.2	220.0	0.19	74.6	73.5	74.7	0.19	73.8	73.0	76.0	0.19	74.0	73.5	77.4	0.08	0.05	-0.67	-1.13	-0.99	32.3	
31	293.0	2.2	0.7	11.7	268.1	72.3	87.3	624.5	404.3	382.5	376.2	220.6	0.19	74.6	73.5	74.8	0.19	73.8	73.0	76.1	0.19	74.0	73.5	77.4	0.08	0.05	-0.68	-1.13	-0.99	33.8	
32	294.0	2.1	0.6	11.7	268.8	72.3	87.5	627.5	405.3	383.8	376.9	221.0	0.19	74.7	73.5	74.9	0.19	73.8	73.1	76.1	0.19	74.1	73.6	77.5	0.07	0.05	-0.69	-1.13	-1.00	34.9	
33	295.0	1.9	0.6	11.8	269.2	72.4	87.3	630.9	406.5	384.5	377.5	221.4	0.19	74.7	73.6	74.9	0.19	73.8	73.1	76.1	0.19	74.1	73.7	77.5	0.08	0.06	-0.68	-1.12	-0.99	36.2	
34	296.0	1.9	0.6	11.9	269.7	72.4	87.6	634.1	407.7	385.2	378.5	221.7	0.19	74.8	73.6	74.9	0.19	73.9	73.1	76.1	0.19	74.2	73.7	77.5	0.08	0.06	-0.68	-1.13	-1.00	37.4	
35	297.0	1.8	0.8	12.0	270.4	72.4	87.5	637.5	408.8	386.2	379.0	222.0	0.19	74.8	73.6	75.0	0.19	73.9	73.1	76.2	0.19	74.2	73.7	77.5	0.08	0.05	-0.68	-1.13	-1.00	38.6	
36	298.0	1.8	0.9	11.9	270.4	72.5	87.9	640.7	410.5	387.2	379.9	222.4	0.19	74.9	73.6	75.0	0.19	74.0	73.2	76.2	0.19	74.2	73.8	77.6	0.08	0.05	-0.68	-1.13	-1.00	40.1	
37	299.0	1.7	1.0	12.0	271.2	72.5	87.6	643.6	412.0	388.0	380.6	222.7	0.19	74.9	73.7	75.1	0.19	74.0	73.2	76.3	0.19	74.3	73.9	77.6	0.08	0.05	-0.68	-1.13	-1.00	41.4	
38	300.0	1.7	1.1	12.1	271.9	72.5	87.8	646.0	413.4	389.0	381.2	223.0	0.19	74.9	73.7	75.1	0.19	74.0	73.2	76.3	0.19	74.3	73.9	77.6	0.08	0.05	-0.70	-1.13	-1.00	42.5	
39	301.0	1.5	0.9	12.2	270.6	72.6	87.4	648.3	414.7	389.8	382.5	223.2	0.19	75.0	73.7	75.1	0.19	74.1	73.3	76.4	0.19	74.4	74.0	77.7	0.07	0.05	-0.70	-1.13	-1.00	43.7	
40	302.0	1.5	0.8	12.0	269.5	72.4	87.7	648.7	416.2	391.0	383.2	223.4	0.19	75.0	73.7	75.2	0.19	74.1	73.3	76.4	0.19	74.4	74.0	77.7	0.07	0.05	-0.70	-1.13	-1.00	44.5	
41	303.																														

115	377.0	0.1	1.5	4.0	142.0	71.4	78.3	312.4	384.9	330.0	325.3	231.9	0.00	73.4	73.4	73.5	0.19	73.4	73.6	74.4	0.19	73.9	78.3	75.0	0.07	0.03	0.10	-1.13	-1.01	-51.1
116	378.0	0.1	1.5	4.0	141.5	71.6	78.3	310.8	383.2	328.9	324.2	231.6	0.00	73.4	73.4	73.5	0.19	73.4	73.6	74.4	0.19	73.9	78.4	74.9	0.08	0.02	0.09	-1.13	-1.00	-52.2
117	379.0	0.1	1.6	3.9	141.2	71.4	77.8	309.3	381.4	327.6	322.9	231.3	0.00	73.4	73.4	73.4	0.19	73.3	73.6	74.4	0.19	73.8	78.4	74.9	0.08	0.03	0.08	-1.14	-1.00	-53.5
118	380.0	0.1	1.6	3.9	140.3	71.3	77.6	307.4	379.5	326.3	321.4	231.0	0.00	73.4	73.4	73.4	0.19	73.2	73.6	74.3	0.19	73.7	78.3	74.8	0.07	0.02	0.09	-1.14	-1.00	-54.9
119	381.0	0.1	1.6	4.0	139.8	71.2	77.6	305.5	377.6	325.4	320.1	230.7	0.00	73.4	73.3	73.4	0.19	73.1	73.5	74.3	0.19	73.6	78.3	74.8	0.07	0.02	0.08	-1.14	-1.00	-56.2
120	382.0	0.1	1.6	3.9	139.4	71.1	77.7	303.6	375.8	323.8	318.7	230.3	0.00	73.4	73.3	73.4	0.19	73.0	73.5	74.2	0.19	73.5	78.2	74.7	0.07	0.02	0.08	-1.14	-0.99	-57.6
121	383.0	0.1	1.6	3.9	138.9	70.9	77.7	302.3	373.9	322.2	317.4	229.9	0.00	73.4	73.2	73.3	0.19	73.0	73.4	74.2	0.19	73.5	78.2	74.7	0.08	0.02	0.09	-1.14	-1.00	-58.8
122	384.0	0.1	1.6	3.8	138.2	71.1	77.9	300.6	371.7	320.8	315.9	229.5	0.00	73.4	73.2	73.3	0.19	73.0	73.4	74.2	0.19	73.5	78.2	74.7	0.07	0.02	0.09	-1.14	-1.00	-60.3
123	385.0	0.1	1.6	3.8	137.8	71.0	78.0	299.0	370.1	319.8	314.6	229.1	0.00	73.3	73.2	73.2	0.19	73.0	73.4	74.2	0.19	73.5	78.2	74.7	0.07	0.02	0.08	-1.14	-1.00	-61.5
124	386.0	0.1	1.7	3.6	137.2	71.1	77.5	297.6	368.3	318.5	313.4	228.7	0.00	73.3	73.2	73.2	0.19	73.0	73.4	74.1	0.19	73.4	78.1	74.6	0.08	0.02	0.09	-1.14	-1.00	-62.7
125	387.0	0.1	1.7	3.5	136.8	71.0	77.7	296.4	366.4	317.4	312.2	228.2	0.00	73.2	73.1	73.2	0.19	72.9	73.4	74.1	0.19	73.4	78.1	74.6	0.07	0.02	0.08	-1.14	-1.00	-63.9
126	388.0	0.1	1.7	3.5	136.3	71.0	77.3	294.2	364.7	316.1	310.9	227.8	0.00	73.2	73.1	73.2	0.19	72.9	73.3	74.0	0.19	73.4	78.1	74.5	0.07	0.02	0.09	-1.14	-1.01	-65.2
127	389.0	0.1	1.8	3.4	135.8	71.2	77.3	293.1	363.2	314.8	309.8	227.3	0.00	73.2	73.1	73.1	0.19	73.0	73.4	74.0	0.19	73.4	78.1	74.5	0.08	0.02	0.08	-1.14	-1.01	-66.4
128	390.0	0.1	1.8	3.4	135.6	71.2	77.2	291.4	361.5	313.7	308.5	226.8	0.00	73.2	73.0	73.1	0.19	72.9	73.3	74.0	0.19	73.4	78.1	74.4	0.07	0.02	0.08	-1.14	-1.00	-67.6
129	391.0	0.1	1.8	3.4	135.0	71.3	77.2	289.9	359.8	312.2	307.3	226.2	0.00	73.2	73.0	73.1	0.19	72.9	73.3	73.9	0.19	73.4	78.1	74.4	0.08	0.02	0.08	-1.14	-0.99	-68.9
130	392.0	0.1	1.8	3.4	134.5	71.0	76.7	288.2	358.1	310.7	306.1	225.7	0.00	73.1	73.0	73.1	0.19	72.9	73.3	73.9	0.19	73.3	78.1	74.4	0.07	0.02	0.09	-1.14	-1.00	-70.2
131	393.0	0.1	1.8	3.4	134.0	71.0	76.9	286.6	356.5	309.1	305.0	225.1	0.00	73.1	73.0	73.0	0.19	72.9	73.3	73.9	0.19	73.3	78.1	74.3	0.07	0.02	0.09	-1.14	-1.00	-71.5
132	394.0	0.0	1.8	3.4	133.6	71.2	76.8	285.5	354.9	307.9	303.9	224.6	0.00	73.1	73.0	73.0	0.19	72.9	73.3	73.8	0.19	73.3	78.1	74.2	0.08	0.02	0.08	-1.14	-1.00	-72.6

DATA 2026-04-16 PI 20355 EPA RUN 4 CAT 1
unit preburn

Time acquisition minutes	Flue	scale	Right	Back	bottom	Top	Left
	temp						
	°F	lbs	°F	°F	°F	°F	°F
1	70,06	2,48	69,88	68,95	68,78	69,76	68,91
2	71,00	4,46	69,88	68,96	68,80	70,39	68,90
3	96,06	2,38	69,97	69,17	68,79	76,36	68,91
4	151,98	2,38	70,63	69,10	68,83	112,33	69,08
5	217,56	2,17	71,05	69,56	68,87	197,09	69,49
6	269,75	2,07	71,66	69,97	68,96	285,39	70,19
7	315,19	1,97	73,00	70,64	69,08	371,93	71,55
8	360,92	1,78	75,22	71,65	69,19	465,81	73,64
9	395,67	1,58	78,33	72,91	69,36	549,17	76,46
10	416,59	1,46	82,30	74,55	69,56	617,70	80,10
11	411,96	1,27	87,34	76,56	69,74	648,25	84,88
12	409,25	1,08	93,49	79,15	70,00	664,75	91,02
13	404,39	1,08	101,08	82,49	70,27	656,67	98,69
14	380,04	4,68	109,24	87,24	70,52	614,71	104,78
15	331,88	6,27	117,24	93,81	70,86	558,25	110,78
16	306,02	6,16	126,39	98,66	71,21	519,89	119,90
17	329,41	6,16	134,51	103,70	71,53	498,41	125,99
18	331,46	6,06	142,86	108,57	71,95	498,86	133,78
19	330,27	5,96	150,66	113,05	72,47	498,36	140,40
20	332,02	5,86	157,73	117,22	73,07	498,35	145,29
21	318,32	5,77	164,38	121,01	73,77	485,39	149,35
22	343,91	5,67	170,46	124,51	74,50	496,45	152,08
23	366,02	5,57	175,67	127,74	75,33	522,11	155,72
24	358,92	5,48	181,54	130,85	76,17	530,12	159,73
25	361,38	5,36	188,12	133,79	77,10	536,27	163,57
26	367,13	5,26	194,29	136,68	78,08	542,66	167,05
27	361,50	5,16	201,15	139,54	79,09	542,92	170,58
28	363,47	5,07	208,26	142,35	80,10	540,79	174,09
29	343,03	4,97	215,33	145,15	81,19	549,25	177,50
30	298,97	4,97	222,18	147,97	82,33	530,00	181,14
31	275,65	4,56	229,39	150,79	83,50	501,55	184,77
32	282,14	4,78	235,94	153,46	84,69	498,95	188,30
33	277,06	4,78	241,65	156,04	86,01	499,77	191,59
34	272,27	4,56	246,69	158,46	87,40	498,12	194,68
35	267,10	4,52	250,96	160,79	88,85	494,98	197,66
36	261,83	4,47	254,69	163,16	90,33	490,62	200,66
37	259,60	4,37	257,87	165,35	91,83	487,40	203,65
38	259,19	4,37	260,68	167,39	93,33	487,53	206,51
39	261,04	4,37	262,92	169,32	94,82	490,41	209,30
40	262,17	4,18	264,95	171,06	96,33	495,64	211,86
41	263,35	4,17	266,57	172,89	97,82	501,07	214,38
42	263,99	4,17	268,11	174,58	99,31	508,61	216,67
43	264,91	3,98	269,67	176,28	100,81	515,61	219,00
44	265,46	3,98	271,11	177,91	102,30	520,86	221,26
45	266,49	3,88	272,67	179,70	103,79	526,40	223,61
46	268,98	3,80	274,37	181,49	105,29	536,09	226,00
47	272,32	3,69	275,99	183,52	106,77	549,38	228,50
48	274,19	3,57	277,84	185,78	108,30	560,90	231,23
49	275,56	3,48	280,01	188,42	109,81	571,59	234,29
50	276,17	3,47	282,35	191,29	111,35	580,32	237,74
51	276,37	3,28	285,29	194,46	112,83	588,97	241,58
52	277,00	3,23	288,28	197,89	114,35	596,15	245,65
53	277,07	3,07	291,90	201,40	115,89	602,64	250,10
54	277,44	3,07	295,15	205,03	117,37	608,85	254,46
55	278,11	2,87	299,43	208,63	118,88	612,94	258,91
56	277,66	2,87	304,01	212,51	120,37	617,43	263,85
57	275,62	2,78	308,91	216,60	121,89	617,95	268,65
58	274,10	2,59	313,85	220,71	123,35	618,98	273,53
59	272,79	2,58	318,87	225,03	124,86	618,92	278,38
60	271,83	2,48	323,85	229,27	126,36	619,17	283,24
61	271,42	2,48	328,61	233,56	127,84	620,07	287,87
62	269,32	2,28	333,31	237,97	129,32	621,63	292,68
63	269,05	2,27	337,81	242,42	130,83	622,03	297,39
64	267,96	2,17	342,24	246,78	132,41	623,59	302,06

DATA 2026-04-16 PI 20355 EPA RUN 4 CAT 1
unit preburn

65	267,51	2,08	346,38	251,26	133,94	625,04	306,66
66	266,37	2,07	350,29	255,80	135,49	627,58	311,07
67	266,89	1,98	354,21	260,41	137,08	631,99	315,77
68	267,68	1,88	358,22	265,13	138,67	636,42	320,08
69	267,25	1,78	362,01	269,85	140,25	637,88	324,63
70	266,21	1,78	365,50	274,73	141,85	638,01	329,08
71	262,84	1,69	369,13	279,86	143,45	632,43	333,80
72	259,61	1,69	372,23	285,26	145,09	626,98	338,36
73	256,65	1,59	375,29	290,89	146,77	620,74	342,50
74	254,09	1,59	378,45	296,73	148,42	615,53	346,53
75	250,73	1,47	381,21	303,09	150,12	606,85	350,35
76	248,43	1,47	383,07	309,41	151,85	600,04	353,85
77	245,50	1,38	384,98	316,01	153,54	592,76	357,40
78	242,46	1,38	387,24	322,96	155,27	586,00	361,18
79	239,82	1,38	389,12	329,66	156,98	580,23	364,41
80	236,45	1,28	390,43	336,49	158,69	573,45	368,08
81	233,21	1,28	391,83	343,44	160,48	565,21	371,64
82	230,36	1,28	392,94	349,97	162,26	555,82	374,75
83	226,49	1,28	393,30	356,16	164,11	547,05	378,20
84	223,19	1,18	394,04	362,41	165,95	538,92	381,77
85	220,60	1,18	394,53	368,40	167,80	530,82	385,07
86	218,28	1,18	393,86	373,46	169,64	523,17	387,69
87	215,27	1,18	393,94	378,74	171,49	516,02	390,98
88	211,78	1,09	394,34	384,07	173,37	506,94	394,20
89	208,91	1,09	394,18	388,66	175,24	498,61	396,85



TESTING THROUGH YOUR REALITY

Date: 2026-04-16 Manufacturer: Morse Model: 2B classic

Project #: PI 20355 Run: 4 Tech: M.M Reviewer: SD

Date: 26-04-16 Manufacturer: Morse Model: 2B classic
Project #: PI 20355 Run: 4 Tech: M.M Reviewer: DO

Project #: PI 20355 Run: 4 Tech: M.M Reviewer: SD

- Kindling 2.5 LBS stand fire
- After 2 min close Door
- At 100 LBS insert preload
- After 2 min close Door
- At 500 LBS close air inlet (minimum setting)
- At 1000 LBS insert preload
- close Door immediately
- At 5 min close air inlet (minimum setting)

TEST LOAD CONFIGURATION

Date: 2026-04-16Manufacturer: Mor-so

PRE / POST CHECKS

Model: 2B ClassicProject #: PI 20355Run: 4Tech: JMReviewer: JP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334	8:00	OK	OK

Pre-Test

Post-Test

Facility Conditions:

Smoke Capture Check (tunnel velocity)

OK	NA
4 sides OK	OK

Picture.....

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H₂O)

Traverse before ignition.....

2026-04-13
2026-04-13
OK
OK

Temperature System:

Ambient (65°-90°F) Y/N.....

OK

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: 2026-04-16

Project #: PI 20355

Leakage Checks Tunnel Samplers

Manufacturer: Mors

Run: L

Tech: M.M

Model: 2B Classic

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.)	-6	-6	-6	-6
Final 1 minute DGM (Liter)	375081, 91	375827, 95	125885, 45	126625, 56
Initial 1 minute DGM (Liter)	375081, 91	375827, 95	125885, 41	126625, 50
Change (Liter)	0	0	0.04	0.06
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	0 M.M			
Check OK	OK	OK	OK	OK



Date: 2022.04.16

Project #: PI 2355

Manufacturer: Morso

Run: 4

Tech: M.M

Model: 2B classic

Reviewer: [Signature]

Leakage Checks Tunnel Samplers

System 1 st hour			Ambient	
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.)	-6	-6	-6	-6
Final 1 minute DGM (Liter)	3204 87	3217 18	800 067 86	800 815 82
Initial 1 minute DGM (Liter)	3204 87	3217 18	800 067 86	800 815 82
Change (Liter)	φ	φ	φ	φ
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK



Date: 2020-06-16
Project #: PI 20335

Manufacturer: Mors
Run: 4

Model: DB classic
Reviewer: RL

Tech: M.M

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-6	-6
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	6.4	3	4
Check OK (no change after 15 sec.)	OK	OK	OK	OK



Project #: 20355

Date: 2020-09-16

Manufacturer: Moroso

Model: 2B Classic

Run: 4

Tech: M.M.

Reviewer: JD

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	44 lbs, Class F	44 lbs
Analytical	EM-335	100.0 mg, Class S	100.0 mg
Analytical	EM-125	200.0000 g, Class S	200.0000 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: 2026-04-16

Manufacturer: Moroso

Model: 2B classic

Project #: PI 2355

Run: 4

Tech: M.M

Reviewer: TD

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	71.46
B - Centroid	3.00	3.50	4	0.074	71.51
A-1	0.50	0.50	0.50	0.061	71.46
A-2	1.50	1.75	2	0.068	71.37
A-3	4.50	5.25	6	0.067	71.37
A-4	5.60	6.5	7.5	0.061	71.41
B-1	0.50	0.50	0.50	0.062	71.51
B-2	1.50	1.75	2	0.062	71.46
B-3	4.50	5.25	6	0.080	71.46
B-4	5.60	6.5	7.5	0.063	71.43
				AVERAGE	

CONTINUOUS ANALYZERS

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		

Date: 2026-04-16

 Manufacturer: Moroso

 Model: 2B classic

 Project #: PT 2355

 Run: 4

 Tech: MM

 Reviewer: DO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3081	3000	1029	1000
Tolerance CO	0	+/- 0.02	0081	+/- 0.15	0029	+/- 0.05
CO ₂	0	0	1796	1800	979	1000
Tolerance CO ₂	0	+/- 0.02	004	+/- 0.5	021	+/- 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	3025	1024	0	0.02	0006	0.15	0005	0.05	✓	
CO ₂	0	1796	982	0	0.02	003	0.5	003	0.5	✓	



TEST DATA LOG

Model: 2B classic

Manufacturer: Moss

Date: 2026-04-16

Reviewer: [Signature]

Tech: M. J.

Run: 4

Project #: PI 20355

RAW DRY GAS METER READINGS

Test	System 1 st hour (Cuft)	System 1 (Liter)	System 2 (Liter)	Blank (Liter)
	Final			
Initial	3217.12	375827.49	126624.50	800815.51
	3204.98	375083.52	125887.04	800070.18

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	1019	1014
Humidity (%):	234	219
Air Velocity (max 50ft/Min)	0	0



POLYTESTS

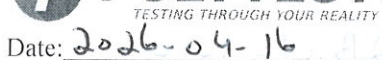
Manufacturer:

Model: 2B classic

Run:

Tech: M. M

Reviewer:



FUEL DATA

Date: 2026-04-16

Manufacturer: *Mor So*

Model: a B class

Project #: PI 20355

Run: 4

Tech: 

Reviewer: 1978

FUEL DESCRIPTION:

Type of wood:

TEST LOAD

[illegible]

TEST LOAD WEIGHT: 4,768 lbs Min 20%: 100 Max 25%: 119

Wood Temperature °C: 21

Wood moisture & Temperature taken within 4hrs prior to the test start (Y/N): Yes

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
Date	Time					gaskets
2026-04-15	17:00	15	900-901	6	30	902-903
		108 7756	0 2470	50450	110 2126	0 2486
2026-04-16	9:30	108 7755	0 2469	50449	110 2125	0 2486
						4 9749
						4 9748

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
Date	Time					gaskets
2026-04-16	14:15	15	900-901	6	30	902-903
		108 7763	0 2474	50462	110 2130	0 2484
2026-04-20	8:00	108 7757	0 2472	50455	110 2126	0 2493
2026-04-21	9:00	108 7757	0 2472	50455	110 2126	0 2493
						4 9763
						4 9752
						4 9752

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Manufacturer: Morsø

Model: 2B class 2

Date: 2026-04-16

Project #: PI 20355

Run: 4

Tech: M.M

Reviewer: DO

TEST FILTERS			
SYSTEM 2		TEST FILTERS	
Pre-test Weight Record	Probe & Housing Number	Front & Back Filter Number	Blank Filter
Date	Time	gaskets	
2026-04-15	17:00	18	906
2026-04-16	9:00	4 1828	0 1256
		4 1829	0 1257
TEST FILTERS			
SYSTEM 2		TEST FILTERS	
Post-test Weight Record	Probe & Housing Number	Front & Back Filter Number	Blank Filter
Date	Time	gaskets	End test time and date
2026-04-16	14:15	18	2026-04-16
2026-04-20	8:00	4 1854	14:00
2026-04-21	9:00	4 1835	
		4 1835	

APPENDIX 2: Proportionality results

Average	Average	Average	Average								Average	Average
16,96	Inlet +	Inlet +	Inlet +								0,278	0,176
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2			
Tunnel	Temp.	Temp.	Temp.	101,09	98,55	98,98	System 1st Hr	System 1	System 2		SQRT	tunnel static
Velocity	Meter 1st Hr	Meter 1	Meter 2	Proportional Rates			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P	pressure
				PR1st hour	PR1	PR2				Time		negative val
Ft/Sec	Deg. R	Deg. R	Deg. R	%	%	%	(ft3)	(ft3)	(ft3)	min	(in H2O)2	(in H2O)
17,394	535,255	535,7	534,9				0,189	0,182	0,191	0	0,278	0,1807055
17,030	535,255	535,8	535,1	102,1	99,6	100,1	0,189	0,182	0,191	1	0,277	0,1819111
16,893	535,356	535,9	535,1	104,2	100,0	100,7	0,192	0,182	0,191	2	0,275	0,1767431
17,008	535,470	535,9	535,2	101,6	99,3	99,9	0,188	0,182	0,191	3	0,277	0,1819046
16,719	535,579	535,9	535,3	102,8	101,0	101,5	0,188	0,182	0,190	4	0,272	0,1788391
17,069	535,631	535,9	535,3	101,5	98,9	99,8	0,189	0,182	0,191	5	0,278	0,1798488
17,070	535,750	536,0	535,4	100,0	99,0	99,6	0,186	0,182	0,191	6	0,278	0,1767442
16,969	535,852	536,0	535,5	102,9	99,7	100,2	0,190	0,182	0,190	7	0,276	0,1767435
16,973	535,969	536,0	535,6	103,3	99,7	100,2	0,191	0,182	0,190	8	0,276	0,1798954
16,801	536,045	536,0	535,6	103,1	100,8	101,2	0,188	0,182	0,190	9	0,273	0,1725972
16,639	536,170	536,0	535,7	104,4	101,9	102,2	0,189	0,182	0,190	10	0,271	0,1798473
16,698	536,284	536,0	535,7	103,4	101,5	101,9	0,188	0,182	0,190	11	0,271	0,1767427
16,877	536,385	536,0	535,8	102,7	100,5	101,1	0,188	0,182	0,190	12	0,274	0,1819136
16,878	536,499	536,1	535,8	103,1	100,6	100,9	0,189	0,182	0,190	13	0,274	0,1802337
16,932	536,625	536,1	535,9	102,7	100,3	100,7	0,189	0,182	0,190	14	0,275	0,1747456
17,105	536,746	536,2	536,0	102,2	99,2	99,7	0,190	0,182	0,190	15	0,278	0,1694989
16,874	536,868	536,3	536,1	102,7	100,8	100,9	0,188	0,182	0,190	16	0,274	0,1767361
16,988	536,959	536,3	536,2	102,5	99,7	100,3	0,189	0,182	0,190	17	0,276	0,1788671
17,086	537,059	536,3	536,2	101,4	98,9	99,6	0,189	0,182	0,190	18	0,278	0,1746704
16,806	537,157	536,4	536,3	103,1	100,6	101,3	0,189	0,181	0,190	19	0,273	0,1746717
17,032	537,253	536,4	536,4	102,0	99,3	99,9	0,189	0,182	0,190	20	0,277	0,1767441
17,097	537,316	536,5	536,5	101,0	99,1	99,4	0,188	0,182	0,190	21	0,278	0,1767436
16,867	537,350	536,6	536,6	103,5	100,5	100,8	0,190	0,182	0,190	22	0,274	0,1746705
16,873	537,486	536,6	536,6	102,4	100,4	100,8	0,188	0,182	0,190	23	0,274	0,1726073
16,755	537,564	536,7	536,7	104,3	100,9	101,8	0,190	0,181	0,190	24	0,272	0,1746726
16,767	537,643	536,8	536,8	102,0	101,1	101,5	0,186	0,181	0,190	25	0,273	0,1746729
17,099	537,728	536,8	536,9	101,5	99,1	99,5	0,189	0,182	0,190	26	0,278	0,1819152
17,145	537,806	536,9	537,0	101,1	98,6	99,2	0,189	0,182	0,190	27	0,279	0,1819145
16,858	537,866	537,0	537,0	102,7	100,1	100,6	0,189	0,182	0,190	28	0,275	0,17985
17,066	537,963	537,1	537,1	101,3	98,8	99,3	0,189	0,182	0,190	29	0,278	0,1819133
17,107	538,017	537,1	537,2	100,7	98,3	98,8	0,188	0,181	0,190	30	0,279	0,1819108
17,209	538,098	537,2	537,3	99,9	97,5	98,2	0,188	0,181	0,190	31	0,281	0,1767431
17,031	538,151	537,2	537,3	100,7	98,4	99,0	0,188	0,181	0,190	32	0,278	0,1795951
16,686	538,216	537,3	537,4	102,6	100,6	101,0	0,188	0,181	0,190	33	0,272	0,1798474
16,960	538,251	537,3	537,5	101,6	98,9	99,3	0,189	0,182	0,190	34	0,277	0,176754
17,169	538,288	537,3	537,5	99,9	97,4	97,8	0,189	0,182	0,190	35	0,281	0,1819088
16,960	538,312	537,4	537,6	100,8	98,4	99,0	0,188	0,181	0,190	36	0,278	0,1767431
16,867	538,338	537,4	537,6	101,8	99,0	99,4	0,189	0,181	0,190	37	0,276	0,1746725
16,855	538,384	537,4	537,7	101,1	98,9	99,0	0,188	0,182	0,190	38	0,276	0,1767422
17,006	538,409	537,4	537,7	100,1	97,8	98,3	0,188	0,182	0,190	39	0,279	0,1726045
16,992	538,431	537,4	537,7	99,6	97,8	98,0	0,187	0,182	0,190	40	0,279	0,1798328
16,707	538,463	537,5	537,8	102,2	99,3	99,8	0,189	0,182	0,190	41	0,274	0,1746701
17,149	538,481	537,4	537,8	98,8	96,6	97,1	0,188	0,181	0,190	42	0,282	0,1695038
17,074	538,460	537,4	537,8	98,2	96,9	97,3	0,186	0,181	0,190	43	0,281	0,1767418
16,913	538,454	537,4	537,8	100,4	97,9	98,3	0,189	0,182	0,190	44	0,278	0,1746696
16,953	538,455	537,4	537,8	98,8	97,4	97,9	0,186	0,181	0,190	45	0,279	0,1694979
16,949	538,441	537,4	537,9	99,8	97,4	97,8	0,188	0,181	0,190	46	0,279	0,1768174
16,946	538,444	537,4	537,9	99,3	97,4	97,6	0,187	0,181	0,189	47	0,279	0,1767416
16,924	538,431	537,4	537,9	98,2	97,5	97,9	0,185	0,182	0,190	48	0,279	0,1746695
17,095	538,437	537,4	537,9	98,6	96,3	96,9	0,188	0,181	0,190	49	0,282	0,1767415
16,750	538,435	537,4	537,9	100,9	98,6	98,5	0,189	0,182	0,190	50	0,276	0,1767429
17,128	538,411	537,4	537,9	97,6	96,2	96,5	0,187	0,182	0,190	51	0,282	0,1726038
16,972	538,384	537,4	538,0	99,9	97,0	97,4	0,189	0,182	0,190	52	0,280	0,1767419
17,080	538,415	537,4	538,0	98,9	96,2	96,6	0,189	0,181	0,190	53	0,282	0,1746702
16,965	538,386	537,4	538,0	99,1	96,9	97,1	0,188	0,181	0,189	54	0,280	0,176741
16,979	538,381	537,3	538,0	98,1	96,7	97,2	0,187	0,181	0,190	55	0,280	0,174669
16,913	538,360	537,3	538,0	99,3	96,9	97,4	0,188	0,181	0,190	56	0,279	0,1726035
17,003	538,367	537,3	537,9	98,4	96,4	96,7	0,187	0,181	0,189	57	0,281	0,1726045
16,996	538,326	537,3	538,0	98,7	96,7	96,7	0,188	0,182	0,189	58	0,281	0,1694975
16,770	538,323	537,3	537,9	100,2	97,5	98,0	0,189	0,182	0,190	59	0,277	0,1622544
16,831	538,315	537,2	538,0	99,4	97,2	97,5	0,188	0,181	0,190	60	0,278	0,1694955
17,203	538,189	537,2	538,0	0,0	95,0	95,5	0,000	0,181	0,190	61	0,284	0,1767408
17,037	538,103	537,2	538,2	0,0	96,0	96,5	0,000	0,181	0,190	62	0,282	0,1746702
17,034	537,985	537,2	538,4	0,0	96,0	96,4	0,000	0,181	0,190	63	0,282	0,1767427
17,025	537,976	537,3	538,6	0,0	96,1	96,1	0,000	0,182	0,189	64	0,282	0,1726038
16,969	537,925	537,3	538,7	0,0	96,4	96,3	0,000	0,182	0,189	65	0,281	0,1727017

Average	Average	Average	Average								Average	Average
16,64	Inlet +	Inlet +	Inlet +								0,270	0,169
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2			
Tunnel	Temp.	Temp.	Temp.	100,50	98,41	98,17	System 1st Hr	System 1	System 2		SQRT	tunnel static
Velocity	Meter 1st Hr	Meter 1	Meter 2	Proportional Rates			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P	pressure
				PR1st hour	PR1	PR2				Time		negative val
Ft/Sec	Deg. R	Deg. R	Deg. R	%	%	%	(ft3)	(ft3)	(ft3)	min	(in H2O)2	(in H2O)
16,824	533,177	532,9	532,3				0,188	0,182	0,191	0	0,271	0,1746814
16,672	533,177	533,1	532,5	100,9	99,0	99,2	0,188	0,182	0,191	1	0,270	0,1726589
16,493	533,245	533,1	532,5	102,5	100,0	100,2	0,189	0,181	0,190	2	0,267	0,1695072
16,569	533,263	533,0	532,5	101,9	100,1	99,8	0,188	0,181	0,190	3	0,268	0,1746761
16,636	533,318	533,1	532,5	101,6	99,4	99,4	0,189	0,182	0,190	4	0,269	0,17468
16,507	533,368	533,1	532,6	102,6	100,3	100,3	0,189	0,181	0,190	5	0,267	0,1760152
16,680	533,435	533,1	532,6	101,2	99,1	98,9	0,188	0,181	0,190	6	0,270	0,1695066
16,800	533,509	533,1	532,7	100,7	98,4	98,4	0,189	0,181	0,190	7	0,271	0,1726125
16,691	533,569	533,1	532,7	101,1	99,1	99,1	0,188	0,181	0,190	8	0,270	0,1726127
16,809	533,670	533,1	532,7	100,0	98,7	98,6	0,187	0,181	0,190	9	0,271	0,1798554
16,815	533,725	533,1	532,8	100,7	98,5	98,5	0,189	0,181	0,190	10	0,271	0,1695065
16,752	533,804	533,1	532,8	101,6	99,0	98,7	0,189	0,181	0,190	11	0,270	0,1746792
16,688	533,861	533,1	532,8	101,1	99,1	99,2	0,188	0,181	0,190	12	0,270	0,1776762
16,689	533,956	533,2	532,9	101,4	99,2	99,0	0,189	0,181	0,190	13	0,270	0,1674421
16,842	534,028	533,2	533,0	100,4	98,3	98,2	0,188	0,181	0,190	14	0,272	0,174679
16,805	534,066	533,2	533,0	100,6	98,4	98,5	0,188	0,181	0,190	15	0,271	0,1746813
16,805	534,130	533,2	533,0	100,5	98,5	98,3	0,188	0,181	0,190	16	0,271	0,1746785
16,389	534,190	533,3	533,1	103,0	101,0	100,8	0,188	0,181	0,190	17	0,265	0,1674383
16,792	534,243	533,3	533,1	100,2	98,4	98,4	0,188	0,181	0,190	18	0,271	0,1629762
16,681	534,341	533,4	533,2	101,0	99,2	98,8	0,188	0,181	0,190	19	0,270	0,167442
16,684	534,377	533,4	533,3	101,0	99,1	98,9	0,188	0,181	0,189	20	0,270	0,1675408
16,739	534,442	533,4	533,3	101,4	98,8	98,6	0,189	0,181	0,190	21	0,271	0,1674389
16,922	534,470	533,5	533,4	98,3	97,7	97,6	0,186	0,181	0,190	22	0,274	0,1674417
16,736	534,506	533,5	533,4	100,5	98,6	98,7	0,188	0,181	0,190	23	0,271	0,1726142
16,559	534,513	533,4	533,4	101,5	100,0	99,6	0,188	0,181	0,190	24	0,268	0,1726145
16,750	534,437	533,2	533,2	100,8	98,7	98,6	0,188	0,181	0,190	25	0,271	0,1674411
16,561	534,414	533,1	533,2	101,4	100,0	99,5	0,187	0,181	0,190	26	0,268	0,1602035
16,494	534,455	533,2	533,2	102,0	100,3	100,0	0,188	0,182	0,190	27	0,267	0,1726092
16,502	534,559	533,3	533,4	101,8	100,2	100,1	0,188	0,182	0,190	28	0,267	0,169507
16,732	534,645	533,4	533,4	100,3	98,7	98,6	0,187	0,181	0,190	29	0,271	0,1675616
16,966	534,701	533,5	533,5	98,9	97,3	97,2	0,187	0,181	0,190	30	0,274	0,1746792
16,783	534,723	533,5	533,5	100,3	98,3	98,1	0,188	0,181	0,190	31	0,271	0,1695068
16,781	534,766	533,6	533,6	99,2	98,2	98,1	0,186	0,181	0,190	32	0,272	0,1726123
16,783	534,807	533,6	533,6	100,4	98,1	98,2	0,188	0,181	0,190	33	0,272	0,176752
16,682	534,880	533,6	533,7	100,7	98,6	98,5	0,188	0,181	0,190	34	0,270	0,1729401
16,523	534,922	533,7	533,7	100,8	99,6	99,2	0,187	0,181	0,189	35	0,268	0,1726407
16,807	534,972	533,7	533,8	100,4	97,7	97,6	0,190	0,181	0,190	36	0,272	0,1726127
16,440	535,002	533,8	533,9	101,6	99,7	99,5	0,188	0,181	0,190	37	0,267	0,1653682
17,073	535,029	533,8	533,9	97,3	96,0	95,7	0,187	0,181	0,189	38	0,277	0,1695075
16,740	535,069	533,8	533,9	100,0	97,8	97,5	0,188	0,181	0,189	39	0,272	0,1653663
16,417	535,080	533,9	534,0	101,5	99,6	99,5	0,188	0,181	0,190	40	0,267	0,1726124
16,759	535,110	533,9	534,1	99,4	97,4	97,3	0,188	0,181	0,190	41	0,272	0,1695071
16,583	535,109	533,9	534,1	100,4	98,4	98,3	0,188	0,181	0,190	42	0,270	0,1726132
16,712	535,102	533,9	534,1	99,5	97,8	97,5	0,188	0,181	0,189	43	0,272	0,1653683
16,688	535,101	533,9	534,2	99,4	97,7	97,2	0,188	0,181	0,189	44	0,271	0,1674306
16,690	535,105	533,9	534,2	99,6	97,7	97,5	0,188	0,181	0,189	45	0,271	0,169501
16,685	535,139	533,9	534,3	100,0	97,6	97,3	0,189	0,181	0,189	46	0,271	0,1628216
16,561	535,108	533,9	534,3	100,3	98,3	98,1	0,188	0,181	0,189	47	0,270	0,172011
16,732	535,114	533,9	534,3	99,2	97,5	96,9	0,188	0,181	0,189	48	0,272	0,1695057
16,789	535,078	533,9	534,2	99,1	96,8	96,6	0,188	0,181	0,189	49	0,273	0,1695054
16,372	535,069	533,9	534,2	101,0	99,5	99,0	0,188	0,181	0,189	50	0,267	0,1653665
16,546	535,081	533,9	534,3	100,5	98,1	98,2	0,189	0,181	0,190	51	0,270	0,1653665
16,479	535,106	533,9	534,3	100,1	98,4	98,3	0,187	0,181	0,190	52	0,269	0,1650427
16,656	535,092	533,9	534,3	99,9	97,5	97,5	0,189	0,181	0,190	53	0,271	0,166442
16,710	535,042	533,9	534,3	98,9	97,2	97,1	0,188	0,181	0,190	54	0,272	0,1654824
16,418	535,012	533,8	534,3	101,3	99,0	98,5	0,189	0,181	0,189	55	0,268	0,1622624
16,523	534,991	533,8	534,3	99,7	98,2	97,7	0,187	0,181	0,189	56	0,270	0,1674381
16,755	534,988	533,8	534,3	98,8	96,7	96,4	0,188	0,181	0,189	57	0,273	0,1653648
16,409	534,971	533,8	534,3	100,8	98,7	98,4	0,188	0,181	0,189	58	0,268	0,1674399
16,572	534,980	533,8	534,4	99,7	97,7	97,4	0,188	0,181	0,189	59	0,271	0,1674367
16,572	535,005	533,9	534,4	99,6	97,8	97,5	0,188	0,181	0,189	60	0,271	0,165365
16,514	534,998	533,9	534,5	0,0	98,0	97,7	0,000	0,181	0,189	61	0,270	0,1674232
16,565	534,807	533,9	534,6	0,0	97,4	97,3	0,000	0,181	0,189	62	0,271	0,1622697
16,449	534,702	533,9	534,8	0,0	98,5	98,1	0,000	0,181	0,189	63	0,269	0,1653675
16,676	534,607	533,9	535,0	0,0	96,9	96,6	0,000	0,181	0,189	64	0,272	0,1653668
16,682	534,563	533,9	535,1	0,0	96,8	96,6	0,000	0,181	0,189	65	0,272	0,1622653
16,489	534,500	533,9	535,1	0,0	98,0	97,6	0,000	0,181	0,189	66	0,269	0,1653683
16,328	534,446	533,8	535,2	0,0	99,0	98,5	0,000	0,181	0,189	67	0,267	0,1581242
16,732	534,389	533,8	535,3	0,0	96,8	96,1	0,000	0,181	0,189	68	0,273	0,1674387
16,615	534,352	533,8	535,3	0,0	97,4	96,9	0,000	0,182	0,189	69	0,271	0,1653668
16,264	534,304	533,8	535,4	0,0	99,2	98,9	0,000	0,181	0,189	70	0,266	0,1663588
16,555	534,261	533,8	535,4	0,0	97,7	97,0	0,000	0,181	0,189	71	0,271	0,1695053
16,660	534,245	533,8	535,4	0,0	96,9	96,4	0,000	0,181	0,189	72	0,272	0,1674382
16,606	534,223	533,8	535,5	0,0	97,3	96,7	0,000	0,181	0,189	73	0,272	0,1653672
16,417	534,188	533,8	535,5	0,0	98,3	97,8	0,000	0,181	0,189	74	0,268	0,167438
16,543	534,201	533,8	535,6	0,0	97,6	97,0	0,000	0,181	0,189	75	0,271	0,1601986

Average	Average	Average	Average								Average	Average
17,01	Inlet +	Inlet +	Inlet +								0,281	0,178
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2			
Tunnel	Temp.	Temp.	Temp.	100,82	98,47	98,88	System 1st Hr	System 1	System 2		SQRT	tunnel static
Velocity	Meter 1st Hr	Meter 1	Meter 2	Proportional Rates			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P	pressure
				PR1st hour	PR1	PR2				Time		negative val
Ft/Sec	Deg. R	Deg. R	Deg. R	%	%	%	(ft3)	(ft3)	(ft3)	min	(in H2O)2	(in H2O)
17,082	532,544	532,5	531,8				0,192	0,185	0,194	0	0,278	0,1766146
17,129	532,544	532,7	532,0	100,4	100,0	100,8	0,192	0,184	0,193	1	0,280	0,1751709
17,015	532,603	532,6	532,0	99,9	100,0	100,7	0,191	0,184	0,192	2	0,279	0,1798527
16,945	532,631	532,6	531,9	99,8	100,1	101,0	0,191	0,184	0,193	3	0,278	0,1798539
16,774	532,627	532,5	531,9	100,2	101,2	101,9	0,189	0,184	0,192	4	0,275	0,1819216
16,967	532,620	532,5	531,9	100,2	100,5	101,2	0,191	0,184	0,192	5	0,278	0,1798518
16,817	532,653	532,5	531,9	100,9	100,9	101,5	0,191	0,184	0,193	6	0,276	0,1767512
16,916	532,640	532,4	531,9	99,6	99,6	100,1	0,191	0,184	0,192	7	0,279	0,1746776
16,705	532,675	532,4	531,9	100,5	100,6	101,4	0,191	0,184	0,192	8	0,275	0,1746753
16,853	532,668	532,4	532,0	99,5	99,5	100,3	0,191	0,184	0,192	9	0,278	0,1746764
16,851	532,691	532,4	532,1	99,7	99,6	100,5	0,191	0,184	0,192	10	0,278	0,1767477
16,958	532,696	532,4	532,1	98,8	99,0	99,8	0,191	0,184	0,193	11	0,280	0,1767478
17,118	532,689	532,4	532,1	97,9	98,1	98,6	0,191	0,184	0,192	12	0,283	0,1819177
16,618	532,718	532,5	532,2	101,3	101,0	101,7	0,192	0,184	0,192	13	0,274	0,1837335
16,843	532,729	532,5	532,2	99,6	99,8	100,3	0,191	0,184	0,192	14	0,278	0,1798504
17,016	532,732	532,5	532,2	99,0	98,4	99,2	0,192	0,184	0,192	15	0,281	0,1798533
16,728	532,742	532,5	532,3	100,3	100,3	100,9	0,191	0,184	0,192	16	0,276	0,1727657
17,002	532,757	532,5	532,3	99,1	98,6	99,2	0,192	0,184	0,192	17	0,281	0,1726756
16,874	532,751	532,5	532,4	98,9	99,2	99,6	0,191	0,184	0,192	18	0,279	0,181917
16,937	532,796	532,6	532,5	99,4	98,8	99,5	0,192	0,184	0,192	19	0,280	0,179852
16,657	532,839	532,6	532,5	100,4	100,6	101,2	0,191	0,184	0,192	20	0,275	0,1746742
17,060	532,881	532,6	532,6	98,2	98,4	98,7	0,191	0,184	0,192	21	0,282	0,1819196
16,744	532,897	532,6	532,6	99,8	100,2	100,8	0,190	0,184	0,192	22	0,276	0,1732224
16,747	532,924	532,6	532,6	101,0	100,3	100,7	0,193	0,184	0,192	23	0,276	0,1798528
17,019	532,949	532,6	532,7	98,4	98,6	99,3	0,191	0,184	0,192	24	0,281	0,1850231
16,806	532,979	532,7	532,7	100,7	100,1	100,8	0,192	0,184	0,192	25	0,277	0,1798526
16,973	532,994	532,7	532,8	99,0	99,2	99,9	0,191	0,184	0,192	26	0,280	0,1798509
16,867	533,004	532,8	532,8	99,2	99,8	100,1	0,190	0,184	0,192	27	0,278	0,1746756
16,766	533,032	532,8	532,9	100,3	100,6	101,1	0,191	0,184	0,192	28	0,276	0,1726087
16,919	533,075	532,9	533,0	98,9	99,4	100,0	0,190	0,184	0,192	29	0,279	0,1798536
16,927	533,117	532,9	533,0	98,6	99,5	100,3	0,189	0,184	0,192	30	0,279	0,18192
16,985	533,148	533,0	533,1	98,8	99,0	99,8	0,190	0,184	0,192	31	0,280	0,1798556
16,870	533,173	533,0	533,2	99,8	99,9	100,3	0,191	0,184	0,192	32	0,278	0,1818892
16,929	533,210	533,1	533,2	99,1	99,3	100,0	0,190	0,184	0,192	33	0,279	0,1819318
16,532	533,233	533,1	533,3	101,6	101,7	102,3	0,191	0,183	0,192	34	0,272	0,1819183
16,763	533,272	533,1	533,3	100,3	100,4	101,0	0,191	0,184	0,192	35	0,276	0,1746748
16,912	533,312	533,2	533,4	99,7	99,8	100,1	0,191	0,184	0,192	36	0,279	0,1819189
16,941	533,347	533,2	533,4	99,1	99,4	99,9	0,190	0,184	0,192	37	0,279	0,1767498
16,720	533,395	533,2	533,4	101,2	100,9	101,5	0,192	0,184	0,192	38	0,275	0,1748392
17,053	533,440	533,2	533,5	99,0	99,6	99,6	0,190	0,184	0,192	39	0,281	0,1798529
17,210	533,472	533,3	533,5	97,9	97,8	98,5	0,191	0,184	0,192	40	0,283	0,1746769
16,774	533,514	533,3	533,6	100,3	100,5	101,2	0,191	0,183	0,192	41	0,276	0,1850251
16,948	533,598	533,4	533,7	99,5	99,5	100,0	0,191	0,184	0,192	42	0,279	0,1819206
17,118	533,628	533,4	533,7	98,5	98,6	99,1	0,191	0,184	0,192	43	0,282	0,1790096
16,950	533,671	533,5	533,8	99,3	99,5	100,1	0,191	0,184	0,192	44	0,279	0,1765887
17,116	533,716	533,5	533,8	98,3	98,6	98,7	0,191	0,184	0,192	45	0,282	0,1850264
17,277	533,764	533,5	533,9	97,2	97,5	98,2	0,190	0,184	0,192	46	0,284	0,1819192
17,333	533,801	533,6	533,9	96,9	97,2	97,7	0,190	0,183	0,192	47	0,285	0,1798528
17,274	533,860	533,6	534,0	97,7	97,6	98,2	0,191	0,184	0,192	48	0,284	0,1819197
17,274	533,889	533,6	534,0	97,5	97,3	98,0	0,191	0,183	0,192	49	0,284	0,1850259
17,053	533,921	533,7	534,1	98,5	98,6	99,3	0,190	0,183	0,192	50	0,281	0,1819176
16,999	533,970	533,7	534,1	99,1	99,0	99,5	0,191	0,183	0,192	51	0,280	0,1768241
16,993	534,032	533,7	534,1	98,3	99,0	99,7	0,189	0,183	0,192	52	0,280	0,1850259
17,014	534,046	533,7	534,2	99,3	99,1	99,3	0,192	0,184	0,192	53	0,280	0,1798507
16,993	534,081	533,8	534,2	99,0	99,0	99,5	0,191	0,183	0,192	54	0,280	0,1850252
16,881	534,131	533,8	534,3	99,8	99,6	100,2	0,191	0,183	0,192	55	0,278	0,1746797
17,318	534,164	533,8	534,3	96,9	97,1	97,5	0,190	0,183	0,192	56	0,285	0,1819181
17,089	534,191	533,9	534,4	97,9	98,3	98,9	0,190	0,183	0,192	57	0,282	0,1819187
17,196	534,227	533,9	534,4	97,5	97,7	98,1	0,190	0,183	0,192	58	0,283	0,1798528
17,302	534,266	534,0	534,5	96,4	96,8	97,4	0,190	0,183	0,191	59	0,285	0,1798516
17,086	534,301	534,0	534,6	98,0	98,1	98,6	0,190	0,183	0,191	60	0,282	0,1819187
17,027	534,334	534,1	534,6	98,7	98,7	99,1	0,191	0,183	0,192	61	0,281	0,1819183
17,303	534,365	534,1	534,6	0,0	96,8	97,7	0,000	0,183	0,192	62	0,285	0,1884626
17,238	534,209	534,1	534,7	0,0	97,2	97,5	0,000	0,183	0,192	63	0,284	0,1819213
17,074	534,102	534,1	534,9	0,0	98,1	98,5	0,000	0,183	0,191	64	0,282	0,1798529
16,958	534,058	534,1	535,1	0,0	98,7	99,1	0,000	0,183	0,191	65	0,280	0,179853
16,962	534,024	534,2	535,3	0,0	98,7	99,0	0,000	0,183	0,191	66	0,280	0,1798539
16,901	534,023	534,2	535,5	0,0	98,9	99,3	0,000	0,183	0,191	67	0,279	0,1819231
17,284	534,020	534,2	535,5	0,0	96,8	97,1	0,000	0,183	0,191	68	0,285	0,1798548
17,111	534,015	534,2	535,6	0,0	97,6	98,1	0,000	0,183	0,191	69	0,283	0,174587
16,947	533,992	534,2	535,7	0,0	98,7	99,0	0,000	0,183	0,191	70	0,280	0,1695049
17,163	533,976	534,2	535,8	0,0	97,3	97,8	0,000	0,183	0,191	71	0,283	0,1819178
16,999	533,973	534,2	535,8	0,0	98,2	98,7	0,000	0,183	0,191	72	0,281	0,1819147
17,223	533,967	534,2	535,8	0,0	97,0	97,1	0,000	0,183	0,191	73	0,284	0,1819208
16,773	533,961	534,2	535,9	0,0	99,6	99,9	0,000	0,183	0,191	74	0,277	0,1746779
17,214	533,930	534,2	535,9	0,0	97,0	97,2	0,000	0,183	0,191	75	0,284	0,1798523
17,266	533,946	534,2	535,9	0,0	96,7	96,9	0,000	0,183	0,191	76	0,285	0,1746783
16,988	533,941	534,2	536,0	0,0	98,3	98,5	0,000	0,183	0,191	77	0,281	0,176748
17,208	533,920	534,2	536,0	0,0	97,1	97,2	0,000	0,183	0,191	78	0,284	0,1746786
17,262	533,916	534,1	536,0	0,0	96,8	97,0	0,000	0,183	0,191	79	0,285	0,1798529
17,041	533,898	534,1	536,0	0,0	97,9	98,1	0,000	0,183	0,191	80	0,282	0,1746766
16,983	533,890	534,2	536,1	0,0	98,3	98,6	0,000	0,183	0,191	81	0,281	0,1798524
17,258	533,889	534,2	536,1	0,0	96,8	96,9	0,000	0,183	0,191	82	0,285	0,176746
16,873	533,876	534,2	536,1	0,0	98,9	99,0	0,000	0,183	0,191	83	0,279	0,1726087
17,308	533,890	534,2	536,1	0,0	96,3	96,6	0,000	0,183	0,191	84	0,286	0,179854
16,922	533,897	534,2	536,1	0,0	98,5	98,8	0,000	0,183	0,191	85		

17,007	533,875	534,2	536,2	0,0	98,0	98,2	0,000	0,183	0,191	86	0,281	0,1746759
17,309	533,877	534,2	536,1	0,0	96,2	96,5	0,000	0,183	0,191	87	0,286	0,1798532
17,187	533,865	534,2	536,2	0,0	96,9	97,1	0,000	0,183	0,191	88	0,284	0,1767489
16,919	533,884	534,2	536,2	0,0	98,5	98,7	0,000	0,183	0,191	89	0,280	0,1746774
16,918	533,886	534,2	536,2	0,0	98,5	98,7	0,000	0,183	0,191	90	0,280	0,1767519
17,155	533,902	534,2	536,1	0,0	97,0	97,3	0,000	0,183	0,191	91	0,284	0,1726088
17,188	533,866	534,2	536,1	0,0	97,0	97,1	0,000	0,183	0,191	92	0,284	0,1819192
16,966	533,874	534,2	536,2	0,0	98,1	98,3	0,000	0,183	0,191	93	0,281	0,1726116
16,969	533,876	534,2	536,2	0,0	98,2	98,2	0,000	0,183	0,191	94	0,281	0,1746765
16,798	533,876	534,2	536,2	0,0	99,1	99,2	0,000	0,183	0,191	95	0,278	0,1798512
16,910	533,887	534,3	536,2	0,0	98,5	98,6	0,000	0,183	0,191	96	0,280	0,1767484
17,179	533,890	534,3	536,3	0,0	96,8	97,3	0,000	0,183	0,191	97	0,284	0,1798105
16,788	533,902	534,3	536,3	0,0	99,0	99,4	0,000	0,183	0,191	98	0,278	0,1746755
16,905	533,894	534,3	536,3	0,0	98,5	98,7	0,000	0,183	0,191	99	0,280	0,174676
17,128	533,877	534,3	536,3	0,0	97,1	97,4	0,000	0,183	0,191	100	0,284	0,1798528
16,845	533,893	534,2	536,3	0,0	98,6	98,9	0,000	0,183	0,191	101	0,279	0,1767483
17,230	533,894	534,3	536,3	0,0	96,6	96,6	0,000	0,183	0,191	102	0,285	0,1767465
16,847	533,908	534,3	536,3	0,0	98,7	98,9	0,000	0,183	0,191	103	0,279	0,1726124
17,249	533,890	534,3	536,4	0,0	96,5	96,5	0,000	0,183	0,191	104	0,286	0,169506
16,853	533,890	534,3	536,3	0,0	98,7	98,7	0,000	0,183	0,191	105	0,279	0,1765431
16,951	533,886	534,3	536,4	0,0	98,0	98,1	0,000	0,183	0,191	106	0,281	0,1767484
16,954	533,863	534,3	536,4	0,0	98,1	98,4	0,000	0,183	0,191	107	0,281	0,1767478
17,224	533,866	534,3	536,3	0,0	96,6	96,7	0,000	0,183	0,191	108	0,285	0,1767363
17,229	533,854	534,3	536,4	0,0	96,5	96,5	0,000	0,183	0,191	109	0,285	0,1798513
17,170	533,871	534,3	536,4	0,0	96,9	97,0	0,000	0,183	0,191	110	0,284	0,1746733
17,003	533,854	534,2	536,4	0,0	97,6	97,9	0,000	0,183	0,191	111	0,282	0,17261
16,944	533,864	534,3	536,4	0,0	98,0	98,2	0,000	0,183	0,191	112	0,281	0,1767486
17,166	533,874	534,3	536,4	0,0	96,7	96,9	0,000	0,183	0,191	113	0,284	0,1819177
17,221	533,872	534,3	536,4	0,0	96,4	96,7	0,000	0,183	0,191	114	0,285	0,1767478
17,260	533,890	534,3	536,4	0,0	96,1	96,3	0,000	0,183	0,191	115	0,286	0,1767469
16,998	533,876	534,3	536,5	0,0	97,6	97,8	0,000	0,183	0,191	116	0,282	0,1798517
17,275	533,868	534,3	536,4	0,0	96,2	96,4	0,000	0,183	0,191	117	0,286	0,1726088
17,109	533,863	534,3	536,4	0,0	97,0	97,2	0,000	0,183	0,191	118	0,283	0,1767488
17,220	533,848	534,2	536,4	0,0	96,5	96,7	0,000	0,183	0,191	119	0,285	0,1767501
16,832	533,827	534,2	536,4	0,0	98,5	98,9	0,000	0,183	0,191	120	0,279	0,1798517

Average	Average	Average	Average								Average	Average
16,68	Inlet +	Inlet +	Inlet +								0,274	0,172
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2			
Tunnel	Temp.	Temp.	Temp.	100,39	98,92	99,28	System 1st Hr	System 1	System 2		SQRT	tunnel static
Velocity	Meter 1st Hr	Meter 1	Meter 2	Proportional Rates			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P	pressure
				PR1st hour	PR1	PR2				Time		negative value
Ft/Sec	Deg. R	Deg. R	Deg. R	%	%	%	(ft3)	(ft3)	(ft3)	min	(in H2O)2	(in H2O)
16,913	533,103	533,0	532,7				0,189	0,182	0,190	0	0,271	0,176749635
16,818	533,103	533,1	532,8	99,3	101,1	101,6	0,189	0,182	0,190	1	0,272	0,1746804
16,613	533,156	533,1	532,8	99,6	101,8	102,5	0,188	0,182	0,190	2	0,270	0,176750326
16,899	533,179	533,1	532,8	98,7	100,3	101,0	0,190	0,182	0,190	3	0,274	0,172611511
16,811	533,198	533,1	532,8	99,7	100,9	101,7	0,190	0,182	0,190	4	0,272	0,179853368
16,990	533,242	533,1	532,8	98,1	100,0	100,7	0,189	0,182	0,190	5	0,275	0,174679399
16,665	533,301	533,1	532,8	99,3	100,9	101,4	0,190	0,182	0,190	6	0,271	0,169506276
16,799	533,340	533,1	532,9	97,6	99,7	100,3	0,189	0,182	0,190	7	0,274	0,174678898
16,563	533,368	533,0	532,9	99,1	100,7	101,7	0,189	0,182	0,190	8	0,271	0,169505215
16,699	533,424	533,1	532,9	98,2	99,6	100,4	0,190	0,182	0,190	9	0,273	0,172611165
16,759	533,472	533,1	532,9	97,2	99,5	100,0	0,188	0,182	0,190	10	0,274	0,174678898
16,703	533,512	533,1	533,0	98,0	99,7	100,4	0,189	0,182	0,190	11	0,273	0,172610712
16,676	533,551	533,1	533,0	98,2	100,0	100,5	0,189	0,182	0,190	12	0,273	0,174677122
16,701	533,591	533,1	533,1	96,8	99,7	100,3	0,187	0,182	0,190	13	0,273	0,174697781
16,986	533,608	533,1	533,1	95,6	98,0	98,7	0,188	0,182	0,190	14	0,278	0,179853642
16,983	533,627	533,1	533,1	95,3	97,9	98,7	0,187	0,182	0,190	15	0,278	0,181918943
16,716	533,654	533,1	533,2	97,6	99,6	100,1	0,189	0,182	0,190	16	0,273	0,176721776
17,155	533,668	533,1	533,2	94,9	96,8	97,6	0,188	0,181	0,190	17	0,281	0,176748562
16,690	533,688	533,2	533,3	97,4	99,4	100,1	0,188	0,181	0,190	18	0,273	0,179852617
16,523	533,716	533,2	533,3	98,8	100,6	101,4	0,189	0,181	0,190	19	0,271	0,179854083
16,755	533,737	533,2	533,3	97,3	99,2	99,9	0,189	0,182	0,190	20	0,274	0,175009227
16,645	533,758	533,2	533,3	98,0	99,8	100,8	0,189	0,181	0,190	21	0,272	0,174678636
16,868	533,788	533,2	533,4	96,6	98,7	99,1	0,189	0,182	0,190	22	0,276	0,176748991
16,762	533,809	533,2	533,4	97,3	99,4	99,8	0,189	0,182	0,190	23	0,274	0,176750612
16,686	533,829	533,2	533,5	97,7	99,8	100,3	0,189	0,182	0,190	24	0,273	0,169505811
16,753	533,862	533,3	533,5	97,0	99,6	99,8	0,188	0,182	0,190	25	0,274	0,174677205
16,811	533,880	533,3	533,6	97,1	98,9	99,4	0,189	0,182	0,190	26	0,275	0,174678731
17,028	533,899	533,4	533,6	95,0	97,7	98,5	0,187	0,182	0,190	27	0,279	0,181922078
16,745	533,930	533,4	533,7	97,6	99,4	100,0	0,189	0,182	0,190	28	0,274	0,178598332
16,749	533,989	533,4	533,7	97,7	99,5	100,0	0,189	0,182	0,190	29	0,274	0,176750779
17,086	534,017	533,4	533,8	95,5	97,3	97,8	0,189	0,182	0,190	30	0,280	0,179856396
16,870	534,071	533,4	533,8	96,0	98,7	99,2	0,187	0,182	0,190	31	0,276	0,17467885
16,686	534,106	533,5	533,9	97,6	99,6	100,2	0,188	0,182	0,190	32	0,273	0,172612786
16,748	534,143	533,5	533,9	96,3	99,3	99,8	0,187	0,182	0,190	33	0,274	0,179837823
16,922	534,177	533,5	534,0	96,6	98,2	98,9	0,189	0,182	0,190	34	0,277	0,1767506
16,976	534,233	533,5	534,0	95,8	98,0	98,3	0,188	0,182	0,190	35	0,278	0,179854798
16,863	534,256	533,6	534,0	96,5	98,6	99,3	0,188	0,182	0,190	36	0,276	0,179852617
16,975	534,299	533,6	534,1	95,8	98,0	98,5	0,188	0,182	0,190	37	0,278	0,169508529
16,812	534,332	533,6	534,1	97,0	98,9	99,4	0,189	0,182	0,190	38	0,275	0,17677393
16,648	534,374	533,7	534,2	98,3	99,7	100,4	0,189	0,181	0,190	39	0,273	0,174673867
16,697	534,385	533,7	534,2	97,7	99,7	100,1	0,189	0,182	0,190	40	0,273	0,174678385
16,694	534,422	533,7	534,3	98,0	99,6	100,1	0,189	0,182	0,190	41	0,273	0,167444646
16,744	534,420	533,8	534,3	97,3	99,1	99,7	0,189	0,182	0,190	42	0,274	0,176750863
16,569	534,463	533,7	534,3	97,4	100,1	100,5	0,187	0,182	0,190	43	0,272	0,176750481
16,727	534,473	533,8	534,4	97,7	99,2	99,6	0,190	0,182	0,190	44	0,274	0,1767483
16,503	534,511	533,8	534,4	98,8	100,6	100,9	0,189	0,182	0,190	45	0,271	0,172609198
16,841	534,517	533,8	534,4	96,5	98,4	98,9	0,189	0,182	0,190	46	0,276	0,167439306
16,893	534,545	533,8	534,5	96,3	99,9	98,5	0,189	0,181	0,190	47	0,277	0,174677753
16,612	534,528	533,8	534,5	97,2	99,5	100,2	0,188	0,181	0,190	48	0,272	0,167400348
16,951	534,541	533,8	534,5	95,4	97,7	98,1	0,188	0,181	0,189	49	0,278	0,174677205
16,726	534,559	533,9	534,6	96,9	99,2	99,6	0,188	0,182	0,189	50	0,274	0,17261095
16,832	534,539	533,9	534,6	95,9	98,3	98,9	0,188	0,182	0,190	51	0,276	0,169504941
16,656	534,596	533,9	534,6	97,6	99,2	99,6	0,189	0,181	0,189	52	0,273	0,174677646
16,826	534,611	533,9	534,6	96,1	98,3	98,6	0,188	0,181	0,189	53	0,276	0,176749098
16,919	534,634	533,9	534,7	95,6	97,5	98,1	0,188	0,181	0,189	54	0,278	0,169505131
16,822	534,623	533,9	534,6	96,5	98,4	98,7	0,189	0,181	0,189	55	0,276	0,174677956
16,593	534,648	533,9	534,7	97,4	99,7	100,0	0,188	0,182	0,189	56	0,272	0,169504607
16,813	534,632	533,9	534,7	96,2	98,3	98,7	0,188	0,182	0,190	57	0,276	0,17261132
16,523	534,633	533,9	534,7	97,8	99,9	100,4	0,188	0,182	0,190	58	0,271	0,16743995
16,691	534,603	533,9	534,7	97,1	98,9	99,4	0,189	0,182	0,190	59	0,274	0,167440462
16,803	534,609	533,9	534,7	96,1	98,0	98,6	0,188	0,181	0,190	60	0,276	0,174677575
16,896	534,624	533,9	534,7	95,5	97,6	98,0	0,188	0,181	0,190	61	0,278	0,167470849
16,718	534,602	533,9	534,7	96,4	98,7	99,2	0,188	0,182	0,190	62	0,275	0,17260983
16,909	534,526	533,8	534,7	0,0	97,6	97,8	0,000	0,182	0,190	63	0,278	0,174677563
16,794	534,387	533,8	534,9	0,0	98,0	98,4	0,000	0,182	0,189	64	0,276	0,169505477
16,567	534,279	533,8	535,1	0,0	99,4	99,9	0,000	0,181	0,189	65	0,272	0,169505775
16,734	534,189	533,9	535,3	0,0	98,4	98,8	0,000	0,181	0,189	66	0,275	0,165368772
16,613	534,127	533,8	535,4	0,0	98,9	99,3	0,000	0,181	0,189	67	0,273	0,169506586
16,608	534,077	533,8	535,5	0,0	99,0	99,4	0,000	0,181	0,189	68	0,273	0,167354202
16,769	534,023	533,8	535,6	0,0	98,0	98,4	0,000	0,181	0,189	69	0,276	0,169311869
16,671	533,986	533,8	535,7	0,0	98,8	99,1	0,000	0,181	0,189	70	0,274	0,17261306
16,781	533,932	533,8	535,7	0,0	98,0	98,3	0,000	0,182	0,189	71	0,276	0,172612023
16,552	533,892	533,8	535,8	0,0	99,2	99,5	0,000	0,181	0,189	72	0,272	0,169104493
16,608	533,858	533,8	535,8	0,0	99,3	99,2	0,000	0,182	0,189	73	0,273	0,169506419
16,491	533,840	533,8	535,9	0,0	99,7	99,9	0,000	0,182	0,189	74	0,271	0,172612906
16,600	533,807	533,7	535,9	0,0	99,1	99,3	0,000	0,182	0,189	75	0,273	0,172612309
16,881	533,779	533,8	535,9	0,0	97,2	97,5	0,000	0,181	0,189	76	0,278	0,17261138
16,423	533,756	533,7	535,9	0,0	100,1	100,2	0,000	0,182	0,189	77	0,271	0,169506097
16,531	533,757	533,7	536,0	0,0	99,2	99,5	0,000	0,182	0,189	78	0,272	0,169502485
16,588	533,724	533,7	536,0	0,0	98,8	99,0	0,000	0,181	0,189	79	0,273	0,169503999
16,595	533,725	533,7	536,0	0,0	98,9	99,1	0,000	0,181	0,189	80	0,273	0,169503653
16,761	533,698	533,7	536,0	0,0	97,9	98,2	0,000	0,181	0,189	81	0,276	0,165367126
16,580	533,669	533,7	536,0	0,0	98,8	98,9	0,000	0,181	0,189	82	0,273	0,162262011
16,434	533,647	533,7	536,0	0,0	99,7	99,8	0,000	0,181	0,189	83	0,271	0,167438233
16,460	533,637	533,8	536,1	0,0	99,5	99,6	0,000	0,182	0,189			

16,517	533,540	533,7	536,1	0,0	99,2	99,3	0,000	0,182	0,189	89	0,272	0,162074077
16,461	533,516	533,7	536,1	0,0	99,4	99,7	0,000	0,181	0,189	90	0,271	0,174676669
16,507	533,503	533,7	536,1	0,0	99,3	99,3	0,000	0,182	0,189	91	0,272	0,167351174
16,455	533,509	533,7	536,1	0,0	99,6	99,8	0,000	0,182	0,189	92	0,271	0,174676836
16,907	533,468	533,7	536,1	0,0	96,8	97,0	0,000	0,182	0,189	93	0,279	0,17467761
16,800	533,468	533,6	536,1	0,0	97,5	97,6	0,000	0,181	0,189	94	0,277	0,172618902
16,736	533,441	533,6	536,1	0,0	98,0	98,1	0,000	0,182	0,189	95	0,276	0,172610795
16,516	533,421	533,6	536,1	0,0	99,3	99,4	0,000	0,182	0,189	96	0,272	0,165365112
16,567	533,402	533,6	536,1	0,0	99,1	99,0	0,000	0,182	0,189	97	0,273	0,165368497
16,626	533,419	533,6	536,1	0,0	98,4	98,6	0,000	0,182	0,189	98	0,274	0,171994853
16,743	533,382	533,6	536,1	0,0	97,9	97,9	0,000	0,182	0,189	99	0,276	0,169459188
16,518	533,366	533,6	536,1	0,0	99,4	99,4	0,000	0,182	0,189	100	0,272	0,169503844
16,192	533,376	533,6	536,1	0,0	101,1	101,2	0,000	0,182	0,189	101	0,267	0,162259769
16,509	533,360	533,6	536,1	0,0	99,1	99,3	0,000	0,182	0,189	102	0,272	0,167436707
16,569	533,330	533,6	536,1	0,0	98,6	99,0	0,000	0,181	0,189	103	0,273	0,174677455
16,681	533,349	533,6	536,1	0,0	98,0	98,5	0,000	0,181	0,189	104	0,275	0,167438281
16,415	533,358	533,6	536,1	0,0	99,7	99,6	0,000	0,181	0,189	105	0,271	0,169503438
16,787	533,329	533,6	536,1	0,0	97,4	97,6	0,000	0,182	0,189	106	0,277	0,17261107
16,503	533,331	533,6	536,1	0,0	99,1	99,3	0,000	0,181	0,189	107	0,272	0,167435145
16,621	533,339	533,6	536,1	0,0	98,4	98,5	0,000	0,182	0,189	108	0,274	0,174676824
16,698	533,347	533,6	536,1	0,0	97,9	98,0	0,000	0,182	0,189	109	0,276	0,169502616
16,384	533,336	533,6	536,1	0,0	99,8	100,0	0,000	0,182	0,189	110	0,271	0,169503736
16,508	533,342	533,6	536,1	0,0	99,2	99,3	0,000	0,182	0,189	111	0,272	0,165362084
16,732	533,365	533,6	536,1	0,0	97,6	97,9	0,000	0,182	0,189	112	0,276	0,167431724
16,825	533,375	533,6	536,1	0,0	96,9	97,1	0,000	0,181	0,189	113	0,278	0,16950357
16,494	533,398	533,6	536,1	0,0	99,0	99,1	0,000	0,181	0,189	114	0,272	0,167434978
16,439	533,396	533,5	536,1	0,0	99,3	99,6	0,000	0,181	0,189	115	0,271	0,166325879
16,761	533,408	533,5	536,1	0,0	97,4	97,6	0,000	0,181	0,189	116	0,277	0,172610164
16,658	533,399	533,5	536,1	0,0	97,9	98,2	0,000	0,181	0,189	117	0,275	0,166384637
16,543	533,396	533,4	536,0	0,0	98,7	98,9	0,000	0,181	0,189	118	0,273	0,16696353
16,313	533,386	533,3	535,9	0,0	100,0	100,2	0,000	0,182	0,189	119	0,270	0,167437696
16,365	533,336	533,3	535,9	0,0	99,8	99,9	0,000	0,182	0,189	120	0,270	0,167436922
16,825	533,306	533,2	535,8	0,0	97,1	97,3	0,000	0,182	0,189	121	0,278	0,17260927
16,546	533,284	533,2	535,8	0,0	98,8	99,0	0,000	0,182	0,189	122	0,273	0,16950444
16,435	533,244	533,2	535,8	0,0	99,6	99,6	0,000	0,182	0,189	123	0,271	0,165713429
16,823	533,219	533,2	535,8	0,0	97,0	97,0	0,000	0,182	0,189	124	0,278	0,169503284
16,430	533,188	533,2	535,8	0,0	99,3	99,7	0,000	0,182	0,189	125	0,271	0,172610617
16,309	533,157	533,1	535,8	0,0	100,1	100,1	0,000	0,182	0,189	126	0,270	0,169503057
16,707	533,138	533,2	535,8	0,0	97,8	97,7	0,000	0,182	0,189	127	0,276	0,165366399
16,479	533,122	533,1	535,7	0,0	99,0	99,2	0,000	0,182	0,189	128	0,272	0,172075379
16,649	533,101	533,1	535,7	0,0	98,2	98,2	0,000	0,182	0,189	129	0,275	0,169504619
16,472	533,059	533,1	535,7	0,0	99,1	99,1	0,000	0,182	0,189	130	0,272	0,169503343
16,474	533,050	533,1	535,7	0,0	99,1	99,3	0,000	0,182	0,189	131	0,272	0,165362775
16,696	533,027	533,1	535,7	0,0	97,7	97,9	0,000	0,182	0,189	132	0,276	0,169526684

APPENDIX 3: Calibration data

TEST DATA PACKAGE

CLIENT	Morso	PROJECT NUMBER	PI-20355
PRODUCT	Wood heater	SAMPLE ID#	QI-20554
MODEL	2B Classic		
STANDARDS	EPA, Method 28R, ASTM E2515-11,		

TEST EQUIPMENT

ITEM	EQUIPMENT TYPE	MANUFACTURER	EQUIPMENT #	CALIBRATION DATE	CALIBRATION DUE DATE
1	Digital Manometer	Dwyer	EM-006	May 2025	May 2026
2	20 ch. card Thermocouple	Keithley	EM-015/2	Nov 2025	May 2026
3	Scale 0-1000lbs Rough Deck	Rice lake	EM-021	August 2025	August 2026
4	analytical scale 200gr.	Ohaus	EM-051	Nov 2025	May 2026
5	Weight 2kg	N/A	EM-090	March 2022	March 2027
6	Gas analyzer	Siemen's	EM-118	Verif before use	Verif before use
7	Vacuum gauge	Dwyer	EM-126	May 2025	May 2026
8	Vacuum gauge	Dwyer	EM-127	May 2025	May 2026
9	Calibration weight 200g	Troemer	EM-129	March 2022	March 2027
10	Dry gas meter	Am. meter	EM-130	January 2026	July 2026
11	Temperature humidity meter	Fluke	EM-136	January 2026	January 2027
12	Vane anemometer	Omega	EM-153	January 2026	January 2027
13	20 ch. card Thermocouple	Keithley	EM-154/2	Nov 2025	May 2026
14	Chronometer	Extech	EM-175	January 2026	January 2027
15	Dry gas meter	Shinagawa	EM-178	January 2026	July 2026
16	Dry gas meter	Shinagawa	EM-179	January 2026	July 2026
17	Wood scale	Ohaus	EM-204	August 2025	August 2026
18	Weight 10kg	N/A	EM-205	January 2026	January 2030
19	Measuring tape	Stanley	EM-224	May 2025	May 2026
20	Digital Manometer	Dwyer	EM-249	May 2025	May 2026
21	Digital manometer	Dwyer	EM-313	May 2025	May 2026
22	Dry gas meter	Shinagawa	EM-318	January 2026	July 2026
23	Barometer	Control company	EM-333	Dec 2025	June 2026
24	Calibration block	Delmhorst	EM-334	January 2026	January 2027
25	Calibration weight 100mg	Troemer	EM-335	March 2022	March 2027
26	Calibration gas	Praxair	EM-336	June 2022	March 2030
27	Calibration gas	Praxair	EM-338	April 2025	March 2029
28	Vacuum gauge	Dwyer	EM-340	May 2025	May 2026



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CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-006 2025-05-26	
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
Location:	N.A.	Version:	Machine: N.A.
CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression 718 1G	Certification #:	2024007082
Serial #:	3562082	Certification Date:	2024-08-23
Certified by:	Alpha Controls	Next Certification:	2025-08-23
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			



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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2025-05-26
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CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
	Verification of the indicator						
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	0.488 "H2O	-0.012 "H2O	0.488 "H2O	-0.012 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.7500 "H2O	0.750 "H2O	0.734 "H2O	-0.016 "H2O	0.734 "H2O	-0.016 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
1.0000 "H2O	1.000 "H2O	0.977 "H2O	-0.023 "H2O	0.977 "H2O	-0.023 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.7500 "H2O	0.7500 "H2O	0.735 "H2O	-0.0150 "H2O	0.735 "H2O	-0.0150 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.5000 "H2O	0.5000 "H2O	0.489 "H2O	-0.0110 "H2O	0.489 "H2O	-0.0110 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.2500 "H2O	0.2500 "H2O	0.248 "H2O	-0.0020 "H2O	0.248 "H2O	-0.0020 "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						
	Verification of the analogic output						
0.0000 "H2O	0.0000 V.dc	0.0010 V.dc	0.0010 V.dc	0.0010 V.dc	0.0010 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.2500 "H2O	2.5000 V.dc	2.4987 V.dc	-0.0013 V.dc	2.4987 V.dc	-0.0013 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.5000 "H2O	5.0000 V.dc	4.8891 V.dc	-0.1109 V.dc	4.8891 V.dc	-0.1109 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						



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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2025-05-26
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Environmental Conditions:	Temperature: 21 °C	Humidity: 35 %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:	2025-05-26		
Next Calibration:	2026-05-26		
Certificate Date:	2025-05-26		
		Before	After
		X	X
		Compliant:	
		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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
- 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



Instrumentation
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2025-11-26		
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)	365
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 #:	6412-15326300
Serial #:	240605643	Certification Date:	2024-08-07
Certified by:	itm- Control Company	Next Certification:	2026-08-07
Comments:			



**Instrumentation
Saint-Laurent inc.**
Certified ISO/IEC 17025:2017



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CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-015/2 2025-11-26					
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	660.3 °F	-1.7 °F	660.3 °F	-1.7 °F	4.0 °F	0.5 °F
Pass	ID. No. 201 (Flue) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.2 °F	-1.8 °F	480.2 °F	-1.8 °F	4.0 °F	0.5 °F
Pass	ID. No. 202 (Right) 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
Pass	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
Pass	ID. No. 204 (Bottom) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.0 °F	-2.0 °F	480.0 °F	-2.0 °F	4.0 °F	0.5 °F
Pass	ID. No. 205 (Top) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	479.9 °F	-2.1 °F	479.9 °F	-2.1 °F	4.0 °F	0.5 °F
Pass	ID. No. 206 (Left) en type "K" En Loop avec EM-015						
662.0 °F	662.0 °F	662.5 °F	0.5 °F	662.5 °F	0.5 °F	4.0 °F	0.5 °F
Pass	ID. No. 207 (Catalyst) en type "K" 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
Pass	ID. No. 209 (DGM 1st HR IN) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	76.7 °F	-0.3 °F	76.7 °F	-0.3 °F	4.0 °F	0.4 °F
Pass	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
Pass	ID. No. 211 (wetbulb tunnel) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	77.9 °F	0.9 °F	77.9 °F	0.9 °F	4.0 °F	0.4 °F
Pass	ID. No. 215 (DGM 1 In) en type "J" 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
Pass	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
Pass	ID. No. 217 (DGM 2 In) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	77.0 °F	0.0 °F	77.0 °F	0.0 °F	4.0 °F	0.4 °F
Pass	ID. No. 218 (DGM 2 out) en type "J" En Loop avec EM-015						
85.0 °F	85.0 °F	83.7 °F	-1.3 °F	83.7 °F	-1.3 °F	4.0 °F	0.5 °F
Pass	ID. No. 220 (Filter 1st Hour) en type "T" En Loop avec EM-015						
Tested Temperature Probe:		Depth:		N.A.			
Environmental Conditions:		Temperature:		20 °C		Humidity: 35 %RH	
The calibration was carried out at the client on-site using the method of comparison to the standard measurement.							
Comments:							



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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2025-11-26
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CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-11-26
Next Calibration:	2026-11-26
Certificate Date:	2025-11-26

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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor $k=2$ such that the coverage probability corresponds to approximately 95 %.
- 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.
- Hysteresis is not accounted for in the calibration procedure nor in the uncertainty budget.

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

26 nov 2025

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:	FE1 _ 4 x 4HP-10K	Asset Number:	EM021
Serial No.:	C25969	Terminal Model:	480
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	400 kg	0,05 kg

Procedure

Calibration Guideline:	ASTM E898 - 20
METTLER TOLEDO Work Instruction:	SVC-WI-LABTEC-063 V2.0

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.

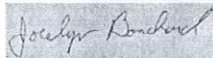
The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight.

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

	Temperature		Humidity	
As Found	Start: 22,0 °C	End: 22,0 °C	Start: 49,0 %	End: 49,0 %
As Left	Start: 20,0 °C	End: 20,0 °C	Start: 49,0 %	End: 49,0 %

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:	26-08-2025	Authorized A2LA Signatory:	
As Left Calibration Date:	29-08-2025		
Issue Date:	29-08-2025		Jocelyn Bouchard
Date of next calibration by customer request:	31-08-2026		

Measurement Results

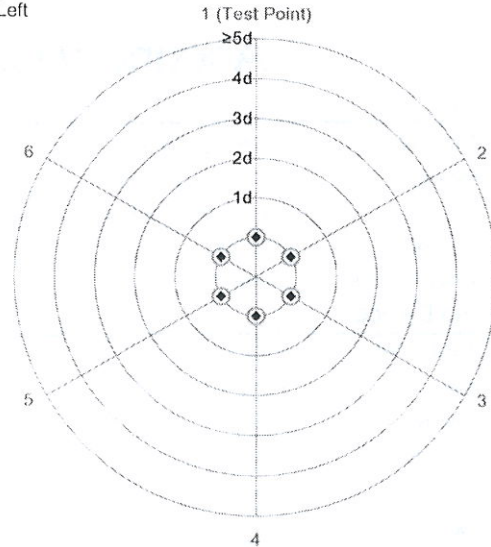
Repeatability

Test Load: 80 kg

	As Found	As Left
1	80,05 kg	80,00 kg
2	80,05 kg	80,00 kg
3	80,05 kg	80,00 kg
4	80,05 kg	80,00 kg
5	80,05 kg	80,00 kg
6	80,05 kg	80,00 kg

Standard Deviation	0,000 kg	0,000 kg
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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.

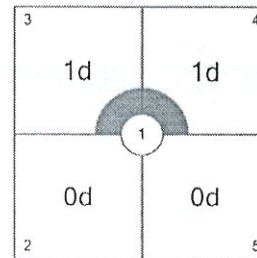
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

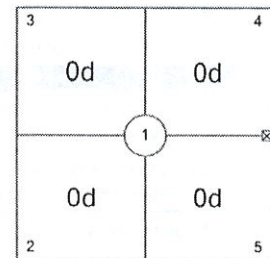
Test Load: 60 kg

Position	As Found	As Left
1	60,00 kg	60,00 kg
2	60,00 kg	60,00 kg
3	60,05 kg	60,00 kg
4	60,05 kg	60,00 kg
5	60,00 kg	60,00 kg

Maximum Deviation	0,05 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.

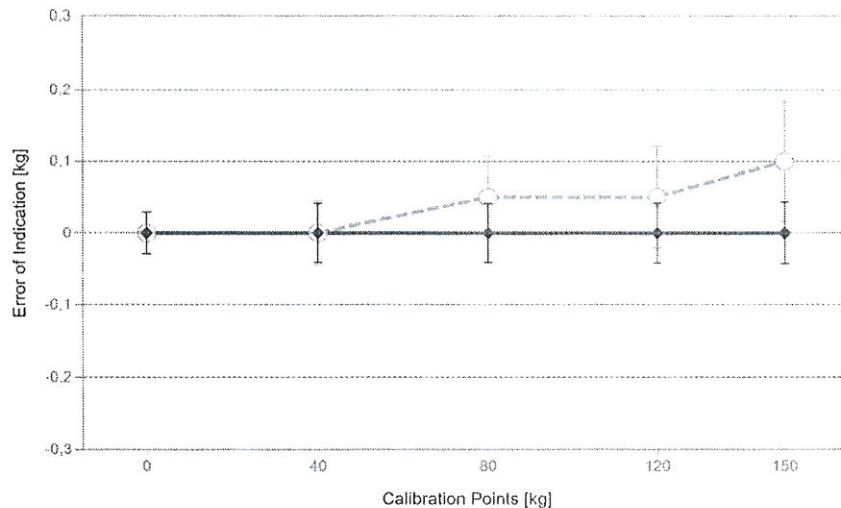
Error of Indication

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	40,00 kg	0,00 kg	0,045 kg	2
3	80 kg	80,05 kg	0,05 kg	0,057 kg	2
4	120 kg	120,05 kg	0,05 kg	0,071 kg	2
5	150 kg	150,10 kg	0,10 kg	0,084 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 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 M1

Weight Set No.:	T2 01 à50	Date of Issue:	07-03-2025
Certificate Number:	1411071	Calibration Due Date:	07-03-2026

Weight Set 2: OIML M1

Weight Set No.:	kit inspecteur	Date of Issue:	02-01-2025
Certificate Number:	M24-0627	Calibration Due Date:	02-01-2026

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

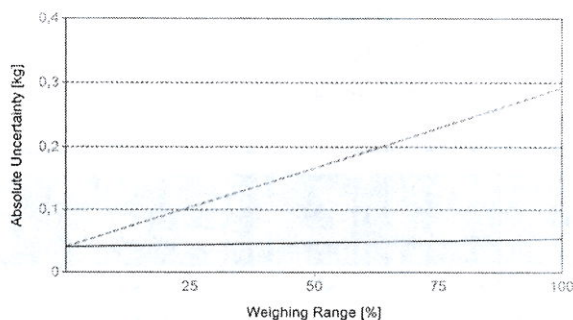
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0,05 kg	150 kg	$U_1 = 41 \text{ g} + 1,68 \text{ g/kg} \cdot R$	$U_1 = 41 \text{ g} + 0,0863 \text{ g/kg} \cdot R$

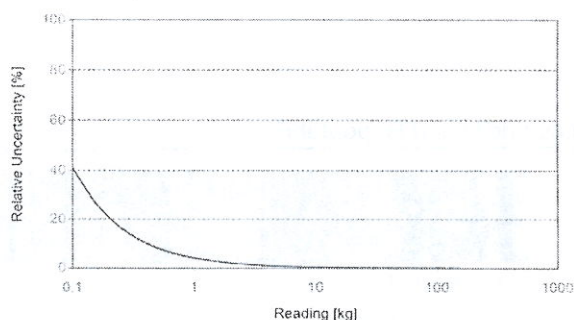
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
1,50 kg	0,044 kg	2,9%	0,041 kg	2,7%
15,00 kg	0,066 kg	0,44%	0,042 kg	0,28%
30,00 kg	0,091 kg	0,30%	0,044 kg	0,15%
75,00 kg	0,17 kg	0,22%	0,047 kg	0,063%
150,00 kg	0,29 kg	0,20%	0,054 kg	0,036%



As Found



As Left



Are you looking for some clarifications on the terms and graphs in your ACC calibration certificate? Do you know how to leverage its full value?

More information at:
www.mt.com/ACC-Cert-Info



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.

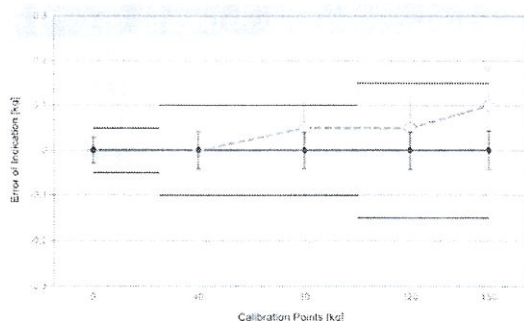
The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

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)	60 kg	0,10 kg	0,05 kg	✓	0,00 kg	✓
Eccentricity (Range)	60 kg	0,1 kg	0,05 kg	✓	0,00 kg	✓
Repeatability (Max. Error)	80 kg	0,1 kg	0,05 kg	✓	0,00 kg	✓
Repeatability (Range)	80 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	0,00 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	0,10 kg	✓	0,00 kg	✓
6	0 kg	0,05 kg	0,00 kg	✓	0,00 kg	✓

Handwritten signature and date: sept 20 2025

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
Zip / Postal: J3B 7S7
State / Province: Quebec
Contact: Danick Power

Weighing Device

Manufacturer: Ohaus
Model: AR2140
Serial No.: M3658329010091
Instrument Type: Weighing Instrument
Asset Number: EM-051
Terminal Model: N/A
Terminal Serial No.: N/A
Terminal Asset No.: N/A
Building: Main
Floor: 1st
Room: N/A

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

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: SVC-WI-LABTEC-063 V2.0

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. As Left 200 g.

	Temperature		Humidity	
	Start	End	Start	End
As Found	23.7 °C	23.3 °C	26.5 %	29.2 %
As Left	23.3 °C	23.3 °C	29.2 %	27.1 %

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: 04-11-2025
As Left Calibration Date: 04-11-2025
Issue Date: 04-11-2025
Date of next calibration by customer request: 30-11-2026
Authorized A2LA Signatory:
Denis Petrov

Measurement Results

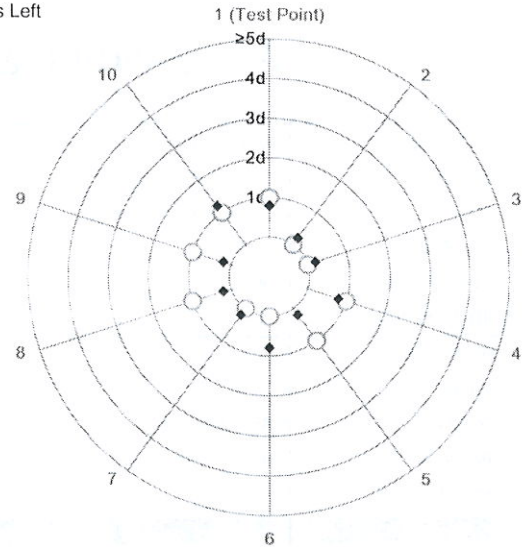
Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9997 g	99.9999 g
2	99.9996 g	99.9998 g
3	99.9996 g	99.9998 g
4	99.9997 g	99.9999 g
5	99.9995 g	99.9998 g
6	99.9996 g	99.9999 g
7	99.9996 g	99.9998 g
8	99.9997 g	99.9998 g
9	99.9995 g	99.9998 g
10	99.9995 g	99.9997 g

Standard Deviation	0.00008 g	0.00006 g
--------------------	-----------	-----------

○ As Found
◆ As Left



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

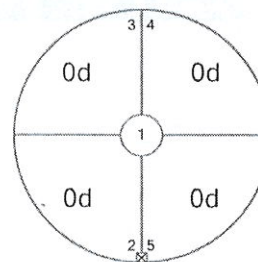
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

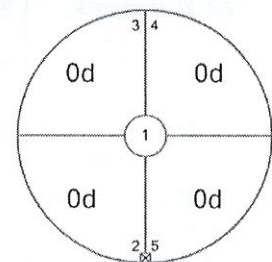
Test Load: 100 g

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.

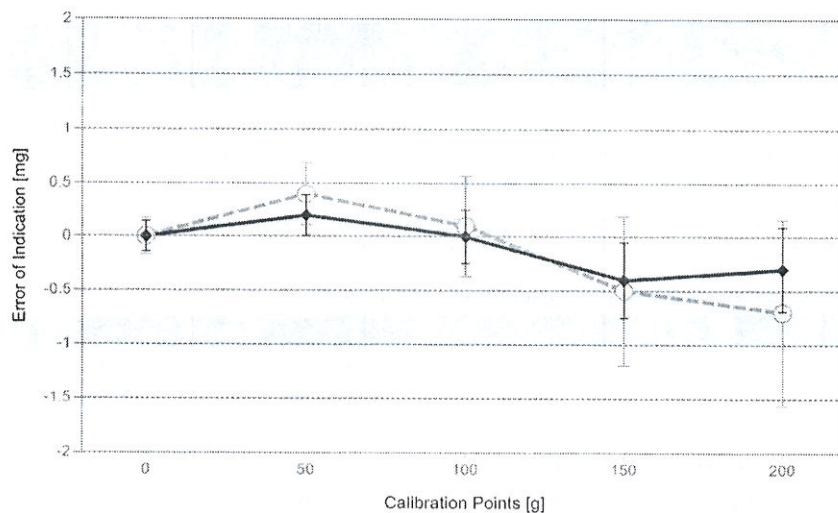
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.17 mg	2
2	50.0000 g	50.0004 g	0.0004 g	0.29 mg	2
3	99.9999 g	100.0000 g	0.0001 g	0.47 mg	2
4	149.9999 g	149.9994 g	-0.0005 g	0.69 mg	2
5	200.0001 g	199.9994 g	-0.0007 g	0.86 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.14 mg	2
2	50.0000 g	50.0002 g	0.0002 g	0.19 mg	2
3	99.9999 g	99.9999 g	0.0000 g	0.25 mg	2
4	149.9999 g	149.9995 g	-0.0004 g	0.35 mg	2
5	200.0001 g	199.9998 g	-0.0003 g	0.39 mg	2



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.:	496	Date of Issue:	14-10-2025
Certificate Number:	C248325905	Calibration Due Date:	31-10-2026

Remarks

Unit is ready to 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

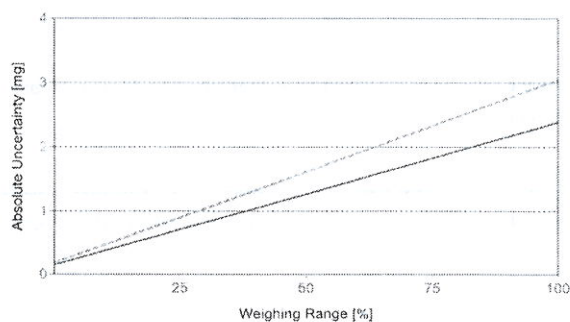
	Range		As Found	As Left
	d	Max		
1	0.0001 g	210 g	$U_1 = 0.18 \text{ mg} + 0.0136 \text{ mg/g} \cdot R$	$U_1 = 0.15 \text{ mg} + 0.0107 \text{ mg/g} \cdot R$

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.

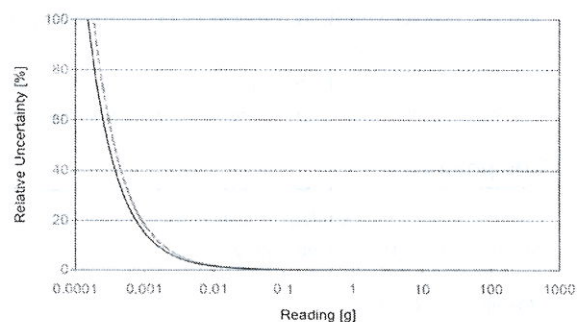
The linear approximation of the uncertainty in use should be regarded as information only. The underlying distribution of the errors of indication does not stipulate a stable approximation function [applies to As Found equation].

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

Net Indication	As Found		As Left	
0.0210 g	0.18 mg	0.86%	0.15 mg	0.72%
0.2100 g	0.18 mg	0.087%	0.15 mg	0.072%
2.1000 g	0.21 mg	0.0099%	0.17 mg	0.0082%
21.0000 g	0.47 mg	0.0022%	0.37 mg	0.0018%
210.0000 g	3.0 mg	0.0014%	2.4 mg	0.0011%



As Found



As Left



Are you looking for some clarifications on the terms and graphs in your ACC calibration certificate? Do you know how to leverage its full value?

More information at:
www.mt.com/ACC-Cert-Info



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	99.9997 g	99.9999 g
2	99.9996 g	99.9998 g
3	99.9996 g	99.9998 g
4	99.9997 g	99.9999 g
5	99.9995 g	99.9998 g
6	99.9996 g	99.9999 g
7	99.9996 g	99.9998 g
8	99.9997 g	99.9998 g
9	99.9995 g	99.9998 g
10	99.9995 g	99.9997 g

Standard Deviation	0.00008 g	0.00006 g
Tolerance	0.00010 g ✓	0.00010 g ✓

[Signature]
Nov 4th 2025

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	50.0004 g	0.0004 g	0.0002 g	✗
3	99.9999 g	100.0000 g	0.0001 g	0.0004 g	✓
4	149.9999 g	149.9994 g	-0.0005 g	0.0006 g	✓
5	200.0001 g	199.9994 g	-0.0007 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	50.0002 g	0.0002 g	0.0002 g	✓
3	99.9999 g	99.9999 g	0.0000 g	0.0004 g	✓
4	149.9999 g	149.9995 g	-0.0004 g	0.0006 g	✓
5	200.0001 g	199.9998 g	-0.0003 g	0.0004 g	✓

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
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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

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



**Instrumentation
Saint-Laurent** inc.
Certified ISO/IEC 17025:2017



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 2025-05-26
----------------------	-----------------------------

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
Location:	N.A.	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression 718 1G	Certification #:	2024007082
Serial #:	3562082	Certification Date:	2024-08-23
Certified by:	Alpha Controls	Next Certification:	2025-08-23
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			



**Instrumentation
Saint-Laurent Inc.**
Certified ISO/IEC 17025:2017



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 2025-05-26
----------------------	-----------------------------

CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
	Verification of the indicator						
0.00 "Hg	0.00 "Hg	-0.42 "Hg	-0.42 "Hg	-0.42 "Hg	-0.42 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-7.50 "Hg	-7.50 "Hg	-8.00 "Hg	-0.50 "Hg	-8.00 "Hg	-0.50 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-15.00 "Hg	-15.00 "Hg	-15.65 "Hg	-0.65 "Hg	-15.65 "Hg	-0.65 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-23.30 "Hg	-0.80 "Hg	-23.30 "Hg	-0.80 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-28.00 "Hg	-28.00 "Hg	-28.87 "Hg	-0.87 "Hg	-28.87 "Hg	-0.87 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-23.30 "Hg	-0.80 "Hg	-23.30 "Hg	-0.80 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-15.00 "Hg	-15.00 "Hg	-15.65 "Hg	-0.65 "Hg	-15.65 "Hg	-0.65 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-7.50 "Hg	-7.50 "Hg	-8.00 "Hg	-0.50 "Hg	-8.00 "Hg	-0.50 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
	Verification of the analogic output						
0.00 "Hg	10.0000 V.dc	10.0963 V.dc	+0.0963 V.dc	10.0963 V.dc	+0.0963 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-7.50 "Hg	8.0000 V.dc	7.9400 V.dc	-0.0600 V.dc	7.9400 V.dc	-0.0600 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-15.00 "Hg	6.0000 V.dc	5.9201 V.dc	-0.0799 V.dc	5.9201 V.dc	-0.0799 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-22.50 "Hg	4.0000 V.dc	3.9145 V.dc	-0.0855 V.dc	3.9145 V.dc	-0.0855 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-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							
-22.50 "Hg	4.0000 V.dc	3.9145 V.dc	-0.0855 V.dc	3.9145 V.dc	-0.0855 V.dc	0.5 V.dc	0.5 V.dc
Compliant							

Environmental Conditions:	Temperature: 21 °C	Humidity: 35 %RH
The calibration was carried out at the client on-site using the method of comparison to the standard measurement.		
Comments:		



Instrumentation
Saint-Laurent inc.
Certified ISO/IEC 17025:2017



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 2025-05-26

CALIBRATION DATE/ISSUANCE OF CERTIFICATE

Calibration Date:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor $k=2$ such that the coverage probability corresponds to approximately 95 %.
- 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


30-2025



Instrumentation
Saint-Laurent inc.
Certified ISO/IEC 17025:2017



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CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-127 2025-05-26	
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
Location:	N.A.	Version:	Machine: N.A.
CALIBRATORS SPECIFICATION			
Calibrator:	Crystal XP2i 300	Certification #:	2024009592
Serial #:	258139	Certification Date:	2024-11-22
Certified by:	Alpha Controls	Next Certification:	2025-11-22
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			



**Instrumentation
Saint-Laurent** inc.
Certified ISO/IEC 17025:2017



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CALIBRATION CERTIFICATE

CERTIFICATE # CE-EM-127 2025-05-26

CALIBRATION RESULTS							
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
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							
-7.50 "Hg	-7.50 "Hg	-7.49 "Hg	0.01 "Hg	-7.49 "Hg	0.01 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-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							
-22.50 "Hg	-22.50 "Hg	-22.53 "Hg	-0.03 "Hg	-22.53 "Hg	-0.03 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-28.00 "Hg	-28.00 "Hg	-28.00 "Hg	0.00 "Hg	-28.00 "Hg	0.00 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-22.53 "Hg	-0.03 "Hg	-22.53 "Hg	-0.03 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-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							
-7.50 "Hg	-7.50 "Hg	-7.49 "Hg	0.01 "Hg	-7.49 "Hg	0.01 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
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 analogic output							
0.00 "Hg	10.0000 V.dc	10.0042 V.dc	0.0042 V.dc	10.0042 V.dc	0.0042 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-7.50 "Hg	8.0000 V.dc	8.0148 V.dc	0.0148 V.dc	8.0148 V.dc	0.0148 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-15.00 "Hg	6.0000 V.dc	6.0014 V.dc	0.0014 V.dc	6.0014 V.dc	0.0014 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-22.50 "Hg	4.0000 V.dc	4.0057 V.dc	0.0057 V.dc	4.0057 V.dc	0.0057 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-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							
-22.50 "Hg	4.0000 V.dc	4.0036 V.dc	0.0036 V.dc	4.0036 V.dc	0.0036 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-15.00 "Hg	6.0000 V.dc	6.0044 V.dc	0.0044 V.dc	6.0044 V.dc	0.0044 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-7.50 "Hg	8.0000 V.dc	8.0008 V.dc	0.0008 V.dc	8.0008 V.dc	0.0008 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.00 "Hg	10.0000 V.dc	10.0068 V.dc	0.0068 V.dc	10.0068 V.dc	0.0068 V.dc	0.5 V.dc	0.5 V.dc
Compliant							



Instrumentation
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Certified ISO/IEC 17025:2017



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Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-127 2025-05-26
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Environmental Conditions:	Temperature:	21 °C	Humidity:	35 %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:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
- 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

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 L. Loren

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/cm³	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.n

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

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 # 27466

Calibration date : 2026-01-12

Certificate issued : 2026-01-12

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

Calibration of
Positive displacement flow meter American Meter Company DTM-200A S/N : 99A274209

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NC SL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

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 Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.

CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument
	Initial readings = Final readings, no adjustment
Results	Final readings in tolerance
Remarks	Calibration frequency every 6 months


Hassan Habli
Metrologist
Laboratory Manager

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3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com



POLYCONTROLS



Calibration certificate # 27466

Serial Number:	99A274209	Test stand:	3
Calibration Date:	2026-01-12	Procedure:	POS-CAL-005
Instrument ID:	EM-130	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500407509	2026-07-22
Fluke molbloc_125 slpm	2E2-S	254	1500407534	2026-07-22
Fluke molbox 1+	Molbox 1+	755+	1500407578	2026-07-23
RTD Mist	Mist	L00295	2025000737-Rev1	2026-02-03
Module 115 PSI with Baro 163671	Module 100	476714	2025004430	2026-05-27

Final specifications of the device under test

Calibration conditions

Gas	Air	Gas	Air
Operation temperature	20 °C	Ambient temperature	22.27 °C
Inlet pressure		Ambient pressure	1010.45 mbar
Outlet pressure		Orientation	Vertical
Reference temperature		Seals	
Reference pressure		Valve	
Range	0-200 ACFH		
Output Signal	Afficheur		
Supply			
Accuracy	±2 %O.R.		

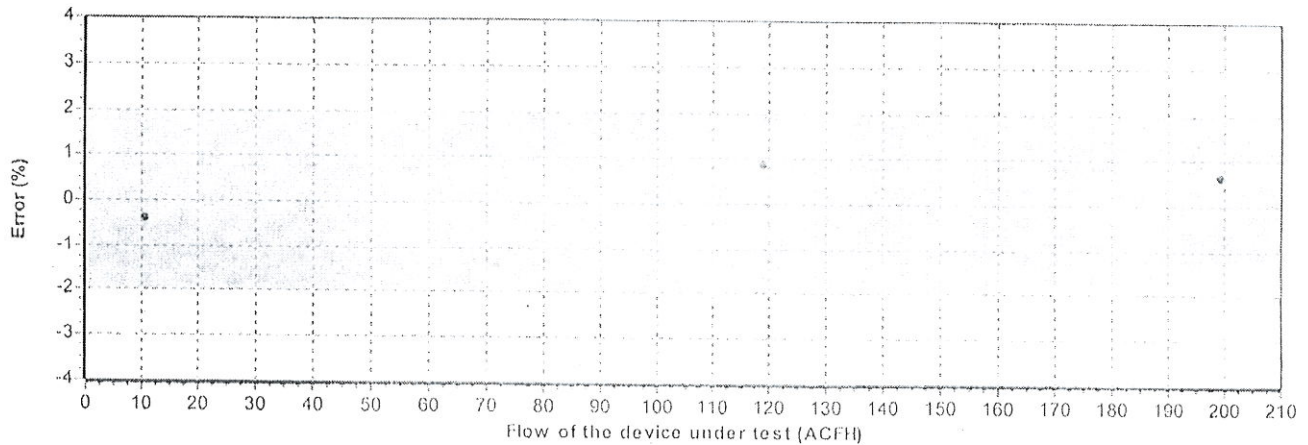
Final readings

Test Flow ACFH	Device under test ft³	Measured values			Calculated Reference ft³	Calculated Error ft³	Acceptable Error ft³	Uncertainty k = 2 ft³	TUR
		Pressure PSIA	Temperature °C	Reference ft³					
10.5514	1.750	14.663	21.539	1.751	1.757	-0.007	0.035	0.009	>4
119.0120	19.960	14.753	21.240	19.860	19.792	0.168	0.396	0.057	>4
199.2387	33.400	14.912	21.186	33.673	33.193	0.207	0.664	0.095	>4

Calibration certificate # 27466

Serial Number:	99A274209	Test stand:	3
Calibration Date:	2026-01-12	Procedure:	POS-CAL-005
Instrument ID:	EM-130	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

$V_c: 1.00$


 JAN 15th, 2026

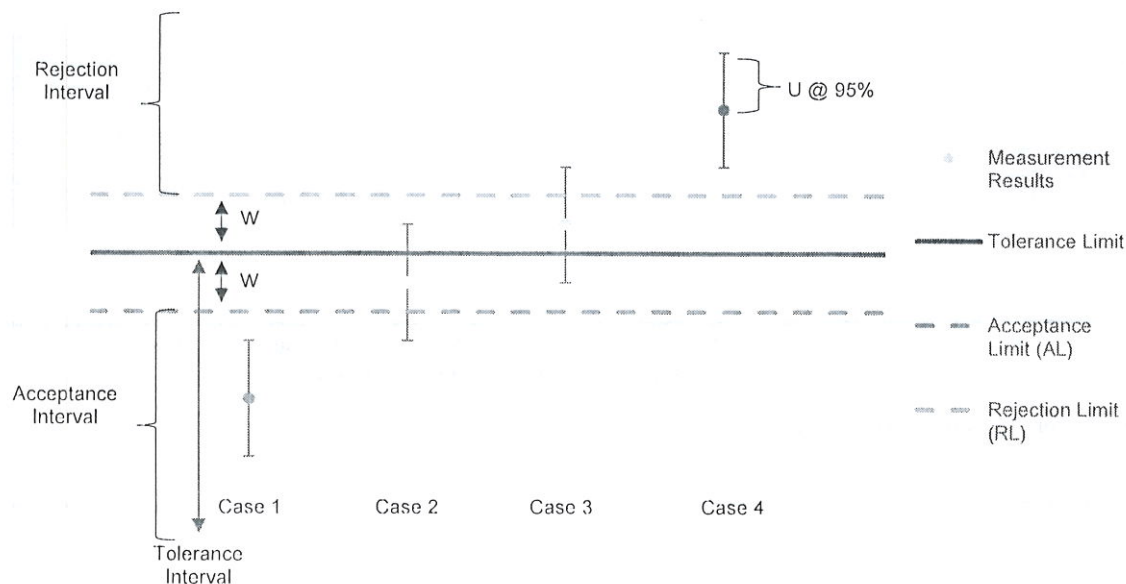


Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula $AL = TL - w$ and the rejection limit $RL = TL + w$, where $w = rU$. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability ($k = 2$). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – Below acceptance limit AL

Status: In tolerance

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. *Green*.

Case 2 – Below tolerance limit TL, greater than acceptance limit AL

Status: In tolerance-Conditional

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band $w = TL - AL$ and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow*.

Case 3 – Greater than tolerance limit, below rejection limit RL

Status: Out of tolerance-Conditional

- The result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band $w = RL - TL$ and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow*.

Case 4 – Greater than rejection limit RL

Status: Out of tolerance

- The result is inside the rejection interval. Uncertainty is directly taken into account. *Red*.

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 CQ006-30064-489 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 Joseph Romportl REVIEWED/ISSUED A.D. 01/14/2026 CALIBRATION LOCATION FVM ENVIRONMENT 71.5°F, 32.5%RH, 28.80inHg CALIBRATION DATE 01/06/2026 RECALIBRATION DUE 01/06/2027		IDENTIFICATION EM-136 SERIAL NUMBER 10610860 PURCHASE ORDER # 100642 PROCEDURES FOLLOWED EL-033A 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>CP168-26178-489</td> <td>06/30/2026</td> </tr> <tr> <td>FVS-471</td> <td>1012820</td> <td>CP163-26368-917</td> <td>06/30/2026</td> </tr> </tbody> </table>	INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL	FVS-275E	16783134	CP168-26178-489	06/30/2026	FVS-471	1012820	CP163-26368-917	06/30/2026
INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL											
FVS-275E	16783134	CP168-26178-489	06/30/2026											
FVS-471	1012820	CP163-26368-917	06/30/2026											

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	60.3	60.3	3.6E-1
	70.0	69.0	71.0	69.8	69.8	3.6E-1
Humidity	(RH)	(RH)	(RH)	(RH)	(RH)	
	25.0	22.5	27.5	27.3	27.3	9.0E-1
	50.0	47.5	52.5	49.5	49.5	9.0E-1
	75.0	72.5	77.5	73.2	73.2	9.0E-1

■ 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.

CERTIFICATION NUMBER CQ006-30064-489

JOB NUMBER RP365-27820-741

PAGE 1 OF 1

[Signature]
JAN 27th 2026

GRAFTEL

An  Company

CERTIFICATE OF CALIBRATION

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

Calibration Certificate No: 130758

Customer Information

Customer: Services Polytests

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

Customer PO #: 100643



Calibration Procedure Information

Procedure: Air Velocity Calibration

Revision #: 1

Calibration Standards Information

Graftel ID	Model #	Description	CAL Due
10187	PTB210	Vaisala Ambient Pressure	6/30/2026
10100	9209	Graftel Temperature	10/31/2028
10171	FC0332-2W	Furness DeltaP Meter, 0 to 0.4"H2O	12/31/2026
10086	FC0332	Furness Controls DeltaP Meter, 0 to 4"H2O	12/31/2026
1A01JMGKP36		Graftel Barometric Pressure, Tank Farm	3/31/2026
T1830459	VAISALA / H MW95D	Vaisala Temp/RH Logger, Velocity Lab	1/31/2026

Calibrated Device Information

Manufacturer: Omega

Model #: HHF143

Instrument ID: EM153

Serial #: 1015949

Comments: Calibration Range: 100-5000 fpm

Description: Anemometer

Rated Accuracy: See Attachments

Range: 40 to 7800 fpm

Calibration Date: 01/20/2026

Method Used: Pitot Tube

Accuracy Specified By: Omega

Condition: Functional

Calibration Due: 01/20/2027

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% ($k=2$). Acceptance criteria per Simple Acceptance Rule as defined in ILAC G8:2019 with a $\geq 4:1$ TUR. Otherwise, measurement uncertainty is provided prior to the work being performed. It is the responsibility of the user to determine the degree of risk that is required for their application. 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.

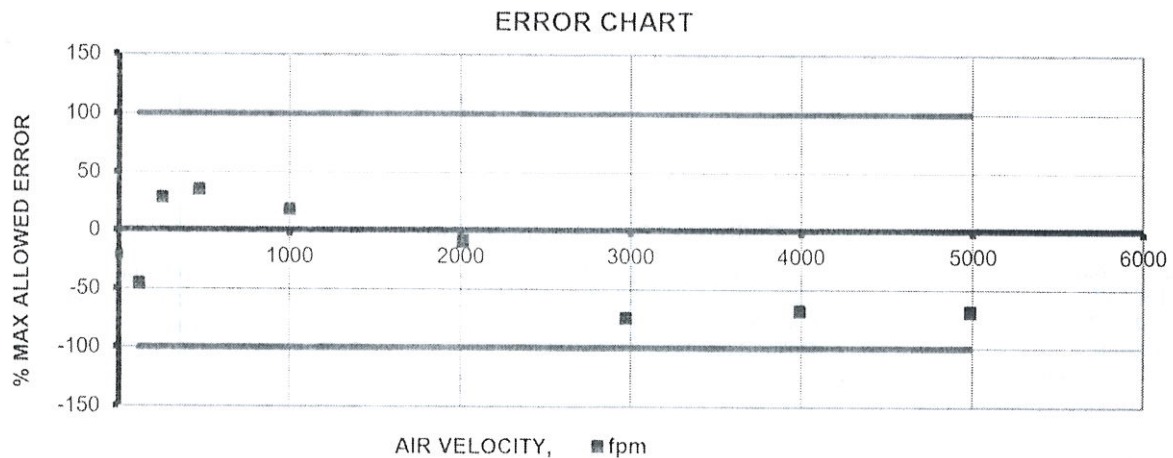
Performed By
Philip Davis, Calibration Technician
01/20/2026

Approved/Issued By
Ehsan Niknafs, Mechanical Design Engineer
01/21/2026

**ATTACHMENT TO CALIBRATION CERTIFICATE 130758
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
119	117	118	121	-1	3.1	3.0	Pass
253	249	254	257	1	4.3	4.2	Pass
471	465	473	477	2	6.2	6.2	Pass
999	988	1001	1010	2	11.0	11.0	Pass
2013	1992	2011	2034	-2	20.1	20.1	Pass
2971	2940	2948	3002	-23	28.7	28.7	Pass
3992	3951	3964	4033	-28	37.9	37.9	Pass
4985	4934	4950	5036	-35	46.8	46.8	Pass



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:	14.32	psia
Humidity:	23.56	%RH
Temperature:	73.31	°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]
JAN 27th 2026



**Instrumentation
Saint-Laurent** inc.
Certified ISO/IEC 17025:2017



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 2025-11-26		
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)	365
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 #:	6412-15326300
Serial #:	240605643	Certification Date:	2024-08-07
Certified by:	itm- Control Company	Next Certification:	2026-08-07
Comments:			



Instrumentation
Saint-Laurent inc.
Certified ISO/IEC 17025:2017



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 2025-11-26						
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	84.5 °F	-0.5 °F	84.5 °F	-0.5 °F	4.0 °F	0.5 °F
Pass	ID. No. 111 (Filter 1) en type "T" En Loop avec EM-154						
85.0 °F	85.0 °F	83.4 °F	-1.6 °F	83.4 °F	-1.6 °F	4.0 °F	0.5 °F
Pass	ID. No. 112 (Filter 2) en type "T" En Loop avec EM-154						
125.0 °F	125.0 °F	124.6 °F	-0.4 °F	124.6 °F	-0.4 °F	4.0 °F	0.4 °F
Pass	ID. No. 113 (Tunnel) en type "J" En Loop avec EM-154						
70.0 °F	70.0 °F	69.4 °F	-0.6 °F	69.4 °F	-0.6 °F	4.0 °F	0.4 °F
Pass	ID. No. 114 (Room) en type "J" En Loop avec EM-154						
100.0 °F	100.0 °F	99.7 °F	-0.3 °F	99.7 °F	-0.3 °F	4.0 °F	0.4 °F
Pass	ID. No. 115 (Dry bulb 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
Pass	ID. No. 116 (Analyzer gaz) en type "J" En Loop avec EM-154						
Tested Temperature Probe: Depth: N.A.							
Environmental Conditions: Temperature: 21 °C Humidity: 35 %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:	2025-11-26		
Next Calibration:	2026-11-26		
Certificate Date:	2025-11-26		
		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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
 - 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.
 - Hysteresis is not accounted for in the calibration procedure nor in the uncertainty budget.

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


NOV 26 2025

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 CQ002-29356-826	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 # 100642												
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>CP168-26178-489</td><td>06/30/2026</td></tr><tr><td>FVS-981C</td><td>FVS-981C</td><td>CP223-55032-826</td><td>08/31/2026</td></tr></tbody></table>	INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL	FVS-275E	16783134	CP168-26178-489	06/30/2026	FVS-981C	FVS-981C	CP223-55032-826	08/31/2026
INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL										
FVS-275E	16783134	CP168-26178-489	06/30/2026										
FVS-981C	FVS-981C	CP223-55032-826	08/31/2026										
CONDITION RECEIVED In Tolerance													
CONDITION RETURNED In Tolerance													
CALIBRATED BY John Svoboda													
REVIEWED/ISSUED A.D. 01/14/2026													
CALIBRATION LOCATION FVM													
ENVIRONMENT 71.9°F, 16.4%RH, 29.10inHg													
CALIBRATION DATE 01/02/2026													
RECALIBRATION DUE 01/02/2027													

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	60.03	60.03	5.8E-1
	60.00	59.50	60.50	60.02	60.02	5.8E-1
5 minute	300.00	299.50	300.50	300.03	300.03	6.3E-1
	300.00	299.50	300.50	300.01	300.01	6.3E-1

■ 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.

CERTIFICATION NUMBER CQ002-29356-826

JOB NUMBER RP365-27820-741

PAGE 1 OF 1

[Signature]
SAU 27th 2026

CALIBRATION CERTIFICATE # 27467

Calibration date : 2026-01-13

Certificate issued : 2026-01-13

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

Calibration of
Positive displacement flow meter Shinigawa DCDa-2c S/N : 23544

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

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 Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.

CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument
	Initial readings = Final readings, no adjustment
Results	Final readings in tolerance
Remarks	Calibration frequency every 6 months
	Corrected Instrument Readings = Display of the instrument * K factor(0.986)


Hassan Habli
Metrologist
Laboratory Manager

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3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com

Calibration certificate # 27467

Serial Number:	23544	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500407509	2026-07-22
Fluke molbloc_125 slpm	2E2-S	254	1500407534	2026-07-22
Fluke molbox 1+	Molbox 1+	755+	1500407578	2026-07-23
RTD Mist	Mist	L00295	2025000737-Rev1	2026-02-03
Module 115 PSI with Baro 163671	Module 100	476714	2025004430	2026-05-27

Final specifications of the device under test
Calibration conditions

Gas	Air	Gas	Air
Operation temperature	20 °C	Ambient temperature	22.52 °C
Inlet pressure		Ambient pressure	1009.92 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

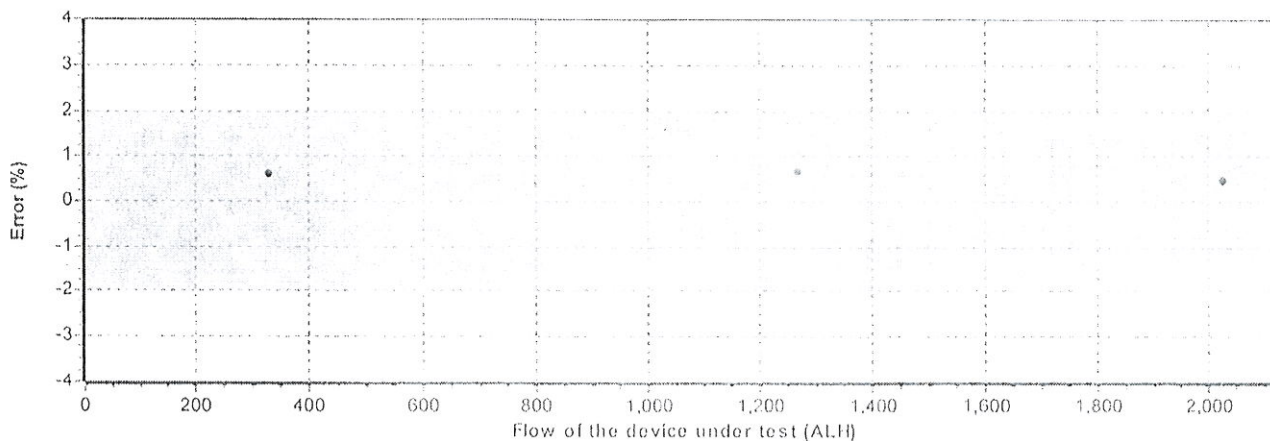
Final readings

Test Flow ALH	Device under test L	Measured values			Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
		Pressure PSIA	Temperature °C	Reference L					
328.815	54.9700	14.663	21.476	54.4400	54.6295	0.3405	1.0926	0.1984	>4
1269.706	212.8300	14.690	21.462	211.1200	211.4595	1.3705	4.2292	0.7678	>4
2029.987	339.2800	14.725	21.502	337.9300	337.7196	1.5604	6.7544	0.9654	>4

Calibration certificate # 27467

Serial Number:	23544	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

$F_c: 0.986$

Jan 15th, 2026

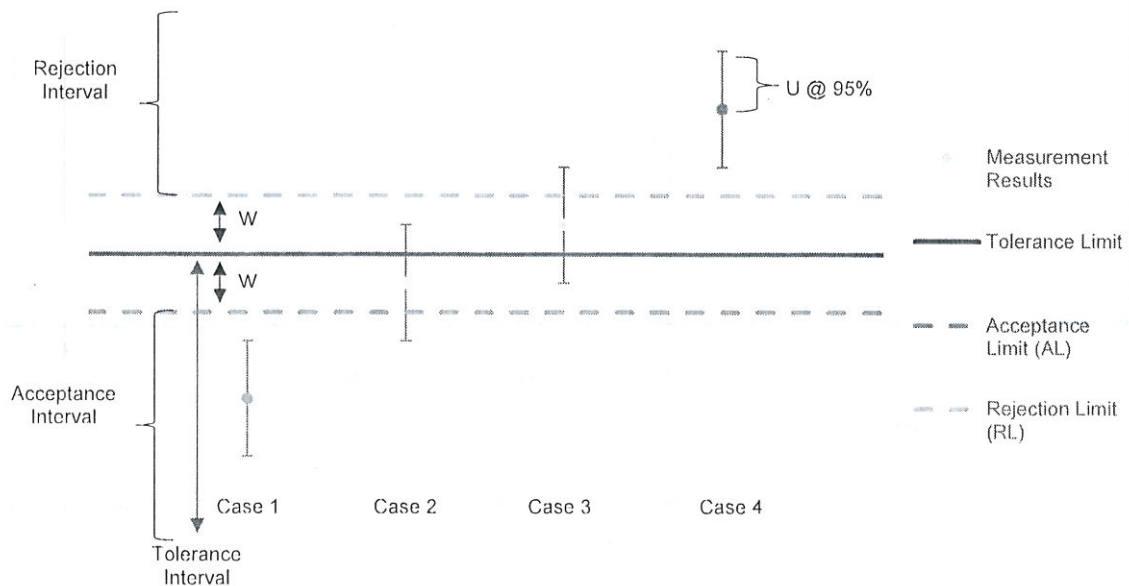


Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula $AL = TL - w$ and the rejection limit $RL = TL + w$, where $w = rU$. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability ($k = 2$). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – Below acceptance limit AL

Status: In tolerance

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. *Green*.

Case 2 – Below tolerance limit TL, greater than acceptance limit AL

Status: In tolerance-Conditional

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band $w = TL - AL$ and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow*.

Case 3 – Greater than tolerance limit, below rejection limit RL

Status: Out of tolerance-Conditional

- The result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band $w = RL - TL$ and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow*.

Case 4 – Greater than rejection limit RL

Status: Out of tolerance

- The result is inside the rejection interval. Uncertainty is directly taken into account. *Red*.

CALIBRATION CERTIFICATE # 27468

Calibration date : 2026-01-13

Certificate issued : 2026-01-13

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

Calibration of
Positive displacement flow meter Shinigawa DCDa-2c S/N : 23543

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

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 Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.

CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument
	Initial readings = Final readings, no adjustment
Results	Final readings in tolerance
Remarks	Calibration frequency every 6 months


Hassan Habli
Metrologist
Laboratory Manager

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3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com



POLYCONTROLS



Calibration certificate # 27468

Serial Number:	23543	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500407509	2026-07-22
Fluke molbloc_125 slpm	2E2-S	254	1500407534	2026-07-22
Fluke molbox 1+	Molbox 1+	755+	1500407578	2026-07-23
RTD Mist	Mist	L00295	2025000737-Rev1	2026-02-03
Module 115 PSI with Baro 163671	Module 100	476714	2025004430	2026-05-27

Final specifications of the device under test

Calibration conditions

Gas	Air	Gas	Air
Operation temperature	20 °C	Ambient temperature	22.24 °C
Inlet pressure		Ambient pressure	1010.06 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

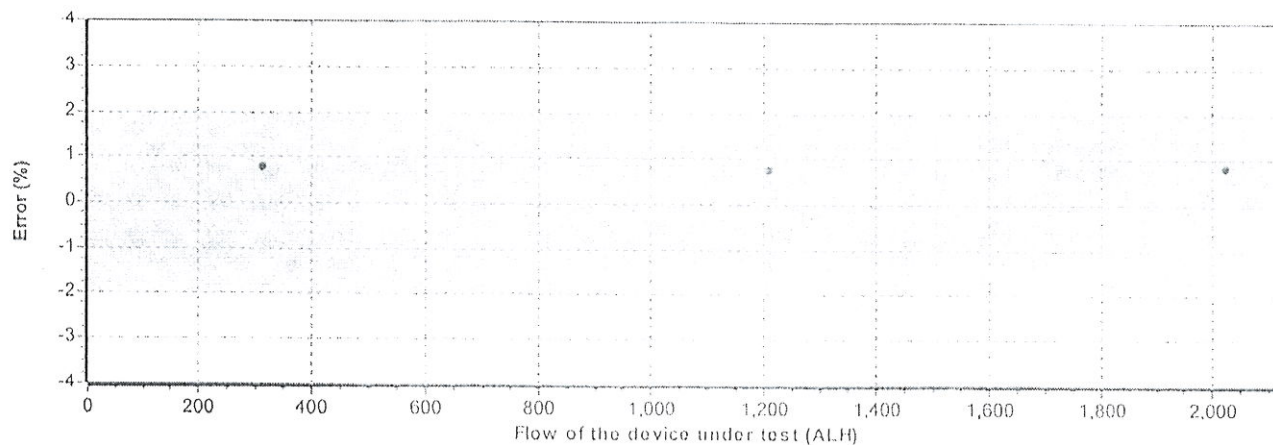
Final readings

Test Flow ALH	Device under test L	Measured values Pressure PSIA	Temperature °C	Reference L	Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
315.2079	52.800	14.667	21.529	52.220	52.399	0.401	1.048	0.190	>4
1212.1752	203.250	14.691	21.154	201.650	201.752	1.498	4.035	0.732	>4
2025.8251	339.850	14.726	21.096	337.830	337.118	2.732	6.742	0.963	>4

Calibration certificate # 27468

Serial Number:	23543	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

$F_c : 0.989$

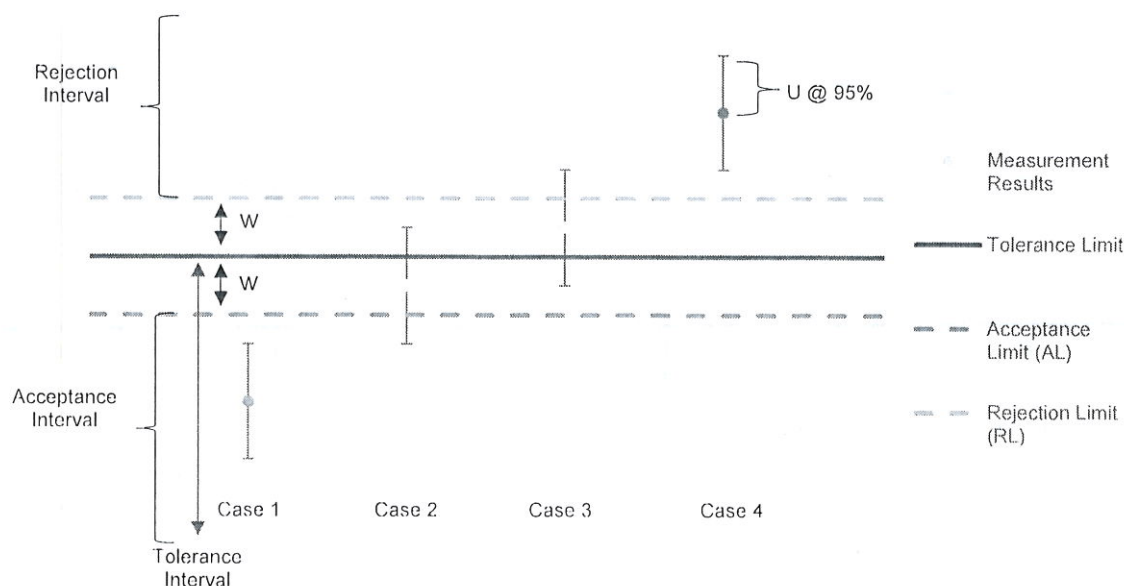
[Signature] Jan 15, 2026

Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula $AL = TL - w$ and the rejection limit $RL = TL + w$, where $w = rU$. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability ($k = 2$). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – Below acceptance limit AL

Status: In tolerance

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. *Green*.

Case 2 – Below tolerance limit TL, greater than acceptance limit AL

Status: In tolerance-Conditional

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band $w = TL - AL$ and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow*.

Case 3 – Greater than tolerance limit, below rejection limit RL

Status: Out of tolerance-Conditional

- The result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band $w = RL - TL$ and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow*.

Case 4 – Greater than rejection limit RL

Status: Out of tolerance

- The result is inside the rejection interval. Uncertainty is directly taken into account. *Red*.

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:	SVC-WI-LABTEC-063 V2.0

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.

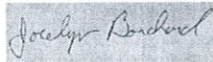
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

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

	Temperature		Humidity	
	Start	End	Start	End
As Found	22,0 °C	End: 22,0 °C	Start: 45,0 %	End: 45,0 %
As Left	Start: 22,0 °C	End: 22,0 °C	Start: 45,0 %	End: 45,0 %

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:	26-08-2025	Authorized A2LA Signatory:	
As Left Calibration Date:	26-08-2025		
Issue Date:	29-08-2025		Jocelyn Bouchard
Date of next calibration by customer request:	31-08-2026		

Measurement Results

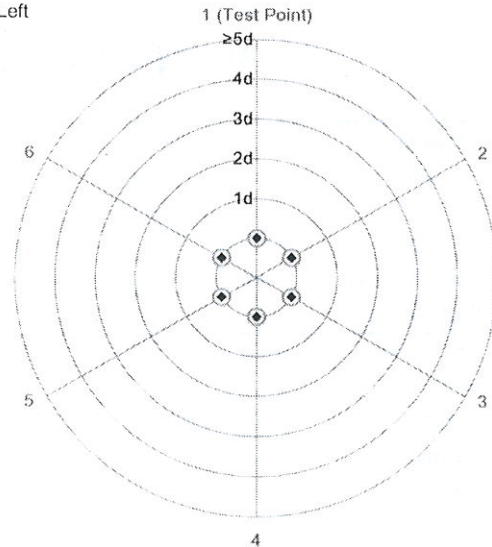
Repeatability

Test Load: 10000 g

	As Found	As Left
1	10003 g	10001 g
2	10003 g	10001 g
3	10003 g	10001 g
4	10003 g	10001 g
5	10003 g	10001 g
6	10003 g	10001 g

Standard Deviation	0,0 g	0,0 g
--------------------	-------	-------

○ As Found
◆ As Left



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

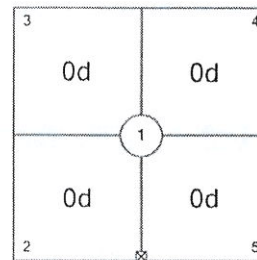
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

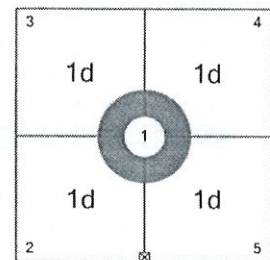
Test Load: 10000 g

Position	As Found	As Left
1	10003 g	10000 g
2	10003 g	10001 g
3	10003 g	10001 g
4	10003 g	10001 g
5	10003 g	10001 g

Maximum Deviation	0 g	1 g
-------------------	-----	-----



As Found



As Left

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

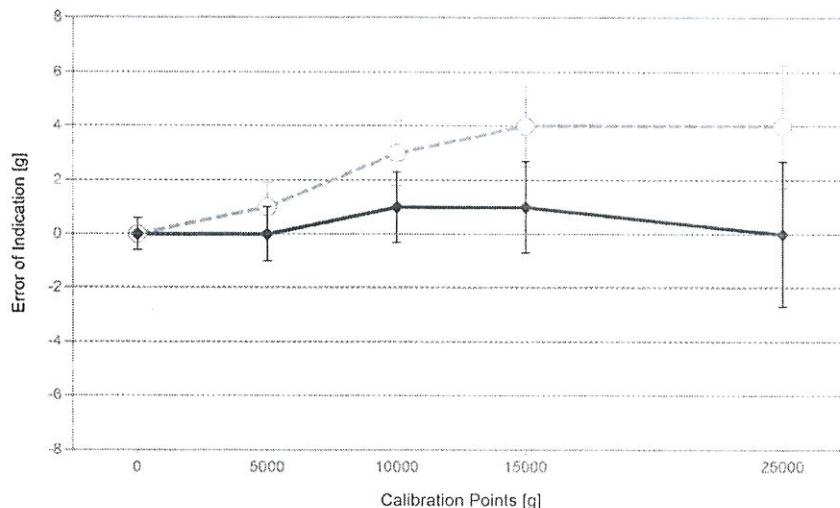
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 g	0 g	0 g	0,6 g	2
2	5000 g	5001 g	1 g	0,9 g	2
3	10000 g	10003 g	3 g	1,2 g	2
4	15000 g	15004 g	4 g	1,5 g	2
5	25000 g	25004 g	4 g	2,3 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	5000 g	5000 g	0 g	1,0 g	2
3	10000 g	10001 g	1 g	1,3 g	2
4	15000 g	15001 g	1 g	1,7 g	2
5	25000 g	25000 g	0 g	2,7 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 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 M1

Weight Set No.:	T2 01 à50	Date of Issue:	07-03-2025
Certificate Number:	1411071	Calibration Due Date:	07-03-2026

Weight Set 2: OIML M1

Weight Set No.:	kit inspecteur	Date of Issue:	02-01-2025
Certificate Number:	M24-0627	Calibration Due Date:	02-01-2026

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

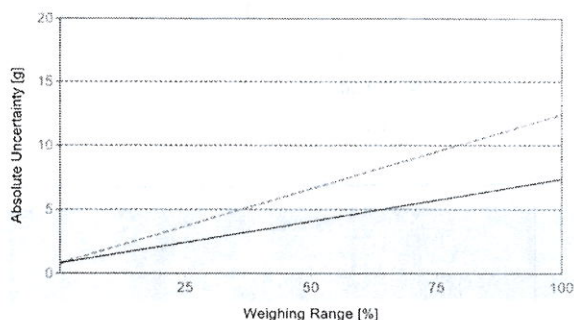
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	1 g	25000 g	$U_1 = 816 \text{ mg} + 0,464 \text{ mg/g} \cdot R$	$U_1 = 816 \text{ mg} + 0,262 \text{ mg/g} \cdot R$

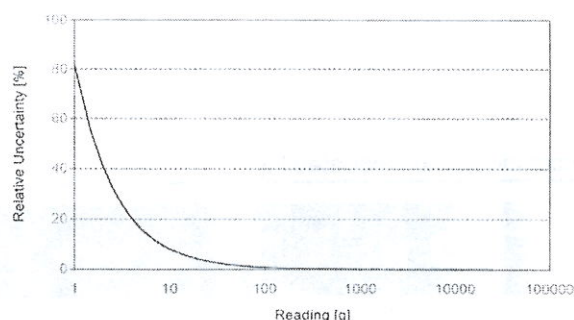
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
25 g	0,83 g	3,3%	0,82 g	3,3%
250 g	0,93 g	0,37%	0,88 g	0,35%
2500 g	2,0 g	0,079%	1,5 g	0,059%
12500 g	6,6 g	0,053%	4,1 g	0,033%
25000 g	12 g	0,050%	7,4 g	0,029%



As Found



As Left



Are you looking for some clarifications on the terms and graphs in your ACC calibration certificate? Do you know how to leverage its full value?

More information at:
www.mt.com/ACC-Cert-Info



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.

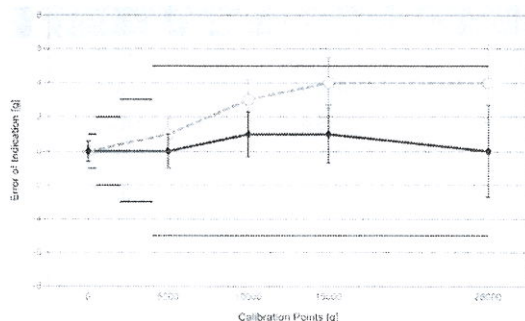
The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

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	25000 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	3 g	✓	1 g	✓
Eccentricity (Range)	10000 g	5 g	0 g	✓	0 g	✓
Repeatability (Max. Error)	10000 g	5 g	3 g	✓	1 g	✓
Repeatability (Range)	10000 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	5000 g	5 g	1 g	✓	0 g	✓
3	10000 g	5 g	3 g	✓	1 g	✓
4	15000 g	5 g	4 g	✓	1 g	✓
5	25000 g	5 g	4 g	✓	0 g	✓
6	0 g	1 g	0 g	✓	0 g	✓

Fox Valley Metrology

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Oshkosh, WI 54902

(920) 426-5894 • Fax (920) 426-8120

<https://www.FoxValleyMetrology.com>

CERTIFICATE OF CALIBRATION



Certificate No. ACT-1272

CERTIFICATION NUMBER CQ002-33259-902	IDENTIFICATION EM-205																
FOR Polytests Services Inc. 695 B rue Gaudette St-Jean-sur-Richelieu, QC, Canada J3B 7S7	SERIAL NUMBER 																
TEST INSTRUMENT Weights	PURCHASE ORDER # 100642																
MAKE Standard Weight	PROCEDURES FOLLOWED MC-012A rev. 2																
MODEL Standard Weight	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-019V</td><td>N/A</td><td>C0290-28623-524</td><td>10/31/2026</td></tr><tr><td>FVS-275M</td><td>16787403.2849444</td><td>CP169-26300-489</td><td>06/30/2026</td></tr><tr><td>FVS-792</td><td>516308752 14737316</td><td>CP190-25619-681</td><td>01/31/2026</td></tr></tbody></table>	INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL	FVS-019V	N/A	C0290-28623-524	10/31/2026	FVS-275M	16787403.2849444	CP169-26300-489	06/30/2026	FVS-792	516308752 14737316	CP190-25619-681	01/31/2026
INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL														
FVS-019V	N/A	C0290-28623-524	10/31/2026														
FVS-275M	16787403.2849444	CP169-26300-489	06/30/2026														
FVS-792	516308752 14737316	CP190-25619-681	01/31/2026														
CONDITION RECEIVED In Tolerance																	
CONDITION RETURNED In Tolerance																	
CALIBRATED BY Philip Nikitin																	
REVIEWED/ISSUED A.D. 01/14/2026																	
CALIBRATION LOCATION FVM																	
ENVIRONMENT 67.2°F, 17.8%RH, 29.11inHg																	
CALIBRATION DATE 01/02/2026																	
RECALIBRATION DUE 01/02/2027																	

2030 DP. 4 years calibration

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
NIST 105-1						
Class F						
Conventional				FVS-792	FVS-792	
Mass						
Correction	(g)	(g)	(g)	(g)	(g)	(g)
10 kg	0.0	-1.0	1.0	0.0	0.0	6.0E-2

COMMENTS

Test Weights Conventional Mass Correction Reference = C0003-WGHTS-FVM

- 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.

CERTIFICATION NUMBER CQ002-33259-902

JOB NUMBER RP365-27820-741

PAGE 1 OF 1

[Signature]
JAN 27th 2026



CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-224 2025-05-30		
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	ISL-022
Address:	695 B rue Gaudette	Required Accuracy:	1/32"
	St-Jean-sur-Richelieu, Québec, J3B 7S7	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 #:	AB-85010080
Serial #:	25113363	Certification Date:	2025-03-20
Certified by:	Starrett	Next Certification:	2026-03-20
Comments:			



CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-224 2025-05-30						
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: 53 %RH							
The calibration was carried out in our laboratory using the method of comparison to the standard measurement.							
Comments:							

CALIBRATION DATE/ISSUANCE OF CERTIFICATE		CALIBRATION CONFORMITY	
Calibration Date:	2025-05-30		
Next Calibration:	2026-05-30		
Certificate Date:	2025-05-30		
		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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
- 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]
June 2024



**Instrumentation
Saint-Laurent** inc.
Certified ISO/IEC 17025:2017



80 rue de la montagne
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(Québec), J0N 1M0
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Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-249 2025-05-26	
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 718 1G	Certification #:	2024007082
Serial #:	3562082	Certification Date:	2024-08-23
Certified by:	Alpha Controls	Next Certification:	2025-08-23
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			



**Instrumentation
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Certified ISO/IEC 17025:2017



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CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-249 2025-05-26						
CALIBRATION RESULTS								
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty	
Conformity	Comment							
	Verification of the indicator							
0.0000 "H2O	0.0000 "H2O	0.0001 "H2O	0.0001 "H2O	0.0001 "H2O	0.0001 "H2O	0.0001 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
0.1250 "H2O	0.1250 "H2O	0.1282 "H2O	0.0032 "H2O	0.1282 "H2O	0.0032 "H2O	0.0032 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
0.2500 "H2O	0.2500 "H2O	0.2578 "H2O	0.0078 "H2O	0.2578 "H2O	0.0078 "H2O	0.0078 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
0.3750 "H2O	0.3750 "H2O	0.3801 "H2O	0.0051 "H2O	0.3801 "H2O	0.0051 "H2O	0.0051 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
0.5000 "H2O	0.5000 "H2O	0.4999 "H2O	-0.0001 "H2O	0.4999 "H2O	-0.0001 "H2O	-0.0001 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
0.3750 "H2O	0.3750 "H2O	0.3802 "H2O	0.0052 "H2O	0.3802 "H2O	0.0052 "H2O	0.0052 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
0.2500 "H2O	0.2500 "H2O	0.2568 "H2O	0.0068 "H2O	0.2568 "H2O	0.0068 "H2O	0.0068 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
0.1250 "H2O	0.1250 "H2O	0.1284 "H2O	0.0034 "H2O	0.1284 "H2O	0.0034 "H2O	0.0034 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
0.0000 "H2O	0.0000 "H2O	0.0009 "H2O	0.0009 "H2O	0.0009 "H2O	0.0009 "H2O	0.0009 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant								
	Verification of the analogic output							
0.0000 "H2O	0.0000 V.dc	0.0051 V.dc	+0.0051 V.dc	0.0051 V.dc	0.0051 V.dc	0.0051 V.dc	0.5 V.dc	0.5 V.dc
Compliant								
0.1250 "H2O	2.5000 V.dc	2.4066 V.dc	-0.0934 V.dc	2.4066 V.dc	-0.0934 V.dc	-0.0934 V.dc	0.5 V.dc	0.5 V.dc
Compliant								
0.2500 "H2O	5.0000 V.dc	4.9750 V.dc	-0.0250 V.dc	4.9750 V.dc	-0.0250 V.dc	-0.0250 V.dc	0.5 V.dc	0.5 V.dc
Compliant								
0.3750 "H2O	7.5000 V.dc	7.5006 V.dc	0.0006 V.dc	7.5006 V.dc	0.0006 V.dc	0.0006 V.dc	0.5 V.dc	0.5 V.dc
Compliant								
0.5000 "H2O	10.0000 V.dc	9.9875 V.dc	-0.0125 V.dc	9.9875 V.dc	-0.0125 V.dc	-0.0125 V.dc	0.5 V.dc	0.5 V.dc
Compliant								
0.3750 "H2O	7.5000 V.dc	7.5007 V.dc	0.0007 V.dc	7.5007 V.dc	0.0007 V.dc	0.0007 V.dc	0.5 V.dc	0.5 V.dc
Compliant								
0.2500 "H2O	5.0000 V.dc	4.9735 V.dc	-0.0265 V.dc	4.9735 V.dc	-0.0265 V.dc	-0.0265 V.dc	0.5 V.dc	0.5 V.dc
Compliant								
0.1250 "H2O	2.5000 V.dc	2.4008 V.dc	-0.0992 V.dc	2.4008 V.dc	-0.0992 V.dc	-0.0992 V.dc	0.5 V.dc	0.5 V.dc
Compliant								
0.0000 "H2O	0.00 V.dc	0.0050 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								



Instrumentation
Saint-Laurent Inc.
Certified ISO/IEC 17025:2017



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info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2025-05-26
----------------------	-----------------------------

Environmental Conditions:	Temperature: 21 °C	Humidity: 35 %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:	2025-05-26		
Next Calibration:	2026-05-26		
Certificate Date:	2025-05-26		
		Before	After
		Compliant:	X
		Non Compliant:	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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
- 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


30 2025



Instrumentation
Saint-Laurent Inc.
Certified ISO/IEC 17025:2017



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(Québec), J0N 1M0
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info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-313 2025-05-26	
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 718 1G	Certification #:	2024007082
Serial #:	3562082	Certification Date:	2024-08-23
Certified by:	Alpha Controls	Next Certification:	2025-08-23
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			



**Instrumentation
Saint-Laurent** inc.
Certified ISO/IEC 17025:2017



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 2025-05-26						
		CALIBRATION RESULTS						
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty	
Conformity	Comment							
	Verification of the indicator							
0.0030 "H2O	0.0000 "H2O	-0.0048 "H2O	-0.0048 "H2O	-0.0028 "H2O	-0.0028 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
0.0250 "H2O	0.0250 "H2O	0.0184 "H2O	-0.0066 "H2O	0.0221 "H2O	-0.0029 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
0.0500 "H2O	0.0500 "H2O	0.0430 "H2O	-0.0070 "H2O	0.0470 "H2O	-0.0030 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
0.0750 "H2O	0.0750 "H2O	0.0654 "H2O	-0.0096 "H2O	0.0711 "H2O	-0.0039 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
0.1000 "H2O	0.1000 "H2O	0.0859 "H2O	-0.0141 "H2O	0.0886 "H2O	-0.0114 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
0.0750 "H2O	0.0750 "H2O	0.0654 "H2O	-0.0096 "H2O	0.0711 "H2O	-0.0039 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
0.0500 "H2O	0.0500 "H2O	0.0430 "H2O	-0.0070 "H2O	0.0470 "H2O	-0.0030 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
0.0250 "H2O	0.0250 "H2O	0.0184 "H2O	-0.0066 "H2O	0.0221 "H2O	-0.0029 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
0.0030 "H2O	0.0000 "H2O	-0.0048 "H2O	-0.0048 "H2O	-0.0048 "H2O	-0.0048 "H2O	0.25 "H2O	± 0.10 "H2O	
Compliant								
	Verification of the analogic output							
0.0030 "H2O	0.0000 V.dc	-0.0048 V.dc	-0.0048 V.dc	-0.0008 V.dc	-0.0008 V.dc	0.5 V.dc	0.5 V.dc	
Compliant								
0.0250 "H2O	2.5000 V.dc	2.4201 V.dc	-0.0799 V.dc	2.4510 V.dc	-0.0490 V.dc	0.5 V.dc	0.5 V.dc	
Compliant								
0.0500 "H2O	5.0000 V.dc	4.8120 V.dc	-0.1880 V.dc	4.9124 V.dc	-0.0876 V.dc	0.5 V.dc	0.5 V.dc	
Compliant								
0.0750 "H2O	7.5000 V.dc	7.4910 V.dc	-0.0090 V.dc	7.4910 V.dc	-0.0090 V.dc	0.5 V.dc	0.5 V.dc	
Compliant								
0.1000 "H2O	10.0000 V.dc	10.6707 V.dc	+0.6707 V.dc	10.0119 V.dc	+0.0119 V.dc	0.5 V.dc	0.5 V.dc	
Compliant								
0.0750 "H2O	7.5000 V.dc	7.5489 V.dc	0.0489 V.dc	7.5489 V.dc	0.0489 V.dc	0.5 V.dc	0.5 V.dc	
Compliant								
0.0500 "H2O	5.0000 V.dc	5.0863 V.dc	0.0863 V.dc	5.0863 V.dc	0.0863 V.dc	0.5 V.dc	0.5 V.dc	
Compliant								
0.0250 "H2O	2.500 V.dc	2.3529 V.dc	-0.1471 V.dc	2.3529 V.dc	-0.1471 V.dc	0.5 V.dc	0.5 V.dc	
Compliant								
0.0030 "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								



Instrumentation
Saint-Laurent Inc.
Certified ISO/IEC 17025:2017



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 2025-05-26
Environmental Conditions:	Temperature: 21 °C Humidity: 35 %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:	2025-05-26		Before	After
Next Calibration:	2026-05-26	Compliant:	X	X
Certificate Date:	2025-05-26	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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
- 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.

Marco Miron - Technicien

CALIBRATION CERTIFICATE # 27470

Calibration date : 2026-01-13

Certificate issued : 2026-01-13

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

Calibration of
Positive displacement flow meter Shinigawa DCSDa-2C S/N : S8020

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

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 Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.

CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument Initial readings = Final readings, no adjustment
Results	Final readings in tolerance
Remarks	Calibration frequency every 6 months Corrected Instrument Readings = Display of the instrument * K factor(1.01)


Hassan Habli
Metrologist
Laboratory Manager

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3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com



POLYCONTROLS



Calibration certificate # 27470

Serial Number:	S8020	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500407509	2026-07-22
Fluke molbloc_125 slpm	2E2-S	254	1500407534	2026-07-22
Fluke molbox 1+	Molbox 1+	755+	1500407578	2026-07-23
RTD Mist	Mist	L00295	2025000737-Rev1	2026-02-03
Module 115 PSI with Baro 163671	Module 100	476714	2025004430	2026-05-27

Final specifications of the device under test

Calibration conditions

Gas	Air	Gas	Air
Operation temperature		Ambient temperature	22.28 °C
Inlet pressure		Ambient pressure	1009.66 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

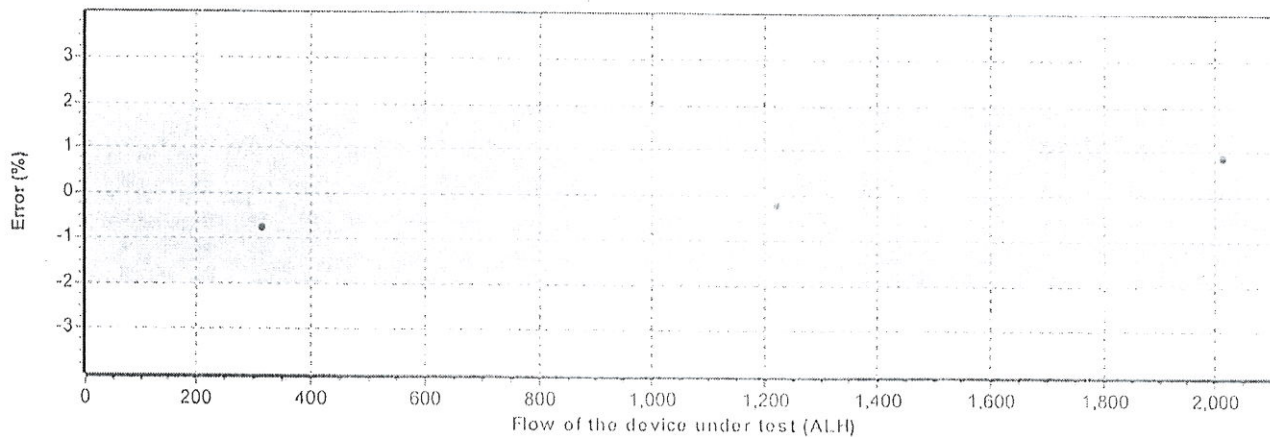
Final readings

Test Flow ALH	Device under test L	Measured values Pressure PSIA	Temperature °C	Reference L	Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
315.7139	52.166	14.653	21.371	52.370	52.570	-0.404	1.051	0.191	>4
1224.3169	203.010	14.679	21.244	203.160	203.484	-0.474	4.070	0.739	>4
2015.2916	338.754	14.712	21.223	336.060	335.826	2.928	6.717	0.960	>4

Calibration certificate # 27470

Serial Number:	S8020	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

For 1.01

[Signature]

JAN 15th 2026

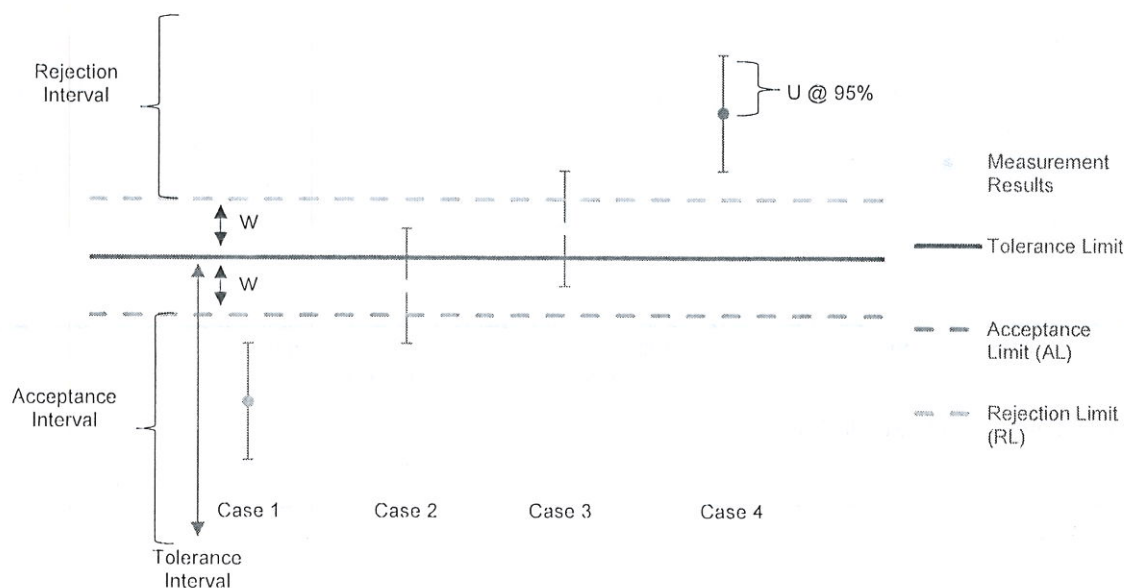


Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula $AL = TL - w$ and the rejection limit $RL = TL + w$, where $w = rU$. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability ($k = 2$). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – Below acceptance limit AL

Status: In tolerance

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. *Green*.

Case 2 – Below tolerance limit TL, greater than acceptance limit AL

Status: In tolerance-Conditional

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band $w = TL - AL$ and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow*.

Case 3 – Greater than tolerance limit, below rejection limit RL

Status: Out of tolerance-Conditional

- The result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band $w = RL - TL$ and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow*.

Case 4 – Greater than rejection limit RL

Status: Out of tolerance

- The result is inside the rejection interval. Uncertainty is directly taken into account. *Red*.



Certificate Number: 2025011438

Page 1 of 2

Manufacturer:	Control Company	RMA:	AC25121179
Model:	4199	PO:	100640
Description:	Barometer	Barcode:	AL00042136
Serial:	210758578	Received Conditions:	Pass
ID:	EM 333	Calibration Date:	22-Dec-2025
Customer:	SERVICES POLYTESTS	Calibration Due:	22-Jun-2026
	695-B GUADETTE	Temperature:	22.51°C
	ST-JEAN-SUR-RICHELIEU QC	Humidity:	30.3%RH
	J3B 7S7		

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-17025:2017 and ANSI/NCSL 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	12-Jun-2025	30-Jun-2026
Reference Pressure Monitor	Fluke RPM4	PRE-MTR-04	12-Jun-2025	30-Jun-2026

Notes: Calibrated in the vertical position.
Adjusted trim pot.

Performed by:

Anthony Morra

Technician

(digitally signed on 22-Dec-2025 9:45 am)

QA Reviewed by:

Ellie Hejazi

Lab Supervisor

(signed and issued on 22-Dec-2025 9:49 am)

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

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

Test Description	True Value	Test Results	Specification	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
MEASUREMENT UNITS: hPa a							
1008.0	1008.0	1012	±5.0	1003	1013	P	5.9e-001

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

Test Description	True Value	Test Results	Specification	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
MEASUREMENT UNITS: hPa a							
1008.0	1008.0	1008	±5.0	1003	1013	P	5.9e-001

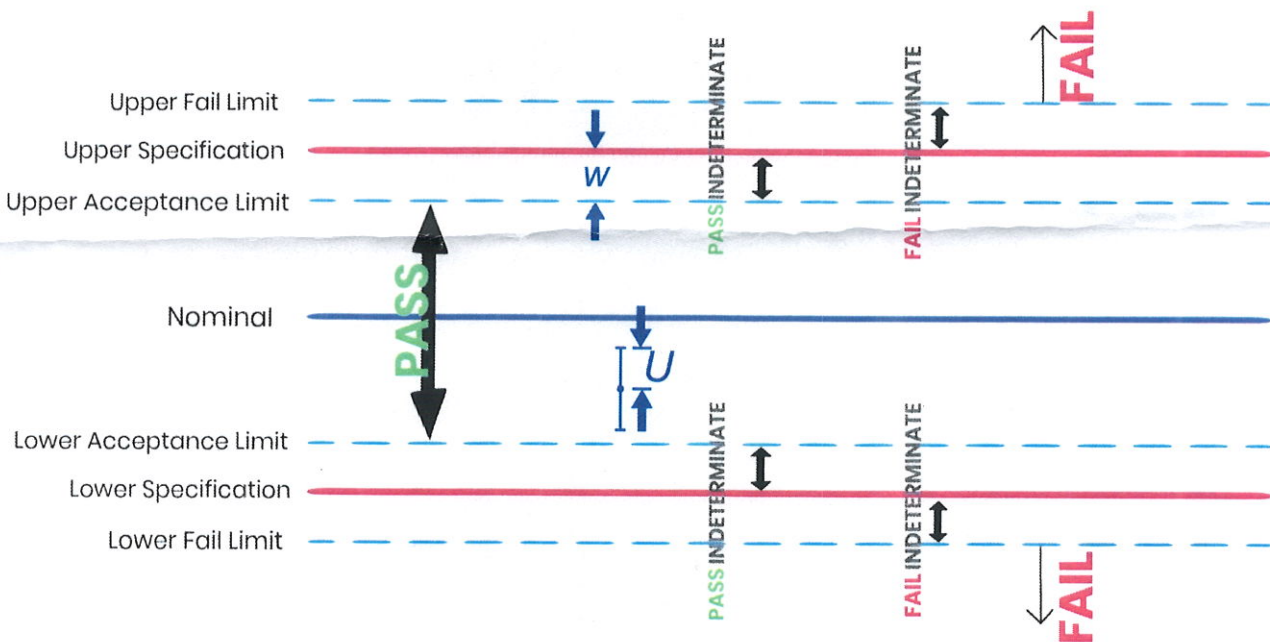
END OF CERTIFICATE

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 CQ002-28867-826	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 # 100642												
MAKE Delmhorst Instrument Co.	PROCEDURES FOLLOWED EL-010A rev. 1												
MODEL MCS-1	STANDARDS USED												
RANGE (1.1M to 120M) ohms	<table><tr><td>INSTRUMENT</td><td>SERIAL NUMBER</td><td>TRACE NUMBER</td><td>NEXT CAL</td></tr><tr><td>FVS-275E</td><td>16783134</td><td>CP168-26178-489</td><td>06/30/2026</td></tr><tr><td>FVS-A23</td><td>MYG0098672</td><td>CP153-40850-823</td><td>06/30/2026</td></tr></table>	INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL	FVS-275E	16783134	CP168-26178-489	06/30/2026	FVS-A23	MYG0098672	CP153-40850-823	06/30/2026
INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL										
FVS-275E	16783134	CP168-26178-489	06/30/2026										
FVS-A23	MYG0098672	CP153-40850-823	06/30/2026										
CUSTOMER LOCATION													
CONDITION RECEIVED In Tolerance													
CONDITION RETURNED In Tolerance													
CALIBRATED BY John Svoboda													
REVIEWED/ISSUED A.D. 01/14/2026													
CALIBRATION LOCATION FVM													
ENVIRONMENT 71.9°F, 16.4%RH, 29.10inHg													
CALIBRATION DATE 01/02/2026													
RECALIBRATION DUE 01/02/2027													

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
Resistance	(Mohm)	(Mohm)	(Mohm)	(Mohm)	(Mohm)	(Mohm)
12% 'Pad'	120.00	119.76	120.24	119.77	119.77	6.0E-3
22% 'Pad'	1.100	1.078	1.122	1.097	1.097	6.0E-4

- 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.

CERTIFICATION NUMBER CQ002-28867-826

JOB NUMBER RP365-27820-741

PAGE 1 OF 1

JAN 27th 2026

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 L. Loren

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/cm³	CCN accreditation # :	668
Identification (if unique) :	DI000J378	CLAS Certification # :	2010-01

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

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.n

REMARKS:

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page 1 of 5
March 2022

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

Client :	Polytests	Certificate Number :	157-77C603-225
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]
JUN 2022

[Signature]
Approved for Release



CERTIFICATE OF ANALYSIS

Signature
April 2025
EM: 338

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

Analysis Date: 3/4/2025 4:25:18PM
Product code: A1334811
Grade: PRIMARY
Size: 44
CGA #: 590

Servitrex barcode No: T3TLT75
Work order number: 1999873
Pressure: 1450 psig
Volume: 4.7 M3
Expiry date: 03/04/2028

COMPONENTS	NOMINAL CONCENTRATION	ANALYSIS RESULTS
CARBON DIOXIDE	10.0000 % Molar	10.00 % Molar
CARBON MONOXIDE	1.0000 % Molar	1.001 % Molar
OXYGEN	10.0000 % Molar	10.00 % Molar
NITROGEN	BALANCE	BALANCE

Analysis performed by:

Signature
JASON NGO - LAB TECHNICIAN

Verified by:

Signature

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%	

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), CA3033-007-120224-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](https://my.airliquide.ca)



Air Liquide Mobile App



Instrumentation
Saint-Laurent_{inc.}
Certified ISO/IEC 17025:2017



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

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-340 2025-05-26		
CLIENT		CALIBRATION SPECIFICATION	
Company:	Services Polytests Inc	Service Procedure:	4IN9106
Address:	695 B rue Gaudette	Required Accuracy:	1.0 inHg
	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 #:	S799031-0001	Range:	-29.93 to 0 inHg
Location:	N.A.	Version:	Machine: N.A.
CALIBRATORS SPECIFICATION			
Calibrator:	Crystal XP2i 300	Certification #:	2024009592
Serial #:	258139	Certification Date:	2024-11-22
Certified by:	Alpha Controls	Next Certification:	2025-11-22
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			



**Instrumentation
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CALIBRATION CERTIFICATE

CERTIFICATE #		CE-EM-340 2025-05-26						
		CALIBRATION RESULTS						
Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty	
Conformity	Comment							
	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								
-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								
-15.00 "Hg	-15.00 "Hg	-14.96 "Hg	0.04 "Hg	-14.96 "Hg	0.04 "Hg	1.0 "Hg	+/- 0.5 "Hg	
Compliant								
-22.50 "Hg	-22.50 "Hg	-22.47 "Hg	0.03 "Hg	-22.47 "Hg	0.03 "Hg	1.0 "Hg	+/- 0.5 "Hg	
Compliant								
-28.00 "Hg	-28.00 "Hg	-27.97 "Hg	0.03 "Hg	-27.97 "Hg	0.03 "Hg	1.0 "Hg	+/- 0.5 "Hg	
Compliant								
-22.50 "Hg	-22.50 "Hg	-22.47 "Hg	0.03 "Hg	-22.47 "Hg	0.03 "Hg	1.0 "Hg	+/- 0.5 "Hg	
Compliant								
-15.00 "Hg	-15.00 "Hg	-14.96 "Hg	0.04 "Hg	-14.96 "Hg	0.04 "Hg	1.0 "Hg	+/- 0.5 "Hg	
Compliant								
-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								
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 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 mA	
Compliant								
-7.50 "Hg	16.00 mA	15.99 mA	-0.01 mA	15.99 mA	-0.01 mA	0.5 mA	+/- 0.0045 mA	
Compliant								
-15.00 "Hg	12.00 mA	11.97 mA	-0.03 mA	11.97 mA	-0.03 mA	0.5 mA	+/- 0.0045 mA	
Compliant								
-22.50 "Hg	8.00 mA	7.94 mA	-0.06 mA	7.94 mA	-0.06 mA	0.5 mA	+/- 0.0045 mA	
Compliant								
-28.00 "Hg	5.00 mA	5.08 mA	+0.08 mA	5.08 mA	+0.08 mA	0.5 mA	+/- 0.0045 mA	
Compliant								
-22.50 "Hg	8.00 mA	7.94 mA	-0.06 mA	7.94 mA	-0.06 mA	0.5 mA	+/- 0.0045 mA	
Compliant								
-15.00 "Hg	12.00 mA	11.97 mA	-0.03 mA	11.97 mA	-0.03 mA	0.5 mA	+/- 0.0045 mA	
Compliant								
-7.50 "Hg	16.00 mA	15.99 mA	-0.01 mA	15.99 mA	-0.01 mA	0.5 mA	+/- 0.0045 mA	
Compliant								
0.00 "Hg	20.00 mA	19.99 mA	-0.01 mA	19.99 mA	-0.01 mA	0.5 mA	+/- 0.0045 mA	
Compliant								



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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-340 2025-05-26
---------------	----------------------

Environmental Conditions:	Temperature: 21 °C	Humidity: 35 %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:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

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/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
- 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

APPENDIX 4: Unit pre burn

Morsø 2B Classic pre-test conditioning					
Last 50+ hours at medium burnrate					
Date dd.mm.yyyy	Time (hh:mm)	Fuel added (kg)	Fuel moisture (% dry basis)		Flue gas temperature (C°)
			piece no. 1	piece no. 2	
10.12.2025	00:00	2 254*	20.9/20.8/20.9	20.7/20.8/20.9	17.60
	00:10				30.11
	00:20				59.83
	00:30				72.61
	00:40				84.33
	00:50				94.01
	01:00				98.63
	01:10				101.11
	01:17	2 193	20.1/19.9/19.8	19.9/19.8/19.6	98.42
	01:20				119.62
	01:30				135.30
	01:40				150.95
	01:50				158.85
	02:00				138.00
	02:10				119.84
	02:17	2 206	19.8/19.7/19.7	20.1/19.9/19.7	108.63
	02:20				121.68
	02:30				125.18
	02:40				128.26
	02:50				124.71
	03:00				114.41
	03:10				95.91
	03:20				84.83
	03:30				76.05
	03:40				70.52
	03:50	2 258	21.1/20.8/21.0	21.7/21.4/21.4	66.13
	04:00				97.90
	04:10				96.50
	04:20				102.38
	04:30				101.07
	04:40				92.93
	04:50				83.53
	05:00				73.61
	05:10				66.65
	05:20				61.51
	05:30				58.40
	05:36	2 390	21.3/21.3/20.9	21.9/21.6/21.6	56.86
	05:40				99.00
	05:50				97.48
	06:00				101.26
	06:10				104.11
	06:20				100.52
	06:30				89.70
	06:40				82.39
	06:50				75.00
	07:00				68.76
	07:10				64.20
	07:20				60.70
	07:30				58.60
	07:40				56.34
	07:50				54.44
	08:00				52.74
	08:10				51.40
	08:20				49.63
	08:30				48.48
	08:40				46.77
	08:50				44.69
	09:00				42.72
	09:10				40.49
	09:20				38.39
	09:30				36.18
	09:40				34.22
	09:50				32.54
	10:00				30.76
	10:10				29.41
	10:20				28.07
	10:30				27.01
	10:40				26.23
	10:50				25.42
	11:00				24.67
11.12.2025	00:00	2 354*	22.5/22.8/22.6	22.1/22.0/22.3	18.98
	00:10				55.80
	00:20				66.76
	00:30				83.70
	00:40				93.21
	00:50				102.54
	01:00				112.32
	01:06				110.22
	01:10				120.93
	01:20				118.79
	01:30				115.17
	01:40				114.48
	01:50				104.55
	02:00				93.27
	02:10				83.23
	02:20				75.00
	02:30				68.15
	02:40				62.73
	02:50				60.23
	03:00				57.79
	03:03	2 136	19.4/19.3/19.5	22.2/22.6/22.5	56.83
	03:10				82.67
	03:20				93.24
	03:30				100.42
	03:40				100.05
	03:50				96.35
	04:00				93.11
	04:10				87.50
	04:20				80.09
	04:30				73.04
	04:40				68.07
	04:47	2 225	20.3/20.2/20.2	21.2/21.2/21.4	64.37
	04:50				86.41
	05:00				94.74
	05:10				109.48
	05:20				124.67
	05:30				120.06

*pieces cut into kindling

Fuel load consist of two pieces of Douglas crib wood. Each piece has three moisture measurements.



	05:40				103.21
	05:50				88.60
	06:00				77.53
	06:10				70.95
	06:20				65.89
	06:30				62.56
	06:34	2 330	19.9/19.9/19.9	20.4/20.5/20.1	60.88
	06:40				87.43
	06:50				86.57
	07:00				97.17
	07:10				104.24
	07:20				108.40
	07:30				110.16
	07:40				108.51
	07:50				100.88
	08:00				91.75
	08:10				85.14
	08:20				79.57
	08:30				75.47
	08:40				70.84
	08:50				67.04
	09:00				64.29
	09:10				61.69
	09:20				58.23
	09:30				55.06
	09:40				51.57
	09:50				48.66
	10:00				45.39
	10:10				42.19
	10:20				39.77
	10:30				37.38
	10:40				35.12
	10:50				33.21
	11:00				31.47
06.01.2026	00:00	2.448*	21.1/21.0/21.5	21.1/21.1/21.4	13.13
	00:10				91.19
	00:20				53.20
	00:30				56.23
	00:40				65.12
	00:50				70.78
	01:00				82.20
	01:10				93.02
	01:20				95.60
	01:30				87.55
	01:34	2 380	21.0/20.8/21.1	20.8/20.8/20.8	83.19
	01:40				101.85
	01:50				103.43
	02:00				104.90
	02:10				105.94
	02:20				102.32
	02:30				95.27
	02:40				88.55
	02:50				79.21
	03:00				73.00
	03:10				68.17
	03:20				64.65
	03:22	2 420	20.5/20.2/20.6	20.8/21.0/21.0	64.42
	03:30				86.83
	03:40				95.02
	03:50				100.06
	04:00				102.24
	04:10				100.55
	04:20				96.61
	04:30				92.27
	04:40				85.79
	04:50				77.95
	05:00				71.16
	05:10				66.74
	05:20				63.51
	05:29	2 325	23.1/23.3/23.3	22.8/22.9/22.9	59.97
	05:30				74.14
	05:40				76.03
	05:50				90.79
	06:00				96.12
	06:10				104.46
	06:20				97.04
	06:30				91.19
	06:40				86.06
	06:48	2 415	23.0/23.2/23.4	23.0/23.0/23.1	80.18
	06:50				110.77
	07:00				115.07
	07:10				116.17
	07:20				115.14
	07:30				110.88
	07:40				105.37
	07:50				93.09
	08:00				83.09
	08:10				77.22
	08:20				71.61
	08:30				68.30
	08:40				65.10
	08:50				62.17
	09:00				61.08
	09:10				59.24
	09:20				58.18
	09:30				56.12
	09:40				53.36
	09:50				51.37
	10:00				48.90
	10:10				45.91
	10:20				43.20
	10:30				39.86
	10:40				37.12
	10:50				34.34
12.01.2026	00:00	2.452*	22.1/22.1/21.9	21.0/20.8/21.0	14.16
	00:10				92.70
	00:20				93.29
	00:30				99.72
	00:40				100.77
	00:50				101.62
	01:00				97.41
	01:10				86.16
	01:20				77.23
	01:22	2 250	24.2/23.8/23.8	23.5/23.6/23.6	75.96
	01:30				143.37
	01:40				108.04

	01:50			112.89
	02:00			113.81
	02:10			102.18
	02:20			93.03
	02:30			80.91
	02:40			73.42
	02:50			67.56
	03:00			63.63
	03:03	2 222	21.8/21.7/21.4	21.6/21.2/21.2
	03:10			61.99
	03:20			109.59
	03:30			97.63
	03:40			106.42
	03:50			104.30
	04:00			97.97
	04:10			89.93
	04:20			82.48
	04:30			75.59
	04:40			69.64
	04:45	2 362	19.9/19.8/19.6	19.9/20.1/19.8
	04:50			65.49
	05:00			62.95
	05:10			80.81
	05:20			98.07
	05:30			106.96
	05:40			115.96
	05:50			110.96
	06:00			97.41
	06:10			86.09
	06:20			78.04
	06:30			70.74
	06:40			66.42
	06:50			62.87
	07:00			60.20
	07:10			58.06
	07:20			55.44
	07:30			53.53
	07:40			50.82
	07:50			47.24
	08:00			44.36
	08:10			40.90
	08:20			38.13
	08:30			35.15
	08:40			32.99
	08:50			30.77
	09:00			28.92
	09:10			27.23
	09:20			26.05
	09:30			24.89
	09:40			23.85
	09:50			22.97
	10:00			22.29
	10:10			21.76
	10:20			21.18
	10:30			20.78
	10:40			20.39
	10:50			20.03
	11:00			19.74
13.01.2026	00:00	2.275*	19.7/19.7/19.7	19.9/19.9/19.7
	00:10			15.86
	00:20			69.37
	00:30			55.62
	00:40			61.35
	00:50			76.01
	01:00			80.34
	01:10			86.59
	01:20			93.87
	01:30			87.75
	01:40			78.65
	01:50			70.74
	02:00	2 220	21.3/21.4/21.4	21.8/21.6/21.6
	02:10			67.71
	02:20			87.27
	02:30			101.72
	02:40			108.75
	02:50			110.80
	03:00			105.94
	03:10			94.42
	03:20			85.03
	03:30			77.98
	03:40			72.58
	03:50			67.69
	04:00	2 268	20.2/20.3/20.0	20.1/20.0/20.2
	04:10			65.09
	04:20			121.04
	04:30			110.09
	04:40			121.94
	04:50			124.93
	05:00			117.78
	05:10			103.46
	05:20			92.34
	05:30			84.07
	05:40			77.34
	05:50			72.61
	06:00	2,38	20.2/20.1/20.1	23.8/23.5/23.5
	06:10			70.77
	06:20			100.85
	06:30			111.68
	06:40			122.44
	06:50			124.41
	07:00			115.03
	07:10			104.86
	07:20			98.68
	07:30			93.72
	07:40			84.90
	07:50			78.87
	08:00			72.86
	08:10			69.46
	08:20	2 360	23.5/23.3/23.3	22.2/21.9/21.8
	08:30			68.43
	08:40			119.66
	08:50			146.72
	09:00			161.25
	09:10			142.74
	09:20			117.55
	09:30			100.52
	09:40			88.99
	09:50			80.86
	10:00			75.77
	10:10			71.76
	10:20			67.88
	10:30			64.89
	10:40			60.72

	09:20				56.75
	09:30				52.50
	09:40				48.85
	09:50				45.16
	10:00				41.83
	10:10				38.80
	10:20				35.93
	10:30				33.62
	10:40				31.43
	10:50				29.70
	11:00				28.48
14.01.2026	00:00	2.385*	21.2/21.3/21.2	20.9/20.8/20.6	16.92
	00:10				67.74
	00:20				65.61
	00:30				73.20
	00:40				83.85
	00:50				101.91
	01:00				110.45
	01:10				111.48
	01:20				106.58
	01:30				99.61
	01:48	2.228	20.5/20.4/20.4	20.3/20.4/20.4	91.82
	01:50				85.46
	02:00				96.13
	02:10				101.28
	02:20				106.03
	02:30				121.01
	02:40				121.50
	02:50				118.55
	03:00				107.04
	03:10	2.245	20.8/20.9/21.0	20.4/20.7/20.6	96.79
	03:20				88.38
	03:30				129.62
	03:40				131.66
	03:50				128.09
	04:00				121.92
	04:10				113.25
	04:20				106.00
	04:30				95.98
	04:36	2.264	20.1/20.2/20.2	20.5/20.5/20.5	88.98
	04:40				84.81
	04:50				106.56
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	05:20				125.11
	05:30				124.59
	05:40				113.22
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	10:10				56.81
	10:20				52.23
	10:30				47.99
	10:40				43.95
	10:50				40.51
	11:00				37.28
					34.70
15.01.2026	00:00	2.336*	22.2/22.1/22.2	21.9/22.0/21.8	14.39
	00:10				14.33
	00:20				15.39
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	00:50				100.37
	01:00				100.10
	01:10				101.43
	01:20				97.18
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	02:50				80.79
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	05:00				65.33

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05:40				115.96
05:50				110.95
06:00				97.41
06:10				85.76
06:20				76.99
06:21	2 378	23.9/24.0/23.9	24.0/24.2/23.7	76.52
06:30				70.84
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07:00				60.28
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08:00				44.16
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08:20				37.91
08:30				35.30
08:40				32.89
08:50				30.57
09:00				28.92
09:10				27.16
09:20				26.00
09:30				24.86
09:40				23.86
09:50				22.89
10:00				22.31
10:10				21.77
10:20				21.19
10:30				20.73
10:40				20.38
10:50				20.02
11:00				19.72

APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
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APPENDIX 6: Drawings and specifications

APPENDIX 7: Operator's manual

morsø

By appointment to The Royal Danish Court

morsø

Installation and Operating Instructions

Morsø 2B Classic

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.

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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 Classic has been certified by PFS TECO.

The test standards are UL 1482-2022 for the United States and ULC-S627-2023 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.

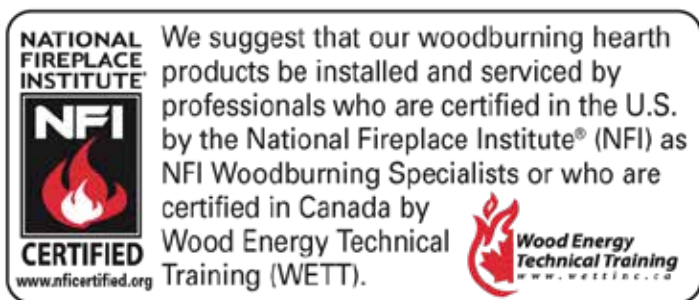
Average particulate emission using EPA Method 28R crib wood test method: 1.6 g/h

Average carbon monoxide emissions during testing: 0.94 g/min

Under specific test conditions this heater has been shown to deliver heat at rates ranging from 11 811 to 22 017 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

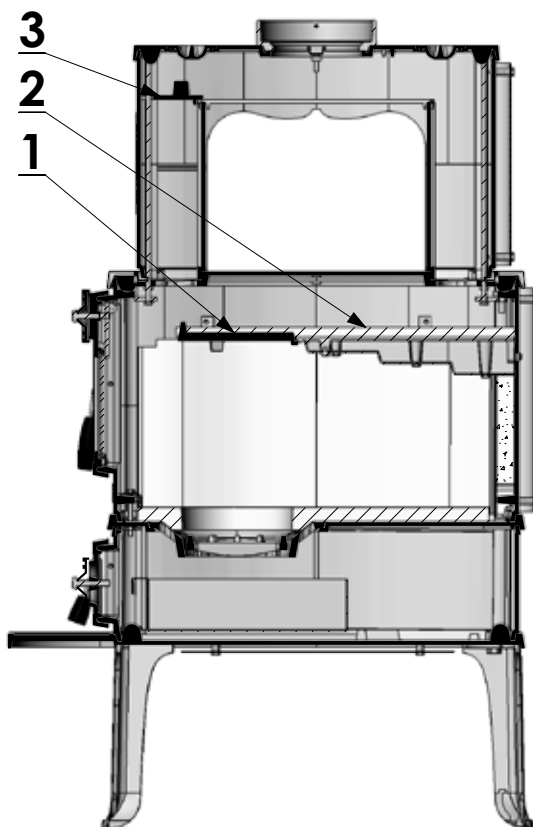
2B Classic: After removing the outer packaging, flatten it and lay onto the floor close to the stove; this can then act as protective work surface during the assembly process.

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.

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. Also check that the cover (3) identification number 2118 are placed correctly.



How to fit the Smoke Cover

Place the smoke cover by the smoke vent in front of the stove. This is easily done by leading the smoke cover down through the flue collar before fitting the pipe. It is also possible to fit the smoke cover through the access door opening. See pictures 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 residential type masonry or listed type HT factory-built chimney.

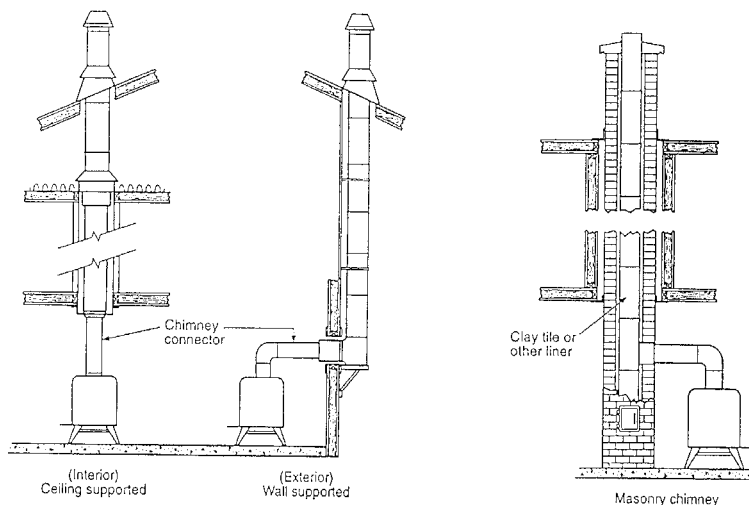
High Temperature (H.T.) Chimney Standard UL-103-1985 (2100° F.) or a code-approved masonry chimney with flue liner for the USA, and High Temperature (650°C) Standard ULC S-629 for Canada.

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.

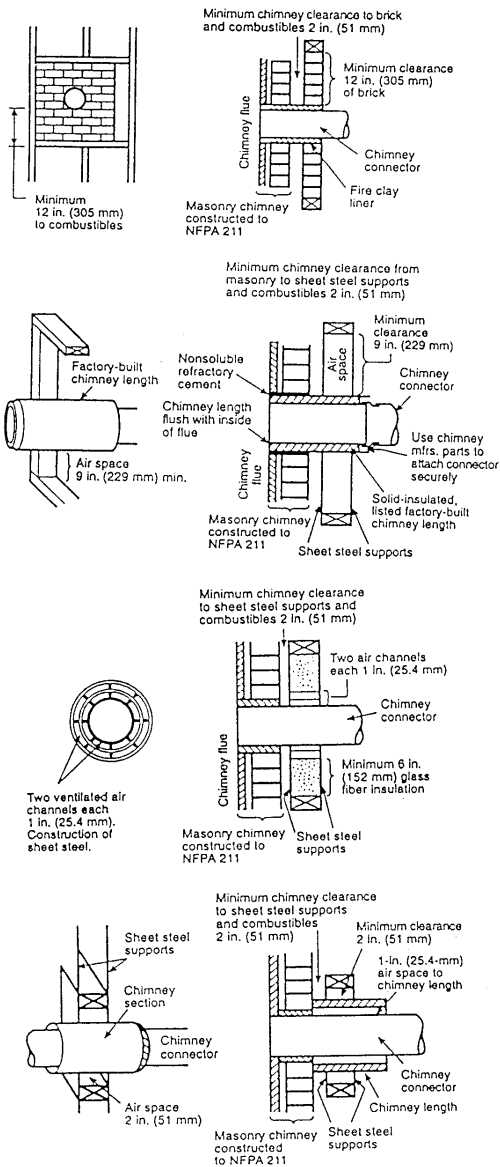
In horizontal runs of chimney, maintain a distance of 18 inches from the ceiling. Keep it as short and direct as possible, with no more than two 90 degree turns. Slope horizontal runs of connector upward 1/4 inch per foot (20 mm per metre) going from the stove toward the chimney. The recommended maximum 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, all applicable local and national building regulations must be observed. The installation clearances specified in the clearance charts below are the minimum tested distances and must always be maintained. These distances may need to be increased if surrounding materials are particularly heat-sensitive.

Note that wallpaper, adhesives, and other decorative materials may be affected by heat over time. Care should be taken to ensure that such materials do not loosen and fall toward the stove.

When the stove is positioned near non-combustible materials, a clearance of at least 4 inches (100 mm) is recommended to allow access for cleaning and to ensure proper air circulation around the stove.

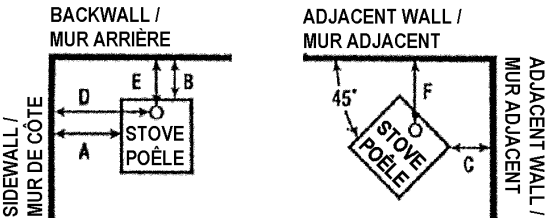
This heater meets the requirements of CAN/ULC-S627 and is suitable for installation on a combustible floor without the need for radiant floor protection.

Please refer to the section below regarding floor protection against falling embers.

Clearance requirements for 2B Classic (Singlewall connector)

CLEARANCE REQUIREMENTS	STANDARD RESIDENTIAL INSTALLATION (SINGLEWALL CONNECTOR)	
	USA	CANADA
A. Sidewall to unit	26"	26" (660 mm)
B. Backwall to unit	7"	7" (178 mm)
C. Cornerwall to unit	22"	22" (559 mm)
D. Sidewall to connector	29"	29" (737 mm)
E. Backwall to connector	15"	15" (381 mm)
F. Cornerwall to connector	29"	29" (737 mm)
G. Unit to ceiling	-	-
H. Floor to ceiling	-	-

MINIMUM CLEARANCES TO COMBUSTIBLES: DEGAGEMENTS MINIMAUX AUX MATERIAUX COMBUSTIBLES:

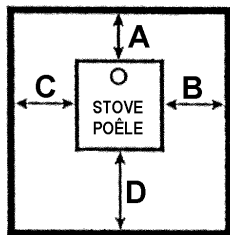


Distance to furniture

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.

**NON-COMBUSTIBLE FLOOR PROTECTOR:
PROTECTEUR DE PLANCHER INCOMBUSTIBLE**



FLOOR PROTECTOR MUST BE NON-COMBUSTIBLE MATERIAL. IT MUST EXTEND BENEATH HEATER, AND TO THE FRONT/SIDES/REAR AS INDICATED.

LE PROTECTEUR DE PLANCHER DOIT ÊTRE D'UN MATERIAL INCOMBUSTIBLE. IL DOIT S'ÉTENDRE EN DESSOUS DE L'APPAREIL ET AU DEVANT, AUX CÔTÉS ET À L'ARRIÈRE DEL L'APPAREIL COMME INDIQUÉ.

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.

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. The air supply must be fully open.
Turn the spinner control $2\frac{1}{2}$ turns counterclockwise from closed position to fully open the primary air supply (See box on page 15 regarding closed position)

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. We recommend setting the spinner control at a minimum of 1-1 $\frac{1}{2}$ turns counterclockwise from closed position, when burning the kindling/start-up fuel. A suitable layer of embers will be formed after about 15-20 minutes.



6. When ready to reload, use a poker to spread the embers 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. Turn the spinner control $\geq 1\frac{1}{2}$ turns counterclockwise from closed position to fully open the primary air supply
The new fuel will ignite in a minute or two

9. After a few minutes, adjust the primary air supply to suit your heating requirements.
If using the minimum low burn rate (spinner control closed) allow the fire to establish properly, by burning at medium burn rate for about 15 minutes beforehand. Turn the spinner control $1-1\frac{1}{2}$ turns counterclockwise from closed position to achieve a medium burn rate.

10. For refueling, add a layer of wood while there are still plenty of live embers, Repeat steps 6-9.



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.

When the spinner air controller is turned all the way down, closed position, there is still a small gap between the spinner and the door frame allowing for the minimum low burn rate. The manufacturer-set gap is 1.8 mm

Warning: Fireplace stoves must never be left unattended with the door open. If the door is left partly open, gas and flame may be drawn out of the fireplace stove opening, creating risks from both fire and smoke. We recommend that you 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.

Excessive chimney draft may cause the stove to burn hotter and faster than intended, even when the primary air control is set to a low position. Signs of excessive draft may include unusually rapid fuel consumption, difficulty maintaining a low burn rate, roaring fire sounds, glowing stove or connector pipe parts, and excessively high flue temperatures. If excessive draft conditions occur:

- Reduce the air supply as much as possible.
- Burn smaller fuel loads.
- Ensure the chimney system conforms to the recommended dimensions in this manual.
- Consult a qualified chimney professional. Installation of a listed flue damper may be necessary in some installations.

Do not overfire the stove. Persistent overfiring may damage the appliance and chimney system and may void the warranty.

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 Emissions

This stove has been certified to comply with U.S. EPA particulate emission standards.

As with all wood-burning appliances, carbon monoxide (CO) is produced during combustion. The amount of CO emitted may vary depending on fuel quality, chimney draft, wood moisture content, burn rate, refueling practices, and operating conditions.

To minimize carbon monoxide emissions:

- Burn only dry, seasoned wood with a moisture content below 20%.
- Maintain adequate combustion air and avoid smoldering fires.
- Operate the stove with the door fully closed except during lighting and refueling.
- Inspect and maintain the chimney system regularly.

Improper operation or poor draft conditions may increase carbon monoxide production and smoke spillage.

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

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.

ALWAYS USE ORIGINAL MORSØ SPAREPARTS

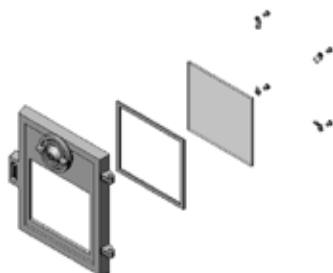
Installing the glass

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 be held tight enough so 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.

Ash disposal

Empty the ashpan on a daily basis or as needed. Ash allowed to build up towards the underside of the grate will trap heat and could cause premature failure of the grate.

Empty the ashpan according to this procedure:

Open the front door, and use a shovel or poker to stir excess ash through the ash slots in the grate down into the ash pan. Take out the ash pan, making sure to keep it level to avoid spilling ash.

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.

Return the ash pan to its original position in the stove, and close the door.

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.

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.

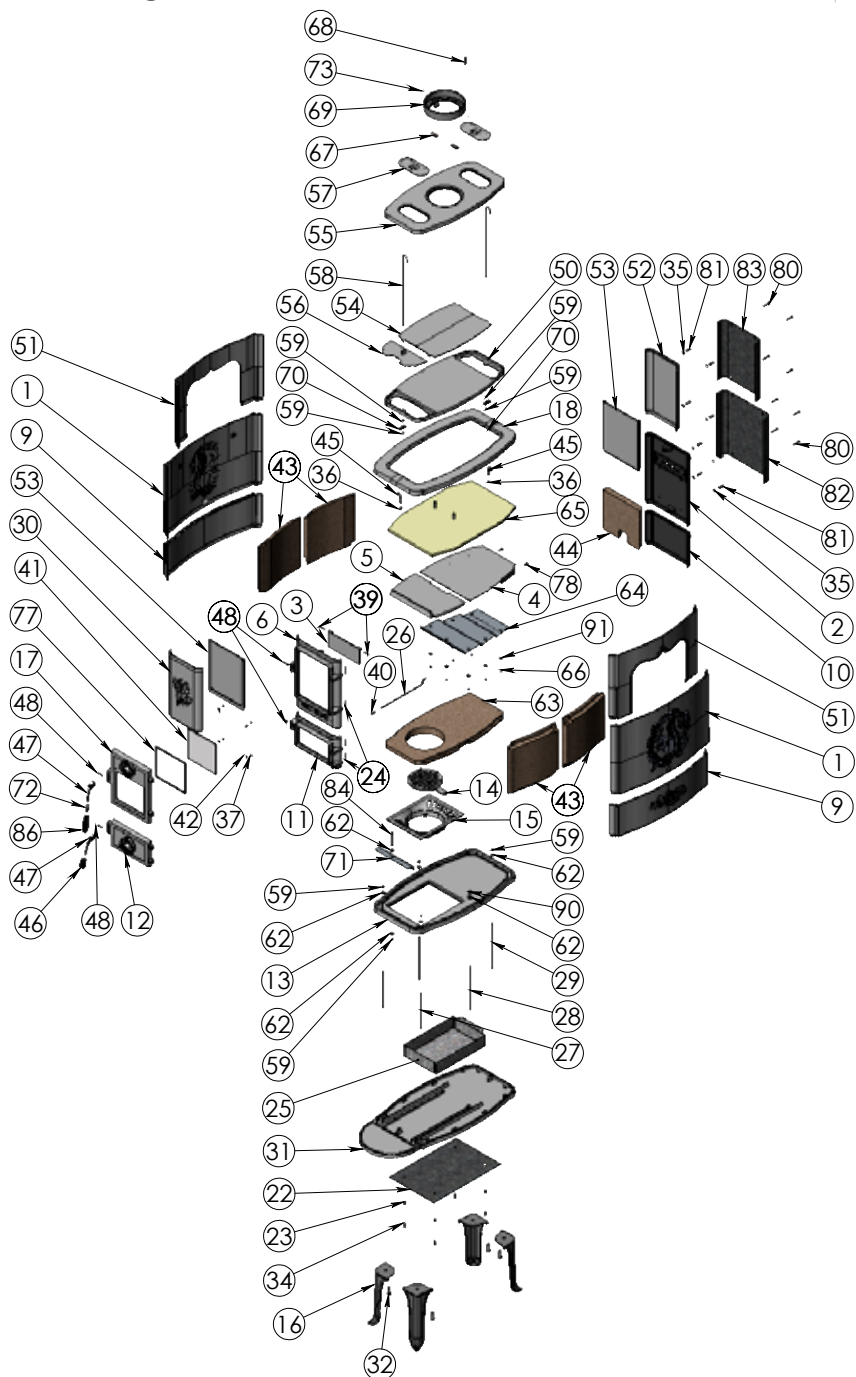
Thank you for buying a Morsø stove.

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 Classic 2020



3.6 Parts list for model Morsø 2B Classic 2020

Pos. No.	Parts	SKU no.
1	Squirrel Side Panel	54200321
2	Rear Plate	44203821
3	Smoke Valve	44200800
4	Horizontal Baffle	44203600
5	Front Baffle	34203800
6	Front	44201521
9	Side Panel for Upper Part	44202521
10	Rear Plate for Lower Part	44202621
11	Front for Lower Part	44202721
12	Ash Door	44204821
13	Intermediate Grate Frame	44204921
14	Riddling Grate	44203000
15	Inner Grate Frame	44203100
16	Leg	44200121
17	Door assembly	44204421
18	Frame	44211121
20	Poker	541075
22	Radiation Shield - Base	54137000
23	Distance Tube Ø10x1 L=10mm	541439
24	Hinge Pin Ø6x45	541808
25	Ash pan	541405
26	Riddling Handle	542052
27	Bolt M6x170	542053
28	Bolt M6x205	542054
29	Bolt M6x215	542055
30	Rear Panel for Upper Part	44211421
31	Base	54209400
32	M10x16 DIN 933 screw (black)	73111600
34	M6x25 DIN 933 Screw (black)	731616
35	Vistop lock washer 6 mm	746206
36	M8 DIN 934 bolt	735008
37	M85x08 ISO 7380 button head screw	73850800
39	M5x25 DIN 965A fzb screw	743525
40	Knob for riddling handle	752619
41	Door Glass	790715
42	Glass Clips	790743
43	Side Brick	79209000
44	Rear Brick	79209100
45	M8x50 DIN 931 angled screw	791172
46	Bakelite Handle 36 mm	79118200
47	Clasp	79127000
48	Ø6x32mm Pin	791868
50	Intermediate Frame	44211200
51	Side Panel for Upper Part	44211321
52	Rear Panel for Upper Part	44203921
53	Inside rear panel upper part	44211521
54	Inside top - upper part	44211621
55	Top - upper part	44200721

3.6 Parts list for model Morsø 2B Classic 2020

Pos. No.	Parts	SKU no.
56	Cover - upper part	44211800
57	Access Door Upper Part	44211921
58	Bolt - Ø5 360 mm	542146
59	M6 DIN 934 black steel nut	735006
62	o6 mm DIN 9021 fzb washer	791891
63	Brick - Base	79209200
64	Baffle - stainless steel	71209061
65	Insulation	79077100
66	M6x08 DIN 933 A2 screw	74160804
67	Fitting for Cover w. thread	44256700
68	M6x30 DIN 7991 screw (black)	74241900
69	Flue Collar	44145921
70	Fitting w/o thread	44256800
71	Radiation Shield - Front	71209161
72	Fitting for handle	75140161
73	3,5x13 DIN 7981 fzb screw	79183600
77	Gasket for glass	79074200
78	M6x16 buttonhead A2 Screw	73861300
80	M6x30 DIN 933 Screw (black)	731630
81	Distance Tube Ø10x1 L=20mm	542635
82	Conv. back rear plate	54201221
83	Radiation Shield - Back	54202921
84	M6x60 DIN 933 Screw (black)	731645
86	Bakelite Handle 72 mm	9118300
90	M6 nut Verbus Ribb - BN2798-HFC851	735306
91	o6 mm 6,5x16x1 fzb DIN 522-A washer	766106

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**

**Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark
+45 96691900**

Phone Number

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 - 18.05.2026- 72207100

morsø



morsø

Manuel d'installation et d'utilisation

Morsø 2B Classic

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 Classic de Morsø a été certifié par les services d'inspection PFS TECO.

Les standards du test sont UL 1482-2022 pour les États Unis et ULC-S627-2023 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 1.6 g / h. Émissions moyennes de monoxyde de carbone pendant les essais : 0,94 g/min

Sous conditions spécifiques de test, on a pu constater que le rendement calorifique varie entre 11,811 et 22,017 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.

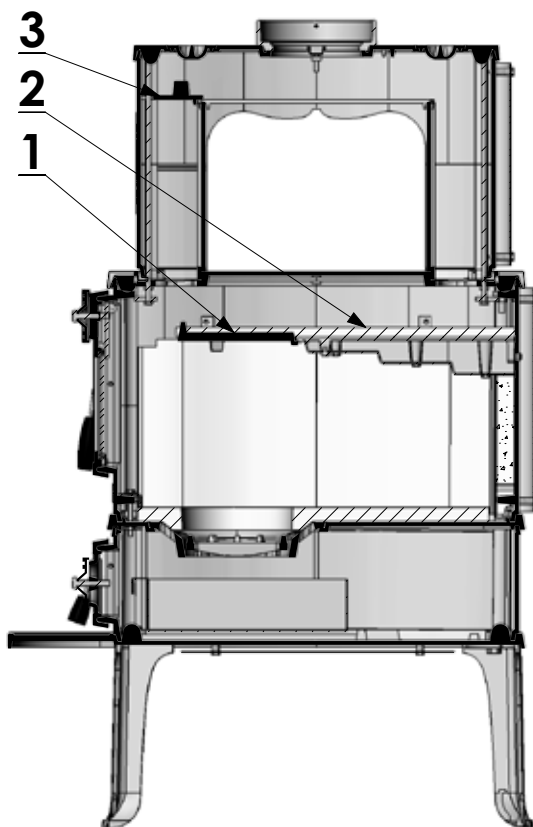
1.1 Déballage du poêle

2B Classic : 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.

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. Vérifiez aussi que le couvercle (3) marqué 2118 est bien placé.



Pose du couvercle de fumée

Placez le couvercle de fumée à côté de l'échappement de fumée, sur le devant du poêle. Pour le faire plus facilement, faites passer le tuyau de fumée par le collier de serrage, avant de fixer le conduit. Vous pouvez aussi placer le couvercle de fumée par l'ouverture de la porte d'accès. Voir 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.

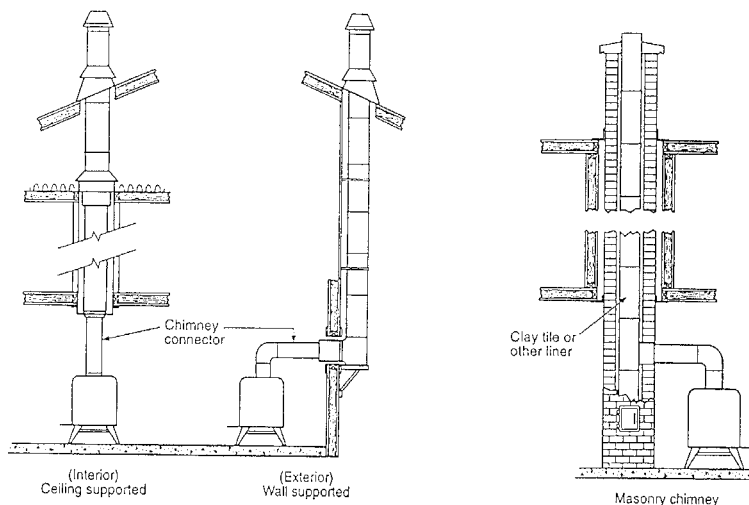
Nous conseillons que la longueur de la cheminée est au moins de 16 pieds (4,90 m) (pas indispensable) au-dessus du poêle dans des situations ménagères normales, mesurée du collier de serrage du tuyau à l'extrémité supérieure de la cheminée.

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.

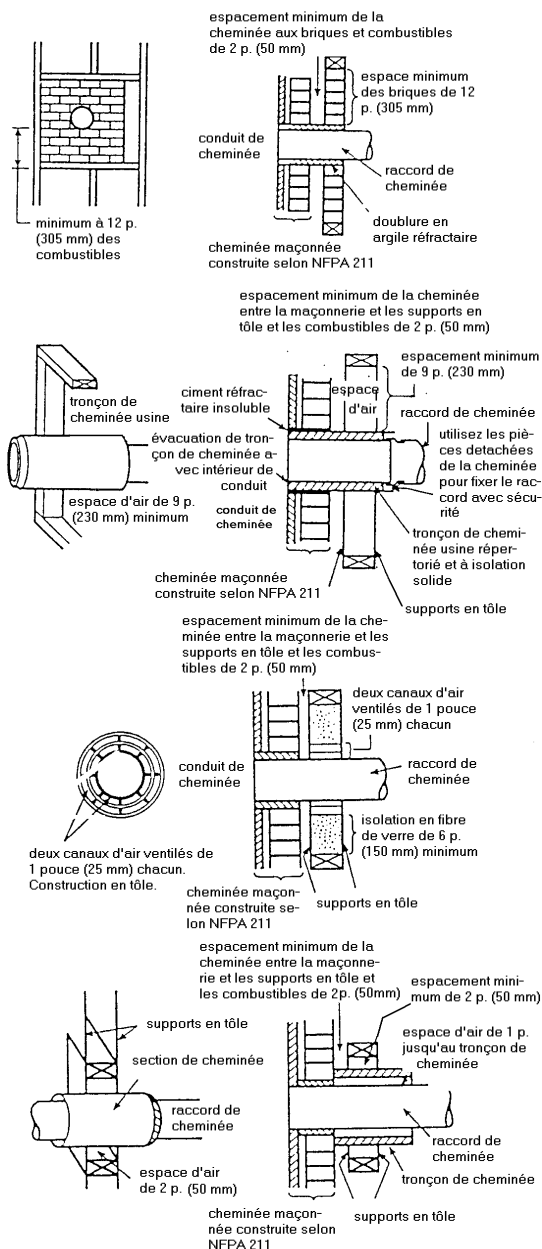
Assurez-vous que le poêle et le raccord de cheminée installés se trouvent à une distance correcte des matériaux de combustion proches. Voir le paragraphe sur les espacements page 9.

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

Lorsque le poêle est installé à proximité de matériaux combustibles, toutes les réglementations locales et nationales en vigueur doivent être respectées. Les distances d'installation indiquées dans les tableaux ci-dessous correspondent aux distances minimales testées et doivent toujours être respectées. Ces distances peuvent devoir être augmentées si les matériaux environnants sont particulièrement sensibles à la chaleur.

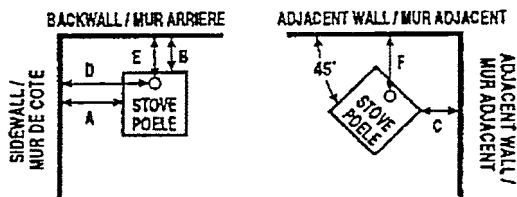
Veillez noter que le papier peint, les adhésifs et autres matériaux décoratifs peuvent être affectés par la chaleur au fil du temps. Il convient de veiller à ce que ces matériaux ne se détachent pas et ne tombent pas vers le poêle.

Lorsque le poêle est installé à proximité de matériaux non combustibles, un espace d'au moins 4 pouces (100 mm) est recommandé afin de permettre le nettoyage et d'assurer une bonne circulation de l'air autour du poêle.

Cet appareil est conforme aux exigences de la norme CAN/ULC-S627 et peut être installé sur un sol combustible sans nécessiter de protection thermique par rayonnement.

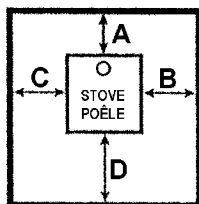
Veillez consulter la section ci-dessous concernant la protection du sol contre les braises incandescentes.

MINIMUM CLEARANCES TO COMBUSTIBLES: DEGAGEMENTS MINIMAUX AUX MATERIAUX COMBUSTIBLES:



Conditions d'espacement requises:	Installation résidentielle standard (raccord à simple paroi)	
	États-Unis	Canada
A. De la paroi latérale à l'unité	26" (660 mm)	26" (660 mm)
B. De la paroi arrière à l'unité	7" (178 mm)	7" (178 mm)
C. De la paroi d'angle à l'unité	22" (559 mm)	22" (559 mm)
D. De la paroi latérale au raccord	29" (737 mm)	29" (737 mm)
E. De la paroi arrière au raccord	15" (381 mm)	15" (381 mm)
F. De la paroi d'angle au raccord	29" (737 mm)	29" (737 mm)
G. De l'unité au plafond	-	-
H. Du sol au plafond	-	-

NON-COMBUSTIBLE FLOOR PROTECTOR:
PROTECTEUR DE PLANCHER INCOMBUSTIBLE



FLOOR PROTECTOR MUST BE NON-COMBUSTIBLE
MATERIAL. IT MUST EXTEND BENEATH HEATER,
AND TO THE FRONT/SIDES/REAR AS INDICATED.

LE PROTECTEUR DE PLANCHER DOIT ÊTRE D'UN
MATÉRIEL INCOMBUSTIBLE. IL DOIT S'ÉTENDRE
EN DESSOUS DE L'APPAREIL ET AU DEVANT, AUX
CÔTÉS ET À L'ARRIÈRE DEL L'APPAREIL COMME
INDIQUÉ.

Exigences de protection du sol	Matériaux incombustibles sous le poêle	
	USA	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 créosote 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 crépite 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'espace 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 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.

2. Ouvrez complètement le régulateur d'air primaire.
Tournez la commande rotative de 2 1/2 tours dans le sens antihoraire de la position fermée pour ouvrir complètement l'alimentation en air primaire
(Voir encadré page 15 concernant la position fermée)

3. Allumez le feu.

4. Après l'allumage, fermez partiellement les portes en les laissant entrouverte de 2 ou 3 cm pour laisser entrer suffisamment d'air de combustion.

5. Lorsque la cheminée est chaude après 5 à 10 minutes, fermez la porte.

Nous recommandons de régler la commande de la centrifugeuse à un minimum de 1 à 1 1/2 tour dans le sens antihoraire à partir de la position fermée, lors de la combustion du bois d'allumage / de démarrage.

Un lit de braises convenable se forme au bout de 15 à 20 minutes.



6. Au moment de recharger, repartez les braises dans le foyer en les rapprochant surtout vers l'avant du poêle.

7. Poser trois morceaux de bois sur les braises. Laissez ½ pouce (1 cm) ou plus entre chaque morceau.

Toujours garder la charge de carburant sous le tube d'air secondaire le plus bas. L'espace devant et au-dessus du tube à air le plus bas est réservé à la combustion de gaz volatil.

8. Fermez la porte. Tournez la commande rotative de 2 1/2 tours dans le sens antihoraire à partir de la position fermée pour ouvrir complètement l'alimentation en air primaire
Le nouveau carburant s'enflammera dans une minute ou deux

9. Après quelques minutes, réglez l'entrée d'air primaire en fonction de la chaleur voulue.

Si vous utilisez le taux de combustion bas minimum (commande de rotation fermée)

permettre au feu de s'établir correctement, en brûlant à une vitesse de combustion moyenne pendant environ 15 minutes à l'avance. Tournez la commande rotative 1-11 / 2 tours dans le sens antihoraire à partir de la position fermée pour atteindre un taux de combustion moyen.

10. 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

Lorsque le contrôleur d'air du cône est tourné à fond vers le bas, position fermée, il est toujours un petit écart entre le cône et le cadre de la porte permettant un faible taux de combustion minimum. L'écart défini par le fabricant est de 1.8 mm

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 consommés) dans la cheminée et le poêle.

Un tirage excessif de la cheminée peut entraîner une combustion plus chaude et plus rapide que prévu, même lorsque le réglage d'air primaire est en position basse. Les signes d'un tirage excessif peuvent inclure une consommation de combustible anormalement rapide, des difficultés à maintenir une faible allure de combustion, des bruits de combustion intenses dans le conduit, des parties du poêle ou du tuyau de raccordement devenant rougeoyantes, ainsi que des températures de fumées excessivement élevées.

En cas de tirage excessif :

- Réduire autant que possible l'arrivée d'air.
- Utiliser des charges de bois plus petites.
- Vérifier que le système de cheminée respecte les dimensions recommandées dans ce manuel.
- Consulter un professionnel qualifié des cheminées. L'installation d'un modérateur de tirage homologué peut être nécessaire dans certaines installations.

Ne pas surchauffer le poêle. Une surchauffe prolongée peut endommager l'appareil et le système de cheminée et peut annuler la garantie.

Émissions de monoxyde de carbone

Ce poêle est certifié conforme aux normes d'émissions de particules de l'EPA américaine.

Comme tous les appareils de chauffage au bois, du monoxyde de carbone (CO) est produit pendant la combustion. La quantité de CO émise peut varier en fonction de la qualité du combustible, du tirage de la cheminée, du taux d'humidité du bois, du régime de combustion, des pratiques de rechargement et des conditions d'utilisation.

Afin de minimiser les émissions de monoxyde de carbone :

- Utiliser uniquement du bois sec et bien séché avec un taux d'humidité inférieur à 20 %.
- Maintenir une arrivée d'air de combustion adéquate et éviter les feux couvants.
- Faire fonctionner le poêle avec la porte complètement fermée, sauf pendant l'allumage et le rechargement.
- Inspecter et entretenir régulièrement le système de cheminée.

Une utilisation incorrecte ou de mauvaises conditions de tirage peuvent augmenter la production de monoxyde de carbone et provoquer des refoulements de fumée.

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 nettoyeurs abrasifs sur la surface vitrée.

Causes possibles de vitre sale

- Combustible trop humide
- Bûches trop grandes ou non fendues
- Température de combustion trop basse

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.

UTILISEZ TOUJOURS DES PIÈCES DE RECHANGE D'ORIGINE MORSØ

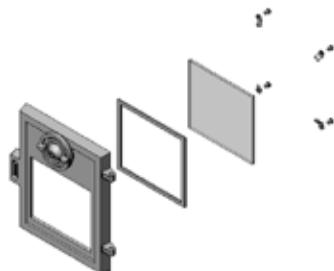
Installer la vitre

N'installez jamais la vitre lors du fonctionnement du poêle.

Remplacement du vitre céramique

Le vitre céramique ne peut pas être recyclé, car sa température de fusion est trop élevée. Si le vitre céramique est mélangé au verre normal, la matière première est dénaturée et le processus de recyclage du vitre peut être interrompu. Veillez à ce que le vitre réfractaire ne soit pas traité comme matériau à recycler normal. Vous contribuerez beaucoup à la protection de l'environnement.

ATTENTION ! Doit être déposé comme vitre 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 – comprendra nt 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 crésote. S'il y a de crésote 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.

Elimination des cendres

Videz les cendriers quotidiennement ou selon les besoins. Si vous laissez des cendres s'accumuler en dessous de la grille, la chaleur est piégée et cela peut entraîner un mauvais fonctionnement prématuré de la grille.

Videz le cendrier 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.

Crésote – 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 crésote. Les vapeurs de crésote se condensent dans le conduit de cheminée relativement froid lors d'un feu brûlant faiblement. Il en résulte que les résidus de crésote s'accumulent sur la paroi du tuyau. Une fois enflammé, le crésote 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 crésote. En cas de dépôt de crésote, éliminez-le pour diminuer le risque de feu de cheminée.

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.

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.

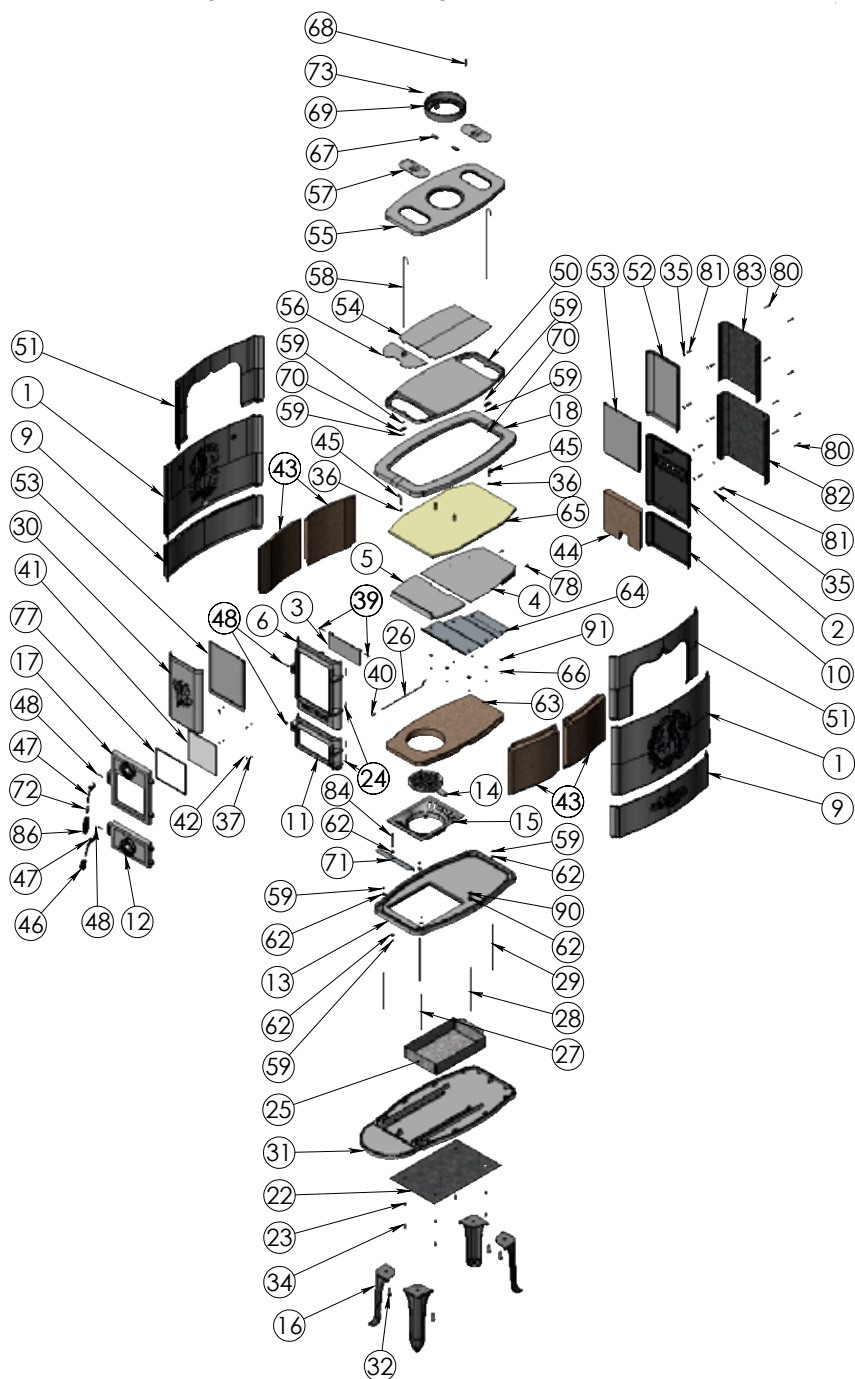
Nous vous remercions d'avoir acheté un poêle Morsø.

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.

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.

3.5 Schéma des pièces détachées pour le modèle 2B Classic 2020



3.6 Liste des pièces détachées pour le modèle 2B Classic 2020

No.	Pièces	SKU no.
1	Panneau latéral Ecureuil	54200321
2	Plaque arrière	44203821
3	Valve à fumée	44200800
4	Déflexeur horizontal	44203600
5	Déflexeur vertical	34203800
6	Face frontale	44201521
9	Panneau latéral, partie supérieure	44202521
10	Plaque arrière, partie inférieure	44202621
11	Porte, partie inférieure	44202721
12	Porte du cendrier	44204821
13	Cadre intermédiaire de poêle	44204921
14	Grille à fentes	44203000
15	Cadre de poêle intérieur	44203100
16	Pied	44203221
17	Porte Assemblé	44204421
18	Cadre	44211121
20	Tisonnier	541075
22	Écran de protection radiant - base	54137000
23	Tube d'éloignement Ø10x1 L=10mm	541439
24	Axe de charnière Ø6x45	541808
25	Boîte de cendrier	542051
26	Poignée à fentes	542052
27	Boulon M6x170	542053
28	Boulon M6x205	542054
29	Boulon M6x215	542055
30	Panneau arrière, partie supérieure	44211421
31	Base	54209400
32	Vis M10x16 DIN 933 screw (black)	73111600
34	Vis M6x25 DIN 933 Screw (black)	731616
35	Rondelle, Vistop 6 mm	746206
36	Vis M8 DIN 934	735008
37	Vis M85x08 ISO 7380	73850800
39	Vis M5x25 DIN 965A fzb	743525
40	Bouton pour poignée à fentes	752619
41	Porte vitrée	790715
42	Clip vitre	790743
43	Brique, latérale	79209000
44	Brique, arrière	79209100
45	Vis M8x50 DIN 931	791172
46	Poignée bakélite 36 mm	79118200
47	Fixation	79127000
48	Pivot Ø6x32mm	791868
50	intermédiaire de grille	44211200
51	Panneau latéral, partie supérieure	44211300
52	Panneau arrière, partie supérieure	44203921
53	Panneau arrière intérieur, partie supérieure	44211521
54	Haut, à l'intérieur - partie supérieure	44211621
55	Haut - partie supérieure	44200721

Pos. No.	Parts	SKU no.
56	Couverture, - partie supérieure	44211800
57	Porte d'accès, partie supérieure	44211921
58	boulon - Ø5 360 mm	542146
59	Écrou, M6 DIN 934	735006
62	Rondelle, 06 mm DIN 9021 fzb	791891
63	Brique, base	79209200
64	Déflexeur - acier inoxydable	71209061
65	isolation	79077100
66	Vis M6x08 DIN 933 A2	74160804
67	Raccord pour couvercle avec filetage	44256700
68	Vis M6x30 DIN 7991	74241900
69	Collier de cheminée	44145921
70	Raccord sans filetage	44256800
71	Écran anti-rayonnement - Avant	71209161
72	Raccord pour poignée	75140161
73	Vis 3,5x13 DIN 7981 fzb	79183600
77	Joint pour verre	79074200
78	Vis M6x16 buttonhead A2	73861300
80	Vis M6x30 DIN 933	731630
81	Tube d'éloignement Ø10x1 L=20mm	542635
82	Plaque arrière pour convection	54201221
83	Écran de protection radiant- arrière	54202921
84	Vis M6x60 DIN 933	731645
86	Poignée bakélite 72 mm	9118300
90	Écrou M6 Verbus Ribb - BN2798-HFC851	735306
91	Rondelle, 06 mm 6,5x16x1 fzb DIN 522-A	766106

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

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 18.05.2026 72208500

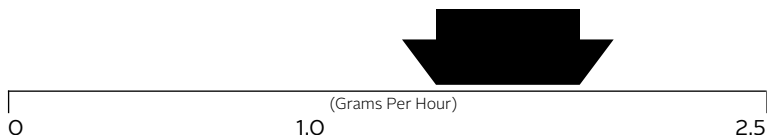
Manufactured by: Morsø
Model: 2B Classic

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards using cord wood.

SMOKE

THIS MODEL



EFFICIENCY



Particulate emission using EPA Method 28R crib wood test method:

Emission

1.6 g/h

Wood heaters with higher efficiencies cost less to operate.

HEAT OUTPUT

11,811 to 22,017 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)

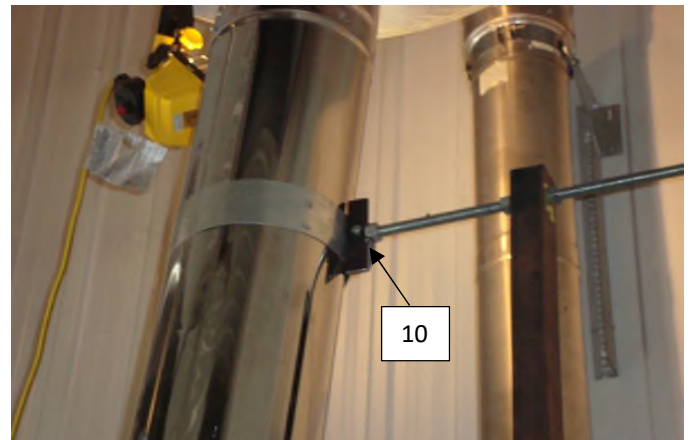
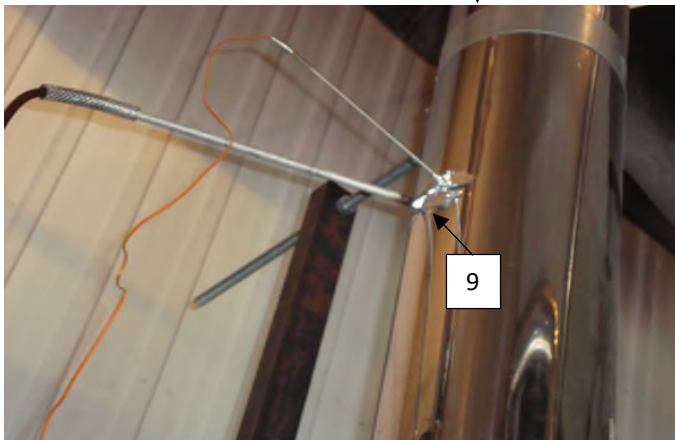
All pipe joints are sealed.

Stack sampling



Gas analysis and temperature probe

chimney support



9 : Temperature and gas analyser sampling ports located 9 feet above platform

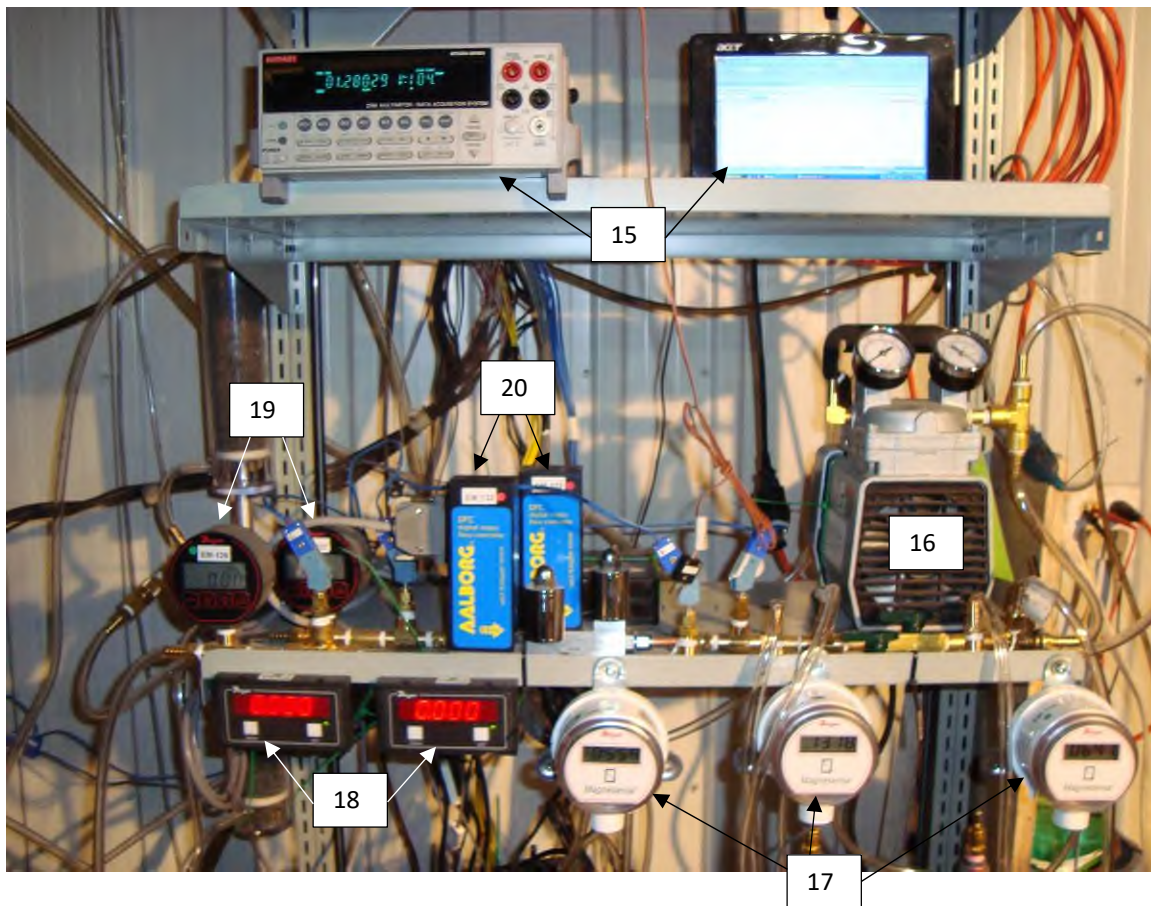
10 : Exhaust system support bracket

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

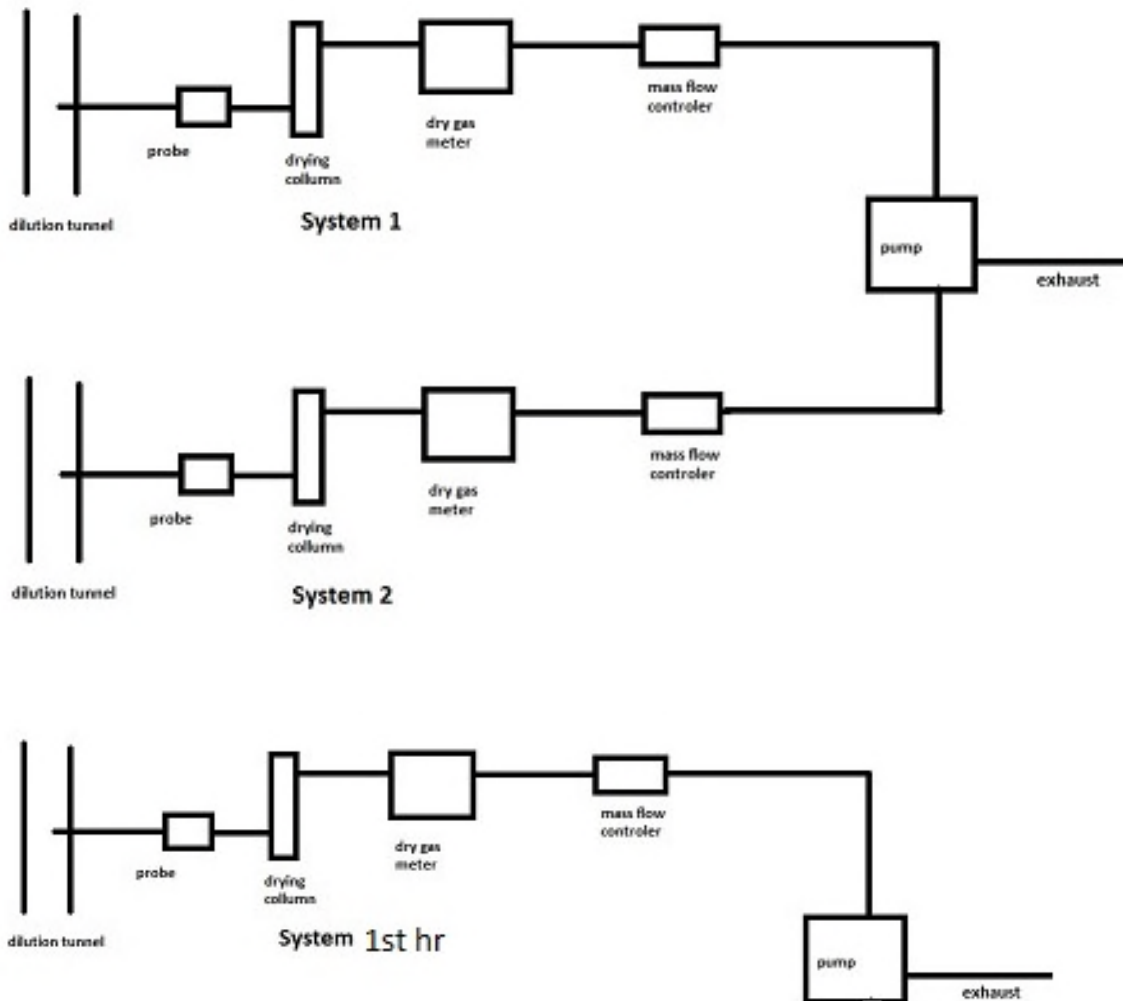
Gaz analyser



Dry gas meter for train 1, train 2 , 1st hour and room filter.



Dilution tunnel sample system



Dilution tunnel

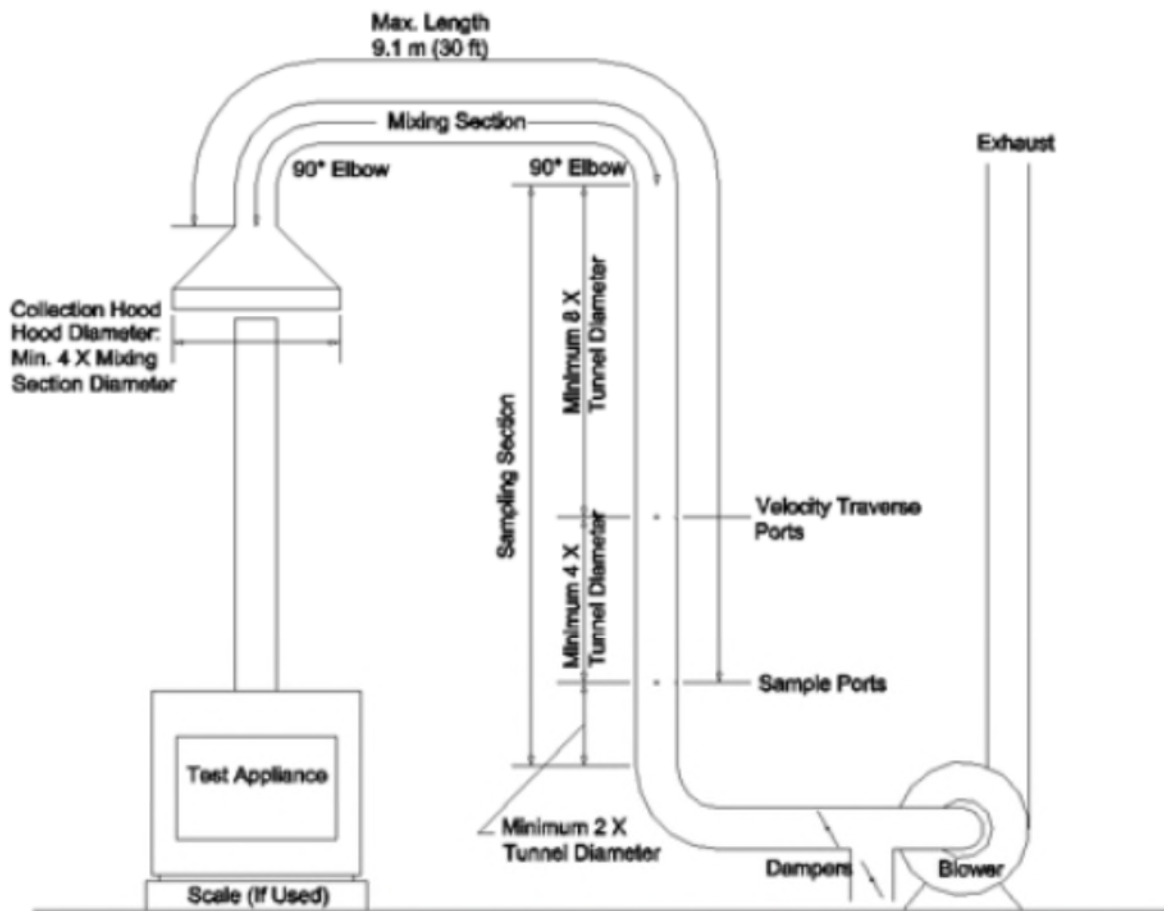


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

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

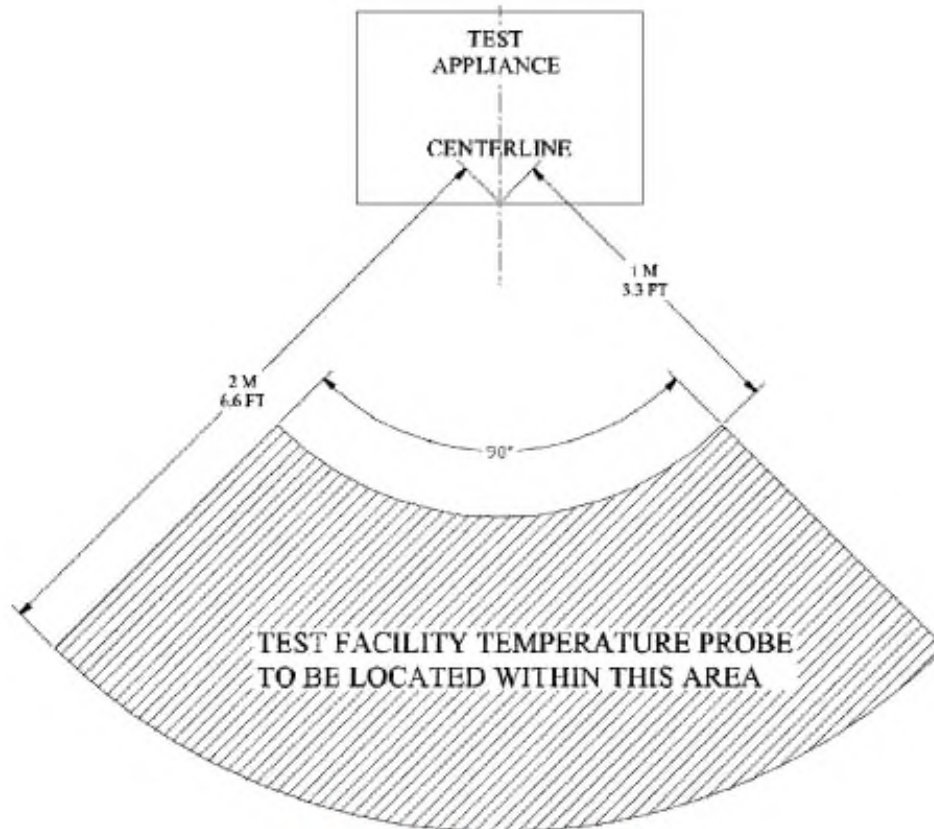


FIG. 8 Test Facility Temperature Monitor

APPENDIX 9: Test load photographs

overall view stove setup



Left side view of the Stove



Back side view of the stove



Right side view of the stove



Run 1, April 13th 2026

Testing load



Preburn load



Charcoal / coal bed for load



Load in stove



Run 2, April 14th 2026

Testing load



Preburn load



Charcoal / coal bed for load



Load in stove



Run 3 April 15th 2026

Testing load



Preburn load



Charcoal / coal bed for load



Load in stove



Run 4, April 16th 2026

Testing load



Preburn load



Charcoal / coal bed for load



Load in stove



Sealed Testing heater



APPENDIX 10: Laboratory Operating Procedures

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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

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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.

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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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- 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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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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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}	4,592 lbs
θ	65 min
$\%M_W$	16,88 %

Calculation

BR	1,599 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	12,91 dcf
Y	1,01
P_{bar}	30,21 in Hg
ΔH	-1,1716 in Hg
T_m	537,0 R

Calculation

$V_{m(std)}$	12,43 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

$F_1 + F_2$ 0,0006 g

ΔPF 0,002 g

Calculation

m_n 2,700 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	2,700 mg
$V_{m(\text{std})}$	12,43 dscf

Calculation

C_s	0,000217 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
$V_{mr(std)}$	12,74 dscf

Calculation

C_r	0,000008 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 cacluated 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}	0,250471084
V_{scent}	0,265516691

Calculation

F_P	0,943335
-------	----------

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: $34.97 \text{ m/sec} \left[\frac{(\frac{g}{g\text{-mole}})(\text{mm Hg})}{(^{\circ}K)(\text{mm H}_2\text{O})} \right]^{1/2}$ For English units: $85.49 \text{ ft/sec} \left[\frac{(\frac{lb}{lb\text{-mole}})(\text{in Hg})}{(^{\circ}R)(\text{in H}_2\text{O})} \right]^{1/2}$
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, $^{\circ}C$ ($^{\circ}F$)
T_S	Absolute dilution tunnel temperature, $^{\circ}K$ ($^{\circ}R$), 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	0,943
$(\sqrt{\Delta P})_{avg}$	0,2776 in H ₂ O ^{1/2}
P_{bar}	30,21 in Hg
P_g	0,28 in H ₂ O
P_S	30,23 in Hg
M_S	29 lb/lb-mol
t_S	114,19 F
T_S	574,19 R

Calculation

V_S	17,9346 ft/s
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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	17,935
A	0,196 ft^2
T_{std}	528 R
T_s	574,19 R
P_s	30,230 in Hg
P_{std}	29,92 in Hg

Calculation

Q_{std}	192,37 dscf/min
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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	0,000217 g/dscf
C _r	0,000008 g/dscf
Q _{std}	192,37 dscf/min

Calculation

E	0,04 g/min
E	2,42 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	0,000217 g/dscf
C_r	0,000008 g/dscf
Q_{std}	192,37 dscf/min
θ	65 min

Calculation

E 2,62 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	0,943	F_p	0,943
K_p	85,49	K_p	85,49
C_p	0,99	C_p	0,99
Δp_i	0,077 in H ₂ O	Δp_i	0,076 in H ₂ O
T_{si}	580,7 R	T_{si}	579,1 R
P_s	30,23 in Hg	P_s	30,23 in Hg
M_s	29 lb/lb-mol	M_s	29 lb/lb-mol

Calculation

i=1		i=2	
v_{si}	18,00 ft/sec	v_{si}	17,86 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	65	min	θ	65	min
θ_i	1	min	θ_i	1	min
V_m	12,24	dcf	V_m	12,44	dcf
$V_{mi(std)}$	0,186	cuft	$V_{mi(std)}$	0,1895	cuft
V_S	16,96	ft/sec	V_S	16,96	ft/sec
V_{Si}	17,030	ft/sec	V_{Si}	17,030	ft/sec
T_m	536,9	R	T_m	537,0	R
T_{mi}	535,82	R	T_{mi}	535,07	R
T_S	574,19	R	T_S	574,19	R
T_{Si}	580,7	R	T_{Si}	580,7	R

Calculation

train=1		train=2	
PR	99,6 %	PR	100,1 %

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}	0,191 dcf
F_A	0,0116 ft^2

Calculation

FV_{max}	16,44 ft/min
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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	2,42 g
Train 2	2,47 g

Calculation

Dual train precision	1,10 %
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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 %
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Calculated with CO concentration values.

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}	4,566 lbs
θ	75 min
$\%M_W$	16,95 %

Calculation

BR	1,376 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	15,01 dcf
Y	1,01
P_{bar}	29,97 in Hg
ΔH	-1,1016 in Hg
T_m	533,8 R

Calculation

$V_{m(std)}$	14,46 dscf
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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

$F_1 + F_2$ 0,0004 g

ΔPF 0,001 g

Calculation

m_n 1,100 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	1,100 mg
$V_{m(\text{std})}$	14,46 dscf

Calculation

C_s	0,000076 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	0,000 mg
$V_{mr(std)}$	14,56 dscf

Calculation

C_r	0,000000 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 cacluated 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}	0,252804703
V_{scent}	0,265516691

Calculation

F_P	0,952124
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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: $34.97 \text{ m/sec} \left[\frac{(\frac{g}{g\text{-mole}})(\text{mm Hg})}{(^{\circ}K)(\text{mm H}_2\text{O})} \right]^{1/2}$ For English units: $85.49 \text{ ft/sec} \left[\frac{(\frac{lb}{lb\text{-mole}})(\text{in Hg})}{(^{\circ}R)(\text{in H}_2\text{O})} \right]^{1/2}$
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, $^{\circ}C$ ($^{\circ}F$)
T_S	Absolute dilution tunnel temperature, $^{\circ}K$ ($^{\circ}R$), 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	0,952
$(\sqrt{\Delta P})_{avg}$	0,2702 in H ₂ O ^{1/2}
P_{bar}	29,97 in Hg
P_g	0,27 in H ₂ O
P_S	29,99 in Hg
M_S	29 lb/lb-mol
t_S	97,20 F
T_S	557,20 R

Calculation

V_S	17,4271 ft/s
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Average dilution tunnel gas flow rate (Q_{std})

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	17,427
A	0,196 ft^2
T_{std}	528 R
T_s	557,20 R
P_s	29,993 in Hg
P_{std}	29,92 in Hg

Calculation

Q_{std}	191,12 dscf/min
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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	0,000076 g/dscf
C_r	0,000000 g/dscf
Q_{std}	191,12 dscf/min

Calculation

E	0,01 g/min
E	0,87 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	0,000076 g/dscf
C_r	0,000000 g/dscf
Q_{std}	191,12 dscf/min
θ	75 min

Calculation

E 1,09 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	0,952	F_p	0,952
K_p	85,49	K_p	85,49
C_p	0,99	C_p	0,99
Δp_i	0,073 in H ₂ O	Δp_i	0,071 in H ₂ O
T_{si}	561,6 R	T_{si}	561,5 R
P_s	29,99 in Hg	P_s	29,99 in Hg
M_s	29 lb/lb-mol	M_s	29 lb/lb-mol

Calculation

i=1		i=2	
v_{si}	17,46 ft/sec	v_{si}	17,27 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	75	min	θ	75	min
θ_i	1	min	θ_i	1	min
V_m	14,14	dcf	V_m	14,47	dcf
$V_{mi(std)}$	0,185	cuft	$V_{mi(std)}$	0,1896	cuft
V_S	16,64	ft/sec	V_S	16,64	ft/sec
V_{Si}	16,672	ft/sec	V_{Si}	16,672	ft/sec
T_m	533,6	R	T_m	533,8	R
T_{mi}	533,10	R	T_{mi}	532,46	R
T_S	557,20	R	T_S	557,20	R
T_{Si}	561,6	R	T_{Si}	561,6	R

Calculation

train=1		train=2	
PR	99,0 %	PR	99,2 %

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}	0,191 dcf
F_A	0,0116 ft^2

Calculation

FV_{max}	16,47 ft/min
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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	0,97 g
Train 2	1,04 g

Calculation

Dual train precision	3,61 %
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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 %
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Calculated with CO concentration values.

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}	4,516 lbs
θ	120 min
$\%M_W$	16,44 %

Calculation

BR	0,856 Dry kg/hr
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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	23,49 dcf
Y	1,01
P_{bar}	30,33 in Hg
ΔH	-0,9677 in Hg
T_m	534,5 R

Calculation

$V_{m(std)}$	22,98 dscf
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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

$F_1 + F_2$ 0,0047 g

ΔPF 0,001 g

Calculation

m_n 5,400 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	5,400 mg
$V_{m(\text{std})}$	22,98 dscf

Calculation

C_s	0,000235 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	0,000 mg
$V_{mr(std)}$	23,59 dscf

Calculation

C_r	0,000000 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 cacluated 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}	0,259737544
V_{scent}	0,272945344

Calculation

F_P	0,951610
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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	0,952
$(\sqrt{\Delta P})_{avg}$	0,2808 in H ₂ O ^{1/2}
P_{bar}	30,33 in Hg
P_g	0,28 in H ₂ O
P_s	30,35 in Hg
M_s	29 lb/lb-mol
t_s	87,73 F
T_s	547,73 R

Calculation

V_s	17,8417 ft/s
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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	17,842
A	0,196 ft^2
T_{std}	528 R
T_s	547,73 R
P_s	30,348 in Hg
P_{std}	29,92 in Hg

Calculation

Q_{std}	201,41 dscf/min
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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	0,000235 g/dscf
C _r	0,000000 g/dscf
Q _{std}	201,41 dscf/min

Calculation

E	0,05 g/min
E	2,84 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	0,000235 g/dscf
C_r	0,000000 g/dscf
Q_{std}	201,41 dscf/min
θ	120 min

Calculation

E 5,68 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	0,952	F_p	0,952
K_p	85,49	K_p	85,49
C_p	0,99	C_p	0,99
Δp_i	0,078 in H ₂ O	Δp_i	0,078 in H ₂ O
T_{si}	559,0 R	T_{si}	555,3 R
P_s	30,35 in Hg	P_s	30,35 in Hg
M_s	29 lb/lb-mol	M_s	29 lb/lb-mol

Calculation

i=1		i=2	
v_{si}	17,96 ft/sec	v_{si}	17,84 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	120	min	θ	120	min
θ_i	1	min	θ_i	1	min
V_m	22,61	dcf	V_m	22,99	dcf
$V_{mi(std)}$	0,185	cuft	$V_{mi(std)}$	0,1896	cuft
V_S	17,01	ft/sec	V_S	17,01	ft/sec
V_{Si}	17,129	ft/sec	V_{Si}	17,129	ft/sec
T_m	533,6	R	T_m	534,5	R
T_{mi}	532,68	R	T_{mi}	531,98	R
T_S	547,73	R	T_S	547,73	R
T_{Si}	559,0	R	T_{Si}	559,0	R

Calculation

train=1		train=2	
PR	100,0 %	PR	100,8 %

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}	0,194 dcf
F_A	0,0116 ft^2

Calculation

FV_{max}	16,75 ft/min
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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	5,09 g
Train 2	5,41 g

Calculation

Dual train precision	3,01 %
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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 %
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Calculated with CO concentration values.

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}	4,766 lbs
θ	132 min
$\%M_W$	16,47 %

Calculation

BR	0,821 Dry kg/hr
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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	26,04 dcf
Y	1,01
P_{bar}	30,02 in Hg
ΔH	-0,9953 in Hg
T_m	534,9 R

Calculation

$V_{m(std)}$	25,17 dscf
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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

$F_1 + F_2$ 0,0004 g

ΔPF 0,001 g

Calculation

m_n 1,100 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	1,100 mg
$V_{m(\text{std})}$	25,17 dscf

Calculation

C_s	0,000044 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
$V_{mr(std)}$	25,92 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 cacluated 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}	0,260114822
V_{scent}	0,272945344

Calculation

F_P	0,952992
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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: $34.97 \text{ m/sec} \left[\frac{(\frac{g}{g-mole})(mm \text{ Hg})}{(^{\circ}K)(mm \text{ H}_2\text{O})} \right]^{1/2}$ For English units: $85.49 \text{ ft/sec} \left[\frac{(\frac{lb}{lb-mole})(in \text{ Hg})}{(^{\circ}R)(in \text{ H}_2\text{O})} \right]^{1/2}$
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)
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, $^{\circ}C$ ($^{\circ}F$)
T_s	Absolute dilution tunnel temperature, $^{\circ}K$ ($^{\circ}R$), 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	0,953
$(\sqrt{\Delta P})_{avg}$	0,2741 in H ₂ O ^{1/2}
P_{bar}	30,02 in Hg
P_g	0,27 in H ₂ O
P_s	30,04 in Hg
M_s	29 lb/lb-mol
t_s	83,64 F
T_s	543,64 R

Calculation

V_s	17,4668 ft/s
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Average dilution tunnel gas flow rate (Q_{std})

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	17,467
A	0,196 ft^2
T_{std}	528 R
T_s	543,64 R
P_s	30,037 in Hg
P_{std}	29,92 in Hg

Calculation

Q_{std}	196,63 dscf/min
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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	0,000044 g/dscf
C _r	0,000004 g/dscf
Q _{std}	196,63 dscf/min

Calculation

E	0,01 g/min
E	0,47 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	0,000044 g/dscf
C_r	0,000004 g/dscf
Q_{std}	196,63 dscf/min
θ	132 min

Calculation

E	1,03 g
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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	0,953	F_p	0,953
K_p	85,49	K_p	85,49
C_p	0,99	C_p	0,99
Δp_i	0,074 in H ₂ O	Δp_i	0,073 in H ₂ O
T_{si}	559,5 R	T_{si}	557,4 R
P_s	30,04 in Hg	P_s	30,04 in Hg
M_s	29 lb/lb-mol	M_s	29 lb/lb-mol

Calculation

i=1		i=2	
v_{si}	17,61 ft/sec	v_{si}	17,39 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	132	min	θ	132	min
θ_i	1	min	θ_i	1	min
V_m	24,76	dcf	V_m	25,18	dcf
$V_{mi(std)}$	0,186	cuft	$V_{mi(std)}$	0,1892	cuft
V_S	16,68	ft/sec	V_S	16,68	ft/sec
V_{Si}	16,818	ft/sec	V_{Si}	16,818	ft/sec
T_m	533,5	R	T_m	534,9	R
T_{mi}	533,11	R	T_{mi}	532,80	R
T_S	543,64	R	T_S	543,64	R
T_{Si}	559,5	R	T_{Si}	559,5	R

Calculation

train=1		train=2	
PR	101,1 %	PR	101,6 %

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}	0,190 dcf
F_A	0,0116 ft ²

Calculation

FV_{max}	16,42 ft/min
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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	1,10 g
Train 2	0,99 g

Calculation

Dual train precision	5,68 %
----------------------	--------

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

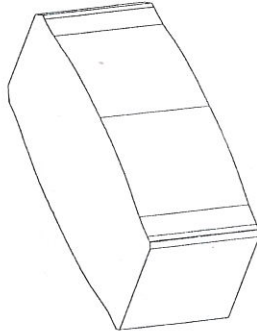
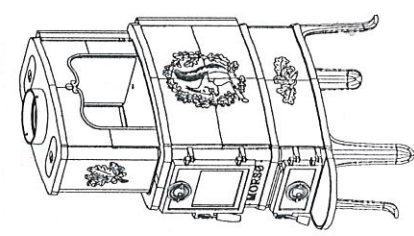
ΔR	0,015 %
Span	5 %

Calculation

Drift	0,30 %
-------	--------

Calculated with CO concentration values.

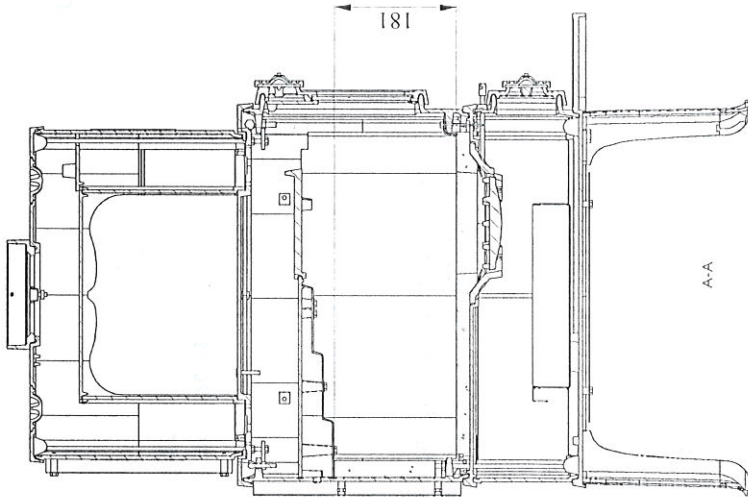
APPENDIX 12: Volume calculations



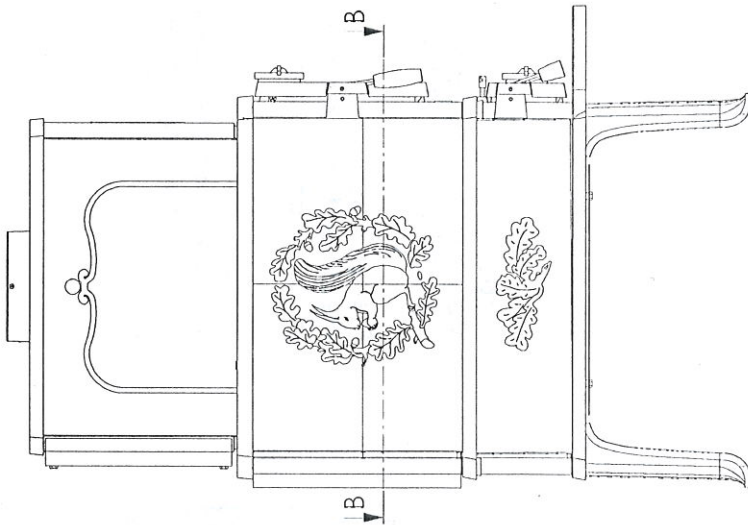
Firebox Volume

0.019431 m³
0.686199 ft³

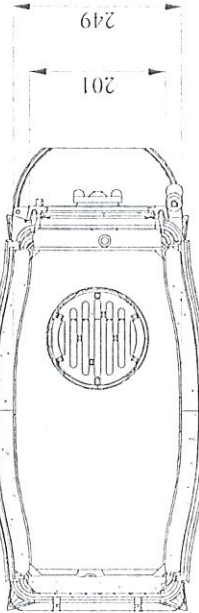
(Solidworks CAD Calculation)



A-A



486



B-B

Firebox width : Side insulation stone to side insulation stone
Firebox height : Hearth to top end of back insulation stone
Firebox depth : Back insulation stone to front door frame

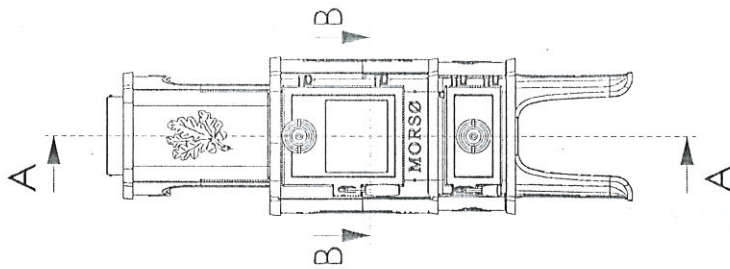
Rev. Revisions
Title
Sign: Date: 20/04/2026
Construction: F.N.
Revised: A2
From: 1:5
Scale: 1:5
Drawing no. 28-162

Morse 28 Classic
Useable Firebox Volume

morsø

Morsø
Weight:
Material:
Drawing:
Laser:
The drawing is a technical drawing and is not a photograph. It is a technical drawing and is not a photograph.

April 13 2026



SECTION A-A

Firebox Width:

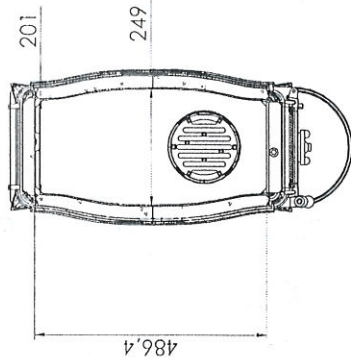
Measured from the inner edge of one side insulation stone to the inner edge of the opposite side insulation stone.

Firebox Height:

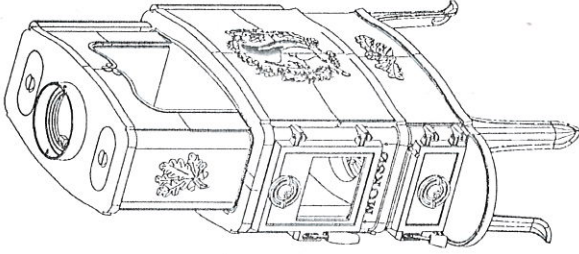
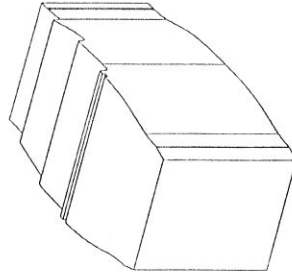
Measured from the surface of the hearth up to the surface of the baffle.

Firebox Depth:

Measured from the back insulation stone to the interior edge of the front door frame.



SECTION B-B



Overall firebox volume:

0.023239 m³
0.820662 ft³

(SolidWorks CAD calculation)

Rev. Revisions	Sign.: E.J.N.	Date: 28.04.2026
Title: Morsø 2B Classic	Construction: Released:	
Overall firebox volume	Format: A3	
	Scale: 1:10	
	Item no.:	
	Drawing no.:	2B-163
Mål uden tolerangivelse iht. DS/ISO 2768-1 m Material: Godkendelsestegning Weight kg: Model no.: Location of file: C:\Morsø\2B Classic\2B Classic_2B_163.dwg This drawing is Morsø Jernstøberi A/S' property and must not be sold, lent or copied without any written authorisation from the company.		



APPENDIX 13: Operating instruction



Operating instruction Morso 2B Classic

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)

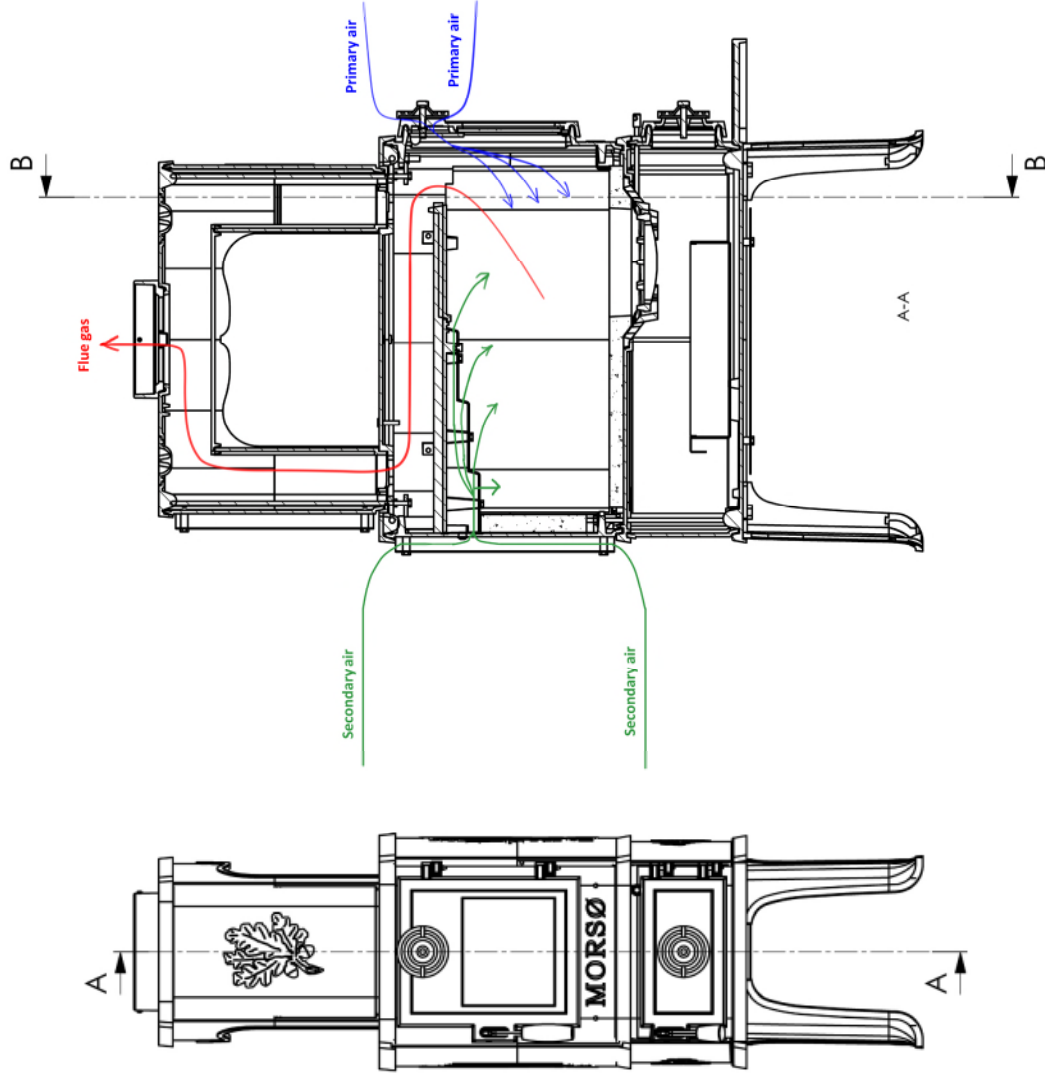
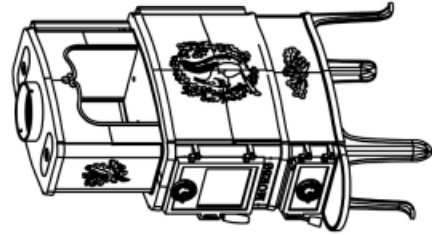
- Air damper Cat3 setting. (1/2 turns from fully open)
- Start the fire with 2.5lbs of kindling
- Keep the door open for a good ignition,
- At 1.0 lbs insert warmup preload and close the door
- In the coal bed allowable range, insert the load,
- close the door with air damper Cat3 setting. (1/2 turns from fully open)

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 5 lbs set the air control to minimum (fully close)
- In the coal bed allowable range, insert the load,
- Wait for a flame before closing the door, air damper fully open
- At 5 minutes set the air inlet to minimum (fully close)

Danick Power April 13th 2026

APPENDIX 14: Drawing Air flow pattern



B-B

A-A

Rev. / Revisions		Sigl. /		Date:	
Title:		Construct. /		FIN	
Air flow diagram		Released:		07.10.2020	
Morsø 2B Classic 2020		Format:		A2	
		Scale:		1:5	
		Item no.:			
		Drawing no.:		28-149	
		The drawing is Morsø Jernstøberi A/S property and must not be used without the company's written permission.			

APPENDIX 15: WHA, CoC, 30 Day notice, Other

**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 Classic

Catalyst: Yes _____ No X _____

Mailing Address:

Street Address:

Furvej 6

City: Nykøbing Mors	State: 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: Denmark	ZIP Code: 7900
-------------------------------	--------------------------	--------------------------

EPA APPROVED TEST LABORATORY

Name and Title of Authorized Representative: Danick Power

Company: Services Polytests inc.

**U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
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- ▶ This notice must be received by the EPA at least 30 days before the start of testing.

Phone: 450 741-3636	E-mail: Dpower@polytests.com	Fax: NA
City: St-jean-sur-richelieu	State: Canada, Quebec	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: 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: Week of April 13 th 2026		
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.
- ▶ This notice must be received by the EPA at least 30 days before the start of testing.

Frank Juel Nielsen

Print Name and Title of Authorized Official



Signature

Marts 5th, 2026

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

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(b), 60.5475(b), and Appendix A–8. 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.

Contents

Application for us epa wood heater certification pursuant to 40 cfr PART 60 Subparts AAA and QQQQ	1
Application for A Certificate of Compliance pursuant to 40 cfr PART 60 Subparts AAA and QQQQ.....	2
2015 Standards of Performance for New Residential Wood Heaters, new residential hydronic heaters and forced-air furnaces.....	2
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EPA-Approved Test Laboratory	3
Compliance Statements and Acknowledgements – Sections 60.533(b) and 60.5475(b)	4
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Wood Burning Heaters	6
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A. <i>Summary Results – Adjustable Wood Burning Heaters</i>	6

**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: Morsø Jernstøberi A/S

Heater Type (Circle One):	Adjustable Burn Rate Wood Heater					
----------------------------------	-------------------------------------	--	--	--	--	--

Hydronic Heater Type (Circle One):					
---	--	--	--	--	--

Forced-Air Furnace Type (Circle One):				
--	--	--	--	--

Fuel Tested:	Crib				
---------------------	------	--	--	--	--

Test Method(s): Method 28R, ASTM E 2515; ASTM E 2780, ALT-154	Catalyst: No
--	---------------------

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 Classic

Physical Address (Street number and Address, not P.O. Box): Furvej 6	Mailing Address: Furvej 6
--	---

City: Nykøbing Mors	State:	ZIP Code: 7900
-------------------------------	---------------	--------------------------

Phone: +45 96 69 19 00	Email: info@morsoe.com	Website: www.morsoe.com
----------------------------------	----------------------------------	-----------------------------------

EPA Submission Date of 30 day Notice:
Marts 5th, 2026

MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION

Name:
Frank Juel Nielsen

Position/Title:
R&D Engineer

Address:
Furvej 6

City: Nykøbing Mors	State:	ZIP Code: 7900
-------------------------------	---------------	--------------------------

Phone: +45 96 69 19 38	E-mail: fjn@morsoe	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 -An NFPA Global Solutions Company

Name of Person Authorized or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity:
John Steinert

Position/Title:
Vice-President, Appliances Division

Address:

City: Clackamas

State: OR

ZIP Code: 97015

Phone: (503)819-1601

Email:
John.Steinert@nfpaglobal.com

Website: 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 (i)
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	Date: May 4 th , 2026
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
4	0,82	0,475	76,6%	11 811	1,06
3	0,86	2,624	77,4%	12 444	1,28
2	1,38	0,803	74,0%	19 147	0,69
1	1,60	2,256	73,3%	22 017	0,74
Weighted particulate emission average of 4 test runs: 1,6 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 75 %.					
Average Co 0,94 gr/min					