TEST REPORT

TEST OF A HYBRID WOOD STOVE FOR EMISSIONS AND EFFICIENCY

PER EPA METHODS 28R AND ASTM E2515 and ASTM E2780, MAY 2015

Client:

Hearthstone

317 Stafford ave.

Morrisville, Vt 05661

Model name: Bari 8171 and Bari Plus 8172

Attention: Rafaël Sanchez

TESTED BY:

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

TEST DATES: July 22nd to 30th 2019
REPORT DATE: August 19th 2019;
Rev1: December 11th 2019
Rev2: November 24th 2020
Rev3: January 20th 2021
REV4 April 15th 2024
Project number: PI-20202

Tested:
Maxime Martin

written by:
Danick Power, P. Eng

Verified by third party certifier (PFS):

SUMMARY

Rev1: December 11th 2019

Rev2 (November 24th 2020):

- Updated Section 1.4 p.6 conditioning was done at medium hate draw.
- Updated Section 1.4 p.6 conditioning was done at medium hate draw.
- NCBI Report added Appendix 12: Volume Calculation
- CBI & NCBI Report added Appendix 13: operating instruction
- The section 3.4 p.13 updated for runs Anomalies, Validity and appropriateness detail.

Rev3 (January 20th 2021):

- appendix 1 molecular weight updated to 29 for all runs
- The section 3.4 p.13 updated to address the negative back filter weight.
- Appendix 9 updated for more detailed fuel load

Rev4 (April 15th 2024):

- Appendix 12 updated to include calculation demonstration of the useable firebox volume
- Appendix 1 updated to include all CSA B415.1 Data for calculation
- Appendix 4 Additional information on damper at the medium position
- Appendix 3 calibration list and calibration date due, provide as first sheet for all equipment calibration certificate.
- Negative mass weight of filter corrected to zero, provide in appendix 1 of the CBI and NCBI report. Discussion of the handling in section 3.4 p.12 of the report.
- Appendix 15 additional spreadsheet for weighted average emission rate with negative filter weight rounded to zero.
- Table 2.6 updated to include train precision in g/Kg
- Table 2.1 updated to include HHV Efficiency % for all runs

List of appendices

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:

1) Unit qualification NSPS 2020, Certify the use of a catalyst supplied by a second source, "Advanced Catalyst Systems" Hearthstone's intent is to have this supplier be a second source, in addition to the current supplier, "Applied Ceramics" with the catalysts to be used interchangeably in the stove. During test no. 6 the alternate catalyst did not meet the requirements to be approved (more than 0.5gr/hr from the original catalyst).

- Test dates: July 22nd to 30th 2019
- Test methods used:
    - Particulate emissions: ASTM E2780-10; ASTM E2515-11 methods 28R as referred into 40 CFR Part 60 Subpart AAA
    - Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Hearthstone
- Product type: Hybrid free standing wood stove
- Combustion system: catalytic, with pre-combustion
- Unit tested: Bari 8171
- Option: Catalyst (run 1 to 4 done with catalyst “Applied Ceramics”; run 5 and 6 done with catalyst “Advanced Catalyst Systems”
- Similar Model: Bari plus 8172, The Bari (L) and the Bari Plus (R) have exactly the same design and dimensions from the top of the firebox down. This is a convection style stove so the external dimensions are not indicative of the firebox. The Bari Plus has additional convective space, external to the “engine”, above the roof of the firebox for heat storage. This modification of the Bari provides for a heat storage accumulation mass. The steel skin is extended to cover this area. This modification to the “jacket” has no impact on the firebox design or construction.

1.3 RESULTS

Emission results obtained

- Average emission rate: 0.94 grams/hour
- Average Efficiency: 75.9%

Conformity: NSPS Phase 2020

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier first week of July 2019. The 50hrs of aging was done by the manufacturer at the medium heat draw (all data in Appendix 4).

Set up

- Venting system type: 6-inch diameter insulated chimney
- System height from floor: 15 feet
- Particularities: Catalyst options (run 1 to 4 done with catalyst "Applied Ceramics" and run 5 and 6 done with "Advanced Catalyst Systems"

Break in period

- Duration: the unit was pre burned by the manufacturer and run for at least 50 hours, adequate documentation of fuel additions, flue and unit temperatures recorded.
- Fuel: BC FIR between 19% and 25%

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Test Date (AAA-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 CO emission Gr/Kg dry	(OHE) %
1	2019-07-22	1,03	1,896	1,75	5,97	3,15	73,06
2	2019-07-23	0,70	0,970	1,79	3,21	3,31	77,16
3	2019-07-24	0,72	0,994	1,34	3,57	3,59	76,52
4	2019-07-25	1,23	1,428	2,05	3,52	2,46	76,22
5	2019-07-29	0,71	0,966	1,34	3,03	3,13	71,24
6	2019-07-30	1,66	1,881	2,83	32,44	17,24	74,55

- Run 6: failed to meet the requirement for catalyst equivalency on +0.5gr/hr from the original test.

2.2 AVERAGE CALCULATION

Test No.	Burn Rate (Kg/hr)	(E) Ave. Emission Rate g/hr	(OHE) %	Heat Output (BTU/HR)	CSA B415.1 CO emission g/min
2	0,97	0,703	77,2	14 065	0,05
3	0,99	0,722	76,5	14 299	0,06
4	1,43	1,227	76,2	20 454	0,06
1	1,90	1,031	73,1	26 036	0,10
Weighted particulate emission average of 4 test runs: 0.94 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 75.9%.					
Average Co 0.07 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	80	79	29,825	29,855	33,1	31,1	0	0
2	79	86	29,766	29,678	52,9	30,3	0	0
3	74	79	29,914	29,914	50,7	40,3	0	0
4	80	84	29,973	29,973	51	38,7	0	0
5	82	87	29,796	29,678	65,1	43,6	0	0
6	85	86	29,766	29,766	50,8	46,6	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	12,14	19,95	2,1	8,42	6,733	19,62	9,5	6	0	20
2	17,90	20,44	1,6	8,06	6,451	19,74	9	6	0	20
3	13,68	19,95	1,6	8,01	6,406	19,79	9	6	0	20
4	19,82	19,90	2,0	8,03	6,426	19,62	9	6	0	20
5	19,95	20,66	2,0	8,03	6,421	19,68	9	6	0	20
6	13,60	19,97	2,0	8,03	6,422	19,76	9	6	0	20

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

Average dilution tunnel measurements				Sample Data			
Run Number	Burn Rate (Min)	Volumetric Flow Rate (dscf/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1	101	167,82	594,41	23,218	22,720	2,30	2,40
2	189	179,48	564,47	43,561	42,552	2,90	2,70
3	183	182,08	560,75	42,192	41,371	2,80	2,70
4	128	189,14	577,82	29,519	28,825	3,30	3,00
5	189	191,85	565,51	43,437	42,353	2,60	2,70
6	97	179,86	589,11	22,165	21,618	3,50	3,30

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	730,03	746,03	1,68	1,79	3,21%	0,035
2	778,70	797,17	2,27	2,16	2,35%	0,034
3	789,73	805,40	2,22	2,19	0,76%	0,011
4	820,16	839,89	2,71	2,53	3,53%	0,060
5	834,76	856,13	2,15	2,30	3,22%	0,047
6	787,08	807,01	2,72	2,63	1,64%	0,028

2.7 GENERAL SUMMARY OF RESULTS

Run Number	Burn Rate (kg/hr)	Average Surface Temperature (F)	Change in surface Temperature (F)	Initial Draft (in. H^2O)	static pressure tunnel (in. H^2O)	Primary Air Setting	Run Time (min)
1	1,896	527,90	-109,3	0,069	0,300	maximum	101
2	0,970	415,85	-33,4	0,047	0,320	minimum	189
3	0,994	408,76	-54,6	0,049	0,320	minimum	183
4	1,428	466,58	-26,4	0,053	0,360	medium	128
5	0,966	404,20	-22,4	0,050	0,340	minimum	189
6	1,881	529,68	-95,5	0,064	0,350	maximum	97

3 PROCESS DESCRIPTION

3.1 DISCUSSION

The unit was delivered by the client and received in a good condition. Four runs have been done for weighted average. Two confirmation tests were done with the other catalyst "Advanced Catalyst Systems", one minimum burn rate and one maximum burn rate to ensure both catalysts can burn approximately with the same burn rate and emission rate. During test no. 6 the alternate catalyst did not meet the requirements to be approved (more than 0.5gr/hr from the original catalyst).

3.2 UNIT DIMENSIONS

Baffle

- Location: between top of combustion chamber and hearth
- Dimensions: 12 inches diameter and leave a restriction at the front
- Material: Vermiculite 1.5 inch thick.

Bricks

- Inside firebox vermiculite brick 1¼ inch. thick cover all the sides and the back of the combustion chamber bottom made from steel

Flue gas exhaust

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

Gasket

- Window: 1 x 1/8 Flat
- Door gasket against facing: fiberglass 3/8 round inch diameter
- Refer to appendix 6 for complete list and location of each gaskets

Overall unit dimension

- Overall dimensions: round 19 inches diameter; 50 inches high
- Usable volume: 1.25 cuft

Convection fan

- none

Catalyst (appendix 6 for details):

- Applied Ceramics – WF-4150001076
- Cell density: 50 CPSI
- Material: Fecralloy foil framed in 304 SS can

3.3 AIR SUPPLY SYSTEM

Description

- Primary air: Window wash design in cast iron channel fully gasketed on the top and bottom of the combustion chamber. Air intake on the bottom of the unit (if facing door of stove)
- Secondary air: secondary tube design with air intake coming from the bottom rear of unit, then up through a steel riser tube to the secondary air tube. Some air bleed holes from the top of Primary air riser tubes also provide secondary air

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 (1) sq. in.			OUTLET
Identification	Type	Imin	Imax	Controlled	(sq. in.)
APPENDIX 14 SHARED and PA	Primary	(Air control slide) 0.72	(Air control slide) 5.46	Yes	(Air Wash) 5.284
APPENDIX 14 SHARED and SA	Secondary	(Rise opening) 0.43	(Rise opening) 0.43	No	(secondary Tube holes + Primary Riser holes) 0.89 + 1.38 = 2.27
Appendix 14 TA	Pilot	(Fed by primary inlet)	(Fed by primary inlet)	No	(Orifice) 0.06

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

Legend

Identification: Tag name referred to on drawings in Appendix 14, section airflow pattern
Type: Characterization of air intake
Imin: Minimum air intake of a particular air channel
Imax: Maximum air intake of a particular air channel
Controlled: Determines if a provision for air control is present
Outlet: Total air outlet of a particular air channel

3.4 OPERATION DURING TEST

All runs have been found appropriate, no anomalies happened and all runs below have been validate and found compliant. Run 5 and run 6 were done for an alternative catalyst, run 6 have been rejected, difference on emission rate grater than 0.5g/hr from the reference run1. Run1 to 4 have been found have been found appropriate, no anomalies happened and all runs below have been validate and found compliant. Some negative weight has been found on back filters only, none on probe or gaskets, those negative weight have been handled properly.

Run #1
This run was performed on July 22nd 2019. It lasted 101 minutes and a 1.90 kg/hr burn rate was obtained & emission at 1.0 gr/hr. Air inlet was set at the Maximum setting,

Run #2
This run was performed on July 23rd 2019. It lasted 189 minutes and a 0.97 kg/hr burn rate was obtained & emission at 0.7 gr/hr. Air inlet was set at the minimum setting and couldn't burn less than 0.8 Kg/hr.

Run #3
This run was performed on July 24th 2019. It lasted 183 minutes and a 0.99 kg/hr burn rate was obtained & emission at 0.7 gr/hr. Air inlet was set at the minimum setting and couldn't burn less than 0.8 Kg/hr.

Run #4
This run was performed on July 25th 2019. It lasted 128 minutes and a 1.42 kg/hr burn rate was obtained & emission at 1.2 gr/hr. Air inlet was set at the medium setting, a category 3 burn rate was obtained.

Run #5
This run was performed on July 29th 2019 as a confirmation minimum test with an alternative Catalyst model "Advanced Catalyst Systems" It lasted 189 minutes and a 0.97 kg/hr burn rate was obtained & emission at 0.7 gr/hr. Air inlet was set at the minimum and similar results from run 2 and 3 was obtained.

Run #6
This run was performed on July 30th 2019 as a confirmation maximum test with an alternative Catalyst model "Advanced Catalyst Systems". It lasted 97 minutes and a 1.88 kg/hr burn rate was obtained & emission at 1.7 gr/hr. Air inlet was set at the maximum and similar burn rate but the alternate catalyst did not meet the requirements to be approved (more than 0.5gr/hr from the original catalyst (WDS-146)).

- 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 and twice burned under 1.0 Kg/hr.

Test fuel cribs

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

3.5 START-UP OPERATION

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

3.6 SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel at a point 15 feet from the tunnel entrance. 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 1.

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 (or equivalent), 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:	HEA

Description du test

Test standard	EPA	
Run #	1	
Date	22-07-2019	
Technicien	M.M	
Project #	PI 20202	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	SILA	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1,25	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,999	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,990	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,997	
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

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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	101,1
Barometer (in.Hg):	29,825289	29,85481876
Dry Bulb (F):	78	78,9
Humidity (%):	33,1	31,1
Air velocity (ft/min)	0	0

DGM #1	Final:	34503,544	cuft	Final:	977031,540	Liter
	Initial:	34478,704	cuft	Initial:	976328,140	Liter
DGM #2	Final:	32575,663	cuft	Final:	922440,040	Liter
	Initial:	32551,142	cuft	Initial:	921745,680	Liter

DGM room				Final:	420,820	cuft
				Initial:	396,040	cuft

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

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Technicien	M.M

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
7,88	8,75	9,63

Load Volume: 0,3889 cu. ft

Loading Density: 9,710 lbs./ft3

Number of Spaces:

Spacer weight (lbs):

Load Density (wet): 31,212 lbs./ft3

Dry Wood Density: 26,021631

Piece Size (in): Thick	Wide	x Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches
1,5	3,5	8	0,724	19,9	20	20,1	20,4	20,2	14,56688	42,00
1,5	3,5	8	0,738	19,3	19,8	19,3	19,4	19,5	14,36148	42,00
1,5	3,5	8	0,768	19,8	19,7	19,3	19,3	19,2	14,94528	42,00
1,5	3,5	8	0,75	20	20,6	20,2	20,4	20,6	15,27	42,00
1,5	3,5	8	0,724	20,8	20,3	20,6	20,8	20,9	14,97232	42,00
1,5	3,5	8	0,744	19,3	19,4	19,8	19,4	19,3	14,46336	42,00
1,5	3,5	8	0,778	20	20,3	20,4	20,8	20,7	15,90232	42,00
1,5	3,5	8	0,828	20,1	19,8	19,8	19,7	19,8	16,42752	42,00
										0,00
1,5	3,5	8	0,756	20,6	20,3	20,4	20,8	20,9	15,5736	42,00
1,5	3,5	8	0,786	19,6	19,9	19,3	19,3	19,4	15,327	42,00
1,5	3,5	8	0,724	19,8	19,4	19,2	19,6	19,3	14,08904	42,00
1,5	3,5	8	0,758	19,9	20	20,6	20,4	20,6	15,3874	42,00
1,5	3,5	8	0,722	20,3	20,4	20,3	20,3	20,8	14,74324	42,00
1,5	3,5	8	0,774	19,1	19,2	19,3	19,4	19,4	14,92272	42,00
1,5	3,5	8	0,78	19,7	19,3	19,2	19,4	19,6	15,1632	42,00
1,5	3,5	8	0,784	20,6	20,3	20,4	20,3	20,4	15,9936	42,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
								SUM MC:	242,10896	

PreTest Load Weight: 12,14 lbs.

Dry Weight: 4,59 kg.

Average Moisture Content: %

Dry: 19,95

19,95

Must be 18-28

Wet: 16,63

must be 15,2-22

Project nu.	PI 20202
Date	22-07-2019
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
7,9	8,8	9,6

* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume: 0,29 cu. ft

Loading Density: 6,7 lbs./ft3

Number of Spaces: 20

Spacer weight: lbs

Load Density (wet): 28,7 lbs./ft3

Dry Wood Density: 24,0 lbs./ft3

Piece Size (in): Thick	Wide	Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
1,5	3,5	9,5	0,97	19,10	19,60	19,40	19,40	19,30	18,74048	49,88	19,4
1,5	3,5	9,5	1,00	19,60	19,20	19,20	19,20	19,40	19,24272	49,88	19,3
1,5	3,5	9,5	1,05	19,10	19,20	19,80	19,90	19,80	20,61624	49,88	19,6
1,5	3,5	9,5	1,10	20,80	20,70	20,80	20,90	20,70	22,858	49,88	20,8
1,5	3,5	9,5	1,12	20,00	19,70	19,80	19,30	19,70	22,0246	49,88	19,7
1,5	3,5	9,5	0,90	19,20	19,30	19,30	19,20	19,10	17,298	49,88	19,2
1,5	0,75	5	0,11			19,10			2,101	5,63	19,1
1,5	0,75	5	0,12			19,00			2,28	5,63	19,0
1,5	0,75	5	0,12			19,20			2,304	5,63	19,2
1,5	0,75	5	0,11			19,30			2,0458	5,63	19,3
1,5	0,75	5	0,10			19,30			2,0072	5,63	19,3
1,5	0,75	5	0,12			19,40			2,2892	5,63	19,4
1,5	0,75	5	0,12			19,30			2,3932	5,63	19,3
1,5	0,75	5	0,12			19,20			2,2272	5,63	19,2
1,5	0,75	5	0,12			19,60			2,3912	5,63	19,6
1,5	0,75	5	0,12			19,70			2,2852	5,63	19,7
1,5	0,75	5	0,11			19,60			2,156	5,63	19,6
1,5	0,75	5	0,10			19,80			1,98	5,63	19,8
1,5	0,75	5	0,11			19,70			2,2064	5,63	19,7
1,5	0,75	5	0,126			19,70			2,4822	5,63	19,7
1,5	0,75	5	0,12			19,50			2,34	5,63	19,5
1,5	0,75	5	0,122			19,60			2,3912	5,63	19,6
1,5	0,75	5	0,102			19,8			2,0196	5,63	19,8
1,5	0,75	5	0,128			19,7			2,5216	5,63	19,7
1,5	0,75	5	0,1			19,3			1,93	5,63	19,3
1,5	0,75	5	0,104			19,2			1,9968	5,63	19,2
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	165,12784		19,5 %

Test Load Weight: 8,42 lbs.

Dry Weight: 3,19 kg.

Average Moisture Content: %

Dry: 19,62 Dry(EPA) 19,62 Dry(B415 19,62

19,62 Must be 19-25

Wet: 16,40 must be 15,2-22

Coal Bed Range: 1,7 lbs. to 2,1 lbs.

TEST CHARGE:

Coal bed weight: 2,1 lbs.

Project nu.	PI 20202
Date	22-07-2019
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,3 in. H20
Barometer: 29,900 in. Hg

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

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

PITOT CONSTANT=
0,931

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,065	76,71	0,2550
B center	0,064	76,89	0,2530
A1	0,052	76,71	0,2280
A2	0,053	76,75	0,2302
A3	0,053	76,86	0,2302
A4	0,055	76,86	0,2345
B1	0,056	76,060	0,2366
B2	0,055	76,570	0,2345
B3	0,055	76,580	0,2345
B4	0,052	76,860	0,2280
AVERAGE	0,0560	76,6850	0,2365

Project nu.	PI 20202
Date	22-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	2	838	839	31	9	840	841	40	17	842	843	41	844		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,1001	0,1250	0,1280	33,9590	61,4469	0,1305	0,1275	34,2905	108,9510	0,1289	0,1267	34,1698	0,1272	2019-07-18	17:00
Before (6)	61,1001	0,1249	0,1280	33,9589	61,4468	0,1304	0,1274	34,2906	108,9510	0,1289	0,1267	34,1699	0,1273	2019-07-22	09:00
After (1)	61,1005	0,1255	0,1254	33,9644	61,4471	0,1293	0,1273	34,2927	108,9515	0,1296	0,1251	34,1745	0,1273	2019-07-22	14:00
After (2)	61,1003	0,1255	0,1254	33,9630	61,4470	0,1293	0,1273	34,2914	108,9512	0,1296	0,1251	34,1731	0,1273	2019-07-30	08:00
After (3)	61,1003	0,1255	0,1255	33,9630	61,4470	0,1294	0,1273	34,2914	108,9511	0,1296	0,1251	34,1731	0,1273	2019-07-31	08:00
After (4)															
After (5)															
After (6)	61,1003	0,1255	0,1255	33,9630	61,4470	0,1294	0,1273	34,2914	108,9511	0,1296	0,1251	34,1731	0,1273	2019-07-31	08:00
Difference	0,0002	0,0006	-0,0025	0,0041	0,0002	-0,0010	-0,0001	0,0008	0,0001	0,0007	-0,0016	0,0032	0,0000		
Total (mg)		2,4				2,3				2,4			0		
Total ajusté (mg)		**2,40**				**2,30**				**2,40**					

Project nu.	PI 20202
Date	22-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	2	838	839	31	9	840	841	40	17	842	843	41	844		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,1001	0,1250	0,1280	33,9590	61,4469	0,1305	0,1275	34,2905	108,9510	0,1289	0,1267	34,1698	0,1272	2019-07-18	17:00
Before (6)	61,1001	0,1249	0,1280	33,9589	61,4468	0,1304	0,1274	34,2906	108,9510	0,1289	0,1267	34,1699	0,1273	2019-07-22	09:00
After (1)	61,1005	0,1255	0,1254	33,9644	61,4471	0,1293	0,1273	34,2927	108,9515	0,1296	0,1251	34,1745	0,1273	2019-07-22	14:00
After (2)	61,1003	0,1255	0,1254	33,9630	61,4470	0,1293	0,1273	34,2914	108,9512	0,1296	0,1251	34,1731	0,1273	2019-07-30	08:00
After (3)	61,1003	0,1255	0,1255	33,9630	61,4470	0,1294	0,1273	34,2914	108,9511	0,1296	0,1251	34,1731	0,1273	2019-07-31	08:00
After (4)															
After (5)															
After (6)	61,1003	0,1255	0,1280	33,9630	61,4470	0,1304	0,1274	34,2914	108,9511	0,1296	0,1267	34,1731	0,1273	2019-07-31	08:00
Difference	0,0002	0,0006	0,0000	0,0041	0,0002	0,0000	0,0000	0,0008	0,0001	0,0007	0,0000	0,0032	0,0000		
Total (mg)		4,9				5,9				4			0		
Total ajusté (mg)		**4,90**				**5,90**				**4,00**					

Project nu.	PI 20202
Date	22-07-2019
Technicien	M.M

Neg filter wieght mass rounded to zero emission rate 2,2gr/hr

SFBA EPA EMISSION RESULTS

Test Duration: **101** min

PRESSURE FACTOR:	DGM 1	0,96177	
	DGM 2	0,96381	
	DGM 3	0,99733	
TEMPERATURE FACTORS	DGM 1	0,97248	
	DGM 2	0,97091	
	DGM 3	0,97684	
VOLUMES SAMPLED	DGM 1	23,218	SCft
	DGM 2	22,720	Scft
	DGM 3	24,074	SCft

TOTAL TUNNEL VOLUME : 16950

SAMPLE RATIOS

Sample Train 1:	730,026
Sample Train 2:	746,029

Paticulate concentration

Sample Train 1	**0,000099**	g/dscf
Sample Train 2	**0,000106**	g/dscf
Room	**0,000000**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**1,68**	g
Sample Train 2	**1,79**	g

EMISSION RATES

Sample Train 1	**1,00**	g/hr
Sample Train 2	**1,06**	g/hr

1st hour emission rate **1,75** g/hr

	Train 1	Train 2
Cs	9,906E-05	0,000105634

RESULTS

Average emission rate: 1,0 g/hr

Burn Rate : 1,896 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,840054	in Hg
Start:	29,825289	in Hg
End:	29,854819	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	34503,544	Cuft
	Initial:	34478,704	Cuft
DGM 2	Final:	32575,663	Cuft
	Initial:	32551,142	Cuft
DGM #3	Final:	420,820	Cuft
	Initial:	396,040	Cuft

TEMPERATURES

DGM 1	542,940	°R
DGM 2	543,818	°R

CALIBRATION FACTORS

DGM 1	0,9993
DGM 2	0,9901
DGM #3	0,9972

TUNNEL FLOW RATE: 167,819 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	2,30	mg
Total Sample Train 2:	2,40	mg
Total Sample Train 1 1st hour:	2,40	mg

DEVIATION: 3,21%

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft	Change in
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Surface
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	up									in wc	in wc	Temp.
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	°F
0,00	155,00	8,4	0,0	8,5	0,0	590,7	80,0	194,0	713,5	574,7	758,2	719,6	134,9	890,8	0,23	81,59	80,63	82,07	0,23	82,37	81,64	79,57	0,06	0,07	0
1,0	156,0	8,2	0,1	4,0	0,0	567,4	79,5	169,2	699,4	568,8	739,1	702,6	135,4	930,0	0,23	82,10	80,66	85,09	0,23	82,68	81,62	79,95	0,06	0,07	-11,12491
2,0	157,0	8,0	0,0	9,6	0,0	536,0	79,0	148,3	693,3	556,9	712,6	677,5	134,8	1061,1	0,23	82,25	80,70	85,60	0,23	82,85	81,64	80,13	0,06	0,07	-25,20889
3,0	158,0	7,9	0,0	12,2	0,0	531,4	79,7	144,0	693,5	545,4	692,0	652,3	134,9	1074,0	0,23	82,27	80,74	86,20	0,23	82,92	81,64	80,39	0,06	0,07	-36,57923
4,0	159,0	7,7	0,0	10,2	0,0	527,5	80,2	142,1	694,2	535,0	675,7	627,2	134,6	1042,9	0,23	82,29	80,76	86,83	0,23	82,95	81,65	80,60	0,06	0,07	-46,84831
5,0	160,0	7,6	0,0	9,2	0,0	525,2	79,5	142,1	693,4	525,8	661,1	604,8	134,5	1039,6	0,23	82,42	80,80	87,52	0,23	83,08	81,69	80,96	0,06	0,07	-56,30057
6,0	161,0	7,5	0,0	10,6	0,0	524,3	80,0	141,5	692,6	517,6	650,5	586,3	134,8	1045,5	0,23	82,46	80,85	88,24	0,23	83,19	81,69	81,28	0,06	0,07	-63,84227
7,0	162,0	7,3	0,0	10,0	0,0	524,1	79,7	141,5	692,2	510,2	642,6	570,0	134,8	1044,5	0,23	82,47	80,88	88,91	0,23	83,19	81,75	81,65	0,06	0,07	-70,21662
8,0	163,0	7,2	0,0	11,1	0,0	523,9	79,9	140,5	692,3	503,4	637,7	556,8	135,0	1053,2	0,23	82,51	80,93	89,11	0,23	83,23	81,78	81,84	0,06	0,07	-75,16455
9,0	164,0	7,0	0,0	11,5	0,0	524,9	79,7	141,1	693,2	497,6	635,2	546,7	135,2	1065,8	0,23	82,48	80,96	87,79	0,23	83,22	81,83	81,71	0,06	0,07	-78,59113
10,0	165,0	6,9	0,0	12,4	0,0	526,4	79,6	140,6	694,6	491,0	635,1	539,4	136,5	1078,2	0,23	82,53	80,99	87,30	0,23	83,30	81,84	82,07	0,06	0,07	-80,86549
11,0	166,0	6,7	0,0	12,5	0,0	527,8	79,7	140,7	697,4	486,7	636,4	534,5	136,0	1087,0	0,23	82,54	81,01	87,19	0,23	83,29	81,89	82,44	0,06	0,07	-81,98566
12,0	167,0	6,5	0,0	12,5	0,0	529,8	80,0	141,0	700,1	481,8	637,9	530,5	135,9	1088,2	0,23	82,57	81,03	87,26	0,23	83,29	81,90	82,81	0,06	0,07	-82,96049
13,0	168,0	6,4	0,0	12,7	0,0	530,7	80,4	141,0	703,0	476,8	639,8	528,2	136,0	1099,6	0,23	82,63	81,07	87,37	0,23	83,36	81,96	83,19	0,06	0,07	-83,43051
14,0	169,0	6,2	0,0	12,6	0,0	530,5	80,4	141,6	706,0	472,8	641,6	526,7	136,0	1100,5	0,23	82,65	81,10	87,59	0,23	83,41	82,01	83,57	0,06	0,07	-83,5575
15,0	170,0	6,1	0,0	12,6	0,0	531,4	80,0	140,4	709,4	468,5	643,1	526,1	136,0	1109,8	0,23	82,72	81,19	87,75	0,23	83,47	82,06	83,95	0,06	0,07	-83,56705
16,0	171,0	5,9	0,0	13,3	0,0	533,4	80,4	141,2	713,2	464,8	645,6	526,1	136,2	1123,5	0,23	82,79	81,23	87,92	0,23	83,52	82,13	84,29	0,06	0,07	-83,01277
17,0	172,0	5,7	0,0	13,0	0,0	534,3	80,2	141,0	716,6	461,0	648,3	526,7	136,2	1123,8	0,23	82,91	81,29	88,13	0,23	83,62	82,16	84,62	0,06	0,07	-82,4193
18,0	173,0	5,6	0,0	13,2	0,0	535,6	80,5	140,7	720,2	457,9	651,1	527,7	136,1	1126,8	0,23	82,95	81,33	88,36	0,23	83,64	82,21	84,96	0,06	0,07	-81,62006
19,0	174,0	5,4	0,0	13,2	0,0	536,7	80,3	141,4	724,1	454,8	653,9	528,9	136,3	1135,2	0,23	83,03	81,37	88,59	0,23	83,69	82,26	85,30	0,06	0,07	-80,59112
20,0	175,0	5,3	0,0	13,1	0,0	537,4	80,5	141,3	727,2	452,2	656,0	531,1	136,2	1137,5	0,23	83,07	81,39	88,73	0,23	83,70	82,31	85,63	0,06	0,07	-79,65782
21,0	176,0	5,1	0,0	13,2	0,0	538,6	80,6	140,2	730,9	449,6	658,0	533,5	136,2	1145,2	0,23	83,09	81,44	88,36	0,23	83,72	82,35	85,85	0,06	0,07	-78,54896
22,0	177,0	5,0	0,0	13,4	0,0	539,4	80,4	141,3	734,4	447,4	660,2	536,7	136,1	1154,5	0,23	83,17	81,51	87,82	0,23	83,86	82,39	86,11	0,06	0,07	-77,2313
23,0	178,0	4,8	0,0	14,0	0,0	541,3	80,2	141,1	738,5	445,4	663,0	539,9	136,1	1162,0	0,23	83,21	81,55	87,77	0,23	83,92	82,44	86,35	0,06	0,07	-75,60963
24,0	179,0	4,6	0,0	13,9	0,0	541,0	80,3	141,7	742,5	443,7	666,2	544,1	136,1	1168,6	0,23	83,33	81,61	87,89	0,23	84,05	82,50	86,59	0,06	0,07	-73,68182
25,0	180,0	4,5	0,0	14,2	0,0	543,4	80,5	141,6	746,8	442,5	669,4	548,2	136,0	1180,1	0,23	83,46	81,66	88,06	0,23	84,17	82,56	86,84	0,06	0,07	-71,62364
26,0	181,0	4,3	0,0	14,7	0,0	543,7	80,6	141,7	751,5	441,6	672,8	552,0	135,8	1194,6	0,23	83,53	81,70	88,29	0,23	84,22	82,62	87,08	0,06	0,07	-69,44204
27,0	182,0	4,2	0,0	15,3	0,0	545,0	80,6	142,0	757,6	441,4	695,8	556,4	135,8	1216,3	0,23	83,54	81,72	88,49	0,23	84,23	82,64	87,32	0,06	0,07	-62,75789
28,0	183,0	4,0	0,1	16,1	0,0	546,2	80,8	140,8	764,8	441,7	702,4	560,9	135,7	1245,0	0,23	83,56	81,76	88,03	0,23	84,26	82,70	87,52	0,06	0,07	-59,10364
29,0	184,0	3,8	0,1	16,7	0,0	548,4	81,0	142,1	773,2	442,2	660,9	564,9	135,6	1267,7	0,23	83,62	81,80	87,85	0,23	84,34	82,74	87,69	0,06	0,07	-64,83998
30,0	185,0	3,6	0,3	16,9	0,0	549,1	80,6	141,0	781,6	442,7	718,6	568,1	135,6	1276,3	0,23	83,70	81,84	87,12	0,23	84,37	82,80	87,86	0,06	0,07	-50,89995
31,0	186,0	3,5	0,3	16,9	0,0	551,6	81,2	142,1	790,0	443,5	701,6	572,4	135,6	1276,5	0,23	83,75	81,89	86,50	0,23	84,42	82,86	86,58	0,06	0,07	-51,56011
32,0	187,0	3,3	0,1	16,3	0,0	553,1	81,1	142,3	796,8	444,5	709,1	577,6	135,4	1260,7	0,23	83,88	81,98	86,29	0,23	84,58	82,92	85,08	0,06	0,07	-47,52819
33,0	188,0	3,2	0,0	15,6	0,0	553,8	81,2	142,4	801,6	446,0	738,9	583,7	135,2	1246,3	0,23	83,95	82,02	86,21	0,23	84,67	82,97	84,19	0,06	0,07	-39,08994
34,0	189,0	3,0	0,0	15,0	0,0	554,3	81,6	142,6	803,7	447,5	725,6	590,2	135,0	1242,0	0,23	84,04	82,08	86,22	0,23	84,74	83,04	83,53	0,06	0,07	-39,79404
35,0	190,0	2,9	0,0	15,2	0,0	554,3	81,5	143,1	806,3	449,2	735,7	594,8	134,6	1238,1	0,23	84,10	82,10	86,37	0,23	84,83	83,10	83,10	0,06	0,07	-36,0712
36,0	191,0	2,8	0,0	15,1	0,0	555,6	81,2	143,5	808,1	451,7	745,0	598,6	134,4	1234,6	0,23	84,21	82,16	86,54	0,23	84,93	83,16	82,72	0,06	0,07	-32,63995
37,0	192,0	2,6	0,0	15,0	0,0	554,5	81,2	143,4	808,7	453,6	753,2	602,8	134,2	1232,6	0,23	84,31	82,20	86,75	0,23	85,01	83,21	82,47	0,06	0,07	-29,67467
38,0	193,0	2,5	0,0	15,1	0,0	553,7	81,9	143,8	809,1	456,1	760,4	607,7	133,9	1229,9	0,23	84,42	82,27	86,98	0,23	85,08	83,27	82,28	0,06	0,07	-26,75348
39,0	194,0	2,4	0,0	14,9	0,0	553,5	81,3	142,3	809,5	458,7	766,5	613,1	133,7	1227,0	0,23	84,51	82,34	87,15	0,23	85,19	83,32	82,11	0,06	0,07	-23,88456
40,0	195,0	2,2	0,0	14,9	0,0	553,3	81,0	141,1	809,4	461,5	772,0	619,7	133,5	1224,1	0,23	84,57	82,37	87,28	0,23	85,28	83,38	81,97	0,06	0,07	-20,9682
41,0	196,0	2,1	0,0	14,7	0,0	552,1	81,7	142,1	809,5	464,8	776,9	626,3	133,2	1217,4	0,23	84,54	82,43	87,47	0,23	85,31	83,44	81,87	0,06	0,07	-18,06076
42,0	197,0	2,0	0,0	14,3	0,0	550,2	81,8	141,4	808,2	467,7	781,0	632,9	132,8	1210,4	0,23	84,51	82,43	87,62	0,23	85,32	83,48	81,83	0,06	0,07	-15,66163
43,0	198,0	1,9	0,0	14,0	0,0	549,5	81,3	141,3	805,7	470,7	784,4	640,4	132,5	1198,4	0,23	84,56	82,50	87,80	0,23	85,39	83,52	81,79	0,06	0,07	-13,44189
44,0	199,0	1,8	0,0	13,1	0,0	547,9	81,8	141,2	802,7	474,2	786,8	649,0	132,3	1175,7	0,23	84,56	82,54	87,92	0,23	85,42	83,53	81,78	0,06	0,07	-11,19724
45,0	200,0	1,7	0,0	12,0	0,0	547,7	81,7	141,1	798,3	477,4	787,4	660,3	131,9	1152,7	0,23	84,64	82,58	88,08	0,23	85,45	83,58	81,75	0,06	0,07	-9,114923
46,0	201,0	1,6	0,0	11,0	0,0	545,0	81,0	139,8	792,3	480,3	787,0	672,1	131,5	1131,7	0,23	84,63	82,63	88,15	0,23	85,44	83,61	81,75	0,06	0,07	-7,557504
47,0	202,0	1,6	0,0	10,3	0,0	540,9	81,1	139,6	785,3	483,9	785,4	684,3	131,1	1109,8	0,23	84,58	82,68	87,42	0,23	85,43	83,64	82,12	0,06	0,07	-6,188434
48,0	203,0	1,5	0,0	9,8	0,0	536,7	81,4	140,0	777,1	487,5	783,5	695,8	130,7	1087,6	0,23	84,51	82,72	86,75	0,23	85,40	83,68	82,85	0,06	0,07	-5,271115
49,0	204,0	1,5	0,0	9,2	0,0	531,4	81,4	139,0	768,2	492,2	781,9	707,9	130,4	1063,9	0,23	84,47	82,76	86,47	0,23	85,38	83,72	83,57	0,06	0,07	-4,087872
50,0	205,0	1,4	0,0	8,8	0,0	527,4	81,4	137,9	758,5	497,1	780,4	719,9	130,0	1043,5	0,23	84,43	82,79	86,39	0,23	85,34	83,74	84,19	0,06	0,07	-3,020285
51,0	206,0	1,4	0,0	8,3	0,0	522,4	81,2	138,3	748,2	502,8	778,4	730,8	129,7	1020,0	0,23	84,46	82,84	86,45	0,23	85,35	83,78	84,80	0,06	0,07	-2,223096
52,0	207,0	1,3	0,0	7,9	0,0	516,7	81,4	137,9	737,0	508,8	776,1	741,4	129,4	996,3	0,23	84,47	82,89	86,57	0,23	85,39	83,80	85,30	0,06	0,07	-1,654758
53,0	208,0	1,3	0,0	7,4	0,0	512,1	81,3	136,6	725,7	514,8	772,6	749,3	129,0	973,3	0,23	84,54	82,94	86,67	0,23	85,46	83,83	85,74	0,06	0,07	-1,907507
54,0	209,0	1,3	0,0	7,1	0,0	505,8	81,1	136,9	713,9	520,6	768,6	756,2	128,6	954,6	0,23	84,59	82,98	86,83	0,23	85,52	83,88	86,16	0,06	0,07	-2,598221
55,0	210,0	1,2	0,0	7,0	0,0	500,9	81,5	136,5	702,1	525,6	763,9	761,7	128,3	938,6	0,23	84,61	83,01	86,96	0,23	85,56	83,91	86,58	0,06	0,07	-3,890869
56,0	211,0	1,2	0,0	7,0	0,0	495,4	81,5	135,6	690,7	529,7	759,1	766,0	128,2	924,4	0,23	84,65	83,06	87,09	0,23	85,62	83,97	86,90	0,06	0,07	-5,458221
57,0	212,0	1,2	0,0	7,0	0,0	489,5	81,0	134,4	679,3	533,3	754,0	769,0	128,0	911,1	0,23	84,69	83,11	87,18	0,23	85,58	83,96	87,18	0,06	0,06	-7,45067
58,0	213,0	1,2	0,0	7,1	0,0	484,9	80,7	133,4	668,0	535,7	749,0	770,8	127,7	898,8	0,22	84,58	83,16	87,19	0,23	85,59	84,00	87,46	0,06	0,06	-9,953152
59,0	214,0	1,1	0,0	7,2	0,0	479,7	80,2	132,3	657,9	537,9	743,7	771,4	127,5	887,4	0,23	84,47	83,19	82,02	0,23	85,45	84,00	87,66	0,06	0,06	-12,5136
60,0	215,0	1,1	0,0	7,2	0,0	475,8	80,4	132,3	648,2	539,3	738,4	771,8	127,4	877,0	0,23	84,31	83,18	82,09	0,23	85,37	84,01	87,91	0,06	0,06	-15,18653
61,0	216,0	1,1	0,0	7,2	0,0	471,3	80,2	131,6	638,8	540,3	733,5	771,0	127,3	867,7	0,23	84,15	83,20	82,17	0,23	85,25	84,02	88,09	0,06	0,06	-18,00042
62,0	217,0	1,0	0,0	7,3	0,0	466,2	80,0	130,2	629,8	541,3	728,2	770,7	127,1	859,5	0,23	84,05	83,20	82,28	0,23	85,17	84,01	88,25	0,06	0,06	-20,7606
63,0	218,0	1,0	0,0	7,2	0,0	462,6	80,1	130,2	621,1	541,8	723,3	770,3	126,9	851,8	0,23	83,91	83,16	82,42	0,23	85,03	83,99	88,38	0,06	0,06	-23,53069
64,0	219,0	1,0	0,0	7,3	0,0	458,5	79,8	129,4	613,2	542,1	718,8	769,0	127,0	845,2	0,23	83,84	83,17	82,61	0,23	84,93	84,00	88,53	0,06	0,06	-26,18745
65,0	220,0	1,0	0,0	7,6	0,0	453,5	80,1	128,8	605,1	541,0	715,0	764,7	126,8	838,5	0,23	83,80	83,15	82,79	0,23	84,89	84,00	88,63	0,06	0,06	-29,6855
66,0	221,0	0,9	0,0	7,6	0,0	450,2	80,1	128,6	598,5	539,5	712,0	759,0	126,9	832,8	0,23	83,79	83,18	82,98	0,23	84,86	84,01	88,71	0,06	0,06	-33,01471
67,0	222,0	0,9	0,0	7,6	0,0	447,4	80,0	128,3	591,3	538,0	709,2	753,7	126,7	827,0	0,23	83,76	83,17	83,20	0,23	84,82	84,03	88,79	0,06	0,06	-36,41655
68,0	223,0	0,9	0,0	7,6	0,0	444,8	80,0	127,5	584,9	536,4	706,4	749,0	126,9	821,8	0,23	83,71	83,20	83,42	0,23	84,77	84,03	88,84	0,06	0,06	-39,48223
69,0	224,0	0,8	0,0	7,6	0,0	441,5	79,7	126,7	578,8	535,1	703,6	744,5	126,9	817,6	0,23	83,67	83,18	83,61	0,23	84,74	84,01	88,89	0,06	0,06	-42,41438
70,0	225,0	0,8	0,0	7,6	0,0	437,8	79,7	126,7	572,9	533,7	700,8	740,5	126,9	813,7	0,23	83,60	83,18	83,85	0,23	84,70	84,02	88,94	0,06	0,06	-45,24597
71,0	226,0	0,8	0,0	7,6	0,0	435,7	79,9	125,6	567,4	532,4	697,8	736,5	126,8	810,5	0,23	83,53	83,18	84,02	0,23	84,62	84,02	88,99	0,06	0,06	-47,97447
72,0	227,0	0,8	0,0	7,7	0,0	433,8	79,7	125,2	562,4	531,2	695,3	733,3	126,9	807,5	0,23	83,54	83,21	84,23	0,23	84,63	84,03	88,98	0,06	0,06	-50,36764
73,0	228,0	0,7	0,0	7,7	0,0	431,2	79,5	124,9	557,9	530,1	692,6	730,8	126,9	804,7	0,23	83,46	83,23	84,40	0,23	84,55	84,07	88,97	0,06	0,06	-52,52002
74,0	229,0	0,7	0,0	7,7	0,0	428,5	79,6	123,4	553,6	528,8	689,9	729,1	126,9	801,8	0,23	83,41	83,25	84,59	0,23	84,48	84,08	88,87	0,07	0,06	-54,55355
75,0	230,0	0,7	0,0	7,7	0,0	426,4	80,1	124,1	549,5	527,5	687,0	727,5	127,0	799,2	0,23	83,29	83,24	84,78	0,23	84,35	84,04	87,39	0,07	0,06	-56,50057
76,0	231,0	0,6	0,0	7,6	0,0	424,7	80,2	124,2	545,5	526,2	683,9	726,1	127,1	796,1	0,23	83,26	83,23	84,93	0,23	84,34	84,05	86,55	0,06	0,06	-58,45726
77,0	232,0	0,6	0,0	7,6	0,0	422,5	80,2	123,0	541,7	524,6	680,3	726,0	127,0	793,3	0,23	83,18	83,23	85,11	0,23	84,27	84,03	86,03	0,07	0,06	-60,27926
78,0	233,0	0,6	0,0	7,2	0,0	419,8	80,4	123,0	538,4	522,5	676,0	726,6	127,2	787,3	0,23	83,17	83,21	85,28	0,23	84,25	84,03	85,64	0,06	0,06	-62,04935
79,0	234,0	0,6	0,0	7,2	0,0	418,2	80,4	123,0	534,7	520,2	671,3	728,1	127,4	784,0	0,23	83,13	83,20	85,40	0,23	84,21	84,04	85,28	0,06	0,06	-63,84747
80,0	235,0	0,5	0,0	7,3	0,0	416,0	80,6	122,9	531,4	518,0	666,5	729,7	127,4	781,7	0,23	83,09	83,20	85,56	0,23	84,15	84,04	84,97	0,07	0,06	-65,59858
81,0	236,0	0,5	0,0	7,3	0,0	415,1	80,8	122,8	527,9	515,8	661,7	729,3	127,5	778,7	0,23	83,13	83,19	85,73	0,23	84,17	84,03	84,73	0,06	0,06	-67,76334
82,0	237,0	0,5	0,0	6,8	0,0	413,6	80,5	122,6	525,0	514,3	657,2	724,0	127,6	773,9	0,23	83,18	83,22	85,88	0,23	84,17	84,06	84,50	0,06	0,06	-70,57771
83,0	238,0	0,5	0,0	6,8	0,0	411,7	80,7	122,3	521,7	512,3	653,0	717,8	127,8	769,9	0,23	83,19	83,23	86,00	0,23	84,17	84,05	84,27	0,06	0,06	-73,67219
84,0	239,0	0,4	0,0	6,8	0,0	410,1	80,8	122,1	518,8	510,5	649,3	711,9	127,8	766,7	0,23	83,21	83,26	86,11	0,23	84,16	84,05	84,06	0,07	0,06	-76,52394
85,0	240,0	0,4	0,0	6,8	0,0	408,2	80,8	122,1	516,0	508,6	645,5	707,5	128,0	764,2	0,23	83,19	83,26	86,22	0,23	84,13	84,06	83,86	0,06	0,06	-79,06606
86,0	241,0	0,4	0,0	6,8	0,0	406,9	80,8	121,2	513,5	506,8	642,4	703,1	128,2	761,7	0,23	83,17	83,26	86,33	0,23	84,17	84,06	83,68	0,07	0,06	-81,40012
87,0	242,0	0,3	0,0	6,9	0,0	404,8	80,5	120,8	510,6	505,3	639,2	699,4	128,4	759,6	0,23	83,16	83,28	86,39	0,23	84,18	84,06	83,50	0,07	0,05	-83,60281
88,0	243,0	0,3	0,0	6,8	0,0	403,9	80,2	120,7	508,2	503,4	636,3	696,8	128,5	757,9	0,23	83,03	83,28	86,42	0,23	84,11	84,03	83,30	0,07	0,06	-85,54475
89,0	244,0	0,3	0,0	6,9	0,0	402,9	80,2	120,2	505,7	501,7	633,6	694,8	128,6	756,2	0,23	82,90	83,26	86,44	0,23	83,98	84,05	83,13	0,06	0,06	-87,31677
90,0	245,0	0,3	0,0	6,9	0,0	401,5	80,0	119,9	503,7	500,1	630,6	692,9	128,7	754,7	0,23	82,77	83,23	86,50	0,23	83,89	84,02	82,95	0,07	0,06	-88,99884
91,0	246,0	0,3	0,0	6,9	0,0	401,0	80,3	120,0	501,4	498,4	628,1	691,3	128,8	753,6	0,23	82,74	83,21	86,61	0,23	83,83	84,01	82,81	0,06	0,05	-90,61645
92,0	247,0	0,2	0,0	6,9	0,0	399,3	80,3	119,8	499,4	497,1	625,6	690,0	129,0	752,5	0,23	82,73	83,21	86,64	0,23	83,78	84,02	82,66	0,06	0,05	-91,98199
93,0	248,0	0,2	0,0	6,8	0,0	398,2	80,4	119,5	497,6	495,4	623,0	687,9	129,1	751,6	0,23	82,74	83,19	86,67	0,23	83,75	84,00	82,51	0,06	0,06	-93,57914
94,0	249,0	0,2	0,0	6,7	0,0	397,5	80,1	119,1	495,8	493,8	620,6	685,0	129,2	749,7	0,23	82,73	83,19	86,73	0,23	83,73	84,02	82,38	0,06	0,05	-95,31109
95,0	250,0	0,1	0,0	6,6	0,0	397,2	79,9	119,1	493,8	492,9	617,9	679,5	129,2	748,5	0,23	82,78	83,20	86,76	0,23	83,77	84,02	82,27	0,06	0,05	-97,54034
96,0	251,0	0,1	0,0	6,5	0,0	396,2	80,5	119,9	492,1	491,3	615,2	674,4	129,5	746,6	0,23	82,72	83,19	86,81	0,23	83,72	84,01	82,12	0,06	0,05	-99,68893
97,0	252,0	0,1	0,0	6,5	0,0	395,1	80,6	119,8	490,7	489,6	612,0	669,4	129,6	744,1	0,23	82,72	83,20	86,89	0,23	83,69	84,01	82,01	0,06	0,05	-101,9184
98,0	253,0	0,1	0,0	6,5	0,0	394,5	80,6	119,6	489,3	488,1	609,1	665,4	129,9	743,7	0,23	82,78	83,21	86,94	0,23	83,71	84,01	81,89	0,06	0,05	-103,8326
99,0	254,0	0,1	0,0	6,5	0,0	394,6	80,6	119,4	487,7	486,6	606,0	661,6	129,8	744,8	0,23	82,80	83,23	86,97	0,23	83,74	84,03	81,78	0,07	0,05	-105,8426
100,0	255,0	0,1	0,0	6,3	0,0	394,1	80,7	119,2	486,7	484,4	603,1	658,9	129,8	746,6	0,23	82,81	83,24	87,00	0,23	83,73	84,05	81,67	0,06	0,05	-107,6265
101,0	256,0	0,0	0,0	6,3	0,0	393,6	80,6	119,2	485,3	482,6	600,2	656,6	130,1	745,6	0,23	82,84	83,23	87,04	0,23	83,77	84,05	81,56	0,06	0,05	-109,2549

Manufacturer: HEARTHSTONE
Model: SILA

Run: 1
Project #: PI 20202
Test Duration: 101 min

	HHV	LHV
Eff	73,06%	78,97%
Comb Eff	99,50%	99,50%
HT Eff	73,43%	79,36%
Output	27 447	kJ/h
Burn Rate	1,90	kg/h
Grams CO	10	g
Input	37 567	kJ/h
MC wet	16,40	

Note: In the "Input data", "Calc. % O_2", "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

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,64
F_0
1,062

Overall Heating Efficiency: 73,06%
Combustion Efficiency: 99,50%
Heat Transfer Efficiency: 73,43%

Heat Output: 26 036 Btu/h
Heat Input: 35 636 Btu/h
Burn Duration: 1,68 h
Burn Rate: 4,18 lb/h
Stack Temp: 487,7 Deg. F

Averages	0,02	10,02	1,19	20,28	10,25	253,71	26,96	100,2%	72,8%	73,0%
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 (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,82	0,02	8,45	132,0%	20,38	11,92	310,4	26,6	100,3%	66,5%	66,6%
1,00	3,70	0,10	3,96	383,7%	20,67	16,66	297,4	26,4	99,2%	45,7%	45,4%
2,00	3,64	0,02	9,59	104,4%	20,31	10,71	280,0	26,1	100,1%	71,2%	71,3%
3,00	3,57	0,01	12,23	60,5%	20,13	7,90	277,4	26,5	100,1%	74,8%	74,9%
4,00	3,50	0,01	10,20	92,4%	20,27	10,06	275,3	26,8	100,2%	72,5%	72,7%
5,00	3,45	0,01	9,18	113,8%	20,33	11,15	274,0	26,4	100,3%	71,0%	71,1%
6,00	3,39	0,01	10,60	85,2%	20,24	9,64	273,5	26,7	100,2%	73,2%	73,3%
7,00	3,32	0,01	10,03	95,6%	20,28	10,24	273,4	26,5	100,2%	72,4%	72,6%
8,00	3,25	0,01	11,14	76,2%	20,20	9,06	273,3	26,6	100,2%	73,9%	74,0%
9,00	3,18	0,01	11,46	71,3%	20,18	8,72	273,8	26,5	100,2%	74,2%	74,4%
10,00	3,11	0,01	12,44	57,8%	20,12	7,67	274,7	26,4	100,1%	75,2%	75,3%
11,00	3,05	0,01	12,51	56,9%	20,11	7,60	275,4	26,5	100,1%	75,2%	75,3%
12,00	2,96	0,01	12,54	56,5%	20,11	7,56	276,5	26,7	100,1%	75,2%	75,3%
13,00	2,89	0,01	12,71	54,5%	20,10	7,39	277,0	26,9	100,1%	75,3%	75,4%
14,00	2,82	0,01	12,56	56,3%	20,11	7,55	277,0	26,9	100,1%	75,2%	75,3%
15,00	2,75	0,01	12,63	55,5%	20,11	7,48	277,4	26,7	100,1%	75,2%	75,3%
16,00	2,66	0,01	13,31	47,4%	20,06	6,74	278,5	26,9	100,1%	75,8%	75,9%
17,00	2,59	0,01	12,97	51,4%	20,08	7,11	279,0	26,8	100,1%	75,5%	75,6%
18,00	2,52	0,01	13,17	49,1%	20,07	6,90	279,8	27,0	100,1%	75,6%	75,7%
19,00	2,46	0,01	13,20	48,7%	20,07	6,86	280,4	26,8	100,1%	75,6%	75,7%
20,00	2,39	0,01	13,12	49,6%	20,07	6,95	280,8	26,9	100,1%	75,5%	75,6%
21,00	2,32	0,01	13,16	49,2%	20,07	6,91	281,4	27,0	100,1%	75,5%	75,6%
22,00	2,25	0,01	13,40	46,5%	20,05	6,65	281,9	26,9	100,1%	75,7%	75,8%
23,00	2,16	0,01	13,96	40,7%	20,02	6,06	283,0	26,8	100,1%	76,1%	76,1%
24,00	2,09	0,01	13,91	41,1%	20,02	6,11	282,8	26,8	100,1%	76,1%	76,1%
25,00	2,02	0,01	14,19	38,4%	20,00	5,81	284,1	27,0	100,1%	76,2%	76,3%
26,00	1,96	0,01	14,65	34,0%	19,97	5,32	284,3	27,0	100,1%	76,5%	76,6%
27,00	1,89	0,02	15,34	27,9%	19,93	4,57	285,0	27,0	100,0%	77,0%	77,0%
28,00	1,80	0,08	16,09	21,5%	19,87	3,74	285,7	27,1	99,6%	77,4%	77,1%
29,00	1,73	0,14	16,74	16,3%	19,82	3,01	286,9	27,2	99,3%	77,7%	77,2%
30,00	1,64	0,28	16,86	14,6%	19,81	2,80	287,3	27,0	98,6%	77,7%	76,7%
31,00	1,57	0,29	16,94	14,0%	19,80	2,71	288,7	27,3	98,6%	77,7%	76,6%
32,00	1,50	0,12	16,25	20,0%	19,86	3,55	289,5	27,3	99,4%	77,3%	76,9%
33,00	1,43	0,03	15,57	25,9%	19,91	4,32	289,9	27,3	99,9%	76,9%	76,8%
34,00	1,37	0,02	15,00	30,8%	19,95	4,94	290,2	27,5	100,0%	76,5%	76,5%
35,00	1,30	0,02	15,19	29,1%	19,94	4,73	290,2	27,5	100,0%	76,6%	76,6%
36,00	1,25	0,01	15,06	30,3%	19,94	4,87	290,9	27,3	100,0%	76,5%	76,5%
37,00	1,18	0,01	15,05	30,4%	19,95	4,89	290,3	27,3	100,0%	76,5%	76,6%
38,00	1,12	0,01	15,08	30,2%	19,94	4,86	289,8	27,7	100,0%	76,6%	76,6%
39,00	1,07	0,01	14,88	31,9%	19,96	5,07	289,7	27,4	100,0%	76,4%	76,5%
40,00	1,00	0,01	14,90	31,7%	19,96	5,05	289,6	27,2	100,0%	76,5%	76,5%
41,00	0,96	0,01	14,68	33,7%	19,97	5,28	288,9	27,6	100,0%	76,4%	76,4%
42,00	0,91	0,01	14,32	37,1%	19,99	5,67	287,9	27,7	100,0%	76,1%	76,2%
43,00	0,84	0,02	14,04	39,7%	20,01	5,96	287,5	27,4	100,0%	75,9%	75,9%
44,00	0,82	0,01	13,13	49,4%	20,07	6,93	286,6	27,7	100,1%	75,2%	75,3%
45,00	0,78	0,01	11,97	64,0%	20,15	8,18	286,5	27,6	100,1%	74,0%	74,2%
46,00	0,73	0,01	11,05	77,7%	20,21	9,16	285,0	27,2	100,2%	73,0%	73,2%
47,00	0,71	0,01	10,33	90,0%	20,26	9,92	282,7	27,3	100,2%	72,2%	72,4%
48,00	0,69	0,01	9,75	101,2%	20,30	10,54	280,4	27,4	100,3%	71,5%	71,7%
49,00	0,66	0,01	9,21	113,2%	20,33	11,12	277,4	27,5	100,3%	70,8%	71,0%
50,00	0,64	0,01	8,77	123,7%	20,36	11,58	275,2	27,4	100,3%	70,2%	70,4%
51,00	0,62	0,01	8,29	136,8%	20,39	12,10	272,4	27,3	100,4%	69,4%	69,7%
52,00	0,59	0,01	7,91	148,3%	20,42	12,51	269,3	27,5	100,4%	68,9%	69,1%
53,00	0,57	0,01	7,38	166,0%	20,45	13,07	266,7	27,4	100,5%	67,8%	68,1%
54,00	0,57	0,01	7,10	176,6%	20,47	13,37	263,2	27,3	100,5%	67,3%	67,7%
55,00	0,55	0,01	7,01	179,8%	20,48	13,46	260,5	27,5	100,5%	67,4%	67,7%
56,00	0,55	0,01	7,03	179,1%	20,48	13,44	257,4	27,5	100,5%	67,7%	68,1%
57,00	0,53	0,01	7,01	179,8%	20,48	13,46	254,1	27,2	100,5%	68,0%	68,3%
58,00	0,53	0,01	7,11	175,9%	20,47	13,35	251,6	27,1	100,5%	68,5%	68,8%
59,00	0,50	0,01	7,16	174,0%	20,47	13,30	248,7	26,8	100,5%	68,9%	69,2%
60,00	0,50	0,01	7,16	174,0%	20,47	13,30	246,5	26,9	100,5%	69,1%	69,4%
61,00	0,48	0,01	7,20	172,7%	20,46	13,26	244,0	26,8	100,5%	69,4%	69,7%
62,00	0,46	0,01	7,26	170,3%	20,46	13,20	241,2	26,7	100,5%	69,8%	70,2%
63,00	0,46	0,01	7,25	170,9%	20,46	13,21	239,2	26,7	100,5%	70,0%	70,3%
64,00	0,44	0,01	7,33	167,9%	20,46	13,13	236,9	26,6	100,5%	70,4%	70,7%
65,00	0,44	0,01	7,59	158,6%	20,44	12,84	234,2	26,7	100,4%	71,3%	71,6%
66,00	0,41	0,01	7,59	158,5%	20,44	12,84	232,3	26,7	100,4%	71,4%	71,8%
67,00	0,41	0,01	7,56	159,6%	20,44	12,88	230,8	26,6	100,4%	71,5%	71,8%
68,00	0,39	0,01	7,56	159,7%	20,44	12,88	229,3	26,7	100,4%	71,6%	72,0%
69,00	0,37	0,01	7,58	159,1%	20,44	12,86	227,5	26,5	100,4%	71,8%	72,2%
70,00	0,37	0,01	7,61	158,0%	20,44	12,83	225,4	26,5	100,4%	72,1%	72,4%
71,00	0,34	0,01	7,64	156,9%	20,44	12,79	224,3	26,6	100,4%	72,3%	72,6%
72,00	0,34	0,01	7,66	156,3%	20,43	12,77	223,2	26,5	100,4%	72,4%	72,7%
73,00	0,32	0,01	7,72	154,1%	20,43	12,70	221,8	26,4	100,4%	72,7%	73,0%
74,00	0,32	0,01	7,71	154,7%	20,43	12,72	220,3	26,5	100,4%	72,8%	73,1%
75,00	0,30	0,01	7,66	156,3%	20,43	12,77	219,1	26,7	100,4%	72,8%	73,1%
76,00	0,28	0,01	7,64	156,8%	20,43	12,79	218,2	26,8	100,4%	72,9%	73,2%
77,00	0,28	0,01	7,59	158,5%	20,44	12,84	217,0	26,8	100,4%	72,9%	73,2%
78,00	0,25	0,01	7,24	170,8%	20,46	13,21	215,5	26,9	100,4%	72,3%	72,6%
79,00	0,25	0,01	7,20	172,7%	20,46	13,26	214,5	26,9	100,4%	72,3%	72,6%
80,00	0,23	0,01	7,26	170,2%	20,46	13,19	213,3	27,0	100,4%	72,6%	72,9%
81,00	0,23	0,01	7,30	168,9%	20,46	13,16	212,8	27,1	100,4%	72,7%	73,0%
82,00	0,21	0,01	6,75	190,6%	20,49	13,74	212,0	27,0	100,5%	71,5%	71,9%
83,00	0,21	0,01	6,78	189,3%	20,49	13,71	211,0	27,1	100,5%	71,7%	72,1%
84,00	0,19	0,01	6,78	189,3%	20,49	13,71	210,0	27,1	100,5%	71,8%	72,2%
85,00	0,16	0,01	6,80	188,5%	20,49	13,69	209,0	27,1	100,5%	72,0%	72,3%
86,00	0,16	0,01	6,83	187,2%	20,49	13,65	208,3	27,1	100,5%	72,1%	72,4%
87,00	0,14	0,01	6,85	186,4%	20,49	13,63	207,1	26,9	100,5%	72,2%	72,6%
88,00	0,14	0,01	6,85	186,4%	20,49	13,63	206,6	26,8	100,5%	72,3%	72,6%
89,00	0,12	0,01	6,88	185,0%	20,48	13,60	206,1	26,8	100,5%	72,4%	72,8%
90,00	0,12	0,01	6,88	185,1%	20,48	13,60	205,3	26,6	100,5%	72,5%	72,8%
91,00	0,12	0,01	6,90	184,3%	20,48	13,58	205,0	26,9	100,5%	72,6%	72,9%
92,00	0,09	0,01	6,90	184,4%	20,48	13,58	204,0	26,8	100,5%	72,7%	73,0%

93,00	0,09	0,01	6,83	187,1%	20,49	13,65	203,4	26,9	100,5%	72,6%	72,9%
94,00	0,07	0,01	6,75	190,7%	20,49	13,74	203,1	26,7	100,5%	72,4%	72,8%
95,00	0,05	0,01	6,55	199,3%	20,51	13,95	202,9	26,6	100,5%	71,9%	72,3%
96,00	0,05	0,01	6,54	200,1%	20,51	13,97	202,3	26,9	100,5%	72,0%	72,3%
97,00	0,05	0,01	6,47	203,2%	20,51	14,04	201,7	27,0	100,5%	71,9%	72,3%
98,00	0,03	0,01	6,45	203,9%	20,51	14,05	201,4	27,0	100,5%	71,9%	72,3%
99,00	0,03	0,01	6,50	201,7%	20,51	14,00	201,4	27,0	100,5%	72,0%	72,4%
100,00	0,03	0,01	6,32	210,3%	20,52	14,20	201,2	27,0	100,5%	71,6%	71,9%
101,00	0,00	0,01	6,31	211,0%	20,52	14,21	200,9	27,0	100,5%	71,6%	71,9%

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2019-07-22 Manufacturer: Hearthstone Model: Sila
Project #: PI 20202 Run: 1 Tech: MM Reviewer: [illegible]

- 2.5 LBS start Fire
- At 2.4 LBS close Door
- At 1.00 LBS insert warm up
- close Door immediatly
- At 1.00 LBS insert preload
- close Door immediatly
- 5 LBS close bypass
- At 2 LBS - open bypass
- open Door
- ~~Ast cha~~ crush coal bed
- close Door
- close bypass after 2 min
open bypass
open door
insert load
close Door
close bypass

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2019-07-18 22 Manufacturer: Hearthstone Model: Sila

Project #: PI 20802 Run: 1 Tech: MM Reviewer: NP

Equipment #	Time	12%	22%
E.M 191	7100	Ok	Ok

Moisture Meter Calibration Check:

	Pre-Test	Post-Test
Facility Conditions:		
Air Velocity from less than 2 feet	0 (max50 Fpm)	0 (max50 Fpm)
Smoke Capture Check (tunnel velocity)	Ok	NA
Picture 4 sides	Ok	Ok
Wood Heater Conditions:		
Date Wood Heater Stack Cleaned	2019-07-22	
Date Dilution Tunnel Cleaned	2019-07-22	
Induced Draft Check (max 0.005 H2O)	Ok	
Traverse before ignition	Ok	
Flow Rate 140 cfm ±10%		Ok
Temperature System:		
Ambient (65°-90°F)		Ok °F
Wood Heater Surface (±125°F)		Ok °F
Proportional Checks:		
Thermocouple check	Ok	
Pitot Clean	Ok	
Pitot verification	Ok	

Sampling Train ID Numbers:	Train 1st hour	Train 1	Train 2
Probe	02	09	17
Filter Front	838	840	842
Filter Back	839	841	843
Filter Thermocouple	11	11	12
Filter (<90°F)	Ok	Ok	Ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2018-07-22 Manufacturer: Hearthstone Model: 5.1A

Project #: pI 20202 Run: 1 Tech: MR Reviewer: AD

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 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)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	976327.20	977033.88	976327.28	977033.98	922745.10	922944.19
Initial 1minute DGM (Liter)	976324.24	977032.78	976327.32	977033.98	922745.24	922944.01
Change © (Liter)	~~976327.20~~ 0.04	0.10	0.04	0.01	0.11	0.09
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	Ok	OK	OK	OK	Ok	Ok

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.5	3	.4
Check OK (no change after 15 sec.)	Ok	Ok	Ok	Ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2019-07-22 Manufacturer: Heartstone Model: 5150

Project #: PT 2202 Run: 1 Tech: MM Reviewer: DO

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Wood	EM-090	44 lbs, Class F	44 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200g, Class S	200 g

LIMITS OF WEIGHT RANGES

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

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019.07.22 Manufacturer: Hearthstone Model: Sila

Project #: PE 20202 Run: 1 Tech: MM Reviewer: NP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 101 (KPa.) Static pressure (P_q) 0.30 (inches w.c.)
Inside diameter: Port A _____ Port B _____.
Tunnel cross sectional area: .1963Ft^2
Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0065	76.71
B - Centroid	3.00	3.50	4	0.064	76.89
A-1	0.40	0.50	0.50	0.052	76.71
A-2	1.50	1.75	2	~~0.051~~ 0.053	76.75
A-3	4.50	5.25	6	0.053	76.86
A-4	5.60	6.5	7.5	0.055	76.86
B-1	0.40	0.50	0.50	0.056	76.06
B-2	1.50	1.75	2	0.055	~~76.92~~ 76.57
B-3	4.50	5.25	6	0.055	76.58
B-4	5.60	6.5	7.5	0.052	76.86
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,
C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.
Δ_p = manometer reading (inches H_2O)
T_s = average absolute dilution tunnel temperature (°F + 460)
P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$
P_q = static pressure $\frac{\text{in. } H_2O}{\{\ 13.6\ \}}$
M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)
K_p = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_p$avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019-07-22 Manufacturer: Hearthstone Model: Sila

Project #: PT 20202 Run: 1 Tech: MM Reviewer: DO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2971	3000	1008	1000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO_2	0	0	1796	1800	975	1000
Tolerance CO2		+/- 0.02		+/- 0.5		+/- 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	2974	1006	0	0.02	0,003	0.15	0,002	0.05	✓	
CO_2	0	1803	980	0	0.02	0,07	0.5	0,05	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2019-07-22 Manufacturer: Hearthstone Model: Sig

Project #: PT 20202 Run: 1 Tech: M M Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	977 031, 54	922 449, 04	420, 82
Initial (Liter)	976 328, 14	921 745, 68	~~306~~ 306,04

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101	101,1
Dry Bulb (F):	78	78,90
Humidity (%):	33,1	31,1

Flow Meter

	Start	End
Flow meter reading	N.A	N.A

Flow Meter Verification

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight (Kg)	N.A	N.A

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-22 Manufacturer: Hearthstone Model: Sil a

Project #: pI 20202 Run: 1 Tech: MM Reviewer: DB

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight		Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 8 in.	0.724	lbs.	199	20	201	204	202
1 1/2 x 3 1/2 x 8 in.	0.738	lbs.	193	198	193	194	195
1 1/2 x 3 1/2 x 8 in.	0.768	lbs.	198	197	193	193	192
1 1/2 x 3 1/2 x 8 in.	0.750	lbs.	200	206	202	204	206
1 1/2 x 3 1/2 x 8 in.	0.724	lbs.	208	203	206	208	209
1 1/2 x 3 1/2 x 8 in.	0.744	lbs.	193	194	198	194	193
1 1/2 x 3 1/2 x 8 in.	0.778	lbs.	200	203	204	208	207
1 1/2 x 3 1/2 x 8 in.	0.828	lbs.	201	198	198	197	198
x x in.		lbs.					
1 1/2 x 3 1/2 x 8 in.	~~0.76~~ 0.756	lbs.	206	203	204	208	209
1 1/2 x 3 1/2 x 8 in.	0.786	lbs.	196	199	193	193	194
1 1/2 x 3 1/2 x 8 in.	0.724	lbs.	198	194	192	196	193
1 1/2 x 3 1/2 x 8 in.	0.758	lbs.	199	200	206	204	206
1 1/2 x 3 1/2 x 8 in.	0.722	lbs.	203	204	203	203	208
1 1/2 x 3 1/2 x 8 in.	0.774	lbs.	191	192	193	194	193
1 1/2 x 3 1/2 x 8 in.	0.780	lbs.	197	193	192	194	196
1 1/2 x 3 1/2 x 8 in.	0.784	lbs.	206	203	204	203	204
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					

TEST LOAD WEIGHT: 12.14 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2016 07 22 Manufacturer: Hearthstone Model: 5,1 a

Project #: pI 20202 Run: 1 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight		Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 9 1/2 in.	0 968	lbs.	191	196	194	194	193
1 1/2 x 3 1/2 x 9 1/2 in.	0 996	lbs.	186	192	192	193	194
1 1/2 x 3 1/2 x 9 1/2 in.	1054	lbs.	191	192	198	199	198
1 1/2 x 3 1/2 x 9 1/2 in.	1100	lbs.	208	207	208	209	207
1 1/2 x 3 1/2 x 9 1/2 in.	1118	lbs.	200	197	198	193	197
1 1/2 x 3 1/2 x 9 1/2 in.	0900	lbs.	192	193	193	192	191
1 1/2 x 3/4 x 5 in.	0 110	lbs.			191		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			190		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			192		
1 1/2 x 3/4 x 5 in.	0 106	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 104	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 118	lbs.			194		
1 1/2 x 3/4 x 5 in.	0 124	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 116	lbs.			192		
1 1/2 x 3/4 x 5 in.	0 122	lbs.			196		
1 1/2 x 3/4 x 5 in.	0 116	lbs.			197		
1 1/2 x 3/4 x 5 in.	0 110	lbs.			196		
1 1/2 x 3/4 x 5 in.	0 100	lbs.			198		
1 1/2 x 3/4 x 5 in.	0 112	lbs.			197		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			197		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			195		
1 1/2 x 3/4 x 5 in.	0 112	lbs.			196		
1 1/2 x 3/4 x 5 in.	0 102	lbs.			198		
1 1/2 x 3/4 x 5 in.	0 128	lbs.			197		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 104	lbs.			192		
x x in.		lbs.					

TEST LOAD WEIGHT: 8 42 lbs Min 20%: 1.68 Max 25%: 2 b

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-18 Manufacturer: Heathstone Model: Sila

Project #: PI 20202 Run: 1 Tech: MA Reviewer: [illegible]

Pre-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	02	838	839	31	09	840	841	40	844
2019-07-18	17:00	61 1001	0 1250	0 1280	33 9590	61 4469	0 1305	0 1275	34 2905	0 1272
2019-07-22	9:00	61 1001	0 1249	0 1280	33 9589	~~61 4478~~ 61 4468	0 1304	0 1274	34 2906	0 1273

Post-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	02	838	839	31	09	840	841	40	844
2019-07-22	14:00	61 1005	0 1255	0 1254	33 9644	61 4471	0 1293	0 1273	34 2927	0 1273
2019-07-30	8:00	61 1003	0 1255	0 1254	33 9630	61 4470	0 1293	0 1273	34 2914	0 1273
2019-07-31	8:00	61 1003	0 1255	0 1255	33 9630	61 4470	0 1294	0 1273	34 2914	0 1273

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-18 Manufacturer: Hearthstone Model: S/a

Project #: PI 2022 Run: 1 Tech: MM Reviewer: AP

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	17	842	843	41
2019-07-18	17:00	108,9510	0,1289	0,1267	34,1698
2019-07-22	9:30	108,9510	0,1289	0,1267	34,1699

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	17	842	843	41
2019-07-22	14:00	108,9515	0,1296	0,1251	34,1745
2019-07-30	8:00	108,9512	0,1296	0,1251	34,1731
2019-07-31	8:00	108,9511	0,1296	0,1251	34,1731

Paramètres

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

Code verrouillage:	HEA

Description du test

Test standard	EPA
Run #	2
Date	23-07-2019
Technicien	M.M
Project #	PI 20202

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	SILA	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1,25	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,999	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,990	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,997	
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20202
Date	23-07-2019
Technicien	M.M

Fuel data

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

Default Fuel Values

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

	Start	End
Barometer (kPa):	100,8	100,5
Barometer (in.Hg):	29,766229	29,67763883
Dry Bulb (F):	77	85,5
Humidity (%):	52,9	30,3
Air velocity (ft/min)	0	0

DGM #1	Final:	34550,362	cuft	Final:	978357,280	Liter
	Initial:	34503,675	cuft	Initial:	977035,250	Liter
DGM #2	Final:	32621,982	cuft	Final:	923751,640	Liter
	Initial:	32575,913	cuft	Initial:	922447,100	Liter

DGM room	Final:	471,750	cuft
	Initial:	420,840	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 245

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

Project nu.	PI 20202
Date	23-07-2019
Technicien	M.M

Preload data sheet

Test Load Weight: Lower	Ideal	Upper
7,88	8,75	9,63

Load Volume: 0,5590 cu. ft

Number of Spaces:

Spacer weight (lbs):

Loading Density: 14,317 lbs./ft3

Load Density (wet): 32,013 lbs./ft3

Dry Wood Density: 26,58087

Piece Size (in): Thick	Wide	x Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches
1,5	3,5	8	0,74	19,3	19,4	19,4	19,3	19,6	14,356	42,00
1,5	3,5	8	0,698	20,1	20,4	20,6	20,3	20,8	14,26712	42,00
1,5	3,5	8	0,682	19,9	19,6	19,4	19,7	19,3	13,35356	42,00
1,5	3,5	8	0,718	19,6	19,8	19,3	19,9	19,9	14,1446	42,00
1,5	3,5	8	0,724	20,1	20,4	20,3	20,3	20,6	14,72616	42,00
1,5	3,5	8	0,746	20,3	20,4	20,9	20,9	21	15,4422	42,00
1,5	3,5	8	0,736	21,1	21	21	20,1	20,9	15,32352	42,00
1,5	3,5	8	0,712	20,4	20,8	20,9	20,3	20,6	14,6672	42,00
										0,00
1,5	3,5	8	0,688	20,6	20,4	20,9	20,3	20,4	14,11776	42,00
1,5	3,5	8	0,686	20,9	20,3	20,8	20,9	20,6	14,2002	42,00
1,5	3,5	8	0,756	20,8	20,8	21	21,3	21,2	15,89112	42,00
1,5	3,5	8	0,744	21,4	21,6	21,3	21,9	22,1	16,11504	42,00
1,5	3,5	8	0,746	22	22,6	22,1	22,1	22,2	16,5612	42,00
1,5	3,5	8	0,7	21,6	21,3	21,3	21	19,9	14,714	42,00
1,5	3,5	8	0,74	19,6	19,9	20,1	20,6	20,2	14,8592	42,00
1,5	3,5	8	0,788	20	20,1	20,3	20,6	20,3	15,96488	42,00
										0,00
1,5	3,5	8	0,812	20,8	20,4	20,9	20,6	20,3	16,7272	42,00
1,5	3,5	8	0,774	20,9	21	21,1	20,5	20,6	16,11468	42,00
1,5	3,5	8	0,782	20,8	20,9	21	21	21,1	16,39072	42,00
1,5	3,5	8	0,762	19,9	19,3	19,6	19,4	19,2	14,84376	42,00
1,5	3,5	8	0,774	19,6	19,3	19,7	19,7	19,8	15,18588	42,00
1,5	3,5	8	0,774	19,6	19,3	19,3	19,4	19,4	15,0156	42,00
1,5	3,5	8	0,822	19,9	20	20,1	20,3	20,2	16,5222	42,00
1,5	3,5	8	0,792	20,1	20,6	20,7	20,5	20,4	16,20432	42,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
								SUM MC:	365,70812	

PreTest Load Weight: 17,90 lbs.

Dry Weight: 6,74 kg.

Average Moisture Content: %

Dry: 20,44

20,44

Must be 18-28

Wet: 16,97

must be 15,2-22

Project nu.	PI 20202
Date	23-07-2019
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
7,9	8,8	9,6

* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume: 0,28 cu. ft

Loading Density: 6,5 lbs./ft3

Number of Spaces: 20

Spacer weight: lbs

Load Density (wet): 28,3 lbs./ft3

Dry Wood Density: 23,7 lbs./ft3

Piece Size (in): Thick	Wide	Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
1,5	3,5	9	1,05	19,10	19,20	19,30	19,60	19,50	20,26832	47,25	19,3
1,5	3,5	9	0,89	20,10	20,60	20,40	20,60	20,50	18,23248	47,25	20,4
1,5	3,5	9	0,96	20,10	20,10	19,30	19,60	19,50	18,85232	47,25	19,7
1,5	3,5	9	0,97	19,10	19,50	19,30	19,60	19,50	18,7792	47,25	19,4
1,5	3,5	9	0,86	20,00	20,10	20,10	20,60	20,40	17,32544	47,25	20,2
1,5	3,5	9	1,05	19,40	19,60	19,30	19,40	19,30	20,2924	47,25	19,4
1,5	0,75	5	0,12			19,10			2,3302	5,63	19,1
1,5	0,75	5	0,11			19,60			2,0776	5,63	19,6
1,5	0,75	5	0,12			19,90			2,3084	5,63	19,9
1,5	0,75	5	0,11			19,70			2,2064	5,63	19,7
1,5	0,75	5	0,11			19,00			2,128	5,63	19,0
1,5	0,75	5	0,12			19,60			2,352	5,63	19,6
1,5	0,75	5	0,13			19,50			2,496	5,63	19,5
1,5	0,75	5	0,14			19,30			2,6248	5,63	19,3
1,5	0,75	5	0,10			19,30			2,0072	5,63	19,3
1,5	0,75	5	0,12			20,30			2,436	5,63	20,3
1,5	0,75	5	0,12			20,30			2,5172	5,63	20,3
1,5	0,75	5	0,12			20,10			2,4522	5,63	20,1
1,5	0,75	5	0,11			20,10			2,1708	5,63	20,1
1,5	0,75	5	0,122			20,60			2,5132	5,63	20,6
1,5	0,75	5	0,12			20,40			2,448	5,63	20,4
1,5	0,75	5	0,102			20,30			2,0706	5,63	20,3
1,5	0,75	5	0,106			19,2			2,0352	5,63	19,2
1,5	0,75	5	0,104			19,6			2,0384	5,63	19,6
1,5	0,75	5	0,106			19,4			2,0564	5,63	19,4
1,5	0,75	5	0,108			20			2,16	5,63	20,0
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	159,17876		19,8 %

Test Load Weight: 8,06 lbs.

Dry Weight: 3,05 kg.

Average Moisture Content: %

Dry: 19,74 Dry(EPA) 19,74 Dry(B415 19,74

19,74 Must be 19-25

Wet: 16,49 must be 15,2-22

Coal Bed Range: 1,6 lbs. to 2,0 lbs.

TEST CHARGE:

Coal bed weight: 1,6 lbs.

Project nu.	PI 20202
Date	23-07-2019
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,32 in. H20
Barometer: 29,900 in. Hg

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

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

PITOT CONSTANT=
0,922

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,065	75,36	0,2550
B center	0,064	74,25	0,2530
A1	0,052	75,29	0,2280
A2	0,054	75,19	0,2324
A3	0,052	75,26	0,2280
A4	0,052	74,55	0,2280
B1	0,051	75,150	0,2258
B2	0,052	75,230	0,2280
B3	0,055	75,230	0,2345
B4	0,052	74,900	0,2280
AVERAGE	0,0549	75,0410	0,2341

Project nu.	PI 20202
Date	23-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	30	847	848	14	32	849	850	23	39	851	852	28	853		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	110,2231	0,1276	0,1312	35,1741	110,1779	0,1280	0,1310	35,2011	110,2784	0,1277	0,1280	35,3475	0,1250	2019-07-22	17:00
Before (6)	110,2232	0,1275	0,1313	35,1742	110,1780	0,1279	0,1309	35,2012	110,2785	0,1276	0,1281	35,3476	0,1249	2019-07-23	09:00
After (1)	110,2233	0,1286	0,1301	35,1775	110,1781	0,1274	0,1304	35,2037	110,2787	0,1289	0,1274	35,3500	0,1250	2019-07-23	15:00
After (2)	110,2233	0,1286	0,1301	35,1766	110,1781	0,1274	0,1304	35,2029	110,2786	0,1289	0,1274	35,3495	0,1250	2019-07-30	08:00
After (3)	110,2233	0,1286	0,1301	35,1765	110,1781	0,1274	0,1304	35,2028	110,2786	0,1290	0,1275	35,3495	0,1250	2019-07-31	08:00
After (4)															
After (5)															
After (6)	110,2233	0,1286	0,1301	35,1765	110,1781	0,1274	0,1304	35,2028	110,2786	0,1290	0,1275	35,3495	0,1250	2019-07-31	08:00
Difference	0,0001	0,0011	-0,0012	0,0023	0,0001	-0,0005	-0,0005	0,0016	0,0001	0,0014	-0,0006	0,0019	0,0001		
Total (mg)		2,3				3				2,8			0,1		
Total ajusté (mg)		**2,20**				**2,90**				**2,70**					

Project nu.	PI 20202
Date	23-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	30	847	848	14	32	849	850	23	39	851	852	28	853		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	110,2231	0,1276	0,1312	35,1741	110,1779	0,1280	0,1310	35,2011	110,2784	0,1277	0,1280	35,3475	0,1250	2019-07-22	17:00
Before (6)	110,2232	0,1275	0,1313	35,1742	110,1780	0,1279	0,1309	35,2012	110,2785	0,1276	0,1281	35,3476	0,1249	2019-07-23	09:00
After (1)	110,2233	0,1286	0,1301	35,1775	110,1781	0,1274	0,1304	35,2037	110,2787	0,1289	0,1274	35,3500	0,1250	2019-07-23	15:00
After (2)	110,2233	0,1286	0,1301	35,1766	110,1781	0,1274	0,1304	35,2029	110,2786	0,1289	0,1274	35,3495	0,1250	2019-07-30	08:00
After (3)	110,2233	0,1286	0,1301	35,1765	110,1781	0,1274	0,1304	35,2028	110,2786	0,1290	0,1275	35,3495	0,1250	2019-07-31	08:00
After (4)															
After (5)															
After (6)	110,2233	0,1286	0,1313	35,1765	110,1781	0,1279	0,1309	35,2028	110,2786	0,1290	0,1281	35,3495	0,1250	2019-07-31	08:00
Difference	0,0001	0,0011	0,0000	0,0023	0,0001	0,0000	0,0000	0,0016	0,0001	0,0014	0,0000	0,0019	0,0001		
Total (mg)		3,5				5,2				3,4			0,1		
Total ajusté (mg)		**3,40**				**5,10**				**3,30**					

Project nu.	PI 20202
Date	23-07-2019
Technicien	M.M

Negative filter weiht rounded to zero, emission rate 1,0gr/hr

SFBA EPA EMISSION RESULTS

Test Duration: **189** min

PRESSURE FACTOR:	DGM 1	0,96081	
	DGM 2	0,96075	
	DGM 3	0,99338	
TEMPERATURE FACTORS	DGM 1	0,97174	
	DGM 2	0,97095	
	DGM 3	0,97492	
VOLUMES SAMPLED	DGM 1	43,561	SCft
	DGM 2	42,552	Scft
	DGM 3	49,167	SCft

TOTAL TUNNEL VOLUME : 33921

SAMPLE RATIOS

Sample Train 1:	778,696
Sample Train 2:	797,166

Paticulate concentration

Sample Train 1	**0,000069**	g/dscf
Sample Train 2	**0,000066**	g/dscf
Room	**0,000002**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,27**	g
Sample Train 2	**2,16**	g

EMISSION RATES

Sample Train 1	**0,72**	g/hr
Sample Train 2	**0,69**	g/hr

1st hour emission rate **1,79** g/hr

	Train 1	Train 2
Cs	6,887E-05	6,58023E-05

RESULTS

Average emission rate: 0,7 g/hr

Burn Rate : 0,970 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,721934	in Hg
Start:	29,766229	in Hg
End:	29,677639	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	34550,362	Cuft
	Initial:	34503,675	Cuft
DGM 2	Final:	32621,982	Cuft
	Initial:	32575,913	Cuft
DGM #3	Final:	471,750	Cuft
	Initial:	420,840	Cuft

TEMPERATURES

DGM 1	543,357	°R
DGM 2	543,798	°R

CALIBRATION FACTORS

DGM 1	0,9993
DGM 2	0,9901
DGM #3	0,9972

TUNNEL FLOW RATE: 179,475 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	3,00	mg
Total Sample Train 2:	2,80	mg
Total Sample Train 1 1st hour:	2,30	mg

DEVIATION: 2,35%

* Elapsed Time min	Raw data row	* Weight Remaining lbs	* CO %	* CO_2 %	* O_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	* Catalyst up °F	Mass flow 1 Reading cuft/min	DGM 1 Inlet T oF	DGM 1 Outlet T oF	Filter 1 Temp oF	Mass flow 2 Reading cuft/min	DGM 2 Inlet T oF	DGM 2 Outlet T oF	Filter 2 Temp oF	Tunnel Velo Pressure in wc	Flue draft Pressure in wc	Change in Surface Temp. °F
0,00	245,0	8,1	0,2	7,0	0,0	328,2	78,9	117,2	407,0	421,3	513,1	519,2	136,4	554,2	0,22	81,20	81,17	80,86	0,23	81,79	81,57	80,52	0,07	0,05	0
1,0	246,0	7,9	0,1	5,3	0,0	319,5	79,0	112,0	400,5	415,8	502,8	501,1	137,2	488,3	0,23	81,67	81,24	81,16	0,23	82,00	81,71	80,63	0,07	0,05	-7,945877
2,0	247,0	7,9	0,1	3,2	0,0	327,6	79,1	109,5	397,5	409,1	488,0	479,8	135,4	602,5	0,23	81,66	81,23	81,27	0,23	81,99	81,71	80,65	0,07	0,05	-17,46237
3,0	248,0	7,8	0,0	4,4	0,0	340,2	79,2	109,0	398,7	403,7	474,9	462,4	135,3	676,9	0,23	81,74	81,24	81,38	0,23	82,04	81,71	80,73	0,07	0,05	-24,39686
4,0	249,0	7,7	0,0	5,0	0,0	352,8	79,0	110,3	402,3	401,0	463,9	450,0	134,2	734,2	0,23	81,82	81,26	81,52	0,23	82,09	81,72	80,85	0,07	0,05	-29,15842
5,0	250,0	7,6	0,0	8,4	0,0	353,0	79,1	108,5	408,9	398,4	455,8	446,7	132,8	785,2	0,23	81,79	81,29	81,63	0,23	82,10	81,73	80,89	0,07	0,05	-30,92523
6,0	251,0	7,5	0,0	8,9	0,0	331,4	79,1	104,4	413,9	395,1	451,1	446,9	132,1	828,4	0,23	81,65	81,31	81,74	0,23	82,01	81,73	80,98	0,07	0,05	-31,61285
7,0	252,0	7,4	0,0	7,6	0,0	323,5	79,1	104,2	419,1	391,2	446,3	443,3	132,2	834,9	0,23	81,64	81,30	81,84	0,23	82,01	81,77	81,04	0,07	0,05	-33,00936
8,0	253,0	7,4	0,0	5,6	0,0	320,3	79,0	103,1	423,8	387,3	440,9	437,2	131,9	820,0	0,23	81,65	81,33	81,95	0,23	82,01	81,79	81,19	0,07	0,05	-35,20828
9,0	254,0	7,3	0,0	5,2	0,0	318,1	79,1	102,8	427,4	383,9	435,7	430,5	132,6	798,9	0,23	81,64	81,33	82,06	0,23	82,04	81,82	81,27	0,07	0,05	-37,4344
10,0	255,0	7,3	0,0	5,4	0,0	317,0	79,0	102,4	430,5	380,6	431,4	423,7	132,1	800,8	0,23	81,56	81,31	82,20	0,23	81,95	81,83	81,44	0,07	0,05	-39,7581
11,0	256,0	7,2	0,0	5,9	0,0	319,1	78,8	102,5	433,8	378,0	427,2	418,2	132,2	822,8	0,23	81,51	81,34	82,33	0,23	81,93	81,83	81,58	0,07	0,05	-41,55823
12,0	257,0	7,1	0,0	1,9	0,0	324,3	79,1	102,9	438,0	374,9	424,3	414,3	132,1	828,6	0,23	81,44	81,35	82,49	0,23	81,87	81,84	81,69	0,07	0,05	-42,67845
13,0	258,0	7,0	0,0	2,4	0,0	331,5	79,3	104,7	443,3	371,7	425,9	412,8	131,9	871,6	0,23	81,41	81,37	82,64	0,23	81,84	81,85	81,83	0,07	0,05	-42,31569
14,0	259,0	6,9	0,1	3,0	0,0	332,4	79,0	103,2	449,3	368,5	432,1	411,5	131,1	858,6	0,23	81,42	81,36	82,72	0,23	81,82	81,85	81,90	0,07	0,05	-40,89862
15,0	260,0	6,8	0,0	6,5	0,0	330,7	79,1	102,9	454,1	365,7	437,4	408,8	131,3	866,5	0,23	81,55	81,41	82,84	0,23	81,93	81,87	82,02	0,07	0,05	-39,93145
16,0	261,0	6,8	0,0	5,5	0,0	330,9	79,2	103,8	458,1	363,3	438,1	406,0	131,1	849,1	0,23	81,71	81,43	82,98	0,23	82,01	81,90	82,17	0,07	0,05	-40,09002
17,0	262,0	6,7	0,0	8,1	0,0	335,2	79,4	104,7	462,1	361,0	436,7	405,5	131,7	855,8	0,23	81,74	81,46	83,13	0,23	82,05	81,92	82,30	0,07	0,05	-39,99971
18,0	263,0	6,6	0,0	11,5	0,0	338,7	79,4	104,4	466,6	358,6	438,6	409,6	131,1	853,1	0,23	81,72	81,46	83,25	0,23	82,05	81,94	82,45	0,07	0,05	-38,52327
19,0	264,0	6,5	0,0	12,2	0,0	341,1	79,2	104,9	470,8	356,2	444,6	413,1	130,7	856,1	0,23	81,62	81,45	83,36	0,23	82,01	81,97	82,56	0,07	0,05	-36,33812
20,0	265,0	6,4	0,0	10,2	0,0	342,8	79,4	105,3	474,5	354,2	450,8	415,1	130,8	849,2	0,23	81,62	81,47	83,48	0,23	82,01	81,97	82,69	0,07	0,05	-34,33841
21,0	266,0	6,3	0,0	11,6	0,0	342,7	79,1	104,8	478,2	352,6	456,3	415,1	130,2	838,1	0,23	81,57	81,48	83,58	0,23	81,98	81,96	82,82	0,07	0,05	-32,93399
22,0	267,0	6,2	0,0	9,2	0,0	340,3	79,4	104,9	480,2	351,2	461,2	414,0	130,3	818,0	0,23	81,57	81,48	83,70	0,23	81,95	81,96	82,91	0,07	0,05	-32,04998
23,0	268,0	6,1	0,0	9,5	0,0	341,1	79,4	105,6	481,6	349,8	464,4	413,4	130,6	831,2	0,23	81,55	81,48	83,83	0,23	81,96	81,99	83,02	0,07	0,05	-31,44673
24,0	269,0	6,0	0,0	10,3	0,0	340,7	79,5	105,1	483,2	348,7	467,6	413,7	130,5	823,8	0,23	81,59	81,51	83,93	0,23	81,97	82,00	83,15	0,07	0,05	-30,67889
25,0	270,0	5,9	0,0	7,8	0,0	339,2	79,5	105,2	484,6	347,7	471,0	413,3	130,7	816,5	0,23	81,55	81,51	84,06	0,23	81,98	82,01	83,27	0,07	0,05	-29,97038
26,0	271,0	5,8	0,0	6,8	0,0	338,8	79,6	105,9	485,3	346,7	473,4	412,5	131,0	818,4	0,23	81,67	81,54	84,16	0,23	82,05	82,03	83,37	0,07	0,05	-29,61731
27,0	272,0	5,8	0,0	8,3	0,0	339,3	79,7	105,7	486,2	345,6	475,6	411,7	130,6	827,4	0,23	81,71	81,57	84,26	0,23	82,07	82,04	83,46	0,07	0,05	-29,49161
28,0	273,0	5,7	0,0	8,9	0,0	340,0	79,7	105,7	487,4	344,9	478,6	411,5	130,4	816,8	0,23	81,75	81,59	84,36	0,23	82,10	82,08	83,60	0,07	0,05	-28,86462
29,0	274,0	5,6	0,0	7,5	0,0	338,4	79,6	105,5	488,3	344,1	481,3	411,3	130,2	810,6	0,23	81,85	81,60	84,48	0,23	82,17	82,10	83,71	0,07	0,05	-28,38428
30,0	275,0	5,5	0,0	8,4	0,0	338,5	79,3	104,8	488,6	343,0	483,4	411,2	129,1	800,3	0,23	81,99	81,62	84,57	0,23	82,27	82,09	83,82	0,07	0,05	-28,3559
31,0	276,0	5,5	0,0	7,7	0,0	337,0	79,5	104,1	488,3	342,7	486,3	411,4	129,1	789,4	0,23	82,07	81,64	84,67	0,23	82,32	82,11	83,90	0,07	0,05	-27,87022
32,0	277,0	5,4	0,0	9,0	0,0	338,0	79,7	105,3	488,2	342,6	489,3	411,6	129,6	798,7	0,23	82,13	81,65	84,71	0,23	82,36	82,14	83,96	0,07	0,05	-27,17385
33,0	278,0	5,3	0,0	12,5	0,0	341,4	79,7	106,6	489,1	342,6	495,3	413,7	129,5	832,2	0,23	82,18	81,69	84,82	0,23	82,39	82,14	84,04	0,07	0,05	-25,37366
34,0	279,0	5,2	0,0	11,7	0,0	343,5	79,8	106,2	491,3	343,2	502,5	416,0	129,4	847,5	0,23	82,18	81,72	84,91	0,23	82,43	82,17	84,09	0,07	0,05	-22,92764
35,0	280,0	5,1	0,0	11,7	0,0	344,8	79,8	106,7	493,4	343,6	509,3	418,3	129,0	842,9	0,23	82,19	81,72	84,99	0,23	82,48	82,21	84,19	0,07	0,05	-20,68331
36,0	281,0	5,0	0,0	10,9	0,0	345,0	79,7	106,2	495,7	343,8	516,1	420,6	128,0	850,4	0,23	82,21	81,75	85,08	0,23	82,50	82,23	84,27	0,07	0,05	-18,60111
37,0	282,0	4,9	0,0	9,1	0,0	345,1	79,4	105,9	497,7	344,3	521,1	422,2	128,0	840,2	0,23	82,28	81,78	85,14	0,23	82,55	82,22	84,33	0,07	0,05	-16,76019
38,0	283,0	4,8	0,0	8,2	0,0	343,3	79,9	105,7	499,6	345,2	524,3	422,8	128,3	825,8	0,23	82,37	81,80	85,21	0,23	82,60	82,23	84,39	0,07	0,05	-15,40105
39,0	284,0	4,7	0,0	10,4	0,0	346,2	80,2	106,1	501,5	346,2	528,1	426,2	128,6	847,3	0,23	82,35	81,83	85,30	0,23	82,59	82,27	84,46	0,07	0,05	-13,29809
40,0	285,0	4,6	0,0	11,6	0,0	347,9	80,3	107,4	504,2	347,2	533,4	429,9	128,5	866,5	0,23	82,31	81,82	85,39	0,23	82,59	82,30	84,55	0,07	0,05	-10,77838
41,0	286,0	4,5	0,0	11,6	0,0	349,8	80,4	108,2	506,9	348,4	538,9	432,3	128,2	874,2	0,23	82,33	81,86	85,50	0,23	82,65	82,32	84,62	0,07	0,05	-8,465131
42,0	287,0	4,4	0,0	11,0	0,0	352,7	80,3	107,8	510,3	349,4	544,3	434,3	127,3	880,2	0,23	82,40	81,86	85,58	0,23	82,70	82,35	84,71	0,07	0,05	-6,300316
43,0	288,0	4,3	0,0	11,7	0,0	354,4	80,3	107,6	514,1	350,9	549,9	436,2	127,8	895,3	0,23	82,58	81,90	85,67	0,23	82,85	82,40	84,78	0,07	0,05	-3,642567
44,0	289,0	4,2	0,0	12,3	0,0	356,3	80,2	108,0	518,2	352,1	555,2	437,7	127,3	904,8	0,23	82,65	81,94	85,74	0,23	82,92	82,42	84,86	0,07	0,05	-1,335922
45,0	290,0	4,2	0,0	11,9	0,0	358,3	80,5	107,5	523,2	353,9	560,8	439,3	127,5	915,1	0,23	82,71	81,98	85,79	0,23	83,00	82,45	84,94	0,07	0,05	1,520819
46,0	291,0	4,1	0,0	12,2	0,0	359,9	80,6	108,5	527,9	355,5	566,0	440,8	127,3	929,7	0,23	82,72	82,00	85,87	0,23	83,02	82,48	85,01	0,07	0,05	4,074501
47,0	292,0	4,0	0,0	13,0	0,0	361,5	80,7	109,4	533,0	357,2	571,8	442,6	127,1	933,0	0,23	82,75	82,03	85,94	0,23	83,08	82,51	85,11	0,07	0,05	6,9213746
48,0	293,0	3,9	0,0	12,3	0,0	363,3	80,6	109,7	538,6	359,1	577,9	444,7	126,9	954,5	0,23	82,83	82,05	86,04	0,23	83,15	82,55	85,17	0,07	0,05	10,018665
49,0	294,0	3,8	0,0	13,7	0,0	366,4	80,8	109,8	544,9	361,1	584,4	447,3	126,7	959,8	0,23	82,86	82,07	86,08	0,23	83,19	82,59	85,24	0,07	0,05	13,473507
50,0	295,0	3,7	0,0	13,5	0,0	369,3	80,4	110,1	550,9	362,9	590,5	450,2	125,5	970,9	0,23	82,94	82,13	86,20	0,23	83,27	82,63	85,34	0,07	0,05	16,566769
51,0	296,0	3,6	0,0	13,6	0,0	371,6	80,8	109,8	557,1	365,3	596,7	453,7	126,2	968,9	0,23	83,05	82,17	86,26	0,23	83,36	82,67	85,41	0,07	0,06	20,390021
52,0	297,0	3,4	0,0	14,1	0,0	373,0	80,7	109,4	563,5	367,4	603,2	457,5	125,9	988,5	0,23	83,03	82,16	86,32	0,23	83,35	82,67	85,44	0,07	0,05	24,079105
53,0	298,0	3,3	0,0	13,5	0,0	375,5	80,8	109,8	570,4	369,7	608,4	461,3	125,5	1016,9	0,23	83,04	82,18	86,41	0,23	83,39	82,70	85,47	0,07	0,06	27,602453
54,0	299,0	3,2	0,0	14,7	0,0	377,4	80,9	109,4	577,9	372,3	613,3	464,8	125,7	1012,5	0,23	83,08	82,20	86,48	0,23	83,43	82,71	85,57	0,07	0,06	31,393434
55,0	300,0	3,1	0,0	14,9	0,0	378,4	81,1	110,1	585,2	375,0	618,7	468,8	125,4	1024,3	0,23	83,11	82,22	86,53	0,23	83,44	82,73	85,60	0,07	0,06	35,210893
56,0	301,0	3,0	0,1	15,3	0,0	379,4	81,1	111,1	592,5	377,9	624,6	473,2	125,1	1045,7	0,23	83,16	82,24	86,62	0,23	83,50	82,76	85,70	0,07	0,06	39,238812
57,0	302,0	2,9	0,1	15,3	0,0	381,8	81,1	111,1	600,5	380,4	630,8	477,7	125,0	1042,3	0,23	83,27	82,31	86,68	0,23	83,61	82,79	85,78	0,07	0,06	43,435687
58,0	303,0	2,8	0,0	14,6	0,0	384,1	81,4	111,3	607,4	383,0	636,9	481,9	124,8	1032,3	0,23	83,29	82,31	86,76	0,23	83,65	82,85	85,87	0,07	0,06	47,413184
59,0	304,0	2,8	0,0	13,7	0,0	385,7	80,7	111,2	613,1	385,8	642,8	486,2	124,1	1036,8	0,23	83,29	82,34	86,76	0,23	83,69	82,86	85,91	0,07	0,06	50,96618
60,0	305,0	2,7	0,0	14,1	0,0	386,2	80,9	110,5	618,2	389,0	648,5	490,9	124,2	1029,4	0,23	83,40	82,37	81,30	0,23	83,78	82,90	85,94	0,07	0,06	54,723056
61,0	306,0	2,6	0,0	14,0	0,0	387,0	81,3	111,7	622,8	391,8	653,6	495,5	123,8	1024,8	0,23	83,40	82,40	81,40	0,23	83,81	82,92	86,02	0,07	0,06	58,067519
62,0	307,0	2,5	0,0	13,3	0,0	386,6	81,5	111,1	626,0	394,6	658,4	500,1	123,9	1019,2	0,23	83,43	82,43	81,51	0,23	83,82	82,95	86,11	0,07	0,05	61,166196
63,0	308,0	2,4	0,0	12,7	0,0	386,2	81,1	110,6	628,6	396,7	663,1	505,1	122,8	1006,9	0,23	83,41	82,43	81,66	0,23	83,83	83,00	86,18	0,07	0,06	63,836363
64,0	309,0	2,4	0,0	12,5	0,0	386,2	81,6	110,0	630,3	399,9	667,7	510,7	123,4	996,7	0,23	83,55	82,45	81,78	0,23	83,91	82,98	86,20	0,07	0,06	66,986157
65,0	310,0	2,3	0,0	11,9	0,0	386,2	81,7	111,3	631,0	402,7	672,9	517,4	123,2	985,0	0,23	83,58	82,48	81,94	0,23	83,98	83,00	86,31	0,07	0,06	69,999324
66,0	311,0	2,2	0,0	11,4	0,0	386,0	81,6	111,4	631,1	405,4	678,0	524,6	123,0	971,5	0,23	83,66	82,51	82,14	0,23	84,01	83,04	86,37	0,07	0,06	72,978542
67,0	312,0	2,2	0,0	10,4	0,0	385,0	81,6	111,7	629,7	407,8	682,2	532,4	122,4	956,1	0,23	83,62	82,54	82,30	0,23	84,05	83,08	86,42	0,07	0,06	75,479364
68,0	313,0	2,1	0,0	9,8	0,0	383,1	81,7	111,6	627,4	410,5	685,5	540,7	122,7	942,3	0,23	83,64	82,59	82,50	0,23	84,11	83,08	86,49	0,07	0,06	77,914522
69,0	314,0	2,1	0,0	9,4	0,0	381,6	81,7	111,3	624,3	412,6	687,3	549,9	122,6	935,4	0,23	83,63	82,60	82,68	0,23	84,14	83,12	86,55	0,07	0,06	79,923184
70,0	315,0	2,0	0,0	9,6	0,0	379,4	81,2	111,7	620,4	414,9	688,1	560,4	122,4	926,2	0,23	83,65	82,64	82,85	0,23	84,17	83,16	86,63	0,07	0,06	81,791487
71,0	316,0	2,0	0,0	9,2	0,0	377,1	81,6	110,6	616,4	417,1	687,7	570,0	122,2	915,0	0,23	83,67	82,66	83,07	0,23	84,20	83,19	86,71	0,07	0,05	83,245067
72,0	317,0	1,9	0,0	8,8	0,0	374,4	81,7	110,9	611,8	419,2	685,8	579,1	121,9	906,8	0,23	83,66	82,70	83,27	0,23	84,20	83,21	86,76	0,07	0,05	84,164597
73,0	318,0	1,9	0,0	9,1	0,0	372,4	81,2	110,4	606,8	421,3	681,9	588,9	121,2	900,8	0,23	83,75	82,72	83,44	0,23	84,27	83,25	86,80	0,07	0,05	84,596039
74,0	319,0	1,9	0,0	9,0	0,0	369,2	81,4	109,7	601,5	422,8	677,2	598,2	121,4	883,6	0,23	83,83	82,77	83,66	0,23	84,30	83,29	86,84	0,07	0,05	84,793527
75,0	320,0	1,8	0,0	8,9	0,0	367,1	81,4	109,2	596,3	424,6	672,1	605,7	120,6	867,4	0,23	83,80	82,78	83,81	0,23	84,28	83,31	86,83	0,07	0,05	84,432745
76,0	321,0	1,8	0,0	8,7	0,0	363,9	81,3	109,0	590,4	426,7	667,6	611,4	120,5	851,9	0,23	83,81	82,79	83,98	0,23	84,24	83,29	86,81	0,07	0,05	83,933072
77,0	322,0	1,8	0,0	8,5	0,0	361,0	81,5	109,0	584,6	429,1	663,9	615,6	121,1	840,1	0,23	83,79	82,79	84,14	0,23	84,23	83,30	86,84	0,07	0,05	83,420047
78,0	323,0	1,7	0,0	8,0	0,0	357,0	81,9	109,0	578,4	431,0	660,5	618,3	120,8	828,3	0,23	83,74	82,80	84,30	0,23	84,22	83,32	86,88	0,07	0,05	82,376375
79,0	324,0	1,7	0,0	7,8	0,0	353,7	81,9	108,3	572,3	432,3	657,5	620,2	120,8	817,7	0,23	83,73	82,84	84,48	0,23	84,25	83,34	86,97	0,07	0,05	81,187405
80,0	325,0	1,7	0,0	7,8	0,0	350,9	82,1	109,0	565,5	433,6	654,0	621,7	120,6	810,3	0,23	83,78	82,86	84,63	0,23	84,30	83,38	87,04	0,07	0,05	79,672048
81,0	326,0	1,7	0,0	7,9	0,0	348,7	81,6	109,2	559,2	434,9	650,9	623,4	120,4	803,3	0,23	83,87	82,89	84,80	0,23	84,37	83,41	87,06	0,07	0,05	78,326242
82,0	327,0	1,6	0,0	7,9	0,0	346,3	81,4	107,9	553,0	435,7	648,1	625,4	120,1	796,3	0,23	83,93	82,92	84,95	0,23	84,39	83,45	87,08	0,07	0,05	77,047328
83,0	328,0	1,6	0,0	8,0	0,0	342,9	81,5	107,5	547,0	437,5	645,7	626,8	120,3	790,7	0,23	83,96	82,96	85,08	0,23	84,46	83,49	87,14	0,07	0,05	76,026057
84,0	329,0	1,6	0,0	7,9	0,0	340,8	81,4	106,8	541,4	438,5	643,5	628,8	120,2	785,6	0,23	83,85	82,93	85,20	0,23	84,42	83,49	87,16	0,07	0,05	75,050147
85,0	330,0	1,6	0,0	7,9	0,0	338,2	81,5	107,1	535,7	439,9	640,9	630,1	120,4	781,5	0,23	83,87	82,98	85,29	0,23	84,40	83,50	87,17	0,07	0,05	73,994963
86,0	331,0	1,6	0,0	7,9	0,0	335,7	81,3	105,8	530,5	440,5	638,7	631,9	120,4	778,9	0,23	83,68	82,95	85,36	0,23	84,25	83,48	87,15	0,07	0,05	72,951526
87,0	332,0	1,5	0,0	7,9	0,0	333,4	81,6	106,5	525,3	441,6	636,1	633,6	120,5	775,8	0,23	83,64	82,95	85,47	0,23	84,25	83,47	87,17	0,07	0,05	71,996632
88,0	333,0	1,5	0,0	7,9	0,0	331,4	81,6	106,4	520,3	442,1	633,5	634,8	120,3	774,3	0,23	83,66	82,99	85,60	0,23	84,24	83,47	87,16	0,07	0,05	70,763751
89,0	334,0	1,5	0,0	7,8	0,0	330,4	81,3	105,4	515,5	442,2	631,1	635,7	119,6	772,6	0,23	83,68	83,00	85,68	0,23	84,20	83,46	87,13	0,07	0,05	69,399994
90,0	335,0	1,5	0,0	7,8	0,0	328,7	81,3	104,3	511,5	443,0	628,4	636,0	120,3	770,2	0,23	83,65	82,99	85,73	0,23	84,17	83,47	87,12	0,07	0,05	68,413312
91,0	336,0	1,5	0,0	7,8	0,0	326,4	81,6	105,8	507,3	443,2	625,7	635,8	120,4	767,9	0,23	83,57	83,01	85,83	0,23	84,11	83,47	87,13	0,07	0,05	67,066661
92,0	337,0	1,5	0,0	7,8	0,0	324,3	81,3	105,5	503,3	443,0	623,2	635,7	120,0	765,5	0,23	83,51	83,02	85,91	0,23	84,11	83,51	87,18	0,07	0,05	65,637236
93,0	338,0	1,4	0,0	7,8	0,0	322,1	81,8	105,7	499,5	443,0	620,8	635,5	120,5	763,7	0,23	83,64	83,04	85,99	0,23	84,19	83,55	87,21	0,07	0,05	64,431564
94,0	339,0	1,4	0,0	7,9	0,0	320,5	81,7	104,9	496,2	443,0	618,2	635,0	120,2	761,7	0,23	83,74	83,09	86,04	0,23	84,24	83,58	87,20	0,07	0,05	63,091884
95,0	340,0	1,4	0,0	7,9	0,0	318,8	81,9	105,4	493,0	443,1	615,9	634,4	120,5	759,3	0,23	83,76	83,11	86,12	0,23	84,30	83,60	87,21	0,07	0,05	61,973849
96,0	341,0	1,4	0,0	7,8	0,0	317,9	81,9	105,5	489,5	442,9	613,8	634,2	120,7	757,2	0,23	83,67	83,14	86,22	0,23	84,24	83,63	87,21	0,07	0,04	60,819403
97,0	342,0	1,4	0,0	7,9	0,0	316,7	82,1	104,2	486,8	442,7	611,5	633,3	121,0	755,6	0,23	83,55	83,11	86,26	0,23	84,19	83,65	87,24	0,07	0,05	59,642539
98,0	343,0	1,3	0,0	7,9	0,0	315,1	81,8	103,8	483,7	442,6	609,3	632,6	120,7	754,0	0,23	83,48	83,11	86,29	0,23	84,13	83,63	87,20	0,07	0,05	58,362437
99,0	344,0	1,3	0,0	7,9	0,0	313,8	82,0	104,9	480,8	442,4	607,5	632,2	120,7	751,9	0,23	83,54	83,15	86,36	0,23	84,18	83,64	87,22	0,07	0,04	57,284175
100,0	345,0	1,3	0,0	7,9	0,0	312,5	81,8	102,7	478,2	442,6	605,4	631,0	121,0	750,6	0,23	83,63	83,19	86,38	0,23	84,23	83,67	87,21	0,07	0,05	56,214143
101,0	346,0	1,3	0,0	7,8	0,0	310,9	81,3	103,5	475,5	442,1	603,5	630,4	121,3	749,5	0,23	83,64	83,22	86,39	0,23	84,20	83,68	87,20	0,07	0,04	55,14811

102,0	347,0	1,3	0,0	7,9	0,0	309,4	81,8	103,6	472,9	441,7	601,6	629,2	121,6	748,8	0,23	83,64	83,24	86,46	0,23	84,17	83,66	87,17	0,07	0,04	53,972646
103,0	348,0	1,2	0,0	7,9	0,0	308,1	81,4	103,4	470,5	441,1	600,0	628,0	121,7	747,3	0,23	83,55	83,24	86,45	0,23	84,11	83,66	87,12	0,07	0,04	52,844185
104,0	349,0	1,2	0,0	7,9	0,0	307,4	81,8	103,1	468,3	440,9	598,1	626,8	121,6	747,5	0,23	83,43	83,24	86,49	0,23	84,04	83,68	87,11	0,07	0,04	51,728862
105,0	350,0	1,2	0,0	7,8	0,0	306,0	82,0	103,5	466,3	440,7	596,4	625,0	122,0	746,3	0,23	83,33	83,23	86,53	0,23	83,99	83,69	87,07	0,07	0,04	50,657907
106,0	351,0	1,2	0,0	7,8	0,0	305,3	81,8	104,3	464,2	440,1	594,7	623,1	122,3	745,7	0,23	83,32	83,26	86,57	0,23	83,97	83,69	87,10	0,07	0,04	49,454549
107,0	352,0	1,2	0,0	7,8	0,0	305,1	82,0	103,6	462,4	439,7	593,1	621,3	122,5	744,6	0,23	83,31	83,25	86,60	0,23	83,99	83,72	87,07	0,07	0,04	48,352005
108,0	353,0	1,2	0,0	7,8	0,0	304,6	81,6	102,9	460,6	438,9	591,3	619,7	121,7	744,8	0,23	83,29	83,28	86,62	0,23	83,96	83,72	87,06	0,07	0,04	47,011558
109,0	354,0	1,1	0,0	7,8	0,0	303,7	81,4	101,7	459,1	438,2	589,6	617,9	122,0	743,9	0,23	83,40	83,29	86,62	0,23	84,03	83,73	87,05	0,07	0,04	45,929187
110,0	355,0	1,1	0,0	7,8	0,0	303,5	81,6	102,3	457,7	437,7	587,7	616,2	122,7	743,0	0,23	83,36	83,27	86,61	0,23	83,98	83,73	86,99	0,07	0,04	44,95414
111,0	356,0	1,1	0,0	7,8	0,0	302,9	81,3	101,0	456,4	437,4	585,6	614,2	123,4	743,4	0,23	83,32	83,28	86,59	0,23	83,93	83,73	86,97	0,07	0,04	43,982843
112,0	357,0	1,1	0,0	7,7	0,0	301,1	81,7	101,8	454,8	437,0	584,0	613,2	123,3	742,7	0,23	83,26	83,28	86,58	0,23	83,91	83,74	86,94	0,07	0,04	43,025436
113,0	358,0	1,1	0,0	7,8	0,0	300,2	81,4	102,1	453,4	436,3	582,3	612,2	123,2	743,2	0,23	83,28	83,29	86,59	0,23	83,91	83,74	86,95	0,07	0,04	42,052649
114,0	359,0	1,1	0,0	7,8	0,0	299,5	81,7	101,3	452,2	436,1	580,5	610,7	123,6	742,9	0,23	83,33	83,27	86,60	0,23	83,92	83,75	86,90	0,07	0,04	41,202887
115,0	360,0	1,0	0,0	7,8	0,0	299,0	81,7	101,7	451,0	435,4	579,0	609,7	123,3	743,6	0,23	83,35	83,28	86,59	0,23	83,93	83,76	86,87	0,07	0,04	40,277234
116,0	361,0	1,0	0,0	7,7	0,0	298,3	81,7	102,2	449,9	434,8	577,5	608,2	124,2	743,4	0,23	83,31	83,31	86,60	0,23	83,91	83,76	86,87	0,07	0,04	39,507617
117,0	362,0	1,0	0,0	7,8	0,0	297,5	81,9	102,1	448,9	434,5	576,0	607,1	124,3	741,5	0,23	83,31	83,29	86,62	0,23	83,91	83,77	86,86	0,07	0,04	38,732233
118,0	363,0	1,0	0,0	7,8	0,0	297,0	82,0	102,0	448,0	434,2	574,6	606,1	124,7	739,4	0,23	83,37	83,33	86,60	0,23	83,98	83,81	86,83	0,07	0,04	38,096523
119,0	364,0	1,0	0,0	7,8	0,0	296,4	82,2	102,1	446,9	434,0	573,2	604,8	124,9	738,5	0,23	83,45	83,38	86,63	0,23	84,07	83,84	86,81	0,07	0,04	37,333873
120,0	365,0	0,9	0,0	7,8	0,0	295,6	82,0	102,5	445,6	433,4	572,3	603,9	124,6	737,8	0,23	83,49	83,41	86,66	0,23	84,08	83,86	86,80	0,07	0,04	36,532809
121,0	366,0	0,9	0,0	7,9	0,0	295,8	82,3	101,9	444,7	433,4	571,1	602,4	125,3	736,9	0,23	83,57	83,41	86,67	0,23	84,14	83,89	86,80	0,07	0,04	35,945779
122,0	367,0	0,9	0,0	7,8	0,0	295,2	82,2	102,7	443,7	432,5	570,4	601,4	124,7	736,5	0,23	83,63	83,45	86,70	0,23	84,19	83,91	86,82	0,07	0,04	35,122681
123,0	368,0	0,9	0,0	7,8	0,0	295,6	82,4	101,7	442,6	432,6	569,1	600,1	125,0	736,6	0,23	83,72	83,47	86,71	0,23	84,25	83,94	86,80	0,07	0,04	34,45723
124,0	369,0	0,9	0,0	7,8	0,0	294,9	82,4	101,5	442,0	432,3	568,5	598,5	125,5	736,3	0,23	83,80	83,50	86,72	0,23	84,31	83,97	86,75	0,07	0,04	33,958206
125,0	370,0	0,9	0,0	7,8	0,0	294,3	82,0	100,9	441,3	432,1	567,7	597,1	126,0	736,1	0,23	83,76	83,51	86,71	0,23	84,35	84,00	86,75	0,07	0,04	33,402211
126,0	371,0	0,8	0,0	7,8	0,0	293,8	82,2	101,7	440,3	431,6	566,9	595,8	126,0	735,7	0,23	83,73	83,53	86,74	0,23	84,30	83,99	86,75	0,07	0,04	32,700646
127,0	372,0	0,8	0,0	7,8	0,0	293,8	82,5	102,1	440,0	431,6	566,2	594,1	126,4	735,9	0,23	83,66	83,51	86,75	0,23	84,26	84,00	86,75	0,07	0,04	32,233986
128,0	373,0	0,8	0,0	7,8	0,0	293,2	82,6	101,8	439,2	431,0	565,6	592,6	126,8	736,4	0,23	83,62	83,52	86,75	0,23	84,25	84,02	86,76	0,07	0,04	31,611613
129,0	374,0	0,8	0,0	7,8	0,0	292,8	82,6	102,4	438,7	430,6	564,9	591,0	126,8	737,4	0,23	83,68	83,52	86,74	0,23	84,26	84,03	86,75	0,07	0,04	30,957242
130,0	375,0	0,8	0,0	7,8	0,0	292,9	82,4	102,3	438,1	430,1	564,1	589,7	126,9	738,7	0,23	83,71	83,55	86,76	0,23	84,30	84,05	86,75	0,07	0,04	30,346846
131,0	376,0	0,7	0,0	7,8	0,0	293,0	81,9	101,2	437,5	429,6	563,4	587,9	126,5	739,7	0,23	83,77	83,57	86,78	0,23	84,34	84,08	86,74	0,07	0,04	29,555263
132,0	377,0	0,7	0,0	7,7	0,0	292,7	82,4	101,8	437,1	429,0	562,6	586,3	127,2	740,7	0,23	83,94	83,60	86,78	0,23	84,44	84,11	86,74	0,07	0,04	29,00732
133,0	378,0	0,7	0,0	7,7	0,0	292,2	82,7	100,9	436,9	428,5	561,2	583,9	127,5	733,3	0,23	84,11	83,62	86,79	0,23	84,52	84,14	86,75	0,07	0,04	28,178708
134,0	379,0	0,7	0,0	7,6	0,0	291,4	82,9	101,6	436,2	427,6	559,1	580,7	127,8	724,2	0,23	84,16	83,64	86,81	0,23	84,59	84,19	86,77	0,07	0,04	26,851605
135,0	380,0	0,7	0,0	7,5	0,0	290,5	83,0	102,7	435,5	426,8	556,8	577,8	127,8	720,6	0,23	84,27	83,68	86,82	0,23	84,68	84,23	86,77	0,07	0,04	25,496724
136,0	381,0	0,7	0,0	7,5	0,0	289,9	83,1	102,3	434,7	426,3	554,4	575,0	127,9	719,7	0,23	84,33	83,72	86,85	0,23	84,75	84,26	86,79	0,07	0,04	24,244986
137,0	382,0	0,6	0,0	7,5	0,0	289,7	83,2	102,5	433,8	425,5	552,3	572,6	128,2	719,3	0,23	84,46	83,77	86,87	0,23	84,83	84,30	86,80	0,07	0,04	23,057288
138,0	383,0	0,6	0,0	7,4	0,0	289,5	82,6	101,8	432,8	424,5	550,8	570,2	128,2	719,9	0,23	84,56	83,78	86,89	0,23	84,90	84,35	86,81	0,07	0,04	21,896741
139,0	384,0	0,6	0,0	7,4	0,0	288,9	82,9	102,2	432,1	424,1	549,0	568,3	127,6	720,6	0,23	84,65	83,84	86,91	0,23	85,00	84,38	86,84	0,07	0,04	20,814667
140,0	385,0	0,6	0,0	7,5	0,0	288,9	83,3	102,0	431,3	423,1	547,6	566,4	128,2	717,9	0,23	84,72	83,88	86,91	0,23	85,02	84,43	86,84	0,07	0,04	19,880081
141,0	386,0	0,6	0,0	7,5	0,0	288,7	83,1	102,5	430,5	422,7	545,7	564,4	128,5	714,4	0,23	84,83	83,90	86,94	0,23	85,10	84,45	86,84	0,07	0,04	18,956882
142,0	387,0	0,6	0,0	7,5	0,0	288,2	83,2	102,0	429,5	421,5	543,9	562,9	128,2	711,9	0,23	84,93	83,94	86,97	0,23	85,18	84,51	86,90	0,07	0,04	17,765256
143,0	388,0	0,5	0,0	7,4	0,0	287,9	83,3	101,3	429,0	421,1	541,8	561,4	128,3	710,7	0,23	85,05	83,97	86,99	0,23	85,26	84,53	86,88	0,07	0,04	16,875354
144,0	389,0	0,5	0,0	7,4	0,0	287,6	83,5	102,4	428,2	421,0	540,0	559,8	129,2	709,7	0,23	85,20	84,00	87,00	0,23	85,31	84,57	86,91	0,07	0,04	16,218512
145,0	390,0	0,5	0,0	7,3	0,0	287,3	83,0	101,1	427,3	419,9	537,7	556,3	129,1	696,7	0,23	85,18	84,03	87,02	0,23	85,35	84,59	86,94	0,07	0,04	14,64664
146,0	391,0	0,5	0,0	7,2	0,0	285,7	83,1	101,1	425,9	418,8	535,8	552,3	129,4	688,4	0,23	85,17	84,06	87,02	0,23	85,37	84,63	86,93	0,07	0,04	13,017822
147,0	392,0	0,5	0,0	7,2	0,0	284,5	83,0	99,8	424,6	417,7	533,8	549,3	129,6	684,6	0,23	85,10	84,10	87,00	0,23	85,35	84,68	86,99	0,07	0,04	11,5655
148,0	393,0	0,5	0,0	7,2	0,0	282,5	83,1	101,2	422,8	416,6	532,1	546,4	130,0	682,5	0,23	85,01	84,10	87,02	0,23	85,28	84,66	87,02	0,07	0,04	10,169003
149,0	394,0	0,4	0,0	7,2	0,0	282,0	82,6	100,9	421,1	415,5	530,9	544,1	129,7	680,5	0,23	85,00	84,11	87,03	0,23	85,26	84,69	87,04	0,07	0,04	8,8395478
150,0	395,0	0,4	0,0	7,2	0,0	281,3	82,5	101,3	419,5	414,2	529,6	541,9	129,3	678,6	0,23	84,94	84,13	87,06	0,23	85,23	84,74	87,06	0,07	0,04	7,4628632
151,0	396,0	0,4	0,0	7,3	0,0	280,4	82,5	100,9	417,8	413,0	528,8	540,2	129,3	676,8	0,23	84,93	84,17	87,03	0,23	85,24	84,76	87,03	0,07	0,04	6,4142058
152,0	397,0	0,4	0,0	7,2	0,0	279,5	82,8	99,6	416,8	412,7	527,7	538,0	130,3	676,8	0,23	84,89	84,18	87,04	0,23	85,21	84,78	87,03	0,07	0,04	5,6647798
153,0	398,0	0,4	0,0	6,6	0,0	278,7	82,7	100,4	415,1	411,1	526,3	535,5	129,8	679,0	0,23	84,82	84,20	87,04	0,23	85,18	84,80	87,04	0,07	0,04	4,1283966
154,0	399,0	0,4	0,0	6,6	0,0	278,2	82,9	99,6	413,7	410,8	524,1	532,5	130,4	680,4	0,23	84,85	84,21	87,04	0,23	85,18	84,81	87,06	0,07	0,04	2,8818606
155,0	400,0	0,4	0,0	6,5	0,0	277,7	82,6	100,5	412,4	409,6	522,0	529,8	130,0	679,7	0,23	84,89	84,23	87,04	0,23	85,21	84,84	87,04	0,07	0,04	1,3483186
156,0	401,0	0,3	0,0	6,6	0,0	277,4	83,0	99,5	411,4	409,0	519,6	526,8	130,6	679,9	0,23	84,92	84,25	87,04	0,23	85,20	84,87	87,05	0,07	0,04	0,054541
157,0	402,0	0,3	0,0	6,5	0,0	276,6	83,2	99,8	410,2	408,1	517,0	524,2	130,9	679,1	0,23	84,93	84,30	87,06	0,23	85,21	84,88	87,08	0,07	0,04	-1,336945
158,0	403,0	0,3	0,0	6,5	0,0	276,4	83,0	100,2	408,8	406,9	514,7	521,6	130,7	678,1	0,23	85,03	84,31	87,05	0,23	85,27	84,91	87,07	0,07	0,04	-2,882581
159,0	404,0	0,3	0,0	6,5	0,0	276,1	83,2	99,6	408,0	406,3	512,3	519,3	130,5	677,3	0,23	85,06	84,33	87,08	0,23	85,28	84,94	87,08	0,07	0,04	-4,141364
160,0	405,0	0,3	0,0	6,5	0,0	275,5	83,2	100,6	406,9	405,5	510,2	517,2	131,2	675,2	0,23	85,06	84,36	87,05	0,23	85,30	84,94	87,08	0,07	0,04	-5,20119
161,0	406,0	0,3	0,0	6,2	0,0	274,9	83,1	100,0	405,8	404,4	507,7	514,5	131,2	671,3	0,23	85,18	84,43	87,04	0,23	85,43	85,02	87,12	0,07	0,04	-6,704004
162,0	407,0	0,3	0,0	6,1	0,0	275,0	83,1	100,1	404,9	403,4	505,4	511,9	131,6	668,9	0,23	85,25	84,41	87,04	0,23	85,47	85,02	87,10	0,07	0,04	-7,995877
163,0	408,0	0,2	0,0	6,2	0,0	274,7	82,8	99,7	403,6	401,7	503,1	509,6	130,6	667,0	0,23	85,26	84,46	87,05	0,23	85,48	85,08	87,09	0,07	0,04	-9,712784
164,0	409,0	0,2	0,0	6,2	0,0	273,3	83,2	99,9	402,6	401,3	500,5	507,3	131,5	665,7	0,23	85,23	84,47	87,03	0,23	85,46	85,10	87,11	0,07	0,04	-10,79388
165,0	410,0	0,2	0,0	6,2	0,0	272,7	83,0	99,6	401,5	400,2	498,3	505,2	131,6	665,5	0,23	85,21	84,51	87,03	0,23	85,44	85,12	87,09	0,07	0,04	-12,08254
166,0	411,0	0,2	0,0	6,3	0,0	271,8	82,9	100,3	400,1	398,9	496,4	503,5	131,2	664,5	0,23	85,23	84,54	87,01	0,23	85,43	85,14	87,08	0,07	0,04	-13,40432
167,0	412,0	0,2	0,0	6,3	0,0	272,0	82,9	100,1	399,2	398,6	494,5	501,9	131,6	662,9	0,23	85,35	84,57	87,03	0,23	85,50	85,18	87,09	0,07	0,04	-14,2855
168,0	413,0	0,2	0,0	6,3	0,0	271,7	83,0	98,9	398,5	398,1	492,7	500,3	131,8	662,1	0,23	85,29	84,58	87,01	0,23	85,44	85,19	87,06	0,07	0,04	-15,13922
169,0	414,0	0,2	0,0	6,3	0,0	270,9	83,2	98,2	397,5	397,4	491,3	499,0	132,3	662,0	0,23	85,25	84,59	87,03	0,23	85,40	85,20	87,08	0,07	0,04	-15,91971
170,0	415,0	0,1	0,0	6,3	0,0	270,1	83,1	99,2	396,5	396,7	489,9	497,9	132,2	661,5	0,23	85,31	84,61	87,01	0,23	85,43	85,20	87,08	0,07	0,04	-16,78959
171,0	416,0	0,1	0,0	6,3	0,0	269,5	83,1	99,3	395,3	395,6	488,7	497,0	131,6	660,5	0,23	85,38	84,65	86,99	0,23	85,47	85,24	87,08	0,07	0,04	-17,76501
172,0	417,0	0,1	0,0	6,1	0,0	268,7	83,5	99,9	394,6	394,9	487,5	495,9	132,4	655,9	0,23	85,50	84,71	87,02	0,23	85,58	85,30	87,07	0,07	0,04	-18,36954
173,0	418,0	0,1	0,0	6,0	0,0	268,2	82,6	99,8	393,5	393,9	486,1	494,3	132,8	656,0	0,23	85,56	84,74	86,98	0,23	85,62	85,33	87,06	0,07	0,04	-19,28965
174,0	419,0	0,1	0,0	5,9	0,0	268,0	83,0	100,2	392,4	392,8	484,6	492,8	132,7	656,2	0,23	85,67	84,76	87,00	0,23	85,73	85,38	87,07	0,07	0,04	-20,37407
175,0	420,0	0,1	0,0	6,0	0,0	268,2	83,3	100,4	391,5	391,2	483,5	490,9	132,3	656,6	0,23	85,74	84,82	87,01	0,23	85,79	85,42	87,07	0,07	0,04	-21,54044
176,0	421,0	0,1	0,0	6,0	0,0	267,9	83,2	99,8	390,7	389,8	482,2	489,4	131,8	657,4	0,23	85,97	84,90	87,03	0,23	85,98	85,49	87,10	0,07	0,04	-22,64037
177,0	422,0	0,1	0,0	6,0	0,0	267,5	83,7	100,0	389,9	389,3	480,6	487,7	132,6	656,9	0,23	86,21	84,96	87,03	0,23	86,13	85,55	87,10	0,07	0,04	-23,38977
178,0	423,0	0,1	0,0	5,9	0,0	267,3	83,7	101,0	389,2	388,0	479,4	486,1	132,5	652,6	0,23	86,31	85,04	87,05	0,23	86,20	85,60	87,12	0,07	0,04	-24,38755
179,0	424,0	0,1	0,0	6,0	0,0	267,1	83,9	99,5	388,5	386,7	478,1	484,2	132,8	649,9	0,23	86,40	85,06	87,08	0,23	86,27	85,65	87,13	0,07	0,04	-25,38393
180,0	425,0	0,1	0,0	5,9	0,0	266,4	84,3	100,0	387,5	386,0	476,8	482,8	133,4	648,4	0,23	86,45	85,13	87,09	0,23	86,35	85,70	87,14	0,07	0,04	-26,13327
181,0	426,0	0,1	0,0	5,9	0,0	266,1	84,4	100,0	386,8	385,1	475,6	481,4	133,4	648,2	0,23	86,46	85,17	87,12	0,23	86,38	85,73	87,14	0,07	0,04	-26,97749
182,0	427,0	0,1	0,0	5,9	0,0	265,8	84,3	100,4	386,0	384,0	474,3	480,0	133,1	648,6	0,23	86,46	85,22	87,15	0,23	86,40	85,79	87,21	0,07	0,04	-27,93131
183,0	428,0	0,1	0,0	5,9	0,0	265,1	84,1	100,4	385,2	383,0	473,5	478,7	133,2	648,8	0,23	86,45	85,25	87,16	0,23	86,41	85,82	87,23	0,07	0,04	-28,73149
184,0	429,0	0,1	0,0	5,9	0,0	264,6	84,5	99,7	384,5	382,2	472,5	477,5	133,2	650,7	0,23	86,54	85,31	87,17	0,23	86,48	85,86	87,23	0,07	0,04	-29,42283
185,0	430,0	0,1	0,0	5,9	0,0	264,4	84,4	99,9	384,1	381,4	471,5	476,3	133,8	652,3	0,23	86,58	85,37	87,18	0,23	86,51	85,91	87,28	0,07	0,04	-30,0254
186,0	431,0	0,1	0,0	5,8	0,0	264,2	84,2	100,2	383,3	380,3	470,5	475,0	134,0	653,0	0,23	86,59	85,40	87,19	0,23	86,53	85,94	87,31	0,07	0,04	-30,79305
187,0	432,0	0,1	0,0	5,8	0,0	264,5	84,3	99,5	382,9	378,6	469,5	473,6	133,3	654,2	0,23	86,61	85,43	87,22	0,23	86,56	85,97	87,34	0,07	0,04	-31,85609
188,0	433,0	0,1	0,0	5,8	0,0	264,3	84,3	100,0	382,5	378,2	468,4	472,3	134,1	655,5	0,23	86,68	85,47	87,24	0,23	86,64	86,02	87,38	0,07	0,04	-32,31881
189,0	434,0	0,0	0,0	5,8	0,0	264,4	84,3	99,9	382,0	376,4	467,3	470,8	133,7	657,4	0,23	86,66	85,53	87,24	0,23	86,67	86,06	87,38	0,07	0,04	-33,37188

Manufacturer: HEARTHSTONE
Model: SILA

Run: 2
Project #: PI 20202
Test Duration: 189 min

Note: In the "Input data", "Calc. % O_2", "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

	HHV	LHV
Eff	77,16%	83,39%
Comb Eff	99,50%	99,50%
HT Eff	77,54%	83,81%
Output	14 827	kJ/h
Burn Rate	0,97	kg/h
Grams CO	10	g
Input	19 217	kJ/h
MC wet	16,49	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,64
F_0
1,061

Overall Heating Efficiency: 77,16%
Combustion Efficiency: 99,50%
Heat Transfer Efficiency: 77,54%

Heat Output: 14 065 Btu/h
Heat Input: 18 229 Btu/h
Burn Duration: 3,15 h
Burn Rate: 2,14 lb/h
Stack Temp: 318,7 Deg. F

Averages	0,02	8,29	1,60	20,39	12,10	159,28	27,55	100,3%	78,3%	78,6%
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 (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,66	0,15	6,97	175,8%	20,47	13,42	164,6	26,1	98,7%	76,5%	75,6%
1,00	3,59	0,13	5,30	261,4%	20,58	15,21	159,7	26,1	98,7%	73,4%	72,5%
2,00	3,57	0,06	3,21	501,5%	20,72	17,49	164,2	26,2	100,1%	62,9%	62,9%
3,00	3,52	0,03	4,44	340,2%	20,65	16,20	171,2	26,2	100,6%	68,9%	69,3%
4,00	3,48	0,02	5,01	290,4%	20,61	15,59	178,2	26,1	100,5%	70,2%	70,5%
5,00	3,43	0,03	8,45	131,8%	20,38	11,92	178,4	26,1	100,2%	77,5%	77,7%
6,00	3,41	0,03	8,90	120,2%	20,35	11,44	166,3	26,1	100,1%	79,0%	79,1%
7,00	3,36	0,02	7,58	158,5%	20,44	12,85	161,9	26,2	100,3%	77,8%	78,0%
8,00	3,34	0,02	5,60	249,8%	20,57	14,96	160,2	26,1	100,5%	74,2%	74,6%
9,00	3,32	0,02	5,22	275,0%	20,59	15,36	159,0	26,2	100,6%	73,4%	73,8%
10,00	3,30	0,02	5,37	264,6%	20,58	15,21	158,3	26,1	100,6%	73,8%	74,3%
11,00	3,27	0,02	5,89	232,4%	20,55	14,65	159,5	26,0	100,5%	75,0%	75,4%
12,00	3,23	0,02	1,86	944,3%	20,82	18,94	162,4	26,1	102,1%	45,3%	46,2%
13,00	3,16	0,02	2,41	708,0%	20,78	18,36	166,4	26,3	101,6%	54,0%	54,9%
14,00	3,11	0,15	2,96	531,9%	20,73	17,70	166,9	26,1	97,6%	60,2%	58,8%
15,00	3,09	0,02	6,52	200,3%	20,51	13,98	165,9	26,2	100,4%	75,6%	75,9%
16,00	3,07	0,02	5,49	256,8%	20,58	15,08	166,0	26,2	100,5%	73,2%	73,6%
17,00	3,02	0,02	8,09	142,4%	20,40	12,31	168,4	26,3	100,3%	77,9%	78,1%
18,00	2,98	0,02	11,46	71,2%	20,18	8,72	170,4	26,3	100,1%	80,9%	81,0%
19,00	2,93	0,01	12,15	61,5%	20,14	7,98	171,7	26,2	100,1%	81,2%	81,3%
20,00	2,89	0,01	10,22	91,9%	20,26	10,04	172,7	26,3	100,2%	79,8%	80,0%
21,00	2,84	0,01	11,62	68,8%	20,17	8,54	172,6	26,2	100,1%	80,9%	81,0%
22,00	2,80	0,01	9,19	113,5%	20,33	11,14	171,3	26,3	100,3%	79,0%	79,2%
23,00	2,75	0,01	9,52	106,0%	20,31	10,78	171,7	26,3	100,2%	79,3%	79,5%
24,00	2,70	0,01	10,27	91,2%	20,26	9,99	171,5	26,4	100,2%	79,9%	80,1%
25,00	2,68	0,01	7,81	151,4%	20,42	12,61	170,7	26,4	100,4%	77,4%	77,7%
26,00	2,64	0,01	6,77	189,8%	20,49	13,72	170,4	26,5	100,5%	75,7%	76,1%
27,00	2,61	0,01	8,32	135,9%	20,39	12,07	170,7	26,5	100,3%	78,0%	78,3%
28,00	2,57	0,01	8,95	119,4%	20,35	11,40	171,1	26,5	100,3%	78,7%	79,0%
29,00	2,55	0,01	7,52	160,9%	20,44	12,92	170,2	26,4	100,4%	77,0%	77,3%
30,00	2,50	0,01	8,41	133,2%	20,38	11,97	170,3	26,3	100,3%	78,2%	78,4%
31,00	2,48	0,01	7,66	156,3%	20,43	12,77	169,4	26,4	100,4%	77,3%	77,6%
32,00	2,43	0,01	8,96	119,0%	20,35	11,38	170,0	26,5	100,3%	78,8%	79,1%
33,00	2,39	0,00	12,53	56,7%	20,11	7,58	171,9	26,5	100,1%	81,5%	81,6%
34,00	2,34	0,01	11,70	67,9%	20,17	8,47	173,1	26,6	100,2%	80,9%	81,0%
35,00	2,30	0,01	11,67	68,2%	20,17	8,49	173,8	26,6	100,2%	80,8%	81,0%
36,00	2,25	0,01	10,86	80,8%	20,22	9,36	173,9	26,5	100,2%	80,3%	80,4%
37,00	2,21	0,01	9,13	115,1%	20,34	11,21	173,9	26,3	100,3%	78,7%	78,9%
38,00	2,18	0,01	8,22	138,8%	20,40	12,18	172,9	26,6	100,4%	77,7%	78,0%
39,00	2,14	0,01	10,36	89,4%	20,26	9,89	174,5	26,8	100,2%	79,8%	80,0%
40,00	2,09	0,01	11,60	69,2%	20,17	8,57	175,5	26,8	100,2%	80,7%	80,8%
41,00	2,05	0,01	11,56	69,9%	20,18	8,62	176,6	26,9	100,2%	80,6%	80,7%
42,00	2,00	0,01	11,03	78,1%	20,21	9,18	178,2	26,8	100,2%	80,1%	80,3%
43,00	1,96	0,01	11,67	68,3%	20,17	8,50	179,1	26,8	100,2%	80,5%	80,7%
44,00	1,91	0,01	12,34	59,1%	20,12	7,78	180,2	26,8	100,2%	80,9%	81,0%
45,00	1,89	0,00	11,88	65,2%	20,16	8,27	181,3	26,9	100,2%	80,5%	80,7%
46,00	1,84	0,01	12,25	60,3%	20,13	7,88	182,2	27,0	100,2%	80,7%	80,8%
47,00	1,80	0,01	12,97	51,4%	20,08	7,11	183,1	27,0	100,1%	81,1%	81,2%
48,00	1,75	0,01	12,31	59,5%	20,13	7,81	184,0	27,0	100,2%	80,6%	80,8%
49,00	1,71	0,01	13,69	43,4%	20,04	6,34	185,8	27,1	100,1%	81,3%	81,4%
50,00	1,66	0,01	13,46	45,8%	20,05	6,58	187,4	26,9	100,1%	81,1%	81,2%
51,00	1,62	0,01	13,56	44,8%	20,04	6,48	188,7	27,1	100,1%	81,1%	81,2%
52,00	1,55	0,01	14,07	39,5%	20,01	5,94	189,4	27,1	100,1%	81,3%	81,4%
53,00	1,50	0,02	13,51	45,2%	20,05	6,53	190,8	27,1	100,0%	80,9%	80,9%
54,00	1,46	0,02	14,66	33,7%	19,97	5,29	191,9	27,1	100,0%	81,5%	81,4%
55,00	1,41	0,05	14,95	31,0%	19,95	4,98	192,4	27,3	99,8%	81,6%	81,4%
56,00	1,37	0,08	15,28	27,9%	19,93	4,61	193,0	27,3	99,7%	81,7%	81,4%
57,00	1,32	0,11	15,31	27,4%	19,92	4,56	194,3	27,3	99,5%	81,6%	81,2%
58,00	1,28	0,03	14,60	34,3%	19,97	5,36	195,6	27,5	99,9%	81,2%	81,2%
59,00	1,25	0,01	13,72	43,0%	20,03	6,30	196,5	27,0	100,1%	80,7%	80,8%
60,00	1,21	0,01	14,07	39,5%	20,01	5,93	196,8	27,2	100,1%	80,9%	81,0%
61,00	1,16	0,02	13,96	40,5%	20,02	6,05	197,2	27,4	100,0%	80,8%	80,8%
62,00	1,14	0,01	13,31	47,4%	20,06	6,74	197,0	27,5	100,1%	80,5%	80,6%
63,00	1,09	0,01	12,74	54,1%	20,10	7,36	196,8	27,3	100,1%	80,2%	80,2%
64,00	1,07	0,01	12,48	57,4%	20,12	7,64	196,8	27,6	100,1%	80,0%	80,1%
65,00	1,03	0,01	11,88	65,2%	20,16	8,27	196,8	27,6	100,2%	79,6%	79,7%
66,00	1,00	0,01	11,39	72,3%	20,19	8,79	196,7	27,5	100,2%	79,2%	79,4%
67,00	0,98	0,01	10,43	88,2%	20,25	9,82	196,1	27,5	100,2%	78,5%	78,6%
68,00	0,96	0,01	9,80	100,3%	20,29	10,49	195,1	27,6	100,3%	77,9%	78,1%
69,00	0,93	0,01	9,42	108,3%	20,32	10,89	194,2	27,6	100,3%	77,6%	77,8%
70,00	0,91	0,01	9,58	104,8%	20,31	10,72	193,0	27,3	100,3%	77,8%	78,0%
71,00	0,89	0,01	9,16	114,3%	20,33	11,17	191,7	27,5	100,3%	77,4%	77,7%
72,00	0,87	0,01	8,76	123,9%	20,36	11,59	190,2	27,6	100,3%	77,1%	77,3%
73,00	0,87	0,01	9,11	115,4%	20,34	11,22	189,1	27,4	100,3%	77,6%	77,8%
74,00	0,84	0,01	9,02	117,6%	20,34	11,32	187,3	27,5	100,3%	77,6%	77,8%
75,00	0,82	0,01	8,88	121,0%	20,35	11,47	186,2	27,4	100,3%	77,5%	77,8%
76,00	0,80	0,01	8,75	124,4%	20,36	11,61	184,4	27,4	100,3%	77,5%	77,8%
77,00	0,80	0,01	8,48	131,3%	20,38	11,89	182,8	27,5	100,3%	77,3%	77,6%
78,00	0,78	0,01	8,03	144,2%	20,41	12,37	180,6	27,7	100,4%	76,9%	77,2%
79,00	0,78	0,01	7,80	151,4%	20,42	12,61	178,7	27,7	100,4%	76,8%	77,0%
80,00	0,75	0,01	7,81	151,3%	20,42	12,61	177,1	27,8	100,4%	76,9%	77,2%
81,00	0,75	0,01	7,94	147,1%	20,42	12,47	175,9	27,6	100,4%	77,2%	77,5%
82,00	0,73	0,01	7,92	147,6%	20,42	12,49	174,6	27,5	100,4%	77,3%	77,5%
83,00	0,73	0,01	8,00	145,1%	20,41	12,40	172,7	27,5	100,3%	77,5%	77,8%
84,00	0,73	0,01	7,92	147,6%	20,42	12,49	171,5	27,4	100,3%	77,5%	77,8%
85,00	0,71	0,01	7,87	149,2%	20,42	12,54	170,1	27,5	100,4%	77,6%	77,9%
86,00	0,71	0,01	7,92	147,6%	20,42	12,49	168,7	27,4	100,3%	77,8%	78,0%
87,00	0,69	0,01	7,89	148,6%	20,42	12,52	167,4	27,6	100,3%	77,9%	78,1%
88,00	0,69	0,01	7,86	149,6%	20,42	12,56	166,3	27,6	100,3%	77,9%	78,2%
89,00	0,69	0,01	7,79	151,8%	20,42	12,63	165,8	27,4	100,3%	77,8%	78,1%
90,00	0,66	0,01	7,76	152,8%	20,43	12,66	164,8	27,4	100,3%	77,9%	78,1%
91,00	0,66	0,01	7,76	152,8%	20,43	12,66	163,6	27,6	100,3%	78,0%	78,3%
92,00	0,66	0,01	7,77	152,3%	20,43	12,65	162,4	27,4	100,3%	78,1%	78,4%

93,00	0,64	0,01	7,82	150,6%	20,42	12,59	161,1	27,7	100,3%	78,3%	78,6%
94,00	0,64	0,01	7,87	149,1%	20,42	12,54	160,3	27,6	100,3%	78,5%	78,7%
95,00	0,62	0,01	7,86	149,6%	20,42	12,56	159,3	27,7	100,3%	78,5%	78,8%
96,00	0,62	0,01	7,84	150,1%	20,42	12,58	158,9	27,7	100,3%	78,6%	78,8%
97,00	0,62	0,01	7,86	149,6%	20,42	12,56	158,2	27,8	100,3%	78,6%	78,9%
98,00	0,59	0,01	7,89	148,5%	20,42	12,52	157,3	27,6	100,3%	78,8%	79,0%
99,00	0,59	0,01	7,91	148,0%	20,42	12,50	156,5	27,8	100,3%	78,8%	79,1%
100,00	0,57	0,01	7,94	147,0%	20,41	12,47	155,8	27,7	100,3%	78,9%	79,2%
101,00	0,57	0,02	7,82	150,7%	20,42	12,59	154,9	27,4	100,3%	78,9%	79,1%
102,00	0,57	0,02	7,86	149,5%	20,42	12,56	154,1	27,7	100,3%	79,0%	79,2%
103,00	0,55	0,02	7,86	149,6%	20,42	12,56	153,4	27,5	100,3%	79,0%	79,3%
104,00	0,55	0,02	7,87	149,0%	20,42	12,54	153,0	27,6	100,3%	79,1%	79,3%
105,00	0,55	0,02	7,82	150,6%	20,42	12,59	152,2	27,8	100,3%	79,1%	79,4%
106,00	0,53	0,02	7,77	152,1%	20,43	12,64	151,9	27,7	100,3%	79,1%	79,3%
107,00	0,53	0,02	7,81	151,1%	20,42	12,61	151,7	27,8	100,3%	79,1%	79,4%
108,00	0,53	0,02	7,79	151,6%	20,42	12,63	151,5	27,5	100,3%	79,1%	79,4%
109,00	0,50	0,02	7,77	152,1%	20,43	12,64	150,9	27,5	100,3%	79,1%	79,4%
110,00	0,50	0,02	7,77	152,1%	20,43	12,64	150,8	27,6	100,3%	79,2%	79,4%
111,00	0,50	0,02	7,79	151,6%	20,42	12,63	150,5	27,4	100,3%	79,2%	79,4%
112,00	0,48	0,02	7,75	153,0%	20,43	12,67	149,5	27,6	100,3%	79,3%	79,5%
113,00	0,48	0,02	7,81	151,0%	20,42	12,61	149,0	27,4	100,3%	79,4%	79,6%
114,00	0,48	0,02	7,81	151,1%	20,42	12,61	148,6	27,6	100,3%	79,4%	79,6%
115,00	0,46	0,02	7,80	151,1%	20,42	12,61	148,3	27,6	100,3%	79,4%	79,7%
116,00	0,46	0,02	7,72	153,7%	20,43	12,70	148,0	27,6	100,3%	79,4%	79,6%
117,00	0,44	0,02	7,79	151,6%	20,42	12,63	147,5	27,7	100,3%	79,5%	79,7%
118,00	0,44	0,02	7,84	150,0%	20,42	12,57	147,2	27,8	100,3%	79,6%	79,8%
119,00	0,44	0,02	7,79	151,6%	20,42	12,63	146,9	27,9	100,3%	79,6%	79,8%
120,00	0,41	0,02	7,77	152,1%	20,43	12,64	146,5	27,8	100,3%	79,6%	79,8%
121,00	0,41	0,02	7,86	149,5%	20,42	12,56	146,5	27,9	100,3%	79,7%	79,9%
122,00	0,41	0,02	7,77	152,1%	20,43	12,64	146,2	27,9	100,3%	79,6%	79,8%
123,00	0,39	0,02	7,84	150,0%	20,42	12,57	146,4	28,0	100,3%	79,7%	79,9%
124,00	0,39	0,02	7,82	150,5%	20,42	12,59	146,0	28,0	100,3%	79,7%	79,9%
125,00	0,39	0,02	7,81	151,1%	20,42	12,61	145,7	27,8	100,3%	79,7%	79,9%
126,00	0,37	0,02	7,82	150,5%	20,42	12,59	145,5	27,9	100,3%	79,7%	79,9%
127,00	0,37	0,02	7,84	150,0%	20,42	12,57	145,4	28,0	100,3%	79,8%	80,0%
128,00	0,37	0,02	7,84	150,0%	20,42	12,57	145,1	28,1	100,3%	79,8%	80,0%
129,00	0,34	0,02	7,81	151,0%	20,42	12,61	144,9	28,1	100,3%	79,8%	80,0%
130,00	0,34	0,02	7,77	152,1%	20,43	12,64	144,9	28,0	100,3%	79,7%	79,9%
131,00	0,32	0,02	7,81	151,0%	20,42	12,61	145,0	27,7	100,3%	79,7%	79,9%
132,00	0,32	0,02	7,74	153,1%	20,43	12,68	144,8	28,0	100,3%	79,7%	79,9%
133,00	0,32	0,02	7,67	155,4%	20,43	12,75	144,5	28,2	100,3%	79,7%	79,9%
134,00	0,30	0,02	7,64	156,5%	20,43	12,78	144,1	28,3	100,3%	79,7%	79,9%
135,00	0,30	0,02	7,54	159,9%	20,44	12,89	143,6	28,3	100,3%	79,6%	79,9%
136,00	0,30	0,02	7,46	162,8%	20,45	12,98	143,3	28,4	100,3%	79,5%	79,8%
137,00	0,28	0,02	7,48	162,1%	20,45	12,96	143,2	28,5	100,3%	79,6%	79,8%
138,00	0,28	0,02	7,41	164,5%	20,45	13,03	143,0	28,1	100,3%	79,5%	79,7%
139,00	0,28	0,02	7,43	163,9%	20,45	13,01	142,7	28,3	100,3%	79,5%	79,8%
140,00	0,25	0,02	7,51	160,9%	20,44	12,92	142,7	28,5	100,3%	79,7%	79,9%
141,00	0,25	0,02	7,53	160,4%	20,44	12,91	142,6	28,4	100,3%	79,7%	79,9%
142,00	0,25	0,02	7,49	161,5%	20,44	12,94	142,3	28,5	100,3%	79,7%	79,9%
143,00	0,23	0,02	7,43	163,9%	20,45	13,01	142,1	28,5	100,3%	79,6%	79,9%
144,00	0,23	0,02	7,43	163,9%	20,45	13,01	142,0	28,6	100,3%	79,6%	79,9%
145,00	0,23	0,01	7,30	168,7%	20,46	13,15	141,8	28,3	100,4%	79,5%	79,7%
146,00	0,21	0,01	7,25	170,6%	20,46	13,21	141,0	28,4	100,4%	79,5%	79,8%
147,00	0,21	0,01	7,21	171,8%	20,46	13,24	140,3	28,3	100,4%	79,5%	79,8%
148,00	0,21	0,01	7,23	171,2%	20,46	13,23	139,2	28,4	100,4%	79,6%	79,9%
149,00	0,19	0,01	7,25	170,5%	20,46	13,21	138,9	28,1	100,4%	79,7%	79,9%
150,00	0,19	0,01	7,24	170,6%	20,46	13,21	138,5	28,1	100,4%	79,7%	80,0%
151,00	0,19	0,01	7,28	169,4%	20,46	13,17	138,0	28,1	100,4%	79,8%	80,1%
152,00	0,16	0,01	7,21	171,8%	20,46	13,24	137,5	28,2	100,4%	79,8%	80,0%
153,00	0,16	0,01	6,57	198,3%	20,51	13,93	137,1	28,2	100,4%	78,9%	79,3%
154,00	0,16	0,02	6,57	198,3%	20,51	13,93	136,8	28,3	100,4%	78,9%	79,3%
155,00	0,16	0,02	6,54	199,8%	20,51	13,96	136,5	28,1	100,4%	78,9%	79,2%
156,00	0,14	0,02	6,55	199,0%	20,51	13,94	136,3	28,4	100,4%	79,0%	79,3%
157,00	0,14	0,02	6,52	200,6%	20,51	13,98	135,9	28,5	100,4%	79,0%	79,3%
158,00	0,14	0,02	6,49	202,0%	20,51	14,02	135,8	28,3	100,4%	78,9%	79,3%
159,00	0,12	0,02	6,47	202,9%	20,51	14,03	135,6	28,5	100,4%	78,9%	79,3%
160,00	0,12	0,02	6,45	203,7%	20,51	14,05	135,3	28,4	100,4%	78,9%	79,3%
161,00	0,12	0,01	6,21	215,5%	20,53	14,31	134,9	28,4	100,5%	78,6%	79,0%
162,00	0,12	0,01	6,15	218,6%	20,53	14,38	135,0	28,4	100,5%	78,5%	78,9%
163,00	0,09	0,02	6,21	215,4%	20,53	14,31	134,8	28,2	100,5%	78,6%	79,0%
164,00	0,09	0,01	6,23	214,8%	20,53	14,29	134,1	28,5	100,5%	78,7%	79,1%
165,00	0,09	0,01	6,22	215,1%	20,53	14,30	133,7	28,4	100,5%	78,7%	79,1%
166,00	0,07	0,01	6,30	211,0%	20,52	14,21	133,2	28,3	100,5%	78,9%	79,3%
167,00	0,07	0,01	6,35	208,7%	20,52	14,16	133,4	28,3	100,5%	79,0%	79,3%
168,00	0,07	0,01	6,33	209,4%	20,52	14,18	133,2	28,3	100,5%	79,0%	79,3%
169,00	0,07	0,01	6,35	208,6%	20,52	14,16	132,7	28,4	100,5%	79,1%	79,4%
170,00	0,05	0,01	6,32	210,0%	20,52	14,19	132,3	28,4	100,5%	79,1%	79,4%
171,00	0,05	0,01	6,34	209,1%	20,52	14,17	131,9	28,4	100,5%	79,1%	79,5%
172,00	0,05	0,01	6,11	220,8%	20,54	14,42	131,5	28,6	100,5%	78,8%	79,2%
173,00	0,05	0,01	5,99	227,0%	20,54	14,54	131,2	28,1	100,5%	78,6%	79,0%
174,00	0,05	0,01	5,93	230,7%	20,55	14,61	131,1	28,3	100,5%	78,5%	78,9%
175,00	0,05	0,02	5,99	227,0%	20,54	14,54	131,2	28,5	100,5%	78,6%	79,0%
176,00	0,05	0,02	5,99	226,9%	20,54	14,54	131,0	28,5	100,5%	78,7%	79,0%
177,00	0,05	0,02	5,98	227,7%	20,54	14,56	130,8	28,7	100,5%	78,7%	79,1%
178,00	0,05	0,02	5,93	230,5%	20,55	14,61	130,7	28,7	100,5%	78,6%	79,0%
179,00	0,03	0,02	5,96	228,7%	20,55	14,58	130,6	28,8	100,5%	78,7%	79,1%
180,00	0,03	0,02	5,88	233,4%	20,55	14,67	130,2	29,1	100,5%	78,6%	79,0%
181,00	0,03	0,02	5,91	231,5%	20,55	14,63	130,1	29,1	100,5%	78,7%	79,1%
182,00	0,03	0,02	5,92	230,7%	20,55	14,62	129,9	29,0	100,5%	78,7%	79,1%
183,00	0,03	0,02	5,91	231,6%	20,55	14,63	129,5	29,0	100,5%	78,7%	79,1%
184,00	0,03	0,02	5,94	229,8%	20,55	14,60	129,2	29,2	100,5%	78,9%	79,2%
185,00	0,03	0,02	5,86	234,2%	20,55	14,68	129,1	29,1	100,5%	78,7%	79,1%
186,00	0,03	0,02	5,81	237,1%	20,56	14,74	129,0	29,0	100,5%	78,6%	79,0%
187,00	0,03	0,02	5,82	236,3%	20,55	14,72	129,2	29,1	100,5%	78,6%	79,0%
188,00	0,03	0,02	5,78	239,1%	20,56	14,77	129,1	29,0	100,5%	78,6%	79,0%
189,00	0,00	0,02	5,81	237,2%	20,56	14,74	129,1	29,0	100,5%	78,6%	79,0%

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2019-07-23 Manufacturer: Hearthstone Model: S/a

Project #: PT 20 [illegible] Run: 2 Tech: M.R. Reviewer: [illegible]

- Kindling 25LBS Start Fire
- At 21LBS close Door
- bypass open
- At 100LBS insert warm-up
- close Door immediatly
- At 100LBS insert pre load
- close Door immediatly
- At 65LBS close bypass
- At 26LBS close air inlet (1.6 inch)
At 16LBS insert second pre load and open air inlet
- At 25LBS close air inlet
At 16LBS insert load (1.00)
- At 16LBS open bypass
- Open Door
crush coal Bed

TEST LOAD CONFIGURATION

- close Door
- close bypass
- after 2 min
open bypass
open air inlet
open Door
insert load
close Door
- close bypass
After 5 min
close air inlet (1.6 inch)

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2019-07-22 Manufacturer: Hearthstone Model: 5.1a

Project #: PI 2.202 Run: 2 Tech: MA Reviewer: DP

Equipment #	Time	12%	22%
Gm 19.	7:26	ok	ok

Moisture Meter Calibration Check:

Pre-Test **Post-Test**

Facility Conditions:

	Pre-Test	Post-Test
Air Velocity from less than 2 feet	0 (max50 Fpm)	0 (max50 Fpm)
Smoke Capture Check (tunnel velocity)	ok	NA
Picture 4 sides	ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned	2019-07-22
Date Dilution Tunnel Cleaned	2019-07-22
Induced Draft Check (max 0.005 H2O)	ok
Traverse before ignition	ok
Flow Rate 140 cfm ±10%	ok

Temperature System:

Ambient (65°-90°F)	ok °F
Wood Heater Surface (±125°F)	ok °F

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok

Sampling Train ID Numbers:

	Train 1st hour	Train 1	Train 2
Probe	30	32	39
Filter Front	847	849	851
Filter Back	848	850	852
Filter Thermocouple	11	11	12
Filter (<90°F)	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2019-07-23 Manufacturer: Hearthstone Model: Sila

Project #: PT 20202 Run: 2 Tech: Mm Reviewer: NP

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 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)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	977034,16	978358,51	977034,30	978358,61	922446,11	923753 89
Initial 1minute DGM (Liter)	977034,13	978358,45	977034,06	978358,59	922446,01	923753 82
Change © (Liter)	0,03	0,06	0,04	0,02	0,10	0,07
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	ok	ok	ok	ok	ok

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	-5	3	-4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2019-07-23 Manufacturer: Hearthstone Model: Si/a
Project #: PI 20202 Run: 2 Tech: M M Reviewer: DL

Scale Type	Audit		Measured Weight
	Equipment #	**Weight**	
Platform	EM-090	44 lbs, Class F	44 lbs
Wood	EM-090	4.4 lbs, Class F	4.4 lbs
Analytical	EM-128	100mg, Class S	100 mg
Analytical	EM-129	200g, Class S	200 g

LIMITS OF WEIGHT RANGES

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

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019-07-23 Manufacturer: Hearthstone Model: S/a
Project #: pI 2202 Run: 2 Tech: MM Reviewer: SP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 100.8 (KPa.) Static pressure (P_q) 0.33 (inches w.c.)
Inside diameter: Port A ____ Port B ____.
Tunnel cross sectional area: .1963Ft^2
Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.065	75.36
B - Centroid	3.00	3.50	4	0.064	74.25
A-1	0.40	0.50	0.50	0.052	75.29
A-2	1.50	1.75	2	0.054	75.19
A-3	4.50	5.25	6	0.052	75.26
A-4	5.60	6.5	7.5	0.052	74.55
B-1	0.40	0.50	0.50	0.051	75.15
B-2	1.50	1.75	2	0.052	75.23
B-3	4.50	5.25	6	0.055	75.23
B-4	5.60	6.5	7.5	0.052	74.90
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,
C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.
Δ_p = manometer reading (inches H_2O)
T_s = average absolute dilution tunnel temperature (°F + 460)
P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$
P_q = static pressure $\frac{\text{in. } H_2O}{\{\ 13.6\ \}}$
M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)
K_p = 85.49 pitot tube constant, (conversion factor for English units)

_$\Delta_p$avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019-07-23 Manufacturer: Hearthstone Model: Sila

Project #: pT 6202 Run: 2 Tech: MM Reviewer: DE

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2.972	3.000	1.010	1.000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO_2	0	0	18.02	18.00	9.75	10.00
Tolerance CO2		+/- 0.02		+/- 0.5		+/- 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	2.980	1.001	0	0.02	0.008	0.15	0.009	0.05	✓	
CO_2	0	17.92	9.80	0	0.02	0.10	0.5	0.05	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2019-07-23 Manufacturer: Heath stove Model: Sila

Project #: pI 7.202 Run: 2 Tech: MM Reviewer: AP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	978357.28	923751.64	431.75
Initial (Liter)	977035.25	922447.10	420.84

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100.8	100.5
Dry Bulb (F):	77.0	85.5
Humidity (%):	52.9	30.3

Flow Meter

	Start	End
Flow meter reading	NA	NA

Flow Meter Verification

	Before	After
Flow meter Check (liters)	NA	N.A
Scale Weight (Kg)	N.A	NA

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-23 Manufacturer: Hearthstone Model: S/a

Project #: pI 20202 Run: 2 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight		Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 8 in.	0740	lbs.	193	194	194	193	196
1 1/2 x 3 1/2 x 8 in.	0698	lbs.	201	209	206	203	208
1 1/2 x 3 1/2 x 8 in.	0682	lbs.	199	196	194	197	193
1 1/2 x 3 1/2 x 8 in.	0718	lbs.	196	198	193	199	199
1 1/2 x 3 1/2 x 8 in.	0724	lbs.	201	204	203	203	206
1 1/2 x 3 1/2 x 8 in.	0746	lbs.	203	204	209	209	210
1 1/2 x 3 1/2 x 8 in.	0736	lbs.	211	210	210	201	209
1 1/2 x 3 1/2 x 8 in.	0712	lbs.	204	208	209	203	206
x x in.		lbs.					
1 1/2 x 3 1/2 x 8 in.	0688	lbs.	206	204	209	203	204
1 1/2 x 3 1/2 x 8 in.	0686	lbs.	209	203	208	209	206
1 1/2 x 3 1/2 x 8 in.	0756	lbs.	208	208	210	213	212
1 1/2 x 3 1/2 x 8 in.	0744	lbs.	214	216	213	219	221
1 1/2 x 3 1/2 x 8 in.	0746	lbs.	220	206	221	221	222
1 1/2 x 3 1/2 x 8 in.	0700	lbs.	216	213	213	210	199
1 1/2 x 3 1/2 x 8 in.	0740	lbs.	196	199	201	206	202
1 1/2 x 3 1/2 x 8 in.	0788	lbs.	200	201	203	206	203
1 1/2 x 3 1/2 x 8 in.	0812	lbs.	208	204	209	206	203
1 1/2 x 3 1/2 x 8 in.	0774	lbs.	209	210	211	205	206
1 1/2 x 3 1/2 x 8 in.	0782	lbs.	208	209	210	210	211
1 1/2 x 3 1/2 x 8 in.	0762	lbs.	199	193	196	194	192
1 1/2 x 3 1/2 x 8 in.	0774	lbs.	196	193	197	197	198
1 1/2 x 3 1/2 x 8 in.	0774	lbs.	196	193	193	199	199
1 1/2 3 1/2 8	0822		199	209	201	203	202
1 1/2 3 1/2 8	0782		201	206	207	205	204

TEST LOAD WEIGHT: 1760 min lbs

1790

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-23 Manufacturer: Hearthstone Model: Sil a

Project #: pI 20202 Run: 2 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight		Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 9 in.	1 048	lbs.	191	192	193	196	195
1 1/2 x 3 1/2 x 9 in.	0 892	lbs.	201	206	204	206	205
1 1/2 x 3 1/2 x 9 in.	0 956	lbs.	201	201	193	196	195
1 1/2 x 3 1/2 x 9 in.	0 968	lbs.	191	195	193	196	195
1 1/2 x 3 1/2 x 9 in.	0 856	lbs.	205	201	201	206	204
1 1/2 x 3 1/2 x 9 in.	1 046	lbs.	194	196	193	194	193
1 1/2 x 3/4 x 5 in.	0 112	lbs.			191		
1 1/2 x 3/4 x 5 in.	0 106	lbs.			196		
1 1/2 x 3/4 x 5 in.	0 116	lbs.			199		
1 1/2 x 3/4 x 5 in.	0 112	lbs.			197		
1 1/2 x 3/4 x 5 in.	0 112	lbs.			196		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			196		
1 1/2 x 3/4 x 5 in.	0 128	lbs.			195		
1 1/2 x 3/4 x 5 in.	0 136	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 104	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			203		
1 1/2 x 3/4 x 5 in.	0 124	lbs.			203		
1 1/2 x 3/4 x 5 in.	0 122	lbs.			201		
1 1/2 x 3/4 x 5 in.	0 108	lbs.			201		
1 1/2 x 3/4 x 5 in.	0 122	lbs.			206		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			204		
1 1/2 x 3/4 x 5 in.	0 102	lbs.			203		
1 1/2 x 3/4 x 5 in.	0 106	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 104	lbs.			196		
1 1/2 x 3/4 x 5 in.	0 106	lbs.			194		
1 1/2 x 3/4 x 5 in.	0 108	lbs.			200		
x x in.		lbs.					

TEST LOAD WEIGHT: 8 06 lbs Min 20%: ..... Max 25%: _____

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-22 Manufacturer: Heartlstone Model: Sila

Project #: pI 20202 Run: 2 Tech: MM Reviewer: DP

		SYSTEM 1 – 1st hour				SYSTEM 1				
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	30	847	848	14	32	849	850	23	853
2019-07-22	17:00	110 2231	0 1276	0 1312	35 1741	110 1779	0 1280	0 1310	35 2011	0 1250
2019-07-23	9:00	110 2232	0 1275	0 1313	35 1742	110 1780	0 1279	0 1309	35 2012	0 1249

		SYSTEM 1 – 1st hour				SYSTEM 1				
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	30	847	848	14	32	849	850	23	853
2019-07-23	15:00	110 2233	0 1286	0 1301	35 1775	110 1781	0 1274	0 1304	35 2037	0 1250
2019-07-30	8:00	110 2233	0 1286	0 1301	35 1766	110 1781	0 1274	0 1304	35 2029	0 1250
2019-07-31	8:00	110 2233	0 1286	0 1301	35 1765	110 1781	0 1274	0 1304	35 2028	0 1250

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-22 Manufacturer: Hearthstone Model: 8.1a

Project #: PI 20202 Run: 2 Tech: MM Reviewer: DO

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	39	851	852	28
2019-07-22	17:00	110 2784	0 1277	0 1280	35 3475
2019-07-23	9:00	110 2785	0 1276	0 1281	35 3476

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	39	851	852	28
2019-07-23	15:00	110 2787	0 1289	0 1274	35 3500
2019-07-30	8:00	110 2786	0 1289	~~0 1277~~	35 3495
2019-07-31	8:00	110 2786	0 1290	0 1274 ~~0 1275~~	35 3495

Paramètres

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

Code verrouillage:	HEA

Description du test

Test standard	EPA	
Run #	3	
Date	24-07-2019	
Technicien	M.M	
Project #	PI 20202	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	SILA	
Combustion system	Cat	
Appliance type	WOODSTOVE	
Firebox volume	1,25	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,999	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,990	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,997	
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20202
Date	24-07-2019
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):	101,3	101,3
Barometer (in.Hg):	29,913879	29,91387874
Dry Bulb (F):	73,7	79,1
Humidity (%):	50,7	40,3
Air velocity (ft/min)	0	0

DGM #1	Final:	34595,255	cuft	Final:	979628,510	Liter
	Initial:	34550,503	cuft	Initial:	978361,280	Liter
DGM #2	Final:	32666,324	cuft	Final:	925007,260	Liter
	Initial:	32622,233	cuft	Initial:	923758,750	Liter

DGM room				Final:	516,900	cuft
				Initial:	471,750	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 200

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

Project nu.	PI 20202
Date	24-07-2019
Technicien	M.M

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
7,88	8,75	9,63

Load Volume: 0,3889 cu. ft

Loading Density: 10,942 lbs./ft3

Number of Spaces:

Load Density (wet): 35,172 lbs./ft3

Spacer weight (lbs):

Dry Wood Density: 29,322028

Piece Size (in): Thick	Wide	x Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches
1,5	3,5	8	0,866	19,3	19,6	19,9	19,3	19,8	16,95628	42,00
1,5	3,5	8	1	19,7	19,7	19,4	19,3	19,2	19,46	42,00
1,5	3,5	8	0,868	20,1	20,4	20,1	20	20	17,46416	42,00
1,5	3,5	8	0,816	19,6	19,3	19,5	19,4	19,9	15,94464	42,00
1,5	3,5	8	0,912	20	20	20,1	20,2	20,3	18,34944	42,00
1,5	3,5	8	0,82	19,9	19,7	19,6	19,6	19,5	16,1212	42,00
1,5	3,5	8	0,872	20,3	20,8	20,2	20,2	20,3	17,75392	42,00
1,5	3,5	8	0,802	19,5	19,3	19,4	19,6	19,6	15,62296	42,00
										0,00
1,5	3,5	8	0,856	20,3	19,9	19,8	19,7	19,8	17,0344	42,00
1,5	3,5	8	0,856	19,8	19,5	19,8	19,3	19,7	16,79472	42,00
1,5	3,5	8	0,87	20,6	20,3	20,6	20,5	20,9	17,9046	42,00
1,5	3,5	8	0,758	20,9	20,6	20,8	20,3	20,6	15,64512	42,00
1,5	3,5	8	0,938	19,9	19,3	19,8	19,8	19,4	18,42232	42,00
1,5	3,5	8	0,814	20	20,6	20,8	20,5	20,8	16,71956	42,00
1,5	3,5	8	0,826	19,9	19,5	19,8	20	20,1	16,40436	42,00
1,5	3,5	8	0,804	20,8	20,3	20,2	20	20	16,28904	42,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
								SUM MC:	272,88672	

PreTest Load Weight: 13,68 lbs.

Dry Weight: 5,17 kg.

Average Moisture Content: %

Dry: 19,95

19,95

Must be 18-28

Wet: 16,63

must be 15,2-22

Project nu.	PI 20202
Date	24-07-2019
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
7,9	8,8	9,6

* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume: 0,28 cu. ft

Loading Density: 6,4 lbs./ft3

Number of Spaces: 20

Spacer weight: lbs

Load Density (wet): 28,1 lbs./ft3

Dry Wood Density: 23,5 lbs./ft3

Piece Size (in): Thick	Wide	Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
1,5	3,5	9	0,98	19,60	19,30	19,20	19,30	19,40	18,93408	47,25	19,4
1,5	3,5	9	0,89	19,80	19,90	19,40	19,20	19,30	17,45088	47,25	19,5
1,5	3,5	9	0,97	20,00	20,10	20,60	20,40	20,30	19,75272	47,25	20,3
1,5	3,5	9	0,84	20,90	21,00	19,90	19,40	19,90	17,06568	47,25	20,2
1,5	3,5	9	1,00	20,00	20,10	20,00	20,30	19,90	20,14024	47,25	20,1
1,5	3,5	9	1,04	20,00	20,30	19,90	19,10	19,60	20,61076	47,25	19,8
1,5	0,75	5	0,12			19,10			2,2156	5,63	19,1
1,5	0,75	5	0,11			19,30			2,0458	5,63	19,3
1,5	0,75	5	0,12			19,20			2,2272	5,63	19,2
1,5	0,75	5	0,13			19,40			2,4832	5,63	19,4
1,5	0,75	5	0,11			19,60			2,2344	5,63	19,6
1,5	0,75	5	0,12			19,50			2,379	5,63	19,5
1,5	0,75	5	0,13			19,80			2,4948	5,63	19,8
1,5	0,75	5	0,10			19,20			1,92	5,63	19,2
1,5	0,75	5	0,12			19,20			2,304	5,63	19,2
1,5	0,75	5	0,11			19,40			2,0952	5,63	19,4
1,5	0,75	5	0,12			19,60			2,3128	5,63	19,6
1,5	0,75	5	0,11			19,30			2,0844	5,63	19,3
1,5	0,75	5	0,11			19,40			2,2116	5,63	19,4
1,5	0,75	5	0,1			19,80			1,98	5,63	19,8
1,5	0,75	5	0,114			20,20			2,3028	5,63	20,2
1,5	0,75	5	0,1			20,40			2,04	5,63	20,4
1,5	0,75	5	0,132			20,6			2,7192	5,63	20,6
1,5	0,75	5	0,102			19,9			2,0298	5,63	19,9
1,5	0,75	5	0,124			19,8			2,4552	5,63	19,8
1,5	0,75	5	0,104			19,2			1,9968	5,63	19,2
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	158,48616		19,7 %

Test Load Weight: 8,01 lbs.

Dry Weight: 3,03 kg.

Average Moisture Content: %

Dry: 19,79 Dry(EPA) 19,79 Dry(B415 19,79

19,79 Must be 19-25

Wet: 16,52 must be 15,2-22

Coal Bed Range: 1,6 lbs. to 2,0 lbs.

TEST CHARGE:

Coal bed weight: 1,6 lbs.

Project nu.	PI 20202
Date	24-07-2019
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,32 in. H20
Barometer: 29,900 in. Hg

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

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

PITOT CONSTANT=
0,927

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,065	75,43	0,2550
B center	0,064	74,84	0,2530
A1	0,051	75,43	0,2258
A2	0,055	75,19	0,2345
A3	0,052	75,19	0,2280
A4	0,051	75,33	0,2258
B1	0,051	74,610	0,2258
B2	0,054	74,690	0,2324
B3	0,060	74,870	0,2449
B4	0,052	74,850	0,2280
AVERAGE	0,0555	75,0430	0,2353

Project nu.	PI 20202
Date	24-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	11	118	119	4	35	120	857	29	43	858	859	34	860		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	93,7217	0,1266	0,1234	35,3376	109,2856	0,1255	0,1293	34,2495	109,1650	0,1285	0,1230	34,2569	0,1226	2019-07-23	17:00
Before (6)	93,7217	0,1266	0,1235	35,3375	109,2856	0,1256	0,1293	34,2493	109,1649	0,1285	0,1231	34,2568	0,1225	2019-07-24	09:00
After (1)	93,7229	0,1269	0,1230	35,3402	109,2861	0,1252	0,1284	34,2526	109,1656	0,1295	0,1222	34,2605	0,1227	2019-07-24	15:30
After (2)	93,7219	0,1269	0,1230	35,3392	109,2858	0,1252	0,1284	34,2517	109,1653	0,1295	0,1222	34,2592	0,1227	2019-07-30	08:00
After (3)	93,7219	0,1269	0,1230	35,3392	109,2858	0,1252	0,1284	34,2517	109,1653	0,1295	0,1222	34,2592	0,1227	2019-07-31	08:00
After (4)															
After (5)															
After (6)	93,7219	0,1269	0,1230	35,3392	109,2858	0,1252	0,1284	34,2517	109,1653	0,1295	0,1222	34,2592	0,1227	2019-07-31	08:00
Difference	0,0002	0,0003	-0,0005	0,0017	0,0002	-0,0004	-0,0009	0,0024	0,0004	0,0010	-0,0009	0,0024	0,0002		
Total (mg)		1,7				3				2,9			0,2		
Total ajusté (mg)		**1,50**				**2,80**				**2,70**					

Project nu.	PI 20202
Date	24-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	11	118	119	4	35	120	857	29	43	858	859	34	860		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	93,7217	0,1266	0,1234	35,3376	109,2856	0,1255	0,1293	34,2495	109,1650	0,1285	0,1230	34,2569	0,1226	2019-07-23	17:00
Before (6)	93,7217	0,1266	0,1235	35,3375	109,2856	0,1256	0,1293	34,2493	109,1649	0,1285	0,1231	34,2568	0,1225	2019-07-24	09:00
After (1)	93,7229	0,1269	0,1230	35,3402	109,2861	0,1252	0,1284	34,2526	109,1656	0,1295	0,1222	34,2605	0,1227	2019-07-24	15:30
After (2)	93,7219	0,1269	0,1230	35,3392	109,2858	0,1252	0,1284	34,2517	109,1653	0,1295	0,1222	34,2592	0,1227	2019-07-30	08:00
After (3)	93,7219	0,1269	0,1230	35,3392	109,2858	0,1252	0,1284	34,2517	109,1653	0,1295	0,1222	34,2592	0,1227	2019-07-31	08:00
After (4)															
After (5)															
After (6)	93,7219	0,1269	0,1235	35,3392	109,2858	0,1256	0,1293	34,2517	109,1653	0,1295	0,1231	34,2592	0,1227	2019-07-31	08:00
Difference	0,0002	0,0003	0,0000	0,0017	0,0002	0,0000	0,0000	0,0024	0,0004	0,0010	0,0000	0,0024	0,0002		
Total (mg)		2,2				4,8				3,8			0,2		
Total ajusté (mg)		**2,00**				**4,60**				**3,60**					

Project nu.	PI 20202
Date	24-07-2019
Technicien	M.M

negative filter weight rounded to zero emission rate 1,1 gr/hr. for demonstration purpose only not a compliance number

SFBA EPA EMISSION RESULTS

Test Duration: **183** min

PRESSURE FACTOR:	DGM 1	0,96255	
	DGM 2	0,96732	
	DGM 3	0,99980	
TEMPERATURE FACTORS	DGM 1	0,98012	
	DGM 2	0,97966	
	DGM 3	0,98402	
VOLUMES SAMPLED	DGM 1	42,192	SCft
	DGM 2	41,371	Scft
	DGM 3	44,295	SCft

TOTAL TUNNEL VOLUME : 33320

SAMPLE RATIOS

Sample Train 1:	789,731
Sample Train 2:	805,402

Paticulate concentration

Sample Train 1	**0,000071**	g/dscf
Sample Train 2	**0,000070**	g/dscf
Room	**0,000005**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,22**	g
Sample Train 2	**2,19**	g

EMISSION RATES

Sample Train 1	**0,73**	g/hr
Sample Train 2	**0,72**	g/hr

1st hour emission rate **1,34** g/hr

	Train 1	Train 2
Cs	7,11E-05	7,0098E-05

RESULTS

Average emission rate: 0,7 g/hr

Burn Rate : 0,994 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,913879	in Hg
Start:	29,913879	in Hg
End:	29,913879	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	34595,255	Cuft
	Initial:	34550,503	Cuft
DGM 2	Final:	32666,324	Cuft
	Initial:	32622,233	Cuft
DGM #3	Final:	516,900	Cuft
	Initial:	471,750	Cuft

TEMPERATURES

DGM 1	538,711	°R
DGM 2	538,961	°R

CALIBRATION FACTORS

DGM 1	0,9993
DGM 2	0,9901
DGM #3	0,9972

TUNNEL FLOW RATE: 182,076 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	3,00	mg
Total Sample Train 2:	2,90	mg
Total Sample Train 1 1st hour:	1,70	mg

DEVIATION: 0,76%

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*											
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft	Change in
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	up	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Surface
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	Temp. °F
0,00	200,00	8,0	0,1	8,5	0,0	323,0	74,3	110,0	436,7	450,7	536,4	529,1	135,3	593,8	0,22	77,42	77,40	77,31	0,23	78,01	77,46	78,01	0,07	0,05	0
1,0	201,0	7,9	0,1	1,3	0,0	328,9	74,3	110,8	429,0	444,0	526,9	512,8	135,4	525,4	0,23	77,65	77,52	77,37	0,23	78,04	77,68	78,29	0,07	0,05	-8,032507
2,0	202,0	7,8	0,1	3,0	0,0	338,0	74,3	107,6	424,2	435,4	511,2	493,0	133,5	649,5	0,23	77,73	77,54	77,36	0,23	78,09	77,73	78,37	0,07	0,05	-18,20433
3,0	203,0	7,8	0,0	3,9	0,0	349,3	74,4	108,3	423,7	427,8	494,9	475,8	132,3	710,1	0,23	77,68	77,55	77,43	0,23	78,10	77,77	78,42	0,07	0,05	-26,74834
4,0	204,0	7,7	0,0	5,6	0,0	360,1	74,6	109,2	426,0	421,2	481,9	462,6	131,2	764,8	0,23	77,74	77,56	77,46	0,23	78,08	77,79	78,51	0,07	0,06	-33,05305
5,0	205,0	7,6	0,0	5,8	0,0	360,0	74,8	106,2	430,4	415,0	472,0	452,5	129,7	775,5	0,23	77,72	77,59	77,49	0,23	78,10	77,83	78,55	0,07	0,05	-37,7252
6,0	206,0	7,5	0,0	5,7	0,0	335,4	74,9	102,0	432,5	409,1	465,6	445,8	129,0	772,4	0,23	77,72	77,61	77,62	0,23	78,11	77,88	78,61	0,07	0,05	-41,26115
7,0	207,0	7,5	0,0	5,4	0,0	326,4	74,6	101,0	433,9	403,7	458,4	438,7	128,7	766,5	0,23	77,75	77,62	77,68	0,23	78,11	77,89	78,66	0,07	0,05	-44,96474
8,0	208,0	7,4	0,0	6,0	0,0	323,8	74,8	100,6	435,8	398,4	451,3	432,4	129,4	784,9	0,23	77,74	77,65	77,82	0,23	78,09	77,92	78,76	0,07	0,05	-48,21706
9,0	209,0	7,4	0,0	7,7	0,0	323,2	74,6	100,6	438,2	393,2	445,4	428,3	129,1	798,3	0,23	77,68	77,65	77,91	0,23	78,03	77,90	78,87	0,07	0,05	-50,79699
10,0	210,0	7,3	0,0	7,1	0,0	322,9	74,4	100,1	440,6	388,2	440,8	425,2	129,0	816,4	0,23	77,55	77,65	78,01	0,23	77,98	77,94	78,94	0,07	0,05	-52,87259
11,0	211,0	7,2	0,0	5,6	0,0	323,6	74,8	99,9	443,4	383,8	435,8	420,6	129,3	817,1	0,23	77,44	77,63	78,09	0,23	77,90	77,95	79,01	0,07	0,05	-55,04798
12,0	212,0	7,2	0,0	6,9	0,0	327,3	74,3	100,5	446,5	379,3	431,1	418,2	129,1	835,9	0,23	77,45	77,65	78,24	0,23	77,88	77,96	79,12	0,07	0,05	-56,79269
13,0	213,0	7,0	0,0	10,5	0,0	332,2	75,0	101,8	450,6	375,2	428,5	416,8	128,8	847,0	0,23	77,40	77,67	78,38	0,23	77,85	78,00	79,25	0,07	0,05	-57,66155
14,0	214,0	6,9	0,0	12,5	0,0	332,9	74,8	102,1	454,7	371,7	430,2	414,8	128,8	809,7	0,23	77,48	77,69	78,46	0,23	77,90	77,98	79,34	0,07	0,05	-57,59817
15,0	215,0	6,9	0,0	9,0	0,0	330,2	75,1	100,6	457,4	368,3	433,8	412,3	128,3	807,0	0,23	77,54	77,69	78,53	0,23	77,91	78,00	79,39	0,07	0,05	-57,63348
16,0	216,0	6,8	0,0	4,8	0,0	330,3	74,9	100,4	459,5	364,7	434,2	409,0	128,3	845,1	0,23	77,63	77,72	78,61	0,23	77,95	78,03	79,51	0,07	0,05	-58,51418
17,0	217,0	6,8	0,0	5,0	0,0	332,2	75,1	100,3	462,5	361,7	431,5	405,7	128,4	885,7	0,23	77,63	77,74	78,71	0,23	77,97	78,03	79,59	0,07	0,05	-59,70045
18,0	218,0	6,7	0,0	6,0	0,0	336,8	74,9	100,8	467,4	359,1	426,6	402,8	128,0	955,8	0,23	77,65	77,75	78,80	0,23	78,00	78,03	79,70	0,07	0,05	-60,86708
19,0	219,0	6,6	0,0	6,8	0,0	338,8	75,0	101,2	473,3	356,9	421,7	401,2	128,1	883,9	0,23	77,65	77,76	78,89	0,23	78,01	78,06	79,79	0,07	0,05	-61,40677
20,0	220,0	6,5	0,0	8,2	0,0	342,7	75,1	101,7	478,1	354,6	418,2	401,6	127,5	903,2	0,23	77,69	77,77	78,97	0,23	78,03	78,06	79,91	0,07	0,05	-61,66185
21,0	221,0	6,5	0,0	8,4	0,0	345,0	75,1	101,5	482,6	352,2	417,9	402,5	127,5	891,9	0,23	77,68	77,75	79,05	0,23	78,04	78,07	80,00	0,07	0,05	-61,11518
22,0	222,0	6,4	0,0	9,8	0,0	344,8	75,0	102,2	485,9	349,9	422,1	404,5	127,1	827,2	0,23	77,70	77,78	79,14	0,23	78,04	78,09	80,10	0,07	0,05	-59,75207
23,0	223,0	6,3	0,0	11,3	0,0	345,1	75,3	102,4	487,6	348,0	430,4	405,1	127,0	822,6	0,23	77,72	77,80	79,21	0,23	78,05	78,09	80,20	0,07	0,05	-58,0267
24,0	224,0	6,2	0,0	10,0	0,0	343,1	75,3	102,2	488,3	346,2	439,2	405,0	126,5	803,2	0,23	77,82	77,80	79,30	0,23	78,09	78,10	80,27	0,07	0,05	-56,60704
25,0	225,0	6,1	0,0	8,7	0,0	340,7	75,4	102,2	487,9	344,7	446,9	404,7	126,8	792,3	0,23	77,95	77,84	79,40	0,23	78,14	78,12	80,37	0,07	0,05	-55,44105
26,0	226,0	6,0	0,0	8,2	0,0	340,9	75,4	102,3	487,6	343,3	452,9	404,7	126,3	798,7	0,23	78,04	77,84	79,49	0,23	78,18	78,14	80,45	0,07	0,05	-54,68446
27,0	227,0	5,9	0,0	10,4	0,0	340,3	75,4	102,6	487,4	342,2	459,4	405,4	126,2	804,7	0,23	78,10	77,85	79,59	0,23	78,22	78,13	80,52	0,07	0,05	-53,52259
28,0	228,0	5,8	0,0	8,6	0,0	340,8	75,4	102,5	487,1	341,1	466,0	406,5	125,9	804,1	0,23	78,22	77,86	79,64	0,23	78,29	78,14	80,60	0,07	0,05	-52,32749
29,0	229,0	5,7	0,0	11,4	0,0	341,2	75,3	102,1	487,3	340,5	473,3	408,3	126,2	813,7	0,23	78,25	77,86	79,72	0,23	78,32	78,13	80,65	0,07	0,05	-50,50393
30,0	230,0	5,6	0,0	8,4	0,0	340,9	75,2	102,3	487,6	339,9	480,0	409,9	125,9	806,4	0,23	78,28	77,88	79,76	0,23	78,37	78,16	80,72	0,07	0,05	-48,98178
31,0	231,0	5,5	0,0	11,3	0,0	343,1	75,4	102,9	488,6	340,0	487,6	412,8	125,7	836,4	0,23	78,26	77,89	79,80	0,23	78,40	78,18	80,75	0,07	0,05	-46,70494
32,0	232,0	5,4	0,0	10,7	0,0	342,3	75,4	102,4	490,4	340,1	495,4	416,1	125,5	831,9	0,23	78,30	77,88	79,81	0,23	78,41	78,18	80,81	0,07	0,05	-44,15655
33,0	233,0	5,3	0,0	9,5	0,0	343,6	75,7	103,3	491,7	340,3	501,6	419,0	125,2	823,1	0,23	78,35	77,91	79,87	0,23	78,43	78,20	80,92	0,07	0,05	-42,09051
34,0	234,0	5,3	0,0	11,1	0,0	343,6	75,6	102,8	493,7	340,8	508,7	422,6	125,0	840,6	0,23	78,40	77,93	79,96	0,23	78,49	78,23	80,98	0,07	0,05	-39,48574
35,0	235,0	5,2	0,0	8,4	0,0	343,9	75,9	102,9	495,1	341,2	514,1	425,3	125,1	829,7	0,23	78,45	77,94	80,05	0,23	78,55	78,24	81,06	0,07	0,05	-37,472
36,0	236,0	5,1	0,0	12,0	0,0	345,3	75,7	103,2	497,1	342,0	520,2	428,7	124,6	845,4	0,23	78,48	77,97	80,08	0,23	78,59	78,27	81,10	0,07	0,05	-35,12769
37,0	237,0	5,0	0,0	10,3	0,0	346,2	75,7	103,0	499,3	342,6	525,7	431,6	124,7	846,8	0,23	78,54	77,97	80,13	0,23	78,59	78,24	81,14	0,07	0,05	-32,87018
38,0	238,0	4,9	0,0	8,9	0,0	346,0	75,6	103,0	500,9	343,6	530,5	434,1	124,3	842,9	0,23	78,56	77,98	80,18	0,23	78,61	78,24	81,21	0,07	0,05	-30,95572
39,0	239,0	4,8	0,0	9,3	0,0	347,3	75,9	102,7	502,8	344,3	534,6	436,1	124,1	843,9	0,23	78,61	78,00	80,21	0,23	78,62	78,24	81,30	0,07	0,05	-29,28749
40,0	240,0	4,7	0,0	9,1	0,0	347,4	75,3	102,4	504,7	345,1	538,7	438,2	123,9	848,4	0,23	78,58	78,00	80,24	0,23	78,60	78,25	81,34	0,07	0,05	-27,51778
41,0	241,0	4,7	0,0	8,5	0,0	347,0	75,7	103,4	506,4	346,1	541,3	439,1	123,8	844,9	0,23	78,53	78,00	80,29	0,23	78,58	78,24	81,43	0,07	0,05	-26,30418
42,0	242,0	4,6	0,0	11,0	0,0	350,2	75,7	103,5	508,5	347,3	545,5	441,8	123,6	864,0	0,23	78,54	78,02	80,30	0,23	78,61	78,25	81,43	0,07	0,05	-24,32005
43,0	243,0	4,5	0,0	12,2	0,0	352,2	75,5	103,8	512,0	348,4	550,4	444,6	123,3	889,6	0,23	78,57	78,03	80,36	0,23	78,66	78,26	81,49	0,07	0,05	-21,89202
44,0	244,0	4,4	0,0	10,3	0,0	353,1	75,9	103,5	515,4	349,6	554,6	445,9	123,2	885,6	0,23	78,58	78,03	80,40	0,23	78,65	78,26	81,50	0,07	0,05	-19,9147
45,0	245,0	4,3	0,0	9,5	0,0	353,4	75,7	103,8	518,4	350,6	557,5	445,9	122,8	877,2	0,23	78,57	78,05	80,41	0,23	78,66	78,28	81,54	0,07	0,05	-18,63695
46,0	246,0	4,2	0,0	11,1	0,0	354,8	75,9	103,3	521,5	351,9	560,8	446,7	122,5	880,3	0,23	78,59	78,03	80,41	0,23	78,66	78,29	81,58	0,07	0,05	-16,97658
47,0	247,0	4,1	0,0	10,1	0,0	356,8	75,4	103,4	524,7	353,2	564,4	448,1	122,3	896,9	0,23	78,58	78,05	80,44	0,23	78,64	78,28	81,61	0,07	0,05	-15,11807
48,0	248,0	4,0	0,0	12,4	0,0	358,4	75,6	103,2	528,2	354,7	568,1	449,0	122,0	912,7	0,23	78,58	78,04	80,57	0,23	78,67	78,27	81,63	0,07	0,06	-13,25192
49,0	249,0	3,9	0,0	11,7	0,0	359,6	75,7	103,8	532,7	356,1	571,9	449,4	122,0	928,5	0,23	78,55	78,02	80,58	0,23	78,65	78,27	81,66	0,07	0,06	-11,23055
50,0	250,0	3,8	0,0	12,6	0,0	362,0	75,8	104,1	537,5	357,7	576,4	450,2	121,7	935,3	0,23	78,56	78,03	80,63	0,23	78,68	78,25	81,71	0,07	0,05	-8,944203
51,0	251,0	3,8	0,0	12,2	0,0	362,5	75,9	104,0	542,2	359,3	580,9	450,8	121,5	940,0	0,23	78,60	78,02	80,67	0,23	78,68	78,25	81,76	0,07	0,06	-6,704597
52,0	252,0	3,7	0,0	12,5	0,0	364,2	75,7	103,9	546,5	361,1	585,0	451,6	120,8	939,4	0,23	78,55	78,02	80,72	0,23	78,68	78,27	81,82	0,07	0,06	-4,656944
53,0	253,0	3,6	0,0	10,8	0,0	364,9	76,1	104,7	550,8	363,0	588,7	452,7	120,9	939,3	0,23	78,58	78,07	80,74	0,23	78,72	78,30	81,84	0,07	0,05	-2,429562
54,0	254,0	3,5	0,0	10,2	0,0	365,1	76,1	104,4	554,2	364,6	591,8	453,7	120,7	928,7	0,23	78,66	78,05	80,81	0,23	78,73	78,30	81,88	0,07	0,05	-0,671597
55,0	255,0	3,4	0,0	9,9	0,0	365,8	76,1	104,9	557,1	366,4	593,5	454,4	120,4	922,8	0,23	78,72	78,09	80,89	0,23	78,81	78,33	81,96	0,07	0,06	0,698097
56,0	256,0	3,4	0,0	9,7	0,0	366,2	76,3	104,7	559,1	368,1	594,5	455,0	120,1	919,0	0,23	78,76	78,09	80,94	0,23	78,86	78,35	81,99	0,07	0,06	1,7080594
57,0	257,0	3,3	0,0	9,5	0,0	366,2	76,4	105,4	561,0	369,8	595,4	455,6	119,9	915,0	0,23	78,81	78,12	80,99	0,23	78,90	78,36	82,01	0,07	0,06	2,690466
58,0	258,0	3,2	0,0	9,5	0,0	366,6	76,1	104,9	562,3	371,1	596,1	456,3	119,4	913,8	0,23	78,82	78,13	81,00	0,23	78,88	78,35	82,06	0,07	0,05	3,39832
59,0	259,0	3,1	0,0	10,4	0,0	367,8	76,3	105,4	563,8	372,6	597,7	457,8	119,5	916,1	0,23	78,83	78,15	81,07	0,23	78,91	78,35	82,11	0,07	0,05	4,6102674
60,0	260,0	3,0	0,0	11,5	0,0	368,6	75,8	104,8	565,4	374,5	600,8	460,1	119,1	929,8	0,23	78,84	78,18	77,60	0,23	78,93	78,36	82,18	0,07	0,06	6,3599654
61,0	261,0	3,0	0,0	11,2	0,0	370,2	76,1	104,8	567,9	376,4	604,5	462,8	118,8	951,7	0,23	78,85	78,18	77,64	0,23	78,95	78,38	82,14	0,07	0,06	8,4087312
62,0	262,0	2,9	0,0	11,9	0,0	372,2	76,2	105,1	571,7	378,3	608,6	466,1	118,7	973,7	0,23	78,85	78,20	77,71	0,23	78,98	78,43	82,20	0,07	0,06	11,03239
63,0	263,0	2,8	0,0	13,7	0,0	373,7	76,2	105,4	576,4	380,9	614,1	470,5	118,5	989,1	0,23	78,82	78,18	77,80	0,23	78,97	78,41	82,21	0,07	0,06	14,435889
64,0	264,0	2,7	0,1	13,7	0,0	374,9	76,4	106,3	582,1	383,8	621,2	475,8	118,4	1004,4	0,23	78,88	78,20	77,91	0,23	79,00	78,41	82,26	0,07	0,06	18,596667
65,0	265,0	2,6	0,1	14,3	0,0	376,7	76,4	106,5	588,0	386,6	628,8	481,6	118,3	1008,6	0,23	78,95	78,23	78,06	0,23	79,07	78,44	82,32	0,07	0,06	23,01279
66,0	266,0	2,5	0,1	14,3	0,0	377,4	76,2	107,0	593,6	389,3	636,4	487,7	118,0	1015,0	0,23	79,01	78,27	78,22	0,23	79,13	78,48	82,39	0,07	0,06	27,364164
67,0	267,0	2,4	0,0	14,0	0,0	379,0	76,4	106,3	599,0	392,0	644,1	494,2	117,7	1012,0	0,23	79,04	78,26	78,35	0,23	79,21	78,50	82,45	0,07	0,06	31,758858
68,0	268,0	2,3	0,0	13,0	0,0	379,4	76,7	106,8	603,8	395,1	651,4	500,6	117,5	1008,2	0,23	79,15	78,28	78,53	0,23	79,32	78,55	82,50	0,07	0,06	36,021738
69,0	269,0	2,3	0,0	13,0	0,0	380,4	76,7	106,9	607,6	397,6	657,7	506,8	117,5	987,7	0,23	79,28	78,31	78,70	0,23	79,42	78,57	82,58	0,07	0,06	39,782985
70,0	270,0	2,2	0,0	10,0	0,0	380,4	77,0	107,4	609,4	400,1	661,7	512,3	117,0	965,9	0,23	79,35	78,35	78,88	0,23	79,48	78,61	82,61	0,07	0,06	42,444516
71,0	271,0	2,1	0,0	10,4	0,0	379,5	76,4	106,6	610,1	402,7	665,3	519,1	116,8	948,8	0,23	79,39	78,35	79,06	0,23	79,51	78,63	82,67	0,07	0,06	45,146005
72,0	272,0	2,1	0,0	9,8	0,0	377,8	76,5	106,6	609,1	405,3	668,6	528,0	116,5	934,3	0,23	79,35	78,40	79,28	0,23	79,52	78,67	82,74	0,07	0,06	47,857399
73,0	273,0	2,0	0,0	8,9	0,0	375,4	76,8	106,7	607,0	407,9	670,0	537,2	116,4	921,8	0,23	79,37	78,40	79,43	0,23	79,52	78,68	82,81	0,07	0,06	50,020729
74,0	274,0	2,0	0,0	9,1	0,0	373,2	76,9	106,7	604,3	410,2	669,9	547,5	116,3	909,7	0,23	79,36	78,41	79,60	0,23	79,57	78,68	82,78	0,07	0,06	51,987642
75,0	275,0	2,0	0,0	9,1	0,0	371,6	76,7	106,3	600,4	412,6	668,3	556,9	115,9	900,6	0,23	79,41	78,44	79,80	0,23	79,61	78,70	82,81	0,07	0,06	53,15061
76,0	276,0	1,9	0,0	8,8	0,0	369,1	76,4	106,5	596,1	414,5	665,5	562,8	115,7	889,5	0,23	79,45	78,45	79,98	0,23	79,59	78,70	82,87	0,07	0,05	53,302316
77,0	277,0	1,9	0,0	8,4	0,0	367,6	77,0	106,1	592,0	416,5	662,1	566,7	115,7	881,6	0,23	79,50	78,48	80,15	0,23	79,64	78,71	82,89	0,07	0,05	52,961162
78,0	278,0	1,8	0,0	8,5	0,0	365,3	77,1	106,3	587,7	418,2	658,5	570,4	115,6	874,3	0,23	79,54	78,49	80,32	0,23	79,68	78,72	82,92	0,07	0,05	52,433992
79,0	279,0	1,8	0,0	8,6	0,0	363,4	77,2	106,6	583,2	420,3	655,4	573,5	115,3	861,3	0,23	79,53	78,51	80,50	0,23	79,67	78,74	82,90	0,07	0,05	51,881564
80,0	280,0	1,8	0,0	8,8	0,0	361,2	77,3	106,1	578,5	423,0	653,3	577,3	115,2	846,3	0,23	79,57	78,55	80,64	0,23	79,72	78,74	82,95	0,07	0,05	51,797783
81,0	281,0	1,7	0,0	8,7	0,0	358,8	77,3	105,7	573,2	426,7	652,4	582,1	115,0	832,4	0,23	79,60	78,57	80,82	0,23	79,76	78,78	82,98	0,07	0,05	52,257565
82,0	282,0	1,7	0,0	8,6	0,0	355,9	77,4	105,3	567,8	431,4	652,1	587,4	114,8	822,9	0,23	79,58	78,59	80,98	0,23	79,79	78,79	83,00	0,07	0,05	53,053293
83,0	283,0	1,7	0,0	8,5	0,0	352,6	77,3	105,6	562,2	436,1	652,0	593,0	114,7	813,5	0,23	79,60	78,60	81,15	0,23	79,80	78,82	83,02	0,07	0,05	53,942004
84,0	284,0	1,6	0,0	8,3	0,0	350,2	77,4	104,3	556,6	440,1	651,7	598,5	114,7	804,4	0,23	79,60	78,62	81,30	0,23	79,84	78,83	83,01	0,07	0,05	54,672153
85,0	285,0	1,6	0,0	8,0	0,0	347,3	76,7	103,8	550,9	443,7	651,1	602,9	114,4	795,4	0,23	79,58	78,65	81,45	0,23	79,84	78,87	83,04	0,07	0,05	54,96716
86,0	286,0	1,6	0,0	7,9	0,0	344,2	77,1	103,9	545,1	447,0	650,1	606,3	114,3	786,9	0,23	79,62	78,65	81,55	0,23	79,86	78,88	83,04	0,07	0,05	54,89382
87,0	287,0	1,6	0,0	7,8	0,0	341,1	77,4	103,3	539,3	449,5	648,9	608,2	114,4	779,8	0,23	79,63	78,64	81,66	0,23	79,83	78,87	83,08	0,07	0,05	54,429321
88,0	288,0	1,5	0,0	7,7	0,0	339,3	76,9	102,6	533,9	451,6	647,0	608,6	114,2	774,2	0,23	79,54	78,61	81,73	0,23	79,74	78,86	82,97	0,07	0,05	53,426979
89,0	289,0	1,5	0,0	7,7	0,0	336,7	76,5	98,1	528,8	452,8	645,0	607,7	114,2	770,0	0,23	79,55	78,61	81,70	0,23	79,79	78,86	82,90	0,07	0,05	52,077437
90,0	290,0	1,5	0,0	7,6	0,0	333,0	77,2	101,4	523,4	454,5	643,9	609,3	114,3	765,7	0,23	79,62	78,65	81,74	0,23	79,86	78,88	82,86	0,07	0,05	51,43341
91,0	291,0	1,5	0,0	7,6	0,0	330,6	77,3	102,0	518,3	455,5	641,8	609,1	114,1	761,8	0,23	79,62	78,66	81,83	0,23	79,89	78,94	82,89	0,07	0,05	50,14549
92,0	292,0	1,5	0,0	7,5	0,0	328,4	77,0	102,6	513,5	455,8	639,3	608,5	114,1	757,9	0,23	79,62	78,68	81,91	0,23	79,91	78,97	82,91	0,07	0,05	48,592059
93,0	293,0	1,4	0,0	7,4	0,0	326,6	77,1	101,6	508,9	455,8	636,6	608,2	114,1	755,1	0,23	79,49	78,65	81,99	0,23	79,83	78,98	82,90	0,07	0,05	47,042291
94,0	294,0	1,4	0,0	7,3	0,0	324,8	77,3	101,8	504,4	455,5	633,6	607,5	114,4	752,9	0,23	79,49	78,70	82,05	0,23	79,87	79,01	82,91	0,07	0,05	45,422133
95,0	295,0	1,4	0,0	7,4	0,0	323,4	76,8	101,1	499,9	454,8	630,6	607,2	113,7	751,1	0,23	79,45	78,69	82,12	0,23	79,82	79,01	82,92	0,07	0,05	43,57361
96,0	296,0	1,4	0,0	7,3	0,0	321,7	76,7	100,5	495,9	454,7	627,7	606,2	114,3	749,3	0,23	79,44	78,70	82,13	0,23	79,76	78,99	82,87	0,07	0,05	42,106154
97,0	297,0	1,4	0,0	7,3	0,0	320,6	77,2	100,4	492,0	454,2	624,4	605,6	114,0	747,9	0,23	79,41	78,69	82,17	0,23	79,72	79,00	82,90	0,07	0,05	40,378308
98,0	298,0	1,4	0,0	7,3	0,0	318,5	77,0	99,2	488,4	453,2	621,4	604,4	113,9	746,1	0,23	79,43	78,70	82,21	0,23	79,71	78,98	82,90	0,07	0,05	38,600679
99,0	299,0	1,3	0,0	7,3	0,0	317,0	77,4	99,5	485,2	453,3	617,9	602,9	114,7	744,8	0,23	79,45	78,72	82,21	0,23	79,71	78,96	82,89	0,07	0,05	37,14525
100,0	300,0	1,3	0,0	7,4	0,0	315,7	77,4	100,5	482,1	452,6	614,8	602,4	114,9	743,6	0,23	79,46	78,74	82,27	0,23	79,74	78,99	82,91	0,07	0,05	35,70623
101,0	301,0	1,3	0,0	7,4	0,0	314,6	77,2	100,1	478,9	451,8	611,7	601,4	115,1	742,9	0,23	79,46	78,75	82,31	0,23	79,76	79,01	82,89	0,07	0,05	34,157808

102,0	302,0	1,3	0,0	7,4	0,0	313,1	77,1	99,9	476,2	451,1	608,6	600,4	115,1	741,5	0,23	79,42	78,76	82,36	0,23	79,72	79,01	82,85	0,07	0,05	32,623323
103,0	303,0	1,3	0,0	7,4	0,0	311,8	76,9	99,7	473,4	450,3	605,6	599,6	115,3	740,7	0,23	79,38	78,75	82,34	0,23	79,68	79,00	82,76	0,07	0,05	31,17157
104,0	304,0	1,2	0,0	7,3	0,0	310,7	77,1	99,9	470,8	449,4	602,5	599,0	115,3	739,8	0,23	79,34	78,77	82,36	0,23	79,66	78,99	82,73	0,07	0,05	29,742259
105,0	305,0	1,2	0,0	7,3	0,0	310,0	77,2	100,1	468,3	448,8	599,5	598,7	115,5	738,1	0,23	79,30	78,75	82,41	0,23	79,60	78,99	82,69	0,07	0,05	28,493715
106,0	306,0	1,2	0,0	7,3	0,0	308,5	77,2	99,6	466,1	448,0	596,4	598,6	115,7	736,7	0,23	79,30	78,78	82,43	0,23	79,61	78,98	82,71	0,07	0,04	27,30556
107,0	307,0	1,2	0,0	7,3	0,0	307,5	77,2	99,6	463,9	447,2	593,6	598,2	115,8	736,3	0,23	79,29	78,78	82,46	0,23	79,60	78,98	82,68	0,07	0,04	26,086644
108,0	308,0	1,2	0,0	7,4	0,0	306,7	77,1	99,2	461,8	446,3	590,7	598,0	115,9	736,4	0,23	79,30	78,77	82,51	0,23	79,59	78,97	82,66	0,07	0,05	24,893985
109,0	309,0	1,2	0,0	7,4	0,0	305,5	77,1	99,4	459,5	445,4	588,0	597,7	116,2	735,6	0,23	79,25	78,78	82,52	0,23	79,55	78,96	82,64	0,07	0,04	23,723467
110,0	310,0	1,1	0,0	7,4	0,0	304,4	77,3	99,0	457,8	444,3	585,3	597,0	116,6	735,7	0,23	79,23	78,79	82,48	0,23	79,54	78,99	82,62	0,07	0,04	22,562567
111,0	311,0	1,1	0,0	7,4	0,0	303,7	77,2	99,2	456,0	443,4	582,8	596,4	116,5	734,3	0,23	79,26	78,81	82,52	0,23	79,55	79,01	82,64	0,07	0,04	21,386586
112,0	312,0	1,1	0,0	7,3	0,0	303,0	77,4	98,7	454,2	442,4	580,4	595,2	116,6	733,0	0,23	79,24	78,82	82,52	0,23	79,55	79,00	82,61	0,07	0,04	20,108357
113,0	313,0	1,1	0,0	7,4	0,0	302,2	77,4	98,6	452,6	441,4	578,1	594,5	116,7	731,7	0,23	79,27	78,85	82,54	0,23	79,59	79,03	82,60	0,07	0,04	19,017108
114,0	314,0	1,1	0,0	7,3	0,0	301,2	77,4	99,3	450,9	440,7	575,9	593,7	116,8	730,6	0,23	79,31	78,86	82,52	0,23	79,61	79,04	82,59	0,07	0,04	17,960319
115,0	315,0	1,1	0,0	7,3	0,0	300,7	77,5	98,7	449,4	439,7	573,8	593,1	116,9	730,4	0,23	79,33	78,88	82,57	0,23	79,66	79,06	82,58	0,07	0,04	16,914462
116,0	316,0	1,0	0,0	7,3	0,0	299,6	77,4	99,0	447,9	438,9	571,6	591,2	117,3	727,7	0,23	79,32	78,91	82,60	0,23	79,67	79,09	82,59	0,07	0,04	15,718417
117,0	317,0	1,0	0,0	6,7	0,0	299,1	77,5	98,9	446,3	437,3	569,0	587,2	117,4	727,0	0,23	79,30	78,94	82,61	0,23	79,66	79,09	82,61	0,07	0,04	13,782622
118,0	318,0	1,0	0,0	6,6	0,0	298,1	77,6	99,1	444,9	435,6	565,9	582,6	117,6	726,7	0,23	79,31	78,94	82,62	0,23	79,68	79,12	82,57	0,07	0,04	11,67655
119,0	319,0	1,0	0,0	6,5	0,0	297,4	77,3	98,8	443,4	433,7	562,4	577,6	117,8	726,2	0,23	79,31	78,94	82,61	0,23	79,66	79,13	82,60	0,07	0,04	9,3335814
120,0	320,0	1,0	0,0	6,5	0,0	297,0	77,4	98,6	442,0	431,7	559,0	573,1	117,8	726,9	0,23	79,32	78,97	82,63	0,23	79,69	79,13	82,58	0,07	0,04	7,0583996
121,0	321,0	1,0	0,0	6,5	0,0	296,3	77,5	98,9	440,5	429,9	555,4	568,6	118,0	726,3	0,23	79,34	78,97	82,64	0,23	79,72	79,14	82,55	0,07	0,04	4,826535
122,0	322,0	0,9	0,0	6,6	0,0	295,5	77,4	98,6	439,1	428,1	551,9	564,6	118,3	725,2	0,23	79,31	79,02	82,66	0,23	79,72	79,18	82,54	0,07	0,04	2,7582136
123,0	323,0	0,9	0,0	6,6	0,0	294,6	77,3	98,4	437,7	426,5	548,7	560,8	118,2	723,7	0,23	79,32	79,02	82,65	0,23	79,70	79,17	82,56	0,07	0,04	0,7278384
124,0	324,0	0,9	0,0	6,6	0,0	294,2	77,4	98,5	436,5	425,0	545,6	557,8	118,6	721,5	0,23	79,24	79,05	82,62	0,23	79,70	79,19	82,56	0,07	0,04	-0,955853
125,0	325,0	0,9	0,0	6,7	0,0	294,0	77,6	98,3	435,2	423,5	542,6	554,8	118,7	719,7	0,23	79,25	79,05	82,64	0,23	79,69	79,20	82,53	0,07	0,04	-2,704436
126,0	326,0	0,9	0,0	6,7	0,0	293,1	77,4	98,4	433,8	422,0	539,8	552,2	118,7	718,4	0,23	79,22	79,05	82,65	0,23	79,65	79,20	82,50	0,07	0,04	-4,330707
127,0	327,0	0,9	0,0	6,6	0,0	292,8	77,2	98,2	432,5	420,6	537,1	549,2	118,9	718,6	0,23	79,24	79,06	82,66	0,23	79,65	79,20	82,49	0,07	0,04	-6,00627
128,0	328,0	0,9	0,0	6,6	0,0	292,5	77,4	98,0	431,3	419,0	534,6	546,4	119,0	717,3	0,23	79,21	79,06	82,64	0,23	79,64	79,21	82,45	0,07	0,04	-7,606893
129,0	329,0	0,8	0,0	6,6	0,0	291,2	77,2	97,9	430,1	417,4	532,2	543,7	119,1	715,1	0,23	79,17	79,04	82,63	0,23	79,59	79,20	82,42	0,07	0,04	-9,143889
130,0	330,0	0,8	0,0	6,6	0,0	290,8	77,4	98,0	429,0	416,3	530,0	541,3	119,5	713,1	0,23	79,14	79,05	82,68	0,23	79,58	79,22	82,40	0,07	0,04	-10,45085
131,0	331,0	0,8	0,0	6,7	0,0	290,2	77,3	97,6	427,8	414,9	527,8	539,5	119,4	711,0	0,23	79,11	79,05	82,64	0,23	79,57	79,22	82,38	0,07	0,04	-11,75673
132,0	332,0	0,8	0,0	6,7	0,0	289,5	77,4	97,5	426,5	413,6	525,9	537,9	119,5	709,3	0,23	79,10	79,06	82,66	0,23	79,55	79,20	82,37	0,07	0,04	-12,96742
133,0	333,0	0,8	0,0	6,7	0,0	288,7	77,5	97,2	425,4	412,4	524,2	536,8	119,7	708,3	0,23	79,09	79,07	82,65	0,23	79,53	79,21	82,35	0,07	0,04	-13,94249
134,0	334,0	0,8	0,0	6,8	0,0	288,0	77,0	97,4	424,0	411,2	522,6	536,1	119,4	708,1	0,23	79,13	79,08	82,69	0,23	79,54	79,23	82,34	0,07	0,04	-15,00152
135,0	335,0	0,7	0,0	6,8	0,0	287,2	77,3	97,4	423,0	410,1	521,0	536,1	119,6	707,2	0,23	79,13	79,07	82,64	0,23	79,52	79,21	82,31	0,07	0,04	-15,67797
136,0	336,0	0,7	0,0	6,9	0,0	286,8	77,4	97,4	422,0	409,1	519,6	536,4	120,1	705,7	0,23	79,18	79,08	82,64	0,23	79,53	79,21	82,30	0,07	0,04	-16,20869
137,0	337,0	0,7	0,0	6,9	0,0	286,5	77,5	97,4	420,9	408,0	518,4	536,9	120,2	704,1	0,23	79,19	79,09	82,62	0,23	79,53	79,21	82,29	0,07	0,04	-16,76965
138,0	338,0	0,7	0,0	6,9	0,0	286,1	77,5	97,1	419,7	407,3	517,1	537,2	120,3	700,7	0,23	79,14	79,09	82,62	0,23	79,50	79,22	82,28	0,07	0,04	-17,33176
139,0	339,0	0,7	0,0	6,7	0,0	285,3	77,4	96,6	418,7	406,0	515,6	536,8	120,2	698,4	0,23	79,10	79,11	82,62	0,23	79,48	79,23	82,28	0,07	0,04	-18,20639
140,0	340,0	0,7	0,0	6,6	0,0	284,6	77,5	96,9	417,6	404,9	514,1	534,9	120,6	698,0	0,23	79,01	79,08	82,61	0,23	79,45	79,24	82,28	0,07	0,04	-19,2291
141,0	341,0	0,7	0,0	6,6	0,0	283,9	77,4	97,2	416,7	403,7	512,6	532,8	120,3	696,6	0,23	79,01	79,08	82,59	0,23	79,45	79,22	82,25	0,07	0,04	-20,43372
142,0	342,0	0,6	0,0	6,6	0,0	283,9	77,3	97,1	415,6	402,5	511,4	530,1	120,7	695,5	0,23	79,03	79,10	82,60	0,23	79,45	79,25	82,27	0,07	0,04	-21,60464
143,0	343,0	0,6	0,0	6,6	0,0	282,9	77,4	96,8	414,6	401,5	510,1	528,1	120,7	694,7	0,23	78,99	79,10	82,58	0,23	79,43	79,25	82,25	0,07	0,04	-22,65911
144,0	344,0	0,6	0,0	6,6	0,0	282,8	77,5	97,2	413,6	400,6	509,0	526,0	120,8	693,5	0,23	79,04	79,11	82,61	0,23	79,45	79,25	82,23	0,07	0,04	-23,66129
145,0	345,0	0,6	0,0	6,7	0,0	282,0	77,5	97,2	412,6	399,5	508,0	524,2	121,2	693,1	0,23	79,13	79,12	82,57	0,23	79,50	79,26	82,24	0,07	0,04	-24,54955
146,0	346,0	0,6	0,0	6,6	0,0	282,0	77,6	97,1	411,8	398,6	507,2	522,5	121,3	695,5	0,23	79,16	79,11	82,56	0,23	79,53	79,27	82,27	0,07	0,04	-25,36212
147,0	347,0	0,6	0,0	6,6	0,0	281,7	77,7	96,5	411,0	398,0	506,4	520,7	121,3	696,7	0,23	79,21	79,14	82,54	0,23	79,55	79,29	82,26	0,07	0,04	-26,16601
148,0	348,0	0,5	0,0	6,6	0,0	281,2	77,6	96,2	410,3	397,2	505,6	518,6	121,4	697,2	0,23	79,15	79,16	82,51	0,23	79,58	79,33	82,25	0,07	0,04	-27,03622
149,0	349,0	0,5	0,0	6,6	0,0	281,2	77,6	96,6	409,7	396,3	504,9	517,2	121,5	698,0	0,23	79,11	79,15	82,51	0,23	79,55	79,32	82,24	0,07	0,04	-27,75456
150,0	350,0	0,5	0,0	6,6	0,0	280,9	77,6	96,8	409,1	395,6	504,1	516,0	121,7	698,5	0,23	79,11	79,15	82,51	0,23	79,53	79,29	82,21	0,07	0,04	-28,35189
151,0	351,0	0,5	0,0	6,7	0,0	280,4	77,3	96,4	408,6	394,9	503,3	514,5	121,7	697,7	0,23	79,08	79,15	82,52	0,23	79,50	79,30	82,19	0,07	0,04	-29,06777
152,0	352,0	0,5	0,0	6,6	0,0	280,0	77,5	96,9	407,9	394,3	502,7	513,1	121,6	695,2	0,23	79,13	79,16	82,52	0,23	79,52	79,30	82,18	0,07	0,04	-29,72424
153,0	353,0	0,5	0,0	6,6	0,0	280,0	77,4	96,6	407,5	393,7	502,0	511,8	121,5	695,5	0,23	79,16	79,19	82,54	0,23	79,52	79,30	82,17	0,07	0,04	-30,34328
154,0	354,0	0,5	0,0	6,5	0,0	279,5	77,6	96,6	406,9	392,9	501,4	510,7	121,8	697,5	0,23	79,20	79,18	82,52	0,23	79,55	79,30	82,15	0,07	0,04	-30,89891
155,0	355,0	0,4	0,0	6,5	0,0	279,9	77,4	96,6	406,5	392,2	500,7	509,2	121,8	700,0	0,23	79,19	79,21	82,47	0,23	79,56	79,34	82,15	0,07	0,04	-31,55822
156,0	356,0	0,4	0,0	6,4	0,0	280,1	77,5	96,5	406,1	391,5	500,0	508,1	121,9	701,0	0,23	79,19	79,21	82,46	0,23	79,58	79,35	82,16	0,07	0,04	-32,1486
157,0	357,0	0,4	0,0	6,5	0,0	279,8	77,6	96,5	405,7	390,9	499,3	506,9	122,0	701,9	0,23	79,21	79,21	82,45	0,23	79,59	79,37	82,15	0,07	0,04	-32,67531
158,0	358,0	0,4	0,0	6,5	0,0	279,4	77,6	96,6	405,4	390,2	498,6	506,4	122,2	702,7	0,23	79,22	79,24	82,44	0,23	79,60	79,38	82,15	0,07	0,04	-33,08584
159,0	359,0	0,4	0,0	6,4	0,0	279,4	77,6	96,6	405,1	389,5	497,9	505,2	122,0	703,6	0,23	79,18	79,24	82,46	0,23	79,59	79,38	82,14	0,07	0,04	-33,73968
160,0	360,0	0,4	0,0	6,4	0,0	279,3	77,4	95,9	405,0	388,9	497,0	504,1	122,0	703,6	0,23	79,18	79,25	82,42	0,23	79,58	79,39	82,15	0,07	0,04	-34,2434
161,0	361,0	0,3	0,0	6,4	0,0	279,1	77,1	96,0	404,6	388,3	496,1	503,3	122,3	702,2	0,23	79,17	79,23	82,40	0,23	79,55	79,37	82,13	0,07	0,04	-34,72776
162,0	362,0	0,3	0,0	6,4	0,0	279,4	77,3	95,4	404,5	387,7	495,5	502,1	122,1	702,1	0,23	79,17	79,22	82,35	0,23	79,53	79,36	82,06	0,07	0,04	-35,27901
163,0	363,0	0,3	0,0	6,3	0,0	279,0	77,3	95,8	404,3	387,0	494,7	501,1	122,2	701,2	0,23	79,02	79,21	82,35	0,23	79,45	79,39	82,05	0,07	0,04	-35,80096
164,0	364,0	0,3	0,0	6,3	0,0	278,5	77,2	95,7	403,9	386,4	493,7	500,2	122,3	699,7	0,23	78,94	79,19	82,35	0,23	79,41	79,38	82,05	0,07	0,04	-36,36209
165,0	365,0	0,3	0,0	6,2	0,0	278,6	77,3	95,4	403,6	385,6	492,8	498,5	122,3	698,5	0,23	78,93	79,21	82,31	0,23	79,42	79,40	82,03	0,07	0,04	-37,09199
166,0	366,0	0,3	0,0	6,1	0,0	277,7	77,4	95,1	403,2	384,9	491,7	496,9	122,0	698,6	0,23	78,91	79,21	82,28	0,23	79,41	79,42	82,04	0,07	0,04	-37,92297
167,0	367,0	0,3	0,0	6,2	0,0	277,6	77,3	95,5	402,9	384,1	490,7	495,0	122,5	699,8	0,23	78,93	79,19	82,27	0,23	79,42	79,41	82,01	0,07	0,04	-38,60122
168,0	368,0	0,2	0,0	6,2	0,0	277,7	77,3	95,1	402,7	383,3	489,6	493,2	122,3	700,5	0,23	78,93	79,19	82,27	0,23	79,40	79,40	82,01	0,07	0,04	-39,42865
169,0	369,0	0,2	0,0	6,1	0,0	277,5	77,3	95,9	402,4	382,6	488,6	491,6	122,6	700,9	0,23	78,94	79,17	82,23	0,23	79,41	79,42	82,02	0,07	0,04	-40,0983
170,0	370,0	0,2	0,0	6,0	0,0	277,8	77,3	95,9	402,2	382,0	487,5	489,3	122,6	700,8	0,23	79,04	79,20	82,20	0,23	79,44	79,42	82,04	0,07	0,04	-40,90735
171,0	371,0	0,2	0,0	6,0	0,0	277,9	77,4	96,3	402,0	381,2	486,3	486,7	122,4	700,5	0,23	79,08	79,20	82,17	0,23	79,45	79,39	82,03	0,07	0,04	-41,9165
172,0	372,0	0,2	0,0	6,0	0,0	278,0	77,4	96,0	401,9	380,9	485,1	484,1	122,7	699,8	0,23	79,13	79,20	82,17	0,23	79,45	79,40	82,05	0,07	0,04	-42,71729
173,0	373,0	0,2	0,0	5,9	0,0	277,8	77,2	95,7	401,4	380,1	484,0	481,5	122,3	698,3	0,23	79,13	79,24	82,15	0,23	79,47	79,39	82,04	0,07	0,04	-43,77422
174,0	374,0	0,2	0,0	5,9	0,0	277,6	76,9	94,7	401,2	378,9	482,8	479,2	122,5	683,4	0,23	79,19	79,22	82,12	0,23	79,52	79,40	82,05	0,07	0,04	-44,74372
175,0	375,0	0,1	0,0	5,9	0,0	276,4	77,4	95,3	400,5	377,7	481,1	477,1	122,8	675,5	0,23	79,17	79,24	82,12	0,23	79,54	79,41	82,03	0,07	0,04	-45,78274
176,0	376,0	0,1	0,0	5,8	0,0	275,5	77,4	95,9	399,6	376,4	479,1	475,3	123,0	671,6	0,23	79,18	79,25	82,12	0,23	79,51	79,40	82,04	0,07	0,04	-46,98563
177,0	377,0	0,1	0,0	5,8	0,0	274,9	76,9	94,9	398,5	374,8	476,9	473,2	122,1	669,9	0,23	79,17	79,24	82,12	0,23	79,50	79,40	82,03	0,07	0,04	-48,56317
178,0	378,0	0,1	0,0	5,6	0,0	274,7	76,9	94,5	397,4	373,9	474,9	471,3	122,6	670,3	0,23	79,15	79,23	82,04	0,23	79,48	79,40	82,00	0,07	0,04	-49,64052
179,0	379,0	0,1	0,0	5,6	0,0	273,7	76,9	95,1	396,7	372,8	473,0	469,7	122,8	669,9	0,23	79,08	79,23	82,08	0,23	79,41	79,40	82,00	0,07	0,04	-50,66704
180,0	380,0	0,1	0,0	5,7	0,0	273,1	76,9	94,8	395,7	371,7	471,1	468,5	122,7	669,3	0,23	79,06	79,22	82,04	0,23	79,40	79,40	81,98	0,07	0,04	-51,69699
181,0	381,0	0,1	0,0	5,7	0,0	272,8	76,9	94,6	394,9	370,6	469,2	466,9	122,9	670,5	0,23	79,05	79,22	82,02	0,23	79,36	79,36	81,96	0,07	0,04	-52,76202
182,0	382,0	0,1	0,0	5,7	0,0	272,5	76,9	95,1	393,9	369,7	467,6	465,8	122,7	670,4	0,23	79,00	79,20	82,04	0,23	79,33	79,34	81,92	0,07	0,04	-53,70786
183,0	383,0	0,0	0,0	5,7	0,0	272,4	77,0	95,6	393,1	368,7	466,0	464,7	122,9	670,7	0,23	79,00	79,21	82,00	0,23	79,32	79,33	81,90	0,07	0,04	-54,55625

Manufacturer: HEARTHSTONE
Model: SILA

Run: 3
Project #: PI 20202
Test Duration: 183 min

Note: In the "Input data", "Calc. % O_2", "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

	HHV	LHV
Eff	76,52%	82,70%
Comb Eff	99,50%	99,50%
HT Eff	76,90%	83,12%
Output	15 074	kJ/h
Burn Rate	0,99	kg/h
Grams CO	11	g
Input	19 700	kJ/h
MC wet	16,52	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,64
F_0
1,061

Overall Heating Efficiency: 76,52%
Combustion Efficiency: 99,50%
Heat Transfer Efficiency: 76,90%

Heat Output: 14 299 Btu/h
Heat Input: 18 688 Btu/h
Burn Duration: 3,05 h
Burn Rate: 2,19 lb/h
Stack Temp: 321,4 Deg. F

Averages	0,01	7,98	1,68	20,41	12,43	160,76	24,76	100,3%	77,6%	77,9%
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 (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,63	0,15	8,50	127,0%	20,37	11,79	161,7	23,5	98,9%	78,7%	77,9%
1,00	3,57	0,11	1,29	1302,2%	20,85	19,50	164,9	23,5	97,2%	24,9%	24,2%
2,00	3,54	0,05	3,04	535,3%	20,74	17,67	170,0	23,5	100,2%	59,7%	59,9%
3,00	3,52	0,02	3,87	405,5%	20,68	16,81	176,3	23,6	100,8%	64,7%	65,3%
4,00	3,48	0,02	5,61	248,8%	20,57	14,95	182,3	23,7	100,5%	71,3%	71,7%
5,00	3,43	0,02	5,79	238,1%	20,56	14,75	182,2	23,8	100,5%	71,9%	72,2%
6,00	3,41	0,01	5,69	244,3%	20,56	14,86	168,6	23,8	100,5%	73,2%	73,6%
7,00	3,39	0,01	5,40	262,7%	20,58	15,17	163,6	23,7	100,6%	73,0%	73,5%
8,00	3,36	0,01	6,04	224,4%	20,54	14,49	162,1	23,8	100,5%	74,8%	75,2%
9,00	3,34	0,01	7,74	153,4%	20,43	12,68	161,8	23,7	100,3%	77,8%	78,1%
10,00	3,30	0,01	7,13	175,1%	20,47	13,33	161,6	23,6	100,4%	76,9%	77,2%
11,00	3,27	0,01	5,61	249,0%	20,57	14,95	162,0	23,8	100,6%	73,8%	74,2%
12,00	3,25	0,02	6,85	186,1%	20,49	13,63	164,1	23,5	100,4%	76,2%	76,5%
13,00	3,18	0,02	10,55	86,0%	20,24	9,69	166,8	23,9	100,1%	80,3%	80,4%
14,00	3,14	0,01	12,53	56,7%	20,11	7,58	167,2	23,8	100,1%	81,6%	81,7%
15,00	3,11	0,01	9,01	117,8%	20,34	11,33	165,7	24,0	100,3%	79,0%	79,3%
16,00	3,09	0,01	4,78	309,5%	20,62	15,83	165,7	23,8	100,7%	70,7%	71,2%
17,00	3,07	0,02	5,03	289,2%	20,61	15,57	166,8	23,9	100,6%	71,5%	71,9%
18,00	3,05	0,03	5,96	228,1%	20,54	14,57	169,3	23,8	100,3%	73,8%	74,1%
19,00	3,00	0,03	6,85	185,7%	20,49	13,62	170,5	23,9	100,3%	75,6%	75,8%
20,00	2,95	0,02	8,19	139,4%	20,40	12,20	172,6	23,9	100,3%	77,5%	77,7%
21,00	2,93	0,02	8,42	132,9%	20,38	11,96	173,9	24,0	100,3%	77,7%	77,9%
22,00	2,89	0,01	9,84	99,5%	20,29	10,45	173,8	23,9	100,2%	79,2%	79,4%
23,00	2,84	0,01	11,33	73,3%	20,19	8,86	173,9	24,0	100,2%	80,4%	80,6%
24,00	2,80	0,01	9,97	96,9%	20,28	10,31	172,8	24,1	100,2%	79,4%	79,6%
25,00	2,75	0,00	8,71	125,3%	20,36	11,65	171,5	24,1	100,4%	78,3%	78,5%
26,00	2,71	0,01	8,15	140,7%	20,40	12,24	171,6	24,1	100,4%	77,6%	77,8%
27,00	2,68	0,00	10,43	88,2%	20,25	9,82	171,3	24,1	100,2%	79,9%	80,1%
28,00	2,64	0,00	8,61	128,1%	20,37	11,76	171,6	24,1	100,4%	78,1%	78,4%
29,00	2,59	0,00	11,41	72,2%	20,19	8,78	171,8	24,0	100,2%	80,6%	80,8%
30,00	2,55	0,00	8,37	134,6%	20,39	12,02	171,6	24,0	100,4%	77,8%	78,1%
31,00	2,50	0,00	11,26	74,4%	20,20	8,93	172,8	24,1	100,2%	80,5%	80,6%
32,00	2,46	0,00	10,73	83,0%	20,23	9,50	172,4	24,1	100,2%	80,1%	80,3%
33,00	2,41	0,00	9,54	105,8%	20,31	10,77	173,1	24,3	100,3%	79,0%	79,3%
34,00	2,39	0,00	11,06	77,6%	20,21	9,15	173,1	24,2	100,2%	80,3%	80,5%
35,00	2,34	0,00	8,40	133,7%	20,39	11,98	173,3	24,4	100,4%	77,8%	78,0%
36,00	2,30	0,00	11,95	64,3%	20,15	8,20	174,1	24,3	100,2%	80,9%	81,0%
37,00	2,25	0,00	10,27	91,3%	20,26	9,99	174,6	24,3	100,3%	79,6%	79,8%
38,00	2,23	0,00	8,94	119,5%	20,35	11,40	174,4	24,2	100,3%	78,3%	78,6%
39,00	2,18	0,00	9,29	111,3%	20,33	11,03	175,2	24,4	100,3%	78,6%	78,9%
40,00	2,14	0,00	9,11	115,6%	20,34	11,23	175,2	24,1	100,3%	78,4%	78,7%
41,00	2,12	0,00	8,55	129,7%	20,38	11,82	175,0	24,3	100,4%	77,8%	78,1%
42,00	2,07	0,00	10,96	79,2%	20,22	9,25	176,8	24,3	100,2%	80,0%	80,2%
43,00	2,02	0,00	12,16	61,5%	20,14	7,97	177,9	24,2	100,2%	80,7%	80,9%
44,00	1,98	0,00	10,33	90,1%	20,26	9,93	178,4	24,4	100,3%	79,4%	79,6%
45,00	1,93	0,00	9,50	106,6%	20,31	10,81	178,6	24,3	100,3%	78,6%	78,8%
46,00	1,91	0,00	11,09	77,0%	20,21	9,11	179,3	24,4	100,2%	79,9%	80,1%
47,00	1,87	0,00	10,08	94,8%	20,27	10,19	180,5	24,1	100,3%	79,0%	79,2%
48,00	1,82	0,00	12,42	58,2%	20,12	7,70	181,3	24,2	100,2%	80,7%	80,8%
49,00	1,77	0,00	11,74	67,3%	20,16	8,43	182,0	24,3	100,2%	80,2%	80,4%
50,00	1,73	0,00	12,59	55,9%	20,11	7,51	183,3	24,3	100,2%	80,7%	80,8%
51,00	1,71	0,00	12,18	61,2%	20,14	7,95	183,6	24,4	100,2%	80,4%	80,6%
52,00	1,66	0,00	12,50	57,2%	20,11	7,62	184,5	24,3	100,2%	80,6%	80,7%
53,00	1,62	0,00	10,80	81,9%	20,23	9,43	185,0	24,5	100,2%	79,3%	79,5%
54,00	1,59	0,00	10,20	92,5%	20,27	10,07	185,1	24,5	100,3%	78,8%	79,0%
55,00	1,55	0,00	9,90	98,3%	20,29	10,38	185,4	24,5	100,3%	78,5%	78,7%
56,00	1,52	0,00	9,69	102,7%	20,30	10,61	185,6	24,6	100,3%	78,3%	78,5%
57,00	1,48	0,00	9,51	106,6%	20,31	10,80	185,7	24,7	100,3%	78,1%	78,3%
58,00	1,46	0,00	9,48	107,2%	20,31	10,84	185,9	24,5	100,3%	78,0%	78,3%
59,00	1,41	0,00	10,41	88,6%	20,25	9,84	186,6	24,6	100,3%	78,9%	79,1%
60,00	1,37	0,00	11,49	70,9%	20,18	8,69	187,0	24,3	100,2%	79,7%	79,9%
61,00	1,34	0,00	11,24	74,6%	20,20	8,95	187,9	24,5	100,2%	79,5%	79,7%
62,00	1,30	0,00	11,92	64,8%	20,15	8,23	189,0	24,5	100,2%	79,9%	80,1%
63,00	1,25	0,01	13,73	43,0%	20,03	6,30	189,8	24,6	100,1%	81,0%	81,0%
64,00	1,21	0,09	13,73	42,2%	20,03	6,26	190,5	24,7	99,6%	80,9%	80,6%
65,00	1,16	0,06	14,32	36,6%	19,99	5,64	191,5	24,7	99,8%	81,2%	81,0%
66,00	1,12	0,07	14,27	37,0%	19,99	5,69	191,9	24,6	99,7%	81,1%	80,9%
67,00	1,09	0,02	14,01	40,0%	20,01	5,99	192,8	24,7	100,0%	81,0%	80,9%
68,00	1,05	0,04	12,99	50,7%	20,08	7,07	193,0	24,8	99,9%	80,4%	80,3%
69,00	1,03	0,02	13,02	50,6%	20,08	7,04	193,5	24,9	100,0%	80,4%	80,4%
70,00	0,99	0,01	9,97	97,0%	20,28	10,31	193,6	25,0	100,3%	78,0%	78,2%
71,00	0,96	0,00	10,45	87,9%	20,25	9,80	193,1	24,7	100,2%	78,5%	78,7%
72,00	0,93	0,00	9,82	99,9%	20,29	10,47	192,1	24,7	100,3%	77,9%	78,2%
73,00	0,91	0,01	8,86	121,5%	20,35	11,49	190,8	24,9	100,3%	77,0%	77,2%
74,00	0,89	0,01	9,08	116,3%	20,34	11,26	189,5	25,0	100,3%	77,3%	77,6%
75,00	0,89	0,01	9,13	115,1%	20,34	11,21	188,6	24,8	100,3%	77,4%	77,7%
76,00	0,87	0,01	8,78	123,6%	20,36	11,58	187,3	24,7	100,3%	77,1%	77,4%
77,00	0,84	0,01	8,38	134,1%	20,39	12,00	186,4	25,0	100,4%	76,7%	77,0%
78,00	0,82	0,01	8,53	130,0%	20,38	11,84	185,2	25,1	100,3%	77,0%	77,3%
79,00	0,82	0,01	8,65	127,0%	20,37	11,72	184,1	25,1	100,3%	77,2%	77,5%
80,00	0,80	0,01	8,78	123,6%	20,36	11,58	182,9	25,2	100,3%	77,5%	77,8%
81,00	0,78	0,01	8,66	126,8%	20,37	11,71	181,5	25,2	100,3%	77,5%	77,7%
82,00	0,78	0,01	8,61	127,9%	20,37	11,75	179,9	25,2	100,3%	77,5%	77,8%
83,00	0,75	0,01	8,48	131,4%	20,38	11,90	178,1	25,2	100,4%	77,5%	77,8%
84,00	0,73	0,01	8,30	136,5%	20,39	12,09	176,8	25,2	100,4%	77,4%	77,7%
85,00	0,73	0,01	8,02	144,8%	20,41	12,39	175,2	24,8	100,4%	77,1%	77,4%
86,00	0,71	0,01	7,90	148,3%	20,42	12,51	173,4	25,0	100,4%	77,1%	77,4%
87,00	0,71	0,01	7,82	150,9%	20,42	12,60	171,7	25,2	100,4%	77,2%	77,5%
88,00	0,69	0,01	7,68	155,7%	20,43	12,75	170,7	24,9	100,4%	77,0%	77,4%
89,00	0,69	0,01	7,66	156,3%	20,43	12,77	169,3	24,7	100,4%	77,1%	77,4%
90,00	0,69	0,01	7,56	159,6%	20,44	12,88	167,2	25,1	100,4%	77,2%	77,5%
91,00	0,66	0,01	7,56	159,6%	20,44	12,88	165,9	25,2	100,4%	77,3%	77,6%
92,00	0,66	0,01	7,46	163,0%	20,45	12,98	164,7	25,0	100,4%	77,3%	77,6%

93,00	0,64	0,01	7,43	164,2%	20,45	13,02	163,6	25,1	100,4%	77,3%	77,6%
94,00	0,64	0,01	7,33	167,7%	20,46	13,12	162,7	25,2	100,4%	77,3%	77,6%
95,00	0,64	0,01	7,38	165,9%	20,45	13,07	161,9	24,9	100,4%	77,4%	77,7%
96,00	0,62	0,01	7,35	167,1%	20,45	13,10	160,9	24,8	100,4%	77,4%	77,7%
97,00	0,62	0,01	7,33	167,7%	20,46	13,12	160,3	25,1	100,4%	77,5%	77,8%
98,00	0,62	0,01	7,34	167,1%	20,45	13,11	159,2	25,0	100,4%	77,6%	77,9%
99,00	0,59	0,01	7,34	167,1%	20,45	13,11	158,3	25,2	100,4%	77,7%	78,0%
100,00	0,59	0,01	7,38	165,9%	20,45	13,07	157,6	25,2	100,4%	77,8%	78,1%
101,00	0,59	0,01	7,43	164,1%	20,45	13,02	157,0	25,1	100,4%	77,9%	78,2%
102,00	0,57	0,01	7,39	165,3%	20,45	13,05	156,2	25,0	100,4%	78,0%	78,3%
103,00	0,57	0,01	7,39	165,3%	20,45	13,05	155,4	25,0	100,4%	78,0%	78,3%
104,00	0,55	0,01	7,30	168,8%	20,46	13,16	154,8	25,1	100,4%	77,9%	78,2%
105,00	0,55	0,01	7,33	167,6%	20,46	13,12	154,4	25,1	100,4%	78,0%	78,3%
106,00	0,55	0,01	7,31	168,2%	20,46	13,14	153,6	25,1	100,4%	78,1%	78,4%
107,00	0,53	0,01	7,33	167,6%	20,46	13,12	153,0	25,1	100,4%	78,2%	78,5%
108,00	0,53	0,01	7,38	165,9%	20,45	13,07	152,6	25,1	100,4%	78,3%	78,6%
109,00	0,53	0,01	7,36	166,4%	20,45	13,09	151,9	25,1	100,4%	78,3%	78,6%
110,00	0,50	0,01	7,36	166,4%	20,45	13,09	151,3	25,1	100,4%	78,4%	78,7%
111,00	0,50	0,01	7,40	165,1%	20,45	13,05	151,0	25,1	100,4%	78,4%	78,7%
112,00	0,50	0,01	7,31	168,2%	20,46	13,14	150,5	25,2	100,4%	78,4%	78,7%
113,00	0,48	0,01	7,38	165,8%	20,45	13,07	150,1	25,2	100,4%	78,5%	78,8%
114,00	0,48	0,01	7,35	166,9%	20,45	13,10	149,6	25,2	100,4%	78,5%	78,8%
115,00	0,48	0,01	7,33	167,6%	20,46	13,12	149,3	25,3	100,4%	78,5%	78,8%
116,00	0,46	0,01	7,33	167,5%	20,46	13,12	148,7	25,2	100,4%	78,6%	78,9%
117,00	0,46	0,01	6,70	192,5%	20,50	13,79	148,4	25,3	100,4%	77,7%	78,0%
118,00	0,46	0,01	6,55	199,2%	20,51	13,95	147,8	25,3	100,5%	77,5%	77,8%
119,00	0,44	0,01	6,50	201,4%	20,51	14,00	147,5	25,2	100,4%	77,4%	77,8%
120,00	0,44	0,01	6,49	202,2%	20,51	14,02	147,2	25,2	100,5%	77,4%	77,8%
121,00	0,44	0,01	6,50	201,4%	20,51	14,00	146,8	25,3	100,4%	77,5%	77,8%
122,00	0,41	0,01	6,57	198,4%	20,51	13,93	146,4	25,2	100,4%	77,7%	78,0%
123,00	0,41	0,01	6,57	198,4%	20,51	13,93	145,9	25,2	100,4%	77,7%	78,0%
124,00	0,41	0,01	6,60	196,8%	20,50	13,89	145,7	25,2	100,4%	77,8%	78,1%
125,00	0,41	0,01	6,65	194,6%	20,50	13,84	145,6	25,3	100,4%	77,9%	78,2%
126,00	0,39	0,01	6,67	194,0%	20,50	13,82	145,1	25,2	100,4%	77,9%	78,3%
127,00	0,39	0,01	6,55	199,1%	20,51	13,95	144,9	25,1	100,4%	77,8%	78,1%
128,00	0,39	0,01	6,57	198,3%	20,51	13,93	144,7	25,2	100,4%	77,8%	78,2%
129,00	0,37	0,01	6,56	198,8%	20,51	13,94	144,0	25,1	100,5%	77,9%	78,2%
130,00	0,37	0,01	6,62	196,2%	20,50	13,88	143,8	25,2	100,4%	78,0%	78,3%
131,00	0,37	0,01	6,65	194,7%	20,50	13,84	143,4	25,2	100,4%	78,1%	78,4%
132,00	0,34	0,01	6,70	192,5%	20,50	13,79	143,1	25,2	100,4%	78,2%	78,5%
133,00	0,34	0,01	6,72	191,8%	20,50	13,77	142,6	25,3	100,4%	78,3%	78,6%
134,00	0,34	0,01	6,82	187,6%	20,49	13,67	142,2	25,0	100,4%	78,4%	78,8%
135,00	0,32	0,01	6,83	186,9%	20,49	13,65	141,8	25,2	100,4%	78,5%	78,9%
136,00	0,32	0,01	6,87	185,5%	20,49	13,61	141,6	25,2	100,4%	78,6%	78,9%
137,00	0,32	0,01	6,92	183,5%	20,48	13,56	141,4	25,3	100,4%	78,7%	79,0%
138,00	0,30	0,01	6,87	185,5%	20,49	13,61	141,2	25,3	100,4%	78,6%	79,0%
139,00	0,30	0,01	6,69	193,2%	20,50	13,81	140,7	25,2	100,4%	78,4%	78,8%
140,00	0,30	0,01	6,60	196,9%	20,50	13,89	140,4	25,3	100,5%	78,3%	78,7%
141,00	0,30	0,01	6,62	196,2%	20,50	13,88	139,9	25,2	100,5%	78,4%	78,7%
142,00	0,28	0,01	6,60	197,0%	20,50	13,90	139,9	25,2	100,5%	78,4%	78,7%
143,00	0,28	0,01	6,64	195,4%	20,50	13,86	139,4	25,2	100,5%	78,5%	78,8%
144,00	0,28	0,01	6,64	195,4%	20,50	13,86	139,3	25,3	100,5%	78,5%	78,8%
145,00	0,25	0,01	6,65	194,6%	20,50	13,84	138,9	25,3	100,4%	78,6%	78,9%
146,00	0,25	0,01	6,59	197,6%	20,50	13,91	138,9	25,3	100,5%	78,5%	78,8%
147,00	0,25	0,01	6,59	197,7%	20,50	13,91	138,7	25,4	100,4%	78,5%	78,8%
148,00	0,23	0,01	6,60	196,9%	20,50	13,89	138,4	25,4	100,4%	78,5%	78,9%
149,00	0,23	0,01	6,64	195,4%	20,50	13,86	138,5	25,4	100,4%	78,6%	78,9%
150,00	0,23	0,01	6,64	195,4%	20,50	13,86	138,3	25,4	100,4%	78,6%	78,9%
151,00	0,23	0,01	6,67	193,9%	20,50	13,82	138,0	25,2	100,4%	78,7%	79,0%
152,00	0,21	0,01	6,64	195,4%	20,50	13,86	137,8	25,3	100,4%	78,6%	79,0%
153,00	0,21	0,01	6,63	195,5%	20,50	13,86	137,8	25,2	100,4%	78,6%	79,0%
154,00	0,21	0,01	6,52	200,6%	20,51	13,98	137,5	25,3	100,4%	78,5%	78,8%
155,00	0,19	0,01	6,47	202,8%	20,51	14,03	137,7	25,2	100,4%	78,4%	78,7%
156,00	0,19	0,01	6,44	204,4%	20,51	14,07	137,8	25,3	100,4%	78,3%	78,7%
157,00	0,19	0,01	6,47	202,8%	20,51	14,03	137,7	25,3	100,4%	78,4%	78,7%
158,00	0,16	0,02	6,47	202,8%	20,51	14,03	137,4	25,4	100,4%	78,4%	78,8%
159,00	0,16	0,02	6,44	204,4%	20,51	14,07	137,4	25,3	100,4%	78,4%	78,7%
160,00	0,16	0,02	6,44	204,4%	20,51	14,07	137,4	25,2	100,4%	78,4%	78,7%
161,00	0,14	0,02	6,37	207,6%	20,52	14,14	137,3	25,1	100,4%	78,3%	78,6%
162,00	0,14	0,02	6,37	207,6%	20,52	14,14	137,4	25,2	100,4%	78,2%	78,6%
163,00	0,14	0,02	6,32	209,9%	20,52	14,19	137,2	25,2	100,5%	78,2%	78,5%
164,00	0,14	0,01	6,30	210,8%	20,52	14,21	137,0	25,1	100,5%	78,2%	78,5%
165,00	0,12	0,02	6,19	216,5%	20,53	14,33	137,0	25,2	100,5%	78,0%	78,4%
166,00	0,12	0,02	6,14	219,1%	20,53	14,39	136,5	25,2	100,5%	78,0%	78,3%
167,00	0,12	0,02	6,21	215,7%	20,53	14,31	136,4	25,2	100,5%	78,1%	78,4%
168,00	0,09	0,02	6,16	218,3%	20,53	14,37	136,5	25,2	100,5%	78,0%	78,4%
169,00	0,09	0,02	6,11	220,8%	20,54	14,42	136,4	25,2	100,5%	77,9%	78,3%
170,00	0,09	0,02	6,03	225,1%	20,54	14,51	136,6	25,2	100,5%	77,7%	78,1%
171,00	0,07	0,02	5,96	228,8%	20,55	14,58	136,6	25,2	100,5%	77,6%	78,0%
172,00	0,07	0,02	5,97	227,9%	20,54	14,56	136,7	25,2	100,5%	77,6%	78,0%
173,00	0,07	0,02	5,93	230,6%	20,55	14,61	136,6	25,1	100,5%	77,6%	77,9%
174,00	0,07	0,01	5,94	229,9%	20,55	14,60	136,4	25,0	100,5%	77,6%	78,0%
175,00	0,05	0,01	5,86	234,4%	20,55	14,68	135,8	25,2	100,6%	77,5%	78,0%
176,00	0,05	0,01	5,80	238,0%	20,56	14,75	135,3	25,2	100,6%	77,5%	77,9%
177,00	0,05	0,01	5,80	238,0%	20,56	14,75	135,0	25,0	100,6%	77,5%	77,9%
178,00	0,03	0,01	5,63	248,2%	20,57	14,93	134,8	25,0	100,6%	77,2%	77,6%
179,00	0,03	0,01	5,65	247,0%	20,57	14,91	134,3	25,0	100,6%	77,3%	77,7%
180,00	0,03	0,01	5,68	245,1%	20,56	14,88	133,9	25,0	100,6%	77,4%	77,8%
181,00	0,03	0,01	5,73	242,0%	20,56	14,82	133,8	24,9	100,6%	77,5%	77,9%
182,00	0,03	0,01	5,70	244,1%	20,56	14,86	133,6	25,0	100,6%	77,4%	77,9%
183,00	0,00	0,01	5,75	241,1%	20,56	14,81	133,5	25,0	100,6%	77,5%	78,0%

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2019-7-24 Manufacturer: Hearthstone Model: S/a

Project #: PI 20202 Run: 3 Tech: MR Reviewer: [illegible]

- Kindling 25 LBS start fire
- At 22 LBS close Door
- by pass open
- At 100 LBS insert WArm-up
- close Door immediatly
- At 100 LBS insert pre load
- close Door immediatly
- At 720 LBS close bypass
At 31 LBS close air inlet (1.6 inch)
At 26 LBS (60 minutes)
min 16 LBS . open by pass
open Door
Crush Load Bed
close Door
close bypass

TEST LOAD CONFIGURATION

after 2 min
open bypass
open Door
open air inlet
insert load
close bypass
close Door
after 5 min
close air inlet
5 (1.6 inch)

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2019.07.24 Manufacturer: Hearthstone Model: S/a

Project #: pI 20202 Run: 3 Tech: MM Reviewer: DL

Equipment #	Time	12%	22%
EM-191	7:30	ok	ok

Moisture Meter Calibration Check:

Pre-Test **Post-Test**

Facility Conditions:

	Pre-Test	Post-Test
Air Velocity from less than 2 feet	0 (max50 Fpm)	0 (max50 Fpm)
Smoke Capture Check (tunnel velocity)	ok	NA
Picture 4 sides	ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned	2019.07.22
Date Dilution Tunnel Cleaned	2019.07.22
Induced Draft Check (max 0.005 H2O)	ok
Traverse before ignition	ok
Flow Rate 140 cfm ±10%	ok

Temperature System:

Ambient (65°-90°F)	ok °F
Wood Heater Surface (±125°F)	ok °F

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok

Sampling Train ID Numbers:

	Train 1st hour	Train 1	Train 2
Probe	11	35	43
Filter Front	118	120	858
Filter Back	119	857	859
Filter Thermocouple	K	K	K
Filter (<90°F)	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2019-07-24 Manufacturer: Hearthstone Model: Sig

Project #: pt 20202 Run: 3 Tech: MA Reviewer: MD

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 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)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	978360.20	979629.44	978360.26	979629.48	923757.92	925008.61
Initial 1minute DGM (Liter)	978360.10	979629.31	978360.24	979629.46	923757.72	925008.51
Change © (Liter)	0.10	0.10	0.02	0.02	0.20	0.10
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	ok	ok	ok	ok	ok

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.5	3	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2019.07.24 Manufacturer: Hearthstone Model: Silo

Project #: PT 20 202 Run: 3 Tech: M.M Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	4,4 lbs, Class F	4,4 lbs
Wood	EM-090	4,4 lbs, Class F	4,4 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200g

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: 2018-07-24 Manufacturer: Hearthstone Model: Sila

Project #: PT 20202 Run: 3 Tech: MM Reviewer: SP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 101.3 (KPa.) Static pressure (P_q) 0.32 (inches w.c.)
Inside diameter: Port A _____ Port B _____.
Tunnel cross sectional area: .1963Ft^2
Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.065	75.43
B - Centroid	3.00	3.50	4	0.064	74.84
A-1	0.40	0.50	0.50	0.051	75.43
A-2	1.50	1.75	2	0.055	75.19
A-3	4.50	5.25	6	0.052	75.19
A-4	5.60	6.5	7.5	0.051	75.33
B-1	0.40	0.50	0.50	0.051	74.61
B-2	1.50	1.75	2	0.054	74.69
B-3	4.50	5.25	6	0.060	74.87
B-4	5.60	6.5	7.5	0.052	74.85
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,
C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.
Δ_p = manometer reading (inches H_2O)
T_s = average absolute dilution tunnel temperature (°F + 460)
P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$
P_q = static pressure $\underline{\text{in. } H_2O}$
{ 13.6 }
M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)
K_p = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_p$avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019. 07. 24 Manufacturer: Hearthstone Model: Sila

Project #: pT 20202 Run: 3 Tech: MM Reviewer: TP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2990	3000	0990	1000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO_2	0	0	1790	1800	9732	10.00
Tolerance CO2		+/- 0.02		+/- 0.5		+/- 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	2994	1000	0	0.02	0.004	0.15	0.010	0.05	✓	
CO_2	0	1785	980	0	0.02	0.05	0.5	0.58	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2019-07-24 Manufacturer: Hearthstone Model: Sila

Project #: PT 20202 Run: 3 Tech: MM Reviewer: DO

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	979628.51	925007.26	516.90
Initial (Liter)	978361.28	923758.75	431.75

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101.3	101.3
Dry Bulb (F):	73.7	79.1
Humidity (%):	50.7	40.3

Flow Meter

	Start	End
Flow meter reading	NA	NA

Flow Meter Verification

	Before	After
Flow meter Check (liters)	NA	NA
Scale Weight (Kg)	NA	NA

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-24 Manufacturer: Hearthstone Model: Sila

Project #: pT 20202 Run: 3 Tech: MM Reviewer: TP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight		Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 8 in.	0.866	lbs.	19.3	19.6	19.9	19.3	19.8
1 1/2 x 3 1/2 x 8 in.	1.000	lbs.	19.7	19.7	19.4	19.3	19.2
1 1/2 x 3 1/2 x 8 in.	0.868	lbs.	20.1	20.4	20.1	20.0	20.0
1 1/2 x 3 1/2 x 8 in.	0.816	lbs.	19.6	19.3	19.5	19.4	19.9
1 1/2 x 3 1/2 x 8 in.	0.912	lbs.	20.0	20.0	20.1	20.2	20.3
1 1/2 x 3 1/2 x 8 in.	0.820	lbs.	19.9	19.7	19.6	19.6	19.5
1 1/2 x 3 1/2 x 8 in.	0.872	lbs.	20.3	20.8	20.2	20.2	20.3
1 1/2 x 3 1/2 x 8 in.	0.802	lbs.	19.5	19.3	19.4	19.6	19.6
x x in.		lbs.					
1 1/2 x 3 1/2 x 8 in.	0.856	lbs.	20.3	19.9	19.8	19.7	19.8
1 1/2 x 3 1/2 x 8 in.	0.856	lbs.	19.8	19.5	19.8	19.3	19.7
1 1/2 x 3 1/2 x 8 in.	0.870	lbs.	20.6	20.3	20.6	20.5	20.9
1 1/2 x 3 1/2 x 8 in.	0.758	lbs.	20.9	20.6	20.8	20.3	20.6
1 1/2 x 3 1/2 x 8 in.	0.938	lbs.	19.9	19.3	19.8	19.8	19.4
1 1/2 x 3 1/2 x 8 in.	0.814	lbs.	20.0	20.6	20.8	20.5	20.8
1 1/2 x 3 1/2 x 8 in.	0.826	lbs.	19.9	19.5	19.8	20.0	20.1
1 1/2 x 3 1/2 x 8 in.	0.804	lbs.	20.8	20.3	20.2	20.0	20.0
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					

TEST LOAD WEIGHT: 13.68 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-24 Manufacturer: Hearthstone Model: Sig

Project #: pI 20202 Run: 3 Tech: MM Reviewer: YB

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 9 in.	0 938 lbs.	196	193	192	193	194
1 1/2 x 3 1/2 x 9 in.	0 894 lbs.	198	199	194	192	193
1 1/2 x 3 1/2 x 9 in.	0 934 lbs.	208	201	206	204	203
1 1/2 x 3 1/2 x 9 in.	0 844 lbs.	209	210	199	194	199
1 1/2 x 3 1/2 x 9 in.	1004 lbs.	200	201	200	203	199
1 1/2 x 3 1/2 x 9 in.	1042 lbs.	200	203	199	191	196
x x in.	lbs.					
1 1/2 x 3/4 x 5 in.	0 116 lbs.			191		
1 1/2 x 3/4 x 5 in.	0 106 lbs.			193		
1 1/2 x 3/4 x 5 in.	0 116 lbs.			192		
1 1/2 x 3/4 x 5 in.	0 128 lbs.			194		
1 1/2 x 3/4 x 5 in.	0 114 lbs.			196		
1 1/2 x 3/4 x 5 in.	0 122 lbs.			195		
1 1/2 x 3/4 x 5 in.	0 126 lbs.			198		
1 1/2 x 3/4 x 5 in.	0 100 lbs.			192		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			192		
1 1/2 x 3/4 x 5 in.	0 108 lbs.			194		
1 1/2 x 3/4 x 5 in.	0 118 lbs.			196		
1 1/2 x 3/4 x 5 in.	0 108 lbs.			193		
1 1/2 x 3/4 x 5 in.	0 114 lbs.			194		
1 1/2 x 3/4 x 5 in.	0 100 lbs.			198		
1 1/2 x 3/4 x 5 in.	0 114 lbs.			202		
1 1/2 x 3/4 x 5 in.	0 100 lbs.			204		
1 1/2 x 3/4 x 5 in.	0 132 lbs.			206		
1 1/2 x 3/4 x 5 in.	0 102 lbs.			199		
1 1/2 x 3/4 x 5 in.	~~0 124~~ 0 124 lbs.			198		
1 1/2 x 3/4 x 5 in.	0 104 lbs.			193		

TEST LOAD WEIGHT: 801 lbs Min 20%: 160 Max 25%: ~~250~~ 200 MM

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019.07.23 Manufacturer: Hearthstone Model: Sila

Project #: pI 20202 Run: 3 Tech: MM Reviewer: DP

Pre-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	11	118	119	4	35	120	857	29	860
2019.07.23	17:00	93 7217	0 1266	0 1234	35 3376	109 2856	0 1255	0 1293	34 2495	0 1226
2019.07.24	9:00	93,7217	0,1266	0,1235	35,3375	109,2856	0,1256	0,1293	34,2496	0,1225

Post-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	11	118	119	4	35	120	857	29	860
2019.07.24	15:30	93 7229	0 1269	0 1230	35 3402	109 2861	0 1252	0 1284	34 2526	0 1227
2019.07.30	8:00	93 7219	0 1269	0 1230	35 3392	109 2858	0 1252	0 1284	34 2517	0 1227
2019.07.31	8:00	93 7219	0 1269	0 1230	35 3392	109 2858	0 1252	0 1284	34 2517	0 1227

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-23 Manufacturer: Heath stone Model: Sila

Project #: pI 20202 Run: 3 Tech: MM Reviewer: DB

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	43	858	859	34
2019.07.23	17:00	109,1650	0,1285	0,1230	34 2569
2019.07.24	9:00	109,1649	0,1285	0,1231	34 2568

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	43	858	859	34
2019-07-24	15:30	109,1656	0,1295	0,1222	34 2605
2019-07-30	8:00	109,1653	0,1295	0,1222	34 2592
2019-07-31	8:00	109,1653	0,1295	0,1222	34 2592

Paramètres

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

Code verrouillage:	HEA

Description du test

Test standard	EPA	
Run #	4	
Date	25-07-2019	
Technicien	M.M	
Project #	PI 20202	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	SILA	
Combustion system	Cat	
Appliance type	WOODSTOVE	
Firebox volume	1,25	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,999	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,990	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,997	
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20202
Date	25-07-2019
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):	101,5	101,5
Barometer (in.Hg):	29,972939	29,97293872
Dry Bulb (F):	73,6	83,9
Humidity (%):	51	38,7
Air velocity (ft/min)	0	0

DGM #1	Final:	34626,934	cuft	Final:	980525,560	Liter
	Initial:	34595,559	cuft	Initial:	979637,120	Liter
DGM #2	Final:	32697,747	cuft	Final:	925897,080	Liter
	Initial:	32666,767	cuft	Initial:	925019,800	Liter
DGM room				Final:	548,580	cuft
				Initial:	516,900	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 253

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

Project nu.	PI 20202
Date	25-07-2019
Technicien	M.M

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
7,88	8,75	9,63

Load Volume: 0,5590 cu. ft

Loading Density: 15,856 lbs./ft3

Number of Spaces:

Spacer weight (lbs):

Load Density (wet): 35,454 lbs./ft3

Dry Wood Density: 29,571026

Piece Size (in): Thick	Wide	x Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches
1,5	3,5	8	0,716	19,6	19,8	19,3	19,4	19,3	13,94768	42,00
1,5	3,5	8	0,762	19,7	19,7	19,8	19,9	19,9	15,0876	42,00
1,5	3,5	8	1,04	20	20,1	20,3	20,6	20,3	21,0704	42,00
1,5	3,5	8	0,724	19,9	19,8	19,3	19,6	19,4	14,1904	42,00
1,5	3,5	8	0,728	20,1	20,4	20	20	20,1	14,64736	42,00
1,5	3,5	8	0,758	19,3	19,4	19,4	19,3	19	14,61424	42,00
1,5	3,5	8	0,766	20,6	21	21	21,2	21,2	16,086	42,00
1,5	3,5	8	0,746	20,4	19,9	19,3	19,2	19,4	14,65144	42,00
										0,00
1,5	3,5	8	0,736	20	20,4	20,8	20,7	20,6	15,088	42,00
1,5	3,5	8	0,998	19,9	19,3	19,3	19,4	19,5	19,44104	42,00
1,5	3,5	8	1,036	19,6	19,4	19,3	19,8	19,9	20,3056	42,00
1,5	3,5	8	0,828	19,3	19,3	19,8	19,7	19,5	16,16256	42,00
1,5	3,5	8	0,746	19,7	19,8	19,7	19,8	19,2	14,65144	42,00
1,5	3,5	8	0,738	19,3	19,6	19,8	19,7	19,8	14,49432	42,00
1,5	3,5	8	0,736	20	20	21,1	21	21	15,17632	42,00
1,5	3,5	8	0,73	20,3	20,8	20,7	20,8	20,8	15,0964	42,00
										0,00
1,5	3,5	8	0,918	20,6	20,8	20,3	20,9	20,7	18,96588	42,00
1,5	3,5	8	0,948	20,3	19,1	19,2	19,3	19,3	18,42912	42,00
1,5	3,5	8	0,842	19,6	19,3	19,4	19,6	19,3	16,36848	42,00
1,5	3,5	8	0,898	19,3	19,2	19,3	19,3	19,3	17,31344	42,00
1,5	3,5	8	0,868	20	20,1	20,6	20,4	20,3	17,60304	42,00
1,5	3,5	8	0,85	20,9	20,4	20,3	20,3	20,2	17,357	42,00
1,5	3,5	8	0,842	19,1	19,3	19,8	19,3	19,3	16,30112	42,00
1,5	3,5	8	0,866	19,8	19,9	20	20	20,1	17,28536	42,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
								SUM MC:	394,33424	

PreTest Load Weight: 19,82 lbs.

Dry Weight: 7,50 kg.

Average Moisture Content: %

Dry: 19,90

19,90

Must be 18-28

Wet: 16,59

must be 15,2-22

Project nu.	PI 20202
Date	25-07-2019
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
7,9	8,8	9,6

* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume: 0,28 cu. ft

Loading Density: 6,4 lbs./ft3

Number of Spaces: 20

Spacer weight: lbs

Load Density (wet): 28,2 lbs./ft3

Dry Wood Density: 23,6 lbs./ft3

Piece Size (in): Thick	Wide	Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
1,5	3,5	9	1,04	19,10	19,60	19,40	19,30	19,60	20,2536	47,25	19,4
1,5	3,5	9	0,86	19,60	19,40	19,00	19,00	19,10	16,49076	47,25	19,2
1,5	3,5	9	1,02	19,00	19,20	19,30	19,40	19,30	19,6248	47,25	19,2
1,5	3,5	9	0,94	19,30	19,30	19,80	20,00	19,90	18,55904	47,25	19,7
1,5	3,5	9	0,90	19,90	20,00	20,10	20,00	20,00	17,96	47,25	20,0
1,5	3,5	9	0,97	20,60	20,00	20,30	20,20	20,20	19,6522	47,25	20,3
1,5	0,75	5	0,13			20,00			2,64	5,63	20,0
1,5	0,75	5	0,13			20,40			2,6928	5,63	20,4
1,5	0,75	5	0,12			19,20			2,304	5,63	19,2
1,5	0,75	5	0,12			19,30			2,316	5,63	19,3
1,5	0,75	5	0,12			19,80			2,376	5,63	19,8
1,5	0,75	5	0,10			19,80			1,98	5,63	19,8
1,5	0,75	5	0,12			19,60			2,2736	5,63	19,6
1,5	0,75	5	0,10			19,40			1,9012	5,63	19,4
1,5	0,75	5	0,10			19,40			1,94	5,63	19,4
1,5	0,75	5	0,12			20,00			2,36	5,63	20,0
1,5	0,75	5	0,11			19,70			2,2064	5,63	19,7
1,5	0,75	5	0,13			19,70			2,6398	5,63	19,7
1,5	0,75	5	0,11			19,80			2,178	5,63	19,8
1,5	0,75	5	0,118			19,90			2,3482	5,63	19,9
1,5	0,75	5	0,098			19,90			1,9502	5,63	19,9
1,5	0,75	5	0,108			19,10			2,0628	5,63	19,1
1,5	0,75	5	0,108			19			2,052	5,63	19,0
1,5	0,75	5	0,116			19,3			2,2388	5,63	19,3
1,5	0,75	5	0,122			19,3			2,3546	5,63	19,3
1,5	0,75	5	0,116			19,1			2,2156	5,63	19,1
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	157,5704		19,6 %

Test Load Weight: 8,03 lbs.

Dry Weight: 3,05 kg.

Average Moisture Content: %

Dry: 19,62 Dry(EPA) 19,62 Dry(B415 19,62

19,62 Must be 19-25

Wet: 16,40 must be 15,2-22

Coal Bed Range: 1,6 lbs. to 2,0 lbs.

TEST CHARGE:

Coal bed weight: 2 lbs.

Project nu.	PI 20202
Date	25-07-2019
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,36 in. H20
Barometer: 29,900 in. Hg

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

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

PITOT CONSTANT=
0,935

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,074	74,71	0,2720
B center	0,073	74,68	0,2702
A1	0,061	74,39	0,2470
A2	0,061	74,49	0,2470
A3	0,062	74,57	0,2490
A4	0,062	74,62	0,2490
B1	0,063	74,680	0,2510
B2	0,062	74,610	0,2490
B3	0,065	74,590	0,2550
B4	0,061	74,590	0,2470
AVERAGE	0,0644	74,5930	0,2536

Project nu.	PI 20202
Date	25-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	7	123	124	6	10	818	819	43	41	820	821	45	822		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,4756	0,1220	0,1251	34,8005	94,6402	0,1269	0,1239	34,3615	110,3665	0,1252	0,1241	34,2635	0,1241	2019-07-24	17:00
Before (6)	61,4756	0,1219	0,1252	34,8006	94,6403	0,1268	0,1240	34,3614	110,3664	0,1251	0,1242	34,2635	0,1241	2019-07-25	09:00
After (1)	61,4760	0,1233	0,1246	34,8037	94,6410	0,1267	0,1238	34,3628	110,3667	0,1264	0,1236	34,2669	0,1242	2019-07-25	14:00
After (2)	61,4758	0,1230	0,1246	34,8024	94,6406	0,1267	0,1238	34,3623	110,3666	0,1264	0,1236	34,2657	0,1242	2019-07-30	08:00
After (3)	61,4758	0,1230	0,1246	34,8024	94,6406	0,1267	0,1238	34,3623	110,3666	0,1264	0,1236	34,2657	0,1242	2019-07-31	08:00
After (4)															
After (5)															
After (6)	61,4758	0,1230	0,1246	34,8024	94,6406	0,1267	0,1238	34,3623	110,3666	0,1264	0,1236	34,2657	0,1242	2019-07-31	08:00
Difference	0,0002	0,0011	-0,0006	0,0018	0,0003	-0,0001	-0,0002	0,0009	0,0002	0,0013	-0,0006	0,0022	0,0001		
Total (mg)		2,5				3,4				3,1			0,1		
Total ajusté (mg)		**2,40**				**3,30**				**3,00**					

Project nu.	PI 20202
Date	25-07-2019
Technicien	

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	7	123	124	6	10	818	819	43	41	820	821	45	822		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,4756	0,1220	0,1251	34,8005	94,6402	0,1269	0,1239	34,3615	110,3665	0,1252	0,1241	34,2635	0,1241	2019-07-24	17:00
Before (6)	61,4756	0,1219	0,1252	34,8006	94,6403	0,1268	0,1240	34,3614	110,3664	0,1251	0,1242	34,2635	0,1241	2019-07-25	09:00
After (1)	61,4760	0,1233	0,1246	34,8037	94,6410	0,1267	0,1238	34,3628	110,3667	0,1264	0,1236	34,2669	0,1242	2019-07-25	14:00
After (2)	61,4758	0,1230	0,1246	34,8024	94,6406	0,1267	0,1238	34,3623	110,3666	0,1264	0,1236	34,2657	0,1242	2019-07-30	08:00
After (3)	61,4758	0,1230	0,1246	34,8024	94,6406	0,1267	0,1238	34,3623	110,3666	0,1264	0,1236	34,2657	0,1242	2019-07-31	08:00
After (4)															
After (5)															
After (6)	61,4758	0,1230	0,1252	34,8024	94,6406	0,1268	0,1240	34,3623	110,3666	0,1264	0,1242	34,2657	0,1242	2019-07-31	08:00
Difference	0,0002	0,0011	0,0000	0,0018	0,0003	0,0000	0,0000	0,0009	0,0002	0,0013	0,0000	0,0022	0,0001		
Total (mg)		3,1				4,3				3,7			0,1		
Total ajusté (mg)		**3,00**				**4,20**				**3,60**					

Project nu.	PI 20202
Date	25-07-2019
Technicien	

Negative filter weight rounded to zero, emission rate 1,5gr/hr. Demonstration purpose only not a compliance number.

SFBA EPA EMISSION RESULTS

Test Duration: **128** min

PRESSURE FACTOR:	DGM 1	0,96942	
	DGM 2	0,96865	
	DGM 3	1,00177	
TEMPERATURE FACTORS	DGM 1	0,97115	
	DGM 2	0,97009	
	DGM 3	0,97453	
VOLUMES SAMPLED	DGM 1	29,519	SCft
	DGM 2	28,825	Scft
	DGM 3	30,841	SCft

TOTAL TUNNEL VOLUME : 24210

SAMPLE RATIOS

Sample Train 1:	820,157
Sample Train 2:	839,888

Paticulate concentration

Sample Train 1	**0,000115**	g/dscf
Sample Train 2	**0,000108**	g/dscf
Room	**0,000003**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,71**	g
Sample Train 2	**2,53**	g

EMISSION RATES

Sample Train 1	**1,27**	g/hr
Sample Train 2	**1,18**	g/hr

1st hour emission rate **2,05** g/hr

	Train 1	Train 2
Cs	0,0001152	0,000107545

RESULTS

Average emission rate: 1,2 g/hr

Burn Rate : 1,428 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,972939	in Hg
Start:	29,972939	in Hg
End:	29,972939	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	34626,934	Cuft
	Initial:	34595,559	Cuft
DGM 2	Final:	32697,747	Cuft
	Initial:	32666,767	Cuft
DGM #3	Final:	548,580	Cuft
	Initial:	516,900	Cuft

TEMPERATURES

DGM 1	543,685	°R
DGM 2	544,282	°R

CALIBRATION FACTORS

DGM 1	0,9993
DGM 2	0,9901
DGM #3	0,9972

TUNNEL FLOW RATE: 189,139 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	3,40	mg
Total Sample Train 2:	3,10	mg
Total Sample Train 1 1st hour:	2,50	mg

DEVIATION: 3,53%

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft	Change in
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Surface
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	up									in wc	in wc	Temp.
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	°F
0,00	253,00	8,0	0,1	8,2	0,0	372,0	79,8	128,3	473,8	467,0	560,0	613,8	129,6	637,1	0,23	82,12	82,07	81,35	0,23	82,95	82,65	81,20	0,07	0,06	0
1,0	254,0	7,9	0,1	6,2	0,0	361,2	80,1	123,6	463,8	460,5	548,8	591,1	130,1	554,1	0,23	82,52	82,09	81,55	0,23	83,08	82,66	81,69	0,08	0,05	-9,999301
2,0	255,0	7,8	0,0	3,6	0,0	364,8	80,0	119,0	458,1	451,1	531,2	565,3	129,4	686,8	0,23	82,60	82,09	81,60	0,23	83,15	82,65	81,86	0,08	0,06	-21,80838
3,0	256,0	7,7	0,0	4,9	0,0	371,4	80,1	118,3	456,7	443,1	514,2	544,9	129,5	733,9	0,23	82,68	82,10	81,73	0,23	83,25	82,68	82,03	0,08	0,06	-31,15409
4,0	257,0	7,6	0,0	5,2	0,0	377,2	79,9	118,4	457,8	435,9	500,1	530,7	129,8	753,1	0,23	82,73	82,11	81,86	0,23	83,26	82,71	82,21	0,08	0,06	-37,96115
5,0	258,0	7,5	0,0	6,7	0,0	371,1	80,2	115,0	459,8	429,4	490,4	522,6	129,0	760,5	0,23	82,77	82,13	82,02	0,23	83,29	82,68	82,39	0,08	0,06	-42,60359
6,0	259,0	7,4	0,0	7,5	0,0	367,0	80,2	114,4	462,0	423,4	483,4	516,5	129,0	775,7	0,23	82,78	82,13	82,14	0,23	83,30	82,70	82,53	0,08	0,06	-45,98123
7,0	260,0	7,4	0,0	7,4	0,0	366,1	80,0	114,4	464,6	418,1	476,7	510,4	128,8	787,3	0,23	82,71	82,14	82,29	0,23	83,27	82,71	82,71	0,08	0,06	-49,12029
8,0	261,0	7,3	0,0	5,5	0,0	367,1	80,1	114,4	467,4	412,7	469,8	503,4	128,9	779,4	0,23	82,67	82,15	82,52	0,23	83,23	82,73	82,90	0,08	0,06	-52,39336
9,0	262,0	7,2	0,0	7,8	0,0	369,1	80,2	114,8	470,8	408,1	463,9	499,8	129,4	789,4	0,23	82,64	82,18	82,72	0,23	83,22	82,73	83,10	0,07	0,06	-54,455
10,0	263,0	7,1	0,0	11,6	0,0	374,4	80,4	115,1	475,7	403,9	462,5	496,8	129,0	838,5	0,23	82,57	82,17	82,93	0,23	83,18	82,72	83,31	0,08	0,06	-55,24419
11,0	264,0	7,0	0,0	9,3	0,0	375,6	80,6	115,2	481,3	400,0	465,9	491,0	128,7	828,0	0,23	82,57	82,20	83,08	0,23	83,16	82,75	83,48	0,08	0,06	-55,45975
12,0	265,0	6,9	0,0	6,1	0,0	378,7	80,7	114,9	485,8	395,8	466,8	484,0	128,5	847,0	0,23	82,55	82,20	83,30	0,23	83,14	82,75	83,67	0,08	0,06	-56,64848
13,0	266,0	6,7	0,0	10,0	0,0	385,8	80,5	116,2	492,4	392,4	465,1	480,5	128,5	896,4	0,23	82,51	82,21	83,50	0,23	83,11	82,78	83,90	0,08	0,06	-57,08261
14,0	267,0	6,6	0,0	12,6	0,0	391,4	80,1	116,0	500,9	389,3	466,7	480,4	128,5	892,9	0,23	82,46	82,23	83,65	0,23	83,09	82,77	84,09	0,08	0,06	-55,67636
15,0	268,0	6,5	0,0	11,2	0,0	393,4	80,1	116,0	508,5	386,6	473,0	478,6	128,2	874,1	0,23	82,42	82,23	83,81	0,23	83,06	82,78	84,23	0,08	0,06	-53,82913
16,0	269,0	6,4	0,0	9,9	0,0	395,2	79,8	116,1	514,6	383,8	480,7	475,8	128,1	872,8	0,23	82,35	82,21	83,96	0,23	82,98	82,80	84,38	0,08	0,06	-52,20318
17,0	270,0	6,2	0,0	10,6	0,0	397,2	80,1	117,2	520,5	381,7	488,7	473,3	128,0	882,7	0,23	82,34	82,22	84,16	0,23	82,95	82,76	84,60	0,08	0,06	-50,40371
18,0	271,0	6,1	0,0	11,0	0,0	400,4	80,1	117,7	526,0	379,8	497,5	471,5	127,9	898,9	0,23	82,42	82,22	84,37	0,23	83,01	82,79	84,76	0,08	0,06	-48,29253
19,0	272,0	6,0	0,0	10,9	0,0	403,5	80,5	118,1	531,8	378,4	506,9	470,8	127,8	906,7	0,23	82,53	82,24	84,54	0,23	83,08	82,82	84,95	0,08	0,06	-45,70588
20,0	273,0	5,8	0,0	11,3	0,0	405,9	80,6	118,4	537,6	377,2	516,5	470,9	127,6	919,6	0,23	82,67	82,26	84,74	0,23	83,12	82,86	85,19	0,08	0,06	-42,88269
21,0	274,0	5,7	0,0	11,8	0,0	408,5	80,8	118,9	543,6	376,3	525,6	472,3	127,5	922,0	0,23	82,75	82,30	84,91	0,23	83,25	82,87	85,37	0,08	0,06	-39,76854
22,0	275,0	5,6	0,0	12,4	0,0	411,7	80,4	118,3	549,8	376,0	535,0	474,7	127,4	941,5	0,23	82,79	82,34	85,04	0,23	83,28	82,91	85,55	0,08	0,06	-36,23444
23,0	276,0	5,5	0,0	11,4	0,0	414,7	80,8	119,3	556,3	375,7	544,2	477,0	127,3	943,1	0,23	82,89	82,37	85,20	0,23	83,37	82,93	85,69	0,07	0,06	-32,71334
24,0	277,0	5,3	0,0	12,7	0,0	417,9	80,6	120,1	562,9	376,1	553,5	481,0	127,1	960,1	0,23	83,09	82,41	85,40	0,23	83,48	82,96	85,88	0,08	0,06	-28,7271
25,0	278,0	5,2	0,0	12,4	0,0	420,2	80,9	118,9	570,1	376,6	562,7	484,3	127,4	973,7	0,23	83,15	82,42	85,55	0,23	83,56	82,99	86,03	0,08	0,06	-24,61186
26,0	279,0	5,1	0,0	11,3	0,0	422,7	81,0	120,1	576,4	377,1	571,4	487,1	126,8	968,8	0,23	83,19	82,47	85,69	0,23	83,61	83,02	86,21	0,08	0,06	-21,08599
27,0	280,0	4,9	0,0	13,2	0,0	426,3	81,0	120,9	583,6	377,9	580,4	492,8	126,6	989,4	0,23	83,25	82,49	85,86	0,23	83,65	83,05	86,34	0,07	0,06	-16,5893
28,0	281,0	4,8	0,0	12,5	0,0	428,4	81,3	121,0	590,5	378,8	589,1	496,6	126,5	995,7	0,23	83,30	82,52	86,04	0,23	83,71	83,10	86,55	0,08	0,06	-12,54002
29,0	282,0	4,7	0,0	13,2	0,0	431,5	81,2	121,9	597,5	380,0	597,2	500,9	126,3	1001,0	0,23	83,35	82,54	86,18	0,23	83,78	83,13	86,73	0,08	0,06	-8,436285
30,0	283,0	4,5	0,0	14,9	0,0	434,4	81,3	122,4	604,9	381,6	606,0	507,6	126,1	1025,2	0,23	83,42	82,56	86,34	0,23	83,86	83,17	86,87	0,08	0,06	-3,579663
31,0	284,0	4,4	0,0	12,9	0,0	436,8	81,3	122,5	611,7	383,1	614,0	509,8	125,8	1016,6	0,23	83,52	82,59	86,47	0,23	83,93	83,21	87,03	0,07	0,06	0,0463164
32,0	285,0	4,3	0,0	12,0	0,0	438,4	81,2	122,8	617,2	384,5	620,8	511,0	125,7	1012,2	0,23	83,58	82,63	86,65	0,23	84,00	83,24	87,20	0,08	0,06	3,0014464
33,0	286,0	4,1	0,0	12,1	0,0	440,0	81,1	123,1	622,4	386,0	626,9	512,2	125,5	1020,8	0,23	83,67	82,66	86,77	0,23	84,11	83,29	87,36	0,08	0,06	5,7776548
34,0	287,0	4,0	0,0	12,4	0,0	441,5	81,3	123,3	627,2	387,7	632,4	513,4	125,3	1027,4	0,23	83,72	82,70	86,92	0,23	84,19	83,32	87,55	0,07	0,06	8,365985
35,0	288,0	3,9	0,0	12,8	0,0	442,8	81,5	123,5	631,8	389,7	638,0	514,5	125,1	1041,7	0,23	83,77	82,73	87,08	0,23	84,23	83,36	87,70	0,08	0,06	10,993152
36,0	289,0	3,8	0,0	13,4	0,0	445,2	81,7	123,6	637,2	391,5	643,6	515,3	124,8	1058,1	0,23	83,84	82,77	87,21	0,23	84,31	83,39	87,86	0,08	0,06	13,652599
37,0	290,0	3,6	0,0	13,8	0,0	448,3	81,6	124,3	643,6	393,8	649,3	515,9	124,7	1071,2	0,23	83,90	82,79	87,35	0,23	84,35	83,42	88,00	0,07	0,07	16,60891
38,0	291,0	3,5	0,0	13,9	0,0	449,8	81,6	124,0	649,4	396,0	655,0	516,8	124,5	1076,4	0,23	83,98	82,83	87,47	0,23	84,45	83,49	88,12	0,07	0,06	19,503833
39,0	292,0	3,4	0,0	13,8	0,0	451,2	81,6	124,3	655,4	398,7	661,0	518,3	124,2	1080,3	0,23	84,02	82,87	87,62	0,23	84,53	83,50	88,27	0,08	0,06	22,680386
40,0	293,0	3,3	0,0	13,4	0,0	452,4	81,4	124,4	660,8	401,3	667,4	520,1	124,1	1078,9	0,23	84,08	82,89	87,71	0,23	84,58	83,55	88,37	0,08	0,06	25,909097
41,0	294,0	3,2	0,0	13,3	0,0	454,0	81,5	124,7	665,0	403,9	673,7	522,4	123,8	1076,7	0,23	84,16	82,94	87,85	0,23	84,63	83,56	88,49	0,08	0,06	28,927573
42,0	295,0	3,0	0,0	13,0	0,0	455,3	81,8	124,6	669,0	406,8	679,7	525,3	123,5	1077,2	0,23	84,25	82,99	87,97	0,23	84,70	83,61	88,65	0,08	0,07	32,039417
43,0	296,0	2,9	0,0	13,2	0,0	456,7	81,8	125,3	672,7	409,7	685,9	528,4	123,5	1079,8	0,23	84,27	83,00	88,12	0,23	84,74	83,63	88,76	0,08	0,06	35,197523
44,0	297,0	2,8	0,0	13,4	0,0	458,0	81,9	125,5	676,1	412,9	692,5	532,2	123,2	1083,6	0,23	84,29	83,03	88,24	0,23	84,80	83,66	88,87	0,08	0,07	38,533101
45,0	298,0	2,7	0,0	13,5	0,0	459,0	81,9	125,1	679,7	416,2	699,4	536,7	122,9	1087,4	0,23	84,35	83,07	88,34	0,23	84,87	83,72	88,99	0,08	0,06	42,143332
46,0	299,0	2,6	0,0	13,4	0,0	459,4	81,8	125,9	682,8	419,4	705,7	541,9	122,6	1087,5	0,23	84,37	83,08	88,48	0,23	84,91	83,74	89,12	0,07	0,06	45,668971
47,0	300,0	2,5	0,0	13,4	0,0	460,8	82,0	125,9	685,4	422,8	711,8	547,6	122,5	1089,5	0,23	84,49	83,11	88,62	0,23	85,02	83,76	89,24	0,07	0,07	49,16457
48,0	301,0	2,4	0,0	13,4	0,0	461,0	82,2	126,3	688,3	426,2	717,9	554,2	122,3	1087,7	0,23	84,63	83,18	88,74	0,23	85,14	83,83	89,37	0,08	0,07	52,957976
49,0	302,0	2,3	0,0	14,7	0,0	460,8	82,6	126,5	691,4	430,1	724,5	564,9	122,2	1112,4	0,23	84,68	83,18	88,87	0,23	85,19	83,84	89,47	0,08	0,06	57,778362
50,0	303,0	2,1	0,1	15,4	0,0	461,3	82,2	126,7	696,1	434,5	731,4	580,1	122,1	1125,8	0,23	84,81	83,22	89,01	0,23	85,30	83,91	89,59	0,07	0,06	63,986886
51,0	304,0	2,0	0,1	15,5	0,0	462,0	82,5	126,9	700,8	439,1	738,2	594,1	121,8	1124,5	0,23	84,94	83,28	89,12	0,23	85,44	83,94	89,72	0,08	0,07	69,973254
52,0	305,0	1,9	0,1	15,0	0,0	463,2	82,5	126,9	705,1	443,6	744,5	606,9	121,6	1102,5	0,23	84,98	83,31	89,20	0,23	85,50	83,99	89,83	0,07	0,07	75,501886
53,0	306,0	1,8	0,0	13,4	0,0	463,6	82,6	125,0	707,2	448,2	749,7	619,6	121,4	1074,0	0,23	85,01	83,38	88,77	0,23	85,53	84,04	88,76	0,08	0,07	80,367958
54,0	307,0	1,8	0,0	12,1	0,0	461,7	82,9	125,4	706,1	452,6	753,4	633,0	121,2	1051,7	0,23	85,06	83,39	88,10	0,23	85,61	84,08	87,24	0,07	0,07	84,427045
55,0	308,0	1,7	0,0	11,3	0,0	459,0	82,7	125,7	702,9	457,6	755,9	645,8	120,9	1030,8	0,23	85,12	83,44	87,58	0,23	85,68	84,11	86,45	0,07	0,06	87,797569
56,0	309,0	1,7	0,0	10,4	0,0	456,0	82,6	125,8	697,9	464,6	756,6	656,9	120,7	1009,8	0,23	85,19	83,48	87,22	0,23	85,75	84,17	85,95	0,07	0,06	90,498656
57,0	310,0	1,6	0,0	9,5	0,0	452,3	83,0	125,4	691,8	474,0	754,8	666,3	120,5	984,6	0,23	85,22	83,54	86,89	0,23	85,83	84,22	85,60	0,07	0,06	92,617018
58,0	311,0	1,6	0,0	8,7	0,0	448,9	83,0	125,3	684,1	483,6	751,3	674,0	120,3	961,3	0,23	85,23	83,58	86,63	0,23	85,85	84,25	85,36	0,07	0,06	93,816894
59,0	312,0	1,5	0,0	8,0	0,0	445,1	82,9	124,1	675,9	491,3	746,6	681,0	120,1	940,3	0,23	85,24	83,60	86,63	0,23	85,89	84,29	85,16	0,08	0,06	94,152295
60,0	313,0	1,5	0,0	7,5	0,0	440,5	82,8	123,0	667,1	496,7	741,1	687,5	119,9	922,6	0,23	85,24	83,64	82,73	0,23	85,90	84,31	84,96	0,08	0,06	93,642413
61,0	314,0	1,5	0,0	7,3	0,0	435,6	82,4	123,4	658,1	500,5	735,5	694,0	119,7	907,2	0,23	85,23	83,67	82,86	0,23	85,91	84,34	84,78	0,08	0,06	92,731979
62,0	315,0	1,5	0,0	7,1	0,0	431,4	82,8	122,2	648,8	503,1	729,8	699,6	119,7	894,0	0,23	85,22	83,69	83,00	0,23	85,91	84,39	84,63	0,08	0,06	91,358891
63,0	316,0	1,4	0,0	7,0	0,0	427,8	82,8	121,9	639,8	505,1	724,3	704,1	119,5	882,3	0,23	85,18	83,74	83,19	0,23	85,86	84,37	84,49	0,07	0,06	89,726823
64,0	317,0	1,4	0,0	7,0	0,0	423,7	82,4	121,4	631,0	506,4	718,9	707,4	119,3	872,4	0,23	85,15	83,76	83,34	0,23	85,80	84,38	84,34	0,08	0,06	87,760084
65,0	318,0	1,4	0,0	6,9	0,0	420,4	82,4	121,3	622,3	507,3	714,0	709,5	119,1	865,1	0,23	85,15	83,77	83,50	0,23	85,80	84,39	84,21	0,07	0,06	85,606679
66,0	319,0	1,4	0,0	6,9	0,0	416,6	82,3	120,8	613,9	507,7	709,1	710,2	119,1	858,7	0,23	85,14	83,80	83,76	0,23	85,77	84,41	84,08	0,08	0,06	83,189439
67,0	320,0	1,3	0,0	6,9	0,0	413,6	82,7	120,5	606,4	507,9	704,3	710,6	119,0	852,6	0,23	85,07	83,79	83,94	0,23	85,75	84,44	83,95	0,08	0,06	80,804271
68,0	321,0	1,3	0,0	6,9	0,0	409,7	82,6	120,1	599,0	507,6	699,8	709,9	119,0	847,1	0,23	84,98	83,81	84,19	0,23	85,70	84,44	83,86	0,08	0,06	78,231077
69,0	322,0	1,3	0,0	7,0	0,0	407,4	82,9	120,9	591,9	507,3	695,4	708,6	118,9	842,7	0,23	84,94	83,84	84,42	0,23	85,67	84,48	83,80	0,07	0,06	75,592822
70,0	323,0	1,3	0,0	7,0	0,0	405,5	82,7	120,2	585,6	506,8	690,8	706,7	118,9	838,5	0,23	84,96	83,86	84,62	0,23	85,69	84,50	83,70	0,08	0,06	72,936851
71,0	324,0	1,3	0,0	7,0	0,0	402,5	82,8	120,2	579,2	506,3	686,5	704,7	118,9	835,0	0,23	84,99	83,88	84,87	0,23	85,73	84,51	83,60	0,08	0,06	70,285298
72,0	325,0	1,2	0,0	7,1	0,0	400,6	82,4	119,3	573,8	505,5	682,5	702,4	119,0	831,0	0,23	85,01	83,90	85,09	0,23	85,73	84,54	83,50	0,08	0,06	67,777544
73,0	326,0	1,2	0,0	7,1	0,0	398,2	82,5	118,7	567,9	504,7	678,5	700,5	119,1	827,4	0,23	84,93	83,93	85,34	0,23	85,70	84,55	83,40	0,08	0,06	65,312851
74,0	327,0	1,2	0,0	7,2	0,0	395,4	82,6	118,1	562,7	503,8	674,9	699,6	119,0	823,9	0,23	84,88	83,95	85,54	0,23	85,67	84,59	83,33	0,08	0,06	63,176167
75,0	328,0	1,2	0,0	7,2	0,0	393,3	82,2	117,7	557,7	502,7	671,2	699,0	119,0	821,8	0,23	84,86	83,96	85,71	0,23	85,64	84,58	83,24	0,08	0,06	61,053342
76,0	329,0	1,1	0,0	7,2	0,0	391,4	82,5	117,2	553,0	501,8	666,8	698,4	119,0	819,2	0,23	84,79	83,95	85,89	0,23	85,56	84,59	83,14	0,08	0,06	58,972441
77,0	330,0	1,1	0,0	7,2	0,0	389,5	82,1	117,1	548,4	500,9	662,4	697,7	119,1	815,9	0,23	84,70	83,95	86,09	0,23	85,51	84,58	83,05	0,08	0,06	56,860849
78,0	331,0	1,1	0,0	7,2	0,0	387,5	82,5	117,0	544,1	499,8	658,0	696,4	119,2	812,6	0,23	84,65	83,98	86,26	0,23	85,47	84,58	82,99	0,08	0,06	54,67486
79,0	332,0	1,1	0,0	7,2	0,0	385,9	82,7	116,6	540,1	499,0	653,7	695,3	119,3	810,0	0,23	84,64	84,01	86,43	0,23	85,42	84,62	82,88	0,08	0,05	52,65939
80,0	333,0	1,1	0,0	7,2	0,0	384,0	82,6	116,6	536,4	498,3	649,9	693,7	119,4	807,9	0,23	84,62	84,03	86,58	0,23	85,43	84,61	82,79	0,08	0,06	50,692668
81,0	334,0	1,0	0,0	7,2	0,0	382,4	82,3	116,5	532,4	497,5	646,0	692,5	119,4	806,1	0,23	84,58	84,03	86,74	0,23	85,40	84,62	82,73	0,08	0,06	48,722382
82,0	335,0	1,0	0,0	7,2	0,0	381,1	82,4	115,6	529,0	496,3	642,4	691,1	119,5	804,3	0,23	84,53	84,07	86,88	0,23	85,36	84,63	82,66	0,08	0,06	46,837843
83,0	336,0	1,0	0,0	7,2	0,0	379,6	82,2	115,7	525,7	495,6	638,9	690,1	119,6	802,3	0,23	84,47	84,05	87,00	0,23	85,29	84,62	82,53	0,08	0,05	45,152853
84,0	337,0	1,0	0,0	7,2	0,0	377,9	82,3	115,0	522,6	494,4	635,5	689,3	119,8	800,9	0,23	84,35	84,03	87,09	0,23	85,22	84,61	82,44	0,08	0,05	43,473738
85,0	338,0	0,9	0,0	7,3	0,0	376,6	82,2	115,4	519,7	493,2	632,5	688,6	119,8	798,3	0,23	84,31	84,04	87,22	0,23	85,14	84,60	82,33	0,08	0,05	41,927988
86,0	339,0	0,9	0,0	7,2	0,0	375,6	82,3	114,9	516,8	492,0	629,5	687,4	120,1	796,4	0,23	84,26	84,04	87,32	0,23	85,10	84,59	82,24	0,08	0,05	40,337863
87,0	340,0	0,9	0,0	7,3	0,0	374,5	81,9	114,8	514,2	490,9	626,8	685,7	120,1	794,1	0,23	84,21	84,04	87,43	0,23	85,01	84,61	82,16	0,08	0,06	38,715214
88,0	341,0	0,9	0,0	7,3	0,0	372,7	82,1	114,1	511,6	490,0	624,3	683,9	120,4	792,6	0,23	84,22	84,04	87,54	0,23	84,99	84,57	82,07	0,08	0,05	37,194427
89,0	342,0	0,8	0,0	7,3	0,0	371,5	82,2	113,6	509,7	488,8	621,8	682,2	120,4	790,9	0,23	84,17	84,04	87,58	0,23	84,95	84,60	81,97	0,08	0,05	35,739679
90,0	343,0	0,8	0,0	7,3	0,0	370,1	82,0	113,7	507,3	487,9	619,5	680,4	120,4	789,0	0,23	84,06	84,03	87,63	0,23	84,90	84,58	81,89	0,08	0,05	34,265259
91,0	344,0	0,8	0,0	7,3	0,0	369,4	81,8	113,3	504,8	486,7	617,2	678,4	120,6	788,5	0,23	84,05	84,03	87,65	0,23	84,86	84,57	81,78	0,08	0,05	32,71337
92,0	345,0	0,8	0,0	7,2	0,0	367,7	82,0	113,3	503,3	485,6	615,2	676,3	120,7	787,7	0,23	84,02	84,03	87,71	0,23	84,79	84,56	81,68	0,08	0,05	31,384741
93,0	346,0	0,8	0,0	7,1	0,0	367,1	81,8	112,8	501,0	484,4	612,9	673,8	120,9	787,4	0,23	84,05	84,05	87,76	0,23	84,79	84,53	81,62	0,08	0,05	29,786201
94,0	347,0	0,7	0,0	7,1	0,0	366,1	81,9	111,8	499,3	483,0	610,8	670,6	121,0	786,7	0,23	84,12	84,04	87,80	0,23	84,79	84,51	81,54	0,08	0,05	28,097334
95,0	348,0	0,7	0,0	7,1	0,0	364,9	81,9	111,2	497,8	481,5	609,0	668,7	121,6	785,2	0,23	84,13	84,03	87,83	0,23	84,79	84,48	81,44	0,08	0,05	26,903053
96,0	349,0	0,7	0,0	7,1	0,0	364,3	81,4	111,5	496,2	480,2	607,1	665,9	121,4	784,4	0,23	84,01	84,01	87,84	0,23	84,69	84,45	81,33	0,08	0,05	25,325694
97,0	350,0	0,7	0,0	7,1	0,0	363,6	81,8	112,2	494,6	478,5	605,6	663,6	121,3	784,5	0,23	83,90	84,03	87,89	0,23	84,64	84,45	81,22	0,08	0,05	23,880927
98,0	351,0	0,7	0,0	7,1	0,0	363,0	81,9	111,2	493,4	476,6	603,8	661,3	121,5	785,4	0,23	83,79	84,01	87,92	0,23	84,57	84,46	81,14	0,08	0,05	22,481543
99,0	352,0	0,6	0,0	7,0	0,0	362,1	81,7	112,1	491,9	475,1	601,8	658,8	121,5	784,8	0,23	83,78	84,00	87,96	0,23	84,55	84,45	81,04	0,08	0,05	20,999264
100,0	353,0	0,6	0,0	7,0	0,0	361,1	81,5	111,2	490,7	473,5	599,9	655,0	121,5	786,2	0,23	83,78	83,99	87,96	0,23	84,49	84,42	80,96	0,08	0,05	19,275938
101,0	354,0	0,6	0,0	6,9	0,0	360,5	81,6	111,4	489,4	471,7	597,8	650,2	121,9	786,6	0,23	83,78	84,00	88,00	0,23	84,46	84,39	80,90	0,08	0,05	17,366072

102,0	355,0	0,6	0,0	6,9	0,0	359,8	81,5	111,7	488,3	469,9	595,7	644,8	121,9	786,2	0,23	83,72	83,98	88,01	0,23	84,44	84,40	80,83	0,08	0,05	15,263302
103,0	356,0	0,5	0,0	6,9	0,0	359,7	81,9	111,6	487,3	468,0	593,6	639,9	122,0	786,2	0,23	83,67	83,97	87,98	0,23	84,43	84,42	80,74	0,08	0,05	13,325755
104,0	357,0	0,5	0,0	7,0	0,0	359,1	82,0	111,5	486,3	466,6	591,4	635,8	122,1	786,1	0,23	83,65	83,98	88,02	0,23	84,41	84,42	80,69	0,08	0,05	11,596382
105,0	358,0	0,5	0,0	6,9	0,0	358,8	81,8	111,9	485,3	464,9	589,4	632,1	122,1	785,5	0,23	83,74	83,99	88,02	0,23	84,44	84,43	80,60	0,08	0,05	9,929077
106,0	359,0	0,5	0,0	6,9	0,0	358,6	82,2	112,0	484,4	463,3	587,5	628,7	122,2	785,4	0,23	83,75	83,99	88,03	0,23	84,46	84,43	80,57	0,08	0,05	8,385069
107,0	360,0	0,5	0,0	6,9	0,0	358,4	82,0	111,7	483,4	461,9	585,6	625,6	122,2	784,8	0,23	83,79	84,03	88,05	0,23	84,47	84,43	80,52	0,08	0,05	6,9163666
108,0	361,0	0,4	0,0	6,9	0,0	358,2	82,3	112,0	482,6	460,4	583,6	623,1	122,4	785,1	0,23	83,78	84,00	88,07	0,23	84,47	84,45	80,49	0,08	0,05	5,5979902
109,0	362,0	0,4	0,0	6,9	0,0	358,2	82,6	112,6	481,8	459,1	581,9	620,8	122,5	784,7	0,23	83,82	84,02	88,06	0,23	84,53	84,49	80,47	0,08	0,05	4,3841396
110,0	363,0	0,4	0,0	6,9	0,0	358,2	81,9	112,2	481,4	457,9	580,0	618,5	122,6	785,0	0,23	83,81	84,04	88,06	0,23	84,56	84,50	80,43	0,08	0,05	3,2395584
111,0	364,0	0,4	0,0	6,8	0,0	357,7	82,1	111,7	480,5	456,4	578,3	616,5	122,6	782,5	0,23	83,84	84,04	88,06	0,23	84,57	84,50	80,40	0,08	0,05	2,021866
112,0	365,0	0,3	0,0	6,6	0,0	356,6	82,1	112,4	479,7	454,9	576,5	613,5	122,8	772,3	0,23	83,98	84,07	88,10	0,23	84,63	84,52	80,36	0,08	0,05	0,643533
113,0	366,0	0,3	0,0	6,6	0,0	355,2	82,2	111,4	478,6	453,1	574,4	608,6	123,1	761,8	0,23	83,99	84,06	88,09	0,23	84,65	84,51	80,32	0,08	0,05	-1,282659
114,0	367,0	0,3	0,0	6,6	0,0	354,1	82,4	112,1	477,2	451,7	572,1	605,0	123,0	758,0	0,23	84,02	84,09	88,13	0,23	84,68	84,54	80,30	0,08	0,05	-3,026433
115,0	368,0	0,3	0,0	6,6	0,0	353,1	82,5	112,1	475,7	450,4	569,8	601,8	123,0	756,4	0,23	84,09	84,12	88,15	0,23	84,73	84,57	80,26	0,08	0,05	-4,678234
116,0	369,0	0,3	0,0	6,6	0,0	352,4	82,2	111,9	474,2	449,1	567,3	598,9	123,2	754,6	0,23	84,16	84,11	88,17	0,23	84,77	84,58	80,23	0,08	0,05	-6,300006
117,0	370,0	0,2	0,0	6,6	0,0	351,7	82,7	111,3	472,9	448,1	564,9	597,2	123,6	752,9	0,23	84,17	84,13	88,19	0,23	84,78	84,58	80,16	0,08	0,05	-7,512137
118,0	371,0	0,2	0,0	6,4	0,0	350,1	82,5	111,7	471,1	446,4	562,6	595,5	123,4	735,2	0,23	84,15	84,13	88,21	0,23	84,79	84,60	80,14	0,08	0,05	-9,036415
119,0	372,0	0,2	0,0	6,1	0,0	348,4	82,6	111,6	469,3	444,2	560,1	594,3	123,8	727,0	0,23	84,17	84,13	88,19	0,23	84,80	84,60	80,09	0,08	0,05	-10,52019
120,0	373,0	0,2	0,0	6,0	0,0	347,3	82,8	111,5	467,1	442,5	557,3	593,0	123,8	723,1	0,23	84,23	84,15	88,20	0,23	84,88	84,63	80,08	0,08	0,05	-12,09047
121,0	374,0	0,2	0,0	6,0	0,0	346,0	82,8	111,5	465,5	440,7	554,6	591,8	124,2	723,2	0,23	84,31	84,19	88,27	0,23	84,94	84,66	80,08	0,08	0,05	-13,49202
122,0	375,0	0,2	0,0	6,0	0,0	345,6	83,1	111,8	463,6	438,9	551,6	590,0	124,2	720,6	0,23	84,40	84,20	88,30	0,23	85,00	84,71	80,05	0,08	0,05	-15,17223
123,0	376,0	0,1	0,0	5,7	0,0	344,5	82,8	111,7	461,5	437,3	548,5	587,4	124,5	715,1	0,23	84,52	84,24	88,31	0,23	85,10	84,74	80,06	0,08	0,05	-16,99193
124,0	377,0	0,1	0,0	5,7	0,0	343,4	82,9	111,9	459,6	435,7	545,2	584,7	124,1	714,0	0,23	84,56	84,27	88,33	0,23	85,14	84,76	80,05	0,08	0,05	-18,9724
125,0	378,0	0,1	0,0	5,7	0,0	342,5	83,1	112,6	457,5	434,1	542,1	581,6	124,1	711,7	0,23	84,58	84,28	88,36	0,23	85,18	84,81	80,04	0,08	0,05	-20,9636
126,0	379,0	0,1	0,0	5,7	0,0	341,8	83,2	111,7	455,8	432,3	539,0	578,3	124,5	709,5	0,23	84,64	84,32	88,40	0,23	85,24	84,84	80,05	0,08	0,05	-22,84959
127,0	380,0	0,1	0,0	5,6	0,0	341,3	82,6	111,0	454,0	430,6	536,0	575,3	124,4	708,0	0,23	84,61	84,33	88,40	0,23	85,25	84,86	80,06	0,08	0,05	-24,79701
128,0	381,0	0,0	0,0	5,7	0,0	340,1	82,7	110,1	452,7	429,0	533,1	572,6	124,8	707,2	0,23	84,60	84,33	88,44	0,23	85,23	84,88	80,07	0,08	0,05	-26,4127

Manufacturer: HEARTHSTONE
Model: SILA

Run: 4
Project #: PI 20202
Test Duration: 128 min

Note: In the "Input data", "Calc. % O_2", "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

	HHV	LHV
Eff	76,22%	82,38%
Comb Eff	99,50%	99,50%
HT Eff	76,60%	82,79%
Output	21 562	kJ/h
Burn Rate	1,43	kg/h
Grams CO	7	g
Input	28 291	kJ/h
MC wet	16,40	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,64
F_0
1,062

Overall Heating Efficiency: 76,22%
Combustion Efficiency: 99,50%
Heat Transfer Efficiency: 76,60%

Heat Output: 20 454 Btu/h
Heat Input: 26 837 Btu/h
Burn Duration: 2,13 h
Burn Rate: 3,15 lb/h
Stack Temp: 397,0 Deg. F

Averages	0,02	8,89	1,43	20,35	11,45	202,65	27,67	100,3%	75,4%	75,6%
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 (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,64	0,14	8,25	134,3%	20,39	12,07	188,9	26,6	99,0%	76,4%	75,6%
1,00	3,57	0,13	6,17	211,8%	20,52	14,29	182,9	26,7	99,0%	73,1%	72,3%
2,00	3,52	0,05	3,59	440,3%	20,70	17,09	184,9	26,7	100,2%	61,9%	62,1%
3,00	3,50	0,02	4,86	302,5%	20,62	15,75	188,6	26,7	100,5%	68,3%	68,7%
4,00	3,45	0,02	5,22	274,9%	20,59	15,36	191,8	26,6	100,5%	69,2%	69,6%
5,00	3,41	0,02	6,72	191,7%	20,50	13,77	188,4	26,8	100,4%	73,8%	74,1%
6,00	3,36	0,02	7,53	160,5%	20,44	12,91	186,1	26,8	100,3%	75,6%	75,8%
7,00	3,34	0,01	7,39	165,2%	20,45	13,05	185,6	26,7	100,4%	75,4%	75,7%
8,00	3,30	0,02	5,55	253,1%	20,57	15,02	186,2	26,7	100,6%	71,1%	71,4%
9,00	3,25	0,01	7,82	150,7%	20,42	12,59	187,3	26,8	100,3%	76,0%	76,2%
10,00	3,20	0,01	11,61	69,0%	20,17	8,55	190,2	26,9	100,1%	79,8%	79,9%
11,00	3,16	0,01	9,27	111,6%	20,33	11,05	190,9	27,0	100,3%	77,6%	77,8%
12,00	3,11	0,01	6,11	220,8%	20,54	14,42	192,6	27,0	100,5%	72,0%	72,3%
13,00	3,05	0,01	10,04	95,5%	20,28	10,23	196,5	26,9	100,2%	78,0%	78,2%
14,00	2,98	0,01	12,61	55,6%	20,11	7,49	199,7	26,7	100,1%	79,9%	79,9%
15,00	2,93	0,01	11,23	74,8%	20,20	8,96	200,8	26,7	100,2%	78,8%	78,9%
16,00	2,89	0,01	9,89	98,4%	20,29	10,39	201,8	26,5	100,2%	77,5%	77,6%
17,00	2,82	0,01	10,58	85,5%	20,24	9,66	202,9	26,7	100,2%	78,1%	78,2%
18,00	2,75	0,01	11,04	77,7%	20,21	9,16	204,7	26,7	100,2%	78,4%	78,5%
19,00	2,70	0,01	10,86	80,7%	20,22	9,36	206,4	26,9	100,2%	78,1%	78,3%
20,00	2,64	0,01	11,26	74,3%	20,20	8,93	207,7	27,0	100,2%	78,4%	78,5%
21,00	2,59	0,01	11,82	66,1%	20,16	8,34	209,2	27,1	100,2%	78,8%	78,9%
22,00	2,52	0,01	12,36	58,8%	20,12	7,76	210,9	26,9	100,1%	79,1%	79,2%
23,00	2,48	0,01	11,38	72,5%	20,19	8,81	212,6	27,1	100,2%	78,2%	78,3%
24,00	2,41	0,01	12,71	54,5%	20,10	7,39	214,4	27,0	100,1%	79,1%	79,2%
25,00	2,34	0,01	12,36	58,8%	20,12	7,76	215,7	27,2	100,1%	78,8%	78,9%
26,00	2,30	0,01	11,31	73,6%	20,19	8,88	217,1	27,2	100,2%	77,8%	78,0%
27,00	2,23	0,01	13,25	48,2%	20,06	6,81	219,0	27,2	100,1%	79,2%	79,3%
28,00	2,16	0,01	12,53	56,7%	20,11	7,58	220,2	27,4	100,1%	78,6%	78,7%
29,00	2,12	0,01	13,18	48,9%	20,07	6,88	221,9	27,3	100,1%	79,0%	79,1%
30,00	2,05	0,03	14,86	31,9%	19,96	5,08	223,6	27,4	99,9%	79,9%	79,9%
31,00	1,98	0,01	12,93	51,8%	20,09	7,15	224,9	27,4	100,1%	78,7%	78,8%
32,00	1,93	0,01	12,05	62,9%	20,14	8,09	225,8	27,3	100,1%	77,9%	78,0%
33,00	1,87	0,01	12,10	62,3%	20,14	8,04	226,7	27,3	100,1%	77,9%	78,0%
34,00	1,82	0,01	12,43	58,0%	20,12	7,69	227,5	27,4	100,1%	78,1%	78,2%
35,00	1,77	0,01	12,82	53,1%	20,09	7,27	228,2	27,5	100,1%	78,4%	78,5%
36,00	1,71	0,01	13,41	46,4%	20,05	6,64	229,6	27,6	100,1%	78,7%	78,8%
37,00	1,64	0,01	13,78	42,5%	20,03	6,25	231,3	27,5	100,1%	78,9%	78,9%
38,00	1,59	0,01	13,88	41,5%	20,02	6,14	232,1	27,5	100,1%	78,9%	79,0%
39,00	1,52	0,01	13,79	42,3%	20,03	6,23	232,9	27,6	100,1%	78,8%	78,9%
40,00	1,48	0,01	13,40	46,5%	20,05	6,66	233,6	27,4	100,1%	78,5%	78,6%
41,00	1,43	0,01	13,28	47,8%	20,06	6,78	234,5	27,5	100,1%	78,4%	78,4%
42,00	1,37	0,01	12,99	51,2%	20,08	7,09	235,2	27,7	100,1%	78,1%	78,2%
43,00	1,32	0,01	13,17	49,0%	20,07	6,89	235,9	27,7	100,1%	78,2%	78,3%
44,00	1,28	0,01	13,36	46,9%	20,06	6,69	236,7	27,7	100,1%	78,3%	78,4%
45,00	1,23	0,01	13,54	44,9%	20,04	6,49	237,2	27,7	100,1%	78,4%	78,5%
46,00	1,16	0,01	13,41	46,3%	20,05	6,64	237,5	27,7	100,1%	78,3%	78,3%
47,00	1,12	0,01	13,36	46,9%	20,06	6,69	238,2	27,8	100,1%	78,2%	78,3%
48,00	1,07	0,01	13,45	46,0%	20,05	6,60	238,4	27,9	100,1%	78,3%	78,3%
49,00	1,03	0,05	14,70	33,2%	19,97	5,24	238,2	28,1	99,8%	79,1%	79,0%
50,00	0,96	0,11	15,44	26,3%	19,91	4,42	238,5	27,9	99,5%	79,5%	79,1%
51,00	0,91	0,09	15,46	26,3%	19,91	4,41	238,9	28,1	99,6%	79,5%	79,1%
52,00	0,87	0,05	14,98	30,7%	19,95	4,94	239,6	28,1	99,8%	79,2%	79,0%
53,00	0,82	0,01	13,38	46,7%	20,06	6,67	239,8	28,1	100,1%	78,2%	78,2%
54,00	0,80	0,01	12,07	62,7%	20,14	8,07	238,7	28,3	100,1%	77,2%	77,3%
55,00	0,78	0,01	11,30	73,8%	20,19	8,89	237,2	28,2	100,2%	76,6%	76,7%
56,00	0,75	0,01	10,41	88,5%	20,25	9,83	235,6	28,1	100,2%	75,7%	75,9%
57,00	0,73	0,01	9,47	107,2%	20,31	10,84	233,5	28,3	100,3%	74,7%	74,9%
58,00	0,71	0,01	8,73	124,8%	20,36	11,63	231,6	28,3	100,3%	73,8%	74,0%
59,00	0,69	0,01	7,99	145,7%	20,41	12,42	229,5	28,3	100,4%	72,6%	72,9%
60,00	0,69	0,01	7,53	160,7%	20,44	12,91	227,0	28,2	100,4%	71,9%	72,2%
61,00	0,66	0,01	7,29	169,0%	20,46	13,16	224,2	28,0	100,4%	71,7%	72,0%
62,00	0,66	0,01	7,15	174,5%	20,47	13,32	221,9	28,2	100,4%	71,6%	71,9%
63,00	0,64	0,01	7,05	178,4%	20,47	13,42	219,9	28,2	100,4%	71,6%	71,9%
64,00	0,64	0,01	6,97	181,6%	20,48	13,51	217,6	28,0	100,4%	71,6%	71,9%
65,00	0,62	0,01	6,92	183,6%	20,48	13,56	215,8	28,0	100,4%	71,6%	71,9%
66,00	0,62	0,01	6,91	183,6%	20,48	13,56	213,7	28,0	100,4%	71,8%	72,2%
67,00	0,59	0,01	6,91	183,6%	20,48	13,56	212,0	28,2	100,4%	72,0%	72,3%
68,00	0,59	0,01	6,95	182,3%	20,48	13,53	209,9	28,1	100,4%	72,3%	72,6%
69,00	0,57	0,01	6,98	180,9%	20,48	13,49	208,5	28,3	100,4%	72,5%	72,8%
70,00	0,57	0,01	7,00	180,2%	20,48	13,47	207,4	28,2	100,4%	72,7%	73,0%
71,00	0,57	0,01	7,03	178,9%	20,47	13,44	205,9	28,2	100,4%	72,9%	73,2%
72,00	0,55	0,01	7,08	176,9%	20,47	13,39	204,8	28,0	100,4%	73,1%	73,4%
73,00	0,55	0,02	7,06	177,5%	20,47	13,40	203,4	28,0	100,4%	73,2%	73,5%
74,00	0,53	0,02	7,16	173,7%	20,47	13,30	201,9	28,1	100,4%	73,5%	73,8%
75,00	0,53	0,02	7,20	172,4%	20,46	13,26	200,7	27,9	100,4%	73,7%	74,0%
76,00	0,50	0,02	7,18	173,1%	20,46	13,28	199,7	28,1	100,4%	73,8%	74,0%
77,00	0,50	0,02	7,18	173,0%	20,46	13,28	198,6	27,8	100,3%	73,9%	74,1%
78,00	0,48	0,02	7,18	173,1%	20,47	13,28	197,5	28,1	100,4%	74,0%	74,2%
79,00	0,48	0,02	7,18	173,0%	20,46	13,28	196,6	28,1	100,3%	74,1%	74,3%
80,00	0,48	0,02	7,20	172,4%	20,46	13,26	195,5	28,1	100,3%	74,2%	74,5%
81,00	0,46	0,02	7,23	171,2%	20,46	13,23	194,7	27,9	100,3%	74,3%	74,6%
82,00	0,46	0,02	7,18	173,0%	20,46	13,28	193,9	28,0	100,3%	74,3%	74,6%
83,00	0,44	0,02	7,21	171,7%	20,46	13,24	193,1	27,9	100,3%	74,5%	74,7%
84,00	0,44	0,02	7,25	170,5%	20,46	13,21	192,2	27,9	100,3%	74,6%	74,9%
85,00	0,41	0,02	7,26	169,8%	20,46	13,19	191,4	27,9	100,3%	74,7%	75,0%
86,00	0,41	0,02	7,25	170,5%	20,46	13,21	190,9	27,9	100,3%	74,7%	75,0%
87,00	0,39	0,02	7,28	169,2%	20,46	13,17	190,3	27,7	100,3%	74,8%	75,1%
88,00	0,39	0,02	7,29	168,7%	20,46	13,15	189,3	27,9	100,3%	75,0%	75,2%
89,00	0,37	0,02	7,30	168,6%	20,46	13,15	188,6	27,9	100,3%	75,0%	75,3%
90,00	0,37	0,02	7,28	169,2%	20,46	13,17	187,8	27,8	100,3%	75,1%	75,3%
91,00	0,34	0,02	7,30	168,4%	20,46	13,15	187,4	27,7	100,3%	75,1%	75,4%
92,00	0,34	0,02	7,18	172,9%	20,46	13,28	186,5	27,8	100,3%	75,0%	75,3%

93,00	0,34	0,02	7,15	174,1%	20,47	13,31	186,2	27,7	100,3%	75,0%	75,2%
94,00	0,32	0,02	7,15	174,0%	20,47	13,31	185,6	27,7	100,3%	75,0%	75,3%
95,00	0,32	0,02	7,11	175,4%	20,47	13,35	184,9	27,7	100,3%	75,0%	75,3%
96,00	0,30	0,02	7,08	176,6%	20,47	13,38	184,6	27,4	100,3%	75,0%	75,2%
97,00	0,30	0,02	7,06	177,3%	20,47	13,40	184,2	27,6	100,3%	75,0%	75,3%
98,00	0,30	0,02	7,08	176,6%	20,47	13,38	183,9	27,7	100,3%	75,1%	75,3%
99,00	0,28	0,02	7,01	179,2%	20,48	13,45	183,4	27,6	100,3%	75,0%	75,2%
100,00	0,28	0,02	7,00	179,9%	20,48	13,47	182,8	27,5	100,3%	75,0%	75,3%
101,00	0,25	0,02	6,93	182,5%	20,48	13,54	182,5	27,6	100,3%	74,9%	75,2%
102,00	0,25	0,02	6,93	182,5%	20,48	13,54	182,1	27,5	100,3%	75,0%	75,2%
103,00	0,23	0,02	6,95	181,9%	20,48	13,52	182,0	27,7	100,3%	75,0%	75,2%
104,00	0,23	0,02	6,96	181,2%	20,48	13,50	181,7	27,8	100,3%	75,1%	75,3%
105,00	0,21	0,02	6,93	182,5%	20,48	13,54	181,5	27,7	100,3%	75,0%	75,3%
106,00	0,21	0,02	6,91	183,2%	20,48	13,56	181,5	27,9	100,3%	75,0%	75,3%
107,00	0,21	0,02	6,90	183,8%	20,48	13,57	181,3	27,8	100,3%	75,0%	75,2%
108,00	0,19	0,02	6,90	183,8%	20,48	13,57	181,2	28,0	100,3%	75,0%	75,2%
109,00	0,19	0,02	6,88	184,5%	20,48	13,59	181,2	28,1	100,3%	75,0%	75,2%
110,00	0,16	0,02	6,87	185,2%	20,49	13,61	181,2	27,7	100,3%	74,9%	75,2%
111,00	0,16	0,02	6,83	186,5%	20,49	13,64	180,9	27,8	100,3%	74,9%	75,1%
112,00	0,14	0,02	6,59	197,3%	20,50	13,91	180,3	27,8	100,3%	74,5%	74,7%
113,00	0,14	0,02	6,60	196,7%	20,50	13,89	179,6	27,9	100,4%	74,6%	74,9%
114,00	0,14	0,02	6,57	198,1%	20,50	13,93	178,9	28,0	100,4%	74,6%	74,9%
115,00	0,12	0,02	6,62	195,9%	20,50	13,87	178,4	28,0	100,4%	74,8%	75,0%
116,00	0,12	0,02	6,62	195,9%	20,50	13,87	178,0	27,9	100,4%	74,8%	75,1%
117,00	0,09	0,02	6,62	196,0%	20,50	13,87	177,6	28,1	100,4%	74,8%	75,1%
118,00	0,09	0,02	6,36	208,1%	20,52	14,15	176,7	28,1	100,4%	74,4%	74,7%
119,00	0,09	0,02	6,09	221,7%	20,54	14,44	175,8	28,1	100,5%	73,9%	74,2%
120,00	0,07	0,02	6,01	226,1%	20,54	14,53	175,2	28,2	100,5%	73,8%	74,1%
121,00	0,07	0,02	5,96	228,8%	20,55	14,58	174,5	28,2	100,5%	73,7%	74,1%
122,00	0,07	0,02	5,96	228,8%	20,55	14,58	174,2	28,4	100,5%	73,8%	74,1%
123,00	0,05	0,02	5,73	242,0%	20,56	14,83	173,6	28,2	100,5%	73,2%	73,6%
124,00	0,05	0,02	5,68	244,9%	20,56	14,88	173,0	28,3	100,5%	73,2%	73,6%
125,00	0,03	0,02	5,69	243,9%	20,56	14,86	172,5	28,4	100,5%	73,3%	73,7%
126,00	0,03	0,02	5,70	243,9%	20,56	14,86	172,1	28,4	100,5%	73,3%	73,7%
127,00	0,03	0,02	5,64	247,0%	20,57	14,91	171,8	28,1	100,5%	73,2%	73,6%
128,00	0,00	0,02	5,66	246,0%	20,57	14,90	171,2	28,2	100,5%	73,3%	73,7%

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2019-07-25 Manufacturer: Hearthstone Model: Sila

Project #: pI 20202 Run: 4 Tech: MM Reviewer: DP

TEST LOAD CONFIGURATION

- Loading 245 LBS stand time
- At 22 LBS close Door
  by pass open
  At 100 LBS hold warm-up
  close Door immediatly
- At 100 LBS hold pre load
  - close Door immediatly
- At 63 LBS close by pass
- At 500 LBS close air inlet (2 inch)
- At 16 LBS hold second pre load
  open air inlet
  At 50 close air inlet (2 inch)
  At 200 LBS (1:00)
  - Open by pass
  - Open Door
  - crush coal bed

- close Door
- close by pass
  After 2 min
  - Open Bypass
  - open Door
  - open air inlet
  - hold load
  - close Door
  - close by pass

After 5 min
close air inlet (2 inch)

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2019.07.25 Manufacturer: Hearthstone Model: Sig

Project #: PI 20202 Run: 4 Tech: MM Reviewer: DF

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-191	7100	ok	ok

Pre-Test **Post-Test**

Facility Conditions:

	Pre-Test	Post-Test
Air Velocity from less than 2 feet	0 (max50 Fpm)	0 (max50 Fpm)
Smoke Capture Check (tunnel velocity)	ok	NA
Picture	4 sides ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned	2019.07.22
Date Dilution Tunnel Cleaned	2019.07.22
Induced Draft Check (max 0.005 H2O)	ok
Traverse before ignition	ok
Flow Rate 140 cfm ±10%	ok

Temperature System:

Ambient (65°-90°F)	ok °F
Wood Heater Surface (±125°F)	ok °F

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok

Sampling Train ID Numbers:

	Train 1st hour	Train 1	Train 2
Probe	7	MM 8 10	41
Filter Front	123	818	820
Filter Back	124	819	822
Filter Thermocouple	11	11	12
Filter (<90°F)	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2019-07-25 Manufacturer: Hearthstone Model: Sila

Project #: PI 20202 Run: 4 Tech: MM Reviewer: JB

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 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)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	979635.90	980546.62	979635.98	980546.79	925018.18	925898.99
Initial 1minute DGM (Liter)	979635.88	980546.60	979635.95	980546.69	925017.98	925898.90
Change © (Liter)	0.02	0.02	0.03	0.10	0.20	0.09
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	ok	ok	ok	ok	ok

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.5	3	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2/9.07.25 Manufacturer: Hearthstone Model: Sila

Project #: pf 22.2 Run: 4 Tech: MM Reviewer: MD

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Wood	EM-090	44 lbs, Class F	44 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

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

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019.07.25 Manufacturer: Hearthstone Model: S/a

Project #: pI 2.252 Run: 4 Tech: MM Reviewer: YP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 101.5 (KPa.) Static pressure (P_q) 0.36 (inches w.c.)
Inside diameter: Port A _____ Port B _____.
Tunnel cross sectional area: .1963Ft^2
Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.074	74.71
B - Centroid	3.00	3.50	4	0.073	74.68
A-1	0.40	0.50	0.50	0.061	74.39
A-2	1.50	1.75	2	0.061	74.49
A-3	4.50	5.25	6	0.062	74.57
A-4	5.60	6.5	7.5	0.062	74.62
B-1	0.40	0.50	0.50	0.063	74.68
B-2	1.50	1.75	2	0.062	74.61
B-3	4.50	5.25	6	0.065	74.59
B-4	5.60	6.5	7.5	0.061	74.59
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,
C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.
Δ_p = manometer reading (inches H_2O)
T_s = average absolute dilution tunnel temperature (°F + 460)
P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$
P_q = static pressure $\frac{\text{in. } H_2O}{\{\ 13.6\ \}}$
M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)
K_p = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_p$avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019.07.25 Manufacturer: Hearthsong Model: Sila

Project #: PT 2020 Run: 4 Tech: MM Reviewer: JS

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2965	3000	1005	1000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO_2	0	0	17.99	18.00	9.78	10.00
Tolerance CO2		+/- 0.02		+/- 0.5		+/- 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	2970	1001	0	0.02	9005	0.15	9004	0.05	✓	
CO_2	0	17.81	9.86	0	0.02	0.18	0.5	008	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2019.07.25 Manufacturer: Hearthstone Model: Sil a

Project #: pI 2202 Run: 4 Tech: MM Reviewer: NS

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	980525,56	925897,08	548,58
Initial (Liter)	979637,12	925019,80	516,90

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101,5	101,5
Dry Bulb (F):	73,6	83,9
Humidity (%):	51	38,7

Flow Meter

	Start	End
Flow meter reading	NA	NA

Flow Meter Verification

	Before	After
Flow meter Check (liters)	NA	NA
Scale Weight (Kg)	NA	NA

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2024-07-25 Manufacturer: Hearthstone Model: Sila

Project #: PI-2252 Run: 4 Tech: MM Reviewer: SP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 8 in.	0.716 lbs.	19.6	19.8	19.3	19.4	19.3
1 1/2 x 3 1/2 x 8 in.	0.762 lbs.	19.7	19.7	19.8	19.9	19.9
1 1/2 x 3 1/2 x 8 in.	1.040 lbs.	20.0	20.1	20.3	20.6	20.3
1 1/2 x 3 1/2 x 8 in.	0.724 lbs.	19.9	19.8	19.3	19.6	19.4
1 1/2 x 3 1/2 x 8 in.	0.728 lbs.	20.1	20.4	20.0	20.0	20.1
1 1/2 x 3 1/2 x 8 in.	0.758 lbs.	19.3	19.4	19.4	19.3	19.0
1 1/2 x 3 1/2 x 8 in.	0.766 lbs.	20.6	21.0	21.0	21.3	21.3
1 1/2 x 3 1/2 x 8 in.	0.746 lbs.	20.4	19.9	19.3	19.3	19.4
x x in.	lbs.					
1 1/2 x 3 1/2 x 8 in.	0.736 lbs.	20.0	20.4	20.8	20.7	20.6
1 1/2 x 3 1/2 x 8 in.	0.998 lbs.	19.9	19.3	19.3	19.4	19.5
1 1/2 x 3 1/2 x 8 in.	1.036 lbs.	19.6	19.4	19.3	19.8	19.9
1 1/2 x 3 1/2 x 8 in.	0.828 lbs.	19.3	19.3	19.8	19.7	19.5
1 1/2 x 3 1/2 x 8 in.	~~1.036~~ 0.746 lbs.	19.7	19.8	19.7	19.8	19.2
1 1/2 x 3 1/2 x 8 in.	0.738 lbs.	19.3	19.6	19.8	19.7	19.8
1 1/2 x 3 1/2 x 8 in.	0.736 lbs.	20.0	20.0	21.1	21.0	21.0
1 1/2 x 3 1/2 x 8 in.	0.730 lbs.	20.3	20.8	20.7	20.8	20.8
1 1/2 x 3 1/2 x 8 in.	0.918 lbs.	20.6	20.8	20.3	20.9	21.7
1 1/2 x 3 1/2 x 8 in.	0.948 lbs.	20.3	19.1	19.2	19.3	19.3
1 1/2 x 3 1/2 x 8 in.	0.842 lbs.	19.6	19.3	19.4	19.6	19.3
1 1/2 x 3 1/2 x 8 in.	0.898 lbs.	19.3	19.2	19.3	19.3	19.3
1 1/2 x 3 1/2 x 8 in.	0.868 lbs.	20.1	20.1	20.6	20.4	20.3
1 1/2 x 3 1/2 x 8 in.	0.850 lbs.	20.9	20.4	20.3	20.3	20.2
1 1/2 3 1/2 x 8 in.	0.842	19.1	19.3	19.8	19.3	19.3
1 1/2 3 1/2 x 8 in.	~~0.886~~	19.8	19.9	20	20	20.1

TEST LOAD WEIGHT: _____ lbs

1.982 MM

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: mm 2019-07-25 Manufacturer: Hearthstone Model: Sila

Project #: pI 4202 Run: 4 Tech: mm Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 9 in.	1044 lbs.	191	196	194	193	196
1 1/2 x 3 1/2 x 9 in.	0858 lbs.	196	194	190	190	191
1 1/2 x 3 1/2 x 9 in.	1020 lbs.	190	192	193	194	193
1 1/2 x 3 1/2 x 9 in.	0 944 lbs.	193	193	198	200	199
1 1/2 x 3 1/2 x 9 in.	0 898 lbs.	199	200	201	200	200
1 1/2 x 3 1/2 x 9 in.	0 970 lbs.	206	200	203	202	202
1 1/2 x 3/4 x 5 in.	0 132 lbs.			200		
1 1/2 x 3/4 x 5 in.	0 132 lbs.			204		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			192		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			193		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			198		
1 1/2 x 3/4 x 5 in.	0 100 lbs.			198		
1 1/2 x 3/4 x 5 in.	0 116 lbs.			196		
1 1/2 x 3/4 x 5 in.	0 098 lbs.			194		
1 1/2 x 3/4 x 5 in.	0 100 lbs.			194		
1 1/2 x 3/4 x 5 in.	0 118 lbs.			200		
1 1/2 x 3/4 x 5 in.	0 112 lbs.			197		
1 1/2 x 3/4 x 5 in.	~~0 [illegible]~~ 0134 lbs.			197		
1 1/2 x 3/4 x 5 in.	0 110 lbs.			198		
1 1/2 x 3/4 x 5 in.	0 118 lbs.			199		
1 1/2 x 3/4 x 5 in.	0 098 lbs.			199		
1 1/2 x 3/4 x 5 in.	0 108 lbs.			191		
1 1/2 x 3/4 x 5 in.	0 108 lbs.			190		
1 1/2 x 3/4 x 5 in.	0 116 lbs.			193		
1 1/2 x 3/4 x 5 in.	0 122 lbs.			193		
1 1/2 x 3/4 x 5 in.	0 116 lbs.			191		
x x in.	lbs.					

TEST LOAD WEIGHT: 8 03 lbs Min 20%: ..... Max 25%: _____

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-24 Manufacturer: Hearthstone Model: S,la

Project #: pf 20202 Run: 4 Tech: MM Reviewer: [illegible]

Pre-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date 24	Time	7	123	124	6	10	818	819	43	822
2019-07-24	17:30	61 4756	0 1220	0 1251	34 8005	94 6402	0 1269	0 1239	34 3615	0 1241
2019-07-25	9:00	61 4756	0 1219	0 1252	34 8006	94 6403	0 1268	0 1240	34 3614	0 1241

Post-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	7	123	124	6	10	818	819	43	822
2019-07-25	14:30	61 4760	0 1233	0 1246	34 8037	94 6410	0 1267	0 1238	34 3628	0 1242
2019-07-30	8:00	61 4758	0 1230	0 1246	34 8024	94 6406	0 1267	0 1238	34 3623	0 1242
2019-07-31	8:30	61 4758	0 1230	0 1246	34 8024	94 6406	0 1267	0 1238	34 3623	0 1242

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-24 Manufacturer: Hearthstone Model: Sila

Project #: PI 20202 Run: 4 Tech: MM Reviewer: [illegible]

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	41	820	821	45
2019-07-24	17:00	110 3665	0 1252	0 1241	34 2635
2019-07-25	9:00	110 3664	0 1251	0 1242	34 2635

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	41	820	821	45
2019-07-25	14:00	110 3667	0 1261	0 1236	34 2669
2019-07-30	8:00	110 3666	0 1261	0 1236	~~34 26 56~~ 34 2657
2019-07-31	8:00	110 3666	0 1264	0 1236	34, 2657

Paramètres

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

Code verrouillage:	HEA

Description du test

Test standard	EPA	
Run #	5	
Date	29-07-2019	
Technicien	M.M	
Project #	PI 20202	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	SILA	
Combustion system	Cat	
Appliance type	WOODSTOVE	
Firebox volume	1,25	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,999	Dimensionless
Equipment number (DGM #1):	em 178	
Calibration Factor (DGM #2):	0,990	Dimensionless
Equipment number (DGM #2):	em 179	
Calibration Factor (DGM #3):	0,997	
Equipment number (DGM #3):	em 070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20202
Date	29-07-2019
Technicien	m.m

Fuel data

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

Default Fuel Values

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

	Start	End
Barometer (kPa):	100,9	100,5
Barometer (in.Hg):	29,795759	29,67763883
Dry Bulb (F):	79,1	86,5
Humidity (%):	65,1	43,6
Air velocity (ft/min)	0	0

DGM #1	Final:	34673,891	cuft	Final:	981855,230	Liter
	Initial:	34627,075	cuft	Initial:	980529,560	Liter
DGM #2	Final:	32743,842	cuft	Final:	927202,320	Liter
	Initial:	32698,015	cuft	Initial:	925904,650	Liter
DGM room				Final:	585,880	cuft
				Initial:	548,580	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 283

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

Project nu.	PI 20202
Date	29-07-2019
Technicien	m.m

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
7,88	8,75	9,63

Load Volume: 0,5590 cu. ft

Loading Density: 15,960 lbs./ft3

Number of Spaces:

Spacer weight (lbs):

Load Density (wet): 35,687 lbs./ft3

Dry Wood Density: 29,576807

Piece Size (in): Thick	Wide	x Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches
1,5	3,5	8	0,846	22,1	22,3	21,4	21,6	22	18,51048	42,00
1,5	3,5	8	0,822	21,8	21,3	21,4	20,8	20,9	17,45928	42,00
1,5	3,5	8	0,85	20,9	21,4	21	21	21	17,901	42,00
1,5	3,5	8	0,78	22	22,1	21,6	21,4	20,9	16,848	42,00
1,5	3,5	8	0,82	20,6	20,8	20,3	20,3	20,8	16,8592	42,00
1,5	3,5	8	0,806	21,9	21,4	21,8	21,8	20,8	17,36124	42,00
1,5	3,5	8	0,834	20,8	20,6	20,7	20,7	20,9	17,29716	42,00
1,5	3,5	8	0,788	21,1	21,6	21,8	21,8	21,9	17,05232	42,00
										0,00
1,5	3,5	8	0,88	20,4	20,9	21,3	21,3	21,3	18,5152	42,00
1,5	3,5	8	0,812	21,4	21,6	21,8	21,7	21,7	17,57168	42,00
1,5	3,5	8	0,832	21,8	22	21,9	21,9	21,3	18,12096	42,00
1,5	3,5	8	0,864	22	21,9	21,4	21,3	21,8	18,73152	42,00
1,5	3,5	8	0,914	20,9	20,8	20,8	20,6	20,8	18,99292	42,00
1,5	3,5	8	0,838	20,7	20,9	20,9	20,8	20,3	17,36336	42,00
1,5	3,5	8	0,86	20,4	20,9	20,6	20,9	20,7	17,802	42,00
1,5	3,5	8	0,87	20,3	20,4	20,6	20,6	20,9	17,8872	42,00
										0,00
1,5	3,5	8	0,814	20,6	20,9	20,4	20,8	20,7	16,83352	42,00
1,5	3,5	8	0,81	20,8	19,9	19,6	19,6	19,3	16,0704	42,00
1,5	3,5	8	0,81	19	19,1	19	19,1	19,2	15,4548	42,00
1,5	3,5	8	0,814	19,4	19,3	19,4	19,3	19,8	15,82416	42,00
1,5	3,5	8	0,818	19,3	19,6	19,4	19,6	19,3	15,90192	42,00
1,5	3,5	8	0,81	19,1	19,3	19,2	19,3	19,8	15,6654	42,00
1,5	3,5	8	0,83	19	19,2	19,2	19,2	19,2	15,9028	42,00
2	3,5	8	0,828	19,1	19,3	19,8	19,9	19,8	16,21224	56,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
								SUM MC:	412,13876	

PreTest Load Weight: 19,95 lbs.

Dry Weight: 7,50 kg.

Average Moisture Content: %

Dry: 20,66

20,66

Must be 18-28

Wet: 17,12

must be 15,2-22

Project nu.	PI 20202
Date	29-07-2019
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FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
7,9	8,8	9,6

* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume: 0,28 cu. ft

Loading Density: 6,4 lbs./ft3

Number of Spaces: 20

Spacer weight: lbs

Load Density (wet): 28,2 lbs./ft3

Dry Wood Density: 23,6 lbs./ft3

Piece Size (in): Thick	Wide	Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
1,5	3,5	9	0,99	19,60	19,30	19,80	19,80	19,70	19,48288	47,25	19,6
1,5	3,5	9	0,95	19,30	19,80	19,70	19,70	19,70	18,57944	47,25	19,6
1,5	3,5	9	0,92	19,80	19,70	19,90	19,30	19,40	18,12888	47,25	19,6
1,5	3,5	9	0,87	19,90	19,90	19,60	19,60	19,50	17,139	47,25	19,7
1,5	3,5	9	1,02	19,10	19,20	19,30	19,20	19,60	19,62704	47,25	19,3
1,5	3,5	9	1,04	20,00	21,00	20,40	20,00	20,60	21,2568	47,25	20,4
1,5	0,75	5	0,10			19,10			1,8336	5,63	19,1
1,5	0,75	5	0,12			19,20			2,304	5,63	19,2
1,5	0,75	5	0,10			19,40			2,0176	5,63	19,4
1,5	0,75	5	0,11			19,80			2,178	5,63	19,8
1,5	0,75	5	0,12			20,00			2,36	5,63	20,0
1,5	0,75	5	0,11			19,10			2,0246	5,63	19,1
1,5	0,75	5	0,10			19,10			1,9482	5,63	19,1
1,5	0,75	5	0,11			19,20			2,1888	5,63	19,2
1,5	0,75	5	0,11			19,40			2,0564	5,63	19,4
1,5	0,75	5	0,11			19,80			2,0988	5,63	19,8
1,5	0,75	5	0,13			19,90			2,5472	5,63	19,9
1,5	0,75	5	0,11			20,00			2,2	5,63	20,0
1,5	0,75	5	0,11			20,60			2,3484	5,63	20,6
1,5	0,75	5	0,136			20,00			2,72	5,63	20,0
1,5	0,75	5	0,11			19,30			2,123	5,63	19,3
1,5	0,75	5	0,112			19,40			2,1728	5,63	19,4
1,5	0,75	5	0,1			19,8			1,98	5,63	19,8
1,5	0,75	5	0,116			19,3			2,2388	5,63	19,3
1,5	0,75	5	0,11			19,3			2,123	5,63	19,3
1,5	0,75	5	0,116			19,4			2,2504	5,63	19,4
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	157,92764		19,6 %

Test Load Weight: 8,03 lbs.

Dry Weight: 3,04 kg.

Average Moisture Content: %

Dry: 19,68 Dry(EPA) 19,68 Dry(B415 19,68

19,68 Must be 19-25

Wet: 16,44 must be 15,2-22

Coal Bed Range: 1,6 lbs. to 2,0 lbs.

TEST CHARGE:

Coal bed weight: 2 lbs.

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Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,34 in. H20
Barometer: 29,900 in. Hg

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

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

PITOT CONSTANT=
0,935

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,075	78,66	0,2739
B center	0,074	78,82	0,2720
A1	0,062	78,69	0,2490
A2	0,064	78,64	0,2530
A3	0,063	78,65	0,2510
A4	0,062	,78,62	0,2490
B1	0,062	78,820	0,2490
B2	0,063	78,780	0,2510
B3	0,066	78,660	0,2569
B4	0,061	78,700	0,2470
AVERAGE	0,0652	70,8420	0,2552

Project nu.	PI 20202
Date	29-07-2019
Technicien	m.m

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	1	826	827	5	21	828	829	10	50	830	831	16	832		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0670	0,1280	0,1235	34,6536	108,7392	0,1247	0,1287	34,4589	107,6471	0,1285	0,1280	35,6871	0,1243	2019-07-25	17:00
Before (6)	61,0669	0,1279	0,1234	34,6537	108,7393	0,1247	0,1287	34,4588	107,6472	0,1285	0,1281	35,6872	0,1242	2019-07-29	10:00
After (1)	61,0675	0,1280	0,1230	34,6578	108,7400	0,1247	0,1279	34,4631	107,6479	0,1296	0,1276	35,6905	0,1244	2019-07-29	16:00
After (2)	61,0670	0,1280	0,1230	34,6554	108,7394	0,1246	0,1278	34,4608	107,6472	0,1296	0,1277	35,6894	0,1243	2019-07-31	08:00
After (3)	61,0670	0,1280	0,1231	34,6554	108,7394	0,1246	0,1278	34,4608	107,6472	0,1296	0,1277	35,6893	0,1243	2019-08-01	08:00
After (4)															
After (5)															
After (6)	61,0670	0,1280	0,1231	34,6554	108,7394	0,1246	0,1278	34,4608	107,6472	0,1296	0,1277	35,6893	0,1243	2019-08-01	08:00
Difference	0,0001	0,0001	-0,0003	0,0017	0,0001	-0,0001	-0,0009	0,0020	0,0000	0,0011	-0,0004	0,0021	0,0001		
Total (mg)		1,6				2,7				2,8			0,1		
Total ajusté (mg)		**1,50**				**2,60**				**2,70**					

Project nu.	PI 20202
Date	29-07-2019
Technicien	m.m

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	1	826	827	5	21	828	829	10	50	830	831	16	832		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0670	0,1280	0,1235	34,6536	108,7392	0,1247	0,1287	34,4589	107,6471	0,1285	0,1280	35,6871	0,1243	2019-07-25	17:00
Before (6)	61,0669	0,1279	0,1234	34,6537	108,7393	0,1247	0,1287	34,4588	107,6472	0,1285	0,1281	35,6872	0,1242	2019-07-29	10:00
After (1)	61,0675	0,1280	0,1230	34,6578	108,7400	0,1247	0,1279	34,4631	107,6479	0,1296	0,1276	35,6905	0,1244	2019-07-29	16:00
After (2)	61,0670	0,1280	0,1230	34,6554	108,7394	0,1246	0,1278	34,4608	107,6472	0,1296	0,1277	35,6894	0,1243	2019-07-31	08:00
After (3)	61,0670	0,1280	0,1231	34,6554	108,7394	0,1246	0,1278	34,4608	107,6472	0,1296	0,1277	35,6893	0,1243	2019-08-01	08:00
After (4)															
After (5)															
After (6)	61,0670	0,1280	0,1234	34,6554	108,7394	0,1247	0,1287	34,4608	107,6472	0,1296	0,1281	35,6893	0,1243	2019-08-01	08:00
Difference	0,0001	0,0001	0,0000	0,0017	0,0001	0,0000	0,0000	0,0020	0,0000	0,0011	0,0000	0,0021	0,0001		
Total (mg)		1,9				4				3,2			0,1		
Total ajusté (mg)		**1,80**				**3,90**				**3,10**					

Project nu.	PI 20202
Date	29-07-2019
Technicien	m.m

negative filter weight rounde to zero emission rate 0,9gr/hr. Demonstration purpose only not a compliance number

SFBA EPA EMISSION RESULTS

Test Duration: **189** min

PRESSURE FACTOR:	DGM 1	0,95907	
	DGM 2	0,96503	
	DGM 3	0,99387	
TEMPERATURE FACTORS	DGM 1	0,96808	
	DGM 2	0,96722	
	DGM 3	0,97035	
VOLUMES SAMPLED	DGM 1	43,437	SCft
	DGM 2	42,353	Scft
	DGM 3	35,872	SCft

TOTAL TUNNEL VOLUME : 36260

SAMPLE RATIOS

Sample Train 1:	834,758
Sample Train 2:	856,129

Paticulate concentration

Sample Train 1	**0,000062**	g/dscf
Sample Train 2	**0,000066**	g/dscf
Room	**0,000003**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,15**	g
Sample Train 2	**2,30**	g

EMISSION RATES

Sample Train 1	**0,68**	g/hr
Sample Train 2	**0,73**	g/hr

1st hour emission rate **1,34** g/hr

	Train 1	Train 2
Cs	6,216E-05	6,61109E-05

RESULTS

Average emission rate: 0,7 g/hr

Burn Rate : 0,966 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,736699	in Hg
Start:	29,795759	in Hg
End:	29,677639	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	34673,891	Cuft
	Initial:	34627,075	Cuft
DGM 2	Final:	32743,842	Cuft
	Initial:	32698,015	Cuft
DGM #3	Final:	585,880	Cuft
	Initial:	548,580	Cuft

TEMPERATURES

DGM 1	545,411	°R
DGM 2	545,895	°R

CALIBRATION FACTORS

DGM 1	0,9993
DGM 2	0,9901
DGM #3	0,9972

TUNNEL FLOW RATE: 191,850 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	2,70	mg
Total Sample Train 2:	2,80	mg
Total Sample Train 1 1st hour:	1,60	mg

DEVIATION: 3,22%

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft	Change in
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Surface
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	up									in wc	in wc	Temp.
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	°F
0,00	283,00	8,0	0,0	2,8	0,0	336,9	82,0	125,1	428,6	456,2	514,4	498,9	136,0	558,6	0,23	83,94	83,79	83,94	0,23	84,39	83,85	84,05	0,08	0,05	0
1,0	284,0	8,0	0,0	1,6	0,0	325,4	82,0	109,5	422,7	446,1	500,7	478,9	134,7	564,0	0,23	84,11	83,79	84,00	0,23	84,48	83,94	84,19	0,08	0,05	-10,19608
2,0	285,0	7,9	0,0	2,4	0,0	329,0	82,1	109,0	419,5	436,7	484,4	459,0	132,9	616,2	0,23	84,18	83,79	84,03	0,23	84,51	83,96	84,28	0,08	0,05	-20,303
3,0	286,0	7,9	0,0	2,6	0,0	333,3	82,2	109,6	417,4	428,1	468,8	441,0	131,6	646,3	0,23	84,23	83,80	84,12	0,23	84,56	83,99	84,37	0,08	0,05	-29,43236
4,0	287,0	7,9	0,0	3,0	0,0	336,3	82,1	110,1	416,3	420,4	454,8	425,4	130,6	657,5	0,23	84,22	83,81	84,20	0,23	84,56	84,04	84,52	0,08	0,05	-37,30749
5,0	288,0	7,8	0,0	3,6	0,0	319,9	82,0	104,7	415,3	413,0	445,0	415,6	128,8	661,2	0,23	84,27	83,83	84,30	0,23	84,58	84,09	84,59	0,08	0,05	-43,27812
6,0	289,0	7,8	0,0	2,3	0,0	303,4	81,9	102,9	413,1	406,3	437,0	408,6	128,8	654,4	0,23	84,28	83,83	84,36	0,23	84,59	84,09	84,66	0,08	0,05	-48,05306
7,0	290,0	7,7	0,0	1,9	0,0	294,9	82,0	102,4	410,3	399,6	428,3	400,3	128,3	637,4	0,23	84,28	83,83	84,49	0,23	84,56	84,08	84,74	0,08	0,05	-53,4435
8,0	291,0	7,7	0,0	1,9	0,0	290,3	81,8	102,3	407,6	393,3	419,7	391,9	128,4	641,5	0,23	84,19	83,83	84,56	0,23	84,51	84,08	84,83	0,08	0,05	-58,61687
9,0	292,0	7,7	0,0	2,1	0,0	288,0	81,9	101,6	405,2	387,3	411,8	384,1	128,2	662,4	0,23	84,06	83,80	84,69	0,23	84,42	84,08	84,96	0,08	0,05	-63,51706
10,0	293,0	7,6	0,0	2,3	0,0	288,4	81,9	101,6	403,9	381,9	404,3	377,1	128,0	688,3	0,23	84,06	83,81	84,78	0,23	84,41	84,10	85,05	0,08	0,05	-67,77035
11,0	294,0	7,6	0,0	2,5	0,0	289,1	82,0	101,5	403,3	376,6	397,5	370,9	127,7	703,2	0,23	84,06	83,84	84,90	0,23	84,40	84,10	85,14	0,08	0,05	-71,61466
12,0	295,0	7,6	0,0	2,6	0,0	289,6	81,9	102,0	402,9	371,3	391,2	366,1	127,3	713,3	0,23	84,02	83,83	84,99	0,23	84,39	84,10	85,25	0,08	0,05	-75,05004
13,0	296,0	7,5	0,0	2,9	0,0	292,3	81,9	101,8	403,4	366,4	385,7	367,4	126,7	710,3	0,23	84,06	83,84	85,10	0,23	84,39	84,13	85,37	0,08	0,05	-76,86888
14,0	297,0	7,4	0,0	4,0	0,0	293,6	81,8	102,2	404,3	361,3	381,0	371,4	126,6	718,7	0,23	84,01	83,86	85,17	0,23	84,36	84,12	85,45	0,08	0,05	-77,86973
15,0	298,0	7,4	0,0	4,6	0,0	295,3	81,9	101,1	405,8	356,7	377,1	371,4	126,8	742,2	0,23	83,92	83,86	85,25	0,23	84,31	84,13	85,57	0,08	0,05	-79,269
16,0	299,0	7,3	0,0	3,3	0,0	298,8	81,8	102,4	407,4	351,9	374,5	369,3	126,5	752,0	0,23	83,89	83,85	85,35	0,23	84,29	84,15	85,68	0,08	0,05	-80,92177
17,0	300,0	7,2	0,0	5,4	0,0	304,3	81,9	102,6	410,5	347,6	373,1	367,8	126,4	791,1	0,23	83,89	83,85	85,45	0,23	84,28	84,16	85,77	0,08	0,05	-81,72398
18,0	301,0	7,1	0,0	6,0	0,0	308,7	82,0	103,0	415,6	343,9	372,7	367,3	126,5	799,8	0,23	83,91	83,86	85,52	0,23	84,29	84,18	85,86	0,08	0,05	-81,6211
19,0	302,0	7,0	0,0	5,7	0,0	308,6	82,0	101,2	420,3	340,3	372,5	366,0	125,9	785,6	0,23	83,87	83,85	85,60	0,23	84,28	84,19	85,93	0,08	0,05	-81,82439
20,0	303,0	7,0	0,0	3,3	0,0	308,0	82,2	101,0	423,4	336,7	371,4	364,0	125,3	761,3	0,23	83,85	83,86	85,62	0,23	84,27	84,19	85,98	0,08	0,05	-82,6577
21,0	304,0	6,9	0,0	2,8	0,0	306,8	82,2	101,3	425,1	333,1	369,6	362,0	125,1	756,3	0,23	83,87	83,86	85,73	0,23	84,25	84,19	86,08	0,08	0,05	-83,82938
22,0	305,0	6,9	0,0	3,1	0,0	306,6	82,3	101,4	426,0	329,6	366,9	360,7	124,5	737,8	0,23	83,83	83,86	85,80	0,23	84,22	84,20	86,13	0,08	0,05	-85,25755
23,0	306,0	6,8	0,0	3,4	0,0	307,6	82,2	101,5	427,1	326,8	364,8	359,9	124,8	769,7	0,23	83,88	83,88	85,86	0,23	84,23	84,22	86,17	0,08	0,05	-86,14178
24,0	307,0	6,7	0,0	4,4	0,0	311,5	82,1	102,2	429,1	323,9	364,4	360,5	124,5	787,8	0,23	83,82	83,87	85,91	0,23	84,19	84,23	86,24	0,08	0,05	-86,33675
25,0	308,0	6,6	0,0	5,4	0,0	313,1	82,3	102,5	432,1	321,6	365,6	362,2	124,1	792,4	0,23	83,79	83,86	85,99	0,23	84,16	84,25	86,31	0,08	0,05	-85,70108
26,0	309,0	6,6	0,0	5,4	0,0	313,9	82,2	102,3	435,1	319,2	367,7	364,0	124,2	806,4	0,23	83,80	83,86	86,02	0,23	84,15	84,26	86,36	0,08	0,05	-84,75882
27,0	310,0	6,5	0,0	4,5	0,0	316,7	82,2	102,7	438,6	317,0	370,1	364,4	123,5	837,5	0,23	83,81	83,87	86,07	0,23	84,17	84,25	86,42	0,08	0,05	-84,10797
28,0	311,0	6,4	0,0	5,7	0,0	319,5	82,3	102,4	442,9	315,2	373,2	364,7	123,4	844,4	0,23	83,82	83,87	86,13	0,23	84,17	84,26	86,47	0,07	0,05	-82,95606
29,0	312,0	6,3	0,0	4,9	0,0	321,4	82,1	102,8	447,4	313,5	376,5	364,9	123,4	876,7	0,23	83,82	83,88	86,16	0,23	84,15	84,28	86,52	0,08	0,05	-81,67953
30,0	313,0	6,2	0,0	5,4	0,0	329,5	82,3	103,5	454,0	311,9	379,3	365,3	122,8	901,3	0,23	83,84	83,88	86,21	0,23	84,17	84,29	86,62	0,08	0,05	-80,15826
31,0	314,0	6,1	0,0	6,5	0,0	334,3	82,3	104,1	461,5	311,0	383,8	366,1	123,0	907,1	0,23	83,86	83,87	86,27	0,23	84,19	84,28	86,68	0,08	0,05	-77,74281
32,0	315,0	6,0	0,2	9,3	0,0	335,0	82,3	104,2	468,7	309,8	393,4	366,5	122,2	873,6	0,23	83,92	83,89	86,30	0,23	84,24	84,29	86,70	0,08	0,05	-74,67967
33,0	316,0	5,9	0,0	6,9	0,0	332,3	82,3	103,6	473,5	309,1	404,2	366,6	122,0	821,0	0,23	83,90	83,87	86,33	0,23	84,20	84,31	86,73	0,08	0,05	-71,72478
34,0	317,0	5,8	0,0	4,3	0,0	330,7	82,3	103,2	476,3	308,3	411,2	366,2	121,8	866,7	0,23	83,89	83,90	86,36	0,23	84,22	84,32	86,79	0,08	0,05	-70,04179
35,0	318,0	5,8	0,0	3,2	0,0	331,2	82,3	103,4	479,3	307,4	412,6	365,0	121,6	892,5	0,23	83,93	83,89	86,42	0,23	84,26	84,34	86,82	0,08	0,05	-69,6131
36,0	319,0	5,7	0,0	3,2	0,0	330,9	82,4	103,2	481,6	306,3	410,9	364,2	121,4	854,8	0,23	84,02	83,91	86,44	0,23	84,29	84,33	86,86	0,08	0,05	-69,91754
37,0	320,0	5,7	0,0	3,5	0,0	329,9	82,4	103,6	483,1	305,6	410,0	364,1	121,1	834,6	0,23	84,09	83,92	86,49	0,23	84,33	84,34	86,89	0,08	0,05	-70,02603
38,0	321,0	5,6	0,0	5,2	0,0	331,8	82,3	103,8	484,3	305,7	413,1	365,0	120,8	825,4	0,23	84,08	83,91	86,52	0,23	84,31	84,33	86,96	0,08	0,05	-69,00488
39,0	322,0	5,5	0,0	6,0	0,0	332,9	82,3	104,4	485,1	305,7	420,1	367,0	120,6	823,7	0,23	84,13	83,93	86,57	0,23	84,36	84,34	86,97	0,07	0,05	-67,08792
40,0	323,0	5,4	0,0	6,7	0,0	335,4	82,3	104,9	486,4	306,0	429,3	369,4	120,3	833,9	0,23	84,22	83,94	86,61	0,23	84,42	84,34	87,06	0,08	0,05	-64,51853
41,0	324,0	5,3	0,0	7,1	0,0	336,1	82,4	105,0	488,2	306,6	440,0	371,5	120,4	834,0	0,23	84,22	83,97	86,65	0,23	84,44	84,36	87,09	0,08	0,05	-61,47547
42,0	325,0	5,2	0,0	6,9	0,0	336,7	82,5	105,0	489,9	307,2	450,8	373,3	120,0	836,3	0,23	84,25	83,95	86,68	0,23	84,47	84,36	87,14	0,08	0,05	-58,57423
43,0	326,0	5,1	0,0	6,6	0,0	336,1	82,3	105,0	491,9	307,9	460,6	374,9	119,7	834,7	0,23	84,26	83,96	86,74	0,23	84,48	84,36	87,19	0,08	0,05	-55,82646
44,0	327,0	5,0	0,0	6,7	0,0	336,6	82,5	105,0	493,8	308,9	469,2	376,9	119,5	833,1	0,23	84,29	83,95	86,75	0,23	84,52	84,38	87,22	0,08	0,05	-53,14039
45,0	328,0	4,9	0,0	5,9	0,0	337,0	82,3	105,0	495,7	310,1	476,8	379,0	119,7	837,0	0,23	84,33	83,98	86,79	0,23	84,56	84,39	87,27	0,08	0,05	-50,5438
46,0	329,0	4,8	0,0	6,5	0,0	338,3	82,5	105,5	497,7	311,3	483,9	381,6	119,2	842,9	0,23	84,38	84,00	86,83	0,23	84,60	84,38	87,33	0,08	0,05	-48,07264
47,0	330,0	4,7	0,0	5,6	0,0	339,2	82,3	104,8	499,9	312,6	490,0	383,7	119,2	844,9	0,23	84,41	84,02	86,92	0,23	84,63	84,42	87,37	0,08	0,05	-45,73312
48,0	331,0	4,7	0,0	6,2	0,0	339,3	82,5	105,2	502,2	314,1	495,9	386,7	119,2	850,4	0,23	84,48	84,02	86,95	0,23	84,68	84,42	87,39	0,08	0,05	-43,21009
49,0	332,0	4,6	0,0	5,9	0,0	339,9	82,2	104,8	504,5	315,5	501,0	388,7	119,1	849,7	0,23	84,48	84,02	86,98	0,23	84,71	84,46	87,44	0,08	0,05	-41,04315
50,0	333,0	4,5	0,0	5,5	0,0	339,7	82,5	105,6	506,5	317,1	504,9	390,3	118,9	847,2	0,23	84,49	84,03	87,02	0,23	84,75	84,47	87,49	0,08	0,05	-39,27521
51,0	334,0	4,4	0,0	6,0	0,0	340,2	82,6	105,4	508,4	318,8	509,1	392,6	118,4	853,2	0,23	84,57	84,06	87,04	0,23	84,79	84,48	87,52	0,08	0,05	-37,36124
52,0	335,0	4,3	0,0	5,9	0,0	341,0	82,6	105,5	510,7	320,3	513,3	394,7	118,2	860,8	0,23	84,54	84,05	87,09	0,23	84,80	84,49	87,57	0,08	0,05	-35,37948
53,0	336,0	4,3	0,0	6,0	0,0	342,4	82,5	105,9	512,7	321,8	516,8	396,3	117,9	862,1	0,23	84,52	84,06	87,11	0,23	84,78	84,49	87,59	0,08	0,05	-33,69468
54,0	337,0	4,2	0,0	5,8	0,0	343,5	82,6	106,4	514,6	323,3	519,9	397,4	118,0	862,0	0,23	84,53	84,06	87,16	0,23	84,83	84,52	87,66	0,08	0,05	-32,17574
55,0	338,0	4,1	0,0	5,8	0,0	343,5	82,6	106,2	516,7	324,9	522,5	398,7	117,9	864,4	0,23	84,58	84,08	87,17	0,23	84,87	84,55	87,68	0,08	0,05	-30,67877
56,0	339,0	4,0	0,0	5,9	0,0	344,8	82,8	106,0	518,7	326,5	525,3	399,8	117,5	871,3	0,23	84,65	84,11	87,22	0,23	84,91	84,56	87,72	0,08	0,05	-29,22013
57,0	340,0	3,9	0,0	6,1	0,0	346,1	82,4	105,9	521,1	328,2	528,9	401,2	117,8	886,1	0,23	84,63	84,12	87,27	0,23	84,91	84,57	87,74	0,08	0,05	-27,37521
58,0	341,0	3,9	0,0	6,7	0,0	348,2	82,7	106,5	524,9	330,5	532,5	402,6	117,9	904,9	0,23	84,71	84,12	87,32	0,23	84,95	84,61	87,81	0,08	0,05	-25,12499
59,0	342,0	3,8	0,0	7,3	0,0	351,5	82,9	107,1	528,8	332,4	536,8	404,2	117,3	931,6	0,23	84,73	84,13	87,38	0,23	84,99	84,62	87,86	0,08	0,05	-22,89763
60,0	343,0	3,7	0,0	7,9	0,0	353,6	82,7	107,3	534,4	334,6	542,4	406,2	117,4	962,7	0,23	84,74	84,14	83,42	0,23	84,98	84,65	87,88	0,08	0,06	-19,81889
61,0	344,0	3,5	0,0	8,2	0,0	357,3	82,5	107,7	541,4	337,0	549,2	408,6	117,1	997,7	0,23	84,80	84,15	83,45	0,23	85,05	84,65	87,94	0,08	0,05	-16,15889
62,0	345,0	3,4	0,0	9,1	0,0	360,4	82,7	107,8	550,4	340,1	557,3	411,5	117,3	1034,5	0,23	84,87	84,17	83,52	0,23	85,11	84,66	87,62	0,08	0,06	-11,48064
63,0	346,0	3,3	0,1	9,2	0,0	361,9	83,0	108,6	560,7	343,2	566,0	415,2	117,0	1055,1	0,23	84,91	84,19	83,63	0,23	85,16	84,68	86,66	0,08	0,06	-6,398361
64,0	347,0	3,2	0,2	9,4	0,0	364,6	82,9	108,8	571,6	346,4	574,7	418,7	117,1	1084,8	0,23	84,95	84,20	83,75	0,23	85,23	84,71	86,03	0,08	0,06	-1,113951
65,0	348,0	3,1	0,1	9,1	0,0	368,3	82,8	109,0	582,6	349,7	582,7	422,2	117,1	1054,3	0,23	84,96	84,22	83,91	0,23	85,26	84,72	85,62	0,07	0,06	4,0679062
66,0	349,0	3,0	0,0	8,3	0,0	370,7	83,0	108,7	592,1	352,8	590,1	425,9	116,9	1042,6	0,23	84,97	84,23	84,04	0,23	85,29	84,75	85,32	0,08	0,06	8,7360578
67,0	350,0	2,9	0,0	7,7	0,0	373,0	83,2	109,3	599,9	356,3	596,6	429,4	116,7	1041,4	0,23	85,03	84,25	84,18	0,23	85,34	84,77	85,09	0,08	0,06	12,974896
68,0	351,0	2,8	0,0	7,8	0,0	374,6	83,2	109,6	606,7	359,5	602,1	432,9	116,6	1042,5	0,23	85,08	84,27	84,33	0,23	85,41	84,77	84,94	0,08	0,06	16,757295
69,0	352,0	2,8	0,0	7,2	0,0	376,5	83,3	109,8	612,1	362,6	606,4	435,9	116,4	1029,0	0,23	85,17	84,29	84,48	0,23	85,45	84,82	84,82	0,08	0,06	19,882301
70,0	353,0	2,7	0,0	6,8	0,0	378,1	83,2	109,3	616,4	365,5	609,6	438,6	116,1	1017,8	0,23	85,14	84,31	84,66	0,23	85,46	84,81	84,72	0,08	0,06	22,43781
71,0	354,0	2,6	0,0	6,5	0,0	377,5	83,2	110,0	619,2	368,4	611,7	441,3	115,8	1009,2	0,23	85,10	84,30	84,82	0,23	85,46	84,84	84,68	0,08	0,06	24,468228
72,0	355,0	2,5	0,0	6,3	0,0	376,5	83,3	110,1	621,1	371,1	613,2	444,0	115,6	995,7	0,23	85,12	84,33	84,98	0,23	85,51	84,87	84,60	0,08	0,06	26,194034
73,0	356,0	2,5	0,0	5,9	0,0	377,2	83,5	110,2	621,8	373,6	614,3	446,2	115,9	981,3	0,23	85,17	84,35	85,15	0,23	85,56	84,89	84,56	0,08	0,06	27,549129
74,0	357,0	2,4	0,0	5,7	0,0	375,7	83,4	110,1	621,3	376,1	615,0	448,9	115,6	966,9	0,23	85,32	84,37	85,32	0,23	85,63	84,92	84,54	0,08	0,06	28,587253
75,0	358,0	2,4	0,0	5,3	0,0	375,0	83,4	110,5	619,9	378,3	615,6	453,2	115,5	948,6	0,23	85,41	84,38	85,52	0,23	85,70	84,91	84,53	0,08	0,06	29,698525
76,0	359,0	2,3	0,0	5,5	0,0	373,9	83,6	110,9	617,9	380,9	616,3	461,7	115,5	938,8	0,23	85,40	84,44	85,71	0,23	85,73	84,96	84,55	0,08	0,05	31,651853
77,0	360,0	2,3	0,0	6,1	0,0	373,0	83,6	110,5	615,7	383,7	618,6	471,8	115,2	934,8	0,23	85,41	84,42	85,88	0,23	85,76	84,97	84,54	0,08	0,06	34,179443
78,0	361,0	2,2	0,0	6,1	0,0	372,9	83,8	110,7	613,6	386,2	621,9	482,3	115,4	929,1	0,23	85,40	84,47	86,06	0,23	85,80	85,01	84,53	0,08	0,05	37,073677
79,0	362,0	2,1	0,0	5,8	0,0	372,1	83,7	110,0	611,0	388,5	625,0	492,6	115,4	923,2	0,23	85,42	84,48	86,24	0,23	85,84	85,04	84,54	0,08	0,06	39,687586
80,0	363,0	2,1	0,0	5,5	0,0	370,3	83,8	109,4	607,9	390,7	627,5	502,4	115,1	913,5	0,23	85,48	84,49	86,39	0,23	85,90	85,06	84,55	0,08	0,06	41,932809
81,0	364,0	2,1	0,0	5,1	0,0	368,4	84,0	110,2	604,4	392,5	628,6	511,2	115,1	908,0	0,23	85,57	84,52	86,57	0,23	85,99	85,11	84,56	0,08	0,05	43,546442
82,0	365,0	2,0	0,0	4,8	0,0	366,3	83,8	109,2	600,8	394,1	627,3	518,1	115,1	901,1	0,23	85,67	84,57	86,73	0,23	86,09	85,14	84,61	0,08	0,05	44,249944
83,0	366,0	2,0	0,0	4,7	0,0	363,7	84,0	109,1	596,8	395,6	624,3	524,3	114,9	895,3	0,23	85,69	84,59	86,90	0,23	86,11	85,17	84,61	0,08	0,05	44,367779
84,0	367,0	1,9	0,0	4,8	0,0	363,0	83,7	109,1	592,6	396,8	620,6	529,4	114,6	889,4	0,23	85,67	84,61	87,06	0,23	86,15	85,20	84,62	0,08	0,06	43,994975
85,0	368,0	1,9	0,0	4,6	0,0	361,1	84,2	109,9	588,2	398,0	616,8	534,2	114,8	882,3	0,23	85,75	84,61	87,17	0,23	86,18	85,24	84,61	0,08	0,05	43,569565
86,0	369,0	1,9	0,0	4,9	0,0	360,4	84,0	109,6	584,1	399,4	613,6	540,5	114,5	867,1	0,23	85,79	84,66	87,31	0,23	86,21	85,29	84,66	0,08	0,05	43,627739
87,0	370,0	1,8	0,0	5,1	0,0	357,6	84,2	109,9	579,6	401,2	611,6	548,6	114,6	847,3	0,23	85,82	84,70	87,47	0,23	86,25	85,29	84,66	0,08	0,05	44,303099
88,0	371,0	1,8	0,0	5,1	0,0	354,8	84,3	109,5	574,6	403,4	611,0	557,7	114,7	829,8	0,23	85,85	84,72	87,65	0,23	86,29	85,34	84,68	0,08	0,05	45,455267
89,0	372,0	1,8	0,0	5,1	0,0	351,1	84,4	108,5	569,0	406,1	611,6	566,4	114,4	814,7	0,23	85,91	84,76	87,72	0,23	86,35	85,36	84,72	0,08	0,05	46,681087
90,0	373,0	1,7	0,0	4,9	0,0	348,7	84,5	108,3	563,2	409,1	612,6	573,6	114,4	801,7	0,23	85,95	84,78	87,85	0,23	86,39	85,42	84,76	0,08	0,05	47,765251
91,0	374,0	1,7	0,0	4,7	0,0	345,6	84,5	108,8	557,0	412,3	613,6	579,3	114,4	791,0	0,23	85,96	84,80	87,97	0,23	86,42	85,44	84,75	0,08	0,05	48,499018
92,0	375,0	1,7	0,0	4,7	0,0	342,7	84,6	107,9	550,9	415,7	614,2	584,5	114,5	782,9	0,23	85,97	84,84	88,07	0,23	86,45	85,49	84,79	0,08	0,05	49,123224
93,0	376,0	1,7	0,0	4,7	0,0	339,8	84,6	107,8	544,9	419,0	614,8	589,1	114,6	775,2	0,23	85,95	84,87	88,16	0,23	86,44	85,50	84,79	0,08	0,05	49,671292
94,0	377,0	1,6	0,0	4,7	0,0	338,1	84,6	107,4	538,9	422,2	615,4	593,7	114,7	768,4	0,23	85,94	84,87	88,25	0,23	86,43	85,53	84,79	0,08	0,05	50,188465
95,0	378,0	1,6	0,0	4,6	0,0	335,3	84,7	107,9	533,2	425,2	615,9	598,3	114,5	762,1	0,23	85,97	84,92	88,33	0,23	86,46	85,54	84,83	0,08	0,05	50,585059
96,0	379,0	1,6	0,0	4,6	0,0	333,5	84,8	107,5	527,6	427,9	616,5	603,0	114,4	756,9	0,23	86,01	84,94	88,45	0,23	86,52	85,59	84,87	0,08	0,05	51,076723
97,0	380,0	1,6	0,0	4,6	0,0	331,0	84,5	107,4	522,0	430,2	617,0	607,5	114,5	752,9	0,23	86,06	84,97	88,50	0,23	86,58	85,63	84,87	0,08	0,05	51,426373
98,0	381,0	1,6	0,0	4,6	0,0	329,1	84,7	107,7	516,9	432,3	617,2	612,0	114,8	749,7	0,23	86,14	85,01	88,57	0,23	86,64	85,66	84,88	0,08	0,05	51,843887
99,0	382,0	1,5	0,0	4,6	0,0	327,0	84,4	107,7	512,1	434,4	617,3	616,1	114,3	746,9	0,23	86,21	85,04	88,64	0,23	86,71	85,68	84,90	0,08	0,05	52,012344
100,0	383,0	1,5	0,0	4,6	0,0	325,1	84,4	107,1	507,5	436,2	617,0	619,5	114,7	745,0	0,23	86,18	85,06	88,70	0,23	86,67	85,69	84,92	0,08	0,05	52,147751
101,0	384,0	1,5	0,0	4,6	0,0	324,1	84,3	106,7	503,1	437,5	616,6	622,5	114,8	743,7	0,23	86,14	85,10	88,75	0,23	86,68	85,72	84,92	0,08	0,05	52,09077

102,0	385,0	1,5	0,0	4,5	0,0	321,6	84,6	105,9	499,1	438,9	616,1	625,5	115,0	743,2	0,23	86,08	85,10	87,85	0,23	86,62	85,72	84,88	0,08	0,05	52,103372
103,0	386,0	1,5	0,0	4,5	0,0	319,9	84,7	105,8	495,5	439,8	615,3	627,5	115,0	744,1	0,23	86,05	85,11	87,18	0,23	86,59	85,74	84,88	0,08	0,05	51,813257
104,0	387,0	1,4	0,0	4,5	0,0	318,0	84,7	106,3	491,8	440,5	614,3	629,0	115,2	744,9	0,23	86,07	85,13	86,79	0,23	86,61	85,77	84,87	0,08	0,05	51,362898
105,0	388,0	1,4	0,0	4,5	0,0	317,2	84,8	106,2	488,7	440,9	613,3	629,8	115,3	747,3	0,23	86,06	85,16	86,46	0,23	86,60	85,81	84,89	0,08	0,05	50,785094
106,0	389,0	1,4	0,0	4,5	0,0	316,4	84,7	105,4	485,8	441,1	611,9	630,3	115,1	750,2	0,23	86,06	85,18	86,20	0,23	86,61	85,86	84,88	0,08	0,05	50,049402
107,0	390,0	1,4	0,0	4,4	0,0	314,8	84,9	105,7	483,2	441,1	610,5	630,2	115,4	751,6	0,23	86,05	85,21	86,00	0,23	86,61	85,87	84,90	0,08	0,05	49,27308
108,0	391,0	1,4	0,0	4,4	0,0	312,7	84,8	105,9	480,8	441,1	608,8	629,7	115,8	752,8	0,23	86,07	85,24	85,83	0,23	86,62	85,90	84,90	0,08	0,05	48,407091
109,0	392,0	1,3	0,0	4,4	0,0	311,1	84,9	105,5	478,6	440,9	606,8	629,1	115,9	753,4	0,23	86,16	85,26	85,65	0,23	86,66	85,89	84,86	0,08	0,05	47,435036
110,0	393,0	1,3	0,0	4,4	0,0	310,3	85,0	105,2	476,4	440,8	604,9	628,3	116,0	754,2	0,23	86,21	85,30	85,57	0,23	86,73	85,95	84,88	0,08	0,05	46,452513
111,0	394,0	1,3	0,0	4,4	0,0	308,7	85,0	105,2	474,7	440,3	602,9	626,9	116,5	754,7	0,23	86,21	85,33	85,47	0,23	86,72	85,98	84,88	0,08	0,05	45,442954
112,0	395,0	1,3	0,0	4,4	0,0	308,0	85,0	105,7	473,0	440,1	600,7	625,8	116,6	754,7	0,23	86,17	85,36	85,36	0,23	86,72	86,02	84,89	0,08	0,05	44,421436
113,0	396,0	1,3	0,0	4,4	0,0	306,9	85,0	105,2	471,3	439,7	598,7	624,6	116,5	755,0	0,23	86,17	85,37	85,30	0,23	86,70	86,02	84,88	0,08	0,05	43,348561
114,0	397,0	1,3	0,0	4,4	0,0	307,3	85,1	105,6	469,8	439,3	596,5	623,2	116,5	755,1	0,23	86,21	85,39	85,24	0,23	86,73	86,06	84,86	0,08	0,05	42,239125
115,0	398,0	1,2	0,0	4,4	0,0	306,4	85,2	105,8	468,2	438,8	594,3	621,9	116,9	754,7	0,23	86,27	85,44	85,18	0,23	86,79	86,09	84,88	0,08	0,05	41,206081
116,0	399,0	1,2	0,0	4,4	0,0	306,2	85,2	105,1	466,8	438,4	592,1	621,1	117,0	755,0	0,23	86,32	85,45	85,14	0,23	86,85	86,14	84,89	0,08	0,05	40,273572
117,0	400,0	1,2	0,0	4,5	0,0	305,1	85,2	105,3	465,3	437,8	590,0	620,6	117,1	755,0	0,23	86,34	85,50	85,11	0,23	86,86	86,13	84,85	0,08	0,05	39,354822
118,0	401,0	1,2	0,0	4,4	0,0	304,1	85,1	105,1	464,0	437,4	587,9	620,3	117,5	754,2	0,23	86,33	85,49	85,07	0,23	86,87	86,16	84,86	0,08	0,05	38,603319
119,0	402,0	1,2	0,0	4,4	0,0	302,8	85,3	104,9	462,8	436,9	585,9	619,8	117,4	754,6	0,23	86,33	85,54	85,03	0,23	86,87	86,21	84,87	0,08	0,05	37,744685
120,0	403,0	1,2	0,0	4,4	0,0	302,6	85,3	104,9	461,5	436,4	584,0	619,1	117,6	754,1	0,23	86,39	85,58	85,02	0,23	86,92	86,23	84,85	0,08	0,04	36,897147
121,0	404,0	1,1	0,0	4,4	0,0	302,6	84,7	104,9	460,4	436,0	581,9	618,0	117,7	753,7	0,23	86,41	85,59	85,01	0,23	86,94	86,26	84,87	0,08	0,04	35,988699
122,0	405,0	1,1	0,0	4,4	0,0	302,3	85,2	104,4	459,3	435,7	579,9	616,9	118,1	753,5	0,23	86,46	85,63	84,98	0,23	86,99	86,29	84,83	0,08	0,04	35,168991
123,0	406,0	1,1	0,0	4,4	0,0	301,4	85,1	104,5	458,4	435,1	578,0	615,6	118,3	752,5	0,23	86,48	85,66	84,96	0,23	87,01	86,31	84,81	0,08	0,04	34,270699
124,0	407,0	1,1	0,0	4,4	0,0	301,2	85,3	104,8	457,2	434,6	576,0	614,6	118,4	750,9	0,23	86,52	85,69	84,91	0,23	87,04	86,35	84,84	0,08	0,04	33,348024
125,0	408,0	1,1	0,0	4,4	0,0	300,0	85,0	104,6	456,1	434,0	574,0	613,7	118,8	749,8	0,23	86,53	85,69	84,92	0,23	87,05	86,36	84,84	0,08	0,04	32,519898
126,0	409,0	1,1	0,0	4,4	0,0	299,6	85,3	104,8	455,1	433,8	571,9	612,8	118,7	749,2	0,23	86,52	85,72	84,92	0,23	87,06	86,38	84,82	0,08	0,05	31,675256
127,0	410,0	1,0	0,0	4,4	0,0	299,1	85,3	104,2	454,1	433,2	570,1	612,0	119,0	748,8	0,23	86,52	85,74	84,90	0,23	87,06	86,40	84,83	0,08	0,04	30,867836
128,0	411,0	1,0	0,0	4,4	0,0	298,0	85,4	104,4	453,2	432,9	568,3	611,3	119,4	747,8	0,23	86,50	85,76	84,89	0,23	87,05	86,42	84,78	0,08	0,04	30,196134
129,0	412,0	1,0	0,0	4,4	0,0	297,7	85,3	104,3	452,2	432,3	566,6	610,5	119,5	745,8	0,23	86,50	85,80	84,87	0,23	87,08	86,44	84,80	0,08	0,04	29,430046
130,0	413,0	1,0	0,0	4,4	0,0	296,8	85,4	104,4	451,5	432,0	564,9	609,9	119,8	744,9	0,23	86,54	85,83	84,87	0,23	87,10	86,46	84,79	0,08	0,04	28,812563
131,0	414,0	1,0	0,0	4,4	0,0	296,9	85,4	104,6	450,5	431,6	563,4	609,5	120,0	744,6	0,23	86,58	85,83	84,87	0,23	87,12	86,47	84,79	0,08	0,04	28,181145
132,0	415,0	0,9	0,0	4,4	0,0	296,1	85,4	104,2	449,8	431,1	561,8	608,7	120,3	744,0	0,23	86,54	85,85	84,84	0,23	87,09	86,51	84,76	0,08	0,04	27,558226
133,0	416,0	0,9	0,0	4,4	0,0	296,2	85,1	104,2	448,9	430,8	560,2	608,5	120,3	743,8	0,23	86,54	85,90	84,86	0,23	87,11	86,54	84,78	0,08	0,04	26,9159
134,0	417,0	0,9	0,0	4,4	0,0	294,7	85,0	103,6	447,8	430,4	558,6	608,0	120,3	743,2	0,23	86,58	85,91	84,82	0,23	87,11	86,56	84,74	0,08	0,04	26,214444
135,0	418,0	0,9	0,0	4,4	0,0	295,3	85,3	104,0	447,1	430,2	557,0	607,5	120,7	743,0	0,23	86,60	85,92	84,82	0,23	87,11	86,57	84,77	0,08	0,04	25,705601
136,0	419,0	0,9	0,0	4,4	0,0	295,0	85,4	103,6	446,4	429,9	555,4	606,9	121,1	743,1	0,23	86,59	85,94	84,82	0,23	87,14	86,60	84,76	0,08	0,04	25,107898
137,0	420,0	0,9	0,0	4,4	0,0	294,5	85,4	103,6	445,7	429,5	553,8	606,2	121,1	743,8	0,23	86,65	85,97	84,80	0,23	87,16	86,60	84,71	0,08	0,04	24,427443
138,0	421,0	0,9	0,0	4,4	0,0	293,8	85,5	104,1	444,9	428,9	552,2	605,7	121,4	744,9	0,23	86,66	85,99	84,80	0,23	87,18	86,65	84,71	0,08	0,04	23,777342
139,0	422,0	0,8	0,0	4,4	0,0	294,3	85,5	104,3	444,2	428,3	550,7	605,1	121,5	745,6	0,23	86,68	86,01	84,80	0,23	87,21	86,66	84,66	0,08	0,04	23,123836
140,0	423,0	0,8	0,0	4,4	0,0	293,8	85,6	104,4	443,8	428,0	549,2	604,2	121,4	746,3	0,23	86,70	86,03	84,83	0,23	87,23	86,69	84,70	0,08	0,04	22,510974
141,0	424,0	0,8	0,0	4,4	0,0	293,8	85,6	103,9	443,1	427,2	547,7	603,6	121,7	747,1	0,23	86,72	86,05	84,81	0,23	87,26	86,71	84,69	0,08	0,04	21,850823
142,0	425,0	0,8	0,0	4,3	0,0	294,0	85,7	104,7	442,6	427,1	546,3	602,7	121,9	745,8	0,23	86,77	86,11	84,79	0,23	87,29	86,74	84,68	0,08	0,04	21,334518
143,0	426,0	0,8	0,0	4,4	0,0	293,3	85,7	104,5	442,1	426,8	544,9	601,5	122,1	746,2	0,23	86,79	86,12	84,80	0,23	87,32	86,77	84,68	0,08	0,04	20,652529
144,0	427,0	0,8	0,0	4,4	0,0	293,3	85,5	103,9	441,8	426,5	543,5	600,2	122,2	746,9	0,23	86,79	86,13	84,77	0,23	87,32	86,78	84,71	0,08	0,04	20,030347
145,0	428,0	0,7	0,0	4,3	0,0	293,0	85,6	103,6	441,3	426,1	542,3	599,1	122,4	747,0	0,23	86,80	86,16	84,78	0,23	87,32	86,82	84,70	0,08	0,04	19,442046
146,0	429,0	0,7	0,0	4,4	0,0	292,4	85,7	104,3	440,9	425,9	541,1	597,8	122,8	745,6	0,23	86,87	86,18	84,79	0,23	87,36	86,82	84,68	0,08	0,04	18,879561
147,0	430,0	0,7	0,0	4,3	0,0	293,0	85,8	104,1	440,5	425,7	539,9	596,2	122,8	746,0	0,23	86,93	86,24	84,79	0,23	87,42	86,89	84,70	0,08	0,04	18,192075
148,0	431,0	0,7	0,0	4,3	0,0	292,8	85,6	104,1	440,0	425,4	538,7	595,0	123,0	747,0	0,23	86,91	86,25	84,81	0,23	87,41	86,89	84,69	0,08	0,04	17,616089
149,0	432,0	0,7	0,0	4,3	0,0	293,0	85,8	104,3	439,8	425,2	537,5	593,4	122,8	748,1	0,23	86,96	86,28	84,80	0,23	87,46	86,94	84,70	0,08	0,04	16,948531
150,0	433,0	0,6	0,0	4,3	0,0	292,8	85,9	104,3	439,4	425,0	536,4	591,7	123,2	748,4	0,23	86,92	86,28	84,80	0,23	87,45	86,94	84,69	0,08	0,04	16,314949
151,0	434,0	0,6	0,0	4,3	0,0	292,9	85,9	103,9	439,2	424,5	535,2	589,8	123,4	752,0	0,23	86,95	86,31	84,79	0,23	87,46	86,97	84,70	0,08	0,04	15,611836
152,0	435,0	0,6	0,0	4,2	0,0	293,8	85,9	104,4	439,0	424,2	533,8	587,8	123,4	754,5	0,23	87,02	86,34	84,82	0,23	87,54	87,00	84,73	0,08	0,04	14,840669
153,0	436,0	0,6	0,0	4,2	0,0	293,2	85,6	104,0	439,0	423,8	532,6	586,1	123,8	753,7	0,23	87,07	86,36	84,81	0,23	87,57	87,03	84,71	0,08	0,04	14,23159
154,0	437,0	0,6	0,0	4,2	0,0	292,4	85,5	104,1	438,9	423,5	531,3	583,8	124,1	755,9	0,23	87,08	86,39	84,82	0,23	87,57	87,06	84,71	0,08	0,04	13,499292
155,0	438,0	0,6	0,0	4,2	0,0	292,2	85,6	104,3	438,9	422,9	530,1	582,0	124,1	755,4	0,23	87,05	86,41	84,80	0,23	87,57	87,08	84,70	0,08	0,04	12,780495
156,0	439,0	0,6	0,0	4,2	0,0	292,4	85,6	103,7	438,8	422,5	528,8	580,4	124,3	757,1	0,23	87,03	86,44	84,81	0,23	87,56	87,09	84,71	0,08	0,04	12,162532
157,0	440,0	0,5	0,0	4,2	0,0	293,0	85,8	104,4	438,7	421,8	527,6	578,5	124,4	757,2	0,23	87,07	86,47	84,83	0,23	87,57	87,11	84,72	0,08	0,04	11,371298
158,0	441,0	0,5	0,0	4,2	0,0	292,9	85,8	104,3	438,5	421,3	526,5	576,4	124,3	755,4	0,23	87,10	86,49	84,81	0,23	87,58	87,11	84,71	0,08	0,04	10,620108
159,0	442,0	0,5	0,0	4,2	0,0	292,9	85,9	104,9	438,6	420,9	525,4	574,5	124,7	753,7	0,23	87,11	86,51	84,83	0,23	87,62	87,16	84,72	0,08	0,04	10,012651
160,0	443,0	0,5	0,0	4,2	0,0	292,7	85,8	104,1	438,5	420,6	524,6	572,9	125,0	752,0	0,23	87,14	86,54	84,84	0,23	87,63	87,18	84,72	0,08	0,04	9,5300612
161,0	444,0	0,5	0,0	4,3	0,0	292,3	85,8	104,1	438,1	419,8	524,0	572,0	124,7	746,2	0,23	87,17	86,57	84,84	0,23	87,63	87,21	84,72	0,08	0,04	8,9077484
162,0	445,0	0,5	0,0	4,3	0,0	292,6	85,9	104,8	437,9	419,3	523,5	570,7	124,6	744,5	0,23	87,15	86,57	84,82	0,23	87,65	87,22	84,72	0,08	0,04	8,4093002
163,0	446,0	0,4	0,0	4,3	0,0	291,3	85,8	104,1	437,5	418,8	523,1	569,9	124,6	743,1	0,23	87,16	86,62	84,85	0,23	87,63	87,24	84,73	0,08	0,04	7,961789
164,0	447,0	0,4	0,0	4,3	0,0	291,5	86,0	104,8	437,0	418,0	522,7	568,8	125,0	742,2	0,23	87,17	86,64	84,87	0,23	87,66	87,27	84,74	0,08	0,04	7,485074
165,0	448,0	0,4	0,0	4,2	0,0	291,2	86,1	104,5	436,6	417,7	522,3	567,5	125,2	744,4	0,23	87,23	86,68	84,87	0,23	87,71	87,31	84,74	0,08	0,04	7,0539064
166,0	449,0	0,4	0,0	4,3	0,0	290,7	86,1	104,5	436,1	417,3	522,2	566,4	125,2	738,3	0,23	87,26	86,68	84,87	0,23	87,73	87,31	84,73	0,08	0,04	6,6464158
167,0	450,0	0,4	0,0	4,4	0,0	290,9	86,2	104,6	435,5	416,7	522,3	565,4	125,2	734,8	0,23	87,32	86,72	84,89	0,23	87,81	87,36	84,75	0,08	0,04	6,2252824
168,0	451,0	0,4	0,0	4,3	0,0	290,4	86,1	104,7	434,9	416,2	522,4	564,6	125,3	733,5	0,23	87,33	86,73	84,87	0,23	87,84	87,37	84,77	0,08	0,04	5,8779252
169,0	452,0	0,3	0,0	4,4	0,0	290,1	86,2	104,3	434,3	415,7	522,3	564,1	125,2	732,0	0,23	87,32	86,74	84,90	0,23	87,82	87,40	84,77	0,08	0,04	5,508243
170,0	453,0	0,3	0,0	4,3	0,0	290,2	86,1	104,6	433,6	414,9	522,3	563,4	125,2	732,3	0,23	87,32	86,77	84,92	0,23	87,85	87,43	84,77	0,08	0,04	5,0759522
171,0	454,0	0,3	0,0	4,3	0,0	288,9	86,1	104,6	433,0	414,5	522,2	562,5	125,7	733,7	0,23	87,40	86,81	84,91	0,23	87,92	87,45	84,78	0,08	0,04	4,7897184
172,0	455,0	0,3	0,0	4,3	0,0	288,6	85,9	104,4	432,5	413,6	522,1	561,4	125,9	734,7	0,23	87,44	86,83	84,92	0,23	87,96	87,50	84,84	0,08	0,04	4,2784852
173,0	456,0	0,3	0,0	4,2	0,0	289,0	86,2	104,7	432,1	413,1	521,8	560,3	125,7	736,3	0,23	87,46	86,86	84,92	0,23	88,00	87,49	84,82	0,08	0,04	3,796901
174,0	457,0	0,3	0,0	4,2	0,0	289,2	86,3	104,6	431,8	412,4	521,5	558,9	125,7	738,0	0,23	87,48	86,89	84,92	0,23	88,03	87,55	84,81	0,08	0,04	3,2592544
175,0	458,0	0,2	0,0	4,2	0,0	289,6	86,2	105,2	431,5	411,7	521,3	557,6	126,0	737,5	0,23	87,51	86,91	84,94	0,23	88,05	87,58	84,82	0,08	0,04	2,800258
176,0	459,0	0,2	0,0	4,2	0,0	289,7	86,1	104,7	431,1	410,8	520,5	554,0	125,8	732,8	0,23	87,56	86,94	84,96	0,23	88,08	87,59	84,85	0,08	0,04	1,6363556
177,0	460,0	0,2	0,0	3,9	0,0	288,9	86,3	105,3	430,4	408,9	519,4	547,2	126,1	725,3	0,23	87,61	86,97	84,96	0,23	88,12	87,64	84,84	0,08	0,04	-0,409254
178,0	461,0	0,2	0,0	3,8	0,0	288,8	86,1	104,0	429,7	407,2	517,8	539,4	126,5	720,2	0,23	87,65	86,99	84,96	0,23	88,17	87,64	84,85	0,08	0,04	-2,680496
179,0	462,0	0,2	0,0	3,8	0,0	287,7	85,8	104,8	428,7	405,3	516,4	532,2	126,0	716,1	0,23	87,63	87,03	84,98	0,23	88,15	87,67	84,83	0,08	0,04	-5,089209
180,0	463,0	0,2	0,0	3,8	0,0	286,2	86,3	104,9	427,9	403,6	515,1	525,9	126,2	714,8	0,23	87,67	87,05	84,96	0,23	88,18	87,69	84,84	0,08	0,04	-7,067244
181,0	464,0	0,2	0,0	3,7	0,0	286,4	86,2	105,0	426,9	401,9	514,1	520,1	126,3	714,6	0,23	87,68	87,07	84,97	0,23	88,20	87,72	84,85	0,08	0,04	-8,971048
182,0	465,0	0,1	0,0	3,8	0,0	286,6	86,2	104,7	425,9	400,4	512,9	514,9	126,1	713,5	0,23	87,69	87,10	84,99	0,23	88,20	87,75	84,87	0,08	0,04	-10,77691
183,0	466,0	0,1	0,0	3,8	0,0	286,7	86,3	104,1	425,0	398,7	511,7	510,4	126,4	713,3	0,23	87,74	87,11	85,01	0,23	88,23	87,77	84,85	0,08	0,04	-12,38239
184,0	467,0	0,1	0,0	3,7	0,0	285,6	86,4	104,5	424,0	397,4	510,7	506,4	126,5	712,6	0,23	87,75	87,14	85,01	0,23	88,24	87,80	84,89	0,08	0,04	-13,81347
185,0	468,0	0,1	0,0	3,6	0,0	284,8	85,9	104,8	422,9	395,9	509,4	502,6	126,2	711,1	0,23	87,72	87,17	85,01	0,23	88,26	87,80	84,89	0,08	0,04	-15,40212
186,0	469,0	0,1	0,0	3,5	0,0	284,6	86,3	104,0	421,9	394,3	507,7	498,9	126,2	705,3	0,23	87,74	87,19	85,01	0,23	88,24	87,83	84,87	0,08	0,04	-16,99684
187,0	470,0	0,1	0,0	3,4	0,0	284,0	86,1	104,2	420,8	392,6	505,3	495,2	126,3	701,6	0,23	87,76	87,22	85,04	0,23	88,30	87,85	84,90	0,08	0,04	-18,76359
188,0	471,0	0,1	0,0	3,3	0,0	283,9	86,4	104,6	419,7	390,9	502,8	491,2	126,6	700,2	0,23	87,76	87,22	85,03	0,23	88,29	87,88	84,87	0,08	0,04	-20,56598
189,0	472,0	0,0	0,0	3,3	0,0	283,3	86,4	104,6	418,7	389,4	499,9	487,6	126,4	700,2	0,23	87,74	87,23	85,04	0,23	88,28	87,89	84,86	0,08	0,04	-22,41486

Manufacturer: HEARTHSTONE
Model: SILA

Run: 5
Project #: PI 20202
Test Duration: 189 min

Note: In the "Input data", "Calc. % O_2", "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

	HHV	LHV
Eff	71,24%	77,00%
Comb Eff	99,50%	99,50%
HT Eff	71,60%	77,39%
Output	13 633	kJ/h
Burn Rate	0,97	kg/h
Grams CO	10	g
Input	19 136	kJ/h
MC wet	16,44	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,64
F_0
1,058

Overall Heating Efficiency: 71,24%
Combustion Efficiency: 99,50%
Heat Transfer Efficiency: 71,60%

Heat Output: 12 932 Btu/h
Heat Input: 18 153 Btu/h
Burn Duration: 3,15 h
Burn Rate: 2,13 lb/h
Stack Temp: 318,4 Deg. F

Averages	0,01	4,78	3,47	20,62	15,84	159,15	28,96	100,9%	71,2%	71,8%
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 (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,64	0,01	2,80	597,6%	20,75	17,95	169,4	27,8	101,5%	58,4%	59,2%
1,00	3,61	0,05	1,60	1093,0%	20,83	19,21	163,0	27,8	101,0%	38,8%	39,2%
2,00	3,59	0,01	2,42	708,4%	20,78	18,35	165,0	27,8	101,9%	54,8%	55,9%
3,00	3,57	0,01	2,55	667,1%	20,77	18,22	167,4	27,9	101,8%	56,0%	57,0%
4,00	3,57	0,01	2,96	561,5%	20,74	17,78	169,1	27,8	101,5%	60,0%	61,0%
5,00	3,54	0,01	3,60	444,2%	20,70	17,10	159,9	27,8	101,2%	66,7%	67,5%
6,00	3,52	0,01	2,25	769,7%	20,79	18,54	150,8	27,7	102,2%	56,3%	57,5%
7,00	3,50	0,01	1,88	942,8%	20,82	18,93	146,1	27,8	102,8%	51,5%	52,9%
8,00	3,50	0,01	1,89	935,3%	20,81	18,92	143,5	27,7	102,7%	52,6%	54,0%
9,00	3,48	0,01	2,09	837,0%	20,80	18,71	142,2	27,7	102,4%	56,3%	57,7%
10,00	3,45	0,01	2,32	743,3%	20,79	18,46	142,4	27,7	102,1%	59,5%	60,7%
11,00	3,45	0,01	2,49	687,3%	20,78	18,28	142,9	27,8	101,9%	61,3%	62,5%
12,00	3,43	0,01	2,59	655,6%	20,77	18,17	143,1	27,7	101,8%	62,3%	63,4%
13,00	3,41	0,01	2,93	568,4%	20,75	17,81	144,6	27,7	101,5%	65,0%	66,0%
14,00	3,36	0,01	3,99	390,8%	20,68	16,68	145,3	27,7	101,1%	71,2%	71,9%
15,00	3,34	0,01	4,59	327,1%	20,64	16,04	146,3	27,7	100,9%	73,3%	73,9%
16,00	3,30	0,01	3,35	485,5%	20,72	17,37	148,2	27,7	101,3%	67,3%	68,1%
17,00	3,27	0,01	5,35	266,4%	20,59	15,23	151,3	27,7	100,7%	74,9%	75,4%
18,00	3,23	0,01	6,01	226,4%	20,54	14,53	153,7	27,8	100,6%	76,1%	76,5%
19,00	3,18	0,01	5,71	243,4%	20,56	14,85	153,6	27,8	100,7%	75,5%	76,0%
20,00	3,16	0,01	3,35	484,9%	20,72	17,36	153,3	27,9	101,3%	66,3%	67,2%
21,00	3,14	0,01	2,82	595,3%	20,75	17,93	152,7	27,9	101,6%	62,3%	63,3%
22,00	3,11	0,01	3,08	536,9%	20,74	17,66	152,5	27,9	101,5%	64,5%	65,5%
23,00	3,09	0,01	3,37	481,8%	20,72	17,34	153,1	27,9	101,3%	66,5%	67,4%
24,00	3,05	0,01	4,41	343,9%	20,65	16,23	155,3	27,9	100,9%	71,4%	72,0%
25,00	3,00	0,01	5,45	259,9%	20,58	15,13	156,2	27,9	100,7%	74,5%	75,1%
26,00	2,98	0,01	5,38	264,3%	20,58	15,20	156,6	27,9	100,7%	74,3%	74,9%
27,00	2,93	0,01	4,50	335,4%	20,64	16,13	158,2	27,9	100,9%	71,3%	72,0%
28,00	2,89	0,01	5,68	245,2%	20,56	14,88	159,7	27,9	100,6%	74,7%	75,2%
29,00	2,84	0,01	4,89	300,6%	20,62	15,72	160,8	27,8	100,8%	72,3%	72,9%
30,00	2,80	0,01	5,37	265,3%	20,58	15,21	165,3	27,9	100,7%	73,2%	73,7%
31,00	2,75	0,01	6,52	200,8%	20,51	13,98	167,9	27,9	100,5%	75,6%	76,0%
32,00	2,70	0,17	9,26	108,4%	20,32	10,97	168,3	27,9	98,9%	79,3%	78,4%
33,00	2,66	0,01	6,85	186,2%	20,49	13,63	166,8	28,0	100,5%	76,4%	76,7%
34,00	2,64	0,01	4,29	356,9%	20,66	16,36	166,0	28,0	101,0%	69,3%	70,0%
35,00	2,61	0,01	3,19	513,6%	20,73	17,53	166,2	27,9	101,4%	62,7%	63,5%
36,00	2,59	0,01	3,21	510,5%	20,73	17,52	166,0	28,0	101,3%	62,9%	63,7%
37,00	2,57	0,01	3,46	466,5%	20,71	17,25	165,5	28,0	101,3%	64,8%	65,6%
38,00	2,52	0,01	5,19	277,9%	20,60	15,40	166,5	27,9	100,7%	72,5%	73,1%
39,00	2,48	0,01	6,03	225,6%	20,54	14,51	167,2	28,0	100,6%	74,7%	75,1%
40,00	2,43	0,01	6,67	194,4%	20,50	13,83	168,6	28,0	100,5%	75,9%	76,3%
41,00	2,39	0,01	7,11	175,9%	20,47	13,35	168,9	28,0	100,5%	76,6%	77,0%
42,00	2,34	0,00	6,88	185,3%	20,49	13,60	169,3	28,0	100,5%	76,2%	76,6%
43,00	2,30	0,00	6,55	199,6%	20,51	13,95	169,0	28,0	100,6%	75,6%	76,0%
44,00	2,27	0,00	6,70	193,0%	20,50	13,79	169,2	28,1	100,6%	75,9%	76,3%
45,00	2,23	0,00	5,86	234,9%	20,55	14,69	169,5	27,9	100,7%	74,0%	74,5%
46,00	2,18	0,00	6,45	204,3%	20,51	14,06	170,2	28,1	100,6%	75,3%	75,7%
47,00	2,14	0,00	5,65	247,6%	20,57	14,92	170,6	28,0	100,7%	73,3%	73,9%
48,00	2,11	0,00	6,22	215,5%	20,53	14,31	170,7	28,0	100,6%	74,7%	75,2%
49,00	2,07	0,00	5,89	233,2%	20,55	14,66	171,1	27,9	100,7%	73,9%	74,4%
50,00	2,05	0,00	5,53	254,9%	20,57	15,04	170,9	28,1	100,8%	73,0%	73,6%
51,00	2,00	0,00	5,99	227,6%	20,54	14,55	171,2	28,1	100,7%	74,2%	74,6%
52,00	1,96	0,00	5,93	231,2%	20,55	14,62	171,7	28,1	100,7%	73,9%	74,5%
53,00	1,93	0,00	6,01	226,6%	20,54	14,53	172,4	28,1	100,7%	74,1%	74,6%
54,00	1,89	0,00	5,79	238,8%	20,56	14,76	173,1	28,1	100,7%	73,5%	74,0%
55,00	1,84	0,00	5,83	236,8%	20,55	14,72	173,1	28,1	100,7%	73,5%	74,1%
56,00	1,82	0,00	5,93	231,2%	20,55	14,62	173,8	28,2	100,7%	73,7%	74,2%
57,00	1,77	0,00	6,11	221,4%	20,54	14,43	174,5	28,0	100,7%	74,1%	74,5%
58,00	1,75	0,00	6,67	194,4%	20,50	13,83	175,7	28,2	100,6%	75,2%	75,6%
59,00	1,71	0,00	7,31	168,5%	20,46	13,14	177,5	28,3	100,5%	76,2%	76,5%
60,00	1,66	0,00	7,94	147,4%	20,42	12,48	178,7	28,2	100,4%	77,0%	77,3%
61,00	1,59	0,01	8,23	138,4%	20,40	12,16	180,7	28,1	100,4%	77,2%	77,5%
62,00	1,55	0,03	9,06	116,1%	20,34	11,27	182,5	28,1	100,1%	78,1%	78,2%
63,00	1,50	0,11	9,18	111,3%	20,33	11,09	183,3	28,3	99,3%	78,2%	77,6%
64,00	1,46	0,24	9,39	104,1%	20,30	10,80	184,8	28,3	98,2%	78,2%	76,8%
65,00	1,41	0,14	9,08	113,2%	20,33	11,19	186,8	28,2	99,1%	77,7%	77,0%
66,00	1,37	0,04	8,35	134,4%	20,39	12,02	188,1	28,4	100,1%	76,8%	76,8%
67,00	1,32	0,02	7,69	154,9%	20,43	12,73	189,5	28,5	100,3%	75,7%	75,9%
68,00	1,27	0,01	7,80	151,3%	20,42	12,61	190,4	28,5	100,4%	75,8%	76,1%
69,00	1,25	0,01	7,23	171,5%	20,46	13,23	191,4	28,5	100,5%	74,7%	75,1%
70,00	1,21	0,00	6,81	188,1%	20,49	13,67	192,3	28,4	100,5%	73,8%	74,2%
71,00	1,18	0,00	6,45	204,2%	20,51	14,06	192,0	28,4	100,6%	73,0%	73,5%
72,00	1,14	0,00	6,27	213,0%	20,53	14,25	191,4	28,5	100,6%	72,7%	73,1%
73,00	1,12	0,00	5,91	232,1%	20,55	14,64	191,8	28,6	100,7%	71,7%	72,2%
74,00	1,09	0,00	5,68	245,5%	20,56	14,88	190,9	28,6	100,7%	71,1%	71,6%
75,00	1,07	0,00	5,32	268,8%	20,59	15,26	190,5	28,5	100,8%	70,0%	70,6%
76,00	1,05	0,00	5,52	255,6%	20,58	15,05	189,9	28,7	100,7%	70,7%	71,3%
77,00	1,03	0,00	6,06	224,0%	20,54	14,48	189,4	28,7	100,7%	72,3%	72,8%
78,00	0,98	0,00	6,06	224,0%	20,54	14,48	189,4	28,8	100,7%	72,4%	72,8%
79,00	0,96	0,00	5,76	240,6%	20,56	14,79	188,9	28,7	100,7%	71,6%	72,1%
80,00	0,93	0,00	5,49	257,7%	20,58	15,09	188,0	28,8	100,7%	70,9%	71,4%
81,00	0,93	0,01	5,11	284,0%	20,60	15,49	186,9	28,9	100,8%	69,8%	70,3%
82,00	0,91	0,01	4,78	310,3%	20,62	15,84	185,7	28,8	100,9%	68,6%	69,2%
83,00	0,89	0,01	4,74	313,8%	20,63	15,88	184,3	28,9	100,9%	68,7%	69,3%
84,00	0,87	0,01	4,78	310,3%	20,62	15,84	183,9	28,7	100,9%	68,9%	69,5%
85,00	0,87	0,01	4,56	330,2%	20,64	16,08	182,8	29,0	100,9%	68,1%	68,8%
86,00	0,84	0,01	4,86	303,9%	20,62	15,76	182,4	28,9	100,8%	69,4%	70,0%
87,00	0,82	0,01	5,14	281,6%	20,60	15,45	180,9	29,0	100,8%	70,7%	71,2%
88,00	0,82	0,01	5,14	281,5%	20,60	15,45	179,3	29,1	100,8%	70,9%	71,5%
89,00	0,80	0,00	5,08	286,5%	20,60	15,52	177,3	29,1	100,8%	70,9%	71,5%
90,00	0,78	0,00	4,88	302,0%	20,62	15,73	175,9	29,1	100,9%	70,4%	71,0%
91,00	0,78	0,00	4,72	315,9%	20,63	15,91	174,2	29,2	100,9%	70,0%	70,7%
92,00	0,75	0,00	4,72	315,7%	20,63	15,90	172,6	29,2	100,9%	70,3%	70,9%

93,00	0,75	0,00	4,70	317,2%	20,63	15,92	171,0	29,2	100,9%	70,4%	71,1%
94,00	0,73	0,00	4,66	321,6%	20,63	15,97	170,1	29,2	100,9%	70,4%	71,1%
95,00	0,73	0,00	4,62	324,6%	20,63	16,01	168,5	29,3	100,9%	70,5%	71,2%
96,00	0,73	0,00	4,64	323,2%	20,63	15,99	167,5	29,3	100,9%	70,7%	71,4%
97,00	0,71	0,00	4,62	324,6%	20,63	16,01	166,1	29,2	100,9%	70,8%	71,5%
98,00	0,71	0,00	4,60	326,2%	20,64	16,03	165,0	29,3	101,0%	70,9%	71,6%
99,00	0,69	0,00	4,57	329,2%	20,64	16,06	163,9	29,1	101,0%	70,9%	71,6%
100,00	0,69	0,00	4,55	330,9%	20,64	16,08	162,9	29,1	101,0%	71,0%	71,7%
101,00	0,66	0,00	4,55	330,9%	20,64	16,08	162,3	29,1	101,0%	71,1%	71,8%
102,00	0,66	0,01	4,52	334,3%	20,64	16,12	160,9	29,2	101,0%	71,2%	71,9%
103,00	0,66	0,01	4,50	335,9%	20,64	16,14	159,9	29,3	101,0%	71,2%	71,9%
104,00	0,64	0,01	4,49	337,2%	20,64	16,15	158,9	29,3	101,0%	71,4%	72,0%
105,00	0,64	0,01	4,49	336,9%	20,64	16,15	158,4	29,3	101,0%	71,4%	72,1%
106,00	0,64	0,01	4,45	340,3%	20,65	16,19	158,0	29,3	101,0%	71,4%	72,0%
107,00	0,62	0,01	4,44	341,8%	20,65	16,20	157,1	29,4	100,9%	71,4%	72,1%
108,00	0,62	0,01	4,44	341,6%	20,65	16,20	155,9	29,3	100,9%	71,6%	72,3%
109,00	0,59	0,01	4,42	343,2%	20,65	16,22	155,0	29,4	100,9%	71,7%	72,4%
110,00	0,59	0,01	4,44	341,5%	20,65	16,20	154,6	29,4	100,9%	71,8%	72,5%
111,00	0,59	0,01	4,42	343,2%	20,65	16,22	153,7	29,4	100,9%	71,9%	72,6%
112,00	0,57	0,01	4,43	342,4%	20,65	16,21	153,3	29,5	100,9%	72,0%	72,6%
113,00	0,57	0,01	4,43	342,7%	20,65	16,21	152,7	29,5	100,9%	72,1%	72,7%
114,00	0,57	0,01	4,41	344,0%	20,65	16,23	152,9	29,5	100,9%	72,0%	72,6%
115,00	0,55	0,01	4,42	343,7%	20,65	16,22	152,4	29,6	100,9%	72,1%	72,7%
116,00	0,55	0,01	4,44	341,1%	20,65	16,20	152,3	29,5	100,9%	72,2%	72,8%
117,00	0,55	0,01	4,47	338,7%	20,64	16,17	151,7	29,5	100,9%	72,4%	73,0%
118,00	0,53	0,01	4,42	343,6%	20,65	16,22	151,2	29,5	100,9%	72,3%	72,9%
119,00	0,53	0,01	4,44	341,3%	20,65	16,20	150,5	29,6	100,9%	72,5%	73,1%
120,00	0,53	0,01	4,43	342,6%	20,65	16,21	150,3	29,6	100,9%	72,4%	73,1%
121,00	0,50	0,01	4,40	345,3%	20,65	16,24	150,3	29,3	100,9%	72,3%	72,9%
122,00	0,50	0,01	4,42	343,7%	20,65	16,22	150,2	29,5	100,9%	72,4%	73,1%
123,00	0,50	0,01	4,44	341,3%	20,65	16,20	149,7	29,5	100,9%	72,6%	73,2%
124,00	0,48	0,01	4,39	346,2%	20,65	16,25	149,6	29,6	100,9%	72,4%	73,0%
125,00	0,48	0,01	4,39	346,5%	20,65	16,26	148,9	29,5	100,9%	72,5%	73,1%
126,00	0,48	0,01	4,43	342,6%	20,65	16,21	148,7	29,6	100,9%	72,7%	73,3%
127,00	0,46	0,01	4,43	342,2%	20,65	16,21	148,4	29,6	100,9%	72,7%	73,4%
128,00	0,46	0,01	4,40	345,5%	20,65	16,25	147,8	29,7	100,9%	72,7%	73,3%
129,00	0,46	0,01	4,43	342,8%	20,65	16,22	147,6	29,6	100,9%	72,8%	73,4%
130,00	0,44	0,01	4,40	345,2%	20,65	16,24	147,1	29,7	100,9%	72,8%	73,5%
131,00	0,44	0,01	4,41	344,1%	20,65	16,23	147,2	29,7	100,9%	72,8%	73,5%
132,00	0,41	0,01	4,42	342,9%	20,65	16,22	146,7	29,7	100,9%	72,9%	73,6%
133,00	0,41	0,01	4,38	347,8%	20,65	16,27	146,8	29,5	100,9%	72,7%	73,4%
134,00	0,41	0,01	4,39	346,1%	20,65	16,25	146,0	29,4	100,9%	72,9%	73,5%
135,00	0,39	0,01	4,41	344,4%	20,65	16,23	146,3	29,6	100,9%	72,9%	73,6%
136,00	0,39	0,01	4,40	345,4%	20,65	16,24	146,1	29,7	100,9%	72,9%	73,6%
137,00	0,39	0,01	4,39	346,1%	20,65	16,25	145,8	29,7	100,9%	73,0%	73,6%
138,00	0,39	0,01	4,41	343,7%	20,65	16,23	145,4	29,7	100,9%	73,1%	73,7%
139,00	0,37	0,01	4,40	344,7%	20,65	16,24	145,7	29,7	100,9%	73,0%	73,7%
140,00	0,37	0,01	4,38	347,3%	20,65	16,27	145,4	29,8	100,8%	73,0%	73,6%
141,00	0,34	0,01	4,37	348,0%	20,65	16,27	145,5	29,8	100,8%	73,0%	73,6%
142,00	0,34	0,01	4,35	350,4%	20,65	16,30	145,5	29,8	100,9%	72,9%	73,5%
143,00	0,34	0,01	4,36	349,3%	20,65	16,29	145,2	29,8	100,9%	73,0%	73,6%
144,00	0,34	0,01	4,36	349,7%	20,65	16,29	145,2	29,7	100,9%	72,9%	73,6%
145,00	0,32	0,01	4,34	351,5%	20,65	16,31	145,0	29,8	100,9%	72,9%	73,5%
146,00	0,32	0,01	4,35	350,0%	20,65	16,29	144,7	29,8	100,9%	73,0%	73,6%
147,00	0,30	0,01	4,29	356,2%	20,66	16,36	145,0	29,9	100,9%	72,8%	73,4%
148,00	0,30	0,01	4,30	355,5%	20,66	16,35	144,9	29,8	100,9%	72,8%	73,4%
149,00	0,30	0,01	4,29	356,3%	20,66	16,36	145,0	29,9	100,9%	72,8%	73,4%
150,00	0,28	0,01	4,31	354,1%	20,65	16,34	144,9	29,9	100,9%	72,9%	73,5%
151,00	0,28	0,01	4,30	355,1%	20,66	16,35	144,9	29,9	100,9%	72,8%	73,4%
152,00	0,28	0,01	4,23	363,2%	20,66	16,43	145,5	29,9	100,9%	72,4%	73,1%
153,00	0,28	0,01	4,22	363,6%	20,66	16,43	145,1	29,8	100,9%	72,5%	73,1%
154,00	0,25	0,01	4,25	361,1%	20,66	16,41	144,7	29,7	100,9%	72,6%	73,2%
155,00	0,25	0,01	4,24	361,8%	20,66	16,41	144,5	29,8	100,9%	72,6%	73,3%
156,00	0,25	0,01	4,25	360,8%	20,66	16,40	144,7	29,8	100,9%	72,6%	73,3%
157,00	0,23	0,01	4,21	365,4%	20,66	16,45	145,0	29,9	100,9%	72,4%	73,1%
158,00	0,23	0,01	4,23	363,3%	20,66	16,43	144,9	29,9	100,9%	72,5%	73,2%
159,00	0,23	0,01	4,21	364,8%	20,66	16,44	144,9	29,9	100,9%	72,5%	73,1%
160,00	0,21	0,01	4,18	368,1%	20,66	16,47	144,8	29,9	100,9%	72,4%	73,0%
161,00	0,21	0,01	4,32	353,5%	20,65	16,33	144,6	29,9	100,9%	72,9%	73,6%
162,00	0,21	0,01	4,30	355,3%	20,66	16,35	144,8	29,9	100,9%	72,8%	73,5%
163,00	0,19	0,01	4,26	359,6%	20,66	16,39	144,1	29,9	100,9%	72,8%	73,5%
164,00	0,19	0,01	4,27	358,9%	20,66	16,38	144,2	30,0	100,9%	72,8%	73,5%
165,00	0,19	0,01	4,24	361,7%	20,66	16,41	144,0	30,0	100,9%	72,8%	73,4%
166,00	0,16	0,01	4,28	357,7%	20,66	16,37	143,7	30,1	100,9%	72,9%	73,6%
167,00	0,16	0,01	4,38	347,6%	20,65	16,27	143,9	30,1	100,9%	73,3%	73,9%
168,00	0,16	0,01	4,35	350,5%	20,65	16,30	143,6	30,1	100,9%	73,2%	73,9%
169,00	0,14	0,01	4,35	350,3%	20,65	16,29	143,4	30,1	100,9%	73,2%	73,9%
170,00	0,14	0,01	4,28	358,3%	20,66	16,38	143,4	30,1	100,9%	73,0%	73,6%
171,00	0,14	0,01	4,28	357,9%	20,66	16,37	142,7	30,1	100,9%	73,1%	73,7%
172,00	0,12	0,01	4,26	360,3%	20,66	16,40	142,6	30,0	100,9%	73,0%	73,7%
173,00	0,12	0,01	4,23	363,5%	20,66	16,43	142,8	30,1	100,9%	72,9%	73,6%
174,00	0,12	0,01	4,22	364,6%	20,66	16,44	142,9	30,2	100,9%	72,8%	73,5%
175,00	0,11	0,01	4,22	364,2%	20,66	16,43	143,1	30,1	100,9%	72,8%	73,5%
176,00	0,09	0,01	4,21	365,6%	20,66	16,45	143,2	30,0	100,9%	72,7%	73,4%
177,00	0,09	0,01	3,94	397,6%	20,68	16,74	142,7	30,1	101,0%	71,7%	72,5%
178,00	0,07	0,01	3,82	413,2%	20,69	16,87	142,7	30,1	101,1%	71,2%	72,0%
179,00	0,07	0,01	3,79	416,7%	20,69	16,89	142,1	29,9	101,1%	71,2%	71,9%
180,00	0,07	0,01	3,76	420,2%	20,69	16,92	141,2	30,2	101,1%	71,2%	72,0%
181,00	0,07	0,01	3,75	422,5%	20,69	16,94	141,3	30,1	101,1%	71,1%	71,9%
182,00	0,05	0,01	3,78	418,7%	20,69	16,91	141,4	30,1	101,1%	71,2%	72,0%
183,00	0,05	0,01	3,76	421,1%	20,69	16,93	141,5	30,2	101,1%	71,1%	71,9%
184,00	0,05	0,01	3,65	436,1%	20,70	17,04	140,9	30,2	101,1%	70,8%	71,5%
185,00	0,05	0,01	3,62	440,4%	20,70	17,07	140,4	29,9	101,1%	70,6%	71,4%
186,00	0,03	0,01	3,50	459,1%	20,71	17,20	140,3	30,2	101,2%	70,1%	70,9%
187,00	0,03	0,01	3,35	483,8%	20,72	17,36	140,0	30,1	101,2%	69,3%	70,2%
188,00	0,03	0,01	3,33	488,1%	20,72	17,39	139,9	30,2	101,2%	69,2%	70,1%
189,00	0,00	0,01	3,31	490,8%	20,72	17,40	139,6	30,2	101,2%	69,2%	70,0%

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2019-07-29 Manufacturer: Hearthstone Model: Sila

Project #: PI 20202 Run: 5 Tech: MM Reviewer: [illegible]

- 25 LBS kindling start fire (New catalyst)
- At 24 LBS close Door
- bypass open
- At 100 LBS insert warm-up
- close ~~dor~~ Door immediatly
- At 100 LBS insert preload
- ~~At~~ close Door immediatly
- At 30 LBS close air inlet (1.6 inch)
- At 16 LBS insert second preload
- open air inlet
- At 33 LBS close air inlet
- At 20 LBS (60 minutes) insert load
open bypass
open Door
crush coal bed
close Door
TEST LOAD CONFIGURATION
close bypass
After 2 min
- open Door
- open bypass
- open air inlet
- insert load
- close Door
- close bypass

- After 5 min
- close air inlet (1.6 inch)

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2019-07-29 Manufacturer: Hearthstone Model: Sila

Project #: pI 20 202 Run: 5 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:	Equipment #	Time	12%	22%
	EM-191	7:00	ok	ok

	Pre-Test	Post-Test
Facility Conditions:		
Air Velocity from less than 2 feet	0 (max50 Fpm)	0 (max50 Fpm)
Smoke Capture Check (tunnel velocity)	ok	NA
Picture (4 sides)	ok	ok
Wood Heater Conditions:		
Date Wood Heater Stack Cleaned	2019-07-22	
Date Dilution Tunnel Cleaned	2019-07-22	
Induced Draft Check (max 0.005 H2O)	ok	
Traverse before ignition	ok	
Flow Rate 140 cfm ±10%		ok
Temperature System:		
Ambient (65°-90°F)		0 ok °F
Wood Heater Surface (±125°F)		ok °F
Proportional Checks:		
Thermocouple check	ok	
Pitot Clean	ok	
Pitot verification	ok	

Sampling Train ID Numbers:	Train 1st hour	Train 1	Train 2
Probe	01	21	50
Filter Front	826	828	830
Filter Back	827	829	831
Filter Thermocouple	11	11	12
Filter (<90°F)	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2019.07.29 Manufacturer: Hearthstone Model: S/a

Project #: PT 20202 Run: 5 Tech: M M Reviewer: [illegible]

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 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)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	980528.15	~~98156~~ 981856.37	980528.49	981856.45	925902.06	927204.50
Initial 1minute DGM (Liter)	980528.05	981856.36	980528.45	981856.39	925901.86	927204.30
Change © (Liter)	0.10	0.01	0.04	0.06	0.20	0.20
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	ok	ok	ok	ok	ok

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.4	3	.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

 M_TP-EPA – V11 – June 2017

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2019-07-29 Manufacturer: Hearthstone Model: Sila

Project #: pI 2.202 Run: 5 Tech: MM Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	Em 090	44 lbs, Class F	44 lbs
Wood	Em 090	44 lbs, Class F	44 lbs
Analytical	Em 128	100 mg, Class S	100 mg
Analytical	Em 129	2.0 g, Class S	2.0 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: 2019-07-29 Manufacturer: Hearthstone Model: 5161a

Project #: pI 20202 Run: 5 Tech: M M Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 100.9 (KPa.) Static pressure (P_q) 034 (inches w.c.)
Inside diameter: Port A _____ Port B _____.
Tunnel cross sectional area: .1963Ft^2
Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0075	7866
B - Centroid	3.00	3.50	4	0074	7882
A-1	0.40	0.50	0.50	0062	7869
A-2	1.50	1.75	2	0064	7864
A-3	4.50	5.25	6	0063	7865
A-4	5.60	6.5	7.5	0062	7862
B-1	0.40	0.50	0.50	0062	7882
B-2	1.50	1.75	2	0063	7878
B-3	4.50	5.25	6	0066	7866
B-4	5.60	6.5	7.5	0061	7870
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,
C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.
Δ_p = manometer reading (inches H_2O)
T_s = average absolute dilution tunnel temperature (°F + 460)
P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$
P_q = static pressure $\frac{\text{in. } H_2O}{\{\ 13.6\ \}}$
M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)
K_p = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_p$avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019-07-29 Manufacturer: Hearthstone Model: Sila

Project #: pI 20202 Run: 5 Tech: M M Reviewer: RP

Pre-Test (Adjust and Record)

	ZERO		SPAN		1,04 CAL. (Record Only)	
CO	0	0	2969	3000	1,96 ppm	1,000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO_2	0	0	17 90	18,00	17,972	10,00
Tolerance CO2		+/- 0.02		+/- 0.5		+/- 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	2,979	1,000	0	0.02	0,010	0.15	0,004	0.05	✓	
CO_2	0	17,96	9,75	0	0.02	0,06	0.5	0,03	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2019.07.29 Manufacturer: Hearthstone Model: Sila

Project #: pT 20202 Run: 5 Tech: MM Reviewer: [illegible]

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	981855,23	927202,32	585,88
Initial (Liter)	980529,56	925904,65	548,58

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100,9	100,5
Dry Bulb (F):	79,1	86,5
Humidity (%):	65,1	43,6

Flow Meter

	Start	End
Flow meter reading	NA	NA

Flow Meter Verification

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight (Kg)	N.A	NA

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-29 Manufacturer: Hearthstone Model: Sila

Project #: pT 20202 Run: 5 Tech: MM Reviewer: DB

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight		Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 8 in.	0.846	lbs.	22.1	22.3	21.4	21.6	22.0
1 1/2 x 3 1/2 x 8 in.	0.822	lbs.	21.8	21.3	21.4	20.8	20.9
1 1/2 x 3 1/2 x 8 in.	0.850	lbs.	20.9	21.4	21.0	21.0	21.0
1 1/2 x 3 1/2 x 8 in.	0.780	lbs.	22.0	22.1	21.6	21.4	20.9
1 1/2 x 3 1/2 x 8 in.	0.820	lbs.	20.6	20.8	20.3	20.3	20.8
1 1/2 x 3 1/2 x 8 in.	0.806	lbs.	21.9	21.4	21.8	21.8	20.8
1 1/2 x 3 1/2 x 8 in.	0.834	lbs.	20.8	20.6	20.7	20.7	20.9
1 1/2 x 3 1/2 x 8 in.	0.788	lbs.	21.1	21.6	21.8	21.8	21.9
x x in.		lbs.					
1 1/2 x 3 1/2 x 8 in.	0.880	lbs.	20.4	20.9	21.3	21.3	21.3
1 1/2 x 3 1/2 x 8 in.	0.812	lbs.	21.4	21.6	21.8	21.7	21.7
1 1/2 x 3 1/2 x 8 in.	0.832	lbs.	21.8	22.0	21.9	21.9	21.3
1 1/2 x 3 1/2 x 8 in.	0.864	lbs.	22.0	21.9	21.4	21.3	21.8
1 1/2 x 3 1/2 x 8 in.	0.914	lbs.	20.9	20.8	20.8	20.6	20.8
1 1/2 x 3 1/2 x 8 in.	0.838	lbs.	20.7	20.9	20.9	20.8	20.3
1 1/2 x 3 1/2 x 8 in.	0.860	lbs.	20.4	20.9	20.6	20.9	20.7
1 1/2 x 3 1/2 x 8 in.	0.870	lbs.	20.3	20.4	20.6	20.6	20.9
1 1/2 x 3 1/2 x 8 in.	0.814	lbs.	20.6	20.9	20.4	20.8	20.7
1 1/2 x 3 1/2 x 8 in.	0.810	lbs.	20.8	19.9	19.6	19.6	19.8
1 1/2 x 3 1/2 x 8 in.	0.810	lbs.	19.0	19.1	19.0	19.1	19.2
1 1/2 x 3 1/2 x 8 in.	0.814	lbs.	19.4	19.3	19.4	19.3	19.8
1 1/2 x 3 1/2 x 8 in.	0.818	lbs.	19.3	19.6	19.4	19.6	19.3
1 1/2 x 3 1/2 x 8 in.	0.810	lbs.	19.1	19.3	19.2	19.3	19.8
1 1/2 x 3 1/2 x 8 in.	0.830		19.0	19.2	19.2	19.2	19.2
1 1/2 x 3 1/2 x 8 in.	0.828		19.1	19.3	19.8	19.9	19.8

TEST LOAD WEIGHT: ~~13.40~~ mm lbs

19.95

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-29 Manufacturer: Hearthstone Model: Sila

Project #: pT 6202 Run: 5 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight		Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 9 in.	0 992	lbs.	196	193	198	198	197
1 1/2 x 3 1/2 x 9 in.	0 946	lbs.	193	198	197	197	197
1 1/2 x 3 1/2 x 9 in.	0 924	lbs.	198	197	199	193	194
1 1/2 x 3 1/2 x 9 in.	0 870	lbs.	199	199	196	196	195
1 1/2 x 3 1/2 x 9 in.	1 018	lbs.	191	192	193	192	196
1 1/2 x 3 1/2 x 9 in.	1 042	lbs.	200	210	204	200	206
1 1/2 x 3/4 x 5 in.	0 096	lbs.			191		
1 1/2 x 3/4 x 5 in.	0 120	lbs.			192		
1 1/2 x 3/4 x 5 in.	0 104	lbs.			194		
1 1/2 x 3/4 x 5 in.	0 110	lbs.			198		
1 1/2 x 3/4 x 5 in.	0 118	lbs.			200		
1 1/2 x 3/4 x 5 in.	0 106	lbs.			191		
1 1/2 x 3/4 x 5 in.	0 102	lbs.			191		
1 1/2 x 3/4 x 5 in.	0 114	lbs.			192		
1 1/2 x 3/4 x 5 in.	0 106	lbs.			194		
1 1/2 x 3/4 x 5 in.	0 106	lbs.			198		
1 1/2 x 3/4 x 5 in.	0 128	lbs.			199		
1 1/2 x 3/4 x 5 in.	0 110	lbs.			200		
1 1/2 x 3/4 x 5 in.	0 114	lbs.			206		
1 1/2 x 3/4 x 5 in.	0 136	lbs.			200		
1 1/2 x 3/4 x 5 in.	0 110	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 112	lbs.			194		
1 1/2 x 3/4 x 5 in.	0 100	lbs.			198		
1 1/2 x 3/4 x 5 in.	0 116	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 110	lbs.			193		
1 1/2 x 3/4 x 5 in.	0 116	lbs.			194		
x x in.		lbs.					

TEST LOAD WEIGHT: 8 03 lbs Min 20%: 1 606 Max 25%: 2 00

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019.07.25 Manufacturer: Hearthstone Model: Sik

Project #: PI 20 202 Run: 5 Tech: M M Reviewer: JP

		SYSTEM 1 – 1st hour				SYSTEM 1				
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	001	826	827	5	2	828	829	10	832
2019.07.25	17:00	61,0670	0,1280	~~0,1235~~ 0,1373	34,6536	108,7392	0,1247	0,1287	34,4589	0,1243
2019.07.29	16:00	61,0669	0,1279	0,1234	34,6537	108,7393	0,1247	0,1287	34,4588	0,1242

		SYSTEM 1 – 1st hour				SYSTEM 1				
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	001	826	827	5	2	828	829	10	832
2019.07.29	16:00	61,0675	0,1280	0,1230	34,6538	108,7400	0,1247	0,1279	34,4631	0,1244
2019.07.31	8:00	61,0670	0,1280	0,1230	34,6554	108,7394	0,1246	0,1278	34,4608	0,1243
2019.08.01	8:00	61,0670	0,1280	0,1231	34,6554	108,7394	0,1246	0,1278	34,4608	0,1243

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-25 Manufacturer: Hearthstone Model: Sila

Project #: pI 20202 Run: 5 Tech: MM Reviewer: DP

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	50	830	831	16
2019.07.25	17:30	107,6471	0,1285	0,1280	35,6871
2019.07.29	10:30	107,6472	0,1285	0,1281	35,6872

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	50	830	831	16
2019.07.29	16:00	107,6479	0,1296	0,1276	35,6905
2019.07.31	8:00	107,6472	0,1296	0,1277	35,6894
2019.08.01	8:00	107,6472	0,1296	0,1277	35,6893

Paramètres

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

Code verrouillage:	HEA

Description du test

Test standard	EPA	
Run #	6	
Date	30-07-2019	
Technicien	M.M	
Project #	PI 20202	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	SILA	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1,25	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,999	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,990	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,997	
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	in.
Molecular weight	29	
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20202
Date	30-07-2019
Technicien	M.M

Fuel data

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

Default Fuel Values

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

	Start	End
Barometer (kPa):	100,8	100,8
Barometer (in.Hg):	29,766229	29,7662288
Dry Bulb (F):	82,2	85,8
Humidity (%):	50,8	46,6
Air velocity (ft/min)	0	0

DGM #1	Final:	34698,005	cuft	Final:	982538,050	Liter
	Initial:	34674,030	cuft	Initial:	981859,180	Liter
DGM #2	Final:	32767,784	cuft	Final:	927880,280	Liter
	Initial:	32744,049	cuft	Initial:	927208,200	Liter
DGM room				Final:	604,920	cuft
				Initial:	585,880	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 190

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

Project nu.	PI 20202
Date	30-07-2019
Technicien	M.M

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
7,88	8,75	9,63

Load Volume: 0,3889 cu. ft

Loading Density: 10,882 lbs./ft3

Number of Spaces:

Load Density (wet): 34,977 lbs./ft3

Spacer weight (lbs):

Dry Wood Density: 29,154923

Piece Size (in): Thick	Wide	x Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches
1,5	3,5	8	0,878	20,3	20,6	20,4	20,3	20,8	17,98144	42,00
1,5	3,5	8	0,84	19,9	19,3	19,8	19,3	19,9	16,4976	42,00
1,5	3,5	8	0,89	20	20,3	20,2	20,3	20,4	18,0136	42,00
1,5	3,5	8	0,82	19,9	19,3	19,2	19,2	19,3	15,8916	42,00
1,5	3,5	8	0,83	20,1	20	20	19,8	19,9	16,5668	42,00
1,5	3,5	8	0,806	19,6	19,3	19,4	19,8	19,7	15,76536	42,00
1,5	3,5	8	0,892	20	20,4	20,4	20,2	20,4	18,08976	42,00
1,5	3,5	8	0,83	21	21,1	21,3	21,6	21,8	17,7288	42,00
										0,00
1,5	3,5	8	0,864	19,8	19,3	19,3	19,6	19,7	16,88256	42,00
1,5	3,5	8	0,816	20	20,3	20,6	20,5	20,4	16,61376	42,00
1,5	3,5	8	0,844	19,9	19,3	19,4	19,3	19,8	16,49176	42,00
1,5	3,5	8	0,836	20	20,1	20,6	20,4	20,8	17,03768	42,00
1,5	3,5	8	0,888	19,1	19,6	19,8	19,8	19,6	17,38704	42,00
1,5	3,5	8	0,872	20	20,1	20,3	20,8	20,7	17,77136	42,00
1,5	3,5	8	0,85	19,1	19,6	19,3	19,4	19,4	16,456	42,00
1,5	3,5	8	0,846	19,5	19,3	19,6	19,3	19,4	16,42932	42,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
								SUM MC:	271,60444	

PreTest Load Weight: 13,60 lbs.

Dry Weight: 5,14 kg.

Average Moisture Content: %

Dry: 19,97

19,97
Must be 18-28

Wet: 16,64
must be 15,2-22

Project nu.	PI 20202
Date	30-07-2019
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
7,9	8,8	9,6

* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume: 0,28 cu. ft

Loading Density: 6,4 lbs./ft3

Number of Spaces: 20

Spacer weight: lbs

Load Density (wet): 28,2 lbs./ft3

Dry Wood Density: 23,6 lbs./ft3

Piece Size (in): Thick	Wide	Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
1,5	3,5	9	1,02	19,90	20,10	20,20	20,40	20,00	20,60288	47,25	20,1
1,5	3,5	9	0,89	20,00	19,30	19,40	19,90	20,60	17,57824	47,25	19,8
1,5	3,5	9	1,03	19,10	19,20	19,20	19,30	19,30	19,83504	47,25	19,2
1,5	3,5	9	0,97	19,20	19,60	19,30	19,30	19,60	18,7404	47,25	19,4
1,5	3,5	9	0,92	19,80	19,70	19,80	19,40	19,90	18,06352	47,25	19,7
1,5	3,5	9	0,98	20,40	20,30	19,90	20,80	20,80	19,99032	47,25	20,4
1,5	0,75	5	0,12			19,60			2,352	5,63	19,6
1,5	0,75	5	0,10			19,80			2,0592	5,63	19,8
1,5	0,75	5	0,12			19,70			2,364	5,63	19,7
1,5	0,75	5	0,10			19,60			1,96	5,63	19,6
1,5	0,75	5	0,10			19,80			2,0592	5,63	19,8
1,5	0,75	5	0,10			20,10			2,0502	5,63	20,1
1,5	0,75	5	0,11			20,20			2,1412	5,63	20,2
1,5	0,75	5	0,10			20,20			2,0604	5,63	20,2
1,5	0,75	5	0,10			19,90			1,99	5,63	19,9
1,5	0,75	5	0,10			19,30			2,0072	5,63	19,3
1,5	0,75	5	0,11			19,50			2,106	5,63	19,5
1,5	0,75	5	0,12			19,60			2,352	5,63	19,6
1,5	0,75	5	0,12			19,70			2,364	5,63	19,7
1,5	0,75	5	0,128			19,30			2,4704	5,63	19,3
1,5	0,75	5	0,12			19,30			2,316	5,63	19,3
1,5	0,75	5	0,12			19,80			2,376	5,63	19,8
1,5	0,75	5	0,128			19,7			2,5216	5,63	19,7
1,5	0,75	5	0,108			19,8			2,1384	5,63	19,8
1,5	0,75	5	0,108			19,5			2,106	5,63	19,5
1,5	0,75	5	0,104			19,3			2,0072	5,63	19,3
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	158,6114		19,7 %

Test Load Weight: 8,03 lbs.

Dry Weight: 3,04 kg.

Average Moisture Content: %

Dry: 19,76 Dry(EPA) 19,76 Dry(B415 19,76

19,76 Must be 19-25

Wet: 16,50 must be 15,2-22

Coal Bed Range: 1,6 lbs. to 2,0 lbs.

TEST CHARGE:

Coal bed weight: 2 lbs.

Project nu.	PI 20202
Date	30-07-2019
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,35 in. H20
Barometer: 29,900 in. Hg

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

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

PITOT CONSTANT=
0,936

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,075	81,04	0,2739
B center	0,074	79,98	0,2720
A1	0,062	80	0,2490
A2	0,062	79,59	0,2490
A3	0,064	79,39	0,2530
A4	0,063	79,53	0,2510
B1	0,062	79,420	0,2490
B2	0,063	79,420	0,2510
B3	0,067	79,980	0,2588
B4	0,062	79,880	0,2490
AVERAGE	0,0654	79,8230	0,2556

Project nu.	PI 20202
Date	30-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	37	102	103	9	38	104	105	30	42	106	107	42	108		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	107,9741	0,1240	0,1259	34,9370	110,4348	0,1268	0,1236	34,7359	110,3120	0,1245	0,1232	33,7433	0,1220	2019-07-29	17:00
Before (6)	107,9742	0,1239	0,1258	34,9371	110,4348	0,1268	0,1237	34,7358	110,3121	0,1246	0,1233	33,7432	0,1219	2019-07-30	09:00
After (1)	107,9745	0,1259	0,1249	34,9415	110,4352	0,1260	0,1232	34,7381	110,3124	0,1266	0,1225	33,7484	0,1222	2019-07-30	14:00
After (2)	107,9744	0,1259	0,1249	34,9394	110,4351	0,1260	0,1232	34,7369	110,3122	0,1265	0,1225	33,7455	0,1221	2019-07-31	08:00
After (3)	107,9744	0,1259	0,1249	34,9394	110,4351	0,1260	0,1232	34,7369	110,3122	0,1265	0,1225	33,7455	0,1221	2019-08-01	08:00
After (4)															
After (5)															
After (6)	107,9744	0,1259	0,1249	34,9394	110,4351	0,1260	0,1232	34,7369	110,3122	0,1265	0,1225	33,7455	0,1221	2019-08-01	08:00
Difference	0,0002	0,0020	-0,0009	0,0023	0,0003	-0,0008	-0,0005	0,0011	0,0001	0,0019	-0,0008	0,0023	0,0002		
Total (mg)		3,6				3,7				3,5			0,2		
Total ajusté (mg)		**3,40**				**3,50**				**3,30**					

Project nu.	PI 20202
Date	30-07-2019
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	37	102	103	9	38	104	105	30	42	106	107	42	108		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	107,9741	0,1240	0,1259	34,9370	110,4348	0,1268	0,1236	34,7359	110,3120	0,1245	0,1232	33,7433	0,1220	2019-07-29	17:00
Before (6)	107,9742	0,1239	0,1258	34,9371	110,4348	0,1268	0,1237	34,7358	110,3121	0,1246	0,1233	33,7432	0,1219	2019-07-30	09:00
After (1)	107,9745	0,1259	0,1249	34,9415	110,4352	0,1260	0,1232	34,7381	110,3124	0,1266	0,1225	33,7484	0,1222	2019-07-30	14:00
After (2)	107,9744	0,1259	0,1249	34,9394	110,4351	0,1260	0,1232	34,7369	110,3122	0,1265	0,1225	33,7455	0,1221	2019-07-31	08:00
After (3)	107,9744	0,1259	0,1249	34,9394	110,4351	0,1260	0,1232	34,7369	110,3122	0,1265	0,1225	33,7455	0,1221	2019-08-01	08:00
After (4)															
After (5)															
After (6)	107,9744	0,1259	0,1258	34,9394	110,4351	0,1268	0,1237	34,7369	110,3122	0,1265	0,1233	33,7455	0,1221	2019-08-01	08:00
Difference	0,0002	0,0020	0,0000	0,0023	0,0003	0,0000	0,0000	0,0011	0,0001	0,0019	0,0000	0,0023	0,0002		
Total (mg)		4,5				5,9				4,3			0,2		
Total ajusté (mg)		**4,30**				**5,70**				**4,10**					

Project nu.	PI 20202
Date	30-07-2019
Technicien	M.M

negative filter weight rounded to zero emission rate 2,4gr/hr, demonstration purpose only not a compliance number.

SFBA EPA EMISSION RESULTS

Test Duration: **97** min

PRESSURE FACTOR:	DGM 1	0,95800	
	DGM 2	0,95369	
	DGM 3	0,99486	
TEMPERATURE FACTORS	DGM 1	0,96574	
	DGM 2	0,96457	
	DGM 3	0,96935	
VOLUMES SAMPLED	DGM 1	22,165	SCft
	DGM 2	21,618	Scft
	DGM 3	18,310	SCft

TOTAL TUNNEL VOLUME : 17446

SAMPLE RATIOS

Sample Train 1:	787,080
Sample Train 2:	807,008

Paticulate concentration

Sample Train 1	**0,000167**	g/dscf
Sample Train 2	**0,000162**	g/dscf
Room	**0,000011**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,72**	g
Sample Train 2	**2,63**	g

EMISSION RATES

Sample Train 1	**1,68**	g/hr
Sample Train 2	**1,63**	g/hr

1st hour emission rate **2,83** g/hr

	Train 1	Train 2
Cs	0,0001669	0,0001619

RESULTS

Average emission rate: 1,7 g/hr

Burn Rate : 1,881 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,766229	in Hg
Start:	29,766229	in Hg
End:	29,766229	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	34698,005	Cuft
	Initial:	34674,030	Cuft
DGM 2	Final:	32767,784	Cuft
	Initial:	32744,049	Cuft
DGM #3	Final:	604,920	Cuft
	Initial:	585,880	Cuft

TEMPERATURES

DGM 1	546,733	°R
DGM 2	547,393	°R

CALIBRATION FACTORS

DGM 1	0,9993
DGM 2	0,9901
DGM #3	0,9972

TUNNEL FLOW RATE: 179,856 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	3,70	mg
Total Sample Train 2:	3,50	mg
Total Sample Train 1 1st hour:	3,60	mg

DEVIATION: 1,64%

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft	Change in
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Surface
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	up									in wc	in wc	Temp.
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	°F
0,00	190,00	8,0	0,0	4,2	0,0	488,4	84,6	134,2	693,7	586,4	723,2	702,8	139,5	881,1	0,23	84,93	84,83	85,79	0,23	86,17	85,67	85,36	0,07	0,06	0
1,0	191,0	7,9	0,1	2,6	0,0	487,7	83,8	146,2	677,4	579,1	708,7	686,2	140,5	781,4	0,23	85,79	84,68	86,04	0,23	86,46	85,50	85,57	0,07	0,06	-10,7229
2,0	192,0	7,9	0,0	4,2	0,0	475,7	83,8	136,7	662,2	564,1	682,9	655,6	140,4	929,8	0,23	86,06	84,68	86,22	0,23	86,64	85,48	85,72	0,07	0,07	-28,07903
3,0	193,0	7,8	0,0	4,9	0,0	475,2	83,4	135,5	652,9	550,6	656,3	626,4	140,8	968,0	0,23	86,07	84,67	86,34	0,23	86,74	85,47	85,88	0,07	0,07	-43,71229
4,0	194,0	7,7	0,0	6,7	0,0	476,2	83,8	134,2	647,3	539,3	634,6	602,0	140,3	959,5	0,23	86,04	84,67	86,54	0,23	86,79	85,49	86,06	0,07	0,06	-56,41582
5,0	195,0	7,5	0,0	11,2	0,0	477,1	83,6	134,7	645,2	529,2	619,9	582,9	139,4	978,9	0,23	86,05	84,67	86,83	0,23	86,82	85,51	86,29	0,07	0,07	-65,79337
6,0	196,0	7,3	0,0	13,0	0,0	479,3	83,7	134,9	645,8	520,2	612,8	569,6	139,3	999,8	0,23	86,00	84,68	87,08	0,23	86,82	85,52	86,51	0,07	0,07	-71,56656
7,0	197,0	7,2	0,0	13,4	0,0	481,8	83,8	134,8	648,4	512,5	610,5	561,2	139,6	1016,3	0,23	86,02	84,68	87,30	0,23	86,85	85,53	86,70	0,07	0,07	-74,67385
8,0	198,0	7,0	0,0	13,6	0,0	484,8	83,2	134,2	651,9	506,1	610,6	555,0	140,0	1030,0	0,23	86,07	84,71	87,52	0,23	86,91	85,56	86,95	0,07	0,07	-76,39553
9,0	199,0	6,9	0,0	13,8	0,0	488,2	83,2	134,0	656,2	500,2	612,2	551,0	140,2	1051,1	0,23	86,05	84,71	87,79	0,23	86,88	85,57	87,21	0,07	0,07	-77,1565
10,0	200,0	6,7	0,0	14,1	0,0	489,7	83,4	134,0	662,1	495,0	615,7	548,8	139,7	1075,8	0,23	86,02	84,73	88,07	0,23	86,89	85,59	87,47	0,07	0,07	-76,84101
11,0	201,0	6,5	0,0	14,5	0,0	494,2	83,7	133,7	668,6	490,5	620,6	547,9	139,9	1089,5	0,23	86,07	84,78	88,21	0,23	86,94	85,62	87,50	0,07	0,07	-75,60843
12,0	202,0	6,3	0,0	14,5	0,0	497,4	83,2	134,4	676,2	486,5	626,6	547,9	139,9	1093,6	0,23	86,19	84,80	87,49	0,23	86,97	85,63	87,14	0,07	0,07	-73,69189
13,0	203,0	6,2	0,0	14,6	0,0	499,0	83,5	134,9	683,3	483,0	633,2	549,4	139,8	1104,5	0,23	86,39	84,84	86,96	0,23	87,05	85,63	86,81	0,07	0,07	-71,38736
14,0	204,0	6,0	0,0	14,7	0,0	502,5	83,6	136,1	690,5	480,0	640,0	551,2	139,9	1116,0	0,23	86,50	84,88	86,62	0,23	87,11	85,67	86,58	0,07	0,07	-68,79254
15,0	205,0	5,8	0,0	14,9	0,0	504,3	83,6	136,1	697,6	477,5	646,9	552,9	139,9	1125,5	0,23	86,61	84,92	86,37	0,23	87,20	85,70	86,43	0,07	0,07	-66,15761
16,0	206,0	5,6	0,0	14,9	0,0	507,4	83,5	136,1	704,6	475,0	653,6	554,7	139,9	1136,6	0,23	86,71	84,96	86,21	0,23	87,29	85,72	86,33	0,07	0,07	-63,55
17,0	207,0	5,5	0,0	15,1	0,0	508,7	83,6	136,2	711,6	473,1	660,1	556,2	140,1	1145,1	0,23	86,91	85,01	86,15	0,23	87,38	85,75	86,28	0,07	0,07	-60,88164
18,0	208,0	5,3	0,0	15,3	0,0	510,8	83,9	136,0	718,2	470,9	666,4	557,9	141,0	1153,4	0,23	87,02	85,07	86,15	0,23	87,51	85,79	86,27	0,07	0,07	-58,23444
19,0	209,0	5,1	0,0	15,3	0,0	512,7	83,7	135,7	725,4	469,6	672,1	559,8	141,7	1159,0	0,23	87,06	85,08	86,12	0,23	87,57	85,81	86,24	0,07	0,07	-55,37377
20,0	210,0	4,9	0,0	15,6	0,0	515,7	83,7	135,4	732,7	469,2	677,6	562,5	141,0	1173,2	0,23	87,05	85,12	86,19	0,23	87,62	85,85	86,24	0,07	0,07	-52,52067
21,0	211,0	4,8	0,1	15,9	0,0	517,3	84,0	136,1	739,9	468,3	683,5	565,2	140,6	1182,7	0,23	87,04	85,16	86,28	0,23	87,65	85,91	86,27	0,07	0,07	-49,6044
22,0	212,0	4,6	0,1	16,0	0,0	519,1	83,6	136,7	746,6	468,1	689,5	568,4	140,5	1188,4	0,23	87,15	85,18	86,32	0,23	87,73	85,94	86,29	0,07	0,07	-46,47815
23,0	213,0	4,4	0,1	16,2	0,0	521,4	83,7	137,3	753,3	468,0	695,5	572,3	140,5	1195,2	0,23	87,25	85,21	86,42	0,23	87,82	85,95	86,38	0,07	0,07	-43,20841
24,0	214,0	4,3	0,1	16,2	0,0	523,1	84,2	137,7	759,0	467,8	701,6	576,6	141,0	1201,6	0,23	87,38	85,24	86,49	0,23	87,89	85,98	86,44	0,07	0,07	-39,91153
25,0	215,0	4,1	0,1	16,3	0,0	524,5	84,2	136,5	764,8	468,1	707,6	581,5	141,9	1209,6	0,23	87,42	85,26	86,62	0,23	87,94	86,03	86,50	0,07	0,07	-36,32804
26,0	216,0	3,9	0,1	16,6	0,0	526,1	84,1	138,6	771,0	469,3	713,3	586,6	142,0	1223,0	0,23	87,57	85,32	86,75	0,23	88,03	86,06	86,61	0,07	0,07	-32,68504
27,0	217,0	3,8	0,1	16,9	0,0	526,5	84,1	137,0	777,6	470,3	719,0	591,1	141,3	1235,2	0,23	87,54	85,35	86,86	0,23	88,05	86,07	86,70	0,07	0,07	-29,24558
28,0	218,0	3,6	0,2	17,2	0,0	527,6	84,7	137,8	784,3	471,9	724,8	595,8	140,7	1255,5	0,23	87,63	85,40	86,99	0,23	88,13	86,16	86,78	0,07	0,07	-25,60614
29,0	219,0	3,4	0,4	17,5	0,0	527,8	84,3	137,5	790,9	473,5	730,8	601,4	140,6	1274,4	0,23	87,73	85,46	87,12	0,23	88,24	86,20	86,89	0,07	0,07	-21,67195
30,0	220,0	3,3	0,7	17,7	0,0	529,3	84,1	137,9	798,0	475,3	736,9	606,8	140,4	1277,6	0,23	87,83	85,50	87,20	0,23	88,34	86,23	86,99	0,07	0,07	-17,62506
31,0	221,0	3,1	1,0	17,8	0,0	529,4	84,0	138,7	804,6	477,4	742,8	612,2	140,3	1273,6	0,23	87,95	85,55	87,30	0,23	88,47	86,30	87,06	0,07	0,07	-13,66632
32,0	222,0	2,9	1,4	17,7	0,0	530,4	84,6	138,4	810,1	479,8	749,1	617,7	140,2	1266,6	0,23	88,02	85,61	87,44	0,23	88,54	86,34	87,16	0,07	0,07	-9,715857
33,0	223,0	2,7	1,8	17,6	0,0	530,1	84,5	138,8	814,6	482,1	755,7	623,3	140,2	1261,9	0,23	88,07	85,66	87,58	0,23	88,60	86,38	87,25	0,07	0,07	-5,910464
34,0	224,0	2,6	2,0	17,4	0,0	529,3	85,1	138,5	817,8	484,9	762,3	628,9	140,0	1257,6	0,23	88,06	85,66	87,67	0,23	88,66	86,42	87,33	0,07	0,07	-2,344052
35,0	225,0	2,4	2,0	17,4	0,0	527,5	84,4	138,2	820,5	487,4	769,0	634,2	140,0	1259,2	0,23	88,16	85,74	87,76	0,23	88,75	86,47	87,43	0,07	0,07	1,1088288
36,0	226,0	2,2	1,5	17,4	0,0	528,7	84,9	137,9	822,5	490,2	775,6	640,9	140,2	1277,6	0,23	88,22	85,76	87,82	0,23	88,86	86,51	87,54	0,07	0,07	4,7417174
37,0	227,0	2,1	0,6	17,3	0,0	532,5	84,7	136,6	825,4	492,8	782,0	647,8	141,1	1278,4	0,23	88,38	85,82	87,96	0,23	88,98	86,57	87,60	0,07	0,07	8,686853
38,0	228,0	2,0	0,2	16,6	0,0	532,6	85,1	138,2	828,0	496,0	787,2	656,2	141,3	1254,9	0,23	88,47	85,86	88,04	0,23	89,03	86,60	87,68	0,07	0,07	12,624298
39,0	229,0	1,9	0,1	15,7	0,0	534,7	85,2	136,9	829,4	499,5	791,1	665,1	140,1	1230,4	0,23	88,57	85,94	88,13	0,23	89,11	86,68	87,79	0,07	0,07	15,929773
40,0	230,0	1,8	0,0	14,1	0,0	534,7	85,5	138,0	828,3	502,6	794,0	674,2	140,5	1200,0	0,23	88,58	85,98	88,22	0,23	89,14	86,71	87,89	0,07	0,07	18,79931
41,0	231,0	1,7	0,0	12,6	0,0	532,4	85,2	136,4	824,1	505,6	794,7	682,1	140,8	1168,1	0,23	88,60	86,02	88,32	0,23	89,18	86,76	87,97	0,07	0,07	20,359167
42,0	232,0	1,6	0,0	11,5	0,0	531,0	85,2	136,2	817,8	508,9	794,4	689,7	139,9	1141,5	0,23	88,67	86,07	88,41	0,23	89,18	86,79	88,04	0,07	0,07	21,015286
43,0	233,0	1,5	0,0	10,5	0,0	527,4	86,0	135,8	809,1	511,8	793,6	697,5	138,8	1115,3	0,23	88,65	86,10	88,49	0,23	89,21	86,82	88,09	0,07	0,07	21,058899
44,0	234,0	1,5	0,0	9,8	0,0	523,9	85,3	133,4	799,7	515,2	792,3	704,8	138,3	1092,4	0,23	88,54	86,15	87,94	0,23	89,21	86,85	88,19	0,07	0,07	20,961719
45,0	235,0	1,4	0,0	9,3	0,0	519,4	85,3	132,9	789,1	519,8	790,9	712,6	137,9	1069,6	0,23	88,53	86,18	87,37	0,23	89,20	86,88	87,07	0,07	0,07	20,954553
46,0	236,0	1,4	0,0	8,6	0,0	514,4	85,6	134,2	777,3	525,3	788,7	721,3	137,5	1042,4	0,23	88,50	86,22	87,07	0,23	89,17	86,91	86,09	0,07	0,07	20,903229
47,0	237,0	1,3	0,0	8,0	0,0	510,5	86,1	133,0	764,9	531,6	785,7	729,0	137,0	1016,6	0,23	88,54	86,25	86,89	0,23	89,19	86,94	85,55	0,07	0,07	20,537973
48,0	238,0	1,3	0,0	7,7	0,0	502,9	85,6	132,0	752,9	537,3	782,2	736,9	136,8	994,6	0,23	88,52	86,31	86,79	0,23	89,17	86,95	85,23	0,07	0,07	20,099682
49,0	239,0	1,3	0,0	7,4	0,0	498,4	85,8	131,5	740,0	542,0	778,5	743,1	136,4	974,2	0,23	88,50	86,31	86,70	0,23	89,14	86,96	85,02	0,07	0,07	18,886896
50,0	240,0	1,2	0,0	7,2	0,0	492,3	85,5	131,1	727,0	545,9	773,8	749,0	136,1	955,4	0,23	88,46	86,37	86,67	0,23	89,15	87,00	84,90	0,07	0,07	17,241128
51,0	241,0	1,2	0,0	7,1	0,0	486,8	85,9	130,3	714,6	548,8	768,9	751,7	135,7	939,2	0,23	88,49	86,39	86,63	0,23	89,15	87,04	84,87	0,07	0,07	14,836047
52,0	242,0	1,2	0,0	6,6	0,0	481,6	85,9	129,0	701,9	549,9	762,3	752,3	135,6	924,3	0,23	88,41	86,41	86,62	0,23	89,11	87,03	84,84	0,07	0,06	11,306036
53,0	243,0	1,2	0,0	6,6	0,0	477,1	85,4	129,6	689,8	550,5	754,8	751,1	135,3	911,3	0,23	88,40	86,43	86,62	0,23	89,11	87,06	84,84	0,07	0,06	7,1710144
54,0	244,0	1,1	0,0	6,7	0,0	472,3	85,5	129,0	678,1	550,3	747,3	748,6	135,1	899,4	0,23	88,42	86,46	86,63	0,23	89,07	87,06	84,89	0,07	0,06	2,7810668
55,0	245,0	1,1	0,0	6,6	0,0	467,5	85,5	128,7	667,1	549,9	739,6	746,4	134,9	888,8	0,23	88,43	86,48	86,66	0,23	89,03	87,06	84,96	0,07	0,06	-1,531598
56,0	246,0	1,1	0,0	6,7	0,0	462,3	85,6	128,2	656,4	549,6	732,1	743,5	134,7	879,1	0,23	88,40	86,50	86,65	0,23	89,00	87,07	85,02	0,07	0,06	-5,858496
57,0	247,0	1,1	0,0	6,7	0,0	457,7	85,2	127,4	646,2	548,8	725,0	740,3	134,9	869,8	0,23	88,32	86,54	86,70	0,23	88,97	87,09	85,08	0,07	0,06	-10,06691
58,0	248,0	1,0	0,0	6,6	0,0	453,0	85,6	126,5	636,9	547,9	718,2	737,2	134,5	861,7	0,23	88,28	86,54	86,70	0,23	88,90	87,09	85,14	0,07	0,06	-14,17782
59,0	249,0	1,0	0,0	6,6	0,0	449,5	85,2	127,2	627,6	546,6	712,0	733,8	134,6	853,5	0,23	88,16	86,57	86,70	0,23	88,82	87,08	85,24	0,07	0,06	-18,19031
60,0	250,0	1,0	0,0	6,6	0,0	444,7	85,4	126,7	619,0	545,7	705,9	730,2	134,9	846,7	0,23	88,09	86,59	87,16	0,23	88,78	87,12	85,29	0,07	0,06	-21,98664
61,0	251,0	1,0	0,0	6,6	0,0	442,0	85,4	126,0	610,8	544,2	699,9	727,1	134,5	839,9	0,23	87,96	86,60	87,01	0,23	88,72	87,14	85,40	0,07	0,06	-25,7947
62,0	252,0	0,9	0,0	6,7	0,0	438,2	84,9	126,2	603,3	542,8	694,5	724,2	134,3	833,5	0,23	87,89	86,61	86,87	0,23	88,67	87,18	85,46	0,07	0,06	-29,29276
63,0	253,0	0,9	0,0	6,7	0,0	434,2	85,4	124,9	596,0	541,4	689,1	720,8	134,3	827,5	0,23	87,86	86,61	86,78	0,23	88,66	87,17	85,52	0,07	0,06	-32,79149
64,0	254,0	0,9	0,0	6,7	0,0	431,5	85,2	125,0	589,3	540,0	684,1	718,7	134,2	821,6	0,23	87,81	86,63	86,69	0,23	88,61	87,18	85,60	0,07	0,06	-35,85147
65,0	255,0	0,9	0,0	6,7	0,0	428,6	85,3	123,3	582,5	538,3	679,5	716,1	134,1	816,4	0,23	87,77	86,64	86,65	0,23	88,58	87,16	85,64	0,07	0,06	-39,02183
66,0	256,0	0,8	0,0	6,7	0,0	425,3	85,6	123,3	576,2	536,6	675,0	713,5	134,0	811,7	0,23	87,71	86,67	86,64	0,23	88,55	87,19	85,74	0,07	0,06	-42,02523
67,0	257,0	0,8	0,0	6,8	0,0	423,0	85,6	121,8	570,3	534,8	671,0	710,0	134,1	807,3	0,23	87,69	86,67	86,58	0,23	88,54	87,20	85,76	0,07	0,06	-45,06834
68,0	258,0	0,8	0,0	6,7	0,0	419,6	85,7	121,7	564,9	532,7	667,0	706,3	134,2	803,0	0,23	87,73	86,68	86,64	0,23	88,51	87,23	85,84	0,07	0,06	-48,09862
69,0	259,0	0,8	0,0	6,8	0,0	417,7	84,8	122,0	559,7	530,8	663,6	702,6	134,0	799,8	0,23	87,69	86,69	86,63	0,23	88,49	87,21	85,90	0,07	0,06	-50,96783
70,0	260,0	0,7	0,0	6,7	0,0	414,6	85,3	122,2	554,8	529,0	660,2	699,4	134,0	795,9	0,23	87,67	86,72	86,68	0,23	88,46	87,22	85,93	0,07	0,06	-53,63845
71,0	261,0	0,7	0,0	6,8	0,0	412,5	85,1	120,8	550,1	527,0	657,0	696,4	134,0	792,8	0,23	87,61	86,70	86,70	0,23	88,40	87,22	85,98	0,07	0,06	-56,21133
72,0	262,0	0,7	0,0	6,8	0,0	410,2	85,3	121,4	545,7	525,3	653,9	693,6	134,4	788,8	0,23	87,57	86,72	86,74	0,23	88,38	87,24	86,02	0,07	0,06	-58,52481
73,0	263,0	0,7	0,0	6,8	0,0	407,8	84,9	120,8	541,5	523,4	651,0	691,3	134,1	785,3	0,23	87,58	86,72	86,79	0,23	88,36	87,24	86,05	0,07	0,06	-60,86151
74,0	264,0	0,6	0,0	6,8	0,0	405,4	84,9	120,1	537,6	521,7	648,3	688,6	134,3	783,0	0,23	87,54	86,73	86,81	0,23	88,29	87,23	86,08	0,07	0,06	-63,01678
75,0	265,0	0,6	0,0	6,8	0,0	403,4	85,0	120,1	533,8	519,6	645,8	686,0	134,1	780,5	0,23	87,56	86,73	86,85	0,23	88,28	87,21	86,11	0,07	0,06	-65,23975
76,0	266,0	0,6	0,0	6,8	0,0	401,8	84,6	119,7	530,2	517,9	643,6	683,7	134,1	778,4	0,23	87,55	86,73	86,88	0,23	88,23	87,19	86,13	0,07	0,06	-67,22439
77,0	267,0	0,6	0,0	6,8	0,0	400,2	84,8	119,8	526,9	516,1	641,3	681,2	134,1	776,9	0,23	87,50	86,74	86,93	0,23	88,22	87,18	86,14	0,07	0,06	-69,19916
78,0	268,0	0,5	0,0	6,8	0,0	399,0	84,9	119,4	523,9	514,1	639,1	679,2	134,2	775,5	0,23	87,39	86,73	86,94	0,23	88,18	87,19	86,15	0,07	0,05	-71,03056
79,0	269,0	0,5	0,0	6,8	0,0	397,4	84,7	119,4	520,9	512,5	637,0	677,2	134,3	775,2	0,23	87,31	86,74	86,98	0,23	88,16	87,21	86,15	0,07	0,06	-72,71966
80,0	270,0	0,5	0,0	6,8	0,0	396,9	84,6	118,8	518,2	510,7	635,1	675,5	134,3	774,1	0,23	87,35	86,75	87,03	0,23	88,15	87,20	86,16	0,07	0,05	-74,34532
81,0	271,0	0,5	0,0	6,9	0,0	395,2	84,7	118,8	515,6	509,1	633,1	674,0	134,3	770,5	0,23	87,34	86,75	87,06	0,23	88,13	87,19	86,18	0,07	0,05	-75,8837
82,0	272,0	0,4	0,0	7,0	0,0	394,4	85,1	118,6	513,3	507,7	631,5	672,9	134,3	765,6	0,23	87,31	86,74	87,08	0,23	88,13	87,21	86,20	0,07	0,05	-77,15896
83,0	273,0	0,4	0,0	7,0	0,0	391,5	85,0	117,6	510,8	506,3	630,0	672,0	134,4	762,5	0,23	87,30	86,76	87,10	0,23	88,08	87,20	86,21	0,07	0,05	-78,40858
84,0	274,0	0,4	0,0	7,0	0,0	391,0	85,0	117,9	508,3	504,9	628,9	671,7	134,5	761,3	0,23	87,29	86,74	87,11	0,23	88,03	87,18	86,19	0,07	0,05	-79,44703
85,0	275,0	0,4	0,0	7,0	0,0	389,4	85,0	118,0	506,2	503,8	627,8	672,2	134,6	759,8	0,23	87,32	86,74	87,16	0,23	88,00	87,17	86,18	0,07	0,05	-80,17895
86,0	276,0	0,3	0,0	7,0	0,0	388,1	84,7	117,5	504,2	502,5	626,8	672,4	134,7	758,4	0,23	87,30	86,73	87,15	0,23	87,98	87,18	86,19	0,07	0,05	-80,95603
87,0	277,0	0,3	0,0	6,9	0,0	387,5	84,5	117,4	502,2	501,5	625,9	672,5	134,7	757,9	0,23	87,21	86,73	87,15	0,23	87,91	87,16	86,19	0,07	0,05	-81,75737
88,0	278,0	0,3	0,0	6,9	0,0	386,9	84,8	117,7	500,6	500,3	624,8	672,2	134,7	758,4	0,23	87,16	86,71	87,16	0,23	87,91	87,18	86,15	0,07	0,05	-82,58729
89,0	279,0	0,3	0,0	6,9	0,0	386,1	84,6	117,0	499,0	499,4	623,9	672,0	134,8	758,2	0,23	87,16	86,71	87,18	0,23	87,91	87,18	86,16	0,07	0,05	-83,29185
90,0	280,0	0,2	0,0	6,9	0,0	385,2	85,0	117,1	497,5	498,3	622,9	671,5	134,9	757,9	0,23	87,17	86,73	87,17	0,23	87,90	87,19	86,15	0,07	0,05	-84,08731
91,0	281,0	0,2	0,0	6,8	0,0	385,7	84,7	117,1	496,1	497,2	621,6	671,0	135,0	757,6	0,23	87,14	86,72	87,17	0,23	87,89	87,19	86,15	0,07	0,05	-84,95501
92,0	282,0	0,2	0,0	6,8	0,0	384,3	85,0	116,6	494,8	496,1	620,3	670,5	134,9	757,2	0,23	87,13	86,71	87,18	0,23	87,88	87,18	86,13	0,07	0,05	-85,80383
93,0	283,0	0,2	0,0	6,8	0,0	383,3	84,7	117,2	493,6	494,8	618,9	669,1	134,9	755,2	0,23	87,14	86,74	87,18	0,23	87,90	87,20	86,10	0,07	0,05	-86,85141
94,0	284,0	0,1	0,0	6,6	0,0	382,6	84,8	117,0	492,4	492,6	615,9	665,7	135,0	752,7	0,23	87,07	86,75	87,22	0,23	87,87	87,18	86,09	0,07	0,05	-88,7641
95,0	285,0	0,1	0,0	6,5	0,0	381,0	84,7	116,7	490,9	490,4	612,0	661,9	135,1	752,4	0,23	87,09	86,73	87,18	0,23	87,84	87,19	86,06	0,07	0,05	-91,0648
96,0	286,0	0,1	0,0	6,5	0,0	380,3	84,9	116,8	489,6	488,3	607,8	657,7	135,4	751,8	0,23	87,14	86,72	87,19	0,23	87,83	87,17	86,05	0,07	0,05	-93,3641
97,0	287,0	0,0	0,0	6,5	0,0	379,8	84,6	117,0	488,4	486,4	603,7	654,3	135,3	750,7	0,23	87,14	86,75	87,20	0,23	87,80	87,16	86,03	0,07	0,05	-95,48789

Manufacturer: HEARTHSTONE
Model: SILA

Run: 6
Project #: PI 20202
Test Duration: 97 min

Note: In the "Input data", "Calc. % O_2", "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

	HHV	LHV
Eff	74,55%	80,57%
Comb Eff	98,95%	98,95%
HT Eff	75,33%	81,42%
Output	27 783	kJ/h
Burn Rate	1,88	kg/h
Grams CO	52	g
Input	37 270	kJ/h
MC wet	16,50	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,64
F_0
1,062

Overall Heating Efficiency: 74,55%
Combustion Efficiency: 98,95%
Heat Transfer Efficiency: 75,33%

Heat Output: 26 356 Btu/h
Heat Input: 35 354 Btu/h
Burn Duration: 1,62 h
Burn Rate: 4,15 lb/h
Stack Temp: 465,0 Deg. F

Averages	0,14	10,17	1,31	20,26	10,02	240,70	29,27	99,7%	73,1%	72,8%
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 (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,64	0,02	4,20	365,2%	20,66	16,45	253,5	29,2	100,7%	55,3%	55,7%
1,00	3,59	0,07	2,57	644,5%	20,77	18,16	253,2	28,8	99,9%	35,3%	35,3%
2,00	3,57	0,03	4,19	365,4%	20,66	16,45	246,5	28,8	100,6%	56,4%	56,7%
3,00	3,52	0,02	4,89	300,0%	20,62	15,72	246,2	28,6	100,6%	60,8%	61,1%
4,00	3,48	0,02	6,70	192,2%	20,50	13,78	246,8	28,8	100,3%	68,0%	68,2%
5,00	3,41	0,01	11,18	75,5%	20,20	9,02	247,3	28,7	100,1%	75,8%	75,9%
6,00	3,33	0,01	12,98	51,2%	20,08	7,09	248,5	28,7	100,1%	77,4%	77,4%
7,00	3,25	0,01	13,41	46,3%	20,05	6,63	249,9	28,8	100,1%	77,6%	77,7%
8,00	3,18	0,01	13,61	44,2%	20,04	6,42	251,6	28,4	100,1%	77,6%	77,7%
9,00	3,11	0,01	13,75	42,7%	20,03	6,27	253,5	28,5	100,1%	77,6%	77,7%
10,00	3,02	0,02	14,09	39,3%	20,01	5,91	254,3	28,6	100,0%	77,8%	77,9%
11,00	2,95	0,02	14,53	35,0%	19,98	5,44	256,8	28,7	100,0%	78,0%	78,0%
12,00	2,86	0,02	14,47	35,6%	19,98	5,51	258,6	28,4	100,0%	77,9%	77,8%
13,00	2,80	0,02	14,60	34,4%	19,97	5,37	259,5	28,6	100,0%	77,9%	77,9%
14,00	2,70	0,02	14,70	33,5%	19,97	5,26	261,4	28,7	100,0%	77,9%	77,9%
15,00	2,64	0,02	14,90	31,6%	19,95	5,05	262,4	28,7	100,0%	77,9%	77,9%
16,00	2,55	0,03	14,93	31,3%	19,95	5,01	264,1	28,6	99,9%	77,9%	77,8%
17,00	2,48	0,03	15,08	30,0%	19,94	4,85	264,9	28,6	99,9%	77,9%	77,9%
18,00	2,39	0,03	15,34	27,8%	19,92	4,57	266,0	28,9	99,9%	78,0%	78,0%
19,00	2,32	0,03	15,29	28,2%	19,93	4,62	267,1	28,7	99,9%	77,9%	77,9%
20,00	2,23	0,05	15,57	25,8%	19,91	4,31	268,7	28,7	99,8%	78,0%	77,9%
21,00	2,16	0,06	15,92	22,9%	19,88	3,93	269,6	28,9	99,7%	78,2%	78,0%
22,00	2,07	0,06	15,97	22,6%	19,88	3,88	270,6	28,6	99,8%	78,2%	78,0%
23,00	2,00	0,07	16,15	21,1%	19,87	3,68	271,9	28,7	99,7%	78,2%	78,0%
24,00	1,93	0,06	16,22	20,7%	19,87	3,62	272,8	29,0	99,7%	78,2%	78,0%
25,00	1,87	0,06	16,33	19,8%	19,86	3,49	273,6	29,0	99,7%	78,2%	78,0%
26,00	1,77	0,09	16,63	17,5%	19,84	3,17	274,5	28,9	99,6%	78,3%	78,0%
27,00	1,71	0,14	16,90	15,3%	19,82	2,85	274,7	29,0	99,4%	78,5%	77,9%
28,00	1,62	0,24	17,22	12,5%	19,79	2,45	275,3	29,3	98,9%	78,6%	77,7%
29,00	1,55	0,40	17,53	9,5%	19,76	2,02	275,4	29,1	98,1%	78,7%	77,2%
30,00	1,48	0,71	17,72	6,6%	19,72	1,65	276,3	28,9	96,8%	78,6%	76,1%
31,00	1,39	0,95	17,78	4,8%	19,70	1,44	276,3	28,9	95,7%	78,6%	75,3%
32,00	1,32	1,43	17,67	2,8%	19,68	1,29	276,9	29,2	93,7%	78,4%	73,5%
33,00	1,23	1,76	17,60	1,4%	19,66	1,18	276,7	29,2	92,4%	78,3%	72,3%
34,00	1,16	2,03	17,42	1,0%	19,66	1,22	276,3	29,5	91,3%	78,2%	71,4%
35,00	1,07	1,97	17,37	1,6%	19,66	1,31	275,3	29,1	91,5%	78,2%	71,5%
36,00	1,00	1,52	17,39	3,9%	19,69	1,55	275,9	29,4	93,3%	78,3%	73,0%
37,00	0,93	0,62	17,25	9,9%	19,76	2,20	278,1	29,3	97,1%	78,4%	76,1%
38,00	0,89	0,23	16,58	16,9%	19,83	3,14	278,1	29,5	98,9%	78,1%	77,3%
39,00	0,84	0,06	15,66	25,0%	19,90	4,22	279,3	29,6	99,7%	77,6%	77,4%
40,00	0,80	0,02	14,14	38,7%	20,01	5,86	279,3	29,7	100,0%	76,6%	76,6%
41,00	0,75	0,01	12,60	55,7%	20,11	7,50	278,0	29,6	100,1%	75,3%	75,4%
42,00	0,73	0,01	11,47	71,0%	20,18	8,70	277,2	29,6	100,1%	74,2%	74,3%
43,00	0,69	0,01	10,51	86,7%	20,25	9,73	275,2	30,0	100,2%	73,2%	73,3%
44,00	0,66	0,01	9,82	99,8%	20,29	10,47	273,3	29,6	100,2%	72,3%	72,5%
45,00	0,64	0,01	9,34	110,1%	20,32	10,98	270,8	29,6	100,3%	71,7%	71,9%
46,00	0,62	0,01	8,61	127,8%	20,37	11,75	268,0	29,8	100,3%	70,6%	70,9%
47,00	0,59	0,01	7,97	146,2%	20,41	12,44	265,8	30,0	100,4%	69,5%	69,8%
48,00	0,57	0,01	7,67	155,7%	20,43	12,75	261,6	29,8	100,4%	69,2%	69,4%
49,00	0,57	0,01	7,39	165,4%	20,45	13,05	259,1	29,9	100,4%	68,7%	69,0%
50,00	0,55	0,01	7,16	173,9%	20,47	13,30	255,7	29,7	100,4%	68,4%	68,7%
51,00	0,55	0,01	7,06	177,7%	20,47	13,40	252,7	29,9	100,4%	68,5%	68,8%
52,00	0,53	0,01	6,62	196,4%	20,50	13,88	249,8	29,9	100,5%	67,5%	67,9%
53,00	0,53	0,01	6,65	194,9%	20,50	13,85	247,3	29,7	100,5%	67,9%	68,2%
54,00	0,50	0,01	6,65	194,9%	20,50	13,84	244,6	29,7	100,5%	68,1%	68,5%
55,00	0,50	0,01	6,60	197,0%	20,50	13,90	241,9	29,7	100,5%	68,3%	68,6%
56,00	0,48	0,01	6,68	193,4%	20,50	13,81	239,0	29,8	100,5%	68,8%	69,1%
57,00	0,48	0,01	6,67	194,0%	20,50	13,82	236,5	29,6	100,5%	69,0%	69,3%
58,00	0,46	0,01	6,62	196,2%	20,50	13,88	233,9	29,8	100,5%	69,2%	69,5%
59,00	0,46	0,01	6,62	196,2%	20,50	13,88	232,0	29,5	100,5%	69,4%	69,7%
60,00	0,44	0,01	6,64	195,2%	20,50	13,85	229,3	29,7	100,5%	69,7%	70,0%
61,00	0,44	0,01	6,61	196,6%	20,50	13,89	227,8	29,7	100,5%	69,8%	70,1%
62,00	0,41	0,01	6,67	194,0%	20,50	13,82	225,7	29,4	100,4%	70,1%	70,4%
63,00	0,41	0,01	6,72	191,9%	20,50	13,77	223,5	29,6	100,4%	70,5%	70,8%
64,00	0,39	0,01	6,70	192,6%	20,50	13,79	221,9	29,5	100,4%	70,6%	70,9%
65,00	0,39	0,01	6,70	192,6%	20,50	13,79	220,3	29,6	100,4%	70,8%	71,1%
66,00	0,37	0,01	6,72	191,9%	20,50	13,77	218,5	29,8	100,4%	71,0%	71,3%
67,00	0,37	0,01	6,79	188,7%	20,49	13,69	217,2	29,8	100,4%	71,3%	71,6%
68,00	0,34	0,01	6,74	190,9%	20,49	13,75	215,3	29,8	100,4%	71,4%	71,7%
69,00	0,34	0,01	6,77	189,8%	20,49	13,72	214,3	29,3	100,4%	71,5%	71,8%
70,00	0,32	0,01	6,72	191,6%	20,50	13,77	212,5	29,6	100,4%	71,6%	71,9%
71,00	0,32	0,01	6,75	190,4%	20,49	13,74	211,4	29,5	100,4%	71,8%	72,1%
72,00	0,30	0,01	6,77	189,7%	20,49	13,72	210,1	29,6	100,4%	72,0%	72,3%
73,00	0,30	0,01	6,80	188,3%	20,49	13,68	208,8	29,4	100,4%	72,2%	72,5%
74,00	0,28	0,01	6,78	189,0%	20,49	13,70	207,5	29,4	100,4%	72,3%	72,6%
75,00	0,28	0,01	6,80	188,3%	20,49	13,68	206,3	29,5	100,4%	72,4%	72,7%
76,00	0,25	0,01	6,78	189,0%	20,49	13,70	205,4	29,2	100,4%	72,5%	72,8%
77,00	0,25	0,01	6,80	188,3%	20,49	13,68	204,5	29,3	100,4%	72,6%	72,9%
78,00	0,23	0,01	6,80	188,3%	20,49	13,68	203,9	29,4	100,4%	72,7%	73,0%
79,00	0,23	0,01	6,82	187,5%	20,49	13,67	203,0	29,3	100,4%	72,8%	73,1%
80,00	0,21	0,01	6,84	186,7%	20,49	13,64	202,7	29,2	100,4%	72,9%	73,1%
81,00	0,21	0,01	6,85	186,1%	20,49	13,63	201,8	29,3	100,4%	73,0%	73,3%
82,00	0,19	0,01	7,05	178,2%	20,47	13,42	201,3	29,5	100,4%	73,5%	73,8%
83,00	0,19	0,01	7,01	179,6%	20,48	13,46	199,7	29,4	100,4%	73,6%	73,9%
84,00	0,16	0,01	7,00	180,2%	20,48	13,47	199,5	29,4	100,4%	73,5%	73,8%
85,00	0,16	0,01	6,96	181,5%	20,48	13,51	198,5	29,4	100,4%	73,6%	73,9%
86,00	0,14	0,01	6,96	181,5%	20,48	13,51	197,9	29,3	100,4%	73,6%	73,9%
87,00	0,14	0,01	6,93	182,9%	20,48	13,54	197,5	29,2	100,4%	73,6%	73,9%
88,00	0,12	0,01	6,92	183,5%	20,48	13,56	197,2	29,3	100,4%	73,6%	73,9%
89,00	0,12	0,01	6,90	184,1%	20,48	13,58	196,7	29,2	100,4%	73,6%	73,9%
90,00	0,09	0,01	6,88	184,8%	20,48	13,60	196,2	29,5	100,4%	73,6%	73,9%
91,00	0,09	0,01	6,82	187,6%	20,49	13,67	196,5	29,3	100,4%	73,4%	73,7%
92,00	0,07	0,01	6,85	186,3%	20,49	13,63	195,7	29,4	100,4%	73,6%	73,9%

93,00	0,07	0,01	6,82	187,6%	20,49	13,66	195,2	29,3	100,4%	73,6%	73,9%
94,00	0,05	0,01	6,60	196,9%	20,50	13,89	194,8	29,3	100,4%	73,1%	73,5%
95,00	0,05	0,01	6,52	200,6%	20,51	13,98	193,9	29,3	100,4%	73,0%	73,4%
96,00	0,03	0,02	6,54	199,9%	20,51	13,96	193,5	29,4	100,4%	73,1%	73,4%
97,00	0,00	0,02	6,52	200,7%	20,51	13,98	193,2	29,2	100,4%	73,1%	73,4%

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sila

Project #: pI 20202 Run: 6 Tech: MM Reviewer: MP

- At 26 LBS kindling stand fire
- bypass open
- At 24 LBS close Door
- At 100 LBS insert warm-up
- close Door immediatly
- At 100 LBS insert preload
- close Door immediatly

At 74 LBS close bypass

At 200 LBS open Door

- open bypass
  crush coal bed
- close Door
- close bypass
  after 2 min
- open Door
- open bypass

TEST LOAD CONFIGURATION

- insert load
- close Door
- close bypass

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2019-07-30 Manufacturer: Hearthstone Model: 5ik

Project #: pT 20202 Run: 6 Tech: MM Reviewer: DL

Moisture Meter Calibration Check:	Equipment #	Time	12%	22%
	EM- 191	7:30	ok	ok

	Pre-Test	Post-Test
Facility Conditions:		
Air Velocity from less than 2 feet	0 (max50 Fpm)	0 (max50 Fpm)
Smoke Capture Check (tunnel velocity)	ok	NA
Picture (4 sides)	ok	ok
Wood Heater Conditions:		
Date Wood Heater Stack Cleaned	2019-07-22	
Date Dilution Tunnel Cleaned	2019-07-22	
Induced Draft Check (max 0.005 H2O)	ok	
Traverse before ignition	ok	
Flow Rate 140 cfm ±10%		ok
Temperature System:		
Ambient (65°-90°F)	ok °F	
Wood Heater Surface (±125°F)	ok °F	
Proportional Checks:		
Thermocouple check	ok	
Pitot Clean	ok	
Pitot verification	ok	

Sampling Train ID Numbers:	Train 1st hour	Train 1	Train 2
Probe	37	38	42
Filter Front	102	104	106
Filter Back	103	105	107
Filter Thermocouple	11	11	12
Filter (<90°F)	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sila

Project #: PT 26 602 Run: 6 Tech: MM Reviewer: SP

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 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)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	981857.59	982539.15	981857.64	982539.21	927206.61	927881.76
Initial 1minute DGM (Liter)	981857.51	982539.10	981857.62	982539.16	927206.51	927881.56
Change © (Liter)	0.08	0.05	0.02	0.05	0.10	0.20
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	ok	ok	ok	ok	ok

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.5	3	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2019.07.30 Manufacturer: Hearthstone Model: Sila

Project #: pT 2.202 Run: 6 Tech: MM Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Wood	EM-090	44 lbs, Class F	44 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM 12a	200g, Class S	200 g

LIMITS OF WEIGHT RANGES

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

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sila

Project #: PT 20202 Run: 6 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 100.8 (KPa.) Static pressure (P_q) 0.35 (inches w.c.)
Inside diameter: Port A _____ Port B _____.
Tunnel cross sectional area: .1963Ft^2
Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.075	81.04
B - Centroid	3.00	3.50	4	0.074	79.98
A-1	0.40	0.50	0.50	0.062	80.00
A-2	1.50	1.75	2	0.062	79.59
A-3	4.50	5.25	6	0.064	79.39
A-4	5.60	6.5	7.5	0.063	79.53
B-1	0.40	0.50	0.50	0.062	79.42
B-2	1.50	1.75	2	0.063	79.42
B-3	4.50	5.25	6	0.067	79.98
B-4	5.60	6.5	7.5	0.062	79.88
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,
C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.
Δ_p = manometer reading (inches H_2O)
T_s = average absolute dilution tunnel temperature (°F + 460)
P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$
P_q = static pressure $\underline{\text{in. } H_2O}$ { 13.6 }
M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)
K_p = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_p$avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sila

Project #: PI 20202 Run: 6 Tech: MR Reviewer: DB

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2974	3000	1007	1,000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO_2	0	0	17.95	18.00	9.70	10,00
Tolerance CO2		+/- 0.02		+/- 0.5		+/- 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	2,981	1,000	0	0.02	0,007	0.15	0,007	0.05	✓	
CO_2	0	17,81	9,75	0	0.02	0,09	0.5	0,05	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sila

Project #: pI 20202 Run: 6 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	982538,05	927880,28	604,92
Initial (Liter)	981859,18	927208,20	585,88

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100,8	~~108,8~~ MM 100,8
Dry Bulb (F):	82,2	85,8
Humidity (%):	50,8	46,6

Flow Meter

	Start	End
Flow meter reading	N.A	N.A

Flow Meter Verification

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight (Kg)	N.A	N.A

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sila

Project #: PI 20202 Run: 6 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 8 in.	0 878 lbs.	203	206	204	203	208
1 1/2 x 3 1/2 x 8 in.	0 840 lbs.	199	193	198	193	199
1 1/2 x 3 1/2 x 8 in.	0 890 lbs.	200	203	202	203	204
1 1/2 x 3 1/2 x 8 in.	0 820 lbs.	199	193	192	192	193
1 1/2 x 3 1/2 x 8 in.	0 830 lbs.	201	200	200	198	199
1 1/2 x 3 1/2 x 8 in.	0 806 lbs.	196	193	194	198	197
1 1/2 x 3 1/2 x 8 in.	0 892 lbs.	200	204	204	202	204
1 1/2 x 3 1/2 x 8 in.	0 830 lbs.	210	210	213	216	218
x x in.	lbs.					
1 1/2 x 3 1/2 x 8 in.	0 864 lbs.	198	193	193	196	197
1 1/2 x 3 1/2 x 8 in.	0 816 lbs.	203	203	206	205	204
1 1/2 x 3 1/2 x 8 in.	0 844 lbs.	199	193	194	193	198
1 1/2 x 3 1/2 x 8 in.	0 836 lbs.	200	201	206	204	208
1 1/2 x 3 1/2 x 8 in.	0 888 lbs.	197	196	198	198	196
1 1/2 x 3 1/2 x 8 in.	0 872 lbs.	200	201	203	208	207
1 1/2 x 3 1/2 x 8 in.	0 850 lbs.	197	196	193	194	194
1 1/2 x 3 1/2 x 8 in.	0 846 lbs.	195	193	196	193	194
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 13 60 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sil'a

Project #: PI 20202 Run: 6 Tech: MM Reviewer: DD

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 9 in.	1 024 lbs.	19 9	20 1	20 2	20 4	20 0
1 1/2 x 3 1/2 x 9 in.	0 886 lbs.	20 0	19 3	19 4	19 9	20 6
1 1/2 x 3 1/2 x 9 in.	~~0~~ 1 032 lbs.	19 1	19 2	19 2	19 3	19 3
1 1/2 x 3 1/2 x 9 in.	0 966 lbs.	19 2	19 6	19 3	19 3	19 6
1 1/2 x 3 1/2 x 9 in.	0 916 lbs.	19 8	19 7	19 8	19 4	19 9
1 1/2 x 3 1/2 x 9 in.	0 978 lbs.	20 4	20 3	19 9	20 8	20 8
1 1/2 x 3/4 x 5 in.	0 120 lbs.			19 6		
1 1/2 x 3/4 x 5 in.	0 104 lbs.			19 8		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			19 7		
1 1/2 x 3/4 x 5 in.	0 100 lbs.			19 6		
1 1/2 x 3/4 x 5 in.	0 104 lbs.			19 8		
1 1/2 x 3/4 x 5 in.	0 102 lbs.			20 1		
1 1/2 x 3/4 x 5 in.	0 106 lbs.			20 2		
1 1/2 x 3/4 x 5 in.	0 102 lbs.			20 2		
1 1/2 x 3/4 x 5 in.	0 100 lbs.			19 9		
1 1/2 x 3/4 x 5 in.	0 104 lbs.			19 3		
1 1/2 x 3/4 x 5 in.	0 108 lbs.			19 5		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			19 6		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			19 7		
1 1/2 x 3/4 x 5 in.	0 128 lbs.			19 3		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			19 3		
1 1/2 x 3/4 x 5 in.	0 120 lbs.			19 8		
1 1/2 x 3/4 x 5 in.	0 128 lbs.			19 7		
1 1/2 x 3/4 x 5 in.	0 108 lbs.			19 8		
1 1/2 x 3/4 x 5 in.	0 108 lbs.			19 5		
1 1/2 x 3/4 x 5 in.	0 104 lbs.			19 3		
x x in.	lbs.					

TEST LOAD WEIGHT: 803 lbs Min 20%: 160 Max 25%: 200

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sila

Project #: PI 20202 Run: 6 Tech: MM Reviewer: DO

Pre-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	37	102	103	9	38	104	105	30	108
2019-07-29	17:00	107 9741	0 1240	0 1259	34 9370	110 4348	0 1268	0 1236	34 7359	0 1220
2019-07-30	9:00	107 9742	0 1239	0 1258	34 9371	110 4348	0 1268	0 1237	34 7358	0 1219

Post-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	37	102	103	9	38	104	105	30	108
2019-07-30	14:00	107 9745	0 1259	0 1249	34 9415	110 4352	0 1260	0 1232	34 7381	0 1222
2019-07-31	8:00	107 9744	0 1259	0 1249	34 9394	110 4351	0 1260	0 1232	34 7369	0 1221
2019-08-01	8:00	107 9744	0 1259	0 1249	34 9394	110 4351	0 1260	0 1232	34 7369	0 1221

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2019-07-30 Manufacturer: Hearthstone Model: Sila

Project #: pI 20 202 Run: 6 Tech: MM Reviewer: DP

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	42	106	107	42
2019.07.29	17:00	110 3120	0 1245	0 1232	33 7433
2019-07-30	9:00	110 3121	0 1246	0 1233	33 7432

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	42	106	107	42
2019.07.30	14:00	110, 3124	0 1266	0 1225	33 7484
2019-07-31	8:00	110 31 22	0 1265	0 1225	33 7455
2019.08.01	8:00	110 3122	0 1265	0 1225	33 7455

APPENDIX 2: Proportionality results

Average	Average	Average						Average
16,40	Inlet +	Inlet +						0,250
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,32	100,48	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	**Proportional Rates**		Vol.Std.	Vol.Std.		Delta-P
			PR1	**PR2**			Time	
Ft/Sec	Deg. R	Deg. R	**%**	**%**	(ft3)	(ft3)	min	(in H2O)2
16,287	541,1	542,0			0,221	0,218	0	0,2367581
16,323	541,4	542,1	105,17	107,58	0,220	0,218	1	0,2419061
16,235	541,5	542,2	102,20	104,45	0,220	0,218	2	0,2446976
16,187	541,5	542,3	101,76	103,97	0,220	0,218	3	0,2448552
16,395	541,5	542,3	100,14	102,32	0,220	0,218	4	0,2483928
16,418	541,6	542,4	99,92	102,25	0,220	0,218	5	0,2487411
16,293	541,7	542,4	100,65	102,85	0,220	0,218	6	0,2469505
16,414	541,7	542,5	99,84	102,07	0,220	0,218	7	0,2488055
16,469	541,7	542,5	99,34	101,56	0,220	0,218	8	0,2498353
16,314	541,7	542,5	100,39	102,56	0,220	0,218	9	0,2473581
16,238	541,8	542,6	100,82	103,01	0,220	0,218	10	0,2463184
16,404	541,8	542,6	99,75	101,89	0,220	0,218	11	0,2488119
16,340	541,8	542,6	100,20	102,35	0,220	0,217	12	0,2477739
16,213	541,9	542,7	100,97	103,20	0,220	0,217	13	0,2458419
16,348	541,9	542,7	100,14	102,37	0,220	0,217	14	0,2477742
16,208	542,0	542,8	100,88	103,06	0,220	0,217	15	0,2459034
16,255	542,0	542,8	100,62	102,87	0,220	0,217	16	0,2464543
16,475	542,1	542,9	99,22	101,44	0,220	0,217	17	0,2498323
16,309	542,1	542,9	100,19	102,43	0,220	0,217	18	0,2473596
16,549	542,2	543,0	98,83	100,96	0,220	0,217	19	0,2508621
16,259	542,2	543,0	100,58	102,83	0,220	0,217	20	0,2464788
16,587	542,3	543,0	98,41	100,52	0,220	0,217	21	0,2516772
16,385	542,3	543,1	99,76	101,97	0,219	0,217	22	0,2483947
16,341	542,4	543,2	100,01	102,21	0,219	0,217	23	0,2477741
16,350	542,5	543,3	100,02	102,25	0,219	0,217	24	0,247775
16,417	542,6	543,4	99,61	101,74	0,219	0,217	25	0,2488079
16,341	542,6	543,4	100,06	102,28	0,219	0,217	26	0,2476493
16,490	542,6	543,4	99,22	101,43	0,219	0,217	27	0,2498311
16,242	542,7	543,5	100,50	102,67	0,219	0,217	28	0,2463204
16,423	542,7	543,5	99,65	101,84	0,219	0,217	29	0,2488071
16,348	542,8	543,6	99,93	102,11	0,219	0,217	30	0,2478895
16,491	542,8	543,6	99,19	101,40	0,219	0,217	31	0,2498354
16,262	542,9	543,7	100,69	102,85	0,219	0,217	32	0,2463208
16,377	543,0	543,8	99,91	102,12	0,219	0,217	33	0,2480495
16,403	543,1	543,9	99,76	101,96	0,219	0,217	34	0,2483957
16,245	543,1	544,0	100,80	102,98	0,219	0,217	35	0,2459041
16,417	543,2	544,0	99,80	102,02	0,219	0,217	36	0,2484248
16,373	543,3	544,1	100,04	102,27	0,219	0,217	37	0,2477739
16,323	543,3	544,2	100,43	102,63	0,219	0,217	38	0,2469467
16,262	543,4	544,3	100,51	102,75	0,219	0,217	39	0,2463216
16,217	543,5	544,3	100,57	102,71	0,219	0,217	40	0,2459045
16,328	543,5	544,4	100,06	102,27	0,219	0,217	41	0,2473612
16,440	543,5	544,4	99,25	101,44	0,219	0,217	42	0,2492207
16,344	543,5	544,5	99,80	102,02	0,219	0,217	43	0,2477748
16,384	543,6	544,5	99,56	101,67	0,219	0,217	44	0,2483957
16,639	543,6	544,5	98,00	100,16	0,219	0,217	45	0,2522902
16,486	543,6	544,5	98,62	100,78	0,219	0,217	46	0,2502485
16,712	543,6	544,5	97,24	99,39	0,219	0,216	47	0,2537099
16,462	543,6	544,5	98,82	101,04	0,219	0,217	48	0,2498348
16,406	543,6	544,5	98,95	101,14	0,219	0,217	49	0,2491935
16,339	543,6	544,5	99,18	101,32	0,219	0,216	50	0,2483966
16,465	543,7	544,6	98,47	100,61	0,219	0,216	51	0,2502487
16,393	543,7	544,6	98,81	100,96	0,219	0,216	52	0,2492215
16,483	543,7	544,6	98,08	100,25	0,219	0,216	53	0,2508628

16,446	543,8	544,7	98,32	100,45	0,219	0,216	54	0,2502485
16,346	543,8	544,7	98,86	101,05	0,219	0,216	55	0,2488088
16,401	543,9	544,8	98,37	100,50	0,219	0,216	56	0,2498385
16,413	543,9	544,8	98,11	100,29	0,219	0,216	57	0,2502499
16,372	543,9	544,8	97,11	100,36	0,218	0,216	58	0,2498386
16,466	543,8	544,7	97,46	99,60	0,218	0,216	59	0,2515096
16,291	543,7	544,7	98,52	100,69	0,219	0,216	60	0,2488381
16,306	543,7	544,6	98,36	100,48	0,219	0,216	61	0,2492244
16,607	543,6	544,6	96,28	98,43	0,219	0,216	62	0,2541159
16,392	543,5	544,5	97,56	99,74	0,219	0,216	63	0,2508321
16,477	543,5	544,5	96,98	99,08	0,219	0,216	64	0,2522913
16,543	543,5	544,4	96,49	98,61	0,219	0,216	65	0,2534421
16,265	543,5	544,4	98,10	100,26	0,219	0,217	66	0,2492219
16,301	543,5	544,4	97,84	99,99	0,219	0,217	67	0,2498401
16,356	543,5	544,4	97,37	99,44	0,219	0,216	68	0,2508648
16,398	543,4	544,4	96,99	99,06	0,219	0,216	69	0,2516815
16,439	543,4	544,4	96,78	98,82	0,219	0,216	70	0,2522848
16,412	543,4	544,3	96,75	98,86	0,219	0,216	71	0,2521191
16,258	543,4	544,3	97,57	99,72	0,219	0,217	72	0,2498386
16,373	543,3	544,3	96,86	98,99	0,219	0,217	73	0,2516807
16,576	543,3	544,3	95,44	97,45	0,219	0,216	74	0,2551245
16,651	543,3	544,2	95,22	97,24	0,219	0,217	75	0,2561201
16,522	543,2	544,2	95,90	98,00	0,219	0,217	76	0,2541164
16,636	543,2	544,2	95,05	97,11	0,219	0,217	77	0,2561273
16,451	543,2	544,1	96,12	98,23	0,219	0,217	78	0,2532854
16,544	543,2	544,1	95,58	97,67	0,219	0,217	79	0,2547203
16,595	543,1	544,1	95,28	97,29	0,219	0,217	80	0,2555264
16,503	543,2	544,1	95,76	97,87	0,219	0,217	81	0,2541172
16,448	543,2	544,1	96,06	98,12	0,219	0,217	82	0,2533071
16,311	543,2	544,1	96,83	98,91	0,219	0,216	83	0,2512732
16,584	543,2	544,1	95,20	97,30	0,219	0,217	84	0,2555264
16,239	543,2	544,1	97,22	99,30	0,219	0,217	85	0,2502108
16,546	543,2	544,1	95,28	97,43	0,219	0,217	86	0,2551242
16,585	543,2	544,1	94,97	97,06	0,219	0,217	87	0,2558382
16,603	543,2	544,1	94,81	96,96	0,219	0,217	88	0,2561373
16,189	543,1	544,0	97,24	99,38	0,219	0,217	89	0,2498397
16,707	543,0	544,0	94,17	96,25	0,219	0,217	90	0,2579256
16,463	543,0	543,9	95,60	97,71	0,219	0,217	91	0,2541218
16,302	543,0	543,9	96,48	98,64	0,219	0,217	92	0,2516824
16,495	543,0	543,9	95,33	97,43	0,219	0,217	93	0,2547223
16,424	543,0	543,9	95,68	97,79	0,219	0,217	94	0,253713
16,200	543,0	543,9	97,00	99,14	0,219	0,217	95	0,2502528
16,343	543,0	543,9	96,28	98,41	0,219	0,217	96	0,2522935
16,277	543,0	543,9	96,65	98,78	0,219	0,217	97	0,2512979
16,296	543,0	543,9	96,51	98,65	0,219	0,217	98	0,2516192
16,519	543,0	543,9	95,16	97,22	0,219	0,217	99	0,255124
16,399	543,0	543,9	95,86	97,95	0,219	0,217	100	0,2533088
16,174	543,0	543,9	97,15	99,31	0,219	0,217	101	0,2498407

Average	Average	Average						Average
16,72	Inlet +	Inlet +						0,264
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,21	100,54	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	**Proportional Rates**		Vol.Std.	Vol.Std.		Delta-P
			PR1	**PR2**			Time	
Ft/Sec	Deg. R	Deg. R	**%**	**%**	(ft3)	(ft3)	min	(in H2O)2
16,381	541,2	541,7			0,216	0,216	0	0,2555264
16,762	541,5	541,9	99,85	102,26	0,218	0,217	1	0,262658
16,612	541,4	541,8	100,31	102,73	0,220	0,217	2	0,2608922
16,656	541,5	541,9	99,87	102,29	0,219	0,217	3	0,2616784
16,587	541,5	541,9	100,59	102,95	0,219	0,217	4	0,2603022
16,717	541,5	541,9	99,43	101,87	0,219	0,217	5	0,2627754
16,602	541,5	541,9	99,39	101,87	0,219	0,217	6	0,2618985
16,561	541,5	541,9	99,64	102,03	0,219	0,217	7	0,2612908
16,677	541,5	541,9	98,71	101,08	0,219	0,217	8	0,2633865
16,627	541,5	541,9	98,96	101,34	0,219	0,217	9	0,2626588
16,559	541,4	541,9	99,30	101,65	0,219	0,217	10	0,2616793
16,745	541,4	541,9	98,19	100,57	0,219	0,217	11	0,264606
16,567	541,4	541,9	99,35	101,74	0,219	0,217	12	0,2616795
16,717	541,4	541,8	98,76	101,15	0,219	0,217	13	0,2636346
16,481	541,4	541,8	99,86	102,27	0,219	0,217	14	0,2602852
16,689	541,5	541,9	98,60	100,97	0,219	0,217	15	0,2636312
16,641	541,6	542,0	99,03	101,42	0,219	0,217	16	0,2626586
16,691	541,6	542,0	98,79	101,23	0,219	0,217	17	0,2632438
16,585	541,6	542,0	99,44	101,78	0,219	0,217	18	0,2616243
16,572	541,5	542,0	99,56	102,03	0,219	0,217	19	0,2613149
16,601	541,5	542,0	99,48	101,83	0,219	0,217	20	0,2616791
16,805	541,5	542,0	98,17	100,53	0,219	0,217	21	0,2649932
16,805	541,5	542,0	98,19	100,53	0,219	0,217	22	0,2649932
16,666	541,5	542,0	99,15	101,50	0,219	0,217	23	0,2626286
16,573	541,6	542,0	99,58	101,89	0,219	0,217	24	0,2612871
16,549	541,5	542,0	99,74	102,12	0,219	0,217	25	0,2608932
16,630	541,6	542,0	99,37	101,75	0,219	0,217	26	0,2619935
16,644	541,6	542,1	99,22	101,63	0,219	0,217	27	0,2622674
16,756	541,7	542,1	98,59	100,96	0,219	0,217	28	0,2640228
16,728	541,7	542,1	98,71	100,99	0,219	0,217	29	0,2636343
16,659	541,8	542,2	98,97	101,31	0,219	0,217	30	0,2627087
16,621	541,9	542,2	99,07	101,41	0,219	0,217	31	0,2622675
16,451	541,9	542,2	100,29	102,71	0,219	0,217	32	0,2593153
16,595	541,9	542,3	99,64	102,06	0,219	0,217	33	0,2612869
16,615	541,9	542,3	99,41	101,86	0,219	0,217	34	0,2616794
16,597	542,0	542,3	99,65	101,98	0,219	0,217	35	0,2612873
16,677	542,0	542,4	99,00	101,47	0,219	0,217	36	0,2626583
16,796	542,0	542,4	98,31	100,69	0,219	0,217	37	0,2646063
16,732	542,1	542,4	98,62	101,04	0,219	0,217	38	0,2636343
16,675	542,1	542,4	99,06	101,43	0,219	0,217	39	0,2626462
16,781	542,1	542,4	98,66	100,98	0,219	0,217	40	0,264023
16,915	542,1	542,5	98,01	100,31	0,219	0,217	41	0,2659447
16,763	542,1	542,5	98,78	101,21	0,219	0,217	42	0,2636344
16,610	542,2	542,6	99,59	102,01	0,219	0,217	43	0,2612871
16,678	542,3	542,7	99,24	101,63	0,219	0,217	44	0,262268
16,696	542,3	542,7	99,04	101,43	0,219	0,217	45	0,2626587
16,802	542,4	542,8	98,65	101,02	0,219	0,217	46	0,264089
16,612	542,4	542,8	99,96	102,27	0,219	0,217	47	0,2608946
16,641	542,4	542,8	99,77	102,23	0,219	0,217	48	0,2612869
16,676	542,5	542,9	99,54	101,98	0,219	0,217	49	0,2618094
16,821	542,5	542,9	98,72	101,10	0,219	0,216	50	0,2640233
16,751	542,6	543,0	99,06	101,45	0,219	0,216	51	0,2630038
16,637	542,6	543,0	99,69	102,08	0,219	0,216	52	0,2612877
16,554	542,6	543,0	100,24	102,65	0,219	0,216	53	0,2599089

16,574	542,6	543,1	100,05	102,49	0,219	0,216	54	0,2603035
16,584	542,7	543,1	100,11	102,53	0,219	0,216	55	0,2603033
16,749	542,7	543,1	99,30	101,75	0,219	0,216	56	0,2626587
16,648	542,8	543,2	99,88	102,28	0,218	0,216	57	0,2610777
16,450	542,8	543,2	101,12	103,56	0,218	0,216	58	0,2579343
16,600	542,8	543,3	100,80	102,54	0,219	0,216	59	0,2603032
16,715	542,9	543,3	99,36	101,70	0,219	0,216	60	0,2622674
16,841	542,9	543,4	98,86	101,18	0,218	0,216	61	0,2639669
16,748	542,9	543,4	99,25	101,63	0,218	0,216	62	0,2626501
16,741	542,9	543,4	99,25	101,58	0,218	0,216	63	0,2626587
16,620	543,0	543,4	99,81	102,24	0,218	0,216	64	0,2608942
16,792	543,0	543,5	99,01	101,38	0,218	0,216	65	0,2632895
16,578	543,1	543,5	100,30	102,70	0,218	0,216	66	0,2599096
16,645	543,1	543,6	99,99	102,33	0,218	0,216	67	0,2608937
16,756	543,1	543,6	99,30	101,63	0,218	0,216	68	0,2626574
16,644	543,1	543,6	99,87	102,31	0,218	0,216	69	0,2609757
16,883	543,1	543,7	98,54	100,88	0,218	0,216	70	0,2646089
16,629	543,2	543,7	99,90	102,25	0,218	0,216	71	0,260894
16,683	543,2	543,7	99,56	102,02	0,218	0,216	72	0,2616795
16,712	543,2	543,8	99,35	101,65	0,218	0,216	73	0,2622496
16,600	543,3	543,8	99,82	102,17	0,218	0,216	74	0,2606469
16,722	543,3	543,8	99,07	101,39	0,218	0,216	75	0,2626595
16,616	543,3	543,8	99,61	101,99	0,218	0,216	76	0,2610583
16,748	543,3	543,8	98,83	101,19	0,218	0,216	77	0,2631229
16,543	543,3	543,8	100,05	102,44	0,218	0,216	78	0,2599088
16,683	543,3	543,8	99,06	101,45	0,218	0,216	79	0,262268
16,693	543,3	543,8	99,15	101,51	0,218	0,216	80	0,2622679
16,721	543,4	543,9	99,05	101,37	0,218	0,216	81	0,2626585
16,701	543,4	543,9	98,88	101,24	0,218	0,216	82	0,2626569
16,907	543,5	544,0	97,68	99,91	0,218	0,216	83	0,2659621
16,772	543,4	544,0	98,28	100,61	0,218	0,216	84	0,2640241
16,953	543,4	543,9	97,28	99,59	0,218	0,216	85	0,2668002
16,708	543,3	543,9	98,54	100,85	0,218	0,216	86	0,2632312
16,620	543,3	543,9	99,16	101,52	0,218	0,216	87	0,2616802
16,804	543,3	543,9	98,05	100,38	0,218	0,216	88	0,2646073
16,702	543,3	543,8	98,52	100,81	0,218	0,216	89	0,263245
16,711	543,3	543,8	98,28	100,56	0,218	0,216	90	0,2636354
16,646	543,3	543,8	98,87	101,23	0,218	0,216	91	0,262269
16,641	543,3	543,8	98,85	101,20	0,218	0,216	92	0,2622691
16,670	543,3	543,9	98,74	101,05	0,218	0,216	93	0,2626601
16,658	543,4	543,9	98,63	100,98	0,218	0,216	94	0,2626602
16,602	543,4	543,9	99,08	101,39	0,218	0,216	95	0,2616808
16,704	543,4	543,9	98,48	100,80	0,218	0,216	96	0,263246
16,787	543,3	543,9	97,80	100,08	0,218	0,216	97	0,2648535
16,678	543,3	543,9	98,33	100,66	0,218	0,216	98	0,263237
16,928	543,3	543,9	97,06	99,40	0,218	0,216	99	0,2669253
16,712	543,4	543,9	97,86	100,21	0,218	0,216	100	0,264025
16,667	543,4	543,9	98,33	100,67	0,218	0,216	101	0,2631203
16,786	543,4	543,9	97,63	99,97	0,218	0,216	102	0,2649958
16,755	543,4	543,9	97,85	100,13	0,218	0,216	103	0,2645367
16,631	543,3	543,9	98,48	100,82	0,218	0,216	104	0,2626608
16,761	543,3	543,8	97,88	100,12	0,218	0,216	105	0,2646106
16,772	543,3	543,8	97,88	100,19	0,218	0,216	106	0,2646081
16,786	543,3	543,9	97,66	100,00	0,218	0,216	107	0,2649957
16,777	543,3	543,8	97,65	99,93	0,218	0,216	108	0,2649967
16,733	543,3	543,9	97,63	99,89	0,218	0,216	109	0,2646101
16,656	543,3	543,9	98,20	100,53	0,218	0,216	110	0,2632461
16,808	543,3	543,8	97,08	99,39	0,218	0,216	111	0,2659626
16,674	543,3	543,8	98,10	100,37	0,218	0,216	112	0,2636364
16,654	543,3	543,8	98,22	100,59	0,218	0,216	113	0,2632463
16,604	543,3	543,8	98,38	100,66	0,218	0,216	114	0,2626612

16,673	543,3	543,8	98,00	100,39	0,218	0,216	115	0,2636372
16,619	543,3	543,8	98,47	100,75	0,218	0,216	116	0,2626614
16,674	543,3	543,8	98,06	100,43	0,218	0,216	117	0,2635684
16,739	543,3	543,9	97,75	99,98	0,218	0,216	118	0,2646089
16,592	543,4	544,0	98,53	100,81	0,218	0,216	119	0,2622704
16,746	543,4	544,0	97,73	100,01	0,218	0,216	120	0,2646089
16,650	543,5	544,0	98,12	100,46	0,218	0,216	121	0,2632471
16,749	543,5	544,0	97,74	100,01	0,218	0,216	122	0,2646098
16,733	543,6	544,1	97,58	99,83	0,218	0,216	123	0,2646096
16,694	543,6	544,1	97,78	100,13	0,218	0,216	124	0,2640264
16,660	543,6	544,2	97,87	100,27	0,218	0,216	125	0,2636352
16,673	543,6	544,1	97,94	100,35	0,218	0,216	126	0,2636394
16,616	543,6	544,1	98,34	100,68	0,218	0,216	127	0,2626631
16,613	543,6	544,1	98,30	100,66	0,218	0,216	128	0,2626642
16,682	543,6	544,1	98,04	100,34	0,218	0,216	129	0,2636254
16,827	543,6	544,2	97,05	99,44	0,218	0,216	130	0,2659506
16,727	543,7	544,2	97,60	99,85	0,218	0,216	131	0,2646115
16,760	543,8	544,3	97,42	99,75	0,218	0,216	132	0,2649987
16,722	543,9	544,3	97,47	99,80	0,218	0,216	133	0,2646116
16,756	543,9	544,4	97,38	99,68	0,218	0,216	134	0,265
16,749	544,0	544,5	97,61	99,93	0,218	0,216	135	0,2646128
16,682	544,0	544,5	97,92	100,26	0,218	0,216	136	0,2636415
16,708	544,1	544,6	97,79	100,04	0,218	0,216	137	0,2640144
16,674	544,2	544,6	97,85	100,14	0,218	0,216	138	0,2636427
16,741	544,2	544,7	97,51	99,85	0,218	0,216	139	0,2646143
16,725	544,3	544,7	97,56	99,90	0,218	0,216	140	0,2644052
16,892	544,4	544,8	96,67	98,98	0,218	0,216	141	0,2669308
16,739	544,4	544,8	97,43	99,79	0,218	0,216	142	0,264616
16,729	544,5	544,9	97,39	99,69	0,218	0,216	143	0,2646173
16,602	544,6	544,9	98,22	100,63	0,218	0,216	144	0,2623527
16,811	544,6	545,0	96,84	99,19	0,218	0,216	145	0,2659725
16,810	544,6	545,0	96,79	99,09	0,218	0,216	146	0,2659735
16,706	544,6	545,0	97,24	99,49	0,218	0,215	147	0,2646191
16,813	544,6	545,0	96,87	99,20	0,218	0,216	148	0,2659738
16,869	544,6	545,0	96,41	98,72	0,218	0,216	149	0,2669384
16,986	544,5	545,0	95,91	98,21	0,218	0,216	150	0,268684
16,873	544,5	545,0	96,47	98,70	0,218	0,216	151	0,2670031
16,788	544,5	545,0	96,65	98,99	0,218	0,215	152	0,2659757
16,800	544,5	545,0	96,76	99,03	0,218	0,215	153	0,2659755
16,703	544,5	545,0	97,23	99,47	0,218	0,215	154	0,2646207
16,717	544,6	545,0	97,25	99,57	0,218	0,215	155	0,2646219
16,727	544,6	545,0	97,07	99,31	0,218	0,215	156	0,2650089
16,877	544,6	545,0	96,21	98,48	0,218	0,215	157	0,2673237
16,708	544,7	545,1	97,29	99,53	0,218	0,215	158	0,2645532
16,814	544,7	545,1	96,53	98,80	0,218	0,215	159	0,2663623
16,803	544,7	545,1	96,76	99,11	0,218	0,215	160	0,2659764
16,649	544,8	545,2	97,52	99,92	0,218	0,216	161	0,2636507
16,881	544,8	545,2	96,15	98,46	0,217	0,215	162	0,2673302
16,936	544,9	545,3	95,83	98,08	0,218	0,215	163	0,2682843
16,878	544,8	545,3	96,21	98,44	0,218	0,215	164	0,2673252
16,849	544,9	545,3	96,33	98,64	0,218	0,215	165	0,2669392
16,823	544,9	545,3	96,56	98,83	0,218	0,215	166	0,2663647
16,908	545,0	545,3	96,05	98,29	0,218	0,215	167	0,2677449
16,718	544,9	545,3	96,91	99,21	0,218	0,215	168	0,2650125
16,768	544,9	545,3	96,46	98,78	0,217	0,215	169	0,2659801
16,725	545,0	545,3	96,88	99,21	0,217	0,215	170	0,2650544
16,612	545,0	545,4	97,60	99,94	0,217	0,215	171	0,2632649
16,707	545,1	545,4	97,07	99,43	0,217	0,215	172	0,2646268
16,730	545,2	545,5	96,91	99,26	0,217	0,215	173	0,2650155
16,834	545,2	545,6	96,42	98,79	0,217	0,215	174	0,2665502
16,971	545,3	545,6	95,69	97,93	0,217	0,215	175	0,2686717

16,852	545,4	545,7	96,20	98,49	0,217	0,215	176	0,2669457
16,829	545,6	545,8	96,31	98,67	0,217	0,215	177	0,2665073
16,724	545,7	545,9	97,06	99,42	0,217	0,215	178	0,2646284
16,727	545,7	546,0	96,78	99,14	0,217	0,215	179	0,2650162
16,820	545,8	546,0	96,33	98,67	0,217	0,215	180	0,2663694
16,820	545,8	546,1	96,32	98,66	0,217	0,215	181	0,2663696
16,887	545,8	546,1	96,01	98,34	0,217	0,215	182	0,2673322
16,905	545,8	546,1	95,90	98,22	0,217	0,215	183	0,2676216
16,791	545,9	546,2	96,43	98,76	0,217	0,215	184	0,2659861
17,024	546,0	546,2	95,12	97,43	0,217	0,215	185	0,2696285
17,089	546,0	546,2	94,74	97,04	0,217	0,215	186	0,2705895
16,812	546,0	546,3	96,19	98,49	0,217	0,215	187	0,2663737
17,004	546,1	546,3	95,22	97,45	0,217	0,215	188	0,2692994
16,904	546,1	546,4	95,78	98,02	0,217	0,215	189	0,2677191

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,36	100,33	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	**Proportional Rates**		Vol.Std.	Vol.Std.		Delta-P
			PR1	**PR2**			Time	
Ft/Sec	Deg. R	Deg. R	**%**	**%**	(ft3)	(ft3)	min	(in H2O)2
17,088	537,4	537,7			0,220	0,219	0	0,2676759
17,307	537,6	537,9	97,21	99,15	0,221	0,220	1	0,2709172
17,175	537,6	537,9	97,39	99,35	0,223	0,221	2	0,2695873
17,106	537,6	537,9	97,91	99,87	0,223	0,221	3	0,2683426
17,162	537,7	537,9	97,73	99,69	0,223	0,221	4	0,2690233
17,068	537,7	538,0	97,75	99,70	0,223	0,221	5	0,2682522
16,883	537,7	538,0	98,06	100,05	0,223	0,221	6	0,2663321
16,953	537,7	538,0	97,42	99,37	0,223	0,221	7	0,2676769
17,092	537,7	538,0	96,56	98,49	0,223	0,220	8	0,2699688
17,031	537,7	538,0	96,92	98,84	0,223	0,220	9	0,2690172
16,892	537,6	538,0	97,62	99,61	0,223	0,220	10	0,2669385
16,936	537,5	537,9	97,35	99,32	0,223	0,221	11	0,2676777
16,750	537,5	537,9	98,56	100,50	0,223	0,220	12	0,2645943
16,899	537,5	537,9	97,89	99,84	0,223	0,220	13	0,2666431
16,704	537,6	537,9	99,08	101,05	0,223	0,220	14	0,2634948
16,922	537,6	538,0	97,53	99,43	0,223	0,220	15	0,2672923
16,749	537,7	538,0	98,51	100,48	0,223	0,220	16	0,2645921
16,917	537,7	538,0	97,44	99,45	0,222	0,220	17	0,2672939
16,950	537,7	538,0	97,40	99,36	0,222	0,220	18	0,2676787
16,845	537,7	538,0	98,04	100,02	0,223	0,220	19	0,2659398
16,768	537,7	538,0	98,61	100,50	0,222	0,220	20	0,2645916
16,728	537,7	538,1	98,81	100,79	0,223	0,220	21	0,264009
16,885	537,7	538,1	98,00	99,93	0,223	0,220	22	0,2663315
16,717	537,8	538,1	99,03	100,94	0,223	0,220	23	0,2636199
16,703	537,8	538,1	99,01	101,05	0,222	0,220	24	0,2634465
16,713	537,9	538,1	98,91	100,97	0,222	0,220	25	0,2636056
16,889	537,9	538,2	97,89	99,94	0,222	0,220	26	0,2663567
16,817	538,0	538,2	98,40	100,40	0,222	0,220	27	0,2651478
16,656	538,0	538,2	99,31	101,31	0,222	0,220	28	0,2626439
16,673	538,1	538,2	99,13	101,10	0,222	0,220	29	0,2630137
16,777	538,1	538,3	98,60	100,60	0,222	0,220	30	0,2645919
16,958	538,1	538,3	97,58	99,54	0,222	0,220	31	0,2673008
16,719	538,1	538,3	98,91	100,87	0,222	0,220	32	0,2636523
16,792	538,1	538,3	98,68	100,59	0,222	0,220	33	0,2645918
16,747	538,2	538,4	98,76	100,77	0,222	0,220	34	0,2640088
16,575	538,2	538,4	99,86	101,82	0,222	0,220	35	0,2612737
16,667	538,2	538,4	99,30	101,31	0,222	0,220	36	0,2626454
16,725	538,3	538,4	98,92	100,91	0,222	0,220	37	0,2636197
16,701	538,3	538,4	99,05	101,06	0,222	0,220	38	0,2632311
16,722	538,3	538,4	98,87	100,88	0,222	0,220	39	0,2636254
16,925	538,3	538,4	97,68	99,63	0,222	0,220	40	0,2669087
16,707	538,3	538,4	99,05	101,10	0,222	0,220	41	0,2632301
16,788	538,3	538,4	98,63	100,63	0,222	0,220	42	0,2644768
16,763	538,3	538,5	98,83	100,85	0,222	0,220	43	0,2640096
16,650	538,3	538,5	99,44	101,50	0,222	0,220	44	0,2623126
16,799	538,3	538,5	98,60	100,61	0,222	0,220	45	0,2645924
16,816	538,3	538,5	98,42	100,47	0,222	0,220	46	0,2649796
16,644	538,3	538,5	99,36	101,46	0,222	0,220	47	0,2622543
16,704	538,3	538,5	99,06	101,07	0,222	0,220	48	0,2632299
16,737	538,3	538,5	98,97	100,98	0,222	0,220	49	0,2636204
16,680	538,3	538,5	99,36	101,42	0,222	0,220	50	0,2626446
16,567	538,3	538,5	100,03	102,15	0,222	0,220	51	0,2608829
16,714	538,3	538,5	99,12	101,13	0,222	0,220	52	0,2632298
16,663	538,3	538,5	99,56	101,57	0,222	0,220	53	0,2622545
16,771	538,4	538,5	98,87	100,97	0,222	0,220	54	0,264005
16,670	538,4	538,6	99,55	101,57	0,222	0,220	55	0,2622944

16,751	538,4	538,6	99,02	101,03	0,222	0,220	56	0,2636201
16,786	538,5	538,6	98,93	100,94	0,222	0,220	57	0,2640099
16,752	538,5	538,6	99,09	101,06	0,222	0,220	58	0,2635899
16,737	538,5	538,6	99,22	101,24	0,222	0,220	59	0,263231
16,814	538,5	538,6	98,65	100,66	0,222	0,220	60	0,2645916
16,579	538,5	538,7	100,06	102,10	0,222	0,220	61	0,2608802
16,587	538,5	538,7	100,06	102,09	0,222	0,220	62	0,2609418
16,786	538,5	538,7	98,93	100,93	0,222	0,220	63	0,2640074
16,651	538,5	538,7	99,89	101,88	0,222	0,220	64	0,2616657
16,864	538,6	538,8	98,64	100,64	0,222	0,220	65	0,2649797
16,653	538,6	538,8	99,97	102,00	0,222	0,220	66	0,2615564
16,474	538,7	538,9	100,93	102,88	0,222	0,220	67	0,2588935
16,757	538,7	538,9	99,34	101,29	0,222	0,220	68	0,2632311
16,633	538,8	539,0	100,04	102,06	0,222	0,220	69	0,2612742
16,704	538,9	539,0	99,70	101,64	0,222	0,220	70	0,262254
16,893	538,9	539,1	98,44	100,42	0,222	0,220	71	0,2654243
16,604	538,9	539,1	100,14	102,17	0,222	0,220	72	0,2608805
16,842	538,9	539,1	98,75	100,75	0,222	0,220	73	0,2645928
16,659	538,9	539,1	99,84	101,85	0,222	0,220	74	0,2617061
16,836	538,9	539,2	98,70	100,61	0,222	0,220	75	0,2645917
16,603	539,0	539,1	100,13	102,06	0,222	0,220	76	0,26088
16,834	539,0	539,2	98,68	100,64	0,222	0,220	77	0,2645922
16,861	539,0	539,2	98,57	100,51	0,222	0,220	78	0,2649807
16,897	539,0	539,2	98,39	100,38	0,222	0,220	79	0,2654756
16,622	539,1	539,2	99,92	101,95	0,222	0,220	80	0,2612738
16,938	539,1	539,3	97,98	99,96	0,222	0,220	81	0,2663326
16,611	539,1	539,3	99,85	101,87	0,222	0,220	82	0,2612736
16,711	539,1	539,3	99,30	101,29	0,222	0,220	83	0,2627881
16,720	539,1	539,3	99,01	101,01	0,222	0,220	84	0,2632296
16,886	539,1	539,4	97,94	99,93	0,222	0,220	85	0,2659479
16,677	539,1	539,4	99,19	101,19	0,222	0,220	86	0,2626447
16,731	539,1	539,4	98,78	100,77	0,222	0,220	87	0,2636202
16,782	539,1	539,3	98,36	100,34	0,222	0,220	88	0,2646025
16,566	539,1	539,3	98,80	100,83	0,222	0,220	89	0,2622544
16,615	539,1	539,4	99,12	101,12	0,222	0,220	90	0,2622536
16,772	539,1	539,4	98,30	100,18	0,222	0,220	91	0,2645924
16,781	539,1	539,4	98,34	100,31	0,222	0,220	92	0,2645921
16,852	539,1	539,4	97,77	99,72	0,222	0,220	93	0,2659478
16,622	539,1	539,4	99,17	101,06	0,222	0,220	94	0,2622546
16,861	539,1	539,4	97,63	99,56	0,222	0,220	95	0,2662211
16,714	539,1	539,4	98,39	100,32	0,222	0,220	96	0,2640195
16,711	539,0	539,4	98,39	100,33	0,222	0,220	97	0,2640099
16,754	539,1	539,3	97,92	99,81	0,222	0,220	98	0,2649696
16,643	539,1	539,3	98,63	100,57	0,222	0,220	99	0,2631367
16,664	539,1	539,4	98,63	100,66	0,222	0,220	100	0,2632318
16,829	539,1	539,4	97,63	99,59	0,222	0,220	101	0,2659478
16,913	539,1	539,4	97,13	99,08	0,222	0,220	102	0,2672963
16,738	539,1	539,3	98,02	100,07	0,222	0,220	103	0,264593
16,531	539,1	539,3	99,37	101,36	0,222	0,220	104	0,2612786
16,743	539,0	539,3	98,15	100,07	0,222	0,220	105	0,264585
16,703	539,0	539,3	98,31	100,26	0,222	0,220	106	0,2640501
16,762	539,0	539,3	97,96	99,85	0,222	0,220	107	0,2649804
16,694	539,0	539,3	98,29	100,27	0,222	0,220	108	0,2640068
16,819	539,0	539,3	97,59	99,56	0,222	0,220	109	0,2659474
16,728	539,0	539,3	98,06	99,94	0,222	0,220	110	0,2645931
16,733	539,0	539,3	98,05	100,03	0,222	0,220	111	0,2646369
16,426	539,0	539,3	99,71	101,80	0,222	0,220	112	0,2598957
16,685	539,1	539,3	98,23	100,21	0,222	0,220	113	0,2640102
16,671	539,1	539,3	98,43	100,41	0,222	0,220	114	0,2636218
16,605	539,1	539,4	98,71	100,69	0,222	0,220	115	0,2627346
16,763	539,1	539,4	97,84	99,81	0,222	0,220	116	0,2651352

16,665	539,1	539,4	98,39	100,37	0,222	0,220	117	0,2636219
16,643	539,1	539,4	98,55	100,51	0,222	0,220	118	0,2632321
16,593	539,1	539,4	98,80	100,76	0,222	0,220	119	0,2625104
16,629	539,1	539,4	98,54	100,52	0,222	0,220	120	0,2631335
16,751	539,2	539,4	97,88	99,84	0,222	0,220	121	0,2649812
16,721	539,2	539,4	97,99	99,87	0,222	0,220	122	0,2645947
16,719	539,2	539,4	97,98	99,94	0,222	0,220	123	0,2645945
16,684	539,1	539,4	98,21	100,17	0,222	0,220	124	0,2640119
16,655	539,2	539,4	98,29	100,21	0,222	0,220	125	0,2636222
16,681	539,1	539,4	98,19	100,16	0,222	0,220	126	0,264011
16,740	539,1	539,4	97,82	99,79	0,222	0,220	127	0,26497
16,859	539,1	539,4	97,09	99,11	0,222	0,220	128	0,266915
16,797	539,1	539,4	97,41	99,40	0,222	0,220	129	0,2659487
16,712	539,1	539,4	97,95	99,91	0,222	0,220	130	0,2645939
16,497	539,1	539,4	99,16	101,08	0,222	0,220	131	0,2612758
16,620	539,1	539,4	98,45	100,36	0,222	0,220	132	0,2632336
16,847	539,1	539,4	97,04	98,98	0,222	0,220	133	0,2669119
16,681	539,1	539,4	98,04	100,01	0,222	0,220	134	0,2642285
16,703	539,1	539,4	97,90	99,86	0,222	0,220	135	0,264595
16,642	539,1	539,4	98,21	100,23	0,222	0,220	136	0,2636232
16,850	539,1	539,4	97,04	99,00	0,222	0,220	137	0,2669114
16,894	539,1	539,4	96,74	98,64	0,222	0,220	138	0,2676804
16,777	539,1	539,4	97,33	99,29	0,222	0,220	139	0,2659497
16,807	539,0	539,3	97,22	99,17	0,222	0,220	140	0,2663357
16,615	539,0	539,3	98,42	100,37	0,222	0,220	141	0,2632324
16,638	539,1	539,3	98,32	100,17	0,222	0,220	142	0,2636234
16,657	539,0	539,3	98,05	100,07	0,222	0,220	143	0,2640115
16,700	539,1	539,4	97,90	99,85	0,222	0,220	144	0,2645913
16,578	539,1	539,4	98,55	100,59	0,222	0,220	145	0,2626473
16,809	539,1	539,4	97,22	99,18	0,222	0,220	146	0,2663354
16,836	539,2	539,4	96,95	98,90	0,222	0,220	147	0,2669123
16,648	539,2	539,5	97,96	99,94	0,222	0,220	148	0,2640123
16,606	539,1	539,4	98,33	100,30	0,222	0,220	149	0,2632342
16,477	539,1	539,4	99,14	101,13	0,222	0,220	150	0,2611329
16,713	539,1	539,4	97,69	99,62	0,222	0,220	151	0,2649799
16,697	539,1	539,4	97,85	99,80	0,222	0,220	152	0,2645952
16,716	539,2	539,4	97,68	99,64	0,222	0,220	153	0,2649825
16,655	539,2	539,4	98,04	100,01	0,222	0,220	154	0,2640029
16,630	539,2	539,5	98,17	100,14	0,222	0,220	155	0,2636251
16,653	539,2	539,5	97,97	99,96	0,222	0,220	156	0,2640121
16,939	539,2	539,5	96,37	98,29	0,222	0,220	157	0,2685304
16,846	539,2	539,5	96,91	98,89	0,222	0,220	158	0,2670419
16,848	539,2	539,5	96,90	98,85	0,222	0,220	159	0,2670735
16,828	539,2	539,5	96,90	98,83	0,222	0,220	160	0,2669133
16,683	539,2	539,5	97,76	99,72	0,222	0,220	161	0,2645958
16,796	539,2	539,4	96,99	98,94	0,222	0,220	162	0,2665414
16,679	539,1	539,4	97,75	99,71	0,222	0,220	163	0,2645959
16,677	539,1	539,4	97,75	99,69	0,222	0,220	164	0,264588
16,612	539,1	539,4	98,05	99,95	0,222	0,220	165	0,2636243
16,606	539,1	539,4	98,07	99,99	0,222	0,220	166	0,263604
16,760	539,1	539,4	97,23	99,17	0,222	0,220	167	0,2659517
16,754	539,1	539,4	97,24	99,05	0,222	0,220	168	0,2659508
16,623	539,1	539,4	98,12	100,10	0,222	0,220	169	0,2636766
16,682	539,1	539,4	97,77	99,72	0,222	0,220	170	0,2645958
16,687	539,1	539,4	97,80	99,75	0,222	0,220	171	0,2645959
16,793	539,2	539,4	97,13	99,08	0,222	0,220	172	0,2663364
16,678	539,2	539,4	97,73	99,70	0,222	0,220	173	0,2645957
16,810	539,2	539,5	96,80	98,69	0,222	0,220	174	0,2669139
16,669	539,2	539,5	97,74	99,67	0,222	0,220	175	0,2645594
16,681	539,2	539,5	97,83	99,71	0,222	0,220	176	0,2645957
16,837	539,2	539,4	96,67	98,63	0,222	0,220	177	0,2672976

16,792	539,2	539,4	96,86	98,81	0,222	0,220	178	0,2666879
16,815	539,2	539,4	96,84	98,78	0,222	0,220	179	0,2669139
16,394	539,1	539,4	99,28	101,27	0,222	0,220	180	0,2602925
16,128	539,1	539,4	100,88	102,88	0,222	0,220	181	0,2561179
16,468	539,1	539,3	98,90	100,89	0,222	0,220	182	0,2613911
16,443	539,1	539,3	99,13	101,13	0,222	0,220	183	0,2608825

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,19	100,57	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	**Proportional Rates**		Vol.Std.	Vol.Std.		Delta-P
			PR1	**PR2**			Time	
Ft/Sec	Deg. R	Deg. R	**%**	**%**	(ft3)	(ft3)	min	(in H2O)2
17,783	542,1	542,8			0,220	0,218	0	0,2718625
17,860	542,3	542,9	99,82	102,30	0,221	0,218	1	0,2741314
18,019	542,3	542,9	98,10	100,50	0,221	0,219	2	0,2776681
17,826	542,4	543,0	99,02	101,44	0,221	0,219	3	0,2748805
17,890	542,4	543,0	98,69	101,11	0,221	0,219	4	0,2758241
17,751	542,4	543,0	98,86	101,25	0,221	0,219	5	0,2745064
18,053	542,5	543,0	97,04	99,43	0,221	0,219	6	0,2793182
17,946	542,4	543,0	97,69	100,03	0,221	0,219	7	0,2776658
17,862	542,4	543,0	98,06	100,55	0,221	0,219	8	0,2763705
17,665	542,4	543,0	99,25	101,67	0,221	0,219	9	0,2731958
17,898	542,4	542,9	98,04	100,43	0,221	0,219	10	0,2767433
18,126	542,4	543,0	96,79	99,21	0,221	0,219	11	0,2802457
17,751	542,4	542,9	98,79	101,20	0,221	0,219	12	0,2745094
17,999	542,4	542,9	97,64	100,03	0,221	0,219	13	0,278041
18,197	542,3	542,9	96,54	98,90	0,221	0,219	14	0,2811618
17,936	542,3	542,9	97,96	100,35	0,221	0,219	15	0,277114
17,890	542,3	542,9	98,24	100,59	0,221	0,219	16	0,2763712
17,761	542,3	542,9	99,13	101,47	0,221	0,219	17	0,2741324
17,818	542,3	542,9	98,90	101,32	0,221	0,219	18	0,2748812
17,884	542,4	543,0	98,59	100,93	0,221	0,219	19	0,2758132
17,804	542,5	543,0	98,99	101,41	0,221	0,218	20	0,2745053
17,837	542,5	543,1	98,87	101,32	0,221	0,218	21	0,2748945
17,863	542,6	543,1	98,69	101,04	0,221	0,218	22	0,2754395
17,733	542,6	543,2	99,51	101,94	0,221	0,218	23	0,2731951
17,815	542,7	543,2	99,16	101,60	0,221	0,218	24	0,2742726
17,802	542,8	543,3	99,03	101,42	0,220	0,218	25	0,2743404
17,806	542,8	543,3	99,20	101,67	0,220	0,218	26	0,274133
17,733	542,9	543,4	99,74	102,19	0,220	0,218	27	0,2728199
17,905	542,9	543,4	98,79	101,22	0,220	0,218	28	0,2754412
17,919	542,9	543,5	98,91	101,26	0,220	0,218	29	0,2754407
17,889	543,0	543,5	99,09	101,43	0,220	0,218	30	0,2748807
17,782	543,1	543,6	99,70	102,15	0,220	0,218	31	0,2731952
17,852	543,1	543,6	99,42	101,79	0,220	0,218	32	0,274201
18,107	543,2	543,7	98,00	100,35	0,220	0,218	33	0,2780297
17,794	543,2	543,8	99,74	102,18	0,220	0,218	34	0,2731944
17,858	543,2	543,8	99,34	101,84	0,220	0,218	35	0,2741328
17,970	543,3	543,8	98,79	101,15	0,220	0,218	36	0,2758141
17,723	543,3	543,9	100,29	102,65	0,220	0,218	37	0,2718759
17,788	543,4	544,0	99,86	102,30	0,220	0,218	38	0,2729384
17,871	543,4	544,0	99,41	101,80	0,220	0,218	39	0,2741325
17,871	543,5	544,1	99,44	101,87	0,220	0,218	40	0,2741329
17,877	543,5	544,1	99,43	101,90	0,220	0,218	41	0,2741321
17,875	543,6	544,2	99,44	101,84	0,220	0,218	42	0,274133
17,911	543,6	544,2	99,36	101,80	0,220	0,218	43	0,2745064
17,890	543,7	544,2	99,51	101,94	0,220	0,218	44	0,2741328
17,931	543,7	544,3	99,14	101,61	0,220	0,218	45	0,2748801
17,833	543,7	544,3	99,86	102,25	0,220	0,218	46	0,2731944
17,799	543,8	544,4	100,05	102,44	0,220	0,218	47	0,2726721
17,925	543,9	544,5	99,37	101,82	0,220	0,218	48	0,2745068
18,014	543,9	544,5	98,89	101,27	0,220	0,218	49	0,2758136
17,760	544,0	544,6	100,32	102,75	0,220	0,218	50	0,2718757
17,919	544,1	544,7	99,40	101,90	0,220	0,218	51	0,274279
17,703	544,1	544,7	100,70	103,07	0,220	0,218	52	0,2709622
17,881	544,2	544,8	99,28	101,70	0,220	0,218	53	0,2741328
17,861	544,2	544,8	99,45	101,87	0,220	0,218	54	0,2737383
17,831	544,3	544,9	99,67	102,13	0,220	0,218	55	0,2731941

17,807	544,3	545,0	99,89	102,22	0,220	0,218	56	0,2728193
17,826	544,4	545,0	99,70	102,04	0,220	0,217	57	0,2731952
17,768	544,4	545,0	99,92	102,34	0,220	0,217	58	0,2723399
17,972	544,4	545,1	98,65	100,98	0,220	0,217	59	0,2757301
17,960	544,4	545,1	98,55	100,85	0,220	0,217	60	0,2758148
17,874	544,4	545,1	99,04	101,40	0,220	0,217	61	0,2744008
17,984	544,5	545,1	98,26	100,61	0,220	0,217	62	0,2763724
17,745	544,5	545,1	99,48	101,89	0,220	0,217	63	0,2727519
17,874	544,5	545,1	98,66	101,05	0,220	0,217	64	0,2748824
17,763	544,5	545,1	99,26	101,67	0,220	0,217	65	0,2731952
17,842	544,5	545,1	98,74	101,14	0,220	0,217	66	0,2745174
17,947	544,4	545,1	98,11	100,40	0,220	0,217	67	0,2762152
17,806	544,4	545,1	98,91	101,22	0,220	0,217	68	0,2741331
17,549	544,4	545,1	100,42	102,78	0,220	0,217	69	0,2699842
17,917	544,4	545,1	98,32	100,61	0,220	0,217	70	0,2758074
17,893	544,4	545,1	98,41	100,70	0,220	0,217	71	0,275442
17,794	544,5	545,1	98,81	101,14	0,220	0,217	72	0,2741335
17,870	544,4	545,1	98,23	100,61	0,220	0,217	73	0,2754415
17,945	544,4	545,1	97,79	100,08	0,220	0,217	74	0,2767438
18,023	544,4	545,1	97,23	99,57	0,220	0,217	75	0,2780412
17,907	544,4	545,1	97,86	100,15	0,220	0,217	76	0,2763736
17,905	544,3	545,0	97,79	100,15	0,220	0,217	77	0,2763728
17,951	544,3	545,0	97,57	99,84	0,220	0,217	78	0,2771157
17,752	544,3	545,0	98,56	100,92	0,220	0,217	79	0,2741344
17,840	544,3	545,0	98,06	100,43	0,220	0,217	80	0,2754819
18,064	544,3	545,0	96,88	99,13	0,220	0,217	81	0,2789625
17,906	544,3	545,0	97,53	99,93	0,220	0,217	82	0,276745
17,976	544,3	545,0	97,17	99,52	0,220	0,218	83	0,2778103
18,064	544,2	544,9	96,69	98,93	0,220	0,217	84	0,2793289
17,924	544,2	544,9	97,42	99,77	0,220	0,218	85	0,2770815
17,871	544,1	544,8	97,69	100,02	0,220	0,218	86	0,2763739
17,809	544,1	544,8	97,97	100,33	0,220	0,218	87	0,2754428
17,906	544,1	544,8	97,35	99,66	0,220	0,218	88	0,2771152
17,791	544,1	544,8	97,88	100,23	0,220	0,218	89	0,2754425
17,960	544,0	544,7	96,96	99,35	0,220	0,218	90	0,2780424
17,954	544,0	544,7	96,93	99,28	0,220	0,218	91	0,2780405
18,066	544,0	544,7	96,35	98,76	0,220	0,218	92	0,2797742
18,084	544,1	544,7	96,17	98,49	0,220	0,218	93	0,2801614
18,014	544,1	544,6	96,36	98,79	0,220	0,218	94	0,2793304
17,920	544,1	544,6	96,83	99,13	0,220	0,218	95	0,2780406
18,073	544,0	544,6	95,99	98,33	0,220	0,218	96	0,2803352
17,997	544,0	544,5	96,60	98,98	0,220	0,218	97	0,2789618
17,837	543,9	544,5	97,23	99,59	0,220	0,218	98	0,2767518
17,791	543,9	544,5	97,63	100,01	0,220	0,218	99	0,2758166
17,838	543,9	544,5	97,23	99,66	0,220	0,218	100	0,2767462
17,823	543,9	544,4	97,43	99,73	0,220	0,218	101	0,276473
17,905	543,8	544,4	97,03	99,41	0,220	0,218	102	0,2776711
17,843	543,8	544,4	97,36	99,64	0,220	0,218	103	0,276745
17,926	543,8	544,4	96,90	99,21	0,220	0,218	104	0,2780415
18,054	543,9	544,4	96,21	98,54	0,220	0,218	105	0,2799168
17,934	543,9	544,4	96,93	99,21	0,220	0,218	106	0,2780416
17,930	543,9	544,4	96,89	99,28	0,220	0,218	107	0,2780416
17,789	543,9	544,5	97,71	100,09	0,220	0,218	108	0,2758161
17,942	543,9	544,5	96,97	99,34	0,220	0,218	109	0,278041
17,709	543,9	544,5	98,19	100,49	0,220	0,218	110	0,2745107
17,929	543,9	544,5	96,81	99,25	0,220	0,218	111	0,2780413
18,141	544,0	544,6	95,78	98,17	0,220	0,218	112	0,2811631
18,024	544,0	544,6	96,26	98,65	0,220	0,218	113	0,2795952
17,935	544,1	544,6	96,90	99,27	0,220	0,218	114	0,2780513
18,137	544,1	544,6	95,83	98,17	0,220	0,218	115	0,2811622
17,728	544,1	544,7	97,99	100,31	0,220	0,218	116	0,2748842

17,839	544,1	544,7	97,27	99,60	0,220	0,218	117	0,276746
17,865	544,1	544,7	97,20	99,49	0,220	0,218	118	0,2770551
17,928	544,1	544,7	96,83	99,22	0,220	0,218	119	0,278042
17,925	544,2	544,8	96,83	99,14	0,220	0,218	120	0,2780417
17,674	544,2	544,8	98,12	100,52	0,220	0,218	121	0,274136
17,931	544,3	544,9	96,75	99,11	0,220	0,218	122	0,2780555
17,928	544,4	544,9	96,78	99,10	0,220	0,217	123	0,2780429
17,849	544,4	545,0	97,22	99,58	0,220	0,217	124	0,2767462
17,944	544,4	545,0	96,84	99,21	0,220	0,218	125	0,2780428
17,821	544,5	545,0	97,35	99,69	0,220	0,218	126	0,2763732
17,800	544,5	545,1	97,34	99,67	0,220	0,217	127	0,2762097
17,796	544,5	545,1	97,16	99,47	0,220	0,217	128	0,2763751

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,40	100,91	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	**Proportional Rates**		Vol.Std.	Vol.Std.		Delta-P
			PR1	**PR2**			Time	
Ft/Sec	Deg. R	Deg. R	**%**	**%**	(ft3)	(ft3)	min	(in H2O)2
18,259	543,9	544,1			0,218	0,217	0	0,2789692
17,871	543,9	544,2	99,74	102,28	0,218	0,216	1	0,2767519
18,089	544,0	544,2	98,44	100,95	0,218	0,216	2	0,2802551
17,848	544,0	544,3	99,83	102,41	0,218	0,216	3	0,2763788
17,881	544,0	544,3	99,69	102,23	0,218	0,216	4	0,2767514
17,853	544,0	544,3	98,89	101,49	0,218	0,216	5	0,277641
17,752	544,1	544,3	99,18	101,74	0,218	0,216	6	0,2765293
17,817	544,1	544,3	98,69	101,30	0,218	0,216	7	0,2776471
17,638	544,0	544,3	99,64	102,27	0,218	0,216	8	0,2748891
17,627	543,9	544,2	99,63	102,19	0,218	0,216	9	0,27489
17,912	543,9	544,3	98,04	100,62	0,218	0,216	10	0,2793369
17,768	544,0	544,2	98,80	101,41	0,218	0,216	11	0,2771165
17,919	543,9	544,2	98,04	100,65	0,218	0,216	12	0,279337
17,809	543,9	544,3	98,62	101,14	0,218	0,216	13	0,2776781
17,921	543,9	544,2	98,06	100,64	0,218	0,216	14	0,2793377
17,715	543,9	544,2	99,05	101,55	0,218	0,216	15	0,2763812
17,760	543,9	544,2	98,96	101,55	0,218	0,216	16	0,2767524
17,806	543,9	544,2	98,79	101,31	0,218	0,216	17	0,2774331
18,135	543,9	544,2	97,04	99,58	0,218	0,216	18	0,2824665
17,882	543,9	544,2	98,06	100,60	0,218	0,216	19	0,2789778
17,821	543,9	544,2	98,38	100,94	0,218	0,216	20	0,278048
17,718	543,9	544,2	99,01	101,58	0,218	0,216	21	0,2763807
17,969	543,8	544,2	97,64	100,19	0,218	0,216	22	0,2802559
17,887	543,9	544,2	98,09	100,66	0,218	0,216	23	0,2789703
17,815	543,8	544,2	98,62	101,14	0,218	0,216	24	0,2776778
17,593	543,8	544,2	99,91	102,52	0,218	0,216	25	0,2741416
17,876	543,8	544,2	98,31	100,86	0,218	0,216	26	0,2785869
17,704	543,8	544,2	99,33	101,92	0,218	0,216	27	0,2758225
17,446	543,8	544,2	100,73	103,28	0,218	0,216	28	0,2718853
17,765	543,8	544,2	98,94	101,49	0,218	0,216	29	0,2767516
17,943	543,9	544,2	98,15	100,60	0,218	0,216	30	0,2793511
17,810	543,9	544,2	98,97	101,49	0,218	0,216	31	0,2771226
17,812	543,9	544,3	98,89	101,48	0,218	0,216	32	0,2771224
17,801	543,9	544,3	98,84	101,46	0,218	0,216	33	0,2771223
17,830	543,9	544,3	98,64	101,23	0,218	0,216	34	0,2776781
17,940	543,9	544,3	98,12	100,68	0,218	0,216	35	0,2793374
17,997	544,0	544,3	97,78	100,33	0,218	0,216	36	0,2802551
17,718	544,0	544,3	99,29	101,94	0,218	0,216	37	0,2758218
17,704	544,0	544,3	99,40	101,98	0,218	0,216	38	0,2755546
17,472	544,0	544,3	100,83	103,47	0,218	0,216	39	0,2717919
17,655	544,1	544,4	99,95	102,48	0,218	0,216	40	0,2745195
17,716	544,1	544,4	99,53	102,16	0,218	0,216	41	0,27545
17,776	544,1	544,4	99,20	101,77	0,218	0,216	42	0,2763808
17,681	544,1	544,4	99,79	102,41	0,218	0,216	43	0,2748904
17,967	544,1	544,5	98,20	100,66	0,218	0,216	44	0,2793405
17,740	544,2	544,5	99,40	101,98	0,218	0,216	45	0,2758226
17,750	544,2	544,5	99,50	102,09	0,218	0,216	46	0,2758479
18,017	544,2	544,5	97,82	100,34	0,218	0,216	47	0,2801648
17,756	544,2	544,5	99,31	101,92	0,218	0,216	48	0,2760235
17,773	544,2	544,6	99,18	101,74	0,218	0,216	49	0,2763767
17,834	544,3	544,6	98,96	101,50	0,218	0,216	50	0,2771226
17,830	544,3	544,6	98,93	101,51	0,218	0,216	51	0,277123
17,868	544,3	544,6	98,83	101,34	0,218	0,216	52	0,2776778
17,898	544,3	544,6	98,64	101,22	0,218	0,216	53	0,2780489
17,965	544,3	544,7	98,38	100,92	0,218	0,216	54	0,2789716
17,795	544,3	544,7	99,33	101,92	0,218	0,216	55	0,27638

17,815	544,4	544,7	99,14	101,68	0,218	0,216	56	0,2767526
17,730	544,4	544,7	99,56	102,15	0,218	0,216	57	0,2754501
17,784	544,4	544,8	99,36	101,95	0,218	0,216	58	0,2761289
17,690	544,4	544,8	100,02	102,60	0,218	0,216	59	0,2745167
17,919	544,4	544,8	98,74	101,31	0,218	0,216	60	0,2780481
17,699	544,5	544,8	100,04	102,65	0,218	0,216	61	0,2745161
17,819	544,5	544,9	99,36	101,95	0,218	0,216	62	0,2763763
17,856	544,6	544,9	99,29	101,81	0,218	0,216	63	0,2767524
17,800	544,6	545,0	99,63	102,22	0,218	0,215	64	0,2758446
17,609	544,6	545,0	100,75	103,38	0,218	0,216	65	0,272818
17,774	544,6	545,0	99,80	102,35	0,218	0,216	66	0,2754503
17,712	544,6	545,1	100,29	102,82	0,218	0,216	67	0,2743379
17,704	544,7	545,1	100,31	102,91	0,218	0,216	68	0,2741421
17,936	544,7	545,1	99,04	101,61	0,218	0,215	69	0,2776817
17,951	544,7	545,1	98,86	101,35	0,218	0,215	70	0,2780462
17,734	544,7	545,1	100,23	102,79	0,218	0,215	71	0,2745214
17,760	544,7	545,2	100,11	102,66	0,218	0,215	72	0,2748904
17,713	544,8	545,2	100,36	102,94	0,218	0,215	73	0,2741415
17,820	544,8	545,3	99,79	102,30	0,218	0,215	74	0,2758244
17,765	544,9	545,3	100,10	102,67	0,218	0,215	75	0,2748897
17,868	544,9	545,3	99,65	102,14	0,218	0,215	76	0,2763807
17,886	544,9	545,4	99,40	101,97	0,218	0,215	77	0,2767421
17,863	544,9	545,4	99,55	102,13	0,218	0,215	78	0,2763449
17,795	545,0	545,4	99,82	102,39	0,218	0,215	79	0,2754498
17,741	545,0	545,5	99,99	102,58	0,218	0,215	80	0,2747846
17,822	545,0	545,5	99,69	102,26	0,217	0,215	81	0,2758234
17,783	545,1	545,6	99,72	102,29	0,217	0,215	82	0,2754522
17,840	545,1	545,6	99,36	101,89	0,217	0,215	83	0,2763815
17,923	545,1	545,7	98,90	101,44	0,217	0,215	84	0,2776791
17,817	545,2	545,7	99,63	102,20	0,217	0,215	85	0,2758242
17,788	545,2	545,8	99,73	102,22	0,217	0,215	86	0,2754486
17,936	545,3	545,8	98,95	101,50	0,217	0,215	87	0,2776777
18,156	545,3	545,8	97,68	100,20	0,217	0,215	88	0,2811724
17,998	545,3	545,9	98,35	100,86	0,217	0,215	89	0,2789717
17,827	545,4	545,9	99,25	101,81	0,217	0,215	90	0,276382
17,920	545,4	545,9	98,89	101,29	0,217	0,215	91	0,2776787
18,090	545,4	546,0	97,74	100,23	0,217	0,215	92	0,2805374
17,846	545,4	546,0	99,09	101,60	0,217	0,215	93	0,2767997
17,919	545,4	546,0	98,56	101,02	0,217	0,215	94	0,278019
18,072	545,4	546,0	97,84	100,35	0,217	0,215	95	0,2802579
17,983	545,5	546,1	98,25	100,68	0,217	0,215	96	0,2789713
17,793	545,5	546,1	99,27	101,76	0,217	0,215	97	0,276056
17,872	545,6	546,1	98,86	101,36	0,217	0,215	98	0,2772244
18,009	545,6	546,2	98,11	100,62	0,217	0,215	99	0,2793397
17,833	545,6	546,2	98,97	101,48	0,217	0,215	100	0,2767541
17,886	545,6	546,2	98,55	101,05	0,217	0,215	101	0,277673
18,063	545,6	546,2	97,51	100,01	0,217	0,215	102	0,280625
18,038	545,6	546,2	97,59	100,04	0,217	0,215	103	0,2802586
17,797	545,6	546,2	99,00	101,55	0,217	0,215	104	0,2763839
17,902	545,6	546,2	98,43	100,86	0,217	0,215	105	0,2780503
17,987	545,6	546,2	97,80	100,33	0,217	0,215	106	0,2795501
17,811	545,6	546,2	98,91	101,38	0,217	0,215	107	0,2767559
17,898	545,7	546,3	98,39	100,83	0,217	0,215	108	0,2780521
17,970	545,7	546,3	97,90	100,35	0,217	0,215	109	0,2792702
17,862	545,8	546,3	98,45	100,97	0,217	0,215	110	0,2776819
17,887	545,8	546,3	98,23	100,75	0,217	0,215	111	0,2780526
17,834	545,8	546,4	98,68	101,12	0,217	0,215	112	0,2771257
18,112	545,8	546,4	97,08	99,55	0,217	0,215	113	0,2815682
17,810	545,8	546,4	98,78	101,26	0,217	0,215	114	0,2767566
17,836	545,9	546,4	98,68	101,15	0,217	0,215	115	0,2771268
18,110	545,9	546,5	97,07	99,56	0,217	0,215	116	0,2815395

18,113	545,9	546,5	97,03	99,48	0,217	0,215	117	0,2815403
18,086	545,9	546,5	97,20	99,60	0,217	0,215	118	0,281165
17,774	545,9	546,5	98,83	101,29	0,217	0,215	119	0,2763854
18,224	546,0	546,6	96,37	98,82	0,217	0,215	120	0,2833583
17,965	546,0	546,6	97,80	100,25	0,217	0,215	121	0,2793411
17,850	546,0	546,6	98,29	100,76	0,217	0,215	122	0,2776831
18,134	546,1	546,7	96,79	99,19	0,217	0,215	123	0,282087
17,856	546,1	546,7	98,35	100,86	0,217	0,215	124	0,2776831
18,101	546,1	546,7	96,95	99,38	0,217	0,215	125	0,2815405
17,880	546,1	546,7	98,15	100,64	0,217	0,215	126	0,2780535
18,013	546,1	546,7	97,30	99,80	0,217	0,215	127	0,280261
17,852	546,1	546,7	98,29	100,74	0,217	0,215	128	0,27769
18,038	546,1	546,8	97,27	99,69	0,217	0,215	129	0,2806275
17,956	546,2	546,8	97,72	100,15	0,217	0,215	130	0,2793425
17,960	546,2	546,8	97,71	100,15	0,217	0,215	131	0,2793443
18,036	546,2	546,8	97,18	99,65	0,217	0,215	132	0,2806278
18,130	546,2	546,8	96,74	99,13	0,217	0,215	133	0,2820882
17,922	546,2	546,8	97,73	100,21	0,217	0,215	134	0,2789759
18,009	546,3	546,8	97,27	99,78	0,217	0,215	135	0,2802615
17,804	546,3	546,9	98,41	100,84	0,217	0,215	136	0,2771453
18,062	546,3	546,9	96,96	99,45	0,217	0,215	137	0,2811766
17,944	546,3	546,9	97,63	100,21	0,217	0,215	138	0,2792075
17,955	546,3	546,9	97,67	100,10	0,217	0,215	139	0,2793323
17,930	546,4	547,0	97,75	100,31	0,217	0,215	140	0,2789228
18,067	546,4	547,0	97,00	99,42	0,217	0,215	141	0,2811782
18,049	546,4	547,0	97,22	99,63	0,217	0,215	142	0,2807119
18,021	546,5	547,0	97,33	99,82	0,217	0,215	143	0,2803152
18,032	546,5	547,1	97,16	99,58	0,217	0,215	144	0,2806292
18,086	546,5	547,1	96,80	99,23	0,217	0,215	145	0,2815423
18,086	546,5	547,1	96,95	99,41	0,217	0,215	146	0,2813735
18,069	546,6	547,2	96,99	99,39	0,217	0,215	147	0,2811595
17,786	546,6	547,1	98,45	101,02	0,217	0,215	148	0,2767595
18,097	546,6	547,2	96,87	99,31	0,217	0,215	149	0,2815426
17,849	546,6	547,2	98,14	100,65	0,217	0,215	150	0,2776854
18,126	546,6	547,2	96,63	99,04	0,217	0,214	151	0,2820903
18,076	546,7	547,3	96,92	99,40	0,217	0,214	152	0,2811784
17,700	546,7	547,3	98,96	101,41	0,217	0,214	153	0,2754581
18,007	546,7	547,3	97,28	99,72	0,217	0,214	154	0,2801805
17,945	546,7	547,3	97,60	100,09	0,217	0,214	155	0,2791864
17,982	546,7	547,3	97,34	99,78	0,217	0,214	156	0,279897
18,098	546,8	547,3	96,85	99,23	0,217	0,214	157	0,2815435
17,849	546,8	547,3	98,13	100,62	0,217	0,214	158	0,2776863
17,627	546,8	547,4	99,52	101,99	0,217	0,214	159	0,2740837
17,810	546,8	547,4	98,27	100,79	0,217	0,214	160	0,2771302
18,099	546,9	547,4	96,70	99,19	0,217	0,214	161	0,2816142
18,140	546,9	547,4	96,60	99,05	0,217	0,214	162	0,2820905
17,831	546,9	547,4	98,18	100,75	0,217	0,214	163	0,2774434
18,140	546,9	547,5	96,63	99,07	0,217	0,214	164	0,2820912
17,995	547,0	547,5	97,36	99,82	0,217	0,214	165	0,2798975
17,769	547,0	547,5	98,54	101,08	0,217	0,214	166	0,2763889
17,960	547,0	547,6	97,51	100,08	0,217	0,214	167	0,2793469
17,939	547,0	547,6	97,64	100,15	0,217	0,214	168	0,2789758
17,991	547,0	547,6	97,28	99,78	0,217	0,214	169	0,2798987
17,938	547,0	547,6	97,61	100,12	0,216	0,214	170	0,2789986
18,043	547,1	547,7	97,08	99,53	0,217	0,214	171	0,2806314
18,100	547,1	547,7	96,74	99,18	0,217	0,214	172	0,2815567
18,162	547,2	547,7	96,41	98,92	0,216	0,214	173	0,2824553
18,136	547,2	547,8	96,52	98,99	0,216	0,214	174	0,2820915
18,029	547,2	547,8	97,22	99,69	0,216	0,214	175	0,2802656
18,020	547,3	547,8	97,20	99,63	0,216	0,214	176	0,2802653
17,828	547,3	547,9	98,29	100,89	0,216	0,214	177	0,2771321

17,927	547,3	547,9	97,52	100,03	0,216	0,214	178	0,2789796
17,858	547,3	547,9	98,05	100,56	0,216	0,214	179	0,2776872
18,001	547,4	547,9	97,28	99,77	0,216	0,214	180	0,2798967
18,049	547,4	548,0	97,06	99,51	0,216	0,214	181	0,2806317
17,819	547,4	548,0	98,22	100,66	0,216	0,214	182	0,2771338
18,036	547,4	548,0	97,00	99,43	0,216	0,214	183	0,28063
18,017	547,4	548,0	97,13	99,59	0,216	0,214	184	0,2802658
17,964	547,4	548,0	97,44	99,94	0,216	0,214	185	0,2793473
17,726	547,5	548,0	98,61	101,14	0,216	0,214	186	0,275834
17,955	547,5	548,1	97,38	99,88	0,216	0,214	187	0,2793486
18,017	547,5	548,1	97,12	99,61	0,216	0,214	188	0,2802126
17,936	547,5	548,1	97,61	100,04	0,216	0,214	189	0,2789803

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,99	101,50	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	**Proportional Rates**		Vol.Std.	Vol.Std.		Delta-P
			PR1	**PR2**			Time	
Ft/Sec	Deg. R	Deg. R	**%**	**%**	(ft3)	(ft3)	min	(in H2O)2
17,523	544,9	545,9			0,218	0,216	0	0,2653848
17,609	545,2	546,0	101,50	104,08	0,218	0,216	1	0,2640275
17,448	545,4	546,1	100,75	103,38	0,218	0,216	2	0,2636948
17,516	545,4	546,1	100,12	102,67	0,218	0,216	3	0,2649983
17,431	545,4	546,1	100,44	102,94	0,218	0,216	4	0,2640046
17,440	545,4	546,2	100,43	103,02	0,218	0,216	5	0,2640272
17,481	545,3	546,2	100,22	102,76	0,218	0,216	6	0,26461
17,390	545,4	546,2	100,71	103,28	0,218	0,216	7	0,2632477
17,562	545,4	546,2	99,65	102,17	0,218	0,216	8	0,2659658
17,495	545,4	546,2	100,00	102,45	0,218	0,216	9	0,2649973
17,469	545,4	546,2	100,13	102,60	0,218	0,215	10	0,264611
17,554	545,4	546,3	99,59	102,02	0,218	0,215	11	0,2659658
17,436	545,5	546,3	100,35	102,92	0,218	0,216	12	0,2640287
17,482	545,6	546,3	100,12	102,64	0,218	0,216	13	0,2646113
17,461	545,7	546,4	100,39	102,90	0,218	0,215	14	0,2640276
17,511	545,8	546,4	100,09	102,65	0,218	0,215	15	0,2647824
17,527	545,8	546,5	100,00	102,56	0,218	0,215	16	0,2650071
17,462	546,0	546,6	100,35	102,93	0,218	0,215	17	0,2640289
17,574	546,0	546,7	99,70	102,23	0,218	0,215	18	0,2657547
17,302	546,1	546,7	101,18	103,77	0,218	0,215	19	0,2617183
17,296	546,1	546,7	101,16	103,74	0,217	0,215	20	0,261692
17,526	546,1	546,8	99,95	102,42	0,217	0,215	21	0,2650028
17,687	546,2	546,8	99,13	101,66	0,217	0,215	22	0,2673094
17,427	546,2	546,9	100,69	103,22	0,217	0,215	23	0,2632502
17,625	546,3	546,9	99,62	102,11	0,217	0,215	24	0,2661414
17,503	546,3	547,0	100,11	102,59	0,217	0,215	25	0,2645701
17,716	546,4	547,0	99,23	101,69	0,217	0,215	26	0,2673136
17,475	546,4	547,1	100,25	102,88	0,217	0,215	27	0,2640285
17,335	546,5	547,1	101,22	103,78	0,217	0,215	28	0,2617355
17,609	546,6	547,2	99,53	102,09	0,217	0,215	29	0,2659612
17,557	546,7	547,3	99,88	102,41	0,217	0,215	30	0,265083
17,383	546,8	547,4	101,02	103,59	0,217	0,215	31	0,2622732
17,340	546,8	547,4	101,23	103,87	0,217	0,215	32	0,261685
17,565	546,9	547,5	99,95	102,52	0,217	0,215	33	0,264999
17,469	546,9	547,5	100,50	103,02	0,217	0,215	34	0,263611
17,531	547,0	547,6	100,04	102,59	0,217	0,215	35	0,2646131
17,372	547,0	547,7	100,95	103,45	0,217	0,215	36	0,2622735
17,443	547,1	547,8	100,24	102,80	0,217	0,215	37	0,2636417
17,581	547,2	547,8	99,74	102,26	0,217	0,215	38	0,2653643
17,538	547,3	547,9	99,75	102,31	0,217	0,215	39	0,2649985
17,334	547,3	547,9	101,08	103,67	0,217	0,215	40	0,2616844
17,435	547,3	548,0	100,22	102,81	0,217	0,215	41	0,2635713
17,282	547,4	548,0	101,06	103,65	0,217	0,215	42	0,2612933
17,434	547,4	548,0	100,12	102,68	0,217	0,215	43	0,2636702
17,460	547,3	548,0	99,56	102,10	0,217	0,215	44	0,2646114
17,362	547,4	548,0	100,03	102,58	0,217	0,215	45	0,2632499
17,524	547,4	548,0	99,34	101,87	0,217	0,215	46	0,2653869
17,300	547,4	548,1	100,41	102,97	0,217	0,215	47	0,2622735
17,491	547,4	548,1	99,14	101,68	0,217	0,215	48	0,2653868
17,240	547,4	548,1	100,50	103,05	0,217	0,215	49	0,2616856
17,388	547,4	548,1	99,62	102,05	0,217	0,214	50	0,2640279
17,504	547,4	548,1	98,78	101,31	0,217	0,214	51	0,2659662
17,449	547,4	548,1	98,87	101,37	0,217	0,215	52	0,2654391
17,582	547,4	548,1	98,23	100,67	0,217	0,214	53	0,267314
17,357	547,4	548,1	99,43	101,94	0,217	0,214	54	0,2640282
17,566	547,5	548,0	98,16	100,62	0,217	0,215	55	0,2672796

17,472	547,5	548,0	98,60	101,13	0,217	0,215	56	0,2659667
17,575	547,4	548,0	97,94	100,34	0,217	0,214	57	0,2677007
17,536	547,4	548,0	97,93	100,45	0,217	0,214	58	0,2673144
17,305	547,4	547,9	99,40	101,96	0,217	0,215	59	0,2636409
17,564	547,3	547,9	97,86	100,28	0,217	0,215	60	0,2676985
17,416	547,3	547,9	98,57	101,09	0,217	0,215	61	0,2656133
17,558	547,3	547,9	97,82	100,32	0,217	0,215	62	0,2677253
17,449	547,2	547,9	98,22	100,65	0,217	0,215	63	0,2663531
17,539	547,2	547,9	97,74	100,23	0,217	0,215	64	0,2676988
17,312	547,2	547,9	98,74	101,26	0,217	0,215	65	0,264613
17,551	547,2	547,9	97,38	99,78	0,217	0,215	66	0,2682939
17,441	547,2	547,9	97,76	100,16	0,217	0,214	67	0,266931
17,492	547,2	547,9	97,45	99,85	0,217	0,214	68	0,2677395
17,254	547,2	547,9	98,85	101,35	0,217	0,215	69	0,2640321
17,447	547,2	547,8	97,79	100,29	0,217	0,215	70	0,2669313
17,389	547,2	547,8	97,87	100,33	0,217	0,215	71	0,2663855
17,364	547,1	547,8	98,13	100,63	0,217	0,215	72	0,265851
17,563	547,1	547,8	96,91	99,39	0,217	0,215	73	0,2690394
17,503	547,1	547,8	97,07	99,62	0,217	0,215	74	0,2682751
17,528	547,1	547,7	96,99	99,48	0,217	0,215	75	0,2686564
17,521	547,1	547,7	97,02	99,36	0,217	0,215	76	0,268657
17,435	547,1	547,7	97,51	99,94	0,217	0,215	77	0,2673151
17,404	547,1	547,7	97,57	100,04	0,217	0,215	78	0,2669315
17,278	547,0	547,7	98,29	100,71	0,217	0,215	79	0,2650016
17,508	547,1	547,7	96,90	99,39	0,217	0,215	80	0,2686572
17,332	547,0	547,7	97,88	100,30	0,217	0,215	81	0,2659686
17,442	547,0	547,7	97,22	99,70	0,217	0,215	82	0,2676983
17,277	547,0	547,6	98,00	100,51	0,217	0,215	83	0,2653888
17,494	547,0	547,6	96,85	99,32	0,217	0,215	84	0,2686569
17,258	547,0	547,6	98,17	100,70	0,217	0,215	85	0,2650014
17,513	547,0	547,6	96,65	99,14	0,217	0,215	86	0,26904
17,511	547,0	547,5	96,70	99,16	0,217	0,215	87	0,2690399
17,320	546,9	547,5	97,84	100,30	0,217	0,215	88	0,2660201
17,455	546,9	547,5	96,90	99,32	0,217	0,215	89	0,2682754
17,395	546,9	547,5	97,26	99,76	0,217	0,215	90	0,2673162
17,754	546,9	547,5	95,30	97,75	0,217	0,215	91	0,2728303
17,387	546,9	547,5	97,22	99,72	0,217	0,215	92	0,2673141
17,396	546,9	547,5	97,27	99,71	0,217	0,215	93	0,2673163
17,498	546,9	547,5	96,68	99,12	0,217	0,215	94	0,268931
17,566	546,9	547,5	96,25	98,72	0,217	0,215	95	0,2700394
17,417	546,9	547,5	97,09	99,59	0,217	0,215	96	0,2677269
17,268	546,9	547,5	97,96	100,49	0,217	0,215	97	0,2653901

APPENDIX 3: Calibration data

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA PACKAGE

CLIENT	Hearthstone	PROJECT NUMBER	PI-20202
PRODUCT	Wood stove	SAMPLE ID#	QI_20303
MODEL	8151 SILA		
STANDARDS	EPA method 28R		

TEST EQUIPMENT

ITEM	EQUIPMENT TYPE	MANUFACTURER	EQUIPMENT #	CALIBRATION DUE DATE	COMPLIES WITH STANDARD REQUIREMENTS
10	Calibration block	Delmhorst	EM-191	2019-December	Y
11	Digital Manometer	Dwyer	EM-006	2020-March	Y
12	Digital Manometer	Dwyer	EM-249	2020-March	Y
13	Data aquisition System	Keithley	EM-147	2019 sept	Y
14	analytical scale 200gr.	Ohaus	EM-232	2019-November	Y
15	Weight 2kg	na	EM-090	2023-January	Y
16	Pitot tube	Dwyer	EM-111	Verification before use	Y
17	Scale 0-1000lbs Rough Deck	Rice lake	EM-114	2019-september	Y
18	Gas analyzer	Siemen's	EM-118	Verification before use	Y
19	Vacuum gauge	Dwyer	EM-126	2020-March	Y
20	Vacuum gauge	Dwyer	EM-127	2020-March	Y
21	Calibration weight 100mg	Troemer	EM-128	2023-January	y
22	Calibration weight 200g	Troemer	EM-129	2023-January	Y
23	Reference Dry gas meter	American meter	EM-130	2019-November	Y
24	Temperature humidity meter	Fluke	EM-136	2020-March	Y
25	Digital weight indicator	Rice lake	EM-137	2019-september	Y
26	Vane anemometer	Omega	EM-153	2019-August	Y
27	Measuring tape	Stanley	EM-224	2020-March	Y
28	Chronometer	Extech	EM-175	2019-December	Y
29	Dry gas meter	Shinagwa corporation	EM-178	2019-december	Y
30	Dry gas meter	Shinagwa corporation	EM-179	2019-december	Y
31	Calibrabration gas	Praxair	EM-275	2020-October	Y
32	Calibrabration gas	Praxair	EM-276	2020-October	Y
33	Thermometer	Fluke	EM-001	2020-March	Y
34	20 channel cards	Keithley	EM-015	2019 September	Y
35	20 channel cards	Keithley	EM-154	2019 September	Y
36	Barometer	Control Company	EM-304	2020 January	y

Instrumentation Saint•Laurent inc.
Certified ISO 17025

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

CALIBRATION CERTIFICATE

Certificate #: CE-EM-015 05/03/19

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Precision:	+\- 2°C
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	**Machine #:**	N.A.

CALIBRATOR SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2019000879
Serial #:	7798010	**Certification Date:**	2019-02-07
Certified by:	Alpha Controls	**Next Certification:**	2020-02-07
Comments:			

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Initial Deviation	Final Value	Uncertainty	Comment
-190.0 °C	-190.0 °C	-190.7 °C	°C	-190.7 °C	1.0 °C	Input#1TypeK
0.0 °C	0.0 °C	-0.3 °C	°C	-0.3 °C	1.0 °C	Input#1TypeK
750.0 °C	750.0 °C	749.8 °C	°C	749.8 °C	1.0 °C	Input#1TypeK
100.0 °C	100.0 °C	99.7 °C	°C	99.7 °C	1.0 °C	Input#2 TypeK
100.0 °C	100.0 °C	99.7 °C	°C	99.7 °C	1.0 °C	Input#3 TypeK
100.0 °C	100.0 °C	99.7 °C	°C	99.7 °C	1.0 °C	Input#4 TypeK
100.0 °C	100.0 °C	99.7 °C	°C	99.7 °C	1.0 °C	Input#5TypeK
100.0 °C	100.0 °C	99.8 °C	°C	99.8 °C	1.0 °C	Input#6TypeK
100.0 °C	100.0 °C	99.9 °C	°C	99.9 °C	1.0 °C	Input#7TypeK
100.0 °C	100.0 °C	99.8 °C	°C	99.8 °C	1.0 °C	Input#8TypeK
100.0 °C	100.0 °C	99.8 °C	°C	99.8 °C	1.0 °C	Input#9TypeK
100.0 °C	100.0 °C	99.9 °C	°C	99.9 °C	1.0 °C	Input#10TypeJ
100.0 °C	100.0 °C	99.8 °C	°C	99.8 °C	1.0 °C	Input#11TypeJ
100.0 °C	100.0 °C	99.9 °C	°C	99.9 °C	1.0 °C	Input#12TypeJ
100.0 °C	100.0 °C	99.9 °C	°C	99.9 °C	1.0 °C	Input#13 TypeJ
100.0 °C	100.0 °C	99.9 °C	°C	99.9 °C	1.0 °C	Input#14TypeJ
100.0 °C	100.0 °C	100.0 °C	°C	100.0 °C	1.0 °C	Input#15 TypeJ
100.0 °C	100.0 °C	99.9 °C	°C	99.9 °C	1.0 °C	Input#16TypeJ
100.0 °C	100.0 °C	100.0 °C	°C	100.0 °C	1.0 °C	Input#17TypeJ
100.0 °C	100.0 °C	99.9 °C	°C	99.9 °C	1.0 °C	Input#18TypeJ
100.0 °C	100.0 °C	100.0 °C	°C	100.0 °C	1.0 °C	Input#19TypeJ
100.0 °C	100.0 °C	100.1 °C	°C	100.1 °C	1.0 °C	Input#20TypeJ
12.000 mA	12.000 mA	12.003 mA	mA	12.003 mA	1.00 mA	Input#21
12.000 mA	12.000 mA	12.003 mA	mA	12.003 mA	1.00 mA	Input#22

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Instrumentation Saint•Laurent inc.
Certified ISO 17025

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

CALIBRATION CERTIFICATE

Certificate #: CE-EM-015 05/03/19

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Precision:	+\- 2°C
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	**Machine #:**	N.A.

CALIBRATION RESULTS

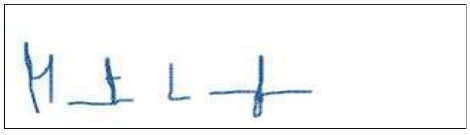
Entry Source	Given Value	Initial Value	Initial Deviation	Final Value	Uncertainty	Comment
Environmental Conditions:		Temperature:	19 °C		Humidity:	20 %RH
Comments:	Test avec EM-147					

Instrumentation Inc., St. Laurent. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 and the standards used to perform the calibration is traceable to NRC and / or NIST. The uncertainty is based on a confidence level = 95%, K = 2.

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2019-03-05
Next Calibration:	2020-03-05
Certificate Date:	2019-03-05

CALIBRATION CONFORMITY		
	Before	**After**
Compliant:	X	X
Non Compliant:		

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



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Instrumentation Saint•Laurent inc.
Certified ISO 17025

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

CALIBRATION CERTIFICATE

Certificate #: CE-EM-154 05/03/19

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Precision:	+\- 2°C
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	**Machine #:**	N.A.

CALIBRATOR SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2019000879
Serial #:	7798010	**Certification Date:**	2019-02-07
Certified by:	Alpha Controls	**Next Certification:**	2020-02-07
Comments:			

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Initial Deviation	Final Value	Uncertainty	Comment
-17.000 mV	-17.000 mV	-17.011 mV	mV	-17.011 mV	0.1 mV	Input#1
0.000 mV	0.000 mV	0.055 mV	mV	0.055 mV	0.1 mV	Input#1
20.000 mV	20.000 mV	19.931 mV	mV	19.931 mV	0.1 mV	Input#1
30.000 mV	30.000 mV	30.006 mV	mV	30.006 mV	0.1 mV	Input#2
Input#3 Non-Conforme						
5.000 V.DC.	5.000 V.DC.	4.999 V.DC.	V.DC.	4.999 V.DC.	0.1 V.DC.	Input#4
30.000 mV	30.000 mV	29.990 mV	mV	29.990 mV	0.1 mV	Input#5
30.000 mV	30.000 mV	30.031 mV	mV	30.031 mV	0.1 mV	Input#6
100.00 Ohms	100.00 Ohms	99.99 Ohms	Ohms	99.99 Ohms	1.0 Ohms	Input#7
100.00 Ohms	100.00 Ohms	99.98 Ohms	Ohms	99.98 Ohms	1.0 Ohms	Input#8
100.00 Ohms	100.00 Ohms	100.02 Ohms	Ohms	100.02 Ohms	1.0 Ohms	Input#9
100.00 Ohms	100.00 Ohms	99.98 Ohms	Ohms	99.98 Ohms	1.0 Ohms	Input#10
100.0 °C	100.0 °C	99.7 °C	°C	99.7 °C	1.0 °C	Input#11TypeT
100.0 °C	100.0 °C	99.7 °C	°C	99.7 °C	1.0 °C	Input#12TypeT
100.0 °C	100.0 °C	99.8 °C	°C	99.8 °C	1.0 °C	Input#13 TypeJ
100.0 °C	100.0 °C	99.8 °C	°C	99.8 °C	1.0 °C	Input#14TypeJ
100.0 °C	100.0 °C	99.8 °C	°C	99.8 °C	1.0 °C	Input#15 TypeJ
100.0 °C	100.0 °C	99.7 °C	°C	99.7 °C	1.0 °C	Input#16TypeJ
100.00 Ohms	100.00 Ohms	99.98 Ohms	Ohms	99.98 Ohms	1.0 Ohms	Input#17
100.00 Ohms	100.00 Ohms	99.99 Ohms	Ohms	99.99 Ohms	1.0 Ohms	Input#18
100.00 Ohms	100.00 Ohms	99.99 Ohms	Ohms	99.99 Ohms	1.0 Ohms	Input#19
100.00 Ohms	100.00 Ohms	99.96 Ohms	Ohms	99.96 Ohms	1.0 Ohms	Input#20
12.000 mA	12.000 mA	12.003 mA	mA	12.003 mA	1.00 mA	Input#21
12.000 mA	12.000 mA	12.003 mA	mA	12.003 mA	1.00 mA	Input#22

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Instrumentation Saint•Laurent inc.
Certified ISO 17025

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

CALIBRATION CERTIFICATE

Certificate #: CE-EM-154 05/03/19

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Precision:	+\- 2°C
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	**Machine #:**	N.A.

CALIBRATION RESULTS

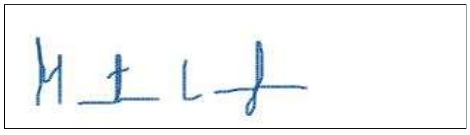
Entry Source	Given Value	Initial Value	Initial Deviation	Final Value	Uncertainty	Comment
Environmental Conditions:		Temperature: 19 °C		Humidity: 20 %RH		
Comments:	Test avec EM-147					

Instrumentation Inc., St. Laurent. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 and the standards used to perform the calibration is traceable to NRC and / or NIST. The uncertainty is based on a confidence level = 95%, K = 2.

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2019-03-05
Next Calibration:	2020-03-05
Certificate Date:	2019-03-05

CALIBRATION CONFORMITY		
	Before	**After**
Compliant:	X	X
Non Compliant:		

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



Martin Langlais - Technicien

5F09101

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005

CERTIFICAT D'ÉTALONNAGE # 9786

Date d'étalonnage : 2018-11-12
Date d'émission du certificat : 2018-11-12

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

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

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols qui est conforme à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2015 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

TRAÇABILITÉ

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

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

APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC

Les références utilisées pour l'étalonnage de débit ont une incertitude de ±0.2% de la lecture pour les mesures entre 5 SCCM à 10 SLPM, ±0.3% de la lecture pour les mesures entre 10 SLPM à 30 SLPM, ±0.2% de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, ±0.3% de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et ±0.5% pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement k = 2, et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale incluant la résolution de l'instrument. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
	Lectures Initiales = Lectures finales, aucun ajustement
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 12 mois

Métrologiste

Responsable du laboratoire

2018-11-22

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS NRC·CNRC CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005 CERTIFICATION

Certificat d'étalonnage # 9786

Numéro de série:	99A274209	Station de mesure:	3
Date d'étalonnage:	2018-11-12	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-130		

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2403	1500237464	2019-04-26
DHI molbloc (100 slpm)	2E2-S	380	1500241926	2019-07-19
DHI molbox1	Molbox1	755	1500237197	2019-04-25
RTD Mist	M22	2208102	2018002234	2019-04-11
Module 44.5 PSI avec Baro 163671	Module 30	160659	2018002180	2019-04-12

Spécifications finales de l'appareil

Gaz	Air
Température d'opération	
Pression à l'entrée	
Pression à la sortie	
Température de référence	
Pression de référence	
Étendue d'échelle	0-200 ACFH
Signaux Entrée/Sortie	-
Alimentation	
Tolérance	±1 %O.R.

Condition d'étalonnage

Gaz	Air
Température ambiante	21.5 °C
Pression ambiante	1026.07 mbar
Orientation	Verticale
Élastomère	Viton
Valve	Viton

Lectures finales

Débit du test ACFH	Instrument en test ft³	Valeurs mesurées Pression PSIA	Température °C	Référence ft³	Référence calculée ft³	Erreur calculée ft³	Tolérance acceptable ft³	TUR
39.5798	6.610	14.8845	21.17	6.674	6.590	0.020	0.066	2.97
70.0656	11.700	14.9044	21.05	11.845	11.677	0.023	0.117	>4
164.1928	27.340	15.0230	20.96	27.959	27.336	0.004	0.273	>4

Bernard Poirier
Métrologiste

B Poirier
Signature

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS 2009-02

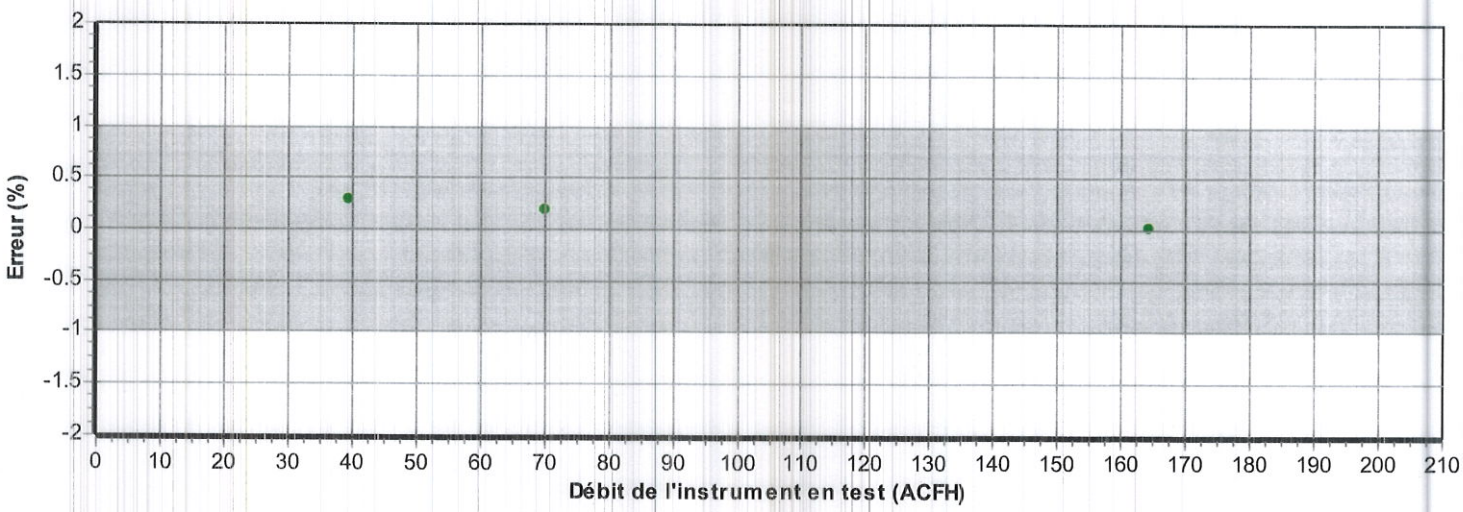
Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005

Certificat d'étalonnage # 9786

Numéro de série:	99A274209	Station de mesure:	3
Date d'étalonnage:	2018-11-12	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-130		

Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC

Bernard Poirier
Métrologiste

Signature

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS NRC·CNRC
CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005 CERTIFICATION

CERTIFICAT D'ÉTALONNAGE # 10723

Date d'étalonnage : 2019-06-03
Date d'émission du certificat : 2019-06-03

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

Étalonnage d'un
Shinigawa DCDa-2c S/N : 23544

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols qui est conforme à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2015 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

TRAÇABILITÉ

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

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

APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC

Les références utilisées pour l'étalonnage de débit ont une incertitude de ±0.2% de la lecture pour les mesures entre 5 SCCM à 10 SLPM, ±0.3% de la lecture pour les mesures entre 10 SLPM à 30 SLPM, ±0.2% de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, ±0.3% de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et ±0.5% pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement k = 2, et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale incluant la résolution de l'instrument. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
	En condiséderant le coefficeient de correction de 0.98 inscrit sur l'instrument
	Lectures initiales = Lectures finales, aucun ajustement
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 12 mois
	Valeur de l'instrument corrigée = Lecture de l'indicateur de l'instrument * 0.98 K facteur

Métrologiste

Responsable du laboratoire

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS NRC·CRC CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005 CERTIFICATION

Certificat d'étalonnage # 10723

Numéro de série:	23544	Station de mesure:	3
Date d'étalonnage:	2019-06-03	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-178		

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2359	1500254646	2020-02-07
DHI molbox1	Molbox1	881	1500241278	2019-07-03
RTD Mist	M22	2208102	2019002616	2020-04-15
Module 44.5 PSI avec Baro 163671	Module 30	160659	2019002630	2020-04-24

Spécifications finales de l'appareil

Gaz	Air
Température d'opération	
Pression à l'entrée	
Pression à la sortie	
Température de référence	
Pression de référence	
Étendue d'échelle	10-2000 ALH
Signaux Entrée/Sortie	-
Alimentation	
Tolérance	±2 %O.R.

Condition d'étalonnage

Gaz	Air
Température ambiante	24 °C
Pression ambiante	1008.25 mbar
Orientation	Horizontale
Élastomère	Viton
Valve	

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées Pression PSIA	Température °C	Référence L	Référence calculée L	Erreur calculée L	Tolérance acceptable L	TUR
404.0576	67.1700	14.6423	24.02	66.2238	67.1255	0.0445	1.3425	>4
707.5637	117.9800	14.6461	23.94	116.0223	117.5388	0.4412	2.3508	>4
1864.2997	309.3860	14.6636	23.94	306.6859	310.3305	-0.9445	6.2066	>4

F_c 0,99934

3 juin 2019

Bernard Poirier
Métrologiste

Signature

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS 2009-02

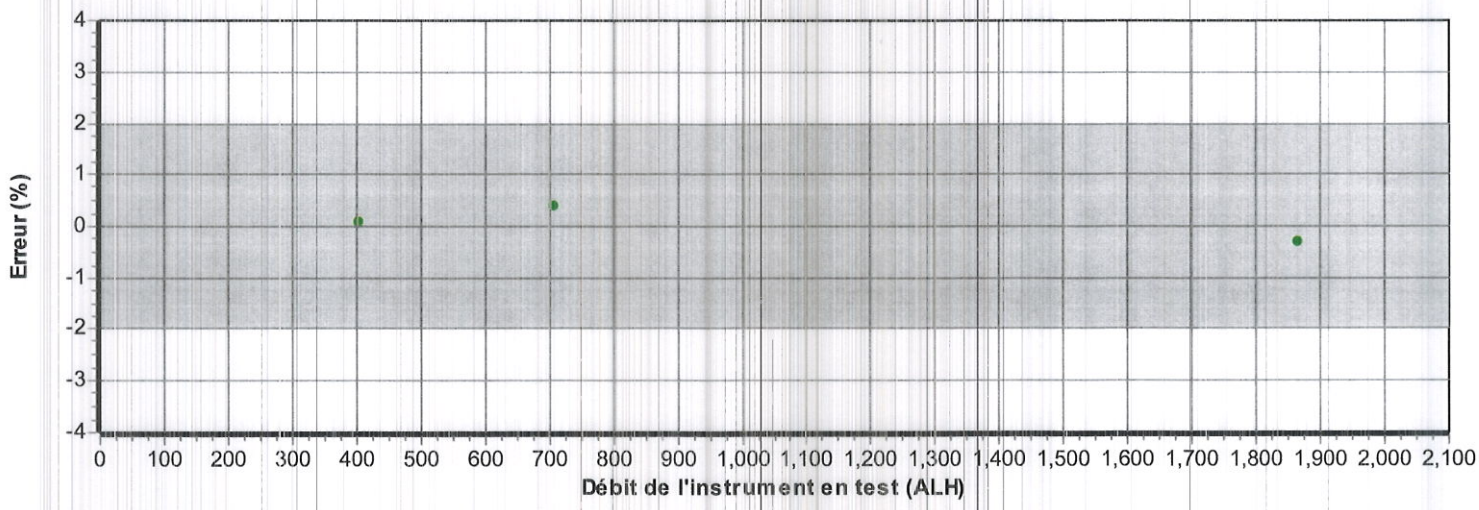
Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005 CERTIFICATION

Certificat d'étalonnage # 10723

Numéro de série:	23544	Station de mesure:	3
Date d'étalonnage:	2019-06-03	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-178		

Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC

Bernard Poirier
Métrologiste

Signature

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005 CERTIFICATION

CERTIFICAT D'ÉTALONNAGE # 10722

Date d'étalonnage : 2019-06-03
Date d'émission du certificat : 2019-06-03

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

Étalonnage d'un
Shinigawa DCDa-2c S/N : 23543

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols qui est conforme à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2015 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

TRAÇABILITÉ

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

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

APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC

Les références utilisées pour l'étalonnage de débit ont une incertitude de ±0.2% de la lecture pour les mesures entre 5 SCCM à 10 SLPM, ±0.3% de la lecture pour les mesures entre 10 SLPM à 30 SLPM, ±0.2% de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, ±0.3% de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et ±0.5% pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement k = 2, et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale incluant la résolution de l'instrument. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
	Lectures Initiales = Lectures finales, aucun ajustement
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 12 mois

Métrologiste

Responsable du laboratoire

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS NRC·CNRC CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005 CERTIFICATION

Certificat d'étalonnage # 10722

Numéro de série:	23543	Station de mesure:	3
Date d'étalonnage:	2019-06-03	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-179		

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2359	1500254646	2020-02-07
DHI molbox1	Molbox1	881	1500241278	2019-07-03
RTD Mist	M22	2208102	2019002616	2020-04-15
Module 44.5 PSI avec Baro 163671	Module 30	160659	2019002630	2020-04-24

Spécifications finales de l'appareil

Gaz	Air
Température d'opération	
Pression à l'entrée	
Pression à la sortie	
Température de référence	
Pression de référence	
Étendue d'échelle	10-2000 ALH
Signaux Entrée/Sortie	-
Alimentation	
Tolérance	±2 %O.R.

Condition d'étalonnage

Gaz	Air
Température ambiante	24 °C
Pression ambiante	1007.02 mbar
Orientation	Horizontale
Élastomère	Viton
Valve	

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées Pression PSIA	Température °C	Référence L	Référence calculée L	Erreur calculée L	Tolérance acceptable L	TUR
403.8216	67.8900	14.6213	24.40	66.1384	67.2209	0.6691	1.3444	>4
711.8065	120.0600	14.6304	24.27	116.6972	118.4813	1.5787	2.3696	>4
1938.4489	324.6100	14.6587	24.14	318.5473	322.6538	1.9562	6.4531	>4

F_C : 0,990144

3 JUIN 2019

Bernard Poirier
Métrologiste

Signature

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS 2009-02

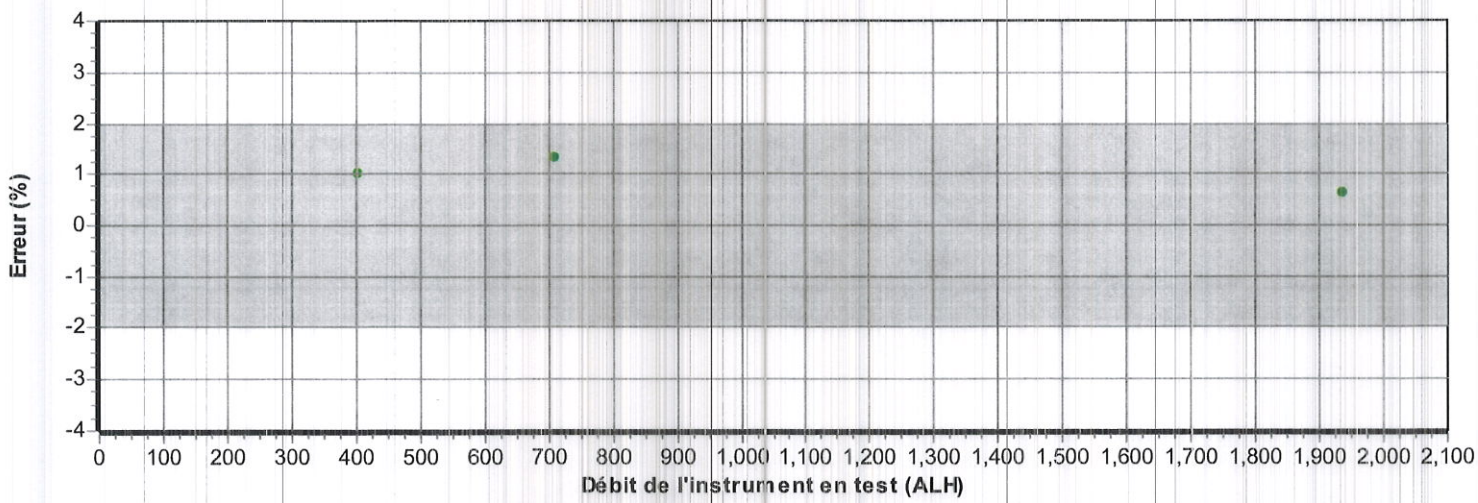
Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005

Certificat d'étalonnage # 10722

Numéro de série:	23543	Station de mesure:	3
Date d'étalonnage:	2019-06-03	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-179		

Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC

Bernard Poirier
Métrologiste

Signature

4407 rue Charleroi, Montréal-Nord (Québec) H1H 1T6 Canada
TEL.: (514) 329-3242 / 1 888 774-6665
FAX : (514) 329-3750
info.canada@trescal.com

Certificat d'Étalonnage / Certificate of Calibration

CLIENT :
SERVICES POLYTESTS INC.
695-B GAUDETTE
ST-JEAN-SUR-RICHELIEU, QUEBEC

Description: VÉRIFICATEUR D'HUMIDITÉ / MOISTURE METER
Fabricant/ Manufacturer: DELMHORST
Modèle/ Model : MCS-1 REFERENCE STANDARD
No série / Serial no : N/A
 # Inventaire / Asset # : **EM-191**

CERTIFICAT No / Certificate No: **254067**

PROCÉDURE / Procedure :
TRESCAL - DELMHORST_MCS-1 REFERENCE STANDARD

aaaa - mm - jj
Date étalonnage/ Calibration Performed : 2018-12-19

Echéance/ Due Date : 2019-12-19

Type de résultat / *Results type* : **As-Found = As-Left**

Résultats d'essais / *Test results* : Conforme / In Tolerance

Conditions de mesure / Measurement conditions

TEMPÉRATURE / Temp. : **23.2°C**

HUMIDITÉ / Humidity : **28% RH**

Usage restreint/ *Restricted use* : ☐

Réparation effectuée / *Repair performed* : ☐

Ajustement effectué / *Adjustment performed* : ☐

ÉTALONS UTILISÉS/ Standards Used:

Identification	Manuf.	Model	Description	Ser. #	Etalonné/ Cal.	Echéance/ Due
PR0661	FLUKE	8508A	REFERENCE MULTIMETER	389272208	2018-07-27	2019-07-27

Les spécifications mentionnées comme limites de tolérances d'essai sont celles établies par le manufacturier, sauf indication contraire.
Test tolerance limits are based on manufacturers specifications unless stated otherwise.

NOTES :

2019. 01. 07

Technicien :
Technician

V. KOSTADINOV

Le système qualité de la société est conforme aux exigences de la norme **ISO 17025** et les étalons utilisés pour le processus d'étalonnage sont retraçables au SI par l'entremise du CNRC et/ou du NIST.
*Our quality system complies with the requirements of **ISO 17025** and the standards used for the calibration are traceable to SI through NRC and/or NIST.*

ACCREDITATION 17025 ISO/IEC

Trescal

Certificat d'Étalonnage
Certificate of Calibration

	254067
CLIENT / Customer :	SERVICES POLYTESTS INC.
DESCRIPTION / Description :	VÉRIFICATEUR D'HUMIDITÉ / MOISTURE METER
MANUFACTURIER / Manufacturer :	DELMHORST
MODÈLE / Model :	MCS-1 REFERENCE STANDARD

DESCRIPTION Description		LIMITES Limits	LECTURES Readings	LIMITES Limits
DOUGLAS-FIR @ 80°F	**Nominal**			**Déviation** ***Mohms***
12 %	120 MOhms		115.1	4.9
22 %	1.10 MOhms		1.099	0.001

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS KRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-006 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+\-0.25"H2O
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	**Type d'entrée:**	Pression
Manufacturier:	Dwyer	**Type de sortie:**	Digitale
No. Model:	MS-321-LCD	**Type de mesure:**	Pression
No. Série:	E47U020014	**Gamme:**	0-0.5"H2O
Emplacement:	N.A.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	**No. du certificat d'étalonnage:**	2019001131
No. Série:	2784759	**Dernière date d'étalonnage:**	27-Feb-19
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	27-Feb-20
Commentaire:			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0000 "H2O	0.000 "H2O	0.000 "H2O	0.000 "H2O	0.000 "H2O	0.25 "H2O	Vérification indicateur
0.2500 "H2O	0.250 "H2O	0.249 "H2O	-0.001 "H2O	0.249 "H2O	0.25 "H2O	Vérification indicateur
0.5000 "H2O	0.500 "H2O	0.500 "H2O	0.000 "H2O	0.500 "H2O	0.25 "H2O	Vérification indicateur
0.7500 "H2O	0.750 "H2O	0.750 "H2O	0.000 "H2O	0.750 "H2O	0.25 "H2O	Vérification indicateur
1.0000 "H2O	1.000 "H2O	0.998 "H2O	-0.002 "H2O	0.998 "H2O	0.25 "H2O	Vérification indicateur
0.0000 "H2O	0.0000 V.DC.	0.0003 V.DC.	+0.0003 V.DC.	0.0003 V.DC.	0.5 V.DC.	Vérification sortie analogique
0.2500 "H2O	2.5000 V.DC.	2.4714 V.DC.	-0.0286 V.DC.	2.4714 V.DC.	0.5 V.DC.	Vérification sortie analogique
0.5000 "H2O	5.0000 V.DC.	5.0177 V.DC.	0.0177 V.DC.	5.0177 V.DC.	0.5 V.DC.	Vérification sortie analogique
0.7500 "H2O	7.5000 V.DC.	7.5058 V.DC.	0.0058 V.DC.	7.5058 V.DC.	0.5 V.DC.	Vérification sortie analogique
1.0000 "H2O	10.0000 V.DC.	9.9982 V.DC.	-0.0018 V.DC.	9.9982 V.DC.	0.5 V.DC.	Vérification sortie analogique

Conditions Environnementales: Température: 19 °C Humidité: 20 %RH

Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Mars 2019
Date du prochain Étalonnage:	6 Mars 2020
Date d'émission du certificat:	6 Mars 2019

CONFORMITÉ D'ÉTALONNAGE	Avant	Après
Conforme:	X	X
Non Conforme:		

2019-03-19

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

5F09106

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS
NRC CNRC
CLAS 2010-01

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

CERTIFICAT D'ÉTALONNAGE

Client :	Polytests	**No. du Certificat :**	**152-4BB901-181**
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	**Date d'étalonnage :**	09-01-2018

Technicien:
Simeonidis, Georgios

David Llorens, Responsable Qualité

DESCRIPTION DU SERVICE:

Description des masses :	ASTM E617	**Date d'approbation :**	09-01-2018
Classe de précision :	ASTM 6	**Date prochain étalonnage :**	09-01-2023
Densité :	7.95g/cm³	**Accrédtation CCN n. :**	668
Identification (si unique) :	EM-090	**Certification CLAS n. :**	2010-01

Condition d'essai :	Temp °C:	21.17	Pression kPa:	101.475	Humidité:	48.665

NOTES:

Pour l'étalonnage des masses, nous utilisons la procédure "Comparaison individuelle" PDL-09-MG-001 et la procédure "Détermination des incertitudes" PDL-09-MG-002. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.

REMARQUES:

11 JAN. 2018

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**152-4BB901-181**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	ASTM 6
		Date d'étalonnage :	09-01-2018
Masse :	2 kg	**Date du prochain étalonnage :**	09-01-2023

RÉSULTAT DE L'ÉTALONNAGE, MASSE CONVENTIONNELLE:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle	Masse conventionnelle après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
2 kg		EM-090	2.0001538 kg		200 mg	2.0 mg

S.P

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS
NRC CNRC
CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**152-4BB901-181**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	ASTM 6
		Date d'étalonnage :	09-01-2018
Masse :	2 kg	**Date du prochain étalonnage :**	09-01-2023

RÉSULTAT DE L'ÉTALONNAGE DES POIDS, CORRECTIONS:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle Correction	Masse conventionnelle Correction après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
2 kg		EM-090	153.8 mg		200 mg	2.0 mg

CERTIFICAT D'ÉTALONNAGE

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

BALANCES UTILISÉES

Pour l'étalonnage manuel :

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

Pour l'étalonnage automatisé :

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

Les balances sont vérifiées selon notre procédure de contrôle périodique PDL-11-MG-001.

INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

1. *L'incertitude associée à l'opération de pesage.*
2. *L'incertitude associée à la densité de l'air.*
3. *L'incertitude associée à l'étalon utilisé.*
4. *L'incertitude associée à la densité de la masse à être étalonnée.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de k = 2. Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

TRAÇABILITÉ

Le Service d'évaluation de laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et a certifié des capacités d'étalonnage spécifiques de ce laboratoire et leur traçabilité à des étalons nationaux de mesure reconnus et au Système international d'unités (SI). Ce certificat d'étalonnage est émis conformément aux conditions de certification accordées par CLAS et aux conditions d'accréditation accordées par le Conseil canadien des normes (CCN). Le CLAS pas plus que le CCN ne peut garantir l'exactitude des étalonnages individuels effectués par des laboratoires accrédités.

S.P

CERTIFICAT D'ÉTALONNAGE

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

RÉFÉRENCES UTILISÉES

Poids	No de série	Fabricant	Date d'étalonnage	Date due
20kg	69976	Troemner	30-05-2017	30-05-2018
5kg	129099	Mettler Toledo	02-09-2017	02-09-2018
5kg	96-0888-50-3	Denver Instrument Company	02-09-2017	02-09-2018
2kg	129098	Mettler Toledo	02-09-2017	02-09-2018
2kg	96-0888-50-3	Denver Instrument Company	02-09-2017	02-09-2018
300g	96-0888-50-2	Denver Instrument Company	02-09-2017	02-09-2018
1kg - 1mg	MT-01	Mettler Toledo	02-09-2017	02-09-2018

ÉTALONS CERTFIÉS PAR LE CNRC(**Référence NRC MS-2016-0021**)

Poids	No de série	Fabricant	Date d'étalonnage	Date due
100g	95170	Mettler Toledo	17-10-2016	17-10-2018
10kg	129100	Mettler Toledo	17-10-2016	17-10-2018
1kg	95171	Mettler Toledo	17-10-2016	17-10-2018

RÉFÉRENCES DE LA STATION ROBOTISÉE

Poids	No de série	Fabricant	Date d'étalonnage	Date due
1kg - 1mg	DK000A132	Laboratoire Dispersion	01-08-2017	01-08-2018

TRANSCAT CANADA
Laboratoire Dispersion

ACCREDITATION ISO 17025
CNN Portée Numéro 668

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**152-5DAF05-191-2130 Rev1**
Adresse :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	**Date d'étalonnage :**	21-05-2019

Technicien:
Simeonidis, Georgios

David Llorens, Responsable Qualité

DESCRIPTION DU SERVICE:

Modèle de Balance :	PA214	**Méthode :**	ISO 17025
Manufacturier :	Ohaus	**Date d'approbation :**	22-05-2019
Numéro de Série :	8331230529	**Date prochain étalonnage :**	21-05-2020
Numéro d'identification :	EM-232	**accréditation CCN n. :**	668
Capacité :	210g	**Certification CLAS n. :**	2010-01
Résolution:	0.0001g		

Condition d'essai :	Temp °C:	22.7	Pression kPa:	100.3	Humidité %:	43.6

Note: Les conditions environnementales ne sont pas utilisées dans le calcul de l'incertitude.

CETTE BALANCE RENCONTRE LES SPÉCIFICATIONS SUIVANTES:

Type de test :	**Manufacturier**			
Excentricité:	Pré: ☑ Oui	☐ Non	Post: ☑ Oui	☐ Non
Linéarité:	☑ Oui	☐ Non	☑ Oui	☐ Non
Sensibilité:	☐ Oui	☑ Non	☑ Oui	☐ Non
Répétabilité:	☑ Oui	☐ Non	☑ Oui	☐ Non

NOTES:

Cette balance a été certifiée selon la procédure de travail PDL-09-MG-010 (certification de balance analytique et à plateau) et la et la procédure PDL-09-MG-012 (détermination des incertitudes de pesées). Nos étalons sont certifiés à chaque année.

2019-05-28

TRANSCAT CANADA
Laboratoire Dispersion

ACCREDITATION ISO 17025
CNN Portée Numéro 668

CERTIFICAT D'ÉTALONNAGE

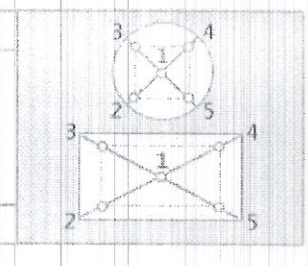
9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**152-5DAF05-191-2130 Rev1**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	Saint-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Modèle de Balance :**	PA214
		Date d'étalonnage :	21-05-2019
Méthode :	ISO 17025	**Date du prochain étalonnage :**	21-05-2020

TEST D'EXCENTRICITÉ:

Poids Test: 50 g Tolérance 0.0003 g
(Note: Le Poids Test est taré au centre du plateau de pesée)

Position	Avant Ajustement	Après Ajustement
1: Centre:	0.0000 g	0.0000 g
2: Avant Gauche:	0.0000 g	0.0000 g
3: Arrière Gauche:	0.0000 g	0.0000 g
4: Arrière Droit:	0.0000 g	0.0000 g
5: Avant Droit:	0.0000 g	0.0000 g
Résultats	0.0000 g	0.0000 g
STATUT	**CONFORME**	**CONFORME**



TEST DE LINÉARITÉ:

Méthode: Substitution Plage: 210 g Poids Test: 50 g Tolérance: 0.0002 g

Pré-Charge	**Avant Ajustement**	**Après Ajustement**
0.0000 g	49.9981 g	49.9981 g
50.0000 g	49.9982 g	49.9982 g
100.0000 g	49.9980 g	49.9980 g
150.0000 g	49.9982 g	49.9982 g
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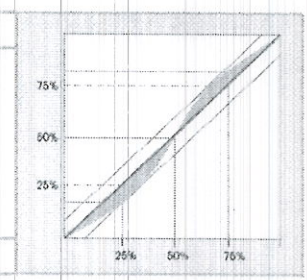
Résultats	**0.00008 g**	**0.00008 g**
STATUT	**CONFORME**	**CONFORME**



TEST DE SENSIBILITÉ:

Valeur de masse conventionnelle: 200.0000 g Tolérance: 0.0004 g Résultats: 0.00% < 0.10%

	Avant Ajustement	**Après Ajustement**
Lecture:	199.9924 g	200.0000 g
Résultats:	**0.0076 g**	**0.0000 g**
STATUT	**NON-CONFORME**	**CONFORME**

$$S = \frac{\Delta W}{\Delta m}$$

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ACCREDITATION ISO 17025 TM
CNN Portée Numéro 668

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**152-5DAF05-191-2130 Rev1**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	Saint-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Modèle de Balance :**	PA214
		Date d'étalonnage :	21-05-2019
Méthode :	ISO 17025	**Date du prochain étalonnage :**	21-05-2020

TEST DE RÉPÉTABILITÉ:

AVANT AJUSTEMENT:

Charge Utilisée:
100.0000 g

Tolérance:
0.00010 g

Résolution d'affichage:
0.0001 g

Moyenne:
99.99616 g

Écart-type:
0.00011 g

#	Vide	Chargé	Différence
1	0.0000 g	99.9960 g	99.9960 g
2	0.0000 g	99.9961 g	99.9961 g
3	0.0000 g	99.9962 g	99.9962 g
4	0.0000 g	99.9960 g	99.9960 g
5	0.0000 g	99.9963 g	99.9963 g
6	0.0000 g	99.9962 g	99.9962 g
7	0.0000 g	99.9962 g	99.9962 g
8	0.0000 g	99.9963 g	99.9963 g
9	0.0000 g	99.9961 g	99.9961 g
10	0.0000 g	99.9962 g	99.9962 g
		Statut :	CONFORME

APRÈS AJUSTEMENT:

Charge Utilisée:
100.0000 g

Tolérance:
0.00010 g

Résolution d'affichage:
0.0001 g

Moyenne:
99.99616 g

Écart-type:
0.00011 g

#	Vide	Chargé	Différence
1	0.0000 g	99.9960 g	99.9960 g
2	0.0000 g	99.9961 g	99.9961 g
3	0.0000 g	99.9962 g	99.9962 g
4	0.0000 g	99.9960 g	99.9960 g
5	0.0000 g	99.9963 g	99.9963 g
6	0.0000 g	99.9962 g	99.9962 g
7	0.0000 g	99.9962 g	99.9962 g
8	0.0000 g	99.9963 g	99.9963 g
9	0.0000 g	99.9961 g	99.9961 g
10	0.0000 g	99.9962 g	99.9962 g
		Statut :	CONFORME

CERTIFICAT D'ÉTALONNAGE

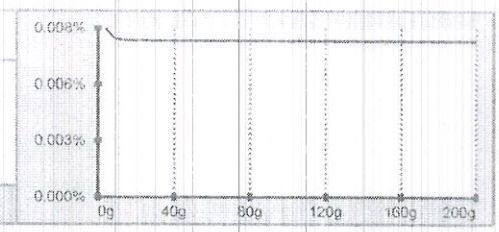
9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

INCERTITUDE AVANT AJUSTEMENT :

$$Uc = \sqrt{(u_{(cr)}{}^2 + s_p{}^2 + u_{(l)}{}^2 + u_{(dr)}{}^2 + u_{(s)}{}^2)}$$

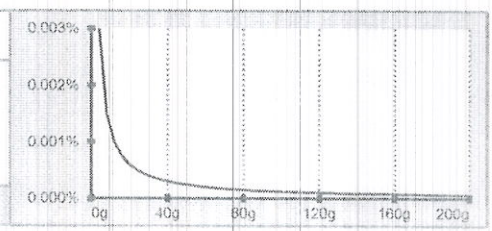
u(cr) =	Incertitude reliée à l'étalon utilisé
Sp =	Incertitude de l'écart-type
u(l) =	Incertitude associée à la linéarité
u(dr) =	Incertitude associée à résolution si Sp = 0
u(s) =	Incertitude liée à la sensibilité (span)

Valeur	Incertitude	Incertitude (%)
12.5000 g	0.00097 g	0.007737 %
25.0000 g	0.00191 g	0.007657 %
50.0000 g	0.00382 g	0.007637 %
100.0000 g	0.00763 g	0.007632 %
200.0000 g	0.01526 g	0.007631 %



INCERTITUDE APRÈS AJUSTEMENT :

Valeur	Incertitude	Incertitude (%)
12.5000 g	0.00016 g	0.001285 %
25.0000 g	0.00016 g	0.000643 %
50.0000 g	0.00016 g	0.000322 %
100.0000 g	0.00016 g	0.000163 %
200.0000 g	0.00029 g	0.000143 %



NOTES :

De ces valeurs d'incertitudes, seule la valeur surlignée est calculée selon ISO17025:2005, les autres étant estimées jusqu'au résultat de l'incertitude minimale. Dans le calcul de cette l'incertitude, l'écart-type utilisé est de 0,577d (où d est la précision d'affichage de la balance) lorsque cet écart-type est plus inférieur à 0,577d.

TRANSCAT® CANADA
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ACCREDITATION ISO 17025
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CERTIFICAT D'ÉTALONNAGE

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www.dispersion.ca 1.866.390.5066

RÉFÉRENCE

ENSEMBLE DE RÉFÉRENCE:

Référence	No de série	Fabricant	Date d'étalonnage
1mg-5kg	DK000A183	Dispersion	09-04-2019

INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

1. *L'incertitude associée à l'opération de pesage.*
2. *L'incertitude associée à l'écart-type.*
3. *L'incertitude associée à l'étalon utilisé.*
4. *L'incertitude associée à la résolution de l'appareil.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de k = 2. Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

TRAÇABILITÉ

Le Service d'évaluation de laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et a certifié des capacités d'étalonnage spécifiques de ce laboratoire et leur traçabilité à des étalons nationaux de mesure reconnus et au Système international d'unités (SI). Ce certificat d'étalonnage est émis conformément aux conditions de certification accordées par CLAS et aux conditions d'accréditation accordées par le Conseil canadien des normes (CCN). Le CLAS pas plus que le CCN ne peut garantir l'exactitude des étalonnages individuels effectués par des laboratoires accrédités.

REMARQUES:

Rev1: Ajout numéro identification

Calibration externe (avec 200g)

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC·CNRC CLAS 2010-02

SCC Accredited LAB Accrédité CCN N°669

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-249 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+/- 0.25 "H2O
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	**Type d'entrée:**	Pression
Manufacturier:	Dwyer	**Type de sortie:**	Voltage
No. Model:	MS-321-LCD	**Type de mesure:**	Pression
No. Série:	N/A	**Gamme:**	0 à 0.10 "H2O
Emplacement:	Banc de test	**No. Machine:**	N/A

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	**No. du certificat d'étalonnage:**	2019001131
No. Série:	2784759	**Dernière date d'étalonnage:**	27-Feb-19
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	27-Feb-20
Commentaire:			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0000 "H2O	0.0000 "H2O	-0.0002 "H2O	-0.0002 "H2O	0.0002 "H2O	0.25 "H2O	Vérification indicateur
0.0250 "H2O	0.0250 "H2O	0.0242 "H2O	-0.0008 "H2O	0.0242 "H2O	0.25 "H2O	Vérification indicateur
0.0500 "H2O	0.0500 "H2O	0.0491 "H2O	-0.0009 "H2O	0.0491 "H2O	0.25 "H2O	Vérification indicateur
0.0750 "H2O	0.0750 "H2O	0.0740 "H2O	-0.0010 "H2O	0.0740 "H2O	0.25 "H2O	Vérification indicateur
0.1000 "H2O	0.1000 "H2O	0.0981 "H2O	-0.0019 "H2O	0.0981 "H2O	0.25 "H2O	Vérification indicateur
0.0000 "H2O	0.0000 V.DC.	0.0006 V.DC.	+0.0006 V.DC.	0.0006 V.DC.	0.5 V.DC.	Vérification sortie analogique
0.0250 "H2O	2.5000 V.DC.	2.4262 V.DC.	-0.0738 V.DC.	2.4262 V.DC.	0.5 V.DC.	Vérification sortie analogique
0.0500 "H2O	5.0000 V.DC.	4.8990 V.DC.	-0.1010 V.DC.	4.8990 V.DC.	0.5 V.DC.	Vérification sortie analogique
0.0750 "H2O	7.5000 V.DC.	7.4021 V.DC.	-0.0979 V.DC.	7.4021 V.DC.	0.5 V.DC.	Vérification sortie analogique
0.1000 "H2O	10.0000 V.DC.	9.8114 V.DC.	-0.1886 V.DC.	9.8114 V.DC.	0.5 V.DC.	Vérification sortie analogique

Conditions Environnementales: Température: 19 °C Humidité: 16 %RH

Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Mars 2019
Date du prochain Étalonnage:	6 Mars 2020
Date d'émission du certificat:	6 Mars 2019

CONFORMITÉ D'ÉTALONNAGE	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

2019-03-19

5F09106

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC·CNRC
CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN
N°669

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-126 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+\- 1"Hg
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Manomètre	**Type d'entrée:**	Pression
Manufacturier:	Dwyer	**Type de sortie:**	Digitale
No. Model:	DPG200	**Type de mesure:**	Pression
No. Série:	N.A.	**Gamme:**	0-28"Hg
Emplacement:	N.A.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2019000879
No. Série:	7798010	**Dernière date d'étalonnage:**	7-Feb-19
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	7-Feb-20
Commentaire:			

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Crystal XP2i	**No. du certificat d'étalonnage:**	2018004512
No. Série:	258139	**Dernière date d'étalonnage:**	9-Jul-18
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	9-Jul-19
Commentaire:			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1 "Hg	Vérification indicateur
-7.50 "Hg	-7.50 "Hg	-7.61 "Hg	-0.11 "Hg	-7.61 "Hg	1 "Hg	Vérification indicateur
-15.00 "Hg	-15.00 "Hg	-15.25 "Hg	-0.25 "Hg	-15.25 "Hg	1 "Hg	Vérification indicateur
-22.50 "Hg	-22.50 "Hg	-22.88 "Hg	-0.38 "Hg	-22.88 "Hg	1 "Hg	Vérification indicateur
-28.00 "Hg	-28.00 "Hg	-28.48 "Hg	-0.48 "Hg	-28.48 "Hg	1 "Hg	Vérification indicateur
0.00 "Hg	10.0000 V.DC.	10.0625 V.DC.	+0.0625 V.DC.	10.0625 V.DC.	0.5 V.DC.	Vérification sortie analogique
-7.50 "Hg	8.0000 V.DC.	8.0413 V.DC.	+0.0413 V.DC.	8.0413 V.DC.	0.5 V.DC.	Vérification sortie analogique
-15.00 "Hg	6.0000 V.DC.	6.0055 V.DC.	+0.0055 V.DC.	6.0055 V.DC.	0.5 V.DC.	Vérification sortie analogique
-22.50 "Hg	4.0000 V.DC.	3.9621 V.DC.	-0.0379 V.DC.	3.9621 V.DC.	0.5 V.DC.	Vérification sortie analogique
-28.00 "Hg	2.5333 V.DC.	2.4497 V.DC.	-0.0836 V.DC.	2.4497 V.DC.	0.5 V.DC.	Vérification sortie analogique

Conditions Environnementales: Température: 19 °C Humidité: 16 %RH

Type d'Étalonnage:

5F09106

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC·CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

80 rue de la montagne
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(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-126 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+\- 1"Hg
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Manomètre	**Type d'entrée:**	Pression
Manufacturier:	Dwyer	**Type de sortie:**	Digitale
No. Model:	DPG200	**Type de mesure:**	Pression
No. Série:	N.A.	**Gamme:**	0-28"Hg
Emplacement:	N.A.	**No. Machine:**	N.A.

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Mars 2019
Date du prochain Étalonnage:	6 Mars 2020
Date d'émission du certificat:	6 Mars 2019

CONFORMITÉ D'ÉTALONNAGE	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

2019.03.19

5F09106

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS
NRC·CNRC
CLAS 2010-02

SCC Accredited LAB
LAB
Accrédité CCN
N°669

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-127 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+\- 1"Hg
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Manomètre	**Type d'entrée:**	Pression
Manufacturier:	Dwyer	**Type de sortie:**	Digitale
No. Model:	DPG200	**Type de mesure:**	Pression
No. Série:	N.A.	**Gamme:**	0-28"Hg
Emplacement:	N.A.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2019000879
No. Série:	7798010	**Dernière date d'étalonnage:**	7-Feb-19
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	7-Feb-20
Commentaire:			

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Crystal XP2i	**No. du certificat d'étalonnage:**	2018004512
No. Série:	258139	**Dernière date d'étalonnage:**	9-Jul-18
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	9-Jul-19
Commentaire:			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1 "Hg	Vérification indicateur
-7.50 "Hg	-7.50 "Hg	-7.49 "Hg	+0.01 "Hg	-7.49 "Hg	1 "Hg	Vérification indicateur
-15.00 "Hg	-15.00 "Hg	-14.84 "Hg	+0.16 "Hg	-14.84 "Hg	1 "Hg	Vérification indicateur
-22.50 "Hg	-22.50 "Hg	-22.57 "Hg	-0.07 "Hg	-22.57 "Hg	1 "Hg	Vérification indicateur
-28.00 "Hg	-28.00 "Hg	-27.86 "Hg	+0.14 "Hg	-27.86 "Hg	1 "Hg	Vérification indicateur
0.00 "Hg	10.0000 V.DC.	10.0152 V.DC.	+0.0152 V.DC.	10.0152 V.DC.	0.5 V.DC.	Vérification sortie analogique
-7.50 "Hg	8.0000 V.DC.	8.0359 V.DC.	+0.0359 V.DC.	8.0359 V.DC.	0.5 V.DC.	Vérification sortie analogique
-15.00 "Hg	6.0000 V.DC.	6.0757 V.DC.	+0.0757 V.DC.	6.0757 V.DC.	0.5 V.DC.	Vérification sortie analogique
-22.50 "Hg	4.0000 V.DC.	3.9980 V.DC.	-0.0020 V.DC.	3.9980 V.DC.	0.5 V.DC.	Vérification sortie analogique
-28.00 "Hg	2.5333 V.DC.	2.5845 V.DC.	+0.0512 V.DC.	2.5845 V.DC.	0.5 V.DC.	Vérification sortie analogique

Conditions Environnementales: Température: 19 °C Humidité: 16 %RH

Type d'Étalonnage:

2019-03-19

5F09106

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN
N°669

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-127 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+\- 1"Hg
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Manomètre	**Type d'entrée:**	Pression
Manufacturier:	Dwyer	**Type de sortie:**	Digitale
No. Model:	DPG200	**Type de mesure:**	Pression
No. Série:	N.A.	**Gamme:**	0-28"Hg
Emplacement:	N.A.	**No. Machine:**	N.A.

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Mars 2019
Date du prochain Étalonnage:	6 Mars 2020
Date d'émission du certificat:	6 Mars 2019

CONFORMITÉ D'ÉTALONNAGE	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

DISPERSION
Laboratoire • Laboratory DIVISION - TRANSCAT CANADA

CLAS
ARC·CNRC
CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**152-4BB901-182**
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	**Date d'étalonnage :**	09-01-2018

Technicien:
Simeonidis, Georgios

David Llorens, Responsable Qualité

DESCRIPTION DU SERVICE:

Description des masses :	ASTM E617	**Date d'approbation :**	09-01-2018
Classe de précision :	ASTM 1	**Date prochain étalonnage :**	09-01-2023
Densité :	7.95g/cm³	**Accrédtation CCN n. :**	668
Identification (si unique) :	(items multiples)	**Certification CLAS n. :**	2010-01

Condition d'essai :	Temp °C:	21.265	Pression kPa:	101.565	Humidité:	49.58

NOTES:

Pour l'étalonnage des masses, nous utilisons la procédure "Comparaison individuelle" PDL-09-MG-001 et la procédure "Détermination des incertitudes" PDL-09-MG-002. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.

REMARQUES:

11 JAN. 2018

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

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CERTIFICAT D'ÉTALONNAGE

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www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**152-4BB901-182**
Adresse :	695 B rue Gaudette	**Accréditation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	ASTM 1
		Date d'étalonnage :	09-01-2018
Masse :	100 mg - 200 g	**Date du prochain étalonnage :**	09-01-2023

RÉSULTAT DE L'ÉTALONNAGE, MASSE CONVENTIONNELLE:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle	Masse conventionnelle après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
100 mg	1000014200	EM-128	99.9993 mg		0.010 mg	0.002 mg
200 g	1000026013	EM-129	199.99962 g		0.50 mg	0.10 mg

D.P.

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**152-4BB901-182**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	ASTM 1
		Date d'étalonnage :	09-01-2018
Masse :	100 mg - 200 g	**Date du prochain étalonnage :**	09-01-2023

RÉSULTAT DE L'ÉTALONNAGE DES POIDS, CORRECTIONS:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle Correction	Masse conventionnelle Correction après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
100 mg	1000014200	EM-128	-0.0007 mg		0.010 mg	0.002 mg
200 g	1000026013	EM-129	-0.38 mg		0.50 mg	0.10 mg

D.P.

CERTIFICAT D'ÉTALONNAGE

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

BALANCES UTILISÉES

Pour l'étalonnage manuel :

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

Pour l'étalonnage automatisé :

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

Les balances sont vérifiées selon notre procédure de contrôle périodique PDL-11-MG-001.

INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

1. *L'incertitude associée à l'opération de pesage.*
2. *L'incertitude associée à la densité de l'air.*
3. *L'incertitude associée à l'étalon utilisé.*
4. *L'incertitude associée à la densité de la masse à être étalonnée.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de k = 2. Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

TRAÇABILITÉ

Le Service d'évaluation de laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et a certifié des capacités d'étalonnage spécifiques de ce laboratoire et leur traçabilité à des étalons nationaux de mesure reconnus et au Système international d'unités (SI). Ce certificat d'étalonnage est émis conformément aux conditions de certification accordées par CLAS et aux conditions d'accréditation accordées par le Conseil canadien des normes (CCN). Le CLAS pas plus que le CCN ne peut garantir l'exactitude des étalonnages individuels effectués par des laboratoires accrédités.

B.P.

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS
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CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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

RÉFÉRENCES UTILISÉES

Poids	No de série	Fabricant	Date d'étalonnage	Date due
20kg	69976	Troemner	30-05-2017	30-05-2018
5kg	129099	Mettler Toledo	02-09-2017	02-09-2018
5kg	96-0888-50-3	Denver Instrument Company	02-09-2017	02-09-2018
2kg	129098	Mettler Toledo	02-09-2017	02-09-2018
2kg	96-0888-50-3	Denver Instrument Company	02-09-2017	02-09-2018
300g	96-0888-50-2	Denver Instrument Company	02-09-2017	02-09-2018
1kg - 1mg	MT-01	Mettler Toledo	02-09-2017	02-09-2018

ÉTALONS CERTFIÉS PAR LE CNRC(**Référence NRC MS-2016-0021**)

Poids	No de série	Fabricant	Date d'étalonnage	Date due
100g	95170	Mettler Toledo	17-10-2016	17-10-2018
10kg	129100	Mettler Toledo	17-10-2016	17-10-2018
1kg	95171	Mettler Toledo	17-10-2016	17-10-2018

RÉFÉRENCES DE LA STATION ROBOTISÉE

Poids	No de série	Fabricant	Date d'étalonnage	Date due
1kg - 1mg	DK000A132	Laboratoire Dispersion	01-08-2017	01-08-2018

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS
NRC·CNRC
CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN
N°669

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-001 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+\- 2.0°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	**Type d'entrée:**	Temp
Manufacturier:	Fluke	**Type de sortie:**	Digitale
No. Model:	52-II	**Type de mesure:**	Température
No. Série:	90630037	**Gamme:**	Divers
Emplacement:	N.A.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2019000879
No. Série:	7798010	**Dernière date d'étalonnage:**	7-Feb-19
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	7-Feb-20
Commentaire:			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.0 °C	1.0 °C	T1 typeJ
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	1.0 °C	T1 typeJ
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	1.0 °C	T1 typeJ
375.0 °C	375.0 °C	375.1 °C	+0.1 °C	375.1 °C	1.0 °C	T1 typeJ
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	1.0 °C	T1 typeJ
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	1.0 °C	T2 typeJ
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	1.0 °C	T2 typeJ
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	1.0 °C	T2 typeJ
375.0 °C	375.0 °C	375.1 °C	+0.1 °C	375.1 °C	1.0 °C	T2 typeJ
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	1.0 °C	T2 typeJ
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	1.0 °C	T1 typeK
125.0 °C	125.0 °C	125.2 °C	+0.2 °C	125.2 °C	1.0 °C	T1 typeK
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	1.0 °C	T1 typeK
375.0 °C	375.0 °C	375.2 °C	+0.2 °C	375.2 °C	1.0 °C	T1 typeK
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	1.0 °C	T1 typeK
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	1.0 °C	T2 typeK
125.0 °C	125.0 °C	125.2 °C	+0.2 °C	125.2 °C	1.0 °C	T2 typeK
250.0 °C	250.0 °C	250.2 °C	+0.2 °C	250.2 °C	1.0 °C	T2 typeK
375.0 °C	375.0 °C	375.2 °C	+0.2 °C	375.2 °C	1.0 °C	T2 typeK
500.0 °C	500.0 °C	500.2 °C	+0.2 °C	500.2 °C	1.0 °C	T2 typeK

Conditions Environnementales: Température: 19 °C Humidité: 16 %RH

Type d'Étalonnage:

5F09101

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC·CNRC CLAS 2010-02

SCC Accredited LAB Accrédité CCN N°669

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-001 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+\- 2.0°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	**Type d'entrée:**	Temp
Manufacturier:	Fluke	**Type de sortie:**	Digitale
No. Model:	52-II	**Type de mesure:**	Température
No. Série:	90630037	**Gamme:**	Divers
Emplacement:	N.A.	**No. Machine:**	N.A.

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Mars 2019
Date du prochain Étalonnage:	6 Mars 2020
Date d'émission du certificat:	6 Mars 2019

CONFORMITÉ D'ÉTALONNAGE		
	Avant	**Après**
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

M L L

Martin Langlais - Technicien

2019-03-19

5F09101

Instrumentation Saint-Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB LAB Accrédité CCN N°669

80 rue de la montagne
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Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-136 09/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	ISL-004
Précision requise:	+\-2°C +\-3%RH
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Hygromètre	**Type d'entrée:**	Temp/%RH
Manufacturier:	Fluke	**Type de sortie:**	Digitale
No. Model:	971	**Type de mesure:**	Temp/humidité
No. Série:	10610850	**Gamme:**	5-95%RH -20a60°C
Emplacement:	N.A.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Vaisala HMI14/HMP46	**No. du certificat d'étalonnage:**	2018002178
No. Série:	T1450150/T1940011	**Dernière date d'étalonnage:**	10-Apr-18
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	10-Apr-19
Commentaire:			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
25.0 °C	25.0 °C	25.2 °C	+0.2 °C	25.2 °C	1.0 °C	
40.0 °C	40.0 °C	40.2 °C	+0.2 °C	40.2 °C	1.0 °C	
28.0 %RH	28.2 %RH	29.0 %RH	+0.8 %RH	29.0 %RH	-- %RH	
48.0 %RH	48.1 %RH	49.3 %RH	+1.2 %RH	49.3 %RH	-- %RH	
75.0 %RH	74.7 %RH	74.0 %RH	-0.7 %RH	74.0 %RH	-- %RH	

Conditions Environnementales: Température: 22 °C Humidité: 45 %RH

Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	9 Mars 2019
Date du prochain Étalonnage:	9 Mars 2020
Date d'émission du certificat:	9 Mars 2019

CONFORMITÉ D'ÉTALONNAGE		
	Avant	**Après**
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

2019. 03. 19

CERTIFICATE OF NIST TRACEABLE CALIBRATION

Calibration Certificate No: 69804

Customer Information

Customer: Services Polytests, Inc.

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

Customer PO #: 100476

Calibration Procedure Information

Procedure ID: GTP AIRVEL Revision #: 6 Revision Date: 1/6/2013

Calibration Standards Information

Graftel ID	Manufacturer	Model #	Description	CAL Due
10086	Furness Controls	FC0332	DP Transmitter	6/6/2019
10100	Graftel	n/a	Temperature	10/29/2019
10171	Furness	FC0332-2W	0 - .4" H2O	11/10/2018
10187	Vaisala	PTB210	Barometric Pressure Gauge	11/22/2018
10157	HOBO	UX100-011	RH/Temp logger	11/10/2018

Sensor Information

Manufacturer: Omega Description: Anemometer Method Used: Pitot Tube

Model #: HHF143 Rated Accuracy: ± See Attachment Accuracy Specified By: Omega

Instrument ID#: EM153 Range: 40 to 7800 fpm Condition: Functional

Serial #: 1015949

Comments: Calibration Date: 08/16/2018 | Note: Limited calibration range = 40 to 5000 fpm
Calibration Due: 08/16/2019

The instrument(s) listed on this certificate have been calibrated against standards traceable to the National Institute of Standards & Technology (NIST) or compared to nationally or internationally recognized consensus standards. The reported calibration uncertainty has a confidence level of 95% (k=2). A calibration uncertainty ratio of 4:1 was maintained unless required uncertainty is supported by analysis. Graftel, LLC. Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2005, ANSI/NCSL Z540-I-1994 and ISO 9001: 2008. 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, LLC. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.

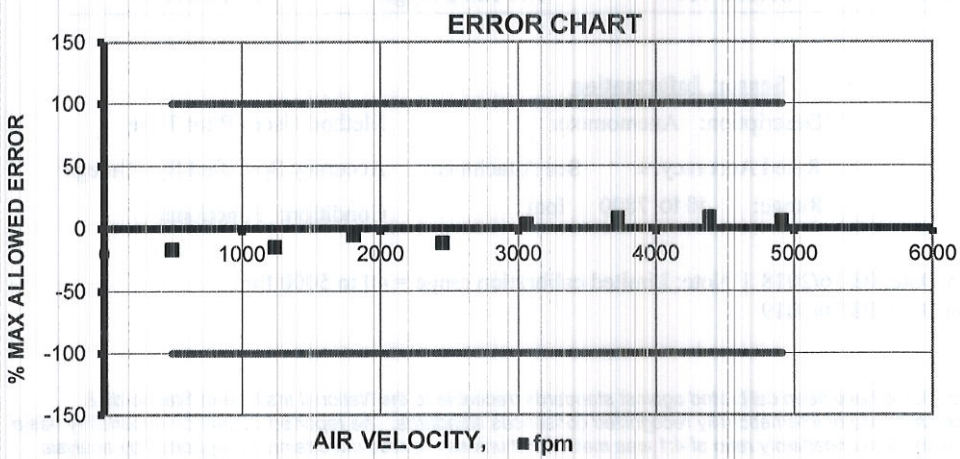
Performed By: _____ Date: 8/16/2018

Philip Davis
Calibration Technician

GRAFTEL 870 Cambridge Drive, Elk Grove Village, IL 60007 847.364.2600
www.graftel.com

ATTACHMENT TO CALIBRATION CERTIFICATE 69804
AS FOUND/AS LEFT DATA

Reading From Standard,	Lower Limit of Meter Reading,	Measured Reading From Meter,	Upper Limit of Meter Reading,	Error,	Measurement Uncertainty,	STATUS
Actual Air Velocity						
fpm	fpm	fpm	fpm	fpm	fpm	
494	488	493	500	-1	2.47	Pass
1238	1225	1236	1251	-2	6.19	Pass
1805	1786	1804	1824	-1	9.03	Pass
2448	2423	2445	2473	-3	12.24	Pass
3063	3031	3064	3095	1	15.32	Pass
3724	3686	3727	3762	3	18.62	Pass
4388	4343	4392	4433	4	21.94	Pass
4911	4861	4914	4961	3	24.56	Pass



INSTRUMENT SPECIFICATIONS		
Test Fluid	Air	
Lower Range	40	fpm
Upper Range	7800	fpm
Rated Accuracy	1%Rding +1 digit	
LABORATORY AMBIENT CONDITIONS		
Pressure	14.36	psia
Humidity	56.22	% RH
Temperature	74.51	F

Flow - Humidity - Temperature - Pressure - Design - Consulting - Engineering

NIST Traceable Calibration Data Sheet

Graftel, LLC. 870 Cambridge Drive, Elk Grove Village, IL.60007
P. 847-364-2600 F. 847-364-2899

www.graftel.com

2018.08.27

4407 rue Charleroi, Montréal-Nord (Québec) H1H 1T6 Canada
TEL.: (514) 329-3242 / 1 888 774-6665
FAX : (514) 329-3750
info.canada@trescal.com

Certificat d'Étalonnage / Certificate of Calibration

CLIENT :
SERVICES POLYTESTS INC.
695-B GAUDETTE
ST-JEAN-SUR-RICHELIEU, QUEBEC

Description: CHRONOMÈTRE / STOPWATCH TIMER
Fabricant/ Manufacturer: EXTECH
Modèle/ Model : 365510
No série / Serial no : 131636
 # Inventaire / Asset # : **EM-175**

CERTIFICAT No / Certificate No: **254068**

PROCÉDURE / Procedure :
TRESCAL - EXTECH_365510

Date étalonnage/ Calibration Performed : 2018-12-20

Echéance/ Due Date : 2019-12-20

Type de résultat / *Results type* : **As-Found = As-Left**

Résultats d'essais / *Test results* : Conforme / In Tolerance

Conditions de mesure / Measurement conditions

TEMPÉRATURE / Temp. : **22°C**

HUMIDITÉ / Humidity : **23% RH**

Usage restreint/ *Restricted use* : ☐

Réparation effectuée / *Repair performed* : ☐

Ajustement effectué / *Adjustment performed* : ☐

ÉTALONS UTILISÉS/ Standards Used:

Identification	Manuf.	Model	Description	Ser. #	Etalonné/ Cal.	Echéance/ Due
PR0313	H-P	53132A	UNIVERSAL COUNTER	3546A03142	2018-07-03	2019-07-03
PR0392	AGILENT	33250A	FUNCTION/ARBITRARY WAVEFORM GENERATOR	MY40008014	2017-06-19	2019-06-19

Les spécifications mentionnées comme limites de tolérances d'essai sont celles établies par le manufacturier, sauf indication contraire.
Test tolerance limits are based on manufacturers specifications unless stated otherwise.

NOTES :

2019-01-07

Technicien :
Technician

Y. MEFTAH

Le système qualité de la société est conforme aux exigences de la norme **ISO 17025** et les étalons utilisés pour le processus d'étalonnage sont retraçables au SI par l'entremise du CNRC et/ou du NIST.
*Our quality system complies with the requirements of **ISO 17025** and the standards used for the calibration are traceable to SI through NRC and/or NIST.*

ACCREDITATION 17025 ISO/IEC

Réf : [illegible]

Trescal

Certificat d'Étalonnage
Certificate of Calibration

	254068
CLIENT / Customer :	SERVICES POLYTESTS INC.
DESCRIPTION / Description :	CHRONOMÈTRE / STOPWATCH TIMER
MANUFACTURIER / Manufacturer :	EXTECH
MODÈLE / Model :	365510

DESCRIPTION Description	LIMITES Limits	LECTURES Readings	LIMITES Limits
	Min		Max
Temps écoulé, chronomètre sous test / Elapsed time on test stopwatch		**Comptes / Counts** Chronomètre/timer 162060	
(Δt) Deviation (1/100sec): 2.00			
Deviation Par jour/ Per day (%): 0.0012 % **Deviation Par jour/ Per day (sec):** **1.07 sec**	*** Secondes** -3.00	Deviation 24hrs **1.07**	*** Secondes** 3.00

Minutes	Seconds	1/100 sec
27	0	60

Total au compteur / Reference timer: 162058.0 comptes/counts

* Tolérances basées sur une déviation maximale de 3 sec/jour
* Tolerances based on a 3 sec/day maximum deviation

Incertitude/ Uncertainty: ±37 ms

Lorsque fournies dans le rapport, les incertitudes de mesure sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95% , obtenu en multipliant l'incertitude-type composée par un facteur de couverture de k=2.

When supplied in the report, the measurement uncertainties are expanded uncertainties representing a confidence level of approximately 95% , obtain by multiplying the combined standard uncertainty by a coverage factor of k=2.

ACCREDITATION 17025 ISO/IEC

Instrumentation Saint•Laurent inc.

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-224 06/03/19

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	ISL-022
Précision requise:	+/- 1/32"
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Ruban à mesurer	**Type d'entrée:**	Mesure
Manufacturier:	Stanley	**Type de sortie:**	N/A
No. Model:	Leverlock 12'	**Type de mesure:**	Inch
No. Série:	N/A	**Gamme:**	0 à 12'
Emplacement:	Portable	**No. Machine:**	N/A

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Tape Mesure	**No. du certificat d'étalonnage:**	TA-47525320
No. Série:	17413592	**Dernière date d'étalonnage:**	23-Oct-17
Certificat fait par:	Starrett	**Prochaine date d'étalonnage:**	23-Oct-19
Commentaire:			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage		Commentaire
1.00 "	1.00 "	1.00 "	0.00 "	1.00 "		
36.00 "	36.00 "	36.00 "	0.00 "	36.00 "		
72.00 "	72.00 "	72.00 "	0.00 "	72.00 "		
108.00 "	108.00 "	108.00 "	0.00 "	108.00 "		
132.00 "	132.00 "	132.00 "	0.00 "	132.00 "		

Conditions Environnementales: Température: 19 °C Humidité: 16 %RH

Commentaire:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Mars 2019
Date du prochain Étalonnage:	6 Mars 2020
Date d'émission du certificat:	6 Mars 2019

CONFORMITÉ D'ÉTALONNAGE	Avant	Après
Conforme:	X	X
Non Conforme:		

Martin Langlais - Technicien

2019.03.19

ID Certificat de Calibration
520501-030-111819-ACC-USI

METTLER TOLEDO

Mettler Toledo
Service Business Unit Industrial
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

Certificat de Calibration de Précision

Accuracy Calibration Certificate

Client

Compagnie:	Services Polytests		
Adresse:	695-B Rue Gaudette		
Ville:	Saint-Jean-Sur-Richelieu	Contact:	Danick Power
Zip/Code Postal:	J3B 7S7		
État/Province:	Quebec		

Weighing Device

Manufacturier:	RICE LAKE	Type d'Instrument:	Weighing Instrument
Modèle:	4X4HP-10K	# Outil:	EM114 — EM.137
No. Série:	C18395	Modèle Indicateur:	IQ+355
Building:	N/D	Terminal Serial No.:	N/D
Floor:	N/D	Terminal Asset No.:	N/D
Room:	N/D		

Plage	Capacité Max	Lisibilité (d)
1	400 kg	0.05 kg

Procedure

Instruction de Calibration:	EURAMET cg-18 v. 4.0 (11/2015)
Instruction de travail METTLER TOLEDO:	30260953 Rev1.31

Ce certificat de calibration contient des mesures pour la calibration Tel que Trouvé. Aucune calibration Tel que Laissé n'a été effectuée puisque l'appareil n'a pas été modifié suite à la calibration Tel que Trouvé. Par conséquent, les résultats Tel que Laissé correspondent aux résultats Tel que Trouvé.

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

	Temperature	
Tel que Trouvé	Start: 21.2 °C	End: 21.2 °C

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.

Date calibration Tel que Trouvé:	18-Nov-2019	Authorized A2LA Signatory:	
Date calibration Tel que Laissé:	N/D		Stephane Poisson
Date d'Émission:	18-Nov-2019		
Requested Next Calibration Date:	30-Nov-2020		

2019-11-20

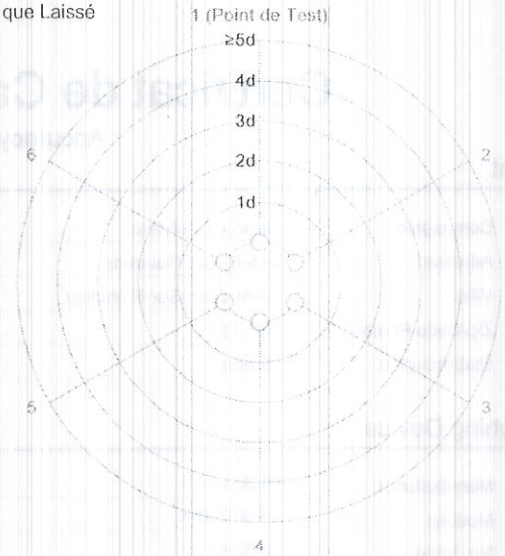
Résultats de Mesure

Répétabilité

Charge de Test: 70 kg

	Tel que Trouvé	Tel que Laissé
1	70.00 kg	N/D
2	70.00 kg	N/D
3	70.00 kg	N/D
4	70.00 kg	N/D
5	70.00 kg	N/D
6	70.00 kg	N/D
Écart Type	0.000 kg	N/D

○ Tel que Trouvé
◆ Tel que Laissé



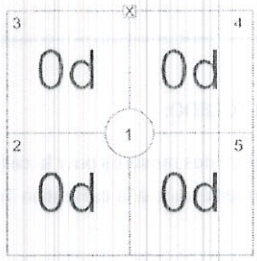
The "d" in the graph represents the readability of the range/interval in which the test was performed.

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

Excentricité

Charge de Test: 50 kg

Position	Tel que Trouvé	Tel que Laissé
1	50.00 kg	N/D
2	50.00 kg	N/D
3	50.00 kg	N/D
4	50.00 kg	N/D
5	50.00 kg	N/D
Déviation Maximale	0.00 kg	N/A



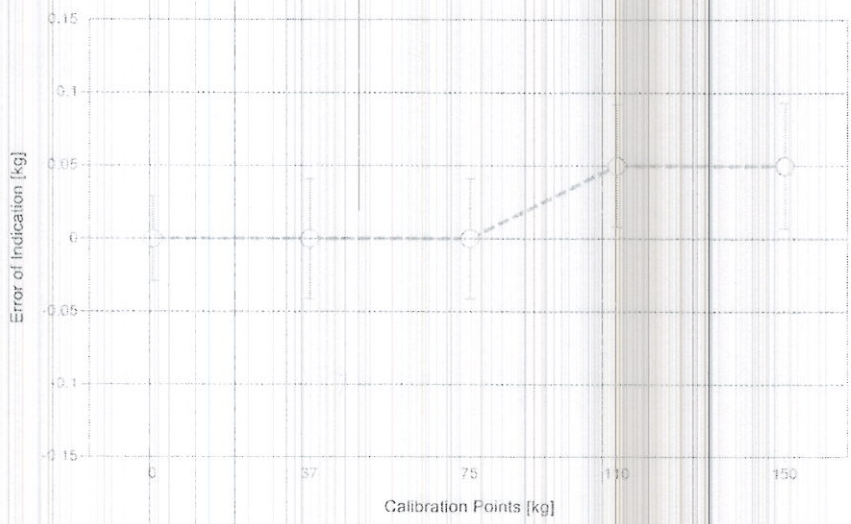
Tel que Trouvé

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

Erreur d'indication

Tel que Trouvé

	Reference Value	Indication	Erreur d'indication	Incertitude Élargie	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	37 kg	37.00 kg	0.00 kg	0.041 kg	2
3	75 kg	75.00 kg	0.00 kg	0.041 kg	2
4	110 kg	110.05 kg	0.05 kg	0.042 kg	2
5	150 kg	150.05 kg	0.05 kg	0.043 kg	2
6	110 kg	110.05 kg	0.05 kg	0.042 kg	2
7	75 kg	75.05 kg	0.05 kg	0.041 kg	2
8	37 kg	37.00 kg	0.00 kg	0.041 kg	2
9	0 kg	0.00 kg	0.00 kg	0.029 kg	2



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

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k -- which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

Tous les poids utilisés pour le contrôle métrologique sont retraçables aux étalons Nationaux et Internationaux. Les poids ont été calibrés et certifiés par un laboratoire de calibration accrédité.

Jeu de Poids 1: OIML M1

Weight Set Number:	M	Date d'Émission:	21-Mar-2019
# Certificat:	1412621	Date de Calibration Due:	21-Mar-2020

Jeu de Poids 2: OIML M1

Weight Set Number:	22939	Date d'Émission:	23-Jul-2019
# Certificat:	M19-0335	Date de Calibration Due:	23-Jul-2020

Remarques

N/D

End of Accredited Section

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

Incertitude de Mesure du dispositif de pesage en opération

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.

Coefficient de température pour l'évaluation de l'incertitude de mesure en opération: $10.0 \cdot 10^{-6}$ / K

Plage d'opération sur le site pour l'évaluation de l'incertitude de mesure en opération: 20 K

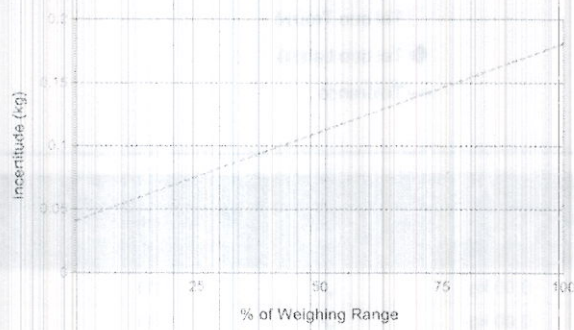
Linéarisation de l'Équation d'Incertitude

	Plage	Tel que Trouvé	Tel que Laissé
1	0 kg - 400 kg	$U_1 = 41\ g + 0.937\ g/kg \cdot R$	N/A

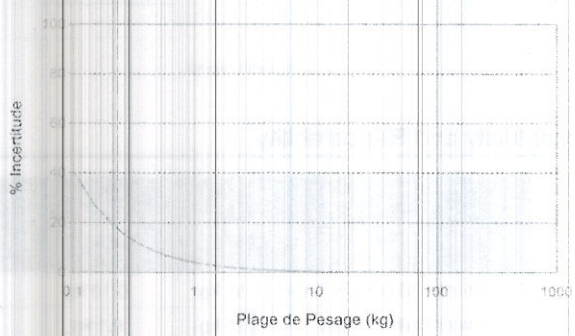
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Indication Net	Tel que Trouvé		Tel que Laissé	
1.50 kg	0.042 kg	2.8%	N/A	N/A
15.00 kg	0.055 kg	0.37%	N/A	N/A
30.00 kg	0.069 kg	0.23%	N/A	N/A
75.00 kg	0.11 kg	0.15%	N/A	N/A
150.00 kg	0.18 kg	0.12%	N/A	N/A



Tel que Trouvé



Tel que Laissé

METTLER TOLEDO Service

Handbook 44 Tolerance Assessment (Entretien)

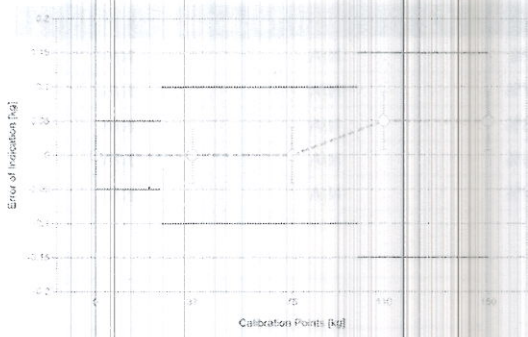
Les mesures du certificat de calibration joint ont été évaluées selon les tolérances définies par NIST HB44.

	Tel que Trouvé	Tel que Laissé
Global	✓	N/D

✓ = 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		Tolérance
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

○ Tel que Trouvé
◆ Tel que Laissé
— Tolérance

Eccentricity and Repeatability

Test	Test Load	Tolérance	As Found		As Left	
			Max. Error / Range	Result	Max. Error / Range	Result
Excentricité (Maximum Error)	50 kg	0.10 kg	0.00 kg	✓	N/D	N/D
Excentricité (Plage)	50 kg	0.1 kg	0.00 kg	✓	N/D	N/D
Répétabilité (Maximum Error)	70 kg	0.1 kg	0.00 kg	✓	N/D	N/D
Répétabilité (Plage)	70 kg	0.10 kg	0.00 kg	✓	N/D	N/D

Max. Error: Maximum of the absolute values of the individual errors.
Range: Difference between largest and smallest measurement value.

Error of Indication

	Reference Value	Tolérance	As Found		As Left	
			Error of Indication	Result	Error of Indication	Result
1	0 kg	0.05 kg	0.00 kg	✓	N/D	N/D
2	37 kg	0.10 kg	0.00 kg	✓	N/D	N/D
3	75 kg	0.10 kg	0.00 kg	✓	N/D	N/D
4	110 kg	0.15 kg	0.05 kg	✓	N/D	N/D
5	150 kg	0.15 kg	0.05 kg	✓	N/D	N/D
6	110 kg	0.15 kg	0.05 kg	✓	N/D	N/D
7	75 kg	0.10 kg	0.05 kg	✓	N/D	N/D
8	37 kg	0.10 kg	0.00 kg	✓	N/D	N/D
9	0 kg	0.05 kg	0.00 kg	✓	N/D	N/D

22 Albiston Way
Auburn, ME 04210
800-292-6218
207-777-6218
Fax 207-777-6215
www.specair.com

Date: 08/14/2017

Certificate of Analysis

Customer:
VAC OXY

Results are reported in mole percent, unless otherwise indicated. Mixes are prepared via partial pressure methods, or gravimetrically, using high load high sensitivity electronic scales. Prior to use, scales are verified for accuracy using applicable NIST traceable weights; analyses are calibrated against reference materials traceable to NIST weights and/or NIST gas reference materials.

Cylinder Serial #: 809277 **Cylinder Size:** K **CGA Connection:** 350 **Fill Pressure:** 1450 PSI

Analysis: Certified Standard **Lot #:** 4722621

Component(s):	Requested Concentration(s):	Actual Concentration(s):
Carbon Monoxide	3%	3.0%
Carbon Dioxide	18%	18.0%
Oxygen	2%	2.0%
Nitrogen	BALANCE	BALANCE

Expiration Date: 08/2020

Approved By:

Tom Bosse

EM-275

5. sept 2017

22 Albiston Way
Auburn, ME 04210
800-292-6218
207-777-6218
Fax 207-777-6215
www.specair.com

Date: 08/14/2017

Certificate of Analysis

Customer:
VAC OXY

Results are reported in mole percent, unless otherwise indicated. Mixes are prepared via partial pressure methods, or gravimetrically, using high load high sensitivity electronic scales. Prior to use, scales are verified for accuracy using applicable NIST traceable weights; analyses are calibrated against reference materials traceable to NIST weights and/or NIST gas reference materials.

Cylinder Serial #: K3886 **Cylinder Size:** K **CGA Connection:** 590 **Fill Pressure:** 1450 PSI

Analysis: Certified Standard **Lot #:** 4722622

Component(s):	Requested Concentration(s):	Actual Concentration(s):
Carbon Monoxide	1%	1.0%
Carbon Dioxide	10%	10.0%
Oxygen	10%	10.0%
Nitrogen	BALANCE	BALANCE

Expiration Date: 08/2020

Approved By:

Tom Bosse

5 sept 2017

EM. 276

EM-303
EM-304

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

ACCREDITED A2LA Certificate No. 1750.01 Calibration

Cert. No.: 4199-10569957

Traceable® Certificate of Calibration for Dial Barometer

Manufactured for and distributed by : Control Company 12554 Galveston Rd B230, Webster, TX 77598

Instrument Identification:

Model: 4199, S/N: 192343395 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	22 Oct 2019	1000432773

Certificate Information:

Technician: 57 Procedure: CAL-33 Cal Date: 17 Jul 2019 Cal Due Date: 17 Jul 2021

Test Conditions: 64.68%RH 23.57°C 1017mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mb/hPa	N.A.	N.A.		960.02	960	Y	955	965	0.62	>4:1
mb/hPa	N.A.	N.A.		985.80	986	Y	981	991	0.62	>4:1
mb/hPa	N.A.	N.A.		1014.51	1013	Y	1010	1020	0.62	>4:1

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement : (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ± U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min=As Left Nominal(Rounded) – Tolerance; Max= As Left Nominal(Rounded) + Tolerance;

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Note :

Maintaining Accuracy:

In our opinion once calibrated your Dial Barometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Dial Barometer change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

Août 2019

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.control3.com

APPENDIX 4: Unit pre burn

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
5/30/2019	0	9.3	548	901
	10	7.3	582	1172
	20	4.7	594	1173
	30	2.4	584	1142
	40	1.2	555	1076
	50	0.9	500	941
	60	0.6	472	894
	70	0.2	456	876
	80	0.1	441	824
	90	-0.1	430	813
5/31/2019	0	8.2	537	1019
	10	6.1	574	1161
	20	3.3	579	1160
	25	2.3	567	1158
	30	1.4	551	1191
	35	1	546	1057
	40	0.8	516	964
	45	0.7	490	917
	50	0.5	472	892
	55	0.4	460	873
	60	0.3	449	852
	65	0.1	438	831
	70	0	432	820
6/3/2019	0	10.2	526	896
	5	9.6	511	1139
	10	8.6	534	1149
	15	7.4	552	1170
	20	6.2	560	1172
	25	5.1	562	1166
	30	4	556	1153
	35	3.1	548	1123
	40	2.1	531	1115
	45	1.7	526	1075

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	50	1.5	499	975
	55	1.3	477	926
	60	1.2	460	894
	65	1.1	445	871
	70	1.1	434	855
	75	0.9	425	845
	80	0.8	421	839
	85	0.6	418	838
	90	0.4	406	806
	95	0.3	401	803
	100	0.3	398	805
	105	0.1	394	784
	110	0.1	388	769
6/4/2019	0	8.6	449	764
	5	8.2	436	808
	10	7.3	489	950
	15	6.2	521	1024
	20	5.1	538	1039
	25	4	544	1053
	30	3.1	547	1068
	35	2	546	1076
	40	1.5	540	1079
	45	1.1	524	1006
	50	0.9	498	926
	55	0.9	474	875
	60	0.5	454	837
	65	0.6	439	809
	70	0.4	431	790
	75	0.3	421	773
	80	0.1	416	764
	85	0	408	743
6/5/2019	0	10.2	375	557

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	5	10.1	327	779
	10	9.9	359	681
	15	9.7	357	658
	20	9.5	341	647
	25	9.3	342	697
	30	8.9	361	787
	35	8.6	337	842
	40	8.3	331	797
	45	8.1	335	834
	50	7.8	320	763
	55	7.4	314	742
	60	7.3	312	774
	65	7.1	312	765
	70	6.7	313	722
	75	6.4	314	737
	80	6.2	314	737
	85	5.8	315	736
	90	5.6	314	738
	95	5.4	314	737
	100	5.1	313	733
	105	5	315	761
	110	4.7	318	777
	115	4.3	321	797
	120	4	325	813
	125	3.8	329	832
	130	3.5	334	845
	135	3.2	334	832
	140	3.1	331	799
	145	3	327	793
	150	2.7	325	781
	155	2.6	318	1022
	160	2.4	331	1071
	165	2.3	342	1107
	170	2.3	348	1095
	175	1.9	337	811
	180	4.9	350	735

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	185	4.6	321	870
	190	4.4	320	772
	195	4.1	318	817
	200	3.7	317	840
	205	3.3	318	851
	210	3.2	314	811
	215	2.9	306	771
	220	2.7	300	750
	225	2.7	294	795
	230	2.5	299	904
	235	2.4	298	848
	240	2.4	291	760
	245	2.2	282	723
	250	2	272	689
	255	2.2	264	657
	260	2.1	257	634
	265	1.9	251	619
	270	1.8	245	606
	275	1.8	241	602
	280	1.6	238	594
	285	1.6	234	587
	290	1.7	232	584
	295	1.5	230	582
	300	1.3	229	586
	305	1.4	230	598
	310	1.3	229	599
	315	1.3	229	596
	320	1.3	228	597
	325	1.1	227	596
	330	1.2	227	599
	335	1.1	227	600
	340	1	226	600
	345	0.9	226	599
	350	0.9	226	599
	355	0.8	226	598
	360	0.8	225	594

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	365	0.6	226	597
	370	0.6	225	597
	375	0.7	225	593
	380	0.5	225	594
	385	0.4	224	582
	390	0.4	222	575
	395	0.4	221	573
	400	0.3	220	571
	405	0.3	218	573
	410	0.2	218	572
	415	0.2	218	571
	420	0.1	217	559
	425	0.1	215	561
	430	0	214	561
	435	4.5	324	779
	440	4.2	322	824
	445	3.8	321	847
	450	3.4	322	858
	455	3.3	318	818
	460	3	310	778
	465	2.8	304	757
	470	2.8	298	802
	475	2.6	303	911
	480	2.5	302	855
	485	2.5	295	767
	490	2.3	286	730
	495	2.1	276	696
	500	2.3	268	664
	505	2.2	261	641
	510	2	255	626
	515	1.9	249	613
	520	1.9	245	609
	525	1.7	242	601
	530	1.7	238	594
	535	1.8	236	591
	540	1.6	234	589

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	545	1.4	233	593
	550	1.5	234	605
	555	1.4	233	606
	560	1.4	233	603
	565	1.4	232	604
	570	1.2	231	603
	575	1.3	231	606
	580	1.2	231	607
	585	1.1	230	607
	590	1	230	606
	595	1	230	606
	600	0.9	230	605
	605	0.9	229	601
	610	0.7	230	604
	615	0.7	229	604
	620	0.8	229	600
	625	0.6	229	601
	630	0.5	228	589
	635	0.5	226	582
	640	0.5	225	580
	645	0.4	224	578
	650	0.4	222	580
	655	0.3	222	579
	660	0.3	222	578
	665	0.2	221	566
	670	0.2	219	568
	675	0.1	218	568
	680	4.1	318	817
	685	3.7	320	844
	690	3.3	321	855
	695	3.2	317	815
	700	2.9	309	775
	705	2.7	303	754
	710	2.7	297	799
	715	2.5	302	908
	720	2.4	301	852

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	725	2.4	294	764
	730	2.2	285	727
	735	2	275	693
	740	2.2	267	661
	745	2.1	260	638
	750	1.9	254	623
	755	1.8	248	610
	760	1.8	244	606
	765	1.6	241	598
	770	1.6	237	591
	775	1.7	235	588
	780	1.5	233	586
	785	1.3	232	590
	790	1.4	233	602
	795	1.3	232	603
	800	1.3	232	600
	805	1.3	231	601
	810	1.1	230	600
	815	1.2	230	603
	820	1.1	230	604
	825	1	229	604
	830	0.9	229	603
	835	0.8	229	603
	840	0.7	229	602
	845	0.6	228	598
	850	0.5	225	594
	855	0.4	224	582
	860	0.4	222	575
	865	0.4	221	573
	870	0.3	220	571
	875	0.3	218	573
	880	0.2	218	572
	885	0.2	218	571
	890	0.1	217	559

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
6/6/2019	0	8.4	307	553
	5	8.4	320	554
	10	8.1	286	597
	15	8	275	656
	20	7.7	285	766
	25	7.5	311	860
	30	7.3	315	845
	35	7	346	822
	40	6.5	347	775
	45	6	346	706
	50	5.8	343	691
	55	5.1	359	762
	60	4.7	377	807
	65	4.1	393	865
	70	3.4	407	911
	75	2.7	418	936
	80	2.3	419	944
	85	2	403	855
	90	1.7	395	859
	95	1.5	377	799
	100	1.4	362	763
	105	1.3	349	740
	110	1.2	341	724
	115	1.2	335	713
	120	0.9	330	708
	125	0.8	327	709
	130	0.9	324	716
	135	0.8	322	716
	140	0.8	321	714
	145	0.6	320	706
	150	0.5	314	680
	155	0.5	310	673
	160	0.4	308	673
	165	0.2	307	673
	170	0.3	306	671
	175	0.1	303	660

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	180	0.2	302	659
	185	0.2	301	659
6/7/2019	0	8.4	309	581
	5	8.3	343	598
	10	8.1	312	575
	15	8	280	580
	20	7.9	267	560
	25	7.6	244	558
	30	7.6	227	549
	35	7.4	221	544
	40	7.3	213	546
	45	7	210	559
	50	6.9	207	650
	55	6.3	246	702
	60	6.1	274	695
	65	5.8	274	662
	70	5.4	283	704
	75	5	309	811
	80	4.5	322	801
	85	4.1	342	870
	90	3.5	362	941
	95	3	375	958
	100	2.5	377	954
	105	2.1	373	886
	110	2.4	356	831
	115	1.5	347	822
	120	1.6	332	761
	125	1.3	320	733
	130	1.3	310	718
	135	1.3	302	707
	140	1.2	296	696
	145	1.1	290	691
	150	1	286	687
	155	0.9	283	684

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	160	0.8	281	685
	165	0.7	279	689
	170	0.7	278	692
	175	0.7	276	694
	180	0.5	277	696
	185	0.5	277	697
	190	0.5	277	691
	195	0.2	276	689
	200	0.3	276	692
	205	0.1	276	693
	210	0.1	275	694
	215	0	276	700
6/10/2019	0	8.1	479	781
	5	7.8	446	762
	10	6.9	507	953
	15	5.7	542	1013
	20	4.5	559	1038
	25	3.6	564	1055
	30	2.6	565	1063
	35	1.8	560	1062
	40	1.3	546	1015
	45	1.2	510	915
	50	1.1	485	854
	55	0.9	466	814
	60	0.8	450	782
	65	0.7	437	761
	70	0.5	428	748
	75	0.4	418	728
	80	0.3	410	717
	85	0.2	405	706
	90	0.1	400	694
	95	0	395	683
6/11/2019	0	8.1	445	695

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	5	7.8	419	787
	10	7	475	1054
	15	5.9	525	1126
	20	5.1	550	1158
	25	4	562	1176
	30	3.2	566	1180
	35	2.3	561	1160
	40	1.6	564	1125
	45	1.2	538	1022
	50	1.1	507	929
	55	0.9	480	869
	60	0.8	459	832
	65	0.7	442	803
	70	0.6	429	781
	75	0.4	419	772
	80	0.3	410	760
	85	0.2	402	747
	90	0.1	399	749
	95	0	394	738
6/12/2019	0	8	375	583
	5	7.9	353	625
	10	7	417	819
	15	6.1	470	966
	20	5.2	511	1088
	25	4.3	537	1151
	30	3.4	554	1179
	35	2.6	564	1156
	40	1.8	568	1154
	45	1.4	545	1030
	50	1.2	512	933
	55	1.1	485	877
	60	1	463	840
	65	0.7	442	793
	70	0.6	428	770

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	75	0.5	418	756
	80	0.4	411	752
	85	0.4	405	749
	90	0.3	399	729
	95	0.2	394	722
	100	0	391	718
6/17/2019	0	7.9	250	407
	5	7.9	294	362
	10	7.1	444	921
	15	5.7	577	1133
	20	4.8	503	994
	25	4.4	424	972
	30	4.1	391	841
	35	3.7	364	789
	40	3.5	354	804
	45	3.1	349	835
	50	2.8	345	830
	55	2.6	338	803
	60	2.4	331	776
	65	2.2	325	755
	70	2	324	972
	75	1.9	352	1117
	80	1.6	345	847
	85	1.5	326	754
	90	1.4	312	716
	95	1.3	298	700
	100	1.2	290	684
	105	1.2	283	678
	110	1.2	279	677
	115	1	275	678
	120	1	273	681
	125	0.9	272	684
	130	0.8	270	679
	135	0.8	268	681

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	140	0.7	268	658
	145	0.6	264	646
	150	0.4	261	644
	155	0.5	260	646
	160	0.3	259	644
	165	0.5	258	646
	170	0.3	257	632
	175	0.2	254	629
	180	0.1	253	624
	185	0	252	620
6/18/2019	0	8.2	295	566
	5	8	340	576
	10	7.7	303	567
	15	7.5	279	537
	20	7.1	289	646
	25	7	289	664
	30	6.7	295	657
	35	6.4	297	650
	40	6.1	296	689
	45	5.7	299	643
	50	5.4	290	627
	55	5.2	285	642
	60	5	285	623
	65	4.8	286	629
	70	4.2	294	670
	75	3.9	309	733
	80	3.7	323	775
	85	3.3	333	798
	90	2.9	336	797
	95	2.7	331	775
	100	2.5	322	743
	105	2.4	311	721
	110	2.2	314	817
	115	2.1	329	892

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	120	2.1	335	888
	125	1.8	327	759
	130	1.7	308	683
	135	1.5	293	648
	140	1.6	281	631
	145	1.5	273	621
	150	1.5	267	616
	155	1.4	263	612
	160	1.2	259	604
	165	1.2	256	599
	170	1.2	253	592
	175	1.2	252	595
	180	1	251	597
	185	1	251	601
	190	0.9	250	601
	195	0.9	251	608
	200	0.8	252	610
	205	0.6	250	601
	210	0.8	250	594
	215	0.6	248	593
	220	0.5	249	596
	225	0.4	249	598
	230	0.5	249	608
	235	0.3	251	611
	240	0.3	251	605
	245	0.3	250	599
	250	0.2	249	598
	255	0.2	247	582
	260	0.1	244	574
	265	0	244	578
6/19/2019	0	8.1	486	801
	5	7.7	484	846
	10	6.7	521	984
	15	5.8	554	1075

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	20	4.7	573	1114
	25	3.8	581	1130
	30	3	584	1127
	35	2.1	584	1131
	40	1.6	573	1066
	45	1.3	548	971
	50	1.1	514	889
	55	1	486	833
	60	0.9	464	795
	65	0.8	444	761
	70	0.6	430	738
	75	0.5	421	719
	80	0.4	413	707
	85	0.3	408	697
	90	0.1	404	687
	95	0	400	681
6/21/2019	0	8	405	675
	5	7.8	380	643
	10	7.3	404	729
	15	6.5	433	790
	20	5.7	481	941
	25	4.7	511	982
	30	4	527	1005
	35	3.1	539	1057
	40	2.2	551	1088
	45	1.6	548	1049
	50	1.1	529	975
	55	0.8	499	888
	60	0.6	473	826
	65	0.6	450	781
	70	0.7	433	750
	75	0.3	420	727
	80	0.4	410	713
	85	0.3	403	701

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	90	0.3	397	693
	95	0	393	685
6/25/2019	0	8.3	255	520
	5	8.1	270	529
	10	8	237	537
	15	7.9	223	540
	20	7.6	215	572
	25	7.3	222	595
	30	7.1	233	627
	35	6.8	269	659
	40	6.4	293	704
	45	6.1	298	685
	50	5.9	302	641
	55	5.5	294	615
	60	5.5	295	677
	65	5.3	311	805
	70	5.1	303	616
	75	4.6	311	679
	80	4	320	709
	85	3.8	337	786
	90	3	358	875
	95	2.6	362	822
	100	2.5	361	809
	105	2.1	356	790
	110	1.9	350	769
	115	1.7	343	750
	120	1.5	333	715
	125	1.6	325	699
	130	1.4	315	671
	135	1.2	307	655
	140	1.3	301	649
	145	1.1	296	645
	150	1.1	292	632
	155	1.1	288	628

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	160	0.9	286	621
	165	0.7	282	616
	170	0.5	281	614
	175	0.8	280	612
	180	0.5	278	602
	185	0.5	275	597
	190	0.6	274	594
	195	0.5	272	592
	200	0.4	271	591
	205	0.3	270	589
	210	0.2	269	589
	215	0	269	592
6/27/2019	0	9.1	395	624
	5	8.7	379	647
	10	8.2	414	723
	15	7.4	450	848
	20	6.3	492	956
	25	5.5	521	1033
	30	4.6	543	1084
	35	3.7	555	1102
	40	2.8	559	1098
	45	2.1	561	1104
	50	1.7	547	1036
	55	1.4	521	946
	60	1.2	491	871
	65	1.1	466	816
	70	1	447	777
	75	0.9	431	751
	80	0.8	419	731
	85	0.7	410	714
	90	0.6	403	702
	95	0.4	398	700
	100	0.3	394	696
	105	0.2	392	686

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	110	0.1	386	671
	115	0.1	380	658
6/28/2019	0	8.5	447	709
	5	8.2	419	716
	10	7.7	429	737
	15	6.9	463	803
	20	6	502	925
	25	5.2	527	998
	30	4.1	550	1084
	35	3.2	566	1120
	40	2.4	574	1140
	45	1.8	568	1098
	50	1.5	543	993
	55	1.3	509	898
	60	1.2	478	831
	65	1	455	787
	70	0.9	437	750
	75	0.8	423	726
	80	0.7	413	711
	85	0.6	407	702
	90	0.5	400	694
	95	0.3	396	678
	100	0.2	391	668
	105	0.1	385	660
	110	0	381	650
6/29/2019	0	10.2	375	557
	5	10.1	327	779
	10	9.9	359	681
	15	9.7	357	658
	20	9.5	341	647
	25	9.3	342	697

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	30	8.9	361	787
	35	8.6	337	842
	40	8.3	331	797
	45	8.1	335	834
	50	7.8	320	763
	55	7.4	314	742
	60	7.3	312	774
	65	7.1	312	765
	70	6.7	313	722
	75	6.4	314	737
	80	6.2	314	737
	85	5.8	315	736
	90	5.6	314	738
	95	5.4	314	737
	100	5.1	313	733
	105	5	315	761
	110	4.7	318	777
	115	4.3	321	797
	120	4	325	813
	125	3.8	329	832
	130	3.5	334	845
	135	3.2	334	832
	140	3.1	331	799
	145	3	327	793
	150	2.7	325	781
	155	2.6	318	1022
	160	2.4	331	1071
	165	2.3	342	1107
	170	2.3	348	1095
	175	1.9	337	811
	180	4.9	350	735
	185	4.6	321	870
	190	4.4	320	772
	195	4.1	318	817
	200	3.7	317	840
	205	3.3	318	851

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	210	3.2	314	811
	215	2.9	306	771
	220	2.7	300	750
	225	2.7	294	795
	230	2.5	299	904
	235	2.4	298	848
	240	2.4	291	760
	245	2.2	282	723
	250	2	272	689
	255	2.2	264	657
	260	2.1	257	634
	265	1.9	251	619
	270	1.8	245	606
	275	1.8	241	602
	280	1.6	238	594
	285	1.6	234	587
	290	1.7	232	584
	295	1.5	230	582
	300	1.3	229	586
	305	1.4	230	598
	310	1.3	229	599
	315	1.3	229	596
	320	1.3	228	597
	325	1.1	227	596
	330	1.2	227	599
	335	1.1	227	600
	340	1	226	600
	345	0.9	226	599
	350	0.9	226	599
	355	0.8	226	598
	360	0.8	225	594
	365	0.6	226	597
	370	0.6	225	597
	375	0.7	225	593
	380	0.5	225	594
	385	0.4	224	582

hearthstone

Wood Stove Preconditioning

Model: SILA

Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	390	0.4	222	575
	395	0.4	221	573
	400	0.3	220	571
	405	0.3	218	573
	410	0.2	218	572
	415	0.2	218	571
	420	0.1	217	559
	425	0.1	215	561
	430	0	214	561
	435	4.5	324	779
	440	4.2	322	824
	445	3.8	321	847
	450	3.4	322	858
	455	3.3	318	818
	460	3	310	778
	465	2.8	304	757
	470	2.8	298	802
	475	2.6	303	911
	480	2.5	302	855
	485	2.5	295	767
	490	2.3	286	730
	495	2.1	276	696
	500	2.3	268	664
	505	2.2	261	641
	510	2	255	626
	515	1.9	249	613
	520	1.9	245	609
	525	1.7	242	601
	530	1.7	238	594
	535	1.8	236	591
	540	1.6	234	589
	545	1.4	233	593
	550	1.5	234	605
	555	1.4	233	606
	560	1.4	233	603
	565	1.4	232	604

hearthstone

Wood Stove Preconditioning

Model: SILA

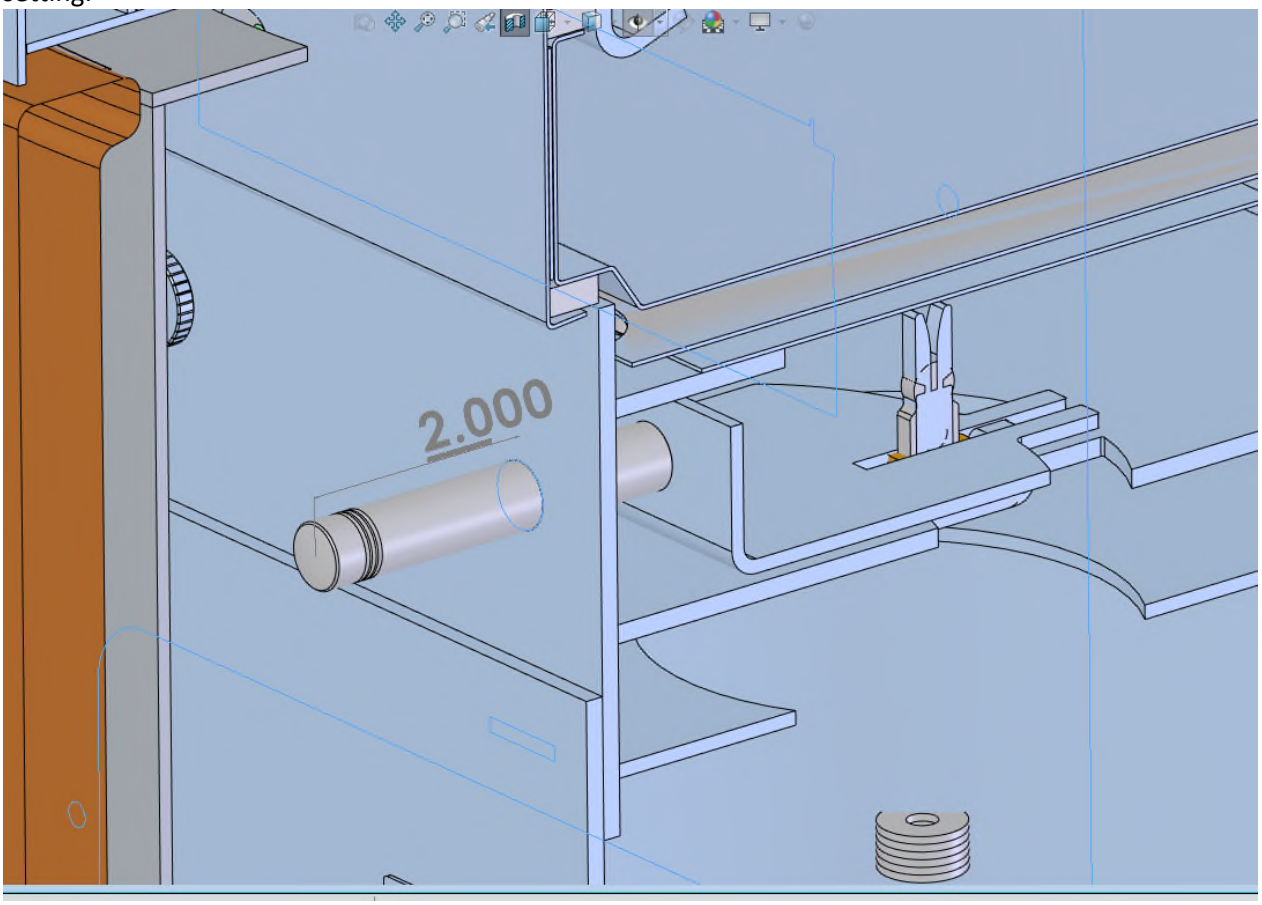
Date: 5/30/2019 thru 6/29/2019 (Applied Ceramics standard catalyst)

Test Engineer: D. Bryant Total Hours: 62

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	570	1.2	231	603
	575	1.3	231	606
	580	1.2	231	607
	585	1.1	230	607
	590	1	230	606
	595	1	230	606
	600	0.9	230	605
	605	0.9	229	601
	610	0.7	230	604
	615	0.7	229	604
	620	0.8	229	600
	625	0.6	229	601
	630	0.5	228	589
	635	0.5	226	582
	640	0.5	225	580
	645	0.4	224	578
	650	0.4	222	580
	655	0.3	222	579
	660	0.3	222	578
	665	0.2	221	566
	670	0.2	219	568
	675	0.1	218	568

Here’s the air control out 2” when measured from the front face of the panel. This is the medium high setting.



hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
7/1/2019	0	8.7	400	692
	5	8.3	398	787
	10	7.7	424	962
	15	7	444	988
	20	6.1	475	1085
	25	5.2	501	1147
	30	4.4	522	1218
	35	3.5	543	1291
	40	2.7	549	1302
	45	2	553	1241
	50	1.6	537	1092
	55	1.3	506	970
	60	1.2	473	885
	65	1.1	447	840
	70	0.9	427	811
	75	0.8	412	791
	80	0.7	400	775
	85	0.6	391	759
	90	0.5	382	747
	95	0.4	377	742
	100	0.3	372	741
	105	0.2	368	730
	110	0.1	362	713
	115	0	359	711

0	8.8	350	1011
5	8.1	340	1001
10	7.8	332	812
15	7.4	322	803
20	7.1	317	768
25	6.7	319	785
30	6.4	305	765
35	6.1	304	768
40	5.7	309	801
45	5.2	317	907
50	4.8	328	953
55	4.5	335	969
60	4.1	342	972
65	3.8	346	958
70	3.3	343	909
75	3	340	888
80	2.7	339	900
85	2.5	332	849
90	2.3	320	807
95	2.2	311	788
100	2	305	825
105	2	299	825
110	1.9	295	794
115	1.8	286	717
120	1.7	277	678
125	1.7	268	657
130	1.6	261	646

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	135	1.5	255	639
	140	1.5	250	634
	145	1.4	247	633
	150	1.4	244	633
	155	1.3	241	636
	160	1.3	238	638
	165	1.2	238	640
	170	1.1	237	645
	175	1.1	236	643
	180	1	235	642
	185	1	235	638
	190	0.9	233	637
	195	0.9	232	636
	200	0.8	233	643
	205	0.7	233	647
	210	0.7	232	651
	215	0.6	232	651
	220	0.6	233	646
	225	0.5	232	643
	230	0.5	232	642
	235	0.5	230	641
	240	0.4	229	639
	245	0.4	230	638
	250	0.3	229	645
	255	0.3	230	642
	260	0.3	232	632
	265	0.2	230	621
	270	0.2	229	609
	275	0.2	226	594
	280	0.2	224	579
	285	0.2	222	568
	290	0.1	219	560
	295	0.1	217	549
	300	0.1	214	537
	305	0.1	211	528
	310	0	208	516

7/2/2019	0	9.3	428	740
	5	9.2	401	731
	10	8.6	421	853
	15	7.8	446	983
	20	6.8	488	1160
	25	6	519	1235
	30	5	538	1264
	35	4.1	550	1288
	40	3.2	557	1248
	45	2.4	553	1271
	50	1.9	546	1131
	55	1.6	518	987
	60	1.5	485	895
	65	1.4	455	851
	70	1.3	435	824

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	75	1.1	420	797
	80	1	407	782
	85	0.9	395	765
	90	0.9	389	759
	95	0.7	382	752
	100	0.6	374	742
	105	0.6	367	720
	110	0.4	361	710
	115	0.3	354	693
	120	0.2	352	688
	125	0.1	348	679
	130	0.1	340	656
	135	0	335	642
7/3/2019	0	8.8	427	760
	5	8.6	425	874
	10	7.9	443	905
	15	7.1	468	1005
	20	6.3	501	1109
	25	5.2	524	1184
	30	4.5	546	1272
	35	3.6	561	1284
	40	2.7	563	1282
	45	2.1	558	1214
	50	1.7	538	1075
	55	1.5	507	954
	60	1.3	476	889
	65	1.2	453	850
	70	1.1	432	811
	75	1	415	784
	80	0.9	403	777
	85	0.8	395	771
	90	0.6	390	769
	95	0.5	389	771
	100	0.4	385	765
	105	0.3	384	774
	110	0.2	381	768
	115	0.1	378	759
	120	0	376	755
7/8/2019	0	8.5	487	817
	5	8.1	466	901
	10	7.5	489	1029
	15	6.6	519	1149
	20	5.5	544	1236
	25	4.7	566	1285
	30	3.7	578	1327
	35	2.7	577	1293
	40	2	581	1287
	45	1.5	568	1155
	50	1.2	536	1017

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	55	1.1	503	927
	60	0.5	476	880
	65	0.8	456	847
	70	0.7	439	827
	75	0.5	429	814
	80	0.4	420	805
	85	0.2	416	799
	90	0.1	409	791
	95	0	407	788
7/8/2019	0	10.2	375	557
	5	10.1	327	779
	10	9.9	359	681
	15	9.7	357	658
	20	9.5	341	647
	25	9.3	342	697
	30	8.9	361	787
	35	8.6	337	842
	40	8.3	331	797
	45	8.1	335	834
	50	7.8	320	763
	55	7.4	314	742
	60	7.3	312	774
	65	7.1	312	765
	70	6.7	313	722
	75	6.4	314	737
	80	6.2	314	737
	85	5.8	315	736
	90	5.6	314	738
	95	5.4	314	737
	100	5.1	313	733
	105	5	315	761
	110	4.7	318	777
	115	4.3	321	797
	120	4	325	813
	125	3.8	329	832
	130	3.5	334	845
	135	3.2	334	832
	140	3.1	331	799
	145	3	327	793
	150	2.7	325	781
	155	2.6	318	1022
	160	2.4	331	1071
	165	2.3	342	1107
	170	2.3	348	1095
	175	1.9	337	811
	180	4.9	350	735
	185	4.6	321	870
	190	4.4	320	772
	195	4.1	318	817
	200	3.7	317	840
	205	3.3	318	851

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	210	3.2	314	811
	215	2.9	306	771
	220	2.7	300	750
	225	2.7	294	795
	230	2.5	299	904
	235	2.4	298	848
	240	2.4	291	760
	245	2.2	282	723
	250	2	272	689
	255	2.2	264	657
	260	2.1	257	634
	265	1.9	251	619
	270	1.8	245	606
	275	1.8	241	602
	280	1.6	238	594
	285	1.6	234	587
	290	1.7	232	584
	295	1.5	230	582
	300	1.3	229	586
	305	1.4	230	598
	310	1.3	229	599
	315	1.3	229	596
	320	1.3	228	597
	325	1.1	227	596
	330	1.2	227	599
	335	1.1	227	600
	340	1	226	600
	345	0.9	226	599
	350	0.9	226	599
	355	0.8	226	598
	360	0.8	225	594
	365	0.6	226	597
	370	0.6	225	597
	375	0.7	225	593
	380	0.5	225	594
	385	0.4	224	582
	390	0.4	222	575
	395	0.4	221	573
	400	0.3	220	571
	405	0.3	218	573
	410	0.2	218	572
	415	0.2	218	571
	420	0.1	217	559
	425	0.1	215	561
	430	0	214	561

7/9/2019	0	8.6	289	556
	5	8.5	316	570
	10	8	286	589
	15	8	289	641
	20	7.6	305	716
	25	7.1	317	809

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	30	6.9	317	764
	35	6.7	327	743
	40	6.3	324	739
	45	5.9	325	730
	50	5.7	320	715
	55	5.5	316	696
	60	5.1	318	725
	65	5	326	800
	70	4.3	341	888
	75	3.9	350	888
	80	3.7	356	870
	85	3.6	364	857
	90	3	368	864
	95	2.8	366	859
	100	2.6	363	836
	105	2.5	357	815
	110	2.1	352	801
	115	2	345	773
	120	1.8	336	734
	125	1.9	326	719
	130	1.7	319	718
	135	1.5	315	718
	140	1.5	311	716
	145	1.4	308	710
	150	1.3	306	714
	155	1.3	304	701
	160	1.2	299	697
	165	1.1	299	697
	170	1	298	700
	175	1	296	703
	180	0.9	295	698
	185	0.8	295	695
	190	0.6	293	675
	195	0.6	291	669
	200	0.6	289	666
	205	0.5	288	664
	210	0.3	286	664
	215	0.3	285	657
	220	0.2	283	652
	225	0.2	283	654
	230	0.2	281	649
	235	0.1	281	645
	240	0	278	639

7/9/2019	0	5.7	305	466
	5	5.6	311	747
	10	5.4	303	832
	15	5.3	320	858
	20	4.9	319	787
	25	4.5	324	785
	30	4	329	917
	35	3.6	370	1270

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	40	3.4	410	1371
	45	3	434	1390
	50	2.5	427	1059
	55	2.2	401	880
	60	2	377	834
	65	1.8	361	807
	70	1.5	350	796
	75	1.2	339	771
	80	1.1	333	819
	85	1.2	325	741
	90	1	315	712
	95	0.7	310	744
	100	0.8	304	706
	105	0.7	296	681
	110	0.7	290	669
	115	0.5	285	660
	120	0.5	281	670
	125	0.4	278	664
	130	0.5	275	663
	135	0.5	272	657
	140	0.2	270	656
	145	0.4	268	641
	150	0.3	264	621
	155	0.2	261	621
	160	0.2	260	618
	165	0.2	259	620
	170	0.2	256	619
	175	0.2	255	619
	180	0.2	255	619
	185	0.2	254	614
	190	0.1	252	593
	195	0.1	250	596
	200	0.1	249	601
	205	0.1	249	603
	210	0.1	248	609
	215	0.1	247	607
	220	0.1	247	590
	225	0.1	241	544
	230	0.1	238	539
	235	0.1	234	530
	240	0.1	230	523
	245	0.1	226	514
	250	0.1	224	510
	255	0	221	509
	260	0	218	508
	265	0	214	506
	270	0	209	503
	275	0	204	501

7/10/2019	0	9	319	367
	5	8.3	346	1068
	10	8	319	816

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	15	7.6	316	807
	20	7.3	314	772
	25	6.9	317	789
	30	6.6	303	769
	35	6.3	302	772
	40	5.9	307	805
	45	5.4	315	911
	50	5	326	957
	55	4.7	333	973
	60	4.3	340	976
	65	4	344	962
	70	3.5	341	913
	75	3.2	338	892
	80	2.9	337	904
	85	2.7	330	853
	90	2.5	318	811
	95	2.4	309	792
	100	2.2	303	829
	105	2.2	297	829
	110	2.1	292	798
	115	2	283	721
	120	1.9	274	682
	125	1.9	265	661
	130	1.8	258	650
	135	1.7	252	643
	140	1.7	247	638
	145	1.6	244	637
	150	1.6	241	637
	155	1.5	238	640
	160	1.5	235	642
	165	1.4	235	644
	170	1.3	234	649
	175	1.3	233	647
	180	1.2	232	646
	185	1.2	232	642
	190	1.1	230	640
	195	1.1	229	639
	200	1	230	646
	205	0.9	230	650
	210	0.9	229	654
	215	0.8	229	654
	220	0.8	230	649
	225	0.7	229	646
	230	0.7	229	645
	235	0.7	227	644
	240	0.5	226	642
	245	0.6	227	641
	250	0.4	226	648
	255	0.4	227	645
	260	0.4	227	635
	265	0.4	225	624
	270	0.2	224	612
	275	0.2	221	597

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	280	0.3	219	582
	285	0.3	217	571
	290	0.2	214	563
	295	0.3	212	552
	300	0.1	209	540
	305	0.1	206	531
	310	0	203	519
	0	8.2	375	667
	5	7.8	385	794
	10	7.2	403	899
	15	6.6	423	945
	20	5.7	449	1004
	25	5	468	1087
	30	4.4	484	1121
	35	3.5	504	1208
	40	2.7	513	1202
	45	2.1	517	1232
	50	1.6	507	1081
	55	1.4	482	967
	60	1.2	454	887
	65	1.1	435	848
	70	1	417	820
	75	0.9	402	798
	80	0.8	392	783
	85	0.7	384	774
	90	0.6	377	769
	95	0.5	371	762
	100	0.4	368	759
	105	0.2	363	757
	110	0.1	361	764
	115	0	361	764
7/11/2019	0	9	348	563
	5	8.7	356	1082
	10	8.1	362	880
	15	7.6	371	883
	20	7.1	370	911
	25	6.6	374	978
	30	6.2	349	892
	35	5.9	341	874
	40	5.6	337	877
	45	5.3	337	893
	50	5	340	945
	55	4.6	346	959
	60	4.4	348	949
	65	3.9	348	947
	70	3.7	344	921
	75	3.5	342	898
	80	3.1	336	842
	85	3.1	330	826

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	90	2.7	323	817
	95	2.5	318	806
	100	2.6	312	780
	105	2.4	307	789
	110	2.1	310	870
	115	2.1	306	829
	120	1.9	299	759
	125	1.8	288	708
	130	1.6	279	674
	135	1.7	272	654
	140	1.6	265	647
	145	1.5	259	641
	150	1.5	256	633
	155	1.4	252	631
	160	1.3	248	632
	165	1.3	247	631
	170	1.2	245	630
	175	1.1	243	633
	180	1	243	638
	185	1	242	634
	190	0.9	242	634
	195	1	240	637
	200	0.7	241	635
	205	0.6	239	638
	210	0.7	239	627
	215	0.6	238	622
	220	0.5	236	619
	225	0.6	236	623
	230	0.6	235	622
	235	0.4	233	615
	240	0.4	233	612
	245	0.3	232	607
	250	0.2	230	601
	255	0.1	229	598
	260	0.1	228	598
	265	0.2	227	581
	270	0.2	225	576
	275	0	223	571
	280	-0.1	222	563
	285	0	220	570
	290	0	219	563
	295	0.2	218	562
	300	0	217	556
	305	-0.1	215	542
	310	0	212	515
	315	0.1	209	510
	320	0.1	204	508
	325	0.1	198	503
	330	0	192	501

7/12/2019	0	8.5	350	653
	5	8.3	374	783

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	10	7.7	388	834
	15	7	413	918
	20	6.3	434	985
	25	5.6	452	1042
	30	4.7	471	1131
	35	4	488	1175
	40	3.4	498	1206
	45	2.7	510	1207
	50	2.1	510	1169
	55	1.7	496	1041
	60	1.5	468	931
	65	1.4	446	872
	70	1.3	425	831
	75	1.2	408	804
	80	1.1	397	785
	85	1	384	772
	90	0.9	379	765
	95	0.8	373	766
	100	0.8	366	746
	105	0.5	362	742
	110	0.4	357	731
	115	0.3	355	722
	120	0.3	352	721
	125	0.1	346	704
	130	0.1	343	699
	135	0.1	340	697
	140	0	338	691
	145	0.1	334	682

	0	0.1	308	599
	5	0	312	638
	10	0	311	613
	15	-0.1	304	597
	20	0.1	301	593
	25	0.2	299	592
	30	0	292	548
	35	0.2	283	527
	40	0	277	514
	45	0	272	513
	50	-0.1	270	510
	55	-0.1	265	508
	60	0	262	503
	65	-0.1	256	501

7/15/2019	0	8.2	312	597
	5	8.1	329	592
	10	7.8	283	578
	15	7.6	283	623
	20	7.2	290	682
	25	6.9	292	683
	30	6.5	295	673

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	35	6.2	305	708
	40	5.9	291	719
	45	5.7	312	707
	50	5.2	318	703
	55	5	322	711
	60	4.6	327	727
	65	4.3	339	746
	70	3.8	350	775
	75	3.3	360	784
	80	3	374	806
	85	2.7	385	826
	90	2.3	387	800
	95	2	383	773
	100	1.9	373	744
	105	1.7	362	712
	110	1.5	349	684
	115	1.4	337	667
	120	1.5	329	655
	125	1.1	322	644
	130	1.2	314	637
	135	1	309	631
	140	1.1	303	627
	145	1.1	299	619
	150	0.6	296	613
	155	0.7	291	607
	160	0.6	289	605
	165	0.6	286	603
	170	0.6	283	593
	175	0.4	280	586
	180	0.3	275	578
	185	0.2	272	571
	190	0.2	268	566
	195	0.1	264	558
	200	0.1	260	550
	205	0.1	257	542
	210	0	253	534

0	9.2	353	573
5	8.9	361	951
10	8.3	367	886
15	7.8	376	889
20	7.3	375	917
25	6.8	379	984
30	6.4	354	898
35	6.1	346	880
40	5.8	342	883
45	5.5	342	899
50	5.2	345	951
55	4.8	351	965
60	4.6	353	955
65	4.1	353	953
70	3.9	349	927

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	75	3.7	347	908
	80	3.3	341	852
	85	3.3	335	836
	90	2.9	328	827
	95	2.7	323	816
	100	2.8	317	790
	105	2.6	312	799
	110	2.3	315	880
	115	2.3	311	839
	120	2.1	304	769
	125	2	293	718
	130	1.8	284	684
	135	1.9	277	664
	140	1.8	270	657
	145	1.7	264	651
	150	1.7	261	643
	155	1.6	257	641
	160	1.5	253	642
	165	1.5	252	641
	170	1.4	249	640
	175	1.3	247	643
	180	1.2	247	648
	185	1.2	246	636
	190	1.1	246	636
	195	11.2	244	1004
	200	10.9	487	1087
	205	10.5	466	1121
	210	10	489	1208
	215	9.5	519	1202
	220	9.1	544	1232
	225	8.7	566	1081
	230	8.5	578	967
	235	7.9	577	887
	240	7.5	581	848
	245	7.1	568	820
	250	6.8	536	798
	255	6.5	503	783
	260	6.2	476	774
	265	5.9	456	769
	270	5.5	439	762
	275	5.1	429	759
	280	4.7	420	757
	285	4.4	416	764
	290	3.8	409	764
	295	3.4	407	761
	300	3	308	710
	305	2.7	301	676
	310	2.3	290	656
	315	2	281	649
	320	1.9	274	643
	325	1.7	267	635
	330	1.5	261	633
	335	1.4	258	634

hearthstone

Wood Stove Preconditioning

Model: SILA (Advanced Catalyst Systems alternate catalyst)

Date: 7/1/19 thru 7/16/19

Test Engineer: D. Bryant

Total Hours: 55

All fuel is natural untreated wood, 15% to 25% moisture (wet)

Date	ET (min)	Scale (lbs)	Flue Temp (°F)	Cat Temp (°F)
	340	1.5	254	633
	345	1.1	250	632
	350	1.2	249	635
	355	1	247	640
	360	1.1	245	636
	365	1.1	245	636
	370	0.6	244	639
	375	0.7	244	637
	380	0.6	242	640
	385	0.6	243	629
	390	0.6	241	624
	395	0.4	241	621
	400	0.3	240	625
	405	0.2	238	624

APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
www.polytests.com

Maxime Martin
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

Dave Bryant
Hearthstone

APPENDIX 6: Drawings and specifications

APPENDIX 7: Operator's manual

hearthstone

hase - Bari

(Model 8171)

Wood Stove
OWNER'S MANUAL

INSTALLATION AND OPERATING INSTRUCTIONS

We recommend that our products be installed and serviced by professionals who are certified in the U.S. by NFI (National Fireplace Institute).
www.nficertified.org

SAVE THIS OWNER'S MANUAL FOR FUTURE REFERENCE

PLEASE READ THIS ENTIRE OWNER'S MANUAL BEFORE YOU INSTALL AND USE YOUR NEW BARI WOOD STOVE.

To reduce the risk of fire, follow the installation instructions. Failure to follow these instructions can result in property damage, bodily injury, or even death.

CONTACT LOCAL AUTHORITIES WITH JURISDICTION (BUILDING DEPARTMENT or FIRE OFFICIALS), ABOUT PERMITS REQUIRED, RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA.

California Prop 65

WARNING: This product can expose you to chemicals including glass wool fiber and carbon monoxide which are known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

Hase Bari Wood Model 8171
Manual: XXXX-XXXXX
R: 08/15/19

Notes on Stove Operation and Efficiency

Rating:

You have purchased a Hearthstone Bari 8171 tested to EPA Method 28, 28A and 5H, 40 CFR Part 60 where applicable. This stove is certified to comply with the U.S. Environmental Protection Agency 2020 particulate emissions standard.

It is certified at .94 gr/hr. emission rate and under specific test conditions has been shown to deliver heat at rates ranging from 14,065 to 26,036 Btu (output).

This wood heater has a manufacturer-set minimum allowable 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.

Please refer to the Warranty section of this manual for registration instructions. In case of warranty claims, please contact the point of original sale or the nearest authorized Hearthstone dealer. All warranty claims are processed by our dealer network. Authorized Hearthstone dealers can be located at www.hearthstonestoves.com.

This heater is designed to burn natural wood only. Higher efficiencies and lower emissions generally result when burning air dried seasoned hardwoods, as compared to softwoods or to green or freshly cut hardwoods. **DO NOT BURN:** *Garbage, lawn clippings, material containing rubber (including tires), materials containing plastic, waste petroleum products paints or paint thinners, asphalt products, materials containing asbestos, construction or demolition debris, railroad ties, pressure treated wood, manure or animal remains, salt water driftwood or other previously salt water saturated materials, unseasoned wood, paper products, cardboard, plywood or particleboard.* This 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 mat result in a release toxic fumes or render the heater ineffective and cause smoke.

Following the maintenance guidelines set forth in this manual will help insure the efficient use of your wood heater and minimize visible emissions. Having you stove inspected by a trained professional on a regular basis will greatly increase the potential for recognizing potential impacts to efficiency.

Proper draft is important to the efficient operation of your heater. Refer to the Normal Operation section of this manual for information regarding adequate draft. Both excessive and sub-minimum draft can affect the efficiency of your wood heater. Excessive draft can lead to over-consumption of fuel, lower overall heating capacity of the stove and potential over firing. Low draft can result in inefficient burns, low heat output, expulsion of smoke into the living area when stove doors are opened and an increased potential for build-up of flammable materials in the flue.

Efficiency:

Efficiency was captured using EPA Method 28R and weighted using CSA B415-10 methodology. A weighted average was used to calculate the overall efficiency across all of the 4 burn rate categories using the higher heating value (HHV). The weighted average efficiency is 75.9% (HHV).

To maximize the efficiency of your wood stove make sure it is sized properly for the space you plan to heat. An oversized stove will often be forced to burn at a lower and dirtier burn rate. Consult with your dealer for sizing and correctly placing the stove in your home. An incorrectly placed stove can greatly reduce efficiency. Maximizing the efficiency of your stove will heat your house quickly, burn cleaner and use less wood.

Refer to the Choosing Firewood section of this manual for appropriate fuel selection. Seasoned firewood is typically at or near 20% moisture content. This can be measured with any number of hand-held moisture meters available through your local hearth shop. Follow instructions included in the meter you purchase to measure fuel wood moisture content. Burn only dry, seasoned wood as using wet wood will greatly reduce your efficiency.

CO Emissions:

The Bari 8171 has the following CO emission rates by burn level: Category 1 (Low) – 3.0 gr./hr., Category 2 (Medium Low) – 3.6 gr./hr., Category 3 (Medium High) – 3.6 gr./hr. and Category 4 (High) – 6.0 gr./hr.. Wet wood or unapproved fuel described above can greatly affect the emissions of a wood burning stove.

Smoke/Fire/CO Detectors:

It is highly recommended that smoke and CO detectors be installed throughout the heated space when a wood burning heater is installed. Be certain to install these devices not only in the area where the wood appliance is located, but also in bedrooms, hallways leading to other areas of the house and all common areas of the heated space. Check the batteries in these devices and assure operation by performing whatever test operations are recommended by the manufacturer.

TABLE OF CONTENTS

Introducing Your Bari Wood Stove

Thank you for purchasing a HASE Collection Bari woodstove from Hearthstone Quality Home Heating Products. This stove will provide years of comfortable heat. This stove also provides the benefits of advanced technology in wood burning without the cost and maintenance requirements of a catalytic device. The Bari blends modern technology with the unique beauty and qualities of steel and soapstone. We trust that you will appreciate the quality of this handcrafted product.

Your Bari woodstove is designed to burn efficiently, and produce a large amount of heat. However, you should not consider your Bari the primary heat source for your home. The Bari's unique ability to rotate 180 degrees and the very large curved glass window allow you to enjoy the fire from a variety of locations in the room.

Please read this manual in its entirety. Its purpose is to familiarize you with your stove's safe installation, proper break-in, operation and maintenance. It contains extremely important information so keep it handy and refer to it often.

A qualified heating technician may need this owner's manual as a reference when installing this stove in your home. There are national, state, and local building codes that direct the technician on how to install your stove. These codes stipulate the dimension of stovepipe and clearances to walls, ceilings, hearth, and other combustible surfaces. The codes exist to reduce the risk of fire. Failure to follow these instructions can result in fire, property damage, bodily injury, and even death.

Install the stove in a safe, open area, away from traffic flow, doors, and hallways. If possible, try to install the stove near an existing chimney and chimney connector. It is extremely important to install this stove with the proper clearance from combustible surfaces. You can purchase specific connector pipe and special wall coverings as specified by this manual and the NFPA 211 code to protect combustible surfaces. Keep furniture, drapes, curtains, wood, paper, and other combustibles at least 36 inches (92 cm) away from the stove. Never install the stove in a location where gasoline, kerosene, charcoal lighter fluid or other flammable liquids are used or stored.

Install the stove in your living area to allow heat to radiate naturally to distant rooms. Do not install your stove in a poorly insulated area. This is inefficient and would likely result in higher fuel usage and possibly unsafe burning conditions.

- **SAFETY NOTICE: AN IMPROPERLY INSTALLED STOVE CAN RESULT IN A HOUSE FIRE. FOR YOUR SAFETY, CAREFULLY FOLLOW THE INSTALLATION DIRECTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA.**

The safety of your stove will depend on many factors, some of which include: distance to combustible objects, correct venting, and adequate chimney maintenance. Should you have any questions, do not hesitate to contact your dealer for additional information.

Contact your dealer for any necessary warranty service.

This stove is warranted by:

Hearthstone *Quality Home Heating Products, Inc*®
317 Stafford Ave.
Morrisville, Vermont 05661
www.hearthstonestoves.com

CODES

When you install your Bari wood stove, it is imperative that you adhere to all Federal and local codes. Obtain these codes from either of the following sources:

American National Standards Institute, Inc. (ANSI)
1430 Broadway
New York, NY 10018

National Fire Protection Association, Inc. (NFPA)
Battery March Park
Quincy, MA 02269

If you are installing your Bari in a mobile or manufactured home, follow the guidelines described in the Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 (United States).

SAFETY INFORMATION

Read and understand this Owner's Manual thoroughly before installing and using this stove.

Make sure to install your stove:

- According to the manufacturer's recommendations,
- In accordance with all applicable codes, and
- With the proper sized chimney.

When using your stove:

- Warn children and others of the danger of touching hot, radiating surfaces of your woodstove. For your additional safety, you can purchase hearth and stove guards through your local dealer.
- Burn natural wood only. Higher efficiencies and lower emissions result when burning air-dried, seasoned wood, as compared to green or freshly cut wood.
- Use caution when loading firewood into a hot stove.
- Keep the front door closed and secured at all times except when loading wood.
- Keep the ash pan tray fully inserted and the handle tightly latched.
- Inspect the stovepipe, chimney connector and chimney, as recommended.

Follow these safety precautions:

- **Never** modify this stove in any way.
- **Never** burn kiln dried, painted or treated wood in this stove.
- **Never** burn garbage or trash, colored or glossy paper, solvents, plywood, artificial logs, cardboard, or driftwood, in this stove.
- **Never** burn coal in this stove.
- **Never** use gasoline, kerosene, charcoal lighter fluid, or other flammable fluids to start or invigorate the fire. These fuels will cause dangerous burning conditions in the stove. Keep all such materials away from the stove.
- **Never** use the stove if the ash pan is open, damaged, not present, or does not fully seal. The ash pan cover must be present under the pan to ensure the pan seals properly.
- **Never** use a wood grate or other device to elevate the fire.
- **Never** allow logs in the firebox to contact with the glass when the door is closed.
- **Never** slam the door or use the door to force wood in to the stove.
- **Never** over-fire your stove. (See page 28)
- **Never** put articles of clothing or candles on a hot stove.
- **Never** connect the stove to a flue used by another appliance.

Other safety guidelines:

- Keep all combustible items such as furniture, drapes, clothing, and other items, at least 36" (0.92 m) from the stove (See page 12)
- Install a smoke detector, preferably in an area away from your wood stove.
- Keep a fire extinguisher handy. We recommend the type rated "A B C."
- Dispose of ashes properly. (See page 29)
- Keep children and pets away from the stove when it is burning; they could be seriously injured by touching a hot stove.
- Clean your chimney system as needed. (See page 30)
- Outside combustion air may be required if:
  1. This solid-fuel-fired appliance does not draw steadily, smoke rollout occurs, fuel burns

poorly, or back-drafts occur whether or not there is combustion present.
2. Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft whether or not there is combustion present.
3. Opening a window slightly on a calm (windless) day alleviates any of the above symptoms.
4. The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices that exhaust house air.
5. There is excessive condensation on windows in the winter.
6. A ventilation system is installed in the house.

If these or other indications suggest that infiltration air is inadequate, additional combustion air should be provided from the outdoors. Outside combustion air can be provided to the appliance by using the optional outside air kit #91-53500 / #91-53700.

PERIODIC CHECKLIST

Perform each of these tasks at least at the specified intervals.

At the End of Every Week:

- Empty ashes from the firebox and ash pan, sooner if the firebox or the ash pan is full.

At the Beginning of Every Other Month:

- Depending upon your use of the stove, visually inspect the chimney connector and chimney for creosote. (Please see page 30)
- Check door seals using the "dollar bill test." - When the stove is cool, shut the door on a dollar bill. If the bill pulls out without any resistance, then your stove's door is not sealing properly. To tighten the seal, adjust the door latch mechanism or change the door gasket. (Refer to page 30.)

At the End of Every Season:

- Dismantle the chimney connector and clean it thoroughly. Replace any pieces that show signs of rust or deterioration.
- Inspect and, if necessary, clean your chimney.
- Thoroughly clean out the inside of the stove.
- Inspect all door gasket material and replace if worn, frayed, cracked or extremely hard.
- Inspect and replace cracked or damaged vermiculite panels.

EMERGENCY PROCEDURES

If you have a stovepipe or chimney fire, follow these instructions:

1. If the fire is too threatening, leave the area and call the fire department immediately! If not, perform the next three steps.
2. Close the primary air control.
3. Close the stovepipe damper (if present).
4. Keep the stove front door and ash pan closed!

- **WARNING: DO NOT ATTEMPT TO PUT OUT A STOVEPIPE OR CHIMNEY FIRE BY THROWING WATER ONTO THE STOVE, STOVEPIPE, OR CHIMNEY. THE EXTREMELY HIGH TEMPERATURE OF SUCH FIRES CAN CAUSE INSTANTANEOUS STEAM AND SERIOUS BODILY HARM.**

Once the chimney fire expires, leave the primary air control closed and let the fire in the stove die out completely. Inspect the stove, stovepipe, and chimney thoroughly for any sign of damage before firing the stove again. You must correct any damage before using your stove again.

SPECIFICATIONS

Maximum Heat Output: 35,000 per hour of cordwood (based on independent laboratory test results).

Floor Size of Heated Area: Up to a maximum of 1,400 square feet. Factors unique to your home can reduce the square footage the stove will heat. Home insulation value, number and efficiency of windows, floor plan, stove placement, quality of the fuel and other conditions may limit the heating ability of the stove.

Firebox Capacity: 1.25 cubic feet or 46 pounds of wood (The amount and weight of wood contained per cubic foot of firebox volume can vary from 15 to 36 lbs. per cubic foot depending on type of wood, moisture content, packing density and other factors. As a constant for comparison and test purposes, we are assuming 20 lbs. of seasoned hardwood per cubic foot of firebox volume).

Finish Options:

Black / Lava ceramic tiles

Soapstone Finish[1] Smooth, Gray Soapstone

[1]Gray soapstone is a natural product and colors will vary from stone to stone. Various amounts of gray, charcoal, blue and green are evident dependent on the natural composition of the stone.

Maximum Log Length: 17" (43 cm), vertically

Stove Dimensions -
Height: 44" (112 cm)
Diameter: 19" (48cm)

Stovepipe Size: 6" (152 mm) diameter

Metal Chimney: 6" (152 mm) inside diameter

Masonry Chimney: 6" (15.2cm) inside diameter (round flue) 8" x 8" (20 x 20cm) (square flue)

Actual Weight: 475 pounds (216 kg)

Crate Dimensions: H-49.5" W-32.4" L-24.5" or 126x82.3x62.2cm (add 4" or 10.2cm for pallet).

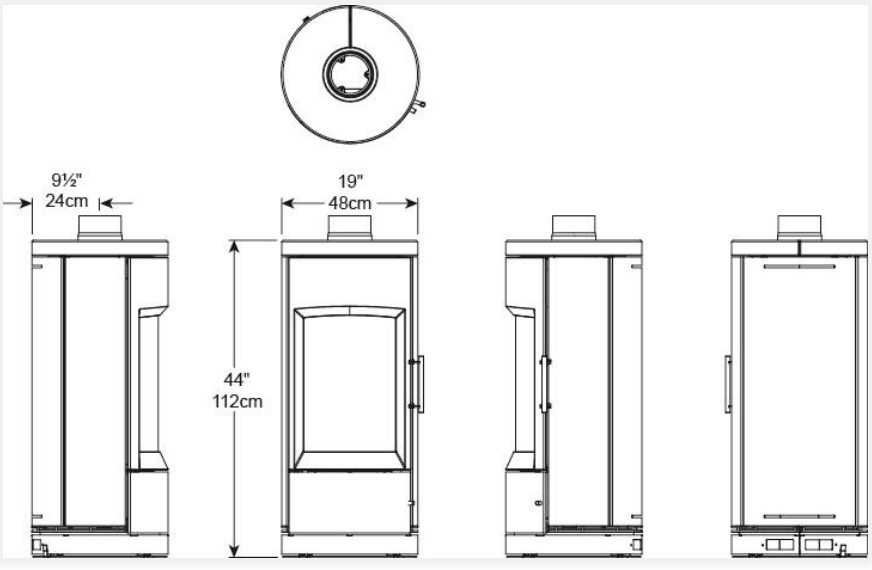
Optional Equipment:

91-53700: Outside Air Kit, Gray

91-53500: Outside Air Kit, Black

91-99400: Mobile Home Lockdown Kit-

90-53308: 4" duct adapter for mobile home outside air.



Installing Your Bari Wood Stove

UNPACKING

Hearthstone packages your Bari stove with the greatest care so that it ships safely. Under certain circumstances, however, damage may occur during transit and handling. When you receive the Bari, carefully unpack and inspect the stove and all accompanying parts. Make sure that all parts are included in the box. If any parts are damaged or missing, please contact your dealer immediately.

The stone panels on this stove are large and heavy (150 pounds total). Use a second person to assist in handling the panels to avoid injury, or damaging the panels. Despite the mass of each piece of soapstone, they will break if dropped.

If you purchased a stove with ceramic panels, they have been shipped already in place. You will need to carefully remove all plastic wrapping and cardboard shipping materials before lighting the unit for the first time.

INSTALLING YOUR STOVE

Choose a place to install your Bari woodstove. Inspect this location to make sure that the stove and stovepipes will have the required clearance from combustible materials that are near the stove. Combustibles include walls, floor, ceiling, and chimney chase. You must carefully consider the clearances to all of these combustibles before actually connecting your stove.

If the floor is made of combustible material, then a non-combustible floor protector is required between the floor and the stove. *An example of a non-combustible floor protector is a hearth constructed with a continuous layer of a listed backer board (such as Micore, Wonder-Board or Durock) used for ember protection with a tile, brick, slate, or another non-combustible facing.*

If you use a close clearance connector pipe, ensure it is listed with Underwriter's Laboratories. Check the listing of your pipe with UL for the correct clearances.

The diagrams in this manual represent typical installations, but are specific to the Simpson Dura-Vent DVL brand.

CLEARANCES TO NFPA CODE 211 PROTECTED SURFACES

You can reduce the clearances to combustible surfaces by using any National Fire Protection Agency (NFPA) approved wall protection system. Please refer to NFPA Code 211 for specifications and complete details. You can obtain this information directly from the NFPA.

National Fire Protection Agency
Batterymarch Park
Quincy, MA 02269
1-800-344-3555
1-617-770-3000
www.nfpa.org

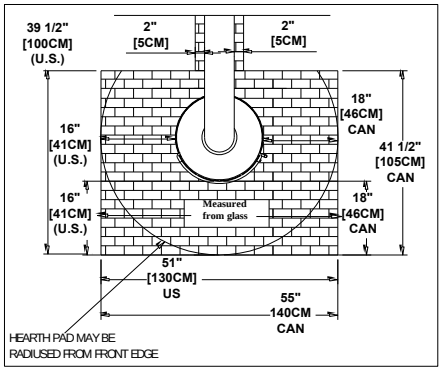
HEARTH REQUIREMENTS AND FLOOR PROTECTION

Ensure you protect combustible flooring with a covering of a noncombustible material. The floor protection must extend beyond the **body** of the stove at the minimum as follows:

In Figures 1 and 2 you will find two hearth options; one hearth for the freely rotating stove and the other for the locked stove.

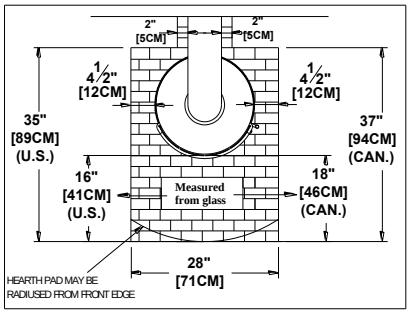
* Installations in Canada require 18" (45.72 cm) of floor protection on both side and front.

** Rear clearance required only if stovepipe runs horizontally back above the top of the stove.



FLOOR PROTECTOR STOVE CAN ROTATE 180 DEG.

Figure 1



Floor protection for stoves only in the locked position shown

Figure 2

- **Note: Dimensions shown in previous figures are from the body of the stove.**

The Bari wood stove has a unique feature that allows it to rotate. This rotation allows positioning the body of the stove into 13 different positions, up to a full 90 degrees to either side. In order to install the Bari onto the smaller hearth protector shown in Figure 2, you must lock the stove in place. To do this, follow the instructions below:

ROTATION LOCK INSTALL PROCEDURE

1. Open the lower control door and locate the rotation control.
2. Ensure the stove is in its 0-degree orientation (line up the index marks)(see fig. 3), and then position the stove to center the door on the hearth.
3. Lift the control lever and remove the hex head screw (see fig. 4).
4. Rotate the control clockwise until the tangs release, and then lift the control out of its position (see fig. 5).
5. Insert the rotation lock, and line up the mounting screw holes (fig. 6).
6. Insert the screw and tighten securely with the hex wrench (fig. 7).

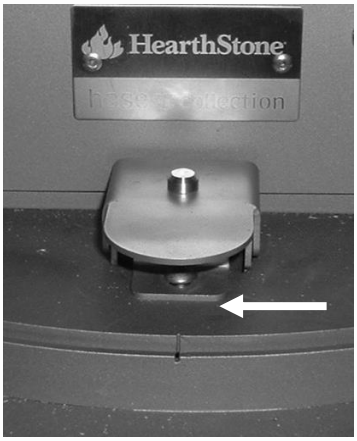


Figure 3 - Zero Index Marks

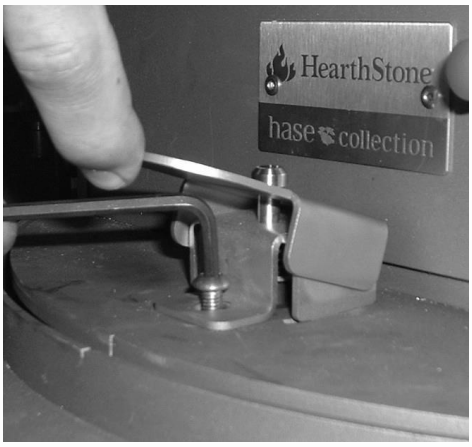


Figure 4: Remove Mounting Screw

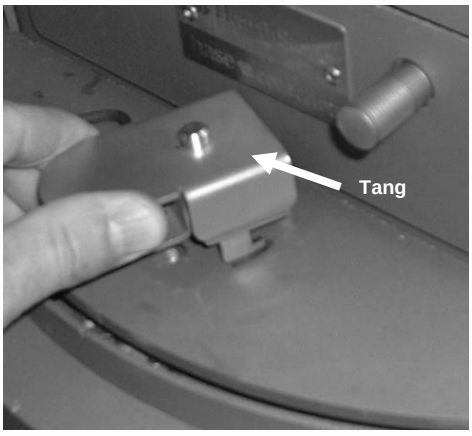


Figure 5: Remove Control

Figure 6: Insert Rotation Lock

Figure 7: Tighten Mounting Screw

COMBUSTIBLE SURFACE REQUIRED CLEARANCES

It is very important to follow minimum clearances for chimney connectors to combustibles such as walls and ceilings when installing the stove near combustible surfaces.

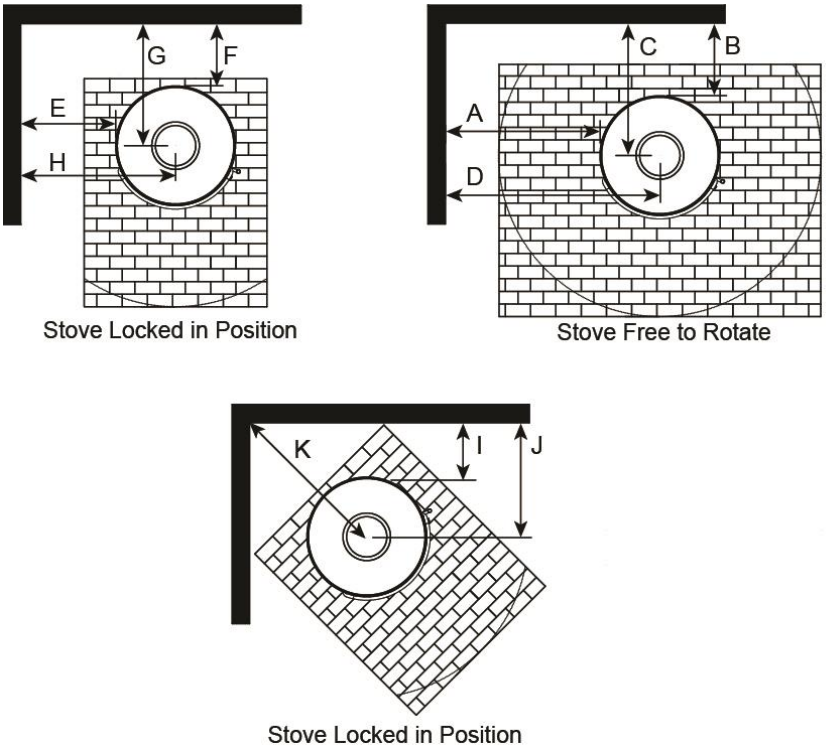


Figure 8: Clearance to combustibles

	Parallel								Corner		
Clearances	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Single or double wall Inches	38	17	26.5	47.5	17	7	16.5	26.5	12	21.5	30.5
Centimeters	96.5	43	67.5	120.5	43	18	42	67.5	30.5	55	77.5

Alcove Clearances (inches)	Unprotected Surfaces	Protected Surfaces (NFPA-211)
Minimum alcove width	46	See NFPA-211
Maximum alcove depth	48	See NFPA-211
Alcove ceiling from floor	84	See NFPA-211

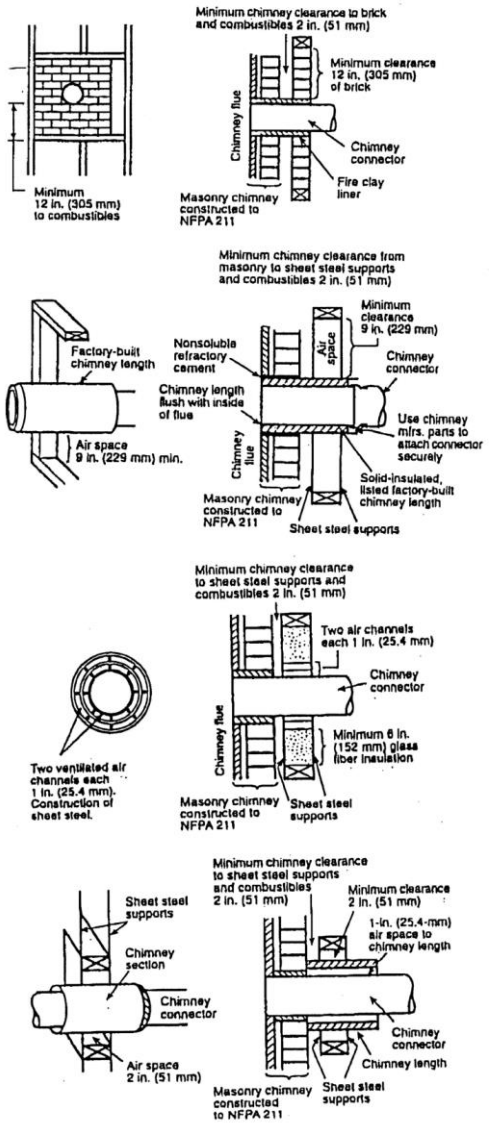


Figure 9: Chimney Connector Clearances

CHIMNEY CONNECTOR SYSTEMS AND CLEARANCES FROM COMBUSTIBLE WALLS FOR RESIDENTIAL HEATING APPLIANCES

A. Minimum 3.5in thick brick masonry all framed into combustible wall with a minimum of 12in. brick separation from clay liner to combustibles. The fire clay 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 1in. or more of insulation with a minimum 9in. 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 1in. air channels, separated from combustibles by a minimum of 6in 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 2in. larger than the chimney connector and having 1in. 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 2in. air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12in. chimney section spaced 1in. 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.

OUTSIDE AIR SUPPLY

(Kit #91- 53700 Gray, Kit#91-53500 Black)

You can connect an outside air source directly to this stove using an optional outside air kit. The advantage of providing outside air directly to the stove is that the air used by the stove for combustion is taken from outside the residence rather than from within the room where the stove is located.

The outside air kit for this stove allows for the direct connection of the stove's air intake to a minimum 3" (76 mm) diameter duct (supplied by others) which leads to the outside of the house. When considering placement of the duct from the outside of the house to the hearth, keep in mind the need to avoid structural members of the house. The outside air kit will attach to the back of the stove.

The International Residential Code (IRC) does not allow the outside air duct to terminate higher than the appliance. Some building officials also do not like to see any vertical rise in the duct's termination. Hearthstone recommends the termination be at the same level, or lower than the air intake on the stove.

Locate the termination of the duct on the outside wall of the home in such a manner to avoid the possibility of obstruction by snow, leaves or other material. Screen the termination using ¼" x ¼" mesh rodent screen and cover it with a rain/wind proof hood (flex pipe, outside termination, mesh, and hood supplied by others) Contact your dealer for availability).

Dampers allowing 100% closure shall be provided in air intakes which are directly connected to the outdoors (Canada).

VENTING COMPONENTS AND CONFIGURATION REQUIREMENTS

- **WARNING: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE USED BY ANOTHER APPLIANCE**
- Single wall connector that is 24 MSG or 25 MSG blued steel stovepipe.
- Double wall connector (close clearance pipe) which is used with a listed, factory-built "Type HT" chimney or with a masonry chimney to reduce clearances, is available from several manufacturers, your dealer can help you choose. Some air insulated connector pipe models available are Simpson Dura Vent DVL and Metalbestos DS. Security, GSW and Ameritec also have acceptable close clearance connector pipe.
- When used in a mobile home, a spark arrester is required. (See page 18)
- The chimney connector cannot pass through a floor or ceiling, nor any attic or roof space, closet or similar concealed space. Where venting requires passage through a wall or partition of combustible construction, the installation must conform to NFPA Code 211 or CAN/CSA - B365.
- It is very important to follow minimum clearances for chimney connectors to combustibles such as walls and ceilings when installing the stove. Typical chimney connector clearances are outlined below. The single wall clearances are generic; the double wall clearances shown are for Simpson DuraVent DVL.
- **CHECK THE SPECIFICATIONS FROM THE MANUFACTURER OF YOUR CONNECTOR.**

COMPONENTS OF A VENTING SYSTEM

The complete venting system consists of several components: chimney connector, wall thimble, wall pass-through, chimney, and liner. It is *absolutely necessary* that you install all of these components and maintain the clearances to combustibles discussed earlier to ensure a safe stove installation.

To protect against the possibility of a house fire, you *must properly install and constantly maintain the venting system*. Upon inspection, immediately replace rusted, cracked, or broken components.

- The *chimney connector* is the stovepipe from the woodstove to the chimney. The chimney connector stovepipe is 6" (152 mm) diameter, 24 MSG or 25 MSG blued steel connector pipe. *Do not use aluminum or galvanized steel pipe* - they cannot withstand the extreme temperatures of a wood fire.
- The *thimble* is a manufactured (or site-constructed) device installed in combustible walls through which the chimney connector passes to the chimney. It keeps the walls from igniting. You must use a wall thimble when installing a chimney connector through a combustible wall to the chimney.

- A *wall pass-through* (or chimney support package) also keeps the walls from igniting. You must use one when connecting through a wall or ceiling to a prefabricated chimney.
- Only install this stove to a *lined masonry chimney* or an approved high temperature *prefabricated residential* type building heating appliance chimney. *Do not* connect this stove to a chimney serving another appliance; you will compromise the safe operation of both the wood stove and the connected appliance.
- A *liner* is the UL 1777 or ULC S635 (for factory built fireplace or masonry) chimney.

You must connect your stove to a chimney comparable to those recommended in this manual. *Do not use stovepipe as a chimney*. Use stovepipe for freestanding installations only to connect the stove to a proper chimney.

WARNING: DO NOT CONNECT THIS APPLIANCE TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.

INSTALLING A VENTING SYSTEM

Install the rotating flue collar adaptor to the top of the stove. Attach stovepipe sections to the rotating adaptor and to each other with the crimped end toward the stove. If creosote builds up, this allows the creosote to run into the stove and not on the outside of the stovepipe or onto the stove.

Secure all joints, including attaching the stovepipe to the stove's flue collar, with three sheet metal screws. Install #10 x 1/2" (3 mm x 13 mm) sheet metal screws into the holes pre-drilled in the flue collar. Disregarding the screws can cause joints to separate from the vibrations that result from a creosote chimney fire.

You can simplify connecting stovepipe by using additional accessories such as telescoping pipes, slip-connectors or clean-out tees. These accessories ease the periodic inspection of your chimney, as well as allow you to dismantle the stovepipe easily (without moving the stove).

Install the stove as close as practical to the chimney, while maintaining all proper clearances. Install stovepipe that is as short and as straight as possible. Horizontal runs of stovepipe must always rise away from the stove at a minimum of 1/4" per foot (21mm/m).

We do not recommend long runs of stovepipe to increase heat dispersal. Longer lengths of stovepipe or more connecting elbows than necessary increase the chances of draft resistance and the accumulation of creosote buildup.

In general, you do not need to install a stovepipe damper with the Bari. Some installations, however, could benefit from a stovepipe damper, such as a tall chimney which can create a higher than normal draft. In such cases, a damper can help regulate the draft. The Bari requires a draft between 0.06" and 0.1" WC. For drafts above 0.1" WC, install a stovepipe damper. Check the draft at stove installation time.

Remember, the NFPA recommends minimum clearances for chimney connectors to combustibles such as walls and ceilings. Once the stove is installed at safe distances from these combustible surfaces, it is important to maintain these connector clearances for the remainder of the installation.

CONNECTING THE STOVE TO A CHIMNEY

You can install your Bari to a prefabricated metal chimney, or a masonry chimney.

CONNECTING TO A PREFABRICATED METAL CHIMNEY

There are two ways to install a prefabricated metal chimney:

1. An *interior* installation where the chimney passes inside the residence through the ceiling and roof.
2. An *exterior* installation where the chimney passes through the wall behind the stove then up the outside of the residence.

Whenever possible, choose an interior chimney. An interior chimney heats up quickly and retains its heat; thus promotes a better draft and discourages the formation of creosote. An exterior chimney does not benefit from the warmth of the building, so it typically operates at lower flue temperatures than an interior chimney. An exterior chimney's draft is not as strong and may experience increased creosote accumulation.

When connecting the Bari to a prefabricated metal chimney, you must follow, precisely, the manufacturer's installation instructions. Use only Type HT (2100 deg. F), prefabricated metal chimneys listed per UL 103 or ULC S629 standards.

Ensure the size of the chimney's flue is appropriate for the Bari. The Bari requires a 6" (152 mm) inside diameter flue for new installations. A 6" diameter flue

provides adequate draft and performance. You can use an 8" (203 mm) diameter existing flue with a reducer. An oversized flue contributes to creosote accumulation. (In this case, bigger is **NOT** better.)

When purchasing a prefabricated chimney to install with your stove, Ensure you also purchase from the same manufacturer the wall pass-through (or ceiling support package), "T" section package, fire-stops (when needed), insulation shield, roof flashing, chimney cap, and any other needed accessories. Follow the manufacturer's instructions when installing the chimney and accessories. In addition, ensure you maintain all manufacturers' recommendations for the proper clearances to the chimney.

CONNECTION TO A MASONRY CHIMNEY

Consider two primary elements when connecting your stove to a masonry chimney: the chimney itself, and the thimble where the stovepipe connects to the chimney. Use only Code approved masonry chimneys with an appropriate flue liner.

Before connecting to a masonry chimney, hire a professional to examine the chimney for cracks, loose mortar, and other signs of deterioration and blockage. If the chimney needs repair, complete them before installing and using your stove. Do not install your stove until the chimney is safe for use Make sure the chimney's cleanout is complete and working properly. To avoid a loss of draft, the cleanout door must close completely and provide a tight seal. If the cleanout door leaks, the chimney will cool, your stove will perform poorly, and creosote will build up.

Ensure the size of the chimney's flue is appropriate for this stove and that it is not too large. Use a masonry chimney with a maximum 8" x 8" (203 mm x 203 mm) tile size for best results. An oversized flue contributes to the accumulation of creosote.

Use the following checklist to ensure that your masonry chimney meets these minimum requirements:

Masonry Chimney wall construction:

- Mortared brick or modular block at least 4" (102 mm) thick
- A mortared rubble or stone wall

Flue liner options:

Tile - minimum wall thickness of 5/8" (16 mm)

- Tile - installed with refractory mortar
- Tile - at least 1" (25 mm) air space around liner
- Stainless steel - UL listed 6" diameter
- Stainless steel - fill space around liner with vermiculite (keeps liner warmer for better performance)
- Ensure an equivalent flue liner is a listed chimney liner system meeting type HT requirements or other approved material.

Interior chimney requirements:

- At least 2" (51 mm) clearance to combustible materials
- Fire stops installed at the spaces where the chimney passes through floors and/or ceiling
- Any insulation is at least 2" (51 mm) from the chimney

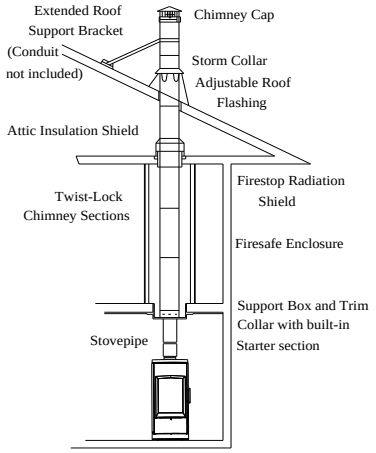
Exterior chimney requirements:

- At least 1" (25 mm) clearance to combustible materials

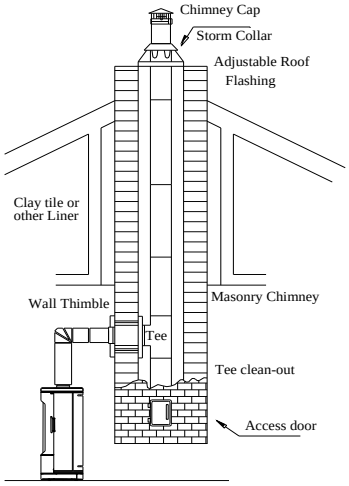
Chimney height requirements (See *Figure 10* below):

- At least 3 feet (0.9 m) higher than the highest part of the roof opening through which it passes.
- At least 2 feet (0.6 m) higher than any part of the roof within 10 feet (3 m) measured horizontally from the top of the chimney.

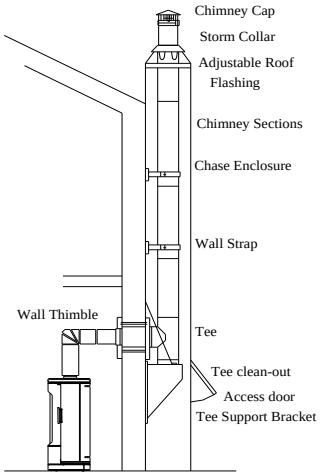
This stove requires a minimum chimney height of 13 feet (4 m). The maximum recommended chimney height is 30 feet (9m).



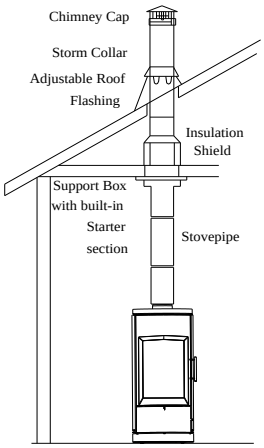
Two story house installation with attic.



Chimney pipe through Clay tile
or other Lined Masonry Chimney



Chimney through outer wall with enclosed chase.
Chimney is supported by Tee Support Bracket.



One story house installation with attic.
Chimney is supported by Ceiling.

Figure 10: Typical Venting Configurations

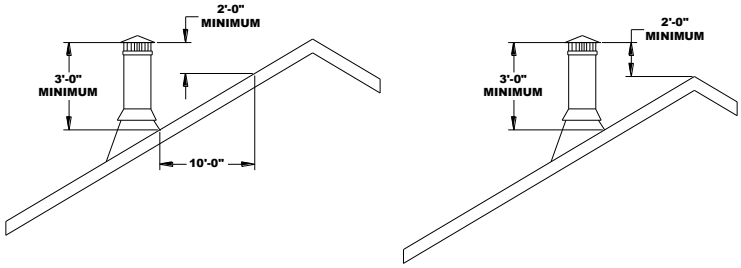


Figure 11: Chimney Height & Roof Clearance Requirements

INSTALLING IN A MOBILE HOME

Follow these special requirements for installing your stove in a mobile home.

Install the stove in accordance with 24 CFR, Part 3280 (HUD)

- Permanently attach the stove to your mobile home's floor. Use Hearthstone's Kit #91-99400 - Mobile Home Lock Down Kit.
- An outside air kit must be used in all mobile home installations. A 4" fresh air intake is required for mobile home installation. Kit # 90-53308. See page 13 for more details.
- Install one of the following Dura-Vent Mobile Home Chimney & Connector Kits:

  6DP-MH 6" Diameter S/N 9096N

  7DP-MH 7" Diameter S/N 9196N

  8DP-MH 8" Diameter S/N 9296N

  Each kit includes:

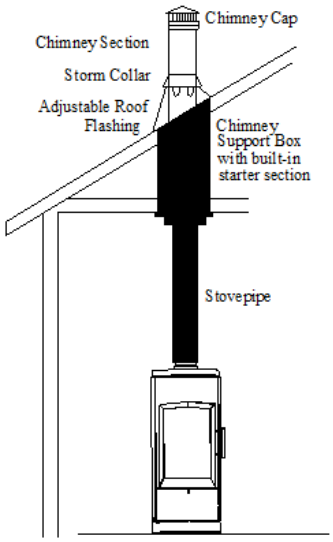
  Stainless spark arrester cap, storm collar, Adjustable vented flashing – 0/12 – 6/12, Two 24" Dura/Plus* chimney pipes, 24" Support box with built-in starter section and trim.

  *** (UL or ULC approved equipment is acceptable)**
- **WARNING: DO NOT INSTALL IN A SLEEPING ROOM IN A MOBILE HOME.**
- **CAUTION: MAINTAIN THE STRUCTURAL INTEGRITY OF THE MOBILE HOME WALLS, FLOOR, CEILING, AND ROOF WHEN INSTALLING AND USING YOUR STOVE**.
- **CAUTION: REMOVE THE CHIMNEY WHEN TRANSPORTING THE MOBILE HOME!**
- **FAILURE TO FOLLOW THESE INSTRUCTIONS AND SPECIFIED COMPONENTS OR USING MAKE-SHIFT COMPROMISES CAN RESULT IN FIRE, PROPERTY DAMAGE, BODILY INJURY, AND EVEN DEATH.**
- **BURNING ANY FUEL OTHER THAN WOOD IN THIS UNIT COULD GENERATE DANGEROUS LEVELS OF CARBON MONOXIDE WITHIN THE LIVING SPACE.**
- **THE FRONT DOOR MUST REMAIN CLOSED WHEN IN OPERATION EXCEPT FOR START UP AND LOADING.** Leaving the door open during use could cause any smoke or fire detectors in the home to be set off or a fire could escape the firebox and start the room on fire**.**
- **If this unit is installed in a mobile home, care must be taken to ensure adequate air is available. If not enough air is available it could starve the room of all the oxygen. (See page 29 for more details)**

- **The chimney should be attached directly to the stove and must extend at least 3 feet (.9 m) above the part of the roof through which it passes. The top of the chimney is to be at least 2 feet (.6 m) above the highest elevation of any part of the mobile home within 10 feet (3 m) of the chimney.**

- **All roof-chimney terminations should be able to be readily removed / re-installed at or below an elevation of 13-1/2 feet (4.1 m) above ground level without the use of special tools or instructions. The chimney assembly shall be provided with a mechanical securement means to secure the chimney to the ceiling support box.**

- **When a chimney exits the mobile home at a location other than through the roof, and exits at a point 7 feet (2.1 m) or less above the ground level on which the mobile home is positioned, a guard or method of enclosing the chimney shall be provided at the point of exit for a height up to 7 feet.**

- 

Typical Mobile Home installation.
Chimney supported by ceiling.

- **The chimney guard shall not allow the passage of a ¾ inch (19.1 mm) diameter rod, and a ½" (12.7 mm) diameter rod shall not be able to touch the chimney when inserted through any part of the guard a distance of 4 inches (102 mm).**

- **The chimney shall be provided with a spark arrester secured to the chimney. The net free area of the arrester above the chimney outlet shall not be less than 4 times the net area of the chimney outlet, and the vertical height of the arrester above the chimney outlet shall not be less than ½ the diameter of the chimney flue. Openings shall not permit the passage of a sphere having a diameter of ½ inch (12.7 mm), and shall allow the passage of a sphere of 3/8" (9.6 mm).**

- **Be sure to follow the manufacturer's instructions to maintain an effective vapor barrier at the location where the chimney of other component penetrates the exterior of the structure.**

- **CAUTION: REMOVE THE CHIMNEY WHEN TRANSPORTING THE MOBILE HOME!**

hearthstone

Hase Bari Wood Model 8171
Manual: XXXX-XXXXX
R: 08/15/19

Operating Your Bari Wood Stove

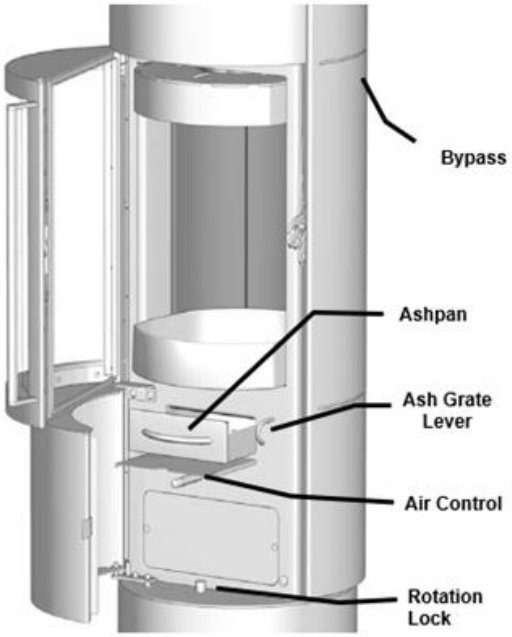
Once your Bari is fully installed, you are ready to light a fire. Hearthstone tests each wood stove before we ship it, so you will easily light your first fire.

- **WARNING: HOT WHILE IN OPERATION! KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT CAN CAUSE SKIN BURNS.**

Read this entire chapter before lighting your first fire. It explains the controls and features of your wood stove, how to choose firewood, and how to use your stove on a daily basis.

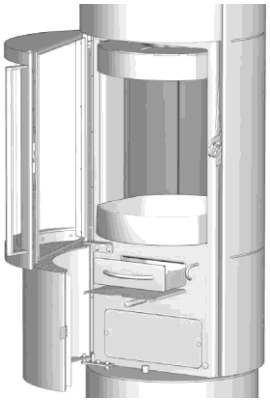
CONTROLS AND FEATURES

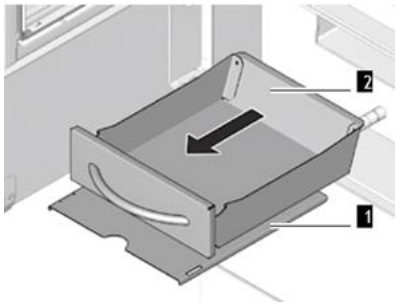
Before lighting any fires, become familiar with the location and operation of your stove's controls and features and learn how to use them (See Fig. 13). For your own safety, do not modify these features in any way. *The Bari wood stove radiates heat into the surrounding area. In doing this, the controls of the heater can become very hot. Please use caution when using any of the controls. Do not use the controls unless the stove is cool or you use the provided hearth glove.*

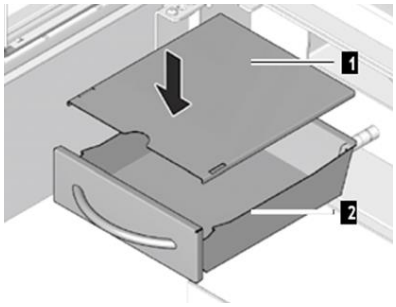


***FRONT DOOR HANDLE*:** The front door allows you to load wood into your stove; a fixed handle operates the front door. To open the door, pull out on the handle and pull the door away from the stove. To latch the door, push the door tightly towards the firebox then continue to push the handle until it latches shut. Gently pull on the door handle to ensure it is properly latched.

ASH GRATE LEVER: *(This becomes very hot during operation. It is best to operate the ash removal system after the stove cools.)* To access the lever, open the control door located under the front door. The grate lever is located above the ash pan. Use the ash grate lever to open the ash grate to move the ashes from the firebox to the ash pan. Pull the lever out to open the grate. Once you have sifted the ashes through the grate into the ash pan, push the lever back in towards the stove to close the grate.





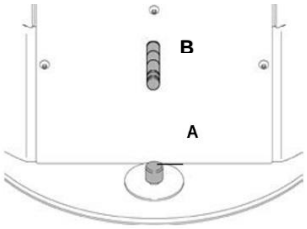


ASH PAN: *(This becomes hot during operation. It is best to remove the ash pan only after the stove cools).* To access the ash pan you must open the control door, which is located under the firebox door. Open the control door and locate the ash pan's handle. The lid for the ash pan is stored under the ash pan. Use the lid to contain the ashes during transport for disposal. **The lid must be stored in place under the ash pan to support it, or the pan will not seal properly.** The ash pan collects the ash residue from each fire and when full, allows you to remove the ash conveniently from your wood stove. Clear the firebox of ashes periodically by opening the ash grate in the bottom of the firebox. Sift the ashes through the grate into the ash pan, and then return the grate to its closed position.

To replace the ash pan, place the pan lid back into the bottom of the ash pan receptacle and slide the ash pan back into place on top of the lid. The lid must be upright to support the ash pan properly.

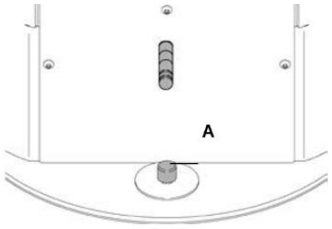
- **Do not operate the stove unless the ASH PAN is in place, and properly sealed. Not doing this could overheat and damage the stove.**

PRIMARY AIR CONTROL: The primary air control handle (B) is located on the front lower right of the stove, just under the ash pan. The primary air control allows you to regulate the amount of air entering the firebox. Generally, the more air allowed into the firebox, the faster the rate of burn; conversely, less air creates a slower burn. For maximum air flow, pull the primary air handle as far out as possible; push the primary air control handle in as far as possible for minimum air flow (does not close completely).

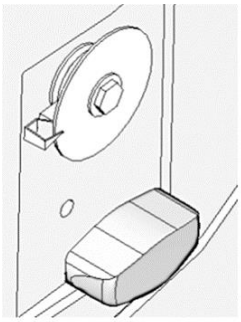


ROTATION CONTROL: Your Bari rotates a full 180 degrees. With the stove centered on your hearth, it will rotate 90 degrees to the left and 90 degrees to the right. There are 13 possible positions.

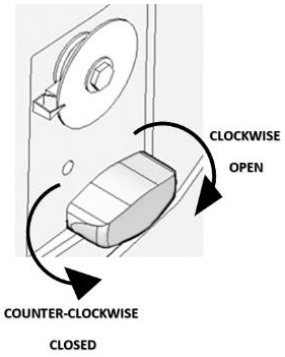
To access the rotation control you must open the control door that is located under the firebox door. Open the control door and locate the push button (A) Push the button to free the unit to rotate to the position you desire. Once the stove is in position, push the button again and slightly turn the stove to ensure it locks into position. If the stove is positioned as you like, close the control door and enjoy the fire.



BYPASS HANDLE: The bypass handle controls the bypass door inside the stove. When the handle is in-line with the flue the bypass is open, and when the handle is horizontal, the bypass door is closed. The bypass door directs the flow of combustion products through or around the catalytic combustor. When the bypass handle is open, combustion products are directed around the catalytic combustor. The bypass handle should be open when first staring a fire until the catalytic combustor heats up to activation temperature, and whenever opening the front door to load the stove. When the bypass handle is closed, combustion products are directed through the catalytic combustor. The bypass handle should be closed once the catalytic combustor heats up to activation temperature, and remain closed whenever the stove is burning and in the active temperature range.



Bypass in closed position



CATALYST THERMOMETER: The catalyst thermometer monitors the downstream temperature of the catalysts, and indicates when the stove is in the active range for the catalysts. When the stove is in the “active” range, the bypass handle should be closed. When the stove is in the “Inactive” range, the bypass handle should be opened until the stove heats up. If the thermometer is in the “Too Hot” range, keep the door closed, fully close the air control, and allow the stove to cool down until the thermometer falls into the “Active” Range. Once the catalyst thermometer has reached the active range, heat generated from burning smoke keeps the catalysts warm and active as long as fuel remains in the stove.

Figure 12 – Catalyst Thermometer

Figure 13: Controls

CHOOSING FIREWOOD

Your Bari Wood Heater is designed to only burn firewood-also known as cordwood.

- **CAUTION: DO NOT USE CHEMICALS OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA, KEROSENE, CHARCOAL LIGHTER FLUID OR ENGINE OIL TO START A FIRE. DO NOT USE CHARCOAL, PELLETS, COAL, ARTIFICIAL LOGS OR ANY OTHER MATERIALS AS FUEL; THEY ARE NOT SAFE. DO NOT BURN GARBAGE.**

The quality of your firewood affects heat output, duration of burn and performance of your Fireplace Insert. Softwoods generally burn hotter and faster, while hardwoods burn longer and produce more long lasting coals. Density and moisture content are two critical factors to consider when purchasing wood for your Fireplace Insert.

The following is a list of wood species and their relative BTU (British Thermal Unit) content. The higher the BTU content the longer the burn. Firewood with higher a BTU content is generally considered ideal for a wood stove.

WOOD HEAT VALUE

Common Name	Lb/ cord	MBTU/ cord
High		
Osage Orange (Hedge)	4,728	32.9
Hickory, Shagbark	4,327	27.7
Hop Hornbeam (Ironwood)	4,267	27.3
Beech, Blue (Ironwood)	3,890	26.8
Birch, Black	3,890	26.8
Locust, Black	3,890	26.8
Hickory, Bitternut	3,832	26.7
Locust, Honey	3,832	26.7
Apple	4,100	26.5
Mulberry	3,712	25.8
Oak, White	4,012	25.7
Medium High		
Beech, European	3,757	24
Maple, Sugar	3,757	24
Oak, Red	3,757	24
Ash, White	3,689	23.6
Birch, Yellow	3,689	23.6
Medium		
Juniper, Rocky Mtn	3,150	21.8
Elm, Red	3,112	21.6
Coffeetree, Kentucky	3.112	21.6
Hackberry	3,247	20.8
Tamarack	3,247	20.8
Birch, Gray	3,179	20.3
Birch, White (Paper)	3,179	20.3
Walnut, Black	3,192	20.2
Cherry	3,120	20
Ash, Green	2,880	19.9
Cherry, Black	2,880	19.9
Elm, American	3,052	19.5
Elm, White	3,052	19.5
Sycamore	2,808	19.5
Ash, Black	2,992	19.1
Maple, Red	2,924	18.7
Fir, Douglas	2,900	18.1
Medium Low		
Boxelder	2,797	17.9
Alder, Red	2,710	17.2
Pine, Jack	2,669	17.1
Pine, Norway (Red Pine)	2,669	17.1
Pine, Pitch	2,669	17.1
Catalpa	2,360	16.4
Hemlock	2,482	15.9
Spruce, Black	2,482	15.9
Pine, Ponderosa	2,380	15.2
Low		
Aspen, American	2,290	14.7
Butternut (Walnut, White)	2,100	14.5
Spruce	2,100	14.5
Willow	2,100	14.5
Fir, Balsam	2,236	14.3
Pine, White (Eastern, Western)	2,236	14.3
Fir, Concolor (White)	2,104	14.1
Basswood (Linden)	2,108	13.8
Buckeye, Ohio	1,984	13.8
Cottonwood	2,108	13.5
Cedar, White	1,913	12.2

Moisture content also plays a key role in the performance of your stove. Wood freshly cut from a living tree (green wood) contains a great deal of

moisture. As you might expect, green wood has difficulty burning and should be seasoned before using it in your wood stove. To properly season green wood: split, stack and allow to air dry for a period of one year.

Stack the firewood on skids or blocking to keep it off the ground, cover only the top of the stack. Plastic or tarps that cover the sides of the stack of wood trap moisture and prevent the wood from drying. As for stacking, an old Vermonter said, "The spaces between the logs should be large enough for a mouse to get through, but not for the cat that's chasing it."

- **Do not store Firewood within the stove's specified clearances to combustible materials.**

BUILDING A FIRE

Once you understand the controls of your wood stove and have the appropriate firewood, you are ready to start a fire.

When you light your first fires, the woodstove will emit some smoke and fumes. This is normal "off-gassing" of the paints and oils used when manufacturing the woodstove. If you find it necessary, open a few windows to vent your room. The smoke and fumes will usually subside after 10 to 20 minutes of operation. The odor and smoke will end once the stove is "cured".

The first fires may produce other odors from impurities that exist in the area immediately surrounding the stove. Some potential impurities are cleaning solvents, paint solvents, cigarette smoke, and soot from scented candles, pet hair, dust, adhesives, a new carpet, and new textiles. These odors will dissipate over time. You can alleviate these odors by opening a few windows or otherwise creating additional ventilation around your stove. If any odor persists, contact your dealer or an authorized service technician.

If you adhere to the operating procedures in this manual, the steel, cast iron, and soapstone components of your stove will give you many years of trouble-free use. With use, the color of the soapstone will change and small fractures may appear on the surface of the stone. These changes will only add character and distinction to your stove.

Avoid the following conditions that can cause the glass, soapstone, steel or cast iron pieces to break:

- Do not throw wood into the stove.
- Do not use the door for leverage to force wood into the stove.
- Do not load wood encrusted with ice into a burning stove - the thermal shock can cause damage.
- Do not use a manufactured log grate. Burn the fire directly on the cast iron bottom of the firebox.

NORMAL OPERATION

Prior to loading the stove, make sure the ash grate and the ash pan door are closed. If left open, the stove will over-fire and will suffer damage.

BUILDING A FIRE FOR EVERYDAY USE

1) Open the front door and place five or six double sheets of tightly twisted newspaper in the center of the firebox. Arrange kindling in a tee-pee configuration over the newspaper. Use approximately 10 pieces of kindling, 1/2" (13 mm) in diameter and 10" to 16" (254 mm to 406 mm) long.
2) Fully open the primary air control by pulling it completely out, away from the firebox. Open the catalyst bypass (handle should be in line with the flue pipe.
3) Light the paper under the kindling. Leave the front door slightly ajar until the kindling begins to burn and draft begins to pull. NOTE: Lighting the kindling at the front, near the glass will get the fire going more quickly.
4) Close the door and allow the fire to burn.
5) Once the kindling is burning vigorously, open the front door and add logs, small at first, to build the fire up. Ensure you keep the logs away from the glass in front in order for the air-wash system to work properly. Keep the front door and ash pan closed while the stove is in use.
6) Once the fire is burning well, use the primary air control to regulate the desired rate of burn. Pull the handle out to open the primary air control for a high rate of burn; or push it in for a low rate of burn. The air control does not close completely.

- **Note:** When opening the front door to reload or re-arrange logs, it is advisable to open the door just a crack, pause for a moment then open the door completely. This procedure allows the firebox to clear of smoke before the door is open fully. In addition, reloading on a bed of hot, red coals reduces smoking time

and brings fresh fuel up to a high temperature rapidly.

BURN RATE

HIGH BURN: Fully load the firebox with wood on a bed of hot coals or on an actively flaming fire and fully open the primary air control by pulling it all the way out, away from the firebox. A high burn rate once or twice a day to heat the stovepipe and chimney fully, will help minimize creosote accumulation.

MEDIUM HIGH BURN: With the primary air control in the open position, push the control handle slightly towards the firebox, or about ¼ to ½ the way in.

MEDIUM LOW BURN: With the primary air control in the open position, push the handle inward about ¾ of the way in. A medium-low burn rate is the typical setting and is preferable if the stove is unattended.

LOW BURN: Push the primary air control inward all the way to the firebox. This closes the air shutter to its minimum opening. A low burn rate over extended periods is not advisable as it can promote the accumulation of creosote. Inspect the venting system frequently if using low burn rates consistently.

CATALYTIC COMBUSTOR OPERATION

The BARI uses a catalytic combustor to ensure highly clean and efficient burns. The catalytic combustor is made from a stainless steel corrugation that is coated with a catalytic material. The catalytic combustor becomes active around 500 ºF (260ºC), helping to burn up smoke and any remaining particles that were not fully burned in the firebox. During the startup of a cold stove, a medium to high firing rate must be maintained for about 20 minutes. This ensures that the stove, catalysts, and fuel are all stabilized and at proper operating temperatures. Even though it is possible to have gas temperatures reach 500 °F (260ºC) within 2 to 3 minutes after a fire is started, if the fire is allowed to die down immediately, it may go out or the combustor may stop working. Once the stove and catalytic combustor heat up, heat generated from burning smoke keeps the catalysts warm and active as long as fuel remains in the stove. You stove will burn the cleanest and most efficiently when the catalysts are in the active range. There should be little to no visible smoke from your chimney when the catalysts are in the active zone and fully functional.

OVER-FIRE CAUTION

Over-firing means the stove is operating at temperatures above the recommended temperatures outlined in the *BURN RATE* section. Carefully avoid over-firing, as it will damage the stove. Symptoms of chronic over-firing can include warped components, short burn times, a roaring sound in the stove or stovepipe, and discoloration of the stovepipe.

Excessive draft, inappropriate fuel, and operator error can cause over-firing. Correct an over-fire situation as follows:

- ***EXCESSIVE DRAFT:*** Contact your local dealer to have a draft reading taken. Any draft in excess of 0.1 WC requires a damper in the stovepipe. Some installations may require more than one damper.
- ***INAPPROPRIATE FUEL:*** Do not burn coal; kiln dried lumber, wax logs or anything other than natural cordwood.
- ***OPERATOR ERROR:*** Ensure all the gaskets are in good condition. Replace worn out or compressed gaskets. Do not burn the stove with the front door, ash pan, or the ash grate in the open position.

If you suspect that your stove is over-firing, contact your dealer immediately. **Damage caused by over-firing is not covered by your warranty**. Results of over-firing can include warped or burned out internal parts, cracked vermiculite panels, discolored or warped external parts, and damaged finish.

REMOVAL AND DISPOSAL OF ASHES

Remove ashes only when the stove is cold. Use protective fireplace gloves if the ash pan is warm. Exercise extreme caution when handling, storing or disposing of ashes.

The ash pan is located behind the control door. The ash pan collects burned ash from a fire and allows you to remove the ash conveniently from your wood stove. Clear the firebox of ashes often, and do not let them build up more than 3 inches high. It is important to prevent ashes from building up around the front door opening. To remove ashes, pull the grate lever out to open the grate. Sift the ashes across the grate into the ash pan. Then return the ash grate to its closed position by pushing the lever back in towards the stove. The ash pan is easy to remove and has a handle and lid for convenient disposal of ashes. The lid must be stored under the ash pan when burning the stove. The ash pan will not seal properly without the lid under it.

Dump ashes from the ash pan directly into a **metal** container with a tight fitting lid. Do not place any other items or trash into the metal container. Do not pour water into the container. Replace the container's lid and allow the ashes to cool. Never place the ash disposal container on a combustible surface or vinyl flooring, as the container could be **hot!**

Pending disposal, place the closed ash container on a noncombustible floor or on the ground, well away from all combustible materials, liquid fuels, or vehicles. Retain ashes in the closed container until all coals thoroughly cool.

- **NEVER** place ashes in wooden or plastic containers, in trashcans with other trash, or in paper or plastic bags, no matter how long the fire has been out. Coals within a bed of ashes can remain hot for several days once removed from the firebox.

Maintenance

Creosote Formation & Need For Removal

When wood burns slowly at low temperatures, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. These 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, which may damage the chimney or even destroy the house. When burning wood, inspect the chimney connector and chimney at least once every two months during the heating season to determine if there is a creosote buildup.

If a creosote build-up occurs, inspect the stovepipe connector and chimney more often, at least monthly during the heating season to monitor the accumulation. If a creosote residue greater than 1/4" (6 mm) accumulates, remove it to reduce the risk of a chimney fire.

Prevention

Burn the stove with the primary air control fully open for 35 - 45 minutes daily to burn out creosote deposits from within the stove and the venting system.

After reloading with wood, burn the stove with the primary air control fully open for 15 to 20 minutes. This manner of operation ensures early engagement of the secondary combustion system that minimizes creosote buildup in the chimney.

If your glass always remains dirty, your operating temperatures are too low or your wood is wet; therefore, there is a higher risk of creosote buildup.

Inspect the venting system at the stove connection *and* at the chimney top. Cooler surfaces tend to build creosote deposits faster, so it is important to check the chimney at the top (where it is coolest) as well as from the bottom near the stove.

Cleaning

Remove accumulated creosote with a cleaning brush specifically designed for the type of chimney in use. We recommend you use a certified chimney sweep to perform this service. Contact your dealer for the name of a certified chimney sweep in your area (your dealer may be a certified sweep!).

We recommend that before each heating season you have the entire system professionally inspected, cleaned and repaired, if necessary.

Door Removal Procedure:

1. Open the door and remove the push nut from the upper hinge pin, and remove the pin.
2. Tilt the top of the door outward, and then lift the door up off the lower pin. The door weighs 81 pounds (37 kg) – so use a helper if necessary.
3. Ensure the brass washer remains in place on the lower pin.
4. Place the door face down on a padded work surface. Use two rolled up towels, or similar, under the door to stabilize the curved door during maintenance.
5. When reinstalling the door, use a new push nut on the upper hinge pin.

Gaskets

Replace door gasket material every two to three seasons, depending on stove use. If the door seal leaks, a new gasket will ensure a tight seal and improve stove performance.

We recommend you only use Hearthstone Hase Collection replacement gaskets and adhesive when you need to replace your door gasket. Contact your dealer for a gasket kit that includes instructions, adhesive, and the gasket for your stove.

Required Door Gasket Kit: Part Number: ~~3110-20075~~291-58700~~, 79" (200cm) Length, 9/16" (14 mm) Diameter.~~

Door Gasket Replacement Procedures:

1. To replace the door gasket, remove the door from the stove (see door removal instructions above), and remove the door's side plates. Pull off the old rope gasket. Carefully remove any old gasket material and adhesive with a small screwdriver, or cold chisel and a hammer. Clean all gasket channels with a small wire brush if necessary.
2. Vacuum the inside of the door as required. Loosely re-attach the door's side plates.
3. Apply a 1/8-inch (3mm) bead of gasket adhesive to the channels. Fold the provided gasket rope in half to find its center point. Start at the top or

bottom center of the door and push the new gasket into place uniformly without stretching or compressing the gasket material. Pinch the gasket into place as necessary. Use masking tape to hold the rope in the channel along the top and bottom of the door.

4. Once the gasket is installed, tighten the door's sidepieces to clamp the gasket in place. The sidepieces form one side of the gasket's channel, and hold the gasket rope along the sides in place.
5. Re-install and close the door immediately to fully seat the gasket in the channel and ensure complete adhesion. Check the gasket seal using a dollar bill or aim a flashlight into the space around the door from the outside (then look in through the glass at the gasket – if you see light, the seal will leak). The leak will most likely be where the gasket was not fully inserted into the channel, or where stretched (thinner), or adjacent to an area where the gasket was compressed (thicker).
6. First, adjust the gasket as necessary by reseating it uniformly. If that does not work, adjust the latch mechanism (see below and Fig. 14 and 15) so it applies more pressure when the door is closed. Keep the door closed and do not burn the stove for 24 hours while the adhesive cures.
7. Remove the tape before burning the stove.

LATCH ADJUSTMENT PROCEDURES:

1. Test gasket seal quality with small latch adjustments first. The curved door geometry means a little movement goes a long way. Too much pressure makes the door difficult to open and close and prematurely wears the roller and the gasket.
2. Loosen bolts, adjust jackscrews, or use a combination of both to shift the latch assembly to apply more, or less closing pressure to the gasket (See Fig. 14).
3. If necessary, loosen the five bolts securing the door side plate containing the handle (mounting holes are slotted). Make additional adjustments by sliding the side plate in towards the stove (less pressure), or out away from the stove (more pressure) (See Fig. 15).

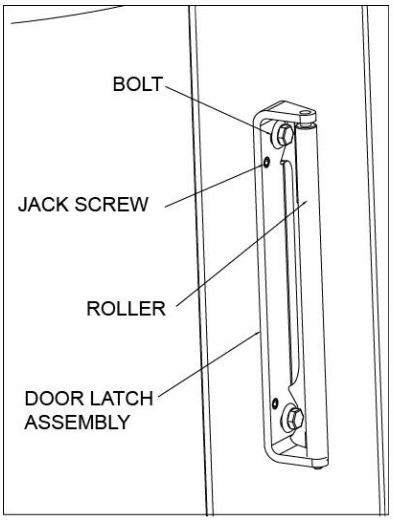


Figure 14: Latch Assembly Detail

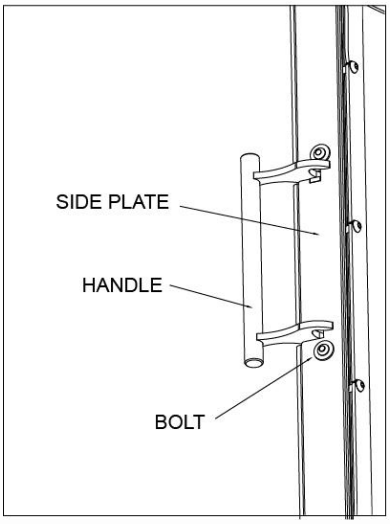


Figure 15: Handle Assembly Detail

GLASS

Do not operate the stove with a broken door glass. Do not abuse the front door by striking or slamming.

When necessary, clean the glass with commercial stove glass cleaners, which are available from your local dealer. Never attempt to clean the glass while the fire is burning or while the glass is hot. Remove deposits by following the instructions provided with the cleaner. To clean heavier, stubborn deposits, remove the door from the stove (See door removal procedures on page 30). Lay the door face down on a clean, padded workbench or table, use rolled up old towels, or similar, to stabilize the curved door so the heavy deposits are at the lowest point. Apply the cleaner to the glass and allow it to soak for a few minutes. Reposition the door as necessary to allow the cleaner to penetrate all the heavy deposits. Wipe the cleaner off with a soft cloth, or black & white newsprint.

> **Important:** scratching or etching the glass will weaken the integrity of the glass. Do not use a razor blade, steel wool, or any other abrasive material to clean the glass. Use a cleaner specifically manufactured for woodstoves only.

The front door glass is a ceramic, shock-resistant glass, made specifically for use in woodstoves. Do not use any replacement glass other than the ceramic glass manufactured and supplied for use in this woodstove. Replacement glass is available through your local Hearthstone dealer.

Replace the door glass immediately if broken or chipped. Contact your local dealer for replacement glass. The glass kit includes instructions and everything needed for the repair. If you replace the glass yourself, wear work gloves and safety glasses.

Required Glass Kit: Part Number: 040-057-V
(Glass with gasket applied).

GLASS REPLACEMENT PROCEDURES:

1. Follow the instructions included with the replacement glass kit.
2. Remove the door (see door removal procedure on page 30).
3. Remove the screws from the glass retainer (use penetrating oil if necessary) – lift the retainer off the glass. Set aside for reinstallation.
4. Remove the inner glass frame from around the glass. Set aside for reinstallation.
5. Carefully lift the damaged glass out of the door and discard.
6. Remove any remaining glass and old gasket material.
7. Clean the screw holes and place a small amount of anti-seize compound in each one.
8. Place the gasketed new glass onto the door.
9. **Important! Center the glass** and ensure that the edges of the curved glass are parallel with the edges of the opening.
10. Reinstall the inner glass frame (limits pressure on glass from the retainer).
11. Check glass position again (centered, and parallel), then screw the glass retainer back on the door using a crisscross pattern. Tighten the screws no more than 1/8th of a turn after they seat. (The glass will break at this point if not positioned correctly. If the glass shifts too much to one side, you will see the gasket from the outside)
12. Apply a light film of anti-seize lubricant on the door's hinge pins and washer if needed.
13. Install the door.
14. After 5 or 6 fires, check the glass retainer screws, and retighten if necessary.

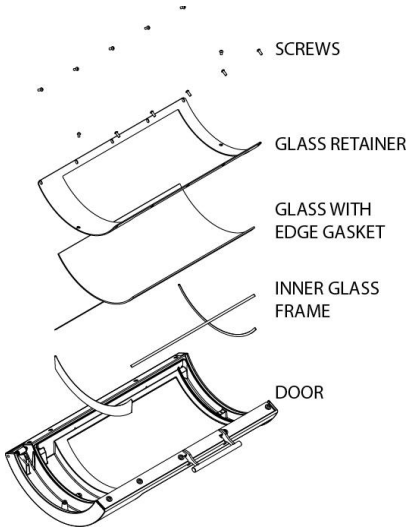


Figure 16: Glass Assembly

VERMICULITE PANEL REPLACEMENT:

1. Remove packing material from spaces along front edges of the outer left and outer right panels.
2. Remove the panel lock plate above the outer right panel.
3. Slide outer right panel slightly to the right, tilt top into firebox, and remove the panel.
4. Slide all other panels to the right, tilt, and remove.
5. To remove the upper panel, remove the screw securing the air tube, slide the air tube to the left, and remove it. Drop down the upper panel.
6. Install the side panels by placing each one into the right most position and then slide it to the left. All side panels are identical.
7. Replace the side panel lock plate.
8. Push side panels together tightly and center them so the spaces along the front edges are equal, Insert packing to prevent panel separation.
9. To install the upper panel, insert the panel rear edge first into the space below the baffle plate – hold in place and insert the air tube. Seat air tube to the right and reinstall screw.

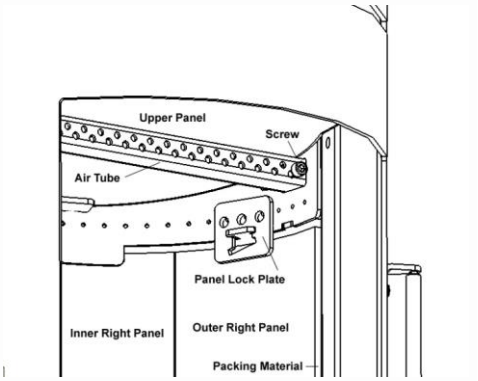


Figure 17: Panel Detail

STONE (IF EQUIPPED)

The stone panels on this stove are large and heavy (150 pounds total). Use a second person to assist in mounting the panels to avoid injury, or damaging the panels. Despite the mass of each piece of soapstone, they will break if dropped. See the Stone Install Instructions included with the Stone Kit.

Occasional cleaning is all that is necessary to maintain the natural beauty of your stove's soapstone finish. The soapstone pieces have a smooth, unpolished surface, and will absorb liquids applied to them. Clean the soapstone only with water, or any non-abrasive glass cleaner and a soft cloth. Wipe dust from the stone with a clean cloth. To avoid staining, do not use chemical agents to wash the stone; do not use waxes or any polishing agents on the stone.

Take care not to scratch or chip the soapstone. Do not set items that can scratch or chip the stone on top of your stove. You can use 240 grit sandpaper to easily repair, or blend in minor scratches

Often, with use and over time, subtle earth tones of brown, green, red, and yellow may appear in the soapstone. This is a natural reaction in the soapstone. Surface or hairline fractures may also appear in the stone after a stove is used. Such changes are normal and do not affect the operation or the integrity of the stove and do not require replacement. If you observe a completely broken stone, contact your dealer for service.

CERAMIC PANELS (IF EQUIPPED)

The ceramic panels do not require maintenance other than an occasional dusting. On a cold stove use a dry, clean cloth to wipe off any debris that may have landed on the panels or top ring. A standard glass cleaner may be used lightly to remove any stains.

CATALYTIC COMBUSTOR INSPECTION AND REPLACEMENT PROCEDURES

- **WARNING: THIS WOOD HEATER CONTAINS A CATALYTIC COMBUSTOR, WHICH NEEDS PERIODIC INSPECTION AND REPLACEMENT FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL, OR IF THE CATALYTIC ELEMENT IS DEACTIVATED OR REMOVED**

It is important to periodically monitor the operation of the catalytic combustor to ensure that it is functioning properly and to determine when it needs to be replaced. A non-functioning combustor will result in a loss of heating efficiency, and an increase in creosote and emissions. Following is a list of items that should be checked on a periodic basis

-Combustors should be visually inspected at least three times during the heating season to determine if physical degradation has occurred. Actual removal of the combustor is not recommended unless more detailed inspection is warranted because of decreased performance. If any of these conditions exists, refer to Catalyst Troubleshooting section of this owner's manual.

-This catalytic (or hybrid) heater is equipped with a thermometer to monitor catalyst operation. Properly functioning combustors typically maintain temperatures in excess of 500 °F, and often reach temperatures in excess of 1,000 °F. If catalyst temperatures are not in excess of 500 °F, refer to the Catalyst Troubleshooting section of this owner's manual.

-You can get an indication of whether the catalysts are working by comparing the amount of smoke leaving the chimney when the smoke is going through the combustor and catalysts light-off has been achieved, to the amount of smoke leaving the chimney when the smoke is not routed through the combustor (bypass mode).

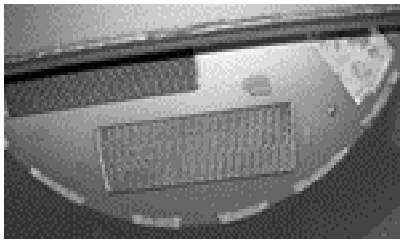
1. Light stove in accordance with operator's instructions
2. With smoke routed through the catalysts, go outside and observe the emissions leaving the chimney.
3. Engage the bypass mechanism and again observe the emissions leaving the chimney. Significantly more smoke will be seen when the exhaust is not routed through the combustor (bypass mode)

INSPECTING THE CATALYSTS AND REMOVING/REPLACING THE BAFFLE

1. Allow the stove and ashes to fully cool.
2. Remove the top baffle by gently lifting the baffle and pushing the retainer clip up and away from the baffle. Remove the baffle from the stove.

Figure 18 - Removing/Replacing the Baffle for Inspection

4. Use a small vacuum nozzle or soft bristled brush to remove any accumulated ash or soot on the face of the catalyst. Inspect the catalysts for any unusual warping, corrosion, or plugged openings.
6. If any unusual conditions are found, remove the catalyst blocks – See replacing the catalysts.
7. Replace the baffle.

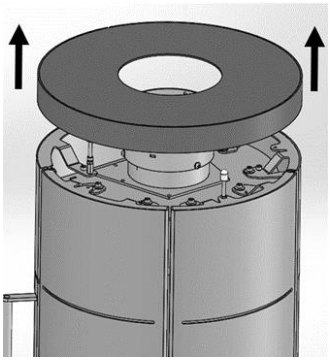


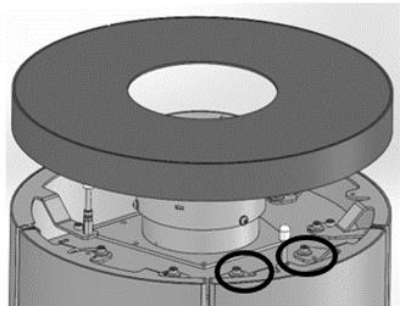
REMOVING OR REPLACING THE CATALYSTS

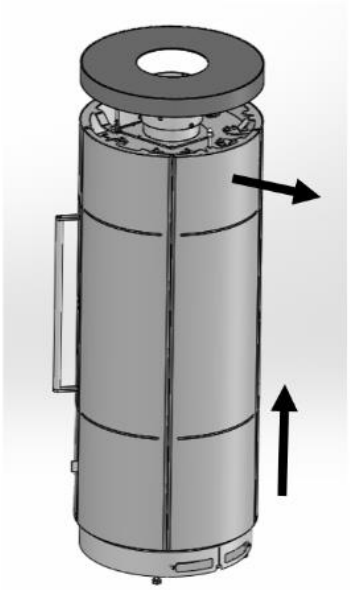
Refer to the Catalytic combustor warranty on page 35 for catalyst replacement information. DO NOT OPERATE UNIT WHITOUT CATALYSTS. Only remove the catalysts if required. In general, the less you handle the catalysts, the better. If any unusual conditions are found, remove the catalyst blocks

1. Allow the stove and ashes to fully cool.

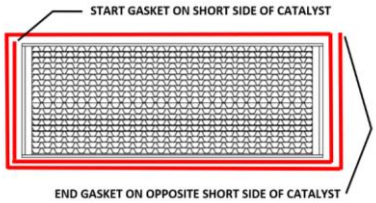
2. Prop the stove top up to gain access to the screws which secure the rear panel.
3. Remove the 2 allen screws that secure the top of the panel. Tilt the top of the panel outward and pull the panel upward at the base.
4. Remove the allen screws securing the catalyst cover, and remove the cover.







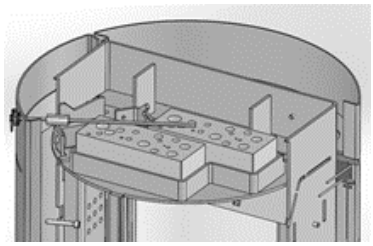
5. Inspect the catalysts for visible damage or fly ash. If fly ash exists, gently brush the catalysts off with a narrow soft-bristle brush, or vacuum with a crevice tool.
6. If fly ash exists, or if there are suspected catalyst performance issues, fully remove the catalysts by gently pulling upwards from the ribs in the cast iron, and then pulling outwards through the catalyst access opening.
7. Remove any remaining gasket material from the opening and from the catalysts.
8. Inspect the catalysts for any fly ash or clogging, and remove with a soft bristled brush or vacuum crevice tool. If extra cleaning is needed, follow the guidelines below:
   -You may use compressed air under 35 psi, air only, no chemicals.
   -You may soak the catalysts in a hot water mix (not boiling), 4 parts water, 1 part vinegar. Rinse with cold water until vinegar smell is mostly gone.
   -No metal tools such as gun cleaners should be used.
   -No detergents or chemicals.



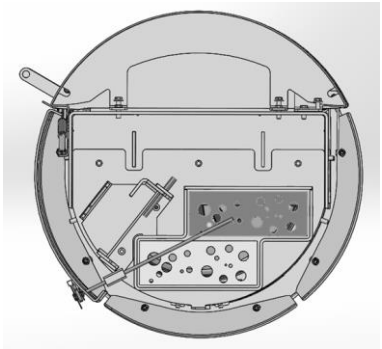
9. Beginning at one corner, re-install fiberglass gasket material on the catalysts.

10. Wrap the gasket tape around the catalysts so it is reasonably tight. Double layer the material on three sides of the individual catalyst cartridges as shown in the following picture.

11. Once the gasket is installed on the catalysts, gently push the catalysts into the catalyst opening until the catalysts hit against the bottom wall of the cavity. Take care to ensure the gasket is not damaged and position the three cartridges so that the single layer gasket edges touch one another in the center.
12. Replace the catalyst access door.
13. Heat the stove slowly during your next fire to allow the fiberglass gasket to properly seat and seal the catalysts.



Single layer ends together



Troubleshooting

COMMON ISSUES

Virtually all woodstove operators experience basic common problems at one time or another. Most are correctable and generally require only a minor adjustment of the stove, installation, or operating technique. In cases where weather conditions dramatically affect stove performance, the problems are typically temporary and solve themselves once the weather changes.

If you question whether your stove is producing adequate heat, the best way to troubleshoot the problem is to monitor the temperature of the stack no more than 12 inches (30 cm) above the flue collar. A 400° F (200° C) stovepipe confirms the stove is supplying sufficient heat. Keep in mind that your house itself will regulate room/house temperatures. How well the walls, floors and ceilings are insulated, the number and size of windows, the tightness of outside doors, and the construction or style of your house (vaulted ceilings or other open spaces which collect large percentages of heat, ceiling fans, etc.) all are determining factors of room temperature.

Your stove's performance is also dependant on its installation. One common cause of poor performance is an oversized chimney flue. Oversized chimney flues result in decreased draft, which prevents the smoke from rising out the chimney. Oversized flues are also more difficult to heat effectively, especially when burning a high efficiency stove. Cool flue temperatures inhibit the establishment of a strong draft (and encourage the accumulation of creosote). The lack of a strong draft will cause the fire to die down and may even force smoke to pour into the room.

If your chimney is the proper size and a strong draft is not easily established, there is the possibility that the chimney is too cold. Again, hot chimneys promote stronger drafts. Opening a window briefly while lighting the stove may help.

Other draft guidelines are as follows:

An **"AIRTIGHT" HOUSE:** The air supply (infiltration) to the interior of the house may be inadequate if your home is super-insulated or especially well sealed. This phenomenon of air starvation within the building is exacerbated if exhaust fans, such as clothes dryers, bathroom fans or cookstove exhaust fans, are in operation within the home. Outfitting your stove with the optional outside air adaptor connected to an air duct, which leads to the outside of the building, can correct this problem.

TALL TREES OR BUILDINGS: These obstructions, when located close to the top of the chimney can cause chronic or occasional downdrafts. When selecting a site for a new chimney, consider the placement of other objects near the proposed chimney location.

WIND VELOCITY: Generally, the stronger and steadier a wind, the stronger (better) the draft. However, "gusty" wind conditions can cause erratic downdrafts. For consistent problems, consider a high wind cap, such as the Vacu-Stack.

BAROMETRIC PRESSURE: Chimney drafts are typically sluggish on balmy, wet or muggy days (low barometric pressure). This is a weather-related phenomenon, which generally is self-correcting as the weather changes.

BRISKNESS OF FIRE: The hotter the fire in your stove, the hotter your chimney and, therefore, the stronger the draft.

BREAKS IN THE VENTING SYSTEM: An unsealed clean-out door at the bottom of the chimney, leaky stovepipe joints, a poor stovepipe-to-thimble connection, missing caps, or a leaky chimney all can cause inadequate draft.

SEASONAL FACTORS: Early fall and late spring are generally difficult seasons in which to establish proper drafts. The colder the outside air is relative to room temperature, the stronger the draft.

OPERATING THE STOVE

As outlined above, there are days when a good draft is just not easy to establish. The causes are usually seasonal factors or a cold chimney. Try starting the fire by using small kindling and fuel to obtain a quick, hot fire. Tend the fire frequently with small fuel until the chimney is hot and the draft is well established. Sometimes, partially opening a first floor window briefly will help quickly get draft established.

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTIONS
STOVE SMOKES	Operating Technique	Fully open the primary air control one minute before opening doors.
	Cold Chimney	Preheat the chimney when first starting a fire. Briefly open a window in the room containing the stove.
	Blocked Chimney	Examine the chimney and stovepipe for blockage or creosote accumulations.
	Oversized Chimney	Reline the chimney to the appropriate diameter
	Undersized Chimney	Install a draft inducer or replace the chimney.
	Chimney Too Short	Lengthen the chimney.
	Air Infiltration Into The Chimney	Seal chimney connections and openings such as clean-out doors.
	More Than One Appliance Connected to the Flue	Disconnect all other appliances and seal openings.
BACK-PUFFING OR GAS EXPLOSIONS	Operating Technique	Fully open the primary air control one minute before opening the door and keep it fully open for a few minutes after reloading.
	Extra Low Burn Rate	Burn the stove at a higher burn rate.
	Chimney Down-draft	Install a chimney cap.
	Excessive Ash Build-up	Empty the ash pan more frequently. Increase efficiency of burns, and avoid using poor quality or green wood.
UNCONTROLLED OR SHORT BURN	Unsealed or Open Door Open ash grate	Close the door tightly or replace the gaskets. Slide ash grate to closed position.
	Excessive Draft	Check the installation. Operate at LOW BURN. Install stovepipe damper.
	Extra Long Chimney	Shorten the chimney. Install stovepipe damper(s).
	Oversized Chimney	Reline the chimney to the proper diameter.
	High Winds or Hilltop Location:	Install a chimney cap.
	Excessive Draft	Draft in excess of 0.1 WC should be corrected with a stovepipe damper(s)
INSUFFICIENT HEAT	Poor Quality or Green Wood	Use only air-dried wood, preferably dried at least one year.
	Low Burn Rate	Operate the stove at a higher burn rate.
	Air Insulated Chimney	Replace with a pre-fabricated insulated chimney system or a properly sized masonry chimney.
	Cold Exterior Chimney	Reline or insulate the chimney.
	Leaky Stovepipe or Chimney	Check the installation.
	Too Much Heat Loss From House	Add insulation, use energy efficient windows, or caulk windows, and seal openings in home.
	Excessive Ash Build-up	Empty the ash pan more frequently. Increase efficiency of burns, and avoid using poor quality or green wood.
BLISTERING OF FINISH	Operating Technique	Do not over-fire the stove. Monitor stove temperatures. Use seasoned wood only.
	Excessive Draft	Check the DRAFT. A damper may be required. Operate the stove at a LOW BURN range.

Replacement Parts & Optional Accessories

PART #	DESCRIPTION	PART #	DESCRIPTION
595-274-V	BAFFLE	565-132	REAR INNER AIR DUCT
595-377-V	SECONDARY AIR SUPPORT	5170-100	SECONDARY AIR RING ASSEMBLY(W/PIPE)
595-379-V	STONE LEVELING PLATE	565-137-V	INNER AIR DUCT
595-278-V	FRONT DOOR TOP HINGE PLATE	575-184	FIREBOX JACKET
595-284-V	FRONT DOOR TOP HINGE PIN (.31"X .98")	800-013-V	ASH TRAY
605-132-V	ASH PAN FAÇADE	601-422-V	LEFT SUPPORT
635-011-V	ASH GRATE, ROTATING	601-425-V	RIGHT SUPPORT
635-052-V	ASH GRATE BASE	780-017-V	UPPER BAFFLE
635-053-V	GRATE ROD	~~3917-100125~~	~~GLOVE~~
650-047-V	AIR CONTROL SHUTTER	~~6400-40459~~	~~MISC.OWNER'S MANUAL~~
505-064-V	BASE PLATE	3917-100125	GLOVE
530-120-V	TOP PLATE	6400-40459~~SP-150GR~~	OWNER'S MANUAL~~AEROSAL PAINT, GREY~~
		SP-150GR	AEROSAL PAINT, GREY
			GASKET KIT, DOOR~~CERAMIC LAVA PANEL~~
170-050-V	VERMICULITE PANEL SET	~~91-5870091-71225~~	~~SET~~
180-218-V1	SIDE PANEL (4 EA)	91-71225	CERAMIC LAVA PANEL SET
180-240-V	TOP PANEL		
	OPTIONAL ACCESSORIES		
91-53700	OUTSIDE AIR KIT, GRAY		
91-53500	OUTSIDE AIR KIT, BLACK		
91-53308	4" OUTSIDE AIR DUCT KIT		
91-99400	MOBILE HOME BOLT DOWN KIT		
	STONE		
1141-820-149-V	RIGHT STONE PANEL		
1141-820-150-V	LEFT STONE PANEL		
1141-820-148-V	TOP STONE RING		

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CONTACT YOUR LOCAL BUILDING OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA

Listed Room Heater, Solid Fuel Type
Also Suitable for Mobile Home Installation Pursuant to (UM)84-HUD

8pfs-cu copy.png

Conforms to UL STD 1482
Certified to ULC STD S627

Manufactured for:
LOGO.PNG
317 Stafford Ave.
Morrisville, VT 05661
By: HASE-Kaminofenbau GmbH
Niederkircher Str. 14 D-54294 Tier
Germany

MODEL NAME:
BARI
MODEL NUMBER: 8171
SERIAL NUMBER:
[redacted]

CAUTION: HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS. INSPECT AND CLEAN CHIMNEY AND CONNECTOR FREQUENTLY. UNDER CERTAIN CONDITIONS OF USE, CREOSOTE BUILDUP MAY OCCUR RAPIDLY.

WARNINGS

Do not use grate or elevate fire. Build wood fire directly on hearth. Do not overfire. If the heater or chimney connector glows, you are overfiring.
(See Operator's Manual)

OPERATE ONLY WITH DOORS CLOSED. DO NOT OBSTRUCT SPACE UNDER HEATER.
TYPE OF FUEL: CORD WOOD ONLY - BURNING FUELS OTHER THAN CORDWOOD MAY DAMAGE THE APPLIANCE

"PREVENT HOUSE FIRES"

Install and use only in accordance with manufacturer's installation instructions and your local building codes.

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

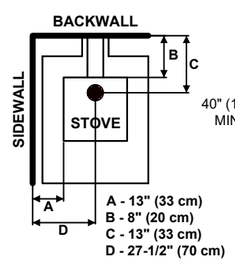
NOTE: Replace glass only with 4mm ceramic glass.

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.

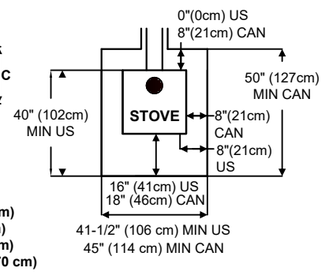
WARNING: (Mobile Home) An outside air inlet must be provided for combustion and be unrestricted while the unit is in use.

THIS APPLIANCE USES A CATALYTIC COMBUSTOR (P/N WF-4150001076)
The performance of the catalytic device or its durability has not been evaluated as part of the certification
CAUTION: Burning materials other than the specified fuels may make the catalyst inactive

Minimum Clearance to Combustible Materials*



Floor Protection*



When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater, and extend at least 16"(41cm) [18" (46cm) CAN] to the front and 8"(21cm) beyond each side of the fuel loading and ash removal openings [side of stove in CAN], the floor protection must extend under the flue connector and extend 2" beyond each side of pipe.

VENT REQUIREMENTS: 8" diameter, single wall, minimum 24 MSG blue steel connector with listed factory-built Type HT chimney or masonry chimney.

OPTIONAL COMPONENTS:
Outside Air Kit Part # 96-XXXXX

***Refer to the installation Manual for additional clearance information, installation instructions, and operating instructions.**

U.S. ENVIRONMENTAL PROTECTION AGENCY
Particulate Emissions: 0.9 g/hr. Tested to: EPA Method 28R
Certified to comply with 2020 crib wood particulate emission standards.

Date of Manufacture

2018	2019	2020	2021	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

DO NOT REMOVE OR COVER THIS LABEL **MADE IN USA** **3300-693**

CONTACTEZ LES AUTORITÉS RESTRICTIONS ET L'INSPECTION LOCALES DES VOTRE INSTALLATION

Poêle à bois recommandé pour chauffage de pièce, utilisant un combustible solide
Convient aussi pour maisons mobiles conformes à la norme (UM)84 HUD

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Conforme à UL STD 1482
Certifié selon ULC STD S627

Fabrique for
LOGO.PNG
317 Stafford Ave.
Morrisville, VT 05661
By: HASE-Kaminofenbau GmbH
Niederkircher Str. 14 D-54294 Tier
Germany

NOM DU MODELE:
BARI
NUMÉRO DE MODÈLE: 8171
NUMÉRO DO SÈRIE:
[redacted]

ATTENTION: CHAUD QUAND IL EST EN MARCHE. NE PAS TOUCHER. TENIR LES ENFANTS, LES VETEMENTS ET MEUBLES ÉLOIGNÉS. LE CONTACT PEUT CAUSER DES BRULURES. VOIR LA PLAQUE SIGNALÉTIGUE ET INSTRUCTIONS. INSPECTER ET NETTOYER FRÉQUEMMENT LA CHEMINÉE ET LE CONDUIT DE RACCORDEMENT. DANS CERTAINES CONDITIONS D'UTILISATION, LE CRÉOSOTE PEUT SE FORMER RAPIDEMENT.

ADVERTISSEMENTS

N'utilisez pas de grille surelevée pour alimenter le feu. Faites le feu directement dans l'âtre. Ne surchauffez pas le poêle.
Si le poêle ou la cheminée devient rouge, vous surchauffez. (Voir le manuel de l'opératteur)

UTILISER SEULEMENT LES PORTES CLOSES. NE PAS OBSTRUER L'ESPACE SOUS LE POÊLE.
COMBUSTIBLE: BÛCHES DE BOIS SEULEMENT - LES COMBUSTIBLES ARTIFICIELS AUTRES QUE CORDWOOD PEUVENT ENDOMMAGER L'APPAREIL

"PRÉVENTION DES INCENDIES"
Installer et utiliser seulement en accord avec les instructions d'installation du manufacturieret les codes locaux du bâtiment.
ATTENTION: Des méthodes spécifiques sont nécessaires pour faire passer la cheminée à travers un mur ou un toit. Référer aux codes locaux du bâtiment. Ne pas brancher cette unité à un conduit de cheminée desservant déjà un autre appareil.

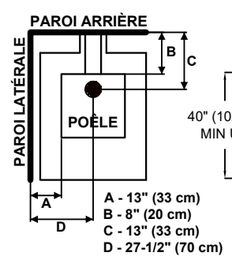
NOTE: Remplacer la vitre seulement avec une vitre de CÉRAMIQUE de 4 mm.

Ce chauffe-bois nécessite une inspection et des réparations périodiques pour un bon fonctionnement. Consultez le manuel du propriétaire pour plus d'informations. Il est contraire aux règlements fédéraux d'utilisation ce chauffeur-bois d'une manière incompatible avec les instructions d'utilisation du manuel du propriétaire.

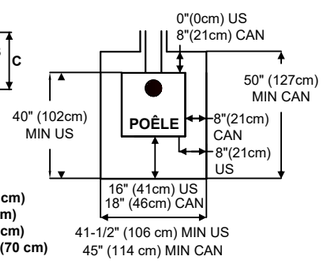
AVERTISSEMENT (MAISON MOBILE): Une prise d'air extérieur est nécessaire à la combustion et doit être effective sans restriction pendant que l'unité fonctionne.

CET APPAREIL UTILISE UN COMBUSTE CATALYTIQUE (Part # WF-4150001076)
La performance du dispositif catalytique ou sa durabilité n'a pas été évaluée dans le cadre de la certification
ATTENTION: les matériaux brûlants autres que les carburants spécifiés peuvent rendre le catalyseur inactif

Dégagements minimum aux matériaux combustibles*



Protection du sol*



Quand le poêle est installé sur un plancher combustible, une protection de plancher non combustible doit être installée pour couvrir la surface sous la poêle. Elle doit dépasser d'au moins 16"(41cm) [18"(46cm) CAN] le devant du poêle, et 8" (21cm) au-delà du dos et des côtés du poêle [côté du poêle en CAN], et déborder de 2" (5 cm) de chaque côté du tuyau de raccordement de la cheminée.

PIÈCES DE VENTILATION REQUISES:
Diamètre de 8" (20,3 cm), tuyau simple, minimum 24 MSG, tuyau de raccord en acier noir pour cheminée homologuée préfabriquée de type HT ou pour cheminée de maçonnerie.

COMPOSANTES OPTIONNELLES:
Prise d'air extérieur Part # 96-XXXXX

*** Référer au Manuel**

AGENCE AMÉRICAINE DE PROTECTION DE L'ENVIRONNEMENT
D'emissions des particulates: 0,9 g/hr. Testé à: Méthode EPA 28R
Certifié pour se conformer aux normes d'émission de particules de bois structuré 2020

NE PAS ENLEVER OU NE PAS COUVRIR CETTE ÉTIQUETTE **FABRIQUÉ AUX ÉTATS-UNIS** **3300-693**

These warranties give you specific legal rights. You may also have other rights which vary from State to State.

Hearthstone Quality Home Heating Products, Inc. (Hearthstone) warrants to the original retail purchaser only (the "Original Purchaser") the new appliance manufactured by Hearthstone, purchased by the Original Purchaser and installed by an authorized Hearthstone dealer or their designated representative against any of the occurrences listed in this document that result from defects in material or workmanship. This warranty is not transferrable. All obligations of Hearthstone under this document commence on the date of the Original Invoice (the "Purchase Date"). The term "Limited Lifetime" is defined as 10 years from the beginning of warranty coverage.
Hearthstone appliances are designed to be operated only with the fuels listed in your owner's manual.

Warranty Period	Wood	Gas	Pellet	Covered Components
Limited Lifetime	X	X	X	Stone
	X	X	X	Cast iron not listed elsewhere
	X			Clean burning air supply system*
5 Year	X	X	X	Door handles and latches
	X	X	X	Steel Components and Firebox
		X		Burner and logs
3 Year			X	Burn Pot and Baffles
2 Year	X	X	X	Appliance Electrical and Gas Components
	X	X		Refractory, Vermiculite Panels, Baffles
1 Year	X	X	X	Enamel finish against peeling or fading
	X	X	X	Accessories
	X	X	X	Glass
	X			Ash Grate
	X	X	X	All components not listed elsewhere

Any parts repaired or replaced during the limited warranty period will be warranted under the terms of the limited warranty for a period not to exceed the remaining term of the original limited warranty or one year, whichever is longer.
Parts: Hearthstone will replace through an authorized dealer, defective parts covered by the foregoing warranty at no charge.
Labor: Within the first (1st) year after the Purchase Date, Hearthstone will pay for warranty labor performed by an authorized Dealer at Hearthstone's published labor rates in effect at the time the labor is performed only if the appliance is installed by an authorized dealer or their designated representative. Otherwise or thereafter, the Original Purchaser is responsible for the cost of labor.
Shipping cost for parts: Within the first ninety (90) days after the Purchase Date, Hearthstone will pay for the shipping of appliance parts covered by any of the foregoing warranties to and from Hearthstone or an authorized Dealer, as the case may be. Thereafter, the Original Purchaser is responsible for all shipping costs related to shipping appliance parts to and from Hearthstone or an authorized Dealer, as the case may be.
Shipping cost for the appliance: Within the first (1st) year after the Purchase Date, if the Original Purchaser is instructed to return the appliance to Hearthstone or an authorized Dealer for repair, Hearthstone will pay fifty percent (50%) and the Original Purchaser will pay fifty percent (50%) of the shipping costs related to shipping the appliance to and from Hearthstone or an authorized Dealer, as the case may be. Thereafter, the Original Purchaser is responsible for one hundred percent (100%) of all of the shipping costs related to shipping the appliance to and from Hearthstone or an authorized Dealer, as the case may be. Notwithstanding any other provision of this document, in no event will Hearthstone pay for any Dealer fees or other fees for pick up or delivery of the appliance returned for repair; the Original Purchaser shall be responsible for any such fees.
EXCLUSIONS & CONDITIONS

The warranties contained in this document do not cover, nor is Hearthstone responsible for:

1. Damages resulting from:
   a. Failure to install, operate, or maintain the appliance in accordance with the owner's manual, operating instructions, installation instructions, or safety rating label provided with the appliance.
   b. Over-firing the appliance. Over-firing can be identified by, but not limited to, warped cast iron or steel, rust colored cast iron, bubbling, cracking and discoloration of steel or enamel finishes.
   c. Failure to install the appliance in accordance with all national or local building codes.
   d. Shipping or improper handling.
   e. Improper operation, abuse, misuse, continued operation with damaged, corroded, or failed components, accident, or improper/incorrect service or repairs.
   f. Environmental conditions, inadequate ventilation, negative pressure, or improper drafting caused by tightly sealed constructions, insufficient make-up air supply, or air handling devices such as exhaust fans, forced air furnaces, or other such causes.
   g. Damage caused by direct exposure to water.
   h. Use of fuels other than those specified in the owner's manual.
   I. Installation or use of components not supplied with the appliance, or any other components not expressly authorized and approved by Hearthstone.
   J. Modifications of the appliance not expressly authorized and approved by Hearthstone in writing
   K. Interruptions or fluctuations of electrical power supplied to the appliance.
2. All stones are warranted against cracking or breakage due to thermal stress, excluding surface and hairline cracks and scratches that do not affect the operation, or safety of the appliance.
3. Repair or replacement of wear parts. Such parts that are subject to normal wear and tear during the warranty period such as paint, gaskets, baffles, refractory materials, ash grates, and glass.
4. Damage resulting from installation, modification, alteration, repair or service of the appliance by any party other than an authorized Hearthstone dealer (a "Dealer") or their designated representative, or Hearthstone.
5. Damage due to water or condensation due to installation of the appliance in a high moisture area.
6. Damage due to installation of the appliance in an atmosphere contaminated by damaging chemicals, including but not limited to chlorine, fluorine or salts.
7. Scratches on glass, enameled surfaces or stones due to mechanical abrasion.
8. Noise caused by expansion or contraction caused by the heating and cooling of the appliance.
9. Odors caused by the heating of the appliance, or surrounding materials
10. Consequential damage caused by leaking of condensate during startup
11. A defect in any part of the appliance if the Original Purchaser fails to comply with Hearthstone's or a Dealer's request to ship the part or the appliance to Hearthstone or a Dealer, as the case may be.
12. Replacement stones and enameled parts are taken from current stock, and may not match originals in color, grain, or pattern. Hearthstone will supply replacement parts for discontinued parts in finishes or colors as available, or at their discretion.
13. Hearthstone's obligation under this warranty does not extend to the appliance's ability to heat the desired space. Information is provided to assist the customer and the dealer in selecting the appropriate appliance for the application. Consideration must be given to appliance location and configuration, environmental conditions, insulation and air tightness of the structure.

THE WARRANTIES CONTAINED IN THIS DOCUMENT ARE EXCLUSIVE AND ARE GIVEN BY HEARTHSTONE AND ACCEPTED BY THE ORIGINAL PURCHASER IN LIEU OF ALL OTHER EXPRESS WARRANTIES AND ANY OBLIGATIONS, LIABILITIES, RIGHTS, CLAIMS, OR REMEDIES IN CONTRACT OR TORT, WHETHER OR NOT ARISING FROM HEARTHSTONE'S NEGLIGENCE, ACTUAL OR IMPUTED. ALL IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE GIVEN ONLY TO THE EXTENT REQUIRED BY FEDERAL OR STATE LAW. EXCEPT AS OTHERWISE REQUIRED BY STATE LAW, UPON THE EXPIRATION OF THE EXPRESS LIMITED WARRANTIES CONTAINED HEREIN, NO IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL APPLY TO THE SUBJECT APPLIANCE. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

THE WARRANTIES CONTAINED IN THIS DOCUMENT EXTEND ONLY TO THE ORIGINAL PURCHASER OF THE APPLIANCE WARRANTED HEREUNDER. THEY ARE NOT TRANSFERRABLE AND DO NOT EXTEND TO ANY SUBSEQUENT OWNERS.

UNDER NO CIRCUMSTANCES SHALL HEARTHSTONE BE LIABLE TO THE ORIGINAL PURCHASER OR ANY OTHER PERSON FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO DAMAGE TO PROPERTY OR PERSONAL INJURIES, WHETHER ARISING OUT OF LOSS OF USE, BREACH OF WARRANTY, TORT, OR OTHERWISE, EVEN IF HEARTHSTONE HAS BEEN APPRAISED OF THE POSSIBILITY OF SUCH DAMAGES. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

QUALIFYING FOR WARRANTY COVERAGE

To obtain performance of any obligation under this document, the Original Purchaser must, within the applicable warranty time period, contact their original Hearthstone dealer, or the current responsible local Hearthstone dealer, for instructions regarding the return of defective parts for repair, the return of the appliance for repair, or to schedule a Dealer service call. The Original Purchaser should refer to the Dealer Network search engine contained on Hearthstone's Web site (www.hearthstonestoves.com) if the original dealer is not available, to find a Hearthstone dealer nearest to the Original Purchaser's location.

REMEDY

The remedy for any breach of the foregoing warranties will consist of repair or replacement, at Hearthstone's option, of any covered defect in the appliance. When the Original Purchaser contacts a Hearthstone Dealer, the Dealer on behalf of Hearthstone, as the case may be, will instruct the Original Purchaser to either return the defective part, or the entire appliance (if requested), to the Dealer or Hearthstone or allow a Dealer to make a service call at the place where the appliance is located. Hearthstone may require that a digital picture be provided to support the claim. Notwithstanding any other provision of this document, the Original Purchaser shall pay for any fees and service charges related to a Dealer's service call or the shipping charges associated with the return.

WARRANTY REGISTRATION

The Original Purchaser can complete their warranty registration on our website at www.hearthstonestoves.com, or send a completed and signed Warranty Registration Form, which is enclosed in the appliance document packet, to the following address:

Hearthstone Quality Home Heating Products, Inc.
Warranty Department
317 Stafford Avenue
Morrisville, VT 05661

NOTE: SENDING IN THE SIGNED WARRANTY REGISTRATION FORM IS *NOT REQUIRED* AS A CONDITION OF WARRANTY COVERAGE OR HEARTHSTONE'S PERFORMANCE.

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

Total length between hood and sampling port : 22 feet.

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60 inches horizontal run between two elbows. Mixing section, No mixing baffle. 6inches diameter pipe

Two 6 inches elbow with horizontal mixing section.

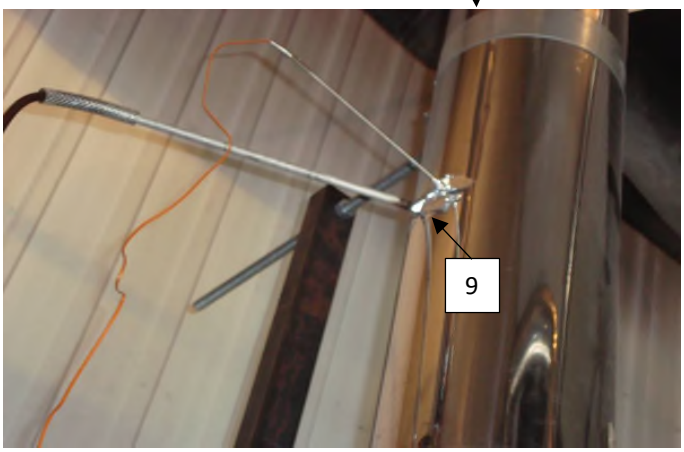
Hood diameter 32 (requirement 4D=24 inches minimum) inches and height of 24 inches (requirement 3D=18 inches minimum)

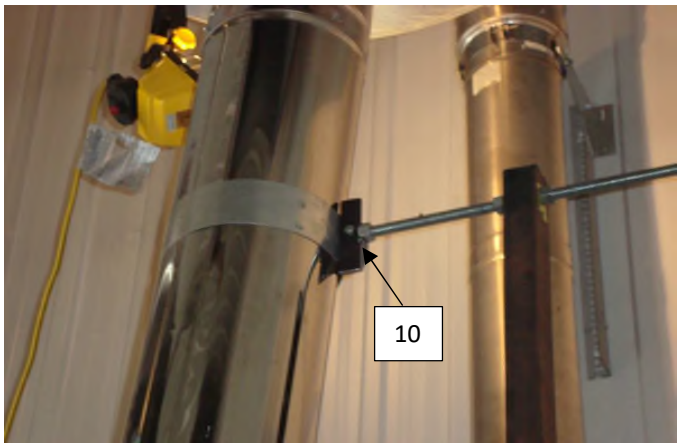
All pipe joints are sealed.

Stack sampling

Gas analysis and temperature probe

chimney support

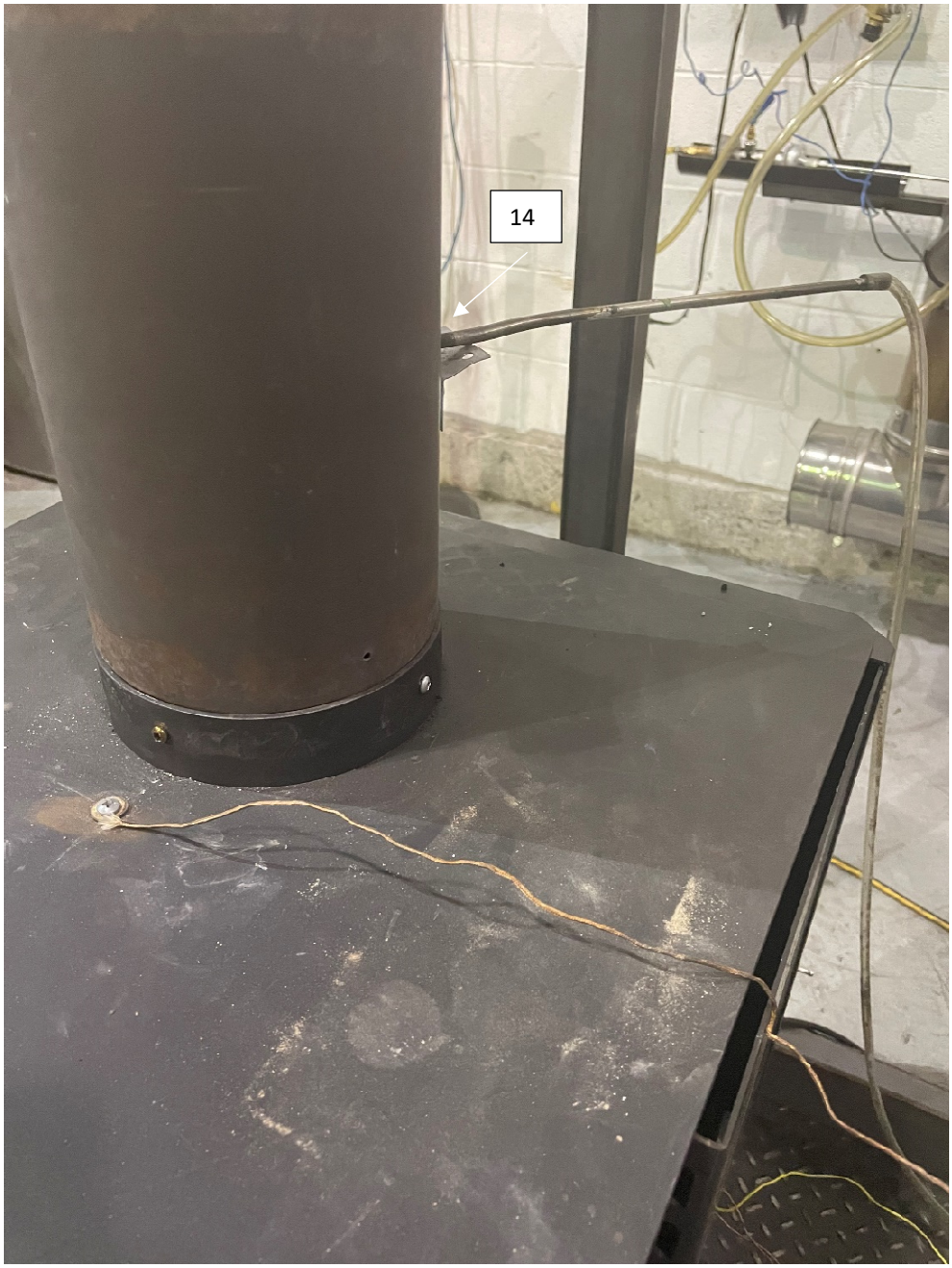




9 : Temperature and gas analyser sampling ports located 9 feet above platform

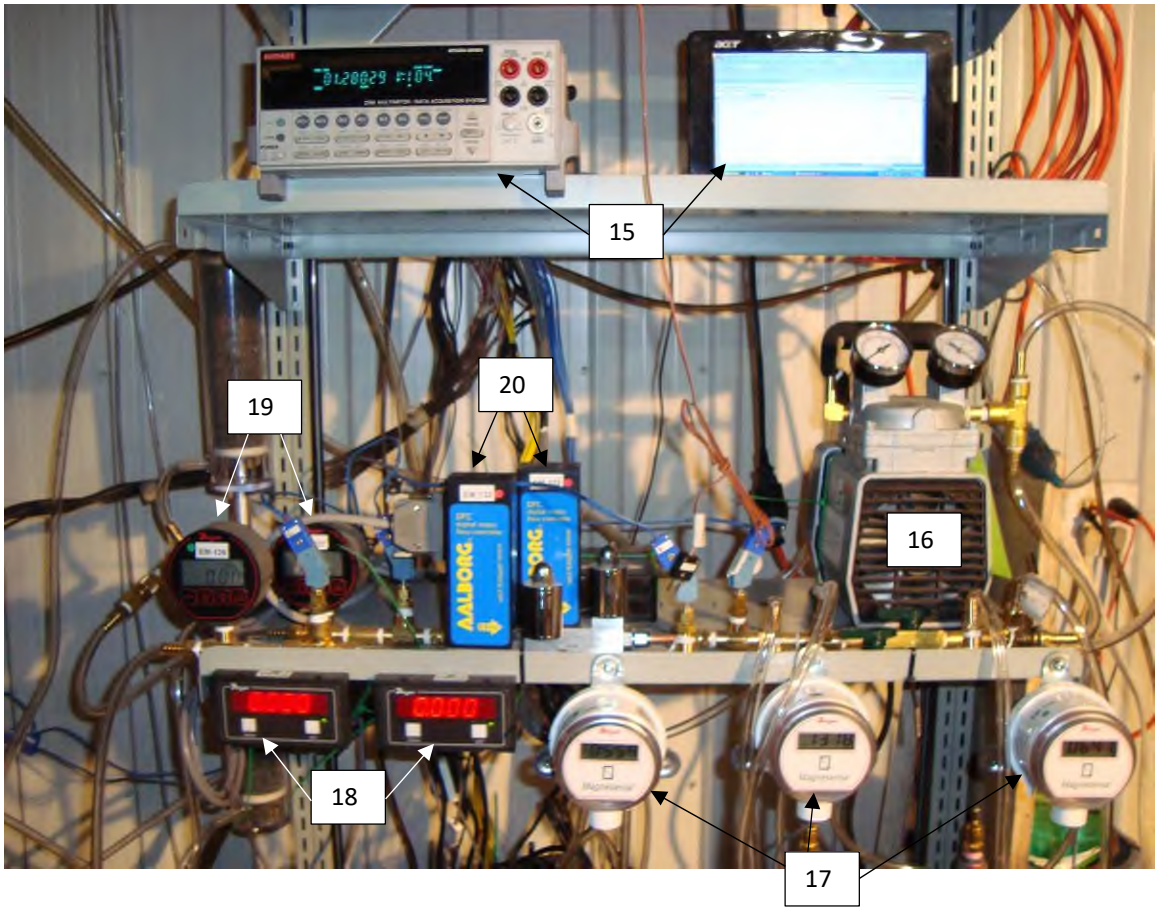
10 : Exhaust system support bracket

Draft sampling



14 : Draft sampling port located 6 in. from the flue outlet

Equipment's



15 : Acquisition system

16 : Vacuum pump

17 : Digital manometer

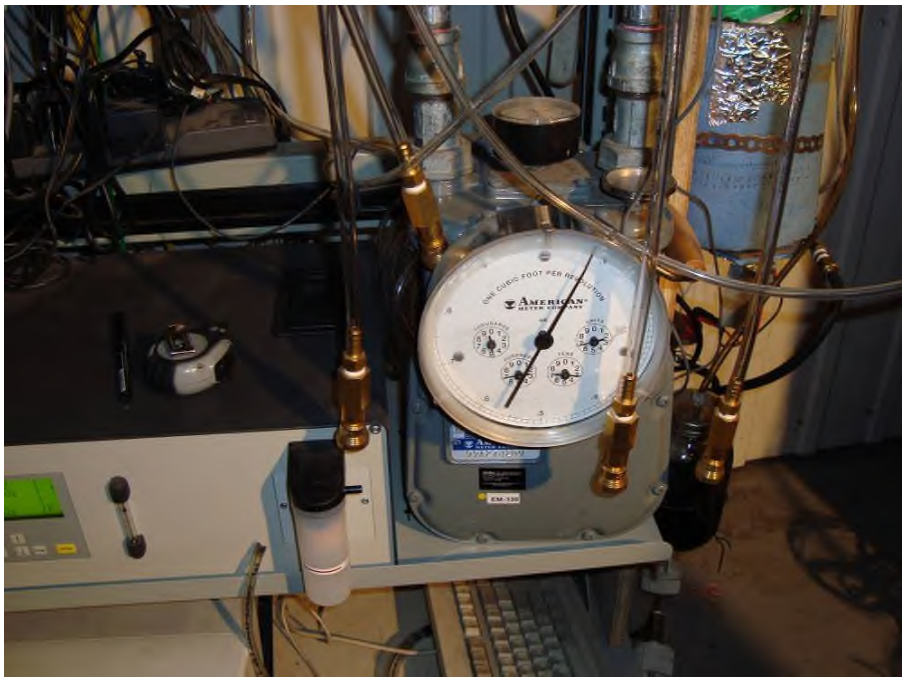
18 : Digital read out for mass flow meter

19 : Digital vacuum gage

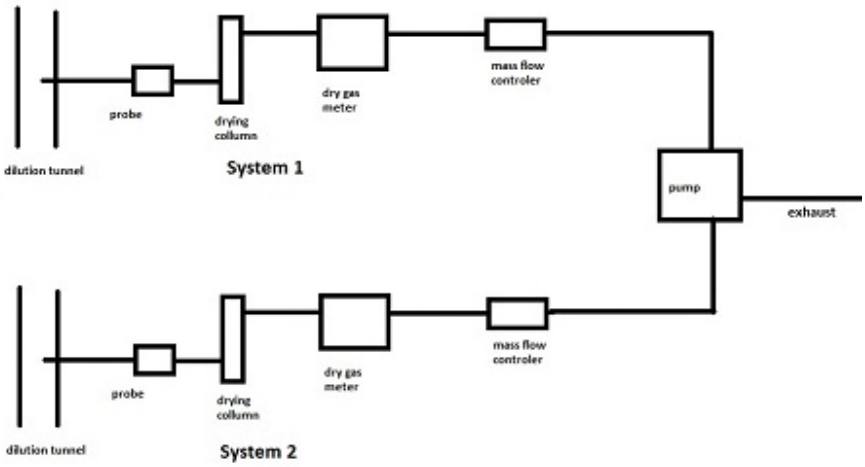
20 : Mass flow meter

Gaz analyser

Reference dry gas meter



Picture 12 : Dilution tunnel sample system



Dilution tunnel

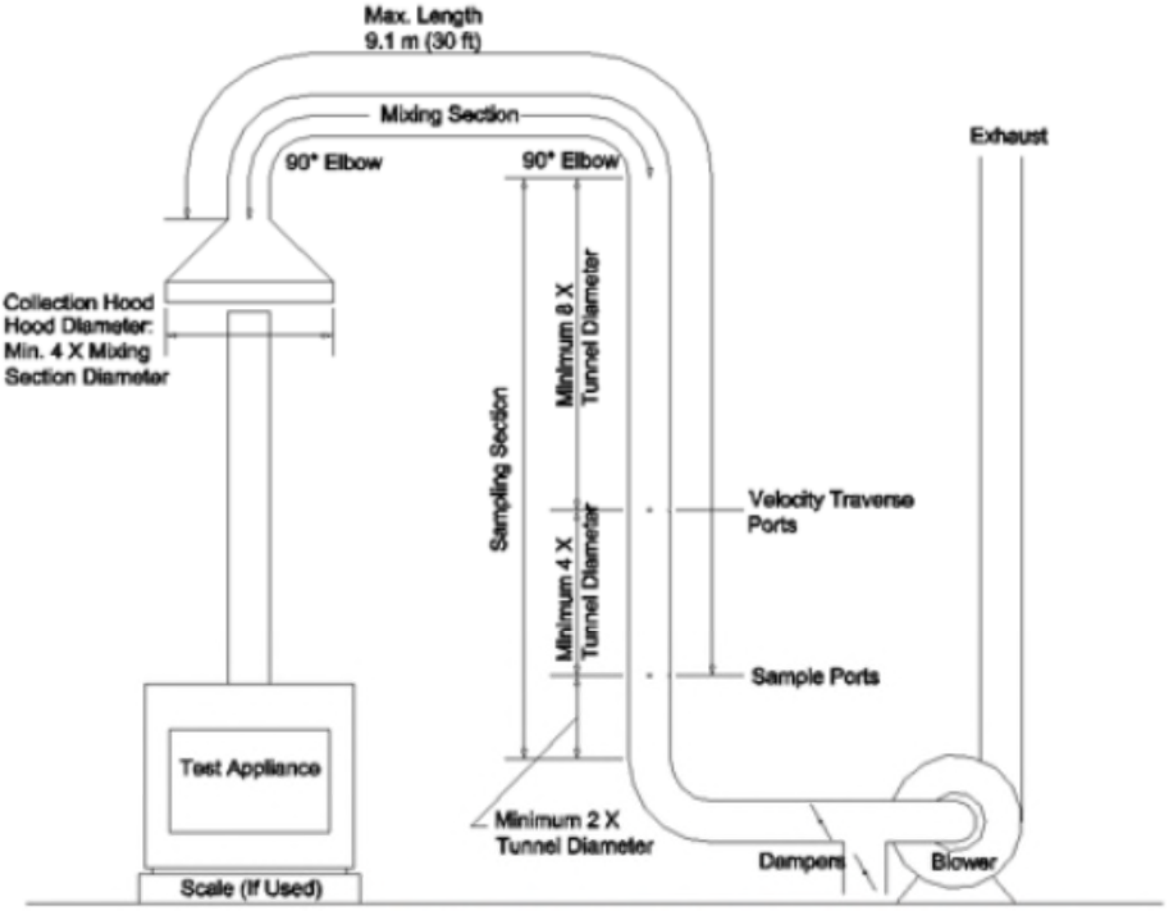


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

APPENDIX 9: Test load photographs

POLYTESTS
TESTING THROUGH YOUR REALITY

Run 1 July 22nd 2019 Maximum burn rate

Testing load 	Back side of stove 
Testing load 	Load in the stove 

POLYTESTS
TESTING THROUGH YOUR REALITY

Run 2 July 23rd 2019 minimum burn rate

Side view of stove 	Testing load 
Testing load 	Load in the stove 

POLYTESTS
TESTING THROUGH YOUR REALITY

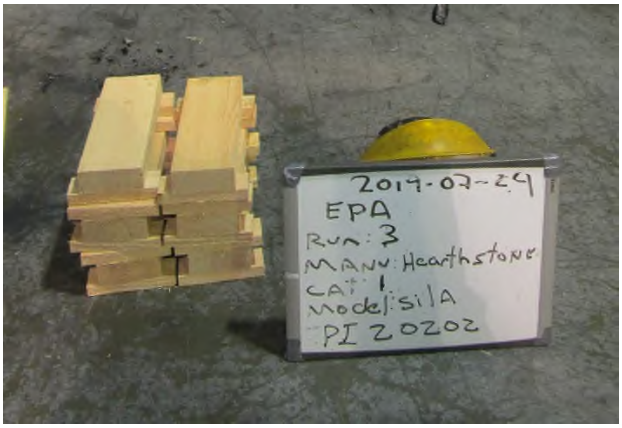
Run 3 July 24th 2019 minimum burn rate

Testing load

Testing load

Load in the stove

Testing load



POLYTESTS
TESTING THROUGH YOUR REALITY

Run 4 July 25th Category 3 burn rate

Testing load

Testing Load

Load in the stove

Testing load

POLYTESTS
TESTING THROUGH YOUR REALITY

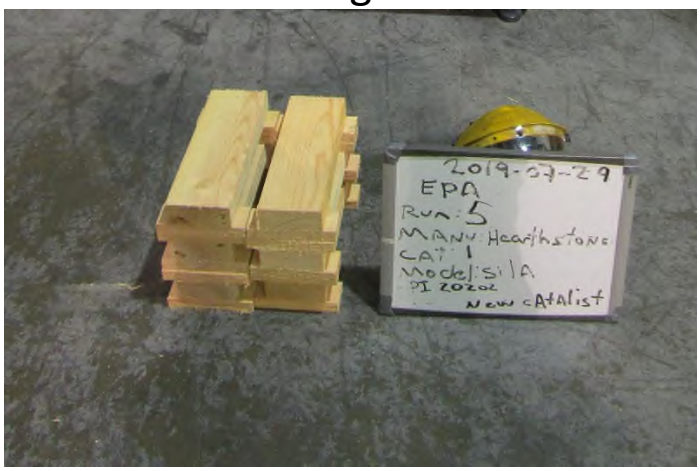
Run 5 July 29th minimum burn rate catalyst equivalency

Testing load

Testing load

Load in the stove

Testing load



POLYTESTS
TESTING THROUGH YOUR REALITY

Run 6 July 30th maximum burn rate catalyst equivalency

Testing load

Testing load

Load in the stove

Testing load

APPENDIX 10: Laboratory Operating Procedures

POLYTESTS Services inc.

SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

INTRODUCTION

This document provides a step by step guide for the technician conducting tests to EPA standard requirements. Procedures outlined here, when followed, will result in tests in conformance with EPA Methods 28R, ASTME2780, ASTME2515, ASTM E2618, Method 28WHH, Method 28 PTS, Method ALT-125, ASMTE 3053.

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. ASTME2780
3. ASTME2515
4. ASTM E2618
5. METHOD 28WHH
6. METHOD 28 PTS
7. ALT-125
8. ASMTE 3053

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 irrepairable, a new unit will need to be obtained.
3. Note whether unit is catalytic of 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) Non-catalytic units: Ten (48) hours at medium burn rate with Douglas Fir scrap or cordwood.
    b) Catalytic units: Fifty (50) hours at medium burn rate with Douglas Fir scrap or cordwood.

    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. Fourthy-height (48) 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.

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.

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 tracable 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 CO_2 and CO analyzers are "ZEROED" on nitrogen. The O_2 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 (O_2 should be 20.93, CO and CO_2 should equal O).
   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 H_2SO_4
   Impinger #2: 100 ml distilled water and 5 ml H_2SO_4
   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.

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 ambiant 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 24 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 5 inches Hg. (NOTE: During test, vacuum must not exceed 5 inches unless posttest leak check shows acceptable results.)

c) Allow vacuum indication to stabilize for two (2) minutes, then record time and dry gas (DGM_1) and (DGM_2) meter readings. Wait ten (10) minutes and record dry gas meter readings again (DGM_3, DGM_4). 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 X 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 X 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.

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 anomometer. 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 manufacturer's.
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.

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 allowed for ALT-125 method))
   f) An alarm will sound an audible signal at the (10) minutes intervals. This signal 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 laod weight
      7) CO, CO_2 and O_2 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,

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 24-hour desiccation before weighing.
4. Weigh probe filter holder units and filters at six (6) hour intervals until weight change between weighings 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}	8,416	lbs
θ	101	min
$\%M_W$	16,40	%

Calculation

BR	1,896	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	24,52	dcf
Y	0,990144	
P_{bar}	29,84	in Hg
ΔH	-1,0030	in Hg
T_m	543,8	R

Calculation

$V_{m(std)}$	22,71	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	Particulate matter collected on front filter, mg
F_2	Particulate matter collected on second filter, mg
ΔPF	Post-test weight gain of probe and filter holder assembly, mg

Sample calculation

Data

F_1	0,0007	g
F_2	-0,002	g
ΔPF	0,003	g

Calculation

m_n	2,400	mg

Calculation based of train 2 data

Particulate concentration (C_S)

Equation used

ASTM 2515, equation 13

$$C_S = (0{,}001\ g/mg) \times \left(\frac{m_n}{V_{m\,(std)}}\right)$$

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
$V_{m(std)}$	Volume of gas sample measured corrected to dry standard conditions, dsm^3 (dscf)

Sample calculation

Data

m_n	2,400 mg
$V_{m(std)}$	22,71 dscf

Calculation

C_s	0,000106 g/dscf

Calculation based of train 2 data

Particulate concentration for room air (C_r)

Equation used

ASTM 2515, equation 14

$$C_r = (0{,}001\ g/mg) \times \left(\frac{m_r}{V_{mr\,(std)}}\right)$$

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 (dsc

Sample calculation

Data

m_r	0,000	mg
$V_{mr(std)}$	24,07	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 caclulated after the Pitot tube traverse
V_{scent}	Average gas velocity at the center of the dilution tunnel cacluated after the multi-point Pitot traverse
F_P	Adjustment factor for center of tunnel pitot tube placement

Sample calculation

Data

V_{strav}	0,236464349
V_{scent}	0,253966594

Calculation

F_P	0,931084

Average dilution tunnel gas velocity (V_S)

Equation used

ASTM 2515, equation 9

$$V_S = F_p K_P C_P \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_S}{P_S M_S}}$$

Nomenclature

V_S	Average dilution tunnel gas velocity, m/s (ft/s)
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ For English units: $85.49\ ft/sec \left[\frac{\left(\frac{lb}{lb-mole}\right)(in\ Hg)}{(°R)(in\ H_2O)}\right]^{1/2}$
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
$\left(\sqrt{\Delta P}\right)_{avg}$	Average square root of each individual velocity head (ΔP)
P_{bar}	Barometric pressure at measurement site, mm H_2O (in. H_2O)
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, °C (°F)
T_S	Absolute dilution tunnel temperature, °K (°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	0,931	
$\left(\sqrt{\Delta P}\right)_{avg}$	0,2501	in $H_20^{1/2}$
P_{bar}	29,84	in Hg
P_g	0,25	in H_20
P_S	29,86	in Hg
M_S	28,78	lb/lb-mol
t_S	134,41	F

T_S 594,41 R

Calculation

V_S 16,3889 ft/s

Average dilution tunnel gas flow rate (Qstd)

Equation used

ASTM 2515, equation 3

$$Q_{std} = 60(1 - B_{WS})V_S A\left(\frac{T_{std}}{T_S}\right)\left(\frac{P_S}{P_{std}}\right)$$

Nomenclature

Q_{std}	Total gas flow rate corrected to dry standard conditions, dsm^3/min (dscf/min)
60	Conversion factor minutes per hour
B_{WS}	Water vapour in the dilution tunnel stream, proportion by volume (may be assumed to be 2%)
V_S	Average dilution tunnel gas velocity, m/s (ft/s)
A	Cross-sectional area of dilution tunnel, m^2 (ft^2)
T_{std}	Standard absolute temperature, 293 °K (528°R)
T_S	Absolute average dilution tunnel temperature, °K (°R), or 273 + t_s for metric units, 460 + t_s for English units
t_S	Dilution tunnel temperature, °C (°F)
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or P_{bar} + P_g
P_{bar}	Barometric pressure at measurement site, mm Hg (in. Hg)
P_g	Dilution tunnel static pressure, mm Hg (in. Hg)
P_{std}	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

Sample calculation

Data

B_{WS}	0,02	
V_S	16,389	
A	0,196	ft^2
T_{std}	528	R
T_S	594,41	R
P_S	29,858	in Hg
P_{std}	29,92	in Hg

Calculation

Q_{std}	167,73	dscf/min

Particulate emission rate (E)

Equation used

$$E = (C_S - C_r)Q_{std}$$

Nomenclature

E	Particulate emission rate, g/hr
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm^3 (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm^3 (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm^3/min (dscf/min)

Sample calculation

Data

C_S	0,000106	g/dscf
C_r	0,000000	g/dscf
Q_{std}	167,73	dscf/min

Calculation

E	0,02	g/min
E	1,06	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	0,000106	g/dscf
C_r	0,000000	g/dscf
Q_{std}	167,73	dscf/min
θ	101	min

Calculation

E	1,79	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

v_{si}	Average gas velocity in dilution tunnel during each min interval, i of the test run m/sec (ft/sec)
F_P	Pitot tube correction factor
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ For English units: $85.49\ ft/sec \left[\frac{\left(\frac{lb}{lb-mole}\right)(in\ Hg)}{(°R)(in\ H_2O)}\right]^{1/2}$
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 $P_{bar} + P_g$
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	0,931	F_P	0,931
K_P	85,49	K_P	85,49
C_P	0,99	C_P	0,99
Δp_i	0,059 in H_20	Δp_i	0,060 in H_20
T_{Si}	629,2 R	T_{Si}	608,3 R
P_S	29,86 in Hg	P_S	29,86 in Hg
M_S	28,78 lb/lb-mol	M_S	28,78 lb/lb-mol

Calculation

i=1		**i=2**	
v_{si}	16,31 ft/sec	v_{si}	16,22 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	101	min	θ	101	min
θ_i	1	min	θ_i	1	min
V_m	23,22	dcf	V_m	22,72	dcf
$V_{mi(std)}$	0,227	cuft	$V_{mi(std)}$	0,2269	cuft
V_S	16,40	ft/sec	V_S	16,40	ft/sec
V_{Si}	16,323	ft/sec	V_{Si}	16,323	ft/sec
T_m	542,9	R	T_m	543,8	R
T_{mi}	541,38	R	T_{mi}	542,15	R
T_S	594,41	R	T_S	594,41	R
T_{Si}	629,2	R	T_{Si}	629,2	R

Calculation

train=1		**train=2**	
PR	105,2 %	PR	107,6 %

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, m2 (ft^2)

Sample calculation

Data

V_{mL}	0,218	dcf
F_A	0,0116	ft^2

Calculation

FV_{max}	18,82	ft/min

Dual train precision

Equation used

$$\frac{Train\ 1 - average\ train\ 1\ and\ train\ 2}{average\ train\ 1\ and\ train\ 2} \times 100 \leq 7.5\%$$

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	1,68 g
Train 2	1,79 g

Calculation

Dual train precision	3,21 %

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
∆R	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

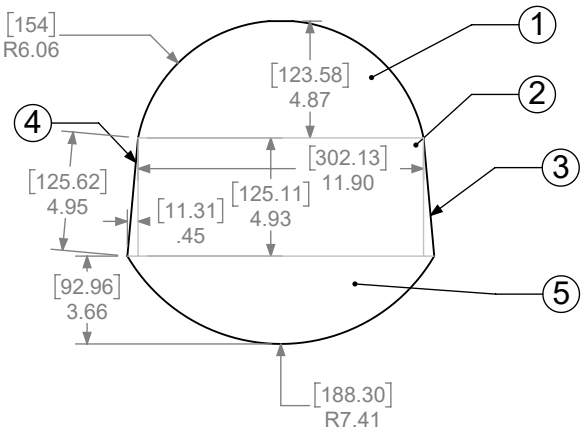
∆R	0,015	%
Span	5	%

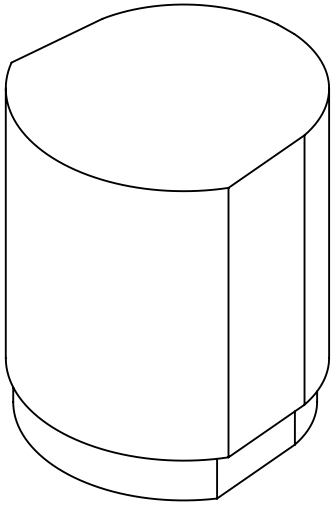
Calculation

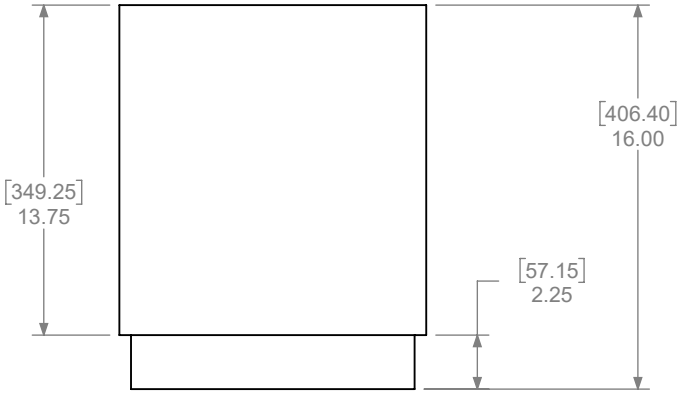
Drift	0,30	%

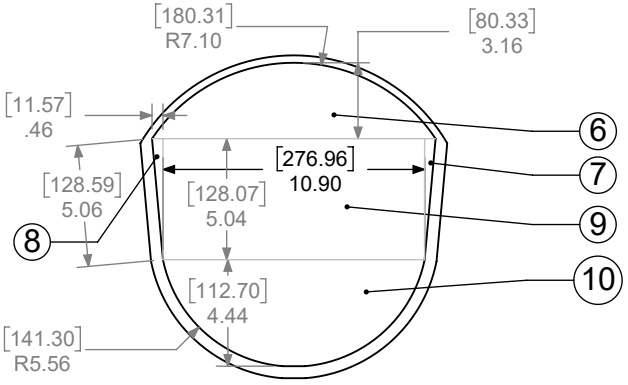
Calculated with CO concentration values.

APPENDIX 12: Volume calculations









USABLE FIREBOX VOLUME		
ZONE	SIZE	VOLUME (CU.IN)
1	D12.12X4.87X13.75	596.14
2	11.90X4.93X13.75	806.67
3	4.95X.45X4.93X13.75	13.75
4	4.95X.45X4.93X13.75	13.75
5	D14.82X3.66X13.75	455.78
6	D14.20X3.16X2.25	59.08
7	.46X5.06X5.04X2.25	2.61
8	.46X5.06X5.04X2.25	2.61
9	10.90X5.04X2.25	123.61
10	D11.12X4.44X2.25	81.43
	X/1728	2155.43
	TOTAL (CU.FT)	1.25

REVISIONS

ECO	REV	DESCRIPTION	DATE	APPROVED

VIEWS ARE THIRD ANGLE

UNLESS OTHERWISE SPECIFIED:

TOLERANCES ARE:

FRACTIONS ± 1/64 DECIMALS .XX± .015 .XXX± .005 ANGLES ±1/4°

1.) DIMENSIONS ARE IN INCHES / MM

2.) ALL MACHINED SURFACES TO BE DE-BURRED AND SMOOTHED

DO NOT SCALE DRAWING

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APPROVALS	DATE
DRAWN Drawn By	
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG	

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BARI

EPA Firebox Volume

SIZE	HEARTHSTONE DWG. NO.	REV.
A		1
SCALE: 1:8	HERGOM DWG. NO.	SHEET 1 OF 1

LAST SAVED: 4/15/2024 2:44:35 PM

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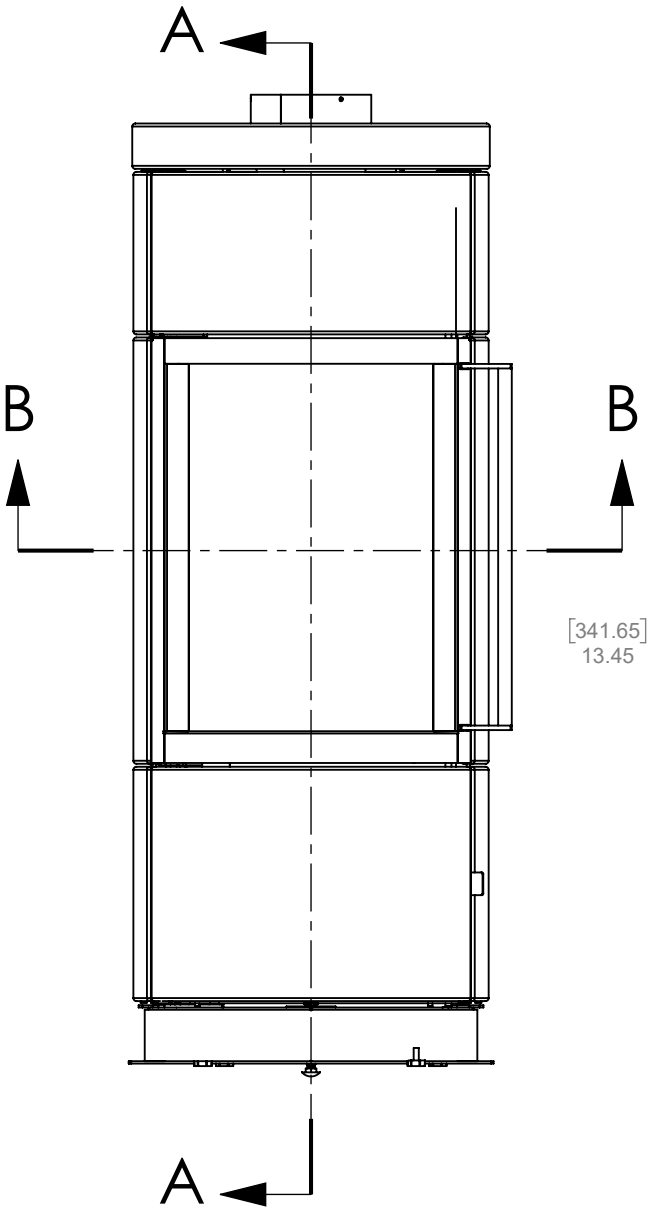
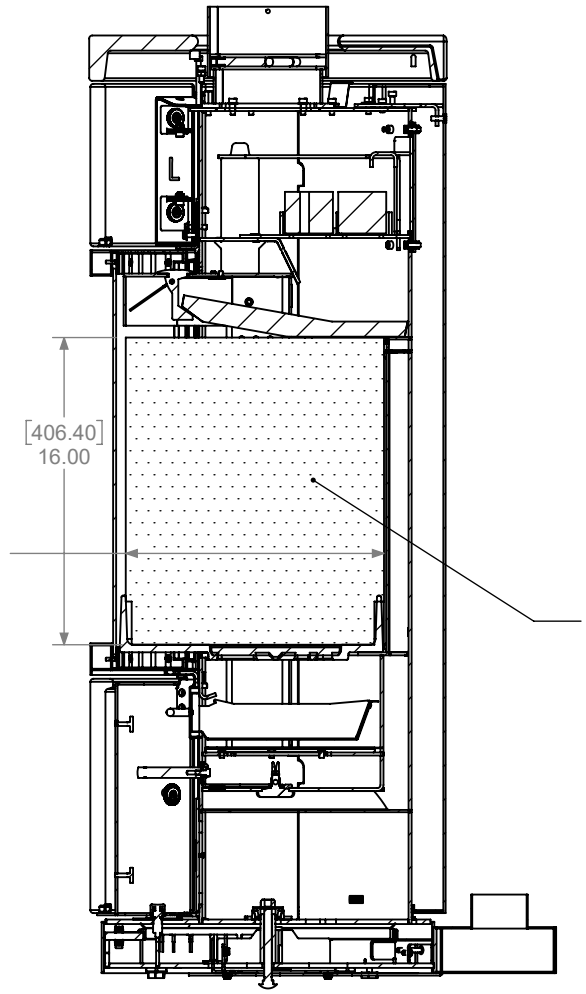
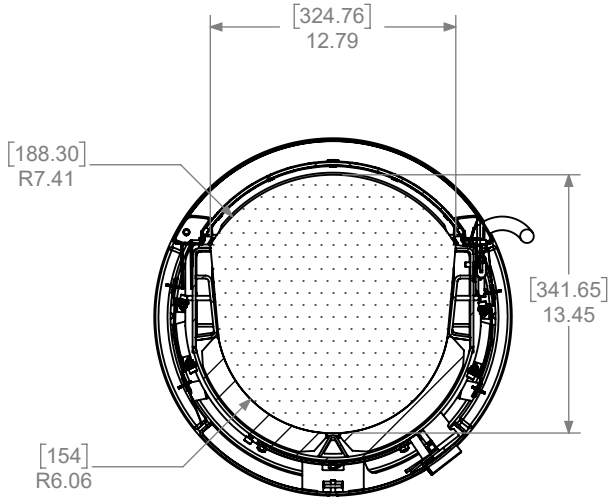




SECTION A-A



SECTION B-B

MATERIAL: Material <not specified>

WEIGHT: 78.04 LBS

REVISIONS

ECO	REV	DESCRIPTION	DATE	APPROVED

VIEWS ARE THIRD ANGLE

UNLESS OTHERWISE SPECIFIED:

TOLERANCES ARE:

FRACTIONS ± 1/64 DECIMALS .XX± .015 .XXX±.005 ANGLES ±1/4°

1.) DIMENSIONS ARE IN INCHES / MM

2.) ALL MACHINED SURFACES TO BE DE-BURRED AND SMOOTHED

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APPROVALS	DATE
DRAWN Drawn By	
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG	

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SILA

EPA Firebox Volume

SIZE A | HEARTHSTONE DWG. NO. | REV. 1

SCALE: 1:10 | HERGOM DWG. NO. | SHEET 1 OF 1

LAST SAVED: 4/15/2024 2:44:35 PM

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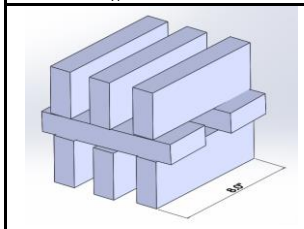
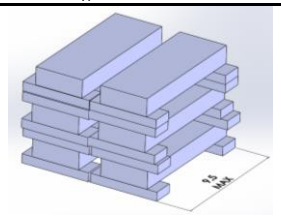
APPENDIX 13: Operating instruction

hearthstone

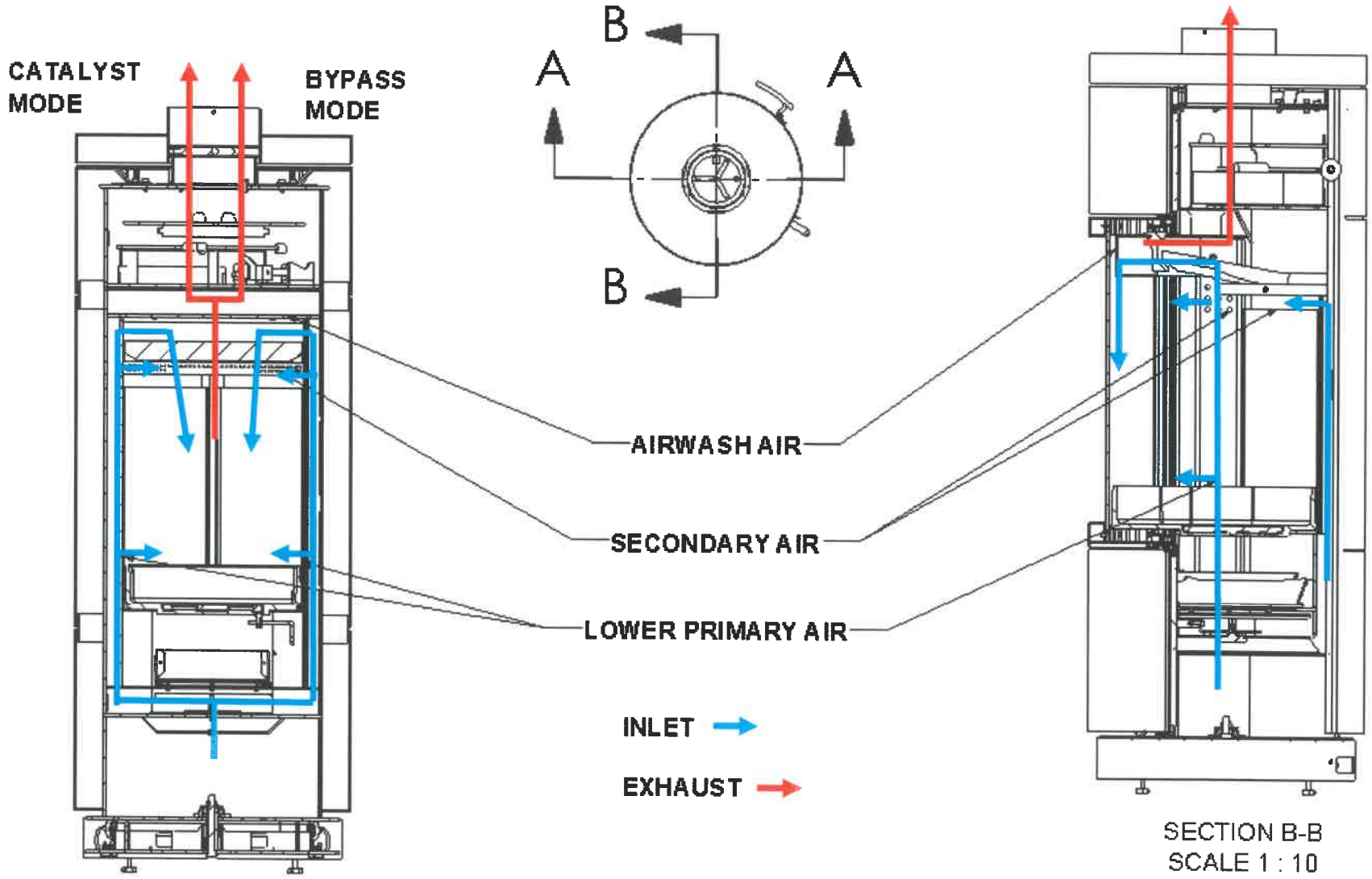
Wood Stove Operating Instructions

Model: Bari
Date: 7/10/2019
Test Engineer: D. Bryant

Burn Rate Category	Kindling	Warm-up Load	Pre-burn Load	Test Load	Pre-Burn Start	Air Setting	Fan Setting	Coal Bed	Test Start
Low 0.85-.95 kg/hr typ.	*2.5 lbs of kindling *Burn to 1 lb before adding warm-up	*8 ea- 2"x4"x8" (Leave door cracked for 5 min to insure preload ignition) Burn down to approx 1 lbs before adding pre-burn load.	*8 ea- 2"x4"x8" (Leave door cracked for 5 min to insure preload ignition) *Close bypass @ 700°F stove temp (approx 8 lbs.)	*6 ea - 2"x4" 8.5" to 9.5" long (max) *20 ea - spacers (No top spacers if possible) **7.88 - 8.75 - 9.63 (lbs)**	0.6 lbs up from top of coal bed range	**1.6**	**N/A**	Rake coal bed 1-2 minutes before test start.	Start at low bracket Start at *330 °F stove temp *600 °F CAT temp *Close door and bypass after loading *Fully open primary air control for the first 5 minutes of test.
Medium Low 1.00-1.25 kg/hr typ.	*2.5 lbs of kindling *Burn to 1 lb before adding warm-up	*8 ea- 2"x4"x8" (Leave door cracked for 5 min to insure preload ignition) Burn down to approx 1 lbs before adding pre-burn load.	*8 ea- 2"x4"x8" (Leave door cracked for 5 min to insure preload ignition) *Close bypass @ 700°F stove temp (approx 8 lbs.)	*6 ea - 2"x4" 8.5" to 9.5" long (max) *20 ea - spacers (No top spacers if possible) **7.88 - 8.75 - 9.63 (lbs)**	1.1 lbs up from top of coal bed range	**1.625**	**N/A**	Rake coal bed 1-2 minutes before test start.	Start at low bracket *360 °F stove temp *600 °F CAT temp *Close door and bypass after loading *Fully open primary air control for the first 5 minutes of test.
Medium High 1.26-1.60 kg/hr typ.	*2.5 lbs of kindling *Burn to 1 lb before adding warm-up	*8 ea- 2"x4"x8" (Leave door cracked for 5 min to insure preload ignition) Burn down to approx 1 lbs before adding pre-burn load.	*8 ea- 2"x4"x8" (Leave door cracked for 5 min to insure preload ignition) *Close bypass @ 700°F stove temp (approx 8 lbs.)	*6 ea - 2"x4" 8.5" to 9.5" long (max) *20 ea - spacers (No top spacers if possible) **7.88 - 8.75 - 9.63 (lbs)**	2.3 lbs up from top of coal bed range	**2**	**N/A**	Rake coal bed 1-2 minutes before test start.	Start at high bracket *360 °F stove temp *600 °F CAT temp *Close door and bypass after loading *Fully open primary air control for the first 5 minutes of test.
High 1.90-2.20 kg/hr typ.	*2.5 lbs of kindling *Burn to 1 lb before adding warm-up	*8 ea- 2"x4"x8" (Leave door cracked for 5 min to insure preload ignition) Burn down to approx 1 lbs before adding pre-burn load.	*8 ea- 2"x4"x8" *Close bypass @ 700°F stove temp (approx 8 lbs.)	*6 ea - 2"x4" 8.5" to 9.5" long (max) *20 ea - spacers (No top spacers if possible) **7.88 - 8.75 - 9.63 (lbs)**	Start Pre-Burn immediately after loading stove.	**Full Open**	**N/A**	Rake coal bed 1-2 minutes before test start.	Start at high bracket *400 °F stove temp *800 °F CAT temp *Close door and bypass after loading

Typical Pre-Burn Load		Typical Test Load
		

APPENDIX 14: Drawing Air flow pattern



SECTION A-A
SCALE 1 : 10

SECTION B-B
SCALE 1 : 10

MATERIAL: N/A

WEIGHT: 56.64LBS

REVISIONS

ECO	REV	DESCRIPTION	DATE	APPROVED

VIEWS ARE THIRD ANGLE

UNLESS OTHERWISE SPECIFIED:
TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
± 1/64 XX± .015 ±1/4°
XXX ±.005

1.) DIMENSIONS ARE IN INCHES / MM

2.) ALL MACHINED SURFACES TO BE DE-BURRED AND SMOOTHED

DO NOT SCALE DRAWING

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

	APPROVALS	DATE
DRAWN	DRB	
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

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BARI
EPA AIR FLOW

SIZE	DRAWING NO.	REV.
A	8171	0

SCALE: 1/6 WEIGHT: SHEET 1 OF 1

LAST SAVED: 8/8/2019 11:54:18 AM

S:\Product Development\1. PRODUCTS\2020 SI LANS. CAD FILES\Final Prototype\

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

United States Environmental Protection Agency

OMB Control No. 2060-0161
Approval expires 08/22/2019

OMB Control No. 2060-0693
Approval expires 08/22/2019

EPA Form 6400-05

Office of Enforcement and Compliance Assurance

30-DAY NOTIFICATION

2015 CLEAN AIR ACT (CAA) STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES 40 CFR PART 60 SUBPARTS AAA AND QQQQ

The public reporting and recordkeeping burden for this collection of information is estimated to average 2 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Regulatory Support Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

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 60.537 and 60.5479. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at sanchez.rafael@epa.gov.

Instructions: 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: Hearthstone QHHP						
Heater Type Check one):	☒Adjustable Burn Rate Wood Heater	☐Pellet Stove	☐Single Burn Rate Heater	☐Hydronic Heater	☐Forced Air Furnace	☐Other:
Hydronic Heater Type (Check one):	☐Full Storage	☐Partial Storage	☐Indoor	☐Outdoor	☐Other:	
Forced-Air Furnace Type (Check one):	☐Small (less than 65,000 BTU/hr heat output)		☐Large (greater than 65,000 BTU/hr heat output)			
Fuel Tested (Check one):	☒Crib	☐Pellet	☐Cordwood	☐Wood Chips	☐Other:	
Model Name(s) (as will appear on test report): Sila (name subject to change for marketing purposes)						
Model Number(s) (as will appear on test report): 8151						
Equipped with a catalytic combustor? ☒Yes ☐No						

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Instructions: 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.

Mailing Address: 317 Stafford Ave.		
Street Address: 317 Stafford Ave.		
City: Morrisville	**State: VT**	**ZIP Code: 05661**
Phone: 802-851-4044	**Fax: NA**	**Web Site: http://www.hearthstonestoves.com/**
Address of Manufacturer: 317 Stafford Ave.		
City: Morrisville	**State: VT**	**ZIP Code: 05661**
EPA APPROVED TEST LABORATORY		
Name and Title of Authorized Representative: Danick Power		
Company: Services Polytests, Inc.		
Phone: 450-741-3636	**E-mail: Dpower@polytests.com**	**Fax: NA**

United States
Environmental Protection
Agency

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Instructions: 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.

City: St-Jean-Sur Richelieu	**State: Quebec, Canada**	**ZIP Code: J3B-7S7**
EPA APPROVED THIRD-PARTY CERTIFIER		
Name and Title of Authorized Representative: John Steinert, General Manager, Portland Laboratory		
Company: PFS-TECO, Inc.		
Phone: 503-650-0088	**E-mail: jsteinert@dirigolab.com**	**Fax: NA**
City: Clackamas	**State: OR**	**ZIP Code: 97015**
COMPLIANCE TEST INFORMATION		
Test Method(s): EPA Method 28R, ASTM E2515-11, ASTM E2780, CSA B415.1-10		
Date(s) of Proposed Test: July 22-29, 2019		

United States
Environmental Protection
Agency

OMB Control No. 2060-0161
Approval expires 08/22/2019

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30-DAY NOTIFICATION

2015 CLEAN AIR ACT (CAA) STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES 40 CFR PART 60 SUBPARTS AAA AND QQQQ

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Instructions: 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.

Testing Location (Name and Address): Polytests Services Inc. 695 B rue Gaudette, St-Jean-sur-Richelieu Québec, Canada, J3B 7S7 *450.741.3636*	
Contact Name: Danick Power	**Title: VP of Operations**
Phone Number: 450 741-3636	**Email Address: Dpower@polytests.com**

Kyle Walker, Product Development Manager, Hearthstone QHHP

Print Name and Title of Authorized Official

Signature

20 jun 2019

Date

Telephone Number: _802-851-4044

Email Address: __kwalker@hearthstonestoves.com

Remarks: **This test series is intended to qualify emissions for the 8151 stove.**
The stove is a "Hybrid" design, incorporating a secondary combustion system and a catalyst.

This test series is also intended to qualify the use of an alternate catalyst from a second supplier (Advanced Catalyst Systems) by repeating high and low burn rate categories (Category 1 and category 4).

v1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

July 30, 2020

Mr. Simon Booth
Hearthstone QHHP, Inc.
317 Stafford Avenue
Morrisville, Vermont 05661

Re: Updated Certification Letter Number 225-19 for Bari 8171 and Bari Plus 8172 Hybrid Wood Heater Models

Dear Mr. Booth:

The United States Environmental Protection Agency (EPA) is in receipt of your June 10, 2020, letter regarding the above-referenced certificate of compliance letter. This certificate currently includes the Bari and Bari Plus 8171 Hybrid models. Hearthstone QHHP, Inc. (Hearthstone) is requesting that the above-referenced certificate be updated to rename the Bari and Bari Plus 8171 models as follows: Bari 8171 and Bari Plus 8172. According to Hearthstone, the above-referenced models will be manufactured exactly the same as the current certified models except for changes to the wood heaters' labeling. Hearthstone affirms that the above-referenced changes will not cause wood heaters within the model line to exceed applicable emission limits.

Under 40 CFR Part 60, §60.533(k)(1), a manufacturer must recertify a model line whenever any change is made in the design that was submitted pursuant to §60.533(b)(2) that affects or is presumed to affect the particulate emission rate for that model. However, EPA may waive the requirement of recertification if the manufacturer presents adequate rationale and EPA determines that the change may not reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission limits.

Based on an August 19, 2019, test report by Services Polytests Inc. and the information provided in your June 10, 2020, letter, EPA has determined that the proposed changes are unlikely to cause the model line to exceed the emission rate of 0.94 g/hr. An emission rate of 0.94 g/hr meets the 2020 New Source Performance Standard (NSPS) for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces at 40 CFR Part 60, Subpart AAA particulate matter emission limit of 2.0 g/hr. Therefore, pursuant to §60.533(k)(1), EPA is waiving certification testing for the above-referenced models and we have updated the above-referenced certificate number to include the new model names. Please refer to the above-referenced certification letter number in all future correspondence.

This certification is valid for the above-referenced models and cannot be transferred to another model line without applying for certification. This certification allows Hearthstone to manufacture and sell the above-referenced models through December 24, 2024. Thereafter, Hearthstone may not manufacture,

advertise for sale, offer for sale, or sell wood heaters under this certificate without applying for and being issued another compliance certification.

All wood heaters manufactured or sold under this certification must comply with EPA labeling requirements found at §60.536. These provisions require each wood heater to have a permanent label affixed to it that includes the month and year of manufacture, model name or number, serial number, certification test emission value, test method, standard met, and compliance certification statement. In addition, Hearthstone must comply with all applicable requirements of the regulation, including:

1. Conducting a third-party certifier-approved quality assurance program which ensures that all units within a model line are similar to the wood heater submitted for certification testing in all respects that would affect emissions and are in compliance with the applicable emission limit, pursuant to §60.533(m);

2. Applying for recertification whenever any change is made to above-referenced models that affect or is presumed to affect the particulate matter emission rate for the model line, pursuant to §60.533(k)(1);

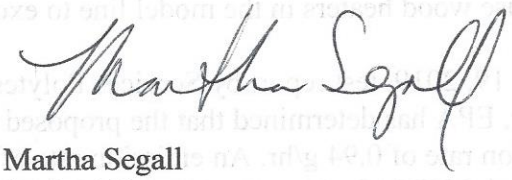
3. Submitting a report to the EPA every two years following issuance of a certificate of compliance for each model line. This report must include the sales for each model by state and certify that no changes in the design or manufacture of this model line have been made that require recertification under §60.533(k);

4. Retaining records and submitting reports as required at §60.537; and

5. Submitting wood heaters for audit testing if selected by the EPA under §60.533(n)(1)(i) and (2)(i).

Failure to comply with these requirements may result in a revocation of this cetification and enforcement action, including penalties as specified under the Clean Air Act. If you have any questions concerning this letter, please contact Rafael Sanchez of my staff at (202) 564-7028 or via email at sanchez.rafael@epa.gov.

Sincerely,



Martha Segall
Acting Director
Monitoring, Assistance, and Media Programs Division
Office of Compliance

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: **Hase Kaminofenbau GmbH, Niederkircher Str. 14, D-54294 Trier, Germany**

Care of: Hearthstone QHHP, Inc. 317 Stafford Ave Morrisville, VT 05661

Heater 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 Tested:	Crib	Pellet	Cordwood	Wood Chips	Other:	

Test Method(s) Method 28R **Catalyst: Yes / 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):

Bari, Bari Plus, Model# 8171

Physical Address (Street number and Address, not P.O. Box): **317 Stafford Ave**	**Mailing Address:** **Same**	
City: Morrisville	**State: Vermont**	**ZIP Code: 05661**
Phone: 802-851-4044	**Email: dbryant@ hearthstonestoves.com**	**Website: www.hearthstonestoves.com**

EPA Submission Date of 30 day Notice: June 20, 2019

MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION

Name: David Bryant

Position/Title: Product Development Engineer

Address: 317 Stafford Ave

City: Morrisville	**State: Vermont**	**ZIP Code: 05661**
Phone: 802-851-4044	**E-mail: dbryant@ hearthstonestoves.com**	**Website: www.hearthstonestoves.com**

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

Remarks: This test series is intended to qualify emissions for the "Bari" 8171 stove. The 30 day notice formerly listed the stove name and model#as "Sila", model 8151.

The final name and model# were revised to provide some continuity with the model which it will be replacing.

The stove is a "Hybrid" design, incorporating a secondary combustion system and a catalyst.

This test series is also intended to qualify the use of an alternate catalyst from a second supplier (Advanced Catalyst Systems) by repeating high and low burn rate categories (Category 1 and category 4)."

EPA-APPROVED TEST LABORATORY		
Name of Test Laboratory: Polytests Services Inc.		
Name of Person Authorized or Responsible for Conducting Compliance Test: Danick Power		
Position/Title: VP operation		
Address: 695-B Gaudette,		
City: St-Jean-sur-Richelieu	**State:** Quebec, Canada	**ZIP Code:** J3B 7S7
Phone: 450 741-3636	**Email:** dpower@polytests.com	**Website:** www.polytests.com
Remarks:		

EPA-Approved Third Party Certifier		
Name of Certifier Entity: PFS-TECO		
Name of Person Authorized or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity: John Steinert		
Position/Title: General Manager, Portland Laboratory		
Address: 11785 SE Highway 212 – Suite 305		
City: Clackamas	**State:** Oregon	**ZIP Code:** 97015
Phone: 503-650-0088	**Email:** John.steinert@pfsteco.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

Engineering drawings and specifications of components that may affect emissions (including specifications for each component listed in paragraphs (k)(2), (3) and (4) of 60.533(b) and 60.5475(b). Manufacturers may use assembly or design drawings that have been prepared for other purposes, but must designate on the drawings the dimensions of each component listed in paragraph (k) of this section. Manufacturers must identify tolerances of components listed in paragraph (k)(2) of 60.533(b) and 60.5475(b) that are different from those specified in that paragraph, and show that such tolerances cannot reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission limits. The drawings must identify how the emission-critical parts, such as air tubes and catalyst, can be readily inspected and replaced.

[DB]Engineering drawings and specifications of components that may affect emissions are included with the CBI certification report. Dimensions and tolerances are in line with 60.533 (b), and our quality assurance plan and quality inspection sheets ensure on-going quality and conformance. Replacement instructions for emission-critical components are included in our operator's manual.

2. Firebox Statement Requirement

A statement whether the firebox or any firebox component (including the materials listed in paragraph (k)(3) of 60.533(b) and 60.5475(b) will be composed of material different from the material used for the firebox or firebox component in the wood heater on which certification testing was performed, a description of any such differences and demonstration that any such differences may not reasonably be anticipated to adversely affect emissions or efficiency.

[DB] All K-list items as described in 60.533 (b) on the certification test unit will be similar in all material respects to the production units

3. CBI

Clear identification of any claimed confidential business information (CBI). Submit such information under separate cover to the EPA CBI Office; Attn: Residential Wood Heater Compliance Program Lead, 1200 Pennsylvania Ave., NW, Room 7138, MS:2227A, Washington, DC 20460. **Note that all emissions data, including all information necessary to determine emission rates in the format of the standard, cannot be claimed as CBI.**

[DB] A CBI and Non-CBI report will be provided separately.

4. Valid Certification Statement

All documentation pertaining to a valid certification test, including the complete test report and, for all test runs: Raw data sheets, laboratory technician notes, calculations and test results. Documentation must include the items specified in the applicable test methods. Documentation must include discussion of each test run and its appropriateness and validity, and must include detailed discussion of all anomalies, whether all burn rate categories were achieved, any data not used in the calculations and, for any test runs not completed, the data collected during the test run and the reason(s) that the test run was not completed and why. The burn rate for the low burn rate category must be no greater than the rate that an operator can achieve in home use and no greater than is advertised by the manufacturer or retailer. The test report must include a summary table that clearly presents the individual and overall emission rates, efficiencies and heat outputs. Submit the test report and all associated required information, according to the procedures for electronic reporting specified in § 60.537(f) and 60.5475(f).

[DB] A valid certification test report with all required documentation as specified above has been submitted by Polytests Services.

5. Warranties

A copy of the warranties for the model line, which must include a statement that the warranties are void if the unit is used to burn materials for which the unit is not certified by the EPA and void if not operated according to the owner's manual.

[DB] The warranty is detailed in the Operator's manual, which is provided with the Polytest Services report.

6. Q/A Statement

A statement that the manufacturer will conduct a quality assurance program for the model line that satisfies the requirements of paragraph (m) of this section.

[DB] Hearthstone is contracted with PFS TECO as our third party certifier to review our QA/QC program, and to provide at least annual audits. Hearthstone's QA plan is included with the certification report.

7. Laboratory Sealing of Unit

A statement describing how the tested unit was sealed by the laboratory after the completion of certification testing and asserting that such unit will be stored by the manufacturer in the sealed state until 5 years after the certification test.

[DB] The unit has been sealed by Polytests and will be transferred back to Hearthstone. Hearthstone will store the unit in a sealed state for at least five years.

8. Statements that the wood heaters manufactured under this certificate will be—

(i) Similar in all material respects that would affect emissions as defined in § 60.531 to the wood heater submitted for certification testing, and labeled as prescribed in § 60.536 and 60.5478.

(ii) Accompanied by an owner's manual that meets the requirements in § 60.536 and 60.5478. In addition, a copy of the owner's manual must be submitted to the Administrator and be available to the public on the manufacturer's web site.

[DB] (i) The tested unit is the same in all material respects that would affect emissions to production units, and production units will be labeled in accordance with 60.536

(ii) All production units will include a copy of the owner's operation/installation manual that meets the requirements as specified in 60.536. A copy of the owner's manual has been provided with the report, and will be made available on Hearthstone's website.

9. Third Party Certification Statement

A statement that the manufacturer has entered into contracts with an approved laboratory and an approved third-party certifier that satisfy the requirements of paragraph (f) of this section.

[DB] Hearthstone is contracted with PFS TECO as our third party certifier.

10. Approved laboratory/third party Statement

A statement that the approved laboratory and approved third-party certifier are allowed to submit information on behalf of the manufacturer, including any claimed to be CBI.

[DB] Polytests and PFS TECO are allowed to submit information related to EPA emissions testing performed by Polytests on behalf of Hearthstone, including any claimed CBI.

11. Manufacturer's Website Certification Test Reports Availability Statement

A statement that the manufacturer will place a copy of the certification test report and summary on the manufacturer's web site available to the public within 30 days after the Administrator issues a certificate of compliance.

[DB] A copy of the certification test report and summary will be available on Hearthstone's website within 30 days after issuation of a certificate of compliance.

12. Transferability Acknowledgement Statement

A statement of acknowledgment that the certificate of compliance cannot be transferred to another manufacturer or model line without written approval by the Administrator.

[DB] Hearthstone acknowledges that the certificate of compliance cannot be transferred to another manufacturer or model line without written approval by the Administrator.

13. Statement about Selling Wood Heaters without an EPA Certificate

A statement acknowledging that it is unlawful to sell, distribute or offer to sell or distribute an affected wood heater without a valid certificate of compliance.

[DB] Hearthstone acknowledges that it is unlawful to sell, distribute or offer to sell or distribute an affected wood heater without a valid certificate of compliance.

Print Name and Title: **David Bryant, Product Development Engineer** **Date: 9/6/19**

Signature of responsible representative of the manufacturer certifying the accuracy of the above statements:

9/6/19

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) %	Heat Output (BTU/HR)	CSA B415.1 CO emission g/min
2	0,97	0,703	77,2	14 065	0,05
3	0,99	0,722	76,5	14 299	0,06
4	1,43	1,227	76,2	20 454	0,06
1	1,90	1,031	73,1	26 036	0,10
Weighted particulate emission average of 4 test runs: 0.94 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 75.9%.					
Average Co 0.07 gr/min					

Weighted avg PI-20202 negative filter weight rounded to zero

		(E)							
		Ave.		Heat			(K)		
	Burn	Emission		Output	CO		Weighting		
Test No.	Rate	Rate g/hr	(OHE)	(BTU/HR)	gr/min)	Prob.	Factor	(KxE)	KxOHE
2	0,97	1,000	77,2%	14065	0,05	0,3486	0,3740	0,3740	0,29
3	0,99	1,100	76,5%	14299	0,06	0,3740	0,3614	0,3975	0,28
4	1,43	1,500	76,2%	20454	0,06	0,7100	0,5200	0,7799	0,40
1	1,90	2,200	73,1%	26036	0,10	0,8939	0,2900	0,6381	0,21
						1,0000	0,0000	0,0000	0,00
						1,0000	0,0000	0,0000	0,00
						1,0000	0,0000	0,0000	0,00
						1,0000	0,0000	0,0000	0,00
						1,0000	0,0000	0,0000	0,00
						1,0000	0,0000	0,0000	0,00
4									
							1,545345	2,1895	1,17
ighted average emissions rate:								1,4168	
	Weighted Average OHE							75,9%	
	Weighted Average CO (gr/min)							0,07	

Average emission calculation with all negative filter weight rounded to zero, Demonstartion purpose only not the compliance number

From: WoodHeaterReports <WoodHeaterReports@epa.gov>
Date: April 11, 2024 at 5:09:27 PM EDT
To: Simon Booth <SBooth@hearthstonestoves.com>
Cc: "Scinta, Robert" <scinta.robert@epa.gov>, "Sanchez, Rafael" <Sanchez.Rafael@epa.gov>, "Needham, Margaret (she/her/hers)" <Needham.Margaret@epa.gov>, "Little, Eleana (she/her/hers)" <Little.Eleana@epa.gov>
Subject: Bari 8171 and Bari Plus 8172; Certificate of Compliance #225-19

Hello Mr. Booth,

Our records show that Certificate of Compliance #225-19 for the Bari 8171 and Bari Plus 8172 Model expires on December 24, 2024. As of today, the EPA has not received a request for renewal from HearthStone Quality Home Heating Products (HearthStone) for the above-mentioned model line. If you intend to renew the Certificate of Compliance for the above-mentioned model line, please ensure that you submit your complete renewal application with all required information in accordance with 40 CFR §§ 60.533 (b), (f), and (i). Please submit the renewal application at least 90 days in advance of certificate expiration in order to ensure renewal in a timely manner. If you choose to no longer manufacture the model line and therefore do not intend to renew the Certificate of Compliance, you must notify the EPA per 40 CFR § 60.533 (i)(1).

Additionally, the EPA Wood Heater team has concluded our review of your certification test report dated August 19, 2019 (last revised January 20, 2021, Rev3) for the above-referenced model and has identified irregularities. The table below contains a list of irregularities that HearthStone must address before we can act upon a certification renewal request for this model.

Test Report Problems or Irregularities	**Regulatory Citation and/or Test Method**	**Information Needed to Address Problems or Irregularities**
Missing or Incomplete Information – Overall Firebox Dimensions and Volume Calculations	40 CFR § 60.533(b)(3), 40 CFR § 60.533(b)(5), and ASTM E2780 (9.3)	Include in the revised test report overall firebox dimensions and calculations that result in the listed firebox volume used for certification testing. These must not conflict with diagrams, drawings, or firebox descriptions elsewhere in the report or owner's manual.
Missing Information – Raw Data Sheets	CSA B415	In the revised report, include all raw data sheets. Currently CSA B415 data is incomplete, as only the first page of the efficiency sheets is included.
Missing Information – Conditioning Data	40 CFR 60.533(b)(5)	In the revised report, include the air damper positioning to document a medium burn.
Missing Information – Calibration Documents	40 CFR 60.533(b)(5)	In the revised report, include an English translation of the calibration documents. Currently, they are mostly in French.
Missing Information – Test Run Data	40 CFR 60.533(b)(5)	In the revised report, include corrected negative weights for particulate matter (PM) emissions for each run, and the train precision in g/kg.

Test Report Problems or Irregularities	Regulatory Citation and/or Test Method	Information Needed to Address Problems or Irregularities
Incomplete Information – Test Run Data	40 CFR 60.533(b)(5)	In the revised report, include higher heating value (HHV) efficiency (%) for all test runs. In the existing test report, the HHV efficiency (%) was only reported as a weighted average of test runs one through four. Also include the HHV efficiency (%) in the summary tables.

The EPA requests that HearthStone submit both a revised confidential business information (CBI) test report and a revised non-CBI test report to the EPA within ten (10) business days from receipt of this email to maintain your Certificate of Compliance. The revised test reports (both CBI and non-CBI) should clearly identify the report as revised, provide a revision date, and include a summary table indicating what revisions have been made and wherein the report the revisions are located. HearthStone must also submit an updated Certification of Conformity that includes a history of revisions page.

If you have any questions concerning the above, please contact WoodHeaterReports@epa.gov.

Thank you,

WoodHeaterReports on behalf of:
Eleana Little, P.E.
Environmental Engineer
Air Branch
Monitoring, Assistance, and Media Programs Division
Office of Compliance, Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
Tel: 202-564-3325