TEST REPORT

TEST OF A WOOD HEATER FOR EMISSIONS AND EFFICIENCY

PER EPA METHODS 28R AND ASTME2515 and ASTME2780 and CSAB415.1, MAY 2015

Client:

Hearthstone QHHP

317 Stafford ave.

Morrisville, Vt 05661

Model name: Lincoln 8060

Attention: Rafaël Sanchez

TESTED BY:

Services Polytests Inc.

695-B Gaudette

St-jean-sur-Richelieu, QC, J3B 7S7

TEST DATES: June 27th to July 27st 2022

REPORT DATE: August 1st 2022

Project number: PI-20272

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Revision:

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1 INTRODUCTION

1.1 GENERAL

Laboratory

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

Test program

- Test dates: June 27th to July 27st 2022
- Test methods used:
    - Particulate emissions: ASTM E2780-10; ASTM E2515-11 methods 28R as referred into 40 CFR Part 60 Subpart AAA; CSA B 415.1-22
    - Efficiency: CSA B415.1-22

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Hearthstone
- Product type: Hybrid wood stove
- Combustion system: catalytic, with pre combustion
- Unit tested: Lincoln 8060
- Option: The alternative Catalyst can be installed in this stove as it meets the requirement emission rate range from the WDS-146.

1.3 RESULTS

Emission results obtained

- Average emission rate: 1.1 grams/hour

Conformity: NSPS Phase 2020 with crib wood and CSAB415.1-22

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier on June 15th 2022. The 50hrs of aging was done by the laboratory at medium heat draw, during week prior to testing (all data in Appendix 4). The 50hrs aging for the alternative catalyst have been done after the first four tests and prior to confirmation test with the alternative catalyst.

Set up

- Venting system type: 6-inch diameter insulated chimney
- System height from floor: 15 feet
- Particularities: After the four tests the catalysts have been changes for the 50 hrs aging of the second (alternative) catalyst. Following the 50 hrs aging on the alternative catalyst a minimum and a maximum test have been done on the stove for catalyst equivalency (WDS-146- in appendix 15).

Break in period

- Duration: the unit was pre burned by Polytests and run for at least 50 hours for each catalyst, adequate documentation of fuel additions, flue and unit temperatures and fuel moisture recorded. All details in Appendix 4.
- Fuel: Red Oak cordwood between 19% and 25%

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Test Date (YR-MM-DD)	Emission Rate (g/hr)	Burn Rate (kg/hr)	1st hour Emission Rate (g/hr)	CSA B415.1 CO emission Gr/hr	CSA B415.1 emission Gr/Mj
1	2022-06-27	0,84	0,987	2,251	38,696	0,055
2	2022-06-28	1,50	1,070	3,032	18,243	0,090
3	2022-06-29	1,14	1,474	1,539	69,026	0,053
4	2022-06-30	1,17	1,396	0,549	17,297	0,055
5	2022-07-25	1,16	1,416	2,049	16,712	0,054
6	2022-07-26	0,84	0,970	1,498	17,888	0,056

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
1	0,987	0,84	79,4%	14 545	0,645
2	1,07	1,50	80,5%	15 776	0,304
4	1,40	1,17	78,0%	20 305	0,288
3	1,47	1,14	75,7%	20 507	1,150
Weighted particulate emission average of 4 test runs: 1.1 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 79 %.					
Average Co 0.60 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	79	79	29,619	29,678	56,9	36,8	0	0
2	77	78	29,943	29,943	51,2	33,6	0	0
3	79	83	29,973	29,973	44,9	33,9	0	0
4	74	79	30,062	30,002	46,6	40,1	0	0
5	80	85	29,530	29,530	44,6	37	0	0
6	78	82	29,766	29,796	55,4	40,3	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	13,97	19,74	1,5	6,96	6,964	20,73	15	4	0	12
2	14,68	20,35	1,8	7,06	7,060	20,54	15	4	0	12
3	14,38	20,61	1,6	7,03	7,028	20,17	15	4	0	12
4	13,83	20,17	1,6	7,03	7,032	20,22	15	4	0	12
5	14,74	20,38	1,6	7,08	7,078	20,41	15	4	0	12
6	14,58	20,39	1,7	6,94	6,942	20,22	15	4	0	12

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	159	347,72	545,81	29,471	28,852	1,20	1,20
2	149	352,95	547,28	27,752	26,921	2,00	1,90
3	108	320,51	559,49	20,245	19,670	1,20	1,20
4	114	325,91	556,81	20,312	20,788	1,20	1,30
5	113	345,80	555,08	20,976	21,108	1,20	1,20
6	162	347,83	548,63	30,091	30,332	1,30	1,20

2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)			
	Train 1	Train 2	Train 1	Train 2	% Deviation	Deviation g/Kg
1	1876,01	1916,26	2,21	2,26	1,17%	0,020
2	1895,00	1953,49	3,75	3,68	0,98%	0,027
3	1709,81	1759,79	2,01	2,08	1,59%	0,025
4	1829,16	1787,25	2,17	2,29	2,78%	0,047
5	1862,87	1851,28	2,18	2,17	0,35%	0,006
6	1872,59	1857,69	2,38	2,18	4,53%	0,079

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	0,987	435,04	-59,8	0,061	0,190	lowest setting	159
2	1,070	436,45	-44,9	0,062	0,190	lowest setting	149
3	1,474	493,95	-19,5	0,063	0,160	maximum opening	108
4	1,396	480,26	-22,1	0,059	0,170	maximum opening	114
5	1,416	478,37	-21,0	0,064	0,200	maximum opening	113
6	0,970	431,76	-57,9	0,054	0,180	lowest setting	162

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 without any convection fan. Two more runs have been done with the alternative catalyst for equivalency, one at the maximum burn rate and a second at minimum burn rate.

3.2 UNIT DIMENSIONS

Baffle

- Location: between top of combustion chamber and hearth
- Restriction: 2X (2.0-inch X 2.625 inch) at the front of the unit
- Dimensions: cover the hearth area minus the restriction at the front
- Material: Gemcolite ½ inch thick.

Bricks

- All stove made from soapstone; bottom made from cast Iron with lining of soapstone in the firebox

Flue gas exhaust

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

Gasket

- For all details refer to appendix 6

Overall unit dimension

- Overall dimensions: 14-inch-wide x 24 ¾ inch deep x 30 ½ inch high
- Usable volume: 1.0 cuft
- Firebox volume details refer to appendix 12 Volume calculation

Convection fan

- None

Catalyst (appendix 6 for details):

- Applied Ceramics – P/N WF-4150001076
- Cell density: 50 CPSI
- Material: 16 Ga SS430 or 304

Alternative Catalyst:

- Applied Ceramics – P/N WF-415000106
- Cell density: 50 CPSI
- Material: 16 Ga SS430 or 304

3.3 AIR SUPPLY SYSTEM

Description

- Primary air: Window wash design in cast iron channel fully gasketed on the top front and bottom back of the combustion chamber. Air intake on the rear 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 baffle at the back

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.				
Identification	Type	Imin	Imax	Controlled	Location	OUTLET (sq. in.)
APPENDIX 14	Primary	0,40	2,37	Yes	Lower rear, Primary delivery	0,49
APPENDIX 14				Yes	Air wash, primary delivery	2,06
Appendix 14 TA	Secondary	0,36	0,62	Yes	Secondary air, baffle delivery	1,25

* 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. test fuel spacers with a length of 4 inches (4" x 1.5" x .75") instead of typical 5 inches, with no other changes to the crib load specifications have been used due to the narrow width of the firebox, approval letter from the EPA can be found in appendix 15. For run 1 to 4 filters have been weighted in pair with the gasket to reduce weighting error propagation, for other runs filters are weighted in pair and the gaskets separately.

Run #1
This run was performed on June 27th 2022. It lasted 159 minutes and a 0.987 kg/hr burn rate was obtained & emission at 0.84 gr/hr. Air inlet damper was set at the minimum (Lowest possible) setting. No convection fan was used during the test

Run #2
This run was performed on June 28th 2022. It lasted 149 minutes and a 1.07 kg/hr burn rate was obtained & emission at 1.5 gr/hr. Air inlet damper was set at the minimum (Lowest possible) setting. No convection fan was used during the test

Run #3
This run was performed on June 29th 2022. It lasted 108 minutes and a 1.47 kg/hr burn rate was obtained & emission at 1.14 gr/hr. Air inlet damper was set at the maximum setting. No convection fan was used during the test

Run #4
This run was performed on June 30th 2022. It lasted 114 minutes and a 1.40 kg/hr burn rate was obtained & emission at 1.17 gr/hr. Air inlet damper was set at the maximum setting. No convection fan was used during the test

Run #5
Following change of catalyst and an aging of 50hrs on this second catalyst. This run was performed on July 25th 2022. It lasted 113 minutes and a 1.41 kg/hr burn rate was obtained & emission at 1.16 gr/hr. Air inlet was set at the maximum opening. This run at the maximum setting meets the catalyst equivalency requirement (WDS-146 enclosed in appendix 15), with less than 0.5gr/hr above to the original catalyst run #3 emission result(1.14gr/hr). No convection fan was used during the test. During this run, negative weight has been found on back filter but none on probe and gasket, those were handled properly

Run #6
This run was performed on July 26th 2022. It lasted 162 minutes and a 0.97 kg/hr burn rate was obtained & emission at 0.84 gr/hr. Air inlet was set at the minimum (Lowest possible) setting. This run at the lowest setting meets the catalyst equivalency requirement (WDS-146 enclosed in appendix 15). No convection fan was used during the test

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

Test fuel cribs

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

3.5 START-UP OPERATION

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

3.6 SAMPLING LOCATIONS

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

3.7 DRAWINGS

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix 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 NIST 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 10 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

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: pI 20272 Run: 1 Tech: MM Reviewer: NP

- loading 28LBS STAND 1st int
- by pass open
- Door open
- At 25LBS close Door
- At 11LBS insert 1st preload
- close Door immediatly
- At 12LBS insert second preload
- close Door immediatly
- At 33LBS close air inlet and close by pass
- At 15LBS Rack coal Bed

After 2 min insert load and open air inlet

At 5 min close air inlet to lowest setting

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2022-06-27 Manufacturer: Hearthstove Model: 8260

Project #: PT 20272 Run: 1 Tech: MM Reviewer: AP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334	7:00	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	2022-06-27
Date Dilution Tunnel Cleaned	2022-06-27
Induced Draft Check (max 0.005 H2O)	ok
Traverse before ignition	ok

Temperature System:

Ambient (65°-90°F)	ok °F

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok
Pictures for report	ok
Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok
Load Length approximately 5/6 of firebox Lenght	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 1 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 ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10		-10		-10	
Final 1minute DGM (Liter)	655543.61	656425.31	655543.80	656425.44	403.402,56	404268,59
Initial 1minute DGM (Liter)	655543.58	656425.31	655543.78	656425.41	403.402,52	404268,59
Change (Liter)	0,04	0	0,02 NM	0,03	0,02	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	0.20	0.20	0.20	0.20	0.20	0.20
Check OK	ok	ok	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 1 Tech: MM Reviewer: DP

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

Scales checks

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	lbs
Platform	EM-205	1000 ~~lbs~~ kgm, Class F	1000 ~~lbs~~ kgm
Wood	EM-090	440 lbs, Class F	440 lbs
Analytical	EM-335	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: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 1 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 103 (KPa.) Static pressure (P_q) 0.19 (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	0.069	77.52
B - Centroid	3.00	3.50	4	0.069	77.55
A-1	0.40	0.50	0.50	0.055	77.52
A-2	1.50	1.75	2	0.065	77.51
A-3	4.50	5.25	6	0.064	77.52
A-4	5.60	6.5	7.5	0.056	77.52
B-1	0.40	0.50	0.50	0.055	77.55
B-2	1.50	1.75	2	0.065	77.59
B-3	4.50	5.25	6	0.074	77.59
B-4	5.60	6.5	7.5	0.055	77.55
				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: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 1 Tech: MP Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3015	3000	1,010	1,000
Tolerance CO	0	+/- 0.02	0015	+/- 0.15	0010	+/- 0.05
CO_2	0	0	17,93	1800	9,74	10,00
Tolerance CO2	0	+/- 0.02	007	+/- 0.5	026	+/- 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	03009	1006	0	0.02	0,006	0.15	0,004	0.05	✓	
CO_2	0	17,98	980	0	0.02	005	0.5	006	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 1 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	656 424, 45	404 267, 18	390 000, 40
Initial (Liter)	655 544, 33	403 402, 38	~~389~~ 389 285, 70 M-

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100,3	100,5
Dry Bulb (F):	78,8	79,1
Humidity (%):	56,9	36,8

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: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 1 Tech: MS 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 14 in.	1 122 lbs.	194	193	194	196	193
1 1/2 x 3 1/2 x 14 in.	1 380 lbs.	196	195	195	195	194
1 1/2 x 3 1/2 x 14 in.	1154 lbs.	20[illegible]	200	199	193	194
1 1/2 x 3 1/2 x 7 in.	0834 lbs.	200	200	198	193	198
1 1/2 x 3 1/2 x 7 in.	0 846 lbs.	191	192	194	194	193
1 1/2 x 3 1/2 x 7 in.	0 846 lbs.	192	192	193	194	193
1 1/2 x 3 1/2 x 7 in.	0 848 lbs.	196	194	193	194	194
x x in.	lbs.					
1 1/2 x 3 1/2 x 14 in.	1092 lbs.	201	201	200	199	198
1 1/2 x 3 1/2 x 14 in.	1336 lbs.	198	196	197	197	198
1 1/2 x 3 1/2 x 14 in.	1204 lbs.	196	~~200~~ 200 MA	203	202	201
1 1/2 x 3 1/2 x 7 in.	0840 lbs.	200	201	201	201	202
1 1/2 x 3 1/2 x 7 in.	0834 lbs.	199	198	199	198	198
1 1/2 x 3 1/2 x 7 in.	0 826 lbs.	199	200	200	203	204
1 1/2 x 3 1/2 x 7 in.	0812 lbs.	201	203	204	204	203
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 6 946 + 7028 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 1 Tech: MM Reviewer: BP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 15 in.	1 518 lbs.	21	21 4	21 3	21 4	21 3
1 1/2 x 3 1/2 x 15 in.	1 53 lbs.	21 5	22 1	22 0	21 8	21 3
1 1/2 x 3 1/2 x 15 in.	1 386 lbs.	21 9	21 3	21 4	21 3	21 2
1 1/2 x 3 1/2 x 15 in.	1 304 lbs.	19 1	19 4	19 3	19 6	19 4
x x in.	lbs.					
1 1/2 x 3 1/2 x 4 in.	0 112 lbs.			19 6		
1 1/2 x 3 1/2 x 4 in.	0 122 lbs.			19 3		
1 1/2 x 3 1/2 x 4 in.	0 104 lbs.			19 8		
1 1/2 x 3 1/2 x 4 in.	0 106 lbs.			19 8		
1 1/2 x 3 1/2 x 4 in.	0 108 lbs.			19 1		
1 1/2 x 3 1/2 x 4 in.	0 092 lbs.			19 2		
1 1/2 x 3 1/2 x 4 in.	0 078 lbs.			19 1		
1 1/2 x 3 1/2 x 4 in.	0 096 lbs.			19 3		
1 1/2 x 3 1/2 x 4 in.	0 112 lbs.			19 2		
1 1/2 x 3 1/2 x 4 in.	0 092 lbs.			19 4		
1 1/2 x 3 1/2 x 4 in.	0 090 lbs.			19 6		
1 1/2 x 3 1/2 x 4 in.	0 114 lbs.			19 5		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 6 98 lbs Min 20%: 1 40 Max 25%: 1 75

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-06-23 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 1 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	19	302	~~303~~ 303	25	32	304	305	34	308
2022-06-23	17:00	109,0900		35 2080		110 1783		34 5082		0 1286
2022-06-27	10:00	109,0899		35,2081		110,1783		34,5082		0,1287

		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	19	302	303	25	32	304	305	34	308
2022-06-27	16:00	109,0906		35 2099		110 1788		34,5094		0 1289
2022-07-07	8:00	109,0900		35 2092		110,1783		34 5083		0,1288
2022-07-08	8:00	109,0900		35 2092		110 1783		34 5083		0,1288

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-06-23 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 1 Tech: MM Reviewer:

Pre-test Weight Record		SYSTEM 2 Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	39	306	307	38
2022-06-23	17:00	110 2778		35 8541	
2022-06-27	10:00	110 2777		35 8540	

Post-test Weight Record		SYSTEM 2 Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	39	306	307	38
2022-06-27	16:00	110 2779		35 8556	
2022-07-07	8:00	110 2778		35 8552	
2022-07-08	8:00	110 2778		35 8552	

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	27-06-2022	
Technicien	M.M	
Project #	PI 20272	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8060	
Combustion system	Non-Cat	
Appliance type	WOOD SYOVE	
Firebox volume	1	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):	1,007	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,005	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	EM 179	Dimensionless

Tunnel

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

Project nu.	PI 20272
Date	27-06-2022
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):	100,3	100,5
Barometer (in.Hg):	29,618579	29,67763883
Dry Bulb (F):	78,8	79,1
Humidity (%):	56,9	36,8
Air velocity (ft/min)	0	0

DGM #1	Final:	23181,411	cuft	Final:	656424,450	Liter
	Initial:	23150,330	cuft	Initial:	655544,330	Liter
DGM #2	Final:	14276,561	cuft	Final:	404267,180	Liter
	Initial:	14246,021	cuft	Initial:	403402,380	Liter
DGM room	Final:	13772,734	cuft	Final:	390000,400	Liter
	Initial:	13747,495	cuft	Initial:	389285,700	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 252

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

Project nu.	PI 20272
Date	27-06-2022
Technicien	M.M

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
6,30	7,00	7,70

Load Volume: 0,4253 cu. ft

Number of Spaces:

Spacer weight (lbs):

Loading Density: 13,974 lbs./ft3

Load Density (wet): 32,853 lbs./ft3

Dry Wood Density: 27,437098

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	14	1,122	19,4	19,3	19,4	19,6	19,3	21,7668	73,50
1,5	3,5	14	1,38	19,6	19,5	19,5	19,5	19,4	26,91	73,50
1,5	3,5	14	1,154	20	20	19,9	19,3	19,4	22,75688	73,50
1,5	3,5	7	0,834	20	20	19,8	19,3	19,8	16,49652	36,75
1,5	3,5	7	0,846	19,1	19,2	19,4	19,4	19,3	16,31088	36,75
1,5	3,5	7	0,846	19,2	19,2	19,3	19,4	19,3	16,31088	36,75
1,5	3,5	7	0,848	19,6	19,4	19,3	19,4	19,4	16,46816	36,75
										0,00
1,5	3,5	14	1,092	20,1	20,1	20	19,9	19,8	21,81816	73,50
1,5	3,5	14	1,336	19,8	19,6	19,7	19,7	19,8	26,34592	73,50
1,5	3,5	14	1,204	19,6	20	20,3	20,2	20,1	24,12816	73,50
1,5	3,5	7	0,84	20	20,1	20,1	20,1	20,2	16,884	36,75
1,5	3,5	7	0,834	19,9	19,8	19,9	19,8	19,8	16,54656	36,75
1,5	3,5	7	0,826	19,9	20	20	20,3	20,4	16,61912	36,75
1,5	3,5	7	0,812	20,1	20,3	20,4	20,4	20,3	16,4836	36,75
										0,00
										0,00
										0,00

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
6,3	7,0	7,7

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

Load Volume: 0,18 cu. ft

Loading Density: 7,0 lbs./ft3

Number of Spaces: 12

Spacer weight: lbs

Load Density (wet): 31,5 lbs./ft3

Dry Wood Density: 26,1 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	15	1,52	21,10	21,40	21,30	21,40	21,30	32,3334	78,75	21,3
1,5	3,5	15	1,53	21,50	22,10	22,00	21,80	21,30	33,2622	78,75	21,7
1,5	3,5	15	1,39	21,90	21,30	21,40	21,30	21,20	29,68812	78,75	21,4
1,5	3,5	15	1,30	19,10	19,40	19,30	19,60	19,40	25,24544	78,75	19,4
										0,00	
										0,00	
										0,00	
										0,00	

1,5	0,75	4	0,11			19,60			2,1952	4,50	19,6
1,5	0,75	4	0,12			19,30			2,3546	4,50	19,3
1,5	0,75	4	0,10			19,80			2,0592	4,50	19,8
1,5	0,75	4	0,11			19,80			2,0988	4,50	19,8
1,5	0,75	4	0,11			19,10			2,0628	4,50	19,1
1,5	0,75	4	0,09			19,20			1,7664	4,50	19,2
1,5	0,75	4	0,08			19,10			1,4898	4,50	19,1
1,5	0,75	4	0,10			19,30			1,8528	4,50	19,3
1,5	0,75	4	0,11			19,20			2,1504	4,50	19,2
1,5	0,75	4	0,09			19,40			1,7848	4,50	19,4
1,5	0,75	4	0,09			19,60			1,764	4,50	19,6
1,5	0,75	4	0,11			19,50			2,223	4,50	19,5
										0,00	
										0,00	
										0,00	
										0,00

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,19 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=
0,952

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,069	77,52	0,2627
B center	0,069	77,55	0,2627
A1	0,055	77,52	0,2345
A2	0,065	77,51	0,2550
A3	0,064	77,52	0,2530
A4	0,056	77,52	0,2366
B1	0,055	77,550	0,2345
B2	0,065	77,590	0,2550
B3	0,074	77,590	0,2720
B4	0,055	77,550	0,2345
AVERAGE	0,0627	77,5420	0,2500

Project nu.	PI 20272
Date	27-06-2022
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	19	302	303	25	32	304	305	34	39	306	307	38	308		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	109,0900		35,2080		110,1783		34,5082		110,2778		35,8541		0,1286	2022-06-23	17:00
Before (6)	109,0899		35,2081		110,1783		34,5082		110,2777		35,8540		0,1287	2022-06-27	10:00
After (1)	109,0906		35,2099		110,1788		34,5094		110,2779		35,8556		0,1289	2022-06-27	16:00
After (2)	109,0900		35,2092		110,1783		34,5083		110,2778		35,8552		0,1288	2022-07-07	08:00
After (3)	109,0900		35,2092		110,1783		34,5083		110,2778		35,8552		0,1288	2022-07-08	08:00
After (4)															
After (5)															
After (6)	109,0900		35,2092		110,1783		34,5083		110,2778		35,8552		0,1288	2022-07-08	08:00
Difference	0,0001	0,0000	0,0011	0,0000	0,0000	0,0000	0,0001	0,0000	0,0001	0,0000	0,0012	0,0000	0,0001		
Total (mg)		1,2				1,3				1,3			0,1		
Total ajusté (mg)		**1,10**				**1,20**				**1,20**					

Project nu.	PI 20272
Date	27-06-2022
Technicien	M.M

SFBA EPA EMISSION RESULTS

Test Duration: **159** min

PRESSURE FACTOR:	DGM 1	0,96288	
	DGM 2	0,96829	
	DGM 3	0,99091	
TEMPERATURE FACTORS	DGM 1	0,97832	
	DGM 2	0,97036	
	DGM 3	0,97914	
VOLUMES SAMPLED	DGM 1	29,471	SCft
	DGM 2	28,852	Scft
	DGM 3	24,199	SCft

TOTAL TUNNEL VOLUME : 55287

SAMPLE RATIOS

Sample Train 1:	1876,008
Sample Train 2:	1916,259

Paticulate concentration

Sample Train 1	**0,000044**	g/dscf
Sample Train 2	**0,000045**	g/dscf
Room	**0,000004**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,21**	g
Sample Train 2	**2,26**	g

EMISSION RATES

Sample Train 1	**0,83**	g/hr
Sample Train 2	**0,85**	g/hr

1st hour emission rate **2,25** g/hr

	Train 1	Train 2
Cs	4,411E-05	4,5058E-05

RESULTS

Average emission rate: 0,84 g/hr

Burn Rate : 0,987 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,64810884	in Hg
Start:	29,61857885	in Hg
End:	29,67763883	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	23181,411	Cuft
	Initial:	23150,330	Cuft
DGM 2	Final:	14276,561	Cuft
	Initial:	14246,021	Cuft
DGM #3	Final:	13772,734	Cuft
	Initial:	13747,495	Cuft

TEMPERATURES

DGM 1	539,702	°R
DGM 2	544,128	°R

CALIBRATION FACTORS

DGM 1	1,0066
DGM 2	1,0054
DGM #3	0,9882

TUNNEL FLOW RATE: 347,717 Dscfm

PARTICULATE CATCH

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

DEVIATION: 1,17%

		Average	0,33	10,59	#DIV/0!	286,31	79,25	85,81	434,71	344,96	548,12	511,96	335,43	704,33	0,19	79,80	79,60	84,09	0,18	83,98	84,28	85,30	0,08	0,05
*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*9	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft
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
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom										in wc	in wc
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
0,00	252,00	6,9	0,1	2,9	0,0	283,2	79,3	91,4	372,7	320,8	578,2	560,3	438,8	456,8	0,18	78,98	79,01	87,71	0,18	79,64	80,44	84,45	0,07	0,05
1,0	253,0	6,9	0,4	4,0	0,0	286,9	79,1	88,5	367,8	316,3	570,9	554,2	437,9	648,6	0,18	78,89	79,00	87,24	0,18	79,68	80,50	84,20	0,07	0,06
2,0	254,0	6,8	0,1	5,7	0,0	305,5	79,0	88,1	365,2	311,7	561,9	544,1	436,4	676,8	0,18	78,92	79,01	86,81	0,18	79,81	80,62	84,01	0,08	0,06
3,0	255,0	6,8	0,1	6,4	0,0	314,7	79,3	88,3	363,9	311,5	552,7	534,3	435,4	681,0	0,18	78,95	79,01	86,52	0,18	79,93	80,70	83,90	0,08	0,06
4,0	256,0	6,7	0,1	6,6	0,0	318,7	78,9	88,9	364,5	309,6	542,1	523,3	433,4	673,5	0,18	78,94	79,02	86,32	0,18	80,10	80,78	83,84	0,07	0,06
5,0	257,0	6,6	0,1	10,3	0,0	307,4	79,0	87,4	369,9	314,5	532,6	513,7	431,7	691,1	0,19	79,05	79,04	86,00	0,18	80,28	80,88	83,72	0,08	0,06
6,0	258,0	6,5	0,1	12,0	0,0	301,3	79,1	87,0	376,8	317,3	523,4	504,0	429,6	687,2	0,19	79,11	79,05	85,70	0,18	80,50	80,97	83,60	0,08	0,06
7,0	259,0	6,5	0,0	10,0	0,0	292,4	79,1	86,5	381,3	320,5	516,1	495,3	427,5	670,3	0,19	79,14	79,06	85,43	0,18	80,68	81,05	83,50	0,07	0,06
8,0	260,0	6,4	0,0	7,4	0,0	286,3	78,9	85,8	381,4	323,2	507,1	485,9	425,0	667,6	0,19	79,13	79,05	85,12	0,18	80,79	81,10	83,33	0,07	0,06
9,0	261,0	6,3	0,0	6,5	0,0	281,9	78,9	85,8	379,9	324,0	500,2	478,2	422,7	647,3	0,19	79,18	79,08	84,87	0,18	80,99	81,21	84,79	0,07	0,05
10,0	262,0	6,3	0,0	7,7	0,0	277,7	79,0	86,1	379,9	326,1	493,2	471,8	420,5	632,4	0,18	79,23	79,07	84,70	0,18	81,17	81,32	87,93	0,08	0,06
11,0	263,0	6,2	0,0	9,6	0,0	278,0	78,9	86,1	382,2	327,5	487,1	464,5	417,8	638,9	0,18	79,23	79,09	84,47	0,18	81,36	81,40	88,12	0,08	0,06
12,0	264,0	6,2	0,0	10,9	0,0	280,7	78,9	86,3	386,9	328,2	482,2	458,1	415,2	655,6	0,18	79,19	79,07	84,26	0,18	81,49	81,46	87,80	0,08	0,06
13,0	265,0	6,1	0,0	11,4	0,0	285,9	78,8	86,6	391,9	329,8	476,8	450,7	412,6	682,0	0,19	79,19	79,09	84,06	0,18	81,66	81,56	87,44	0,08	0,06
14,0	266,0	6,0	0,0	12,3	0,0	291,6	78,8	86,7	398,7	330,4	473,0	445,2	409,9	698,2	0,19	79,18	79,08	83,88	0,18	81,78	81,61	87,14	0,08	0,06
15,0	267,0	5,9	0,0	12,4	0,0	295,7	78,8	86,4	406,4	332,7	469,7	441,4	407,3	707,7	0,19	79,20	79,08	83,68	0,18	81,91	81,67	86,81	0,08	0,06
16,0	268,0	5,9	0,0	11,9	0,0	296,6	79,0	86,5	412,1	335,4	467,5	440,3	405,1	710,6	0,19	79,25	79,09	83,52	0,18	82,07	81,80	86,56	0,07	0,06
17,0	269,0	5,8	0,0	11,3	0,0	296,8	78,9	86,4	417,0	337,1	464,6	439,2	402,7	716,5	0,19	79,30	79,11	83,44	0,18	82,26	81,94	86,37	0,08	0,06
18,0	270,0	5,7	0,0	11,1	0,0	296,7	78,9	86,5	420,4	339,1	463,6	439,0	400,2	708,0	0,19	79,28	79,11	83,27	0,18	82,34	82,03	86,12	0,07	0,06
19,0	271,0	5,6	0,1	10,9	0,0	299,2	79,1	87,4	423,2	342,3	461,5	437,8	397,9	725,0	0,19	79,36	79,14	83,21	0,18	82,53	82,15	85,97	0,08	0,06
20,0	272,0	5,5	0,1	11,1	0,0	301,0	79,1	86,7	425,6	344,3	460,4	436,2	395,6	735,6	0,19	79,40	79,15	83,12	0,18	82,64	82,24	85,77	0,07	0,06
21,0	273,0	5,5	0,1	11,1	0,0	301,7	79,0	87,4	427,4	345,8	458,8	434,3	393,1	739,7	0,19	79,38	79,16	83,07	0,18	82,75	82,33	85,57	0,07	0,06
22,0	274,0	5,4	0,1	11,2	0,0	304,8	79,1	87,8	430,7	349,2	457,8	433,3	390,8	761,7	0,19	79,45	79,18	83,02	0,18	82,89	82,44	85,49	0,08	0,06
23,0	275,0	5,3	0,1	11,6	0,0	308,9	79,2	87,8	433,7	351,1	455,5	432,0	388,4	773,0	0,19	79,68	79,25	83,01	0,18	83,14	82,58	85,43	0,07	0,06
24,0	276,0	5,2	0,1	12,2	0,0	314,9	79,0	87,2	437,9	351,2	455,1	430,2	385,8	774,9	0,19	79,68	79,25	82,95	0,18	83,20	82,65	85,27	0,07	0,06
25,0	277,0	5,1	0,2	13,8	0,0	320,3	78,8	86,8	444,4	353,7	454,9	430,2	383,5	761,8	0,19	79,63	79,29	82,83	0,18	83,26	82,73	85,12	0,08	0,06
26,0	278,0	5,0	0,1	13,5	0,0	323,2	79,0	86,6	449,4	354,4	456,8	430,6	381,2	757,7	0,19	79,69	79,30	82,68	0,18	83,34	82,84	84,90	0,08	0,06
27,0	279,0	4,9	0,5	13,8	0,0	328,9	79,1	88,3	453,9	358,7	459,5	432,0	379,2	779,9	0,19	79,65	79,30	82,70	0,18	83,37	82,90	84,81	0,07	0,07
28,0	280,0	4,8	0,6	13,7	0,0	333,1	79,2	88,2	457,6	360,9	462,0	433,6	377,0	778,8	0,19	79,71	79,35	82,69	0,18	83,55	83,03	84,72	0,08	0,06
29,0	281,0	4,7	0,4	13,4	0,0	335,2	79,2	87,8	462,4	359,8	466,2	434,5	374,9	780,8	0,19	79,71	79,35	82,65	0,18	83,68	83,17	84,64	0,08	0,06
30,0	282,0	4,7	0,1	13,0	0,0	332,8	79,0	87,1	467,4	359,0	470,2	435,9	372,6	765,1	0,19	79,66	79,37	82,55	0,18	83,68	83,19	84,42	0,07	0,06
31,0	283,0	4,6	0,0	13,0	0,0	330,3	79,1	86,8	471,5	358,5	472,5	437,4	370,5	757,8	0,19	79,63	79,34	82,44	0,18	83,66	83,23	84,21	0,07	0,07
32,0	284,0	4,5	0,1	13,4	0,0	331,1	79,2	86,8	475,1	360,2	475,8	439,8	368,4	771,0	0,19	79,61	79,36	82,38	0,18	83,68	83,25	84,09	0,07	0,06
33,0	285,0	4,4	0,2	13,6	0,0	332,4	79,2	88,2	478,3	361,9	478,4	441,5	366,5	777,1	0,19	79,65	79,37	82,42	0,18	83,71	83,31	84,08	0,08	0,06
34,0	286,0	4,3	0,5	13,9	0,0	334,3	79,1	89,0	480,6	363,6	478,4	443,4	364,4	789,3	0,19	79,64	79,34	82,46	0,18	83,79	83,37	84,04	0,07	0,07
35,0	287,0	4,2	0,8	14,0	0,0	337,8	79,3	87,7	482,8	364,4	483,5	445,7	362,5	798,5	0,18	79,82	79,41	82,38	0,18	83,99	83,47	83,92	0,07	0,06
36,0	288,0	4,1	1,2	13,9	0,0	340,6	79,2	87,9	485,9	363,2	485,6	446,4	360,5	803,7	0,19	79,77	79,41	82,37	0,18	83,98	83,51	83,84	0,08	0,07
37,0	289,0	4,0	1,5	14,0	0,0	341,8	79,0	87,3	488,8	362,6	487,8	447,5	358,5	809,0	0,19	79,68	79,40	82,31	0,18	83,95	83,49	83,72	0,08	0,07
38,0	290,0	3,9	1,7	14,1	0,0	343,7	79,0	88,1	492,2	365,1	489,1	448,6	356,7	827,2	0,19	79,61	79,40	82,27	0,18	83,93	83,52	83,66	0,07	0,07
39,0	291,0	3,8	2,5	14,4	0,0	343,6	79,3	89,0	496,0	367,7	491,0	451,1	355,0	837,8	0,19	79,69	79,40	82,33	0,18	83,99	83,60	83,64	0,08	0,06
40,0	292,0	3,7	2,4	14,5	0,0	343,5	79,5	88,4	500,0	367,1	495,2	453,4	353,2	841,7	0,19	79,80	79,41	83,89	0,18	84,11	83,69	83,70	0,08	0,07
41,0	293,0	3,6	2,5	14,3	0,0	343,4	79,4	88,4	504,2	371,0	497,3	455,2	351,6	845,2	0,19	79,84	79,47	86,32	0,18	84,19	83,82	83,67	0,07	0,07
42,0	294,0	3,5	2,6	14,4	0,0	342,3	79,4	90,2	507,6	372,9	500,5	458,4	350,1	844,1	0,19	79,91	79,50	86,61	0,18	84,33	83,97	83,74	0,07	0,07
43,0	295,0	3,3	2,6	14,4	0,0	341,0	79,5	90,0	510,1	374,9	503,3	461,1	348,6	846,8	0,19	79,99	79,52	86,45	0,18	84,41	84,07	83,70	0,08	0,06
44,0	296,0	3,3	2,4	14,4	0,0	340,9	79,3	88,9	513,2	375,4	507,1	463,7	347,1	848,6	0,19	79,86	79,54	86,22	0,18	84,44	84,17	83,62	0,08	0,06
45,0	297,0	3,2	2,3	14,5	0,0	342,0	79,3	88,7	515,9	376,5	510,4	466,8	345,5	849,1	0,19	79,82	79,55	86,05	0,18	84,48	84,27	83,57	0,08	0,07
46,0	298,0	3,1	2,1	14,6	0,0	341,7	79,3	89,1	518,3	380,0	514,0	469,5	344,1	846,6	0,19	79,74	79,53	85,88	0,18	84,45	84,39	83,52	0,08	0,06
47,0	299,0	3,0	2,0	14,7	0,0	340,9	78,9	87,4	520,5	379,7	517,4	472,8	342,6	845,3	0,19	79,74	79,52	85,64	0,18	84,44	84,44	83,43	0,07	0,06
48,0	300,0	2,9	1,8	14,6	0,0	339,7	79,3	87,3	522,1	382,7	521,0	476,0	341,3	843,5	0,19	79,73	79,53	85,50	0,18	84,44	84,51	83,38	0,08	0,07
49,0	301,0	2,8	1,6	14,6	0,0	338,5	79,1	86,7	524,2	383,0	523,2	479,3	339,7	837,2	0,19	79,66	79,52	85,30	0,18	84,39	84,48	84,89	0,07	0,06
50,0	302,0	2,7	1,7	14,5	0,0	336,3	79,4	88,1	526,5	387,2	526,6	481,9	338,3	834,7	0,19	79,64	79,52	85,18	0,18	84,33	84,49	88,06	0,07	0,06
51,0	303,0	2,6	1,7	14,6	0,0	335,7	79,6	90,1	527,0	389,9	530,9	485,4	337,1	837,9	0,19	79,87	79,55	85,22	0,18	84,50	84,56	88,48	0,08	0,07
52,0	304,0	2,5	1,6	14,5	0,0	334,8	79,5	87,6	528,7	388,4	535,2	489,7	335,8	839,5	0,19	79,86	79,55	85,01	0,18	84,51	84,60	88,16	0,08	0,07
53,0	305,0	2,5	1,5	14,4	0,0	334,4	79,4	87,0	530,5	388,1	541,4	493,7	334,5	835,0	0,19	79,80	79,55	84,76	0,18	84,48	84,59	87,77	0,07	0,06
54,0	306,0	2,4	1,3	14,5	0,0	333,9	79,5	87,2	531,1	389,2	546,4	498,9	333,2	835,9	0,19	79,85	79,54	84,57	0,18	84,50	84,63	87,45	0,08	0,06
55,0	307,0	2,3	1,2	14,6	0,0	333,7	79,6	87,3	532,6	390,7	551,7	505,1	332,1	838,3	0,19	79,90	79,58	84,44	0,18	84,51	84,66	87,18	0,07	0,06
56,0	308,0	2,3	1,0	14,6	0,0	332,8	79,5	86,3	534,4	388,1	555,7	511,1	330,7	831,4	0,19	79,95	79,59	84,21	0,18	84,59	84,70	86,89	0,08	0,06
57,0	309,0	2,2	0,7	14,7	0,0	332,5	79,6	86,7	536,1	386,6	561,4	517,4	329,4	830,6	0,19	79,92	79,60	84,05	0,18	84,54	84,65	86,65	0,07	0,06
58,0	310,0	2,1	0,5	14,7	0,0	331,9	79,6	87,0	537,8	387,2	566,0	523,4	328,3	830,3	0,19	79,97	79,62	83,92	0,18	84,51	84,67	86,39	0,08	0,06
59,0	311,0	2,0	0,4	14,6	0,0	332,0	79,6	86,2	539,6	384,9	569,4	528,1	327,0	834,5	0,19	80,08	79,65	83,58	0,18	84,63	84,71	86,22	0,08	0,07
60,0	312,0	2,0	0,3	14,5	0,0	331,4	79,7	86,3	541,7	384,4	573,3	532,8	325,9	821,8	0,19	80,11	79,68	83,33	0,18	84,64	84,74	85,99	0,07	0,06
61,0	313,0	1,9	0,2	14,2	0,0	328,7	79,8	87,4	544,1	386,1	576,6	537,2	325,0	806,3	0,19	80,10	79,69	83,19	0,18	84,65	84,78	85,81	0,08	0,06
62,0	314,0	1,8	0,1	13,7	0,0	325,4	79,8	86,7	546,2	383,1	579,2	540,3	323,8	792,9	0,19	80,08	79,71	83,07	0,18	84,71	84,79	85,71	0,08	0,06
63,0	315,0	1,8	0,1	13,3	0,0	322,1	79,5	85,9	547,0	384,0	580,7	543,0	322,8	789,1	0,19	80,06	79,70	82,18	0,18	84,61	84,77	85,47	0,08	0,06
64,0	316,0	1,8	0,1	13,0	0,0	318,3	79,6	85,9	548,3	383,9	581,8	544,7	321,8	790,6	0,19	80,18	79,74	83,00	0,18	84,71	84,83	85,33	0,07	0,06
65,0	317,0	1,7	0,1	12,8	0,0	315,1	79,4	85,6	549,2	381,2	583,1	546,1	320,8	780,1	0,19	80,15	79,76	85,72	0,18	84,71	84,90	85,11	0,07	0,06
66,0	318,0	1,7	0,0	12,5	0,0	310,7	79,7	87,0	548,6	383,2	584,5	547,7	320,0	766,8	0,19	80,11	79,75	87,30	0,18	84,69	84,91	84,97	0,08	0,06
67,0	319,0	1,6	0,0	12,2	0,0	307,3	79,8	86,0	547,3	382,1	584,9	548,7	319,1	761,0	0,19	80,10	79,74	87,51	0,18	84,73	84,93	84,81	0,08	0,06
68,0	320,0	1,6	0,0	11,8	0,0	303,1	79,4	85,2	545,8	380,0	585,1	549,4	318,2	754,5	0,19	80,07	79,74	87,29	0,18	84,71	84,93	84,64	0,07	0,06
69,0	321,0	1,5	0,0	11,4	0,0	300,3	79,7	85,1	543,8	380,9	584,6	549,4	317,4	746,3	0,19	80,08	79,74	87,01	0,18	84,72	84,95	84,50	0,07	0,06
70,0	322,0	1,5	0,0	11,2	0,0	297,2	79,6	84,8	540,9	378,3	584,1	549,4	316,6	739,1	0,19	80,04	79,74	86,72	0,18	84,71	84,96	84,33	0,07	0,06
71,0	323,0	1,5	0,0	11,1	0,0	293,5	79,4	85,4	537,4	376,8	583,4	549,1	315,7	735,1	0,19	79,94	79,72	86,49	0,18	84,65	84,93	84,19	0,07	0,06
72,0	324,0	1,5	0,0	11,0	0,0	291,9	79,4	85,0	533,7	374,2	584,3	548,1	314,8	733,5	0,19	79,88	79,73	86,24	0,18	84,57	84,87	84,01	0,08	0,06
73,0	325,0	1,4	0,0	10,9	0,0	289,5	79,3	84,4	529,3	372,8	584,2	547,9	313,9	728,7	0,19	79,83	79,72	85,95	0,18	84,47	84,85	83,84	0,08	0,05
74,0	326,0	1,4	0,0	11,0	0,0	287,3	79,4	84,5	524,9	372,1	584,1	547,0	313,2	724,8	0,19	79,77	79,68	85,65	0,18	84,43	84,81	83,66	0,07	0,05
75,0	327,0	1,3	0,0	10,8	0,0	285,4	79,4	85,9	521,2	373,0	584,9	547,6	312,7	717,8	0,19	79,76	79,67	85,49	0,18	84,42	84,81	83,58	0,07	0,05
76,0	328,0	1,3	0,0	10,9	0,0	284,2	79,3	86,0	516,8	371,8	585,6	547,3	312,2	711,8	0,19	79,79	79,66	85,40	0,18	84,46	84,83	83,51	0,07	0,05
77,0	329,0	1,3	0,0	10,9	0,0	282,7	79,3	84,9	513,0	368,6	586,1	546,7	311,2	709,6	0,19	79,82	79,67	85,21	0,18	84,50	84,85	83,40	0,07	0,05
78,0	330,0	1,3	0,0	10,9	0,0	281,0	79,5	84,6	509,2	368,3	587,0	547,1	310,8	703,4	0,19	79,85	79,68	84,96	0,18	84,46	84,85	83,27	0,08	0,05
79,0	331,0	1,2	0,0	11,1	0,0	280,6	79,7	85,9	505,4	368,1	586,2	546,9	310,2	704,0	0,19	79,91	79,70	84,83	0,18	84,52	84,88	84,26	0,08	0,05
80,0	332,0	1,2	0,0	10,9	0,0	279,1	79,7	87,6	501,7	368,2	585,3	546,9	309,9	701,7	0,19	80,05	79,73	84,86	0,18	84,67	84,98	87,97	0,07	0,05
81,0	333,0	1,2	0,0	11,0	0,0	277,0	79,6	87,1	498,4	366,4	587,8	547,0	309,4	691,7	0,19	80,11	79,76	84,83	0,18	84,80	85,08	88,58	0,08	0,05
82,0	334,0	1,2	0,0	10,5	0,0	275,3	79,3	87,4	494,8	366,5	588,8	547,6	309,1	686,0	0,19	80,11	79,77	84,79	0,18	84,86	85,14	88,33	0,07	0,05
83,0	335,0	1,1	0,0	10,4	0,0	274,0	79,6	86,1	491,8	365,1	590,7	547,0	308,7	685,4	0,19	80,11	79,78	84,64	0,18	84,87	85,22	87,99	0,07	0,05
84,0	336,0	1,1	0,0	10,3	0,0	272,2	79,2	85,7	488,1	363,6	590,4	546,4	308,3	683,8	0,19	80,04	79,78	84,44	0,18	84,85	85,26	87,60	0,08	0,05
85,0	337,0	1,1	0,0	10,2	0,0	270,7	79,3	84,1	484,3	360,7	591,2	546,0	307,9	686,2	0,19	80,03	79,79	84,23	0,18	84,88	85,31	87,26	0,08	0,05
86,0	338,0	1,0	0,0	10,1	0,0	270,8	79,3	84,1	480,2	358,9	592,3	546,0	307,5	691,0	0,19	80,02	79,79	84,01	0,18	84,87	85,33	86,96	0,07	0,05
87,0	339,0	1,0	0,0	9,6	0,0	269,9	79,3	84,4	475,7	357,5	592,4	545,8	307,2	691,7	0,19	79,98	79,78	83,85	0,18	84,82	85,32	86,66	0,07	0,05
88,0	340,0	1,0	0,0	9,4	0,0	269,6	79,5	84,3	470,4	354,4	591,8	544,8	306,8	689,1	0,19	80,00	79,79	83,74	0,18	84,81	85,38	86,41	0,07	0,05
89,0	341,0	1,0	0,0	9,3	0,0	269,2	79,4	84,4	465,7	354,2	591,7	544,8	306,5	689,3	0,19	79,98	79,79	83,67	0,18	84,78	85,37	86,18	0,07	0,05
90,0	342,0	1,0	0,1	9,5	0,0	268,3	79,5	84,3	461,0	351,6	592,1	544,2	306,1	687,1	0,19	80,02	79,79	83,57	0,18	84,81	85,38	85,90	0,07	0,05
91,0	343,0	0,9	0,1	9,7	0,0	267,4	79,4	84,1	456,7	349,9	591,4	543,4	305,7	682,2	0,19	79,96	79,77	83,47	0,18	84,72	85,37	85,62	0,08	0,05
92,0	344,0	0,9	0,0	9,6	0,0	266,6	79,3	84,3	452,4	349,1	590,7	544,1	305,3	680,6	0,19	79,90	79,76	83,38	0,18	84,67	85,32	85,37	0,07	0,05
93,0	345,0	0,9	0,1	9,6	0,0	265,4	79,3	84,3	448,7	350,8	590,4	544,6	305,2	675,4	0,19	79,91	79,78	83,28	0,18	84,66	85,30	85,11	0,08	0,05
94,0	346,0	0,9	0,0	9,7	0,0	265,0	79,2	84,7	444,3	350,5	590,8	544,9	304,9	673,8	0,19	79,83	79,74	83,27	0,18	84,66	85,27	85,01	0,08	0,05

95,0	347,0	0,9	0,1	9,6	0,0	264,4	79,2	84,9	440,3	348,4	590,1	545,4	304,6	673,9	0,19	79,87	79,76	83,25	0,18	84,65	85,28	84,87	0,07	0,05
96,0	348,0	0,9	0,1	9,5	0,0	263,6	79,2	84,8	436,7	345,6	590,6	545,3	304,2	672,2	0,19	79,78	79,73	83,15	0,18	84,59	85,22	84,64	0,07	0,05
97,0	349,0	0,8	0,1	9,6	0,0	263,9	79,1	84,4	433,2	345,6	591,3	546,3	303,9	673,8	0,19	79,70	79,70	83,07	0,18	84,47	85,15	84,41	0,07	0,05
98,0	350,0	0,8	0,1	9,6	0,0	264,0	79,0	84,3	429,6	345,3	591,2	546,8	303,8	672,1	0,19	79,65	79,67	82,95	0,18	84,37	85,12	84,21	0,07	0,05
99,0	351,0	0,8	0,1	9,3	0,0	262,8	78,9	84,1	426,5	344,1	590,5	547,1	303,5	667,8	0,19	79,63	79,67	82,89	0,18	84,34	85,09	84,02	0,08	0,05
100,0	352,0	0,8	0,1	9,3	0,0	262,3	79,0	84,3	423,2	342,8	589,8	547,7	303,4	666,7	0,19	79,59	79,66	82,79	0,18	84,32	85,08	83,87	0,08	0,05
101,0	353,0	0,8	0,1	9,2	0,0	261,5	78,8	84,1	419,9	341,5	589,8	547,9	303,2	666,4	0,19	79,60	79,63	82,69	0,18	84,30	85,05	83,66	0,07	0,05
102,0	354,0	0,8	0,1	9,2	0,0	261,2	79,0	84,3	417,0	340,5	590,1	547,9	303,0	664,6	0,19	79,53	79,61	82,63	0,18	84,25	85,01	83,55	0,08	0,05
103,0	355,0	0,8	0,1	9,2	0,0	260,2	78,9	84,2	414,0	339,3	589,9	548,4	302,9	662,8	0,19	79,51	79,59	82,56	0,18	84,21	84,97	83,41	0,07	0,05
104,0	356,0	0,7	0,1	9,2	0,0	259,9	78,8	84,3	411,7	337,4	589,8	547,7	302,7	663,2	0,19	79,50	79,60	82,52	0,18	84,15	84,94	83,26	0,08	0,05
105,0	357,0	0,7	0,1	9,1	0,0	259,8	79,0	84,0	408,9	338,4	589,6	549,2	302,8	662,5	0,19	79,54	79,58	82,46	0,18	84,13	84,95	85,66	0,08	0,05
106,0	358,0	0,7	0,1	9,2	0,0	260,6	79,2	84,5	406,0	339,3	589,4	549,7	303,1	659,5	0,19	79,66	79,63	82,46	0,18	84,29	85,04	88,20	0,08	0,05
107,0	359,0	0,7	0,1	9,1	0,0	260,2	79,2	84,8	403,4	337,5	588,8	549,3	303,2	663,2	0,19	79,69	79,63	82,52	0,18	84,38	85,11	88,21	0,08	0,05
108,0	360,0	0,7	0,1	9,1	0,0	259,9	79,0	84,0	401,2	334,7	587,9	545,9	302,9	658,2	0,19	79,66	79,63	82,44	0,18	84,32	85,05	87,75	0,07	0,05
109,0	361,0	0,6	0,1	9,1	0,0	258,8	79,0	83,8	398,9	332,8	588,2	547,7	302,9	657,2	0,19	79,67	79,64	82,35	0,18	84,27	85,03	87,25	0,07	0,05
110,0	362,0	0,6	0,1	9,1	0,0	259,4	79,2	84,1	396,7	331,9	587,9	548,0	303,1	657,5	0,19	79,72	79,64	82,30	0,18	84,30	85,03	86,91	0,07	0,05
111,0	363,0	0,6	0,1	9,3	0,0	258,5	79,2	84,1	394,6	329,8	586,9	547,4	303,1	644,6	0,19	79,74	79,65	82,27	0,18	84,28	85,02	86,60	0,07	0,05
112,0	364,0	0,6	0,1	9,2	0,0	256,8	79,3	84,2	392,6	331,1	586,6	547,6	303,4	639,1	0,19	79,74	79,65	82,98	0,18	84,26	85,05	86,31	0,07	0,05
113,0	365,0	0,6	0,1	9,2	0,0	255,7	78,9	84,3	390,8	330,5	585,3	546,6	303,6	635,3	0,19	79,76	79,65	85,49	0,18	84,30	85,03	85,99	0,07	0,05
114,0	366,0	0,6	0,1	9,3	0,0	254,3	79,2	84,0	388,5	328,8	585,1	546,2	303,7	634,7	0,19	79,80	79,65	86,79	0,18	84,34	85,05	85,63	0,08	0,05
115,0	367,0	0,5	0,1	9,2	0,0	253,7	79,2	84,2	386,6	329,8	583,9	546,2	303,9	635,5	0,19	79,87	79,70	86,88	0,18	84,40	85,06	85,36	0,07	0,05
116,0	368,0	0,5	0,1	9,1	0,0	253,2	79,3	83,8	384,4	329,9	583,2	545,8	304,1	633,1	0,19	79,90	79,70	86,72	0,18	84,46	85,07	85,16	0,08	0,05
117,0	369,0	0,5	0,1	9,2	0,0	252,3	79,0	84,5	382,5	331,1	582,9	546,3	304,5	633,5	0,19	79,94	79,72	86,46	0,18	84,50	85,09	84,96	0,08	0,05
118,0	370,0	0,5	0,1	9,1	0,0	252,0	79,3	84,8	380,6	329,2	581,8	544,9	304,7	632,7	0,19	79,97	79,75	86,28	0,18	84,59	85,15	84,80	0,07	0,05
119,0	371,0	0,5	0,1	9,1	0,0	252,1	79,3	84,6	378,8	328,8	580,9	544,4	304,9	632,4	0,19	79,95	79,76	86,03	0,18	84,52	85,12	84,59	0,08	0,05
120,0	372,0	0,5	0,1	9,2	0,0	252,2	79,2	84,5	377,1	329,5	579,5	543,8	305,2	634,0	0,19	79,92	79,75	85,77	0,18	84,49	85,10	84,35	0,08	0,05
121,0	373,0	0,5	0,1	9,2	0,0	252,2	79,1	84,2	375,5	329,5	578,8	543,4	305,6	635,0	0,19	79,82	79,74	85,54	0,18	84,45	85,09	84,19	0,07	0,05
122,0	374,0	0,5	0,1	9,2	0,0	251,9	79,1	84,1	374,2	328,7	577,6	543,1	305,9	631,6	0,19	79,86	79,72	85,31	0,18	84,49	85,08	84,05	0,07	0,05
123,0	375,0	0,4	0,1	9,1	0,0	251,2	79,1	84,2	372,2	326,4	576,8	540,8	306,1	625,9	0,19	79,86	79,74	85,07	0,18	84,44	85,03	83,86	0,07	0,05
124,0	376,0	0,4	0,1	9,1	0,0	250,4	79,0	84,1	370,9	328,2	575,2	540,9	306,4	623,7	0,19	79,82	79,73	84,89	0,18	84,38	85,00	83,73	0,08	0,05
125,0	377,0	0,4	0,1	9,0	0,0	249,6	79,1	84,0	369,5	326,4	573,9	540,1	306,8	624,3	0,19	79,94	79,75	84,70	0,18	84,50	85,00	83,55	0,08	0,05
126,0	378,0	0,4	0,1	9,1	0,0	249,6	79,2	84,1	368,1	327,1	572,5	540,0	307,2	629,1	0,18	79,99	79,78	84,53	0,18	84,53	85,04	83,46	0,08	0,04
127,0	379,0	0,3	0,1	9,2	0,0	250,2	79,2	84,3	366,7	328,2	571,4	539,8	307,8	631,3	0,19	80,05	79,79	84,40	0,18	84,62	85,11	83,40	0,07	0,05
128,0	380,0	0,3	0,1	9,2	0,0	250,6	79,0	84,3	365,1	326,4	570,0	537,4	308,0	634,3	0,18	80,07	79,81	84,30	0,18	84,64	85,15	83,31	0,08	0,05
129,0	381,0	0,3	0,1	9,1	0,0	250,3	79,1	84,3	363,8	326,1	569,1	536,8	308,4	632,8	0,19	80,02	79,80	84,17	0,18	84,63	85,20	84,43	0,08	0,05
130,0	382,0	0,3	0,1	9,2	0,0	249,7	79,2	84,6	362,8	324,2	569,2	536,5	308,7	630,1	0,19	80,04	79,81	84,10	0,18	84,65	85,23	87,84	0,07	0,05
131,0	383,0	0,3	0,1	9,0	0,0	249,5	79,3	84,8	361,6	322,7	569,2	534,3	308,8	632,1	0,19	80,03	79,82	84,02	0,18	84,59	85,19	88,13	0,08	0,05
132,0	384,0	0,3	0,1	9,0	0,0	249,6	79,2	84,6	360,3	322,8	568,4	535,0	309,2	633,3	0,19	80,00	79,80	83,89	0,18	84,56	85,17	87,82	0,08	0,05
133,0	385,0	0,3	0,1	8,9	0,0	250,3	79,3	84,5	359,2	320,4	567,9	532,5	309,4	636,4	0,18	80,02	79,83	83,77	0,18	84,57	85,18	87,47	0,07	0,05
134,0	386,0	0,3	0,1	9,0	0,0	249,3	79,2	84,3	358,3	319,7	566,8	531,4	309,8	625,2	0,19	80,04	79,83	83,65	0,18	84,55	85,16	87,14	0,07	0,05
135,0	387,0	0,3	0,1	8,9	0,0	249,3	79,5	84,5	357,3	319,7	566,7	532,4	310,3	627,0	0,19	80,10	79,85	83,56	0,18	84,65	85,18	86,82	0,07	0,05
136,0	388,0	0,2	0,1	8,7	0,0	249,6	79,4	84,5	356,1	319,8	566,1	532,0	310,8	629,7	0,19	80,10	79,88	83,46	0,18	84,68	85,18	86,59	0,07	0,05
137,0	389,0	0,2	0,1	8,8	0,0	250,9	79,5	84,3	355,1	319,8	565,2	532,4	311,3	634,0	0,19	80,15	79,85	83,39	0,18	84,70	85,18	86,28	0,07	0,05
138,0	390,0	0,2	0,1	8,8	0,0	251,1	79,4	84,5	354,2	318,1	563,7	531,4	311,7	637,2	0,19	80,14	79,89	83,32	0,18	84,74	85,22	86,07	0,07	0,05
139,0	391,0	0,2	0,1	8,8	0,0	252,0	79,4	84,8	353,1	316,0	562,8	528,5	311,8	641,4	0,19	80,09	79,89	83,28	0,18	84,69	85,19	85,82	0,08	0,05
140,0	392,0	0,2	0,1	8,6	0,0	253,0	79,3	84,7	352,5	317,4	561,7	528,3	312,2	644,8	0,19	80,03	79,85	83,20	0,18	84,59	85,18	85,51	0,08	0,05
141,0	393,0	0,2	0,1	8,5	0,0	252,9	79,2	84,4	351,3	315,3	560,7	527,7	312,3	642,8	0,19	80,06	79,87	83,10	0,18	84,60	85,19	85,25	0,07	0,05
142,0	394,0	0,2	0,1	8,3	0,0	252,7	79,3	84,4	350,7	313,7	560,0	527,1	312,7	643,0	0,19	80,00	79,87	83,01	0,18	84,58	85,20	85,01	0,07	0,05
143,0	395,0	0,2	0,1	8,2	0,0	253,2	79,2	84,7	350,0	312,8	558,3	523,8	312,8	641,2	0,19	80,02	79,88	82,95	0,18	84,56	85,22	84,86	0,07	0,05
144,0	396,0	0,1	0,1	8,2	0,0	253,8	79,4	84,7	348,8	311,5	557,9	523,5	313,1	642,2	0,19	80,00	79,87	82,92	0,18	84,52	85,20	84,70	0,07	0,05
145,0	397,0	0,1	0,1	8,2	0,0	254,4	79,3	84,7	347,9	311,0	555,0	520,6	313,3	643,3	0,19	80,04	79,88	82,88	0,18	84,54	85,21	84,53	0,07	0,05
146,0	398,0	0,1	0,1	8,2	0,0	254,8	79,4	84,7	347,2	309,1	554,0	519,1	313,4	636,5	0,19	80,16	79,91	82,83	0,18	84,65	85,22	84,29	0,07	0,05
147,0	399,0	0,1	0,1	8,2	0,0	253,2	79,4	84,4	346,2	308,8	552,9	518,6	313,7	628,1	0,19	80,25	79,94	82,75	0,18	84,70	85,25	84,12	0,08	0,05
148,0	400,0	0,1	0,1	8,0	0,0	252,5	79,6	84,6	345,3	308,0	552,0	517,4	314,0	629,3	0,19	80,39	79,97	82,73	0,18	84,80	85,26	83,96	0,08	0,05
149,0	401,0	0,1	0,1	7,8	0,0	252,3	79,5	84,9	344,2	305,1	550,3	514,5	314,0	629,0	0,19	80,44	80,03	82,72	0,18	84,82	85,30	83,86	0,07	0,05
150,0	402,0	0,1	0,1	7,8	0,0	252,7	79,5	84,9	343,0	303,9	549,0	513,3	314,1	626,9	0,19	80,37	80,01	82,67	0,18	84,73	85,26	83,73	0,07	0,05
151,0	403,0	0,1	0,1	7,5	0,0	252,7	79,4	84,9	342,4	302,5	546,7	511,3	314,1	623,7	0,19	80,33	80,02	82,67	0,18	84,71	85,26	83,61	0,08	0,05
152,0	404,0	0,1	0,1	7,6	0,0	252,3	79,5	84,6	341,1	301,4	545,0	510,5	314,3	622,5	0,19	80,24	80,02	82,63	0,18	84,70	85,24	83,51	0,08	0,05
153,0	405,0	0,1	0,1	7,7	0,0	252,3	79,3	84,1	340,3	299,6	542,8	506,0	314,0	624,1	0,19	80,17	80,00	82,55	0,18	84,67	85,24	83,42	0,07	0,05
154,0	406,0	0,1	0,1	7,8	0,0	252,9	79,3	84,2	339,0	297,5	542,5	506,0	314,1	626,1	0,19	80,13	80,00	82,48	0,18	84,56	85,22	84,64	0,08	0,05
155,0	407,0	0,1	0,1	7,7	0,0	253,2	79,4	84,7	338,2	296,6	540,9	504,4	314,2	628,4	0,19	80,10	79,98	82,55	0,18	84,55	85,22	87,86	0,07	0,05
156,0	408,0	0,1	0,1	7,8	0,0	253,1	79,1	84,7	337,4	295,1	539,0	501,4	314,1	627,1	0,19	80,13	79,99	82,54	0,18	84,52	85,20	88,08	0,08	0,05
157,0	409,0	0,1	0,1	7,6	0,0	253,3	79,3	84,4	336,5	292,7	537,5	500,0	314,1	623,9	0,19	80,12	79,98	82,49	0,18	84,50	85,20	87,66	0,07	0,05
158,0	410,0	0,1	0,1	7,6	0,0	253,7	79,4	84,5	335,9	291,6	536,8	498,5	314,2	626,3	0,19	80,15	79,99	82,44	0,18	84,53	85,19	87,31	0,07	0,05
159,0	411,0	0,0	0,1	7,4	0,0	254,3	79,3	84,2	335,6	290,1	534,7	497,1	314,1	629,7	0,19	80,22	80,00	82,43	0,18	84,62	85,20	86,94	0,08	0,05

Manufacturer: HEARTHSTONE
Model: 8060

Run: 1
Project #: PI 20272
Test Duration: 159 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	79,36%	85,78%
Comb Eff	97,26%	97,26%
HT Eff	81,60%	88,20%
Output	15 333	kJ/h
Burn Rate	0,98	kg/h
Grams CO	102	g
Input	19 319	kJ/h
MC wet	17,17	

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

Overall Heating Efficiency: 79,36%
Combustion Efficiency: 97,26%
Heat Transfer Efficiency: 81,60%

Heat Output: 14 545 Btu/h
Heat Input: 18 327 Btu/h
Burn Duration: 2,65 h
Burn Rate: 2,15 lb/h
Stack Temp: 286,3 Deg. F

Averages	0,33	10,59	0,94	20,22	9,46	141,28	26,25	0,98	0,82	#DIV/0!
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,12	0,13	2,93	540,3%	20,74	17,74	139,5	26,3	98,0%	65,7%	64,4%
1,00	3,12	0,40	4,03	343,8%	20,65	16,42	141,6	26,2	93,4%	71,4%	66,7%
2,00	3,07	0,09	5,68	240,7%	20,56	14,84	151,9	26,1	99,5%	75,2%	74,8%
3,00	3,07	0,06	6,44	202,1%	20,51	14,04	157,0	26,3	99,8%	76,3%	76,1%
4,00	3,03	0,06	6,57	196,0%	20,50	13,90	159,3	26,0	99,8%	76,3%	76,1%
5,00	2,98	0,07	10,25	90,2%	20,26	9,97	153,0	26,1	99,7%	81,0%	80,8%
6,00	2,94	0,11	12,04	61,6%	20,14	8,04	149,6	26,2	99,4%	82,3%	81,9%
7,00	2,94	0,05	10,02	95,0%	20,27	10,23	144,7	26,1	99,9%	81,5%	81,4%
8,00	2,89	0,05	7,43	162,7%	20,45	12,99	141,3	26,1	100,0%	79,3%	79,3%
9,00	2,85	0,05	6,51	199,8%	20,51	13,98	138,8	26,1	100,0%	78,3%	78,3%
10,00	2,85	0,04	7,71	153,6%	20,43	12,70	136,5	26,1	100,1%	80,1%	80,2%
11,00	2,81	0,04	9,64	103,0%	20,30	10,64	136,7	26,1	100,0%	81,8%	81,8%
12,00	2,80	0,04	10,92	79,3%	20,22	9,28	138,2	26,1	100,0%	82,5%	82,4%
13,00	2,76	0,04	11,39	71,8%	20,18	8,77	141,0	26,0	99,9%	82,6%	82,5%
14,00	2,71	0,05	12,28	59,4%	20,13	7,82	144,2	26,0	99,8%	82,8%	82,7%
15,00	2,67	0,05	12,42	57,5%	20,12	7,67	146,5	26,0	99,9%	82,7%	82,6%
16,00	2,67	0,05	11,91	64,2%	20,15	8,21	147,0	26,1	99,9%	82,5%	82,4%
17,00	2,62	0,05	11,31	73,0%	20,19	8,86	147,1	26,0	99,9%	82,1%	82,0%
18,00	2,57	0,05	11,09	76,3%	20,20	9,09	147,0	26,1	99,9%	82,0%	81,9%
19,00	2,53	0,05	10,93	78,9%	20,22	9,26	148,4	26,1	99,9%	81,8%	81,7%
20,00	2,48	0,06	11,06	76,7%	20,21	9,12	149,4	26,2	99,8%	81,8%	81,7%
21,00	2,48	0,06	11,11	76,0%	20,20	9,07	149,8	26,1	99,8%	81,8%	81,7%
22,00	2,44	0,06	11,22	74,1%	20,20	8,94	151,5	26,2	99,8%	81,8%	81,6%
23,00	2,39	0,07	11,63	67,9%	20,17	8,50	153,8	26,2	99,7%	81,9%	81,7%
24,00	2,35	0,06	12,16	60,7%	20,13	7,94	157,1	26,1	99,8%	82,0%	81,8%
25,00	2,30	0,22	13,83	39,8%	20,01	6,07	160,2	26,0	98,8%	82,5%	81,5%
26,00	2,26	0,10	13,50	44,5%	20,04	6,50	161,8	26,1	99,5%	82,3%	81,9%
27,00	2,21	0,47	13,76	38,1%	20,00	6,01	164,9	26,2	97,4%	82,1%	80,0%
28,00	2,17	0,62	13,68	37,4%	20,00	6,01	167,3	26,2	96,5%	81,9%	79,0%
29,00	2,12	0,38	13,40	42,6%	20,03	6,44	168,5	26,2	97,8%	81,8%	80,0%
30,00	2,12	0,10	13,00	50,0%	20,08	7,02	167,1	26,1	99,5%	81,8%	81,4%
31,00	2,08	0,05	13,00	50,5%	20,08	7,05	165,7	26,2	99,8%	81,9%	81,8%
32,00	2,03	0,07	13,41	45,7%	20,05	6,60	166,1	26,2	99,7%	82,1%	81,8%
33,00	1,98	0,21	13,63	41,9%	20,03	6,29	166,9	26,2	98,8%	82,1%	81,1%
34,00	1,94	0,47	13,86	37,1%	19,99	5,90	167,9	26,2	97,4%	82,0%	79,9%
35,00	1,89	0,85	14,01	32,2%	19,96	5,52	169,9	26,3	95,3%	81,9%	78,0%
36,00	1,85	1,22	13,91	29,8%	19,94	5,42	171,4	26,2	93,3%	81,6%	76,2%
37,00	1,80	1,52	14,04	26,2%	19,91	5,11	172,1	26,1	91,9%	81,5%	74,9%
38,00	1,76	1,71	14,09	24,3%	19,90	4,95	173,2	26,1	91,0%	81,4%	74,1%
39,00	1,71	2,46	14,40	16,5%	19,83	4,19	173,1	26,3	87,9%	81,3%	71,5%
40,00	1,67	2,44	14,47	16,2%	19,82	4,13	173,0	26,4	88,1%	81,4%	71,7%
41,00	1,62	2,55	14,34	16,3%	19,82	4,21	173,0	26,3	87,5%	81,3%	71,1%
42,00	1,58	2,64	14,41	15,2%	19,81	4,09	172,4	26,4	87,2%	81,3%	70,9%
43,00	1,49	2,60	14,40	15,5%	19,82	4,11	171,7	26,4	87,3%	81,4%	71,1%
44,00	1,49	2,44	14,40	16,6%	19,83	4,21	171,6	26,3	88,0%	81,4%	71,7%
45,00	1,44	2,29	14,45	17,3%	19,83	4,24	172,2	26,3	88,7%	81,5%	72,2%
46,00	1,39	2,14	14,62	17,2%	19,83	4,14	172,1	26,3	89,4%	81,6%	72,9%
47,00	1,35	1,96	14,65	18,2%	19,84	4,21	171,6	26,0	90,2%	81,7%	73,7%
48,00	1,30	1,81	14,57	20,0%	19,86	4,39	170,9	26,3	90,8%	81,7%	74,2%
49,00	1,26	1,60	14,55	21,7%	19,87	4,52	170,3	26,2	91,8%	81,8%	75,1%
50,00	1,23	1,70	14,54	21,0%	19,87	4,48	169,1	26,3	91,3%	81,9%	74,7%
51,00	1,17	1,71	14,59	20,5%	19,86	4,42	168,7	26,4	91,3%	81,9%	74,8%
52,00	1,15	1,62	14,50	21,9%	19,88	4,57	168,2	26,4	91,7%	81,9%	75,1%
53,00	1,12	1,50	14,44	23,2%	19,89	4,70	168,0	26,3	92,2%	81,9%	75,5%
54,00	1,08	1,34	14,50	23,9%	19,89	4,72	167,7	26,4	93,0%	82,0%	76,3%
55,00	1,03	1,16	14,62	24,5%	19,90	4,70	167,6	26,4	93,9%	82,1%	77,1%
56,00	1,03	0,95	14,62	26,1%	19,91	4,82	167,1	26,4	94,9%	82,2%	78,1%
57,00	0,99	0,70	14,67	27,9%	19,93	4,91	167,0	26,4	96,3%	82,4%	79,3%
58,00	0,94	0,52	14,65	29,5%	19,94	5,02	166,6	26,5	97,2%	82,4%	80,1%
59,00	0,90	0,43	14,60	30,7%	19,95	5,13	166,7	26,4	97,7%	82,4%	80,5%
60,00	0,90	0,30	14,49	32,8%	19,96	5,32	166,4	26,5	98,4%	82,5%	81,1%
61,00	0,85	0,18	14,16	37,1%	19,99	5,75	164,8	26,6	99,1%	82,4%	81,7%
62,00	0,80	0,11	13,71	42,1%	20,03	6,26	163,0	26,6	99,5%	82,4%	81,9%
63,00	0,80	0,07	13,35	46,4%	20,05	6,67	161,2	26,4	99,7%	82,3%	82,1%
64,00	0,80	0,07	13,03	49,9%	20,07	7,01	159,1	26,4	99,7%	82,3%	82,1%
65,00	0,76	0,06	12,82	52,5%	20,09	7,24	157,3	26,3	99,8%	82,3%	82,1%
66,00	0,76	0,04	12,51	56,6%	20,11	7,59	154,8	26,5	99,9%	82,3%	82,2%
67,00	0,71	0,03	12,23	60,3%	20,13	7,89	152,9	26,6	100,0%	82,3%	82,3%
68,00	0,71	0,02	11,77	66,6%	20,16	8,38	150,6	26,3	100,0%	82,2%	82,2%
69,00	0,70	0,02	11,36	72,6%	20,19	8,82	149,0	26,5	100,1%	82,1%	82,1%
70,00	0,67	0,02	11,20	75,1%	20,20	8,99	147,3	26,5	100,1%	82,1%	82,1%
71,00	0,67	0,02	11,08	76,9%	20,21	9,11	145,3	26,4	100,1%	82,1%	82,2%
72,00	0,67	0,03	10,98	78,4%	20,21	9,21	144,4	26,3	100,0%	82,1%	82,2%
73,00	0,62	0,03	10,87	80,3%	20,22	9,34	143,0	26,3	100,0%	82,2%	82,2%
74,00	0,62	0,03	11,05	77,3%	20,21	9,15	141,9	26,3	100,0%	82,3%	82,4%
75,00	0,58	0,03	10,79	81,6%	20,23	9,43	140,8	26,3	100,0%	82,3%	82,3%
76,00	0,58	0,03	10,85	80,6%	20,22	9,36	140,1	26,3	100,0%	82,3%	82,4%
77,00	0,58	0,03	10,91	79,5%	20,22	9,29	139,3	26,3	100,0%	82,4%	82,4%
78,00	0,58	0,03	10,95	78,9%	20,22	9,25	138,3	26,4	100,0%	82,5%	82,5%
79,00	0,53	0,03	11,10	76,5%	20,21	9,09	138,1	26,5	100,0%	82,6%	82,6%
80,00	0,53	0,03	10,89	79,9%	20,22	9,32	137,3	26,5	100,0%	82,6%	82,6%
81,00	0,53	0,03	11,01	77,8%	20,21	9,18	136,1	26,4	100,0%	82,7%	82,7%
82,00	0,53	0,03	10,47	87,0%	20,25	9,76	135,2	26,3	100,0%	82,4%	82,5%
83,00	0,49	0,03	10,40	88,3%	20,25	9,83	134,4	26,4	100,0%	82,5%	82,5%
84,00	0,49	0,03	10,34	89,4%	20,26	9,90	133,5	26,2	100,0%	82,5%	82,5%
85,00	0,49	0,04	10,15	92,8%	20,27	10,09	132,6	26,3	100,0%	82,4%	82,4%
86,00	0,44	0,04	10,10	93,6%	20,27	10,15	132,6	26,3	99,9%	82,4%	82,3%
87,00	0,44	0,05	9,60	103,6%	20,30	10,68	132,2	26,3	99,9%	82,1%	82,0%
88,00	0,44	0,05	9,36	108,8%	20,32	10,93	132,0	26,4	99,9%	82,0%	81,9%
89,00	0,44	0,05	9,33	109,5%	20,32	10,97	131,8	26,3	99,9%	81,9%	81,9%
90,00	0,44	0,05	9,46	106,4%	20,31	10,82	131,3	26,4	99,9%	82,1%	82,0%
91,00	0,42	0,05	9,67	102,0%	20,30	10,60	130,8	26,3	99,9%	82,3%	82,1%
92,00	0,40	0,05	9,59	103,7%	20,30	10,69	130,3	26,3	99,9%	82,2%	82,1%

93,00	0,40	0,05	9,64	102,7%	20,30	10,63	129,6	26,3	99,9%	82,3%	82,2%
94,00	0,40	0,05	9,67	102,0%	20,30	10,60	129,5	26,2	99,9%	82,3%	82,2%
95,00	0,40	0,05	9,64	102,7%	20,30	10,63	129,1	26,2	99,9%	82,3%	82,2%
96,00	0,40	0,05	9,52	105,1%	20,31	10,76	128,7	26,2	99,9%	82,3%	82,2%
97,00	0,35	0,05	9,57	104,0%	20,30	10,70	128,8	26,2	99,8%	82,3%	82,2%
98,00	0,35	0,06	9,57	104,0%	20,30	10,70	128,9	26,1	99,8%	82,3%	82,2%
99,00	0,35	0,05	9,34	109,1%	20,32	10,95	128,2	26,1	99,9%	82,2%	82,1%
100,00	0,35	0,05	9,26	110,9%	20,32	11,04	127,9	26,1	99,9%	82,2%	82,0%
101,00	0,35	0,06	9,21	112,0%	20,33	11,09	127,5	26,0	99,8%	82,2%	82,0%
102,00	0,35	0,06	9,20	112,3%	20,33	11,10	127,3	26,1	99,8%	82,2%	82,0%
103,00	0,35	0,06	9,18	112,7%	20,33	11,12	126,8	26,1	99,8%	82,2%	82,1%
104,00	0,33	0,06	9,18	112,7%	20,33	11,12	126,6	26,0	99,8%	82,2%	82,1%
105,00	0,30	0,06	9,15	113,5%	20,33	11,16	126,5	26,1	99,8%	82,2%	82,0%
106,00	0,30	0,06	9,18	112,7%	20,33	11,12	127,0	26,2	99,8%	82,2%	82,0%
107,00	0,30	0,06	9,15	113,4%	20,33	11,16	126,8	26,2	99,8%	82,2%	82,0%
108,00	0,30	0,06	9,14	113,4%	20,33	11,16	126,6	26,1	99,8%	82,2%	82,0%
109,00	0,26	0,06	9,09	114,6%	20,34	11,21	126,0	26,1	99,8%	82,2%	82,0%
110,00	0,26	0,06	9,13	113,7%	20,33	11,17	126,3	26,2	99,8%	82,2%	82,0%
111,00	0,26	0,06	9,31	109,7%	20,32	10,98	125,8	26,2	99,8%	82,4%	82,2%
112,00	0,26	0,06	9,20	112,3%	20,33	11,11	124,9	26,3	99,8%	82,4%	82,2%
113,00	0,26	0,06	9,19	112,4%	20,33	11,11	124,3	26,1	99,8%	82,4%	82,3%
114,00	0,26	0,06	9,26	110,9%	20,32	11,04	123,5	26,2	99,8%	82,5%	82,4%
115,00	0,24	0,06	9,21	111,8%	20,33	11,08	123,2	26,2	99,8%	82,5%	82,3%
116,00	0,22	0,06	9,15	113,4%	20,33	11,16	122,9	26,3	99,8%	82,5%	82,3%
117,00	0,22	0,06	9,16	113,1%	20,33	11,14	122,4	26,1	99,8%	82,5%	82,4%
118,00	0,22	0,06	9,14	113,4%	20,33	11,16	122,2	26,3	99,8%	82,5%	82,4%
119,00	0,22	0,06	9,15	113,4%	20,33	11,16	122,3	26,3	99,8%	82,5%	82,4%
120,00	0,22	0,06	9,16	113,0%	20,33	11,14	122,3	26,2	99,8%	82,5%	82,4%
121,00	0,22	0,06	9,16	113,0%	20,33	11,14	122,3	26,1	99,8%	82,5%	82,3%
122,00	0,22	0,06	9,18	112,6%	20,33	11,12	122,2	26,1	99,8%	82,5%	82,4%
123,00	0,17	0,06	9,09	114,6%	20,34	11,21	121,8	26,2	99,8%	82,5%	82,4%
124,00	0,17	0,06	9,06	115,3%	20,34	11,25	121,3	26,1	99,8%	82,5%	82,4%
125,00	0,17	0,06	9,03	116,2%	20,34	11,28	120,9	26,2	99,8%	82,5%	82,4%
126,00	0,17	0,06	9,13	113,6%	20,33	11,17	120,9	26,2	99,8%	82,6%	82,4%
127,00	0,12	0,07	9,21	111,7%	20,33	11,08	121,2	26,2	99,7%	82,6%	82,4%
128,00	0,13	0,07	9,23	111,4%	20,33	11,07	121,4	26,1	99,7%	82,6%	82,4%
129,00	0,12	0,07	9,15	113,2%	20,33	11,15	121,3	26,1	99,7%	82,6%	82,4%
130,00	0,12	0,06	9,16	112,9%	20,33	11,14	120,9	26,2	99,8%	82,6%	82,4%
131,00	0,12	0,06	9,03	116,0%	20,34	11,28	120,8	26,3	99,8%	82,6%	82,4%
132,00	0,12	0,07	8,96	117,5%	20,34	11,35	120,9	26,2	99,7%	82,5%	82,3%
133,00	0,12	0,07	8,94	117,9%	20,34	11,37	121,3	26,3	99,7%	82,5%	82,2%
134,00	0,12	0,06	9,00	116,8%	20,34	11,31	120,7	26,2	99,8%	82,5%	82,3%
135,00	0,12	0,06	8,88	119,6%	20,35	11,44	120,7	26,4	99,8%	82,5%	82,3%
136,00	0,08	0,07	8,75	122,8%	20,36	11,58	120,9	26,3	99,7%	82,3%	82,1%
137,00	0,08	0,07	8,76	122,4%	20,36	11,56	121,6	26,4	99,7%	82,3%	82,1%
138,00	0,08	0,07	8,77	122,3%	20,36	11,56	121,7	26,3	99,7%	82,3%	82,0%
139,00	0,08	0,07	8,82	120,9%	20,35	11,50	122,2	26,3	99,7%	82,3%	82,0%
140,00	0,08	0,07	8,63	125,6%	20,37	11,70	122,8	26,3	99,7%	82,1%	81,8%
141,00	0,08	0,07	8,50	129,1%	20,37	11,84	122,7	26,2	99,7%	82,0%	81,7%
142,00	0,08	0,07	8,33	133,7%	20,38	12,01	122,6	26,3	99,7%	81,9%	81,6%
143,00	0,08	0,07	8,20	137,3%	20,39	12,15	122,9	26,2	99,7%	81,7%	81,5%
144,00	0,03	0,07	8,23	136,5%	20,39	12,12	123,2	26,3	99,7%	81,7%	81,5%
145,00	0,03	0,08	8,20	137,3%	20,39	12,15	123,6	26,3	99,6%	81,7%	81,4%
146,00	0,03	0,07	8,24	136,2%	20,39	12,11	123,8	26,3	99,7%	81,7%	81,4%
147,00	0,03	0,07	8,19	138,0%	20,40	12,18	122,9	26,3	99,8%	81,7%	81,5%
148,00	0,03	0,07	7,99	143,7%	20,41	12,38	122,5	26,4	99,8%	81,6%	81,4%
149,00	0,03	0,07	7,84	148,3%	20,42	12,54	122,4	26,4	99,7%	81,5%	81,2%
150,00	0,03	0,07	7,79	149,9%	20,42	12,60	122,6	26,4	99,7%	81,4%	81,2%
151,00	0,03	0,07	7,54	158,1%	20,44	12,86	122,6	26,3	99,7%	81,2%	#DIV/0!
152,00	0,03	0,07	7,63	155,2%	20,43	12,77	122,4	26,4	99,7%	81,3%	#DIV/0!
153,00	0,03	0,07	7,71	152,5%	20,43	12,68	122,4	26,3	99,7%	81,3%	#DIV/0!
154,00	0,03	0,07	7,77	150,4%	20,42	12,61	122,7	26,3	99,7%	81,4%	#DIV/0!
155,00	0,03	0,07	7,74	151,4%	20,42	12,65	122,9	26,3	99,7%	81,3%	#DIV/0!
156,00	0,03	0,07	7,83	148,7%	20,42	12,56	122,8	26,2	99,7%	81,4%	#DIV/0!
157,00	0,03	0,07	7,65	154,5%	20,43	12,75	123,0	26,3	99,7%	81,2%	#DIV/0!
158,00	0,03	0,07	7,60	156,0%	20,43	12,80	123,2	26,3	99,7%	81,2%	80,9%
159,00	0,00	0,07	7,44	161,4%	20,44	12,97	123,5	26,3	99,7%	81,0%	80,7%

DATA 2022-06-27 EPA PI 20272 RUN 1 MODEL 8060
preburn

Temps	Flue	Room	Tunnel	Catalyst	scale	Right	Back	bottom	Top	Left
acquisition	temp	temp	dry bulb							
minutes	°F	°F	°F	°F	lbs	°F	°F	°F	°F	°F
1	77,22	76,63	77,80	77,66	2,77	77,93	77,78	77,86	78,24	78,06
2	85,58	76,65	78,30	97,70	2,77	78,00	77,95	77,87	78,29	78,11
3	111,70	76,56	80,71	151,85	2,76	78,30	78,48	77,95	78,38	78,55
4	142,08	76,57	83,71	181,02	2,67	80,13	80,68	78,17	78,47	79,85
5	158,38	76,67	85,81	190,45	2,67	85,59	85,33	78,42	78,63	82,11
6	170,38	76,67	81,84	249,41	2,57	91,89	86,42	78,64	79,29	84,57
7	179,04	76,65	80,38	300,25	2,47	98,45	86,87	78,87	80,91	89,58
8	207,22	76,62	81,09	383,14	2,37	105,54	89,70	79,14	83,52	96,02
9	293,98	76,65	84,12	591,37	2,27	114,34	93,58	79,59	87,78	102,75
10	356,50	76,62	86,35	717,72	2,09	126,70	99,05	80,56	94,03	110,57
11	388,01	76,64	87,36	749,88	1,97	141,13	104,98	82,49	101,60	120,31
12	420,28	76,66	89,47	819,59	1,77	156,22	111,10	86,06	109,61	133,51
13	422,74	76,69	89,21	793,19	1,67	173,63	117,71	91,00	116,83	151,08
14	428,90	76,74	90,07	806,15	1,57	195,07	125,11	96,47	123,81	168,95
15	405,86	76,75	89,01	705,24	1,47	215,05	134,03	101,92	130,78	186,97
16	393,27	76,77	89,65	684,54	1,37	233,16	143,45	107,04	136,43	204,82
17	400,26	76,84	89,85	695,34	1,27	248,66	153,02	112,09	142,37	222,81
18	401,64	76,89	90,54	683,57	1,17	262,43	162,57	117,75	147,89	241,81
19	398,48	76,90	89,83	670,46	1,07	274,86	172,19	123,68	153,15	262,67
20	408,92	77,10	108,43	550,35	0,97	286,31	184,14	129,85	155,50	283,64
21	340,35	77,22	112,92	339,74	7,87	300,22	201,67	136,27	161,37	303,10
22	312,01	77,12	92,19	444,79	7,77	312,43	206,94	141,85	173,23	315,83
23	290,84	77,12	88,47	433,74	7,77	319,98	209,31	146,10	181,50	319,89
24	282,86	77,11	87,62	448,74	7,67	323,03	209,96	149,12	188,52	319,40
25	272,70	77,06	86,32	433,01	7,58	322,92	210,93	151,41	194,48	317,28
26	266,62	77,05	86,26	427,44	7,58	322,09	212,56	152,97	199,35	314,02
27	256,54	77,09	85,14	404,40	7,58	320,78	213,51	154,33	203,28	310,77
28	244,60	77,03	84,52	384,90	7,47	319,67	212,83	155,35	206,54	307,24
29	235,85	77,06	84,08	374,46	7,47	317,66	210,32	156,27	209,05	303,13
30	231,57	77,04	83,84	373,37	7,47	316,55	206,92	157,18	211,07	299,24
31	236,52	77,05	83,98	391,39	7,37	315,91	203,01	158,15	212,66	295,45
32	262,81	77,04	85,11	468,95	7,37	317,73	199,12	159,25	213,92	292,12
33	314,22	77,06	87,00	617,17	7,17	319,64	195,81	160,38	215,19	289,59
34	318,78	77,07	86,48	572,62	7,17	325,55	193,10	161,68	216,41	288,78
35	303,97	77,12	85,97	514,72	7,17	333,45	191,03	163,25	218,28	288,91
36	280,70	77,14	86,10	452,51	7,07	340,67	189,37	164,95	220,14	289,13
37	258,94	77,20	85,04	410,75	7,03	343,91	187,01	166,82	222,11	288,32
38	242,36	77,18	84,55	378,83	6,97	344,96	184,94	168,74	223,88	286,59
39	230,53	77,16	84,60	361,66	6,97	343,90	182,29	170,77	225,15	284,70
40	221,16	77,15	83,91	347,16	6,97	342,04	179,50	172,90	226,00	282,21
41	213,44	77,14	83,90	333,17	6,97	340,01	176,72	175,00	226,70	278,98
42	206,95	77,16	83,48	321,72	6,97	338,24	174,06	177,09	226,84	276,07
43	203,29	77,17	83,70	303,05	6,97	336,30	171,77	179,21	226,67	272,93
44	199,45	77,17	91,41	233,06	6,97	334,65	170,69	181,33	226,00	269,94
45	200,73	77,13	92,75	228,71	6,88	333,08	169,38	183,53	224,93	267,15
46	229,21	77,16	87,19	376,20	6,88	331,79	166,89	185,61	223,78	264,87
47	260,66	77,23	86,28	488,01	6,74	332,91	165,29	187,48	222,61	264,93
48	325,41	77,24	88,13	670,12	6,57	340,10	164,32	189,50	221,80	265,67
49	382,94	77,26	90,32	777,93	6,47	349,35	164,73	191,45	221,85	267,75
50	419,94	77,33	91,89	839,63	6,27	357,78	166,88	193,43	222,96	272,08
51	431,01	77,38	91,91	811,13	6,18	364,68	169,99	195,47	225,10	278,00
52	432,43	77,40	92,51	801,48	6,07	371,51	174,44	197,65	228,89	284,28
53	435,81	77,43	93,19	804,90	5,97	377,63	178,63	199,88	233,28	290,64
54	444,53	77,52	93,83	835,38	5,77	384,12	183,16	202,00	238,77	296,74
55	454,31	77,53	95,10	845,97	5,67	390,39	187,89	204,09	245,10	302,13
56	460,21	77,63	94,81	847,63	5,57	396,21	192,79	206,12	251,91	307,32
57	461,24	77,71	95,33	845,03	5,47	403,29	197,78	208,20	259,29	313,14
58	460,91	77,80	96,22	842,72	5,37	411,60	202,24	210,25	266,81	319,09
59	462,48	78,11	96,88	846,26	5,17	419,39	206,76	212,43	274,03	324,72
60	468,87	78,30	95,63	884,96	5,07	427,79	210,84	214,60	281,85	330,00
61	493,07	78,45	96,28	953,70	4,97	434,69	214,76	216,79	289,47	335,81
62	498,74	78,70	97,35	940,18	4,77	442,49	218,94	219,05	297,22	343,30
63	495,83	79,03	97,84	933,31	4,67	449,59	223,48	221,24	305,34	351,67
64	495,74	79,08	97,79	935,36	4,49	456,65	227,76	223,46	313,48	360,32
65	501,05	79,32	98,92	964,09	4,37	463,22	231,72	225,71	321,70	368,28
66	514,25	79,32	100,39	999,31	4,27	471,65	236,20	227,96	329,84	376,59
67	522,43	79,47	100,51	1014,49	4,07	481,10	239,83	230,16	337,95	385,06
68	528,68	79,35	101,85	1020,79	3,97	493,21	245,22	232,43	346,32	394,30
69	532,54	79,53	100,46	1018,44	3,78	506,16	248,26	234,63	355,19	403,05
70	532,53	79,55	101,07	1010,64	3,67	521,14	252,77	236,85	364,03	411,25
71	533,03	79,65	101,37	1008,68	3,47	537,67	257,41	239,30	373,59	419,93
72	536,51	79,67	101,60	1015,93	3,30	554,27	261,30	241,64	383,31	429,65
73	532,63	79,72	101,60	993,67	3,17	569,89	266,27	244,22	393,31	439,96
74	533,35	79,65	101,98	1004,01	3,07	583,43	271,49	246,85	403,56	450,84
75	529,86	79,76	102,18	998,90	2,87	595,36	278,05	249,73	413,90	461,05
76	527,48	79,96	102,92	996,39	2,77	605,99	284,82	252,75	423,67	472,37
77	527,39	80,05	102,33	992,72	2,67	613,92	291,67	255,75	432,91	482,70
78	527,10	80,32	103,17	1005,03	2,47	620,42	300,84	259,14	441,86	493,58
79	524,62	79,97	101,67	998,51	2,37	623,76	308,29	262,55	449,42	502,43
80	518,97	79,74	104,06	984,89	2,27	626,52	316,41	266,04	456,18	513,64
81	513,47	79,75	103,11	969,75	2,17	630,53	323,46	269,67	462,80	523,19
82	504,76	79,54	101,27	946,37	2,07	633,31	328,85	273,31	468,22	532,00
83	492,80	79,28	99,36	908,93	1,97	637,32	332,45	276,88	472,73	539,79
84	481,73	79,25	99,02	891,48	1,87	641,04	335,24	280,44	476,53	547,85
85	474,30	79,33	98,58	876,56	1,87	644,93	338,09	284,27	479,35	556,43
86	467,29	79,39	98,00	866,63	1,77	646,31	339,96	288,00	481,55	564,02
87	459,00	79,19	97,02	845,94	1,68	647,99	341,54	291,59	482,88	569,78
88	450,34	79,44	98,93	815,39	1,66	647,36	344,91	295,47	483,18	578,09
89	441,61	79,46	98,19	796,13	1,57	647,66	346,07	299,40	483,30	584,03
90	431,85	79,10	95,57	782,71	1,57	647,58	347,07	303,02	482,95	588,41

91	423,37	79,05	94,49	767,26	1,47	645,75	346,22	306,77	481,52	591,59
92	414,91	78,94	94,54	752,31	1,47	643,14	347,50	310,49	479,62	595,66
93	407,83	79,14	94,89	738,17	1,37	644,31	349,06	314,79	477,10	602,50
94	399,78	78,91	94,01	720,58	1,37	643,07	347,55	318,58	474,33	604,11
95	391,35	78,84	98,93	707,31	1,37	643,03	347,55	322,52	470,80	609,33
96	382,91	79,44	98,93	694,04	1,37	642,99	347,56	326,46	467,26	614,56
97	374,48	79,46	98,19	680,77	1,35	642,94	347,56	330,39	463,73	619,79
98	366,05	79,10	95,57	667,50	1,32	642,90	347,56	334,33	460,19	625,02
99	357,62	79,05	94,49	654,24	1,29	642,85	347,57	338,27	456,66	630,25
100	349,18	78,94	94,54	640,97	1,26	642,81	347,57	342,21	453,12	635,48
101	353,57	79,14	91,62	657,35	1,24	638,52	337,74	344,24	446,50	614,74
102	349,67	79,14	106,67	484,90	1,21	639,96	338,69	348,56	441,08	614,19
103	316,31	79,20	113,99	363,67	8,28	639,27	339,34	352,79	435,20	611,16
104	303,83	78,86	96,68	487,56	8,18	634,88	336,03	356,90	427,97	605,29
105	303,07	78,90	92,89	520,43	8,08	626,71	329,09	360,75	422,05	598,76
106	301,90	78,76	92,05	526,55	7,98	615,96	325,24	363,89	416,21	589,42
107	307,41	78,82	91,98	557,79	7,88	605,67	321,76	366,35	410,75	579,83
108	319,78	78,62	92,19	592,70	7,77	594,13	320,31	367,75	404,99	566,47
109	332,51	78,37	92,65	625,84	7,59	583,08	321,64	368,80	399,88	556,64
110	375,28	78,71	94,03	764,26	7,38	576,57	329,67	370,27	395,37	549,48
111	408,97	78,72	94,54	803,97	7,17	568,38	333,45	371,16	391,88	541,66
112	421,10	78,57	95,12	804,66	7,07	562,04	340,26	372,11	390,12	534,23
113	437,29	78,47	96,51	829,07	6,88	556,27	346,67	372,82	388,95	527,72
114	454,75	78,48	96,99	853,98	6,61	553,50	355,86	373,78	388,12	523,38
115	468,87	78,63	98,81	876,56	6,47	551,06	364,92	375,13	388,68	520,35
116	481,84	78,53	98,41	905,17	6,21	547,89	370,65	376,08	390,60	515,59
117	491,54	78,53	98,13	925,91	5,98	547,15	379,72	377,62	392,83	514,99
118	503,71	78,54	98,89	955,37	5,87	546,13	389,09	379,50	395,78	515,10
119	515,76	78,61	98,50	980,70	5,67	546,63	401,13	381,56	399,50	515,21
120	522,48	78,57	98,92	992,93	5,48	544,70	406,91	382,86	404,01	513,90
121	536,11	78,53	99,66	1046,29	5,36	544,74	417,10	383,93	408,89	515,32
122	545,49	78,43	98,87	1068,63	5,17	543,93	425,29	384,63	414,43	516,08
123	549,29	78,81	101,44	1067,33	5,07	544,63	435,96	385,61	420,08	517,24
124	552,83	78,64	101,40	1082,24	4,87	544,52	443,15	386,15	426,70	518,23
125	554,96	78,65	99,99	1080,35	4,78	542,33	446,51	386,26	433,25	517,45
126	549,47	78,46	100,00	1071,87	4,57	540,82	451,56	386,57	440,93	518,29
127	549,76	78,68	103,21	1070,15	4,47	540,85	461,07	387,32	447,52	520,70
128	546,26	78,96	101,84	1067,48	4,32	540,51	462,21	387,92	454,83	521,45
129	545,05	79,06	102,21	1066,38	4,17	540,75	464,47	388,53	461,97	522,05
130	545,33	78,79	102,83	1072,72	4,08	540,39	462,44	389,15	467,73	522,96
131	548,94	78,90	101,31	1092,49	3,87	538,98	459,33	389,32	473,82	521,99
132	553,16	79,04	101,41	1104,64	3,79	539,25	457,37	389,59	479,51	520,95
133	558,21	78,90	101,45	1109,62	3,67	539,28	456,67	389,90	485,82	522,33
134	560,68	79,06	102,00	1117,80	3,57	539,91	457,06	390,53	491,75	524,53
135	558,42	79,21	102,32	1099,11	3,47	540,12	457,94	390,98	498,61	526,42
136	557,49	79,14	102,46	1106,58	3,27	541,51	459,51	391,76	505,13	528,68
137	471,78	79,41	97,25	927,34	3,21	543,46	464,84	393,02	533,36	532,19
138	434,31	79,34	95,10	924,62	3,07	545,28	468,24	394,48	550,07	535,23
139	414,99	79,32	95,02	931,18	2,97	547,47	468,71	396,15	561,25	537,33
140	402,85	79,24	93,86	930,14	2,97	549,39	467,60	397,56	570,17	539,57
141	394,64	79,26	94,39	937,52	2,87	551,08	468,42	399,33	576,40	542,95
142	385,95	79,39	92,95	930,78	2,77	554,30	465,71	400,68	582,15	545,94
143	377,11	79,31	92,49	916,15	2,77	556,66	459,71	401,58	586,95	546,45
144	372,19	79,37	92,15	922,09	2,68	558,47	454,46	402,60	589,56	549,09
145	367,40	79,19	91,94	924,17	2,68	560,17	451,36	403,72	591,71	552,09
146	363,47	79,23	91,47	922,32	2,57	561,25	446,25	404,58	593,41	553,93
147	359,67	79,31	91,31	912,55	2,47	563,12	441,26	405,57	596,37	556,22
148	355,97	79,39	91,36	893,17	2,47	564,08	436,18	406,45	598,44	557,95
149	352,84	79,26	90,42	897,17	2,47	564,89	429,53	407,20	598,99	558,41
150	349,48	79,31	90,74	890,68	2,37	565,44	424,49	408,07	598,54	559,21
151	344,64	79,27	90,48	869,76	2,27	567,87	421,11	409,05	598,01	562,16
152	341,14	79,32	90,52	867,37	2,27	568,74	416,65	409,99	597,10	563,08
153	336,76	79,12	90,08	870,69	2,27	568,75	413,48	410,91	597,21	563,19
154	333,40	79,25	91,47	868,30	2,17	571,01	413,82	412,33	595,68	565,88
155	330,13	79,35	91,29	861,72	2,17	571,59	410,18	413,54	593,18	567,45
156	326,54	79,24	89,99	850,09	2,17	571,71	407,61	414,54	591,93	569,55
157	323,63	79,61	91,22	836,31	2,10	574,18	406,64	415,90	588,47	572,48
158	319,58	79,68	89,65	825,33	2,07	574,86	402,70	417,13	583,31	575,16
159	316,85	79,72	90,33	815,08	2,07	575,66	402,51	418,37	575,31	578,03
160	314,52	79,81	89,27	801,45	2,01	577,34	399,34	419,57	565,42	581,18
161	311,88	80,04	90,46	786,69	1,98	579,20	398,02	420,87	555,60	584,05
162	308,28	79,89	90,27	776,20	1,98	580,03	394,77	422,03	546,33	586,62
163	304,50	79,44	88,93	765,17	1,98	580,23	390,77	422,77	537,54	587,92
164	301,38	79,52	89,01	754,51	1,98	582,54	389,40	424,00	528,90	590,44
165	298,39	79,60	88,34	744,93	1,98	583,85	387,23	425,08	521,15	591,48
166	294,37	79,67	89,51	732,51	1,90	586,27	385,73	426,23	512,99	593,02
167	291,37	79,74	89,64	726,33	1,98	588,47	383,49	427,36	505,66	593,73
168	288,70	79,65	89,25	720,07	1,87	589,29	383,04	428,21	498,39	593,78
169	286,52	79,85	89,02	715,98	1,87	591,13	380,13	429,04	491,16	593,35
170	284,22	79,57	88,56	711,63	1,87	593,38	376,05	429,68	484,64	592,77
171	281,37	79,16	88,20	705,72	1,87	594,15	369,42	429,59	478,38	588,95
172	279,28	79,35	88,58	701,27	1,87	596,01	367,69	430,01	472,14	589,39
173	276,63	79,19	88,24	698,65	1,87	598,06	363,32	430,01	466,65	586,03
174	275,24	79,33	87,98	694,68	1,86	600,28	361,57	430,35	461,36	587,66
175	273,61	79,52	87,94	689,83	1,77	602,13	362,07	430,72	456,05	587,52
176	272,24	79,60	87,24	684,69	1,77	603,45	356,85	430,95	450,95	586,24
177	271,43	79,53	88,09	684,76	1,77	604,13	358,08	431,41	446,14	585,17
178	269,63	79,36	88,29	679,61	1,77	605,24	354,52	431,94	441,93	584,32
179	267,70	79,41	87,56	673,71	1,77	606,06	349,91	432,22	437,83	583,16
180	266,48	79,37	87,13	669,81	1,77	605,78	347,29	432,76	433,71	582,76
181	264,53	79,30	87,19	664,04	1,67	606,39	343,94	433,16	430,08	581,41
182	262,90	79,25	87,21	660,66	1,68	605,38	344,17	433,83	426,55	581,33
183	262,54	79,07	87,07	657,54	1,67	604,02	343,82	434,47	423,14	580,84

184	260,39	79,31	87,25	651,81	1,67	602,69	339,92	435,05	419,43	580,78
185	258,80	79,40	87,74	648,78	1,67	601,84	339,17	435,70	416,48	579,83
186	257,84	79,55	88,85	648,47	1,67	599,30	340,28	436,38	413,28	580,32
187	257,65	79,63	88,71	646,57	1,67	598,44	339,55	437,24	409,89	579,65
188	256,74	79,49	87,58	645,13	1,57	596,63	335,28	437,87	407,12	578,70
189	255,91	79,74	86,46	644,60	1,62	597,05	335,17	438,64	404,67	578,44
190	255,83	79,61	86,90	643,89	1,57	594,78	332,01	439,10	401,91	577,86
191	255,10	79,66	86,82	644,13	1,57	594,30	330,74	439,50	399,48	577,01
192	254,39	79,38	86,61	642,06	1,57	592,07	328,31	439,46	397,24	575,21
193	253,03	79,17	86,39	643,36	1,57	591,67	328,40	439,29	394,82	574,49
194	253,04	79,38	86,40	644,51	1,57	589,87	327,20	439,43	392,21	574,30
195	259,97	79,20	89,30	590,84	3,32	589,99	324,79	439,17	390,77	572,50
196	260,55	79,26	89,02	570,41	1,48	588,71	323,56	439,20	387,20	571,47
197	250,27	79,01	86,55	588,91	1,47	585,85	320,52	438,96	382,65	567,04
198	245,09	79,22	85,14	585,51	1,47	583,55	322,70	439,25	378,90	564,81

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 2 Tech: MM Reviewer: DP

- Kindling 28 LBS START FIRE
- by pass open
- Door open
- At 25 LBS close Door
- At 12 LBS Insert 1st pre load
- close Door immediatly
- At 12 LBS Insert Second pre load
- close Door immediatly
- At 78 LBS close air inlet and by pass
- At 66 LBS open bypass and air inlet
- At 47 LBS close air inlet and by pass
- At 18 LBS Rack coal Bed
- After 2 min insert load and open ~~by pass~~ air inlet M.M
- At 5 min close air inlet to lowest setting

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2022-06-28 Manufacturer: Hearthstove Model: 8060

Project #: PI 20272 Run: 2 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334	7:00	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	2022-06-27
Date Dilution Tunnel Cleaned	2022-06-27
Induced Draft Check (max 0.005 H2O)	ok
Traverse before ignition	ok

Temperature System:

Ambient (65°-90°F)	ok °F

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok
Pictures for report: Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok

Load Length approximately 5/6 of firebox Lenght: ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 2 Tech: MM 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 ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10	-10	-10	-10	-10	-10
Final 1minute DGM (Liter)	6526426,05	6572425,53	6564263,35	6572425,80	4042687,78	4050650,00
Initial 1minute DGM (Liter)	6564263,53	6564263,53	6572425,80	6572425,75	4042687,78	4050650,00
Change (Liter)	0	0,01	0,02	0,05	0	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**
Check OK	OK	OK	OK	OK	OK	OK

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 2 Tech: MR Reviewer: DP

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	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

Scales checks

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM- 090	44 lbs, Class F	44 lbs
Platform	EM 205	10,00 kg ~~lbs~~, Class F	10,00 kg ~~lbs~~
Wood	EM- 090	440 lbs, Class F	440 lbs
Analytical	EM- 335	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: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 2 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 1014 (KPa.) Static pressure (P_q) 0,19 (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	0071	7575
B - Centroid	3.00	3.50	4	0072	7549
A-1	0.40	0.50	0.50	0057 / 0063 MM	7575 / 7564 MM
A-2	1.50	1.75	2	0063	7575
A-3	4.50	5.25	6	0060	7564
A-4	5.60	6.5	7.5	0057	7553
B-1	0.40	0.50	0.50	0057	7549
B-2	1.50	1.75	2	0077	7548
B-3	4.50	5.25	6	0074	7548
B-4	5.60	6.5	7.5	0058	7540
				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: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 2 Tech: MM Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3,014	3000	1,022	1,000
Tolerance CO	0	+/- 0.02	0,014	+/- 0.15	0,022	+/- 0.05
CO_2	0	0	17,88	18,00	9,80	10,00
Tolerance CO2	0	+/- 0.02	0,12	+/- 0.5	0,20	+/- 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	3010	1,009	0	0.02	0,004	0.15	0,013	0.05	✓	
CO_2	0	17,81	9,86	0	0.02	0,07	0.5	0,06	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PE 20272 Run: 2 Tech: MM Reviewer: MP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	657241,71	405063,82	390673,92
Initial (Liter)	656426,68	404268,48	390000,41

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101,4	101,4
Dry Bulb (F):	73,6	78,1
Humidity (%):	51,2	33,6

Flow Meter

	Start	End
Flow meter reading	N.A	NA

Flow Meter Verification

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

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 2 Tech: M M Reviewer: [illegible]

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3/4 x 14 in.	1410 lbs.	20¹	20⁴	20³	20⁶	20,4
1 1/2 x 3/4 x 14 in.	1490 lbs.	20⁸	21⁰	20⁹	20⁸	20⁷
1 1/2 x 3/4 x 14 in.	1424 lbs.	20¹	19⁹	19⁸	19⁸	19⁸
1 1/2 x 3/4 x 7 in.	0858 lbs.	19⁶	19⁴	19³	19⁶	19⁴
1 1/2 x 3/4 x 7 in.	0586 lbs.	20⁰	20⁰	20¹	20¹	20⁴
1 1/2 x 3/4 x 7 in.	0676 lbs.	21⁰	21¹	21¹	21²	21³
1 1/2 x 3/4 x 7 in.	0868 lbs.	19¹	19¹	19²	19²	19³
x x in.	lbs.					
1 1/2 x 3 1/2 x 14 in.	1476 lbs.	20⁰	21⁰	20⁹	20⁸	20⁸
1 1/2 x 3 1/2 x 14 in.	1416 lbs.	19⁹	19⁸	19⁶	19⁸	19⁹
1 1/2 x 3 1/2 x 14 in.	1508 lbs.	20¹	20²	20²	19⁹	19⁸
1 1/2 x 3 1/2 x 7 in.	0586 lbs.	21¹	21⁰	21¹	21⁰	21²
1 1/2 x 3 1/2 x 7 in.	0858 lbs.	21⁶	21⁵	21⁴	21⁵	21⁵
1 1/2 x 3 1/2 x 7 in.	0676 lbs.	20,9	21⁰	20⁹	21⁰	21⁰
1 1/2 x 3 1/2 x 7 in.	0850 lbs.	20,6	20,3	20⁸	20⁶	20⁴
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 7316 + 7366 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 2 Tech: M M Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 15 in.	1372 lbs.	20.9	21.1	20.8	20.7	20.8
1 1/2 x 3 1/2 x 15 in.	1470 lbs.	20.8	20.6	20.9	20.8	20.3
1 1/2 x 3 1/2 x 15 in.	1528 lbs.	21.1	21.4	21.3	21.2	21.2
1 1/2 x 3 1/2 x 15 in.	1440 lbs.	20.1	20.3	20.4	20.5	20.3
x x in.	lbs.					
1 1/2 x 3/4 x 4 in.	0098 lbs.			20.1		
1 1/2 x 3/4 x 4 in.	0.100 lbs.			19.3		
1 1/2 x 3/4 x 4 in.	0.122 lbs.			19.4		
1 1/2 x 3/4 x 4 in.	0.122 lbs.			19.3		
1 1/2 x 3/4 x 4 in.	0.108 lbs.			19.2		
1 1/2 x 3/4 x 4 in.	0.108 lbs.			19.2		
1 1/2 x 3/4 x 4 in.	0.080 lbs.			19.4		
1 1/2 x 3/4 x 4 in.	0.082 lbs.			19.5		
1 1/2 x 3/4 x 4 in.	0.110 lbs.			19.6		
1 1/2 x 3/4 x 4 in.	0.130 lbs.			19.4		
1 1/2 x 3/4 x 4 in.	0.096 lbs.			19.3		
1 1/2 x 3/4 x 4 in.	0.094 lbs.			19.4		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 7.068 lbs Min 20%: 1.41 Max 25%: 1.77

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-06-27 Manufacturer: Heathstone Model: 8060

Project #: PT 20272 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	17	311	312	9	9	309	310	8	315
2022-06-27	17:00	108 9424		35 2120		61 4546		36 0289		0 1288
2022-06-28	9:00	108 9422		35 2121		61 4547		36 0288		0 1288

		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	17	311	312	9	9	309	310	8	315
2022-06-28	15:00	108 9427		35 2148		61 4548		36 0293		0 1288
2022-07-07	8:00	108 9424		35 2137		61 4548		36 0293		0 1289
2022-07-08	8:00	108 9423		35 2136		61 4547		36 0293		0 1289

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-06-27 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 2 Tech: MM Reviewer: DP

Pre-test Weight Record		SYSTEM 2			
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	50	313	314	13
2022-06-27	17:00 ~~9:00~~	107 6474		35 0398	
2022-06-28	9:00	107 6475		35 0397	

Post-test Weight Record		SYSTEM 2			
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	50	313	314	13
2022-06-28	15:00	107 6477		35 0423	
2022-07-07	8:00	107 6476		35 0415	
2022-07-08	8:00	107 6476		35 0416	

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	28-06-2022	
Technicien	M.M	
Project #	PI 20272	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8060	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1	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):	1,007	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,005	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	EM 179	Dimensionless

Tunnel

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

Project nu.	PI 20272
Date	28-06-2022
Technicien	M.M

Fuel data

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

Default Fuel Values

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

	Start	End
Barometer (kPa):	101,4	101,4
Barometer (in.Hg):	29,943409	29,94340873
Dry Bulb (F):	73,6	78,1
Humidity (%):	51,2	33,6
Air velocity (ft/min)	0	0

DGM #1	Final:	23210,272	cuft	Final:	657241,710	Liter
	Initial:	23181,490	cuft	Initial:	656426,680	Liter
DGM #2	Final:	14304,694	cuft	Final:	405063,820	Liter
	Initial:	14276,607	cuft	Initial:	404268,480	Liter
DGM room	Final:	13796,520	cuft	Final:	390673,920	Liter
	Initial:	13772,735	cuft	Initial:	390000,410	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 275

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

Project nu.	PI 20272
Date	28-06-2022
Technicien	M.M

Preload data sheet

Test Load Weight: Lower	Ideal	Upper
6,30	7,00	7,70

Load Volume: 0,4253 cu. ft

Number of Spaces:

Spacer weight (lbs):

Loading Density: 14,682 lbs./ft3

Load Density (wet): 34,518 lbs./ft3

Dry Wood Density: 28,681834

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	14	1,41	20,1	20,4	20,3	20,6	20,4	28,7076	73,50
1,5	3,5	14	1,49	20,8	21	20,9	20,8	20,7	31,0516	73,50
1,5	3,5	14	1,424	20,1	19,9	19,8	19,8	19,8	28,30912	73,50
1,5	3,5	7	0,858	19,6	19,4	19,3	19,6	19,4	16,69668	36,75
1,5	3,5	7	0,586	20	20	20,1	20,1	20,4	11,79032	36,75
1,5	3,5	7	0,676	21	21,1	21,1	21,2	21,3	14,29064	36,75
1,5	3,5	7	0,868	19,1	19,1	19,2	19,2	19,3	16,64824	36,75
										0,00
1,5	3,5	14	1,476	20	21	20,9	20,8	20,8	30,5532	73,50
1,5	3,5	14	1,416	19,9	19,8	19,6	19,8	19,9	28,0368	73,50
1,5	3,5	14	1,508	20,1	20,2	20,2	19,9	19,8	30,22032	73,50
1,5	3,5	7	0,586	21,1	21	21,1	21	21,2	12,35288	36,75
1,5	3,5	7	0,858	21,6	21,5	21,4	21,5	21,5	18,447	36,75
1,5	3,5	7	0,676	20,9	21	20,9	21	21	14,16896	36,75
1,5	3,5	7	0,85	20,6	20,3	20,8	20,6	20,4	17,459	36,75
										0,00
										0,00
										0,00

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
6,3	7,0	7,7

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

Load Volume: 0,18 cu. ft

Loading Density: 7,1 lbs./ft3

Number of Spaces: 12

Spacer weight: lbs

Load Density (wet): 31,9 lbs./ft3

Dry Wood Density: 26,4 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	15	1,37	20,90	21,10	20,80	20,70	20,80	28,61992	78,75	20,9
1,5	3,5	15	1,47	20,80	20,60	20,90	20,80	20,30	30,3996	78,75	20,7
1,5	3,5	15	1,53	21,10	21,40	21,30	21,20	21,20	32,45472	78,75	21,2
1,5	3,5	15	1,44	20,10	20,30	20,40	20,50	20,30	29,2608	78,75	20,3
										0,00	
										0,00	
										0,00	
										0,00	

1,5	0,75	4	0,10			20,10			1,9698	4,50	20,1
1,5	0,75	4	0,10			19,30			1,93	4,50	19,3
1,5	0,75	4	0,12			19,40			2,3668	4,50	19,4
1,5	0,75	4	0,12			19,30			2,3546	4,50	19,3
1,5	0,75	4	0,11			19,20			2,0736	4,50	19,2
1,5	0,75	4	0,11			19,20			2,0736	4,50	19,2
1,5	0,75	4	0,08			19,40			1,552	4,50	19,4
1,5	0,75	4	0,08			19,50			1,599	4,50	19,5
1,5	0,75	4	0,11			19,60			2,156	4,50	19,6
1,5	0,75	4	0,13			19,40			2,522	4,50	19,4
1,5	0,75	4	0,10			19,30			1,8528	4,50	19,3
1,5	0,75	4	0,09			19,40			1,8236	4,50	19,4
										0,00	
										0,00	
										0,00	
										0,00

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,19 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=
0,949

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,071	75,75	0,2665
B center	0,072	75,49	0,2683
A1	0,057	75,64	0,2387
A2	0,063	75,75	0,2510
A3	0,060	75,64	0,2449
A4	0,057	75,53	0,2387
B1	0,057	75,490	0,2387
B2	0,077	75,480	0,2775
B3	0,074	75,480	0,2720
B4	0,058	75,400	0,2408
AVERAGE	0,0646	75,5650	0,2537

Project nu.	PI 20272
Date	28-06-2022
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	17	311	312	9	9	309	310	8	50	313	314	13	315		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	108,9421		35,2120		61,4546		36,0289		107,6474		35,0398		0,1288	2022-06-27	17:00
Before (6)	108,9422		35,2121		61,4547		36,0288		107,6475		35,0397		0,1288	2022-06-28	09:00
After (1)	108,9427		35,2148		61,4548		36,0293		107,6477		35,0423		0,1288	2022-06-28	15:00
After (2)	108,9424		35,2137		61,4548		36,0293		107,6476		35,0415		0,1289	2022-07-07	08:00
After (3)	108,9423		35,2136		61,4547		36,0293		107,6476		35,0416		0,1289	2022-07-08	08:00
After (4)															
After (5)															
After (6)	108,9423		35,2136		61,4547		36,0293		107,6476		35,0416		0,1289	2022-07-08	08:00
Difference	0,0001	0,0000	0,0015	0,0000	0,0000	0,0000	0,0005	0,0000	0,0001	0,0000	0,0019	0,0000	0,0001		
Total (mg)		1,6				2,1				2			0,1		
Total ajusté (mg)		**1,50**				**2,00**				**1,90**					

Project nu.	PI 20272
Date	28-06-2022
Technicien	M.M

SFBA EPA EMISSION RESULTS

Test Duration: **149** min

PRESSURE FACTOR:	DGM 1	0,97528	
	DGM 2	0,97930	
	DGM 3	1,00078	
TEMPERATURE FACTORS	DGM 1	0,98219	
	DGM 2	0,97344	
	DGM 3	0,98131	
VOLUMES SAMPLED	DGM 1	27,752	SCft
	DGM 2	26,921	Scft
	DGM 3	23,082	SCft

TOTAL TUNNEL VOLUME : 52590

SAMPLE RATIOS

Sample Train 1:	1895,003
Sample Train 2:	1953,491

Paticulate concentration

Sample Train 1	**0,000076**	g/dscf
Sample Train 2	**0,000074**	g/dscf
Room	**0,000004**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**3,75**	g
Sample Train 2	**3,68**	g

EMISSION RATES

Sample Train 1	**1,51**	g/hr
Sample Train 2	**1,48**	g/hr

1st hour emission rate **3,03** g/hr

	Train 1	Train 2
Cs	7,567E-05	7,42919E-05

RESULTS

Average emission rate: 1,5 g/hr

Burn Rate : 1,070 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,943409	in Hg
Start:	29,943409	in Hg
End:	29,943409	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	23210,272	Cuft
	Initial:	23181,490	Cuft
DGM 2	Final:	14304,694	Cuft
	Initial:	14276,607	Cuft
DGM #3	Final:	13796,520	Cuft
	Initial:	13772,735	Cuft

TEMPERATURES

DGM 1	537,573	°R
DGM 2	542,409	°R

CALIBRATION FACTORS

DGM 1	1,0066
DGM 2	1,0054
DGM #3	0,9882

TUNNEL FLOW RATE: 352,950 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	2,10	mg
Total Sample Train 2:	2,00	mg
Total Sample Train 1 1st hour:	1,60	mg

DEVIATION: 0,98%

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*9	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												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	275,00	6,9	0,2	3,1	0,0	287,4	76,7	93,3	359,1	335,8	555,7	561,9	395,9	415,7	0,18	75,57	75,84	83,02	0,18	76,00	78,30	84,79	0,07	0,04	0
1,0	276,0	6,9	0,6	2,8	0,0	278,1	76,4	88,1	353,8	331,4	550,4	556,0	396,7	583,1	0,18	75,51	75,91	82,77	0,18	76,12	78,36	84,46	0,07	0,06	-4,010718
2,0	277,0	6,8	0,1	5,6	0,0	309,7	76,6	87,9	349,5	326,5	541,3	547,3	397,4	674,8	0,18	75,48	75,93	82,56	0,18	76,29	78,43	84,26	0,07	0,06	-9,268909
3,0	278,0	6,8	0,1	6,1	0,0	327,9	76,6	88,3	347,1	323,1	531,6	538,6	397,9	685,6	0,18	75,43	75,94	82,33	0,18	76,36	78,51	84,10	0,07	0,07	-14,00001
4,0	279,0	6,7	0,1	7,3	0,0	331,3	76,7	88,7	347,6	322,4	522,1	528,4	398,1	664,6	0,19	75,57	75,97	82,15	0,18	76,59	78,59	84,00	0,08	0,06	-17,95072
5,0	280,0	6,6	0,1	9,1	0,0	323,2	76,7	87,9	352,9	323,5	511,9	518,4	398,1	691,4	0,19	75,64	76,01	81,99	0,18	76,78	78,68	83,87	0,07	0,07	-20,70491
6,0	281,0	6,6	0,1	10,9	0,0	309,5	76,9	86,5	357,1	326,5	502,7	508,7	397,8	697,1	0,18	75,82	76,05	80,08	0,18	77,11	78,80	83,64	0,07	0,06	-23,09835
7,0	282,0	6,5	0,1	7,5	0,0	307,8	76,3	86,4	356,0	329,3	494,7	499,8	397,3	716,2	0,18	75,84	76,09	83,50	0,18	77,28	78,89	83,45	0,08	0,06	-26,2194
8,0	283,0	6,4	0,1	7,2	0,0	306,4	76,6	86,4	354,5	331,2	487,9	491,1	396,8	709,6	0,19	75,93	76,11	86,89	0,18	77,52	79,02	83,29	0,08	0,06	-29,36508
9,0	284,0	6,4	0,1	7,2	0,0	301,5	76,9	86,8	352,9	332,7	482,3	483,8	396,0	681,5	0,19	76,09	76,15	87,44	0,18	77,82	79,15	83,16	0,08	0,06	-32,13777
10,0	285,0	6,3	0,1	8,4	0,0	300,8	77,3	87,0	355,4	333,6	476,4	476,7	395,2	693,3	0,19	76,33	76,22	87,24	0,18	78,18	79,30	83,08	0,08	0,06	-34,18931
11,0	286,0	6,2	0,6	14,2	0,0	313,0	77,4	88,1	365,0	335,3	470,5	470,1	394,2	759,5	0,18	76,62	76,30	87,01	0,18	78,54	79,47	83,06	0,08	0,07	-34,63585
12,0	287,0	6,1	0,4	14,1	0,0	317,5	77,7	88,1	375,7	336,5	465,4	463,9	393,2	752,3	0,19	76,96	76,40	86,76	0,18	78,94	79,64	83,02	0,08	0,07	-34,72039
13,0	288,0	6,0	0,1	13,5	0,0	316,8	77,6	88,4	384,8	338,3	460,4	457,9	392,0	740,3	0,19	77,05	76,47	86,58	0,18	79,19	79,81	82,94	0,08	0,06	-34,96772
14,0	289,0	5,9	0,1	13,0	0,0	316,4	76,8	88,1	393,0	339,3	457,1	451,8	390,9	737,1	0,18	76,74	76,47	86,36	0,18	79,19	79,83	85,34	0,08	0,06	-35,25058
15,0	290,0	5,8	0,3	14,4	0,0	323,1	76,6	88,2	402,6	341,6	454,1	447,7	389,6	762,0	0,19	76,32	76,44	86,09	0,18	79,07	79,88	87,88	0,08	0,07	-34,53843
16,0	291,0	5,8	0,2	14,8	0,0	328,1	76,9	87,6	411,3	343,1	449,6	445,2	388,2	758,8	0,19	76,24	76,41	85,80	0,18	79,15	79,97	87,72	0,07	0,07	-34,17412
17,0	292,0	5,7	0,1	14,3	0,0	328,3	76,8	88,1	420,0	345,6	449,0	442,3	386,8	743,9	0,18	76,41	76,45	85,61	0,18	79,35	80,10	87,31	0,08	0,07	-32,9036
18,0	293,0	5,6	0,0	14,0	0,0	328,1	77,1	87,9	428,1	347,6	447,4	440,0	385,4	744,5	0,19	76,58	76,51	85,40	0,18	79,58	80,22	86,93	0,08	0,07	-31,94767
19,0	294,0	5,5	0,1	14,6	0,0	331,6	77,0	87,3	435,4	348,5	446,5	439,6	384,0	754,7	0,18	76,67	76,54	85,16	0,18	79,78	80,34	86,57	0,08	0,07	-30,85565
20,0	295,0	5,4	0,1	14,5	0,0	334,4	77,0	88,1	443,1	350,8	446,6	438,0	382,6	758,4	0,18	76,71	76,59	84,98	0,18	79,92	80,43	86,22	0,08	0,07	-29,44182
21,0	296,0	5,3	0,1	14,3	0,0	336,0	77,2	87,7	449,2	351,7	446,1	437,3	381,2	755,8	0,19	76,64	76,62	84,80	0,18	79,98	80,55	85,90	0,08	0,07	-28,55769
22,0	297,0	5,2	0,0	14,2	0,0	336,3	77,1	87,6	453,8	352,1	445,8	438,3	379,7	764,8	0,19	76,66	76,63	84,65	0,18	80,07	80,66	85,65	0,08	0,07	-27,7251
23,0	298,0	5,1	0,2	14,4	0,0	338,8	77,3	88,3	460,2	354,2	446,8	438,1	378,3	782,6	0,19	76,70	76,66	84,51	0,18	80,21	80,76	85,41	0,08	0,07	-26,1622
24,0	299,0	4,9	0,1	14,5	0,0	342,1	77,3	88,2	466,3	354,6	447,2	438,3	376,9	785,6	0,19	76,78	76,71	84,43	0,18	80,32	80,89	85,20	0,08	0,07	-24,99619
25,0	300,0	4,8	0,3	14,6	0,0	347,4	77,4	87,8	472,0	355,4	448,0	440,3	375,4	816,2	0,19	76,82	76,74	84,29	0,18	80,46	80,97	84,95	0,08	0,07	-23,41931
26,0	301,0	4,7	0,5	14,3	0,0	349,8	77,0	88,0	477,5	355,6	450,0	442,4	374,0	818,1	0,19	76,89	76,76	84,14	0,18	80,56	81,06	84,76	0,07	0,07	-21,77815
27,0	302,0	4,6	0,3	14,5	0,0	350,2	77,2	88,3	481,5	357,1	453,7	444,4	372,6	831,1	0,18	76,88	76,78	84,00	0,18	80,59	81,12	84,50	0,07	0,07	-19,79592
28,0	303,0	4,5	0,2	14,8	0,0	352,5	77,0	87,7	484,2	357,5	457,9	447,3	371,2	835,1	0,19	76,78	76,80	83,88	0,18	80,61	81,21	84,29	0,07	0,07	-18,03411
29,0	304,0	4,4	0,3	14,8	0,0	353,1	77,1	88,2	486,1	358,7	462,4	449,9	369,9	833,0	0,19	76,72	76,80	83,79	0,18	80,64	81,31	84,12	0,08	0,07	-16,25309
30,0	305,0	4,3	0,3	14,8	0,0	354,3	77,2	88,8	489,3	360,0	467,6	453,1	368,6	840,4	0,19	76,71	76,83	83,74	0,18	80,69	81,41	83,96	0,07	0,07	-13,9303
31,0	306,0	4,2	0,3	14,7	0,0	355,2	77,0	89,0	492,4	360,4	473,6	456,9	367,3	854,0	0,19	76,68	76,82	83,68	0,18	80,72	81,53	83,82	0,08	0,07	-11,53228
32,0	307,0	4,1	0,4	14,3	0,0	356,4	77,4	89,0	494,9	361,5	479,0	459,6	366,0	843,6	0,18	76,69	76,84	83,62	0,18	80,76	81,61	83,73	0,08	0,07	-9,454718
33,0	308,0	4,3	0,3	14,2	0,0	356,3	77,5	89,2	497,6	362,2	482,7	462,3	364,8	838,9	0,19	76,70	76,86	83,58	0,18	80,80	81,70	83,64	0,07	0,07	-7,742621
34,0	309,0	3,9	0,3	14,2	0,0	356,0	77,6	89,0	500,7	362,8	485,5	465,7	363,6	835,5	0,19	76,91	76,88	83,50	0,18	81,02	81,80	83,55	0,08	0,07	-5,973078
35,0	310,0	3,8	0,3	14,2	0,0	355,6	77,7	89,0	502,8	363,8	487,5	468,3	362,4	832,3	0,19	77,02	76,93	83,45	0,18	81,09	81,90	83,47	0,07	0,07	-4,714276
36,0	311,0	3,7	0,3	14,3	0,0	355,5	77,6	89,4	505,7	364,4	489,0	470,0	361,3	833,9	0,19	76,98	76,97	83,41	0,18	81,11	81,99	83,41	0,08	0,07	-3,58324
37,0	312,0	3,6	0,4	14,3	0,0	354,2	77,5	89,5	509,0	365,5	490,5	472,5	360,1	830,3	0,19	76,86	76,95	83,40	0,18	81,10	81,99	83,33	0,07	0,07	-2,143726
38,0	313,0	3,5	0,4	14,5	0,0	353,1	77,6	89,9	510,9	366,8	492,7	475,1	359,0	837,1	0,19	76,77	76,95	83,39	0,18	81,06	82,02	83,26	0,08	0,07	-0,771619
39,0	314,0	3,4	0,4	14,4	0,0	353,0	77,7	90,4	514,1	367,4	495,3	477,5	357,9	848,6	0,19	76,80	76,98	83,36	0,18	81,10	82,09	83,24	0,08	0,07	0,7912532
40,0	315,0	3,3	0,4	14,4	0,0	352,2	77,7	90,8	516,9	369,1	496,2	480,2	356,8	850,2	0,19	76,86	77,00	83,44	0,18	81,14	82,12	83,21	0,08	0,07	2,1805418
41,0	316,0	3,2	0,5	14,5	0,0	352,0	77,8	90,9	519,6	370,6	498,0	482,4	355,8	848,7	0,19	76,93	77,04	83,43	0,18	81,21	82,17	83,22	0,08	0,07	3,6249938
42,0	317,0	3,1	0,5	14,5	0,0	351,1	78,0	91,1	521,7	371,7	500,2	485,2	354,9	852,5	0,19	76,97	77,05	83,44	0,18	81,25	82,19	83,19	0,08	0,07	5,0813048
43,0	318,0	3,0	0,5	14,5	0,0	350,5	77,8	90,4	524,5	371,7	503,5	487,5	354,0	853,3	0,19	76,99	77,10	83,42	0,18	81,29	82,22	83,09	0,08	0,07	6,5818542
44,0	319,0	2,8	0,5	14,5	0,0	349,0	77,8	90,1	526,3	374,3	505,3	490,4	353,0	851,6	0,19	77,02	77,10	83,35	0,18	81,33	82,21	83,09	0,08	0,07	8,2136474
45,0	320,0	2,8	0,5	14,6	0,0	348,9	78,0	90,0	528,2	376,1	507,3	493,4	352,1	852,7	0,19	77,11	77,15	83,28	0,18	81,41	82,30	86,69	0,08	0,07	9,7598814
46,0	321,0	2,7	0,5	14,5	0,0	348,1	78,2	89,2	529,5	378,4	509,9	496,9	351,3	847,7	0,19	77,09	77,17	83,21	0,18	81,43	82,39	88,07	0,08	0,07	11,546631
47,0	322,0	2,6	0,5	14,6	0,0	346,9	78,1	90,4	531,2	380,3	512,7	499,3	350,5	843,8	0,19	77,14	77,22	83,25	0,18	81,49	82,47	87,85	0,08	0,07	13,130511
48,0	323,0	2,5	0,4	14,6	0,0	345,1	78,1	90,3	532,9	382,2	516,0	502,4	349,8	841,8	0,19	77,15	77,22	83,27	0,18	81,54	82,56	87,49	0,08	0,07	14,994226
49,0	324,0	2,4	0,4	14,7	0,0	343,4	78,0	89,9	534,1	383,5	518,2	505,6	349,0	842,3	0,19	77,21	77,26	83,22	0,18	81,59	82,65	87,15	0,08	0,07	16,431451
50,0	325,0	2,4	0,3	14,5	0,0	342,2	77,7	89,7	535,1	384,7	520,7	508,8	348,3	840,7	0,18	77,12	77,27	83,16	0,18	81,56	82,69	86,81	0,08	0,07	17,863721
51,0	326,0	2,2	0,3	14,4	0,0	340,6	77,9	89,7	535,7	385,1	524,6	512,2	347,6	834,0	0,19	76,98	77,25	83,12	0,18	81,48	82,73	86,50	0,08	0,07	19,375146
52,0	327,0	2,2	0,4	14,3	0,0	340,0	78,0	89,9	536,8	385,1	529,1	515,7	346,9	824,6	0,19	76,99	77,27	83,11	0,18	81,51	82,78	86,27	0,08	0,06	21,072906
53,0	328,0	2,1	0,3	14,4	0,0	338,3	78,2	90,0	539,1	385,4	533,8	520,0	346,1	824,6	0,19	77,06	77,27	83,12	0,18	81,54	82,81	86,04	0,07	0,07	23,241937
54,0	329,0	2,1	0,2	14,5	0,0	337,7	78,2	89,8	541,1	385,6	538,7	525,2	345,6	832,7	0,19	77,17	77,30	83,11	0,18	81,67	82,87	85,77	0,07	0,07	25,557818
55,0	330,0	2,0	0,3	14,4	0,0	338,4	78,4	89,8	543,3	384,9	542,7	529,9	344,9	831,6	0,19	77,22	77,34	83,07	0,18	81,71	82,93	85,61	0,07	0,07	27,471368
56,0	331,0	1,9	0,2	14,7	0,0	338,4	78,4	89,6	547,4	384,4	546,3	534,3	344,3	836,4	0,18	77,27	77,37	83,07	0,18	81,75	83,02	85,42	0,08	0,07	29,690357
57,0	332,0	1,9	0,3	14,6	0,0	337,0	78,4	90,1	550,5	383,7	549,5	537,9	343,8	824,7	0,19	77,34	77,41	83,06	0,18	81,84	83,11	85,28	0,08	0,06	31,424182
58,0	333,0	1,8	0,1	14,1	0,0	332,7	78,3	89,1	552,2	382,9	552,7	542,0	343,2	811,6	0,19	77,31	77,43	83,04	0,18	81,82	83,10	85,07	0,08	0,06	32,955212
59,0	334,0	1,7	0,1	13,7	0,0	328,2	78,3	88,8	553,0	382,7	554,8	546,2	342,7	808,5	0,19	77,34	77,44	81,63	0,18	81,87	83,15	84,83	0,08	0,07	34,208374
60,0	335,0	1,7	0,1	13,5	0,0	326,0	78,1	89,0	553,6	381,1	557,3	549,8	342,1	805,4	0,19	77,52	77,46	83,59	0,18	82,01	83,21	84,70	0,08	0,06	35,123743
61,0	336,0	1,6	0,0	13,1	0,0	322,6	78,5	89,1	554,0	380,7	558,2	552,9	341,6	797,5	0,19	77,64	77,52	86,47	0,18	82,12	83,31	84,56	0,07	0,06	35,854156
62,0	337,0	1,6	0,0	12,8	0,0	319,7	78,4	88,6	554,3	379,4	560,7	556,5	341,2	784,8	0,19	77,56	77,53	86,53	0,18	82,11	83,38	84,43	0,08	0,06	36,771313
63,0	338,0	1,6	0,0	12,5	0,0	315,4	78,3	88,9	553,5	378,5	560,1	560,0	340,8	770,3	0,19	77,55	77,56	86,24	0,18	82,10	83,44	84,33	0,08	0,06	36,906879
64,0	339,0	1,5	0,0	12,2	0,0	313,4	78,4	88,6	554,1	377,1	559,9	561,7	340,4	759,8	0,19	77,61	77,59	85,82	0,18	82,18	83,50	84,17	0,08	0,06	36,994122
65,0	340,0	1,5	0,0	12,8	0,0	311,9	78,5	89,0	553,7	376,3	559,9	563,5	339,9	755,4	0,19	77,58	77,61	85,59	0,18	82,19	83,57	84,10	0,08	0,06	36,993829
66,0	341,0	1,4	0,0	12,8	0,0	309,2	78,4	88,3	553,2	374,8	558,6	564,7	339,6	743,7	0,19	77,67	77,62	85,29	0,18	82,26	83,57	83,99	0,08	0,06	36,536548
67,0	342,0	1,4	0,0	12,6	0,0	305,9	78,2	88,9	552,2	374,3	558,0	564,3	339,2	745,5	0,19	77,66	77,65	85,02	0,18	82,27	83,69	83,86	0,07	0,06	35,949732
68,0	343,0	1,4	0,0	12,3	0,0	303,3	78,3	88,8	549,1	372,4	559,0	564,9	338,9	743,2	0,19	77,55	77,65	84,85	0,18	82,21	83,72	83,79	0,07	0,06	35,216589
69,0	344,0	1,3	0,0	11,8	0,0	299,8	78,5	87,5	545,1	371,3	559,0	565,1	338,6	731,1	0,19	77,56	77,65	84,57	0,18	82,21	83,70	83,60	0,08	0,06	34,16607
70,0	345,0	1,3	0,0	11,2	0,0	296,4	78,3	88,0	540,4	370,3	559,9	565,7	338,3	715,7	0,19	77,65	77,66	84,38	0,18	82,25	83,76	83,51	0,08	0,06	33,29516
71,0	346,0	1,3	0,0	11,2	0,0	293,4	78,1	87,8	535,5	369,9	560,2	566,6	338,0	709,8	0,19	77,64	77,65	84,20	0,18	82,28	83,77	83,41	0,08	0,06	32,371594
72,0	347,0	1,3	0,0	11,0	0,0	290,0	78,6	87,7	530,7	368,6	559,7	567,7	337,8	702,7	0,19	77,96	77,73	83,98	0,18	82,51	83,83	83,28	0,08	0,06	31,246527
73,0	348,0	1,2	0,0	10,7	0,0	287,6	78,4	87,7	525,2	367,4	560,4	569,0	337,6	697,5	0,19	77,96	77,76	83,80	0,18	82,54	83,92	83,23	0,07	0,06	30,255871
74,0	349,0	1,2	0,0	10,5	0,0	285,4	78,3	87,9	520,6	365,9	561,1	569,4	337,4	692,4	0,19	77,89	77,77	83,67	0,18	82,53	83,94	83,18	0,08	0,05	29,220319
75,0	350,0	1,1	0,0	10,3	0,0	283,5	78,5	87,6	515,1	365,0	562,1	570,3	337,2	689,2	0,19	77,88	77,80	83,55	0,18	82,53	84,01	83,09	0,08	0,06	28,289899
76,0	351,0	1,1	0,0	10,2	0,0	281,3	78,7	87,2	510,0	363,9	561,7	571,0	337,1	687,1	0,19	77,75	77,79	83,43	0,18	82,48	84,00	84,18	0,08	0,05	27,09436
77,0	352,0	1,1	0,0	10,1	0,0	279,4	78,7	87,6	504,0	361,8	562,1	572,8	337,0	678,9	0,19	77,72	77,81	83,34	0,18	82,45	84,05	87,73	0,08	0,05	25,888153
78,0	353,0	1,1	0,0	9,9	0,0	277,5	78,7	87,5	499,2	361,2	561,5	573,3	336,9	674,9	0,19	77,98	77,87	83,16	0,18	82,61	84,11	87,95	0,08	0,05	24,752283
79,0	354,0	1,0	0,0	9,7	0,0	276,3	78,6	87,1	492,4	360,4	560,3	573,6	336,8	675,8	0,19	77,97	77,88	83,07	0,18	82,62	84,18	87,60	0,08	0,05	23,047864
80,0	355,0	1,0	0,0	9,6	0,0	275,8	78,7	87,3	487,7	359,4	561,2	573,4	336,8	673,9	0,19	77,94	77,90	82,97	0,18	82,62	84,22	87,24	0,08	0,06	22,04129
81,0	356,0	1,0	0,0	9,4	0,0	274,4	78,7	87,6	481,9	358,2	559,8	573,4	336,8	671,0	0,19	77,94	77,94	82,93	0,18	82,62	84,26	86,91	0,08	0,05	20,370715
82,0	357,0	1,0	0,0	9,4	0,0	274,0	78,8	87,4	476,7	357,9	559,1	572,4	336,7	666,2	0,19	78,02	77,96	82,89	0,18	82,67	84,28	86,61	0,08	0,05	18,903906
83,0	358,0	1,0	0,0	9,6	0,0	273,3	78,4	87,3	471,8	356,7	558,2	573,2	336,8	661,2	0,19	78,01	77,99	82,78	0,18	82,63	84,27	86,27	0,08	0,05	17,682599
84,0	359,0	1,0	0,0	9,6	0,0	271,9	78,5	87,1	467,0	355,2	558,2	573,5	336,9	655,3	0,19	78,07	78,02	82,71	0,18	82,69	84,29	85,99	0,08	0,05	16,50296
85,0	360,0	0,9	0,0	9,6	0,0	270,5	78,8	87,1	462,7	354,9	556,9	573,9	336,9	653,3	0,19	78,09	78,00	82,66	0,18	82,73	84,27	85,76	0,07	0,05	15,403949
86,0	361,0	0,9	0,0	9,7	0,0	269,0	78,7	87,2	458,5	354,1	555,7	574,5	337,0	646,7	0,19	78,10	78,04	82,63	0,18	82,68	84,25	85,44	0,08	0,05	14,293725
87,0	362,0	0,9	0,0	9,7	0,0	267,7	78,5	86,3	454,6	351,9	555,3	574,2	337,0	645,3	0,19	78,07	78,05	82,53	0,18	82,67	84,23	85,17	0,08	0,05	12,948144
88,0	363,0	0,9	0,0	9,4	0,0	268,0	78,2	86,7	450,0	352,0	554,6	575,6	337,1	650,5	0,19	78,02	78,03	82,41	0,18	82,60	84,20	84,85	0,08	0,05	12,189203
89,0	364,0	0,9	0,0	9,0	0,0	268,1	78,7	86,3	446,0	351,0	554,0	575,8	337,2	655,2	0,19	78,18	78,10	82,25	0,18	82,75	84,31	84,63	0,07	0,05	11,138409
90,0	365,0	0,9	0,0	8,6	0,0	267,5	78,8	85,6	441,7	349,9	552,8	575,2	337,2	651,5	0,19	78,28	78,12	82,16	0,18	82,85	84,37	84,45	0,08	0,05	9,7232484
91,0	366,0	0,9	0,0	8,5	0,0	266,7	78,6	86,0	436,6	348,8	551,5	574,3	337,4	648,9	0,19	78,32	78,14	82,12	0,18	82,94	84,44	84,30	0,08	0,05	8,061389
92,0	367,0	0,8	0,0	8,5	0,0	266,5	78,4	86,2	433,0	347,1	551,8	572,3	337,5	645,5	0,19	78,22	78,12	82,08	0,18	82,86	84,52	84,18	0,08	0,05	6,6982482
93,0	368,0	0,8	0,0	8,5	0,0	266,0	78,4	86,8	429,0	346,3	551,3	570,7	337,8	645,2	0,19	78,07	78,13	82,04	0,18	82,80	84,58	84,08	0,08	0,05	5,3521118
94,0	369,0	0,8	0,0	8,5	0,0	265,9	78,3	86,6	424,6	345,4	550,2	569,2	337,8	644,7	0,19	77,91	78,10	82,00	0,18	82,69	84,61	83,96	0,08	0,05	3,7930236
95,0	370,0	0,8	0,0	8,5	0,0	265,6	78,3	86,2	421,1	343,8	549,2	567,4	338,0	644,4	0,19	77,90	78,10	81,94	0,18	82,66	84,61	83,83	0,08	0,05	2,2518124
96,0	371,0	0,8	0,0	8,5	0,0	265,2	78,5	85,9	417,3	342,0	547,7	567,7	338,2	644,4	0,19	78,07	78,13	82,33	0,18	82,76	84,60	83,68	0,08	0,05	0,9050966
97,0	372,0	0,7	0,0	8,5	0,0

102,0	377,0	0,7	0,0	8,9	0,0	264,3	78,2	86,6	399,3	335,6	546,5	559,8	339,0	647,9	0,19	77,93	78,20	85,67	0,18	82,66	84,63	85,85	0,08	0,05	-5,612482
103,0	378,0	0,6	0,1	8,9	0,0	263,8	78,4	86,6	397,1	334,9	546,8	559,3	339,1	649,1	0,19	77,94	78,19	85,35	0,18	82,67	84,64	88,15	0,07	0,05	-6,20965
104,0	379,0	0,6	0,1	8,8	0,0	264,8	78,3	86,9	394,9	334,6	546,9	559,2	339,2	654,1	0,19	77,92	78,19	85,07	0,18	82,67	84,67	88,01	0,08	0,05	-6,6896
105,0	380,0	0,6	0,1	8,8	0,0	265,5	78,4	85,3	392,3	333,2	546,7	560,8	339,3	655,1	0,19	77,93	78,21	84,77	0,18	82,68	84,66	87,56	0,07	0,05	-7,209229
106,0	381,0	0,7	0,1	8,7	0,0	266,4	78,5	85,9	390,4	332,6	547,6	558,9	339,4	658,0	0,19	78,01	78,25	84,46	0,18	82,73	84,67	87,08	0,07	0,05	-7,887531
107,0	382,0	0,6	0,1	8,6	0,0	266,9	78,3	84,2	388,4	331,5	546,6	560,7	339,5	659,3	0,19	78,28	78,27	84,14	0,18	82,95	84,69	86,62	0,08	0,05	-8,329095
108,0	383,0	0,6	0,1	8,6	0,0	267,7	78,7	85,5	386,4	331,2	547,6	559,1	339,6	662,1	0,19	78,43	78,33	83,85	0,18	83,10	84,76	86,25	0,08	0,05	-8,873541
109,0	384,0	0,5	0,1	8,6	0,0	267,6	78,4	85,2	384,1	329,7	546,9	559,7	339,7	663,2	0,19	78,42	78,37	83,68	0,18	83,13	84,78	86,03	0,08	0,05	-9,643085
110,0	385,0	0,5	0,1	8,7	0,0	267,8	79,0	85,1	383,0	329,7	547,7	559,1	339,9	661,6	0,19	78,63	78,42	83,43	0,18	83,32	84,81	85,70	0,08	0,05	-9,759021
111,0	386,0	0,5	0,1	8,6	0,0	268,0	78,6	85,4	380,6	328,5	547,3	558,3	340,0	663,0	0,19	78,62	78,45	83,31	0,18	83,34	84,88	85,47	0,08	0,05	-10,71464
112,0	387,0	0,5	0,1	8,5	0,0	268,7	78,6	85,9	379,1	327,2	547,3	557,0	340,2	664,8	0,19	78,44	78,46	83,22	0,18	83,23	84,93	85,25	0,08	0,05	-11,51886
113,0	388,0	0,5	0,1	8,5	0,0	270,2	78,6	85,6	377,1	326,1	547,1	556,4	340,2	667,1	0,19	78,26	78,43	83,08	0,18	83,08	84,87	84,95	0,08	0,05	-12,27433
114,0	389,0	0,5	0,1	8,5	0,0	269,3	78,5	86,3	375,8	325,0	546,7	554,7	340,3	663,7	0,19	78,12	78,40	83,01	0,18	82,96	84,78	84,67	0,07	0,05	-13,16991
115,0	390,0	0,5	0,1	8,4	0,0	269,6	78,4	85,8	374,2	324,2	544,5	555,1	340,3	667,6	0,19	78,05	78,39	82,93	0,18	82,88	84,73	84,45	0,08	0,05	-14,02335
116,0	391,0	0,5	0,1	8,4	0,0	270,1	78,4	85,8	372,7	323,7	544,4	553,9	340,3	667,7	0,19	78,02	78,37	82,77	0,18	82,83	84,72	84,23	0,08	0,05	-14,66506
117,0	392,0	0,4	0,1	8,3	0,0	270,3	78,5	84,6	370,6	321,4	542,7	555,1	340,3	665,8	0,19	78,06	78,37	82,64	0,18	82,87	84,75	84,06	0,08	0,05	-15,64644
118,0	393,0	0,4	0,1	8,2	0,0	270,2	78,6	84,7	369,3	321,2	542,9	552,5	340,3	666,6	0,19	78,32	78,42	82,41	0,18	83,05	84,83	83,82	0,07	0,05	-16,40962
119,0	394,0	0,4	0,1	8,2	0,0	270,0	78,2	84,1	367,4	318,7	539,9	553,3	340,3	665,4	0,19	78,36	78,42	82,29	0,18	83,05	84,91	83,68	0,07	0,05	-17,73619
120,0	395,0	0,4	0,1	8,0	0,0	270,8	78,4	83,7	366,4	317,8	540,3	552,0	340,3	663,1	0,19	78,40	78,43	82,07	0,18	83,10	85,00	83,43	0,08	0,05	-18,29295
121,0	396,0	0,4	0,1	7,9	0,0	270,3	78,5	84,9	365,3	317,3	540,2	549,4	340,4	665,1	0,19	78,43	78,46	81,99	0,18	83,13	85,07	83,33	0,08	0,05	-19,13885
122,0	397,0	0,4	0,1	7,8	0,0	270,2	78,4	84,7	363,6	315,9	538,9	548,1	340,4	663,9	0,19	78,30	78,46	83,59	0,18	83,08	85,05	83,19	0,08	0,05	-20,28942
123,0	398,0	0,4	0,1	7,8	0,0	270,6	78,3	85,2	362,4	314,6	537,9	546,8	340,5	662,1	0,19	78,22	78,45	86,08	0,18	83,04	85,02	83,07	0,08	0,05	-21,21315
124,0	399,0	0,4	0,1	7,8	0,0	270,1	78,3	85,7	361,1	312,8	536,8	544,4	340,4	661,9	0,19	78,12	78,44	86,13	0,18	82,98	85,00	83,01	0,07	0,05	-22,56273
125,0	400,0	0,3	0,1	7,8	0,0	270,1	78,1	85,4	359,2	311,4	535,5	542,1	340,4	660,2	0,19	78,00	78,43	85,58	0,18	82,89	84,98	85,23	0,08	0,05	-23,93643
126,0	401,0	0,4	0,1	7,8	0,0	269,8	78,3	85,1	357,6	309,4	533,1	541,7	340,4	658,9	0,19	77,95	78,39	85,12	0,18	82,81	84,97	88,03	0,08	0,05	-25,24047
127,0	402,0	0,3	0,1	7,9	0,0	269,4	78,3	85,5	357,0	307,9	534,0	538,6	340,4	657,2	0,19	77,96	78,40	84,62	0,18	82,82	84,98	87,83	0,08	0,05	-26,05645
128,0	403,0	0,3	0,1	8,0	0,0	269,4	78,4	85,8	355,9	306,4	533,0	536,4	340,3	657,0	0,19	78,00	78,42	84,35	0,18	82,83	84,91	87,38	0,08	0,05	-27,26173
129,0	404,0	0,3	0,1	7,9	0,0	268,8	78,2	84,8	354,6	305,5	532,2	535,3	340,2	655,7	0,19	78,06	78,43	84,04	0,18	82,84	84,84	86,86	0,08	0,05	-28,09127
130,0	405,0	0,3	0,1	7,9	0,0	269,2	78,5	85,3	353,6	303,5	531,2	533,3	340,2	656,0	0,19	78,23	78,44	83,81	0,18	82,97	84,85	86,52	0,08	0,05	-29,29826
131,0	406,0	0,2	0,1	7,9	0,0	268,8	78,4	84,6	352,3	302,7	529,9	531,4	340,1	654,0	0,19	78,22	78,45	83,52	0,18	82,95	84,82	86,14	0,08	0,05	-30,3406
132,0	407,0	0,3	0,1	8,0	0,0	268,5	78,4	85,2	351,4	301,9	529,4	530,6	340,1	650,0	0,19	78,14	78,44	83,37	0,18	82,89	84,78	85,82	0,08	0,05	-30,96323
133,0	408,0	0,2	0,1	8,1	0,0	267,9	78,7	85,6	350,0	301,6	528,6	529,9	340,0	649,0	0,19	78,20	78,46	83,26	0,18	82,94	84,79	85,56	0,08	0,05	-31,63538
134,0	409,0	0,2	0,1	8,1	0,0	267,3	78,7	86,2	349,6	301,1	528,6	529,0	340,0	646,6	0,19	78,31	78,51	83,17	0,18	83,04	84,81	85,35	0,08	0,05	-32,01079
135,0	410,0	0,2	0,1	8,0	0,0	266,8	78,7	85,4	348,5	300,2	527,0	529,0	339,9	646,5	0,19	78,37	78,52	83,04	0,18	83,10	84,79	85,07	0,08	0,05	-32,74395
136,0	411,0	0,2	0,1	7,9	0,0	266,4	78,4	85,6	347,4	298,7	526,1	527,7	339,9	643,3	0,19	78,44	78,53	82,87	0,18	83,16	84,83	84,88	0,08	0,05	-33,70322
137,0	412,0	0,2	0,1	8,0	0,0	265,9	78,7	86,0	346,7	298,3	526,9	527,5	340,0	642,5	0,19	78,51	78,57	82,79	0,18	83,22	84,89	84,68	0,08	0,05	-33,77791
138,0	413,0	0,2	0,1	8,0	0,0	265,7	78,9	85,7	345,6	297,7	526,1	526,9	340,0	637,7	0,19	78,62	78,58	82,70	0,18	83,31	84,90	84,52	0,08	0,05	-34,40236
139,0	414,0	0,1	0,1	7,9	0,0	264,9	78,9	85,4	344,4	296,9	524,5	526,6	340,0	636,6	0,19	78,64	78,62	82,58	0,18	83,35	84,91	84,32	0,08	0,05	-35,19782
140,0	415,0	0,1	0,1	7,7	0,0	263,8	78,8	84,9	343,5	295,6	523,5	524,6	340,0	635,3	0,18	78,56	78,63	82,45	0,18	83,32	84,87	84,08	0,08	0,05	-36,20591
141,0	416,0	0,1	0,1	7,7	0,0	263,7	78,8	85,2	342,1	294,7	521,5	523,9	340,0	633,7	0,19	78,53	78,63	82,40	0,18	83,27	84,81	83,92	0,08	0,05	-37,21744
142,0	417,0	0,1	0,1	7,5	0,0	263,3	78,6	84,2	341,0	294,2	520,8	522,3	340,0	632,1	0,19	78,50	78,63	82,23	0,18	83,25	84,79	83,68	0,08	0,05	-37,97261
143,0	418,0	0,1	0,1	7,5	0,0	263,2	78,3	84,5	339,6	293,5	517,9	522,6	340,1	633,2	0,19	78,42	78,60	82,11	0,18	83,17	84,74	83,45	0,08	0,05	-38,92237
144,0	419,0	0,1	0,1	7,8	0,0	262,9	78,5	84,3	338,9	292,2	516,8	521,6	340,1	627,8	0,19	78,40	78,61	81,95	0,18	83,18	84,75	83,27	0,08	0,05	-39,72761
145,0	420,0	0,1	0,1	8,1	0,0	260,7	78,6	84,4	338,0	291,7	514,8	519,7	340,2	619,9	0,19	78,38	78,62	81,92	0,18	83,16	84,75	83,17	0,07	0,05	-40,76328
146,0	421,0	0,1	0,1	7,7	0,0	260,2	78,6	84,7	336,4	291,9	512,7	519,1	340,1	626,1	0,19	78,33	78,60	84,03	0,18	83,13	84,72	86,05	0,08	0,05	-41,61736
147,0	422,0	0,1	0,1	7,6	0,0	260,7	78,3	84,3	334,9	292,2	510,7	516,9	340,2	625,8	0,19	78,27	78,59	85,98	0,18	83,07	84,68	88,08	0,08	0,05	-42,69703
148,0	423,0	0,1	0,1	7,5	0,0	261,0	78,5	84,6	334,1	292,1	509,9	514,7	340,2	627,8	0,19	78,31	78,61	85,64	0,18	83,07	84,70	87,79	0,07	0,05	-43,45912
149,0	424,0	0,0	0,1	7,7	0,0	260,2	78,4	84,9	333,2	291,2	507,7	511,5	340,2	628,7	0,19	78,22	78,60	85,13	0,18	83,07	84,78	87,38	0,08	0,05	-44,89171

Manufacturer: HEARTHSTONE
Model: 8060

Run: 2
Project #: PI 20272
Test Duration: 149 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	80,50%	87,00%
Comb Eff	98,92%	98,92%
HT Eff	81,38%	87,95%
Output	16 620	kJ/h
Burn Rate	1,04	kg/h
Grams CO	45	g
Input	20 648	kJ/h
MC wet	17,04	

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

Overall Heating Efficiency: 80,50%
Combustion Efficiency: 98,92%
Heat Transfer Efficiency: 81,38%

Heat Output: 15 766 Btu/h
Heat Input: 19 586 Btu/h
Burn Duration: 2,48 h
Burn Rate: 2,30 lb/h
Stack Temp: 298,9 Deg. F

Averages	0,14	10,66	0,99	20,23	9,50	148,25	25,59	0,99	0,81	0,81
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	3,12	0,21	3,05	502,5%	20,72	17,57	141,9	24,8	96,2%	65,9%	63,4%
1,00	3,12	0,59	2,80	478,7%	20,72	17,62	136,7	24,7	87,0%	65,0%	56,6%
2,00	3,07	0,15	5,62	240,3%	20,56	14,86	154,3	24,8	98,6%	74,7%	73,6%
3,00	3,07	0,11	6,15	213,8%	20,53	14,32	164,4	24,8	99,1%	74,7%	74,1%
4,00	3,03	0,09	7,29	166,1%	20,45	13,12	166,3	24,8	99,5%	76,7%	76,4%
5,00	2,98	0,07	9,15	113,2%	20,33	11,15	161,8	24,8	99,7%	79,4%	79,2%
6,00	2,98	0,08	10,91	78,8%	20,21	9,27	154,2	25,0	99,6%	81,4%	81,1%
7,00	2,94	0,07	7,49	159,8%	20,44	12,91	153,2	24,6	99,7%	78,2%	78,0%
8,00	2,89	0,06	7,25	168,8%	20,46	13,18	152,4	24,8	99,8%	77,9%	77,8%
9,00	2,89	0,06	7,18	171,4%	20,46	13,25	149,7	25,0	99,9%	78,1%	78,0%
10,00	2,85	0,05	8,38	132,8%	20,38	11,97	149,4	25,2	99,9%	79,7%	79,6%
11,00	2,80	0,62	14,19	32,6%	19,96	5,46	156,1	25,2	96,5%	82,7%	79,9%
12,00	2,79	0,35	14,14	35,6%	19,98	5,67	158,6	25,4	98,1%	82,7%	81,1%
13,00	2,71	0,11	13,53	44,0%	20,04	6,45	158,2	25,3	99,5%	82,5%	82,1%
14,00	2,67	0,05	12,97	50,9%	20,08	7,09	158,0	24,9	99,8%	82,3%	82,1%
15,00	2,62	0,29	14,35	34,2%	19,97	5,48	161,7	24,8	98,5%	82,6%	81,3%
16,00	2,61	0,22	14,76	31,1%	19,95	5,08	164,5	24,9	98,9%	82,6%	81,7%
17,00	2,57	0,08	14,26	37,0%	19,99	5,70	164,6	24,9	99,6%	82,5%	82,2%
18,00	2,53	0,04	13,98	40,2%	20,01	6,02	164,5	25,1	99,9%	82,4%	82,3%
19,00	2,48	0,09	14,60	33,7%	19,97	5,32	166,4	25,0	99,6%	82,5%	82,2%
20,00	2,44	0,09	14,50	34,7%	19,98	5,43	168,0	25,0	99,6%	82,4%	82,1%
21,00	2,39	0,06	14,32	36,7%	19,99	5,65	168,9	25,1	99,8%	82,3%	82,1%
22,00	2,35	0,05	14,21	37,8%	20,00	5,77	169,1	25,1	99,8%	82,2%	82,1%
23,00	2,30	0,16	14,44	34,6%	19,98	5,46	170,5	25,2	99,2%	82,2%	81,6%
24,00	2,21	0,12	14,47	34,6%	19,98	5,44	172,3	25,2	99,4%	82,2%	81,7%
25,00	2,19	0,28	14,63	31,7%	19,96	5,18	175,2	25,2	98,5%	82,0%	80,8%
26,00	2,12	0,46	14,29	33,1%	19,97	5,44	176,5	25,0	97,4%	81,7%	79,6%
27,00	2,08	0,32	14,54	32,2%	19,96	5,26	176,8	25,1	98,3%	81,9%	80,5%
28,00	2,03	0,25	14,78	30,7%	19,95	5,04	178,0	25,0	98,7%	81,9%	80,9%
29,00	1,98	0,35	14,75	30,1%	19,94	5,02	178,4	25,1	98,2%	81,9%	80,4%
30,00	1,94	0,34	14,78	29,9%	19,94	4,99	179,1	25,1	98,2%	81,9%	80,4%
31,00	1,89	0,33	14,73	30,4%	19,95	5,05	179,5	25,0	98,2%	81,8%	80,4%
32,00	1,85	0,35	14,25	34,5%	19,98	5,54	180,2	25,2	98,1%	81,6%	80,0%
33,00	1,97	0,29	14,22	35,3%	19,98	5,61	180,2	25,3	98,4%	81,6%	80,3%
34,00	1,76	0,25	14,19	36,0%	19,99	5,67	180,0	25,3	98,6%	81,6%	80,5%
35,00	1,71	0,26	14,24	35,4%	19,98	5,61	179,8	25,4	98,6%	81,6%	80,4%
36,00	1,67	0,32	14,26	34,8%	19,98	5,56	179,7	25,3	98,3%	81,6%	80,2%
37,00	1,62	0,36	14,32	33,8%	19,97	5,47	179,0	25,3	98,0%	81,7%	80,0%
38,00	1,58	0,40	14,49	31,9%	19,96	5,27	178,4	25,3	97,8%	81,8%	80,0%
39,00	1,53	0,42	14,37	32,8%	19,96	5,38	178,3	25,4	97,7%	81,7%	79,8%
40,00	1,49	0,45	14,42	32,1%	19,96	5,31	177,9	25,4	97,6%	81,7%	79,7%
41,00	1,44	0,47	14,49	31,3%	19,95	5,23	177,8	25,5	97,4%	81,8%	79,7%
42,00	1,39	0,48	14,52	30,9%	19,95	5,19	177,3	25,5	97,4%	81,8%	79,7%
43,00	1,35	0,50	14,50	30,9%	19,95	5,20	176,9	25,4	97,3%	81,8%	79,6%
44,00	1,26	0,50	14,47	31,2%	19,95	5,23	176,1	25,5	97,3%	81,8%	79,6%
45,00	1,26	0,47	14,55	30,7%	19,95	5,16	176,1	25,6	97,4%	81,9%	79,8%
46,00	1,21	0,47	14,54	30,9%	19,95	5,18	175,6	25,7	97,4%	81,9%	79,8%
47,00	1,17	0,47	14,63	30,1%	19,94	5,08	174,9	25,6	97,5%	82,0%	79,9%
48,00	1,12	0,43	14,63	30,4%	19,95	5,10	174,0	25,6	97,7%	82,1%	80,2%
49,00	1,08	0,38	14,67	30,5%	19,95	5,09	173,0	25,6	98,0%	82,1%	80,5%
50,00	1,07	0,30	14,52	32,5%	19,96	5,29	172,3	25,4	98,4%	82,1%	80,8%
51,00	0,99	0,34	14,39	33,4%	19,97	5,41	171,4	25,5	98,2%	82,1%	80,6%
52,00	0,99	0,39	14,25	34,1%	19,97	5,52	171,1	25,5	97,8%	82,0%	80,3%
53,00	0,94	0,33	14,35	33,8%	19,97	5,45	170,2	25,6	98,2%	82,2%	80,7%
54,00	0,93	0,22	14,52	33,2%	19,97	5,34	169,8	25,7	98,8%	82,3%	81,3%
55,00	0,89	0,28	14,44	33,5%	19,97	5,39	170,2	25,8	98,5%	82,2%	81,0%
56,00	0,85	0,19	14,67	32,2%	19,96	5,20	170,2	25,8	99,0%	82,4%	81,6%
57,00	0,85	0,34	14,65	31,1%	19,95	5,13	169,5	25,8	98,2%	82,3%	80,8%
58,00	0,80	0,12	14,11	38,0%	20,00	5,83	167,1	25,7	99,4%	82,3%	81,8%
59,00	0,76	0,08	13,68	42,8%	20,03	6,31	164,6	25,7	99,6%	82,3%	82,0%
60,00	0,76	0,07	13,53	44,4%	20,04	6,48	163,3	25,6	99,7%	82,3%	82,0%
61,00	0,71	0,04	13,12	49,3%	20,07	6,93	161,5	25,8	99,9%	82,2%	82,1%
62,00	0,71	0,04	12,75	53,6%	20,10	7,32	159,8	25,8	99,9%	82,1%	82,1%
63,00	0,71	0,03	12,47	57,1%	20,11	7,63	157,5	25,7	100,0%	82,1%	82,1%
64,00	0,67	0,03	12,23	60,3%	20,13	7,89	156,3	25,8	100,0%	82,1%	82,1%
65,00	0,67	0,03	12,75	53,7%	20,10	7,33	155,5	25,8	100,0%	82,4%	82,4%
66,00	0,62	0,02	12,84	52,7%	20,09	7,24	154,0	25,8	100,0%	82,5%	82,5%
67,00	0,62	0,02	12,56	56,2%	20,11	7,54	152,1	25,7	100,1%	82,5%	82,5%
68,00	0,62	0,02	12,30	59,5%	20,13	7,82	150,7	25,7	100,1%	82,4%	82,5%
69,00	0,58	0,02	11,78	66,5%	20,16	8,37	148,8	25,8	100,1%	82,3%	82,4%
70,00	0,58	0,02	11,18	75,4%	20,20	9,01	146,9	25,7	100,1%	82,1%	82,2%
71,00	0,58	0,02	11,23	74,6%	20,20	8,96	145,2	25,6	100,1%	82,2%	82,3%
72,00	0,58	0,02	10,98	78,5%	20,21	9,22	143,4	25,9	100,1%	82,2%	82,3%
73,00	0,53	0,02	10,73	82,6%	20,23	9,48	142,0	25,8	100,1%	82,1%	82,2%
74,00	0,53	0,02	10,51	86,4%	20,24	9,72	140,8	25,7	100,1%	82,1%	82,1%
75,00	0,49	0,03	10,31	90,1%	20,26	9,94	139,7	25,8	100,1%	82,0%	82,1%
76,00	0,49	0,03	10,22	91,8%	20,26	10,03	138,5	26,0	100,1%	82,1%	82,1%
77,00	0,49	0,03	10,05	94,8%	20,27	10,21	137,4	26,0	100,1%	82,0%	82,1%
78,00	0,49	0,03	9,88	98,4%	20,29	10,40	136,4	25,9	100,1%	82,0%	82,1%
79,00	0,47	0,03	9,69	102,0%	20,30	10,59	135,7	25,9	100,1%	81,9%	82,0%
80,00	0,45	0,03	9,57	104,5%	20,31	10,72	135,5	25,9	100,0%	81,8%	81,9%
81,00	0,44	0,03	9,37	108,8%	20,32	10,93	134,7	26,0	100,0%	81,8%	81,8%
82,00	0,44	0,03	9,43	107,6%	20,32	10,87	134,5	26,0	100,0%	81,8%	81,8%
83,00	0,44	0,03	9,61	103,7%	20,30	10,68	134,0	25,8	100,0%	82,0%	82,0%
84,00	0,44	0,03	9,59	104,0%	20,30	10,69	133,3	25,8	100,0%	82,0%	82,0%
85,00	0,40	0,03	9,59	104,0%	20,30	10,69	132,5	26,0	100,0%	82,1%	82,1%
86,00	0,40	0,03	9,73	101,2%	20,30	10,55	131,7	26,0	100,0%	82,2%	82,2%
87,00	0,40	0,03	9,71	101,7%	20,30	10,57	130,9	25,8	100,0%	82,3%	82,3%
88,00	0,40	0,04	9,36	109,1%	20,32	10,94	131,1	25,7	100,0%	82,0%	82,0%
89,00	0,40	0,04	8,96	118,2%	20,35	11,36	131,2	25,9	100,0%	81,7%	81,7%
90,00	0,39	0,04	8,65	126,1%	20,37	11,70	130,9	26,0	100,0%	81,5%	81,5%
91,00	0,40	0,04	8,50	130,0%	20,38	11,86	130,4	25,9	100,0%	81,4%	81,4%
92,00	0,35	0,04	8,48	130,4%	20,38	11,87	130,3	25,8	100,0%	81,4%	81,4%

93,00	0,35	0,04	8,50	130,0%	20,38	11,85	130,0	25,8	100,0%	81,4%	81,4%
94,00	0,35	0,04	8,52	129,4%	20,37	11,83	129,9	25,7	100,0%	81,4%	81,4%
95,00	0,35	0,04	8,53	129,0%	20,37	11,82	129,8	25,7	100,0%	81,5%	81,4%
96,00	0,35	0,04	8,53	129,0%	20,37	11,82	129,6	25,8	100,0%	81,5%	81,5%
97,00	0,30	0,05	8,47	130,8%	20,38	11,89	129,5	25,8	100,0%	81,4%	81,4%
98,00	0,30	0,05	8,50	129,8%	20,38	11,85	129,3	25,7	99,9%	81,5%	81,4%
99,00	0,30	0,05	8,63	126,4%	20,37	11,71	129,2	25,8	99,9%	81,6%	81,5%
100,00	0,30	0,05	8,75	123,3%	20,36	11,59	129,4	25,8	99,9%	81,7%	81,6%
101,00	0,30	0,05	8,96	118,0%	20,35	11,36	129,2	25,7	99,9%	81,8%	81,8%
102,00	0,30	0,05	8,95	118,4%	20,35	11,38	129,1	25,7	99,9%	81,8%	81,8%
103,00	0,26	0,05	8,86	120,4%	20,35	11,46	128,8	25,8	99,9%	81,8%	81,7%
104,00	0,26	0,05	8,81	121,5%	20,35	11,51	129,3	25,7	99,9%	81,7%	81,6%
105,00	0,26	0,06	8,80	121,9%	20,36	11,53	129,7	25,8	99,9%	81,7%	81,6%
106,00	0,30	0,06	8,70	124,3%	20,36	11,63	130,2	25,9	99,8%	81,6%	81,4%
107,00	0,26	0,06	8,60	126,9%	20,37	11,74	130,5	25,7	99,8%	81,4%	81,3%
108,00	0,26	0,06	8,58	127,3%	20,37	11,76	130,9	25,9	99,8%	81,4%	81,3%
109,00	0,22	0,06	8,60	126,8%	20,37	11,74	130,9	25,8	99,8%	81,4%	81,3%
110,00	0,22	0,06	8,67	125,1%	20,36	11,67	131,0	26,1	99,8%	81,5%	81,3%
111,00	0,22	0,06	8,57	127,7%	20,37	11,78	131,1	25,9	99,8%	81,4%	81,2%
112,00	0,22	0,06	8,50	129,4%	20,37	11,84	131,5	25,9	99,8%	81,3%	81,1%
113,00	0,22	0,06	8,45	130,7%	20,38	11,89	132,3	25,9	99,8%	81,2%	81,0%
114,00	0,22	0,06	8,47	130,2%	20,38	11,88	131,8	25,8	99,8%	81,2%	81,1%
115,00	0,22	0,06	8,44	131,1%	20,38	11,91	132,0	25,8	99,8%	81,2%	81,0%
116,00	0,22	0,07	8,39	132,4%	20,38	11,96	132,3	25,8	99,8%	81,1%	80,9%
117,00	0,17	0,07	8,25	136,2%	20,39	12,11	132,4	25,8	99,8%	81,0%	80,8%
118,00	0,17	0,06	8,19	137,9%	20,39	12,17	132,4	25,9	99,8%	80,9%	80,8%
119,00	0,17	0,06	8,17	138,6%	20,40	12,20	132,2	25,7	99,8%	80,9%	80,7%
120,00	0,17	0,06	8,02	142,9%	20,41	12,35	132,7	25,8	99,8%	80,7%	80,6%
121,00	0,17	0,07	7,93	145,8%	20,41	12,45	132,4	25,8	99,8%	80,7%	80,5%
122,00	0,17	0,06	7,82	149,0%	20,42	12,56	132,3	25,8	99,8%	80,6%	80,4%
123,00	0,17	0,06	7,81	149,4%	20,42	12,58	132,5	25,7	99,8%	80,5%	80,4%
124,00	0,17	0,06	7,77	150,6%	20,42	12,62	132,3	25,7	99,8%	80,5%	80,3%
125,00	0,12	0,07	7,77	150,6%	20,42	12,62	132,3	25,6	99,8%	80,5%	80,3%
126,00	0,17	0,07	7,75	151,2%	20,42	12,64	132,1	25,7	99,8%	80,5%	80,3%
127,00	0,12	0,06	7,85	148,1%	20,42	12,53	131,9	25,7	99,8%	80,6%	80,4%
128,00	0,12	0,07	7,99	143,8%	20,41	12,38	131,9	25,8	99,8%	80,8%	80,6%
129,00	0,12	0,06	7,94	145,3%	20,41	12,44	131,6	25,7	99,8%	80,7%	80,6%
130,00	0,12	0,07	7,91	146,4%	20,41	12,48	131,8	25,9	99,8%	80,7%	80,5%
131,00	0,09	0,06	7,94	145,5%	20,41	12,44	131,6	25,8	99,8%	80,7%	80,6%
132,00	0,12	0,06	8,03	142,8%	20,41	12,35	131,4	25,8	99,8%	80,9%	80,7%
133,00	0,08	0,06	8,12	139,9%	20,40	12,24	131,0	25,9	99,8%	81,0%	80,8%
134,00	0,08	0,06	8,08	141,3%	20,40	12,30	130,7	25,9	99,8%	81,0%	80,8%
135,00	0,08	0,06	8,04	142,5%	20,41	12,34	130,5	25,9	99,8%	81,0%	80,8%
136,00	0,08	0,06	7,94	145,5%	20,41	12,44	130,2	25,8	99,8%	80,9%	80,7%
137,00	0,08	0,06	7,97	144,5%	20,41	12,41	129,9	26,0	99,8%	80,9%	80,8%
138,00	0,08	0,06	7,96	144,9%	20,41	12,42	129,8	26,0	99,8%	80,9%	80,8%
139,00	0,03	0,06	7,87	147,6%	20,42	12,51	129,4	26,0	99,8%	80,9%	80,7%
140,00	0,03	0,06	7,73	152,1%	20,43	12,66	128,8	26,0	99,8%	80,8%	80,6%
141,00	0,03	0,06	7,75	151,5%	20,42	12,65	128,7	26,0	99,8%	80,8%	80,7%
142,00	0,03	0,06	7,53	158,8%	20,44	12,88	128,5	25,9	99,8%	80,6%	80,4%
143,00	0,03	0,06	7,51	159,4%	20,44	12,90	128,5	25,7	99,8%	80,6%	80,4%
144,00	0,03	0,06	7,76	151,1%	20,42	12,63	128,3	25,9	99,8%	80,9%	80,7%
145,00	0,03	0,06	8,12	140,2%	20,40	12,25	127,0	25,9	99,8%	81,3%	81,2%
146,00	0,03	0,06	7,75	151,5%	20,42	12,65	126,8	25,9	99,8%	81,0%	80,8%
147,00	0,03	0,06	7,62	155,5%	20,43	12,78	127,1	25,7	99,8%	80,8%	80,6%
148,00	0,03	0,06	7,54	158,2%	20,44	12,86	127,2	25,8	99,8%	80,7%	80,6%
149,00	0,00	0,07	7,66	154,3%	20,43	12,74	126,8	25,8	99,8%	80,9%	80,7%

DATA 2022-06-28 EPA PI 20272 RUN 2 MODEL 8060
preburn

Temps acquisition minutes	Flue temp °F	Room temp °F	Tunnel dry bulb °F	Catalyst °F	scale lbs	Right °F	Back °F	bottom °F	Top °F	Left °F
0	74,30	71,56	75,91	75,40	2,67	76,07	75,80	76,32	76,20	76,69
1	84,65	71,61	76,48	94,50	2,67	76,12	75,90	76,29	76,27	76,80
2	134,02	71,60	81,51	207,65	2,47	76,59	76,11	76,36	76,65	78,02
3	190,16	71,51	79,40	476,98	2,47	77,38	76,72	76,60	77,20	81,39
4	275,70	71,71	80,99	643,93	2,34	78,98	78,86	77,11	79,24	84,60
5	333,38	71,93	82,97	760,00	2,27	81,47	82,65	78,17	83,23	90,61
6	358,66	71,69	84,10	771,73	2,07	85,31	87,00	80,08	89,10	106,66
7	376,29	72,02	84,80	747,73	1,89	91,52	91,54	82,77	96,46	128,09
8	366,78	72,20	85,05	674,31	1,77	99,81	97,06	85,90	104,01	147,52
9	405,99	72,19	87,08	805,53	1,57	110,66	104,49	89,15	112,25	161,14
10	433,82	72,18	88,48	836,01	1,47	127,39	114,21	92,31	120,48	172,92
11	452,97	72,48	89,85	870,92	1,27	146,97	125,22	95,27	128,28	186,23
12	467,68	72,82	107,27	679,66	1,17	167,23	140,94	98,04	134,34	201,53
13	423,55	73,03	120,02	451,05	1,87	190,33	163,62	100,78	134,66	219,95
14	332,83	72,63	111,75	307,90	8,28	216,12	180,64	103,53	136,02	242,01
15	323,91	72,46	95,95	500,87	8,18	235,15	189,74	106,28	142,85	254,79
16	313,65	72,46	88,88	485,71	8,08	246,29	194,62	108,93	149,80	260,12
17	316,80	72,46	86,73	538,09	7,98	251,58	199,54	111,40	156,78	262,03
18	347,20	72,48	86,83	641,27	7,98	254,07	204,37	113,77	164,61	263,01
19	360,08	72,58	86,68	645,52	7,77	257,19	208,48	115,99	171,75	264,07
20	354,66	72,52	86,47	616,91	7,73	259,72	213,31	118,15	178,36	266,10
21	342,25	72,49	86,12	565,69	7,67	262,75	217,69	120,51	184,61	268,01
22	336,88	72,66	86,01	584,35	7,58	265,56	220,62	123,17	190,82	269,94
23	350,95	72,74	86,64	633,47	7,48	268,10	223,26	126,14	196,58	272,00
24	352,47	72,81	86,68	624,48	7,40	271,62	224,19	129,45	202,13	274,65
25	351,26	72,82	86,50	619,53	7,38	275,33	223,83	132,75	207,54	277,19
26	340,97	72,70	85,88	585,39	7,27	278,33	222,68	136,44	212,75	279,56
27	325,86	72,68	85,96	551,02	7,17	281,83	221,95	140,24	217,65	282,54
28	320,75	72,01	85,26	553,98	7,17	283,66	219,41	144,20	222,18	284,25
29	318,93	71,96	85,22	544,66	7,17	285,45	215,77	148,33	226,26	286,10
30	300,99	72,09	84,57	489,18	7,07	287,87	212,56	152,52	229,90	287,99
31	277,09	72,34	83,90	436,11	6,97	288,86	208,79	156,85	233,27	289,18
32	318,70	72,32	88,34	533,68	6,88	289,11	204,62	161,26	235,55	289,03
33	381,57	72,43	88,85	757,61	6,78	293,88	200,62	165,66	237,79	290,14
34	430,54	72,37	90,58	849,83	6,57	305,28	200,01	170,06	240,37	294,16
35	461,44	72,61	92,50	882,98	6,47	319,95	201,09	174,71	243,97	300,46
36	469,26	72,49	92,65	852,35	6,27	335,62	203,78	179,73	248,79	308,06
37	456,70	72,37	92,35	820,72	6,18	350,38	207,05	185,23	254,80	316,46
38	454,13	72,65	92,93	824,41	6,08	364,55	210,33	191,09	261,51	324,44
39	458,54	72,24	93,40	835,51	5,97	376,28	213,04	197,10	268,40	331,05
40	475,33	72,29	94,20	878,05	5,77	389,02	215,41	203,30	275,76	337,51
41	490,03	72,49	95,18	907,48	5,67	401,60	220,20	209,98	283,69	345,15
42	495,55	72,70	95,73	918,28	5,57	414,40	224,38	216,60	291,49	353,40
43	500,21	72,79	96,22	929,18	5,38	426,22	229,64	223,21	299,67	361,81
44	506,54	72,91	97,17	942,06	5,17	439,13	234,16	229,61	308,06	370,63
45	510,09	73,08	97,19	935,19	5,07	452,53	239,29	235,88	316,39	379,56
46	512,97	73,22	97,34	938,94	4,87	464,44	243,97	241,97	325,02	388,16
47	512,76	73,24	97,13	922,68	4,78	476,15	250,01	248,01	333,69	396,87
48	513,06	73,38	97,07	939,00	4,68	485,38	256,12	254,07	342,28	404,78
49	513,01	73,41	97,02	944,28	4,47	494,07	261,33	259,62	350,26	411,05
50	511,90	73,32	96,99	936,67	4,37	502,62	266,31	264,84	358,64	418,46
51	506,57	73,16	97,30	916,56	4,27	510,00	271,44	269,68	366,07	425,33
52	499,00	73,17	97,47	905,39	4,17	516,64	276,20	274,08	373,65	432,60
53	493,00	73,36	97,59	898,05	4,08	522,37	281,05	278,17	380,53	439,93
54	490,54	73,43	96,95	902,99	3,97	526,26	284,54	281,80	386,46	447,25
55	491,49	73,53	96,78	921,01	3,87	532,03	286,95	285,03	392,32	455,09
56	496,25	73,43	96,85	944,98	3,67	536,40	289,90	288,10	397,51	463,70
57	504,95	73,41	98,06	980,46	3,57	541,37	293,31	291,37	402,53	473,19
58	522,19	73,36	99,08	1050,90	3,47	546,22	296,19	294,47	407,84	482,26
59	538,53	73,45	99,66	1096,32	3,27	551,60	299,52	297,78	413,17	491,59
60	551,13	73,80	101,12	1122,37	3,17	557,68	302,65	301,10	418,99	500,78
61	557,96	73,78	101,78	1130,89	2,97	564,91	306,36	304,45	425,23	510,35
62	556,81	74,07	102,15	1080,50	2,87	572,08	311,46	308,06	432,19	520,17
63	554,93	73,84	101,92	1079,02	2,68	579,43	316,67	311,77	438,70	529,70
64	549,44	73,93	101,42	1055,72	2,58	586,78	323,44	315,75	445,07	538,31
65	540,00	74,27	101,53	1032,37	2,47	594,26	328,86	319,55	451,35	546,64
66	530,23	73,90	100,25	1009,57	2,37	601,13	334,22	322,91	457,36	554,29
67	520,29	74,09	99,63	979,72	2,27	608,31	339,30	325,84	463,47	560,65
68	504,03	73,98	98,99	924,11	2,27	613,30	343,39	328,41	468,24	566,81
69	489,85	74,07	98,48	889,08	2,17	617,36	347,27	330,83	472,87	572,40
70	478,87	74,40	97,45	867,99	2,16	621,29	350,63	333,08	475,48	576,97
71	468,18	74,57	97,38	856,23	2,07	624,08	352,92	335,29	477,61	581,01
72	458,61	74,87	96,53	830,62	1,98	625,73	354,38	337,44	477,98	584,02
73	446,97	75,09	95,78	800,61	1,98	629,13	354,91	339,65	478,34	586,57
74	436,18	74,94	95,04	777,38	1,87	630,35	354,26	341,90	477,30	589,01
75	428,23	74,81	95,08	764,41	1,87	633,17	355,01	344,21	475,54	590,73
76	425,92	74,85	94,99	761,41	1,86	635,30	354,53	346,70	473,60	592,06
77	423,68	74,64	95,06	761,26	1,77	637,56	353,91	349,36	470,89	592,85
78	418,35	74,98	94,58	774,08	1,67	638,85	353,84	352,26	467,46	593,44
79	413,71	75,23	94,25	759,74	1,67	640,91	353,48	355,24	464,42	593,86
80	409,37	75,29	93,72	752,48	1,57	641,17	353,79	358,37	460,95	594,96
81	404,07	75,18	93,88	742,06	1,57	641,97	353,04	361,49	457,38	595,70
82	399,85	75,20	93,31	734,79	1,57	642,58	353,23	364,67	454,04	595,72
83	395,52	75,00	93,17	730,58	1,47	641,88	352,67	367,93	450,32	595,79
84	391,11	74,89	93,21	716,78	1,47	641,93	352,57	371,22	447,00	595,63
85	387,41	75,02	93,06	707,46	1,37	641,48	353,52	374,58	442,81	595,25
86	382,89	75,24	92,13	699,98	1,37	641,17	352,99	377,92	439,39	594,94
87	377,61	75,30	92,61	687,24	1,37	640,36	353,11	381,33	435,21	595,40
88	373,30	75,17	92,40	677,44	1,28	638,94	351,88	384,74	431,52	595,17
89	367,56	75,38	91,66	665,93	1,28	637,42	351,02	388,13	427,60	595,64

90	362,71	75,46	91,76	657,84	1,28	635,71	349,70	391,50	423,16	597,58
91	358,09	75,56	91,08	657,80	1,28	634,96	347,13	394,91	419,95	597,51
92	337,23	75,83	112,29	396,13	4,45	632,58	353,57	398,60	413,94	598,25
93	304,87	75,57	104,23	415,06	8,48	630,02	353,41	402,63	408,70	596,53
94	304,08	75,21	94,44	504,52	8,37	623,90	346,84	406,42	403,31	592,51
95	303,33	75,34	91,95	525,41	8,30	613,24	340,56	409,64	397,82	584,50
96	302,35	75,32	91,16	537,88	8,28	603,18	336,56	412,34	392,59	575,06
97	337,02	75,50	91,16	635,06	8,18	591,90	335,28	414,30	390,21	565,60
98	314,57	75,09	88,55	723,68	8,08	580,79	338,86	415,63	394,98	555,68
99	315,45	75,28	89,31	582,83	8,01	570,85	339,56	416,46	402,79	546,31
100	344,77	75,22	90,95	737,24	7,95	561,80	340,76	416,72	399,04	537,20
101	377,42	75,25	91,17	765,84	7,86	552,19	345,40	416,53	400,72	529,19
102	347,80	75,32	89,49	775,31	7,78	543,00	354,44	415,87	410,81	521,13
103	334,37	75,25	88,77	741,81	7,67	534,50	361,53	415,11	416,40	513,70
104	325,28	75,46	88,29	728,12	7,58	527,07	365,59	414,03	420,65	506,96
105	318,51	75,14	87,93	727,11	7,58	520,83	364,75	412,86	422,42	499,97
106	313,98	75,11	87,74	727,36	7,48	514,90	362,87	411,42	422,50	493,67
107	310,65	74,74	87,70	733,98	7,48	508,45	358,13	409,88	420,85	487,74
108	309,51	75,03	87,27	761,16	7,38	502,71	354,41	408,27	417,07	482,05
109	309,73	75,15	86,56	755,63	7,38	496,41	348,74	406,60	411,63	476,01
110	305,91	75,27	86,88	731,79	7,38	490,38	344,26	404,85	405,14	470,84
111	302,88	75,15	86,23	719,40	7,28	483,72	339,01	403,13	399,72	464,94
112	300,31	75,09	86,64	715,95	7,28	478,85	334,04	401,32	393,99	459,35
113	298,64	74,86	86,89	694,58	7,28	472,85	329,43	399,56	388,89	453,82
114	294,76	74,63	86,81	663,04	7,17	467,53	329,05	397,79	385,17	448,47
115	296,85	74,82	87,25	686,32	7,17	461,86	331,10	396,04	382,89	444,16
116	311,03	75,21	87,44	785,05	7,07	456,76	334,98	394,32	383,83	440,26
117	322,47	75,30	87,72	828,31	6,97	452,47	339,19	392,71	385,79	436,49
118	328,65	75,47	87,38	819,75	6,88	448,33	343,47	391,15	388,22	433,01
119	331,18	75,46	87,55	803,05	6,78	446,32	349,03	389,47	391,37	429,74
120	332,56	75,04	87,41	812,32	6,68	443,95	354,07	387,85	395,62	427,12
121	344,61	74,91	88,26	868,53	6,68	441,16	357,78	386,26	402,64	424,70
122	424,61	75,41	92,75	956,45	6,51	440,26	358,57	384,68	420,78	423,66
123	485,11	75,13	96,62	1003,92	6,37	439,33	360,18	383,18	418,56	424,15
124	512,06	75,18	97,84	1022,12	6,18	440,71	362,81	381,67	415,70	425,15
125	531,11	75,53	98,99	1050,47	5,98	443,31	367,92	380,11	413,72	428,10
126	540,76	75,51	100,15	1053,51	5,77	448,39	373,76	378,81	413,36	429,38
127	545,95	75,74	100,89	1050,94	5,57	454,03	378,73	377,74	414,34	432,26
128	548,97	75,89	102,24	1054,07	5,48	460,95	383,49	376,84	416,58	435,14
129	550,44	75,91	102,45	1056,96	5,28	467,75	386,69	376,19	420,78	439,64
130	553,60	76,07	103,01	1060,21	5,17	476,34	389,90	375,76	425,44	444,75
131	557,13	76,30	103,26	1076,26	4,97	485,76	392,60	375,54	431,04	450,59
132	561,11	76,12	103,45	1084,24	4,78	494,79	394,57	375,42	436,88	457,41
133	556,94	75,59	102,81	986,96	4,68	504,48	397,14	375,51	449,00	463,61
134	468,40	76,41	97,23	911,95	4,57	513,59	402,81	375,72	480,47	470,32
135	437,61	76,69	95,76	925,05	4,47	521,01	407,27	376,01	499,98	476,77
136	420,09	76,24	95,24	927,59	4,37	526,33	409,31	376,47	514,86	482,09
137	407,99	76,07	93,34	924,83	4,27	530,12	410,21	376,85	524,87	486,31
138	398,21	75,91	92,51	919,39	4,17	532,69	410,68	377,21	532,34	489,91
139	389,58	75,93	92,23	904,42	4,08	534,82	411,67	377,37	538,46	493,04
140	383,04	76,07	92,10	887,18	3,98	537,31	410,96	377,54	543,12	496,10
141	378,45	76,13	92,00	875,49	3,97	538,84	411,08	377,56	547,05	498,90
142	375,19	76,25	91,58	870,60	3,87	540,40	410,33	377,54	550,18	501,23
143	371,53	76,11	91,73	891,60	3,77	541,60	410,35	377,42	552,66	503,61
144	368,82	76,09	91,64	895,22	3,67	543,54	410,11	377,28	555,03	505,11
145	366,05	76,14	91,29	896,79	3,67	545,00	410,40	377,09	556,23	507,33
146	363,10	76,30	91,36	895,09	3,57	546,63	410,63	376,90	557,21	509,17
147	360,26	76,39	90,72	892,50	3,47	549,18	408,77	376,72	557,76	510,35
148	358,93	76,27	90,52	888,91	3,47	549,81	410,09	376,43	558,51	512,08
149	357,95	76,43	90,43	889,66	3,32	551,71	409,94	376,14	559,26	513,30
150	356,95	76,45	90,22	890,33	3,28	552,29	409,70	375,87	559,56	515,88
151	357,37	76,48	90,17	892,16	3,17	554,24	409,21	375,60	560,65	516,56
152	357,95	76,22	89,91	891,51	3,17	556,02	408,89	375,28	561,54	518,36
153	357,42	76,27	89,65	888,95	3,07	558,56	407,53	375,07	562,96	519,08
154	356,72	76,26	89,08	888,06	2,97	562,47	405,83	374,81	563,45	520,39
155	355,37	76,50	89,22	882,34	2,87	566,10	405,08	374,53	564,11	522,42
156	351,89	76,39	89,03	873,46	2,81	570,15	404,31	374,30	564,52	524,02
157	348,31	76,46	89,80	866,94	2,77	574,30	403,09	374,10	566,76	526,36
158	341,37	76,67	90,18	836,03	2,77	576,74	401,41	373,99	568,24	528,55
159	335,78	76,72	89,32	810,97	2,68	578,09	399,65	373,84	568,91	530,14
160	330,32	76,88	89,64	785,09	2,68	578,44	397,60	373,69	568,97	532,29
161	325,73	76,77	89,24	772,93	2,57	578,90	394,76	373,56	568,73	533,57
162	321,75	76,43	89,26	765,25	2,57	579,16	392,95	373,38	567,61	535,16
163	318,43	76,50	88,60	755,60	2,47	579,25	390,92	373,27	565,91	536,53
164	312,97	76,75	87,90	750,14	2,47	579,58	388,65	373,22	563,87	538,20
165	313,14	77,13	88,77	784,23	2,47	579,89	387,55	373,07	559,12	540,45
166	314,00	77,06	88,72	793,30	2,47	580,07	385,91	372,92	553,87	544,53
167	311,64	77,00	88,19	768,33	2,37	579,58	384,43	372,86	547,08	550,04
168	306,99	76,70	88,09	742,00	2,37	579,03	382,40	372,77	539,18	555,83
169	301,59	76,64	88,29	726,70	2,37	579,44	380,18	372,83	532,47	561,17
170	297,32	76,83	87,71	715,03	2,37	579,92	379,58	372,78	525,12	567,11
171	293,41	76,43	87,54	706,11	2,27	579,78	377,62	372,82	517,84	571,90
172	289,99	76,52	87,20	700,19	2,27	580,44	376,07	372,93	510,69	577,43
173	286,48	76,47	87,61	692,10	2,27	581,29	374,38	373,12	504,16	582,44
174	284,02	76,50	87,15	693,63	2,27	582,23	373,03	373,33	497,99	585,87
175	283,03	76,26	86,97	696,20	2,27	583,53	370,18	373,69	490,97	588,43
176	281,61	76,30	87,01	691,65	2,17	583,91	368,37	373,89	484,16	591,15
177	280,27	76,57	86,62	689,51	2,21	583,07	366,65	374,11	477,29	593,53
178	279,58	76,44	86,46	684,18	2,27	582,44	364,73	374,50	470,39	596,47
179	277,75	76,61	86,38	680,17	2,17	582,60	363,24	374,86	465,18	596,72
180	276,31	76,32	86,08	675,20	2,25	582,80	361,31	375,34	458,75	596,61
181	274,28	76,38	86,38	670,35	2,17	582,61	359,09	375,81	453,87	596,84
182	272,52	76,37	86,36	662,62	2,17	582,57	357,77	376,31	448,25	597,30

183	270,28	76,28	86,26	655,29	2,17	582,22	355,56	376,83	443,49	596,51
184	268,11	76,26	85,90	654,87	2,17	581,79	355,75	377,24	438,19	595,82
185	266,85	76,45	86,31	652,64	2,17	581,41	355,46	377,78	434,52	594,90
186	265,06	76,40	86,45	649,01	2,10	580,14	355,51	378,23	429,78	593,89
187	263,29	76,41	85,88	643,78	2,07	579,21	355,25	378,70	425,55	593,34
188	262,07	76,72	86,64	639,68	2,07	578,70	355,46	379,26	422,10	592,25
189	261,25	76,76	86,19	637,84	2,07	577,15	353,89	379,82	418,34	590,25
190	260,72	76,57	86,01	634,76	2,07	575,30	353,64	380,28	414,40	590,31
191	260,40	76,40	86,11	635,39	2,07	573,84	353,52	380,87	411,56	588,68
192	260,13	76,68	85,92	635,55	1,97	572,66	353,28	381,33	408,17	587,18
193	259,30	76,59	86,26	633,28	1,97	571,20	352,67	381,86	404,98	585,95
194	258,09	76,76	86,44	630,15	1,97	570,52	352,25	382,45	402,34	585,05
195	257,41	77,02	86,24	625,61	1,97	569,43	351,00	383,07	399,66	583,05
196	256,29	77,02	85,65	622,08	1,97	568,34	350,12	383,67	396,70	581,58
197	255,31	77,19	85,67	623,21	1,97	566,83	349,73	384,26	394,47	580,68
198	254,49	77,02	86,01	621,39	1,97	566,26	348,86	384,90	392,38	579,14
199	253,71	77,29	85,68	620,31	1,97	564,69	347,86	385,57	390,00	578,64
200	253,01	77,01	85,80	617,67	1,87	563,92	347,15	386,24	387,91	577,42
201	252,74	77,27	85,78	613,01	1,87	563,48	346,31	387,05	386,38	576,09
202	251,75	77,35	85,90	611,40	1,87	562,83	345,42	387,83	384,17	575,09
203	251,30	77,22	85,66	611,14	1,87	562,76	343,94	388,64	382,23	573,12
204	251,04	77,27	85,52	610,93	1,87	562,37	342,34	389,45	380,64	572,32
205	251,07	77,06	85,32	608,43	1,78	561,31	341,29	390,24	378,68	570,30
206	250,81	77,02	85,29	609,78	1,77	561,19	340,34	391,10	376,67	570,41
207	251,09	76,40	85,32	613,28	1,80	560,96	339,56	391,86	374,45	569,04
208	251,39	76,39	85,02	615,21	1,77	560,98	338,29	392,71	373,20	567,95
209	251,66	76,35	85,00	616,07	1,77	560,31	337,44	393,53	371,22	567,55
210	265,89	76,40	93,03	485,40	1,77	559,91	338,30	394,25	371,15	566,27
211	252,72	76,77	86,81	550,00	1,77	558,43	335,96	394,99	365,81	565,96

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: pI 20272 Run: 3 Tech: MM Reviewer: JP

- Kindling 28 LBS STAN FIRE
- by pass open
- Door open
- At ~~45 LBS~~ 35 LBS close Door
- At 12 LBS insert 1st preload
- close Door immediatly
- At 12 LBS insert 2nd preload
- close by pass immediatly
- close Door immediatly
- At 16 LBS pack coal Bed

After 2 min insert load and close immediatly

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 3 Tech: MM Reviewer: [illegible]

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM- 334	7:00	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	2022-06-27
Date Dilution Tunnel Cleaned	2022-06-27
Induced Draft Check (max 0.005 H2O)	Ok
Traverse before ignition	ok

Temperature System:

Ambient (65°-90°F)	Ok °F

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok
Pictures for report	
Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok
Load Length approximately 5/6 of firebox Lenght	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 3 Tech: MM Reviewer: JP

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10	-10	-10	-10	-10	-10
Final 1minute DGM (Liter)	657442.96	657841.68	657243.12	657841.96	405065.22	405649.06
Initial 1minute DGM (Liter)	657442.95	657841.65	657243.11	657841.95	∅	405649.05
Change (Liter)	0.01	0.03	0.01	0.01		0.01
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	0.20	0.20	0.20	0.20	0.20	0.20
Check OK	OK	OK	OK	OK	OK	OK

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: PI 20222 Run: 3 Tech: MM Reviewer: JP

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	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

Scales checks

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	10.00 ~~lbs~~ kg, Class F	10.00 ~~lbs~~ kg
Wood	EM-090	440 lbs, Class F	440 lbs
Analytical	EM-335	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%

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: OT 20272 Run: 3 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 101.5 (KPa.) Static pressure (P_q) 0.16 (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	0.070	74.39
B - Centroid	3.00	3.50	4	0.069	74.32
A-1	0.40	0.50	0.50	0.056	74.39
A-2	1.50	1.75	2	0.058	74.34
A-3	4.50	5.25	6	0.061	74.34
A-4	5.60	6.5	7.5	0.056	74.33
B-1	0.40	0.50	0.50	0.057	74.32
B-2	1.50	1.75	2	0.058	74.39
B-3	4.50	5.25	6	0.069	74.39
B-4	5.60	6.5	7.5	0.057	74.47
				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: 2022-06-29 2pm Manufacturer: Hearthstone Model: 8060

Project #: pI 20272 Run: 3 Tech: MM Reviewer: JP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3026	3.000	1.021	1.000
Tolerance CO	0	+/- 0.02	0026	+/- 0.15	0021	+/- 0.05
CO_2	0	0	17.90	18.00	9.80	10.00
Tolerance CO2	0	+/- 0.02	0.10	+/- 0.5	0.20	+/- 0.5
O_2 informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	3.019	1.018	✓	0.02	0.007	0.15	0.003	0.05	✓	
CO_2	0	17.93	9.89	✓	0.02	0.03	0.5	0.009	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: pI 20272 Run: 3 Tech: MM Reviewer: DO

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	657 841, 15	405 648, 98	391 160, 72
Initial (Liter)	657 243, 56	405 064, 90	390 674, 00

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101,5	101,5
Dry Bulb (F):	77,8	83,3
Humidity (%):	44,9	33,9

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: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: pI 20272 Run: 3 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 14 in.	1224 lbs.	20.4	20.2	20.2	20.1	20.0
1 1/2 x 3 1/2 x 14 in.	1'448 lbs.	210	21.1	21.1	21.4	20.0
1 1/2 x 3 1/2 x 14 in.	1464 lbs.	20.8	20.6	20.7	20.7	20.8
1 1/2 x 3 1/2 x 7 in.	0'720 lbs.	20.1	20.2	20.4	20.5	20.4
1 1/2 x 3 1/2 x 7 in.	0'814 lbs.	20.1	20.6	20.4	20.6	20.7
1 1/2 x 3 1/2 x 7 in.	0'744 lbs.	20.1	20.6	20.1	20.2	20.6
1 1/2 x 3 1/2 x 7 in.	0'784 lbs.	20.6	20.8	20.9	20.7	20.8
x x in.	lbs.					
1 1/2 x 3 1/2 x 14 in.	1204 lbs.	21.1	20.8	20.7	20.7	20.6
1 1/2 x 3 1/2 x 14 in.	1'480 lbs.	19.9	20.0	20.1	20.1	20.0
1 1/2 x 3 1/2 x 14 in.	1'478 lbs.	20.6	20.5	20.4	20.3	20.4
1 1/2 x 3 1/2 x 7 in.	0'716 lbs.	20.6	20.7	20.8	20.8	20.6
1 1/2 x 3 1/2 x 7 in.	0'808 lbs.	21.0	20.9	20.8	20.6	20.7
1 1/2 x 3 1/2 x 7 in.	0'754 lbs.	21.1	21.3	21.4	21.3	21.4
1 1/2 x 3 1/2 x 7 in.	0'738 lbs.	21.0	21.3	21.3	21.3	21.2
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 718+719 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: pT 20272 Run: 3 Tech: M M Reviewer: SP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 15 in.	1 342 lbs.	191	192	193	194	193
1 1/2 x 3 1/2 x 15 in.	1 522 lbs.	208	203	204	203	202
1 1/2 x 3 1/2 x 15 in.	1 486 lbs.	210	207	208	206	204
1 1/2 x 3 1/2 x 15 in.	1 442 lbs.	211	205	206	204	205
x x in.	lbs.					
1 1/2 x 3/4 x 4 in.	0 122 lbs.			191		
1 1/2 x 3/4 x 4 in.	0 108 lbs.			193		
1 1/2 x 3/4 x 4 in.	0 096 lbs.			196		
1 1/2 x 3/4 x 4 in.	0 092 lbs.			195		
1 1/2 x 3/4 x 4 in.	0 080 lbs.			191		
1 1/2 x 3/4 x 4 in.	0 120 lbs.			198		
1 1/2 x 3/4 x 4 in.	0 118 lbs.			195		
1 1/2 x 3/4 x 4 in.	0 106 lbs.			20		
1 1/2 x 3/4 x 4 in.	0 094 lbs.			26		
1 1/2 x 3/4 x 4 in.	0 088 lbs.			203		
1 1/2 x 3/4 x 4 in.	0 098 lbs.			203		
1 1/2 x 3/4 x 4 in.	0 114 lbs.			204		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 7 028 lbs Min 20%: 1 40 Max 25%: 1 76

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-06-28 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 3 Tech: MA Reviewer: [illegible]

		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	007	316	317	19	33	318	319	41	322
2022-06-28	17:00	61,4737		34,3601		109,3631		35,3470		0,1263
2022-06-29	9:00	61,4737		34,3600		109,3630		35,3471		0,1263

		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	007	316	317	19	33	318	319	41	322
2022-06-29	15:00	61,4741		34,3626		109,3636		35,3482		0,1266
2022-07-06	8:00	61,4739		34,3607		109,3632		35,3472		0,1264
2022-07-07	8:00	61,4739		34,3607		109,3632		35,3473		0,1264

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: PZ20272 Run: 3 Tech: MM Reviewer: DP

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	35	320	321	42
2022-06-28	17:00	109,2826		34,0072	
2022-06-29	9:30	109,2826		34,0073	

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	35	320	321	42
~~2022-06-29~~ ~~2022-07-06~~	15:00	109,2829		34,0104	
2022-07-06	8:30	109,2828		34,0084	
2022-07-07	8:30	109,2828		34,0084	

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	29-06-2022	
Technicien	m.m	
Project #	pi 20272	

Description de l'unité

Manufacturier	heaerthstone	
Modèle	8060	
Combustion system	Cat	
Appliance type	wood stove	
Firebox volume	1	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):	1,007	Dimensionless
Equipment number (DGM #1):	em 178	
Calibration Factor (DGM #2):	1,005	Dimensionless
Equipment number (DGM #2):	em 318	
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	em 179	Dimensionless

Tunnel

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

Project nu.	pi 20272
Date	29-06-2022
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):	77,8	83,3
Humidity (%):	44,9	33,9
Air velocity (ft/min)	0	0

DGM #1	Final:	23231,441	cuft	Final:	657841,150	Liter
	Initial:	23210,338	cuft	Initial:	657243,560	Liter
DGM #2	Final:	14325,359	cuft	Final:	405648,980	Liter
	Initial:	14304,732	cuft	Initial:	405064,900	Liter
DGM room	Final:	13813,711	cuft	Final:	391160,720	Liter
	Initial:	13796,522	cuft	Initial:	390674,000	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 255

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

Project nu.	pi 20272
Date	29-06-2022
Technicien	m.m

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
6,30	7,00	7,70

Load Volume: 0,4253 cu. ft

Loading Density: 14,376 lbs./ft3

Number of Spaces:

Spacer weight (lbs):

Load Density (wet): 33,798 lbs./ft3

Dry Wood Density: 28,023754

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	14	1,224	20,4	20,2	20,2	20,1	20	24,70032	73,50
1,5	3,5	14	1,448	21	21,1	21,1	21,4	20	30,29216	73,50
1,5	3,5	14	1,464	20,8	20,6	20,7	20,7	20,8	30,33408	73,50
1,5	3,5	7	0,72	20,1	20,2	20,4	20,5	20,4	14,6304	36,75
1,5	3,5	7	0,814	20,1	20,6	20,4	20,6	20,7	16,67072	36,75
1,5	3,5	7	0,744	20,1	20,6	20,1	20,2	20,6	15,11808	36,75
1,5	3,5	7	0,784	20,6	20,8	20,9	20,7	20,8	16,27584	36,75
										0,00
1,5	3,5	14	1,204	21,1	20,8	20,7	20,7	20,6	25,01912	73,50
1,5	3,5	14	1,48	19,9	20	20,1	20,1	20	29,6296	73,50
1,5	3,5	14	1,478	20,6	20,5	20,4	20,3	20,4	30,21032	73,50
1,5	3,5	7	0,716	20,6	20,7	20,8	20,8	20,6	14,8212	36,75
1,5	3,5	7	0,808	21	20,9	20,8	20,6	20,7	16,8064	36,75
1,5	3,5	7	0,754	21,1	21,3	21,4	21,3	21,4	16,0602	36,75
1,5	3,5	7	0,738	21	21,3	21,3	21,3	21,2	15,66036	36,75
										0,00
										0,00
										0,00

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,16 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=
0,937

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,070	74,39	0,2646
B center	0,069	74,32	0,2627
A1	0,056	74,39	0,2366
A2	0,058	74,34	0,2408
A3	0,061	74,34	0,2470
A4	0,056	74,33	0,2366
B1	0,057	74,320	0,2387
B2	0,058	74,390	0,2408
B3	0,069	74,390	0,2627
B4	0,057	74,470	0,2387
AVERAGE	0,0611	74,3680	0,2469

Project nu.	pi 20272
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Technicien	m.m

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
6,3	7,0	7,7

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

Load Volume: 0,18 cu. ft

Loading Density: 7,0 lbs./ft3

Number of Spaces: 12

Spacer weight: lbs

Load Density (wet): 31,8 lbs./ft3

Dry Wood Density: 26,4 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	15	1,34	19,10	19,20	19,30	19,40	19,30	25,84692	78,75	19,3
1,5	3,5	15	1,52	20,80	20,30	20,40	20,30	20,40	31,10968	78,75	20,4
1,5	3,5	15	1,49	21,00	20,70	20,80	20,60	20,40	30,7602	78,75	20,7
1,5	3,5	15	1,44	21,10	20,50	20,60	20,40	20,40	29,7052	78,75	20,6
										0,00	
										0,00	
										0,00	
										0,00	

1,5	0,75	4	0,12			19,10			2,3302	4,50	19,1
1,5	0,75	4	0,11			19,30			2,0844	4,50	19,3
1,5	0,75	4	0,10			19,60			1,8816	4,50	19,6
1,5	0,75	4	0,09			19,50			1,794	4,50	19,5
1,5	0,75	4	0,08			19,10			1,528	4,50	19,1
1,5	0,75	4	0,12			19,80			2,376	4,50	19,8
1,5	0,75	4	0,12			19,40			2,2892	4,50	19,4
1,5	0,75	4	0,11			20,00			2,12	4,50	20,0
1,5	0,75	4	0,09			20,00			1,88	4,50	20,0
1,5	0,75	4	0,09			20,10			1,7688	4,50	20,1
1,5	0,75	4	0,10			20,30			1,9894	4,50	20,3
1,5	0,75	4	0,11			20,40			2,3256	4,50	20,4
										0,00	
										0,00	
										0,00	
										0,00

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	316	317	19	33	318	319	41	35	320	321	42	322		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,4737		34,3601		109,3631		35,3470		109,2826		34,0072		0,1263	2022-06-28	17:00
Before (6)	61,4737		34,3600		109,3630		35,3471		109,2826		34,0073		0,1263	2022-06-29	09:00
After (1)	61,4741		34,3626		109,3636		35,3482		109,2829		34,0104		0,1266	2022-06-29	15:00
After (2)	61,4739		34,3607		109,3632		35,3472		109,2828		34,0084		0,1264	2022-07-06	08:00
After (3)	61,4739		34,3607		109,3632		35,3473		109,2828		34,0084		0,1264	2022-07-07	08:00
After (4)															
After (5)															
After (6)	61,4739		34,3607		109,3632		35,3473		109,2828		34,0084		0,1264	2022-07-07	08:00
Difference	0,0002	0,0000	0,0007	0,0000	0,0002	0,0000	0,0002	0,0000	0,0002	0,0000	0,0011	0,0000	0,0001		
Total (mg)		0,9				1,3				1,3			0,1		
Total ajusté (mg)		**0,80**				**1,20**				**1,20**					

Project nu.	pi 20272
Date	29-06-2022
Technicien	m.m

SFBA EPA EMISSION RESULTS

Test Duration: **108** min

PRESSURE FACTOR:	DGM 1	0,97661	
	DGM 2	0,97958	
	DGM 3	1,00177	
TEMPERATURE FACTORS	DGM 1	0,97590	
	DGM 2	0,96824	
	DGM 3	0,97780	
VOLUMES SAMPLED	DGM 1	20,245	SCft
	DGM 2	19,670	Scft
	DGM 3	16,637	SCft

TOTAL TUNNEL VOLUME : 34615

SAMPLE RATIOS

Sample Train 1:	1709,813
Sample Train 2:	1759,789

Paticulate concentration

Sample Train 1	**0,000064**	g/dscf
Sample Train 2	**0,000066**	g/dscf
Room	**0,000006**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,01**	g
Sample Train 2	**2,08**	g

EMISSION RATES

Sample Train 1	**1,12**	g/hr
Sample Train 2	**1,16**	g/hr

1st hour emission rate **1,54** g/hr

	Train 1	Train 2
Cs	6,421E-05	6,609E-05

RESULTS

Average emission rate: 1,14 g/hr

Burn Rate : 1,474 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:	23231,441	Cuft
	Initial:	23210,338	Cuft
DGM 2	Final:	14325,359	Cuft
	Initial:	14304,732	Cuft
DGM #3	Final:	13813,711	Cuft
	Initial:	13796,522	Cuft

TEMPERATURES

DGM 1	541,041	°R
DGM 2	545,320	°R

CALIBRATION FACTORS

DGM 1	1,0066
DGM 2	1,0054
DGM #3	0,9882

TUNNEL FLOW RATE: 320,512 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	1,30	mg
Total Sample Train 2:	1,30	mg
Total Sample Train 1 1st hour:	0,90	mg

DEVIATION: 1,59%

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*9	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft
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
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom										in wc	in wc
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
0,00	255,00	6,9	0,1	2,9	0,0	334,2	78,6	99,6	388,0	336,2	595,8	637,8	447,4	468,8	0,19	79,10	79,11	83,87	0,18	79,63	80,69	85,42	0,07	0,05
1,0	256,0	6,8	0,3	2,8	0,0	314,4	78,5	95,1	382,5	332,2	590,5	631,7	448,9	579,9	0,19	79,22	79,19	83,80	0,18	79,88	80,83	85,25	0,07	0,06
2,0	257,0	6,8	0,1	4,2	0,0	318,2	78,7	95,5	378,0	328,7	583,0	622,3	450,6	620,3	0,19	79,37	79,26	83,90	0,18	80,10	80,97	85,22	0,07	0,06
3,0	258,0	6,8	0,1	4,9	0,0	320,6	78,6	95,8	375,4	326,5	572,8	610,3	452,1	619,2	0,19	79,51	79,31	84,00	0,18	80,35	81,13	85,29	0,07	0,06
4,0	259,0	6,7	0,1	5,8	0,0	321,4	78,8	95,8	373,5	325,0	562,4	597,6	453,3	621,3	0,19	79,55	79,33	84,15	0,18	80,57	81,26	85,31	0,07	0,07
5,0	260,0	6,6	0,1	6,9	0,0	326,6	78,5	95,6	376,3	325,7	551,6	585,0	454,0	651,8	0,19	79,55	79,36	84,21	0,18	80,73	81,39	85,31	0,06	0,07
6,0	261,0	6,5	0,1	11,7	0,0	348,2	78,5	96,7	386,9	329,7	542,3	573,2	454,5	726,6	0,19	79,56	79,39	84,35	0,18	80,92	81,52	85,35	0,07	0,07
7,0	262,0	6,4	0,1	12,0	0,0	359,8	78,7	97,5	398,1	334,2	534,3	562,3	454,5	741,8	0,19	79,57	79,40	84,48	0,18	81,11	81,62	85,44	0,07	0,07
8,0	263,0	6,3	0,1	12,1	0,0	375,5	78,5	98,0	410,1	338,8	527,4	552,0	454,2	801,2	0,19	79,56	79,39	84,68	0,18	81,30	81,69	85,52	0,07	0,07
9,0	264,0	6,2	0,2	13,6	0,0	392,0	78,6	98,9	424,2	344,3	520,8	543,5	453,5	817,3	0,19	79,56	79,40	84,85	0,18	81,46	81,79	85,64	0,07	0,08
10,0	265,0	6,0	0,1	13,9	0,0	400,0	78,6	98,7	438,3	348,0	515,8	535,4	452,6	826,3	0,19	79,54	79,40	85,00	0,18	81,62	81,86	85,69	0,07	0,07
11,0	266,0	5,9	0,1	13,8	0,0	403,8	78,7	99,4	451,4	351,7	512,9	529,3	451,5	825,7	0,19	79,55	79,42	85,16	0,18	81,78	81,94	85,74	0,07	0,08
12,0	267,0	5,8	0,1	13,7	0,0	409,1	78,7	100,3	462,1	355,5	510,5	524,1	450,3	851,6	0,19	79,68	79,44	85,36	0,18	82,00	82,06	85,88	0,07	0,08
13,0	268,0	5,7	0,1	14,2	0,0	419,0	78,7	100,4	472,8	358,0	508,9	523,2	448,9	898,8	0,19	79,76	79,49	85,52	0,18	82,24	82,17	85,95	0,07	0,08
14,0	269,0	5,5	0,6	15,1	0,0	431,6	78,9	100,6	485,3	360,3	509,2	525,2	447,4	935,9	0,19	79,91	79,53	85,65	0,18	82,47	82,29	86,01	0,06	0,08
15,0	270,0	5,4	0,4	14,5	0,0	441,1	79,0	100,3	497,0	362,8	510,5	528,6	446,0	935,8	0,19	79,98	79,56	85,76	0,18	82,63	82,44	86,09	0,07	0,08
16,0	271,0	5,2	0,4	14,5	0,0	449,9	78,9	101,9	507,4	364,5	511,5	530,4	444,4	968,4	0,19	80,02	79,60	85,96	0,18	82,83	82,59	86,23	0,07	0,09
17,0	272,0	5,1	0,5	15,0	0,0	454,3	79,1	102,7	516,7	365,8	512,6	531,4	442,8	948,0	0,19	80,13	79,67	86,20	0,18	83,07	82,74	86,41	0,07	0,08
18,0	273,0	4,9	0,2	14,9	0,0	454,5	79,5	102,7	524,9	366,2	516,0	531,2	441,2	939,6	0,19	80,29	79,73	86,37	0,18	83,31	82,92	86,55	0,06	0,08
19,0	274,0	4,8	0,3	15,2	0,0	456,5	79,4	103,3	533,2	368,3	519,0	530,7	439,4	959,1	0,19	80,49	79,79	86,56	0,18	83,53	83,06	86,70	0,06	0,08
20,0	275,0	4,7	0,3	15,7	0,0	458,8	79,5	103,7	540,2	370,6	523,4	530,4	437,8	978,1	0,19	80,76	79,88	86,73	0,18	83,80	83,23	86,87	0,07	0,08
21,0	276,0	4,5	0,8	15,9	0,0	461,0	79,5	102,9	546,0	372,1	529,3	530,0	436,2	976,0	0,19	80,92	79,95	86,87	0,18	84,03	83,40	86,96	0,06	0,08
22,0	277,0	4,4	0,9	15,2	0,0	461,3	79,7	103,2	551,1	374,0	535,6	530,5	434,6	946,3	0,19	81,02	80,03	87,00	0,18	84,24	83,55	87,09	0,06	0,08
23,0	278,0	4,2	0,8	15,0	0,0	459,9	79,9	104,3	556,6	377,2	539,5	531,1	433,1	946,2	0,19	81,00	80,09	87,15	0,18	84,33	83,73	87,21	0,06	0,08
24,0	279,0	4,2	0,6	14,8	0,0	459,9	79,9	103,9	560,3	378,2	542,1	533,0	431,6	946,6	0,19	81,13	80,15	87,29	0,18	84,56	83,89	87,33	0,06	0,08
25,0	280,0	4,0	0,5	14,6	0,0	459,3	79,6	103,7	563,7	379,8	545,0	534,1	430,1	953,3	0,19	81,14	80,20	87,42	0,18	84,68	84,05	87,45	0,07	0,08
26,0	281,0	3,9	0,7	14,7	0,0	459,9	79,8	103,3	567,0	378,6	546,6	535,1	428,5	955,9	0,19	81,03	80,23	87,48	0,18	84,74	84,13	87,47	0,06	0,08
27,0	282,0	3,8	1,0	14,8	0,0	460,2	79,3	102,7	570,1	378,9	548,5	536,6	426,9	966,0	0,19	80,74	80,22	87,42	0,18	84,61	84,12	87,38	0,07	0,08
28,0	283,0	3,6	1,2	15,0	0,0	460,7	79,5	103,1	573,5	381,4	550,5	538,8	425,4	975,1	0,19	80,75	80,24	87,51	0,18	84,63	84,17	87,46	0,07	0,08
29,0	284,0	3,5	1,5	15,1	0,0	461,0	79,5	102,0	576,4	382,7	552,2	540,7	424,0	973,2	0,19	80,85	80,26	87,50	0,18	84,74	84,26	87,45	0,07	0,08
30,0	285,0	3,3	1,2	16,0	0,0	457,3	79,8	101,7	580,9	383,4	554,7	543,3	422,5	958,4	0,19	80,92	80,28	87,53	0,18	84,87	84,35	87,44	0,07	0,08
31,0	286,0	3,2	1,3	15,9	0,0	456,6	79,8	103,0	585,5	385,4	556,6	546,3	421,1	959,1	0,19	80,94	80,32	87,64	0,18	84,92	84,39	87,47	0,07	0,08
32,0	287,0	3,1	1,4	15,9	0,0	456,4	79,6	102,6	589,7	387,3	559,1	549,7	419,6	961,0	0,19	80,85	80,33	87,70	0,18	84,91	84,46	87,52	0,07	0,08
33,0	288,0	2,9	1,4	15,9	0,0	456,4	79,6	103,6	594,2	390,5	560,9	553,2	418,4	964,3	0,19	80,85	80,35	87,84	0,18	84,95	84,50	87,66	0,07	0,08
34,0	289,0	2,8	1,4	16,0	0,0	457,5	79,4	104,5	598,5	393,6	564,3	557,8	417,1	977,6	0,19	80,67	80,34	87,98	0,18	84,87	84,55	87,75	0,07	0,08
35,0	290,0	2,7	1,5	16,0	0,0	458,0	79,9	103,9	602,3	395,9	567,0	562,1	415,9	982,4	0,19	80,73	80,36	88,05	0,18	84,92	84,62	87,82	0,07	0,08
36,0	291,0	2,5	1,6	16,0	0,0	458,5	79,6	102,4	607,6	397,9	570,2	566,4	414,6	983,6	0,19	80,79	80,38	87,96	0,18	85,00	84,67	87,82	0,07	0,08
37,0	292,0	2,4	2,0	15,8	0,0	457,0	79,6	103,1	612,3	401,0	572,9	570,5	413,5	972,8	0,19	80,82	80,40	87,45	0,18	85,03	84,78	87,52	0,07	0,08
38,0	293,0	2,3	2,3	15,7	0,0	455,4	80,1	104,1	616,4	404,8	576,2	574,3	412,4	969,5	0,19	80,96	80,44	87,14	0,18	85,16	84,89	87,17	0,07	0,08
39,0	294,0	2,1	2,5	15,6	0,0	454,3	80,1	103,6	620,8	406,5	579,6	579,0	411,3	970,5	0,19	81,12	80,50	87,10	0,18	85,33	85,02	86,90	0,07	0,08
40,0	295,0	2,0	2,4	15,5	0,0	454,1	80,0	101,5	624,4	408,6	582,0	583,3	410,2	983,7	0,19	81,09	80,54	86,81	0,18	85,38	85,04	86,61	0,07	0,08
41,0	296,0	1,9	2,1	15,5	0,0	454,4	79,8	103,4	627,8	411,1	585,9	587,4	409,2	1001,1	0,19	81,02	80,54	86,69	0,18	85,35	85,07	86,45	0,07	0,08
42,0	297,0	1,8	1,6	15,4	0,0	454,3	79,6	103,9	629,8	412,9	591,0	592,7	408,2	1007,3	0,19	80,82	80,56	86,71	0,18	85,24	85,11	86,40	0,06	0,08
43,0	298,0	1,7	1,2	15,2	0,0	454,5	79,9	103,3	630,6	413,2	596,4	598,1	407,3	1008,3	0,19	80,91	80,57	86,65	0,18	85,32	85,23	86,32	0,06	0,08
44,0	299,0	1,6	0,8	15,1	0,0	454,4	80,1	103,6	631,5	414,4	602,1	604,0	406,5	1013,4	0,19	81,14	80,63	86,60	0,18	85,50	85,33	86,32	0,07	0,08
45,0	300,0	1,6	0,5	15,0	0,0	453,2	80,1	103,8	633,8	416,9	607,2	610,5	405,7	1010,4	0,19	81,30	80,69	86,59	0,18	85,63	85,49	86,28	0,07	0,08
46,0	301,0	1,5	0,1	14,3	0,0	448,0	80,3	103,1	633,9	416,4	613,3	616,3	404,8	971,1	0,19	81,47	80,78	86,59	0,18	85,82	85,62	86,29	0,06	0,08
47,0	302,0	1,4	0,0	13,0	0,0	439,4	80,4	103,3	631,7	414,0	619,4	622,3	404,0	932,1	0,19	81,43	80,80	86,55	0,18	85,85	85,68	86,28	0,06	0,08
48,0	303,0	1,3	0,0	12,4	0,0	430,9	80,5	103,2	628,3	413,2	623,1	627,6	403,3	909,1	0,19	81,53	80,87	86,55	0,18	85,92	85,75	86,28	0,07	0,08
49,0	304,0	1,3	0,0	12,0	0,0	423,1	80,5	100,6	623,4	409,9	628,5	632,0	402,4	885,6	0,19	81,77	80,95	86,39	0,18	86,08	85,84	86,19	0,06	0,07
50,0	305,0	1,2	0,0	11,5	0,0	416,2	80,6	101,0	617,8	409,0	632,8	636,3	401,7	867,1	0,19	81,78	80,99	86,23	0,18	86,13	85,93	86,07	0,07	0,07
51,0	306,0	1,2	0,0	11,1	0,0	409,5	80,4	101,6	611,9	408,1	636,1	640,6	400,9	851,2	0,19	81,73	81,01	86,19	0,18	86,15	85,97	86,04	0,07	0,07
52,0	307,0	1,2	0,0	10,8	0,0	403,9	80,6	101,1	605,3	407,3	639,1	644,4	400,2	837,4	0,19	81,80	81,06	86,14	0,18	86,23	86,04	86,02	0,07	0,07
53,0	308,0	1,2	0,0	10,5	0,0	398,5	80,5	101,2	598,1	405,7	642,6	648,5	399,6	823,3	0,19	81,82	81,10	86,18	0,18	86,33	86,20	86,04	0,06	0,07
54,0	309,0	1,1	0,0	10,0	0,0	393,4	80,4	101,1	591,4	403,8	645,2	652,1	398,9	810,2	0,19	81,74	81,14	86,10	0,18	86,29	86,31	85,99	0,07	0,07
55,0	310,0	1,1	0,0	9,6	0,0	389,3	80,4	100,2	584,1	401,4	647,6	655,4	398,3	798,9	0,19	81,67	81,17	86,10	0,18	86,27	86,41	86,00	0,07	0,07
56,0	311,0	1,1	0,0	9,2	0,0	384,6	80,4	98,7	576,8	398,1	648,6	657,5	397,5	790,9	0,19	81,61	81,19	85,95	0,18	86,26	86,46	85,89	0,06	0,07
57,0	312,0	1,0	0,0	8,9	0,0	380,7	80,3	99,9	568,8	396,9	647,7	659,1	397,1	783,1	0,19	81,58	81,21	85,86	0,18	86,24	86,50	85,82	0,07	0,07
58,0	313,0	1,0	0,0	8,8	0,0	377,5	80,2	98,9	561,0	393,6	648,1	660,7	396,5	778,8	0,19	81,51	81,22	85,85	0,18	86,18	86,50	85,80	0,07	0,07
59,0	314,0	0,9	0,1	8,7	0,0	375,0	80,1	98,7	552,7	390,5	647,6	661,2	395,9	775,9	0,19	81,44	81,23	85,72	0,18	86,13	86,50	85,70	0,06	0,07
60,0	315,0	0,9	0,1	8,5	0,0	372,6	80,1	98,7	545,0	387,5	647,0	661,7	395,3	770,6	0,19	81,38	81,22	85,66	0,18	86,08	86,48	85,64	0,07	0,07
61,0	316,0	0,9	0,1	8,4	0,0	370,6	80,3	98,2	537,0	385,8	646,1	661,7	394,9	765,5	0,19	81,38	81,24	85,59	0,18	86,05	86,53	85,57	0,07	0,07
62,0	317,0	0,9	0,1	8,1	0,0	368,2	80,0	99,0	529,7	383,8	645,4	661,0	394,4	758,9	0,19	81,36	81,23	85,59	0,18	86,01	86,55	85,56	0,07	0,07
63,0	318,0	0,9	0,1	8,1	0,0	366,0	80,1	98,8	522,4	381,9	643,4	660,7	394,1	752,9	0,19	81,33	81,23	83,29	0,18	86,00	86,51	85,52	0,06	0,07
64,0	319,0	0,8	0,1	8,1	0,0	363,7	80,0	98,3	515,2	380,2	641,1	659,6	393,7	748,9	0,19	81,30	81,26	83,26	0,18	85,99	86,53	85,43	0,07	0,07
65,0	320,0	0,8	0,1	8,0	0,0	362,1	80,0	98,2	508,9	378,6	639,7	659,0	393,4	744,1	0,19	81,30	81,26	83,25	0,18	86,00	86,54	85,42	0,07	0,07
66,0	321,0	0,8	0,1	8,1	0,0	360,6	80,1	98,5	502,3	376,4	637,6	658,2	393,2	741,3	0,19	81,51	81,31	83,24	0,18	86,13	86,63	85,38	0,07	0,07
67,0	322,0	0,8	0,1	8,0	0,0	358,6	80,3	98,1	496,2	374,8	635,6	657,1	393,0	736,5	0,19	81,58	81,36	83,29	0,18	86,16	86,69	85,33	0,07	0,07
68,0	323,0	0,8	0,1	7,9	0,0	357,1	80,3	98,6	490,4	372,6	634,2	656,6	392,9	731,0	0,19	81,61	81,36	83,31	0,18	86,22	86,74	85,29	0,06	0,07
69,0	324,0	0,8	0,1	7,9	0,0	355,8	80,3	97,9	485,3	370,1	631,7	655,0	392,7	726,8	0,19	81,59	81,40	83,33	0,18	86,21	86,76	85,24	0,07	0,07
70,0	325,0	0,7	0,1	8,0	0,0	354,5	80,2	99,5	480,1	368,9	629,0	654,7	392,7	723,6	0,19	81,58	81,41	83,35	0,18	86,21	86,79	85,23	0,07	0,06
71,0	326,0	0,7	0,1	8,1	0,0	352,5	80,4	97,6	475,4	365,9	627,7	653,7	392,6	717,5	0,19	81,66	81,44	83,36	0,18	86,26	86,87	85,22	0,07	0,07
72,0	327,0	0,7	0,1	8,0	0,0	350,6	80,1	97,6	470,3	364,4	625,2	652,5	392,5	712,5	0,19	81,72	81,48	83,38	0,18	86,32	86,92	85,18	0,07	0,06
73,0	328,0	0,7	0,1	7,9	0,0	349,6	80,2	98,7	465,8	364,3	623,2	651,4	392,6	710,0	0,19	81,70	81,48	83,41	0,18	86,34	86,97	85,18	0,07	0,06
74,0	329,0	0,7	0,1	7,9	0,0	348,1	79,9	98,5	461,4	363,3	620,5	649,5	392,7	707,4	0,19	81,64	81,51	83,44	0,18	86,29	87,06	85,20	0,06	0,06
75,0	330,0	0,6	0,1	7,9	0,0	347,4	79,9	98,4	457,6	361,7	619,1	647,9	392,7	706,5	0,19	81,47	81,49	83,42	0,18	86,22	87,04	85,14	0,06	0,07
76,0	331,0	0,6	0,1	7,9	0,0	346,1	79,9	98,1	453,5	359,2	617,1	646,2	392,7	704,7	0,19	81,41	81,46	83,45	0,18	86,17	87,04	85,09	0,07	0,06
77,0	332,0	0,6	0,1	8,0	0,0	345,9	80,7	97,4	450,1	359,1	615,7	644,1	392,9	704,7	0,19	81,45	81,49	83,48	0,18	86,18	87,00	85,03	0,07	0,06
78,0	333,0	0,6	0,1	8,0	0,0	346,3	80,9	97,4	446,6	357,6	613,9	642,1	393,0	707,1	0,19	81,54	81,50	83,45	0,18	86,22	87,02	85,00	0,07	0,06
79,0	334,0	0,6	0,1	8,1	0,0	346,3	81,1	97,4	443,4	356,5	612,1	641,0	393,1	707,9	0,19	81,65	81,52	83,45	0,18	86,31	87,07	84,94	0,07	0,06
80,0	335,0	0,5	0,1	8,1	0,0	346,7	81,1	97,7	440,2	355,1	610,6	639,6	393,3	707,8	0,19	81,66	81,53	83,48	0,18	86,29	87,07	84,91	0,07	0,06
81,0	336,0	0,5	0,1	8,1	0,0	346,5	81,3	96,9	437,5	353,4	610,0	638,0	393,5	707,9	0,19	81,74	81,56	83,50	0,18	86,32	87,08	84,88	0,06	0,06
82,0	337,0	0,5	0,1	8,1	0,0	345,8	81,2	95,8	434,8	351,4	607,6	636,4	393,6	707,0	0,19	81,79	81,57	83,50	0,18	86,35	87,05	84,78	0,07	0,06
83,0	338,0	0,5	0,1	8,1	0,0	346,4	81,3	96,6	431,9	350,6	607,5	635,6	393,9	706,7	0,19	81,85	81,62	83,52	0,18	86,40	87,10	84,74	0,06	0,06
84,0	339,0	0,5	0,1	8,0	0,0	345,5	80,8	97,2	429,6	350,4	606,1	634,2	394,2	706,5	0,19	81,91	81,62	83,55	0,18	86,47	87,14	84,73	0,07	0,06
85,0	340,0	0,4	0,1	8,1	0,0	346,1	80,7	96,9	426,7	349,4	604,4	634,4	394,6	709,8	0,19	82,01	81,67	83,52	0,18	86,55	87,21	84,73	0,07	0,06
86,0	341,0	0,4	0,1	8,0	0,0	347,4	80,8	97,4	424,5	348,1	604,0	633,0	395,0	710,5	0,19	82,17	81,72	83,55	0,18	86,64	87,33	84,76	0,07	0,06
87,0	342,0	0,4	0,1	8,0	0,0	348,6	80,5	97,3	422,1	347,2	603,8	632,1	395,3	712,9	0,19	82,36	81,80	83,54	0,18	86,79	87,50	84,74	0,06	0,07
88,0	343,0	0,4	0,1	8,0	0,0	349,0	80,6	96,9	419,8	345,8	602,7	630,6	395,8	714,8	0,19	82,46	81,87	83,52	0,18	86,93	87,66	84,71	0,07	0,07
89,0	344,0	0,4	0,1	7,9	0,0	349,0	80,6	96,9	417,8	343,5	601,3	629,9	396,3	716,0	0,19	82,39	81,92	83,52	0,18	86,97	87,71	84,68	0,07	0,06
90,0	345,0	0,3	0,1	7,9	0,0	348,3	80,3	95,8	415,7	341,3	600,5	628,6	396,4	712,0	0,19	82,25	81,94	83,51	0,18	86,94	87,74	84,62	0,07	0,07
91,0	346,0	0,3	0,1	7,6	0,0	347,6	80,7	96,7	413,6	340,5	600,1	627,8	396,9	713,4	0,19	82,26	81,97	83,54	0,18	86,93	87,80	84,59	0,07	0,06
92,0	347,0	0,3	0,1	7,6	0,0	348,6	80,7	96,6	411,4	339,0	599,8	627,0	397,2	716,5	0,19	82,34	81,97	83,54	0,18	86,98	87,85	84,69	0,07	0,06
93,0	348,0	0,3	0,1	7,7	0,0	349,1	80,9	97,0	409,5	337,4	598,9	625,5	397,7	717,8	0,19	82,34	82,01	83,59	0,18	86,99	87,94	84,87	0,07	0,06
94,0	349,0	0,3	0,1	7,7	0,0	349,3	80,4	98,0	407,6	337,0	597,5	624,6	398,1	720,6	0,19	82,20	82,04	83,59	0,18	86,87	88,02	85,09	0,07	0,06
95,0	350,0	0,2	0,1	7,8	0,0	350,2	80,6	96,9	405,8	334,7	596,2	622,9	398,4	723,0	0,19	82,21	82,03	83,62	0,18	86,91	88,01	85,19	0,07	0,06

96,0	351,0	0,2	0,1	7,7	0,0	351,1	80,3	98,1	404,0	334,6	595,7	621,6	398,8	724,1	0,19	82,17	82,05	83,62	0,18	86,89	88,02	85,36	0,07	0,06
97,0	352,0	0,2	0,1	7,7	0,0	351,4	80,2	98,2	402,7	333,1	595,4	620,1	399,0	722,0	0,19	82,11	82,03	83,63	0,18	86,84	87,97	85,51	0,07	0,06
98,0	353,0	0,2	0,1	7,8	0,0	348,1	80,6	97,5	400,9	332,0	593,8	618,4	399,3	700,6	0,19	82,16	82,04	83,64	0,18	86,86	87,95	85,63	0,07	0,06
99,0	354,0	0,2	0,1	7,8	0,0	344,3	80,7	96,4	399,4	331,6	593,1	616,9	399,6	692,9	0,19	82,19	82,06	83,67	0,18	86,90	87,95	85,65	0,07	0,06
100,0	355,0	0,2	0,1	7,8	0,0	342,4	80,6	95,9	397,8	331,1	591,7	615,2	399,8	690,8	0,19	82,11	82,06	83,69	0,18	86,86	87,92	85,70	0,07	0,06
101,0	356,0	0,1	0,1	7,8	0,0	342,0	80,7	96,0	396,4	331,4	590,3	613,9	400,0	690,5	0,19	82,03	82,03	83,69	0,18	86,79	87,87	85,74	0,07	0,06
102,0	357,0	0,1	0,1	7,8	0,0	341,4	80,7	96,0	394,8	332,4	589,4	612,4	400,1	689,6	0,19	82,01	82,04	83,72	0,18	86,78	87,81	85,78	0,07	0,06
103,0	358,0	0,1	0,1	7,8	0,0	341,5	80,4	96,0	393,4	332,8	588,7	611,3	400,4	692,6	0,19	81,94	82,05	83,72	0,18	86,74	87,78	85,88	0,06	0,06
104,0	359,0	0,1	0,1	7,7	0,0	342,0	80,3	95,4	392,3	333,5	586,2	610,5	400,6	696,7	0,19	81,92	82,02	83,71	0,18	86,67	87,72	85,95	0,07	0,06
105,0	360,0	0,1	0,1	7,6	0,0	342,1	80,5	95,9	391,0	333,5	585,1	609,0	401,0	695,2	0,19	81,93	82,01	83,73	0,18	86,66	87,69	85,97	0,07	0,06
106,0	361,0	0,1	0,1	7,5	0,0	342,9	80,4	95,6	389,8	333,6	583,4	607,3	401,3	696,1	0,19	82,00	82,05	83,76	0,18	86,70	87,74	86,06	0,07	0,06
107,0	362,0	0,1	0,1	7,5	0,0	342,7	80,5	96,3	388,4	333,5	582,2	606,9	401,8	695,5	0,19	82,10	82,07	83,74	0,18	86,76	87,79	86,14	0,07	0,06
108,0	363,0	0,0	0,1	7,5	0,0	343,1	80,6	95,4	386,8	331,9	581,8	605,0	402,1	698,2	0,19	82,11	82,10	83,72	0,18	86,76	87,84	86,17	0,06	0,06

Manufacturer: heaerthstone
Model: 8060

Run: 3
Project #: pi 20272
Test Duration: 108 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	75,65%	81,77%
Comb Eff	96,65%	96,65%
HT Eff	78,28%	84,60%
Output	21 618	kJ/h
Burn Rate	1,44	kg/h
Grams CO	124	g
Input	28 575	kJ/h
MC wet	16,79	

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

Overall Heating Efficiency: 75,65%
Combustion Efficiency: 96,65%
Heat Transfer Efficiency: 78,28%

Heat Output: 20 507 Btu/h
Heat Input: 27 107 Btu/h
Burn Duration: 1,80 h
Burn Rate: 3,18 lb/h
Stack Temp: 390,0 Deg. F

Averages	0,39	10,66	1,06	20,21	9,36	198,62	26,66	0,98	0,77	#DIV/0!
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed	Weight	%	%	Excess	Total	Calc. %	Flue	Room	Eff	Transfer	Eff
Time	Remaining (kg)	CO [e]	CO_2 [d]	Air EA	O_2	O_2 [g]	Gas (°C)	Temp (°C)	%	%	%
0,00	3,12	0,15	2,90	544,0%	20,74	17,76	167,9	25,9	97,5%	59,3%	57,9%
1,00	3,07	0,34	2,82	520,5%	20,73	17,74	156,9	25,8	92,5%	61,1%	56,5%
2,00	3,07	0,10	4,16	360,8%	20,66	16,45	159,0	25,9	99,1%	69,4%	68,8%
3,00	3,07	0,08	4,93	292,7%	20,61	15,65	160,3	25,9	99,6%	72,1%	71,9%
4,00	3,03	0,06	5,81	234,3%	20,55	14,71	160,8	26,0	99,8%	74,6%	74,5%
5,00	2,98	0,05	6,86	184,0%	20,48	13,59	163,7	25,8	99,9%	76,4%	76,4%
6,00	2,94	0,06	11,67	67,5%	20,17	8,47	175,6	25,9	99,8%	80,6%	80,4%
7,00	2,89	0,06	12,01	62,8%	20,14	8,10	182,1	25,9	99,8%	80,4%	80,3%
8,00	2,85	0,06	12,11	61,3%	20,14	7,99	190,8	25,8	99,7%	79,9%	79,7%
9,00	2,80	0,16	13,57	43,1%	20,03	6,39	200,0	25,9	99,1%	80,3%	79,6%
10,00	2,71	0,14	13,86	40,3%	20,02	6,09	204,5	25,9	99,3%	80,2%	79,6%
11,00	2,67	0,08	13,77	41,8%	20,03	6,21	206,6	26,0	99,7%	80,1%	79,8%
12,00	2,62	0,06	13,72	42,5%	20,03	6,28	209,5	25,9	99,7%	79,9%	79,7%
13,00	2,57	0,11	14,23	37,0%	19,99	5,71	215,0	26,0	99,5%	79,9%	79,4%
14,00	2,48	0,59	15,14	24,9%	19,90	4,46	222,0	26,1	96,9%	79,8%	77,4%
15,00	2,44	0,38	14,53	31,7%	19,96	5,23	227,3	26,1	97,9%	79,3%	77,7%
16,00	2,35	0,39	14,49	32,0%	19,96	5,28	232,2	26,1	97,9%	79,0%	77,3%
17,00	2,30	0,49	14,98	26,9%	19,92	4,69	234,6	26,1	97,4%	79,1%	77,1%
18,00	2,21	0,23	14,93	29,5%	19,94	4,89	234,7	26,4	98,8%	79,2%	78,2%
19,00	2,17	0,32	15,24	26,2%	19,91	4,51	235,8	26,3	98,3%	79,3%	78,0%
20,00	2,12	0,32	15,74	22,3%	19,88	3,98	237,1	26,4	98,4%	79,5%	78,2%
21,00	2,03	0,79	15,92	17,6%	19,84	3,52	238,3	26,4	96,1%	79,4%	76,3%
22,00	1,98	0,85	15,19	22,4%	19,88	4,26	238,5	26,5	95,6%	79,0%	75,5%
23,00	1,91	0,79	14,98	24,5%	19,90	4,52	237,7	26,6	95,8%	78,9%	75,6%
24,00	1,89	0,59	14,80	27,6%	19,92	4,83	237,7	26,6	96,8%	78,9%	76,4%
25,00	1,80	0,52	14,62	29,8%	19,94	5,06	237,4	26,5	97,2%	78,8%	76,6%
26,00	1,76	0,72	14,72	27,2%	19,92	4,84	237,7	26,5	96,1%	78,8%	75,7%
27,00	1,71	0,99	14,83	24,1%	19,90	4,57	237,9	26,3	94,8%	78,7%	74,6%
28,00	1,62	1,22	15,00	21,2%	19,87	4,26	238,2	26,4	93,8%	78,7%	73,8%
29,00	1,58	1,48	15,08	18,6%	19,85	4,03	238,3	26,4	92,6%	78,7%	72,9%
30,00	1,49	1,23	16,04	13,8%	19,80	3,15	236,3	26,5	94,1%	79,4%	74,7%
31,00	1,44	1,33	15,90	14,0%	19,80	3,24	235,9	26,5	93,6%	79,3%	74,2%
32,00	1,39	1,41	15,87	13,7%	19,80	3,22	235,8	26,5	93,2%	79,3%	73,9%
33,00	1,30	1,40	15,92	13,4%	19,80	3,18	235,8	26,5	93,3%	79,3%	74,0%
34,00	1,26	1,45	15,97	12,8%	19,79	3,10	236,4	26,4	93,1%	79,3%	73,8%
35,00	1,21	1,45	15,99	12,6%	19,79	3,08	236,6	26,6	93,1%	79,3%	73,8%
36,00	1,12	1,58	15,99	11,8%	19,78	3,00	237,0	26,4	92,5%	79,2%	73,3%
37,00	1,08	2,02	15,84	10,0%	19,76	2,91	236,1	26,5	90,6%	79,1%	71,6%
38,00	1,03	2,31	15,72	9,0%	19,75	2,87	235,2	26,7	89,4%	79,0%	70,6%
39,00	0,94	2,47	15,61	8,7%	19,75	2,91	234,6	26,7	88,7%	78,9%	70,0%
40,00	0,90	2,37	15,54	9,6%	19,76	3,03	234,5	26,6	89,0%	78,9%	70,2%
41,00	0,85	2,09	15,51	11,6%	19,78	3,23	234,7	26,6	90,1%	79,0%	71,2%
42,00	0,80	1,63	15,41	15,3%	19,82	3,59	234,6	26,5	92,1%	79,0%	72,8%
43,00	0,76	1,19	15,19	19,9%	19,86	4,07	234,7	26,6	94,0%	79,1%	74,3%
44,00	0,71	0,76	15,14	23,5%	19,89	4,37	234,7	26,7	96,1%	79,2%	76,0%
45,00	0,71	0,48	14,97	27,1%	19,92	4,71	234,0	26,7	97,4%	79,2%	77,2%
46,00	0,67	0,14	14,29	36,2%	19,99	5,63	231,1	26,8	99,3%	79,0%	78,5%
47,00	0,62	0,05	13,05	50,0%	20,08	7,00	226,4	26,9	99,9%	78,5%	78,4%
48,00	0,58	0,03	12,44	57,6%	20,12	7,67	221,6	27,0	100,0%	78,4%	78,4%
49,00	0,58	0,03	11,97	63,7%	20,15	8,16	217,3	26,9	100,0%	78,3%	78,3%
50,00	0,53	0,02	11,55	69,8%	20,18	8,62	213,5	27,0	100,0%	78,2%	78,2%
51,00	0,53	0,02	11,05	77,3%	20,21	9,14	209,7	26,9	100,1%	78,0%	78,0%
52,00	0,53	0,03	10,78	81,8%	20,23	9,44	206,6	27,0	100,1%	78,0%	78,0%
53,00	0,52	0,03	10,46	87,3%	20,25	9,77	203,6	27,0	100,1%	77,9%	77,9%
54,00	0,49	0,03	9,96	96,6%	20,28	10,30	200,8	26,9	100,0%	77,5%	77,6%
55,00	0,49	0,03	9,56	104,8%	20,31	10,73	198,5	26,9	100,0%	77,3%	77,3%
56,00	0,49	0,04	9,22	112,2%	20,33	11,09	195,9	26,9	100,0%	77,1%	77,1%
57,00	0,44	0,04	8,92	119,1%	20,35	11,40	193,7	26,9	100,0%	76,9%	76,9%
58,00	0,44	0,05	8,83	121,4%	20,35	11,50	191,9	26,8	99,9%	76,9%	76,8%
59,00	0,41	0,06	8,70	124,4%	20,36	11,64	190,6	26,7	99,9%	76,8%	76,7%
60,00	0,40	0,06	8,54	128,3%	20,37	11,80	189,2	26,7	99,8%	76,7%	76,6%
61,00	0,40	0,07	8,38	132,6%	20,38	11,97	188,1	26,8	99,8%	76,6%	76,4%
62,00	0,40	0,07	8,13	139,5%	20,40	12,23	186,8	26,6	99,7%	76,4%	76,2%
63,00	0,40	0,07	8,13	139,6%	20,40	12,23	185,6	26,7	99,7%	76,5%	76,2%
64,00	0,35	0,07	8,12	139,9%	20,40	12,25	184,3	26,7	99,7%	76,6%	76,3%
65,00	0,35	0,07	8,03	142,3%	20,40	12,33	183,4	26,7	99,7%	76,5%	76,3%
66,00	0,35	0,07	8,08	140,8%	20,40	12,28	182,6	26,7	99,7%	76,7%	76,4%
67,00	0,35	0,08	7,99	143,6%	20,41	12,38	181,5	26,8	99,6%	76,6%	76,3%
68,00	0,35	0,08	7,89	146,6%	20,41	12,49	180,6	26,8	99,6%	76,5%	76,3%
69,00	0,35	0,08	7,94	145,1%	20,41	12,44	179,9	26,9	99,6%	76,7%	76,4%
70,00	0,30	0,08	8,00	143,1%	20,41	12,36	179,1	26,8	99,6%	76,8%	76,6%
71,00	0,30	0,08	8,05	141,6%	20,40	12,31	178,1	26,9	99,6%	77,0%	76,7%
72,00	0,30	0,08	7,95	144,6%	20,41	12,42	177,0	26,7	99,6%	76,9%	76,7%
73,00	0,30	0,08	7,90	146,0%	20,41	12,47	176,5	26,8	99,6%	76,9%	76,6%
74,00	0,30	0,08	7,89	146,6%	20,41	12,49	175,6	26,6	99,6%	77,0%	76,7%
75,00	0,29	0,08	7,90	146,0%	20,41	12,47	175,2	26,6	99,6%	77,0%	76,7%
76,00	0,26	0,08	7,92	145,5%	20,41	12,45	174,5	26,6	99,6%	77,1%	76,8%
77,00	0,26	0,08	7,95	144,4%	20,41	12,41	174,4	27,0	99,6%	77,2%	76,9%
78,00	0,26	0,09	8,00	142,8%	20,41	12,36	174,6	27,2	99,5%	77,3%	76,9%
79,00	0,26	0,09	8,07	140,7%	20,40	12,29	174,6	27,3	99,5%	77,4%	77,0%
80,00	0,22	0,09	8,10	139,7%	20,40	12,25	174,8	27,3	99,5%	77,4%	77,0%
81,00	0,22	0,09	8,09	140,2%	20,40	12,27	174,7	27,4	99,5%	77,4%	77,0%
82,00	0,22	0,09	8,08	140,2%	20,40	12,27	174,4	27,3	99,5%	77,4%	77,0%
83,00	0,22	0,09	8,07	140,6%	20,40	12,29	174,7	27,4	99,5%	77,4%	77,0%
84,00	0,21	0,09	8,03	141,7%	20,40	12,32	174,2	27,1	99,5%	77,3%	76,9%
85,00	0,17	0,10	8,05	141,1%	20,40	12,30	174,5	27,0	99,5%	77,3%	76,9%
86,00	0,17	0,10	8,01	142,3%	20,40	12,35	175,2	27,1	99,4%	77,2%	76,7%
87,00	0,17	0,10	7,97	143,3%	20,41	12,39	175,9	26,9	99,4%	77,1%	76,6%
88,00	0,17	0,10	7,99	142,7%	20,41	12,36	176,1	27,0	99,4%	77,1%	76,6%
89,00	0,17	0,11	7,92	144,7%	20,41	12,44	176,1	27,0	99,3%	77,0%	76,5%
90,00	0,12	0,11	7,91	145,2%	20,41	12,45	175,7	26,8	99,3%	77,0%	76,5%
91,00	0,12	0,11	7,61	154,6%	20,43	12,77	175,3	27,1	99,3%	76,6%	76,1%
92,00	0,12	0,12	7,59	154,9%	20,43	12,78	175,9	27,0	99,2%	76,5%	75,9%

93,00	0,12	0,12	7,69	151,5%	20,42	12,67	176,2	27,2	99,2%	76,7%	76,0%
94,00	0,12	0,12	7,71	151,0%	20,42	12,66	176,3	26,9	99,2%	76,7%	76,0%
95,00	0,08	0,12	7,76	149,2%	20,42	12,60	176,8	27,0	99,2%	76,7%	76,1%
96,00	0,08	0,12	7,73	150,3%	20,42	12,64	177,3	26,8	99,2%	76,6%	75,9%
97,00	0,08	0,12	7,69	151,4%	20,42	12,67	177,4	26,8	99,1%	76,5%	75,8%
98,00	0,08	0,11	7,84	147,1%	20,42	12,52	175,6	27,0	99,3%	76,9%	76,4%
99,00	0,08	0,10	7,81	148,5%	20,42	12,56	173,5	27,1	99,4%	77,1%	76,6%
100,00	0,08	0,10	7,81	148,4%	20,42	12,56	172,5	27,0	99,4%	77,2%	76,7%
101,00	0,03	0,10	7,85	147,2%	20,42	12,52	172,2	27,0	99,4%	77,2%	76,8%
102,00	0,03	0,10	7,82	147,9%	20,42	12,54	171,9	27,1	99,4%	77,2%	76,7%
103,00	0,03	0,11	7,82	147,7%	20,42	12,54	172,0	26,9	99,3%	77,2%	76,7%
104,00	0,03	0,11	7,66	152,9%	20,43	12,72	172,2	26,8	99,3%	76,9%	76,4%
105,00	0,03	0,11	7,58	155,5%	20,43	12,80	172,3	26,9	99,3%	76,8%	#DIV/0!
106,00	0,03	0,12	7,53	157,1%	20,44	12,85	172,7	26,9	99,2%	76,7%	#DIV/0!
107,00	0,03	0,11	7,53	157,1%	20,44	12,85	172,6	27,0	99,2%	76,7%	76,1%
108,00	0,00	0,12	7,46	159,3%	20,44	12,92	172,8	27,0	99,2%	76,6%	76,0%

DATA 2022-06-29 EPA PI 20272 RUN 3 MODEL 8060
preburn

Temps acquisition minutes	Flue temp °F	Room temp °F	Tunnel dry bulb °F	Catalyst down °F	scale lbs	Right °F	Back °F	bottom °F	Top °F	Left °F
1	74,57	73,10	77,64	76,11	2,67	75,29	75,20	75,49	75,35	75,81
2	84,11	72,99	78,39	100,39	2,67	75,26	75,47	75,51	75,43	75,88
3	102,65	73,07	80,49	140,17	2,57	75,40	75,74	75,51	75,56	76,43
4	165,07	73,12	90,42	315,52	1,36	76,07	80,80	75,64	75,71	79,84
5	249,16	73,15	84,96	601,89	2,37	78,25	80,96	75,87	77,26	91,78
6	309,63	73,15	86,67	718,68	2,17	83,14	85,04	76,68	80,80	113,40
7	351,13	73,06	88,39	745,14	1,97	90,99	91,74	78,89	85,93	136,52
8	385,31	73,33	90,13	779,61	1,87	103,38	100,62	82,31	92,69	161,67
9	405,84	73,57	91,16	812,17	1,67	121,76	110,89	86,49	100,69	187,61
10	421,48	73,60	92,26	827,82	1,57	144,23	121,60	91,00	109,36	214,28
11	435,22	73,57	93,31	838,96	1,37	168,62	133,18	95,49	118,60	240,99
12	446,95	73,64	94,34	869,82	1,17	192,65	145,12	100,01	127,61	265,54
13	423,06	73,72	124,64	561,04	6,22	213,76	165,73	104,42	131,27	288,13
14	332,91	73,70	113,78	345,49	8,28	235,18	182,46	108,88	133,12	307,47
15	284,97	73,66	110,02	311,93	8,18	248,68	194,62	113,14	134,92	318,30
16	266,40	73,66	107,61	316,63	8,07	254,14	205,49	116,98	138,04	321,06
17	320,20	73,74	111,00	358,90	7,94	255,15	211,76	120,23	144,06	320,38
18	392,05	73,74	103,98	660,20	7,67	254,68	217,89	123,00	152,72	319,59
19	404,49	73,64	95,65	763,64	7,58	254,03	224,03	125,42	159,79	319,48
20	374,93	73,69	92,49	649,69	7,47	255,14	230,65	127,51	166,41	319,31
21	358,77	73,84	91,23	637,57	7,37	255,37	238,87	129,39	172,93	318,11
22	368,63	73,84	91,84	690,36	7,27	255,70	244,83	131,17	179,39	316,74
23	382,63	73,82	92,42	748,50	7,17	256,33	250,93	132,95	186,02	315,57
24	406,09	73,69	93,76	801,94	6,97	257,91	257,31	134,70	192,92	314,56
25	419,76	73,73	93,97	802,57	6,88	259,59	263,97	136,48	199,93	314,06
26	419,92	73,76	94,69	770,03	6,77	261,78	271,44	138,29	207,19	314,71
27	420,33	73,69	94,63	772,99	6,67	264,31	278,87	140,18	214,96	314,84
28	419,58	73,73	94,77	776,75	6,57	266,22	285,55	142,16	222,76	314,48
29	416,56	73,68	94,62	769,52	6,47	268,35	291,59	144,41	230,72	315,20
30	414,22	73,80	94,55	764,76	6,37	270,85	297,55	146,72	238,39	316,78
31	415,71	73,93	94,60	778,66	6,27	274,12	301,90	149,35	246,06	316,88
32	417,57	73,91	94,90	780,99	6,07	277,19	305,89	152,31	253,55	318,81
33	419,17	74,00	95,50	790,32	6,04	280,92	309,78	155,47	261,02	320,77
34	422,27	74,09	95,89	819,95	5,87	285,02	312,79	158,92	268,47	324,04
35	428,36	74,15	96,13	811,43	5,77	288,68	314,57	162,52	275,23	326,17
36	441,44	74,10	97,28	836,45	5,67	293,81	316,99	166,39	282,20	331,83
37	453,74	74,11	97,96	876,65	5,57	300,09	318,69	170,21	288,96	336,79
38	463,38	74,10	98,47	890,05	5,48	305,78	319,72	174,30	295,66	342,04
39	468,22	74,34	98,41	899,63	5,27	312,54	320,88	178,31	302,76	345,57
40	470,70	74,37	99,78	897,71	5,17	320,84	324,99	182,39	310,13	350,86
41	468,69	74,46	99,73	886,42	5,07	328,41	324,34	186,38	317,32	354,36
42	464,14	74,46	99,25	864,28	4,97	334,95	324,90	190,26	324,55	356,35
43	462,10	74,58	98,62	861,89	4,87	341,12	326,01	194,42	331,58	359,44
44	463,21	74,64	99,66	867,31	4,72	347,90	330,34	198,72	338,47	365,36
45	467,85	74,75	99,06	892,30	4,57	351,94	331,31	202,98	344,50	367,84
46	474,80	74,71	100,22	907,41	4,47	357,52	334,26	207,59	350,78	374,60
47	479,61	74,72	100,42	916,02	4,37	362,89	335,43	212,11	357,02	378,36
48	485,36	74,86	101,48	931,98	4,17	369,03	337,52	216,78	363,40	385,27
49	492,25	74,98	102,16	947,42	4,07	375,62	340,01	221,49	369,73	393,57
50	498,16	75,00	102,46	969,29	3,97	383,21	343,22	226,27	376,49	401,51
51	504,68	75,07	103,23	991,17	3,77	391,39	345,87	230,96	382,97	409,21
52	510,59	75,17	103,60	1008,85	3,67	399,47	349,93	235,75	389,98	417,66
53	514,91	75,19	104,49	1014,85	3,50	407,94	351,91	240,50	396,93	427,17
54	524,69	75,53	105,20	1037,75	3,37	416,86	354,90	245,30	404,42	437,56
55	530,79	75,54	105,66	1048,08	3,27	425,12	356,58	250,14	411,53	446,03
56	532,39	75,55	105,71	1035,42	3,17	432,96	358,38	255,00	419,47	451,14
57	532,64	75,61	106,17	1025,53	2,97	442,09	362,07	259,92	427,30	454,45
58	534,39	75,83	106,11	1027,63	2,87	451,75	364,29	264,87	435,16	458,40
59	535,09	76,03	105,09	1023,84	2,77	461,90	366,31	269,97	442,97	461,10
60	532,20	76,10	105,65	1011,25	2,57	470,82	369,49	275,19	450,52	463,49
61	531,16	75,99	105,48	1007,47	2,47	480,38	372,01	280,52	458,04	466,82
62	527,82	76,09	105,97	1005,38	2,37	492,19	372,33	285,88	464,90	470,13
63	524,67	75,91	105,70	995,00	2,27	504,37	373,38	291,31	471,18	473,41
64	519,21	75,80	106,50	972,50	2,17	517,67	375,93	296,89	476,71	477,77
65	512,56	76,07	105,21	958,92	1,97	530,17	376,70	302,28	481,52	481,69
66	505,41	76,11	104,42	945,26	1,87	540,62	374,33	307,54	485,38	485,44
67	499,39	75,91	104,22	933,79	1,87	551,28	376,00	313,04	489,09	490,79
68	493,28	75,94	103,43	925,29	1,77	563,20	373,86	318,31	491,93	494,97
69	486,12	76,16	102,31	910,84	1,67	574,57	374,49	323,68	494,23	500,35
70	476,52	76,50	101,21	888,94	1,66	584,40	372,82	328,85	495,93	504,60
71	465,37	76,24	100,72	856,27	1,57	592,71	372,98	334,16	496,84	509,69
72	456,58	76,22	100,86	839,41	1,57	601,13	372,01	339,35	496,80	513,82
73	450,23	76,14	101,67	830,93	1,47	608,01	371,38	344,72	496,51	519,68
74	441,81	76,20	100,58	816,54	1,47	614,41	370,89	350,22	495,75	525,58
75	427,82	76,31	98,93	769,30	1,39	619,09	366,13	355,64	493,85	531,31
76	413,38	76,31	97,89	736,88	1,37	621,80	363,92	361,32	491,98	536,80
77	401,53	76,56	98,48	717,34	1,37	626,36	362,19	367,63	489,11	544,79
78	391,22	76,48	98,73	699,80	1,37	627,81	358,57	373,99	485,45	551,95
79	382,06	76,39	98,17	682,76	1,37	628,80	355,11	380,44	481,52	557,71
80	373,99	76,63	96,35	668,53	1,37	628,66	349,55	386,57	476,84	561,04
81	367,34	76,54	96,79	665,90	1,27	628,82	347,60	392,89	472,31	565,21
82	361,65	76,65	95,38	658,65	1,27	627,18	341,70	398,81	466,77	567,95
83	356,86	76,59	94,86	652,31	1,27	625,53	338,50	404,61	461,70	570,03
84	352,76	76,44	95,18	646,98	1,27	623,64	336,63	410,47	456,31	573,39
85	349,44	76,53	95,43	639,76	1,27	622,22	333,93	416,13	450,94	575,76
86	340,05	76,55	117,64	403,18	1,21	619,73	334,06	421,67	444,67	578,30
87	308,49	76,69	108,54	398,56	8,37	616,64	336,42	427,37	437,34	579,68
88	313,89	76,55	97,35	617,44	8,28	611,31	332,44	432,90	431,02	577,53
89	349,38	76,73	96,91	768,70	8,28	602,03	325,75	437,84	424,33	572,48
90	364,30	76,68	96,17	760,04	8,18	592,12	323,83	441,92	418,62	564,45

91	383,42	76,76	97,39	891,05	8,08	580,18	323,78	445,03	417,92	556,64
92	402,59	76,90	97,39	919,51	7,98	571,22	326,30	447,06	423,78	547,96
93	411,16	76,78	98,80	924,80	7,88	561,09	329,85	448,28	433,56	540,30
94	421,69	76,75	97,85	984,38	7,77	551,64	334,92	448,69	446,11	531,40
95	435,45	76,95	98,77	1010,83	7,62	544,89	341,65	448,66	459,37	524,16
96	441,59	77,30	98,13	1007,50	7,52	538,26	346,65	448,01	471,95	517,36
97	444,54	77,11	98,90	993,29	7,38	531,19	353,89	447,23	485,00	510,44
98	445,85	77,13	99,25	994,71	7,28	525,93	359,60	446,12	497,74	504,64
99	447,59	77,15	99,85	981,64	7,18	521,24	365,73	444,81	509,81	499,32
100	454,04	77,25	99,46	989,44	6,99	516,66	368,52	443,34	521,32	493,91
101	455,08	77,16	99,64	994,23	6,88	512,70	373,05	441,82	531,04	488,64
102	455,89	77,03	100,87	990,89	6,78	510,25	376,85	440,20	539,75	484,74
103	456,80	77,01	100,64	991,08	6,68	508,01	381,75	438,49	548,37	480,35
104	458,33	77,04	100,33	1006,28	6,58	506,12	386,47	436,82	557,34	476,67
105	458,28	77,01	99,92	1000,67	6,47	504,61	391,14	435,07	564,97	473,61
106	457,57	76,95	100,41	992,84	6,27	503,42	395,20	433,37	572,70	470,99
107	457,08	76,94	99,44	999,70	6,18	502,45	397,71	431,51	579,96	468,89
108	457,97	77,06	100,48	1014,42	6,08	501,83	402,26	429,98	586,40	467,07
109	457,96	77,22	100,20	1009,65	5,98	501,57	404,98	428,40	592,84	466,07
110	456,93	77,29	100,43	1001,85	5,87	501,79	408,24	426,76	598,18	465,78
111	455,30	77,31	100,48	995,79	5,77	501,38	409,35	425,21	602,58	465,50
112	455,26	77,23	99,46	994,63	5,57	502,29	408,53	423,53	607,80	465,61
113	456,11	77,38	100,98	1011,18	5,57	503,62	409,74	422,10	612,55	466,64
114	457,99	77,30	100,66	1014,29	5,38	505,44	411,20	420,56	616,94	466,72
115	460,20	77,08	100,35	1014,58	5,28	508,25	413,77	419,25	621,26	468,06
116	460,82	77,17	100,63	1017,49	5,17	510,57	414,64	417,88	625,19	468,61
117	461,62	77,24	99,91	1016,43	5,07	513,82	415,89	416,52	628,97	469,61
118	462,30	77,34	101,16	1021,82	4,97	517,92	418,28	415,22	632,59	471,83
119	461,78	77,40	100,24	1027,72	4,87	521,24	422,17	414,14	636,18	473,46
120	461,45	77,55	100,15	1032,76	4,68	524,71	424,10	412,88	639,67	474,34
121	461,17	77,25	100,69	1020,68	4,68	528,09	426,04	411,75	642,27	476,42
122	462,21	77,44	100,38	1027,76	4,47	532,49	430,16	410,71	644,79	478,47
123	462,59	77,28	101,40	1021,77	4,37	535,38	432,92	409,78	645,70	481,37
124	463,51	77,37	102,15	1023,08	4,27	541,21	435,15	408,82	646,76	484,54
125	462,79	77,51	101,21	1024,28	4,17	547,17	436,08	407,92	648,65	487,57
126	462,35	77,81	100,70	1019,32	4,08	551,74	435,16	406,99	650,36	490,55
127	460,99	77,51	100,60	1017,04	3,98	557,56	436,36	406,16	652,77	493,97
128	461,09	77,48	100,92	1021,87	3,87	563,59	437,55	405,32	654,42	497,28
129	459,67	77,42	100,86	1023,23	3,77	569,73	437,69	404,52	655,91	500,80
130	458,23	77,42	100,97	1021,24	3,67	577,28	439,41	403,83	657,10	504,28
131	457,86	77,47	101,26	1021,72	3,57	585,55	439,85	403,20	658,48	508,53
132	455,58	77,48	101,88	1017,23	3,47	592,81	441,18	402,63	660,15	513,19
133	455,81	77,40	101,83	1013,81	3,38	599,73	441,32	402,11	660,43	517,33
134	454,25	77,71	100,01	1007,82	3,28	606,11	442,63	401,51	661,22	521,51
135	452,73	77,96	101,65	997,46	3,17	615,25	442,17	401,16	662,44	525,25
136	451,24	77,70	101,48	1002,73	3,07	621,67	443,30	400,90	663,31	529,20
137	450,23	77,88	102,13	997,26	2,97	628,32	442,73	400,75	664,33	533,04
138	447,76	77,91	102,39	985,13	2,87	636,25	443,30	400,61	664,74	537,01
139	444,21	78,00	102,01	973,18	2,87	642,40	443,06	400,52	665,48	540,90
140	440,42	77,99	102,73	955,09	2,77	647,71	442,20	400,45	664,97	545,29
141	436,51	78,21	102,12	942,55	2,68	651,98	439,10	400,33	663,68	549,90
142	431,57	78,48	101,91	925,28	2,68	655,95	437,28	400,35	661,77	553,67
143	427,92	78,54	100,88	911,66	2,58	660,04	434,41	400,32	658,97	558,10
144	424,05	78,71	100,67	905,04	2,47	663,45	431,65	400,34	655,20	561,55
145	420,59	78,57	100,50	886,29	2,47	667,11	426,24	400,43	650,55	566,12
146	415,95	78,59	99,45	872,43	2,47	669,55	421,57	400,42	644,98	570,57
147	411,14	78,48	98,13	859,07	2,37	671,31	417,31	400,52	638,20	574,39
148	406,57	78,54	96,79	847,46	2,37	672,18	413,05	400,56	629,77	578,96
149	403,83	78,27	99,41	837,29	2,27	672,82	411,97	400,93	620,03	585,25
150	398,76	78,59	98,01	825,32	2,27	672,74	407,95	401,37	609,50	589,42
151	394,04	78,59	98,79	811,75	2,27	672,60	404,13	401,88	598,18	592,94
152	389,84	78,48	97,37	800,37	2,27	670,84	401,34	402,37	586,11	597,21
153	384,60	78,42	96,75	789,91	2,27	671,71	395,90	402,95	575,06	600,25
154	380,01	78,15	96,53	780,61	2,22	669,65	393,43	403,77	564,98	603,19
155	376,20	78,51	97,32	772,35	2,17	669,58	391,21	404,57	554,70	606,49
156	373,28	78,29	97,02	770,18	2,17	667,98	389,42	405,52	546,42	609,70
157	370,23	78,20	97,06	766,08	2,17	667,52	387,22	406,43	537,50	613,28
158	367,27	78,18	97,17	760,95	2,17	665,89	383,98	407,51	528,88	616,88
159	365,32	78,39	96,32	757,28	2,07	664,23	380,88	408,48	520,98	620,21
160	363,53	78,02	96,58	750,96	2,07	661,96	378,75	409,57	513,87	623,67
161	360,49	78,12	96,21	741,26	2,07	661,19	377,27	410,78	506,31	627,11
162	357,77	78,09	96,00	736,69	2,07	658,92	374,04	411,88	499,17	629,50
163	355,65	78,37	95,89	731,08	1,98	656,19	373,03	413,09	492,26	632,23
164	353,19	78,57	95,58	726,53	2,07	652,95	370,93	414,29	485,98	633,61
165	351,20	78,69	95,41	724,00	1,98	649,69	368,99	415,50	480,01	635,79
166	350,84	78,60	95,56	722,20	1,98	647,11	367,17	416,79	474,35	637,76
167	348,84	78,47	96,39	717,90	1,98	644,22	365,77	418,10	468,47	639,01
168	348,05	78,34	96,67	717,64	1,98	641,42	363,88	419,48	463,00	640,22
169	346,99	78,21	95,53	714,33	1,98	638,13	361,40	420,82	458,22	641,10
170	346,32	78,35	95,84	709,59	1,87	636,37	360,42	422,13	453,56	641,52
171	344,83	78,37	96,63	706,97	1,87	634,36	358,39	423,51	449,17	642,83
172	344,04	78,40	95,37	704,23	1,87	631,12	356,30	424,87	444,92	643,73
173	342,65	78,53	94,41	701,05	1,87	628,22	354,16	426,24	440,73	644,06
174	341,88	78,38	95,87	699,37	1,87	625,76	354,42	427,57	437,18	644,64
175	341,31	78,35	95,81	696,92	1,87	623,93	353,25	428,97	433,45	645,57
176	340,23	78,35	95,75	692,96	1,82	622,66	350,90	430,39	429,58	646,68
177	338,29	78,20	94,47	688,52	1,77	619,60	349,17	431,71	426,23	646,99
178	336,82	78,17	95,46	684,79	1,77	618,33	347,59	432,97	422,66	645,73
179	335,94	78,12	95,54	682,77	1,77	615,80	346,45	434,29	419,57	645,39
180	335,36	78,04	94,53	680,99	1,77	613,68	344,79	435,60	416,69	644,44
181	334,25	78,34	94,23	679,06	1,77	611,95	343,78	436,93	413,64	643,58
182	333,34	78,53	94,83	678,61	1,77	609,90	342,64	438,26	410,99	643,40
183	332,05	78,65	94,70	676,88	1,67	608,21	340,49	439,57	408,55	642,95

184	331,05	78,66	94,23	675,43	1,67	605,95	338,33	440,93	405,89	642,57
185	330,87	78,58	94,68	672,43	1,67	604,12	337,36	442,22	403,41	641,66
186	329,71	78,59	94,48	670,51	1,67	602,90	336,56	443,56	401,16	641,32
187	329,48	78,76	94,88	669,41	1,57	600,91	334,09	444,73	398,97	640,33
188	349,47	78,67	99,31	580,71	1,62	598,41	336,87	446,09	394,60	639,51

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2022-06-30 Manufacturer: Heathstone Model: 8060

Project #: PT 20272 Run: 4 Tech: MM Reviewer: NP

- kindling 3 8 LBS 5 MIN FIRE
- by pass open
- air inlet Full open
- At 2,5 LBS close Door
- At 1,2 LBS insert 1er preload
- close Door immediatly
- At 1,2 LBS insert Second preload
- close Door immediatly
- At 5,3 LBS close by pass
- At 16 LBS ~~insert~~ mm.7 Rack coal Bed
- After 3 mm ir insert load and close Door immediatly

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2022-06-30 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 4 Tech: MM Reviewer: DP

	Equipment #	Time	12%	22%
Moisture Meter Calibration Check:	EM-334	7100	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)	0	NA
Picture	4 sides ok	ok
Wood Heater Conditions:		
Date Wood Heater Stack Cleaned	2022-06-27	
Date Dilution Tunnel Cleaned	2022-06-27	
Induced Draft Check (max 0.005 H2O)	ok	
Traverse before ignition	ok	
Temperature System:		
Ambient (65°-90°F)		ok °F
Proportional Checks:		
Thermocouple check	OK	
Pitot Clean	ok	
Pitot verification	ok	
Pictures for report	Side ok Coal bed ok Load ok Load in stove ok Fuel adjustment ok	
Load Length approximately 5/6 of firebox Lenght		ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-06-30 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 4 Tech: MM Reviewer: DP

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10	-15	-10	-10	-16	-10
Final 1minute DGM (Liter)	657842,48	658470,06	657847,75	658470,18	405649,62	406264,32
Initial 1minute DGM (Liter)	657842,43	658470,06	657842,65	658470,15	405649,52	406264,32
Change (Liter)	0,05		0,10		0,10	
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**
Check OK	OK	OK	OK	OK	OK	OK

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-06-30 Manufacturer: Hearthstone Model: 8060

Project #: pI 20272 Run: 4 Tech: MP Reviewer: DP

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~~ .5 MP
Check OK (no change after 15 sec.)	ok	ok	ok	ok

Scales checks

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44.0 lbs
Platform	EM-205	10.00 ~~lbs~~ kg, Class F	10.00 ~~lbs~~ kg
Wood	EM-090	44.0 lbs, Class F	44.0 lbs
Analytical	EM-325	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%

Date: 2022-06-30 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 4 Tech: MR Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 101.8 (KPa.) Static pressure (P_q) 0.17 (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	0,070	73.11
B - Centroid	3.00	3.50	4	0.069	72.88
A-1	0.40	0.50	0.50	0,056	73,11
A-2	1.50	1.75	2	0.058	73.00
A-3	4.50	5.25	6	0,060	73,00
A-4	5.60	6.5	7.5	0.057	72.89
B-1	0.40	0.50	0.50	0,057	72.89
B-2	1.50	1.75	2	0,060	72.78
B-3	4.50	5.25	6	0.069	72.78
B-4	5.60	6.5	7.5	0.057	72.73
				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: 2022-06-30 Manufacturer: Hearthstone Model: 8060

Project #: 01 2022 Run: 4 Tech: MM Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3019	3.000	1018	1.000
Tolerance CO	0	+/- 0.02	.0019	+/- 0.15	.0018	+/- 0.05
CO_2	0	0	17.86	18.00	9.81	10.00
Tolerance CO2	0	+/- 0.02	6.14	+/- 0.5	~~0.8~~ 0.19	+/- 0.5
O_2 informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	3.009	1.016	0	0.02	0.010	0.15	0.002	0.05	✓	
CO_2	0	17.90	9.88	0	0.02	0.04	0.5	0.07	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2022-06-30 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 4 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	658469,23	406262,82	391675,65
Initial (Liter)	657873,55	405649,70	391160,72

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101,8	101,6
Dry Bulb (F):	74,8	79,3
Humidity (%):	46	40,1

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: 2022-06-30 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 4 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 14 in.	1110 lbs.	20.3	20.9	20,8	20.8	20.6
1 1/2 x 3 1/2 x 14 in.	1726 lbs.	20,9	21.0	20.9	20.8	20.7
1 1/2 x 3 1/2 x 14 in.	1686 lbs.	19.9	19.8	19.7	19.7	19.8
1 1/2 x 3 1/2 x 7 in.	0584 lbs.	20.1	20.0	20.1	20.3	20.2
1 1/2 x 3 1/2 x 7 in.	0568 lbs.	19.6	19.7	19.6	19.8	19.9
1 1/2 x 3 1/2 x 7 in.	0588 lbs.	20.1	20.3	20.4	20.6	20.9
1 1/2 x 3 1/2 x 7 in.	0664 lbs.	19.1	19.2	19.3	19.4	19.3
x x in.	lbs.					
1 1/2 x3 1/2 x 14 in.	1632 lbs.	19.3	19.4	19.6	19.8	19.4
1 1/2 x 3 1/2 x 14 in.	1704 lbs.	19.8	19.9	19.7	19.6	19.8
1 1/2 x 3 1/2 x 14 in.	~~1672~~ 1884 lbs.	20.1	20.0	20.0	20.3	20.6
1 1/2 x 3 1/2 x 7 in.	0544 lbs.	20.6	20.9	20.8	20.6	20.5
1 1/2 x 3 1/2 x 7 in.	0574 lbs.	20.6	20.8	20.9	21.0	21.0
1 1/2 x 3 1/2 x 7 in.	0574 lbs.	21.1	21.3	21.6	21.3	21.4
1 1/2 x x 7 in.	0712 lbs.	20.0	20.1	20.3	20.2	20.3
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 6924+6924 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2022-06-30 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 4 Tech: MA Reviewer: DO

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight		Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 15 in.	1282	lbs.	202	203	204	205	203
1 1/2 x 3 1/2 x 15 in.	1530	lbs.	200	196	198	198	198
1 1/2 x 3 1/2 x 15 in.	1462	lbs.	217	218	215	218	219
1 1/2 x 3 1/2 x 15 in.	1510	lbs.	193	197	196	196	198
x x in.		lbs.					
1 1/2 x 3/4 x 4 in.	0092	lbs.		196	0106 M		
1 1/2 x 3/4 x 4 in.	0128	lbs.		193	0116 M		
1 1/2 x 3/4 x 4 in.	0164	lbs.		194	0120 M		
1 1/2 x 3/4 x 4 in.	0094	lbs.		193	0094 M		
1 1/2 x 3/4 x 4 in.	0094	lbs.		200	0114 M		
1 1/2 x 3/4 x 4 in.	0114	lbs.		199	0094 M		
1 1/2 x 3/4 x 4 in.	0080	lbs.		200	0098 M		
1 1/2 x 3/4 x 4 in.	0098	lbs.		196	0096 M		
1 1/2 x 3/4 x 4 in.	0116	lbs.		197	0120 M		
1 1/2 x 3/4 x 4 in.	0094	lbs.		197	0080 M		
1 1/2 x 3/4 x 4 in.	0128	lbs.		198			
1 1/2 x 3/4 x 4 in.	0106	lbs.		201			
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					

TEST LOAD WEIGHT: 703 lbs Min 20%: 140 Max 25%: 175

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: pI 20272 Run: 4 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	21	323	324	4	34	325	326	21	329
2022-06-29	17:00	108 7376		34 7547		110 1040		33 9212		0 1286
2022-06-30	9:00	108 7375		34 7546		110, 1040		33, 9213		0 1286

		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	21	323	324	4	34	325	326	21	329
2022-06-30	14:00	108 7377		34 7561		110 1041		33 9223		0 1287
2022-07-06	8:30	108 7376		34 7548		110 1040		33 9223		0 1287
2022-07-07	8:30	108 7376		34 7548		110 1040		33, 9223		0 1287

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-06-29 Manufacturer: Hearthstone Model: 8060

Project #: pI 20272 Run: 4 Tech: MM Reviewer: DO

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	40	327	328	44
2022-06-29	17:00	110 1013		356755	
2022-06-30	9:00	110 1013		356754	35 MM

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	40	327	328	44
2022-06-30	14:00	110 1015		356767	
2022-07-06	8:00	110 1014		356767	
2022-07-07	8:00	110 1014		356767	

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	30-06-2022	
Technicien	M.M	
Project #	PI 20272	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8060	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1	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):	1,007	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,005	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	EM 179	Dimensionless

Tunnel

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

Project nu.	PI 20272
Date	30-06-2022
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):	101,8	101,6
Barometer (in.Hg):	30,061529	30,00246871
Dry Bulb (F):	74,8	79,3
Humidity (%):	46,6	40,1
Air velocity (ft/min)	0	0

DGM #1	Final:	23253,622	cuft	Final:	658469,230	Liter
	Initial:	23232,586	cuft	Initial:	657873,550	Liter
DGM #2	Final:	14347,036	cuft	Final:	406262,820	Liter
	Initial:	14325,384	cuft	Initial:	405649,700	Liter
DGM room	Final:	13831,895	cuft	Final:	391675,650	Liter
	Initial:	13813,711	cuft	Initial:	391160,720	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 258

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

Project nu.	PI 20272
Date	30-06-2022
Technicien	M.M

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
6,30	7,00	7,70

Load Volume: 0,4253 cu. ft

Loading Density: 13,830 lbs./ft3

Number of Spaces:

Spacer weight (lbs):

Load Density (wet): 32,515 lbs./ft3

Dry Wood Density: 27,057813

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	14	1,11	20,3	20,9	20,8	20,8	20,6	22,9548	73,50
1,5	3,5	14	1,726	20,9	21	20,9	20,8	20,7	36,00436	73,50
1,5	3,5	14	1,686	19,9	19,8	19,7	19,7	19,8	33,34908	73,50
1,5	3,5	7	0,584	20,1	20	20,1	20,3	20,2	11,76176	36,75
1,5	3,5	7	0,568	19,6	19,3	19,6	19,8	19,9	11,15552	36,75
1,5	3,5	7	0,588	20,1	20,3	20,4	20,6	20,9	12,03048	36,75
1,5	3,5	7	0,644	19,1	19,2	19,3	19,4	19,3	12,40344	36,75
										0,00
1,5	3,5	14	1,632	19,3	19,4	19,6	19,8	19,4	31,824	73,50
1,5	3,5	14	1,704	19,8	19,9	19,7	19,6	19,8	33,67104	73,50
1,5	3,5	14	1,184	20,1	20	20	20,3	20,6	23,9168	73,50
1,5	3,5	7	0,544	20,6	20,9	20,8	20,6	20,5	11,24992	36,75
1,5	3,5	7	0,574	20,6	20,8	20,9	21	21	11,97364	36,75
1,5	3,5	7	0,574	21,1	21,3	21,6	21,3	21,4	12,24916	36,75
1,5	3,5	7	0,712	20	20,1	20,3	20,2	20,3	14,36816	36,75
										0,00
										0,00
										0,00

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
6,3	7,0	7,7

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

Load Volume: 0,18 cu. ft

Loading Density: 7,0 lbs./ft3

Number of Spaces: 12

Spacer weight: lbs

Load Density (wet): 31,7 lbs./ft3

Dry Wood Density: 26,4 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	15	1,28	20,20	20,30	20,40	20,50	20,30	26,07588	78,75	20,3
1,5	3,5	15	1,53	20,00	19,60	19,80	19,80	19,80	30,294	78,75	19,8
1,5	3,5	15	1,46	21,70	21,80	21,50	21,80	21,90	31,78388	78,75	21,7
1,5	3,5	15	1,51	19,30	19,30	19,60	19,60	19,80	29,4752	78,75	19,5
										0,00	
										0,00	
										0,00	
										0,00	

1,4	0,75	4	0,09			19,60			1,8032	4,20	19,6
1,4	0,75	4	0,13			19,30			2,4704	4,20	19,3
1,4	0,75	4	0,10			19,40			2,0176	4,20	19,4
1,4	0,75	4	0,09			19,30			1,8142	4,20	19,3
1,4	0,75	4	0,09			20,00			1,88	4,20	20,0
1,4	0,75	4	0,11			19,90			2,2686	4,20	19,9
1,4	0,75	4	0,08			20,00			1,6	4,20	20,0
1,4	0,75	4	0,10			19,60			1,9208	4,20	19,6
1,4	0,75	4	0,12			19,70			2,2852	4,20	19,7
1,4	0,75	4	0,09			19,70			1,8518	4,20	19,7
1,4	0,75	4	0,13			19,80			2,5344	4,20	19,8
1,4	0,75	4	0,11			20,10			2,1306	4,20	20,1
										0,00	
										0,00	
										0,00	
										0,00

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,17 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=
0,938

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,070	73,11	0,2646
B center	0,069	72,88	0,2627
A1	0,056	73,11	0,2366
A2	0,058	73	0,2408
A3	0,060	73	0,2449
A4	0,057	72,89	0,2387
B1	0,057	72,890	0,2387
B2	0,060	72,780	0,2449
B3	0,069	72,780	0,2627
B4	0,057	72,730	0,2387
AVERAGE	0,0613	72,9170	0,2474

Project nu.	PI 20272
Date	30-06-2022
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	21	323	324	4	34	325	326	21	40	327	328	44	329		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	108,7376		34,7547		110,1040		33,9212		110,1013		35,6755		0,1286	2022-06-29	17:00
Before (6)	108,7375		34,7546		110,1040		33,9213		110,1013		35,6754		0,1286	2022-06-30	09:00
After (1)	108,7377		34,7561		110,1041		33,9223		110,1015		35,6767		0,1287	2022-06-30	14:00
After (2)	108,7376		34,7548		110,1040		33,9223		110,1014		35,6767		0,1287	2022-07-06	08:00
After (3)	108,7376		34,7548		110,1040		33,9223		110,1014		35,6767		0,1287	2022-07-07	08:00
After (4)															
After (5)															
After (6)	108,7376		34,7548		110,1040		33,9223		110,1014		35,6767		0,1287	2022-07-25	08:00
Difference	0,0001	0,0000	0,0002	0,0000	0,0000	0,0000	0,0010	0,0000	0,0001	0,0000	0,0013	0,0000	0,0001		
Total (mg)		0,3				1,3				1,4			0,1		
Total ajusté (mg)		**0,20**				**1,20**				**1,30**					

Project nu.	PI 20272
Date	30-06-2022
Technicien	M.M

SFBA EPA EMISSION RESULTS

Test Duration: **114** min

PRESSURE FACTOR:	DGM 1	0,97651	
	DGM 2	0,97982	
	DGM 3	1,00374	
TEMPERATURE FACTORS	DGM 1	0,98235	
	DGM 2	0,97456	
	DGM 3	0,98320	
VOLUMES SAMPLED	DGM 1	20,312	SCft
	DGM 2	20,788	Scft
	DGM 3	17,734	SCft

TOTAL TUNNEL VOLUME : 37154

SAMPLE RATIOS

Sample Train 1:	1829,165
Sample Train 2:	1787,252

Paticulate concentration

Sample Train 1	**0,000064**	g/dscf
Sample Train 2	**0,000067**	g/dscf
Room	**0,000006**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,17**	g
Sample Train 2	**2,29**	g

EMISSION RATES

Sample Train 1	**1,14**	g/hr
Sample Train 2	**1,21**	g/hr

1st hour emission rate **0,55** g/hr

	Train 1	Train 2
Cs	6,4E-05	6,7346E-05

RESULTS

Average emission rate: 1,17 g/hr

Burn Rate : 1,396 Dry kg/hr

BAROMETRIC PRESSURE

Average:	30,0319987	in Hg
Start:	30,06152868	in Hg
End:	30,00246871	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	23253,622	Cuft
	Initial:	23232,586	Cuft
DGM 2	Final:	14347,036	Cuft
	Initial:	14325,384	Cuft
DGM #3	Final:	13831,895	Cuft
	Initial:	13813,711	Cuft

TEMPERATURES

DGM 1	537,486	°R
DGM 2	541,785	°R

CALIBRATION FACTORS

DGM 1	1,0066
DGM 2	1,0054
DGM #3	0,9882

TUNNEL FLOW RATE: 325,908 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	1,30	mg
Total Sample Train 2:	1,40	mg
Total Sample Train 1 1st hour:	0,30	mg

DEVIATION: 2,78%

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*9	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft
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
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	Down									in wc	in wc
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
0,00	258,00	7,0	0,1	2,9	0,0	316,3	74,5	97,3	390,7	340,4	603,8	583,6	412,9	465,7	0,18	74,37	74,38	82,74	0,18	75,10	75,68	84,05	0,07	0,05
1,0	259,0	6,9	0,2	3,8	0,0	300,6	74,7	92,3	385,6	339,9	596,7	576,5	413,6	566,0	0,18	74,45	74,41	82,53	0,18	75,24	75,79	83,75	0,07	0,06
2,0	260,0	6,9	0,0	5,3	0,0	301,7	74,9	91,7	382,6	338,2	586,2	566,7	413,9	587,3	0,18	74,50	74,42	82,41	0,18	75,37	75,89	83,52	0,07	0,06
3,0	261,0	6,9	0,0	5,7	0,0	302,6	74,8	91,3	380,4	338,4	574,4	556,3	414,2	590,4	0,18	74,57	74,43	82,24	0,18	75,57	76,00	83,36	0,07	0,06
4,0	262,0	6,8	0,0	6,0	0,0	304,6	74,8	91,8	379,4	339,7	563,0	545,4	414,3	596,4	0,18	74,67	74,47	82,21	0,18	75,75	76,11	83,21	0,07	0,06
5,0	263,0	6,7	0,0	8,4	0,0	319,3	75,0	92,6	386,4	340,7	551,7	534,8	413,8	678,0	0,18	74,74	74,46	82,12	0,18	75,97	76,21	83,12	0,06	0,07
6,0	264,0	6,6	0,0	11,4	0,0	336,5	74,9	92,7	395,4	344,6	541,8	524,1	413,2	702,7	0,18	74,84	74,52	82,07	0,18	76,19	76,34	83,00	0,06	0,07
7,0	265,0	6,5	0,0	10,3	0,0	343,6	74,8	93,1	402,6	348,7	533,5	514,7	412,6	703,6	0,18	74,83	74,55	82,00	0,18	76,37	76,42	82,93	0,07	0,07
8,0	266,0	6,5	0,0	10,2	0,0	347,2	74,6	92,9	407,6	352,2	525,7	506,4	411,7	697,4	0,18	74,83	74,55	81,95	0,18	76,55	76,52	82,88	0,07	0,07
9,0	267,0	6,4	0,0	8,8	0,0	347,1	74,9	93,1	411,0	356,4	519,2	497,5	410,6	688,6	0,18	74,92	74,58	81,93	0,18	76,74	76,65	82,79	0,07	0,06
10,0	268,0	6,3	0,0	9,3	0,0	347,4	75,0	93,0	414,3	358,3	513,7	490,7	409,3	686,3	0,18	75,09	74,62	81,93	0,18	77,02	76,82	83,61	0,07	0,07
11,0	269,0	6,2	0,0	8,8	0,0	346,8	75,0	92,9	416,6	363,4	509,5	484,5	408,0	679,5	0,18	75,16	74,66	81,86	0,18	77,21	76,91	87,01	0,07	0,06
12,0	270,0	6,1	0,0	8,7	0,0	347,9	75,0	93,5	419,9	366,6	506,0	479,1	406,6	694,2	0,18	75,13	74,69	81,82	0,18	77,39	77,02	87,68	0,06	0,07
13,0	271,0	6,0	0,1	10,6	0,0	359,4	75,0	93,9	427,8	370,4	502,1	474,1	405,0	756,4	0,18	75,15	74,70	81,81	0,18	77,54	77,11	87,40	0,07	0,07
14,0	272,0	5,9	0,1	13,0	0,0	379,7	75,1	94,4	438,9	374,0	498,6	469,6	403,4	817,0	0,18	75,27	74,74	81,84	0,18	77,76	77,23	87,03	0,06	0,07
15,0	273,0	5,8	0,1	12,6	0,0	383,4	75,3	94,5	448,9	375,3	495,3	465,9	401,5	783,7	0,18	75,36	74,78	81,85	0,18	77,95	77,33	86,71	0,07	0,07
16,0	274,0	5,7	0,0	11,8	0,0	384,7	75,4	94,8	456,7	378,8	493,3	464,4	399,9	789,2	0,18	75,44	74,84	81,86	0,18	78,10	77,46	86,39	0,07	0,07
17,0	275,0	5,6	0,1	12,9	0,0	397,7	75,3	94,7	467,5	380,6	491,5	464,2	397,9	841,7	0,18	75,53	74,87	81,87	0,18	78,32	77,59	86,14	0,07	0,08
18,0	276,0	5,4	0,3	15,0	0,0	416,4	75,5	96,5	478,9	382,6	491,5	465,1	396,3	916,0	0,18	75,51	74,90	81,95	0,18	78,42	77,65	85,91	0,07	0,08
19,0	277,0	5,3	0,6	15,4	0,0	429,9	75,3	96,5	489,2	383,8	493,7	466,2	394,4	931,8	0,18	75,54	74,94	82,00	0,18	78,56	77,73	85,73	0,06	0,08
20,0	278,0	5,2	0,2	14,3	0,0	428,5	75,2	96,4	497,2	384,4	497,1	469,4	392,6	856,7	0,18	75,55	74,96	81,99	0,18	78,69	77,80	85,52	0,07	0,08
21,0	279,0	5,1	0,1	12,8	0,0	423,6	75,1	97,5	503,7	386,9	501,0	473,5	391,1	846,7	0,18	75,47	74,97	82,04	0,18	78,70	77,86	85,34	0,07	0,08
22,0	280,0	5,0	0,0	13,4	0,0	423,4	75,0	96,7	512,2	387,4	503,1	475,6	389,4	860,2	0,18	75,40	74,98	82,09	0,18	78,75	77,91	85,19	0,07	0,08
23,0	281,0	4,8	0,0	14,1	0,0	425,3	74,8	97,3	521,5	387,3	503,9	477,6	387,7	874,7	0,18	75,34	74,97	82,16	0,18	78,76	77,98	85,07	0,06	0,08
24,0	282,0	4,7	0,0	14,9	0,0	428,5	75,1	97,6	532,4	387,3	505,1	479,5	385,9	897,1	0,18	75,30	74,97	82,24	0,18	78,80	78,06	84,96	0,07	0,08
25,0	283,0	4,6	0,2	15,4	0,0	438,5	75,4	98,2	540,7	387,4	506,0	480,9	384,0	957,7	0,18	75,37	74,99	82,27	0,18	78,87	78,15	84,81	0,07	0,08
26,0	284,0	4,4	0,7	15,7	0,0	444,5	75,4	97,8	548,4	386,7	509,7	483,0	382,0	959,6	0,18	75,51	75,02	82,30	0,18	79,05	78,27	84,67	0,06	0,08
27,0	285,0	4,3	0,5	15,8	0,0	447,6	75,6	98,9	556,0	387,8	517,0	486,5	380,2	940,2	0,18	75,63	75,07	82,36	0,18	79,17	78,36	84,66	0,07	0,08
28,0	286,0	4,2	0,1	15,1	0,0	445,2	75,5	98,0	560,8	388,8	524,1	491,2	378,3	932,7	0,18	75,69	75,12	82,33	0,18	79,30	78,44	84,50	0,06	0,08
29,0	287,0	4,0	0,1	15,0	0,0	443,0	75,7	97,4	565,2	388,8	530,1	494,1	376,5	910,4	0,18	75,72	75,14	82,31	0,18	79,37	78,50	84,36	0,07	0,08
30,0	288,0	3,9	0,1	14,6	0,0	438,9	75,6	97,5	569,7	389,9	535,1	497,3	374,8	891,5	0,18	75,78	75,18	82,29	0,18	79,49	78,60	84,25	0,06	0,08
31,0	289,0	3,9	0,1	14,4	0,0	436,2	75,8	98,8	573,1	391,6	540,1	501,2	373,4	883,2	0,18	75,83	75,22	82,41	0,18	79,54	78,70	84,23	0,07	0,08
32,0	290,0	3,7	0,1	14,4	0,0	434,1	75,9	100,1	576,4	393,9	545,2	505,0	372,1	881,9	0,18	75,99	75,26	82,57	0,18	79,72	78,86	84,26	0,07	0,08
33,0	291,0	3,6	0,1	14,7	0,0	433,5	76,1	101,1	579,2	396,0	549,8	508,3	370,8	886,5	0,18	76,24	75,33	82,86	0,18	79,97	79,04	84,43	0,07	0,08
34,0	292,0	3,5	0,1	15,1	0,0	436,3	76,5	100,9	582,8	397,2	553,9	511,5	369,5	902,4	0,18	76,57	75,46	83,07	0,18	80,30	79,23	84,54	0,07	0,08
35,0	293,0	3,4	0,2	15,5	0,0	440,0	76,9	101,8	587,0	398,0	556,4	514,8	368,1	929,1	0,18	77,01	75,61	83,31	0,18	80,67	79,45	84,69	0,07	0,08
36,0	294,0	3,2	0,4	15,9	0,0	445,0	77,2	102,2	591,7	399,8	559,9	517,9	366,9	964,6	0,18	77,41	75,76	83,53	0,18	81,07	79,69	84,88	0,07	0,08
37,0	295,0	3,2	0,8	16,1	0,0	449,8	77,4	101,3	596,6	400,6	561,9	520,8	365,7	984,3	0,18	77,74	75,93	83,69	0,18	81,41	79,91	84,98	0,07	0,08
38,0	296,0	3,0	0,2	16,1	0,0	452,6	77,7	103,2	601,5	403,6	564,2	523,0	364,6	990,2	0,18	78,05	76,08	83,97	0,18	81,74	80,14	85,16	0,07	0,08
39,0	297,0	2,9	0,3	16,0	0,0	453,3	77,9	103,1	605,9	406,4	566,0	525,4	363,5	984,9	0,18	78,29	76,25	84,19	0,18	82,01	80,34	85,33	0,07	0,08
40,0	298,0	2,8	0,3	16,0	0,0	452,1	78,0	103,3	610,5	409,4	568,5	527,6	362,3	971,4	0,18	78,54	76,39	84,41	0,18	82,31	80,55	85,48	0,07	0,08
41,0	299,0	2,6	0,2	16,0	0,0	452,7	78,3	103,4	615,6	412,5	570,8	530,1	361,2	987,3	0,18	78,70	76,52	84,60	0,18	82,52	80,76	85,63	0,07	0,08
42,0	300,0	2,5	0,7	15,9	0,0	451,9	78,3	103,4	619,3	415,6	572,8	533,2	360,2	987,0	0,18	78,90	76,66	84,75	0,18	82,74	80,94	85,76	0,06	0,08
43,0	301,0	2,4	0,4	15,6	0,0	450,7	78,4	103,7	622,9	418,3	575,7	536,4	359,2	972,8	0,18	79,06	76,78	84,92	0,18	82,93	81,17	85,88	0,07	0,08
44,0	302,0	2,3	0,2	15,1	0,0	448,5	78,3	103,5	625,3	419,8	578,9	540,6	358,2	963,8	0,18	79,21	76,92	85,06	0,18	83,14	81,36	86,03	0,07	0,08
45,0	303,0	2,3	0,1	14,9	0,0	449,6	78,7	103,8	626,6	421,6	582,5	545,0	357,3	972,4	0,18	79,36	77,03	85,24	0,18	83,32	81,56	86,18	0,07	0,08
46,0	304,0	2,2	0,1	14,7	0,0	448,2	78,6	103,5	627,2	422,5	586,2	550,1	356,3	956,4	0,18	79,50	77,13	85,40	0,18	83,49	81,70	86,28	0,07	0,08
47,0	305,0	2,1	0,1	14,5	0,0	446,5	78,5	104,0	627,5	424,1	591,3	554,9	355,5	953,6	0,18	79,61	77,24	85,53	0,18	83,63	81,90	86,42	0,07	0,08
48,0	306,0	2,0	0,1	14,3	0,0	442,3	78,8	104,0	627,2	425,1	596,7	560,0	354,7	944,3	0,18	79,76	77,36	85,69	0,18	83,83	82,08	86,53	0,07	0,08
49,0	307,0	1,9	0,0	14,2	0,0	439,8	78,8	103,8	626,6	425,3	602,3	565,3	353,8	932,0	0,18	79,87	77,46	85,84	0,18	83,96	82,24	86,64	0,07	0,08
50,0	308,0	1,8	0,0	14,0	0,0	436,2	78,9	103,6	625,9	424,7	607,6	570,9	353,1	923,8	0,18	79,97	77,59	85,96	0,18	84,12	82,44	86,79	0,07	0,08
51,0	309,0	1,8	0,0	13,9	0,0	432,4	79,0	103,5	624,8	424,5	612,4	576,3	352,4	904,7	0,18	80,08	77,69	86,10	0,18	84,25	82,58	86,92	0,07	0,08
52,0	310,0	1,7	0,0	13,3	0,0	429,2	79,0	103,7	623,1	423,7	616,7	582,0	351,7	902,2	0,18	80,19	77,78	86,19	0,18	84,36	82,75	87,01	0,07	0,08
53,0	311,0	1,6	0,0	13,1	0,0	425,2	79,1	101,8	622,2	421,6	620,2	588,0	351,0	901,2	0,18	80,26	77,86	86,29	0,18	84,48	82,90	87,10	0,07	0,07
54,0	312,0	1,6	0,0	12,9	0,0	421,5	79,2	103,4	620,2	420,9	623,7	593,5	350,4	887,5	0,18	80,39	77,98	86,40	0,18	84,65	83,07	87,19	0,07	0,08
55,0	313,0	1,5	0,0	12,7	0,0	417,3	79,1	102,8	617,6	419,8	627,9	598,5	349,8	886,1	0,18	80,49	78,07	86,50	0,18	84,76	83,21	87,27	0,07	0,07
56,0	314,0	1,4	0,0	12,5	0,0	414,4	79,5	102,7	614,8	417,7	631,3	603,1	349,2	877,1	0,18	80,62	78,20	86,70	0,18	84,93	83,35	87,37	0,07	0,07
57,0	315,0	1,4	0,0	12,4	0,0	411,0	79,5	102,5	611,1	415,9	635,2	607,7	348,7	867,2	0,18	80,83	78,30	86,70	0,18	85,12	83,51	87,45	0,07	0,07
58,0	316,0	1,3	0,0	12,2	0,0	407,2	79,5	102,0	606,9	414,4	638,7	612,2	348,2	853,7	0,18	80,96	78,40	86,74	0,18	85,24	83,65	87,51	0,07	0,07
59,0	317,0	1,3	0,0	12,0	0,0	403,1	79,7	101,7	602,7	412,7	642,4	616,2	347,8	841,6	0,18	81,08	78,54	86,82	0,18	85,39	83,78	87,60	0,07	0,07
60,0	318,0	1,2	0,0	11,8	0,0	398,9	79,8	101,8	598,9	411,2	646,3	620,5	347,4	837,9	0,18	81,20	78,64	86,89	0,18	85,52	83,95	87,69	0,07	0,07
61,0	319,0	1,2	0,0	11,5	0,0	395,5	79,5	100,8	594,8	409,2	649,8	624,6	347,0	826,1	0,18	81,31	78,74	86,89	0,18	85,65	84,08	87,73	0,07	0,07
62,0	320,0	1,1	0,0	10,9	0,0	391,7	79,8	100,9	590,1	407,8	651,8	628,9	346,7	815,1	0,18	81,40	78,83	83,44	0,18	85,73	84,25	87,75	0,07	0,07
63,0	321,0	1,1	0,0	10,9	0,0	388,9	79,8	102,0	584,7	406,8	655,6	632,0	346,5	808,6	0,18	81,51	78,95	86,86	0,18	85,84	84,38	87,86	0,07	0,07
64,0	322,0	1,1	0,0	10,8	0,0	385,9	79,8	100,0	580,1	403,9	658,0	635,2	346,3	804,6	0,18	81,51	79,03	87,93	0,18	85,93	84,48	87,91	0,07	0,07
65,0	323,0	1,1	0,0	10,8	0,0	383,2	79,9	101,8	575,3	403,1	659,9	638,4	346,2	798,8	0,18	81,59	79,11	88,34	0,18	86,01	84,59	88,02	0,07	0,07
66,0	324,0	1,0	0,0	10,4	0,0	381,0	79,7	100,7	569,9	401,0	662,4	641,0	346,0	791,2	0,18	81,58	79,18	88,49	0,18	86,04	84,69	88,06	0,07	0,07
67,0	325,0	1,0	0,0	9,6	0,0	377,7	80,0	101,0	563,7	399,3	664,8	643,9	346,0	782,6	0,18	81,61	79,26	88,53	0,18	86,15	84,80	88,08	0,07	0,07
68,0	326,0	1,0	0,1	8,7	0,0	375,9	80,0	100,9	555,9	396,7	666,6	646,3	346,0	778,9	0,18	81,71	79,35	88,59	0,18	86,26	84,92	88,15	0,07	0,07
69,0	327,0	0,9	0,1	8,4	0,0	374,5	80,1	100,4	548,3	394,3	667,0	647,7	346,1	778,1	0,18	81,80	79,43	88,64	0,18	86,40	85,06	88,20	0,07	0,07
70,0	328,0	0,9	0,1	8,3	0,0	373,7	79,8	99,6	541,0	391,5	665,9	649,0	346,2	774,3	0,18	81,88	79,52	88,63	0,18	86,48	85,19	88,17	0,07	0,07
71,0	329,0	0,9	0,1	8,2	0,0	372,2	80,1	100,8	533,9	388,6	663,9	650,1	346,4	771,1	0,18	81,96	79,60	88,68	0,18	86,48	85,31	88,21	0,07	0,07
72,0	330,0	0,9	0,1	8,2	0,0	369,9	79,5	98,7	526,3	384,2	662,4	650,1	346,3	767,8	0,18	81,92	79,67	88,64	0,18	86,48	85,44	88,24	0,07	0,07
73,0	331,0	0,8	0,1	8,5	0,0	368,8	78,6	96,9	520,0	380,2	659,5	649,2	346,2	764,9	0,18	81,25	79,58	88,37	0,18	86,07	85,36	88,01	0,07	0,07
74,0	332,0	0,8	0,1	8,4	0,0	367,1	78,4	96,4	513,3	377,3	657,2	649,4	346,3	761,5	0,18	80,73	79,51	88,16	0,18	85,63	85,30	87,84	0,07	0,07
75,0	333,0	0,8	0,1	8,2	0,0	365,9	77,9	95,9	507,0	374,7	654,8	648,0	346,4	759,0	0,18	80,12	79,36	87,96	0,18	85,15	85,18	87,61	0,07	0,07
76,0	334,0	0,8	0,1	8,1	0,0	364,6	77,8	95,7	501,1	371,8	652,1	649,0	346,6	756,5	0,18	79,67	79,21	87,79	0,18	84,78	85,05	87,43	0,07	0,07
77,0	335,0	0,7	0,1	8,0	0,0	363,8	77,4	95,5	495,3	368,4	649,1	647,5	346,7	753,3	0,18	79,17	79,04	87,69	0,18	84,39	84,92	87,26	0,07	0,07
78,0	336,0	0,7	0,1	8,0	0,0	362,2	77,0	95,2	489,6	367,3	646,0	646,9	347,1	750,8	0,18	78,76	78,88	87,49	0,18	84,03	84,78	87,05	0,07	0,07
79,0	337,0	0,7	0,1	8,1	0,0	359,3	76,9	94,3	484,3	364,8	643,2	646,3	347,5	734,4	0,18	78,43	78,73	87,33	0,18	83,71	84,63	86,86	0,07	0,07
80,0	338,0	0,7	0,1	7,8	0,0	354,9	76,8	94,5	478,5	363,0	640,2	645,4	347,9	727,0	0,18	78,26	78,64	87,17	0,18	83,48	84,54	86,70	0,07	0,07
81,0	339,0	0,7	0,1	7,9	0,0	353,7	76,7	94,0	473,4	362,2	637,0	643,3	348,5	726,7	0,18	78,10	78,53	87,04	0,18	83,32	84,44	86,51	0,07	0,07
82,0	340,0	0,6	0,1	8,0	0,0	353,3	76,7	92,6	468,6	360,3	633,4	640,6	348,8	730,8	0,18	77,99	78,44	86,83	0,18	83,18	84,32	86,31	0,07	0,06
83,0	341,0	0,6	0,1	8,1	0,0	352,4	77,0	92,4	463,8	359,5	630,3	638,4	349,2	731,9	0,18	78,03	78,39	86,63	0,18	83,09	84,25	86,11	0,07	0,07
84,0	342,0	0,6	0,1	8,1	0,0	353,0	76,9	92,5	459,5	359,7	626,6	635,8	349,8	729,8	0,18	78,14	78,39	86,47	0,18	83,12	84,27	85,97	0,07	0,06
85,0	343,0	0,6	0,1	8,1	0,0	352,2	77,2	91,5	455,3	357,4	623,2	633,2	350,1	728,6	0,18	78,18	78,37	86,34	0,18	83,15	84,30	85,86	0,07	0,07
86,0	344,0	0,5	0,1	8,0	0,0	351,8	77,0	91,9	451,1	358,6	620,0	631,3	350,7	725,2	0,18	78,11	78,34	86,21	0,18	83,13	84,36	85,75	0,07	0,07
87,0	345,0	0,5	0,1	8,0	0,0	351,0	77,2	92,8	447,1	357,2	617,0	629,0	351,2	724,0	0,18	78,22	78,36	86,19	0,18	83,17	84,35	85,71	0,07	0,06
88,0	346,0	0,6	0,1	8,0	0,0	350,6	76,8	93,4	443,5	357,7	614,6	626,8	351,8	723,0	0,18	78,16	78,32	86,12	0,18	83,11	84,37	85,58	0,07	0,06
89,0	347,0	0,5	0,1	7,8	0,0	349,7	76,9	92,8	439,6	355,7	611,4	624,3	352,2	721,2	0,18	78,09	78,29	86,06	0,18	83,00	84,35	85,47	0,07	0,06
90,0	348,0	0,5	0,1	7,9	0,0	348,9	76,8	92,4	436,0	354,2	608,7	622,3	352,6	719,7	0,18	77,89	78,25	85,97	0,18	82,87	84,28	85,32	0,07	0,06
91,0	349,0	0,5	0,1	7,9	0,0	348,3	76,7	92,1	432,9	353,8	606,0	620,0	353,2	718,4	0,18	77,83	78,22	85,85	0,18	82,79	84,26	85,16	0,07	0,06
92,0	350,0	0,4	0,1	8,0	0,0	348,8	76,6	93,3	429,7	353,5	603,7	618,5	353,8	722,9	0,18	77,76	78,19	85,88	0,18	82,77	84,26	85,15	0,07	0,06
93,0	351,0	0,4	0,1	8,0	0,0	348,6	76,5	92,8	426,5	352,0	600,8	616,3	354,4	720,9	0,18	77,61	78,16	85,77	0,18	82,62	84,26	85,04	0,07	0,06
94,0	352,0	0,4	0,1	8,0	0,0	348,5	76,2	92,7	423,3	352,0	598,5	615,4	355,1	718,2	0,18	77,39	78,10	85,70	0,18	82,47	84,25	84,97	0,07	0,06
95,0	353,0	0,4	0,1	7,7	0,0	348,3	76,2	92,4	420,8	349,9	596,3	613,3	355,7	713,1	0,18	77,35	78,08	85,58	0,18	82,42	84,27	84,89	0,07	0,06

96,0	354,0	0,3	0,1	7,8	0,0	348,1	76,4	91,9	418,5	348,9	594,8	611,1	356,3	715,6	0,18	77,40	78,07	85,47	0,18	82,44	84,28	84,77	0,07	0,06
97,0	355,0	0,3	0,1	7,9	0,0	347,6	76,5	92,3	415,7	347,5	592,4	609,2	357,0	717,3	0,18	77,58	78,07	85,42	0,18	82,54	84,29	84,69	0,06	0,06
98,0	356,0	0,3	0,1	7,8	0,0	347,5	76,5	92,0	413,3	346,5	590,7	608,3	357,6	719,0	0,18	77,56	78,07	85,32	0,18	82,49	84,26	84,56	0,07	0,06
99,0	357,0	0,3	0,1	7,9	0,0	348,2	76,3	92,2	410,9	346,0	588,9	606,9	358,3	720,2	0,18	77,44	78,04	85,26	0,18	82,38	84,19	84,51	0,07	0,06
100,0	358,0	0,3	0,1	7,8	0,0	348,1	76,3	92,4	408,6	345,4	587,1	605,4	359,0	718,5	0,18	77,30	77,99	85,21	0,18	82,28	84,08	84,44	0,07	0,06
101,0	359,0	0,3	0,1	7,8	0,0	348,4	76,4	92,6	406,7	344,8	584,6	603,6	359,7	716,7	0,18	77,30	77,94	85,17	0,18	82,25	84,04	84,39	0,07	0,06
102,0	360,0	0,3	0,1	7,8	0,0	347,4	76,5	92,7	404,7	343,5	584,5	603,4	360,3	711,7	0,18	77,37	77,93	85,12	0,18	82,29	84,03	84,32	0,07	0,06
103,0	361,0	0,3	0,1	7,4	0,0	346,2	76,4	91,7	402,9	342,0	582,7	601,2	361,0	706,8	0,18	77,33	77,91	85,04	0,18	82,23	83,95	84,21	0,07	0,06
104,0	362,0	0,2	0,1	7,1	0,0	345,0	76,6	92,2	400,2	340,6	581,6	600,7	361,7	707,0	0,18	77,40	77,88	85,02	0,18	82,28	83,93	84,14	0,07	0,06
105,0	363,0	0,2	0,1	7,2	0,0	345,7	76,4	91,7	398,4	338,9	579,3	598,7	362,4	710,3	0,18	77,37	77,87	84,93	0,18	82,23	83,88	83,99	0,07	0,07
106,0	364,0	0,2	0,1	7,2	0,0	347,2	76,4	92,2	396,3	337,9	577,8	596,6	363,2	713,9	0,18	77,30	77,86	84,89	0,18	82,19	83,88	83,93	0,07	0,06
107,0	365,0	0,2	0,1	7,3	0,0	347,1	76,1	91,3	394,3	335,5	575,7	594,2	363,7	714,0	0,18	77,14	77,81	84,83	0,18	82,11	83,84	83,85	0,07	0,07
108,0	366,0	0,1	0,1	7,3	0,0	348,1	76,3	92,4	392,7	335,4	573,5	592,7	364,7	719,3	0,18	77,23	77,81	84,76	0,18	82,17	83,84	83,80	0,07	0,06
109,0	367,0	0,1	0,1	7,2	0,0	349,3	76,2	91,3	390,7	333,3	570,2	589,9	365,5	721,6	0,18	77,34	77,80	84,71	0,18	82,18	83,83	83,74	0,07	0,07
110,0	368,0	0,1	0,1	7,3	0,0	351,0	76,2	91,1	389,0	330,8	569,6	587,4	366,2	724,0	0,18	77,27	77,80	84,61	0,18	82,08	83,82	83,67	0,07	0,06
111,0	369,0	0,1	0,1	7,3	0,0	351,6	76,1	91,8	387,4	329,8	567,9	585,2	367,0	727,0	0,18	77,07	77,74	84,55	0,18	81,98	83,76	83,57	0,07	0,06
112,0	370,0	0,1	0,1	7,4	0,0	353,4	76,4	91,1	385,8	327,5	567,1	583,3	367,7	734,5	0,18	77,14	77,74	84,51	0,18	82,00	83,76	83,49	0,07	0,06
113,0	371,0	0,1	0,1	7,2	0,0	353,9	76,5	91,5	384,6	326,6	565,8	581,3	368,5	734,9	0,18	77,21	77,73	84,51	0,18	82,05	83,79	83,48	0,07	0,07
114,0	372,0	0,0	0,2	7,0	0,0	355,7	76,5	91,5	383,2	325,5	563,6	579,4	369,3	738,7	0,18	77,35	77,76	84,50	0,18	82,15	83,85	83,45	0,07	0,07

Manufacturer: HEARTHSTONE
Model: 8060

Run: 4
Project #: PI 20272
Test Duration: 114 min

	HHV	LHV
Eff	78,00%	84,31%
Comb Eff	99,30%	99,30%
HT Eff	78,55%	84,90%
Output	21 405	kJ/h
Burn Rate	1,39	kg/h
Grams CO	33	g
Input	27 442	kJ/h
MC wet	16,82	

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: 78,00%
Combustion Efficiency: 99,30%
Heat Transfer Efficiency: 78,55%

Heat Output: 20 305 Btu/h
Heat Input: 26 032 Btu/h
Burn Duration: 1,90 h
Burn Rate: 3,05 lb/h
Stack Temp: 385,2 Deg. F

Averages	0,12	10,65	1,04	20,23	9,51	195,87	25,01	0,99	0,78	0,77
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	3,16	0,14	2,92	542,6%	20,74	17,75	157,9	23,6	97,8%	61,1%	59,8%
1,00	3,15	0,21	3,84	385,8%	20,67	16,73	149,2	23,7	96,9%	69,0%	66,9%
2,00	3,12	0,05	5,28	269,0%	20,59	15,29	149,8	23,8	100,1%	74,3%	74,4%
3,00	3,12	0,03	5,72	241,6%	20,56	14,83	150,3	23,8	100,3%	75,3%	75,5%
4,00	3,07	0,03	6,01	225,1%	20,54	14,51	151,5	23,8	100,3%	75,9%	76,1%
5,00	3,03	0,03	8,40	133,1%	20,38	11,97	159,6	23,9	100,1%	78,8%	78,9%
6,00	2,98	0,04	11,42	71,3%	20,18	8,74	169,2	23,9	99,9%	80,7%	80,6%
7,00	2,94	0,04	10,34	89,4%	20,26	9,90	173,1	23,8	100,0%	79,6%	79,6%
8,00	2,94	0,04	10,15	92,6%	20,27	10,09	175,1	23,7	99,9%	79,3%	79,3%
9,00	2,89	0,04	8,84	121,2%	20,35	11,49	175,0	23,8	100,0%	78,0%	78,0%
10,00	2,85	0,04	9,27	110,9%	20,33	11,03	175,2	23,9	100,0%	78,5%	78,5%
11,00	2,80	0,04	8,80	122,2%	20,36	11,54	174,9	23,9	100,0%	78,0%	78,0%
12,00	2,76	0,04	8,70	124,9%	20,36	11,65	175,5	23,9	100,0%	77,8%	77,8%
13,00	2,71	0,05	10,64	83,8%	20,23	9,57	181,9	23,9	99,8%	79,3%	79,2%
14,00	2,67	0,08	13,00	50,2%	20,08	7,03	193,2	23,9	99,6%	80,3%	80,0%
15,00	2,62	0,05	12,60	55,3%	20,10	7,48	195,2	24,0	99,8%	79,9%	79,7%
16,00	2,57	0,04	11,85	65,3%	20,16	8,29	195,9	24,1	99,9%	79,3%	79,3%
17,00	2,53	0,07	12,87	51,8%	20,09	7,18	203,2	24,1	99,7%	79,6%	79,3%
18,00	2,44	0,25	14,96	29,1%	19,94	4,84	213,5	24,2	98,7%	80,2%	79,1%
19,00	2,39	0,58	15,43	22,7%	19,88	4,16	221,1	24,1	97,0%	79,9%	77,5%
20,00	2,35	0,16	14,29	36,0%	19,99	5,62	220,3	24,0	99,2%	79,5%	78,8%
21,00	2,30	0,05	12,76	53,4%	20,09	7,31	217,6	23,9	99,8%	78,7%	78,5%
22,00	2,26	0,04	13,36	46,5%	20,05	6,67	217,4	23,9	99,9%	79,1%	79,0%
23,00	2,19	0,04	14,12	38,7%	20,01	5,87	218,5	23,8	99,9%	79,5%	79,4%
24,00	2,12	0,05	14,87	31,7%	19,96	5,06	220,3	24,0	99,8%	79,8%	79,7%
25,00	2,08	0,21	15,40	25,8%	19,91	4,41	225,8	24,1	98,9%	79,8%	78,9%
26,00	1,98	0,70	15,74	19,5%	19,85	3,76	229,2	24,1	96,5%	79,6%	76,8%
27,00	1,94	0,50	15,84	20,2%	19,86	3,77	230,9	24,2	97,5%	79,7%	77,7%
28,00	1,89	0,13	15,15	28,6%	19,93	4,72	229,6	24,2	99,4%	79,5%	79,0%
29,00	1,81	0,13	14,99	29,9%	19,94	4,89	228,3	24,3	99,4%	79,5%	79,0%
30,00	1,76	0,07	14,60	33,9%	19,97	5,34	226,1	24,2	99,7%	79,4%	79,2%
31,00	1,75	0,05	14,38	36,1%	19,99	5,58	224,6	24,3	99,8%	79,4%	79,2%
32,00	1,67	0,05	14,39	36,0%	19,99	5,57	223,4	24,4	99,8%	79,4%	79,3%
33,00	1,62	0,07	14,68	33,2%	19,97	5,25	223,1	24,5	99,7%	79,6%	79,4%
34,00	1,58	0,12	15,08	29,3%	19,94	4,80	224,6	24,7	99,4%	79,7%	79,3%
35,00	1,53	0,25	15,46	25,1%	19,90	4,32	226,7	24,9	98,7%	79,8%	78,8%
36,00	1,44	0,44	15,89	20,3%	19,86	3,75	229,4	25,1	97,8%	79,8%	78,1%
37,00	1,44	0,75	16,12	16,4%	19,83	3,33	232,1	25,2	96,3%	79,7%	76,8%
38,00	1,35	0,23	16,07	20,5%	19,86	3,68	233,7	25,4	98,9%	79,8%	78,9%
39,00	1,30	0,28	15,95	21,0%	19,87	3,78	234,0	25,5	98,6%	79,7%	78,6%
40,00	1,26	0,26	16,03	20,5%	19,86	3,70	233,4	25,6	98,7%	79,8%	78,7%
41,00	1,17	0,24	15,98	21,1%	19,87	3,77	233,7	25,7	98,8%	79,7%	78,8%
42,00	1,12	0,73	15,94	17,9%	19,84	3,54	233,3	25,7	96,4%	79,6%	76,7%
43,00	1,08	0,38	15,61	22,9%	19,88	4,09	232,6	25,8	98,1%	79,6%	78,0%
44,00	1,04	0,20	15,06	28,7%	19,93	4,77	231,4	25,7	99,0%	79,4%	78,6%
45,00	1,03	0,13	14,93	30,4%	19,95	4,95	232,0	25,9	99,4%	79,3%	78,8%
46,00	0,99	0,12	14,73	32,3%	19,96	5,17	231,2	25,9	99,4%	79,3%	78,8%
47,00	0,94	0,07	14,48	35,0%	19,98	5,46	230,3	25,8	99,7%	79,2%	78,9%
48,00	0,90	0,06	14,35	36,3%	19,99	5,61	228,0	26,0	99,8%	79,2%	79,0%
49,00	0,85	0,04	14,17	38,2%	20,00	5,81	226,6	26,0	99,9%	79,2%	79,1%
50,00	0,81	0,03	13,99	40,1%	20,01	6,01	224,5	26,0	99,9%	79,2%	79,1%
51,00	0,81	0,03	13,86	41,5%	20,02	6,15	222,4	26,1	100,0%	79,2%	79,2%
52,00	0,76	0,02	13,33	47,1%	20,06	6,72	220,6	26,1	100,0%	79,0%	79,0%
53,00	0,71	0,03	13,12	49,4%	20,07	6,94	218,5	26,2	100,0%	79,0%	79,0%
54,00	0,71	0,03	12,92	51,7%	20,09	7,15	216,4	26,2	100,0%	79,0%	79,0%
55,00	0,67	0,03	12,70	54,3%	20,10	7,38	214,1	26,1	100,0%	79,0%	79,0%
56,00	0,62	0,03	12,57	55,9%	20,11	7,52	212,4	26,4	100,0%	79,0%	79,0%
57,00	0,62	0,03	12,39	58,2%	20,12	7,72	210,6	26,4	100,0%	79,0%	79,0%
58,00	0,58	0,02	12,18	61,0%	20,13	7,95	208,4	26,4	100,0%	78,9%	79,0%
59,00	0,58	0,02	12,01	63,2%	20,15	8,12	206,2	26,5	100,0%	79,0%	79,0%
60,00	0,53	0,02	11,82	65,9%	20,16	8,33	203,8	26,5	100,0%	79,0%	79,0%
61,00	0,53	0,02	11,54	69,9%	20,18	8,63	201,9	26,4	100,0%	78,9%	78,9%
62,00	0,49	0,02	10,95	79,0%	20,22	9,26	199,8	26,6	100,1%	78,5%	78,6%
63,00	0,49	0,03	10,86	80,4%	20,22	9,35	198,3	26,6	100,1%	78,6%	78,6%
64,00	0,49	0,03	10,83	80,9%	20,22	9,38	196,6	26,6	100,0%	78,6%	78,7%
65,00	0,49	0,03	10,78	81,7%	20,23	9,43	195,1	26,6	100,0%	78,7%	78,7%
66,00	0,44	0,03	10,45	87,4%	20,25	9,78	193,9	26,5	100,0%	78,5%	78,5%
67,00	0,44	0,04	9,62	103,3%	20,30	10,66	192,1	26,6	100,0%	77,8%	77,8%
68,00	0,44	0,06	8,72	123,9%	20,36	11,62	191,1	26,7	99,8%	76,8%	76,7%
69,00	0,40	0,07	8,42	131,5%	20,38	11,93	190,3	26,7	99,7%	76,5%	76,3%
70,00	0,40	0,08	8,29	134,9%	20,39	12,06	189,8	26,6	99,6%	76,3%	76,0%
71,00	0,40	0,08	8,19	137,5%	20,39	12,17	189,0	26,7	99,6%	76,2%	75,9%
72,00	0,40	0,09	8,24	136,1%	20,39	12,11	187,7	26,4	99,5%	76,4%	76,0%
73,00	0,36	0,09	8,45	130,0%	20,38	11,88	187,1	25,9	99,5%	76,7%	76,4%
74,00	0,35	0,09	8,35	132,7%	20,38	11,99	186,2	25,8	99,5%	76,6%	76,2%
75,00	0,35	0,09	8,20	136,8%	20,39	12,14	185,5	25,5	99,5%	76,5%	76,1%
76,00	0,35	0,10	8,09	140,0%	20,40	12,26	184,8	25,5	99,4%	76,4%	75,9%
77,00	0,31	0,10	8,04	141,5%	20,40	12,32	184,4	25,2	99,4%	76,3%	75,8%
78,00	0,31	0,10	7,99	142,9%	20,41	12,37	183,5	25,0	99,4%	76,3%	75,8%
79,00	0,31	0,10	8,09	140,0%	20,40	12,26	181,8	24,9	99,4%	76,6%	76,1%
80,00	0,31	0,09	7,77	150,0%	20,42	12,61	179,4	24,9	99,5%	76,3%	75,9%
81,00	0,31	0,09	7,91	145,4%	20,41	12,45	178,7	24,9	99,5%	76,6%	76,2%
82,00	0,29	0,10	8,00	142,5%	20,41	12,35	178,5	24,8	99,4%	76,7%	76,3%
83,00	0,29	0,10	8,10	139,4%	20,40	12,24	178,0	25,0	99,4%	76,9%	76,5%
84,00	0,26	0,10	8,05	140,8%	20,40	12,30	178,3	25,0	99,4%	76,8%	76,3%
85,00	0,26	0,10	8,06	140,8%	20,40	12,29	177,9	25,1	99,4%	76,9%	76,4%
86,00	0,22	0,10	8,02	141,7%	20,40	12,33	177,6	25,0	99,4%	76,8%	76,3%
87,00	0,23	0,10	8,01	142,2%	20,40	12,35	177,2	25,1	99,4%	76,9%	76,4%
88,00	0,26	0,11	7,95	143,8%	20,41	12,40	177,0	24,9	99,3%	76,8%	76,3%
89,00	0,22	0,11	7,84	147,1%	20,42	12,52	176,5	24,9	99,3%	76,7%	76,1%
90,00	0,22	0,11	7,91	145,0%	20,41	12,45	176,1	24,9	99,3%	76,8%	76,3%
91,00	0,22	0,11	7,86	146,6%	20,41	12,50	175,7	24,8	99,3%	76,7%	76,2%
92,00	0,17	0,11	8,01	141,9%	20,40	12,34	176,0	24,8	99,3%	76,9%	76,4%

93,00	0,17	0,11	8,03	141,2%	20,40	12,31	175,9	24,7	99,3%	77,0%	76,4%
94,00	0,17	0,11	8,01	142,0%	20,40	12,34	175,8	24,6	99,3%	76,9%	76,4%
95,00	0,17	0,11	7,66	152,8%	20,43	12,71	175,7	24,6	99,3%	76,4%	75,9%
96,00	0,15	0,11	7,79	148,4%	20,42	12,57	175,6	24,7	99,2%	76,6%	76,1%
97,00	0,12	0,11	7,89	145,4%	20,41	12,46	175,3	24,7	99,2%	76,8%	76,2%
98,00	0,12	0,12	7,82	147,3%	20,42	12,53	175,3	24,7	99,2%	76,7%	76,1%
99,00	0,12	0,12	7,86	146,3%	20,41	12,50	175,7	24,6	99,2%	76,7%	76,1%
100,00	0,12	0,12	7,83	147,3%	20,42	12,53	175,6	24,6	99,2%	76,7%	76,1%
101,00	0,12	0,12	7,79	148,4%	20,42	12,57	175,8	24,6	99,2%	76,6%	76,0%
102,00	0,11	0,12	7,76	149,4%	20,42	12,60	175,2	24,7	99,2%	76,6%	76,0%
103,00	0,12	0,12	7,40	161,5%	20,44	12,99	174,6	24,6	99,2%	76,1%	75,5%
104,00	0,08	0,12	7,15	170,2%	20,46	13,25	173,9	24,8	99,1%	75,8%	75,1%
105,00	0,08	0,13	7,16	169,6%	20,46	13,23	174,3	24,7	99,1%	75,7%	75,0%
106,00	0,08	0,13	7,23	166,7%	20,45	13,16	175,1	24,7	99,0%	75,8%	75,0%
107,00	0,08	0,13	7,26	165,7%	20,45	13,12	175,1	24,5	99,0%	75,8%	75,1%
108,00	0,03	0,13	7,27	165,4%	20,45	13,12	175,6	24,6	99,0%	75,8%	75,0%
109,00	0,03	0,14	7,22	167,1%	20,45	13,17	176,3	24,5	98,9%	75,6%	74,8%
110,00	0,03	0,14	7,32	163,5%	20,45	13,06	177,2	24,5	98,9%	75,7%	74,9%
111,00	0,03	0,14	7,32	163,4%	20,45	13,06	177,6	24,5	98,9%	75,7%	74,9%
112,00	0,03	0,15	7,37	161,5%	20,44	13,00	178,5	24,7	98,9%	75,7%	74,8%
113,00	0,03	0,15	7,18	167,9%	20,46	13,20	178,8	24,7	98,8%	75,3%	74,4%
114,00	0,00	0,15	6,98	175,3%	20,47	13,41	179,8	24,7	98,7%	74,9%	73,9%

DATA 2022-06-30 EPA PI 20272 RUN 4 MODEL 8060
preburn

Temps acquisition minutes	Flue temp °F	Room temp °F	Tunnel dry bulb °F	Catalyst down °F	scale lbs	Right °F	Back °F	bottom °F	Top °F	Left °F
1	71,82	69,19	73,29	72,01	2,67	73,77	73,41	74,24	73,53	74,30
2	76,80	69,23	73,66	84,38	2,67	73,74	73,64	74,21	73,54	74,44
3	94,92	69,13	75,73	128,56	2,66	73,97	76,52	74,25	73,55	78,27
4	165,97	69,29	86,37	243,71	2,47	74,70	76,43	74,58	74,58	92,11
5	246,69	69,25	80,46	581,65	2,27	78,57	79,49	75,42	77,76	114,59
6	329,63	69,03	83,71	721,33	2,07	88,94	87,91	76,55	83,24	140,34
7	381,16	68,92	85,45	801,74	1,87	103,72	99,39	78,00	90,30	164,35
8	410,40	69,09	86,33	845,48	1,77	120,59	110,93	79,82	98,70	185,21
9	437,21	69,30	88,27	881,67	1,57	140,08	121,89	81,86	107,33	203,26
10	450,94	69,23	89,28	893,24	1,37	161,03	132,80	84,18	116,11	219,24
11	459,99	69,17	89,98	900,43	1,27	183,30	143,29	86,74	124,96	233,41
12	459,68	69,16	90,04	892,58	1,17	204,34	153,01	89,58	132,51	247,54
13	467,09	69,14	90,89	897,13	1,29	221,94	161,70	92,65	140,06	263,64
14	416,10	69,03	123,55	453,60	5,17	241,32	178,83	95,97	141,45	280,98
15	332,43	69,00	97,89	394,45	7,77	260,34	187,16	99,74	144,44	298,75
16	313,90	69,30	87,18	458,30	7,77	272,58	188,46	103,85	151,39	307,80
17	303,30	69,27	85,07	471,62	7,67	277,08	189,72	107,72	158,02	310,72
18	298,27	69,40	84,15	484,05	7,67	277,35	192,08	111,19	165,74	310,12
19	291,22	69,46	83,47	484,09	7,58	276,00	195,83	114,09	173,41	308,43
20	296,24	69,66	83,47	507,23	7,51	274,34	200,62	116,61	180,56	305,86
21	314,54	69,68	84,08	576,39	7,47	273,32	205,61	118,80	186,49	303,06
22	320,64	69,74	84,56	577,85	7,37	272,52	211,52	120,75	191,72	300,85
23	310,23	70,07	83,83	529,71	7,27	271,22	216,69	122,47	196,27	298,20
24	301,10	70,32	83,13	513,98	7,27	271,26	220,89	124,05	200,59	296,34
25	296,33	70,53	83,00	512,68	7,17	270,58	223,92	125,59	204,48	294,14
26	291,09	70,40	82,72	499,23	7,11	270,53	226,03	127,09	208,04	292,86
27	293,27	70,29	83,44	517,66	7,07	269,75	226,89	128,56	211,33	290,49
28	294,30	70,36	83,17	514,88	6,97	270,50	227,86	130,08	214,24	289,32
29	287,46	70,25	83,01	494,41	6,97	270,59	229,05	131,59	216,86	288,43
30	275,95	70,36	82,52	461,77	6,87	270,35	230,19	133,21	219,18	287,55
31	265,27	70,63	82,23	438,69	6,88	269,87	231,03	134,92	221,30	286,67
32	257,59	70,74	81,95	427,32	6,77	268,43	230,66	136,70	222,97	285,64
33	250,35	70,61	81,75	412,45	6,77	267,45	229,95	138,62	224,43	284,60
34	242,51	70,76	81,30	399,60	6,77	266,35	228,43	140,69	225,19	283,27
35	239,44	70,90	81,24	397,93	6,77	265,32	226,26	142,93	225,84	281,88
36	234,92	70,81	80,74	387,39	6,67	264,19	223,50	145,23	226,17	280,07
37	229,72	70,63	80,43	374,00	6,67	263,47	220,49	147,62	226,32	278,31
38	224,22	70,54	80,18	364,15	6,67	262,64	217,29	150,04	226,21	276,50
39	218,56	70,60	79,62	346,96	6,67	261,27	214,24	152,50	225,66	274,51
40	212,14	70,66	79,59	330,13	6,67	260,30	210,43	154,90	225,45	272,81
41	205,12	70,57	79,22	318,66	6,67	259,22	206,69	157,32	224,97	271,15
42	198,39	70,65	79,39	303,11	6,57	257,99	203,43	159,70	224,02	269,09
43	192,92	70,75	78,76	292,32	6,57	256,15	200,06	161,92	223,07	267,24
44	188,93	70,68	78,77	283,94	6,57	254,77	196,14	164,01	221,85	265,35
45	186,44	70,60	78,78	286,22	6,57	253,58	192,64	165,99	220,68	263,79
46	185,76	70,71	78,38	294,32	6,57	252,26	188,80	167,79	219,26	262,21
47	186,70	70,73	78,78	315,12	6,47	250,60	185,54	169,43	217,76	260,99
48	191,04	70,75	78,58	337,13	6,47	249,25	183,14	171,00	216,27	260,53
49	202,95	70,75	79,00	386,94	6,47	248,48	180,74	172,48	214,61	260,67
50	232,32	70,92	80,16	468,14	6,37	247,92	179,59	173,87	213,15	262,29
51	259,18	70,98	81,09	477,75	6,27	248,28	179,00	175,20	211,81	264,28
52	280,21	71,14	82,03	509,86	6,18	249,11	179,88	176,53	210,83	265,64
53	295,28	70,98	82,49	543,12	6,07	249,88	180,92	177,76	210,35	267,55
54	305,28	70,93	82,91	585,04	5,97	251,73	183,52	179,23	210,71	269,21
55	333,32	70,90	84,34	696,34	5,97	253,82	185,53	180,66	211,49	270,92
56	360,97	70,88	85,93	725,85	5,77	257,43	187,71	182,27	212,83	273,45
57	373,92	70,80	86,60	746,13	5,67	263,46	189,35	183,99	214,82	276,76
58	386,85	70,62	87,71	779,55	5,57	272,80	190,87	185,92	217,73	279,99
59	408,63	70,57	88,92	826,95	5,47	284,27	192,97	187,93	220,99	284,53
60	417,08	70,69	89,41	835,33	5,37	298,73	195,47	190,11	225,01	289,65
61	441,32	71,00	90,82	896,84	5,21	315,30	199,08	192,33	230,00	295,40
62	453,19	71,00	92,35	899,24	5,07	333,07	203,80	194,72	235,72	301,55
63	461,00	71,21	93,23	889,90	4,97	349,86	209,00	197,09	242,11	308,00
64	471,22	71,20	93,89	897,81	4,87	364,79	214,79	199,47	249,62	314,32
65	478,61	70,99	94,29	891,71	4,67	379,84	221,32	201,80	257,58	320,61
66	486,96	71,16	95,54	913,90	4,47	393,80	229,69	204,34	266,07	327,35
67	490,50	70,84	95,89	913,19	4,37	408,37	237,97	206,95	274,98	334,40
68	492,72	70,79	96,62	921,55	4,18	424,41	245,50	209,55	284,80	341,73
69	498,74	70,59	97,45	939,02	4,07	439,18	252,71	212,07	294,44	349,59
70	506,28	70,92	98,08	963,67	3,97	454,56	260,32	214,53	304,30	357,93
71	512,78	71,05	99,06	971,89	3,77	469,07	268,18	216,92	314,44	366,67
72	515,30	71,10	98,95	984,90	3,67	481,76	276,02	219,27	324,72	375,62
73	513,01	71,24	98,72	968,00	3,47	492,06	282,92	221,57	334,72	384,58
74	509,38	71,10	98,19	961,69	3,37	502,29	289,39	223,77	344,75	393,73
75	507,30	71,16	97,88	961,75	3,17	511,00	295,91	226,04	354,51	402,72
76	505,84	71,49	98,73	960,57	3,07	520,02	301,91	228,42	363,45	411,38
77	506,04	71,54	98,94	966,88	2,97	529,13	305,94	230,92	371,97	419,45
78	505,73	71,45	99,16	964,16	2,87	537,71	310,50	233,63	380,71	427,31
79	503,44	71,58	98,73	954,27	2,77	546,31	314,07	236,47	388,75	434,95
80	501,13	71,50	97,67	950,06	2,57	554,89	317,70	239,44	397,02	443,02
81	498,23	71,66	98,32	946,50	2,57	560,91	322,21	242,49	404,14	450,22
82	497,37	71,67	98,74	951,62	2,46	568,57	325,25	245,63	410,86	457,61
83	497,03	71,59	99,26	953,97	2,33	575,26	328,99	248,84	417,22	464,67
84	497,23	71,65	99,08	965,87	2,17	581,56	330,93	252,00	423,29	471,49
85	497,76	71,65	99,08	953,45	2,07	588,47	333,67	255,26	428,79	478,27
86	498,20	71,52	99,19	963,79	1,97	594,63	337,97	258,61	433,84	487,58
87	496,40	71,51	99,13	955,96	1,87	601,36	340,15	261,97	438,62	498,05
88	491,60	71,51	99,36	938,67	1,77	607,42	343,11	265,37	443,32	509,15
89	485,62	71,49	98,83	905,03	1,67	612,67	346,22	268,88	447,33	518,78
90	477,44	71,50	97,41	862,01	1,67	617,48	347,81	272,39	450,95	527,62

91	468,63	71,41	97,64	824,50	1,57	621,52	349,88	276,03	453,96	535,84
92	461,09	71,31	97,28	811,64	1,48	624,74	351,75	279,74	456,67	543,37
93	448,87	71,67	96,19	793,00	1,47	627,21	352,62	283,51	458,68	551,90
94	436,21	71,59	95,49	773,46	1,47	630,49	352,53	287,43	459,37	558,81
95	425,97	72,03	94,44	756,28	1,37	630,77	352,16	291,48	459,32	568,22
96	416,24	71,91	94,28	745,42	1,37	633,37	351,76	295,72	458,90	576,26
97	406,77	71,81	93,49	735,93	1,37	634,15	351,02	300,14	457,30	583,94
98	397,66	71,57	92,39	720,07	1,27	634,39	349,51	304,68	455,25	591,23
99	388,43	71,58	92,51	700,71	1,27	635,40	347,72	309,32	452,76	598,00
100	380,39	71,79	104,36	563,51	1,37	634,99	347,32	314,05	449,03	602,25
101	351,00	72,11	119,82	399,03	8,18	633,63	351,51	319,07	444,09	605,96
102	330,49	72,22	95,17	512,72	8,08	629,96	346,67	324,39	439,11	604,95
103	324,66	72,47	91,67	546,37	8,08	621,31	340,61	329,57	433,68	600,48
104	336,50	72,49	94,15	552,67	7,98	611,43	335,45	334,32	428,30	591,90
105	326,58	72,56	90,89	569,60	7,88	597,77	331,83	338,41	422,98	583,50
106	326,63	72,54	90,70	615,94	7,87	584,82	330,31	341,87	417,53	574,57
107	358,84	72,51	92,73	752,95	7,77	572,91	330,10	344,52	411,69	565,96
108	394,36	72,40	93,50	835,76	7,64	561,22	331,36	346,70	406,58	556,65
109	427,90	72,22	95,23	900,23	7,48	550,86	334,73	348,37	402,64	548,82
110	461,70	72,22	97,14	981,10	7,38	541,99	339,54	349,62	399,95	542,00
111	483,62	72,35	98,60	989,74	7,27	534,27	344,82	350,46	399,59	535,08
112	493,14	72,37	98,97	991,83	7,07	527,72	351,07	351,07	401,31	529,88
113	499,64	72,32	99,97	994,79	6,97	521,11	357,70	351,41	403,21	524,04
114	504,25	72,37	100,26	996,67	6,78	516,55	364,29	351,62	406,34	520,10
115	503,58	72,36	99,77	979,35	6,68	512,43	370,34	351,70	409,89	516,01
116	502,60	72,62	99,84	972,51	6,58	507,35	375,02	351,68	412,81	514,84
117	501,54	72,64	99,83	964,57	6,37	504,21	380,38	351,71	417,70	513,07
118	502,21	72,97	101,13	966,28	6,27	501,60	384,35	351,74	422,40	512,24
119	500,27	72,88	100,70	957,24	6,18	499,66	387,34	351,84	426,58	510,81
120	499,95	72,89	101,72	955,79	6,08	496,70	389,21	351,94	430,91	510,26
121	496,15	72,75	100,20	951,54	5,98	494,54	391,19	352,00	435,48	510,22
122	493,30	72,99	99,01	937,54	5,84	492,52	392,40	352,07	439,41	510,48
123	492,69	73,16	99,64	940,07	5,77	490,94	394,55	352,21	443,72	510,54
124	496,46	72,89	99,82	963,47	5,57	488,06	394,99	352,31	447,65	510,74
125	502,80	73,17	99,86	977,67	5,48	486,74	397,12	352,50	451,25	511,35
126	507,45	73,47	100,84	991,37	5,38	486,45	398,39	352,61	454,75	512,36
127	491,56	73,43	98,76	891,36	5,17	485,60	400,13	352,72	470,23	513,14
128	469,67	73,57	97,21	950,24	5,09	486,92	405,18	353,05	502,31	514,55
129	460,25	73,63	96,24	932,24	5,02	487,38	407,20	353,38	523,59	516,33
130	452,61	73,72	96,23	926,76	4,97	488,00	407,21	353,59	539,91	517,92
131	448,83	73,57	96,64	922,83	4,85	489,85	408,94	354,01	553,33	519,35
132	445,80	73,44	95,71	917,70	4,68	491,52	409,14	354,34	564,21	520,49
133	443,55	73,23	95,29	919,05	4,57	492,28	410,34	354,73	572,73	521,54
134	440,91	73,23	96,13	914,17	4,57	494,03	410,81	355,12	578,77	522,76
135	437,88	73,07	95,81	907,21	4,47	495,85	410,32	355,41	583,73	524,27
136	433,51	72,97	94,73	895,75	4,37	497,32	410,03	355,63	587,45	525,07
137	428,93	72,89	95,22	885,28	4,27	499,43	410,77	355,92	589,38	526,48
138	425,16	72,83	94,92	876,55	4,17	500,68	412,64	356,30	590,02	527,45
139	422,26	73,18	96,17	873,16	4,08	503,08	412,98	356,65	590,01	529,40
140	419,98	73,22	95,20	874,29	4,08	504,74	411,86	356,90	590,74	531,23
141	418,83	73,44	95,34	883,11	3,98	506,40	411,90	357,20	592,28	531,88
142	418,32	73,65	94,98	894,36	3,87	507,74	411,94	357,40	592,55	533,89
143	419,42	73,58	95,38	900,87	3,77	509,40	414,08	357,72	592,99	534,88
144	420,47	73,67	95,41	906,80	3,67	511,75	412,89	357,98	594,75	536,70
145	420,89	73,44	95,21	914,21	3,67	514,59	414,04	358,22	597,51	537,92
146	421,77	73,50	94,63	919,33	3,56	516,19	412,68	358,41	600,30	538,25
147	422,26	73,58	93,75	952,62	3,47	519,22	413,34	358,59	602,22	539,28
148	424,50	73,45	95,18	963,00	3,38	521,55	417,01	358,88	603,10	542,00
149	425,56	73,67	95,79	967,03	3,27	524,80	418,01	359,33	604,65	543,73
150	425,05	73,82	95,62	960,49	3,17	527,23	417,74	359,66	605,56	545,78
151	424,13	73,98	96,13	943,19	3,09	529,96	419,21	360,06	605,85	548,51
152	424,00	74,15	95,72	955,03	3,07	531,86	419,25	360,44	606,03	551,38
153	425,03	74,13	96,07	960,45	2,97	535,03	418,45	360,79	606,33	554,59
154	426,00	73,91	95,78	954,22	2,97	539,29	418,20	361,20	606,23	557,87
155	424,23	73,97	97,20	932,99	2,87	543,95	418,42	361,67	607,53	560,99
156	423,01	73,94	95,29	930,28	2,77	546,91	415,23	361,94	608,76	565,12
157	420,94	74,06	95,52	924,31	2,68	549,73	416,17	362,50	609,62	569,29
158	418,19	73,96	95,92	913,62	2,68	552,07	416,45	362,98	609,81	573,57
159	415,04	73,97	96,09	894,90	2,57	555,14	415,08	363,54	608,70	577,98
160	410,23	74,20	94,90	882,24	2,57	557,59	412,39	363,97	607,85	582,26
161	407,74	74,00	94,42	897,00	2,47	560,06	411,11	364,55	605,86	586,23
162	406,78	73,57	94,96	894,21	2,47	563,08	409,55	365,09	601,47	589,56
163	405,96	73,62	94,00	910,36	2,37	565,86	408,76	365,76	597,39	592,97
164	404,61	73,52	94,75	912,51	2,27	571,63	407,67	366,51	592,75	596,63
165	402,55	73,61	95,16	902,86	2,27	578,66	404,33	367,26	588,32	599,32
166	399,19	74,01	94,55	874,85	2,27	586,06	402,36	368,14	584,02	601,84
167	393,48	74,53	93,52	844,52	2,27	594,61	399,29	369,00	578,53	604,90
168	387,97	75,00	93,68	823,35	2,17	602,29	396,67	369,94	571,72	606,73
169	382,60	74,63	93,20	805,55	2,17	607,99	393,70	370,86	564,09	608,47
170	378,83	74,64	92,87	792,64	2,17	612,22	390,13	371,87	555,88	610,06
171	374,74	74,95	93,42	782,48	2,07	618,01	387,94	373,02	548,05	613,18
172	371,55	74,73	93,58	774,43	2,07	622,34	384,97	374,20	540,11	614,75
173	368,66	74,28	92,88	769,08	2,07	625,87	382,67	375,37	532,46	616,27
174	367,27	74,15	92,33	765,89	2,07	628,28	379,57	376,49	524,86	616,39
175	365,04	74,12	92,43	762,62	1,98	629,88	375,50	377,60	516,94	617,17
176	363,82	74,30	92,59	759,73	2,07	634,61	373,61	378,85	509,17	618,69
177	363,30	74,26	92,81	756,27	1,98	636,72	371,62	380,19	501,43	619,84
178	361,18	74,11	92,38	751,02	1,98	637,67	368,20	381,41	494,38	620,45
179	358,77	74,03	92,45	745,90	1,98	638,09	365,55	382,75	487,98	620,63
180	356,17	74,12	92,51	739,81	1,88	638,63	363,78	384,05	481,72	620,40
181	355,30	74,07	92,11	735,20	1,88	638,01	362,17	385,39	475,98	619,98
182	353,39	73,96	92,82	730,43	1,87	638,06	360,75	386,78	470,50	619,46
183	351,41	74,28	91,56	725,62	1,87	637,38	357,43	387,96	465,20	618,24

184	349,94	74,36	91,73	722,10	1,87	635,88	356,07	389,47	460,22	617,36
185	348,52	74,34	92,05	717,83	1,87	635,22	354,17	390,93	455,31	616,21
186	347,03	74,25	91,96	714,38	1,87	634,31	353,10	392,37	450,85	615,28
187	346,10	74,58	91,93	717,49	1,77	633,61	351,75	393,82	446,49	614,55
188	345,09	74,58	91,46	716,32	1,77	631,26	348,54	395,07	442,16	612,45
189	345,11	74,82	91,09	712,38	1,77	631,66	347,22	396,44	438,01	611,20
190	344,50	74,81	91,20	709,77	1,77	630,94	345,97	397,84	434,26	611,81
191	343,41	74,56	91,60	707,50	1,77	629,32	344,12	399,21	430,59	610,42
192	342,22	74,67	92,17	701,97	1,77	628,31	342,69	400,70	426,52	610,04
193	339,90	74,48	91,71	698,56	1,67	627,46	341,19	401,89	422,78	607,51
194	339,27	74,67	91,84	697,50	1,67	626,22	338,93	403,21	419,09	604,94
195	339,33	74,57	92,01	696,01	1,67	625,46	337,58	404,54	416,14	604,35
196	338,01	74,99	92,02	695,05	1,67	623,40	334,74	405,71	412,57	602,18
197	326,16	75,11	95,28	596,88	1,67	621,54	333,30	406,90	409,97	599,02
198	318,11	75,11	91,64	614,05	1,67	619,59	332,02	408,27	405,32	596,08
199	312,39	74,83	91,31	612,03	1,67	615,08	333,01	409,99	401,61	591,61
200	308,91	74,62	91,08	608,76	1,57	609,23	334,37	411,46	397,93	587,29

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: PI 202 72 Run: 5 Tech: MM Reviewer: DO

- kindling 28 LBS STAND 1" IN
- by pass open
- DOOR open
- At 25 LBS close DOOR
- At 12 LBS insert 1st preload
- close DOOR immediatly
- At 13 LBS insert second preload
- close DOOR immediatly
- close by pass
- At 16 LBS rack coal Bed

After 2 min insert load and close DOOR immediatly

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 5 Tech: M M Reviewer: DP

	Equipment #	Time	12%	22%
Moisture Meter Calibration Check:	EM-334	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	2022-07-25	
Date Dilution Tunnel Cleaned	2022-07-25	
Induced Draft Check (max 0.005 H2O)	ok	
Traverse before ignition	ok	
Temperature System:		
Ambient (65°-90°F)	ok °F	
Proportional Checks:		
Thermocouple check	ok	
Pitot Clean	ok	
Pitot verification	ok	
Pictures for report: Side		ok
Coal bed		ok
Load		ok
Load in stove		ok
Fuel adjustment		ok
Load Length approximately 5/6 of firebox Lenght		ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: pt 20272 Run: 5 Tech: MM Reviewer: DP

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10	-10	-10	-10	-10	-10
Final 1minute DGM (Liter)	659668.72	660302.51	659668.94	660302.58	407967.15	408601.95
Initial 1minute DGM (Liter)	659668.72	660302.51	659668.94	660302.58	407967.99	408601.85
Change (Liter)	0	0	0	0	0.16	0.10
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**
Check OK	ok	ok	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 5 Tech: MR Reviewer: DP

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

Scales checks

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	10,000 kg lbs, Class F	10,000 kg lbs
Wood	EM-090	440 lbs, Class F	440 lbs
Analytical	EM-335	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%

Date: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 5 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 1060 (KPa.) Static pressure (P_q) 0.15 (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	0073	77.27
B - Centroid	3.00	3.50	4	0.074	77.11
A-1	0.40	0.50	0.50	0.060	77.27
A-2	1.50	1.75	2	0.070	77.16
A-3	4.50	5.25	6	0.073	77.16
A-4	5.60	6.5	7.5	0.059	77.08
B-1	0.40	0.50	0.50	0.060	77.11
B-2	1.50	1.75	2	0.073	77.18
B-3	4.50	5.25	6	0.077	77.18
B-4	5.60	6.5	7.5	0.060	77.02
				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: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 5 Tech: MM Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2.986	3.000	1.006	1.000
Tolerance CO	0	+/- 0.02	0014	+/- 0.15	0.006	+/- 0.05
CO_2	0	0	17.99	18.00	9.78	10.00
Tolerance CO2	0	+/- 0.02	0.01	+/- 0.5	0.22	+/- 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	2.991	1.002	0	0.02	0.005	0.15	0.004	0.05	✓	
CO_2	0	18.04	9.81	0	0.02	0.05	0.5	0.03	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: PT20272 Run: 5 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	660301,75	408599,12	392989,38
Initial (Liter)	659669,31	407966,31	392505,49

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	1000	1000
Dry Bulb (F):	813	847
Humidity (%):	446	370

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: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: pT 20272 Run: 5 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 14 in.	1.32 lbs.	20.1	20.2	20.2	20.3	20.4
1 1/2 x 3 1/2 x 14 in.	1.38 lbs.	20.6	20.5	20.4	20.3	20.3
1 1/2 x 3 1/2 x 14 in.	1.28 lbs.	20.2	20.1	20.3	20.4	20.4
1 1/2 x 3 1/2 x 7 in.	0.86 lbs.	21.1	21.0	21.1	21.1	21.0
1 1/2 x 3 1/2 x 7 in.	0.86 lbs.	20.9	20.8	20.8	20.4	20.5
1 1/2 x 3 1/2 x 7 in.	0.86 lbs.	19.9	20.0	20.3	20.2	20.1
1 1/2 x 3 1/2 x 7 in.	~~0.84~~ 0.86 lbs.	20.0	20.1	20.2	20.1	20.0
x x in.	lbs.					
1 1/2 x 3 1/2 x 14 in.	1.34 lbs.	21.1	21.2	21.2	20.9	20.9
1 1/2 x 3 1/2 x 14 in.	1.38 lbs.	20.6	20.3	20.5	20.6	20.8
1 1/2 x 3 1/2 x 14 in.	1.38 lbs.	20.6	20.3	20.4	20.3	20.8
1 1/2 x 3 1/2 x 7 in.	0.86 lbs.	19.1	19.2	19.2	19.2	19.3
1 1/2 x 3 1/2 x 7 in.	0.84 lbs.	20.0	20.1	20.0	19.9	19.8
1 1/2 x 3 1/2 x 7 in.	0.82 lbs.	20.1	20.8	20.8	20.8	20.4
1 1/2 x 3 1/2 x 7 in.	0.86 lbs.	20.0	20.1	20.1	20.4	20.3
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 7.36 + 7.38 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: pt 20272 Run: 6 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 15 in.	1320	lbs.	206	205	208	209	207
1 1/2 x 3 1/2 x 15 in.	1566	lbs.	207	208	207	207	208
1 1/2 x 3 1/2 x 15 in.	1580	lbs.	201	200	199	198	198
1 1/2 x 3 1/2 x 15 in.	1400	lbs.	201	201	200	204	203
x x in.		lbs.					
1 1/2 x 3/4 x 4 in.	0082	lbs.			211		
1 1/2 x 3/4 x 4 in.	0102	lbs.			210		
1 1/2 x 3/4 x 4 in.	0100	lbs.			208		
1 1/2 x 3/4 x 4 in.	0082	lbs.			206		
1 1/2 x 3/4 x 4 in.	0100	lbs.			204		
1 1/2 x 3/4 x 4 in.	0102	lbs.			205		
1 1/2 x 3/4 x 4 in.	0102	lbs.			206		
1 1/2 x 3/4 x 4 in.	0100	lbs.			207		
1 1/2 x 3/4 x 4 in.	0122	lbs.			208		
1 1/2 x 3/4 x 4 in.	0100	lbs.			206		
1 1/2 x 3/4 x 4 in.	0120	lbs.			199		
1 1/2 x 3/4 x 4 in.	0100	lbs.			198		
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					
x x in.		lbs.					

TEST LOAD WEIGHT: 708 lbs Min 20%: 141.6 Max 25%: 177

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-07-07 Manufacturer: Hearthstone Model: 8060

Project #: PJ 20272 Run: 5 Tech: MM Reviewer: AP

		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	18	624	625	02	35	626	627	12	630
2022-07-07	17:00	108,9466		0,2616	34,5729	109,2831		0,2602	35,1644	0,1310
2022-07-25	11:00	108,9466		0,2615	34,5728	109,2832		0,2603	35,1645	0,1311

		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	18	624	625	02	35	626	627	12	630
2022-07-25	17:00	108,9468		0,2617	34,5753	109,2834		0,2597	35,1670	0,1314
2022-07-28	8:00	108,9466		0,2618	34,5736	109,2832		0,2598	35,1652	0,1312
2022-08-01	8:00	108,9466		0,2618	34,5736	109,2832		0,2598	35,1652	0,1312

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-07-07 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 5 Tech: MM Reviewer: DP

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	40	628	629	28
2022-07-07	17:00	110 1014		02615	35 3630
~~2022-07-25~~ 2022-07-25	11:00	110 1015		02614	35 3631

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	40	628	629	28
2022-07-25	17:00	110 1017		02616	35 3650
2022-07-28	8:00	110 1015		02615	35 3642
2022-08-01	8:00	110 1015		02615	35 3642

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	25-07-2022	
Technicien	M.M	
Project #	PI 20272	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8060	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	1	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):	1,003	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,014	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM #3):	0,997	
Equipment number (DGM #3):	EM 179	Dimensionless

Tunnel

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

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Fuel data

Fuel type	Cord	
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	100
Barometer (in.Hg):	29,529989	29,52998888
Dry Bulb (F):	81,3	84,7
Humidity (%):	44,6	37
Air velocity (ft/min)	0	0

DGM #1	Final:	23318,337	cuft	Final:	660301,750	Liter
	Initial:	23296,002	cuft	Initial:	659669,310	Liter
DGM #2	Final:	14429,542	cuft	Final:	408599,120	Liter
	Initial:	14407,195	cuft	Initial:	407966,310	Liter
DGM room	Final:	13878,289	cuft	Final:	392989,380	Liter
	Initial:	13861,201	cuft	Initial:	392505,490	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 395

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

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Preload data sheet

Test Load Weight: Lower	Ideal	Upper
6,30	7,00	7,70

Load Volume: 0,4253 cu. ft

Number of Spaces:

Spacer weight (lbs):

Loading Density: 14,740 lbs./ft3

Load Density (wet): 34,654 lbs./ft3

Dry Wood Density: 28,786105

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	14	1,32	20,1	20,2	20,2	20,3	20,4	26,7168	73,50
1,5	3,5	14	1,38	20,6	20,5	20,4	20,3	20,3	28,1796	73,50
1,5	3,5	14	1,28	20,2	20,1	20,3	20,4	20,4	25,9584	73,50
1,5	3,5	7	0,86	21,1	21	21,1	21	21	18,0944	36,75
1,5	3,5	7	0,86	20,9	20,8	20,8	20,4	20,5	17,7848	36,75
1,5	3,5	7	0,86	19,9	20	20,3	20,2	20,1	17,286	36,75
1,5	3,5	7	0,8	20	20,1	20,2	20,1	20	16,064	36,75
										0,00
1,5	3,5	14	1,34	21,1	21,2	21,2	20,9	20,9	28,2204	73,50
1,5	3,5	14	1,28	20,6	20,3	20,8	20,6	20,8	26,3936	73,50
1,5	3,5	14	1,38	20,6	20,3	20,4	20,3	20,8	28,2624	73,50
1,5	3,5	7	0,86	19,1	19,2	19,2	19,2	19,3	16,512	36,75
1,5	3,5	7	0,84	20	20,1	20	19,9	19,8	16,7664	36,75
1,5	3,5	7	0,82	20,1	20,8	20,8	20,8	20,4	16,8756	36,75
1,5	3,5	7	0,86	20	20,1	20,1	20,4	20,3	17,3548	36,75
										0,00
										0,00
										0,00

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
6,3	7,0	7,7

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

Load Volume: 0,18 cu. ft

Loading Density: 7,1 lbs./ft3

Number of Spaces: 12

Spacer weight: lbs

Load Density (wet): 32,2 lbs./ft3

Dry Wood Density: 26,7 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	15	1,32	20,60	20,50	20,80	20,90	20,70	27,324	78,75	20,7
1,5	3,5	15	1,57	20,70	20,80	20,70	20,70	20,80	32,47884	78,75	20,7
1,5	3,5	15	1,58	20,10	20,00	19,90	19,80	19,80	31,4736	78,75	19,9
1,5	3,5	15	1,40	20,10	20,10	20,00	20,40	20,30	28,252	78,75	20,2
										0,00	
										0,00	
										0,00	
										0,00	
1,5	0,75	4	0,08			21,10			1,7302	4,50	21,1
1,5	0,75	4	0,10			21,00			2,142	4,50	21,0
1,5	0,75	4	0,10			20,80			2,08	4,50	20,8
1,5	0,75	4	0,08			20,60			1,6892	4,50	20,6
1,5	0,75	4	0,10			20,40			2,04	4,50	20,4
1,5	0,75	4	0,10			20,50			2,091	4,50	20,5
1,5	0,75	4	0,10			20,60			2,1012	4,50	20,6
1,5	0,75	4	0,10			20,70			2,07	4,50	20,7
1,5	0,75	4	0,12			20,80			2,5376	4,50	20,8
1,5	0,75	4	0,10			20,60			2,06	4,50	20,6
1,5	0,75	4	0,12			19,90			2,388	4,50	19,9
1,5	0,75	4	0,10			19,80			1,98	4,50	19,8
										0,00	
										0,00	
										0,00	
										0,00

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,2 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=
0,960

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,073	77,27	0,2702
B center	0,074	77,11	0,2720
A1	0,060	77,27	0,2449
A2	0,070	77,16	0,2646
A3	0,073	77,16	0,2702
A4	0,059	77,08	0,2429
B1	0,060	77,110	0,2449
B2	0,073	77,180	0,2702
B3	0,077	77,180	0,2775
B4	0,060	77,020	0,2449
AVERAGE	0,0679	77,1540	0,2602

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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	18	624	625	2	35	626	627	12	40	628	629	28	630		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	108,9466		0,2616	34,5729	109,2831		0,2602	35,1644	110,1014		0,2615	35,3630	0,1310	2022-07-07	17:00
Before (6)	108,9466		0,2615	34,5728	109,2832		0,2603	35,1645	110,1014		0,2614	35,3631	0,1311	2022-07-25	11:00
After (1)	108,9468		0,2617	34,5753	109,2834		0,2597	35,1670	110,1017		0,2616	35,3650	0,1314	2022-07-25	17:00
After (2)	108,9466		0,2618	34,5736	109,2832		0,2598	35,1652	110,1015		0,2615	35,3642	0,1312	2022-07-28	08:00
After (3)	108,9466		0,2618	34,5736	109,2832		0,2598	35,1652	110,1015		0,2615	35,3642	0,1312	2022-08-01	08:00
After (4)															
After (5)															
After (6)	108,9466		0,2618	34,5736	109,2832		0,2598	35,1652	110,1015		0,2615	35,3642	0,1312	2022-08-01	08:00
Difference	0,0000	0,0000	0,0003	0,0008	0,0000	0,0000	-0,0005	0,0007	0,0001	0,0000	0,0001	0,0011	0,0001		
Total (mg)		1,1				1,3				1,3			0,1		
Total ajusté (mg)		**1,00**				**1,20**				**1,20**					

Project nu.	PI 20272
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Technicien	

Not the real number filter weight to zero for comparison purpose only

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	18	624	625	2	35	626	627	12	40	628	629	28	630		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	108,9466		0,2616	34,5729	109,2831		0,2602	35,1644	110,1014		0,2615	35,3630	0,1310	2022-07-07	17:00
Before (6)	108,9466		0,2615	34,5728	109,2832		0,2603	35,1645	110,1014		0,2614	35,3631	0,1311	2022-07-25	11:00
After (1)	108,9468		0,2617	34,5753	109,2834		0,2597	35,1670	110,1017		0,2616	35,3650	0,1314	2022-07-25	17:00
After (2)	108,9466		0,2618	34,5736	109,2832		0,2598	35,1652	110,1015		0,2615	35,3642	0,1312	2022-07-28	08:00
After (3)	108,9466		0,2618	34,5736	109,2832		0,2598	35,1652	110,1015		0,2615	35,3642	0,1312	2022-08-01	08:00
After (4)															
After (5)															
After (6)	108,9466		0,2618	34,5736	109,2832		0,2603	35,1652	110,1015		0,2615	35,3642	0,1312	2022-08-01	08:00
Difference	0,0000	0,0000	0,0003	0,0008	0,0000	0,0000	0,0000	0,0007	0,0001	0,0000	0,0001	0,0011	0,0001		
Total (mg)		1,1				1,8				1,3			0,1		
Total ajusté (mg)		**1,00**				**1,70**				**1,20**					

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Technicien	mm

SFBA EPA EMISSION RESULTS

Test Duration: **113** min

PRESSURE FACTOR:	DGM 1	0,96221	
	DGM 2	0,96500	
	DGM 3	0,98696	
TEMPERATURE FACTORS	DGM 1	0,97362	
	DGM 2	0,96519	
	DGM 3	0,97685	
VOLUMES SAMPLED	DGM 1	20,976	SCft
	DGM 2	21,108	Scft
	DGM 3	16,418	SCft

TOTAL TUNNEL VOLUME : 39076

SAMPLE RATIOS

Sample Train 1:	1862,867
Sample Train 2:	1851,275

Paticulate concentration

Sample Train 1	**0,000062**	g/dscf
Sample Train 2	**0,000062**	g/dscf
Room	**0,000006**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,18**	g
Sample Train 2	**2,17**	g

EMISSION RATES

Sample Train 1	**1,16**	g/hr
Sample Train 2	**1,15**	g/hr

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

	Train 1	Train 2
Cs	6,197E-05	6,1589E-05

RESULTS

Average emission rate: 1,16 g/hr

Burn Rate : 1,416 Dry kg/hr

BAROMETRIC PRESSURE

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

DGM CONTROLLER VALUES

DGM 1	Final:	23318,337	Cuft
	Initial:	23296,002	Cuft
DGM 2	Final:	14429,542	Cuft
	Initial:	14407,195	Cuft
DGM #3	Final:	13878,289	Cuft
	Initial:	13861,201	Cuft

TEMPERATURES

DGM 1	542,307	°R
DGM 2	547,042	°R

CALIBRATION FACTORS

DGM 1	1,0025
DGM 2	1,0141
DGM #3	0,9965

TUNNEL FLOW RATE: 345,804 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	1,30	mg
Total Sample Train 2:	1,30	mg
Total Sample Train 1 1st hour:	1,10	mg

DEVIATION: 0,35%

*		*	*	*	*	*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
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
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
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
0,00	395,00	7,0	0,0	3,6	0,0	361,4	79,8	98,8	407,1	333,4	611,4	605,6	392,9	489,4	0,18	80,46	80,98	88,59	0,18	81,77	82,48	85,25	0,08	0,05
1,0	396,0	6,9	0,1	3,6	0,0	335,0	79,8	92,1	401,3	329,8	606,7	599,7	393,8	623,1	0,18	80,51	81,01	88,12	0,18	81,74	82,59	85,14	0,08	0,06
2,0	397,0	6,9	0,1	5,3	0,0	337,7	79,7	91,6	396,9	328,2	597,8	590,0	394,7	651,6	0,18	80,48	80,97	87,81	0,18	81,71	82,70	85,10	0,08	0,06
3,0	398,0	6,8	0,1	5,7	0,0	341,7	79,6	91,7	393,4	326,7	585,5	578,1	395,5	664,9	0,18	80,53	80,95	87,60	0,18	81,74	82,80	85,09	0,07	0,06
4,0	399,0	6,8	0,0	6,6	0,0	345,2	79,7	92,3	393,3	328,2	574,8	566,1	396,1	681,7	0,18	80,54	80,92	87,49	0,18	81,80	82,93	85,15	0,07	0,07
5,0	400,0	6,7	0,0	9,6	0,0	363,2	79,6	92,9	400,4	330,3	563,2	554,4	396,5	755,1	0,18	80,57	80,90	87,35	0,18	81,88	83,04	84,96	0,08	0,07
6,0	401,0	6,6	0,0	11,2	0,0	375,7	79,6	93,1	411,8	333,5	552,2	542,6	396,5	772,5	0,18	80,63	80,90	87,28	0,18	81,96	83,19	84,69	0,07	0,07
7,0	402,0	6,5	0,0	10,5	0,0	378,3	79,6	93,1	420,0	336,7	542,8	532,7	396,4	761,8	0,19	80,69	80,88	86,75	0,18	82,09	83,34	84,49	0,07	0,07
8,0	403,0	6,3	0,0	10,4	0,0	388,2	79,6	92,7	427,8	340,7	535,5	523,0	396,0	795,2	0,19	80,77	80,87	86,12	0,18	82,23	83,51	84,29	0,07	0,07
9,0	404,0	6,3	0,1	12,8	0,0	401,0	79,6	93,6	440,3	345,7	529,4	514,7	395,6	816,6	0,18	80,86	80,85	85,76	0,18	82,37	83,67	84,18	0,08	0,07
10,0	405,0	6,1	0,0	12,1	0,0	404,7	79,7	94,6	449,9	350,1	523,5	507,8	394,9	817,3	0,19	80,92	80,87	85,45	0,18	82,51	83,79	84,15	0,07	0,07
11,0	406,0	6,0	0,1	12,2	0,0	412,0	79,7	93,9	459,3	353,3	517,5	503,4	394,1	836,0	0,18	81,01	80,87	85,12	0,18	82,68	83,97	84,06	0,07	0,07
12,0	407,0	5,9	0,1	11,9	0,0	417,0	79,8	94,6	467,4	357,2	513,1	501,0	393,2	846,8	0,18	81,07	80,87	84,89	0,18	82,86	84,12	84,02	0,08	0,07
13,0	408,0	5,8	0,1	11,7	0,0	419,7	79,7	95,2	476,0	360,5	508,2	499,6	392,2	862,7	0,19	81,12	80,89	84,65	0,18	83,02	84,32	83,99	0,07	0,07
14,0	409,0	5,6	0,1	12,3	0,0	428,8	79,8	95,5	485,0	363,7	504,1	498,0	391,0	890,6	0,18	81,16	80,89	84,45	0,18	83,15	84,47	83,97	0,07	0,08
15,0	410,0	5,6	0,1	12,8	0,0	434,8	79,7	95,5	495,0	365,9	500,0	496,5	389,8	884,5	0,18	81,24	80,90	84,34	0,18	83,29	84,65	83,97	0,07	0,08
16,0	411,0	5,4	0,1	12,6	0,0	437,7	79,8	95,6	504,4	368,7	496,8	494,3	388,5	897,2	0,18	81,38	80,92	84,21	0,19	83,44	84,83	83,97	0,08	0,08
17,0	412,0	5,4	0,1	12,4	0,0	437,5	79,8	96,2	510,2	370,8	494,2	491,9	387,2	896,9	0,18	81,45	80,92	84,08	0,18	83,60	84,96	83,97	0,07	0,08
18,0	413,0	5,2	0,1	12,9	0,0	449,5	79,8	96,2	517,7	373,8	492,1	490,0	385,9	972,1	0,19	81,47	80,97	83,99	0,19	83,74	85,12	83,99	0,07	0,08
19,0	414,0	5,1	0,2	14,3	0,0	460,1	79,9	97,2	526,6	376,9	490,5	489,1	384,5	977,5	0,19	81,57	80,99	83,92	0,18	83,87	85,27	84,03	0,07	0,08
20,0	415,0	4,9	0,4	14,0	0,0	455,5	79,9	97,3	533,2	379,7	490,2	491,2	383,1	900,9	0,19	81,62	81,01	83,92	0,18	84,02	85,41	84,09	0,08	0,08
21,0	416,0	4,8	0,1	11,5	0,0	444,4	79,9	97,2	535,9	381,8	490,9	494,5	381,8	873,6	0,19	81,70	81,03	83,83	0,18	84,12	85,53	84,09	0,08	0,07
22,0	417,0	4,8	0,0	10,9	0,0	439,2	79,9	96,7	538,0	383,4	492,4	496,0	380,4	867,4	0,19	81,75	81,07	83,75	0,18	84,25	85,72	84,06	0,08	0,08
23,0	418,0	4,6	0,0	11,5	0,0	439,3	79,9	95,7	540,8	384,8	493,5	496,2	379,1	887,2	0,19	81,80	81,09	83,61	0,18	84,35	85,89	84,04	0,07	0,08
24,0	419,0	4,5	0,1	12,6	0,0	446,3	80,0	97,0	545,7	385,9	494,3	496,3	377,8	915,0	0,19	81,84	81,10	83,56	0,19	84,45	86,01	84,05	0,08	0,08
25,0	420,0	4,4	0,3	13,7	0,0	460,4	80,0	97,3	551,7	386,8	496,8	496,7	376,6	985,6	0,19	81,95	81,16	83,55	0,19	84,56	86,16	84,06	0,07	0,08
26,0	421,0	4,3	0,2	14,6	0,0	466,7	80,1	98,0	556,5	387,9	499,8	498,1	375,4	992,2	0,19	82,07	81,19	83,54	0,18	84,68	86,26	84,12	0,08	0,08
27,0	422,0	4,1	0,9	14,9	0,0	469,9	80,1	96,7	560,6	388,1	501,6	501,2	374,2	994,5	0,19	82,10	81,23	83,46	0,18	84,78	86,39	84,12	0,08	0,08
28,0	423,0	4,0	0,7	14,8	0,0	469,3	80,1	98,3	566,1	389,8	505,0	504,2	373,0	981,9	0,19	82,13	81,25	83,45	0,19	84,89	86,54	84,13	0,07	0,08
29,0	424,0	3,9	0,6	14,6	0,0	467,4	80,1	98,0	571,7	390,9	507,6	506,7	371,8	972,1	0,19	82,14	81,28	83,46	0,18	84,99	86,66	84,18	0,08	0,08
30,0	425,0	3,8	0,4	14,3	0,0	464,0	80,2	97,4	576,7	391,8	509,3	508,9	370,6	951,0	0,19	82,24	81,31	83,41	0,19	85,08	86,77	84,20	0,08	0,08
31,0	426,0	3,7	0,2	14,0	0,0	461,8	80,2	98,4	583,3	393,3	511,4	510,8	369,5	932,4	0,19	82,30	81,37	83,37	0,19	85,17	86,87	84,19	0,08	0,08
32,0	427,0	3,5	0,1	13,8	0,0	459,9	80,3	98,2	587,3	394,6	512,4	513,0	368,3	938,3	0,19	82,33	81,39	83,39	0,19	85,26	87,01	84,21	0,07	0,08
33,0	428,0	3,5	0,2	13,8	0,0	458,9	80,3	97,3	591,7	396,2	513,6	515,3	367,2	957,4	0,18	82,33	81,40	83,29	0,19	85,35	87,14	84,20	0,07	0,08
34,0	429,0	3,3	0,2	14,0	0,0	458,8	80,3	97,5	595,6	398,1	514,6	518,6	366,2	969,2	0,19	82,38	81,43	83,27	0,18	85,41	87,27	84,22	0,07	0,08
35,0	430,0	3,2	0,2	14,3	0,0	460,3	80,4	98,0	600,0	399,3	515,8	522,1	365,2	987,0	0,19	82,37	81,46	83,28	0,18	85,48	87,40	84,22	0,08	0,08
36,0	431,0	3,1	0,4	14,5	0,0	462,4	80,4	99,5	605,0	401,9	518,1	526,1	364,2	994,2	0,19	82,37	81,47	83,33	0,19	85,54	87,51	84,28	0,07	0,08
37,0	432,0	3,0	0,5	14,7	0,0	465,8	80,4	98,5	608,9	403,7	519,4	530,4	363,2	1001,5	0,19	82,38	81,49	83,31	0,18	85,58	87,61	84,31	0,08	0,08
38,0	433,0	2,9	0,5	14,9	0,0	468,0	80,5	99,3	613,7	405,6	520,8	534,4	362,2	1004,4	0,19	82,43	81,52	83,33	0,19	85,65	87,71	84,35	0,07	0,08
39,0	434,0	2,8	0,7	15,0	0,0	470,3	80,5	98,9	619,1	407,6	522,9	538,4	361,3	1004,9	0,19	82,47	81,55	83,32	0,19	85,71	87,81	84,38	0,08	0,08
40,0	435,0	2,6	0,9	15,2	0,0	472,1	80,6	99,1	624,6	409,8	525,1	542,5	360,4	1002,7	0,19	82,51	81,57	83,32	0,19	85,75	87,93	84,43	0,08	0,08
41,0	436,0	2,5	0,3	15,2	0,0	473,0	80,6	99,8	629,4	411,9	526,8	546,3	359,5	996,5	0,19	82,59	81,61	83,34	0,18	85,83	88,02	84,50	0,08	0,08
42,0	437,0	2,3	0,4	15,1	0,0	471,7	80,7	100,1	634,0	414,4	529,4	550,3	358,7	991,0	0,19	82,68	81,65	83,38	0,19	85,90	88,14	84,50	0,08	0,08
43,0	438,0	2,2	0,4	15,0	0,0	470,6	80,8	99,5	638,1	416,2	531,7	554,5	357,8	989,0	0,19	82,77	81,72	83,36	0,19	86,00	88,24	84,48	0,07	0,08
44,0	439,0	2,1	0,3	15,0	0,0	466,9	80,8	98,6	640,9	418,9	534,6	558,3	357,0	992,5	0,19	82,81	81,74	83,27	0,18	86,08	88,33	84,48	0,07	0,08
45,0	440,0	2,1	0,2	15,0	0,0	466,9	80,8	99,1	644,0	420,9	536,4	562,7	356,2	1005,7	0,18	82,85	81,80	83,27	0,19	86,14	88,44	84,46	0,08	0,08
46,0	441,0	1,9	0,3	14,7	0,0	464,4	80,8	98,7	646,7	423,1	539,7	566,5	355,5	984,4	0,19	82,90	81,83	83,25	0,19	86,20	88,55	84,48	0,07	0,08
47,0	442,0	1,9	0,2	13,9	0,0	460,6	80,8	99,2	647,2	424,6	541,9	570,9	354,8	967,5	0,19	82,98	81,89	83,26	0,18	86,25	88,62	84,51	0,07	0,07
48,0	443,0	1,8	0,1	13,3	0,0	455,7	80,9	98,2	647,1	424,9	545,4	576,6	354,1	957,1	0,19	82,98	81,91	83,23	0,19	86,32	88,70	84,48	0,07	0,08
49,0	444,0	1,7	0,1	12,8	0,0	451,1	80,9	97,8	646,7	425,2	548,7	582,1	353,3	959,4	0,19	82,97	81,92	83,15	0,19	86,37	88,78	84,45	0,07	0,07
50,0	445,0	1,6	0,1	13,0	0,0	451,8	80,9	97,5	645,0	425,5	553,1	588,8	352,6	969,9	0,19	83,01	81,95	83,12	0,19	86,39	88,84	84,40	0,08	0,07
51,0	446,0	1,6	0,0	12,7	0,0	447,1	80,9	98,5	642,9	424,2	557,7	595,2	351,9	940,7	0,19	83,05	81,99	83,13	0,19	86,48	88,98	84,46	0,07	0,08
52,0	447,0	1,5	0,0	12,1	0,0	441,8	81,0	97,2	639,8	423,0	563,0	600,7	351,4	922,3	0,19	83,10	82,04	83,05	0,19	86,56	89,09	84,37	0,07	0,07
53,0	448,0	1,5	0,0	11,7	0,0	436,7	81,0	98,3	635,9	421,5	567,8	605,9	350,8	908,4	0,19	83,16	82,07	83,05	0,18	86,59	89,17	84,40	0,07	0,07
54,0	449,0	1,4	0,0	11,1	0,0	430,3	81,0	96,0	631,0	420,0	572,1	611,2	350,3	878,0	0,18	83,21	82,12	83,01	0,19	86,61	89,21	84,33	0,08	0,07
55,0	450,0	1,3	0,0	10,4	0,0	423,8	81,0	96,3	624,8	418,2	575,8	615,0	349,8	859,7	0,19	83,21	82,13	82,96	0,19	86,64	89,30	84,29	0,07	0,07
56,0	451,0	1,3	0,0	10,3	0,0	418,6	81,1	95,8	619,0	416,5	579,6	618,4	349,4	847,5	0,19	83,28	82,19	82,88	0,19	86,72	89,40	84,23	0,08	0,07
57,0	452,0	1,2	0,0	10,1	0,0	413,9	81,1	97,1	612,5	414,8	582,7	621,7	349,0	837,1	0,19	83,27	82,22	82,87	0,19	86,74	89,47	84,21	0,08	0,07
58,0	453,0	1,2	0,0	9,9	0,0	409,3	81,0	96,7	605,6	413,6	585,6	624,5	348,6	828,6	0,19	83,24	82,24	82,84	0,19	86,81	89,55	84,21	0,07	0,07
59,0	454,0	1,2	0,0	9,6	0,0	405,8	81,0	96,0	598,6	412,4	588,5	626,9	348,2	820,2	0,19	83,28	82,25	82,80	0,18	86,83	89,63	84,20	0,08	0,07
60,0	455,0	1,1	0,0	9,4	0,0	402,0	80,9	96,0	591,0	410,3	590,6	630,7	347,9	813,6	0,19	83,22	82,27	82,78	0,19	86,83	89,71	84,16	0,07	0,07
61,0	456,0	1,1	0,0	9,3	0,0	399,2	81,0	94,9	584,4	409,1	593,0	633,0	347,6	807,8	0,19	83,19	82,28	82,63	0,19	86,83	89,77	84,08	0,07	0,07
62,0	457,0	1,1	0,0	9,2	0,0	395,4	81,0	96,9	577,1	407,6	595,2	634,8	347,3	797,5	0,19	83,16	82,29	82,69	0,19	86,82	89,85	84,13	0,08	0,07
63,0	458,0	1,0	0,0	9,0	0,0	392,8	80,9	94,3	570,7	406,1	597,3	636,6	347,1	790,8	0,19	83,24	82,32	82,60	0,18	86,81	89,88	84,06	0,08	0,07
64,0	459,0	1,0	0,0	8,9	0,0	390,2	80,9	94,7	563,7	404,0	599,5	637,8	346,8	784,6	0,19	83,28	82,34	82,52	0,19	86,84	89,95	84,01	0,08	0,07
65,0	460,0	1,0	0,0	8,9	0,0	387,6	80,8	95,3	557,6	402,2	601,9	639,1	346,6	778,9	0,19	83,31	82,36	82,47	0,19	86,85	90,00	83,99	0,08	0,07
66,0	461,0	0,9	0,0	8,8	0,0	385,2	80,9	95,1	551,2	400,3	605,0	638,5	346,4	774,4	0,19	83,33	82,39	82,41	0,19	86,85	90,02	83,94	0,08	0,07
67,0	462,0	0,9	0,0	8,6	0,0	383,6	80,9	95,0	544,6	397,9	607,4	639,6	346,2	775,4	0,19	83,42	82,41	82,40	0,19	86,90	90,09	83,90	0,08	0,07
68,0	463,0	0,9	0,0	8,6	0,0	383,1	80,9	94,3	538,0	395,8	609,2	640,0	346,1	774,2	0,19	83,38	82,42	82,35	0,19	86,86	90,12	83,87	0,07	0,07
69,0	464,0	0,8	0,0	8,3	0,0	378,8	80,9	94,9	531,2	394,0	610,7	640,1	345,9	762,4	0,19	83,36	82,42	82,30	0,18	86,90	90,17	83,84	0,08	0,06
70,0	465,0	0,8	0,0	8,2	0,0	376,3	80,8	93,9	524,8	392,0	611,1	641,1	345,8	756,8	0,19	83,36	82,45	83,19	0,18	86,88	90,25	83,83	0,07	0,06
71,0	466,0	0,8	0,0	8,0	0,0	374,2	80,8	94,2	518,0	390,0	611,1	641,4	345,6	753,5	0,19	83,34	82,48	82,63	0,18	86,86	90,31	83,79	0,07	0,06
72,0	467,0	0,8	0,0	7,9	0,0	372,0	80,8	94,2	511,6	387,8	611,1	642,5	345,5	751,6	0,19	83,29	82,48	82,74	0,19	86,83	90,33	83,77	0,08	0,06
73,0	468,0	0,8	0,1	7,8	0,0	372,2	80,8	94,1	505,4	385,8	611,0	642,8	345,5	750,2	0,19	83,31	82,48	83,40	0,19	86,85	90,36	83,76	0,07	0,06
74,0	469,0	0,7	0,1	7,7	0,0	370,1	80,8	94,1	499,1	384,2	610,8	643,3	345,5	748,4	0,19	83,36	82,51	84,12	0,19	86,89	90,35	83,72	0,08	0,06
75,0	470,0	0,7	0,1	7,8	0,0	368,7	80,8	94,4	493,4	381,7	610,5	643,9	345,5	746,0	0,19	83,42	82,52	84,73	0,19	86,93	90,38	83,75	0,07	0,06
76,0	471,0	0,7	0,1	7,7	0,0	368,1	80,8	93,3	488,1	380,0	610,0	643,6	345,6	745,5	0,19	83,48	82,56	85,71	0,19	86,93	90,32	83,66	0,07	0,06
77,0	472,0	0,7	0,1	7,5	0,0	366,9	80,9	92,7	482,8	378,8	609,8	643,1	345,7	742,4	0,19	83,41	82,56	86,56	0,19	86,90	90,32	83,71	0,08	0,06
78,0	473,0	0,7	0,1	7,5	0,0	365,4	80,9	94,5	477,0	376,9	608,8	642,3	345,8	738,9	0,19	83,38	82,57	86,55	0,19	86,90	90,39	83,93	0,08	0,06
79,0	474,0	0,6	0,1	7,5	0,0	364,8	80,9	92,2	472,5	375,6	607,2	641,5	346,0	736,0	0,19	83,40	82,58	86,36	0,18	86,89	90,44	84,05	0,07	0,06
80,0	475,0	0,6	0,1	7,5	0,0	363,6	80,9	93,3	467,2	373,9	606,5	640,7	346,2	733,7	0,19	83,37	82,61	86,20	0,19	86,90	90,46	84,23	0,08	0,06
81,0	476,0	0,6	0,1	7,6	0,0	362,1	81,0	92,8	462,5	372,5	604,8	639,0	346,3	730,6	0,19	83,38	82,62	86,08	0,19	86,95	90,50	84,37	0,08	0,06
82,0	477,0	0,6	0,1	7,6	0,0	360,9	80,9	94,0	458,2	371,1	604,2	637,7	346,6	728,4	0,19	83,40	82,62	86,00	0,19	86,94	90,54	84,56	0,08	0,06
83,0	478,0	0,6	0,1	7,5	0,0	360,2	80,9	92,4	454,0	369,5	602,8	636,2	346,8	729,2	0,19	83,41	82,62	85,94	0,18	86,95	90,57	84,65	0,07	0,06
84,0	479,0	0,6	0,1	7,4	0,0	359,6	80,9	93,5	450,5	368,7	602,4	634,9	347,1	729,8	0,18	83,44	82,66	85,91	0,18	86,96	90,63	84,77	0,08	0,06
85,0	480,0	0,5	0,1	7,5	0,0	359,4	80,8	93,1	446,2	367,4	601,2	633,2	347,5	728,0	0,19	83,41	82,68	85,84	0,19	86,95	90,68	84,91	0,08	0,06
86,0	481,0	0,5	0,1	7,5	0,0	358,3	80,8	93,6	442,7	366,3	600,4	631,2	347,9	727,4	0,19	83,40	82,67	85,79	0,19	86,96	90,68	85,04	0,07	0,06
87,0	482,0	0,5	0,1	7,5	0,0	358,5	80,8	93,2	439,3	364,3	599,1	629,3	348,2	726,0	0,19	83,37	82,68	85,72	0,19	86,95	90,71	85,14	0,07	0,06
88,0	483,0	0,5	0,1	7,6	0,0	358,1	80,8	92,5	435,9	363,7	597,7	627,3	348,6	723,9	0,19	83,37	82,67	85,67	0,19	86,91	90,71	85,24	0,08	0,06
89,0	484,0	0,5	0,1	7,7	0,0	357,7	80,8	93,4	433,2	362,9	597,0	625,3	349,0	723,5	0,19	83,38	82,68	85,63	0,19	86,91	90,74	85,34	0,08	0,06
90,0	485,0	0,4	0,1	7,6	0,0	357,0	80,8	93,3	429,8	361,8	596,3	623,9	349,5	721,3	0,19	83,35	82,67	85,58	0,19	86,88	90,79	85,41	0,08	0,06
91,0	486,0	0,4	0,1	7,6	0,0	356,0	80,7	92,9	426,7	360,5	595,5	621,8	349,9	719,2	0,19	83,36	82,68	85,50	0,18	86,89	90,80	85,46	0,07	0,06
92,0	487,0	0,4	0,1	7,5	0,0	355,2	80,7	93,3	423,9	359,1	594,7	620,6	350,4	716,9	0,19	83,32	82,66	85,44	0,19	86,88	90,82	85,55	0,08	0,06
93,0	488,0	0,4	0,1	7,4	0,0	354,3	80,7	93,6	421,4	358,2	594,4	619,1	350,9	715,7	0,19	83,36	82,67	85,37	0,19	86,88	90,79	85,61	0,08	0,06
94,0	489,0	0,3	0,1	7,5	0,0	354,0	80,8	92,2	419,2	357,4	594,1	617,8	351,4	716,9	0,19	83,36	82,67	85,33	0,18	86,88	90,82	85,65	0,08	0,06
95,0	490,0	0,3	0,1	7,4	0,0	354,0	80,8	93,4	416,7	356,1	593,8	616,1	351,9	718,3	0,18	83,37	82,69	85,28	0,18	86,87	90,85	85,69	0,08	0,06

96,0	491,0	0,3	0,1	7,4	0,0	355,4	80,7	92,3	414,0	355,2	593,5	614,4	352,3	720,7	0,18	83,34	82,67	85,18	0,18	86,83	90,84	85,73	0,07	0,06
97,0	492,0	0,3	0,1	7,5	0,0	355,4	80,7	92,0	411,9	354,0	593,3	612,2	352,9	719,3	0,19	83,35	82,70	85,12	0,19	86,88	90,89	85,70	0,07	0,06
98,0	493,0	0,2	0,1	7,4	0,0	354,6	80,7	93,2	409,4	353,4	593,0	610,7	353,3	720,6	0,18	83,33	82,68	85,03	0,19	86,88	90,93	85,79	0,07	0,06
99,0	494,0	0,2	0,1	7,3	0,0	355,8	80,8	93,2	407,3	351,9	591,9	608,9	353,9	724,7	0,19	83,34	82,73	84,98	0,19	86,87	90,94	85,85	0,07	0,06
100,0	495,0	0,2	0,1	7,3	0,0	357,1	80,8	92,1	405,3	350,3	591,3	607,6	354,4	725,5	0,19	83,37	82,73	84,94	0,19	86,85	90,90	85,86	0,07	0,06
101,0	496,0	0,2	0,1	7,3	0,0	356,7	80,8	92,0	403,3	348,9	591,2	605,8	354,9	724,6	0,19	83,39	82,73	84,83	0,19	86,88	90,93	85,87	0,08	0,06
102,0	497,0	0,2	0,1	7,2	0,0	356,7	80,7	92,2	401,0	347,7	590,8	604,2	355,4	723,4	0,19	83,45	82,71	84,75	0,19	86,86	90,92	85,87	0,08	0,06
103,0	498,0	0,2	0,1	7,1	0,0	357,5	80,7	93,1	399,4	346,4	591,3	602,8	356,0	721,6	0,19	83,48	82,74	84,70	0,19	86,89	90,93	85,97	0,07	0,06
104,0	499,0	0,1	0,1	7,1	0,0	356,7	80,7	92,8	397,4	344,8	590,3	600,7	356,5	718,0	0,19	83,41	82,75	84,61	0,18	86,87	90,91	85,98	0,08	0,06
105,0	500,0	0,2	0,1	7,1	0,0	356,0	80,7	91,4	395,6	343,5	589,9	599,2	357,0	717,7	0,19	83,39	82,76	84,53	0,18	86,86	90,89	85,94	0,07	0,06
106,0	501,0	0,1	0,1	7,0	0,0	355,2	80,7	91,8	393,5	342,2	589,9	597,9	357,6	716,6	0,19	83,37	82,74	84,49	0,19	86,89	90,90	85,96	0,08	0,06
107,0	502,0	0,1	0,1	6,9	0,0	354,5	80,6	92,3	391,7	340,5	589,8	596,3	358,1	712,8	0,19	83,33	82,73	84,42	0,19	86,83	90,85	85,97	0,08	0,06
108,0	503,0	0,1	0,1	6,9	0,0	353,4	80,8	91,8	390,4	339,1	589,8	593,9	358,7	705,9	0,19	83,33	82,75	84,38	0,19	86,83	90,90	85,97	0,07	0,06
109,0	504,0	0,1	0,1	6,7	0,0	349,5	80,7	92,9	388,7	338,1	589,2	592,6	359,3	696,3	0,19	83,35	82,76	84,30	0,19	86,84	90,92	86,01	0,08	0,06
110,0	505,0	0,1	0,1	6,5	0,0	348,7	80,7	90,9	387,0	336,8	588,9	590,4	359,9	696,1	0,19	83,40	82,77	84,25	0,19	86,86	90,94	86,00	0,08	0,06
111,0	506,0	0,1	0,1	6,5	0,0	348,5	80,7	91,7	385,0	335,3	587,8	588,2	360,4	697,1	0,19	83,36	82,78	84,19	0,19	86,83	90,93	85,97	0,08	0,06
112,0	507,0	0,1	0,1	6,5	0,0	348,4	80,7	91,5	383,5	334,0	586,7	586,7	361,1	699,3	0,19	83,40	82,78	84,15	0,19	86,82	90,94	85,96	0,08	0,06
113,0	508,0	0,0	0,1	6,5	0,0	348,0	80,7	91,9	381,4	332,3	585,4	584,6	361,7	696,3	0,19	83,46	82,79	84,11	0,19	86,81	90,87	85,98	0,08	0,06

Manufacturer: HEARTHSTONE
Model: 8060

Run: 1
Project #: PI 20272
Test Duration: 113 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	76,90%	83,12%
Comb Eff	99,01%	99,01%
HT Eff	77,67%	83,95%
Output	14 827	kJ/h
Burn Rate	0,97	kg/h
Grams CO	45	g
Input	19 280	kJ/h
MC wet	16,95	

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

Overall Heating Efficiency: 76,90%
Combustion Efficiency: 99,01%
Heat Transfer Efficiency: 77,67%

Heat Output: 14 065 Btu/h
Heat Input: 18 289 Btu/h
Burn Duration: 2,70 h
Burn Rate: 2,15 lb/h
Stack Temp: 361,4 Deg. F

Averages	0,15	9,55	1,19	20,30	10,68	182,99	26,88	0,99	0,78	#DIV/0!
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,16	0,05	3,63	433,9%	20,70	17,04	183,0	26,6	100,3%	62,5%	62,7%
1,00	3,12	0,14	3,60	424,5%	20,69	17,02	168,3	26,5	98,1%	64,9%	63,7%
2,00	3,12	0,07	5,28	267,3%	20,59	15,27	169,8	26,5	99,8%	72,1%	71,9%
3,00	3,09	0,06	5,66	243,8%	20,56	14,88	172,0	26,5	99,9%	72,9%	72,8%
4,00	3,07	0,05	6,57	196,8%	20,50	13,91	174,0	26,5	100,0%	74,8%	74,8%
5,00	3,03	0,05	9,64	102,9%	20,30	10,64	184,0	26,4	99,9%	78,4%	78,3%
6,00	2,98	0,04	11,15	75,4%	20,20	9,03	190,9	26,4	99,9%	79,2%	79,2%
7,00	2,94	0,03	10,55	85,7%	20,24	9,68	192,4	26,5	100,0%	78,6%	78,7%
8,00	2,85	0,03	10,37	88,9%	20,25	9,87	197,9	26,4	100,0%	78,1%	78,1%
9,00	2,85	0,06	12,85	52,1%	20,09	7,21	205,0	26,5	99,8%	79,6%	79,4%
10,00	2,76	0,04	12,09	62,0%	20,14	8,03	207,0	26,5	99,9%	78,9%	78,9%
11,00	2,71	0,06	12,20	60,2%	20,13	7,90	211,1	26,5	99,8%	78,8%	78,6%
12,00	2,67	0,07	11,89	64,3%	20,15	8,23	213,9	26,5	99,7%	78,4%	78,1%
13,00	2,62	0,07	11,73	66,4%	20,16	8,39	215,4	26,5	99,7%	78,1%	77,9%
14,00	2,53	0,13	12,29	58,1%	20,12	7,76	220,4	26,5	99,3%	78,3%	77,7%
15,00	2,53	0,12	12,77	52,3%	20,09	7,26	223,8	26,5	99,3%	78,4%	77,9%
16,00	2,44	0,07	12,62	54,7%	20,10	7,44	225,4	26,5	99,7%	78,2%	78,0%
17,00	2,44	0,09	12,39	57,4%	20,12	7,68	225,3	26,6	99,6%	78,0%	77,7%
18,00	2,35	0,08	12,85	51,9%	20,09	7,19	231,9	26,5	99,6%	78,0%	77,7%
19,00	2,30	0,23	14,33	34,9%	19,98	5,53	237,8	26,6	98,8%	78,6%	77,7%
20,00	2,21	0,38	14,02	36,3%	19,99	5,77	235,3	26,6	97,9%	78,5%	76,9%
21,00	2,17	0,06	11,55	69,1%	20,17	8,59	229,1	26,6	99,8%	77,1%	76,9%
22,00	2,16	0,05	10,87	79,8%	20,22	9,32	226,2	26,6	99,9%	76,7%	76,6%
23,00	2,08	0,05	11,48	70,4%	20,18	8,67	226,3	26,6	99,9%	77,2%	77,1%
24,00	2,03	0,07	12,55	55,6%	20,11	7,52	230,2	26,6	99,7%	77,9%	77,7%
25,00	1,98	0,27	13,72	40,4%	20,02	6,16	238,0	26,7	98,5%	78,2%	77,1%
26,00	1,94	0,23	14,57	32,7%	19,96	5,28	241,5	26,7	98,8%	78,6%	77,6%
27,00	1,85	0,86	14,87	24,9%	19,90	4,60	243,3	26,7	95,5%	78,5%	74,9%
28,00	1,80	0,68	14,80	26,9%	19,92	4,78	243,0	26,7	96,4%	78,5%	75,7%
29,00	1,76	0,60	14,57	29,5%	19,94	5,07	241,9	26,7	96,8%	78,5%	75,9%
30,00	1,71	0,36	14,27	34,3%	19,97	5,52	240,0	26,8	98,0%	78,5%	76,9%
31,00	1,67	0,19	14,01	38,4%	20,00	5,90	238,8	26,8	99,0%	78,4%	77,6%
32,00	1,58	0,13	13,84	40,5%	20,02	6,11	237,7	26,8	99,3%	78,4%	77,8%
33,00	1,58	0,16	13,76	41,1%	20,02	6,18	237,2	26,8	99,2%	78,3%	77,7%
34,00	1,49	0,19	13,96	38,8%	20,01	5,95	237,1	26,9	99,0%	78,5%	77,7%
35,00	1,44	0,24	14,33	34,8%	19,98	5,53	237,9	26,9	98,7%	78,6%	77,6%
36,00	1,39	0,39	14,50	32,0%	19,96	5,26	239,1	26,9	97,9%	78,6%	77,0%
37,00	1,34	0,48	14,66	29,7%	19,94	5,03	241,0	26,9	97,4%	78,6%	76,6%
38,00	1,30	0,48	14,86	28,0%	19,93	4,83	242,2	27,0	97,5%	78,7%	76,7%
39,00	1,25	0,65	15,05	25,1%	19,90	4,53	243,5	27,0	96,6%	78,7%	76,0%
40,00	1,17	0,91	15,19	22,0%	19,88	4,23	244,5	27,0	95,3%	78,6%	74,9%
41,00	1,12	0,27	15,24	26,6%	19,92	4,54	245,0	27,0	98,6%	78,8%	77,7%
42,00	1,03	0,37	15,13	26,7%	19,92	4,60	244,3	27,0	98,1%	78,8%	77,2%
43,00	1,00	0,39	15,02	27,5%	19,92	4,71	243,7	27,1	97,9%	78,7%	77,1%
44,00	0,94	0,33	14,98	28,3%	19,93	4,78	241,6	27,1	98,2%	78,8%	77,4%
45,00	0,94	0,21	14,98	29,3%	19,94	4,85	241,6	27,1	98,9%	78,9%	78,0%
46,00	0,85	0,35	14,65	31,0%	19,95	5,12	240,2	27,1	98,1%	78,7%	77,2%
47,00	0,85	0,16	13,93	39,4%	20,01	6,00	238,1	27,1	99,2%	78,4%	77,8%
48,00	0,80	0,09	13,27	47,0%	20,06	6,74	235,4	27,2	99,6%	78,1%	77,8%
49,00	0,76	0,06	12,80	52,8%	20,09	7,26	232,8	27,1	99,8%	78,0%	77,8%
50,00	0,71	0,06	12,98	50,6%	20,08	7,07	233,2	27,1	99,8%	78,1%	77,9%
51,00	0,71	0,05	12,71	54,0%	20,10	7,37	230,6	27,2	99,8%	78,0%	77,9%
52,00	0,67	0,03	12,09	62,1%	20,14	8,03	227,7	27,2	100,0%	77,7%	77,7%
53,00	0,67	0,03	11,68	67,7%	20,17	8,47	224,9	27,2	100,0%	77,6%	77,6%
54,00	0,62	0,02	11,06	77,3%	20,21	9,14	221,3	27,2	100,1%	77,2%	77,3%
55,00	0,58	0,02	10,45	87,8%	20,25	9,80	217,7	27,2	100,2%	76,8%	77,0%
56,00	0,58	0,02	10,33	89,8%	20,26	9,92	214,8	27,3	100,1%	76,9%	77,0%
57,00	0,53	0,02	10,12	93,8%	20,27	10,14	212,1	27,3	100,1%	76,9%	77,0%
58,00	0,53	0,02	9,92	97,6%	20,28	10,35	209,6	27,2	100,1%	76,9%	77,0%
59,00	0,53	0,02	9,61	104,0%	20,30	10,69	207,7	27,2	100,1%	76,6%	76,7%
60,00	0,49	0,02	9,37	109,0%	20,32	10,94	205,6	27,2	100,1%	76,5%	76,6%
61,00	0,49	0,02	9,28	111,2%	20,33	11,04	204,0	27,2	100,1%	76,5%	76,6%
62,00	0,49	0,03	9,24	112,0%	20,33	11,07	201,9	27,2	100,1%	76,6%	76,7%
63,00	0,44	0,03	9,04	116,6%	20,34	11,29	200,5	27,2	100,1%	76,5%	76,6%
64,00	0,44	0,03	8,91	119,7%	20,35	11,42	199,0	27,2	100,1%	76,4%	76,5%
65,00	0,44	0,03	8,87	120,6%	20,35	11,46	197,6	27,1	100,1%	76,5%	76,6%
66,00	0,40	0,03	8,79	122,7%	20,36	11,55	196,2	27,2	100,1%	76,5%	76,6%
67,00	0,40	0,03	8,59	127,7%	20,37	11,76	195,4	27,2	100,1%	76,3%	76,4%
68,00	0,40	0,04	8,63	126,6%	20,37	11,72	195,1	27,1	100,0%	76,4%	76,4%
69,00	0,36	0,04	8,33	134,5%	20,39	12,03	192,7	27,2	100,0%	76,2%	76,2%
70,00	0,35	0,04	8,18	138,8%	20,40	12,19	191,3	27,1	100,0%	76,1%	76,1%
71,00	0,35	0,04	7,99	144,6%	20,41	12,40	190,1	27,1	100,0%	75,9%	75,9%
72,00	0,35	0,05	7,87	148,0%	20,42	12,52	188,9	27,1	100,0%	75,8%	75,8%
73,00	0,35	0,05	7,77	151,1%	20,42	12,63	189,0	27,1	99,9%	75,6%	75,6%
74,00	0,30	0,06	7,74	151,9%	20,43	12,65	187,8	27,1	99,9%	75,7%	75,6%
75,00	0,30	0,06	7,79	150,3%	20,42	12,60	187,1	27,1	99,8%	75,8%	75,7%
76,00	0,30	0,06	7,74	151,9%	20,43	12,66	186,7	27,1	99,8%	75,8%	75,6%
77,00	0,30	0,07	7,53	158,7%	20,44	12,88	186,0	27,2	99,7%	75,5%	75,3%
78,00	0,30	0,07	7,54	158,1%	20,44	12,86	185,2	27,1	99,7%	75,6%	75,4%
79,00	0,26	0,07	7,54	158,1%	20,44	12,86	184,9	27,2	99,7%	75,6%	75,4%
80,00	0,26	0,07	7,54	158,0%	20,44	12,86	184,2	27,2	99,7%	75,7%	75,5%
81,00	0,26	0,07	7,59	156,4%	20,43	12,81	183,4	27,2	99,7%	75,8%	75,6%
82,00	0,26	0,07	7,64	154,7%	20,43	12,75	182,7	27,1	99,7%	76,0%	75,8%
83,00	0,26	0,07	7,54	157,9%	20,44	12,86	182,3	27,2	99,7%	75,9%	75,6%
84,00	0,26	0,08	7,45	161,0%	20,44	12,96	182,0	27,2	99,6%	75,7%	75,4%
85,00	0,22	0,08	7,53	158,2%	20,44	12,87	181,9	27,1	99,6%	75,9%	75,6%
86,00	0,22	0,08	7,49	159,3%	20,44	12,90	181,3	27,1	99,6%	75,9%	75,6%
87,00	0,21	0,08	7,50	158,9%	20,44	12,90	181,4	27,1	99,6%	75,9%	75,5%
88,00	0,22	0,08	7,63	154,9%	20,43	12,76	181,1	27,1	99,6%	76,1%	75,8%
89,00	0,21	0,08	7,69	152,7%	20,43	12,70	180,9	27,1	99,6%	76,2%	75,9%
90,00	0,17	0,08	7,64	154,2%	20,43	12,75	180,5	27,1	99,6%	76,2%	75,8%
91,00	0,17	0,08	7,59	155,9%	20,43	12,80	180,0	27,1	99,6%	76,1%	75,8%
92,00	0,17	0,08	7,51	158,7%	20,44	12,89	179,5	27,0	99,6%	76,0%	75,7%

93,00	0,17	0,08	7,42	161,6%	20,44	12,98	179,1	27,1	99,6%	75,9%	75,6%
94,00	0,12	0,09	7,46	160,3%	20,44	12,94	178,9	27,1	99,5%	76,0%	75,7%
95,00	0,12	0,09	7,38	162,8%	20,45	13,02	178,9	27,1	99,5%	75,9%	75,5%
96,00	0,12	0,09	7,36	163,4%	20,45	13,04	179,6	27,1	99,4%	75,8%	75,4%
97,00	0,12	0,09	7,49	158,8%	20,44	12,90	179,7	27,1	99,4%	76,0%	75,6%
98,00	0,11	0,09	7,41	161,9%	20,44	12,99	179,2	27,1	99,4%	75,9%	75,5%
99,00	0,08	0,10	7,33	164,3%	20,45	13,07	179,9	27,1	99,3%	75,7%	75,2%
100,00	0,08	0,11	7,33	164,1%	20,45	13,06	180,6	27,1	99,3%	75,6%	75,1%
101,00	0,08	0,11	7,26	166,5%	20,45	13,14	180,4	27,1	99,3%	75,5%	75,0%
102,00	0,08	0,11	7,21	168,3%	20,46	13,19	180,4	27,1	99,3%	75,5%	74,9%
103,00	0,08	0,11	7,10	172,6%	20,46	13,31	180,8	27,0	99,3%	75,2%	74,7%
104,00	0,03	0,10	7,13	171,5%	20,46	13,28	180,4	27,0	99,3%	75,3%	74,8%
105,00	0,08	0,10	7,08	173,3%	20,47	13,33	180,0	27,1	99,3%	75,3%	74,7%
106,00	0,03	0,11	6,95	178,3%	20,47	13,47	179,5	27,1	99,3%	75,1%	74,5%
107,00	0,03	0,10	6,92	179,8%	20,48	13,51	179,2	27,0	99,3%	75,0%	74,5%
108,00	0,03	0,11	6,95	178,6%	20,47	13,48	178,5	27,1	99,3%	75,2%	74,6%
109,00	0,03	0,09	6,66	191,0%	20,49	13,79	176,4	27,1	99,5%	74,8%	#DIV/0!
110,00	0,03	0,09	6,53	196,8%	20,50	13,93	176,0	27,1	99,4%	74,6%	#DIV/0!
111,00	0,03	0,10	6,54	195,8%	20,50	13,91	175,8	27,0	99,4%	74,6%	#DIV/0!
112,00	0,03	0,10	6,54	195,7%	20,50	13,91	175,8	27,1	99,3%	74,6%	74,1%
113,00	0,00	0,10	6,53	196,2%	20,50	13,92	175,6	27,0	99,3%	74,6%	74,1%
114,00	0,30	0,17	9,01	113,9%	20,33	11,24	135,6	26,5	98,8%	81,4%	80,4%
115,00	0,31	0,17	9,00	114,3%	20,33	11,25	135,1	26,6	98,8%	81,4%	80,5%
116,00	0,31	0,17	8,80	119,0%	20,35	11,46	134,7	26,6	98,8%	81,3%	80,3%
117,00	0,31	0,17	8,83	118,2%	20,35	11,43	134,7	26,5	98,8%	81,3%	80,3%
118,00	0,31	0,15	9,39	105,8%	20,31	10,84	133,5	26,6	99,0%	81,9%	81,0%
119,00	0,26	0,15	9,14	111,3%	20,33	11,11	132,8	26,7	99,0%	81,7%	80,9%
120,00	0,26	0,15	9,04	113,6%	20,33	11,21	132,0	26,7	98,9%	81,7%	80,9%
121,00	0,26	0,15	8,82	119,1%	20,35	11,46	131,5	26,7	99,0%	81,6%	80,8%
122,00	0,26	0,15	8,70	122,0%	20,36	11,58	131,0	26,7	98,9%	81,5%	80,7%
123,00	0,26	0,16	8,62	123,9%	20,36	11,67	131,0	26,6	98,9%	81,5%	80,5%
124,00	0,22	0,17	8,88	117,1%	20,34	11,38	130,9	26,6	98,8%	81,7%	80,7%
125,00	0,22	0,17	8,86	117,5%	20,34	11,40	130,8	26,6	98,8%	81,7%	80,7%
126,00	0,22	0,17	8,59	124,5%	20,36	11,69	130,5	26,5	98,8%	81,5%	80,5%
127,00	0,22	0,17	8,50	126,5%	20,37	11,78	130,4	26,7	98,7%	81,4%	80,4%
128,00	0,22	0,17	8,63	123,1%	20,36	11,64	130,6	26,6	98,7%	81,5%	80,4%
129,00	0,22	0,18	8,78	119,1%	20,35	11,47	130,8	26,6	98,6%	81,6%	80,5%
130,00	0,22	0,19	8,80	118,7%	20,35	11,46	131,1	26,7	98,6%	81,6%	80,4%
131,00	0,18	0,19	8,78	119,0%	20,35	11,47	130,9	26,7	98,6%	81,6%	80,4%
132,00	0,17	0,19	8,78	119,0%	20,35	11,47	130,9	26,7	98,6%	81,6%	80,4%
133,00	0,17	0,19	8,75	119,8%	20,35	11,51	130,9	26,7	98,6%	81,6%	80,4%
134,00	0,17	0,19	8,70	121,0%	20,35	11,56	131,0	26,6	98,6%	81,5%	80,3%
135,00	0,15	0,18	8,73	120,5%	20,35	11,53	130,5	26,7	98,7%	81,6%	80,5%
136,00	0,12	0,18	8,65	122,6%	20,36	11,62	129,9	26,6	98,7%	81,6%	80,5%
137,00	0,12	0,18	8,60	123,7%	20,36	11,67	129,6	26,7	98,7%	81,6%	80,5%
138,00	0,12	0,18	8,58	124,1%	20,36	11,69	129,6	26,7	98,6%	81,5%	80,4%
139,00	0,12	0,18	8,47	127,0%	20,37	11,81	129,5	26,7	98,6%	81,4%	80,3%
140,00	0,12	0,19	8,42	128,2%	20,37	11,86	130,0	26,7	98,5%	81,4%	80,2%
141,00	0,12	0,20	8,34	130,1%	20,38	11,94	130,3	26,7	98,4%	81,3%	80,0%
142,00	0,08	0,20	8,22	133,2%	20,38	12,06	130,8	26,7	98,4%	81,1%	79,8%
143,00	0,12	0,21	8,10	136,3%	20,39	12,18	130,9	26,7	98,3%	81,0%	79,6%
144,00	0,09	0,21	8,04	138,1%	20,40	12,25	131,3	26,7	98,3%	80,9%	79,5%
145,00	0,08	0,21	8,02	138,5%	20,40	12,27	131,4	26,7	98,2%	80,9%	79,5%
146,00	0,08	0,22	7,99	139,4%	20,40	12,30	131,6	26,7	98,2%	80,8%	79,3%
147,00	0,08	0,22	7,97	139,8%	20,40	12,32	131,6	26,7	98,2%	80,8%	79,3%
148,00	0,08	0,22	7,92	141,3%	20,40	12,37	131,7	26,7	98,2%	80,7%	79,3%
149,00	0,08	0,22	7,94	140,7%	20,40	12,35	131,3	26,8	98,1%	80,8%	79,3%
150,00	0,06	0,22	7,84	143,6%	20,41	12,46	131,5	26,8	98,1%	80,7%	79,1%
151,00	0,03	0,23	7,89	142,0%	20,40	12,40	131,2	26,8	98,1%	80,8%	79,2%
152,00	0,03	0,23	7,78	145,2%	20,41	12,51	131,3	26,8	98,0%	80,6%	79,0%
153,00	0,03	0,23	7,64	149,5%	20,42	12,66	131,3	26,8	98,0%	80,5%	78,9%
154,00	0,03	0,23	7,60	150,8%	20,42	12,71	131,7	26,8	97,9%	80,4%	78,7%
155,00	0,03	0,23	7,64	149,5%	20,42	12,66	131,7	26,8	98,0%	80,4%	78,8%
156,00	0,03	0,23	7,51	153,8%	20,43	12,80	131,3	26,8	98,0%	80,3%	78,7%
157,00	0,03	0,23	7,45	155,8%	20,43	12,87	131,6	26,8	97,9%	80,2%	#DIV/0!
158,00	0,03	0,23	7,35	158,9%	20,44	12,97	131,3	26,8	97,9%	80,2%	78,5%
159,00	0,02	0,25	7,03	169,9%	20,46	13,30	132,0	26,8	97,7%	79,7%	77,9%
160,00	0,02	0,26	6,97	171,9%	20,46	13,37	132,4	26,9	97,5%	79,6%	#DIV/0!
161,00	0,02	0,24	6,69	183,4%	20,48	13,67	131,9	26,8	97,7%	79,3%	77,4%
162,00	0,00	0,23	6,54	190,4%	20,49	13,84	131,4	26,9	97,8%	79,1%	77,3%

DATA 2022-07-25 EPA PI 20272 RUN 5 MODEL 8060 OTHER CATALIST
preburn

Temps acquisition minutes	Flue temp °F	Room temp °F	Tunnel dry bulb °F	Catalyst up °F	scale lbs	Right °F	Back °F	bottom °F	Top °F	Left °F
1	77,00	75,98	77,34	77,46	2,48	77,00	77,01	76,76	77,96	77,09
2	94,23	76,05	78,28	101,98	2,77	77,12	77,09	76,78	78,12	77,13
3	135,31	76,06	81,42	144,46	2,67	77,80	77,42	76,83	78,33	77,30
4	223,75	76,06	85,12	328,97	2,57	79,78	78,95	77,36	79,40	78,27
5	277,39	76,10	82,55	615,88	2,45	83,97	82,05	78,32	81,91	80,75
6	362,71	76,13	85,62	759,86	2,27	94,41	87,08	79,81	86,16	85,25
7	410,11	76,18	87,64	820,13	2,07	112,53	94,70	81,91	91,86	92,62
8	429,06	76,21	88,55	826,83	1,87	137,70	103,80	84,55	99,25	102,12
9	434,01	76,23	89,12	799,29	1,77	167,05	113,51	87,56	107,82	115,30
10	416,34	76,26	88,47	753,06	1,67	195,04	123,61	90,62	116,27	130,95
11	420,25	76,27	89,11	759,91	1,52	216,41	133,35	93,85	124,32	147,10
12	415,76	76,38	89,12	722,26	1,47	236,01	143,07	97,10	131,05	163,61
13	429,68	76,41	90,12	769,27	1,35	255,61	152,32	100,41	137,34	179,81
14	439,48	76,46	90,91	776,72	1,21	273,76	161,47	103,52	143,45	195,09
15	436,69	76,43	90,48	766,26	1,07	291,11	170,26	106,41	148,75	209,34
16	463,10	76,58	106,99	685,63	0,97	306,62	180,49	109,20	152,81	221,97
17	390,60	76,57	118,46	436,19	8,28	322,10	196,63	112,15	151,48	236,95
18	344,84	76,56	94,07	521,90	8,18	337,33	201,51	115,18	163,16	253,18
19	432,51	76,61	94,19	903,73	7,97	345,41	204,00	118,28	173,76	260,57
20	412,60	76,59	91,95	690,76	7,87	347,32	207,54	121,14	182,85	263,23
21	372,56	76,58	90,08	604,90	7,87	347,01	213,72	123,67	191,41	264,80
22	355,99	76,61	89,23	587,01	7,77	344,77	220,92	125,84	199,34	264,90
23	347,09	76,63	88,56	576,52	7,67	342,00	229,12	127,73	206,37	264,42
24	336,63	76,66	88,20	562,67	7,67	339,26	236,60	129,63	212,55	263,95
25	345,37	76,62	88,48	611,38	7,58	336,44	242,69	131,39	218,24	263,52
26	333,89	76,64	87,77	562,79	7,47	334,96	246,41	133,18	223,12	263,44
27	340,00	76,67	88,15	576,13	7,48	332,49	248,40	135,06	227,71	262,76
28	326,09	76,63	87,80	542,31	7,37	330,22	249,60	136,83	231,63	262,49
29	304,83	76,64	87,18	502,06	7,27	328,46	249,78	138,58	235,25	262,53
30	294,78	76,65	86,44	486,74	7,27	325,67	249,44	140,36	238,53	262,16
31	295,60	76,67	86,64	496,46	7,27	323,48	248,71	142,17	241,22	261,95
32	297,26	76,70	86,80	503,02	7,17	321,12	247,93	143,93	243,07	261,04
33	297,12	76,64	87,22	496,84	7,13	319,50	247,69	145,66	244,68	260,37
34	282,86	76,66	86,59	467,06	7,07	317,02	247,60	147,64	246,15	260,09
35	271,23	76,64	85,86	448,56	7,07	314,23	247,44	149,72	247,09	259,64
36	262,86	76,69	85,57	429,71	6,97	312,56	246,97	151,97	247,85	258,83
37	253,57	76,62	85,08	413,04	6,97	309,55	245,30	154,25	248,46	257,89
38	244,39	76,62	84,29	398,48	6,97	307,05	243,29	156,65	248,61	257,07
39	236,60	76,65	84,75	384,97	6,97	304,45	240,49	159,11	248,40	256,27
40	229,23	76,63	84,11	363,92	6,88	301,68	237,09	161,74	247,96	254,86
41	222,62	76,70	83,98	349,49	6,88	299,05	233,45	164,38	247,31	253,93
42	216,80	76,71	84,16	337,45	6,88	296,60	229,39	166,97	246,28	252,84
43	211,47	76,65	83,39	327,99	6,77	293,59	225,48	169,63	245,14	251,20
44	206,69	76,67	83,02	321,66	6,88	290,99	221,28	172,16	243,69	250,18
45	202,56	76,69	83,28	311,76	6,77	288,80	217,50	174,79	242,52	248,94
46	199,23	76,66	82,79	310,56	6,77	286,04	213,57	177,30	240,87	247,38
47	196,04	76,67	82,82	308,49	6,77	283,53	210,13	179,90	239,07	246,02
48	193,36	76,65	82,79	303,02	6,77	281,25	206,62	182,37	237,20	244,91
49	189,93	76,67	82,71	297,18	6,67	279,12	203,44	184,77	235,52	243,40
50	187,10	76,64	82,24	290,76	6,67	276,66	200,32	187,15	233,43	241,84
51	184,86	76,65	81,97	289,98	6,67	274,39	197,37	189,50	231,43	240,37
52	206,65	76,68	82,95	365,22	6,57	272,35	194,35	191,92	229,45	239,31
53	293,08	76,63	85,50	581,66	6,47	271,38	191,60	194,41	227,46	238,61
54	371,52	76,71	88,14	710,28	6,37	273,34	189,93	196,90	226,18	239,69
55	406,57	76,72	89,38	752,08	6,27	278,47	190,17	199,65	225,89	242,01
56	418,70	76,72	90,63	726,86	6,07	285,44	192,34	202,72	226,97	245,25
57	438,26	76,82	91,30	763,34	5,97	293,13	195,49	206,17	229,49	248,77
58	465,08	76,83	93,06	838,63	5,77	302,03	199,54	209,96	233,36	253,43
59	484,43	76,85	94,68	872,36	5,67	312,32	203,76	213,90	238,80	259,26
60	501,05	76,93	95,99	909,39	5,47	324,02	208,47	217,94	245,32	266,77
61	512,88	77,02	96,54	926,86	5,37	337,99	213,31	222,01	252,95	275,05
62	512,47	77,05	96,49	905,81	5,17	352,34	218,46	225,91	261,38	283,06
63	508,59	77,13	97,06	894,16	5,07	367,21	223,72	229,87	270,13	291,21
64	505,12	77,15	96,73	890,42	4,97	382,00	228,77	233,82	278,93	299,04
65	501,87	77,18	96,54	884,87	4,77	396,11	233,79	237,57	287,76	305,81
66	498,34	77,30	96,91	871,58	4,67	409,64	238,21	241,24	296,73	312,36
67	493,01	77,36	96,49	858,40	4,57	422,33	242,69	244,88	305,15	318,72
68	493,05	77,44	96,78	850,35	4,43	433,02	246,67	248,52	313,42	324,18
69	492,66	77,41	96,25	858,50	4,27	442,60	250,75	252,17	321,30	329,67
70	492,23	77,64	96,85	853,91	4,17	451,37	254,95	255,84	328,58	335,39
71	493,69	77,64	97,23	856,90	4,07	459,65	259,82	259,73	335,98	341,81
72	494,50	77,63	96,92	864,69	3,97	467,89	264,46	263,59	343,27	348,16
73	492,39	77,74	97,00	865,04	3,77	476,67	268,82	267,37	349,78	354,91
74	491,11	77,76	98,55	866,48	3,67	485,16	273,13	271,08	356,50	362,01
75	494,48	77,76	98,38	882,16	3,57	493,49	276,90	274,69	362,60	369,71
76	499,83	77,73	99,08	895,19	3,47	501,97	280,52	278,27	368,79	378,41
77	503,09	77,82	98,92	910,11	3,27	511,32	284,04	281,86	374,51	386,77
78	510,97	77,87	99,16	930,06	3,17	520,96	287,93	285,46	379,99	394,00
79	516,62	77,91	99,69	943,50	3,07	530,52	291,45	289,17	385,17	400,91
80	522,59	77,98	100,30	957,75	2,97	540,82	295,31	292,96	390,99	407,55
81	528,97	77,95	101,20	966,52	2,87	551,16	299,35	296,87	396,66	413,25
82	533,29	78,11	101,15	974,09	2,67	562,05	303,56	301,00	402,74	419,32
83	531,70	78,08	101,10	962,27	2,57	573,32	307,83	305,09	408,90	424,69
84	531,92	78,18	101,06	961,34	2,37	584,56	311,90	309,20	414,92	430,22
85	529,45	78,21	101,58	955,40	2,37	594,84	316,03	313,30	421,08	435,78
86	531,67	78,25	100,44	969,70	2,17	606,18	319,80	317,60	426,89	441,43
87	529,09	78,37	99,89	954,69	2,07	615,27	323,29	321,86	432,81	446,00
88	522,77	78,40	100,83	936,06	1,97	623,53	325,99	326,11	438,12	449,26
89	514,67	78,33	101,16	908,21	1,87	630,25	329,15	330,21	443,54	451,85
90	504,65	78,41	100,35	886,98	1,87	636,11	331,80	334,14	447,48	454,90

91	491,77	78,43	99,02	857,61	1,77	641,13	333,92	338,15	451,11	457,91
92	476,04	78,44	99,04	829,35	1,67	645,66	335,67	342,18	454,50	461,55
93	459,99	78,45	97,87	801,78	1,67	647,98	337,39	346,26	456,38	465,28
94	448,83	78,45	97,59	779,53	1,57	648,49	337,95	350,37	457,51	470,03
95	441,10	78,45	96,15	770,79	1,57	647,67	337,92	354,51	458,07	475,30
96	435,06	78,50	96,10	763,90	1,47	645,89	337,17	358,57	457,38	481,25
97	429,59	78,51	95,98	759,87	1,47	644,69	336,33	362,61	456,41	487,52
98	425,46	78,58	96,29	748,03	1,47	642,94	335,37	366,68	454,80	494,62
99	421,56	78,56	96,18	741,97	1,37	640,85	333,99	370,77	453,40	503,14
100	415,88	78,61	94,84	731,40	1,37	640,00	332,56	375,03	450,78	512,98
101	409,26	78,58	96,01	719,16	1,27	638,76	331,73	379,49	448,45	524,47
102	399,17	78,63	94,32	698,71	1,27	637,50	329,87	384,16	445,19	535,17
103	389,13	78,61	93,33	680,40	1,27	636,39	328,92	389,10	442,50	544,59
104	380,47	78,56	93,31	666,66	2,18	634,66	327,08	394,24	439,50	550,96
105	328,64	78,58	106,16	464,15	8,57	634,42	330,57	400,35	435,43	555,56
106	346,11	78,60	95,13	644,32	8,47	629,71	327,41	406,97	431,04	555,97
107	349,68	78,49	93,43	658,73	8,47	621,65	323,63	412,68	425,23	551,53
108	346,41	78,41	91,60	651,09	8,37	610,63	319,60	417,25	419,26	543,60
109	343,54	78,54	92,00	648,53	8,47	598,48	316,27	420,55	412,62	535,12
110	341,84	78,51	91,92	650,50	8,37	586,71	313,73	422,73	406,09	525,81
111	341,86	78,48	91,82	654,02	8,35	575,34	311,76	424,04	399,48	516,26
112	341,68	78,43	91,13	655,16	8,28	564,32	310,20	424,58	393,44	507,41
113	341,85	78,41	91,56	659,65	8,28	553,59	308,24	424,58	387,17	498,59
114	341,68	78,46	91,01	644,52	8,18	543,27	306,79	424,13	381,89	490,16
115	362,95	78,41	92,54	784,86	8,08	533,15	306,29	423,36	382,21	481,97
116	411,65	78,39	93,54	925,55	7,98	524,24	309,15	422,49	390,60	473,96
117	435,97	78,43	93,17	955,72	7,87	517,30	314,32	421,40	403,37	466,79
118	427,34	78,38	94,92	824,85	7,77	513,21	320,50	420,15	414,75	460,67
119	417,71	78,38	94,25	795,52	7,67	509,76	325,28	418,74	424,04	455,25
120	410,22	78,38	94,21	792,32	7,58	506,90	328,84	417,22	431,10	450,07
121	408,36	78,45	94,19	791,46	7,54	504,03	331,26	415,53	433,93	445,21
122	403,14	78,46	93,97	777,45	7,48	499,19	331,96	413,81	433,55	441,06
123	397,36	78,45	94,19	767,05	7,38	495,35	332,89	412,10	430,55	436,48
124	393,74	78,57	92,92	759,01	7,37	490,68	333,33	410,32	427,62	432,07
125	393,79	78,52	92,96	772,96	7,27	485,45	334,05	408,57	425,85	427,74
126	397,77	78,54	92,89	792,94	7,17	481,28	335,90	406,94	427,37	423,55
127	405,20	78,54	94,03	810,28	7,07	477,27	338,19	405,23	431,30	419,68
128	416,05	78,52	94,46	843,20	6,97	473,83	340,84	403,61	437,42	416,16
129	432,88	78,62	94,21	886,94	6,88	470,19	344,12	402,02	446,06	412,62
130	451,32	78,61	95,22	975,98	6,78	467,90	349,38	400,54	457,32	410,01
131	459,65	78,69	96,30	992,22	6,57	466,07	355,39	399,08	468,18	407,78
132	466,89	78,68	96,23	992,06	6,47	466,35	362,20	397,70	479,93	406,28
133	469,80	78,72	95,81	973,90	6,37	467,87	369,39	396,33	491,29	405,44
134	470,91	78,69	96,63	953,07	6,18	469,37	376,19	395,03	501,79	405,14
135	468,55	78,83	95,69	932,45	6,08	471,97	382,12	393,80	511,45	405,06
136	463,42	78,82	97,06	915,38	5,97	474,89	388,25	392,61	520,37	405,42
137	459,22	78,77	95,94	906,17	5,87	478,37	393,63	391,43	528,26	406,15
138	455,40	78,85	96,05	899,24	5,77	480,68	397,63	390,21	534,07	406,96
139	450,69	78,86	96,53	887,21	5,67	482,06	400,97	388,97	538,34	407,72
140	446,80	78,91	96,27	882,36	5,57	484,46	404,27	387,73	541,84	408,50
141	449,61	78,95	94,97	904,41	5,57	485,90	406,51	386,49	547,09	409,53
142	454,24	79,03	94,73	918,49	5,48	487,51	409,17	385,35	553,74	410,73
143	456,72	79,07	95,72	938,55	5,30	489,53	411,78	384,23	560,46	412,11
144	460,11	79,23	96,47	962,41	5,17	491,49	415,19	383,19	565,70	413,31
145	463,45	79,15	96,82	971,58	5,07	493,27	418,97	382,23	569,91	415,08
146	464,51	79,09	97,75	975,45	4,97	493,75	422,27	381,27	573,95	416,45
147	467,28	79,21	96,51	992,86	4,87	495,31	424,93	380,34	579,18	418,42
148	469,13	79,18	96,49	1011,02	4,78	496,30	427,86	379,44	584,29	420,63
149	470,31	79,22	95,71	988,47	4,67	497,12	430,20	378,58	588,63	423,31
150	468,33	79,31	95,70	971,85	4,57	498,20	431,52	377,75	592,70	426,16
151	463,18	79,19	95,52	964,08	4,47	498,57	432,89	376,83	596,39	428,46
152	458,96	79,24	96,79	955,38	4,37	500,44	434,58	376,06	599,73	431,08
153	457,51	79,30	94,98	959,03	4,27	502,24	436,00	375,29	602,15	433,80
154	456,93	79,43	96,04	967,22	4,17	503,79	437,64	374,64	604,61	435,97
155	457,43	79,37	96,91	965,72	4,08	504,98	438,14	373,96	607,82	438,71
156	457,97	79,45	95,97	968,92	3,97	507,07	439,80	373,34	611,02	441,40
157	458,66	79,49	95,57	971,93	3,97	508,63	441,12	372,76	613,82	443,58
158	458,52	79,40	97,07	975,98	3,84	510,47	442,32	372,09	616,02	445,92
159	458,80	79,43	95,66	974,34	3,67	512,67	443,42	371,57	619,28	448,31
160	457,95	79,51	96,75	962,83	3,65	515,21	444,68	371,04	621,95	450,98
161	455,94	79,46	95,85	957,17	3,57	517,64	445,50	370,53	623,60	453,56
162	453,05	79,48	96,54	953,37	3,47	520,43	446,15	370,00	625,48	455,72
163	451,30	79,45	96,44	953,49	3,38	523,92	447,66	369,58	627,22	458,21
164	450,33	79,50	94,40	946,10	3,27	526,75	448,17	369,14	629,17	460,96
165	448,27	79,55	94,53	936,30	3,17	529,29	448,03	368,65	629,91	463,28
166	445,21	79,52	95,65	925,62	3,17	531,66	449,29	368,28	629,17	465,67
167	442,63	79,66	96,62	923,03	3,07	536,17	449,28	367,92	628,87	468,16
168	441,53	79,64	96,52	929,96	2,97	539,46	450,30	367,66	628,58	470,87
169	441,04	79,72	96,54	938,66	2,87	541,98	450,39	367,39	628,44	474,06
170	440,01	79,70	95,80	935,43	2,77	545,96	450,70	367,19	627,91	476,99
171	437,41	79,69	96,85	920,17	2,77	549,73	450,15	367,02	626,60	480,02
172	434,41	79,60	96,97	908,16	2,68	553,27	449,67	366,83	623,27	483,13
173	430,14	79,65	95,28	893,37	2,64	557,58	448,75	366,76	618,87	486,58
174	426,33	79,71	95,93	901,55	2,57	561,92	447,17	366,67	614,92	489,61
175	426,54	79,75	95,19	916,00	2,47	566,29	444,96	366,66	614,16	492,72
176	425,97	79,81	96,31	910,42	2,47	571,03	441,96	366,61	612,11	495,60
177	421,99	79,81	95,03	886,86	2,38	574,55	438,06	366,64	607,75	498,71
178	417,95	79,78	94,42	875,56	2,37	577,60	433,87	366,65	603,57	501,66
179	414,57	79,83	94,58	864,19	2,32	581,26	429,78	366,75	599,04	504,46
180	409,98	79,86	93,98	853,16	2,27	584,88	425,86	366,90	593,62	506,46
181	406,42	79,88	94,74	833,71	2,27	590,38	422,00	367,15	587,11	509,36
182	403,20	79,81	93,21	824,29	2,17	595,99	417,91	367,41	578,45	511,96
183	400,73	79,96	92,88	817,42	2,17	600,28	414,10	367,76	569,56	514,36

184	398,06	79,87	94,48	810,53	2,17	603,47	410,55	368,12	560,86	516,60
185	395,96	79,87	93,70	805,56	2,17	606,23	406,69	368,54	552,74	519,61
186	393,35	79,91	93,39	798,78	2,07	607,00	402,81	369,01	543,85	521,65
187	390,19	79,87	92,69	793,49	2,07	608,76	398,76	369,50	535,88	524,17
188	387,81	79,89	92,29	786,97	2,07	609,22	395,43	370,08	528,48	526,49
189	385,02	79,90	92,67	780,60	2,07	610,62	392,60	370,68	521,35	528,32
190	383,23	79,79	93,14	772,92	1,97	611,52	388,26	371,38	514,78	530,62
191	381,17	79,75	92,55	769,03	1,97	612,78	386,08	372,10	508,66	532,42
192	379,48	79,79	92,54	764,27	1,97	613,74	383,03	372,91	503,24	534,80
193	377,14	79,78	91,91	762,23	1,97	614,73	380,65	373,82	497,82	537,17
194	376,06	79,78	92,48	761,75	1,95	615,45	377,53	374,70	492,44	539,21
195	376,38	79,74	91,85	763,46	1,95	616,63	374,54	375,53	487,30	542,38
196	375,73	79,82	92,13	763,84	1,87	618,31	372,17	376,47	482,43	546,01
197	375,05	79,80	91,11	761,73	1,87	619,05	369,56	377,42	477,72	550,65
198	374,21	79,79	91,57	758,83	1,87	619,54	366,56	378,37	472,65	555,49
199	372,73	79,75	91,21	756,92	1,77	620,54	364,93	379,43	468,34	560,92
200	372,35	79,73	91,90	754,58	1,85	621,09	361,90	380,36	463,70	566,40
201	370,80	79,67	92,23	752,15	1,77	621,10	359,71	381,32	459,38	571,40
202	370,76	79,79	92,68	751,41	1,77	621,65	356,77	382,29	455,30	576,64
203	370,52	79,80	92,30	749,63	1,77	621,20	354,56	383,25	451,28	581,26
204	369,62	79,83	91,97	746,86	1,77	621,18	351,94	384,20	447,62	584,89
205	369,68	79,71	91,97	744,72	1,77	620,65	350,40	385,16	444,08	588,96
206	367,82	79,76	91,39	742,14	1,67	620,43	347,84	386,12	440,45	592,45
207	367,59	79,78	92,42	741,66	1,67	620,38	345,07	387,08	436,83	595,99
208	367,73	79,73	91,94	742,95	1,57	621,95	342,50	387,97	433,30	599,86
209	366,76	79,80	92,31	744,46	1,67	619,93	339,69	388,88	429,78	601,98
210	367,53	79,67	91,59	744,35	1,57	618,20	336,83	389,63	426,70	604,36
211	367,37	79,79	90,91	744,37	1,67	618,29	333,86	390,41	423,34	605,32
212	415,79	79,85	99,28	659,78	1,57	616,57	333,87	391,13	418,81	606,91
213	356,31	79,81	91,82	645,32	1,57	616,37	331,86	392,06	414,72	607,64

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 6 Tech: MM Reviewer: DP

- kindling 2.96 Bs start fire
- ~~At~~ by pass open and Door open
- At 2.7LBs close Door
- At 1.2LBs insert preload
- close Door immediatly
- At 1.2 LBs insert second preload
- close Door immediatly
- At 4.7LBs close air inlet and by pass
- At 1.7LBs Rack coal Bed
- After 2 min insert load and open air inlet
- At 5 min close air inlet

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 6 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:	Equipment #	Time	12%	22%
	EM-334	7:00	ok	ok

	Pre-Test	Post-Test
Facility Conditions:		
Air Velocity from less than 2 feet	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	2022-07-25	
Date Dilution Tunnel Cleaned	2022-07-25	
Induced Draft Check (max 0.005 H2O)	ok	
Traverse before ignition	ok	
Temperature System:		
Ambient (65°-90°F)		ok °F
Proportional Checks:		
Thermocouple check	ok	
Pitot Clean	ok	
Pitot verification	ok	
Pictures for report	Side	ok
	Coal bed	ok
	Load	ok
	Load in stove	ok
	Fuel adjustment	ok
Load Length approximately 5/6 of firebox Lenght		ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 6 6mm Tech: MM Reviewer: DP

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test ASTM (-15) CSA B415 (-5)
Vacuum (inches Hg.)	-10	-10	-10	-10	-10	-10
Final 1minute DGM (Liter)	660 303 40	661 207 60	660 303 48	661 207 67	408 628 18	409 523 85
Initial 1minute DGM (Liter)	660 303 36	661 207 60	660 303 48	661 207 65	408 628 18	409 523 80
Change (Liter)	0,04	0	0	0,02	0	0,05
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	0.20	0.20	0.20	0.20	0.20	0.20
Check OK	ok	ok	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 6 Tech: MM Reviewer: DP

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	.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

Scales checks

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	10,00 ~~lbs~~ kg mm, Class F	10,00 ~~lbs~~ kg mm
Wood	~~EM-335~~ EM-090 mm	440 lbs, Class F	440 lbs
Analytical	EM-335	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%

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: PT 28272 Run: 6 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 1008 (KPa.) Static pressure (P_q) 0.18 (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	72.91
B - Centroid	3.00	3.50	4	0.074	~~74~~ 73.41
A-1	0.40	0.50	0.50	0.061	72.91
A-2	1.50	1.75	2	0.073	73.09
A-3	4.50	5.25	6	0.063	73.09
A-4	5.60	6.5	7.5	0.061	73.18
B-1	0.40	0.50	0.50	0.060	73.41
B-2	1.50	1.75	2	0.064	73.56
B-3	4.50	5.25	6	0.078	73.56
B-4	5.60	6.5	7.5	0.062	73.71
				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.

CONTINUOUS ANALYZERS

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: PT 20272 Run: 6 Tech: M M Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3 009	3 000	1 023	1 000
Tolerance CO	0	+/- 0.02	0 009	+/- 0.15	0 023	+/- 0.05
CO_2	0	0	17 96	18 00	9 82	10,00
Tolerance CO2	0	+/- 0.02	0,04	+/- 0.5	0 18	+/- 0.5
O_2 informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	3001	1009	0	0.02	0,008	0.15	0014	0.05	✓	
CO_2	0	1792	986	0	0.02	0,04	0.5	0,04	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: pt 20272 Run: 6 Tech: MR Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	661201,60	409525,38	393675,86
Initial (Liter)	660303,76	408627,65	392986,72

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100,8	100,9
Dry Bulb (F):	74,9	81,6
Humidity (%):	55,4	40,3

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: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 6 Tech: MM Reviewer: SD

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 14 in.	1.70 lbs.	206	203	204	203	206
1 1/2 x 3 1/2 x 14 in.	1.26 lbs.	211	210	210	211	212
1 1/2 x 3 1/2 x 14 in.	1.68 lbs.	211	211	211	212	212
1 1/2 x 3 1/2 x 7 in.	0.96 lbs.	199	200	200	201	202
1 1/2 x 3 1/2 x 7 in.	0.96 lbs.	191	191	192	193	192
1 1/2 x 3 1/2 x 7 in.	0.92 lbs.	196	196	194	193	193
1 1/2 x 3 1/2 x 7 in.	0.94 lbs.	200	204	206	208	209
x x in.	lbs.					
1 1/2 x 3 1/2 x 14 in.	1.44 lbs.	203	204	208	203	206
1 1/2 x 3 1/2 x 14 in.	1.74 lbs.	204	208	206	208	207
1 1/2 x 3 1/2 x 14 in.	1.68 lbs.	201	201	202	203	204
1 1/2 x 3 1/2 x 7 in.	0.96 lbs.	191	192	191	191	192
1 1/2 x 3 1/2 x 7 in.	0.92 lbs.	200	201	203	204	206
1 1/2 x 3 1/2 x 7 in.	0.92 lbs.	201	200	201	202	203
1 1/2 x 3 1/2 x 7 in.	0.90 lbs.	206	205	204	203	203
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 736 + 720 lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: pt 20272 Run: 6 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 15 in.	1320 lbs.	204	206	206	208	209
1 1/2 x 3 1/2 x 15 in.	1340 lbs.	199	200	201	200	200
1 1/2 x 3 1/2 x 15 in.	1600 lbs.	203	202	201	204	206
1 1/2 x 3 1/2 x 15 in.	1600 lbs.	199	196	198	197	198
x x in.	lbs.					
1 1/2 x 3/4 x 4 in.	0082 lbs.			206		
1 1/2 x 3/4 x 4 in.	~~0080~~ 0082 lbs.			203		
1 1/2 x 3/4 x 4 in.	0104 lbs.			204		
1 1/2 x 3/4 x 4 in.	0100 lbs.			206		
1 1/2 x 3/4 x 4 in.	0104 lbs.			208		
1 1/2 x 3/4 x 4 in.	0106 lbs.			204		
1 1/2 x 3/4 x 4 in.	0060 lbs.			205		
1 1/2 x 3/4 x 4 in.	0088 lbs.			205		
1 1/2 x 3/4 x 4 in.	0088 lbs.			204		
1 1/2 x 3/4 x 4 in.	0108 lbs.			203		
1 1/2 x 3/4 x 4 in.	0080 lbs.			204		
1 1/2 x 3/4 x 4 in.	0080 lbs.			206		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 6 94 lbs Min 20%: 138 Max 25%: 173

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-07-25 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 6 Tech: MM 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	15	616	617	3	17	618	619	23	622
2022-07-25	17:00	108,7800		0,2613	34,3301	108,9419		0,2610	33,4490	0,1314
2022-07-26	9:00	108,7801		0,2613	34,3300	108,9418		0,2611	33,4489	0,1315

		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	15	616	617	3	17	618	619	23	622
2022-07-26	16:00	108,7806		0,2616 mm ~~0,2615~~	34,3318	108,9423		0,2610	334514	0,1318
2022-07-28	8:00	108,7802		0,2616	34,3305	108,9419		0,2610	33,4495	0,1316
2022-08-01	8:00	108,7802		0,2615	34,3305	108,9419		0,2611	33,4494	0,1316

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2022-07-26 Manufacturer: Hearthstone Model: 8060

Project #: PI 20272 Run: 6 Tech: MA Reviewer: DP

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	32	620	621	39
2022-07-25	17:00	110,1781		0,2624	35,3434
2022-07-26	9:00	110,1780		0,2625	35,3435

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	32	620	621	39
2022-07-26	16:00	110,1782		0,2623	35,3454
2022-07-28	8:00	110,1781		0,2624	35,3446
2022-08-01	8:00	110,1781		0,2625	35,3447

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	26-07-2022	
Technicien	M.M	
Project #	PI 20272	

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8060	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1	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):	1,003	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,014	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM #3):	0,997	
Equipment number (DGM #3):	EM 179	Dimensionless

Tunnel

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

Project nu.	PI 20272
Date	26-07-2022
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	100,9
Barometer (in.Hg):	29,766229	29,79575878
Dry Bulb (F):	74,9	81,6
Humidity (%):	55,4	40,3
Air velocity (ft/min)	0	0

DGM #1	Final:	23350,115	cuft	Final:	661201,600	Liter
	Initial:	23318,408	cuft	Initial:	660303,760	Liter
DGM #2	Final:	14462,253	cuft	Final:	409525,380	Liter
	Initial:	14430,550	cuft	Initial:	408627,650	Liter
DGM room	Final:	13902,532	cuft	Final:	393675,860	Liter
	Initial:	13878,195	cuft	Initial:	392986,720	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 243

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

Project nu.	PI 20272
Date	26-07-2022
Technicien	M.M

Preload data sheet

Test Load Weight: Lower	Ideal	Upper
6,30	7,00	7,70

Load Volume: 0,4253 cu. ft

Number of Spaces:

Spacer weight (lbs):

Loading Density: 14,580 lbs./ft3

Load Density (wet): 34,278 lbs./ft3

Dry Wood Density: 28,472762

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	14	1,7	20,6	20,3	20,4	20,3	20,6	34,748	73,50
1,5	3,5	14	1,26	21,1	21	21	21,1	21,2	26,5608	73,50
1,5	3,5	14	1,68	21,1	21,1	21,1	21,2	21,2	35,5152	73,50
1,5	3,5	7	0,66	19,9	20	20	20,1	20,2	13,2264	36,75
1,5	3,5	7	0,66	19,1	19,1	19,2	19,3	19,2	12,6588	36,75
1,5	3,5	7	0,62	19,6	19,6	19,4	19,3	19,3	12,0528	36,75
1,5	3,5	7	0,64	20	20,4	20,6	20,8	20,9	13,1456	36,75
										0,00
1,5	3,5	14	1,44	20,3	20,4	20,8	20,3	20,6	29,4912	73,50
1,5	3,5	14	1,74	20,4	20,8	20,6	20,8	20,7	35,9484	73,50
1,5	3,5	14	1,68	20,1	20,1	20,2	20,3	20,4	33,9696	73,50
1,5	3,5	7	0,66	19,1	19,2	19,1	19,1	19,2	12,6324	36,75
1,5	3,5	7	0,62	20	20,1	20,3	20,4	20,6	12,5736	36,75
1,5	3,5	7	0,62	20,1	20	20,1	20,2	20,3	12,4868	36,75
1,5	3,5	7	0,6	20,6	20,5	20,4	20,3	20,3	12,252	36,75
										0,00
										0,00
										0,00

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
6,3	7,0	7,7

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

Load Volume: 0,18 cu. ft

Loading Density: 6,9 lbs./ft3

Number of Spaces: 12

Spacer weight: lbs

Load Density (wet): 32,1 lbs./ft3

Dry Wood Density: 26,7 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	15	1,32	20,40	20,60	20,60	20,80	20,90	27,2712	78,75	20,7
1,5	3,5	15	1,34	19,90	20,00	20,10	20,00	20,00	26,8	78,75	20,0
1,5	3,5	15	1,60	20,30	20,20	20,10	20,40	20,60	32,512	78,75	20,3
1,5	3,5	15	1,60	19,90	19,60	19,80	19,70	19,80	31,616	78,75	19,8
										0,00	
										0,00	
										0,00	
										0,00	

1,5	0,75	4	0,08			20,60			1,6892	4,50	20,6
1,5	0,75	4	0,08			20,30			1,6646	4,50	20,3
1,5	0,75	4	0,10			20,40			2,1216	4,50	20,4
1,5	0,75	4	0,10			20,60			2,06	4,50	20,6
1,5	0,75	4	0,10			20,80			2,1632	4,50	20,8
1,5	0,75	4	0,11			20,40			2,1624	4,50	20,4
1,5	0,75	4	0,06			20,50			1,23	4,50	20,5
1,5	0,75	4	0,09			20,50			1,804	4,50	20,5
1,5	0,75	4	0,09			20,40			1,7952	4,50	20,4
1,5	0,75	4	0,11			20,30			2,1924	4,50	20,3
1,5	0,75	4	0,08			20,40			1,632	4,50	20,4
1,5	0,75	4	0,08			20,60			1,648	4,50	20,6
										0,00	
										0,00	
										0,00	
										0,00

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,18 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=
0,948

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,075	72,91	0,2739
B center	0,074	73,41	0,2720
A1	0,061	72,91	0,2470
A2	0,073	73,09	0,2702
A3	0,063	73,09	0,2510
A4	0,061	73,18	0,2470
B1	0,060	73,410	0,2449
B2	0,064	73,560	0,2530
B3	0,078	73,560	0,2793
B4	0,062	73,710	0,2490
AVERAGE	0,0671	73,2830	0,2587

Project nu.	PI 20272
Date	26-07-2022
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	15	616	617	3	17	618	619	23	32	620	621	39	622		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	108,7800		0,2613	34,3301	108,9419		0,2610	33,4490	110,1781		0,2624	35,3434	0,1314	2022-07-25	17:00
Before (6)	108,7801		0,2613	34,3300	108,9418		0,2611	33,4489	110,1780		0,2625	35,3435	0,1315	2022-07-26	09:00
After (1)	108,7806		0,2616	34,3318	108,9423		0,2610	33,4514	110,1782		0,2623	35,3454	0,1318	2022-07-26	16:00
After (2)	108,7802		0,2616	34,3305	108,9419		0,2610	33,4495	110,1781		0,2624	35,3446	0,1316	2022-07-28	08:00
After (3)	108,7802		0,2615	34,3305	108,9419		0,2611	33,4494	110,1781		0,2625	35,3447	0,1316	2022-08-01	08:00
After (4)															08:00
After (5)															
After (6)	108,7802		0,2615	34,3305	108,9419		0,2611	33,4494	110,1781		0,2625	35,3447	0,1316	2022-08-01	
Difference	0,0001	0,0000	0,0002	0,0005	0,0001	0,0000	0,0000	0,0005	0,0001	0,0000	0,0000	0,0012	0,0001		
Total (mg)		0,8				1,4				1,3			0,1		
Total ajusté (mg)		**0,70**				**1,30**				**1,20**					

Project nu.	PI 20272
Date	26-07-2022
Technicien	M.M

SFBA EPA EMISSION RESULTS

Test Duration: **162** min

PRESSURE FACTOR:	DGM 1	0,96842	
	DGM 2	0,97256	
	DGM 3	0,99535	
TEMPERATURE FACTORS	DGM 1	0,97752	
	DGM 2	0,97010	
	DGM 3	0,97890	
VOLUMES SAMPLED	DGM 1	30,091	SCft
	DGM 2	30,332	Scft
	DGM 3	23,630	SCft

TOTAL TUNNEL VOLUME : 56348

SAMPLE RATIOS

Sample Train 1:	1872,592
Sample Train 2:	1857,694

Paticulate concentration

Sample Train 1	**0,000047**	g/dscf
Sample Train 2	**0,000043**	g/dscf
Room	**0,000004**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**2,38**	g
Sample Train 2	**2,18**	g

EMISSION RATES

Sample Train 1	**0,88**	g/hr
Sample Train 2	**0,81**	g/hr

1st hour emission rate **1,50** g/hr

	Train 1	Train 2
Cs	4,653E-05	4,2859E-05

RESULTS

Average emission rate: 0,84 g/hr

Burn Rate : 0,970 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,78099379	in Hg
Start:	29,7662288	in Hg
End:	29,79575878	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	23350,115	Cuft
	Initial:	23318,408	Cuft
DGM 2	Final:	14462,253	Cuft
	Initial:	14430,550	Cuft
DGM #3	Final:	13902,532	Cuft
	Initial:	13878,195	Cuft

TEMPERATURES

DGM 1	540,144	°R
DGM 2	544,274	°R

CALIBRATION FACTORS

DGM 1	1,0025
DGM 2	1,0141
DGM #3	0,9965

TUNNEL FLOW RATE: 347,828 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	1,40	mg
Total Sample Train 2:	1,30	mg
Total Sample Train 1 1st hour:	0,80	mg

DEVIATION: 4,53%

*		*	*	*	*	*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
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
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
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
0,00	243,00	6,9	0,1	2,8	0,0	314,2	78,4	96,6	374,2	341,8	586,5	589,1	429,5	427,2	0,18	77,96	78,06	83,76	0,19	79,29	79,61	84,60	0,08	0,04
1,0	244,0	6,8	0,1	2,5	0,0	286,2	78,3	89,4	369,2	336,2	579,8	582,8	429,9	534,9	0,18	77,96	78,09	83,45	0,19	79,28	79,75	84,30	0,08	0,05
2,0	245,0	6,8	0,0	4,0	0,0	288,9	78,1	89,0	365,8	331,0	569,8	573,0	430,1	568,7	0,18	77,96	78,13	83,19	0,19	79,29	79,87	84,07	0,08	0,06
3,0	246,0	6,8	0,0	4,1	0,0	291,3	78,0	88,4	363,0	327,4	559,2	562,3	430,2	576,2	0,18	77,97	78,12	83,01	0,19	79,35	79,98	83,94	0,08	0,06
4,0	247,0	6,7	0,0	3,8	0,0	292,9	78,2	88,8	359,6	324,0	548,0	550,8	429,8	578,9	0,18	77,97	78,13	82,89	0,19	79,43	80,03	83,82	0,08	0,06
5,0	248,0	6,7	0,0	3,5	0,0	293,2	78,1	88,9	356,8	323,9	536,8	539,4	429,4	577,1	0,19	78,04	78,14	82,76	0,19	79,53	80,13	83,72	0,08	0,06
6,0	249,0	6,7	0,0	4,0	0,0	269,1	78,2	87,8	353,7	324,9	525,8	528,6	428,6	561,8	0,18	78,23	78,17	82,67	0,19	79,79	80,26	83,64	0,08	0,05
7,0	250,0	6,6	0,0	3,6	0,0	257,2	78,4	87,6	350,2	327,3	515,9	518,1	427,6	565,4	0,18	78,44	78,22	82,58	0,19	80,05	80,41	83,55	0,08	0,05
8,0	251,0	6,6	0,1	4,0	0,0	255,4	78,6	87,9	349,4	327,1	505,9	507,5	426,3	567,5	0,19	78,62	78,26	82,51	0,19	80,30	80,55	83,51	0,08	0,05
9,0	252,0	6,5	0,0	8,4	0,0	259,2	78,3	87,5	354,2	325,4	497,8	499,1	425,1	603,0	0,19	78,70	78,32	82,50	0,19	80,48	80,70	83,50	0,08	0,05
10,0	253,0	6,5	0,0	6,7	0,0	260,4	78,4	87,7	356,7	322,4	488,9	490,3	423,5	612,2	0,18	78,81	78,34	82,49	0,19	80,64	80,87	83,47	0,08	0,05
11,0	254,0	6,4	0,1	3,5	0,0	258,1	78,4	87,3	354,5	318,9	479,3	482,6	421,6	599,5	0,19	78,85	78,35	82,44	0,19	80,75	80,99	83,41	0,08	0,05
12,0	255,0	6,4	0,1	3,3	0,0	253,6	78,1	86,4	351,6	314,4	473,9	475,5	419,8	583,4	0,19	78,81	78,38	82,28	0,19	80,84	81,07	83,28	0,07	0,05
13,0	256,0	6,4	0,1	3,9	0,0	250,7	78,3	86,6	348,6	310,5	467,9	469,7	417,9	583,1	0,18	78,82	78,39	82,18	0,19	80,97	81,17	83,17	0,08	0,05
14,0	257,0	6,3	0,1	3,2	0,0	250,0	78,3	86,7	344,8	306,7	461,4	465,0	416,0	591,6	0,19	78,84	78,39	82,08	0,19	81,11	81,24	83,08	0,08	0,05
15,0	258,0	6,4	0,1	2,9	0,0	248,8	78,4	86,5	341,4	304,8	455,1	460,3	414,1	567,7	0,19	78,95	78,42	82,05	0,19	81,29	81,34	83,02	0,08	0,05
16,0	259,0	6,3	0,0	3,8	0,0	244,1	78,5	86,3	337,8	304,0	445,1	455,0	412,0	547,6	0,19	79,10	78,46	85,37	0,19	81,47	81,45	83,61	0,08	0,05
17,0	260,0	6,3	0,0	4,1	0,0	242,7	78,3	86,5	335,2	303,8	440,8	449,2	410,0	546,2	0,19	79,23	78,50	86,86	0,19	81,63	81,58	86,13	0,08	0,05
18,0	261,0	6,2	0,0	4,5	0,0	240,3	78,5	86,2	333,0	305,2	436,0	443,2	408,0	543,1	0,18	79,26	78,54	86,59	0,19	81,74	81,66	87,50	0,08	0,05
19,0	262,0	6,2	0,0	4,6	0,0	239,4	78,5	86,6	330,7	307,6	429,7	437,1	405,9	541,5	0,19	79,34	78,57	86,22	0,19	81,88	81,77	87,47	0,08	0,05
20,0	263,0	6,1	0,0	4,9	0,0	239,2	78,5	87,7	329,9	309,8	425,2	431,5	403,9	534,6	0,19	79,33	78,58	86,00	0,19	81,95	81,89	87,37	0,07	0,05
21,0	264,0	6,1	0,0	7,1	0,0	244,8	78,5	88,9	331,4	312,7	420,5	425,8	401,8	569,4	0,19	79,33	78,58	85,90	0,19	82,03	82,00	87,33	0,08	0,05
22,0	265,0	6,0	0,2	10,6	0,0	262,0	78,6	89,9	336,9	316,0	416,2	421,2	399,8	646,7	0,19	79,46	78,62	85,83	0,19	82,21	82,10	87,34	0,07	0,06
23,0	266,0	6,0	0,2	11,4	0,0	278,1	78,6	90,7	343,2	319,5	413,6	417,2	397,8	689,0	0,18	79,59	78,68	85,78	0,19	82,38	82,24	87,32	0,08	0,06
24,0	267,0	5,9	0,1	10,9	0,0	283,9	78,6	91,5	348,9	323,5	411,5	414,0	395,7	668,8	0,19	79,79	78,72	85,75	0,19	82,56	82,35	87,30	0,08	0,06
25,0	268,0	5,8	0,1	10,0	0,0	283,3	78,7	91,5	353,8	327,2	409,7	411,5	393,7	650,4	0,19	79,95	78,79	85,73	0,19	82,77	82,49	87,29	0,07	0,05
26,0	269,0	5,7	0,1	9,3	0,0	281,0	78,8	92,0	357,7	330,7	408,4	409,8	391,7	631,7	0,19	80,13	78,86	85,68	0,19	82,95	82,62	87,27	0,08	0,05
27,0	270,0	5,7	0,0	9,2	0,0	278,3	78,9	92,1	361,4	334,0	407,4	408,5	389,6	629,8	0,19	80,32	78,91	85,61	0,19	83,14	82,75	87,22	0,07	0,05
28,0	271,0	5,6	0,1	9,2	0,0	277,9	78,9	92,3	364,3	336,9	406,4	407,8	387,6	633,2	0,18	80,50	79,00	85,61	0,19	83,32	82,90	87,17	0,08	0,05
29,0	272,0	5,5	0,1	8,8	0,0	276,1	79,0	92,5	367,3	339,4	405,8	406,9	385,5	625,5	0,19	80,68	79,07	85,58	0,19	83,51	83,02	87,13	0,07	0,05
30,0	273,0	5,5	0,0	8,8	0,0	274,8	79,1	92,6	369,7	341,1	405,9	406,6	383,4	620,4	0,18	80,85	79,16	85,56	0,19	83,69	83,16	87,08	0,07	0,05
31,0	274,0	5,4	0,0	8,6	0,0	274,5	79,1	92,2	371,7	342,7	406,0	406,2	381,4	619,5	0,19	80,96	79,26	85,51	0,19	83,84	83,27	87,03	0,08	0,05
32,0	275,0	5,4	0,0	8,8	0,0	272,8	79,2	92,1	374,1	343,4	406,1	406,3	379,3	619,1	0,18	81,17	79,32	85,49	0,19	83,98	83,39	86,95	0,08	0,05
33,0	276,0	5,3	0,0	8,8	0,0	271,9	79,3	91,5	376,3	342,7	407,3	405,8	377,2	617,3	0,19	81,33	79,40	85,44	0,19	84,12	83,50	86,89	0,08	0,05
34,0	277,0	5,2	0,0	9,0	0,0	272,1	79,1	89,6	378,1	343,7	405,3	405,3	374,9	618,2	0,18	81,33	79,47	85,20	0,19	84,17	83,59	86,64	0,08	0,05
35,0	278,0	5,2	0,0	9,4	0,0	277,5	79,2	89,7	380,9	343,3	408,2	405,0	372,8	672,9	0,19	81,29	79,52	84,95	0,19	84,25	83,69	86,36	0,08	0,06
36,0	279,0	5,1	0,1	10,4	0,0	285,6	79,1	88,1	384,7	344,3	409,7	404,0	370,7	674,2	0,19	81,09	79,54	84,70	0,19	84,19	83,72	86,09	0,08	0,06
37,0	280,0	5,0	0,1	11,3	0,0	291,9	79,0	88,9	390,4	345,2	411,4	403,7	368,6	707,4	0,18	80,80	79,53	84,56	0,19	84,08	83,72	85,82	0,08	0,06
38,0	281,0	4,9	0,1	11,3	0,0	296,3	79,0	89,5	395,9	346,7	412,2	403,9	366,5	703,1	0,19	80,68	79,51	84,47	0,19	84,00	83,73	85,71	0,08	0,06
39,0	282,0	4,9	0,1	11,7	0,0	307,2	78,9	88,3	402,5	345,2	414,6	405,3	364,3	768,1	0,19	80,61	79,50	84,34	0,19	83,98	83,78	85,55	0,07	0,06
40,0	283,0	4,7	0,6	13,5	0,0	320,3	79,0	88,6	409,8	349,1	416,4	405,7	362,4	797,4	0,18	80,53	79,48	84,16	0,19	83,97	83,78	85,39	0,07	0,06
41,0	284,0	4,7	0,6	13,8	0,0	329,3	79,0	89,1	417,0	351,6	419,1	408,0	360,5	807,3	0,19	80,55	79,48	84,09	0,19	83,95	83,85	85,32	0,08	0,06
42,0	285,0	4,5	0,2	13,7	0,0	336,2	78,9	89,9	423,7	353,4	422,4	411,7	358,7	811,3	0,18	80,43	79,49	84,08	0,19	83,92	83,87	85,28	0,08	0,06
43,0	286,0	4,4	0,2	13,6	0,0	341,4	78,7	89,9	428,6	356,0	424,0	417,1	356,7	822,9	0,19	80,40	79,47	83,99	0,19	83,92	83,90	85,16	0,08	0,07
44,0	287,0	4,3	0,2	13,6	0,0	346,1	78,9	90,4	434,6	357,4	433,0	425,1	354,8	817,8	0,19	80,48	79,51	83,94	0,19	83,94	84,02	85,09	0,08	0,07
45,0	288,0	4,2	0,3	13,5	0,0	349,2	79,0	89,8	439,3	359,0	439,3	433,2	353,0	811,4	0,19	80,35	79,49	83,84	0,19	83,96	84,03	84,98	0,08	0,07
46,0	289,0	4,1	0,4	13,5	0,0	350,1	79,0	90,1	444,1	361,1	444,6	441,8	351,2	809,3	0,19	80,30	79,50	83,80	0,19	83,92	84,04	84,92	0,08	0,07
47,0	290,0	4,0	0,4	13,5	0,0	350,0	78,9	89,8	449,8	362,7	450,7	450,2	349,5	799,4	0,18	80,25	79,48	83,71	0,19	83,91	84,04	84,79	0,08	0,07
48,0	291,0	3,9	0,3	13,6	0,0	349,2	78,8	88,6	455,6	362,5	456,2	459,1	347,6	793,8	0,19	80,13	79,47	83,55	0,19	83,86	84,00	84,67	0,08	0,07
49,0	292,0	3,8	0,4	13,5	0,0	351,0	79,1	89,5	460,5	366,8	459,8	467,0	346,1	792,4	0,19	80,24	79,47	83,45	0,19	83,93	84,05	84,56	0,08	0,07
50,0	293,0	3,7	0,4	13,5	0,0	351,0	78,9	89,8	465,8	367,2	463,1	473,7	344,4	806,2	0,18	80,18	79,47	83,43	0,19	83,92	84,07	84,51	0,08	0,07
51,0	294,0	3,6	0,3	13,6	0,0	350,7	79,0	88,5	471,0	369,0	466,4	477,4	342,7	814,9	0,19	80,15	79,47	83,31	0,19	83,90	84,05	84,36	0,07	0,07
52,0	295,0	3,6	0,3	13,6	0,0	351,4	79,1	88,7	476,8	371,6	467,9	478,2	341,1	828,2	0,18	80,24	79,49	83,16	0,19	83,96	84,12	84,26	0,08	0,07
53,0	296,0	3,4	0,3	13,6	0,0	352,6	79,3	90,2	481,5	374,4	470,3	480,1	339,5	829,4	0,19	80,42	79,53	83,20	0,19	84,03	84,22	84,31	0,08	0,07
54,0	297,0	3,3	0,3	13,6	0,0	353,1	79,2	90,3	485,5	376,9	472,6	480,9	338,0	826,7	0,19	80,41	79,55	83,22	0,19	84,03	84,29	84,29	0,08	0,07
55,0	298,0	3,2	0,3	13,6	0,0	353,6	79,1	89,3	489,2	378,4	475,9	482,6	336,6	818,8	0,18	80,26	79,55	83,16	0,19	84,00	84,31	84,18	0,08	0,07
56,0	299,0	3,1	0,3	13,5	0,0	352,6	79,0	89,9	492,7	381,3	479,4	483,9	335,2	817,1	0,18	80,23	79,55	83,14	0,19	84,04	84,35	84,17	0,07	0,07
57,0	300,0	3,1	0,3	13,5	0,0	351,4	79,2	90,0	496,5	382,9	481,8	485,4	333,8	825,7	0,18	80,28	79,57	83,18	0,19	84,03	84,38	84,17	0,08	0,07
58,0	301,0	2,9	0,3	13,7	0,0	351,8	79,2	90,2	500,3	384,7	485,1	487,5	332,5	834,7	0,19	80,28	79,59	82,47	0,19	84,03	84,43	84,15	0,08	0,06
59,0	302,0	2,9	0,2	13,9	0,0	353,9	79,4	91,9	504,0	387,2	488,5	489,4	331,2	869,5	0,19	80,42	79,59	82,22	0,19	84,13	84,52	84,26	0,08	0,06
60,0	303,0	2,8	0,9	13,9	0,0	354,7	79,4	89,5	508,0	387,1	492,0	492,6	329,8	863,1	0,19	80,47	79,63	82,14	0,19	84,09	84,58	84,19	0,08	0,07
61,0	304,0	2,7	0,5	13,7	0,0	353,3	79,3	89,6	511,8	389,0	494,6	494,7	328,4	845,9	0,19	80,44	79,64	84,42	0,19	84,10	84,63	84,10	0,08	0,06
62,0	305,0	2,7	0,3	13,5	0,0	351,0	79,4	90,6	514,1	390,8	499,5	497,0	327,3	829,0	0,19	80,47	79,65	87,93	0,19	84,16	84,69	84,15	0,07	0,06
63,0	306,0	2,6	0,2	13,1	0,0	347,9	79,4	90,1	515,8	392,1	502,8	499,3	326,1	810,3	0,19	80,43	79,67	88,40	0,19	84,20	84,73	84,08	0,08	0,06
64,0	307,0	2,5	0,1	12,7	0,0	345,0	79,2	90,7	517,3	392,9	505,3	502,0	324,8	793,3	0,19	80,36	79,66	88,17	0,19	84,12	84,78	84,10	0,08	0,06
65,0	308,0	2,5	0,1	12,5	0,0	340,6	79,2	90,2	518,4	392,2	510,4	505,8	323,6	788,2	0,19	80,31	79,67	87,81	0,19	84,11	84,78	84,08	0,08	0,06
66,0	309,0	2,4	0,1	12,6	0,0	338,3	79,2	88,5	519,4	393,1	514,6	509,1	322,5	788,4	0,19	80,21	79,68	87,39	0,19	84,13	84,78	83,93	0,08	0,06
67,0	310,0	2,3	0,1	12,4	0,0	336,4	79,2	89,2	520,5	394,8	519,0	511,6	321,4	786,3	0,19	80,14	79,68	86,98	0,19	84,12	84,72	83,81	0,08	0,06
68,0	311,0	2,3	0,1	12,6	0,0	335,8	79,2	89,0	522,6	393,0	522,8	516,2	320,3	799,8	0,18	80,13	79,69	86,61	0,19	84,13	84,72	83,80	0,07	0,07
69,0	312,0	2,2	0,1	12,8	0,0	336,5	79,2	88,7	525,1	393,4	526,4	518,9	319,1	805,0	0,19	80,06	79,69	86,21	0,19	84,12	84,67	83,71	0,08	0,06
70,0	313,0	2,2	0,1	12,8	0,0	335,8	79,3	90,3	526,6	395,7	529,6	520,4	318,2	806,2	0,19	80,06	79,69	85,84	0,19	84,11	84,66	83,70	0,08	0,06
71,0	314,0	2,1	0,1	12,6	0,0	333,4	79,3	89,5	527,6	393,6	533,2	524,1	317,1	800,1	0,18	80,09	79,69	85,54	0,19	84,17	84,67	83,68	0,08	0,06
72,0	315,0	2,0	0,1	12,4	0,0	333,0	79,3	88,6	529,1	394,1	536,8	525,7	316,1	814,9	0,19	80,10	79,72	85,21	0,19	84,19	84,69	83,60	0,08	0,06
73,0	316,0	2,0	0,2	12,8	0,0	331,9	79,4	87,9	530,4	392,0	539,2	528,2	315,0	811,0	0,19	80,13	79,73	84,93	0,19	84,24	84,69	83,55	0,08	0,06
74,0	317,0	1,9	0,1	12,1	0,0	328,4	79,4	87,4	532,1	391,5	541,4	530,9	314,0	794,9	0,19	80,13	79,73	84,59	0,19	84,23	84,67	83,47	0,08	0,06
75,0	318,0	1,9	0,1	12,4	0,0	329,9	79,1	87,4	533,2	389,6	542,3	532,9	312,9	826,4	0,18	80,08	79,73	84,28	0,19	84,15	84,62	83,36	0,08	0,06
76,0	319,0	1,8	0,2	13,0	0,0	330,5	79,3	87,4	534,1	388,5	545,3	535,1	312,1	833,9	0,18	80,04	79,73	84,00	0,19	84,06	84,61	83,30	0,08	0,06
77,0	320,0	1,8	0,1	12,6	0,0	328,6	79,3	88,2	535,2	387,8	548,0	537,4	311,2	818,3	0,19	80,01	79,73	83,76	0,19	84,05	84,61	83,25	0,08	0,06
78,0	321,0	1,7	0,1	12,5	0,0	325,9	79,4	89,3	535,2	386,5	551,5	540,2	310,3	810,3	0,19	80,01	79,72	83,53	0,19	84,07	84,63	83,31	0,08	0,06
79,0	322,0	1,7	0,1	12,4	0,0	324,1	79,3	88,2	535,1	384,2	554,6	543,3	309,4	804,7	0,18	80,11	79,73	83,33	0,19	84,17	84,72	83,32	0,07	0,06
80,0	323,0	1,6	0,1	12,0	0,0	322,0	79,4	87,8	535,5	383,4	556,7	544,6	308,6	794,0	0,18	80,15	79,76	83,07	0,19	84,19	84,75	83,23	0,08	0,06
81,0	324,0	1,5	0,1	12,2	0,0	319,1	79,4	88,1	535,5	382,0	559,0	546,9	307,8	787,1	0,19	80,21	79,79	83,07	0,19	84,21	84,77	83,19	0,07	0,06
82,0	325,0	1,5	0,1	11,7	0,0	317,6	79,4	89,4	534,6	380,8	556,4	548,6	306,8	779,4	0,19	80,23	79,79	83,15	0,19	84,23	84,78	83,23	0,08	0,06
83,0	326,0	1,4	0,0	11,3	0,0	314,4	79,4	88,2	534,1	378,6	561,3	551,0	306,1	765,5	0,19	80,20	79,82	83,18	0,19	84,16	84,82	83,25	0,08	0,06
84,0	327,0	1,4	0,0	11,2	0,0	311,6	79,3	87,9	532,3	378,1	561,8	552,5	305,2	758,9	0,19	80,16	79,83	83,10	0,19	84,22	84,82	83,16	0,08	0,06
85,0	328,0	1,4	0,0	11,1	0,0	309,1	79,4	87,8	531,6	376,6	562,4	553,6	304,6	755,0	0,19	80,26	79,81	83,16	0,19	84,25	84,90	83,22	0,08	0,06
86,0	329,0	1,3	0,1	11,1	0,0	308,9	79,4	86,9	530,9	374,9	564,2	555,3	303,8	761,7	0,18	80,18	79,85	83,07	0,19	84,21	84,90	83,10	0,08	0,06
87,0	330,0	1,3	0,1	11,2	0,0	309,8	79,3	86,7	530,3	373,6	563,9	555,9	303,2	781,1	0,18	80,23	79,85	83,04	0,19	84,26	84,94	84,47	0,08	0,06
88,0	331,0	1,3	0,1	11,5	0,0	311,7	79,6	88,3	528,8	371,9	563,4	556,9	302,5	793,1	0,19	80,42	79,89	83,12	0,19	84,35	85,06	87,06	0,07	0,06
89,0	332,0	1,2	0,1	11,2	0,0	310,6	79,4	87,9	526,6	370,5	564,1	558,2	302,0	777,1	0,19	80,38	79,91	83,17	0,19	84,39	85,10	87,65	0,08	0,06
90,0	333,0	1,2	0,1	11,2	0,0	309,3	79,5	88,0	523,2	369,9	563,6	560,1	301,4	787,1	0,19	80,34	79,93	83,14	0,19	84,40	85,15	87,51	0,08	0,06
91,0	334,0	1,2	0,1	11,4	0,0	307,4	79,3	88,7	519,7	369,4	565,7	561,9	300,9	780,7	0,19	80,34	79,96	83,25	0,19	84,35	85,20	87,43	0,07	0,06
92,0	335,0	1,1	0,1	11,3	0,0	304,9	79,5	88,7	516,3	369,1	565,7	564,8	300,3	763,0	0,19	80,35	79,95	83,31	0,19	84,38	85,25	87,31	0,08	0,06
93,0	336,0	1,1	0,1	11,1	0,0	300,9	79,5	89,4	512,5	368,2	567,9	567,0	299,9	742,8	0,19	80,45	79,98	83,38	0,19	84,36	85,29	87,22	0,08	0,05
94,0	337,0	1,1	0,1	10,8	0,0	296,7	79,6	89,5	508,7	368,2	571,1	569,6	299,6	728,2	0,18	80,39	79,98	83,46	0,19	84,29	85,32	87,10	0,08	0,05
95,0	338,0	1,1	0,1	10,4	0,0	292,1	79,6	88,0	504,1	366,0	574,3	573,1	299,2	712,4	0,19	80,33	79,99	83,43	0,19	84,31	85,34	86,84	0,08	0,05

96,0	339,0	1,0	0,1	9,9	0,0	288,6	79,4	88,8	499,2	366,4	576,6	575,2	298,9	699,2	0,19	80,51	80,03	83,41	0,19	84,52	85,40	86,67	0,08	0,05
97,0	340,0	1,0	0,1	10,0	0,0	284,9	79,5	87,3	494,1	364,6	579,1	579,0	298,7	693,2	0,18	80,57	80,05	83,35	0,19	84,57	85,44	86,52	0,08	0,05
98,0	341,0	1,0	0,1	9,8	0,0	281,5	79,5	88,7	489,6	364,8	580,6	581,4	298,4	691,8	0,19	80,55	80,07	83,40	0,19	84,63	85,47	86,37	0,08	0,05
99,0	342,0	1,0	0,1	9,5	0,0	281,3	79,6	88,1	483,8	363,4	584,0	584,5	298,2	695,2	0,19	80,52	80,06	83,46	0,19	84,56	85,48	86,25	0,08	0,05
100,0	343,0	0,9	0,1	9,4	0,0	281,1	79,6	87,3	478,6	361,3	586,7	587,5	297,8	701,0	0,19	80,46	80,10	83,41	0,19	84,58	85,46	86,03	0,07	0,05
101,0	344,0	0,9	0,1	9,3	0,0	279,7	79,6	87,9	473,6	360,5	588,7	589,7	297,7	702,9	0,19	80,48	80,10	83,40	0,19	84,65	85,47	85,87	0,08	0,05
102,0	345,0	0,9	0,1	9,3	0,0	279,0	79,7	88,0	468,5	359,3	590,7	591,7	297,5	699,9	0,19	80,56	80,12	83,43	0,19	84,68	85,48	85,72	0,07	0,05
103,0	346,0	0,9	0,1	9,2	0,0	278,6	79,7	87,2	464,0	358,1	591,9	593,4	297,4	699,9	0,19	80,57	80,13	83,37	0,19	84,71	85,46	85,49	0,08	0,05
104,0	347,0	0,9	0,1	9,1	0,0	277,4	79,6	87,2	459,4	355,8	593,2	596,1	297,2	701,9	0,19	80,57	80,17	83,37	0,19	84,75	85,48	85,39	0,07	0,05
105,0	348,0	0,9	0,1	9,1	0,0	276,8	79,6	87,5	455,2	355,5	594,9	597,0	297,2	701,8	0,19	80,52	80,14	83,35	0,19	84,73	85,43	85,23	0,08	0,05
106,0	349,0	0,9	0,2	9,0	0,0	276,6	79,8	87,7	451,0	353,3	596,1	599,3	297,1	701,6	0,18	80,52	80,16	83,39	0,19	84,73	85,48	85,19	0,08	0,05
107,0	350,0	0,9	0,2	8,9	0,0	277,1	79,7	87,9	447,0	353,2	596,7	599,7	297,2	700,1	0,19	80,63	80,18	83,44	0,19	84,83	85,53	85,14	0,07	0,05
108,0	351,0	0,8	0,2	8,9	0,0	276,9	79,8	88,2	443,3	352,5	596,3	600,5	297,2	700,4	0,19	80,69	80,20	83,43	0,19	84,81	85,55	85,08	0,08	0,05
109,0	352,0	0,8	0,2	8,8	0,0	277,0	79,8	87,8	439,2	350,1	595,9	602,4	297,2	702,3	0,19	80,80	80,24	83,49	0,19	84,89	85,62	85,00	0,08	0,05
110,0	353,0	0,8	0,2	8,9	0,0	277,6	79,7	88,7	435,7	349,1	594,7	602,6	297,0	703,6	0,19	80,77	80,25	83,53	0,19	84,81	85,66	84,88	0,08	0,05
111,0	354,0	0,8	0,2	8,9	0,0	277,1	79,8	89,4	432,5	347,8	596,0	603,2	297,3	701,8	0,19	80,79	80,27	83,63	0,19	84,80	85,74	84,86	0,08	0,05
112,0	355,0	0,7	0,2	8,9	0,0	276,7	79,8	88,2	429,4	345,5	597,0	604,1	297,3	701,1	0,18	80,77	80,28	83,60	0,19	84,82	85,73	84,67	0,08	0,05
113,0	356,0	0,7	0,2	9,0	0,0	277,3	79,4	89,3	426,8	345,6	595,9	604,2	297,5	699,0	0,19	80,78	80,29	83,64	0,19	84,83	85,76	84,63	0,08	0,05
114,0	357,0	0,7	0,2	9,0	0,0	276,1	79,7	88,7	423,9	343,2	595,5	604,7	297,6	694,8	0,19	80,85	80,31	83,72	0,19	84,85	85,80	84,64	0,08	0,05
115,0	358,0	0,7	0,2	9,0	0,0	275,1	79,9	88,0	421,5	342,1	596,9	604,7	297,8	691,6	0,19	80,85	80,33	83,67	0,19	84,88	85,82	84,49	0,08	0,05
116,0	359,0	0,7	0,2	8,8	0,0	274,5	79,9	88,6	418,8	340,6	596,4	606,1	298,0	690,8	0,19	80,80	80,36	83,70	0,19	84,90	85,84	84,48	0,08	0,05
117,0	360,0	0,7	0,2	8,8	0,0	274,5	79,8	88,5	416,6	340,5	596,9	605,3	298,2	689,0	0,19	80,88	80,37	83,72	0,19	84,96	85,87	84,38	0,08	0,05
118,0	361,0	0,7	0,2	9,4	0,0	272,3	79,8	86,7	414,0	339,5	596,4	605,9	298,4	680,0	0,19	81,14	80,42	83,63	0,19	85,11	85,90	84,24	0,08	0,05
119,0	362,0	0,6	0,2	9,1	0,0	271,0	80,0	87,0	411,6	338,7	596,1	605,1	298,7	675,5	0,19	81,28	80,49	83,58	0,19	85,21	85,94	84,16	0,08	0,05
120,0	363,0	0,6	0,2	9,0	0,0	269,7	80,0	87,8	409,5	338,8	595,1	605,2	298,9	670,9	0,19	81,32	80,53	83,64	0,19	85,27	86,01	84,15	0,07	0,05
121,0	364,0	0,6	0,1	8,8	0,0	268,7	80,0	88,2	407,3	339,3	594,1	605,0	299,2	665,4	0,19	81,30	80,55	83,69	0,19	85,26	86,07	84,16	0,08	0,05
122,0	365,0	0,6	0,2	8,7	0,0	267,9	80,0	87,6	405,1	337,0	593,5	605,3	299,3	667,4	0,19	81,25	80,57	83,73	0,19	85,22	86,09	84,14	0,07	0,05
123,0	366,0	0,6	0,2	8,6	0,0	267,8	80,0	87,6	403,0	337,4	592,8	603,4	299,7	669,2	0,19	81,20	80,58	83,69	0,19	85,24	86,08	84,05	0,08	0,05
124,0	367,0	0,5	0,2	8,9	0,0	267,7	79,9	87,1	401,4	337,1	592,2	600,8	299,9	670,9	0,19	81,14	80,60	83,64	0,19	85,25	86,06	83,98	0,08	0,05
125,0	368,0	0,5	0,2	8,9	0,0	267,4	79,9	87,0	399,3	336,2	592,4	599,5	300,2	667,6	0,19	81,05	80,59	83,61	0,19	85,23	86,04	83,87	0,08	0,05
126,0	369,0	0,5	0,2	8,6	0,0	266,9	79,8	86,9	397,5	335,9	592,2	597,7	300,5	668,2	0,19	81,03	80,58	83,58	0,19	85,17	86,05	83,79	0,07	0,05
127,0	370,0	0,5	0,2	8,5	0,0	266,8	80,0	89,0	395,5	336,9	590,8	594,8	300,9	668,7	0,19	81,16	80,63	83,68	0,19	85,27	86,07	83,82	0,08	0,05
128,0	371,0	0,5	0,2	8,6	0,0	267,1	79,9	87,3	393,8	332,7	591,0	592,2	301,0	672,1	0,19	81,17	80,61	83,71	0,19	85,22	86,05	83,79	0,08	0,05
129,0	372,0	0,5	0,2	8,8	0,0	267,4	79,8	87,4	392,2	333,6	590,6	588,6	301,5	673,2	0,19	81,13	80,63	83,63	0,19	85,20	86,03	83,70	0,08	0,05
130,0	373,0	0,5	0,2	8,8	0,0	268,1	80,0	88,5	390,8	334,0	588,9	585,5	301,8	675,0	0,19	81,15	80,62	83,65	0,19	85,14	86,05	83,69	0,08	0,05
131,0	374,0	0,4	0,2	8,8	0,0	267,7	80,1	88,3	389,1	333,3	589,8	583,6	302,2	674,2	0,19	81,19	80,66	83,73	0,19	85,16	86,08	83,73	0,07	0,05
132,0	375,0	0,4	0,2	8,8	0,0	267,6	80,0	88,0	387,3	333,1	588,7	581,5	302,7	675,4	0,19	81,23	80,64	83,75	0,19	85,21	86,14	83,71	0,08	0,05
133,0	376,0	0,4	0,2	8,7	0,0	267,7	80,0	88,2	386,0	332,8	588,4	580,0	303,1	674,6	0,19	81,25	80,67	83,76	0,19	85,22	86,19	83,71	0,08	0,05
134,0	377,0	0,4	0,2	8,7	0,0	267,8	79,9	87,5	384,3	332,9	587,7	578,7	303,6	672,4	0,19	81,37	80,69	83,74	0,19	85,26	86,24	83,70	0,08	0,05
135,0	378,0	0,3	0,2	8,7	0,0	267,0	80,1	87,3	382,8	331,9	586,3	577,8	304,1	664,2	0,19	81,48	80,75	83,73	0,19	85,39	86,30	83,63	0,08	0,05
136,0	379,0	0,3	0,2	8,6	0,0	265,9	79,9	87,9	381,5	331,0	585,0	576,7	304,4	662,8	0,19	81,41	80,76	83,75	0,19	85,35	86,30	83,62	0,08	0,05
137,0	380,0	0,3	0,2	8,6	0,0	265,2	80,0	88,4	380,2	331,3	583,4	573,9	304,8	661,9	0,19	81,48	80,79	83,77	0,19	85,37	86,32	83,61	0,08	0,05
138,0	381,0	0,3	0,2	8,6	0,0	265,3	80,1	88,2	378,8	330,4	584,0	572,1	305,3	660,9	0,19	81,53	80,81	83,84	0,19	85,41	86,40	83,64	0,08	0,05
139,0	382,0	0,3	0,2	8,5	0,0	265,1	80,0	87,9	377,6	329,7	584,0	569,9	305,7	661,2	0,18	81,47	80,82	83,82	0,19	85,37	86,40	83,60	0,08	0,05
140,0	383,0	0,3	0,2	8,4	0,0	266,0	80,0	88,1	376,6	329,7	581,5	566,9	306,1	664,5	0,19	81,48	80,82	83,77	0,19	85,41	86,46	83,56	0,08	0,05
141,0	384,0	0,3	0,2	8,3	0,0	266,6	80,1	87,8	375,4	328,2	582,7	564,8	306,6	667,0	0,19	81,54	80,85	83,82	0,19	85,46	86,49	83,58	0,08	0,05
142,0	385,0	0,2	0,2	8,2	0,0	267,4	80,0	88,4	374,5	327,8	580,6	562,7	307,0	668,6	0,19	81,58	80,85	83,86	0,19	85,52	86,54	83,61	0,07	0,05
143,0	386,0	0,3	0,2	8,1	0,0	267,7	80,0	88,1	373,3	326,6	581,0	559,9	307,4	670,6	0,18	81,58	80,88	83,86	0,19	85,52	86,57	83,63	0,08	0,05
144,0	387,0	0,2	0,2	8,0	0,0	268,4	80,1	88,3	371,9	324,9	580,2	557,9	307,9	673,8	0,19	81,63	80,89	83,94	0,19	85,56	86,58	83,67	0,08	0,05
145,0	388,0	0,2	0,2	8,0	0,0	268,5	80,1	88,9	370,6	324,0	578,5	555,2	308,3	675,3	0,19	81,56	80,90	83,94	0,19	85,51	86,62	83,65	0,08	0,05
146,0	389,0	0,2	0,2	8,0	0,0	269,0	80,1	87,8	369,4	321,1	578,3	553,3	308,7	677,4	0,19	81,52	80,91	83,95	0,19	85,50	86,63	83,65	0,08	0,05
147,0	390,0	0,2	0,2	8,0	0,0	268,9	80,0	87,3	368,6	318,4	577,4	550,7	309,0	677,5	0,19	81,49	80,91	83,88	0,19	85,44	86,60	83,56	0,08	0,05
148,0	391,0	0,2	0,2	7,9	0,0	269,1	80,1	87,3	367,5	317,8	575,4	548,4	309,4	677,9	0,19	81,70	80,96	83,83	0,19	85,51	86,57	83,53	0,08	0,05
149,0	392,0	0,2	0,2	7,9	0,0	268,4	80,2	87,2	366,2	315,3	574,9	546,1	309,7	678,6	0,19	81,82	81,00	83,80	0,19	85,58	86,57	83,48	0,08	0,05
150,0	393,0	0,1	0,2	7,8	0,0	268,7	80,2	87,4	365,3	314,5	573,9	542,6	310,0	678,3	0,19	81,76	80,98	83,80	0,19	85,54	86,53	83,45	0,08	0,05
151,0	394,0	0,1	0,2	7,9	0,0	268,2	80,3	87,3	364,1	313,7	573,5	539,8	310,3	678,2	0,19	81,69	81,01	83,81	0,19	85,53	86,52	83,43	0,08	0,05
152,0	395,0	0,1	0,2	7,8	0,0	268,3	80,2	87,1	363,1	311,6	571,6	538,0	310,5	681,0	0,19	81,64	81,01	83,81	0,19	85,53	86,53	83,46	0,08	0,05
153,0	396,0	0,1	0,2	7,6	0,0	268,4	80,2	87,3	362,1	311,0	570,7	535,3	310,8	680,9	0,19	81,60	81,01	83,80	0,19	85,49	86,51	83,44	0,08	0,05
154,0	397,0	0,1	0,2	7,6	0,0	269,1	80,2	87,9	360,8	308,5	568,9	532,6	311,0	680,6	0,19	81,65	81,00	83,86	0,19	85,49	86,53	83,48	0,08	0,05
155,0	398,0	0,1	0,2	7,6	0,0	269,1	80,3	87,4	359,8	307,2	567,7	530,0	311,1	678,0	0,19	81,57	81,01	83,83	0,19	85,44	86,51	83,43	0,08	0,05
156,0	399,0	0,1	0,2	7,5	0,0	268,3	80,2	87,5	358,6	306,1	567,3	527,3	311,3	676,8	0,19	81,52	81,01	83,84	0,19	85,42	86,46	83,40	0,07	0,05
157,0	400,0	0,1	0,2	7,4	0,0	268,9	80,3	88,0	357,7	306,1	566,2	524,8	311,6	678,1	0,19	81,57	81,01	83,86	0,19	85,45	86,50	83,45	0,08	0,05
158,0	401,0	0,1	0,2	7,4	0,0	268,4	80,3	87,6	356,3	304,8	565,1	522,5	311,9	676,6	0,19	81,56	81,02	83,85	0,19	85,44	86,51	83,50	0,08	0,05
159,0	402,0	0,1	0,2	7,0	0,0	269,6	80,2	89,2	355,0	304,6	562,6	520,1	312,2	680,0	0,19	81,66	81,03	83,92	0,19	85,55	86,57	83,58	0,08	0,05
160,0	403,0	0,1	0,3	7,0	0,0	270,4	80,4	88,4	353,5	303,4	561,8	517,5	312,4	678,5	0,19	81,76	81,05	84,01	0,19	85,60	86,61	83,61	0,08	0,05
161,0	404,0	0,1	0,2	6,7	0,0	269,4	80,2	88,8	351,4	301,9	553,8	514,6	312,4	669,7	0,19	81,99	81,12	84,06	0,19	85,73	86,72	83,67	0,08	0,05
162,0	405,0	0,0	0,2	6,5	0,0	268,5	80,4	89,1	350,3	301,1	555,9	511,7	312,7	665,2	0,19	82,22	81,19	84,02	0,19	85,82	86,83	83,64	0,08	0,05

Manufacturer: HEARTHSTONE
Model: 8060

Run: 6
Project #: PI 20272
Test Duration: 162 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	79,70%	86,15%
Comb Eff	98,97%	98,97%
HT Eff	80,54%	87,04%
Output	15 178	kJ/h
Burn Rate	0,96	kg/h
Grams CO	48	g
Input	19 042	kJ/h
MC wet	16,82	

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

Overall Heating Efficiency: 79,70%
Combustion Efficiency: 98,97%
Heat Transfer Efficiency: 80,54%

Heat Output: 14 398 Btu/h
Heat Input: 18 064 Btu/h
Burn Duration: 2,70 h
Burn Rate: 2,12 lb/h
Stack Temp: 292,2 Deg. F

Averages	0,16	9,51	1,35	20,30	10,71	144,61	26,32	0,99	0,80	#DIV/0!
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	3,12	0,08	2,78	585,3%	20,75	17,93	156,8	25,8	99,4%	60,6%	60,2%
1,00	3,07	0,13	2,55	633,6%	20,76	18,15	141,2	25,7	97,8%	61,8%	60,5%
2,00	3,07	0,05	4,04	380,5%	20,67	16,61	142,7	25,6	100,2%	71,4%	71,5%
3,00	3,07	0,04	4,15	369,1%	20,66	16,50	144,0	25,6	100,4%	71,6%	71,9%
4,00	3,03	0,04	3,79	412,9%	20,69	16,88	144,9	25,6	100,5%	69,9%	70,2%
5,00	3,03	0,04	3,49	456,2%	20,71	17,20	145,1	25,6	100,5%	68,3%	68,6%
6,00	3,03	0,03	3,96	391,8%	20,68	16,70	131,7	25,7	100,5%	72,8%	73,2%
7,00	2,98	0,05	3,62	435,9%	20,70	17,06	125,1	25,8	100,2%	72,5%	72,7%
8,00	2,98	0,05	3,99	385,4%	20,67	16,65	124,1	25,9	100,1%	74,2%	74,3%
9,00	2,94	0,04	8,42	132,1%	20,38	11,94	126,2	25,7	100,0%	81,7%	81,7%
10,00	2,94	0,05	6,68	191,7%	20,50	13,79	126,9	25,8	100,0%	79,8%	79,8%
11,00	2,89	0,06	3,48	454,8%	20,71	17,19	125,6	25,8	100,1%	71,8%	71,9%
12,00	2,89	0,05	3,28	488,7%	20,72	17,41	123,1	25,6	100,2%	71,2%	71,4%
13,00	2,89	0,05	3,86	401,3%	20,68	16,79	121,5	25,7	100,1%	74,1%	74,2%
14,00	2,87	0,06	3,21	499,6%	20,72	17,48	121,1	25,7	100,0%	71,3%	71,2%
15,00	2,89	0,06	2,92	558,5%	20,74	17,79	120,4	25,8	100,1%	69,7%	69,8%
16,00	2,85	0,04	3,77	415,2%	20,69	16,90	117,8	25,8	100,4%	74,4%	74,7%
17,00	2,85	0,04	4,07	378,2%	20,67	16,58	117,1	25,7	100,3%	75,6%	75,8%
18,00	2,80	0,04	4,46	336,2%	20,64	16,16	115,7	25,8	100,3%	77,0%	77,2%
19,00	2,80	0,04	4,62	321,6%	20,63	15,99	115,2	25,8	100,3%	77,4%	77,7%
20,00	2,76	0,04	4,88	299,5%	20,62	15,72	115,1	25,8	100,3%	78,1%	78,3%
21,00	2,76	0,03	7,08	176,3%	20,47	13,38	118,2	25,8	100,1%	81,1%	81,2%
22,00	2,71	0,19	10,62	81,5%	20,23	9,50	127,8	25,9	98,7%	83,0%	82,0%
23,00	2,71	0,19	11,39	69,7%	20,18	8,70	136,7	25,9	98,8%	82,8%	81,9%
24,00	2,67	0,12	10,88	78,6%	20,21	9,28	139,9	25,9	99,4%	82,4%	81,8%
25,00	2,62	0,07	10,00	95,2%	20,28	10,25	139,6	25,9	99,7%	81,9%	81,7%
26,00	2,58	0,05	9,33	109,4%	20,32	10,97	138,3	26,0	99,9%	81,5%	81,4%
27,00	2,57	0,04	9,20	112,6%	20,33	11,11	136,8	26,0	100,0%	81,5%	81,5%
28,00	2,53	0,06	9,19	112,3%	20,33	11,11	136,6	26,1	99,8%	81,5%	81,4%
29,00	2,48	0,05	8,80	122,0%	20,36	11,53	135,6	26,1	99,9%	81,3%	81,2%
30,00	2,48	0,05	8,78	122,5%	20,36	11,55	134,9	26,2	99,9%	81,3%	81,3%
31,00	2,44	0,04	8,65	126,1%	20,37	11,70	134,7	26,2	100,0%	81,2%	81,2%
32,00	2,44	0,04	8,80	122,3%	20,36	11,54	133,8	26,2	100,0%	81,4%	81,4%
33,00	2,39	0,04	8,83	121,6%	20,35	11,51	133,3	26,3	100,0%	81,5%	81,5%
34,00	2,35	0,04	8,99	117,4%	20,34	11,33	133,4	26,2	100,0%	81,6%	81,6%
35,00	2,35	0,05	9,39	108,1%	20,32	10,90	136,4	26,2	99,9%	81,7%	81,6%
36,00	2,30	0,10	10,43	86,5%	20,24	9,76	140,9	26,2	99,4%	82,1%	81,6%
37,00	2,26	0,07	11,26	73,5%	20,19	8,90	144,4	26,1	99,7%	82,3%	82,1%
38,00	2,24	0,09	11,30	72,5%	20,19	8,84	146,8	26,1	99,6%	82,2%	81,9%
39,00	2,21	0,10	11,75	65,7%	20,16	8,36	152,9	26,1	99,5%	82,1%	81,6%
40,00	2,15	0,63	13,53	38,7%	20,01	6,16	160,2	26,1	96,4%	82,3%	79,3%
41,00	2,12	0,59	13,78	36,7%	19,99	5,92	165,2	26,1	96,7%	82,2%	79,4%
42,00	2,03	0,23	13,68	41,2%	20,02	6,23	169,0	26,1	98,7%	82,0%	81,0%
43,00	1,99	0,18	13,58	42,8%	20,03	6,36	171,9	25,9	99,0%	81,8%	81,0%
44,00	1,94	0,24	13,63	41,6%	20,02	6,27	174,5	26,1	98,6%	81,7%	80,6%
45,00	1,92	0,35	13,51	41,8%	20,03	6,34	176,2	26,1	98,0%	81,5%	79,9%
46,00	1,85	0,35	13,54	41,3%	20,02	6,30	176,7	26,1	98,0%	81,5%	79,8%
47,00	1,80	0,36	13,54	41,3%	20,02	6,30	176,6	26,1	97,9%	81,5%	79,8%
48,00	1,76	0,35	13,56	41,2%	20,02	6,29	176,2	26,0	98,0%	81,5%	79,9%
49,00	1,71	0,41	13,50	41,3%	20,02	6,32	177,2	26,1	97,7%	81,4%	79,5%
50,00	1,67	0,38	13,55	41,0%	20,02	6,28	177,2	26,1	97,8%	81,5%	79,7%
51,00	1,63	0,32	13,61	41,0%	20,02	6,25	177,0	26,1	98,2%	81,5%	80,0%
52,00	1,62	0,28	13,61	41,5%	20,02	6,27	177,4	26,2	98,4%	81,5%	80,3%
53,00	1,53	0,26	13,58	42,0%	20,03	6,32	178,1	26,3	98,5%	81,5%	80,3%
54,00	1,49	0,28	13,58	41,7%	20,02	6,31	178,4	26,2	98,4%	81,5%	80,2%
55,00	1,44	0,31	13,56	41,6%	20,02	6,31	178,7	26,2	98,2%	81,4%	80,0%
56,00	1,39	0,34	13,51	41,8%	20,03	6,34	178,1	26,1	98,0%	81,4%	79,8%
57,00	1,39	0,34	13,48	42,1%	20,03	6,37	177,4	26,2	98,0%	81,4%	79,8%
58,00	1,33	0,30	13,69	40,4%	20,02	6,17	177,7	26,2	98,3%	81,6%	80,2%
59,00	1,30	0,24	13,87	39,2%	20,01	6,02	178,8	26,3	98,7%	81,6%	80,5%
60,00	1,26	0,85	13,86	33,5%	19,97	5,68	179,3	26,3	95,2%	81,4%	77,5%
61,00	1,21	0,53	13,68	38,2%	20,00	6,06	178,5	26,3	97,0%	81,4%	78,9%
62,00	1,21	0,34	13,51	41,7%	20,02	6,34	177,2	26,3	98,0%	81,5%	79,9%
63,00	1,17	0,19	13,10	47,8%	20,06	6,87	175,5	26,3	98,9%	81,4%	80,6%
64,00	1,15	0,11	12,74	52,8%	20,09	7,30	173,9	26,2	99,4%	81,3%	80,9%
65,00	1,12	0,08	12,49	56,3%	20,11	7,58	171,4	26,2	99,6%	81,4%	81,1%
66,00	1,08	0,10	12,61	54,6%	20,10	7,44	170,2	26,2	99,5%	81,5%	81,1%
67,00	1,04	0,09	12,42	57,0%	20,11	7,65	169,1	26,2	99,6%	81,5%	81,1%
68,00	1,03	0,10	12,57	55,0%	20,10	7,48	168,8	26,2	99,5%	81,5%	81,1%
69,00	0,99	0,14	12,82	51,5%	20,08	7,19	169,2	26,2	99,2%	81,6%	81,0%
70,00	0,99	0,11	12,82	51,9%	20,09	7,21	168,8	26,3	99,4%	81,7%	81,2%
71,00	0,94	0,11	12,57	54,9%	20,10	7,48	167,4	26,3	99,5%	81,6%	81,2%
72,00	0,90	0,10	12,44	56,7%	20,11	7,63	167,2	26,3	99,5%	81,6%	81,2%
73,00	0,90	0,19	12,75	51,7%	20,09	7,24	166,6	26,3	98,9%	81,7%	80,9%
74,00	0,85	0,08	12,06	61,8%	20,14	8,04	164,6	26,3	99,6%	81,5%	81,2%
75,00	0,85	0,12	12,43	56,6%	20,11	7,63	165,5	26,2	99,4%	81,7%	81,2%
76,00	0,80	0,19	12,98	49,1%	20,07	6,99	165,9	26,3	99,0%	81,9%	81,1%
77,00	0,80	0,13	12,62	54,1%	20,10	7,41	164,8	26,3	99,3%	81,8%	81,3%
78,00	0,76	0,08	12,52	55,9%	20,11	7,55	163,3	26,4	99,6%	81,9%	81,6%
79,00	0,75	0,08	12,36	57,9%	20,12	7,72	162,3	26,3	99,6%	81,8%	81,5%
80,00	0,71	0,06	11,96	63,4%	20,15	8,15	161,1	26,3	99,8%	81,7%	81,5%
81,00	0,67	0,07	12,18	60,4%	20,13	7,92	159,5	26,4	99,7%	81,9%	81,7%
82,00	0,67	0,05	11,75	66,4%	20,16	8,39	158,7	26,3	99,8%	81,7%	81,6%
83,00	0,62	0,05	11,34	72,6%	20,19	8,83	156,9	26,3	99,9%	81,6%	81,5%
84,00	0,62	0,04	11,17	75,1%	20,20	9,00	155,3	26,3	99,9%	81,6%	81,5%
85,00	0,62	0,04	11,06	77,0%	20,21	9,13	154,0	26,3	99,9%	81,6%	81,6%
86,00	0,58	0,06	11,12	75,7%	20,20	9,05	153,8	26,3	99,8%	81,7%	81,5%
87,00	0,58	0,07	11,24	73,8%	20,19	8,92	154,3	26,3	99,7%	81,7%	81,5%
88,00	0,58	0,08	11,45	70,3%	20,18	8,68	155,4	26,4	99,6%	81,8%	81,4%
89,00	0,53	0,08	11,15	74,9%	20,20	9,01	154,8	26,3	99,6%	81,6%	81,3%
90,00	0,53	0,09	11,22	73,8%	20,19	8,93	154,0	26,4	99,6%	81,7%	81,4%
91,00	0,53	0,10	11,38	71,1%	20,18	8,75	153,0	26,3	99,5%	81,9%	81,5%
92,00	0,49	0,09	11,30	72,5%	20,19	8,84	151,6	26,4	99,6%	81,9%	81,6%

93,00	0,49	0,07	11,05	76,6%	20,21	9,12	149,4	26,4	99,7%	81,9%	81,7%
94,00	0,49	0,07	10,78	81,1%	20,22	9,41	147,1	26,4	99,7%	81,9%	81,7%
95,00	0,49	0,07	10,41	87,4%	20,25	9,80	144,5	26,4	99,7%	81,8%	81,6%
96,00	0,47	0,06	9,93	96,6%	20,28	10,32	142,5	26,3	99,8%	81,6%	81,4%
97,00	0,44	0,07	9,98	95,5%	20,28	10,26	140,5	26,4	99,7%	81,8%	81,6%
98,00	0,44	0,07	9,81	98,7%	20,29	10,44	138,6	26,4	99,7%	81,8%	81,6%
99,00	0,44	0,09	9,55	103,7%	20,30	10,71	138,5	26,4	99,5%	81,7%	81,3%
100,00	0,40	0,11	9,37	107,3%	20,31	10,89	138,4	26,4	99,4%	81,5%	81,0%
101,00	0,40	0,12	9,28	109,0%	20,32	10,98	137,6	26,4	99,3%	81,5%	80,9%
102,00	0,40	0,12	9,28	108,9%	20,32	10,98	137,2	26,5	99,2%	81,5%	80,9%
103,00	0,40	0,13	9,16	111,4%	20,33	11,10	137,0	26,5	99,2%	81,5%	80,8%
104,00	0,40	0,14	9,09	112,8%	20,33	11,17	136,3	26,4	99,1%	81,5%	80,7%
105,00	0,40	0,14	9,06	113,4%	20,33	11,20	136,0	26,5	99,0%	81,5%	80,7%
106,00	0,40	0,15	9,00	114,7%	20,34	11,26	135,9	26,6	99,0%	81,4%	80,6%
107,00	0,40	0,16	8,95	115,9%	20,34	11,32	136,1	26,5	98,9%	81,3%	80,5%
108,00	0,35	0,16	8,88	117,2%	20,34	11,38	136,1	26,6	98,9%	81,3%	80,4%
109,00	0,35	0,17	8,81	118,8%	20,35	11,45	136,1	26,6	98,8%	81,2%	80,3%
110,00	0,35	0,17	8,88	117,0%	20,34	11,37	136,4	26,5	98,8%	81,3%	80,3%
111,00	0,35	0,17	8,94	115,5%	20,34	11,31	136,2	26,5	98,8%	81,3%	80,3%
112,00	0,31	0,18	8,95	115,3%	20,34	11,30	135,9	26,6	98,7%	81,4%	80,3%
113,00	0,33	0,18	8,96	115,0%	20,34	11,29	136,3	26,3	98,7%	81,3%	80,3%
114,00	0,30	0,17	9,01	113,9%	20,33	11,24	135,6	26,5	98,8%	81,4%	80,4%
115,00	0,31	0,17	9,00	114,3%	20,33	11,25	135,1	26,6	98,8%	81,5%	80,5%
116,00	0,31	0,17	8,80	119,0%	20,35	11,46	134,7	26,6	98,8%	81,3%	80,3%
117,00	0,31	0,17	8,83	118,2%	20,35	11,43	134,7	26,5	98,8%	81,4%	80,3%
118,00	0,31	0,15	9,39	105,8%	20,31	10,84	133,5	26,6	99,0%	81,9%	81,0%
119,00	0,26	0,15	9,14	111,3%	20,33	11,11	132,8	26,7	99,0%	81,8%	80,9%
120,00	0,26	0,15	9,04	113,6%	20,33	11,21	132,0	26,7	98,9%	81,8%	80,9%
121,00	0,26	0,15	8,82	119,1%	20,35	11,46	131,5	26,7	99,0%	81,6%	80,8%
122,00	0,26	0,15	8,70	122,0%	20,36	11,58	131,0	26,7	98,9%	81,6%	80,7%
123,00	0,26	0,16	8,62	123,9%	20,36	11,67	131,0	26,6	98,9%	81,5%	80,6%
124,00	0,22	0,17	8,88	117,1%	20,34	11,38	130,9	26,6	98,8%	81,7%	80,7%
125,00	0,22	0,17	8,86	117,5%	20,34	11,40	130,8	26,6	98,8%	81,7%	80,7%
126,00	0,22	0,17	8,59	124,5%	20,36	11,69	130,5	26,5	98,8%	81,5%	80,5%
127,00	0,22	0,17	8,50	126,5%	20,37	11,78	130,4	26,7	98,7%	81,4%	80,4%
128,00	0,22	0,17	8,63	123,1%	20,36	11,64	130,6	26,6	98,7%	81,5%	80,5%
129,00	0,22	0,18	8,78	119,1%	20,35	11,47	130,8	26,6	98,6%	81,6%	80,5%
130,00	0,22	0,19	8,80	118,7%	20,35	11,46	131,1	26,7	98,6%	81,6%	80,5%
131,00	0,18	0,19	8,78	119,0%	20,35	11,47	130,9	26,7	98,6%	81,6%	80,5%
132,00	0,17	0,19	8,78	119,0%	20,35	11,47	130,9	26,7	98,6%	81,6%	80,5%
133,00	0,17	0,19	8,75	119,8%	20,35	11,51	130,9	26,7	98,6%	81,6%	80,4%
134,00	0,17	0,19	8,70	121,0%	20,35	11,56	131,0	26,6	98,6%	81,5%	80,4%
135,00	0,15	0,18	8,73	120,5%	20,35	11,53	130,5	26,7	98,7%	81,6%	80,5%
136,00	0,12	0,18	8,65	122,6%	20,36	11,62	129,9	26,6	98,7%	81,6%	80,5%
137,00	0,12	0,18	8,60	123,7%	20,36	11,67	129,6	26,7	98,7%	81,6%	80,5%
138,00	0,12	0,18	8,58	124,1%	20,36	11,69	129,6	26,7	98,6%	81,6%	80,4%
139,00	0,12	0,18	8,47	127,0%	20,37	11,81	129,5	26,7	98,6%	81,5%	80,3%
140,00	0,12	0,19	8,42	128,2%	20,37	11,86	130,0	26,7	98,5%	81,4%	80,2%
141,00	0,12	0,20	8,34	130,1%	20,38	11,94	130,3	26,7	98,4%	81,3%	80,0%
142,00	0,08	0,20	8,22	133,2%	20,38	12,06	130,8	26,7	98,4%	81,1%	79,8%
143,00	0,12	0,21	8,10	136,3%	20,39	12,18	130,9	26,7	98,3%	81,0%	79,6%
144,00	0,09	0,21	8,04	138,1%	20,40	12,25	131,3	26,7	98,3%	80,9%	79,5%
145,00	0,08	0,21	8,02	138,5%	20,40	12,27	131,4	26,7	98,2%	80,9%	79,5%
146,00	0,08	0,22	7,99	139,4%	20,40	12,30	131,6	26,7	98,2%	80,8%	79,4%
147,00	0,08	0,22	7,97	139,8%	20,40	12,32	131,6	26,7	98,2%	80,8%	79,3%
148,00	0,08	0,22	7,92	141,3%	20,40	12,37	131,7	26,7	98,2%	80,8%	79,3%
149,00	0,08	0,22	7,94	140,7%	20,40	12,35	131,3	26,8	98,1%	80,8%	79,3%
150,00	0,06	0,22	7,84	143,6%	20,41	12,46	131,5	26,8	98,1%	80,7%	79,2%
151,00	0,03	0,23	7,89	142,0%	20,40	12,40	131,2	26,8	98,1%	80,8%	79,2%
152,00	0,03	0,23	7,78	145,2%	20,41	12,51	131,3	26,8	98,0%	80,7%	79,1%
153,00	0,03	0,23	7,64	149,5%	20,42	12,66	131,3	26,8	98,0%	80,5%	78,9%
154,00	0,03	0,23	7,60	150,8%	20,42	12,71	131,7	26,8	97,9%	80,4%	78,8%
155,00	0,03	0,23	7,64	149,5%	20,42	12,66	131,7	26,8	98,0%	80,5%	78,9%
156,00	0,03	0,23	7,51	153,8%	20,43	12,80	131,3	26,8	98,0%	80,4%	78,8%
157,00	0,03	0,23	7,45	155,8%	20,43	12,87	131,6	26,8	97,9%	80,3%	#DIV/0!
158,00	0,03	0,23	7,35	158,9%	20,44	12,97	131,3	26,8	97,9%	80,2%	78,5%
159,00	0,02	0,25	7,03	169,9%	20,46	13,30	132,0	26,8	97,7%	79,7%	77,9%
160,00	0,02	0,26	6,97	171,9%	20,46	13,37	132,4	26,9	97,5%	79,6%	#DIV/0!
161,00	0,02	0,24	6,69	183,4%	20,48	13,67	131,9	26,8	97,7%	79,3%	77,5%
162,00	0,00	0,23	6,54	190,4%	20,49	13,84	131,4	26,9	97,8%	79,1%	77,4%

DATA 2022-07-26 EPA PI 20272 RUN 6 MODEL 8060 OTHER CATALIST
preburn

Temps acquisition minutes	Flue temp °F	Room temp °F	Tunnel dry bulb °F	Catalyst up °F	scale lbs	Right °F	Back °F	bottom °F	Top °F	Left °F
1	73,86	72,21	73,71	79,54	2,97	75,62	75,19	75,71	75,44	75,72
2	81,95	72,16	74,02	89,24	2,87	75,65	75,54	75,77	75,49	75,81
3	104,43	72,28	75,83	127,66	2,79	75,89	75,84	76,23	75,66	76,59
4	186,14	72,24	83,03	218,75	2,67	76,52	76,42	77,31	76,43	79,44
5	168,06	72,19	75,72	238,82	2,67	78,62	78,13	79,50	78,28	88,53
6	177,74	72,12	75,80	294,91	2,57	82,19	80,39	82,37	80,61	102,50
7	223,01	72,14	77,08	412,74	2,57	86,75	82,91	85,19	83,58	118,27
8	263,07	72,37	78,36	489,42	2,37	93,09	85,92	87,93	87,09	142,76
9	282,88	72,45	78,90	526,47	2,37	99,61	89,23	90,73	91,54	168,69
10	306,27	72,17	79,70	550,34	2,17	106,11	92,77	93,87	96,66	191,38
11	360,26	72,37	82,39	694,05	2,07	114,56	97,25	97,63	102,78	212,26
12	401,37	72,23	83,86	766,30	1,87	128,62	104,69	102,17	109,63	230,51
13	424,69	72,38	85,22	787,42	1,67	148,05	114,57	107,54	116,98	249,61
14	438,62	72,38	86,38	808,85	1,57	169,62	125,76	113,65	124,32	268,11
15	437,56	72,42	86,10	781,21	1,37	190,90	137,59	120,51	130,94	285,32
16	448,13	72,54	87,58	823,57	1,37	210,89	150,04	127,76	137,43	301,47
17	461,61	72,53	88,06	841,86	1,07	231,21	162,38	135,12	143,63	317,22
18	478,22	72,69	120,60	587,29	3,97	250,51	180,11	142,89	144,47	334,08
19	350,30	72,57	99,29	461,45	8,07	271,62	193,61	151,12	145,82	351,42
20	335,05	72,51	87,55	500,51	7,99	286,48	197,54	158,13	151,76	362,03
21	316,56	72,53	84,46	480,29	7,97	294,37	197,57	163,96	157,43	363,87
22	306,79	72,61	84,01	474,62	7,87	299,63	196,85	168,99	164,23	362,41
23	316,45	72,63	84,00	529,43	7,77	305,33	196,67	173,60	171,82	358,35
24	351,43	72,57	84,75	609,97	7,67	309,45	198,29	177,51	179,31	353,78
25	378,77	72,54	85,72	667,26	7,48	311,89	201,59	180,64	186,12	349,00
26	390,13	72,60	86,18	680,65	7,37	314,75	206,55	183,25	192,55	344,53
27	382,42	72,57	86,58	649,20	7,27	317,80	212,84	185,74	199,17	340,05
28	370,98	72,74	86,39	626,00	7,17	320,56	220,04	188,37	205,69	336,69
29	387,14	72,60	86,40	674,65	7,07	323,63	227,78	191,04	212,16	333,38
30	400,01	72,60	86,54	694,74	6,96	327,21	235,73	193,77	218,53	330,57
31	407,63	72,78	87,54	700,98	6,87	331,89	243,68	196,69	225,29	328,53
32	404,90	72,86	88,21	697,70	6,67	337,53	251,87	199,77	231,87	326,88
33	396,72	72,99	87,94	682,98	6,57	344,18	259,61	202,92	238,71	325,42
34	389,76	72,78	87,48	681,19	6,47	350,60	265,39	206,11	244,91	324,86
35	389,38	73,06	87,86	675,19	6,37	356,32	271,05	209,33	250,56	324,21
36	388,49	72,86	87,16	670,24	6,37	361,33	274,18	212,49	255,75	324,80
37	396,01	73,04	87,32	694,69	6,17	366,99	277,37	215,96	260,91	325,73
38	403,24	73,20	88,97	707,40	6,07	373,62	278,73	219,50	265,82	326,86
39	399,88	73,25	89,09	678,96	6,06	380,32	280,42	223,04	270,24	328,03
40	395,49	73,22	88,55	660,79	5,97	385,72	281,69	226,55	274,42	328,90
41	405,27	73,19	88,83	689,10	5,77	390,01	283,81	230,28	278,76	329,20
42	435,49	73,21	90,48	776,27	5,67	394,48	286,79	234,11	283,65	330,08
43	475,36	73,19	92,13	862,83	5,57	399,76	289,98	238,01	288,35	331,48
44	478,29	73,18	92,39	836,15	5,47	405,70	292,77	242,03	293,56	335,90
45	461,82	73,24	91,65	786,14	5,37	411,12	295,71	246,36	299,99	341,83
46	457,80	73,38	93,00	817,85	5,17	416,96	299,16	251,20	306,01	346,74
47	477,18	73,56	94,36	867,60	5,07	422,86	302,76	256,24	312,41	350,92
48	473,72	73,62	93,10	853,50	4,97	429,17	304,64	261,51	318,73	354,56
49	463,94	73,70	93,01	830,56	4,87	437,31	305,07	266,95	324,25	357,90
50	456,42	73,76	92,61	815,61	4,77	446,44	306,23	272,64	330,43	361,20
51	453,55	73,80	92,53	813,97	4,67	455,35	305,94	278,54	335,90	364,65
52	450,86	73,76	92,65	807,68	4,57	465,04	305,21	284,73	341,16	368,97
53	452,26	73,72	92,74	813,67	4,47	473,67	303,93	291,16	345,82	373,83
54	457,47	73,79	93,49	829,95	4,37	481,64	302,99	297,55	350,08	379,28
55	465,24	73,75	93,06	842,96	4,27	487,91	302,07	303,76	354,05	385,38
56	467,63	73,88	93,91	845,88	4,17	494,87	301,75	309,89	357,50	391,56
57	471,95	73,75	93,78	856,25	4,07	501,34	301,29	315,79	361,35	395,96
58	473,62	73,73	94,31	855,82	3,97	508,42	303,96	322,01	365,34	399,96
59	474,44	73,78	94,27	860,55	3,87	515,35	305,23	327,97	368,79	403,48
60	482,10	73,91	93,50	882,50	3,77	521,80	307,49	333,88	372,55	407,04
61	491,40	74,02	95,69	898,62	3,67	527,92	309,76	339,90	375,81	410,30
62	495,29	73,89	94,87	899,87	3,48	533,64	312,46	345,68	379,94	415,56
63	492,56	73,86	95,62	890,43	3,47	539,45	315,40	351,35	383,38	421,37
64	487,64	73,92	95,06	882,97	3,29	544,77	317,45	356,83	387,14	427,93
65	488,25	73,81	94,32	889,84	3,17	549,39	317,59	361,82	390,98	433,98
66	489,51	73,88	95,10	894,18	3,07	554,69	320,50	367,20	394,89	441,53
67	492,51	74,12	96,95	910,89	2,97	561,44	324,08	372,71	398,11	448,84
68	501,44	74,39	96,10	925,03	2,87	566,19	326,26	378,06	401,37	457,09
69	504,49	74,19	94,90	926,42	2,77	569,77	326,78	383,03	404,63	465,05
70	505,11	74,23	96,40	925,82	2,67	575,85	329,13	388,42	408,32	474,62
71	507,92	74,25	96,23	937,80	2,57	580,40	330,46	393,86	411,26	483,90
72	510,25	74,45	97,70	937,05	2,38	586,74	333,63	399,48	415,26	492,24
73	512,00	74,61	97,56	939,41	2,37	591,54	335,43	404,97	418,73	500,64
74	514,74	74,53	98,01	941,31	2,27	594,95	336,23	410,03	421,88	508,93
75	514,66	74,81	97,47	938,26	2,07	601,86	338,46	415,21	426,40	517,18
76	511,54	74,84	98,14	927,63	2,07	605,88	339,69	420,12	430,53	525,02
77	512,09	74,96	97,61	917,03	1,97	611,99	342,34	424,89	434,58	530,98
78	506,47	75,03	97,85	904,25	1,87	617,21	344,92	429,20	438,00	537,33
79	502,82	75,18	98,04	894,50	1,77	621,84	347,87	433,38	442,01	543,15
80	493,39	75,09	97,76	876,82	1,67	626,69	349,62	437,62	445,32	549,76
81	478,70	74,91	95,77	847,88	1,67	631,56	351,00	441,63	448,22	555,47
82	466,14	74,96	95,94	822,74	1,57	633,53	352,36	445,26	449,72	559,52
83	452,41	75,01	94,46	793,18	1,57	634,93	352,15	448,86	451,41	562,05
84	439,39	75,29	93,87	773,68	1,47	638,23	352,62	452,68	452,53	563,77
85	429,81	75,34	94,30	758,30	1,47	639,18	352,39	456,54	451,79	566,33
86	421,87	75,34	94,28	745,01	1,47	641,27	351,69	460,54	451,30	567,85
87	415,77	75,18	93,22	729,39	1,37	641,64	350,65	464,65	449,87	569,48
88	410,37	75,00	93,16	717,80	1,37	640,52	349,28	468,78	447,40	571,38
89	406,06	75,25	92,68	711,83	1,37	640,45	348,33	472,62	445,06	572,77
90	400,35	75,43	92,40	700,36	1,27	639,02	346,59	475,92	442,59	572,45

91	395,44	75,51	92,66	693,02	1,27	636,34	345,86	478,67	439,61	572,25
92	389,52	75,44	92,33	683,81	1,27	634,54	345,39	481,24	436,67	571,65
93	359,60	75,70	115,90	433,36	5,87	631,61	350,23	484,34	432,05	570,70
94	321,09	75,60	102,62	459,44	8,47	627,51	350,24	487,65	426,71	569,23
95	327,39	75,62	93,54	543,53	8,48	620,18	342,89	490,41	421,68	566,58
96	348,30	75,53	93,44	628,36	8,28	610,48	336,77	492,31	416,94	561,37
97	363,26	75,49	92,48	692,53	8,18	598,02	334,72	493,24	411,71	553,82
98	368,96	75,59	93,03	688,09	8,18	588,37	333,76	493,57	407,11	546,47
99	355,38	75,78	91,81	641,05	8,08	578,62	334,39	493,13	402,70	538,30
100	400,13	75,71	93,02	813,68	7,92	568,44	337,29	492,19	399,08	529,99
101	460,82	75,65	95,38	919,60	7,77	559,63	341,74	490,88	396,15	522,32
102	492,31	75,75	97,95	970,67	7,58	550,70	348,96	489,06	394,05	515,64
103	512,85	75,75	98,58	999,02	7,48	543,52	356,42	486,99	393,63	510,44
104	520,50	75,74	99,66	997,33	7,30	537,58	363,42	484,78	395,03	505,19
105	527,39	75,80	100,88	1009,88	7,17	531,44	370,16	482,40	396,68	500,77
106	527,92	75,86	100,42	1006,92	7,07	528,33	375,99	480,00	400,22	497,00
107	528,20	75,94	101,24	988,64	6,88	524,41	380,92	477,41	403,79	494,57
108	530,10	76,14	101,72	984,30	6,78	521,16	384,20	474,92	408,09	492,70
109	522,54	76,06	100,36	951,67	6,68	518,63	385,85	472,39	412,97	491,45
110	514,93	76,21	99,83	936,99	6,47	515,52	388,09	469,84	418,24	490,08
111	514,00	76,26	99,77	934,34	6,37	512,86	390,06	467,41	423,46	489,25
112	515,11	76,31	100,81	940,61	6,27	508,74	392,29	465,02	427,84	488,86
113	516,73	76,32	100,44	955,52	6,18	506,12	393,27	462,74	432,37	488,36
114	523,17	76,58	101,06	980,36	5,98	504,99	393,06	460,73	436,50	488,63
115	529,34	76,53	100,45	1001,60	5,88	503,34	394,33	458,74	440,68	489,34
116	535,15	76,79	101,34	1020,88	5,77	501,83	395,68	456,93	444,60	490,43
117	543,66	76,71	101,74	1046,22	5,57	500,61	396,85	455,25	448,29	492,44
118	551,99	76,87	103,02	1053,32	5,38	500,26	399,15	453,82	452,78	494,84
119	557,85	76,82	103,62	1052,34	5,28	501,48	401,77	452,53	457,65	497,82
120	560,43	76,73	102,26	1064,18	5,17	503,59	403,70	451,38	462,84	501,73
121	563,89	76,69	102,88	1068,51	4,97	505,69	406,44	450,28	468,03	506,06
122	564,39	76,84	102,65	1068,34	4,87	510,02	408,49	449,31	473,52	511,14
123	565,10	76,62	101,98	1073,04	4,98	513,27	410,19	448,46	479,13	516,70
124	465,33	76,45	95,25	920,47	4,65	517,82	416,43	447,77	507,26	521,90
125	433,97	76,79	93,69	942,64	4,58	523,06	420,49	447,32	524,92	527,27
126	417,37	76,83	93,30	942,96	4,47	528,10	424,23	446,84	537,73	531,61
127	407,14	76,93	94,95	939,20	4,37	531,91	427,11	446,41	546,85	534,94
128	397,49	76,96	94,33	924,07	4,27	536,30	428,00	445,99	554,22	537,59
129	389,40	76,88	93,16	915,58	4,27	540,24	427,12	445,58	559,11	539,77
130	384,25	76,79	92,79	921,91	4,17	541,93	425,73	445,13	563,10	542,17
131	382,71	76,90	93,65	927,48	4,08	544,57	425,77	444,53	565,53	543,34
132	383,16	77,03	93,24	928,29	3,98	546,55	425,38	443,97	567,80	545,13
133	381,54	76,84	92,16	926,06	3,88	549,44	424,05	443,39	569,87	546,91
134	381,42	76,93	92,47	927,08	3,77	552,20	423,71	442,69	571,28	548,42
135	379,11	76,97	91,81	924,13	3,77	555,03	422,60	442,03	572,19	550,17
136	377,44	77,05	92,12	919,81	3,67	557,91	423,12	441,28	573,73	551,74
137	374,10	76,97	92,17	914,38	3,57	560,15	422,91	440,42	574,28	553,23
138	371,30	77,11	93,30	912,29	3,47	561,63	423,86	439,53	574,80	554,73
139	369,01	76,99	93,04	909,66	3,38	563,48	423,76	438,59	575,21	555,98
140	366,97	77,17	92,78	902,84	3,38	565,21	423,44	437,68	575,05	557,25
141	364,57	77,35	92,96	899,68	3,28	565,68	424,77	436,78	574,06	558,67
142	363,21	77,26	91,49	900,99	3,17	568,54	423,24	435,89	573,49	560,00
143	363,10	77,06	91,31	909,36	3,17	569,09	423,66	434,98	574,04	561,25
144	364,14	77,15	92,44	915,44	3,07	568,88	425,09	433,97	574,36	562,81
145	364,07	77,02	91,88	908,64	2,97	570,24	425,10	433,05	575,22	564,59
146	363,38	77,21	91,24	904,62	2,87	572,05	424,55	432,13	576,20	566,35
147	361,49	77,02	90,59	896,24	2,87	572,27	422,37	431,16	576,24	569,01
148	358,97	77,12	89,84	886,25	2,77	573,17	420,73	430,16	576,08	571,10
149	356,52	77,14	90,28	881,03	2,69	574,04	421,79	429,11	575,98	572,14
150	352,01	77,39	90,52	861,56	2,68	576,18	420,08	428,05	575,19	574,39
151	346,45	77,46	90,41	845,30	2,60	577,89	421,67	427,17	574,44	575,19
152	341,03	77,46	89,50	829,50	2,58	578,72	418,99	426,11	572,99	577,09
153	335,38	77,37	89,49	825,01	2,47	579,64	420,49	425,17	572,20	578,13
154	330,03	77,07	88,92	816,60	2,47	580,16	419,56	424,16	569,50	579,68
155	324,29	76,89	89,86	797,16	2,47	581,40	420,10	423,20	566,55	580,64
156	319,08	77,39	89,84	783,52	2,41	582,59	419,06	422,35	562,80	581,89
157	314,15	77,25	89,37	774,38	2,37	581,88	414,32	421,42	559,25	584,48
158	309,41	77,29	89,23	765,25	2,37	582,26	410,82	420,57	554,03	585,63
159	305,39	77,45	89,70	753,08	2,37	582,97	407,99	419,84	547,67	586,00
160	302,53	77,42	89,54	749,48	2,37	582,97	403,70	419,12	540,36	586,91
161	300,67	77,49	88,35	752,66	2,27	582,97	401,36	418,40	533,50	586,59
162	299,54	77,66	89,38	751,50	2,27	583,15	400,14	417,86	525,72	586,07
163	297,87	77,82	91,06	748,32	2,27	582,35	398,39	417,45	517,99	586,11
164	296,41	77,70	90,49	748,67	2,27	581,71	395,62	417,11	510,48	586,51
165	295,65	77,73	90,57	747,98	2,27	581,49	393,34	416,86	502,94	586,65
166	293,96	77,86	88,44	746,33	2,17	579,71	387,72	416,72	495,48	587,92
167	292,38	77,68	89,75	743,43	2,17	579,22	386,66	416,60	488,79	587,57
168	290,96	78,01	89,84	738,97	2,17	579,04	384,31	416,59	482,26	588,07
169	289,46	78,08	89,85	733,80	2,17	579,23	382,89	416,61	475,97	588,15
170	287,24	77,87	89,11	726,61	2,17	578,15	378,42	416,76	470,09	589,50
171	284,46	78,07	88,88	717,05	2,17	578,46	376,46	416,92	464,99	589,96
172	282,81	78,02	88,76	706,38	2,17	579,04	375,78	417,14	460,22	589,86
173	280,12	77,89	89,10	696,91	2,07	579,41	373,94	417,39	455,38	590,55
174	277,20	77,61	88,57	691,94	2,07	579,11	372,11	417,61	451,62	591,87
175	275,94	77,79	89,03	685,47	2,07	579,90	371,30	417,90	447,51	592,21
176	274,01	77,89	88,85	682,29	2,04	580,01	371,60	418,20	444,04	592,55
177	272,39	78,03	89,52	679,45	2,04	581,52	369,80	418,61	440,06	593,01
178	270,46	77,63	87,99	674,78	1,98	581,15	365,81	418,87	436,39	594,92
179	268,91	77,79	87,86	669,94	1,98	582,07	363,87	419,22	433,26	594,66
180	267,19	77,84	88,30	665,68	1,98	583,96	365,07	419,62	430,09	594,31
181	266,10	78,08	89,77	662,67	1,98	585,41	365,86	420,02	426,66	594,20
182	264,98	78,09	88,33	662,83	1,98	586,23	364,30	420,53	423,78	594,40
183	264,59	78,08	88,70	663,14	1,98	586,69	363,61	420,94	420,93	594,68

184	263,11	78,03	88,26	660,95	1,87	587,30	360,90	421,48	418,19	595,37
185	261,91	77,93	88,28	659,75	1,89	587,79	359,29	421,93	415,57	595,69
186	261,54	78,06	87,89	658,81	1,87	588,23	357,71	422,37	413,14	595,50
187	260,80	78,23	88,00	653,54	1,87	589,06	358,24	422,79	410,70	594,75
188	259,25	78,18	88,41	650,14	1,87	589,41	357,97	423,21	408,49	594,69
189	258,93	78,24	88,15	648,70	1,87	589,89	357,86	423,50	406,26	594,71
190	257,98	78,16	87,68	648,39	1,87	590,36	355,07	423,86	404,33	595,12
191	257,07	78,26	87,94	649,21	1,87	590,90	354,21	424,31	402,22	595,14
192	256,99	78,02	87,78	650,01	1,81	591,35	352,93	424,75	400,65	594,64
193	257,06	78,14	87,85	648,96	1,77	591,89	352,70	425,16	398,70	593,99
194	256,42	78,29	88,75	647,76	1,77	592,96	352,35	425,64	396,89	593,64
195	255,48	78,41	88,40	647,72	1,77	592,93	349,55	426,15	395,34	594,11
196	255,27	78,39	88,56	648,57	1,77	591,60	349,49	426,59	393,56	593,91
197	255,53	78,53	87,88	646,76	1,77	592,57	348,39	427,01	392,07	593,18
198	255,04	78,60	87,97	645,89	1,67	593,41	347,56	427,45	390,33	593,01
199	254,57	78,66	88,45	646,15	1,67	592,63	346,02	427,92	388,98	592,93
200	255,19	78,78	88,63	649,56	1,67	591,98	346,19	428,25	387,27	593,01
201	338,69	78,72	97,62	564,71	1,67	591,09	344,82	428,67	384,23	593,40
202	278,71	78,75	88,66	574,86	1,67	589,90	344,17	429,10	380,90	591,77

APPENDIX 2: Proportionality results

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	100,03	100,03	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
17,631	539,0	540,0			0,180	0,176	0	0,2732026
17,377	538,9	540,1	102,05	102,68	0,180	0,176	1	0,2699891
17,831	539,0	540,2	99,40	99,93	0,181	0,176	2	0,2771211
18,522	539,0	540,3	95,71	96,22	0,181	0,176	3	0,287843
17,323	539,0	540,4	102,33	103,08	0,181	0,176	4	0,26904
17,627	539,0	540,6	100,51	100,73	0,181	0,176	5	0,2741398
18,352	539,1	540,7	96,42	96,80	0,181	0,176	6	0,2855199
17,381	539,1	540,9	101,67	102,16	0,181	0,176	7	0,2705441
16,927	539,1	540,9	104,29	104,64	0,181	0,176	8	0,263637
16,989	539,1	541,1	103,92	104,42	0,181	0,176	9	0,2646021
18,012	539,1	541,2	97,99	98,54	0,181	0,176	10	0,2804634
17,975	539,2	541,4	98,17	98,64	0,181	0,176	11	0,2798877
17,657	539,1	541,5	100,02	100,46	0,181	0,176	12	0,2748922
18,472	539,1	541,6	95,74	96,26	0,181	0,176	13	0,2874774
17,623	539,1	541,7	100,34	100,52	0,181	0,176	14	0,2742553
17,754	539,1	541,8	99,67	99,82	0,181	0,176	15	0,2763782
17,484	539,2	541,9	101,26	101,54	0,181	0,176	16	0,2721432
17,871	539,2	542,1	98,97	99,09	0,181	0,176	17	0,2782016
17,565	539,2	542,2	100,63	100,70	0,181	0,176	18	0,2734195
18,019	539,3	542,3	98,30	98,69	0,181	0,176	19	0,2802523
17,555	539,3	542,4	100,85	100,85	0,181	0,176	20	0,2732035
17,014	539,3	542,5	104,24	104,22	0,181	0,176	21	0,2646104
17,802	539,3	542,7	99,55	99,69	0,181	0,176	22	0,2767544
17,451	539,5	542,9	101,67	101,77	0,181	0,176	23	0,2713165
17,336	539,5	542,9	102,17	102,27	0,181	0,176	24	0,2696646
18,030	539,5	543,0	98,25	98,22	0,181	0,176	25	0,2805607
17,948	539,5	543,1	98,49	98,75	0,181	0,176	26	0,2793363
17,557	539,5	543,1	101,05	101,26	0,181	0,176	27	0,2728257
18,009	539,5	543,3	98,57	98,74	0,181	0,176	28	0,279887
18,389	539,5	543,4	96,38	96,58	0,181	0,176	29	0,285878
17,293	539,5	543,4	102,58	102,55	0,181	0,176	30	0,2690356
17,534	539,5	543,4	100,88	101,19	0,181	0,176	31	0,2728258
17,073	539,5	543,5	103,64	103,88	0,181	0,176	32	0,265683
18,057	539,5	543,5	98,22	98,45	0,181	0,176	33	0,2806197
17,507	539,5	543,6	101,53	101,57	0,181	0,176	34	0,2718837
17,467	539,6	543,7	101,28	101,53	0,181	0,175	35	0,2715782
17,970	539,6	543,7	98,70	98,59	0,181	0,175	36	0,2793368
17,817	539,5	543,7	99,60	99,40	0,181	0,175	37	0,2771206
17,554	539,5	543,7	100,96	101,86	0,181	0,176	38	0,272826
18,210	539,5	543,8	97,43	97,64	0,181	0,176	39	0,2828087
18,456	539,6	543,9	96,02	96,16	0,181	0,175	40	0,2867729
17,522	539,7	544,0	101,35	101,10	0,181	0,175	41	0,2722603
17,526	539,7	544,1	101,61	101,40	0,181	0,175	42	0,2718834
18,303	539,8	544,2	97,22	97,01	0,181	0,175	43	0,2839669
18,511	539,7	544,3	95,99	95,74	0,181	0,175	44	0,2874936
18,484	539,7	544,4	95,88	95,80	0,181	0,175	45	0,287135
18,071	539,6	544,4	98,25	98,28	0,181	0,175	46	0,2806214
17,511	539,6	544,4	101,33	101,13	0,181	0,175	47	0,2723352
18,484	539,6	544,5	95,94	95,85	0,181	0,175	48	0,2874925
17,029	539,6	544,4	103,88	104,02	0,181	0,176	49	0,2650006
17,262	539,6	544,4	102,77	102,50	0,181	0,175	50	0,2682884
18,006	539,7	544,5	98,86	98,80	0,181	0,175	51	0,2793404
18,001	539,7	544,6	98,77	98,64	0,181	0,175	52	0,2798901
17,293	539,7	544,5	102,36	102,23	0,181	0,175	53	0,2690374
18,016	539,7	544,6	98,24	98,17	0,181	0,175	54	0,2802352
17,297	539,7	544,6	102,25	102,37	0,181	0,175	55	0,2690366

18,224	539,8	544,6	97,03	96,91	0,181	0,175	56	0,2837161
17,434	539,8	544,6	101,42	101,47	0,181	0,175	57	0,2713163
17,956	539,8	544,6	98,51	98,47	0,181	0,175	58	0,2793685
17,692	539,9	544,7	99,73	99,75	0,181	0,175	59	0,2754508
17,489	539,9	544,7	101,05	100,75	0,181	0,175	60	0,2722616
18,358	539,9	544,7	96,39	96,07	0,181	0,175	61	0,285512
17,807	539,9	544,7	99,41	99,20	0,181	0,175	62	0,2771246
18,136	539,9	544,7	97,43	97,51	0,181	0,175	63	0,2824458
17,095	540,0	544,8	103,30	103,18	0,181	0,175	64	0,2662386
17,453	540,0	544,8	101,01	101,11	0,181	0,175	65	0,2718864
17,620	539,9	544,8	100,49	100,22	0,181	0,175	66	0,2741385
17,974	539,9	544,8	98,10	98,24	0,181	0,175	67	0,2798885
17,531	539,9	544,8	100,55	100,68	0,181	0,175	68	0,273203
17,236	539,9	544,8	102,23	102,05	0,181	0,175	69	0,2686339
17,465	539,9	544,8	100,95	101,00	0,181	0,175	70	0,2722614
17,329	539,8	544,8	101,90	101,42	0,181	0,175	71	0,2699903
18,318	539,8	544,7	96,24	96,24	0,181	0,175	72	0,2855211
17,626	539,8	544,7	99,92	100,12	0,181	0,176	73	0,2748889
17,147	539,7	544,6	102,64	102,60	0,181	0,175	74	0,2673959
17,103	539,7	544,6	103,38	103,12	0,181	0,175	75	0,2663505
17,568	539,7	544,6	100,55	100,36	0,181	0,175	76	0,2735611
17,466	539,7	544,7	100,94	100,87	0,181	0,175	77	0,2722614
18,290	539,8	544,7	96,51	96,31	0,181	0,175	78	0,2851852
18,018	539,8	544,7	98,09	97,90	0,181	0,175	79	0,2806153
17,591	539,9	544,8	100,70	100,79	0,181	0,175	80	0,2735378
17,957	539,9	544,9	98,57	98,37	0,181	0,175	81	0,2793373
17,249	539,9	545,0	102,82	102,57	0,181	0,175	82	0,2682653
17,507	539,9	545,0	100,85	100,90	0,181	0,175	83	0,272584
17,600	539,9	545,1	100,30	100,31	0,181	0,175	84	0,2741406
17,775	539,9	545,1	98,95	98,61	0,181	0,175	85	0,2772744
17,453	539,9	545,1	100,96	100,60	0,181	0,175	86	0,2722615
17,078	539,9	545,1	102,93	103,09	0,181	0,175	87	0,2663252
17,311	539,9	545,1	101,87	101,57	0,181	0,175	88	0,2699908
17,398	539,9	545,1	101,22	101,05	0,181	0,175	89	0,2713176
17,456	539,9	545,1	100,95	100,83	0,181	0,175	90	0,2722619
17,599	539,9	545,0	100,05	99,98	0,181	0,175	91	0,2745468
17,347	539,8	545,0	101,52	101,46	0,181	0,175	92	0,2705579
17,720	539,8	545,0	99,37	99,33	0,181	0,175	93	0,2763788
18,115	539,8	545,0	97,38	97,16	0,181	0,175	94	0,2824326
16,975	539,8	545,0	103,78	103,57	0,181	0,175	95	0,2646108
17,501	539,8	544,9	100,59	100,66	0,181	0,175	96	0,2728271
17,557	539,7	544,8	100,23	100,35	0,181	0,175	97	0,2738132
17,396	539,7	544,7	101,21	101,10	0,181	0,175	98	0,2713179
18,187	539,7	544,7	96,95	96,71	0,181	0,175	99	0,2837133
18,052	539,6	544,7	97,54	97,61	0,181	0,175	100	0,2815335
17,050	539,6	544,7	103,39	103,29	0,181	0,175	101	0,2659659
17,578	539,6	544,6	100,11	100,00	0,181	0,175	102	0,274151
17,432	539,5	544,6	101,14	101,08	0,181	0,175	103	0,2718918
18,109	539,5	544,5	97,20	97,29	0,181	0,175	104	0,2824432
18,170	539,6	544,5	96,90	96,71	0,181	0,175	105	0,2834578
17,758	539,6	544,7	99,22	99,03	0,181	0,175	106	0,2769097
18,036	539,7	544,7	97,65	97,56	0,181	0,175	107	0,2811718
17,392	539,6	544,7	101,27	101,31	0,181	0,175	108	0,2713165
17,384	539,7	544,6	101,23	101,16	0,181	0,175	109	0,2712674
17,535	539,7	544,7	100,35	100,18	0,181	0,175	110	0,2735329
17,308	539,7	544,6	101,63	101,77	0,181	0,175	111	0,2699842
17,346	539,7	544,7	101,55	101,49	0,181	0,175	112	0,2705571
17,055	539,7	544,7	103,74	103,30	0,181	0,175	113	0,2660103
18,104	539,7	544,7	97,12	97,04	0,181	0,175	114	0,282443
17,455	539,8	544,7	100,93	100,84	0,181	0,175	115	0,2722615
18,042	539,8	544,8	97,39	97,37	0,181	0,175	116	0,281526

18,012	539,8	544,8	97,72	97,64	0,181	0,175	117	0,280862
17,525	539,9	544,9	100,54	100,37	0,181	0,175	118	0,2732018
18,138	539,9	544,8	97,16	97,00	0,181	0,175	119	0,2828083
17,855	539,8	544,8	98,63	98,46	0,181	0,175	120	0,2784148
17,346	539,8	544,8	101,45	100,76	0,181	0,175	121	0,2705562
17,429	539,8	544,8	101,09	101,32	0,181	0,175	122	0,2718822
17,432	539,8	544,7	101,05	101,02	0,181	0,176	123	0,2719075
17,942	539,8	544,7	97,98	97,95	0,181	0,175	124	0,2798875
18,128	539,8	544,7	97,16	97,01	0,181	0,175	125	0,2828079
18,129	539,9	544,8	96,89	96,93	0,181	0,175	126	0,2828082
17,431	539,9	544,9	101,02	100,89	0,181	0,175	127	0,2718716
17,578	539,9	544,9	99,76	100,29	0,180	0,175	128	0,2741471
18,272	539,9	544,9	96,41	96,32	0,180	0,175	129	0,2849786
17,082	539,9	544,9	103,05	103,13	0,181	0,175	130	0,2663532
18,256	539,9	544,9	96,50	96,45	0,181	0,175	131	0,2846185
17,604	539,9	544,9	100,19	100,10	0,181	0,175	132	0,2744924
17,229	539,9	544,9	101,84	101,87	0,180	0,175	133	0,2686538
17,433	539,9	544,9	101,00	101,01	0,180	0,175	134	0,2718834
16,822	540,0	544,9	104,81	104,77	0,181	0,175	135	0,2623127
17,459	540,0	544,9	101,06	100,30	0,181	0,175	136	0,2722606
17,225	540,0	544,9	102,19	102,22	0,181	0,175	137	0,268654
17,495	540,0	545,0	100,75	100,42	0,181	0,175	138	0,2728252
17,635	540,0	544,9	99,92	99,88	0,181	0,175	139	0,2749234
18,139	539,9	544,9	97,29	97,15	0,181	0,175	140	0,28281
17,398	540,0	544,9	101,17	101,09	0,181	0,175	141	0,2713163
17,519	539,9	544,9	100,65	100,46	0,181	0,175	142	0,2732019
16,784	539,9	544,9	105,20	104,70	0,181	0,175	143	0,261689
17,084	539,9	544,9	103,19	102,98	0,181	0,175	144	0,2663499
17,403	540,0	544,9	101,32	101,32	0,181	0,175	145	0,2713157
17,121	540,0	544,9	102,88	102,97	0,181	0,175	146	0,2669282
17,948	540,1	545,0	98,11	98,06	0,181	0,175	147	0,2798813
17,950	540,2	545,0	98,16	98,11	0,181	0,175	148	0,2798895
17,124	540,2	545,1	103,14	102,79	0,181	0,175	149	0,2669276
17,552	540,2	545,0	100,43	100,10	0,181	0,175	150	0,2736047
17,610	540,2	545,0	99,97	100,10	0,181	0,175	151	0,2745116
18,114	540,1	545,0	97,36	97,26	0,181	0,175	152	0,282445
17,344	540,1	545,0	101,46	101,35	0,181	0,175	153	0,2705582
18,185	540,1	544,9	96,86	96,89	0,181	0,175	154	0,2836626
17,256	540,0	544,9	102,04	102,00	0,181	0,175	155	0,2690344
17,918	540,1	544,9	98,37	97,84	0,181	0,175	156	0,2793363
17,519	540,0	544,8	100,37	100,51	0,181	0,175	157	0,2732019
17,547	540,1	544,9	100,42	100,36	0,181	0,175	158	0,2736067
18,131	540,1	544,9	97,38	97,24	0,181	0,175	159	0,2828093

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,48	100,39	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
17,055	535,7	537,1			0,183	0,179	0	0,2659677
17,375	535,7	537,2	102,18	103,41	0,183	0,179	1	0,2722652
17,373	535,7	537,4	102,00	103,41	0,183	0,178	2	0,2722646
17,038	535,7	537,4	104,15	105,75	0,183	0,179	3	0,2669325
17,977	535,8	537,6	99,01	100,31	0,184	0,179	4	0,2815209
16,736	535,8	537,7	106,11	107,66	0,184	0,179	5	0,2622838
17,350	535,9	538,0	101,96	103,52	0,183	0,179	6	0,272264
17,880	536,0	538,1	98,99	100,38	0,183	0,179	7	0,2806002
17,940	536,0	538,3	98,75	100,13	0,184	0,179	8	0,2815334
18,167	536,1	538,5	97,50	98,81	0,184	0,179	9	0,2849823
17,786	536,3	538,7	99,61	100,99	0,183	0,179	10	0,2789718
17,910	536,5	539,0	99,01	100,50	0,183	0,179	11	0,2806433
17,887	536,7	539,3	99,28	100,41	0,183	0,178	12	0,280258
18,055	536,8	539,5	98,45	99,56	0,184	0,178	13	0,2828123
17,663	536,6	539,5	100,40	101,98	0,183	0,179	14	0,276754
17,865	536,4	539,5	99,49	100,57	0,183	0,179	15	0,2798907
17,452	536,3	539,6	101,75	102,73	0,184	0,178	16	0,2735967
17,968	536,4	539,7	98,72	99,87	0,183	0,178	17	0,2815387
18,046	536,5	539,9	98,44	99,32	0,183	0,178	18	0,2828123
17,812	536,6	540,1	99,36	100,51	0,183	0,178	19	0,2793079
17,746	536,7	540,2	99,91	101,16	0,183	0,178	20	0,2780504
18,181	536,6	540,3	97,64	98,69	0,183	0,178	21	0,2849832
17,820	536,6	540,4	99,50	100,59	0,183	0,178	22	0,2793409
18,110	536,7	540,5	97,97	98,92	0,183	0,178	23	0,2837175
17,910	536,7	540,6	99,15	99,95	0,183	0,178	24	0,2806242
17,492	536,8	540,7	101,54	102,51	0,184	0,178	25	0,2741438
17,403	536,8	540,8	102,06	103,24	0,184	0,178	26	0,2726975
17,172	536,8	540,9	103,26	104,41	0,183	0,178	27	0,269037
16,993	536,8	540,9	104,35	105,47	0,183	0,178	28	0,2663544
17,854	536,8	541,0	99,50	100,53	0,183	0,178	29	0,2797241
17,047	536,8	541,0	104,44	105,27	0,184	0,178	30	0,2669316
17,736	536,7	541,1	100,29	100,93	0,184	0,178	31	0,2776808
17,901	536,8	541,2	99,19	100,52	0,183	0,178	32	0,2802586
16,957	536,8	541,3	104,82	105,68	0,183	0,178	33	0,2654211
17,842	536,9	541,4	99,60	100,56	0,183	0,178	34	0,2793404
17,099	537,0	541,5	103,98	104,66	0,183	0,178	35	0,2677004
18,056	537,0	541,5	98,49	99,35	0,183	0,177	36	0,2826026
17,341	536,9	541,5	102,56	103,53	0,183	0,178	37	0,2713613
18,055	536,9	541,5	98,75	99,45	0,184	0,178	38	0,2824494
18,064	536,9	541,6	98,68	99,56	0,184	0,178	39	0,2824494
17,908	536,9	541,6	99,84	100,54	0,184	0,178	40	0,2799002
17,684	537,0	541,7	100,90	101,84	0,184	0,178	41	0,2763789
17,876	537,0	541,7	99,80	100,76	0,183	0,178	42	0,2793412
18,188	537,0	541,8	98,06	99,20	0,183	0,178	43	0,2843787
17,894	537,1	541,8	99,44	100,26	0,183	0,178	44	0,2798918
18,162	537,1	541,9	98,07	99,08	0,183	0,178	45	0,2840815
17,884	537,1	541,9	99,36	100,32	0,183	0,178	46	0,2799452
17,645	537,2	542,0	100,95	101,89	0,183	0,178	47	0,2758939
17,863	537,2	542,0	99,71	100,59	0,183	0,178	48	0,2793394
18,253	537,2	542,1	97,52	98,24	0,183	0,177	49	0,2855255
17,827	537,2	542,1	99,61	100,95	0,183	0,178	50	0,2789224
18,075	537,1	542,1	98,43	99,32	0,183	0,178	51	0,282809
18,137	537,1	542,1	98,17	99,01	0,183	0,178	52	0,2837293
17,261	537,2	542,2	103,08	104,08	0,183	0,178	53	0,2699925
17,010	537,2	542,3	104,53	105,59	0,183	0,178	54	0,2661167
17,344	537,3	542,3	102,60	103,35	0,183	0,178	55	0,2713445

18,156	537,3	542,4	97,71	98,95	0,183	0,178	56	0,2840828
17,890	537,4	542,5	99,41	100,48	0,183	0,178	57	0,2798132
18,355	537,4	542,5	96,79	97,56	0,183	0,178	58	0,2873241
17,674	537,4	542,5	100,62	101,26	0,183	0,177	59	0,276756
18,098	537,5	542,6	98,27	98,98	0,184	0,177	60	0,2833576
17,052	537,6	542,7	104,14	104,80	0,183	0,177	61	0,2669383
17,893	537,5	542,7	99,21	100,03	0,183	0,177	62	0,2802527
18,062	537,6	542,8	98,27	99,21	0,183	0,178	63	0,2828135
17,836	537,6	542,8	99,63	100,43	0,183	0,178	64	0,2793421
18,145	537,6	542,9	97,95	98,89	0,183	0,178	65	0,2840801
17,773	537,6	542,9	99,89	100,53	0,183	0,178	66	0,2784211
17,158	537,7	543,0	103,51	104,72	0,183	0,178	67	0,2686596
17,327	537,6	543,0	102,45	103,33	0,183	0,178	68	0,2713245
17,901	537,6	543,0	99,09	99,76	0,183	0,177	69	0,2806359
17,767	537,7	543,0	99,92	100,52	0,183	0,177	70	0,2784212
18,049	537,6	543,0	98,27	99,08	0,183	0,177	71	0,2828801
17,918	537,8	543,2	98,80	99,70	0,183	0,177	72	0,2808555
17,429	537,9	543,2	101,78	102,30	0,183	0,177	73	0,2732065
17,924	537,8	543,2	98,87	99,70	0,183	0,177	74	0,2808999
17,531	537,8	543,3	101,15	101,86	0,183	0,177	75	0,2748094
18,288	537,8	543,2	96,69	97,56	0,183	0,177	76	0,2867824
18,179	537,8	543,3	97,55	98,15	0,183	0,177	77	0,2849843
17,794	537,9	543,4	99,48	100,39	0,183	0,177	78	0,278974
18,032	537,9	543,4	98,09	98,83	0,183	0,177	79	0,2827937
17,830	537,9	543,4	99,33	100,05	0,183	0,177	80	0,2795761
18,158	537,9	543,4	97,61	98,49	0,183	0,177	81	0,2846459
17,740	538,0	543,5	99,77	100,72	0,183	0,178	82	0,2781343
17,949	538,0	543,4	98,45	99,36	0,183	0,177	83	0,2814509
17,753	538,0	543,5	99,78	100,46	0,183	0,177	84	0,2784223
17,252	538,0	543,5	102,49	103,31	0,183	0,177	85	0,2705654
18,173	538,1	543,5	97,37	98,17	0,183	0,177	86	0,2849826
17,997	538,1	543,5	98,09	98,92	0,183	0,177	87	0,2824483
17,487	538,0	543,4	101,24	101,98	0,183	0,177	88	0,2743588
17,425	538,1	543,5	101,43	102,12	0,183	0,177	89	0,2734916
18,008	538,2	543,6	97,80	98,93	0,183	0,177	90	0,2828145
17,830	538,2	543,7	98,89	99,82	0,183	0,177	91	0,2799035
17,859	538,2	543,7	98,86	99,60	0,183	0,177	92	0,2803178
18,099	538,1	543,7	97,61	98,50	0,183	0,177	93	0,2839387
18,324	538,0	543,6	96,60	97,28	0,183	0,177	94	0,287498
17,864	538,0	543,6	98,75	99,68	0,183	0,177	95	0,2804002
18,047	538,1	543,7	97,81	98,55	0,183	0,177	96	0,2833585
18,291	538,2	543,7	96,41	97,27	0,183	0,177	97	0,2871407
17,121	538,1	543,7	103,25	103,75	0,183	0,177	98	0,2686592
17,587	538,2	543,8	100,47	101,24	0,183	0,177	99	0,2760392
17,999	538,2	543,8	98,26	99,00	0,183	0,177	100	0,2824515
18,099	538,1	543,7	97,62	98,89	0,183	0,178	101	0,2840825
17,984	538,1	543,6	98,22	99,02	0,183	0,178	102	0,2821796
17,098	538,1	543,7	103,35	104,12	0,183	0,177	103	0,2682705
18,225	538,1	543,7	97,06	97,96	0,183	0,177	104	0,2858854
17,415	538,1	543,7	101,15	101,80	0,183	0,177	105	0,2735842
17,317	538,1	543,7	101,96	102,73	0,183	0,177	106	0,2718895
17,705	538,3	543,8	99,43	100,30	0,183	0,177	107	0,2784217
18,179	538,4	543,9	96,91	97,69	0,183	0,177	108	0,2855269
18,036	538,4	544,0	97,89	98,50	0,183	0,177	109	0,2833596
18,195	538,5	544,1	96,79	97,72	0,183	0,177	110	0,2858856
17,643	538,5	544,1	99,81	100,62	0,183	0,177	111	0,2771279
18,153	538,4	544,1	97,08	98,04	0,183	0,177	112	0,2850112
17,789	538,3	544,0	99,16	99,83	0,183	0,177	113	0,2793709
17,324	538,3	543,9	101,87	102,90	0,183	0,177	114	0,2718871
18,203	538,2	543,8	96,98	97,92	0,183	0,178	115	0,2858207
18,155	538,2	543,8	97,26	97,90	0,183	0,177	116	0,2850735

18,026	538,2	543,8	97,75	98,47	0,183	0,177	117	0,2833557
17,359	538,4	543,9	101,41	102,22	0,183	0,177	118	0,2728313
17,108	538,4	544,0	102,84	103,56	0,183	0,177	119	0,2690418
18,090	538,4	544,0	97,06	97,92	0,183	0,177	120	0,2846064
17,775	538,4	544,1	99,05	99,85	0,183	0,177	121	0,2793422
18,050	538,4	544,1	97,50	98,32	0,183	0,177	122	0,2837198
17,841	538,3	544,0	98,63	99,48	0,183	0,177	123	0,2802806
17,047	538,3	544,0	103,63	104,43	0,183	0,177	124	0,2677017
18,221	538,2	543,9	96,80	97,56	0,183	0,177	125	0,286208
17,994	538,2	543,9	97,84	98,48	0,183	0,177	126	0,2827391
18,008	538,2	543,9	97,89	98,59	0,183	0,177	127	0,282839
18,184	538,2	543,9	97,05	97,47	0,183	0,177	128	0,2855257
17,491	538,2	543,8	100,65	101,41	0,183	0,177	129	0,2748926
17,842	538,3	543,9	98,84	99,63	0,183	0,177	130	0,2802764
18,107	538,3	543,9	97,13	98,14	0,183	0,177	131	0,2846227
18,389	538,3	543,8	95,77	96,48	0,183	0,177	132	0,2889227
18,228	538,3	543,9	96,70	97,60	0,183	0,177	133	0,2862628
17,690	538,4	543,9	99,89	100,51	0,183	0,177	134	0,2776622
18,177	538,4	543,9	97,04	97,75	0,183	0,177	135	0,285524
18,123	538,5	544,0	97,25	97,86	0,183	0,177	136	0,2846235
17,949	538,5	544,1	98,32	99,17	0,183	0,177	137	0,2817664
18,285	538,6	544,1	96,34	97,36	0,183	0,177	138	0,2871385
18,085	538,6	544,1	97,35	98,28	0,183	0,177	139	0,2840821
18,272	538,6	544,1	96,11	97,14	0,183	0,177	140	0,2871383
18,037	538,6	544,0	97,66	98,30	0,183	0,177	141	0,2833525
17,798	538,6	544,0	98,82	99,59	0,183	0,177	142	0,2798923
17,827	538,5	544,0	98,70	99,77	0,183	0,177	143	0,2802476
17,684	538,5	544,0	99,46	100,42	0,183	0,178	144	0,2780496
17,294	538,5	544,0	101,65	102,61	0,183	0,177	145	0,2718863
18,245	538,5	543,9	96,50	97,51	0,183	0,177	146	0,2867836
17,825	538,4	543,9	98,75	99,60	0,183	0,178	147	0,2802607
17,176	538,5	543,9	102,48	103,29	0,183	0,177	148	0,2699912
17,775	538,4	543,9	98,97	99,96	0,183	0,177	149	0,2793399

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	100,91	100,71	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
17,007	539,1	540,2			0,186	0,180	0	0,2673222
16,346	539,2	540,4	101,16	101,47	0,186	0,180	1	0,2579667
16,501	539,3	540,5	100,14	100,59	0,186	0,180	2	0,2603149
17,033	539,4	540,7	97,26	97,57	0,186	0,180	3	0,2686438
16,579	539,4	540,9	99,86	100,03	0,186	0,180	4	0,2614883
15,995	539,5	541,1	103,56	103,63	0,186	0,180	5	0,2523051
16,647	539,5	541,2	99,59	99,83	0,186	0,180	6	0,262324
17,145	539,5	541,4	97,03	97,15	0,186	0,180	7	0,2699975
16,960	539,5	541,5	98,12	98,35	0,186	0,180	8	0,2669526
16,527	539,5	541,6	100,83	101,31	0,186	0,180	9	0,2599203
17,106	539,5	541,7	97,29	97,46	0,186	0,180	10	0,269092
16,788	539,5	541,9	99,33	99,72	0,186	0,180	11	0,2639237
16,547	539,6	542,0	100,90	101,08	0,186	0,180	12	0,2599154
16,333	539,6	542,2	102,19	102,35	0,186	0,180	13	0,2565419
16,157	539,7	542,4	103,34	103,46	0,186	0,179	14	0,2537258
16,463	539,8	542,5	101,31	101,38	0,186	0,179	15	0,2585979
16,444	539,8	542,7	101,88	101,92	0,186	0,179	16	0,2579403
16,695	539,9	542,9	100,60	100,64	0,186	0,180	17	0,2616921
16,248	540,0	543,1	103,28	103,06	0,186	0,179	18	0,2546853
16,260	540,1	543,3	103,27	103,29	0,186	0,179	19	0,2547366
16,292	540,3	543,5	103,13	102,96	0,186	0,179	20	0,2551382
16,239	540,4	543,7	103,17	103,02	0,186	0,179	21	0,2544863
16,194	540,5	543,9	103,47	103,35	0,186	0,179	22	0,2537196
16,274	540,5	544,0	103,23	103,19	0,186	0,179	23	0,2547356
16,049	540,6	544,2	104,62	104,53	0,186	0,179	24	0,2512877
16,560	540,7	544,4	101,47	101,26	0,186	0,179	25	0,2593396
16,260	540,6	544,4	103,11	102,87	0,186	0,179	26	0,2547382
16,646	540,5	544,4	100,59	100,38	0,186	0,179	27	0,2609071
16,826	540,5	544,4	99,62	99,62	0,186	0,179	28	0,2636497
16,810	540,6	544,5	99,62	99,38	0,186	0,179	29	0,2636516
16,289	540,6	544,6	102,79	102,71	0,186	0,179	30	0,2555427
16,612	540,6	544,7	100,78	100,78	0,186	0,179	31	0,2603174
16,671	540,6	544,7	100,55	100,14	0,186	0,179	32	0,2613318
16,658	540,6	544,7	100,74	100,59	0,186	0,179	33	0,2609074
16,393	540,5	544,7	102,58	102,17	0,186	0,179	34	0,2565439
16,944	540,5	544,8	99,10	98,94	0,186	0,179	35	0,2652984
17,075	540,6	544,8	98,10	97,83	0,186	0,179	36	0,2677073
16,411	540,6	544,9	102,20	102,09	0,186	0,179	37	0,2571419
16,691	540,7	545,0	100,61	100,43	0,186	0,179	38	0,2613022
17,154	540,8	545,2	97,91	97,57	0,186	0,179	39	0,2686653
16,388	540,8	545,2	102,07	101,83	0,186	0,179	40	0,2571449
16,831	540,8	545,2	99,55	99,61	0,186	0,179	41	0,2636502
16,075	540,7	545,2	104,31	104,01	0,186	0,179	42	0,2516973
16,169	540,7	545,3	103,66	103,62	0,186	0,179	43	0,2533202
16,426	540,9	545,4	102,13	102,18	0,186	0,179	44	0,2572663
16,537	541,0	545,6	101,26	101,19	0,186	0,179	45	0,2589385
16,128	541,1	545,7	103,86	103,48	0,186	0,178	46	0,2527155
16,131	541,1	545,8	103,62	103,67	0,186	0,178	47	0,2527148
16,954	541,2	545,8	98,78	98,75	0,186	0,179	48	0,2656237
16,049	541,4	546,0	103,93	103,52	0,186	0,179	49	0,2520404
16,645	541,4	546,0	100,39	99,94	0,186	0,178	50	0,2613016
16,478	541,4	546,1	101,26	101,19	0,186	0,179	51	0,2585377
17,143	541,4	546,1	97,28	96,84	0,186	0,178	52	0,2690929
16,230	541,5	546,3	102,81	102,51	0,186	0,178	53	0,2547364
16,433	541,4	546,3	101,60	101,28	0,186	0,178	54	0,2579416
16,526	541,4	546,3	100,84	100,60	0,186	0,179	55	0,2596223

16,194	541,4	546,4	102,75	102,39	0,186	0,179	56	0,2547382
16,803	541,4	546,4	99,11	98,79	0,186	0,179	57	0,2640412
16,640	541,4	546,3	99,80	99,58	0,186	0,178	58	0,2616974
16,194	541,3	546,3	102,45	102,26	0,186	0,178	59	0,2547397
16,395	541,3	546,3	101,38	101,08	0,186	0,178	60	0,257913
16,516	541,3	546,3	100,58	100,31	0,186	0,179	61	0,2599238
16,600	541,3	546,3	100,11	99,77	0,186	0,178	62	0,2610611
16,131	541,3	546,3	103,17	102,68	0,186	0,178	63	0,2537265
16,605	541,3	546,3	100,01	99,56	0,186	0,178	64	0,261304
16,590	541,3	546,3	100,17	100,08	0,186	0,179	65	0,2610995
16,395	541,4	546,4	101,40	101,13	0,186	0,179	66	0,2579434
16,628	541,5	546,4	99,84	99,58	0,186	0,179	67	0,2616995
16,128	541,5	546,5	102,99	102,56	0,186	0,178	68	0,2537289
16,364	541,5	546,5	101,39	101,15	0,186	0,178	69	0,2576007
16,256	541,5	546,5	102,43	101,94	0,186	0,178	70	0,255536
16,381	541,5	546,6	101,16	100,74	0,186	0,178	71	0,2579431
16,448	541,6	546,6	100,69	100,55	0,186	0,178	72	0,2589873
16,347	541,6	546,7	101,62	101,31	0,186	0,178	73	0,2571448
16,191	541,6	546,7	102,58	102,28	0,186	0,178	74	0,2547411
16,061	541,5	546,6	103,42	102,96	0,186	0,178	75	0,2527166
16,451	541,4	546,6	100,91	100,73	0,186	0,178	76	0,2589365
16,353	541,5	546,6	101,44	101,09	0,186	0,179	77	0,2575436
16,913	541,5	546,6	98,02	97,90	0,186	0,179	78	0,2663641
16,442	541,6	546,7	100,85	100,48	0,186	0,179	79	0,2589358
16,443	541,6	546,7	100,87	100,59	0,186	0,178	80	0,2588916
15,793	541,6	546,7	104,87	104,54	0,186	0,178	81	0,2488284
16,593	541,7	546,7	99,63	99,21	0,186	0,178	82	0,2616982
16,125	541,7	546,8	102,60	102,17	0,186	0,178	83	0,2541362
16,738	541,8	546,8	98,82	98,59	0,186	0,178	84	0,2636537
16,497	541,8	546,9	100,44	100,00	0,186	0,178	85	0,2599267
16,561	541,9	547,0	100,14	99,56	0,186	0,178	86	0,26082
16,172	542,1	547,1	102,42	101,83	0,186	0,178	87	0,2547299
16,882	542,2	547,3	97,97	97,77	0,186	0,178	88	0,2659796
16,434	542,2	547,3	100,59	100,35	0,186	0,178	89	0,2589367
16,358	542,1	547,3	101,11	100,37	0,186	0,178	90	0,2579929
16,644	542,1	547,4	99,35	99,11	0,186	0,178	91	0,2622851
16,877	542,2	547,4	98,11	97,47	0,186	0,178	92	0,265978
16,581	542,2	547,5	99,82	99,50	0,186	0,178	93	0,2612345
16,513	542,1	547,4	100,48	100,19	0,186	0,178	94	0,2599253
16,498	542,1	547,5	100,34	99,95	0,186	0,178	95	0,2599254
16,363	542,1	547,5	100,96	100,71	0,185	0,178	96	0,2575447
16,478	542,1	547,4	100,78	100,18	0,185	0,178	97	0,2593212
16,768	542,1	547,4	98,77	98,50	0,186	0,178	98	0,2640395
16,640	542,1	547,4	99,40	98,88	0,186	0,178	99	0,2622852
16,804	542,1	547,4	98,33	98,16	0,186	0,178	100	0,2650061
16,695	542,0	547,3	99,00	98,80	0,186	0,179	101	0,2632611
16,892	542,0	547,3	97,74	97,53	0,186	0,178	102	0,2663641
16,091	542,0	547,3	102,82	102,30	0,186	0,178	103	0,2537295
17,113	542,0	547,2	96,49	96,21	0,186	0,178	104	0,2699875
16,419	542,0	547,2	100,74	100,24	0,186	0,178	105	0,2589353
16,390	542,0	547,2	100,82	100,49	0,186	0,178	106	0,2585376
16,933	542,1	547,3	97,60	97,36	0,186	0,178	107	0,2669422
15,992	542,1	547,3	103,14	102,92	0,186	0,178	108	0,2523079

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	100,91	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
17,008	534,4	535,4			0,179	0,182	0	0,2676873
16,761	534,4	535,5	99,59	100,05	0,179	0,182	1	0,265005
16,462	534,5	535,6	101,35	101,66	0,178	0,182	2	0,2604102
16,722	534,5	535,8	99,86	100,04	0,179	0,182	3	0,2646033
16,894	534,6	535,9	98,96	99,16	0,179	0,182	4	0,2672169
15,897	534,6	536,1	105,31	105,56	0,179	0,182	5	0,251272
16,117	534,7	536,3	103,77	104,03	0,179	0,182	6	0,2547175
16,835	534,7	536,4	99,61	99,60	0,179	0,182	7	0,2659549
16,873	534,7	536,5	99,35	99,19	0,179	0,181	8	0,2666116
16,712	534,8	536,7	100,36	100,49	0,179	0,181	9	0,2640192
16,711	534,9	536,9	100,35	100,43	0,179	0,182	10	0,264018
16,891	534,9	537,1	99,21	99,24	0,179	0,182	11	0,2668909
16,000	534,9	537,2	104,81	104,81	0,179	0,181	12	0,2526804
16,489	534,9	537,3	101,68	101,73	0,179	0,181	13	0,2602998
16,081	535,0	537,5	104,64	104,41	0,179	0,181	14	0,2537503
16,434	535,1	537,6	102,24	102,26	0,179	0,181	15	0,2593105
16,885	535,1	537,8	99,49	99,36	0,179	0,181	16	0,2663405
16,587	535,2	538,0	101,32	101,34	0,179	0,181	17	0,2616754
16,655	535,2	538,0	101,28	101,12	0,179	0,181	18	0,2623181
16,024	535,2	538,1	105,26	105,25	0,179	0,181	19	0,2523898
16,481	535,3	538,2	102,32	102,17	0,179	0,181	20	0,2596064
16,479	535,2	538,3	102,44	102,40	0,179	0,181	21	0,2593111
16,398	535,2	538,3	102,63	102,70	0,179	0,181	22	0,258237
16,094	535,2	538,4	104,76	104,82	0,179	0,181	23	0,2533008
16,543	535,1	538,4	102,03	102,14	0,179	0,181	24	0,2602999
16,615	535,2	538,5	101,92	101,52	0,179	0,181	25	0,2612832
16,041	535,3	538,7	105,45	105,18	0,179	0,181	26	0,2523453
16,537	535,3	538,8	102,44	102,13	0,179	0,181	27	0,2599035
16,104	535,4	538,9	104,99	104,81	0,179	0,181	28	0,2533057
16,291	535,4	538,9	103,64	103,40	0,179	0,181	29	0,2563874
15,967	535,5	539,0	105,85	105,39	0,179	0,181	30	0,2512692
16,385	535,5	539,1	103,21	103,31	0,179	0,181	31	0,2575248
16,618	535,6	539,3	102,19	101,74	0,179	0,181	32	0,2608928
16,823	535,8	539,5	101,01	100,59	0,179	0,181	33	0,2638853
16,529	536,0	539,8	102,82	102,52	0,179	0,181	34	0,2593033
16,668	536,3	540,1	101,95	101,70	0,179	0,181	35	0,2612845
16,614	536,6	540,4	102,35	102,11	0,179	0,181	36	0,2603438
16,509	536,8	540,7	102,62	102,33	0,178	0,180	37	0,2589213
16,449	537,1	540,9	103,42	102,95	0,178	0,180	38	0,257526
16,599	537,3	541,2	102,48	102,19	0,178	0,180	39	0,2598996
16,540	537,5	541,4	102,88	102,35	0,178	0,180	40	0,2589228
17,053	537,6	541,6	99,81	99,26	0,178	0,180	41	0,2669254
16,182	537,8	541,8	104,94	104,87	0,178	0,180	42	0,2533086
16,684	537,9	542,0	102,03	101,54	0,178	0,180	43	0,2611016
17,053	538,1	542,3	99,73	99,17	0,178	0,180	44	0,2669244
16,547	538,2	542,4	102,69	102,38	0,178	0,180	45	0,2589225
16,903	538,3	542,6	100,48	100,22	0,178	0,180	46	0,2645728
16,679	538,4	542,8	101,96	101,42	0,178	0,180	47	0,2609501
17,110	538,6	543,0	99,35	98,90	0,178	0,180	48	0,2676951
16,910	538,7	543,1	100,39	100,07	0,178	0,180	49	0,2646109
16,325	538,8	543,3	104,03	103,56	0,178	0,180	50	0,2555057
16,905	538,9	543,4	100,29	100,24	0,178	0,180	51	0,2646114
16,608	539,0	543,6	102,23	101,85	0,178	0,180	52	0,2599146
16,669	539,1	543,7	101,39	101,08	0,178	0,180	53	0,2612931
16,755	539,2	543,9	101,23	100,50	0,178	0,179	54	0,2622738
16,896	539,3	544,0	100,24	99,81	0,178	0,179	55	0,2646127

16,745	539,4	544,1	101,08	100,72	0,178	0,179	56	0,262275
16,917	539,6	544,3	100,16	99,58	0,178	0,179	57	0,2650211
16,821	539,7	544,4	100,57	100,30	0,178	0,180	58	0,2636422
16,643	539,8	544,6	101,44	101,19	0,178	0,180	59	0,2609015
16,731	539,9	544,7	101,11	100,63	0,178	0,179	60	0,2622759
16,778	540,0	544,9	100,50	100,10	0,178	0,179	61	0,263256
16,916	540,1	545,0	99,74	99,03	0,178	0,179	62	0,2653893
16,445	540,2	545,1	102,75	102,20	0,178	0,179	63	0,2577359
16,879	540,3	545,2	99,78	99,22	0,178	0,179	64	0,2650037
16,518	540,3	545,3	102,32	101,55	0,178	0,179	65	0,2589277
17,122	540,4	545,4	98,37	97,88	0,177	0,179	66	0,2686596
16,792	540,4	545,5	100,54	99,91	0,177	0,179	67	0,2634161
16,656	540,5	545,6	101,25	100,71	0,178	0,179	68	0,2613056
16,498	540,6	545,7	102,17	101,53	0,178	0,179	69	0,2589306
16,661	540,7	545,8	100,89	100,44	0,177	0,179	70	0,2616884
16,891	540,8	545,9	99,74	99,26	0,177	0,179	71	0,2650058
16,384	540,8	546,0	102,35	102,06	0,177	0,179	72	0,2575372
16,954	540,4	545,7	98,81	98,19	0,177	0,179	73	0,2669363
17,203	540,1	545,5	97,23	96,66	0,178	0,179	74	0,2709596
16,215	539,7	545,2	103,24	102,47	0,178	0,179	75	0,2555353
16,276	539,4	544,9	102,93	102,53	0,178	0,179	76	0,2565418
16,723	539,1	544,7	99,99	99,35	0,178	0,179	77	0,2636207
16,893	538,8	544,4	99,19	98,59	0,178	0,179	78	0,2663796
16,854	538,6	544,2	98,97	98,56	0,178	0,180	79	0,2659723
17,148	538,4	544,0	97,64	97,18	0,178	0,180	80	0,2705659
17,104	538,3	543,9	97,87	97,00	0,178	0,180	81	0,269996
16,142	538,2	543,7	103,44	102,67	0,178	0,179	82	0,2551307
17,080	538,2	543,7	97,67	97,06	0,178	0,180	83	0,2699967
17,283	538,3	543,7	96,53	96,22	0,178	0,180	84	0,2731927
16,154	538,3	543,7	103,12	102,42	0,178	0,180	85	0,2555809
16,927	538,2	543,7	98,54	97,99	0,178	0,180	86	0,2677025
16,793	538,3	543,8	99,30	98,79	0,178	0,180	87	0,2653909
16,686	538,2	543,7	100,21	99,56	0,178	0,180	88	0,2635283
17,025	538,2	543,7	98,07	97,64	0,178	0,180	89	0,2690391
16,528	538,1	543,6	100,78	100,53	0,178	0,180	90	0,2612961
16,374	538,0	543,5	101,94	101,06	0,178	0,180	91	0,2589287
16,557	538,0	543,5	100,98	100,19	0,178	0,179	92	0,2615191
16,855	537,9	543,4	98,93	98,35	0,178	0,180	93	0,2663725
16,975	537,7	543,4	98,29	97,70	0,178	0,180	94	0,2682769
17,198	537,7	543,3	97,01	96,55	0,178	0,180	95	0,2718873
16,841	537,7	543,4	99,12	98,42	0,178	0,180	96	0,2663547
16,022	537,8	543,4	104,36	103,30	0,179	0,180	97	0,2533151
17,005	537,8	543,4	97,95	97,60	0,178	0,180	98	0,2689093
16,885	537,7	543,3	98,77	98,25	0,178	0,180	99	0,2669771
16,652	537,6	543,2	100,11	99,66	0,178	0,180	100	0,2632511
16,912	537,6	543,1	98,76	98,23	0,178	0,180	101	0,2673153
16,823	537,6	543,2	99,31	98,73	0,178	0,180	102	0,2658769
16,752	537,6	543,1	99,54	98,94	0,178	0,180	103	0,2649999
16,930	537,6	543,1	98,56	97,91	0,178	0,180	104	0,2676997
16,927	537,6	543,1	98,44	98,37	0,178	0,180	105	0,2677724
16,640	537,6	543,0	100,30	99,71	0,178	0,180	106	0,263094
17,206	537,5	543,0	96,63	96,12	0,178	0,180	107	0,272263
16,376	537,5	543,0	101,71	101,48	0,178	0,180	108	0,2588881
16,808	537,6	543,0	99,18	98,60	0,178	0,180	109	0,265977
16,658	537,5	542,9	100,07	99,51	0,179	0,180	110	0,2636397
16,909	537,4	542,9	98,66	98,15	0,179	0,180	111	0,2674496
17,059	537,4	542,9	97,82	97,14	0,179	0,180	112	0,2700117
16,896	537,5	542,9	98,67	97,97	0,179	0,180	113	0,2673134
17,004	537,6	543,0	98,04	97,40	0,178	0,180	114	0,2690377

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,80	99,10	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
18,046	540,7	542,1			0,178	0,180	0	0,2749139
18,119	540,8	542,2	98,29	98,15	0,178	0,180	1	0,2777012
17,966	540,7	542,2	98,95	99,00	0,178	0,180	2	0,2754727
17,846	540,7	542,3	99,68	99,62	0,178	0,180	3	0,2736049
17,708	540,7	542,4	100,63	100,47	0,178	0,180	4	0,2713407
17,926	540,7	542,5	99,58	99,46	0,179	0,180	5	0,2745392
17,868	540,8	542,6	99,87	99,77	0,179	0,180	6	0,2736035
17,763	540,8	542,7	100,58	100,15	0,179	0,180	7	0,2719855
17,837	540,8	542,9	100,07	99,66	0,179	0,180	8	0,2732268
18,218	540,9	543,0	97,99	97,73	0,179	0,180	9	0,2788374
17,810	540,9	543,2	100,59	100,33	0,179	0,180	10	0,2723397
17,881	540,9	543,3	99,75	99,63	0,178	0,180	11	0,273602
17,953	541,0	543,5	99,70	99,48	0,178	0,180	12	0,274538
17,704	541,0	543,7	101,24	100,68	0,179	0,179	13	0,2705814
17,820	541,0	543,8	100,45	99,98	0,178	0,179	14	0,2722814
17,796	541,1	544,0	100,74	100,33	0,178	0,179	15	0,2719014
18,177	541,1	544,1	98,62	98,42	0,179	0,180	16	0,2777
17,770	541,2	544,3	100,98	100,37	0,179	0,179	17	0,2713396
17,813	541,2	544,4	100,76	100,56	0,179	0,179	18	0,2719944
17,847	541,3	544,6	100,81	100,07	0,179	0,179	19	0,2722837
17,998	541,3	544,7	100,07	99,43	0,179	0,179	20	0,2745377
18,057	541,4	544,8	99,69	98,89	0,179	0,179	21	0,2754713
18,279	541,4	545,0	98,27	97,77	0,179	0,179	22	0,2789864
17,675	541,4	545,1	101,53	100,94	0,179	0,179	23	0,2700111
18,199	541,5	545,2	98,82	98,27	0,179	0,179	24	0,2776994
17,887	541,6	545,4	100,62	100,02	0,179	0,179	25	0,2728484
17,998	541,6	545,5	100,14	99,39	0,179	0,179	26	0,2743873
18,012	541,7	545,6	99,66	99,08	0,179	0,179	27	0,2749108
17,952	541,7	545,7	100,31	99,76	0,178	0,179	28	0,2736013
17,984	541,7	545,8	100,17	99,40	0,179	0,179	29	0,2741627
18,060	541,8	545,9	99,57	98,99	0,179	0,179	30	0,2754704
18,331	541,8	546,0	98,34	97,66	0,179	0,179	31	0,2793573
17,901	541,9	546,1	100,67	100,12	0,179	0,179	32	0,2728487
17,833	541,9	546,2	100,66	100,29	0,178	0,179	33	0,272031
17,850	541,9	546,3	100,77	99,97	0,178	0,179	34	0,2722369
18,008	541,9	546,4	99,99	99,21	0,179	0,179	35	0,2745372
17,971	541,9	546,5	100,50	99,93	0,179	0,179	36	0,2736006
18,138	541,9	546,6	99,49	98,47	0,179	0,179	37	0,2764021
17,943	542,0	546,7	100,53	99,96	0,179	0,179	38	0,2732245
18,023	542,0	546,8	99,99	99,69	0,178	0,179	39	0,2745355
18,050	542,0	546,8	99,88	99,29	0,178	0,179	40	0,274911
18,007	542,1	546,9	100,36	99,05	0,179	0,178	41	0,2740641
18,043	542,2	547,0	100,16	99,83	0,179	0,179	42	0,2745499
17,971	542,2	547,1	100,55	100,26	0,179	0,180	43	0,2736013
17,871	542,3	547,2	100,70	99,99	0,178	0,179	44	0,2722836
17,996	542,3	547,3	100,02	99,56	0,178	0,179	45	0,2740631
17,811	542,4	547,4	101,17	100,37	0,178	0,179	46	0,2713457
17,819	542,4	547,4	101,21	100,31	0,178	0,179	47	0,2713395
17,864	542,4	547,5	100,88	100,20	0,179	0,179	48	0,2722841
17,858	542,4	547,6	100,83	99,93	0,179	0,179	49	0,2722824
18,038	542,5	547,6	100,02	99,00	0,179	0,179	50	0,2751136
17,758	542,5	547,7	101,34	100,55	0,179	0,179	51	0,2705818
17,823	542,6	547,8	100,87	99,95	0,178	0,178	52	0,2719048
17,951	542,6	547,9	100,35	99,34	0,179	0,178	53	0,2736009
17,945	542,7	547,9	99,55	99,29	0,178	0,179	54	0,2740692
17,809	542,7	548,0	100,63	99,91	0,178	0,179	55	0,2719063

18,034	542,7	548,1	99,22	98,46	0,178	0,178	56	0,2754714
17,960	542,7	548,1	100,01	99,12	0,178	0,178	57	0,2740102
17,922	542,7	548,2	99,96	99,26	0,178	0,178	58	0,2735277
18,037	542,8	548,2	99,38	98,36	0,178	0,178	59	0,2754696
17,866	542,7	548,3	100,27	99,49	0,178	0,178	60	0,2728491
17,786	542,7	548,3	100,57	99,95	0,178	0,179	61	0,2719072
18,068	542,7	548,3	99,39	98,91	0,178	0,179	62	0,2757195
18,104	542,8	548,3	98,76	97,61	0,178	0,179	63	0,2769166
18,211	542,8	548,4	98,14	97,28	0,178	0,178	64	0,2784401
17,981	542,8	548,4	99,41	98,67	0,178	0,178	65	0,2747787
17,986	542,9	548,4	99,42	98,62	0,178	0,178	66	0,274913
17,984	542,9	548,5	99,48	98,65	0,178	0,178	67	0,2749123
17,887	542,9	548,5	99,80	98,96	0,178	0,178	68	0,2736032
17,934	542,9	548,5	99,67	98,69	0,178	0,178	69	0,2741646
17,878	542,9	548,6	99,73	98,76	0,178	0,178	70	0,2735545
17,838	542,9	548,6	99,95	98,71	0,178	0,178	71	0,2728799
17,971	542,9	548,6	99,54	98,52	0,178	0,178	72	0,2749133
17,736	542,9	548,6	100,61	99,75	0,178	0,178	73	0,2713406
17,921	542,9	548,6	99,76	98,76	0,178	0,178	74	0,2741649
17,889	543,0	548,7	99,88	99,06	0,178	0,178	75	0,2736012
17,872	543,0	548,6	99,77	98,86	0,178	0,178	76	0,2736026
17,948	543,0	548,6	99,42	98,27	0,178	0,178	77	0,2749133
17,976	543,0	548,6	99,43	98,82	0,178	0,178	78	0,2749135
17,853	543,0	548,7	99,77	98,66	0,178	0,178	79	0,2735946
17,933	543,0	548,7	99,50	98,57	0,178	0,178	80	0,27454
17,986	543,0	548,7	99,08	98,34	0,178	0,178	81	0,2754736
18,035	543,0	548,7	99,08	98,16	0,178	0,179	82	0,2759257
17,857	543,0	548,8	99,66	98,62	0,178	0,178	83	0,273603
18,106	543,0	548,8	98,17	97,50	0,178	0,178	84	0,2771476
17,911	543,0	548,8	99,46	98,66	0,178	0,178	85	0,2742491
17,827	543,0	548,8	99,94	99,19	0,178	0,178	86	0,2728516
17,481	543,0	548,8	101,93	101,11	0,178	0,178	87	0,267655
17,920	543,0	548,8	99,40	98,45	0,178	0,178	88	0,2745398
17,934	543,0	548,8	99,43	98,68	0,178	0,178	89	0,2745406
18,054	543,0	548,8	98,91	97,86	0,178	0,178	90	0,2763929
17,755	543,0	548,8	100,36	99,22	0,178	0,178	91	0,2719043
18,139	543,0	548,9	98,36	97,45	0,178	0,178	92	0,2777019
17,990	543,0	548,8	99,08	98,79	0,178	0,179	93	0,2753409
18,036	543,0	548,8	98,64	97,61	0,178	0,179	94	0,2764066
17,959	543,0	548,9	99,08	98,01	0,178	0,178	95	0,2749123
17,807	543,0	548,8	99,62	98,91	0,178	0,178	96	0,272852
17,801	543,0	548,9	99,98	99,11	0,178	0,178	97	0,2728512
17,839	543,0	548,9	99,65	99,29	0,178	0,179	98	0,2731325
17,820	543,0	548,9	99,91	99,00	0,178	0,178	99	0,2728516
17,851	543,0	548,9	99,67	98,81	0,178	0,178	100	0,2736039
17,912	543,1	548,9	99,42	98,37	0,178	0,178	101	0,2745451
18,036	543,1	548,9	98,69	98,00	0,178	0,178	102	0,2763975
17,868	543,1	548,9	99,98	98,99	0,179	0,179	103	0,2736027
17,985	543,1	548,9	98,94	97,88	0,178	0,178	104	0,2754692
17,806	543,1	548,9	99,71	98,67	0,178	0,178	105	0,2730644
17,933	543,1	548,9	99,51	98,55	0,179	0,178	106	0,274911
18,062	543,0	548,8	98,39	97,73	0,178	0,179	107	0,2767757
17,797	543,0	548,9	99,81	99,12	0,178	0,178	108	0,2728504
17,891	543,1	548,9	99,53	98,56	0,178	0,178	109	0,2740157
18,015	543,1	548,9	98,44	97,73	0,178	0,178	110	0,2764057
18,077	543,1	548,9	98,29	97,66	0,178	0,179	111	0,277146
17,879	543,1	548,9	99,31	98,57	0,178	0,179	112	0,2741649
17,913	543,1	548,8	99,29	98,43	0,178	0,178	113	0,2745971

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,72	99,83	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
17,912	538,0	539,5			0,181	0,184	0	0,2780602
17,714	538,0	539,5	99,61	100,25	0,181	0,184	1	0,2767649
17,849	538,0	539,6	98,91	99,53	0,181	0,184	2	0,2789827
17,898	538,0	539,7	98,43	99,12	0,181	0,184	3	0,2798997
17,810	538,1	539,7	99,26	99,59	0,181	0,184	4	0,2784292
17,787	538,1	539,8	99,53	99,90	0,181	0,184	5	0,2780608
17,763	538,2	540,0	99,25	99,95	0,181	0,184	6	0,2779407
17,744	538,3	540,2	99,33	100,05	0,181	0,184	7	0,2776927
17,913	538,4	540,4	98,57	98,67	0,181	0,184	8	0,2802679
17,705	538,5	540,6	99,64	99,93	0,181	0,184	9	0,277125
17,744	538,6	540,8	99,29	99,59	0,181	0,184	10	0,2776748
17,844	538,6	540,9	98,75	99,05	0,181	0,184	11	0,2793494
17,438	538,6	541,0	100,88	101,37	0,181	0,184	12	0,2732161
18,055	538,6	541,1	97,38	97,82	0,181	0,184	13	0,2828138
17,668	538,6	541,2	99,71	100,02	0,181	0,184	14	0,2767307
17,831	538,7	541,3	98,77	98,98	0,181	0,184	15	0,2793482
17,863	538,8	541,5	98,47	98,75	0,181	0,184	16	0,2799006
17,548	538,9	541,6	100,30	100,62	0,181	0,184	17	0,274901
17,804	538,9	541,7	98,63	98,95	0,181	0,184	18	0,2789845
17,750	539,0	541,8	99,08	99,80	0,181	0,184	19	0,278043
17,338	539,0	541,9	101,76	101,89	0,181	0,184	20	0,2713301
17,538	539,0	542,0	100,72	101,05	0,181	0,184	21	0,2741533
17,439	539,0	542,2	101,53	101,72	0,181	0,184	22	0,2723508
17,793	539,1	542,3	99,32	99,87	0,181	0,183	23	0,2776909
17,746	539,3	542,5	100,25	100,22	0,181	0,183	24	0,2767645
17,522	539,4	542,6	101,16	101,77	0,181	0,184	25	0,2732632
17,680	539,5	542,8	100,42	100,53	0,181	0,184	26	0,2756121
16,826	539,6	542,9	105,52	105,86	0,181	0,183	27	0,2622611
17,759	539,7	543,1	99,76	100,08	0,181	0,183	28	0,2767667
17,008	539,9	543,3	104,36	104,53	0,180	0,183	29	0,2650117
17,489	540,0	543,4	101,34	101,83	0,180	0,183	30	0,2724863
17,675	540,1	543,6	100,38	100,34	0,180	0,183	31	0,2754772
17,733	540,2	543,7	99,79	100,38	0,180	0,183	32	0,2763959
18,054	540,4	543,8	98,08	98,52	0,180	0,183	33	0,281551
17,587	540,4	543,9	100,18	100,36	0,180	0,183	34	0,2747365
17,883	540,4	544,0	98,67	98,94	0,180	0,183	35	0,2793532
17,525	540,3	544,0	100,78	100,87	0,181	0,183	36	0,2741571
18,010	540,2	543,9	97,78	97,91	0,181	0,183	37	0,2815477
17,822	540,1	543,9	98,99	99,24	0,180	0,183	38	0,2784498
17,202	540,1	543,9	102,75	102,75	0,181	0,183	39	0,2690518
17,390	540,0	543,9	101,19	101,56	0,181	0,183	40	0,2719004
17,791	540,0	543,9	99,60	99,38	0,181	0,183	41	0,2780633
17,741	540,0	543,9	99,48	99,80	0,181	0,183	42	0,2770877
18,027	539,9	543,9	97,97	98,17	0,180	0,183	43	0,2815494
17,730	540,0	544,0	99,71	100,02	0,181	0,183	44	0,2767669
17,827	539,9	544,0	99,09	99,20	0,181	0,183	45	0,2784324
17,605	539,9	544,0	100,33	100,48	0,181	0,183	46	0,2749051
17,803	539,9	544,0	99,00	99,41	0,180	0,183	47	0,2780627
17,617	539,8	543,9	100,10	100,36	0,180	0,183	48	0,275465
17,738	539,9	544,0	99,54	99,57	0,181	0,183	49	0,2771375
17,783	539,8	544,0	99,11	99,32	0,180	0,183	50	0,2777597
17,472	539,8	544,0	101,27	100,70	0,181	0,183	51	0,2732173
17,535	539,9	544,0	100,45	100,66	0,181	0,183	52	0,2741569
17,784	540,0	544,1	99,50	99,52	0,181	0,183	53	0,2776751
17,787	540,0	544,2	99,54	100,06	0,181	0,183	54	0,2776927
17,593	539,9	544,2	100,22	100,48	0,181	0,183	55	0,2749041

17,517	539,9	544,2	100,78	100,80	0,180	0,183	56	0,2735923
17,556	539,9	544,2	100,44	100,79	0,180	0,183	57	0,2741563
17,560	539,9	544,2	100,77	100,85	0,180	0,183	58	0,2741887
17,778	540,0	544,3	99,85	100,06	0,181	0,183	59	0,2771428
17,715	540,1	544,3	99,82	99,64	0,181	0,183	60	0,2767652
17,714	540,0	544,4	99,60	99,80	0,181	0,183	61	0,2767387
17,531	540,1	544,4	100,96	101,13	0,181	0,183	62	0,2736251
17,784	540,0	544,5	99,41	99,47	0,181	0,183	63	0,2776921
17,592	540,0	544,4	100,74	100,81	0,181	0,183	64	0,2745303
18,043	540,0	544,4	97,99	97,76	0,181	0,183	65	0,2817089
17,894	539,9	544,5	98,62	98,32	0,181	0,182	66	0,2798198
17,627	539,9	544,4	100,07	100,27	0,181	0,183	67	0,2754621
17,358	539,9	544,4	101,44	101,84	0,180	0,183	68	0,2713314
17,809	539,9	544,4	99,00	99,15	0,180	0,183	69	0,2784423
17,709	539,9	544,4	99,92	99,76	0,181	0,183	70	0,276478
17,917	539,9	544,4	98,29	98,44	0,180	0,183	71	0,2799076
17,724	539,9	544,4	99,43	99,49	0,180	0,183	72	0,2771355
17,796	539,9	544,5	98,87	99,10	0,181	0,183	73	0,2784317
17,844	539,9	544,5	98,90	98,71	0,181	0,183	74	0,2793159
17,705	539,9	544,4	99,22	99,64	0,181	0,183	75	0,2771362
17,705	539,9	544,3	99,22	99,35	0,180	0,183	76	0,2771369
17,610	539,9	544,3	100,14	100,16	0,181	0,183	77	0,275464
17,877	539,9	544,4	98,87	98,73	0,181	0,183	78	0,2793525
17,406	539,9	544,4	101,06	101,12	0,181	0,183	79	0,272276
17,569	540,0	544,5	99,99	100,36	0,180	0,183	80	0,2749037
16,916	540,0	544,5	104,22	104,18	0,180	0,183	81	0,2646262
17,630	540,0	544,5	100,10	100,13	0,181	0,183	82	0,2754634
17,894	540,0	544,5	98,56	98,51	0,181	0,183	83	0,2798993
17,748	540,0	544,5	99,13	99,33	0,181	0,183	84	0,2776932
17,747	540,0	544,6	99,22	99,27	0,181	0,183	85	0,2776925
18,120	540,0	544,6	96,87	97,09	0,181	0,183	86	0,2837801
17,836	540,0	544,6	98,37	98,44	0,180	0,183	87	0,2793512
17,408	540,2	544,7	101,19	101,48	0,180	0,183	88	0,2722768
17,747	540,1	544,7	99,19	99,34	0,181	0,183	89	0,2776914
17,857	540,1	544,8	98,61	98,94	0,181	0,183	90	0,2793515
17,477	540,1	544,8	100,86	101,00	0,181	0,183	91	0,2732535
17,785	540,1	544,8	99,13	99,01	0,181	0,183	92	0,2780601
17,853	540,2	544,8	98,89	98,96	0,181	0,183	93	0,2789457
17,595	540,2	544,8	100,11	100,34	0,180	0,183	94	0,2749023
17,773	540,2	544,8	99,08	99,09	0,180	0,183	95	0,2780637
17,679	540,3	545,0	99,67	99,99	0,181	0,183	96	0,2763929
17,560	540,3	545,0	99,95	99,91	0,180	0,183	97	0,2749052
17,768	540,3	545,0	99,21	99,13	0,180	0,182	98	0,2778089
17,751	540,3	545,0	99,15	99,43	0,181	0,183	99	0,2776923
17,137	540,3	545,0	102,65	103,15	0,181	0,183	100	0,2682905
17,830	540,3	545,1	98,75	98,56	0,181	0,183	101	0,2789851
17,258	540,3	545,1	101,94	101,96	0,181	0,183	102	0,2699964
17,594	540,3	545,1	99,79	99,81	0,180	0,183	103	0,2754644
17,330	540,4	545,1	101,49	101,36	0,181	0,183	104	0,2713321
17,882	540,3	545,1	98,34	98,21	0,181	0,183	105	0,2799022
17,551	540,3	545,1	100,11	100,23	0,180	0,183	106	0,2746536
17,439	540,4	545,2	100,85	101,00	0,180	0,183	107	0,2728407
17,694	540,4	545,2	99,48	99,50	0,180	0,183	108	0,2767668
17,771	540,5	545,3	99,13	99,03	0,181	0,183	109	0,2780622
17,696	540,5	545,2	99,75	99,55	0,181	0,183	110	0,2766874
17,595	540,5	545,3	100,31	100,34	0,181	0,183	111	0,2749147
17,574	540,5	545,3	99,95	100,12	0,180	0,183	112	0,2749054
17,629	540,5	545,3	100,06	100,30	0,180	0,183	113	0,2754654
17,842	540,6	545,3	98,77	98,95	0,180	0,183	114	0,2789625
17,607	540,6	545,3	99,99	99,85	0,181	0,183	115	0,2754646
17,724	540,6	545,4	99,50	99,40	0,181	0,183	116	0,2771388

17,536	540,6	545,4	100,37	100,60	0,181	0,183	117	0,2742162
17,577	540,8	545,5	99,92	100,02	0,180	0,183	118	0,2753028
17,508	540,9	545,6	100,36	100,23	0,181	0,183	119	0,2741489
17,340	540,9	545,6	101,50	101,32	0,181	0,182	120	0,2713338
17,777	540,9	545,7	99,19	98,97	0,181	0,182	121	0,2780642
17,457	540,9	545,7	100,72	100,55	0,181	0,182	122	0,2732238
17,565	540,9	545,7	100,29	100,11	0,181	0,182	123	0,2749025
17,818	540,9	545,7	98,66	98,39	0,181	0,182	124	0,2789855
17,532	540,8	545,6	100,14	100,31	0,180	0,183	125	0,2745318
17,176	540,8	545,6	102,55	102,10	0,181	0,183	126	0,2689895
17,623	540,9	545,7	100,18	100,00	0,181	0,182	127	0,275465
18,102	540,9	545,6	97,20	97,01	0,181	0,183	128	0,2833698
17,563	540,9	545,6	99,92	100,04	0,180	0,183	129	0,2749077
17,667	540,9	545,6	99,52	99,54	0,180	0,182	130	0,2762766
17,496	540,9	545,6	100,61	100,69	0,180	0,183	131	0,2736621
17,524	540,9	545,7	100,61	100,38	0,181	0,183	132	0,2741579
17,895	541,0	545,7	98,63	98,11	0,181	0,182	133	0,2799046
17,711	541,0	545,8	99,17	99,24	0,181	0,182	134	0,2772083
17,762	541,1	545,8	98,88	98,78	0,180	0,182	135	0,2780652
17,666	541,1	545,8	99,75	99,36	0,181	0,182	136	0,2763957
17,779	541,1	545,8	98,87	98,89	0,180	0,182	137	0,2780641
17,942	541,2	545,9	98,15	97,87	0,180	0,182	138	0,2806515
17,889	541,1	545,9	98,05	98,27	0,180	0,182	139	0,2798978
17,549	541,1	545,9	100,11	100,05	0,180	0,182	140	0,2745324
17,853	541,2	546,0	98,40	98,40	0,180	0,182	141	0,2793546
17,470	541,2	546,0	100,76	100,55	0,180	0,182	142	0,273219
17,752	541,2	546,0	98,79	98,86	0,180	0,182	143	0,277694
17,861	541,3	546,1	98,39	98,51	0,180	0,182	144	0,2793544
17,706	541,2	546,1	99,53	99,57	0,180	0,183	145	0,2767678
17,759	541,2	546,1	98,87	99,02	0,180	0,183	146	0,2778816
17,513	541,2	546,0	100,28	100,34	0,180	0,183	147	0,2741733
17,786	541,3	546,0	98,82	98,89	0,180	0,183	148	0,2784334
17,737	541,4	546,1	99,00	99,09	0,180	0,183	149	0,2776949
17,651	541,4	546,0	99,45	99,49	0,180	0,183	150	0,2763009
17,560	541,4	546,0	100,08	100,14	0,180	0,183	151	0,2749062
17,924	541,3	546,0	97,91	98,03	0,180	0,183	152	0,2806381
17,551	541,3	546,0	100,08	100,20	0,180	0,183	153	0,2747539
17,906	541,3	546,0	98,34	98,09	0,181	0,183	154	0,280174
17,684	541,3	546,0	99,38	99,29	0,181	0,182	155	0,2768098
17,456	541,3	545,9	100,66	100,93	0,180	0,183	156	0,2732192
17,750	541,3	546,0	99,31	98,86	0,181	0,183	157	0,2776937
17,786	541,3	546,0	98,63	98,86	0,180	0,182	158	0,2783753
17,567	541,3	546,1	100,28	100,26	0,180	0,183	159	0,2745426
18,084	541,4	546,1	97,14	97,17	0,180	0,182	160	0,282825
17,904	541,6	546,2	98,17	98,30	0,180	0,182	161	0,2799055
17,784	541,7	546,3	99,03	99,00	0,180	0,182	162	0,2779308

APPENDIX 3: Calibration data

Instrumentation
Saint•Laurent inc.
Certified 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
Phone: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2022-05-10

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	+\-0.25"H2O
Calibration Frequency:(days)	365

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

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression	**Certification #:**	2021008414
Serial #:	3330050	**Certification Date:**	2021-11-22
Certified by:	Alpha Controls	**Next Certification:**	2022-11-22
Comments:			
Calibrator:	Fluke 744	**Certification #:**	2022001379
Serial #:	8223003	**Certification Date:**	2022-02-18
Certified by:	Alpha Controls	**Next Certification:**	2022-05-18
Comments:			

5F09106 Version 1

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Instrumentation Saint•Laurent inc.
Certified 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
Phone: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2022-05-10

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
0.0000 "H2O	0.000 "H2O	-0.012 "H2O	-0.012 "H2O	-0.012 "H2O	+\-0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.2500 "H2O	0.250 "H2O	0.237 "H2O	-0.013 "H2O	0.237 "H2O	+\-0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.5000 "H2O	0.500 "H2O	0.488 "H2O	-0.012 "H2O	0.488 "H2O	+\-0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.7500 "H2O	0.750 "H2O	0.742 "H2O	-0.008 "H2O	0.742 "H2O	+\-0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
1.0000 "H2O	1.000 "H2O	0.989 "H2O	-0.011 "H2O	0.989 "H2O	+\-0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.0000 "H2O	0.0000 V.DC.	0.0004 V.DC.	+0.0004 V.DC.	0.0004 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.2500 "H2O	2.5000 V.DC.	2.3569 V.DC.	-0.1431 V.DC.	2.3569 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.5000 "H2O	5.0000 V.DC.	4.9466 V.DC.	-0.0534 V.DC.	4.9466 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.7500 "H2O	7.5000 V.DC.	7.4342 V.DC.	-0.0658 V.DC.	7.4342 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
1.0000 "H2O	10.0000 V.DC.	9.8526 V.DC.	-0.1474 V.DC.	9.8526 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					

Environmental Conditions: Temperature: N.A. Humidity: N.A.

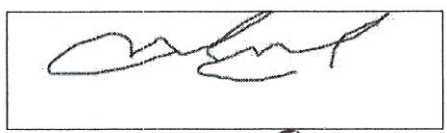
Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-10
Next Calibration:	2023-05-10
Certificate Date:	2022-05-10

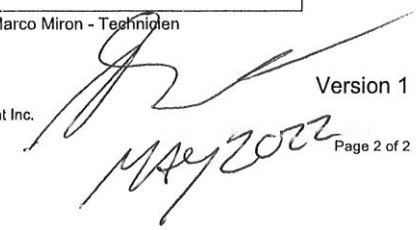
CALIBRATION CONFORMITY		
	Before	**After**
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-001 2022-05-10

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9105
Required Accuracy:	+\- 2.0°C
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	**Input Type:**	Temp
Manufacturer:	Fluke	**Output Type:**	Digitale
Model #:	52-II	**Measurement Type:**	Temperature
Serial #:	90630037	**Range:**	Divers
Location:	N.A.	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2022003082
Serial #:	8180008	**Certification Date:**	2022-04-12
Certified by:	Alpha Controls	**Next Certification:**	2023-04-12
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-001 2022-05-10

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
0.0 °C	0.0 °C	0.1 °C	+0.1 °C	0.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
375.0 °C	375.0 °C	375.1 °C	+0.1 °C	375.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T1 typeJ					
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	+/- 2 °C	0.2 °C
Compliant	T2 typeJ					
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	+/- 2 °C	0.2 °C
Compliant	T2 typeJ					
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T2 typeJ					
375.0 °C	375.0 °C	375.1 °C	+0.1 °C	375.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T2 typeJ					
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	+/- 2.0 °C	0.2 °C
Compliant	T2 typeJ					
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
125.0 °C	125.0 °C	125.2 °C	+0.2 °C	125.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
250.0 °C	250.0 °C	250.1 °C	+0.1 °C	250.1 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
375.0 °C	375.0 °C	375.1 °C	+0.1 °C	375.1 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	+/- 2.0 °C	0.3 °C
Compliant	T1 typeK					
0.0 °C	0.0 °C	0.3 °C	+0.3 °C	0.3 °C	+/- 2.0 °C	0.3 °C
Compliant	T2 typeK					
125.0 °C	125.0 °C	125.2 °C	+0.2 °C	125.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T2 typeK					
250.0 °C	250.0 °C	250.2 °C	+0.2 °C	250.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T2 typeK					
375.0 °C	375.0 °C	375.2 °C	+0.2 °C	375.2 °C	+/- 2.0 °C	0.3 °C
Compliant	T2 typeK					

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-001 2022-05-10

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
500.0 °C	500.0 °C	500.1 °C	+0.1 °C	500.1 °C	+/- 2.0 °C	1.0 °C
Compliant	T2 typeK					

Environmental Conditions: Temperature: 21 °C Humidity: 41 %RH

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE

Calibration Date:	2022-05-10
Next Calibration:	2023-05-10
Certificate Date:	2022-05-10

CALIBRATION CONFORMITY

	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
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May 2022

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Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2022-05-11

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Accuracy:	+\- 4.0°F
Calibration Frequency:(days)	181

INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	**Input Type:**	Temp
Manufacturer:	Keithley	**Output Type:**	Digitale
Model #:	7700	**Measurement Type:**	Temperature
Serial #:	1213648	**Range:**	Divers
Location:	N/A	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2022003082
Serial #:	8180008	**Certification Date:**	2022-04-12
Certified by:	Alpha Controls	**Next Certification:**	2023-04-12
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2022-05-11

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
662.0 °F	662.0 °F	661.4 °F	-0.6 °F	661.4 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 201 (Flue) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	481.4 °F	-0.6 °F	481.4 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 202 (Right) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	481.7 °F	-0.3 °F	481.7 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 203 (Back) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	481.7 °F	-0.3 °F	481.7 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 204 (Bottom) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	481.9 °F	-0.1 °F	481.9 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 205 (Top) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	481.8 °F	-0.2 °F	481.8 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 206 (Left) en type "K" En Loop avec EM-015					
662.0 °F	662.0 °F	661.8 °F	-0.2 °F	661.8 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 208 (Catalyst down) en type "K" En Loop avec EM-015					
77.0 °F	77.0 °F	76.7 °F	-0.3 °F	76.7 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 215 (DGM 1 In) en type "J" En Loop avec EM-015					
77.0 °F	77.0 °F	76.7 °F	-0.3 °F	76.7 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 216 (DGM 1 Out) en type "J" En Loop avec EM-015					
77.0 °F	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 217 (DGM 2 In) en type "J" En Loop avec EM-015					
77.0 °F	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 218 (DGM 2 Out) en type "J" En Loop avec EM-015					

Environmental Conditions: Temperature: 21 °C Humidity: 42 %RH

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-11
Next Calibration:	2022-11-11
Certificate Date:	2022-05-11

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

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2022-05-11

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MAY 2022

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015 2022-05-11

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Accuracy:	+\- 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	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2022003082
Serial #:	8180008	**Certification Date:**	2022-04-12
Certified by:	Alpha Controls	**Next Certification:**	2023-04-12
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015 2022-05-11

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
-190.0 °C	-190.0 °C	-190.0 °C	0.0 °C	190.0 °C	+\- 2.0 °C	+/- 0.4 °C
Compliant	Input#1TypeK					
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#1TypeK					
750.0 °C	750.0 °C	750.0 °C	0.0 °C	750.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#1TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#2 TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#3 TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#4 TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#5TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#6TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#7TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#8TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#9TypeK					
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#10TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#11TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#12TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#13 TypeJ					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#14TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#15 TypeJ					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#16TypeJ					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#17TypeJ					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#18TypeJ					

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015 2022-05-11

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
100.0 °C	100.0 °C	100.2 °C	+0.2 °C	100.2 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#19TypeJ					
100.0 °C	100.0 °C	100.1 °C	+0.1 °C	100.1 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#20TypeJ					
12.000 mA	12.000 mA	12.000 mA	0.000 mA	12.000 mA	+\- 0,100 mA	1.00 mA
Compliant	Input#21					
12.000 mA	12.000 mA	12.000 mA	0.000 mA	12.000 mA	+\- 0,100 mA	1.00 mA
Compliant	Input#22					

Environmental Conditions: Temperature: 21 °C Humidity: 42 %RH

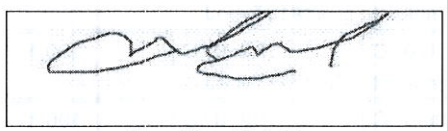
Comments: Test avec EM-147

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-11
Next Calibration:	2023-05-11
Certificate Date:	2022-05-11

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

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
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May 2022

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Calibration Certificate ID
CA0123-007-042022-ACC

METTLER TOLEDO

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

Accuracy Calibration Certificate

Customer

Company:	Services Polytests		
Address:	695-B Rue Gaudette		
City:	Saint-Jean-Sur-Richelieu	Contact:	Danick Power
Zip / Postal:	J3B 7S7	Order Number:	0332427627
State / Province:	Quebec		

Weighing Device

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

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

Procedure

Calibration Guideline:	EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction:	30260953

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

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight. As Left 350

As Found Calibration Date:	20-04-2022	Service Technician:	
As Left Calibration Date:	20-04-2022		Kamel Mohand Kaci
Issue Date:	20-04-2022		
Next Calibration Date:	31-10-2022		

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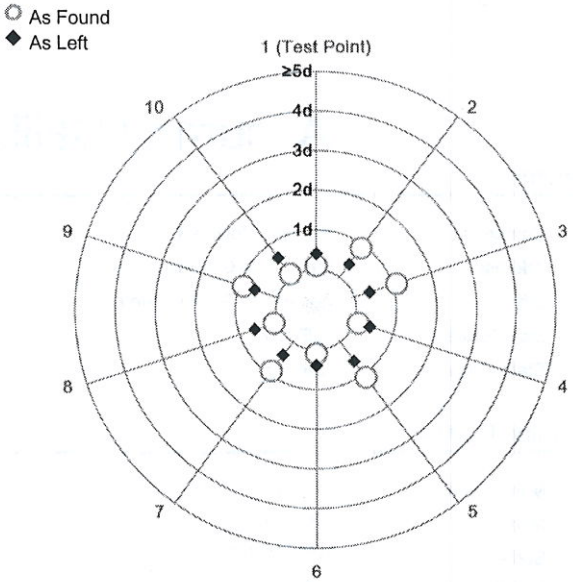
Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0000 g	100.0000 g
2	99.9999 g	100.0000 g
3	100.0001 g	100.0000 g
4	100.0000 g	100.0000 g
5	100.0001 g	100.0001 g
6	100.0000 g	100.0000 g
7	99.9999 g	100.0000 g
8	100.0000 g	100.0001 g
9	99.9999 g	100.0001 g
10	100.0000 g	100.0001 g

Standard Deviation	**0.00007 g**	**0.00005 g**



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

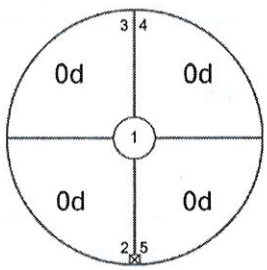
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

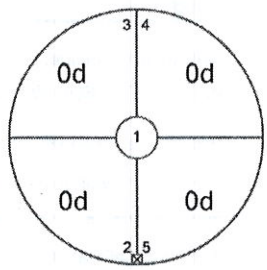
Test Load: 100 g

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

Maximum Deviation	**0.0000 g**	**0.0000 g**



As Found



As Left

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

Error of Indication

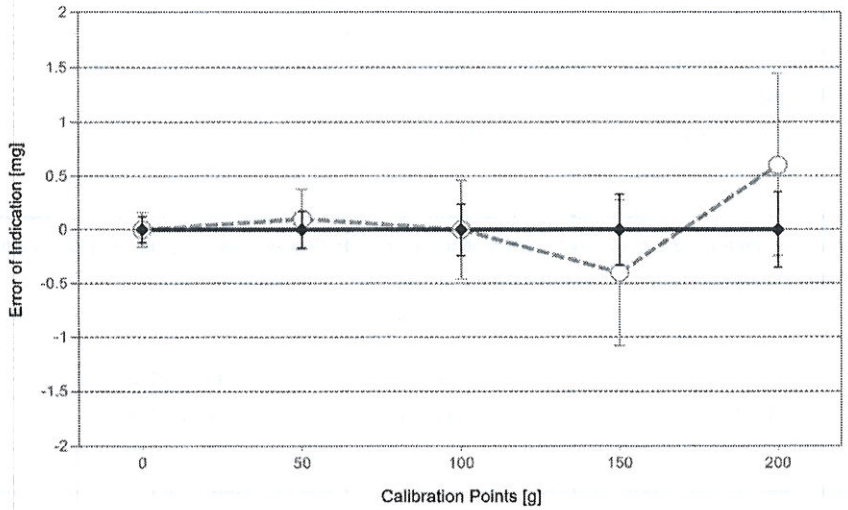
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.16 mg	2
2	50.0000 g	50.0001 g	0.0001 g	0.28 mg	2
3	100.0000 g	100.0000 g	0.0000 g	0.46 mg	2
4	150.0000 g	149.9996 g	-0.0004 g	0.68 mg	2
5	200.0001 g	200.0007 g	0.0006 g	0.84 mg	2

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As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.12 mg	2
2	50.0000 g	50.0000 g	0.0000 g	0.17 mg	2
3	100.0000 g	100.0000 g	0.0000 g	0.24 mg	2
4	150.0000 g	150.0000 g	0.0000 g	0.33 mg	2
5	200.0001 g	200.0001 g	0.0000 g	0.35 mg	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.

Measurement Uncertainty of the Weighing Instrument in Use

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

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

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

Linearization of Uncertainty Equation

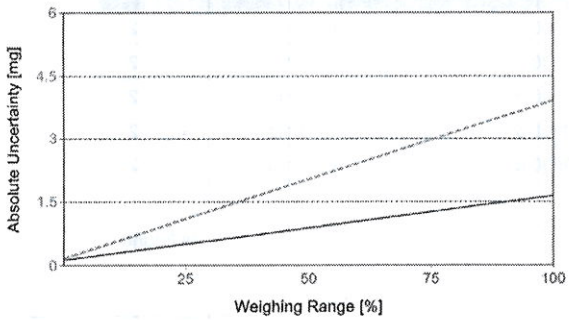
	Range		As Found	As Left
	d	Max		
1	0.0001 g	210 g	$U_1 = 0.17$ mg + 0.0178 mg/g · R	$U_1 = 0.13$ mg + 0.00719 mg/g · R

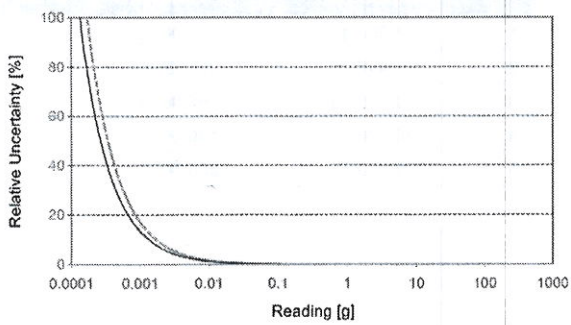
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0210 g	0.17 mg	0.81%	0.13 mg	0.62%
0.2100 g	0.17 mg	0.083%	0.13 mg	0.063%
2.1000 g	0.21 mg	0.0099%	0.15 mg	0.0069%
21.0000 g	0.54 mg	0.0026%	0.28 mg	0.0013%
210.0000 g	3.9 mg	0.0019%	1.6 mg	0.00078%

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As Found

As Left

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	350	Date of Issue:	15-02-2022
Certificate Number:	220554739-1	Calibration Due Date:	28-02-2023

Remarks

This document is issued to record completion of the work performed by METTLER TOLEDO on the subject device in accordance with agreed standards. It does not guarantee the continued performance of the subject device. Any measurements recorded are based on the subject device's performance at a given time as tested by METTLER TOLEDO and, except where explicitly stated otherwise, do not express an opinion as to the sufficiency of any customer designed procedures used to test the device. This document is not a warranty, either implied or express. METTLER TOLEDO expressly disclaims any liability arising from the use of the information in this document for any purpose other than as specified herein.

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METTLER TOLEDO Service

Custom Tolerance Assessment

Assessment done without considering measurement uncertainty.

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

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

Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0000 g	100.0000 g
2	99.9999 g	100.0000 g
3	100.0001 g	100.0000 g
4	100.0000 g	100.0000 g
5	100.0001 g	100.0001 g
6	100.0000 g	100.0000 g
7	99.9999 g	100.0000 g
8	100.0000 g	100.0001 g
9	99.9999 g	100.0001 g
10	100.0000 g	100.0001 g

Standard Deviation	0.00007 g	0.00005 g
Tolerance	0.00020 g ✓	0.00020 g ✓

2022-04-20

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Eccentricity

Test Load: 100 g

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

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

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Tolerance
1	0.0000 g	0.0000 g	0.0000 g	0.0002 g ✓
2	50.0000 g	50.0001 g	0.0001 g	0.0002 g ✓
3	100.0000 g	100.0000 g	0.0000 g	0.0004 g ✓
4	150.0000 g	149.9996 g	-0.0004 g	0.0006 g ✓
5	200.0001 g	200.0007 g	0.0006 g	0.0010 g ✓

As Left

	Reference Value	Indication	Error of Indication	Tolerance
1	0.0000 g	0.0000 g	0.0000 g	0.0002 g ✓
2	50.0000 g	50.0000 g	0.0000 g	0.0002 g ✓
3	100.0000 g	100.0000 g	0.0000 g	0.0004 g ✓
4	150.0000 g	150.0000 g	0.0000 g	0.0006 g ✓
5	200.0001 g	200.0001 g	0.0000 g	0.0010 g ✓

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TRANSCAT® CANADA
Trust in every measure

ACCREDITATION ISO 17025 ™
SCC Scope Number 668

CALIBRATION CERTIFICATE

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

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

Technician:
Coutu, Daniel

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	**Date approved :**	04-03-2022
Precision class :	ASTM 6	**Next Calibration :**	04-03-2027
Density :	7.95g/cm³	**CCN accreditation # :**	668
Identification (if unique) :	EM-090	**CLAS Certification # :**	2010-01

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

NOTES:

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

REMARKS:

March 2022

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ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

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

CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
2 kg		EM-090	2.0001384 kg		200 mg	2.0 mg

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ACCREDITATION ISO 17025
SCC Scope Number 668

CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

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

CALIBRATION RESULTS, CORRECTIONS:

Nominal Mass	Serial #	Inventory #	Conventional mass Corrections	Conventional mass Corrections after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
2 kg		EM-090	138.4 mg		200 mg	2.0 mg

CALIBRATION CERTIFICATE

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

BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

UNCERTAINTIES:

The following uncertainties exist :

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

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

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

TRACEABILITY

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

CALIBRATION CERTIFICATE

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

USED REFERENCES

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

ENVIRONMENTAL CONDITIONS

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

Calibration Certificate ID
CA0206-112-122021-ACC-USI

METTLER TOLEDO

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

Accredited by the American Association for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1902.01
ISO 17025 Registered
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

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

Weighing Device

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

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

Procedure

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

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

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

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

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

	Temperature	
As Found	Start: 20.0 °C	End: 20.0 °C
As Left	Start: 20.0 °C	End: 20.0 °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.

As Found Calibration Date:	20-12-2021
As Left Calibration Date:	20-12-2021
Issue Date:	20-12-2021

Authorized A2LA Signatory:

Marc-Andre Chouinard

20 dec 2021

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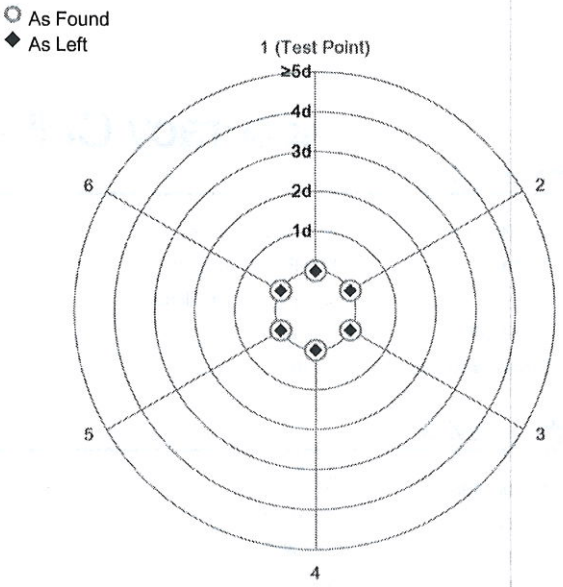
Measurement Results

Repeatability

Test Load: 70 kg

	As Found	As Left
1	70.10 kg	70.00 kg
2	70.10 kg	70.00 kg
3	70.10 kg	70.00 kg
4	70.10 kg	70.00 kg
5	70.10 kg	70.00 kg
6	70.10 kg	70.00 kg

Standard Deviation	**0.000 kg**	**0.000 kg**



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

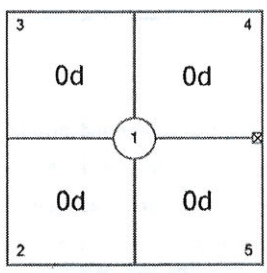
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

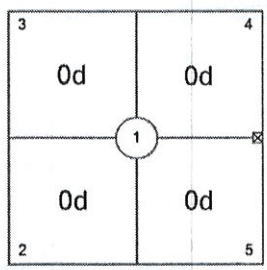
Test Load: 50 kg

Position	As Found	As Left
1	50.05 kg	50.00 kg
2	50.05 kg	50.00 kg
3	50.05 kg	50.00 kg
4	50.05 kg	50.00 kg
5	50.05 kg	50.00 kg

Maximum Deviation	**0.00 kg**	**0.00 kg**



As Found



As Left

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

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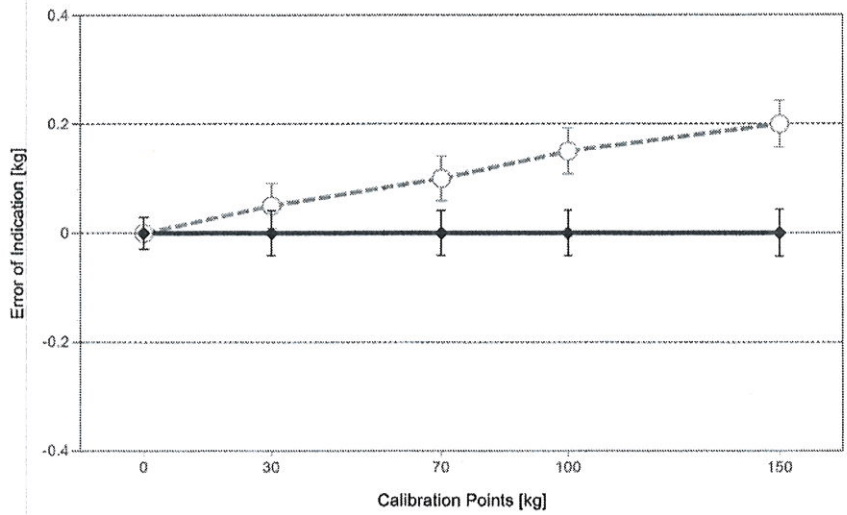
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	30 kg	30.05 kg	0.05 kg	0.041 kg	2
3	70 kg	70.10 kg	0.10 kg	0.041 kg	2
4	100 kg	100.15 kg	0.15 kg	0.042 kg	2
5	150 kg	150.20 kg	0.20 kg	0.043 kg	2
6	100 kg	100.15 kg	0.15 kg	0.042 kg	2
7	70 kg	70.10 kg	0.10 kg	0.041 kg	2
8	30 kg	30.05 kg	0.05 kg	0.041 kg	2
9	0 kg	0.00 kg	0.00 kg	0.029 kg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	30 kg	30.00 kg	0.00 kg	0.041 kg	2
3	70 kg	70.00 kg	0.00 kg	0.041 kg	2
4	100 kg	100.00 kg	0.00 kg	0.042 kg	2
5	150 kg	150.00 kg	0.00 kg	0.043 kg	2
6	100 kg	100.00 kg	0.00 kg	0.042 kg	2
7	70 kg	70.00 kg	0.00 kg	0.041 kg	2
8	30 kg	30.00 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 ASTM E898 and EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

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Test Equipment

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

Weight Set 1: OIML M1

Weight Set No.:	92294	Date of Issue:	23-09-2021
Certificate Number:	M21-0283	Calibration Due Date:	23-09-2022

Weight Set 2: OIML M1

Weight Set No.:	T-100	Date of Issue:	12-05-2021
Certificate Number:	1412861	Calibration Due Date:	12-05-2022

Remarks

N/A

End of Accredited Section

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

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Measurement Uncertainty of the Weighing Instrument in Use

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

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

Temperature range on site for the evaluation of the measurement uncertainty in use: 20 K

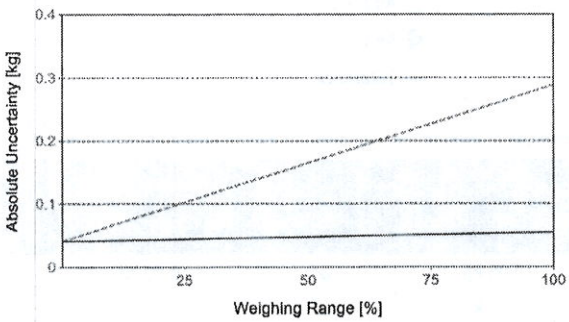
Linearization of Uncertainty Equation

	Range		As Found	As Left
	d	Max		
1	0.05 kg	150 kg	U_1 = 41 g + 1.66 g/kg · R	U_1 = 41 g + 0.0938 g/kg · R

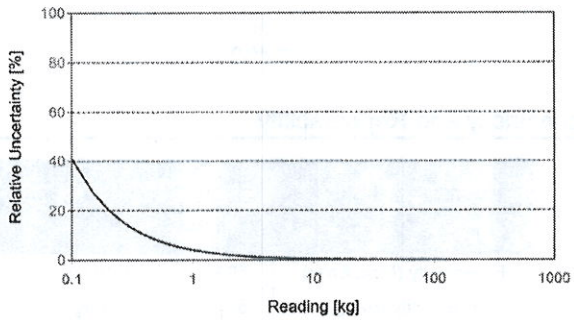
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
1.50 kg	0.043 kg	2.9%	0.041 kg	2.7%
15.00 kg	0.066 kg	0.44%	0.042 kg	0.28%
30.00 kg	0.091 kg	0.30%	0.044 kg	0.15%
75.00 kg	0.17 kg	0.22%	0.048 kg	0.064%
150.00 kg	0.29 kg	0.19%	0.055 kg	0.037%



As Found



As Left

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METTLER TOLEDO Service

Handbook 44 Tolerance Assessment (Maintenance)

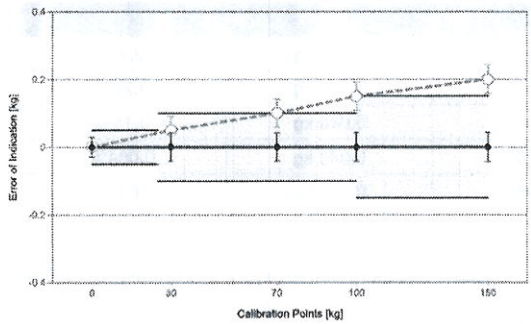
Assessment done without considering measurement uncertainty.
The measurements from the attached calibration certificate were assessed against the Tolerances defined by NIST Handbook 44.
The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

	As Found	As Left
Overall	✗	✓

✓ = Passed
✗ = Failed

Weighing Device

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



Tolerances according to NIST Handbook 44

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

○ As Found
◆ As Left
— Tolerance

Eccentricity and Repeatability

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

Max. Error: Maximum of the absolute values of the individual errors.
Range: Difference between largest and smallest measurement value.

Error of Indication

	Reference Value	Tolerance	As Found		As Left	
			Error of Indication	Result	Error of Indication	Result
1	0 kg	0.05 kg	0.00 kg	✓	0.00 kg	✓
2	30 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
3	70 kg	0.10 kg	0.10 kg	✓	0.00 kg	✓
4	100 kg	0.10 kg	0.15 kg	✗	0.00 kg	✓
5	150 kg	0.15 kg	0.20 kg	✗	0.00 kg	✓
6	100 kg	0.10 kg	0.15 kg	✗	0.00 kg	✓
7	70 kg	0.10 kg	0.10 kg	✓	0.00 kg	✓
8	30 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
9	0 kg	0.05 kg	0.00 kg	✓	0.00 kg	✓

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CLAS 2010-02

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Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-126 2022-05-10

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	+\- 1"Hg
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Pressure Gauge	**Input Type:**	Pression
Manufacturer:	Dwyer	**Output Type:**	Digitale
Model #:	DPG200	**Measurement Type:**	Pressure
Serial #:	N.A.	**Range:**	0-28"Hg
Location:	N.A.	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Crystal XP2i 300	**Certification #:**	2021008359
Serial #:	870437	**Certification Date:**	2021-11-15
Certified by:	Alpha Controls	**Next Certification:**	2022-11-15
Comments:			
Calibrator:	Fluke 744	**Certification #:**	2022003082
Serial #:	8180008	**Certification Date:**	2022-04-12
Certified by:	Alpha Controls	**Next Certification:**	2023-04-12
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-126 2022-05-10

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+\- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
-7.50 "Hg	-7.50 "Hg	-7.64 "Hg	-0.14 "Hg	-7.64 "Hg	+\- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
-15.00 "Hg	-15.00 "Hg	-15.24 "Hg	-0.24 "Hg	-15.24 "Hg	+\- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
-22.50 "Hg	-22.50 "Hg	-22.90 "Hg	-0.40 "Hg	-22.90 "Hg	+\- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
-28.00 "Hg	-28.00 "Hg	-28.51 "Hg	-0.51 "Hg	-28.51 "Hg	+\- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
0.00 "Hg	10.0000 V.DC.	10.0778 V.DC.	+0.0778 V.DC.	10.0778 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
-7.50 "Hg	8.0000 V.DC.	8.0447 V.DC.	+0.0447 V.DC.	8.0447 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
-15.00 "Hg	6.0000 V.DC.	6.0069 V.DC.	+0.0069 V.DC.	6.0069 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
-22.50 "Hg	4.0000 V.DC.	3.9596 V.DC.	-0.0404 V.DC.	3.9596 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
-28.00 "Hg	2.5333 V.DC.	2.4444 V.DC.	-0.0889 V.DC.	2.4444 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					

Environmental Conditions: Temperature: 21 °C Humidity: 41 %RH

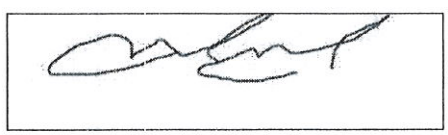
Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-10
Next Calibration:	2023-05-10
Certificate Date:	2022-05-10

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

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

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



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Version 1

MAY 2022

Instrumentation Saint•Laurent inc.
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-127 2022-05-10

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	+\- 1"Hg
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Pressure Gauge	**Input Type:**	Pression
Manufacturer:	Dwyer	**Output Type:**	Digitale
Model #:	DPG200	**Measurement Type:**	Pressure
Serial #:	N.A.	**Range:**	0-28"Hg
Location:	N.A.	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2022003082
Serial #:	8180008	**Certification Date:**	2022-04-12
Certified by:	Alpha Controls	**Next Certification:**	2023-04-12
Comments:			
Calibrator:	Crystal XP2i 300	**Certification #:**	2021008359
Serial #:	870437	**Certification Date:**	2021-11-15
Certified by:	Alpha Controls	**Next Certification:**	2022-11-15
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-127 2022-05-10

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+/-1 "Hg	1 "Hg
Compliant	Verification of the indicator					
-7.50 "Hg	-7.50 "Hg	-7.52 "Hg	-0.02 "Hg	-7.52 "Hg	+/- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
-15.00 "Hg	-15.00 "Hg	-15.03 "Hg	-0.03 "Hg	-15.03 "Hg	+/- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
-22.50 "Hg	-22.50 "Hg	-22.56 "Hg	-0.06 "Hg	-22.56 "Hg	+/- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
-28.00 "Hg	-28.00 "Hg	-28.11 "Hg	-0.11 "Hg	-28.11 "Hg	+/- 1 "Hg	1 "Hg
Compliant	Verification of the indicator					
0.00 "Hg	10.0000 V.DC.	10.0236 V.DC.	+0.0236 V.DC.	10.0236 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
-7.50 "Hg	8.0000 V.DC.	8.0275 V.DC.	+0.0275 V.DC.	8.0275 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
-15.00 "Hg	6.0000 V.DC.	6.0185 V.DC.	+0.0185 V.DC.	6.0185 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
-22.50 "Hg	4.0000 V.DC.	4.0002 V.DC.	+0.0002 V.DC.	4.0002 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
-28.00 "Hg	2.5333 V.DC.	2.5160 V.DC.	-0.0173 V.DC.	2.5160 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					

Environmental Conditions: Temperature: 21 °C Humidity: 41 %RH

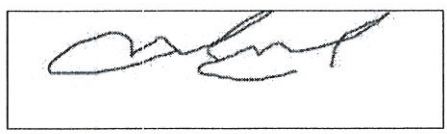
Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-10
Next Calibration:	2023-05-10
Certificate Date:	2022-05-10

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

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

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May 2022

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ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

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

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

Technician:
Coutu, Daniel

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	**Date approved :**	04-03-2022
Precision class :	ASTM 1	**Next Calibration :**	04-03-2027
Density :	7.95g/cm³	**CCN accreditation # :**	668
Identification (if unique) :	1000026013	**CLAS Certification # :**	2010-01

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

NOTES:

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

REMARKS:

March 2022

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ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

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

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

CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
200 g*	1000026013	EM-129	199.99954 g	199.99986 g	0.50 mg	0.10 mg

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

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CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

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

CALIBRATION RESULTS, CORRECTIONS:

Nominal Mass	Serial #	Inventory #	Conventional mass Corrections	Conventional mass Corrections after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
200 g*	1000026013	EM-129	-0.46 mg	-0.14 mg	0.50 mg	0.10 mg

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

CALIBRATION CERTIFICATE

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

BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

UNCERTAINTIES:

The following uncertainties exist :

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

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

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

TRACEABILITY

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

CALIBRATION CERTIFICATE

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

USED REFERENCES

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

ENVIRONMENTAL CONDITIONS

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

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Phone: (450) 473-6169
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Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-136 2022-05-25

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

CALIBRATION SPECIFICATION	
Service Procedure:	ISL-004
Required Accuracy:	+\-2°C +\-3%RH
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Hygrometer	**Input Type:**	Temp/%RH
Manufacturer:	Fluke	**Output Type:**	Digitale
Model #:	971	**Measurement Type:**	Temp/Humidity
Serial #:	10610850	**Range:**	5-95%RH -20a60°C
Location:	N.A.	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Hygrometre 485B-1/RPM	**Certification #:**	2022001936
Serial #:	035V4V	**Certification Date:**	2022-03-11
Certified by:	Alpha Controls	**Next Certification:**	2023-03-11
Comments:			

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(Québec), J0N 1M0
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Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-136 2022-05-25

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
25.0 °C	25.0 °C	25.1 °C	+0.1 °C	25.1 °C	+/- 2.0 °C	1.0 °C
40.0 °C	40.0 °C	40.3 °C	+0.3 °C	40.3 °C	+/- 2.0 °C	1.0 °C
30.0 %RH	30.0 %RH	28.1 %RH	-1.9 %RH	28.1 %RH	+/- 3.0 %RH	-- %RH
55.0 %RH	55.0 %RH	52.8 %RH	-2.2 %RH	52.8 %RH	+/- 3.0 %RH	-- %RH
75.0 %RH	75.0 %RH	73.8 %RH	-1.2 %RH	73.8 %RH	+/- 3.0 %RH	-- %RH

Environmental Conditions: Temperature: 22 °C Humidity: 39 %RH

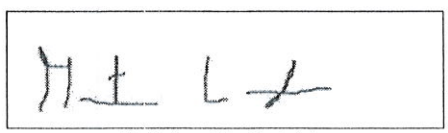
Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-25
Next Calibration:	2023-05-25
Certificate Date:	2022-05-25

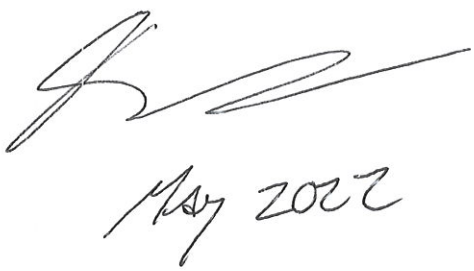
CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
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(Québec), J0N 1M0
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Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-147 2022-05-11

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Accuracy:	+\- 2.0C
Calibration Frequency:(days)	365

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

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2022003082
Serial #:	8180008	**Certification Date:**	2022-04-12
Certified by:	Alpha Controls	**Next Certification:**	2023-04-12
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-147 2022-05-11

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
EntrySource	GivenValue	ActualValue	Deviation	Post Calib	Tolerance	Incertitude
Conformity	Voir Commentaire					

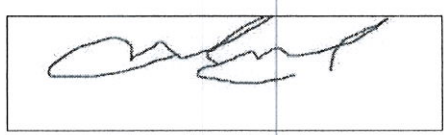
Environmental Conditions:	Temperature:	21 °C	Humidity: 42 %RH
Comments:	Data Acquisition system Conforme Les 2 slot de l'enregistreur ont été vérifié.		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-11
Next Calibration:	2023-05-11
Certificate Date:	2022-05-11

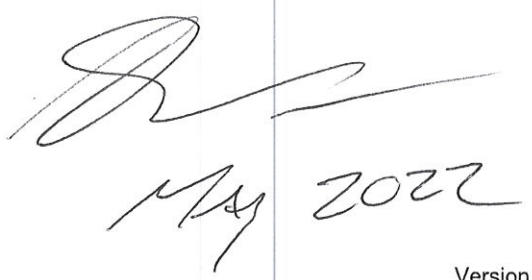
CALIBRATION CONFORMITY		
	Before	**After**
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
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¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
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Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154/2 2022-05-11

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
77.0 °F	77.0 °F	76.4 °F	-0.6 °F	76.4 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 111 (Filtre 1) en type "T" En Loop avec EM-154					
77.0 °F	77.0 °F	76.3 °F	-0.7 °F	76.3 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 112 (Filtre 2) en type "T" En Loop avec EM-154					
140.0 °F	140.0 °F	139.7 °F	-0.3 °F	139.7 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 113 (Tunnel) en type "J" En Loop avec EM-154					
68.0 °F	68.0 °F	67.6 °F	-0.4 °F	67.6 °F	+/- 4.0 °F	+/- 0.4 °F
Compliant	ID. No. 114 (Room) en type "J" En Loop avec EM-154					
77.0 °F	77.0 °F	76.6 °F	-0.4 °F	76.6 °F	+/- 4.0 °F	+/- 0.4 °F
Non-Compliant	ID. No. 115 (Analyzer gaz) en type "J" En Loop avec EM-154					

Environmental Conditions: Temperature: 21 °C Humidity: 42 %RH

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-11
Next Calibration:	2022-11-11
Certificate Date:	2022-05-11

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

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
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May 2022

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Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154/2 2022-05-11

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Accuracy:	+\- 4.0°F
Calibration Frequency:(days)	181

INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	**Input Type:**	Temp
Manufacturer:	Keithley	**Output Type:**	Digitale
Model #:	7700	**Measurement Type:**	Temperature
Serial #:	1306774	**Range:**	Divers
Location:	N/A	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2022003082
Serial #:	8180008	**Certification Date:**	2022-04-12
Certified by:	Alpha Controls	**Next Certification:**	2023-04-12
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154 2022-05-11

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Accuracy:	+\- 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	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke 744	**Certification #:**	2022003082
Serial #:	8180008	**Certification Date:**	2022-04-12
Certified by:	Alpha Controls	**Next Certification:**	2023-04-12
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154 2022-05-11

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	Comment					
-17.000 mV	-17.000 mV	-17.106 mV	-0.106 mV	-17.106 mV	+/- 0.500 mV	0.1 mV
Compliant	Input#1					
0.000 mV	0.000 mV	-0.105 mV	-0.105 mV	-0.105 mV	+/- 0.500 mV	0.1 mV
Compliant	Input#1					
20.000 mV	20.000 mV	19.897 mV	-0.103 mV	19.897 mV	+/- 0.500 mV	0.1 mV
Compliant	Input#1					
30.000 mV	30.000 mV	29.870 mV	-0.130 mV	29.870 mV	+/- 0.500 mV	0.1 mV
Compliant	Input#2					
30.000 mV	30.000 mV	29.870 mV	-0.130 mV	29.870 mV	+/- 0.500 mV	0.1 mV
Compliant	Input#3 Non-Conforme					
5.000 V.DC.	5.000 V.DC.	5.000 V.DC.	0.000 V.DC.	5.000 V.DC.	+/- 0.050 V.DC.	0.1 V.DC.
Compliant	Input#4					
30.000 mV	30.000 mV	29.647 mV	-0.353 mV	29.647 mV	+/- 0.050 mV	0.1 mV
Compliant	Input#5					
30.000 mV	30.000 mV	29.642 mV	-0.358 mV	29.642 mV	+/- 0.050 mV	0.1 mV
Compliant	Input#6					
100.00 Ohms	100.00 Ohms	101.02 Ohms	+1.02 Ohms	101.02 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#7					
100.00 Ohms	100.00 Ohms	101.00 Ohms	+1.00 Ohms	101.00 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#8					
100.00 Ohms	100.00 Ohms	101.00 Ohms	+1.00 Ohms	101.00 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#9					
100.00 Ohms	100.00 Ohms	100.90 Ohms	+0.90 Ohms	100.90 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#10					
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#11TypeT					
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	+\- 2.0 °C	+/- 0.3 °C
Compliant	Input#12TypeT					
100.0 °C	100.0 °C	99.7 °C	+0.3 °C	99.7 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#13 TypeJ					
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#14TypeJ					
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#15 TypeJ					
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	+\- 2.0 °C	+/- 0.2 °C
Compliant	Input#16TypeJ					
100.00 Ohms	100.00 Ohms	101.08 Ohms	+1.08 Ohms	101.08 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#17					
100.00 Ohms	100.00 Ohms	101.04 Ohms	+1.04 Ohms	101.04 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#18					

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154 2022-05-11

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
100.00 Ohms	100.00 Ohms	101.03 Ohms	+0.02 Ohms	101.03 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#19					
100.00 Ohms	100.00 Ohms	100.99 Ohms	+0.99 Ohms	100.99 Ohms	+/- 0.10 Ohms	+/- 0.051 Ohms
Non-Compliant	Input#20					
12.000 mA	12.000 mA	12.001 mA	+0.001 mA	12.001 mA	+/- 0.100 mA	1.00 mA
Compliant	Input#21					
12.000 mA	12.000 mA	-------- mA	-------- mA	-------- mA	+/- 0.100 mA	1.00 mA
Non-Compliant	Input#22 Fonctionne pas					

Environmental Conditions: Temperature: 21 °C Humidity: 42 %RH

Comments: Test avec EM-147

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-11
Next Calibration:	2023-05-11
Certificate Date:	2022-05-11

CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

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Marco Miron - Technicien

May 2022

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Trescal

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| LA MÉTROLOGIE AU SERVICE DE VOTRE PERFORMANCE |

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

2022.01.17

Certificat d'Étalonnage / Certificate of Calibration

CLIENT :
SERVICES POLYTESTS INC.
695-B GAUDETTE
ST-JEAN-SUR-RICHELIEU, QC J3B7S7

Description: STOPWATCH
Fabricant/ Manufacturer: EXTECH
Modèle/ Model : 365510
No série / Serial no : 131636
Inventaire / Asset # : EM-175

CERTIFICAT No / Certificate No: 347561

PROCÉDURE / Procedure : TRESCAL - EXTECH_365510

Date étalonnage/ Calibration Performed : aaaa - mm - jj 2021-12-24

Echéance/ Due Date : 2022-12-24

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

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

Conditions de mesure / Measurement conditions

TEMPÉRATURE / Temp. : 23.0°C

HUMIDITÉ / Humidity : 36% RH

Usage restreint/ *Restricted use* : ☐

Réparation effectuée / *Repair performed* : ☐

Ajustement effectué / *Adjustment performed* : ☐

ÉTALONS UTILISÉS/ Standards Used:

Identification	Manuf.	Model	Description	Ser. #	Étalonné/ Cal.	Échéance/ Due
PR0313	H-P	53132A	UNIVERSAL COUNTER	3546A03142	2021-08-25	2022-08-25
PR0392	AGILENT	33250A	FUNCTION/ARBITRARY WAVEFORM GENERATOR	MY40008014	2021-06-11	2023-06-11

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 :

Technicien :
Technician M. BARRAK

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.

LE DROIT D'AUTEUR DE CE CERTIFICAT APPARTIENT À TRESCAL CANADA INC.CE CERTIFICAT NE PEUT ÊTRE REPRODUIT AUTREMENT QU'EN ENTIER ET AVEC LE CONSENTEMENT PRÉALABLE ÉCRIT DE TRESCAL CANADA INC..
TRESCAL CANADA *INC. OWN COPYRIGHT OF THIS CERTIFICATE. THE CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN CONSENT OF TRESCAL CANADA INC..*

Trescal

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Certificat d'Étalonnage
Certificate of Calibration

	347561
CLIENT / Customer :	SERVICES POLYTESTS INC.
DESCRIPTION / Description :	STOPWATCH
MANUFACTURIER / Manufacturer :	EXTECH
MODÈLE / Model :	365510

DESCRIPTION Description	LIMITES Limits	LECTURES Readings	LIMITES Limits
	Min	Comptes / Counts Chronomètre/timer 162444	Max

Temps écoulé, chronomètre sous test / Elapsed time on test stopwatch

Minutes	Seconds	1/100 sec
27	4	44

Total au compteur / Reference timer: 162447,4 comptes/counts

(Δt) Deviation (1/100sec): -3,40

Deviation Par jour/ Per day (%): -0,0021 %

Deviation Par jour/ Per day (sec): **-1,81 sec**

* Secondes	Deviation 24hrs	* Secondes
-3,00	**-1,81**	3,00

* 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.

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS 2009-02

#655

CALIBRATION CERTIFICATE # 17213

Calibration date : 2022-07-05
Certificate issued : 2022-07-05

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

Calibration of
Shinigawa DCDa-2c S/N : 23544

QUALITY PROGRAM CONFORMANCE

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

TRACEABILITY

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

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

CALIBRATION AND MEASUREMENT CAPABILITY

Calibration measurement capabilities have an uncertainty of ±0.2% of reading for a flow range between 5 SCCM to 10 SLPM, ±0.3% of reading for a flow range between 10 SLPM to 30 SLPM, ±0.2% of reading for a flow range between 30 SLPM to 3000 SLPM, ±0.3% of reading for a flow range above 3000 SLPM to 6000 SLPM and ±0.5% of reading for a flow range under 5 SCCM down to 1 SCCM, air or nitrogen equivalent. The reported uncertainty is expanded using a coverage factor k=2 for a level of confidence of approximately 95%, assuming a normal distribution including resolution of the instrument. The test uncertainty ratio (TUR) of this calibration is at least 4:1 unless otherwise stated.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Initial readings = Final readings, no adjustment. Calibration of the instrument
Results	Final readings in tolerance with K factor = 0.98. Final readings in tolerance
Remarks	Calibration frequency every 12 months

Louis-Philippe Tremblay
Metrologist

Laboratory Manager

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CLAS 2009-02

#655

Calibration certificate # 17213

Serial Number:	23544	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500331212	2023-05-03
Fluke molbox1+	Molbox1+	2089	1500317991	2022-10-05
RTD Mist	Mist	L00295	2022000011	2023-01-10
Module 44.5 PSI avec Baro 163671	Module 30	160659	2022003929	2023-05-13

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature		Ambient temperature	22 °C
Inlet pressure		Ambient pressure	1012.35 mbar
Outlet pressure		Orientation	Horizontal
Reference temperature		Seals	Viton
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy ±2 %O.R.			

Final readings

Test Flow ALH	Device under test m³	Measured values Pressure PSIA	Temperature °C	Reference m³	Calculated Reference m³	Calculated Error m³	Acceptable Error m³	Uncertainty k = 2 m³	TUR
373.1579	61.9850	14.6731	22.39	57.3300	62.1414	-0.1564	1.2428	0.2141	>4
1078.5347	179.8300	14.6851	22.31	165.8700	179.5948	0.2352	3.5919	0.6186	>4
1838.4293	304.8241	14.7102	22.40	283.1400	306.1385	-1.3144	6.1228	1.0545	>4

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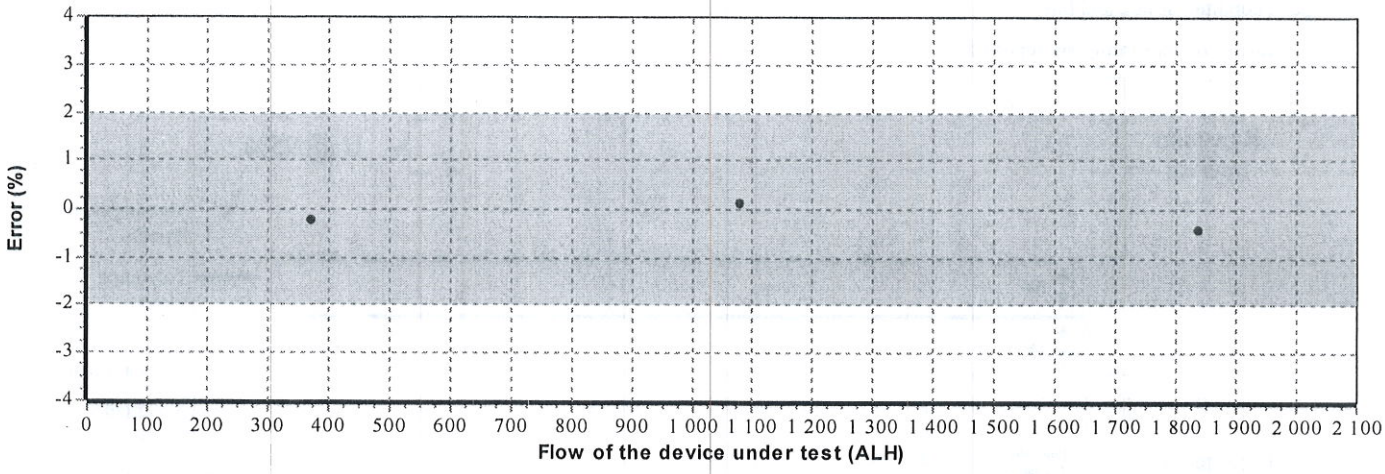
CLAS 2009-02

#655

Calibration certificate # 17213

Serial Number:	23544	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

Cal Fact. 1.002523

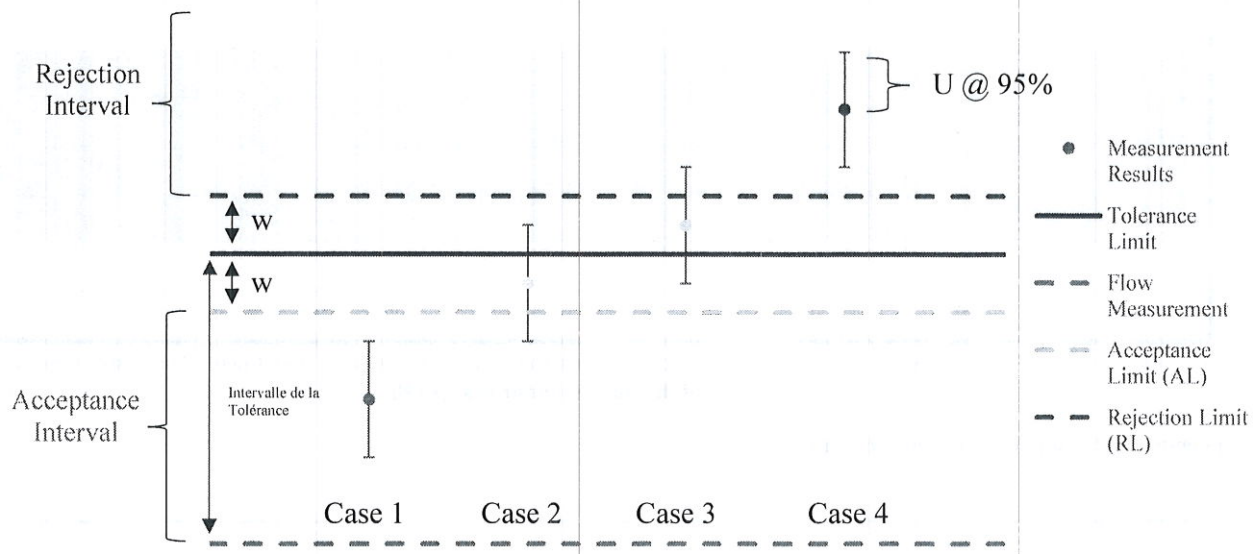
July 26th 2022

Appendix for the decision rule

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

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

Statements of conformity are reported as:



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

Case 1 *– Below acceptance limit AL*
Status: In tolerance

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

Case 2 *– Below tolerance limit TL, greater than acceptance limit AL*
Status: In tolerance-Conditional

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

Case 3 *– Greater than tolerance limit, below rejection limit RL*
Status: Out of tolerance-Conditional

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

Case 4 *– Greater than rejection limit RL*
Status: Out of tolerance

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

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CLAS NRC·CNRC
CLAS 2009-02

SCC Accredited LAB
LAB Accredité CCN
#655

CALIBRATION CERTIFICATE # 17215

Calibration date : 2022-07-05
Certificate issued : 2022-07-05

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

Calibration of
Shinigawa DCDa-2c S/N : 23543

QUALITY PROGRAM CONFORMANCE

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

TRACEABILITY

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

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CALIBRATION AND MEASUREMENT CAPABILITY

Calibration measurement capabilities have an uncertainty of ±0.2% of reading for a flow range between 5 SCCM to 10 SLPM, ±0.3% of reading for a flow range between 10 SLPM to 30 SLPM, ±0.2% of reading for a flow range between 30 SLPM to 3000 SLPM, ±0.3% of reading for a flow range above 3000 SLPM to 6000 SLPM and ±0.5% of reading for a flow range under 5 SCCM down to 1 SCCM, air or nitrogen equivalent. The reported uncertainty is expanded using a coverage factor k=2 for a level of confidence of approximately 95%, assuming a normal distribution including resolution of the instrument. The test uncertainty ratio (TUR) of this calibration is at least 4:1 unless otherwise stated.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument
Results	Initial readings in tolerance-conditional. Final readings in tolerance
Remarks	Calibration frequency every 12 months. Apply K factor 1.02 to display to meet accuracy.

Louis-Philippe Tremblay
Metrologist

Laboratory Manager

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CLAS 2009-02

#655

Calibration certificate # 17215

Serial Number:	23543	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Standard equipment used for initial calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500331212	2023-05-03
Fluke molbox1+	Molbox1+	2089	1500317991	2022-10-05
RTD Mist	Mist	L00295	2022000011	2023-01-10
Module 44.5 PSI avec Baro 163671	Module 30	160659	2022003929	2023-05-13

Initial specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature		Ambient temperature	22 °C
Inlet pressure		Ambient pressure	1010.63 mbar
Outlet pressure		Orientation	Horizontal
Reference temperature		Seals	Viton
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy ±2 %O.R.			

Initial readings

Test Flow ALH	Device under test m³	Measured values Pressure PSIA	Temperature °C	Reference m³	Calculated Reference m³	Calculated Error m³	Acceptable Error m³	Uncertainty k = 2 m³	TUR
344.0786	58.1450	14.6588	22.38	52.8000	57.2843	0.8607	1.1457	0.1974	>4
1082.8864	183.5100	14.6686	22.37	166.3200	180.3206	3.1894	3.6064	0.6212	>4
1832.4116	307.8200	14.6893	22.56	281.6500	305.1232	2.6968	6.1025	1.0513	>4

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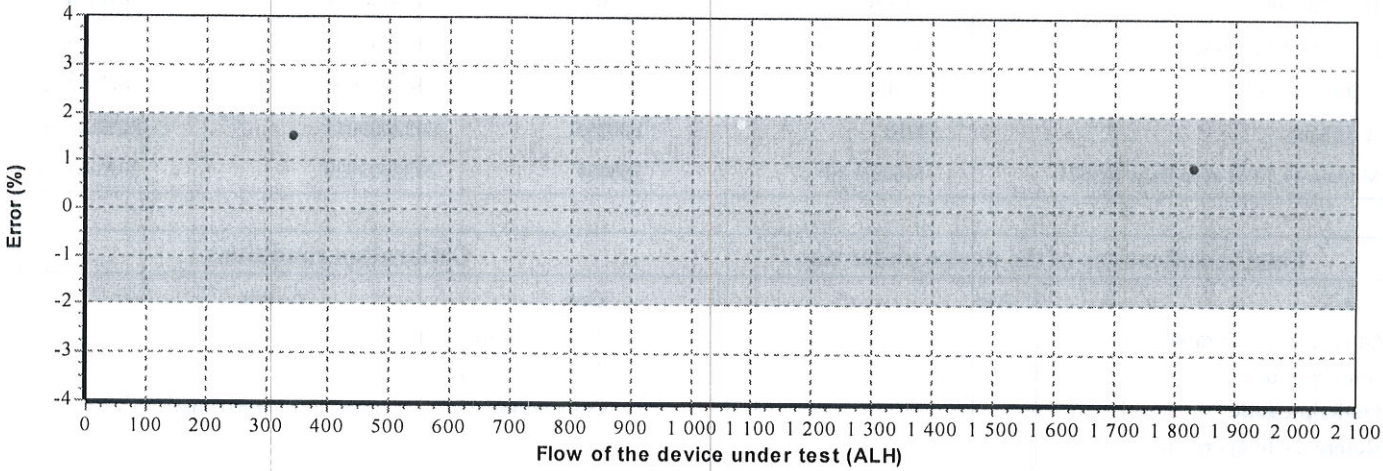
CLAS NRC-CNRC CLAS 2009-02

SCC Accredited LAB Accredite-SCC #655

Calibration certificate # 17215

Serial Number:	23543	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Initial results



See the appendix for the guideline of decision rule

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#655

Calibration certificate # 17215

Serial Number:	23543	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500331212	2023-05-03
Fluke molbox1+	Molbox1+	2089	1500317991	2022-10-05
RTD Mist	Mist	L00295	2022000011	2023-01-10
Module 44.5 PSI avec Baro 163671	Module 30	160659	2022003929	2023-05-13

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature		Ambient temperature	
Inlet pressure		Ambient pressure	
Outlet pressure		Orientation	Horizontal
Reference temperature		Seals	Viton
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy ±2 %O.R.			

Final readings

Test Flow ALH	Device under test m³	Measured values Pressure PSIA	Temperature °C	Reference m³	Calculated Reference m³	Calculated Error m³	Acceptable Error m³	Uncertainty k = 2 m³	TUR
373.8365	57.0049	14.6589	22.80	52.2843	56.8061	0.1988	1.1361	0.1958	>4
1082.8910	179.9117	14.6686	22.37	166.3200	180.3214	-0.4097	3.6064	0.6212	>4
1832.4310	301.7843	14.6893	22.56	281.6500	305.1264	-3.3421	6.1025	1.0513	>4

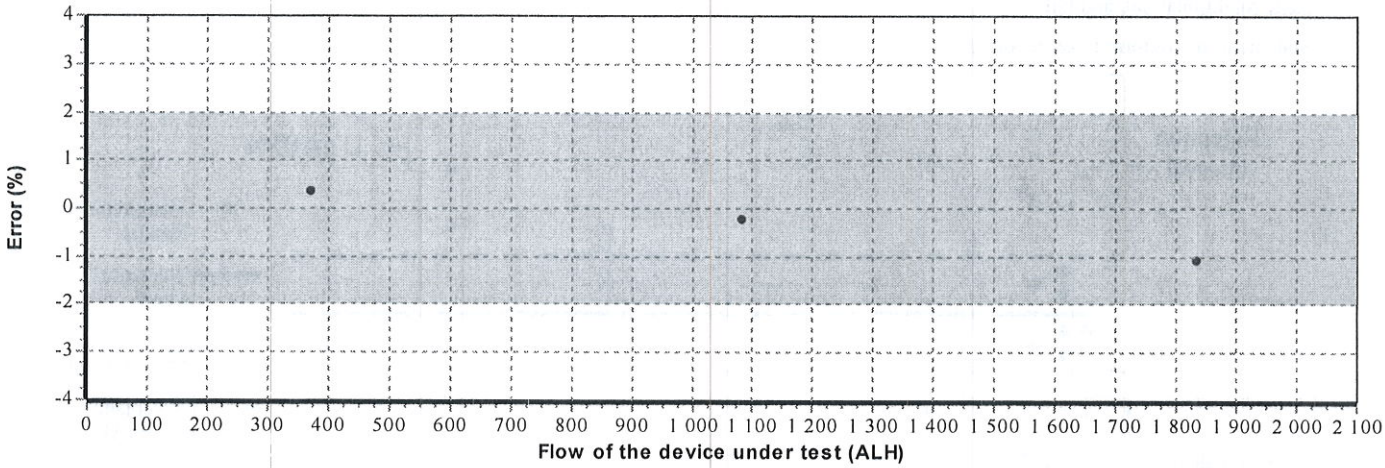
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#655

Calibration certificate # 17215			
Serial Number:	23543	Test stand:	3
Calibration Date:	2022-07-05	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

CalFactor : 0.996513

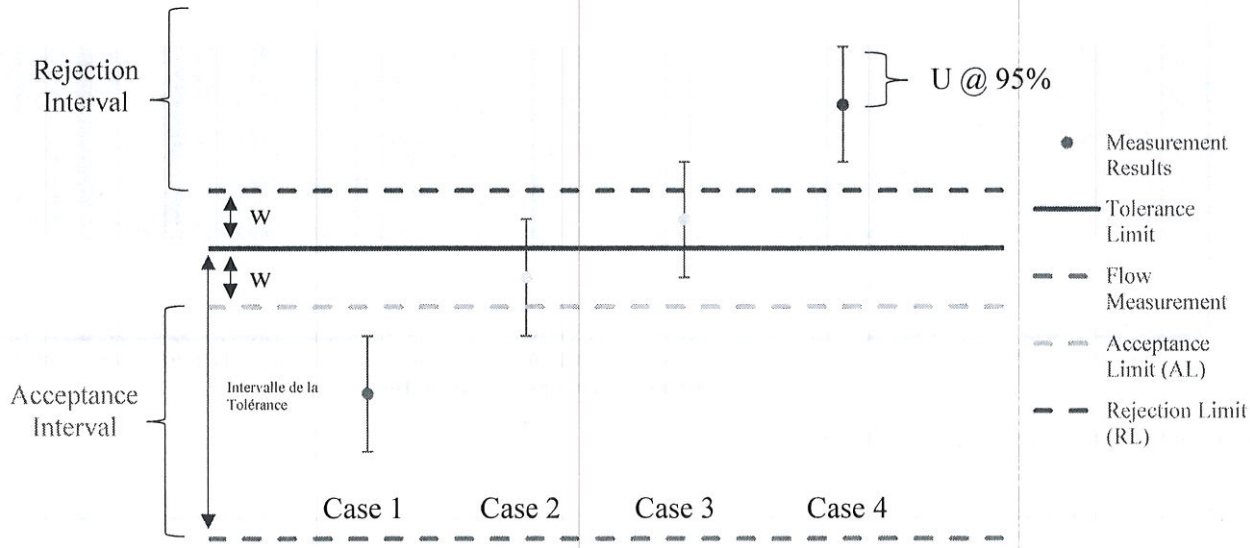
July 26th 2022

Appendix for the decision rule

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

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

Statements of conformity are reported as:



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

Case 1 *– Below acceptance limit AL*
Status: In tolerance

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

Case 2 *– Below tolerance limit TL, greater than acceptance limit AL*
Status: In tolerance-Conditional

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

Case 3 *– Greater than tolerance limit, below rejection limit RL*
Status: Out of tolerance-Conditional

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

Case 4 *– Greater than rejection limit RL*
Status: Out of tolerance

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

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CLAS 2009-02

#655

CALIBRATION CERTIFICATE # 17221

Calibration date : 2022-07-06
Certificate issued : 2022-07-06

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

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

QUALITY PROGRAM CONFORMANCE

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

TRACEABILITY

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

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CALIBRATION AND MEASUREMENT CAPABILITY

Calibration measurement capabilities have an uncertainty of ±0.2% of reading for a flow range between 5 SCCM to 10 SLPM, ±0.3% of reading for a flow range between 10 SLPM to 30 SLPM, ±0.2% of reading for a flow range between 30 SLPM to 3000 SLPM, ±0.3% of reading for a flow range above 3000 SLPM to 6000 SLPM and ±0.5% of reading for a flow range under 5 SCCM down to 1 SCCM, air or nitrogen equivalent. The reported uncertainty is expanded using a coverage factor k=2 for a level of confidence of approximately 95%, assuming a normal distribution including resolution of the instrument. The test uncertainty ratio (TUR) of this calibration is at least 4:1 unless otherwise stated.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Initial readings = Final readings, no adjustment. Calibration of the instrument
Results	Final readings in tolerance
Remarks	Calibration frequency every 12 months

Louis-Philippe Tremblay
Metrologist

Laboratory Manager

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CLAS 2009-02

#655

Calibration certificate # 17221

Serial Number:	S8020	Test stand:	3
Calibration Date:	2022-07-06	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2359	1500331212	2023-05-03
Fluke molbox1+	Molbox1+	2089	1500317991	2022-10-05
RTD Mist	Mist	L00295	2022000011	2023-01-10
Module 44.5 PSI avec Baro 163671	Module 30	160659	2022003929	2023-05-13

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature		Ambient temperature	22 °C
Inlet pressure		Ambient pressure	1013.54 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy ±2 %O.R.			

Final readings

Test Flow ALH	Device under test m³	Measured values Pressure PSIA	Temperature °C	Reference m³	Calculated Reference m³	Calculated Error m³	Acceptable Error m³	Uncertainty k = 2 m³	TUR
361.5227	59.3600	14.6578	22.32	55.4900	60.1955	-0.8355	1.2039	0.2074	>4
1085.7119	181.7350	14.6623	22.42	166.9800	181.1431	0.5919	3.6229	0.6241	>4
1826.9168	304.6100	14.6745	22.38	281.2500	304.8173	-0.2073	6.0963	1.0501	>4

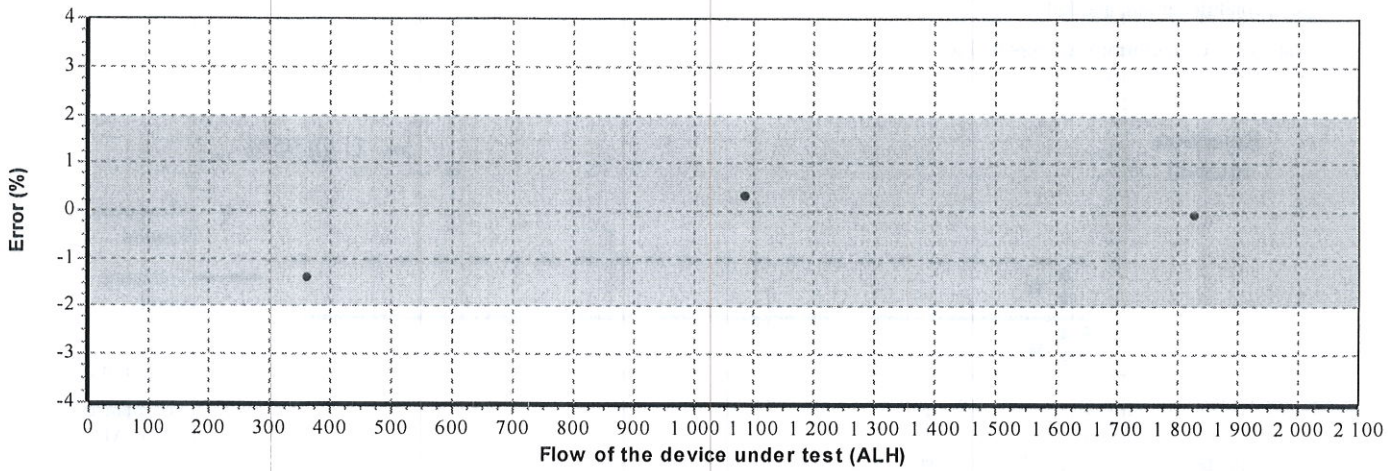
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CLAS 2009-02

#655

Calibration certificate # 17221			
Serial Number:	S8020	Test stand:	3
Calibration Date:	2022-07-06	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

CalFact: 1,014075

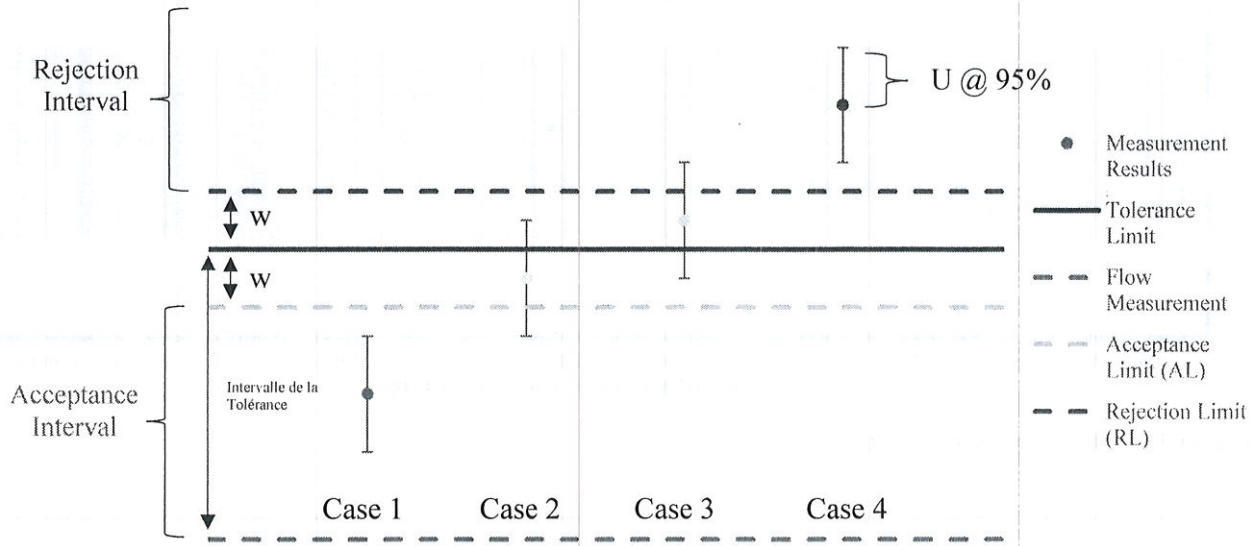
July 26th 2022

Appendix for the decision rule

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

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

Statements of conformity are reported as:



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

Case 1 *– Below acceptance limit AL*
Status: In tolerance

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

Case 2 *– Below tolerance limit TL, greater than acceptance limit AL*
Status: In tolerance-Conditional

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

Case 3 *– Greater than tolerance limit, below rejection limit RL*
Status: Out of tolerance-Conditional

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

Case 4 *– Greater than rejection limit RL*
Status: Out of tolerance

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

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

TRANSCAT® CANADA
Trust in every measure

ACCREDITATION ISO 17025 TM
SCC Scope Number 668

CALIBRATION CERTIFICATE

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

Client :	Polytests	**Certificate Number :**	**157-77C603-222**
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	**Calibration date :**	04-03-2022

Technician:
Coutu, Daniel

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	NIST F	**Date approved :**	14-03-2022
Precision class :	NIST F	**Next Calibration :**	04-03-2026
Density :	7.7g/cm³	**CCN accreditation # :**	668
Identification (if unique) :	DI000D532	**CLAS Certification # :**	2010-01

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

NOTES:

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

REMARKS:

March 2022

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ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

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

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

CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
10 kg	DI000D532	EM205	9.999938 kg		1 000 mg	10 mg

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Trust in every measure

ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

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

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

CALIBRATION RESULTS, CORRECTIONS:

Nominal Mass	Serial #	Inventory #	Conventional mass Corrections	Conventional mass Corrections after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
10 kg	DI000D532		-62 mg		1 000 mg	10 mg

CALIBRATION CERTIFICATE

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

BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

UNCERTAINTIES:

The following uncertainties exist :

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

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

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

TRACEABILITY

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

CALIBRATION CERTIFICATE

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

USED REFERENCES

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

ENVIRONMENTAL CONDITIONS

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

Instrumentation
Saint•Laurent inc.

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

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-224 2022-05-25

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

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

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

CALIBRATORS SPECIFICATION			
Calibrator:	tape a mesurer	**Certification #:**	VB-19652440
Serial #:	22091327	**Certification Date:**	2022-03-10
Certified by:	Starrett	**Next Certification:**	2023-03-10
Comments:			

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Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-224 2022-05-25

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	
	Comment					
1.00 "	1.00 "	1.00 "	0.00 "	1.00 "	+/- 1/32 "	
36.00 "	36.00 "	36.00 "	0.00 "	36.00 "	+/- 1/32 "	
72.00 "	72.00 "	72.00 "	0.00 "	72.00 "	+/- 1/32 "	
108.00 "	108.00 "	108.00 "	0.00 "	108.00 "	+/- 1/32 "	
132.00 "	132.00 "	132.00 "	0.00 "	132.00 "	+/- 1/32 "	

Environmental Conditions: Temperature: 22 °C Humidity: 39 %RH

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-25
Next Calibration:	2023-05-25
Certificate Date:	2022-05-25

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

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

Martin Langlais - Technicien

MAY 2022

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Instrumentation
Saint•Laurent inc.
Certified ISO 17025

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MRC·CRC
CLAS 2010-02

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2022-05-10

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	+/- 0.25 "H2O
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	**Input Type:**	Pression
Manufacturer:	Dwyer	**Output Type:**	Voltage
Model #:	MS-321-LCD	**Measurement Type:**	Pressure
Serial #:	N/A	**Range:**	0 à 0.10 "H2O
Location:	Banc de test	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression	**Certification #:**	2021008414
Serial #:	3330050	**Certification Date:**	2021-11-22
Certified by:	Alpha Controls	**Next Certification:**	2022-11-22
Comments:			
Calibrator:	Fluke 744	**Certification #:**	2022001379
Serial #:	8223003	**Certification Date:**	2022-02-18
Certified by:	Alpha Controls	**Next Certification:**	2022-05-18
Comments:			

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Instrumentation Saint•Laurent inc.
Certified ISO 17025

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2022-05-10

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
0.0000 "H2O	0.0000 "H2O	0.0010 "H2O	0.0010 "H2O	0.0010 "H2O	+/- 0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.0250 "H2O	0.0250 "H2O	0.0254 "H2O	+0.0004 "H2O	0.0254 "H2O	+/- 0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.0500 "H2O	0.0500 "H2O	0.0496 "H2O	-0.0004 "H2O	0.0496 "H2O	+/- 0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.0750 "H2O	0.0750 "H2O	0.0740 "H2O	-0.0010 "H2O	0.0740 "H2O	+/- 0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.1000 "H2O	0.1000 "H2O	0.9963 "H2O	-0.0037 "H2O	0.9963 "H2O	+/- 0.25 "H2O	0.10 "H2O
Compliant	Verification of the indicator					
0.0000 "H2O	0.0000 V.DC.	0.0715 V.DC.	+0.0715 V.DC.	0.0715 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.0250 "H2O	2.5000 V.DC.	2.4770 V.DC.	-0.023 V.DC.	2.4770 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.0500 "H2O	5.0000 V.DC.	4.9157 V.DC.	-0.0843 V.DC.	4.9157 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.0750 "H2O	7.5000 V.DC.	7.4215 V.DC.	-0.0785 V.DC.	7.4215 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.1000 "H2O	10.0000 V.DC.	9.9532 V.DC.	-0.0468 V.DC.	9.9532 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					

Environmental Conditions: Temperature: 21 °C Humidity: 41 %RH

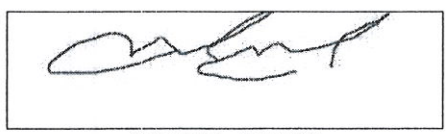
Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-10
Next Calibration:	2023-05-10
Certificate Date:	2022-05-10

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

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

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



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Version 1

MAY 2022

CERTIFICATE OF CALIBRATION

ACCREDITED
CALIBRATION
CERT #2260.01

Certificate Number: 2022004548

Manufacturer:	Control Company	***RMA:***	AC22051901
Model:	4199	***Workorder:***	2022004548
Description:	Barometer	***Barcode:***	AL00040350-P
Serial:	192343395	***Received Conditions:***	In Tolerance
ID:	EM 304	***Calibration Date:***	06-Jun-2022
Customer:	SERVICES POLYTESTS 695-B GUADETTE ST-JEAN-SUR-RICHELIEU QC J3B 7S7	***Calibration Due:***	06-Jun-2023
		Temperature:	21.52°C
		Humidity:	44.1%RH

STATEMENT OF UNCERTAINTY: The reported expanded uncertainty of measurement is stated as the standard measurement uncertainty multiplied by the coverage factor K = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 percent. Alpha Controls & Instrumentation Inc. certifies this instrument was calibrated on the date shown using standards traceable to NIST/NRC or accepted intrinsic standards and in compliance with ISO/IEC-17025:2017 and ANSI/NCSL Z540-1.

Any statement of compliance is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only. The customer must ensure equipment calibrated meets the intended use.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only.

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

STANDARDS USED

Description	*Model*	*ID*	*Cal Date*	*Due Date*
Pressure Controller/Calibrator	Fluke Calibration 6270A	PRE-CAL-08	No Cal Required	
Pressure Measurement Module	Fluke Calibration PM600-A7M	PRE-MOD-01	25-Oct-2021	25-Oct-2022

Notes: Adjusted from adjustment screw on back of unit.

Performed by: Anthony Morra
Technician
(digitally signed on 06-Jun-2022 8:38 am)

QA Reviewed by: Slava Peciurov
Lab Manager
(digitally signed on 06-Jun-2022 9:37 am)

Form: ROC101 Rev 9.3.a

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

Procedure: Pressure Gauge: CAL VER /6270A (1.1.A) **FOUND (Pass)**

Test Description	True Value	Test Results	Tolerance	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
993.05 mbar	993.05 mbar	998.0 mbar	±5.00 mbar	988.0 mbar	998.0 mbar	Pass	1.2e-001 mbar

Procedure: Pressure Gauge: CAL VER /6270A (1.1.A) **LEFT (Pass)**

Test Description	True Value	Test Results	Tolerance	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
992.90 mbar	992.90 mbar	993.0 mbar	±5.00 mbar	987.9 mbar	997.9 mbar	Pass	1.1e-001 mbar

END OF CERTIFICATE

Instrumentation
Saint•Laurent inc.
Certified ISO 17025

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CLAS 2010-02

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N°669

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(Québec), J0N 1M0
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-313 2022-05-10

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	+/- 0.25"H2O
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	**Input Type:**	Pression
Manufacturer:	Dwyer	**Output Type:**	Voltage
Model #:	MS-321-LCD	**Measurement Type:**	Pressure
Serial #:	N.A.	**Range:**	0 a 0.1 inchh20
Location:	N.A.	**Version:**	

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression	**Certification #:**	2021008414
Serial #:	3330050	**Certification Date:**	2021-11-22
Certified by:	Alpha Controls	**Next Certification:**	2022-11-22
Comments:			
Calibrator:	Fluke 744	**Certification #:**	2022001379
Serial #:	8223003	**Certification Date:**	2022-02-18
Certified by:	Alpha Controls	**Next Certification:**	2022-05-18
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-313 2022-05-10

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Accuracy	Uncertainty
Conformity	**Comment**					
0.0000 "H2O	0.0000 "H2O	+0.0015 "H2O	0.0015 "H2O	+0.0015 "H2O	+/- 0.25 "H2O	0.25 "H2O
Compliant	Verification of the indicator					
0.0250 "H2O	0.0250 "H2O	0.0261 "H2O	+0.0011 "H2O	0.0261 "H2O	+/- 0.25 "H2O	0.25 "H2O
Compliant	Verification of the indicator					
0.0500 "H2O	0.0500 "H2O	0.0510 "H2O	+0.0010 "H2O	0.0510 "H2O	+/- 0.25 "H2O	0.25 "H2O
Compliant	Verification of the indicator					
0.0750 "H2O	0.0750 "H2O	0.0762 "H2O	+0.0012 "H2O	0.0762 "H2O	+/- 0.25 "H2O	0.25 "H2O
Compliant	Verification of the indicator					
0.1000 "H2O	0.1000 "H2O	0.1011 "H2O	+0.0011 "H2O	0.1011 "H2O	+/- 0.25 "H2O	0.25 "H2O
Compliant	Verification of the indicator					
0.0000 "H2O	0.0000 V.DC.	0.0420 V.DC.	+0.0420 V.DC.	0.0420 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.0250 "H2O	2.5000 V.DC.	2.5828 V.DC.	+0.0828 V.DC.	2.5828 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.0500 "H2O	5.0000 V.DC.	5.1261 V.DC.	+0.1261 V.DC.	5.1261 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.0750 "H2O	7.5000 V.DC.	7.6332 V.DC.	+0.1332 V.DC.	7.6332 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					
0.1000 "H2O	10.0000 V.DC.	10.1287 V.DC.	+0.1287 V.DC.	10.1287 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Compliant	Verification of the analogic output					

Environmental Conditions: Temperature: 21 °C Humidity: 41 %RH

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2022-05-10
Next Calibration:	2023-05-10
Certificate Date:	2022-05-10

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

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
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Version 1

MAY 2022

Kalibrier-Protokoll

Certificate of conformity • Protocole d'étalonnage
Certicifato di taratura • Informe de calibración

Be sure. testo

Gerät / Module type / Modèle / Modelo: **testo 405i**

Messbereich / Measuring range / Etendue de mesure / Rango de medición: **Velocity: 0 … 30 m/s** **Temperature: -20 … +60 °C**

Serien-Nr. / Serial no. / N°. de série / Número de serie: 46100640

Messwerte / Measured values / Valeurs mesurées / Valores medidos:		
Sollwert / Reference / Référence / Referencia:	Zulässige Toleranz / Permissible tolerance / Tolérance admise / Tolerancia permitida:	Istwert / Actual Value / Valeur réelle / Valor medido:
Velocity:		
8.0 m/s	**±0.7 m/s**	**8.1 m/s**
Temperature :		
24.8 °C	**±0.5 °C**	**24.7 °C**

Prüfer / Inspector / Responsable / Verificador

EM-332

ITM INSTRUMENTS INC

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Ste-Anne-de-Bellevue, QC H9X 0A1

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16975 Leslie Street
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Calgary, AB T2C 5J3

VANCOUVER
1282 Cliveden Av
Delta, BC V3M 6G4

www.itm.com
information@itm.com
1.800.561.8187

Certificat d'étalonnage / Calibration Certificate

Client/Customer: *Services Polytests*

Certificat/Certificate: C458078-00-01

Identification de l'unité / Unit Identification

Fabricant/Manufacturer: **Delmhorst**
Modèle/Model: **MCS-1**
Description: **Wood Moisture Content Standard**
Série/Serial: **NA**
ID de l'unité/Unit ID: **NA**

Date d'étalonnage / Calibration Date

Date d'étalonnage/Cal Date: **17-Jan-2022**
Échéance/Due Date: **17-Jan-2023**

Conditions d'étalonnage / Calibration Conditions

Température/Temperature: **21.76°C**
Humidité/Humidity: **15.39 %**
Pression barométrique/Barometric Pressure: **N/A**

Information générales / General Information

Commentaire/Remark:**N/A**

Étalons utilisés / Standards Used

ID de l'unité / Unit ID	Fabricant / Manufacturer	Modéle / Model	Date d'étalonnage / Cal Date	Date Due / Due Date
INV022	Hewlett Packard	3458A	17-Dec-2021	17-Dec-2022

L'étalonnage a été effectué à l'aide d'étalons qui ont été vérifiés par rapport à ceux de l'Institut des Étalons Nationaux de Mesure (IÉNM) du Conseil National de Recherches du Canada (CNRC) ou à ceux du National institute of Standards and Technology (NIST) des États-Unis, et/ou ont été dérivés de constantes physiques de base et/ou par technique d'autoétalonnage proportionelle. L'incertitude d'étalonnage indiqué dans ce rapport est obtenue en utilisant un facteur de couverture de k=2 selon un degré de confiance d'environ 95%.

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted instrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of k=2 corresponding to a confidence level of approximately 95%.

Étalonné par/Calibrated by: ***B. Cardin***

Approuvé par/Approved by:

EM. 334

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Delta, BC V3M 6G4

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Résultats du test / Test Results

Procédure/Procedure: **DELMHORST MCS-1 : 3458** Rev: **1**

Type de donnée/Data Type: **À la réception\As Found** Résultats/Results: **Passer\Pass**

Description du test Test Description	Valeur réelle True Value	Lecture Reading	Limite min. Lower Limit	Limite max. Upper Limit	Status de test Test Status	Ince Elarg Exp Uncert
----- 12% MOISTURE -----						
----- 120MOHMS +/-10% -----						
120.00 MOhm		119.800 MOhm	108.000 MOhm	132.000 MOhm	Pass	4.1e+004 Ohm
----- 22% MOISTURE -----						
----- 1.1MOHMS +/-10% -----						
1.100 MOhm		1.0969 MOhm	0.9900 MOhm	1.2100 MOhm	Pass	5.8e+002 Ohm

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ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

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

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

Technician:
Coutu, Daniel

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	**Date approved :**	14-03-2022
Precision class :	ASTM 1	**Next Calibration :**	14-03-2027
Density :	7.96g/cm³	**CCN accreditation # :**	668
Identification (if unique) :	DI000J378	**CLAS Certification # :**	2010-01

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

NOTES:

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

REMARKS:

March 2022

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

CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
100mg	DI000J378	EM-335	99.9999 mg		0.010 mg	0.002 mg

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CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

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

CALIBRATION RESULTS, CORRECTIONS:

Nominal Mass	Serial #	Inventory #	Conventional mass Corrections	Conventional mass Corrections after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
100mg	DI000J378		-0.0001 mg		0.010 mg	0.002 mg

CALIBRATION CERTIFICATE

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

BALANCES

The following balances are used for calibration purposes :

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

We are also using these balances in our automated procedure :

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

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

UNCERTAINTIES:

The following uncertainties exist :

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

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

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

TRACEABILITY

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

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ACCREDITATION ISO 17025 TM
SCC Scope Number 668

CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

USED REFERENCES

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

ENVIRONMENTAL CONDITIONS

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

APPENDIX 4: Unit pre burn

Temps	wood	Flue	Room	Tunnel	Catalyst	scale	Right	Back	Bottom	Top	Left
acquisition	moisture content	temp	temp	dry bulb							
minutes	each pieces	°F	°F	°F	°F	lbs	°F	°F	°F	°F	°F
		Flue	Room	Tunnel	catlist down	weight	right	back	bottom	top	left
0		257,6	78,9	88,6	602,9	9,1	425,6	270,4	344,8	295,7	408,3
10		396,5	79,1	96,3	929,6	7,9	410,4	309,9	338,2	405,2	437,4
20		414,3	79,9	98,4	913,5	6,5	434,2	344,7	330,4	504,4	492,2
30		423,2	80,2	99,8	959,2	5,2	464,2	368,3	322,9	559,9	527,4
40		414,1	80,6	100,2	929,4	4,1	507,4	392,9	317,9	586,0	561,3
50		412,7	81,1	100,6	953,6	2,9	553,6	412,3	315,9	600,1	596,5
60		381,3	81,2	99,6	859,0	2,2	582,6	423,2	316,2	593,6	627,3
70		341,7	81,0	97,9	754,7	1,9	600,1	404,4	319,5	538,4	623,6
80		321,8	80,7	96,2	722,4	1,7	592,8	384,4	327,1	474,2	609,5
90		310,5	80,7	95,4	698,1	1,5	589,7	374,4	338,0	435,0	601,7
100		307,6	80,8	94,9	695,1	1,3	579,7	362,7	350,1	404,6	591,1
110		300,7	80,5	93,7	680,6	1,1	568,0	364,4	361,2	385,9	586,9
120		300,2	80,4	93,2	677,0	0,9	557,7	359,7	369,8	370,4	578,9
130		294,1	80,5	92,8	655,6	0,8	546,6	353,3	376,4	357,7	569,7
140		291,8	80,2	92,9	649,8	0,6	537,2	347,7	382,6	349,3	565,6
150		285,0	80,2	92,8	629,9	0,5	531,2	340,8	387,1	341,4	559,6
160		280,5	80,1	92,4	620,7	0,3	524,7	331,5	390,4	334,7	556,7
170		270,3	80,1	92,0	588,3	0,2	515,6	315,7	392,1	324,4	536,5
180		259,7	80,0	91,2	561,5	0,1	510,6	298,8	391,4	312,8	513,1
190		249,6	79,7	90,6	535,9	0,0	486,9	283,5	387,9	299,1	493,1
200		97,2	74,0	75,2	125,7	1,6	75,2	75,0	75,3	74,8	75,4
210	20-19-18	260,7	74,2	79,8	662,7	9,4	133,9	105,3	75,8	174,2	108,4
220		387,3	74,4	87,8	769,8	7,8	269,5	163,8	85,6	326,5	183,9
230		399,3	74,7	89,1	852,2	6,3	383,0	235,8	106,4	424,4	303,7
240		409,8	75,2	91,2	870,0	5,0	463,1	294,1	132,4	483,1	405,1
250		409,2	75,7	91,5	893,6	3,8	522,2	344,1	159,3	527,7	470,8
260		404,2	76,1	92,1	917,8	2,8	575,0	376,3	188,0	553,2	531,3
270		372,6	76,5	90,3	822,1	2,1	605,4	379,0	216,1	551,2	592,0
280		346,5	76,7	89,1	768,4	1,8	581,1	361,6	238,6	487,7	584,8
290		325,6	76,8	87,9	717,7	1,6	577,1	356,3	258,3	443,1	583,6
300		303,8	76,7	87,3	666,6	1,4	564,0	343,7	277,3	406,5	577,2
310		289,0	76,7	86,5	639,1	1,2	539,6	326,1	292,5	376,0	560,0
320		283,7	76,6	86,0	633,3	1,1	521,7	315,8	304,7	355,9	545,6
330		278,9	76,4	84,6	630,2	1,0	509,5	306,9	318,0	339,8	533,0
340		275,4	76,5	84,6	613,0	0,8	504,5	298,4	326,7	328,3	520,9
350		271,4	76,5	84,8	603,0	0,7	504,1	291,1	334,1	320,1	509,6
360		257,7	76,5	84,1	563,6	0,6	494,8	280,6	340,3	309,4	495,9
370		246,2	76,4	83,2	535,0	0,5	474,5	267,2	343,3	297,3	477,4
380		238,8	76,2	82,9	508,0	0,4	455,0	256,3	343,9	286,3	460,1
390	20-21-22-23	190,3	74,9	82,0	370,2	12,8	415,7	248,7	346,5	262,7	418,5
400		162,5	75,5	81,1	320,2	12,7	366,9	252,1	338,6	241,1	364,9
410		149,1	75,4	79,4	292,6	12,5	330,2	246,4	322,5	223,9	326,1
420		156,1	75,3	79,2	312,3	12,3	305,0	251,3	305,4	219,1	299,5
430		152,7	75,4	79,4	303,8	12,0	292,9	273,9	289,4	218,0	285,6
440		143,1	75,2	78,8	275,1	11,8	277,5	264,4	275,7	208,8	271,3
450		140,2	75,3	78,4	267,8	11,6	264,2	253,5	265,1	200,6	260,5
460		159,5	75,2	78,8	328,2	11,2	263,8	246,8	257,8	221,3	268,0
470		273,6	75,2	82,9	649,8	10,3	306,4	257,2	257,0	341,7	342,6
480		287,7	75,6	84,6	675,3	9,3	390,0	296,9	260,7	413,6	432,1
490		317,5	75,9	86,3	785,0	8,3	462,7	331,1	265,7	459,2	498,1
500		333,7	76,1	87,4	850,8	7,4	524,2	340,9	271,8	502,4	542,1
510		316,8	76,4	86,8	810,2	6,8	555,7	339,2	279,0	513,9	561,1
520		323,6	76,7	87,7	807,5	6,2	571,8	340,7	287,5	534,3	573,6
530		325,7	76,8	88,0	846,9	5,6	578,5	343,0	303,6	542,6	593,2
540		323,8	77,0	88,4	814,4	5,0	587,6	342,9	323,3	545,0	594,8
550		291,5	76,9	87,2	733,4	4,7	582,0	333,1	342,4	503,6	586,5
560		278,6	77,0	86,7	692,9	4,4	574,1	323,7	358,9	472,5	575,5
570		264,7	76,7	86,0	658,4	4,2	559,1	313,0	370,6	420,5	561,1
580		252,4	76,6	85,3	628,5	4,1	542,5	303,6	381,1	377,6	542,8
590		243,6	76,7	84,5	605,4	4,0	527,6	295,2	388,2	350,3	529,8
600		237,7	76,5	84,0	595,6	3,8	513,9	289,8	392,9	331,2	516,9
610		233,0	76,4	83,9	589,6	3,7	500,9	290,5	394,4	316,6	504,1
620		231,9	76,3	83,8	580,4	3,6	497,7	289,0	392,1	307,6	495,4
630		227,6	76,2	83,4	568,2	3,5	492,9	286,0	391,1	300,0	488,3
640		221,3	76,3	83,4	540,6	3,4	482,9	281,5	389,2	292,0	481,7
650		214,6	76,1	82,8	525,5	3,3	470,6	272,0	385,8	283,5	472,6
660		209,3	76,1	82,5	511,6	3,2	458,9	263,2	381,5	275,0	460,3
670		204,0	76,0	82,2	495,6	3,1	445,8	254,5	375,6	266,1	446,4
680		199,2	76,0	82,1	478,9	3,1	431,3	246,8	369,3	257,9	430,7
690		194,2	75,9	81,8	464,6	3,0	415,3	239,4	361,6	249,9	414,7
700		191,5	75,8	81,6	451,7	2,9	401,3	231,8	353,6	242,6	400,2
710		188,2	75,9	81,1	452,2	2,8	388,8	225,5	345,8	236,0	387,9
720		185,1	75,8	80,8	440,5	2,8	378,3	220,9	338,7	230,4	378,3
730		181,4	75,8	80,7	429,3	2,7	367,2	216,6	330,4	224,9	366,9
740		176,1	75,7	80,8	407,8	2,6	357,0	210,4	321,6	219,5	356,0
750		155,6	75,6	80,0	334,8	2,5	346,6	202,9	313,4	213,2	342,7
760		138,6	75,5	79,4	301,9	2,4	334,1	195,3	305,0	205,3	327,7
770		130,7	75,5	78,8	252,4	2,3	319,3	186,5	295,1	197,1	311,2
780		124,8	75,4	78,5	246,7	2,2	303,6	178,1	284,0	189,5	293,5
790		120,1	75,3	78,1	250,4	2,1	289,1	170,3	272,1	182,4	276,8
800		116,0	75,3	77,8	237,8	2,0	275,3	163,4	259,5	175,8	261,2
810		112,5	75,2	77,5	227,5	1,9	263,4	157,3	247,3	170,2	247,0
820		109,7	75,1	77,5	205,8	1,8	253,4	152,0	235,6	165,1	234,9
830		107,1	75,1	77,2	209,7	1,7	244,7	147,1	224,7	159,9	223,9
840		104,9	75,0	76,9	201,8	1,6	237,2	142,9	214,4	155,7	214,4
850	20-19-18-19	102,6	73,8	75,2	124,4	12,2	77,3	76,5	76,9	82,6	77,9
860		199,0	73,7	77,7	407,6	11,7	93,3	93,4	77,8	155,5	192,7
870		424,5	74,4	87,5	931,9	10,4	129,2	127,0	88,8	298,5	248,2
880		448,6	74,8	92,1	938,1	9,1	183,7	196,7	111,1	371,5	288,3
890		427,4	75,3	92,7	916,8	7,7	295,5	265,7	137,3	469,3	387,8
900		428,9	75,8	93,9	951,5	6,4	376,9	317,8	169,5	515,1	473,1
910		422,9	76,3	94,1	902,2	5,4	457,2	351,7	207,4	543,6	551,1
920		371,1	76,7	92,4	800,2	4,8	515,6	371,0	242,3	526,8	590,4
930		347,7	76,8	91,3	746,4	4,4	529,5	363,7	280,8	484,9	597,3
940		330,4	77,0	90,4	707,0	4,0	532,3	355,7	321,7	451,4	596,7
950		320,4	77,0	90,1	699,1	3,7	536,3	350,6	357,0	427,6	592,2
960		320,8	77,1	89,6	681,6	3,5	531,6	341,8	374,3	398,8	575,4
970		299,4	76,9	88,8	638,8	3,4	514,9	325,7	389,4	366,7	548,9

980		289,6	76,9	88,5	618,7	3,2	504,0	314,2	403,7	344,8	528,3
990		273,3	76,9	87,8	573,1	3,1	499,6	303,1	413,5	327,1	510,6
1000		261,6	76,9	87,6	549,2	3,0	492,2	289,7	417,0	309,8	490,9
1010		249,3	76,7	86,6	517,8	2,9	484,4	277,0	419,2	294,8	473,6
1020		245,6	76,9	86,5	509,4	2,8	478,0	263,1	419,2	281,5	456,6
1030		239,9	76,8	86,1	491,5	2,7	473,1	251,5	414,9	270,7	443,7
1040		231,1	76,9	85,6	473,6	2,7	463,8	240,3	407,2	259,8	431,0
1050		221,8	76,8	85,4	452,9	2,6	447,7	229,8	398,7	249,5	417,1
1060		214,3	76,7	85,0	437,5	2,5	434,5	220,9	390,4	240,4	403,1
1070		207,4	76,8	84,5	422,6	2,5	423,8	212,4	381,9	232,5	392,1
1080		182,1	76,8	83,7	337,8	2,4	394,7	203,1	372,2	223,2	378,6
1090		169,0	76,6	83,4	311,2	2,3	369,8	193,6	360,9	213,2	359,9
1100		159,9	76,7	83,0	289,1	2,2	347,6	185,8	349,4	203,5	341,0
1110		151,4	76,6	82,5	267,1	2,1	326,1	177,0	338,1	194,0	321,3
1120		143,5	76,6	82,1	248,0	2,0	306,1	168,4	326,3	184,8	302,0
1130		137,0	76,6	81,6	231,5	1,9	286,9	161,1	314,4	176,5	284,3
1140		131,1	76,6	81,4	219,4	1,8	269,1	155,3	302,4	169,0	266,3
1150		126,0	76,6	81,0	207,8	1,7	253,6	149,7	290,4	162,4	250,2
1160		121,2	76,6	80,9	195,1	1,6	237,8	144,7	277,4	155,9	235,9
1170	18-19-20-21	136,1	76,7	82,4	175,9	8,4	224,1	140,7	264,6	148,9	222,9
1180	21-22-23	150,2	76,9	81,5	284,5	13,5	213,6	136,3	247,5	187,5	213,0
1190		174,4	77,0	83,2	347,5	12,9	224,6	143,9	235,0	201,7	211,1
1200		231,9	77,1	85,6	519,0	11,5	258,4	197,9	237,8	265,3	259,7
1210		293,8	77,3	87,9	831,0	10,3	328,1	256,6	248,7	336,6	331,0
1220		353,5	77,7	91,6	874,6	9,3	375,5	275,3	259,5	432,5	366,2
1230		353,6	78,1	92,9	871,1	8,3	436,0	299,2	269,3	483,9	413,2
1240		348,7	78,4	93,9	860,9	7,4	512,6	325,2	280,7	507,8	458,8
1250		336,6	78,7	93,6	839,2	6,7	560,1	343,0	296,0	520,8	483,7
1260		329,2	78,8	93,9	784,7	6,1	587,9	360,7	311,5	515,8	496,7
1270		325,1	79,1	93,9	811,9	5,5	584,7	368,6	319,5	518,1	497,3
1280		320,2	79,2	93,7	819,6	5,0	565,3	352,8	323,7	539,6	499,1
1290		333,6	79,2	94,0	946,8	4,6	554,5	346,6	331,8	512,1	510,2
1300		282,2	79,2	92,3	705,5	4,4	547,5	336,1	341,2	453,5	517,3
1310		266,0	79,4	91,6	680,8	4,2	540,4	327,7	353,4	416,4	518,6
1320		250,6	79,2	90,9	637,5	4,1	534,9	328,6	360,9	387,6	514,9
1330		245,1	79,4	90,6	627,1	3,9	524,9	320,8	366,5	364,0	507,4
1340		238,5	79,3	89,8	610,3	3,8	512,1	309,9	371,7	345,2	499,7
1350		230,9	79,2	89,6	585,0	3,7	498,8	299,4	375,2	330,1	488,2
1360		225,1	79,2	89,2	567,6	3,6	486,9	288,8	377,6	318,1	476,9
1370		218,6	79,2	89,0	549,5	3,5	477,8	279,0	379,6	306,5	466,5
1380		212,6	79,1	88,5	532,9	3,4	466,0	269,9	379,0	296,2	456,7
1390		209,5	79,1	88,9	523,3	3,3	452,9	261,3	376,9	286,0	446,5
1400		205,9	79,0	88,0	518,1	3,2	440,7	252,5	373,7	278,1	436,0
1410		203,5	78,9	88,0	507,5	3,1	428,0	243,1	368,9	270,3	425,4
1420		197,5	79,1	88,0	486,2	3,1	414,9	233,6	362,4	262,5	414,5
1430		193,8	78,8	87,4	480,4	3,0	401,4	225,1	355,6	254,7	403,4
1440		189,8	78,8	87,5	464,4	2,9	389,0	217,2	348,7	247,5	391,9
1450		186,6	78,8	86,9	450,9	2,9	376,8	210,1	341,1	241,7	381,3
1460		184,0	78,7	86,6	439,3	2,8	363,0	203,8	332,3	235,2	370,0
1470		170,3	78,6	86,1	348,9	2,8	348,2	197,0	323,3	228,6	354,7
1480		146,6	78,6	85,4	292,7	2,7	331,4	190,3	313,9	220,6	338,2
1490		137,8	78,4	84,8	287,4	2,6	316,4	183,9	304,6	212,4	322,0
1500		132,2	78,5	84,6	280,2	2,5	301,4	177,2	294,9	204,7	307,1
1510		127,3	78,4	84,0	241,5	2,4	287,3	171,3	285,2	197,7	294,5
1520		123,7	78,3	83,9	229,2	2,3	277,1	166,8	276,6	191,1	283,4
1530		119,9	78,2	83,6	219,7	2,2	266,3	161,6	268,4	185,0	271,5
1540		116,5	78,2	83,2	219,8	2,1	252,2	155,8	258,6	178,6	259,5
1550		81,7	76,4	78,1	103,8	3,6	78,8	77,8	77,6	86,8	78,9
1560	20-18-19-20	152,6	76,4	79,5	311,9	12,1	101,2	95,7	78,7	142,1	144,6
1570		372,4	76,6	88,4	884,7	10,9	167,5	135,7	88,4	301,7	269,7
1580		419,1	77,1	93,1	920,7	9,5	296,5	191,0	112,6	428,8	373,1
1590		409,3	77,3	94,5	866,7	8,4	409,4	238,1	140,5	496,1	440,1
1600		425,8	78,0	96,6	924,0	7,3	486,9	274,9	169,0	539,1	500,7
1610		421,9	78,4	97,3	932,0	6,3	551,0	307,4	196,7	563,3	555,2
1620		392,1	78,7	96,4	815,4	5,4	595,5	338,3	222,5	565,9	594,8
1630		371,9	79,1	95,2	802,0	4,7	598,1	356,4	241,9	559,0	601,5
1640		352,6	79,1	94,7	771,4	4,3	575,4	344,0	265,0	520,8	590,6
1650		337,6	79,1	94,0	733,6	4,0	562,7	336,8	289,4	496,4	581,7
1660		318,1	79,1	92,8	683,1	3,9	553,2	325,1	311,6	437,8	573,3
1670		305,5	79,2	92,3	656,4	3,7	541,0	312,1	330,8	399,9	564,0
1680		296,3	79,0	91,8	631,9	3,6	531,5	301,2	346,9	374,9	556,1
1690		285,9	79,1	91,6	607,0	3,4	517,4	288,7	359,7	353,9	542,3
1700		284,0	79,2	90,9	605,7	3,3	504,3	279,0	367,9	338,9	527,8
1710		275,8	79,2	91,1	581,5	3,2	494,9	274,7	372,7	327,1	515,7
1720		267,4	79,0	90,5	560,2	3,1	487,3	269,2	376,5	316,9	507,1
1730		254,5	79,2	90,5	524,5	2,9	475,8	264,2	378,1	305,9	494,4
1740		243,3	79,2	90,0	492,9	2,8	460,3	253,6	377,2	293,3	477,4
1750		229,9	79,0	89,4	460,1	2,8	441,3	240,4	372,4	280,2	455,4
1760		218,5	79,0	88,7	430,6	2,7	421,3	226,9	365,2	266,8	431,5
1770		210,8	79,2	88,3	411,7	2,6	402,6	214,9	358,2	255,5	410,0
1780		199,8	79,0	87,7	389,5	2,5	385,8	204,2	351,2	244,6	390,2
1790		188,9	79,0	87,6	348,2	2,4	370,0	195,0	343,4	234,5	373,0
1800		174,0	79,1	86,9	319,0	2,3	355,7	186,7	334,7	224,7	355,5
1810		160,1	78,9	86,3	286,2	2,2	338,5	177,9	323,8	214,2	334,8
1820	18-19-20-21	172,4	79,5	89,1	223,0	15,4	318,1	170,4	312,0	200,3	313,1
1830		151,6	79,1	86,2	299,9	15,3	290,8	159,1	300,1	228,5	278,5
1840		216,2	79,0	87,7	568,6	14,8	291,4	160,5	283,9	275,7	283,0
1850		311,8	79,2	91,3	823,7	14,0	326,1	185,4	269,4	328,7	341,3
1860		289,2	79,5	91,9	678,1	13,4	364,9	234,8	256,2	373,9	373,9
1870		288,9	79,6	92,5	692,0	12,7	409,6	254,5	244,6	417,7	420,2
1880		291,8	79,9	93,5	674,1	12,0	458,3	262,3	235,1	455,3	471,5
1890		319,7	80,0	94,7	833,2	11,3	495,4	271,2	228,2	481,2	515,6
1900		293,7	80,3	94,6	694,5	10,6	489,2	302,8	223,8	474,5	537,6
1910		291,1	80,4	94,3	705,5	10,1	493,3	309,0	221,3	474,8	542,2
1920		305,1	80,4	95,0	760,5	9,4	517,5	316,0	221,2	501,4	552,0
1930		315,9	80,8	95,7	796,4	8,7	538,5	317,3	223,4	528,8	566,6
1940		308,6	81,0	95,9	761,0	8,1	553,4	317,7	228,2	531,2	583,0
1950		302,8	80,9	96,2	751,9	7,5	564,2	317,8	235,4	528,7	593,3
1960		294,3	81,3	95,8	728,7	6,9	563,6	316,7	245,1	522,8	594,2
1970		283,0	81,3	95,5	692,4	6,5	558,2	312,3	256,7	503,4	587,5
1980		277,1	81,3	95,1	675,8	6,1	551,3	309,0	269,2	486,3	583,4
1990		273,5	81,2	94,9	698,1	5,7	542,0	301,9	282,2	460,3	571,2
2000		273,8	81,2	94,5	719,2	5,4	532,5	293,6	296,8	426,8	555,7

2010		277,0	81,2	94,5	712,5	5,1	516,8	335,3	305,6	401,5	536,5
2020		257,4	81,0	93,7	641,1	4,9	502,6	352,2	308,9	368,4	520,9
2030		243,3	81,0	93,3	602,3	4,7	490,9	342,3	315,3	345,3	507,1
2040		231,7	81,1	92,5	572,1	4,6	482,4	328,4	323,5	328,4	497,1
2050		224,0	81,0	92,3	558,3	4,5	474,8	317,6	331,7	315,5	488,2
2060		218,2	81,0	91,8	540,5	4,3	466,7	306,6	338,5	304,2	478,5
2070		213,4	80,8	91,5	525,5	4,3	459,3	294,7	342,7	293,8	469,8
2080		209,1	80,9	90,9	508,9	4,2	449,8	283,7	343,9	284,1	458,6
2090		203,7	80,6	90,7	496,3	4,1	439,7	274,9	344,1	275,7	445,9
2100		198,5	80,8	90,3	477,4	4,0	431,0	266,7	343,5	268,2	434,9
2110		193,9	80,7	90,0	463,7	3,9	420,5	257,6	341,2	260,5	423,0
2120		189,7	80,5	89,6	445,6	3,8	409,7	249,2	338,3	253,4	410,6
2130		184,2	80,5	89,3	436,2	3,8	401,6	241,6	335,1	247,1	400,2
2140		186,3	80,4	89,3	452,6	3,7	393,6	235,1	331,7	242,6	390,2
2150		182,6	80,5	89,1	429,6	3,7	386,9	229,6	328,4	238,8	382,2
2160		179,0	80,4	88,7	421,5	3,6	380,7	224,3	325,3	235,1	374,7
2170		174,7	80,5	88,5	404,7	3,5	372,5	219,1	321,5	230,8	367,8
2180		159,6	80,3	87,9	352,1	3,4	363,7	214,5	317,2	226,2	359,8
2190		148,0	80,3	87,5	329,8	3,4	355,2	211,5	312,7	221,3	351,6
2200		140,3	80,4	87,2	308,6	3,3	346,3	207,4	308,3	215,8	342,7
2210		136,2	80,3	86,8	299,0	3,3	337,8	203,0	303,7	210,5	333,6
2220		133,2	80,3	86,6	262,8	3,3	330,3	198,9	298,8	206,0	325,4
2230		130,4	80,3	86,3	276,7	3,2	322,5	195,3	293,5	201,8	317,0
2240		128,1	80,3	86,1	246,8	3,2	315,1	192,5	287,6	198,0	308,7
2250		126,3	80,2	85,8	238,2	3,1	306,6	189,6	280,9	194,4	299,6
2260		124,6	80,1	85,6	263,9	3,0	298,8	185,6	273,7	190,6	291,8
2270		123,5	80,1	85,4	233,4	3,0	291,5	181,7	266,6	187,9	284,6
2280		122,1	80,0	85,4	225,2	3,0	284,7	178,3	259,9	185,9	277,9
2290		120,9	80,0	85,0	251,3	2,9	278,6	175,6	253,7	183,9	272,0
2300		119,4	79,9	84,9	236,6	2,9	272,9	173,0	247,8	181,9	265,7
2310		118,1	79,9	84,8	242,2	2,8	268,1	170,1	242,3	179,6	259,4
2320		115,7	79,9	84,6	233,0	2,7	260,5	167,4	237,4	176,3	253,2
2330		113,9	79,7	84,4	207,6	2,6	252,8	163,9	232,2	172,8	245,8
2340		499,5	73,1	75,2	329,8	1,2	196,1	139,9	85,2	120,7	203,1
2350	22-23-22-23-21%	224,6	74,5	75,6	308,6	5,8	254,7	187,7	139,6	177,4	262,9
2360		233,8	76,5	75,7	375,4	5,4	255,2	177,6	181,0	190,1	263,4
2370		185,1	77,4	75,9	305,9	5,0	264,6	168,7	216,6	190,9	274,8
2380		177,6	77,6	76,2	308,6	4,5	272,1	162,7	244,8	183,8	267,9
2390		195,1	76,8	76,3	242,8	3,9	277,1	161,4	269,9	178,1	277,1
2400		334,5	78,9	76,9	690,7	3,0	373,4	202,4	290,9	326,2	368,2
2410		317,6	82,2	77,8	680,1	2,3	461,2	250,9	313,9	418,5	476,6
2420		306,2	82,9	78,1	688,4	1,9	468,8	248,7	333,5	429,7	490,5
2430		312,2	84,2	78,1	665,5	1,6	464,3	237,7	347,5	409,3	487,7
2440		291,3	85,1	77,7	604,0	1,4	442,8	224,9	359,3	342,7	464,0
2450		274,2	86,6	77,4	567,8	1,3	419,2	215,1	368,2	304,2	443,0
2460		252,5	87,2	76,9	512,5	1,2	404,5	210,6	374,1	280,8	427,6
2470		239,7	87,0	76,8	488,6	1,0	391,6	203,8	378,0	263,3	413,3
2480		229,6	85,9	76,4	465,9	0,9	378,4	197,3	378,0	250,4	401,4
2490		216,5	85,0	77,0	435,5	0,9	368,1	191,8	373,8	238,9	388,0
2500		185,9	84,2	75,9	347,6	0,8	351,1	184,1	365,8	227,2	371,6
2510		164,0	82,3	76,9	301,7	0,7	333,7	176,1	353,1	213,5	349,0
2520	21- 21 22 22 23 22%	172,7	81,8	77,3	238,6	8,2	306,9	166,1	335,9	198,0	324,6
2530		170,3	81,0	77,6	221,3	7,9	269,2	153,2	319,3	182,3	287,0
2540		180,5	80,3	78,1	229,1	7,6	244,3	143,2	301,9	174,1	259,7
2550		254,0	79,4	77,7	453,8	7,0	239,6	145,0	289,0	218,7	297,4
2560		303,2	79,0	78,0	621,0	6,3	277,8	163,6	285,4	300,9	411,1
2570		380,4	80,7	79,4	769,1	5,4	367,5	202,7	295,7	425,3	458,7
2580		403,8	80,6	80,0	809,3	4,3	483,0	254,1	313,7	497,9	526,3
2590		396,9	86,8	80,4	816,2	3,5	559,8	288,6	336,1	524,1	585,7
2600		324,4	90,0	80,5	701,6	2,9	592,6	306,9	358,3	504,8	613,6
2610		300,8	92,3	80,5	671,4	2,6	572,9	291,3	381,3	443,8	590,2
2620		290,7	91,2	80,4	660,1	2,4	544,4	277,6	409,4	395,9	562,6
2630		283,7	91,6	80,6	640,0	2,1	521,4	266,4	433,2	365,3	539,9
2640		259,6	91,8	80,2	578,5	1,9	512,6	276,3	448,3	350,8	532,3
2650		256,7	91,3	79,7	584,5	1,7	499,0	266,6	459,9	331,7	521,4
2660		246,0	91,5	78,5	555,4	1,6	481,7	255,4	463,4	313,8	502,4
2670		237,5	90,6	79,3	542,5	1,4	463,0	247,4	458,4	298,5	479,1
2680		228,3	88,2	78,8	511,9	1,3	446,7	244,1	449,3	285,7	457,8
2690		220,9	87,3	78,7	496,3	1,2	429,8	237,4	438,0	273,7	437,5
2700		212,6	88,8	78,2	474,4	1,1	409,7	228,7	425,4	261,2	415,9
2710		353,7	87,0	78,2	799,4	2,8	415,6	265,8	411,0	338,8	420,6
2720		379,3	89,7	78,8	842,6	1,8	500,8	320,0	397,4	458,5	506,6
2730	22-22-21%	417,5	92,8	78,8	559,4	10,1	510,5	334,5	390,5	415,5	518,6
2740		385,4	91,5	79,3	884,5	9,0	500,7	343,6	382,2	474,6	490,9
2750		398,9	94,4	79,2	857,7	9,1	517,3	369,1	369,8	536,5	495,9
2760		376,4	96,3	80,8	832,3	7,9	524,0	393,3	362,9	564,5	463,2
2770		373,4	98,8	82,1	860,6	6,8	549,7	409,0	361,2	576,9	461,2
2780		377,7	100,7	82,7	896,3	5,9	575,7	411,8	362,1	591,4	478,5
2790		372,7	102,2	83,3	866,7	5,1	594,4	411,6	367,3	602,4	512,8
2800		364,5	104,0	83,3	883,6	4,4	602,7	411,5	376,4	596,9	543,7
2810		348,3	106,3	83,8	811,8	3,8	614,7	414,0	387,6	592,4	566,8
2820		318,6	106,8	83,8	751,0	3,5	610,1	403,0	399,8	550,8	580,6
2830		305,5	106,4	83,3	725,7	3,2	586,7	384,7	413,2	486,6	581,2
2840		290,0	105,1	83,5	691,0	3,0	563,6	368,2	425,1	438,6	570,8
2850		283,4	104,1	82,8	673,2	2,8	542,4	355,1	434,9	405,5	559,5
2860		270,2	103,4	83,1	640,0	2,6	526,1	347,8	441,2	381,2	548,0
2870		253,9	101,8	82,3	600,0	2,5	511,3	336,6	442,3	358,9	533,0
2880		247,2	99,4	82,3	583,5	2,3	499,3	322,6	436,9	341,2	517,3
2890		240,5	99,2	82,2	573,4	2,1	491,9	311,8	432,6	329,4	504,7
2900		235,5	97,5	81,9	559,5	2,0	485,8	302,1	431,7	318,4	496,6
2910		230,3	97,2	81,7	547,2	1,8	478,5	293,8	431,1	308,3	491,1
2920		225,1	97,3	81,4	534,0	1,7	471,9	285,5	430,2	299,7	480,6
2930		219,3	95,9	81,2	514,6	1,6	462,5	274,9	429,1	290,8	469,5
2940		213,8	91,0	81,3	496,4	1,5	448,0	261,0	425,3	281,3	457,6
2950		205,2	93,1	81,0	470,2	1,4	433,8	251,3	420,5	270,1	442,1
2960		198,8	93,6	80,8	455,1	1,3	415,0	238,7	411,9	259,0	426,6
2970		194,7	92,8	80,7	444,4	1,2	399,1	229,3	402,7	249,9	411,9
2980		188,9	91,3	80,7	419,9	1,2	381,5	219,4	393,6	241,6	401,2
2990		183,7	91,2	80,2	406,1	1,1	367,2	211,2	384,0	233,0	389,8
3000		165,4	89,4	80,3	371,9	1,1	350,5	202,7	374,7	224,5	373,3
3010		148,3	89,5	80,0	301,1	1,0	333,3	195,3	364,6	214,1	353,9
3020		139,0	88,4	80,0	276,8	0,9	314,3	186,6	353,3	203,5	332,7
3030		132,2	86,7	79,6	257,0	0,8	293,7	177,2	340,6	193,7	313,2

moisture content each pieces %	Temps acquisition minutes	Flue temp °F	Room temp °F	Tunnel dry bulb °F	Catalyst °F	scale lbs	Right °F	Back °F	bottom °F	Top °F	Left °F
	0	78,8	77,1	79,6	635,6	2,6	323,7	186,0	210,5	303,3	368,1
22-22-21-21%	10	277,6	78,5	79,5	634,4	2,5	314,3	181,6	233,6	285,8	363,4
	20	266,1	80,4	78,8	604,9	2,3	309,1	179,1	251,6	270,9	357,6
21-22-22-23-22%	30	259,5	79,7	80,3	716,7	9,2	283,9	170,7	257,3	244,2	332,8
	40	313,7	81,4	81,3	647,9	8,2	318,6	216,4	266,3	321,0	385,8
	50	367,4	84,2	82,1	825,6	7,2	393,6	285,7	280,8	403,3	475,4
	60	353,3	87,6	83,5	783,2	6,4	446,8	312,4	296,2	465,2	519,5
	70	328,5	87,2	81,9	759,1	5,9	457,1	297,9	308,1	495,6	514,9
	80	322,9	87,4	81,7	738,8	5,3	463,6	291,5	319,5	501,9	508,9
	90	322,3	87,5	81,6	738,2	4,7	473,6	288,8	331,0	503,7	506,1
	100	328,5	89,0	81,5	773,6	4,1	487,8	290,9	341,5	520,4	507,0
	110	315,2	93,6	84,8	746,2	3,6	503,2	297,4	353,7	529,4	513,0
	120	295,8	96,3	85,2	713,7	3,2	510,2	297,4	366,9	512,6	514,3
	130	287,3	98,0	85,8	688,5	2,9	507,5	291,7	380,8	487,8	510,1
	140	282,8	98,4	86,0	683,5	2,7	500,1	285,5	400,3	424,2	509,9
	150	271,3	98,1	86,1	658,8	2,5	491,7	282,8	420,4	381,4	505,1
	160	265,2	96,7	84,0	635,4	2,3	478,6	279,0	434,2	350,3	496,3
	170	254,1	93,8	83,8	600,7	2,2	469,5	274,3	441,9	327,1	484,1
	180	243,2	92,1	83,1	571,1	2,1	457,9	267,5	447,4	308,9	472,3
21-22-2223%	190	255,9	89,0	81,6	650,6	10,0	439,7	255,8	448,8	290,1	452,5
	200	353,6	87,2	82,4	916,5	9,5	406,4	241,4	434,4	283,2	394,6
	210	362,9	86,9	82,2	910,8	8,9	400,2	248,6	415,6	294,7	364,7
	220	359,0	86,3	81,5	775,0	8,1	415,5	261,1	405,4	339,3	359,1
	230	368,6	87,6	82,0	949,4	7,4	451,9	279,2	399,5	392,9	388,0
	240	351,4	89,7	81,5	824,7	6,7	483,6	291,8	396,6	441,0	404,0
	250	341,6	91,6	81,7	808,6	6,0	528,8	317,0	394,5	477,8	452,0
	260	319,2	92,0	82,4	751,1	5,4	556,9	330,0	393,1	485,1	487,9
	270	308,4	95,1	82,7	736,9	4,8	571,4	336,3	393,2	479,3	511,0
	280	316,9	95,5	82,3	786,6	4,2	587,5	349,5	393,4	479,7	525,0
	290	295,9	96,0	82,5	709,6	3,7	593,3	372,5	392,5	480,6	543,9
	300	288,1	96,7	82,9	714,5	3,5	573,3	357,1	393,5	425,1	542,0
	310	274,8	95,8	82,0	680,0	3,3	544,6	337,1	399,2	380,5	524,9
121-22-23-22-21-20-22%	320	280,8	95,3	81,8	597,6	12,6	529,4	321,8	409,3	348,3	511,4
	330	298,9	94,8	82,4	739,1	12,2	465,5	316,8	413,0	313,5	438,7
	340	309,8	96,0	82,5	770,4	11,8	421,3	320,8	403,6	296,1	392,7
	350	319,9	95,3	83,8	799,8	11,3	396,7	318,9	392,9	285,4	365,7
	360	340,1	95,8	83,2	881,5	10,8	383,8	322,1	383,6	282,8	350,0
	370	377,3	96,6	82,9	1017,7	10,3	381,8	328,9	375,5	291,2	343,9
	380	349,7	96,3	84,5	724,1	8,9	440,1	361,3	368,3	369,8	358,0
	390	345,8	96,9	84,9	818,4	7,9	513,3	380,1	359,3	454,0	396,6
	400	353,9	100,8	84,1	840,4	7,0	548,6	395,1	350,4	499,3	438,1
	410	355,8	103,7	84,5	893,2	6,3	578,3	402,4	344,1	522,3	489,9
	420	346,1	105,9	84,5	850,6	5,7	575,5	394,2	340,3	550,3	523,2
	430	309,7	105,5	86,5	767,0	5,3	570,6	384,1	338,8	534,7	532,7
	440	316,0	106,9	86,2	788,6	4,9	555,3	375,6	340,2	519,2	528,8
	450	306,2	107,2	85,1	776,4	4,6	555,3	369,2	344,2	500,3	531,3
	460	288,9	106,2	85,0	714,3	4,4	547,5	353,5	348,5	431,5	526,8
	470	273,5	104,2	85,6	674,9	4,2	542,3	340,0	353,4	391,1	523,0
	480	263,8	103,5	85,0	654,3	4,0	540,9	329,9	358,7	369,6	523,0
	490	252,6	102,6	85,2	623,3	3,8	533,7	319,2	363,9	351,3	517,8
	500	249,8	102,9	84,4	618,1	3,7	523,3	309,1	368,3	337,2	510,1
	510	246,3	102,1	84,1	609,4	3,5	514,5	301,1	373,6	326,9	505,7
	520	243,5	101,5	83,9	594,7	3,4	507,5	294,4	379,9	317,7	503,0
	530	238,0	100,9	84,1	581,3	3,2	500,2	288,2	385,8	309,7	498,1
	540	232,8	99,0	84,2	564,5	3,1	490,7	281,6	390,3	300,6	492,6
	550	227,7	99,2	83,9	549,8	3,0	484,0	277,9	393,7	293,5	485,5
	560	226,1	98,8	83,8	547,4	2,8	479,6	275,2	395,3	288,7	481,8
	570	222,9	98,2	83,6	535,5	2,7	475,2	273,3	395,0	283,5	478,6
	580	218,0	96,7	84,1	519,7	2,6	471,5	269,0	392,7	277,6	474,4
	590	216,2	96,0	83,7	516,0	2,5	464,4	264,3	388,6	274,3	469,8
	600	213,3	95,1	84,1	507,0	2,4	459,5	259,2	385,1	269,5	465,0
	610	213,4	95,8	83,3	504,3	2,3	452,1	254,0	381,4	265,6	459,4
	620	211,2	95,5	83,1	494,3	2,2	440,0	254,2	376,4	261,5	452,9
	630	205,6	94,9	83,1	478,9	2,1	427,4	249,6	370,5	256,3	445,7
	640	202,5	94,1	83,0	470,3	2,0	416,7	242,5	365,5	251,5	439,4
	650	199,1	93,0	83,1	459,0	1,9	407,7	236,1	361,5	247,2	433,2
	660	196,2	91,8	83,4	452,6	1,8	398,3	230,3	357,3	243,3	427,1
	670	196,4	91,3	83,3	449,8	1,7	390,1	226,7	352,6	239,5	410,7
	680	191,2	91,8	83,0	430,4	1,6	379,8	220,9	346,1	233,8	390,4
	690	185,8	91,6	82,3	411,9	1,6	367,8	214,1	339,8	228,3	374,2
	700	175,8	90,7	82,3	377,7	1,5	352,8	206,8	333,4	221,1	358,5
	710	167,1	89,8	82,5	352,0	1,5	333,7	197,2	324,9	212,4	340,3
	720	161,2	88,3	81,8	336,4	1,4	316,0	189,3	315,6	204,1	323,5
	730	144,0	88,2	81,9	268,7	1,4	299,1	182,7	306,2	196,6	308,4
	740	75,1	74,1	73,6	80,6	1,0	81,7	78,8	83,8	80,1	82,8
223-22-23-21-22%	750	387,5	73,6	73,8	525,7	8,4	129,0	118,7	84,4	134,7	146,2
	760	368,4	72,9	74,0	722,2	7,2	216,5	185,0	95,1	305,3	263,7
	770	424,6	75,6	74,5	907,3	6,0	321,3	249,5	112,9	417,9	367,1
	780	431,0	78,5	74,8	933,1	5,0	433,2	290,6	133,8	489,1	467,8
	790	395,2	81,8	75,9	812,0	5,1	514,9	308,4	157,2	526,7	541,0
	800	367,8	85,5	76,2	771,8	4,6	564,2	306,9	183,3	524,1	573,2
	810	344,8	87,6	76,0	736,2	4,2	583,5	303,1	213,2	500,0	584,7
	820	329,8	89,7	76,4	712,7	3,9	590,1	299,0	241,4	467,5	579,4
	830	320,1	91,6	76,5	692,2	3,5	581,0	302,1	266,3	446,9	564,8
	840	307,1	91,0	76,1	656,8	3,4	560,9	286,5	286,4	393,8	540,8
	850	288,3	91,9	76,3	614,0	3,2	536,2	268,7	301,0	353,5	509,9
	860	273,9	90,6	76,1	582,0	3,1	515,0	258,6	311,5	327,5	484,0
	870	262,2	89,4	75,5	553,3	2,9	487,1	248,1	317,8	307,1	460,3
	880	247,4	88,4	75,9	514,9	2,8	458,1	238,1	321,2	290,1	437,6
	890	237,1	87,3	75,6	492,5	2,7	433,1	229,5	321,3	276,3	414,5
	900	228,9	86,4	76,4	468,7	2,6	415,1	222,7	320,2	263,9	397,0
	910	218,3	85,3	76,1	445,5	2,5	398,5	213,8	318,1	252,3	379,7
	920	210,1	85,3	76,3	422,9	2,4	382,5	205,3	315,3	240,9	362,7
	930	205,0	83,9	75,3	412,3	2,3	365,3	200,2	310,5	231,4	345,2
	940	195,4	83,1	75,5	385,0	2,3	348,4	192,9	304,1	221,0	327,8
	950	174,1	82,6	75,9	320,6	2,2	329,7	185,9	297,0	209,5	311,0
	960	151,8	81,9	75,9	276,5	2,2	308,4	177,4	288,6	197,8	292,2
23-23-23-23-21%	970	137,9	81,0	75,6	236,9	9,3	284,1	166,8	279,0	184,5	271,2
	980	125,7	80,8	75,6	211,5	9,2	254,6	154,4	265,9	171,6	243,0
	990	143,1	80,2	75,6	158,5	9,1	232,3	146,3	250,2	160,2	219,6

	1000	165,0	79,9	76,0	183,4	8,9	215,6	140,0	236,7	149,8	200,5
	1010	175,9	79,2	75,8	202,5	8,6	219,5	138,3	227,6	149,9	192,8
	1020	178,1	79,3	76,7	267,5	8,2	235,9	138,7	224,4	159,5	195,4
	1030	146,0	79,3	76,2	231,3	8,0	248,2	133,0	227,0	162,0	201,3
	1040	140,4	79,4	76,3	225,4	7,8	236,3	126,2	232,3	158,6	202,6
	1050	140,6	78,4	75,9	227,5	7,5	229,3	123,1	242,3	157,2	208,7
	1060	143,0	78,7	76,4	230,7	7,3	229,0	122,4	254,5	157,6	219,4
	1070	148,0	78,8	76,6	258,4	7,0	231,6	123,2	265,2	161,8	231,1
	1080	331,3	79,2	76,9	657,1	6,2	314,9	154,5	275,5	284,1	320,6
	1090	291,7	80,9	77,5	682,6	5,7	380,4	178,8	284,8	312,6	379,8
	1100	296,1	83,4	78,2	702,3	5,4	381,9	183,2	292,0	313,1	399,8
	1110	311,4	84,9	78,4	752,6	5,1	376,4	183,0	298,9	314,4	408,2
	1120	284,1	86,7	78,4	620,0	4,8	379,5	188,0	304,6	328,4	405,3
	1130	262,6	87,2	79,1	591,7	4,3	457,9	235,0	307,8	356,5	455,7
	1140	243,3	88,3	79,4	556,4	4,1	463,0	239,0	310,9	325,8	456,0
	1150	269,1	88,9	79,5	652,3	4,0	442,1	223,5	314,1	298,8	445,3
	1160	259,6	89,5	79,9	605,8	3,8	424,3	211,7	318,2	283,6	437,1
	1170	248,6	89,6	79,7	579,4	3,7	416,5	208,4	326,5	274,6	443,4
	1180	238,0	89,4	79,7	548,8	3,6	412,1	205,8	334,0	267,1	444,3
	1190	234,3	89,1	80,1	544,7	3,4	406,0	203,1	338,6	260,0	440,0
	1200	225,3	89,4	79,8	516,8	3,3	405,6	200,4	339,9	254,5	425,9
	1210	216,0	89,7	80,0	491,4	3,2	400,5	196,9	340,7	247,8	410,8
	1220	209,2	91,0	79,2	473,4	3,1	392,9	193,7	339,6	242,4	394,9
	1230	201,2	89,7	80,0	448,4	3,0	382,0	189,9	336,6	233,9	381,4
	1240	177,5	90,1	79,9	352,4	2,9	369,9	185,5	330,8	226,7	368,0
	1250	149,3	89,2	80,2	294,6	2,8	357,3	184,3	324,4	218,0	353,9
	1260	140,7	89,2	79,8	277,0	2,8	343,9	187,0	314,9	210,1	338,2
	1270	136,5	89,5	79,5	263,9	2,7	331,8	190,8	305,4	204,6	322,5
	1280	132,2	89,2	79,8	254,1	2,5	319,3	193,5	296,1	198,2	308,3
22-23-22-22-22-22%	1290	209,8	89,3	80,2	250,3	12,9	307,4	195,4	284,8	186,0	291,1
	1300	291,0	89,3	80,7	347,7	12,2	366,3	195,3	281,8	217,8	315,1
	1310	394,8	90,0	81,1	869,0	11,3	398,4	204,6	289,6	295,9	321,6
	1320	412,0	91,9	81,0	856,9	10,3	465,5	247,9	291,0	447,1	405,9
	1330	414,3	94,8	81,9	840,8	9,4	521,3	303,4	289,7	482,2	488,4
	1340	416,4	98,2	82,1	864,0	8,5	572,5	335,6	291,5	521,4	562,9
	1350	402,1	102,0	82,6	837,4	7,7	603,0	345,0	295,8	536,7	590,3
	1360	415,9	105,1	83,0	891,6	6,9	628,9	358,4	301,8	538,3	609,0
	1370	412,4	108,4	83,5	883,6	6,1	653,8	373,4	314,2	551,9	635,6
	1380	399,8	111,2	83,8	849,9	5,4	661,4	377,6	331,4	561,2	647,4
	1390	372,8	113,0	83,9	774,4	4,8	665,2	376,0	352,7	558,8	650,0
	1400	350,7	114,0	84,0	738,5	4,4	650,2	360,8	378,1	539,9	630,5
	1410	338,0	114,6	84,0	722,8	4,1	638,2	348,3	401,5	497,7	608,7
	1420	323,4	113,7	83,7	680,2	3,9	610,3	330,4	422,5	434,2	583,0
	1430	309,9	112,2	83,6	644,4	3,7	579,4	313,4	435,1	391,6	556,7
	1440	288,8	110,1	83,4	588,8	3,6	553,4	297,7	433,0	360,2	535,0
	1450	273,2	108,1	83,2	552,2	3,4	526,6	279,5	423,9	335,0	511,6
	1460	265,5	106,1	83,0	532,8	3,3	501,1	264,1	415,0	315,8	488,8
	1470	255,9	104,6	82,7	509,8	3,1	477,8	251,9	408,6	299,3	468,4
	1480	246,1	102,7	82,7	487,4	3,0	459,5	242,0	402,1	285,1	450,7
	1490	238,0	101,3	82,4	467,8	2,9	441,9	233,0	395,0	272,2	434,3
	1500	230,9	99,8	82,3	451,5	2,8	425,8	224,8	389,0	261,1	419,2
	1510	223,9	98,7	82,0	434,9	2,7	410,4	217,0	383,8	250,7	405,3
	1520	217,6	97,4	81,8	417,8	2,6	396,5	210,4	378,3	241,9	392,3
	1530	214,5	96,3	81,8	409,9	2,6	383,5	204,5	372,2	234,3	380,2
	1540	209,1	95,5	81,6	395,9	2,5	373,2	198,3	365,1	227,5	368,0
	1550	204,8	94,7	81,5	383,6	2,4	363,2	191,2	355,2	221,2	355,6
	1560	202,3	93,8	81,4	382,4	2,4	351,8	184,4	345,1	216,5	343,5
	1570	198,8	93,1	81,2	372,6	2,3	339,3	177,9	335,3	212,2	331,5
	1580	178,0	92,7	81,3	304,3	2,2	327,2	172,6	325,8	207,2	320,4
	1590	161,2	91,9	81,1	285,6	2,2	315,9	168,4	316,8	202,0	310,8
	1600	152,9	91,3	81,2	271,2	2,2	303,7	164,2	308,0	195,8	300,6
	1610	147,3	90,7	81,0	259,4	2,1	291,0	160,1	299,1	189,8	290,2
	1620	141,4	90,3	80,9	244,9	2,1	278,3	155,8	290,0	183,3	278,7
	1630	136,8	89,7	80,8	233,5	2,1	265,7	151,5	280,9	177,2	268,5
	1640	133,2	89,0	80,7	223,9	2,0	254,5	147,9	271,3	172,0	259,4
	1650	132,4	88,4	80,6	229,3	2,0	244,9	144,8	261,1	168,3	251,8
	1660	134,9	88,0	80,5	237,8	1,9	241,0	143,7	250,9	168,5	250,6
	1670	134,8	87,8	80,4	238,8	1,9	238,6	142,8	242,2	168,8	250,1
	1680	131,6	87,3	80,4	225,9	1,9	234,8	140,8	234,6	166,3	246,5
	1690	342,1	77,6	91,8	661,7	3,2	556,2	302,9	375,4	348,9	546,2
23-22-23-20-21%	1700	328,7	77,8	92,7	696,5	10,8	495,3	310,9	373,0	358,6	492,2
	1710	349,5	78,3	93,3	747,3	10,0	485,8	344,3	362,9	431,2	488,2
	1720	365,9	78,2	92,7	779,8	9,2	480,2	361,9	354,6	484,3	493,7
	1730	370,1	78,8	94,9	781,7	8,3	542,9	379,7	346,5	518,5	525,4
	1740	353,8	78,2	93,8	754,9	7,5	582,3	379,3	341,0	521,9	561,1
	1750	348,5	78,3	94,2	752,2	6,8	592,3	367,9	336,2	515,4	592,1
	1760	345,8	79,4	93,8	750,8	6,2	623,4	358,0	332,4	517,9	622,9
	1770	341,1	79,4	93,2	743,8	5,5	625,1	347,2	331,2	513,5	630,8
	1780	332,0	79,1	92,9	730,7	5,0	623,4	336,2	332,0	505,5	622,1
	1790	322,8	80,2	92,2	706,1	4,6	609,0	323,6	336,7	492,4	604,0
	1800	315,4	79,6	92,7	688,0	4,3	602,6	311,4	342,4	477,7	590,9
	1810	309,6	79,5	92,1	671,6	4,1	581,6	301,3	347,9	423,1	576,6
	1820	300,6	79,3	90,6	645,7	3,9	547,0	287,0	352,2	383,1	545,8
	1830	287,3	79,2	91,2	601,4	3,8	520,5	274,6	355,5	353,4	516,3
	1840	278,9	78,8	89,9	586,2	3,7	496,7	263,5	359,9	331,1	491,6
	1850	276,4	78,7	89,5	584,9	3,6	478,1	257,3	365,3	314,5	473,9
	1860	275,2	79,2	98,9	352,7	3,5	466,5	258,1	369,9	298,4	459,6
23-22-22-23-21%	1870	193,9	78,8	88,9	348,8	17,5	404,6	259,8	370,1	268,3	404,6
	1880	178,6	79,4	89,8	327,1	17,1	358,2	281,0	358,1	247,8	363,2
	1890	178,2	79,7	89,5	326,1	16,6	333,4	296,1	346,0	236,6	335,3
	1900	176,2	79,8	89,5	321,6	16,2	334,4	306,2	338,5	230,2	317,5
	1910	186,5	79,9	89,5	345,7	15,5	331,4	317,3	333,8	234,8	309,9
	1920	186,0	79,9	89,4	345,9	14,9	332,4	320,4	330,0	231,6	312,9
	1930	185,0	80,0	89,3	345,7	14,2	335,5	314,8	326,9	230,7	322,3
	1940	185,6	80,1	89,1	344,4	13,5	335,2	303,0	326,3	229,7	334,6
	1950	264,8	80,2	92,8	578,7	12,5	345,5	291,7	329,3	295,9	352,3
	1960	327,4	80,6	96,4	705,2	10,9	452,2	319,7	331,5	412,0	384,9
	1970	351,2	80,9	98,1	804,9	9,6	544,8	342,0	332,8	483,0	434,7
	1980	364,0	81,1	99,5	831,7	8,5	602,4	362,7	336,7	520,8	484,1
	1990	372,5	81,5	99,9	877,8	7,5	645,7	379,5	341,1	545,2	519,4
	2000	354,7	81,7	99,6	809,2	6,8	657,2	384,9	347,0	556,8	545,5
	2010	325,7	81,8	97,7	735,2	6,4	657,9	375,0	356,1	530,7	562,4
	2020	312,8	81,7	96,9	716,4	6,1	639,2	358,2	366,7	493,4	564,0
	2030	323,6	81,7	97,1	774,6	5,8	619,6	344,7	376,4	457,5	561,8

	2040	309,2	81,7	95,9	698,4	5,7	599,7	330,7	385,8	420,6	553,6
	2050	295,3	81,6	95,3	666,1	5,5	581,9	320,5	395,8	391,1	546,5
	2060	286,0	81,5	95,2	635,3	5,3	566,7	316,3	405,4	371,3	542,2
	2070	280,7	81,4	93,7	634,1	5,1	548,1	327,8	410,9	356,9	531,5
	2080	277,9	81,4	93,8	628,9	5,0	533,5	327,0	416,7	345,0	522,2
	2090	274,5	81,4	93,3	618,3	4,9	526,6	321,9	424,2	336,6	517,2
	2100	270,0	81,5	92,8	604,5	4,7	522,6	315,7	432,1	329,2	512,9
	2110	263,7	81,4	92,9	584,3	4,6	517,3	308,2	437,5	322,4	507,5
	2120	258,0	81,3	92,3	569,8	4,4	511,7	300,9	441,3	315,9	501,3
	2130	254,4	81,3	91,7	562,4	4,3	505,6	295,0	443,9	309,9	496,2
	2140	252,3	81,3	91,8	561,1	4,2	499,5	291,0	445,5	304,1	489,5
	2150	251,5	81,2	91,5	563,4	4,0	488,7	297,1	444,1	299,6	485,1
	2160	249,1	81,3	91,4	550,7	3,9	475,4	294,9	439,8	297,0	477,9
	2170	244,9	81,1	91,2	539,2	3,8	462,5	287,8	432,6	293,9	465,6
	2180	241,0	81,0	90,8	525,4	3,6	453,4	280,2	427,2	291,2	455,4
	2190	236,0	81,1	91,2	510,8	3,5	444,2	271,7	423,5	288,3	446,5
	2200	230,1	80,8	90,1	493,4	3,4	435,1	261,9	420,9	282,5	435,6
	2210	226,6	80,9	90,3	485,7	3,3	426,0	252,1	417,6	275,9	423,7
	2220	221,2	80,7	89,0	468,7	3,3	417,1	242,7	414,9	268,7	410,3
	2230	216,7	80,6	88,8	457,2	3,2	409,1	235,0	412,7	262,1	398,2
	2240	212,0	80,6	88,7	445,8	3,1	399,6	227,8	408,3	256,0	387,1
	2250	201,9	80,5	88,8	414,3	3,0	390,3	220,3	401,4	247,9	377,5
	2260	194,8	80,4	87,9	399,8	3,0	378,0	212,3	392,7	239,8	368,9
	2270	189,6	80,3	87,2	383,3	2,9	367,4	204,2	383,4	232,4	359,5
	2280	176,8	80,1	86,6	359,2	2,8	356,4	197,5	373,3	225,0	348,8
	2290	158,8	80,1	86,3	295,6	2,8	343,8	191,3	363,2	217,2	338,3
	2300	150,2	80,0	85,4	275,5	2,8	331,5	185,0	352,3	209,4	326,2
	2310	143,3	79,9	85,0	258,5	2,8	318,4	178,7	340,9	201,7	315,0
	2320	138,2	79,9	84,9	245,6	2,7	304,3	173,1	329,1	194,3	303,8
20-20-21	2330	94,5	78,0	78,9	99,8	5,8	81,5	80,3	80,8	84,6	81,5
	2340	183,7	78,3	81,6	288,4	5,4	110,7	97,7	84,6	131,9	116,7
	2350	223,8	78,6	83,1	380,1	4,8	177,2	122,2	98,3	186,9	234,4
	2360	322,4	79,0	88,5	626,7	4,1	255,4	148,2	120,5	288,7	299,4
	2370	335,0	79,2	91,0	638,3	3,3	353,8	176,7	154,0	353,4	373,3
21-20-20	2380	314,9	79,7	92,7	633,6	10,7	414,5	196,8	200,2	369,3	414,3
	2390	344,1	79,5	92,6	830,9	9,9	469,4	209,7	215,9	387,6	384,8
	2400	349,9	79,5	94,1	820,8	9,0	532,8	253,0	221,8	439,6	374,5
	2410	326,2	79,7	93,6	761,9	8,3	555,3	290,4	227,6	472,3	377,6
	2420	320,5	79,9	93,9	766,4	7,6	548,5	305,7	234,9	481,5	381,0
	2430	318,1	80,0	93,9	768,9	6,9	547,4	325,7	243,1	491,4	392,6
	2440	311,8	80,1	93,6	732,5	6,3	551,9	354,1	253,7	475,6	400,2
	2450	312,5	80,0	93,7	767,6	5,9	550,9	329,1	265,9	497,7	411,1
	2460	309,9	80,3	93,5	756,6	5,3	545,9	314,7	278,5	507,6	423,4
	2470	307,3	80,4	93,7	779,0	4,8	541,6	309,5	291,1	503,9	433,7
	2480	316,3	80,3	93,9	791,6	4,3	542,6	314,0	302,7	511,8	454,8
	2490	325,2	80,4	94,1	817,6	3,8	549,1	319,3	315,4	504,0	509,9
	2500	306,8	80,5	94,2	747,3	3,3	566,3	324,0	334,5	499,6	586,1
	2510	280,1	80,4	92,7	685,1	2,9	570,6	321,3	352,2	457,5	638,7
20-21-19-20	2520	275,3	80,4	92,6	697,6	14,6	557,2	310,9	368,7	404,3	643,9
	2530	326,0	80,4	94,6	838,5	14,0	492,6	309,4	373,5	392,6	544,3
	2540	357,0	80,4	96,0	962,6	13,2	474,1	333,1	363,1	468,5	491,1
	2550	379,7	80,5	96,6	1079,4	12,6	439,5	344,8	352,1	413,2	451,9
	2560	406,8	80,5	98,2	1187,8	12,0	418,8	354,8	343,5	392,3	425,9
	2570	395,0	80,4	99,1	978,7	11,2	423,6	364,7	337,9	437,1	416,6
	2580	366,4	80,6	98,1	885,3	10,3	477,6	368,6	334,8	510,7	429,9
	2590	383,2	80,9	98,5	1171,4	9,5	491,2	371,6	332,3	520,6	436,2
	2600	413,1	81,0	100,2	1221,1	8,9	490,0	367,6	331,6	471,9	434,2
	2610	419,3	81,0	100,9	1259,0	8,2	495,6	362,5	332,8	460,3	436,5
	2620	425,3	81,1	101,1	1281,2	7,5	498,9	360,6	334,6	460,9	439,6
	2630	427,0	81,0	101,2	1197,6	6,9	500,1	359,4	337,0	465,9	444,1
	2640	372,0	81,1	99,3	891,5	6,1	545,9	377,8	339,3	499,9	473,2
	2650	348,3	81,4	98,0	868,8	5,3	601,5	392,4	341,2	520,2	521,4
	2660	326,1	81,4	97,1	797,3	4,8	596,2	381,8	342,6	531,6	533,4
	2670	302,5	81,5	95,6	738,3	4,6	574,7	365,7	344,2	463,2	526,6
	2680	280,3	81,4	92,8	695,3	4,4	554,8	353,1	347,0	413,4	518,2
21-22-20-23	2690	291,5	81,5	93,8	748,1	12,3	531,8	338,8	351,3	373,9	504,9
	2700	310,0	81,2	94,4	793,5	12,0	469,3	331,4	352,9	342,9	456,9
	2710	324,2	81,2	95,0	844,1	11,6	427,5	336,5	347,8	329,8	420,5
	2720	340,2	81,1	95,6	900,2	11,1	399,6	343,1	340,8	319,1	394,4
	2730	358,6	81,2	96,5	950,8	10,7	384,2	345,2	334,0	315,6	377,4
	2740	321,2	81,3	96,8	695,4	9,7	394,8	365,0	328,0	396,2	383,1
	2750	335,3	81,3	97,4	840,8	8,7	439,9	385,9	323,1	463,9	422,9
	2760	348,0	81,6	98,0	871,8	7,9	479,1	400,0	318,5	499,9	468,7
	2770	349,6	81,8	98,6	872,7	7,0	512,5	408,6	314,8	519,2	506,1
	2780	340,0	82,0	98,2	869,0	6,3	539,9	410,8	311,9	533,1	539,5
	2790	335,4	82,1	98,3	877,1	5,8	558,0	407,0	309,8	553,5	555,0
	2800	344,8	82,1	98,9	901,3	5,3	565,4	402,2	308,9	516,3	563,7
	2810	317,6	82,1	97,0	792,8	5,1	568,9	396,2	309,4	468,1	573,7
	2820	287,6	82,1	95,8	718,4	4,9	560,9	383,5	311,1	424,5	575,0
	2830	273,2	82,0	95,1	681,8	4,8	546,8	373,2	313,7	395,6	574,9
	2840	265,1	81,9	94,2	664,5	4,6	533,8	364,0	316,8	375,9	572,9
	2850	261,3	81,8	93,8	657,1	4,5	524,2	357,4	320,1	361,6	570,4
	2860	253,0	81,8	93,3	630,4	4,3	515,3	354,2	323,2	349,0	555,6
	2870	249,4	81,7	93,1	619,2	4,2	508,2	348,1	325,8	339,0	543,8
	2880	247,7	81,8	92,8	618,4	4,0	504,8	341,5	328,0	332,0	541,1
	2890	247,1	81,7	92,5	619,9	3,9	502,9	337,1	330,3	326,2	542,5
	2900	242,9	81,6	92,3	603,1	3,8	498,7	334,8	332,5	321,8	542,4
	2910	238,3	81,6	91,9	592,0	3,6	496,2	330,4	333,6	317,5	540,6
	2920	241,9	81,6	92,3	599,9	3,5	490,8	326,4	333,7	315,0	540,1
	2930	236,6	81,5	91,7	579,5	3,4	480,7	323,0	332,5	311,9	540,1
	2940	232,4	81,5	91,6	568,6	3,2	470,0	317,4	330,3	307,8	532,6
	2950	227,2	81,5	91,0	551,1	3,2	461,7	307,9	327,9	300,8	511,5
	2960	224,5	81,4	91,0	540,8	3,0	453,2	297,1	324,9	294,7	495,7
	2970	220,3	81,4	90,7	527,5	2,9	444,1	286,9	321,8	288,4	482,9
	2980	218,7	81,4	90,6	524,3	2,8	436,5	276,2	318,5	282,6	467,0
	2990	216,9	81,2	90,1	518,2	2,8	431,1	266,0	314,8	277,5	452,6
	3000	213,8	81,2	89,8	509,7	2,6	426,9	257,9	311,3	273,0	442,4
	3010	209,5	81,2	89,4	490,2	2,6	424,2	249,3	308,1	267,6	429,0
	3020	203,4	81,2	89,1	472,4	2,5	416,7	240,6	304,6	260,9	416,1
	3030	199,2	81,0	88,7	459,9	2,5	407,3	232,5	301,1	254,4	403,1
	3040	193,8	81,0	88,5	436,5	2,4	398,0	226,5	297,7	247,8	389,5
	3050	179,8	80,8	87,9	363,8	2,3	386,2	219,2	294,3	240,8	375,4
	3060	155,2	80,7	86,9	306,2	2,3	375,1	213,3	290,5	233,8	364,2
	3070	146,0	80,6	86,2	286,4	2,2	363,1	206,7	286,5	225,9	352,6

3080	139,6	80,6	85,7	271,6	2,2	352,6	199,9	282,3	218,8	338,8

APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
www.polytests.com

Maxime Martin
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

APPENDIX 6: Drawings and specifications

APPENDIX 7: Operator's manual

hearthstone



Lincoln

(Model 8060)

Woodstove

OWNER'S MANUAL

Installation And Operating Instructions

NFI NATIONAL FIREPLACE INSTITUTE
A CERTIFICATION AGENCY

We recommend that our products be installed and serviced by professionals who are certified in the U.S. by NFI (National Fireplace Institute), or by W.E.T.T. (Wood Energy Technology Transfer) in Canada.
www.nficertified.org
www.wettinc.ca

PFS C US

PFS Report Fxx-xx

SAVE THIS OWNER'S MANUAL
FOR FUTURE REFERENCE

PLEASE READ THIS ENTIRE OWNER'S MANUAL BEFORE YOU INSTALL AND USE YOUR NEW LINCOLN WOOD STOVE.

If this room heater is not properly installed, a house fire may result.
To reduce the risk of fire, follow the installation instructions.
Failure to follow these instructions can result in property damage, bodily injury, or even death.
Conforms to UL Std. 1482-2011 (R2015)
Certified to ULC Std. S6270-00 (R2016)

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**

Lincoln (Model 8060)
Manual: 6400-41432
R: 8/9/22

Notes on Stove Operation and Efficiency

Rating:

You have purchased a Hearthstone Lincoln tested to EPA Method 28R 40 CFR Part 60 where applicable. This stove is certified to comply with the U.S. Environmental Protection Agency 2020 particulate emissions standard using crib wood. It is certified at 1.14 gr/hr. emission rate and under specific test conditions has been shown to deliver heat at rates ranging from 14,545 to 20,507 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. Our dealer network processes all warranty claims. 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, sawdust, wax and similar substances for the purpose of starting a fire in an affected wood heater. Burning these materials may 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 ensure the efficient use of your wood heater and minimize visible emissions. Having your 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 measured and weighted using EPA Method 28R and 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 78.5% (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 moist

ure content. Burn only dry, seasoned wood as using wet wood will greatly reduce your efficiency.

CO Emissions:

The Lincoln has the following CO emission rates by burn level: Category 1 (low) –38.7 g/hr., Category 2 (med. low) – 18.2 g/hr., Category 3 (med. high) – 17.3 g/hr. and Category 4 – 69.0 g/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.

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INTRODUCTION

Thank you for purchasing a Lincoln woodstove from Hearthstone Quality Home Heating Products. This stove will provide years of comfortable heat. This stove combines the warmth and comfort of soapstone and cast iron with the efficiency of advanced catalytic technology. The Lincoln blends modern technology with the unique beauty and qualities of cast iron and soapstone. We trust that you will appreciate the quality of this handcrafted product.

Your Lincoln woodstove burns very efficiently, and produces a large amount of heat. However, you should not consider your Lincoln the primary heat source for your home. The Lincoln's large glass window allows 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. As a general rule, keep furniture, drapes, curtains, wood, paper, and other combustibles at least 36 inches (92 cm) away from the stove. Never install the stove in or near a storage location for gasoline, kerosene, charcoal lighter fluid or any other flammable liquids.

Install the stove in your central 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.

- **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 Lincoln Model 8060 stove is warranted by:

Hearthstone ***Quality Home Heating Products, Inc***®
317 Stafford Ave.
Morrisville, Vermont 05661, USA
www.Hearthstonestoves.com

CODES

When you install your Lincoln woodstove, 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
www.ansi.org

National Fire Protection Association, Inc. (NFPA)
Battery March Park
Quincy, MA 02269
www.nfpa.org

If you are installing your Lincoln 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
- With the proper sized chimney

When using your stove, follow these safety precautions:

- **Never** modify this stove in any way.
- **Never** burn kiln dried, painted or treated wood in this stove.
- **DO NOT BURN GARBAGE. 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.
- **DO NOT BURN FLAMMABLE FLUIDS.**
- **DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE. 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 a wood grate or other device to elevate the fire.
- **Never** allow logs in the firebox to hit 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 25)
- **Never** put articles of clothing or candles on a hot stove.
- **Never** connect the stove to a flue used by another appliance.
- **Never** connect to or use in conjunction with any air distribution ductwork unless specifically approved for such installations

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 9)
- 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 23)
- 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 29)
- 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 #96-53400

PERIODIC CHECKLIST

Perform each of these tasks at the specified intervals.

At the End of Every Week:

- Empty ashes from the firebox, sooner if the firebox 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. (see page 29)
- 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 29.)
- Inspect the face of the catalytic combustor for fly ash and soot. Use a soft-bristled brush to remove if present. It is recommended to visually inspect the catalytic combustor at least 3 times during the heating season, or every 2-3 months.

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.
- Clean out the inside of the stove thoroughly.
- Check and clean the catalytic combustor, if necessary
- Inspect all door gasket material and replace if worn, frayed, cracked or extremely hard.

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. Close the bypass damper
5. Keep the stove front door 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 and bypass handle 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.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

SPECIFICATIONS

Maximum Heat Output:
40,000 BTUs 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:
1.0 cubic feet.

Maximum Log Length: Up To 18" (45cm), 16" (40cm) Recommended

Emissions: 1.14 g/hr.

Burn Time: Up to 16+ hrs. (*Heat Life*™: Up to 20 hours) Note: The amount and weight of wood contained per cubic foot of firebox volume can vary from 10 to 25 lbs. per cubic foot depending on type of wood, moisture content, packing density and other factors.

Stove Dimensions:

Height:	30 1/2" (77.2cm)
Width:	23 3/4" (59.1cm)
Depth:	19 3/8" (49.2cm)
Weight:	350 lbs. (159 kg)

Connector Size:	6" (152 mm) diameter
Metal Chimney:	6" (152 mm) inside diameter
Masonry Chimney:	6" (152 mm) inside diameter (round flue), 8" x 8" (203 x 203 mm) (square flue)

Crate Dimensions: H-40" W-29" L-36" or 102x74x 92cm

Optional Equipment:

Outside Air Kit	96-53400
Rear Heatshield	90-68601
Side Heatshield (Single)	90-68605

Figure 1 – Lincoln Dimensions

INSTALLATION

UNPACKING

Hearthstone packages your Lincoln woodstove with the greatest care so that it ships safely. Under certain circumstances, however, damage may occur during transit and handling. When you receive the Lincoln, carefully unpack and inspect the stove and all accompanying parts. Ensure that all parts are included inside the stove. If any parts are damaged or missing, please contact your authorized Hearthstone dealer immediately.

Be sure to remove the packaging material in the flue collar and above the baffle before installing the chimney.

PACK LIST

Lincoln Model 8060 Woodstove
Owner's Manual

The label is attached by a cable to the bottom of the stove. Take care when lifting the stove not to damage the label or cable. After final positioning of the stove, the label may be stored in the holding clip on the bottom shield of the stove.

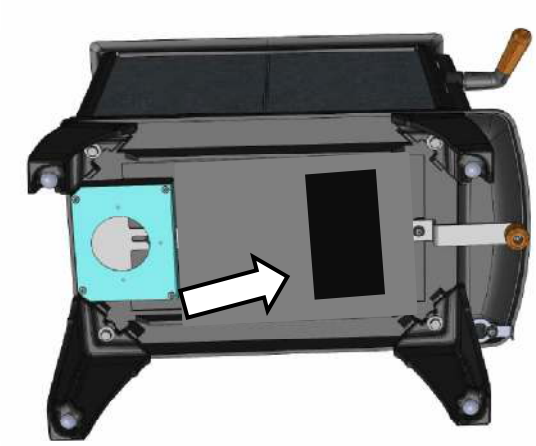


Figure 2 - Label Location

INSTALLING YOUR STOVE

Choose a place to install your Lincoln woodstove. Consider the location of your stove for optimum heating efficiency. In general, it is better to place your stove in a main living area, rather than in a basement or other confined space.

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 tile, brick, slate, glass or another non-combustible facing. There is no R-value requirement.

If you use a rear 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 with additional approval of the regulatory authority having jurisdiction in your area. 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 & FLOOR PROTECTION

Ensure you protect combustible flooring with a covering of noncombustible material. The Lincoln does not require an insulated hearth pad. The minimum floor protection must be met under the stove and extend beyond the stove as follows:

The minimum floor protection for US installations is 33in x 31-1/2in.
The minimum floor protection for installations in Canada is 43in x 40in.

Figure 3 – Hearth Dimensions

Installing the stove in a room with Luxury Vinyl Plank (LVP) or Luxury Vinyl Tile (LVT) flooring requires a minimum clearance from the stove to the LVP or LVT flooring. LVP and LVT flooring begins to warp at 110 degrees Fahrenheit. The minimum required clearance for the LVP or LVT flooring to the front glass of the stove is 55”.

/ 46 cm

COMBUSTIBLE SURFACE REQUIRED CLEARANCES

Note: *Dimensions shown in the following figures are from the furthest point on cast body of the stove unless otherwise indicated.*

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.

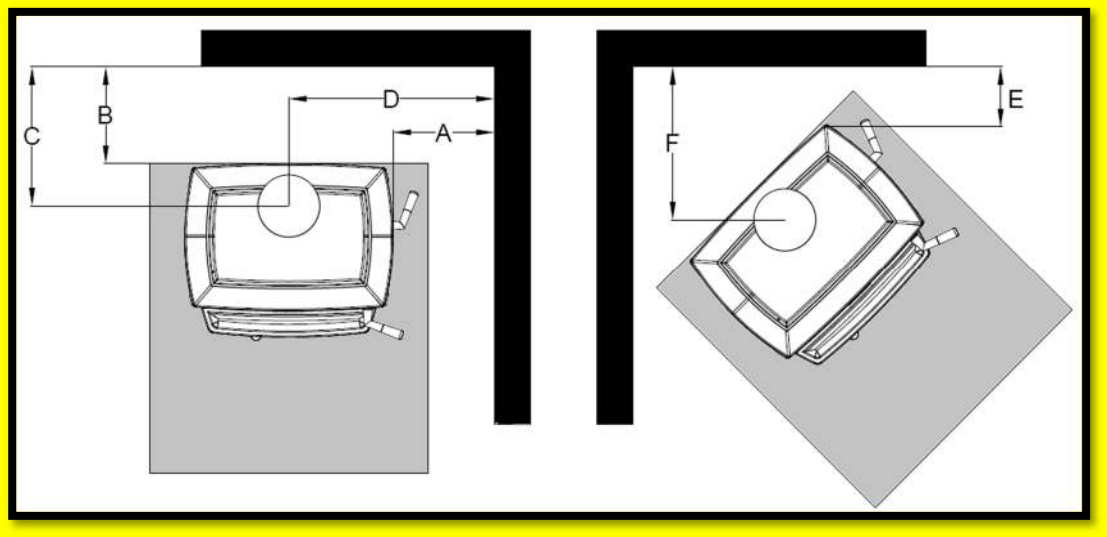


Figure 4 – Clearance to Combustibles

	Parallel				Corner	Corner
Clearances	A	B	C	D	E	F
Single wall Connector – Inc. Rear Heat Shield	14”-36cm	13-3/4”-35cm	18-3/4”-48cm	25-7/8”-66cm	7”-18cm	17.25”-44cm
Single Wall Connector – With Blower Kit Shield	14”-36cm	13-3/4”-35cm	18-3/4”-48cm	25-7/8”-66cm	7”-18cm	17.25”-44cm
Double Wall Connector – Inc. Rear Heat Shield	14”-36cm	9-3/4”-25cm	14-3/4”-38cm	25-7/8”-66cm	7”-18cm	17.25”-44cm
Double Wall Connector – With Blower Kit Shield	14”-36cm	9-3/4”-25cm	14-3/4”-38cm	25-7/8”-66cm	7”-18cm	17.25”-44cm
Single Wall Connector – No Rear Heat Shield	14”-36cm	16”-41cm	21”-54cm	25-7/8”-66cm	14”-36cm	25-1/2”-65cm
Alcove W/Sngl or Dbl Wall Conn – Inc. Rear Heat Shield	14”-36cm	13-3/4”-35cm	18-3/4-48cm	25-7/8”-66cm	See NFPA-211	
Alcove W/Sngl or Dbl Wall Conn – With Blower Kit Shield	14”-36cm	13-3/4”-35cm	18-3/4-48cm	25-7/8”-66cm	See NFPA-211	

Alcove Clearances (inches)	Unprotected Surfaces	Protected Surfaces (NFPA-211)
Minimum alcove width	51-3/4” – 132cm	See NFPA-211
Min. Alcove ceiling from floor with single wall connector	56” – 142.3cm	See NFPA-211
Min. Alcove ceiling from floor with double wall connector	56” – 142.3cm	See NFPA-211

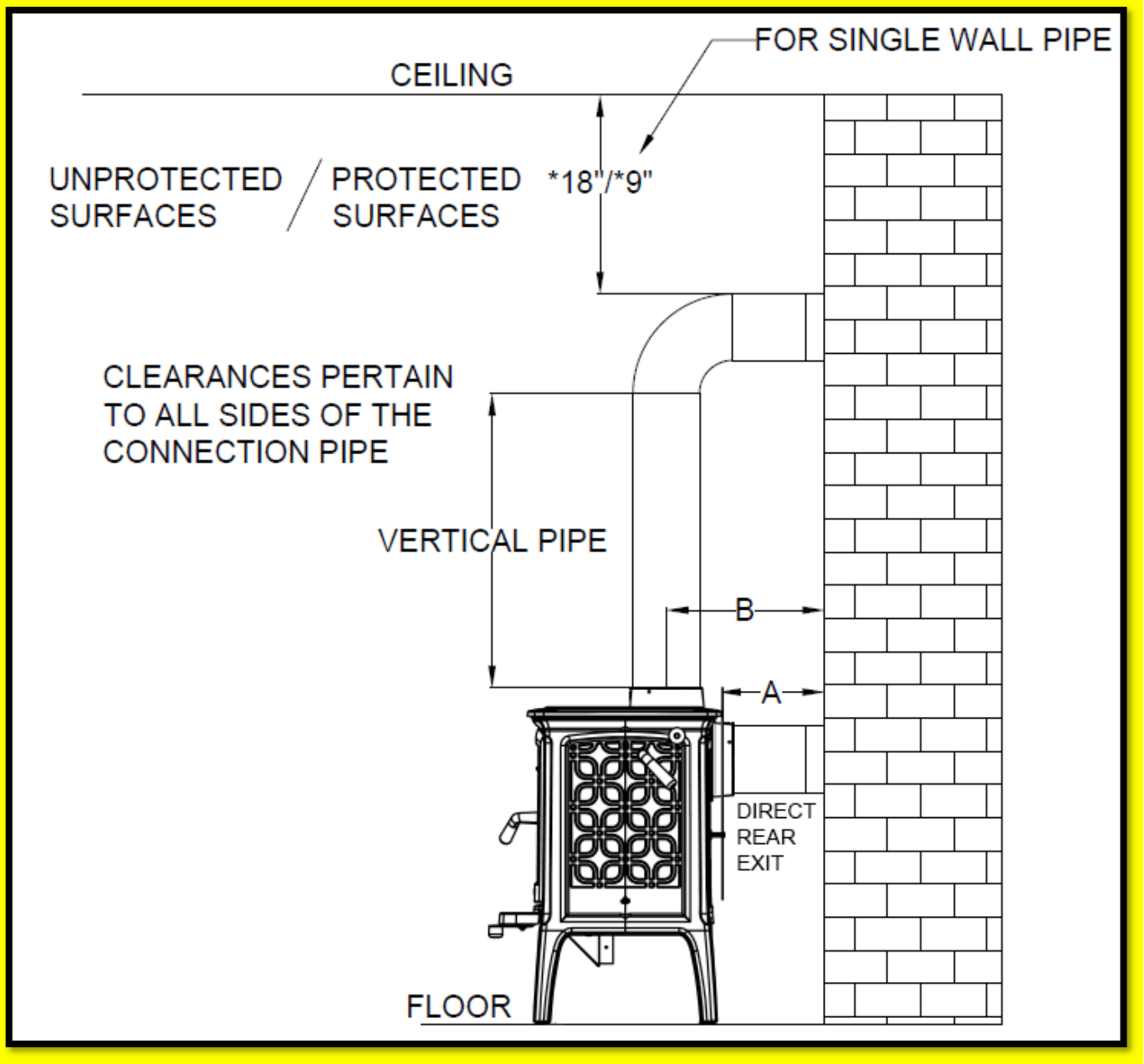
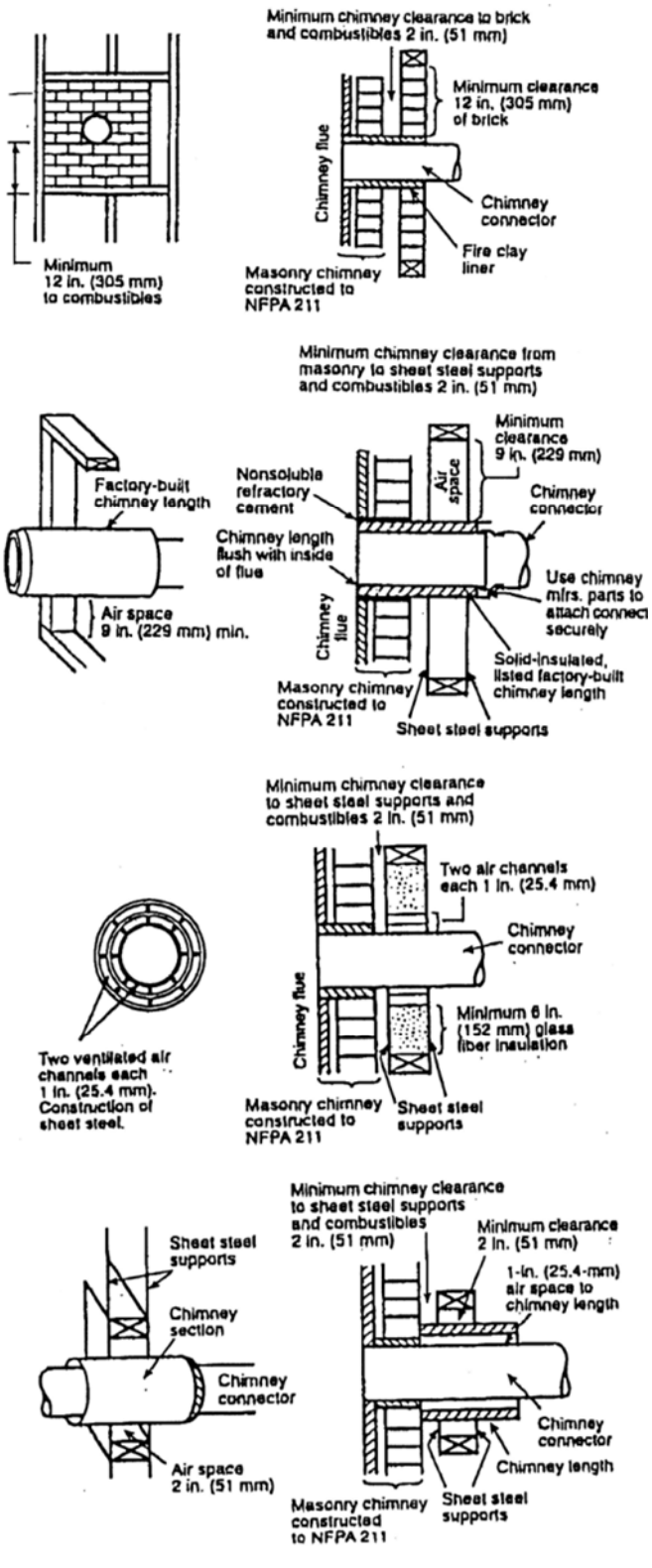


Figure 5 Chimney Connector Clearances

	Single Wall Pipe			Double Wall Pipe	
Through the wall top flue exit or direct rear exit	**With Blower Kit Shield****	**Inc. Rear Heat Shield**	**No Rear Heat Shield**	**With Blower Kit Shield****	**Inc. Rear Heat Shield**
A	13-3/4"-35cm	13-3/4"-35cm	15-1/2" – 40cm	9-3/4"-25cm	9-3/4"-25cm
B	18-3/4"-48cm	18-3/4"-48cm	21" – 54cm	14"-36cm	14"-36cm

***For double wall pipe clearance to ceiling, refer to pipe manufacturer specifications.**

See Parallel Clearance to Combustibles for clearances to the sides of the stove.



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.

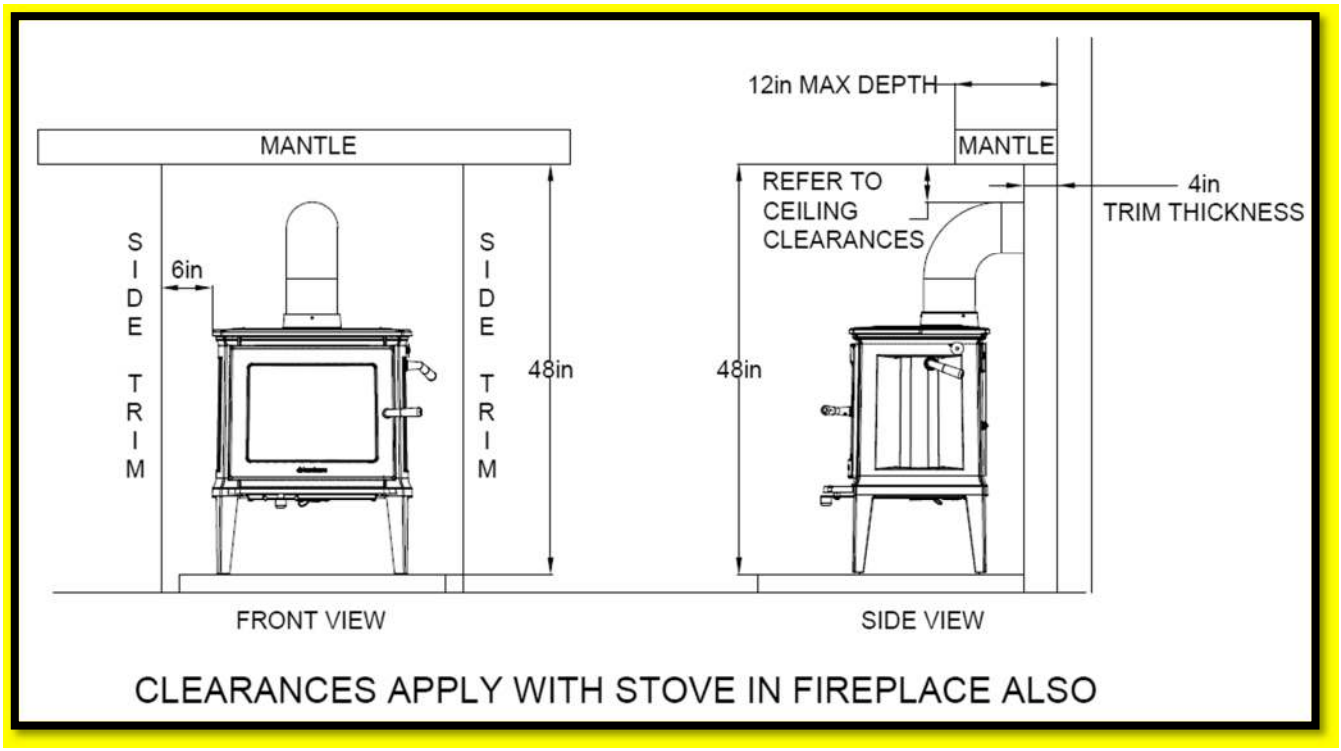


Figure 6 Trim and Mantle Clearances

OUTSIDE AIR SUPPLY

(Optional Kit #96-xxxx)

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 attaches to the underside of the stove. Refer to the instructions provided with the kit for installation.

*An adaptor for 4" duct is available if needed. KIT #90-53308

When using an outside air kit in Canada, the stove must be attached to your home's floor. Use the shipping clips that came with the stove and fasteners long enough to attach securely to the subfloor. (The clips and fastener heads may be painted to minimize visibility).

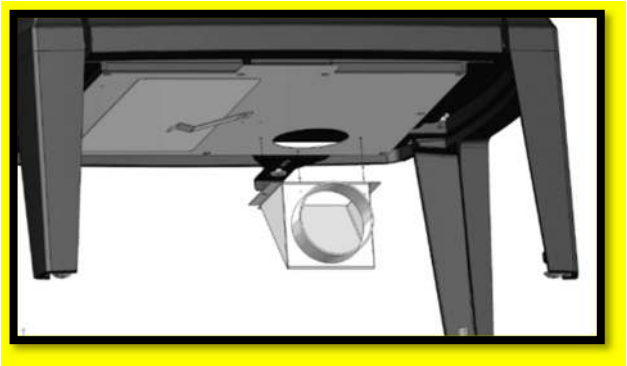


Figure 7 – Outside Air Kit Detail

The International Residential Code (IRC) does not allow the outside air duct to terminate higher than the appliance. Some building officials restrict 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. When using an outside air kit in Canada, a damper allowing 100% closure shall be installed.

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.

VENTING COMPONENTS & CONFIGURATION REQUIREMENTS

- **DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE USED BY ANOTHER APPLIANCE**

- Single wall connector that is at least 24 MSG or 25 MSG blued steel stovepipe.

- Double wall connector (Rear 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 recommended are Simpson Dura Vent DVL and Metalbestos DS. Security, GSW and Ameritec also manufacture acceptable Rear 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.

- 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

- 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 specifically for Simpson DuraVent DVL and may vary with other brands. ***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 in good condition. Be sure to inspect the chimney and chimney connector and keep it clean.* Upon inspection, immediately replace rusted, cracked, or broken components. Failure to follow these instructions and specified components or using make-shift compromises can result in fire, property damage, bodily injury, and even death.

- 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

Attach stovepipe sections to the flue collar 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 Lincoln. 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 Lincoln requires a draft between -0.06" and -0.1" WC. For drafts above -0.1" WC, install a stovepipe damper. To vent the Lincoln directly out the back flue exit, a minimum draft of -0.08" WC is required. 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 also important to maintain these connector clearances for the remainder of the installation.

CONNECTING THE STOVE TO A CHIMNEY

You can install your Lincoln to a prefabricated metal chimney, or to a masonry chimney.

This room heater must be connected to (1) a listed Type HT (2100° F) chimney per UL 103 or ULC S629, or (2) a code-approved masonry chimney with a flue liner. The chimney size should not be less than the flue collar, or more than three times greater than the cross-sectional area of the flue collar.

We recommend installing a cleanout tee where possible to simplify chimney cleaning and maintenance.

Connecting to a Prefabricated Metal Chimney

There are two ways to install a prefabricated metal chimney:

- An *interior* installation where the chimney passes inside the residence through the ceiling and roof.
- 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 and may experience increased creosote accumulation.

When connecting the Lincoln to a prefabricated metal chimney, you must follow, precisely, the manufacturer's installation instructions. Use only Type HT (2100° F), prefabricated metal chimneys listed per UL 103 or ULC S629 standards.

Ensure the size of the prefabricated chimney's flue is appropriate for the Lincoln. The Lincoln 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 required 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 containing a proper 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.

Ensure 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 can form.

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 6" Diameter or 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 – must use liner
- A mortared rubble or stone wall – must use liner

FLUE LINER OPTIONS:

- Tile - minimum wall thickness of 5/8" (16 mm), installed with refractory mortar, and with at least 1" (25 mm) air space around the liner
- Stainless steel - UL listed 6" diameter, insulated or wrapped liner, or the space around the liner filled with vermiculite or suitable material (these keep the liner warmer for better performance)
- Ensure any equivalent flue liner is a listed chimney liner system meeting type HT requirements or other approved material.

INTERIOR CHIMNEY REQUIREMENTS:

- Must have at least 2" (51 mm) clearance to combustible materials
- Must install fire stops at the spaces where the chimney passes through floors and/or ceiling
- Any insulation material must be 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 9):

- 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.

The recommended minimum chimney height for top of stove installation is 16 feet (4.9 m) off the floor or 13 feet 7 1/4 inches (4.3 m) from the top of the stove. For rear exit connection, the recommended minimum chimney height is 19 feet (5.8m) off the floor or 16 feet 7 1/4 inches (5.2m) from the top of the stove. The recommended maximum chimney height is 30 feet (9m). The Lincoln requires a draft between -0.06" and -0.1" water column. Ensure your chimney is long enough to provide the minimum draft, and use a damper if your installation has a required chimney height that provides too much draft.

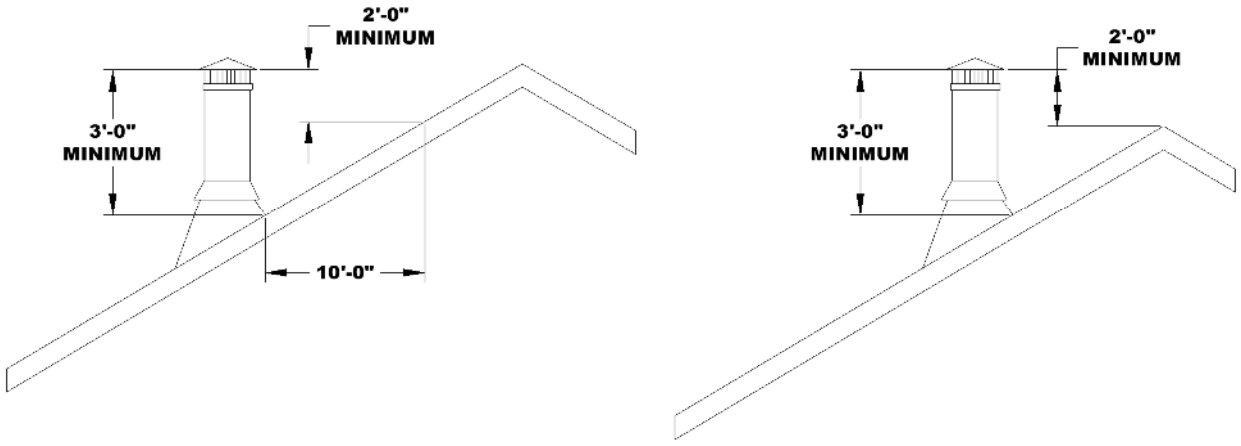


Figure 9 – Chimney Height Requirements

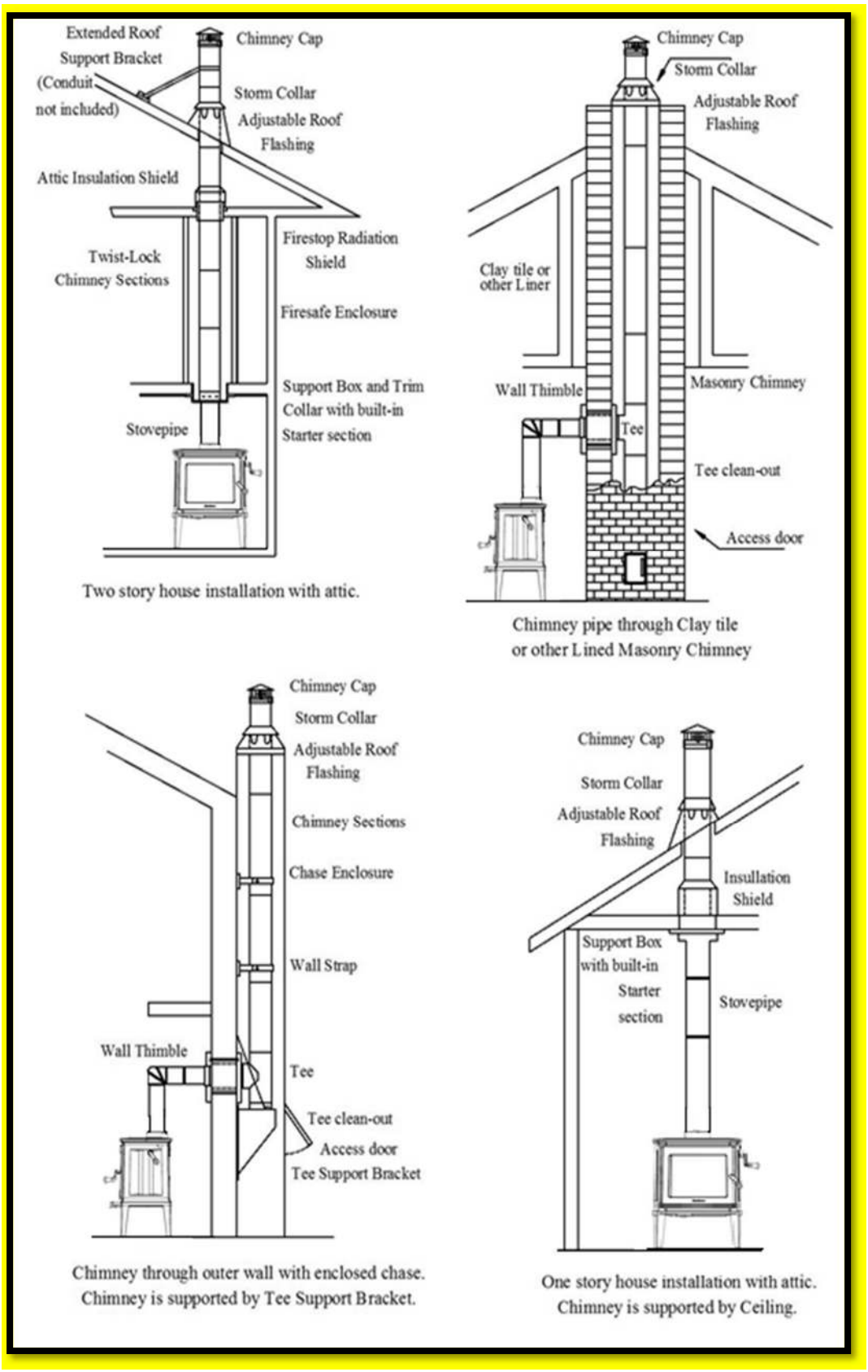


Figure 10 – Typical Chimney Configurations

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)
- An outside air kit must be used in all mobile home installations. See page 12 for details.
- Permanently attach the stove to your mobile home's floor. Use the shipping clips that came with the stove and fasteners long enough to attach securely to the subfloor. (The clips and fastener heads may be painted to minimize visibility).

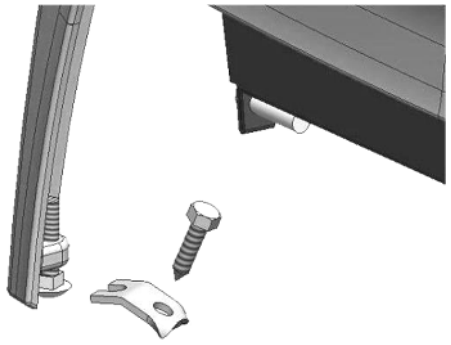


Figure 11 - Lock Down Detail

- Install a Mobile Home Chimney & Connector Kit*.

  Each kit must include:
  Stainless spark arrester cap, storm collar, Adjustable vented flashing – 0/12 – 6/12, Two 24" chimney pipes, 24" support box with built-in starter section and trim.

  * Install a Mobile Home Chimney and Connector Kit conforming to US/UL103 or CAN/ULC-S629, Standard for Factory-Built Chimneys.

- 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.
- 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 27 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.
- 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).

- CAUTION: REMOVE THE CHIMNEY WHEN TRANSPORTING THE MOBILE HOME!

- 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

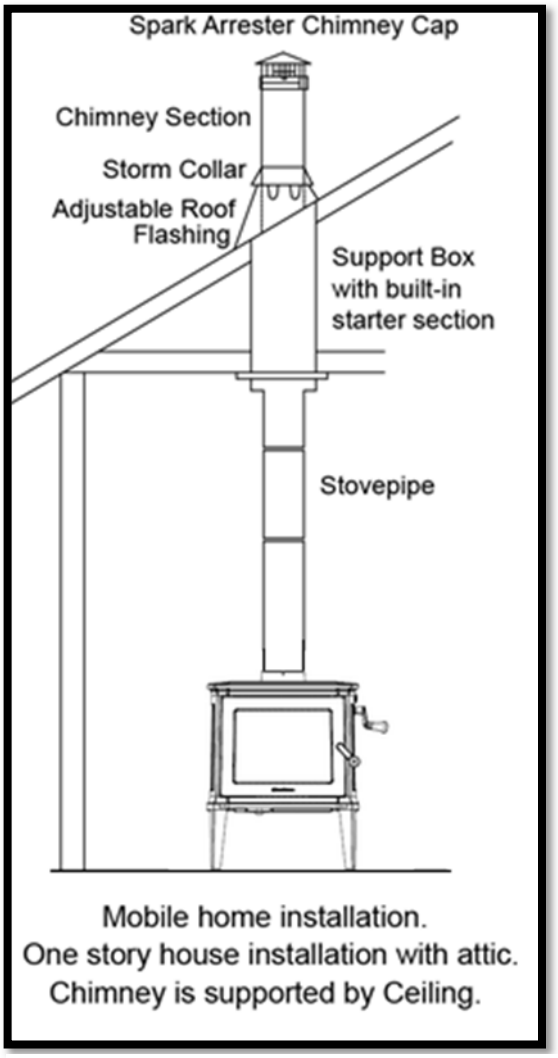


Figure 12 – Mobile Home Installation

OPERATION

Once your Lincoln is installed, you are ready to light a fire.

Every installation, season's firewood, and operator's technique varies. Learn how to use your stove most efficiently for your installation. We can give you the basic principles, but only you can ensure maximizing the potential of your stove while also operating it safely.

- **WARNING: HOT WHILE IN OPERATION! KEEP CHILDREN, PETS, CLOTHING AND FURNITURE AWAY. CONTACT MAY 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 Figure 13*). For your own safety, do not modify these features in any way. We recommend you use fireplace gloves when the stove is in operation and hot.



Figure 13 - Controls & Features

FRONT DOOR HANDLE: The firebox door allows you to load wood into your stove; a wood handle operates the door. To open the door, pull up on the handle and swing the door away from the stove. To latch the door, push the door tightly towards the firebox then continue to push the handle in and down until it latches shut. Gently pull on the door handle to make sure it is properly latched.

PRIMARY AIR CONTROL: The primary air control lever is located under the ash lip. 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 and the higher the heat output; conversely, less air creates a slower burn, with lower heat output. For maximum airflow, pull the lever out as far as possible; move the lever inwards as far as possible for minimum airflow (does not close completely).

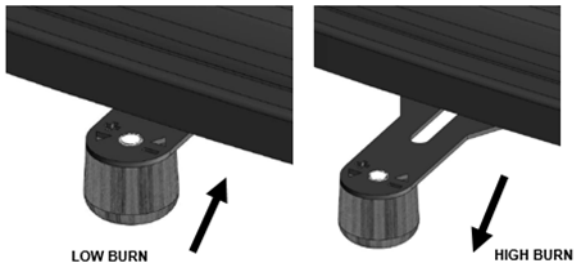


Figure 14 – Air Control

BYPASS HANDLE: The bypass handle controls the bypass door inside the stove. When the handle is pointed towards the front of the stove, the bypass door is open, and when the handle is pointed towards the rear of the stove, 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.

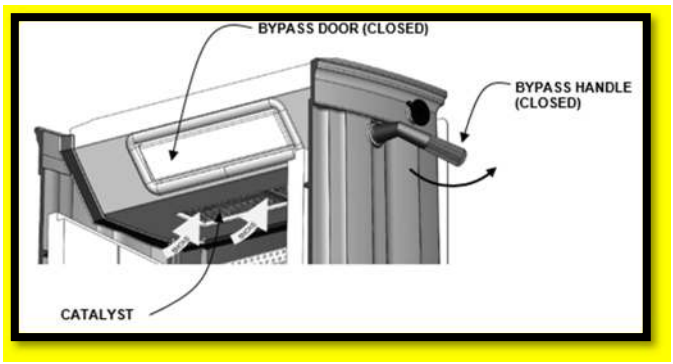


Figure 15 – Bypass Closed

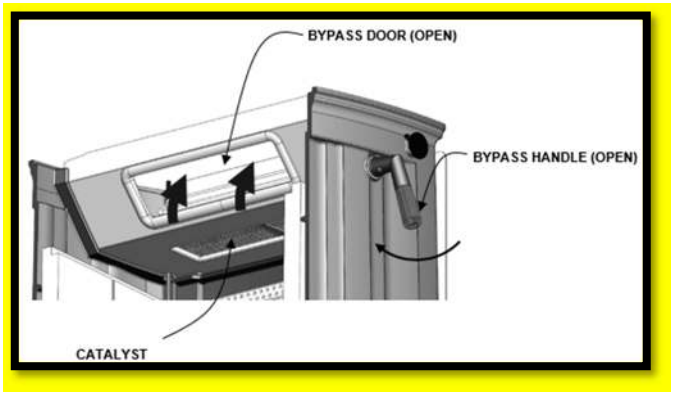


Figure 16 – Bypass Open

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. The catalyst probe should be spaced 3/8" from the body of the stove. 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. The Lincoln typically operates in the 800 ºF to 1300 ºF range.



Figure 17 – Catalyst Thermometer

CHOOSING FIREWOOD

Burn only natural firewood (known as cordwood) in the Lincoln Model 8640 Wood Heater. This stove is not designed to burn other fuels.

- **CAUTION: DO NOT USE CHEMICALS OR FLAMMABLE FLUIDS TO START THE FIRE. DO NOT USE CHARCOAL, PELLETS, COAL, ARTIFICIAL LOGS OR ANY OTHER MATERIALS AS FUEL; THEY ARE NOT SAFE. DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS.**
- **THE USE OF UNAUTHORIZED FUEL SUCH AS COAL COULD PRODUCE HIGH LEVELS OF CARBON DIOXIDE IN THE LIVING SPACE. AT HIGH LEVELS CARBON DIOXIDE COULD RESULT IN PERSONAL INJURY OR DEATH.**

The quality of your firewood directly affects heat output, duration of burn and performance of your stove. Softwoods generally burn hotter and faster, while hardwoods burn longer and produce better coals. Density and moisture content are two critical factors to consider when purchasing wood.

The following is a list of some wood species and their relative BTU (British Thermal Unit) content. The higher the BTU content, the longer the burn. Firewood with higher BTUs is generally ideal for a wood stove.

Burn untreated wood only. Other materials such as wood preservatives, metal foils, coal, plastic, garbage, Sulphur, or oil may damage the catalysts.

Wood Heat Value: Sorted By Btu Content

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
Coffee tree, 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 burns poorly. You must season green wood before using it in your wood stove. To season green wood properly, split, stack, and allow it to air dry for a period of one year. Green wood may provide less than 2000 Btu per pound, whereas dry wood can provide up to 7000 Btu per pound.

Stack the firewood on skids or blocks to keep it off the ground, cover only the top of the stack. Plastic or tarps that cover the sides of the woodpile 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."

- **CAUTION: 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.

- **WARNING: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS HEATER. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE HEATER WHILE IT IS IN USE.**

BREAKING IN YOUR WOOD STOVE

It is imperative that your stove is "broken in" gradually. Soapstone must be "seasoned"; over-firing a new stove may cause soapstone to crack or may damage other stove parts. Natural moisture in the freshly quarried soapstone must be driven out slowly to minimize the “shock” to the stone of its first exposure to high firebox temperatures. In addition, the asbestos-free furnace cement must be cured slowly to ensure adequate sealing and bonding.

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 shortly after first firing. The odor and smoke will end once the stove is “cured”.

The first few fires of the season 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 may change and small fractures may appear on the surface. These changes do not affect the function of the stove. If a panel breaks completely, it must be replaced

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 as a lever 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 or otherwise support the fuel. Burn the fire directly on the floor of the firebox.

PROTECT YOUR HEARTH

While your stove radiates heat slowly and evenly when in use, it also absorbs moisture condensations when not in use. Specifically, true with a brand-new stove, but also for stoves during the off season, your stove and chimney flue has moisture in it. During the early stages of use and during certain heating conditions, this condensation can turn to a liquid. This dark liquid can find a way through the bottom of your stove and onto your hearth. We recommend placing some pieces of aluminum foil or other non-combustible material in the area around each of the legs of the stove temporarily to catch this liquid until the moisture has been removed from the heating system. As the system becomes seasoned these can be removed for normal use.

A NOTE ABOUT MAJOLICA ENAMELS

The porcelain Majolica enamels Hearthstone uses are a natural glass-based product. The Majolica process consists of a neutral opaque color base, usually an off-white, with a translucent color applied over it. It is essentially molten-glass applied as a powder and each coat is fused to the iron in our ovens at nearly 2000 F. The darkness of the color is dependent upon the thickness of the translucent color over the base color, the thickness of the part and the oven temperatures. Details in the iron allow for the molten glass to pool darkly in low places and be thinner on edges of detail. Color variations are what makes it so beautiful. Please expect variations in color as this is a normal part of the process. Crazing (minuscule lines in the glaze) is common with repeated heating and cooling. or extreme use. Crazing has no significant effects on the ceramics, it is cosmetic and in the top coat only. Majolica finishes are applied by artists; having been used on ceramic pottery for hundreds of years. Antique Majolica plates, saucers, cups and teapots are normally crazed to varying degrees and have color variations piece to piece.
Enjoy a lifetime of beauty with this classic finish we are proud to offer.

BUILDING A BREAK IN FIRE

1) Open the bypass handle. 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 crisscross pattern over the newspaper. Kindling should be approximately ten pieces, 1/2" (13 mm) in diameter and 10" to 16" (254 mm to 457 mm) long.
2) Fully open the primary air control by pulling the control handle towards you, away from the firebox.
3) Light the paper under the kindling. Leave the door slightly ajar momentarily until the kindling has started to burn and draft begins to pull.
4) Close the door and allow the fire to burn. Keep the door closed while the stove is in use.
5) KEEP A WATCHFUL EYE ON YOUR STOVE to maintain a steady, low-heat fire. Your first fire should make the stove warm but **not hot to the**

touch. Visible steam, or boiling moisture and hissing indicate the soapstone is too hot. At most, a few small chunks of wood should be added to the fire to reach safe break-in temperatures.

6) Once the stove is warm but **not hot to the touch,** close the primary air control by pushing it fully inward toward the stove to allow the fire to die out completely.

7) Let the stove return to room temperature.

Your first fire and first fire each season thereafter should be built and maintained as outlined above. Your patience will be rewarded by a properly seasoned stove.

- NOTE: The cool flue gas temperatures present during the break-in procedure may cause rapid creosote build-up. The door glass may also get dirty. A good hot fire will clean it. We recommend a visual inspection (and cleaning if necessary) of your stovepipe and chimney once the break-in procedure is completed.

NORMAL OPERATION

BUILDING A FIRE FOR EVERYDAY USE

1) Open the bypass handle. 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 the lever completely out, away from the firebox.

3) Light the paper under the kindling. Leave the front door slightly ajar momentarily until the kindling begins to burn and draft begins to pull.

4) Close the door and allow the fire to burn.

5) Once the kindling is burning, 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 closed while the stove is in use.

   CAUTION: DO NOT BUILD THE FIRE TOO CLOSE TO THE GLASS. KEEPING THE FIRE TOWARDS THE CENTER OF THE FIRE BOX WILL KEEP COALS FROM BUILDING UP AGAINST THE GLASS DURING RELOADING.

6) Once the fire is burning well, and the catalyst thermometer indicates that the stove is in the active range, close the bypass handle. Now the combustion products are passing through the catalytic combustor, and your stove will be burning at its optimal efficiency.

7) After closing the bypass door, allow the stove to run on a high setting for around 20 minutes to ensure the catalytic combustor stays in the active range. This will also allow the fire to burn off any residue on the door glass from any previous low-burn fires

8) Use the primary air control to regulate the desired rate of burn. Pull the handle towards you for a higher burn rate, and push the handle towards the stove for a lower burn rate. The air control does not close completely.

Note: Always remember to open the bypass handle before opening the front door. 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. During the refueling and

rekindling of a cool fire, or a fire that has burned down to the charcoal phase, operate the stove at a medium to high firing rate for about 10 minutes to ensure that the catalysts reach approximately 600 °F. Once the catalysts reach operating temperature, the bypass handle can be closed. When reloading the stove, try to keep an open path behind the Lower Primary Air Opening (LPAO). It is helpful to leave a small valley in the coal bed behind the LPAO to insure faster re-lighting.

CATALYTIC COMBUSTOR OPERATION

The Lincoln 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.

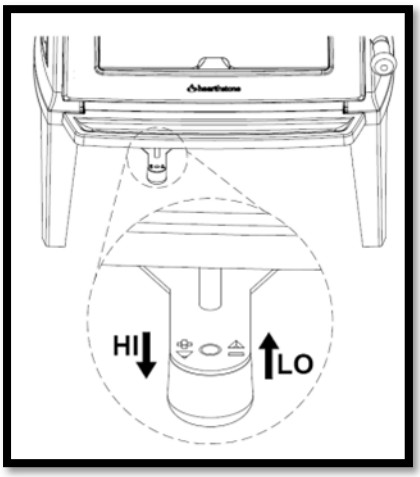


Figure 17 – Air Control Position

BURN RATE

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

LOW BURN: Move the air control lever all the way inward toward the stove. (*See figure 17*). 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.

MEDIUM LOW BURN: With the primary air control in the low position, pull the air control forward (a little less than 1/4”). A medium-low burn rate is the typical setting and is preferable if the stove is unattended. At this burn rate, a little goes a long way.

MEDIUM HIGH BURN: With the primary air control in the low position, pull the air control forward (a little less than 3/8”)

HIGH BURN: Completely open the primary air control by moving it all the way outward toward the operator. Fully load the firebox with wood on a bed of hot coals or on an actively flaming fire. To minimize creosote accumulation, run the stove on high once or twice daily for 35 to 45 minutes to fully heat the stovepipe and chimney.

CAUTION: Do not burn fuel other than cordwood in your stove.

OVER-FIRE CAUTION

Over-firing means the stove is operating at temperatures above normal temperatures reached during High Burns 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. A properly installed stove using fuel and following operating procedures as outlined in this manual should not over-fire.

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, compressed wood, highly volatile fuels or combustibles, or anything other than natural cordwood.
- **OPERATOR ERROR:** Ensure all the gaskets are in good condition. Replace worn out or compressed gaskets. Only burn the stove with the firing and ash doors in the closed position.

If you suspect your stove is over-firing, discontinue use and 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 refractory panels, discolored or warped external parts, and damaged finish.

- **ANY SIGNS OF OVER-FIRING WILL VOID YOUR WARRANTY!**
- **THE FRONT DOOR MUST REMAIN CLOSED WHEN IN OPERATION**

REMOVAL AND DISPOSAL OF ASHES

You can leave a thin layer of ashes in the firebox if preferred. Allow fire to die down or go out completely. It is important to prevent ashes from building up around the front door opening or they will spill out, or they can pack into the gasket channel and prevent proper sealing. To remove ashes, use a fireplace shovel. Avoid removing large live coals by pushing them to the side and removing only the finer ash with a shovel.

Disposal of ashes - Ashes should be placed 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 outside, well away from all combustible materials, liquid fuels, or vehicles. Retain ashes in the closed container until all coals thoroughly cool.

If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

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

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

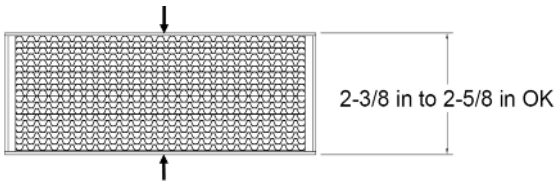


Figure 21 - Acceptable Catalytic Distortion

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 metal baffle protector by sliding it to the left or right, and then rotating it towards you.
3. Lift up on the right-side baffle, and gently pull the left side baffle down and out of the stove

CAUTION - Do not force the baffle pieces. Gently adjust the baffle orientation until each side can be removed freely from the stove.

4. Use a small vacuum nozzle or soft bristled brush to remove any accumulated ash or soot on the face of the catalyst.
5. Inspect the catalyst for any unusual warping, corrosion, or plugged openings.
4. Use a small vacuum nozzle or soft bristled brush to remove any accumulated ash or soot on the face of the catalysts.
5. 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 baffles and baffle protector. Installation is the opposite of removal.
8. Ensure that the baffle pieces are pushed

Figure 19a – Removing / Replacing the Baffle

Figure 19b – Removing / Replacing 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. Loosen, but do not remove the screws securing the rear heatshield. (If stove is so equipped).
3. Remove the heat shield by sliding the screw heads through the slots in the heatshield.
4. Remove the 2 bolts securing the cast iron catalyst access 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. Newer generations of stoves may not use a catalyst gasket.
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. Some warping or bowing of the catalysts over time is acceptable, as long as the catalyst gasket continues to seal. Measure the catalysts in the middle section – if the dimensions are outside the range shown in Figure 21, replace the catalysts.
10. Depending on the generation of your stove, re-gasketing the catalyst may not be necessary. If there was gasket material on the catalyst when you removed them, they will need to be re-gasketed during the installation. Beginning at one corner, re-install fiberglass gasket material on the catalysts.

Figure 20 – Catalyst Access

11. 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.

12. Once the gasket is installed on the catalysts, gently push the catalysts into the catalyst opening until the catalysts hit against the back wall of the cavity. Take care to ensure the gasket is not damaged and position the two cartridges so that the single layer gasket edges touch one another in the center. Replace the catalyst access door.

13. Replace catalyst access door.
14. Heat the stove slowly during your next fire to allow the gasket to fully expand and seal the catalysts.

GLASS REPLACEMENT PROCEDURES

Figure 23: Front Door assembly

- **WARNING: DO NOT OPERATE THIS APPLIANCE WITH THE GLASS PANEL REMOVED, CRACKED, OR BROKEN. DO NOT SUBJECT THE DOOR TO ABUSE, SUCH AS STRIKING OR SLAMMING SHUT. ONLY A QUALIFIED SERVICE PERSON SHOULD REPLACE THE GLASS PANEL.**

1. Follow the instructions included with the replacement glass kit.
2. Remove the door.
3. Remove the screws from the glass clips (use penetrating oil if necessary) – Set aside for reinstallation.
4. Carefully lift the damaged glass off the door and discard.
5. Remove any remaining glass and old gasket material.
6. Clean the screw holes and place a small amount of anti-seize compound in each one.
7. Install a new glass gasket in the glass gasket groove.

8. Place the new glass onto the door.
9. **Important! Center the glass** and ensure that the edges of the glass are parallel with the edges of the opening.
10. Check glass position again (centered, and parallel), then screw the glass retainer clips with the glass pads 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.
11. Apply a light film of anti-seize lubricant on the door's hinge pins if needed.
12. Install the door.
13. After 5 or 6 fires, check the glass retainer screws, and retighten if necessary.

Required Glass Kit: Part Number: 93-58925. Use only Ceramic, or Neoceram glass. Contact your Hearthstone dealer.

CREOSOTE FORMATION & REMOVAL

When wood burns slowly at low temperatures, it may produce 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 that 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.

GASKETS

Replace door gasket material every two to three seasons, or whenever it becomes deteriorated or loose, 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 replacement gaskets when you need to replace your door gasket. Contact your dealer for a gasket kit that includes instructions, and the gasket for your stove.

GLASS

The glass used in our stoves is actually not plain glass, but a tough, clear ceramic material capable of operating at temperatures up to 2300° F. 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. For the inside surface of the glass, we recommend using a damp paper towel dipped in gray ash. Rub the inside of the glass with a circular motion. When all the deposits are removed, clean up with window cleaner or with commercial stove glass cleaners, which are available from your local dealer. Use this type of cleaner for the outside surface as well. 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. 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, thermal 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 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: PN: 93-xxx.

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 dependent 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 in the room 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 cook stove 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, and ensure the bypass is open before opening door.
	Cold Chimney or reverse draft	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. Check clean-out doors.
	Bypass not closed	Ensure that the bypass door is closed when the catalysts are in the active range.
	Catalysts not functioning	Inspect catalysts for damage, ash build-up, or plugging. Brush catalysts with a soft-bristled brush, or vacuum lightly. Replace if required. Follow instructions to ensure catalyst light-off.
	Not burning proper fuel	Ensure cordwood is seasoned and dry.
	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. Ensure the bypass door is open before opening the door
	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.
UNCONTROLL-ED OR SHORT BURN	Unsealed or Open Door	Close the door tightly or replace the gaskets. Air leakage around glass gasket – replace gasket
	Excessive Draft	Check the installation. Operate at LOW BURN. Install stovepipe damper. Draft in excess of 0.1 wc should be corrected with a stovepipe damper(s)
	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.
INSUFFICIENT HEAT	Poor Quality, low Btu content, or Green Wood	Use only air-dried wood, preferably dried at least one year. Use a wood with a high Btu content if available.
	Low Burn Rate	Operate the stove at a higher burn rate.
	Cold Exterior Chimney	Reline or insulate the chimney.
	Leaky Stovepipe or Chimney	Check the installation. Replace with a pre-fabricated insulated chimney system or a properly sized masonry chimney.
	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.

CATALYST TROUBLESHOOTING GUIDE

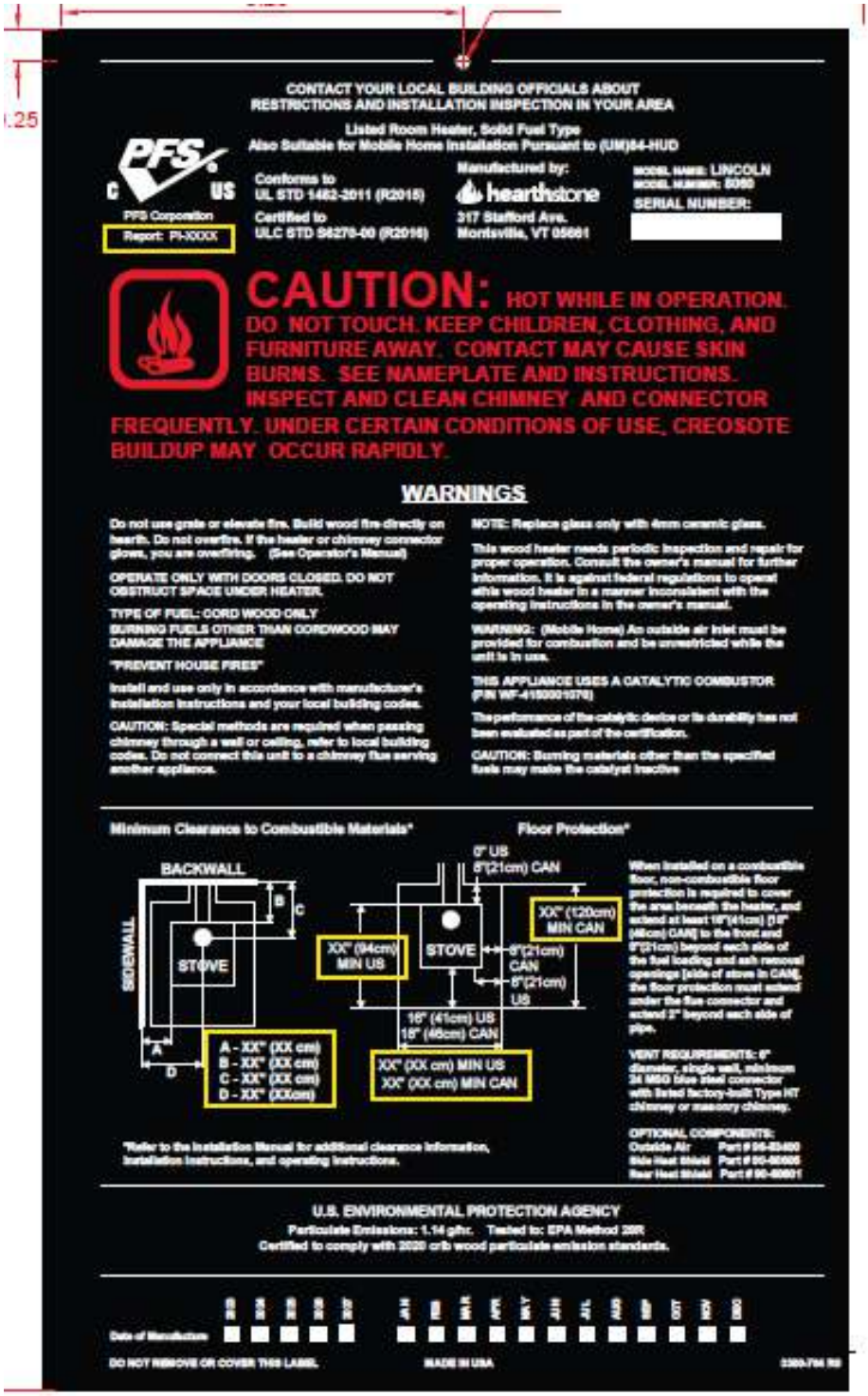
PROBLEM	POSSIBLE CAUSE	SOLUTIONS
FLY ASH BUILD UP ON CATALYSTS	Catalysts have not maintained light-off temperature	Brush cold combustor with soft-bristled brush or vacuum lightly. Follow instructions in the manual for a proper catalyst light-off
	Burning materials that cause a lot of char and fly-ash	Don't burn cardboard, gift wrap paper, or garbage. Burn only dry, seasoned wood, per the owner's manual.
	Bypass closed too soon	Follow instructions in the manual for a proper catalyst light-off
CATALYSTS PLUGGING OR MASKING (SOOT/CRESO-TE)	Burning wet, pitchy woods, or burning large loads of small diameter wood with the combustor in the operating position without catalyst light off occurring	Burn dry seasoned wood. Follow instructions in the manual for a proper catalyst light-off, and ensure catalyst light-off as occurred before closing bypass damper. It may be possible to burn the soot or creosote off by building a hot fire, and allowing the stove to run until the catalysts are well within the operating range before closing the bypass. Continue to run the stove at a high temperature for one hour, while ensuring the catalysts stay in the upper operating range, but not too hot.
WARPING OR BOWING OF THE CATALYSTS	Excessive catalyst temperatures for long periods of time.	Ensure that the catalysts remain in the operating zone, and does not get to hot. Reduce air control settings for a lower burn rate to ensure catalyst temperatures do not exceed the operating range.

REPLACEMENT PARTS & OPTIONAL ACCESSORIES

PART #	DESCRIPTION
	REPLACEMENT PARTS
	BOTTOM HEAT SHIELD
	DOOR HINGE
	BAFFLE GUARD
	DOOR CATCH
	DOOR LATCH
	CATALYST THERMOMETER
	REPLACEMENT KITS AND ACCESSORIES
96-53400	OUTSIDE AIR KIT
	GASKET KIT
	GLASS KIT
	HANDLE KIT
	FRONT DOOR LATCH KIT
	CATALYST REPLACEMENT KIT
	BAFFLE KIT
90-68601	Rear Heatshield
90-68605	Side Heatshield (Single)

Refer to the Illustrated Parts list for further detail about stove components, available online at www.hearthstonestoves.com.

SAFETY LABEL



LIMITED WARRANTY

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.

Catalytic combustor LIMITED LIFETIME WARRANTY: The catalytic combustors are covered directly by the combustor manufacturer, Applied Ceramics. Included with your stove you will find the LIMITED LIFETIME WARRANTY for the catalysts, as well as a warranty card.

Catalyst Model Number: ACI-6M2 Catalyst Manufacturer: APPLIED CERAMICS

APPLIED CERAMICS warrants to the consumer who purchases a FIRECAT STEEL COMBUSTOR as a component in an EPA certified solid fuel appliance, to replace at no charge to the consumer the FIRECAT STEEL COMBUSTOR that ceases to function with two (2) years from the date of purchase by the original consumer, provided that the following conditions are met:

(1) A copy of the original bill of sale that includes place and date of purchase must be submitted with the warranty claim.
(2) The original FIRECAT STEEL COMBUSTOR must be returned to APPLIED CERAMICS
(3) The FIRECAT STEEL COMBUSTOR must not have been mechanically abused, nor must the wrong fuels have been used in the appliance.

If after two years the FIRECAT STEEL COMBUSTOR fails to function, the prorated warranty will allow replacement at the following special price schedule:

Year 3	$130.00
Year 4	$140.00
Year 5	$150.00
Year 6	$160.00
Year 7	and after at current retail price

Conditions 1, 2, and 3 also apply to the Prorated portion of the warranty. Any EPA certified solid fuel appliance will receive one replacement catalyst for each defective catalyst returned during the three year period. The consumer will be responsible for any removal, any servicing, and return of any items required for filing the warranty claim. This warranty is APPLIED CERAMIC'S exclusive warranty, and APPLIED CERAMICS, disclaims any other express or implied warranty for the FIRECAT STEEL COMBUSTOR, including any warranty or merchantability fitness for a particular use.

Ensure the catalyst is well wrapped and padded for shipment in bubble wrap, or similar material. Ship the catalyst with padding inside of a cardboard box.

All warranty claims must include $12.50 for postage and handling within the continental U.S. Alaska and Canada claims must include $35.00.

Please allow 2-3 weeks for delivery. Order online @ www.firecatcombustors.com

Please read and understand the full warranty. Please return the completed warranty card promptly to Applied Ceramics. The warranty card, and any warranty claims can be shipped to:
Applied Ceramics
55555 Pleasantdale Road
Doraville, GA, 30340

Stove components Limited Warranty

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

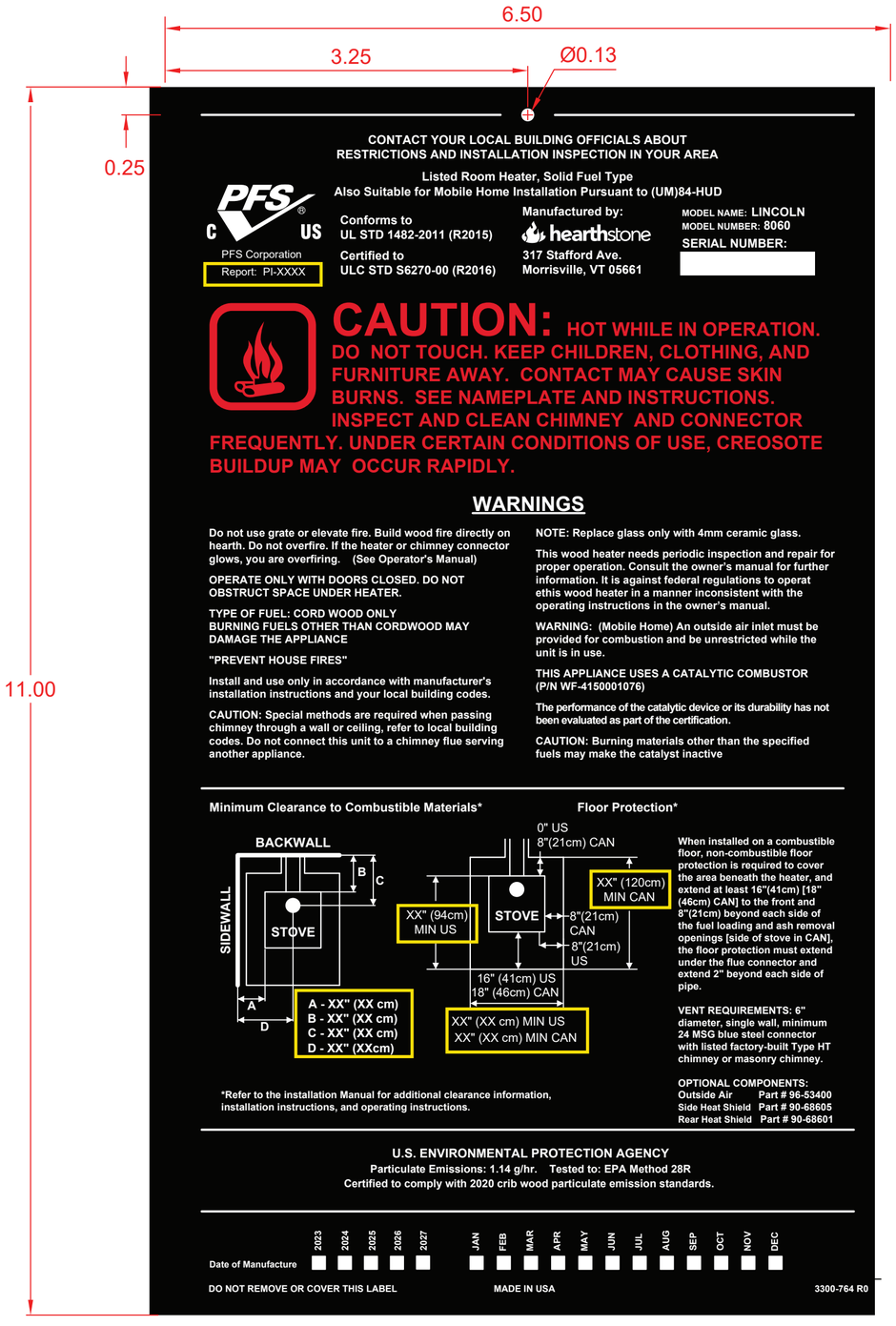
The remedy for any breach of the foregoing warranties will consist of repair or replacement, at Hearthstone's option, of any covered defect in the appliance. When the Original Purchaser contacts a Hearthstone Dealer, the Dealer on behalf of Hearthstone, as the case may be, will instruct the Original 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

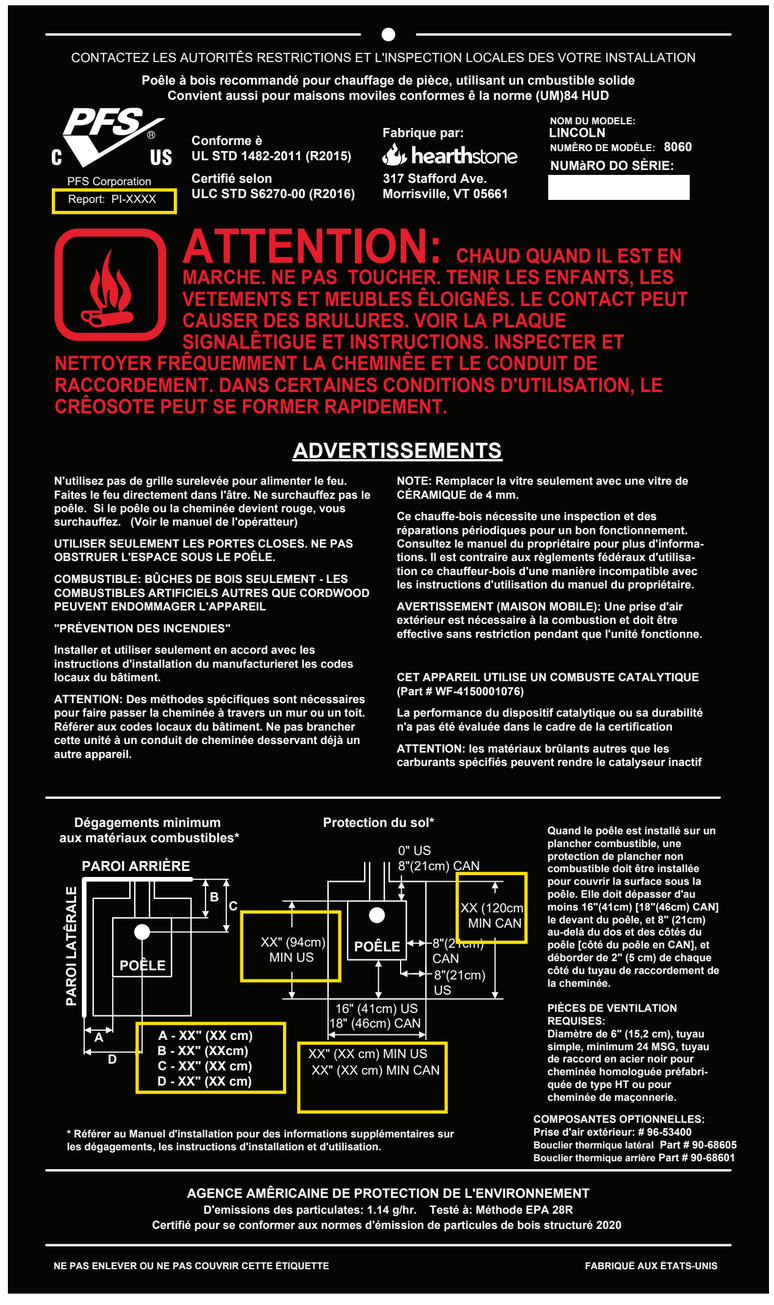
The Original Purchaser can complete their warranty registration on our website at www.hearthstonestoves.com, or send a completed and signed Warranty Registration Form, which is enclosed in the appliance document packet, to the following address:

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.



FRONT / ENGLISH



BACK / FRENCH

NOTES:
1. MATERIAL: .020 ALUMINUM
2. PRINTING: BLACK LABEL WITH SILVER/RED LETTERS

REVISIONS				
ECO	REV.	DESCRIPTION	DATE	APPROVED
	0	INITIAL RELEASE FOR NEW CERTIFICATION	8/17/22	SPB

VIEWS ARE THIRD ANGLE

This document submitted by HearthStone is the property of HearthStone and may contain information of a proprietary nature and shall not be copied or duplicated in whole or in part or used in whole or in part for any purpose other than that which is necessary for the preparation of bids or fabrication. Please return to HearthStone.

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
MATERIAL: SEE NOTES
FINISH: SEE NOTES

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN SPB	8/17/2022
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG.	

hearthstone

LABEL: SAFETY

LINCOLN 8060

SIZE B | HEARTHSTONE DWG. NO. 3300-764 | REV. 0

SCALE: 1:1 | HERGOM DWG. NO. | SHEET 1 OF 2

APPENDIX 8: Photographs of test set up

Dilution picture Dia 8 no. EG-029

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=32 inches minimum) velocity ports and 18 inches above downstream Tee. (Requirement 2D=16 inches minimum)

Adjustable damper for flow adjustments

Extraction blower



Total length between hood and sampling port: 23 feet.

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Two 8 inches elbow with horizontal mixing section.

60 inches horizontal run between two elbows. Mixing section, No mixing baffle. 8 inches diameter pipe

Hood diameter 32 (requirement 4D=32 inches minimum) inches and height of 24 inches (requirement 3D=24 inches minimum)

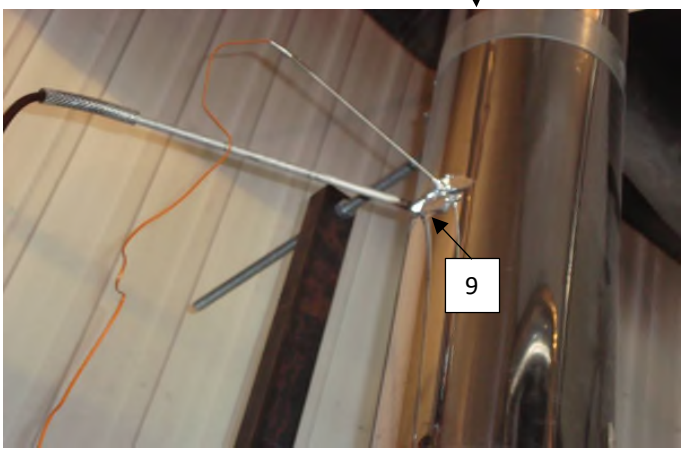
All pipe joints are sealed.

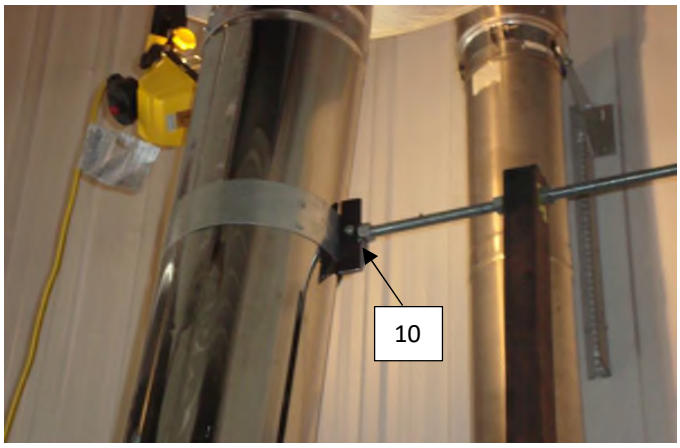
Stack sampling



Gas analysis and temperature probe

chimney support

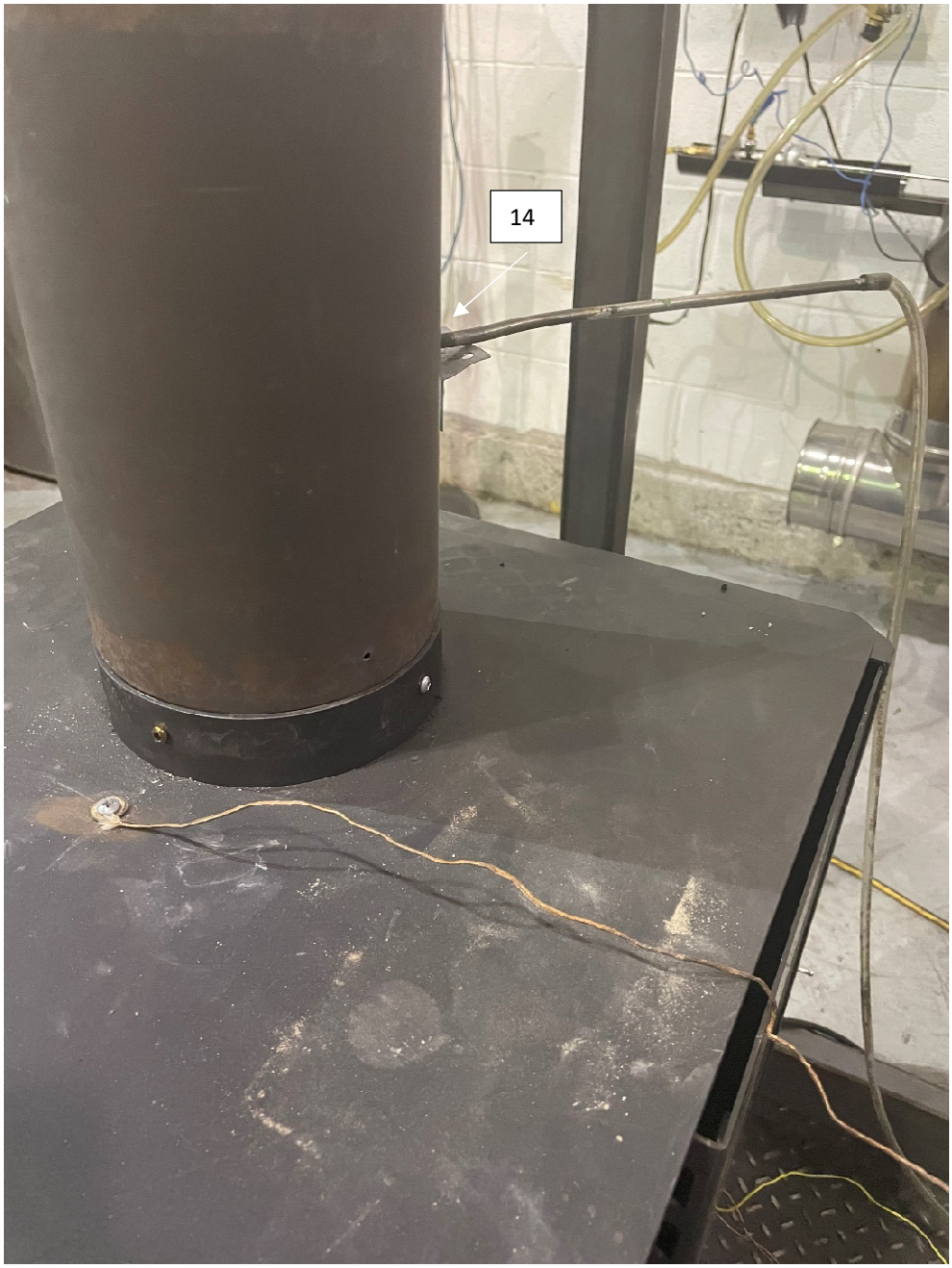




9 : Temperature and gas analyser sampling ports located 9 feet above platform

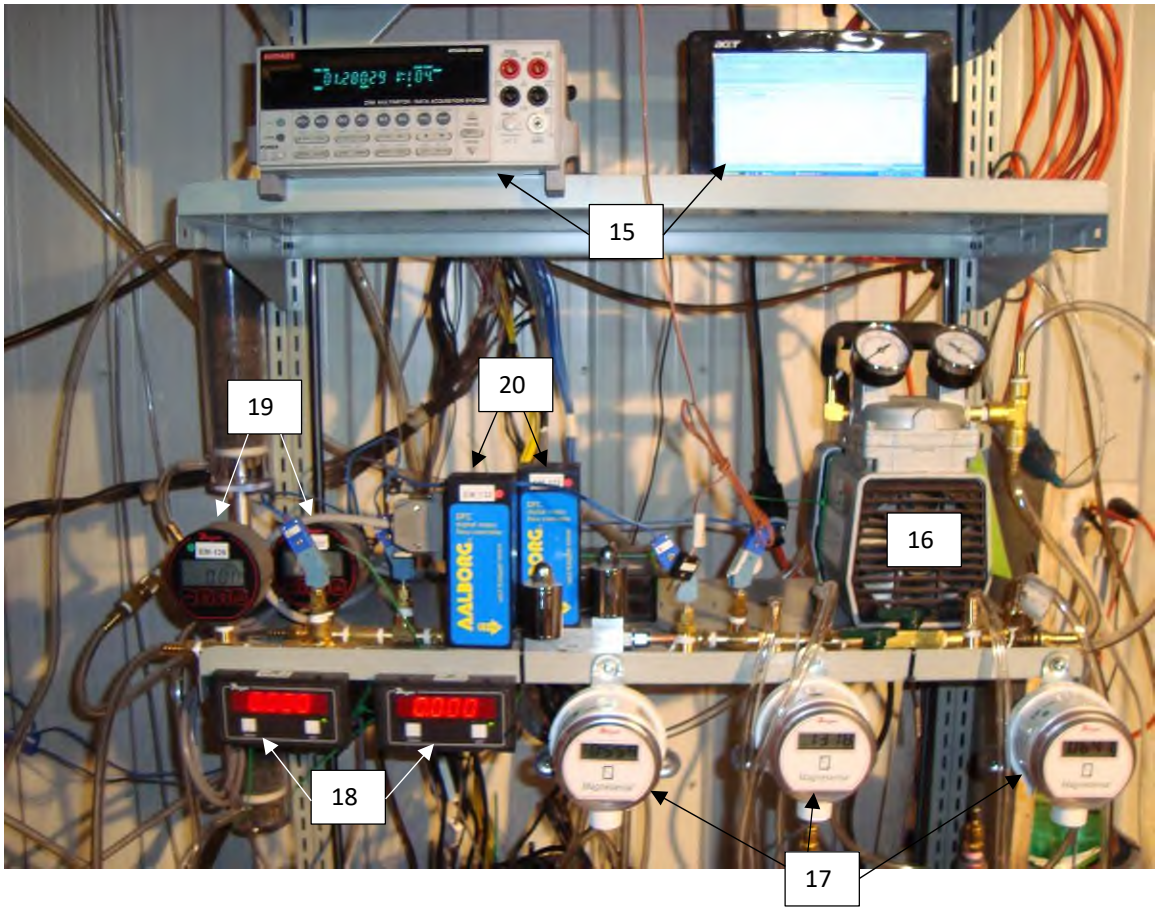
10 : Exhaust system support bracket

Draft sampling



14 : Draft sampling port located 6 in. from the flue outlet

Equipment's



15 : Acquisition system

16 : Vacuum pump

17 : Digital manometer

18 : Digital read out for mass flow meter

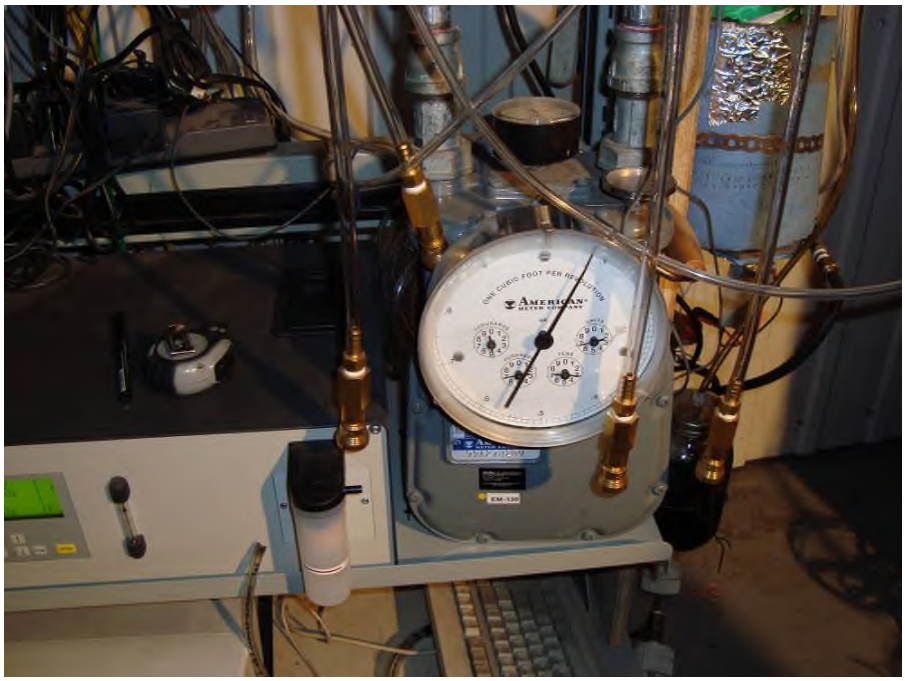
19 : Digital vacuum gage

20 : Mass flow meter

Gaz analyser



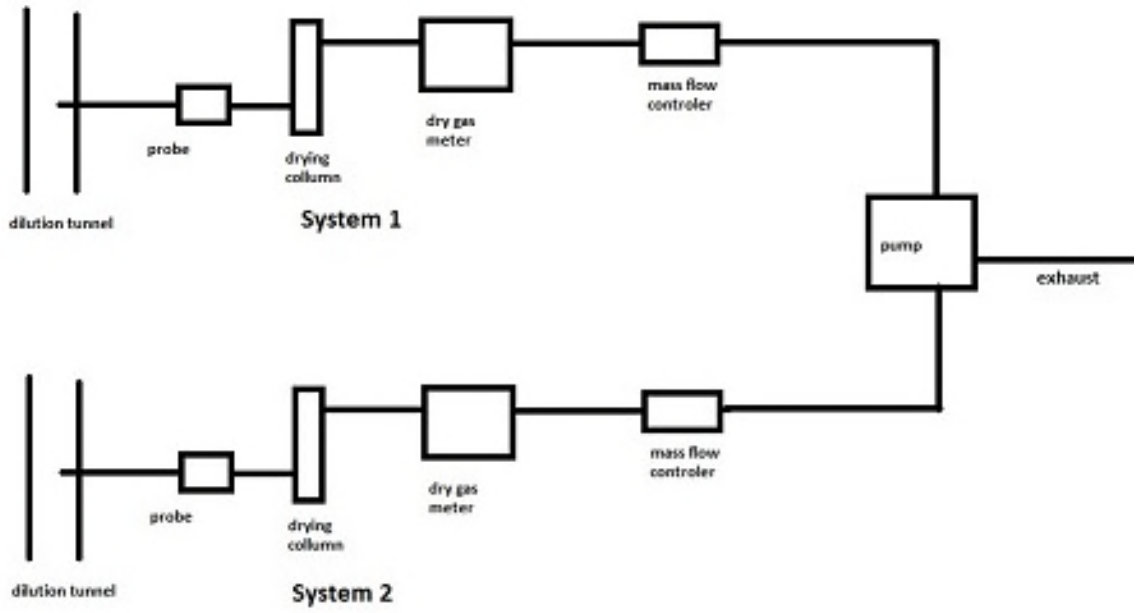
Reference dry gas meter



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



Dilution tunnel sample system



Dilution tunnel

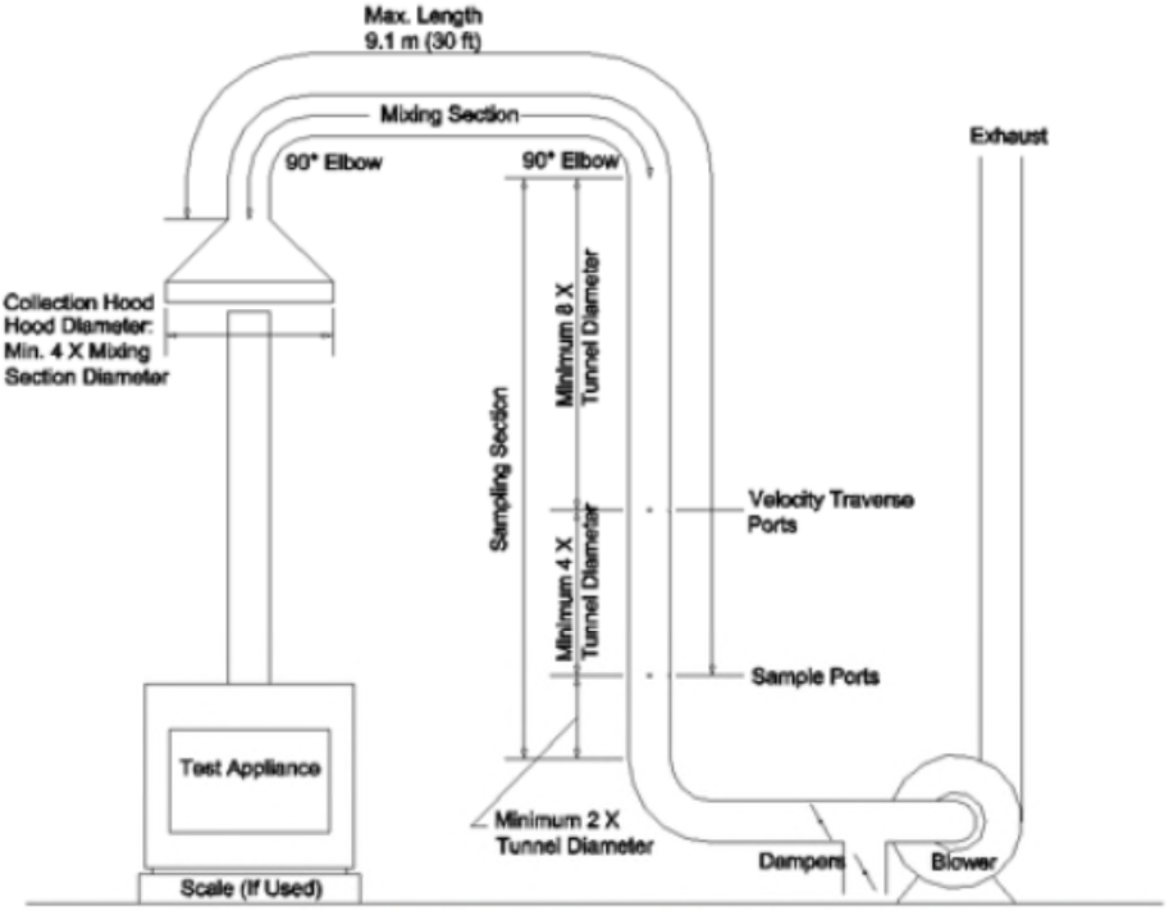


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

APPENDIX 9: Test load photographs

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Run 1 June 27th 2022

Kindling 	Front view 
Coal bed for Load 	Load in the stove 

POLYTESTS
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Run 2 June 28th 2022

Kindling 	Pre-burn load 
Coal bed for Load 	Load in the stove 

POLYTESTS
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Run 3 June 29th 2022

Kindling



Pre-burn load



Coal bed for Load



Load in the stove



POLYTESTS
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Run 4 June 30th 2022

Kindling



Pre-burn load



Coal bed for Load



Load in the stove



POLYTESTS
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Run 5 July 25th 2022

Front view 	Preburn load 
Coal bed for Load 	Load in the stove 

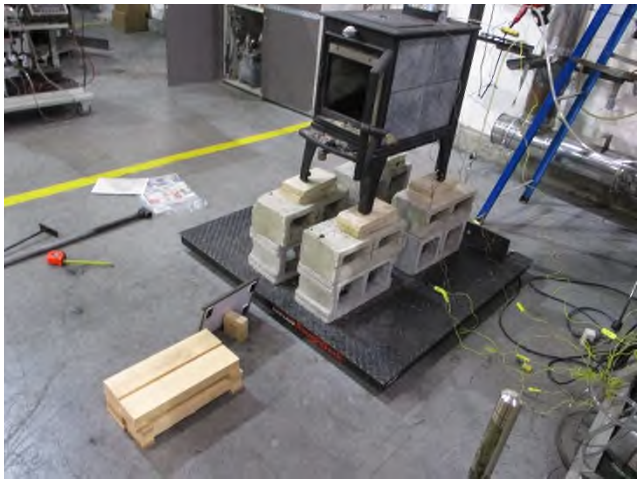
POLYTESTS
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Run 6 July 26th 2022

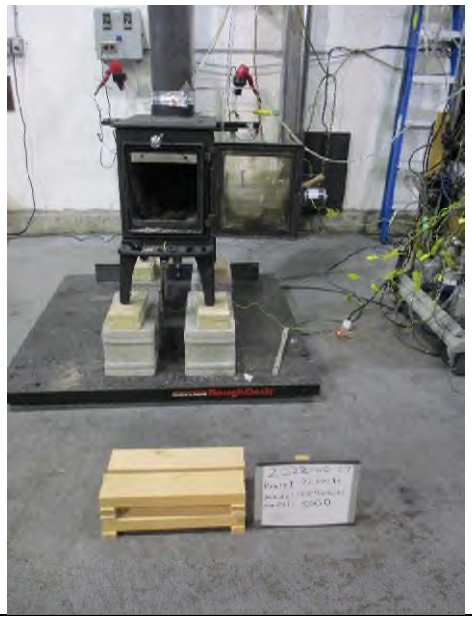
Kindling 	Preburn load 
Coal bed for Load 	Load in the stove 

POLYTESTS
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Side view



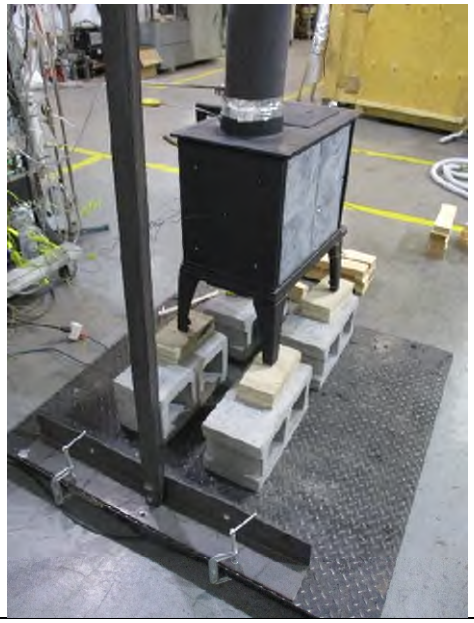
Front view



Side view



Back view



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, ALT-134, ASTME2779

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
9. ALT-134
10. ASTME2779

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) Fifty (50) hours at medium burn rate with Douglas Fir scrap or cordwood. Between 18% and 25% MC.

During these break-in runs the unit may be connected to a lab chimney and fuel additions noted into the corresponding data acquisition file. For catalytic units, a thermocouple must be installed in the catalyst.

Record catalyst temperature at 1-hour intervals or on chart recorder. Operating should continue until data shows at least fifty (50) hours of operation with catalyst temperature in excess of 500 degrees Fahrenheit (active range).

For non-catalytic units a stack thermocouple should be installed and stack temperature recorded at 1-hour intervals. 50 hours minimum burn time with a stack temperature of at least 250 degrees Fahrenheit is required.

Once break-in is completed, allow unit to cool. Clean unit thoroughly.

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 traceable calibration gas bottles. Adjust flow meter, if necessary, at each instrument to required flow value.

   a) Using span gas, adjust span control to values specified on calibration gas label.
   b) Using nitrogene, adjust zero controls to provide a 0.00 analyzer readout.
   c) Repeat a) and b) until no further adjustment is required.
   d) Check readout vs. calibration gases (2) labels.

   The 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 48 hours prior to use.
b) Filters should be numbered and filter and probe combinations labeled prior to use.
c) Weigh desiccated filters and probe-filter units on analytical balance. Record weights data form no. EPA-10-TP. Note that probe and front half of front filter are to be weighed as a unit.
d) Carefully assemble filter holder units and connect to sampling systems. Check "DRIERITE" columns for adequate dry absorbent (blue).

2. Leak checking.

a) Each sample system is to be checked for leakage prior to inserting probes in tunnel.
b) Plug probes and start samplers, adjust pump bypass valve to produce a vacuum reading of 10 inches Hg. (NOTE: During test, vacuum must not exceed 10 inches unless posttest leak check shows acceptable results.)
c) Allow vacuum indication to stabilize for two (2) minutes, then record time and dry gas (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 manufacturers.
7. Following addition of pretest fuel load (splitted pieces), start computer for data logging.
8. All fuel additions, air intake settings and operational characteristics shall be noted with associated time stamp on form no. EPA-1-TP.

C. TEST RUN

1. Once the targeted test fuel bed weight is obtained, the test is to be started as follows:

   a) Insert the sample probes into the tunnel being careful not to hit sides of tunnel with probe tip.
   b) Check tunnel pitot tube for proper position. (Pitot should be carefully cleaned prior to each test.)
   c) Turn on probe sample systems and stack sampler.
   d) Open stove door, rake coals and load stove as follows: **TO BE DETERMINED**
   e) Close door or follow manufacturer's start-up procedures. (Five (5) minutes maximum time before all doors and controls must be set to final positions for duration of test. 15 minutes or 15% of lad burned allowed for ALT-125 method))
   f) An alarm will sound an audible signal at the (10) minutes intervals. This signals a reading interval. You must verify at each interval that the following readings are correctly logged by the data acquisition system and make observations of any unusual or non-routine events that could occur.

      1) Rotometer readings.
      2) Tunnel pitot tube reading.

(Zero regularly between readings)

      3) Gas meter readings.
      4) Temperature readings.
      5) Draft reading
      6) Test 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 48-hour desiccation before weighing.
4. Weigh probe filter holder units and filters at six (6) hour intervals minimum until weight change between weightings is less than 0.2 mg. Record all weights taken on data form no. EPA-10-TP.

B. CALCULATION OF RESULTS

The computer program carries out all final calculations. When run, it will ask for data from forms used during the test. Enter data as called for.

GENERAL

This guide cannot cover every possible contingency, which may develop during a particular test program. Many questions, which may arise, can be answered by a complete understanding of the test standards and their intent. When in doubt on any detail, check with the laboratory manager and be sure you understand the procedures involved.

It is critical that all spaces on the data forms be properly filled in. Each test must be represented by a complete record of what was done and when.

APPENDIX 11: Sample calculations

Validation du fichier de calcul avec les équations provenant des normes:
ASTM E2515-11
ASTME2618

Dry burn rate (BR)

Equation used

B415.1, 13.4

$$BR = \left[\frac{60W_{WD}}{\theta}\right]\left[\frac{100 - \%M_W}{100}\right]$$

Nomenclature

BR	Dry wood burn rate, kg/hr (lb/hr)
W_{WD}	Total mass of wood burned (wet basis) during the test run, kg (lb)
θ	Total time of test run, minutes
$\%M_W$	Average moisture in test fuel charge, wet basis, %
	To convert from dry basis to wet basis: % moisture wet basis =

Sample calculation

Data

W_{WD}	6,964	lbs
θ	159	min
$\%M_W$	17,17	%

Calculation

BR	0,988	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	30,54	dcf
Y	1,005445	
P_{bar}	29,65	in Hg
ΔH	-0,6768	in Hg
T_m	544,1	R

Calculation

$V_{m(std)}$	28,84	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	g
F_2	0,001	g
ΔPF	0,000	g

Calculation

m_n	1,300	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	1,300 mg
$V_{m(std)}$	28,84 dscf

Calculation

C_s	0,000045 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	0,100	mg
$V_{mr(std)}$	24,20	dscf

Calculation

C_r	0,000004	g/dscf

Calculation based of train 2 data

Adjustment factor for alternative pitot tube placement (FP)

Equation used

ASTM 2515, equation 1

$$F_P = \frac{V_{strav}}{V_{scent}}$$

Nomenclature

V_{strav}	Average gas velocity caclulated after the Pitot tube traverse
V_{scent}	Average gas velocity at the center of the dilution tunnel cacluated after the multi-point Pitot traverse
F_P	Adjustment factor for center of tunnel pitot tube placement

Sample calculation

Data

V_{strav}	0,250047615
V_{scent}	0,262678511

Calculation

F_P	0,951915

Average dilution tunnel gas velocity (V_S)

Equation used

ASTM 2515, equation 9

$$V_S = F_p K_P C_P (\sqrt{\Delta P})_{avg} \sqrt{\frac{T_S}{P_S M_S}}$$

Nomenclature

V_S	Average dilution tunnel gas velocity, m/s (ft/s)
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ 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
$(\sqrt{\Delta P})_{avg}$	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	0,952	
$(\sqrt{\Delta P})_{avg}$	0,2751	in $H_20^{1/2}$
P_{bar}	29,65	in Hg
P_g	0,28	in H_20
P_S	29,67	in Hg
M_S	29	lb/lb-mol
t_S	85,81	F
T_S	545,81	R

Calculation

V_S	17,6507	ft/s

Average dilution tunnel gas flow rate (Qstd)

Equation used

ASTM 2515, equation 3

$$Q_{std} = 60(1 - B_{WS})V_S A\left(\frac{T_{std}}{T_S}\right)\left(\frac{P_S}{P_{std}}\right)$$

Nomenclature

Q_{std}	Total gas flow rate corrected to dry standard conditions, dsm^3/min (dscf/min)
60	Conversion factor minutes per hour
B_{WS}	Water vapour in the dilution tunnel stream, proportion by volume (may be assumed to be 2%)
V_S	Average dilution tunnel gas velocity, m/s (ft/s)
A	Cross-sectional area of dilution tunnel, m^2 (ft^2)
T_{std}	Standard absolute temperature, 293 °K (528°R)
T_S	Absolute average dilution tunnel temperature, °K (°R), or 273 + t_s for metric units, 460 + t_s for English units
t_S	Dilution tunnel temperature, °C (°F)
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or P_{bar} + P_g
P_{bar}	Barometric pressure at measurement site, mm Hg (in. Hg)
P_g	Dilution tunnel static pressure, mm Hg (in. Hg)
P_{std}	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

Sample calculation

Data

B_{WS}	0,02	
V_S	17,651	
A	0,349	ft^2
T_{std}	528	R
T_S	545,81	R
P_S	29,668	in Hg
P_{std}	29,92	in Hg

Calculation

Q_{std}	347,52	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	0,000045	g/dscf
C_r	0,000004	g/dscf
Q_{std}	347,52	dscf/min

Calculation

E	0,01	g/min
E	0,85	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	0,000045	g/dscf
C_r	0,000004	g/dscf
Q_{std}	347,52	dscf/min
θ	159	min

Calculation

E	2,26	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	0,952	F_P	0,952
K_P	85,49	K_P	85,49
C_P	0,99	C_P	0,99
Δp_i	0,073 in H_20	Δp_i	0,077 in H_20
T_{Si}	548,5 R	T_{Si}	548,1 R
P_S	29,67 in Hg	P_S	29,67 in Hg
M_S	29 lb/lb-mol	M_S	29 lb/lb-mol

Calculation

i=1		**i=2**	
v_{si}	17,37 ft/sec	v_{si}	17,82 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	159	min	θ	159	min
θ_i	1	min	θ_i	1	min
V_m	29,47	dcf	V_m	28,85	dcf
$V_{mi(std)}$	0,185	cuft	$V_{mi(std)}$	0,1811	cuft
V_S	17,66	ft/sec	V_S	17,66	ft/sec
V_{Si}	17,377	ft/sec	V_{Si}	17,377	ft/sec
T_m	539,7	R	T_m	544,1	R
T_{mi}	538,95	R	T_{mi}	540,09	R
T_S	545,81	R	T_S	545,81	R
T_{Si}	548,5	R	T_{Si}	548,5	R

Calculation

train=1		**train=2**	
PR	102,1 %	PR	102,7 %

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}	0,176	dcf
F_A	0,0116	ft^2

Calculation

FV_{max}	15,19	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	2,21 g
Train 2	2,26 g

Calculation

Dual train precision	1,17 %

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

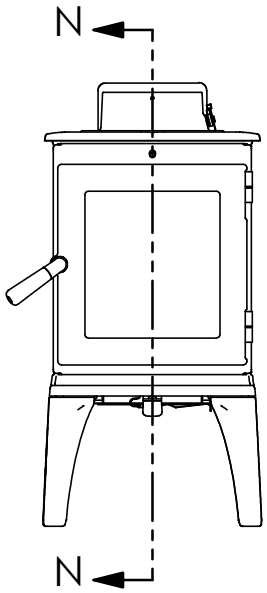
∆R	0,015 %
Span	5 %

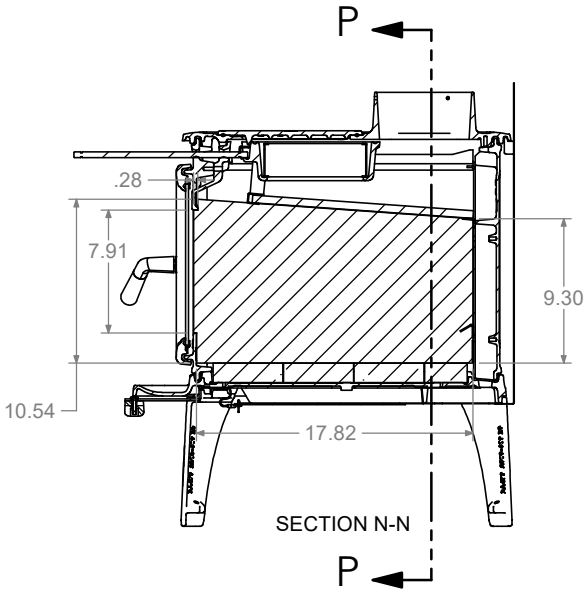
Calculation

Drift	0,30 %

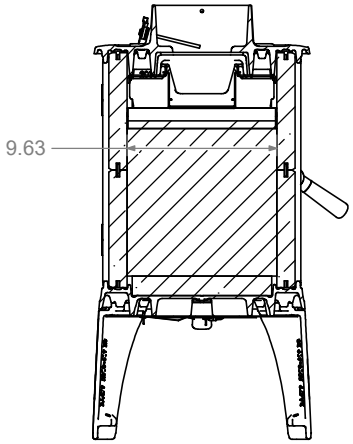
Calculated with CO concentration values.

APPENDIX 12: Volume calculations

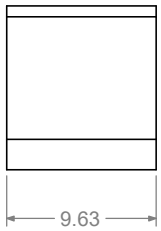


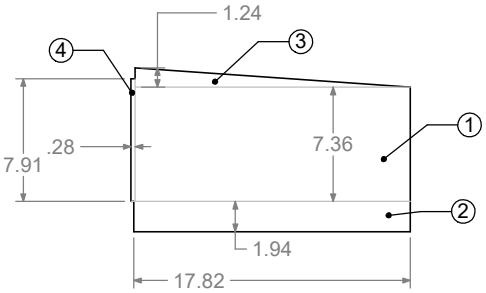


SECTION N-N



SECTION P-P





ZONE	DIMENSIONS	VOLUME (IN3)	VOLUME (FT3)
1	7.36 X 17.82 X 9.63	1263.02	.730
2	1.94 X 17.82 X 9.63	332.92	.193
3	17.82 X 1.24 X 9.63	106.40	.062
4	.28 X 7.91 X 9.63	21.33	.012
		TOTAL	.997

WEIGHT:

REVISIONS				
ECO	REV.	DESCRIPTION	DATE	APPROVED

VIEWS ARE THIRD ANGLE

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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
MATERIAL:
FINISH:

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN	8/30/2022
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG.	

hearthstone

LINCOLN 8060
VOLUME CALCULATION

SIZE B | HEARTHSTONE DWG. NO. | REV.
SCALE: 1:8 | HERGOM DWG. NO. | SHEET 4 OF 4

APPENDIX 13: Operating instruction

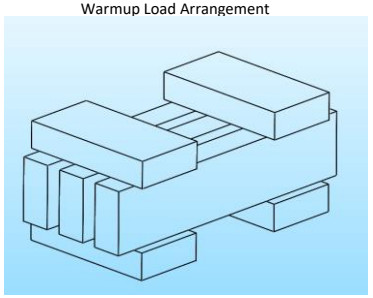
hearthstone

MODEL: 8060
DATE: 6/20/2022
TEST ENGINEER: WE

WOOD STOVE OPERATING INSTRUCTIONS

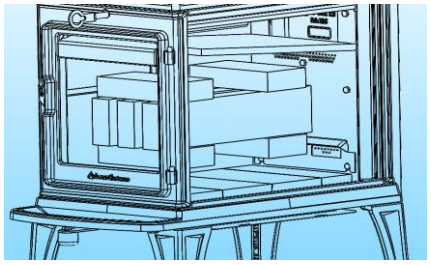
BURN RATE CATEGORY	KINDLING	FIRST WARM UP	SECOND WARM UP AND PREBURN	PREBURN START	AIR SETTINGS	TEST FAN SETTING	COAL BED PREP	TEST LOAD	START OF TEST
LOW .85KGH	2.5-2.8 LBS, BURN TO ABOUT 1.25 LBS	7 AND 14" LG 2X4 @ 7 TO 8 LBS KEEP DOOR OPENED UNTIL ALL WOOD PIECES ARE INVOLED, BURN TO 1.2 LBS	7 AND 14" LG 2X4 @ 7 TO 8 LBS KEEP DOOR OPENED UNTIL ALL WOOD IS FULLY INVOLED, BURN TO UP COAL BED RANGE	1.5 LBS ABOVE COAL BED RANGE (UP RANGE), CLOSE BYPASS, SET PRIMARY AIR TO TEST SETTING	WARMUP SET AIR TO FULL OPEN, AT PREBURN START SET AIR TO LOWEST SETTING	NO FAN	BREAK UP COALS AND LEVEL, MAKE EVEN DENSITY AND HIGHT, FRONT TO BACK AND SIDE TO SIDE 2 MIN BEFORE START OF TEST	4 PCS 2X4 CUT 15" LG +- 1" @6.3 TO 7.7LBS WITH 7 LBS IDEAL. CUT SPACERS TO 4". NO TOP SPACERS.	AT UPPER COAL BED WEIGHT OPEN PRIMARY, INSERT WOOD CLOSE LOADING DOOR, @5 MIN CLOSE BYPASS DOOR AND SET PRIMARY TO LOWEST SETTING
LOW .85KGH	2.5-2.8 LBS, BURN TO ABOUT 1.25 LBS	7 AND 14" LG 2X4 @ 7 TO 8 LBS KEEP DOOR OPENED UNTIL ALL WOOD PIECES ARE INVOLED, BURN TO 1.2 LBS	7 AND 14" LG 2X4 @ 7 TO 8 LBS KEEP DOOR OPENED UNTIL ALL WOOD IS FULLY INVOLED, BURN TO UP COAL BED RANGE	2.9 LBS ABOVE COAL BED RANGE (UP RANGE), CLOSE BYPASS, SET PRIMARY AIR TO TEST SETTING	WARMUP SET AIR TO FULL OPEN, AT PREBURN START SET AIR TO LOWEST SETTING	NO FAN	BREAK UP COALS AND LEVEL, MAKE EVEN DENSITY AND HIGHT, FRONT TO BACK AND SIDE TO SIDE 2 MIN BEFORE START OF TEST	4 PCS 2X4 CUT 15" LG +- 1" @6.3 TO 7.7LBS WITH 7 LBS IDEAL. CUT SPACERS TO 4". NO TOP SPACERS.	AT UPPER COAL BED WEIGHT OPEN PRIMARY, INSERT WOOD CLOSE LOADING DOOR, @5 MIN CLOSE BYPASS DOOR AND SET PRIMARY TO LOWEST SETTING
MED HIGH 1.4KGH	2.5-2.8 LBS, BURN TO ABOUT 1.25 LBS	7 AND 14" LG 2X4 @ 7 TO 8 LBS KEEP DOOR OPENED UNTIL ALL WOOD PIECES ARE INVOLED, BURN TO 1.2 LBS	7 AND 14" LG 2X4 @ 7 TO 8 LBS KEEP DOOR OPENED UNTIL ALL WOOD IS FULLY INVOLED, BURN TO UP COAL BED RANGE	3.5 LBS ABOVE COAL BED RANGE (UP RANGE), CLOSE BYPASS, SET PRIMARY AIR TO TEST SETTING	WARMUP SET AIR TO FULL OPEN, AT PREBURN START SET AIR TO HIGHEST SETTING	NO FAN	BREAK UP COALS AND LEVEL, MAKE EVEN DENSITY AND HIGHT, FRONT TO BACK AND SIDE TO SIDE 2 MIN BEFORE START OF TEST	4 PCS 2X4 CUT 15" LG +- 1" @6.3 TO 7.7LBS WITH 7 LBS IDEAL. CUT SPACERS TO 4". NO TOP SPACERS.	AT MID COAL BED WEIGHT OPEN PRIMARY, INSERT WOOD CLOSE LOADING DOOR, @5 MIN CLOSE BYPASS DOOR AND SET PRIMARY TO HIGHEST SETTING
HIGH 1.4KGH	2.5-2.8 LBS, BURN TO ABOUT 1.25 LBS	7 AND 14" LG 2X4 @ 7 TO 8 LBS KEEP DOOR OPENED UNTIL ALL WOOD PIECES ARE INVOLED, BURN TO 1.2 LBS	7 AND 14" LG 2X4 @ 7 TO 8 LBS KEEP DOOR OPENED UNTIL ALL WOOD IS FULLY INVOLED, START PREBURN	START WHEN SECOND WARMUP LOAD IS ADDED,CLOSE BYPASS, SET PRIMARY AIR TO TEST SETTING	WARMUP SET AIR TO FULL OPEN, AT PREBURN START SET AIR TO HIGHEST SETTING	NO FAN	BREAK UP COALS AND LEVEL, MAKE EVEN DENSITY AND HIGHT, FRONT TO BACK AND SIDE TO SIDE 2 MIN BEFORE START OF TEST	4 PCS 2X4 CUT 15" LG +- 1" @6.3 TO 7.7LBS WITH 7 LBS IDEAL. CUT SPACERS TO 4". NO TOP SPACERS.	AT MID COAL BED WEIGHT OPEN PRIMARY, INSERT WOOD CLOSE LOADING DOOR, @5 MIN CLOSE BYPASS DOOR AND SET PRIMARY TO HIGHEST SETTING

Warmup Load Arrangement

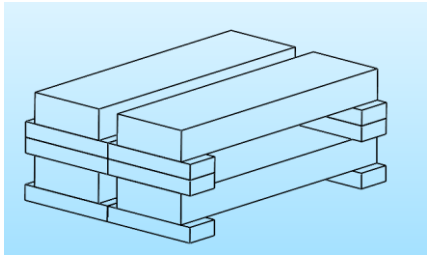


3 TO 4 PCS 14" LONG FRONT TO BACK ON EDGE,SET ON TOP OF 2 PCS 7" LONG LAYING LEFT TO RIGHT WITH 2 PCS 7" ON TOP . PLACE AT CENTER OF FIRE BOX KEEPING 1" AWAY FROM REAR HOOD FOR GOOD AIR CIRCULATION

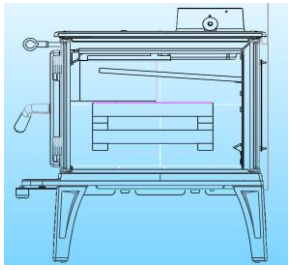
Warmup Load In Stove



Test Load Arrangement

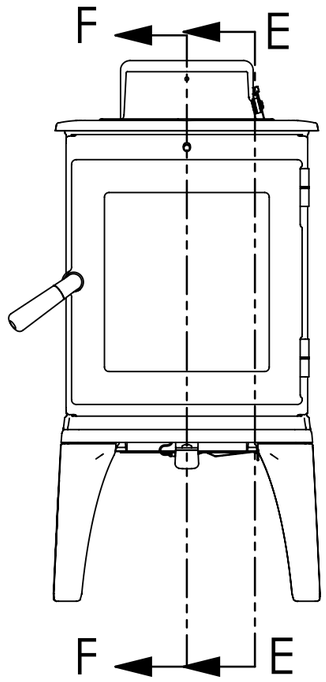


Test Load In Stove

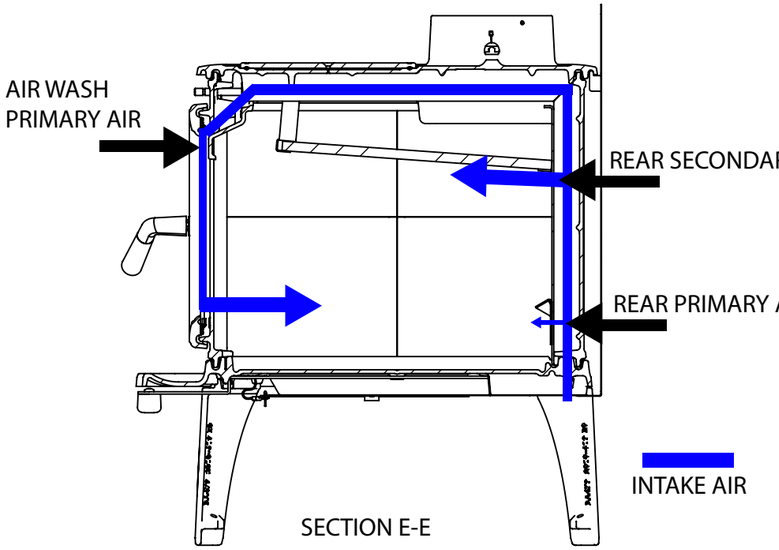


SET WOOD LOAD TO MIDDLE OF FIRE BOX FRONT TO BACK AND LEFT TO RIGHT. KEEP FUEL 1 INCH AWAY FROM REAR HOOD FOR BEST AIR MOVEMENT. DO NOT CRUSH COAL BED

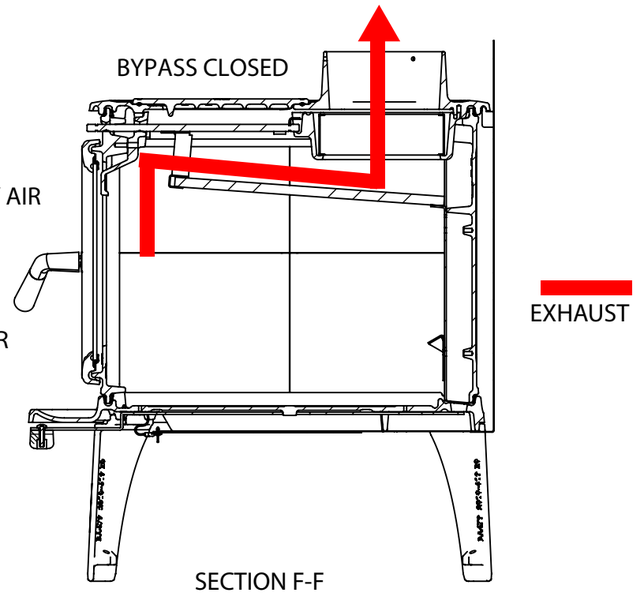
APPENDIX 14: Drawing Air flow pattern



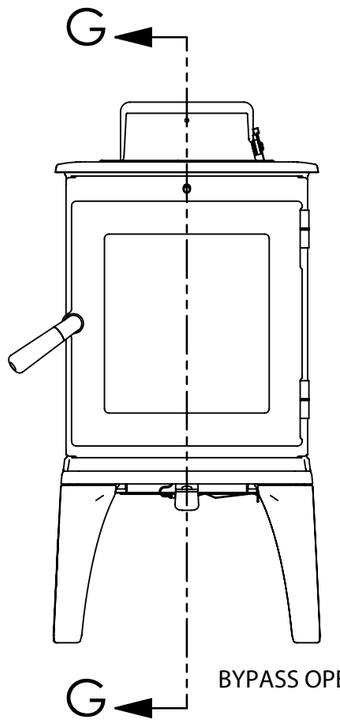
BYPASS CLOSED



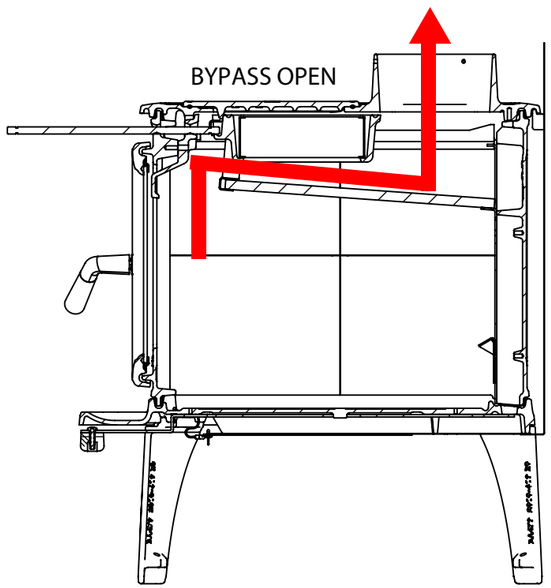
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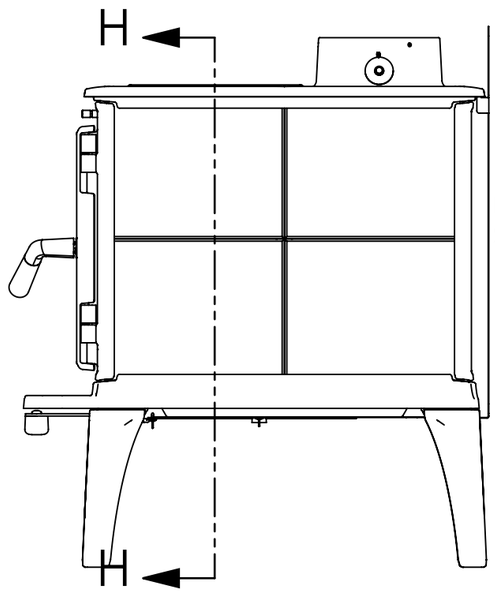
SECTION F-F

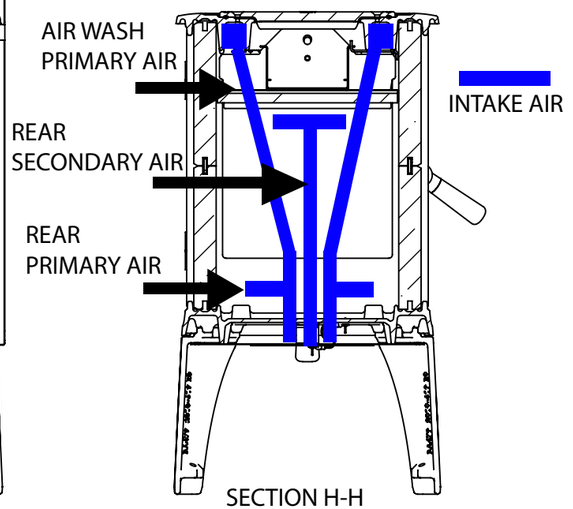


BYPASS OPEN



SECTION G-G





SECTION H-H

VIEWS ARE THIRD ANGLE

This document submitted by HearthStone is the property of HearthStone and may contain information of a proprietary nature and shall not be copied or duplicated in whole or in part or used in whole or in part for any purpose other than that which is necessary for the preparation of bids or fabrication. Please return to HearthStone.

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
MATERIAL:
FINISH:

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN	8/30/2022
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG.	

hearthstone

LINCOLN 8060

AIR FLOW DIAGRAM

SIZE B | HEARTHSTONE DWG. NO. | REV.
SCALE: 1:8 | HERGOM DWG. NO. | SHEET2 OF 2

APPENDIX 15: Notice, CoC, WHA, others

March 28, 2022

Steffan Johnson
Measurement Technology Group Lead
US EPA Office of Air Quality Planning and Standards
Air Quality Assessment Division
U.S. Environmental Protection Agency (EPA)
109 TW Alexander Drive,
RTP, NC 27710

RE: Alternative Test Method Request

Dear Steffan Johnson,

Pursuant to section 60.8 (b) (2) of 40 CFR part 60, Hearthstone Quality Home Heating Products formally requests approval to test our Lincoln Model 8060 to a modified version of 40 CFR Part 60, sub part AAA, appendix A-8, Test Method 28R.

Specifically, Hearthstone Quality Home Heating Products requests to modify only section 9.4.1.10 (2) of ASTM E2780-10 which outlines the dimensions of crib spacers for the crib load. This request is necessitated by the width of the firebox size for the Lincoln 8060, which does not allow for two fuel cribs to be positioned side by side if the spacers are 5" in length. See Figure 1 in the appendix for firebox dimensions.

The modification to 9.4.1.10 (2) would change the spacer width from 5 x 1.5 x .75" to 4 x 1.5 x .75", with no other modifications to crib load specification. See Figure 2 in the appendix for proposed crib dimensions.

Additionally, Hearthstone would like to acknowledge and address another issue that presented during our in-house testing of the Lincoln 8060. The Lincoln 8060 is designed with a 1.0 cubic foot firebox. Due to the firebox dimensions, it has proven difficult to meet the requirements of ASTM E2780-10 Sections 9.4.1.5 and 9.4.1.6 at the same time. As shown in Photos 1 & 2 in the Appendix, which are documenting two different crib loads, in order to reach the 7.0 ± 0.7lbs loading density stated in 9.4.1.5, the load measures much below the exact 5/6 fuel length requirement of section 9.4.1.6. For the 18" deep firebox, the 5/6 load length should be 15", but loads are consistently coming out in the 11"-13" range. Hearthstone will direct the certification testing lab to make every effort to select wood which meets both requirements of 9.4.1.5 & 9.4.1.6, but this may not prove to be possible in reality. Hearthstone requests that consideration be given to the allowance of 9.4.1.6 that the fuel load "shall closely approximate 5/6" of the firebox length, and allow a greater variance, if necessary during testing, to the ±1" interpretation of "closely approximate" recently adopted by the Office of Air Quality Planning and Standards.

Sincerely,

Simon Booth
Engineering Manager
sbooth@hearthstonestoves.com
802.851.4044
Hearthstone Quality Home Heating Products
317 Stafford Ave, Morrisville VT 05661

3/29/2022 Digital Signiture

Appendix

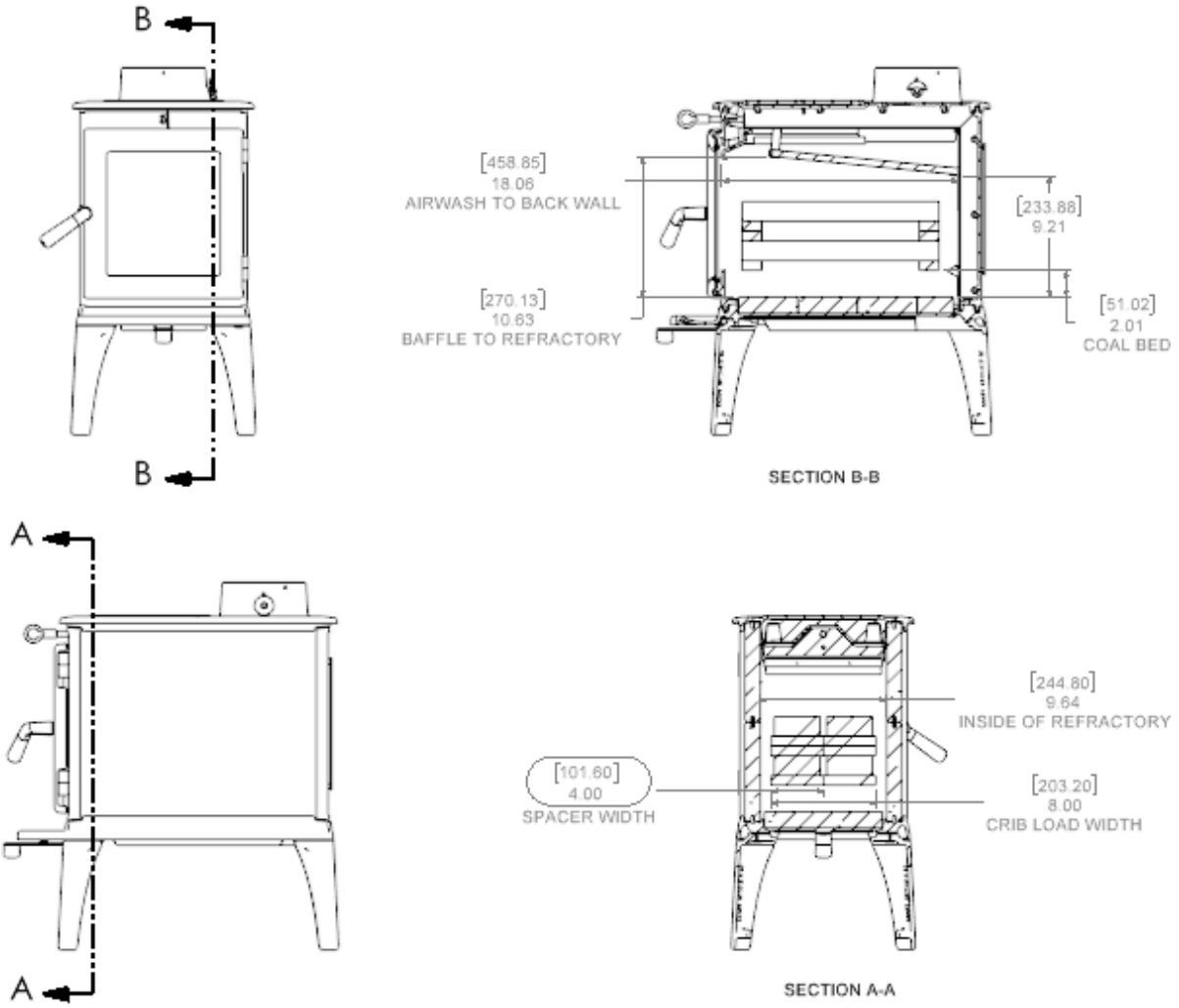


Figure 1: Firebox Dimensions

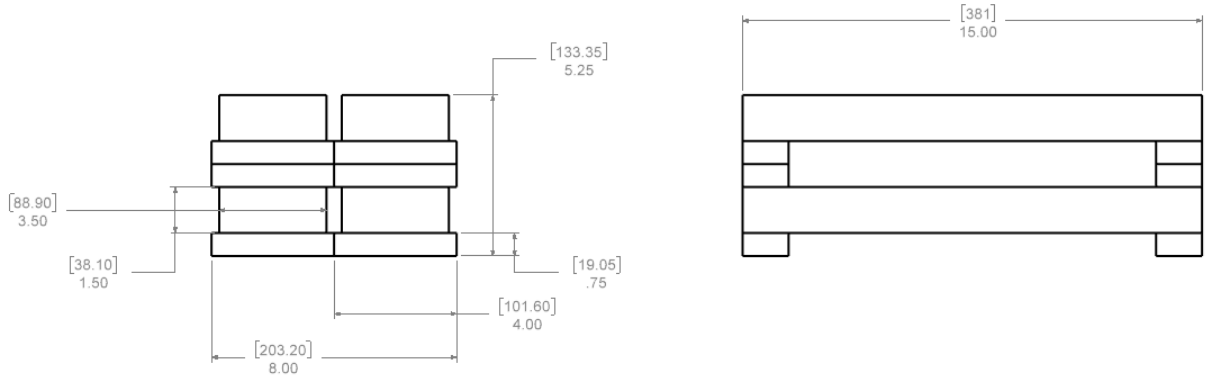


Figure 2: Proposed Crib Dimensions

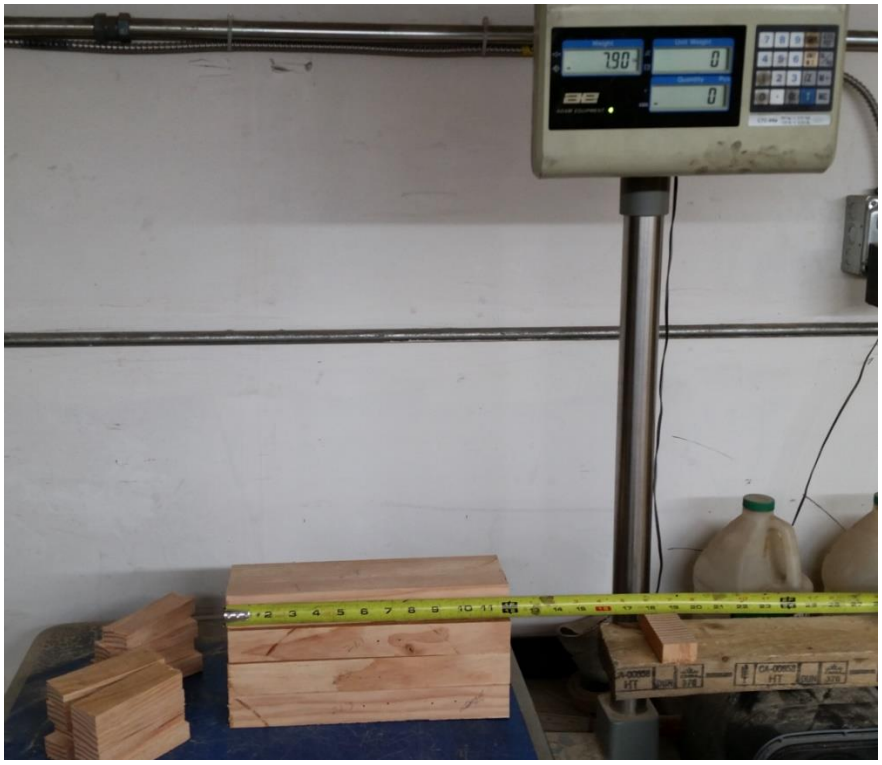


Photo 1: 12” long crib, 7.90lbs weight



Photo 2: 11” long crib, 7.42 lbs weight

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

Disclaimer: The statutory provisions and the EPA regulations described in this document contain legally binding requirements. This document is not a substitute for those provisions or regulations, nor is it a regulation itself. In the event of a discrepancy, please refer to 40 CFR PART 60 Subparts AAA AND QQQQ, Sections 60.533 and 60.5475. This document may be revised periodically without public notice. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at sanchez.rafael@epa.gov.

- **The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to WoodHeaterReports@epa.gov.**
- **This notice must be received by the EPA at least 30 days before the start of testing.**

GENERAL INFORMATION						
Manufacturer's Name: Hearthstone QHHP						
Appliance Type (Circle One):	☒ Adjustable Burn Rate Wood Heater	☐ Pellet Stove	☐ Single Burn Rate Heater	☐ Hydronic Heater	☐ Forced Air Furnace	☐ Other:
Hydronic Heater Type (Circle One):	☐ Traditional	☐ Full Storage	☐ Partial Storage	☐ Indoor/Outdoor	☐ Other:	
Forced-Air Furnace Type (Circle One):	☐ Small (less than 65,000 BTU/hr heat output)		☐ Large (greater than 65,000 BTU/hr heat output)		☐ Other:	
Fuel Type:	☒ Crib	☐ Pellet	☐ Cordwood	☐ Other:		
Model Name and Number: Lincoln 8060						
Catalyst: ☒ **Yes** ☐ **No**						
Mailing Address: 317 Stafford Ave						
Street Address: 317 Stafford Ave						
City: Morrisville	**State:** VT	**ZIP Code:** 05661				
Phone: 802 851 4044	**Fax:** N/A	**Web Site:** www.hearthstonestoves.com				
Address of Manufacturing Facility: 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.						

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
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- **The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to WoodHeaterReports@epa.gov.**
- **This notice must be received by the EPA at least 30 days before the start of testing.**

Phone: 450 741-3636	**E-mail: Dpower@polytests.com**	**Fax: NA**
City: St-jean-sur-richelieu	**State: Canada, Quebec**	**ZIP Code: J3B 7S7**

EPA APPROVED THIRD-PARTY CERTIFIER

Name and Title of Authorized Representative: John Steinert, General Manager, Portland Laboratory

Company: PFS-TECO, Inc.

Phone: 580 650 0088	**E-mail:** john.steinert@pfsteco.com	**Fax:** N/A
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 **MODIFIED ALTERNATIVE TEST METHOD and CATALYST EQUIVALENCY TESTING**

Date(s) of Proposed Test: Primary preconditioning and performance testing scheduled for June 27th through July 1st 2022, Extended catalyst equivalency preconditioning and testing scheduled to take place between July 4th and July 26th, 2022. Services Polytests is closed for business for Canada Day Holidays from 7/8/2022-7/24/2022.

Testing Location:

Polytests Services Inc.
695 B rue Gaudette,
St-Jean-sur-Richelieu
Québec, Canada, J3B 7S7
450.741.3636

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

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- **The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to WoodHeaterReports@epa.gov.**
- **This notice must be received by the EPA at least 30 days before the start of testing.**

Simon Booth, Engineering Lab Manager
Print Name and Title of Authorized Official

Simon Booth
Signature

5/19/2022__Updated 6/14/2022
Date

Remarks:

The Lincoln 8060 is a "Hybrid"-type appliance, incorporating both a secondary combustion system and a catalyst, and should be listed as such.

This testing is to follow an alternative test method approved by Steffan Johnson on 5/17/2022.

This testing is also to certify an alternative catalyst.

v1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Mr. Simon Booth
Engineering Manager
Hearthstone Quality Home Heating Products
317 Stafford Avenue
Morrisville VT, 05661

05/17/2020

Dear Mr. Booth,

I am writing in response to your letter dated March 28, 2022, regarding certification testing of your Lincoln Model 8060 wood heater. You are planning to demonstrate compliance with 40 CFR 60, Subpart AAA - Standards of Performance for New Residential Wood Heaters (Subpart AAA) using EPA Method 28R. You are requesting an alternative certification testing procedure for your Lincoln Model 8060 wood heater because it cannot meet the 5 inch crib wood test fuel spacer length requirements as specified in Section 9.4.1.10 (2) ofASTM E2780-10, "Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters" Section 9.4.1.10 (2), which is referenced by Method 28R. You provided engineering drawings to show that the small firebox width of the Lincoln Model 8620, does not allow two fuel cribs to be placed side by side using the 5" x 1.5" x .75" spacers.

You instead propose to use test fuel spacers with a length of 4 inches (4" x 1.5" x .75") with no other changes to the crib load specifications.

Additionally, you state that the Lincoln Model 8060 is designed with a 1.0 cubic foot firebox volume and during in house testing, it proved to be difficult to meet the requirements of ASTM E2780-10 sections 9.4.1.5 and 9.4.1.6 at the same time. In the appendix of your letter, you provided photos 1 and 2, showing the weights for two different test fuel cribs constructed to meet the 7.0 ± 0.7 lbs/ft^3 loading density stated in section 9.4.1.5. These test fuel load lengths are significantly less than the 5/6^{ths} fuel length requirement describesd in ASTM E2780-10 section 9.4.1.6. You state that for an 18.06 inch firebox depth (the longest dimension of your firebox) 5/6^{ths} of this longest dimension equates to a test fuel crib length of 15 inches, but load lengths are consistently coming out to be in the 11 to 13 inch range.

You state that Heartstone will request that the test lab make every effort to construct a test fuel crib that meets both requirements in ASTM E2780-10 sections 9.4.1.5 and 9.4.1.6, but this may not prove to be possible. Hearthstone requests that consideration be given to the allowance of

section 9.4.1.6 that the fuel load "shall closely approximate 5/6" of the firebox length, and allow a greater variance, if necessary, to meet the ±1 inch interpretation of "closely approximate" recently adopted by the Office of Air Quality Planning and Standards.

With the caveats set forth below, we are approving your alternative method request for certification testing of the Lincoln 8060 wood heater to use crib wood spacer that are 4 inches length. We are also approving your request for potential flexibility in the 5/6 ± 1.0 inch requirement of ASTM E2780-10 section 9.4.1.6: however, Hearthstone and its' test lab must make every effort to meet both the load density requirement of 7.0 ± 0.7 lbs/ft^3 for every test fuel load and the requirement that the test fuel length shall closely approximate 5/6^{ths} of the firebox length (defined as the longest horizontal firebox dimension).

We understand this is a balancing procedure between ASTM E2780-10 sections 9.4.1.5 and 9.4.1.6. and that it is possible only one of these two requirements may be met, depending on the maximum allowed loading density. At no time should Hearthstone choose a test fuel loading density that only meets the minimum load density requirement of 6.7 lbs/ft^3 with test fuel length that is significantly shorter than the 5/6 ± 1.0 inch requirement specifically where a longer test fuel length could be used to achieve the maximum loading density requirement of 7.7 lbs/ft^3 as described in ASTM E2780-10 section 9.4.1.5.

With the documented process laid out below, we will allow fuel lengths for your compliance test to be shorter than 5/6ths, AS NEEDED, in order to prevent going over the maximum fuel load density of 7.7 lb/ft^3. The test lab must document and report that they made a deliberate effort to meet each of these two requirements in ASTM E2780-10 section 9.4.1.5 and 9.4.1.6 and the test fuel crib does not exceed the maximum loading density of 7.7 lbs/ft^3. The lab test must also use a test fuel length that is the longest length possible in the firebox in order to meet the "must closely approximate 5/6^{ths} of the longest dimension" test method requirement.

To achieve this, the test lab must demonstrate their attempt to meet both requirements in section 9.4.1.5 and 9.4.1.6. In order to do this they must build a test fuel load that is 5/6^{ths} of the firebox longest length and calculate the loading density. If this test fuel load is over the loading density maximum allowance of 7.7 lbs/ft^3 requirement, then the assembled crib must be trimmed by cutting off an equal portion of wood from each test fuel piece and recalculating the density. If the test load remains over the maximum allowed loading density continue to cut equal portions off of each test fuel piece until the fuel load falls below maximum loading density requirement of 7.7 lbs/ft^3 in ASTM E2780-10 section 9.4.1.5. The resultant test fuel length may be less than the 5/6^{ths} of the longest length method requirement BUT the test lab has then demonstrated an effort to meet this requirement. The test lab must take detailed notes for each test fuel load weight when crib was first made, piece reduction/amount cut off (1/4", 3/8", 1/2" etc) and the resulting weight. The test lab must document this process and must provide detailed notes of each stage of this process in order to arrive at the final test fuel load. The test report must include these detailed notes and must include the load dimensions and density calculations for each trial crib, including the final test fuel crib dimensions and mass.

As required in Subpart AAA, section 60.534(d), the manufacturer/approved test laboratory must also measure the first hour of particulate matter emissions for each test run using a separate set of filters in one of the two parallel sampling trains. These results must be reported separately and also included in the total particulate matter emissions per run. Also, as required in Subpart AAA, section 60.534(e), the manufacturer/approved test laboratory must measure the efficiency, heat output, and carbon monoxide emissions of the tested wood heater using CSA Method B415.1-10. For particulate matter emission concentrations, ASTM E2515-11 "Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel" must be used; four inch filters are acceptable.

The following caveats to ASTM E2515-11 should be followed for the certification testing:

1. The filter temperature must be maintained between 80 and 90 ^{o}F during testing.
2. Filters must be weighed in pairs to reduce weighing error propagation see ASTM E2515-11 section 10.2.1.

Please remember the following items are required and listed in the third party certifier check list:

1. Dual train comparison (precision) must be calculated in terms of percent difference between the two sample trains and in terms of calculated emissions difference on a g/kg basis.
2. Negative filter weights must be discussed in the test report. Where negative mass (i.e..filter material left on O-rings and gaskets) is subtracted from the overall PM mass, the resultant PM mass must be reported with the mass subtracted and with the mass not subtracted for comparison purposes.

This approval is based on the understanding that the lowest heat output (BTU/hr) setting on the Hearthstone Lincoln Model 8060 room heater available to the user will correspond to the lowest burn rate to be evaluated during certification testing and the test report will reflect that the certification testing was conducted as such. This is consistent with section 60.534(a)(1) of Subpart AAA which states "the burn rate for the low burn rate category must be no greater than the burn rate that an operator can achieve in home use and no greater than is advertised by the manufactuer or retailer. This letter is only to be used for certification of the Hearthstone Lincoln Model 8060 wood heater. A copy of this letter must be included in the certification test report where this alternative test method determination is utilized.

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

Sincerely,

Steffan M. Johnson

Steffan M. Johnson
Group Leader
Measurement Technology Group

cc: Angelina Brashear, EPA/OAQPS/AQAD
Shanon Banner, EPA/OAQPS/SPPD
Rafael Sanchez, EPA/OECA
Robert Scinta, EPA/OECA
Michael Toney, EPA/OAQPS/AQAD
Mark Turner, EPA/OAQPS/SPPD
Chet Wayland, EPA/OAQPS/AQAD

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF
COMPLIANCE

DEC 15 2016

Chris Neufeld
Vice President
Blaze King Industries, Inc.
146 A Street
Walla Walla, Washington 99362

RE: Blaze King Industries, Inc. (Blaze King) Request for Catalyst Suitable Replacement Procedures

Dear Mr. Neufeld:

This letter is in response to the February 3, 2016, Blaze King letter requesting the United States Environmental Protection Agency (EPA) implement a program to allow catalyst equipped wood heater manufacturers and suppliers to seek suitable replacement status during the life cycle of the product. As discussed below, replacement catalysts may be used if equivalency is properly demonstrated.

To have a catalyst deemed suitable for replacement, equivalency testing must be conducted by an EPA-approved test laboratory. Consistent with the 2015 Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces (Subpart AAA) (2015 Standards), the manufacturer must notify the EPA of the date that certification testing (catalyst equivalency testing) is scheduled to begin as stated in Section 60.534(g). This notice must be received by the EPA at least 30 days before the start of testing. EPA will consider the following steps to be adequate to demonstrate replacement catalyst equivalency:

1) The manufacturer uses the same test method as the original certification test was conducted. If the original certification test method is no longer valid, the manufacturer requests an alternative test method prior to testing.

2) The replacement catalyst is aged 50 hours prior to catalytic equivalency testing. The catalyst is tested in the same model or model line unit in which the original catalyst was tested.

3) Both a Category 1 run and Category 4 run are conducted by an EPA-approved test laboratory.

4) The new Category 1 run is compared to the original Category 1 run, and the new Category 4 run is compared to the original Category 4 run. The new runs are not more than 0.5 grams/hour greater than the original certification test results for each run. They are compared separately, with no averaging. In equation form:

Replacement catalyst category 1 ≤ (original catalyst category 1 + 0.5g/hr)

AND

Replacement catalyst category 4 ≤ (original catalyst category 4 + 0.5g/hr)

As noted in Section 60.533(k)(4)[1], the EPA Administrator must approve the change in the catalyst in advance, with proper documentation of the equivalency testing. This documentation consists of the original certification test report category 1 and 4 data and the new category 1 and 4 test data results. All demonstration test data must be sent to WoodHeaterReports@epa.gov within 60 days after the date of completing the test. EPA considers the catalyst equivalency testing to be a form of certification testing governed by the provisions in Section 60.534.

The EPA finds the request outside the scope of an applicability determination. The term "applicability determination" is limited to the Agency's formal decisions, issued in response to a non-hypothetical and site-specific request about the applicability of a specific rule to a specific facility. Therefore, the EPA considers this response to be a regulatory interpretation to a source request for clarification.[2]

This response has been prepared in consultation with the Office of Air Quality, Planning, and Standards, and the Office of General Counsel. If you have any questions, please contact Rafael Sanchez of my staff at 202-564-7028 or email at sanchez.rafael@epa.gov.

Sincerely,

Edward J. Messina

Edward J. Messina, Director
Monitoring, Assistance, and Media Programs Division
Office of Compliance

[1] A change in the make, model or composition of a catalyst is presumed to affect particulate matter and carbon monoxide emissions and efficiency, unless the change has been requested by the heater manufacturer and has been approved in advance by the Administrator, based on test data that demonstrate that the replacement catalyst is equivalent to or better than the original catalyst in terms of particulate matter emission reduction.
[2] This regulatory interpretation updates EPA Applicability Determination WDS-138 (July 6, 1990).

cc: Amanda Aldridge, OAQPS
Adam Baumgart-Getz, OAQPS
Mike Toney, OAQPS
Scott Jordan, OGC
Sara Ayres, OC

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
2015 Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces Application
40 CFR PART 60 SUBPARTS AAA AND QQQQ

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B. Summary Results – Single Burn Rate Wood Burning Heaters ..... **Error! Bookmark not defined.**

C. Summary Results – Pellet Heaters ..... **Error! Bookmark not defined.**

Hydronic Heaters ..... **Error! Bookmark not defined.**

II. Test Method 28WHH for Measurement of Particulate Emissions and Heating Efficiency of Wood-Fired Hydronic Heating Appliances **Error! Bookmark not defined.**

Table 1A. Data Summary Part A ..... **Error! Bookmark not defined.**

..... **Error! Bookmark not defined.**

Table 1B. Data Summary Part B ..... **Error! Bookmark not defined.**

Table 1C: Additional (Hangtag) Information ..... **Error! Bookmark not defined.**

Table 2. Annual Weighting ..... **Error! Bookmark not defined.**

III. Test Method 28WHH for Certification of Cord Wood-Fired Hydronic Heating Appliances With Partial Thermal Storage ..... **Error! Bookmark not defined.**

Table 2A. Data Summary Part A ..... **Error! Bookmark not defined.**

Table 2B. Data Summary Part B ..... **Error! Bookmark not defined.**

Table 3C. Data Summary Part D ..... **Error! Bookmark not defined.**

Forced-Air Furnaces ..... **Error! Bookmark not defined.**

IV. Forced-Air Furnaces ..... **Error! Bookmark not defined.**

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: Hearthstone Quality Home Heating Products

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) Preapproved Alternative test method. See Attached Letter of Approval	**Catalyst: Yes**

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):
Lincoln 8060

Physical Address (Street number and Address, not P.O. Box): 317 Stafford Ave	**Mailing Address: 317 Stafford Ave**

City: Morrisville	**State: VT**	**ZIP Code: 05661**
Phone: 1-802-851-4044	**Email: warm@hearthstonestoves.com**	**Website: https://www.hearthstonestoves.com/**

EPA Submission Date of 30 day Notice: 5/19/2022, updated 6/14/2022

MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION

Name: SIMON BOOTH

Position/Title: ENGINEERING MANAGER

Address: 317 STAFFORD AVE

City: MORRISVILLE	**State: VT**	**ZIP Code: 05661**
Phone: 802-851-4044	**E-mail: SBOOTH@HEARTHSTONESTOVES.COM**	**Website: https://www.hearthstonestoves.com/**

Remarks:

APPLICATION FOR A CERTIFICATE OF COMPLIANCE PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ

2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

EPA-APPROVED TEST LABORATORY		
Name of Test Laboratory: **Polytests Services inc.**		
Name of Person Authorized or Responsible for Conducting Compliance Test: Danick Power		
Position/Title: VP operation		
Address: 695-B Gaudette,		
City: St-Jean-sur-Richelieu	**State: Quebec, Canada**	**ZIP Code: J3B 7S7**
Phone: 450 741-3636	**Email: dpower@polytests.com**	**Website: www.polytests.com**
Remarks:		

EPA-Approved Third Party Certifier		
Name of Certifier Entity: PFS TECO		
Name of Person Authorized or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity: John Steinert		
Position/Title: Laboratory Manager		
Address: 11785 Highway 212. Ste. 305		
City: Clackasmas	**State: OR**	**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.

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.

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.**

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).

A valid certification test report with all required documentation as specified above has been submitted by Polytests.

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.

The warranty is detailed in the Operator's manual, which is provided with Polytest's 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.

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.

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.

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 once the unit is available for sale.

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.

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.

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.

Hearthstone will place a copy of the Non-CBI (or public version) of the certification test report and summary on our website as soon as the unit becomes available for sale.

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.

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.
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: Simon Booth	**Date: 8/17/2022**

Signature of responsible representative of the manufacturer certifying the accuracy of the above statements:



8/17/2022

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
1	0,987	0,84	79,4%	14 545	0,645
2	1,07	1,50	80,5%	15 776	0,304
4	1,40	1,17	78,0%	20 305	0,288
3	1,47	1,14	75,7%	20 507	1,150
Weighted particulate emission average of 4 test runs: 1.14 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 78.5 %.					
Average Co 0.598 gr/min					

Certificate of Conformity

Issued to:	Hearthstone QHHP 317 Stafford Ave. Morrisville, VT 05661 (802) 851-4044
Model:	Lincoln 8060
Effective Date:	September 9, 2022
Report #	PI-20272 (PFS #22-801)

Certification tests were performed by Services Polytests, Inc. located at: 695-B Gaudette- St-jean-sur-Richelieu, QC, J3B 7S7 CANADA.

PFS TECO certifies conformity to the following per 40 CFR Part 60 §60.533 (f) (A):

- The test report is complete and accurate.
- The instrumentation used for the test was properly calibrated.
- The representative model tested meets the applicable emission limits.
- The tests have been conducted per the appropriate guidelines.
- The manufacturer's Quality Control Plan has been reviewed to ensure that all production units are similar in all material respects that would affect emissions to the tested/certified model and that the units in the model line will meet all (other) applicable requirements.

PFS TECO certifies that the emissions levels as measured in the test report are in compliance with the 2020 PM emission limit of ≤ 2.0 g/hr using crib wood per EPA Method 28R, ASTM E2780 & Alternate Certification Test Procedure per EPA letter dated 5/17/20. Efficiency measured per CSA B415.1-22.

The weighted average emissions for the Lincoln 8060 wood heater is **1.1 g/hr** with a weighted average efficiency of **79.0%.** Average CO emissions are **0.60 g/min.**

Issued by: PFS TECO
11785 SE Highway 212
Suite 305
Clackamas, OR 97015

John Steinert, Vice President Hearth Products Division

PFS TECO is accredited by IAS to ISO 17020:2012 "Criteria For Bodies Performing Inspections, ISO 17025: 2005 "Requirements For Testing Laboratories", and by Standards Council of Canada to ISO 17065: 2012 "Requirements For Bodies Operating Product Certification Systems".