



TEST REPORT

TEST OF A HYBRID WOOD STOVE FOR EMISSIONS AND EFFICIENCY

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

Client:

Hearthstone QHHP

317 Stafford ave.

Morrisville, Vt 05661

Model name: Heritage 8024

Attention: Rafaël Sanchez

TESTED BY:

Services Polytests Inc.

695-B Gaudette

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

TEST DATES: September 10th to September 14th 2018

REPORT DATE: September 25th 2018

Project number: PI-20176

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Tested:

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1 INTRODUCTION

1.1 GENERAL

Laboratory

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

Test program

- Purpose: unit qualification NSPS 2020
- Test dates: September 10th to September 14th 2018
- Test methods used:
 - o Particulate emissions: ASTM E2780-10 ; ASTM E2515-11 methods 28R as referred into 40 CFR Part 60 Subpart AAA
 - o Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Hearthstone
- Product type: Hybrid wood stove
- Combustion system: catalytic, with post combustion
- Unit tested: Heritage 8024
- Option: optional convection fan can be installed on the wood stove

1.3 RESULTS

Emission results obtained

- Average emission rate: 0.54 grams/hour
- Average Efficiency: 77.1 %

Conformity: NSPS Phase 2020

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier first week of September 2018. The 50hrs of aging was done by the manufacturer (all data in Appendix 4).

Set up

- Venting system type: 6 inch diameter insulated chimney
- System height from floor: 15 feet
- Particularities: The unit was tested with the convection Fan ON for average numbers (Test #1,2,3 and 5), and one confirmation test is done without any convection fan (test #4).

Break in period

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

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Test Date (Y-MM-DD)	Emission Rate (g/hr)	Burn Rate (kg/hr)	1st hour Emission Rate (g/hr)	CSA B415.1 CO emission Gr/hr	CSA B415.1 CO emission Gr/Kg dry
1	2018-09-10	0,47	0,866	1,463	6,624	8,100
2	2018-09-11	0,24	0,964	0,956	14,906	15,445
3	2018-09-12	0,23	1,428	0,977	5,867	4,121
4	2018-09-13	0,50	1,027	2,086	11,378	10,613
5	2018-09-14	1,76	2,724	2,890	247,195	91,457

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	0,87	0,468	80,1%	12 317	0,11
2	0,96	0,245	79,8%	14 475	0,25
3	1,43	0,227	76,6%	20 482	0,10
5	2,72	1,765	70,6%	35 845	4,12
Weighted particulate emission average of 4 test runs: 0.54 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 77.1 %.					
Average Co 1.14 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	76	83	30,268	30,091	38,8	30,6	0	0
2	79	84	30,002	29,973	48	45,6	0	0
3	77	85	30,121	30,121	62	41,2	0	0
4	77	88	30,150	30,062	56,4	41,8	0	0
5	77	83	30,091	30,062	58,4	54	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	16,70	20,23	3,7	14,61	6,703	21,17	16	3	2	16
2	16,50	20,80	3,7	15,38	7,053	21,30	17	3	2	16
3	17,36	21,35	3,7	15,24	6,993	21,58	17	3	2	16
4	17,59	20,29	3,7	15,36	7,045	21,47	17	3	2	16
5	17,03	20,59	3,7	15,32	7,027	21,46	17	3	2	16

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	379	299,18	546,35	62,015	60,818	1,50	1,60
2	358	307,57	552,36	57,596	56,562	0,70	0,70
3	239	310,24	555,40	37,962	37,080	0,40	0,40
4	335	302,70	554,74	53,474	52,234	1,30	1,40
5	126	307,86	563,75	20,131	19,788	1,90	1,80

2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)		
	Train 1	Train 2	Train 1	Train 2	% Deviation
1	1828,41	1864,41	2,84	3,08	4,12%
2	1911,78	1946,75	1,45	1,47	0,96%
3	1953,16	1999,64	0,89	0,92	1,28%
4	1896,32	1941,34	2,68	2,94	4,65%
5	1926,90	1960,26	3,77	3,64	1,74%

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 ² O)	static pressure tunnel (in. H ² O)	Primary Air Setting	Run Time (min)
1	0,866	345,63	-53,7	0,057	0,180	minimum setting	379
2	0,964	363,20	-71,0	0,063	0,200	3/16 drill bit	358
3	1,428	424,78	-79,5	0,071	0,200	medium, 1/2 drill bit	239
4	1,027	378,56	-34,0	0,062	0,210	drill bit 3/16	335
5	2,724	510,02	-23,6	0,080	0,210	full open	126

3 PROCESS DESCRIPTION

3.1 DISCUSSION

The unit was delivered by the client and received in a good condition. Three Preliminary runs were done at the lab to ensure repeatability of testing done by manufacturer at his location before official test series. Four runs have been done for weighted average with the optional convection fan at "ON" position. One confirmation test was done without the optional convection fan.

3.2 UNIT DIMENSIONS

Baffle

- Location: between top of combustion chamber and hearth
- Restriction: 1.75-inch X 17.5-inch at the front of the unit
- Dimensions: cover the hearth area minus the restriction at the front
- Material: Gemcolite ½ inch thick.

Bricks

- Inside firebox refractory Soapstone 1¼ inch. thick cover all the right side, back and bottom, a second door without glass is located on the left side of the stove.

Flue gas exhaust

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

Gasket

- Glass holder: miniglass
- Glass: 1/4 Round
- Door gasket against facing: fiberglass 3/8 round inch diameter
- Refer to appendix 6 for complete list and location of each gaskets

Overall unit dimension

- Overall dimensions: 27.5-inch-wide x 21.5-inch-deep x 30.25 inch high
- Usable volume: 2.18 cuft

Convection fan

- Convection fan blower:
 - Free air : 150 CFM 110-120V (ref. : PT#90-57000)

Catalyst (appendix 6 for details):

- Applied Ceramics – P/N WF-4150001076
- 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 gasketed on bottom, cemented on top and sides of the combustion chamber. Air intake on bottom of unit at front left corner (if facing door of stove)
- Secondary air: Secondary tube design with air intake at bottom center rear of unit, up through a steel riser tube to manifold and secondary air tubes.

Characterization

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

AIR INTRODUCTION SYSTEM		INLET (1) sq. in.			OUTLET (sq. in.)
Identification	Type	Imin	Imax	Controlled	
APPENDIX 14 SHARED and PA	Primary	Air control Slide 0.195	Air control Slide 2.415	yes	(air wash) 3.366
APPENDIX 14 SHARED and SA	Secondary	(Riser Opening) 0.75	(Riser Opening) 0.75	No	(secondary Tube holes) 1.397
Appendix 14 TA	LPAO	Controlled by the primary	Controlled by the primary	Yes	(Orifice) 0.196

* 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

Run #1

This run was performed on September 10th 2018. It lasted 379 minutes and a 0.866 kg/hr burn rate was obtained & emission at 0.5 gr/hr. The optional convection fan Option was at on position during the entire test. The air inlet was at the minimum setting during the test

Run #2

This run was performed on September 11th 2018. It lasted 358 minutes and a 0.96 kg/hr burn rate was obtained & emission at 0.2 gr/hr. The optional convection fan Option was at on position during the entire test. The air inlet was at the minimum setting during the test, this is the second attempt to burn less than 0.8kg/hr. At the minimum air setting, the stove cannot burn below 0.8kg/hr

Run #3

This run was performed on September 12th 2018. It lasted 239 minutes and a 1.43 kg/hr burn rate was obtained & emission at 0.2 gr/hr. The optional convection fan Option was at on position during the entire test. The air inlet was at the medium setting during the test. Category 3 burn rate been achieved.

Run #4

This run was performed on September 13th 2018. It lasted 335 minutes and a 1.027 kg/hr burn rate was obtained & emission at 0.5 gr/hr. The optional convection fan Option was at OFF position during the entire test. The air inlet was at the medium setting during the test. Category 2 burn rate been achieved.

Run #5

This run was performed on September 14th 2018. It lasted 126 minutes and a 2.72 kg/hr burn rate was obtained & emission at 1.8 gr/hr. The optional convection fan Option was at on position during the entire test. The air inlet was at the maximum setting during the test. Category 4 burn rate been achieved.

- 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 at a point 15 feet from the tunnel entrance. The tunnel has two elbows and two mixing baffles in the system ahead of the sampling section. The sampling section is a continuous 15 foot section of 8 inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard pitot tube located 48 inches from the beginning of the sampling section. Thermocouple is installed on the pitot tube to measure the dry bulb temperature. MC is assumed, as allowed, to be 4%. Tunnel samplers are located 56 inches downstream of the pitot tube and 16 inches upstream from the end of this section.

3.7 DRAWINGS

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix 1.

3.8 EMISSIONS EFFICIENCY TESTING EQUIPMENT LIST

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

4 SAMPLING METHODS

4.1 PARTICULATE SAMPLING

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

5 QUALITY ASSURANCE

5.1 INSTRUMENT CALIBRATION

5.1.1 GAS METERS

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

5.1.2 SCALES

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

5.1.3 GAS ANALYZERS

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

5.2 TEST METHOD PROCEDURES

5.2.1 LEAK CHECK PROCEDURES

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

5.2.2 TUNNEL VELOCITY FLOW MEASUREMENT

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

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

5.2.3 PM SAMPLING PROPORTIONALITY (ASTM E2515)

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

APPENDIX 1: Raw data, forms and results

Paramètres

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

Code verrouillage: HEA

Description du test

Test standard	EPA
Run #	1
Date	10-09-2018
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Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8024 HERITAGE	
Combustion system	Cat	
Appliance type	WOODSTOVE	
Firebox volume	2,18	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,988	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,991	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,996	Dimensionless
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	300	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

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Fuel data

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

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

	Start	End
Barometer (kPa):	102,5	101,9
Barometer (in.Hg):	30,268239	30,09105867
Dry Bulb (F):	74,12	83,12
Humidity (%):	38,8	30,6
Air velocity (ft/min)	0	0

DGM #1	Final:	26899,771	cuft
	Initial:	26834,569	cuft
DGM #2	Final:	25260,096	cuft
	Initial:	25196,619	cuft

DGM room	
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	Final:	761716,660	Liter
	Initial:	759870,350	Liter
	Final:	715286,260	Liter
	Initial:	713488,780	Liter

	Final:	649,510	cuft
	Initial:	519,610	cuft

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

260

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

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FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
13,7	15,3	16,8

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

Load Volume: cu. ft

Loading Density: 6,7 lbs./ft3

Number of Spaces: 16
Spacer weight: lbs

Load Density (wet):	31,1	lbs./ft3
Dry Wood Density:	25,6	lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content					Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %					Weight	Cubic Inches	%
1,5	3,5	16	1,65	21,30	21,00	20,80	20,60	20,90	34,43432	84,00	20,9
1,5	3,5	16	1,50	22,80	22,40	22,60	22,40	22,60	33,93024	84,00	22,6
1,5	3,5	16	1,57	21,30	21,80	21,40	21,60	21,30	33,76656	84,00	21,5
3,5	3,5	16	4,06	21,90	21,00	21,10	21,00	21,10	86,23808	196,00	21,2
3,5	3,5	16	3,94	21,00	20,90	20,80	21,10	21,00	82,49856	196,00	21,0
										0,00	
										0,00	
1,5	0,75	5	0,12			20,90			2,5498	5,63	20,9
1,5	0,75	5	0,13			19,60			2,548	5,63	19,6
1,5	0,75	5	0,12			19,30			2,3932	5,63	19,3
1,5	0,75	5	0,10			19,90			1,99	5,63	19,9
1,5	0,75	5	0,12			20,10			2,4924	5,63	20,1
1,5	0,75	5	0,12			20,40			2,4072	5,63	20,4
1,5	0,75	5	0,11			20,80			2,3712	5,63	20,8
1,5	0,75	5	0,10			20,30			2,03	5,63	20,3
1,5	0,75	5	0,12			20,90			2,4662	5,63	20,9
1,5	0,75	5	0,11			20,80			2,2464	5,63	20,8
										0,00	
1,5	0,75	5	0,11			20,40			2,2032	5,63	20,4
1,5	0,75	5	0,126			19,90			2,5074	5,63	19,9
1,5	0,75	5	0,134			20,10			2,6934	5,63	20,1
										0,00	
1,5	0,75	5	0,122			20,4			2,4888	5,63	20,4
1,5	0,75	5	0,122			20,9			2,5498	5,63	20,9
1,5	0,75	5	0,12			20,6			2,472	5,63	20,6
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	309,27676		20,6 %

Test Load Weight: 14,61 lbs.

Dry Weight: kg.

Average Moisture Content: %

Dry:	21,17	Dry(EPA)	21,17
		Dry(B415)	21,17

21,17
Must be 19-25

Wet:
must be 15,2-22

Coal Bed Range: lbs. to

3,7 lbs.

TEST CHARGE:

Coal bed weight: 3,7

lbs.

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Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,18 in. H₂O
 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=
0,967

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,059	70,93	0,2429
B center	0,058	70,89	0,2408
A1	0,048	70,89	0,2191
A2	0,065	70,95	0,2550
A3	0,051	70,95	0,2258
A4	0,050	70,93	0,2236
B1	0,052	70,890	0,2280
B2	0,062	70,900	0,2490
B3	0,054	70,870	0,2324
B4	0,049	70,870	0,2214
AVERAGE	0,0548	70,9070	0,2338

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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	1	10	11	2	32	12	13	13	43	14	15	19	16		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0691	0,1261	0,1265	34,2344	110,1773	0,1280	0,1290	34,3496	109,1644	0,1302	0,1277	33,7376	0,1266	2018-09-06	17:00
Before (6)	61,0692	0,1262	0,1266	34,2344	110,1774	0,1279	0,1289	34,3495	109,1646	0,1303	0,1276	33,7375	0,1266	2018-09-10	11:00
After (1)	61,0701	0,1260	0,1264	34,2360	110,1784	0,1275	0,1288	34,3569	109,1659	0,1308	0,1274	33,7489	0,1268	2018-09-10	18:00
After (2)	61,0694	0,1260	0,1264	34,2352	110,1775	0,1275	0,1288	34,3505	109,1651	0,1308	0,1274	33,7384	0,1268	2018-09-17	08:00
After (3)	61,0694	0,1261	0,1265	34,2352	110,1775	0,1276	0,1289	34,3505	109,1651	0,1308	0,1274	33,7384	0,1267	2018-09-21	08:00
After (4)															
After (5)															
After (6)	61,0694	0,1261	0,1265	34,2352	110,1775	0,1276	0,1289	34,3505	109,1651	0,1308	0,1274	33,7384	0,1267	2018-09-21	08:00
Difference	0,0002	-0,0001	-0,0001	0,0008	0,0001	-0,0003	0,0000	0,0010	0,0005	0,0005	-0,0002	0,0009	0,0001		
Total (mg)		0,8				1,6				1,7			0,1		
Total ajusté (mg)		0,70				1,50				1,60					

Project nu.	PI 20176
Date	10-09-2018
Technicien	mm

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,5 g/hr

Burn Rate : 0,866 Dry kg/hr

Test Duration: 379 min

PRESSURE FACTOR: DGM 1 0,98663
DGM 2 0,99102
DGM 3 1,00868

BAROMETRIC PRESSURE
Average: 30,17964864 in Hg
Start: 30,26823861 in Hg
End: 30,09105867 in Hg

TEMPERATURE FACTORS DGM 1 0,97527
DGM 2 0,97517
DGM 3 0,98159

DGM CONTROLLER VALUES

DGM 1 Final: 26899,771 Cuft
Initial: 26834,569 Cuft

VOLUMES SAMPLED DGM 1 62,015 SCft
DGM 2 60,818 SCft
DGM 3 128,070 SCft

DGM 2 Final: 25260,096 Cuft
Initial: 25196,619 Cuft

DGM #3 Final: 649,510 Cuft
Initial: 519,610 Cuft

TOTAL TUNNEL VOLUME : 113390

TEMPERATURES

SAMPLE RATIOS
Sample Train 1: 1828,410
Sample Train 2: 1864,406

DGM 1 541,391 °R
DGM 2 541,444 °R

CALIBRATION FACTORS

Paticulate concentration
Sample Train 1 0,000026 g/dscf
Sample Train 2 0,000028 g/dscf
Room 0,000001 g/dscf

DGM 1 0,9885
DGM 2 0,9914
DGM #3 0,9958

TUNNEL FLOW RATE: 299,181 Dscfm

TOTAL EMISSIONS
Sample Train 1 2,84 g
Sample Train 2 3,08 g

PARTICULATE CATCH
Total Sample Train 1: 1,60 mg
Total Sample Train 2: 1,70 mg
Total Sample Train 1 1st hour: 0,80 mg

EMISSION RATES
Sample Train 1 0,45 g/hr
Sample Train 2 0,49 g/hr

1st hour emission rate 1,46 g/hr

DEVIATION: 4,12%

Cs Train 1 Train 2
2,58E-05 2,7952E-05

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*
Elapsed	Raw data row	Weight	CO	CO ₂	O ₂	Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst
Time		Remaining				Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	
min		lbs	%	%	%	%F	%F	%F	%F	%F	%F	%F	%F	%F
0,00	260,00	13,8	0,037	4,6	0,0	262,5	75,7	102,6	334,9	338,2	406,6	344,5	491,1	484,0
1,0	261,0	14,5	0,241	5,7	0,0	267,3	75,7	90,9	333,3	337,7	405,3	343,5	487,7	506,1
2,0	262,0	14,4	0,052	3,9	0,0	297,2	76,1	90,5	331,8	337,2	403,8	342,2	484,3	608,2
3,0	263,0	14,3	0,028	4,6	0,0	322,6	76,1	91,5	330,5	336,3	401,8	340,4	481,1	680,5
4,0	264,0	14,2	0,025	7,4	0,0	351,6	75,9	92,4	329,2	335,2	399,5	338,5	478,2	746,6
5,0	265,0	14,1	0,021	8,3	0,0	327,4	76,2	90,0	328,4	333,9	396,9	336,9	475,6	766,0
6,0	266,0	14,0	0,035	6,6	0,0	292,9	75,9	87,8	328,5	332,3	394,2	335,1	473,4	734,5
7,0	267,0	14,0	0,024	3,6	0,0	274,1	75,9	87,2	328,8	330,6	391,7	333,3	471,2	678,1
8,0	268,0	14,0	0,022	3,1	0,0	261,6	75,9	86,8	329,2	328,8	389,1	331,4	468,8	649,2
9,0	269,0	13,9	0,022	2,9	0,0	253,5	75,9	86,2	329,1	326,9	386,4	329,4	466,1	635,2
10,0	270,0	13,9	0,023	3,0	0,0	247,6	76,1	86,1	328,6	324,9	383,6	327,2	463,2	631,8
11,0	271,0	13,9	0,024	3,1	0,0	244,2	76,1	85,7	328,5	322,9	380,9	324,8	460,2	639,8
12,0	272,0	13,8	0,026	3,4	0,0	242,8	75,9	85,7	328,2	320,9	378,1	322,4	457,1	654,1
13,0	273,0	13,8	0,030	3,6	0,0	243,8	76,2	85,6	328,0	318,7	375,3	319,8	454,1	673,8
14,0	274,0	13,7	0,024	4,6	0,0	243,9	76,2	86,0	327,1	316,9	372,6	317,5	451,1	683,2
15,0	275,0	13,7	0,023	4,6	0,0	243,6	76,4	85,9	326,2	314,8	369,8	315,1	448,2	686,2
16,0	276,0	13,6	0,026	4,5	0,0	243,6	75,9	85,9	325,3	312,8	367,0	312,6	445,4	695,8
17,0	277,0	13,6	0,027	4,5	0,0	243,8	75,9	85,6	324,3	310,8	364,4	310,1	442,6	693,0
18,0	278,0	13,5	0,027	4,5	0,0	243,7	75,7	85,6	323,3	308,8	361,7	307,5	439,9	692,2
19,0	279,0	13,5	0,026	4,8	0,0	244,5	76,0	85,6	322,4	306,8	359,1	305,0	437,2	691,6
20,0	280,0	13,4	0,026	4,9	0,0	246,2	76,1	85,2	321,4	304,9	356,7	302,8	434,5	701,6
21,0	281,0	13,3	0,036	4,8	0,0	247,2	76,0	85,3	320,4	302,9	354,3	300,8	432,0	710,3
22,0	282,0	13,3	0,038	4,9	0,0	248,1	75,9	85,4	319,5	301,0	352,0	298,6	429,6	718,0
23,0	283,0	13,2	0,039	4,9	0,0	249,2	76,0	85,6	318,4	299,2	349,8	296,4	427,2	723,5
24,0	284,0	13,2	0,040	5,0	0,0	250,4	76,2	85,8	317,0	297,5	347,6	294,2	424,9	726,7
25,0	285,0	13,1	0,037	5,1	0,0	251,4	76,3	85,7	316,3	295,6	345,6	292,1	422,7	729,4
26,0	286,0	13,1	0,035	5,4	0,0	251,6	76,3	85,9	315,2	293,8	343,5	290,1	420,6	732,0
27,0	287,0	13,0	0,034	5,5	0,0	253,0	76,2	86,0	314,3	292,2	341,5	288,2	418,7	733,7
28,0	288,0	12,9	0,031	5,7	0,0	253,0	76,2	86,2	313,5	290,5	339,6	286,3	416,9	732,7
29,0	289,0	12,9	0,030	5,8	0,0	253,4	76,0	86,2	312,6	288,7	337,8	284,6	415,3	731,7
30,0	290,0	12,8	0,031	5,8	0,0	254,5	76,1	85,8	311,9	288,0	336,0	283,0	413,8	734,8
31,0	291,0	12,7	0,033	6,0	0,0	255,7	76,2	85,5	310,2	286,6	334,3	281,4	412,4	757,4
32,0	292,0	12,7	0,040	6,5	0,0	259,4	76,1	85,1	309,1	285,2	332,7	279,9	411,1	793,4
33,0	293,0	12,6	0,047	6,6	0,0	263,0	76,2	85,1	308,2	283,7	331,3	278,5	409,9	807,9
34,0	294,0	12,5	0,046	6,6	0,0	264,1	76,5	84,8	307,2	282,2	329,9	277,4	408,7	801,1
35,0	295,0	12,5	0,043	6,3	0,0	264,2	76,3	85,5	306,3	280,9	328,4	275,9	407,6	790,8
36,0	296,0	12,4	0,043	6,1	0,0	263,8	76,3	85,1	305,8	279,5	327,1	274,9	406,4	787,6
37,0	297,0	12,3	0,043	6,3	0,0	263,9	76,5	85,1	305,0	278,1	325,8	273,7	405,4	793,7
38,0	298,0	12,3	0,044	6,4	0,0	264,8	76,9	85,1	304,3	276,9	324,6	272,3	404,4	803,8
39,0	299,0	12,2	0,045	6,4	0,0	266,0	76,8	84,9	303,4	275,6	323,5	271,3	403,5	811,1
40,0	300,0	12,1	0,045	6,7	0,0	268,5	76,7	85,1	302,5	274,5	322,4	270,6	402,5	825,7
41,0	301,0	12,1	0,049	7,0	0,0	270,0	76,8	85,4	301,8	273,3	321,3	269,5	401,7	835,2
42,0	302,0	12,0	0,048	7,1	0,0	273,1	76,8	85,8	300,9	272,1	320,5	268,7	400,8	866,3
43,0	303,0	11,9	0,056	8,0	0,0	278,8	76,6	86,0	300,4	271,0	319,5	267,8	400,0	918,4
44,0	304,0	11,8	0,073	9,2	0,0	286,1	76,7	86,1	300,0	270,0	318,8	267,2	399,2	929,3
45,0	305,0	11,7	0,073	9,7	0,0	290,4	76,7	86,1	299,9	268,9	318,2	266,9	398,5	914,3
46,0	306,0	11,6	0,073	9,9	0,0	295,2	76,9	86,6	300,0	268,1	317,7	266,5	397,8	925,1
47,0	307,0	11,5	0,088	10,2	0,0	299,1	76,9	87,0	300,4	266,9	317,4	266,3	397,2	941,8
48,0	308,0	11,4	0,122	10,5	0,0	303,6	76,5	87,3	300,8	266,1	317,2	265,8	396,7	936,2
49,0	309,0	11,3	0,296	10,6	0,0	306,6	76,9	87,5	302,2	265,4	317,1	266,0	396,2	952,4
50,0	310,0	11,2	0,201	10,6	0,0	309,9	76,9	87,5	303,8	264,5	317,3	266,2	395,8	972,2
51,0	311,0	11,1	0,208	10,8	0,0	313,1	76,8	88,0	305,5	263,8	317,5	266,6	395,4	990,0
52,0	312,0	11,0	0,304	10,9	0,0	315,0	76,7	87,8	307,5	263,2	318,0	267,1	395,1	987,5
53,0	313,0	10,9	0,245	10,9	0,0	317,1	76,7	87,9	309,7	262,7	318,6	267,8	394,7	1005,7
54,0	314,0	10,8	0,231	10,6	0,0	318,8	76,5	88,2	312,2	262,3	319,4	268,4	394,4	1004,7
55,0	315,0	10,7	0,281	10,7	0,0	318,3	76,7	87,5	315,0	261,7	320,2	269,0	394,1	995,4
56,0	316,0	10,6	0,226	10,8	0,0	318,7	76,4	88,2	317,9	261,2	321,1	269,7	393,8	999,4
57,0	317,0	10,5	0,290	11,0	0,0	320,1	76,6	88,0	321,3	261,0	322,0	270,3	393,5	1006,5
58,0	318,0	10,4	0,286	11,0	0,0	320,7	76,7	88,3	324,9	260,5	322,9	271,2	393,4	1001,9
59,0	319,0	10,3	0,288	11,2	0,0	321,3	76,7	88,5	328,7	260,3	323,9	272,1	393,5	996,9
60,0	320,0	10,2	0,278	11,3	0,0	321,6	76,8	88,8	332,7	260,1	325,0	272,6	393,5	1001,1
61,0	321,0	10,1	0,285	11,2	0,0	322,3	76,6	88,9	337,0	260,0	326,1	273,6	393,4	1002,4
62,0	322,0	10,0	0,261	11,2	0,0	323,0	76,8	88,8	341,5	259,9	327,3	274,4	393,1	1001,0
63,0	323,0	9,9	0,242	11,1	0,0	322,5	76,9	88,9	345,8	259,8	328,6	275,2	392,8	1003,5
64,0	324,0	9,8	0,211	10,9	0,0	324,3	76,8	89,3	350,0	259,8	329,9	275,9	392,5	1024,5
65,0	325,0	9,7	0,250	11,0	0,0	325,6	76,7	89,2	354,2	259,9	331,4	276,7	392,1	1021,1
66,0	326,0	9,6	0,182	11,0	0,0	327,6	76,8	89,3	358,0	259,9	332,8	277,3	391,8	1020,4
67,0	327,0	9,5	0,196	11,1	0,0	328,0	76,7	89,1	361,7	260,1	334,2	278,1	391,5	1014,6
68,0	328,0	9,4	0,158	11,1	0,0	327,8	76,9	88,9	365,2	260,1	335,6	279,2	391,2	1002,3
69,0	329,0	9,3	0,090	11,1	0,0	326,8	76,5	88,8	368,9	260,4	337,0	280,0	391,0	991,8
70,0	330,0	9,2	0,057	10,9	0,0	325,2	77,0	89,0	372,0	260,6	338,4	281,5	390,7	970,7
71,0	331,0	9,1	0,047	11,1	0,0	323,3	77,0	89,2	375,3	260,8	339,6	282,6	390,5	961,2
72,0	332,0	9,0	0,035	10,8	0,0	321,9	77,1	89,3	378,6	261,1	340,9	284,1	390,2	958,0
73,0	333,0	8,9	0,031	10,6	0,0	320,3	77,1	89,3	381,6	261,5	342,2	285,2	389,8	955,6
74,0	334,0	8,8	0,030	10,5	0,0	319,3	77,1	89,4	384,8	261,7	343,3	286,7	389,5	958,9
75,0	335,0	8,7	0,032	10,6	0,0	319,6	77,0	89,5	387,7	262,1	344,4	288,0	389,2	980,7
76,0	336,0	8,6	0,035	10,9	0,0	320,0	77,1	89,3	390,4	262,5	345,4	289,4	388,8	984,9
77,0	337,0	8,6	0,032	11,0	0,0	319,2	77,2	89,2	392,9	262,9	346,3	290,7	388,4	973,9
78,0	338,0	8,5	0,031	10,8	0,0	318,1	77,0	89,4	395,4	263,3	347,3	292,4	388,0	967,7
79,0	339,0	8,4	0,034	10,6	0,0	316,5	77,2	89,3	397,9	263,7	348,2	293,9	387,5	964,2
80,0	340,0	8,3	0,038	10,3	0,0	315,0	77,2	89,2	399,7	264,1	349,2	295,3	386,8	960,9

Manufacturer: HEARTHSTONE
Model: 8024 HERITAGE

Run: 1
Project #: PI 20176
Test Duration: 379

	min	
	HHV	LHV
Eff	80,15%	86,63%
Comb Eff	99,50%	99,50%
HT Eff	80,55%	87,06%
Output	12 985	kJ/h
Burn Rate	0,82	kg/h
Grams CO	42	g
Input	16 201	kJ/h
MC wet	17,47	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

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

Overall Heating Efficiency:	80,15%	Air Fuel Ratio (A/F)	
Combustion Efficiency:	99,50%	Dry Molecular Weight (M _d)	29,71
Heat Transfer Efficiency:	80,55%	Dry Moles Exhaust Gas (N _e):	506,80
		Air Fuel Ratio (A/F)	14,55

Heat Output:	12 317 Btu/h	12 985 kJ/h
Heat Input:	15 368 Btu/h	16 201 kJ/h
Burn Duration:	6,32 h	
Burn Rate:	1,80 lb/h	0,818 kg/h
Stack Temp:	243,9 Deg. F	117,7 Deg. C

Date: 2018-09-10 Manufacturer: Hearthstone Model: 8024 Heritage
Project #: PI 20176 Run: 1 Tech: mm Reviewer: RP

	- 55 LBS SLASH FINE
	- Fan off
Atta 10 min	by pass open
	At 50 LBS instl load per burn
	Door open
	- At 15 LBS (30 minutes) close door
	- At 55 LBS open fan close by pass
	and close air inlet (mech 1/8)
	- At 37 LBS open door mech Break
	coal and close door
	- Atta 2 min open Door open
	by pass & instl load close door
	and close by pass
	- Fan off
	At 5 min close air inlet mech 1/8
TEST LOAD CONFIGURATION	
	At 30 minutes open fan low

PRE / POST CHECKS

Date: 2018-09-10 Manufacturer: Hearlstone Model: 8624 Heritage
 Project #: PI 20126 Run: 1 Tech: mm Reviewer: YBP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
<u>Em 191</u>	<u>7:00</u>	<u>ok</u>	<u>ok</u>

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

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

Smoke Capture Check.....

Picture.....

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O).....

Traverse before ignition.....

Flow Rate 140 cfm ±10%.....

<u>2018-09-10</u>
<u>2018-09-10</u>
<u>ok</u>
<u>ok</u>

<u>ok</u>

Temperature System:

Ambient (65°-90°F).....

Wood Heater Surface (±125°F).....

<u>ok</u>	°F
<u>ok</u>	°F

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

<u>ok</u>
<u>ok</u>
<u>ok</u>

Sampling Train ID Numbers:

Probe.....

Filter Front.....

Filter Back.....

Filter Thermocouple.....

Filter (<90°F).....

Train 1 st hour	Train 1	Train 2
<u>01</u>	<u>32</u>	<u>43</u>
<u>10</u>	<u>12</u>	<u>14</u>
<u>11</u>	<u>13</u>	<u>15</u>
<u>11</u>	<u>11</u>	<u>12</u>
<u>ok</u>	<u>ok</u>	<u>ok</u>

SAMPLING EQUIPMENT CHECK OUT

 Date: 2018-09-10

 Manufacturer: Heathington

 Model: 8004 Heritage

 Project #: PI 20176

 Run: 1

 Tech: AM

 Reviewer: DP

Leakage Checks Tunnel Samplers

	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	- 15	- 15	- 15	- 15	- 15	- 15
Final 1minute DGM (Liter)	759868 75	761717 59	759870 01	761717 65	713988 04	715287 18
Initial 1minute DGM (Liter)	759868 95	761717 59	759869 99	761717 65	713988 04	715287 18
Change © (Liter)	Ø	Ø	0.05	Ø	Ø	Ø
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)	- 5	- 5
Rotometer Reading (mml/min.)	6	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H ₂ O static	Pre Test 0.4-0.5 H ₂ O velocity	Post Test 3 H ₂ O Static	Post Test 0.4-0.5 H ₂ O velocity
Vacuum (inches Hg.)	3	.4	3	.5
Check OK (no change after 15 sec.)	OK	OK	OK	OK

PRE-TEST SCALE AUDIT

 Date: 2018-09-10

 Manufacturer: Healthstone

 Model: 8024 Heritage

 Project #: PI 20176

 Run: 1

 Tech: MM

 Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM 090	44 lbs, Class F	44 lbs
Wood	EM 090	44 lbs, Class F	44 lbs
Analytical	EM 128	100 mg, Class S	100 mg
Analytical	EM 128	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: 2018-09-10 Manufacturer: Herthstone Model: 8024 Heritage
 Project #: PI 20176 Run: 1 Tech: MM Reviewer: SP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 102.5 40.5 mm (KPa.) Static pressure (P_q) 0.18 (inches w.c.)
 Inside diameter: Port A _____ Port B _____
 Tunnel cross sectional area: .1963Ft²
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0059	70.93
B - Centroid	3.00	3.50	4	0058	70.89
A-1	0.40	0.50	0.50	0048	70.89
A-2	1.50	1.75	2	0065	70.95
A-3	4.50	5.25	6	0051	70.95
A-4	5.60	6.5	7.5	0050	70.93
B-1	0.40	0.50	0.50	0052	70.89
B-2	1.50	1.75	2	0062	70.90
B-3	4.50	5.25	6	0055	70.87
B-4	5.60	6.5	7.5	0049	70.87
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 H₂O)

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 in. H₂O
 { 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: 2018-09-10

 Manufacturer: Health Stone

 Model: 8024 Heritage

 Project #: PI 2016

 Run: 1

 Tech: mm

 Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2974	3000	1000	1000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	1789	1800	977	1000
Tolerance CO ₂		+/- 0.02		+/- 0.5		+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	2000	2979	1000	0	0.02	9005	0.15	9000	0.05	J	
CO ₂	001	1785	977	001	0.02	004	0.5	903	0.5	J	

TEST DATA LOG

Date: 2018-09-10 Manufacturer: Hearthstone Model: 8024 Heritage
 Project #: PJ 20176 Run: 1 Tech: MM Reviewer: JP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	761 716 66	715 286 26	6 49 51
Initial (Liter)	759 870 35	713 488 78	519 61

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102.5	101.9
Dry Bulb (F):	79.12	83.12
Humidity (%):	38.8	30.6

Flow Meter

	Start	End
Flow meter reading	NA	NA

Flow Meter Verification

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

FUEL DATA

Date: 2/18/09 Manufacturer: Heath Stone Model: 8024 Heritage
 Project #: PI 20176 Run: 1 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 1/8 in.	1886 lbs.	196	193	198	194	198
1 1/2	x 3 1/2	x 1/8 in.	1788 lbs.	198	201	203	203	202
1 1/2	x 3 1/2	x 1/8 in.	1836 lbs.	199	198	194	199	199
1 1/2	x 3 1/2	x 1/8 in.	1866 lbs.	201	204	204	203	208
1 1/2	x 3 1/2	x 1/2 in.	1424 lbs.	207	199	196	193	198
1 1/2	x 3 1/2	x 1/2 in.	1334 lbs.	199	200	204	208	201
1 1/2	x 3 1/2	x 1/2 in.	1302 lbs.	199	196	196	195	193
1 1/2	x 3 1/2	x 1/2 in.	1499 lbs.	200	204	208	206	209
1 1/2	x 3 1/2	x 1/2 in.	1196 lbs.	208	204	209	208	209
1 1/2	x 3 1/2	x 1/2 in.	1288 lbs.	210	203	218	214	209
1 1/2	x 3 1/2	x 1/2 in.	1280 lbs.	209	206	203	209	208
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					

TEST LOAD WEIGHT: 1670 lbs

FUEL DATA

Date: 2018-09-10 Manufacturer: Hearthstone Model: 8024 Heritage
 Project #: PI 20176 Run: 1 Tech: mm Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size			Weight		Meter Moisture Content (% dry)*				
1 1/2	x 3 1/2	x 16 in.	1646	lbs.	213	210	208	206	209
1 1/2	x 3 1/2	x 16 in.	1504	lbs.	228	224	226	224	226
1 1/2	x 3 1/2	x 16 in.	1572	lbs.	213	218	214	216	213
3 1/2	x 3 1/2	x 16 in.	4064	lbs.	219	210	211	210	211
3 1/2	x 3 1/2	x 16 in.	3934	lbs.	210	209	208	211	210
1 1/2	x 3 1/2	x 5 in.	0116	lbs.			208		
1 1/2	x 3 1/2	x 5 in.	0106	lbs.			206		
1 1/2	x 3 1/2	x 5 in.	0122	lbs.			209		
1 1/2	x 3 1/2	x 5 in.	0130	lbs.			196		
1 1/2	x 3 1/2	x 5 in.	0124	lbs.			193		
1 1/2	x 3 1/2	x 5 in.	0100	lbs.			192		
1 1/2	x 3 1/2	x 5 in.	0124	lbs.			201		
1 1/2	x 3 1/2	x 5 in.	0118	lbs.			204		
1 1/2	x 3 1/2	x 5 in.	0114	lbs.			208		
1 1/2	x 3 1/2	x 5 in.	0100	lbs.			203		
1 1/2	x 3 1/2	x 5 in.	0118	lbs.			209		
1 1/2	x 3 1/2	x 5 in.	0108	lbs.			208		
1 1/2	x 3 1/2	x 5 in.	0106	lbs.			204		
1 1/2	x 3 1/2	x 5 in.	0108	lbs.			204		
1 1/2	x 3 1/2	x 5 in.	0126	lbs.			199		
1 1/2	x 3 1/2	x 5 in.	0134	lbs.			201		
1 1/2	x 3 1/2	x 5 in.	0102	lbs.			208		
1 1/2	x 3 1/2	x 5 in.	0102	lbs.			204		
1 1/2	x 3 1/2	x 5 in.	0122	lbs.			209		
1 1/2	x 3 1/2	x 5 in.	0120	lbs.			206		
x	x	in.		lbs.					
x	x	in.		lbs.					

TEST LOAD WEIGHT: 1504 lbs Min 20%: 308 Max 25%: 371
19,61 mm 2922 mm 365 mm

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-09-06 Manufacturer: Heart/Hersberg Model: 8024 Heritage

Project #: PT 20176 Run: 1 Tech: MM Reviewer: SE

		SYSTEM 1 - 1 st 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	Blank
Date	Time	01	10	11	2	32	12	13	16
2018-09-06	17:00	610691	01261	01265	342344	1101773	01280	343496	01266
2018-09-06	11:00	610692	01262	01266	342344	1101774	01279	343495	01266

		SYSTEM 1 - 1 st 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	Blank		
Date	Time	01	10	11	2	32	12	13	16		
2018-09-06	18:00	610701	01260	01264	342360	1101784	01275	343569	01268		
2018-09-17	8:00	610694	01260	01264	342352	1101775	01275	343505	01268		
2018-09-21	8:00	610694	01261	01265	342352	1101775	01276	343505	01267		

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-09-06 Project #: PT-20176 Run: 1 Manufacturer: Heckel Stone Model: 8024 Heritage
 Tech: MM Reviewer: SP

SYSTEM 2				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2018-09-06	17:00	1091644	01302	01277 337376
2018-09-10	11:25	1091646	01303	01276 337375

SYSTEM 2				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2018-09-10	18:00	1091659	01308	01274 337489
2018-09-17	8:00	1091651	01308	01274 337384
2018-09-21	8:00	1091651	01308	01274 337384

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	11-09-2018
Technicien	M.M
Project #	PI 20176

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8024 HERITAGE	
Combustion system	Cat	
Appliance type	WOODSTOVE	
Firebox volume	2,18	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,988	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,991	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,996	Dimensionless
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	300	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20176
Date	11-09-2018
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):	101,6	101,5
Barometer (in.Hg):	30,002469	29,97293872
Dry Bulb (F):	77,18	83,66
Humidity (%):	48	45,6
Air velocity (ft/min)	0	0

DGM #1	Final:	26961,008	cuft
	Initial:	26899,830	cuft
DGM #2	Final:	25319,981	cuft
	Initial:	25260,195	cuft

DGM room	
----------	--

	Final:	763450,700	Liter
	Initial:	761718,350	Liter
	Final:	716981,990	Liter
	Initial:	715289,050	Liter

	Final:	785,690	cuft
	Initial:	649,530	cuft

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

216

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

Project nu.	PI 20176
Date	11-09-2018
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
13,7	15,3	16,8

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

Load Volume: cu. ft

Loading Density: 7,1 lbs./ft3

Number of Spaces:	16
Spacer weight:	lbs

Load Density (wet):	30,7	lbs./ft3
Dry Wood Density:	25,3	lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content					Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %					Weight	Cubic Inches	%
1,5	3,5	17	1,82	21,90	21,30	21,00	21,20	21,60	38,9908	89,25	21,4
1,5	3,5	17	1,67	21,50	21,80	21,40	21,60	21,90	36,18208	89,25	21,6
1,5	3,5	17	1,62	22,30	22,00	22,10	21,90	21,30	35,42272	89,25	21,9
3,5	3,5	17	4,27	22,10	22,00	21,80	21,90	21,30	93,1714	208,25	21,8
3,5	3,5	17	4,14	20,80	20,60	20,90	20,30	20,90	85,698	208,25	20,7
1,5	0,75	5	0,12			20,60			2,4308	5,63	20,6
1,5	0,75	5	0,10			20,30			2,0706	5,63	20,3
1,5	0,75	5	0,11			20,40			2,1624	5,63	20,4
1,5	0,75	5	0,12			20,50			2,501	5,63	20,5
1,5	0,75	5	0,11			20,80			2,2048	5,63	20,8
1,5	0,75	5	0,12			20,10			2,4522	5,63	20,1
1,5	0,75	5	0,11			20,60			2,3072	5,63	20,6
1,5	0,75	5	0,12			20,30			2,436	5,63	20,3
1,5	0,75	5	0,12			20,90			2,4662	5,63	20,9
1,5	0,75	5	0,12			20,50			2,46	5,63	20,5
1,5	0,75	5	0,12			20,60			2,472	5,63	20,6
1,5	0,75	5	0,13			20,90			2,6334	5,63	20,9
1,5	0,75	5	0,12			20,80			2,4128	5,63	20,8
1,5	0,75	5	0,12			20,10			2,3718	5,63	20,1
1,5	0,75	5	0,11			20,30			2,233	5,63	20,3
1,5	0,75	5	0,12			20,20			2,424	5,63	20,2
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	327,5032		20,7 %

Test Load Weight: 15,38 lbs.

Dry Weight: kg.

Average Moisture Content: %

Dry:	21,30	Dry(EPA)	21,30
		Dry(B415)	21,30

21,30
Must be 19-25

Wet: 17,56
must be 15,2-22

Coal Bed Range: lbs. to

3,8 lbs.

TEST CHARGE:

Coal bed weight: 3,7

lbs.

Project nu.	PI 20176
Date	11-09-2018
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,2 in. H2O
 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=
0,968

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,060	73,75	0,2449
B center	0,060	74,01	0,2449
A1	0,048	73,73	0,2191
A2	0,067	73,73	0,2588
A3	0,051	73,8	0,2258
A4	0,049	74,01	0,2214
B1	0,048	73,800	0,2191
B2	0,071	73,800	0,2665
B3	0,060	73,860	0,2449
B4	0,051	73,900	0,2258
AVERAGE	0,0565	73,8390	0,2371

Project nu.	PI 20176
Date	11-09-2018
Technicien	M.M

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	7	7	8	20	17	9	417	29	39	618	619	31	640		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,4759	0,1271	0,1253	34,0702	108,9496	0,1262	0,1269	33,8688	110,2775	0,1286	0,1266	33,4936	0,1251	2018-09-10	18:15
Before (6)	61,4758	0,1271	0,1253	34,0704	108,9497	0,1263	0,1269	33,8688	110,2775	0,1286	0,1266	33,4935	0,1252	2018-09-11	10:00
After (1)	61,4762	0,1271	0,1253	34,0848	108,9500	0,1255	0,1270	33,8838	110,2779	0,1285	0,1266	33,5085	0,1255	2018-09-11	17:15
After (2)	61,4760	0,1270	0,1252	34,0709	108,9499	0,1254	0,1269	33,8698	110,2776	0,1285	0,1265	33,4942	0,1254	2018-09-17	08:00
After (3)	61,4760	0,1270	0,1252	34,0709	108,9499	0,1254	0,1269	33,8698	110,2776	0,1286	0,1266	33,4942	0,1253	2018-09-21	08:00
After (4)															
After (5)															
After (6)	61,4760	0,1270	0,1252	34,0709	108,9499	0,1254	0,1269	33,8698	110,2776	0,1286	0,1266	33,4942	0,1253	2018-09-21	08:00
Difference	0,0002	-0,0001	-0,0001	0,0005	0,0002	-0,0009	0,0000	0,0010	0,0001	0,0000	0,0000	0,0007	0,0001		
Total (mg)		0,5				0,8				0,8			0,1		
Total ajusté (mg)		0,40				0,70				0,70					

Project nu.	PI 20176
Date	11-09-2018
Technicien	mm

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,2 g/hr

Burn Rate : 0,964 Dry kg/hr

Test Duration: 358 min

PRESSURE FACTOR: DGM 1 0,98408
DGM 2 0,98601
DGM 3 1,00226

BAROMETRIC PRESSURE
Average: 29,987704 in Hg
Start: 30,002469 in Hg
End: 29,972939 in Hg

TEMPERATURE FACTORS DGM 1 0,96785
DGM 2 0,96781
DGM 3 0,97908

DGM CONTROLLER VALUES

DGM 1 Final: 26961,008 Cuft
Initial: 26899,830 Cuft

VOLUMES SAMPLED DGM 1 57,596 SCft
DGM 2 56,562 SCft
DGM 3 133,047 SCft

DGM 2 Final: 25319,981 Cuft
Initial: 25260,195 Cuft

DGM #3 Final: 785,690 Cuft
Initial: 649,530 Cuft

TOTAL TUNNEL VOLUME : 110111

TEMPERATURES

SAMPLE RATIOS
Sample Train 1: 1911,779
Sample Train 2: 1946,752

DGM 1 545,539 °R
DGM 2 545,559 °R

Paticulate concentration
Sample Train 1 0,000014 g/dscf
Sample Train 2 0,000014 g/dscf
Room 0,000001 g/dscf

CALIBRATION FACTORS

DGM 1 0,9885
DGM 2 0,9914
DGM #3 0,9958

TUNNEL FLOW RATE: 307,573 Dscfm

TOTAL EMISSIONS
Sample Train 1 1,45 g
Sample Train 2 1,47 g

PARTICULATE CATCH
Total Sample Train 1: 0,80 mg
Total Sample Train 2: 0,80 mg
Total Sample Train 1 1st hour: 0,50 mg

EMISSION RATES
Sample Train 1 0,24 g/hr
Sample Train 2 0,25 g/hr

1st hour emission rate 0,96 g/hr

DEVIATION: 0,96%

Cs Train 1 Train 2
1,389E-05 1,41439E-05

	*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*
	Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst
Raw data row	Remaining	CO	CO ₂	O ₂	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	up
	lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F
216.00	15.4	0,0	1,1	0,0	263,1	78,7	103,6	328,6	345,4	412,3	345,5	515,6	437,6
217,0	15,3	0,3	1,8	0,0	285,6	78,3	95,8	327,6	345,2	411,0	344,4	509,2	575,5
218,0	15,2	0,1	5,9	0,0	335,5	78,3	96,4	326,4	344,8	409,2	343,1	503,7	747,7
219,0	15,0	0,1	8,1	0,0	376,1	78,2	98,2	325,4	344,1	407,0	341,4	499,3	854,3
220,0	16,1	0,0	10,7	0,0	412,3	78,3	100,1	325,2	343,1	404,4	339,6	496,0	940,9
221,0	14,7	0,2	12,7	0,0	372,7	78,0	96,2	325,8	341,9	401,6	337,8	494,0	933,3
222,0	14,6	0,1	8,2	0,0	339,4	78,3	93,9	326,8	340,3	398,7	336,3	492,3	845,2
223,0	14,6	0,0	5,9	0,0	319,6	77,8	93,2	328,2	338,5	395,8	334,5	490,2	788,2
224,0	14,5	0,0	5,6	0,0	308,3	78,1	93,1	330,3	336,5	393,1	332,9	487,8	763,2
225,0	14,4	0,0	5,6	0,0	301,6	78,3	92,7	331,4	334,7	390,2	331,1	485,4	755,2
226,0	14,4	0,0	5,8	0,0	297,5	78,2	92,6	333,0	332,7	387,3	329,4	482,8	759,7
227,0	14,3	0,0	6,2	0,0	295,6	78,2	92,6	334,2	330,8	384,4	327,5	480,3	772,5
228,0	14,2	0,0	6,5	0,0	296,2	78,3	92,7	335,3	328,9	381,4	325,6	477,9	784,3
229,0	14,1	0,0	6,7	0,0	296,4	78,1	92,9	336,0	326,8	378,4	323,5	475,5	786,6
230,0	14,1	0,0	6,7	0,0	296,1	78,3	92,8	336,6	324,9	375,5	321,3	473,3	781,6
231,0	14,0	0,0	7,0	0,0	298,0	78,3	92,9	337,1	322,9	372,7	319,3	471,4	785,3
232,0	13,9	0,0	7,0	0,0	299,5	78,0	92,2	337,1	321,2	370,0	317,5	469,8	798,5
233,0	13,8	0,0	7,0	0,0	301,1	78,3	92,7	337,5	319,2	367,3	315,9	468,5	804,4
234,0	13,7	0,0	7,4	0,0	304,0	78,1	92,8	338,0	317,4	364,7	314,3	467,4	815,0
235,0	13,6	0,0	8,0	0,0	306,9	78,2	93,4	338,6	315,7	362,2	312,7	466,4	832,5
236,0	13,5	0,1	8,7	0,0	311,9	78,0	93,7	339,3	313,9	359,8	311,1	465,6	858,3
237,0	13,4	0,1	9,1	0,0	317,0	78,4	93,9	340,3	312,2	357,5	309,7	464,9	882,6
238,0	13,3	0,1	9,4	0,0	320,9	78,2	93,8	340,9	310,5	355,4	308,1	464,4	883,8
239,0	13,2	0,0	9,4	0,0	322,1	78,3	94,4	342,2	309,0	353,4	307,0	464,0	883,8
240,0	13,1	0,0	9,3	0,0	325,2	78,1	94,3	343,6	307,4	351,5	306,1	463,8	890,9
241,0	13,0	0,0	9,4	0,0	326,7	78,2	94,5	345,3	306,0	349,7	305,1	463,6	893,2
242,0	12,9	0,0	9,6	0,0	329,4	77,8	94,1	346,8	304,5	348,1	304,2	463,3	903,8
243,0	12,8	0,0	9,6	0,0	331,7	78,2	94,2	348,7	303,2	346,7	303,4	463,0	912,8
244,0	12,7	0,0	9,7	0,0	333,8	78,2	94,9	351,4	301,9	345,3	302,6	462,8	924,7
245,0	12,6	0,0	10,1	0,0	335,9	78,4	95,1	354,4	300,7	344,0	301,9	462,6	933,9
246,0	12,5	0,0	10,4	0,0	339,8	78,2	95,0	357,0	299,8	342,8	301,6	462,4	944,7
247,0	12,4	0,1	10,8	0,0	342,0	78,2	94,4	358,7	299,4	341,6	301,0	462,3	959,5
248,0	12,3	0,1	10,9	0,0	345,0	78,3	94,5	361,2	298,5	340,6	300,8	462,3	964,7
249,0	12,2	0,5	11,1	0,0	344,3	77,8	94,6	363,9	297,6	339,7	300,7	462,2	935,3
250,0	12,0	0,2	11,1	0,0	343,6	78,3	94,7	366,7	296,7	339,0	300,5	462,0	923,9
251,0	11,9	0,1	10,6	0,0	342,9	78,4	94,7	369,9	295,9	338,3	300,4	461,6	927,7
252,0	11,8	0,1	10,5	0,0	342,1	78,5	94,9	373,0	295,2	337,8	300,4	461,0	915,6
253,0	11,7	0,1	10,6	0,0	340,7	78,6	94,8	376,1	294,5	337,3	300,3	460,1	913,2
254,0	11,6	0,1	10,5	0,0	341,7	78,6	94,7	379,5	293,9	336,9	300,3	459,1	941,1
255,0	11,5	0,1	10,4	0,0	342,6	78,8	94,8	382,4	293,5	336,6	300,3	458,2	956,5
256,0	11,4	0,1	10,5	0,0	343,1	78,3	95,1	385,9	292,9	336,1	300,3	457,3	967,4
257,0	11,3	0,2	10,7	0,0	345,0	78,8	95,1	388,9	292,3	335,9	300,4	456,4	970,6
258,0	11,2	0,3	10,8	0,0	346,9	78,7	95,3	391,8	291,9	335,7	300,6	455,5	973,2
259,0	11,1	0,5	11,1	0,0	348,4	78,9	95,4	394,3	291,6	335,5	300,8	454,6	967,8
260,0	11,0	0,6	11,3	0,0	350,4	78,8	95,6	397,1	291,3	335,4	301,1	453,7	986,5
261,0	10,8	0,8	11,5	0,0	352,3	78,8	95,8	400,2	290,9	335,4	301,4	453,0	999,3
262,0	10,7	0,9	11,6	0,0	354,3	78,8	95,9	402,8	290,7	335,5	301,7	452,2	1016,4
263,0	10,6	0,9	11,6	0,0	354,7	78,7	96,1	406,0	290,4	335,6	302,2	451,3	1014,2
264,0	10,5	1,0	11,9	0,0	354,6	78,5	95,9	409,0	290,2	335,7	302,8	450,4	996,9
265,0	10,4	0,8	11,9	0,0	353,4	78,7	96,0	411,7	290,0	336,0	303,0	449,5	988,5
266,0	10,2	0,6	12,0	0,0	352,2	78,7	96,1	414,6	289,9	336,1	303,8	448,5	979,8
267,0	10,1	0,3	12,1	0,0	351,1	78,7	96,2	417,2	289,9	336,4	304,7	447,5	990,6
268,0	10,0	0,4	11,8	0,0	352,3	78,8	95,7	419,8	289,8	336,9	305,4	446,7	1000,5
269,0	9,9	0,2	11,8	0,0	350,9	79,0	96,0	422,6	289,8	337,4	306,5	445,9	1005,4
270,0	9,8	0,3	11,9	0,0	351,6	79,0	96,1	425,2	289,8	338,0	307,5	445,3	1008,9
271,0	9,7	0,3	11,9	0,0	351,3	78,7	96,1	427,7	289,8	338,7	308,3	444,7	994,3
272,0	9,6	0,3	12,0	0,0	351,3	78,8	96,0	430,1	290,0	339,6	309,4	444,1	1006,5
273,0	9,5	0,3	12,0	0,0	351,8	78,8	96,3	432,0	290,3	340,5	310,5	443,6	1019,1
274,0	9,4	0,4	12,0	0,0	351,6	78,9	96,2	434,6	290,4	341,4	311,7	443,1	1007,8
275,0	9,3	0,3	12,2	0,0	351,4	79,1	96,2	437,1	290,7	342,2	312,8	442,6	1002,9
276,0	9,2	0,2	12,2	0,0	351,0	78,9	96,4	439,0	290,9	343,2	314,0	442,0	998,9
277,0	9,0	0,3	12,2	0,0	349,2	78,6	96,2	441,1	291,2	344,3	314,9	441,4	987,1
278,0	8,9	0,1	12,3	0,0	350,1	78,7	96,1	443,6	291,6	345,3	316,2	440,8	990,1
279,0	8,8	0,1	12,2	0,0	349,7	79,0	96,1	446,4	292,0	346,4	317,6	440,2	995,7
280,0	8,7	0,1	12,1	0,0	349,8	79,0	96,1	448,7	292,5	347,5	319,1	439,4	1004,1
281,0	8,6	0,2	12,1	0,0	349,2	78,9	96,2	450,6	293,0	348,8	320,4	438,7	992,8
282,0	8,5	0,1	12,1	0,0	348,0	79,0	96,3	453,4	293,4	349,9	321,9	438,2	983,9
283,0	8,4	0,1	12,1	0,0	347,5	79,0	96,4	455,5	294,0	351,1	323,1	437,6	981,4
284,0	8,3	0,1	12,1	0,0	346,1	79,3	96,5	457,7	294,6	352,5	324,6	437,1	971,8
285,0	8,2	0,1	12,1	0,0	344,9	78,8	96,5	460,1	295,2	353,6	326,2	436,6	964,1
286,0	8,1	0,1	12,0	0,0	345,1	79,2	96,6	462,6	295,8	354,9	327,7	436,1	966,6
287,0	8,0	0,1	12,2	0,0	343,9	79,3	96,4	464,7	296,5	356,2	329,2	435,3	964,9
288,0	7,9	0,1	12,1	0,0	343,1	79,2	96,5	466,7	297,3	357,4	330,7	434,3	960,9
289,0	7,8	0,1	12,0	0,0	342,3	79,3	96,5	468,4	297,8	358,6	332,2	433,3	960,7
290,0	7,7	0,1	12,1	0,0	340,3	79,0	96,4	470,4	298,7	359,9	333,7	432,4	960,6
291,0	7,6	0,1	12,1	0,0	340,5	79,2	96,6	472,1	299,3	361,2	335,0	431,6	962,0
292,0	7,5	0,1	12,2	0,0	340,6	79,2	96,4	473,8	300,1	362,5	336,3	430,9	967,1
293,0	7,4	0,1	12,2	0,0	339,4	79,1	96,4	475,2	300,9	363,9	338,0	430,3	971,6
294,0	7,3	0,1	12,3	0,0	340,3	79,4	96,4	477,0	301,7	365,2	339,5	429,8	978,2
295,0	7,2	0,1	12,4	0,0	340,1	79,7	96,7	478,6	302,6	366,6	341,0	429,5	986,5
296,0	7,1	0,1	12,5	0,0	340,3	79,6	96,7	480,4	303,4	367,9	342,6	429,1	991,2
297,0	7,0	0,2	12,6	0,0	340,9	79,8	96,8	481,9	304,2	369,2	343,9	428,7	995,1
298,0	6,9	0,2	12,6	0,0	340,8	79,7	96,8	483,6	305,1	370,5	345,0	428,1	995,9
299,0	6,8	0,2	12,7	0,0	342,0	79,1	96,5	485,2	305,9	371,9	346,1	427,6	997,2
300,0	6,7	0,1	12,6	0,0	341,2	78,7	96,2	486,3	306,7	373,1	347,1	427,1	994,1
301,0	6,6	0,1	12,5	0,0	340,4	78,7	95,9	488,1	307,6	374,5	348,4	426,6	989,8
302,0	6,5	0,1	12,4	0,0	340,1	78,3	95,4	489,8	308,6	376,0	349,3	426,0	988,5
303,0	6,5	0,0	12,2	0,0	339,0	78,6	94,						

314,0	5,6	0,0	10,3	0,0	319,0	79,7	95,7	501,2	320,2	396,9	364,1	420,2	946,6
315,0	5,5	0,0	10,2	0,0	317,1	79,7	95,5	500,4	321,0	398,8	365,2	419,8	955,2
316,0	5,5	0,0	10,2	0,0	316,1	79,8	95,6	499,7	322,1	400,5	366,2	419,5	963,2
317,0	5,4	0,0	10,2	0,0	315,4	79,8	95,7	498,9	323,0	402,1	367,0	419,4	966,9
318,0	5,3	0,0	10,2	0,0	315,6	79,8	95,6	497,7	323,7	403,5	367,7	419,1	953,6
319,0	5,3	0,0	10,1	0,0	312,8	79,5	95,5	496,2	324,5	404,9	368,6	418,6	915,3
320,0	5,2	0,0	9,8	0,0	309,5	79,8	95,5	494,8	325,5	406,4	369,2	417,9	893,2
321,0	5,2	0,0	9,8	0,0	306,4	79,7	95,3	493,4	326,1	407,7	369,9	417,0	877,9
322,0	5,1	0,0	9,6	0,0	303,4	79,8	95,2	491,8	327,1	409,2	370,6	416,1	870,7
323,0	5,0	0,0	9,5	0,0	300,8	80,0	95,1	490,3	328,1	410,3	371,3	415,1	865,7
324,0	5,0	0,0	9,4	0,0	298,1	79,8	95,0	488,3	328,7	411,3	372,0	414,0	863,0
325,0	4,9	0,0	9,3	0,0	296,3	80,0	95,0	486,4	329,6	412,4	372,7	412,9	868,8
326,0	4,9	0,0	9,3	0,0	295,5	79,9	94,9	484,9	330,2	413,4	373,3	411,8	870,5
327,0	4,8	0,0	9,3	0,0	293,7	80,2	94,8	482,8	330,9	414,2	373,9	410,7	862,4
328,0	4,8	0,0	9,2	0,0	293,1	80,0	94,6	481,3	331,4	414,9	374,4	409,6	856,9
329,0	4,7	0,0	9,2	0,0	291,4	80,0	94,7	479,6	332,0	415,7	374,8	408,6	853,2
330,0	4,7	0,0	9,3	0,0	290,3	79,9	94,7	478,2	332,5	416,5	375,5	407,6	850,0
331,0	4,6	0,0	9,3	0,0	289,0	80,1	94,4	476,2	333,0	417,2	375,8	406,7	846,5
332,0	4,6	0,0	9,2	0,0	288,1	80,1	94,4	474,7	333,5	417,8	376,5	405,8	843,0
333,0	4,5	0,0	9,2	0,0	286,6	80,2	94,3	472,7	333,7	418,3	376,8	404,9	837,1
334,0	4,5	0,0	9,2	0,0	285,1	80,2	94,5	471,4	334,0	419,0	377,4	404,1	834,3
335,0	4,4	0,0	9,1	0,0	284,9	80,2	94,5	469,9	334,2	419,5	378,1	403,2	834,1
336,0	4,4	0,0	9,2	0,0	283,8	80,4	94,5	468,0	334,4	420,2	378,6	402,4	831,0
337,0	4,3	0,0	9,1	0,0	283,1	80,5	94,4	467,1	334,6	420,7	379,2	401,6	828,2
338,0	4,2	0,0	9,2	0,0	282,3	80,9	94,5	466,1	334,8	421,1	379,9	400,7	825,5
339,0	4,2	0,0	9,3	0,0	282,0	80,8	94,3	464,9	334,9	421,4	380,5	399,8	822,6
340,0	4,1	0,0	9,4	0,0	281,5	80,7	94,2	463,6	334,9	421,5	380,9	398,9	821,2
341,0	4,1	0,0	9,5	0,0	280,7	80,1	94,0	462,7	334,8	422,0	381,2	397,9	818,8
342,0	4,0	0,0	9,3	0,0	279,6	80,4	93,9	461,5	334,8	422,4	381,2	397,0	815,1
343,0	4,0	0,0	9,1	0,0	278,9	80,4	93,6	460,3	334,8	422,8	382,0	396,0	810,5
344,0	4,0	0,0	9,0	0,0	277,8	80,2	93,8	459,4	334,6	423,1	382,6	394,9	809,2
345,0	3,9	0,0	9,0	0,0	276,7	80,0	93,6	458,1	334,7	423,4	383,5	393,8	810,6
346,0	3,9	0,0	9,0	0,0	275,3	80,3	93,9	456,7	334,6	423,9	384,1	392,9	810,6
347,0	3,8	0,0	8,9	0,0	273,8	80,3	93,8	455,7	334,4	424,3	384,4	392,0	810,5
348,0	3,8	0,0	8,9	0,0	272,3	80,6	93,8	454,5	334,4	424,6	384,8	391,1	813,4
349,0	3,7	0,0	8,9	0,0	271,1	80,2	93,8	453,5	334,3	425,0	385,1	390,3	820,1
350,0	3,7	0,0	8,7	0,0	270,1	80,5	93,8	452,4	334,2	425,5	385,0	389,7	825,1
351,0	3,7	0,0	8,7	0,0	268,6	80,4	93,8	451,4	334,0	425,8	385,0	389,0	824,0
352,0	3,6	0,0	8,7	0,0	267,3	80,4	93,9	450,0	333,8	426,3	385,0	388,5	820,2
353,0	3,6	0,0	8,6	0,0	265,2	80,5	93,9	448,6	333,7	426,7	384,9	387,9	819,0
354,0	3,6	0,0	8,6	0,0	264,2	80,2	93,8	447,5	333,4	427,1	384,4	387,5	821,0
355,0	3,5	0,0	8,5	0,0	263,5	80,4	93,5	445,8	333,3	427,7	384,0	387,1	822,3
356,0	3,5	0,0	8,4	0,0	262,3	80,5	93,4	444,6	333,2	428,2	383,6	386,9	827,0
357,0	3,5	0,0	8,4	0,0	262,3	80,2	93,5	443,2	333,1	428,7	383,3	386,8	835,2
358,0	3,4	0,0	8,4	0,0	261,6	80,5	93,6	442,4	332,9	429,1	382,9	387,0	833,5
359,0	3,4	0,0	8,3	0,0	260,8	80,6	93,6	441,4	332,7	429,5	382,5	387,6	829,6
360,0	3,4	0,0	8,1	0,0	259,5	79,8	93,5	440,0	332,6	429,8	382,2	388,4	824,7
361,0	3,4	0,0	7,9	0,0	258,5	80,2	93,4	438,2	332,5	430,1	381,7	389,2	818,8
362,0	3,3	0,0	7,8	0,0	257,8	79,8	93,4	436,9	332,5	430,2	381,4	390,1	809,5
363,0	3,3	0,0	7,8	0,0	256,9	80,5	93,2	434,7	332,5	430,3	381,1	391,0	800,4
364,0	3,3	0,0	7,8	0,0	256,1	80,3	93,3	433,0	332,4	430,4	380,8	391,8	793,8
365,0	3,3	0,0	7,7	0,0	255,0	80,3	93,2	430,3	332,4	430,6	380,5	392,6	786,6
366,0	3,2	0,0	7,7	0,0	253,4	80,4	93,3	428,0	332,5	430,8	380,2	393,4	781,0
367,0	3,2	0,0	7,7	0,0	251,9	80,4	93,1	426,2	332,6	430,9	380,0	394,1	775,6
368,0	3,2	0,0	7,6	0,0	251,1	80,4	93,3	423,8	332,7	431,1	379,7	394,7	771,9
369,0	3,2	0,0	7,6	0,0	249,5	80,1	93,0	421,3	332,8	431,2	379,2	395,3	766,5
370,0	3,2	0,0	7,5	0,0	248,8	80,2	92,7	418,6	332,9	431,4	379,0	395,8	760,9
371,0	3,1	0,0	7,5	0,0	247,6	80,2	92,7	416,0	333,0	431,5	378,9	396,2	756,0
372,0	3,1	0,0	7,4	0,0	246,3	80,3	92,7	413,2	333,1	431,7	378,5	396,6	752,8
373,0	3,1	0,0	7,4	0,0	245,4	80,3	92,7	410,6	333,4	431,7	378,3	397,0	750,5
374,0	3,1	0,0	7,3	0,0	244,2	80,2	92,7	407,8	333,6	431,8	378,2	397,2	746,9
375,0	3,1	0,0	7,3	0,0	243,0	80,6	92,7	405,3	333,7	431,7	377,9	397,6	745,3
376,0	3,0	0,0	7,3	0,0	241,8	80,7	92,5	402,8	333,9	431,5	377,7	397,8	745,0
377,0	3,0	0,0	7,3	0,0	241,2	80,6	92,8	400,0	334,1	431,4	377,4	397,9	743,2
378,0	3,0	0,0	7,2	0,0	240,8	80,8	92,6	396,9	334,4	431,1	377,2	397,8	740,7
379,0	3,0	0,0	7,2	0,0	240,1	80,6	92,7	394,8	334,5	431,0	376,8	397,6	739,3
380,0	3,0	0,0	7,2	0,0	239,5	80,5	92,8	392,5	334,6	430,8	376,6	397,3	736,5
381,0	3,0	0,0	7,2	0,0	239,1	80,1	92,9	389,6	334,7	430,7	376,3	397,0	734,6
382,0	2,9	0,0	7,1	0,0	238,4	80,6	92,9	387,3	334,7	430,6	375,9	396,8	734,5
383,0	2,9	0,0	7,1	0,0	238,0	80,9	92,8	385,1	334,9	430,4	375,6	396,6	734,4
384,0	2,9	0,0	7,1	0,0	237,9	80,5	92,7	382,7	335,0	430,2	375,2	396,3	734,3
385,0	2,9	0,0	7,1	0,0	236,9	80,8	92,8	380,2	335,1	429,9	374,8	396,1	733,7
386,0	2,8	0,0	7,0	0,0	236,2	81,1	92,7	377,9	335,2	429,4	374,4	395,9	730,9
387,0	2,8	0,0	7,1	0,0	235,7	80,6	92,6	375,8	335,3	429,1	373,9	395,8	727,9
388,0	2,8	0,0	7,0	0,0	234,9	81,0	92,6	373,5	335,2	428,7	373,4	395,6	726,1
389,0	2,8	0,0	7,0	0,0	234,8	80,6	92,6	371,3	335,2	428,2	372,9	395,4	724,7
390,0	2,8	0,0	7,0	0,0	234,4	80,5	92,5	369,1	335,0	427,9	372,4	395,2	724,3
391,0	2,8	0,0	7,0	0,0	234,3	80,7	92,3	367,0	335,0	427,5	371,8	395,1	722,9
392,0	2,7	0,0	7,0	0,0	234,2	80,3	92,4	364,9	335,0	427,0	371,3	395,0	721,5
393,0	2,7	0,0	7,0	0,0	233,6	80,0	92,3	362,8	335,0	426,5	370,8	394,9	720,4
394,0	2,7	0,0	7,0	0,0	233,2	80,1	92,2	360,9	334,8	426,1	370,2	394,8	719,7
395,0	2,7	0,0	7,0	0,0	232,9	80,0	92,2	358,8	334,8	425,5	369,6	394,8	718,5
396,0	2,7	0,0	7,0	0,0	232,5	80,1	92,0	356,9	334,6	425,0	368,9	394,8	717,3
397,0	2,7	0,0	7,0	0,0	232,2	79,9	91,8	354,7	334,3	424,7	368,2	394,7	716,2
398,0	2,7	0,0	6,9	0,0	231,8	80,0	91,8	352,8	334,3	424,3	367,8	394,7	714,9
399,0	2,6	0,0	6,9	0,0	231,3	79,9	91,9	351,3	334,2	423,8	367,2	394,7	712,6
400,0	2,6	0,0	7,0	0,0	230,8	79,4	91,8	349,3	334,0	423,2	366,7	394,7	710,3
401,0	2,6	0,0	6,9	0,0	230,4	79,4	91,9	347,6	333,8	422,9	366,0	394,6	707,3
402,0	2,6	0,0	6,9	0,0	229,7	79,5	91,8	345,8	333,5	422,5	365,1	394,5	704,6
403,0	2,6	0,0	6,9	0,0	229,3	79,7	91,7	344,0	333,4	422,2	364,8	394,4	703,7
404,0	2,6	0,0	6,8	0,0	228,9	79,6	91,7	342,5	333,4	421,7	364,2	394,4	701,5
405,0													

416,0	2,4	0,0	6,8	0,0	224,1	80,4	91,6	324,0	330,9	417,2	358,1	394,2	689,3
417,0	2,4	0,0	6,8	0,0	223,5	80,3	91,6	322,6	330,7	416,8	357,6	394,2	687,3
418,0	2,4	0,0	6,8	0,0	222,8	80,1	91,7	321,4	330,4	416,5	357,3	394,3	686,0
419,0	2,3	0,0	6,8	0,0	223,1	80,3	91,7	319,9	330,1	416,1	356,8	394,3	686,1
420,0	2,3	0,0	6,8	0,0	222,4	80,0	91,5	318,5	329,9	415,9	356,4	394,4	685,4
421,0	2,3	0,0	6,8	0,0	221,9	80,2	91,6	317,3	329,7	415,6	355,9	394,5	682,9
422,0	2,3	0,0	6,8	0,0	221,8	80,7	91,3	316,3	329,6	415,4	355,5	394,6	680,8
423,0	2,3	0,0	6,8	0,0	220,8	80,6	91,3	315,4	329,4	415,0	355,2	394,7	680,4
424,0	2,3	0,0	6,8	0,0	220,9	80,5	91,4	314,0	329,1	414,7	354,9	394,8	680,2
425,0	2,2	0,0	6,8	0,0	220,5	80,3	91,2	312,7	329,0	414,4	354,3	395,0	681,6
426,0	2,2	0,0	6,8	0,0	220,2	80,2	91,1	311,5	328,7	414,1	354,2	395,2	683,8
427,0	2,2	0,0	6,9	0,0	220,4	79,9	91,2	310,4	328,5	413,9	353,9	395,4	685,7
428,0	2,2	0,0	6,9	0,0	220,4	80,0	91,4	309,5	328,3	413,6	353,4	395,6	687,9
429,0	2,2	0,0	6,9	0,0	220,4	80,0	91,3	308,4	328,1	413,4	353,0	395,7	688,5
430,0	2,2	0,0	6,9	0,0	220,8	80,0	91,0	307,5	328,0	413,2	352,6	395,9	690,4
431,0	2,1	0,0	7,0	0,0	220,6	79,8	91,3	306,6	328,1	413,2	352,0	396,1	692,3
432,0	2,1	0,0	7,1	0,0	220,6	79,6	91,2	305,6	327,7	413,0	351,5	396,2	693,4
433,0	2,1	0,1	7,1	0,0	221,0	79,7	91,2	304,4	327,6	412,8	351,3	396,4	693,0
434,0	2,1	0,1	7,1	0,0	220,7	79,9	91,2	303,4	327,5	412,7	350,8	396,5	693,9
435,0	2,1	0,1	7,1	0,0	221,0	79,5	91,2	302,3	327,3	412,8	350,4	396,7	693,8
436,0	2,1	0,1	7,2	0,0	220,6	79,7	91,1	301,6	327,2	412,7	350,0	396,9	695,4
437,0	2,0	0,1	7,2	0,0	221,0	79,7	91,1	301,0	327,2	412,6	349,3	397,1	695,8
438,0	2,0	0,1	7,2	0,0	220,8	79,8	91,1	300,3	327,2	412,5	348,9	397,2	693,7
439,0	2,0	0,0	7,3	0,0	220,5	79,7	91,2	299,5	326,8	412,5	348,5	397,3	692,9
440,0	2,0	0,0	7,3	0,0	219,9	79,5	91,0	298,7	326,7	412,6	348,0	397,3	692,5
441,0	2,0	0,0	7,3	0,0	219,7	79,6	91,1	297,9	326,5	412,6	347,8	397,3	692,7
442,0	1,9	0,0	7,2	0,0	219,8	79,4	91,2	297,5	326,4	412,7	347,2	397,4	691,9
443,0	1,9	0,0	7,2	0,0	219,9	79,4	91,1	296,7	326,3	412,7	346,6	397,5	690,9
444,0	1,9	0,0	7,2	0,0	219,2	79,5	91,2	296,2	326,4	412,8	346,5	397,6	689,9
445,0	1,9	0,0	7,2	0,0	219,5	79,3	90,9	295,2	326,3	412,7	346,1	397,5	689,1
446,0	1,9	0,0	7,2	0,0	219,2	79,3	90,7	295,0	326,2	412,9	345,9	397,4	688,5
447,0	1,9	0,0	7,2	0,0	218,8	79,4	90,8	294,4	326,1	412,9	345,3	397,4	686,2
448,0	1,8	0,0	7,2	0,0	218,3	79,8	90,8	293,9	326,2	413,0	345,2	397,5	685,1
449,0	1,8	0,0	7,2	0,0	218,5	79,4	90,6	293,3	326,0	413,2	345,0	397,6	684,5
450,0	1,8	0,0	7,3	0,0	217,9	79,4	90,8	293,0	326,0	413,3	344,6	397,5	678,0
451,0	1,8	0,0	7,7	0,0	216,8	79,2	90,7	292,4	326,0	413,5	344,5	397,1	671,3
452,0	1,8	0,0	7,6	0,0	215,9	79,4	90,7	292,2	325,9	413,5	344,2	396,7	666,2
453,0	1,8	0,0	7,5	0,0	215,1	79,5	90,7	291,7	326,0	413,4	343,9	396,4	662,3
454,0	1,7	0,0	7,4	0,0	214,2	79,8	90,7	291,1	326,1	413,2	343,8	396,1	659,3
455,0	1,7	0,0	7,3	0,0	214,2	79,6	90,6	290,5	326,2	413,1	343,6	395,9	658,0
456,0	1,7	0,0	7,2	0,0	213,5	79,6	90,6	290,0	326,1	412,9	343,4	395,7	657,3
457,0	1,7	0,0	7,1	0,0	212,5	80,0	90,4	289,5	326,2	412,8	343,3	395,5	656,5
458,0	1,7	0,0	7,1	0,0	212,3	79,7	90,4	288,9	326,2	412,5	343,2	395,2	656,7
459,0	1,6	0,0	7,1	0,0	212,0	79,8	90,3	288,1	326,2	412,3	343,2	395,0	656,9
460,0	1,6	0,0	7,0	0,0	211,6	79,7	90,3	287,5	326,2	412,1	343,3	394,8	657,2
461,0	1,6	0,0	7,0	0,0	211,4	79,6	90,2	286,9	326,3	411,7	343,1	394,7	657,0
462,0	1,6	0,0	7,0	0,0	211,1	79,5	90,2	286,2	326,1	411,4	343,1	394,6	656,5
463,0	1,6	0,0	7,0	0,0	211,3	79,3	90,2	285,5	326,2	411,0	343,0	394,5	657,6
464,0	1,6	0,0	6,9	0,0	211,4	79,2	90,2	284,9	326,1	410,5	342,8	394,3	658,7
465,0	1,6	0,0	7,0	0,0	211,5	79,1	90,0	284,4	326,0	410,3	342,8	394,2	657,6
466,0	1,5	0,0	6,9	0,0	211,5	79,3	89,9	283,8	325,9	409,8	342,5	394,1	657,6
467,0	1,5	0,0	6,9	0,0	211,4	79,4	89,9	283,0	325,9	409,5	342,5	393,9	658,1
468,0	1,5	0,0	6,8	0,0	211,2	79,2	89,9	282,5	325,7	409,1	342,4	393,8	658,1
469,0	1,5	0,0	6,8	0,0	210,9	78,8	89,8	281,6	325,6	408,6	342,2	393,6	657,8
470,0	1,5	0,0	6,8	0,0	210,9	79,1	89,9	281,1	325,5	408,3	342,3	393,5	658,0
471,0	1,5	0,0	6,8	0,0	211,0	78,9	90,2	280,2	325,2	407,8	342,3	393,4	658,2
472,0	1,4	0,0	6,8	0,0	210,7	79,5	90,1	279,7	325,3	407,2	342,2	393,4	657,6
473,0	1,4	0,0	6,8	0,0	211,0	79,2	90,0	279,0	325,1	406,6	342,0	393,3	657,3
474,0	1,4	0,0	6,8	0,0	211,2	79,2	90,1	278,1	324,8	406,1	341,9	393,2	658,1
475,0	1,4	0,0	6,8	0,0	211,2	79,0	90,1	277,4	324,6	405,7	341,6	393,1	659,1
476,0	1,4	0,0	6,7	0,0	211,0	79,2	90,0	276,8	324,4	405,4	341,4	393,0	659,8
477,0	1,4	0,1	6,7	0,0	210,9	78,9	90,0	276,2	324,2	404,9	341,2	392,9	659,8
478,0	1,3	0,0	6,7	0,0	211,0	78,9	90,0	275,4	324,1	404,4	341,0	392,9	660,3
479,0	1,3	0,1	6,7	0,0	210,9	78,8	90,1	274,8	324,0	403,8	340,9	392,8	664,2
480,0	1,3	0,1	6,8	0,0	210,8	79,0	90,2	274,5	323,7	403,3	340,9	392,7	663,6
481,0	1,3	0,1	6,7	0,0	211,3	79,0	90,1	273,6	323,5	402,8	340,7	392,6	663,1
482,0	1,3	0,1	6,7	0,0	211,6	79,1	89,8	272,9	323,2	402,4	340,5	392,6	663,3
483,0	1,3	0,1	6,7	0,0	211,8	79,0	90,1	272,8	323,1	401,9	340,2	392,6	663,4
484,0	1,3	0,1	6,7	0,0	211,9	79,1	90,1	272,0	322,8	401,5	340,1	392,6	663,3
485,0	1,3	0,1	6,7	0,0	212,1	79,0	90,0	271,4	322,6	401,0	339,7	392,6	664,1
486,0	1,2	0,1	6,8	0,0	211,9	78,9	89,9	270,8	322,1	400,7	339,5	392,6	663,9
487,0	1,2	0,1	6,7	0,0	212,3	79,0	89,9	270,0	322,0	400,2	339,1	392,6	664,1
488,0	1,2	0,1	6,7	0,0	211,9	78,9	89,9	269,9	321,9	399,7	338,9	392,7	663,7
489,0	1,2	0,1	6,7	0,0	212,7	79,0	89,9	269,5	321,6	399,3	338,7	392,7	660,9
490,0	1,2	0,0	6,9	0,0	211,7	78,8	89,7	269,1	321,4	399,0	338,5	392,7	639,8
491,0	1,2	0,0	7,4	0,0	210,3	78,8	89,7	268,6	321,0	398,7	338,2	392,4	625,7
492,0	1,1	0,0	7,4	0,0	208,7	78,9	89,9	268,1	320,9	398,4	338,1	392,2	619,2
493,0	1,1	0,0	7,3	0,0	207,4	79,0	89,7	267,5	320,8	398,1	338,0	391,9	617,6
494,0	1,1	0,0	7,1	0,0	206,4	79,0	89,8	267,3	320,6	397,9	337,7	391,7	618,6
495,0	1,1	0,0	7,1	0,0	205,8	78,9	89,8	267,0	320,3	398,0	337,5	391,5	618,9
496,0	1,1	0,0	7,0	0,0	205,0	78,8	89,7	266,4	320,2	398,1	337,3	391,4	618,6
497,0	1,1	0,0	6,9	0,0	204,7	78,7	89,6	265,9	320,0	398,2	337,1	391,3	619,9
498,0	1,0	0,0	6,8	0,0	203,5	78,8	89,9	265,6	320,0	397,9	336,9	391,0	622,1
499,0	1,0	0,0	6,9	0,0	202,8	78,6	89,8	265,2	319,9	397,9	336,7	390,6	623,8
500,0	1,0	0,0	6,8	0,0	202,0	78,6	89,8	264,7	319,6	397,8	336,5	390,1	626,2
501,0	1,0	0,0	6,7	0,0	201,4	78,6	89,7	264,2	319,2	397,9	336,1	389,4	627,6
502,0	1,0	0,0	6,6	0,0	201,2	78,8	89,6	263,7	319,0	398,0	335,9	388,8	627,7
503,0	1,0	0,0	6,6	0,0	201,3	78,5	89,7	262,9	318,7	397,9	335,5	388,1	629,0
504,0	1,0	0,0	6,6	0,0	201,1	78,8	89,6	262,5	318,5	397,8	335,4	387,5	631,0
505,0	0,9	0,0	6,5	0,0	201,1	78,7	89,6	261,9	318,3	397,6	335,1	387,0	633,3
506,0	0,9	0,0	6,5	0,0	200,9	78,8	89,6	261,5	318,1	397,3	335,0	386,4	634,4
507,0	0												

518,0	0,8	0,0	6,3	0,0	200,5	78,5	89,4	255,4	313,6	393,0	331,8	381,3	632,3
519,0	0,8	0,1	6,3	0,0	200,1	78,9	89,4	254,9	313,1	392,8	331,4	381,2	633,3
520,0	0,7	0,1	6,3	0,0	200,5	79,0	89,4	254,6	312,7	392,5	331,0	381,2	633,4
521,0	0,7	0,1	6,2	0,0	201,0	78,8	89,3	254,1	312,3	392,0	330,7	381,2	634,3
522,0	0,7	0,1	6,2	0,0	201,0	78,6	89,2	253,6	311,8	391,7	330,3	381,2	634,5
523,0	0,7	0,1	6,2	0,0	201,0	78,7	89,1	253,2	311,5	391,3	329,9	381,2	635,0
524,0	0,7	0,1	6,2	0,0	201,2	78,9	89,2	252,9	311,3	390,9	329,7	381,3	635,3
525,0	0,7	0,1	6,2	0,0	201,1	79,0	89,2	252,6	311,0	390,4	329,4	381,3	635,0
526,0	0,7	0,1	6,2	0,0	201,0	79,1	89,2	252,4	310,6	389,9	329,0	381,3	634,5
527,0	0,6	0,1	6,2	0,0	201,1	78,8	89,3	252,0	310,3	389,5	328,7	381,3	635,4
528,0	0,6	0,1	6,2	0,0	201,9	79,0	89,3	251,7	310,0	389,0	328,2	381,2	637,7
529,0	0,6	0,1	6,2	0,0	202,3	78,7	89,4	251,3	309,8	388,5	327,9	381,2	637,8
530,0	0,6	0,1	6,2	0,0	202,5	78,6	89,2	250,9	309,3	388,1	327,6	381,2	636,9
531,0	0,6	0,1	6,2	0,0	202,6	78,8	89,2	250,5	309,0	387,7	327,1	381,2	631,5
532,0	0,6	0,0	6,2	0,0	201,8	78,6	89,1	250,1	308,7	387,3	326,8	381,3	622,7
533,0	0,6	0,0	6,2	0,0	201,0	78,5	89,1	249,7	308,4	386,9	326,3	381,4	618,7
534,0	0,6	0,0	6,2	0,0	200,5	78,4	89,0	249,3	308,0	386,6	325,9	381,5	616,5
535,0	0,5	0,0	6,1	0,0	200,1	78,7	89,2	249,1	307,8	386,1	325,6	381,6	614,8
536,0	0,5	0,0	6,1	0,0	199,5	78,7	89,2	249,0	307,6	385,6	325,3	381,7	615,4
537,0	0,5	0,0	6,1	0,0	199,3	78,6	89,1	248,6	307,2	385,1	324,9	381,8	615,9
538,0	0,5	0,0	6,1	0,0	199,0	78,5	89,1	248,1	306,9	384,6	324,5	381,9	616,6
539,0	0,5	0,1	6,1	0,0	199,4	78,5	89,0	247,8	306,6	384,2	324,2	382,0	618,6
540,0	0,5	0,1	6,1	0,0	199,0	78,6	88,9	247,5	306,3	383,8	323,9	382,1	619,8
541,0	0,5	0,1	6,1	0,0	199,4	78,6	89,0	247,2	306,1	383,3	323,6	382,1	620,8
542,0	0,5	0,1	6,1	0,0	199,7	78,3	89,0	247,1	305,7	382,8	323,3	382,1	621,7
543,0	0,5	0,1	6,1	0,0	199,7	78,5	89,0	246,9	305,4	382,4	322,9	382,1	622,5
544,0	0,4	0,1	6,1	0,0	199,9	78,5	89,1	246,5	305,2	381,9	322,6	382,0	623,6
545,0	0,4	0,1	6,1	0,0	200,3	78,4	89,0	246,2	304,8	381,5	322,2	381,9	624,8
546,0	0,4	0,1	6,0	0,0	200,3	78,5	89,0	246,0	304,5	381,1	321,7	381,8	624,6
547,0	0,4	0,1	6,0	0,0	200,4	78,4	89,1	245,7	304,2	380,6	321,4	381,7	623,4
548,0	0,4	0,1	6,0	0,0	200,3	78,5	89,0	245,4	303,9	380,2	321,0	381,6	623,2
549,0	0,4	0,1	6,0	0,0	200,4	78,5	88,9	245,1	303,6	379,8	320,6	381,5	623,1
550,0	0,4	0,1	6,0	0,0	200,4	78,6	88,7	244,9	303,3	379,5	320,3	381,4	623,8
551,0	0,4	0,1	6,0	0,0	200,1	78,4	88,8	244,7	303,0	379,1	320,1	381,4	623,4
552,0	0,3	0,1	6,0	0,0	200,2	78,5	88,9	244,2	302,8	378,8	319,5	381,4	623,6
553,0	0,3	0,1	6,0	0,0	200,0	78,7	88,9	243,9	302,4	378,4	319,2	381,3	624,3
554,0	0,3	0,1	6,0	0,0	200,1	78,7	88,9	243,8	302,1	378,0	318,8	381,3	627,5
555,0	0,3	0,1	6,0	0,0	200,5	78,4	88,8	243,7	301,9	377,7	318,5	381,3	630,9
556,0	0,3	0,1	6,0	0,0	200,7	78,5	88,8	243,4	301,6	377,2	318,1	381,2	633,4
557,0	0,3	0,1	6,0	0,0	201,2	78,3	88,6	243,2	301,2	376,8	317,6	381,2	634,0
558,0	0,3	0,1	6,0	0,0	201,5	78,4	88,7	242,6	300,9	376,5	317,2	381,0	634,2
559,0	0,2	0,1	6,0	0,0	201,4	78,6	88,7	242,4	300,7	376,1	317,0	380,9	636,3
560,0	0,2	0,1	5,9	0,0	202,2	78,4	88,7	242,1	300,3	375,8	316,6	380,7	638,8
561,0	0,2	0,1	5,9	0,0	202,4	78,7	88,7	241,8	300,2	375,4	316,3	380,4	639,7
562,0	0,2	0,1	5,9	0,0	202,6	78,7	88,8	241,7	299,8	375,0	316,0	380,2	639,2
563,0	0,2	0,1	5,8	0,0	203,1	78,4	88,8	241,2	299,5	374,5	315,5	379,8	638,4
564,0	0,2	0,1	5,8	0,0	203,2	78,5	88,6	240,7	299,2	374,2	315,2	379,5	638,0
565,0	0,2	0,1	5,8	0,0	203,1	78,5	88,7	240,8	299,0	373,6	314,9	379,2	637,3
566,0	0,2	0,1	5,8	0,0	203,2	78,5	88,6	240,5	298,8	373,1	314,5	378,9	636,8
567,0	0,2	0,1	5,8	0,0	203,2	78,4	88,6	240,3	298,3	372,7	314,1	378,6	639,7
568,0	0,1	0,1	5,8	0,0	203,7	78,3	88,7	240,1	298,1	372,1	313,6	378,4	639,2
569,0	0,1	0,1	5,7	0,0	204,0	78,6	88,7	240,0	297,8	371,5	313,3	378,1	639,5
570,0	0,1	0,1	5,7	0,0	204,2	78,7	88,7	239,9	297,6	370,9	312,9	377,9	639,2
571,0	0,1	0,1	5,8	0,0	203,9	78,4	88,7	239,5	297,2	370,3	312,5	377,7	635,3
572,0	0,1	0,1	6,0	0,0	204,5	78,3	88,6	239,3	296,8	369,8	312,1	377,5	640,6
573,0	0,1	0,1	6,2	0,0	205,5	78,2	88,6	239,3	296,6	369,2	311,6	377,5	647,7
574,0	0,0	0,1	6,2	0,0	206,4	78,2	88,6	239,0	296,2	368,6	311,1	377,5	652,2

Manufacturer: HEARTHSTONE
Model: 8024 HERITAGE

Run: 2
Project #: PI 20176
Test Duration: 358 min

	HHV	LHV
Eff	79,82%	86,27%
Comb Eff	99,22%	99,22%
HT Eff	80,44%	86,94%
Output	15 259	kJ/h
Burn Rate	0,97	kg/h
Grams CO	89	g
Input	19 118	kJ/h
MC wet	17,56	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

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

Overall Heating Efficiency:	79,82%	Air Fuel Ratio (A/F)	
Combustion Efficiency:	99,22%	Dry Molecular Weight (M _d)	29,78
Heat Transfer Efficiency:	80,44%	Dry Moles Exhaust Gas (N _e):	470,80
		Air Fuel Ratio (A/F)	13,51

Heat Output:	14 475 Btu/h	15 259 kJ/h
Heat Input:	18 136 Btu/h	19 118 kJ/h
Burn Duration:	5,97 h	
Burn Rate:	2,13 lb/h	0,965 kg/h
Stack Temp:	257,8 Deg. F	125,4 Deg. C

PRE / POST CHECKS

 Date: 2018-09-11

 Manufacturer: Hearthstone

 Model: 8026 Heritage

 Project #: PT 20176

 Run: 2

 Tech: MM

 Reviewer: JP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-191	7:00	ok	ok

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check.....

Picture.....

Pre-Test		Post-Test	
0	(max50 Fpm)	0	(max50 Fpm)
ok		ok	
4 sides	ok	ok	

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O).....

Traverse before ignition.....

 Flow Rate 140 cfm $\pm$ 10%.....

2018-09-10
2018-09-10
ok
ok

ok

Temperature System:

Ambient (65°-90°F).....

 Wood Heater Surface ($\pm$ 125°F).....

ok	°F
ok	°F

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

ok
ok
ok

Sampling Train ID Numbers:

Probe.....

Filter Front.....

Filter Back.....

Filter Thermocouple.....

Filter (<90°F).....

Train 1 st hour	Train 1	Train 2
07	17	3a
07	0a	618
08	417	61a
h	11	12
ok	ok	ok

MM

SAMPLING EQUIPMENT CHECK OUT

Date: 2018-09-11 Manufacturer: Hearthstone Model: 8024
 Project #: PT 20176 Run: 2 Tech: MM Reviewer: DP

Leakage Checks Tunnel Samplers

	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	76345,92	76345,66	76345,10	76345,72	715288,17	716982,94
Initial 1minute DGM (Liter)	76345,82	76345,55	76345,10	76345,72	715288,16	716982,94
Change © (Liter)	010	001	0	0	001	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

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

PRE-TEST SCALE AUDIT

Date: 2018-09-11 Manufacturer: Hearthstone Model: 8024 Heritage
 Project #: PI 2176 Run: 2 Tech: mm Reviewer: DP

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



FOR TUNNELS < 12 in

M TP-EPA – V11 – June 2017

CONTINUOUS ANALYZERS

 Date: 2018-09-11

 Manufacturer: Hearthstone

 Model: 8024 Heritage

 Project #: PI 20176

 Run: 2

 Tech: MM

 Reviewer: DP
Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2963	100 300	1005	1000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	1784	1800	974	1000
Tolerance CO ₂		+/- 0.02		+/- 0.5		+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0005	2970	1001	0005	0.02	0007	0.15	0004	0.05	✓	
CO ₂	000	1780	980	0	0.02	006	0.5	006	0.5	✓	

TEST DATA LOG

Date: 2018-09-11 Manufacturer: Healthstone Model: 8024 Heritage
 Project #: PI 20176 Run: 2 Tech: MM Reviewer: DO

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	763 450, 70	716 981, 99	785, 69
Initial (Liter)	761 718, 35	7152 89, 05	649, 53

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101,6	101,5
Dry Bulb (F):	77,18	83,66
Humidity (%):	48	45,6

Flow Meter

	Start	End
Flow meter reading	NA	NA

Flow Meter Verification

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

FUEL DATA

Date: 2018-02-11 Manufacturer: Heartland Model: 8004 Heritage
 Project #: PI 20176 Run: 2 Tech: MR 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 18 in.	1702 lbs.	20.6	20.4	21.0	20.6	20.7		
1 1/2 x 3 1/2 x 18 in.	1654 lbs.	20.8	20.4	20.9	20.8	20.7		
1 1/2 x 3 1/2 x 18 in.	1702 lbs.	20.7	20.5	20.3	20.4	20.6		
1 1/2 x 3 1/2 x 18 in.	1740 lbs.	20.9	20.3	20.2	20.2	20.4		
1 1/2 x 3 1/2 x 12 in.	1204 lbs.	20.7	20.6	20.5	20.9	20.8		
1 1/2 x 3 1/2 x 12 in.	1138 lbs.	19.7	19.6	19.9	19.7	19.8		
1 1/2 x 3 1/2 x 12 in.	1500 lbs.	21.0	21.3	21.3	21.4	21.5		
1 1/2 x 3 1/2 x 12 in.	1480 lbs.	21.0	21.8	21.3	21.4	21.6		
1 1/2 x 3 1/2 x 12 in.	1452 lbs.	21.8	21.9	21.5	21.2	21.9		
1 1/2 x 3 1/2 x 12 in.	1392 lbs.	21.6	21.9	21.4	21.0	20.3		
1 1/2 x 3 1/2 x 12 in.	1540 lbs.	20.2	20.3	20.4	20.5	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.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							

TEST LOAD WEIGHT: 1650 lbs

FUEL DATA

Date: 2018-09-11 Manufacturer: Hearthstone Model: 8004 Heritage
 Project #: PI 20176 Run: 2 Tech: M.M. Reviewer: DO

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2" x 3 1/2" x 17 in.	1822 lbs.	21.9	21.3	20.0	21.2	21.6
1 1/2" x 3 1/2" x 17 in.	1672 lbs.	21.5	21.8	21.4	21.6	21.9
1 1/2" x 3 1/2" x 17 in.	1616 lbs.	22.3	22.0	22.1	21.9	21.3
3 1/2" x 3 1/2" x 17 in.	427 lbs.	22.1	22.0	21.8	21.9	21.3
3 1/2" x 3 1/2" x 17 in.	414 lbs.	20.8	20.6	20.9	20.3	20.9
1 1/2" x 3 1/4" x 5 in.	0 118 lbs.			20.6		
1 1/2" x 3 1/4" x 5 in.	0 102 lbs.			20.3		
1 1/2" x 3 1/4" x 5 in.	0 106 lbs.			20.4		
1 1/2" x 3 1/4" x 5 in.	0 122 lbs.			20.5		
1 1/2" x 3 1/4" x 5 in.	0 106 lbs.			20.8		
1 1/2" x 3 1/4" x 5 in.	0 122 lbs.			20.1		
1 1/2" x 3 1/4" x 5 in.	0 112 lbs.			20.6		
1 1/2" x 3 1/4" x 5 in.	0 126 lbs.			20.3		
1 1/2" x 3 1/4" x 5 in.	0 118 lbs.			20.9		
1 1/2" x 3 1/4" x 5 in.	0 120 lbs.			20.5		
1 1/2" x 3 1/4" x 5 in.	0 120 lbs.			20.6		
1 1/2" x 3 1/4" x 5 in.	0 126 lbs.			20.9		
1 1/2" x 3 1/4" x 5 in.	0 116 lbs.			20.8		
1 1/2" x 3 1/4" x 5 in.	0 118 lbs.			20.1		
1 1/2" x 3 1/4" x 5 in.	0 110 lbs.			20.3		
1 1/2" x 3 1/4" x 5 in.	0 120 lbs.			20.2		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 1538 lbs Min 20%: 308 Max 25%: 385

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-09-10 Manufacturer: Hearshesdon Model: 8024 Heritage

Project #: PI 20176 Run: 2 Tech: MM Reviewer: DP

		SYSTEM 1 - 1 st 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	Blanc		
Date	Time	07	07	08	20	17	09	417	29	640	
20180910	18:15	614759	01271	01253	340702	1089496	01262	01269	338688	01251	
20180911	10:00	614758	01271	01253	340704	1089497	01263	01269	338688	01252	

		SYSTEM 1 - 1 st 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	Blank	
Date	Time	07	07	08	20	17	09	417	29	640
2018-09-11	17:15	614762	01271	01253	340848	108.9500 108.9499	01255	01270	33.8838	0.1255
2018-09-17	8:00	614760	01270	01252	340709	108.9499 108.9499	01254	01269	33.8698	0.1254
2018-09-21	8:00	614760	01270	01252	34.0709	108.9499	0.1254	0.1269	33.8698	0.1253

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-09-10 Project #: PI 20176 Run: 2 Manufacturer: Heartsong Model: 8024 Heritage
 Tech: MM Reviewer: DO

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2018-09-10	18:15	110 2775	01286	01266	33 4936
2018-09-11	10:00	110 2775	01286	01266	33 4935

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2018-09-11	17:15	110 2779	01285	01266	33 5085
2018-09-17	8:00	110 2776	01285	01265	33 4942
2018-09-21	8:00	110 2776	01286	01266	33 4942

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	12-09-2018
Technicien	M.M
Project #	PI 20176

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8024 HERITAGE	
Combustion system	Cat	
Appliance type	WOODSTOVE	
Firebox volume	2,18	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,988	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,991	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,996	Dimensionless
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	300	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20176
Date	12-09-2018
Technicien	M.M

Fuel data

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

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

	Start	End
Barometer (kPa):	102	102
Barometer (in.Hg):	30,120589	30,12058866
Dry Bulb (F):	75,38	85,28
Humidity (%):	62	41,2
Air velocity (ft/min)	0	0

DGM #1	Final:	27001,089	cuft
	Initial:	26961,078	cuft
DGM #2	Final:	25358,888	cuft
	Initial:	25320,058	cuft

DGM room	
----------	--

Final:	764585,680	Liter
Initial:	763452,680	Liter
Final:	718083,730	Liter
Initial:	716984,180	Liter

Final:	876,210	cuft
Initial:	785,690	cuft

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

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

Project nu.	PI 20176
Date	12-09-2018
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
13,7	15,3	16,8

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

Load Volume: cu. ft

Loading Density: 7,0 lbs./ft3

Number of Spaces:	16
Spacer weight:	lbs

Load Density (wet): 30,5 lbs./ft3
Dry Wood Density: 25,1 lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content					Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %					Weight	Cubic Inches	%
1,5	3,5	17	1,80	22,00	22,60	21,90	21,00	21,80	39,30428	89,25	21,9
1,5	3,5	17	1,68	21,80	21,90	22,00	21,90	21,80	36,7584	89,25	21,9
1,5	3,5	17	1,58	21,50	21,90	21,80	21,80	21,90	34,4124	89,25	21,8
3,5	3,5	17	4,23	21,90	21,80	21,90	21,50	21,80	92,08584	208,25	21,8
3,5	3,5	17	4,09	21,30	21,60	21,40	21,90	21,60	88,1804	208,25	21,6
1,5	0,75	5	0,11			20,10			2,1708	5,63	20,1
1,5	0,75	5	0,11			20,40			2,2848	5,63	20,4
1,5	0,75	5	0,12			20,60			2,4308	5,63	20,6
1,5	0,75	5	0,12			20,90			2,4662	5,63	20,9
1,5	0,75	5	0,12			20,70			2,484	5,63	20,7
1,5	0,75	5	0,12			20,30			2,436	5,63	20,3
1,5	0,75	5	0,11			21,00			2,394	5,63	21,0
1,5	0,75	5	0,11			21,10			2,2788	5,63	21,1
1,5	0,75	5	0,12			19,90			2,388	5,63	19,9
1,5	0,75	5	0,11			19,60			2,156	5,63	19,6
1,5	0,75	5	0,12			20,80			2,4128	5,63	20,8
1,5	0,75	5	0,12			20,50			2,46	5,63	20,5
1,5	0,75	5	0,11			20,50			2,337	5,63	20,5
1,5	0,75	5	0,11			20,30			2,2736	5,63	20,3
1,5	0,75	5	0,12			20,20			2,424	5,63	20,2
1,5	0,75	5	0,138			20,50			2,829	5,63	20,5
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	328,96712		20,8 %

Test Load Weight: 15,24 lbs.

Dry Weight: 5,69 kg.

Average Moisture Content: %

Dry:	21,58	Dry(EPA)	21,58
		Dry(B415)	21,58

21,58
Must be 19-25

Wet: 17,75
must be 15,2-22

Coal Bed Range: lbs. to

3,8 lbs.

TEST CHARGE:

Coal bed weight: 3,7

lbs.

Project nu.	PI 20176
Date	12-09-2018
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,2 in. H2O
 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=
0,971

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,060	76,91	0,2449
B center	0,061	76,94	0,2470
A1	0,048	76,82	0,2191
A2	0,070	76,97	0,2646
A3	0,051	76,99	0,2258
A4	0,049	76,93	0,2214
B1	0,050	76,990	0,2236
B2	0,072	77,000	0,2683
B3	0,062	77,020	0,2490
B4	0,050	77,020	0,2236
AVERAGE	0,0573	76,9590	0,2387

Project nu.	PI 20176
Date	12-09-2018
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	33	620	621	7	35	622	623	8	40	624	625	25	626		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	109,3626	0,1306	0,1259	33,8693	109,2859	0,1285	0,1257	34,4093	110,1099	0,1266	0,1270	33,6596	0,1274	2018-09-11	17:00
Before (6)	109,3625	0,1307	0,1259	33,8692	109,2859	0,1286	0,1257	34,4092	110,1101	0,1266	0,1270	33,6594	0,1274	2108-09-12	10:00
After (1)	109,3628	0,1307	0,1259	33,8821	109,2861	0,1280	0,1256	34,4213	110,1103	0,1266	0,1267	33,6726	0,1275	2018-09-12	15:00
After (2)	109,3626	0,1307	0,1257	33,8698	109,2859	0,1280	0,1256	34,4099	110,1102	0,1264	0,1266	33,6604	0,1275	2018-09-17	08:00
After (3)	109,3626	0,1307	0,1257	33,8698	109,2859	0,1280	0,1256	34,4099	110,1102	0,1264	0,1266	33,6604	0,1275	2018-09-21	08:00
After (4)															
After (5)															
After (6)	109,3626	0,1307	0,1257	33,8698	109,2859	0,1280	0,1256	34,4099	110,1102	0,1264	0,1266	33,6604	0,1275	2018-09-21	08:00
Difference	0,0001	0,0000	-0,0002	0,0006	0,0000	-0,0006	-0,0001	0,0007	0,0001	-0,0002	-0,0004	0,0010	0,0001		
Total (mg)		0,5				0,5				0,5			0,1		
Total ajusté (mg)		0,40				0,40				0,40					

Project nu.	PI 20176
Date	12-09-2018
Technicien	M.M

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,2 g/hr

Burn Rate : 1,428 Dry kg/hr

Test Duration: 239 min

PRESSURE FACTOR: DGM 1 0,98702
 DGM 2 0,99046
 DGM 3 1,00670

BAROMETRIC PRESSURE
 Average: 30,120589 in Hg
 Start: 30,120589 in Hg
 End: 30,120589 in Hg

TEMPERATURE FACTORS DGM 1 0,97248
 DGM 2 0,97249
 DGM 3 0,97917

DGM CONTROLLER VALUES

DGM 1 Final: 27001,089 Cuft
 Initial: 26961,078 Cuft

VOLUMES SAMPLED DGM 1 37,962 SCft
 DGM 2 37,080 SCft
 DGM 3 88,850 SCft

DGM 2 Final: 25358,888 Cuft
 Initial: 25320,058 Cuft

DGM #3 Final: 876,210 Cuft
 Initial: 785,690 Cuft

TOTAL TUNNEL VOLUME : 74147

TEMPERATURES

SAMPLE RATIOS
 Sample Train 1: 1953,159
 Sample Train 2: 1999,638

DGM 1 542,944 °R
 DGM 2 542,937 °R

Paticulate concentration
 Sample Train 1 0,000013 g/dscf
 Sample Train 2 0,000013 g/dscf
 Room 0,000001 g/dscf

CALIBRATION FACTORS

DGM 1 0,9885
 DGM 2 0,9914
 DGM #3 0,9958

TUNNEL FLOW RATE: 310,237 Dscfm

TOTAL EMISSIONS
 Sample Train 1 0,89 g
 Sample Train 2 0,92 g

PARTICULATE CATCH
 Total Sample Train 1: 0,50 mg
 Total Sample Train 2: 0,50 mg
 Total Sample Train 1 1st hour: 0,50 mg

EMISSION RATES
 Sample Train 1 0,22 g/hr
 Sample Train 2 0,23 g/hr

1st hour emission rate 0,98 g/hr

DEVIATION: 1,28%

Cs Train 1 Train 2
 1,317E-05 1,34844E-05

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*
Elapsed	Raw data row	Weight	CO	CO ₂	O ₂	Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst
Time		Remaining				Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F
0,00	199,00	15,2	0,0	5,5	0,0	326,9	77,0	112,4	410,5	414,1	474,7	437,1	702,8	505,8
1,0	200,0	15,1	0,3	8,4	0,0	341,6	77,0	99,6	408,9	415,0	474,0	435,4	687,1	683,1
2,0	201,0	15,1	0,0	3,7	0,0	360,8	77,3	99,4	407,4	415,6	472,9	432,8	672,3	726,1
3,0	202,0	15,0	0,0	4,4	0,0	374,0	77,6	98,9	406,0	415,7	471,0	429,3	658,4	745,5
4,0	203,0	14,8	0,0	5,5	0,0	389,2	77,4	99,3	404,1	415,1	468,4	425,1	645,7	764,8
5,0	204,0	14,7	0,0	7,7	0,0	371,3	77,2	97,0	402,6	413,9	465,1	420,7	634,0	770,9
6,0	205,0	14,7	0,0	5,0	0,0	357,3	77,0	95,6	400,8	412,1	461,4	415,8	623,3	741,6
7,0	206,0	14,6	0,0	4,5	0,0	352,3	77,7	96,1	400,2	409,8	457,4	411,1	613,4	754,2
8,0	207,0	14,5	0,0	7,1	0,0	354,6	77,9	96,1	399,5	407,1	453,1	406,4	604,3	802,4
9,0	208,0	14,4	0,0	5,8	0,0	357,0	77,7	95,6	398,6	404,2	448,9	401,5	595,8	792,2
10,0	209,0	14,3	0,0	5,7	0,0	360,6	77,4	95,7	398,1	401,1	444,8	396,7	588,0	817,7
11,0	210,0	14,2	0,0	5,5	0,0	361,7	77,9	96,5	397,5	397,9	440,6	392,5	580,7	844,8
12,0	211,0	14,1	0,0	5,9	0,0	364,5	78,1	96,9	397,4	394,6	436,4	388,1	574,1	853,5
13,0	212,0	14,0	0,0	6,2	0,0	368,5	78,0	96,6	397,0	391,3	432,3	383,8	568,1	877,7
14,0	213,0	13,9	0,0	5,9	0,0	368,8	77,9	96,7	396,6	388,1	428,2	379,6	562,7	857,1
15,0	214,0	13,8	0,0	6,4	0,0	369,1	77,8	97,1	396,7	384,8	424,3	375,6	557,6	825,0
16,0	215,0	13,7	0,0	5,6	0,0	370,0	77,8	97,6	395,9	381,5	420,5	371,5	552,4	811,6
17,0	216,0	13,6	0,0	6,1	0,0	373,6	78,0	97,1	395,5	378,2	416,9	367,6	547,2	824,1
18,0	217,0	13,5	0,0	6,4	0,0	375,9	78,0	97,3	395,1	375,2	413,3	364,1	542,2	842,7
19,0	218,0	13,4	0,0	6,2	0,0	377,1	77,9	97,7	394,3	372,1	409,8	360,9	537,5	831,6
20,0	219,0	13,3	0,0	8,0	0,0	380,2	77,1	98,0	393,9	369,0	406,3	357,4	533,1	871,8
21,0	220,0	13,2	0,1	7,2	0,0	383,2	77,5	98,0	393,1	366,0	403,1	354,4	529,1	854,1
22,0	221,0	13,0	0,0	9,8	0,0	385,6	77,6	98,4	393,3	363,2	400,0	351,7	525,6	864,1
23,0	222,0	12,9	0,0	8,6	0,0	386,7	77,6	98,6	394,0	360,4	397,1	349,3	522,6	862,9
24,0	223,0	12,8	0,0	8,6	0,0	389,1	77,7	98,8	394,8	357,8	394,6	347,1	520,0	895,3
25,0	224,0	12,6	0,0	8,9	0,0	395,2	77,8	99,2	396,3	355,1	392,4	345,2	517,6	945,6
26,0	225,0	12,5	0,2	11,7	0,0	397,1	77,9	99,0	398,1	352,7	390,5	343,7	515,1	932,3
27,0	226,0	12,4	0,0	9,5	0,0	396,1	77,8	98,6	399,5	350,3	388,9	342,4	512,5	930,2
28,0	227,0	12,3	0,0	8,6	0,0	398,8	77,4	97,8	401,1	348,1	387,3	340,4	510,3	929,2
29,0	228,0	12,1	0,0	10,1	0,0	397,9	77,8	98,4	404,2	345,9	386,2	340,1	508,3	917,6
30,0	229,0	12,0	0,0	9,5	0,0	395,2	77,6	97,9	405,9	344,6	385,3	339,6	506,5	919,9
31,0	230,0	11,9	0,0	8,6	0,0	395,6	78,0	97,5	407,6	343,2	384,3	339,1	504,8	942,9
32,0	231,0	11,8	0,0	8,2	0,0	398,6	78,0	97,4	409,1	341,3	383,4	338,7	503,1	948,8
33,0	232,0	11,7	0,0	8,5	0,0	398,6	77,7	97,7	410,9	339,3	382,7	338,2	501,4	940,9
34,0	233,0	11,6	0,0	8,9	0,0	398,2	78,0	97,9	412,5	337,9	381,9	338,0	499,6	917,8
35,0	234,0	11,5	0,0	9,4	0,0	397,6	78,1	98,0	414,0	336,2	381,4	337,8	497,8	918,3
36,0	235,0	11,3	0,0	9,7	0,0	394,9	78,1	98,1	415,5	334,8	380,9	337,8	495,8	904,7
37,0	236,0	11,2	0,0	9,7	0,0	393,7	77,9	98,0	417,1	333,4	380,3	338,2	493,8	901,1
38,0	237,0	11,1	0,0	9,5	0,0	391,6	78,3	98,0	418,6	332,0	380,0	338,6	491,8	912,1
39,0	238,0	11,0	0,0	9,5	0,0	391,9	78,6	98,1	419,7	330,5	379,6	339,1	490,0	914,2
40,0	239,0	10,8	0,0	9,8	0,0	393,4	78,8	98,2	421,4	329,2	379,4	339,6	487,8	921,1
41,0	240,0	10,7	0,0	10,5	0,0	395,0	78,6	98,4	422,9	328,0	379,2	340,3	485,6	927,5
42,0	241,0	10,6	0,0	11,0	0,0	396,1	78,3	98,2	423,6	326,8	379,5	341,0	483,5	929,8
43,0	242,0	10,5	0,0	11,2	0,0	395,5	78,6	98,4	424,8	325,8	380,1	342,1	481,8	927,2
44,0	243,0	10,3	0,0	11,3	0,0	395,8	78,6	98,5	426,8	324,7	380,9	343,3	480,3	927,8
45,0	244,0	10,2	0,0	11,2	0,0	395,4	78,6	98,4	429,0	323,7	382,4	344,5	478,9	922,1
46,0	245,0	10,1	0,0	11,1	0,0	395,2	78,7	98,4	430,8	323,1	383,7	346,3	477,5	923,6
47,0	246,0	9,9	0,0	11,0	0,0	394,5	78,9	98,2	432,7	322,3	385,2	348,1	476,1	926,3
48,0	247,0	9,8	0,0	10,9	0,0	395,1	78,8	98,2	434,4	321,5	387,0	350,0	474,6	934,2
49,0	248,0	9,7	0,0	11,0	0,0	396,1	78,6	98,2	436,6	320,9	388,9	351,5	473,2	940,5
50,0	249,0	9,6	0,0	11,2	0,0	396,2	78,9	98,4	438,3	320,5	390,7	353,9	471,7	944,5
51,0	250,0	9,4	0,0	11,3	0,0	397,6	79,2	98,6	440,4	320,2	392,4	355,9	470,3	944,5
52,0	251,0	9,3	0,0	11,5	0,0	398,4	79,1	99,0	442,3	319,9	394,3	358,0	468,9	946,8
53,0	252,0	9,2	0,0	11,6	0,0	399,4	79,2	99,0	444,4	319,5	396,1	360,1	467,6	951,3
54,0	253,0	9,1	0,0	11,7	0,0	400,9	79,1	98,7	446,3	319,3	398,1	362,3	466,3	953,2
55,0	254,0	8,9	0,0	11,8	0,0	401,9	79,0	99,1	448,8	319,1	400,0	364,4	465,1	954,1
56,0	255,0	8,8	0,0	12,0	0,0	402,6	78,8	98,8	450,5	319,0	402,2	366,5	463,8	959,2
57,0	256,0	8,7	0,0	11,9	0,0	403,5	78,6	99,1	453,0	318,9	404,4	368,8	462,5	961,9
58,0	257,0	8,5	0,0	12,0	0,0	403,8	79,2	99,0	455,4	319,0	406,6	371,4	461,1	963,3
59,0	258,0	8,4	0,0	11,9	0,0	405,1	79,3	98,9	456,5	319,2	408,5	374,0	459,7	964,1
60,0	259,0	8,3	0,0	12,0	0,0	405,4	79,4	99,0	459,6	319,3	410,6	376,8	458,2	964,5
61,0	260,0	8,1	0,0	11,9	0,0	405,3	79,3	99,2	462,4	319,4	412,9	379,4	456,6	964,4
62,0	261,0	8,0	0,0	11,9	0,0	405,9	79,1	99,3	464,6	319,5	415,4	382,1	455,0	968,8
63,0	262,0	7,9	0,0	11,9	0,0	405,5	79,2	99,2	466,8	319,8	417,8	384,9	453,4	971,0
64,0	263,0	7,8	0,0	11,9	0,0	405,3	79,1	99,4	469,1	320,3	420,3	387,9	451,7	973,6
65,0	264,0	7,7	0,0	11,9	0,0	405,2	79,2	99,3	471,1	320,6	422,6	390,6	450,0	973,3
66,0	265,0	7,5	0,0	11,8	0,0	404,3	79,5	99,3	473,1	321,0	424,9	393,1	448,3	973,9
67,0	266,0	7,4	0,0	11,9	0,0	403,4	79,3	99,0	474,8	321,5	427,0	395,9	446,6	978,5
68,0	267,0	7,3	0,0	11,8	0,0	402,4	79,5	99,1	475,9	321,8	429,2	398,2	444,9	967,6
69,0	268,0	7,2	0,1	11,6	0,0	402,0	79,7	99,0	478,3	322,5	431,7	400,5	443,1	972,7
70,0	269,0	7,1	0,1	11,9	0,0	402,3	79,8	99,0	480,1	323,0	434,2	402,8	441,3	973,1
71,0	270,0	7,0	0,1	11,8	0,0	402,7	79,7	99,1	481,9	323,7	436,8	405,3	439,5	973,0
72,0	271,0	6,9	0,1	11,7	0,0	401,1	79,9	99,0	483,5	324,4	439,2	407,5	437,7	971,2
73,0	272,0	6,7	0,1	11,7	0,0	400,7	80,0	98,9	485,1	325,0	441,8	409,9	436,1	971,6
74,0	273,0	6,6	0,0	11,7	0,0	400,4	79,9	99,0	486,3	325,7	444,2	412,3	434,5	976,6
75,0	274,0	6,5	0,0	12,5	0,0	400,5	80,0	99,0	488,0	326,4	446,6	414,3	432,9	974,9
76,0	275,0	6,4	0,0	11,9	0,0	399,5	80,0	99,0	489,4	327,2	449,0	416,4	430,8	965,1
77,0	276,0	6,3	0,0	11,6	0,0	399,0	80,0	98,9	491,1	327,9	451,4	418,5	428,3	962,9
78,0	277,0	6,2	0,1	11,7	0,0	399,9	80,0	99,2	492,4	328,7	453,8	420,7	425,5	977,4
79,0	278,0	6,1	0,0	12,6	0,0	400,6	80,1	98,9	494,4	329,3	456,1	422,7	422,8	982,7
80,0	279,0	6,0	0,0	12,6	0,0	401,1	80,2	99,1	496,4	330,2	458,4	424,9	420,2	989,2
81,0	280,0	5,9	0,0	12,5	0,0	402,7	80,1	98,9	498,0	331,0	460,6	427,3	417,8	996,5
82,0	281,0	5,8												

Manufacturer: HEARTHSTONE
Model: 8024 HERITAGE

Run: 3
Project #: PI 20176
Test Duration: 239

	min	
	HHV	LHV
Eff	76,56%	82,75%
Comb Eff	99,50%	99,50%
HT Eff	76,95%	83,17%
Output	21 591	kJ/h
Burn Rate	1,42	kg/h
Grams CO	23	g
Input	28 200	kJ/h
MC wet	17,75	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

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

		Air Fuel Ratio (A/F)	
Overall Heating Efficiency:	76,56%	Dry Molecular Weight (M _d)	29,83
Combustion Efficiency:	99,50%	Dry Moles Exhaust Gas (N _e):	454,12
Heat Transfer Efficiency:	76,95%	Air Fuel Ratio (A/F)	13,04

Heat Output:	20 482 Btu/h	21 591 kJ/h
Heat Input:	26 751 Btu/h	28 200 kJ/h
Burn Duration:	3,98 h	
Burn Rate:	3,14 lb/h	1,424 kg/h
Stack Temp:	346,2 Deg. F	174,5 Deg. C

PRE / POST CHECKS

 Date: 2018-09-10¹² mm

 Manufacturer: Hearthstone

 Model: 803H

 Project #: PI 20176

 Run: 3

 Tech: mm

 Reviewer: Heritage

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
Em-1a	7:00	ok	ok

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check.....

Picture.....

Pre-Test

Post-Test

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

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O).....

Traverse before ignition.....

Flow Rate 140 cfm ±10%.....

Temperature System:

Ambient (65°-90°F).....

Wood Heater Surface (±125°F).....

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

Sampling Train ID Numbers:

Probe.....

Filter Front.....

Filter Back.....

Filter Thermocouple.....

Filter (<90°F).....

2018-09-10
2018-09-10
ok
ok

ok

ok	°F
ok	°F

ok
ok
ok

Train 1 st hour	Train 1	Train 2
33	35	40
620	622	624
621	623	625
11	11	12
ok	ok	ok

SAMPLING EQUIPMENT CHECK OUT

 Date: 2018-09-12

 Manufacturer: Hearthstone

 Model: 8024 Heritage

 Project #: PI 20176

 Run: 3

 Tech: MM

 Reviewer: TR

Leakage Checks Tunnel Samplers

	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	763453.08	764586.65	763453.45	764586.74	716983.72	718084.67
Initial 1minute DGM (Liter)	763453.08	764586.64	763453.30	764586.73	716983.72	718084.67
Change © (Liter)	0	0.01	0.15	0.01	0	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H ₂ O static	Pre Test 0.4-0.5 H ₂ O velocity	Post Test 3 H ₂ O Static	Post Test 0.4-0.5 H ₂ O velocity
Vacuum (inches Hg.)	3	.4	3	.5
Check OK (no change after 15 sec.)	OK	OK	OK	OK

PRE-TEST SCALE AUDIT

 Date: 2018-09-12

 Manufacturer: Hearthstone

 Model: 8024 Heritage

 Project #: PI 2-176

 Run: 3

 Tech: MM

 Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	<u>EM-090</u>	<u>4.4</u> lbs, Class F	<u>4.4</u> lbs
Wood	<u>EM-090</u>	<u>4.4</u> lbs, Class F	<u>4.4</u> lbs
Analytical	<u>EM-128</u>	<u>100</u> mg, Class S	<u>100</u> mg
Analytical	<u>EM-129</u>	<u>200</u> g, Class S	<u>200</u> 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%

CONTINUOUS ANALYZERS

Date: 2018-09-12 Manufacturer: Heathkit Model: 8024 Heritage
 Project #: PI 2.176 Run: 3 Tech: MM Reviewer: JD

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2963	3000	1,005	1,000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	1785	1800	974	1000
Tolerance CO ₂		+/- 0.02		+/- 0.5		+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0006	2954	1009	006	0.02	0009	0.15	0004	0.05	✓	
CO ₂	0	1770	971	0	0.02	015	0.5	003	0.5	✓	

TEST DATA LOG

Date: 2018-09-12 Manufacturer: Heathstone Model: 8024 Heritage
 Project #: PJ 20176 Run: 3 SP Tech: MM Reviewer: SP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	764 585,68	718083 73	876 21
Initial (Liter)	763 452,68	716984 18	785,69

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102	102
Dry Bulb (F):	75.38	85.28
Humidity (%):	67.0	41.2

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

FUEL DATA

Date: 2018-09-12 Manufacturer: Hearthstone Model: 8024 Heritage
 Project #: PI 2016 Run: 3 Tech: MM Reviewer: EL

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/4 x 18 in.	1718 lbs.	216	213	210	212	212
1 1/2 x 3 1/4 x 18 in.	1832 lbs.	224	221	220	221	221
1 1/2 x 3 1/4 x 18 in.	1726 lbs.	206	202	209	205	205
1 1/2 x 3 1/2 x 18 in.	1742 lbs.	209	209	204	206	207
1 1/2 x 3 1/4 x 12 in.	1572 lbs.	210	214	218	220	221
1 1/2 x 3 1/4 x 12 in.	1562 lbs.	220	223	223	219	218
1 1/2 x 3 1/4 x 12 in.	1436 lbs.	218	219	217	218	219
1 1/2 x 3 1/4 x 12 in.	1656 lbs.	220	223	228	224	225
1 1/2 x 3 1/4 x 12 in.	1460 lbs.	214	219	218	213	218
1 1/2 x 3 1/4 x 12 in.	1344 lbs.	206	204	208	209	209
1 1/2 x 3 1/4 x 12 in.	1310 lbs.	201	196	193	193	195
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 1736 lbs

FUEL DATA

Date: 2018-09-12 Manufacturer: Hearthstone Model: 8024 Heritage
 Project #: PI 2016 Run: 3 Tech: MR Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 17 in.	1798 lbs.	220	226	21.9	21.0	21.8
1 1/2 x 3 1/2 x 17 in.	1680 lbs.	21.8	21.9	220	21.9	21.8
1 1/2 x 3 1/2 x 17 in.	1580 lbs.	21.5	21.9	21.8	21.8	21.9
3 1/2 x 3 1/2 x 17 in.	4228 lbs.	21.9	21.8	21.9	21.5	21.8
3 1/2 x 3 1/2 x 17 in.	409 lbs.	21.3	21.6	21.4	21.9	21.6
1 1/2 x 3 1/4 x 5 in.	0108 lbs.			20.1		
1 1/2 x 3 1/4 x 5 in.	0112 lbs.			20.4		
1 1/2 x 3 1/4 x 5 in.	0118 lbs.			20.6		
1 1/2 x 3 1/4 x 5 in.	0118 lbs.			20.9		
1 1/2 x 3 1/4 x 5 in.	0120 lbs.			20.7		
1 1/2 x 3 1/4 x 5 in.	0120 lbs.			20.3		
1 1/2 x 3 1/4 x 5 in.	0114 lbs.			21.0		
1 1/2 x 3 1/4 x 5 in.	0108 lbs.			21.1		
1 1/2 x 3 1/4 x 5 in.	0120 lbs.			19.9		
1 1/2 x 3 1/4 x 5 in.	0110 lbs.			19.6		
1 1/2 x 3 1/4 x 5 in.	0116 lbs.			20.8		
1 1/2 x 3 1/4 x 5 in.	0120 lbs.			20.5		
1 1/2 x 3 1/4 x 5 in.	0114 lbs.			20.5		
1 1/2 x 3 1/4 x 5 in.	0112 lbs.			20.3		
1 1/2 x 3 1/4 x 5 in.	0120 lbs.			20.2		
1 1/2 x 3 1/4 x 5 in.	0138 lbs.			20.5		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 1524 lbs Min 20%: 305 Max 25%: 381

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 20/08-09-17 Manufacturer: Healthstone Model: 8024 Heritage
 Project #: PT 20176 Run: 3 Tech: MM Reviewer: DP

		SYSTEM 1 - 1 st 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	Blanc		
Date	Time	33	620	64	7	35	622	8	626		
20/08/17	17:00	109.3626	0.1306	0.1259	33.8693	109.2859	0.1285	34.4093	0.1274		
20/08/17	18:00	109.3625	0.1307	0.1259	33.8692	109.2859	0.1286	34.4092	0.1274		

		SYSTEM 1 - 1 st 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	Blanc		
Date	Time	3	620	7	35	622	623	8	626		
2018-09-12	15:00	109.3628	0.1307	33.8821	109.2861	0.1280	0.1256	34.4213 34.4099 34.4102	0.1275		
2018-09-17	8:00	109.3626	0.1307	33.8698	109.2859	0.1280	0.1256	34.4099	0.1275		
2018-09-21	8:00	109.3626	0.1307	33.8698	109.2859	0.1280	0.1256				

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-09-11 Project #: PT 20176 Run: 3 Manufacturer: Hearshel Model: 8024 Heritage
 Tech: MR Reviewer: RP

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2018-09-11	17:00	110 1099	01266	01270	336596
2018-09-12	10:00	110 1101	01266	01270	336594

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2018-09-12	15:00	110 1103	01266	01267	336726
2018-09-17	8:00	110 1102	01264	01266	336604
2018-09-21	8:00	110 1102	01264	01266	336604

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	13-09-2018
Technicien	M.M
Project #	PI 20176

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8024 HERITAGE	
Combustion system	Cat	
Appliance type	WOODSTOVE	
Firebox volume	2,18	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,988	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,991	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,996	Dimensionless
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	300	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20176
Date	13-09-2018
Technicien	M.M

Fuel data

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

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

	Start	End
Barometer (kPa):	102,1	101,8
Barometer (in.Hg):	30,150119	30,06152868
Dry Bulb (F):	76,28	87,98
Humidity (%):	56,4	41,8
Air velocity (ft/min)	0	0

DGM #1	Final:	27057,780	cuft
	Initial:	27001,160	cuft
DGM #2	Final:	25413,911	cuft
	Initial:	25358,955	cuft

DGM room	
----------	--

Final:	766190,980	Liter
Initial:	764587,680	Liter
Final:	719641,800	Liter
Initial:	718085,620	Liter

Final:	1003,220	cuft
Initial:	876,220	cuft

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

215

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

Project nu.	PI 20176
Date	13-09-2018
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
13,7	15,3	16,8

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

Load Volume: cu. ft

Loading Density: 7,0 lbs./ft3

Number of Spaces:	16
Spacer weight:	lbs

Load Density (wet):	30,7	lbs./ft3
Dry Wood Density:	25,3	lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content					Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %					Weight	Cubic Inches	%
1,5	3,5	17	1,88	21,90	21,80	21,60	21,80	21,70	40,95232	89,25	21,8
1,5	3,5	17	1,64	21,90	21,80	21,60	21,90	21,80	35,752	89,25	21,8
1,5	3,5	17	1,64	20,90	20,60	21,00	21,10	21,00	34,26696	89,25	20,9
3,5	3,5	17	4,27	21,80	21,90	21,30	21,40	21,50	92,18976	208,25	21,6
3,5	3,5	17	4,09	21,90	21,60	21,90	21,80	21,40	88,92168	208,25	21,7
1,5	0,75	5	0,12			21,90			2,5842	5,63	21,9
1,5	0,75	5	0,11			21,30			2,2578	5,63	21,3
1,5	0,75	5	0,12			20,80			2,4128	5,63	20,8
1,5	0,75	5	0,12			20,30			2,436	5,63	20,3
1,5	0,75	5	0,12			19,90			2,3084	5,63	19,9
1,5	0,75	5	0,12			19,80			2,3364	5,63	19,8
1,5	0,75	5	0,11			19,40			2,0564	5,63	19,4
1,5	0,75	5	0,12			19,90			2,388	5,63	19,9
1,5	0,75	5	0,12			20,80			2,4544	5,63	20,8
1,5	0,75	5	0,12			20,60			2,472	5,63	20,6
1,5	0,75	5	0,12			20,80			2,4128	5,63	20,8
1,5	0,75	5	0,11			20,40			2,2032	5,63	20,4
1,5	0,75	5	0,10			20,80			2,1632	5,63	20,8
1,5	0,75	5	0,11			20,30			2,3142	5,63	20,3
1,5	0,75	5	0,126			20,90			2,6334	5,63	20,9
1,5	0,75	5	0,106			20,40			2,1624	5,63	20,4
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	329,67832		20,8 %

Test Load Weight: 15,36 lbs.

Dry Weight: 5,74 kg.

Average Moisture Content: %

Dry:	21,47	Dry(EPA)	21,47
		Dry(B415)	21,47

21,47
Must be 19-25

Wet: 17,67
must be 15,2-22

Coal Bed Range: lbs. to

3,8 lbs.

TEST CHARGE:

Coal bed weight: 3,7

lbs.

Project nu.	PI 20176
Date	13-09-2018
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,21 in. H2O
 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=
0,972

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,057	75,29	0,2387
B center	0,058	74,31	0,2408
A1	0,047	75,29	0,2168
A2	0,065	75,29	0,2550
A3	0,048	74,86	0,2191
A4	0,049	74,54	0,2214
B1	0,047	74,830	0,2168
B2	0,070	74,830	0,2646
B3	0,059	74,210	0,2429
B4	0,046	74,210	0,2145
AVERAGE	0,0546	74,7660	0,2331

Project nu.	PI 20176
Date	13-09-2018
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	10	407	408	9	16	409	410	15	41	411	412	27	413		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	94,6405	0,1235	0,1272	34,4940	108,7533	0,1282	0,1239	34,1453	110,3640	0,1256	0,1260	33,7730	0,1254	2018-09-12	17:00
Before (6)	94,6406	0,1236	0,1273	34,4940	108,7533	0,1283	0,1239	34,1454	110,3641	0,1256	0,1261	33,7729	0,1254	2018-09-13	09:00
After (1)	94,6410	0,1238	0,1274	34,5078	108,7535	0,1277	0,1240	34,1590	110,3642	0,1256	0,1261	33,7871	0,1258	2018-09-13	17:15
After (2)	94,6408	0,1235	0,1274	34,4949	108,7535	0,1276	0,1239	34,1462	110,3642	0,1255	0,1260	33,7746	0,1256	2018-09-17	08:00
After (3)	94,6408	0,1235	0,1274	34,4949	108,7535	0,1277	0,1239	34,1462	110,3642	0,1255	0,1260	33,7746	0,1256	2018-09-20	08:00
After (4)															
After (5)															
After (6)	94,6408	0,1235	0,1274	34,4949	108,7535	0,1277	0,1239	34,1462	110,3642	0,1255	0,1260	33,7746	0,1256	2018-09-20	08:00
Difference	0,0002	-0,0001	0,0001	0,0009	0,0002	-0,0006	0,0000	0,0008	0,0001	-0,0001	-0,0001	0,0017	0,0002		
Total (mg)		1,1				1,5				1,6			0,2		
Total ajusté (mg)		0,90				1,30				1,40					

Project nu.	PI 20176
Date	13-09-2018
Technicien	M.M

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,5 g/hr

Burn Rate : 1,027 Dry kg/hr

Test Duration: 335 min

PRESSURE FACTOR: DGM 1 0,98732
DGM 2 0,99089
DGM 3 1,00621

BAROMETRIC PRESSURE
Average: 30,105824 in Hg
Start: 30,150119 in Hg
End: 30,061529 in Hg

TEMPERATURE FACTORS DGM 1 0,96772
DGM 2 0,96753
DGM 3 0,97404

DGM CONTROLLER VALUES

DGM 1 Final: 27057,780 Cuft
Initial: 27001,160 Cuft

VOLUMES SAMPLED DGM 1 53,474 SCft
DGM 2 52,234 SCft
DGM 3 123,944 SCft

DGM 2 Final: 25413,911 Cuft
Initial: 25358,955 Cuft

DGM #3 Final: 1003,220 Cuft
Initial: 876,220 Cuft

TOTAL TUNNEL VOLUME : 101404

TEMPERATURES

SAMPLE RATIOS
Sample Train 1: 1896,316
Sample Train 2: 1941,338

DGM 1 545,610 °R
DGM 2 545,722 °R

Paticulate concentration
Sample Train 1 0,000028 g/dscf
Sample Train 2 0,000031 g/dscf
Room 0,000002 g/dscf

CALIBRATION FACTORS

DGM 1 0,9885
DGM 2 0,9914
DGM #3 0,9958

TUNNEL FLOW RATE: 302,697 Dscfm

TOTAL EMISSIONS
Sample Train 1 2,68 g
Sample Train 2 2,94 g

PARTICULATE CATCH
Total Sample Train 1: 1,50 mg
Total Sample Train 2: 1,60 mg
Total Sample Train 1 1st hour: 1,10 mg

EMISSION RATES
Sample Train 1 0,48 g/hr
Sample Train 2 0,53 g/hr

1st hour emission rate 2,09 g/hr

DEVIATION: 4,65%

Cs Train 1 Train 2
2,805E-05 3,06315E-05

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*
Elapsed	Raw data row	Weight	CO	CO ₂	O ₂	Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst
Time		Remaining				Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F
0,00	215,00	16,0	0,0	4,8	395,8	267,3	77,0	100,9	346,3	355,1	394,0	343,4	540,3	472,9
1,0	216,0	15,3	0,3	6,4	393,9	284,3	77,5	94,9	344,6	354,6	393,4	342,3	534,4	567,6
2,0	217,0	15,2	0,1	4,8	391,8	319,4	77,1	94,8	343,1	353,9	392,2	341,0	529,0	694,5
3,0	218,0	15,0	0,0	6,0	389,7	347,5	77,4	95,3	341,7	353,1	390,6	338,7	524,3	761,3
4,0	219,0	14,9	0,0	8,3	387,8	371,0	77,5	96,7	340,8	351,8	388,6	336,9	520,7	810,6
5,0	220,0	14,8	0,0	9,3	386,1	332,4	77,6	92,9	340,8	350,3	386,5	334,8	518,1	822,2
6,0	221,0	14,7	0,0	6,3	384,5	308,5	77,9	91,8	341,3	348,6	384,3	332,6	515,9	786,1
7,0	222,0	14,7	0,0	4,1	383,1	293,3	77,9	91,3	342,4	346,9	382,1	330,6	513,4	734,1
8,0	223,0	14,6	0,0	3,6	381,3	282,8	78,1	91,1	342,8	345,1	379,8	328,4	510,3	704,9
9,0	224,0	14,6	0,0	3,7	379,3	275,6	78,1	91,0	343,1	343,1	377,5	326,0	506,8	696,4
10,0	225,0	14,5	0,0	4,0	377,0	272,0	78,2	90,6	343,0	340,9	375,0	323,3	503,1	702,1
11,0	226,0	14,5	0,0	4,2	374,8	269,4	78,2	90,4	342,5	338,9	372,4	320,6	499,4	708,5
12,0	227,0	14,4	0,0	4,4	372,5	268,6	77,5	90,2	342,2	336,7	369,7	317,9	495,7	720,5
13,0	228,0	14,4	0,0	4,6	370,2	268,2	77,5	90,6	341,8	334,6	367,0	315,3	492,2	734,1
14,0	229,0	14,3	0,0	4,9	367,9	269,6	77,6	90,4	341,2	332,2	364,4	312,7	488,8	751,9
15,0	230,0	14,3	0,0	5,0	365,6	271,4	77,6	90,1	340,7	330,1	361,7	309,8	485,6	762,3
16,0	231,0	14,2	0,0	5,2	363,2	273,9	77,7	90,2	339,4	327,9	359,1	307,0	482,7	776,5
17,0	232,0	14,1	0,0	5,4	361,1	275,7	77,8	90,2	338,7	325,7	356,6	304,5	480,0	783,1
18,0	233,0	14,1	0,0	5,4	359,1	276,7	77,6	90,2	338,2	323,7	354,1	302,2	477,4	781,9
19,0	234,0	14,0	0,0	5,7	357,2	278,4	77,5	90,4	337,3	321,7	351,7	300,2	475,1	800,0
20,0	235,0	13,9	0,0	6,0	355,2	281,2	77,4	90,4	336,0	319,6	349,5	298,2	472,9	825,7
21,0	236,0	13,8	0,0	6,3	353,3	284,6	77,5	90,6	335,2	317,5	347,3	295,8	470,8	847,4
22,0	237,0	13,8	0,0	6,5	351,5	289,4	77,6	90,4	334,3	315,5	345,2	293,8	468,9	867,5
23,0	238,0	13,7	0,1	7,0	350,0	292,3	77,9	90,9	333,7	313,7	343,3	292,0	467,1	871,5
24,0	239,0	13,6	0,1	6,8	348,2	294,8	78,1	90,8	332,4	311,7	341,6	289,8	465,2	871,0
25,0	240,0	13,5	0,1	6,7	346,7	297,0	78,0	90,9	332,3	309,8	339,9	288,0	463,3	869,0
26,0	241,0	13,5	0,1	6,7	345,1	299,2	77,8	91,2	331,6	308,0	338,2	286,3	461,4	870,5
27,0	242,0	13,4	0,1	6,8	343,6	300,9	77,8	91,4	330,8	306,3	336,8	284,8	459,5	873,1
28,0	243,0	13,3	0,1	6,7	342,2	301,6	77,9	91,4	330,4	304,6	335,3	283,2	457,6	875,6
29,0	244,0	13,2	0,1	6,8	340,9	302,3	78,0	91,3	329,9	303,0	333,9	282,0	455,8	873,7
30,0	245,0	13,1	0,1	6,8	339,8	302,4	78,3	91,9	329,6	301,5	332,7	281,0	454,1	873,2
31,0	246,0	13,1	0,1	6,8	338,6	303,7	78,1	91,6	329,4	299,9	331,5	279,6	452,5	877,3
32,0	247,0	13,0	0,1	6,9	337,5	303,9	78,1	91,6	329,2	298,5	330,4	278,5	451,0	877,6
33,0	248,0	12,9	0,1	7,0	336,5	305,8	78,3	91,6	329,4	297,0	329,3	277,3	449,5	886,9
34,0	249,0	12,8	0,1	7,2	335,4	307,1	78,4	91,8	329,0	295,6	328,3	276,1	448,2	900,7
35,0	250,0	12,7	0,1	7,5	334,5	310,0	78,3	92,2	328,5	294,3	327,3	275,2	446,9	915,4
36,0	251,0	12,7	0,1	7,7	333,8	314,0	78,4	92,9	329,1	293,2	326,5	274,5	445,8	927,5
37,0	252,0	12,6	0,1	7,8	333,1	316,9	78,6	92,9	329,1	292,0	325,7	273,8	444,8	936,9
38,0	253,0	12,5	0,1	8,1	332,4	319,6	78,3	92,8	328,9	290,8	324,9	273,2	443,9	957,0
39,0	254,0	12,4	0,1	8,5	331,7	323,8	78,8	93,1	328,9	289,7	324,2	272,5	443,1	977,8
40,0	255,0	12,3	0,1	9,0	331,4	328,0	79,0	93,8	329,9	288,8	323,8	272,1	442,5	996,5
41,0	256,0	12,2	0,1	9,4	330,9	331,2	79,0	93,4	330,0	287,9	323,3	271,6	441,8	1009,0
42,0	257,0	12,1	0,1	9,8	330,7	332,6	79,0	93,8	330,9	287,0	323,0	271,1	441,3	982,0
43,0	258,0	12,0	0,1	10,5	330,5	332,3	78,8	94,2	332,0	286,1	322,9	270,8	440,8	967,9
44,0	259,0	11,9	0,1	10,7	330,5	333,5	78,7	94,2	333,3	285,3	323,1	270,5	440,5	969,5
45,0	260,0	11,8	0,1	10,8	331,0	335,7	78,7	94,1	336,0	284,6	323,4	270,6	440,3	977,5
46,0	261,0	11,6	0,2	10,8	331,3	338,1	78,9	94,0	338,3	283,9	323,7	270,7	440,1	984,5
47,0	262,0	11,5	0,2	10,8	332,0	339,5	79,0	93,9	341,5	283,5	324,2	270,9	439,9	977,6
48,0	263,0	11,4	0,2	10,9	332,5	338,8	79,5	94,0	345,0	282,7	324,6	270,5	439,5	963,7
49,0	264,0	11,3	0,1	10,7	333,4	338,7	79,4	94,5	349,5	282,3	325,2	271,1	439,1	962,4
50,0	265,0	11,2	0,1	10,5	334,5	337,8	79,1	94,9	354,0	281,9	326,0	272,0	438,7	965,5
51,0	266,0	11,1	0,1	10,4	335,4	337,6	79,3	94,5	357,6	281,6	326,7	272,6	438,5	973,3
52,0	267,0	11,0	0,2	10,5	336,6	337,8	79,4	95,0	362,5	281,2	327,6	273,4	438,4	975,4
53,0	268,0	10,9	0,3	10,6	337,8	337,7	79,9	95,5	367,1	281,0	328,5	274,1	438,4	980,3
54,0	269,0	10,8	0,3	10,8	338,8	339,1	79,5	94,7	371,1	280,6	329,4	274,3	438,4	986,0
55,0	270,0	10,7	0,2	10,9	340,1	340,3	79,8	95,4	376,0	280,6	330,4	275,1	438,5	982,4
56,0	271,0	10,6	0,2	11,0	341,4	341,2	79,6	95,4	380,5	280,5	331,4	275,9	438,6	982,0
57,0	272,0	10,5	0,2	11,1	342,7	341,4	79,9	95,0	385,2	280,4	332,4	276,6	438,7	980,4
58,0	273,0	10,4	0,1	11,1	343,9	342,1	79,7	94,8	389,4	280,4	333,6	277,3	439,0	973,0
59,0	274,0	10,3	0,1	11,1	345,4	343,7	79,8	95,2	394,1	280,5	334,8	278,4	439,2	1018,6
60,0	275,0	10,2	0,1	10,9	346,8	345,6	79,8	95,0	398,4	280,7	336,0	279,4	439,4	1000,7
61,0	276,0	10,1	0,1	11,0	348,2	343,4	80,2	95,8	402,7	280,8	337,3	280,8	439,5	972,9
62,0	277,0	10,0	0,1	10,9	349,4	342,9	79,9	95,6	406,4	280,9	338,5	281,9	439,3	981,8
63,0	278,0	9,9	0,1	10,9	350,5	342,8	80,0	95,7	409,4	281,1	339,9	283,1	439,1	983,0
64,0	279,0	9,8	0,1	10,9	351,6	343,2	80,0	95,8	412,7	281,3	341,2	284,2	438,7	982,7
65,0	280,0	9,7	0,1	10,9	352,9	344,3	80,1	95,7	416,0	281,6	342,7	285,7	438,4	988,8
66,0	281,0	9,6	0,1	11,0	354,1	343,3	80,3	95,9	419,0	281,9	344,0	287,2	438,1	972,0
67,0	282,0	9,5	0,1	11,0	355,4	342,5	80,2	95,7	422,5	282,3	345,4	288,8	438,0	967,7
68,0	283,0	9,4	0,1	11,0	356,5	341,2	80,5	96,6	425,2	282,7	346,9	290,2	437,8	964,7
69,0	284,0	9,3	0,0	11,0	357,5	340,2	80,2	95,8	427,1	283,1	348,4	291,6	437,5	965,6
70,0	285,0	9,2	0,0	11,0	358,9	340,5	80,0	96,2	429,9	283,7	349,7	293,9	437,1	986,3
71,0	286,0	9,1	0,1	11,0	360,2	340,6	80,5	96,0	433,0	284,2	351,1	295,8	436,8	976,2
72,0	287,0	9,0	0,0	11,0	361,1	339,9	80,5	95,8	434,4	284,7	352,6	297,4	436,4	976,7
73,0	288,0	8,9	0,0	11,1	362,1	340,5	80,5	95,7	436,5	285,2	353,9	299,0	435,7	988,1
74,0	289,0	8,8	0,0	11,2	363,0	340,7	80,3	95,9	438,5	285,7	355,4	300,8	434,6	991,5
75,0	290,0	8,7	0,0	11,4	364,0	341,2	80,8	96,3	440,9	286,4	356,8	302,7	433,6	996,5
76,0	291,0	8,6	0,0	11,5	364,8	341,6	81,0	96,2	442,1	287,0	358,2	304,3	432,5	1002,4
77,0	292,0	8,5	0,0	11,6	365,9	342,8	81,1	96,5	444,6	287,6	359,7	306,2	431,6	1011,8
78,0	293,0	8,4	0,1	11,7	366,8	343,4	81,0	96,5	445,9	288,3	361,1	307,7	430,7	1014,5
79,0	294,0	8,4	0,1	11,8	367,7	344,4	80,7	96,0	448,1	289,1	362,6	309,0	430,0	1017,9
80,0	295,0	8,3	0,1	11,8	368,7	344,9	80,7	96,5	449,5	289,7	364,1	310,8	429,3	

Manufacturer: HEARTHSTONE
Model: 8024 HERITAGE

Run: 4
Project #: PI 20176
Test Duration: 335

	min	
	HHV	LHV
Eff	79,08%	85,47%
Comb Eff	99,50%	99,50%
HT Eff	79,47%	85,90%
Output	16 794	kJ/h
Burn Rate	1,07	kg/h
Grams CO	64	g
Input	21 238	kJ/h
MC wet	17,67	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

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

Overall Heating Efficiency:	79,08%	Air Fuel Ratio (A/F)	
Combustion Efficiency:	99,50%	Dry Molecular Weight (M _d)	29,78
Heat Transfer Efficiency:	79,47%	Dry Moles Exhaust Gas (N _e):	474,37
		Air Fuel Ratio (A/F)	13,61

Heat Output:	15 931 Btu/h	16 794 kJ/h
Heat Input:	20 146 Btu/h	21 238 kJ/h
Burn Duration:	5,58 h	
Burn Rate:	2,36 lb/h	1,072 kg/h
Stack Temp:	284,7 Deg. F	140,4 Deg. C

Date: 2/18/09 13

Manufacturer: Hearnstone

Model: 8024 Heritage

Project #: PJ 20176

Run: 24

Tech: MM

Reviewer: JP

- 55 LBS Small Fan
- Bypass oper
- oper Door
- Fan off
- At 2.5 LBS install pre load
- At 16.5 LBS 30 minute close Door
- At 5.8 LBS close air inlet (Drill bit 3/16)
- close bypass
- At 33 LBS oper Door Break cool and close Door
- After 2 min oper Door oper by pass
- Open air inlet install load close bypass close Door
- After 5 minutes close air inlet (Drill bit 3/16)

TEST LOAD CONFIGURATION

No Fan

PRE / POST CHECKS

 Date: 2018-09-13

 Manufacturer: Hearlstone

 Model: 8024 Heritage

 Project #: PI 20176

 Run: 34
mm

 Tech: mm

 Reviewer: X

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
<u>6m-191</u>	<u>7:00</u>	<u>ok</u>	<u>ok</u>

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check.....

Picture.....

Pre-Test

Post-Test

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

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O).....

Traverse before ignition.....

Flow Rate 140 cfm ±10%.....

<u>2018-09-10</u>
<u>2018-09-10</u>
<u>ok</u>
<u>ok</u>

ok

Temperature System:

Ambient (65°-90°F).....

Wood Heater Surface (±125°F).....

<u>ok</u> °F
<u>ok</u> °F

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

<u>ok</u>
<u>ok</u>
<u>ok</u>

Sampling Train ID Numbers:

Probe.....

Filter Front.....

Filter Back.....

Filter Thermocouple.....

Filter (<90°F).....

Train 1 st hour	Train 1	Train 2
<u>10</u>	<u>16</u>	<u>41</u>
<u>407</u>	<u>409</u>	<u>411</u>
<u>408</u>	<u>410</u>	<u>412</u>
<u>11</u>	<u>11</u>	<u>12</u>
<u>ok</u>	<u>ok</u>	<u>ok</u>

SAMPLING EQUIPMENT CHECK OUT

 Date: 2018-09-13

 Manufacturer: Heathstone

 Model: 8024 Heritage

 Project #: PT 60176

 Run: 54
m.m

 Tech: MM

 Reviewer: SP

Leakage Checks Tunnel Samplers

	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	764586.94	766191.98	764587.13	766192.07	718085.14	719642.75
Initial 1minute DGM (Liter)	764586.94	766191.98	764587.10	766192.05	718085.14	719643.74
Change © (Liter)	0	0	0.03	0.02	0	0.91
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H ₂ O static	Pre Test 0.4-0.5 H ₂ O velocity	Post Test 3 H ₂ O Static	Post Test 0.4-0.5 H ₂ O velocity
Vacuum (inches Hg.)	3	-5	3	-4
Check OK (no change after 15 sec.)	OK	OK	OK	OK

PRE-TEST SCALE AUDIT

 Date: 2018-09-13

 Manufacturer: Hearthstone

 Model: 8024 Heritage

 Project #: PT 20176

 Run: 3 4 mm

 Tech: mm

 Reviewer: DE

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

LIMITS OF WEIGHT RANGES

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

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

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

CONTINUOUS ANALYZERS

 Date: 2018-09-13

 Manufacturer: Hearthstone

 Model: 8024 Heritage

 Project #: PI 2017L

 Run: 8th
mm

 Tech: MM

 Reviewer: DE

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2961	3000	1.005	1.000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	17,80	18,00	9.74	10.00
Tolerance CO ₂		+/- 0.02		+/- 0.5		+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0.002	2950	1.001	0.006	0.02	0.011	0.15	0.004	0.05	✓	
CO ₂	0.00	1760	9.66	0	0.02	0.20	0.5	0.08	0.5	✓	

TEST DATA LOG

Date: 2018-07-13 Manufacturer: Hearthstone Model: 8024 Heritage
 Project #: PT 20176 Run: 34 Tech: MM Reviewer: SO

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	766190.98	719641.80	1003.22
Initial (Liter)	764587.68	718085.62	876.24

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102.1	101.8
Dry Bulb (F):	76.28	87.98
Humidity (%):	56.4	41.8

Flow Meter

	Start	End
Flow meter reading	NA	NA

Flow Meter Verification

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

FUEL DATA

 Date: 2018-09-13

 Manufacturer: Heartland Stone

 Model: 8024 Heritage

 Project #: PI 20176

 Run: 34
mm

 Tech: mm

 Reviewer: 15

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size			Weight	Meter Moisture Content (% dry)*				
1 1/2	x 3 1/2	x 18 in.	1924 lbs.	198	199	196	199	197
1 1/2	x 3 1/2	x 18 in.	1846 lbs.	206	204	204	205	209
1 1/2	x 3 1/2	x 18 in.	1878 lbs.	205	200	196	193	198 1/2
1 1/2	x 3 1/2	x 18 in.	1852 lbs.	208	204	206	206	203
1 1/2	x 3 1/2	x 12 in.	1428 lbs.	199	193	198	194	198
1 1/2	x 3 1/2	x 12 in.	1348 lbs.	210	214	209	206	203
1 1/2	x 3 1/2	x 12 in.	1606 lbs.	214	219	218	216	218
1 1/2	x 3 1/2	x 12 in.	1506 lbs.	207	203	206	208	203
1 1/2	x 3 1/2	x 12 in.	1350 lbs.	197	198	196	199	200
1 1/2	x 3 1/2	x 12 in.	1704 lbs.	204	208	203	204	208
1 1/2	x 3 1/2	x 12 in.	1150 lbs.	193	194	198	193	193
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					
	x	x in.	lbs.					

 TEST LOAD WEIGHT: 1759 lbs

FUEL DATA

Date: 2018-02-13 Manufacturer: Heartland 1000 Model: 8024 Heritage
 Project #: PI 20176 Run: 6 Tech: mm Reviewer: JS

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 17 in.	1 882 lbs.	21.9	21.8	21.6	21.8	21.7
1 1/2 x 3 1/2 x 17 in.	1 640 lbs.	21.9	21.8	21.6	21.9	21.8
1 1/2 x 3 1/2 x 17 in.	1 638 lbs.	20.9	20.6	21.0	21.1	21.0
3 1/2 x 3 1/2 x 17 in.	4 272 lbs.	21.8	21.9	21.3	21.4	21.5
3 1/2 x 3 1/2 x 17 in.	4 094 lbs.	21.9	21.6	21.9	21.8	21.4
1 1/2 x 3 1/4 x 5 in.	0 118 lbs.			21.9		
1 1/2 x 3 1/4 x 5 in.	0 106 lbs.			21.3		
1 1/2 x 3 1/4 x 5 in.	0 116 lbs.			20.8		
1 1/2 x 3 1/4 x 5 in.	0 120 lbs.			20.3		
1 1/2 x 3 1/4 x 5 in.	0 116 lbs.			19.9		
1 1/2 x 3 1/2 x 5 in.	0 118 lbs.			19.8		
1 1/2 x 3 1/2 x 5 in.	0 106 lbs.			19.4		
1 1/2 x 3 1/4 x 5 in.	0 120 lbs.			19.9		
1 1/2 x 3 1/2 x 5 in.	0 118 lbs.			20.8		
1 1/2 x 3 1/4 x 5 in.	0 120 lbs.			20.6		
1 1/2 x 3 1/4 x 5 in.	0 116 lbs.			20.8		
1 1/2 x 3 1/4 x 5 in.	0 108 lbs.			20.4		
1 1/2 x 3 1/2 x 5 in.	0 104 lbs.			20.8		
1 1/2 x 3 1/2 x 5 in.	0 114 lbs.			20.3		
1 1/2 x 3 1/4 x 5 in.	0 116 lbs.			20.9		
1 1/2 x 3 1/4 x 5 in.	0 106 lbs.			20.4		
X X in.	lbs.					
X X in.	lbs.					
X X in.	lbs.					
X X in.	lbs.					
X X in.	lbs.					
X X in.	lbs.					

TEST LOAD WEIGHT: 1536 lbs Min 20%: 307 Max 25%: 384

Date: 2018-09-12 Manufacturer: Hearts to Love Model: 8024 Accufuge
Project #: PT 20176 Run: 24 Tech: MM Reviewer: DE

		SYSTEM 1 - 1 st 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	Probe & Housing Number	Front Filter Number	Back Filter Number
Date	Time	10	407	408	9	16	409	15	410	413	
2018-09-12	17:00	94,6405	01235	01272	34,4940	108,7533	01282	34,4953	01239	01254	
2018-09-12	9:00	94,6406	01236	01273	34,4940	108,7533	01283	34,4954	01239	01254	

		SYSTEM 1 - 1 st 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	Probe & Housing Number	Front Filter Number	Back Filter Number
Date	Time	10	407	408	9	16	409	15	410	413	
2018-09-13	17:15	94,6410	01238	01274	34,5078	108,7535	01277	34,5090	01240	01258	
2018-09-17	8:00	94,6408	01235	01274	34,4949	108,7535	01276	34,4962	01239	01256	
2018-09-21	8:00	94,6408	01235	01274	34,4949	108,7535	01277	34,4962	01239	01256	

DILUTION TUNNEL PARTICULATE SAMPLER DATA

 Date: 2018-09-12

 Manufacturer: Hearshesboro

 Model: 8024 Heritage

 Project #: PI 201736

 Tech: MM

 Reviewer: BP

 Run: 4

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2018-09-12	17:00	110 3640	01256	01260	33 7730
2018-09-13	9:00	110 3641	01256	01261	33 7729

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2018-09-12	17:15	110 3642 110 3643	01256	01261	33 7871
2018-09-17	8:00	110 3642	01255	01260	33 7736
2018-09-21	8:00	110 3647	01255	01260	33 7736

Paramètres

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

Code verrouillage: HEA

Description du test

Test standard	EPA
Run #	5
Date	14-09-2018
Technicien	M.M
Project #	PI 20176

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	8024 HERITAGE	
Combustion system	Cat	
Appliance type	WOODSTOVE	
Firebox volume	2,18	cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,988	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,991	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,996	Dimensionless
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	300	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20176
Date	14-09-2018
Technicien	M.M

Fuel data

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

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

	Start	End
Barometer (kPa):	101,9	101,8
Barometer (in.Hg):	30,091059	30,06152868
Dry Bulb (F):	75,38	83,12
Humidity (%):	58,4	54
Air velocity (ft/min)	0	0

DGM #1	Final:	27079,081	cuft
	Initial:	27057,838	cuft
DGM #2	Final:	25434,722	cuft
	Initial:	25413,975	cuft

DGM room	
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	Final:	766794,180	Liter
	Initial:	766192,620	Liter
	Final:	720231,120	Liter
	Initial:	719643,630	Liter

	Final:	51,240	cuft
	Initial:	3,230	cuft

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

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

Project nu.	PI 20176
Date	14-09-2018
Technicien	M.M

Test Load Weight:		
Lower	Ideal	Upper
13,7	15,3	16,8

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

Load Volume: cu. ft

Loading Density: 7,0 lbs./ft3

Number of Spaces:	16
Spacer weight:	lbs

Load Density (wet):	30,6	lbs./ft3
Dry Wood Density:	25,2	lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content					Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %					Weight	Cubic Inches	%
1,5	3,5	17	1,98	22,10	22,30	22,10	22,40	21,90	43,78816	89,25	22,2
1,5	3,5	17	1,67	22,00	21,90	21,40	21,80	21,30	36,24896	89,25	21,7
1,5	3,5	17	1,62	21,90	21,30	21,80	21,90	21,80	35,26228	89,25	21,7
3,5	3,5	17	4,13	21,00	21,30	21,40	21,80	21,30	88,2168	208,25	21,4
3,5	3,5	17	4,21	22,00	21,90	21,60	21,30	21,40	91,19096	208,25	21,6
1,5	0,75	5	0,10			20,10			2,0502	5,63	20,1
1,5	0,75	5	0,10			20,60			2,0188	5,63	20,6
1,5	0,75	5	0,09			19,10			1,719	5,63	19,1
1,5	0,75	5	0,11			19,30			2,1616	5,63	19,3
1,5	0,75	5	0,10			20,40			2,1216	5,63	20,4
1,5	0,75	5	0,11			20,90			2,299	5,63	20,9
1,5	0,75	5	0,12			20,80			2,4544	5,63	20,8
1,5	0,75	5	0,11			20,90			2,2154	5,63	20,9
1,5	0,75	5	0,10			20,00			1,92	5,63	20,0
1,5	0,75	5	0,13			20,00			2,52	5,63	20,0
1,5	0,75	5	0,10			19,60			1,9992	5,63	19,6
1,5	0,75	5	0,12			19,30			2,2388	5,63	19,3
1,5	0,75	5	0,11			19,90			2,1094	5,63	19,9
1,5	0,75	5	0,11			19,40			2,0952	5,63	19,4
1,5	0,75	5	0,108			19,80			2,1384	5,63	19,8
1,5	0,75	5	0,102			19,30			1,9686	5,63	19,3
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	328,73676		20,4 %

Test Load Weight: 15,32 lbs.

Dry Weight: 5,72 kg.

Average Moisture Content: %

Dry:	21,46	Dry(EPA)	21,46
		Dry(B415)	21,46

21,46
Must be 19-25

Wet:
must be 15,2-22

Coal Bed Range: lbs. to

3,8 lbs.

TEST CHARGE:

Coal bed weight: 3,7

lbs.

Project nu.	PI 20176
Date	14-09-2018
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,21 in. H₂O
 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=
0,966

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,058	76,8	0,2408
B center	0,059	76,55	0,2429
A1	0,047	76,8	0,2168
A2	0,067	76,95	0,2588
A3	0,049	76,9	0,2214
A4	0,047	76,9	0,2168
B1	0,047	76,550	0,2168
B2	0,070	76,850	0,2646
B3	0,058	76,320	0,2408
B4	0,047	76,280	0,2168
AVERAGE	0,0549	76,6900	0,2337

Project nu.	PI 20176
Date	14-09-2018
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	5	400	401	3	12	404	405	32	11	402	403	11	406		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,5046	0,1255	0,1275	33,9074	94,5413	0,1258	0,1293	34,0176	93,7253	0,1281	0,1261	34,2026	0,1279	2018-09-13	18:00
Before (6)	61,5046	0,1255	0,1276	33,9075	94,5414	0,1258	0,1293	34,0175	93,7254	0,1280	0,1261	34,2027	0,1280	2018-09-14	08:00
After (1)	61,5058	0,1260	0,1279	33,9212	94,5425	0,1252	0,1293	34,0299	93,7272	0,1285	0,1263	34,2164	0,1283	2018-09-14	13:15
After (2)	61,5048	0,1257	0,1276	33,9086	94,5418	0,1252	0,1293	34,0182	93,7260	0,1282	0,1261	34,2038	0,1281	2018-09-17	08:00
After (3)	61,5048	0,1257	0,1276	33,9086	94,5418	0,1252	0,1293	34,0182	93,7260	0,1282	0,1261	34,2038	0,1281	2018-09-21	08:00
After (4)															
After (5)															
After (6)	61,5048	0,1257	0,1276	33,9086	94,5418	0,1252	0,1293	34,0182	93,7260	0,1282	0,1261	34,2038	0,1281	2018-09-21	08:00
Difference	0,0002	0,0002	0,0000	0,0011	0,0004	-0,0006	0,0000	0,0007	0,0006	0,0002	0,0000	0,0011	0,0001		
Total (mg)		1,5				2				1,9			0,1		
Total ajusté (mg)		1,40				1,90				1,80					

Project nu.	PI 20176
Date	14-09-2018
Technicien	M.M

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 1,8 g/hr

Burn Rate : 2,724 Dry kg/hr

Test Duration: 126 min

PRESSURE FACTOR: DGM 1 0,98324
 DGM 2 0,98736
 DGM 3 1,00522

BAROMETRIC PRESSURE
 Average: 30,076294 in Hg
 Start: 30,091059 in Hg
 End: 30,061529 in Hg

TEMPERATURE FACTORS DGM 1 0,97500
 DGM 2 0,97438
 DGM 3 0,97660

DGM CONTROLLER VALUES

DGM 1 Final: 27079,081 Cuft
 Initial: 27057,838 Cuft

VOLUMES SAMPLED DGM 1 20,131 SCft
 DGM 2 19,788 SCft
 DGM 3 46,931 SCft

DGM 2 Final: 25434,722 Cuft
 Initial: 25413,975 Cuft

DGM #3 Final: 51,240 Cuft
 Initial: 3,230 Cuft

TOTAL TUNNEL VOLUME : 38790

TEMPERATURES

SAMPLE RATIOS
 Sample Train 1: 1926,898
 Sample Train 2: 1960,257

DGM 1 541,539 °R
 DGM 2 541,882 °R

Paticulate concentration
 Sample Train 1 0,000099 g/dscf
 Sample Train 2 0,000096 g/dscf
 Room 0,000002 g/dscf

CALIBRATION FACTORS

DGM 1 0,9885
 DGM 2 0,9914
 DGM #3 0,9958

TUNNEL FLOW RATE: 307,858 Dscfm

TOTAL EMISSIONS
 Sample Train 1 3,77 g
 Sample Train 2 3,64 g

PARTICULATE CATCH
 Total Sample Train 1: 2,00 mg
 Total Sample Train 2: 1,90 mg
 Total Sample Train 1 1st hour: 1,50 mg

EMISSION RATES
 Sample Train 1 1,80 g/hr
 Sample Train 2 1,73 g/hr

1st hour emission rate 2,89 g/hr

DEVIATION: 1,74%

Cs Train 1 Train 2
 9,935E-05 9,60165E-05

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	*
Elapsed	Raw data row	Weight	CO	CO ₂	O ₂	Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Catalyst
Time		Remaining				Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F	°F
0,00	197,00	15,2	0,0	7,1	512,6	384,9	77,3	115,8	390,4	462,8	536,8	486,7	686,3	675,6
1,0	198,0	15,1	0,2	3,0	511,2	408,2	77,0	104,3	392,5	464,4	539,6	485,4	673,8	952,4
2,0	199,0	14,9	0,0	7,9	508,9	434,6	77,4	103,1	393,9	465,2	541,2	482,6	661,7	1058,7
3,0	200,0	14,7	0,2	11,3	506,4	457,4	77,6	103,9	395,7	465,2	541,5	479,1	650,3	1091,7
4,0	201,0	14,5	0,2	12,4	503,6	479,8	77,5	104,8	398,5	464,4	540,6	474,8	639,7	1117,3
5,0	202,0	14,2	0,3	13,5	500,7	490,4	77,3	105,2	402,2	462,6	538,7	470,1	629,9	1129,4
6,0	203,0	14,0	0,3	13,2	497,9	500,5	77,2	104,9	406,6	460,2	536,0	465,9	620,9	1147,2
7,0	204,0	13,8	0,6	13,7	495,3	509,1	77,8	106,7	411,5	457,1	532,8	462,6	612,6	1156,3
8,0	205,0	13,5	1,0	13,8	493,1	518,8	77,9	108,4	418,1	453,7	529,2	459,4	605,0	1159,8
9,0	206,0	13,3	2,1	14,3	490,9	526,8	77,7	109,0	424,7	450,4	525,4	456,3	597,8	1166,8
10,0	207,0	13,0	1,9	14,6	489,2	533,3	78,0	109,9	432,2	447,0	521,8	454,2	591,0	1158,5
11,0	208,0	12,8	1,9	14,6	487,7	536,2	78,3	109,8	439,9	443,6	517,9	452,7	584,6	1162,2
12,0	209,0	12,5	1,6	14,6	486,6	541,1	78,5	110,0	448,5	440,3	514,3	451,3	578,7	1175,1
13,0	210,0	12,2	1,6	14,8	485,6	545,0	78,7	111,2	456,2	437,0	510,8	450,6	573,2	1174,0
14,0	211,0	12,0	1,9	14,8	484,6	546,6	78,7	111,7	464,4	433,6	507,6	449,6	567,9	1173,1
15,0	212,0	11,7	2,2	14,7	484,4	549,2	78,9	111,9	473,1	430,7	505,1	450,1	562,9	1170,1
16,0	213,0	11,5	2,6	14,7	484,4	551,0	79,1	112,2	482,0	427,9	503,0	450,9	558,4	1167,8
17,0	214,0	11,2	2,7	14,7	484,4	552,7	79,1	112,7	490,0	425,2	501,5	451,3	554,1	1176,8
18,0	215,0	10,9	2,7	14,7	484,8	553,3	79,2	113,0	498,7	422,8	500,2	452,3	550,1	1181,1
19,0	216,0	10,7	2,6	14,8	485,4	554,0	79,3	113,4	507,0	420,5	499,4	453,4	546,5	1183,7
20,0	217,0	10,4	2,6	14,8	486,1	554,6	79,5	113,5	515,0	418,4	499,0	454,9	543,1	1185,0
21,0	218,0	10,2	2,7	14,7	487,1	555,3	79,5	113,9	522,8	416,7	499,0	457,0	540,0	1179,1
22,0	219,0	9,9	2,9	14,7	488,3	555,6	79,7	113,8	530,5	415,1	499,3	459,5	537,4	1182,7
23,0	220,0	9,7	2,9	14,6	489,7	556,0	79,8	113,6	538,0	413,6	499,9	462,3	534,9	1184,1
24,0	221,0	9,4	3,1	14,6	491,0	556,7	79,8	114,0	544,7	412,3	500,7	464,8	532,6	1188,1
25,0	222,0	9,2	3,2	14,6	492,7	557,1	80,1	114,4	551,9	411,4	501,7	467,9	530,6	1187,6
26,0	223,0	8,9	3,4	14,5	494,5	556,9	80,0	114,3	558,8	410,5	503,2	471,4	528,5	1186,8
27,0	224,0	8,7	3,3	14,5	496,1	554,6	80,1	113,8	564,7	409,8	504,9	474,8	526,5	1182,2
28,0	225,0	8,4	3,1	14,6	497,9	554,3	80,2	113,0	570,7	409,2	506,9	478,5	524,4	1177,6
29,0	226,0	8,2	3,1	14,6	499,9	553,4	80,3	113,2	576,9	408,8	509,1	482,6	522,2	1176,8
30,0	227,0	8,0	3,1	14,5	500,5	549,5	79,9	112,1	577,1	408,0	511,5	486,1	520,0	1179,4
31,0	228,0	7,7	3,1	14,5	500,6	543,2	80,4	111,3	574,9	406,4	514,0	490,1	517,8	1177,3
32,0	229,0	7,5	3,0	14,5	501,3	536,8	80,4	111,3	574,5	405,1	516,4	494,5	515,7	1173,8
33,0	230,0	7,3	2,6	14,5	502,1	532,4	80,4	110,9	574,6	404,4	519,2	498,7	513,9	1173,6
34,0	231,0	7,1	2,3	14,6	503,2	528,6	80,6	110,3	574,7	403,8	522,0	503,1	512,2	1171,7
35,0	232,0	6,9	2,2	14,6	504,1	525,1	80,4	109,9	574,7	403,0	524,9	506,9	510,8	1170,4
36,0	233,0	6,7	2,1	14,5	505,3	523,9	80,5	109,7	574,5	402,7	528,0	511,5	509,7	1166,9
37,0	234,0	6,5	1,9	14,6	506,5	522,4	80,5	109,4	574,1	402,7	531,1	515,9	508,7	1161,8
38,0	235,0	6,3	1,7	14,6	507,7	519,5	80,5	109,3	573,7	402,1	534,6	520,1	507,9	1159,7
39,0	236,0	6,1	1,6	14,7	508,8	517,2	80,8	109,0	572,6	401,8	538,2	524,0	507,3	1157,5
40,0	237,0	6,0	1,4	14,7	510,2	516,0	80,8	108,7	571,4	402,1	541,6	528,9	507,0	1154,1
41,0	238,0	5,8	1,3	14,8	511,7	515,1	80,7	109,0	570,5	402,3	545,3	533,3	506,9	1152,4
42,0	239,0	5,6	1,3	14,7	513,1	513,7	80,9	108,6	570,0	402,6	548,6	537,2	507,1	1153,4
43,0	240,0	5,4	1,2	14,7	514,5	512,4	81,0	108,6	568,5	403,2	552,1	541,7	507,1	1154,7
44,0	241,0	5,3	1,1	14,6	515,8	512,4	81,1	108,4	567,2	403,7	555,6	545,9	506,7	1152,3
45,0	242,0	5,1	0,9	14,5	517,0	510,8	81,2	108,1	566,3	404,5	559,0	549,3	505,9	1151,7
46,0	243,0	4,9	0,7	14,5	518,2	508,7	81,5	107,9	565,4	405,4	562,3	553,1	505,1	1150,8
47,0	244,0	4,8	0,6	14,4	519,3	505,8	81,6	107,6	564,5	406,3	565,3	556,4	504,2	1151,6
48,0	245,0	4,6	0,5	14,3	520,4	503,4	81,3	107,3	563,7	407,4	568,1	559,2	503,5	1154,9
49,0	246,0	4,5	0,3	14,1	521,5	499,9	81,4	106,8	562,3	408,7	571,1	562,5	503,0	1162,0
50,0	247,0	4,4	0,1	13,8	522,6	496,6	81,3	106,7	561,1	410,0	574,0	565,5	502,5	1156,0
51,0	248,0	4,2	0,1	13,5	523,8	493,0	81,4	106,5	559,6	411,4	577,1	568,8	502,2	1148,0
52,0	249,0	4,1	0,0	13,1	524,8	489,2	81,4	105,9	558,0	412,8	580,4	571,2	501,8	1138,5
53,0	250,0	4,0	0,0	12,8	525,8	484,4	81,6	105,8	556,5	413,9	583,5	573,8	501,4	1123,1
54,0	251,0	3,9	0,0	12,5	526,7	480,1	81,4	105,5	554,4	415,2	586,7	576,3	501,1	1104,7
55,0	252,0	3,8	0,0	12,3	527,7	476,1	81,1	105,4	552,2	416,8	589,8	578,8	500,8	1093,0
56,0	253,0	3,7	0,0	12,0	528,6	471,3	81,3	105,1	549,9	418,5	592,7	581,2	500,8	1080,2
57,0	254,0	3,6	0,0	11,8	529,2	467,3	81,3	104,7	547,3	420,2	595,5	582,2	501,0	1068,6
58,0	255,0	3,5	0,0	11,6	530,0	464,3	81,2	104,5	544,4	421,8	598,2	584,5	501,2	1059,6
59,0	256,0	3,4	0,0	11,4	530,8	461,5	80,5	104,0	541,2	423,6	600,9	586,6	501,4	1059,1
60,0	257,0	3,3	0,0	11,3	531,4	457,3	81,0	103,6	538,1	425,9	603,3	588,0	501,6	1045,7
61,0	258,0	3,2	0,0	11,2	531,8	454,1	81,4	103,1	534,7	428,0	605,6	589,2	501,7	1029,9
62,0	259,0	3,1	0,0	10,8	532,3	449,7	81,5	103,2	531,4	430,2	607,5	590,7	501,4	1012,8
63,0	260,0	3,0	0,0	10,6	532,3	445,2	81,7	103,0	528,0	432,0	609,4	591,4	500,7	1005,4
64,0	261,0	3,0	0,0	10,6	532,3	441,4	81,6	102,7	524,3	433,6	611,4	592,3	499,9	997,3
65,0	262,0	2,9	0,0	10,5	532,2	438,5	81,3	102,6	520,2	435,4	613,4	592,9	499,0	990,8
66,0	263,0	2,8	0,0	10,4	532,0	437,2	81,2	102,1	516,1	437,4	615,1	593,0	498,2	992,3
67,0	264,0	2,7	0,0	10,4	531,7	436,2	81,3	101,8	512,2	438,9	616,7	593,2	497,4	994,9
68,0	265,0	2,6	0,0	10,4	531,6	432,7	82,1	102,0	508,6	441,7	617,8	592,8	497,0	990,5
69,0	266,0	2,5	0,0	10,4	531,4	432,0	81,4	101,5	504,6	443,4	618,9	592,8	497,2	988,2
70,0	267,0	2,5	0,0	10,4	531,3	429,6	81,7	101,3	501,1	445,4	619,7	592,7	497,8	979,9
71,0	268,0	2,4	0,0	10,2	531,1	426,6	82,0	101,3	497,4	447,5	620,2	591,7	498,6	976,1
72,0	269,0	2,3	0,0	10,2	531,0	426,9	81,3	101,2	493,7	449,7	620,7	591,7	499,2	978,3
73,0	270,0	2,3	0,0	10,2	530,7	425,3	81,4	101,1	490,1	451,8	621,2	591,3	499,2	965,8
74,0	271,0	2,2	0,0	10,1	530,4	423,6	80,8	101,0	486,6	454,3	621,6	590,6	498,9	968,0
75,0	272,0	2,1	0,0	10,1	529,9	421,8	80,7	100,9	483,2	455,9	622,3	589,6	498,7	946,7
76,0	273,0	2,0	0,0	10,1	529,6	420,4	81,1	100,7	479,9	457,8	623,0	588,7	498,6	941,9
77,0	274,0	2,0	0,0	10,0	529,4	417,9	81,5	100,5	477,0	459,7	623,2	588,6	498,5	933,8
78,0	275,0	1,9	0,0	9,8	528,8	415,9	81,5	100,2	473,7	460,6	623,6	588,0	498,3	923,8
79,0	276,0	1,8	0,0	9,6	528,4	413,1	81,0	100,2	470,4	462,2	624,2	587,3	498,2	911,2
80,0														

Manufacturer: HEARTHSTONE
Model: 8024 HERITAGE

Run: 5
Project #: PI 20176
Test Duration: 126 min

	HHV	LHV
Eff	70,57%	76,28%
Comb Eff	93,37%	93,37%
HT Eff	75,58%	81,69%
Output	37 787	kJ/h
Burn Rate	2,70	kg/h
Grams CO	519	g
Input	53 543	kJ/h
MC wet	17,67	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

Ultimate CO₂
CO_{2-ult} 19,64
F₀
1,063

Overall Heating Efficiency: 70,57%
Combustion Efficiency: 93,37%
Heat Transfer Efficiency: 75,58%

Air Fuel Ratio (A/F)	
Dry Molecular Weight (M _d)	30,12
Dry Moles Exhaust Gas (N _e):	335,07
Air Fuel Ratio (A/F)	9,58

Heat Output:	35 845 Btu/h	37 787 kJ/h
Heat Input:	50 792 Btu/h	53 543 kJ/h
Burn Duration:	2,10 h	
Burn Rate:	5,96 lb/h	2,703 kg/h
Stack Temp:	451,6 Deg. F	233,1 Deg. C

Date: 2018-09-14 Manufacturer: Hearthstone Model: 8024 Heritage
 Project #: PT 20176 Run: 5 Tech: MM Reviewer: DP

- 55 handling STAND FIRE
- by pass open
- open Door
- Fan off
- At 25 LBS install probe
- At 163 LBS close Door (30 minutes)
- At 1280 LBS close by pass open
Fan High
At 78 LBS open Door Break cool
close Door
After 2 min open Door open by pass
install board close Door close by pass
Fan off
After 30 minutes open Fan (High)

TEST LOAD CONFIGURATION

PRE / POST CHECKS

 Date: 2018-09-14

 Manufacturer: Heathstone

 Model: 8024 Her

 Project #: PI 20176

 Run: 5

 Tech: MM

 Reviewer: Heritage MM

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-190	8:00	OK	OK

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check.....

Picture.....

Pre-Test

Post-Test

0 (max50 Fpm)	0 (max50 Fpm)
0 k	0 k
4 sides 0 k	0 k

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O).....

Traverse before ignition.....

 Flow Rate 140 cfm $\pm$ 10%.....

2018-09-10
2018-09-10
0 k
0 k

0 k

Temperature System:

Ambient (65°-90°F).....

 Wood Heater Surface ($\pm$ 125°F).....

0 k °F
0 k °F

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

0 k
0 k
0 k

Sampling Train ID Numbers:

Probe.....

Filter Front.....

Filter Back.....

Filter Thermocouple.....

Filter (<90°F).....

Train 1 st hour	Train 1	Train 2
5	11	12
400	402	402
401	403	405
11	11	12
0 k	0 k	0 k

Date: 2018-09-14 Manufacturer: Heritage Model: 8024 Heritage
 Project #: PI 20176 Run: 5 Tech: MM Reviewer: DP

Leakage Checks Tunnel Samplers

	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	- 18	- 15	- 15	- 15	- 15	- 15
Final 1minute DGM (Liter)	766/92, 23	766/95, 15	766/92, 38	766/95, 32	719/643, 34	720/233, 20
Initial 1minute DGM (Liter)	766/92, 25	766/95, 15	766/92, 38	766/95, 20	719/643, 34	720/233, 20
Change © (Liter)	0.02	0	0	0.6	0	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK

Leakage Checks Flue Gas Sampler

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

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H ₂ O static	Pre Test 0.4-0.5 H ₂ O velocity	Post Test 3 H ₂ O Static	Post Test 0.4-0.5 H ₂ O velocity
Vacuum (inches Hg.)	3	4	3	4
Check OK (no change after 15 sec.)	OK	OK	OK	OK

PRE-TEST SCALE AUDIT

 Date: 2018-09-14

 Manufacturer: Hearthstone

 Model: 8024 Heritage

 Project #: PI 20176

 Run: 5

 Tech: MM

 Reviewer: SD

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Wood	EM-090	44 lbs, Class F	44 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-128	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: 2018-09-14 Manufacturer: Heathstone Model: 8024 / 11m. tag
 Project #: PI 20176 Run: 5 Tech: MR Reviewer: DR

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 101.9 (KPa.) Static pressure (P_q) 0.21 (inches w.c.)
 Inside diameter: Port A _____ Port B _____
 Tunnel cross sectional area: .1963Ft²
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	00 58	76 80
B - Centroid	3.00	3.50	4	00 59	76 55
A-1	0.40	0.50	0.50	00 47	76 80
A-2	1.50	1.75	2	00 67	76 95
A-3	4.50	5.25	6	00 49	76 90
A-4	5.60	6.5	7.5	00 47	76 90
B-1	0.40	0.50	0.50	00 47	76 55
B-2	1.50	1.75	2	00 70	76 85
B-3	4.50	5.25	6	00 58	76 32
B-4	5.60	6.5	7.5	00 47	76 28
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 H₂O)

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 in. H₂O
 { 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)

Δ_{pavg} = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

CONTINUOUS ANALYZERS

Date: 2018-07-14 Manufacturer: Hearthstone Model: 8024 Heritage
 Project #: PT 20176 Run: 5 Tech: MM Reviewer: BO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2953	3000	1001	1000
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	1783	1800	973	1000
Tolerance CO ₂		+/- 0.02		+/- 0.5		+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0009	2940	1009	0007	0.02	0.014	0.15	0.008	0.05	✓	
CO ₂	0	1769	977	0	0.02	0.14	0.5	0.04	0.5	✓	

TEST DATA LOG

Date: 2-18-09 / 14 Manufacturer: Heritage Model: 8024 Heritage
 Project #: PI 20176 Run: 5 Tech: mm Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	766 794, 18	710 231, 12	051, 24
Initial (Liter)	766 192, 62	719 643, 63	003, 23

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101, 9	101, 8
Dry Bulb (F):	75, 38	83, 12
Humidity (%):	58, 4	54, 0

Flow Meter

	Start	End
Flow meter reading	NA	NA

Flow Meter Verification

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

FUEL DATA

Date: 2018-09-14 Manufacturer: Heartthrob Model: 8024 Heritage
 Project #: PI 20176 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 18 in.	1702 lbs.	21.2	21.4	22.0	21.9	21.6		
1 1/2 x 3 1/2 x 18 in.	1750 lbs.	21.8	21.9	21.3	21.8	21.4		
1 1/2 x 3 1/2 x 18 in.	1826 lbs.	22.0	21.7	19.9	19.3	19.4		
1 1/2 x 3 1/2 x 18 in.	1872 lbs.	20.0	21.3	21.4	21.8	21.1		
1 1/2 x 3 1/2 x 12 in.	1326 lbs.	19.4	19.6	19.3	19.3	19.6		
1 1/2 x 3 1/2 x 12 in.	1220 lbs.	19.9	20.0	20.1	19.3	19.4		
1 1/2 x 3 1/2 x 12 in.	1250 lbs.	19.2	19.3	19.3	19.8	19.1		
1 1/2 x 3 1/2 x 12 in.	1442 lbs.	19.8	19.7	19.2	20.6	20.6		
1 1/2 x 3 1/2 x 12 in.	1596 lbs.	20.6	20.4	20.9	20.6	20.8		
1 1/2 x 3 1/2 x 12 in.	1472 lbs.	20.7	20.6	20.9	20.3	20.7		
1 1/2 x 3 1/2 x 12 in.	1576 lbs.	20.9	21.1	20.6	20.8	21.7		
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							

TEST LOAD WEIGHT: 1703 lbs

FUEL DATA

 Date: 2018-09-14

 Manufacturer: Hearthstone

 Model: 8024 Heritage

 Project #: PT 20176

 Run: 5

 Tech: mm

 Reviewer: JP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3/4 x 17 in.	1976 lbs.	221	223	221	224	219
1 1/2 x 3/4 x 17 in.	1672 lbs.	220	219	219	218	213
1 1/2 x 3/4 x 17 in.	1622 lbs.	219	213	218	219	218
3 1/2 x 3/4 x 17 in.	4130 lbs.	210	213	214	218	213
3 1/2 x 3/4 x 17 in.	4214 lbs.	220	219	216	213	214
1 1/2 x 3/4 x 5 in.	0102 lbs.			201		
1 1/2 x 3/4 x 5 in.	0098 lbs.			206		
1 1/2 x 3/4 x 5 in.	0090 lbs.			191		
1 1/2 x 3/4 x 5 in.	0090 lbs.			193		
1 1/2 x 3/4 x 5 in.	0104 lbs.			204		
1 1/2 x 3/4 x 5 in.	0110 lbs.			209		
1 1/2 x 3/4 x 5 in.	0118 lbs.			208		
1 1/2 x 3/4 x 5 in.	0106 lbs.			209		
1 1/2 x 3/4 x 5 in.	0096 lbs.			200		
1 1/2 x 3/4 x 5 in.	0106 lbs.			200		
1 1/2 x 3/4 x 5 in.	0102 lbs.			196		
1 1/2 x 3/4 x 5 in.	0116 lbs.			193		
1 1/2 x 3/4 x 5 in.	0106 lbs.			199		
1 1/2 x 3/4 x 5 in.	0108 lbs.			194		
1 1/2 x 3/4 x 5 in.	0108 lbs.			198		
1 1/2 x 3/4 x 5 in.	0102 lbs.			193		
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: 15,32 lbs Min 20%: 306 Max 25%: 383

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-09-13 Manufacturer: Hearshel Smith Model: 8024 Heritage

Project #: PI 20176 Run: 5 Tech: MM Reviewer: DP

		SYSTEM 1 - 1 st hour					SYSTEM 1 Sys 2			
Pre-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
		5	400	401	3	11	402	403	11	406
2018-09-13 18:00		615046	01255	01275	339074	937253	01281	01261	342026	01279
2018-09-14 8:00		615046	01255	01276	339075	937254	01280	01261	342027	01280
							</			

		SYSTEM 1 - 1 st 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	Blanc		
Date	Time	5	400	401	3	11	402	403	11	406	
2018-09-14	13:15	615058	01260	01279	339212	937272	01285	01263	342064	01283	
2018-09-17	8:00	615048	01257	01276	339086	937260	01282	01261	342038 342038	01281	
2018-09-21	7:00	615048	01257	01276	339086	937260	01282	01261	342038	01281	

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Model: 8024 Heritage

Manufacturer: Heathston

Date: 2018-09-13

Project #: PI 20176 Run: 5

Tech: MM

Reviewer: DL

Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	12	404	405	32
2018-09-13	18:30	945413	01258	01293	340176
2018-09-14	8:30	945414	01258	01293	340175

Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	12	404	405	32
2018-09-14	13:15	945425	01252	01293	340299
2018-09-17	8:00	945418	01254	01293	340182
2018-09-21	8:00	945418	01252	01293	340182

APPENDIX 2: Proportionality results

Average	Average	Average						Average
14,94	Inlet +	Inlet +						0,230
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,03	97,89	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
15,179	538,5	538,5			0,156	0,154	0	0,2304885
15,021	538,6	538,6	98,79	98,73	0,157	0,154	1	0,2304886
15,229	538,6	538,6	97,51	97,45	0,157	0,154	2	0,2337675
15,000	538,6	538,6	99,06	99,01	0,157	0,154	3	0,2300482
15,085	538,6	538,6	98,71	98,64	0,157	0,154	4	0,2311491
14,909	538,6	538,6	99,45	99,38	0,157	0,154	5	0,2289434
14,979	538,6	538,7	98,39	98,32	0,157	0,154	6	0,2304888
14,942	538,6	538,7	98,68	98,61	0,157	0,154	7	0,2300492
15,036	538,7	538,7	98,04	97,97	0,157	0,154	8	0,2315875
14,999	538,7	538,8	98,11	98,03	0,157	0,154	9	0,2311495
14,927	538,7	538,8	98,63	98,55	0,157	0,154	10	0,230049
15,021	538,7	538,9	97,89	97,81	0,157	0,154	11	0,2315871
15,050	538,8	538,9	97,70	97,63	0,157	0,154	12	0,2320257
15,020	538,9	538,9	97,87	97,79	0,157	0,154	13	0,2315875
14,926	538,9	538,9	98,65	98,45	0,157	0,154	14	0,2300492
15,165	538,9	538,9	96,89	96,77	0,157	0,154	15	0,233769
14,995	538,9	538,9	97,87	97,88	0,156	0,154	16	0,2311494
15,005	538,9	538,9	97,88	97,81	0,156	0,154	17	0,2313608
15,049	538,9	539,0	97,75	97,45	0,157	0,154	18	0,2320258
15,020	538,9	539,0	97,84	97,46	0,157	0,154	19	0,2315877
14,814	538,9	539,0	99,15	99,16	0,157	0,154	20	0,2285
15,044	538,9	539,0	97,66	97,43	0,157	0,154	21	0,2320258
14,989	538,9	539,0	97,84	97,80	0,156	0,154	22	0,2311491
14,877	538,9	539,0	98,77	98,55	0,156	0,154	23	0,229387
14,923	538,9	539,0	98,57	98,25	0,157	0,154	24	0,2300492
14,950	539,0	539,1	98,29	98,03	0,157	0,154	25	0,2304894
14,953	539,0	539,1	98,38	97,99	0,157	0,154	26	0,2304889
15,053	539,0	539,2	97,68	97,43	0,157	0,154	27	0,232026
15,028	539,0	539,2	97,88	97,62	0,157	0,154	28	0,2315877
14,999	539,0	539,2	98,07	97,77	0,157	0,154	29	0,2311495
14,880	539,1	539,2	98,70	98,58	0,157	0,154	30	0,2293872
14,847	539,1	539,3	98,88	98,82	0,156	0,154	31	0,2289437
15,041	539,2	539,3	97,47	97,38	0,156	0,154	32	0,2320261
15,041	539,2	539,3	97,68	97,38	0,157	0,154	33	0,2320259
15,080	539,2	539,4	97,12	97,13	0,157	0,154	34	0,2326814
14,947	539,3	539,4	98,21	97,89	0,156	0,154	35	0,2304899
15,041	539,4	539,5	97,37	97,30	0,156	0,153	36	0,2320265
15,013	539,5	539,5	97,68	97,43	0,156	0,153	37	0,2315877
14,913	539,5	539,5	98,29	98,18	0,156	0,154	38	0,2300496
15,010	539,6	539,6	97,76	97,55	0,156	0,154	39	0,231588
14,984	539,6	539,6	97,70	97,54	0,156	0,153	40	0,2311499
14,909	539,7	539,7	98,23	98,28	0,156	0,153	41	0,2299233
15,023	539,7	539,7	97,76	97,44	0,156	0,153	42	0,2315879
14,997	539,8	539,7	98,04	97,86	0,157	0,154	43	0,2311495
15,056	539,8	539,7	97,64	97,51	0,157	0,154	44	0,2320268
14,999	539,8	539,7	97,80	98,08	0,156	0,154	45	0,2311495
15,006	539,8	539,7	98,01	97,67	0,156	0,154	46	0,2311499
15,110	539,9	539,8	97,32	97,10	0,156	0,153	47	0,2326816
14,943	539,9	539,8	98,59	98,36	0,156	0,153	48	0,23005
15,075	539,9	539,8	97,63	97,64	0,156	0,154	49	0,2320261
14,846	539,9	539,8	99,34	98,85	0,156	0,154	50	0,2285008
15,124	539,9	539,9	97,37	97,39	0,156	0,153	51	0,2326818
15,022	539,9	539,9	98,15	97,89	0,156	0,154	52	0,2311498
14,952	539,9	539,9	98,40	98,37	0,156	0,154	53	0,2300495

14,912	540,0	539,9	98,80	98,77	0,156	0,154	54	0,229387
14,975	540,0	539,9	98,36	98,07	0,156	0,154	55	0,2304899
15,055	540,0	540,0	97,88	97,66	0,156	0,153	56	0,2315877
15,025	540,0	540,0	97,86	97,60	0,156	0,153	57	0,2311499
15,085	540,0	540,0	97,45	97,58	0,156	0,153	58	0,2320265
15,201	540,0	540,0	97,03	96,65	0,156	0,153	59	0,233769
15,063	540,1	540,0	98,01	97,98	0,156	0,153	60	0,2315882
15,037	540,1	540,0	98,00	98,04	0,156	0,154	61	0,2311501
15,064	540,1	540,1	97,69	98,13	0,156	0,154	62	0,2315881
14,994	540,1	540,1	98,40	98,34	0,156	0,154	63	0,2304888
14,928	540,1	540,1	98,83	99,10	0,156	0,154	64	0,229388
14,969	540,1	540,1	98,76	98,45	0,156	0,154	65	0,2300499
14,999	540,2	540,1	98,45	98,28	0,156	0,153	66	0,2304898
14,985	540,2	540,2	98,58	98,38	0,156	0,153	67	0,2303129
14,966	540,2	540,2	98,54	98,59	0,156	0,154	68	0,2300504
14,993	540,3	540,2	98,40	98,19	0,156	0,154	69	0,2304902
14,865	540,3	540,3	99,10	99,03	0,156	0,153	70	0,2285011
15,069	540,3	540,3	97,96	97,83	0,156	0,153	71	0,2315885
15,071	540,3	540,3	98,12	97,77	0,156	0,153	72	0,2315888
15,071	540,4	540,3	98,10	97,79	0,157	0,153	73	0,2315887
15,043	540,4	540,3	98,06	98,18	0,156	0,154	74	0,2311561
15,101	540,4	540,4	97,82	97,64	0,156	0,154	75	0,2320267
14,826	540,4	540,4	99,56	99,38	0,156	0,153	76	0,2278329
15,041	540,5	540,4	98,06	98,00	0,156	0,153	77	0,2311506
14,972	540,5	540,5	98,56	98,28	0,156	0,153	78	0,2300505
14,999	540,5	540,5	98,30	98,19	0,156	0,153	79	0,2304905
14,889	540,5	540,5	99,28	98,96	0,156	0,153	80	0,2288312
15,042	540,6	540,5	98,18	98,25	0,156	0,154	81	0,2311504
14,897	540,6	540,5	99,11	99,13	0,156	0,154	82	0,228944
14,924	540,6	540,5	98,92	98,88	0,156	0,154	83	0,2293876
14,968	540,6	540,6	98,56	98,42	0,156	0,154	84	0,2300508
14,826	540,6	540,6	99,47	99,39	0,156	0,153	85	0,2278332
14,969	540,6	540,6	98,64	98,50	0,156	0,153	86	0,2300506
14,972	540,7	540,6	98,59	98,43	0,156	0,153	87	0,2300508
14,923	540,7	540,7	98,95	98,72	0,156	0,153	88	0,2293608
14,897	540,7	540,7	99,15	98,87	0,156	0,153	89	0,2289448
14,897	540,7	540,7	99,10	98,88	0,156	0,153	90	0,2289453
14,870	540,7	540,7	99,30	99,11	0,156	0,153	91	0,2285015
15,001	540,8	540,8	98,61	98,28	0,156	0,153	92	0,2304907
14,897	540,8	540,8	99,05	98,91	0,156	0,153	93	0,2289451
14,969	540,8	540,8	98,65	98,32	0,156	0,153	94	0,2300508
15,072	540,9	540,8	98,03	97,78	0,156	0,153	95	0,2315892
14,969	540,9	540,9	98,44	98,38	0,156	0,153	96	0,2300506
14,995	540,9	540,9	98,38	98,48	0,156	0,154	97	0,2304916
14,998	541,0	541,0	98,67	98,33	0,156	0,154	98	0,2304913
15,045	541,1	541,0	98,13	98,08	0,156	0,154	99	0,2311514
14,900	541,1	541,0	98,98	98,97	0,156	0,154	100	0,2289455
14,996	541,1	541,0	98,34	98,20	0,156	0,153	101	0,230491
14,996	541,1	541,0	98,45	98,13	0,156	0,153	102	0,2304936
14,895	541,1	541,0	98,86	98,98	0,156	0,153	103	0,2289447
14,997	541,1	541,1	98,36	98,03	0,156	0,153	104	0,2304907
14,891	541,2	541,1	99,06	99,00	0,156	0,153	105	0,228945
14,862	541,2	541,1	99,08	99,04	0,156	0,154	106	0,2285018
15,038	541,2	541,1	98,09	97,75	0,156	0,153	107	0,2311514
14,825	541,2	541,1	99,61	99,45	0,156	0,153	108	0,2278344
15,067	541,2	541,2	98,00	97,74	0,156	0,153	109	0,2315897
14,968	541,3	541,2	98,59	98,39	0,156	0,153	110	0,2300513
14,993	541,3	541,2	98,36	98,22	0,156	0,153	111	0,2304919
14,965	541,3	541,2	98,69	98,42	0,156	0,153	112	0,2300514
14,889	541,3	541,3	99,10	99,04	0,156	0,154	113	0,2289423
14,962	541,4	541,3	98,35	98,41	0,156	0,154	114	0,2300511

14,962	541,4	541,3	98,47	98,69	0,156	0,154	115	0,2300433
14,990	541,4	541,3	98,19	98,15	0,156	0,154	116	0,230491
14,989	541,4	541,3	98,26	98,23	0,156	0,153	117	0,2304912
14,853	541,5	541,3	99,10	99,03	0,156	0,153	118	0,2285028
14,952	541,5	541,4	98,39	98,47	0,156	0,154	119	0,2300515
14,982	541,5	541,4	98,16	98,11	0,156	0,154	120	0,2304915
14,985	541,5	541,4	98,28	98,22	0,156	0,153	121	0,230492
14,963	541,5	541,4	98,53	98,44	0,156	0,154	122	0,2300518
14,890	541,5	541,4	98,79	98,74	0,156	0,153	123	0,2289457
14,961	541,5	541,4	98,46	98,33	0,156	0,153	124	0,2300515
14,920	541,6	541,4	98,83	98,86	0,156	0,154	125	0,2293888
14,861	541,6	541,5	99,18	99,00	0,156	0,154	126	0,2285022
14,990	541,6	541,5	98,16	98,29	0,156	0,153	127	0,230492
14,960	541,6	541,5	98,31	98,45	0,156	0,154	128	0,2300515
14,890	541,7	541,5	98,95	98,75	0,156	0,153	129	0,2289456
14,962	541,7	541,6	98,39	98,46	0,156	0,153	130	0,2300669
15,031	541,7	541,6	97,80	97,74	0,156	0,153	131	0,2311521
15,063	541,7	541,6	97,84	97,67	0,156	0,153	132	0,2315899
15,085	541,8	541,6	97,49	97,30	0,156	0,153	133	0,2320289
15,130	541,9	541,7	97,23	97,14	0,156	0,153	134	0,2326838
14,855	541,9	541,7	98,97	99,20	0,156	0,153	135	0,2285029
14,805	541,9	541,7	99,38	99,15	0,156	0,153	136	0,227729
14,912	541,9	541,7	98,73	98,50	0,156	0,153	137	0,2293897
14,910	541,9	541,7	98,61	98,53	0,156	0,153	138	0,2293891
14,979	541,9	541,7	97,88	98,05	0,156	0,153	139	0,2304923
14,880	541,9	541,7	98,78	98,54	0,156	0,153	140	0,2289461
14,948	541,9	541,8	98,11	98,39	0,156	0,153	141	0,2300526
15,075	541,9	541,8	97,29	97,12	0,156	0,153	142	0,2320293
14,974	541,9	541,8	98,12	97,84	0,156	0,153	143	0,2304929
14,945	541,9	541,8	98,32	98,26	0,156	0,153	144	0,2300526
14,977	541,9	541,8	98,12	97,82	0,156	0,153	145	0,2304921
15,017	541,9	541,8	97,77	97,72	0,156	0,153	146	0,2311521
15,013	541,9	541,8	97,86	97,54	0,156	0,153	147	0,2311502
14,897	542,0	541,9	98,32	98,45	0,156	0,153	148	0,2293892
15,012	542,0	541,9	98,07	97,62	0,156	0,153	149	0,2311462
14,968	542,0	541,9	98,07	98,06	0,156	0,153	150	0,2304923
14,966	542,0	541,9	97,90	97,84	0,156	0,153	151	0,2304926
14,892	542,0	541,9	98,40	98,45	0,156	0,153	152	0,2293893
14,935	542,0	541,9	98,30	97,88	0,156	0,153	153	0,2300522
15,008	542,0	541,9	97,72	97,37	0,156	0,153	154	0,2311526
14,894	542,0	541,9	98,52	98,35	0,156	0,153	155	0,2293895
14,935	542,0	541,9	98,37	98,16	0,156	0,153	156	0,2300493
14,963	542,0	541,9	97,95	97,66	0,156	0,153	157	0,2304928
15,029	542,0	541,9	97,51	97,35	0,156	0,153	158	0,2315719
14,911	542,0	541,9	98,31	98,39	0,156	0,153	159	0,2296801
14,937	542,0	541,9	98,13	98,05	0,156	0,153	160	0,2300518
15,006	542,0	541,9	97,68	97,51	0,156	0,153	161	0,2311526
15,034	542,0	541,9	97,47	97,14	0,156	0,153	162	0,2315898
15,035	542,0	541,9	97,51	97,33	0,156	0,153	163	0,2315904
15,007	542,0	541,9	97,61	97,44	0,156	0,153	164	0,2311522
14,861	542,0	542,0	98,53	98,45	0,156	0,153	165	0,2289462
14,893	542,0	542,0	98,36	98,24	0,156	0,153	166	0,2294838
15,029	542,0	542,0	97,46	97,41	0,156	0,153	167	0,2315902
14,896	542,0	542,0	98,16	98,13	0,156	0,153	168	0,2295471
14,787	542,0	542,0	99,17	98,86	0,156	0,153	169	0,2278354
15,032	542,0	542,0	97,33	97,24	0,156	0,153	170	0,2315906
14,859	542,0	542,0	98,51	98,43	0,156	0,153	171	0,2289462
14,958	542,0	542,0	97,83	97,69	0,156	0,153	172	0,2304927
14,959	542,0	542,0	97,97	97,64	0,156	0,153	173	0,2304923
14,859	542,1	542,0	98,58	98,41	0,156	0,153	174	0,2289466
14,934	542,1	542,0	98,04	97,96	0,156	0,153	175	0,2300515

15,008	542,1	542,0	97,46	97,51	0,156	0,153	176	0,2311527
15,011	542,1	542,0	97,60	97,46	0,156	0,153	177	0,2311524
14,840	542,1	542,1	98,78	98,83	0,156	0,153	178	0,2285033
14,939	542,1	542,1	98,05	98,05	0,156	0,153	179	0,2300525
15,008	542,1	542,1	97,52	97,67	0,156	0,153	180	0,2311524
14,866	542,1	542,1	98,54	98,68	0,156	0,153	181	0,2289466
14,942	542,1	542,1	98,17	98,15	0,156	0,153	182	0,2300524
14,837	542,1	542,1	98,82	98,65	0,156	0,153	183	0,2285029
14,890	542,1	542,1	98,38	98,15	0,156	0,153	184	0,2293898
15,037	542,1	542,1	97,53	97,19	0,156	0,153	185	0,2315898
14,959	542,2	542,1	98,05	97,74	0,156	0,153	186	0,2304919
15,035	542,1	542,1	97,48	97,28	0,156	0,153	187	0,2315901
14,964	542,2	542,1	97,93	97,91	0,156	0,153	188	0,2304923
15,040	542,1	542,1	97,40	97,21	0,156	0,153	189	0,2315905
14,934	542,2	542,2	97,87	97,85	0,156	0,153	190	0,2300523
15,063	542,2	542,2	97,16	97,12	0,156	0,153	191	0,2320288
15,004	542,2	542,2	97,61	97,49	0,156	0,153	192	0,2311528
15,006	542,2	542,2	97,46	97,65	0,156	0,153	193	0,2311527
14,862	542,2	542,1	98,42	98,54	0,156	0,153	194	0,2289463
14,964	542,2	542,1	97,92	97,69	0,156	0,153	195	0,2304927
14,895	542,2	542,1	98,35	98,22	0,156	0,153	196	0,2293897
14,892	542,2	542,1	98,29	98,03	0,156	0,153	197	0,2293871
14,971	542,2	542,1	97,91	97,76	0,156	0,153	198	0,2306262
14,829	542,2	542,2	98,73	98,57	0,156	0,153	199	0,2284987
14,964	542,2	542,2	97,85	97,69	0,156	0,153	200	0,2304927
14,961	542,2	542,2	97,75	97,71	0,156	0,153	201	0,2304923
14,926	542,2	542,2	98,20	97,80	0,156	0,153	202	0,229997
14,886	542,2	542,2	98,46	97,95	0,156	0,153	203	0,2294067
14,854	542,1	542,2	98,46	98,15	0,156	0,153	204	0,228946
14,960	542,1	542,2	97,85	97,69	0,156	0,153	205	0,2304923
14,960	542,1	542,2	97,90	97,79	0,156	0,153	206	0,2304923
14,885	542,2	542,2	98,13	98,00	0,156	0,153	207	0,2293898
15,002	542,2	542,3	97,63	97,47	0,156	0,153	208	0,2311528
14,855	542,2	542,2	98,52	98,41	0,156	0,153	209	0,2289468
15,031	542,2	542,2	97,47	97,29	0,156	0,153	210	0,2315906
14,955	542,2	542,2	97,60	97,46	0,156	0,153	211	0,2304924
14,858	542,2	542,2	98,53	98,24	0,156	0,153	212	0,2289428
14,825	542,2	542,2	98,46	98,38	0,156	0,153	213	0,2285035
14,927	542,2	542,3	97,88	97,77	0,155	0,153	214	0,2300526
14,953	542,2	542,3	97,69	97,56	0,156	0,153	215	0,2304927
14,956	542,2	542,3	97,82	97,45	0,156	0,153	216	0,2304929
14,927	542,2	542,3	98,02	97,85	0,156	0,153	217	0,2300533
14,784	542,2	542,2	98,93	98,94	0,156	0,153	218	0,2278356
14,954	542,1	542,2	97,80	97,72	0,156	0,153	219	0,2304924
14,925	542,1	542,2	97,89	97,64	0,156	0,153	220	0,2300524
14,882	542,1	542,2	98,20	98,16	0,156	0,153	221	0,2293898
14,818	542,1	542,2	98,46	98,29	0,156	0,153	222	0,2285037
15,014	542,1	542,2	97,18	96,95	0,156	0,153	223	0,2315907
14,815	542,2	542,3	98,64	98,18	0,156	0,153	224	0,2285031
15,017	542,3	542,3	97,43	97,13	0,156	0,153	225	0,2315914
14,876	542,3	542,3	98,04	97,86	0,156	0,153	226	0,2293903
14,948	542,3	542,3	97,52	97,51	0,155	0,153	227	0,2304929
14,918	542,3	542,3	97,83	97,61	0,155	0,153	228	0,2300531
14,846	542,2	542,3	98,20	98,01	0,156	0,153	229	0,2289465
15,020	542,2	542,3	97,22	97,09	0,156	0,153	230	0,2315909
14,747	542,2	542,3	99,04	98,79	0,156	0,153	231	0,2273902
14,920	542,2	542,3	97,93	97,54	0,156	0,153	232	0,2300526
14,918	542,3	542,3	97,79	97,90	0,156	0,153	233	0,2300521
14,920	542,2	542,3	97,77	97,58	0,155	0,153	234	0,2300527
14,924	542,2	542,3	97,78	98,01	0,155	0,153	235	0,2300525
14,879	542,2	542,3	98,07	97,99	0,155	0,153	236	0,2293898

14,920	542,2	542,3	97,85	97,56	0,156	0,153	237	0,2300525
14,951	542,2	542,3	97,61	97,56	0,156	0,153	238	0,2304927
14,845	542,2	542,3	98,24	98,23	0,155	0,153	239	0,2289467
14,923	542,2	542,3	97,71	97,57	0,155	0,153	240	0,2300524
14,948	542,2	542,3	97,71	97,78	0,155	0,153	241	0,2304929
14,921	542,2	542,3	97,97	97,80	0,156	0,153	242	0,2300523
14,922	542,2	542,2	97,72	97,62	0,156	0,153	243	0,230052
14,879	542,2	542,2	98,03	98,05	0,155	0,153	244	0,2293898
14,878	542,1	542,2	98,10	97,99	0,155	0,153	245	0,2293897
15,018	542,1	542,3	97,34	97,04	0,156	0,153	246	0,2315909
14,989	542,2	542,2	97,33	97,35	0,156	0,153	247	0,2311532
14,917	542,1	542,2	97,88	97,59	0,156	0,153	248	0,2300521
14,874	542,1	542,3	98,27	98,16	0,156	0,153	249	0,2293899
14,917	542,1	542,3	97,93	97,77	0,156	0,153	250	0,2300527
14,945	542,1	542,2	97,78	97,53	0,156	0,153	251	0,2304931
15,044	542,1	542,3	97,09	96,83	0,156	0,153	252	0,2320204
15,017	542,2	542,3	97,09	96,97	0,156	0,153	253	0,2315906
14,774	542,1	542,2	98,91	98,75	0,156	0,153	254	0,2278357
14,912	542,1	542,3	97,87	97,66	0,156	0,153	255	0,2300524
15,039	542,2	542,3	96,82	96,78	0,156	0,153	256	0,2320295
14,912	542,2	542,3	97,75	97,53	0,155	0,153	257	0,230052
15,010	542,2	542,3	97,04	96,80	0,155	0,153	258	0,231591
14,942	542,2	542,3	97,68	97,54	0,156	0,153	259	0,2304929
14,940	542,2	542,3	97,65	97,55	0,156	0,153	260	0,2304928
14,985	542,2	542,3	97,24	97,10	0,156	0,153	261	0,2311529
15,012	542,2	542,3	97,27	97,03	0,156	0,153	262	0,2315906
15,010	542,2	542,3	97,35	97,08	0,156	0,153	263	0,2315908
14,908	542,2	542,3	97,79	97,67	0,156	0,153	264	0,2300526
15,012	542,2	542,3	97,32	97,01	0,156	0,153	265	0,2315904
14,870	542,2	542,3	97,98	97,85	0,156	0,153	266	0,2293894
15,011	542,2	542,3	97,13	97,18	0,155	0,153	267	0,2315906
14,809	542,1	542,3	98,50	98,24	0,156	0,153	268	0,2285033
14,905	542,2	542,3	97,46	97,38	0,155	0,153	269	0,2300524
14,939	542,1	542,3	97,68	97,52	0,155	0,153	270	0,2304928
14,935	542,1	542,3	97,58	97,39	0,156	0,153	271	0,2304932
14,910	542,1	542,3	97,87	97,69	0,156	0,153	272	0,2300525
14,836	542,1	542,3	98,12	98,12	0,156	0,153	273	0,2289472
14,981	542,1	542,3	97,32	97,13	0,155	0,153	274	0,2311529
14,908	542,1	542,3	97,72	97,72	0,156	0,153	275	0,2300531
14,907	542,1	542,3	97,82	97,48	0,156	0,153	276	0,2300531
14,909	542,1	542,3	97,92	97,78	0,156	0,153	277	0,2300526
14,982	542,1	542,3	97,51	97,32	0,156	0,153	278	0,2311526
15,008	542,1	542,2	97,20	96,85	0,156	0,153	279	0,231591
14,935	542,1	542,2	97,54	97,28	0,156	0,153	280	0,2304931
14,904	542,0	542,2	97,82	97,50	0,156	0,153	281	0,2300528
14,977	542,0	542,2	97,34	97,05	0,156	0,153	282	0,231153
14,935	542,0	542,2	97,57	97,53	0,156	0,153	283	0,2304933
14,802	542,0	542,2	98,33	98,07	0,156	0,153	284	0,2285034
14,803	542,1	542,2	98,45	98,14	0,156	0,153	285	0,2285031
14,936	542,1	542,3	97,62	97,47	0,156	0,153	286	0,2304925
14,933	542,1	542,3	97,60	97,34	0,156	0,153	287	0,2304927
14,761	542,1	542,3	98,71	98,92	0,156	0,153	288	0,2278357
14,975	542,1	542,3	97,30	97,10	0,156	0,153	289	0,2311526
14,832	542,1	542,3	98,25	98,41	0,156	0,153	290	0,2289459
14,976	542,1	542,2	97,37	97,13	0,156	0,153	291	0,2311527
14,832	542,1	542,2	98,27	98,04	0,156	0,153	292	0,2289465
14,732	542,1	542,2	99,04	98,80	0,156	0,153	293	0,2273902
14,975	542,0	542,2	97,23	97,29	0,156	0,153	294	0,2311523
14,931	542,1	542,2	97,38	97,51	0,155	0,153	295	0,2304929
15,028	542,0	542,2	96,98	96,73	0,156	0,153	296	0,2320292
14,860	542,1	542,2	98,03	98,02	0,156	0,153	297	0,2293901

15,001	542,1	542,2	96,96	97,19	0,156	0,153	298	0,2315909
14,833	542,0	542,2	98,30	98,25	0,156	0,153	299	0,2289467
14,973	542,0	542,1	97,28	97,24	0,156	0,153	300	0,2311532
14,978	542,0	542,1	97,19	97,38	0,156	0,153	301	0,2311532
14,833	542,0	542,1	98,26	98,11	0,156	0,153	302	0,2289468
14,977	542,0	542,1	97,39	97,13	0,156	0,153	303	0,231153
14,934	542,0	542,1	97,69	97,33	0,156	0,153	304	0,2304928
14,906	542,0	542,1	98,01	97,61	0,156	0,153	305	0,2300528
14,904	542,0	542,1	97,57	97,60	0,156	0,153	306	0,2300526
14,934	542,0	542,1	97,64	97,40	0,156	0,153	307	0,2304931
14,863	542,0	542,2	98,11	97,90	0,156	0,153	308	0,2293905
15,032	542,0	542,2	96,95	96,78	0,156	0,153	309	0,2320293
14,834	542,0	542,2	98,33	98,12	0,156	0,153	310	0,228947
14,934	542,0	542,2	97,49	97,51	0,156	0,153	311	0,2304935
14,975	542,0	542,2	97,37	97,04	0,156	0,153	312	0,2311531
14,932	542,0	542,1	97,57	97,29	0,156	0,153	313	0,2304928
14,905	542,0	542,1	97,70	97,60	0,156	0,153	314	0,2300531
14,928	542,0	542,1	97,56	97,21	0,156	0,153	315	0,2304934
14,905	541,9	542,1	97,89	97,68	0,156	0,153	316	0,2300533
15,034	541,9	542,1	96,97	96,79	0,156	0,153	317	0,2320297
14,801	542,0	542,1	98,47	98,23	0,156	0,153	318	0,2285036
14,857	542,0	542,1	98,06	98,02	0,156	0,153	319	0,2293897
14,929	541,9	542,1	97,39	97,39	0,156	0,153	320	0,2304931
14,832	542,0	542,1	98,29	97,99	0,156	0,153	321	0,2289469
14,931	542,0	542,1	97,75	97,49	0,156	0,153	322	0,2304926
14,931	542,0	542,1	97,64	97,26	0,156	0,153	323	0,2304928
15,001	541,9	542,1	97,10	96,87	0,156	0,153	324	0,2315906
14,832	541,9	542,1	98,34	98,10	0,156	0,153	325	0,2289489
14,971	542,0	542,1	97,27	97,24	0,156	0,153	326	0,2311533
14,858	542,0	542,2	98,08	97,75	0,156	0,153	327	0,2293899
14,831	542,0	542,1	98,27	98,05	0,156	0,153	328	0,2289472
14,931	542,0	542,2	97,57	97,10	0,156	0,153	329	0,2304933
14,972	542,0	542,2	97,18	96,88	0,156	0,152	330	0,231153
14,974	542,0	542,2	97,25	97,25	0,156	0,153	331	0,2311529
14,859	542,0	542,2	97,84	97,81	0,155	0,153	332	0,2293901
14,902	542,0	542,2	97,74	97,61	0,155	0,153	333	0,2300531
14,900	542,0	542,2	97,82	97,31	0,156	0,153	334	0,2300532
14,902	542,0	542,2	97,81	97,40	0,156	0,152	335	0,2300528
14,902	542,1	542,2	97,60	97,74	0,156	0,153	336	0,2300533
14,931	542,0	542,2	97,69	97,42	0,156	0,153	337	0,2304932
14,999	542,0	542,2	97,04	97,20	0,156	0,153	338	0,2315913
14,858	542,0	542,2	97,98	97,87	0,156	0,153	339	0,2293905
14,831	542,0	542,2	98,28	98,19	0,156	0,153	340	0,228947
14,930	542,0	542,2	97,49	97,46	0,156	0,153	341	0,2304932
15,003	542,0	542,2	97,09	96,83	0,156	0,153	342	0,231591
15,005	542,0	542,2	97,03	96,89	0,156	0,153	343	0,2315906
14,934	542,0	542,2	97,62	97,56	0,156	0,153	344	0,2304929
14,834	542,0	542,2	98,22	98,25	0,156	0,153	345	0,2289469
14,931	542,0	542,2	97,47	97,46	0,156	0,153	346	0,2304928
14,902	542,0	542,2	97,85	97,83	0,156	0,153	347	0,2300528
14,974	542,0	542,2	97,22	97,21	0,156	0,153	348	0,2311525
14,830	541,9	542,2	98,11	97,86	0,155	0,153	349	0,2289468
14,904	541,9	542,2	97,83	97,59	0,156	0,153	350	0,2300529
14,860	541,9	542,1	98,21	97,75	0,156	0,153	351	0,2293896
14,802	541,9	542,1	98,31	98,06	0,156	0,153	352	0,2285032
14,860	541,9	542,2	98,14	97,88	0,156	0,153	353	0,2293902
14,975	541,9	542,1	97,40	96,96	0,156	0,153	354	0,2311531
14,658	541,9	542,2	99,56	99,38	0,156	0,153	355	0,2262717
14,730	541,9	542,2	98,82	98,82	0,156	0,153	356	0,2273904
14,758	541,9	542,1	98,59	98,66	0,155	0,153	357	0,2278358
14,931	541,9	542,1	97,76	97,51	0,156	0,153	358	0,2304927

14,931	541,9	542,1	97,64	97,28	0,156	0,153	359	0,2304931
14,974	541,9	542,1	97,27	97,40	0,156	0,153	360	0,231153
14,731	541,9	542,1	98,88	98,81	0,156	0,153	361	0,2273914
14,857	541,9	542,1	98,03	98,03	0,156	0,153	362	0,2293894
14,801	541,9	542,2	98,60	98,23	0,156	0,153	363	0,2285036
14,902	541,9	542,2	97,77	97,58	0,156	0,153	364	0,230053
15,002	541,9	542,2	97,21	96,92	0,156	0,153	365	0,2315907
14,973	541,9	542,2	97,18	97,08	0,156	0,153	366	0,2311524
14,860	542,0	542,2	98,10	97,68	0,156	0,153	367	0,2293897
14,933	542,0	542,2	97,63	97,44	0,156	0,153	368	0,2304929
14,831	542,0	542,2	98,38	98,37	0,156	0,153	369	0,2289475
14,977	542,0	542,2	97,23	97,20	0,156	0,153	370	0,2311881
14,803	541,9	542,2	98,48	98,14	0,156	0,153	371	0,2285032
14,864	541,9	542,2	98,26	97,75	0,156	0,153	372	0,2293899
14,977	541,9	542,2	97,35	97,16	0,156	0,153	373	0,2311527
14,934	541,9	542,2	97,56	97,67	0,156	0,153	374	0,2304929
14,862	541,9	542,2	98,01	97,82	0,156	0,153	375	0,22939
14,934	541,9	542,2	97,60	97,52	0,156	0,153	376	0,230493
14,932	541,9	542,2	97,66	97,25	0,156	0,153	377	0,2304926
14,977	541,9	542,2	97,26	97,03	0,156	0,153	378	0,2311532
14,934	542,0	542,2	97,63	97,36	0,156	0,153	379	0,2304933

Average	Average	Average						Average
15,63	Inlet +	Inlet +						0,238
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,51	98,29	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
15,754	542,6	542,6			0,153	0,150	0	0,237863
15,573	542,7	542,6	100,09	99,90	0,153	0,150	1	0,2367931
15,583	542,7	542,6	100,12	99,90	0,153	0,150	2	0,2367936
15,607	542,7	542,6	100,27	100,25	0,153	0,150	3	0,2367939
15,705	542,6	542,6	99,93	99,84	0,153	0,150	4	0,2378632
15,719	542,6	542,6	99,28	98,91	0,153	0,150	5	0,2389277
15,687	542,6	542,7	99,05	98,75	0,153	0,150	6	0,2389281
15,510	542,6	542,7	99,97	99,85	0,153	0,150	7	0,236365
15,536	542,7	542,7	99,79	99,42	0,153	0,150	8	0,2367945
15,768	542,7	542,7	98,33	98,20	0,153	0,150	9	0,2404105
15,697	542,7	542,7	98,62	98,41	0,153	0,150	10	0,2393514
15,669	542,8	542,8	98,80	98,80	0,153	0,150	11	0,238928
15,671	542,8	542,8	98,73	98,74	0,153	0,150	12	0,2389281
15,533	542,8	542,8	99,91	99,53	0,153	0,150	13	0,2367936
15,699	542,8	542,8	98,66	98,43	0,153	0,150	14	0,2393521
15,701	542,9	542,9	98,61	98,31	0,153	0,150	15	0,2393523
15,565	542,9	542,9	99,45	99,48	0,153	0,150	16	0,2374359
15,573	542,9	542,9	99,45	99,54	0,153	0,150	17	0,2374362
15,461	543,0	542,9	100,04	99,88	0,153	0,150	18	0,2357205
15,610	543,0	543,0	99,42	99,14	0,153	0,150	19	0,2378644
15,545	543,1	543,0	99,86	99,39	0,153	0,150	20	0,2367944
15,688	543,1	543,0	98,84	98,66	0,153	0,150	21	0,2389285
15,755	543,1	543,1	98,51	98,13	0,153	0,150	22	0,2399877
15,694	543,2	543,1	98,82	98,84	0,153	0,150	23	0,2389282
15,623	543,2	543,1	99,49	99,04	0,153	0,150	24	0,2378642
15,527	543,2	543,2	99,96	99,83	0,153	0,150	25	0,2363661
15,550	543,3	543,2	99,73	99,66	0,152	0,150	26	0,2367941
15,552	543,3	543,2	99,79	99,65	0,153	0,150	27	0,2367941
15,550	543,3	543,3	99,96	99,70	0,153	0,150	28	0,2366254
15,704	543,4	543,3	98,93	98,60	0,153	0,150	29	0,2389286
15,703	543,4	543,3	98,96	98,88	0,153	0,150	30	0,2389279
15,554	543,5	543,4	99,83	99,66	0,153	0,150	31	0,2367943
15,597	543,5	543,4	99,45	99,06	0,153	0,150	32	0,2374362
15,487	543,5	543,4	100,16	99,88	0,152	0,150	33	0,2357205
15,487	543,6	543,5	100,25	99,97	0,152	0,150	34	0,2357205
15,558	543,7	543,5	99,66	99,75	0,152	0,150	35	0,2367945
15,533	543,7	543,6	99,83	99,86	0,152	0,150	36	0,2363659
15,700	543,7	543,6	98,90	98,71	0,152	0,150	37	0,2389283
15,530	543,8	543,7	100,16	99,67	0,153	0,150	38	0,2363655
15,728	543,9	543,8	98,65	98,47	0,153	0,150	39	0,2393526
15,635	543,9	543,8	99,30	99,18	0,152	0,150	40	0,237864
15,634	543,9	543,9	99,33	99,28	0,152	0,150	41	0,2378643
15,609	544,0	543,9	99,46	99,27	0,152	0,150	42	0,2374365
15,638	544,0	544,0	99,33	98,91	0,152	0,150	43	0,2378639
15,570	544,0	544,0	99,94	99,42	0,153	0,149	44	0,2367942
15,503	544,1	544,1	100,43	100,22	0,153	0,150	45	0,2357201
15,505	544,2	544,1	100,28	100,13	0,153	0,150	46	0,2357206
15,620	544,2	544,1	99,43	99,41	0,152	0,150	47	0,2374365
15,547	544,2	544,2	100,11	99,83	0,152	0,150	48	0,2363661
15,478	544,3	544,2	100,49	100,26	0,152	0,150	49	0,2352901
15,719	544,3	544,3	98,94	99,02	0,152	0,150	50	0,2389283
15,621	544,3	544,3	99,62	99,45	0,152	0,150	51	0,2374366
15,713	544,4	544,4	98,93	98,84	0,152	0,150	52	0,2389287
15,646	544,4	544,4	99,40	99,15	0,152	0,150	53	0,2378644

15,648	544,4	544,4	99,28	99,05	0,152	0,150	54	0,2378651
15,719	544,4	544,5	99,11	98,61	0,152	0,150	55	0,2389293
15,647	544,5	544,5	99,48	99,12	0,153	0,150	56	0,2378652
15,623	544,5	544,5	99,50	99,50	0,152	0,150	57	0,2374375
15,650	544,6	544,6	99,37	99,33	0,152	0,150	58	0,2378651
15,551	544,6	544,6	99,94	99,70	0,152	0,150	59	0,2363664
15,625	544,6	544,6	99,57	99,42	0,152	0,150	60	0,2374424
15,622	544,6	544,7	99,61	99,45	0,152	0,150	61	0,2374378
15,621	544,6	544,7	99,76	99,24	0,153	0,150	62	0,2374379
15,620	544,7	544,7	99,45	99,25	0,152	0,150	63	0,2374379
15,718	544,7	544,7	98,83	98,85	0,152	0,150	64	0,2389302
15,509	544,7	544,8	100,28	100,04	0,152	0,150	65	0,2357215
15,721	544,8	544,8	98,92	98,61	0,152	0,150	66	0,2389297
15,631	544,8	544,8	99,58	99,17	0,152	0,150	67	0,2375295
15,723	544,8	544,9	98,95	98,66	0,152	0,150	68	0,2389296
15,654	544,8	544,9	99,33	99,23	0,152	0,150	69	0,237865
15,725	544,9	544,9	98,84	98,57	0,152	0,150	70	0,2389296
15,653	544,9	545,0	99,31	99,32	0,152	0,150	71	0,2378654
15,723	545,0	545,0	98,89	98,78	0,152	0,150	72	0,23893
15,583	545,0	545,1	99,66	99,68	0,152	0,150	73	0,2367954
15,625	545,1	545,1	99,49	99,41	0,152	0,150	74	0,2374408
15,585	545,1	545,2	99,77	99,42	0,152	0,150	75	0,2367958
15,750	545,1	545,2	98,72	98,40	0,152	0,149	76	0,2393547
15,722	545,2	545,2	98,63	98,57	0,152	0,149	77	0,2389308
15,582	545,3	545,3	99,71	99,32	0,152	0,149	78	0,2367967
15,654	545,4	545,4	99,19	99,12	0,152	0,149	79	0,2378245
15,727	545,5	545,4	98,88	98,54	0,152	0,149	80	0,2389303
15,728	545,5	545,5	99,04	98,54	0,152	0,149	81	0,2389308
15,728	545,6	545,5	98,86	98,59	0,152	0,149	82	0,2389308
15,584	545,6	545,6	99,64	99,23	0,152	0,149	83	0,2367969
15,649	545,5	545,6	99,09	98,90	0,152	0,149	84	0,237867
15,716	545,5	545,5	98,84	98,46	0,152	0,149	85	0,2389312
15,569	545,3	545,4	99,58	99,35	0,152	0,149	86	0,2367968
15,632	545,2	545,2	99,14	98,91	0,152	0,150	87	0,2378668
15,565	545,0	545,1	99,73	99,47	0,152	0,150	88	0,2367965
15,539	545,0	545,1	99,74	99,63	0,152	0,150	89	0,2363512
15,644	545,0	545,1	99,18	98,69	0,152	0,149	90	0,2378666
15,575	545,1	545,2	99,66	99,36	0,152	0,149	91	0,2367966
15,545	545,2	545,2	99,79	99,55	0,152	0,149	92	0,2363679
15,504	545,3	545,3	100,16	99,59	0,152	0,149	93	0,235723
15,573	545,3	545,4	99,67	99,42	0,152	0,149	94	0,2367963
15,545	545,4	545,4	99,81	99,58	0,152	0,149	95	0,2363682
15,543	545,5	545,5	99,72	99,61	0,152	0,149	96	0,2363682
15,571	545,5	545,5	99,50	99,44	0,152	0,150	97	0,2367964
15,615	545,6	545,6	99,53	99,13	0,152	0,150	98	0,2374382
15,542	545,7	545,6	99,81	99,38	0,152	0,149	99	0,2363682
15,712	545,7	545,7	98,65	98,53	0,152	0,149	100	0,238931
15,642	545,7	545,8	99,20	98,87	0,152	0,149	101	0,2378653
15,642	545,8	545,8	99,13	98,86	0,152	0,149	102	0,2378668
15,569	545,8	545,9	99,52	99,35	0,152	0,149	103	0,236797
15,709	545,9	545,9	98,69	98,47	0,152	0,149	104	0,2389312
15,637	545,9	546,0	99,02	98,76	0,152	0,149	105	0,2378667
15,495	545,9	546,0	100,12	99,85	0,152	0,149	106	0,2357265
15,606	545,9	546,0	99,33	98,89	0,152	0,149	107	0,2374393
15,605	545,9	546,0	99,16	99,00	0,152	0,149	108	0,2374389
15,563	546,0	546,1	99,55	99,27	0,152	0,149	109	0,2367974
15,631	546,0	546,1	99,07	98,58	0,152	0,149	110	0,2378666
15,700	546,0	546,1	98,76	98,31	0,152	0,149	111	0,2389307
15,600	546,0	546,1	99,19	99,09	0,152	0,149	112	0,2374393
15,698	546,0	546,2	98,56	98,36	0,152	0,149	113	0,2389143
15,727	546,1	546,2	98,44	98,25	0,152	0,149	114	0,239356

15,625	546,1	546,2	98,99	98,89	0,152	0,150	115	0,2378676
15,555	546,1	546,2	99,28	99,17	0,152	0,149	116	0,2367975
15,693	546,1	546,3	98,60	98,16	0,152	0,149	117	0,2389317
15,696	546,2	546,3	98,50	98,37	0,152	0,149	118	0,2389314
15,723	546,2	546,4	98,37	98,21	0,152	0,149	119	0,2393557
15,724	546,2	546,4	98,29	98,15	0,152	0,149	120	0,2393557
15,554	546,3	546,4	99,34	99,22	0,152	0,149	121	0,2367975
15,765	546,3	546,4	98,02	97,61	0,152	0,149	122	0,239991
15,595	546,3	546,5	98,91	98,68	0,152	0,149	123	0,2374395
15,551	546,3	546,5	99,16	99,35	0,152	0,149	124	0,2367976
15,717	546,3	546,4	98,12	98,05	0,152	0,149	125	0,2393561
15,687	546,3	546,4	98,41	98,14	0,152	0,149	126	0,2389322
15,711	546,3	546,4	98,06	98,07	0,152	0,149	127	0,239356
15,686	546,2	546,4	98,46	98,05	0,152	0,149	128	0,2389318
15,586	546,2	546,4	98,90	98,75	0,152	0,149	129	0,2374405
15,589	546,2	546,4	98,99	98,59	0,152	0,149	130	0,2374398
15,588	546,3	546,4	99,13	98,77	0,152	0,149	131	0,2374401
15,686	546,3	546,4	98,24	98,31	0,152	0,149	132	0,2389317
15,615	546,3	546,5	98,72	98,51	0,152	0,149	133	0,2378677
15,685	546,4	546,5	98,23	98,15	0,152	0,149	134	0,2389323
15,755	546,4	546,5	97,85	97,75	0,152	0,149	135	0,2399915
15,519	546,5	546,6	99,52	99,29	0,152	0,149	136	0,2363696
15,715	546,5	546,6	98,23	98,07	0,152	0,149	137	0,2393567
15,545	546,5	546,6	99,32	98,97	0,152	0,149	138	0,2367984
15,612	546,6	546,7	98,68	98,41	0,152	0,149	139	0,2378683
15,680	546,6	546,7	98,32	98,07	0,152	0,149	140	0,2389325
15,542	546,7	546,7	99,05	99,16	0,152	0,149	141	0,2367985
15,683	546,7	546,7	98,23	97,93	0,152	0,149	142	0,2389326
15,752	546,7	546,8	97,76	97,68	0,152	0,149	143	0,2399921
15,612	546,7	546,8	98,83	98,45	0,152	0,149	144	0,2378684
15,610	546,8	546,8	98,65	98,49	0,152	0,149	145	0,2378684
15,611	546,8	546,8	98,54	98,28	0,152	0,149	146	0,237869
15,689	546,7	546,8	98,19	97,98	0,152	0,149	147	0,2391148
15,609	546,8	546,8	98,67	98,46	0,152	0,149	148	0,2378691
15,746	546,8	546,9	97,57	97,53	0,152	0,149	149	0,2399924
15,470	546,8	546,9	99,35	99,24	0,151	0,149	150	0,2357458
15,677	546,8	546,9	98,36	97,78	0,152	0,149	151	0,2389329
15,678	546,8	546,9	98,32	97,90	0,152	0,149	152	0,2389332
15,702	546,9	547,0	98,01	97,78	0,152	0,149	153	0,239357
15,601	546,8	546,9	98,63	98,48	0,152	0,149	154	0,2378696
15,600	546,7	546,9	98,57	98,22	0,152	0,149	155	0,2378693
15,670	546,7	546,9	98,17	97,93	0,152	0,149	156	0,2389333
15,698	546,8	546,9	97,99	97,89	0,152	0,149	157	0,2393569
15,740	546,8	546,9	97,75	97,43	0,152	0,149	158	0,2399924
15,600	546,8	546,9	98,48	98,17	0,152	0,149	159	0,2378692
15,500	546,8	546,9	99,04	98,63	0,151	0,149	160	0,2363704
15,574	546,8	546,9	98,72	98,49	0,151	0,149	161	0,2374411
15,697	546,9	546,9	97,93	97,73	0,152	0,149	162	0,2393577
15,698	546,9	547,0	97,84	97,75	0,151	0,149	163	0,2393578
15,532	546,9	547,0	99,01	98,69	0,151	0,149	164	0,2367998
15,771	546,9	547,0	97,44	97,65	0,152	0,149	165	0,2404163
15,742	547,0	547,1	97,78	97,46	0,152	0,149	166	0,2399932
15,672	547,1	547,1	98,20	97,90	0,152	0,149	167	0,2389335
15,698	547,1	547,2	97,95	97,78	0,152	0,149	168	0,2393576
15,699	547,2	547,2	97,85	97,61	0,152	0,149	169	0,2393576
15,600	547,2	547,2	98,55	98,47	0,151	0,149	170	0,2378692
15,600	547,2	547,2	98,69	98,41	0,152	0,149	171	0,2378698
15,697	547,2	547,3	97,96	98,01	0,152	0,149	172	0,2393575
15,571	547,2	547,3	98,76	98,59	0,152	0,149	173	0,2374417
15,668	547,2	547,3	97,96	97,94	0,151	0,149	174	0,2389337
15,665	547,2	547,3	98,04	97,87	0,151	0,149	175	0,2389336

15,666	547,1	547,2	98,07	97,85	0,152	0,149	176	0,238934
15,790	547,0	547,2	97,35	97,06	0,152	0,149	177	0,2408374
15,663	547,0	547,2	98,17	97,87	0,152	0,149	178	0,2389339
15,495	547,0	547,2	99,11	99,15	0,152	0,149	179	0,2363711
15,688	547,0	547,2	97,79	97,76	0,151	0,149	180	0,2393581
15,686	546,9	547,1	97,85	97,62	0,152	0,149	181	0,2393583
15,658	546,9	547,1	98,00	97,62	0,152	0,149	182	0,2389339
15,659	546,9	547,1	98,15	97,82	0,152	0,149	183	0,2389335
15,588	546,9	547,1	98,50	98,23	0,152	0,149	184	0,2378696
15,659	546,9	547,1	98,00	97,71	0,152	0,149	185	0,2389341
15,686	547,0	547,1	97,86	98,00	0,152	0,149	186	0,2393581
15,684	547,0	547,1	97,78	97,47	0,152	0,149	187	0,2393581
15,586	547,0	547,1	98,35	98,48	0,151	0,149	188	0,2378695
15,683	547,0	547,1	97,78	97,57	0,151	0,149	189	0,2393576
15,657	546,9	547,0	98,10	97,74	0,152	0,149	190	0,2389354
15,729	546,9	547,1	97,67	97,38	0,152	0,149	191	0,2399934
15,490	547,0	547,1	99,10	99,07	0,152	0,149	192	0,2363713
15,726	547,0	547,1	97,35	97,25	0,151	0,149	193	0,2399936
15,446	547,1	547,1	99,19	98,92	0,151	0,149	194	0,2357258
15,515	547,1	547,1	99,12	98,56	0,152	0,149	195	0,2368
15,721	547,1	547,1	97,44	97,56	0,152	0,149	196	0,2399935
15,651	547,1	547,1	97,94	97,80	0,151	0,149	197	0,2389344
15,583	547,1	547,1	98,47	98,45	0,152	0,149	198	0,2378702
15,583	547,1	547,1	98,31	98,18	0,151	0,149	199	0,2378703
15,557	547,1	547,1	98,54	98,34	0,151	0,149	200	0,2374441
15,515	547,2	547,1	98,72	98,58	0,151	0,149	201	0,2368003
15,656	547,2	547,1	97,93	97,69	0,151	0,149	202	0,2389344
15,558	547,2	547,1	98,66	98,66	0,152	0,149	203	0,2374422
15,584	547,2	547,1	98,39	98,06	0,152	0,149	204	0,2378698
15,820	547,2	547,1	97,14	96,64	0,152	0,149	205	0,2414696
15,511	547,2	547,1	99,01	98,56	0,152	0,149	206	0,2368008
15,483	547,2	547,1	98,96	98,92	0,152	0,149	207	0,2363716
15,680	547,2	547,1	97,81	97,53	0,151	0,149	208	0,2393584
15,485	547,2	547,1	99,02	98,77	0,152	0,149	209	0,2364217
15,647	547,1	547,0	98,09	97,85	0,152	0,149	210	0,2389337
15,533	547,1	547,0	98,65	98,45	0,152	0,149	211	0,2371601
15,554	547,0	547,0	98,70	98,17	0,152	0,149	212	0,237443
15,720	547,0	546,9	97,72	97,05	0,152	0,149	213	0,239994
15,646	546,9	546,9	97,87	97,51	0,152	0,149	214	0,2389343
15,651	546,9	546,9	98,20	97,85	0,152	0,149	215	0,2389286
15,677	546,9	546,8	97,71	97,68	0,152	0,149	216	0,2393587
15,649	546,8	546,8	98,18	97,75	0,152	0,149	217	0,238935
15,649	546,8	546,7	97,98	97,69	0,152	0,149	218	0,2389347
15,678	546,7	546,7	97,76	97,57	0,152	0,149	219	0,2393585
15,468	546,7	546,7	99,20	98,79	0,152	0,149	220	0,2361857
15,648	546,7	546,6	98,00	97,84	0,152	0,149	221	0,2389343
15,648	546,7	546,6	98,11	97,63	0,152	0,149	222	0,2389345
15,718	546,7	546,6	97,49	97,32	0,152	0,149	223	0,2399935
15,576	546,6	546,6	98,56	98,41	0,152	0,149	224	0,2378704
15,507	546,6	546,5	98,81	98,62	0,152	0,149	225	0,2368002
15,580	546,5	546,5	98,32	98,23	0,151	0,149	226	0,23787
15,675	546,5	546,4	97,67	97,59	0,151	0,149	227	0,2393589
15,677	546,4	546,4	97,94	97,77	0,152	0,149	228	0,2393582
15,473	546,4	546,3	99,25	98,80	0,152	0,149	229	0,2363043
15,670	546,4	546,3	97,91	97,52	0,152	0,149	230	0,2393586
15,643	546,3	546,3	98,03	97,68	0,152	0,149	231	0,2389346
15,334	546,3	546,2	99,93	99,63	0,152	0,149	232	0,2342143
15,669	546,3	546,2	97,66	97,56	0,152	0,149	233	0,2393582
15,574	546,3	546,2	98,41	98,19	0,152	0,149	234	0,2378701
15,544	546,3	546,2	98,68	98,49	0,152	0,149	235	0,237442
15,669	546,2	546,2	97,76	97,74	0,152	0,149	236	0,2393581

15,670	546,2	546,2	97,78	97,64	0,152	0,149	237	0,2393583
15,572	546,3	546,2	98,32	98,29	0,152	0,149	238	0,2378697
15,571	546,2	546,1	98,30	98,07	0,151	0,149	239	0,2378695
15,571	546,2	546,1	98,31	98,18	0,151	0,149	240	0,2378698
15,499	546,2	546,1	98,82	98,49	0,152	0,149	241	0,2367997
15,638	546,1	546,0	97,87	97,41	0,152	0,149	242	0,2389335
15,665	546,1	546,0	97,65	97,52	0,151	0,149	243	0,2393576
15,427	546,1	546,0	99,25	99,24	0,152	0,149	244	0,2357255
15,705	546,1	546,0	97,40	97,27	0,152	0,149	245	0,2399931
15,537	546,0	545,9	98,66	98,35	0,152	0,149	246	0,2374413
15,705	546,0	545,9	97,39	97,16	0,152	0,149	247	0,2399926
15,495	545,9	545,8	98,98	98,72	0,152	0,149	248	0,2367995
15,633	545,9	545,8	98,00	97,87	0,152	0,149	249	0,238933
15,659	545,8	545,8	97,65	97,57	0,152	0,149	250	0,2393571
15,658	545,8	545,7	97,77	97,55	0,152	0,149	251	0,2393577
15,659	545,7	545,7	97,72	97,64	0,152	0,149	252	0,2393571
15,532	545,7	545,7	98,54	98,41	0,152	0,149	253	0,2374412
15,533	545,7	545,7	98,56	98,23	0,152	0,149	254	0,2374417
15,634	545,7	545,7	97,99	97,71	0,152	0,149	255	0,2389332
15,661	545,7	545,6	97,81	97,60	0,152	0,149	256	0,2393571
15,632	545,7	545,6	97,87	97,76	0,152	0,149	257	0,2389327
15,634	545,7	545,6	97,93	98,04	0,152	0,149	258	0,2389327
15,536	545,7	545,7	98,58	98,47	0,152	0,149	259	0,2374406
15,492	545,7	545,7	98,98	98,67	0,152	0,149	260	0,2367991
15,660	545,8	545,6	97,77	97,60	0,152	0,149	261	0,2393568
15,563	545,8	545,6	98,50	98,23	0,152	0,149	262	0,2378685
15,535	545,8	545,6	98,56	98,25	0,152	0,149	263	0,2374407
15,704	545,7	545,7	97,51	97,22	0,152	0,149	264	0,2399917
15,633	545,8	545,6	97,84	97,92	0,152	0,149	265	0,2389325
15,658	545,7	545,6	97,73	97,55	0,152	0,149	266	0,2393566
15,634	545,7	545,6	97,98	97,58	0,152	0,149	267	0,2389327
15,633	545,7	545,6	97,85	97,82	0,152	0,149	268	0,238932
15,492	545,7	545,6	98,90	98,78	0,152	0,149	269	0,2367981
15,631	545,6	545,6	98,01	97,67	0,152	0,149	270	0,2389323
15,561	545,6	545,5	98,28	98,49	0,152	0,149	271	0,2378678
15,491	545,6	545,5	98,86	98,49	0,152	0,149	272	0,2367977
15,631	545,5	545,5	98,04	97,74	0,152	0,149	273	0,2389326
15,628	545,6	545,5	97,82	97,79	0,152	0,149	274	0,2389321
15,753	545,6	545,5	97,00	97,14	0,151	0,149	275	0,2408356
15,631	545,6	545,5	97,91	97,83	0,152	0,149	276	0,2389324
15,628	545,6	545,5	97,86	97,81	0,152	0,149	277	0,2389321
15,657	545,6	545,5	97,78	97,46	0,152	0,149	278	0,2393568
15,727	545,6	545,5	97,36	97,23	0,152	0,149	279	0,240415
15,725	545,6	545,5	97,24	96,97	0,152	0,149	280	0,240415
15,696	545,6	545,5	97,51	97,29	0,152	0,149	281	0,2399916
15,533	545,6	545,5	98,50	98,18	0,152	0,149	282	0,2374399
15,560	545,6	545,5	98,27	98,01	0,152	0,149	283	0,2378712
15,560	545,6	545,5	98,37	98,09	0,152	0,149	284	0,2378675
15,655	545,5	545,5	97,64	97,55	0,152	0,149	285	0,2393557
15,557	545,6	545,5	98,48	98,16	0,152	0,149	286	0,2378672
15,460	545,5	545,5	99,05	98,74	0,152	0,149	287	0,2363696
15,626	545,5	545,5	97,93	97,58	0,152	0,149	288	0,2389323
15,654	545,6	545,5	97,69	97,44	0,152	0,149	289	0,2393562
15,627	545,5	545,4	98,05	97,86	0,152	0,149	290	0,238932
15,691	545,5	545,4	97,43	97,40	0,152	0,149	291	0,2399179
15,557	545,5	545,5	98,37	98,17	0,152	0,149	292	0,2378681
15,626	545,5	545,4	98,00	97,77	0,152	0,149	293	0,2389321
15,558	545,5	545,4	98,30	98,12	0,152	0,149	294	0,2379001
15,653	545,5	545,4	97,82	97,42	0,152	0,149	295	0,2393565
15,654	545,5	545,4	97,89	97,48	0,152	0,149	296	0,239359
15,749	545,4	545,4	97,24	97,05	0,152	0,149	297	0,2408355

15,651	545,5	545,4	97,96	97,56	0,152	0,149	298	0,2393557
15,721	545,4	545,4	97,21	96,88	0,152	0,149	299	0,240414
15,552	545,4	545,4	98,29	98,09	0,152	0,149	300	0,2378675
15,651	545,4	545,3	97,79	97,76	0,152	0,149	301	0,2393557
15,554	545,4	545,3	98,42	98,04	0,152	0,149	302	0,2378669
15,651	545,4	545,3	97,69	97,26	0,152	0,149	303	0,2393554
15,747	545,4	545,3	97,18	97,05	0,152	0,149	304	0,2408352
15,719	545,4	545,3	97,32	96,97	0,152	0,149	305	0,240414
15,787	545,4	545,3	97,01	96,67	0,152	0,149	306	0,2414679
15,647	545,3	545,3	97,89	97,53	0,152	0,149	307	0,2393554
15,551	545,3	545,3	98,33	98,08	0,152	0,149	308	0,2378676
15,551	545,3	545,3	98,49	98,01	0,152	0,149	309	0,2378668
15,690	545,3	545,3	97,56	97,28	0,152	0,149	310	0,2399907
15,691	545,3	545,3	97,44	97,33	0,152	0,149	311	0,2399902
15,626	545,3	545,3	98,03	97,60	0,152	0,149	312	0,2389877
15,651	545,3	545,3	97,68	97,50	0,152	0,149	313	0,2393557
15,690	545,3	545,3	97,42	97,24	0,152	0,149	314	0,2399921
15,690	545,3	545,3	97,61	97,39	0,152	0,149	315	0,2399899
15,744	545,3	545,3	97,08	96,85	0,152	0,149	316	0,2408356
15,522	545,3	545,3	98,51	98,31	0,152	0,149	317	0,2374389
15,688	545,3	545,3	97,46	97,28	0,152	0,149	318	0,2399913
15,554	545,3	545,3	98,44	98,04	0,152	0,149	319	0,2379088
15,648	545,3	545,3	97,75	97,57	0,152	0,149	320	0,2393557
15,689	545,2	545,3	97,51	97,47	0,152	0,149	321	0,2399908
15,689	545,2	545,3	97,49	97,32	0,152	0,149	322	0,2399907
15,420	545,2	545,3	99,15	98,89	0,152	0,149	323	0,2358938
15,741	545,2	545,3	97,18	96,93	0,152	0,149	324	0,2408346
15,687	545,1	545,2	97,42	97,21	0,152	0,149	325	0,2399905
15,687	545,1	545,2	97,52	97,36	0,152	0,149	326	0,2399905
15,687	545,1	545,2	97,40	97,42	0,152	0,149	327	0,2399903
15,549	545,1	545,2	98,25	97,91	0,152	0,149	328	0,2378667
15,784	545,1	545,2	97,04	96,63	0,152	0,149	329	0,2414669
15,687	545,1	545,2	97,63	97,13	0,152	0,149	330	0,2399899
15,785	545,1	545,2	96,87	96,79	0,152	0,149	331	0,241467
15,687	545,1	545,2	97,64	97,37	0,152	0,149	332	0,2399905
15,713	545,1	545,2	97,42	97,04	0,152	0,149	333	0,2404134
15,738	545,1	545,2	97,13	96,90	0,152	0,149	334	0,2408343
15,546	545,1	545,2	98,37	98,27	0,152	0,149	335	0,2378673
15,616	545,0	545,2	98,03	97,53	0,152	0,149	336	0,2389313
15,615	545,1	545,2	98,02	97,74	0,152	0,149	337	0,2389193
15,741	545,0	545,2	97,16	97,01	0,152	0,149	338	0,2408348
15,740	545,0	545,2	97,17	97,05	0,152	0,149	339	0,2408347
15,740	545,1	545,2	97,15	96,78	0,152	0,149	340	0,2408345
15,640	545,0	545,1	97,88	97,64	0,152	0,149	341	0,2393548
15,683	545,0	545,1	97,61	97,08	0,152	0,149	342	0,2399901
15,682	544,9	545,1	97,53	97,36	0,152	0,149	343	0,2399903
15,711	544,9	545,1	97,39	97,26	0,152	0,149	344	0,240413
15,780	544,9	545,1	96,91	96,81	0,152	0,149	345	0,2414664
15,615	544,9	545,0	98,05	97,70	0,152	0,149	346	0,2389313
15,517	544,9	545,0	98,60	98,40	0,152	0,149	347	0,2374389
15,709	544,9	545,0	97,27	97,21	0,152	0,149	348	0,2404133
15,780	544,9	545,0	96,87	96,94	0,152	0,149	349	0,2414662
15,681	544,9	545,0	97,53	97,57	0,152	0,150	350	0,2399886
15,736	544,8	545,0	97,27	96,95	0,152	0,149	351	0,2408348
15,737	544,8	545,0	97,26	97,08	0,152	0,149	352	0,2408346
15,683	544,8	545,0	97,56	97,18	0,152	0,149	353	0,239992
15,682	544,8	545,0	97,77	97,25	0,152	0,149	354	0,2399901
15,682	544,8	545,0	97,56	97,38	0,152	0,149	355	0,2399893
15,709	544,8	545,0	97,43	97,15	0,152	0,149	356	0,2404126
15,681	544,8	545,0	97,37	97,42	0,152	0,149	357	0,2399898
15,612	544,7	545,0	98,02	97,59	0,152	0,149	358	0,2389304

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,15	99,45	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
15,981	540,8	540,9			0,154	0,151	0	0,2393512
15,871	540,9	541,0	100,52	100,64	0,154	0,151	1	0,2404095
15,868	541,0	541,0	100,23	100,67	0,154	0,151	2	0,2404093
15,862	541,1	541,1	100,40	100,44	0,154	0,151	3	0,2404097
15,867	541,2	541,2	100,39	100,74	0,154	0,151	4	0,2404095
15,834	541,2	541,2	100,22	100,34	0,154	0,151	5	0,2404096
15,814	541,3	541,3	100,06	100,17	0,154	0,151	6	0,24041
15,723	541,3	541,3	100,52	100,84	0,154	0,151	7	0,2389273
15,821	541,4	541,3	99,86	100,12	0,154	0,151	8	0,2404101
15,842	541,4	541,4	99,68	100,19	0,154	0,151	9	0,2408308
15,746	541,4	541,4	100,36	100,66	0,154	0,151	10	0,2393512
15,827	541,4	541,5	99,90	100,23	0,154	0,151	11	0,2404101
15,902	541,5	541,5	99,53	99,85	0,154	0,151	12	0,2414631
15,800	541,5	541,6	99,96	100,31	0,154	0,151	13	0,2399864
15,830	541,5	541,6	99,82	100,10	0,153	0,151	14	0,2404095
15,640	541,5	541,7	101,17	101,50	0,154	0,151	15	0,2374359
15,709	541,6	541,7	100,78	100,97	0,154	0,151	16	0,2383817
15,906	541,6	541,7	99,44	99,72	0,153	0,151	17	0,2414639
15,770	541,6	541,7	100,31	100,59	0,153	0,151	18	0,2393695
15,872	541,6	541,7	99,65	99,98	0,153	0,151	19	0,2408318
15,751	541,7	541,7	100,54	101,14	0,153	0,151	20	0,2389275
15,751	541,6	541,7	100,61	100,98	0,153	0,151	21	0,2389277
15,785	541,6	541,7	100,36	100,80	0,153	0,151	22	0,2393521
15,955	541,7	541,7	99,45	99,68	0,153	0,151	23	0,2418834
15,790	541,6	541,7	100,50	100,77	0,154	0,151	24	0,2393518
15,838	541,7	541,7	100,13	100,33	0,153	0,151	25	0,2399875
15,765	541,7	541,8	100,70	100,84	0,153	0,151	26	0,238928
15,857	541,7	541,8	99,94	100,22	0,153	0,151	27	0,2404103
15,916	541,8	541,9	99,28	99,68	0,153	0,151	28	0,2414807
15,854	541,8	541,9	100,01	100,37	0,153	0,151	29	0,2404111
15,916	541,9	542,0	99,34	99,69	0,153	0,151	30	0,2414641
15,771	541,9	542,0	100,24	100,56	0,153	0,151	31	0,2393523
15,770	542,0	542,0	100,29	100,34	0,153	0,151	32	0,2393527
15,747	542,0	542,1	100,45	100,54	0,153	0,150	33	0,2389281
15,778	542,1	542,1	100,17	100,38	0,153	0,150	34	0,2393521
15,848	542,1	542,2	99,64	100,00	0,153	0,150	35	0,2404109
15,682	542,2	542,2	100,84	101,22	0,153	0,151	36	0,2378643
15,779	542,3	542,3	100,15	100,41	0,153	0,151	37	0,2393523
15,820	542,3	542,4	99,91	100,12	0,153	0,150	38	0,2399879
15,682	542,3	542,4	100,80	100,90	0,153	0,150	39	0,2378647
15,920	542,3	542,5	99,06	99,30	0,153	0,150	40	0,2414644
15,686	542,3	542,5	100,74	101,00	0,153	0,150	41	0,2378645
15,852	542,4	542,5	99,60	99,87	0,153	0,150	42	0,2404112
15,687	542,4	542,5	100,64	100,98	0,153	0,150	43	0,2378647
15,856	542,4	542,5	99,60	99,99	0,153	0,150	44	0,2404116
15,659	542,4	542,5	100,73	101,18	0,153	0,150	45	0,2374373
15,617	542,4	542,5	100,94	101,47	0,153	0,150	46	0,2368062
15,655	542,5	542,5	100,82	101,11	0,153	0,150	47	0,2374367
15,921	542,5	542,5	99,07	99,33	0,153	0,150	48	0,2414643
15,921	542,5	542,6	99,09	99,32	0,153	0,150	49	0,2414645
15,785	542,6	542,7	100,02	100,51	0,153	0,150	50	0,2393528
15,662	542,6	542,7	100,68	101,08	0,153	0,150	51	0,237437
15,694	542,7	542,7	100,63	100,83	0,153	0,150	52	0,2378646
15,695	542,7	542,7	100,53	101,12	0,153	0,150	53	0,2378651
15,761	542,7	542,7	100,15	100,53	0,153	0,150	54	0,2389293
15,836	542,8	542,7	99,60	99,90	0,153	0,150	55	0,2399882

15,791	542,8	542,7	99,84	100,11	0,153	0,150	56	0,2393535
15,696	542,8	542,8	100,50	100,61	0,153	0,150	57	0,2378647
15,667	542,8	542,8	100,67	100,63	0,153	0,149	58	0,2374373
15,931	542,8	542,8	98,85	98,94	0,152	0,149	59	0,2414646
15,553	542,9	542,9	101,24	101,74	0,152	0,150	60	0,2357214
15,837	542,9	542,9	99,47	99,83	0,152	0,150	61	0,2399883
15,797	542,9	542,9	99,70	100,06	0,152	0,150	62	0,2393529
15,893	542,9	542,8	99,17	99,59	0,152	0,150	63	0,2408326
15,868	542,9	542,8	99,57	99,79	0,153	0,150	64	0,2404115
15,839	542,9	542,9	99,56	99,84	0,153	0,150	65	0,239989
15,798	543,0	542,9	99,81	100,13	0,152	0,150	66	0,2393537
15,890	543,0	543,0	99,19	99,35	0,152	0,150	67	0,2408339
15,766	543,0	543,0	100,04	100,08	0,152	0,150	68	0,2389291
15,666	543,0	543,0	100,41	100,84	0,152	0,150	69	0,2374373
15,765	543,0	543,1	99,81	100,29	0,152	0,150	70	0,2389294
15,766	543,0	543,0	99,81	100,13	0,152	0,150	71	0,2389294
15,835	543,0	543,0	99,36	99,53	0,152	0,149	72	0,2399884
15,861	543,0	543,0	99,07	99,17	0,152	0,149	73	0,240412
15,765	543,0	543,0	99,69	100,15	0,152	0,149	74	0,2389298
15,933	543,0	542,9	98,62	98,94	0,152	0,149	75	0,2414655
15,932	543,0	542,9	98,68	99,10	0,152	0,149	76	0,2414657
15,792	543,0	542,9	99,65	99,75	0,152	0,149	77	0,2393539
15,795	543,0	542,9	99,49	99,92	0,152	0,149	78	0,2393541
15,871	543,0	542,9	98,99	99,26	0,152	0,149	79	0,2405543
15,794	543,0	542,9	99,37	99,66	0,152	0,149	80	0,239354
15,890	543,1	542,9	98,69	99,41	0,152	0,149	81	0,2408335
15,961	543,1	542,9	98,41	98,71	0,152	0,149	82	0,2418853
15,862	543,0	542,9	98,96	99,22	0,152	0,149	83	0,2404128
15,930	543,0	542,9	98,54	98,78	0,152	0,149	84	0,2414657
15,891	543,0	542,9	98,68	99,25	0,152	0,149	85	0,240834
15,860	543,1	542,9	98,96	99,24	0,152	0,149	86	0,2404127
15,856	543,1	543,0	98,81	99,23	0,152	0,149	87	0,2404127
15,956	543,1	543,0	98,21	98,52	0,152	0,149	88	0,2418852
15,955	543,1	543,0	98,39	98,88	0,152	0,149	89	0,2418852
15,925	543,1	543,0	98,58	98,78	0,152	0,149	90	0,2414657
15,855	543,1	543,0	99,01	99,44	0,152	0,149	91	0,2404129
15,856	543,1	543,0	99,10	99,18	0,152	0,149	92	0,2404127
15,831	543,1	543,0	99,16	99,51	0,152	0,149	93	0,2399894
15,885	543,1	543,0	98,68	99,10	0,152	0,149	94	0,2408339
15,787	543,1	543,0	99,39	99,83	0,152	0,149	95	0,2393549
15,853	543,1	543,0	99,16	99,47	0,152	0,150	96	0,2404129
15,825	543,1	543,1	99,04	99,35	0,152	0,149	97	0,2399897
15,919	543,1	543,1	98,51	98,76	0,152	0,149	98	0,2414657
15,880	543,1	543,1	98,70	98,93	0,152	0,149	99	0,2408342
15,920	543,1	543,1	98,44	99,06	0,152	0,149	100	0,2414662
15,782	543,1	543,1	99,27	99,49	0,152	0,149	101	0,2393543
15,804	543,1	543,1	99,01	99,41	0,152	0,149	102	0,2397364
15,844	543,1	543,0	98,88	99,11	0,152	0,149	103	0,2404131
15,910	543,1	543,1	98,35	98,63	0,152	0,149	104	0,2414657
15,834	543,1	543,0	98,85	99,10	0,152	0,149	105	0,2403882
15,807	543,1	543,0	99,02	99,59	0,152	0,149	106	0,2399897
15,863	543,0	543,0	98,61	99,02	0,152	0,150	107	0,2408336
15,863	543,0	543,0	98,59	99,21	0,152	0,149	108	0,240834
15,734	543,1	543,0	99,45	99,72	0,152	0,149	109	0,2389304
15,899	543,1	543,0	98,47	98,76	0,152	0,149	110	0,2414663
15,925	543,1	543,0	98,17	98,42	0,152	0,149	111	0,2418853
15,729	543,0	543,0	99,56	99,73	0,152	0,149	112	0,2389319
15,822	543,1	543,0	98,78	99,08	0,152	0,149	113	0,2404124
15,746	543,1	543,0	99,21	99,37	0,152	0,149	114	0,2393749
15,880	543,0	543,0	98,38	98,26	0,152	0,149	115	0,2414657
15,909	543,0	543,0	98,15	98,51	0,152	0,149	116	0,2418853

15,838	543,0	543,0	98,71	98,65	0,152	0,149	117	0,2408337
15,810	542,9	543,0	98,54	98,95	0,152	0,149	118	0,2403961
15,878	542,9	543,0	98,42	98,72	0,152	0,149	119	0,2414661
15,779	543,0	543,0	99,15	99,35	0,152	0,150	120	0,2399893
15,910	543,0	543,1	98,38	98,66	0,152	0,150	121	0,2418851
15,840	543,0	543,1	98,73	99,04	0,152	0,150	122	0,2408336
15,780	543,1	543,1	98,91	99,23	0,152	0,149	123	0,239989
15,777	543,1	543,1	98,90	99,29	0,152	0,149	124	0,239989
15,708	543,1	543,1	99,37	99,84	0,152	0,150	125	0,2389299
15,607	543,1	543,1	99,91	100,19	0,152	0,149	126	0,237438
15,772	543,1	543,0	98,95	99,24	0,152	0,149	127	0,2399893
15,733	543,1	543,0	99,29	99,60	0,152	0,150	128	0,2393543
15,772	543,0	543,0	98,97	99,01	0,152	0,149	129	0,2399891
15,796	543,0	543,0	98,78	99,11	0,152	0,149	130	0,2404124
15,768	543,0	543,0	98,85	99,26	0,152	0,150	131	0,23999
15,723	542,9	543,0	99,05	99,32	0,152	0,149	132	0,2393233
15,764	543,0	543,0	98,80	99,27	0,152	0,149	133	0,2399895
15,719	543,0	543,0	99,08	99,49	0,152	0,150	134	0,2393548
15,759	543,0	543,0	98,81	98,99	0,152	0,149	135	0,2399898
15,798	542,9	543,0	98,65	98,71	0,152	0,149	136	0,2405642
15,754	542,9	542,9	98,85	98,99	0,152	0,149	137	0,2399892
15,812	542,9	542,9	98,43	98,75	0,152	0,149	138	0,2408341
15,813	542,9	542,9	98,52	98,94	0,152	0,150	139	0,2408245
15,784	543,0	542,9	98,53	98,64	0,152	0,149	140	0,2404122
15,588	543,0	542,9	99,92	100,03	0,152	0,149	141	0,2374376
15,811	543,1	543,0	98,53	98,99	0,152	0,149	142	0,2408338
15,855	543,0	543,1	98,09	98,54	0,152	0,150	143	0,2414655
15,780	543,0	543,1	98,51	98,87	0,152	0,149	144	0,2403999
15,752	543,0	543,0	98,67	98,98	0,152	0,149	145	0,2399892
15,808	543,0	543,0	98,47	98,76	0,152	0,149	146	0,2408336
15,682	543,0	543,0	99,10	99,67	0,152	0,150	147	0,23893
15,847	543,0	543,0	98,15	98,27	0,152	0,149	148	0,2414655
15,948	543,0	543,0	97,56	97,79	0,152	0,149	149	0,2429326
15,709	543,1	543,1	98,97	99,42	0,152	0,149	150	0,2393542
15,775	543,1	543,1	98,49	98,58	0,152	0,149	151	0,2404125
15,681	543,2	543,1	99,09	99,42	0,152	0,149	152	0,23893
15,801	543,2	543,1	98,41	98,67	0,152	0,149	153	0,2408342
15,797	543,2	543,1	98,36	98,74	0,152	0,149	154	0,240834
15,846	543,2	543,2	98,11	98,47	0,152	0,149	155	0,2414658
15,800	543,2	543,2	98,31	98,75	0,152	0,149	156	0,240834
15,772	543,2	543,3	98,45	98,84	0,152	0,149	157	0,2404126
15,678	543,2	543,4	99,06	99,37	0,152	0,149	158	0,2389304
15,938	543,2	543,4	97,53	97,89	0,152	0,149	159	0,2428979
15,778	543,3	543,4	98,56	98,62	0,152	0,149	160	0,240412
15,679	543,3	543,5	99,15	99,37	0,152	0,149	161	0,2389299
15,848	543,3	543,5	98,17	98,26	0,152	0,149	162	0,2414653
15,506	543,4	543,5	100,20	100,42	0,152	0,149	163	0,2363671
15,738	543,4	543,5	98,62	99,17	0,152	0,149	164	0,2399891
15,769	543,5	543,5	98,47	98,65	0,152	0,149	165	0,240413
15,865	543,5	543,5	97,79	98,12	0,152	0,149	166	0,2418854
15,770	543,5	543,5	98,42	98,88	0,152	0,149	167	0,2404126
15,862	543,5	543,5	97,78	98,19	0,152	0,149	168	0,2418855
15,738	543,5	543,5	98,50	98,96	0,152	0,149	169	0,2399893
15,863	543,4	543,4	97,79	98,38	0,152	0,150	170	0,2418854
15,862	543,4	543,4	97,76	98,18	0,152	0,150	171	0,2418859
15,792	543,5	543,5	98,33	98,55	0,152	0,149	172	0,240834
15,792	543,5	543,5	98,20	98,76	0,152	0,149	173	0,2408343
15,697	543,5	543,5	98,78	99,29	0,152	0,150	174	0,2393544
15,835	543,5	543,5	98,01	98,29	0,152	0,149	175	0,241466
15,736	543,5	543,5	98,60	98,88	0,152	0,149	176	0,2399885
15,791	543,5	543,5	98,21	98,75	0,152	0,149	177	0,2408342

15,835	543,5	543,5	97,76	98,27	0,152	0,149	178	0,2414658
15,791	543,5	543,5	98,22	98,56	0,152	0,149	179	0,2408342
15,765	543,5	543,6	98,50	98,69	0,152	0,149	180	0,2404132
15,737	543,6	543,6	98,56	98,83	0,152	0,149	181	0,2399899
15,831	543,6	543,6	97,97	98,03	0,152	0,149	182	0,2414663
15,663	543,6	543,6	99,01	99,42	0,152	0,149	183	0,2389311
15,665	543,6	543,5	99,05	99,31	0,152	0,149	184	0,2389309
15,858	543,6	543,5	98,04	98,12	0,152	0,149	185	0,2418852
15,667	543,5	543,5	99,31	99,46	0,152	0,149	186	0,2389311
15,767	543,5	543,5	98,48	98,83	0,152	0,149	187	0,2404131
15,665	543,5	543,5	99,30	99,33	0,152	0,149	188	0,2389313
15,791	543,5	543,5	98,45	98,93	0,152	0,150	189	0,2408341
15,791	543,4	543,5	98,45	98,90	0,152	0,150	190	0,2408346
15,665	543,5	543,5	99,20	99,56	0,152	0,150	191	0,2389303
15,763	543,5	543,5	98,63	98,86	0,152	0,150	192	0,2404131
15,763	543,5	543,5	98,44	98,77	0,152	0,149	193	0,2404131
15,693	543,5	543,5	99,05	99,36	0,152	0,150	194	0,2393548
15,791	543,5	543,4	98,44	98,73	0,152	0,150	195	0,2408341
15,667	543,5	543,4	99,30	99,49	0,152	0,150	196	0,2389309
15,831	543,5	543,4	98,26	98,50	0,152	0,150	197	0,2414663
15,594	543,5	543,4	99,67	100,27	0,152	0,150	198	0,2378671
15,690	543,5	543,5	99,02	99,36	0,152	0,150	199	0,2393552
15,792	543,5	543,5	98,49	98,62	0,152	0,150	200	0,240835
15,733	543,5	543,4	98,88	99,02	0,152	0,149	201	0,2399909
15,669	543,6	543,5	99,25	99,33	0,152	0,149	202	0,2389313
15,762	543,6	543,5	98,49	98,97	0,152	0,149	203	0,240414
15,763	543,6	543,5	98,57	98,68	0,152	0,149	204	0,2404138
15,760	543,6	543,6	98,51	98,77	0,152	0,149	205	0,2404139
15,735	543,6	543,6	98,67	98,89	0,152	0,149	206	0,2399902
15,830	543,6	543,6	98,14	98,36	0,152	0,149	207	0,2414673
15,696	543,7	543,7	99,00	99,09	0,152	0,149	208	0,2393558
15,669	543,7	543,6	99,08	99,70	0,152	0,150	209	0,2389306
15,567	543,7	543,6	99,77	100,11	0,152	0,150	210	0,2374397
15,766	543,7	543,6	98,58	98,95	0,152	0,150	211	0,2404264
15,695	543,7	543,6	99,14	99,20	0,152	0,150	212	0,2393555
15,792	543,7	543,6	98,39	98,76	0,152	0,150	213	0,2408353
15,665	543,7	543,6	99,27	99,66	0,152	0,150	214	0,2389315
15,569	543,7	543,6	99,87	100,08	0,152	0,150	215	0,2374395
15,693	543,7	543,6	99,08	99,33	0,152	0,150	216	0,2393522
15,733	543,7	543,6	98,75	98,98	0,152	0,150	217	0,239984
15,762	543,7	543,6	98,57	98,83	0,152	0,149	218	0,2404136
15,695	543,7	543,6	99,03	99,16	0,152	0,149	219	0,2393557
15,643	543,7	543,6	99,31	99,47	0,152	0,149	220	0,2386277
15,665	543,6	543,5	99,10	99,42	0,152	0,149	221	0,2389315
15,581	543,6	543,5	99,74	100,11	0,152	0,150	222	0,2376855
15,788	543,6	543,5	98,37	98,60	0,152	0,150	223	0,2408356
15,761	543,6	543,5	98,45	99,01	0,152	0,150	224	0,2404143
15,735	543,7	543,5	98,79	99,01	0,152	0,150	225	0,2399913
15,761	543,7	543,6	98,46	98,55	0,152	0,149	226	0,2404143
15,694	543,7	543,6	99,01	99,29	0,152	0,149	227	0,2393492
15,694	543,7	543,6	99,00	99,21	0,152	0,149	228	0,2393559
15,568	543,7	543,6	99,79	100,33	0,152	0,150	229	0,23744
15,733	543,7	543,6	98,70	99,22	0,152	0,150	230	0,2399911
15,759	543,7	543,6	98,39	98,89	0,152	0,150	231	0,2404147
15,789	543,7	543,7	98,29	98,70	0,152	0,150	232	0,2408336
15,763	543,7	543,7	98,62	98,92	0,152	0,150	233	0,2404145
15,736	543,7	543,7	98,55	99,02	0,152	0,150	234	0,2399915
15,665	543,8	543,7	99,10	99,25	0,152	0,149	235	0,2389319
15,665	543,8	543,7	99,01	99,44	0,152	0,149	236	0,2389319
15,790	543,8	543,8	98,45	98,81	0,152	0,150	237	0,2408357
15,575	543,9	543,8	99,65	100,27	0,152	0,150	238	0,2374393

15,835	543,9	543,8	97,96	98,58	0,152	0,150	239	0,2414675
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	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,88	99,19	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
15,405	540,8	540,7			0,154	0,152	0	0,2327004
15,464	540,9	540,8	99,95	100,07	0,154	0,151	1	0,2348522
15,463	541,0	540,8	100,05	100,06	0,154	0,151	2	0,2348566
15,399	541,0	540,9	100,44	100,53	0,154	0,151	3	0,2337744
15,417	541,0	540,9	100,52	100,82	0,154	0,151	4	0,2337737
15,494	540,9	540,9	99,39	99,66	0,154	0,151	5	0,2357196
15,477	541,0	541,0	99,32	99,82	0,154	0,152	6	0,2357196
15,371	541,1	541,0	100,04	100,04	0,154	0,152	7	0,2342056
15,411	541,1	541,1	99,53	100,06	0,154	0,151	8	0,2348568
15,409	541,2	541,1	99,56	100,08	0,154	0,152	9	0,2348568
15,432	541,2	541,2	99,33	99,57	0,154	0,152	10	0,2352892
15,401	541,3	541,2	99,42	99,71	0,154	0,151	11	0,2348567
15,399	541,3	541,3	99,34	99,52	0,154	0,151	12	0,2348566
15,461	541,3	541,3	99,03	99,27	0,154	0,151	13	0,2357198
15,331	541,4	541,4	99,94	99,94	0,154	0,151	14	0,2337742
15,212	541,4	541,4	100,53	100,93	0,154	0,151	15	0,2320315
15,356	541,4	541,4	99,78	99,89	0,154	0,151	16	0,2342077
15,427	541,4	541,4	99,14	99,21	0,154	0,151	17	0,2352893
15,455	541,4	541,4	98,92	99,51	0,154	0,151	18	0,2357195
15,358	541,4	541,4	99,53	99,83	0,154	0,151	19	0,2342075
15,430	541,4	541,5	99,15	99,34	0,154	0,151	20	0,2352892
15,433	541,4	541,5	99,23	99,50	0,154	0,151	21	0,2352892
15,432	541,5	541,5	99,13	99,27	0,154	0,151	22	0,2353373
15,408	541,5	541,5	99,28	99,61	0,154	0,151	23	0,2348565
15,505	541,5	541,6	98,67	98,85	0,154	0,151	24	0,236365
15,339	541,6	541,6	99,67	100,11	0,154	0,151	25	0,2338001
15,441	541,6	541,7	99,41	99,36	0,154	0,151	26	0,2352894
15,344	541,7	541,7	99,84	99,96	0,154	0,151	27	0,2337751
15,372	541,7	541,8	99,52	100,13	0,154	0,151	28	0,2342083
15,199	541,8	541,8	100,59	100,68	0,154	0,151	29	0,2315939
15,351	541,8	541,8	99,86	100,37	0,154	0,151	30	0,2337751
15,517	541,9	541,9	98,71	99,28	0,154	0,151	31	0,2363659
15,419	542,0	542,0	99,24	99,36	0,154	0,151	32	0,2348578
15,447	542,0	542,0	98,99	99,36	0,153	0,151	33	0,2352903
15,449	542,1	542,1	99,04	99,42	0,153	0,151	34	0,2352909
15,474	542,1	542,1	98,82	99,41	0,153	0,151	35	0,2355787
15,294	542,1	542,2	100,29	100,76	0,153	0,151	36	0,2326875
15,465	542,2	542,2	99,01	99,34	0,153	0,151	37	0,2352904
15,392	542,2	542,3	99,55	99,72	0,153	0,151	38	0,2342085
15,368	542,3	542,3	99,74	100,10	0,153	0,151	39	0,2337756
15,377	542,3	542,4	99,93	100,14	0,153	0,151	40	0,2337755
15,501	542,4	542,4	98,83	99,08	0,153	0,151	41	0,2357207
15,505	542,5	542,5	99,02	99,23	0,153	0,151	42	0,2357207
15,383	542,5	542,5	99,86	100,23	0,153	0,151	43	0,2337755
15,454	542,6	542,6	99,43	99,59	0,153	0,151	44	0,2348579
15,310	542,6	542,6	100,19	100,54	0,153	0,151	45	0,2326878
15,508	542,5	542,6	98,82	98,96	0,153	0,150	46	0,2357215
15,408	542,6	542,7	99,54	100,02	0,153	0,151	47	0,2342094
15,409	542,6	542,7	99,45	99,85	0,153	0,151	48	0,2342092
15,416	542,7	542,8	99,58	99,73	0,153	0,150	49	0,2342094
15,563	542,8	542,9	98,70	98,86	0,153	0,150	50	0,2363669
15,488	542,9	542,9	98,91	99,16	0,153	0,150	51	0,2353041
15,376	542,9	542,9	99,74	100,34	0,153	0,150	52	0,2334919
15,501	543,0	543,0	99,04	99,40	0,153	0,151	53	0,2352912
15,561	543,0	543,1	98,52	98,80	0,153	0,150	54	0,2363665
15,328	543,1	543,1	100,16	100,39	0,153	0,150	55	0,2326871

15,500	543,1	543,1	99,08	99,24	0,153	0,150	56	0,2352911
15,495	543,1	543,1	99,04	99,17	0,153	0,150	57	0,2352912
15,392	543,1	543,1	99,53	99,78	0,153	0,150	58	0,2337761
15,468	543,1	543,2	99,23	99,33	0,153	0,150	59	0,2348585
15,423	543,2	543,2	99,40	99,93	0,153	0,150	60	0,2342093
15,534	543,2	543,3	98,68	99,09	0,153	0,150	61	0,2357217
15,573	543,2	543,3	98,55	98,91	0,153	0,150	62	0,2363675
15,289	543,3	543,4	100,39	100,65	0,153	0,150	63	0,2320335
15,434	543,3	543,4	99,34	99,84	0,153	0,150	64	0,2342101
15,433	543,3	543,4	99,46	99,71	0,153	0,150	65	0,23421
15,507	543,4	543,5	98,97	99,26	0,153	0,150	66	0,2352916
15,476	543,5	543,5	99,10	99,47	0,153	0,150	67	0,2348595
15,507	543,5	543,6	99,17	99,47	0,153	0,150	68	0,2351496
15,534	543,5	543,6	98,86	99,30	0,153	0,150	69	0,2357222
15,411	543,6	543,6	99,64	100,00	0,153	0,150	70	0,2337839
15,537	543,7	543,7	98,72	98,85	0,153	0,150	71	0,2357263
15,434	543,7	543,7	99,28	99,64	0,153	0,150	72	0,2342106
15,503	543,8	543,8	98,93	99,29	0,153	0,150	73	0,2352926
15,479	543,9	543,9	99,13	99,24	0,153	0,150	74	0,2348601
15,441	544,0	543,9	99,41	99,86	0,153	0,150	75	0,2342109
15,511	544,0	544,0	99,04	99,18	0,153	0,150	76	0,2352929
15,300	544,1	544,0	100,08	100,50	0,153	0,150	77	0,2320351
15,343	544,2	544,1	100,09	100,37	0,153	0,150	78	0,23269
15,337	544,3	544,1	99,85	100,24	0,153	0,150	79	0,2326905
15,514	544,3	544,1	98,77	99,10	0,152	0,150	80	0,2352935
15,543	544,3	544,2	98,72	99,15	0,153	0,150	81	0,2357244
15,525	544,3	544,2	98,90	99,14	0,153	0,150	82	0,2352931
15,350	544,4	544,3	100,00	100,19	0,153	0,150	83	0,2326901
15,522	544,4	544,3	98,86	99,06	0,153	0,150	84	0,2352931
15,455	544,3	544,3	99,29	99,77	0,152	0,150	85	0,2342118
15,421	544,4	544,3	99,50	99,74	0,152	0,150	86	0,2337791
15,347	544,4	544,3	100,07	100,09	0,153	0,150	87	0,2326912
15,495	544,4	544,3	98,93	99,34	0,153	0,150	88	0,2348608
15,256	544,4	544,3	100,60	100,95	0,152	0,150	89	0,2311597
15,430	544,4	544,3	99,34	99,49	0,152	0,150	90	0,2337788
15,427	544,3	544,3	99,30	99,88	0,152	0,150	91	0,2337788
15,429	544,4	544,3	99,50	99,80	0,152	0,150	92	0,2337791
15,354	544,4	544,3	99,78	100,13	0,152	0,150	93	0,2326907
15,543	544,4	544,3	98,65	99,25	0,152	0,150	94	0,2355646
15,453	544,4	544,4	99,23	99,45	0,152	0,150	95	0,2342128
15,272	544,5	544,4	100,40	100,76	0,152	0,150	96	0,2314687
15,492	544,5	544,4	98,86	98,91	0,152	0,149	97	0,2348616
15,492	544,5	544,4	98,96	99,13	0,152	0,149	98	0,234862
15,418	544,5	544,4	99,49	99,61	0,152	0,150	99	0,2337758
15,443	544,6	544,4	98,97	99,41	0,152	0,150	100	0,2342126
15,445	544,6	544,4	99,07	99,36	0,152	0,150	101	0,2342127
15,452	544,6	544,5	99,19	99,37	0,152	0,149	102	0,234213
15,420	544,6	544,5	99,09	99,56	0,152	0,149	103	0,2337793
15,446	544,7	544,6	99,13	99,31	0,152	0,149	104	0,2342123
15,414	544,7	544,6	99,17	99,54	0,152	0,149	105	0,2337785
15,419	544,7	544,7	99,36	99,72	0,152	0,150	106	0,233779
15,518	544,8	544,7	98,60	98,94	0,152	0,150	107	0,235294
15,353	544,8	544,7	99,76	100,23	0,152	0,150	108	0,2326919
15,421	544,9	544,8	99,21	99,46	0,152	0,150	109	0,2337797
15,251	544,9	544,8	100,40	100,70	0,152	0,149	110	0,23116
15,524	545,0	544,9	98,78	98,92	0,152	0,149	111	0,2352735
15,353	545,0	544,9	99,74	100,23	0,152	0,150	112	0,2326922
15,486	545,0	544,9	98,63	99,17	0,152	0,150	113	0,2348626
15,421	545,0	544,9	99,19	99,47	0,152	0,149	114	0,2337799
15,444	545,0	544,9	98,97	99,19	0,152	0,149	115	0,2342129
15,305	545,0	544,9	99,77	100,27	0,152	0,149	116	0,2320371

15,304	545,0	545,0	99,85	100,34	0,152	0,149	117	0,2320371
15,488	545,0	545,0	98,76	99,01	0,152	0,149	118	0,2348628
15,346	545,1	545,0	99,51	99,79	0,152	0,149	119	0,2326925
15,339	545,1	545,1	99,39	99,76	0,152	0,149	120	0,2326926
15,343	545,2	545,1	99,40	99,82	0,152	0,149	121	0,232693
15,546	545,3	545,2	98,13	98,48	0,152	0,149	122	0,2357259
15,494	545,3	545,3	98,54	98,73	0,152	0,149	123	0,2348633
15,454	545,4	545,3	98,89	99,18	0,152	0,149	124	0,2342143
15,420	545,4	545,4	98,91	99,39	0,152	0,149	125	0,2337807
15,243	545,4	545,4	100,04	100,46	0,152	0,149	126	0,2311594
15,233	545,4	545,4	99,87	100,26	0,152	0,149	127	0,2311616
15,412	545,4	545,4	98,84	99,00	0,152	0,149	128	0,2337807
15,477	545,4	545,4	98,41	99,05	0,152	0,149	129	0,2348636
15,292	545,4	545,4	99,73	99,91	0,152	0,149	130	0,2320381
15,433	545,4	545,4	98,61	99,05	0,152	0,149	131	0,2342143
15,428	545,4	545,4	98,74	98,78	0,152	0,149	132	0,2342143
15,289	545,4	545,4	99,74	99,97	0,152	0,149	133	0,232038
15,337	545,4	545,5	99,27	99,75	0,152	0,149	134	0,2326928
15,488	545,5	545,5	98,47	98,87	0,152	0,149	135	0,2348631
15,273	545,5	545,5	99,84	99,87	0,152	0,149	136	0,231593
15,415	545,5	545,6	98,84	99,25	0,152	0,149	137	0,2337814
15,480	545,6	545,6	98,32	98,45	0,152	0,149	138	0,2348634
15,489	545,6	545,6	98,42	98,80	0,152	0,149	139	0,2348636
15,481	545,6	545,7	98,46	98,84	0,152	0,149	140	0,234862
15,508	545,6	545,7	98,13	98,41	0,152	0,149	141	0,2352958
15,444	545,7	545,7	98,69	99,15	0,152	0,149	142	0,2343072
15,330	545,7	545,8	99,25	99,71	0,152	0,149	143	0,232693
15,429	545,8	545,8	98,56	99,07	0,152	0,149	144	0,2342147
15,428	545,8	545,9	98,54	98,89	0,152	0,149	145	0,2342144
15,395	545,9	545,9	98,91	99,22	0,152	0,149	146	0,2336774
15,501	545,9	545,9	98,05	98,48	0,152	0,149	147	0,235296
15,428	546,0	546,0	98,57	98,99	0,152	0,149	148	0,2342148
15,255	546,0	546,0	99,54	100,09	0,151	0,149	149	0,2315996
15,526	546,0	546,0	97,75	98,32	0,151	0,149	150	0,2357264
15,399	546,0	546,1	98,52	98,90	0,151	0,149	151	0,2337812
15,327	546,0	546,1	98,94	99,29	0,151	0,149	152	0,2326935
15,421	546,0	546,1	98,41	98,47	0,151	0,148	153	0,2342149
15,470	546,0	546,1	98,05	98,60	0,151	0,149	154	0,2348638
15,286	546,1	546,1	99,39	99,75	0,151	0,149	155	0,2320386
15,400	546,0	546,1	98,70	98,84	0,151	0,149	156	0,2337816
15,437	546,1	546,1	98,60	98,67	0,152	0,149	157	0,2342145
15,471	546,1	546,2	98,15	98,60	0,151	0,149	158	0,2348637
15,257	546,1	546,2	99,61	100,05	0,151	0,149	159	0,2316005
15,411	546,2	546,2	98,79	99,03	0,152	0,149	160	0,2337816
15,268	546,2	546,2	99,58	99,89	0,151	0,149	161	0,2316004
15,411	546,2	546,2	98,66	98,90	0,151	0,149	162	0,233782
15,401	546,2	546,3	98,69	98,83	0,151	0,149	163	0,2337814
15,436	546,3	546,3	98,52	98,79	0,151	0,149	164	0,2342145
15,435	546,3	546,3	98,40	98,98	0,151	0,149	165	0,2342149
15,164	546,3	546,3	100,23	100,50	0,151	0,149	166	0,2300624
15,442	546,3	546,4	98,50	98,77	0,151	0,149	167	0,2342151
15,411	546,4	546,4	98,66	98,94	0,151	0,149	168	0,2337816
15,400	546,4	546,4	98,58	98,92	0,151	0,149	169	0,2337816
15,513	546,4	546,4	98,01	98,49	0,151	0,149	170	0,2352966
15,440	546,4	546,5	98,55	98,68	0,151	0,149	171	0,234215
15,479	546,5	546,6	98,16	98,53	0,151	0,149	172	0,2348638
15,433	546,6	546,6	98,35	98,77	0,151	0,149	173	0,2342147
15,406	546,6	546,7	98,78	99,06	0,151	0,149	174	0,2337815
15,432	546,7	546,7	98,42	98,74	0,151	0,149	175	0,2342305
15,398	546,7	546,7	98,36	98,63	0,151	0,149	176	0,2337816
15,331	546,7	546,8	99,15	99,72	0,151	0,149	177	0,2326936

15,285	546,7	546,7	99,25	99,63	0,151	0,149	178	0,2320384
15,426	546,7	546,7	98,30	98,64	0,151	0,149	179	0,234215
15,428	546,6	546,7	98,41	98,58	0,151	0,149	180	0,2342147
15,430	546,6	546,7	98,46	98,79	0,151	0,149	181	0,2342147
15,476	546,6	546,6	98,10	98,58	0,151	0,149	182	0,2348638
15,239	546,6	546,6	99,97	100,22	0,151	0,149	183	0,2311621
15,294	546,6	546,6	99,43	99,62	0,152	0,149	184	0,2320389
15,434	546,6	546,6	98,50	98,75	0,151	0,149	185	0,2342153
15,428	546,6	546,7	98,39	98,75	0,151	0,149	186	0,2342151
15,479	546,6	546,7	98,24	98,45	0,151	0,149	187	0,2348643
15,397	546,7	546,8	98,56	98,99	0,151	0,149	188	0,2337819
15,469	546,7	546,8	98,09	98,16	0,151	0,149	189	0,2348639
15,402	546,8	546,9	98,54	99,06	0,151	0,149	190	0,2337812
15,402	546,8	546,9	98,51	98,86	0,151	0,149	191	0,2337812
15,424	546,9	546,9	98,44	98,73	0,151	0,149	192	0,234215
15,331	546,9	547,0	99,05	99,40	0,151	0,149	193	0,2326939
15,322	546,9	547,0	99,15	99,21	0,151	0,149	194	0,2326941
15,427	546,9	547,0	98,38	98,71	0,151	0,149	195	0,2342153
15,279	546,9	547,0	99,31	99,52	0,151	0,149	196	0,232039
15,432	547,0	547,0	98,31	98,58	0,151	0,149	197	0,2342153
15,480	547,0	547,1	97,94	98,49	0,151	0,149	198	0,234864
15,533	547,1	547,1	97,60	98,08	0,151	0,149	199	0,235727
15,469	547,1	547,2	98,13	98,20	0,151	0,148	200	0,2348639
15,335	547,1	547,1	99,14	99,48	0,151	0,149	201	0,2326939
15,326	547,0	547,1	98,95	99,34	0,151	0,149	202	0,2326943
15,396	547,0	547,1	98,67	98,86	0,151	0,149	203	0,2337818
15,391	547,0	547,1	98,56	98,98	0,151	0,149	204	0,2337821
15,226	547,0	547,1	99,56	99,99	0,151	0,149	205	0,2311628
15,426	547,0	547,2	98,38	98,76	0,151	0,149	206	0,2342161
15,422	547,0	547,2	98,27	98,74	0,151	0,149	207	0,2342162
15,494	547,1	547,2	97,92	98,20	0,151	0,149	208	0,2352971
15,258	547,1	547,2	99,47	99,82	0,151	0,149	209	0,2316009
15,395	547,1	547,2	98,54	98,72	0,151	0,149	210	0,2337821
15,396	547,1	547,3	98,64	98,90	0,151	0,149	211	0,2337827
15,396	547,1	547,3	98,43	98,64	0,151	0,149	212	0,2337826
15,281	547,1	547,3	99,25	99,70	0,151	0,149	213	0,2320392
15,331	547,1	547,3	99,01	99,35	0,151	0,149	214	0,2326946
15,398	547,1	547,3	98,58	98,86	0,151	0,149	215	0,2337827
15,286	547,1	547,3	99,42	99,53	0,151	0,149	216	0,232039
15,430	547,2	547,3	98,44	98,66	0,151	0,149	217	0,2342159
15,467	547,2	547,4	98,12	98,39	0,151	0,149	218	0,2348649
15,395	547,3	547,4	98,39	98,90	0,151	0,149	219	0,233782
15,229	547,3	547,4	99,61	100,05	0,151	0,149	220	0,2311628
15,422	547,3	547,5	98,21	98,40	0,151	0,149	221	0,2342159
15,435	547,3	547,5	98,28	98,72	0,151	0,148	222	0,2342159
15,426	547,3	547,5	98,04	98,50	0,151	0,149	223	0,2342158
15,184	547,4	547,6	99,95	100,11	0,151	0,148	224	0,2305028
15,280	547,4	547,6	99,18	99,61	0,151	0,149	225	0,232039
15,218	547,4	547,6	99,52	99,73	0,151	0,149	226	0,2311626
15,390	547,4	547,6	98,36	98,74	0,151	0,148	227	0,2337818
15,319	547,4	547,6	98,80	99,01	0,151	0,148	228	0,2326924
15,324	547,4	547,6	98,90	99,28	0,151	0,148	229	0,2326946
15,320	547,4	547,6	98,71	99,06	0,151	0,148	230	0,2326944
15,315	547,4	547,6	98,83	99,16	0,151	0,148	231	0,2326945
15,424	547,4	547,6	98,40	98,45	0,151	0,148	232	0,2342157
15,424	547,4	547,6	98,16	98,42	0,151	0,148	233	0,234216
15,416	547,3	547,6	98,26	98,56	0,151	0,148	234	0,2342158
15,273	547,3	547,6	99,11	99,43	0,151	0,149	235	0,2320396
15,269	547,3	547,6	99,02	99,66	0,151	0,149	236	0,23204
15,412	547,3	547,6	98,09	98,51	0,151	0,149	237	0,2342163
15,210	547,3	547,5	99,47	99,81	0,151	0,149	238	0,2311637

15,459	547,3	547,6	97,93	98,10	0,151	0,148	239	0,2348651
15,313	547,4	547,6	98,77	99,06	0,151	0,148	240	0,2326951
15,414	547,4	547,6	98,13	98,62	0,151	0,149	241	0,2342161
15,379	547,4	547,6	98,19	98,78	0,151	0,149	242	0,2337831
15,380	547,3	547,6	98,22	98,52	0,151	0,149	243	0,2337829
15,504	547,3	547,6	97,63	97,91	0,151	0,148	244	0,2357278
15,411	547,3	547,6	98,12	98,69	0,151	0,149	245	0,234216
15,309	547,3	547,6	98,66	99,00	0,151	0,149	246	0,232695
15,250	547,4	547,7	99,01	99,75	0,151	0,149	247	0,231854
15,413	547,4	547,7	98,26	98,44	0,151	0,149	248	0,2342164
15,313	547,4	547,7	98,83	99,26	0,151	0,149	249	0,232695
15,172	547,4	547,7	99,77	99,92	0,151	0,148	250	0,2305034
15,218	547,5	547,7	99,41	99,87	0,151	0,148	251	0,2311634
15,312	547,5	547,7	98,67	99,06	0,151	0,148	252	0,2327042
15,210	547,6	547,8	99,40	99,74	0,151	0,148	253	0,2311632
15,307	547,5	547,7	98,84	99,01	0,151	0,148	254	0,2326948
15,451	547,5	547,7	97,85	98,25	0,151	0,148	255	0,2348655
15,453	547,4	547,7	97,86	98,11	0,151	0,148	256	0,2348655
15,382	547,4	547,7	98,26	98,59	0,151	0,148	257	0,2337827
15,385	547,4	547,7	98,30	98,43	0,151	0,148	258	0,2337819
15,311	547,4	547,7	98,85	99,13	0,151	0,148	259	0,2326948
15,315	547,4	547,7	98,80	99,00	0,151	0,148	260	0,2326948
15,384	547,5	547,8	98,22	98,58	0,151	0,148	261	0,2337825
15,377	547,5	547,8	98,29	98,45	0,151	0,148	262	0,2337837
15,407	547,5	547,8	98,09	98,54	0,151	0,148	263	0,2342164
15,262	547,4	547,7	99,05	99,48	0,151	0,149	264	0,2320394
15,480	547,4	547,7	97,71	97,82	0,151	0,148	265	0,2352974
15,376	547,4	547,7	98,32	98,51	0,151	0,148	266	0,2337828
15,261	547,4	547,7	99,04	99,23	0,151	0,148	267	0,2320393
15,448	547,4	547,7	97,79	97,90	0,151	0,148	268	0,2348655
15,263	547,4	547,7	99,08	99,47	0,151	0,148	269	0,2320394
15,301	547,4	547,7	98,71	98,90	0,151	0,148	270	0,2326948
15,404	547,3	547,7	98,07	98,49	0,151	0,148	271	0,2342155
15,446	547,3	547,7	97,82	98,19	0,151	0,149	272	0,2348648
15,259	547,4	547,7	99,08	99,40	0,151	0,149	273	0,2320394
15,303	547,4	547,7	98,67	99,29	0,151	0,149	274	0,2326944
15,405	547,4	547,7	98,12	98,34	0,151	0,149	275	0,2342159
15,407	547,4	547,7	97,93	98,32	0,151	0,148	276	0,2342162
15,413	547,4	547,7	98,33	98,56	0,151	0,148	277	0,2342162
15,384	547,4	547,7	98,20	98,52	0,151	0,148	278	0,2337824
15,167	547,4	547,7	99,63	100,06	0,151	0,148	279	0,230503
15,239	547,4	547,8	99,35	99,35	0,151	0,148	280	0,2316015
15,479	547,5	547,8	97,60	97,88	0,151	0,148	281	0,2352972
15,303	547,6	547,8	98,61	99,29	0,151	0,149	282	0,2326694
15,401	547,6	547,9	97,97	98,33	0,151	0,149	283	0,2342154
15,261	547,6	547,9	98,99	99,44	0,151	0,149	284	0,2320397
15,206	547,6	547,9	99,38	99,67	0,151	0,149	285	0,2311632
15,450	547,6	547,9	97,83	98,13	0,151	0,148	286	0,2348651
15,449	547,5	547,9	97,90	98,18	0,151	0,148	287	0,2348658
15,266	547,6	547,9	99,07	99,23	0,151	0,148	288	0,2320397
15,308	547,6	547,9	98,71	99,26	0,151	0,149	289	0,2326949
15,234	547,6	547,9	99,21	99,39	0,151	0,148	290	0,2316017
15,414	547,6	547,9	98,10	98,40	0,151	0,148	291	0,234216
15,411	547,6	547,9	98,19	98,57	0,151	0,149	292	0,2342164
15,292	547,6	548,0	98,84	99,19	0,151	0,149	293	0,2324935
15,375	547,7	548,0	98,20	98,41	0,151	0,148	294	0,2337828
15,450	547,7	548,0	97,90	98,06	0,151	0,148	295	0,2348657
15,511	547,8	548,0	97,34	97,84	0,151	0,148	296	0,2357287
15,263	547,8	548,0	98,95	99,32	0,151	0,148	297	0,2320399
15,407	547,8	548,1	98,09	98,41	0,151	0,148	298	0,234217
15,266	547,7	548,1	99,08	99,42	0,151	0,148	299	0,2320401

15,293	547,7	548,1	99,08	99,21	0,151	0,148	300	0,232348
15,242	547,7	548,1	99,20	99,38	0,151	0,148	301	0,2316013
15,383	547,7	548,1	98,34	98,65	0,151	0,148	302	0,2337834
15,309	547,8	548,1	98,73	98,95	0,151	0,148	303	0,232695
15,448	547,8	548,1	97,91	98,04	0,151	0,148	304	0,234866
15,474	547,8	548,1	97,75	97,79	0,151	0,148	305	0,2352979
15,399	547,7	548,1	98,07	98,42	0,151	0,148	306	0,2342171
15,137	547,7	548,1	99,87	99,90	0,151	0,148	307	0,2301482
15,370	547,7	548,1	98,15	98,49	0,151	0,148	308	0,2337832
15,442	547,7	548,1	97,74	98,22	0,151	0,149	309	0,2348658
15,407	547,7	548,1	98,04	98,19	0,151	0,148	310	0,234217
15,381	547,8	548,2	98,30	98,47	0,151	0,148	311	0,2337843
15,411	547,8	548,1	98,02	98,40	0,151	0,148	312	0,2342167
15,205	547,8	548,1	99,44	99,75	0,151	0,148	313	0,2311637
15,398	547,8	548,2	97,90	98,16	0,151	0,148	314	0,2342137
15,376	547,8	548,2	98,44	98,23	0,151	0,148	315	0,2337835
15,448	547,7	548,2	97,86	98,13	0,151	0,148	316	0,2348659
15,405	547,7	548,2	98,17	98,25	0,151	0,148	317	0,2342169
15,302	547,8	548,2	98,63	98,83	0,151	0,148	318	0,2326957
15,307	547,8	548,2	98,71	99,01	0,151	0,148	319	0,2326959
15,422	547,8	548,2	97,96	98,06	0,151	0,148	320	0,2344716
15,506	547,9	548,3	97,62	97,79	0,151	0,148	321	0,2357283
15,376	547,9	548,3	98,21	98,50	0,151	0,148	322	0,2337835
15,260	547,9	548,3	99,02	99,12	0,151	0,148	323	0,2320407
15,234	547,9	548,3	99,05	99,39	0,151	0,148	324	0,2316025
15,403	547,9	548,3	97,94	98,41	0,151	0,148	325	0,2342174
15,408	548,0	548,4	97,99	98,42	0,151	0,148	326	0,234217
15,379	548,0	548,4	98,27	98,30	0,151	0,148	327	0,2337834
15,261	548,0	548,4	98,97	99,31	0,151	0,148	328	0,2320166
15,237	548,0	548,4	99,08	99,51	0,151	0,148	329	0,2316015
15,452	548,0	548,4	97,67	98,04	0,151	0,148	330	0,2348659
15,200	548,1	548,5	99,37	99,48	0,151	0,148	331	0,2311656
15,370	548,1	548,5	98,10	98,46	0,151	0,148	332	0,2337835
15,307	548,1	548,5	98,66	98,80	0,151	0,148	333	0,2326955
15,408	548,1	548,5	98,31	98,30	0,151	0,148	334	0,2342172
15,306	548,1	548,5	98,62	98,98	0,151	0,148	335	0,2326955

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	98,96	98,60	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
16,064	539,0	539,0			0,154	0,151	0	0,2408257
15,971	539,0	539,1	99,29	99,14	0,154	0,151	1	0,2418774
15,886	539,0	539,1	99,69	99,29	0,154	0,151	2	0,2408266
16,035	539,1	539,2	98,72	98,39	0,154	0,151	3	0,2429251
15,978	539,1	539,2	99,42	98,98	0,154	0,151	4	0,2418786
15,817	539,1	539,3	100,42	99,95	0,154	0,151	5	0,2393471
15,884	539,2	539,3	99,79	99,46	0,154	0,151	6	0,2404055
15,936	539,2	539,4	99,84	99,55	0,154	0,151	7	0,2408268
15,763	539,3	539,4	101,29	100,86	0,154	0,151	8	0,2378588
15,743	539,4	539,5	101,51	101,09	0,154	0,151	9	0,2374308
16,023	539,4	539,5	99,90	99,34	0,154	0,151	10	0,2414586
16,049	539,5	539,6	99,71	99,21	0,154	0,151	11	0,2418782
16,052	539,5	539,7	99,62	99,45	0,154	0,151	12	0,2418781
15,972	539,6	539,7	100,37	100,19	0,154	0,151	13	0,2404056
15,908	539,7	539,8	100,94	100,41	0,154	0,151	14	0,2393473
15,931	539,6	539,9	100,71	100,68	0,154	0,151	15	0,2396582
16,014	539,7	539,9	100,29	99,91	0,154	0,151	16	0,2408271
15,969	539,7	540,0	100,55	100,29	0,154	0,151	17	0,2400656
15,926	539,8	540,0	100,81	100,65	0,154	0,151	18	0,2393473
16,072	539,8	540,1	99,91	99,71	0,153	0,151	19	0,2414593
15,763	539,9	540,2	102,13	101,60	0,154	0,151	20	0,2367893
16,037	540,0	540,3	100,35	100,00	0,154	0,151	21	0,240827
15,838	540,1	540,3	101,50	101,22	0,154	0,151	22	0,2378596
16,005	540,1	540,4	100,43	100,11	0,153	0,151	23	0,2404062
15,911	540,2	540,5	101,04	100,73	0,153	0,151	24	0,2389238
15,855	540,2	540,5	101,68	101,33	0,154	0,151	25	0,2379944
16,043	540,3	540,6	100,21	99,79	0,154	0,151	26	0,2408277
15,772	540,3	540,7	101,97	101,57	0,153	0,151	27	0,2368567
16,025	540,3	540,7	99,99	99,88	0,153	0,151	28	0,2408278
15,929	540,4	540,7	100,70	100,21	0,153	0,151	29	0,2393485
15,743	540,4	540,8	101,88	101,34	0,153	0,150	30	0,2367907
15,973	540,4	540,8	100,05	99,71	0,153	0,150	31	0,2404069
15,874	540,5	540,9	100,79	100,26	0,153	0,150	32	0,2389243
15,939	540,6	540,9	100,38	99,98	0,153	0,151	33	0,2399836
15,789	540,6	541,0	101,29	100,79	0,154	0,151	34	0,2378606
15,784	540,6	541,0	101,22	100,69	0,154	0,151	35	0,2378606
15,922	540,7	541,1	100,23	99,80	0,154	0,151	36	0,2399833
15,777	540,7	541,1	101,25	100,72	0,154	0,151	37	0,2378612
15,874	540,7	541,1	100,43	100,21	0,154	0,151	38	0,2393488
15,871	540,8	541,2	100,46	100,03	0,153	0,151	39	0,239349
15,908	540,8	541,2	99,99	99,62	0,153	0,150	40	0,2399843
15,871	540,8	541,2	100,42	99,96	0,153	0,150	41	0,2393492
15,837	540,9	541,3	100,54	100,22	0,153	0,151	42	0,2389246
15,935	540,9	541,3	99,95	99,57	0,153	0,151	43	0,2404079
15,834	541,0	541,3	100,50	100,25	0,153	0,151	44	0,2389246
15,668	541,0	541,4	101,65	101,13	0,153	0,151	45	0,236473
15,897	541,0	541,4	99,93	99,36	0,153	0,150	46	0,2399843
15,752	541,0	541,4	100,89	100,45	0,153	0,150	47	0,2378613
15,749	541,1	541,5	100,91	100,69	0,153	0,151	48	0,2378612
15,811	541,1	541,5	100,30	99,76	0,153	0,151	49	0,2389256
15,952	541,2	541,5	99,40	98,84	0,153	0,150	50	0,241058
15,933	541,2	541,6	99,45	99,08	0,153	0,150	51	0,2408297
15,925	541,3	541,6	99,37	99,08	0,153	0,150	52	0,2408303
15,727	541,3	541,7	100,71	100,21	0,153	0,150	53	0,2378622
15,920	541,4	541,8	99,38	99,09	0,153	0,150	54	0,2408301
15,918	541,4	541,8	99,28	99,00	0,153	0,150	55	0,2408302

15,859	541,5	541,8	99,47	99,28	0,153	0,150	56	0,2399857
15,880	541,6	541,9	99,50	98,98	0,153	0,150	57	0,2404089
15,709	541,6	541,9	100,39	100,03	0,153	0,150	58	0,2378623
15,773	541,6	542,0	100,03	99,55	0,153	0,150	59	0,2389268
15,865	541,7	542,0	99,37	98,89	0,153	0,150	60	0,240409
15,831	541,8	542,1	99,30	98,99	0,153	0,150	61	0,2399861
15,859	541,8	542,1	99,19	98,85	0,153	0,150	62	0,240409
15,759	541,8	542,2	99,71	99,40	0,153	0,150	63	0,2389268
15,880	541,9	542,2	99,04	98,91	0,153	0,150	64	0,2408305
15,851	541,9	542,3	99,26	99,20	0,153	0,151	65	0,2404098
16,038	541,9	542,3	97,80	97,49	0,153	0,150	66	0,2433466
16,033	542,0	542,3	97,92	97,46	0,153	0,150	67	0,2433463
15,843	542,0	542,3	98,95	98,73	0,153	0,150	68	0,2404095
16,001	542,0	542,4	98,06	97,70	0,153	0,150	69	0,2429299
15,735	542,0	542,4	99,41	99,29	0,153	0,150	70	0,2389271
15,833	541,9	542,3	98,96	98,64	0,153	0,150	71	0,24041
15,900	541,9	542,3	98,59	98,15	0,153	0,150	72	0,2414634
15,857	541,9	542,4	98,75	98,24	0,153	0,150	73	0,2408314
15,995	542,0	542,4	98,02	97,51	0,153	0,150	74	0,2429305
15,799	542,0	542,4	99,07	98,81	0,153	0,150	75	0,2399871
15,852	542,1	542,5	98,75	98,66	0,153	0,150	76	0,2408313
15,890	542,1	542,5	98,33	98,20	0,153	0,150	77	0,2414634
16,052	542,1	542,5	97,47	97,00	0,153	0,150	78	0,2439732
15,982	542,1	542,6	97,90	97,74	0,153	0,150	79	0,2429305
15,843	542,2	542,6	98,70	98,41	0,153	0,150	80	0,2408319
15,712	542,2	542,6	99,47	98,69	0,153	0,150	81	0,2389279
15,810	542,2	542,7	98,76	98,72	0,153	0,150	82	0,2404106
15,970	542,3	542,7	97,84	97,29	0,153	0,150	83	0,242931
15,831	542,3	542,7	98,62	98,43	0,153	0,150	84	0,2408317
15,868	542,3	542,7	98,30	98,01	0,153	0,150	85	0,2414638
15,989	542,4	542,8	97,49	97,14	0,153	0,150	86	0,2433479
15,989	542,5	542,8	97,45	97,11	0,153	0,150	87	0,2433483
15,960	542,5	542,9	97,60	97,19	0,153	0,150	88	0,2429308
15,889	542,6	542,9	97,96	97,60	0,153	0,150	89	0,2418841
15,957	542,7	543,0	97,63	97,31	0,153	0,150	90	0,2429312
16,049	542,7	543,0	96,85	96,55	0,153	0,150	91	0,2443892
15,953	542,6	543,0	97,50	97,22	0,153	0,150	92	0,2429316
15,815	542,6	543,0	98,31	98,15	0,153	0,150	93	0,2408329
15,756	542,7	543,0	98,82	98,34	0,153	0,150	94	0,2399886
15,947	542,7	543,1	97,36	97,22	0,153	0,150	95	0,2429318
15,880	542,8	543,1	97,87	97,48	0,153	0,150	96	0,241884
15,709	542,8	543,1	98,97	98,44	0,153	0,150	97	0,2393529
15,847	542,9	543,2	97,87	97,69	0,153	0,150	98	0,2414656
15,682	542,9	543,2	99,13	98,68	0,153	0,150	99	0,2389294
16,012	542,8	543,2	97,03	96,72	0,153	0,150	100	0,2439757
15,846	542,9	543,2	97,88	97,83	0,153	0,150	101	0,2414651
15,706	542,9	543,3	98,86	98,66	0,153	0,150	102	0,2393539
15,748	542,9	543,3	98,59	98,16	0,153	0,150	103	0,2399892
15,969	542,9	543,3	97,26	96,99	0,153	0,150	104	0,2433492
15,842	542,9	543,3	97,98	97,65	0,153	0,150	105	0,2414653
15,800	543,0	543,4	98,39	97,60	0,153	0,150	106	0,2408331
15,800	543,0	543,4	98,12	97,81	0,153	0,150	107	0,240833
15,842	543,0	543,4	97,96	97,73	0,153	0,150	108	0,2414649
15,800	543,1	543,5	98,16	97,96	0,153	0,150	109	0,2408331
16,004	543,1	543,5	97,09	96,51	0,153	0,150	110	0,2439746
15,840	543,2	543,6	97,98	97,57	0,153	0,150	111	0,2414659
16,003	543,2	543,6	96,88	96,47	0,153	0,150	112	0,2439753
16,192	543,2	543,6	95,67	95,27	0,152	0,150	113	0,2468702
16,298	543,2	543,6	95,01	94,59	0,152	0,150	114	0,2485067
16,028	543,2	543,7	96,78	96,30	0,153	0,150	115	0,2443907
16,232	543,3	543,7	95,73	95,03	0,153	0,150	116	0,2474873

16,028	543,3	543,7	96,61	96,26	0,153	0,150	117	0,2443908
16,299	543,4	543,8	95,05	94,71	0,152	0,150	118	0,2485155
16,257	543,4	543,8	95,39	94,86	0,153	0,150	119	0,2478974
16,229	543,5	543,9	95,38	94,99	0,152	0,150	120	0,247487
16,255	543,5	544,0	95,15	94,80	0,152	0,149	121	0,2478979
16,188	543,5	543,9	95,54	95,55	0,152	0,150	122	0,2468705
16,190	543,5	544,0	95,56	95,52	0,152	0,150	123	0,2468708
16,162	543,5	543,9	95,78	95,38	0,152	0,150	124	0,2464599
16,318	543,5	543,9	94,81	94,57	0,152	0,150	125	0,248919
16,315	543,4	543,9	94,69	94,35	0,152	0,150	126	0,2489196

APPENDIX 4: Unit pre burn



Model: HER 8024
Date: 09/27/2018
Test Engineer: CFM

Wood Stove Preconditioning

Total Hours: 60.75

Date	Time	Scale	Flue Temp (°F)	Cat Temp (°F)	Minutes (Cumulative)
22-Aug	1835	4.9 LBS KINDLING			
	1855	17.4 LBS FUEL			
	1910	16.7	677	712	0
	1920	12.9	479	688	
	1930	10.7	487	968	
	1940	8.9	523	1136	
	1950	7.0	522	1129	
	2000	5.5	491	1019	
	2010	4.4	473	1011	
	2020	3.3	458	1049	70
	2024	15.4	429	870	TEST STARTED, SCALE ZEROED
	2030	14.5	483	1030	
	2040	12.2	560	1146	
	2050	10.1	572	1151	
	2100	7.5	558	1112	
	2110	5.6	543	1131	
	2120	4.2	514	1098	
	2130	3.1	482	992	
	2140	2.4	440	880	
	2150	1.8	433	883	
	2200	1.1	417	843	
	2210	1.0	398	817	
	2220	0.6	388	805	
	2230	0.5	380	789	200
	2239	-0.1	376	775	
	2248	17.3	372	773	SCALE ZEROED, FUEL ADDED TO HOT STOVE
	2300	15.9	432	918	230
	2310	15.0	378	919	
	2320	13.9	375	920	
	2330	12.7	383	905	
	2340	11.6	385	908	
	2350	10.8	380	924	280
23-Aug	0000	9.4	374	903	
	0010	8.3	371	891	
	0020	7.4	364	884	
	0030	6.5	364	896	
	0040	5.6	353	865	
	0050	5.0	346	882	
	0100	4.4	340	877	
	0110	3.8	321	834	
	0120	3.4	312	812	
	0130	3.0	306	814	
	0140	2.9	291	732	
	0150	2.5	280	709	400
	0200	2.3	275	695	
	0210	2.1	269	667	
	0220	2.0	266	660	
	0230	1.8	263	654	
	0240	1.6	261	647	

0250	1.6	261	653	
0300	1.3	259	655	
0310	1.2	247	621	
0320	1.1	239	603	
0330	0.8	238	615	500
0340	0.7	237	605	
0350	0.3	238	611	
0400	0.4	241	620	
0410	0.2	241	617	
0420	0.1	237	607	
0430	0.0	237	608	
0440	0.0	235	600	
0450	0.0	230	587	
0500	0.0	226	567	
0510	0.2	221	556	600
0520	0.1	221	571	
0530	0.0	218	558	
0540	0.0	213	539	
0550	0.0	209	540	
0600	0.0	211	569	
0610	0.0	214	583	
0620	0.0	208	559	
0630	-0.1	204	574	
0640	0.0	202	562	
0650	0.1	196	557	700
0700	0.0	196	543	
0705	0.0	188	508	715
1520	5.1 LBS KINDLING		STOVE COOLED, RELIT	
1535	17.9 LBS FUEL			
1600	15.5	415	520	715
1610	14.2	311	720	
1620	13.7	251	689	
1630	13.0	351	799	
1640	12.4	263	720	
1650	12.0	247	683	
1700	11.5	239	686	
1710	9.9	505	1065	
1720	8.3	518	1058	795
1730	6.7	504	990	
1740	5.7	319	864	
1750	5.6	274	900	
1800	5.2	264	905	
1810	4.9	257	893	
1820	4.5	254	894	
1830	4.4	245	869	
1840	4.1	239	835	
1850	4.1	231	799	885
1859	3.8	225	778	
1904	16.1	238	686 TEST STARTED, SCALE ZEROED	
1920	15.3	237	630	915
1930	14.8	249	681	
1940	14.5	266	768	
1950	13.5	278	850	
2000	12.9	286	813	
2010	12.2	290	895	
2020	11.5	300	938	
2030	10.8	308	997	

	2040	10.1	317	1037	995
	2050	9.3	329	1085	
	2100	8.5	332	1089	
	2110	7.7	328	1083	
	2120	7.1	322	1073	
	2130	6.2	321	1085	
	2140	5.6	325	1113	
	2150	4.6	319	1083	
	2200	4.1	305	1044	
	2210	3.9	302	1036	
	2220	3.2	294	998	1095
	2230	3.0	274	899	
	2240	2.9	252	795	
	2250	2.6	237	745	
	2300	2.5	228	723	
	2310	2.4	220	701	
	2320	2.4	214	684	
	2330	2.3	209	675	
	2340	2.1	206	665	
	2350	2.1	203	658	
24-Aug	0000	1.9	199	622	1195
	0010	1.7	195	624	
	0020	1.7	192	614	
	0030	1.5	190	613	
	0040	1.4	189	612	
	0050	1.2	190	619	
	0100	1.3	188	615	
	0110	0.9	190	652	
	0120	0.6	187	630	
	0130	0.5	186	635	
	0140	0.8	186	617	1295
	0150	0.6	182	601	
	0200	0.2	182	606	
	0210	0.1	185	633	
	0220	0.1	184	619	
	0230	0.1	184	634	
	0240	0.0	186	640	
	0250	0.2	185	626	
	0300	-0.2	183	619	
	0310	0.0	182	617	
	0320	0.0	179	609	1395
	0330	-0.1	177	610	
	0340	-0.2	180	630	
	0350	0.0	182	619	
	0400	-0.1	181	615	
	0410	0.0	179	608	
	0420	-0.2	177	594	
	0430	0.0	176	585	
	0440	0.1	175	589	
	0450	0.1	172	569	
	0500	-0.1	169	553	1495
	0510	-0.1	166	531	
	0520	0.0	160	508	
	0524	0.0	158	500	1519
	1140	5.6 LBS KINDLING		STOVE COOLED, RELIT	
	1155	18.0 LBS FUEL			
	1220	16.0	390	556	1519

1230	14.3	401	603	
1240	12.2	680	754	
1250	12.1	772	864	
1300	9.6	746	892	
1310	6.0	629	816	
1320	4.1	314	838	
1330	3.8	272	811	1589
1340	3.6	251	766	
1350	3.4	242	772	
1400	3.3	229	693	
1410	3.0	217	691	1629
1413	16.3	225	610 TEST STARTED, SCALE ZEROED	
1420	15.9	262	645	1639
1430	15.7	210	506	
1440	15.5	215	601	
1450	15.0	245	736	
1500	14.2	278	777	
1510	13.6	289	872	
1520	13.1	297	865	1699
1530	12.1	309	929	
1540	11.1	312	893	
1550	10.5	299	991	
1600	9.8	319	1056	
1610	8.9	321	1086	
1620	8.2	321	1092	
1630	7.7	319	1092	
1640	7.1	318	1092	
1650	6.3	320	1111	
1700	5.4	323	1126	1799
1710	4.8	302	937	
1720	4.4	275	864	
1730	3.9	262	867	
1740	3.6	262	956	
1750	3.4	246	785	
1800	3.4	230	732	
1810	3.0	219	691	
1820	2.8	210	661	
1830	2.8	205	652	
1840	2.9	202	649	1899
1850	2.7	200	645	
1900	2.5	198	648	
1910	2.3	200	681	
1920	2.1	204	718	
1930	2.2	206	715	
1940	2.0	207	719	
1950	1.7	207	720	
2000	1.9	208	718	
2010	1.6	202	610	
2020	1.7	188	602	1999
2030	1.3	187	632	
2040	1.2	191	644	
2050	1.0	191	649	
2100	1.0	192	657	
2110	0.8	194	666	
2120	0.6	192	662	
2130	0.4	191	638	
2140	0.3	188	620	

	2150	0.1	185	611	2089
	2157	-0.1	186	621 TEST ENDED, TEMPERATURE LOGGING CONTINUED	
	2200	0.0	186	623 NO FUEL ADDED	2099
	2210	0.0	183	611	
	2220	0.0	182	608	
	2230	0.2	180	595	
	2240	-0.1	176	574	
	2250	0.0	175	582	
	2300	0.0	174	581	
	2310	0.1	172	567	
	2320	-0.1	172	579	
	2330	0.0	172	579	
	2340	0.0	170	568	2199
	2350	-0.1	168	554	
	2400	-0.1	166	547	
	2410	0.0	165	556	
	2420	0.0	163	532	
	2430	0.1	159	513	
	2440	0.0	155	511	
	2450	0.0	154	502	2169
	2457	0.1	154	501	2176
25-Aug	1555	5.1 LBS KINDLING		STOVE COOLED, RELIT	
	1615	16.3 LBS FUEL			
	1747	3.7	257	675 CATALYST TC CHANNEL REPAIRED	2176
	1750	3.8	253	781	2179
	1800	3.7	246	759	
	1810	3.5	236	701	2199
	1814	15.4	236	648 TEST STARTED, SCALE ZEROED	
	1824	14.9	252	592	
	1830	14.7	241	593	2219
	1840	14.3	256	669	
	1850	13.7	279	783	
	1900	12.9	309	906	
	1910	12.0	326	982	
	1920	11.1	338	974	
	1930	10.1	345	1125	
	1940	9.4	354	1172	
	1950	8.6	343	1037	2299
	2000	8.0	317	895	
	2010	7.2	338	1064	
	2020	6.4	352	1213	
	2030	6.0	353	1136	
	2040	5.2	320	901	
	2050	4.4	301	857	
	2100	4.1	288	855	
	2110	3.7	273	808	
	2120	3.4	266	814	
	2130	3.4	253	761	2399
	2140	3.1	246	739	
	2150	2.7	240	723	
	2200	2.7	235	719	
	2210	2.6	232	712	
	2220	2.3	231	716	
	2230	2.2	243	796	
	2240	2.1	246	794	
	2250	1.9	246	786	
	2300	1.8	245	778	

	2310	1.7	246	775	2499
	2320	1.5	245	774	
	2330	1.5	245	768	
	2340	1.3	244	763	
	2350	1.1	244	765	
26-Aug	0000	0.9	244	771	
	0010	0.8	229	700	
	0020	0.8	226	697	
	0030	0.5	223	699	
	0040	0.6	223	685	
	0050	0.3	217	657	2599
	0100	0.0	216	674	
	0105	-0.1	217	681 TEST ENDED, LOGGING STOPPED	2614
	1811	5.1 LBS KINDLING		STOVE COOLED, RELIT	
	1822	17.2 LBS FUEL			
	1831	18.0	489	641	2614
	1841	15.2	424	332	
	1851	12.3	763	890	2634
	1900	10.1	788	938	2643
	1910	6.7	780	928	
	1920	5.3	375	932	
	1930	4.8	317	865	
	1940	4.6	320	1041	
	1950	4.1	316	1049	
	2000	3.9	298	960	2703
	2010	3.8	282	891	
	2015	15.3	285	771 TEST STARTED, SCALE ZEROED	
	2020	14.8	401	788	
	2030	14.4	289	807	
	2040	13.6	319	934	
	2050	12.7	336	981	
	2100	11.8	338	993	
	2110	10.9	333	908	
	2120	10.2	340	1117	
	2130	9.4	355	1169	
	2140	8.7	359	1193	2803
	2150	8.1	361	1183	
	2200	7.2	360	1172	
	2210	6.3	354	1140	
	2220	5.6	346	1116	
	2230	5.1	339	1100	
	2240	4.7	337	1106	
	2250	4.0	340	1136	
	2300	3.3	338	1141	
	2310	3.0	311	887	
	2320	2.5	281	821	2903
	2330	2.4	259	725	
	2340	2.3	242	694	
	2350	2.2	233	690	
27-Aug	0000	2.0	228	687	
	0010	1.7	226	687	
	0020	1.6	225	689	
	0030	1.3	224	682	
	0040	1.3	224	681	
	0050	1.3	227	697	
	0100	1.1	224	682	3003
	0110	1.1	222	687	

0120	1.0	225	702	
0130	0.7	226	705	
0140	0.6	224	697	
0150	0.4	224	697	
0200	0.3	222	695	3063
0208	0.0	224	696 TEST ENDED, LOGGING STOPPED	3071
1201 5.4 LBS KINDLING		STOVE COOLED, RELIT		
1215 15.8 LBS FUEL				
1240	12.9	649	731	3071
1250	10.7	683	761	
1300	8.2	795	857	
1310	6.0	427	1029	3101
1320	5.3	318	865	
1330	5.0	291	861	
1340	4.6	273	821	
1350	4.3	263	829	
1400	4.1	274	999	
1410	3.6	275	959	
1420 16.0		263 765 TEST STARTED, SCALE ZEROED		
1430	15.6	269	640	
1440	15.4	257	670	
1450	14.8	279	774	3201
1500	13.8	305	865	
1510	13.0	315	915	
1520	12.1	332	1015	
1530	11.3	336	959	
1540	10.4	343	1013	
1550	9.3	341	1003	
1600	8.4	320	910	
1610	8.0	296	871	
1620	7.3	295	886	
1630	6.9	299	871	3301
1640	6.0	294	889	
1650	5.5	287	867	
1700	4.9	279	868	
1710	4.3	272	825	
1720	4.0	262	794	
1730	3.8	252	764	
1740	3.6	236	724	
1750	3.4	228	703	
1800	3.2	222	688	
1810	3.3	218	680	3401
1820	3.0	217	684	
1830	3.0	215	683	
1840	2.7	215	685	
1850	2.5	214	693	
1900	2.4	208	649	
1910	2.4	205	653	
1920	2.2	205	658	
1930	2.2	204	660	
1940	2.0	203	656	
1950	1.7	205	667	3501
2000	1.6	203	648	
2010	1.5	199	632	
2020	1.4	197	635	
2030	1.3	197	640	
2040	1.2	197	634	

2050	1.0	197	645	
2100	0.9	197	647	
2110	0.9	202	665	
2120	0.5	205	660	
2130	0.6	204	658	3601
2140	0.5	205	667	
2150	0.3	202	668	
2200	0.1	195	633	
2210	0.0	193	635	
2214	0.1	194	643 TEST ENDED, LOGGING STOPPED	3645

Total Minutes	3645
Total Hours	60.75

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

Charlotte Morgan
Design Engineer
Hearthstone QHHP
877 877-2113

APPENDIX 7: Operator's manual



Heritage IV

(Model 8024)
Woodstove

OWNER'S MANUAL

Installation And Operating Instructions



**SAVE THIS OWNER'S MANUAL
FOR FUTURE REFERENCE**

**PLEASE READ THIS ENTIRE OWNER'S MANUAL BEFORE YOU INSTALL AND USE YOUR
NEW HERITAGE 8024 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

Certified to ULC Std. S627

**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

Heritage IV (Model 8024)
Manual: 6400-XXXXX
R: 10/08/18

NOTES ON STOVE OPERATION AND EFFICIENCY

Rating:

You have purchased a Hearthstone Heritage 8024 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 0.54 gr/hr. emission rate and under specific test conditions has been shown to deliver heat at rates ranging from 12,317 to 35,845 Btu/hr (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, render the heater ineffective, cause smoke and may damage catalysts.

Following the maintenance guidelines set forth in this manual will help insure 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 possible 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 77.1% (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 with the meter you purchase to measure fuel wood moisture content. Burn only dry, seasoned wood as using wet wood will greatly reduce your efficiency.

CO Emissions:

The Heritage 8024 has the following CO emission rates by burn level: Category 1 (low) – 0.11 g/min, Category 2 (med. low) – 0.25 g/min, Category 3 (med. high) – 0.10 g/min, and Category 4 – 4.12 g/min. 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 Heritage 8024 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 Heritage 8024 blends modern technology with the unique beauty and qualities of cast iron. We trust that you will appreciate the quality of this handcrafted product.

Your Heritage 8024 woodstove burns very efficiently, and produces a large amount of heat. However, you should not consider your Heritage 8024 the primary heat source for your home. The Heritage 8024'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 Heritage 8024 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 Heritage 8024 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 Heritage 8024 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 23)
- **Never** put articles of clothing or candles on a hot stove.
- **Never** connect the stove to a flue used by another appliance.

Other safety guidelines:

- Keep all combustible items such as furniture, drapes, clothing, and other items, at least 36" (0.92 m) from the stove (See page 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 28)
- 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 #90-53220.

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 28)
- 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 28.)

- 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

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.

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.

SPECIFICATIONS

Maximum Heat Output:

35,845 BTUs per hour of cordwood (based on independent laboratory test results).

Floor Size of Heated Area:

Up to a maximum of 2,000 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:

2.2 cubic feet.

Maximum Log Length: Up To 21" (53.3 cm).

Emissions: 0.54 g/hr.

Burn Time: Up to TBD hrs. (*Heat Life™*: Up to TBD 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 1/4" (76.9cm)
Width: 28 1/8" (64.7cm)
Depth: 21 5/8" (55.5cm)
Weight: 560 lbs. (254 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-39" W-29" L-36" or
 99x73.7x 91.5cm (add 4" or
 10.2cm for pallet).

Optional Equipment:

Outside Air Kit	90-53220
Blower	90-57210
Rear Heat Shield	90-68210

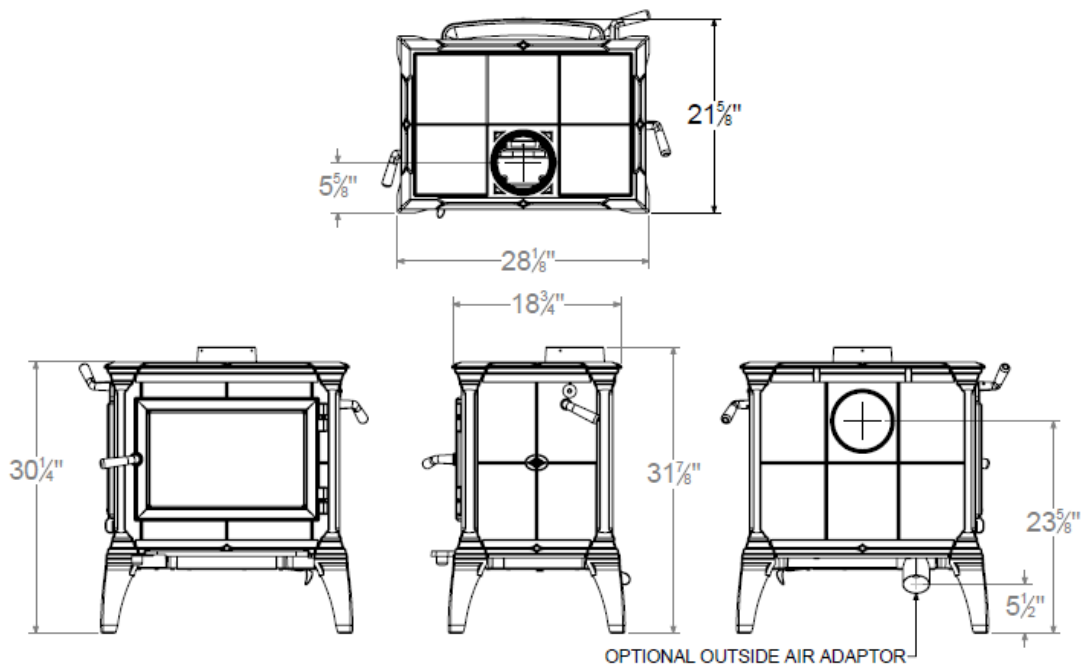


Figure 1 – Heritage 8024 Dimensions

INSTALLATION

UNPACKING

Hearthstone packages your Heritage 8024 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 Heritage 8024, carefully unpack and inspect the stove and all accompanying parts. Ensure that all parts are included in the ash pan. If any parts are damaged or missing, please contact your authorized Hearthstone dealer immediately.

The catalysts are secured in the stove with packaging material for shipping. This material does not need to be removed and will burn off during your first fire.

PACK LIST

Heritage 8024 Woodstove
Owner's Manual
Wood Handles, Screws, And
Washers (See Illustration 1 on page 8 for
installation)

The door and bypass handles are shipped inside the stove to protect them during shipping and installation. It is best not to install them until after stove is moved into its final location.

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.

Installing Your Stove

Choose a place to install your Heritage 8024 woodstove. Consider the location of your stove for optimum heating efficiency. In general, it is better to

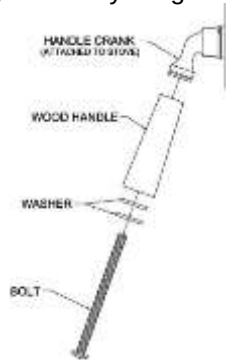


Illustration 1 – Handle Installation

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

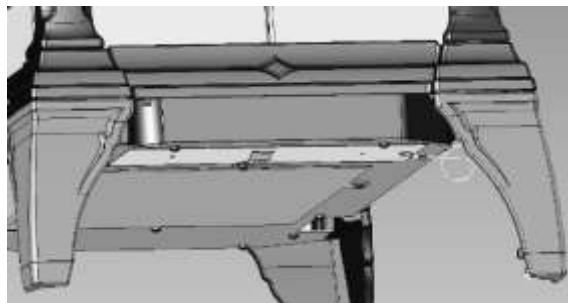


Illustration 2 – Tag Location

HEARTH REQUIREMENTS & FLOOR PROTECTION

Ensure you protect combustible flooring with a covering of noncombustible material. The Heritage 8024 does not require an insulated hearth pad. The minimum floor protection must be met under the stove and extend beyond the stove as follows:

SIDE DOOR (LEFT AS SHOWN) 16" (41 cm) US / 18" (46 cm) Canada
 OTHER SIDE (RIGHT AS SHOWN) 5" (13 cm)
 REAR 2" (5 cm)
 FRONT 16" (41 cm) US / 18" (46 cm) Canada

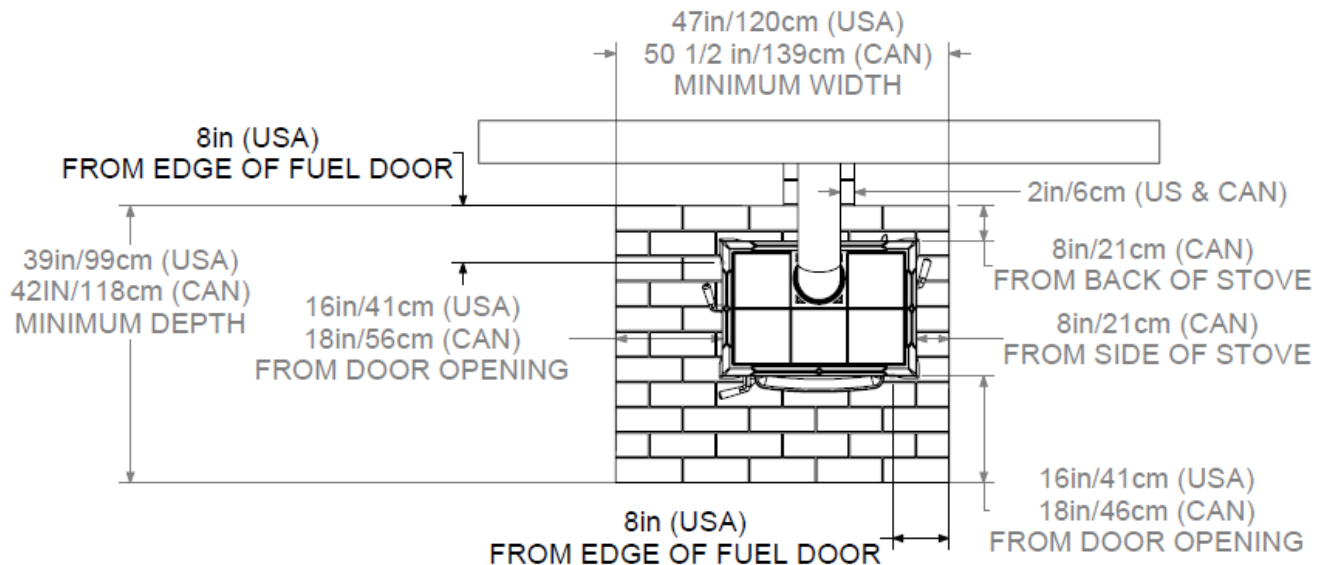


Figure 2 – Hearth Dimensions

Note: Dimensions shown in figure above are measured from the body of the stove, not the legs.

Minimum hearth pad dimensions can be reduced by installing the Side Door Lock Kit (Kit 90-70210). **(Minimum hearth pad width with the lock kit is 37in/94cm USA, 40 1/2 in/103cm CAN).**

COMBUSTIBLE SURFACE REQUIRED CLEARANCES

Note: Dimensions shown in the following figures are from the top casting 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.

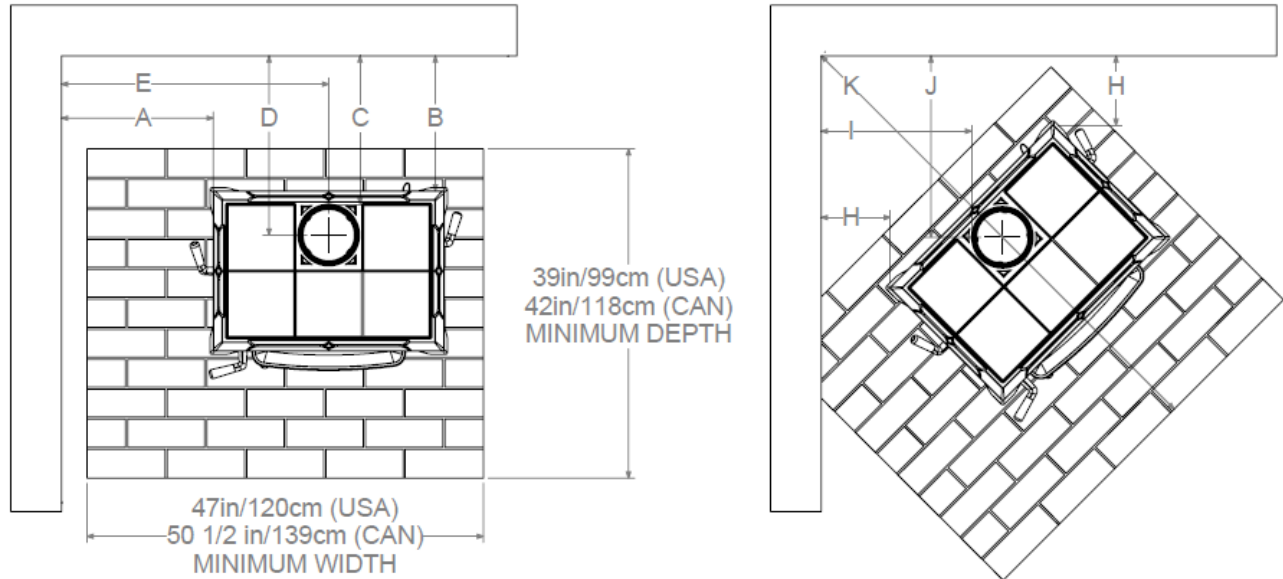


Figure 3 – Clearance to Combustibles

Clearances (inches)	Parallel					Corner			
	A	B	C	D	E	H	I	J	K*
Single wall stove pipe without heat shield	16" 41cm	18" 46cm	20" 51cm	23" 59cm	29.5" 75cm	8" 21cm	19" 48cm	22" 56cm	63" 160cm
Single wall stove pipe with heat shield	16" 41cm	10" 26cm	12" 31cm	15" 38cm	29.5" 75cm	8" 21cm	19" 48cm	22" 56cm	63" 160cm
Double wall stove pipe with heat shield	16" 41cm	6" 15cm	8" 21cm	11" 28cm	29.5" 75cm	8" 21cm	19" 48cm	22" 56cm	63" 160cm

*In US. For Canadian installations, add 2"/5cm

Alcove Clearances (inches)	Unprotected Surfaces	Protected Surfaces (NFPA-211)
Minimum alcove width	60 1/2"/154cm	See NFPA-211
Minimum alcove side clearance	18"/46cm	See NFPA-211
Minimum alcove rear clearance	20"/51cm	See NFPA-211
Alcove ceiling above stove top	32 1/8"/82cm	See NFPA-211
Alcove ceiling above floor	64"/163cm	See NFPA-211

Note: Dimensions shown in the following figures are from the top casting of the stove unless otherwise indicated.

If you use a rear heat shield to obtain reduced clearances, you must use the optional rear heat shield manufactured by Hearthstone available through your local dealer. Close clearance connector pipe must be tested to UL standards and listed. Check listings of your pipe for actual clearances. Shown are measurements typical only and specific to Simpson Dura Vent DVL brand. Clearances cannot be reduced without the use of the rear heat shield and/or with close clearance connector pipe and/or by protecting the surfaces per NFPA 211 standards.

FOR REAR HEAT SHIELD, USE KIT #90-68210

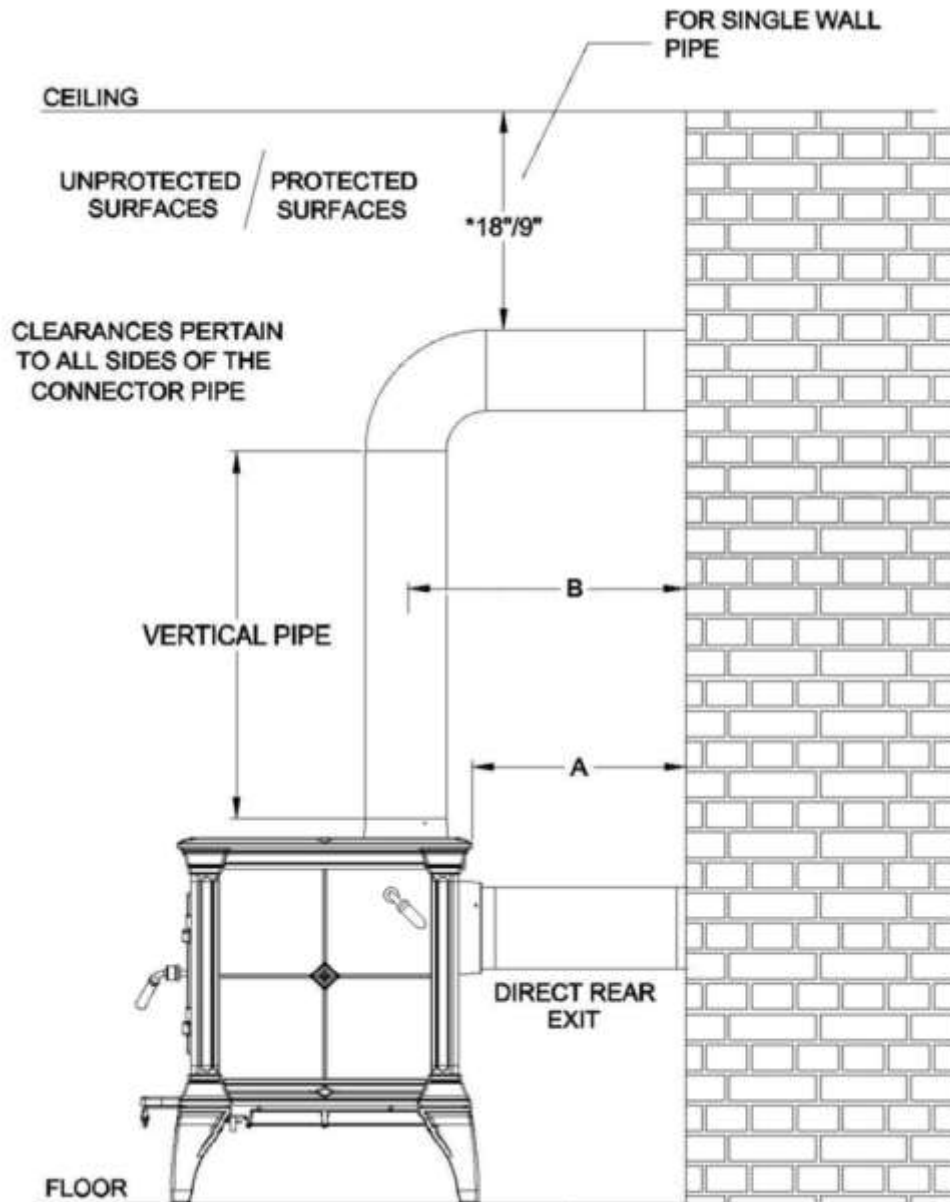


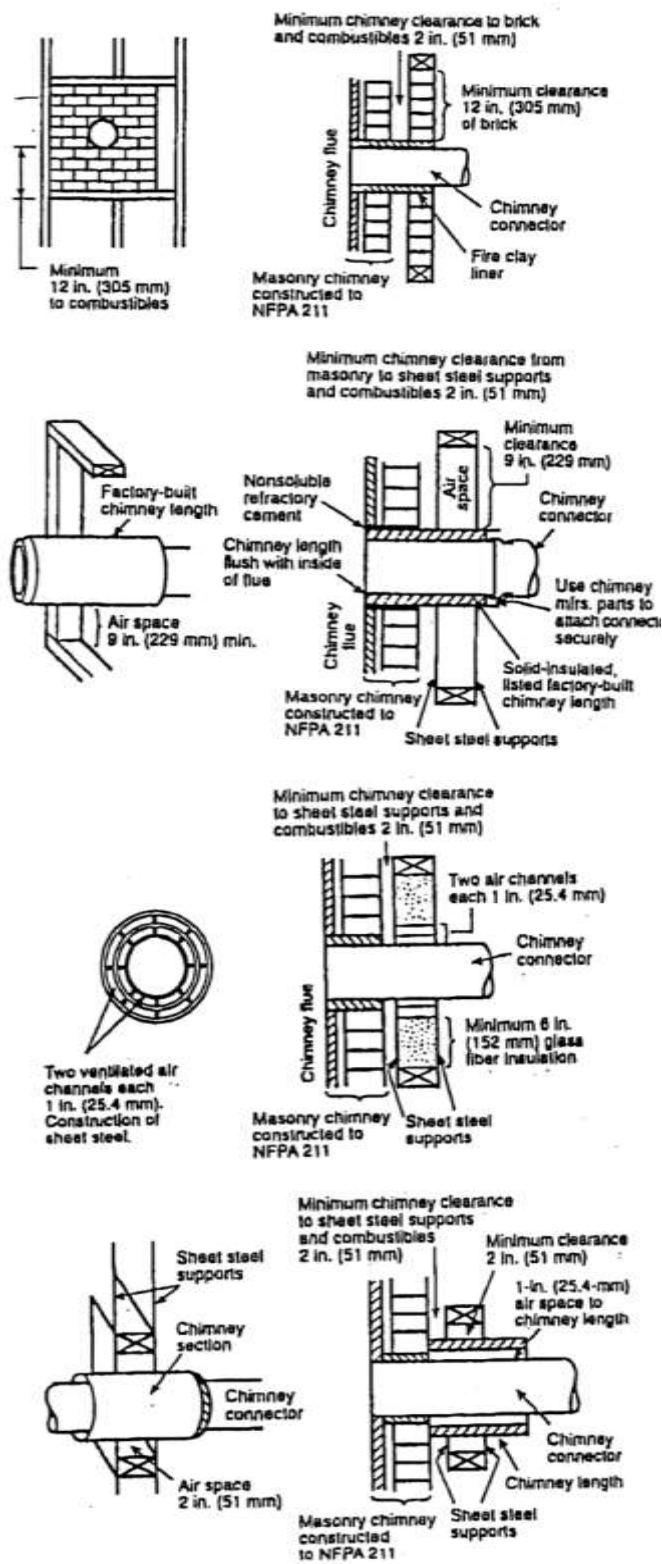
Figure 4 Chimney Connector Clearances

	Single Wall Pipe		Double Wall Pipe	
Through the wall top flue or direct rear exit	With Heat Shield**	Without Heat Shield**	With Heat Shield**	Without Heat Shield**
A	10"/26cm	18"/46cm	6"/15cm	18"/46cm
B	15"/38cm	23"/59cm	11"/28cm	23"/59cm

*For double wall pipe clearance to ceiling, refer to pipe manufacturer specifications.

** Rear Heatshield, kit #90-68210

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.

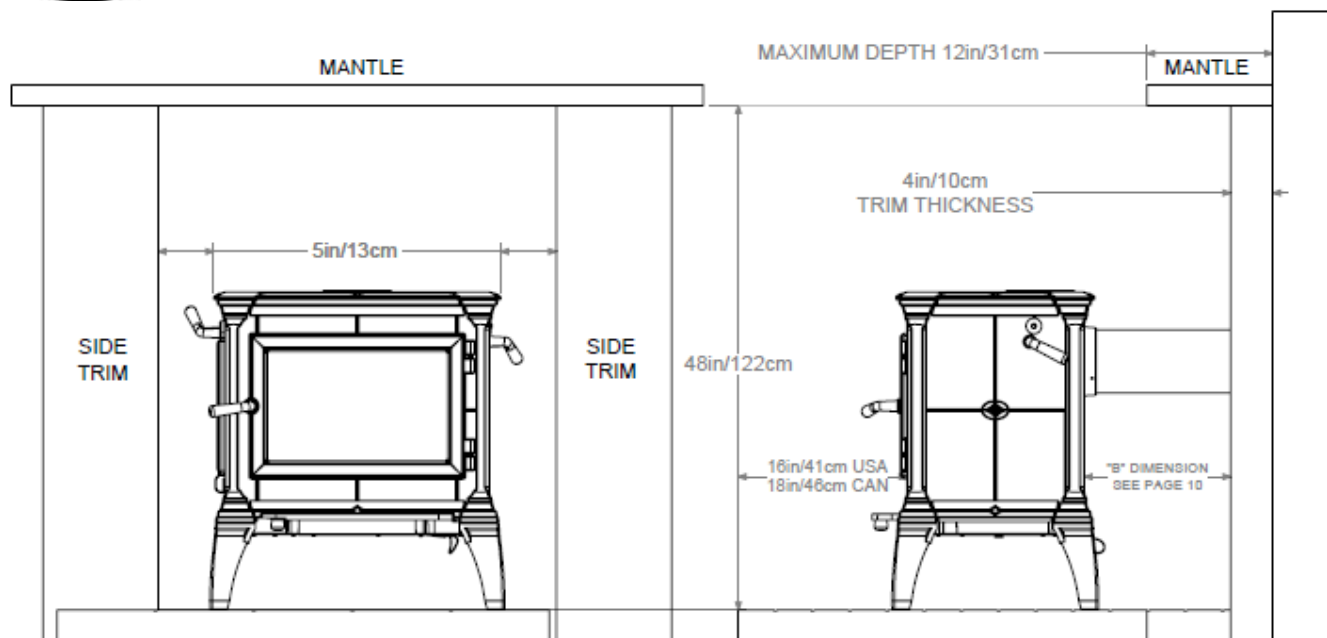


Figure 5 Trim and Mantle Clearances

OUTSIDE AIR SUPPLY

(Optional Kit #90-53220)

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.

For installations in Canada, where the outside air supply kit is used, the stove must be permanently attached to the floor for stability. See page 17 for lock down instructions.

*An adaptor for 4" duct is available if needed. KIT #90-53308

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.

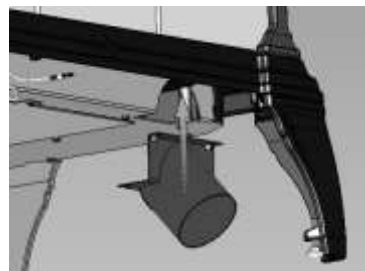


Figure 6 – Outside Air Kit Detail

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 1/4" x 1/4" 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.

When selecting ducting and other components, note that for installations in Canada, any air intake which is connected directly to the outdoors must include a damper allowing 100% closure.

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 available are Simpson Dura Vent DVL and Metalbestos DS. Security, GSW and Ameritex also have 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.
- 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. Failure to follow these instructions and specified components or using make-shift compromises can result in fire, property damage, bodily injury, and even death. Be sure to follow the manufacturer's instructions to maintain an effective vapor barrier at the location where the chimney or other component penetrates the exterior of the structure.

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 connector and keep it clean. Upon inspection, immediately replace rusted, cracked, or broken components.

- The *chimney connector* is the stovepipe from the woodstove to the chimney. The chimney connector stovepipe is 6" (152 mm) diameter, 24 MSG or 25 MSG blued steel connector pipe. *Do not use*

aluminum or galvanized steel pipe - they cannot withstand the extreme temperatures of a wood fire.

- The *thimble* is a manufactured (or site-constructed) device installed in combustible walls through which the chimney connector passes to the chimney. It keeps the walls from igniting. You must use a wall thimble when installing a chimney connector through a combustible wall to the chimney.
- A *wall pass-through* (or chimney support package) also keeps the walls from igniting. You must use one when connecting through a wall or ceiling to a prefabricated chimney.
- Only install this stove to a *lined masonry chimney* or an *approved high temperature prefabricated residential* type building heating appliance chimney. *Do not* connect this stove to a chimney serving another appliance; you will compromise the safe operation of both the wood stove and the connected appliance.
- A *liner* is the UL 1777 or ULC S635 (for factory built fireplace or masonry) chimney.

You must connect your stove to a chimney comparable to those recommended in this manual. *Do not use stovepipe as a chimney*. Use stovepipe for freestanding installations only to connect the stove to a proper chimney.

- **WARNING: DO NOT CONNECT THIS APPLIANCE TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.**

INSTALLING A VENTING SYSTEM

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 Heritage 8024. 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 Heritage 8024 requires a draft between 0.06" and 0.1" WC. For drafts above 0.1" WC, install a stovepipe damper. Check the draft at stove installation time.

Remember, the NFPA recommends minimum clearances for chimney connectors to combustibles such as walls and ceilings. Once the stove is installed at safe distances from these combustible surfaces, it is also important to maintain these connector clearances for the remainder of the installation.

CONNECTING THE STOVE TO A CHIMNEY

You can install your Heritage 8024 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 Heritage 8024 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 Heritage 8024. The Heritage 8024 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 is 10 feet (3 m) off the floor. The recommended maximum chimney height is 30 feet (9m). The Heritage 8024 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.

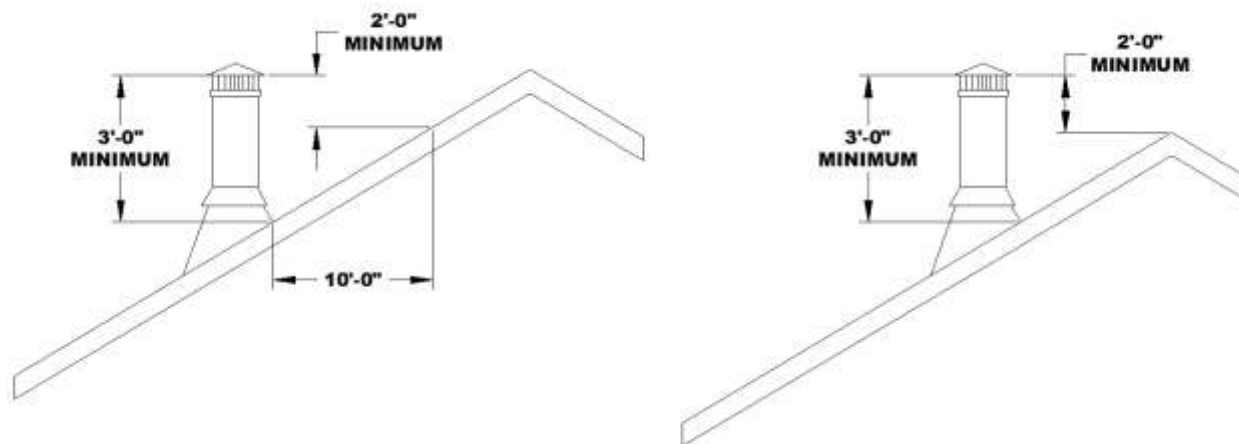
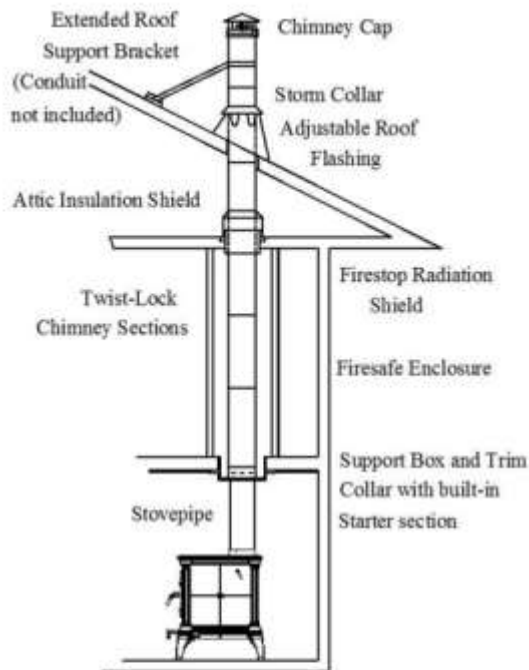
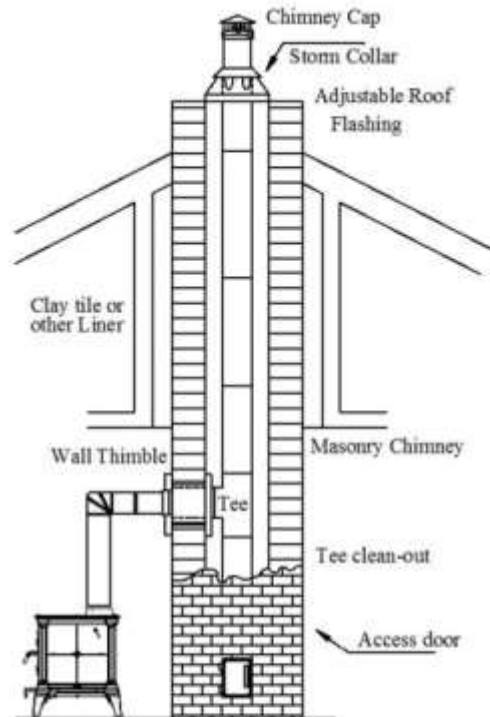


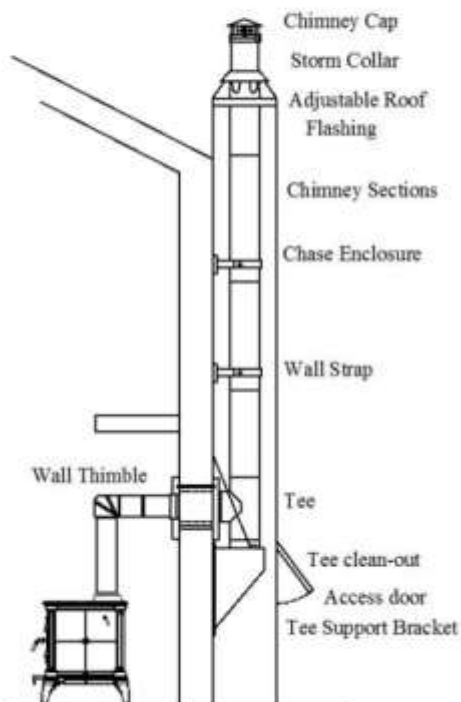
Figure 8 – Chimney Height Requirements



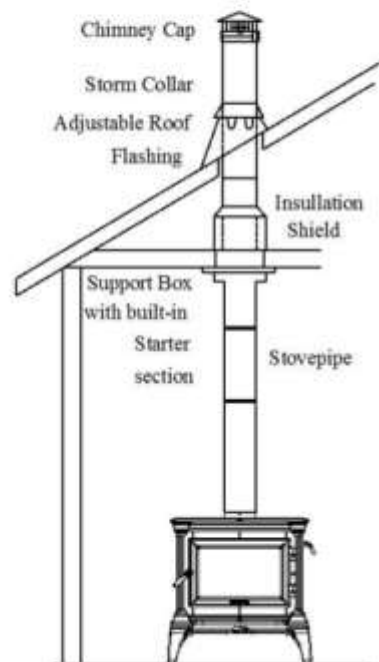
Two story house installation with attic.



Chimney pipe through Clay tile or other Lined Masonry Chimney



Chimney through outer wall with enclosed chase. Chimney is supported by Tee Support Bracket.



One story house installation with attic. Chimney is supported by Ceiling.

Figure 9 – Typical Chimney Configuration

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).

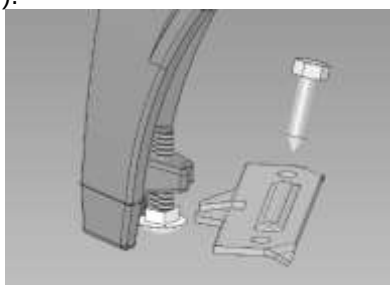


Figure 10 - Lock Down Detail

- Install a Mobile Home Chimney & Connector Kit conforming to US/UL103 or CAN/ULC-S629, Standard for Factory-Built Chimneys. The system must be removable for transportation and meet all applicable local and federal guidelines for termination height.

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.

- Failure to follow these instructions and specified components or using make-shift compromises can result in fire, property damage, bodily injury, and even death.
- **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.**
- 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)
- **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.
- Chimney must be attached directly to stove.
- Chimney must extend at least 3 feet (0.9 m) above the part of the roof through which it passes.
- Top of chimney must be at least 2 feet (0.6 m) above the highest required elevation of any part of the mobile home within 10 feet (3 m) of the chimney.
- All roof-chimney terminations must be readily removable and reinstallable at or below an elevation of 13-1/2 feet (4.1 m) above ground level, without the use of special tools or instructions.
- When the 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, a guard or other enclosure must be installed at the point of exit up to a height of 7 feet.
- For installations as described above, a chimney guard or enclosure must not permit a 3/4" (19.1 mm) diameter rod to pass through it, and must not allow a 1/2 inch (12.7 mm) rod to make contact with the chimney when passed through the guard a distance of 4 inches (102 mm).

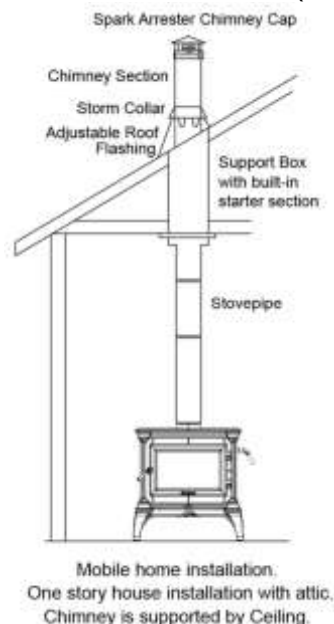


Figure 11 – Mobile Home Installation

OPERATION

Once your Heritage 8024 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 12). 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.

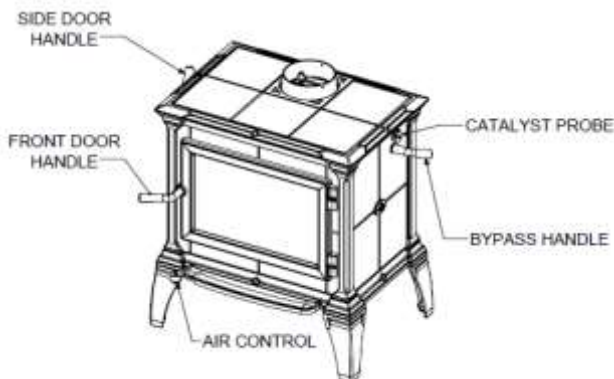


Figure 7 - Controls & Features

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 handle is located on the front lower left of the stove, just 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 and hotter the rate of burn; conversely, less air creates a slower burn. To fully open the primary air intake, move the handle as far as it will go to the left; move the handle as far as it will go to the right, to close the primary air control.

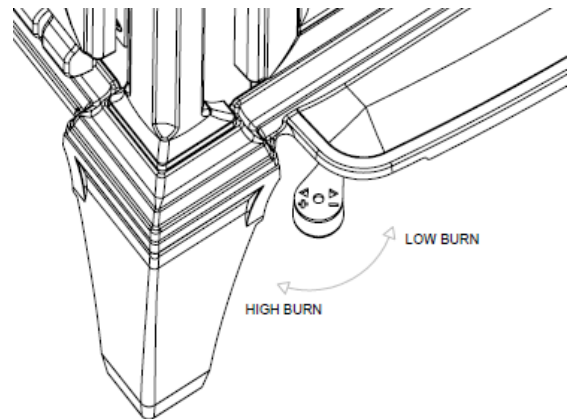


Figure 8 – Air Control

OPTIONAL ASH PAN: See the installation instructions included with the ash pan kit if installation is necessary. The ash pan collects burned ash from a fire and allows you to conveniently remove the ash from your wood stove. The ash pan and ash pan access door is located under the ash lip. To operate the ash grate, open the ash pan door, and simply pull the handle out to open the ash grate and push the handle in to close the ash grate. When the ash door is closed, it will automatically close the ash grate. (Refer to figure below to see the attachment of the ash grate control handle to the control slide.) The firebox should be cleared of ashes periodically by sliding the ash grate towards the front door, sifting the ashes across the grate into the ash pan, then returning the grate to its closed position.

The ash pan is easy to remove and has a handle for convenient disposal of ashes. Before removing the ash pan, push it (hard!) into the stove, which kicks the ashes further into the pan. To close the ash door, push the door closed and turn the handle from vertical down to its previous position. Note: The ash grate can only be opened when the ash door is ajar or open.

Do not operate the stove unless the ASH PAN is inserted into the stove and the ash door is closed. This could overheat and damage the stove.

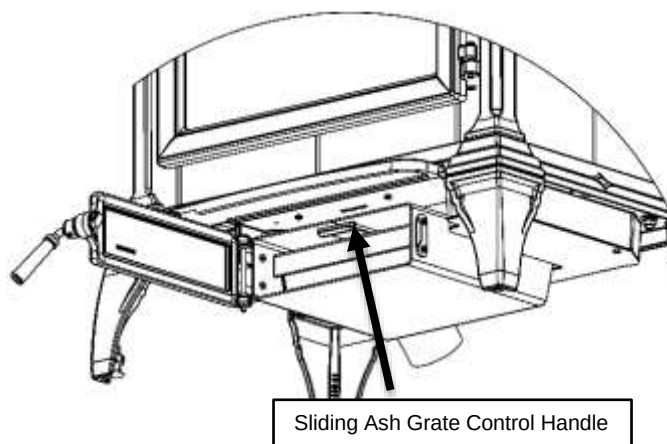


Figure 9 – Ash Grate Operation

CUSTOMIZING YOUR STOVE'S DOORS

Both the Front and optional Ashpan Doors can be reversed for loading and cleaning convenience (from hinged at the left to hinged at the right, for example).

Detailed instructions for reversing the Front Door are found with the installation instructions included with the optional Front Door Reversal Kit (90-73229). The kit includes a striker plate for latching the door on either the right or left side.

Detailed instructions for reversing the Ashpan Door are found with the installation instructions included with the optional Ashpan Kit (90-57220).

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 starting 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.

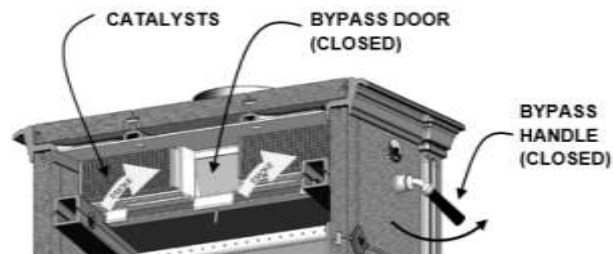


Figure 14 – Bypass Closed

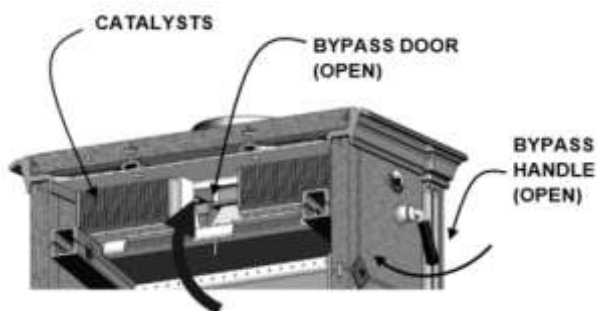


Figure 15 – Bypass Open

CATALYST PROBE: The catalyst probe monitors the downstream temperature of the catalyst, and indicates when the stove is in the active range for the catalyst. 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 probe is in the “Too Hot” range, keep the door closed, fully close the air control, and allow the stove to cool down until the probe falls into the “Active” Range. Once the catalyst probe has reached the active range, heat generated from burning smoke keeps the catalyst warm and active as long as fuel remains in the stove. The Heritage 8024 typically operates in the 800 °F to 1300 °F range.



Figure 16 – Catalyst Probe

CHOOSING FIREWOOD

Burn only natural firewood (known as cordwood) in the Heritage 8024 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 for your stove.

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.

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 after 10 to 20 minutes of operation. 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.

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 fully to the left stop.
- 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 sliding it fully to the left.
- 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 probe 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 catalyst reaches approximately 600 °F. Once catalyst reaches 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 Heritage 8024 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 °F (260°C), 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, catalyst, and fuel are all stabilized and at proper operating temperatures. Even though it is possible to have gas temperatures reach 500 °F (260°C) 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 catalyst warm and active as long as fuel remains in the stove. You stove will burn the cleanest and most efficiently when the catalyst is in the active range. There should be little to no visible smoke from your chimney when the catalyst is in the active zone and fully functional.

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 to the right. (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.

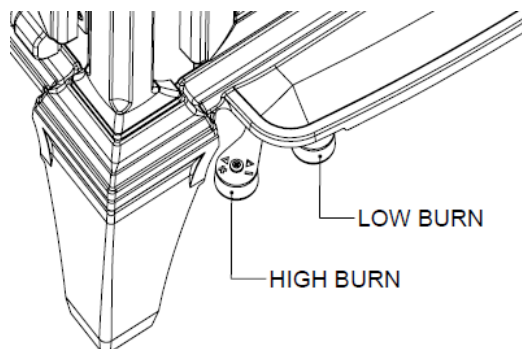


Figure 17 – Air Control Settings

MEDIUM BURN: Any setting from low to high will deliver varying rates of burn depending on the chimney setup, fuel and other local conditions. It is best to experiment to find the most comfortable setting for your situation.

HIGH BURN: Completely open the primary air control by moving it all the way to the left. 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.

OPEN DOOR BURNING: The Heritage 8024 is not intended to be burned with the door open. Burn your Heritage 8024 with the door closed only. Door may be left ajar for short periods as necessary for lighting.

CAUTION: Do not burn fuel other than cord wood 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 fuel and combustible material 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 CATALYTIC COMBUSTORS, WHICH NEED 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 ELEMENTS ARE DEACTIVATED OR REMOVED. DO NOT OPERATE YOUR STOVE WITH THE CATALYTIC ELEMENTS REMOVED.**

It is important to periodically monitor the operation of the catalytic combustors to ensure that they are functioning properly and to determine when they need 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 combustors 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 temperature probe 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 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 catalyst light-off has been

achieved, to the amount of smoke leaving the chimney when the smoke is not routed through the combustors (bypass mode).

1. Light stove in accordance with instructions in section 3.3.5.
2. With smoke routed through the catalyst, 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 CATALYST AND REMOVING/REPLACING THE BAFFLE

1. Allow the stove and ashes to fully cool.
2. Remove the metal baffle retainer by removing the cotter pin (A) through the front air tube, and lifting the retainer upwards (B) away from the baffle.
3. Gently pull the front baffle towards the front of the stove (C), over the front tube, and out of the stove.

CAUTION - Do not force the baffle out of the stove. Gently adjust the baffle orientation until it can be removed freely from the stove.

4. The middle air tube may be removed for easier access to the catalysts, but it is not required
5. To remove the middle tube, remove the cotter pin on the right-hand side of the middle air tube, and push the tube to the right until the left end is free. Tip the left side of the tube downwards and pull the tube out of the stove
6. Use a small vacuum nozzle or soft bristled brush to remove any accumulated ash or soot on the face of the catalyst.
7. Inspect the catalyst for any unusual warping, corrosion, or plugged openings
8. If any unusual conditions are found, remove the catalyst blocks – See Removing or Replacing the Catalysts.
9. Once the catalysts are inspected and cleaned, replace the middle air tube, baffle, and baffle retainer. Installation is the reverse of removal.

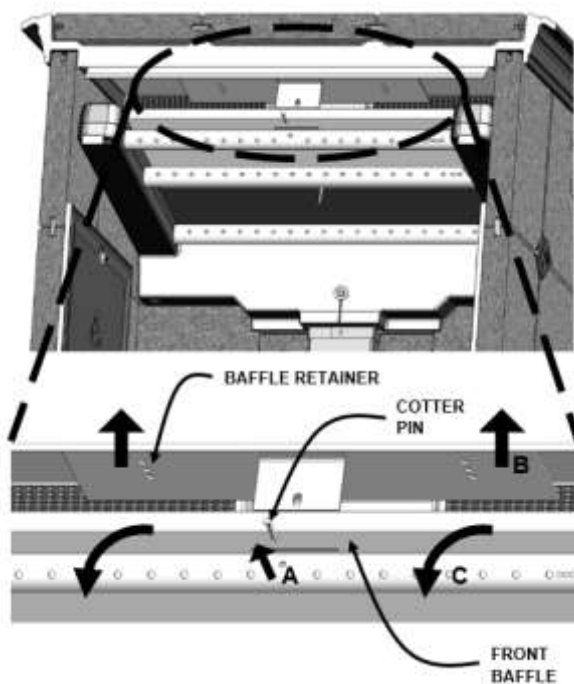


Figure 18 – Removing the Front Baffle

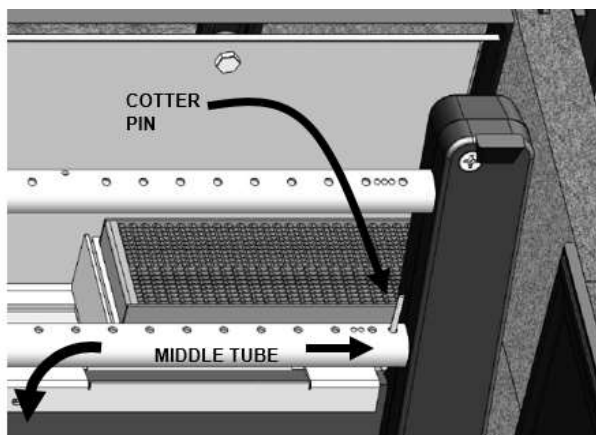
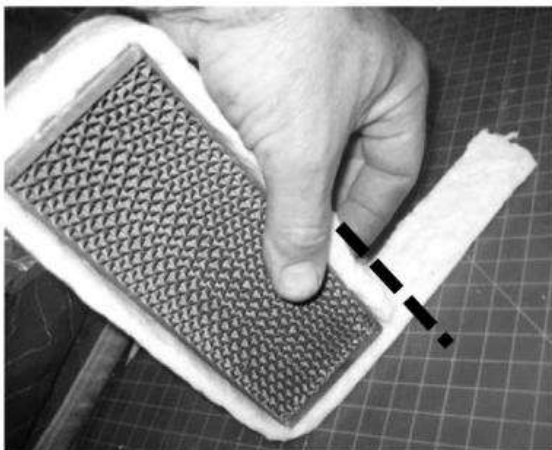


Figure 19 – Removing the Middle Air Tube



REMOVING OR REPLACING THE CATALYST

Refer to the Catalytic combustor warranty on page 35 for additional catalyst replacement information.

1. Allow the stove and ashes to fully cool.
2. Follow the procedures from "INSPECTING THE CATALYSTS AND REMOVING/REPLACING THE FRONT BAFFLE" to gain access to the catalysts.
3. Inspect the catalysts for visible damage or fly ash. If fly ash exists, gently brush the catalyst off with a narrow soft-bristle brush, or vacuum with a crevice tool.
4. If excessive fly ash exists, or if there are suspected catalyst performance issues, fully remove the catalysts by gently pulling the catalysts outwards towards the front of the stove. It may be necessary to gently rock the catalysts from side to side and top to bottom while pulling outwards to free the catalysts from the opening. Save gasket material for reinstallation. If gasket material is damaged, it will need to be replaced (Kit number 90-58313).
5. Remove any remaining gasket material from the openings and from the catalysts.
6. 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.

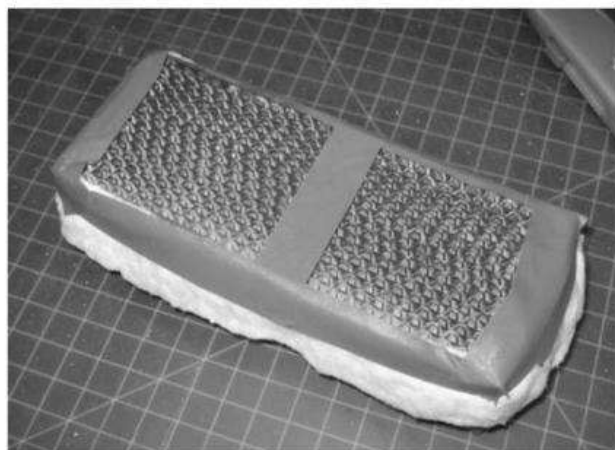


Figure 20 – Installing Gasket on Catalyst

7. Re-install ceramic wool gasket material on the catalysts. Keep the gasket material flush with one side of the catalyst. Masking tape can be used to hold the gasket in place on the catalyst. It will burn away when the stove gets hot. Wrap the tape around the gasket and catalyst so it is reasonably tight and some of the tape side is hanging over the edge of the catalyst, all around. Fold the edges of the tape in over the catalyst face. Finally add 3 smaller strips of tape as shown to hold gasket snug at ends and in the middle. This will reduce snagging and make it easier to reinstall the catalyst.
8. 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 – See replacing the catalysts.
9. Some warping or bowing of the catalysts over time is acceptable, as long as the catalyst gasket continues to seal. Measure the catalyst in the middle section – if the dimensions are outside the range shown in Figure 21 above, replace the catalyst.
10. Once the gasket is installed on the catalysts, gently push the catalyst into the catalyst opening until the catalyst hits against the back wall of the cavity. Take care to ensure the gasket is not damaged.

REMOVING/REPLACING THE REAR BAFFLE

1. Allow the stove and ashes to fully cool.
2. Follow the procedures from “INSPECTING THE CATALYSTS AND REMOVING/REPLACING THE FRONT BAFFLE” to remove the front baffle.
3. Remove the cotter pin securing the rear baffle support to the catalyst housing (A). See Figure 22.
4. Support the rear baffle while pulling the rear baffle support outwards towards the front of the stove (B)
5. Remove the rear baffle.
6. Installation is the reverse of removal.
7. Allow the stove and ashes to fully cool.
8. Follow the procedures from “INSPECTING THE CATALYSTS AND REMOVING/REPLACING THE FRONT BAFFLE” to remove the front baffle.
9. Remove the cotter pin securing the rear baffle support to the catalyst housing (A)
10. Support the rear baffle while pulling the rear baffle support outwards towards the front of the stove (B)
11. Remove the rear baffle.
12. Installation is the reverse of removal.
13. Allow the stove and ashes to fully cool.
14. Follow the procedures from “INSPECTING THE CATALYSTS AND REMOVING/REPLACING THE FRONT BAFFLE” to remove the front baffle.
15. Remove the cotter pin securing the rear baffle support to the catalyst housing (A)
16. Support the rear baffle while pulling the rear baffle support outwards towards the front of the stove (B)
17. Remove the rear baffle.
18. Installation is the reverse of removal.

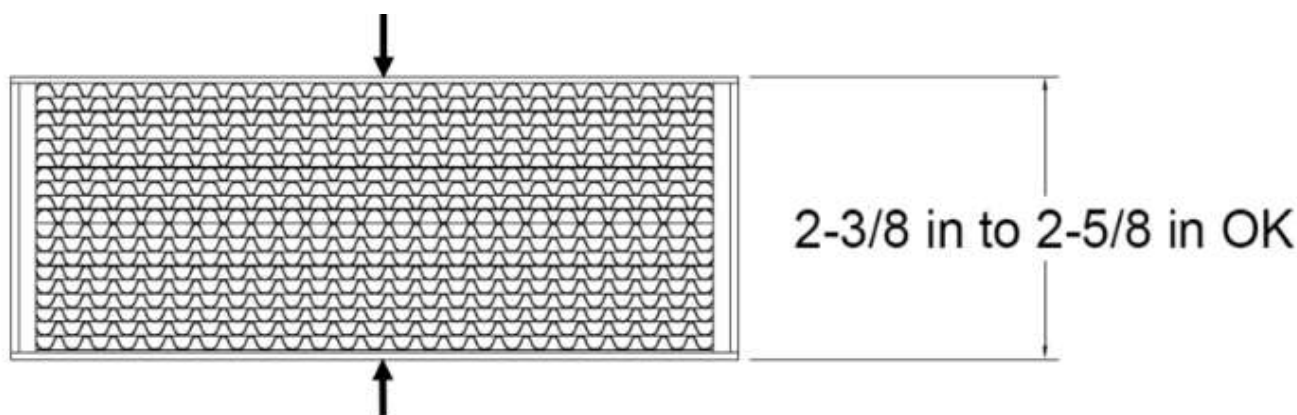


Figure 21 - Acceptable Catalyst Distortion

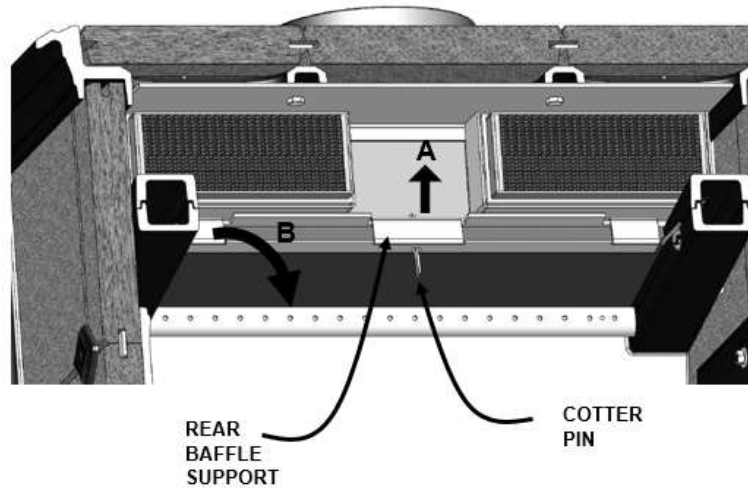


Figure 22 - Removing the Rear Baffle

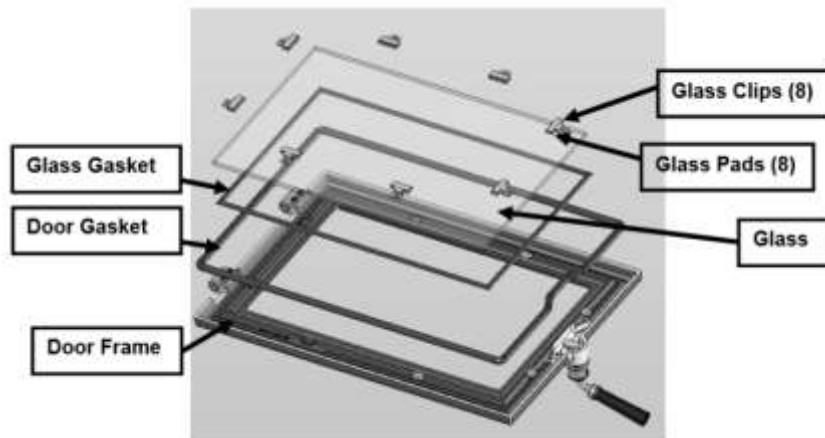


Figure 23 – Glass and Gasket Replacement

GLASS REPLACEMENT PROCEDURES

- **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 retainer (use penetrating oil if necessary) – lift the retainer off the glass. Set aside for reinstallation.
4. Carefully lift the damaged glass out of 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. Place the new glass onto the door. **Ensure sticker indicating the coated side is on the exterior face of the glass.**
8. **Important! Center the glass** and ensure that the edges of the glass are parallel with the edges of the opening.
9. 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.

10. Apply a light film of anti-seize lubricant on the door's hinge pins if needed.
11. Install the door.
12. After 5 or 6 fires, check the glass retainer screws, and retighten if necessary.

Required Glass Kit: Part Number: 90-58215. Use only 5mm x 287mm x 457mm Ceramic IR, or Neoceram IR 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 than 1/4" (6 mm) accumulates, remove it to reduce the risk of a chimney fire.

PREVENTION

Burn the stove with the primary air control fully open for 35 - 45 minutes daily to burn out creosote deposits from within the stove and the venting system.

After reloading with wood, burn the stove with the primary air control fully open for 15 to 20 minutes. This manner of operation ensures early engagement of the secondary combustion system that minimizes creosote buildup in the chimney.

If your glass always remains dirty, your operating temperatures are too low or your wood is wet; therefore, there is a higher risk of creosote buildup.

Inspect the venting system at the stove connection *and* at the chimney top. Cooler surfaces tend to build creosote deposits faster, so it is important to check the chimney at the top (where it is coolest) as well as from the bottom near the stove.

CLEANING

Remove accumulated creosote with a cleaning brush specifically designed for the type of chimney in use. We recommend you use a certified chimney sweep to perform this service. Contact your dealer for the name of a certified chimney sweep in your area (your dealer may be a certified sweep!).

We recommend that before each heating season you have the entire system professionally inspected, cleaned and repaired, if necessary.

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: 90-58215.

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 catalyst is in the active range.
	Catalyst not functioning	Inspect catalyst for damage, ash build-up, or plugging. Brush catalyst 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 <u>at least</u> 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.

ADDITIONAL CATALYST TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTIONS
FLY ASH BUILD UP ON CATALYST	Catalyst has 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
CATALYST PLUGGING OR MASKING (SOOT/CRESOTE)	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 catalyst is well within the operating range before closing the bypass. Continue to run the stove at a high temperature for one hour, while ensuring the catalyst stays in the upper operating range, but not too hot.
WARPING OR BOWING OF THE CATALYST	Excessive catalyst temperatures for long periods of time.	Ensure that the catalyst remains in the operating zone, and does not get too 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
5030-045	Hinge Bushing
5022-028	Hinge Pin
5022-026	Hinge Plate
5021-041	Secondary Combustion Tube #1
5024-042	Secondary Combustion Tube #2
5024-043	Secondary Combustion Tube #3
5210-2330	Tie Rod
7200-525	Catalyst Temperature Probe
	REPLACEMENT KITS AND ACCESSORIES
90-57210	BLOWER KIT
90-53220	OUTSIDE AIR KIT
90-68210	REAR HEAT SHIELD KIT
90-58230	GASKET KIT
90-58215	GLASS KIT
90-71240	DOOR HANDLE KIT
90-73240	DOOR LATCH KIT
90-70210	SIDE DOOR LOCK KIT
90-76240	BAFFLE KIT
90-58313	CATALYST REPLACEMENT KIT

Refer to the Illustrated Parts list for further detail about stove components, available online at www.hearthstonestoves.com.

SAFETY LABEL (FRONT)

CONTACT YOUR LOCAL BUILDING OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA.

Listed Room Heater, Solid Fuel Type

Also Suitable for Mobile Home Installation Pursuant to (UM)84-HUD

Manufactured by: **HERITAGE IV**
MODEL NUMBER: 8024
SERIAL: _____

Conforms to UL Std. 1482
 Certified to ULC Std. 5627

WARNINGS:

Do not use grade or elevate fire. Build wood fire directly on hearth. Do not overfire. If the heater or chimney connector glows, you are overfiring. (See Operator's Manual)

OPERATE ONLY WITH DOORS CLOSED. DO NOT OBSTRUCT SPACE UNDER HEATER.

TYPE OF FUEL: CORD WOOD ONLY - BURNING FUELS OTHER THAN CORDWOOD MAY DAMAGE THE APPLIANCE

"PREVENT HOUSE FIRES"

Install and use only in accordance with manufacturer's installation instructions and your local building codes.

CAUTION: Special methods are required when passing chimney through a wall or ceiling, refer to local building codes. Do not connect this unit to a chimney flue serving another appliance.

NOTE: Replace glass only with form ceramic glass.

This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information.

It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

WARNING: (Mobile Home) An outside air inlet must be provided for combustion and be unrestricted while the unit is in use.

THIS APPLIANCE USES A CATALYTIC COMBUSTOR (PIN WF-4150001076). The performance of the catalytic device or its durability has not been evaluated as part of the certification.

CAUTION: Burning materials other than the specified fuels may make the catalyst inactive.

CAUTION:
 HOT WHILE IN OPERATION.
 DO NOT TOUCH.
 KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY.
 CONTACT MAY CAUSE SKIN BURNS.
 SEE NAMEPLATE AND INSTRUCTIONS.
 INSPECT AND CLEAN CHIMNEY AND CONNECTOR FREQUENTLY.
 UNDER CERTAIN CONDITIONS OF USE, CREOSOTE BUILDUP MAY OCCUR RAPIDLY.

Clearance to Combustibles*

Floor Protection*

US: E 37" F 16" G 31-1/2" H 8"
 CAN: J 520 cm K 21 cm L 48 cm M 105 cm

Floor Protection and Minimum Clearance to Combustible Materials*

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater, and extend at least 18" (46cm) [18" (46cm) CAN] to the front and 8" (21cm) beyond each side of the fuel loading and ash removal openings [side of stove in CAN], the floor protection must extend under flue connector and extend 2" beyond each side of pipe.

VENT REQUIREMENTS: 8" diameter, single wall, minimum 24 MSG blue steel connector with listed factory-built Type HT chimney or masonry chimney.

OPTIONAL COMPONENTS:

Rear Heatshield	Part #90-68210	*Refer to the installation Manual for additional clearance information, installation instructions, and operating instructions.
Blower Kit	Part #90-57210	
Outside Air Kit	Part #90-53220	
Side Door Lock Kit	Part #90-70210	

U.S. ENVIRONMENTAL PROTECTION AGENCY
 Particulate Emissions: 0.54 g/hr. Tested to: EPA Method 28R
 Certified to comply with 2020 CRB wood particulate emission standards.

Date of Manufacture

DO NOT REMOVE OR COVER THIS LABEL. MADE IN USA. 3300-753

CONTACTEZ LES AUTORITÉS RESTRICTIONS ET L'INSPECTION LOCALES DES VOTRE INSTALLATION

Poêle à bois recommandé pour chauffage de pièce, utilisant un combustible solide

Convient aussi pour maisons mobiles conformes à la norme (UM)84 HUD

Manufactured by: **HERITAGE IV**
MODEL NUMBER: 8024
SERIAL: _____

Conforms to UL Std. 1482
 Certified to ULC Std. 5627

ATTENTION:

N'utilisez pas de grille surélevée pour alimenter le feu. Faites le feu directement dans l'âtre. Ne surchauffez pas le poêle.

Si le poêle ou la cheminée devient rouge, vous surchauffez. (Voir le manuel de l'opérateur)

UTILISER SEULEMENT LES PORTES FERMÉES. NE PAS OBSTRUER L'ESPACE SOUS LE POÊLE.

COMBUSTIBLE: Bûches de bois seulement - Les combustibles artificiels autres que cordwood peuvent endommager l'appareil.

"PRÉVENTION DES INCENDIES"

Installer et utiliser seulement en accord avec les instructions d'installation du fabricant et les codes locaux du bâtiment.

ATTENTION: Des méthodes spécifiques sont nécessaires pour faire passer la cheminée à travers un mur ou un toit. Référez aux codes locaux du bâtiment. Ne pas brancher cette unité à un conduit de cheminée desservant déjà un autre appareil.

NOTE: Remplacer la vitre seulement avec une vitre de CÉRAMIQUE de 5 mm.

Ce chauffe-bois nécessite une inspection et des réparations périodiques pour un bon fonctionnement. Consultez le manuel du propriétaire pour plus d'informations. Il est contraire aux règlements fédéraux d'utilisation de chauffe-bois d'une manière incompatible avec les instructions d'utilisation du manuel du propriétaire.

AVERTISSEMENT (MAISON MOBILE): Une prise d'air extérieure est nécessaire à la combustion et doit être effective sans restriction pendant que l'unité fonctionne.

ATTENTION

CHAUD QUAND IL EST EN MARCHE. NE PAS TOUCHER. TENIR LES ENFANTS, LES VÊTEMENTS ET MEUBLES ÉLOIGNÉS. LE CONTACT PEUT CAUSER DES BRULURES. VOIR LA PLAQUE SIGNALÉTIQUE ET INSTRUCTIONS. INSPECTER ET NETTOYER FRÉQUEMMENT LA CHEMINÉE ET LE CONDUIT DE RACCORDEMENT. DANS CERTAINES CONDITIONS D'UTILISATION, LE CRÉOSOTE PEUT SE FORMER RAPIDEMENT.

Protection du sol et dégagements minimum aux matériaux combustibles*

Voir l'autre côté de cette plaque signalétique pour les dessins des dégagements minimaux et de la protection du sol

Quand le poêle est installé sur un plancher combustible, une protection de plancher non combustible doit être installée pour couvrir la surface sous la poêle. Elle doit dépasser d'au moins 18" (46cm) [18" (46cm) CAN] le devant du poêle, et 8" (21cm) au-delà du dos et des côtés du poêle [côté du poêle en CAN], et déborder de 2" (5 cm) de chaque côté du tuyau de raccordement de la cheminée.

PIÈCES DE VENTILATION REQUISES:

Diamètre de 8" (15.2 cm), tuyau simple, minimum 24 MSG, tuyau de raccord en acier noir pour cheminée homologuée préfabriquée de type HT ou pour cheminée de maçonnerie.

COMPOSANTS OPTIONNELS:

Pare-chaleur de buse	Part #90-68210	* Référez au Manuel
Soufflerie	Part #90-57210	
Prise d'air extérieur	Part #90-53220	
Barrure de porte latérale	Part #90-70210	

AGENCE AMERICAINE DE PROTECTION DE L'ENVIRONNEMENT
 D'émissions des particules: 0.54 g/hr. Testé à: Méthode EPA 28R
 Certifié pour se conformer aux normes d'émission de particules de bois structurés 2020

NE PAS ENLEVER OU NE PAS COUVRIR CETTE ÉTIQUETTE
 FABRIQUÉ AUX ÉTATS-UNIS 3300-753



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 catalyst, 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.

12.50"

3.25"

1.625"

CONTACT YOUR LOCAL BUILDING OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA

Listed Room Heater, Solid Fuel Type

Also Suitable for Mobile Home Installation Pursuant to (UM)84-HUD

PFS

US

317 Stafford Ave.

Morrisville VT 05661

Manufactured by:

hearthstone

317 Stafford Ave.

Morrisville VT 05661

MODEL NAME:

HERITAGE IV

MODEL NUMBER:

8024

SERIAL:

Conforms to UL Std. 1482

Certified to ULC Std. S627

WARNINGS

Do not use grate or elevate fire. Build wood fire directly on hearth. Do not overfire. If the heater or chimney connector glows, you are overfiring. (See Operator's Manual)

OPERATE ONLY WITH DOORS CLOSED. DO NOT OBSTRUCT SPACE UNDER HEATER.

TYPE OF FUEL: CORD WOOD ONLY - BURNING FUELS OTHER THAN CORDWOOD MAY DAMAGE THE APPLIANCE

"PREVENT HOUSE FIRES"

Install and use only in accordance with manufacturer's installation instructions and your local building codes.

CAUTION: Special methods are required when passing chimney through a wall or ceiling, refer to local building codes. Do not connect this unit to a chimney flue serving another appliance.

NOTE: Replace glass only with 5mm ceramic glass.

This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information.

It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

WARNING: (Mobile Home) An outside air inlet must be provided for combustion and be unrestricted while the unit is in use.

THIS APPLIANCE USES A CATALYTIC COMBUSTOR (P/N WF-4150001076)

The performance of the catalytic device or its durability has not been evaluated as part of the certification

CAUTION: Burning materials other than the specified fuels may make the catalyst inactive

Clearance to Combustibles*

REAR WALL

STOVE

A - 16"

B - 18"

C - 22"

D - 28"

Floor Protection*

STOVE

E

F, L

G, M

H

I

J

K

US: E 37" F 16" G 31-1/2" H 8"

CAN: I 21 cm J 120 cm K 21 cm L 46 cm M 105 cm

Floor Protection and Minimum Clearance to Combustible Materials*

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater, and extend at least 16"(41cm) [18" (46cm) CAN] to the front and 8"(21cm) beyond each side of the fuel loading and ash removal openings [side of stove in CAN], the floor protection must extend under flue connector and extend 2" beyond each side of pipe.

VENT REQUIREMENTS: 6" diameter, single wall, minimum 24 MSG blue steel connector with listed factory-built Type HT chimney or masonry chimney.

OPTIONAL COMPONENTS:

Rear Heatshield Part #90-68210

Blower Kit Part #90-57210

Outside Air Kit Part #90-53220

Side Door Lock Kit Part #90-70210

*Refer to the installation Manual for additional clearance information, installation instructions, and operating instructions.

U.S. ENVIRONMENTAL PROTECTION AGENCY

Particulate Emissions: 0.54 g/hr. Tested to: EPA Method 28R

Certified to comply with 2020 crib wood particulate emission standards.

Date of Manufacture

2019

2020

2021

2022

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

DO NOT REMOVE OR COVER THIS LABEL

MADE IN USA

3300-753

3.25"

1.625"

CONTACTEZ LES AUTORITÉS RESTRICTIONS ET L'INSPECTION LOCALES DES VOTRE INSTALLATION

Poêle à bois recommandé pour chauffage de pièce, utilisant un combustible solide

Convient aussi pour maisons mobiles conformes à la norme (UM)84 HUD

PFS

US

317 Stafford Ave.

Morrisville VT 05661

Manufactured by:

hearthstone

317 Stafford Ave.

Morrisville VT 05661

MODEL NAME:

HERITAGE IV

MODEL NUMBER:

8024

SERIAL:

Conforms to UL Std. 1482

Certified to ULC Std. S627

N'utilisez pas de grille surelevée pour alimenter le feu. Faites le feu directement dans l'âtre. Ne surchauffez pas le poêle.

Si le poêle ou la cheminée devient rouge, vous surchauffez. (Voir le manuel de l'opérateur)

UTILISER SEULEMENT LES PORTES CLOSES. NE PAS OBSTRUER L'ESPACE SOUS LE POÊLE.

COMBUSTIBLE: BÛCHES DE BOIS SEULEMENT - LES COMBUSTIBLES ARTIFICIELS AUTRES QUE CORDWOOD PEUVENT ENDOMMAGER L'APPAREIL

"PRÉVENTION DES INCENDIES"

Installer et utiliser seulement en accord avec les instructions d'installation du manufacturieret les codes locaux du bâtiment.

ATTENTION: Des méthodes spécifiques sont nécessaires pour faire passer la cheminée à travers un mur ou un toit. Référer aux codes locaux du bâtiment. Ne pas brancher cette unité à un conduit de cheminée desservant déjà un autre appareil.

NOTE: Remplacer la vitre seulement avec une vitre de CÉRAMIQUE de 5 mm.

Ce chauffe-bois nécessite une inspection et des réparations périodiques pour un bon fonctionnement. Consultez le manuel du propriétaire pour plus d'informations.

Il est contraire aux règlements fédéraux d'utilisation ce chauffe-bois d'une manière incompatible avec les instructions d'utilisation du manuel du propriétaire.

AVERTISSEMENT (MAISON MOBILE): Une prise d'air extérieur est nécessaire à la combustion et doit être effective sans restriction pendant que l'unité fonctionne.

CET APPAREIL UTILISE UN COMBUSTE CATALYTIQUE (Part # WF-4150001076)

La performance du dispositif catalytique ou sa durabilité n'a pas été évaluée dans le cadre de la certification

ATTENTION: les matériaux brûlants autres que les carburants spécifiés peuvent rendre le catalyseur inactif

ATTENTION

CHAUD QUAND IL EST EN MARCHÉ. NE PAS TOUCHER. TENIR LES ENFANTS, LES VETEMENTS ET MEUBLES ÉLOIGNÉS. LE CONTACT PEUT CAUSER DES BRULURES. VOIR LA PLAQUE SIGNALÉTIQUE ET INSTRUCTIONS. INSPECTER ET NETTOYER FRÉQUEMMENT LA CHEMINÉE ET LE CONDUIT DE RACCORDEMENT. DANS CERTAINES CONDITIONS D'UTILISATION, LE CRÉOSOTE PEUT SE FORMER RAPIDEMENT.

Protection du sol et dégagements minimum aux matériaux combustibles*

Voir l'autre côté de cette plaque signalétique pour les dessins des dégagements minimaux et de la protection du sol

Quand le poêle est installé sur un plancher combustible, une protection de plancher non combustible doit être installée pour couvrir la surface sous la poêle. Elle doit dépasser d'au moins 16"(41cm) [18"(46cm) CAN] le devant du poêle, et 8" (21cm) au-delà du dos et des côtés du poêle [côté du poêle en CAN], et déborder de 2" (5 cm) de chaque côté du tuyau de raccordement de la cheminée.

PIÈCES DE VENTILATION REQUISES:

Diamètre de 6" (15,2 cm), tuyau simple, minimum 24 MSG, tuyau de raccord en acier noir pour cheminée homologuée préfabriquée de type HT ou pour cheminée de maçonnerie.

COMPOSANTS OPTIONNELS:

Pare-chaleur de buse Part #90-68210

Soufflerie Part #90-57210

Prise d'air extérieur Part #90-53220

Barrure de porte latérale Part #90-70210

* Référer au Manuel

AGENCE AMÉRICAINNE DE PROTECTION DE L'ENVIRONNEMENT

D'émissions des particulates: 0.54 g/hr. Testé à: Méthode EPA 28R

Certifié pour se conformer aux normes d'émission de particules de bois structuré 2020

NE PAS ENLEVER OU NE PAS COUVRIR CETTE ÉTIQUETTE

FABRIQUÉ AUX ÉTATS-UNIS

3300-753

SIDE 1

SIDE 2

1.) LABEL WILL BE BLACK WITH SILVER LETTERS

2.) LABEL WILL BE .020 ALUMINUM

3.) SERIALIZE LABELS

4.) (1) Ø.170 CABLE MOUNTING HOLE

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: CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE		HERITAGE 4 8024 Safety Rating Label SIZE A DWG. NO. 3300-753 REV. 0 SCALE NONE SHEET 1 OF 1	
	TOLERANCES ARE:			
	FRACTIONS DECIMALS ANGLES			
	± 1/64 .XX± .015 ±1/4°			
	.XXX±.005			
1.) DIMENSIONS ARE IN INCHES / MM	APPROVALS	DATE	CFM	10/02/2018
	DRAWN			
	CHECKED			
	RESP ENG			
	MFG ENG			
2.) ALL MACHINED SURFACES TO BE DE-BURRED AND SMOOTHED	QUAL ENG			
DO NOT SCALE DRAWING				

APPENDIX 13: Operating instruction



MODEL: 8024

DATE: 9/10/2018

TEST ENGINEER: CFM

WOOD STOVE OPERATING INSTRUCTIONS

BURN RATE CATEGORY	KINDLING	WARM UP AND PREBURN	PREBURN START	AIR SETTINGS	TEST FAN SETTING	COAL BED PREP	TEST LOAD	START OF TEST
LOW 0.80 - 0.95 KGH	5.5 LBS, BURN 10-15 MINUTES OR UNTIL FULLY INVOLVED, DOOR OPEN 1/2"	SEE FIGURE 1 FOR SIZES AND WEIGHT RANGE, KEEP DOOR OPEN 1/2" 20 MINUTES OR UNTIL FULLY INVOLVED, BURN TO PREBURN START WEIGHT	1.5 LBS ABOVE COAL BED RANGE, CLOSE BYPASS, SET PRIMARY AIR TO TEST SETTING	WARMUP SET AIR TO FULL OPEN, AT PREBURN START SET AIR TO 1/8"	WARMUP: OFF PREBURN: ON (LOW) FIRST 30 MIN OF TEST: OFF TEST: ON (LOW)	2 MIN BEFORE START OF TEST BREAK UP COALS TO APPX 2" - 3", MAKE EVEN DENSITY AND HEIGHT, KEEP LPAO CLEAR OF COALS	SEE FIGURE 2 FOR SIZE AND NUMBER OF PIECES 15.3 LBS IDEAL	OPEN BYPASS AND PRIMARY, INSERT WOOD PRESSING SPACERS INTO COAL BED, CLOSE LOAD DOOR AND BYPASS, @ 5 MIN SET PRIMARY TO 1/8", KEEP LPAO CLEAR OF COALS IN FRONT OF TEST LOAD
MEDIUM-LOW 1.0 - 0.1.2 KGH	5.5 LBS, BURN 10-15 MINUTES OR UNTIL FULLY INVOLVED, DOOR OPEN 1/2"	SEE FIGURE 1 FOR SIZES AND WEIGHT RANGE, KEEP DOOR OPEN 1/2" 20 MINUTES OR UNTIL FULLY INVOLVED, BURN TO PREBURN START WEIGHT	2 LBS ABOVE COAL BED RANGE, CLOSE BYPASS, SET PRIMARY AIR TO TEST SETTING	WARMUP SET AIR TO FULL OPEN, AT PREBURN START SET AIR TO 3/16"	WARMUP: OFF PREBURN: ON (LOW) FIRST 30 MIN OF TEST: OFF TEST: ON (LOW)	2 MIN BEFORE START OF TEST BREAK UP COALS TO APPX 2" - 3", MAKE EVEN DENSITY AND HEIGHT, KEEP LPAO CLEAR OF COALS	SEE FIGURE 2 FOR SIZE AND NUMBER OF PIECES 15.3 LBS IDEAL	OPEN BYPASS AND PRIMARY, INSERT WOOD PRESSING SPACERS INTO COAL BED, CLOSE LOAD DOOR AND BYPASS AND @ 5 MIN SET PRIMARY TO 3/16", KEEP LPAO CLEAR OF COALS IN FRONT OF TEST LOAD
MED HIGH 1.4 KGH	5.5 LBS, BURN 10-15 MINUTES OR UNTIL FULLY INVOLVED, DOOR OPEN 1/2"	SEE FIGURE 1 FOR SIZES AND WEIGHT RANGE, KEEP DOOR OPEN 1/2" 20 MINUTES OR UNTIL FULLY INVOLVED, BURN TO PREBURN START WEIGHT	4.5 LBS ABOVE COAL BED RANGE, CLOSE BYPASS, SET PRIMARY AIR TO TEST SETTING	WARMUP SET AIR TO FULL OPEN, AT PREBURN START SET AIR TO 1/2"	WARMUP: OFF PREBURN: ON (LOW) FIRST 30 MIN OF TEST: OFF TEST: ON (LOW)	2 MIN BEFORE START OF TEST BREAK UP COALS TO APPX 2" - 3", MAKE EVEN DENSITY AND HEIGHT, KEEP LPAO CLEAR OF COALS	SEE FIGURE 2 FOR SIZE AND NUMBER OF PIECES 15.3 LBS IDEAL	OPEN BYPASS AND PRIMARY, INSERT WOOD PRESSING SPACERS INTO COAL BED, CLOSE LOAD DOOR. CLOSE BYPASS @ 5 MIN SET PRIMARY TO 1/2", KEEP LPAO CLEAR OF COALS IN FRONT OF TEST LOAD
HIGH 2+ KGH	5.5 LBS, BURN 10-15 MINUTES OR UNTIL FULLY INVOLVED, DOOR OPEN 1/2"	SEE FIGURE 1 FOR SIZES AND WEIGHT RANGE, KEEP DOOR OPEN 1/2" 20 MINUTES OR UNTIL FULLY INVOLVED, BURN TO PREBURN START WEIGHT	9 LBS ABOVE COAL BED RANGE, CLOSE BYPASS	WARMUP SET AIR TO FULL OPEN, AT PREBURN START SET AIR TO FULL OPEN (1-1/2")	WARMUP: OFF PREBURN: ON (HIGH) FIRST 30 MIN OF TEST: OFF TEST: ON (HIGH)	2 MIN BEFORE START OF TEST BREAK UP COALS TO APPX 2" - 3", MAKE EVEN DENSITY AND HEIGHT, KEEP LPAO CLEAR OF COALS	SEE FIGURE 2 FOR SIZE AND NUMBER OF PIECES 15.3 LBS IDEAL	OPEN BYPASS AND PRIMARY, INSERT WOOD PRESSING SPACERS INTO COAL BED, CLOSE LOAD DOOR. CLOSE BYPASS AND SET PRIMARY TO FULL OPEN, KEEP LPAO CLEAR OF COALS IN FRONT OF TEST LOAD

FIGURE 1: WARMUP/PREBURN LOAD CONFIGURATION

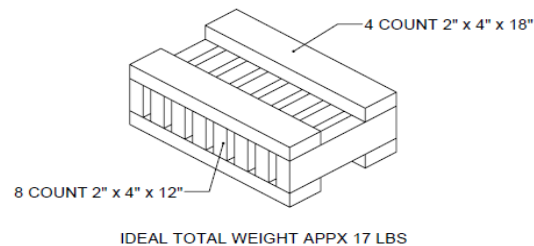


FIGURE 2: TEST LOAD CONFIGURATION

